A load management system for fixed appliances in a Safe DC RDP house

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Declaration

I, Kritzman Phillip Jooste, declare that the contents of this dissertation represent my own unaided work, and that the dissertation has not to my knowledge previously been submitted for academic examination towards any qualification. Furthermore, it represents my own opinions and not necessarily those of the Cape Peninsula University of Technology.

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Signed Date

Abstract

This dissertation represents the design and development of a load management system for fixed appliances in a safe direct current (DC) Reconstruction and Development Programme (RDP) house. A combination of valley filling, load shifting and peak clipping load management techniques were employed to assist in reducing the peaks observed in the RDP house load profile during peak hours.

A DC RDP house laboratory model was developed. The study is based on the assumption that the normally 220 V alternative current (AC) grid is replaced by a 350 V DC grid. The assumption is thus that 350 V DC is available at the distribution box in the RDP house laboratory model. All theoretical work was based on a 350 V DC system, but due to the lack of a laboratory 350 V DC supply, all physical tests were conducted by making use of a 300 V DC supply which was available. Consequently all calculations were thus based on 300 V DC as well.

The geyser was the main fixed appliance focused on since it contributes to a significant portion of the power used. An AC geyser was successfully modified in order to be used in the DC network. Safety of the system was considered in order to interrupt the power in case of overcurrent or to isolate the power. Electronic switches were also developed and implemented to ensure that the DC power could be safely switched on and off and that the low power DC was isolated from the high power DC.

LabVIEW allowed all other appliances in the DC RDP house to be virtually represented so that a holistic view of the power use of the house could be represented. This also allowed the system to be successfully simulated before any physical work was conducted.

The load management system was successfully implemented by making use of power line communication. This proved to be a cost effective means to apply the load management algorithm. The algorithm consisted mainly of power on / off instructions that were executed during peak and off-peak times. It follows the normal use of timers used in the AC system to help reduce demand.

It was found that the load management system successfully reduced the demand during peak hours without compromising the basic needs of the user. The power line communication modem proved to be very reliable in implementing the load management algorithm.

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List of Abbreviations

AC	– Alternating Current
ANC	– African National Congress
API	– Application Program Interface
CEO	– Chief Executive Officer
CFL	– Compact Fluorescent Light
CPUT	– Cape Peninsula University of Technology
CSMA/CA	– Carrier Sense Multiple Access with Collision Avoidance
DAQ	– Data Acquisition Device
DC	– Direct Current
DR	– Demand Response
DSM	– Demand Side Management
EEPROM	– Electrically Erasable Programmable Read Only Memory
ESKOM	– Electricity Supply Commission
FBE	– Free Basic Electricity
FEC	– Forward Error Correction
FSK	– Frequency Shift Keying
GND	– Ground
Hi-Fi	– High Fidelity
I2C	– Inter-Integrated Circuit
IAP	– Indoor Air Pollutants

IC	– Integrated Circuit
IEC	– International Electrotechnical Commission
IEE	– Institution of Electrical Engineers
IH	– Induction Heating
LED	– Light Emitting Diode
MAC	– Media Access Control
MATLAB	– Matrix Laboratory
OFDM	– Orthogonal Frequency Division Multiplexing
PLC	– Power Line Communication
PoE	– Power over Ethernet
PVC	– Photo Voltaic Cell
PWM	– Pulse Width Modulation
RDP	– Reconstruction and Development Programme
SABS	– South African Bureau of Standards
SANS	– South African National Standards
SCL	– Serial Clock
SDA	– Serial Data
SRAM	– Static Random Access Memory
TOU	– Time of Use
TTL	– Transistor-Transistor Logic
UART	– Universal Asynchronous Receiver / Transmitter

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Chapter 1

Introduction

The South African electrical distribution network has been under heavy strain due to the ever-increasing electricity demand. This has led to load shedding to avoid national blackouts. There is a need to bring the power generation and demand into balance. Measures have been introduced to change consumers' behaviour towards power use in terms of power saving and power management technologies, but these are not readily available to low income users (Ghaemi & Brauner, 2009).

An alternative way of distributing the power in a house other than the conventional Alternating Current (AC) method, can make energy saving and availability a reality for most domestic users. If most loads use Direct Current (DC) at the final stage, it makes sense to distribute the power in DC form (Shwehdi & Al Aqil, 2015).

If DC distribution grids are considered, it has the potential to facilitate the application of smart grid technologies. It has the potential of allowing DC sources and DC loads to be connected directly to the DC bus, eliminating the need to convert from DC to AC and vice versa. This reduces conversion steps and it removes the need to have frequency synchronisation. Power converters allow the system to be easily modified, which is essential to the implementation of smart grid applications. DC grids make more use of power converters than AC grids and with this in mind, smart grid technologies can be activated more in DC distribution grids, as power converters provide more controllability and ultimately, it is more suitable for the implementation of ICT-based smart grid applications, such as active demand side management (TUDelft, 2014).

1.1 Problem statement

South Africa's steady economic growth as it increasingly focuses on industrialisation, together with its mass electrification programme to take power into deep rural areas, resulted in a steep increase in the demand for electricity. Many initiatives have been introduced to bring the demand into balance with the power generated.

These include changing the consumer's behaviour, introducing power management and power saving technologies, and as a last resort, load shedding, where certain areas are removed from the grid, in order to put less strain on the grid and avoid a national blackout (CBi-electric, 2009; Ghaemi & Brauner, 2009; Shibata, et al., 2011; ESKOMHoldings, 2014).

The objective of this study is thus to investigate and develop a reliable, effective and automatic load management system, that will be applied to a 350 V DC Reconstruction and Development Programme (RDP) house in order to reduce strain on the national grid (Ekanayake, et al., 2012; Smart Home, 2014). In order to achieve this, the various parts to successfully implement the system needed to be investigated. These are discussed in the problem approach.

1.2 Problem approach

A thorough literature review was conducted into electrical safety standards, in order to determine which are applicable to residential houses. A two bedroom RDP house was selected as the basis for the study and the literature review focused mainly on the most commonly found appliances available in the house, in order to develop a load profile. Once the load profile was developed, a load management technique was implemented on a power line communication network selected for the DC system. The following research questions were investigated:

1) Can a 350 V DC test bench be developed for a DC house?
    a) What considerations are necessary to ensure Safety on a 350 V DC system?
    b) Can virtual appliances be developed to supplement real appliances that are not a necessary part of the study, however necessary when representing the house as a whole?
    c) Can a standard AC geyser be converted to a DC geyser?
2) Can a power line communication network be successfully implemented for this application?
    a) Will the selected power line communication system provide reliable communication?
3) Can an effective load management system be developed for this application?
    a) Can an effective valley filling technique be developed to "flatten" the electrical demand profile?
    b) Can the system effectively respond to the needs of the user?

The focus of this study thus revolved around a well-defined load profile of an RDP house, clearly defining all virtual and real appliances, selecting a reliable power line communication modem and implementing a suitable load management technique to effectively manage the demand safely.

1.3 Delineation of project

The study focused only on the following:

- A typical 40 m^2, two bedroom South African RDP house
- Simulated for DC only
- Control for the geyser in a laboratory environment
- Virtual appliances will be used to simulate the load demand of typical household appliances (excluding the geyser)

The study excludes the following:

- Low DC power
- Renewable technology like PVCs, etc.
- Kettle use for hot beverages

1.4 Outline of dissertation

The layout of the remaining part of this dissertation is as follows:

Chapter 2: This chapter covered the rationale behind why a DC network will be better suited to better manage demand side electricity. An RDP house is selected and the appliances in use in this house are highlighted. The load profile for this house will be defined. Common load management techniques are evaluated. Power line communication modems will be investigated. Simulation software for control and monitoring will be evaluated. The safety standards will be determined.

Chapter 3: This chapter covered the design specifications for the project. It includes all the design requirements, objectives as well as an overall block diagram.

Chapter 4: This chapter covered the development of each part of the system. Firstly is the development of the load profile based on the appliances and their quantity as found in the RDP house and the number of hours used per day.

A daily routine will be setup based on this information. Then a load management algorithm will be developed. The main techniques that will be focused on are peak clipping, valley filling and / or load shedding. This will then also be simulated.

Chapter 5: This chapter further covered the development of the system. The geyser will be modified from AC to DC and be connected to the load management system via power line communication. The main focus will be on controlling and monitoring the geyser and emulating the other appliances.

Chapter 6: This chapter covered all tests conducted and the results will be presented in the form of tables and graphs and will also include a thorough discussion of the results.

Chapter 7: This chapter is the concluding chapter of the study and includes recommendations and future work.

Chapter 2

Literature review

Briefly, the literature review included research into the reasons for and against AC and DC grids, typical RDP houses and their appliances, power line communication and available modems, as well as different load management techniques.

From the late 1880's when electricity was first discovered, the battle for the preferred current convention has been going on between Thomas Edison and George Westinghouse. Edison was in favour of DC power to be used for distribution and house use while Westinghouse promoted AC. What made AC more preferable at the time was that AC can be converted to different voltages by using transformers (Lantero, 2013). Transformers are used to step the voltage of AC power up or down. This saves money on conductor material if the power is distributed over long distances at a very high voltage. Due to the lack of power electronics at the time, DC power could not be manipulated easily into higher or lower voltages. With the technology currently available in the field of power electronics, energy can be saved by supplying residential houses with DC power (Fairley, 2012).

A lot of the challenges faced with the balance of power were the introduction of the Reconstruction and Development Programme (RDP) houses by the South African government. One of the key programmes of the RDP is to meet the basic needs of the people. These needs include but are not limited to jobs, land, housing, water and electricity (ANC, 1994). Between 1994 and 2001 more than 1 million houses had been built and during this same period more than 1.75 million houses were connected to the national grid. Apart from this, the proportion of rural homes with electricity grew from 12% to 42% (Lodge, 2003).

2.1 Reconstruction and Development Programme (RDP) House

RDP housing is aimed at providing low cost housing to South African families who are either unemployed or who earn a combined salary of R3500 or less per month. Many RDP houses are built on the outskirts of cities where larger portions of land are available at a lower cost (Greyling, 2009).

New houses consist of simple single storey structures large enough to house a single family. The first few housing projects were generally a two room brickwork structure with corrugated iron roof sheeting. Throughout the years however there have been improvements to the design of the house and five room brickwork structures with either corrugated iron roof sheeting or clay roof tiles are now available. Lights and electricity are supplied and a geyser is optional (Greyling, 2009). Figure 2.1 shows a typical two room RDP house.

Figure 2.1 Typical two bedroom RDP house (Moladi, 2017)

As can be seen from Figure 2.1, RDP housing is very basic. This one consists of two bedrooms, a sitting room, kitchen and toilet. It was developed to work towards providing basic needs to all South Africans (ANC, 2011). The introduction of these houses had a significant impact on the national electrical grid.

2.2 RDP houses use of electricity

In order to determine the impact the introduction of the RDP houses has on the national grid, it is important to establish what electricity is supplied and how this electricity is utilised. The 'blanket' electrification approach adopted by Eskom provides the house with a standard 20 A supply, including a pre-payment meter and a ready distribution board. This includes 50 kWh of free basic electricity (FBE). This electricity is primarily used for lighting, radios, television and refrigeration. A significant percentage of these electrified houses own electrical appliances such as hotplates, kettles, irons, refrigerators, televisions and radios/hi-fis. Ownership of electrical appliances does however not mean that these appliances are used on a regular basis.

There are various reasons for this which includes cost and usefulness, while many also consider the symbolic value of the appliance as important (Thom, 2000; Mokonese, et al., 2012).

Table 2.1 indicates the most common appliances owned and also indicates how often it is used.

Table 2.1 Appliances and their quantities in a two bedroom RDP house, including summer and winter average daily operation (Thom, 2000; Africa, et al., 2011; Mokonese, et al., 2012; Ijeoma & Okafor, 2014).

Product Name	Typical number of devices	Average Hours Operation (Summer)	Average Hours Operation (Winter)
Space heating	1	0.0	5.0
Lighting	5	5.0	8.0
Kettle	1	0.5	0.5
Cooking	1	1.0	1.0
Refrigeration	1	12.0	8.0
Geyser	1	4.00	6.00
TV	1	6.00	6.00
DVD	1	2.00	2.00
Hi-Fi	1	3.00	3.00
Cell phone	3	2.00	2.00
Fan	1	4.00	0.00

Electrified households commonly us electric lighting, but many houses continue to use other fuels, especially candles. Many houses own radios or hi-fis, but still choose to use batteries to operate them. A significant amount of households use electricity for cooking, but it is still not the main fuel for cooking. A significant percentage uses three fuels in combination for their energy needs, especially for cooking and water heating purposes. This includes electricity, coal and particularly paraffin. There are many reasons for this trend, but it is the view that paraffin is cheaper to use than electricity (Thom, 2000). Table 2.2 shows the percentage of houses that own certain appliances, in order to highlight the use of different fuels.

Table 2.2 Percentage of RDP houses that have the indicated appliances (SAARF, 2012; Dekenah, 2014)

Category	**Appliance**	**Percentage that do have**
Bathing	Geyser	1%
Laundry	Twin tub / Semi-automatic washing machine	1%
Cooking	Electric hotplate	68%
	Electric stove	27%
	Microwave oven	17%
	Coal or gas stove	12%
Refrigeration	Free standing deep freezer	4%
	Fridge / fridge-freezer	79%
Entertainment	DVD	39%
	Hi-Fi / Music centre	46%
	Home Theatre	9%
	TV	90%
	VCR	2%

Less than 1% of the houses use electric geysers, 68% use hot plates and 27% use electric stoves. The other percentage therefore makes use of alternative fuels for their cooking and water heating purposes.

The consumers obtain hot water by using an electric kettle, by heating a pot of water on a hotplate, or by heating a pot of water by means of fire ignited with traditional fuels like paraffin, wood or dung. This is very inefficient and dangerous to the consumer (Thom, 2000; Brighton, 2016; MarginUp, 2016).

2.2.1 RDP houses Electricity vs Traditional fuels

According to Thom (2000) by the end of 1999 more than half the rural households in South Africa were added to the grid. These consumers do own electrical appliances as described in Table 2.1, however in spite of this, not all consumers use them on a regular basis. Though electrified houses do have electric lighting, some consumers still prefer to use other fuels for lighting, such as candles; many prefer to use battery operated radios or hi-fis; and wood, paraffin and gas stoves are used as frequently as hotplates (Africa, et al., 2011; Keller, 2012).

Thom (2000) indicates that there are two major reasons why consumers acquire electrical appliances and these reasons are usefulness and cost and in some cases the appliances are of a symbolic value only. It is clear that only higher income groups use solely electricity for all their needs, while the lower income group, prefers to use both electricity and other fuels.

These fuels are mainly paraffin, gas, wood, coal and in some cases, dung (Thom, 2000; Africa, et al., 2011; Ijeoma & Okafor, 2014). Figure 2.2 indicates the fuels consumers would prefer to use in conjunction with electricity.

Figure 2.2 Alternative fuels are used for cooking and water heating purposes. These include the Isitofu (wood, dung, pellets), Paraffin (kerosene) heaters and wood or coal (Brighton, 2016; MarginUp, 2016).

Consumers prefer to use wood and paraffin rather than electricity for their cooking and hot water needs.

The main reason for this is that paraffin and wood is cheaper and consumers perceive electricity as expensive. Paraffin, for example, is also more convenient to buy, any quantity can be purchased and appliances are readily available (Africa, et al., 2011).

Hotplates are used to boil water, to make porridge and to drink coffee or tea in the mornings. It is also used for fast cooking vegetables, meat or soups for food in the evenings. For slow cooking food, as well as cooking large quantities of food, paraffin and wood are still preferred (Thom, 2000).

Two reasons why traditional fuels are preferred rather than electricity is the fact that consumers would prefer to have better control over the amount of electricity they use. Some say for instance that they would prefer to have coin operated electricity, so that they can see how much money they spend for the amount of electricity they use. Others say that the 50kWh monthly FBE supplied is simply insufficient, either resulting in more electricity needed to be purchased or as in most cases, alternative fuels are preferred (Ijeoma & Okafor, 2014).

2.2.2 Health and safety when using wood, paraffin and gas

When using alternative fuels such as candles, wood, paraffin and gas, the first major safety hazard is obviously fire. Fire resulting from candles that are knocked over, wood fires burning out of control, or paraffin or gas stoves that are knocked over (Africa, et al., 2011; Mokonese, et al., 2012).

According to Howell (2005) indoor exposure to particulate matter making use of traditional fuels for cooking and heating water causes more than 2 million deaths each year in developing countries. Figure 2.3 indicates the prevalence of energy-related injuries according to the Paraffin Safety Association of Southern Africa.

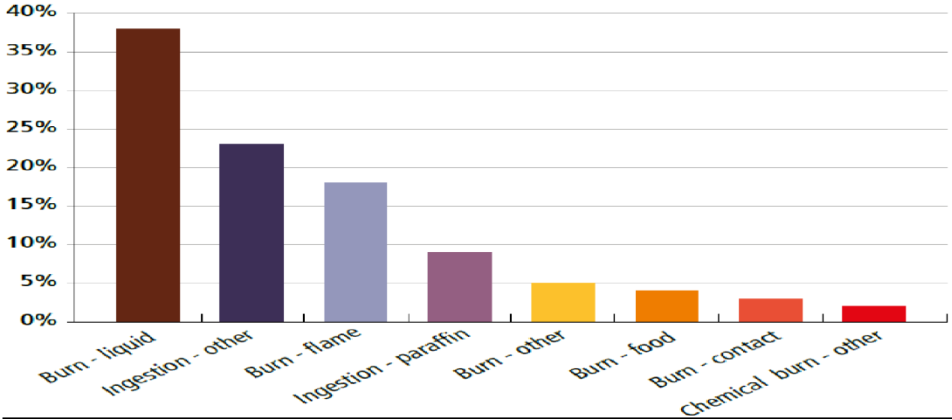

Figure 2.3 Prevalence of energy-related injuries (PASASA, 2012)

From Figure 2.3 it is observed that there are many injuries resulting from burns due to the use of traditional fuels. Hospitals in the Western Cape indicate that 12 – 25% of burn injuries were due to paraffin stoves and it was mostly urban poor children who were particularly vulnerable (Matzopoulos, 2005). Figure 2.4 is the result of a paraffin heater that was knocked over.

Figure 2.4 Fire as a result of paraffin heater. Either an unsafe device was used or it was knocked over (Lloyd, 2010).

As seen in Figure 2.4, within seconds the fire would blaze out of control. It might also be that the heater used did not comply with the new safety standards as indicated by (Howells, et al., 2005; Lloyd, 2010).

When heating water in a pot, irrespective of what fuel is used, there is always the risk that the pot might be knocked over accidentally by for instance a child. This could result in severe burns as well.

Another reason for fires is also that the 50 kWh FBE is limited to 10 A circuit breakers only. This results in power failures and thus dark nights when too many appliances are connected to the supply. This can lead to damage to appliances and also fires, because consumers are forced to use alternative fuels (Howells, et al., 2005; Mokonese, et al., 2012).

Many children are at risk of being poisoned when they ingest paraffin. Paraffin can usually be bought in small quantities in unmarked containers which children mistake for cooldrink. More than 54% of poison related cases at the King Mshinyeni Memorial Hospital in Durban were children under the age of two years old and poisoning due to ingestion of paraffin (Howells, et al., 2005; Keller, 2012). Figure 2.5 is an indication of age categories and amount of poison ingestions also as indicated by (PASASA, 2012).

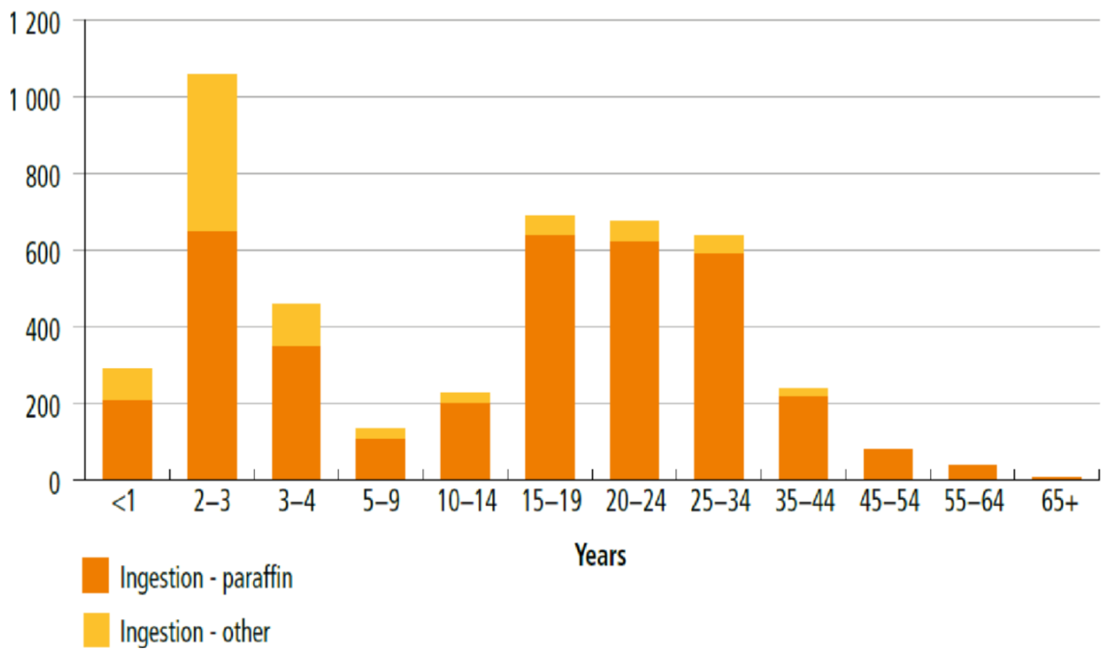

Figure 2.5 Age categories and poison ingestions (PASASA, 2012).

From Figure 2.5 it is observed that children from 0-3 years are the ones that are at a greater risk of accidental poisoning. This is followed by older children and young adults from 15-34 years of age (HESASA, 2016).

Another health concern is the formation of indoor air pollutants (IAP). Wood and paraffin fires are made inside the house and therefore pollute the air.

These pollutants may result in the following health related problems, namely:

- Chronic obstructive lung disease in adults,
- prenatal mortality,
- low birth weight,
- asthma, and
- cataracts (Africa, et al., 2011).

Educating people on the dangers of these traditional fuels as well as helping them to better understand electricity is very important.

2.2.3 Water heating

As seen in Table 2.2, less than 1% of the consumers make use of geysers. The consumers obtain hot water by using an electric kettle, by heating a pot of water on a hotplate, or by heating a pot of water by means of fire ignited with traditional fuels like paraffin, wood or dung.

This is very inefficient and dangerous. An alternative option available is to make use of solar water heaters. The South African government has initiated a solar water heater programme to provide solar heaters to these and other consumers (ESKOMHoldings, 2014; SADoE, 2014). A few disadvantages of these systems are that they have high installation costs and works optimally only when the sun shines. In overcast conditions, a back-up element starts up and the water heater works as a normal electric geyser (SolarHeart, 2007).

Thermal stratification is defined as the formation of different temperature layers at different depths of a body, such as a geyser tank, due to warm water leaving the tank and cold water entering the tank to replace the water that has been removed (Altuntop, et al., 2005; Han, et al., 2009; Spanggaard & Schwaner, 2015). Generally, as shown in Figure 2.6, water with different temperatures have different densities.

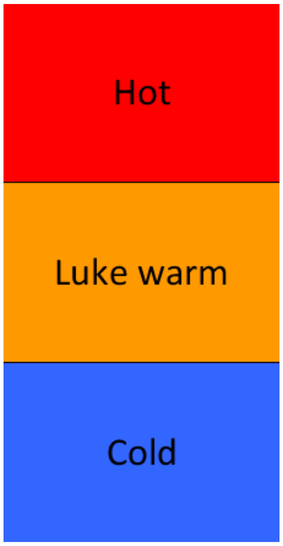

Figure 2.6 Thermal stratification of the geyser water (Chess, 2017)

Warm water is generally less dense and will accumulate at the top of the tank, while cold water is more dense and will accumulate at the bottom of the tank (Han, et al., 2009). Since there are definitely three distinct layers that will be formed, the use of several sensors are recommended in order to establish the temperature in the water accurately. The set point temperature of the geyser is determined by establishing the average temperature from the sensors (Harmelen, et al., 1994).

2.2.4 Safety

There are two safety aspects to consider for geysers, namely electrical safety, as well as thermal safety.

2.2.4.1 Electrical Safety

The South African Bureau of Standards (SABS) is a member of the International Electrotechnical Commission (IEC), therefore certain standards like the wiring of residential houses and those for geysers and refrigerators can be derived from there (SABS, 2012). SANS 10142 deals with the safety for geysers permanently connected to the wiring installation. SANS 10254 deals with the safety of the installation, maintenance, replacement and repair of fixed electric storage water heating systems.

Currently South Africa does not have DC standards for 350 V DC. There are however AC and other international DC standards that are available (IEE, 2004; IEC, 2005; SABS, 2012).

2.2.4.2 Thermal safety

Thermal safety refers to the minimum and maximum temperatures at which the geyser can operate without exposing the consumer to health risks. If the temperature of the geyser is too high, it can lead to burns. Many germs grow at cooler temperatures and that can also affect the user’s health (Walker, et al., 2003).

A definite minimum and maximum temperature thus have to be adhered to. The geyser comprises both safety in terms of health and the comfort of the user. The recommended temperature for geysers is between 55 and 60 degrees Celsius. Temperatures that are below 55 degrees Celsius may result in microbial growth (Kagande, et al., 2013). It is also important to ensure that the geyser temperature does not get too high to avoid calcification in the geyser and pipes.

Too high temperatures can result in skin burns, it can even cause an explosion and even loss of life (PowertimeAgent, 2013; Deist, 2016).

2.3 Load profile of RDP houses

With the supply of electricity and the way in which it is utilised established, a load profile will more clearly show how the RDP house impacts the national grid. A load profile will vary according to customer type (typical examples include residential, commercial and industrial), temperature and holiday seasons. Power producers use this information to plan how much electricity they will need to make available at any given time (Forlee, 1998). Figure 2.7 is an average load profile for an RDP house and a load profile for a small RDP community.

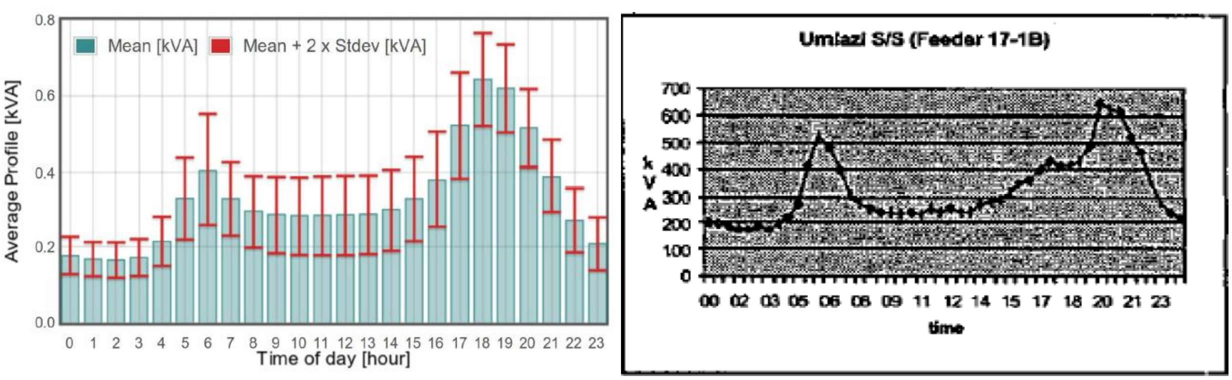

Figure 2.7 Average Profile for RDP in kVA (Dekenah, 2014) and a profile of 11kV feeder to Ethekwini residential load (Govender, et al., 2004).

As can be observed from Figure 2.7 there are two peaks. These are times when the grid is under strain and the power will need to be controlled and managed better. There are many suitable demand side management or load management schemes in use in the AC grid system that allows regulation of the power distributed.

2.4 Demand side management

There are various ways in which the increased demand for electricity can be compensated for, like by building a new plant or by installing some electric storage device fed from some renewable technology like solar panels. This is however costly and this is where demand side management (DSM) has the advantage. It is an inexpensive way to intelligently manipulate a load (Palensky & Dietrich, 2011).

DSM systems have been implemented in South Africa in order to reduce strain on the grid during peak hours, by making more efficient use of the available power.

According to Govender, Ramballee and Moodley (2004) tariffs have always been a good way to ensure that industries manage their power consumption efficiently during peak periods.

A DSM system was suggested for domestic users as well since this would contribute positively towards reducing the load on the grid (Govender, et al., 2004). Figure 2.8 shows the low and high demand seasons time of use (TOU) periods.

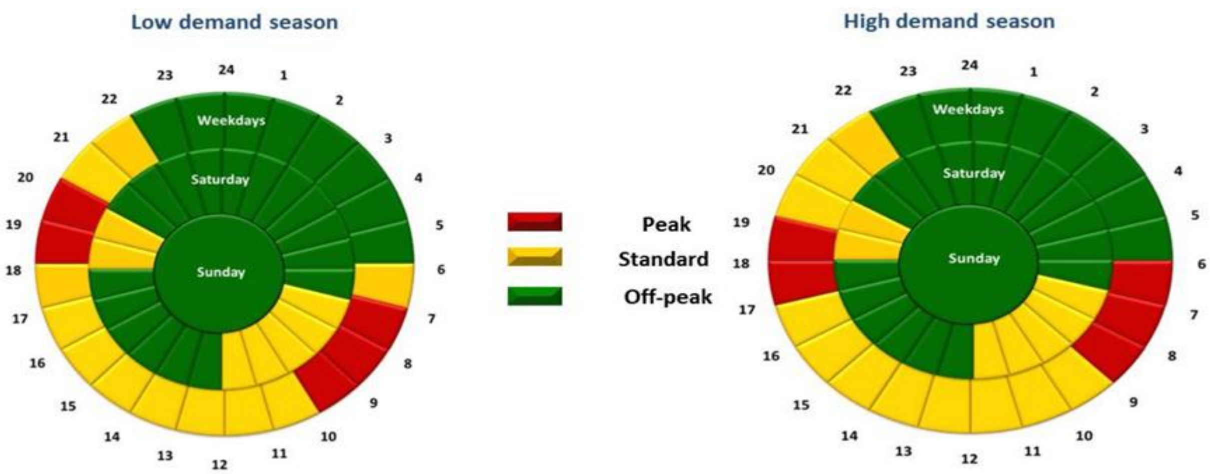

Figure 2.8 Low and High demand seasons TOU periods (Eskom, 2016).

Figure 2.8 indicates that during the low demand seasons (summer), during the week, a morning peak exists from 7am till 10am, as well as an evening peak between 6pm and 8pm.

During the high demand seasons (winter), during the week, a morning peak exists from 6am till 9am, as well as an evening peak between 5pm and 7pm. During this period, the cost of electricity is also higher.

DSM is a range of methods implemented to better make use of power on the demand side. It can be anything from changing power usage behaviour, using more superior or effective materials, different energy tariffs for specific consumption profiles and even includes more complex methods like real-time control of the distributed power (Palensky & Dietrich, 2011).

2.4.1 Power Alert

Power alert is one of the methods that ESKOM has implemented to make consumers aware of what the status of the national grid is and thus giving guidance as to how the consumer can contribute to reducing the strain on the grid (PowerAlert, 2012). As can be seen from Figure 2.9, the Power Alert has several conditions, each with their own suggestions to aid the grid.

SA Power Alert **Colours and meanings**
GREEN means the electricity is stable, but limited. Please continue to use electricity sparingly.
YELLOW / ORANGE means the electricity supply is under strain. Please switch off your geyser, pool pump and none essential appliances.
RED means the electricity supply is under severe strain. Switch off as much as you can – geysers, stoves, appliances and most lights.
BLACK means power outages are already being experienced in certain areas. To avoid possible power failure in your area, switch off everything besides your TV and one room light.

Figure 2.9 Power alert colours and suggested action (PowerAlert, 2012).

The downside of Power Alert is that it is very dependent on the consumer's behaviour. Only with a consumer that is willing to act accordingly, will this have any benefit to reducing strain on the grid (Ghaemi & Brauner, 2009).

2.4.2 Demand controllers

Demand controllers aid in the levelling of the peaks that are evident during peak demand periods. There are various major appliances and systems, such as water heating, that can be controlled in order to reduce the demand and also save costs. If applied together with a power efficient approach and properly configured, it can reduce the demand even further with very little inconvenience to the consumer. The controller can either be activated by a ripple control receiver, a timer or a user defined threshold input (Govender, et al., 2004).

2.4.2.1 Ripple control receiver

Ripple control is where a small signal is added to the incoming power. The frequency of the superimposed signal is usually much higher than the standard 50 Hz of the power signal. Ripple control receivers are usually attached to the load that is intended to be controlled when the receiver receives the signal. It shuts down the load either via a relay or switch. Ripple control is usually paired with some sort of tariff incentive (Chang, et al., 1997; Sheed, 2013). Typical devices usually switched off via ripple control receivers are geysers. They are switched off remotely by the municipality especially during peak demand periods (ESIAfrica, 2008).

2.4.2.2 Timer

A timer is normally fitted to the geyser to regulate the power to the geyser more efficiently. It is usually inexpensive and easy to install. The main function is to switch the geyser off during those times that hot water is not required and to switch it on only during peak hot water demand periods. The Geyserwise unit is an example of a typical timer with additional user defined threshold inputs (Geyserwise, 2010). Demand controllers are best suited when used in conjunction with a load management technique.

2.4.3 Load / demand side management techniques

There are several load management schemes. These schemes include load shifting, peak clipping, dynamic energy management, energy efficiency improvement and strategic load growth (Ekanayake, et al., 2012).

2.4.3.1 Load shifting / Peak shifting / Valley filling

This program involves both the load shifting and valley filling techniques. It encourages users to shift their electricity consumption from on-peak periods to off-peak periods. These include mostly appliances such as washing machines, dishwashers or appliances that do not need to be used during peak periods. Timers and ripple relays are used in this scheme (Ekanayake, et al., 2012; Saker, et al., 2012; SchneiderElectric, 2014). Figure 2.10 illustrates these techniques.

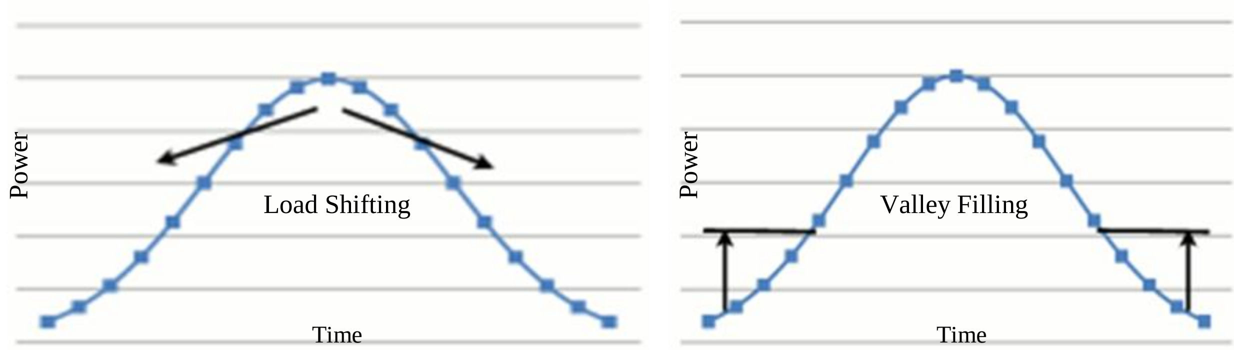

Figure 2.10 Load Shifting and Valley Filling load management techniques (Malone, 2010)

Peak shifting, also known as load shifting, is a technique where appliances are used outside of the peak period. Valley filling is similar, since it too implies that appliances be shifted outside the peak periods and rather used when the grid is under no pressure at all.

2.4.3.2 Peak Clipping

This scheme seeks to reduce energy consumption at the time of the daily peak so that the maximum demand of the overall system can be lowered. This scheme involves mostly appliances which are in use. A load control relay is normally incorporated to report power consumption and provide timer scheduling (Ekanayake, et al., 2012; Saker, et al., 2012). Figure 2.11 illustrates this technique.

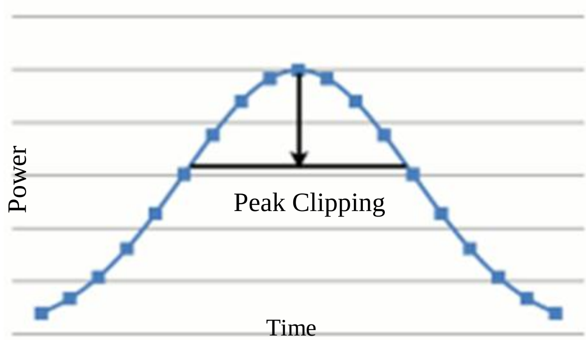

Figure 2.11 Load / Peak shifting, valley filling and peak clipping load management technique (Malone, 2010)

Peak clipping simply implies switching devices off during peak periods thus reducing the demand during the peak. Demand side management techniques can be better implemented in an automated system that adheres to a certain set of rules.

2.4.4 Load management algorithms

The objective of introducing load management techniques is to control and influence the energy demand to bring about a reduction in the peak demand, thus reshaping the domestic load profile which in turn contributes to bringing about a balance between the electricity supply and demand (Logenthiran, et al., 2011; Pipattanasomporn, et al., 2012). Implementing such a load management technique relies on developing an algorithm, which is a set of rules that the system must adhere to.

An algorithm can be very simple as in the case of Bischke and Sella (1985) that describe the load management system for a geyser. This system utilises bi-directional communication. The load control commands originate from control schedules entered into a despatching computer at the control centre that relays it to the distribution substation via telephone line and they are coded and distributed via the distribution system. These messages are decoded by load control receivers at the customer's house and it turns the geyser off. The geyser can be switched off for several hours by repeating the turn-off command every 12 minutes. If however, after 15 minutes the command is not repeated, the geyser will be switched on again (Bischke & Sella, 1985).

An algorithm can be more complex when more parameters are considered and can involve mathematical formula to aid its execution. These parameters may include past behaviour of devices, costs of electricity at specific periods and user comfort parameters. The latter has become a very critical consideration because in the past, load management systems failed, not because they did not have technical benefits, but rather because of the impact it had on users. Therefore, as part of a more acceptable load management technique, it is important to consider user comfort constraints and ensure that these are not violated (Sepulveda, et al., 2010; Du & Lu, 2012). Sepulveda, et al. (2010) applied the load management system to domestic geysers. The geyser load and water temperature were predicted first and was based on a non-aggregated geyser model. The load was recorded at 15 minute intervals. Once the load was established, the temperature in the tank was determined in real-time, so that user comfort was not compromised (Sepulveda, et al., 2010). Paull, et al. 2010 used a similar approach by also profiling the load of the geyser and also detailing the temperature behaviour of the tank by hot water usage.

The hot water usage was determined through short water draws that did not cause the geyser to switch on, to larger water draws that did force the geyser to switch on.

This gave an indication of how much water was used and how long it took to heat the water to the setpoint temperature which was then used to setup parameters that did not compromise the user's comfort (Paull, et al., 2010).

Other load management algorithms such as presented by Pipattanasomporn, et al. (2012) allows the user to set their load priority and comfort preference. These parameters are included in the algorithm. The load management system receives an external signal to reduce the demand and in this case a parameter is to keep the total load below the specified demand. Depending on the user set priority and comfort preference, the algorithm will start switching devices off to keep the demand below the specified demand. If however, the user comfort is compromised, for example the geyser temperature falls below a set minimum, it switches it on, heats the water to the setpoint temperature and switches the geyser off again (Pipattanasomporn, et al., 2012)

2.5 Smart houses and house automation

The combination of three very distinct parts or layers makes home automation possible and turns an ordinary house into a smart house. These layers are the connected devices layer, the communication layer and the network foundation or backbone layer (Al-Kuwari, et al., 2011; OECD, 2013; Tuohy, 2015). Figure 2.12 represents these three very distinct layers.

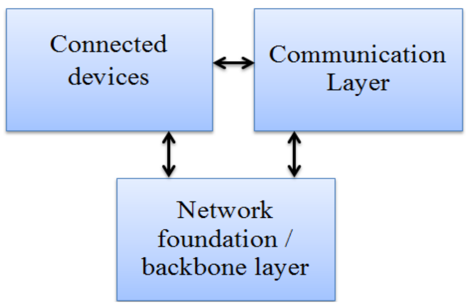

Figure 2.12 The three distinct layers that make home automation possible

The connected devices layer consists of the electrical devices that are connected to sensors and a communication network. The communication network allows device to device communication in order to transmit information. All these devices are connected to a network foundation where cloud computing is applied. Cloud computing is a practice that allows the use of a remote server to store and process data (OECD, 2013; Tuohy, 2015).

A smart house system is thus a house that incorporates advanced automation systems to provide the inhabitants with sophisticated monitoring and control over the building's functions.

For example a smart house may control lighting, temperature, multimedia, security, window and door operations, as well as many other functions.

2.5.1 Communication layer

The communication layer usually consists of a standardised network package or communication bus that contains control and user information that control the connected devices.

The Inter-Integrated Circuit (I^2C) communication bus has been an industry standard for many years and was developed in 1982. Two signal lines are used by this multi-master protocol. The one is referred to as the serial data (SDA), while the other is referred to as the serial clock (SCL). I^2C eliminates the need of slave select or arbitration logic.

Any number of slaves and any number of masters can be connected onto the communication bus and communication between the two lines is according to the protocol defined below (Thaker & Guz, 2006; Leens, 2009):

- 8-bit communication
- Speeds: 100kbps (standard mode), 400kbps (fast mode) and 3.4Mbps (high speed mode)
- Master and slave concept (there can be many masters and many slaves, most cases there is only one master with multiple saves).
- Uses only two IOs – SDA (serial data) and SCL (serial clock).
- 7-bit/10-bit slave addressing (master talks with the slaves using these addresses).

2.5.1.1 Communication Procedure

All I^2C addresses are either 7 bits or 10 bits. For the 7 bit addresses it can have up to 128 devices on the I^2C bus, since a 7 bit number can be from 0 to 127. When sending out the 7 bit address, 8 bits are always sent. The extra bit is used to inform the slave if the master is writing to it or reading from it. If the bit is zero, the master is writing to the slave. If the bit is 1 the master is reading from the slave.

I^2C communication step by step is as follows (Leens, 2009):

1. Send a start sequence.
2. Send the I^2C address of the slave with the R/W bit low (even address).
3. Send the internal register number you want to write to.
4. Send the data byte.
5. Optionally, send any further data bytes.
6. Send the stop sequence.

The first thing that will happen is that the master will send out a start sequence. This will alert all the slave devices on the bus that a transaction is starting and they should listen in case it is for them. Next, the master will send out the device address. The slave that matches this address will continue with the transaction, any others will ignore the rest of this transaction and wait for the next. Having addressed the slave device, the master must now send out the internal location or register number inside the slave that it wishes to write to or read from. This number is dependent on what the slave actually is and how many internal registers it has. Some very simple devices do not have any (Leens, 2009).

Having sent the I^2C address and the internal register address the master can now send the data byte (or bytes, it does not have to be just one). The master can continue to send data bytes to the slave and these will normally be placed in the following registers because the slave will automatically increment the internal register address after each byte. When the master has finished writing all data to the slave, it sends a stop sequence which completes the transaction (Leens, 2009).

2.5.1.2 Bus communication

Communication is established and 8-bit bytes are exchanged, each one being acknowledged using a 9th data bit generated by the receiving party, until the data transfer is complete. The bus is made free for use by other ICs when the 'master' releases the SDA line during a time when SCL is high. Apart from the two special exceptions of start and stop, no device is allowed to change the state of the SDA bus line unless the SCL line is low. Figure 2.13 is an example of how an address header looks like (Leens, 2009).

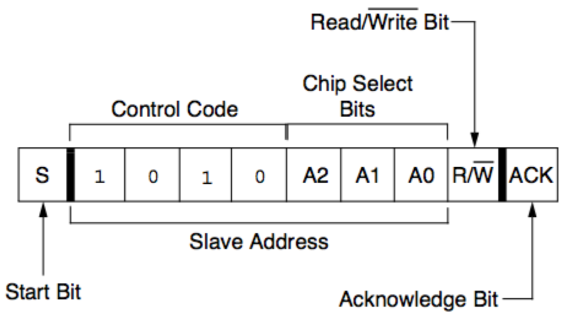

Figure 2.13 Typical address header (Leens, 2009)

On the 7-bit address header, typically the first four bits are fixed, the next three bits are set by hardware address pins (A0, A1 and A2) that allows the user to modify the address allowing up to eight of the same devices to operate on the bus. These pins are either held high through a resistor, or held low to ground GND. The last bit of the initial byte indicates if the master is going to send (write) or receive (read) data from the slave. Each transmission sequence must begin with the start condition and end with the stop condition (Leens, 2009).

2.5.1.3 Communication standard

There are many different communication standards and the oldest of them is the X10. It is a standard for communication among electronic devices used for home automation, both internationally and in the open industry. It mainly uses power line technology to transmit signals and commands. There are however various other existing systems, though X10 remains the leading standard in its category, but there are several drawbacks to the system when compared to much faster systems that have much more functionality (Al-Kuwari, et al., 2011). Table 2.3 is a comparison between X10 and other similar systems with their advantages and disadvantages.

Table 2.3 Comparison of the most popular communication standards (Bierhoff, et al., n.d.)

Systems	Transmission Speed (bit/s)	Transmission Range (m)	Signal transmission	Advantages	Disadvantages
X10	50 – 60	unlimited	Power Line	Global support; low cost availability of new components; solution for simple and quick home automation systems	Wiring compatibility with the protocol – leads to weak communication or noise if not correct type; signals can get lost when two or more devices are addressed; lacks support for encryption and has a maximum of 256 devices; slow; limited functionality
C-Bus	1200 – 9600	1000	Cat5 cable	Enhanced reliability of data transmission; mixture of transmission mediums for communication and control	Cannot function with standard mains wire installation; fully new wiring system must be installed; wireless offers less functionality
Z-Wave	9.6 – 40 k	75	Embedded low power RF radio	Great capability	Device must be included in the network before it can be used; Problematic to remove added devices; suffers from flexibility
Zigbee	20 – 250 k	1500	IEEE 802.15.4-2003 (WPAN)	General purpose; inexpensive; self-organising mesh network; uses small amounts of power	Replacement with Zigbee compliant appliances can be costly; No more secure than a typical 802.11 wireless network; Zigbee compliance certification for appliance manufacturers mandates lithium battery use; Can be confusing at first for the homeowner; Zigbee compliant manufacturers slow to make an appearance on the market

From Table 2.3 it is clear that a simple power line communication system is more practical and cost effective, since it does not require additional cables or devices to be connected to the system in order for devices to communicate with one another. For this reason, further investigation was carried out on power line communication.

2.5.1.4 Power Line Communication

To enable effective communication between smart appliances over the power line, a suitable communication protocol must be implemented to identify smart appliances and regulate communication (Pipattanasomporn, et al., 2012).

The power line communication technology has been attracting a lot of attention during the last few years. The PLC technology takes advantage of the electrical medium to enable connectivity between devices (Ferreira, et al., 2011). The PLC can be divided into two major categories according to the bandwidth used: the broadband power line communication and the narrowband power line communication.

The electrical medium used for power line communication was not designed for data transmission, therefore the transmission of data through the electrical medium face issues such as: high noise in the medium, signal attenuation and signal distortion. It usually requires a sophisticated modem to communicate reliably through the power line (Bradshaw, 2011). There are many of these modems available on the market (Lee, et al., 2003; NXP, 2010).

2.5.2 Network foundation / backbone layer

This layer consists of the actual hardware that is responsible for the control of the connected devices in the connected devices layer. It is usually a micro controller board. There are several of these micro controller boards available in the market. An example of this micro controller board can be seen in Figure 2.14.

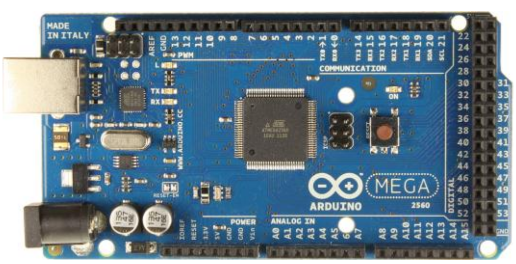

Figure 2.14 Arduino Mega 2560 (ElectroSchematics, 2017)

Advantages of this micro controller board is that it is ready to use, many example codes are available, it offers effortless functions and a large web based community, to assist with programming challenges, exist. Some disadvantages do however exist and the main one is cost (EngineerExperiences, 2015).

Before any system can be implemented, it is necessary to simulate it in order to predict how it will behave. Once this is done, the system must also be practically tested in order to see if it performs similar to the simulation. For this reason simulation, control and power management software will have to be incorporated.

2.6 Simulation, control and power monitoring

Before real-world tests can be carried out on any system, it must first be simulated. This will give an indication of how the system will behave and therefore allows for errors to be detected earlier or allow for modification before physically assembling and testing the system. There are several simulation software packages available and three are discussed in Table 2.4. The table lists the advantages and disadvantages of the simulation software.

Table 2.4 Advantages and disadvantages of MATLAB, LabVIEW and CASPOC software (YorkUniversity, 2010; Orduna, et al., 2012; Ahmed, 2013; Caspoc, 2014).

Software	Advantages	Disadvantages
MATLAB	Its basic data element is the matrix. A simple integer is considered a matrix of one row and one column	It uses a large amount of memory and on slow computers it is very hard to use
	Several mathematical operations that work on arrays or matrices are built-in to the MATLAB environment	It sits "on top" of Windows, getting as much CPU time as Windows allows it to have. This makes real-time applications very complicated.
	Vectorised operations	Dealing with differential equations of the mathematical models of engineering systems mostly encounter difficulties
	The graphical output is optimised for interaction	The system of differential equations should be organised in the form of the first order differential equations,
	MATLAB's functionality can be greatly expanded by the addition of toolboxes	Transformation of the system of differential equations is mandatory, which leads to mistakes and is time consuming
LabVIEW	Ability to scale to meet the needs of a given application	Some features like remote panel, require plug-in to run
	Freedom to choose between ease of use and low-level flexibility	The LabVIEW Runtime is not available for all platforms, like mobile devices, etc.
	Graphical interface is flexible and easy to use without any programming skills	The student is required to have LabVIEW runtime installed.
	Provides a universal platform for numerous applications in diverse fields	The communications are not encrypted, and they are hard to encrypt
	Can be used with 3rd party hardware - can be interfaced with C/C++, VB, Fortran	The communications are based on a TCP socket. This makes the deployment difficult when trying to support other web platforms
CASPOC	Fast simulation, no convergence problems	
	View results during simulation	
	Easy to learn	
	Power Electronics, Drives, Control, all in one schematic	No literature on disadvantages for this software was found
	Optimise your simulations using the C-script language. Set parameters in your simulation and perform multiple simulations from the C-script	

Based on these comparisons it is clear that LabVIEW has more advantages, because even programming beginners can use it, due to the graphical interface and existing programming. This saves time because there is a shorter learning curve and the software can be used with other platforms and external hardware (NationalInstruments, 2015).

Chapter 3
Design considerations

The Cape Peninsula University of Technology and The Delft University of Technology have been working together on the development of a DC grid for residential houses as an alternative way to deal with the increasing problems associated with the generation and use of electricity. DC has specifically been chosen since a load management system can easier control and monitor a DC system than its AC equivalent (TUDelft, 2014). The Delft University of Technology has also been working closely with Mr Harry Stokman, CEO of Direct Current BV, on renovating more than 110 000 houses into energy efficient houses that they also refer to as “Zero-On-The-Meter” houses (DirectCurrentBV, 2014). In South Africa, the study was mainly focused on developing a system for RDP houses only. It focused on creating a laboratory model of the house. Figure 3.1 is a block diagram of a load management system for fixed appliances in the safe DC RDP house.

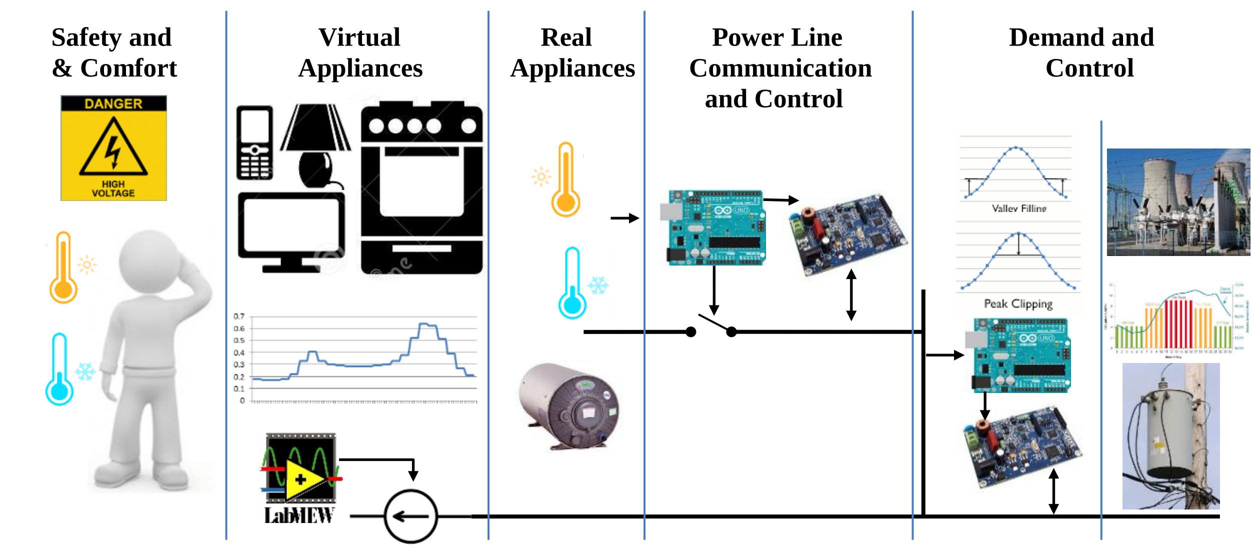

Figure 3.1 Block diagram of the load management system for fixed appliances in a DC RDP house

Safety and comfort - There are various safety aspects to the study that will be considered. Firstly, electrical safety for residential houses. There are however no DC standards currently for the 350V DC. Industrial DC standards and standards for lower and higher DC voltages aided as guidelines.

Secondly there is the safety in terms of health. Since the load management system will be switching the geyser off or on, depending on the load conditions, the minimum safe temperature is 55 degrees Celsius (Kagande, et al., 2013) and maximum temperatures of 75 degrees Celsius is not to be exceeded.

Virtual Appliances – The study is focused on fixed appliances in a two bedroom RDP house only. However, it is necessary to find a way to represent the power consumed by other common appliances found in the house in order to effectively apply and test the load management system.

Real Appliances – The study focused only on the fixed geyser. The normally AC appliance will be modified in order to work on the DC system. The geyser temperature will be monitored and based on the limits set it should be able to override the load management system, in order to bring the geyser's temperature within the required range ensuring that the end user always has hot water available.

Power Line Communication and control – Power line communication is a critical part of the study, because it allows data communication to take place directly on the DC power line. No additional cable will be required, saving costs of installation and it will make the system much more efficient. The geyser will be fitted with a PLC device that works in conjunction with a micro controller that will allow the appliance to be allocated an address and it can therefore be communicated with directly, allowing for easy monitoring and control.

Demand and control - A load profile will be developed. This is in order to produce a time of use for each appliance in the DC RDP house based on the literature review. The system will run for a 24 hour period and appliances will be switched on and off according to the developed load profile. LabVIEW will monitor and log all the results in order to determine the power used. The load management system will perform peak clipping, load shifting or valley filling according to the information received from LabVIEW. The load management system will be developed on an Arduino Mega micro controller.

The design focuses on a simplified model where the appliances are on for an extended period, thus representing a worst case scenario.

All load profiles developed, will therefore represent the appliances as being used at fixed times and it is assumed that these routines are representative of each working day of the week. The design does however not consider that the appliances might be used sporadically.

Chapter 4

Design of Load profile and Simulation

This section of the study focused on developing the different parts of the system. It must be emphasised that the study aims to develop a load management system for a 350V DC RDP house. The geyser elements were thus designed for a 350 V DC grid. A 350 V DC laboratory power supply was however not available. All experiments were conducted with a 300 V DC power supply. This means that there is a slight difference in the calculated power results and actual power results. This will be more evident in the discussion of the results.

Another important aspect of the system that must be mentioned is that it considers temperature hysteresis. The set point temperature of the geyser is selected as 60 degrees Celsius and the minimum allowed temperature is 55 degrees Celsius. With a hysteresis allowance of 5 degrees Celsius, the temperatures considered for the experiments were 65 degrees Celsius for the set point and 60 degrees Celsius for the minimum allowed temperature. This means that a lag in temperature of 5 degrees Celsius is considered. The set point and minimum temperatures therefore remain 60 and 55 degrees Celsius respectively. With these considerations in place, the system was developed and implemented and that is discussed in detail below.

4.1 Load profile

In order to develop a load management system that would be able to control and monitor fixed appliances, it was essential that a baseline load profile be developed. This baseline load profile indicated the amount of power used by a typical two bedroom RDP house and it was dependant on the number of appliances, their power ratings and how often the appliances were used. Table 4.1 summarises the information from work done by (Thom, 2000; Spalding-Fecher, 2003; Africa, et al., 2011; Keller, 2012; Mokonese, et al., 2012; Dekenah, 2014; Ijeoma & Okafor, 2014), in order to develop the load profile.

Table 4.1 Appliances and their quantities in a two bedroom RDP house, including summer and winter average daily operation (Thom, 2000; Spalding-Fecher, 2003; Africa, et al., 2011; Keller, 2012; Mokonese, et al., 2012; Dekenah, 2014; Ijeoma & Okafor, 2014)

Appliance	Typical number of devices	Power (kW)	Current at 350VDC (A)	Avg Hours Operation (summer)	Avg Hours Operation (Winter)
Fan	1	0.50	1.43	4.00	0.00
Space heating	1	0.75	2.14	0.0	5.0
Lighting	5	0.055	0.057	5.0	8.0
TV	1	0.11675	0.446	6.00	6.00
DVD	1	0.00745	0.071	2.00	2.00
Hi-Fi	1	0.0225	0.043	3.00	3.00
Cell phone	3	0.006	0.017	2.00	2.00
Cooking	1	2.00	5.71	1.0	1.0
Kettle	1	2.00	5.71	1.5	1.5
Refrigeration	1	0.14	0.467	12.0	8.0

The next step was to develop a daily routine, based on the average daily operating hours of the appliances. This was in order to emulate persons staying in the house. Since it is a two bedroom RDP house, the number of people was assumed as four, two adults and two children.

In a normal weekday the family wakes up at 5am, switches on the lights, space heater and charges their phones. They all gather to pray for 10 minutes. The parents listen to the radio right after prayers. At 6am all phones are removed from chargers and the mother starts cooking breakfast on a hotplate for 15 minutes. This is usually either oats or maize meal. She then prepares a table. The family has breakfast. After breakfast she boils water in a kettle to wash the dishes and for bathing purposes. Boiling of water is done for 1 hour starting at 06:45 and ending at 07:45. The space heater is switched off at 06:45 as well as the radio. The mother switches off the lights at 7am and leaves for work. At 07:45 the father takes the children to school.

The children attend after school activities and arrive home at 4pm upon which they switch on the television while doing homework. At 5pm the mother arrives from work and switches on the lights. The father arrives from work at 6pm and watches TV with the children. The mother starts cooking dinner at 6pm with the help of her daughter. The meal takes 45 minutes to prepare and the table is set for family supper at 7pm. They eat while watching the news. The daughter also switches on the heater at 7pm. At 19:30 she boils water in the kettle to wash the dishes and also for bathing purposes. The kettle is used for 1 hour. After dinner the family watches a movie from 8pm until 10pm, while all take turns to bath.

From 10pm until 11pm, the parents are in bed, listening to the radio. All phones are also charged at 10pm for one hour. At 11pm all lights as well as the space heater is switched off.

With this information in place, the following load profiles for each individual appliance were generated using MS Excel. Since the operating hours differ for summer and winter, a load profile for winter alone was considered, since power consumption is more during this time.

4.1.1 Space heating

The heater and fan are seasonal items. For winter there is no fan use, therefore only the heater is considered. It is assumed that the family wakes up at 05:00. They immediately switch on the heater to warm up the house. The heater is used for 2 hours in the morning and is switched off again when the family goes to work and school. When the family is home in the evening, they switch on the heater again. They let it warm the house for 3 hours and switch it off when they go to bed.

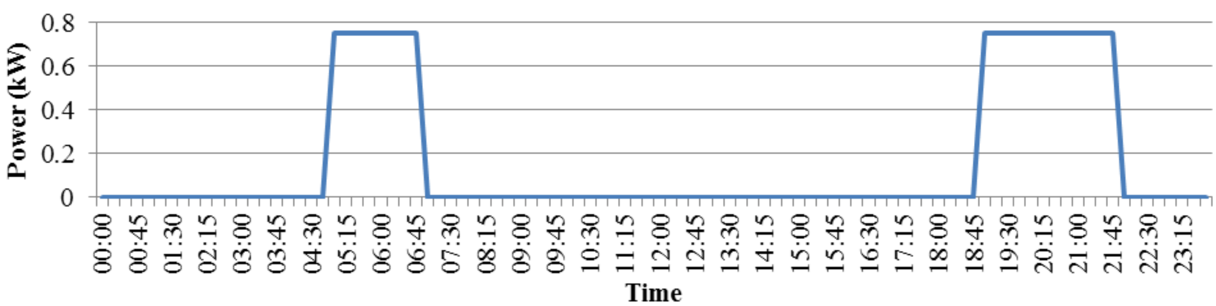

Figure 4.1 Load profile for Space heating

From Figure 4.1, the heater is on from 05:00 until 07:00 and from 19:00 until 22:00. Power used is 750 W.

4.1.2 Lighting

For lighting purposes, 5 units of 11W energy saving light bulbs were considered, one for the lounge, one for the kitchen, one for the bathroom and one for each of the bedrooms. It is assumed that the family wakes up at 05:00. They switch on all the lights. They leave the lights on for 2 hours and switch it off when they go to work and school. When they return in the evening, they switch on the lights again and use it for 6 hours. They switch the lights off when they go to bed.

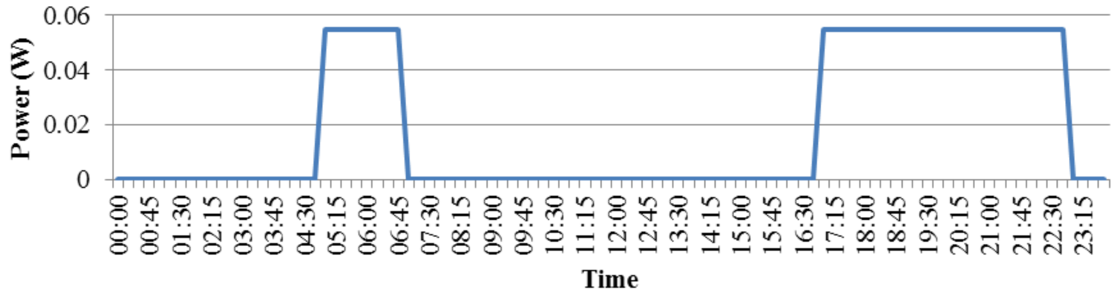

Figure 4.2 Load profile for Lighting

From Figure 4.2, the lights are on from 05:00 until 07:00 and from 19:00 until 23:00. Power used is 55 W.

4.1.3 TV

It is assumed that when the children return from school in the afternoon, they watch television for a few hours until their parents return from work. The parents also watch television for a few hours. The television is on for a total of 6 hours. For the television standby power was considered.

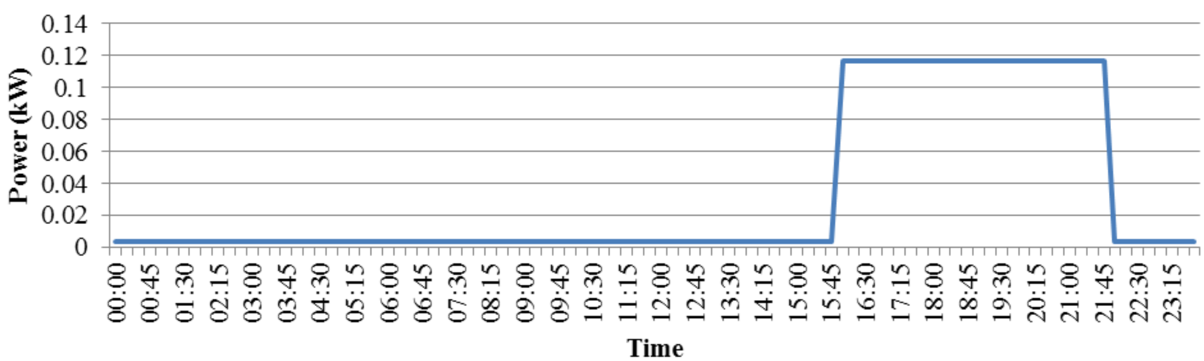

Figure 4.3 Load profile for TV

From Figure 4.3, the TV is on from 16:00 until 22:00. Power used is 117 W. From 22:00 till 16:00 the next day, the television is in standby mode. During this time the television's power usage is about 3.74 W.

4.1.4 DVD

It is assumed that the children watch a movie after supper. The parents stop watching television as soon as the news ends. The movies are about 2 hours long. As soon as the movie ends the DVD is switched off. For the DVD standby power was considered.

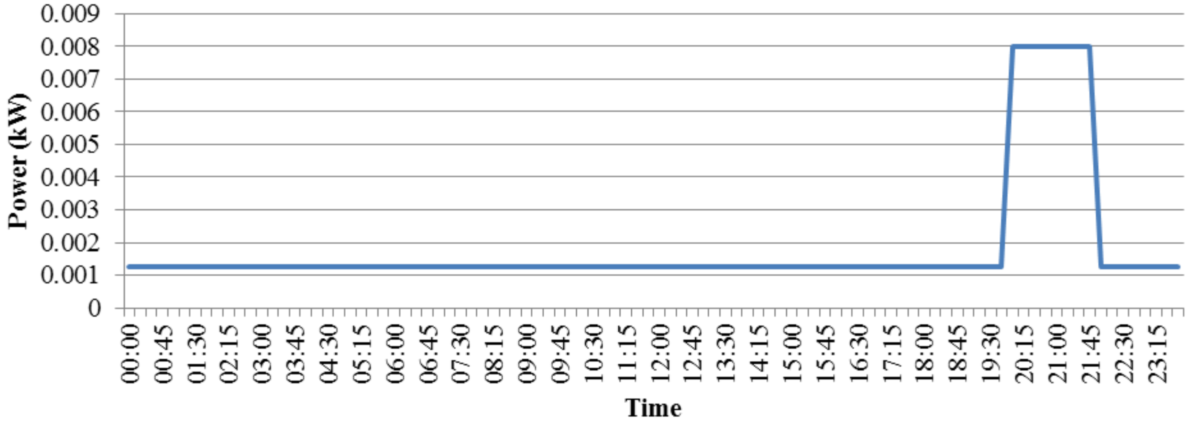

Figure 4.4 Load profile for DVD

From Figure 4.4, the DVD is on from 20:00 until 22:00. Power used is 8 W. From 22:00 to 20:00 the next day, it is in standby mode. During this time the DVD's power is about 1.26 W.

4.1.5 Hi-Fi (Radio)

It is assumed that the parents are the ones that use the radio more frequently. They switch it on in the morning while they get ready for work. In the morning it is used for 2 hours. When the parents go to work, the radio is switched off. The radio then goes into standby mode. It is switched on again in the evening before the parents go to bed after watching the news. It is used for 1 hour and is switched off when the parents go to sleep. The radio then goes into standby mode again. For the radio standby power was considered.

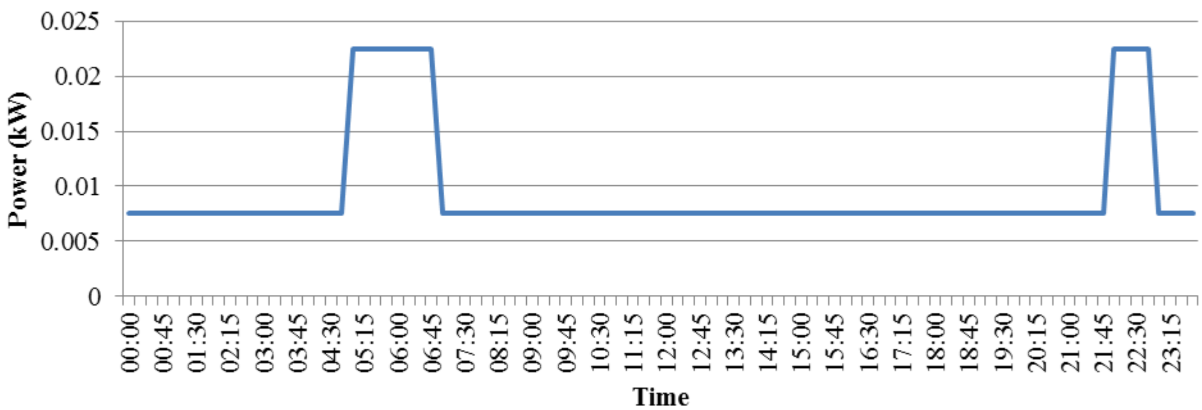

Figure 4.5 Load profile for Hi-Fi / Radio

From Figure 4.5, the radio is on from 05:00 until 07:00 and from 22:00 until 23:00. Power used is 23 W. During the times that the radio is in standby mode, its power usage is about 7.5 W.

4.1.6 Cell phone

It is assumed that only the two adults and one child have a cell phone. The family wakes up at 05:00. They charge their cell phones. They charge it for 1 hour while they get ready for work and school. In the evening they charge their phones again for 1 hour before going to bed.

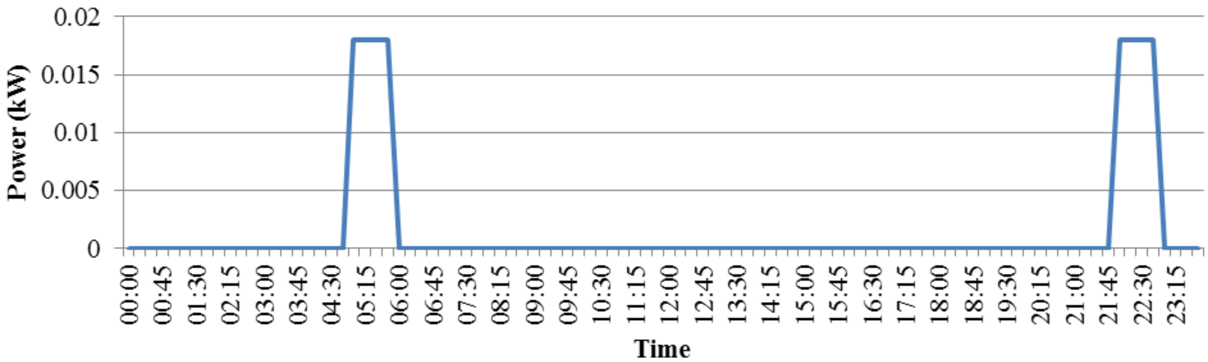

Figure 4.6 Load profile for Cell phone

From Figure 4.6, the cell phones have a total power rating of 18 W. They are charged from 05:00 until 06:00 and from 22:00 until 23:00.

4.1.7 Cooking

For cooking it is assumed that a hotplate is used. The mother prepares porridge for her family in the morning. She uses the hotplate for about 15 minutes. In the evening she prepares a balanced meal and uses the hotplate for a longer period of up to 45 minutes.

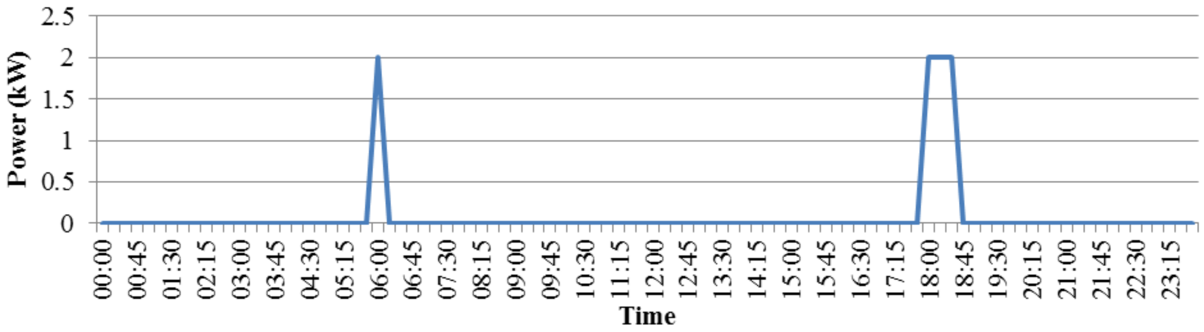

Figure 4.7 Load profile for Cooking

From Figure 4.7, the hotplate is on from 06:00 until 06:15 and from 18:00 until 18:45. Power used is 2 kW.

4.1.8 Kettle

According to Table 4.1 the kettle is used for 90 minutes per day. The water is used for bathing, washing dishes as well as for preparing hot beverages both in the morning and in the evening.

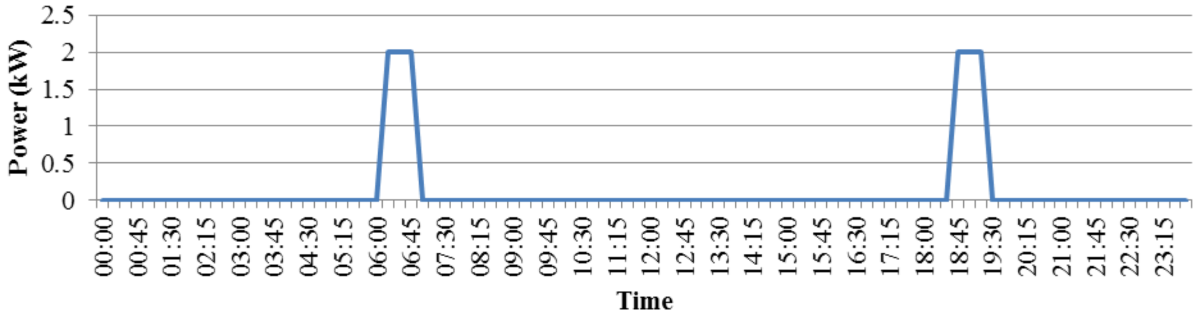

Figure 4.8 Load profile for Kettle

From Figure 4.8, the kettle is on from 06:15 until 07:00 and from 18:45 until 19:30. Power used is 2 kW.

4.1.9 Refrigeration

Most of the RDP houses have a refrigerator. The refrigerator is used to cool food so that it does not get spoilt. The refrigerator is permanently switched on, but it does not run at full power all the time. According to Table 4.1 it runs for 8 hours at full power. It runs for about 15 minutes, it switches off for about 30 minutes and this cycle is repeated in a 24 hour period.

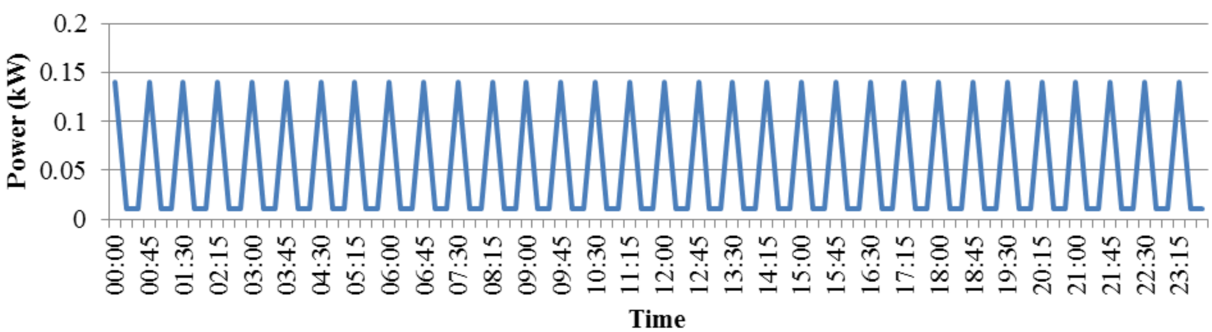

Figure 4.9 Load profile for Refrigeration

From Figure 4.9, the refrigerator is the only device that runs for the entire day, but it only contributes significantly for 8 hours during winter, cycling between on and off for every 15 and 30 minutes with a total power rating of 140 W.

4.1.10 Baseline load profile

From this information a winter daily load profile was developed. A comparison between the baseline load profile and that of Dekenah (2014) is made and it is shown in Figure 4.10.

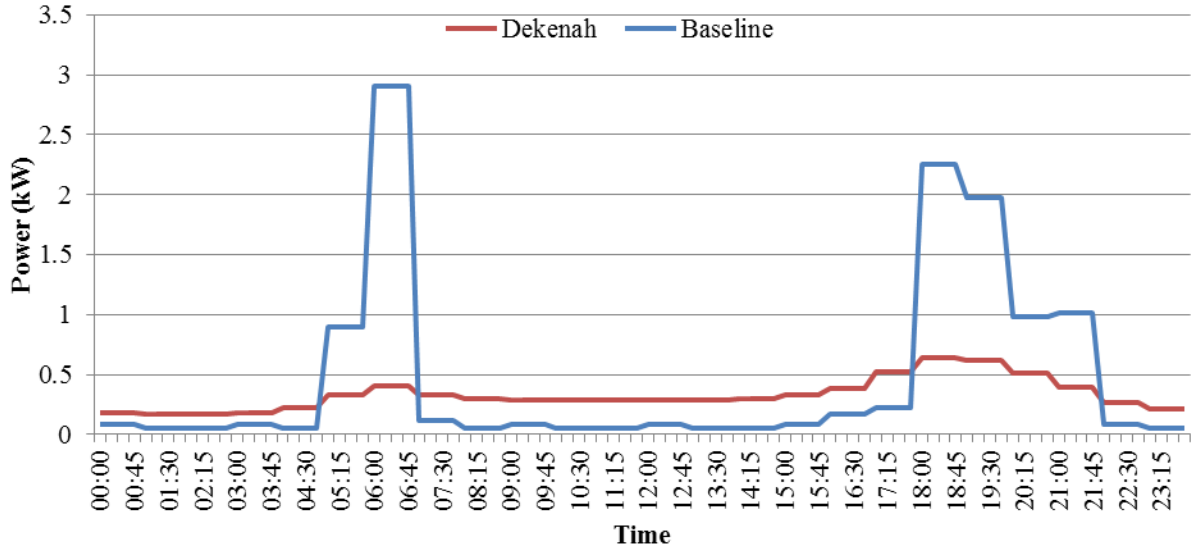

Figure 4.10 Comparison of developed RDP load profile to that of (Dekenah, 2014)

The baseline has similar characteristics to that by Dekenah (2014), the most obvious being the two peaks that form. The reason that the peaks are so different however is because the baseline considers one house only, while Dekenah (2014) is an average of a community.

With the baseline in place, the first intervention was to introduce a geyser into the system to replace the kettle as the main means by which water is heated. Thereafter load management techniques were applied.

4.2 Load profile with geyser

The next step was to introduce a geyser into the system that would heat water for bathing and washing purposes. The volume of water used is unknown, but can be determined from the time that the kettle is used.

In order to determine which capacity geyser would be sufficient to replace the use of the kettle, it was necessary to determine how much water was used when only the kettle was used. This was determined using the heat energy equation. Assuming a standard 1.5 litre kettle is used with a power rating of 2 kW and has to heat the water from 20 ℃ to 100 ℃.

Using the heat energy equation it is possible to determine the amount of energy used to heat the 1.5 litres or 1.5 kg of water;

$$E = mc\Delta T = 1.5\ kg * \frac{4200\ J}{kg} ℃ * (100\ ℃ - 20\ ℃) = 504\ 000\ Joules = 504\ 000\ Ws$$

where: E is the energy gained or lost in $Joules$;
m is the mass of the body in kg;
c is the specific heat constant of the body; and
ΔT is the change in temperature.

Next, the time can be calculated to heat one kettle of 1.5 litres of water

$$t = \frac{E}{P} = \frac{504000\ Ws}{2\ kW} = 252s = 4.2\ min$$

where: t is the time in seconds;
E is the energy gained or lost in $Joules$; and
P is the power rating.

The kettle is used about 90 minutes a day, and one kettle takes 4.2 minutes to heat the water. This means that approximately 21.43 kettles heating 1.5 litres of water, results in 32.14 litres of water.

From the literature review the amount of power indicated for water heating purposes, is 3 kWh for both winter and summer (Keller, 2012). It is also used for 90 minutes per day. That can be broken down to 1.5 kWh for 45 minutes in the morning as well as in the evening.

Therefore from this

$$E = \frac{P}{t} = \frac{1.5\ kWh}{2.77778E-7} = 5\ 399\ 995.68 \text{ Joules}$$

$$m = \frac{E}{c\Delta T} = \frac{5399995.68}{4200*(60-20)} = 32.142\ kg = 32.142\ litres$$

This is the total amount of water per day. This can be divided into two to give a morning and evening hot water use of approximately 16.1 litres.

The geyser that was selected for this study was therefore the 15 L point of use under basin geyser manufactured by Tecron Water Heating PTY (LTD). It is usually installed in very close proximity of a single fixture.

This adds the advantage that hot water is available almost immediately at the fixture and taps do not have to run before the hot water is available (Tecron, 2011).

Before the load profile was however developed, it was important to establish the following characteristics of the geyser, namely:

a) Heat time after a partial withdrawal;
b) Heat time after a full withdrawal; and
c) Does stratification hold?

This information would be representative of someone washing dishes (partial withdrawal) or taking a shower (full withdrawal). This would give a more real life representation of the geyser behaviour and thus a more accurate load profile could be established.

Firstly, six LM35 temperature sensors were placed directly to the side of the copper geyser tank. These temperature sensors were placed 40mm apart, the first starting at the top joint of the tank and the last at the bottom joint of the tank as shown in Figure 4.11.

Figure 4.11 Six LM35 temperature sensors along the side

Figure 4.11 shows the six LM35 temperature devices placed along the side of the copper tank. Two sensors were also placed at the inlet and outlet pipes and these are shown in Figure 4.12.

Figure 4.12 Two LM35 temperature sensors on inlet and outlet pipes

A solenoid valve was connected to the cold water tap in order to control the water flow into the geyser. The pressure was adjusted to allow a low flow rate of 4.5 litres / min (Kaps & Wolf, 2011; SavingEnergy, 2011).

Figure 4.13 Solenoid valve connected to inlet pipe of geyser to control the water into the geyser

The same test circuit was developed on LabVIEW. The interface between the computer and the geyser was the NI USB-6009. All temperature sensors were connected to the analogue inputs of the DAQ. These sensors were calibrated and the calibrated reading was displayed on a graph and readings logged to an Excel sheet. The calibration was done by measuring the actual temperature at the physical position of the sensor and this was compared to the reading indicated by LabVIEW. The APPA51 thermometer was used for the actual temperature measurement.

Switches were introduced to control the solenoid valve and the two elements. With the test circuit in place, the following could be determined.

4.2.1 Heating time

Two experiments were conducted, one representing a partial withdrawal of about 5 litres of hot water, and full withdrawal of about 13.5 litres of hot water. These experiments were conducted to determine how long it takes for the water to heat up to the set point temperature after the withdrawal of water.

4.2.1.1 Heating experiment 1

Theoretically, the time needed to get the geyser temperature to the set point temperature of 60 degrees Celsius can be calculated. Using the heat energy equation it is possible to determine the amount of energy used to heat 5 litres or 5 kg of water (partial withdrawal);

$$E = mc\Delta T = 5\ kg * \frac{4200\ J}{kg} ℃ * (60\ ℃ - 20\ ℃) = 840\ 000\ Joules = 840\ 000\ Ws$$

where: E is the energy gained or lost in $Joules$;
m is the mass of the body in kg;
c is the specific heat constant of the body; and
ΔT is the change in temperature.

Next, the time can be calculated to heat the 5 litres of water

$$t = \frac{E}{P} = \frac{840000Ws}{1\ kW} = 840\ s = 14\ min$$

where: t is the time in seconds;
E is the energy gained or lost in $Joules$; and
P is the power rating.

Heating experiment 1 was a 5 litre withdrawal done in order to emulate a basin being filled to wash dishes. This was done with both elements on and the power was set to 1 kW in order to observe whether stratification took place in the geyser as discussed in the literature review. Before the withdrawal, the water was heated to the set point temperature. The results of the experiment are represented in Figure 4.14.

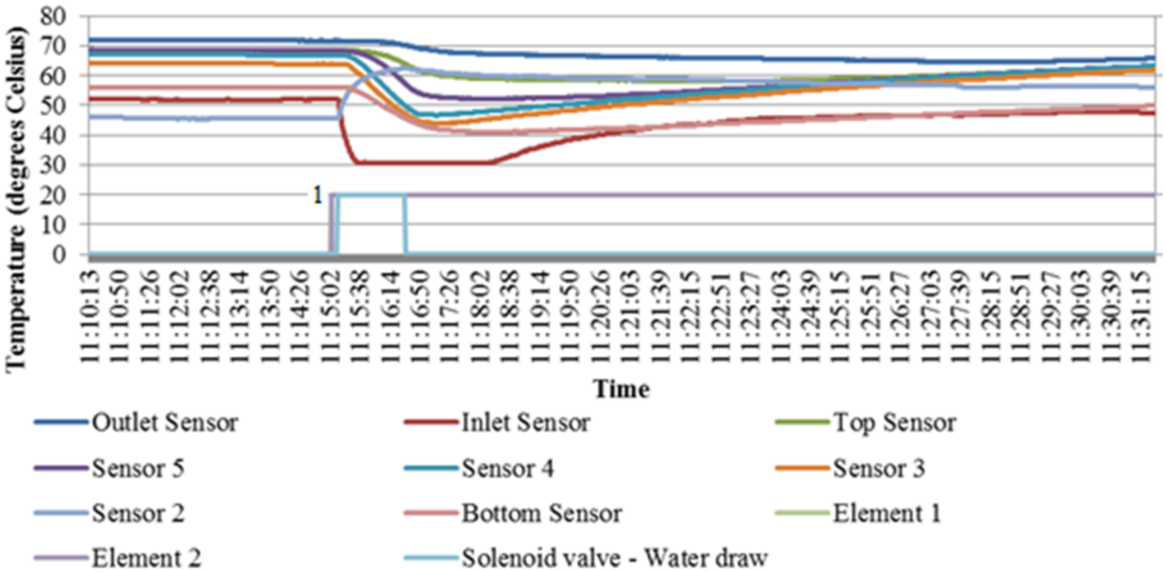

Figure 4.14 Heating experiment 1 – 5 litre water withdrawal

From the graph, the horizontal axis represents time. The experiment started at 11:10 and ended at 11:30. The vertical axis represents the temperature in degrees Celsius. The six sensors on the side of the geyser tank are represented from top to bottom by, first the top sensor, sensors 5 to 2, and lastly the bottom sensor. Sensor 3 is used to represent the temperature of the water inside the geyser because it is aligned with the thermostat of the geyser. The sensors on the inlet and outlet pipes are represented by inlet and outlet sensors respectively. At the bottom of the graph the condition of the elements and valve can be observed on the vertical scale, represented by either a 1 if it is ‘on’ or 0 if it is ‘off’.

At 11:15 the solenoid valve goes high and the water is drawn. Immediately it can be observed that the temperature in the tank starts to drop and three temperature layers form, with the top layer remaining hot with a minimum and maximum between 52 ˚C – 58 ˚C recorded by the two top temperature sensors, while the two middle sensors recorded a minimum and maximum reading between 44 ˚C – 46 ˚C and the bottom sensor recording the lowest reading of 40 ˚C. It is clear that stratification holds. The temperatures started rising again after these minimums were reached. The experiment was stopped when Sensor 3 reached the set point temperature of 60 degrees Celsius. From the graph, we observe that it takes approximately 15 minutes for the water to reach the set point temperature.

4.2.1.2 Heating experiment 2

Theoretically, the time needed to get the geyser temperature to the set point temperature of 60 degrees Celsius can be calculated. Using the heat energy equation it is possible to determine the amount of energy used to heat 13.5 litres or 13.5 kg of water (full withdrawal);

$$E = mc\Delta T = 13.5\,kg * \frac{4200J}{kg}\,℃ * (60\,℃ - 20\,℃) = 2\,268\,000\,Joules = 2\,268\,000\,Ws$$

where: E is the energy gained or lost in $Joules$;
m is the mass of the body in kg;
c is the specific heat constant of the body; and
ΔT is the change in temperature.

Next, the time can be calculated to heat the 5 litres of water

$$t = \frac{E}{P} = \frac{2268000\,Ws}{1\,kW} = 2268\,s = 37.8\,min$$

where: t is the time in seconds;
E is the energy gained or lost in $Joules$; and
P is the power rating.

Heating experiment 2 was a 13.5 litre withdrawal done in order to emulate a person taking a shower. This was also done with both the elements on and the power was set to 1 kW in order to observe whether stratification took place in the geyser as discussed in the literature review. The results are represented in Figure 4.15.

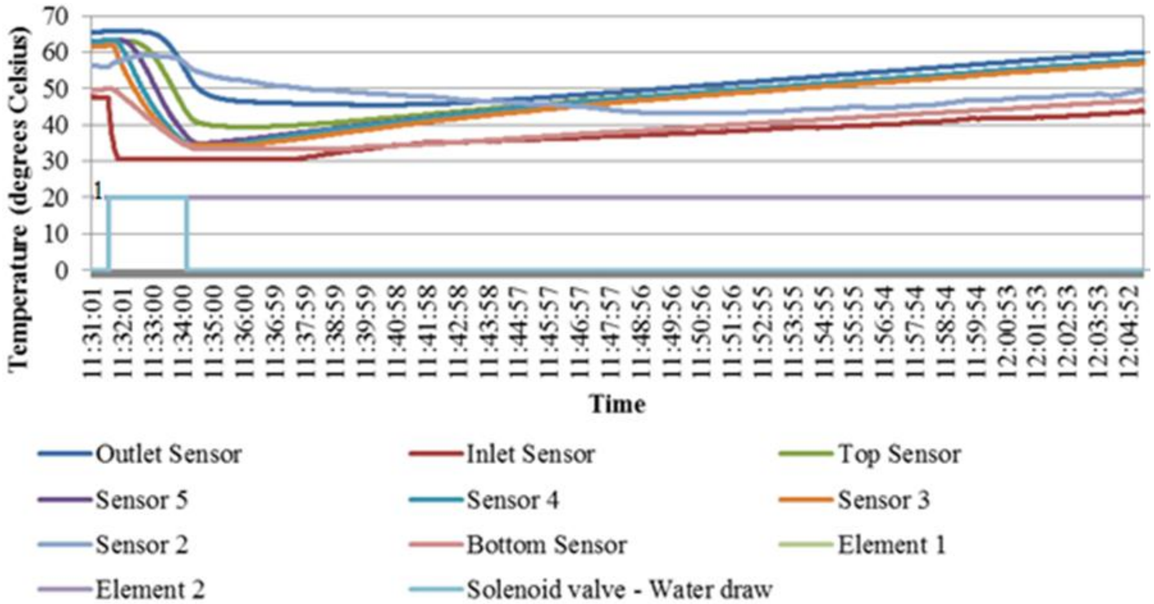

Figure 4.15 Heating experiment 2 – 13.5 litre water withdrawal

From the graph, the horizontal axis represents time. The experiment started at 11:31 and ended at 12:03. The vertical axis represents the temperature in degrees Celsius. The same setup is used as for Experiment 1.

At 11:31 the solenoid valve goes high and the water is drawn. Immediately it can be observed that the temperature in the tank starts to drop. From the graph, it can be observed that the three layers are almost gone and stratification therefore does not hold. This is because almost all the water was removed from the geyser. The temperature started rising again and it took approximately 40 minutes for the water to heat to the set point temperature.

4.2.2 Geyser load profile

To determine the geyser load profile it is necessary to have a look at the kettle load profile again. The 2 kW kettle is switched on for 45 minutes and it is used to heat water from 06:15 until 07:00. Then in the evening it is switched on and it is used to heat water from 18:45 until 19:30. The kettle has to switch on before the washing event, the geyser however switches on during the washing event. Assuming that the dishes are washed before the shower at 07:00, a 15 minutes partial withdrawal will start at 06:45 and end at 07:00. The shower or full withdrawal will start at 07:00 and end at 07:45. In the evening the same sequence of events will be used, starting at 19:30 and ends at 20:15.

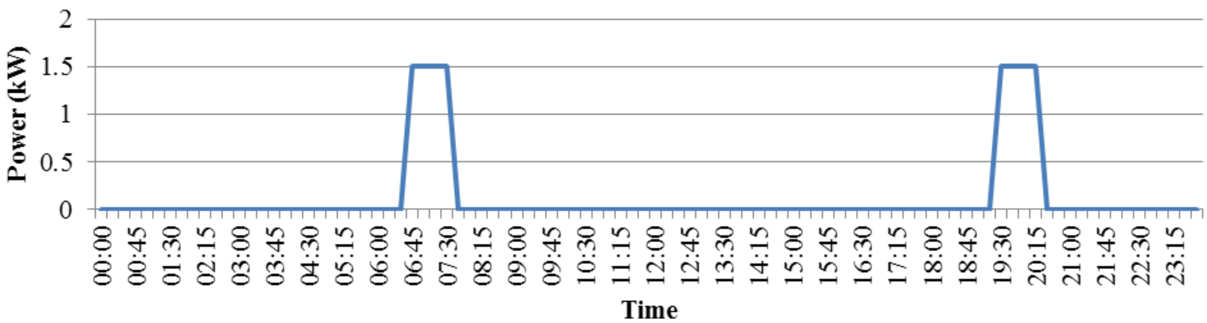

Figure 4.16 Geyser load profile

The geyser will replace the kettle to heat the water for bathing purposes. As a result the kettle profile was removed from the baseline profile and it was replaced by the geyser profile. Figure 4.17 is a comparison between the baseline and the modified profile with the geyser.

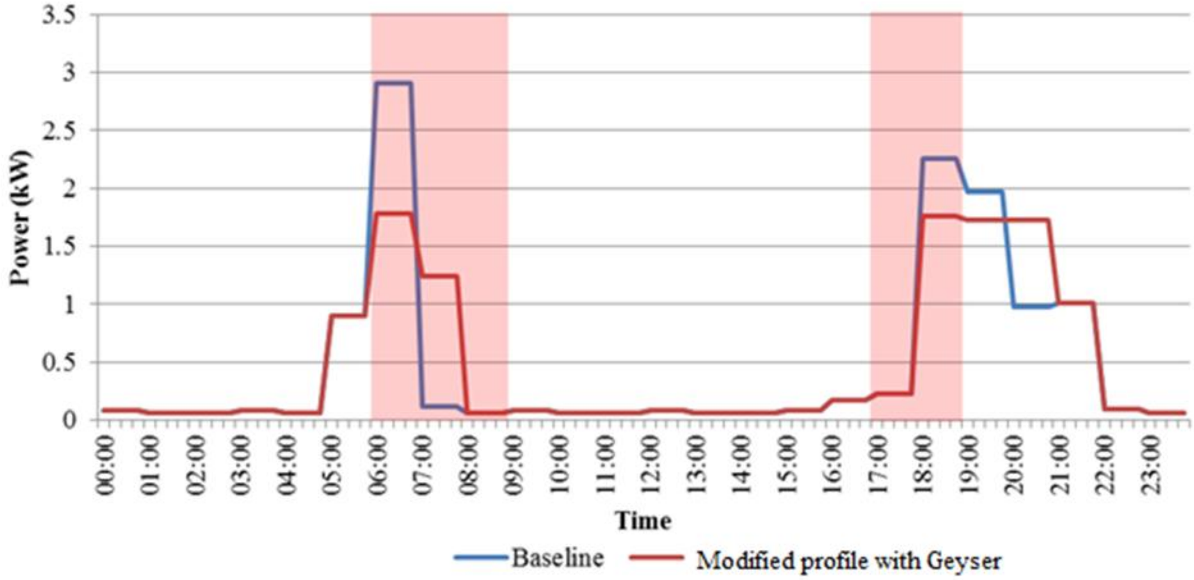

Figure 4.17 Comparison between the baseline and the modified profile with geyser

From the graph it can be observed that the geyser has a positive impact on the load profile. During both peak periods there is a reduction observed in the total power used. The morning peak is from 06:00 to 09:00. During this time the baseline average power use is approximately 2.91 kW and with the geyser it is approximately 1.78 kW, therefore with the geyser in place, there is a total reduction in the peak power of approximately 1.13 kW.

The evening peak is from 17:00 to 19:00. During this time the baseline average power use is approximately 2.26 kW and with the geyser it is approximately 1.76 kW, therefore with the geyser in place, there is a total reduction in the peak power of approximately 0.5 kW. From these results it is apparent that a reduction in the peak can be achieved by simply installing a geyser.

4.3 Simulation

Once the load profile was established, it was necessary to simulate the DC RDP house. This was in order to establish a 24 hour baseline of the load profile. For convenience sake, simulations were started before the evening peak. LabVIEW graphs thus show the evening peak first, followed by the morning peak. Also note that for these simulations non-averaged results were considered.

This simulated profile would then be compared to the load profile to which load management techniques have been applied, in order to see if there were any significant changes to the profile in terms of power use, specifically during peak times.

In order to do this, it was necessary to know the number of appliances, their total amount of hours used per day, as well as their rated power. This was already established in the literature review and is again summarised in Table 4.2 below.

Table 4.2 Below is a representation of all the appliances in the two bedroom RDP house, their number, hours of use and power rating. This information was used to simulate the DC RDP laboratory model (Klunne, 2003; Bredekamp, et al., 2006; Smit, 2009; Keller, 2012; Mokonese, et al., 2012; Ijeoma & Okafor, 2014).

Appliance	Number of appliances	Hours of use	Current @ 300V DC (A)	Power rating (kW)
Fan	1	0.00	1.67	0.500
Space Heating	1	5.00	2.50	0.750
Lighting	5	8.00	0.18	0.055
TV	1	6.00	0.39	0.11675
DVD	1	2.00	0.025	0.00745
Hi-Fi	1	3.00	0.075	0.0225
Cell phone	3	2.00	0.02	0.006
Cooking	1	1.00	6.67	2.00
Kettle	1	1.50	6.67	2.00
Refrigeration	1	8.00	0.47	0.14

Table 4.2 is a representation of a few appliances in the RDP house and their rated power. It also indicates the current drawn at 300 V by each appliance. With this information a simulation of the RDP house could be done in order to see if the simulated results are similar to that of the theoretically developed baseline. LabVIEW was used to do the simulation. In this simulation, each appliance is represented. Figure 4.18 shows the virtual house created on the Front Panel of LabVIEW.

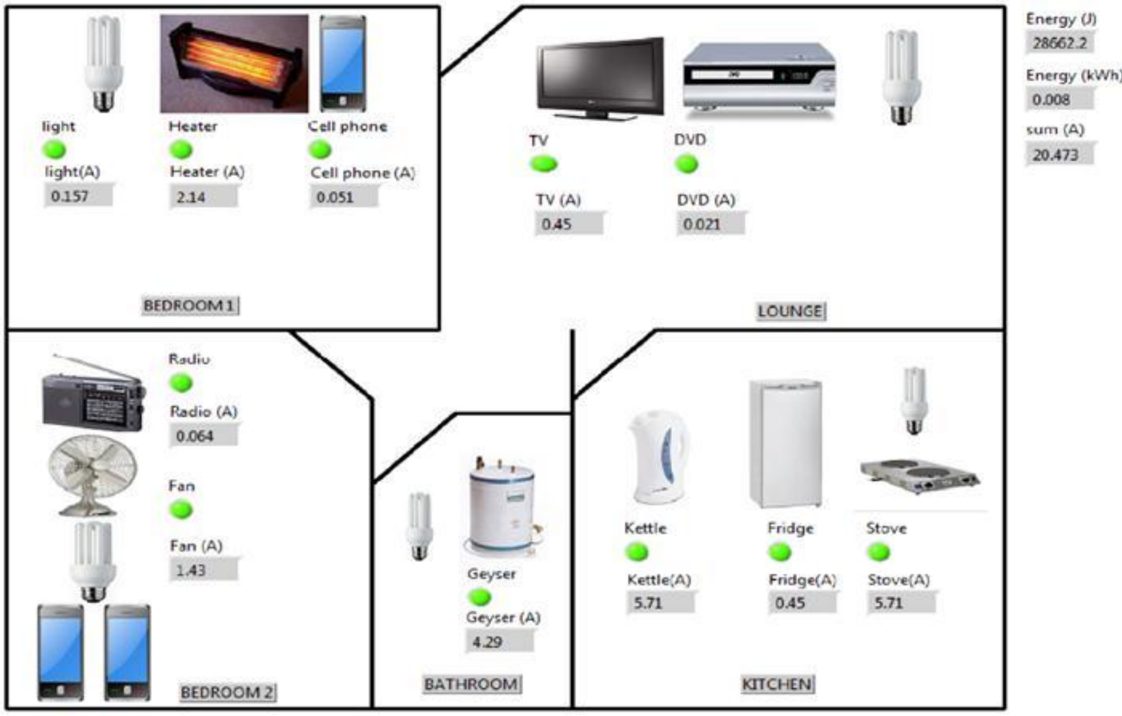

Figure 4.18 Virtual house represented in LabVIEW – Front Panel of simulation code

The Front Panel house represents the actual RDP house virtually. It consists of 2 bedrooms, a lounge, a kitchen and a bathroom. The block diagram in LabVIEW includes the code to run the simulation. The timer circuit portion of the code is shown in Figure 4.19. This simulated all appliances that were on during that specific time frame.

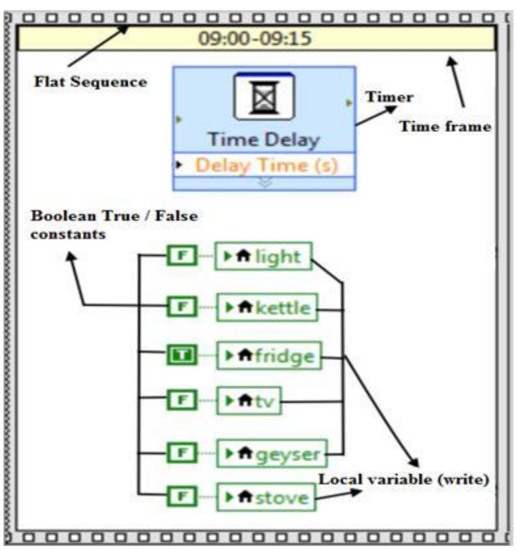

Figure 4.19 Shows code to simulate all appliances on during this time frame

The code consists of a while loop and a timer. It includes a write local variable that stores the value of the Boolean constant. There is then another code that includes a read local variable which reads the instruction within the timer circuit's code and when it triggers a true constant it will run the specific code with respect to the appliance. The read local variable is connected to a LED indicator. Once that appliance reads a true constant the LED will light up green as can be seen in Figure 4.18. This is connected to a multiplier that multiplies a Boolean number with a numeric constant. This numeric constant represents the current of the appliance. If the local variable is true, the Boolean will read a '1' and this will be multiplied with the current of the respective appliance. This will be connected to a write local variable that stores the result and allows it to be displayed on the Front Panel. The 15 minute timer circuits are all linked in a flat sequence. A portion of the flat sequence can be seen in Figure 4.20.

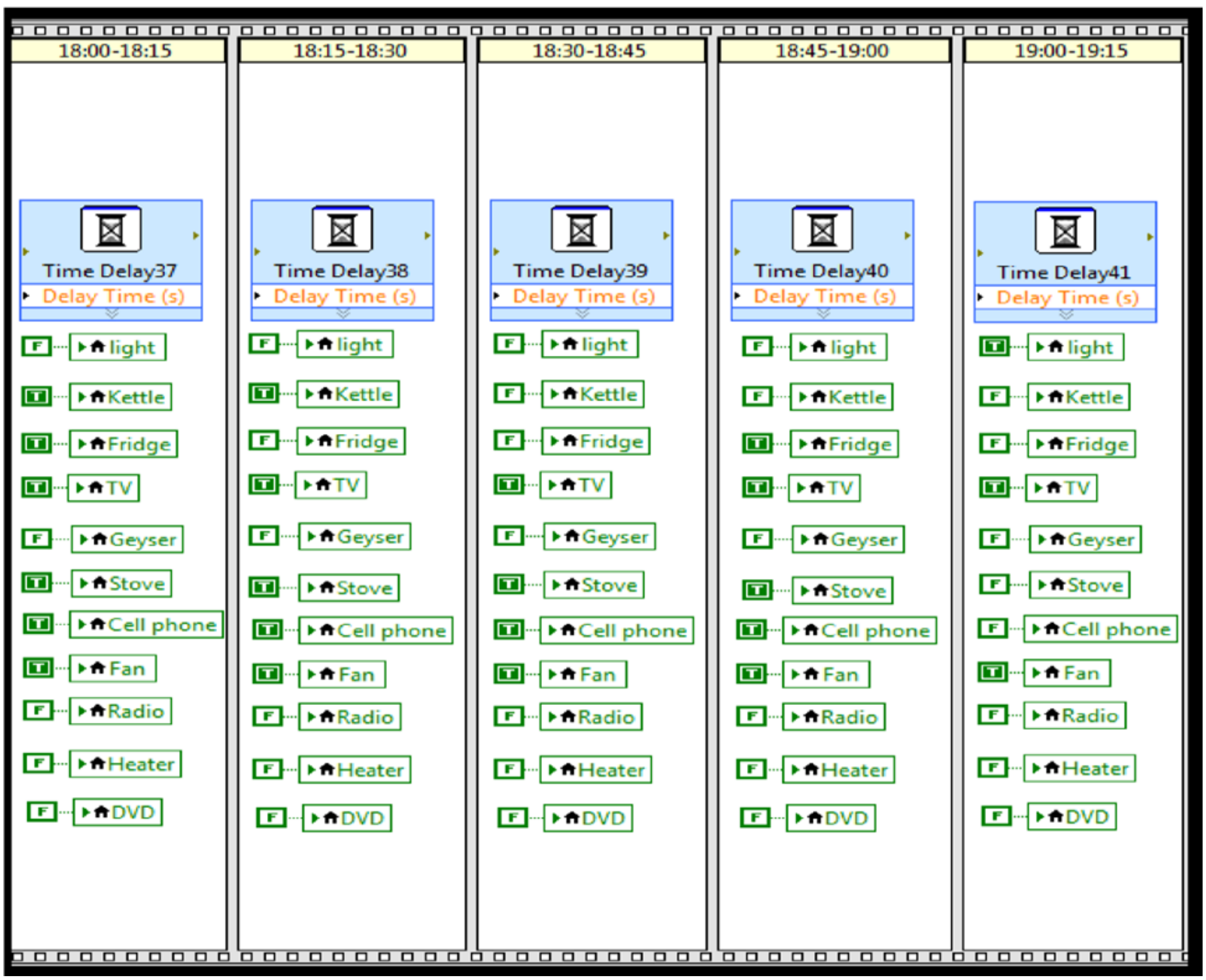

Figure 4.20 Section of flat sequence timer

Figure 4.20 shows a portion of the flat sequence timer from 18:00 till 19:00. The timer circuits are set in a flat sequence to run in series each for 15 minutes and for a total of 24 hours. The complete timing sequence can be seen in Appendix I. When the timer circuits trigger a true constant it will run the specific code with respect to the appliance as explained above. An example of the kettle code is shown in Figure 4.21. The other appliance codes can be seen in Appendix C.

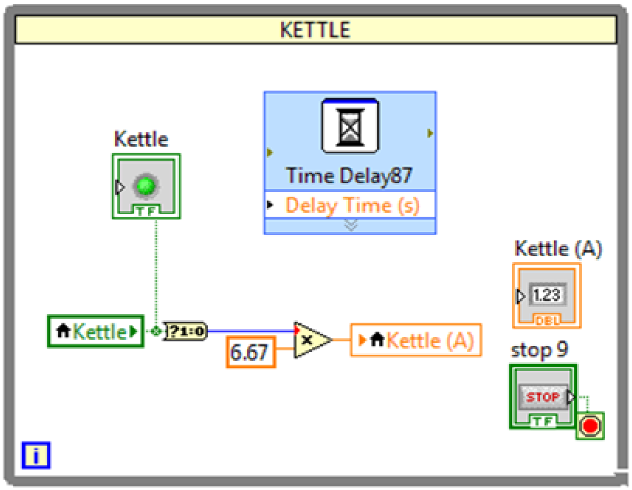

Figure 4.21 An example of the while loop in which the current of an appliance is stored in a local variable depending on the state of the Boolean constant. This is an example of the kettle.

As can be seen in Figure 4.21, the Boolean variable is multiplied with a numeric constant. In this case the numeric constant is 6.67 representing the approximate 6.67 A that is drawn by the kettle rated 2 kW on a 300 V system. If the Boolean constant is true, this value is multiplied by '1' and 6.67 is stored in the local variable, namely *Kettle (A)* in this example. If the Boolean constant was false, 6.67 would be multiplied by '0' and 0 would be stored in *Kettle (A)*. It is important to note that a *Boolean To (0,1) function,* indicated as *?1:0*, must be included in the code, which is a function that converts the Boolean false or true value to a 16-bit integer with a value of 0 or 1, respectively.

Once this is done, all local variables representing the current are summed together in a separate while loop and the result is stored in a local variable named *Total Simulated Current (A)*. The code is shown in Figure 4.22.

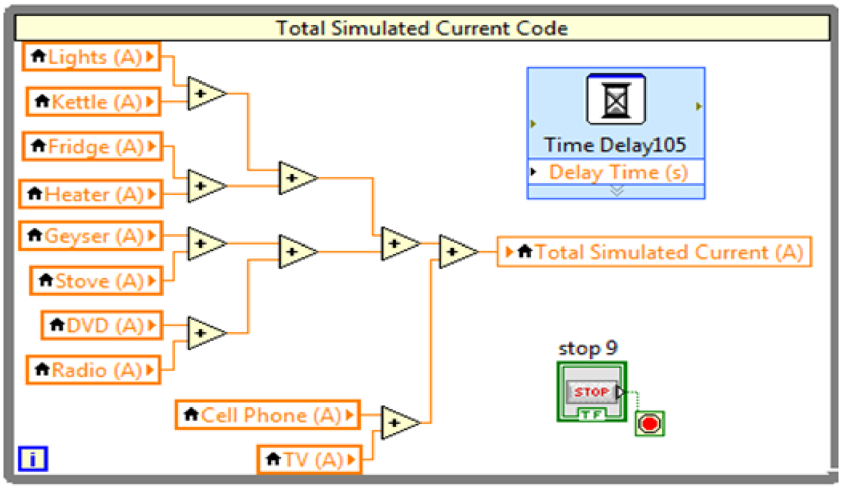

Figure 4.22 All currents are added together to represent the total current in a specific 15 minute time frame.

As can be observed in Figure 4.22 the respective local variables are added to each other to get one total value. This is done by using *add functions* in the coding. The summed result thus represents the total current for a specific 15 minute time frame and is stored in the read local variable named *Total Simulated Current (A)*. In a different loop the value in *Total Simulated Current (A)* is multiplied by another read local variable named *System Voltage (V)* in order to get the total power. The result is stored in a read local variable named *Simulated Power (W)*. This thus represents the total power in watts for the 15 minute interval and is displayed on the Front Panel as shown in Figure 4.18 and the code for this is indicated in Figure 4.23.

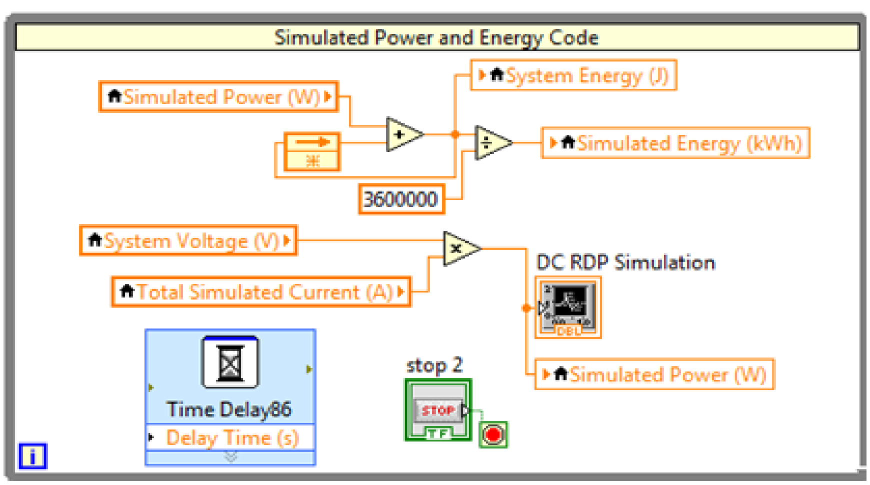

Figure 4.23 Code used to calculate the Energy used by the RDP virtual house.

As observed in Figure 4.23 the *System Voltage (V)* is multiplied by the *Total Simulated Current (A)* and the result is stored in the read local variable *Simulated Power (W)*. *System Voltage (V)* is a *numeric control* in the Front Panel of LabVIEW that can be set to the voltage the system is running at. This value was set to 300 V, but simulations were also done at 350 V for comparison purposes. The *numeric control* allows the value to be changed as required and was chosen because of this capability. The *System Voltage (V)* numeric control can be observed in Figure 4.23. The code continues to calculate the energy used by the house. This is done by adding the *Simulated Power (W)* to a *Feedback Node* and storing the result in a read local variable named *Simulated Energy (J)* to represent the energy in Joules. The *Feedback Node* is used specifically to keep adding the previous value of *Simulated Energy (J)* to the *Simulated Power (W)*. In order to get the energy used in kilowatt-hours, the *Simulated Energy (J)* is divided by 3 600 000, because 1 kWh is equal to 3 600 000 J, and the result is stored in the read local variable named *Simulated Energy (kWh)*. All results are displayed along with a graph on the Front Panel of LabVIEW. The simulation was run for 24 hours and all data was logged with LabVIEW. The results can be seen in Appendix S. Figure 4.24 is a comparison of the simulated load profile to the baseline developed earlier.

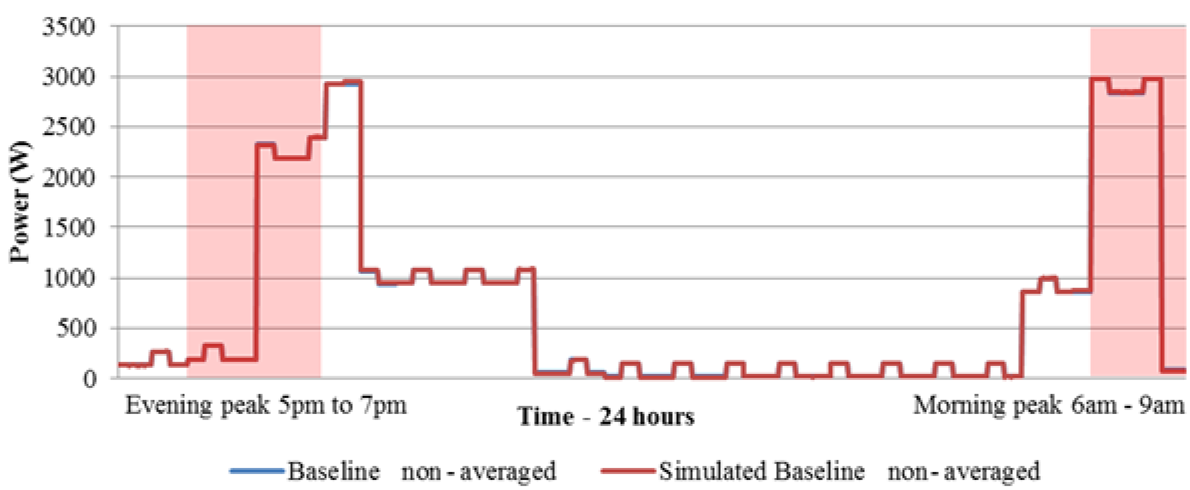

Figure 4.24 Non-averaged Baseline load profile vs. non-averaged simulated load profile

From Figure 4.24 it is observed that the simulation matches the baseline non-averaged load profile. The reason the non-averaged baseline is considered, is because the simulation runs at intervals of 15 minutes to accurately represent the power used during that 15 minute period. This simulated load profile was therefore used as the baseline reference profile.

Chapter 5
Emulation of virtual appliances and hardware design

Next it was necessary to get the virtual appliances to interact with the real world appliance.

5.1 Emulation of virtual appliances

In order to get the virtual appliances to interact with the real world appliance, the NI USB-6009 was used. The NI USB-6009 is a low-cost portable data acquisition device (DAQ) that uses LabVIEW-based software instruments, allowing the capability to analyse real-world signals (NI, 2014).

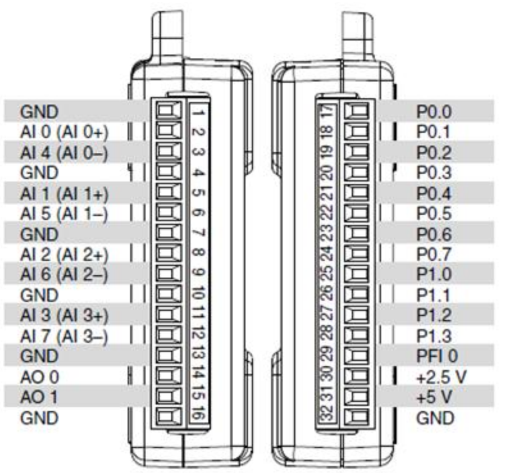

Figure 5.1 Pin out of the USB-6009 DAQ (NationalInstruments, 2015)

The NI USB-6009 provides eight single ended analogue input channels, two analogue output channels, 12 digital input / output channels, and a 32-bit counter with a full-speed USB interface.

The code for the emulation is exactly the same as for the simulation with a few changes, mainly that the USB-6009 DAQ is included into the code and instead of each individual appliance's current, the total current in a 15 minute time frame is considered. This is shown in Figure 5.2.

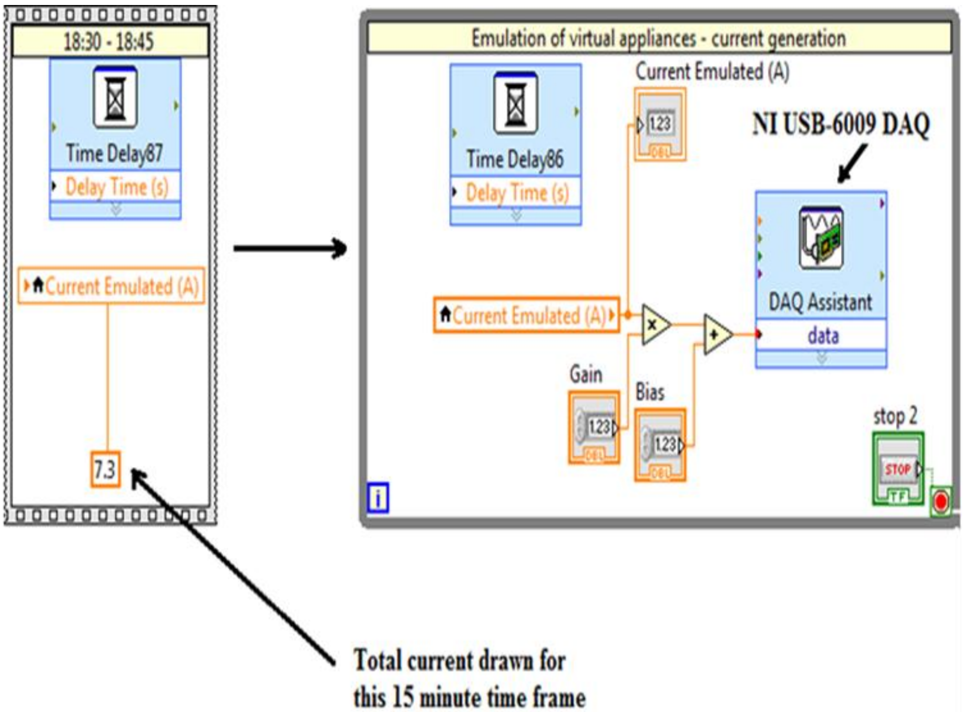

Figure 5.2 The code to generate the current needed to emulate the virtual appliances

The total current for the 15 minute time frame is entered as a numeric constant. This value is stored to the write local variable named *Current Emulated (A)*. When this specific time frame is executed, another code runs and the value in the read local variable named *Current Emulated (A)* is displayed on the Front Panel of LabVIEW by inserting a numeric indicator named *Current Emulated (A)* in the code. The local variable *Current Emulated (A)* is connected to the DAQ Assistant. The value is now available on the specific output channel selected when the DAQ Assistant was setup. Default values for the DAQ Assistant were used. Figure 5.3 shows the output channel selected.

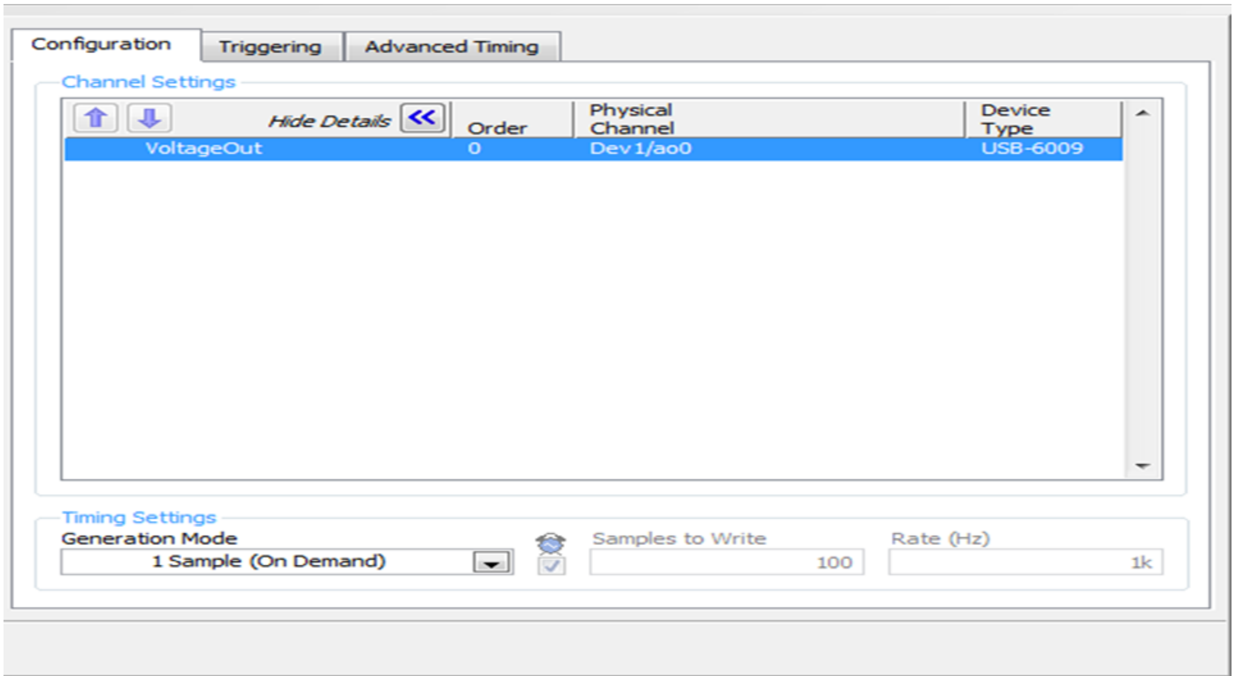

Figure 5.3 Channel selected as the output to represent the current

As observed above, the channel ao0 was selected. It is an analogue output, because the value of the current varies with each 15 minute time frame. Important to note is that the DAQ does not produce a current signal, but rather a voltage signal. It was therefore necessary to use a voltage to current converter. This had to be calibrated and these calibration *Gain* and *Bias* numeric constants are observed in the code in Figure 4.26. More on the hardware is discussed later. The value stored in *Current Emulated (A)* is also used in another code to calculate the power and is also displayed on the Front Panel with a graph. This is shown in Figure 5.4.

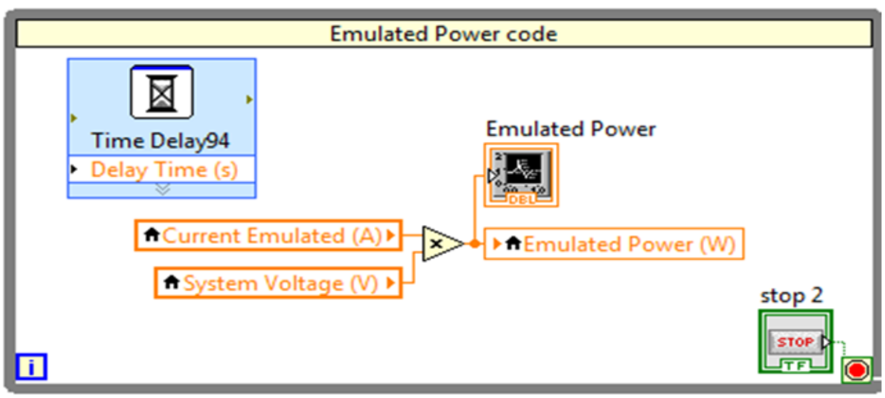

Figure 5.4 Emulated Power code

The value in local variable *Current Emulated (A)* is multiplied by the value in local variable *System Voltage (V)* and the result is stored in the local variable *Emulated Power (W)* and is also displayed on a graph as Emulated Power. All values in the local variables are also indicated on the Front Panel alongside the graph. This is shown in Figure 5.5.

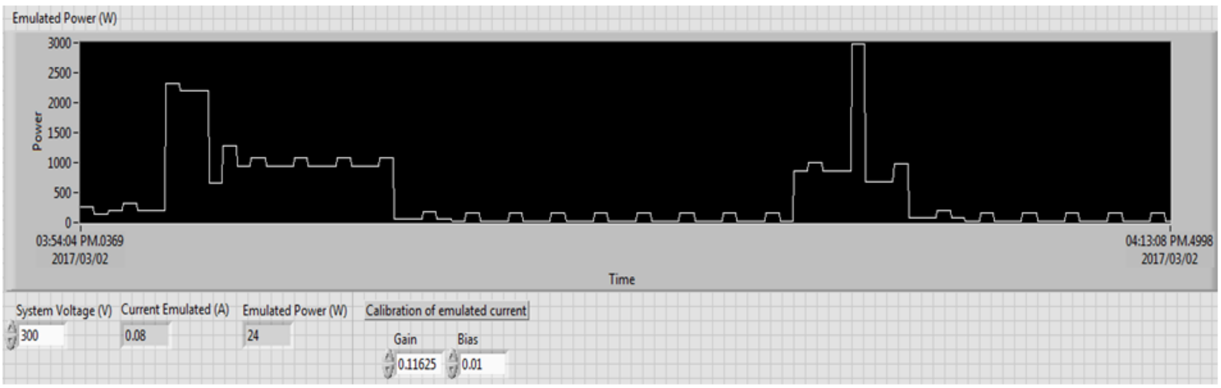

Figure 5.5 Front Panel view of non-averaged Emulated Power graph and values

As can be observed from the Front Panel of LabVIEW, the local variables indicate the *System Voltage (V)*, *Current Emulated (A)* and the *Emulated Power (W)*. The graph also indicates the emulated power graphically. The *Emulated Power (W)* does not include the geyser power, because the geyser power will not be emulated, but rather a real value is measured. This is discussed later. Also bear in mind that the emulation no longer has the kettle power included, since the emulation is based on the kettle being replaced by the geyser.

5.2 External hardware for the emulation

In order for the emulation to be successful, several components had to be used. Firstly, a way to measure the current was needed and therefore an LEM current transducer was implemented. The LTRS 25-NP was selected, since it can measure currents of up to 25 A with great accuracy.

As mentioned earlier, the problem is however that the DAQ cannot produce currents at the output, only voltages of up to 5 V. Therefore a voltage to current converter had to be developed. The LM12 was selected for this purpose. It was setup as a transconductance amplifier. That is an amplifier whose differential input voltage produces an output current and it is therefore a voltage controlled current source. The calibration of the LM12 is in Appendix O. Figure 5.6 is the schematic diagram for this circuit.

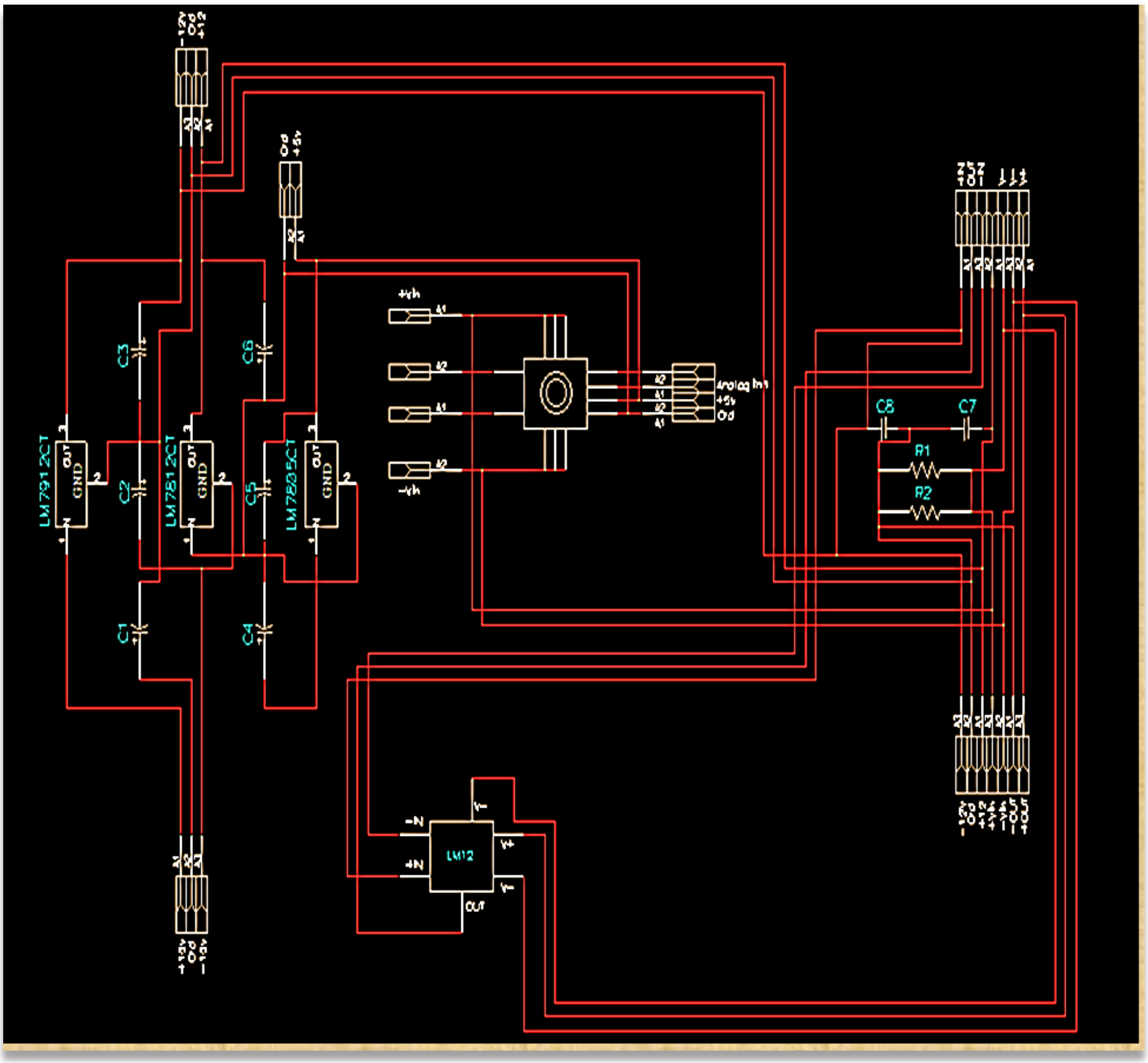

Figure 5.6 Schematic diagram of the emulation circuit

The connection for the emulation of the virtual appliances is shown in Figure 5.7. Note that the real appliance will also be connected to the same diagram at point 8. Off-the-shelf +5 V, +12 V and -12 V voltage regulators were used to power the LM12 and the LEM and they in turn are powered by a bench power supply.

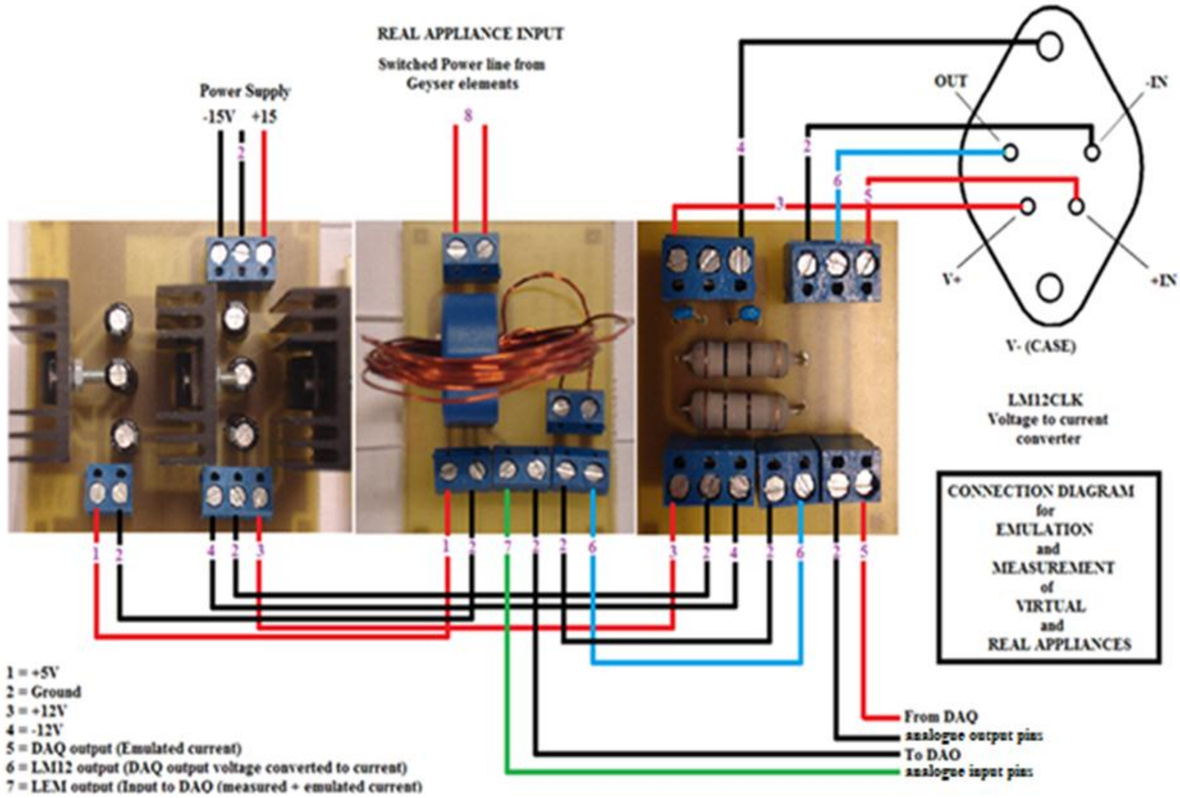

Figure 5.7 Connection diagram for the emulation and measurement of real and virtual appliances

The output from the DAQ is connected to the non-inverting input of the LM12. The maximum output of the DAQ is 5 V. If the output of the DAQ is at maximum, 5 V will be measured on the non-inverting input of the LM12. Since it is setup as a transconductance amplifier, 5 V must therefore also be present on the inverting input. If a 5 W resistor is used to get the necessary current to flow that will result in 5 V across the inverting input, it must be run safely at half the full power rating, which is 2.5 W. Therefore, the output current of the circuit is 0.5 A. This means the value of the resistor is 10 Ω as can be observed in the connection and circuit diagrams. 5 V however represents a maximum current of 20 A. Therefore, in order for the current to be maximum, the 0.5 A must be amplified 40 times. This is achieved by turning the output wire of the LM12 40 times around the core of the LEM.

This value is fed back into LabVIEW where it is used in code to determine the measured emulated power, for example, and is also displayed on the Front Panel of LabVIEW. The value however has to be attenuated because of the 40 turn gain.

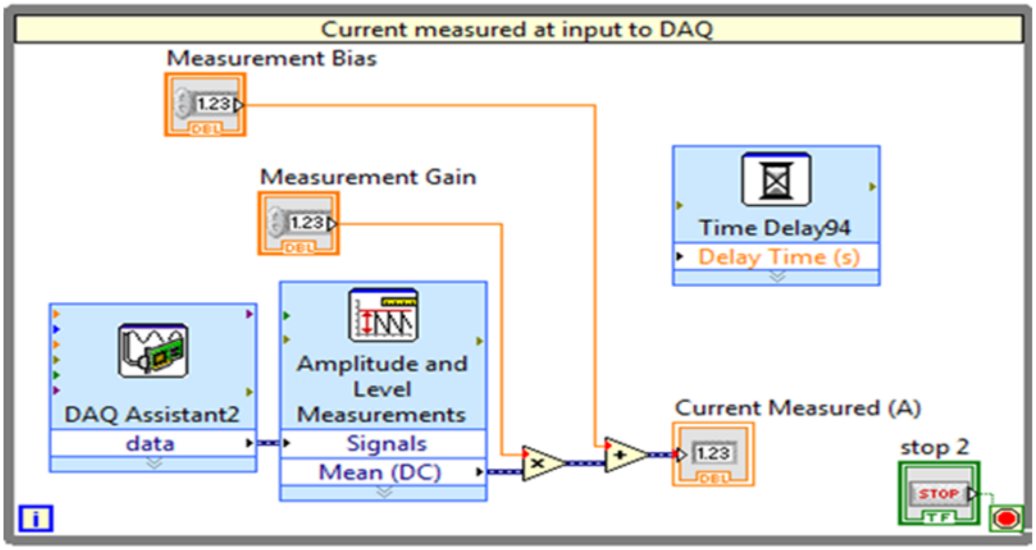

Figure 5.8 Current measured at input of DAQ. Both real and emulated current measured

The output of the LEM is connected to the analogue input channel of the DAQ and this is setup in the configuration of the DAQ Assistant in the code. That is connected to an Amplitude and Level Measurement Express VI in order to get only the mean value. The value is calibrated and the result is stored and expressed in the local variable and numeric indicator *Current Measured (A)*. This variable is also used in other code as shown in Figure 5.9.

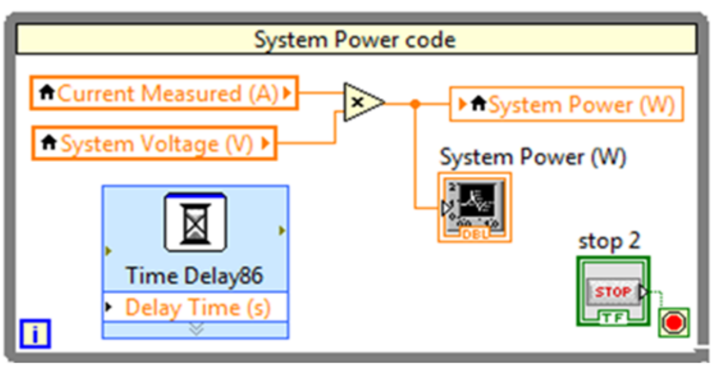

Figure 5.9 System Power code

Current Measured (A) is multiplied by *System Voltage (V)* and the result is stored in the local variable *System Power (W)*. If no geyser current is present, the *System Power (W)* is equal to the *Emulated Power (W)*. All values are also displayed on the Front Panel of LabVIEW along with a graph of the power as shown in Figure 5.10.

Figure 5.10 Front Panel view of non-averaged Emulated and System Power

The graph is a true representation of the non-averaged Emulated and System Power. It shows that the calibrations are very accurate since the *Emulated Current (A)* and *Current Measured (A)* values are almost the same. The *Emulated Power (W)* and *System Power (W)* are similar. The two graphs are similar as well. If the geyser is to be connected, the geyser current would be the difference between *Current Emulated* and *Current Measured*. Before the geyser code and graphs are discussed however, a discussion of how the AC geyser was modified to be able to work in a DC system is discussed.

5.3 Development / Modification of real appliances

The study's main focus was to develop a load management system for fixed appliances in a safe DC RDP house. The main focus was of course the geyser. The normally AC geyser had to be modified to be able to operate on a DC system. These modifications are discussed below.

5.3.1. Geyser

The element is the main part of the geyser that had to be modified. The element is a resistive load and the rating of the element is 1.5 kW. Fortunately, a resistive element does not differentiate between AC and DC voltage. The only requirement was that the nominal resistance required for the 1.5 kW @ 350 V (initial design specification) be approximately 82 Ohms. However, for future work, it was decided to mount two separate elements of 750 watts each, onto the standard removable screw in type immersion element bracket, so resistance for each was approximately 160 Ohms.

The second challenge was to replace the thermostat. The function of the thermostat is to switch the geyser 'on' when the temperature drops below the set point temperature and to switch it 'off' when the set point temperature is reached. The reason for replacing the thermostat is discussed later in this section under electric arc. The thermostat was replaced by an LM35 temperature sensor. It was mounted against the copper tank of the geyser as illustrated previously in Figure 4.11. This sensor was placed in line with the original thermostat position. Two other LM35s were placed one at the inlet pipe and the other at the outlet pipe. The set point of the geyser was set to 60 degrees Celsius with a minimum temperature of 55 degrees Celsius. The sensors were all connected to the DAQ in order for the temperature to be recorded and monitored by LabVIEW. It was also connected to the load management devices that will be discussed later.

At 300 V DC an electric arc is created when disconnecting the voltage mechanically. A relay was used to demonstrate the arc created when disconnecting 300 V DC mechanically.

5.3.2 Electric arc

An electric arc, also sometimes referred to as an arc discharge, is a visible plasma discharge between two electrodes, or contacts, and this is due to a current flowing through a nonconductive medium, like air (Novak, 2012; Slade, 2013). In order to demonstrate this, the relay circuit in Figure 5.11 was constructed and connected to a 300 V supply.

An arc can only exist if there is a current flow between two contacts separated by a gap sufficient to sustain an arc, and this current is only due to a voltage that exists on the contacts.

The resultant arc is due to the relay's inability to handle the high voltage or current or both (PickerComponents, 2015).

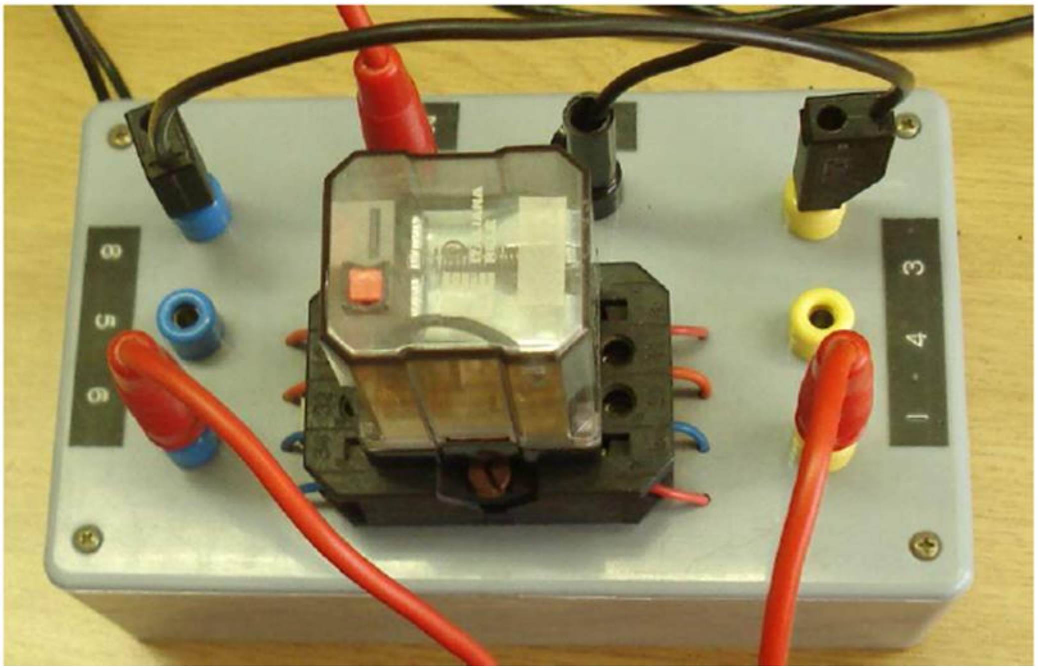

Figure 5.11 Relay test circuit to demonstrate arcing effect

When the switch is closed, the transistor switches on and energises the relay coil. This in turn closes the mechanical contacts and current flows. During this time, the operation of the relay is normal. The problem however starts when the switch is opened and the coil discharges, forcing the mechanical contacts to open. As the contacts begin to separate, the area that carries the load current starts to reduce more and more. Load current begins to funnel into the constriction area, which refers to the last, tiny area of contact surface to break, and the I^2R heat begins to increase (PickerComponents, 2015).

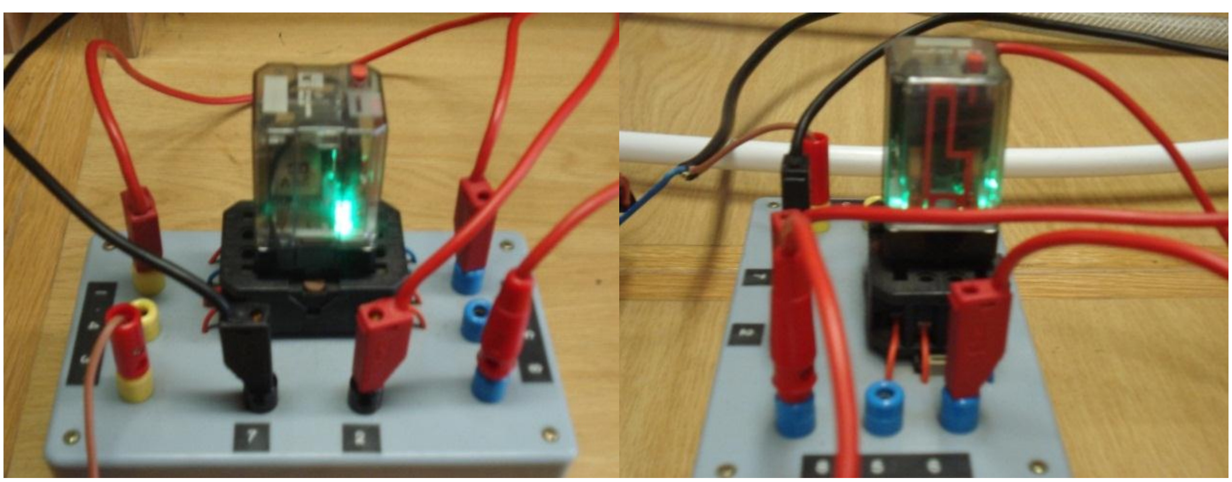

Figure 5.12 Relay test showing the arcing effect

Depending on the severity and duration the arc lasts, each and every time an arc ignites, contact erosion occurs. This causes a big loss of contact material which may result in contacts that will ultimately fail to close the load circuit, or where one contact loses so much material that a spike and crater results. This can lead to the contact's failure to open (Slade, 2013; PickerComponents, 2015). From this it is clear that switching the appliances on or off with a mechanical switch will not work. An electronic switch will have to be developed and implemented.

5.3.3 Electronic switch

The following electronic switch was developed for the DC application. It is a simple design with the main component being the IRF460 MOSFET. It operates in conditions of up to 500 V. Figure 5.13 is the circuit diagram as well as an example of a populated board.

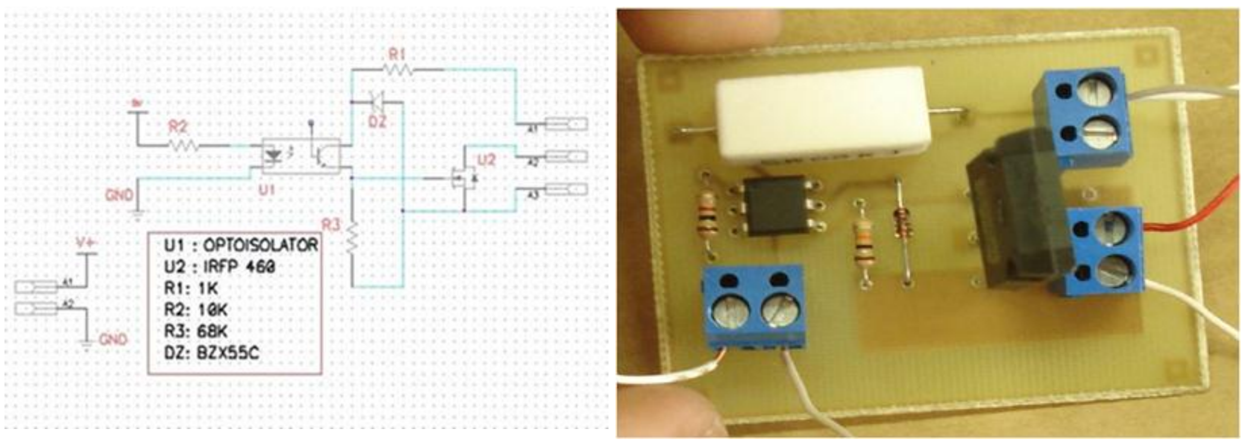

Figure 5.13Electronic switch circuit for the DC voltage

A signal from the load management device (Arduino Mega) to pin A1, which is the anode of the opto-coupler, will switch the opto-coupler, which will in turn switch on the MOSFET and cause current to flow, thus supplying DC voltage to the appliance connected to pins A2 and A3 of the circuit. Once the signal to A1 is removed, the MOSFET will switch off. The opto-coupler is included for safety purposes, isolating the low voltage circuit from the high voltage circuit.

With all these modifications done, the geyser was connected to the system. As previously discussed and shown in Figure 5.7, the geyser is connected to point 8 on the diagram. That is the input pins of the LEM. Two of the electronic switches are used because the geyser has two elements of 750 watts each to give a total of 1.5 kW. This is shown in Figure 5.14.

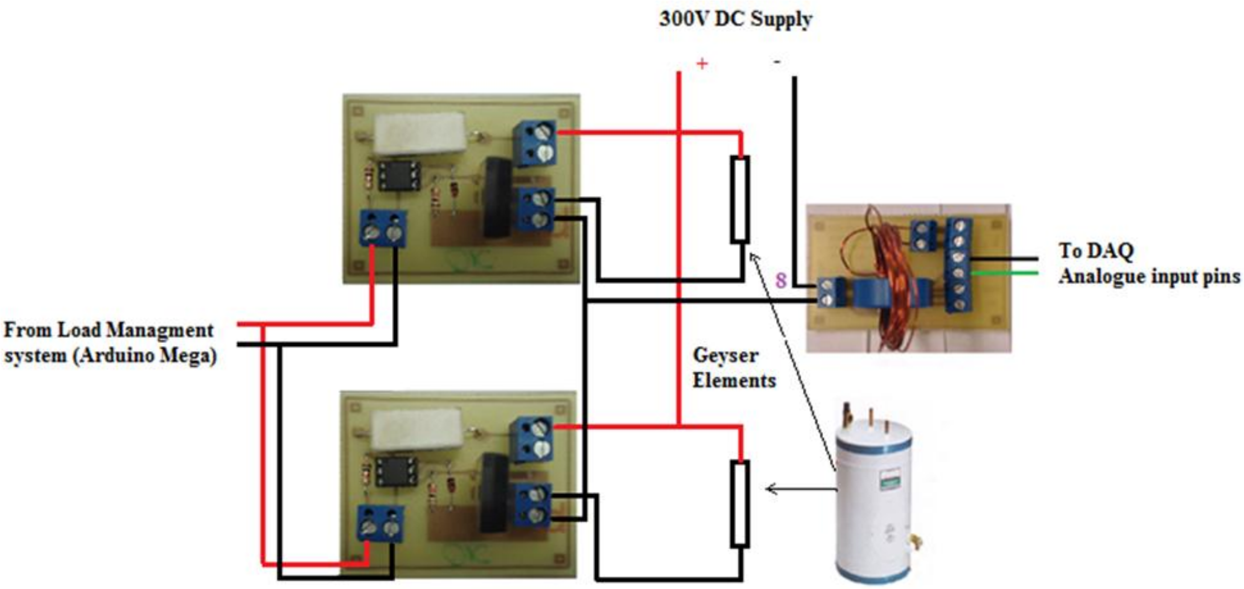

Figure 5.14 Geyser connected to the LEM to measure the actual current drawn when switched on

A signal from the load management system will switch on the opto-coupler which in turn will switch on the MOSFET allowing the High voltage to switch and the current to flow. The LEM is connected in series to the negative line of the supply voltage. The LEM output is connected to the analogue input channel of the DAQ designated for the measurement of the current and is displayed on the Front Panel of LabVIEW and is used in several calculations in the LabVIEW code. This is shown in Figure 5.15.

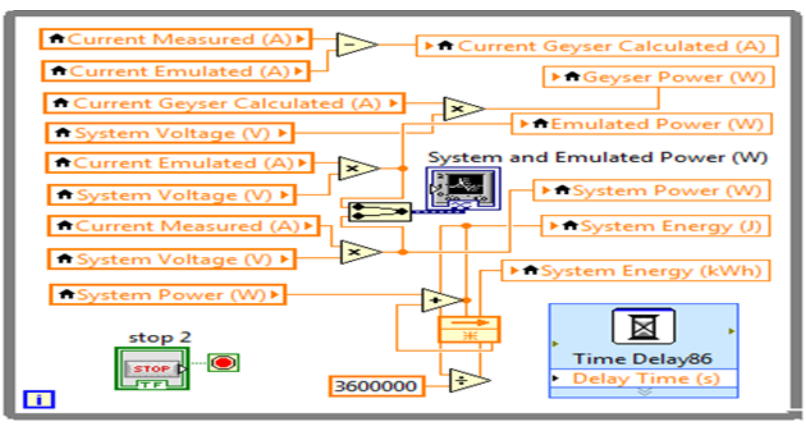

Figure 5.15 Current Measured used in various calculations

The local variable *Current Emulated (A)* is subtracted from the local variable *Current Measured (A)* and the result is stored in the local variable *Current Geyser Calculated (A)*. This is a true representation of the real geyser current.

This same value is multiplied by the local variable *System Voltage (V)* and the product is stored in the local variable *Geyser Power (W)*, which represents the power used by the geyser when it is on.

Current Measured is also multiplied by *System Voltage* and the result is stored in the local variable *System Power (W)* which represents the overall power of the system. This value is used to calculate the energy as well. All values are displayed on the Front Panel of LabVIEW, along with a graph that shows the non-averaged Emulated and System power. Therefore, from the graph the impact of the geyser can be observed as shown in Figure 5.16.

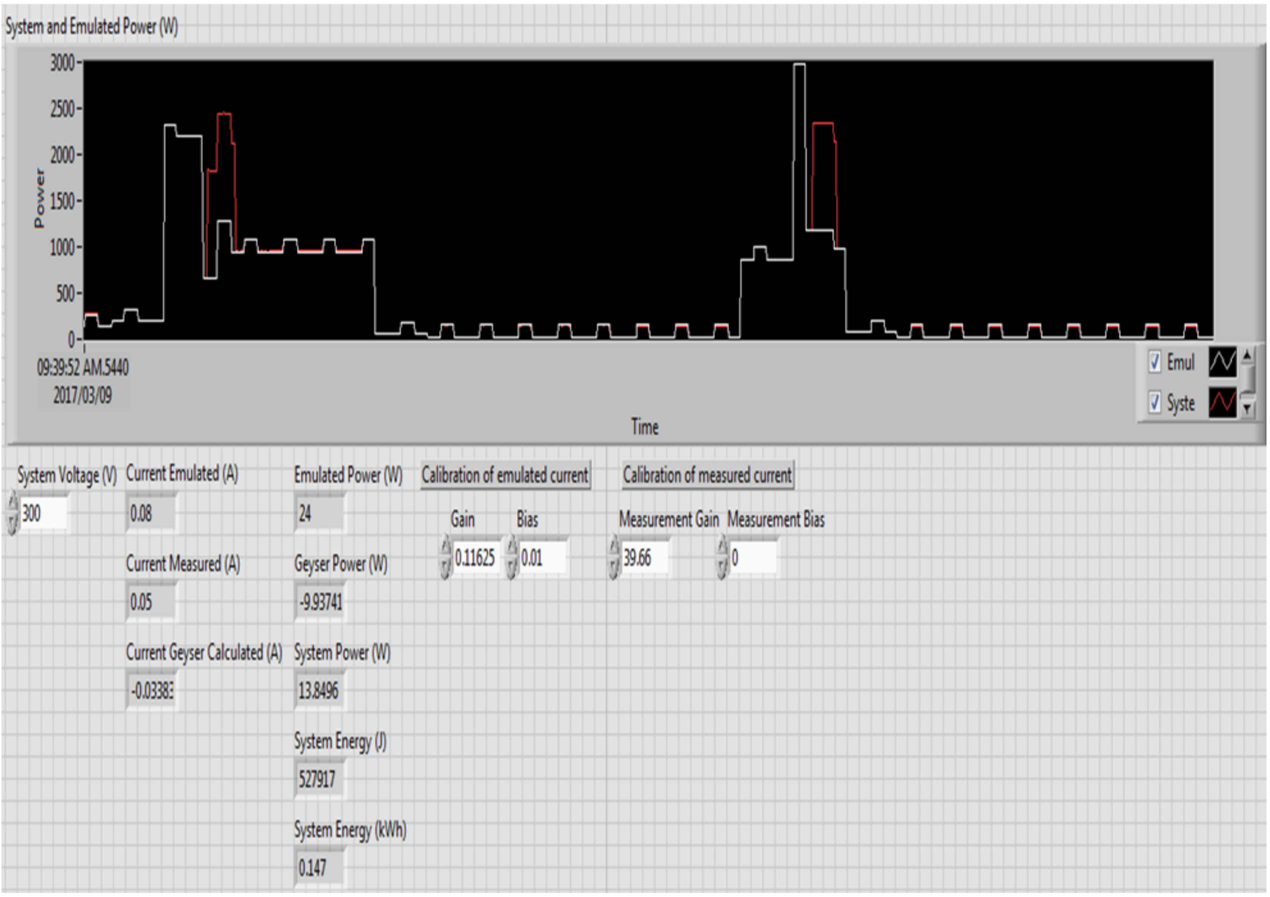

Figure 5.16 Front Panel view showing the geyser current and related power, as well as a graph that shows the impact of the geyser (non-averaged).

The Front Panel of LabVIEW indicates the *Current Emulated* as well as the *Current Measured*. From these two the geyser current is calculated by subtracting the *Current Emulated* from the *Current Measured*. The result is stored in the local variable *Current Geyser Calculated (A)*.

This value is also displayed on the Front Panel. It is further used to calculate the geyser power and the system power. Both these results are also displayed on the Front Panel.

At this stage, the load profile has been established, the baseline with no geyser has been established, the virtual appliances are being emulated, the geyser is modified and the impact it has on the system can be monitored. Everything is thus in place for the load management system to be applied. The load management setup is therefore discussed next.

5.4 Power Line Communication and Control

With the appliances modified and capable of working on the DC grid safely, the next step was to implement the power line communication and control. This consisted of two parts, namely the actual power line communication modem for the communication and a micro controller to implement the load management system on.

5.4.1 Power Line Communication modem

As indicated in the literature review, Power Line Communication (PLC) was chosen, since it made it possible for communication to take place directly on the DC power line. This saves costs and makes the system more efficient. For this study, an off-the-shelf modem was selected. It is the Spyder UART by LinkSprite as shown in Figure 5.17.

Figure 5.17 Spyder - Narrow Band Power Line Communication Modem (LinkSpriteTechnologies, 2011)

From the electrical specifications it is clear that the device can operate safely up to 400 V DC, which is well within the range of the study.

The connection to the Spyder was relatively simple with only pin 2 and pin 3 used as the transmitter and receiver respectively, with power applied to pin 1 and grounded via pin 10. These transmitter and receiver pins were connected to the micro controllers. These micro controllers were setup as a master and slave.

5.4.2 Arduino Mega 2560

The load management system was developed on an Arduino Mega 2560. The reason it was chosen is because it has several serial communication ports, allowing several slaves or appliances to be connected and the communication speed is relatively fast.

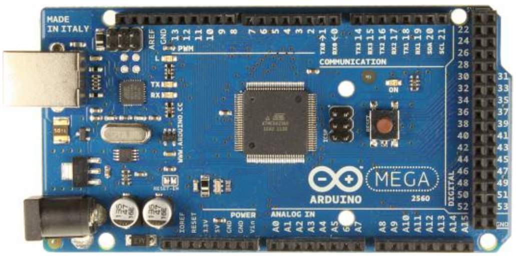

Figure 5.18 Arduino Mega 2560 used as the platform for the load management system (ElectroSchematics, 2017).

The Arduino Mega 2560 is a micro controller board based on the ATmega2560. It simply needed to be connected to the devices and is easily powered by either an AC-to-DC adapter or via battery. The board can operate on an external supply of 6 to 20 volts. The Arduino Mega2560 has a number of facilities for communicating with a computer, another Arduino, or other micro controllers. The ATmega2560 provides four hardware UARTs for TTL (5V) serial communication. A simple bidirectional logical level converter was however necessary to convert the 5V to 3.3V and vice versa, to allow communication between the micro controller and the PLC modem. The bidirectional logical level converter is basically only MOSFETs and in this case the BSS138 was used.

5.4.3 Synchronisation of LabVIEW and Arduino platforms

The challenge faced with linking the LabVIEW simulation / emulation and applying the load management algorithm to it was the time synchronisation. Since the LabVIEW code could be run at any time, it was necessary to find a way to let the algorithm know what time frame was being executed.

Though a real-time clock was also used in the Arduino platform, this could not solve the synchronisation problem. The way this was solved was by putting a voltage on the DAQ output channel and linking that specific voltage level to a specific time frame hour. The algorithm runs according to peak hours and non-peak hours as explained previously.

Each hour in a 24 hour day is thus represented by a voltage. In the LabVIEW code, this voltage is applied as shown in the code in Figure 5.19.

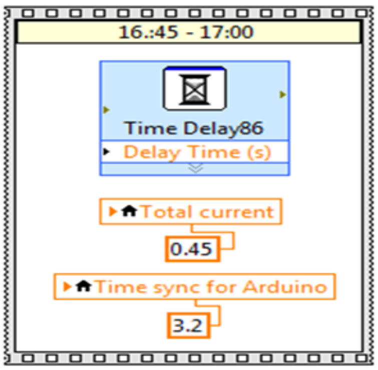

Figure 5.19 Time synchronisation for LabVIEW and Arduino platform

From this time frame the output channel of the DAQ will be set to 3.2 V, which therefore represents the time period between 16:00 and 17:00. The other time periods and their related voltages can be seen in Figure 5.20.

```
    analogTime=int(analogRead(lVTimeA0)*4.87072633);   //mV 4.8828125
    Serial.println(analogTime);

    if(analogTime>=1000 && analogTime<=1100) lVTime=18;          //6 pm
    else if(analogTime>=1100 && analogTime<=1200) lVTime=19;     //7 pm
    else if(analogTime>=1200 && analogTime<=1300) lVTime=20;     //8 pm
    else if(analogTime>=1300 && analogTime<=1400) lVTime=21;     //9 pm
    else if(analogTime>=1400 && analogTime<=1500) lVTime=22;     //10 pm
    else if(analogTime>=1500 && analogTime<=1600) lVTime=23;     //11 pm
    else if(analogTime>=1600 && analogTime<=1700) lVTime=24;     //12 pm
    else if(analogTime>=1700 && analogTime<=1800) lVTime=1;      //1 am
    else if(analogTime>=1800 && analogTime<=1900) lVTime=2;      //2 am
    else if(analogTime>=1900 && analogTime<=2000) lVTime=3;      //3 am
    else if(analogTime>=2000 && analogTime<=2100) lVTime=4;      //4 am
    else if(analogTime>=2100 && analogTime<=2200) lVTime=5;      //5 am
    else if(analogTime>=2200 && analogTime<=2300) lVTime=6;      //6 am
    else if(analogTime>=2300 && analogTime<=2400) lVTime=7;      //7 am
    else if(analogTime>=2400 && analogTime<=2500) lVTime=8;      //8 am
    else if(analogTime>=2500 && analogTime<=2600) lVTime=9;      //9 am
    else if(analogTime>=2600 && analogTime<=2700) lVTime=10;     //10 am
    else if(analogTime>=2700 && analogTime<=2800) lVTime=11;     //11 am
    else if(analogTime>=2800 && analogTime<=2900) lVTime=12;     //12 am
    else if(analogTime>=2900 && analogTime<=3000) lVTime=13;     //1 pm
    else if(analogTime>=3000 && analogTime<=3100) lVTime=14;     //2 pm
    else if(analogTime>=3100 && analogTime<=3200) lVTime=15;     //3 pm
    else if(analogTime>=3200 && analogTime<=3300) lVTime=16;     //4 pm
    else if(analogTime>=3300 && analogTime<=3400) lVTime=17;     //5 pm
}
```

Figure 5.20 Voltage allocation for time synchronisation

Each hour is represented by a voltage. This was only necessary for synchronising the LabVIEW emulation with the Arduino platform.

If the system was to be used with no LabVIEW emulation, the real-time clock is sufficient.

5.4.4 Solenoid valve setup

The very first thing was to set up code that would do the water draws automatically. The code consists of a while loop and a timer that are all set in a flat sequence. The code includes a write local variable named *Valve on or off* that stores the value of a Boolean constant. There is more code that includes a read local variable named *Valve on or off* which reads the instruction within the timer circuit's code and when it triggers a true constant it will run the specific code with respect to the solenoid valve. The *Valve on or off* local variable is connected to an LED indicator. Once the *Valve on or off* reads a true constant the LED will light up green as can be seen in Figure 5.25. If the *Valve on or off* reads true, the selected output channel on the DAQ goes high and the solenoid valve is switched on for the time period indicated by the timer. The timer is linked to the timer of the load profile time frame flat sequence so that the two codes will be synchronised. This code is shown in Figure 5.21.

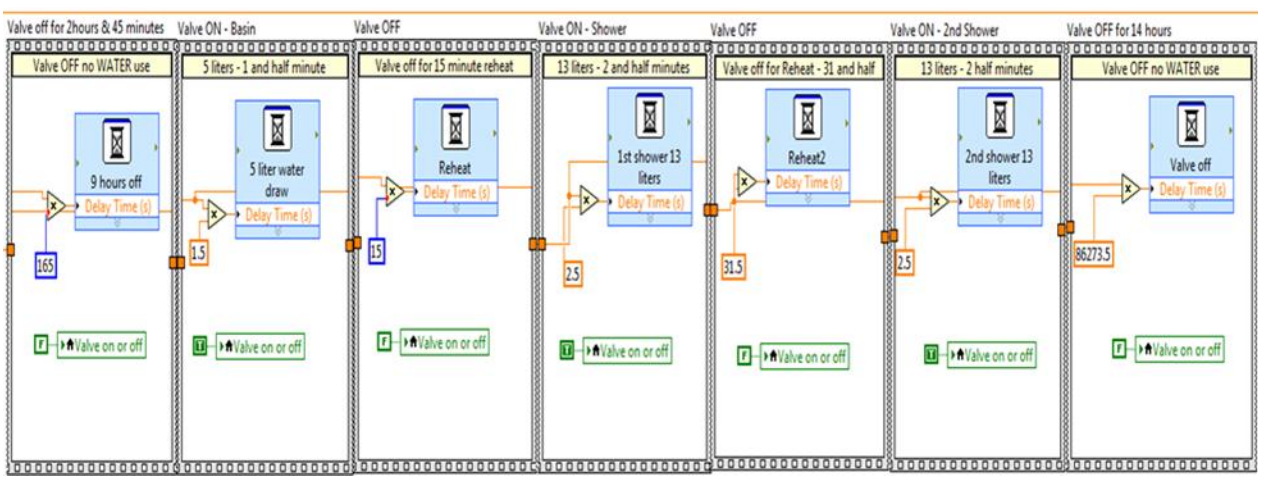

Figure 5.21 Code for automatic water draws from the DC geyser

When the timer circuits trigger a true constant it will run the specific code with respect to the read local variable named *Valve on or off*. It will run for the duration set by the timer. If the *Valve on or off* is false, the solenoid valve will remain off for the duration set by the timer. The solenoid valve code is shown in Figure 5.22.

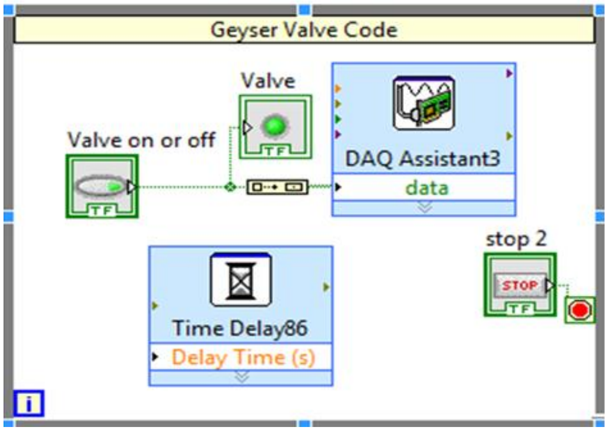

Figure 5.22 Valve code for drawing water from the geyser

When the Boolean constant reads true, an LED is switched on and can be observed in the Front Panel of LabVIEW. At the same time the output pin selected in the setup of the DAQ goes high, which in turn switches on the solenoid valve mentioned in Figure 4.13. The solenoid valve will remain on for the duration of the time set by the timer of the loop as well as the timer set by the load management time frame sequence. The synchronisation is shown in Figure 5.23.

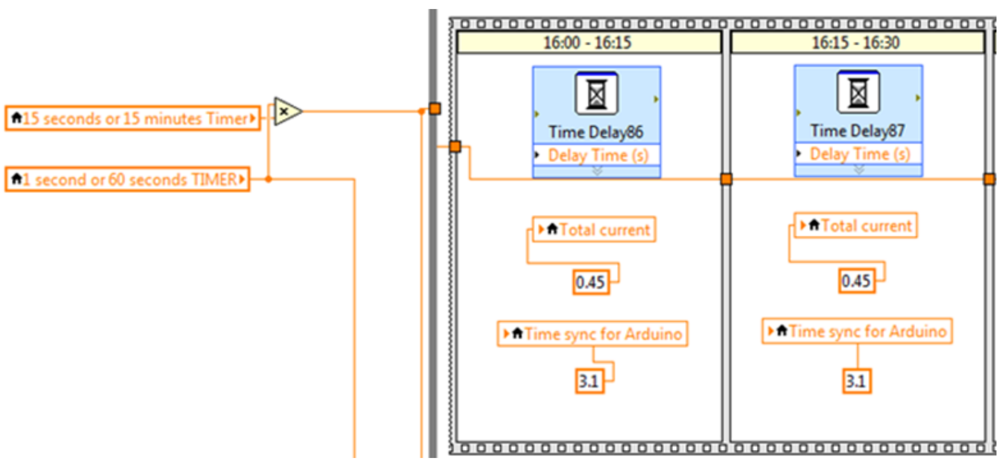

Figure 5.23 Timer synchronisation

The timer for the load management time frame in LabVIEW is such that two options are available, namely, the time can be set to run for 24 minutes or it can run for 24 hours. The 24 minutes were necessary when simple tests were conducted. The 24 hours option was not limited to running the program 24 hours, but rather to get real time based results. What is meant by this is that if something needed to run for 15 minutes, it must run for 15 minutes.

If the value set in the read local variable *1 second or 60 seconds TIMER* is 1 second and the value in the read local variable *15 seconds or 15 minutes TIMER* is 15 seconds, the product of the two is 15 seconds meaning the code runs for 15 seconds. If the value set in the read local variable *1 second or 60 seconds TIMER* is 60 seconds and the value in the read local variable *15 seconds or 15 minutes TIMER* is 15 seconds, the product of the two is 900 seconds meaning the code runs for 15 minutes. The *1 second or 60 seconds TIMER* is synchronised to the solenoid valve timers as shown in Figure 5.24.

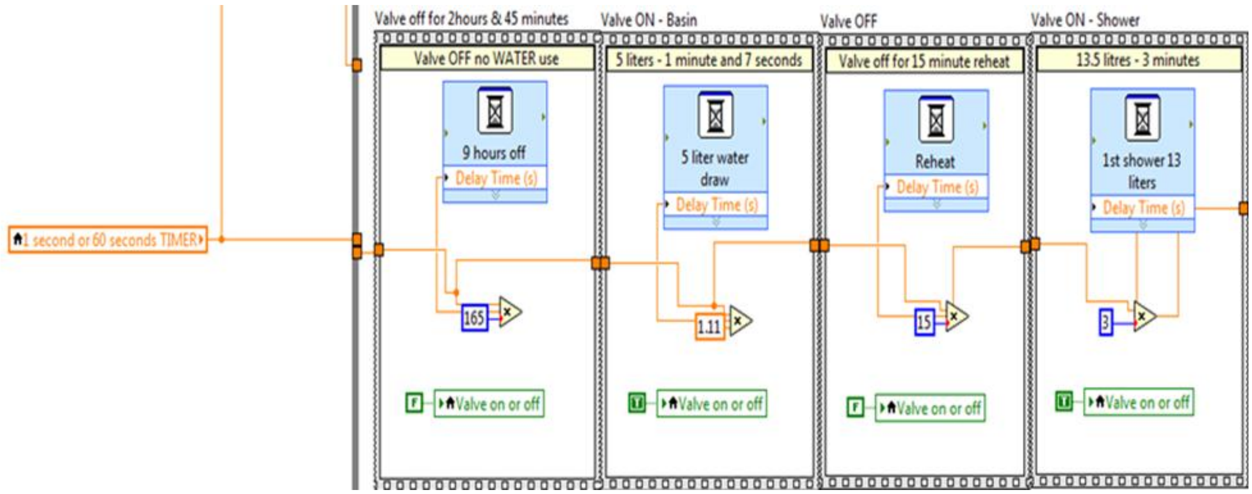

Figure 5.24 Time synchronisation for the solenoid valve timer

If the *1 second or 60 seconds TIMER* is set to 1 second, 1 second is multiplied with the numeric constant in the while loop, for example the 3 minute water draw will result in a 3 second draw. If the *1 second or 60 seconds TIMER* was set to 60 seconds, the product would be 180 seconds which is 3 minutes. The timers are adjusted in the Front Panel of LabVIEW by numeric controls. They are shown in Figure 5.25.

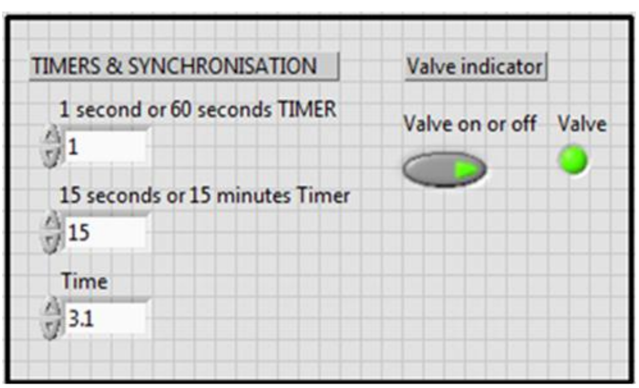

Figure 5.25 Timers and solenoid valve indicator in Front Panel of LabVIEW

The timers are thus set in the Front Panel as indicated. If the solenoid valve is on, the valve indicator LED goes green.

5.4.5 Load management system

Communications between devices in this system is based on a master-slave configuration. In this configuration, the main or compulsory device is called the master and optional devices are called slaves. In the context of the study, the fixed appliance, the geyser, is a slave device and the master is linked to a personal computer. This is better illustrated in Figure 5.26.

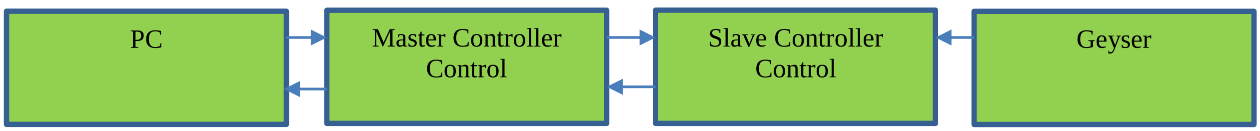

Figure 5.26 Communications between devices

Communications begin with the master sending a message to the slave. This message is a request for the current state of the slave. The slave acknowledges this request by sending a message to the master and responds with its current state by sending another message immediately. The master receives the messages and acknowledges this by sending a message in return. The master relays this information to a personal computer which stores this information using LabVIEW as illustrated in Figure 5.27.

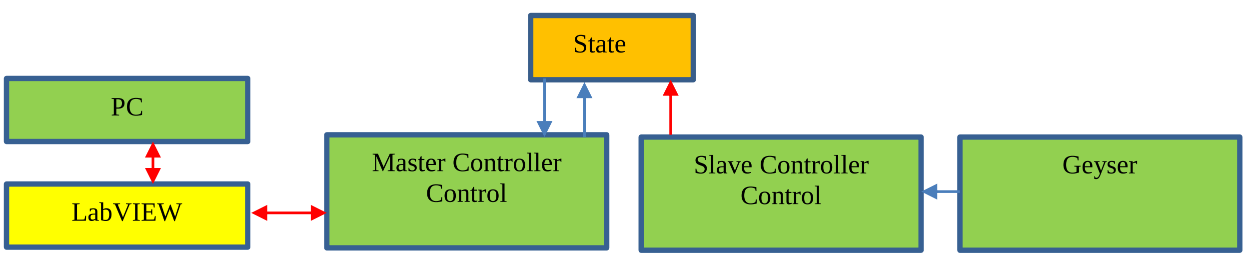

Figure 5.27 Master relays information to PC via LabVIEW

The current state of the slave contains important information about the geyser. This information includes the water temperature inside the geyser, the inlet temperature which is the water entering the geyser via the solenoid valve, the outlet temperature which is the water that is withdrawn from the geyser, as well as the element state, indicating whether the geyser is on or off. Apart from this specific geyser information, the slave also sends the valve condition, indicating whether it is on or off, as well as the current time of the slave. This is better illustrated in Figure 5.28.

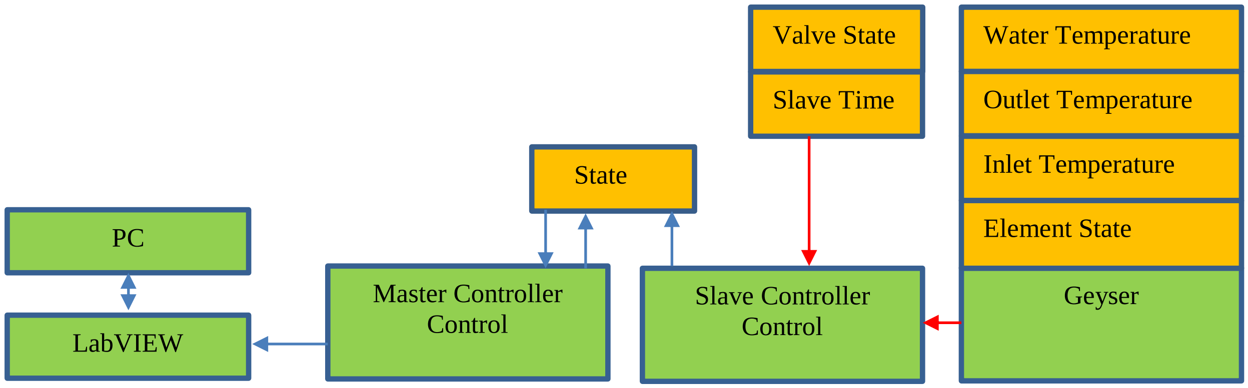

Figure 5.28 Slave responds to Master by giving the current state of the slave device

Now that the master is aware of the state of the slave it can make decisions based on user input and other sensor data such as the time and solenoid valve control. Any user defined changes as well as some sensor data are sent to the slave via a message. This message is a request to adjust the current state of the slave. The slave acknowledges this request by sending a message to the master and adjusts its state accordingly. The master receives the message and acknowledges this by sending a message in return. This is better illustrated in Figure 5.29.

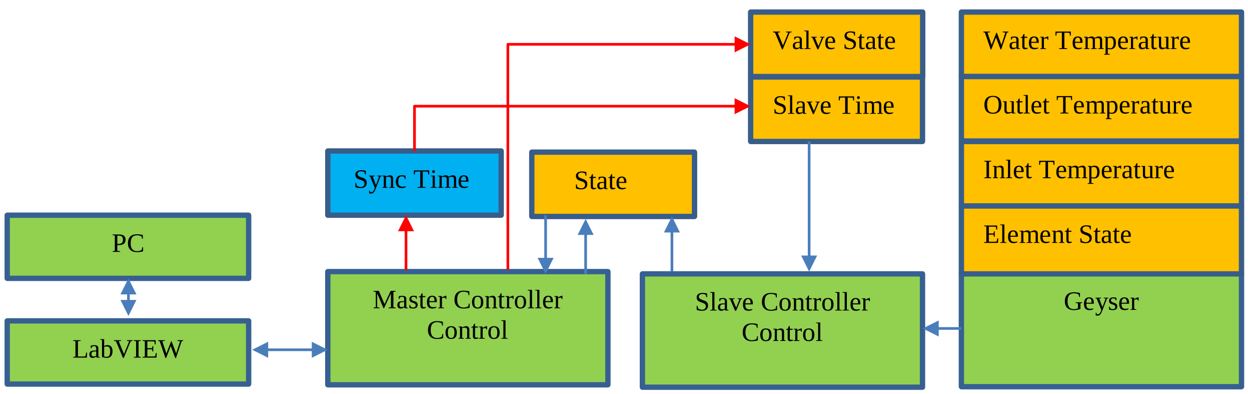

Figure 5.29 Master requests slave to adjust its state

If water is drawn, LabVIEW sends a high valve condition to the master which in turn switches on the valve. LabVIEW also sends the time synchronisation voltage signals to the master which relays it to the slave. Peak hours as per the literature review are between 06:00 and 09:00 in the morning and between 17:00 and 19:00 in the evening. This is named the Peak time for the purpose of this study.

The master continuously sends these time changes to the slave and the slave responds by doing the following.

During Peak time the algorithm will:

1. Switch off the geyser and monitor the geyser temperature; switch on the geyser if the minimum temperature is reached, and switch it off again, when the set point temperature is reached. It does this for the duration of the peak period.

During Non-peak hours the algorithm will:

1. Monitor the geyser temperature, ensuring the temperature is always maintained between the minimum and set point temperature; and
2. Heat the geyser to 75 degrees before the peak and after the peak.

This means load shifting/valley filling is applied, ensuring that the geyser is switched on outside peak hours and therefore ensures that hot water is present before the geyser is switched off. This is illustrated in Figure 5.30.

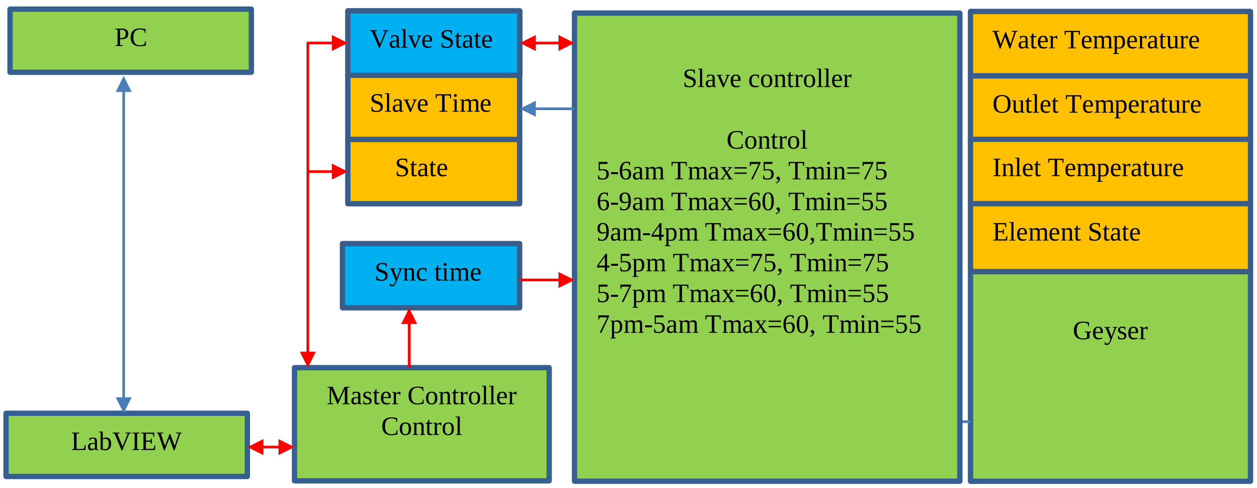

Figure 5.30 Implementation of algorithm according to time synchronisation

During 05:00 to 06:00, the temperature of the geyser is increased to 75 degrees Celsius and is maintained at that temperature until 06:00. This is the actual valley filling technique being applied. From 06:00 to 09:00, the geyser is switched off and the temperature of the water is monitored to keep it between a minimum of 55 degrees and a maximum of 60 degrees. This means that if the temperature drops below 55 degrees Celsius, the geyser will switch on and once the temperature reaches 60 degrees Celsius, it will switch off again. This monitoring and control is done for this entire period.

From 10:00 to 16:00, the geyser is switched off and the temperature of the water is monitored to keep it between a minimum of 55 degrees and a maximum of 60 degrees.

During 16:00 to 17:00, the temperature of the geyser is increased to 75 degrees Celsius and is maintained at that temperature until 17:00. This is the valley filling technique being applied before the peak. From 17:00 to 19:00, the geyser is switched off and the temperature of the water is monitored to keep it between a minimum of 55 degrees and a maximum of 60 degrees.

From 19:00 to 05:00, the geyser is switched off and the temperature of the water is monitored to keep it between a minimum of 55 degrees and a maximum of 60 degrees.

With all this in place a communications test was conducted and the example is discussed next. In this example the master sends the following: [254, 4, 49, 85] where 254 is the address, 4 is the length of the message, 49 is the actual payload or information and 85 is the end of the message. If the slave receives this correctly, it responds and sends an Ack message, which is the exact inverse, or one’s complement of the binary, of what the master sent, as an acknowledgement, ended with the end message. When the master receives the Ack message, it responds by sending its own Ack message. This happens every time a message is sent from either the master or the slave. Figure 5.31 is a snapshot of the serial communication showing one complete communications transaction.

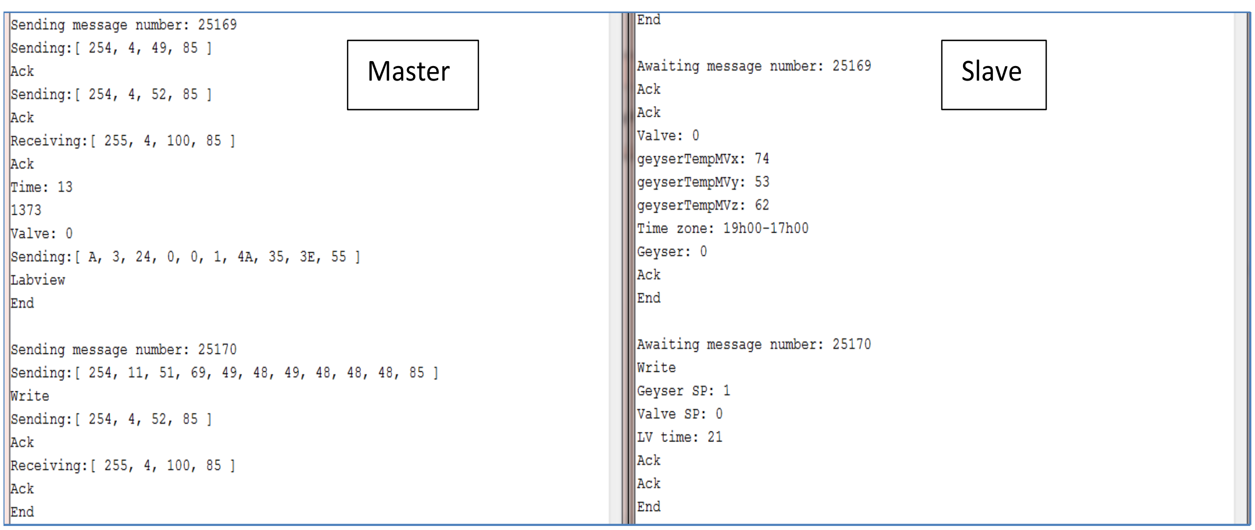

Figure 5.31 Snapshot of serial communications showing one complete communications transaction

Once the master and slave have completed communications, the master sends what it received from the slave as a message to LabVIEW.

In message 25169, the information sent to LabVIEW is in hexadecimal notation: [A, 3, 24, 0, 0, 1, 4A, 35, 3E, 55] which in decimal notation is: [10, 3, 36, 0, 0, 1, 74, 53, 62, 85] where 10 is the length of the message, 3 is the type of message, 36 refers to the time, 0 to 62 is the payload or information and 85 is the end of the message. The transaction of message number 25169 is then ended and the next message begins and this cycle repeats indefinitely. The payload information in this case is the user input and sensor data where 0 means the power of the geyser is off, the next 0 means the water inlet valve is off, the 1 means the temperature is positive, 74, 53, 62 represents the actual temperature in degrees Celsius of the geyser, the inlet and outlet pipe respectively, 36 refers to the LabVIEW time frame and in this case it is the 9pm time frame. This is calculated by subtracting 15 from 36 as discussed in the code. The real or actual time this transaction took place is indicated by Time and in message number 25169, this transaction took place at 13:00. The code for the load management system can be seen in Appendix T.

5.4.6 LabVIEW data logging code

Data is received from the master via a serial port. Each byte represents a different parameter. These include the time, geyser power state, geyser set point temperature, geyser inlet temperature, and geyser outlet temperature. Bytes are sent in strings of specific length that terminate with a linefeed character.

The bytes are located by counting the string characters and were stored individually in memory. The stored bytes are written to a text file. The Front Panel view of the data logging is shown in Figure 5.32. The code can be seen in Appendix N.

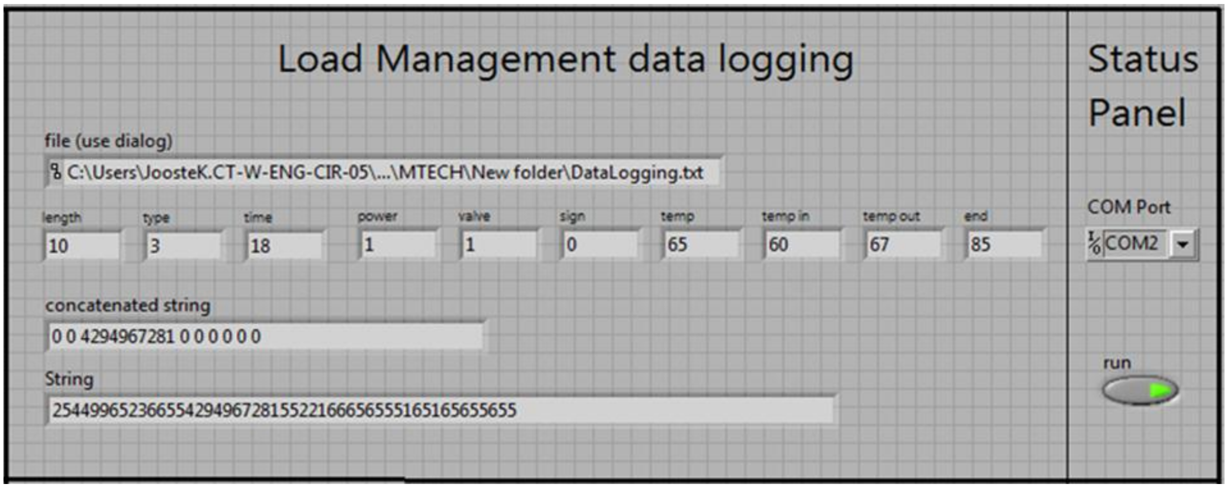

Figure **5.32 Data logging of the state of the slave – DC Geyser**

The Prolific PL2303 USB to UART bridge driver was used to log the data serially to LabVIEW. It is simply connected to the Arduino Mega's communication pins. It was connected to COM port 2 as can be seen in Figure 5.32.

The information logged is the time associated with the timeframe of the load profile that was being executed by LabVIEW, the state of the geyser and solenoid valve, meaning whether it is 'on' or 'off', 0 meaning 'off' and 1 meaning 'on' and also the temperature of the geyser, set point, inlet and outlet. The *Sign* string is there to indicate a positive or negative temperature. The data is stored to the text file named *DataLogging* as shown by the directory path. An example of the logged information can be seen in Figure 5.33.

Length	Type	Time	Power	Valve		Sign	Temp SP	Temp In	Temp Out	End
10	3	17	1	0	0	1	55	45	54	85
10	3	17	1	0	0	1	55	45	54	85
10	3	17	1	0	0	1	55	45	54	85
10	3	17	1	0	0	1	55	45	54	85
10	3	17	1	0	0	1	55	45	54	85
10	3	17	1	0	0	1	55	45	54	85
10	3	17	1	0	0	1	55	45	54	85
10	3	17	1	0	0	1	55	45	54	85
10	3	17	1	0	0	1	55	45	54	85
10	3	17	1	0	0	1	55	45	54	85
10	3	17	1	0	0	1	55	45	54	85
10	3	17	1	0	0	1	55	45	54	85
10	3	17	1	0	0	1	55	45	54	85
10	3	17	1	0	0	1	55	45	54	85

Figure 5.33 Geyser Data logged to text file and loaded to Excel sheet

This was one way in which the data concerning the geyser could be logged by using LabVIEW.

5.4.7 Initial algorithm test with controlled water withdrawals

The LabVIEW and Arduino platforms have been synchronised, the solenoid valve has been setup, the algorithm has been developed and a means to store results have been established. To test if all are functioning as it should, specific time water draw experiments were conducted during the morning and evening peak and the results can be observed in the graphs that follow.

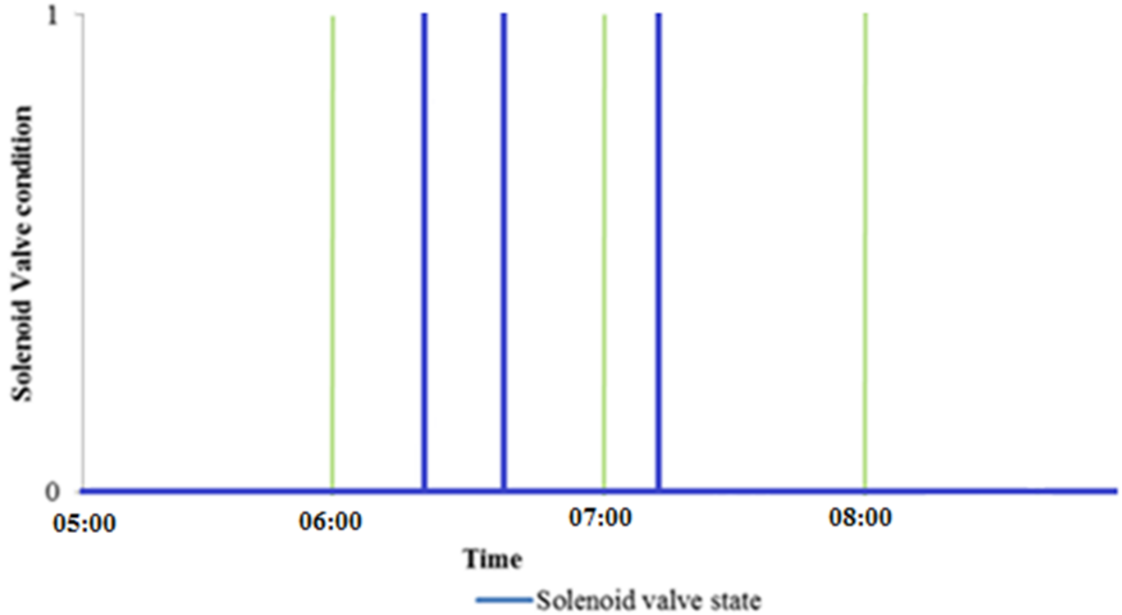

Figure 5.34Times the solenoid valve was on during the morning peak

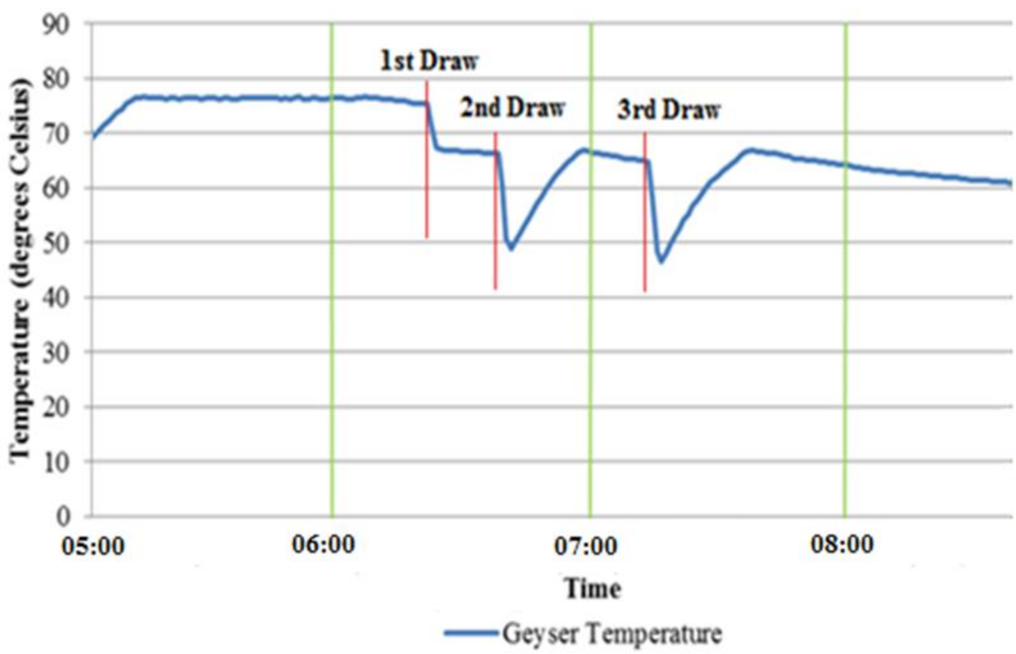

Figure 5.35 Temperature of the geyser during specific water draws during morning peak

As can be observed from the solenoid valve graph, water draws took place during 06:00 and 07:00. The first draw represents a wash basin being filled. During this draw, the geyser water temperature drops to 65 degrees Celsius. This is also the geyser set point temperature. After the second draw, representing a 3 minute shower, the temperature drops to just below 50 degrees Celsius. The temperature increases to 65 degrees Celsius and stabilises there for a few minutes.

This means that the geyser switched on, the water heated up to the set point temperature, and the geyser switched off again. After the third draw, representing a 3 minute shower, the geyser water temperature drops to just below 50 degrees Celsius and from the power graph it can be observed that the geyser switches on and the water heats to the set point temperature of 65 degrees Celsius, at which point the geyser switches off again. The effect of this on the power grid can better be observed in the Figure 5.36.

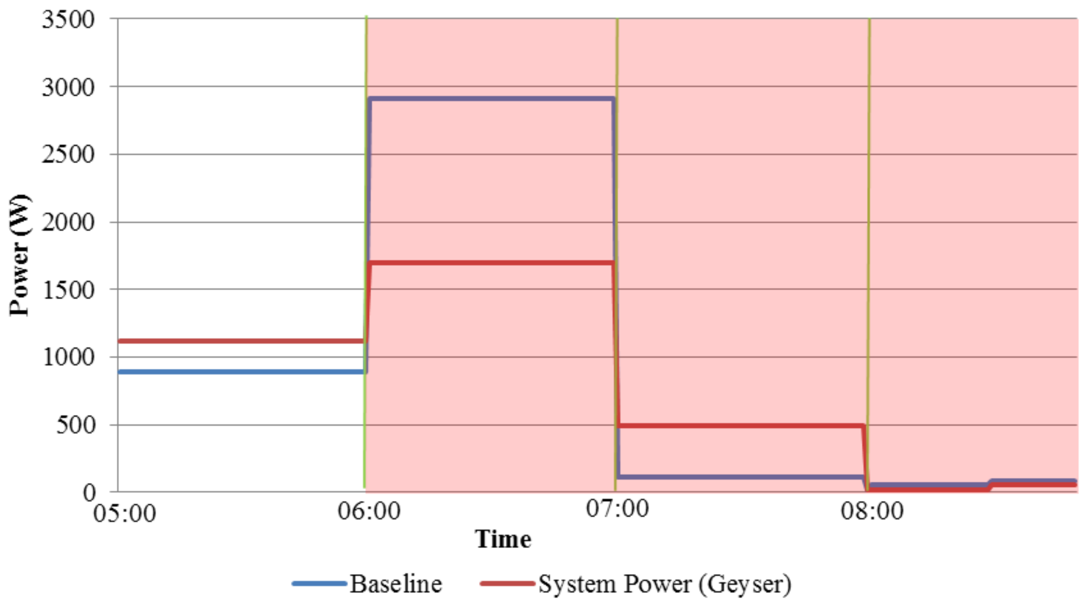

Figure 5.36 Baseline power vs. System Power (Geyser) with specific water draws during morning peak

During 05:00 to 06:00, the System Power is slightly higher than the Baseline. The difference is about 220 W. When the peak period starts at 06:00, the System Power is less than the Baseline and the total reduction is about 1200 W. At 07:00, there is a drop in power with the System Power higher than the Baseline and the difference is about 380 W.

It is evident that during the peak there is a reduction in the peak power while the period before the peak has an increase in power because the valley filling technique is applied.

The same experiments were carried out during the evening peak. The results can be observed in the graphs that follow.

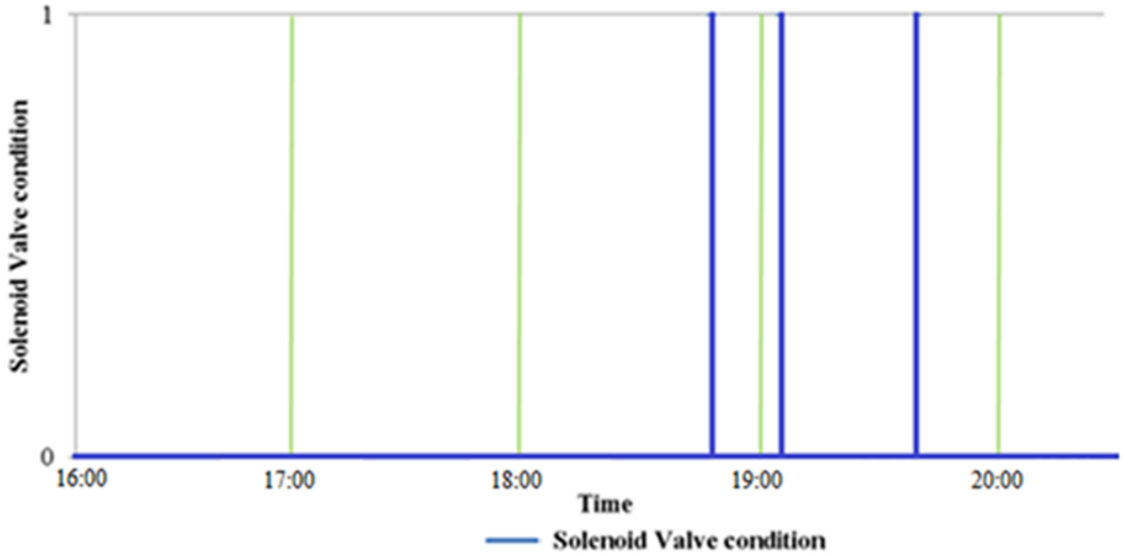

Figure 5.37 Times the solenoid valve was on during the evening peak

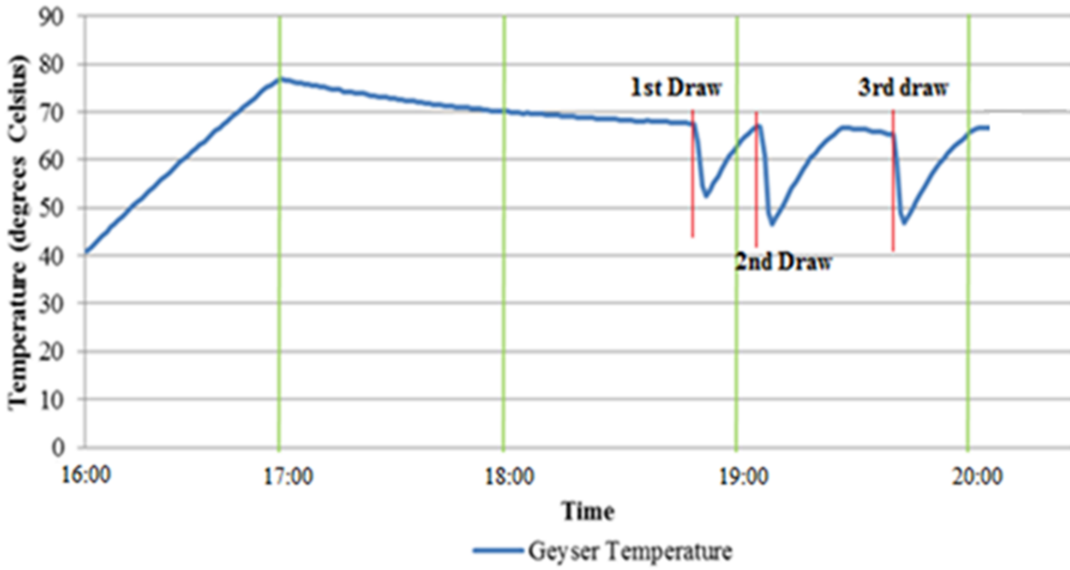

Figure 5.38 Temperature of the geyser during specific water draws during evening peak

As can be observed from the solenoid valve graph, water draws took place between 18:00 and 20:00.

During the first draw, representing a wash basin being filled, the geyser water temperature drops to 50 degrees Celsius. The geyser temperature increases to the set point temperature of 65 degrees Celsius.

After the second draw, representing a 3 minute shower, the temperature drops to just below 50 degrees Celsius. The temperature increases to the set point temperature of 65 degrees Celsius. After the third draw, representing another 3 minute shower, the geyser water temperature drops to just below 50 degrees Celsius. The temperature increases to the set point temperature of 65 degrees Celsius, it stabilises there for a while. The effect of this on the power grid can better be observed in the Figure 5.39.

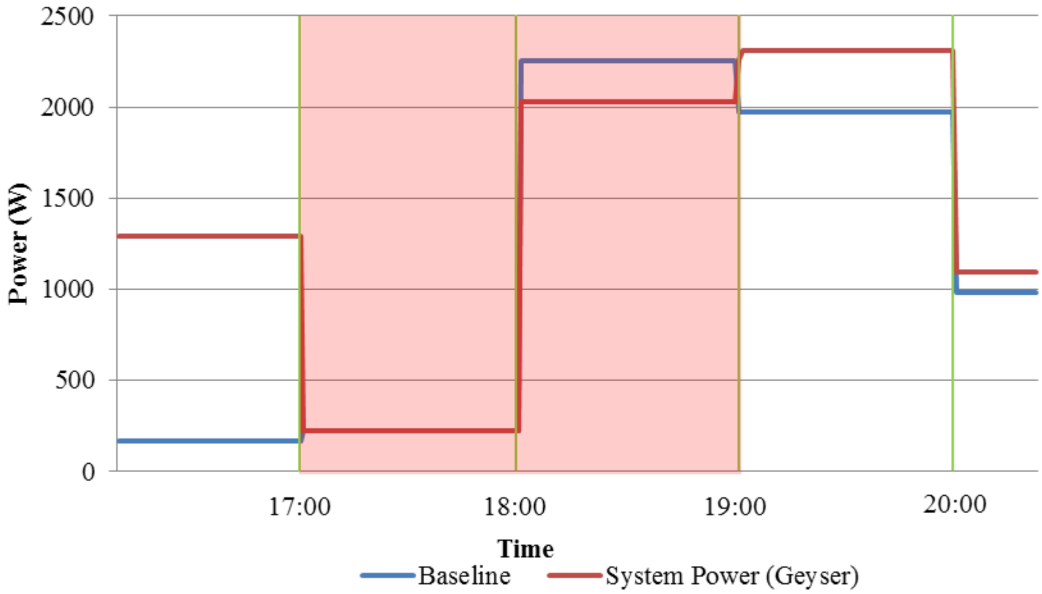

Figure 5.39 Baseline power vs. System Power (Geyser) with specific water draws during evening peak

During 16:00 to 17:00, the System Power is higher than the Baseline. The difference is about 1100 W. When the peak period starts at 17:00, the System Power and Baseline is almost the same. At 18:00 both increase but the System Power is slightly less than the Baseline and the total difference is about 220 W. At 19:00, there is an increase in the System Power while the Baseline drops and the difference is about 330 W. After 20:00, the System power and the Baseline drops and the difference is about 100 W. It is evident that during the peak there is a reduction in the power while the period before the peak has an increase in power because the valley filling technique is applied.

From these initial tests, it is evident that the algorithm is responding as it should. With the solenoid valve setup and the algorithm tested the research questions could be investigated and are discussed in the next chapter.

Chapter 6

Discussion of results

The following experiments were done to see how the system responded. All power results have been averaged. What was critical was to see if the load management techniques are applied and also whether the minimum needs of the user are adhered to. All this required a communication system that was reliable.

6.1 DC test bench for DC house

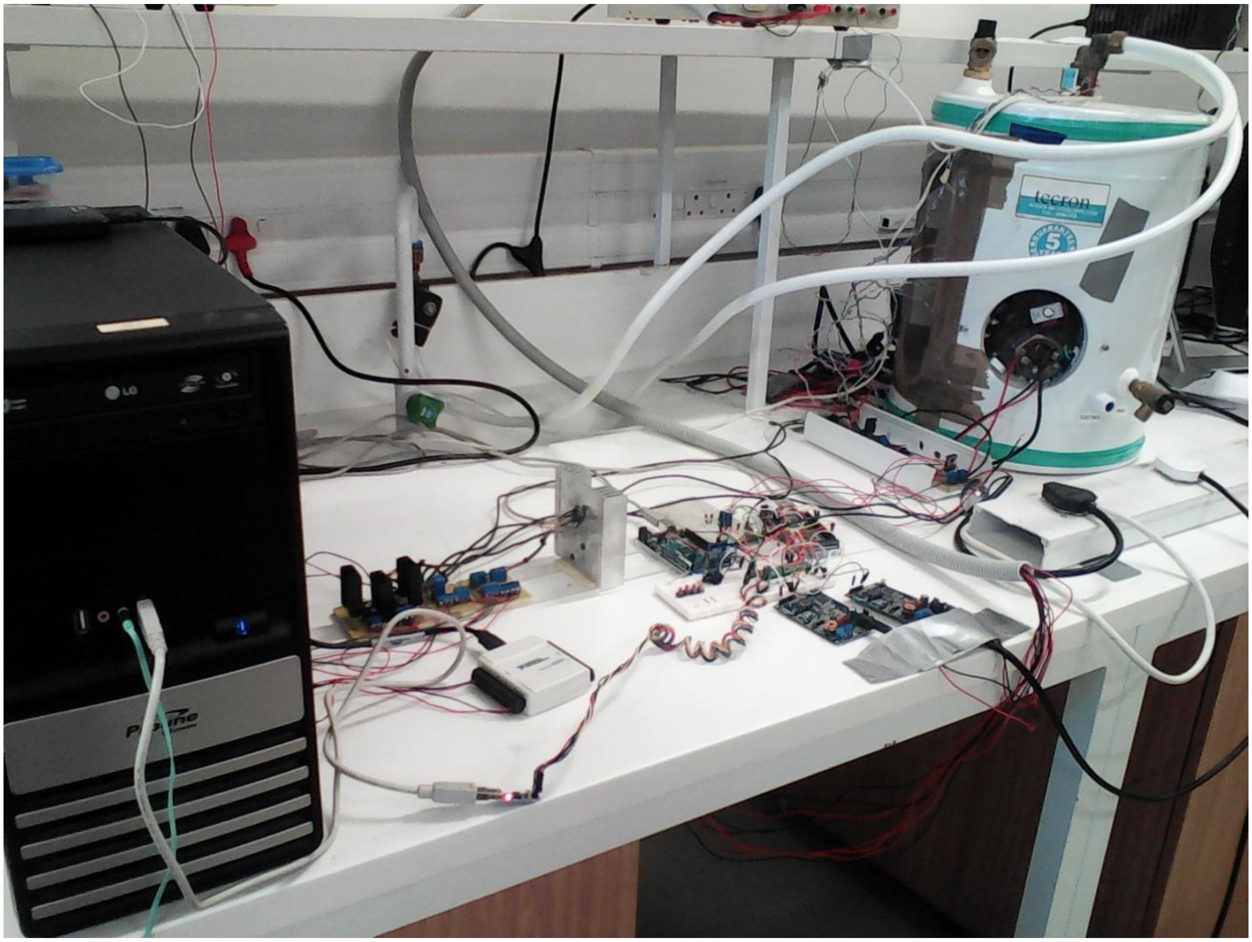

Figure 6.1 DC test bench for the DC house

The setup in Figure 6.1 was used for all the tests conducted.

Briefly the PC is connected to the DAQ unit, which is connected to the external hardware for the emulation, this is the LEM and LM12 voltage to current converter, and this in turn is connected to the master and slave Arduino Megas which are communicating via the PLC LinkSprite Spyder modems. The geyser is connected to the slave.

6.1.1 Safety on a DC system

Electrical Safety: The main challenge was to work according to 350 V DC standards that are not as yet available. Here the AC standards and DC standards for other industries were useful as mentioned in the literature review and acted as guidelines. Most important considerations were an isolation device or circuit breaker.

Figure 6.2 (a) shows the DC circuit breaker that was employed to ensure that the high DC voltage could be disconnected during normal operation of the system or be interrupted in cases of overcurrent.

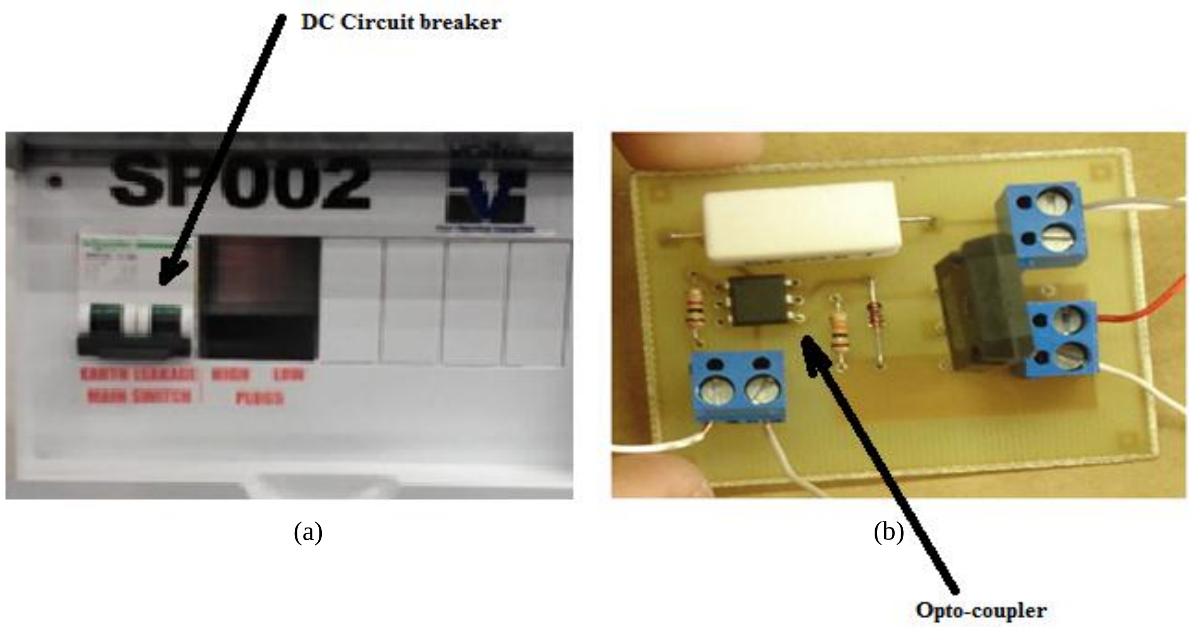

Figure 6.2 (a) DC circuit breaker and (b) opto-coupler employed in DC RDP house

Figure 6.2 (b) shows the opto-couplers that were employed to isolate the low DC voltage from the high DC voltage.

Thermal Safety: Temperature sensors were employed to ensure that the geyser power is switched off, if maximum or set point temperatures are reached and these are shown in Figure 6.3.

Figure 6.3 Temperature sensors on side of geyser for temperature monitoring

6.1.2 Virtual appliances

Can virtual appliances be developed to supplement real appliances that are not a necessary part of the study, however necessary when representing the house as a whole?

Yes. Virtual appliances were developed and were successfully emulated for the experiments that were conducted. Figure 6.4 shows the Front Panel view of LabVIEW indicating the virtual appliances developed.

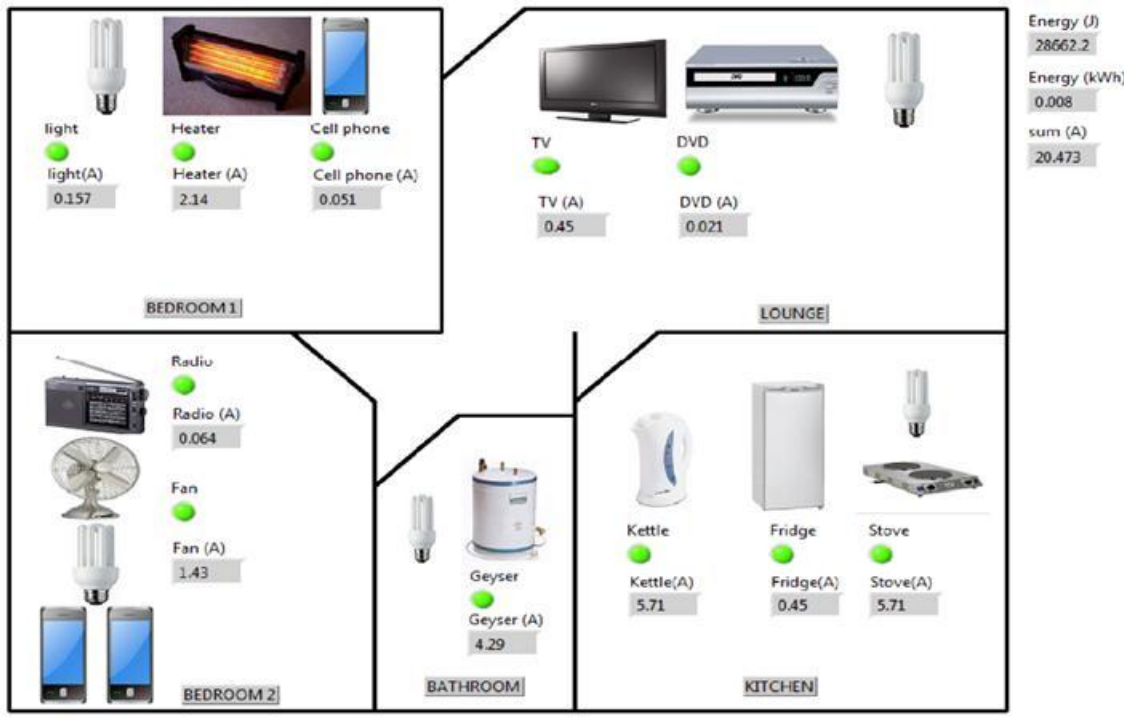

Figure 6.4 LabVIEW Front Panel showing the virtual appliances

6.1.3 AC to DC conversion

Can a standard AC geyser be converted to a DC geyser?

Yes. The geyser was successfully converted from an AC appliance to a DC appliance. Main change was simply to change the resistive value of the element. The modified geyser can be seen in Figure 6.5.

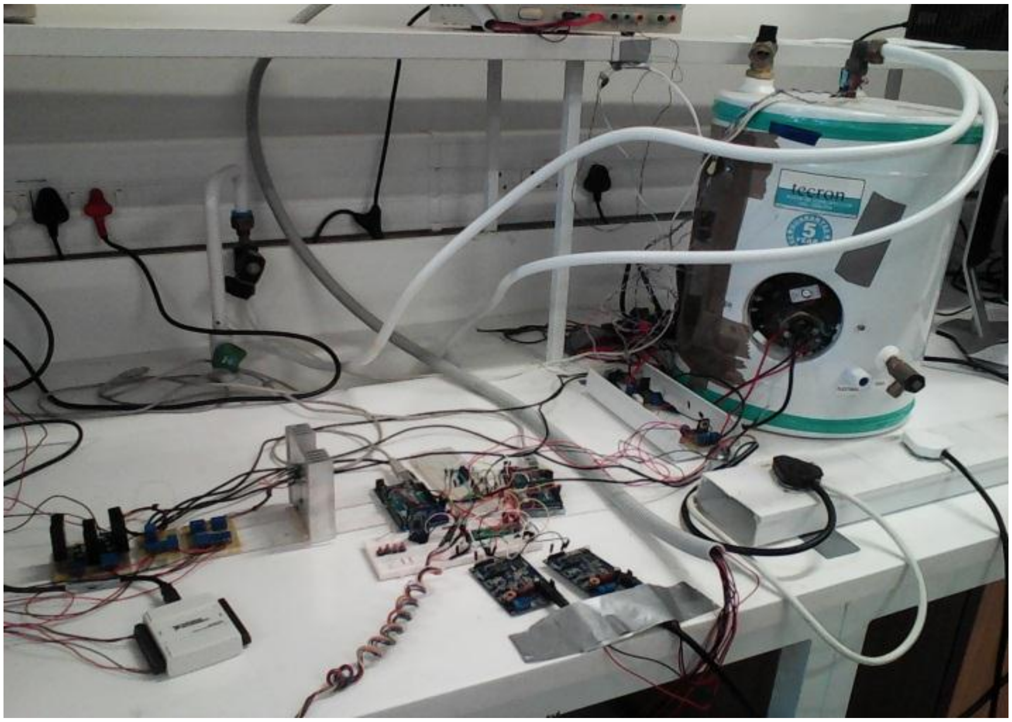

Figure 6.5 Modified geyser in DC system

6.2 Reliability of communication

In order for the load management system to work effectively, a reliable communication network had to be established. Several experiments were done to see if the system was reliable. For this experiment, both the master and slave Arduino Mega boards were connected to the PC via their USB type B connectors to allow serial monitoring. The PLC units were connected to the power points via 100 meter length of cable.

The first experiment was to see if all the messages sent from the master are received by the slave and vice versa. This was done by adjusting the code to send a fixed quantity of messages and once all were sent, to stop. This code can be seen in Appendix U. Snapshots of the serial monitor communications are shown in Figure 6.6, Figure 6.7 and Figure 6.8.

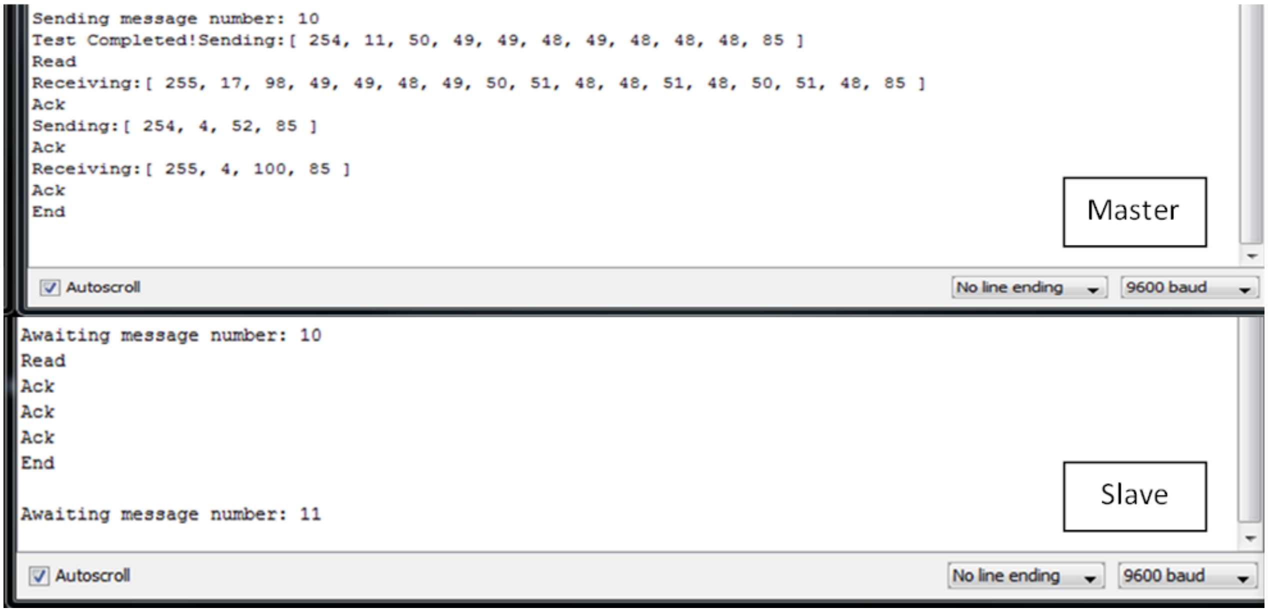

Figure 6.6 Snapshot of the serial communications showing 10 messages sent and all 10 received

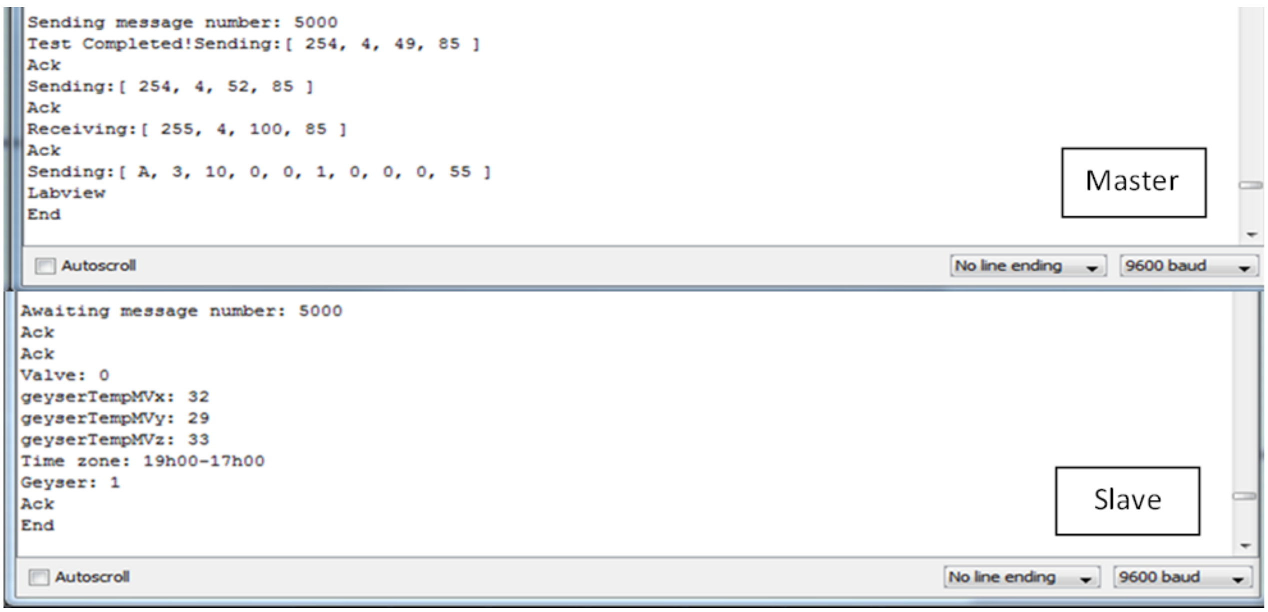

Figure 6.7 Snapshot of the serial communications showing 5000 messages sent and all 5000 received

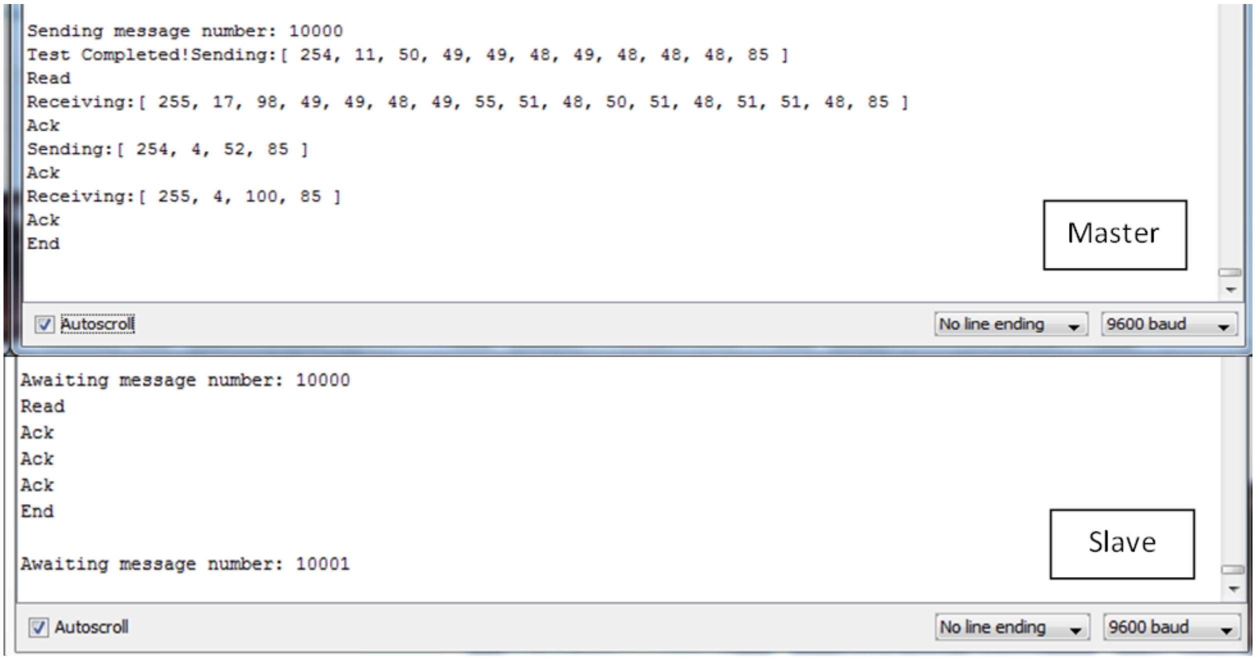

Figure 6.8 Snapshot of the serial communications showing 10 000 messages sent and all 10 000 received

From these snapshots it can be observed that all messages that were sent are received, the first experiment only 10, the second 5 000 and the third 10 000. It is evident that the communication backbone is reliable.

It was also important for the communication backbone to show error messages if the communication was compromised. Below is a snapshot of an error message.

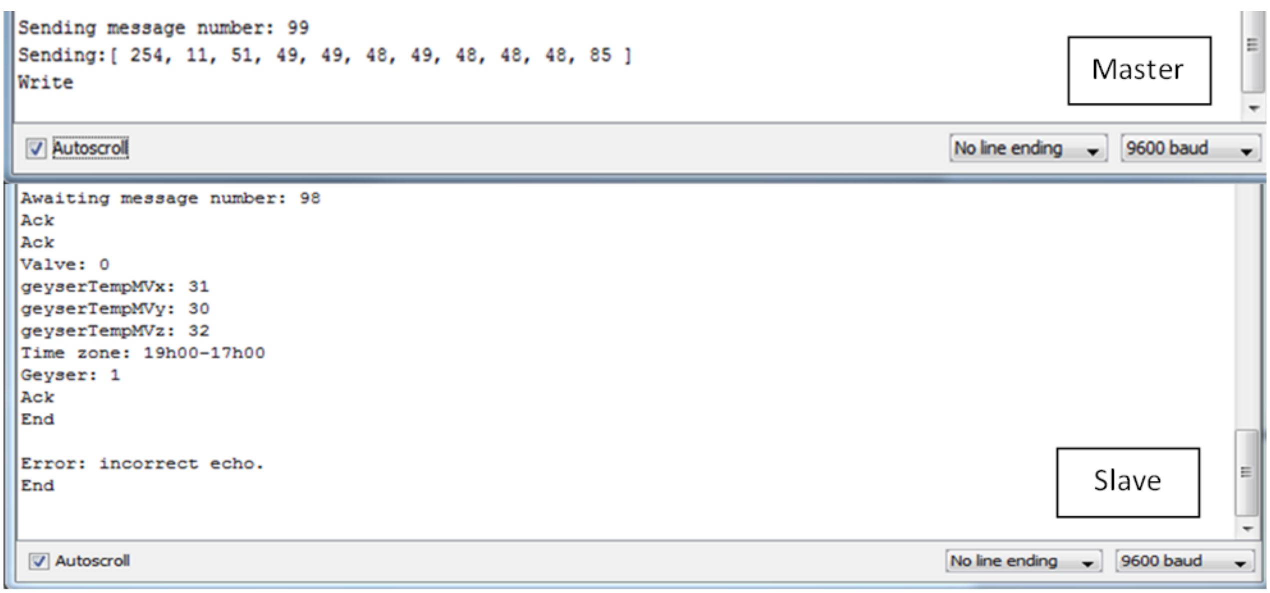

Figure 6.9 Snapshot of the serial communications showing error message

From Figure 6.9, 100 messages were sent, but before the hundredth message was sent, the cable was disconnected. The slave waits a few seconds, receives nothing and the error message is displayed. It is evident that the communication network is reliable.

6.3 Effectiveness of load management system

The following experiments were conducted to test the effectiveness of the load management system. The hardware was setup as discussed previously with the addition of a Fluke 43 Power Quality Analyser to act as reference for the power logs from LabVIEW. The current clamp was connected to the input of the LEM.

6.3.1 Valley filling

With the valley filling load management technique, it is expected that the geyser should switch on at 05:00 and heat the geyser to 75 degrees Celsius and maintain it at that temperature until the peak period begins. When the peak period begins at 06:00 the geyser should switch off and remain off for the duration of the peak period. No water withdrawal will take place, but if the temperature of the geyser should drop to below the minimum temperature of 55 degrees Celsius, the geyser should switch on and heat it to the set point temperature of 65 degrees Celsius.

Figure 6.10 shows the morning peak results.

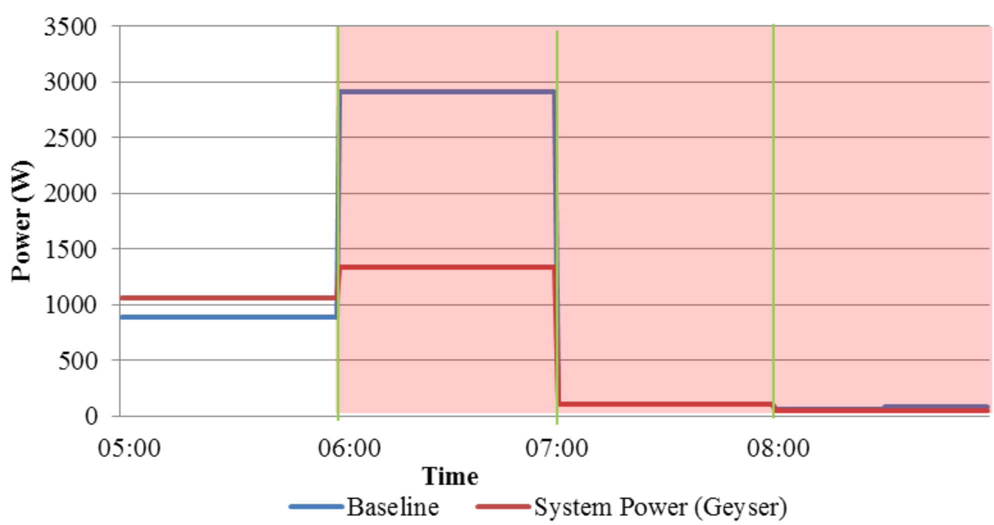

Figure 6.10 Morning peak load profile with valley filling applied.

At 05:00 it can be observed that the Baseline is approximately 890 W. At the same time, the System Power is approximately 1080 W. The difference in the Baseline and System Power is about 160 W.

At 06:00 both System Power and Baseline increase, with the System Power lower than the Baseline with a reduction of about 1570 W. Just after 07:00 both drop to about 110 W and after 08:00 both drop even lower. From these results it is evident that the valley filling load management technique is successfully implemented and that there is a reduction in the peak power throughout the peak period. To verify that the results recorded by LabVIEW were accurate, a Fluke 43 Power Quality Analyser was used to log the results as well. A comparison between the LabVIEW logs and the Fluke 43 is made in Figure 6.11.

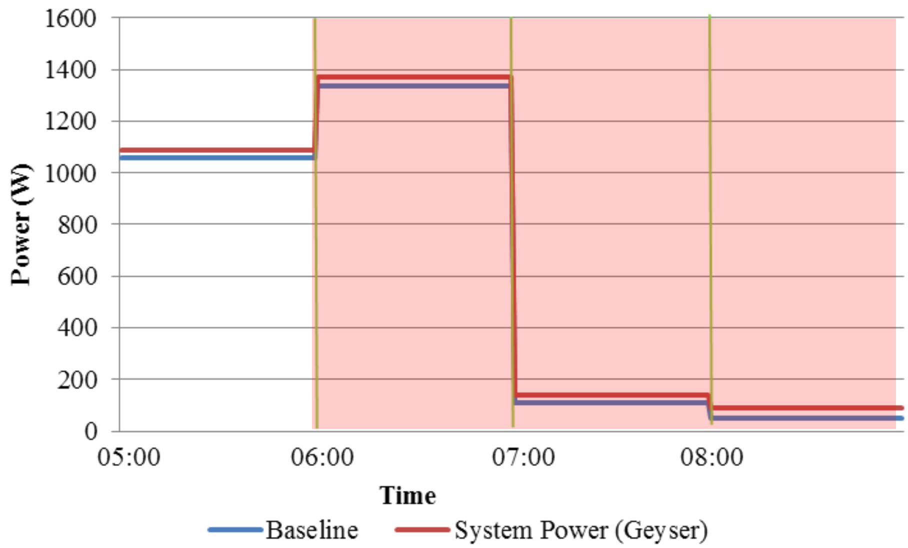

Figure 6.11 Comparison of LabVIEW log vs. Fluke 43 Power Quality Analyser log

As can be seen from the graph, the results logged by LabVIEW are almost the same as that of the Fluke 43 with a slight difference due to the error in both devices with an average percentage error of approximately 19%. But it is safe to say that the LabVIEW log is reliable since it produces similar results compared to that of a trusted product. It is therefore also evident that the load management system is responding as it should. This can be seen more clearly in the temperature graph shown in Figure 6.12.

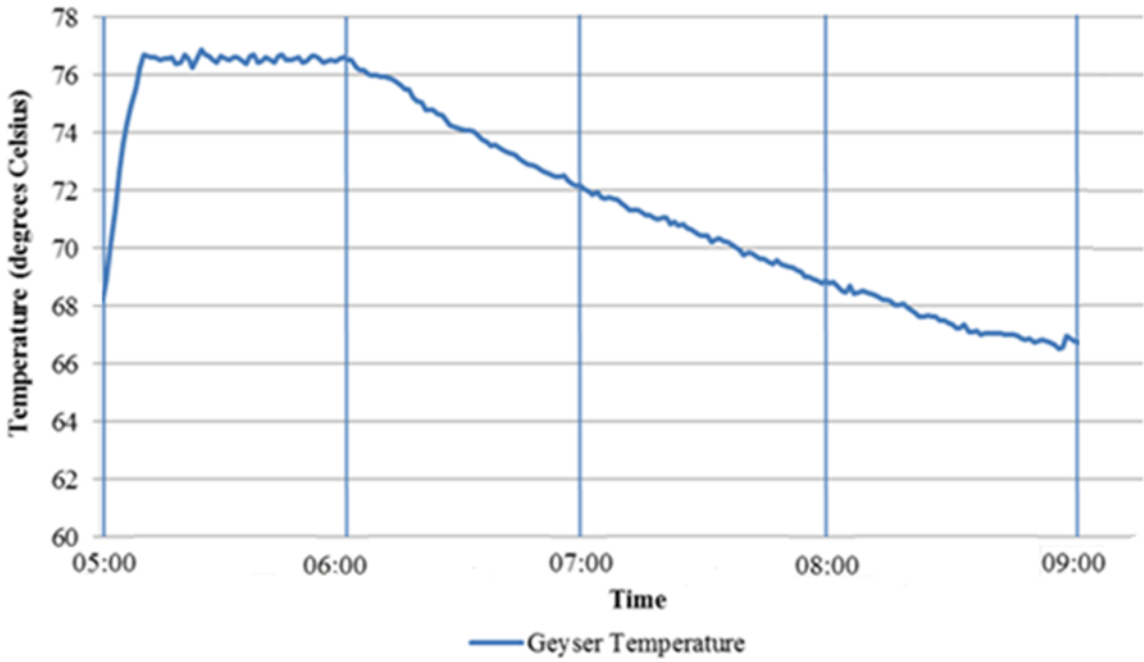

Figure 6.12 Morning peak temperature behaviour of the geyser

It can be observed that the temperature starts to increase at 05:00. It increases to about 76 degrees Celsius, which is slightly higher than the 75 degrees Celsius preheat temperature. The temperature is stable for that period until the peak period begins. As soon as the peak period begins at 06:00 the temperature starts to drop. For the full peak period it drops to as low as 67 degrees Celsius, which is still higher than the geyser set point temperature of 65 degrees Celsius. It is evident that the load management system responds as it should during the morning peak. Now a look at the evening peak shown in Figure 6.13.

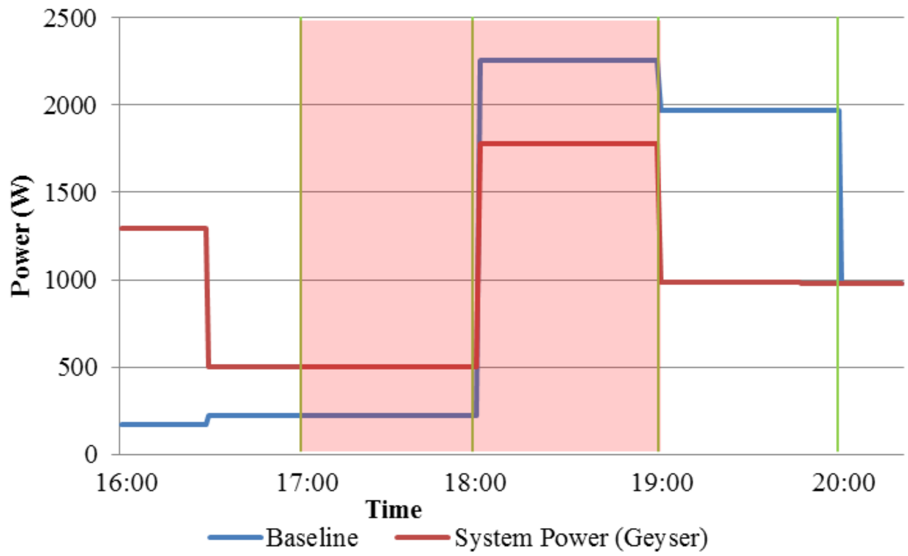

Figure 6.13 The evening peak load profile with valley filling applied

When the experiment begins it is observed that the Baseline is approximately 160 W. At the same time, the system power is approximately 1300 W. This is a difference of about 1140 W. This power represents the geyser and this means that at 16:00 the geyser is on. After 16:30, the System Power drops to 500 W and the difference between the two is about 280 W. The power remains at these levels for the first hour of the peak period. At 18:00 both increase with the Baseline at 2250 W and the System Power at about 1780 W. That is a reduction of about 480 W. Slightly after 19:00, the System Power drops to about 1000 W, while the Baseline drops to about 1970 W. At 20:00 the Baseline drops to about 1000 W. From these observations it is evident that the valley filling load management technique is successfully implemented. It is also evident that during the overall peak period, that there is a reduction in the peak power. To verify that the results recorded by LabVIEW were accurate, a Fluke 43 Power Quality Analyser was used to log the results as well. A comparison between the LabVIEW logs and the Fluke 43 is made in Figure 6.14.

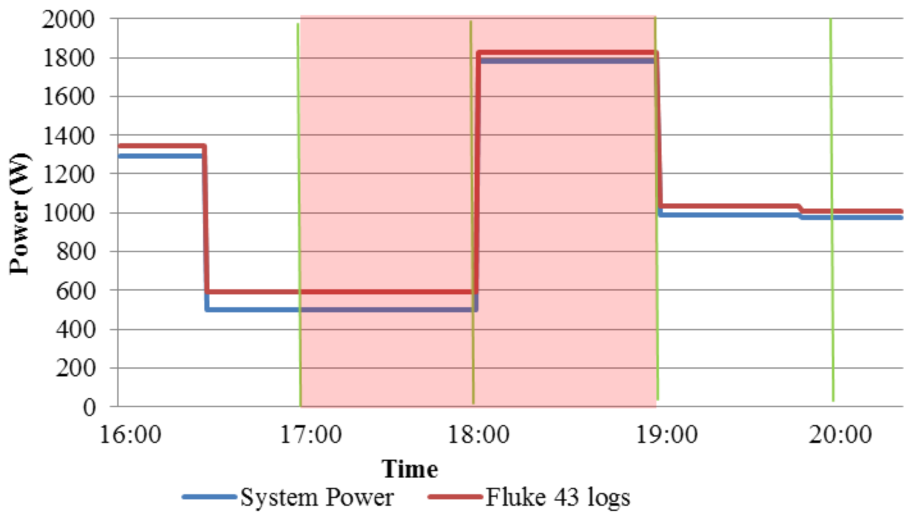

Figure 6.14 Comparison of LabVIEW log vs. Fluke 43 Power Quality analyser log

As can be seen from the graph, the results logged by LabVIEW are similar to that of the Fluke 43 with a slight difference due to the error in both devices with an average percentage error of approximately 7%. But it is evident that the LabVIEW log is reliable since it produces similar results compared to that of a trusted product. It is therefore also clear that the load management system is responding as it should. This can be seen more clearly in the temperature graph shown in Figure 6.15.

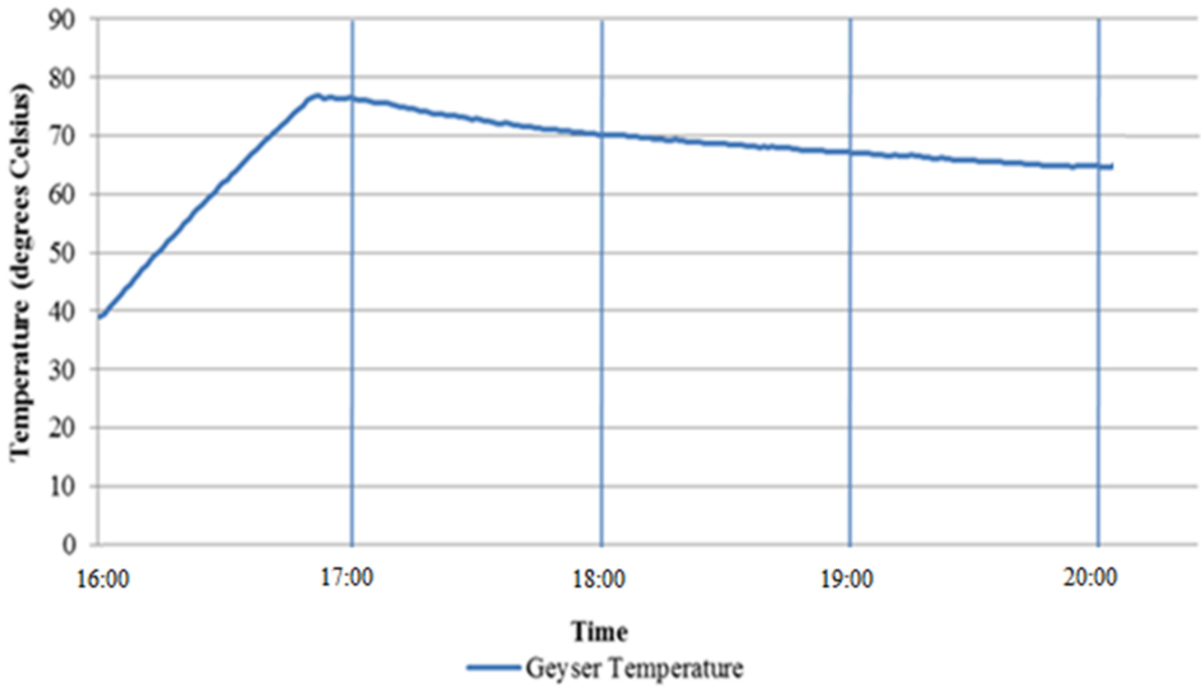

Figure 6.15 Evening peak temperature behaviour of the geyser

It can be observed that the temperature starts to increase as soon as the experiment begins. It reaches to about 76 degrees Celsius, slightly higher than the 75 degrees Celsius preheat temperature. During the peak period, the temperature drops to about 65 degrees Celsius, which is the set point temperature. From this graph it is evident that the load management system responds as it should.

6.3.2 Minimum needs of the user

The load management system applies the valley filling technique, which means that the geyser is off during the peak period. If however, the temperature of the water drops below the set minimum, the geyser must switch on to ensure that hot water will be made available to the user at all times. This part of the load management algorithm was tested next.

6.3.2.1 Water draws at random periods.

The same automated water drawing technique was used for the following experiments. The only difference was to try and do the draws outside the peak periods in order to see if the algorithm still catered to the minimum user needs. The results are shown in the graphs that follow.

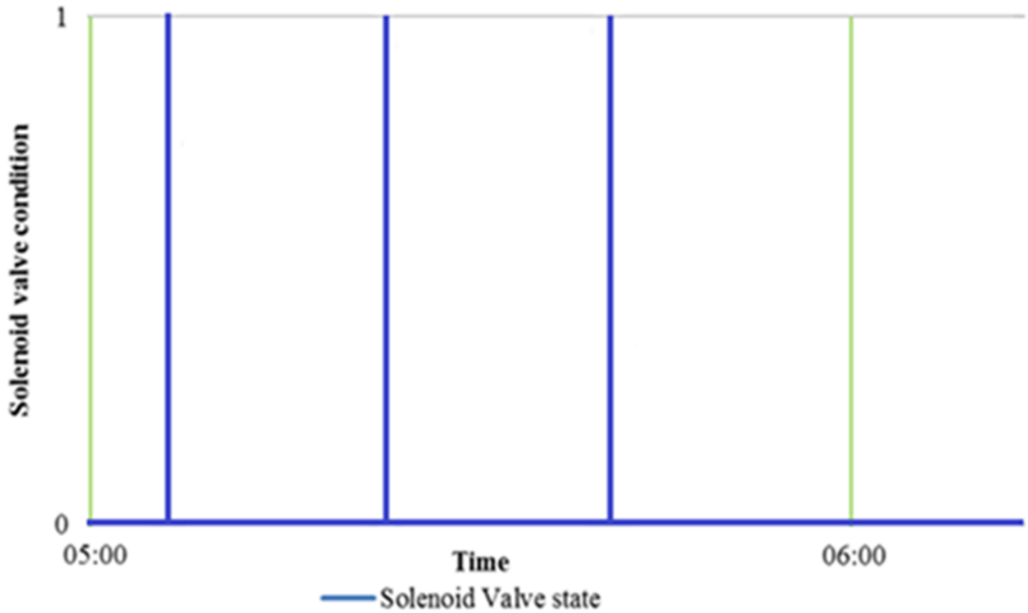

Figure 6.16 Times the solenoid valve was on during the morning for random draws

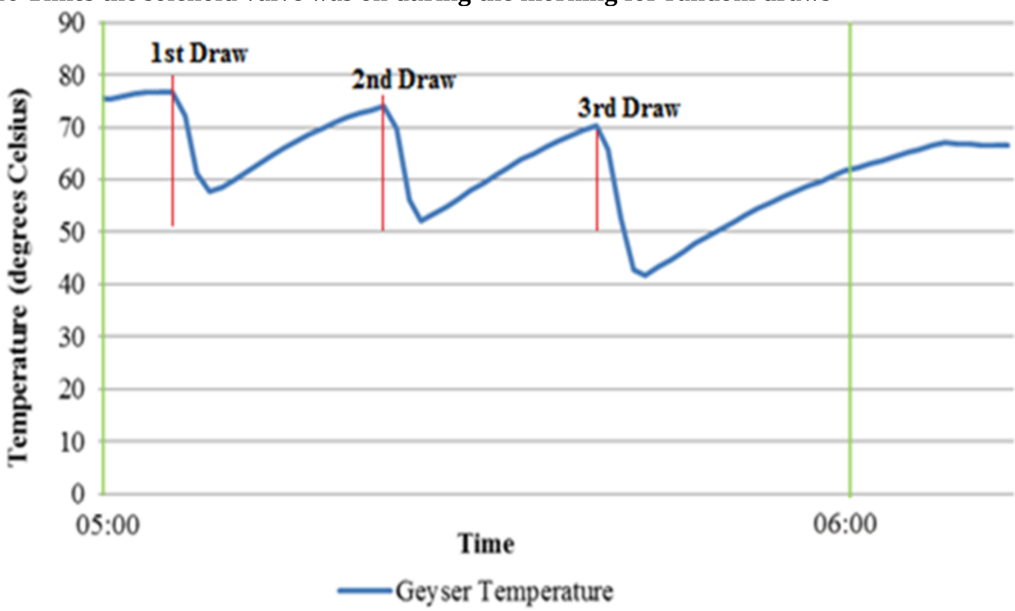

Figure 6.17 Temperature of the geyser during random water draws during the morning

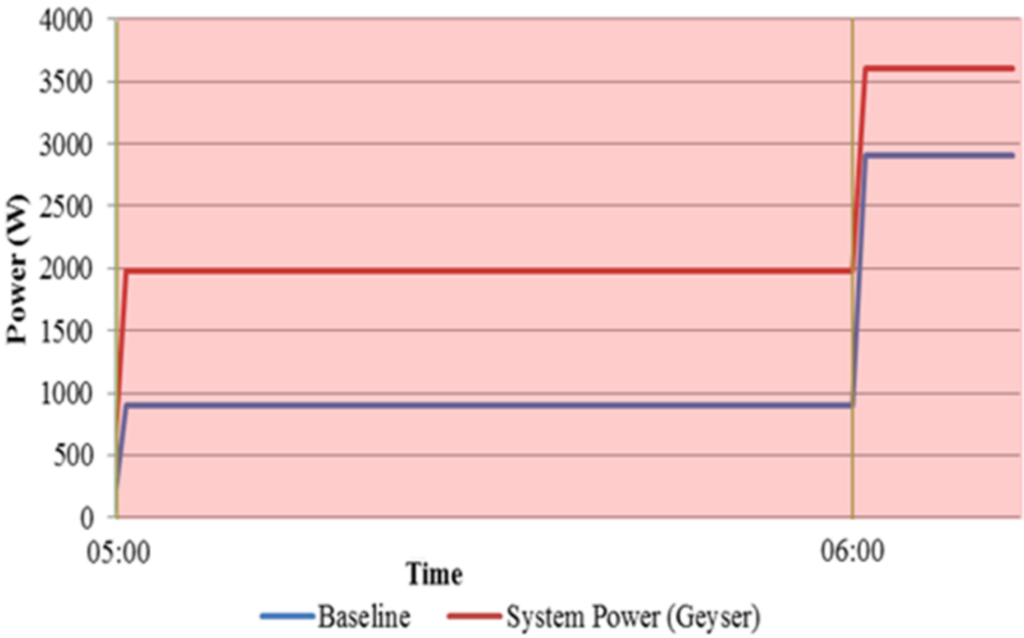

Figure 6.18 Baseline power vs. System Power with random water draws during the morning

As can be observed from the solenoid valve condition graph in Figure 6.16, draws took place between 05:00 and 06:00. This is just before and including a bit of the peak period. After the first draw, it can be observed in the temperature graph in Figure 6.17 that the temperature drops to below 60 degrees Celsius. As can be observed from the power graph in Figure 6.18, the geyser switches on and the water is heated to 75 degrees Celsius as observed in the temperature graph. This is because the draw is taking place during the preheat valley filling phase of the algorithm. After the second draw, the temperature drops to about 50 degrees Celsius. The geyser is on during this time because of the valley filling condition and heats the water to 75 degrees Celsius. After the third draw, the water drops to 40 degrees Celsius, and is immediately heated and this time it is only heated to the set point of 65 degrees Celsius, because the process occurs as the peak period begins. From these results it is evident that the load management algorithm responds outside the peak period as well. Now a look at the evening peak and the results are shown in the graphs below.

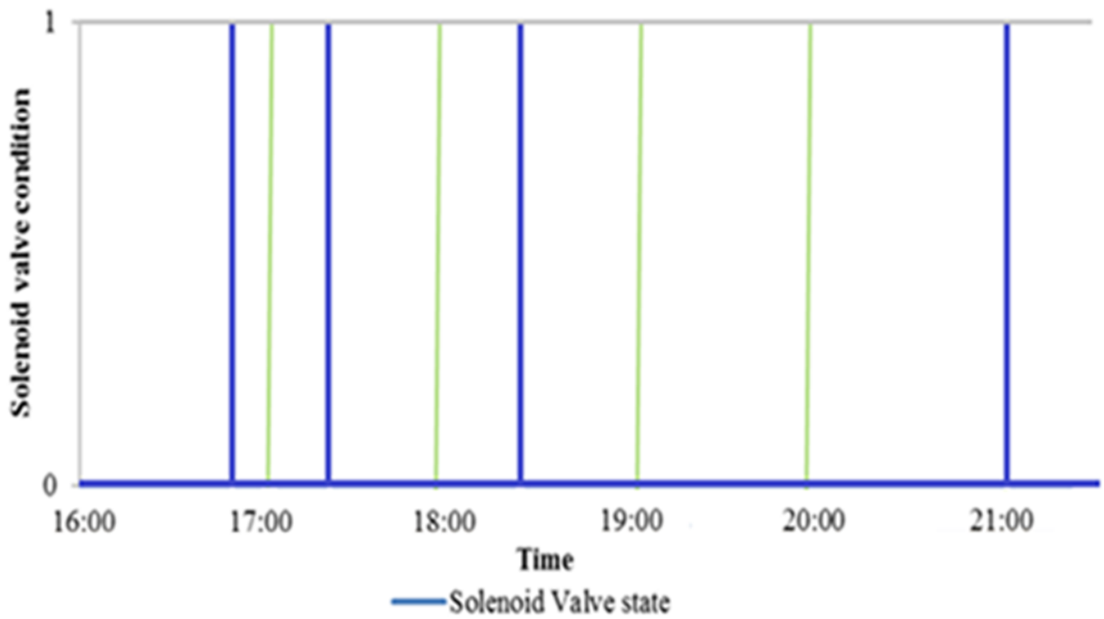

Figure 6.19 Times the solenoid valve was on during the evening for random draws

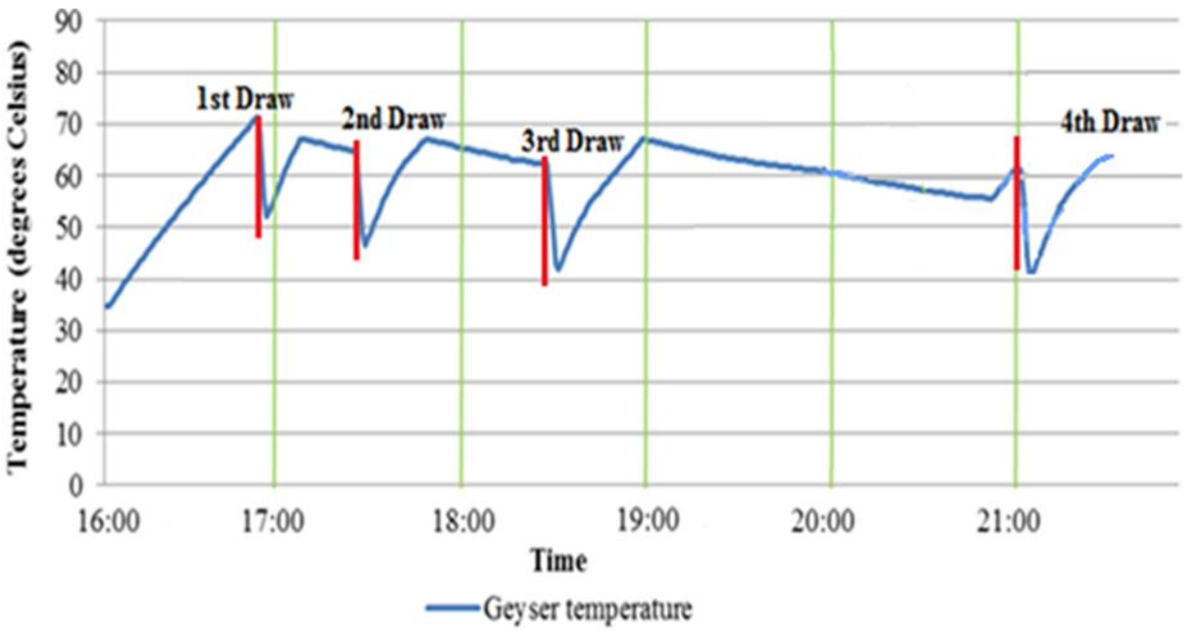

Figure 6.20 Temperature of the geyser during random water draws during the evening

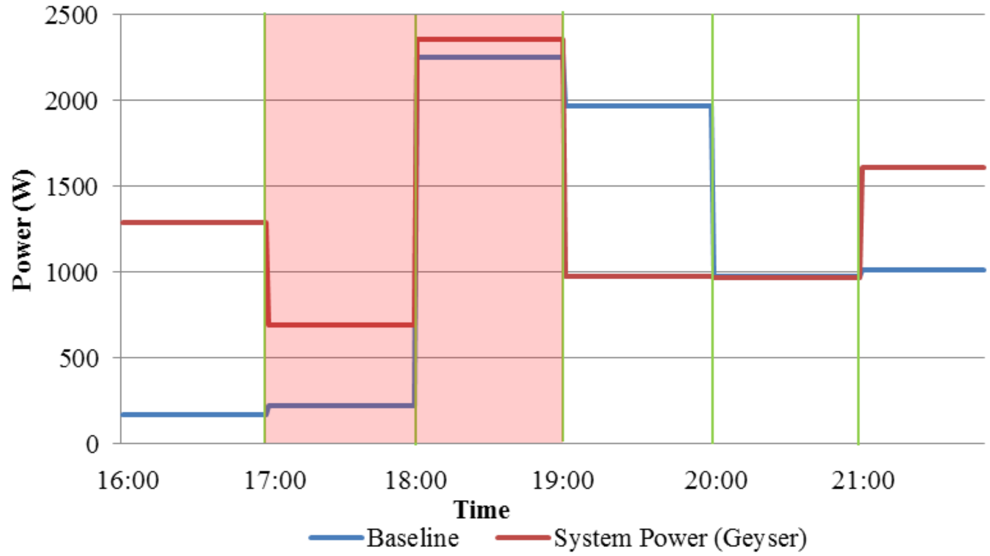

Figure 6.21 Baseline power vs. System Power with random water draws during the evening

As can be observed from the solenoid valve condition graph in Figure 6.19, draws took place between 16:00 and 17:30. There was a draw at 18:30 and a last draw at 21:00. After the first draw, the temperature drops to just above 50 degrees Celsius as observed in the temperature graph in Figure 6.20. As can be observed from the power graph in Figure 6.21, the geyser switches on and the water is heated to 65 degrees Celsius as observed in the temperature graph. After the second draw, the temperature drops to below 50 degrees Celsius and the geyser switches on and the water is heated to 65 degrees Celsius. After the third draw, the water temperature drops to below 50 degrees Celsius and the geyser switches on and the water is heated to 65 degrees Celsius. The final draw happens outside the peak period and here the water temperature drops to below 60 degrees Celsius. The geyser switches on and the water is heated to 65 degrees Celsius. From the water temperature graph it is also clear that the preheat valley filling technique is applied. Clearly the load management algorithm works under all conditions.

Chapter 7

Conclusions and Recommendations

This dissertation represents the design and development of a load management system for fixed appliances in a safe Direct Current Reconstruction and Development Programme house. A valley filling / load shifting load management technique was employed to assist in reducing the peaks observed in the RDP house load profile during peak hours.

The safety of users and of the appliances in a DC system is very important and was considered for this study. These safety considerations were both electrical safety, as well as thermal safety. A DC circuit breaker was employed to ensure that the high DC voltage could be disconnected during normal operation of the system or be interrupted in cases of overcurrent. Opto-couplers were employed to isolate the low DC voltage from the high DC voltage. Temperature sensors were employed to ensure that the geyser power is switched off if maximum or set point temperatures are reached. A DC model was therefore realised without compromising safety.

All the appliances identified in this study that would not be modified, but had to be represented in order to present a holistic view of the power used by the DC house, was successfully emulated as virtual appliances. This was made possible by employing LabVIEW. LabVIEW also made it possible to simulate and log results.

The usually AC geyser was modified to work in a DC system. The main modification was to change the resistance of the element. The elements were modified to have a watt rating of 1.5 kW at 350 V DC. However, actual tests were only conducted at 300 V DC. This is the reason why the results show the geyser power as approximately 1170 W and not 1.5 kW. This is because at 350 V DC, the elements were designed as 82 Ω, but at 300 V, the 82 Ω element is theoretically approximately 1098 W from the power equation $P = V^2R$, so the result of 1170 W is acceptable.

Switching 300 V DC (350 V DC) mechanically is dangerous because of arcing. This was a challenge for switching both the elements and the thermocouple on and off. The way this was dealt with, was to develop electronic switches to switch the 300 V DC. The thermocouple was also replaced by electronic temperature sensors.

Power Line Communication was employed and this was very reliable. An added advantage is that communication is represented in binary / hex value. This has a lower byte count when transmitting or receiving. This not only reduces transmission times, but also reduces error counts. Another advantage is reduced memory cost when storing data. For example: The number 255 represented in binary is just one byte long, '11111111'. When using ASCII character representation the number requires three bytes namely; '00110000' (2), '00110101' (5), and '00110101' (5). This allows for more errors and is thus more unreliable. The modem also transmitted successfully on a 100 m cable, which is more than the product specification of approximately 92 m.

The load management system was successfully implemented using Arduino Megas in a master slave configuration. The valley filling / load shifting technique successfully contributed to flattening the electrical demand profile during peak periods. Under normal conditions a reduction of approximately 1500 W is observed during the morning peak and 500 W during the evening peak. This was achieved without compromising the needs of the users. Minimum service levels were always maintained and therefore the users always had hot water made available to them when it was needed.

The 15 L geyser's capacity is a bit small. If water is used during peak hours, it will cause the geyser to be switched on. If a larger geyser is used, it could mean that for the same scenarios as this study, the geyser will not switch on during the peak period but inevitably will use more power to heat up.

During the initial execution of the project, there were challenges encountered with the synchronisation of the LabVIEW code and the Arduino platform. Briefly, the time of the LabVIEW code was represented by a voltage on the output channel of the DAQ. Each time frame or hour was represented by a specific voltage level. The voltage level was initially incremented by 10 mV. The difference of 10 mV between time frames was too small; the Arduino hardware did not detect that there was a change in the voltage level. This resulted in the two platforms being out of synch at times, and therefore certain code was executed at the wrong time. The code was adjusted to increments of 100 mV and this was more stable. For the voltage that represents the LabVIEW time it is however recommended that it should be set to increments of 500 mV or higher, because this is more stable than increments of 100 mV.

Another challenge that was encountered was with the logging of data. The LabVIEW code was programmed to read 1000 samples at a rate of 1000 Hz per minute. The logging of data was however erratic. Sometimes it would sample less data and other times it would sample more data. The challenge this presented was that for certain periods more data was available and for other periods a lack of data was available. This made presenting data on the graphs difficult because to present the data correctly, some data had to be removed in order to present equal data to that where there was a lack of data. This was challenging because there were lots of samples and to decide which samples to use and which to ignore was difficult. A more stable way to log data needs to be investigated.

All experiments were considered as worst-case scenarios under ideal conditions. It is however recommended to also test the load management system under conditions where there is noise introduced to see if the communication backbone remains stable and thus continues to be reliable. Also to see how the load management system responds when appliances are switched on sporadically.

If literature can be found on the behaviour of consumers using the kettle for hot beverages, this could then also be added to give a more holistic view of the power consumption of the house.

In conclusion, a DC network can be successfully realised, without compromising safety. It allows for much easier control of appliances, thus making home automation more convenient. DC ultimately allows for more efficient use of power.

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Appendix A: Code for the load management system

```
/*

Title:  Master PLC
Date:   25 June 2016
Ver:    0.1

Description:
This program sends read or write commands to a slave on the PLC bus. The slave will respond to both read and write commands. All commands are encoded in HEX-Ascii (i.e. numerals = 0x30-0x39 or 48-57) so slave ID's can range from 2-47 and 58-255.

Message:
Receiver ID (02-47,58-255) | Length (4-16 bytes) | Type (Ack,R,Wr) | Multi-byte payload | End (0x55)

Todo:
- USB serial with LV
- assign ID's to slaves automatically (have the slave send out an ID request)

*/
#include <Arduino.h>
#include <Wire.h>
#include <RTClib.h>

RTC_DS3231 rtc;              //clock on pins 20 (SDA) and 21 (SCL)
#define valveI 2             //valve switch
#define lVTimeA0 0           //analog time

byte address;                //0xFF is master
byte rxMessageLength;        //includes all message bytes
byte txMessageLength;        //includes all message bytes
byte messageType;            //read or write
unsigned long messageCounter=1;
const byte readType = 2;  //arbitrary value ascii value for decimal 1
const byte writeType = 3;  //""
const byte ackType = 4;   //""
const byte idleType = 1;  //""
const byte messageEnd = 0x55; //alternating 1's and 0's (ease of determination?)
byte payload[20];            //actual data
byte message[20];            //full message
byte rxMessage[20];          //full message
byte txMessage[20];          //full message
byte rxByte;                 //temporary storage
byte rxEcho;                 //temporary storage
byte txEcho;                 //temporary storage
boolean txFlag = false;      //received end byte from slave
boolean rxFlag = false;      //sent end byte to slave
boolean errorFlag = false;   //incorrect byte received as echo from slave
boolean ackTxFlag = false;   //received end byte from slave
boolean ackRxFlag = false;   //sent end byte to slave
boolean run = true;          ///run program
byte type;
enum type {idleState=1,readState=2,writeState=3};

//geyser – slave

byte geyserTempSP = 0;   //temperature set point
byte geyserTempMV1 = 0;   //temperature measured value
byte geyserTempMV2 = 0;   //temperature measured value
byte geyserTempMV3 = 0;   //temperature measured value
byte geyserTempMVx = 0;   //temperature measured value
byte geyserTempMVy = 0;   //temperature measured value
byte geyserTempMVz = 0;   //temperature measured value
byte geyserStateSP = 1;   //power set point
byte geyserStateMV = 0;   //power measured value
boolean signSP=1;
boolean signMV=1;
int analogTime=0;
```

```
byte currentTime = 1;
byte lVTime = 1;
byte timeMV = 1;

boolean valveStateSP;
boolean valveStateMV;

//set up the controller
void setup()
{
  Serial.begin(9600);   //PC
  Serial1.begin(9600);  //slave
  Serial2.begin(9600);  //labview
  pinMode(valveI, INPUT);
  pinMode(lVTimeA0, INPUT);
}

//main loop
void loop()
{
  type=readState; //force the type (debugging)

  while(run)
  {
    if(!errorFlag) //if error occurs end comms
    {
//      delay (50); //wait before each loop
      Serial.print("Sending message number: ");
      Serial.println(messageCounter);
      messageCounter++;

      switch(type)
      {
        case idleState: //processing done here
          //send request for state change
          setIdle();    //prep message
          sendData();   //send the message and get echoes from slave

          //confirm echoes and send ack
          setAck();       //prep message
          sendData();     //send ack and get echoes from slave
          receiveData(1); //get ack and send echoes

          getTime();
          getValve();

          labview();

          //if input from user or system then
          type=writeState;//force write
        break;

        case writeState: //write a new state to slave
          //send request for state change
          setWrite();   //prep message
          sendData();   //send the message and get echoes from slave

          //confirm echoes and send ack
          setAck();       //prep message
          sendData();     //send ack and get echoes from slave
          receiveData(1); //get ack and send echoes

          type=readState;//force read
        break;

        case readState:
          //send request for state
          setRead();      //prep message
          sendData();     //send the message and get echoes from slave
```

```
      //slave sends state
      receiveData(1); //get state and send echoes

      timeMV=rxMessage[3]-48;
      Serial.print("Slave time: "); //print time as decimal
      Serial.println(timeMV,DEC); //print time as decimal
      geyserStateMV=rxMessage[4]-48;
      valveStateMV=rxMessage[5]-48;
      signMV=rxMessage[6]-48;
      slaveTemp();

      //confirm state received and send ack
      setAck();      //prep message
      sendData();    //send ack and get echoes
      receiveData(1); //get ack and send echoes

      type=idleState;//force idle
     break;

     default:  //commType==0
      errorFlag=true;//set error flag because no comm flag was set
     break;
    }
   }
   else  //error present
   {
    run=0;
    Serial.println("Error: incorrect echo.");
   }

   Serial.println("End");
   Serial.println("");
  }
}

void setIdle()
{
 //prepare the ack message
 address = 0xFF-1;    //to slave 1
 txMessageLength = 4;  //minimum length
 type = idleType+48;      //type

 //put values in the message
 txMessage[0] = address;
 txMessage[1] = txMessageLength;
 txMessage[2] = type;
 txMessage[3] = messageEnd;
}

void setAck()
{
 //prepare the ack message
 address = 0xFF-1;    //to slave 1
 txMessageLength = 4;  //minimum length
 type = ackType+48;      //type
 //put values in the message
 txMessage[0] = address;
 txMessage[1] = txMessageLength;
 txMessage[2] = type;
 txMessage[3] = messageEnd;
}

void setWrite()
{
 //prepare write command
 address = 0xFF-1;    //to slave 1
 txMessageLength = 4;  //minimum length
 type = writeType+48;      //type

 payload[0] = lVTime+48;    //time (hour)
```

```
  payload[1] = geyserStateSP+48;  //power state
  payload[2] = valveStateMV+48;      //valve
  payload[3] = signSP+48;             //temperature sign
  payload[4] = (geyserTempSP%10)+48;      //sp1
  payload[5] = (geyserTempSP%100)/10+48;  //sp2
  payload[6] = (geyserTempSP/100)+48;     //sp3

  //check if payload has data (put in send)
  for(int i=0; i<7; i++)
  {
    txMessageLength+=1;
    txMessage[3+i] = payload[i];
  }

  //put values in the message
  txMessage[0] = address;
  txMessage[1] = txMessageLength;
  txMessage[2] = type;
  txMessage[txMessageLength-1] = messageEnd;
}

void setRead()
{
  //prepare read command
  address = 0xFF-1;     //to slave 1
  txMessageLength = 4;  //minimum length
  type = readType+48;   //type

  //check if payload has data (put in send)
  for(int i=0; i<8; i++)
  {
    if(payload[i] != 0) txMessageLength+=1;
    txMessage[3+i] = payload[i];
  }

  //put values in the message
  txMessage[0] = address;
  txMessage[1] = txMessageLength;
  txMessage[2] = type;
  txMessage[txMessageLength-1] = messageEnd;
}

void sendData()
{
  //send and print data
  Serial.print("Sending:[ "); //head
  for(int i=0; i<txMessageLength; i++)  //send and print all bytes
  {
    Serial1.write(txMessage[i]);  //send
    Serial.print(txMessage[i]);   //print
    if(i<txMessageLength-1) Serial.print(", ");
  }
  Serial.println(" ]"); //tail

  if(txMessage[2]==50) Serial.println("Read");
  else if(txMessage[2]==51)Serial.println("Write");
  else Serial.println("Ack");

  //get echoes for each byte sent
  for(int i=0; i<txMessageLength-1; i++) //except end byte
  {
    while(Serial1.available()==0);  //wait for byte
    rxEcho = Serial1.read();        //read
    if(rxEcho!=(0xFF-txMessage[i])) errorFlag = true; //error if not complement
    else errorFlag = false;         //clear
  }
}

void receiveData(bool dataType)
{
```

```
  while(Serial1.available()==0);  //wait for byte
  rxMessage[0]=Serial1.read();    //get ID

  if(dataType)
  {
    if(rxMessage[0]==0xFF)          //if this address
    {
      //get and print data
      Serial.print("Receiving:[ "); //head
      Serial.print(rxMessage[0]);   //ID
      Serial.print(", ");

      while(Serial1.available()==0);  //wait for bytes
      rxMessage[1] = Serial1.read();  //store length
      Serial.print(rxMessage[1]);     //print
      Serial.print(", ");

      for(int i=2; i<(rxMessage[1]); i++)  //except ID and length since it was already stored
      {
        while(Serial1.available()==0);  //wait for bytes
        rxMessage[i] = Serial1.read();  //store
        Serial.print(rxMessage[i]);     //print
        if(i<rxMessage[1]-1) Serial.print(", ");
      }

      Serial.println(" ]"); //tail

      if(rxMessage[2]==50) Serial.println("Read");
      else if(rxMessage[2]==51)Serial.println("Write");
      else Serial.println("Ack");

      //send echoes
      for(int i=0; i<rxMessage[1]-1; i++)  //except end byte
      {
        txEcho = 255-rxMessage[i];  //invert
        Serial1.write(txEcho);      //send
      }
    }
    else  //ignore if not address
    {
      while(Serial1.available()==0);  //wait for byte
      rxMessage[1]=Serial1.read();    //length

      for(int i=1; i<((rxMessage[1]*2)-1); i++)  //ignore transmission
      {
        while(Serial1.available()==0);
        Serial1.read();  //ignore
      }
    }
  }
  else  //ignore echoes
  {
    for(int i=1; i<(txMessageLength); i++)  //ignore echoes of last transmission
    {
      while(Serial1.available()==0);
      Serial1.read();  //ignore
    }
  }
}

void getTime()
{
  //get time  (RTCC)
  if (!rtc.begin())  //is working?
  {
    Serial.println("Couldn't find RTC");
    while (1);  //pause
  }

  if (rtc.lostPower())  //set time
```

```
 {
   Serial.println("RTC lost power, lets set the time!");
   // following line sets the RTC to the date & time this sketch was compiled
   rtc.adjust(DateTime(F(__DATE__), F(__TIME__)));
   // This line sets the RTC with an explicit date & time, for example to set
   // January 21, 2014 at 3am you would call:
   // rtc.adjust(DateTime(2014, 1, 21, 3, 0, 0));
 }

 DateTime now = rtc.now(); //current date and time
 currentTime = now.hour();
 Serial.print("Time: "); //print time as decimal
 Serial.println(currentTime,DEC); //print time as decimal

 analogTime=int(analogRead(lVTimeA0)*4.87072633);  //mV 4.8828125
 Serial.println(analogTime);

 if(analogTime>=1000 && analogTime<=1100) lVTime=18;  //6 pm
 else if(analogTime>=1100 && analogTime<=1200) lVTime=19;  //7 pm
 else if(analogTime>=1200 && analogTime<=1300) lVTime=20;  //8 pm
 else if(analogTime>=1300 && analogTime<=1400) lVTime=21;  //9 pm
 else if(analogTime>=1400 && analogTime<=1500) lVTime=22;  //10 pm
 else if(analogTime>=1500 && analogTime<=1600) lVTime=23;  //11 pm
 else if(analogTime>=1600 && analogTime<=1700) lVTime=24;  //12 pm
 else if(analogTime>=1700 && analogTime<=1800) lVTime=1;  //1 am
 else if(analogTime>=1800 && analogTime<=1900) lVTime=2;  //2 am
 else if(analogTime>=1900 && analogTime<=2000) lVTime=3;  //3 am
 else if(analogTime>=2000 && analogTime<=2100) lVTime=4;  //4 am
 else if(analogTime>=2100 && analogTime<=2200) lVTime=5;  //5 am
 else if(analogTime>=2200 && analogTime<=2300) lVTime=6;  //6 am
 else if(analogTime>=2300 && analogTime<=2400) lVTime=7;  //7 am
 else if(analogTime>=2400 && analogTime<=2500) lVTime=8;  //8 am
 else if(analogTime>=2500 && analogTime<=2600) lVTime=9;  //9 am
 else if(analogTime>=2600 && analogTime<=2700) lVTime=10;  //10 am
 else if(analogTime>=2700 && analogTime<=2800) lVTime=11;  //11 am
 else if(analogTime>=2800 && analogTime<=2900) lVTime=12;  //12 am
 else if(analogTime>=2900 && analogTime<=3000) lVTime=13;  //1 pm
 else if(analogTime>=3000 && analogTime<=3100) lVTime=14;  //2 pm
 else if(analogTime>=3100 && analogTime<=3200) lVTime=15;  //3 pm
 else if(analogTime>=3200 && analogTime<=3300) lVTime=16;  //4 pm
 else if(analogTime>=3300 && analogTime<=3400) lVTime=17;  //5 pm
}

void getValve()
{
 valveStateSP = digitalRead(valveI);
 valveStateMV = valveStateSP;
 Serial.print("Valve: "); //print time as decimal
 Serial.println(valveStateMV); //print time as decimal
}

void slaveTemp()
{
 geyserTempMV1=(rxMessage[9]-48)*100;   //mv1
 geyserTempMV2=(rxMessage[8]-48)*10;  //mv2
 geyserTempMV3=(rxMessage[7]-48);  //mv3
 geyserTempMVx=geyserTempMV1+geyserTempMV2+geyserTempMV3;
 Serial.print("Slave Temp x: "); //print time as decimal
 Serial.println(geyserTempMVx);

 geyserTempMV1=(rxMessage[12]-48)*100;   //mv1
 geyserTempMV2=(rxMessage[11]-48)*10;  //mv2
 geyserTempMV3=(rxMessage[10]-48);  //mv3
 geyserTempMVy=geyserTempMV1+geyserTempMV2+geyserTempMV3;
 Serial.print("Slave Temp y: "); //print time as decimal
 Serial.println(geyserTempMVy);

 geyserTempMV1=(rxMessage[15]-48)*100;   //mv1
 geyserTempMV2=(rxMessage[14]-48)*10;  //mv2
 geyserTempMV3=(rxMessage[13]-48);  //mv3
```

```
  geyserTempMVz=geyserTempMV1+geyserTempMV2+geyserTempMV3;
  Serial.print("Slave Temp z: "); //print time as decimal
  Serial.println(geyserTempMVz);
}

void labview()
{
  //prepare labview message
  txMessageLength = 3;  //minimum length
  type = writeType;  //type

  payload[0] = timeMV+15;        //time (hour)
  payload[1] = geyserStateMV; //power state
  payload[2] = valveStateMV;  //valve
  payload[3] = signMV;        //temperature sign
  payload[4] = geyserTempMVx; //mv at x
  payload[5] = geyserTempMVy; //mv at y
  payload[6] = geyserTempMVz; //mv at z

  //check if payload has data (put in send)
  for(int i=0; i<7; i++)
  {
    txMessageLength+=1;
    txMessage[2+i] = payload[i];
  }

  //put values in the message
  txMessage[0] = txMessageLength;
  txMessage[1] = type;
  txMessage[txMessageLength-1] = messageEnd;

  //send and print data
  Serial.print("Sending:[ "); //head

  for(int i=0; i<txMessageLength; i++)  //send and print all bytes
  {
    Serial2.print(txMessage[i],HEX);  //send
    Serial.print(txMessage[i],HEX);   //print
    if(i<txMessageLength-1) Serial.print(", ");
  }

  Serial2.print("\n");  //send
  Serial.println(" ]"); //tail
  Serial.println("Labview");
}

/*
Title:  Slave PLC
Date:   25 June 2016
Ver:    0.1

Description:
This program responds to read or write commands from the master on the PLC bus. The master will send read and write commands. All
commands are encoded in HEX-Ascii (i.e. numerals = 0x30-0x39 or 48-57) so slave ID's can range from 2-47 and 58-255.

Message:
Receiver ID (02-47,58-255) | Length (4-16 bytes) | Type (Ack,R,Wr) | Multi-byte payload | End (0x55)

Todo:
     - valve control from LV
     - assign ID's to slaves automatically (have the slave send out an ID request)
*/
#include <Arduino.h>

#define geyser 7            //geyser switch
#define valveO 8            //valve switch
#define lm35x 3             //lm35 input (geyser)
#define lm35y 2             //lm35 input (inlet)
#define lm35z 1             //lm35 input (outlet)
```

```
#define timePot 0            //time adjust input

byte address;                //0xFF is master
byte rxMessageLength;        //includes all message bytes
byte txMessageLength;        //includes all message bytes
byte messageType;            //read or write
unsigned long messageCounter=1;
const byte readType = 48+2;  //arbitrary value ascii value for decimal 1
const byte writeType = 48+3;  //""
const byte ackType = 48+4;    //""
const byte idleType = 48+1;   //""
const byte messageEnd = 0x55; //alternating 1's and 0's (ease of determination?)
byte payload[20];            //actual data
byte message[20];            //full message
byte rxMessage[20];          //full message
byte txMessage[20];          //full message
byte rxByte;                 //temporary storage
byte rxEcho;                 //temporary storage
byte txEcho;                 //temporary storage
boolean txFlag = false;      //received end byte from slave
boolean rxFlag = false;      //sent end byte to slave
boolean errorFlag = false;   //incorrect byte received as echo from slave
boolean ackTxFlag = false;   //received end byte from slave
boolean ackRxFlag = false;   //sent end byte to slave
boolean run = true;          ///run program
byte type;
enum type {idleState=1,readState=2,writeState=3};
byte timeZone = 1;
enum timeZone {peak=1,norm=2, preheat=3};
byte currentTime;
int adjustedTime;

//geyser - slave
byte geyserTempSP = 0;    //temperature set point
byte geyserTempMVx = 0;   //temperature measured value
byte geyserTempMVy = 0;   //temperature measured value
byte geyserTempMVz = 0;   //temperature measured value
byte geyserStateSP = 1;   //power set point
byte geyserStateMV = 0;   //power measured value
boolean sign=1;
int maxTemp=75;
int hiTemp=65;
int lowTemp=55;
boolean valveStateSP;
boolean valveStateMV;

//set up the controller
void setup()
{
  Serial.begin(9600);   //PC
  Serial1.begin(9600);  //slave

  pinMode(geyser, OUTPUT);
  digitalWrite(geyser,LOW);
  pinMode(valveO, OUTPUT);
  digitalWrite(valveO,LOW);
}

//main loop
void loop()
{
  while(run)
  {
    if(!errorFlag) //if error occurs end comms
    {
//      delay(1000);
      Serial.print("Awaiting message number: ");
      Serial.println(messageCounter);
      //wait for master and...
      receiveData(1);  //receive request and send echoes
```

```
      messageCounter++;

      type=rxMessage[2]-48; //set case

      switch(type)
      {
       case idleState: //processing done here
        //master gets echoes and sends ack
        receiveData(1);  //get ack and send echoes to master

        //if ack received
        setValve();   //open or close valve
        getTemp();    //get temperature of water
        setTime();    //set time zone
        setHeater();  //change heater state

        //confirm ack and send ack
        setAck();       //prep message
        sendData();     //send ack and get echoes

        //master waits for input from user or system event, slave then goes to write state
       break;

       case writeState://write a new state
        //get geyser power state
        geyserStateSP=rxMessage[4]-48;//set new state
        Serial.print("Geyser SP: "); //print time as decimal
        Serial.println(geyserStateSP);

        //get valve state
        valveStateSP=rxMessage[5]-48;//set new state
        Serial.print("Valve SP: "); //print time as decimal
        Serial.println(valveStateSP);

        //get time
        currentTime = rxMessage[3]-48; //set time
        Serial.print("LV time: "); //print time as decimal
        Serial.println(currentTime,DEC); //print time as decimal

        //get adjusted time
        adjustedTime = round(analogRead(timePot)/42.6);  //if at 23, change to 00

//          Serial.print("Adjusted time: "); //print time as decimal
//          Serial.println(adjustedTime,DEC); //print time as decimal

        //set as time
//          currentTime=adjustedTime;

        //master gets echoes and sends ack
        receiveData(1);  //get ack and send echoes to master

        //if ack received
        //confirm ack and send ack
        setAck();       //prep message
        sendData();     //send ack and get echoes

        //master requests read from slave
       break;

       case readState: //send state
        //master gets echoes and expects state
        setRead();    //prep message
        sendData();   //send the state and get echoes from master

        //confirm ack
        receiveData(1);//get ack and send echoes to master

        //confirm ack and send ack
        setAck();       //prep message
        sendData();     //send ack and get echoes
```

```
      //master becomes idle and so does slave (via message)
     break;

     default:  //commType==0
       errorFlag=true;//set error flag because no comm flag was set
     break;
    }
  }
  else  //error present
  {
    run=0;
    Serial.println("Error: incorrect echo.");
  }

  Serial.println("End");
  Serial.println("");
 }
}

void setRead()
{
 //prepare read command
 address = 0xFF;       //to master
 txMessageLength = 4;  //minimum length
 type = readType+48;      //type

 payload[0] = currentTime+48;            //time (hour)
 payload[1] = geyserStateMV+48;          //power state
 payload[2] = valveStateMV+48;           //valve state
 payload[3] = sign+48;                   //temperature sign
 payload[4] = (geyserTempMVx%10)+48;      //mv1
 payload[5] = (geyserTempMVx%100)/10+48;  //mv2
 payload[6] = (geyserTempMVx/100)+48;     //mv3
 payload[7] = (geyserTempMVy%10)+48;      //mv1
 payload[8] = (geyserTempMVy%100)/10+48;  //mv2
 payload[9] = (geyserTempMVy/100)+48;     //mv3
 payload[10] = (geyserTempMVz%10)+48;      //mv1
 payload[11] = (geyserTempMVz%100)/10+48;  //mv2
 payload[12] = (geyserTempMVz/100)+48;     //mv3

 //check if payload has data (put in send)
 for(int i=0; i<13; i++)
 {
   txMessageLength+=1;
   txMessage[3+i] = payload[i];
 }

 //rest of message
 txMessage[0] = address;
 txMessage[1] = txMessageLength;
 txMessage[2] = type;
 txMessage[txMessageLength-1] = messageEnd;
}

void setAck()
{
 //prepare the ack message
 address = 0xFF;     //to master
 txMessageLength = 4;  //minimum length
 type = ackType+48;         //type

 //put values in the message
 txMessage[0] = address;
 txMessage[1] = txMessageLength;
 txMessage[2] = type;
 txMessage[3] = messageEnd;
}

void sendData()
```

```
{
  //send and print data
//  Serial.print("Sending:[ "); //head

  for(int i=0; i<txMessageLength; i++)  //send and print all bytes
  {
    Serial1.write(txMessage[i]);  //send
//    Serial.print(txMessage[i]);   //print
//    if(i<txMessageLength-1) Serial.print(", ");
  }

//  Serial.println(" ]"); //tail

  if(txMessage[2]==50) Serial.println("Read");
  else if(txMessage[2]==51)Serial.println("Write");
  else Serial.println("Ack");

  //get echoes
  for(int i=0; i<txMessageLength-1; i++) //get eacho of each byte except end
  {
    while(Serial1.available()==0);  //wait for bytes
    rxEcho = Serial1.read();  //read
    if(rxEcho!=(0xFF-txMessage[i])) errorFlag = true; //error
    else errorFlag = false; //clear
  }
}

void receiveData(bool dataType)
{
  while(Serial1.available()==0);  //wait for bytes
  rxMessage[0]=Serial1.read();    //get byte

  if(dataType)
  {
    if(rxMessage[0]==0xFF-1)          //if this address
    {
      //get and print data
//      Serial.print("Receiving:[ "); //head
//      Serial.print(rxMessage[0]);   //ID
//      Serial.print(", ");

      while(Serial1.available()==0);  //wait for bytes
      rxMessage[1] = Serial1.read();  //store length
//      Serial.print(rxMessage[1]);     //print
//      Serial.print(", ");

      for(int i=2; i<(rxMessage[1]); i++)  //except ID and length since it was already stored
      {
        while(Serial1.available()==0);  //wait for bytes
        rxMessage[i] = Serial1.read();  //store
//        Serial.print(rxMessage[i]);     //print
//        if(i<rxMessage[1]-1) Serial.print(", ");
      }

//      Serial.println(" ]"); //tail

      if(rxMessage[2]==50) Serial.println("Read");
      else if(rxMessage[2]==51)Serial.println("Write");
      else Serial.println("Ack");

      //send echoes
      for(int i=0; i<rxMessage[1]-1; i++)  //echo each byte received except end
      {
        txEcho = 255-rxMessage[i];  //invert
        Serial1.write(txEcho);      //send
      }
    }
    else  //ignore if not address
    {
      while(Serial1.available()==0);
```

```
      rxMessage[1]=Serial1.read();  //length

      for(int i=1; i<((rxMessage[1]*2)-1); i++)  //ignore transmission
      {
        while(Serial1.available()==0);
        Serial1.read();  //ignore
      }
    }
  }
  else  //ignore echoes
  {
    for(int i=1; i<(txMessageLength); i++)  //ignore echoes of last transmission
    {
      while(Serial1.available()==0);
      Serial1.read();  //ignore
    }
  }
}

void setHeater()
{
  switch(timeZone)
  {
    case peak:
    {
      if(geyserTempMVx>=hiTemp && geyserStateSP==1)
      {
        geyserStateMV = 0;
        digitalWrite(geyser, LOW);
      }
      else if(geyserTempMVx<=lowTemp && geyserStateSP==1)
      {
        geyserStateMV = 1;
        digitalWrite(geyser, HIGH);
      }
    }
    break;

    case norm:
    {
      if(geyserTempMVx>=maxTemp && geyserStateSP==1)
      {
        geyserStateMV = 0;
        digitalWrite(geyser, LOW);
      }
      else if(geyserTempMVx<=lowTemp && geyserStateSP==1)
      {
        geyserStateMV = 1;
        digitalWrite(geyser, HIGH);
      }
    }
    break;
    case preheat:
    {
      if(geyserTempMVx>=maxTemp && geyserStateSP==1)
      {
        geyserStateMV = 0;
        digitalWrite(geyser, LOW);
      }
      else if(geyserTempMVx<maxTemp && geyserStateSP==1)
      {
        geyserStateMV = 1;
        digitalWrite(geyser, HIGH);
      }
    }
    break;

    default:
    {
      //turn off geyser, something is wrong.
```

```
      geyserStateMV = 0;
      digitalWrite(geyser, LOW);
    }
  }

  Serial.print("Geyser: ");
  Serial.println(geyserStateMV);
}

void setTime()
{
  Serial.print("Time zone: "); //print time as decimal
  if(currentTime>=17 && currentTime<=18)  //17h00-19h00
  {
    timeZone = peak;
    Serial.println("17h00-19h00"); //print time as decimal
  }
  else if(currentTime>=6 && currentTime<=8)  //06h00-09h00
  {
    timeZone = peak;
    Serial.println("06h00-09h00"); //print time as decimal
  }
  else  //19h00-17h00
  {
    timeZone = norm;
    Serial.println("19h00-17h00"); //print time as decimal

    if(currentTime==5 || currentTime==9 ||
       currentTime==16 || currentTime==19)  //preheat an hour before and immediately after the peak times
    {
      timeZone = preheat;
      Serial.println("preheat"); //print time as decimal
    }
  }
}
void getTemp()
{
  //LM35 is ~10.0 mV/°C so take the mV reading from AI (1023 * 4.88 =~ 5000 mV) and divide by 10
  geyserTempMVx = round((analogRead(lm35x)*4.8828125)/10);  //read LM35 voltage and convert to celcius
  Serial.print("geyserTempMVx: "); //print
  Serial.println(geyserTempMVx);

  //LM35 is ~10.0 mV/°C so take the mV reading from AI (1023 * 4.88 =~ 5000 mV) and divide by 10
  geyserTempMVy = round((analogRead(lm35y)*4.8828125)/10);  //read LM35 voltage and convert to celcius
  Serial.print("geyserTempMVy: "); //print
  Serial.println(geyserTempMVy);
  //LM35 is ~10.0 mV/°C so take the mV reading from AI (1023 * 4.88 =~ 5000 mV) and divide by 10
  geyserTempMVz = round((analogRead(lm35z)*4.8828125)/10);  //read LM35 voltage and convert to celcius
  Serial.print("geyserTempMVz: "); //print
  Serial.println(geyserTempMVz);
}

void setValve()
{
  if(valveStateSP)
  {
    valveStateMV=valveStateSP;  //valve is set
    digitalWrite(valveO, HIGH);
  }
  else
  {
    valveStateMV=valveStateSP;  //valve is set
    digitalWrite(valveO, LOW);
  }
  Serial.print("Valve: "); //print time as decimal
  Serial.println(valveStateMV);
}
```

Appendix B: Code for the reliability tests

```
/*

Title:  Master PLC
Date:   25 June 2016
Ver:    0.1

Description:
This program sends read or write commands to a slave on the PLC bus. The slave will respond to both read and write commands. All commands
are encoded in HEX-Ascii (i.e. numerals = 0x30-0x39 or 48-57) so slave ID's can range from 2-47 and 58-255.

Message:
Receiver ID (02-47,58-255) | Length (4-16 bytes) | Type (Ack,R,Wr) | Multi-byte payload | End (0x55)

Todo:
- USB serial with LV
- assign ID's to slaves automatically (have the slave send out an ID request)

*/
#include <Arduino.h>
#include <Wire.h>
#include <RTClib.h>
RTC_DS3231 rtc;              //clock on pins 20 (SDA) and 21 (SCL)
#define valveI 2             //valve switch
#define lVTimeA0 0           //analog time
byte address;                //0xFF is master
byte rxMessageLength;        //includes all message bytes
byte txMessageLength;        //includes all message bytes
byte messageType;            //read or write
unsigned long messageCounter=1;
const byte readType = 2;   //arbitrary value ascii value for decimal 1
const byte writeType = 3;  //""
const byte ackType = 4;    //""
const byte idleType = 1;   //""
const byte messageEnd = 0x55; //alternating 1's and 0's (ease of determination?)
byte payload[20];            //actual data
byte message[20];            //full message
byte rxMessage[20];          //full message
byte txMessage[20];          //full message
byte rxByte;                 //temporary storage
byte rxEcho;                 //temporary storage
byte txEcho;                 //temporary storage
boolean txFlag = false;      //received end byte from slave
boolean rxFlag = false;      //sent end byte to slave
boolean errorFlag = false;   //incorrect byte received as echo from slave
boolean ackTxFlag = false;   //received end byte from slave
boolean ackRxFlag = false;   //sent end byte to slave
boolean run = true;          ///run program
byte type;
enum type {idleState=1,readState=2,writeState=3};
//geyser - slave
byte geyserTempSP = 0;    //temperature set point
byte geyserTempMV1 = 0;   //temperature measured value
byte geyserTempMV2 = 0;   //temperature measured value
byte geyserTempMV3 = 0;   //temperature measured value
byte geyserTempMVx = 0;   //temperature measured value
byte geyserTempMVy = 0;   //temperature measured value
byte geyserTempMVz = 0;   //temperature measured value
byte geyserStateSP = 1;   //power set point
byte geyserStateMV = 0;   //power measured value
boolean signSP=1;
boolean signMV=1;
int analogTime=0;
byte currentTime = 1;
byte lVTime = 1;
byte timeMV = 1;
boolean valveStateSP;
boolean valveStateMV;
//set up the controller
void setup()
```

```
{
Serial.begin(9600);   //PC
Serial1.begin(9600);  //slave
Serial2.begin(9600);  //labview
pinMode(valveI, INPUT);
pinMode(lVTimeA0, INPUT);
}
//main loop
void loop()
{
type=readState; //force the type (debugging)
while(run)
{
if(!errorFlag) //if error occurs end comms
{
delay (50); //wait before each loop
Serial.print("Sending message number: ");
Serial.println(messageCounter);

if(messageCounter==5000)
{
Serial.print("Test Completed!");
run=0;
}
else messageCounter++;

switch(type)
{
case idleState: //processing done here
//send request for state change
setIdle();    //prep message
sendData();   //send the message and get echoes from slave

//confirm echoes and send ack
setAck();       //prep message
sendData();     //send ack and get echoes from slave
receiveData(1); //get ack and send echoes

labview();

//if input from user or system then
type=writeState;//force write
break;

case writeState: //write a new state to slave
//send request for state change
setWrite();   //prep message
sendData();   //send the message and get echoes from slave

//confirm echoes and send ack
setAck();       //prep message
sendData();     //send ack and get echoes from slave
receiveData(1); //get ack and send echoes

type=readState;//force read
break;

case readState:
//send request for state
setRead();      //prep message
sendData();     //send the message and get echoes from slave

//slave sends state
receiveData(1); //get state and send echoes

//confirm state received and send ack
setAck();       //prep message
sendData();     //send ack and get echoes
receiveData(1); //get ack and send echoes
```

```
type=idleState;//force idle
break;

default:  //commType==0
errorFlag=true;//set error flag because no comm flag was set
break;
}
}
else  //error present
{
run=0;
Serial.println("Error: incorrect echo.");
}

Serial.println("End");
Serial.println("");
}
}

void setIdle()
{
//prepare the ack message
address = 0xFF-1;     //to slave 1
txMessageLength = 4;  //minimum length
type = idleType+48;       //type

//put values in the message
txMessage[0] = address;
txMessage[1] = txMessageLength;
txMessage[2] = type;
txMessage[3] = messageEnd;
}

void setAck()
{
//prepare the ack message
address = 0xFF-1;     //to slave 1
txMessageLength = 4;  //minimum length
type = ackType+48;       //type
//put values in the message
txMessage[0] = address;
txMessage[1] = txMessageLength;
txMessage[2] = type;
txMessage[3] = messageEnd;
}

void setWrite()
{
//prepare write command
address = 0xFF-1;     //to slave 1
txMessageLength = 4;  //minimum length
type = writeType+48;       //type

payload[0] = lVTime+48;    //time (hour)
payload[1] = geyserStateSP+48;  //power state
payload[2] = valveStateMV+48;      //valve
payload[3] = signSP+48;             //temperature sign
payload[4] = (geyserTempSP%10)+48;      //sp1
payload[5] = (geyserTempSP%100)/10+48;  //sp2
payload[6] = (geyserTempSP/100)+48;     //sp3

//check if payload has data (put in send)
for(int i=0; i<7; i++)
{
txMessageLength+=1;
txMessage[3+i] = payload[i];
}

//put values in the message
txMessage[0] = address;
```

```
txMessage[1] = txMessageLength;
txMessage[2] = type;
txMessage[txMessageLength-1] = messageEnd;
}

void setRead()
{
//prepare read command
address = 0xFF-1;     //to slave 1
txMessageLength = 4;  //minimum length
type = readType+48;   //type

//check if payload has data (put in send)
for(int i=0; i<8; i++)
{
if(payload[i] != 0) txMessageLength+=1;
txMessage[3+i] = payload[i];
}

//put values in the message
txMessage[0] = address;
txMessage[1] = txMessageLength;
txMessage[2] = type;
txMessage[txMessageLength-1] = messageEnd;
}

void sendData()
{
//send and print data
Serial.print("Sending:[ "); //head
for(int i=0; i<txMessageLength; i++)  //send and print all bytes
{
Serial1.write(txMessage[i]);  //send
Serial.print(txMessage[i]);   //print
if(i<txMessageLength-1) Serial.print(", ");
}
Serial.println(" ]"); //tail

if(txMessage[2]==50) Serial.println("Read");
else if(txMessage[2]==51)Serial.println("Write");
else Serial.println("Ack");

//get echoes for each byte sent
for(int i=0; i<txMessageLength-1; i++) //except end byte
{
while(Serial1.available()==0);  //wait for byte
rxEcho = Serial1.read();        //read
if(rxEcho!=(0xFF-txMessage[i])) errorFlag = true; //error if not complement
else errorFlag = false;         //clear
}
}

void receiveData(bool dataType)
{
while(Serial1.available()==0);  //wait for byte
rxMessage[0]=Serial1.read();    //get ID

if(dataType)
{
if(rxMessage[0]==0xFF)          //if this address
{
//get and print data
Serial.print("Receiving:[ "); //head
Serial.print(rxMessage[0]);   //ID
Serial.print(", ");

while(Serial1.available()==0);  //wait for bytes
rxMessage[1] = Serial1.read();  //store length
Serial.print(rxMessage[1]);     //print
Serial.print(", ");
```

```
for(int i=2; i<(rxMessage[1]); i++)  //except ID and length since it was already stored
{
while(Serial1.available()==0);  //wait for bytes
rxMessage[i] = Serial1.read();  //store
Serial.print(rxMessage[i]);     //print
if(i<rxMessage[1]-1) Serial.print(", ");
}

Serial.println(" ]"); //tail

if(rxMessage[2]==50) Serial.println("Read");
else if(rxMessage[2]==51)Serial.println("Write");
else Serial.println("Ack");

//send echoes
for(int i=0; i<rxMessage[1]-1; i++)  //except end byte
{
txEcho = 255-rxMessage[i];  //invert
Serial1.write(txEcho);      //send
}
}
else  //ignore if not address
{
while(Serial1.available()==0);  //wait for byte
rxMessage[1]=Serial1.read();    //length

for(int i=1; i<((rxMessage[1]*2)-1); i++)  //ignore transmission
{
while(Serial1.available()==0);
Serial1.read();  //ignore
}
}
}
else  //ignore echoes
{
for(int i=1; i<(txMessageLength); i++)  //ignore echoes of last transmission
{
while(Serial1.available()==0);
Serial1.read();  //ignore
}
}
}

void getTime()
{
//get time  (RTCC)
if (!rtc.begin())  //is working?
{
Serial.println("Couldn't find RTC");
while (1);  //pause
}

if (rtc.lostPower())  //set time
{
Serial.println("RTC lost power, lets set the time!");
// following line sets the RTC to the date & time this sketch was compiled
rtc.adjust(DateTime(F(__DATE__), F(__TIME__)));
// This line sets the RTC with an explicit date & time, for example to set
// January 21, 2014 at 3am you would call:
// rtc.adjust(DateTime(2014, 1, 21, 3, 0, 0));
}

DateTime now = rtc.now(); //current date and time
currentTime = now.hour();
Serial.print("Time: "); //print time as decimal
Serial.println(currentTime,DEC); //print time as decimal

analogTime=int(analogRead(lVTimeA0)*4.87072633);  //mV 4.8828125
Serial.println(analogTime);
```

```
if(analogTime>=4040 && analogTime<=4080) lVTime=18;  //6 pm
else if(analogTime>=4080 && analogTime<=4120) lVTime=19;  //7 pm
else if(analogTime>=4120 && analogTime<=4160) lVTime=20;  //8 pm
else if(analogTime>=4160 && analogTime<=4200) lVTime=21;  //9 pm
else if(analogTime>=4200 && analogTime<=4240) lVTime=22;  //10 pm
else if(analogTime>=4240 && analogTime<=4280) lVTime=23;  //11 pm
else if(analogTime>=4280 && analogTime<=4320) lVTime=24;  //12 pm
else if(analogTime>=4320 && analogTime<=4360) lVTime=1;  //1 am
else if(analogTime>=4360 && analogTime<=4400) lVTime=2;  //2 am
else if(analogTime>=4400 && analogTime<=4440) lVTime=3;  //3 am
else if(analogTime>=4440 && analogTime<=4480) lVTime=4;  //4 am
else if(analogTime>=4480 && analogTime<=4520) lVTime=5;  //5 am
else if(analogTime>=4520 && analogTime<=4560) lVTime=6;  //6 am
else if(analogTime>=4560 && analogTime<=4600) lVTime=7;  //7 am
else if(analogTime>=4600 && analogTime<=4640) lVTime=8;  //8 am
else if(analogTime>=4640 && analogTime<=4680) lVTime=9;  //9 am
else if(analogTime>=4680 && analogTime<=4720) lVTime=10;  //10 am
else if(analogTime>=4720 && analogTime<=4760) lVTime=11;  //11 am
else if(analogTime>=4760 && analogTime<=4800) lVTime=12;  //12 am
else if(analogTime>=4800 && analogTime<=4840) lVTime=13;  //1 pm
else if(analogTime>=4840 && analogTime<=4880) lVTime=14;  //2 pm
else if(analogTime>=4880 && analogTime<=4920) lVTime=15;  //3 pm
else if(analogTime>=4920 && analogTime<=4960) lVTime=16;  //4 pm
else if(analogTime>=4960 && analogTime<=5000) lVTime=17;  //5 pm
}

void getValve()
{
valveStateSP = digitalRead(valveI);
valveStateMV = valveStateSP;
Serial.print("Valve: "); //print time as decimal
Serial.println(valveStateMV); //print time as decimal
}

void slaveTemp()
{
geyserTempMV1=(rxMessage[9]-48)*100;   //mv1
geyserTempMV2=(rxMessage[8]-48)*10;  //mv2
geyserTempMV3=(rxMessage[7]-48);  //mv3
geyserTempMVx=geyserTempMV1+geyserTempMV2+geyserTempMV3;
Serial.print("Slave Temp x: "); //print time as decimal
Serial.println(geyserTempMVx);

geyserTempMV1=(rxMessage[12]-48)*100;   //mv1
geyserTempMV2=(rxMessage[11]-48)*10;  //mv2
geyserTempMV3=(rxMessage[10]-48);  //mv3
geyserTempMVy=geyserTempMV1+geyserTempMV2+geyserTempMV3;
Serial.print("Slave Temp y: "); //print time as decimal
Serial.println(geyserTempMVy);

geyserTempMV1=(rxMessage[15]-48)*100;   //mv1
geyserTempMV2=(rxMessage[14]-48)*10;  //mv2
geyserTempMV3=(rxMessage[13]-48);  //mv3
geyserTempMVz=geyserTempMV1+geyserTempMV2+geyserTempMV3;
Serial.print("Slave Temp z: "); //print time as decimal
Serial.println(geyserTempMVz);
}

void labview()
{
//prepare labview message
txMessageLength = 3;  //minimum length
type = writeType;  //type

payload[0] = timeMV+15;        //time (hour)
payload[1] = geyserStateMV; //power state
payload[2] = valveStateMV;  //valve
payload[3] = signMV;        //temperature sign
payload[4] = geyserTempMVx; //mv at x
```

```
payload[5] = geyserTempMVy; //mv at y
payload[6] = geyserTempMVz; //mv at z

//check if payload has data (put in send)
for(int i=0; i<7; i++)
{
txMessageLength+=1;
txMessage[2+i] = payload[i];
}

//put values in the message
txMessage[0] = txMessageLength;
txMessage[1] = type;
txMessage[txMessageLength-1] = messageEnd;

//send and print data
Serial.print("Sending:[ "); //head

for(int i=0; i<txMessageLength; i++)  //send and print all bytes
{
Serial2.print(txMessage[i],HEX);  //send
Serial.print(txMessage[i],HEX);   //print
if(i<txMessageLength-1) Serial.print(", ");
}

Serial2.print("\n");  //send
Serial.println(" ]"); //tail
Serial.println("Labview");
}

/*
Title:  Slave PLC
Date:   25 June 2016
Ver:    0.1

Description:
This program responds to read or write commands from the master on the PLC bus. The master will send read and write commands. All
commands are encoded in HEX-Ascii (i.e. numerals = 0x30-0x39 or 48-57) so slave ID's can range from 2-47 and 58-255.

Message:
Receiver ID (02-47,58-255) | Length (4-16 bytes) | Type (Ack,R,Wr) | Multi-byte payload | End (0x55)

Todo:
- valve control from LV
- assign ID's to slaves automatically (have the slave send out an ID request)

*/
#include <Arduino.h>

#define geyser 7              //geyser switch
#define valveO 8              //valve switch
#define lm35x 3               //lm35 input (geyser)
#define lm35y 2               //lm35 input (inlet)
#define lm35z 1               //lm35 input (outlet)
#define timePot 0             //time adjust input

byte address;                 //0xFF is master
byte rxMessageLength;         //includes all message bytes
byte txMessageLength;         //includes all message bytes
byte messageType;             //read or write
unsigned long messageCounter=1;
const byte readType = 48+2;   //arbitrary value ascii value for decimal 1
const byte writeType = 48+3;  //""
const byte ackType = 48+4;    //""
const byte idleType = 48+1;   //""
const byte messageEnd = 0x55; //alternating 1's and 0's (ease of determination?)
byte payload[20];             //actual data
byte message[20];             //full message
byte rxMessage[20];           //full message
byte txMessage[20];           //full message
```

```
byte rxByte;                   //temporary storage
byte rxEcho;                   //temporary storage
byte txEcho;                   //temporary storage
boolean txFlag = false;        //received end byte from slave
boolean rxFlag = false;        //sent end byte to slave
boolean errorFlag = false;     //incorrect byte received as echo from slave
boolean ackTxFlag = false;     //received end byte from slave
boolean ackRxFlag = false;     //sent end byte to slave
boolean run = true;            ///run program
byte type;
enum type {idleState=1,readState=2,writeState=3};
byte timeZone = 1;
enum timeZone {peak=1,norm=2, preheat=3};
byte currentTime;
int adjustedTime;

//geyser - slave
byte geyserTempSP = 0;    //temperature set point
byte geyserTempMVx = 0;   //temperature measured value
byte geyserTempMVy = 0;   //temperature measured value
byte geyserTempMVz = 0;   //temperature measured value
byte geyserStateSP = 1;   //power set point
byte geyserStateMV = 0;   //power measured value
boolean sign=1;
int maxTemp=75;
int hiTemp=65;
int lowTemp=55;
boolean valveStateSP;
boolean valveStateMV;

//set up the controller
void setup()
{
Serial.begin(9600);   //PC
Serial1.begin(9600);  //slave

pinMode(geyser, OUTPUT);
digitalWrite(geyser,LOW);
pinMode(valveO, OUTPUT);
digitalWrite(valveO,LOW);
}

//main loop
void loop()
{
while(run)
{
if(!errorFlag) //if error occurs end comms
{
//      delay(1000);
Serial.print("Awaiting message number: ");
Serial.println(messageCounter);
//wait for master and...
receiveData(1);  //receive request and send echoes
messageCounter++;

type=rxMessage[2]-48; //set case

switch(type)
{
case idleState: //processing done here
//master gets echoes and sends ack
receiveData(1);  //get ack and send echoes to master

//confirm ack and send ack
setAck();       //prep message
sendData();     //send ack and get echoes

//master waits for input from user or system event, slave then goes to write state
break;
```

```
case writeState://write a new state
//master gets echoes and sends ack
receiveData(1);  //get ack and send echoes to master

//if ack received
//confirm ack and send ack
setAck();       //prep message
sendData();     //send ack and get echoes

//master requests read from slave
break;

case readState: //send state
//master gets echoes and expects state
setRead();    //prep message
sendData();   //send the state and get echoes from master

//confirm ack
receiveData(1);//get ack and send echoes to master

//confirm ack and send ack
setAck();       //prep message
sendData();     //send ack and get echoes

//master becomes idle and so does slave (via message)
break;

default:  //commType==0
errorFlag=true;//set error flag because no comm flag was set
break;
}
}
else  //error present
{
run=0;
Serial.println("Error: incorrect echo.");
}

Serial.println("End");
Serial.println("");
}
}

void setRead()
{
//prepare read command
address = 0xFF;       //to master
txMessageLength = 4;  //minimum length
type = readType+48;      //type

payload[0] = currentTime+48;            //time (hour)
payload[1] = geyserStateMV+48;          //power state
payload[2] = valveStateMV+48;           //valve state
payload[3] = sign+48;                   //temperature sign
payload[4] = (geyserTempMVx%10)+48;      //mv1
payload[5] = (geyserTempMVx%100)/10+48;  //mv2
payload[6] = (geyserTempMVx/100)+48;     //mv3
payload[7] = (geyserTempMVy%10)+48;      //mv1
payload[8] = (geyserTempMVy%100)/10+48;  //mv2
payload[9] = (geyserTempMVy/100)+48;     //mv3
payload[10] = (geyserTempMVz%10)+48;      //mv1
payload[11] = (geyserTempMVz%100)/10+48;  //mv2
payload[12] = (geyserTempMVz/100)+48;     //mv3

//check if payload has data (put in send)
for(int i=0; i<13; i++)
{
txMessageLength+=1;
txMessage[3+i] = payload[i];
```

```
}

//rest of message
txMessage[0] = address;
txMessage[1] = txMessageLength;
txMessage[2] = type;
txMessage[txMessageLength-1] = messageEnd;
}

void setAck()
{
//prepare the ack message
address = 0xFF;     //to master
txMessageLength = 4;  //minimum length
type = ackType+48;         //type

//put values in the message
txMessage[0] = address;
txMessage[1] = txMessageLength;
txMessage[2] = type;
txMessage[3] = messageEnd;
}

void sendData()
{
//send and print data
//  Serial.print("Sending:[ "); //head

for(int i=0; i<txMessageLength; i++)  //send and print all bytes
{
Serial1.write(txMessage[i]);  //send
//    Serial.print(txMessage[i]);   //print
//    if(i<txMessageLength-1) Serial.print(", ");
}

//  Serial.println(" ]"); //tail

if(txMessage[2]==50) Serial.println("Read");
else if(txMessage[2]==51)Serial.println("Write");
else Serial.println("Ack");

//get echoes
for(int i=0; i<txMessageLength-1; i++) //get eacho of each byte except end
{
while(Serial1.available()==0);  //wait for bytes
rxEcho = Serial1.read();  //read
if(rxEcho!=(0xFF-txMessage[i])) errorFlag = true; //error
else errorFlag = false; //clear
}
}

void receiveData(bool dataType)
{
while(Serial1.available()==0);  //wait for bytes
rxMessage[0]=Serial1.read();    //get byte

if(dataType)
{
if(rxMessage[0]==0xFF-1)          //if this address
{
//get and print data
//      Serial.print("Receiving:[ "); //head
//      Serial.print(rxMessage[0]);   //ID
//      Serial.print(", ");

while(Serial1.available()==0);  //wait for bytes
rxMessage[1] = Serial1.read();  //store length
//      Serial.print(rxMessage[1]);     //print
//      Serial.print(", ");
```

```
for(int i=2; i<(rxMessage[1]); i++)  //except ID and length since it was already stored
{
while(Serial1.available()==0);  //wait for bytes
rxMessage[i] = Serial1.read();  //store
//        Serial.print(rxMessage[i]);     //print
//        if(i<rxMessage[1]-1) Serial.print(", ");
}

//      Serial.println(" ]"); //tail

if(rxMessage[2]==50) Serial.println("Read");
else if(rxMessage[2]==51)Serial.println("Write");
else Serial.println("Ack");

//send echoes
for(int i=0; i<rxMessage[1]-1; i++)  //echo each byte received except end
{
txEcho = 255-rxMessage[i];  //invert
Serial1.write(txEcho);      //send
}
}
else  //ignore if not address
{
while(Serial1.available()==0);
rxMessage[1]=Serial1.read();  //length

for(int i=1; i<((rxMessage[1]*2)-1); i++)  //ignore transmission
{
while(Serial1.available()==0);
Serial1.read();  //ignore
}
}
}
else  //ignore echoes
{
for(int i=1; i<(txMessageLength); i++)  //ignore echoes of last transmission
{
while(Serial1.available()==0);
Serial1.read();  //ignore
}
}
}

void setHeater()
{
switch(timeZone)
{
case peak:
{
if(geyserTempMVx>=hiTemp && geyserStateSP==1)
{
geyserStateMV = 0;
digitalWrite(geyser, LOW);
}
else if(geyserTempMVx<=lowTemp && geyserStateSP==1)
{
geyserStateMV = 1;
digitalWrite(geyser, HIGH);
}
}
break;

case norm:
{
if(geyserTempMVx>=maxTemp && geyserStateSP==1)
{
geyserStateMV = 0;
digitalWrite(geyser, LOW);
}
else if(geyserTempMVx<=lowTemp && geyserStateSP==1)
```

```
{
geyserStateMV = 1;
digitalWrite(geyser, HIGH);
}
}
break;

case preheat:
{
if(geyserTempMVx>=maxTemp && geyserStateSP==1)
{
geyserStateMV = 0;
digitalWrite(geyser, LOW);
}
else if(geyserTempMVx<maxTemp && geyserStateSP==1)
{
geyserStateMV = 1;
digitalWrite(geyser, HIGH);
}
}
break;

default:
{
//turn off geyser, something is wrong.
geyserStateMV = 0;
digitalWrite(geyser, LOW);
}
}

Serial.print("Geyser: ");
Serial.println(geyserStateMV);
}

void setTime()
{
Serial.print("Time zone: "); //print time as decimal
if(currentTime>=17 && currentTime<=19)  //17h00-19h00
{
timeZone = peak;
Serial.println("17h00-19h00"); //print time as decimal
}
else if(currentTime>=6 && currentTime<=9)  //06h00-09h00
{
timeZone = peak;
Serial.println("06h00-09h00"); //print time as decimal
}
else  //19h00-17h00
{
timeZone = norm;
Serial.println("19h00-17h00"); //print time as decimal

if(currentTime==5 || currentTime==10 ||
currentTime==16 || currentTime==20)  //06h00-09h00
{
timeZone = preheat;
Serial.println("preheat"); //print time as decimal
}
}
}

void getTemp()
{
//LM35 is ~10.0 mV/°C so take the mV reading from AI (1023 * 4.88 =~ 5000 mV) and divide by 10
geyserTempMVx = round((analogRead(lm35x)*4.8828125)/10);  //read LM35 voltage and convert to celcius
Serial.print("geyserTempMVx: "); //print
Serial.println(geyserTempMVx);

//LM35 is ~10.0 mV/°C so take the mV reading from AI (1023 * 4.88 =~ 5000 mV) and divide by 10
geyserTempMVy = round((analogRead(lm35y)*4.8828125)/10);  //read LM35 voltage and convert to celcius
```

```
Serial.print("geyserTempMVy: "); //print
Serial.println(geyserTempMVy);

//LM35 is ~10.0 mV/°C so take the mV reading from AI (1023 * 4.88 =~ 5000 mV) and divide by 10
geyserTempMVz = round((analogRead(lm35z)*4.8828125)/10);  //read LM35 voltage and convert to celcius
Serial.print("geyserTempMVz: "); //print
Serial.println(geyserTempMVz);
}

void setValve()
{
if(valveStateSP)
{
valveStateMV=valveStateSP;  //valve is set
digitalWrite(valveO, HIGH);
}
else
{
valveStateMV=valveStateSP;  //valve is set
digitalWrite(valveO, LOW);
}

Serial.print("Valve: "); //print time as decimal
Serial.println(valveStateMV);
```

Appendix C: Code relating to current for all appliances

Appendix D: Developed Load profile no geyser – Baseline

Winter	Peak	Standard	Off-peak									
Time	Marcus	Fridge	Lights	Space Heating	Kettle	Stove	TV	DVD	Cellphone	Radio	Total	Total Avg
00:00	0.18	0.14	0	0	0	0	0	0	0	0.008	0.15	0.0875
00:15	0.18	0.01	0	0	0	0	0	0	0	0.008	0.02	0.0875
00:30	0.18	0.01	0	0	0	0	0	0	0	0.008	0.02	0.0875
00:45	0.18	0.14	0	0	0	0	0	0	0	0.008	0.15	0.0875
01:00	0.17	0.01	0	0	0	0	0	0	0	0.008	0.02	0.055
01:15	0.17	0.01	0	0	0	0	0	0	0	0.008	0.02	0.055
01:30	0.17	0.14	0	0	0	0	0	0	0	0.008	0.15	0.055
01:45	0.17	0.01	0	0	0	0	0	0	0	0.008	0.02	0.055
02:00	0.17	0.01	0	0	0	0	0	0	0	0.008	0.02	0.055
02:15	0.17	0.14	0	0	0	0	0	0	0	0.008	0.15	0.055
02:30	0.17	0.01	0	0	0	0	0	0	0	0.008	0.02	0.055
02:45	0.17	0.01	0	0	0	0	0	0	0	0.008	0.02	0.055
03:00	0.175	0.14	0	0	0	0	0	0	0	0.008	0.15	0.0875
03:15	0.175	0.01	0	0	0	0	0	0	0	0.008	0.02	0.0875
03:30	0.175	0.01	0	0	0	0	0	0	0	0.008	0.02	0.0875
03:45	0.175	0.14	0	0	0	0	0	0	0	0.008	0.15	0.0875
04:00	0.22	0.01	0	0	0	0	0	0	0	0.008	0.02	0.055
04:15	0.22	0.01	0	0	0	0	0	0	0	0.008	0.02	0.055
04:30	0.22	0.14	0	0	0	0	0	0	0	0.008	0.15	0.055
04:45	0.22	0.01	0	0	0	0	0	0	0	0.008	0.02	0.055
05:00	0.33	0.01	0.055	0.75	0	0	0	0	0.018	0.023	0.86	0.893
05:15	0.33	0.14	0.055	0.75	0	0	0	0	0.018	0.023	0.99	0.893
05:30	0.33	0.01	0.055	0.75	0	0	0	0	0.018	0.023	0.86	0.893
05:45	0.33	0.01	0.055	0.75	0	0	0	0	0.018	0.023	0.86	0.893
06:00	0.405	0.14	0.055	0.75	0	2	0	0	0	0.023	2.97	2.9075
06:15	0.405	0.01	0.055	0.75	2	0	0	0	0	0.023	2.84	2.9075
06:30	0.405	0.01	0.055	0.75	2	0	0	0	0	0.023	2.84	2.9075
06:45	0.405	0.14	0.055	0.75	2	0	0	0	0	0.023	2.97	2.9075
07:00	0.33	0.01	0	0	0	0	0	0	0	0.008	0.02	0.055
07:15	0.33	0.01	0	0	0	0	0	0	0	0.008	0.02	0.055
07:30	0.33	0.14	0	0	0	0	0	0	0	0.008	0.15	0.055
07:45	0.33	0.01	0	0	0	0	0	0	0	0.008	0.02	0.055
08:00	0.3	0.01	0	0	0	0	0	0	0	0.008	0.02	0.055
08:15	0.3	0.14	0	0	0	0	0	0	0	0.008	0.15	0.055
08:30	0.3	0.01	0	0	0	0	0	0	0	0.008	0.02	0.055

Time	Marcus	Fridge	Lights	Space Heating	Kettle	Stove	TV	DVD	Cellphone	Radio	Total	Total Avg
08:45	0.3	0.01	0	0	0	0	0	0	0	0.008	0.02	0.055
09:00	0.29	0.14	0	0	0	0	0	0	0	0.008	0.15	0.0875
09:15	0.29	0.01	0	0	0	0	0	0	0	0.008	0.02	0.0875
09:30	0.29	0.01	0	0	0	0	0	0	0	0.008	0.02	0.0875
09:45	0.29	0.14	0	0	0	0	0	0	0	0.008	0.15	0.0875
10:00	0.285	0.01	0	0	0	0	0	0	0	0.008	0.02	0.055
10:15	0.285	0.01	0	0	0	0	0	0	0	0.008	0.02	0.055
10:30	0.285	0.14	0	0	0	0	0	0	0	0.008	0.15	0.055
10:45	0.285	0.01	0	0	0	0	0	0	0	0.008	0.02	0.055
11:00	0.285	0.01	0	0	0	0	0	0	0	0.008	0.02	0.055
11:15	0.285	0.14	0	0	0	0	0	0	0	0.008	0.15	0.055
11:30	0.285	0.01	0	0	0	0	0	0	0	0.008	0.02	0.055
11:45	0.285	0.01	0	0	0	0	0	0	0	0.008	0.02	0.055
12:00	0.285	0.14	0	0	0	0	0	0	0	0.008	0.15	0.0875
12:15	0.285	0.01	0	0	0	0	0	0	0	0.008	0.02	0.0875
12:30	0.285	0.01	0	0	0	0	0	0	0	0.008	0.02	0.0875
12:45	0.285	0.14	0	0	0	0	0	0	0	0.008	0.15	0.0875
13:00	0.29	0.01	0	0	0	0	0	0	0	0.008	0.02	0.055
13:15	0.29	0.01	0	0	0	0	0	0	0	0.008	0.02	0.055
13:30	0.29	0.14	0	0	0	0	0	0	0	0.008	0.15	0.055
13:45	0.29	0.01	0	0	0	0	0	0	0	0.008	0.02	0.055
14:00	0.3	0.01	0	0	0	0	0	0	0	0.008	0.02	0.055
14:15	0.3	0.14	0	0	0	0	0	0	0	0.008	0.15	0.055
14:30	0.3	0.01	0	0	0	0	0	0	0	0.008	0.02	0.055
14:45	0.3	0.01	0	0	0	0	0	0	0	0.008	0.02	0.055
15:00	0.33	0.14	0	0	0	0	0	0	0	0.008	0.15	0.0875
15:15	0.33	0.01	0	0	0	0	0	0	0	0.008	0.02	0.0875
15:30	0.33	0.01	0	0	0	0	0	0	0	0.008	0.02	0.0875
15:45	0.33	0.14	0	0	0	0	0	0	0	0.008	0.15	0.0875
16:00	0.38	0.01	0	0	0	0	0	0	0	0.008	0.14	0.16801
16:15	0.38	0.01	0	0	0	0	0	0	0	0.008	0.14	0.16801
16:30	0.38	0.14	0	0	0	0	0	0	0	0.008	0.27	0.16801
16:45	0.38	0.01	0	0	0	0	0	0	0	0.008	0.14	0.16801
17:00	0.52	0.01	0.055	0	0	0	0	0	0	0.008	0.19	0.22301
17:15	0.52	0.14	0.055	0	0	0	0	0	0	0.008	0.32	0.22301
17:30	0.52	0.01	0.055	0	0	0	0	0	0	0.008	0.19	0.22301
17:45	0.52	0.01	0.055	0	0	0	0	0	0	0.008	0.19	0.22301
18:00	0.64	0.14	0.055	0	0	2	0	0	0	0.008	2.32	2.25551
18:15	0.64	0.01	0.055	0	0	2	0	0	0	0.008	2.19	2.25551
18:30	0.64	0.01	0.055	0	0	2	0	0	0	0.008	2.19	2.25551
18:45	0.64	0.14	0.055	0	2	0	0	0	0	0.008	2.32	2.25551

Time	Marcus	Fridge	Lights	Space Heating	Kettle	Stove	TV	DVD	Cellphone	Radio	Total	Total Avg
19:00	0.62	0.01	0.055	0.75	2	0	0	0	0	0.008	2.94	1.97301
19:15	0.62	0.01	0.055	0.75	2	0	0	0	0	0.008	2.94	1.97301
19:30	0.62	0.14	0.055	0.75	0	0	0	0	0	0.008	1.07	1.97301
19:45	0.62	0.01	0.055	0.75	0	0	0	0	0	0.008	0.94	1.97301
20:00	0.515	0.01	0.055	0.75	0	0	0	0.01	0	0.008	0.95	0.97975
20:15	0.515	0.14	0.055	0.75	0	0	0	0.01	0	0.008	1.08	0.97975
20:30	0.515	0.01	0.055	0.75	0	0	0	0.01	0	0.008	0.95	0.97975
20:45	0.515	0.01	0.055	0.75	0	0	0	0.01	0	0.008	0.95	0.97975
21:00	0.39	0.14	0.055	0.75	0	0	0	0.01	0	0.008	1.08	1.01225
21:15	0.39	0.01	0.055	0.75	0	0	0	0.01	0	0.008	0.95	1.01225
21:30	0.39	0.01	0.055	0.75	0	0	0	0.01	0	0.008	0.95	1.01225
21:45	0.39	0.14	0.055	0.75	0	0	0	0.01	0	0.008	1.08	1.01225
22:00	0.27	0.01	0.055	0	0	0	0	0	0.018	0.023	0.11	0.143
22:15	0.27	0.01	0.055	0	0	0	0	0	0.018	0.023	0.11	0.143
22:30	0.27	0.14	0.055	0	0	0	0	0	0.018	0.023	0.24	0.143
22:45	0.27	0.01	0.055	0	0	0	0	0	0.018	0.023	0.11	0.143
23:00	0.21	0.01	0	0	0	0	0	0	0	0.008	0.02	0.055
23:15	0.21	0.14	0	0	0	0	0	0	0	0.008	0.15	0.055
23:30	0.21	0.01	0	0	0	0	0	0	0	0.008	0.02	0.055
23:45	0.21	0.01	0	0	0	0	0	0	0	0.008	0.02	0.055
	7.89	5.12	1.76	15	12	8	3	0.17	0.144	0.9	11.5	SUM

Appendix E: Developed Load profile with geyser

Winter	Peak	Standard	Off-peak									
Time	**Marcus**	**Fridge**	**Lights**	**Space Heating**	**Geyser**	**Stove**	**TV**	**DVD**	**Cell phone**	**Radio**	**Total**	**Total Avg**
00:00	0.18	0.14	0	0	0	0	0.0037	0.0013	0	0.0075	0.1525	0.0875
00:15	0.18	0.01	0	0	0	0	0.0037	0.0013	0	0.0075	0.0225	0.0875
00:30	0.18	0.01	0	0	0	0	0.0037	0.0013	0	0.0075	0.0225	0.0875
00:45	0.18	0.14	0	0	0	0	0.0037	0.0013	0	0.0075	0.1525	0.0875
01:00	0.17	0.01	0	0	0	0	0.0037	0.0013	0	0.0075	0.0225	0.055
01:15	0.17	0.01	0	0	0	0	0.0037	0.0013	0	0.0075	0.0225	0.055
01:30	0.17	0.14	0	0	0	0	0.0037	0.0013	0	0.0075	0.1525	0.055
01:45	0.17	0.01	0	0	0	0	0.0037	0.0013	0	0.0075	0.0225	0.055
02:00	0.17	0.01	0	0	0	0	0.0037	0.0013	0	0.0075	0.0225	0.055
02:15	0.17	0.14	0	0	0	0	0.0037	0.0013	0	0.0075	0.1525	0.055
02:30	0.17	0.01	0	0	0	0	0.0037	0.0013	0	0.0075	0.0225	0.055
02:45	0.17	0.01	0	0	0	0	0.0037	0.0013	0	0.0075	0.0225	0.055
03:00	0.175	0.14	0	0	0	0	0.0037	0.0013	0	0.0075	0.1525	0.0875
03:15	0.175	0.01	0	0	0	0	0.0037	0.0013	0	0.0075	0.0225	0.0875
03:30	0.175	0.01	0	0	0	0	0.0037	0.0013	0	0.0075	0.0225	0.0875
03:45	0.175	0.14	0	0	0	0	0.0037	0.0013	0	0.0075	0.1525	0.0875
04:00	0.22	0.01	0	0	0	0	0.0037	0.0013	0	0.0075	0.0225	0.055
04:15	0.22	0.01	0	0	0	0	0.0037	0.0013	0	0.0075	0.0225	0.055
04:30	0.22	0.14	0	0	0	0	0.0037	0.0013	0	0.0075	0.1525	0.055
04:45	0.22	0.01	0	0	0	0	0.0037	0.0013	0	0.0075	0.0225	0.055
05:00	0.33	0.01	0.055	0.75	0	0	0.0037	0.0013	0.02	0.0225	0.8605	0.893
05:15	0.33	0.14	0.055	0.75	0	0	0.0037	0.0013	0.02	0.0225	0.9905	0.893
05:30	0.33	0.01	0.055	0.75	0	0	0.0037	0.0013	0.02	0.0225	0.8605	0.893
05:45	0.33	0.01	0.055	0.75	0	0	0.0037	0.0013	0.02	0.0225	0.8605	0.893
06:00	0.405	0.14	0.055	0.75	0	2	0.0037	0.0013	0	0.0225	2.9725	1.7825
06:15	0.405	0.01	0.055	0.75	0	0	0.0037	0.0013	0	0.0225	0.8425	1.7825
06:30	0.405	0.01	0.055	0.75	0	0	0.0037	0.0013	0	0.0225	0.8425	1.7825
06:45	0.405	0.14	0.055	0.75	1.5	0	0.0037	0.0013	0	0.0225	2.4725	1.7825
07:00	0.33	0.01	0.055	0	1.5	0	0.0037	0.0013	0	0.0075	1.5775	1.235
07:15	0.33	0.01	0.055	0	1.5	0	0.0037	0.0013	0	0.0075	1.5775	1.235
07:30	0.33	0.14	0.055	0	1.5	0	0.0037	0.0013	0	0.0075	1.7075	1.235
07:45	0.33	0.01	0.055	0	0	0	0.0037	0.0013	0	0.0075	0.0775	1.235
08:00	0.3	0.01	0	0	0	0	0.0037	0.0013	0	0.0075	0.0225	0.055
08:15	0.3	0.14	0	0	0	0	0.0037	0.0013	0	0.0075	0.1525	0.055

Time	Marcus	Fridge	Lights	Space Heating	Geyser	Stove	TV	DVD	Cell phone	Radio	Total	Total Avg
08:30	0.3	0.01	0	0	0	0	0.0037	0.0013	0	0.0075	0.0225	0.055
08:45	0.3	0.01	0	0	0	0	0.0037	0.0013	0	0.0075	0.0225	0.055
09:00	0.29	0.14	0	0	0	0	0.0037	0.0013	0	0.0075	0.1525	0.0875
09:15	0.29	0.01	0	0	0	0	0.0037	0.0013	0	0.0075	0.0225	0.0875
09:30	0.29	0.01	0	0	0	0	0.0037	0.0013	0	0.0075	0.0225	0.0875
09:45	0.29	0.14	0	0	0	0	0.0037	0.0013	0	0.0075	0.1525	0.0875
10:00	0.285	0.01	0	0	0	0	0.0037	0.0013	0	0.0075	0.0225	0.055
10:15	0.285	0.01	0	0	0	0	0.0037	0.0013	0	0.0075	0.0225	0.055
10:30	0.285	0.14	0	0	0	0	0.0037	0.0013	0	0.0075	0.1525	0.055
10:45	0.285	0.01	0	0	0	0	0.0037	0.0013	0	0.0075	0.0225	0.055
11:00	0.285	0.01	0	0	0	0	0.0037	0.0013	0	0.0075	0.0225	0.055
11:15	0.285	0.14	0	0	0	0	0.0037	0.0013	0	0.0075	0.1525	0.055
11:30	0.285	0.01	0	0	0	0	0.0037	0.0013	0	0.0075	0.0225	0.055
11:45	0.285	0.01	0	0	0	0	0.0037	0.0013	0	0.0075	0.0225	0.055
12:00	0.285	0.14	0	0	0	0	0.0037	0.0013	0	0.0075	0.1525	0.0875
12:15	0.285	0.01	0	0	0	0	0.0037	0.0013	0	0.0075	0.0225	0.0875
12:30	0.285	0.01	0	0	0	0	0.0037	0.0013	0	0.0075	0.0225	0.0875
12:45	0.285	0.14	0	0	0	0	0.0037	0.0013	0	0.0075	0.1525	0.0875
13:00	0.29	0.01	0	0	0	0	0.0037	0.0013	0	0.0075	0.0225	0.055
13:15	0.29	0.01	0	0	0	0	0.0037	0.0013	0	0.0075	0.0225	0.055
13:30	0.29	0.14	0	0	0	0	0.0037	0.0013	0	0.0075	0.1525	0.055
13:45	0.29	0.01	0	0	0	0	0.0037	0.0013	0	0.0075	0.0225	0.055
14:00	0.3	0.01	0	0	0	0	0.0037	0.0013	0	0.0075	0.0225	0.055
14:15	0.3	0.14	0	0	0	0	0.0037	0.0013	0	0.0075	0.1525	0.055
14:30	0.3	0.01	0	0	0	0	0.0037	0.0013	0	0.0075	0.0225	0.055
14:45	0.3	0.01	0	0	0	0	0.0037	0.0013	0	0.0075	0.0225	0.055
15:00	0.33	0.14	0	0	0	0	0.0037	0.0013	0	0.0075	0.1525	0.0875
15:15	0.33	0.01	0	0	0	0	0.0037	0.0013	0	0.0075	0.0225	0.0875
15:30	0.33	0.01	0	0	0	0	0.0037	0.0013	0	0.0075	0.0225	0.0875
15:45	0.33	0.14	0	0	0	0	0.0037	0.0013	0	0.0075	0.1525	0.0875
16:00	0.38	0.01	0	0	0	0	0.1168	0.0013	0	0.0075	0.1355	0.168
16:15	0.38	0.01	0	0	0	0	0.1168	0.0013	0	0.0075	0.1355	0.168
16:30	0.38	0.14	0	0	0	0	0.1168	0.0013	0	0.0075	0.2655	0.168
16:45	0.38	0.01	0	0	0	0	0.1168	0.0013	0	0.0075	0.1355	0.168
17:00	0.52	0.01	0.055	0	0	0	0.1168	0.0013	0	0.0075	0.1905	0.223
17:15	0.52	0.14	0.055	0	0	0	0.1168	0.0013	0	0.0075	0.3205	0.223
17:30	0.52	0.01	0.055	0	0	0	0.1168	0.0013	0	0.0075	0.1905	0.223
17:45	0.52	0.01	0.055	0	0	0	0.1168	0.0013	0	0.0075	0.1905	0.223
18:00	0.64	0.14	0.055	0	0	2	0.1168	0.0013	0	0.0075	2.3205	1.7555
18:15	0.64	0.01	0.055	0	0	2	0.1168	0.0013	0	0.0075	2.1905	1.7555
18:30	0.64	0.01	0.055	0	0	2	0.1168	0.0013	0	0.0075	2.1905	1.7555

Time	Marcus	Fridge	Lights	Space Heating	Geyser	Stove	TV	DVD	Cell phone	Radio	Total	Total Avg
18:45	0.64	0.14	0.055	0	0	0	0.1168	0.0013	0	0.0075	0.3205	1.7555
19:00	0.62	0.01	0.055	0.75	0	0	0.1168	0.0013	0	0.0075	0.9405	1.723
19:15	0.62	0.01	0.055	0.75	0	0	0.1168	0.0013	0	0.0075	0.9405	1.723
19:30	0.62	0.14	0.055	0.75	1.5	0	0.1168	0.0013	0	0.0075	2.5705	1.723
19:45	0.62	0.01	0.055	0.75	1.5	0	0.1168	0.0013	0	0.0075	2.4405	1.723
20:00	0.515	0.01	0.055	0.75	1.5	0	0.1168	0.008	0	0.0075	2.4473	1.7298
20:15	0.515	0.14	0.055	0.75	1.5	0	0.1168	0.008	0	0.0075	2.5773	1.7298
20:30	0.515	0.01	0.055	0.75	0	0	0.1168	0.008	0	0.0075	0.9473	1.7298
20:45	0.515	0.01	0.055	0.75	0	0	0.1168	0.008	0	0.0075	0.9473	1.7298
21:00	0.39	0.14	0.055	0.75	0	0	0.1168	0.008	0	0.0075	1.0773	1.0123
21:15	0.39	0.01	0.055	0.75	0	0	0.1168	0.008	0	0.0075	0.9473	1.0123
21:30	0.39	0.01	0.055	0.75	0	0	0.1168	0.008	0	0.0075	0.9473	1.0123
21:45	0.39	0.14	0.055	0.75	0	0	0.1168	0.008	0	0.0075	1.0773	1.0123
22:00	0.27	0.01	0	0	0	0	0.0037	0.0013	0.02	0.0225	0.0555	0.088
22:15	0.27	0.01	0	0	0	0	0.0037	0.0013	0.02	0.0225	0.0555	0.088
22:30	0.27	0.14	0	0	0	0	0.0037	0.0013	0.02	0.0225	0.1855	0.088
22:45	0.27	0.01	0	0	0	0	0.0037	0.0013	0.02	0.0225	0.0555	0.088
23:00	0.21	0.01	0	0	0	0	0.0037	0.0013	0	0.0075	0.0225	0.055
23:15	0.21	0.14	0	0	0	0	0.0037	0.0013	0	0.0075	0.1525	0.055
23:30	0.21	0.01	0	0	0	0	0.0037	0.0013	0	0.0075	0.0225	0.055
23:45	0.21	0.01	0	0	0	0	0.0037	0.0013	0	0.0075	0.0225	0.055
	7.89	5.12	1.76	15	12	8	3.0713	0.1749	0.14	0.9	11.543	SUM

Appendix F: Evening peak results with fixed withdrawals

Time	Emulated Power (W)	System Power (W)	Non Averaged Baseline	Averaged Baseline	Averaged System Power
08:29:23 AM.3883 2017/01/16	135	1293.59	135.51	168.01	1287.416235
08:30:23 AM.3906 2017/01/16	135	1293.48	135.51	168.01	1287.416235
08:31:23 AM.3988 2017/01/16	135	1293.65	135.51	168.01	1287.416235
08:32:23 AM.3953 2017/01/16	135	1293.43	135.51	168.01	1287.416235
08:33:23 AM.4190 2017/01/16	135	1293.02	135.51	168.01	1287.416235
08:34:23 AM.4018 2017/01/16	135	1292.32	135.51	168.01	1287.416235
08:35:23 AM.4041 2017/01/16	135	1292.95	135.51	168.01	1287.416235
08:36:23 AM.4211 2017/01/16	135	1293.04	135.51	168.01	1287.416235
08:37:23 AM.4449 2017/01/16	135	1292.97	135.51	168.01	1287.416235
08:38:23 AM.4120 2017/01/16	135	1293.46	135.51	168.01	1287.416235
08:39:23 AM.4133 2017/01/16	135	1293.16	135.51	168.01	1287.416235
08:40:23 AM.4293 2017/01/16	135	1293.08	135.51	168.01	1287.416235
08:41:23 AM.4209 2017/01/16	135	1293.51	135.51	168.01	1287.416235
08:42:23 AM.4222 2017/01/16	135	1293.4	135.51	168.01	1287.416235
08:43:23 AM.4235 2017/01/16	135	1293.25	135.51	168.01	1287.416235
08:44:23 AM.4258 2017/01/16	135	1293.32	135.51	168.01	1287.416235
08:45:23 AM.4301 2017/01/16	135	1293.39	135.51	168.01	1287.416235
08:46:23 AM.4314 2017/01/16	135	1292.57	135.51	168.01	1287.416235
08:47:23 AM.4337 2017/01/16	135	1293.03	135.51	168.01	1287.416235
08:48:23 AM.4370 2017/01/16	135	1292.98	135.51	168.01	1287.416235
08:49:23 AM.4383 2017/01/16	135	1292.62	135.51	168.01	1287.416235
08:50:23 AM.4524 2017/01/16	267	1429.2	265.51	168.01	1287.416235
08:51:23 AM.4429 2017/01/16	267	1429.08	265.51	168.01	1287.416235
08:52:23 AM.4667 2017/01/16	267	1429.14	265.51	168.01	1287.416235
08:53:23 AM.4485 2017/01/16	267	1429.78	265.51	168.01	1287.416235
08:54:23 AM.4684 2017/01/16	267	1428.74	265.51	168.01	1287.416235
08:55:23 AM.4512 2017/01/16	267	1428.84	265.51	168.01	1287.416235
08:56:23 AM.4554 2017/01/16	267	1428.3	265.51	168.01	1287.416235
08:57:23 AM.4734 2017/01/16	267	1428.53	265.51	168.01	1287.416235
08:58:23 AM.4600 2017/01/16	267	1428.52	265.51	168.01	1287.416235
08:59:23 AM.4623 2017/01/16	267	1428.79	265.51	168.01	1287.416235
09:00:23 AM.4656 2017/01/16	267	1429.12	265.51	168.01	1287.416235
09:01:23 AM.4670 2017/01/16	267	1428.9	265.51	168.01	1287.416235
09:02:23 AM.4702 2017/01/16	267	1428.69	265.51	168.01	1287.416235
09:03:23 AM.4716 2017/01/16	267	1428.75	265.51	168.01	1287.416235
09:04:23 AM.4758 2017/01/16	267	1428.71	265.51	168.01	1287.416235
09:05:23 AM.4771 2017/01/16	135	1292.05	135.51	168.01	1287.416235

Time	Emulated Power (W)	System Power (W)	Non Averaged Baseline	Averaged Baseline	Averaged System Power
09:06:23 AM.4794 2017/01/16	135	1292.48	135.51	168.01	1287.416235
09:07:23 AM.4818 2017/01/16	135	1292.04	135.51	168.01	1287.416235
09:08:23 AM.4841 2017/01/16	135	1292.41	135.51	168.01	1287.416235
09:09:23 AM.4873 2017/01/16	135	1292.66	135.51	168.01	1287.416235
09:10:23 AM.4906 2017/01/16	135	1292.15	135.51	168.01	1287.416235
09:11:23 AM.4919 2017/01/16	135	1292.06	135.51	168.01	1287.416235
09:12:23 AM.4942 2017/01/16	135	1292.19	135.51	168.01	1287.416235
09:13:23 AM.4985 2017/01/16	135	1292.56	135.51	168.01	1287.416235
09:14:23 AM.4998 2017/01/16	135	1292.38	135.51	168.01	1287.416235
09:15:23 AM.5012 2017/01/16	135	1292.09	135.51	168.01	1287.416235
09:16:23 AM.5044 2017/01/16	135	1292.2	135.51	168.01	1287.416235
09:17:23 AM.5067 2017/01/16	135	1291.68	135.51	168.01	1287.416235
09:18:23 AM.5091 2017/01/16	135	134.765	135.51	168.01	1287.416235
09:19:23 AM.5123 2017/01/16	135	135.203	135.51	168.01	1287.416235
09:20:23 AM.5146 2017/01/16	192	192.785	190.51	223.01	224.5019333
09:21:23 AM.5257 2017/01/16	192	192.618	190.51	223.01	224.5019333
09:22:23 AM.5192 2017/01/16	192	192.993	190.51	223.01	224.5019333
09:23:23 AM.5215 2017/01/16	192	192.554	190.51	223.01	224.5019333
09:24:23 AM.5239 2017/01/16	192	191.825	190.51	223.01	224.5019333
09:25:23 AM.5262 2017/01/16	192	192.239	190.51	223.01	224.5019333
09:26:23 AM.5285 2017/01/16	192	193.472	190.51	223.01	224.5019333
09:27:23 AM.5317 2017/01/16	192	191.64	190.51	223.01	224.5019333
09:28:23 AM.5340 2017/01/16	192	192.785	190.51	223.01	224.5019333
09:29:23 AM.5451 2017/01/16	192	191.979	190.51	223.01	224.5019333
09:30:23 AM.5387 2017/01/16	192	191.483	190.51	223.01	224.5019333
09:31:23 AM.5400 2017/01/16	192	191.557	190.51	223.01	224.5019333
09:32:23 AM.5433 2017/01/16	192	192.32	190.51	223.01	224.5019333
09:33:23 AM.5456 2017/01/16	192	191.997	190.51	223.01	224.5019333
09:34:23 AM.5518 2017/01/16	192	191.686	190.51	223.01	224.5019333
09:35:23 AM.5492 2017/01/16	321	325.023	320.51	223.01	224.5019333
09:36:23 AM.5632 2017/01/16	321	324.886	320.51	223.01	224.5019333
09:37:23 AM.5665 2017/01/16	321	324.447	320.51	223.01	224.5019333
09:38:23 AM.5561 2017/01/16	321	325.457	320.51	223.01	224.5019333
09:39:23 AM.5594 2017/01/16	321	325.183	320.51	223.01	224.5019333
09:40:23 AM.5607 2017/01/16	321	325.364	320.51	223.01	224.5019333
09:41:23 AM.5640 2017/01/16	321	325.1	320.51	223.01	224.5019333
09:42:23 AM.5849 2017/01/16	321	324.066	320.51	223.01	224.5019333
09:43:23 AM.5676 2017/01/16	321	323.768	320.51	223.01	224.5019333
09:44:23 AM.5699 2017/01/16	321	324.303	320.51	223.01	224.5019333
09:45:23 AM.5732 2017/01/16	321	323.678	320.51	223.01	224.5019333

Time	Emulated Power (W)	System Power (W)	Non Averaged Baseline	Averaged Baseline	Averaged System Power
09:46:23 AM.5736 2017/01/16	321	323.945	320.51	223.01	224.5019333
09:47:23 AM.5768 2017/01/16	321	323.814	320.51	223.01	224.5019333
09:48:23 AM.5801 2017/01/16	321	323.795	320.51	223.01	224.5019333
09:49:23 AM.5815 2017/01/16	321	324.208	320.51	223.01	224.5019333
09:50:23 AM.6131 2017/01/16	192	190.871	190.51	223.01	224.5019333
09:51:23 AM.5870 2017/01/16	192	190.694	190.51	223.01	224.5019333
09:52:23 AM.5884 2017/01/16	192	190.605	190.51	223.01	224.5019333
09:53:23 AM.5897 2017/01/16	192	191.17	190.51	223.01	224.5019333
09:54:23 AM.5920 2017/01/16	192	190.471	190.51	223.01	224.5019333
09:55:23 AM.5963 2017/01/16	192	190.727	190.51	223.01	224.5019333
09:56:23 AM.5986 2017/01/16	192	190.996	190.51	223.01	224.5019333
09:57:23 AM.6009 2017/01/16	192	190.686	190.51	223.01	224.5019333
09:58:23 AM.6266 2017/01/16	192	191.504	190.51	223.01	224.5019333
09:59:23 AM.6045 2017/01/16	192	191.116	190.51	223.01	224.5019333
10:00:23 AM.6068 2017/01/16	192	190.821	190.51	223.01	224.5019333
10:01:23 AM.6101 2017/01/16	192	190.595	190.51	223.01	224.5019333
10:02:23 AM.6114 2017/01/16	192	190.709	190.51	223.01	224.5019333
10:03:23 AM.6147 2017/01/16	192	190.813	190.51	223.01	224.5019333
10:04:23 AM.6160 2017/01/16	192	190.657	190.51	223.01	224.5019333
10:05:23 AM.6183 2017/01/16	192	190.515	190.51	223.01	224.5019333
10:06:23 AM.6450 2017/01/16	192	190.549	190.51	223.01	224.5019333
10:07:23 AM.6229 2017/01/16	192	189.708	190.51	223.01	224.5019333
10:08:23 AM.6252 2017/01/16	192	191.147	190.51	223.01	224.5019333
10:09:23 AM.6275 2017/01/16	192	190.211	190.51	223.01	224.5019333
10:10:23 AM.6298 2017/01/16	192	190.029	190.51	223.01	224.5019333
10:11:23 AM.6331 2017/01/16	192	190.9	190.51	223.01	224.5019333
10:12:23 AM.6335 2017/01/16	192	190.672	190.51	223.01	224.5019333
10:13:23 AM.6367 2017/01/16	192	190.575	190.51	223.01	224.5019333
10:14:23 AM.6391 2017/01/16	192	189.85	190.51	223.01	224.5019333
10:15:23 AM.6414 2017/01/16	192	189.988	190.51	223.01	224.5019333
10:16:23 AM.6437 2017/01/16	192	190.54	190.51	223.01	224.5019333
10:17:23 AM.6469 2017/01/16	192	190.514	190.51	223.01	224.5019333
10:18:23 AM.6473 2017/01/16	192	190.907	190.51	223.01	224.5019333
10:19:23 AM.6594 2017/01/16	192	190.606	190.51	223.01	224.5019333
10:20:23 AM.6519 2017/01/16	2322	2323.71	2320.51	2255.51	2026.321933
10:21:23 AM.6552 2017/01/16	2322	2323.24	2320.51	2255.51	2026.321933
10:22:23 AM.6575 2017/01/16	2322	2322.82	2320.51	2255.51	2026.321933
10:23:23 AM.6598 2017/01/16	2322	2322.09	2320.51	2255.51	2026.321933
10:24:23 AM.6631 2017/01/16	2322	2323.03	2320.51	2255.51	2026.321933
10:25:23 AM.6849 2017/01/16	2322	2322	2320.51	2255.51	2026.321933

Time	Emulated Power (W)	System Power (W)	Non Averaged Baseline	Averaged Baseline	Averaged System Power
10:26:23 AM.6667 2017/01/16	**2322**	**2322.36**	**2320.51**	**2255.51**	**2026.321933**
10:27:23 AM.6690 2017/01/16	**2322**	**2322.38**	**2320.51**	**2255.51**	**2026.321933**
10:28:23 AM.6713 2017/01/16	**2322**	**2321.7**	**2320.51**	**2255.51**	**2026.321933**
10:29:23 AM.6736 2017/01/16	**2322**	**2321.37**	**2320.51**	**2255.51**	**2026.321933**
10:30:23 AM.6769 2017/01/16	**2322**	**2322.01**	**2320.51**	**2255.51**	**2026.321933**
10:31:23 AM.6782 2017/01/16	**2322**	**2323.03**	**2320.51**	**2255.51**	**2026.321933**
10:32:23 AM.6815 2017/01/16	**2322**	**2321.34**	**2320.51**	**2255.51**	**2026.321933**
10:33:23 AM.6828 2017/01/16	**2322**	**2321.59**	**2320.51**	**2255.51**	**2026.321933**
10:34:23 AM.6851 2017/01/16	**2322**	**2320.35**	**2320.51**	**2255.51**	**2026.321933**
10:35:23 AM.6874 2017/01/16	**2190**	**2191.13**	**2190.51**	**2255.51**	**2026.321933**
10:36:23 AM.6897 2017/01/16	**2190**	**2190.05**	**2190.51**	**2255.51**	**2026.321933**
10:37:23 AM.6930 2017/01/16	**2190**	**2191.04**	**2190.51**	**2255.51**	**2026.321933**
10:38:23 AM.6943 2017/01/16	**2190**	**2190.97**	**2190.51**	**2255.51**	**2026.321933**
10:39:23 AM.6967 2017/01/16	**2190**	**2190.18**	**2190.51**	**2255.51**	**2026.321933**
10:40:23 AM.6990 2017/01/16	**2190**	**2190.29**	**2190.51**	**2255.51**	**2026.321933**
10:41:23 AM.7013 2017/01/16	**2190**	**2190.81**	**2190.51**	**2255.51**	**2026.321933**
10:42:23 AM.7036 2017/01/16	**2190**	**2191.44**	**2190.51**	**2255.51**	**2026.321933**
10:43:23 AM.7068 2017/01/16	**2190**	**2190**	**2190.51**	**2255.51**	**2026.321933**
10:44:23 AM.7082 2017/01/16	**2190**	**2191.75**	**2190.51**	**2255.51**	**2026.321933**
10:45:23 AM.7115 2017/01/16	**2190**	**2189.91**	**2190.51**	**2255.51**	**2026.321933**
10:46:23 AM.7128 2017/01/16	**2190**	**2191.3**	**2190.51**	**2255.51**	**2026.321933**
10:47:23 AM.7151 2017/01/16	**2190**	**2190.82**	**2190.51**	**2255.51**	**2026.321933**
10:48:23 AM.7193 2017/01/16	**2190**	**2191.81**	**2190.51**	**2255.51**	**2026.321933**
10:49:23 AM.7207 2017/01/16	**2190**	**2190.55**	**2190.51**	**2255.51**	**2026.321933**
10:50:23 AM.7230 2017/01/16	**2190**	**2191.17**	**2190.51**	**2255.51**	**2026.321933**
10:51:23 AM.7243 2017/01/16	**2190**	**2190.88**	**2190.51**	**2255.51**	**2026.321933**
10:52:23 AM.7256 2017/01/16	**2190**	**2190.2**	**2190.51**	**2255.51**	**2026.321933**
10:53:23 AM.7279 2017/01/16	**2190**	**2190.63**	**2190.51**	**2255.51**	**2026.321933**
10:54:23 AM.7322 2017/01/16	**2190**	**2190.63**	**2190.51**	**2255.51**	**2026.321933**
10:55:26 AM.6076 2017/01/16	**2190**	**2190.97**	**2190.51**	**2255.51**	**2026.321933**
10:56:23 AM.7368 2017/01/16	**2190**	**2189.69**	**2190.51**	**2255.51**	**2026.321933**
10:57:23 AM.7381 2017/01/16	**2190**	**2190.25**	**2190.51**	**2255.51**	**2026.321933**
10:58:23 AM.7404 2017/01/16	**2190**	**2190.37**	**2190.51**	**2255.51**	**2026.321933**
10:59:23 AM.7476 2017/01/16	**2190**	**2191.65**	**2190.51**	**2255.51**	**2026.321933**
11:00:24 AM.5253 2017/01/16	**2190**	**2190.55**	**2190.51**	**2255.51**	**2026.321933**
11:01:23 AM.7639 2017/01/16	**2190**	**2190.95**	**2190.51**	**2255.51**	**2026.321933**
11:02:23 AM.7496 2017/01/16	**2190**	**2190.99**	**2190.51**	**2255.51**	**2026.321933**
11:03:23 AM.7529 2017/01/16	**2190**	**2191.42**	**2190.51**	**2255.51**	**2026.321933**
11:04:23 AM.8099 2017/01/16	**2190**	**2191.86**	**2190.51**	**2255.51**	**2026.321933**
11:05:23 AM.7634 2017/01/16	**2396**	**399.1**	**2320.51**	**2255.51**	**2026.321933**

Time	Emulated Power (W)	System Power (W)	Non Averaged Baseline	Averaged Baseline	Averaged System Power
11:06:23 AM.7608 2017/01/16	2396	398.016	2320.51	2255.51	2026.321933
11:07:23 AM.7621 2017/01/16	2396	1556.79	2320.51	2255.51	2026.321933
11:08:23 AM.7723 2017/01/16	2396	1556.89	2320.51	2255.51	2026.321933
11:09:23 AM.7658 2017/01/16	2396	1556.35	2320.51	2255.51	2026.321933
11:10:23 AM.7681 2017/01/16	2396	1556.42	2320.51	2255.51	2026.321933
11:11:23 AM.7714 2017/01/16	2396	1555.89	2320.51	2255.51	2026.321933
11:12:23 AM.7854 2017/01/16	2396	1555.89	2320.51	2255.51	2026.321933
11:13:23 AM.7760 2017/01/16	2396	1556.53	2320.51	2255.51	2026.321933
11:14:23 AM.7773 2017/01/16	2396	1555.28	2320.51	2255.51	2026.321933
11:15:23 AM.7796 2017/01/16	2396	1556.46	2320.51	2255.51	2026.321933
11:16:23 AM.7819 2017/01/16	2396	1555.18	2320.51	2255.51	2026.321933
11:17:23 AM.7979 2017/01/16	2396	1554.21	2320.51	2255.51	2026.321933
11:18:23 AM.7865 2017/01/16	2396	1554.49	2320.51	2255.51	2026.321933
11:19:23 AM.7888 2017/01/16	2396	1554.54	2320.51	2255.51	2026.321933
11:20:23 AM.8067 2017/01/16	2927	2092.26	2940.51	1973.01	2308.94165
11:21:23 AM.7944 2017/01/16	2927	934.239	2940.51	1973.01	2308.94165
11:22:23 AM.7947 2017/01/16	2927	933.924	2940.51	1973.01	2308.94165
11:23:23 AM.7980 2017/01/16	2927	934.506	2940.51	1973.01	2308.94165
11:24:23 AM.8003 2017/01/16	2927	2093.9	2940.51	1973.01	2308.94165
11:25:23 AM.8036 2017/01/16	2927	2094.4	2940.51	1973.01	2308.94165
11:26:23 AM.8049 2017/01/16	2927	2093.42	2940.51	1973.01	2308.94165
11:27:23 AM.8072 2017/01/16	2927	2093.09	2940.51	1973.01	2308.94165
11:28:23 AM.8261 2017/01/16	2927	2092.39	2940.51	1973.01	2308.94165
11:29:23 AM.8128 2017/01/16	2927	2092.68	2940.51	1973.01	2308.94165
11:30:23 AM.8142 2017/01/16	2927	2092.74	2940.51	1973.01	2308.94165
11:31:23 AM.8340 2017/01/16	2927	2092.46	2940.51	1973.01	2308.94165
11:32:23 AM.8197 2017/01/16	2927	2092.37	2940.51	1973.01	2308.94165
11:33:23 AM.8211 2017/01/16	2927	2092.37	2940.51	1973.01	2308.94165
11:34:23 AM.8224 2017/01/16	2927	2093.09	2940.51	1973.01	2308.94165
11:35:23 AM.8257 2017/01/16	2927	2107.88	2940.51	1973.01	2308.94165
11:36:23 AM.8290 2017/01/16	2927	2108.6	2940.51	1973.01	2308.94165
11:37:23 AM.8313 2017/01/16	2927	2107.41	2940.51	1973.01	2308.94165
11:38:23 AM.8521 2017/01/16	2927	2107.9	2940.51	1973.01	2308.94165
11:39:23 AM.8700 2017/01/16	2927	2107.94	2940.51	1973.01	2308.94165
11:40:23 AM.8558 2017/01/16	2927	2107.38	2940.51	1973.01	2308.94165
11:41:23 AM.8620 2017/01/16	2927	2108.67	2940.51	1973.01	2308.94165
11:42:23 AM.8584 2017/01/16	2927	2107.92	2940.51	1973.01	2308.94165
11:43:23 AM.8685 2017/01/16	2927	946.209	2940.51	1973.01	2308.94165
11:44:23 AM.8464 2017/01/16	2927	946.451	2940.51	1973.01	2308.94165
11:45:23 AM.8497 2017/01/16	2927	946.1	2940.51	1973.01	2308.94165

Time	Emulated Power (W)	System Power (W)	Non Averaged Baseline	Averaged Baseline	Averaged System Power
11:46:23 AM.9038 2017/01/16	2927	945.823	2940.51	1973.01	2308.94165
11:47:23 AM.8543 2017/01/16	2927	946.072	2940.51	1973.01	2308.94165
11:48:23 AM.8986 2017/01/16	2927	945.928	2940.51	1973.01	2308.94165
11:49:23 AM.8579 2017/01/16	2927	946.008	2940.51	1973.01	2308.94165
11:50:23 AM.8612 2017/01/16	1071	2236.65	1070.51	1973.01	2308.94165
11:51:23 AM.8635 2017/01/16	1071	2236.68	1070.51	1973.01	2308.94165
11:52:23 AM.8648 2017/01/16	1071	2236.43	1070.51	1973.01	2308.94165
11:53:23 AM.8671 2017/01/16	1071	2236.7	1070.51	1973.01	2308.94165
11:54:23 AM.8704 2017/01/16	1071	2236.41	1070.51	1973.01	2308.94165
11:55:23 AM.8727 2017/01/16	1071	2236.91	1070.51	1973.01	2308.94165
11:56:23 AM.8545 2017/01/16	1071	2236.26	1070.51	1973.01	2308.94165
11:57:23 AM.8535 2017/01/16	1071	2236.91	1070.51	1973.01	2308.94165
11:58:23 AM.8535 2017/01/16	1071	3394.71	1070.51	1973.01	2308.94165
11:59:23 AM.8545 2017/01/16	1071	3394.2	1070.51	1973.01	2308.94165
12:00:23 PM.8535 2017/01/16	1071	3393.62	1070.51	1973.01	2308.94165
12:01:23 PM.8535 2017/01/16	1071	3393.44	1070.51	1973.01	2308.94165
12:02:23 PM.8545 2017/01/16	1071	3393.93	1070.51	1973.01	2308.94165
12:03:23 PM.8535 2017/01/16	1071	3393.64	1070.51	1973.01	2308.94165
12:04:23 PM.8535 2017/01/16	1071	3393.88	1070.51	1973.01	2308.94165
12:05:23 PM.8545 2017/01/16	942	3263.63	940.51	1973.01	2308.94165
12:06:23 PM.8535 2017/01/16	942	3263.8	940.51	1973.01	2308.94165
12:07:23 PM.8535 2017/01/16	942	3264.09	940.51	1973.01	2308.94165
12:08:23 PM.8662 2017/01/16	942	3263.65	940.51	1973.01	2308.94165
12:09:23 PM.8545 2017/01/16	942	3263.19	940.51	1973.01	2308.94165
12:10:23 PM.8545 2017/01/16	942	3264.08	940.51	1973.01	2308.94165
12:11:23 PM.8545 2017/01/16	942	3263.34	940.51	1973.01	2308.94165
12:12:23 PM.8545 2017/01/16	942	3263.74	940.51	1973.01	2308.94165
12:13:23 PM.8545 2017/01/16	942	3263.83	940.51	1973.01	2308.94165
12:14:23 PM.8535 2017/01/16	942	3263.72	940.51	1973.01	2308.94165
12:15:23 PM.8789 2017/01/16	942	3263.92	940.51	1973.01	2308.94165
12:16:23 PM.8545 2017/01/16	942	3264.46	940.51	1973.01	2308.94165
12:17:23 PM.8545 2017/01/16	942	1104.913	940.51	1973.01	2308.94165
12:18:23 PM.8535 2017/01/16	942	1105.785	940.51	1973.01	2308.94165
12:19:23 PM.8535 2017/01/16	942	1105.851	940.51	1973.01	2308.94165
12:20:23 PM.8535 2017/01/16	948	1112.256	947.25	979.75	1096.790826
12:21:23 PM.8545 2017/01/16	948	1104.913	947.25	979.75	1096.790826
12:22:23 PM.8535 2017/01/16	948	1105.785	947.25	979.75	1096.790826
12:23:23 PM.8535 2017/01/16	948	1105.851	947.25	979.75	1096.790826
12:24:23 PM.8535 2017/01/16	948	1112.256	947.25	979.75	1096.790826
12:25:23 PM.8545 2017/01/16	948	1104.913	947.25	979.75	1096.790826

Time	Emulated Power (W)	System Power (W)	Non Averaged Baseline	Averaged Baseline	Averaged System Power
12:26:23 PM.8525 2017/01/16	**948**	**1105.785**	**947.25**	**979.75**	**1096.790826**
12:27:23 PM.8545 2017/01/16	**948**	**1105.851**	**947.25**	**979.75**	**1096.790826**
12:28:23 PM.8535 2017/01/16	**948**	**1112.256**	**947.25**	**979.75**	**1096.790826**
12:29:23 PM.8545 2017/01/16	**948**	**1104.913**	**947.25**	**979.75**	**1096.790826**
12:30:23 PM.8535 2017/01/16	**948**	**1105.785**	**947.25**	**979.75**	**1096.790826**
12:31:23 PM.8555 2017/01/16	**948**	**1105.851**	**947.25**	**979.75**	**1096.790826**
12:32:23 PM.8535 2017/01/16	**948**	**1112.256**	**947.25**	**979.75**	**1096.790826**
12:33:23 PM.8545 2017/01/16	**948**	**1104.913**	**947.25**	**979.75**	**1096.790826**
12:34:23 PM.8535 2017/01/16	**948**	**1105.851**	**947.25**	**979.75**	**1096.790826**
12:35:23 PM.8525 2017/01/16	**1077**	**1091.95**	**1077.25**	**979.75**	**1096.790826**
12:36:23 PM.8662 2017/01/16	**1077**	**1071.63**	**1077.25**	**979.75**	**1096.790826**
12:37:23 PM.8535 2017/01/16	**1077**	**1081.25**	**1077.25**	**979.75**	**1096.790826**
12:38:23 PM.8682 2017/01/16	**1077**	**1071.45**	**1077.25**	**979.75**	**1096.790826**
12:39:23 PM.8535 2017/01/16	**1077**	**1079.28**	**1077.25**	**979.75**	**1096.790826**
12:40:23 PM.8535 2017/01/16	**1077**	**1071.56**	**1077.25**	**979.75**	**1096.790826**
12:41:23 PM.8535 2017/01/16	**1077**	**1071.47**	**1077.25**	**979.75**	**1096.790826**
12:42:23 PM.8535 2017/01/16	**1077**	**1078.23**	**1077.25**	**979.75**	**1096.790826**

Appendix G: Evening peak results with random withdrawals

Time	Emulated Power (W)	System Power (W)	Non Averaged Baseline	Averaged Baseline	Averaged System Power
08:47:06 AM.4889 2017/01/19	135	134.195	135.51	168.01	1288.38
08:48:06 AM.4967 2017/01/19	135	1295.29	135.51	168.01	1288.38
08:49:06 AM.4802 2017/01/19	135	1294.53	135.51	168.01	1288.38
08:50:06 AM.4832 2017/01/19	135	1294.78	135.51	168.01	1288.38
08:51:06 AM.4784 2017/01/19	135	1294.17	135.51	168.01	1288.38
08:52:06 AM.4785 2017/01/19	135	1293.83	135.51	168.01	1288.38
08:53:06 AM.4736 2017/01/19	135	1294.33	135.51	168.01	1288.38
08:54:06 AM.4698 2017/01/19	135	1294.25	135.51	168.01	1288.38
08:55:06 AM.4621 2017/01/19	135	1294.16	135.51	168.01	1288.38
08:56:06 AM.4592 2017/01/19	135	1293.61	135.51	168.01	1288.38
08:57:06 AM.4573 2017/01/19	135	1293.49	135.51	168.01	1288.38
08:58:06 AM.4535 2017/01/19	135	1294.14	135.51	168.01	1288.38
08:59:06 AM.4565 2017/01/19	135	1294.36	135.51	168.01	1288.38
09:00:06 AM.4468 2017/01/19	135	1294.02	135.51	168.01	1288.38
09:01:06 AM.4468 2017/01/19	135	1294.28	135.51	168.01	1288.38
09:02:06 AM.4498 2017/01/19	135	1293.88	135.51	168.01	1288.38
09:03:06 AM.8512 2017/01/19	135	1293.88	135.51	168.01	1288.38
09:04:06 AM.4910 2017/01/19	135	1293.82	135.51	168.01	1288.38
09:05:06 AM.4949 2017/01/19	135	1294.1	135.51	168.01	1288.38
09:06:06 AM.4579 2017/01/19	135	1293.85	135.51	168.01	1288.38
09:07:06 AM.6718 2017/01/19	135	1293.63	135.51	168.01	1288.38
09:08:06 AM.4434 2017/01/19	135	1294	135.51	168.01	1288.38
09:09:06 AM.4474 2017/01/19	135	1294.02	135.51	168.01	1288.38
09:10:06 AM.4458 2017/01/19	135	1294.22	135.51	168.01	1288.38
09:11:06 AM.4579 2017/01/19	135	1292.69	135.51	168.01	1288.38
09:12:06 AM.4895 2017/01/19	135	1292.67	135.51	168.01	1288.38
09:13:06 AM.4537 2017/01/19	135	1293.19	135.51	168.01	1288.38
09:14:06 AM.4326 2017/01/19	135	1292.36	135.51	168.01	1288.38
09:15:06 AM.4642 2017/01/19	135	1292.29	135.51	168.01	1288.38
09:16:06 AM.4704 2017/01/19	267	1428.43	265.51	168.01	1288.38
09:17:06 AM.4825 2017/01/19	267	1428.61	265.51	168.01	1288.38
09:18:06 AM.4467 2017/01/19	267	1428.52	265.51	168.01	1288.38
09:19:06 AM.4675 2017/01/19	267	1428.71	265.51	168.01	1288.38
09:20:06 AM.4523 2017/01/19	267	1428.42	265.51	168.01	1288.38
09:21:06 AM.4770 2017/01/19	267	1428.24	265.51	168.01	1288.38
09:22:06 AM.4608 2017/01/19	267	1428.27	265.51	168.01	1288.38
09:23:06 AM.4640 2017/01/19	267	1427.78	265.51	168.01	1288.38

Time	Emulated Power (W)	System Power (W)	Non Averaged Baseline	Averaged Baseline	Averaged System Power
09:24:06 AM.4654 2017/01/19	**267**	**1428.14**	**265.51**	**168.01**	**1288.38**
09:25:06 AM.4677 2017/01/19	**267**	**1428.63**	**265.51**	**168.01**	**1288.38**
09:26:06 AM.4690 2017/01/19	**267**	**1429.06**	**265.51**	**168.01**	**1288.38**
09:27:06 AM.4733 2017/01/19	**267**	**1428.55**	**265.51**	**168.01**	**1288.38**
09:28:06 AM.5361 2017/01/19	**267**	**1428.42**	**265.51**	**168.01**	**1288.38**
09:29:06 AM.4955 2017/01/19	**267**	**1428.33**	**265.51**	**168.01**	**1288.38**
09:30:06 AM.4802 2017/01/19	**267**	**272.915**	**265.51**	**168.01**	**1288.38**
09:31:06 AM.5108 2017/01/19	**135**	**1292.07**	**135.51**	**168.01**	**1288.38**
09:32:06 AM.4877 2017/01/19	**135**	**1291.73**	**135.51**	**168.01**	**1288.38**
09:33:06 AM.4871 2017/01/19	**135**	**1292.1**	**135.51**	**168.01**	**1288.38**
09:34:06 AM.5119 2017/01/19	**135**	**1291.82**	**135.51**	**168.01**	**1288.38**
09:35:06 AM.4917 2017/01/19	**135**	**1292.52**	**135.51**	**168.01**	**1288.38**
09:36:06 AM.5047 2017/01/19	**135**	**1291.43**	**135.51**	**168.01**	**1288.38**
09:37:06 AM.5246 2017/01/19	**135**	**1292.11**	**135.51**	**168.01**	**1288.38**
09:38:06 AM.5006 2017/01/19	**135**	**1291.83**	**135.51**	**168.01**	**1288.38**
09:39:06 AM.5058 2017/01/19	**135**	**1292.17**	**135.51**	**168.01**	**1288.38**
09:40:06 AM.5071 2017/01/19	**135**	**1292.21**	**135.51**	**168.01**	**1288.38**
09:41:06 AM.5075 2017/01/19	**135**	**1292.4**	**135.51**	**168.01**	**1288.38**
09:42:06 AM.5127 2017/01/19	**135**	**1292.45**	**135.51**	**168.01**	**1288.38**
09:43:06 AM.5140 2017/01/19	**135**	**1292.13**	**135.51**	**168.01**	**1288.38**
09:44:06 AM.5348 2017/01/19	**135**	**1291.96**	**135.51**	**168.01**	**1288.38**
09:45:06 AM.5271 2017/01/19	**135**	**1292.16**	**135.51**	**168.01**	**1288.38**
09:46:06 AM.5067 2017/01/19	**192**	**1349.79**	**190.51**	**223.01**	**688.984**
09:47:06 AM.4989 2017/01/19	**192**	**1350.11**	**190.51**	**223.01**	**688.984**
09:48:06 AM.5058 2017/01/19	**192**	**1350.19**	**190.51**	**223.01**	**688.984**
09:49:06 AM.5147 2017/01/19	**192**	**1349.67**	**190.51**	**223.01**	**688.984**
09:50:06 AM.5024 2017/01/19	**192**	**193.297**	**190.51**	**223.01**	**688.984**
09:51:06 AM.5057 2017/01/19	**192**	**193.901**	**190.51**	**223.01**	**688.984**
09:52:06 AM.5080 2017/01/19	**192**	**193.464**	**190.51**	**223.01**	**688.984**
09:53:06 AM.5151 2017/01/19	**192**	**193.435**	**190.51**	**223.01**	**688.984**
09:54:06 AM.5096 2017/01/19	**192**	**193.869**	**190.51**	**223.01**	**688.984**
09:55:06 AM.5158 2017/01/19	**192**	**193.653**	**190.51**	**223.01**	**688.984**
09:56:06 AM.5142 2017/01/19	**192**	**193.413**	**190.51**	**223.01**	**688.984**
09:57:06 AM.5273 2017/01/19	**192**	**194.024**	**190.51**	**223.01**	**688.984**
09:58:06 AM.5208 2017/01/19	**192**	**192.741**	**190.51**	**223.01**	**688.984**
09:59:06 AM.5231 2017/01/19	**192**	**192.837**	**190.51**	**223.01**	**688.984**
10:00:06 AM.5264 2017/01/19	**192**	**193.327**	**190.51**	**223.01**	**688.984**
10:01:06 AM.5277 2017/01/19	**321**	**326.521**	**320.51**	**223.01**	**688.984**
10:02:06 AM.5320 2017/01/19	**321**	**326.404**	**320.51**	**223.01**	**688.984**
10:03:06 AM.5343 2017/01/19	**321**	**326.347**	**320.51**	**223.01**	**688.984**

Time	Emulated Power (W)	System Power (W)	Non Averaged Baseline	Averaged Baseline	Averaged System Power
10:04:06 AM.5376 2017/01/19	321	326.001	320.51	223.01	688.984
10:05:06 AM.5408 2017/01/19	321	326.065	320.51	223.01	688.984
10:06:06 AM.5422 2017/01/19	321	326.171	320.51	223.01	688.984
10:07:06 AM.5425 2017/01/19	321	326.012	320.51	223.01	688.984
10:08:06 AM.5468 2017/01/19	321	326.394	320.51	223.01	688.984
10:09:06 AM.5501 2017/01/19	321	326.242	320.51	223.01	688.984
10:10:06 AM.5641 2017/01/19	321	1483.69	320.51	223.01	688.984
10:11:06 AM.5527 2017/01/19	321	1483.99	320.51	223.01	688.984
10:12:06 AM.5540 2017/01/19	321	1483.45	320.51	223.01	688.984
10:13:06 AM.5563 2017/01/19	321	1483.36	320.51	223.01	688.984
10:14:06 AM.5606 2017/01/19	321	1483.08	320.51	223.01	688.984
10:15:06 AM.5639 2017/01/19	321	1482.63	320.51	223.01	688.984
10:16:06 AM.5701 2017/01/19	192	1349.24	190.51	223.01	688.984
10:17:06 AM.5646 2017/01/19	192	1349.42	190.51	223.01	688.984
10:18:06 AM.5628 2017/01/19	192	1349.07	190.51	223.01	688.984
10:19:06 AM.5599 2017/01/19	192	1349	190.51	223.01	688.984
10:20:06 AM.5551 2017/01/19	192	1348.44	190.51	223.01	688.984
10:21:06 AM.5532 2017/01/19	192	1348.84	190.51	223.01	688.984
10:22:06 AM.5474 2017/01/19	192	1349.01	190.51	223.01	688.984
10:23:06 AM.5475 2017/01/19	192	1349.23	190.51	223.01	688.984
10:24:06 AM.5397 2017/01/19	192	1348.64	190.51	223.01	688.984
10:25:06 AM.5398 2017/01/19	192	1348.68	190.51	223.01	688.984
10:26:06 AM.5321 2017/01/19	192	1348.81	190.51	223.01	688.984
10:27:06 AM.5263 2017/01/19	192	1348.89	190.51	223.01	688.984
10:28:06 AM.5254 2017/01/19	192	1348.79	190.51	223.01	688.984
10:29:06 AM.5196 2017/01/19	192	1349.34	190.51	223.01	688.984
10:30:06 AM.5187 2017/01/19	192	193.452	190.51	223.01	688.984
10:31:06 AM.5129 2017/01/19	192	193.337	190.51	223.01	688.984
10:32:06 AM.5090 2017/01/19	192	192.934	190.51	223.01	688.984
10:33:06 AM.5052 2017/01/19	192	193.289	190.51	223.01	688.984
10:34:06 AM.5023 2017/01/19	192	193.121	190.51	223.01	688.984
10:35:06 AM.5105 2017/01/19	192	192.81	190.51	223.01	688.984
10:36:06 AM.5040 2017/01/19	192	192.486	190.51	223.01	688.984
10:37:06 AM.5063 2017/01/19	192	193.292	190.51	223.01	688.984
10:38:06 AM.5115 2017/01/19	192	193.36	190.51	223.01	688.984
10:39:06 AM.5128 2017/01/19	192	192.676	190.51	223.01	688.984
10:40:06 AM.5122 2017/01/19	192	193.195	190.51	223.01	688.984
10:41:06 AM.5155 2017/01/19	192	192.917	190.51	223.01	688.984
10:42:06 AM.5158 2017/01/19	192	193.06	190.51	223.01	688.984
10:43:06 AM.5211 2017/01/19	192	193.378	190.51	223.01	688.984

Time	Emulated Power (W)	System Power (W)	Non Averaged Baseline	Averaged Baseline	Averaged System Power
10:44:06 AM.5283 2017/01/19	192	192.86	190.51	223.01	688.984
10:45:06 AM.5247 2017/01/19	192	193.402	190.51	223.01	688.984
10:46:06 AM.5260 2017/01/19	2322	2323.71	2320.51	2255.51	2354.64
10:47:06 AM.5283 2017/01/19	2322	2323.18	2320.51	2255.51	2354.64
10:48:06 AM.5306 2017/01/19	2322	2322.68	2320.51	2255.51	2354.64
10:49:06 AM.5349 2017/01/19	2322	2321.69	2320.51	2255.51	2354.64
10:50:06 AM.5343 2017/01/19	2322	2322.41	2320.51	2255.51	2354.64
10:51:06 AM.5366 2017/01/19	2322	2321.56	2320.51	2255.51	2354.64
10:52:06 AM.5356 2017/01/19	2322	2321.97	2320.51	2255.51	2354.64
10:53:06 AM.5318 2017/01/19	2322	2321.29	2320.51	2255.51	2354.64
10:54:06 AM.5289 2017/01/19	2322	2321.58	2320.51	2255.51	2354.64
10:55:06 AM.5241 2017/01/19	2322	2321.86	2320.51	2255.51	2354.64
10:56:06 AM.5222 2017/01/19	2322	2321.77	2320.51	2255.51	2354.64
10:57:06 AM.5216 2017/01/19	2322	2321.24	2320.51	2255.51	2354.64
10:58:06 AM.5220 2017/01/19	2322	2321.4	2320.51	2255.51	2354.64
10:59:06 AM.5438 2017/01/19	2322	2321.73	2320.51	2255.51	2354.64
11:00:06 AM.5295 2017/01/19	2322	2321.35	2320.51	2255.51	2354.64
11:01:06 AM.5289 2017/01/19	2190	2191.25	2190.51	2255.51	2354.64
11:02:06 AM.5429 2017/01/19	2190	2191.82	2190.51	2255.51	2354.64
11:03:06 AM.5345 2017/01/19	2190	2192.33	2190.51	2255.51	2354.64
11:04:06 AM.5368 2017/01/19	2190	2191.63	2190.51	2255.51	2354.64
11:05:06 AM.5401 2017/01/19	2190	2191.46	2190.51	2255.51	2354.64
11:06:06 AM.5424 2017/01/19	2190	2191.59	2190.51	2255.51	2354.64
11:07:06 AM.5466 2017/01/19	2190	2191.28	2190.51	2255.51	2354.64
11:08:06 AM.5460 2017/01/19	2190	2193.31	2190.51	2255.51	2354.64
11:09:06 AM.5508 2017/01/19	2190	2192.95	2190.51	2255.51	2354.64
11:10:06 AM.5440 2017/01/19	2190	2192.94	2190.51	2255.51	2354.64
11:11:06 AM.5402 2017/01/19	2190	3349.12	2190.51	2255.51	2354.64
11:12:06 AM.5422 2017/01/19	2190	3348.86	2190.51	2255.51	2354.64
11:13:06 AM.5384 2017/01/19	2190	3349.16	2190.51	2255.51	2354.64
11:14:06 AM.5457 2017/01/19	2190	3349.49	2190.51	2255.51	2354.64
11:15:06 AM.5304 2017/01/19	2190	3349.88	2190.51	2255.51	2354.64
11:16:06 AM.5337 2017/01/19	2190	3349.31	2190.51	2255.51	2354.64
11:17:06 AM.5360 2017/01/19	2190	3348.4	2190.51	2255.51	2354.64
11:18:06 AM.5383 2017/01/19	2190	3349.25	2190.51	2255.51	2354.64
11:19:06 AM.5406 2017/01/19	2190	3348.11	2190.51	2255.51	2354.64
11:20:06 AM.5420 2017/01/19	2190	3348.21	2190.51	2255.51	2354.64
11:21:06 AM.5443 2017/01/19	2190	3348.82	2190.51	2255.51	2354.64
11:22:06 AM.5495 2017/01/19	2190	3348.07	2190.51	2255.51	2354.64
11:23:06 AM.5489 2017/01/19	2190	3348.73	2190.51	2255.51	2354.64

Time	Emulated Power (W)	System Power (W)	Non Averaged Baseline	Averaged Baseline	Averaged System Power
11:24:06 AM.5512 2017/01/19	**2190**	**3348.74**	**2190.51**	**2255.51**	**2354.64**
11:25:06 AM.5535 2017/01/19	**2190**	**3348.64**	**2190.51**	**2255.51**	**2354.64**
11:26:06 AM.5523 2017/01/19	**2190**	**3348.09**	**2190.51**	**2255.51**	**2354.64**
11:27:06 AM.5495 2017/01/19	**2190**	**3348.56**	**2190.51**	**2255.51**	**2354.64**
11:28:06 AM.5447 2017/01/19	**2190**	**3348.01**	**2190.51**	**2255.51**	**2354.64**
11:29:06 AM.5418 2017/01/19	**2190**	**3348.14**	**2190.51**	**2255.51**	**2354.64**
11:30:06 AM.5370 2017/01/19	**2190**	**3348.46**	**2190.51**	**2255.51**	**2354.64**
11:31:06 AM.5366 2017/01/19	**2396**	**1556.05**	**2320.51**	**2255.51**	**2354.64**
11:32:06 AM.5389 2017/01/19	**2396**	**1554.96**	**2320.51**	**2255.51**	**2354.64**
11:33:06 AM.5422 2017/01/19	**2396**	**1555.51**	**2320.51**	**2255.51**	**2354.64**
11:34:06 AM.5669 2017/01/19	**2396**	**1555.62**	**2320.51**	**2255.51**	**2354.64**
11:35:06 AM.5458 2017/01/19	**2396**	**1555.58**	**2320.51**	**2255.51**	**2354.64**
11:36:06 AM.5510 2017/01/19	**2396**	**1554.88**	**2320.51**	**2255.51**	**2354.64**
11:37:06 AM.5533 2017/01/19	**2396**	**1555.94**	**2320.51**	**2255.51**	**2354.64**
11:38:06 AM.5537 2017/01/19	**2396**	**1555.87**	**2320.51**	**2255.51**	**2354.64**
11:39:06 AM.5570 2017/01/19	**2396**	**1555.79**	**2320.51**	**2255.51**	**2354.64**
11:40:06 AM.5583 2017/01/19	**2396**	**1555.89**	**2320.51**	**2255.51**	**2354.64**
11:41:06 AM.5596 2017/01/19	**2396**	**399.772**	**2320.51**	**2255.51**	**2354.64**
11:42:06 AM.5697 2017/01/19	**2396**	**400.031**	**2320.51**	**2255.51**	**2354.64**
11:43:06 AM.5652 2017/01/19	**2396**	**399.786**	**2320.51**	**2255.51**	**2354.64**
11:44:06 AM.5685 2017/01/19	**2396**	**399.505**	**2320.51**	**2255.51**	**2354.64**
11:45:06 AM.5688 2017/01/19	**2396**	**399.247**	**2320.51**	**2255.51**	**2354.64**
11:46:06 AM.5711 2017/01/19	**2927**	**935.773**	**2940.51**	**1973.01**	**979.891**
11:47:06 AM.5744 2017/01/19	**2927**	**935.935**	**2940.51**	**1973.01**	**979.891**
11:48:06 AM.5767 2017/01/19	**2927**	**935.185**	**2940.51**	**1973.01**	**979.891**
11:49:06 AM.5780 2017/01/19	**2927**	**935.859**	**2940.51**	**1973.01**	**979.891**
11:50:06 AM.5813 2017/01/19	**2927**	**935.718**	**2940.51**	**1973.01**	**979.891**
11:51:06 AM.5817 2017/01/19	**2927**	**935.643**	**2940.51**	**1973.01**	**979.891**
11:52:06 AM.5850 2017/01/19	**2927**	**935.774**	**2940.51**	**1973.01**	**979.891**
11:53:06 AM.5882 2017/01/19	**2927**	**935.301**	**2940.51**	**1973.01**	**979.891**
11:54:06 AM.5896 2017/01/19	**2927**	**935.656**	**2940.51**	**1973.01**	**979.891**
11:55:06 AM.5919 2017/01/19	**2927**	**935.644**	**2940.51**	**1973.01**	**979.891**
11:56:06 AM.5952 2017/01/19	**2927**	**935.868**	**2940.51**	**1973.01**	**979.891**
11:57:06 AM.5975 2017/01/19	**2927**	**935.639**	**2940.51**	**1973.01**	**979.891**
11:58:06 AM.6037 2017/01/19	**2927**	**935.589**	**2940.51**	**1973.01**	**979.891**
11:59:06 AM.6030 2017/01/19	**2927**	**935.683**	**2940.51**	**1973.01**	**979.891**
12:00:06 PM.6086 2017/01/19	**2927**	**935.998**	**2940.51**	**1973.01**	**979.891**
12:01:06 PM.5979 2017/01/19	**1071**	**951.158**	**1070.51**	**1973.01**	**979.891**
12:02:06 PM.5980 2017/01/19	**1071**	**951.131**	**1070.51**	**1973.01**	**979.891**
12:03:06 PM.5902 2017/01/19	**1071**	**950.763**	**1070.51**	**1973.01**	**979.891**

Time	Emulated Power (W)	System Power (W)	Non Averaged Baseline	Averaged Baseline	Averaged System Power
12:04:06 PM.5864 2017/01/19	1071	951.445	1070.51	1973.01	979.891
12:05:06 PM.6118 2017/01/19	1071	951.205	1070.51	1973.01	979.891
12:06:06 PM.5787 2017/01/19	1071	951.042	1070.51	1973.01	979.891
12:07:06 PM.5749 2017/01/19	1071	951.442	1070.51	1973.01	979.891
12:08:06 PM.5710 2017/01/19	1071	951.706	1070.51	1973.01	979.891
12:09:06 PM.5643 2017/01/19	1071	950.991	1070.51	1973.01	979.891
12:10:06 PM.5624 2017/01/19	1071	951.246	1070.51	1973.01	979.891
12:11:06 PM.5585 2017/01/19	1071	950.524	1070.51	1973.01	979.891
12:12:06 PM.5547 2017/01/19	1071	951.29	1070.51	1973.01	979.891
12:13:06 PM.5509 2017/01/19	1071	951.248	1070.51	1973.01	979.891
12:14:06 PM.5490 2017/01/19	1071	951.422	1070.51	1973.01	979.891
12:15:06 PM.5517 2017/01/19	1071	951.062	1070.51	1973.01	979.891
12:16:06 PM.5481 2017/01/19	1071	1082.06	1070.51	1973.01	979.891
12:17:06 PM.5504 2017/01/19	1071	1081.93	1070.51	1973.01	979.891
12:18:06 PM.5537 2017/01/19	1071	1082.15	1070.51	1973.01	979.891
12:19:06 PM.5550 2017/01/19	1071	1081.94	1070.51	1973.01	979.891
12:20:06 PM.5593 2017/01/19	1071	1081.24	1070.51	1973.01	979.891
12:21:06 PM.5625 2017/01/19	1071	1081.91	1070.51	1973.01	979.891
12:22:06 PM.5619 2017/01/19	1071	1082.14	1070.51	1973.01	979.891
12:23:06 PM.5642 2017/01/19	1071	1082.14	1070.51	1973.01	979.891
12:24:06 PM.5665 2017/01/19	1071	1081.47	1070.51	1973.01	979.891
12:25:06 PM.5688 2017/01/19	1071	1081.93	1070.51	1973.01	979.891
12:26:06 PM.5721 2017/01/19	1071	1082.66	1070.51	1973.01	979.891
12:27:06 PM.5734 2017/01/19	1071	1081.86	1070.51	1973.01	979.891
12:28:06 PM.5767 2017/01/19	1071	1081.83	1070.51	1973.01	979.891
12:29:06 PM.5820 2017/01/19	1071	1082.24	1070.51	1973.01	979.891
12:30:06 PM.5852 2017/01/19	1071	1082.03	1070.51	1973.01	979.891
12:31:06 PM.5846 2017/01/19	942	950.87	940.51	1973.01	979.891
12:32:06 PM.5859 2017/01/19	942	951.098	940.51	1973.01	979.891
12:33:06 PM.5882 2017/01/19	942	950.787	940.51	1973.01	979.891
12:34:06 PM.5887 2017/01/19	942	950.797	940.51	1973.01	979.891
12:35:06 PM.5859 2017/01/19	942	951.077	940.51	1973.01	979.891
12:36:06 PM.5820 2017/01/19	942	950.952	940.51	1973.01	979.891
12:37:06 PM.5802 2017/01/19	942	950.748	940.51	1973.01	979.891
12:38:06 PM.5724 2017/01/19	942	951.503	940.51	1973.01	979.891
12:39:06 PM.5686 2017/01/19	942	951.151	940.51	1973.01	979.891
12:40:06 PM.5667 2017/01/19	942	951.164	940.51	1973.01	979.891
12:41:06 PM.5726 2017/01/19	942	951.366	940.51	1973.01	979.891
12:42:06 PM.5580 2017/01/19	942	948.329	940.51	1973.01	979.891
12:43:06 PM.5552 2017/01/19	942	950.337	940.51	1973.01	979.891

Time	Emulated Power (W)	System Power (W)	Non Averaged Baseline	Averaged Baseline	Averaged System Power
12:44:06 PM.5541 2017/01/19	942	950.57	940.51	1973.01	979.891
12:45:06 PM.5574 2017/01/19	942	950.232	940.51	1973.01	979.891
12:46:06 PM.5626 2017/01/19	948	956.426	947.25	979.75	1372.18
12:47:06 PM.5581 2017/01/19	948	2114.47	947.25	979.75	1372.18
12:48:06 PM.5604 2017/01/19	948	2114.77	947.25	979.75	1372.18
12:49:06 PM.5637 2017/01/19	948	2114.74	947.25	979.75	1372.18
12:50:06 PM.5767 2017/01/19	948	2114.36	947.25	979.75	1372.18
12:51:06 PM.5722 2017/01/19	948	2113.78	947.25	979.75	1372.18
12:52:06 PM.5784 2017/01/19	948	2114.04	947.25	979.75	1372.18
12:53:06 PM.5758 2017/01/19	948	2114.19	947.25	979.75	1372.18
12:54:06 PM.5752 2017/01/19	948	2114.91	947.25	979.75	1372.18
12:55:06 PM.6048 2017/01/19	948	2113.97	947.25	979.75	1372.18
12:56:06 PM.5798 2017/01/19	948	2113.74	947.25	979.75	1372.18
12:57:06 PM.5821 2017/01/19	948	2113.79	947.25	979.75	1372.18
12:58:06 PM.5864 2017/01/19	948	2113.32	947.25	979.75	1372.18
12:59:06 PM.5867 2017/01/19	948	2113.69	947.25	979.75	1372.18
01:00:06 PM.6124 2017/01/19	948	2113.97	947.25	979.75	1372.18
01:01:06 PM.5952 2017/01/19	1077	2243.74	1077.25	979.75	1372.18
01:02:06 PM.5946 2017/01/19	1077	2243.3	1077.25	979.75	1372.18
01:03:06 PM.5989 2017/01/19	1077	2243.37	1077.25	979.75	1372.18
01:04:06 PM.6012 2017/01/19	1077	2243.56	1077.25	979.75	1372.18
01:05:06 PM.6015 2017/01/19	1077	2243.51	1077.25	979.75	1372.18
01:06:06 PM.6048 2017/01/19	1077	2243.29	1077.25	979.75	1372.18
01:07:06 PM.6042 2017/01/19	1077	1083.3	1077.25	979.75	1372.18
01:08:06 PM.6104 2017/01/19	1077	1082.4	1077.25	979.75	1372.18
01:09:06 PM.6026 2017/01/19	1077	1082.64	1077.25	979.75	1372.18
01:10:06 PM.6037 2017/01/19	1077	1082.71	1077.25	979.75	1372.18
01:11:06 PM.5949 2017/01/19	1077	1082.4	1077.25	979.75	1372.18
01:12:06 PM.5921 2017/01/19	1077	1083.26	1077.25	979.75	1372.18
01:13:06 PM.5921 2017/01/19	1077	1082.98	1077.25	979.75	1372.18
01:14:06 PM.5932 2017/01/19	1077	1083.4	1077.25	979.75	1372.18
01:15:06 PM.5815 2017/01/19	1077	1083.01	1077.25	979.75	1372.18
01:16:06 PM.5767 2017/01/19	948	951.437	947.25	979.75	1372.18
01:17:06 PM.5719 2017/01/19	948	952.283	947.25	979.75	1372.18
01:18:06 PM.5690 2017/01/19	948	953.076	947.25	979.75	1372.18
01:19:06 PM.5697 2017/01/19	948	952.596	947.25	979.75	1372.18
01:20:06 PM.5730 2017/01/19	948	952.2	947.25	979.75	1372.18
01:21:06 PM.5763 2017/01/19	948	952.931	947.25	979.75	1372.18
01:22:06 PM.5756 2017/01/19	948	952.177	947.25	979.75	1372.18
01:23:06 PM.5789 2017/01/19	948	952.75	947.25	979.75	1372.18

Time	Emulated Power (W)	System Power (W)	Non Averaged Baseline	Averaged Baseline	Averaged System Power
01:24:06 PM.5822 2017/01/19	948	952.552	947.25	979.75	1372.18
01:25:06 PM.5816 2017/01/19	948	952.742	947.25	979.75	1372.18
01:26:06 PM.5849 2017/01/19	948	952.198	947.25	979.75	1372.18
01:27:06 PM.5891 2017/01/19	948	951.654	947.25	979.75	1372.18
01:28:06 PM.5895 2017/01/19	948	952.287	947.25	979.75	1372.18
01:29:06 PM.5918 2017/01/19	948	951.892	947.25	979.75	1372.18
01:30:06 PM.5990 2017/01/19	948	951.783	947.25	979.75	1372.18
01:31:06 PM.6198 2017/01/19	948	952.521	947.25	979.75	1372.18
01:32:06 PM.5987 2017/01/19	948	952.196	947.25	979.75	1372.18
01:33:06 PM.5990 2017/01/19	948	952.411	947.25	979.75	1372.18
01:34:06 PM.6033 2017/01/19	948	952.151	947.25	979.75	1372.18
01:35:06 PM.6066 2017/01/19	948	951.983	947.25	979.75	1372.18
01:36:06 PM.6089 2017/01/19	948	951.93	947.25	979.75	1372.18
01:37:06 PM.6141 2017/01/19	948	952.525	947.25	979.75	1372.18
01:38:06 PM.6125 2017/01/19	948	952.265	947.25	979.75	1372.18
01:39:06 PM.6158 2017/01/19	948	952.102	947.25	979.75	1372.18
01:40:06 PM.6249 2017/01/19	948	952.784	947.25	979.75	1372.18
01:41:06 PM.6194 2017/01/19	948	951.909	947.25	979.75	1372.18
01:42:06 PM.6216 2017/01/19	948	952.563	947.25	979.75	1372.18
01:43:06 PM.6197 2017/01/19	948	952.421	947.25	979.75	1372.18
01:44:06 PM.6139 2017/01/19	948	953.058	947.25	979.75	1372.18
01:45:06 PM.6159 2017/01/19	948	952.675	947.25	979.75	1372.18
01:46:06 PM.6091 2017/01/19	1077	1083.81	1077.25	1012.25	1608.39
01:47:06 PM.6043 2017/01/19	1077	1082.93	1077.25	1012.25	1608.39
01:48:06 PM.5985 2017/01/19	1077	1084.06	1077.25	1012.25	1608.39
01:49:06 PM.5957 2017/01/19	1077	1083.41	1077.25	1012.25	1608.39
01:50:06 PM.5928 2017/01/19	1077	1083.6	1077.25	1012.25	1608.39
01:51:06 PM.5860 2017/01/19	1077	1083.04	1077.25	1012.25	1608.39
01:52:06 PM.5822 2017/01/19	1077	1083.11	1077.25	1012.25	1608.39
01:53:06 PM.5793 2017/01/19	1077	1081.89	1077.25	1012.25	1608.39
01:54:06 PM.5774 2017/01/19	1077	1081.84	1077.25	1012.25	1608.39
01:55:06 PM.5716 2017/01/19	1077	1082.24	1077.25	1012.25	1608.39
01:56:06 PM.5678 2017/01/19	1077	1081.86	1077.25	1012.25	1608.39
01:57:06 PM.5641 2017/01/19	1077	1082.16	1077.25	1012.25	1608.39
01:58:06 PM.5684 2017/01/19	1077	1081.99	1077.25	1012.25	1608.39
01:59:06 PM.5697 2017/01/19	1077	1083.12	1077.25	1012.25	1608.39
02:00:06 PM.5720 2017/01/19	1077	1082.46	1077.25	1012.25	1608.39
02:01:06 PM.5782 2017/01/19	948	951.645	947.25	1012.25	1608.39
02:02:06 PM.5766 2017/01/19	948	952.172	947.25	1012.25	1608.39
02:03:06 PM.5848 2017/01/19	948	951.887	947.25	1012.25	1608.39

Time	Emulated Power (W)	System Power (W)	Non Averaged Baseline	Averaged Baseline	Averaged System Power
02:04:06 PM.5822 2017/01/19	948	952.095	947.25	1012.25	1608.39
02:05:06 PM.5952 2017/01/19	948	2114.75	947.25	1012.25	1608.39
02:06:06 PM.5868 2017/01/19	948	2114.03	947.25	1012.25	1608.39
02:07:06 PM.5881 2017/01/19	948	2113.03	947.25	1012.25	1608.39
02:08:06 PM.5924 2017/01/19	948	2113.78	947.25	1012.25	1608.39
02:09:06 PM.6181 2017/01/19	948	2113.54	947.25	1012.25	1608.39
02:10:06 PM.5999 2017/01/19	948	2113.22	947.25	1012.25	1608.39
02:11:06 PM.5983 2017/01/19	948	2113.67	947.25	1012.25	1608.39
02:12:06 PM.6192 2017/01/19	948	955.495	947.25	1012.25	1608.39
02:13:06 PM.6049 2017/01/19	948	955.601	947.25	1012.25	1608.39
02:14:06 PM.6111 2017/01/19	948	954.58	947.25	1012.25	1608.39
02:15:06 PM.6085 2017/01/19	948	955.058	947.25	1012.25	1608.39
02:16:06 PM.6099 2017/01/19	948	955.259	947.25	1012.25	1608.39
02:17:06 PM.6122 2017/01/19	948	2114.15	947.25	1012.25	1608.39
02:18:06 PM.6203 2017/01/19	948	2113.29	947.25	1012.25	1608.39
02:19:06 PM.6158 2017/01/19	948	2113.82	947.25	1012.25	1608.39
02:20:06 PM.6181 2017/01/19	948	2113.38	947.25	1012.25	1608.39
02:21:06 PM.6204 2017/01/19	948	2113.22	947.25	1012.25	1608.39
02:22:06 PM.6237 2017/01/19	948	2113.75	947.25	1012.25	1608.39
02:23:06 PM.6260 2017/01/19	948	2112.79	947.25	1012.25	1608.39
02:24:06 PM.6302 2017/01/19	948	2113.43	947.25	1012.25	1608.39
02:25:06 PM.6306 2017/01/19	948	2113.51	947.25	1012.25	1608.39
02:26:06 PM.6368 2017/01/19	948	2112.91	947.25	1012.25	1608.39
02:27:06 PM.6508 2017/01/19	948	2113.26	947.25	1012.25	1608.39
02:28:06 PM.6355 2017/01/19	948	2112.88	947.25	1012.25	1608.39
02:29:06 PM.6418 2017/01/19	948	2112.89	947.25	1012.25	1608.39
02:30:06 PM.6402 2017/01/19	948	2112.85	947.25	1012.25	1608.39
02:31:06 PM.6434 2017/01/19	1077	2242.38	1077.25	1012.25	1608.39
02:32:06 PM.6448 2017/01/19	1077	2242.16	1077.25	1012.25	1608.39
02:33:06 PM.6480 2017/01/19	1077	2242.71	1077.25	1012.25	1608.39
02:34:06 PM.6513 2017/01/19	1077	2242.32	1077.25	1012.25	1608.39
02:35:06 PM.6585 2017/01/19	1077	2242.44	1077.25	1012.25	1608.39

Appendix H: Evening peak results with no withdrawals – reduction of approximately 500 W is observed

Time	Emulated Power (W)	System Power (W)	Non Averaged Baseline	Fluke logs	Averaged Baseline	Averaged System Power	Fluke averaged
08:15:21 AM.8851 2017/01/20	135	1297.56	135.51	1332.06	168.01	1295.566	1345.73
08:16:21 AM.8822 2017/01/20	135	1296.58	135.51	1332.06	168.01	1295.566	1345.73
08:17:21 AM.8803 2017/01/20	135	1296.44	135.51	1332.06	168.01	1295.566	1345.73
08:18:21 AM.8775 2017/01/20	135	1296.4	135.51	1332.06	168.01	1295.566	1345.73
08:19:21 AM.8756 2017/01/20	135	1296.42	135.51	1332.06	168.01	1295.566	1345.73
08:20:21 AM.8717 2017/01/20	135	1296.9	135.51	1332.06	168.01	1295.566	1345.73
08:21:21 AM.8679 2017/01/20	135	1296.68	135.51	1332.06	168.01	1295.566	1345.73
08:22:21 AM.8641 2017/01/20	135	1296.46	135.51	1332.06	168.01	1295.566	1345.73
08:23:21 AM.8651 2017/01/20	135	1296.52	135.51	1332.06	168.01	1295.566	1345.73
08:24:21 AM.8593 2017/01/20	135	1296.92	135.51	1332.06	168.01	1295.566	1345.73
08:25:21 AM.8591 2017/01/20	135	1296.3	135.51	1352.92	168.01	1295.566	1345.73
08:26:21 AM.8633 2017/01/20	135	1296.31	135.51	1352.92	168.01	1295.566	1345.73
08:27:21 AM.8666 2017/01/20	135	1296.36	135.51	1352.92	168.01	1295.566	1345.73
08:28:21 AM.8689 2017/01/20	135	1296.02	135.51	1352.92	168.01	1295.566	1345.73
08:29:21 AM.8732 2017/01/20	135	1296.04	135.51	1352.92	168.01	1295.566	1345.73
08:30:21 AM.8735 2017/01/20	135	1295.94	135.51	1352.92	168.01	1295.566	1345.73
08:31:21 AM.8768 2017/01/20	135	1296.48	135.51	1352.92	168.01	1295.566	1345.73
08:32:21 AM.8772 2017/01/20	135	1296.46	135.51	1352.92	168.01	1295.566	1345.73
08:33:21 AM.8804 2017/01/20	135	1296.13	135.51	1352.92	168.01	1295.566	1345.73
08:34:21 AM.8827 2017/01/20	135	1296.28	135.51	1352.92	168.01	1295.566	1345.73
08:35:21 AM.8860 2017/01/20	135	1295.89	135.51	1352.92	168.01	1295.566	1345.73
08:36:21 AM.8873 2017/01/20	135	1293.24	135.51	1352.92	168.01	1295.566	1345.73
08:37:21 AM.8965 2017/01/20	135	1293.8	135.51	1352.92	168.01	1295.566	1345.73
08:38:21 AM.8939 2017/01/20	135	1293.47	135.51	1352.92	168.01	1295.566	1345.73
08:39:21 AM.8972 2017/01/20	135	1293.75	135.51	1352.92	168.01	1295.566	1345.73
08:40:21 AM.8995 2017/01/20	135	1292.94	135.51	1352.92	168.01	1295.566	1345.73
08:41:21 AM.8998 2017/01/20	135	1292.95	135.51	1352.92	168.01	1295.566	1345.73
08:42:21 AM.9051 2017/01/20	135	1293.17	135.51	1352.92	168.01	1295.566	1345.73
08:43:21 AM.9064 2017/01/20	135	1292.99	135.51	1352.92	168.01	1295.566	1345.73
08:44:21 AM.9077 2017/01/20	267	1429.66	265.51	1487.02	223.01	502.4404	590.837
08:45:21 AM.9100 2017/01/20	267	1428.94	265.51	1487.02	223.01	502.4404	590.837
08:46:21 AM.9153 2017/01/20	267	1429.34	265.51	1487.02	223.01	502.4404	590.837
08:47:21 AM.9146 2017/01/20	267	1429.18	265.51	1487.02	223.01	502.4404	590.837
08:48:21 AM.9169 2017/01/20	267	1429.55	265.51	1487.02	223.01	502.4404	590.837
08:49:21 AM.9202 2017/01/20	267	1429.63	265.51	1487.02	223.01	502.4404	590.837
08:50:21 AM.9225 2017/01/20	267	1429.99	265.51	1487.02	223.01	502.4404	590.837
08:51:21 AM.9258 2017/01/20	267	1428.67	265.51	1487.02	223.01	502.4404	590.837

Time	Emulated Power (W)	System Power (W)	Non Averaged Baseline	Fluke logs	Averaged Baseline	Averaged System Power	Fluke averaged
08:52:21 AM.9281 2017/01/20	267	1429.12	265.51	1487.02	223.01	502.4404	590.837
08:53:21 AM.9285 2017/01/20	267	1428.76	265.51	1487.02	223.01	502.4404	590.837
08:54:21 AM.9308 2017/01/20	267	1428.91	265.51	1487.02	223.01	502.4404	590.837
08:55:21 AM.9321 2017/01/20	267	1428.92	265.51	1487.02	223.01	502.4404	590.837
08:56:21 AM.9354 2017/01/20	267	1428.47	265.51	1487.02	223.01	502.4404	590.837
08:57:21 AM.9377 2017/01/20	267	1429.64	265.51	1487.02	223.01	502.4404	590.837
08:58:21 AM.9390 2017/01/20	267	1428.86	265.51	1487.02	223.01	502.4404	590.837
08:59:21 AM.9433 2017/01/20	135	1292.64	135.51	1359	223.01	502.4404	590.837
09:00:21 AM.9465 2017/01/20	135	1292.26	135.51	1359	223.01	502.4404	590.837
09:01:21 AM.9596 2017/01/20	135	1293.1	135.51	1359	223.01	502.4404	590.837
09:02:21 AM.9521 2017/01/20	135	1292.82	135.51	1359	223.01	502.4404	590.837
09:03:21 AM.9769 2017/01/20	135	1292.71	135.51	1359	223.01	502.4404	590.837
09:04:21 AM.9802 2017/01/20	135	1292.48	135.51	1359	223.01	502.4404	590.837
09:05:21 AM.9893 2017/01/20	135	136.576	135.51	1359	223.01	502.4404	590.837
09:06:21 AM.9643 2017/01/20	135	136.86	135.51	1359	223.01	502.4404	590.837
09:07:21 AM.9851 2017/01/20	135	137.558	135.51	1359	223.01	502.4404	590.837
09:08:21 AM.9699 2017/01/20	135	1294.54	135.51	1359	223.01	502.4404	590.837
09:09:21 AM.9956 2017/01/20	135	136.92	135.51	243	223.01	502.4404	590.837
09:10:21 AM.9735 2017/01/20	135	137.198	135.51	243	223.01	502.4404	590.837
09:11:21 AM.9748 2017/01/20	135	137.586	135.51	243	223.01	502.4404	590.837
09:12:21 AM.9771 2017/01/20	135	136.801	135.51	243	223.01	502.4404	590.837
09:13:22 AM.0009 2017/01/20	135	137.116	135.51	243	223.01	502.4404	590.837
09:14:21 AM.9827 2017/01/20	192	195.699	190.51	243	223.01	502.4404	590.837
09:15:21 AM.9850 2017/01/20	192	194.837	190.51	243	223.01	502.4404	590.837
09:16:21 AM.9883 2017/01/20	192	195.269	190.51	243	223.01	502.4404	590.837
09:17:21 AM.9896 2017/01/20	192	194.827	190.51	243	223.01	502.4404	590.837
09:18:21 AM.9919 2017/01/20	192	194.743	190.51	243	223.01	502.4404	590.837
09:19:21 AM.9942 2017/01/20	192	194.212	190.51	243	223.01	502.4404	590.837
09:20:21 AM.9975 2017/01/20	192	195.254	190.51	243	223.01	502.4404	590.837
09:21:22 AM.0750 2017/01/20	192	194.473	190.51	243	223.01	502.4404	590.837
09:22:22 AM.0754 2017/01/20	192	195.324	190.51	243	223.01	502.4404	590.837
09:23:22 AM.0855 2017/01/20	192	195.161	190.51	243	223.01	502.4404	590.837
09:24:22 AM.0809 2017/01/20	192	193.251	190.51	243	223.01	502.4404	590.837
09:25:22 AM.0842 2017/01/20	192	193.237	190.51	243	223.01	502.4404	590.837
09:26:22 AM.0865 2017/01/20	192	193.301	190.51	243	223.01	502.4404	590.837
09:27:22 AM.0898 2017/01/20	192	193.544	190.51	243	223.01	502.4404	590.837
09:28:22 AM.0931 2017/01/20	192	193.588	190.51	243	223.01	502.4404	590.837
09:29:22 AM.0983 2017/01/20	321	327.128	320.51	366	223.01	502.4404	590.837
09:30:22 AM.1006 2017/01/20	321	326.491	320.51	366	223.01	502.4404	590.837
09:31:22 AM.1029 2017/01/20	321	326.779	320.51	366	223.01	502.4404	590.837

Time	Emulated Power (W)	System Power (W)	Non Averaged Baseline	Fluke logs	Averaged Baseline	Averaged System Power	Fluke averaged
09:32:22 AM.1257 2017/01/20	321	326.358	320.51	366	223.01	502.4404	590.837
09:33:22 AM.1075 2017/01/20	321	326.59	320.51	366	223.01	502.4404	590.837
09:34:22 AM.1401 2017/01/20	321	326.658	320.51	366	223.01	502.4404	590.837
09:35:22 AM.1131 2017/01/20	321	326.639	320.51	366	223.01	502.4404	590.837
09:36:22 AM.1164 2017/01/20	321	327.099	320.51	366	223.01	502.4404	590.837
09:37:22 AM.1207 2017/01/20	321	326.615	320.51	366	223.01	502.4404	590.837
09:38:22 AM.1230 2017/01/20	321	326.584	320.51	366	223.01	502.4404	590.837
09:39:22 AM.1233 2017/01/20	321	326.741	320.51	366	223.01	502.4404	590.837
09:40:22 AM.1266 2017/01/20	321	326.123	320.51	366	223.01	502.4404	590.837
09:41:22 AM.1328 2017/01/20	321	326.82	320.51	366	223.01	502.4404	590.837
09:42:22 AM.1312 2017/01/20	321	327.079	320.51	366	223.01	502.4404	590.837
09:43:22 AM.1384 2017/01/20	321	326.701	320.51	366	223.01	502.4404	590.837
09:44:22 AM.1407 2017/01/20	192	192.66	190.51	231	223.01	502.4404	590.837
09:45:22 AM.1420 2017/01/20	192	193.312	190.51	231	223.01	502.4404	590.837
09:46:22 AM.1443 2017/01/20	192	193.521	190.51	231	223.01	502.4404	590.837
09:47:22 AM.1447 2017/01/20	192	194.719	190.51	231	223.01	502.4404	590.837
09:48:22 AM.1499 2017/01/20	192	194.107	190.51	231	223.01	502.4404	590.837
09:49:22 AM.1493 2017/01/20	192	193.887	190.51	231	223.01	502.4404	590.837
09:50:22 AM.1535 2017/01/20	192	193.776	190.51	231	223.01	502.4404	590.837
09:51:22 AM.1559 2017/01/20	192	193.649	190.51	231	223.01	502.4404	590.837
09:52:22 AM.1601 2017/01/20	192	194.229	190.51	231	223.01	502.4404	590.837
09:53:22 AM.1605 2017/01/20	192	193.974	190.51	231	223.01	502.4404	590.837
09:54:22 AM.1618 2017/01/20	192	193.671	190.51	231	223.01	502.4404	590.837
09:55:22 AM.1641 2017/01/20	192	193.309	190.51	231	223.01	502.4404	590.837
09:56:22 AM.1683 2017/01/20	192	194.351	190.51	231	223.01	502.4404	590.837
09:57:22 AM.1716 2017/01/20	192	193.517	190.51	231	223.01	502.4404	590.837
09:58:22 AM.1720 2017/01/20	192	194.197	190.51	231	223.01	502.4404	590.837
09:59:22 AM.1987 2017/01/20	192	194.002	190.51	231	223.01	502.4404	590.837
10:00:22 AM.1776 2017/01/20	192	193.784	190.51	231	223.01	502.4404	590.837
10:01:22 AM.1799 2017/01/20	192	194.39	190.51	231	223.01	502.4404	590.837
10:02:22 AM.1831 2017/01/20	192	194.285	190.51	231	223.01	502.4404	590.837
10:03:22 AM.1855 2017/01/20	192	193.866	190.51	231	223.01	502.4404	590.837
10:04:22 AM.1897 2017/01/20	192	193.85	190.51	231	223.01	502.4404	590.837
10:05:22 AM.1910 2017/01/20	192	194.33	190.51	231	223.01	502.4404	590.837
10:06:22 AM.1943 2017/01/20	192	194.015	190.51	231	223.01	502.4404	590.837
10:07:22 AM.1976 2017/01/20	192	194.479	190.51	231	223.01	502.4404	590.837
10:08:22 AM.1989 2017/01/20	192	194.634	190.51	231	223.01	502.4404	590.837
10:09:22 AM.2022 2017/01/20	192	193.734	190.51	231	223.01	502.4404	590.837
10:10:22 AM.2045 2017/01/20	192	194.068	190.51	231	223.01	502.4404	590.837
10:11:22 AM.1951 2017/01/20	192	193.577	190.51	231	223.01	502.4404	590.837

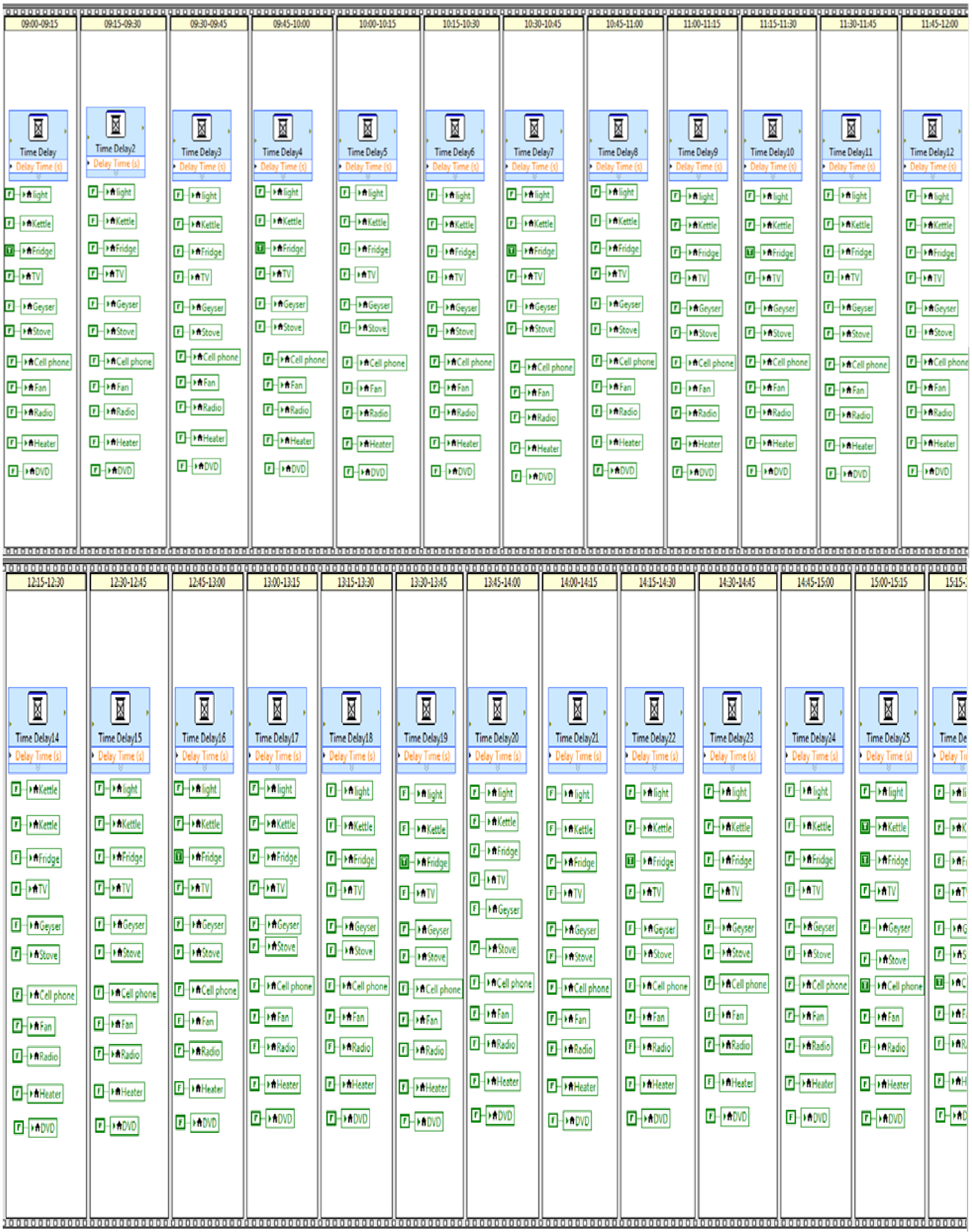
Time	Emulated Power (W)	System Power (W)	Non Averaged Baseline	Fluke logs	Averaged Baseline	Averaged System Power	Fluke averaged
10:12:22 AM.1738 2017/01/20	192	193.761	190.51	231	223.01	502.4404	590.837
10:13:22 AM.1515 2017/01/20	192	194.048	190.51	231	223.01	502.4404	590.837
10:14:22 AM.1566 2017/01/20	2322	2325.48	2320.51	2373	2255.51	1778.205	1829.85
10:15:22 AM.1079 2017/01/20	2322	2324.75	2320.51	2373	2255.51	1778.205	1829.85
10:16:22 AM.0925 2017/01/20	2322	2324.24	2320.51	2373	2255.51	1778.205	1829.85
10:17:22 AM.0825 2017/01/20	2322	2319.55	2320.51	2373	2255.51	1778.205	1829.85
10:18:22 AM.0725 2017/01/20	2322	2320.11	2320.51	2373	2255.51	1778.205	1829.85
10:19:22 AM.0616 2017/01/20	2322	2323.04	2320.51	2373	2255.51	1778.205	1829.85
10:20:22 AM.0536 2017/01/20	2322	2323.66	2320.51	2373	2255.51	1778.205	1829.85
10:21:22 AM.0465 2017/01/20	2322	2324.03	2320.51	2373	2255.51	1778.205	1829.85
10:22:22 AM.0427 2017/01/20	2322	2323.08	2320.51	2373	2255.51	1778.205	1829.85
10:23:22 AM.0418 2017/01/20	2322	2323	2320.51	2373	2255.51	1778.205	1829.85
10:24:22 AM.0360 2017/01/20	2322	2323.95	2320.51	2373	2255.51	1778.205	1829.85
10:25:22 AM.0321 2017/01/20	2322	2323.09	2320.51	2373	2255.51	1778.205	1829.85
10:26:22 AM.0302 2017/01/20	2322	2323.29	2320.51	2373	2255.51	1778.205	1829.85
10:27:22 AM.0254 2017/01/20	2322	2323	2320.51	2373	2255.51	1778.205	1829.85
10:28:22 AM.0226 2017/01/20	2322	2323.15	2320.51	2373	2255.51	1778.205	1829.85
10:29:22 AM.0207 2017/01/20	2190	2193.04	2190.51	2244	2255.51	1778.205	1829.85
10:30:22 AM.0149 2017/01/20	2190	2193.32	2190.51	2244	2255.51	1778.205	1829.85
10:31:22 AM.0101 2017/01/20	2190	2193.6	2190.51	2244	2255.51	1778.205	1829.85
10:32:22 AM.0062 2017/01/20	2190	2192.98	2190.51	2244	2255.51	1778.205	1829.85
10:33:22 AM.0034 2017/01/20	2190	2192.98	2190.51	2244	2255.51	1778.205	1829.85
10:34:22 AM.0005 2017/01/20	2190	2193.17	2190.51	2244	2255.51	1778.205	1829.85
10:35:21 AM.9957 2017/01/20	2190	2194.59	2190.51	2244	2255.51	1778.205	1829.85
10:36:21 AM.9957 2017/01/20	2190	2194.17	2190.51	2244	2255.51	1778.205	1829.85
10:37:21 AM.9981 2017/01/20	2190	2194.37	2190.51	2244	2255.51	1778.205	1829.85
10:38:21 AM.9994 2017/01/20	2190	2194.15	2190.51	2244	2255.51	1778.205	1829.85
10:39:22 AM.0017 2017/01/20	2190	2193.83	2190.51	2244	2255.51	1778.205	1829.85
10:40:22 AM.0059 2017/01/20	2190	2193.99	2190.51	2244	2255.51	1778.205	1829.85
10:41:22 AM.0063 2017/01/20	2190	2194.55	2190.51	2244	2255.51	1778.205	1829.85
10:42:22 AM.0096 2017/01/20	2190	2194.07	2190.51	2244	2255.51	1778.205	1829.85
10:43:22 AM.0148 2017/01/20	2190	2193.98	2190.51	2244	2255.51	1778.205	1829.85
10:44:22 AM.0132 2017/01/20	2190	2194.73	2190.51	2244	2255.51	1778.205	1829.85
10:45:22 AM.0194 2017/01/20	2190	2194.49	2190.51	2253	2255.51	1778.205	1829.85
10:46:22 AM.0168 2017/01/20	2190	2194.36	2190.51	2253	2255.51	1778.205	1829.85
10:47:22 AM.0211 2017/01/20	2190	2193.89	2190.51	2253	2255.51	1778.205	1829.85
10:48:22 AM.0224 2017/01/20	2190	2194.15	2190.51	2253	2255.51	1778.205	1829.85
10:49:22 AM.0237 2017/01/20	2190	2193.59	2190.51	2253	2255.51	1778.205	1829.85
10:50:22 AM.0280 2017/01/20	2190	2194.45	2190.51	2253	2255.51	1778.205	1829.85
10:51:22 AM.0313 2017/01/20	2190	2194.47	2190.51	2253	2255.51	1778.205	1829.85

Time	Emulated Power (W)	System Power (W)	Non Averaged Baseline	Fluke logs	Averaged Baseline	Averaged System Power	Fluke averaged
10:52:22 AM.0375 2017/01/20	2190	2194.33	2190.51	2253	2255.51	1778.205	1829.85
10:53:22 AM.0339 2017/01/20	2190	2194.27	2190.51	2253	2255.51	1778.205	1829.85
10:54:22 AM.0353 2017/01/20	2190	2194.22	2190.51	2253	2255.51	1778.205	1829.85
10:55:22 AM.0385 2017/01/20	2190	2193.86	2190.51	2253	2255.51	1778.205	1829.85
10:56:22 AM.0408 2017/01/20	2190	2194.17	2190.51	2253	2255.51	1778.205	1829.85
10:57:22 AM.0461 2017/01/20	2190	2194.91	2190.51	2253	2255.51	1778.205	1829.85
10:58:22 AM.0445 2017/01/20	2190	2194.73	2190.51	2253	2255.51	1778.205	1829.85
10:59:22 AM.0487 2017/01/20	2396	400.939	2320.51	450	2255.51	1778.205	1829.85
11:00:22 AM.0491 2017/01/20	2396	400.717	2320.51	450	2255.51	1778.205	1829.85
11:01:22 AM.0553 2017/01/20	2396	401.262	2320.51	450	2255.51	1778.205	1829.85
11:02:22 AM.0557 2017/01/20	2396	401.571	2320.51	450	2255.51	1778.205	1829.85
11:03:22 AM.0570 2017/01/20	2396	402.318	2320.51	450	2255.51	1778.205	1829.85
11:04:22 AM.0593 2017/01/20	2396	401.686	2320.51	450	2255.51	1778.205	1829.85
11:05:22 AM.0616 2017/01/20	2396	402.03	2320.51	450	2255.51	1778.205	1829.85
11:06:22 AM.0639 2017/01/20	2396	401.775	2320.51	450	2255.51	1778.205	1829.85
11:07:22 AM.0662 2017/01/20	2396	401.721	2320.51	450	2255.51	1778.205	1829.85
11:08:22 AM.0675 2017/01/20	2396	401.559	2320.51	450	2255.51	1778.205	1829.85
11:09:22 AM.0708 2017/01/20	2396	401.584	2320.51	450	2255.51	1778.205	1829.85
11:10:22 AM.0731 2017/01/20	2396	401.421	2320.51	450	2255.51	1778.205	1829.85
11:11:22 AM.0754 2017/01/20	2396	401.658	2320.51	450	2255.51	1778.205	1829.85
11:12:22 AM.0777 2017/01/20	2396	401.943	2320.51	450	2255.51	1778.205	1829.85
11:13:22 AM.0810 2017/01/20	2396	401.29	2320.51	450	2255.51	1778.205	1829.85
11:14:22 AM.0823 2017/01/20	2927	937.711	2940.51	984	1973.01	989.0633	1037.55
11:15:22 AM.0846 2017/01/20	2927	938.4	2940.51	984	1973.01	989.0633	1037.55
11:16:22 AM.0860 2017/01/20	2927	937.347	2940.51	984	1973.01	989.0633	1037.55
11:17:22 AM.0892 2017/01/20	2927	937.923	2940.51	984	1973.01	989.0633	1037.55
11:18:22 AM.0925 2017/01/20	2927	937.189	2940.51	984	1973.01	989.0633	1037.55
11:19:22 AM.0938 2017/01/20	2927	937.162	2940.51	984	1973.01	989.0633	1037.55
11:20:22 AM.0961 2017/01/20	2927	936.948	2940.51	984	1973.01	989.0633	1037.55
11:21:22 AM.0984 2017/01/20	2927	938.391	2940.51	984	1973.01	989.0633	1037.55
11:22:22 AM.1008 2017/01/20	2927	937.377	2940.51	984	1973.01	989.0633	1037.55
11:23:22 AM.1031 2017/01/20	2927	938.004	2940.51	984	1973.01	989.0633	1037.55
11:24:22 AM.1063 2017/01/20	2927	937.825	2940.51	984	1973.01	989.0633	1037.55
11:25:22 AM.1077 2017/01/20	2927	937.843	2940.51	984	1973.01	989.0633	1037.55
11:26:22 AM.1100 2017/01/20	2927	937.499	2940.51	984	1973.01	989.0633	1037.55
11:27:22 AM.1133 2017/01/20	2927	937.322	2940.51	984	1973.01	989.0633	1037.55
11:28:22 AM.1136 2017/01/20	2927	937.963	2940.51	984	1973.01	989.0633	1037.55
11:29:22 AM.1179 2017/01/20	1071	952.46	1071	999	1973.01	989.0633	1037.55
11:30:22 AM.1202 2017/01/20	1071	952.853	1071	999	1973.01	989.0633	1037.55
11:31:22 AM.1234 2017/01/20	1071	953.373	1071	999	1973.01	989.0633	1037.55

Time	Emulated Power (W)	System Power (W)	Non Averaged Baseline	Fluke logs	Averaged Baseline	Averaged System Power	Fluke averaged
11:32:22 AM.1257 2017/01/20	1071	953.017	1071	999	1973.01	989.0633	1037.55
11:33:22 AM.1271 2017/01/20	1071	952.812	1071	999	1973.01	989.0633	1037.55
11:34:22 AM.1284 2017/01/20	1071	953.018	1071	999	1973.01	989.0633	1037.55
11:35:22 AM.1307 2017/01/20	1071	953.476	1071	999	1973.01	989.0633	1037.55
11:36:22 AM.1330 2017/01/20	1071	953.241	1071	999	1973.01	989.0633	1037.55
11:37:22 AM.1373 2017/01/20	1071	953.381	1071	999	1973.01	989.0633	1037.55
11:38:22 AM.1386 2017/01/20	1071	952.616	1071	999	1973.01	989.0633	1037.55
11:39:22 AM.1409 2017/01/20	1071	952.96	1071	999	1973.01	989.0633	1037.55
11:40:22 AM.1432 2017/01/20	1071	953.57	1071	999	1973.01	989.0633	1037.55
11:41:22 AM.1455 2017/01/20	1071	952.936	1071	999	1973.01	989.0633	1037.55
11:42:22 AM.1517 2017/01/20	1071	952.739	1071	999	1973.01	989.0633	1037.55
11:43:22 AM.1491 2017/01/20	1071	953.108	1071	999	1973.01	989.0633	1037.55
11:44:22 AM.1505 2017/01/20	1071	1083.71	1071	1134	1973.01	989.0633	1037.55
11:45:22 AM.1577 2017/01/20	1071	1081.65	1071	1134	1973.01	989.0633	1037.55
11:46:22 AM.1560 2017/01/20	1071	1081.88	1071	1134	1973.01	989.0633	1037.55
11:47:22 AM.1584 2017/01/20	1071	1081.41	1071	1134	1973.01	989.0633	1037.55
11:48:22 AM.1607 2017/01/20	1071	1081.87	1071	1134	1973.01	989.0633	1037.55
11:49:22 AM.1630 2017/01/20	1071	1081.63	1071	1134	1973.01	989.0633	1037.55
11:50:22 AM.1662 2017/01/20	1071	1081.26	1071	1134	1973.01	989.0633	1037.55
11:51:22 AM.1676 2017/01/20	1071	1081.48	1071	1134	1973.01	989.0633	1037.55
11:52:22 AM.1699 2017/01/20	1071	1081.1	1071	1134	1973.01	989.0633	1037.55
11:53:22 AM.1732 2017/01/20	1071	1081.4	1071	1134	1973.01	989.0633	1037.55
11:54:22 AM.1745 2017/01/20	1071	1081.29	1071	1134	1973.01	989.0633	1037.55
11:55:22 AM.1787 2017/01/20	1071	1081.4	1071	1134	1973.01	989.0633	1037.55
11:56:22 AM.1791 2017/01/20	1071	1081.18	1071	1134	1973.01	989.0633	1037.55
11:57:22 AM.1814 2017/01/20	1071	1081.32	1071	1134	1973.01	989.0633	1037.55
11:58:22 AM.1837 2017/01/20	1071	1081.37	1071	1134	1973.01	989.0633	1037.55
11:59:22 AM.1860 2017/01/20	942	950.627	941.5	1005	1973.01	989.0633	1037.55
12:00:22 PM.1893 2017/01/20	942	950.934	941.5	1005	1973.01	989.0633	1037.55
12:01:22 PM.1906 2017/01/20	942	950.33	941.5	1005	1973.01	975.1746	1005
12:02:22 PM.1929 2017/01/20	942	951.184	941.5	1005	1973.01	975.1746	1005
12:03:22 PM.1972 2017/01/20	942	950.389	941.5	1005	1973.01	975.1746	1005
12:04:22 PM.1975 2017/01/20	942	950.891	941.5	1005	1973.01	975.1746	1005
12:05:22 PM.1998 2017/01/20	942	951.062	941.5	1005	1973.01	975.1746	1005
12:06:22 PM.2021 2017/01/20	942	950.419	941.5	1005	1973.01	975.1746	1005
12:07:22 PM.2044 2017/01/20	942	950.671	941.5	1005	1973.01	975.1746	1005
12:08:22 PM.2058 2017/01/20	942	951.219	941.5	1005	1973.01	975.1746	1005
12:09:22 PM.2090 2017/01/20	942	951.173	941.5	1005	1973.01	975.1746	1005
12:10:22 PM.2104 2017/01/20	942	951.398	941.5	1005	1973.01	975.1746	1005
12:11:22 PM.2146 2017/01/20	942	951.477	941.5	1005	1973.01	975.1746	1005

Time	Emulated Power (W)	System Power (W)	Non Averaged Baseline	Fluke logs	Averaged Baseline	Averaged System Power	Fluke averaged
12:12:22 PM.2160 2017/01/20	942	950.783	941.5	1005	1973.01	975.1746	1005
12:13:22 PM.2192 2017/01/20	942	951.432	941.5	1005	1973.01	975.1746	1005
12:14:22 PM.2206 2017/01/20	948	957.476	947.25	1005	979.75	975.1746	1005
12:15:22 PM.2238 2017/01/20	948	950.934	947.25	1005	979.75	975.1746	1005
12:16:22 PM.2252 2017/01/20	948	950.33	947.25	1005	979.75	975.1746	1005
12:17:22 PM.2265 2017/01/20	948	951.184	947.25	1005	979.75	975.1746	1005
12:18:22 PM.2298 2017/01/20	948	950.389	947.25	1005	979.75	975.1746	1005
12:19:22 PM.2545 2017/01/20	948	950.891	947.25	1005	979.75	975.1746	1005
12:20:22 PM.2354 2017/01/20	948	951.062	947.25	1005	979.75	975.1746	1005
12:21:22 PM.2377 2017/01/20	948	950.419	947.25	1005	979.75	975.1746	1005
12:22:22 PM.2400 2017/01/20	948	950.671	947.25	1005	979.75	975.1746	1005
12:23:22 PM.2423 2017/01/20	948	951.219	947.25	1005	979.75	975.1746	1005
12:24:22 PM.2446 2017/01/20	948	951.173	947.25	1005	979.75	975.1746	1005
12:25:22 PM.2459 2017/01/20	948	951.398	947.25	1005	979.75	975.1746	1005
12:26:22 PM.2492 2017/01/20	948	951.477	947.25	1005	979.75	975.1746	1005
12:27:22 PM.2505 2017/01/20	948	950.783	947.25	1005	979.75	975.1746	1005
12:28:22 PM.2538 2017/01/20	948	951.432	947.25	1005	979.75	975.1746	1005
12:29:22 PM.2561 2017/01/20	1077	1087.16	1077.25	1005	979.75	975.1746	1005
12:30:22 PM.2574 2017/01/20	1077	1087.38	1077.25	1005	979.75	975.1746	1005
12:31:22 PM.2802 2017/01/20	1077	1087.16	1077.25	1005	979.75	975.1746	1005
12:32:22 PM.2630 2017/01/20	1077	1086.97	1077.25	1005	979.75	975.1746	1005
12:33:22 PM.2643 2017/01/20	1077	1087.17	1077.25	1005	979.75	975.1746	1005
12:34:22 PM.2676 2017/01/20	1077	1086.83	1077.25	1005	979.75	975.1746	1005

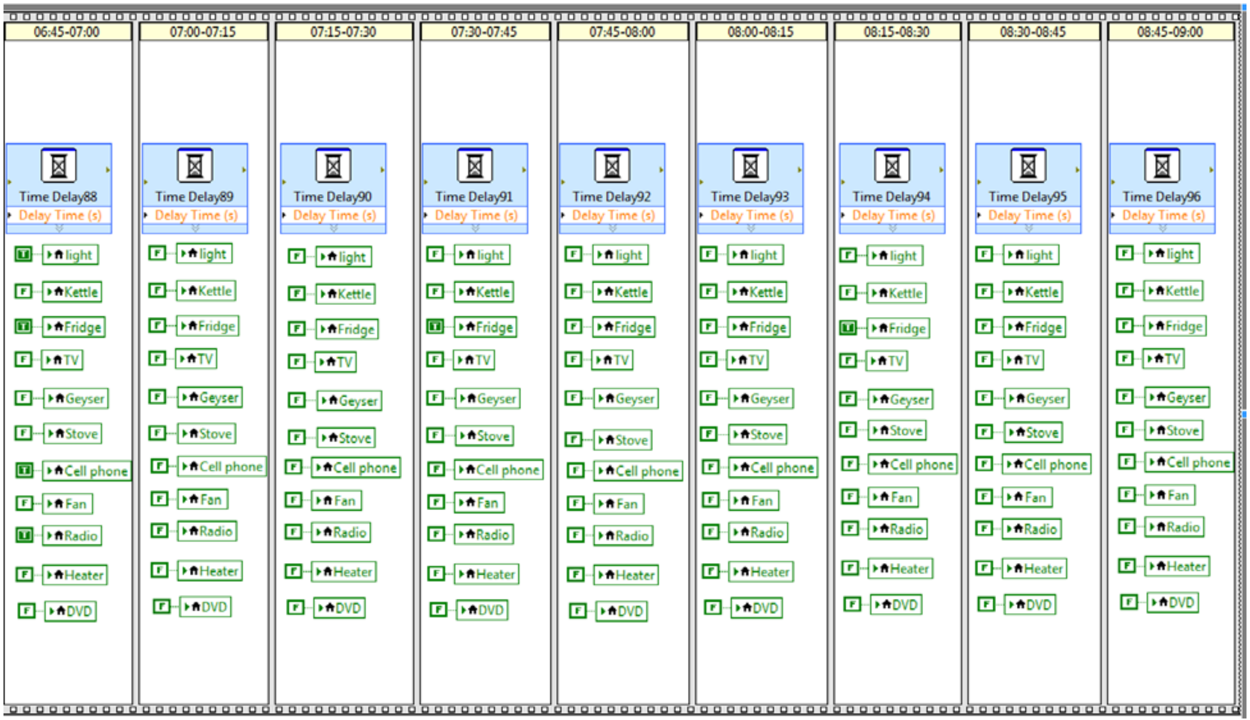
Appendix I: Flat sequence of 24 hour load profile development




15:15-15:30
15:30-15:45
15:45-16:00
16:00-16:15
16:15-16:30
16:30-16:45
16:45-17:00
17:00-17:15
17:15-17:30
17:30-17:45
17:45-18:00
18:00-18:15
Time Delay26
Time Delay27
Time Delay28
Time Delay29
Time Delay30
Time Delay31
Time Delay32
Time Delay33
Time Delay34
Time Delay35
Time Delay36
Time Delay37
Delay Time (s)
light
Kettle
Fridge
TV
Geyser
Stove
Cell phone
Fan
Radio
Heater
DVD
18:15-18:30
18:30-18:45
18:45-19:00
19:00-19:15
19:15-19:30
19:30-19:45
19:45-20:00
20:00-20:15
20:15-20:30
20:30-20:45
20:45-21:00
21:00-21:15
Time Delay38
Time Delay39
Time Delay40
Time Delay41
Time Delay42
Time Delay43
Time Delay44
Time Delay45
Time Delay46
Time Delay47
Time Delay48
Time Delay49


20:15-20:30
20:30-20:45
20:45-21:00
21:00-21:15
21:15-21:30
21:30-21:45
21:45-22:00
22:00-22:15
22:15-22:30
22:30-22:45
22:45-23:00
23:00-23:15
Time Delay46
Time Delay47
Time Delay48
Time Delay49
Time Delay50
Time Delay51
Time Delay52
Time Delay53
Time Delay54
Time Delay55
Time Delay56
Time Delay57
23:15-23:30
23:30-23:45
23:45-00:00
00:00-00:15
00:15-00:30
00:30-00:45
00:45-01:00
01:00-01:15
01:15-01:30
01:30-01:45
01:45-02:00
02:00-02:15
Time Delay58
Time Delay59
Time Delay60
Time Delay61
Time Delay62
Time Delay63
Time Delay64
Time Delay65
Time Delay66
Time Delay67
Time Delay68
Time Delay69
Delay Time (s)
light
Kettle
Fridge
TV
Geyser
Stove
Cell phone
Fan
Radio
Heater
DVD


02:15-02:30
02:30-02:45
02:45-03:00
03:00-03:15
03:15-03:30
03:30-03:45
03:45-04:00
04:00-04:15
04:15-04:30
04:30-04:45
04:45-05:00
05:00-05:15
Time Delay70
Time Delay71
Time Delay72
Time Delay73
Time Delay74
Time Delay75
Time Delay76
Time Delay77
Time Delay78
Time Delay79
Time Delay80
Time Delay81
Delay Time (s)
light
Kettle
Fridge
TV
Geyser
Stove
Cell phone
Fan
Radio
Heater
DVD
05:15-05:30
05:30-05:45
05:45-06:00
06:00-06:15
06:15-06:30
06:30-06:45
06:45-07:00
07:00-07:15
07:15-07:30
07:30-07:45
07:45-08:00
08:00-08:15
Time Delay82
Time Delay83
Time Delay84
Time Delay85
Time Delay86
Time Delay87
Time Delay88
Time Delay89
Time Delay90
Time Delay91
Time Delay92
Time Delay93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07:00-07:15
07:15-07:30
07:30-07:45
07:45-08:00
08:00-08:15
08:15-08:30
08:30-08:45
08:45-09:00
Time Delay88
Time Delay89
Time Delay90
Time Delay91
Time Delay92
Time Delay93
Time Delay94
Time Delay95
Time Delay96
Delay Time (s)
light
Kettle
Fridge
TV
Geyser
Stove
Cell phone
Fan
Radio
Heater
DVD

Appendix J: Fluke 43 power logs for evening with valley filling applied

Title	Record 1	Voltage		Title	Record 2	Current	
ID	1			ID	1		
Type	MinAvgMax			Type	MinAvgMax		
Date	1/20/2017			Date	1/20/2017		
Time	10:17:39			Time	10:17:39		
X Scale	1.44E+04			X Scale	1.44E+04		
X At 0%	0.00E+00			X At 0%	0.00E+00		
X Resolution	2.81E+01			X Resolution	2.81E+01		
X Size	17			X Size	17		
X Unit	s			X Unit	s		
X Label	4 h/Div			X Label	4 h/Div		
Y Scale	1.00E+02			Y Scale	2.00E+00		
Y At 50%	1.50E+02			Y At 50%	3.00E+00		
Y Resolution	1.00E+03			Y Resolution	2.00E+02		
Y Size	65536			Y Size	65536		
Y Unit	V			Y Unit	A		
Y Label	V			Y Label	A		
5.12E+02	2.98E+02	2.98E+02	2.98E+02	5.12E+02	4.46E+00	4.46E+00	4.47E+00
1.02E+03	2.98E+02	2.98E+02	2.98E+02	1.02E+03	4.46E+00	4.50E+00	4.54E+00
1.54E+03	2.98E+02	2.98E+02	2.98E+02	1.54E+03	4.53E+00	4.77E+00	4.99E+00
2.05E+03	2.98E+02	2.98E+02	2.98E+02	2.05E+03	4.98E+00	4.98E+00	4.99E+00
2.56E+03	2.98E+02	2.98E+02	3.00E+02	2.56E+03	6.10E-01	4.17E+00	4.99E+00
3.07E+03	2.99E+02	3.00E+02	3.00E+02	3.07E+03	6.10E-01	1.17E+00	4.53E+00
3.58E+03	3.00E+02	3.00E+02	3.00E+02	3.58E+03	8.00E-01	8.00E-01	8.10E-01
4.10E+03	3.00E+02	3.00E+02	3.00E+02	4.10E+03	7.80E-01	8.90E-01	1.22E+00
4.61E+03	3.00E+02	3.00E+02	3.00E+02	4.61E+03	1.22E+00	1.22E+00	1.22E+00
5.12E+03	3.00E+02	3.00E+02	3.00E+02	5.12E+03	7.70E-01	9.90E-01	1.22E+00
5.63E+03	3.00E+02	3.00E+02	3.00E+02	5.63E+03	7.70E-01	7.70E-01	7.70E-01
6.14E+03	3.00E+02	3.00E+02	3.00E+02	6.14E+03	7.70E-01	7.70E-01	7.70E-01
6.66E+03	3.00E+02	3.00E+02	3.00E+02	6.66E+03	7.60E-01	7.60E-01	7.70E-01
5.12E+02	3.00E+02	3.00E+02	3.00E+02	5.12E+02	7.47E+00	7.59E+00	7.91E+00
1.02E+03	3.00E+02	3.00E+02	3.00E+02	1.02E+03	7.47E+00	7.47E+00	7.48E+00
1.54E+03	3.00E+02	3.00E+02	3.00E+02	1.54E+03	7.47E+00	7.48E+00	7.48E+00
2.05E+03	3.00E+02	3.00E+02	3.00E+02	2.05E+03	1.49E+00	6.19E+00	7.51E+00
2.56E+03	3.00E+02	3.00E+02	3.00E+02	2.56E+03	1.49E+00	1.49E+00	1.50E+00
3.07E+03	3.00E+02	3.00E+02	3.00E+02	3.07E+03	1.49E+00	2.30E+00	3.28E+00
3.58E+03	3.00E+02	3.00E+02	3.00E+02	3.58E+03	3.27E+00	3.28E+00	3.28E+00

Title	**Record 1**	**Voltage**		**Title**	**Record 2**	**Current**	
ID	**1**			**ID**	**1**		
Type	**MinAvgMax**			**Type**	**MinAvgMax**		
Date	**1/20/2017**			**Date**	**1/20/2017**		
Time	**10:17:39**			**Time**	**10:17:39**		
X Scale	**1.44E+04**			**X Scale**	**1.44E+04**		
X At 0%	**0.00E+00**			**X At 0%**	**0.00E+00**		
X Resolution	**2.81E+01**			**X Resolution**	**2.81E+01**		
X Size	**17**			**X Size**	**17**		
X Unit	**s**			**X Unit**	**s**		
X Label	**4 h/Div**			**X Label**	**4 h/Div**		
Y Scale	**1.00E+02**			**Y Scale**	**2.00E+00**		
Y At 50%	**1.50E+02**			**Y At 50%**	**3.00E+00**		
Y Resolution	**1.00E+03**			**Y Resolution**	**2.00E+02**		
Y Size	**65536**			**Y Size**	**65536**		
Y Unit	**V**			**Y Unit**	**A**		
Y Label	**V**			**Y Label**	**A**		
4.10E+03	**3.00E+02**	**3.00E+02**	**3.00E+02**	**4.10E+03**	**3.28E+00**	**3.31E+00**	**3.33E+00**
4.61E+03	**3.00E+02**	**3.00E+02**	**3.00E+02**	**4.61E+03**	**3.33E+00**	**3.33E+00**	**3.33E+00**
5.12E+03	**3.00E+02**	**3.00E+02**	**3.00E+02**	**5.12E+03**	**3.33E+00**	**3.74E+00**	**3.78E+00**
5.63E+03	**3.00E+02**	**3.00E+02**	**3.00E+02**	**5.63E+03**	**3.34E+00**	**3.69E+00**	**3.78E+00**
6.14E+03	**3.00E+02**	**3.00E+02**	**3.00E+02**	**6.14E+03**	**3.34E+00**	**3.34E+00**	**3.35E+00**
6.66E+03	**2.98E+02**	**2.99E+02**	**3.00E+02**	**6.66E+03**	**3.34E+00**	**4.99E+00**	**7.29E+00**
7.17E+03	**2.98E+02**	**2.98E+02**	**2.98E+02**	**7.17E+03**	**7.27E+00**	**7.27E+00**	**7.28E+00**
7.68E+03	**2.98E+02**	**2.99E+02**	**3.00E+02**	**7.68E+03**	**3.37E+00**	**5.25E+00**	**7.72E+00**

Appendix K: Fluke 43 power logs for morning with valley filling applied

Title	Record 1	Voltage		Title	Record 2	Current	
ID	1			ID	1		
Type	MinAvgMax			Type	MinAvgMax		
Date	1/27/2017			Date	1/27/2017		
Time	10:13:30			Time	10:13:30		
X Scale	3.60E+03			X Scale	3.60E+03		
X At 0%	0.00E+00			X At 0%	0.00E+00		
X Resolution	2.81E+01			X Resolution	2.81E+01		
X Size	128			X Size	128		
X Unit	s			X Unit	s		
X Label	1 h/Div			X Label	1 h/Div		
Y Scale	1.00E+02			Y Scale	5.00E+00		
Y At 50%	1.50E+02			Y At 50%	7.50E+00		
Y Resolution	1.00E+03			Y Resolution	5.00E+02		
Y Size	65536			Y Size	65536		
Y Unit	V			Y Unit	A		
Y Label	V			Y Label	A		
0.00E+00	3.00E+02	3.00E+02	3.00E+02	0.00E+00	1.60E-01	1.60E-01	1.60E-01
1.28E+02	3.00E+02	3.00E+02	3.00E+02	1.28E+02	1.60E-01	1.60E-01	1.60E-01
2.56E+02	3.00E+02	3.00E+02	3.00E+02	2.56E+02	1.60E-01	1.60E-01	1.60E-01
3.84E+02	3.00E+02	3.00E+02	3.00E+02	3.84E+02	1.60E-01	1.60E-01	1.60E-01
5.12E+02	3.00E+02	3.00E+02	3.00E+02	5.12E+02	1.60E-01	1.60E-01	1.60E-01
6.40E+02	3.00E+02	3.00E+02	3.00E+02	6.40E+02	1.60E-01	1.60E-01	1.60E-01
7.68E+02	3.00E+02	3.00E+02	3.00E+02	7.68E+02	1.60E-01	1.60E-01	1.60E-01
8.96E+02	2.98E+02	2.99E+02	3.00E+02	8.96E+02	1E+308	1E+308	1E+308
1.02E+03	2.98E+02	2.98E+02	2.98E+02	1.02E+03	6.92E+00	6.92E+00	6.92E+00
1.15E+03	2.98E+02	2.98E+02	2.98E+02	1.15E+03	6.92E+00	6.92E+00	6.92E+00
1.28E+03	2.98E+02	2.98E+02	2.98E+02	1.28E+03	6.92E+00	6.92E+00	6.92E+00
1.41E+03	2.98E+02	3.00E+02	3.00E+02	1.41E+03	3.01E+00	4.27E+00	6.92E+00
1.54E+03	3.00E+02	3.00E+02	3.00E+02	1.54E+03	3.01E+00	3.15E+00	6.93E+00
1.66E+03	2.99E+02	3.00E+02	3.00E+02	1.66E+03	3.01E+00	3.75E+00	6.93E+00
1.79E+03	2.99E+02	3.00E+02	3.00E+02	1.79E+03	3.01E+00	3.47E+00	7.36E+00
1.92E+03	2.99E+02	3.00E+02	3.00E+02	1.92E+03	3.44E+00	4.17E+00	7.36E+00
2.05E+03	3.00E+02	3.00E+02	3.00E+02	2.05E+03	3.44E+00	3.51E+00	7.36E+00
2.18E+03	2.98E+02	3.00E+02	3.00E+02	2.18E+03	3.44E+00	4.91E+00	7.36E+00
2.30E+03	3.00E+02	3.00E+02	3.00E+02	2.30E+03	3.44E+00	3.44E+00	3.45E+00
2.43E+03	2.99E+02	3.00E+02	3.00E+02	2.43E+03	3.44E+00	3.80E+00	7.36E+00
2.56E+03	2.99E+02	3.00E+02	3.00E+02	2.56E+03	3.44E+00	3.80E+00	7.36E+00

Title	Record 1	Voltage		Title	Record 2	Current	
ID	1			ID	1		
Type	MinAvgMax			Type	MinAvgMax		
Date	1/27/2017			Date	1/27/2017		
Time	10:13:30			Time	10:13:30		
X Scale	3.60E+03			X Scale	3.60E+03		
X At 0%	0.00E+00			X At 0%	0.00E+00		
X Resolution	2.81E+01			X Resolution	2.81E+01		
X Size	128			X Size	128		
X Unit	s			X Unit	s		
X Label	1 h/Div			X Label	1 h/Div		
Y Scale	1.00E+02			Y Scale	5.00E+00		
Y At 50%	1.50E+02			Y At 50%	7.50E+00		
Y Resolution	1.00E+03			Y Resolution	5.00E+02		
Y Size	65536			Y Size	65536		
Y Unit	V			Y Unit	A		
Y Label	V			Y Label	A		
2.69E+03	2.99E+02	3.00E+02	3.00E+02	2.69E+03	3.01E+00	3.71E+00	6.93E+00
2.82E+03	3.00E+02	3.00E+02	3.00E+02	2.82E+03	3.01E+00	3.16E+00	6.93E+00
2.94E+03	2.99E+02	3.00E+02	3.00E+02	2.94E+03	3.01E+00	4.03E+00	6.93E+00
3.07E+03	2.99E+02	3.00E+02	3.00E+02	3.07E+03	3.02E+00	3.25E+00	6.95E+00
3.20E+03	2.99E+02	3.00E+02	3.00E+02	3.20E+03	3.03E+00	3.56E+00	6.94E+00
3.33E+03	2.99E+02	3.00E+02	3.00E+02	3.33E+03	3.03E+00	4.02E+00	6.95E+00
3.46E+03	3.00E+02	3.00E+02	3.00E+02	3.46E+03	3.03E+00	3.09E+00	6.94E+00
3.58E+03	2.99E+02	3.00E+02	3.00E+02	3.58E+03	3.03E+00	3.51E+00	6.95E+00
3.71E+03	3.00E+02	3.00E+02	3.00E+02	3.71E+03	3.03E+00	3.16E+00	6.95E+00
3.84E+03	2.99E+02	3.00E+02	3.00E+02	3.84E+03	3.03E+00	3.93E+00	6.95E+00
3.97E+03	3.00E+02	3.00E+02	3.00E+02	3.97E+03	3.03E+00	3.03E+00	3.03E+00
4.10E+03	2.99E+02	3.00E+02	3.00E+02	4.10E+03	3.03E+00	3.73E+00	6.95E+00
4.22E+03	2.99E+02	3.00E+02	3.00E+02	4.22E+03	3.03E+00	3.46E+00	6.94E+00
4.35E+03	3.00E+02	3.00E+02	3.00E+02	4.35E+03	3.03E+00	3.24E+00	6.94E+00
4.48E+03	3.00E+02	3.00E+02	3.00E+02	4.48E+03	1E+308	1E+308	1E+308
4.61E+03	3.00E+02	3.00E+02	3.00E+02	4.61E+03	1.01E+01	1.01E+01	1.01E+01
4.74E+03	3.00E+02	3.00E+02	3.00E+02	4.74E+03	1.01E+01	1.01E+01	1.01E+01
4.86E+03	3.00E+02	3.00E+02	3.00E+02	4.86E+03	1.01E+01	1.01E+01	1.01E+01
4.99E+03	3.00E+02	3.00E+02	3.00E+02	4.99E+03	1.01E+01	1.01E+01	1.01E+01
5.12E+03	3.00E+02	3.00E+02	3.00E+02	5.12E+03	1.01E+01	1.01E+01	1.01E+01
5.25E+03	3.00E+02	3.00E+02	3.00E+02	5.25E+03	1.01E+01	1.01E+01	1.01E+01
5.38E+03	3.00E+02	3.00E+02	3.00E+02	5.38E+03	2.40E+00	4.05E+00	1.01E+01
5.50E+03	3.00E+02	3.00E+02	3.00E+02	5.50E+03	2.40E+00	2.40E+00	2.41E+00
5.63E+03	3.00E+02	3.00E+02	3.00E+02	5.63E+03	2.40E+00	2.40E+00	2.41E+00
5.76E+03	3.00E+02	3.00E+02	3.00E+02	5.76E+03	2.40E+00	2.40E+00	2.41E+00

Title	Record 1	Voltage		Title	Record 2	Current	
ID	1			ID	1		
Type	MinAvgMax			Type	MinAvgMax		
Date	1/27/2017			Date	1/27/2017		
Time	10:13:30			Time	10:13:30		
X Scale	3.60E+03			X Scale	3.60E+03		
X At 0%	0.00E+00			X At 0%	0.00E+00		
X Resolution	2.81E+01			X Resolution	2.81E+01		
X Size	128			X Size	128		
X Unit	s			X Unit	s		
X Label	1 h/Div			X Label	1 h/Div		
Y Scale	1.00E+02			Y Scale	5.00E+00		
Y At 50%	1.50E+02			Y At 50%	7.50E+00		
Y Resolution	1.00E+03			Y Resolution	5.00E+02		
Y Size	65536			Y Size	65536		
Y Unit	V			Y Unit	A		
Y Label	V			Y Label	A		
5.89E+03	3.00E+02	3.00E+02	3.00E+02	5.89E+03	2.40E+00	2.40E+00	2.41E+00
6.02E+03	3.00E+02	3.00E+02	3.00E+02	6.02E+03	2.40E+00	2.40E+00	2.41E+00
6.14E+03	3.00E+02	3.00E+02	3.00E+02	6.14E+03	2.40E+00	2.40E+00	2.41E+00
6.27E+03	3.00E+02	3.00E+02	3.00E+02	6.27E+03	2.40E+00	2.40E+00	2.41E+00
6.40E+03	3.00E+02	3.00E+02	3.00E+02	6.40E+03	2.40E+00	2.40E+00	2.41E+00
6.53E+03	3.00E+02	3.00E+02	3.00E+02	6.53E+03	2.40E+00	2.40E+00	2.41E+00
6.66E+03	3.00E+02	3.00E+02	3.00E+02	6.66E+03	2.40E+00	2.40E+00	2.41E+00
6.78E+03	3.00E+02	3.00E+02	3.00E+02	6.78E+03	2.40E+00	2.40E+00	2.41E+00
6.91E+03	3.00E+02	3.00E+02	3.00E+02	6.91E+03	2.40E+00	2.40E+00	2.41E+00
7.04E+03	3.00E+02	3.00E+02	3.00E+02	7.04E+03	2.40E+00	2.40E+00	2.41E+00
7.17E+03	3.00E+02	3.00E+02	3.00E+02	7.17E+03	2.41E+00	3.12E+00	3.40E+00
7.30E+03	3.00E+02	3.00E+02	3.00E+02	7.30E+03	3.39E+00	3.39E+00	3.40E+00
7.42E+03	3.00E+02	3.00E+02	3.00E+02	7.42E+03	3.39E+00	3.39E+00	3.40E+00
7.55E+03	3.00E+02	3.00E+02	3.00E+02	7.55E+03	3.39E+00	3.39E+00	3.40E+00
7.68E+03	3.00E+02	3.00E+02	3.00E+02	7.68E+03	3.39E+00	3.39E+00	3.40E+00
7.81E+03	3.00E+02	3.00E+02	3.00E+02	7.81E+03	3.39E+00	3.39E+00	3.40E+00
7.94E+03	3.00E+02	3.00E+02	3.00E+02	7.94E+03	3.39E+00	3.39E+00	3.40E+00
8.06E+03	3.00E+02	3.00E+02	3.00E+02	8.06E+03	3.60E-01	1.30E+00	3.40E+00
8.19E+03	3.00E+02	3.00E+02	3.00E+02	8.19E+03	3.60E-01	3.60E-01	3.70E-01
8.32E+03	3.00E+02	3.00E+02	3.00E+02	8.32E+03	3.60E-01	3.60E-01	3.70E-01
8.45E+03	3.00E+02	3.00E+02	3.00E+02	8.45E+03	3.60E-01	3.60E-01	3.70E-01
8.58E+03	3.00E+02	3.00E+02	3.00E+02	8.58E+03	3.60E-01	3.60E-01	3.70E-01
8.70E+03	3.00E+02	3.00E+02	3.00E+02	8.70E+03	3.60E-01	3.60E-01	3.70E-01
8.83E+03	3.00E+02	3.00E+02	3.00E+02	8.83E+03	3.60E-01	3.60E-01	3.70E-01
8.96E+03	3.00E+02	3.00E+02	3.00E+02	8.96E+03	3.60E-01	3.60E-01	3.70E-01

Title	**Record 1**	**Voltage**		**Title**	**Record 2**	**Current**	
ID	**1**			**ID**	**1**		
Type	**MinAvgMax**			**Type**	**MinAvgMax**		
Date	**1/27/2017**			**Date**	**1/27/2017**		
Time	**10:13:30**			**Time**	**10:13:30**		
X Scale	**3.60E+03**			**X Scale**	**3.60E+03**		
X At 0%	**0.00E+00**			**X At 0%**	**0.00E+00**		
X Resolution	**2.81E+01**			**X Resolution**	**2.81E+01**		
X Size	**128**			**X Size**	**128**		
X Unit	**s**			**X Unit**	**s**		
X Label	**1 h/Div**			**X Label**	**1 h/Div**		
Y Scale	**1.00E+02**			**Y Scale**	**5.00E+00**		
Y At 50%	**1.50E+02**			**Y At 50%**	**7.50E+00**		
Y Resolution	**1.00E+03**			**Y Resolution**	**5.00E+02**		
Y Size	**65536**			**Y Size**	**65536**		
Y Unit	**V**			**Y Unit**	**A**		
Y Label	**V**			**Y Label**	**A**		
9.09E+03	**3.00E+02**	**3.00E+02**	**3.00E+02**	**9.09E+03**	**3.60E-01**	**3.60E-01**	**3.70E-01**
9.22E+03	**3.00E+02**	**3.00E+02**	**3.00E+02**	**9.22E+03**	**3.70E-01**	**3.70E-01**	**3.70E-01**
9.34E+03	**3.00E+02**	**3.00E+02**	**3.00E+02**	**9.34E+03**	**3.60E-01**	**3.60E-01**	**3.70E-01**
9.47E+03	**3.00E+02**	**3.00E+02**	**3.00E+02**	**9.47E+03**	**3.60E-01**	**3.60E-01**	**3.70E-01**
9.60E+03	**3.00E+02**	**3.00E+02**	**3.00E+02**	**9.60E+03**	**3.60E-01**	**3.60E-01**	**3.70E-01**
9.73E+03	**3.00E+02**	**3.00E+02**	**3.00E+02**	**9.73E+03**	**3.60E-01**	**3.60E-01**	**3.70E-01**
9.86E+03	**3.00E+02**	**3.00E+02**	**3.00E+02**	**9.86E+03**	**3.60E-01**	**6.40E-01**	**8.10E-01**
9.98E+03	**3.00E+02**	**3.00E+02**	**3.00E+02**	**9.98E+03**	**8.00E-01**	**8.00E-01**	**8.10E-01**
1.01E+04	**3.00E+02**	**3.00E+02**	**3.00E+02**	**1.01E+04**	**8.00E-01**	**8.00E-01**	**8.10E-01**
1.02E+04	**3.00E+02**	**3.00E+02**	**3.00E+02**	**1.02E+04**	**8.00E-01**	**8.00E-01**	**8.10E-01**
1.04E+04	**3.00E+02**	**3.00E+02**	**3.00E+02**	**1.04E+04**	**8.00E-01**	**8.00E-01**	**8.10E-01**
1.05E+04	**3.00E+02**	**3.00E+02**	**3.00E+02**	**1.05E+04**	**8.00E-01**	**8.00E-01**	**8.10E-01**
1.06E+04	**3.00E+02**	**3.00E+02**	**3.00E+02**	**1.06E+04**	**8.00E-01**	**8.00E-01**	**8.10E-01**
1.08E+04	**3.00E+02**	**3.00E+02**	**3.00E+02**	**1.08E+04**	**3.60E-01**	**5.40E-01**	**8.10E-01**
1.09E+04	**3.00E+02**	**3.00E+02**	**3.00E+02**	**1.09E+04**	**3.60E-01**	**3.60E-01**	**3.70E-01**
1.10E+04	**3.00E+02**	**3.00E+02**	**3.00E+02**	**1.10E+04**	**3.60E-01**	**3.60E-01**	**3.70E-01**
1.11E+04	**3.00E+02**	**3.00E+02**	**3.00E+02**	**1.11E+04**	**3.60E-01**	**3.60E-01**	**3.70E-01**
1.13E+04	**3.00E+02**	**3.00E+02**	**3.00E+02**	**1.13E+04**	**3.60E-01**	**3.60E-01**	**3.70E-01**
1.14E+04	**3.00E+02**	**3.00E+02**	**3.00E+02**	**1.14E+04**	**3.60E-01**	**3.60E-01**	**3.70E-01**
1.15E+04	**3.00E+02**	**3.00E+02**	**3.00E+02**	**1.15E+04**	**3.60E-01**	**3.60E-01**	**3.70E-01**
1.16E+04	**3.00E+02**	**3.00E+02**	**3.00E+02**	**1.16E+04**	**1.90E-01**	**2.80E-01**	**1.50E+00**
1.18E+04	**3.00E+02**	**3.00E+02**	**3.00E+02**	**1.18E+04**	**1.90E-01**	**1.90E-01**	**1.90E-01**
1.19E+04	**3.00E+02**	**3.00E+02**	**3.00E+02**	**1.19E+04**	**1.90E-01**	**1.90E-01**	**1.90E-01**
1.20E+04	**3.00E+02**	**3.00E+02**	**3.00E+02**	**1.20E+04**	**1.90E-01**	**1.90E-01**	**2.00E-01**
1.22E+04	**3.00E+02**	**3.00E+02**	**3.00E+02**	**1.22E+04**	**1.90E-01**	**1.90E-01**	**1.90E-01**

Title	Record 1	Voltage		Title	Record 2	Current	
ID	1			ID	1		
Type	MinAvgMax			Type	MinAvgMax		
Date	1/27/2017			Date	1/27/2017		
Time	10:13:30			Time	10:13:30		
X Scale	3.60E+03			X Scale	3.60E+03		
X At 0%	0.00E+00			X At 0%	0.00E+00		
X Resolution	2.81E+01			X Resolution	2.81E+01		
X Size	128			X Size	128		
X Unit	s			X Unit	s		
X Label	1 h/Div			X Label	1 h/Div		
Y Scale	1.00E+02			Y Scale	5.00E+00		
Y At 50%	1.50E+02			Y At 50%	7.50E+00		
Y Resolution	1.00E+03			Y Resolution	5.00E+02		
Y Size	65536			Y Size	65536		
Y Unit	V			Y Unit	A		
Y Label	V			Y Label	A		
1.23E+04	3.00E+02	3.00E+02	3.00E+02	1.23E+04	1.90E-01	1.90E-01	1.90E-01
1.24E+04	3.00E+02	3.00E+02	3.00E+02	1.24E+04	1.90E-01	1.90E-01	1.90E-01
1.25E+04	3.00E+02	3.00E+02	3.00E+02	1.25E+04	1.90E-01	4.20E-01	6.30E-01
1.27E+04	3.00E+02	3.00E+02	3.00E+02	1.27E+04	6.30E-01	6.30E-01	6.30E-01
1.28E+04	3.00E+02	3.00E+02	3.00E+02	1.28E+04	6.30E-01	6.30E-01	6.30E-01
1.29E+04	3.00E+02	3.00E+02	3.00E+02	1.29E+04	6.30E-01	6.30E-01	6.30E-01
1.31E+04	3.00E+02	3.00E+02	3.00E+02	1.31E+04	6.30E-01	6.30E-01	6.30E-01
1.32E+04	3.00E+02	3.00E+02	3.00E+02	1.32E+04	6.30E-01	6.30E-01	6.30E-01
1.33E+04	3.00E+02	3.00E+02	3.00E+02	1.33E+04	6.20E-01	6.20E-01	6.30E-01
1.34E+04	3.00E+02	3.00E+02	3.00E+02	1.34E+04	1.90E-01	4.00E-01	6.30E-01
1.36E+04	3.00E+02	3.00E+02	3.00E+02	1.36E+04	1.90E-01	1.90E-01	1.90E-01
1.37E+04	3.00E+02	3.00E+02	3.00E+02	1.37E+04	1.90E-01	1.90E-01	1.90E-01
1.38E+04	3.00E+02	3.00E+02	3.00E+02	1.38E+04	1.90E-01	1.90E-01	1.90E-01
1.40E+04	3.00E+02	3.00E+02	3.00E+02	1.40E+04	1.90E-01	2.60E-01	4.12E+00
1.41E+04	2.99E+02	3.00E+02	3.00E+02	1.41E+04	1.90E-01	4.80E-01	4.11E+00
1.42E+04	2.99E+02	3.00E+02	3.00E+02	1.42E+04	1.90E-01	4.10E-01	4.11E+00
1.43E+04	3.00E+02	3.00E+02	3.00E+02	1.43E+04	1.90E-01	2.60E-01	4.12E+00
1.45E+04	3.00E+02	3.00E+02	3.00E+02	1.45E+04	1.90E-01	1.90E-01	2.00E-01
1.46E+04	2.99E+02	3.00E+02	3.00E+02	1.46E+04	1.90E-01	3.30E-01	4.11E+00
1.47E+04	3.00E+02	3.00E+02	3.00E+02	1.47E+04	1.90E-01	1.90E-01	2.00E-01
1.48E+04	2.99E+02	3.00E+02	3.00E+02	1.48E+04	1.90E-01	4.40E-01	4.12E+00
1.50E+04	2.98E+02	3.00E+02	3.00E+02	1.50E+04	1.90E-01	8.40E-01	4.11E+00
1.51E+04	3.00E+02	3.00E+02	3.00E+02	1.51E+04	1.90E-01	2.70E-01	4.11E+00
1.52E+04	2.98E+02	2.99E+02	3.00E+02	1.52E+04	1.90E-01	1.97E+00	4.56E+00
1.54E+04	2.98E+02	2.98E+02	2.98E+02	1.54E+04	4.55E+00	4.55E+00	4.55E+00

Title	Record 1	Voltage		Title	Record 2	Current	
ID	1			ID	1		
Type	MinAvgMax			Type	MinAvgMax		
Date	1/27/2017			Date	1/27/2017		
Time	10:13:30			Time	10:13:30		
X Scale	3.60E+03			X Scale	3.60E+03		
X At 0%	0.00E+00			X At 0%	0.00E+00		
X Resolution	2.81E+01			X Resolution	2.81E+01		
X Size	128			X Size	128		
X Unit	s			X Unit	s		
X Label	1 h/Div			X Label	1 h/Div		
Y Scale	1.00E+02			Y Scale	5.00E+00		
Y At 50%	1.50E+02			Y At 50%	7.50E+00		
Y Resolution	1.00E+03			Y Resolution	5.00E+02		
Y Size	65536			Y Size	65536		
Y Unit	V			Y Unit	A		
Y Label	V			Y Label	A		
1.55E+04	2.98E+02	2.98E+02	2.98E+02	1.55E+04	4.54E+00	4.54E+00	4.55E+00
1.56E+04	2.98E+02	2.98E+02	2.98E+02	1.56E+04	4.54E+00	4.54E+00	4.55E+00
1.57E+04	2.98E+02	2.98E+02	2.98E+02	1.57E+04	4.54E+00	4.54E+00	4.55E+00
1.59E+04	2.98E+02	2.98E+02	2.98E+02	1.59E+04	4.54E+00	4.57E+00	4.61E+00
1.60E+04	2.98E+02	2.99E+02	3.00E+02	1.60E+04	6.60E-01	3.29E+00	4.61E+00
1.61E+04	1.00E-01	1.70E+02	3.00E+02	1.61E+04	6.40E-01	6.50E-01	6.60E-01
1.63E+04	1.00E-01	1.00E-01	1.00E-01	1.63E+04	6.50E-01	6.50E-01	6.50E-01

Appendix L: Geyser water temperature and stratification results

Valve	0 - OFF	1 - ON								
Element	0 - OFF	1 - ON								
Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:10:13	71.9	52.1	68.5	68.6	67.3	64.3	46.1	55.8	0	0
11:10:14	71.9	52.1	68.6	68.6	67.3	64.3	46.1	55.8	0	0
11:10:16	71.9	52.2	68.5	68.6	67.3	64.3	46.1	55.8	0	0
11:10:17	71.9	52.2	68.5	68.7	67.2	64.3	46.1	55.8	0	0
11:10:18	71.9	52.1	68.5	68.6	67.3	64.3	46.1	55.8	0	0
11:10:19	71.9	52.2	68.6	68.6	67.3	64.2	46.1	55.8	0	0
11:10:20	71.9	52.1	68.5	68.6	67.3	64.3	46.1	55.8	0	0
11:10:21	71.9	52.1	68.5	68.6	67.3	64.3	46.1	55.8	0	0
11:10:22	71.9	52.2	68.6	68.6	67.3	64.3	46.1	55.8	0	0
11:10:23	71.9	52.2	68.5	68.6	67.2	64.3	46.0	55.8	0	0
11:10:24	71.9	52.2	68.5	68.6	67.3	64.3	46.0	55.8	0	0
11:10:25	71.9	52.2	68.5	68.6	67.3	64.3	46.0	55.8	0	0
11:10:26	71.9	52.2	68.5	68.6	67.3	64.3	46.0	55.8	0	0
11:10:27	71.9	52.2	68.6	68.6	67.2	64.3	46.0	55.8	0	0
11:10:28	71.9	52.2	68.5	68.6	67.3	64.3	46.0	55.8	0	0
11:10:29	71.9	52.2	68.6	68.6	67.3	64.3	45.9	55.8	0	0
11:10:30	71.9	52.1	68.6	68.6	67.2	64.3	45.9	55.9	0	0
11:10:31	71.9	52.2	68.5	68.6	67.3	64.2	45.9	55.8	0	0
11:10:32	71.9	52.1	68.6	68.6	67.2	64.3	45.9	55.8	0	0
11:10:33	71.9	52.1	68.6	68.6	67.3	64.3	45.9	55.8	0	0
11:10:34	71.9	52.1	68.6	68.6	67.2	64.3	45.9	55.8	0	0
11:10:35	71.9	52.1	68.6	68.6	67.3	64.3	45.9	55.8	0	0
11:10:36	71.9	52.1	68.6	68.6	67.2	64.3	45.9	55.8	0	0
11:10:37	71.9	52.1	68.6	68.6	67.3	64.3	45.9	55.8	0	0
11:10:38	71.9	52.1	68.6	68.6	67.3	64.3	45.9	55.8	0	0
11:10:39	71.9	52.2	68.5	68.6	67.2	64.3	45.9	55.8	0	0
11:10:40	71.9	52.2	68.6	68.6	67.2	64.3	46.0	55.8	0	0
11:10:41	71.9	52.2	68.5	68.6	67.2	64.3	46.0	55.8	0	0
11:10:42	71.9	52.2	68.6	68.6	67.2	64.3	46.0	55.8	0	0
11:10:43	71.9	52.2	68.5	68.6	67.2	64.3	46.0	55.8	0	0
11:10:44	71.9	52.2	68.6	68.6	67.2	64.2	46.0	55.8	0	0
11:10:45	71.9	52.2	68.5	68.6	67.2	64.3	46.0	55.8	0	0
11:10:46	71.9	52.2	68.5	68.6	67.2	64.3	46.0	55.8	0	0
11:10:47	71.9	52.2	68.5	68.6	67.2	64.2	45.9	55.8	0	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:10:48	71.9	52.2	68.5	68.6	67.2	64.2	45.9	55.8	0	0
11:10:50	71.9	52.2	68.5	68.6	67.2	64.3	46.0	55.8	0	0
11:10:51	71.9	52.2	68.5	68.6	67.2	64.2	45.9	55.8	0	0
11:10:52	71.9	52.2	68.5	68.6	67.2	64.2	45.9	55.8	0	0
11:10:53	71.9	52.2	68.5	68.6	67.2	64.3	45.9	55.8	0	0
11:10:54	71.9	52.2	68.5	68.6	67.2	64.2	45.9	55.8	0	0
11:10:55	71.9	52.1	68.5	68.6	67.2	64.2	45.9	55.8	0	0
11:10:56	71.9	52.1	68.5	68.6	67.2	64.2	45.9	55.8	0	0
11:10:57	71.9	52.1	68.6	68.6	67.2	64.2	45.8	55.8	0	0
11:10:58	71.9	52.1	68.5	68.6	67.2	64.2	45.8	55.8	0	0
11:10:59	71.9	52.1	68.5	68.6	67.2	64.2	45.8	55.8	0	0
11:11:00	71.9	52.1	68.5	68.6	67.2	64.2	45.8	55.8	0	0
11:11:01	71.8	52.1	68.5	68.6	67.2	64.2	45.8	55.8	0	0
11:11:02	71.9	52.1	68.6	68.6	67.2	64.2	45.8	55.8	0	0
11:11:03	71.9	52.1	68.5	68.6	67.2	64.2	45.8	55.8	0	0
11:11:04	71.9	52.1	68.5	68.6	67.2	64.2	45.8	55.8	0	0
11:11:05	71.9	52.1	68.5	68.6	67.2	64.2	45.8	55.8	0	0
11:11:06	71.9	52.1	68.5	68.6	67.2	64.2	45.8	55.8	0	0
11:11:07	71.8	52.0	68.5	68.6	67.2	64.2	45.8	55.8	0	0
11:11:08	71.9	52.0	68.5	68.6	67.2	64.2	45.7	55.8	0	0
11:11:09	71.9	52.0	68.5	68.6	67.2	64.2	45.7	55.8	0	0
11:11:10	71.9	52.0	68.5	68.6	67.2	64.2	45.7	55.8	0	0
11:11:11	71.9	52.0	68.5	68.6	67.2	64.3	45.7	55.8	0	0
11:11:12	71.9	52.0	68.5	68.6	67.2	64.2	45.7	55.8	0	0
11:11:13	71.9	52.0	68.5	68.6	67.2	64.3	45.7	55.8	0	0
11:11:14	71.9	52.0	68.5	68.6	67.2	64.3	45.7	55.8	0	0
11:11:15	71.9	52.0	68.5	68.5	67.2	64.2	45.7	55.8	0	0
11:11:16	71.9	51.9	68.5	68.6	67.2	64.2	45.7	55.8	0	0
11:11:17	71.8	51.9	68.5	68.6	67.1	64.3	45.7	55.9	0	0
11:11:18	71.9	51.9	68.5	68.5	67.2	64.2	45.7	55.8	0	0
11:11:19	71.8	51.9	68.5	68.5	67.2	64.2	45.7	55.8	0	0
11:11:20	71.8	51.9	68.6	68.5	67.2	64.2	45.7	55.9	0	0
11:11:21	71.8	51.9	68.5	68.6	67.1	64.3	45.7	55.9	0	0
11:11:22	71.9	51.9	68.5	68.6	67.1	64.2	45.7	55.8	0	0
11:11:23	71.9	51.9	68.5	68.6	67.2	64.2	45.6	55.8	0	0
11:11:25	71.9	51.9	68.5	68.6	67.2	64.2	45.7	55.8	0	0
11:11:26	71.8	51.9	68.5	68.5	67.2	64.3	45.7	55.9	0	0
11:11:27	71.8	51.9	68.5	68.5	67.2	64.2	45.7	55.8	0	0
11:11:28	71.9	52.0	68.5	68.5	67.2	64.2	45.6	55.8	0	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:11:29	71.8	51.9	68.6	68.5	67.2	64.2	45.7	55.9	0	0
11:11:30	71.8	52.0	68.5	68.5	67.2	64.2	45.6	55.8	0	0
11:11:31	71.8	51.9	68.5	68.5	67.2	64.2	45.6	55.9	0	0
11:11:32	71.9	51.9	68.5	68.6	67.1	64.2	45.6	55.9	0	0
11:11:33	71.8	51.9	68.5	68.6	67.1	64.2	45.6	55.9	0	0
11:11:34	71.9	51.9	68.5	68.6	67.1	64.3	45.6	55.8	0	0
11:11:35	71.9	51.9	68.5	68.6	67.1	64.2	45.5	55.8	0	0
11:11:36	71.8	51.9	68.5	68.6	67.1	64.2	45.5	55.8	0	0
11:11:37	71.8	51.9	68.5	68.6	67.1	64.2	45.5	55.9	0	0
11:11:38	71.8	51.8	68.6	68.5	67.1	64.3	45.6	55.9	0	0
11:11:39	71.8	51.8	68.5	68.5	67.1	64.3	45.6	55.9	0	0
11:11:40	71.9	51.9	68.5	68.5	67.2	64.2	45.5	55.8	0	0
11:11:41	71.8	51.9	68.5	68.5	67.1	64.2	45.5	55.9	0	0
11:11:42	71.8	51.9	68.5	68.6	67.1	64.2	45.5	55.8	0	0
11:11:43	71.8	51.9	68.5	68.5	67.1	64.2	45.5	55.9	0	0
11:11:44	71.8	51.9	68.5	68.5	67.1	64.2	45.5	55.8	0	0
11:11:45	71.8	51.9	68.5	68.5	67.1	64.2	45.5	55.9	0	0
11:11:46	71.8	51.8	68.5	68.6	67.1	64.2	45.5	55.8	0	0
11:11:47	71.8	51.8	68.5	68.5	67.2	64.2	45.5	55.8	0	0
11:11:48	71.8	51.8	68.5	68.5	67.1	64.2	45.5	55.9	0	0
11:11:49	71.8	51.8	68.5	68.5	67.1	64.2	45.5	55.9	0	0
11:11:50	71.8	51.8	68.5	68.5	67.1	64.2	45.5	55.9	0	0
11:11:51	71.8	51.8	68.5	68.5	67.1	64.2	45.5	55.9	0	0
11:11:52	71.8	51.8	68.5	68.5	67.1	64.2	45.5	55.9	0	0
11:11:53	71.9	51.9	68.5	68.5	67.1	64.2	45.5	55.8	0	0
11:11:54	71.8	51.9	68.5	68.5	67.1	64.2	45.5	55.9	0	0
11:11:55	71.8	51.9	68.5	68.5	67.1	64.2	45.5	55.9	0	0
11:11:56	71.8	51.9	68.5	68.5	67.1	64.2	45.5	55.9	0	0
11:11:57	71.8	51.9	68.6	68.4	67.2	64.1	45.5	55.8	0	0
11:11:59	71.8	51.9	68.5	68.5	67.1	64.2	45.5	55.9	0	0
11:12:00	71.9	51.9	68.5	68.5	67.2	64.1	45.4	55.8	0	0
11:12:01	71.8	51.8	68.5	68.5	67.1	64.2	45.5	55.8	0	0
11:12:02	71.8	51.9	68.5	68.5	67.1	64.2	45.5	55.8	0	0
11:12:03	71.8	51.8	68.5	68.5	67.1	64.2	45.5	55.8	0	0
11:12:04	71.8	51.8	68.5	68.5	67.1	64.2	45.5	55.8	0	0
11:12:05	71.8	51.8	68.5	68.5	67.1	64.2	45.4	55.8	0	0
11:12:06	71.8	51.8	68.5	68.5	67.1	64.2	45.4	55.8	0	0
11:12:07	71.8	51.8	68.5	68.5	67.1	64.2	45.4	55.8	0	0
11:12:08	71.8	51.8	68.5	68.5	67.1	64.2	45.5	55.9	0	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:12:09	71.8	51.8	68.5	68.6	67.1	64.2	45.5	55.8	0	0
11:12:10	71.8	51.8	68.5	68.5	67.1	64.2	45.5	55.8	0	0
11:12:11	71.8	51.8	68.5	68.5	67.1	64.2	45.4	55.9	0	0
11:12:12	71.8	51.8	68.5	68.5	67.1	64.2	45.5	55.9	0	0
11:12:13	71.8	51.8	68.5	68.5	67.1	64.2	45.4	55.8	0	0
11:12:14	71.8	51.8	68.5	68.5	67.1	64.2	45.4	55.8	0	0
11:12:15	71.8	51.8	68.5	68.5	67.1	64.2	45.5	55.8	0	0
11:12:16	71.8	51.8	68.5	68.5	67.1	64.2	45.5	55.8	0	0
11:12:17	71.8	51.7	68.5	68.5	67.1	64.2	45.5	55.8	0	0
11:12:18	71.8	51.8	68.5	68.5	67.1	64.2	45.4	55.8	0	0
11:12:19	71.8	51.8	68.5	68.5	67.1	64.2	45.5	55.8	0	0
11:12:20	71.8	51.8	68.5	68.5	67.1	64.2	45.4	55.8	0	0
11:12:21	71.8	51.8	68.5	68.5	67.1	64.2	45.4	55.8	0	0
11:12:22	71.8	51.8	68.5	68.5	67.1	64.2	45.4	55.8	0	0
11:12:23	71.8	51.8	68.5	68.5	67.1	64.2	45.4	55.8	0	0
11:12:24	71.8	51.8	68.5	68.5	67.1	64.2	45.4	55.8	0	0
11:12:25	71.8	51.8	68.5	68.5	67.1	64.2	45.4	55.8	0	0
11:12:26	71.8	51.9	68.5	68.5	67.1	64.2	45.4	55.8	0	0
11:12:27	71.8	51.8	68.5	68.5	67.1	64.2	45.4	55.8	0	0
11:12:28	71.8	51.8	68.5	68.5	67.1	64.2	45.4	55.8	0	0
11:12:29	71.8	51.8	68.5	68.5	67.1	64.2	45.4	55.9	0	0
11:12:30	71.8	51.8	68.5	68.5	67.1	64.2	45.4	55.8	0	0
11:12:31	71.8	51.8	68.5	68.5	67.1	64.2	45.4	55.9	0	0
11:12:33	71.8	51.8	68.5	68.5	67.1	64.2	45.4	55.9	0	0
11:12:34	71.8	51.8	68.5	68.5	67.0	64.2	45.4	55.9	0	0
11:12:35	71.8	51.8	68.5	68.5	67.0	64.2	45.4	55.9	0	0
11:12:36	71.8	51.8	68.5	68.5	67.0	64.2	45.4	55.8	0	0
11:12:37	71.8	51.8	68.5	68.5	67.1	64.2	45.4	55.8	0	0
11:12:38	71.8	51.8	68.5	68.5	67.0	64.2	45.5	55.8	0	0
11:12:39	71.8	51.8	68.5	68.5	67.1	64.2	45.4	55.8	0	0
11:12:40	71.8	51.8	68.5	68.5	67.1	64.1	45.4	55.9	0	0
11:12:41	71.8	51.8	68.5	68.5	67.0	64.2	45.5	55.8	0	0
11:12:42	71.8	51.8	68.5	68.5	67.0	64.2	45.4	55.9	0	0
11:12:43	71.8	51.8	68.5	68.5	67.0	64.1	45.5	55.8	0	0
11:12:44	71.8	51.9	68.5	68.5	67.0	64.1	45.5	55.8	0	0
11:12:45	71.8	51.9	68.5	68.5	67.0	64.1	45.5	55.8	0	0
11:12:46	71.8	51.8	68.5	68.5	67.0	64.1	45.5	55.8	0	0
11:12:47	71.8	51.8	68.5	68.5	67.0	64.1	45.5	55.8	0	0
11:12:48	71.8	51.8	68.4	68.5	67.0	64.1	45.5	55.8	0	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:12:49	71.8	51.8	68.5	68.5	67.0	64.2	45.5	55.8	0	0
11:12:50	71.8	51.8	68.5	68.5	67.1	64.1	45.5	55.9	0	0
11:12:51	71.8	51.8	68.5	68.5	67.0	64.2	45.5	55.8	0	0
11:12:52	71.8	51.9	68.5	68.5	67.0	64.1	45.5	55.9	0	0
11:12:53	71.8	51.8	68.5	68.5	67.0	64.2	45.5	55.9	0	0
11:12:54	71.8	51.9	68.5	68.5	67.0	64.1	45.5	55.9	0	0
11:12:55	71.8	51.8	68.5	68.5	67.0	64.2	45.5	55.9	0	0
11:12:56	71.8	51.9	68.5	68.5	67.0	64.1	45.5	55.9	0	0
11:12:57	71.8	51.9	68.5	68.5	67.0	64.2	45.5	55.9	0	0
11:12:58	71.8	51.9	68.5	68.5	67.0	64.1	45.5	55.9	0	0
11:12:59	71.8	51.9	68.5	68.4	67.0	64.1	45.5	55.9	0	0
11:13:00	71.8	52.0	68.5	68.5	67.1	64.1	45.5	55.8	0	0
11:13:01	71.8	51.9	68.5	68.5	67.0	64.1	45.5	55.8	0	0
11:13:02	71.8	51.9	68.5	68.5	67.0	64.1	45.5	55.9	0	0
11:13:03	71.8	51.9	68.5	68.5	67.0	64.1	45.5	55.9	0	0
11:13:04	71.8	51.9	68.5	68.5	67.0	64.1	45.5	55.9	0	0
11:13:05	71.8	51.8	68.5	68.5	67.0	64.2	45.6	55.9	0	0
11:13:07	71.8	51.8	68.5	68.5	67.0	64.1	45.5	55.8	0	0
11:13:08	71.8	51.8	68.5	68.5	67.0	64.1	45.5	55.9	0	0
11:13:09	71.8	51.8	68.5	68.5	67.0	64.1	45.6	55.9	0	0
11:13:10	71.8	51.8	68.5	68.4	67.0	64.1	45.6	55.9	0	0
11:13:11	71.8	51.8	68.5	68.4	67.0	64.1	45.6	55.9	0	0
11:13:12	71.8	51.8	68.5	68.5	67.0	64.1	45.6	55.9	0	0
11:13:13	71.8	51.7	68.5	68.4	67.0	64.1	45.6	55.9	0	0
11:13:14	71.8	51.7	68.5	68.5	67.0	64.1	45.6	55.9	0	0
11:13:15	71.8	51.7	68.5	68.5	67.0	64.1	45.6	55.9	0	0
11:13:16	71.8	51.7	68.5	68.5	67.0	64.1	45.6	55.9	0	0
11:13:17	71.8	51.7	68.5	68.4	67.0	64.1	45.6	55.9	0	0
11:13:18	71.8	51.7	68.5	68.4	67.0	64.1	45.6	55.9	0	0
11:13:19	71.8	51.7	68.5	68.5	67.0	64.1	45.6	55.9	0	0
11:13:20	71.8	51.7	68.5	68.5	67.0	64.1	45.6	55.9	0	0
11:13:21	71.8	51.7	68.5	68.5	67.0	64.1	45.6	55.9	0	0
11:13:22	71.8	51.7	68.5	68.5	67.0	64.1	45.6	55.9	0	0
11:13:23	71.8	51.7	68.5	68.5	67.0	64.1	45.6	55.9	0	0
11:13:24	71.8	51.7	68.5	68.5	66.9	64.1	45.6	55.9	0	0
11:13:25	71.8	51.7	68.5	68.4	67.0	64.1	45.6	55.9	0	0
11:13:26	71.8	51.7	68.5	68.5	66.9	64.1	45.6	55.9	0	0
11:13:27	71.8	51.7	68.5	68.4	66.9	64.1	45.6	55.9	0	0
11:13:28	71.8	51.7	68.5	68.4	67.0	64.1	45.6	55.9	0	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:13:29	71.8	51.7	68.5	68.4	67.0	64.1	45.6	55.9	0	0
11:13:30	71.8	51.7	68.5	68.5	66.9	64.1	45.6	55.9	0	0
11:13:31	71.8	51.7	68.5	68.4	66.9	64.0	45.6	55.9	0	0
11:13:32	71.8	51.7	68.5	68.4	66.9	64.0	45.6	55.9	0	0
11:13:33	71.8	51.7	68.5	68.4	66.9	64.1	45.5	55.9	0	0
11:13:34	71.8	51.7	68.5	68.4	66.9	64.1	45.6	55.9	0	0
11:13:35	71.8	51.7	68.5	68.4	66.9	64.1	45.6	55.9	0	0
11:13:36	71.8	51.7	68.5	68.4	66.9	64.0	45.5	55.9	0	0
11:13:37	71.8	51.8	68.5	68.4	67.0	63.9	45.5	55.9	0	0
11:13:38	71.7	51.7	68.5	68.4	66.9	64.1	45.6	55.9	0	0
11:13:39	71.8	51.8	68.5	68.4	66.9	64.0	45.5	55.9	0	0
11:13:41	71.8	51.8	68.5	68.4	66.9	64.0	45.5	55.9	0	0
11:13:42	71.8	51.8	68.4	68.5	66.9	64.0	45.5	55.9	0	0
11:13:43	71.8	51.7	68.5	68.4	66.9	64.0	45.5	56.0	0	0
11:13:44	71.8	51.8	68.4	68.4	66.9	64.0	45.5	55.9	0	0
11:13:45	71.7	51.7	68.5	68.3	66.9	64.0	45.6	56.0	0	0
11:13:46	71.7	51.7	68.5	68.4	66.9	64.0	45.6	56.0	0	0
11:13:47	71.7	51.7	68.5	68.4	66.9	64.0	45.6	56.0	0	0
11:13:48	71.7	51.8	68.4	68.4	66.8	64.0	45.6	56.0	0	0
11:13:49	71.7	51.8	68.5	68.4	66.9	63.9	45.6	56.0	0	0
11:13:50	71.7	51.7	68.5	68.4	66.9	64.0	45.7	56.0	0	0
11:13:51	71.7	51.8	68.4	68.4	66.8	64.0	45.6	56.0	0	0
11:13:52	71.7	51.8	68.5	68.4	66.9	64.0	45.7	56.1	0	0
11:13:53	71.7	51.7	68.5	68.4	66.8	64.0	45.7	56.1	0	0
11:13:54	71.7	51.7	68.4	68.4	66.8	64.0	45.7	56.1	0	0
11:13:55	71.7	51.7	68.4	68.4	66.8	63.9	45.7	56.1	0	0
11:13:56	71.8	51.7	68.4	68.4	66.8	64.0	45.7	56.1	0	0
11:13:57	71.8	51.7	68.4	68.4	66.8	63.9	45.7	56.1	0	0
11:13:58	71.8	51.8	68.4	68.4	66.8	63.9	45.7	56.1	0	0
11:13:59	71.7	51.7	68.4	68.3	66.8	63.9	45.7	56.1	0	0
11:14:00	71.7	51.7	68.4	68.4	66.8	63.9	45.7	56.1	0	0
11:14:01	71.7	51.8	68.4	68.4	66.8	63.9	45.7	56.1	0	0
11:14:02	71.7	51.8	68.4	68.3	66.8	63.9	45.8	56.1	0	0
11:14:03	71.7	51.8	68.4	68.4	66.8	63.9	45.8	56.1	0	0
11:14:04	71.7	51.9	68.4	68.3	66.8	63.9	45.8	56.1	0	0
11:14:05	71.7	51.9	68.4	68.4	66.8	63.9	45.8	56.1	0	0
11:14:06	71.7	51.9	68.4	68.4	66.8	63.9	45.8	56.1	0	0
11:14:07	71.7	51.9	68.4	68.3	66.8	63.9	45.8	56.1	0	0
11:14:08	71.7	52.0	68.4	68.3	66.8	63.9	45.8	56.1	0	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:14:09	71.7	52.0	68.4	68.3	66.8	63.9	45.8	56.1	0	0
11:14:10	71.8	52.0	68.4	68.3	66.8	63.9	45.8	56.0	0	0
11:14:11	71.7	52.1	68.4	68.3	66.8	63.9	45.8	56.1	0	0
11:14:12	71.7	52.1	68.4	68.3	66.8	63.9	45.8	56.1	0	0
11:14:13	71.7	52.0	68.4	68.3	66.8	63.9	45.8	56.1	0	0
11:14:15	71.7	52.0	68.4	68.3	66.7	63.9	45.8	56.1	0	0
11:14:16	71.7	52.0	68.4	68.3	66.7	63.9	45.8	56.1	0	0
11:14:17	71.7	52.0	68.4	68.3	66.8	63.9	45.8	56.0	0	0
11:14:18	71.7	52.0	68.4	68.3	66.8	63.9	45.8	56.1	0	0
11:14:19	71.7	52.0	68.4	68.3	66.8	63.9	45.8	56.0	0	0
11:14:20	71.7	51.9	68.4	68.3	66.8	63.9	45.8	56.1	0	0
11:14:21	71.7	52.0	68.3	68.4	66.7	63.9	45.8	56.0	0	0
11:14:22	71.7	52.0	68.4	68.3	66.7	63.9	45.8	56.0	0	0
11:14:23	71.7	52.0	68.4	68.3	66.7	63.9	45.8	56.0	0	0
11:14:24	71.7	52.0	68.3	68.4	66.7	63.9	45.8	56.0	0	0
11:14:25	71.7	52.0	68.4	68.3	66.7	63.9	45.8	56.1	0	0
11:14:26	71.7	52.0	68.4	68.3	66.8	63.9	45.8	56.1	0	0
11:14:27	71.7	52.0	68.4	68.3	66.7	63.9	45.8	56.0	0	0
11:14:28	71.7	51.9	68.4	68.3	66.7	63.9	45.8	56.0	0	0
11:14:29	71.7	51.9	68.4	68.3	66.7	63.9	45.8	56.0	0	0
11:14:30	71.7	51.9	68.4	68.3	66.8	63.8	45.8	56.0	0	0
11:14:31	71.7	51.9	68.3	68.3	66.7	63.8	45.7	56.0	0	0
11:14:32	71.7	51.9	68.3	68.3	66.7	63.9	45.8	56.0	0	0
11:14:33	71.6	51.9	68.4	68.3	66.7	63.9	45.8	56.0	0	0
11:14:34	71.6	51.8	68.4	68.3	66.8	63.9	45.8	56.1	0	0
11:14:35	71.6	51.9	68.4	68.2	66.8	63.9	45.8	56.1	0	0
11:14:36	71.7	51.9	68.4	68.3	66.7	63.9	45.8	56.0	0	0
11:14:37	71.6	51.9	68.4	68.3	66.7	63.9	45.8	56.0	0	0
11:14:38	71.7	51.9	68.4	68.3	66.7	63.9	45.7	56.0	0	0
11:14:39	71.7	51.9	68.3	68.3	66.7	63.9	45.7	56.0	0	0
11:14:40	71.7	51.9	68.3	68.3	66.7	63.9	45.7	56.0	0	0
11:14:41	71.7	51.9	68.4	68.3	66.7	63.9	45.8	56.0	0	0
11:14:42	71.6	51.9	68.4	68.3	66.7	63.9	45.8	56.1	0	0
11:14:43	71.6	52.0	68.4	68.3	66.7	63.9	45.8	56.0	0	0
11:14:44	71.7	52.0	68.3	68.3	66.7	63.9	45.8	56.0	0	0
11:14:45	71.7	52.1	68.3	68.3	66.7	63.9	45.8	56.0	0	0
11:14:46	71.6	52.1	68.4	68.2	66.8	63.9	45.8	56.0	0	0
11:14:47	71.6	52.1	68.3	68.3	66.6	64.0	45.8	56.0	0	0
11:14:49	71.7	52.2	68.3	68.2	66.7	63.8	45.7	56.0	0	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:14:50	71.6	52.2	68.3	68.3	66.7	63.9	45.8	56.0	0	0
11:14:51	71.6	52.2	68.3	68.3	66.7	63.9	45.8	56.0	0	0
11:14:52	71.7	52.2	68.3	68.3	66.7	63.9	45.7	55.9	0	0
11:14:53	71.7	52.2	68.3	68.3	66.7	63.8	45.7	55.9	0	0
11:14:54	71.7	52.3	68.3	68.3	66.7	63.8	45.7	55.9	0	0
11:14:55	71.6	52.1	68.3	68.3	66.6	64.0	45.8	56.0	0	0
11:14:56	71.6	52.2	68.4	68.3	66.7	63.9	45.9	56.0	0	0
11:14:57	71.6	52.2	68.4	68.3	66.7	63.9	45.8	56.0	0	0
11:14:58	71.6	52.2	68.4	68.3	66.7	63.9	45.8	56.0	0	0
11:14:59	71.6	52.2	68.3	68.3	66.7	63.9	45.8	56.0	0	0
11:15:00	71.7	52.2	68.3	68.3	66.7	63.9	45.8	56.0	0	0
11:15:01	71.6	52.3	68.4	68.2	66.8	63.8	45.8	55.9	0	0
11:15:02	71.6	52.3	68.3	68.2	66.7	63.8	45.8	55.9	0	0
11:15:03	71.6	52.2	68.4	68.3	66.7	63.9	45.8	55.9	0	0
11:15:04	71.6	52.3	68.3	68.2	66.7	63.9	45.8	55.9	0	0
11:15:05	71.6	52.2	68.4	68.3	66.7	63.9	45.8	56.0	1	0
11:15:06	71.7	52.2	68.3	68.3	66.7	63.9	45.7	55.9	1	0
11:15:07	71.6	52.2	68.4	68.2	66.7	63.9	45.8	56.0	1	0
11:15:08	71.7	52.2	68.3	68.3	66.7	63.9	45.7	55.9	1	0
11:15:09	71.7	52.2	68.3	68.3	66.7	63.9	45.7	55.9	1	0
11:15:10	71.7	52.2	68.3	68.3	66.7	63.8	45.6	55.9	1	0
11:15:11	71.6	52.1	68.3	68.3	66.7	63.9	45.7	55.9	1	0
11:15:12	71.6	52.2	68.3	68.2	66.7	63.8	45.7	55.9	1	0
11:15:13	71.7	51.5	68.3	68.3	66.7	63.8	45.9	55.9	1	1
11:15:14	71.6	49.2	68.3	68.2	66.7	63.9	47.0	55.9	1	1
11:15:15	71.7	46.9	68.3	68.2	66.7	63.9	48.3	55.9	1	1
11:15:16	71.7	45.0	68.3	68.3	66.7	63.9	49.4	55.9	1	1
11:15:17	71.7	43.3	68.3	68.3	66.7	63.9	50.2	55.9	1	1
11:15:18	71.6	41.9	68.3	68.2	66.7	63.9	51.0	56.0	1	1
11:15:19	71.6	40.7	68.3	68.2	66.7	63.9	51.6	55.9	1	1
11:15:20	71.6	39.6	68.3	68.2	66.7	63.9	52.2	55.9	1	1
11:15:21	71.6	38.6	68.3	68.2	66.6	63.9	52.7	55.9	1	1
11:15:23	71.6	37.7	68.3	68.2	66.6	63.7	53.2	55.8	1	1
11:15:24	71.6	36.9	68.3	68.2	66.6	63.6	53.7	55.8	1	1
11:15:25	71.6	36.0	68.3	68.2	66.4	63.6	54.2	55.9	1	1
11:15:26	71.6	35.3	68.3	68.2	66.3	63.4	54.6	55.8	1	1
11:15:27	71.6	34.6	68.3	68.1	66.3	63.1	54.9	55.7	1	1
11:15:28	71.6	34.0	68.3	68.1	66.1	62.9	55.3	55.6	1	1
11:15:29	71.6	33.4	68.3	68.0	66.0	62.6	55.6	55.5	1	1

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:15:30	71.6	32.9	68.3	67.9	66.0	62.4	55.9	55.4	1	1
11:15:31	71.6	32.3	68.3	68.0	65.8	62.2	56.3	55.3	1	1
11:15:32	71.6	31.8	68.3	67.9	65.6	62.0	56.5	55.2	1	1
11:15:33	71.6	31.5	68.2	67.9	65.4	61.8	56.8	55.0	1	1
11:15:34	71.6	31.3	68.2	67.8	65.3	61.4	57.0	54.8	1	1
11:15:35	71.6	31.0	68.2	67.8	65.0	61.2	57.2	54.7	1	1
11:15:36	71.5	30.7	68.3	67.6	64.8	61.0	57.5	54.7	1	1
11:15:37	71.5	30.7	68.3	67.6	64.6	60.8	57.8	54.6	1	1
11:15:38	71.6	30.7	68.2	67.5	64.4	60.6	58.0	54.4	1	1
11:15:39	71.6	30.8	68.2	67.4	64.3	60.3	58.1	54.2	1	1
11:15:40	71.5	30.6	68.2	67.3	64.0	60.1	58.4	54.2	1	1
11:15:41	71.6	30.7	68.1	67.3	63.9	59.7	58.5	53.9	1	1
11:15:42	71.6	30.7	68.0	67.2	63.7	59.4	58.6	53.8	1	1
11:15:43	71.5	30.7	68.1	67.1	63.5	59.1	58.9	53.7	1	1
11:15:44	71.6	30.8	68.0	67.0	63.3	58.7	58.9	53.4	1	1
11:15:45	71.5	30.7	68.1	66.9	62.9	58.5	59.2	53.4	1	1
11:15:46	71.5	30.7	67.9	66.9	62.6	58.3	59.2	53.2	1	1
11:15:47	71.5	30.7	68.0	66.7	62.4	57.9	59.4	53.0	1	1
11:15:48	71.5	30.7	67.9	66.6	62.0	57.6	59.6	52.8	1	1
11:15:49	71.4	30.6	67.9	66.5	61.7	57.4	59.7	52.7	1	1
11:15:50	71.4	30.6	67.9	66.4	61.4	57.1	59.9	52.6	1	1
11:15:51	71.4	30.6	67.8	66.2	61.1	56.8	60.0	52.5	1	1
11:15:52	71.5	30.7	67.7	66.1	60.8	56.5	60.0	52.2	1	1
11:15:53	71.4	30.7	67.8	65.8	60.6	56.2	60.2	52.0	1	1
11:15:54	71.3	30.6	67.7	65.7	60.2	55.9	60.3	51.9	1	1
11:15:55	71.4	30.7	67.6	65.6	59.9	55.6	60.4	51.7	1	1
11:15:57	71.4	30.6	67.6	65.5	59.6	55.4	60.5	51.5	1	1
11:15:58	71.4	30.6	67.5	65.3	59.3	55.1	60.6	51.3	1	1
11:15:59	71.4	30.7	67.4	65.1	59.1	54.8	60.6	51.1	1	1
11:16:00	71.4	30.7	67.3	65.0	58.8	54.6	60.7	51.0	1	1
11:16:01	71.3	30.7	67.3	64.8	58.5	54.3	60.8	50.8	1	1
11:16:02	71.3	30.7	67.3	64.5	58.3	54.0	60.9	50.7	1	1
11:16:03	71.3	30.7	67.3	64.3	58.0	53.7	61.0	50.5	1	1
11:16:04	71.3	30.7	67.1	64.2	57.6	53.5	61.0	50.3	1	1
11:16:05	71.2	30.6	67.1	64.0	57.3	53.3	61.2	50.2	1	1
11:16:06	71.2	30.6	66.9	63.8	57.0	53.0	61.2	50.0	1	1
11:16:07	71.3	30.6	66.8	63.7	56.7	52.7	61.3	49.8	1	1
11:16:08	71.3	30.8	66.8	63.3	56.5	52.3	61.3	49.5	1	1
11:16:09	71.2	30.7	66.7	63.2	56.2	52.3	61.4	49.4	1	1

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:16:10	71.2	30.6	66.6	63.0	55.8	52.0	61.5	49.3	1	1
11:16:11	71.0	30.6	66.6	62.7	55.7	51.8	61.7	49.2	1	1
11:16:12	71.0	30.6	66.6	62.5	55.4	51.5	61.7	49.0	1	1
11:16:13	71.0	30.6	66.4	62.4	55.0	51.3	61.7	48.8	1	1
11:16:14	70.9	30.6	66.4	62.0	54.8	51.0	61.9	48.7	1	1
11:16:15	70.9	30.5	66.3	61.9	54.4	50.9	62.0	48.5	1	1
11:16:16	70.9	30.6	66.1	61.6	54.2	50.6	61.9	48.3	1	1
11:16:17	70.9	30.6	66.0	61.4	53.9	50.5	62.0	48.2	1	1
11:16:18	70.9	30.7	65.9	61.1	53.7	50.1	62.0	47.9	1	1
11:16:19	70.8	30.6	65.7	60.9	53.3	50.0	62.0	47.8	1	1
11:16:20	70.9	30.6	65.6	60.7	53.1	49.7	62.0	47.6	1	1
11:16:21	70.8	30.6	65.6	60.4	52.8	49.5	62.1	47.5	1	1
11:16:22	70.8	30.6	65.4	60.2	52.5	49.3	62.1	47.3	1	1
11:16:23	70.7	30.6	65.3	59.9	52.3	49.1	62.2	47.2	1	1
11:16:24	70.6	30.6	65.2	59.6	52.1	48.9	62.2	47.0	1	1
11:16:25	70.6	30.6	65.0	59.4	51.8	48.6	62.2	46.8	1	1
11:16:26	70.6	30.6	64.9	59.1	51.6	48.4	62.2	46.7	1	1
11:16:27	70.5	30.6	64.7	58.9	51.3	48.3	62.3	46.6	1	1
11:16:28	70.4	30.6	64.6	58.7	51.1	48.1	62.3	46.4	1	1
11:16:29	70.3	30.6	64.4	58.4	50.9	47.9	62.3	46.3	1	1
11:16:31	70.3	30.6	64.2	58.2	50.5	47.7	62.3	46.1	1	1
11:16:32	70.2	30.6	64.2	57.9	50.3	47.5	62.3	46.0	1	1
11:16:33	70.2	30.6	64.0	57.7	50.0	47.3	62.3	45.8	1	1
11:16:34	70.2	30.7	63.9	57.3	49.9	47.0	62.3	45.6	1	1
11:16:35	70.1	30.6	63.7	57.0	49.6	46.9	62.3	45.5	1	0
11:16:36	70.0	30.6	63.6	56.7	49.4	46.8	62.4	45.4	1	0
11:16:37	70.0	30.7	63.3	56.5	49.1	46.5	62.2	45.1	1	0
11:16:38	69.9	30.6	63.2	56.2	48.8	46.4	62.3	45.1	1	0
11:16:39	69.8	30.6	63.1	55.9	48.7	46.2	62.2	44.9	1	0
11:16:40	69.8	30.7	62.8	55.7	48.5	45.9	62.1	44.7	1	0
11:16:41	69.6	30.6	62.8	55.5	48.2	45.8	62.2	44.7	1	0
11:16:42	69.6	30.6	62.5	55.3	48.1	45.6	62.1	44.5	1	0
11:16:43	69.5	30.6	62.4	55.1	47.8	45.5	62.1	44.3	1	0
11:16:44	69.5	30.6	62.3	55.0	47.6	45.4	62.1	44.2	1	0
11:16:45	69.3	30.6	62.3	54.7	47.5	45.2	62.1	44.1	1	0
11:16:46	69.4	30.7	62.0	54.7	47.4	45.0	61.9	43.9	1	0
11:16:47	69.2	30.6	62.0	54.4	47.4	44.9	62.0	43.8	1	0
11:16:48	69.2	30.6	61.8	54.4	47.1	44.9	61.9	43.7	1	0
11:16:49	69.2	30.7	61.6	54.3	47.1	44.7	61.8	43.6	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:16:50	69.1	30.7	61.6	54.1	47.1	44.6	61.8	43.5	1	0
11:16:51	69.0	30.6	61.5	54.0	47.0	44.6	61.8	43.4	1	0
11:16:52	69.0	30.6	61.4	53.9	47.0	44.5	61.7	43.3	1	0
11:16:53	68.9	30.6	61.3	53.8	46.9	44.5	61.8	43.2	1	0
11:16:54	69.0	30.7	61.2	53.7	47.0	44.4	61.6	43.0	1	0
11:16:55	68.9	30.7	61.2	53.5	47.0	44.3	61.6	43.0	1	0
11:16:56	68.8	30.6	61.1	53.6	46.8	44.4	61.6	43.0	1	0
11:16:57	68.8	30.6	61.0	53.4	46.8	44.3	61.6	42.9	1	0
11:16:58	68.8	30.7	60.9	53.4	46.9	44.2	61.5	42.7	1	0
11:16:59	68.7	30.6	60.9	53.3	46.9	44.3	61.5	42.8	1	0
11:17:00	68.7	30.6	60.8	53.3	46.9	44.3	61.4	42.6	1	0
11:17:01	68.7	30.7	60.7	53.2	46.9	44.2	61.4	42.5	1	0
11:17:02	68.6	30.6	60.7	53.1	46.9	44.2	61.4	42.5	1	0
11:17:03	68.5	30.6	60.7	53.0	46.9	44.1	61.4	42.5	1	0
11:17:05	68.5	30.7	60.6	53.0	46.8	44.1	61.4	42.4	1	0
11:17:06	68.5	30.6	60.5	53.0	46.7	44.1	61.3	42.3	1	0
11:17:07	68.4	30.6	60.6	52.9	46.8	44.1	61.4	42.3	1	0
11:17:08	68.3	30.5	60.5	52.9	46.7	44.1	61.4	42.4	1	0
11:17:09	68.3	30.6	60.4	53.0	46.7	44.1	61.3	42.2	1	0
11:17:10	68.3	30.6	60.3	53.0	46.6	44.1	61.2	42.2	1	0
11:17:11	68.3	30.6	60.2	52.9	46.7	44.0	61.2	42.1	1	0
11:17:12	68.3	30.6	60.2	52.9	46.7	44.0	61.1	42.1	1	0
11:17:13	68.3	30.6	60.1	52.9	46.7	44.0	61.1	42.0	1	0
11:17:14	68.2	30.6	60.2	52.7	46.8	44.0	61.1	42.0	1	0
11:17:15	68.2	30.6	60.0	52.8	46.7	44.0	61.0	41.9	1	0
11:17:16	68.1	30.5	60.1	52.7	46.8	44.1	61.1	41.9	1	0
11:17:17	68.1	30.6	60.0	52.6	46.9	44.0	61.0	41.8	1	0
11:17:18	68.1	30.6	60.0	52.7	46.8	44.1	61.0	41.8	1	0
11:17:19	68.2	30.7	59.9	52.6	46.9	44.0	60.9	41.7	1	0
11:17:20	68.1	30.7	59.9	52.6	47.0	44.0	60.9	41.7	1	0
11:17:21	68.1	30.7	59.8	52.6	46.9	44.0	60.8	41.6	1	0
11:17:22	68.0	30.6	59.9	52.6	47.0	44.0	60.9	41.7	1	0
11:17:23	68.0	30.6	59.8	52.5	47.0	44.0	60.8	41.6	1	0
11:17:24	68.0	30.6	59.7	52.6	46.9	44.1	60.8	41.6	1	0
11:17:25	68.0	30.6	59.7	52.5	46.9	44.1	60.8	41.6	1	0
11:17:26	67.8	30.6	59.8	52.4	47.1	44.0	60.8	41.6	1	0
11:17:27	67.8	30.6	59.8	52.4	47.1	44.1	60.8	41.6	1	0
11:17:28	67.9	30.6	59.7	52.5	47.0	44.2	60.8	41.6	1	0
11:17:29	67.9	30.7	59.6	52.5	47.0	44.1	60.7	41.5	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:17:30	67.8	30.6	59.7	52.4	47.0	44.2	60.7	41.5	1	0
11:17:31	67.7	30.6	59.7	52.4	47.1	44.1	60.7	41.4	1	0
11:17:32	67.8	30.7	59.7	52.4	47.1	44.2	60.7	41.4	1	0
11:17:33	67.7	30.7	59.6	52.3	47.2	44.1	60.7	41.4	1	0
11:17:34	67.8	30.7	59.6	52.3	47.2	44.2	60.6	41.3	1	0
11:17:35	67.7	30.5	59.5	52.4	47.1	44.4	60.7	41.4	1	0
11:17:36	67.7	30.6	59.5	52.4	47.1	44.4	60.6	41.3	1	0
11:17:38	67.7	30.7	59.5	52.3	47.3	44.3	60.6	41.3	1	0
11:17:39	67.7	30.7	59.5	52.3	47.3	44.3	60.5	41.2	1	0
11:17:40	67.6	30.6	59.4	52.4	47.2	44.5	60.5	41.3	1	0
11:17:41	67.7	30.7	59.3	52.3	47.3	44.4	60.4	41.2	1	0
11:17:42	67.6	30.7	59.4	52.3	47.4	44.4	60.4	41.2	1	0
11:17:43	67.6	30.6	59.3	52.3	47.4	44.5	60.5	41.3	1	0
11:17:44	67.6	30.7	59.4	52.2	47.5	44.4	60.4	41.2	1	0
11:17:45	67.6	30.7	59.3	52.3	47.4	44.4	60.4	41.2	1	0
11:17:46	67.5	30.6	59.4	52.3	47.4	44.5	60.5	41.3	1	0
11:17:47	67.5	30.7	59.3	52.3	47.5	44.5	60.4	41.2	1	0
11:17:48	67.6	30.7	59.2	52.3	47.5	44.5	60.3	41.1	1	0
11:17:49	67.6	30.7	59.2	52.3	47.5	44.6	60.3	41.1	1	0
11:17:50	67.5	30.7	59.3	52.3	47.5	44.6	60.4	41.1	1	0
11:17:51	67.5	30.6	59.2	52.3	47.4	44.8	60.4	41.2	1	0
11:17:52	67.5	30.7	59.2	52.2	47.5	44.7	60.3	41.1	1	0
11:17:53	67.5	30.7	59.2	52.3	47.5	44.8	60.3	41.1	1	0
11:17:54	67.5	30.7	59.1	52.3	47.5	44.8	60.3	41.1	1	0
11:17:55	67.5	30.7	59.2	52.3	47.6	44.9	60.3	41.1	1	0
11:17:56	67.5	30.7	59.1	52.3	47.6	44.9	60.3	41.1	1	0
11:17:57	67.4	30.6	59.2	52.2	47.6	45.0	60.3	41.1	1	0
11:17:58	67.4	30.7	59.2	52.2	47.7	44.9	60.2	41.1	1	0
11:17:59	67.4	30.7	59.2	52.2	47.8	44.9	60.2	41.1	1	0
11:18:00	67.4	30.7	59.2	52.2	47.8	45.0	60.2	41.1	1	0
11:18:01	67.5	30.7	59.0	52.3	47.7	45.1	60.1	41.0	1	0
11:18:02	67.4	30.8	59.2	52.1	47.9	44.9	60.1	41.0	1	0
11:18:03	67.4	30.7	59.1	52.2	47.8	45.1	60.1	41.0	1	0
11:18:04	67.4	30.8	59.0	52.2	47.9	45.0	60.0	40.9	1	0
11:18:05	67.4	30.7	59.0	52.2	47.9	45.1	60.0	40.9	1	0
11:18:06	67.3	30.7	59.0	52.2	47.9	45.2	60.0	41.0	1	0
11:18:07	67.3	30.7	59.1	52.2	48.0	45.2	60.0	41.0	1	0
11:18:08	67.3	30.7	59.1	52.2	48.0	45.3	60.0	41.1	1	0
11:18:09	67.3	30.7	59.0	52.2	48.0	45.3	60.0	41.0	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:18:10	67.3	30.7	59.0	52.2	48.1	45.3	59.9	41.0	1	0
11:18:12	67.3	30.7	59.0	52.2	48.1	45.3	60.0	41.0	1	0
11:18:13	67.3	30.6	59.0	52.2	48.0	45.5	60.0	41.1	1	0
11:18:14	67.3	30.7	59.0	52.2	48.1	45.4	59.9	41.0	1	0
11:18:15	67.3	30.7	59.0	52.2	48.1	45.5	59.9	41.0	1	0
11:18:16	67.3	30.8	59.0	52.1	48.2	45.4	59.9	41.0	1	0
11:18:17	67.3	30.7	59.0	52.2	48.1	45.5	59.9	41.0	1	0
11:18:18	67.2	30.9	59.0	52.2	48.1	45.6	60.0	41.1	1	0
11:18:19	67.3	31.1	58.9	52.2	48.2	45.6	59.9	41.0	1	0
11:18:20	67.3	31.2	58.9	52.3	48.2	45.6	59.8	40.9	1	0
11:18:21	67.2	31.2	58.9	52.3	48.1	45.8	59.9	41.1	1	0
11:18:22	67.2	31.3	58.9	52.2	48.3	45.7	59.8	41.0	1	0
11:18:23	67.2	31.3	59.0	52.2	48.2	45.8	59.9	41.1	1	0
11:18:24	67.1	31.4	59.0	52.2	48.3	45.8	59.9	41.1	1	0
11:18:25	67.2	31.5	58.9	52.3	48.3	45.8	59.8	41.0	1	0
11:18:26	67.2	31.7	58.9	52.3	48.3	45.8	59.8	41.0	1	0
11:18:27	67.2	31.8	58.9	52.2	48.4	45.8	59.7	41.0	1	0
11:18:28	67.2	31.9	58.8	52.2	48.4	45.8	59.7	41.0	1	0
11:18:29	67.2	31.8	58.9	52.2	48.4	45.9	59.8	41.0	1	0
11:18:30	67.2	31.9	58.9	52.2	48.4	46.0	59.7	41.1	1	0
11:18:31	67.2	32.1	58.8	52.2	48.5	46.0	59.6	41.0	1	0
11:18:32	67.1	32.2	58.9	52.2	48.5	46.0	59.7	41.0	1	0
11:18:33	67.1	32.2	58.9	52.2	48.5	46.2	59.7	41.1	1	0
11:18:34	67.2	32.4	58.8	52.3	48.5	46.1	59.6	41.0	1	0
11:18:35	67.2	32.5	58.8	52.3	48.5	46.2	59.6	41.0	1	0
11:18:36	67.1	32.6	58.8	52.2	48.6	46.2	59.7	41.1	1	0
11:18:37	67.2	32.7	58.7	52.4	48.5	46.3	59.6	41.1	1	0
11:18:38	67.1	32.9	58.8	52.2	48.7	46.2	59.6	41.1	1	0
11:18:39	67.1	32.9	58.8	52.2	48.7	46.2	59.6	41.1	1	0
11:18:40	67.1	33.0	58.8	52.2	48.8	46.3	59.6	41.1	1	0
11:18:41	67.1	33.0	58.8	52.3	48.7	46.3	59.6	41.1	1	0
11:18:42	67.0	33.1	58.8	52.2	48.8	46.4	59.7	41.1	1	0
11:18:43	67.1	33.1	58.8	52.3	48.7	46.4	59.7	41.2	1	0
11:18:44	67.0	33.1	58.8	52.3	48.8	46.4	59.7	41.2	1	0
11:18:45	67.0	33.2	58.8	52.3	48.8	46.4	59.7	41.2	1	0
11:18:47	67.1	33.3	58.7	52.3	48.8	46.5	59.7	41.1	1	0
11:18:48	67.1	33.4	58.6	52.4	48.8	46.5	59.6	41.1	1	0
11:18:49	67.0	33.6	58.8	52.2	48.9	46.5	59.7	41.2	1	0
11:18:50	67.1	33.7	58.7	52.3	48.9	46.5	59.6	41.1	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:18:51	67.1	33.9	58.7	52.3	48.9	46.6	59.6	41.1	1	0
11:18:52	67.1	34.1	58.7	52.3	48.9	46.6	59.6	41.1	1	0
11:18:53	67.1	34.2	58.6	52.4	48.9	46.7	59.6	41.1	1	0
11:18:54	67.0	34.3	58.7	52.3	49.0	46.7	59.7	41.1	1	0
11:18:55	67.0	34.3	58.7	52.3	49.0	46.7	59.7	41.2	1	0
11:18:56	67.0	34.5	58.7	52.3	49.1	46.7	59.7	41.2	1	0
11:18:57	67.0	34.7	58.7	52.3	49.1	46.7	59.7	41.1	1	0
11:18:58	66.9	34.7	58.7	52.4	49.0	46.9	59.8	41.2	1	0
11:18:59	67.0	34.9	58.6	52.3	49.2	46.8	59.7	41.1	1	0
11:19:00	67.0	35.0	58.6	52.3	49.2	46.8	59.7	41.2	1	0
11:19:01	66.9	35.1	58.7	52.3	49.2	46.9	59.8	41.2	1	0
11:19:02	67.0	35.1	58.6	52.4	49.2	46.9	59.7	41.2	1	0
11:19:03	67.0	35.2	58.6	52.4	49.2	46.9	59.7	41.2	1	0
11:19:04	66.9	35.2	58.6	52.4	49.3	47.0	59.7	41.3	1	0
11:19:05	66.9	35.3	58.7	52.4	49.3	47.0	59.8	41.3	1	0
11:19:06	67.0	35.4	58.6	52.4	49.4	46.9	59.6	41.2	1	0
11:19:07	66.9	35.4	58.7	52.3	49.4	47.0	59.7	41.3	1	0
11:19:08	66.9	35.4	58.6	52.4	49.4	47.1	59.7	41.3	1	0
11:19:09	66.9	35.5	58.6	52.4	49.4	47.1	59.7	41.4	1	0
11:19:10	66.9	35.6	58.6	52.5	49.4	47.2	59.7	41.3	1	0
11:19:11	67.0	35.8	58.5	52.5	49.4	47.1	59.6	41.3	1	0
11:19:12	66.9	35.9	58.6	52.4	49.5	47.1	59.6	41.3	1	0
11:19:13	66.9	35.9	58.6	52.4	49.5	47.2	59.6	41.4	1	0
11:19:14	66.9	36.0	58.6	52.4	49.5	47.2	59.6	41.4	1	0
11:19:15	66.9	36.1	58.6	52.4	49.5	47.2	59.6	41.4	1	0
11:19:16	66.8	36.1	58.6	52.4	49.6	47.3	59.7	41.4	1	0
11:19:17	66.9	36.3	58.5	52.4	49.6	47.3	59.6	41.4	1	0
11:19:18	66.8	36.3	58.7	52.4	49.7	47.3	59.7	41.5	1	0
11:19:19	66.8	36.4	58.6	52.4	49.6	47.4	59.7	41.4	1	0
11:19:21	66.8	36.4	58.5	52.5	49.6	47.4	59.6	41.4	1	0
11:19:22	66.8	36.5	58.5	52.5	49.7	47.4	59.6	41.4	1	0
11:19:23	66.8	36.5	58.6	52.5	49.7	47.5	59.7	41.5	1	0
11:19:24	66.8	36.6	58.6	52.4	49.7	47.5	59.6	41.5	1	0
11:19:25	66.8	36.7	58.5	52.5	49.8	47.5	59.6	41.4	1	0
11:19:26	66.7	36.7	58.6	52.4	49.8	47.5	59.7	41.6	1	0
11:19:27	66.8	36.8	58.5	52.5	49.8	47.6	59.6	41.5	1	0
11:19:28	66.8	36.9	58.5	52.6	49.8	47.6	59.5	41.5	1	0
11:19:29	66.7	37.0	58.6	52.4	49.9	47.6	59.6	41.5	1	0
11:19:30	66.7	37.0	58.6	52.5	49.9	47.7	59.6	41.6	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:19:31	66.7	37.1	58.6	52.4	50.0	47.6	59.6	41.6	1	0
11:19:32	66.8	37.1	58.5	52.6	49.9	47.7	59.5	41.5	1	0
11:19:33	66.7	37.3	58.6	52.5	50.1	47.7	59.5	41.5	1	0
11:19:34	66.7	37.3	58.5	52.5	50.1	47.7	59.4	41.5	1	0
11:19:35	66.7	37.3	58.5	52.6	50.1	47.8	59.4	41.5	1	0
11:19:36	66.7	37.4	58.5	52.6	50.0	47.9	59.4	41.6	1	0
11:19:37	66.7	37.5	58.5	52.6	50.1	47.9	59.4	41.6	1	0
11:19:38	66.7	37.5	58.5	52.6	50.1	47.9	59.3	41.6	1	0
11:19:39	66.7	37.6	58.5	52.6	50.1	48.0	59.3	41.6	1	0
11:19:40	66.7	37.6	58.5	52.6	50.1	48.0	59.3	41.6	1	0
11:19:41	66.7	37.8	58.5	52.6	50.1	48.1	59.3	41.6	1	0
11:19:42	66.7	37.9	58.5	52.7	50.2	48.1	59.3	41.6	1	0
11:19:43	66.7	38.0	58.5	52.6	50.2	48.1	59.3	41.6	1	0
11:19:44	66.7	38.0	58.5	52.7	50.2	48.2	59.3	41.6	1	0
11:19:45	66.7	38.2	58.5	52.6	50.3	48.1	59.2	41.6	1	0
11:19:46	66.7	38.2	58.5	52.7	50.3	48.1	59.1	41.6	1	0
11:19:47	66.6	38.2	58.5	52.6	50.4	48.2	59.2	41.7	1	0
11:19:48	66.7	38.3	58.5	52.7	50.4	48.2	59.1	41.6	1	0
11:19:49	66.7	38.4	58.4	52.8	50.3	48.3	59.1	41.6	1	0
11:19:50	66.7	38.5	58.4	52.8	50.3	48.3	59.0	41.6	1	0
11:19:51	66.6	38.5	58.5	52.7	50.4	48.3	59.1	41.7	1	0
11:19:52	66.6	38.5	58.5	52.7	50.4	48.4	59.2	41.8	1	0
11:19:53	66.6	38.7	58.5	52.7	50.5	48.3	59.0	41.7	1	0
11:19:55	66.7	38.8	58.4	52.8	50.5	48.4	59.0	41.7	1	0
11:19:56	66.7	38.8	58.4	52.8	50.5	48.4	59.0	41.6	1	0
11:19:57	66.6	38.7	58.5	52.8	50.5	48.5	59.1	41.8	1	0
11:19:58	66.7	38.8	58.5	52.8	50.6	48.4	59.0	41.7	1	0
11:19:59	66.6	38.8	58.5	52.8	50.6	48.6	59.0	41.8	1	0
11:20:00	66.6	38.9	58.5	52.8	50.6	48.6	59.0	41.8	1	0
11:20:01	66.6	38.9	58.5	52.8	50.7	48.6	59.0	41.8	1	0
11:20:02	66.7	38.9	58.4	52.9	50.6	48.7	59.0	41.7	1	0
11:20:03	66.6	38.9	58.5	52.9	50.6	48.8	59.0	41.9	1	0
11:20:04	66.5	39.0	58.6	52.8	50.8	48.7	59.1	41.9	1	0
11:20:05	66.6	39.0	58.5	52.9	50.7	48.8	59.0	41.8	1	0
11:20:06	66.6	39.1	58.5	52.9	50.7	48.9	59.0	41.9	1	0
11:20:07	66.6	39.1	58.5	52.9	50.8	48.9	59.0	41.9	1	0
11:20:08	66.6	39.3	58.5	52.9	50.9	48.8	59.0	41.8	1	0
11:20:09	66.6	39.3	58.5	52.9	50.9	48.9	59.0	41.9	1	0
11:20:10	66.6	39.3	58.4	52.9	50.9	48.9	59.0	41.8	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:20:11	66.6	39.4	58.4	52.9	50.9	48.9	59.0	41.8	1	0
11:20:12	66.5	39.3	58.5	53.0	50.9	49.1	59.2	42.0	1	0
11:20:13	66.6	39.5	58.5	53.0	51.0	49.0	59.0	41.9	1	0
11:20:14	66.6	39.5	58.4	53.0	51.0	49.0	59.0	41.9	1	0
11:20:15	66.6	39.5	58.4	53.0	51.0	49.0	59.0	41.9	1	0
11:20:16	66.5	39.5	58.5	53.0	51.0	49.1	59.1	42.0	1	0
11:20:17	66.5	39.6	58.5	53.0	51.0	49.1	59.1	42.0	1	0
11:20:18	66.5	39.6	58.4	53.0	51.0	49.2	59.1	42.0	1	0
11:20:19	66.6	39.7	58.4	53.1	51.1	49.1	59.0	42.0	1	0
11:20:20	66.5	39.7	58.5	53.0	51.1	49.2	59.0	42.0	1	0
11:20:21	66.5	39.7	58.4	53.1	51.1	49.2	59.1	42.1	1	0
11:20:22	66.6	39.9	58.4	53.1	51.1	49.2	59.0	42.0	1	0
11:20:23	66.5	39.9	58.4	53.0	51.2	49.2	59.0	42.1	1	0
11:20:24	66.5	39.9	58.4	53.0	51.2	49.3	59.0	42.1	1	0
11:20:25	66.5	40.0	58.4	53.1	51.2	49.3	59.0	42.1	1	0
11:20:26	66.6	40.2	58.3	53.1	51.3	49.3	58.9	42.0	1	0
11:20:27	66.5	40.1	58.4	53.1	51.2	49.4	59.0	42.1	1	0
11:20:29	66.5	40.1	58.4	53.1	51.3	49.4	59.0	42.2	1	0
11:20:30	66.5	40.2	58.4	53.1	51.3	49.4	59.0	42.2	1	0
11:20:31	66.5	40.2	58.4	53.1	51.3	49.5	59.0	42.2	1	0
11:20:32	66.5	40.2	58.4	53.1	51.4	49.5	59.0	42.2	1	0
11:20:33	66.4	40.3	58.4	53.2	51.4	49.5	59.0	42.2	1	0
11:20:34	66.5	40.3	58.4	53.2	51.4	49.5	59.0	42.1	1	0
11:20:35	66.5	40.4	58.4	53.2	51.4	49.6	58.9	42.2	1	0
11:20:36	66.4	40.4	58.4	53.2	51.5	49.6	59.0	42.2	1	0
11:20:37	66.4	40.4	58.4	53.2	51.5	49.7	59.0	42.3	1	0
11:20:38	66.4	40.5	58.4	53.3	51.5	49.7	59.0	42.2	1	0
11:20:39	66.4	40.6	58.4	53.2	51.6	49.6	58.9	42.2	1	0
11:20:40	66.4	40.6	58.4	53.3	51.5	49.7	58.9	42.2	1	0
11:20:41	66.4	40.6	58.4	53.3	51.6	49.8	58.9	42.2	1	0
11:20:42	66.4	40.7	58.4	53.3	51.6	49.7	58.9	42.2	1	0
11:20:43	66.4	40.6	58.4	53.3	51.6	49.8	58.9	42.3	1	0
11:20:44	66.4	40.7	58.4	53.3	51.7	49.8	58.9	42.3	1	0
11:20:45	66.4	40.8	58.4	53.3	51.7	49.8	58.9	42.3	1	0
11:20:46	66.4	40.8	58.3	53.4	51.7	49.9	58.9	42.3	1	0
11:20:47	66.4	40.8	58.4	53.4	51.7	49.9	58.9	42.3	1	0
11:20:48	66.4	40.9	58.4	53.4	51.8	49.9	58.9	42.3	1	0
11:20:49	66.4	41.0	58.3	53.5	51.7	50.0	58.8	42.3	1	0
11:20:50	66.4	41.1	58.3	53.4	51.8	49.9	58.8	42.3	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:20:51	66.4	41.1	58.4	53.5	51.8	50.0	58.9	42.3	1	0
11:20:52	66.3	41.2	58.4	53.4	51.8	50.1	58.9	42.4	1	0
11:20:53	66.3	41.3	58.4	53.5	51.9	50.0	58.9	42.3	1	0
11:20:54	66.3	41.3	58.4	53.4	51.9	50.1	58.9	42.4	1	0
11:20:55	66.3	41.4	58.4	53.5	51.9	50.1	58.9	42.4	1	0
11:20:56	66.3	41.4	58.3	53.5	51.9	50.1	58.8	42.3	1	0
11:20:57	66.3	41.4	58.4	53.5	52.0	50.2	58.8	42.4	1	0
11:20:58	66.4	41.4	58.3	53.6	52.0	50.2	58.8	42.4	1	0
11:20:59	66.3	41.4	58.4	53.6	52.0	50.3	58.8	42.4	1	0
11:21:00	66.2	41.4	58.4	53.5	52.1	50.3	58.9	42.5	1	0
11:21:01	66.3	41.5	58.4	53.6	52.1	50.3	58.8	42.4	1	0
11:21:03	66.3	41.5	58.4	53.6	52.1	50.3	58.8	42.4	1	0
11:21:04	66.2	41.5	58.4	53.6	52.1	50.4	58.8	42.5	1	0
11:21:05	66.3	41.5	58.4	53.6	52.1	50.4	58.7	42.5	1	0
11:21:06	66.3	41.5	58.4	53.6	52.1	50.4	58.8	42.5	1	0
11:21:07	66.3	41.5	58.3	53.7	52.1	50.4	58.8	42.5	1	0
11:21:08	66.3	41.5	58.3	53.7	52.1	50.4	58.7	42.5	1	0
11:21:09	66.2	41.5	58.3	53.7	52.2	50.4	58.7	42.5	1	0
11:21:10	66.2	41.6	58.4	53.6	52.2	50.4	58.8	42.4	1	0
11:21:11	66.3	41.7	58.2	53.7	52.1	50.4	58.7	42.4	1	0
11:21:12	66.2	41.7	58.3	53.6	52.2	50.4	58.8	42.4	1	0
11:21:13	66.2	41.7	58.3	53.7	52.3	50.4	58.7	42.4	1	0
11:21:14	66.2	41.8	58.3	53.7	52.2	50.4	58.7	42.4	1	0
11:21:15	66.2	41.8	58.3	53.7	52.2	50.5	58.7	42.4	1	0
11:21:16	66.2	41.8	58.2	53.7	52.2	50.5	58.7	42.4	1	0
11:21:17	66.2	41.8	58.3	53.7	52.3	50.5	58.7	42.4	1	0
11:21:18	66.2	41.9	58.2	53.7	52.3	50.5	58.7	42.4	1	0
11:21:19	66.2	41.9	58.2	53.7	52.3	50.5	58.7	42.4	1	0
11:21:20	66.2	42.0	58.2	53.7	52.3	50.6	58.7	42.4	1	0
11:21:21	66.2	42.1	58.2	53.8	52.3	50.6	58.7	42.4	1	0
11:21:22	66.2	42.1	58.2	53.8	52.4	50.6	58.8	42.4	1	0
11:21:23	66.2	42.2	58.2	53.8	52.4	50.6	58.8	42.5	1	0
11:21:24	66.2	42.2	58.2	53.8	52.4	50.7	58.8	42.5	1	0
11:21:25	66.2	42.3	58.2	53.8	52.4	50.7	58.8	42.5	1	0
11:21:26	66.2	42.3	58.2	53.8	52.4	50.7	58.8	42.5	1	0
11:21:27	66.1	42.4	58.2	53.8	52.5	50.8	58.9	42.5	1	0
11:21:28	66.1	42.4	58.2	53.8	52.5	50.8	58.9	42.5	1	0
11:21:29	66.1	42.4	58.2	53.8	52.5	50.8	58.9	42.6	1	0
11:21:30	66.1	42.5	58.2	53.8	52.6	50.8	58.9	42.6	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:21:31	66.1	42.5	58.2	53.9	52.6	50.9	58.9	42.6	1	0
11:21:32	66.1	42.6	58.2	53.9	52.6	50.9	58.9	42.6	1	0
11:21:33	66.1	42.6	58.2	53.9	52.6	50.9	58.9	42.6	1	0
11:21:34	66.2	42.7	58.1	53.9	52.7	50.9	58.8	42.6	1	0
11:21:35	66.2	42.8	58.2	53.9	52.8	50.8	58.8	42.6	1	0
11:21:37	66.2	42.7	58.2	54.0	52.7	50.9	58.9	42.6	1	0
11:21:38	66.0	42.6	58.3	54.0	52.7	51.0	59.0	42.8	1	0
11:21:39	66.1	42.7	58.2	54.0	52.8	51.0	58.9	42.7	1	0
11:21:40	66.1	42.8	58.2	54.0	52.8	51.0	58.9	42.7	1	0
11:21:41	66.1	42.8	58.2	54.1	52.8	51.0	58.9	42.7	1	0
11:21:42	66.1	42.8	58.2	54.1	52.8	51.1	59.0	42.8	1	0
11:21:43	66.0	42.7	58.3	54.1	52.8	51.2	59.0	42.9	1	0
11:21:44	66.1	42.9	58.1	54.1	52.9	51.1	58.9	42.7	1	0
11:21:45	66.1	42.8	58.2	54.2	52.9	51.2	58.9	42.8	1	0
11:21:46	66.1	42.9	58.2	54.2	52.9	51.2	58.9	42.8	1	0
11:21:47	66.1	42.9	58.2	54.2	53.0	51.2	58.9	42.8	1	0
11:21:48	66.1	42.9	58.2	54.2	52.9	51.3	58.9	42.8	1	0
11:21:49	66.1	43.0	58.2	54.3	53.0	51.3	58.9	42.8	1	0
11:21:50	66.0	43.0	58.2	54.3	53.0	51.3	59.0	42.9	1	0
11:21:51	66.1	43.1	58.2	54.2	53.0	51.4	59.0	42.9	1	0
11:21:52	66.1	43.1	58.2	54.3	53.1	51.4	59.0	42.9	1	0
11:21:53	66.1	43.2	58.2	54.3	53.1	51.4	58.9	42.9	1	0
11:21:54	66.1	43.2	58.2	54.3	53.1	51.4	58.9	42.9	1	0
11:21:55	66.1	43.2	58.2	54.4	53.1	51.5	58.9	42.9	1	0
11:21:56	66.1	43.3	58.2	54.4	53.2	51.5	58.9	42.9	1	0
11:21:57	66.1	43.3	58.1	54.4	53.2	51.5	58.8	42.9	1	0
11:21:58	66.0	43.2	58.2	54.4	53.2	51.6	58.9	43.0	1	0
11:21:59	66.1	43.3	58.2	54.4	53.2	51.6	58.9	43.0	1	0
11:22:00	66.1	43.3	58.2	54.4	53.3	51.6	58.8	43.0	1	0
11:22:01	66.1	43.3	58.2	54.4	53.3	51.5	58.8	43.0	1	0
11:22:02	66.0	43.3	58.2	54.4	53.3	51.6	58.9	43.1	1	0
11:22:03	66.0	43.3	58.3	54.4	53.4	51.7	58.9	43.1	1	0
11:22:04	66.0	43.3	58.2	54.5	53.4	51.7	58.8	43.0	1	0
11:22:05	66.0	43.3	58.2	54.5	53.4	51.7	58.8	43.1	1	0
11:22:06	66.0	43.3	58.2	54.5	53.5	51.7	58.8	43.1	1	0
11:22:07	66.0	43.4	58.2	54.5	53.5	51.8	58.8	43.0	1	0
11:22:08	66.0	43.4	58.2	54.6	53.5	51.8	58.8	43.1	1	0
11:22:09	66.0	43.3	58.2	54.6	53.5	51.9	58.8	43.1	1	0
11:22:11	66.0	43.4	58.2	54.6	53.5	51.9	58.8	43.1	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:22:12	66.0	43.3	58.2	54.6	53.5	51.9	58.8	43.2	1	0
11:22:13	66.0	43.4	58.2	54.6	53.6	51.9	58.8	43.2	1	0
11:22:14	66.0	43.4	58.2	54.6	53.6	51.9	58.7	43.2	1	0
11:22:15	66.0	43.4	58.2	54.7	53.6	52.0	58.7	43.2	1	0
11:22:16	66.0	43.5	58.2	54.7	53.7	52.0	58.7	43.2	1	0
11:22:17	66.0	43.5	58.2	54.7	53.7	52.0	58.7	43.2	1	0
11:22:18	65.9	43.6	58.3	54.6	53.8	52.0	58.7	43.3	1	0
11:22:19	66.0	43.6	58.2	54.7	53.7	52.0	58.6	43.2	1	0
11:22:20	66.0	43.6	58.2	54.8	53.7	52.1	58.6	43.3	1	0
11:22:21	66.0	43.6	58.2	54.8	53.8	52.1	58.7	43.3	1	0
11:22:22	66.0	43.7	58.2	54.8	53.8	52.2	58.6	43.3	1	0
11:22:23	66.0	43.7	58.2	54.8	53.8	52.2	58.6	43.3	1	0
11:22:24	66.0	43.7	58.2	54.8	53.8	52.2	58.6	43.3	1	0
11:22:25	66.0	43.8	58.2	54.8	53.9	52.2	58.5	43.3	1	0
11:22:26	65.9	43.7	58.2	54.9	53.9	52.3	58.5	43.4	1	0
11:22:27	66.0	43.7	58.2	54.9	53.9	52.3	58.5	43.4	1	0
11:22:28	66.0	43.7	58.2	54.9	53.9	52.3	58.5	43.4	1	0
11:22:29	66.0	43.7	58.2	54.9	54.0	52.3	58.5	43.4	1	0
11:22:30	66.0	43.7	58.2	54.9	54.0	52.4	58.4	43.5	1	0
11:22:31	66.0	43.7	58.2	54.9	54.0	52.4	58.4	43.5	1	0
11:22:32	65.9	43.7	58.2	54.9	54.0	52.4	58.4	43.5	1	0
11:22:33	65.9	43.7	58.3	54.9	54.1	52.4	58.4	43.6	1	0
11:22:34	66.0	43.6	58.2	55.0	54.1	52.5	58.4	43.6	1	0
11:22:35	65.9	43.7	58.2	55.0	54.1	52.5	58.4	43.6	1	0
11:22:36	65.9	43.7	58.2	55.0	54.1	52.5	58.4	43.6	1	0
11:22:37	65.9	43.7	58.2	55.0	54.2	52.5	58.4	43.6	1	0
11:22:38	65.9	43.8	58.2	55.0	54.2	52.5	58.4	43.7	1	0
11:22:39	65.9	43.8	58.2	55.1	54.2	52.6	58.4	43.7	1	0
11:22:40	65.9	43.9	58.2	55.1	54.2	52.6	58.4	43.7	1	0
11:22:41	66.0	43.9	58.2	55.1	54.2	52.6	58.4	43.7	1	0
11:22:42	65.9	43.9	58.2	55.1	54.2	52.6	58.5	43.7	1	0
11:22:43	65.9	44.0	58.2	55.1	54.3	52.6	58.5	43.7	1	0
11:22:45	65.9	44.0	58.2	55.1	54.3	52.7	58.5	43.8	1	0
11:22:46	65.9	44.0	58.2	55.1	54.3	52.6	58.5	43.8	1	0
11:22:47	65.9	44.1	58.2	55.2	54.4	52.6	58.4	43.7	1	0
11:22:48	65.9	44.1	58.2	55.2	54.3	52.7	58.5	43.8	1	0
11:22:49	65.9	44.1	58.2	55.2	54.4	52.7	58.4	43.8	1	0
11:22:50	65.9	44.1	58.2	55.2	54.4	52.7	58.4	43.8	1	0
11:22:51	65.9	44.2	58.2	55.3	54.4	52.8	58.4	43.9	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:22:52	65.9	44.2	58.2	55.3	54.4	52.8	58.4	43.9	1	0
11:22:53	65.9	44.2	58.2	55.3	54.4	52.8	58.4	43.9	1	0
11:22:54	65.9	44.3	58.2	55.3	54.4	52.9	58.4	43.9	1	0
11:22:55	65.9	44.3	58.2	55.3	54.5	52.8	58.4	43.9	1	0
11:22:56	65.9	44.4	58.2	55.4	54.5	52.9	58.4	43.9	1	0
11:22:57	65.8	44.4	58.3	55.3	54.5	52.9	58.4	44.0	1	0
11:22:58	65.9	44.5	58.2	55.4	54.5	52.9	58.3	44.0	1	0
11:22:59	65.9	44.5	58.2	55.4	54.5	52.9	58.3	44.0	1	0
11:23:00	65.9	44.6	58.2	55.4	54.5	52.9	58.3	43.9	1	0
11:23:01	65.9	44.6	58.2	55.4	54.6	52.9	58.3	44.0	1	0
11:23:02	65.9	44.6	58.2	55.5	54.5	53.0	58.3	44.0	1	0
11:23:03	65.9	44.7	58.2	55.5	54.6	53.0	58.2	44.0	1	0
11:23:04	65.8	44.7	58.2	55.5	54.6	53.0	58.2	44.0	1	0
11:23:05	65.8	44.7	58.2	55.5	54.6	53.0	58.2	44.0	1	0
11:23:06	65.9	44.8	58.1	55.5	54.7	53.0	58.1	44.0	1	0
11:23:07	65.8	44.8	58.2	55.5	54.7	53.0	58.1	44.0	1	0
11:23:08	65.8	44.8	58.2	55.5	54.7	53.0	58.1	44.0	1	0
11:23:09	65.8	44.8	58.2	55.5	54.7	53.1	58.1	44.1	1	0
11:23:10	65.8	44.8	58.2	55.6	54.7	53.1	58.0	44.1	1	0
11:23:11	65.8	44.8	58.2	55.6	54.7	53.1	58.0	44.1	1	0
11:23:12	65.8	44.8	58.2	55.6	54.7	53.1	58.0	44.1	1	0
11:23:13	65.8	44.8	58.2	55.6	54.7	53.2	58.0	44.1	1	0
11:23:14	65.8	44.8	58.2	55.7	54.7	53.2	58.0	44.1	1	0
11:23:15	65.8	44.7	58.2	55.7	54.7	53.3	58.1	44.2	1	0
11:23:16	65.8	44.9	58.2	55.6	54.8	53.2	58.0	44.2	1	0
11:23:17	65.8	44.9	58.2	55.7	54.8	53.2	58.0	44.2	1	0
11:23:18	65.8	44.9	58.2	55.7	54.8	53.2	58.0	44.2	1	0
11:23:20	65.8	44.9	58.2	55.7	54.8	53.3	58.0	44.2	1	0
11:23:21	65.8	45.0	58.2	55.7	54.9	53.3	58.0	44.2	1	0
11:23:22	65.7	45.0	58.2	55.7	54.9	53.3	58.0	44.2	1	0
11:23:23	65.8	45.0	58.2	55.7	54.9	53.3	58.0	44.2	1	0
11:23:24	65.8	45.1	58.2	55.7	54.9	53.3	58.0	44.2	1	0
11:23:25	65.8	45.1	58.1	55.8	54.9	53.4	58.0	44.2	1	0
11:23:26	65.7	45.1	58.2	55.8	55.0	53.4	58.0	44.3	1	0
11:23:27	65.7	45.1	58.2	55.8	55.0	53.4	58.1	44.3	1	0
11:23:28	65.7	45.2	58.2	55.8	55.0	53.4	58.0	44.3	1	0
11:23:29	65.7	45.2	58.2	55.8	55.1	53.5	58.0	44.3	1	0
11:23:30	65.7	45.2	58.2	55.9	55.1	53.5	58.0	44.3	1	0
11:23:31	65.7	45.2	58.2	55.9	55.1	53.6	58.0	44.3	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:23:32	65.7	45.3	58.2	55.9	55.1	53.6	57.9	44.3	1	0
11:23:33	65.7	45.3	58.2	55.9	55.2	53.5	58.0	44.3	1	0
11:23:34	65.7	45.3	58.2	55.9	55.2	53.6	58.0	44.3	1	0
11:23:35	65.7	45.4	58.2	55.9	55.2	53.6	58.0	44.3	1	0
11:23:36	65.7	45.4	58.2	56.0	55.2	53.6	58.0	44.3	1	0
11:23:37	65.7	45.4	58.2	56.0	55.2	53.7	58.0	44.4	1	0
11:23:38	65.7	45.4	58.2	56.0	55.2	53.7	57.9	44.3	1	0
11:23:39	65.7	45.4	58.2	56.0	55.3	53.7	58.0	44.4	1	0
11:23:40	65.7	45.4	58.2	56.1	55.3	53.8	58.0	44.4	1	0
11:23:41	65.7	45.4	58.2	56.1	55.3	53.8	58.0	44.4	1	0
11:23:42	65.7	45.4	58.2	56.1	55.4	53.8	58.0	44.4	1	0
11:23:43	65.6	45.4	58.2	56.1	55.3	53.9	58.0	44.4	1	0
11:23:44	65.6	45.5	58.2	56.1	55.4	53.9	58.0	44.4	1	0
11:23:45	65.7	45.4	58.2	56.2	55.4	53.9	58.0	44.4	1	0
11:23:46	65.6	45.5	58.3	56.2	55.5	53.9	57.9	44.4	1	0
11:23:47	65.6	45.5	58.2	56.2	55.5	54.0	58.0	44.5	1	0
11:23:48	65.6	45.5	58.3	56.2	55.5	54.0	58.0	44.5	1	0
11:23:49	65.6	45.5	58.3	56.2	55.6	53.9	57.9	44.5	1	0
11:23:50	65.6	45.5	58.3	56.2	55.6	54.0	57.9	44.5	1	0
11:23:51	65.6	45.5	58.3	56.2	55.6	54.0	57.9	44.5	1	0
11:23:52	65.6	45.5	58.2	56.3	55.6	54.1	57.9	44.5	1	0
11:23:54	65.6	45.5	58.3	56.3	55.6	54.1	57.9	44.5	1	0
11:23:55	65.6	45.4	58.3	56.3	55.6	54.2	58.0	44.6	1	0
11:23:56	65.6	45.5	58.3	56.4	55.6	54.2	57.9	44.5	1	0
11:23:57	65.6	45.5	58.3	56.4	55.7	54.2	57.9	44.5	1	0
11:23:58	65.5	45.6	58.4	56.2	55.8	54.1	58.0	44.5	1	0
11:23:59	65.5	45.6	58.4	56.3	55.8	54.2	58.0	44.6	1	0
11:24:00	65.6	45.5	58.3	56.4	55.7	54.3	57.9	44.6	1	0
11:24:01	65.6	45.5	58.3	56.5	55.8	54.3	57.9	44.6	1	0
11:24:02	65.6	45.6	58.3	56.5	55.8	54.3	57.9	44.5	1	0
11:24:03	65.6	45.6	58.3	56.4	55.8	54.3	57.9	44.6	1	0
11:24:04	65.6	45.6	58.3	56.5	55.8	54.4	57.8	44.6	1	0
11:24:05	65.6	45.5	58.3	56.5	55.8	54.4	57.9	44.6	1	0
11:24:06	65.5	45.5	58.4	56.5	55.9	54.4	57.9	44.6	1	0
11:24:07	65.6	45.6	58.4	56.5	56.0	54.4	57.8	44.6	1	0
11:24:08	65.5	45.5	58.4	56.6	55.9	54.5	57.9	44.7	1	0
11:24:09	65.5	45.6	58.4	56.5	56.0	54.4	57.8	44.7	1	0
11:24:10	65.5	45.5	58.4	56.6	55.9	54.5	57.8	44.7	1	0
11:24:11	65.6	45.5	58.3	56.7	56.0	54.5	57.8	44.7	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:24:12	65.6	45.6	58.4	56.6	56.1	54.5	57.8	44.6	1	0
11:24:13	65.5	45.5	58.4	56.7	56.0	54.6	57.9	44.7	1	0
11:24:14	65.5	45.6	58.4	56.7	56.1	54.6	57.8	44.7	1	0
11:24:15	65.5	45.6	58.4	56.7	56.1	54.6	57.8	44.7	1	0
11:24:16	65.5	45.6	58.4	56.7	56.1	54.6	57.8	44.7	1	0
11:24:17	65.5	45.7	58.4	56.7	56.1	54.6	57.8	44.7	1	0
11:24:18	65.5	45.7	58.4	56.8	56.2	54.6	57.7	44.8	1	0
11:24:19	65.5	45.6	58.4	56.8	56.2	54.7	57.7	44.8	1	0
11:24:20	65.5	45.6	58.4	56.8	56.2	54.7	57.7	44.8	1	0
11:24:21	65.5	45.7	58.4	56.8	56.2	54.7	57.7	44.8	1	0
11:24:22	65.5	45.7	58.5	56.7	56.3	54.7	57.7	44.9	1	0
11:24:23	65.5	45.7	58.4	56.8	56.2	54.8	57.7	44.9	1	0
11:24:24	65.5	45.7	58.4	56.8	56.3	54.8	57.7	44.9	1	0
11:24:25	65.5	45.7	58.4	56.9	56.3	54.8	57.7	44.9	1	0
11:24:26	65.5	45.6	58.5	56.9	56.3	54.9	57.7	44.9	1	0
11:24:28	65.5	45.7	58.5	56.9	56.3	54.9	57.7	44.9	1	0
11:24:29	65.4	45.6	58.5	56.9	56.3	54.9	57.7	45.0	1	0
11:24:30	65.5	45.7	58.5	56.9	56.4	54.9	57.7	45.0	1	0
11:24:31	65.5	45.7	58.5	56.9	56.4	54.9	57.6	45.0	1	0
11:24:32	65.5	45.7	58.5	57.0	56.4	55.0	57.6	45.0	1	0
11:24:33	65.5	45.7	58.5	57.0	56.4	55.0	57.6	45.0	1	0
11:24:34	65.4	45.7	58.5	57.0	56.4	55.0	57.6	45.0	1	0
11:24:35	65.5	45.7	58.5	57.0	56.5	55.0	57.6	45.0	1	0
11:24:36	65.4	45.7	58.5	57.0	56.5	55.0	57.6	45.1	1	0
11:24:37	65.4	45.7	58.6	57.0	56.5	55.1	57.6	45.1	1	0
11:24:38	65.4	45.7	58.6	57.0	56.5	55.1	57.6	45.1	1	0
11:24:39	65.4	45.8	58.6	57.1	56.6	55.1	57.5	45.1	1	0
11:24:40	65.4	45.8	58.6	57.1	56.6	55.1	57.5	45.1	1	0
11:24:41	65.4	45.8	58.6	57.2	56.5	55.2	57.5	45.1	1	0
11:24:42	65.5	45.8	58.5	57.2	56.6	55.2	57.4	45.1	1	0
11:24:43	65.4	45.8	58.6	57.2	56.6	55.2	57.5	45.1	1	0
11:24:44	65.4	45.8	58.6	57.2	56.7	55.2	57.5	45.1	1	0
11:24:45	65.4	45.8	58.6	57.2	56.7	55.2	57.4	45.1	1	0
11:24:46	65.4	45.9	58.6	57.2	56.7	55.2	57.4	45.2	1	0
11:24:47	65.4	45.9	58.6	57.2	56.7	55.3	57.4	45.1	1	0
11:24:48	65.4	45.9	58.6	57.2	56.7	55.3	57.4	45.1	1	0
11:24:49	65.3	45.9	58.7	57.2	56.8	55.3	57.5	45.2	1	0
11:24:50	65.4	45.9	58.6	57.3	56.8	55.3	57.4	45.2	1	0
11:24:51	65.4	45.9	58.6	57.3	56.8	55.4	57.4	45.2	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:24:52	65.4	46.0	58.6	57.3	56.9	55.3	57.3	45.2	1	0
11:24:53	65.4	45.9	58.6	57.4	56.8	55.4	57.4	45.2	1	0
11:24:54	65.4	45.9	58.6	57.4	56.8	55.5	57.4	45.3	1	0
11:24:55	65.3	45.9	58.7	57.3	57.0	55.4	57.4	45.3	1	0
11:24:56	65.3	45.9	58.7	57.4	56.9	55.5	57.4	45.3	1	0
11:24:57	65.4	45.9	58.7	57.4	56.9	55.5	57.4	45.3	1	0
11:24:58	65.3	45.9	58.7	57.4	57.0	55.5	57.4	45.3	1	0
11:24:59	65.3	45.9	58.7	57.4	57.0	55.5	57.3	45.3	1	0
11:25:00	65.4	45.9	58.7	57.5	57.0	55.5	57.3	45.3	1	0
11:25:02	65.4	46.0	58.7	57.5	57.0	55.5	57.3	45.3	1	0
11:25:03	65.4	46.0	58.7	57.5	57.1	55.5	57.3	45.3	1	0
11:25:04	65.3	45.9	58.8	57.4	57.1	55.5	57.4	45.4	1	0
11:25:05	65.4	46.0	58.7	57.6	57.0	55.6	57.2	45.3	1	0
11:25:06	65.4	46.0	58.7	57.5	57.1	55.6	57.3	45.3	1	0
11:25:07	65.3	46.0	58.7	57.6	57.1	55.7	57.3	45.4	1	0
11:25:08	65.3	46.0	58.8	57.6	57.1	55.7	57.3	45.4	1	0
11:25:09	65.3	46.0	58.8	57.6	57.1	55.7	57.4	45.5	1	0
11:25:10	65.3	46.0	58.8	57.6	57.2	55.7	57.3	45.4	1	0
11:25:11	65.3	46.0	58.8	57.6	57.2	55.7	57.3	45.5	1	0
11:25:12	65.3	46.0	58.8	57.7	57.2	55.7	57.3	45.4	1	0
11:25:13	65.2	46.0	58.9	57.6	57.3	55.8	57.3	45.5	1	0
11:25:14	65.3	46.0	58.8	57.7	57.2	55.8	57.3	45.5	1	0
11:25:15	65.3	46.0	58.8	57.8	57.2	55.9	57.3	45.5	1	0
11:25:16	65.3	46.1	58.8	57.7	57.3	55.8	57.2	45.5	1	0
11:25:17	65.3	46.1	58.8	57.7	57.3	55.8	57.3	45.5	1	0
11:25:18	65.3	46.1	58.9	57.8	57.3	55.9	57.2	45.6	1	0
11:25:19	65.3	46.1	58.9	57.7	57.4	55.9	57.2	45.6	1	0
11:25:20	65.3	46.1	58.9	57.8	57.3	55.9	57.2	45.6	1	0
11:25:21	65.3	46.1	58.9	57.8	57.3	56.0	57.2	45.6	1	0
11:25:22	65.2	46.0	59.0	57.8	57.4	56.0	57.3	45.7	1	0
11:25:23	65.2	46.1	58.9	57.8	57.4	56.0	57.2	45.6	1	0
11:25:24	65.2	46.1	58.9	57.8	57.5	56.0	57.2	45.6	1	0
11:25:25	65.2	46.1	59.0	57.8	57.5	56.0	57.2	45.7	1	0
11:25:26	65.2	46.1	58.9	57.9	57.5	56.0	57.2	45.7	1	0
11:25:27	65.2	46.1	58.9	57.9	57.5	56.0	57.2	45.7	1	0
11:25:28	65.2	46.1	59.0	57.9	57.5	56.1	57.2	45.7	1	0
11:25:29	65.2	46.1	59.0	57.9	57.6	56.1	57.2	45.7	1	0
11:25:30	65.2	46.2	59.0	57.9	57.6	56.1	57.2	45.7	1	0
11:25:31	65.2	46.2	59.0	57.9	57.6	56.1	57.2	45.7	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:25:32	65.2	46.3	58.9	58.0	57.6	56.1	57.1	45.7	1	0
11:25:33	65.2	46.2	59.0	58.0	57.6	56.2	57.2	45.7	1	0
11:25:34	65.2	46.3	59.0	58.0	57.7	56.2	57.1	45.7	1	0
11:25:35	65.2	46.3	59.0	58.0	57.7	56.2	57.2	45.7	1	0
11:25:37	65.2	46.3	59.0	58.1	57.6	56.3	57.2	45.7	1	0
11:25:38	65.2	46.3	59.0	58.0	57.7	56.2	57.2	45.7	1	0
11:25:39	65.2	46.3	59.0	58.1	57.7	56.3	57.2	45.8	1	0
11:25:40	65.2	46.3	59.0	58.1	57.7	56.3	57.2	45.8	1	0
11:25:41	65.2	46.3	59.0	58.1	57.7	56.3	57.2	45.8	1	0
11:25:42	65.2	46.3	59.0	58.2	57.8	56.3	57.2	45.8	1	0
11:25:43	65.2	46.3	59.0	58.2	57.7	56.4	57.2	45.8	1	0
11:25:44	65.1	46.3	59.1	58.2	57.8	56.4	57.3	45.9	1	0
11:25:45	65.2	46.3	59.0	58.3	57.8	56.4	57.2	45.8	1	0
11:25:46	65.2	46.4	59.0	58.3	57.8	56.4	57.1	45.8	1	0
11:25:47	65.2	46.4	59.1	58.2	57.9	56.4	57.2	45.9	1	0
11:25:48	65.2	46.3	59.1	58.3	57.9	56.5	57.2	45.9	1	0
11:25:49	65.2	46.4	59.1	58.3	57.9	56.4	57.2	45.9	1	0
11:25:50	65.2	46.4	59.1	58.3	57.9	56.5	57.2	46.0	1	0
11:25:51	65.1	46.3	59.2	58.3	57.9	56.5	57.2	46.0	1	0
11:25:52	65.1	46.4	59.2	58.2	58.0	56.4	57.2	46.0	1	0
11:25:53	65.1	46.4	59.1	58.3	58.0	56.5	57.2	46.0	1	0
11:25:54	65.1	46.4	59.2	58.3	58.0	56.5	57.2	46.0	1	0
11:25:55	65.2	46.4	59.1	58.4	58.0	56.6	57.1	46.0	1	0
11:25:56	65.1	46.4	59.2	58.4	58.0	56.6	57.2	46.0	1	0
11:25:57	65.1	46.4	59.1	58.4	58.0	56.6	57.2	46.1	1	0
11:25:58	65.1	46.4	59.2	58.4	58.1	56.6	57.2	46.1	1	0
11:25:59	65.1	46.4	59.2	58.4	58.1	56.7	57.2	46.1	1	0
11:26:00	65.1	46.4	59.2	58.4	58.1	56.7	57.1	46.1	1	0
11:26:01	65.1	46.5	59.2	58.4	58.2	56.6	57.1	46.1	1	0
11:26:02	65.1	46.4	59.1	58.6	58.0	56.8	57.1	46.1	1	0
11:26:03	65.1	46.4	59.2	58.5	58.1	56.7	57.1	46.1	1	0
11:26:04	65.1	46.4	59.2	58.5	58.1	56.8	57.1	46.1	1	0
11:26:05	65.1	46.4	59.2	58.5	58.2	56.8	57.1	46.2	1	0
11:26:06	65.1	46.4	59.3	58.5	58.2	56.8	57.1	46.2	1	0
11:26:07	65.1	46.4	59.3	58.5	58.2	56.8	57.1	46.2	1	0
11:26:08	65.0	46.4	59.3	58.6	58.2	56.8	57.1	46.2	1	0
11:26:09	65.0	46.4	59.3	58.6	58.3	56.8	57.1	46.2	1	0
11:26:11	65.1	46.4	59.3	58.6	58.3	56.9	57.0	46.2	1	0
11:26:12	65.1	46.4	59.3	58.6	58.3	56.9	57.0	46.2	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:26:13	65.0	46.4	59.3	58.7	58.3	56.9	57.0	46.2	1	0
11:26:14	65.1	46.4	59.4	58.7	58.3	57.0	57.0	46.3	1	0
11:26:15	65.0	46.5	59.4	58.6	58.4	56.9	57.0	46.2	1	0
11:26:16	65.0	46.5	59.4	58.7	58.4	57.0	57.0	46.3	1	0
11:26:17	65.0	46.5	59.4	58.7	58.4	57.0	57.0	46.3	1	0
11:26:18	65.0	46.5	59.4	58.7	58.4	57.0	57.0	46.3	1	0
11:26:19	65.0	46.5	59.4	58.8	58.4	57.0	57.0	46.3	1	0
11:26:20	65.0	46.5	59.4	58.8	58.4	57.0	57.0	46.3	1	0
11:26:21	65.0	46.5	59.4	58.8	58.5	57.0	57.0	46.3	1	0
11:26:22	65.0	46.6	59.5	58.8	58.5	57.0	57.0	46.3	1	0
11:26:23	65.0	46.6	59.5	58.8	58.5	57.1	57.0	46.3	1	0
11:26:24	65.0	46.5	59.5	58.8	58.5	57.1	57.0	46.4	1	0
11:26:25	64.9	46.6	59.5	58.9	58.5	57.1	57.0	46.4	1	0
11:26:26	64.9	46.5	59.5	58.9	58.6	57.1	57.0	46.4	1	0
11:26:27	65.0	46.6	59.5	58.9	58.6	57.1	57.0	46.4	1	0
11:26:28	65.0	46.6	59.5	58.9	58.6	57.2	57.0	46.4	1	0
11:26:29	65.0	46.6	59.5	58.9	58.6	57.2	57.0	46.4	1	0
11:26:30	64.9	46.6	59.6	58.9	58.6	57.2	57.0	46.4	1	0
11:26:31	64.9	46.6	59.6	58.9	58.7	57.2	57.0	46.5	1	0
11:26:32	64.9	46.6	59.6	58.9	58.7	57.2	57.0	46.5	1	0
11:26:33	64.9	46.6	59.6	58.9	58.7	57.3	57.0	46.5	1	0
11:26:34	64.9	46.6	59.6	59.0	58.7	57.3	57.0	46.5	1	0
11:26:35	64.9	46.6	59.6	59.0	58.7	57.3	57.0	46.5	1	0
11:26:36	64.9	46.6	59.6	59.0	58.8	57.3	57.0	46.5	1	0
11:26:37	64.9	46.6	59.6	59.0	58.8	57.3	57.0	46.5	1	0
11:26:38	64.9	46.6	59.6	59.0	58.8	57.3	57.0	46.5	1	0
11:26:39	64.9	46.6	59.6	59.1	58.8	57.3	57.0	46.5	1	0
11:26:40	64.9	46.6	59.7	59.1	58.8	57.4	57.0	46.5	1	0
11:26:41	64.9	46.6	59.7	59.1	58.8	57.4	57.0	46.5	1	0
11:26:42	64.9	46.7	59.7	59.1	58.9	57.4	57.0	46.5	1	0
11:26:43	64.8	46.6	59.7	59.1	58.9	57.4	57.0	46.6	1	0
11:26:45	64.8	46.7	59.7	59.1	58.9	57.4	57.0	46.6	1	0
11:26:46	64.8	46.7	59.7	59.1	58.9	57.5	57.0	46.6	1	0
11:26:47	64.8	46.7	59.7	59.2	58.9	57.5	57.0	46.6	1	0
11:26:48	64.8	46.7	59.7	59.2	59.0	57.5	57.0	46.6	1	0
11:26:49	64.8	46.6	59.7	59.2	59.0	57.6	57.0	46.7	1	0
11:26:50	64.8	46.7	59.7	59.2	59.0	57.5	56.9	46.6	1	0
11:26:51	64.8	46.6	59.7	59.3	59.0	57.6	57.0	46.7	1	0
11:26:52	64.8	46.6	59.8	59.2	59.1	57.6	57.0	46.7	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:26:53	64.8	46.6	59.8	59.3	59.1	57.6	56.9	46.7	1	0
11:26:54	64.8	46.6	59.7	59.3	59.0	57.6	56.9	46.7	1	0
11:26:55	64.8	46.6	59.8	59.3	59.1	57.7	57.0	46.7	1	0
11:26:56	64.8	46.7	59.8	59.3	59.1	57.6	57.0	46.7	1	0
11:26:57	64.8	46.7	59.8	59.3	59.2	57.6	57.0	46.7	1	0
11:26:58	64.8	46.7	59.8	59.4	59.2	57.7	57.0	46.8	1	0
11:26:59	64.8	46.7	59.8	59.4	59.1	57.8	57.0	46.8	1	0
11:27:00	64.8	46.7	59.8	59.4	59.2	57.7	57.0	46.8	1	0
11:27:01	64.8	46.7	59.8	59.4	59.2	57.8	57.0	46.8	1	0
11:27:02	64.7	46.7	59.9	59.4	59.2	57.8	57.0	46.8	1	0
11:27:03	64.8	46.7	59.9	59.5	59.2	57.8	57.0	46.8	1	0
11:27:04	64.8	46.7	59.8	59.5	59.2	57.8	57.0	46.8	1	0
11:27:05	64.7	46.7	59.9	59.5	59.3	57.9	57.0	46.9	1	0
11:27:06	64.8	46.7	59.9	59.5	59.2	57.9	57.0	46.8	1	0
11:27:07	64.7	46.7	59.9	59.5	59.3	57.9	57.0	46.9	1	0
11:27:08	64.7	46.7	59.9	59.5	59.3	57.9	57.0	46.9	1	0
11:27:09	64.7	46.8	60.0	59.5	59.3	57.9	57.0	46.9	1	0
11:27:10	64.7	46.8	59.9	59.6	59.3	57.9	57.0	46.9	1	0
11:27:11	64.7	46.8	60.0	59.6	59.4	58.0	57.0	46.9	1	0
11:27:12	64.7	46.8	60.0	59.6	59.4	58.0	57.0	46.9	1	0
11:27:13	64.7	46.8	60.0	59.6	59.4	58.0	57.0	46.9	1	0
11:27:14	64.7	46.8	60.0	59.6	59.4	58.0	57.0	46.9	1	0
11:27:15	64.7	46.8	60.0	59.6	59.4	58.0	57.1	47.0	1	0
11:27:16	64.7	46.8	60.0	59.6	59.4	58.0	57.0	47.0	1	0
11:27:17	64.7	46.8	60.0	59.7	59.4	58.0	57.0	47.0	1	0
11:27:18	64.7	46.8	60.1	59.7	59.4	58.1	57.0	47.0	1	0
11:27:20	64.7	46.8	60.0	59.7	59.4	58.1	57.0	47.0	1	0
11:27:21	64.8	46.8	60.0	59.7	59.5	58.1	57.0	47.0	1	0
11:27:22	64.7	46.8	60.1	59.8	59.5	58.1	57.0	47.0	1	0
11:27:23	64.7	46.8	60.1	59.7	59.6	58.1	57.0	47.0	1	0
11:27:24	64.7	46.7	60.1	59.8	59.5	58.1	57.0	47.0	1	0
11:27:25	64.7	46.7	60.1	59.7	59.6	58.1	57.0	47.1	1	0
11:27:26	64.8	46.8	60.1	59.8	59.6	58.1	56.9	47.0	1	0
11:27:27	64.7	46.7	60.1	59.9	59.6	58.2	56.9	47.0	1	0
11:27:28	64.6	46.7	60.2	59.8	59.6	58.2	56.9	47.1	1	0
11:27:29	64.6	46.7	60.2	59.8	59.7	58.2	56.9	47.1	1	0
11:27:30	64.7	46.8	60.1	59.9	59.7	58.2	56.8	47.0	1	0
11:27:31	64.7	46.7	60.2	59.9	59.7	58.3	56.9	47.1	1	0
11:27:32	64.7	46.7	60.2	59.9	59.7	58.3	56.8	47.1	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:27:33	64.6	46.7	60.2	59.9	59.7	58.3	56.8	47.1	1	0
11:27:34	64.6	46.6	60.2	60.0	59.7	58.4	56.8	47.2	1	0
11:27:35	64.6	46.6	60.3	60.0	59.7	58.4	56.7	47.2	1	0
11:27:36	64.6	46.7	60.3	59.9	59.8	58.3	56.6	47.2	1	0
11:27:37	64.6	46.7	60.3	60.0	59.8	58.4	56.5	47.2	1	0
11:27:38	64.7	46.6	60.3	60.0	59.8	58.4	56.4	47.2	1	0
11:27:39	64.6	46.6	60.3	60.0	59.8	58.4	56.4	47.2	1	0
11:27:40	64.6	46.7	60.3	60.0	59.8	58.4	56.3	47.3	1	0
11:27:41	64.6	46.7	60.3	60.1	59.8	58.4	56.3	47.3	1	0
11:27:42	64.6	46.7	60.3	60.1	59.8	58.5	56.2	47.3	1	0
11:27:43	64.6	46.7	60.3	60.1	59.9	58.5	56.2	47.3	1	0
11:27:44	64.6	46.7	60.3	60.1	59.9	58.5	56.1	47.3	1	0
11:27:45	64.6	46.8	60.4	60.1	59.9	58.5	56.0	47.3	1	0
11:27:46	64.6	46.8	60.4	60.2	59.9	58.5	56.0	47.4	1	0
11:27:47	64.6	46.8	60.4	60.2	59.9	58.5	55.9	47.4	1	0
11:27:48	64.6	46.8	60.4	60.2	59.9	58.5	55.9	47.4	1	0
11:27:49	64.6	46.8	60.4	60.2	59.9	58.5	55.9	47.4	1	0
11:27:50	64.6	46.9	60.4	60.2	60.0	58.6	55.9	47.4	1	0
11:27:51	64.6	46.9	60.4	60.2	60.0	58.6	55.9	47.4	1	0
11:27:52	64.6	46.9	60.4	60.3	60.0	58.6	55.8	47.4	1	0
11:27:54	64.6	46.9	60.4	60.3	60.0	58.6	55.8	47.4	1	0
11:27:55	64.6	46.9	60.4	60.3	60.0	58.6	55.8	47.5	1	0
11:27:56	64.6	46.9	60.4	60.3	60.0	58.6	55.8	47.5	1	0
11:27:57	64.6	46.9	60.5	60.3	60.0	58.6	55.8	47.5	1	0
11:27:58	64.6	46.9	60.5	60.3	60.0	58.6	55.8	47.5	1	0
11:27:59	64.6	46.9	60.5	60.3	60.1	58.6	55.8	47.5	1	0
11:28:00	64.6	47.0	60.5	60.3	60.1	58.7	55.8	47.5	1	0
11:28:01	64.6	47.0	60.5	60.3	60.1	58.7	55.8	47.6	1	0
11:28:02	64.6	47.0	60.5	60.3	60.1	58.7	55.8	47.6	1	0
11:28:03	64.6	47.0	60.5	60.4	60.1	58.7	55.8	47.6	1	0
11:28:04	64.6	47.0	60.5	60.4	60.2	58.7	55.8	47.6	1	0
11:28:05	64.6	47.0	60.6	60.4	60.2	58.8	55.8	47.6	1	0
11:28:06	64.6	47.0	60.6	60.4	60.2	58.7	55.8	47.6	1	0
11:28:07	64.6	47.0	60.6	60.4	60.2	58.8	55.8	47.7	1	0
11:28:08	64.6	47.0	60.6	60.4	60.2	58.8	55.8	47.7	1	0
11:28:09	64.6	47.0	60.6	60.5	60.3	58.8	55.8	47.6	1	0
11:28:10	64.6	47.0	60.6	60.5	60.3	58.8	55.8	47.7	1	0
11:28:11	64.6	47.0	60.6	60.5	60.3	58.8	55.8	47.7	1	0
11:28:12	64.6	47.0	60.7	60.5	60.3	58.8	55.8	47.7	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:28:13	64.6	47.0	60.6	60.5	60.3	58.9	55.8	47.7	1	0
11:28:14	64.6	47.0	60.7	60.5	60.3	58.9	55.8	47.7	1	0
11:28:15	64.6	47.1	60.7	60.5	60.3	58.9	55.8	47.7	1	0
11:28:16	64.6	47.1	60.7	60.6	60.3	58.9	55.9	47.7	1	0
11:28:17	64.6	47.0	60.7	60.6	60.3	58.9	55.8	47.7	1	0
11:28:18	64.6	47.1	60.7	60.6	60.4	58.9	55.9	47.7	1	0
11:28:19	64.6	47.0	60.7	60.6	60.3	59.0	55.9	47.7	1	0
11:28:20	64.6	47.0	60.8	60.6	60.4	59.0	55.9	47.8	1	0
11:28:21	64.6	47.1	60.8	60.6	60.4	59.0	55.9	47.7	1	0
11:28:22	64.6	47.1	60.8	60.6	60.4	59.0	55.9	47.7	1	0
11:28:23	64.6	47.1	60.8	60.6	60.4	59.1	55.9	47.8	1	0
11:28:24	64.6	47.1	60.8	60.6	60.4	59.1	55.9	47.8	1	0
11:28:25	64.6	47.1	60.8	60.7	60.4	59.1	55.9	47.8	1	0
11:28:26	64.6	47.1	60.8	60.7	60.5	59.1	55.9	47.8	1	0
11:28:28	64.6	47.1	60.8	60.7	60.5	59.1	55.9	47.8	1	0
11:28:29	64.6	47.1	60.9	60.7	60.5	59.1	55.9	47.8	1	0
11:28:30	64.6	47.1	60.9	60.7	60.5	59.2	55.9	47.8	1	0
11:28:31	64.6	47.1	60.9	60.7	60.5	59.1	55.9	47.8	1	0
11:28:32	64.6	47.1	60.9	60.8	60.5	59.2	56.0	47.9	1	0
11:28:33	64.6	47.1	60.9	60.8	60.5	59.2	56.0	47.9	1	0
11:28:34	64.6	47.1	60.9	60.8	60.6	59.2	56.0	47.9	1	0
11:28:35	64.6	47.1	60.9	60.8	60.6	59.2	56.0	47.9	1	0
11:28:36	64.6	47.1	60.9	60.9	60.6	59.2	56.0	47.9	1	0
11:28:37	64.6	47.2	60.9	60.9	60.6	59.2	56.0	47.9	1	0
11:28:38	64.6	47.2	61.0	60.9	60.6	59.3	56.0	47.9	1	0
11:28:39	64.6	47.2	61.0	60.9	60.6	59.3	56.0	47.9	1	0
11:28:40	64.6	47.2	61.0	60.9	60.7	59.3	56.0	47.9	1	0
11:28:41	64.6	47.2	61.0	60.9	60.7	59.3	56.0	47.9	1	0
11:28:42	64.6	47.2	61.0	60.9	60.7	59.3	56.0	48.0	1	0
11:28:43	64.6	47.2	61.0	61.0	60.7	59.3	56.0	48.0	1	0
11:28:44	64.6	47.2	61.0	61.0	60.7	59.4	56.1	48.0	1	0
11:28:45	64.6	47.2	61.0	61.0	60.8	59.4	56.1	48.0	1	0
11:28:46	64.6	47.2	61.1	61.0	60.8	59.4	56.1	48.0	1	0
11:28:47	64.6	47.2	61.1	61.0	60.8	59.4	56.1	48.0	1	0
11:28:48	64.6	47.2	61.1	61.0	60.8	59.4	56.1	48.0	1	0
11:28:49	64.6	47.2	61.1	61.1	60.9	59.5	56.1	48.0	1	0
11:28:50	64.6	47.2	61.1	61.1	60.9	59.5	56.2	48.0	1	0
11:28:51	64.6	47.2	61.1	61.1	60.9	59.5	56.2	48.0	1	0
11:28:52	64.6	47.2	61.1	61.1	60.9	59.5	56.2	48.1	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:28:53	64.6	47.2	61.1	61.1	60.9	59.6	56.2	48.1	1	0
11:28:54	64.6	47.2	61.1	61.1	61.0	59.6	56.2	48.1	1	0
11:28:55	64.6	47.2	61.1	61.2	61.0	59.6	56.2	48.1	1	0
11:28:56	64.6	47.2	61.2	61.2	61.0	59.6	56.2	48.1	1	0
11:28:57	64.6	47.2	61.2	61.2	61.0	59.6	56.2	48.1	1	0
11:28:58	64.6	47.2	61.2	61.2	61.0	59.7	56.2	48.1	1	0
11:28:59	64.6	47.2	61.2	61.2	61.1	59.7	56.2	48.1	1	0
11:29:00	64.6	47.2	61.2	61.2	61.0	59.7	56.2	48.1	1	0
11:29:02	64.7	47.2	61.2	61.2	61.1	59.7	56.2	48.2	1	0
11:29:03	64.7	47.2	61.2	61.2	61.1	59.7	56.2	48.2	1	0
11:29:04	64.7	47.2	61.2	61.3	61.1	59.7	56.2	48.2	1	0
11:29:05	64.7	47.2	61.3	61.3	61.1	59.7	56.2	48.2	1	0
11:29:06	64.7	47.2	61.3	61.3	61.1	59.8	56.2	48.2	1	0
11:29:07	64.7	47.2	61.3	61.3	61.2	59.8	56.2	48.2	1	0
11:29:08	64.7	47.2	61.3	61.3	61.1	59.8	56.2	48.2	1	0
11:29:09	64.7	47.3	61.3	61.3	61.2	59.8	56.2	48.2	1	0
11:29:10	64.7	47.3	61.3	61.3	61.2	59.8	56.2	48.3	1	0
11:29:11	64.7	47.3	61.3	61.4	61.2	59.8	56.2	48.3	1	0
11:29:12	64.7	47.3	61.3	61.4	61.2	59.8	56.2	48.3	1	0
11:29:13	64.7	47.4	61.4	61.4	61.2	59.9	56.2	48.3	1	0
11:29:14	64.7	47.4	61.4	61.4	61.3	59.9	56.3	48.3	1	0
11:29:15	64.7	47.4	61.4	61.4	61.2	59.9	56.3	48.3	1	0
11:29:16	64.7	47.4	61.4	61.4	61.3	59.9	56.3	48.3	1	0
11:29:17	64.7	47.4	61.4	61.4	61.3	59.9	56.3	48.3	1	0
11:29:18	64.7	47.4	61.4	61.5	61.3	59.9	56.3	48.3	1	0
11:29:19	64.7	47.4	61.4	61.5	61.3	60.0	56.3	48.4	1	0
11:29:20	64.7	47.5	61.5	61.5	61.3	60.0	56.3	48.3	1	0
11:29:21	64.7	47.5	61.5	61.5	61.4	60.0	56.3	48.4	1	0
11:29:22	64.7	47.5	61.5	61.5	61.4	60.0	56.4	48.4	1	0
11:29:23	64.7	47.5	61.5	61.6	61.4	60.0	56.4	48.4	1	0
11:29:24	64.8	47.5	61.5	61.6	61.4	60.0	56.4	48.4	1	0
11:29:25	64.7	47.5	61.5	61.6	61.4	60.1	56.4	48.4	1	0
11:29:26	64.8	47.5	61.5	61.6	61.4	60.1	56.4	48.4	1	0
11:29:27	64.7	47.6	61.5	61.6	61.5	60.1	56.4	48.4	1	0
11:29:28	64.7	47.5	61.6	61.6	61.5	60.1	56.4	48.5	1	0
11:29:29	64.8	47.5	61.6	61.7	61.5	60.1	56.4	48.5	1	0
11:29:30	64.8	47.6	61.6	61.7	61.5	60.1	56.4	48.5	1	0
11:29:31	64.8	47.6	61.6	61.7	61.5	60.1	56.3	48.5	1	0
11:29:32	64.8	47.5	61.6	61.7	61.5	60.2	56.3	48.5	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:29:33	64.8	47.6	61.6	61.7	61.6	60.2	56.3	48.5	1	0
11:29:34	64.8	47.6	61.6	61.7	61.6	60.2	56.3	48.5	1	0
11:29:35	64.8	47.6	61.6	61.7	61.6	60.2	56.3	48.5	1	0
11:29:37	64.8	47.6	61.6	61.7	61.6	60.2	56.3	48.6	1	0
11:29:38	64.8	47.6	61.6	61.8	61.6	60.2	56.3	48.6	1	0
11:29:39	64.8	47.6	61.7	61.8	61.7	60.2	56.4	48.6	1	0
11:29:40	64.8	47.7	61.7	61.8	61.7	60.2	56.4	48.6	1	0
11:29:41	64.9	47.7	61.7	61.8	61.7	60.3	56.4	48.6	1	0
11:29:42	64.8	47.7	61.7	61.8	61.7	60.3	56.4	48.6	1	0
11:29:43	64.9	47.8	61.7	61.8	61.7	60.3	56.4	48.6	1	0
11:29:44	64.9	47.8	61.7	61.8	61.7	60.3	56.4	48.6	1	0
11:29:45	64.9	47.8	61.7	61.9	61.7	60.3	56.4	48.6	1	0
11:29:46	64.9	47.9	61.7	61.9	61.7	60.4	56.4	48.7	1	0
11:29:47	64.9	47.9	61.8	61.9	61.7	60.4	56.5	48.7	1	0
11:29:48	64.9	47.9	61.8	61.9	61.7	60.4	56.5	48.7	1	0
11:29:49	64.9	47.9	61.8	61.9	61.8	60.4	56.4	48.7	1	0
11:29:50	64.9	48.0	61.8	61.9	61.8	60.4	56.5	48.7	1	0
11:29:51	64.9	48.0	61.8	61.9	61.8	60.4	56.5	48.7	1	0
11:29:52	64.9	48.0	61.8	61.9	61.8	60.4	56.5	48.7	1	0
11:29:53	64.9	48.0	61.8	61.9	61.8	60.5	56.5	48.7	1	0
11:29:54	64.9	48.0	61.8	62.0	61.8	60.5	56.5	48.7	1	0
11:29:55	65.0	48.0	61.8	62.0	61.8	60.5	56.5	48.8	1	0
11:29:56	65.0	48.0	61.9	62.0	61.9	60.5	56.5	48.8	1	0
11:29:57	65.0	48.0	61.9	62.0	61.9	60.5	56.4	48.8	1	0
11:29:58	65.0	48.0	61.9	62.0	61.9	60.5	56.4	48.8	1	0
11:29:59	65.0	48.0	61.9	62.0	61.9	60.5	56.4	48.8	1	0
11:30:00	65.0	48.0	61.9	62.0	61.9	60.6	56.4	48.8	1	0
11:30:01	65.0	47.9	61.9	62.1	61.9	60.6	56.4	48.8	1	0
11:30:02	65.0	47.9	61.9	62.1	61.9	60.6	56.4	48.8	1	0
11:30:03	65.0	47.9	61.9	62.1	61.9	60.6	56.4	48.8	1	0
11:30:04	65.0	47.9	62.0	62.1	61.9	60.6	56.4	48.8	1	0
11:30:05	65.0	47.9	62.0	62.1	62.0	60.6	56.4	48.9	1	0
11:30:06	65.1	47.9	62.0	62.2	62.0	60.6	56.4	48.9	1	0
11:30:07	65.1	47.8	62.0	62.2	62.0	60.7	56.4	48.9	1	0
11:30:08	65.1	47.8	62.0	62.2	62.0	60.7	56.4	48.9	1	0
11:30:09	65.1	47.8	62.1	62.2	62.0	60.7	56.4	48.9	1	0
11:30:11	65.1	47.8	62.1	62.2	62.0	60.7	56.4	48.9	1	0
11:30:12	65.1	47.7	62.1	62.3	62.0	60.7	56.4	48.9	1	0
11:30:13	65.1	47.7	62.1	62.3	62.1	60.7	56.4	49.0	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:30:14	65.1	47.7	62.1	62.3	62.1	60.8	56.3	49.0	1	0
11:30:15	65.1	47.7	62.1	62.3	62.1	60.8	56.4	49.0	1	0
11:30:16	65.1	47.7	62.1	62.3	62.1	60.8	56.4	49.0	1	0
11:30:17	65.1	47.7	62.1	62.3	62.1	60.8	56.4	49.0	1	0
11:30:18	65.1	47.7	62.1	62.3	62.1	60.8	56.4	49.0	1	0
11:30:19	65.1	47.7	62.2	62.3	62.2	60.8	56.4	49.1	1	0
11:30:20	65.1	47.7	62.2	62.4	62.2	60.8	56.4	49.1	1	0
11:30:21	65.1	47.7	62.2	62.4	62.2	60.8	56.4	49.1	1	0
11:30:22	65.2	47.7	62.2	62.4	62.2	60.9	56.4	49.1	1	0
11:30:23	65.2	47.6	62.2	62.4	62.2	60.9	56.4	49.1	1	0
11:30:24	65.2	47.6	62.2	62.4	62.3	60.9	56.4	49.1	1	0
11:30:25	65.2	47.6	62.2	62.4	62.3	60.9	56.4	49.1	1	0
11:30:26	65.2	47.6	62.2	62.4	62.3	60.9	56.4	49.1	1	0
11:30:27	65.2	47.6	62.2	62.5	62.3	60.9	56.4	49.1	1	0
11:30:28	65.2	47.7	62.3	62.4	62.3	60.9	56.4	49.1	1	0
11:30:29	65.2	47.7	62.2	62.5	62.3	61.0	56.4	49.2	1	0
11:30:30	65.2	47.7	62.3	62.5	62.3	61.0	56.4	49.2	1	0
11:30:31	65.2	47.7	62.3	62.5	62.3	61.0	56.4	49.2	1	0
11:30:32	65.2	47.8	62.3	62.5	62.4	61.0	56.4	49.2	1	0
11:30:33	65.2	47.8	62.3	62.5	62.4	61.0	56.4	49.2	1	0
11:30:34	65.2	47.8	62.3	62.5	62.4	61.1	56.4	49.2	1	0
11:30:35	65.2	47.8	62.4	62.6	62.4	61.1	56.4	49.2	1	0
11:30:36	65.2	47.8	62.4	62.6	62.4	61.1	56.4	49.2	1	0
11:30:37	65.2	47.8	62.4	62.6	62.5	61.1	56.5	49.2	1	0
11:30:38	65.2	47.8	62.4	62.6	62.5	61.1	56.5	49.2	1	0
11:30:39	65.3	47.8	62.4	62.6	62.5	61.1	56.5	49.2	1	0
11:30:40	65.3	47.8	62.4	62.6	62.5	61.1	56.5	49.2	1	0
11:30:41	65.3	47.8	62.4	62.6	62.5	61.1	56.5	49.2	1	0
11:30:42	65.3	47.8	62.4	62.7	62.5	61.2	56.5	49.2	1	0
11:30:43	65.3	47.8	62.4	62.7	62.5	61.2	56.5	49.3	1	0
11:30:44	65.3	47.8	62.4	62.7	62.6	61.2	56.5	49.2	1	0
11:30:46	65.3	47.8	62.4	62.7	62.6	61.2	56.6	49.3	1	0
11:30:47	65.3	47.9	62.4	62.7	62.6	61.2	56.6	49.3	1	0
11:30:48	65.3	47.8	62.5	62.7	62.6	61.2	56.6	49.3	1	0
11:30:49	65.3	47.8	62.5	62.7	62.6	61.3	56.6	49.3	1	0
11:30:50	65.3	47.8	62.5	62.8	62.6	61.3	56.6	49.3	1	0
11:30:51	65.3	47.8	62.5	62.8	62.6	61.3	56.6	49.3	1	0
11:30:52	65.3	47.8	62.5	62.8	62.7	61.3	56.5	49.3	1	0
11:30:53	65.4	47.8	62.5	62.8	62.6	61.3	56.5	49.3	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:30:54	65.4	47.8	62.5	62.8	62.7	61.3	56.5	49.3	1	0
11:30:55	65.4	47.8	62.5	62.8	62.7	61.3	56.5	49.3	1	0
11:30:56	65.4	47.8	62.5	62.8	62.7	61.4	56.5	49.4	1	0
11:30:57	65.4	47.8	62.5	62.8	62.7	61.4	56.5	49.4	1	0
11:30:58	65.4	47.8	62.6	62.9	62.7	61.4	56.4	49.4	1	0
11:30:59	65.4	47.7	62.6	62.9	62.8	61.4	56.4	49.4	1	0
11:31:00	65.5	47.7	62.6	62.9	62.8	61.4	56.4	49.4	1	0
11:31:01	65.4	47.7	62.6	62.9	62.8	61.4	56.4	49.5	1	0
11:31:02	65.4	47.7	62.6	62.9	62.8	61.4	56.4	49.4	1	0
11:31:03	65.4	47.7	62.6	62.9	62.8	61.4	56.4	49.5	1	0
11:31:04	65.5	47.7	62.7	62.9	62.8	61.5	56.4	49.5	1	0
11:31:05	65.5	47.6	62.7	62.9	62.8	61.5	56.3	49.5	1	0
11:31:06	65.5	47.6	62.7	63.0	62.8	61.5	56.3	49.5	1	0
11:31:07	65.5	47.6	62.7	63.0	62.9	61.5	56.3	49.5	1	0
11:31:08	65.5	47.6	62.7	63.0	62.9	61.5	56.3	49.6	1	0
11:31:09	65.5	47.7	62.8	63.0	62.9	61.5	56.3	49.6	1	0
11:31:10	65.5	47.6	62.8	63.0	62.9	61.5	56.3	49.6	1	0
11:31:11	65.5	47.6	62.8	63.0	62.9	61.5	56.3	49.6	1	0
11:31:12	65.6	47.6	62.8	63.0	62.9	61.5	56.2	49.6	1	0
11:31:13	65.6	47.6	62.8	63.0	63.0	61.5	56.2	49.6	1	0
11:31:14	65.6	47.6	62.8	63.0	63.0	61.6	56.2	49.7	1	0
11:31:15	65.6	47.6	62.9	63.1	63.0	61.6	56.2	49.7	1	0
11:31:16	65.6	47.6	62.9	63.1	63.0	61.6	56.1	49.7	1	0
11:31:17	65.6	47.5	62.9	63.1	63.0	61.6	56.1	49.7	1	0
11:31:18	65.6	47.5	62.9	63.1	63.0	61.6	56.1	49.7	1	0
11:31:20	65.6	47.5	62.9	63.1	63.0	61.6	56.0	49.7	1	0
11:31:21	65.6	47.5	62.9	63.1	63.1	61.6	56.0	49.7	1	0
11:31:22	65.6	47.5	62.9	63.1	63.1	61.6	56.0	49.7	1	0
11:31:23	65.7	47.5	62.9	63.2	63.1	61.7	56.0	49.7	1	0
11:31:24	65.7	47.5	63.0	63.2	63.1	61.7	56.0	49.8	1	0
11:31:25	65.7	47.5	63.0	63.2	63.1	61.7	55.9	49.8	1	0
11:31:26	65.7	47.5	63.0	63.2	63.1	61.7	55.9	49.8	1	0
11:31:27	65.7	47.5	63.0	63.2	63.1	61.7	55.9	49.8	1	0
11:31:28	65.7	47.4	63.0	63.2	63.2	61.7	55.9	49.8	1	0
11:31:29	65.7	47.4	63.0	63.2	63.2	61.8	55.9	49.8	1	0
11:31:30	65.7	47.4	63.0	63.2	63.2	61.8	55.9	49.8	1	0
11:31:31	65.7	47.4	63.0	63.3	63.2	61.8	55.8	49.8	1	0
11:31:32	65.7	47.4	63.0	63.3	63.2	61.8	55.8	49.8	1	0
11:31:33	65.7	47.4	63.0	63.3	63.2	61.8	55.8	49.8	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:31:34	65.7	47.4	63.1	63.3	63.2	61.8	55.8	49.8	1	0
11:31:35	65.8	46.7	63.1	63.3	63.2	61.8	55.9	49.9	1	1
11:31:36	65.8	44.7	63.1	63.3	63.2	61.9	56.1	49.9	1	1
11:31:37	65.8	42.8	63.1	63.3	63.3	61.9	56.3	49.9	1	1
11:31:38	65.8	41.2	63.1	63.3	63.3	61.9	56.4	49.9	1	1
11:31:39	65.8	39.8	63.1	63.4	63.3	61.9	56.5	49.9	1	1
11:31:40	65.8	38.6	63.1	63.4	63.3	61.9	56.7	49.9	1	1
11:31:41	65.8	37.6	63.1	63.4	63.3	61.9	56.8	49.9	1	1
11:31:42	65.8	36.7	63.1	63.4	63.3	61.9	56.9	49.8	1	1
11:31:43	65.8	35.8	63.1	63.4	63.3	61.9	56.9	49.8	1	1
11:31:44	65.8	35.1	63.1	63.4	63.3	61.8	57.0	49.8	1	1
11:31:45	65.8	34.4	63.1	63.4	63.3	61.6	57.0	49.7	1	1
11:31:46	65.9	33.7	63.1	63.4	63.3	61.4	57.1	49.6	1	1
11:31:47	65.9	33.1	63.1	63.4	63.2	61.1	57.2	49.5	1	1
11:31:48	65.9	32.5	63.2	63.4	63.2	60.8	57.2	49.4	1	1
11:31:49	65.9	32.0	63.1	63.4	63.2	60.4	57.3	49.3	1	1
11:31:50	65.9	31.6	63.2	63.4	63.1	60.0	57.3	49.2	1	1
11:31:51	65.9	31.3	63.2	63.4	63.0	59.5	57.4	49.1	1	1
11:31:52	65.9	31.0	63.2	63.4	62.9	59.1	57.5	49.0	1	1
11:31:54	65.9	30.7	63.2	63.4	62.7	58.8	57.5	48.8	1	1
11:31:55	65.9	30.7	63.2	63.4	62.5	58.4	57.6	48.7	1	1
11:31:56	65.9	30.7	63.2	63.4	62.3	58.1	57.6	48.6	1	1
11:31:57	65.9	30.7	63.2	63.4	62.1	57.9	57.7	48.5	1	1
11:31:58	65.9	30.7	63.2	63.3	61.9	57.6	57.7	48.4	1	1
11:31:59	65.9	30.7	63.2	63.3	61.7	57.2	57.7	48.3	1	1
11:32:00	65.9	30.7	63.2	63.3	61.5	57.0	57.8	48.2	1	1
11:32:01	65.9	30.7	63.2	63.3	61.3	56.6	57.8	48.1	1	1
11:32:02	65.9	30.7	63.2	63.3	61.0	56.4	57.9	47.9	1	1
11:32:03	65.9	30.7	63.2	63.2	60.8	56.0	57.9	47.8	1	1
11:32:04	65.9	30.7	63.2	63.2	60.6	55.7	57.9	47.7	1	1
11:32:05	65.9	30.7	63.2	63.1	60.3	55.4	57.9	47.6	1	1
11:32:06	65.9	30.7	63.2	63.1	60.0	55.1	58.0	47.5	1	1
11:32:07	65.9	30.6	63.2	63.0	59.8	54.9	58.0	47.3	1	1
11:32:08	65.9	30.7	63.2	63.0	59.6	54.6	58.1	47.2	1	1
11:32:09	65.9	30.7	63.2	62.9	59.3	54.3	58.1	47.1	1	1
11:32:10	65.9	30.7	63.1	62.9	59.0	54.0	58.2	47.0	1	1
11:32:11	65.9	30.7	63.1	62.8	58.8	53.7	58.2	46.9	1	1
11:32:12	65.9	30.7	63.1	62.7	58.5	53.4	58.3	46.7	1	1
11:32:13	65.9	30.6	63.1	62.6	58.2	53.1	58.3	46.6	1	1

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:32:14	65.9	30.7	63.1	62.5	57.9	52.8	58.4	46.5	1	1
11:32:15	65.9	30.7	63.1	62.4	57.6	52.5	58.4	46.4	1	1
11:32:16	65.9	30.6	63.1	62.3	57.3	52.3	58.5	46.3	1	1
11:32:17	65.9	30.6	63.1	62.1	57.0	52.0	58.5	46.1	1	1
11:32:18	65.9	30.6	63.1	61.9	56.7	51.7	58.5	46.0	1	1
11:32:19	65.9	30.6	63.0	61.8	56.4	51.5	58.6	45.9	1	1
11:32:20	65.9	30.7	63.0	61.7	56.1	51.2	58.6	45.8	1	1
11:32:21	65.9	30.6	63.0	61.5	55.8	50.9	58.6	45.7	1	1
11:32:22	65.9	30.6	63.0	61.3	55.5	50.7	58.6	45.5	1	1
11:32:23	65.9	30.6	63.0	61.2	55.2	50.4	58.7	45.4	1	1
11:32:24	65.9	30.6	62.9	61.0	54.8	50.2	58.7	45.2	1	1
11:32:25	65.9	30.6	62.9	60.8	54.5	49.9	58.7	45.1	1	1
11:32:26	65.8	30.6	62.8	60.6	54.2	49.7	58.7	45.0	1	1
11:32:27	65.8	30.6	62.8	60.4	53.9	49.4	58.8	44.9	1	1
11:32:29	65.8	30.6	62.7	60.2	53.6	49.2	58.8	44.7	1	1
11:32:30	65.8	30.6	62.7	60.0	53.3	49.0	58.8	44.6	1	1
11:32:31	65.8	30.6	62.6	59.8	53.0	48.7	58.8	44.5	1	1
11:32:32	65.8	30.6	62.6	59.6	52.7	48.5	58.9	44.4	1	1
11:32:33	65.8	30.6	62.5	59.3	52.4	48.3	58.9	44.3	1	1
11:32:34	65.8	30.6	62.5	59.1	52.2	48.0	58.9	44.1	1	1
11:32:35	65.8	30.6	62.4	58.9	51.9	47.7	58.9	44.0	1	1
11:32:36	65.8	30.6	62.4	58.6	51.6	47.5	59.0	43.9	1	1
11:32:37	65.8	30.6	62.3	58.4	51.3	47.3	59.0	43.8	1	1
11:32:38	65.7	30.6	62.3	58.1	51.0	47.0	59.0	43.6	1	1
11:32:39	65.7	30.6	62.2	57.9	50.8	46.8	59.0	43.5	1	1
11:32:40	65.7	30.6	62.1	57.6	50.5	46.6	59.0	43.3	1	1
11:32:41	65.7	30.6	62.0	57.4	50.2	46.4	59.0	43.2	1	1
11:32:42	65.7	30.6	61.9	57.1	49.9	46.2	59.1	43.1	1	1
11:32:43	65.7	30.6	61.8	56.9	49.6	46.0	59.1	43.0	1	1
11:32:44	65.6	30.6	61.7	56.6	49.4	45.7	59.1	42.8	1	1
11:32:45	65.6	30.6	61.6	56.3	49.1	45.6	59.1	42.7	1	1
11:32:46	65.6	30.6	61.5	56.1	48.8	45.3	59.1	42.6	1	1
11:32:47	65.6	30.6	61.4	55.7	48.6	45.1	59.1	42.4	1	1
11:32:48	65.6	30.6	61.3	55.4	48.3	44.9	59.2	42.3	1	1
11:32:49	65.5	30.6	61.2	55.2	48.1	44.7	59.2	42.2	1	1
11:32:50	65.5	30.6	61.0	54.9	47.8	44.5	59.2	42.1	1	1
11:32:51	65.5	30.6	60.9	54.7	47.5	44.3	59.2	42.0	1	1
11:32:52	65.5	30.6	60.8	54.4	47.3	44.1	59.2	41.8	1	1
11:32:53	65.5	30.6	60.6	54.2	47.1	43.9	59.2	41.7	1	1

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:32:54	65.4	30.6	60.4	53.9	46.8	43.7	59.2	41.6	1	1
11:32:55	65.4	30.6	60.3	53.6	46.6	43.5	59.2	41.5	1	1
11:32:56	65.4	30.6	60.1	53.3	46.3	43.4	59.1	41.3	1	1
11:32:57	65.3	30.6	60.0	53.0	46.1	43.2	59.1	41.2	1	1
11:32:58	65.3	30.6	59.8	52.7	45.8	43.0	59.1	41.1	1	1
11:32:59	65.3	30.6	59.7	52.4	45.6	42.8	59.1	41.0	1	1
11:33:00	65.2	30.6	59.5	52.1	45.4	42.7	59.1	40.9	1	1
11:33:01	65.2	30.6	59.3	51.8	45.2	42.5	59.1	40.7	1	1
11:33:03	65.2	30.6	59.1	51.5	45.0	42.3	59.1	40.6	1	1
11:33:04	65.1	30.6	59.0	51.3	44.8	42.2	59.0	40.5	1	1
11:33:05	65.1	30.6	58.8	51.0	44.6	42.0	59.0	40.4	1	1
11:33:06	65.0	30.6	58.6	50.7	44.3	41.8	59.0	40.2	1	1
11:33:07	65.0	30.6	58.3	50.4	44.1	41.7	59.0	40.2	1	1
11:33:08	64.9	30.6	58.1	50.2	43.9	41.5	59.0	40.0	1	1
11:33:09	64.8	30.6	57.9	49.9	43.8	41.3	59.0	39.9	1	1
11:33:10	64.8	30.6	57.7	49.6	43.5	41.2	59.0	39.8	1	1
11:33:11	64.7	30.6	57.5	49.3	43.4	41.0	58.9	39.7	1	1
11:33:12	64.6	30.6	57.3	49.0	43.1	40.8	58.9	39.6	1	1
11:33:13	64.6	30.6	57.1	48.7	42.9	40.7	58.9	39.5	1	1
11:33:14	64.5	30.6	56.9	48.4	42.7	40.5	58.9	39.4	1	1
11:33:15	64.4	30.6	56.7	48.1	42.5	40.4	58.9	39.2	1	1
11:33:16	64.3	30.6	56.4	47.8	42.3	40.2	58.9	39.1	1	1
11:33:17	64.2	30.6	56.2	47.5	42.1	40.1	58.8	39.0	1	1
11:33:18	64.1	30.6	56.0	47.3	42.0	39.9	58.8	38.9	1	1
11:33:19	63.9	30.6	55.7	47.0	41.8	39.8	58.8	38.8	1	1
11:33:20	63.8	30.6	55.5	46.7	41.6	39.6	58.8	38.7	1	1
11:33:21	63.7	30.6	55.2	46.5	41.4	39.5	58.8	38.5	1	1
11:33:22	63.6	30.6	55.0	46.2	41.2	39.3	58.8	38.4	1	1
11:33:23	63.5	30.6	54.8	46.0	41.0	39.2	58.8	38.3	1	1
11:33:24	63.4	30.6	54.5	45.7	40.8	39.0	58.8	38.2	1	1
11:33:25	63.2	30.6	54.2	45.4	40.7	38.9	58.8	38.1	1	1
11:33:26	63.1	30.6	54.0	45.1	40.5	38.7	58.7	38.0	1	1
11:33:27	63.0	30.6	53.7	44.9	40.3	38.6	58.7	37.9	1	1
11:33:28	62.8	30.6	53.5	44.6	40.1	38.5	58.7	37.8	1	1
11:33:29	62.7	30.6	53.2	44.3	40.0	38.3	58.7	37.7	1	1
11:33:30	62.6	30.6	53.0	44.1	39.8	38.2	58.7	37.7	1	1
11:33:31	62.4	30.6	52.7	43.9	39.6	38.1	58.7	37.5	1	1
11:33:32	62.2	30.6	52.5	43.6	39.5	37.9	58.7	37.4	1	1
11:33:33	62.0	30.6	52.2	43.4	39.3	37.8	58.7	37.3	1	1

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:33:34	61.9	30.6	52.0	43.2	39.2	37.6	58.7	37.2	1	1
11:33:35	61.7	30.6	51.7	42.9	39.0	37.5	58.6	37.1	1	1
11:33:37	61.5	30.6	51.4	42.7	38.8	37.4	58.6	37.0	1	1
11:33:38	61.3	30.6	51.2	42.5	38.7	37.3	58.6	36.9	1	1
11:33:39	61.2	30.6	50.9	42.3	38.5	37.1	58.6	36.8	1	1
11:33:40	61.0	30.6	50.6	42.1	38.4	37.0	58.6	36.7	1	1
11:33:41	60.8	30.6	50.3	41.9	38.2	36.9	58.5	36.6	1	1
11:33:42	60.6	30.6	50.1	41.7	38.1	36.8	58.5	36.5	1	1
11:33:43	60.4	30.6	49.8	41.4	37.9	36.6	58.5	36.4	1	1
11:33:44	60.1	30.6	49.5	41.3	37.8	36.5	58.5	36.3	1	1
11:33:45	59.9	30.6	49.3	41.0	37.6	36.4	58.5	36.2	1	1
11:33:46	59.7	30.6	49.0	40.8	37.5	36.3	58.4	36.1	1	1
11:33:47	59.5	30.6	48.7	40.6	37.3	36.2	58.4	36.0	1	1
11:33:48	59.3	30.6	48.4	40.5	37.2	36.1	58.4	35.9	1	1
11:33:49	59.1	30.6	48.1	40.2	37.0	36.0	58.3	35.8	1	1
11:33:50	58.9	30.6	47.9	40.0	36.9	35.9	58.3	35.7	1	1
11:33:51	58.6	30.6	47.6	39.8	36.7	35.8	58.2	35.6	1	1
11:33:52	58.4	30.6	47.4	39.7	36.6	35.7	58.2	35.5	1	1
11:33:53	58.2	30.6	47.1	39.4	36.5	35.6	58.1	35.5	1	1
11:33:54	57.9	30.6	46.9	39.2	36.4	35.5	58.0	35.4	1	1
11:33:55	57.7	30.6	46.6	39.1	36.2	35.4	57.9	35.3	1	1
11:33:56	57.4	30.6	46.3	38.9	36.1	35.4	57.8	35.2	1	1
11:33:57	57.2	30.6	46.1	38.7	36.0	35.3	57.8	35.1	1	1
11:33:58	56.9	30.6	45.8	38.5	35.8	35.2	57.6	35.0	1	1
11:33:59	56.7	30.6	45.6	38.3	35.7	35.2	57.5	34.9	1	1
11:34:00	56.5	30.6	45.3	38.2	35.6	35.1	57.4	34.9	1	1
11:34:01	56.2	30.6	45.1	38.0	35.5	35.0	57.3	34.8	1	1
11:34:02	55.9	30.6	44.8	37.8	35.4	34.9	57.2	34.7	1	1
11:34:03	55.7	30.6	44.6	37.7	35.3	34.8	57.1	34.6	1	1
11:34:04	55.4	30.6	44.3	37.5	35.1	34.6	57.0	34.6	1	1
11:34:05	55.1	30.6	44.1	37.3	35.0	34.5	56.9	34.5	1	1
11:34:06	54.9	30.6	43.9	37.2	34.9	34.5	56.8	34.4	1	1
11:34:07	54.6	30.6	43.7	37.0	34.8	34.5	56.7	34.4	1	1
11:34:08	54.4	30.6	43.4	36.8	34.7	34.5	56.5	34.3	1	0
11:34:09	54.1	30.6	43.2	36.7	34.6	34.5	56.4	34.2	1	0
11:34:11	53.8	30.6	43.0	36.5	34.5	34.5	56.3	34.2	1	0
11:34:12	53.6	30.6	42.8	36.4	34.4	34.5	56.1	34.1	1	0
11:34:13	53.3	30.6	42.6	36.2	34.3	34.5	56.0	34.1	1	0
11:34:14	53.1	30.6	42.4	36.1	34.2	34.5	55.8	34.1	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:34:15	52.8	30.6	42.2	35.9	34.1	34.5	55.7	34.0	1	0
11:34:16	52.6	30.6	42.0	35.8	34.0	34.5	55.6	34.0	1	0
11:34:17	52.4	30.6	41.8	35.7	33.9	34.5	55.5	33.9	1	0
11:34:18	52.2	30.6	41.7	35.5	33.8	34.5	55.4	33.8	1	0
11:34:19	51.9	30.6	41.6	35.4	33.8	34.5	55.3	33.7	1	0
11:34:20	51.7	30.6	41.5	35.4	33.7	34.5	55.2	33.6	1	0
11:34:21	51.6	30.6	41.4	35.3	33.6	34.5	55.2	33.5	1	0
11:34:22	51.3	30.6	41.3	35.2	33.6	34.5	55.1	33.5	1	0
11:34:23	51.1	30.6	41.2	35.1	33.5	34.5	55.0	33.5	1	0
11:34:24	50.9	30.6	41.1	35.1	33.5	34.5	55.0	33.5	1	0
11:34:25	50.8	30.6	41.0	35.1	33.4	34.5	54.9	33.5	1	0
11:34:26	50.6	30.6	40.9	35.0	33.4	34.5	54.9	33.5	1	0
11:34:27	50.5	30.6	40.8	34.9	33.4	34.5	54.8	33.5	1	0
11:34:28	50.3	30.6	40.8	34.9	33.3	34.5	54.7	33.5	1	0
11:34:29	50.2	30.6	40.7	34.9	33.3	34.5	54.7	33.5	1	0
11:34:30	50.1	30.6	40.6	34.8	33.3	34.5	54.6	33.5	1	0
11:34:31	49.9	30.6	40.6	34.8	33.3	34.5	54.6	33.5	1	0
11:34:32	49.8	30.6	40.5	34.8	33.3	34.5	54.5	33.5	1	0
11:34:33	49.7	30.6	40.5	34.8	33.2	34.5	54.5	33.5	1	0
11:34:34	49.6	30.6	40.4	34.8	33.3	34.5	54.4	33.5	1	0
11:34:35	49.5	30.6	40.4	34.8	33.2	34.5	54.4	33.5	1	0
11:34:36	49.4	30.6	40.4	34.8	33.2	34.5	54.4	33.5	1	0
11:34:37	49.3	30.6	40.3	34.8	33.2	34.5	54.3	33.5	1	0
11:34:38	49.2	30.6	40.3	34.8	33.2	34.5	54.3	33.5	1	0
11:34:39	49.1	30.6	40.3	34.8	33.3	34.5	54.2	33.5	1	0
11:34:40	49.0	30.6	40.2	34.8	33.3	34.5	54.2	33.5	1	0
11:34:41	48.9	30.6	40.2	34.8	33.3	34.5	54.1	33.5	1	0
11:34:42	48.9	30.6	40.2	34.8	33.3	34.5	54.1	33.5	1	0
11:34:43	48.8	30.6	40.1	34.8	33.3	34.5	54.0	33.5	1	0
11:34:44	48.7	30.6	40.1	34.8	33.3	34.5	54.0	33.5	1	0
11:34:46	48.6	30.6	40.1	34.8	33.3	34.5	53.9	33.5	1	0
11:34:47	48.5	30.6	40.1	34.8	33.3	34.5	53.9	33.5	1	0
11:34:48	48.4	30.6	40.0	34.8	33.4	34.5	53.9	33.5	1	0
11:34:49	48.4	30.6	40.0	34.9	33.4	34.5	53.8	33.5	1	0
11:34:50	48.3	30.6	40.0	34.9	33.4	34.5	53.8	33.5	1	0
11:34:51	48.2	30.6	40.0	34.9	33.4	34.5	53.8	33.5	1	0
11:34:52	48.2	30.6	39.9	34.9	33.4	34.5	53.7	33.5	1	0
11:34:53	48.1	30.6	39.9	35.0	33.5	34.5	53.7	33.5	1	0
11:34:54	48.1	30.6	39.9	35.0	33.5	34.5	53.6	33.5	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:34:55	48.0	30.6	39.9	35.0	33.5	34.5	53.6	33.5	1	0
11:34:56	47.9	30.6	39.9	35.0	33.5	34.5	53.6	33.5	1	0
11:34:57	47.9	30.6	39.8	35.0	33.5	34.5	53.5	33.5	1	0
11:34:58	47.8	30.6	39.8	35.0	33.5	34.5	53.5	33.5	1	0
11:34:59	47.8	30.6	39.8	35.0	33.5	34.5	53.4	33.5	1	0
11:35:00	47.7	30.6	39.8	35.0	33.6	34.5	53.4	33.5	1	0
11:35:01	47.7	30.6	39.8	35.1	33.6	34.5	53.3	33.5	1	0
11:35:02	47.7	30.6	39.8	35.1	33.6	34.5	53.3	33.5	1	0
11:35:03	47.6	30.6	39.8	35.1	33.6	34.5	53.3	33.5	1	0
11:35:04	47.6	30.6	39.8	35.1	33.6	34.5	53.2	33.5	1	0
11:35:05	47.5	30.6	39.8	35.1	33.7	34.5	53.2	33.5	1	0
11:35:06	47.5	30.6	39.7	35.1	33.7	34.5	53.2	33.5	1	0
11:35:07	47.5	30.6	39.7	35.1	33.7	34.5	53.1	33.5	1	0
11:35:08	47.4	30.6	39.7	35.1	33.7	34.5	53.1	33.5	1	0
11:35:09	47.4	30.6	39.7	35.2	33.8	34.5	53.1	33.5	1	0
11:35:10	47.3	30.6	39.7	35.2	33.8	34.5	53.1	33.5	1	0
11:35:11	47.3	30.6	39.7	35.2	33.8	34.5	53.0	33.5	1	0
11:35:12	47.3	30.6	39.7	35.2	33.8	34.5	53.0	33.5	1	0
11:35:13	47.2	30.6	39.7	35.2	33.8	34.5	53.0	33.5	1	0
11:35:14	47.2	30.6	39.7	35.2	33.8	34.5	53.0	33.5	1	0
11:35:15	47.1	30.6	39.6	35.3	33.9	34.5	53.0	33.5	1	0
11:35:16	47.1	30.6	39.6	35.3	33.9	34.5	52.9	33.5	1	0
11:35:17	47.1	30.6	39.6	35.3	33.9	34.5	52.9	33.5	1	0
11:35:18	47.1	30.6	39.6	35.3	33.9	34.5	52.9	33.5	1	0
11:35:20	47.0	30.6	39.6	35.3	34.0	34.5	52.9	33.5	1	0
11:35:21	47.0	30.6	39.6	35.3	34.0	34.5	52.8	33.5	1	0
11:35:22	47.0	30.6	39.6	35.4	34.0	34.5	52.8	33.5	1	0
11:35:23	47.0	30.6	39.5	35.4	34.0	34.5	52.8	33.5	1	0
11:35:24	46.9	30.6	39.5	35.4	34.1	34.5	52.7	33.5	1	0
11:35:25	46.9	30.7	39.6	35.4	34.1	34.5	52.7	33.5	1	0
11:35:26	46.9	30.6	39.5	35.4	34.1	34.5	52.7	33.5	1	0
11:35:27	46.9	30.6	39.5	35.4	34.1	34.5	52.7	33.5	1	0
11:35:28	46.9	30.6	39.5	35.4	34.2	34.5	52.6	33.5	1	0
11:35:29	46.9	30.6	39.5	35.5	34.2	34.5	52.6	33.5	1	0
11:35:30	46.8	30.6	39.5	35.5	34.2	34.5	52.6	33.5	1	0
11:35:31	46.8	30.6	39.5	35.5	34.2	34.5	52.6	33.5	1	0
11:35:32	46.8	30.7	39.5	35.5	34.3	34.5	52.6	33.5	1	0
11:35:33	46.8	30.6	39.5	35.5	34.2	34.5	52.6	33.5	1	0
11:35:34	46.8	30.6	39.5	35.5	34.3	34.5	52.6	33.5	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:35:35	46.8	30.6	39.5	35.6	34.3	34.5	52.5	33.5	1	0
11:35:36	46.8	30.6	39.5	35.6	34.3	34.5	52.5	33.5	1	0
11:35:37	46.7	30.6	39.5	35.6	34.3	34.5	52.5	33.5	1	0
11:35:38	46.7	30.6	39.5	35.6	34.4	34.5	52.5	33.5	1	0
11:35:39	46.7	30.6	39.5	35.6	34.4	34.5	52.5	33.5	1	0
11:35:40	46.7	30.6	39.5	35.7	34.4	34.5	52.5	33.5	1	0
11:35:41	46.7	30.6	39.5	35.7	34.5	34.5	52.4	33.5	1	0
11:35:42	46.7	30.6	39.5	35.7	34.5	34.5	52.4	33.5	1	0
11:35:43	46.6	30.6	39.5	35.7	34.5	34.5	52.4	33.5	1	0
11:35:44	46.6	30.6	39.5	35.7	34.5	34.5	52.4	33.5	1	0
11:35:45	46.6	30.6	39.5	35.7	34.6	34.5	52.4	33.5	1	0
11:35:46	46.6	30.7	39.5	35.7	34.6	34.5	52.3	33.5	1	0
11:35:47	46.5	30.7	39.5	35.8	34.6	34.5	52.3	33.5	1	0
11:35:48	46.5	30.7	39.5	35.8	34.7	34.5	52.3	33.5	1	0
11:35:49	46.5	30.7	39.4	35.8	34.7	34.5	52.3	33.5	1	0
11:35:50	46.5	30.7	39.4	35.8	34.7	34.5	52.3	33.5	1	0
11:35:51	46.5	30.6	39.5	35.8	34.7	34.5	52.3	33.5	1	0
11:35:52	46.5	30.6	39.4	35.8	34.7	34.5	52.3	33.5	1	0
11:35:54	46.5	30.6	39.4	35.8	34.8	34.5	52.3	33.5	1	0
11:35:55	46.5	30.6	39.4	35.8	34.8	34.5	52.3	33.5	1	0
11:35:56	46.5	30.7	39.4	35.9	34.8	34.5	52.3	33.5	1	0
11:35:57	46.5	30.6	39.4	35.9	34.8	34.5	52.2	33.5	1	0
11:35:58	46.5	30.7	39.4	35.9	34.8	34.5	52.2	33.5	1	0
11:35:59	46.5	30.7	39.4	35.9	34.9	34.5	52.2	33.5	1	0
11:36:00	46.4	30.7	39.4	35.9	34.9	34.5	52.2	33.5	1	0
11:36:01	46.4	30.7	39.4	35.9	34.9	34.5	52.2	33.5	1	0
11:36:02	46.4	30.6	39.4	35.9	35.0	34.5	52.2	33.5	1	0
11:36:03	46.4	30.6	39.4	36.0	35.0	34.5	52.2	33.5	1	0
11:36:04	46.4	30.6	39.4	36.0	35.0	34.5	52.2	33.5	1	0
11:36:05	46.4	30.6	39.4	36.0	35.0	34.5	52.1	33.5	1	0
11:36:06	46.4	30.7	39.4	36.0	35.1	34.5	52.1	33.5	1	0
11:36:07	46.4	30.7	39.4	36.0	35.1	34.5	52.0	33.5	1	0
11:36:08	46.4	30.7	39.4	36.0	35.1	34.5	52.0	33.5	1	0
11:36:09	46.3	30.7	39.4	36.0	35.2	34.5	52.0	33.5	1	0
11:36:10	46.3	30.7	39.4	36.1	35.2	34.5	52.0	33.5	1	0
11:36:11	46.3	30.6	39.4	36.1	35.2	34.5	51.9	33.5	1	0
11:36:12	46.3	30.7	39.4	36.1	35.2	34.5	51.9	33.5	1	0
11:36:13	46.3	30.7	39.4	36.1	35.3	34.5	51.9	33.5	1	0
11:36:14	46.3	30.7	39.4	36.1	35.3	34.5	51.9	33.5	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:36:15	46.3	30.6	39.4	36.1	35.3	34.5	51.9	33.5	1	0
11:36:16	46.3	30.7	39.4	36.1	35.3	34.5	51.8	33.5	1	0
11:36:17	46.3	30.6	39.4	36.2	35.3	34.5	51.8	33.5	1	0
11:36:18	46.3	30.7	39.4	36.2	35.3	34.5	51.8	33.5	1	0
11:36:19	46.3	30.7	39.4	36.2	35.4	34.5	51.7	33.5	1	0
11:36:20	46.3	30.6	39.4	36.2	35.4	34.6	51.7	33.5	1	0
11:36:21	46.2	30.7	39.5	36.2	35.4	34.5	51.7	33.5	1	0
11:36:22	46.2	30.7	39.4	36.2	35.4	34.5	51.7	33.5	1	0
11:36:23	46.2	30.7	39.4	36.3	35.5	34.5	51.6	33.5	1	0
11:36:24	46.2	30.7	39.4	36.3	35.5	34.6	51.6	33.5	1	0
11:36:25	46.2	30.7	39.5	36.3	35.5	34.6	51.6	33.5	1	0
11:36:26	46.2	30.7	39.4	36.3	35.5	34.6	51.6	33.5	1	0
11:36:28	46.2	30.7	39.4	36.3	35.5	34.7	51.5	33.5	1	0
11:36:29	46.2	30.7	39.4	36.4	35.6	34.7	51.5	33.5	1	0
11:36:30	46.2	30.7	39.4	36.4	35.6	34.7	51.5	33.5	1	0
11:36:31	46.2	30.7	39.5	36.4	35.6	34.8	51.4	33.5	1	0
11:36:32	46.2	30.7	39.4	36.4	35.7	34.8	51.4	33.5	1	0
11:36:33	46.2	30.7	39.4	36.4	35.7	34.8	51.4	33.5	1	0
11:36:34	46.2	30.7	39.4	36.5	35.7	34.8	51.4	33.5	1	0
11:36:35	46.2	30.7	39.5	36.5	35.7	34.9	51.3	33.5	1	0
11:36:36	46.2	30.7	39.4	36.5	35.7	34.9	51.3	33.5	1	0
11:36:37	46.2	30.7	39.5	36.5	35.8	34.9	51.3	33.5	1	0
11:36:38	46.2	30.7	39.5	36.5	35.8	34.9	51.3	33.5	1	0
11:36:39	46.2	30.7	39.5	36.6	35.8	35.0	51.2	33.5	1	0
11:36:40	46.2	30.7	39.5	36.6	35.8	35.0	51.2	33.5	1	0
11:36:41	46.2	30.7	39.5	36.6	35.9	35.0	51.2	33.5	1	0
11:36:42	46.2	30.7	39.5	36.6	35.9	35.0	51.2	33.5	1	0
11:36:43	46.1	30.7	39.5	36.6	35.9	35.0	51.1	33.5	1	0
11:36:44	46.1	30.7	39.5	36.7	35.9	35.0	51.1	33.5	1	0
11:36:45	46.1	30.7	39.5	36.7	35.9	35.1	51.1	33.5	1	0
11:36:46	46.1	30.7	39.5	36.7	36.0	35.1	51.1	33.5	1	0
11:36:47	46.1	30.7	39.5	36.7	36.0	35.1	51.0	33.5	1	0
11:36:48	46.1	30.7	39.5	36.7	36.0	35.1	51.0	33.5	1	0
11:36:49	46.1	30.7	39.5	36.7	36.1	35.2	51.0	33.5	1	0
11:36:50	46.1	30.7	39.5	36.7	36.1	35.2	51.0	33.5	1	0
11:36:51	46.1	30.7	39.5	36.7	36.1	35.2	50.9	33.5	1	0
11:36:52	46.1	30.7	39.5	36.8	36.1	35.2	50.9	33.5	1	0
11:36:53	46.1	30.7	39.5	36.8	36.1	35.2	50.9	33.5	1	0
11:36:54	46.0	30.7	39.5	36.8	36.1	35.3	50.9	33.5	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:36:55	46.1	30.7	39.6	36.8	36.2	35.3	50.9	33.5	1	0
11:36:56	46.1	30.7	39.6	36.8	36.2	35.3	50.9	33.5	1	0
11:36:57	46.1	30.7	39.6	36.9	36.2	35.3	50.9	33.5	1	0
11:36:58	46.1	30.7	39.6	36.9	36.2	35.3	50.8	33.5	1	0
11:36:59	46.1	30.7	39.6	36.9	36.2	35.3	50.8	33.5	1	0
11:37:00	46.1	30.7	39.6	36.9	36.3	35.3	50.8	33.5	1	0
11:37:01	46.1	30.7	39.6	36.9	36.3	35.3	50.8	33.5	1	0
11:37:03	46.1	30.7	39.6	37.0	36.3	35.3	50.8	33.5	1	0
11:37:04	46.1	30.7	39.6	37.0	36.3	35.4	50.8	33.5	1	0
11:37:05	46.0	30.7	39.6	37.0	36.4	35.4	50.8	33.5	1	0
11:37:06	46.0	30.7	39.7	37.0	36.4	35.4	50.8	33.5	1	0
11:37:07	46.0	30.7	39.6	37.1	36.4	35.4	50.7	33.5	1	0
11:37:08	46.0	30.7	39.7	37.1	36.4	35.4	50.8	33.5	1	0
11:37:09	46.0	30.7	39.7	37.1	36.5	35.4	50.7	33.5	1	0
11:37:10	46.0	30.7	39.7	37.1	36.5	35.4	50.7	33.5	1	0
11:37:11	46.0	30.7	39.7	37.2	36.5	35.5	50.7	33.5	1	0
11:37:12	46.0	30.7	39.7	37.2	36.5	35.5	50.7	33.5	1	0
11:37:13	46.0	30.7	39.7	37.2	36.5	35.5	50.6	33.5	1	0
11:37:14	46.0	30.7	39.7	37.2	36.5	35.5	50.7	33.5	1	0
11:37:15	46.0	30.7	39.7	37.2	36.6	35.5	50.6	33.5	1	0
11:37:16	46.0	30.7	39.7	37.2	36.6	35.5	50.6	33.5	1	0
11:37:17	46.0	30.7	39.7	37.3	36.6	35.6	50.6	33.5	1	0
11:37:18	46.0	30.7	39.7	37.3	36.7	35.6	50.6	33.5	1	0
11:37:19	45.9	30.7	39.7	37.3	36.7	35.6	50.6	33.5	1	0
11:37:20	45.9	30.7	39.7	37.3	36.7	35.6	50.6	33.5	1	0
11:37:21	45.9	30.7	39.7	37.3	36.7	35.6	50.6	33.5	1	0
11:37:22	45.9	30.7	39.7	37.3	36.7	35.6	50.6	33.5	1	0
11:37:23	45.9	30.7	39.7	37.4	36.8	35.7	50.5	33.5	1	0
11:37:24	45.9	30.7	39.8	37.4	36.8	35.7	50.5	33.5	1	0
11:37:25	45.9	30.7	39.7	37.4	36.8	35.7	50.5	33.5	1	0
11:37:26	45.9	30.7	39.8	37.4	36.8	35.8	50.5	33.5	1	0
11:37:27	45.9	30.7	39.8	37.4	36.9	35.8	50.5	33.5	1	0
11:37:28	45.9	30.7	39.8	37.4	36.9	35.8	50.5	33.5	1	0
11:37:29	45.9	30.7	39.8	37.5	36.9	35.8	50.5	33.5	1	0
11:37:30	45.9	30.7	39.8	37.5	36.9	35.8	50.4	33.5	1	0
11:37:31	45.9	30.7	39.8	37.5	37.0	35.8	50.4	33.5	1	0
11:37:32	45.9	30.7	39.8	37.5	37.0	35.9	50.4	33.5	1	0
11:37:33	45.9	30.7	39.8	37.5	37.0	35.9	50.4	33.5	1	0
11:37:34	45.9	30.7	39.8	37.5	37.0	35.9	50.4	33.5	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:37:35	45.9	30.7	39.8	37.6	37.1	35.9	50.4	33.5	1	0
11:37:36	45.9	30.7	39.8	37.6	37.1	35.9	50.3	33.5	1	0
11:37:38	45.9	30.7	39.9	37.6	37.1	36.0	50.3	33.5	1	0
11:37:39	45.9	30.7	39.8	37.6	37.1	36.0	50.3	33.5	1	0
11:37:40	45.9	30.7	39.9	37.6	37.2	36.0	50.3	33.5	1	0
11:37:41	45.8	30.7	39.9	37.7	37.2	36.0	50.3	33.5	1	0
11:37:42	45.8	30.7	39.9	37.7	37.2	36.0	50.3	33.5	1	0
11:37:43	45.9	30.7	39.9	37.7	37.2	36.0	50.2	33.5	1	0
11:37:44	45.9	30.7	39.9	37.7	37.2	36.1	50.2	33.5	1	0
11:37:45	45.9	30.7	39.9	37.8	37.3	36.1	50.2	33.5	1	0
11:37:46	45.9	30.7	39.9	37.8	37.3	36.1	50.2	33.5	1	0
11:37:47	45.8	30.7	39.9	37.8	37.3	36.1	50.2	33.5	1	0
11:37:48	45.8	30.7	39.9	37.8	37.3	36.1	50.2	33.5	1	0
11:37:49	45.8	30.7	39.9	37.8	37.3	36.2	50.2	33.5	1	0
11:37:50	45.8	30.7	39.9	37.8	37.3	36.2	50.1	33.5	1	0
11:37:51	45.8	30.7	39.9	37.9	37.4	36.2	50.1	33.5	1	0
11:37:52	45.8	30.7	40.0	37.9	37.4	36.2	50.1	33.5	1	0
11:37:53	45.8	30.7	40.0	37.9	37.4	36.2	50.1	33.5	1	0
11:37:54	45.8	30.7	40.0	37.9	37.4	36.2	50.0	33.5	1	0
11:37:55	45.8	30.7	40.0	37.9	37.4	36.3	50.0	33.5	1	0
11:37:56	45.8	30.7	40.0	37.9	37.5	36.3	50.0	33.5	1	0
11:37:57	45.8	30.8	40.0	37.9	37.5	36.3	50.0	33.5	1	0
11:37:58	45.8	30.9	40.0	38.0	37.5	36.3	49.9	33.5	1	0
11:37:59	45.8	30.9	40.0	38.0	37.5	36.3	49.9	33.5	1	0
11:38:00	45.8	31.0	40.0	38.0	37.6	36.3	49.9	33.5	1	0
11:38:01	45.8	31.0	40.0	38.0	37.6	36.4	49.9	33.5	1	0
11:38:02	45.8	31.1	40.0	38.0	37.6	36.4	49.9	33.5	1	0
11:38:03	45.8	31.1	40.1	38.0	37.6	36.4	49.9	33.5	1	0
11:38:04	45.8	31.1	40.1	38.0	37.6	36.4	49.8	33.5	1	0
11:38:05	45.8	31.1	40.1	38.1	37.6	36.5	49.8	33.5	1	0
11:38:06	45.8	31.2	40.1	38.1	37.7	36.5	49.8	33.5	1	0
11:38:07	45.8	31.2	40.1	38.1	37.7	36.5	49.8	33.5	1	0
11:38:08	45.8	31.2	40.1	38.1	37.7	36.5	49.8	33.5	1	0
11:38:09	45.8	31.2	40.1	38.1	37.7	36.5	49.8	33.5	1	0
11:38:10	45.8	31.2	40.1	38.1	37.7	36.6	49.8	33.5	1	0
11:38:12	45.8	31.2	40.1	38.2	37.8	36.6	49.7	33.5	1	0
11:38:13	45.7	31.2	40.1	38.2	37.8	36.6	49.7	33.5	1	0
11:38:14	45.8	31.3	40.2	38.2	37.8	36.6	49.7	33.5	1	0
11:38:15	45.8	31.3	40.2	38.2	37.8	36.6	49.7	33.5	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:38:16	45.8	31.3	40.2	38.2	37.8	36.7	49.7	33.5	1	0
11:38:17	45.8	31.3	40.2	38.3	37.9	36.7	49.7	33.5	1	0
11:38:18	45.8	31.4	40.2	38.3	37.9	36.7	49.7	33.5	1	0
11:38:19	45.8	31.4	40.2	38.3	37.9	36.7	49.7	33.5	1	0
11:38:20	45.8	31.4	40.2	38.3	37.9	36.7	49.7	33.5	1	0
11:38:21	45.7	31.4	40.2	38.3	37.9	36.7	49.7	33.5	1	0
11:38:22	45.7	31.4	40.2	38.4	37.9	36.8	49.6	33.5	1	0
11:38:23	45.8	31.4	40.2	38.4	38.0	36.8	49.6	33.5	1	0
11:38:24	45.7	31.4	40.3	38.4	38.0	36.8	49.6	33.5	1	0
11:38:25	45.7	31.5	40.3	38.4	38.0	36.8	49.6	33.5	1	0
11:38:26	45.7	31.5	40.3	38.4	38.0	36.9	49.6	33.5	1	0
11:38:27	45.7	31.5	40.3	38.4	38.0	36.9	49.6	33.5	1	0
11:38:28	45.7	31.6	40.3	38.5	38.1	36.9	49.6	33.5	1	0
11:38:29	45.7	31.6	40.3	38.5	38.1	36.9	49.6	33.5	1	0
11:38:30	45.7	31.6	40.3	38.5	38.1	36.9	49.6	33.5	1	0
11:38:31	45.7	31.6	40.3	38.5	38.1	36.9	49.6	33.5	1	0
11:38:32	45.7	31.7	40.4	38.5	38.1	37.0	49.5	33.5	1	0
11:38:33	45.7	31.7	40.4	38.5	38.2	37.0	49.6	33.5	1	0
11:38:34	45.7	31.7	40.3	38.5	38.2	37.0	49.5	33.5	1	0
11:38:35	45.7	31.7	40.4	38.6	38.2	37.0	49.5	33.5	1	0
11:38:36	45.7	31.7	40.4	38.6	38.2	37.0	49.5	33.5	1	0
11:38:37	45.7	31.8	40.4	38.6	38.2	37.1	49.5	33.5	1	0
11:38:38	45.7	31.8	40.4	38.6	38.2	37.1	49.5	33.5	1	0
11:38:39	45.7	31.8	40.4	38.6	38.3	37.1	49.5	33.5	1	0
11:38:40	45.7	31.8	40.4	38.6	38.3	37.1	49.5	33.5	1	0
11:38:41	45.7	31.9	40.4	38.6	38.3	37.2	49.5	33.5	1	0
11:38:42	45.7	31.9	40.4	38.7	38.3	37.2	49.5	33.5	1	0
11:38:43	45.7	31.9	40.5	38.7	38.3	37.2	49.5	33.5	1	0
11:38:44	45.7	32.0	40.5	38.7	38.4	37.2	49.5	33.5	1	0
11:38:46	45.7	32.0	40.5	38.7	38.4	37.3	49.5	33.5	1	0
11:38:47	45.7	32.0	40.5	38.7	38.4	37.3	49.5	33.5	1	0
11:38:48	45.7	32.0	40.5	38.8	38.5	37.3	49.5	33.5	1	0
11:38:49	45.7	32.1	40.5	38.8	38.4	37.3	49.5	33.5	1	0
11:38:50	45.7	32.1	40.5	38.8	38.5	37.4	49.5	33.5	1	0
11:38:51	45.7	32.1	40.5	38.8	38.5	37.4	49.5	33.5	1	0
11:38:52	45.7	32.1	40.5	38.8	38.5	37.4	49.5	33.5	1	0
11:38:53	45.6	32.1	40.5	38.8	38.5	37.4	49.5	33.5	1	0
11:38:54	45.7	32.1	40.5	38.9	38.6	37.4	49.5	33.5	1	0
11:38:55	45.7	32.2	40.6	38.9	38.6	37.5	49.5	33.5	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:38:56	45.6	32.2	40.6	38.9	38.6	37.5	49.5	33.5	1	0
11:38:57	45.7	32.2	40.6	38.9	38.7	37.5	49.5	33.5	1	0
11:38:58	45.7	32.3	40.6	38.9	38.7	37.5	49.5	33.5	1	0
11:38:59	45.7	32.3	40.6	39.0	38.7	37.5	49.4	33.5	1	0
11:39:00	45.7	32.3	40.6	39.0	38.7	37.6	49.4	33.5	1	0
11:39:01	45.6	32.3	40.6	39.0	38.7	37.6	49.4	33.5	1	0
11:39:02	45.6	32.4	40.6	39.0	38.7	37.6	49.4	33.5	1	0
11:39:03	45.6	32.4	40.6	39.0	38.8	37.6	49.4	33.5	1	0
11:39:04	45.6	32.4	40.7	39.1	38.8	37.6	49.4	33.5	1	0
11:39:05	45.6	32.4	40.7	39.1	38.8	37.6	49.4	33.5	1	0
11:39:06	45.6	32.5	40.7	39.1	38.8	37.7	49.4	33.5	1	0
11:39:07	45.6	32.5	40.7	39.1	38.8	37.7	49.4	33.5	1	0
11:39:08	45.6	32.5	40.7	39.1	38.9	37.7	49.3	33.5	1	0
11:39:09	45.6	32.5	40.7	39.2	38.9	37.7	49.3	33.5	1	0
11:39:10	45.6	32.5	40.7	39.2	38.9	37.7	49.3	33.5	1	0
11:39:11	45.6	32.5	40.8	39.2	38.9	37.7	49.3	33.5	1	0
11:39:12	45.6	32.5	40.8	39.2	38.9	37.8	49.3	33.5	1	0
11:39:13	45.6	32.5	40.8	39.2	38.9	37.8	49.3	33.5	1	0
11:39:14	45.6	32.5	40.8	39.2	39.0	37.8	49.3	33.5	1	0
11:39:15	45.6	32.6	40.8	39.2	39.0	37.8	49.3	33.5	1	0
11:39:16	45.6	32.6	40.8	39.3	39.0	37.9	49.3	33.5	1	0
11:39:17	45.6	32.6	40.8	39.3	39.0	37.9	49.2	33.5	1	0
11:39:18	45.6	32.6	40.9	39.3	39.0	37.9	49.3	33.5	1	0
11:39:20	45.6	32.6	40.9	39.3	39.0	37.9	49.2	33.5	1	0
11:39:21	45.6	32.7	40.9	39.3	39.1	38.0	49.2	33.5	1	0
11:39:22	45.6	32.7	40.9	39.3	39.1	38.0	49.2	33.5	1	0
11:39:23	45.6	32.7	40.9	39.4	39.1	38.0	49.2	33.5	1	0
11:39:24	45.6	32.7	40.9	39.4	39.2	38.0	49.2	33.5	1	0
11:39:25	45.6	32.8	40.9	39.4	39.2	38.0	49.1	33.5	1	0
11:39:26	45.6	32.8	41.0	39.4	39.2	38.0	49.1	33.5	1	0
11:39:27	45.6	32.8	41.0	39.5	39.2	38.1	49.1	33.5	1	0
11:39:28	45.6	32.8	41.0	39.5	39.2	38.1	49.1	33.5	1	0
11:39:29	45.5	32.9	41.0	39.5	39.2	38.1	49.1	33.5	1	0
11:39:30	45.5	32.9	41.0	39.5	39.3	38.1	49.0	33.5	1	0
11:39:31	45.5	32.9	41.0	39.5	39.3	38.1	49.0	33.5	1	0
11:39:32	45.5	32.9	41.1	39.5	39.3	38.2	49.0	33.6	1	0
11:39:33	45.5	32.9	41.1	39.6	39.3	38.2	49.0	33.6	1	0
11:39:34	45.5	32.9	41.1	39.6	39.3	38.2	49.0	33.6	1	0
11:39:35	45.5	33.0	41.1	39.6	39.3	38.2	48.9	33.6	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:39:36	45.5	33.0	41.1	39.6	39.4	38.2	48.9	33.7	1	0
11:39:37	45.5	33.0	41.1	39.7	39.4	38.2	48.9	33.7	1	0
11:39:38	45.5	33.0	41.1	39.7	39.4	38.2	48.9	33.7	1	0
11:39:39	45.5	33.0	41.1	39.7	39.4	38.3	48.9	33.7	1	0
11:39:40	45.5	33.0	41.1	39.7	39.4	38.3	48.9	33.7	1	0
11:39:41	45.5	33.0	41.1	39.7	39.5	38.3	48.9	33.7	1	0
11:39:42	45.5	33.1	41.2	39.8	39.5	38.3	48.9	33.7	1	0
11:39:43	45.5	33.1	41.1	39.8	39.5	38.3	48.9	33.8	1	0
11:39:44	45.5	33.1	41.2	39.8	39.5	38.3	48.9	33.8	1	0
11:39:45	45.5	33.1	41.1	39.8	39.5	38.4	48.9	33.8	1	0
11:39:46	45.5	33.1	41.2	39.8	39.5	38.4	48.9	33.8	1	0
11:39:47	45.5	33.1	41.2	39.8	39.5	38.4	48.8	33.8	1	0
11:39:48	45.5	33.1	41.2	39.9	39.5	38.4	48.8	33.8	1	0
11:39:49	45.5	33.2	41.2	39.9	39.6	38.4	48.8	33.8	1	0
11:39:50	45.5	33.2	41.2	39.9	39.6	38.4	48.8	33.8	1	0
11:39:51	45.5	33.2	41.2	39.9	39.6	38.5	48.8	33.9	1	0
11:39:52	45.5	33.2	41.2	39.9	39.6	38.5	48.8	33.9	1	0
11:39:54	45.5	33.3	41.2	39.9	39.6	38.5	48.8	33.9	1	0
11:39:55	45.5	33.3	41.3	39.9	39.7	38.5	48.8	33.9	1	0
11:39:56	45.5	33.3	41.3	39.9	39.7	38.5	48.8	33.9	1	0
11:39:57	45.5	33.3	41.3	40.0	39.7	38.6	48.8	33.9	1	0
11:39:58	45.5	33.4	41.3	40.0	39.7	38.6	48.8	33.9	1	0
11:39:59	45.5	33.4	41.3	40.0	39.7	38.6	48.8	33.9	1	0
11:40:00	45.5	33.4	41.3	40.0	39.8	38.6	48.7	33.9	1	0
11:40:01	45.5	33.4	41.3	40.0	39.8	38.6	48.7	34.0	1	0
11:40:02	45.5	33.4	41.3	40.1	39.8	38.6	48.7	33.9	1	0
11:40:03	45.5	33.4	41.4	40.1	39.8	38.7	48.7	34.0	1	0
11:40:04	45.5	33.4	41.4	40.1	39.8	38.7	48.7	34.0	1	0
11:40:05	45.5	33.5	41.4	40.1	39.9	38.7	48.7	34.0	1	0
11:40:06	45.5	33.5	41.4	40.1	39.9	38.7	48.7	34.0	1	0
11:40:07	45.5	33.5	41.4	40.1	39.9	38.7	48.7	34.0	1	0
11:40:08	45.5	33.5	41.4	40.2	39.9	38.8	48.6	34.0	1	0
11:40:09	45.5	33.5	41.4	40.2	39.9	38.8	48.6	34.0	1	0
11:40:10	45.5	33.5	41.4	40.2	39.9	38.8	48.6	34.0	1	0
11:40:11	45.5	33.5	41.5	40.2	40.0	38.8	48.6	34.0	1	0
11:40:12	45.5	33.6	41.5	40.3	40.0	38.8	48.6	34.0	1	0
11:40:13	45.5	33.6	41.5	40.2	40.0	38.8	48.6	34.0	1	0
11:40:14	45.5	33.6	41.5	40.3	40.0	38.9	48.6	34.0	1	0
11:40:15	45.5	33.6	41.5	40.3	40.0	38.9	48.6	34.0	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:40:16	45.5	33.6	41.5	40.3	40.0	38.9	48.6	34.0	1	0
11:40:17	45.5	33.6	41.6	40.3	40.1	38.9	48.6	34.1	1	0
11:40:18	45.5	33.7	41.6	40.4	40.1	38.9	48.6	34.1	1	0
11:40:19	45.5	33.7	41.6	40.4	40.1	39.0	48.6	34.1	1	0
11:40:20	45.4	33.7	41.6	40.4	40.1	39.0	48.6	34.1	1	0
11:40:21	45.5	33.7	41.6	40.4	40.1	39.0	48.5	34.1	1	0
11:40:22	45.5	33.7	41.6	40.4	40.1	39.0	48.5	34.1	1	0
11:40:23	45.5	33.7	41.7	40.4	40.2	39.0	48.5	34.1	1	0
11:40:24	45.5	33.8	41.7	40.4	40.2	39.0	48.5	34.1	1	0
11:40:25	45.5	33.8	41.7	40.5	40.2	39.1	48.5	34.1	1	0
11:40:26	45.5	33.8	41.7	40.5	40.2	39.1	48.5	34.1	1	0
11:40:28	45.5	33.9	41.7	40.5	40.2	39.1	48.5	34.1	1	0
11:40:29	45.5	33.9	41.7	40.5	40.2	39.1	48.5	34.1	1	0
11:40:30	45.5	33.9	41.7	40.5	40.2	39.2	48.5	34.1	1	0
11:40:31	45.5	33.9	41.7	40.5	40.3	39.2	48.5	34.1	1	0
11:40:32	45.5	33.9	41.7	40.5	40.3	39.2	48.4	34.1	1	0
11:40:33	45.5	33.9	41.8	40.6	40.3	39.2	48.4	34.1	1	0
11:40:34	45.5	34.0	41.8	40.6	40.3	39.3	48.4	34.1	1	0
11:40:35	45.5	34.0	41.8	40.6	40.4	39.3	48.4	34.1	1	0
11:40:36	45.5	34.0	41.8	40.6	40.4	39.3	48.4	34.1	1	0
11:40:37	45.5	34.0	41.8	40.6	40.4	39.3	48.4	34.1	1	0
11:40:38	45.5	34.0	41.8	40.6	40.4	39.3	48.4	34.1	1	0
11:40:39	45.5	34.0	41.8	40.7	40.4	39.4	48.4	34.2	1	0
11:40:40	45.5	34.0	41.8	40.7	40.5	39.4	48.4	34.2	1	0
11:40:41	45.4	34.0	41.9	40.7	40.5	39.4	48.4	34.2	1	0
11:40:42	45.5	34.0	41.9	40.7	40.5	39.4	48.4	34.2	1	0
11:40:43	45.5	34.1	41.8	40.7	40.5	39.4	48.3	34.2	1	0
11:40:44	45.5	34.1	41.9	40.7	40.5	39.4	48.3	34.2	1	0
11:40:45	45.5	34.1	41.9	40.7	40.5	39.4	48.3	34.2	1	0
11:40:46	45.5	34.1	41.9	40.8	40.6	39.5	48.3	34.2	1	0
11:40:47	45.5	34.1	41.9	40.8	40.6	39.5	48.3	34.2	1	0
11:40:48	45.5	34.2	41.9	40.8	40.6	39.5	48.3	34.2	1	0
11:40:49	45.5	34.2	41.9	40.8	40.6	39.5	48.3	34.2	1	0
11:40:50	45.5	34.2	42.0	40.8	40.6	39.6	48.3	34.2	1	0
11:40:51	45.5	34.2	42.0	40.8	40.6	39.6	48.3	34.2	1	0
11:40:52	45.5	34.3	42.0	40.8	40.7	39.6	48.3	34.2	1	0
11:40:53	45.5	34.3	42.0	40.9	40.7	39.6	48.3	34.2	1	0
11:40:54	45.5	34.3	42.0	40.9	40.7	39.6	48.3	34.2	1	0
11:40:55	45.5	34.3	42.0	40.9	40.7	39.7	48.3	34.2	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:40:56	45.5	34.4	42.0	40.9	40.7	39.7	48.3	34.2	1	0
11:40:57	45.5	34.4	42.1	40.9	40.7	39.7	48.3	34.3	1	0
11:40:58	45.5	34.4	42.1	41.0	40.8	39.7	48.2	34.2	1	0
11:40:59	45.5	34.4	42.1	41.0	40.8	39.7	48.2	34.3	1	0
11:41:01	45.5	34.4	42.1	41.0	40.8	39.7	48.2	34.3	1	0
11:41:02	45.5	34.4	42.1	41.0	40.8	39.8	48.2	34.3	1	0
11:41:03	45.5	34.4	42.1	41.0	40.8	39.8	48.2	34.3	1	0
11:41:04	45.5	34.4	42.1	41.1	40.8	39.8	48.2	34.3	1	0
11:41:05	45.5	34.5	42.1	41.1	40.9	39.8	48.2	34.3	1	0
11:41:06	45.5	34.5	42.1	41.1	40.9	39.9	48.2	34.3	1	0
11:41:07	45.5	34.5	42.1	41.1	40.9	39.9	48.2	34.3	1	0
11:41:08	45.5	34.5	42.2	41.1	40.9	39.9	48.2	34.3	1	0
11:41:09	45.5	34.5	42.2	41.1	41.0	39.9	48.1	34.3	1	0
11:41:10	45.5	34.5	42.2	41.2	41.0	40.0	48.1	34.3	1	0
11:41:11	45.5	34.5	42.2	41.2	41.0	40.0	48.1	34.3	1	0
11:41:12	45.5	34.5	42.2	41.2	41.0	40.0	48.1	34.3	1	0
11:41:13	45.5	34.5	42.2	41.2	41.0	40.0	48.1	34.4	1	0
11:41:14	45.5	34.5	42.2	41.2	41.1	40.0	48.1	34.3	1	0
11:41:15	45.5	34.5	42.2	41.2	41.1	40.0	48.1	34.4	1	0
11:41:16	45.5	34.5	42.2	41.2	41.1	40.0	48.1	34.4	1	0
11:41:17	45.5	34.5	42.3	41.3	41.1	40.1	48.0	34.4	1	0
11:41:18	45.5	34.5	42.3	41.3	41.2	40.1	48.0	34.4	1	0
11:41:19	45.6	34.5	42.3	41.3	41.2	40.1	48.0	34.4	1	0
11:41:20	45.6	34.5	42.3	41.3	41.2	40.1	48.0	34.4	1	0
11:41:21	45.6	34.5	42.3	41.3	41.2	40.1	48.0	34.4	1	0
11:41:22	45.6	34.5	42.3	41.3	41.2	40.1	48.0	34.4	1	0
11:41:23	45.6	34.5	42.3	41.4	41.2	40.1	48.0	34.4	1	0
11:41:24	45.6	34.5	42.3	41.4	41.3	40.1	47.9	34.4	1	0
11:41:25	45.6	34.5	42.4	41.4	41.3	40.2	47.9	34.4	1	0
11:41:26	45.6	34.5	42.4	41.4	41.3	40.2	47.9	34.4	1	0
11:41:27	45.6	34.6	42.4	41.4	41.3	40.2	47.9	34.4	1	0
11:41:28	45.6	34.6	42.4	41.4	41.3	40.2	47.9	34.4	1	0
11:41:29	45.6	34.6	42.4	41.5	41.3	40.3	47.8	34.4	1	0
11:41:30	45.6	34.6	42.4	41.5	41.4	40.3	47.8	34.5	1	0
11:41:31	45.6	34.6	42.5	41.5	41.4	40.3	47.8	34.5	1	0
11:41:32	45.6	34.6	42.5	41.5	41.4	40.3	47.8	34.5	1	0
11:41:33	45.6	34.7	42.5	41.5	41.4	40.4	47.8	34.5	1	0
11:41:35	45.6	34.7	42.5	41.5	41.4	40.4	47.8	34.5	1	0
11:41:36	45.6	34.7	42.5	41.6	41.4	40.4	47.8	34.5	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:41:37	45.6	34.7	42.5	41.6	41.4	40.4	47.8	34.5	1	0
11:41:38	45.6	34.7	42.6	41.6	41.5	40.4	47.8	34.5	1	0
11:41:39	45.6	34.7	42.6	41.6	41.5	40.4	47.8	34.5	1	0
11:41:40	45.6	34.8	42.6	41.6	41.5	40.4	47.9	34.5	1	0
11:41:41	45.6	34.8	42.6	41.6	41.5	40.5	47.8	34.5	1	0
11:41:42	45.6	34.8	42.6	41.7	41.5	40.5	47.8	34.5	1	0
11:41:43	45.6	34.8	42.6	41.7	41.6	40.5	47.9	34.5	1	0
11:41:44	45.6	34.8	42.6	41.7	41.6	40.6	47.9	34.5	1	0
11:41:45	45.6	34.8	42.6	41.7	41.6	40.6	47.9	34.6	1	0
11:41:46	45.6	34.9	42.7	41.7	41.6	40.6	47.9	34.6	1	0
11:41:47	45.6	34.9	42.7	41.8	41.6	40.6	47.9	34.6	1	0
11:41:48	45.7	34.9	42.7	41.8	41.7	40.6	47.9	34.6	1	0
11:41:49	45.6	34.9	42.7	41.8	41.7	40.6	47.9	34.6	1	0
11:41:50	45.7	34.9	42.7	41.8	41.7	40.7	47.9	34.6	1	0
11:41:51	45.6	34.9	42.7	41.8	41.7	40.7	48.0	34.6	1	0
11:41:52	45.7	34.9	42.7	41.9	41.7	40.7	48.0	34.6	1	0
11:41:53	45.7	35.0	42.8	41.9	41.8	40.7	48.0	34.6	1	0
11:41:54	45.7	35.0	42.8	41.9	41.8	40.7	48.0	34.6	1	0
11:41:55	45.7	35.0	42.8	41.9	41.8	40.7	48.0	34.7	1	0
11:41:56	45.7	35.1	42.8	41.9	41.8	40.7	48.0	34.7	1	0
11:41:57	45.7	35.1	42.8	41.9	41.8	40.7	47.9	34.7	1	0
11:41:58	45.7	35.1	42.8	41.9	41.8	40.8	47.9	34.7	1	0
11:41:59	45.7	35.1	42.8	41.9	41.9	40.8	47.9	34.7	1	0
11:42:00	45.7	35.1	42.8	42.0	41.9	40.8	47.9	34.7	1	0
11:42:01	45.7	35.1	42.9	42.0	41.9	40.8	47.8	34.7	1	0
11:42:02	45.7	35.1	42.9	42.0	41.9	40.8	47.8	34.7	1	0
11:42:03	45.7	35.1	42.9	42.0	41.9	40.8	47.8	34.7	1	0
11:42:04	45.7	35.1	42.9	42.0	41.9	40.9	47.8	34.7	1	0
11:42:05	45.7	35.1	42.9	42.1	41.9	40.9	47.8	34.7	1	0
11:42:06	45.7	35.1	42.9	42.0	42.0	40.9	47.8	34.8	1	0
11:42:07	45.7	35.1	43.0	42.1	42.0	40.9	47.8	34.8	1	0
11:42:08	45.7	35.1	43.0	42.1	42.0	40.9	47.7	34.8	1	0
11:42:10	45.7	35.1	43.0	42.1	42.0	41.0	47.7	34.8	1	0
11:42:11	45.7	35.1	43.0	42.1	42.0	41.0	47.7	34.8	1	0
11:42:12	45.7	35.1	43.0	42.1	42.0	41.0	47.7	34.8	1	0
11:42:13	45.8	35.1	43.1	42.2	42.0	41.0	47.6	34.8	1	0
11:42:14	45.7	35.1	43.1	42.2	42.1	41.0	47.7	34.8	1	0
11:42:15	45.8	35.1	43.1	42.2	42.1	41.0	47.6	34.8	1	0
11:42:16	45.7	35.1	43.1	42.2	42.1	41.0	47.6	34.8	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:42:17	45.8	35.0	43.1	42.2	42.1	41.1	47.6	34.8	1	0
11:42:18	45.8	35.0	43.1	42.2	42.1	41.1	47.6	34.8	1	0
11:42:19	45.8	35.1	43.2	42.2	42.1	41.1	47.6	34.8	1	0
11:42:20	45.8	35.0	43.2	42.3	42.2	41.1	47.6	34.8	1	0
11:42:21	45.8	35.0	43.2	42.3	42.2	41.1	47.6	34.9	1	0
11:42:22	45.8	35.0	43.2	42.3	42.2	41.2	47.6	34.9	1	0
11:42:23	45.8	35.1	43.2	42.3	42.2	41.2	47.5	34.9	1	0
11:42:24	45.8	35.1	43.2	42.3	42.2	41.2	47.5	34.9	1	0
11:42:25	45.8	35.1	43.2	42.4	42.2	41.2	47.5	34.9	1	0
11:42:26	45.8	35.1	43.2	42.4	42.3	41.2	47.5	34.9	1	0
11:42:27	45.8	35.1	43.2	42.4	42.3	41.2	47.5	34.9	1	0
11:42:28	45.8	35.1	43.3	42.4	42.3	41.3	47.5	34.9	1	0
11:42:29	45.8	35.1	43.3	42.4	42.3	41.3	47.5	34.9	1	0
11:42:30	45.8	35.1	43.3	42.5	42.3	41.3	47.5	34.9	1	0
11:42:31	45.8	35.1	43.3	42.5	42.3	41.3	47.4	34.9	1	0
11:42:32	45.9	35.1	43.3	42.5	42.3	41.3	47.4	35.0	1	0
11:42:33	45.8	35.1	43.3	42.5	42.3	41.3	47.4	35.0	1	0
11:42:34	45.9	35.1	43.3	42.5	42.4	41.4	47.4	35.0	1	0
11:42:35	45.8	35.1	43.3	42.5	42.4	41.4	47.4	35.0	1	0
11:42:36	45.8	35.1	43.4	42.5	42.4	41.4	47.4	35.0	1	0
11:42:37	45.9	35.1	43.3	42.6	42.4	41.4	47.3	35.0	1	0
11:42:38	45.9	35.1	43.4	42.5	42.4	41.4	47.3	35.0	1	0
11:42:39	45.9	35.1	43.4	42.6	42.4	41.4	47.3	35.0	1	0
11:42:40	45.9	35.1	43.4	42.6	42.5	41.5	47.3	35.0	1	0
11:42:41	45.9	35.1	43.4	42.6	42.5	41.5	47.3	35.0	1	0
11:42:42	45.9	35.1	43.4	42.6	42.5	41.5	47.2	35.0	1	0
11:42:44	45.9	35.1	43.4	42.6	42.5	41.5	47.2	35.0	1	0
11:42:45	45.9	35.1	43.4	42.6	42.6	41.5	47.2	35.0	1	0
11:42:46	45.9	35.1	43.5	42.6	42.6	41.5	47.2	35.1	1	0
11:42:47	45.9	35.1	43.5	42.7	42.6	41.6	47.2	35.1	1	0
11:42:48	45.9	35.1	43.5	42.7	42.6	41.6	47.1	35.1	1	0
11:42:49	45.9	35.1	43.5	42.7	42.6	41.6	47.1	35.1	1	0
11:42:50	45.9	35.1	43.5	42.7	42.6	41.6	47.1	35.1	1	0
11:42:51	46.0	35.1	43.5	42.7	42.6	41.6	47.1	35.1	1	0
11:42:52	46.0	35.1	43.6	42.8	42.7	41.6	47.1	35.1	1	0
11:42:53	46.0	35.1	43.6	42.8	42.7	41.6	47.1	35.1	1	0
11:42:54	46.0	35.1	43.6	42.8	42.7	41.6	47.1	35.1	1	0
11:42:55	46.0	35.1	43.6	42.8	42.7	41.7	47.0	35.1	1	0
11:42:56	46.0	35.1	43.6	42.8	42.7	41.7	47.0	35.2	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:42:57	46.0	35.1	43.6	42.9	42.8	41.7	47.0	35.2	1	0
11:42:58	46.1	35.2	43.6	42.9	42.8	41.7	47.0	35.2	1	0
11:42:59	46.1	35.2	43.6	42.9	42.8	41.7	47.0	35.2	1	0
11:43:00	46.1	35.2	43.7	42.9	42.8	41.7	47.0	35.2	1	0
11:43:01	46.1	35.2	43.7	42.9	42.8	41.7	46.9	35.2	1	0
11:43:02	46.1	35.2	43.7	42.9	42.8	41.8	46.9	35.2	1	0
11:43:03	46.1	35.2	43.7	43.0	42.8	41.8	46.9	35.3	1	0
11:43:04	46.1	35.2	43.7	43.0	42.9	41.8	46.9	35.3	1	0
11:43:05	46.1	35.2	43.7	43.0	42.9	41.8	46.9	35.3	1	0
11:43:06	46.1	35.3	43.8	43.0	42.9	41.8	46.9	35.3	1	0
11:43:07	46.1	35.2	43.8	43.0	42.9	41.9	46.8	35.3	1	0
11:43:08	46.1	35.3	43.8	43.0	42.9	41.9	46.8	35.3	1	0
11:43:09	46.2	35.2	43.8	43.1	42.9	41.9	46.8	35.3	1	0
11:43:10	46.2	35.3	43.8	43.1	42.9	41.9	46.8	35.3	1	0
11:43:11	46.2	35.3	43.8	43.1	43.0	41.9	46.8	35.3	1	0
11:43:12	46.2	35.3	43.8	43.1	43.0	42.0	46.8	35.3	1	0
11:43:13	46.2	35.3	43.8	43.1	43.0	42.0	46.8	35.3	1	0
11:43:14	46.2	35.3	43.8	43.1	43.0	42.0	46.8	35.3	1	0
11:43:15	46.2	35.3	43.8	43.1	43.0	42.0	46.7	35.4	1	0
11:43:16	46.2	35.3	43.8	43.2	43.0	42.0	46.8	35.4	1	0
11:43:18	46.2	35.3	43.9	43.1	43.1	42.0	46.8	35.4	1	0
11:43:19	46.2	35.3	43.9	43.2	43.1	42.1	46.7	35.4	1	0
11:43:20	46.2	35.3	43.9	43.2	43.1	42.1	46.7	35.4	1	0
11:43:21	46.2	35.3	43.9	43.2	43.1	42.1	46.7	35.4	1	0
11:43:22	46.2	35.3	43.9	43.2	43.1	42.1	46.7	35.4	1	0
11:43:23	46.2	35.3	43.9	43.2	43.1	42.1	46.7	35.4	1	0
11:43:24	46.2	35.3	43.9	43.2	43.2	42.1	46.7	35.4	1	0
11:43:25	46.2	35.4	43.9	43.3	43.2	42.1	46.7	35.5	1	0
11:43:26	46.3	35.4	44.0	43.3	43.2	42.1	46.7	35.4	1	0
11:43:27	46.3	35.4	44.0	43.3	43.2	42.2	46.7	35.5	1	0
11:43:28	46.3	35.4	44.0	43.3	43.2	42.2	46.7	35.5	1	0
11:43:29	46.3	35.4	44.0	43.3	43.3	42.2	46.7	35.5	1	0
11:43:30	46.3	35.5	44.0	43.3	43.3	42.2	46.7	35.5	1	0
11:43:31	46.3	35.5	44.0	43.3	43.3	42.2	46.7	35.5	1	0
11:43:32	46.3	35.5	44.1	43.4	43.3	42.2	46.7	35.5	1	0
11:43:33	46.3	35.5	44.1	43.4	43.3	42.3	46.7	35.5	1	0
11:43:34	46.3	35.5	44.1	43.4	43.4	42.3	46.7	35.5	1	0
11:43:35	46.3	35.5	44.1	43.4	43.4	42.3	46.6	35.5	1	0
11:43:36	46.3	35.5	44.1	43.4	43.4	42.3	46.6	35.5	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:43:37	46.3	35.5	44.1	43.4	43.4	42.3	46.6	35.5	1	0
11:43:38	46.3	35.5	44.1	43.5	43.4	42.3	46.6	35.5	1	0
11:43:39	46.3	35.5	44.2	43.5	43.4	42.3	46.6	35.5	1	0
11:43:40	46.4	35.5	44.2	43.5	43.4	42.4	46.6	35.6	1	0
11:43:41	46.4	35.6	44.2	43.5	43.4	42.4	46.6	35.5	1	0
11:43:42	46.4	35.5	44.2	43.5	43.5	42.4	46.6	35.6	1	0
11:43:43	46.4	35.6	44.2	43.6	43.5	42.4	46.5	35.6	1	0
11:43:44	46.4	35.6	44.2	43.6	43.5	42.4	46.5	35.6	1	0
11:43:45	46.4	35.6	44.2	43.6	43.5	42.5	46.6	35.6	1	0
11:43:46	46.4	35.6	44.3	43.6	43.5	42.5	46.5	35.6	1	0
11:43:47	46.4	35.6	44.3	43.6	43.5	42.5	46.5	35.6	1	0
11:43:48	46.4	35.6	44.3	43.6	43.5	42.5	46.5	35.6	1	0
11:43:49	46.4	35.6	44.3	43.6	43.6	42.5	46.5	35.6	1	0
11:43:50	46.4	35.6	44.3	43.6	43.6	42.5	46.5	35.6	1	0
11:43:51	46.4	35.6	44.3	43.7	43.6	42.6	46.5	35.6	1	0
11:43:53	46.4	35.6	44.3	43.7	43.6	42.6	46.5	35.7	1	0
11:43:54	46.5	35.6	44.4	43.7	43.6	42.6	46.5	35.7	1	0
11:43:55	46.5	35.6	44.4	43.7	43.6	42.6	46.5	35.7	1	0
11:43:56	46.5	35.6	44.4	43.7	43.6	42.6	46.5	35.7	1	0
11:43:57	46.5	35.6	44.4	43.7	43.7	42.6	46.5	35.7	1	0
11:43:58	46.5	35.6	44.4	43.8	43.7	42.7	46.5	35.7	1	0
11:43:59	46.5	35.6	44.4	43.8	43.7	42.7	46.5	35.7	1	0
11:44:00	46.5	35.6	44.4	43.8	43.7	42.7	46.4	35.7	1	0
11:44:01	46.5	35.6	44.5	43.8	43.7	42.7	46.4	35.7	1	0
11:44:02	46.5	35.7	44.4	43.8	43.7	42.7	46.4	35.7	1	0
11:44:03	46.5	35.6	44.5	43.9	43.8	42.7	46.4	35.8	1	0
11:44:04	46.6	35.7	44.5	43.9	43.8	42.7	46.4	35.8	1	0
11:44:05	46.6	35.7	44.5	43.9	43.8	42.8	46.4	35.8	1	0
11:44:06	46.6	35.7	44.5	43.9	43.8	42.8	46.4	35.8	1	0
11:44:07	46.6	35.7	44.5	43.9	43.8	42.8	46.4	35.8	1	0
11:44:08	46.6	35.7	44.5	43.9	43.9	42.8	46.4	35.8	1	0
11:44:09	46.6	35.7	44.5	43.9	43.9	42.8	46.4	35.8	1	0
11:44:10	46.6	35.7	44.6	43.9	43.9	42.8	46.4	35.8	1	0
11:44:11	46.6	35.7	44.6	44.0	43.9	42.8	46.4	35.8	1	0
11:44:12	46.6	35.7	44.6	44.0	43.9	42.9	46.4	35.8	1	0
11:44:13	46.7	35.7	44.6	44.0	43.9	42.9	46.4	35.8	1	0
11:44:14	46.6	35.7	44.6	44.0	43.9	42.9	46.4	35.8	1	0
11:44:15	46.7	35.7	44.6	44.0	44.0	42.9	46.4	35.8	1	0
11:44:16	46.7	35.6	44.6	44.0	44.0	42.9	46.4	35.9	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:44:17	46.7	35.7	44.7	44.1	44.0	42.9	46.3	35.9	1	0
11:44:18	46.7	35.6	44.6	44.1	44.0	42.9	46.3	35.9	1	0
11:44:19	46.7	35.6	44.7	44.1	44.0	42.9	46.4	35.9	1	0
11:44:20	46.7	35.6	44.7	44.1	44.0	43.0	46.3	35.9	1	0
11:44:21	46.7	35.7	44.7	44.1	44.0	43.0	46.3	35.9	1	0
11:44:22	46.7	35.6	44.7	44.1	44.0	43.0	46.3	35.9	1	0
11:44:23	46.8	35.7	44.7	44.1	44.1	43.0	46.3	35.9	1	0
11:44:24	46.8	35.7	44.7	44.2	44.1	43.0	46.3	35.9	1	0
11:44:25	46.8	35.7	44.8	44.2	44.1	43.0	46.3	35.9	1	0
11:44:27	46.8	35.7	44.8	44.2	44.1	43.1	46.3	36.0	1	0
11:44:28	46.8	35.7	44.8	44.2	44.1	43.1	46.3	36.0	1	0
11:44:29	46.8	35.7	44.8	44.2	44.1	43.1	46.2	36.0	1	0
11:44:30	46.8	35.7	44.8	44.2	44.1	43.1	46.2	36.0	1	0
11:44:31	46.8	35.7	44.8	44.3	44.2	43.1	46.2	36.0	1	0
11:44:32	46.8	35.7	44.8	44.3	44.2	43.1	46.2	36.0	1	0
11:44:33	46.8	35.7	44.8	44.3	44.2	43.1	46.2	36.1	1	0
11:44:34	46.8	35.7	44.9	44.3	44.2	43.1	46.2	36.1	1	0
11:44:35	46.8	35.7	44.9	44.3	44.2	43.1	46.2	36.1	1	0
11:44:36	46.8	35.7	44.9	44.3	44.2	43.2	46.2	36.1	1	0
11:44:37	46.8	35.8	44.9	44.4	44.2	43.2	46.1	36.1	1	0
11:44:38	46.9	35.7	44.9	44.4	44.3	43.2	46.2	36.1	1	0
11:44:39	46.9	35.8	45.0	44.4	44.3	43.2	46.1	36.1	1	0
11:44:40	46.9	35.8	44.9	44.4	44.3	43.2	46.1	36.1	1	0
11:44:41	46.9	35.8	45.0	44.4	44.3	43.2	46.1	36.1	1	0
11:44:42	46.9	35.8	45.0	44.4	44.3	43.2	46.1	36.1	1	0
11:44:43	46.9	35.8	45.0	44.4	44.3	43.3	46.1	36.1	1	0
11:44:44	46.9	35.8	45.0	44.5	44.4	43.3	46.1	36.2	1	0
11:44:45	46.9	35.8	45.0	44.5	44.4	43.3	46.1	36.2	1	0
11:44:46	46.9	35.8	45.0	44.5	44.4	43.3	46.0	36.2	1	0
11:44:47	46.9	35.9	45.0	44.5	44.4	43.3	46.0	36.2	1	0
11:44:48	46.9	35.9	45.1	44.5	44.5	43.3	46.0	36.2	1	0
11:44:49	46.9	35.9	45.1	44.6	44.5	43.3	46.0	36.2	1	0
11:44:50	46.9	35.9	45.1	44.6	44.5	43.4	46.0	36.2	1	0
11:44:51	47.0	35.9	45.1	44.6	44.5	43.4	46.0	36.2	1	0
11:44:52	47.0	35.9	45.1	44.6	44.5	43.4	46.0	36.2	1	0
11:44:53	47.0	35.9	45.1	44.6	44.5	43.4	46.0	36.3	1	0
11:44:54	47.0	35.9	45.1	44.6	44.5	43.4	46.0	36.3	1	0
11:44:55	47.0	35.9	45.2	44.6	44.5	43.4	46.0	36.3	1	0
11:44:56	47.0	35.9	45.2	44.6	44.5	43.4	46.0	36.3	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:44:57	47.0	35.9	45.2	44.6	44.6	43.4	46.0	36.3	1	0
11:44:58	47.1	35.9	45.2	44.7	44.6	43.5	46.0	36.3	1	0
11:44:59	47.0	36.0	45.2	44.7	44.6	43.5	46.0	36.3	1	0
11:45:01	47.1	35.9	45.2	44.7	44.6	43.5	46.0	36.3	1	0
11:45:02	47.1	35.9	45.2	44.7	44.6	43.5	46.0	36.3	1	0
11:45:03	47.1	36.0	45.2	44.7	44.6	43.5	45.9	36.3	1	0
11:45:04	47.1	36.0	45.3	44.7	44.7	43.5	45.9	36.4	1	0
11:45:05	47.1	36.0	45.3	44.7	44.7	43.6	45.9	36.3	1	0
11:45:06	47.1	36.0	45.3	44.8	44.7	43.6	45.9	36.4	1	0
11:45:07	47.1	36.0	45.3	44.8	44.7	43.6	45.9	36.4	1	0
11:45:08	47.1	36.0	45.3	44.8	44.7	43.6	45.9	36.4	1	0
11:45:09	47.1	36.0	45.3	44.8	44.7	43.6	45.9	36.4	1	0
11:45:10	47.2	36.0	45.3	44.8	44.7	43.6	45.9	36.4	1	0
11:45:11	47.2	36.0	45.3	44.8	44.7	43.6	45.9	36.4	1	0
11:45:12	47.2	36.0	45.3	44.8	44.7	43.7	45.9	36.4	1	0
11:45:13	47.2	36.0	45.3	44.9	44.8	43.7	45.9	36.4	1	0
11:45:14	47.2	36.0	45.4	44.8	44.8	43.7	45.9	36.4	1	0
11:45:15	47.2	36.0	45.4	44.9	44.8	43.7	45.9	36.4	1	0
11:45:16	47.2	36.0	45.4	44.9	44.8	43.7	45.9	36.5	1	0
11:45:17	47.2	36.0	45.4	44.9	44.8	43.7	45.8	36.4	1	0
11:45:18	47.2	36.0	45.4	44.9	44.8	43.8	45.9	36.5	1	0
11:45:19	47.2	36.0	45.4	44.9	44.8	43.7	45.9	36.5	1	0
11:45:20	47.2	36.0	45.4	44.9	44.8	43.8	45.9	36.5	1	0
11:45:21	47.3	36.0	45.4	44.9	44.8	43.8	45.8	36.5	1	0
11:45:22	47.3	36.0	45.5	45.0	44.9	43.8	45.9	36.5	1	0
11:45:23	47.3	36.0	45.5	44.9	44.9	43.8	45.9	36.5	1	0
11:45:24	47.3	36.0	45.5	44.9	44.9	43.8	45.9	36.5	1	0
11:45:25	47.3	36.0	45.5	45.0	44.9	43.9	45.8	36.5	1	0
11:45:26	47.3	36.0	45.5	45.0	44.9	43.9	45.9	36.5	1	0
11:45:27	47.3	36.0	45.5	45.0	44.9	43.9	45.8	36.5	1	0
11:45:28	47.3	36.0	45.5	45.0	44.9	43.9	45.9	36.5	1	0
11:45:29	47.3	36.0	45.5	45.0	45.0	43.9	45.9	36.5	1	0
11:45:30	47.3	36.0	45.5	45.1	45.0	44.0	45.8	36.6	1	0
11:45:31	47.4	36.0	45.6	45.1	45.0	44.0	45.8	36.6	1	0
11:45:32	47.4	36.0	45.6	45.1	45.0	44.0	45.8	36.6	1	0
11:45:33	47.4	36.0	45.6	45.1	45.0	44.0	45.8	36.6	1	0
11:45:35	47.4	36.0	45.6	45.1	45.1	44.0	45.8	36.6	1	0
11:45:36	47.4	36.0	45.6	45.1	45.1	44.0	45.8	36.6	1	0
11:45:37	47.4	36.0	45.6	45.2	45.1	44.0	45.8	36.6	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:45:38	47.4	36.0	45.6	45.2	45.1	44.1	45.8	36.6	1	0
11:45:39	47.4	36.0	45.7	45.2	45.1	44.1	45.8	36.6	1	0
11:45:40	47.4	36.0	45.7	45.2	45.1	44.1	45.8	36.7	1	0
11:45:41	47.5	36.0	45.7	45.2	45.2	44.1	45.7	36.7	1	0
11:45:42	47.5	36.0	45.7	45.2	45.2	44.1	45.8	36.7	1	0
11:45:43	47.5	36.0	45.7	45.3	45.2	44.1	45.8	36.7	1	0
11:45:44	47.5	36.0	45.7	45.3	45.2	44.2	45.8	36.7	1	0
11:45:45	47.5	36.0	45.8	45.3	45.2	44.2	45.8	36.7	1	0
11:45:46	47.5	36.0	45.8	45.3	45.2	44.2	45.7	36.7	1	0
11:45:47	47.5	36.0	45.8	45.3	45.2	44.2	45.7	36.7	1	0
11:45:48	47.5	36.0	45.8	45.3	45.3	44.2	45.7	36.8	1	0
11:45:49	47.5	36.1	45.8	45.4	45.3	44.2	45.7	36.8	1	0
11:45:50	47.6	36.1	45.8	45.4	45.3	44.2	45.7	36.8	1	0
11:45:51	47.5	36.1	45.8	45.4	45.3	44.2	45.7	36.8	1	0
11:45:52	47.6	36.1	45.8	45.4	45.3	44.2	45.7	36.8	1	0
11:45:53	47.6	36.1	45.8	45.4	45.3	44.2	45.7	36.8	1	0
11:45:54	47.6	36.1	45.9	45.4	45.4	44.3	45.7	36.8	1	0
11:45:55	47.6	36.1	45.9	45.4	45.4	44.3	45.7	36.9	1	0
11:45:56	47.6	36.1	45.9	45.5	45.4	44.3	45.7	36.8	1	0
11:45:57	47.6	36.2	45.9	45.5	45.4	44.3	45.7	36.9	1	0
11:45:58	47.6	36.1	45.9	45.5	45.4	44.3	45.7	36.9	1	0
11:45:59	47.6	36.2	45.9	45.5	45.4	44.4	45.6	36.9	1	0
11:46:00	47.6	36.2	45.9	45.5	45.4	44.4	45.6	36.9	1	0
11:46:01	47.6	36.2	45.9	45.5	45.4	44.4	45.6	36.9	1	0
11:46:02	47.7	36.2	45.9	45.5	45.5	44.4	45.6	36.9	1	0
11:46:03	47.7	36.2	46.0	45.5	45.5	44.4	45.6	36.9	1	0
11:46:04	47.7	36.2	46.0	45.6	45.5	44.4	45.6	36.9	1	0
11:46:05	47.7	36.2	46.0	45.6	45.5	44.4	45.6	36.9	1	0
11:46:06	47.7	36.2	46.0	45.6	45.5	44.4	45.6	37.0	1	0
11:46:07	47.7	36.3	46.0	45.6	45.5	44.5	45.6	37.0	1	0
11:46:09	47.7	36.2	46.0	45.6	45.5	44.5	45.6	37.0	1	0
11:46:10	47.7	36.3	46.0	45.6	45.6	44.5	45.6	37.0	1	0
11:46:11	47.7	36.3	46.0	45.6	45.6	44.5	45.6	37.0	1	0
11:46:12	47.7	36.3	46.1	45.6	45.6	44.5	45.5	37.0	1	0
11:46:13	47.8	36.3	46.1	45.6	45.6	44.5	45.5	37.0	1	0
11:46:14	47.8	36.3	46.1	45.7	45.6	44.5	45.5	37.0	1	0
11:46:15	47.8	36.3	46.1	45.7	45.6	44.6	45.5	37.0	1	0
11:46:16	47.8	36.3	46.1	45.7	45.6	44.6	45.5	37.0	1	0
11:46:17	47.8	36.3	46.1	45.7	45.7	44.6	45.5	37.0	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:46:18	47.8	36.3	46.1	45.7	45.7	44.6	45.5	37.1	1	0
11:46:19	47.8	36.3	46.1	45.8	45.7	44.6	45.5	37.1	1	0
11:46:20	47.8	36.3	46.1	45.8	45.7	44.6	45.5	37.1	1	0
11:46:21	47.8	36.3	46.2	45.8	45.7	44.7	45.5	37.1	1	0
11:46:22	47.9	36.3	46.2	45.8	45.7	44.7	45.5	37.1	1	0
11:46:23	47.9	36.3	46.2	45.8	45.7	44.7	45.4	37.1	1	0
11:46:24	47.9	36.3	46.2	45.8	45.7	44.7	45.4	37.1	1	0
11:46:25	47.9	36.3	46.2	45.8	45.7	44.7	45.4	37.1	1	0
11:46:26	47.9	36.3	46.2	45.9	45.8	44.7	45.4	37.1	1	0
11:46:27	47.9	36.3	46.2	45.9	45.8	44.7	45.4	37.1	1	0
11:46:28	47.9	36.3	46.2	45.9	45.8	44.8	45.4	37.1	1	0
11:46:29	47.9	36.3	46.2	45.9	45.8	44.8	45.4	37.1	1	0
11:46:30	48.0	36.3	46.3	45.9	45.8	44.8	45.3	37.1	1	0
11:46:31	48.0	36.3	46.3	45.9	45.8	44.8	45.3	37.2	1	0
11:46:32	48.0	36.3	46.3	45.9	45.8	44.8	45.3	37.2	1	0
11:46:33	48.0	36.3	46.3	45.9	45.9	44.8	45.3	37.2	1	0
11:46:34	48.0	36.3	46.3	46.0	45.9	44.9	45.3	37.2	1	0
11:46:35	48.0	36.3	46.3	46.0	45.9	44.9	45.2	37.2	1	0
11:46:36	48.0	36.4	46.3	46.0	45.9	44.9	45.3	37.2	1	0
11:46:37	48.1	36.4	46.4	46.0	45.9	44.9	45.2	37.2	1	0
11:46:38	48.1	36.3	46.4	46.0	45.9	44.9	45.2	37.2	1	0
11:46:39	48.1	36.3	46.4	46.0	46.0	44.9	45.2	37.2	1	0
11:46:40	48.1	36.3	46.4	46.0	46.0	44.9	45.2	37.2	1	0
11:46:41	48.1	36.4	46.4	46.0	46.0	44.9	45.2	37.2	1	0
11:46:43	48.1	36.4	46.4	46.1	46.0	44.9	45.2	37.3	1	0
11:46:44	48.1	36.4	46.4	46.1	46.0	45.0	45.2	37.3	1	0
11:46:45	48.1	36.4	46.4	46.1	46.0	45.0	45.1	37.3	1	0
11:46:46	48.2	36.4	46.4	46.1	46.1	45.0	45.1	37.3	1	0
11:46:47	48.2	36.4	46.5	46.1	46.1	45.0	45.1	37.3	1	0
11:46:48	48.2	36.4	46.5	46.1	46.1	45.0	45.1	37.3	1	0
11:46:49	48.2	36.4	46.5	46.1	46.1	45.1	45.1	37.3	1	0
11:46:50	48.2	36.4	46.5	46.1	46.1	45.0	45.1	37.3	1	0
11:46:51	48.2	36.4	46.5	46.1	46.1	45.1	45.1	37.4	1	0
11:46:52	48.2	36.4	46.5	46.1	46.1	45.1	45.0	37.4	1	0
11:46:53	48.2	36.4	46.5	46.1	46.1	45.1	45.0	37.4	1	0
11:46:54	48.2	36.4	46.5	46.2	46.2	45.1	45.0	37.4	1	0
11:46:55	48.2	36.4	46.6	46.2	46.2	45.1	45.0	37.4	1	0
11:46:56	48.2	36.4	46.6	46.2	46.2	45.1	45.0	37.4	1	0
11:46:57	48.2	36.4	46.6	46.2	46.2	45.1	45.0	37.4	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:46:58	48.2	36.4	46.6	46.2	46.2	45.1	45.0	37.4	1	0
11:46:59	48.3	36.4	46.6	46.2	46.2	45.2	45.0	37.4	1	0
11:47:00	48.3	36.4	46.6	46.2	46.3	45.2	45.0	37.5	1	0
11:47:01	48.3	36.4	46.6	46.3	46.2	45.2	45.0	37.5	1	0
11:47:02	48.3	36.4	46.6	46.3	46.3	45.2	45.0	37.5	1	0
11:47:03	48.3	36.4	46.7	46.3	46.3	45.2	45.0	37.5	1	0
11:47:04	48.3	36.4	46.7	46.3	46.3	45.2	45.0	37.5	1	0
11:47:05	48.3	36.4	46.7	46.3	46.3	45.3	44.9	37.5	1	0
11:47:06	48.3	36.4	46.7	46.3	46.3	45.3	44.9	37.5	1	0
11:47:07	48.3	36.4	46.7	46.3	46.3	45.3	44.9	37.5	1	0
11:47:08	48.3	36.4	46.7	46.3	46.3	45.3	44.9	37.5	1	0
11:47:09	48.3	36.4	46.7	46.3	46.4	45.3	44.9	37.5	1	0
11:47:10	48.4	36.4	46.7	46.4	46.3	45.4	44.9	37.6	1	0
11:47:11	48.4	36.4	46.7	46.4	46.4	45.4	44.9	37.5	1	0
11:47:12	48.4	36.4	46.8	46.4	46.4	45.4	44.9	37.5	1	0
11:47:13	48.4	36.4	46.8	46.4	46.4	45.4	44.8	37.6	1	0
11:47:14	48.4	36.5	46.8	46.4	46.4	45.4	44.8	37.6	1	0
11:47:15	48.4	36.5	46.8	46.4	46.4	45.4	44.8	37.6	1	0
11:47:17	48.4	36.5	46.8	46.5	46.4	45.4	44.8	37.6	1	0
11:47:18	48.4	36.5	46.8	46.5	46.4	45.4	44.8	37.6	1	0
11:47:19	48.4	36.5	46.8	46.5	46.5	45.5	44.8	37.6	1	0
11:47:20	48.4	36.5	46.8	46.5	46.5	45.5	44.8	37.6	1	0
11:47:21	48.5	36.6	46.8	46.5	46.5	45.5	44.8	37.6	1	0
11:47:22	48.5	36.6	46.8	46.5	46.5	45.5	44.7	37.6	1	0
11:47:23	48.5	36.6	46.8	46.5	46.5	45.5	44.7	37.7	1	0
11:47:24	48.5	36.6	46.8	46.5	46.5	45.5	44.8	37.7	1	0
11:47:25	48.5	36.6	46.8	46.5	46.5	45.5	44.7	37.7	1	0
11:47:26	48.5	36.6	46.9	46.6	46.6	45.5	44.7	37.7	1	0
11:47:27	48.5	36.6	46.8	46.5	46.6	45.6	44.7	37.7	1	0
11:47:28	48.5	36.7	46.9	46.6	46.6	45.6	44.7	37.7	1	0
11:47:29	48.5	36.7	46.9	46.6	46.6	45.6	44.7	37.7	1	0
11:47:30	48.5	36.7	46.9	46.6	46.6	45.6	44.7	37.7	1	0
11:47:31	48.6	36.7	46.9	46.6	46.6	45.6	44.7	37.7	1	0
11:47:32	48.6	36.7	46.9	46.6	46.6	45.6	44.6	37.7	1	0
11:47:33	48.6	36.7	46.9	46.6	46.7	45.6	44.6	37.7	1	0
11:47:34	48.6	36.7	46.9	46.6	46.7	45.7	44.6	37.8	1	0
11:47:35	48.6	36.7	46.9	46.6	46.7	45.7	44.6	37.7	1	0
11:47:36	48.6	36.7	46.9	46.6	46.7	45.7	44.6	37.8	1	0
11:47:37	48.6	36.7	47.0	46.6	46.7	45.7	44.5	37.8	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:47:38	48.7	36.7	47.0	46.6	46.7	45.7	44.5	37.8	1	0
11:47:39	48.7	36.7	47.0	46.6	46.7	45.7	44.5	37.8	1	0
11:47:40	48.7	36.7	47.0	46.6	46.7	45.7	44.5	37.8	1	0
11:47:41	48.7	36.7	47.0	46.7	46.8	45.7	44.5	37.8	1	0
11:47:42	48.7	36.7	47.0	46.7	46.8	45.7	44.4	37.8	1	0
11:47:43	48.7	36.7	47.0	46.7	46.8	45.8	44.4	37.8	1	0
11:47:44	48.7	36.7	47.0	46.7	46.8	45.8	44.4	37.8	1	0
11:47:45	48.7	36.7	47.0	46.7	46.8	45.8	44.4	37.8	1	0
11:47:46	48.7	36.7	47.1	46.7	46.9	45.8	44.4	37.8	1	0
11:47:47	48.7	36.8	47.1	46.7	46.8	45.8	44.3	37.8	1	0
11:47:48	48.7	36.7	47.1	46.7	46.9	45.8	44.3	37.8	1	0
11:47:49	48.7	36.8	47.1	46.7	46.9	45.8	44.3	37.8	1	0
11:47:51	48.8	36.8	47.1	46.8	46.9	45.8	44.3	37.9	1	0
11:47:52	48.8	36.8	47.1	46.8	46.9	45.9	44.2	37.9	1	0
11:47:53	48.8	36.8	47.1	46.8	46.9	45.9	44.2	37.9	1	0
11:47:54	48.8	36.8	47.1	46.8	46.9	45.9	44.2	37.9	1	0
11:47:55	48.8	36.8	47.1	46.8	46.9	45.9	44.2	37.9	1	0
11:47:56	48.8	36.8	47.1	46.8	46.9	45.9	44.2	37.9	1	0
11:47:57	48.8	36.8	47.2	46.8	46.9	45.9	44.2	37.9	1	0
11:47:58	48.8	36.8	47.2	46.8	47.0	46.0	44.1	37.9	1	0
11:47:59	48.8	36.8	47.2	46.8	47.0	46.0	44.1	37.9	1	0
11:48:00	48.8	36.8	47.2	46.8	47.0	46.0	44.1	38.0	1	0
11:48:01	48.8	36.8	47.2	46.8	47.0	46.0	44.1	38.0	1	0
11:48:02	48.9	36.8	47.2	46.9	47.0	46.0	44.1	38.0	1	0
11:48:03	48.9	36.8	47.2	46.9	47.0	46.1	44.1	38.0	1	0
11:48:04	48.9	36.8	47.2	46.9	47.0	46.1	44.1	38.0	1	0
11:48:05	48.9	36.8	47.2	46.9	47.0	46.1	44.0	38.0	1	0
11:48:06	48.9	36.8	47.3	46.9	47.0	46.1	44.0	38.0	1	0
11:48:07	48.9	36.8	47.3	46.9	47.1	46.1	44.0	38.0	1	0
11:48:08	48.9	36.8	47.3	46.9	47.1	46.1	44.0	38.0	1	0
11:48:09	48.9	36.8	47.3	46.9	47.1	46.2	44.0	38.0	1	0
11:48:10	48.9	36.8	47.3	47.0	47.1	46.1	44.0	38.1	1	0
11:48:11	48.9	36.9	47.3	46.9	47.1	46.2	43.9	38.1	1	0
11:48:12	48.9	36.8	47.3	47.0	47.1	46.2	43.9	38.1	1	0
11:48:13	49.0	36.8	47.3	47.0	47.1	46.2	43.9	38.1	1	0
11:48:14	49.0	36.9	47.3	47.0	47.1	46.2	43.9	38.1	1	0
11:48:15	49.0	36.9	47.4	47.0	47.2	46.2	43.9	38.1	1	0
11:48:16	49.0	36.9	47.3	47.0	47.2	46.2	43.9	38.1	1	0
11:48:17	49.0	36.8	47.4	47.1	47.2	46.2	43.8	38.1	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:48:18	49.0	36.8	47.4	47.0	47.2	46.3	43.8	38.1	1	0
11:48:19	49.0	36.8	47.4	47.0	47.2	46.3	43.8	38.1	1	0
11:48:20	49.1	36.8	47.4	47.1	47.2	46.3	43.8	38.1	1	0
11:48:21	49.1	36.8	47.4	47.1	47.2	46.3	43.8	38.1	1	0
11:48:22	49.1	36.8	47.4	47.1	47.3	46.3	43.8	38.1	1	0
11:48:24	49.1	36.8	47.4	47.1	47.3	46.3	43.7	38.1	1	0
11:48:25	49.1	36.8	47.4	47.1	47.3	46.3	43.7	38.2	1	0
11:48:26	49.1	36.8	47.4	47.1	47.3	46.3	43.7	38.2	1	0
11:48:27	49.1	36.8	47.4	47.1	47.3	46.3	43.7	38.2	1	0
11:48:28	49.1	36.9	47.5	47.1	47.3	46.4	43.7	38.2	1	0
11:48:29	49.1	36.9	47.5	47.2	47.3	46.4	43.7	38.2	1	0
11:48:30	49.2	36.9	47.5	47.2	47.4	46.4	43.7	38.2	1	0
11:48:31	49.2	36.9	47.5	47.2	47.4	46.4	43.6	38.2	1	0
11:48:32	49.2	36.9	47.5	47.2	47.4	46.4	43.6	38.2	1	0
11:48:33	49.2	36.9	47.5	47.2	47.4	46.4	43.6	38.2	1	0
11:48:34	49.2	36.9	47.5	47.2	47.4	46.4	43.6	38.2	1	0
11:48:35	49.2	36.9	47.6	47.2	47.4	46.4	43.6	38.2	1	0
11:48:36	49.2	36.9	47.6	47.2	47.4	46.4	43.6	38.3	1	0
11:48:37	49.2	36.9	47.6	47.2	47.4	46.4	43.6	38.3	1	0
11:48:38	49.2	36.9	47.6	47.3	47.4	46.5	43.5	38.3	1	0
11:48:39	49.2	36.9	47.6	47.3	47.4	46.5	43.6	38.3	1	0
11:48:40	49.3	36.9	47.6	47.3	47.4	46.5	43.5	38.3	1	0
11:48:41	49.3	36.9	47.6	47.3	47.4	46.5	43.5	38.3	1	0
11:48:42	49.3	36.9	47.6	47.3	47.5	46.5	43.5	38.3	1	0
11:48:43	49.3	36.9	47.6	47.3	47.5	46.5	43.5	38.3	1	0
11:48:44	49.3	36.9	47.6	47.3	47.5	46.5	43.5	38.3	1	0
11:48:45	49.3	37.0	47.6	47.3	47.5	46.5	43.5	38.3	1	0
11:48:46	49.3	37.0	47.6	47.3	47.5	46.6	43.5	38.3	1	0
11:48:47	49.3	37.0	47.6	47.3	47.5	46.5	43.5	38.3	1	0
11:48:48	49.3	37.0	47.7	47.3	47.5	46.6	43.5	38.3	1	0
11:48:49	49.4	37.0	47.7	47.4	47.5	46.6	43.5	38.4	1	0
11:48:50	49.4	37.0	47.7	47.4	47.5	46.6	43.4	38.4	1	0
11:48:51	49.4	37.1	47.7	47.4	47.5	46.6	43.5	38.4	1	0
11:48:52	49.4	37.1	47.7	47.4	47.6	46.6	43.4	38.4	1	0
11:48:53	49.4	37.1	47.7	47.4	47.6	46.6	43.5	38.4	1	0
11:48:54	49.4	37.1	47.7	47.4	47.6	46.6	43.4	38.4	1	0
11:48:55	49.4	37.1	47.8	47.4	47.6	46.7	43.4	38.4	1	0
11:48:56	49.4	37.1	47.8	47.4	47.6	46.7	43.4	38.4	1	0
11:48:57	49.4	37.1	47.8	47.5	47.6	46.7	43.4	38.4	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:48:59	49.5	37.1	47.8	47.5	47.6	46.7	43.4	38.4	1	0
11:49:00	49.5	37.1	47.8	47.4	47.6	46.7	43.4	38.4	1	0
11:49:01	49.5	37.1	47.8	47.5	47.6	46.7	43.4	38.4	1	0
11:49:02	49.5	37.1	47.8	47.5	47.7	46.7	43.4	38.4	1	0
11:49:03	49.5	37.1	47.8	47.5	47.7	46.8	43.4	38.5	1	0
11:49:04	49.5	37.1	47.8	47.5	47.7	46.8	43.4	38.5	1	0
11:49:05	49.5	37.2	47.8	47.5	47.7	46.8	43.4	38.5	1	0
11:49:06	49.5	37.2	47.8	47.5	47.7	46.8	43.4	38.5	1	0
11:49:07	49.6	37.2	47.9	47.5	47.7	46.8	43.4	38.5	1	0
11:49:08	49.6	37.2	47.9	47.5	47.7	46.8	43.4	38.5	1	0
11:49:09	49.6	37.2	47.9	47.6	47.7	46.8	43.4	38.5	1	0
11:49:10	49.6	37.2	47.9	47.6	47.7	46.8	43.3	38.5	1	0
11:49:11	49.6	37.2	47.9	47.6	47.8	46.8	43.3	38.5	1	0
11:49:12	49.6	37.2	47.9	47.6	47.8	46.8	43.4	38.5	1	0
11:49:13	49.6	37.2	47.9	47.6	47.8	46.8	43.4	38.5	1	0
11:49:14	49.6	37.2	47.9	47.6	47.8	46.9	43.3	38.5	1	0
11:49:15	49.7	37.2	47.9	47.6	47.8	46.9	43.3	38.6	1	0
11:49:16	49.7	37.2	47.9	47.6	47.8	46.9	43.3	38.5	1	0
11:49:17	49.7	37.2	47.9	47.6	47.8	46.9	43.3	38.6	1	0
11:49:18	49.7	37.2	48.0	47.6	47.9	46.9	43.3	38.6	1	0
11:49:19	49.7	37.2	48.0	47.6	47.8	46.9	43.3	38.6	1	0
11:49:20	49.7	37.3	48.0	47.7	47.9	46.9	43.3	38.6	1	0
11:49:21	49.7	37.2	48.0	47.7	47.9	46.9	43.3	38.6	1	0
11:49:22	49.7	37.3	48.0	47.7	47.9	46.9	43.3	38.6	1	0
11:49:23	49.7	37.3	48.0	47.7	47.9	47.0	43.3	38.6	1	0
11:49:24	49.8	37.3	48.0	47.7	47.9	47.0	43.3	38.7	1	0
11:49:25	49.8	37.3	48.0	47.7	47.9	47.0	43.3	38.7	1	0
11:49:26	49.8	37.3	48.0	47.8	47.9	47.0	43.3	38.7	1	0
11:49:27	49.8	37.3	48.0	47.8	47.9	47.0	43.3	38.7	1	0
11:49:28	49.8	37.3	48.0	47.8	48.0	47.0	43.2	38.7	1	0
11:49:29	49.8	37.3	48.1	47.8	48.0	47.0	43.2	38.7	1	0
11:49:30	49.8	37.3	48.1	47.8	48.0	47.0	43.2	38.7	1	0
11:49:31	49.8	37.3	48.1	47.8	48.0	47.1	43.2	38.7	1	0
11:49:32	49.8	37.3	48.1	47.8	48.0	47.1	43.2	38.7	1	0
11:49:34	49.8	37.3	48.1	47.9	48.0	47.1	43.2	38.7	1	0
11:49:35	49.9	37.3	48.1	47.9	48.0	47.1	43.2	38.8	1	0
11:49:36	49.9	37.2	48.1	47.9	48.0	47.1	43.2	38.8	1	0
11:49:37	49.9	37.3	48.1	47.9	48.1	47.1	43.2	38.8	1	0
11:49:38	49.9	37.3	48.1	47.9	48.1	47.1	43.2	38.8	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:49:39	49.9	37.3	48.1	47.9	48.1	47.1	43.2	38.8	1	0
11:49:40	49.9	37.3	48.1	47.9	48.1	47.2	43.2	38.8	1	0
11:49:41	49.9	37.3	48.2	47.9	48.1	47.2	43.2	38.8	1	0
11:49:42	49.9	37.3	48.2	47.9	48.1	47.2	43.2	38.8	1	0
11:49:43	49.9	37.4	48.2	48.0	48.1	47.2	43.2	38.8	1	0
11:49:44	49.9	37.4	48.2	47.9	48.1	47.2	43.2	38.8	1	0
11:49:45	49.9	37.4	48.2	48.0	48.1	47.2	43.2	38.9	1	0
11:49:46	49.9	37.4	48.2	48.0	48.1	47.2	43.1	38.9	1	0
11:49:47	49.9	37.4	48.2	48.0	48.1	47.2	43.1	38.9	1	0
11:49:48	50.0	37.4	48.2	48.0	48.1	47.2	43.1	38.9	1	0
11:49:49	50.0	37.4	48.3	48.0	48.2	47.3	43.2	38.9	1	0
11:49:50	50.0	37.4	48.2	48.0	48.2	47.3	43.1	38.9	1	0
11:49:51	50.0	37.4	48.2	48.0	48.2	47.3	43.1	38.9	1	0
11:49:52	50.0	37.5	48.3	48.0	48.2	47.3	43.1	38.9	1	0
11:49:53	50.1	37.5	48.3	48.0	48.2	47.3	43.1	38.9	1	0
11:49:54	50.1	37.4	48.3	48.1	48.2	47.3	43.1	38.9	1	0
11:49:55	50.1	37.5	48.3	48.0	48.2	47.3	43.1	38.9	1	0
11:49:56	50.1	37.5	48.3	48.0	48.2	47.3	43.1	38.9	1	0
11:49:57	50.1	37.5	48.3	48.1	48.2	47.4	43.1	38.9	1	0
11:49:58	50.1	37.5	48.4	48.1	48.2	47.4	43.1	39.0	1	0
11:49:59	50.1	37.5	48.4	48.1	48.2	47.4	43.1	39.0	1	0
11:50:00	50.1	37.5	48.4	48.1	48.3	47.4	43.1	39.0	1	0
11:50:01	50.2	37.5	48.4	48.1	48.3	47.4	43.1	39.0	1	0
11:50:02	50.2	37.5	48.4	48.1	48.3	47.4	43.1	39.0	1	0
11:50:03	50.2	37.5	48.4	48.1	48.3	47.4	43.1	39.0	1	0
11:50:04	50.2	37.6	48.4	48.1	48.3	47.4	43.1	39.0	1	0
11:50:05	50.2	37.6	48.4	48.1	48.3	47.4	43.1	39.1	1	0
11:50:06	50.2	37.6	48.4	48.1	48.3	47.4	43.1	39.0	1	0
11:50:08	50.2	37.6	48.5	48.2	48.3	47.5	43.1	39.1	1	0
11:50:09	50.2	37.6	48.5	48.2	48.3	47.5	43.1	39.1	1	0
11:50:10	50.3	37.6	48.5	48.2	48.4	47.5	43.1	39.1	1	0
11:50:11	50.2	37.6	48.5	48.2	48.4	47.5	43.1	39.1	1	0
11:50:12	50.3	37.6	48.5	48.2	48.4	47.5	43.1	39.1	1	0
11:50:13	50.3	37.6	48.5	48.2	48.4	47.5	43.1	39.1	1	0
11:50:14	50.3	37.6	48.5	48.2	48.4	47.5	43.1	39.1	1	0
11:50:15	50.3	37.6	48.5	48.3	48.4	47.5	43.1	39.1	1	0
11:50:16	50.3	37.6	48.5	48.3	48.4	47.6	43.1	39.1	1	0
11:50:17	50.3	37.6	48.6	48.3	48.4	47.6	43.1	39.2	1	0
11:50:18	50.3	37.6	48.6	48.3	48.5	47.6	43.1	39.2	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:50:19	50.4	37.6	48.6	48.3	48.5	47.6	43.1	39.2	1	0
11:50:20	50.3	37.6	48.6	48.3	48.5	47.6	43.1	39.2	1	0
11:50:21	50.4	37.6	48.6	48.3	48.5	47.6	43.1	39.2	1	0
11:50:22	50.4	37.6	48.6	48.3	48.5	47.6	43.1	39.2	1	0
11:50:23	50.4	37.6	48.6	48.4	48.5	47.6	43.1	39.2	1	0
11:50:24	50.4	37.6	48.6	48.4	48.5	47.6	43.1	39.2	1	0
11:50:25	50.4	37.6	48.6	48.4	48.6	47.6	43.2	39.2	1	0
11:50:26	50.4	37.6	48.7	48.4	48.6	47.6	43.2	39.2	1	0
11:50:27	50.4	37.7	48.7	48.4	48.6	47.7	43.2	39.2	1	0
11:50:28	50.4	37.7	48.7	48.5	48.6	47.7	43.2	39.2	1	0
11:50:29	50.5	37.7	48.7	48.5	48.6	47.7	43.2	39.2	1	0
11:50:30	50.5	37.7	48.7	48.5	48.6	47.7	43.2	39.3	1	0
11:50:31	50.5	37.7	48.7	48.5	48.6	47.7	43.2	39.3	1	0
11:50:32	50.5	37.7	48.7	48.5	48.6	47.7	43.2	39.3	1	0
11:50:33	50.5	37.7	48.7	48.5	48.6	47.7	43.2	39.3	1	0
11:50:34	50.5	37.7	48.7	48.5	48.7	47.7	43.2	39.3	1	0
11:50:35	50.5	37.7	48.7	48.5	48.7	47.8	43.2	39.3	1	0
11:50:36	50.5	37.7	48.7	48.6	48.7	47.8	43.2	39.3	1	0
11:50:37	50.5	37.7	48.7	48.6	48.7	47.8	43.2	39.3	1	0
11:50:38	50.5	37.7	48.7	48.6	48.7	47.8	43.2	39.4	1	0
11:50:39	50.5	37.7	48.7	48.6	48.7	47.8	43.2	39.4	1	0
11:50:40	50.5	37.7	48.8	48.6	48.7	47.8	43.2	39.4	1	0
11:50:42	50.5	37.7	48.8	48.6	48.8	47.8	43.2	39.4	1	0
11:50:43	50.6	37.8	48.8	48.6	48.7	47.9	43.2	39.4	1	0
11:50:44	50.6	37.8	48.8	48.6	48.8	47.9	43.2	39.4	1	0
11:50:45	50.6	37.8	48.8	48.6	48.7	47.9	43.2	39.4	1	0
11:50:46	50.6	37.8	48.8	48.6	48.8	47.9	43.2	39.4	1	0
11:50:47	50.6	37.8	48.8	48.6	48.8	47.9	43.2	39.4	1	0
11:50:48	50.6	37.8	48.8	48.7	48.8	47.9	43.2	39.4	1	0
11:50:49	50.6	37.8	48.8	48.6	48.8	47.9	43.2	39.4	1	0
11:50:50	50.6	37.8	48.8	48.7	48.8	47.9	43.2	39.5	1	0
11:50:51	50.7	37.9	48.9	48.7	48.8	48.0	43.2	39.5	1	0
11:50:52	50.7	37.9	48.9	48.7	48.8	48.0	43.2	39.5	1	0
11:50:53	50.7	37.9	48.9	48.7	48.9	48.0	43.2	39.5	1	0
11:50:54	50.7	37.9	48.9	48.7	48.9	48.0	43.2	39.5	1	0
11:50:55	50.7	37.9	48.9	48.7	48.9	48.0	43.2	39.5	1	0
11:50:56	50.7	37.9	48.9	48.7	48.9	48.0	43.2	39.5	1	0
11:50:57	50.7	37.9	48.9	48.7	48.9	48.0	43.3	39.5	1	0
11:50:58	50.8	37.9	49.0	48.7	48.9	48.1	43.3	39.5	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:50:59	50.8	38.0	49.0	48.7	48.9	48.1	43.3	39.5	1	0
11:51:00	50.8	38.0	49.0	48.8	48.9	48.1	43.3	39.5	1	0
11:51:01	50.8	37.9	49.0	48.8	48.9	48.1	43.3	39.5	1	0
11:51:02	50.8	37.9	49.0	48.8	48.9	48.1	43.3	39.5	1	0
11:51:03	50.8	37.9	49.0	48.8	48.9	48.1	43.3	39.6	1	0
11:51:04	50.9	37.9	49.1	48.8	49.0	48.1	43.3	39.5	1	0
11:51:05	50.9	38.0	49.1	48.8	49.0	48.1	43.3	39.6	1	0
11:51:06	50.9	38.0	49.1	48.8	49.0	48.1	43.3	39.5	1	0
11:51:07	50.9	38.0	49.1	48.8	49.0	48.2	43.3	39.6	1	0
11:51:08	50.9	38.0	49.1	48.9	49.0	48.2	43.3	39.6	1	0
11:51:09	50.9	38.0	49.1	48.9	49.0	48.2	43.2	39.6	1	0
11:51:10	50.9	38.0	49.1	48.9	49.0	48.2	43.2	39.6	1	0
11:51:11	50.9	38.0	49.2	48.9	49.1	48.2	43.2	39.6	1	0
11:51:12	50.9	38.0	49.1	48.9	49.0	48.2	43.2	39.6	1	0
11:51:13	50.9	38.0	49.2	48.9	49.1	48.2	43.2	39.6	1	0
11:51:14	50.9	38.0	49.2	48.9	49.1	48.2	43.2	39.6	1	0
11:51:16	51.0	38.0	49.2	49.0	49.1	48.2	43.2	39.6	1	0
11:51:17	50.9	38.0	49.2	48.9	49.1	48.2	43.2	39.6	1	0
11:51:18	51.0	38.0	49.2	49.0	49.1	48.2	43.2	39.6	1	0
11:51:19	51.0	38.0	49.2	49.0	49.1	48.3	43.3	39.7	1	0
11:51:20	51.0	38.0	49.2	49.0	49.2	48.3	43.3	39.7	1	0
11:51:21	51.0	38.0	49.3	49.0	49.2	48.3	43.3	39.7	1	0
11:51:22	51.0	38.0	49.3	49.0	49.2	48.3	43.2	39.7	1	0
11:51:23	51.0	38.0	49.3	49.0	49.2	48.3	43.2	39.7	1	0
11:51:24	51.0	38.1	49.3	49.0	49.2	48.3	43.2	39.7	1	0
11:51:25	51.0	38.1	49.3	49.0	49.2	48.3	43.3	39.7	1	0
11:51:26	51.0	38.1	49.3	49.0	49.3	48.3	43.2	39.7	1	0
11:51:27	51.0	38.0	49.3	49.1	49.2	48.3	43.2	39.7	1	0
11:51:28	51.1	38.1	49.3	49.1	49.3	48.3	43.2	39.7	1	0
11:51:29	51.1	38.1	49.3	49.1	49.3	48.4	43.2	39.7	1	0
11:51:30	51.1	38.1	49.3	49.1	49.3	48.4	43.2	39.7	1	0
11:51:31	51.1	38.1	49.3	49.1	49.3	48.4	43.2	39.8	1	0
11:51:32	51.1	38.1	49.3	49.1	49.3	48.4	43.2	39.7	1	0
11:51:33	51.1	38.1	49.4	49.1	49.3	48.4	43.2	39.8	1	0
11:51:34	51.1	38.1	49.4	49.2	49.4	48.4	43.2	39.8	1	0
11:51:35	51.1	38.1	49.4	49.2	49.4	48.4	43.2	39.8	1	0
11:51:36	51.2	38.1	49.4	49.2	49.4	48.5	43.2	39.8	1	0
11:51:37	51.2	38.1	49.4	49.2	49.4	48.5	43.2	39.8	1	0
11:51:38	51.2	38.1	49.4	49.2	49.4	48.5	43.2	39.8	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:51:39	51.2	38.1	49.4	49.2	49.4	48.5	43.2	39.8	1	0
11:51:40	51.2	38.1	49.4	49.2	49.4	48.5	43.2	39.8	1	0
11:51:41	51.2	38.1	49.4	49.2	49.4	48.5	43.2	39.9	1	0
11:51:42	51.2	38.1	49.5	49.3	49.4	48.5	43.2	39.8	1	0
11:51:43	51.2	38.1	49.5	49.3	49.4	48.5	43.2	39.9	1	0
11:51:44	51.3	38.1	49.5	49.3	49.5	48.5	43.3	39.9	1	0
11:51:45	51.3	38.2	49.5	49.3	49.5	48.5	43.2	39.9	1	0
11:51:46	51.3	38.1	49.5	49.3	49.5	48.5	43.2	39.9	1	0
11:51:47	51.3	38.2	49.5	49.3	49.5	48.6	43.2	39.9	1	0
11:51:48	51.3	38.2	49.5	49.3	49.5	48.6	43.3	39.9	1	0
11:51:49	51.3	38.2	49.6	49.3	49.5	48.6	43.3	39.9	1	0
11:51:51	51.4	38.2	49.6	49.4	49.5	48.6	43.2	39.9	1	0
11:51:52	51.4	38.2	49.6	49.4	49.5	48.6	43.3	39.9	1	0
11:51:53	51.4	38.2	49.6	49.4	49.5	48.6	43.3	40.0	1	0
11:51:54	51.4	38.2	49.6	49.4	49.5	48.6	43.3	40.0	1	0
11:51:55	51.4	38.2	49.6	49.4	49.5	48.6	43.3	40.0	1	0
11:51:56	51.4	38.3	49.6	49.4	49.6	48.7	43.3	40.0	1	0
11:51:57	51.4	38.3	49.6	49.4	49.6	48.7	43.3	40.0	1	0
11:51:58	51.4	38.3	49.7	49.5	49.6	48.7	43.3	40.0	1	0
11:51:59	51.4	38.3	49.7	49.4	49.6	48.7	43.3	40.0	1	0
11:52:00	51.5	38.3	49.7	49.5	49.6	48.7	43.3	40.0	1	0
11:52:01	51.5	38.3	49.7	49.5	49.6	48.7	43.3	40.0	1	0
11:52:02	51.5	38.3	49.7	49.5	49.6	48.7	43.3	40.1	1	0
11:52:03	51.5	38.3	49.7	49.5	49.6	48.7	43.3	40.1	1	0
11:52:04	51.5	38.3	49.7	49.5	49.6	48.8	43.3	40.1	1	0
11:52:05	51.5	38.3	49.7	49.5	49.7	48.8	43.3	40.1	1	0
11:52:06	51.5	38.3	49.8	49.5	49.7	48.8	43.3	40.1	1	0
11:52:07	51.5	38.3	49.8	49.6	49.7	48.8	43.3	40.1	1	0
11:52:08	51.5	38.3	49.8	49.6	49.7	48.8	43.3	40.1	1	0
11:52:09	51.6	38.3	49.8	49.6	49.7	48.8	43.3	40.1	1	0
11:52:10	51.6	38.3	49.8	49.6	49.7	48.8	43.3	40.1	1	0
11:52:11	51.6	38.3	49.8	49.6	49.7	48.8	43.3	40.1	1	0
11:52:12	51.6	38.3	49.8	49.6	49.7	48.8	43.3	40.1	1	0
11:52:13	51.6	38.3	49.8	49.6	49.7	48.8	43.3	40.1	1	0
11:52:14	51.6	38.3	49.8	49.6	49.8	48.8	43.4	40.2	1	0
11:52:15	51.6	38.3	49.8	49.6	49.7	48.8	43.4	40.2	1	0
11:52:16	51.6	38.3	49.8	49.6	49.8	48.9	43.4	40.2	1	0
11:52:17	51.6	38.3	49.9	49.6	49.8	48.9	43.4	40.2	1	0
11:52:18	51.6	38.4	49.9	49.7	49.8	48.9	43.4	40.2	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:52:19	51.7	38.4	49.9	49.6	49.8	48.9	43.4	40.2	1	0
11:52:20	51.7	38.4	49.9	49.7	49.8	48.9	43.4	40.2	1	0
11:52:21	51.7	38.4	49.9	49.7	49.8	48.9	43.4	40.2	1	0
11:52:22	51.7	38.4	49.9	49.7	49.8	48.9	43.4	40.2	1	0
11:52:23	51.7	38.5	49.9	49.7	49.8	48.9	43.4	40.2	1	0
11:52:25	51.7	38.5	49.9	49.7	49.9	48.9	43.4	40.2	1	0
11:52:26	51.7	38.5	49.9	49.7	49.8	48.9	43.4	40.2	1	0
11:52:27	51.7	38.5	49.9	49.7	49.8	48.9	43.4	40.2	1	0
11:52:28	51.7	38.5	49.9	49.7	49.9	48.9	43.5	40.2	1	0
11:52:29	51.7	38.5	49.9	49.7	49.9	48.9	43.5	40.2	1	0
11:52:30	51.7	38.5	50.0	49.8	49.9	49.0	43.5	40.3	1	0
11:52:31	51.7	38.5	49.9	49.8	49.9	49.0	43.5	40.3	1	0
11:52:32	51.7	38.5	50.0	49.8	49.9	49.0	43.5	40.3	1	0
11:52:33	51.7	38.5	50.0	49.8	49.9	49.0	43.5	40.3	1	0
11:52:34	51.8	38.5	50.0	49.8	49.9	49.0	43.5	40.3	1	0
11:52:35	51.8	38.5	50.0	49.8	49.9	49.0	43.5	40.3	1	0
11:52:36	51.8	38.5	50.0	49.8	49.9	49.0	43.5	40.3	1	0
11:52:37	51.8	38.5	50.0	49.8	50.0	49.0	43.5	40.3	1	0
11:52:38	51.8	38.5	50.0	49.8	50.0	49.1	43.5	40.3	1	0
11:52:39	51.8	38.6	50.0	49.9	50.0	49.1	43.5	40.3	1	0
11:52:40	51.9	38.5	50.0	49.9	50.0	49.1	43.6	40.4	1	0
11:52:41	51.9	38.5	50.0	49.9	50.0	49.1	43.6	40.4	1	0
11:52:42	51.9	38.6	50.0	49.9	50.0	49.1	43.6	40.4	1	0
11:52:43	51.9	38.6	50.1	49.9	50.0	49.1	43.5	40.4	1	0
11:52:44	51.9	38.5	50.0	49.9	50.0	49.1	43.5	40.4	1	0
11:52:45	51.9	38.6	50.1	49.9	50.1	49.1	43.5	40.4	1	0
11:52:46	51.9	38.6	50.1	49.9	50.0	49.1	43.6	40.4	1	0
11:52:47	51.9	38.6	50.1	49.9	50.1	49.2	43.5	40.4	1	0
11:52:48	51.9	38.6	50.1	50.0	50.1	49.2	43.5	40.4	1	0
11:52:49	51.9	38.6	50.1	50.0	50.1	49.2	43.6	40.4	1	0
11:52:50	52.0	38.6	50.1	50.0	50.1	49.2	43.6	40.5	1	0
11:52:51	52.0	38.6	50.1	50.0	50.1	49.2	43.6	40.5	1	0
11:52:52	52.0	38.7	50.2	50.0	50.1	49.2	43.6	40.5	1	0
11:52:53	52.0	38.7	50.2	50.0	50.1	49.2	43.6	40.5	1	0
11:52:54	52.0	38.7	50.2	50.0	50.1	49.2	43.6	40.5	1	0
11:52:55	52.0	38.7	50.2	50.0	50.1	49.2	43.6	40.5	1	0
11:52:56	52.0	38.7	50.2	50.1	50.1	49.2	43.6	40.5	1	0
11:52:57	52.0	38.7	50.2	50.0	50.2	49.2	43.6	40.5	1	0
11:52:59	52.0	38.7	50.2	50.0	50.1	49.3	43.6	40.5	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:53:00	52.1	38.7	50.2	50.1	50.1	49.3	43.6	40.5	1	0
11:53:01	52.1	38.7	50.2	50.1	50.2	49.3	43.6	40.5	1	0
11:53:02	52.1	38.7	50.2	50.1	50.2	49.3	43.6	40.5	1	0
11:53:03	52.1	38.8	50.2	50.1	50.2	49.3	43.6	40.5	1	0
11:53:04	52.1	38.8	50.2	50.1	50.2	49.3	43.6	40.6	1	0
11:53:05	52.1	38.8	50.3	50.1	50.2	49.3	43.6	40.6	1	0
11:53:06	52.1	38.8	50.3	50.1	50.2	49.3	43.6	40.6	1	0
11:53:07	52.2	38.8	50.3	50.1	50.2	49.3	43.6	40.6	1	0
11:53:08	52.2	38.8	50.3	50.1	50.2	49.3	43.6	40.6	1	0
11:53:09	52.2	38.8	50.3	50.1	50.3	49.4	43.6	40.6	1	0
11:53:10	52.2	38.8	50.3	50.1	50.3	49.4	43.7	40.6	1	0
11:53:11	52.2	38.8	50.3	50.2	50.3	49.4	43.6	40.6	1	0
11:53:12	52.2	38.8	50.3	50.2	50.3	49.4	43.7	40.6	1	0
11:53:13	52.2	38.9	50.3	50.2	50.3	49.4	43.7	40.6	1	0
11:53:14	52.2	38.9	50.3	50.2	50.3	49.4	43.7	40.6	1	0
11:53:15	52.2	38.9	50.3	50.2	50.3	49.4	43.7	40.6	1	0
11:53:16	52.2	38.9	50.4	50.2	50.3	49.4	43.7	40.6	1	0
11:53:17	52.3	38.9	50.4	50.2	50.3	49.5	43.7	40.7	1	0
11:53:18	52.3	38.9	50.4	50.2	50.4	49.5	43.7	40.7	1	0
11:53:19	52.3	38.9	50.4	50.2	50.4	49.5	43.7	40.7	1	0
11:53:20	52.3	38.9	50.4	50.2	50.4	49.5	43.7	40.7	1	0
11:53:21	52.3	38.9	50.4	50.3	50.4	49.5	43.7	40.7	1	0
11:53:22	52.3	39.0	50.4	50.3	50.4	49.5	43.7	40.7	1	0
11:53:23	52.3	39.0	50.4	50.3	50.4	49.5	43.7	40.7	1	0
11:53:24	52.3	39.0	50.5	50.3	50.4	49.5	43.7	40.7	1	0
11:53:25	52.3	39.0	50.5	50.3	50.4	49.6	43.7	40.7	1	0
11:53:26	52.4	39.0	50.5	50.3	50.4	49.6	43.7	40.7	1	0
11:53:27	52.4	39.0	50.5	50.3	50.5	49.6	43.7	40.7	1	0
11:53:28	52.4	39.0	50.5	50.3	50.5	49.6	43.7	40.7	1	0
11:53:29	52.4	39.0	50.5	50.3	50.5	49.6	43.7	40.8	1	0
11:53:30	52.4	39.0	50.5	50.4	50.5	49.6	43.7	40.8	1	0
11:53:31	52.4	39.0	50.5	50.4	50.5	49.6	43.7	40.8	1	0
11:53:32	52.4	39.0	50.5	50.4	50.5	49.6	43.7	40.8	1	0
11:53:34	52.4	39.0	50.6	50.4	50.5	49.7	43.7	40.8	1	0
11:53:35	52.4	39.0	50.6	50.4	50.5	49.7	43.7	40.8	1	0
11:53:36	52.5	39.0	50.6	50.4	50.6	49.7	43.7	40.8	1	0
11:53:37	52.5	39.0	50.6	50.4	50.6	49.7	43.8	40.8	1	0
11:53:38	52.5	39.0	50.6	50.4	50.6	49.7	43.7	40.8	1	0
11:53:39	52.5	39.0	50.6	50.5	50.6	49.7	43.8	40.8	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:53:40	52.5	39.0	50.7	50.5	50.6	49.7	43.8	40.8	1	0
11:53:41	52.5	39.0	50.7	50.5	50.6	49.7	43.8	40.8	1	0
11:53:42	52.5	39.0	50.7	50.5	50.6	49.8	43.8	40.9	1	0
11:53:43	52.5	39.0	50.7	50.5	50.6	49.8	43.8	40.8	1	0
11:53:44	52.5	39.0	50.7	50.5	50.6	49.8	43.8	40.9	1	0
11:53:45	52.6	39.0	50.7	50.6	50.7	49.8	43.8	40.9	1	0
11:53:46	52.6	39.0	50.7	50.6	50.7	49.8	43.9	40.9	1	0
11:53:47	52.6	39.1	50.7	50.6	50.7	49.8	43.9	40.9	1	0
11:53:48	52.6	39.1	50.8	50.6	50.7	49.8	43.9	40.9	1	0
11:53:49	52.6	39.1	50.8	50.6	50.7	49.8	43.9	40.9	1	0
11:53:50	52.6	39.1	50.8	50.6	50.7	49.8	43.9	40.9	1	0
11:53:51	52.6	39.1	50.8	50.6	50.7	49.8	43.9	40.9	1	0
11:53:52	52.6	39.1	50.8	50.6	50.8	49.8	43.9	40.9	1	0
11:53:53	52.6	39.2	50.8	50.6	50.8	49.8	43.9	40.9	1	0
11:53:54	52.6	39.2	50.8	50.7	50.8	49.9	43.9	40.9	1	0
11:53:55	52.7	39.2	50.8	50.7	50.8	49.9	43.9	41.0	1	0
11:53:56	52.7	39.2	50.8	50.7	50.8	49.9	44.0	41.0	1	0
11:53:57	52.7	39.2	50.8	50.7	50.8	49.9	44.0	41.0	1	0
11:53:58	52.7	39.2	50.8	50.7	50.8	49.9	44.0	41.0	1	0
11:53:59	52.7	39.2	50.8	50.7	50.8	49.9	44.0	41.0	1	0
11:54:00	52.7	39.2	50.9	50.7	50.9	49.9	44.0	41.0	1	0
11:54:01	52.7	39.2	50.9	50.7	50.9	49.9	44.0	41.0	1	0
11:54:02	52.7	39.2	50.9	50.7	50.9	50.0	44.0	41.0	1	0
11:54:03	52.8	39.2	50.9	50.7	50.9	50.0	44.0	41.0	1	0
11:54:04	52.8	39.2	50.9	50.7	50.9	50.0	44.1	41.0	1	0
11:54:05	52.8	39.2	50.9	50.7	50.9	50.0	44.1	41.0	1	0
11:54:06	52.8	39.2	50.9	50.8	50.9	50.0	44.1	41.0	1	0
11:54:08	52.8	39.2	50.9	50.8	50.9	50.0	44.1	41.1	1	0
11:54:09	52.8	39.2	50.9	50.8	50.9	50.0	44.1	41.1	1	0
11:54:10	52.8	39.2	50.9	50.8	51.0	50.1	44.1	41.1	1	0
11:54:11	52.8	39.2	50.9	50.8	51.0	50.1	44.1	41.1	1	0
11:54:12	52.8	39.2	50.9	50.8	51.0	50.1	44.1	41.1	1	0
11:54:13	52.9	39.2	51.0	50.8	51.0	50.1	44.1	41.1	1	0
11:54:14	52.9	39.2	51.0	50.8	51.0	50.1	44.1	41.1	1	0
11:54:15	52.9	39.2	51.0	50.9	51.0	50.1	44.1	41.1	1	0
11:54:16	52.9	39.2	51.0	50.8	51.0	50.1	44.2	41.1	1	0
11:54:17	52.9	39.2	51.0	50.9	51.0	50.1	44.2	41.1	1	0
11:54:18	52.9	39.2	51.0	50.9	51.1	50.2	44.2	41.1	1	0
11:54:19	52.9	39.2	51.0	50.9	51.1	50.2	44.2	41.1	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:54:20	52.9	39.2	51.0	50.9	51.1	50.2	44.2	41.1	1	0
11:54:21	52.9	39.2	51.0	50.9	51.1	50.2	44.2	41.1	1	0
11:54:22	53.0	39.2	51.1	50.9	51.1	50.2	44.2	41.2	1	0
11:54:23	53.0	39.2	51.1	50.9	51.1	50.2	44.2	41.2	1	0
11:54:24	53.0	39.2	51.1	50.9	51.1	50.2	44.2	41.2	1	0
11:54:25	53.0	39.2	51.1	50.9	51.1	50.3	44.2	41.2	1	0
11:54:26	53.0	39.2	51.1	50.9	51.1	50.2	44.2	41.2	1	0
11:54:27	53.0	39.2	51.1	51.0	51.1	50.3	44.2	41.2	1	0
11:54:28	53.0	39.2	51.1	51.0	51.1	50.3	44.2	41.2	1	0
11:54:29	53.0	39.2	51.2	51.0	51.2	50.3	44.3	41.2	1	0
11:54:30	53.1	39.3	51.2	51.0	51.2	50.3	44.2	41.2	1	0
11:54:31	53.1	39.2	51.2	51.0	51.2	50.3	44.3	41.2	1	0
11:54:32	53.1	39.2	51.2	51.0	51.2	50.3	44.3	41.2	1	0
11:54:33	53.1	39.3	51.2	51.0	51.2	50.3	44.3	41.2	1	0
11:54:34	53.1	39.2	51.2	51.0	51.2	50.3	44.3	41.2	1	0
11:54:35	53.1	39.2	51.3	51.1	51.2	50.3	44.3	41.2	1	0
11:54:36	53.1	39.2	51.3	51.1	51.2	50.3	44.3	41.3	1	0
11:54:37	53.2	39.2	51.3	51.1	51.2	50.4	44.3	41.3	1	0
11:54:38	53.2	39.2	51.3	51.1	51.3	50.4	44.3	41.3	1	0
11:54:39	53.2	39.2	51.3	51.1	51.3	50.4	44.3	41.3	1	0
11:54:40	53.2	39.2	51.3	51.1	51.3	50.4	44.3	41.3	1	0
11:54:41	53.2	39.2	51.3	51.1	51.3	50.4	44.3	41.3	1	0
11:54:43	53.2	39.2	51.3	51.2	51.3	50.4	44.3	41.3	1	0
11:54:44	53.2	39.2	51.4	51.2	51.3	50.4	44.3	41.3	1	0
11:54:45	53.2	39.2	51.4	51.2	51.3	50.4	44.3	41.3	1	0
11:54:46	53.3	39.2	51.4	51.2	51.4	50.4	44.3	41.4	1	0
11:54:47	53.3	39.2	51.4	51.2	51.4	50.4	44.3	41.4	1	0
11:54:48	53.3	39.2	51.4	51.2	51.4	50.4	44.3	41.4	1	0
11:54:49	53.3	39.2	51.4	51.2	51.4	50.5	44.3	41.4	1	0
11:54:50	53.3	39.2	51.4	51.3	51.4	50.5	44.3	41.4	1	0
11:54:51	53.3	39.2	51.4	51.3	51.4	50.5	44.3	41.4	1	0
11:54:52	53.3	39.2	51.4	51.3	51.4	50.5	44.4	41.4	1	0
11:54:53	53.3	39.3	51.5	51.3	51.5	50.5	44.3	41.5	1	0
11:54:54	53.3	39.2	51.5	51.3	51.5	50.5	44.4	41.5	1	0
11:54:55	53.3	39.2	51.5	51.3	51.5	50.5	44.4	41.5	1	0
11:54:56	53.3	39.2	51.5	51.3	51.5	50.5	44.4	41.5	1	0
11:54:57	53.4	39.3	51.5	51.3	51.5	50.5	44.3	41.5	1	0
11:54:58	53.4	39.3	51.5	51.3	51.5	50.5	44.3	41.5	1	0
11:54:59	53.4	39.2	51.5	51.4	51.5	50.5	44.3	41.5	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:55:00	53.4	39.2	51.5	51.4	51.5	50.6	44.3	41.5	1	0
11:55:01	53.4	39.2	51.5	51.4	51.5	50.6	44.3	41.5	1	0
11:55:02	53.4	39.2	51.5	51.4	51.5	50.6	44.3	41.5	1	0
11:55:03	53.4	39.2	51.5	51.4	51.5	50.6	44.3	41.6	1	0
11:55:04	53.4	39.2	51.5	51.4	51.5	50.6	44.3	41.6	1	0
11:55:05	53.4	39.2	51.6	51.4	51.6	50.6	44.3	41.6	1	0
11:55:06	53.5	39.2	51.6	51.4	51.6	50.6	44.4	41.6	1	0
11:55:07	53.5	39.2	51.6	51.4	51.6	50.6	44.4	41.6	1	0
11:55:08	53.5	39.2	51.6	51.4	51.6	50.6	44.4	41.6	1	0
11:55:09	53.5	39.2	51.6	51.4	51.6	50.6	44.4	41.6	1	0
11:55:10	53.5	39.2	51.6	51.4	51.6	50.7	44.4	41.6	1	0
11:55:11	53.5	39.2	51.6	51.5	51.6	50.7	44.4	41.6	1	0
11:55:12	53.6	39.3	51.6	51.5	51.6	50.7	44.4	41.6	1	0
11:55:13	53.5	39.3	51.6	51.5	51.6	50.7	44.4	41.6	1	0
11:55:14	53.6	39.3	51.6	51.5	51.6	50.7	44.5	41.6	1	0
11:55:15	53.6	39.3	51.6	51.5	51.6	50.7	44.5	41.7	1	0
11:55:17	53.6	39.4	51.7	51.5	51.6	50.7	44.5	41.7	1	0
11:55:18	53.6	39.4	51.7	51.5	51.7	50.7	44.5	41.7	1	0
11:55:19	53.6	39.4	51.7	51.5	51.7	50.7	44.5	41.7	1	0
11:55:20	53.6	39.4	51.7	51.5	51.7	50.7	44.6	41.7	1	0
11:55:21	53.6	39.4	51.7	51.5	51.7	50.8	44.6	41.7	1	0
11:55:22	53.6	39.4	51.7	51.5	51.7	50.8	44.6	41.7	1	0
11:55:23	53.7	39.5	51.7	51.6	51.7	50.8	44.6	41.7	1	0
11:55:24	53.7	39.5	51.7	51.6	51.7	50.8	44.6	41.7	1	0
11:55:25	53.7	39.5	51.8	51.6	51.7	50.8	44.6	41.7	1	0
11:55:26	53.7	39.5	51.8	51.6	51.7	50.8	44.6	41.7	1	0
11:55:27	53.7	39.5	51.8	51.6	51.7	50.8	44.6	41.7	1	0
11:55:28	53.8	39.5	51.8	51.6	51.7	50.8	44.6	41.7	1	0
11:55:29	53.8	39.5	51.8	51.6	51.8	50.8	44.6	41.7	1	0
11:55:30	53.8	39.5	51.8	51.6	51.8	50.9	44.7	41.7	1	0
11:55:31	53.8	39.5	51.8	51.7	51.8	50.8	44.7	41.8	1	0
11:55:32	53.8	39.5	51.9	51.7	51.8	50.9	44.7	41.8	1	0
11:55:33	53.8	39.5	51.9	51.7	51.8	50.9	44.7	41.8	1	0
11:55:34	53.8	39.5	51.9	51.7	51.8	50.9	44.7	41.8	1	0
11:55:35	53.8	39.6	51.9	51.7	51.8	50.9	44.7	41.8	1	0
11:55:36	53.8	39.6	51.9	51.7	51.9	50.9	44.7	41.8	1	0
11:55:37	53.9	39.6	51.9	51.7	51.9	50.9	44.7	41.8	1	0
11:55:38	53.9	39.6	51.9	51.7	51.9	50.9	44.8	41.8	1	0
11:55:39	53.8	39.6	51.9	51.8	51.9	50.9	44.8	41.8	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:55:40	53.9	39.7	51.9	51.8	51.9	50.9	44.8	41.8	1	0
11:55:41	53.9	39.7	51.9	51.8	51.9	50.9	44.8	41.8	1	0
11:55:42	53.9	39.7	51.9	51.8	51.9	51.0	44.8	41.9	1	0
11:55:43	53.9	39.7	51.9	51.8	51.9	51.0	44.8	41.9	1	0
11:55:44	53.9	39.7	51.9	51.8	52.0	51.0	44.8	41.9	1	0
11:55:45	53.9	39.7	51.9	51.8	52.0	51.0	44.8	41.9	1	0
11:55:46	53.9	39.7	52.0	51.8	52.0	51.0	44.8	41.9	1	0
11:55:47	53.9	39.7	51.9	51.9	52.0	51.0	44.9	41.9	1	0
11:55:48	53.9	39.7	52.0	51.8	52.0	51.0	44.9	41.9	1	0
11:55:49	53.9	39.7	52.0	51.9	52.0	51.0	44.9	41.9	1	0
11:55:50	53.9	39.8	52.0	51.9	52.0	51.1	44.9	41.9	1	0
11:55:52	53.9	39.8	52.0	51.9	52.1	51.1	44.9	41.9	1	0
11:55:53	54.0	39.7	52.0	51.9	52.1	51.1	44.9	41.9	1	0
11:55:54	54.0	39.7	52.0	51.9	52.1	51.1	44.9	41.9	1	0
11:55:55	54.0	39.7	52.0	51.9	52.1	51.1	44.9	42.0	1	0
11:55:56	54.0	39.7	52.0	51.9	52.1	51.1	44.9	41.9	1	0
11:55:57	54.0	39.7	52.0	51.9	52.1	51.1	44.9	42.0	1	0
11:55:58	54.0	39.7	52.0	52.0	52.1	51.1	44.9	42.0	1	0
11:55:59	54.0	39.7	52.1	52.0	52.1	51.1	45.0	42.0	1	0
11:56:00	54.0	39.7	52.1	52.0	52.1	51.2	45.0	42.0	1	0
11:56:01	54.1	39.8	52.1	52.0	52.2	51.2	45.0	42.0	1	0
11:56:02	54.1	39.8	52.1	52.0	52.1	51.2	45.0	42.0	1	0
11:56:03	54.1	39.8	52.1	52.0	52.1	51.2	45.0	42.0	1	0
11:56:04	54.1	39.8	52.1	52.0	52.1	51.2	45.0	42.1	1	0
11:56:05	54.1	39.8	52.1	52.1	52.2	51.2	45.0	42.1	1	0
11:56:06	54.1	39.8	52.1	52.0	52.2	51.2	45.0	42.1	1	0
11:56:07	54.1	39.8	52.2	52.1	52.2	51.2	45.0	42.1	1	0
11:56:08	54.1	39.8	52.2	52.1	52.2	51.2	45.0	42.1	1	0
11:56:09	54.2	39.8	52.2	52.1	52.2	51.3	45.0	42.1	1	0
11:56:10	54.2	39.8	52.2	52.1	52.2	51.3	45.1	42.1	1	0
11:56:11	54.2	39.8	52.2	52.1	52.2	51.3	45.1	42.1	1	0
11:56:12	54.2	39.8	52.2	52.1	52.2	51.3	45.0	42.1	1	0
11:56:13	54.2	39.8	52.2	52.1	52.2	51.3	45.0	42.1	1	0
11:56:14	54.2	39.8	52.3	52.1	52.3	51.3	44.9	42.1	1	0
11:56:15	54.2	39.8	52.3	52.1	52.3	51.3	44.9	42.2	1	0
11:56:16	54.3	39.8	52.2	52.2	52.3	51.3	44.8	42.2	1	0
11:56:17	54.3	39.8	52.3	52.2	52.3	51.3	44.8	42.2	1	0
11:56:18	54.3	39.8	52.3	52.2	52.3	51.4	44.8	42.2	1	0
11:56:19	54.3	39.8	52.3	52.2	52.3	51.4	44.7	42.2	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:56:20	54.3	39.8	52.3	52.2	52.3	51.4	44.7	42.2	1	0
11:56:21	54.3	39.8	52.3	52.2	52.4	51.4	44.7	42.2	1	0
11:56:22	54.3	39.8	52.3	52.2	52.3	51.4	44.7	42.2	1	0
11:56:23	54.3	39.8	52.4	52.2	52.4	51.4	44.7	42.2	1	0
11:56:24	54.4	39.9	52.4	52.3	52.4	51.4	44.6	42.2	1	0
11:56:25	54.4	39.9	52.4	52.3	52.4	51.5	44.6	42.2	1	0
11:56:27	54.4	39.9	52.4	52.3	52.4	51.5	44.6	42.2	1	0
11:56:28	54.4	39.9	52.4	52.3	52.4	51.5	44.6	42.2	1	0
11:56:29	54.4	39.9	52.4	52.3	52.4	51.5	44.5	42.2	1	0
11:56:30	54.4	39.9	52.4	52.3	52.4	51.5	44.6	42.3	1	0
11:56:31	54.4	39.9	52.5	52.3	52.4	51.5	44.5	42.3	1	0
11:56:32	54.4	39.9	52.4	52.3	52.4	51.5	44.5	42.3	1	0
11:56:33	54.4	39.9	52.5	52.3	52.5	51.5	44.5	42.3	1	0
11:56:34	54.4	39.9	52.4	52.4	52.5	51.5	44.6	42.3	1	0
11:56:35	54.5	40.0	52.5	52.4	52.5	51.5	44.6	42.3	1	0
11:56:36	54.4	40.0	52.5	52.4	52.5	51.5	44.6	42.3	1	0
11:56:37	54.5	40.0	52.5	52.4	52.5	51.5	44.6	42.3	1	0
11:56:38	54.5	40.0	52.5	52.4	52.5	51.6	44.6	42.3	1	0
11:56:39	54.5	40.0	52.5	52.4	52.5	51.6	44.6	42.3	1	0
11:56:40	54.5	40.0	52.5	52.4	52.5	51.6	44.6	42.3	1	0
11:56:41	54.5	40.0	52.5	52.4	52.5	51.6	44.6	42.4	1	0
11:56:42	54.5	40.0	52.5	52.4	52.5	51.6	44.6	42.4	1	0
11:56:43	54.5	40.0	52.6	52.4	52.6	51.6	44.6	42.4	1	0
11:56:44	54.5	40.0	52.6	52.4	52.5	51.6	44.6	42.4	1	0
11:56:45	54.5	40.0	52.6	52.5	52.6	51.6	44.6	42.4	1	0
11:56:46	54.5	40.0	52.6	52.5	52.6	51.6	44.6	42.4	1	0
11:56:47	54.6	40.0	52.6	52.5	52.6	51.6	44.6	42.4	1	0
11:56:48	54.6	40.0	52.6	52.5	52.6	51.7	44.6	42.4	1	0
11:56:49	54.6	40.0	52.6	52.5	52.6	51.7	44.6	42.4	1	0
11:56:50	54.6	40.0	52.6	52.5	52.6	51.7	44.6	42.4	1	0
11:56:51	54.6	40.0	52.6	52.5	52.6	51.7	44.6	42.5	1	0
11:56:52	54.6	40.0	52.7	52.5	52.6	51.7	44.6	42.5	1	0
11:56:53	54.6	40.0	52.7	52.6	52.7	51.7	44.6	42.5	1	0
11:56:54	54.6	40.0	52.7	52.5	52.6	51.7	44.6	42.5	1	0
11:56:55	54.6	40.0	52.7	52.6	52.7	51.7	44.6	42.5	1	0
11:56:56	54.7	40.0	52.7	52.6	52.7	51.7	44.6	42.5	1	0
11:56:57	54.7	40.0	52.7	52.6	52.7	51.8	44.6	42.5	1	0
11:56:58	54.7	40.0	52.7	52.6	52.7	51.7	44.6	42.5	1	0
11:56:59	54.7	40.0	52.7	52.6	52.7	51.8	44.6	42.6	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:57:00	54.7	40.0	52.7	52.6	52.7	51.8	44.7	42.6	1	0
11:57:02	54.7	40.0	52.7	52.7	52.7	51.8	44.7	42.6	1	0
11:57:03	54.7	40.0	52.8	52.7	52.7	51.8	44.7	42.6	1	0
11:57:04	54.7	40.0	52.8	52.7	52.7	51.8	44.7	42.6	1	0
11:57:05	54.7	40.0	52.8	52.7	52.8	51.8	44.7	42.6	1	0
11:57:06	54.8	40.0	52.8	52.7	52.8	51.8	44.7	42.6	1	0
11:57:07	54.8	40.0	52.8	52.7	52.8	51.8	44.7	42.6	1	0
11:57:08	54.8	40.0	52.8	52.7	52.8	51.8	44.7	42.6	1	0
11:57:09	54.8	40.0	52.8	52.7	52.8	51.9	44.7	42.6	1	0
11:57:10	54.8	40.0	52.8	52.8	52.8	51.9	44.8	42.6	1	0
11:57:11	54.8	40.0	52.9	52.8	52.8	51.9	44.8	42.6	1	0
11:57:12	54.8	40.0	52.9	52.8	52.9	51.9	44.8	42.7	1	0
11:57:13	54.9	40.0	52.9	52.8	52.9	51.9	44.8	42.7	1	0
11:57:14	54.9	40.0	52.9	52.8	52.9	51.9	44.8	42.7	1	0
11:57:15	54.9	40.0	52.9	52.8	52.9	51.9	44.8	42.7	1	0
11:57:16	54.9	40.0	52.9	52.8	52.9	51.9	44.8	42.7	1	0
11:57:17	54.9	40.1	52.9	52.8	52.9	51.9	44.8	42.7	1	0
11:57:18	54.9	40.1	52.9	52.8	52.9	51.9	44.8	42.7	1	0
11:57:19	54.9	40.1	52.9	52.8	52.9	51.9	44.9	42.7	1	0
11:57:20	54.9	40.1	52.9	52.9	52.9	51.9	44.9	42.7	1	0
11:57:21	54.9	40.1	52.9	52.9	52.9	52.0	44.9	42.7	1	0
11:57:22	54.9	40.2	53.0	52.9	52.9	52.0	44.9	42.7	1	0
11:57:23	54.9	40.2	53.0	52.9	53.0	52.0	44.9	42.7	1	0
11:57:24	54.9	40.2	53.0	52.9	53.0	52.0	44.9	42.7	1	0
11:57:25	55.0	40.2	53.0	52.9	53.0	52.0	44.9	42.7	1	0
11:57:26	55.0	40.2	53.0	52.9	53.0	52.0	44.9	42.7	1	0
11:57:27	55.0	40.3	53.0	52.9	53.0	52.0	44.9	42.7	1	0
11:57:28	55.0	40.3	53.0	53.0	53.0	52.1	44.9	42.8	1	0
11:57:29	55.0	40.3	53.0	52.9	53.0	52.1	44.9	42.8	1	0
11:57:30	55.0	40.3	53.0	53.0	53.0	52.1	44.9	42.8	1	0
11:57:31	55.0	40.3	53.0	53.0	53.0	52.1	44.9	42.8	1	0
11:57:32	55.0	40.3	53.0	53.0	53.1	52.1	45.0	42.8	1	0
11:57:33	55.0	40.3	53.0	53.0	53.1	52.1	45.0	42.8	1	0
11:57:34	55.1	40.4	53.0	53.0	53.1	52.2	45.0	42.8	1	0
11:57:36	55.1	40.4	53.1	53.0	53.1	52.2	45.0	42.8	1	0
11:57:37	55.1	40.4	53.1	53.0	53.1	52.2	45.0	42.8	1	0
11:57:38	55.1	40.4	53.1	53.0	53.1	52.2	45.0	42.8	1	0
11:57:39	55.1	40.4	53.1	53.0	53.1	52.2	45.0	42.8	1	0
11:57:40	55.1	40.5	53.1	53.0	53.1	52.2	45.1	42.9	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:57:41	55.1	40.5	53.1	53.1	53.1	52.2	45.1	42.9	1	0
11:57:42	55.1	40.5	53.1	53.0	53.1	52.2	45.1	42.9	1	0
11:57:43	55.1	40.5	53.2	53.0	53.2	52.2	45.1	42.9	1	0
11:57:44	55.2	40.5	53.2	53.1	53.1	52.2	45.1	42.9	1	0
11:57:45	55.2	40.6	53.2	53.1	53.2	52.3	45.1	42.9	1	0
11:57:46	55.2	40.6	53.2	53.1	53.2	52.3	45.2	42.9	1	0
11:57:47	55.2	40.6	53.2	53.1	53.2	52.3	45.2	42.9	1	0
11:57:48	55.2	40.6	53.2	53.1	53.2	52.3	45.2	42.9	1	0
11:57:49	55.2	40.6	53.2	53.1	53.2	52.3	45.2	42.9	1	0
11:57:50	55.2	40.7	53.3	53.1	53.2	52.3	45.2	42.9	1	0
11:57:51	55.3	40.7	53.3	53.1	53.2	52.3	45.2	43.0	1	0
11:57:52	55.2	40.7	53.3	53.2	53.2	52.3	45.3	43.0	1	0
11:57:53	55.3	40.7	53.3	53.2	53.2	52.3	45.3	43.0	1	0
11:57:54	55.3	40.7	53.3	53.2	53.2	52.3	45.3	43.0	1	0
11:57:55	55.3	40.7	53.3	53.2	53.3	52.3	45.4	43.0	1	0
11:57:56	55.3	40.7	53.3	53.2	53.3	52.3	45.4	43.0	1	0
11:57:57	55.3	40.7	53.3	53.2	53.3	52.3	45.4	43.0	1	0
11:57:58	55.3	40.7	53.3	53.2	53.3	52.3	45.4	43.0	1	0
11:57:59	55.4	40.7	53.3	53.2	53.3	52.4	45.4	43.0	1	0
11:58:00	55.4	40.7	53.4	53.3	53.3	52.4	45.4	43.0	1	0
11:58:01	55.4	40.7	53.4	53.3	53.3	52.4	45.4	43.0	1	0
11:58:02	55.4	40.7	53.4	53.3	53.4	52.4	45.4	43.0	1	0
11:58:03	55.4	40.7	53.4	53.3	53.4	52.4	45.4	43.0	1	0
11:58:04	55.4	40.7	53.4	53.3	53.4	52.4	45.4	43.0	1	0
11:58:05	55.4	40.7	53.4	53.3	53.4	52.4	45.4	43.1	1	0
11:58:06	55.4	40.7	53.4	53.3	53.4	52.4	45.4	43.1	1	0
11:58:07	55.4	40.7	53.4	53.3	53.4	52.4	45.4	43.1	1	0
11:58:08	55.5	40.7	53.4	53.3	53.5	52.4	45.4	43.1	1	0
11:58:09	55.5	40.7	53.4	53.4	53.4	52.4	45.4	43.1	1	0
11:58:11	55.5	40.7	53.4	53.4	53.5	52.5	45.4	43.1	1	0
11:58:12	55.5	40.7	53.4	53.4	53.5	52.5	45.4	43.1	1	0
11:58:13	55.5	40.7	53.4	53.4	53.5	52.5	45.4	43.1	1	0
11:58:14	55.5	40.7	53.5	53.4	53.5	52.5	45.4	43.1	1	0
11:58:15	55.5	40.7	53.5	53.4	53.5	52.5	45.4	43.1	1	0
11:58:16	55.5	40.7	53.5	53.4	53.5	52.5	45.4	43.1	1	0
11:58:17	55.5	40.7	53.5	53.4	53.5	52.5	45.4	43.1	1	0
11:58:18	55.5	40.7	53.5	53.5	53.5	52.5	45.4	43.1	1	0
11:58:19	55.5	40.7	53.5	53.5	53.5	52.5	45.4	43.1	1	0
11:58:20	55.6	40.7	53.5	53.5	53.5	52.6	45.4	43.2	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:58:21	55.6	40.7	53.5	53.5	53.5	52.6	45.4	43.2	1	0
11:58:22	55.6	40.7	53.5	53.5	53.5	52.6	45.4	43.2	1	0
11:58:23	55.6	40.7	53.5	53.5	53.6	52.6	45.4	43.2	1	0
11:58:24	55.6	40.7	53.5	53.5	53.6	52.6	45.4	43.2	1	0
11:58:25	55.6	40.7	53.5	53.5	53.6	52.6	45.4	43.2	1	0
11:58:26	55.6	40.7	53.6	53.5	53.6	52.6	45.5	43.2	1	0
11:58:27	55.6	40.7	53.5	53.5	53.6	52.6	45.5	43.2	1	0
11:58:28	55.7	40.7	53.6	53.5	53.6	52.6	45.5	43.2	1	0
11:58:29	55.7	40.7	53.6	53.6	53.6	52.6	45.5	43.3	1	0
11:58:30	55.7	40.7	53.6	53.6	53.6	52.6	45.5	43.3	1	0
11:58:31	55.7	40.7	53.6	53.6	53.6	52.7	45.5	43.3	1	0
11:58:32	55.7	40.8	53.6	53.6	53.6	52.7	45.5	43.3	1	0
11:58:33	55.7	40.8	53.6	53.6	53.6	52.7	45.5	43.3	1	0
11:58:34	55.7	40.8	53.6	53.6	53.6	52.7	45.5	43.3	1	0
11:58:35	55.7	40.8	53.7	53.6	53.7	52.7	45.5	43.3	1	0
11:58:36	55.7	40.8	53.7	53.6	53.7	52.7	45.5	43.3	1	0
11:58:37	55.8	40.8	53.7	53.6	53.7	52.7	45.6	43.3	1	0
11:58:38	55.8	40.8	53.7	53.6	53.7	52.8	45.6	43.3	1	0
11:58:39	55.8	40.9	53.7	53.7	53.7	52.8	45.6	43.3	1	0
11:58:40	55.8	40.9	53.7	53.7	53.7	52.8	45.6	43.3	1	0
11:58:41	55.8	40.9	53.7	53.7	53.7	52.8	45.6	43.4	1	0
11:58:42	55.8	40.9	53.7	53.7	53.7	52.8	45.7	43.4	1	0
11:58:43	55.8	40.9	53.7	53.7	53.7	52.8	45.7	43.4	1	0
11:58:45	55.8	40.9	53.7	53.7	53.7	52.9	45.7	43.4	1	0
11:58:46	55.9	40.9	53.8	53.7	53.7	52.9	45.7	43.4	1	0
11:58:47	55.9	41.0	53.8	53.7	53.8	52.9	45.7	43.4	1	0
11:58:48	55.9	41.0	53.8	53.7	53.8	52.9	45.8	43.4	1	0
11:58:49	55.9	41.1	53.8	53.7	53.8	52.9	45.8	43.4	1	0
11:58:50	55.9	41.1	53.8	53.7	53.8	52.9	45.8	43.4	1	0
11:58:51	55.9	41.1	53.8	53.8	53.8	52.9	45.8	43.4	1	0
11:58:52	55.9	41.1	53.8	53.8	53.8	52.9	45.8	43.4	1	0
11:58:53	55.9	41.2	53.8	53.8	53.8	53.0	45.8	43.4	1	0
11:58:54	55.9	41.2	53.9	53.8	53.8	53.0	45.9	43.4	1	0
11:58:55	56.0	41.2	53.9	53.8	53.9	53.0	45.9	43.4	1	0
11:58:56	56.0	41.2	53.9	53.8	53.9	53.0	45.9	43.5	1	0
11:58:57	56.0	41.2	53.9	53.8	53.9	53.0	45.9	43.5	1	0
11:58:58	56.0	41.2	53.9	53.8	53.9	53.0	45.9	43.5	1	0
11:58:59	56.0	41.2	53.9	53.9	53.9	53.0	46.0	43.5	1	0
11:59:00	56.0	41.2	53.9	53.9	53.9	53.0	46.0	43.5	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:59:01	56.0	41.2	53.9	53.9	53.9	53.1	46.0	43.5	1	0
11:59:02	56.0	41.2	53.9	53.9	54.0	53.1	46.0	43.5	1	0
11:59:03	56.0	41.2	53.9	53.9	53.9	53.1	46.0	43.5	1	0
11:59:04	56.0	41.2	54.0	53.9	54.0	53.1	46.0	43.5	1	0
11:59:05	56.0	41.2	54.0	53.9	54.0	53.1	46.1	43.5	1	0
11:59:06	56.0	41.2	54.0	53.9	54.0	53.1	46.1	43.6	1	0
11:59:07	56.1	41.2	54.0	54.0	54.0	53.1	46.1	43.6	1	0
11:59:08	56.1	41.2	54.0	54.0	54.0	53.1	46.1	43.6	1	0
11:59:09	56.1	41.2	54.0	54.0	54.0	53.1	46.2	43.6	1	0
11:59:10	56.1	41.2	54.0	54.0	54.0	53.1	46.2	43.6	1	0
11:59:11	56.1	41.2	54.0	54.0	54.0	53.1	46.2	43.6	1	0
11:59:12	56.1	41.2	54.0	54.0	54.0	53.2	46.2	43.6	1	0
11:59:13	56.1	41.2	54.0	54.0	54.0	53.2	46.2	43.6	1	0
11:59:14	56.1	41.3	54.0	54.0	54.1	53.2	46.2	43.6	1	0
11:59:15	56.2	41.3	54.0	54.0	54.1	53.2	46.3	43.6	1	0
11:59:16	56.2	41.3	54.1	54.0	54.1	53.2	46.3	43.6	1	0
11:59:17	56.2	41.3	54.1	54.1	54.1	53.2	46.3	43.6	1	0
11:59:19	56.2	41.3	54.1	54.1	54.1	53.2	46.3	43.6	1	0
11:59:20	56.2	41.4	54.1	54.1	54.1	53.2	46.4	43.7	1	0
11:59:21	56.3	41.4	54.1	54.1	54.1	53.2	46.4	43.7	1	0
11:59:22	56.3	41.4	54.1	54.1	54.1	53.2	46.4	43.7	1	0
11:59:23	56.3	41.4	54.1	54.1	54.2	53.2	46.4	43.7	1	0
11:59:24	56.3	41.4	54.2	54.1	54.1	53.2	46.4	43.7	1	0
11:59:25	56.3	41.4	54.2	54.2	54.2	53.2	46.5	43.7	1	0
11:59:26	56.3	41.5	54.2	54.2	54.2	53.2	46.5	43.7	1	0
11:59:27	56.3	41.5	54.2	54.2	54.2	53.3	46.5	43.7	1	0
11:59:28	56.4	41.5	54.2	54.2	54.2	53.3	46.5	43.7	1	0
11:59:29	56.4	41.5	54.2	54.2	54.2	53.3	46.5	43.7	1	0
11:59:30	56.4	41.5	54.2	54.2	54.2	53.3	46.6	43.7	1	0
11:59:31	56.4	41.5	54.2	54.2	54.2	53.3	46.6	43.7	1	0
11:59:32	56.4	41.5	54.2	54.2	54.2	53.3	46.6	43.7	1	0
11:59:33	56.4	41.5	54.2	54.2	54.3	53.3	46.7	43.7	1	0
11:59:34	56.4	41.5	54.3	54.2	54.3	53.3	46.6	43.7	1	0
11:59:35	56.4	41.6	54.3	54.3	54.3	53.3	46.7	43.7	1	0
11:59:36	56.4	41.6	54.3	54.3	54.3	53.4	46.7	43.7	1	0
11:59:37	56.4	41.6	54.3	54.3	54.3	53.4	46.7	43.7	1	0
11:59:38	56.4	41.6	54.3	54.3	54.4	53.4	46.7	43.8	1	0
11:59:39	56.4	41.7	54.3	54.3	54.4	53.4	46.7	43.8	1	0
11:59:40	56.5	41.7	54.3	54.3	54.4	53.4	46.7	43.8	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
11:59:41	56.5	41.7	54.3	54.3	54.4	53.4	46.7	43.8	1	0
11:59:42	56.5	41.7	54.3	54.3	54.4	53.4	46.7	43.8	1	0
11:59:43	56.5	41.7	54.3	54.3	54.4	53.4	46.7	43.8	1	0
11:59:44	56.5	41.7	54.3	54.4	54.4	53.5	46.7	43.8	1	0
11:59:45	56.5	41.7	54.4	54.4	54.4	53.5	46.7	43.8	1	0
11:59:46	56.5	41.7	54.4	54.4	54.4	53.5	46.7	43.8	1	0
11:59:47	56.5	41.7	54.4	54.4	54.4	53.5	46.7	43.9	1	0
11:59:48	56.5	41.7	54.4	54.4	54.5	53.5	46.7	43.8	1	0
11:59:49	56.5	41.7	54.4	54.4	54.5	53.5	46.7	43.9	1	0
11:59:50	56.5	41.7	54.4	54.4	54.5	53.6	46.7	43.9	1	0
11:59:51	56.5	41.7	54.4	54.4	54.5	53.6	46.7	43.9	1	0
11:59:53	56.6	41.7	54.4	54.4	54.5	53.6	46.7	43.9	1	0
11:59:54	56.6	41.7	54.4	54.4	54.5	53.6	46.7	43.9	1	0
11:59:55	56.6	41.7	54.4	54.5	54.5	53.6	46.7	43.9	1	0
11:59:56	56.6	41.7	54.5	54.5	54.5	53.6	46.7	43.9	1	0
11:59:57	56.6	41.7	54.5	54.5	54.5	53.6	46.7	43.9	1	0
11:59:58	56.6	41.7	54.5	54.5	54.5	53.6	46.7	43.9	1	0
11:59:59	56.6	41.6	54.5	54.5	54.6	53.7	46.7	43.9	1	0
12:00:00	56.6	41.7	54.5	54.5	54.6	53.7	46.7	43.9	1	0
12:00:01	56.7	41.6	54.5	54.5	54.6	53.7	46.7	43.9	1	0
12:00:02	56.7	41.7	54.5	54.5	54.6	53.7	46.7	43.9	1	0
12:00:03	56.7	41.7	54.6	54.5	54.6	53.7	46.7	44.0	1	0
12:00:04	56.7	41.7	54.6	54.5	54.6	53.7	46.7	44.0	1	0
12:00:05	56.7	41.7	54.6	54.6	54.6	53.7	46.8	44.0	1	0
12:00:06	56.7	41.7	54.6	54.6	54.6	53.7	46.7	44.0	1	0
12:00:07	56.7	41.7	54.6	54.6	54.7	53.7	46.7	44.0	1	0
12:00:08	56.8	41.7	54.6	54.6	54.7	53.7	46.7	44.0	1	0
12:00:09	56.8	41.8	54.6	54.6	54.7	53.7	46.7	44.0	1	0
12:00:10	56.8	41.8	54.6	54.6	54.7	53.7	46.8	44.0	1	0
12:00:11	56.8	41.8	54.7	54.6	54.7	53.8	46.8	44.0	1	0
12:00:12	56.8	41.8	54.7	54.7	54.7	53.8	46.8	44.0	1	0
12:00:13	56.8	41.8	54.7	54.7	54.7	53.8	46.8	44.1	1	0
12:00:14	56.8	41.7	54.7	54.7	54.7	53.8	46.8	44.1	1	0
12:00:15	56.9	41.7	54.7	54.7	54.7	53.8	46.8	44.1	1	0
12:00:16	56.8	41.7	54.7	54.7	54.8	53.8	46.8	44.1	1	0
12:00:17	56.9	41.7	54.7	54.7	54.8	53.8	46.8	44.1	1	0
12:00:18	56.9	41.7	54.7	54.7	54.8	53.8	46.8	44.1	1	0
12:00:19	56.9	41.7	54.7	54.7	54.8	53.9	46.8	44.1	1	0
12:00:20	56.9	41.7	54.8	54.7	54.8	53.9	46.8	44.1	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
12:00:21	56.9	41.7	54.7	54.7	54.8	53.9	46.8	44.1	1	0
12:00:22	56.9	41.7	54.8	54.7	54.8	53.9	46.8	44.1	1	0
12:00:23	56.9	41.7	54.8	54.8	54.8	53.9	46.8	44.2	1	0
12:00:24	56.9	41.7	54.8	54.8	54.9	53.9	46.8	44.2	1	0
12:00:26	56.9	41.7	54.8	54.8	54.8	53.9	46.8	44.2	1	0
12:00:27	57.0	41.7	54.8	54.8	54.9	54.0	46.8	44.2	1	0
12:00:28	57.0	41.7	54.8	54.8	54.9	53.9	46.8	44.2	1	0
12:00:29	57.0	41.7	54.8	54.8	54.9	54.0	46.8	44.2	1	0
12:00:30	57.0	41.7	54.8	54.8	54.9	54.0	46.8	44.2	1	0
12:00:31	57.0	41.7	54.8	54.8	54.9	54.0	46.8	44.2	1	0
12:00:32	57.0	41.7	54.8	54.8	54.9	54.0	46.8	44.2	1	0
12:00:33	57.0	41.7	54.9	54.8	54.9	54.0	46.8	44.2	1	0
12:00:34	57.0	41.7	54.9	54.8	55.0	54.0	46.8	44.2	1	0
12:00:35	57.0	41.7	54.9	54.8	55.0	54.0	46.8	44.2	1	0
12:00:36	57.0	41.7	54.9	54.8	55.0	54.0	46.8	44.2	1	0
12:00:37	57.0	41.7	54.9	54.9	55.0	54.1	46.8	44.2	1	0
12:00:38	57.0	41.7	54.9	54.9	55.0	54.1	46.8	44.2	1	0
12:00:39	57.0	41.7	54.9	54.9	55.0	54.1	46.9	44.2	1	0
12:00:40	57.1	41.7	54.9	54.9	55.0	54.1	46.8	44.3	1	0
12:00:41	57.1	41.7	54.9	54.9	55.1	54.1	46.9	44.2	1	0
12:00:42	57.1	41.7	55.0	54.9	55.1	54.2	46.9	44.3	1	0
12:00:43	57.1	41.7	55.0	54.9	55.1	54.2	46.9	44.3	1	0
12:00:44	57.1	41.7	55.0	54.9	55.1	54.2	46.9	44.3	1	0
12:00:45	57.1	41.7	55.0	54.9	55.1	54.2	46.9	44.3	1	0
12:00:46	57.1	41.8	55.0	54.9	55.1	54.2	46.9	44.3	1	0
12:00:47	57.1	41.8	55.0	55.0	55.1	54.2	47.0	44.3	1	0
12:00:48	57.1	41.8	55.0	55.0	55.1	54.2	47.0	44.3	1	0
12:00:49	57.1	41.8	55.0	55.0	55.1	54.2	47.0	44.3	1	0
12:00:50	57.2	41.8	55.0	55.0	55.2	54.3	47.0	44.3	1	0
12:00:51	57.2	41.8	55.0	55.0	55.2	54.3	47.1	44.3	1	0
12:00:52	57.2	41.8	55.0	55.0	55.2	54.3	47.1	44.3	1	0
12:00:53	57.2	41.8	55.1	55.0	55.2	54.3	47.1	44.3	1	0
12:00:54	57.2	41.8	55.1	55.0	55.2	54.3	47.1	44.4	1	0
12:00:55	57.2	41.8	55.1	55.1	55.2	54.3	47.1	44.4	1	0
12:00:56	57.2	41.9	55.1	55.1	55.2	54.3	47.1	44.4	1	0
12:00:57	57.2	41.9	55.1	55.1	55.2	54.3	47.1	44.4	1	0
12:00:58	57.3	41.9	55.1	55.1	55.2	54.4	47.1	44.4	1	0
12:00:59	57.3	41.9	55.1	55.1	55.2	54.4	47.1	44.4	1	0
12:01:01	57.3	41.9	55.1	55.1	55.3	54.4	47.1	44.4	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
12:01:02	57.3	41.8	55.2	55.1	55.3	54.4	47.2	44.4	1	0
12:01:03	57.3	41.9	55.2	55.1	55.3	54.4	47.2	44.4	1	0
12:01:04	57.3	41.9	55.2	55.1	55.3	54.4	47.2	44.5	1	0
12:01:05	57.3	41.8	55.2	55.2	55.3	54.4	47.2	44.4	1	0
12:01:06	57.3	41.8	55.2	55.2	55.3	54.4	47.2	44.5	1	0
12:01:07	57.4	41.8	55.2	55.2	55.3	54.4	47.2	44.5	1	0
12:01:08	57.4	41.8	55.2	55.2	55.3	54.4	47.2	44.5	1	0
12:01:09	57.4	41.8	55.2	55.2	55.3	54.4	47.3	44.5	1	0
12:01:10	57.4	41.8	55.3	55.2	55.4	54.5	47.3	44.5	1	0
12:01:11	57.4	41.8	55.3	55.2	55.4	54.5	47.3	44.5	1	0
12:01:12	57.4	41.8	55.3	55.3	55.4	54.5	47.3	44.5	1	0
12:01:13	57.4	41.8	55.3	55.3	55.4	54.5	47.3	44.5	1	0
12:01:14	57.4	41.8	55.3	55.3	55.4	54.5	47.3	44.5	1	0
12:01:15	57.4	41.9	55.3	55.3	55.4	54.5	47.3	44.5	1	0
12:01:16	57.5	41.9	55.4	55.3	55.4	54.5	47.3	44.5	1	0
12:01:17	57.5	41.9	55.3	55.3	55.4	54.5	47.3	44.6	1	0
12:01:18	57.5	41.9	55.4	55.3	55.5	54.5	47.3	44.6	1	0
12:01:19	57.5	41.9	55.4	55.3	55.5	54.5	47.3	44.6	1	0
12:01:20	57.5	41.9	55.4	55.3	55.5	54.5	47.3	44.6	1	0
12:01:21	57.5	41.9	55.4	55.4	55.5	54.5	47.4	44.6	1	0
12:01:22	57.5	41.9	55.4	55.4	55.5	54.5	47.4	44.6	1	0
12:01:23	57.5	41.9	55.4	55.4	55.5	54.6	47.4	44.6	1	0
12:01:24	57.6	41.9	55.4	55.4	55.5	54.6	47.4	44.6	1	0
12:01:25	57.6	41.9	55.4	55.4	55.6	54.6	47.4	44.6	1	0
12:01:26	57.6	41.9	55.4	55.4	55.6	54.6	47.4	44.6	1	0
12:01:27	57.6	41.9	55.4	55.4	55.6	54.6	47.4	44.6	1	0
12:01:28	57.6	41.9	55.4	55.4	55.6	54.6	47.4	44.6	1	0
12:01:29	57.6	41.9	55.4	55.4	55.6	54.6	47.4	44.6	1	0
12:01:30	57.6	41.9	55.5	55.5	55.6	54.6	47.4	44.6	1	0
12:01:31	57.6	41.9	55.5	55.5	55.6	54.6	47.4	44.7	1	0
12:01:32	57.7	41.9	55.5	55.5	55.6	54.6	47.4	44.7	1	0
12:01:33	57.7	41.9	55.5	55.5	55.6	54.7	47.4	44.7	1	0
12:01:35	57.7	41.9	55.5	55.5	55.6	54.7	47.3	44.7	1	0
12:01:36	57.7	41.9	55.5	55.5	55.6	54.7	47.4	44.7	1	0
12:01:37	57.7	41.9	55.5	55.5	55.7	54.7	47.4	44.8	1	0
12:01:38	57.7	42.0	55.5	55.5	55.7	54.7	47.4	44.7	1	0
12:01:39	57.7	41.9	55.5	55.5	55.7	54.7	47.4	44.8	1	0
12:01:40	57.7	41.9	55.6	55.5	55.7	54.7	47.4	44.8	1	0
12:01:41	57.8	41.9	55.6	55.5	55.7	54.7	47.4	44.8	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
12:01:42	57.8	42.0	55.6	55.6	55.7	54.7	47.4	44.8	1	0
12:01:43	57.8	42.0	55.6	55.6	55.7	54.7	47.4	44.8	1	0
12:01:44	57.8	42.0	55.6	55.6	55.7	54.8	47.4	44.9	1	0
12:01:45	57.8	42.0	55.6	55.6	55.8	54.7	47.4	44.9	1	0
12:01:46	57.8	42.0	55.6	55.6	55.8	54.8	47.4	44.9	1	0
12:01:47	57.8	42.0	55.6	55.6	55.8	54.8	47.4	44.9	1	0
12:01:48	57.8	42.0	55.6	55.6	55.8	54.8	47.5	44.9	1	0
12:01:49	57.8	42.0	55.7	55.7	55.8	54.8	47.5	44.9	1	0
12:01:50	57.8	42.0	55.6	55.7	55.8	54.8	47.5	44.9	1	0
12:01:51	57.9	42.0	55.7	55.7	55.8	54.8	47.5	44.9	1	0
12:01:52	57.9	42.0	55.7	55.7	55.8	54.8	47.5	44.9	1	0
12:01:53	57.9	42.0	55.7	55.7	55.8	54.8	47.5	44.9	1	0
12:01:54	57.9	42.0	55.7	55.7	55.8	54.8	47.5	45.0	1	0
12:01:55	57.9	42.1	55.7	55.7	55.8	54.9	47.5	45.0	1	0
12:01:56	57.9	42.0	55.7	55.7	55.8	54.9	47.5	45.0	1	0
12:01:57	57.9	42.0	55.7	55.7	55.9	54.9	47.5	45.0	1	0
12:01:58	57.9	42.0	55.7	55.8	55.9	54.9	47.5	45.0	1	0
12:01:59	57.9	42.0	55.7	55.8	55.9	54.9	47.5	45.0	1	0
12:02:00	57.9	42.0	55.7	55.8	55.9	54.9	47.5	45.0	1	0
12:02:01	57.9	42.0	55.7	55.8	55.9	54.9	47.5	45.0	1	0
12:02:02	57.9	42.0	55.8	55.8	55.9	54.9	47.5	45.0	1	0
12:02:03	58.0	42.0	55.8	55.8	55.9	54.9	47.5	45.1	1	0
12:02:04	58.0	42.0	55.8	55.8	55.9	55.0	47.5	45.1	1	0
12:02:05	58.0	42.0	55.8	55.8	55.9	55.0	47.5	45.1	1	0
12:02:06	58.0	42.0	55.8	55.8	55.9	55.0	47.5	45.1	1	0
12:02:07	58.0	42.0	55.8	55.8	56.0	55.0	47.5	45.1	1	0
12:02:09	58.0	42.0	55.8	55.9	56.0	55.0	47.5	45.1	1	0
12:02:10	58.0	42.0	55.8	55.9	56.0	55.0	47.5	45.1	1	0
12:02:11	58.0	42.0	55.8	55.9	56.0	55.0	47.5	45.1	1	0
12:02:12	58.0	42.1	55.9	55.9	56.0	55.0	47.6	45.1	1	0
12:02:13	58.0	42.1	55.9	55.9	56.0	55.1	47.6	45.1	1	0
12:02:14	58.0	42.1	55.9	55.9	56.0	55.1	47.6	45.1	1	0
12:02:15	58.1	42.1	55.9	55.9	56.0	55.1	47.6	45.2	1	0
12:02:16	58.1	42.1	55.9	56.0	56.1	55.1	47.6	45.2	1	0
12:02:17	58.1	42.1	55.9	56.0	56.1	55.1	47.6	45.2	1	0
12:02:18	58.1	42.1	55.9	55.9	56.1	55.1	47.6	45.2	1	0
12:02:19	58.1	42.2	55.9	56.0	56.1	55.1	47.6	45.2	1	0
12:02:20	58.1	42.1	56.0	56.0	56.1	55.1	47.6	45.2	1	0
12:02:21	58.1	42.2	56.0	56.0	56.1	55.1	47.6	45.2	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
12:02:22	58.1	42.1	56.0	56.0	56.1	55.1	47.6	45.2	1	0
12:02:23	58.2	42.1	56.0	56.0	56.1	55.2	47.6	45.2	1	0
12:02:24	58.2	42.1	56.0	56.0	56.1	55.2	47.7	45.2	1	0
12:02:25	58.2	42.1	56.0	56.1	56.1	55.2	47.7	45.2	1	0
12:02:26	58.2	42.1	56.0	56.1	56.2	55.2	47.7	45.2	1	0
12:02:27	58.2	42.2	56.0	56.1	56.2	55.2	47.7	45.2	1	0
12:02:28	58.2	42.1	56.0	56.1	56.2	55.2	47.7	45.2	1	0
12:02:29	58.3	42.1	56.1	56.1	56.2	55.2	47.7	45.3	1	0
12:02:30	58.3	42.2	56.1	56.1	56.2	55.2	47.7	45.3	1	0
12:02:31	58.3	42.2	56.1	56.1	56.2	55.2	47.7	45.3	1	0
12:02:32	58.3	42.2	56.1	56.1	56.2	55.2	47.8	45.3	1	0
12:02:33	58.3	42.2	56.1	56.2	56.2	55.2	47.8	45.3	1	0
12:02:34	58.3	42.2	56.1	56.2	56.2	55.2	47.8	45.3	1	0
12:02:35	58.3	42.2	56.1	56.2	56.2	55.3	47.8	45.3	1	0
12:02:36	58.3	42.2	56.1	56.2	56.2	55.3	47.8	45.3	1	0
12:02:37	58.3	42.2	56.1	56.2	56.2	55.3	47.8	45.3	1	0
12:02:38	58.3	42.2	56.1	56.2	56.2	55.3	47.9	45.3	1	0
12:02:39	58.4	42.2	56.1	56.2	56.3	55.3	47.9	45.3	1	0
12:02:40	58.4	42.2	56.1	56.2	56.3	55.3	47.9	45.4	1	0
12:02:41	58.4	42.2	56.1	56.2	56.3	55.3	47.9	45.4	1	0
12:02:43	58.4	42.2	56.2	56.2	56.3	55.3	47.9	45.4	1	0
12:02:44	58.4	42.2	56.2	56.2	56.3	55.3	47.9	45.4	1	0
12:02:45	58.4	42.2	56.2	56.2	56.3	55.3	47.9	45.4	1	0
12:02:46	58.4	42.2	56.2	56.2	56.3	55.3	47.9	45.4	1	0
12:02:47	58.4	42.2	56.2	56.2	56.3	55.4	47.9	45.4	1	0
12:02:48	58.4	42.3	56.2	56.3	56.3	55.4	48.0	45.4	1	0
12:02:49	58.4	42.3	56.2	56.3	56.3	55.4	48.0	45.4	1	0
12:02:50	58.5	42.3	56.2	56.3	56.3	55.4	48.0	45.4	1	0
12:02:51	58.5	42.3	56.2	56.3	56.3	55.4	48.0	45.4	1	0
12:02:52	58.5	42.3	56.3	56.3	56.3	55.4	48.0	45.4	1	0
12:02:53	58.5	42.4	56.2	56.3	56.4	55.4	48.1	45.5	1	0
12:02:54	58.5	42.4	56.3	56.3	56.4	55.4	48.1	45.5	1	0
12:02:55	58.5	42.4	56.3	56.3	56.4	55.4	48.1	45.5	1	0
12:02:56	58.5	42.4	56.3	56.3	56.4	55.5	48.1	45.5	1	0
12:02:57	58.5	42.4	56.3	56.3	56.4	55.5	48.1	45.5	1	0
12:02:58	58.6	42.4	56.3	56.4	56.4	55.5	48.1	45.5	1	0
12:02:59	58.6	42.5	56.3	56.4	56.4	55.5	48.1	45.5	1	0
12:03:00	58.6	42.5	56.3	56.4	56.4	55.5	48.1	45.5	1	0
12:03:01	58.6	42.5	56.3	56.4	56.4	55.5	48.1	45.6	1	0

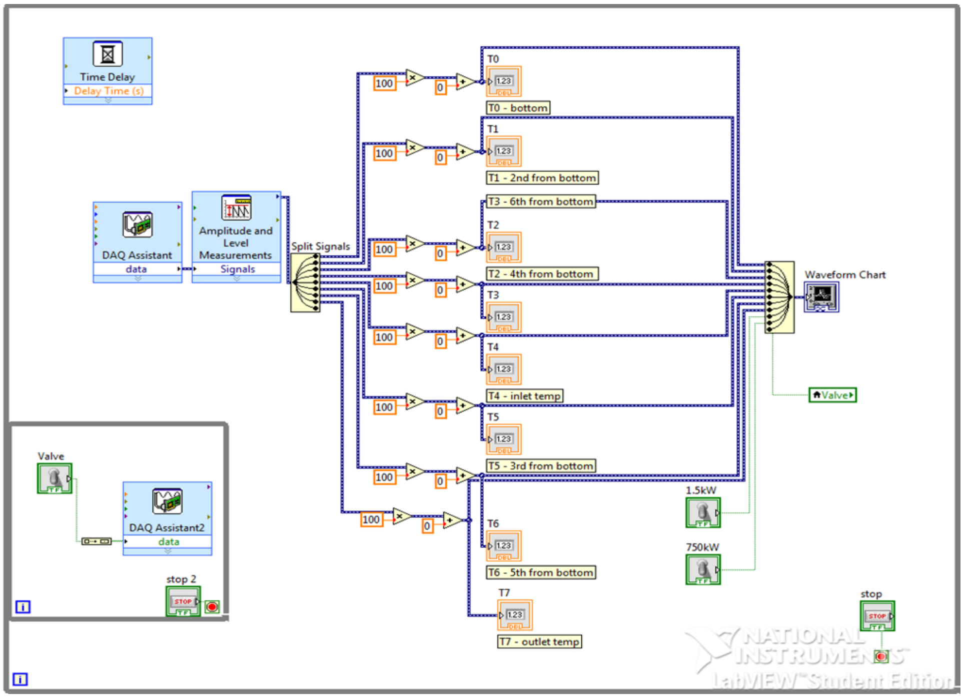
Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
12:03:02	58.6	42.5	56.3	56.4	56.4	55.5	48.2	45.6	1	0
12:03:03	58.6	42.5	56.3	56.4	56.5	55.5	48.2	45.6	1	0
12:03:04	58.6	42.5	56.4	56.4	56.4	55.6	48.2	45.6	1	0
12:03:05	58.6	42.5	56.4	56.4	56.5	55.6	48.2	45.6	1	0
12:03:06	58.6	42.5	56.4	56.4	56.5	55.6	48.2	45.6	1	0
12:03:07	58.6	42.5	56.4	56.4	56.5	55.6	48.2	45.6	1	0
12:03:08	58.6	42.5	56.4	56.5	56.5	55.6	48.2	45.6	1	0
12:03:09	58.6	42.5	56.4	56.5	56.5	55.6	48.2	45.6	1	0
12:03:10	58.6	42.5	56.4	56.5	56.5	55.6	48.2	45.6	1	0
12:03:11	58.7	42.5	56.4	56.5	56.5	55.7	48.2	45.6	1	0
12:03:12	58.7	42.5	56.4	56.5	56.5	55.7	48.2	45.6	1	0
12:03:13	58.7	42.5	56.4	56.5	56.5	55.7	48.2	45.7	1	0
12:03:14	58.7	42.5	56.4	56.5	56.6	55.7	48.2	45.7	1	0
12:03:15	58.7	42.5	56.5	56.5	56.6	55.7	48.2	45.7	1	0
12:03:17	58.7	42.5	56.5	56.5	56.6	55.7	48.2	45.7	1	0
12:03:18	58.7	42.5	56.5	56.6	56.6	55.7	48.2	45.7	1	0
12:03:19	58.7	42.5	56.5	56.5	56.6	55.7	48.2	45.7	1	0
12:03:20	58.7	42.5	56.5	56.6	56.6	55.7	48.2	45.7	1	0
12:03:21	58.7	42.5	56.5	56.6	56.6	55.7	48.2	45.7	1	0
12:03:22	58.8	42.5	56.5	56.6	56.6	55.7	48.2	45.7	1	0
12:03:23	58.8	42.5	56.5	56.6	56.6	55.7	48.2	45.7	1	0
12:03:24	58.8	42.6	56.6	56.6	56.7	55.7	48.2	45.7	1	0
12:03:25	58.8	42.6	56.6	56.6	56.7	55.8	48.2	45.7	1	0
12:03:26	58.8	42.6	56.6	56.6	56.7	55.8	48.2	45.8	1	0
12:03:27	58.8	42.6	56.6	56.7	56.7	55.8	48.2	45.8	1	0
12:03:28	58.8	42.6	56.6	56.7	56.7	55.8	48.2	45.8	1	0
12:03:29	58.8	42.6	56.6	56.7	56.7	55.8	48.2	45.8	1	0
12:03:30	58.8	42.6	56.6	56.7	56.7	55.8	48.2	45.8	1	0
12:03:31	58.9	42.6	56.6	56.7	56.7	55.8	48.2	45.8	1	0
12:03:32	58.9	42.6	56.6	56.7	56.8	55.8	48.2	45.8	1	0
12:03:33	58.9	42.7	56.7	56.7	56.8	55.8	48.2	45.8	1	0
12:03:34	58.9	42.7	56.7	56.7	56.8	55.9	48.2	45.8	1	0
12:03:35	58.9	42.7	56.7	56.8	56.8	55.9	48.2	45.8	1	0
12:03:36	58.9	42.7	56.7	56.8	56.8	55.9	48.2	45.8	1	0
12:03:37	58.9	42.7	56.7	56.8	56.8	55.9	48.3	45.8	1	0
12:03:38	59.0	42.7	56.7	56.8	56.8	55.9	48.3	45.9	1	0
12:03:39	59.0	42.8	56.7	56.8	56.8	55.9	48.3	45.9	1	0
12:03:40	59.0	42.8	56.7	56.8	56.8	55.9	48.3	45.9	1	0
12:03:41	59.0	42.8	56.7	56.8	56.9	55.9	48.3	45.9	1	0

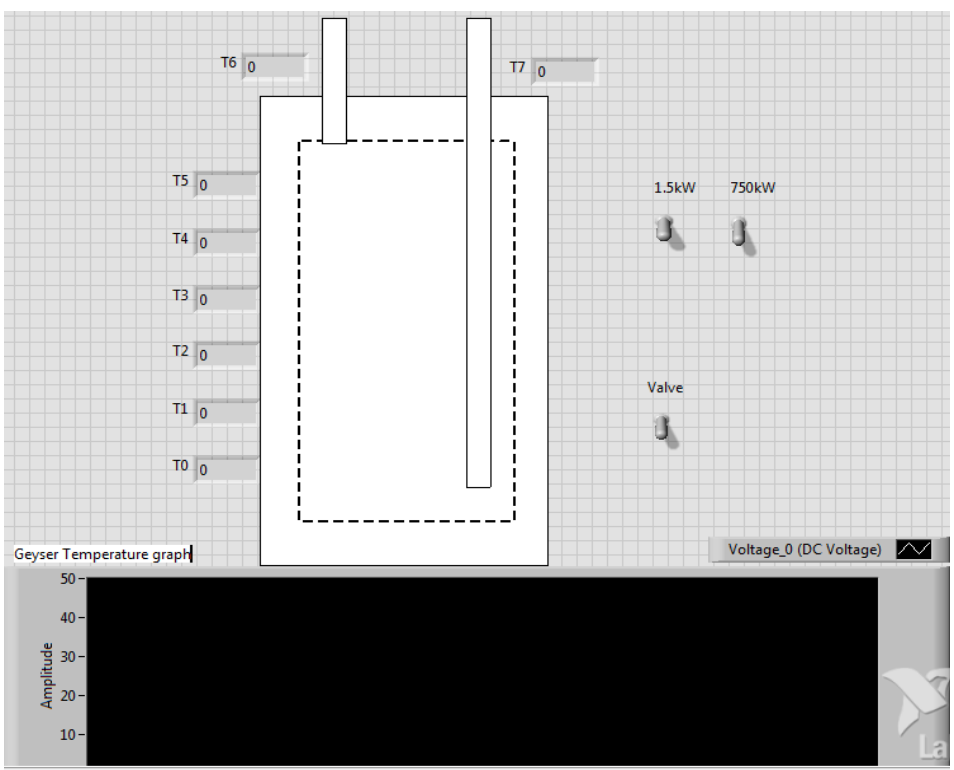
Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
12:03:42	59.0	42.8	56.7	56.8	56.9	55.9	48.3	45.9	1	0
12:03:43	59.0	42.8	56.7	56.8	56.9	56.0	48.3	45.9	1	0
12:03:44	59.0	42.8	56.8	56.8	56.9	56.0	48.3	45.9	1	0
12:03:45	59.0	42.8	56.8	56.8	56.9	56.0	48.4	45.9	1	0
12:03:46	59.0	42.8	56.8	56.8	56.9	56.0	48.3	45.9	1	0
12:03:47	59.0	42.8	56.8	56.8	56.9	56.0	48.3	45.9	1	0
12:03:48	59.1	42.8	56.8	56.9	56.9	56.0	48.4	46.0	1	0
12:03:49	59.1	42.8	56.8	56.9	56.9	56.0	48.4	45.9	1	0
12:03:51	59.1	42.8	56.8	56.9	56.9	56.0	48.4	45.9	1	0
12:03:52	59.1	42.8	56.8	56.9	57.0	56.0	48.4	45.9	1	0
12:03:53	59.1	42.8	56.8	56.9	57.0	56.0	48.4	46.0	1	0
12:03:54	59.1	42.8	56.9	56.9	57.0	56.1	48.4	46.0	1	0
12:03:55	59.1	42.8	56.9	56.9	57.0	56.1	48.5	46.0	1	0
12:03:56	59.1	42.9	56.9	56.9	57.0	56.1	48.5	46.0	1	0
12:03:57	59.1	42.9	56.9	57.0	57.0	56.1	48.5	46.0	1	0
12:03:58	59.2	42.9	56.9	57.0	57.0	56.1	48.5	46.0	1	0
12:03:59	59.2	42.9	56.9	57.0	57.0	56.1	48.5	46.0	1	0
12:04:00	59.2	42.9	56.9	57.0	57.0	56.1	48.5	46.0	1	0
12:04:01	59.2	43.0	56.9	57.0	57.1	56.2	48.5	46.0	1	0
12:04:02	59.2	42.9	56.9	57.0	57.1	56.2	48.5	46.0	1	0
12:04:03	59.2	42.9	56.9	57.0	57.1	56.2	48.4	46.0	1	0
12:04:04	59.2	42.9	57.0	57.0	57.1	56.2	48.4	46.1	1	0
12:04:05	59.2	42.9	57.0	57.0	57.1	56.2	48.3	46.1	1	0
12:04:06	59.2	42.9	57.0	57.0	57.1	56.3	48.3	46.1	1	0
12:04:07	59.2	42.9	57.0	57.1	57.1	56.3	48.2	46.1	1	0
12:04:08	59.2	42.9	57.0	57.1	57.1	56.3	48.2	46.1	1	0
12:04:09	59.2	42.9	57.0	57.1	57.1	56.3	48.2	46.1	1	0
12:04:10	59.3	43.0	57.0	57.1	57.2	56.3	48.2	46.1	1	0
12:04:11	59.3	43.0	57.0	57.1	57.2	56.3	48.1	46.1	1	0
12:04:12	59.3	43.0	57.0	57.1	57.2	56.3	48.1	46.2	1	0
12:04:13	59.3	43.0	57.1	57.1	57.2	56.3	48.1	46.2	1	0
12:04:14	59.3	43.0	57.1	57.1	57.2	56.3	48.1	46.2	1	0
12:04:15	59.3	43.0	57.1	57.1	57.2	56.3	48.1	46.2	1	0
12:04:16	59.3	43.1	57.1	57.1	57.2	56.4	48.0	46.2	1	0
12:04:17	59.3	43.1	57.1	57.2	57.2	56.4	48.0	46.2	1	0
12:04:18	59.3	43.1	57.1	57.2	57.2	56.4	48.0	46.2	1	0
12:04:19	59.3	43.1	57.1	57.2	57.3	56.4	48.0	46.2	1	0
12:04:20	59.3	43.2	57.1	57.2	57.3	56.4	48.0	46.2	1	0
12:04:21	59.3	43.2	57.1	57.2	57.3	56.4	48.0	46.3	1	0

Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
12:04:22	59.4	43.2	57.1	57.2	57.3	56.4	48.0	46.2	1	0
12:04:23	59.4	43.2	57.1	57.2	57.3	56.4	48.0	46.3	1	0
12:04:25	59.4	43.2	57.2	57.2	57.3	56.4	48.1	46.3	1	0
12:04:26	59.4	43.2	57.2	57.2	57.3	56.4	48.1	46.2	1	0
12:04:27	59.4	43.2	57.2	57.2	57.3	56.4	48.1	46.3	1	0
12:04:28	59.4	43.3	57.2	57.2	57.3	56.4	48.1	46.2	1	0
12:04:29	59.4	43.3	57.2	57.2	57.3	56.4	48.2	46.3	1	0
12:04:30	59.4	43.3	57.2	57.3	57.3	56.4	48.2	46.3	1	0
12:04:31	59.4	43.3	57.2	57.3	57.3	56.4	48.2	46.3	1	0
12:04:32	59.4	43.3	57.2	57.3	57.3	56.4	48.2	46.3	1	0
12:04:33	59.5	43.3	57.2	57.3	57.4	56.4	48.2	46.3	1	0
12:04:34	59.5	43.3	57.3	57.3	57.4	56.5	48.2	46.3	1	0
12:04:35	59.5	43.3	57.3	57.3	57.4	56.5	48.2	46.3	1	0
12:04:36	59.5	43.3	57.3	57.3	57.4	56.5	48.3	46.3	1	0
12:04:37	59.5	43.3	57.3	57.3	57.4	56.5	48.3	46.3	1	0
12:04:38	59.5	43.3	57.3	57.3	57.4	56.5	48.3	46.3	1	0
12:04:39	59.6	43.3	57.3	57.3	57.4	56.5	48.3	46.3	1	0
12:04:40	59.6	43.3	57.3	57.3	57.4	56.5	48.3	46.3	1	0
12:04:41	59.6	43.3	57.3	57.3	57.4	56.5	48.4	46.3	1	0
12:04:42	59.6	43.3	57.3	57.4	57.4	56.5	48.4	46.3	1	0
12:04:43	59.6	43.3	57.3	57.4	57.5	56.5	48.5	46.3	1	0
12:04:44	59.6	43.3	57.4	57.4	57.5	56.5	48.5	46.4	1	0
12:04:45	59.6	43.3	57.3	57.4	57.5	56.5	48.6	46.4	1	0
12:04:46	59.6	43.3	57.4	57.4	57.5	56.6	48.6	46.4	1	0
12:04:47	59.7	43.3	57.4	57.4	57.5	56.6	48.7	46.4	1	0
12:04:48	59.7	43.3	57.4	57.4	57.5	56.6	48.7	46.4	1	0
12:04:49	59.7	43.3	57.4	57.4	57.5	56.6	48.7	46.4	1	0
12:04:50	59.7	43.4	57.4	57.4	57.6	56.6	48.7	46.4	1	0
12:04:51	59.7	43.4	57.4	57.4	57.5	56.6	48.8	46.4	1	0
12:04:52	59.7	43.4	57.4	57.4	57.6	56.6	48.8	46.4	1	0
12:04:53	59.8	43.4	57.4	57.4	57.6	56.6	48.8	46.4	1	0
12:04:54	59.8	43.4	57.4	57.5	57.6	56.6	48.8	46.5	1	0
12:04:55	59.7	43.4	57.4	57.5	57.6	56.6	48.8	46.5	1	0
12:04:56	59.8	43.5	57.4	57.5	57.6	56.6	48.9	46.4	1	0
12:04:57	59.8	43.5	57.4	57.5	57.6	56.7	48.9	46.5	1	0
12:04:58	59.8	43.5	57.4	57.5	57.6	56.6	48.9	46.5	1	0
12:05:00	59.8	43.5	57.5	57.5	57.6	56.7	49.0	46.5	1	0
12:05:01	59.8	43.6	57.5	57.5	57.6	56.7	49.0	46.5	1	0
12:05:02	59.8	43.6	57.5	57.6	57.6	56.7	49.0	46.5	1	0

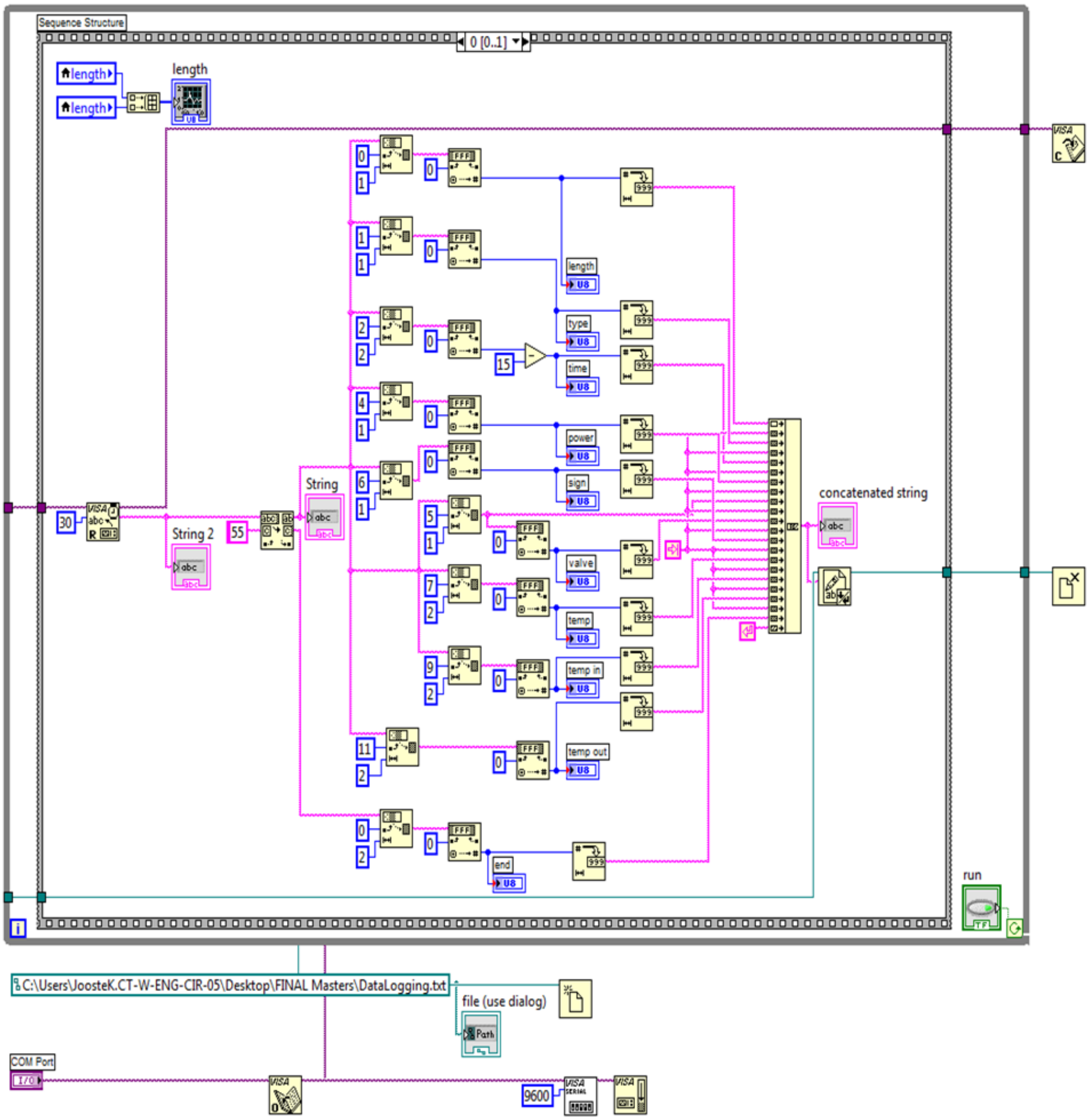
Time	Outlet Sensor	Inlet Sensor	Top Sensor	Sensor 5	Sensor 4	Sensor 3	Sensor 2	Bottom Sensor	750 W element	Water Valve
12:05:03	59.8	43.6	57.5	57.6	57.6	56.7	49.0	46.5	1	0
12:05:04	59.8	43.6	57.5	57.6	57.6	56.7	49.0	46.5	1	0
12:05:05	59.8	43.6	57.5	57.6	57.7	56.7	49.1	46.5	1	0
12:05:06	59.8	43.6	57.5	57.6	57.7	56.7	49.1	46.5	1	0
12:05:07	59.8	43.6	57.5	57.6	57.7	56.8	49.1	46.5	1	0
12:05:08	59.9	43.6	57.5	57.6	57.7	56.8	49.1	46.5	1	0
12:05:09	59.8	43.6	57.5	57.6	57.7	56.8	49.1	46.5	1	0
12:05:10	59.9	43.7	57.5	57.7	57.7	56.8	49.1	46.6	1	0
12:05:11	59.9	43.7	57.5	57.6	57.7	56.8	49.1	46.6	1	0
12:05:12	59.9	43.7	57.5	57.6	57.7	56.8	49.1	46.6	1	0
12:05:13	59.9	43.8	57.5	57.7	57.7	56.8	49.1	46.6	1	0
12:05:14	59.9	43.8	57.5	57.7	57.8	56.8	49.2	46.6	1	0
12:05:15	59.9	43.8	57.5	57.7	57.8	56.8	49.2	46.6	1	0
12:05:16	59.9	43.8	57.5	57.7	57.8	56.9	49.1	46.6	1	0
12:05:17	59.9	43.8	57.6	57.7	57.8	56.9	49.1	46.6	1	0
12:05:18	59.9	43.8	57.6	57.7	57.8	56.9	49.1	46.6	1	0
12:05:19	59.9	43.8	57.6	57.7	57.8	56.9	49.1	46.7	1	0
12:05:20	59.9	43.8	57.6	57.7	57.8	56.9	49.1	46.7	1	0
12:05:21	60.0	43.8	57.6	57.7	57.8	56.9	49.1	46.7	1	0
12:05:22	60.0	43.8	57.6	57.8	57.9	57.0	49.1	46.7	1	0
12:05:23	60.0	43.8	57.6	57.7	57.9	57.0	49.1	46.7	1	0
12:05:24	60.0	43.8	57.7	57.8	57.9	57.0	49.1	46.7	1	0
12:05:25	60.0	43.7	57.7	57.8	57.9	57.0	49.2	46.8	1	0

Appendix M: LabVIEW code for the geyser tests



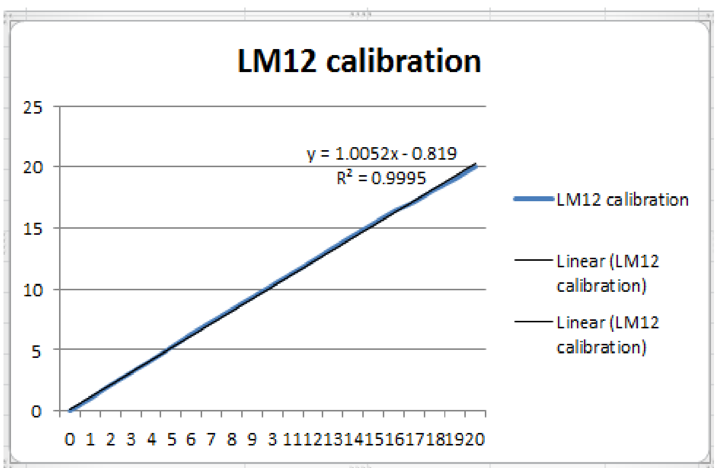


Appendix N: LabVIEW logging of data



Appendix O: LM12 Calibration

Input to DAQ Labview (A)	Output from DAQ	Current clamp (43turns) (A)	Am-meter	LEM 0V	LEM Ref	Gain	Bias	Dev	Err/FS D %	Dev	ERR/FS R %
0	0.15	0	0	2.5	0	0.1162	0.15	0	0.00	0	0.00
1	0.26	1	25	2.53	0.02	0.1162	0.15	0	0.00	1.074	5.37
2	0.38	2	48	2.56	0.05	0.1162	0.15	0	0.00	2.062	10.31
3	0.49	3.1	72	2.58	0.07	0.1162	0.15	0.1	0.50	3.093	15.47
4	0.61	4.1	96	2.61	0.1	0.1162	0.15	0.1	0.50	4.124	20.62
5	0.73	5.1	120	2.64	0.12	0.1162	0.15	0.1	0.50	5.155	25.78
6	0.84	6.1	144	2.66	0.15	0.1162	0.15	0.1	0.50	6.186	30.93
7	0.96	7.2	0.167	2.69	0.17	0.1162	0.15	0.2	1.00	0.00018	0.00
8	1.07	8.2	192	2.71	0.2	0.1162	0.15	0.2	1.00	8.248	41.24
9	1.19	9.2	215	2.74	0.23	0.1162	0.15	0.2	1.00	9.236	46.18
10	1.31	10.3	239	2.76	0.25	0.1162	0.15	0.3	1.50	10.267	51.34
11	1.43	11.3	263	2.79	0.28	0.1162	0.15	0.3	1.50	11.298	56.49
12	1.54	12.3	286	2.82	0.3	0.1162	0.15	0.3	1.50	12.286	61.43
13	1.66	13.3	308	2.84	0.33	0.1162	0.15	0.3	1.50	13.231	66.16
14	1.78	14.4	331	2.87	0.35	0.1162	0.15	0.4	2.00	14.219	71.10
15	1.89	15.2	353	2.89	0.38	0.1162	0.15	0.2	1.00	15.164	75.82
16	2.01	16.2	376	2.92	0.4	0.1162	0.15	0.2	1.00	16.152	80.76
17	2.12	17.3	399	2.94	0.43	0.1162	0.15	0.3	1.50	17.14	85.70
18	2.24	18.2	422	2.97	0.45	0.1162	0.15	0.2	1.00	18.128	90.64
19	2.36	19.3	446	2.99	0.48	0.1162	0.15	0.3	1.50	19.159	95.80
20	2.48	20.3	467	3.02	0.5	0.1162	0.15	0.3	1.50	20.061	100.31



Appendix P: Morning peak results with fixed withdrawals

Time	Emulated Power (W)	System Power (W)	Non Averaged Baseline	Averaged Baseline	Average System Power
12:39:35 PM.6 2017/01/13	24	16.8123	22.5	55	17.99183
12:40:35 PM.6 2017/01/13	24	17.7342	22.5	55	17.99183
12:41:35 PM.6 2017/01/13	24	17.7342	22.5	55	17.99183
12:42:35 PM.6 2017/01/13	24	17.7342	22.5	55	17.99183
12:43:35 PM.6 2017/01/13	24	17.7342	22.5	55	17.99183
12:44:30 PM.5 2017/01/13	24	17.1372	22.5	55	17.99183
12:45:30 PM.5 2017/01/13	24	18.0296	22.5	55	17.99183
12:46:30 PM.5 2017/01/13	24	18.0296	22.5	55	17.99183
12:47:30 PM.5 2017/01/13	24	18.0705	22.5	55	17.99183
12:48:30 PM.5 2017/01/13	24	18.3518	22.5	55	17.99183
12:49:30 PM.5 2017/01/13	24	18.3216	22.5	55	17.99183
12:50:30 PM.5 2017/01/13	24	18.6819	22.5	55	17.99183
12:51:30 PM.5 2017/01/13	24	18.0651	22.5	55	17.99183
12:52:30 PM.5 2017/01/13	24	18.5236	22.5	55	17.99183
12:53:30 PM.5 2017/01/13	24	18.6513	22.5	55	17.99183
12:54:30 PM.5 2017/01/13	24	17.857	22.5	55	17.99183
12:55:30 PM.5 2017/01/13	24	17.7066	22.5	55	17.99183
12:56:30 PM.5 2017/01/13	24	17.9564	22.5	55	17.99183
12:57:30 PM.5 2017/01/13	24	18.6966	22.5	55	17.99183
12:58:30 PM.4 2017/01/13	24	18.0087	22.5	55	17.99183
12:59:30 PM.4 2017/01/13	861	870.375	860.5	893	1113.981
01:00:30 PM.4 2017/01/13	861	2026.77	860.5	893	1113.981
01:01:30 PM.4 2017/01/13	861	2026.58	860.5	893	1113.981
01:02:30 PM.4 2017/01/13	861	2026.17	860.5	893	1113.981
01:03:30 PM.4 2017/01/13	861	2025.76	860.5	893	1113.981
01:04:30 PM.4 2017/01/13	861	2025.92	860.5	893	1113.981
01:05:30 PM.4 2017/01/13	861	2026.25	860.5	893	1113.981
01:06:30 PM.4 2017/01/13	861	2026.13	860.5	893	1113.981
01:07:30 PM.4 2017/01/13	861	2025.76	860.5	893	1113.981
01:08:30 PM.4 2017/01/13	861	2026.34	860.5	893	1113.981
01:09:30 PM.4 2017/01/13	861	870.399	860.5	893	1113.981
01:10:30 PM.4 2017/01/13	861	870.147	860.5	893	1113.981
01:11:30 PM.4 2017/01/13	861	870.7	860.5	893	1113.981
01:12:30 PM.4 2017/01/13	861	871.17	860.5	893	1113.981
01:13:30 PM.4 2017/01/13	861	870.292	860.5	893	1113.981
01:14:30 PM.4 2017/01/13	990	999.524	990.5	893	1113.981
01:15:30 PM.4 2017/01/13	990	999.692	990.5	893	1113.981

Time	Emulated Power (W)	System Power (W)	Non Averaged Baseline	Averaged Baseline	Average System Power
01:16:30 PM.4 2017/01/13	990	999.745	990.5	893	1113.981
01:17:30 PM.4 2017/01/13	990	999.228	990.5	893	1113.981
01:18:30 PM.4 2017/01/13	990	1000.24	990.5	893	1113.981
01:19:30 PM.4 2017/01/13	990	999.814	990.5	893	1113.981
01:20:30 PM.4 2017/01/13	990	999.589	990.5	893	1113.981
01:21:30 PM.4 2017/01/13	990	999.588	990.5	893	1113.981
01:22:30 PM.4 2017/01/13	990	999.563	990.5	893	1113.981
01:23:30 PM.4 2017/01/13	990	999.421	990.5	893	1113.981
01:24:30 PM.4 2017/01/13	990	1027.6	990.5	893	1113.981
01:25:30 PM.3 2017/01/13	990	999.759	990.5	893	1113.981
01:26:30 PM.3 2017/01/13	990	999.103	990.5	893	1113.981
01:27:30 PM.3 2017/01/13	990	999.713	990.5	893	1113.981
01:28:30 PM.3 2017/01/13	990	997.946	990.5	893	1113.981
01:29:30 PM.3 2017/01/13	861	867.965	860.5	893	1113.981
01:30:30 PM.3 2017/01/13	861	868.321	860.5	893	1113.981
01:31:30 PM.3 2017/01/13	861	868.017	860.5	893	1113.981
01:32:30 PM.3 2017/01/13	861	2017.63	860.5	893	1113.981
01:33:30 PM.3 2017/01/13	861	868.293	860.5	893	1113.981
01:34:30 PM.3 2017/01/13	861	868.86	860.5	893	1113.981
01:35:30 PM.3 2017/01/13	861	868.496	860.5	893	1113.981
01:36:30 PM.3 2017/01/13	861	868.061	860.5	893	1113.981
01:37:30 PM.3 2017/01/13	861	868.692	860.5	893	1113.981
01:38:30 PM.3 2017/01/13	861	867.948	860.5	893	1113.981
01:39:30 PM.3 2017/01/13	861	868.108	860.5	893	1113.981
01:40:30 PM.3 2017/01/13	861	867.352	860.5	893	1113.981
01:41:30 PM.3 2017/01/13	861	868.073	860.5	893	1113.981
01:42:30 PM.3 2017/01/13	861	868.129	860.5	893	1113.981
01:43:30 PM.3 2017/01/13	861	868.056	860.5	893	1113.981
01:44:30 PM.3 2017/01/13	861	2025.35	860.5	893	1113.981
01:45:30 PM.3 2017/01/13	861	868.116	860.5	893	1113.981
01:46:30 PM.3 2017/01/13	861	867.727	860.5	893	1113.981
01:47:30 PM.3 2017/01/13	861	868.47	860.5	893	1113.981
01:48:30 PM.3 2017/01/13	861	868.191	860.5	893	1113.981
01:49:30 PM.3 2017/01/13	861	867.887	860.5	893	1113.981
01:50:30 PM.3 2017/01/13	861	868.38	860.5	893	1113.981
01:51:30 PM.3 2017/01/13	861	867.823	860.5	893	1113.981
01:52:30 PM.2 2017/01/13	861	868.28	860.5	893	1113.981
01:53:30 PM.2 2017/01/13	861	868.289	860.5	893	1113.981
01:54:30 PM.2 2017/01/13	861	867.854	860.5	893	1113.981
01:55:30 PM.2 2017/01/13	861	870.782	860.5	893	1113.981

Time	Emulated Power (W)	System Power (W)	Non Averaged Baseline	Averaged Baseline	Average System Power
01:56:30 PM.2 2017/01/13	861	870.082	860.5	893	1113.981
01:57:30 PM.2 2017/01/13	861	870.575	860.5	893	1113.981
01:58:30 PM.2 2017/01/13	861	869.751	860.5	893	1113.981
01:59:30 PM.2 2017/01/13	2973	2984.24	2972.5	2907.5	1694.295
02:00:30 PM.2 2017/01/13	2973	2982.27	2972.5	2907.5	1694.295
02:01:30 PM.2 2017/01/13	2973	2982.15	2972.5	2907.5	1694.295
02:02:30 PM.2 2017/01/13	2973	2981.68	2972.5	2907.5	1694.295
02:03:30 PM.2 2017/01/13	2973	2981.16	2972.5	2907.5	1694.295
02:04:30 PM.2 2017/01/13	2973	2980.88	2972.5	2907.5	1694.295
02:05:30 PM.2 2017/01/13	2973	2981.08	2972.5	2907.5	1694.295
02:06:30 PM.2 2017/01/13	2973	2980.94	2972.5	2907.5	1694.295
02:07:30 PM.2 2017/01/13	2973	2980.73	2972.5	2907.5	1694.295
02:08:30 PM.2 2017/01/13	2973	2980.76	2972.5	2907.5	1694.295
02:09:30 PM.2 2017/01/13	2973	2980.76	2972.5	2907.5	1694.295
02:10:30 PM.3 2017/01/13	2973	2980.57	2972.5	2907.5	1694.295
02:11:30 PM.3 2017/01/13	2973	2980.4	2972.5	2907.5	1694.295
02:12:30 PM.3 2017/01/13	2973	2980.29	2972.5	2907.5	1694.295
02:13:30 PM.3 2017/01/13	2973	2980.35	2972.5	2907.5	1694.295
02:14:30 PM.3 2017/01/13	2843	2980.81	2842.5	2907.5	1694.295
02:15:30 PM.2 2017/01/13	2843	685.058	2842.5	2907.5	1694.295
02:16:30 PM.6 2017/01/13	2843	685.397	2842.5	2907.5	1694.295
02:17:54 PM.5 2017/01/13	2843	685.001	2842.5	2907.5	1694.295
02:18:38 PM.8 2017/01/13	2843	685.842	2842.5	2907.5	1694.295
02:19:38 PM.7 2017/01/13	2843	685.599	2842.5	2907.5	1694.295
02:20:38 PM.7 2017/01/13	2843	686.122	2842.5	2907.5	1694.295
02:21:38 PM.7 2017/01/13	2843	685.079	2842.5	2907.5	1694.295
02:22:38 PM.7 2017/01/13	2843	685.349	2842.5	2907.5	1694.295
02:23:38 PM.7 2017/01/13	2843	685.438	2842.5	2907.5	1694.295
02:24:38 PM.7 2017/01/13	2843	685.593	2842.5	2907.5	1694.295
02:25:38 PM.8 2017/01/13	2843	685.61	2842.5	2907.5	1694.295
02:26:39 PM.2 2017/01/13	2843	685.574	2842.5	2907.5	1694.295
02:27:39 PM.4 2017/01/13	2843	685.875	2842.5	2907.5	1694.295
02:28:39 PM.7 2017/01/13	2843	684.907	2842.5	2907.5	1694.295
02:29:40 PM.0 2017/01/13	2843	685.572	2842.5	2907.5	1694.295
02:30:40 PM.2 2017/01/13	2843	685.574	2842.5	2907.5	1694.295
02:31:40 PM.3 2017/01/13	2843	685.34	2842.5	2907.5	1694.295
02:32:40 PM.4 2017/01/13	2843	684.696	2842.5	2907.5	1694.295
02:33:40 PM.5 2017/01/13	2843	1841.15	2842.5	2907.5	1694.295
02:34:40 PM.6 2017/01/13	2843	1840.14	2842.5	2907.5	1694.295
02:35:40 PM.7 2017/01/13	2843	1840.43	2842.5	2907.5	1694.295

Time	Emulated Power (W)	System Power (W)	Non Averaged Baseline	Averaged Baseline	Average System Power
02:36:40 PM.7 2017/01/13	2843	1840.91	2842.5	2907.5	1694.295
02:37:40 PM.9 2017/01/13	2843	1840.57	2842.5	2907.5	1694.295
02:38:40 PM.8 2017/01/13	2843	1838.86	2842.5	2907.5	1694.295
02:39:40 PM.9 2017/01/13	2843	1838.51	2842.5	2907.5	1694.295
02:40:40 PM.9 2017/01/13	2843	1838.57	2842.5	2907.5	1694.295
02:41:40 PM.9 2017/01/13	2843	1838.59	2842.5	2907.5	1694.295
02:42:40 PM.9 2017/01/13	2843	1837.42	2842.5	2907.5	1694.295
02:43:40 PM.9 2017/01/13	2843	1838.81	2842.5	2907.5	1694.295
02:44:41 PM.0 2017/01/13	2973	2137.9	2972.5	2907.5	1694.295
02:45:41 PM.0 2017/01/13	2973	2138.2	2972.5	2907.5	1694.295
02:46:41 PM.0 2017/01/13	2973	2138.72	2972.5	2907.5	1694.295
02:47:41 PM.0 2017/01/13	2973	2138.51	2972.5	2907.5	1694.295
02:48:41 PM.0 2017/01/13	2973	2138.59	2972.5	2907.5	1694.295
02:49:41 PM.0 2017/01/13	2973	1852.68	2972.5	2907.5	1694.295
02:50:41 PM.0 2017/01/13	2973	982.389	2972.5	2907.5	1694.295
02:51:41 PM.0 2017/01/13	2973	982.811	2972.5	2907.5	1694.295
02:52:41 PM.0 2017/01/13	2973	982.232	2972.5	2907.5	1694.295
02:53:41 PM.0 2017/01/13	2973	983.116	2972.5	2907.5	1694.295
02:54:41 PM.0 2017/01/13	2973	982.532	2972.5	2907.5	1694.295
02:55:41 PM.0 2017/01/13	2973	982.125	2972.5	2907.5	1694.295
02:56:41 PM.0 2017/01/13	2973	981.734	2972.5	2907.5	1694.295
02:57:41 PM.0 2017/01/13	2973	982.755	2972.5	2907.5	1694.295
02:58:41 PM.0 2017/01/13	2973	982.765	2972.5	2907.5	1694.295
02:59:41 PM.0 2017/01/13	78	74.5257	77.5	110	491.5246
03:00:41 PM.0 2017/01/13	78	74.2881	77.5	110	491.5246
03:01:41 PM.0 2017/01/13	78	73.9085	77.5	110	491.5246
03:02:41 PM.0 2017/01/13	78	74.5375	77.5	110	491.5246
03:03:41 PM.0 2017/01/13	78	74.6211	77.5	110	491.5246
03:04:41 PM.0 2017/01/13	78	74.5104	77.5	110	491.5246
03:05:41 PM.0 2017/01/13	78	74.1311	77.5	110	491.5246
03:06:41 PM.0 2017/01/13	78	74.0007	77.5	110	491.5246
03:07:41 PM.0 2017/01/13	78	1228.93	77.5	110	491.5246
03:08:41 PM.0 2017/01/13	78	1228.63	77.5	110	491.5246
03:09:41 PM.0 2017/01/13	78	1228.91	77.5	110	491.5246
03:10:41 PM.0 2017/01/13	78	1228.1	77.5	110	491.5246
03:11:41 PM.0 2017/01/13	78	1227.79	77.5	110	491.5246
03:12:41 PM.0 2017/01/13	78	1228.48	77.5	110	491.5246
03:13:41 PM.0 2017/01/13	78	1227.18	77.5	110	491.5246
03:14:41 PM.0 2017/01/13	78	1228.88	77.5	110	491.5246
03:15:41 PM.0 2017/01/13	78	1226.19	77.5	110	491.5246

Time	Emulated Power (W)	System Power (W)	Non Averaged Baseline	Averaged Baseline	Average System Power
03:16:41 PM.0 2017/01/13	78	1227.53	77.5	110	491.5246
03:17:41 PM.0 2017/01/13	78	1227.56	77.5	110	491.5246
03:18:41 PM.0 2017/01/13	78	1227.85	77.5	110	491.5246
03:19:41 PM.0 2017/01/13	78	1227.9	77.5	110	491.5246
03:20:41 PM.0 2017/01/13	78	1228.13	77.5	110	491.5246
03:21:41 PM.0 2017/01/13	78	1227.63	77.5	110	491.5246
03:22:41 PM.0 2017/01/13	78	1227.58	77.5	110	491.5246
03:23:41 PM.1 2017/01/13	78	1228.05	77.5	110	491.5246
03:24:41 PM.1 2017/01/13	78	1227.5	77.5	110	491.5246
03:25:41 PM.1 2017/01/13	78	1227.29	77.5	110	491.5246
03:26:41 PM.1 2017/01/13	78	1227.3	77.5	110	491.5246
03:27:41 PM.1 2017/01/13	78	73.8995	77.5	110	491.5246
03:28:41 PM.1 2017/01/13	78	73.4809	77.5	110	491.5246
03:29:41 PM.1 2017/01/13	207	206.39	207.5	110	491.5246
03:30:41 PM.1 2017/01/13	207	205.396	207.5	110	491.5246
03:31:41 PM.1 2017/01/13	207	206.166	207.5	110	491.5246
03:32:41 PM.1 2017/01/13	207	205.894	207.5	110	491.5246
03:33:41 PM.1 2017/01/13	207	205.703	207.5	110	491.5246
03:34:41 PM.1 2017/01/13	207	205.844	207.5	110	491.5246
03:35:41 PM.1 2017/01/13	207	206.027	207.5	110	491.5246
03:36:41 PM.1 2017/01/13	207	206.077	207.5	110	491.5246
03:37:41 PM.1 2017/01/13	207	205.629	207.5	110	491.5246
03:38:41 PM.1 2017/01/13	207	206.451	207.5	110	491.5246
03:39:41 PM.1 2017/01/13	207	206.08	207.5	110	491.5246
03:40:41 PM.1 2017/01/13	207	205.927	207.5	110	491.5246
03:41:41 PM.1 2017/01/13	207	205.352	207.5	110	491.5246
03:42:41 PM.1 2017/01/13	207	205.404	207.5	110	491.5246
03:43:41 PM.1 2017/01/13	207	205.207	207.5	110	491.5246
03:44:41 PM.1 2017/01/13	78	73.698	77.5	110	491.5246
03:45:41 PM.2 2017/01/13	78	73.2009	77.5	110	491.5246
03:46:41 PM.2 2017/01/13	78	73.7795	77.5	110	491.5246
03:47:41 PM.2 2017/01/13	78	74.2259	77.5	110	491.5246
03:48:41 PM.1 2017/01/13	78	73.4117	77.5	110	491.5246
03:49:41 PM.1 2017/01/13	78	73.5099	77.5	110	491.5246
03:50:41 PM.1 2017/01/13	78	73.3552	77.5	110	491.5246
03:51:41 PM.1 2017/01/13	78	73.7735	77.5	110	491.5246
03:52:41 PM.1 2017/01/13	78	73.6634	77.5	110	491.5246
03:53:41 PM.1 2017/01/13	78	73.6805	77.5	110	491.5246
03:54:41 PM.1 2017/01/13	78	73.1906	77.5	110	491.5246
03:55:41 PM.1 2017/01/13	78	73.8906	77.5	110	491.5246

Time	Emulated Power (W)	System Power (W)	Non Averaged Baseline	Averaged Baseline	Average System Power
03:56:41 PM.1 2017/01/13	78	73.5474	77.5	110	491.5246
03:57:41 PM.1 2017/01/13	78	73.7215	77.5	110	491.5246
03:58:41 PM.1 2017/01/13	78	73.9684	77.5	110	491.5246
03:59:41 PM.1 2017/01/13	24	15.4221	22.5	22.5	16.96331
04:00:41 PM.1 2017/01/13	24	15.8497	22.5	55	16.96331
04:01:41 PM.1 2017/01/13	24	14.6326	22.5	55	16.96331
04:02:41 PM.2 2017/01/13	24	15.3378	22.5	55	16.96331
04:03:41 PM.1 2017/01/13	24	15.2903	22.5	55	16.96331
04:04:41 PM.1 2017/01/13	24	15.4632	22.5	55	16.96331
04:05:41 PM.2 2017/01/13	24	16.0605	22.5	55	16.96331
04:06:41 PM.2 2017/01/13	24	15.5575	22.5	55	16.96331
04:07:41 PM.2 2017/01/13	24	15.4099	22.5	55	16.96331
04:08:41 PM.2 2017/01/13	24	14.8952	22.5	55	16.96331
04:09:41 PM.2 2017/01/13	24	16.2126	22.5	55	16.96331
04:10:41 PM.2 2017/01/13	24	15.7252	22.5	55	16.96331
04:11:41 PM.2 2017/01/13	24	15.8474	22.5	55	16.96331
04:12:41 PM.2 2017/01/13	24	15.8199	22.5	55	16.96331
04:13:41 PM.2 2017/01/13	24	15.6534	22.5	55	16.96331
04:14:41 PM.2 2017/01/13	24	18.7074	22.5	55	16.96331
04:15:41 PM.2 2017/01/13	24	18.196	22.5	55	16.96331
04:16:41 PM.2 2017/01/13	24	18.3658	22.5	55	16.96331
04:17:41 PM.2 2017/01/13	24	18.1259	22.5	55	16.96331
04:18:41 PM.2 2017/01/13	24	18.5191	22.5	55	16.96331
04:19:41 PM.2 2017/01/13	24	18.0583	22.5	55	16.96331
04:20:41 PM.2 2017/01/13	24	18.2546	22.5	55	16.96331
04:21:41 PM.2 2017/01/13	24	18.364	22.5	55	16.96331
04:22:41 PM.2 2017/01/13	24	17.8738	22.5	55	16.96331
04:23:41 PM.2 2017/01/13	24	18.683	22.5	55	16.96331
04:24:41 PM.2 2017/01/13	24	18.4184	22.5	55	16.96331
04:25:41 PM.2 2017/01/13	24	18.9	22.5	55	16.96331
04:26:41 PM.2 2017/01/13	24	18.3258	22.5	55	16.96331
04:27:41 PM.2 2017/01/13	24	18.5474	22.5	55	16.96331
04:28:41 PM.2 2017/01/13	24	18.3826	22.5	55	16.96331
04:29:41 PM.2 2017/01/13	24	18.3826	22.5	87.5	1109.603
04:30:41 PM.2 2017/01/13	24	1184.01	22.5	87.5	1109.603
04:31:41 PM.2 2017/01/13	24	1183.69	22.5	87.5	1109.603
04:32:41 PM.2 2017/01/13	24	1183.64	22.5	87.5	1109.603
04:33:41 PM.2 2017/01/13	24	1182.23	22.5	87.5	1109.603
04:34:41 PM.2 2017/01/13	24	1183.21	22.5	87.5	1109.603
04:35:41 PM.2 2017/01/13	24	1183.5	22.5	87.5	1109.603

Time	Emulated Power (W)	System Power (W)	Non Averaged Baseline	Averaged Baseline	Average System Power
04:36:41 PM.2 2017/01/13	24	1182.87	22.5	87.5	1109.603
04:37:41 PM.2 2017/01/13	24	1183.97	22.5	87.5	1109.603
04:38:41 PM.2 2017/01/13	24	1183.03	22.5	87.5	1109.603
04:39:41 PM.2 2017/01/13	24	1182.88	22.5	87.5	1109.603
04:40:41 PM.2 2017/01/13	24	1182.57	22.5	87.5	1109.603
04:41:41 PM.2 2017/01/13	24	1182.51	22.5	87.5	1109.603
04:42:41 PM.2 2017/01/13	24	1182.87	22.5	87.5	1109.603
04:43:41 PM.2 2017/01/13	24	1183.02	22.5	87.5	1109.603
04:44:41 PM.2 2017/01/13	154	1312.65	22.5	87.5	1109.603
04:45:41 PM.2 2017/01/13	154	1312.11	22.5	87.5	1109.603
04:46:41 PM.2 2017/01/13	154	1312.49	22.5	87.5	1109.603
04:47:41 PM.2 2017/01/13	154	1312.78	22.5	87.5	1109.603
04:48:41 PM.2 2017/01/13	154	1311.86	22.5	87.5	1109.603
04:49:50 PM.8 2017/01/13	154	157.39	22.5	87.5	1109.603

Appendix Q: Morning peak results with no withdrawals – reduction of about 1500 W is observed

Time	Emulated Power (W)	System Power (W)	Fluke	Non Averaged Baseline	Averaged Baseline	Averaged System Power	Fluke averaged
10:15:39 AM.2 2017/01/27	24	19.0711	48.02	22.5	55	19.49278	48.016
10:16:39 AM.2 2017/01/27	24	19.5823	48.02	22.5	55	19.49278	48.016
10:17:39 AM.1 2017/01/27	24	18.9945	48.02	22.5	55	19.49278	48.016
10:18:39 AM.1 2017/01/27	24	19.7304	48.02	22.5	55	19.49278	48.016
10:19:39 AM.1 2017/01/27	24	19.4401	48.02	22.5	55	19.49278	48.016
10:20:39 AM.1 2017/01/27	24	19.61	48.02	22.5	55	19.49278	48.016
10:21:39 AM.1 2017/01/27	24	19.049	48.02	22.5	55	19.49278	48.016
10:22:39 AM.1 2017/01/27	24	19.911	48.02	22.5	55	19.49278	48.016
10:23:39 AM.1 2017/01/27	24	19.313	48.02	22.5	55	19.49278	48.016
10:24:39 AM.1 2017/01/27	24	19.6112	48.02	22.5	55	19.49278	48.016
10:25:39 AM.1 2017/01/27	24	19.9805	48.02	22.5	55	19.49278	48.016
10:26:39 AM.1 2017/01/27	24	19.9624	48.02	22.5	55	19.49278	48.016
10:27:39 AM.1 2017/01/27	24	19.2017	48.02	22.5	55	19.49278	48.016
10:28:39 AM.1 2017/01/27	24	19.4417	48.02	22.5	55	19.49278	48.016
10:29:39 AM.1 2017/01/27	861	872.566	897.9	860.5	893	1059.116	1087.878
10:30:39 AM.1 2017/01/27	861	2031.14	2064	860.5	893	1059.116	1087.878
10:31:39 AM.0 2017/01/27	861	2030.81	2064	860.5	893	1059.116	1087.878
10:32:39 AM.0 2017/01/27	861	2030.61	2064	860.5	893	1059.116	1087.878
10:33:39 AM.0 2017/01/27	861	2030.37	2064	860.5	893	1059.116	1087.878
10:34:39 AM.0 2017/01/27	861	2030.77	2064	860.5	893	1059.116	1087.878
10:35:39 AM.0 2017/01/27	861	2030.01	2064	860.5	893	1059.116	1087.878
10:36:39 AM.0 2017/01/27	861	2030.5	2064	860.5	893	1059.116	1087.878
10:37:39 AM.0 2017/01/27	861	2030.63	2064	860.5	893	1059.116	1087.878
10:38:39 AM.0 2017/01/27	861	872.566	897.9	860.5	893	1059.116	1087.878
10:39:39 AM.0 2017/01/27	861	873.111	897.9	860.5	893	1059.116	1087.878
10:40:39 AM.0 2017/01/27	861	872.792	897.9	860.5	893	1059.116	1087.878
10:41:39 AM.0 2017/01/27	861	872.73	900.6	860.5	893	1059.116	1087.878
10:42:39 AM.0 2017/01/27	861	872.667	900.6	860.5	893	1059.116	1087.878
10:43:39 AM.0 2017/01/27	861	872.667	900.6	860.5	893	1059.116	1087.878
10:44:39 AM.0 2017/01/27	990	1002.16	1029	990.5	893	1059.116	1087.878
10:45:39 AM.0 2017/01/27	990	1002.27	1029	990.5	893	1059.116	1087.878
10:46:39 AM.0 2017/01/27	990	1001.99	1029	990.5	893	1059.116	1087.878
10:47:39 AM.0 2017/01/27	990	1001.99	1029	990.5	893	1059.116	1087.878
10:48:39 AM.0 2017/01/27	990	1002.43	1029	990.5	893	1059.116	1087.878
10:49:39 AM.0 2017/01/27	990	1002.07	1029	990.5	893	1059.116	1087.878
10:50:39 AM.0 2017/01/27	990	1002.79	1029	990.5	893	1059.116	1087.878
10:51:39 AM.0 2017/01/27	990	1003.55	1029	990.5	893	1059.116	1087.878

Time	Emulated Power (W)	System Power (W)	Fluke	Non Averaged Baseline	Averaged Baseline	Averaged System Power	Fluke averaged
10:52:39 AM.0 2017/01/27	990	1002.19	1029	990.5	893	1059.116	1087.878
10:53:39 AM.0 2017/01/27	990	1002.52	1029	990.5	893	1059.116	1087.878
10:54:39 AM.0 2017/01/27	990	1002.38	1029	990.5	893	1059.116	1087.878
10:55:39 AM.0 2017/01/27	990	1002.6	1029	990.5	893	1059.116	1087.878
10:56:39 AM.0 2017/01/27	990	1002.77	1029	990.5	893	1059.116	1087.878
10:57:39 AM.0 2017/01/27	990	1002.64	1029	990.5	893	1059.116	1087.878
10:58:39 AM.0 2017/01/27	990	1001.84	1029	990.5	893	1059.116	1087.878
10:59:39 AM.0 2017/01/27	861	873.247	900.9	860.5	893	1059.116	1087.878
11:00:39 AM.0 2017/01/27	861	873.247	900.9	860.5	893	1059.116	1087.878
11:01:39 AM.1 2017/01/27	861	873.073	900.9	860.5	893	1059.116	1087.878
11:02:39 AM.1 2017/01/27	861	873.116	900.9	860.5	893	1059.116	1087.878
11:03:39 AM.1 2017/01/27	861	872.569	900.9	860.5	893	1059.116	1087.878
11:04:39 AM.1 2017/01/27	861	872.569	900.9	860.5	893	1059.116	1087.878
11:05:39 AM.1 2017/01/27	861	872.74	900.9	860.5	893	1059.116	1087.878
11:06:39 AM.1 2017/01/27	861	871.324	900.9	860.5	893	1059.116	1087.878
11:07:39 AM.1 2017/01/27	861	871.178	900.9	860.5	893	1059.116	1087.878
11:08:39 AM.1 2017/01/27	861	870.901	900.9	860.5	893	1059.116	1087.878
11:09:39 AM.1 2017/01/27	861	870.873	900.9	860.5	893	1059.116	1087.878
11:10:39 AM.1 2017/01/27	861	871.215	900.9	860.5	893	1059.116	1087.878
11:11:39 AM.1 2017/01/27	861	888.305	900.9	860.5	893	1059.116	1087.878
11:12:39 AM.1 2017/01/27	861	870.143	900.9	860.5	893	1059.116	1087.878
11:13:39 AM.1 2017/01/27	861	870.716	900.9	860.5	893	1059.116	1087.878
11:14:39 AM.1 2017/01/27	861	870.716	900.9	860.5	893	1059.116	1087.878
11:15:39 AM.1 2017/01/27	861	870.399	900.9	860.5	893	1059.116	1087.878
11:16:39 AM.1 2017/01/27	861	870.619	900.9	860.5	893	1059.116	1087.878
11:17:39 AM.1 2017/01/27	861	870.709	900.9	860.5	893	1059.116	1087.878
11:18:39 AM.1 2017/01/27	861	870.709	900.9	860.5	893	1059.116	1087.878
11:19:39 AM.1 2017/01/27	861	871.12	900.9	860.5	893	1059.116	1087.878
11:20:39 AM.1 2017/01/27	861	870.604	900.9	860.5	893	1059.116	1087.878
11:21:39 AM.1 2017/01/27	861	870.69	900.9	860.5	893	1059.116	1087.878
11:22:39 AM.1 2017/01/27	861	870.811	900.9	860.5	893	1059.116	1087.878
11:23:39 AM.1 2017/01/27	861	870.992	900.9	860.5	893	1059.116	1087.878
11:24:39 AM.1 2017/01/27	861	871.03	900.9	860.5	893	1059.116	1087.878
11:25:39 AM.1 2017/01/27	861	870.876	900.9	860.5	893	1059.116	1087.878
11:26:39 AM.1 2017/01/27	861	870.805	900.9	860.5	893	1059.116	1087.878
11:27:39 AM.1 2017/01/27	861	871.08	900.9	860.5	893	1059.116	1087.878
11:28:39 AM.1 2017/01/27	861	870.469	900.9	860.5	893	1059.116	1087.878
11:29:39 AM.1 2017/01/27	2973	2986.99	3028	2972.5	2907.5	1336.093	1371.457
11:30:39 AM.1 2017/01/27	2973	2985.66	3028	2972.5	2907.5	1336.093	1371.457
11:31:39 AM.2 2017/01/27	2973	2984.13	3028	2972.5	2907.5	1336.093	1371.457

Time	Emulated Power (W)	System Power (W)	Fluke	Non Averaged Baseline	Averaged Baseline	Averaged System Power	Fluke averaged
11:32:39 AM.1 2017/01/27	2973	2983.58	3028	2972.5	2907.5	1336.093	1371.457
11:33:39 AM.4 2017/01/27	2973	2983.56	3028	2972.5	2907.5	1336.093	1371.457
11:34:39 AM.3 2017/01/27	2973	2983.74	3028	2972.5	2907.5	1336.093	1371.457
11:35:39 AM.2 2017/01/27	2973	2983.24	3028	2972.5	2907.5	1336.093	1371.457
11:36:39 AM.1 2017/01/27	2973	2983.03	3028	2972.5	2907.5	1336.093	1371.457
11:37:39 AM.1 2017/01/27	2973	2983.33	3028	2972.5	2907.5	1336.093	1371.457
11:38:39 AM.1 2017/01/27	2973	2983.17	3028	2972.5	2907.5	1336.093	1371.457
11:39:39 AM.1 2017/01/27	2973	2982.74	3028	2972.5	2907.5	1336.093	1371.457
11:40:39 AM.1 2017/01/27	2973	2982.71	3028	2972.5	2907.5	1336.093	1371.457
11:41:39 AM.1 2017/01/27	2973	2982.67	3028	2972.5	2907.5	1336.093	1371.457
11:42:39 AM.2 2017/01/27	2973	2982.79	3028	2972.5	2907.5	1336.093	1371.457
11:43:39 AM.2 2017/01/27	2973	2982.94	3028	2972.5	2907.5	1336.093	1371.457
11:44:39 AM.2 2017/01/27	2843	686.352	720.2	2842.5	2907.5	1336.093	1371.457
11:45:39 AM.2 2017/01/27	2843	686.686	720.2	2842.5	2907.5	1336.093	1371.457
11:46:39 AM.2 2017/01/27	2843	687.271	720.2	2842.5	2907.5	1336.093	1371.457
11:47:39 AM.2 2017/01/27	2843	686.947	720.2	2842.5	2907.5	1336.093	1371.457
11:48:39 AM.2 2017/01/27	2843	686.877	720.2	2842.5	2907.5	1336.093	1371.457
11:49:39 AM.2 2017/01/27	2843	686.872	720.2	2842.5	2907.5	1336.093	1371.457
11:50:39 AM.2 2017/01/27	2843	687.02	720.2	2842.5	2907.5	1336.093	1371.457
11:51:39 AM.3 2017/01/27	2843	687.196	720.2	2842.5	2907.5	1336.093	1371.457
11:52:39 AM.2 2017/01/27	2843	687.093	720.2	2842.5	2907.5	1336.093	1371.457
11:53:39 AM.2 2017/01/27	2843	687.146	720.2	2842.5	2907.5	1336.093	1371.457
11:54:39 AM.2 2017/01/27	2843	687.786	720.2	2842.5	2907.5	1336.093	1371.457
11:55:39 AM.2 2017/01/27	2843	687.214	720.2	2842.5	2907.5	1336.093	1371.457
11:56:39 AM.2 2017/01/27	2843	687.627	720.2	2842.5	2907.5	1336.093	1371.457
11:57:39 AM.2 2017/01/27	2843	687.428	720.2	2842.5	2907.5	1336.093	1371.457
11:58:39 AM.2 2017/01/27	2843	688.074	720.2	2842.5	2907.5	1336.093	1371.457
11:59:39 AM.2 2017/01/27	2843	687.724	720.2	2842.5	2907.5	1336.093	1371.457
12:00:39 PM.2 2017/01/27	2843	687.094	720.2	2842.5	2907.5	1336.093	1371.457
12:01:39 PM.2 2017/01/27	2843	687.602	720.2	2842.5	2907.5	1336.093	1371.457
12:02:39 PM.2 2017/01/27	2843	687.22	720.2	2842.5	2907.5	1336.093	1371.457
12:03:39 PM.2 2017/01/27	2843	687.287	720.2	2842.5	2907.5	1336.093	1371.457
12:04:39 PM.2 2017/01/27	2843	686.838	720.2	2842.5	2907.5	1336.093	1371.457
12:05:39 PM.2 2017/01/27	2843	687.451	720.2	2842.5	2907.5	1336.093	1371.457
12:06:39 PM.2 2017/01/27	2843	687.493	720.2	2842.5	2907.5	1336.093	1371.457
12:07:39 PM.2 2017/01/27	2843	687.384	720.2	2842.5	2907.5	1336.093	1371.457
12:08:39 PM.2 2017/01/27	2843	687.177	720.2	2842.5	2907.5	1336.093	1371.457
12:09:39 PM.2 2017/01/27	2843	687.899	720.2	2842.5	2907.5	1336.093	1371.457
12:10:39 PM.2 2017/01/27	2843	687.734	720.2	2842.5	2907.5	1336.093	1371.457
12:11:39 PM.2 2017/01/27	2843	686.972	720.2	2842.5	2907.5	1336.093	1371.457

Time	Emulated Power (W)	System Power (W)	Fluke	Non Averaged Baseline	Averaged Baseline	Averaged System Power	Fluke averaged
12:12:39 PM.2 2017/01/27	2843	687.811	720.2	2842.5	2907.5	1336.093	1371.457
12:13:39 PM.2 2017/01/27	2843	687.584	720.2	2842.5	2907.5	1336.093	1371.457
12:14:39 PM.2 2017/01/27	2973	986.331	1017	2972.5	2907.5	1336.093	1371.457
12:15:39 PM.3 2017/01/27	2973	985.455	1017	2972.5	2907.5	1336.093	1371.457
12:16:39 PM.2 2017/01/27	2973	985.661	1017	2972.5	2907.5	1336.093	1371.457
12:17:39 PM.2 2017/01/27	2973	986.496	1017	2972.5	2907.5	1336.093	1371.457
12:18:39 PM.2 2017/01/27	2973	986.4	1017	2972.5	2907.5	1336.093	1371.457
12:19:39 PM.2 2017/01/27	2973	986.88	1017	2972.5	2907.5	1336.093	1371.457
12:20:39 PM.2 2017/01/27	2973	986.302	1017	2972.5	2907.5	1336.093	1371.457
12:21:39 PM.2 2017/01/27	2973	986.72	1017	2972.5	2907.5	1336.093	1371.457
12:22:39 PM.2 2017/01/27	2973	985.926	1017	2972.5	2907.5	1336.093	1371.457
12:23:39 PM.2 2017/01/27	2973	985.795	1017	2972.5	2907.5	1336.093	1371.457
12:24:39 PM.2 2017/01/27	2973	986.354	1017	2972.5	2907.5	1336.093	1371.457
12:25:39 PM.3 2017/01/27	2973	985.85	1017	2972.5	2907.5	1336.093	1371.457
12:26:39 PM.3 2017/01/27	2973	985.884	1017	2972.5	2907.5	1336.093	1371.457
12:27:39 PM.3 2017/01/27	2973	985.684	1017	2972.5	2907.5	1336.093	1371.457
12:28:39 PM.3 2017/01/27	2973	986.676	1017	2972.5	2907.5	1336.093	1371.457
12:29:39 PM.3 2017/01/27	78	76.3196	108	77.5	110	109.551	141.047
12:30:39 PM.2 2017/01/27	78	76.4018	108	77.5	110	109.551	141.047
12:31:39 PM.2 2017/01/27	78	76.5715	108	77.5	110	109.551	141.047
12:32:39 PM.2 2017/01/27	78	76.8422	108	77.5	110	109.551	141.047
12:33:39 PM.2 2017/01/27	78	76.6863	108	77.5	110	109.551	141.047
12:34:39 PM.1 2017/01/27	78	76.4449	108	77.5	110	109.551	141.047
12:35:39 PM.1 2017/01/27	78	76.6145	108	77.5	110	109.551	141.047
12:36:39 PM.1 2017/01/27	78	77.5135	108	77.5	110	109.551	141.047
12:37:39 PM.1 2017/01/27	78	77.0146	108	77.5	110	109.551	141.047
12:38:39 PM.1 2017/01/27	78	77.3847	108	77.5	110	109.551	141.047
12:39:39 PM.1 2017/01/27	78	76.958	108	77.5	110	109.551	141.047
12:40:39 PM.1 2017/01/27	78	76.3239	108	77.5	110	109.551	141.047
12:41:39 PM.1 2017/01/27	78	76.9177	108	77.5	110	109.551	141.047
12:42:39 PM.1 2017/01/27	78	76.9074	108	77.5	110	109.551	141.047
12:43:39 PM.1 2017/01/27	78	76.8362	108	77.5	110	109.551	141.047
12:44:39 PM.1 2017/01/27	78	76.9393	108	77.5	110	109.551	141.047
12:45:39 PM.0 2017/01/27	78	77.2539	108	77.5	110	109.551	141.047
12:46:39 PM.0 2017/01/27	78	77.2419	108	77.5	110	109.551	141.047
12:47:39 PM.0 2017/01/27	78	75.9133	108	77.5	110	109.551	141.047
12:48:39 PM.0 2017/01/27	78	76.5407	108	77.5	110	109.551	141.047
12:49:39 PM.0 2017/01/27	78	76.5485	108	77.5	110	109.551	141.047
12:50:39 PM.0 2017/01/27	78	76.8887	108	77.5	110	109.551	141.047
12:51:39 PM.0 2017/01/27	78	76.5223	108	77.5	110	109.551	141.047

Time	Emulated Power (W)	System Power (W)	Fluke	Non Averaged Baseline	Averaged Baseline	Averaged System Power	Fluke averaged
12:52:39 PM.0 2017/01/27	78	76.7306	108	77.5	110	109.551	141.047
12:53:39 PM.0 2017/01/27	78	76.838	108	77.5	110	109.551	141.047
12:54:39 PM.0 2017/01/27	78	76.9475	108	77.5	110	109.551	141.047
12:55:39 PM.0 2017/01/27	78	76.9943	108	77.5	110	109.551	141.047
12:56:39 PM.0 2017/01/27	78	76.6106	108	77.5	110	109.551	141.047
12:57:39 PM.0 2017/01/27	78	76.6114	108	77.5	110	109.551	141.047
12:58:39 PM.0 2017/01/27	78	76.6229	108	77.5	110	109.551	141.047
12:59:39 PM.0 2017/01/27	24	208.805	240.1	22.5	110	109.551	141.047
01:00:39 PM.0 2017/01/27	24	209.097	240.1	22.5	110	109.551	141.047
01:01:39 PM.0 2017/01/27	24	208.328	240.1	22.5	110	109.551	141.047
01:02:39 PM.0 2017/01/27	24	208.304	240.1	22.5	110	109.551	141.047
01:03:39 PM.0 2017/01/27	24	209.216	240.1	22.5	110	109.551	141.047
01:04:39 PM.0 2017/01/27	24	209.27	240.1	22.5	110	109.551	141.047
01:05:39 PM.0 2017/01/27	24	209.394	240.1	22.5	110	109.551	141.047
01:06:39 PM.0 2017/01/27	24	208.344	240.1	22.5	110	109.551	141.047
01:07:39 PM.0 2017/01/27	24	208.84	240.1	22.5	110	109.551	141.047
01:08:39 PM.0 2017/01/27	24	208.321	240.1	22.5	110	109.551	141.047
01:09:39 PM.0 2017/01/27	24	208.351	240.1	22.5	110	109.551	141.047
01:10:39 PM.0 2017/01/27	24	208.35	240.1	22.5	110	109.551	141.047
01:11:39 PM.0 2017/01/27	24	208.697	240.1	22.5	110	109.551	141.047
01:12:39 PM.0 2017/01/27	24	207.413	240.1	22.5	110	109.551	141.047
01:13:39 PM.0 2017/01/27	24	208.143	240.1	22.5	110	109.551	141.047
01:14:39 PM.0 2017/01/27	78	76.4874	108	77.5	110	109.551	141.047
01:15:39 PM.0 2017/01/27	78	76.4706	108	77.5	110	109.551	141.047
01:16:39 PM.0 2017/01/27	78	75.9909	108	77.5	110	109.551	141.047
01:17:39 PM.0 2017/01/27	78	75.7328	108	77.5	110	109.551	141.047
01:18:39 PM.0 2017/01/27	78	75.8395	108	77.5	110	109.551	141.047
01:19:39 PM.1 2017/01/27	78	76.7884	108	77.5	110	109.551	141.047
01:20:39 PM.0 2017/01/27	78	76.3103	108	77.5	110	109.551	141.047
01:21:39 PM.0 2017/01/27	78	75.6457	108	77.5	110	109.551	141.047
01:22:39 PM.0 2017/01/27	78	76.1911	108	77.5	110	109.551	141.047
01:23:39 PM.0 2017/01/27	78	76.0647	108	77.5	110	109.551	141.047
01:24:39 PM.0 2017/01/27	78	76.1193	108	77.5	110	109.551	141.047
01:25:39 PM.1 2017/01/27	78	76.1306	108	77.5	110	109.551	141.047
01:26:39 PM.1 2017/01/27	78	75.9394	108	77.5	110	109.551	141.047
01:27:39 PM.1 2017/01/27	78	75.6444	108	77.5	110	109.551	141.047
01:28:39 PM.1 2017/01/27	78	75.8907	108	77.5	110	109.551	141.047
01:29:39 PM.1 2017/01/27	24	18.5989	57.02	22.5	55	51.88123	90.58951
01:30:39 PM.1 2017/01/27	24	18.3816	57.02	22.5	55	51.88123	90.58951
01:31:39 PM.1 2017/01/27	24	18.2391	57.02	22.5	55	51.88123	90.58951

Time	Emulated Power (W)	System Power (W)	Fluke	Non Averaged Baseline	Averaged Baseline	Averaged System Power	Fluke averaged
01:32:39 PM.1 2017/01/27	24	18.1864	57.02	22.5	55	51.88123	90.58951
01:33:39 PM.1 2017/01/27	24	18.5323	57.02	22.5	55	51.88123	90.58951
01:34:39 PM.1 2017/01/27	24	18.1696	57.02	22.5	55	51.88123	90.58951
01:35:39 PM.1 2017/01/27	24	18.3425	57.02	22.5	55	51.88123	90.58951
01:36:39 PM.1 2017/01/27	24	18.4142	57.02	22.5	55	51.88123	90.58951
01:37:39 PM.1 2017/01/27	24	18.6388	57.02	22.5	55	51.88123	90.58951
01:38:39 PM.1 2017/01/27	24	18.2912	57.02	22.5	55	51.88123	90.58951
01:39:39 PM.1 2017/01/27	24	18.5277	57.02	22.5	55	51.88123	90.58951
01:40:39 PM.1 2017/01/27	24	18.4705	57.02	22.5	55	51.88123	90.58951
01:41:39 PM.1 2017/01/27	24	18.1414	57.02	22.5	55	51.88123	90.58951
01:42:39 PM.1 2017/01/27	24	18.614	57.02	22.5	55	51.88123	90.58951
01:43:39 PM.1 2017/01/27	24	18.8476	57.02	22.5	55	51.88123	90.58951
01:44:39 PM.1 2017/01/27	153	150.707	189.1	152.5	55	51.88123	90.58951
01:45:39 PM.1 2017/01/27	153	150.268	189.1	152.5	55	51.88123	90.58951
01:46:39 PM.1 2017/01/27	153	151.075	189.1	152.5	55	51.88123	90.58951
01:47:39 PM.1 2017/01/27	153	150.961	189.1	152.5	55	51.88123	90.58951
01:48:39 PM.1 2017/01/27	153	150.371	189.1	152.5	55	51.88123	90.58951
01:49:39 PM.1 2017/01/27	153	150.905	189.1	152.5	55	51.88123	90.58951
01:50:39 PM.1 2017/01/27	153	150.42	189.1	152.5	55	51.88123	90.58951
01:51:39 PM.1 2017/01/27	153	150.916	189.1	152.5	55	51.88123	90.58951
01:52:39 PM.1 2017/01/27	153	151.169	189.1	152.5	55	51.88123	90.58951
01:53:39 PM.1 2017/01/27	153	150.675	189.1	152.5	55	51.88123	90.58951
01:54:39 PM.1 2017/01/27	153	151.023	189.1	152.5	55	51.88123	90.58951
01:55:39 PM.1 2017/01/27	153	150.722	189.1	152.5	55	51.88123	90.58951
01:56:39 PM.1 2017/01/27	153	150.646	189.1	152.5	55	51.88123	90.58951
01:57:39 PM.1 2017/01/27	153	149.908	189.1	152.5	55	51.88123	90.58951
01:58:39 PM.1 2017/01/27	153	151.029	189.1	152.5	55	51.88123	90.58951
01:59:39 PM.1 2017/01/27	24	18.5337	57.02	22.5	87.5	51.88123	90.58951
02:00:39 PM.1 2017/01/27	24	18.3392	57.02	22.5	87.5	51.88123	90.58951
02:01:39 PM.2 2017/01/27	24	18.5866	57.02	22.5	87.5	51.88123	90.58951
02:02:39 PM.1 2017/01/27	24	18.5307	57.02	22.5	87.5	51.88123	90.58951
02:03:39 PM.1 2017/01/27	24	18.5798	57.02	22.5	87.5	51.88123	90.58951
02:04:39 PM.1 2017/01/27	24	18.5101	57.02	22.5	87.5	51.88123	90.58951
02:05:39 PM.1 2017/01/27	24	18.2046	57.02	22.5	87.5	51.88123	90.58951
02:06:39 PM.1 2017/01/27	24	18.3804	57.02	22.5	87.5	51.88123	90.58951
02:07:39 PM.1 2017/01/27	24	18.4732	57.02	22.5	87.5	51.88123	90.58951
02:08:39 PM.2 2017/01/27	24	18.8736	57.02	22.5	87.5	51.88123	90.58951
02:09:39 PM.2 2017/01/27	24	18.0146	57.02	22.5	87.5	51.88123	90.58951
02:10:39 PM.2 2017/01/27	24	17.3146	57.02	22.5	87.5	51.88123	90.58951
02:11:39 PM.2 2017/01/27	24	17.3146	57.02	22.5	87.5	51.88123	90.58951

Time	Emulated Power (W)	System Power (W)	Fluke	Non Averaged Baseline	Averaged Baseline	Averaged System Power	Fluke averaged
02:12:39 PM.2 2017/01/27	24	17.2988	57.02	22.5	87.5	51.88123	90.58951
02:13:39 PM.2 2017/01/27	24	17.4763	57.02	22.5	87.5	51.88123	90.58951
02:14:39 PM.2 2017/01/27	24	17.7336	57.02	22.5	87.5	51.88123	90.58951
02:15:39 PM.2 2017/01/27	24	17.6892	57.02	22.5	87.5	51.88123	90.58951
02:16:39 PM.2 2017/01/27	24	18.0966	57.02	22.5	87.5	51.88123	90.58951
02:17:39 PM.2 2017/01/27	24	17.9656	57.02	22.5	87.5	51.88123	90.58951
02:18:39 PM.2 2017/01/27	24	17.9994	57.02	22.5	87.5	51.88123	90.58951
02:19:39 PM.2 2017/01/27	24	17.9785	57.02	22.5	87.5	51.88123	90.58951
02:20:39 PM.2 2017/01/27	24	18.2952	57.02	22.5	87.5	51.88123	90.58951
02:21:39 PM.2 2017/01/27	24	18.0777	57.02	22.5	87.5	51.88123	90.58951
02:22:39 PM.2 2017/01/27	24	18.0211	57.02	22.5	87.5	51.88123	90.58951
02:23:39 PM.2 2017/01/27	24	17.6898	57.02	22.5	87.5	51.88123	90.58951
02:24:39 PM.2 2017/01/27	24	17.812	57.02	22.5	87.5	51.88123	90.58951
02:25:39 PM.2 2017/01/27	24	18.091	57.02	22.5	87.5	51.88123	90.58951
02:26:39 PM.2 2017/01/27	24	17.8612	57.02	22.5	87.5	51.88123	90.58951
02:27:39 PM.2 2017/01/27	24	18.0601	57.02	22.5	87.5	51.88123	90.58951
02:28:39 PM.2 2017/01/27	24	17.9249	57.02	152.5	87.5	1007.897	1049.686
02:29:39 PM.2 2017/01/27	153	150.834	57.02	152.5	87.5	1007.897	1049.686
02:30:39 PM.2 2017/01/27	153	1306.13	1357	152.5	87.5	1007.897	1049.686
02:31:39 PM.2 2017/01/27	153	1305.91	1357	152.5	87.5	1007.897	1049.686
02:32:39 PM.2 2017/01/27	153	1305.83	1357	152.5	87.5	1007.897	1049.686
02:33:39 PM.2 2017/01/27	153	1305.93	1357	152.5	87.5	1007.897	1049.686
02:34:39 PM.2 2017/01/27	153	1305.48	1357	152.5	87.5	1007.897	1049.686
02:35:39 PM.2 2017/01/27	153	1306.07	1357	152.5	87.5	1007.897	1049.686
02:36:39 PM.2 2017/01/27	153	1306.23	1357	152.5	87.5	1007.897	1049.686
02:37:39 PM.2 2017/01/27	153	1305.76	1357	152.5	87.5	1007.897	1049.686
02:38:39 PM.2 2017/01/27	153	1305.69	1357	152.5	87.5	1007.897	1049.686
02:39:39 PM.2 2017/01/27	153	1306.01	1357	152.5	87.5	1007.897	1049.686
02:40:39 PM.2 2017/01/27	153	1302.42	1357	152.5	87.5	1007.897	1049.686
02:41:39 PM.2 2017/01/27	153	1302.72	1357	152.5	87.5	1007.897	1049.686
02:42:39 PM.2 2017/01/27	153	146.668	196.9	152.5	87.5	1007.897	1049.686
02:43:39 PM.2 2017/01/27	153	146.749	196.9	152.5	87.5	1007.897	1049.686

Appendix R: Morning peak results with random withdrawals

Time	Emulated Power (W)	System Power (W)	Non Averaged Baseline	Averaged Baseline	Averaged System Power
02:57:55 PM.7 2017/01/19	24	1173.28	22.5	55	349.725
02:58:55 PM.7 2017/01/19	24	1173.59	22.5	55	349.725
02:59:55 PM.7 2017/01/19	24	1173.94	22.5	55	349.725
03:00:55 PM.7 2017/01/19	24	1172.79	22.5	55	349.725
03:01:55 PM.7 2017/01/19	24	17.0009	22.5	55	349.725
03:02:55 PM.7 2017/01/19	24	20.7155	22.5	55	349.725
03:03:55 PM.6 2017/01/19	24	20.6118	22.5	55	349.725
03:04:55 PM.6 2017/01/19	24	20.2804	22.5	55	349.725
03:05:55 PM.6 2017/01/19	24	20.8732	22.5	55	349.725
03:06:55 PM.6 2017/01/19	24	20.3724	22.5	55	349.725
03:07:55 PM.7 2017/01/19	24	20.1792	22.5	55	349.725
03:08:55 PM.7 2017/01/19	24	20.8248	22.5	55	349.725
03:09:55 PM.7 2017/01/19	24	20.8211	22.5	55	349.725
03:10:55 PM.7 2017/01/19	24	20.8768	22.5	55	349.725
03:11:55 PM.7 2017/01/19	861	871.957	860.5	893	1980.22
03:12:55 PM.7 2017/01/19	861	2030.39	860.5	893	1980.22
03:13:55 PM.7 2017/01/19	861	2030.58	860.5	893	1980.22
03:14:55 PM.7 2017/01/19	861	872.497	860.5	893	1980.22
03:15:55 PM.7 2017/01/19	861	872.118	860.5	893	1980.22
03:16:55 PM.7 2017/01/19	861	872.461	860.5	893	1980.22
03:17:55 PM.7 2017/01/19	861	2030.86	860.5	893	1980.22
03:18:55 PM.7 2017/01/19	861	2031.02	860.5	893	1980.22
03:19:55 PM.7 2017/01/19	861	2030.37	860.5	893	1980.22
03:20:55 PM.7 2017/01/19	861	2030.6	860.5	893	1980.22
03:21:55 PM.7 2017/01/19	861	2029.53	860.5	893	1980.22
03:22:55 PM.7 2017/01/19	861	2030.19	860.5	893	1980.22
03:23:55 PM.7 2017/01/19	861	2029.64	860.5	893	1980.22
03:24:55 PM.7 2017/01/19	861	2029.77	860.5	893	1980.22
03:25:55 PM.7 2017/01/19	861	2030.05	860.5	893	1980.22
03:26:55 PM.7 2017/01/19	990	2159.36	990.5	893	1980.22
03:27:55 PM.7 2017/01/19	990	2154.8	990.5	893	1980.22
03:28:55 PM.7 2017/01/19	990	2153.41	990.5	893	1980.22
03:29:55 PM.7 2017/01/19	990	2152.76	990.5	893	1980.22
03:30:55 PM.7 2017/01/19	990	2152.23	990.5	893	1980.22
03:31:55 PM.7 2017/01/19	990	2152.44	990.5	893	1980.22
03:32:55 PM.7 2017/01/19	990	2151.9	990.5	893	1980.22
03:33:55 PM.8 2017/01/19	990	2152.01	990.5	893	1980.22

Time	Emulated Power (W)	System Power (W)	Non Averaged Baseline	Averaged Baseline	Averaged System Power
03:34:55 PM.7 2017/01/19	990	2152.1	990.5	893	1980.22
03:35:55 PM.7 2017/01/19	990	2153.06	990.5	893	1980.22
03:36:55 PM.7 2017/01/19	990	2152.85	990.5	893	1980.22
03:37:55 PM.7 2017/01/19	990	2153.01	990.5	893	1980.22
03:38:55 PM.7 2017/01/19	990	2153.02	990.5	893	1980.22
03:39:55 PM.7 2017/01/19	990	2152.81	990.5	893	1980.22
03:40:55 PM.7 2017/01/19	990	2152.59	990.5	893	1980.22
03:41:55 PM.7 2017/01/19	861	2022.54	860.5	893	1980.22
03:42:55 PM.7 2017/01/19	861	2023.67	860.5	893	1980.22
03:43:55 PM.7 2017/01/19	861	2023.15	860.5	893	1980.22
03:44:55 PM.8 2017/01/19	861	2022.5	860.5	893	1980.22
03:45:55 PM.8 2017/01/19	861	2023.03	860.5	893	1980.22
03:46:55 PM.8 2017/01/19	861	2022.86	860.5	893	1980.22
03:47:55 PM.8 2017/01/19	861	2022.8	860.5	893	1980.22
03:48:55 PM.8 2017/01/19	861	2022.99	860.5	893	1980.22
03:49:55 PM.8 2017/01/19	861	2022.42	860.5	893	1980.22
03:50:55 PM.8 2017/01/19	861	2023.2	860.5	893	1980.22
03:51:55 PM.8 2017/01/19	861	2022.51	860.5	893	1980.22
03:52:55 PM.8 2017/01/19	861	2023.54	860.5	893	1980.22
03:53:55 PM.8 2017/01/19	861	2023.28	860.5	893	1980.22
03:54:55 PM.8 2017/01/19	861	2023.71	860.5	893	1980.22
03:55:55 PM.8 2017/01/19	861	2023.95	860.5	893	1980.22
03:56:55 PM.8 2017/01/19	861	2023.5	860.5	893	1980.22
03:57:55 PM.8 2017/01/19	861	2023.45	860.5	893	1980.22
03:58:55 PM.8 2017/01/19	861	2023.5	860.5	893	1980.22
03:59:55 PM.8 2017/01/19	861	2022.93	860.5	893	1980.22
04:00:55 PM.8 2017/01/19	861	2023.39	860.5	893	1980.22
04:01:55 PM.8 2017/01/19	861	2023.18	860.5	893	1980.22
04:02:55 PM.7 2017/01/19	861	2023.38	860.5	893	1980.22
04:03:55 PM.7 2017/01/19	861	2023.04	860.5	893	1980.22
04:04:55 PM.7 2017/01/19	861	2023.55	860.5	893	1980.22
04:05:55 PM.7 2017/01/19	861	2023.4	860.5	893	1980.22
04:06:55 PM.7 2017/01/19	861	2022.82	860.5	893	1980.22
04:07:55 PM.7 2017/01/19	861	2022.17	860.5	893	1980.22
04:08:55 PM.7 2017/01/19	861	2022.7	860.5	893	1980.22
04:09:55 PM.7 2017/01/19	861	2023.24	860.5	893	1980.22
04:11:26 PM.9 2017/01/19	861	2022.63	860.5	893	1980.22
04:11:59 PM.7 2017/01/19	2973	4139.38	2972.5	2907.5	3602.3
04:12:59 PM.7 2017/01/19	2973	4137.15	2972.5	2907.5	3602.3
04:13:59 PM.7 2017/01/19	2973	4137.22	2972.5	2907.5	3602.3

Time	Emulated Power (W)	System Power (W)	Non Averaged Baseline	Averaged Baseline	Averaged System Power
04:14:59 PM.7 2017/01/19	2973	4135.98	2972.5	2907.5	3602.3
04:15:59 PM.7 2017/01/19	2973	4135.63	2972.5	2907.5	3602.3
04:16:59 PM.6 2017/01/19	2973	4135.05	2972.5	2907.5	3602.3
04:17:59 PM.7 2017/01/19	2973	4134.83	2972.5	2907.5	3602.3
04:18:59 PM.6 2017/01/19	2973	2979.35	2972.5	2907.5	3602.3
04:19:59 PM.6 2017/01/19	2973	2979.12	2972.5	2907.5	3602.3
04:20:59 PM.7 2017/01/19	2973	2979.34	2972.5	2907.5	3602.3
04:21:59 PM.6 2017/01/19	2973	2978.23	2972.5	2907.5	3602.3
04:22:59 PM.7 2017/01/19	2973	2979.61	2972.5	2907.5	3602.3
04:24:01 PM.9 2017/01/19	2973	2979.05	2972.5	2907.5	3602.3

Appendix S: Simulated load profile with kettle - Baseline

Time	Simulated Power (W)	System Power (W)	Geyser Temperature (Degrees Celsius)	Water Valve	Time (Sync with Arduino)
46:15.4	135	128.884	57.4179	0	4.92
47:15.4	135	128.804	57.4118	0	4.92
48:15.4	135	129.089	57.4026	0	4.92
49:15.4	135	129.372	57.3422	0	4.92
50:15.4	135	128.77	57.3163	0	4.92
51:15.4	135	128.742	57.3144	0	4.92
52:15.4	135	128.98	57.2834	0	4.92
53:15.4	135	129.331	57.3167	0	4.92
54:15.4	135	129.079	57.2188	0	4.92
55:15.4	135	128.326	57.1855	0	4.92
56:15.4	135	128.563	57.135	0	4.92
57:15.4	135	128.696	57.1162	0	4.92
58:15.4	135	128.535	57.138	0	4.92
59:15.4	135	128.775	57.1215	0	4.92
00:15.4	135	129.386	56.946	0	4.92
01:15.4	135	128.361	57.0086	0	4.92
02:15.4	135	128.246	57.0884	0	4.92
03:15.4	135	129.17	56.9742	0	4.92
04:15.4	135	128.212	56.9169	0	4.92
05:15.4	135	128.866	56.9221	0	4.92
06:15.4	135	128.828	56.9154	0	4.92
07:15.4	135	129.391	56.8814	0	4.92
08:15.4	135	128.159	56.7991	0	4.92
09:15.4	135	128.443	56.8347	0	4.92
10:15.4	135	129.144	56.7665	0	4.92
11:15.4	135	128.454	56.8592	0	4.92
12:15.4	135	128.553	56.7926	0	4.92
13:15.4	135	128.859	56.7331	0	4.92
14:15.4	135	128.496	56.732	0	4.92
15:15.4	267	264.824	56.6715	0	4.92
16:15.4	267	264.864	56.6321	0	4.92
17:15.4	267	264.708	56.6152	0	4.92
18:15.4	267	265.427	56.6125	0	4.92

Time	Simulated Power (W)	System Power (W)	Geyser Temperature (Degrees Celsius)	Water Valve	Time (Sync with Arduino)
19:15.4	267	268.382	56.5544	0	4.92
20:15.4	267	268.221	56.5371	0	4.92
21:15.4	267	268.067	56.5167	0	4.92
22:15.4	267	267.761	56.4814	0	4.92
23:15.4	267	268.011	56.461	0	4.92
24:15.4	267	267.418	56.4562	0	4.92
25:15.4	267	267.776	56.443	0	4.92
26:15.4	267	268.126	56.3724	0	4.92
27:15.4	267	268.577	56.3772	0	4.92
28:15.4	267	268.011	56.3185	0	4.92
29:15.4	267	267.651	56.2794	0	4.92
30:15.4	135	131.849	56.2834	0	4.92
31:15.4	135	132.242	56.2842	0	4.92
32:15.5	135	131.926	56.2137	0	4.92
33:15.5	135	131.366	56.2496	0	4.92
34:15.5	135	131.569	56.161	0	4.92
35:15.5	135	131.838	56.1701	0	4.92
36:15.5	135	131.273	56.1208	0	4.92
37:15.5	135	131.948	56.1039	0	4.92
38:15.5	135	132.182	56.0765	0	4.92
39:15.5	135	131.612	56.0749	0	4.92
40:15.5	135	131.706	56.0404	0	4.92
41:15.5	135	131.765	56.0499	0	4.92
42:15.5	135	131.71	56.0351	0	4.92
43:15.5	135	131.672	56.0079	0	4.92
44:15.5	135	132.064	55.9591	0	4.92
45:15.5	192	190.121	55.9246	0	5
46:15.5	192	189.465	55.8835	0	5
47:15.5	192	189.682	55.8588	0	5
48:15.5	192	189.35	55.8289	0	5
49:15.5	192	189.679	55.8307	0	5
50:15.5	192	189.815	55.813	0	5
51:15.5	192	189.411	55.7649	0	5
52:15.5	192	189.322	55.7249	0	5
53:15.5	192	189.414	55.6855	0	5
54:15.5	192	189.526	55.6788	0	5
55:15.5	192	189.131	55.6254	0	5

Time	Simulated Power (W)	System Power (W)	Geyser Temperature (Degrees Celsius)	Water Valve	Time (Sync with Arduino)
56:15.5	**192**	**189.394**	**55.6285**	**0**	**5**
57:15.5	**192**	**189.128**	**55.5731**	**0**	**5**
58:15.5	**192**	**189.463**	**55.5509**	**0**	**5**
59:15.5	**192**	**189.089**	**55.5395**	**0**	**5**
00:15.5	**321**	**322.52**	**55.4603**	**0**	**5**
01:15.5	**321**	**322.815**	**55.4892**	**0**	**5**
02:15.5	**321**	**322.998**	**55.5009**	**0**	**5**
03:15.5	**321**	**322.986**	**55.4364**	**0**	**5**
04:15.5	**321**	**322.746**	**55.4202**	**0**	**5**
05:15.5	**321**	**323.226**	**55.3943**	**0**	**5**
06:15.5	**321**	**322.897**	**55.3269**	**0**	**5**
07:15.5	**321**	**323.281**	**55.337**	**0**	**5**
08:15.5	**321**	**323.043**	**55.3411**	**0**	**5**
09:15.5	**321**	**323.267**	**55.2955**	**0**	**5**
10:15.5	**321**	**323.145**	**55.252**	**0**	**5**
11:15.5	**321**	**322.727**	**55.2236**	**0**	**5**
12:15.5	**321**	**322.971**	**55.2291**	**0**	**5**
13:15.5	**321**	**322.159**	**55.1527**	**0**	**5**
14:15.5	**321**	**322.624**	**55.1354**	**0**	**5**
15:15.5	**192**	**189.369**	**55.0724**	**0**	**5**
16:15.5	**192**	**189.401**	**55.0867**	**0**	**5**
17:15.5	**192**	**189.503**	**55.0591**	**0**	**5**
18:15.5	**192**	**188.456**	**55.0642**	**0**	**5**
19:15.5	**192**	**189.081**	**55.0287**	**0**	**5**
20:15.5	**192**	**189.158**	**54.9805**	**0**	**5**
21:15.5	**192**	**189.311**	**54.957**	**0**	**5**
22:15.5	**192**	**188.946**	**54.9861**	**0**	**5**
23:15.5	**192**	**189.102**	**54.9291**	**0**	**5**
24:15.5	**192**	**188.968**	**54.9445**	**0**	**5**
25:15.5	**192**	**189.862**	**54.8909**	**0**	**5**
26:15.5	**192**	**188.598**	**54.8434**	**0**	**5**
27:15.5	**192**	**189.24**	**54.8544**	**0**	**5**
28:15.5	**192**	**189.607**	**54.807**	**0**	**5**
29:15.5	**192**	**189.639**	**54.7663**	**0**	**5**
30:15.5	**192**	**189.172**	**54.7473**	**0**	**5**
31:15.5	**192**	**188.918**	**54.7297**	**0**	**5**
32:15.5	**192**	**189.148**	**54.7273**	**0**	**5**

Time	Simulated Power (W)	System Power (W)	Geyser Temperature (Degrees Celsius)	Water Valve	Time (Sync with Arduino)
33:15.5	192	188.832	54.7207	0	5
34:15.5	192	188.422	54.7673	0	5
35:15.5	192	189.138	54.7981	0	5
36:15.5	192	189.017	54.7648	0	5
37:15.5	192	188.923	54.8456	0	5
38:15.5	192	188.723	54.8504	0	5
39:15.5	192	188.387	54.7474	0	5
40:15.5	192	189.112	54.763	0	5
41:15.5	192	188.76	54.7678	0	5
42:15.5	192	188.487	54.7569	0	5
43:15.5	192	188.982	54.7194	0	5
44:15.6	192	188.951	54.6844	0	5
45:15.6	2322	2319.11	54.5558	0	4.08
46:15.5	2322	2318.67	54.5417	0	4.08
47:15.5	2322	2318.43	54.4659	0	4.08
48:15.5	2322	2318.22	54.4663	0	4.08
49:15.5	2322	2317.92	54.4133	0	4.08
50:15.5	2322	2317.8	54.3964	0	4.08
51:15.5	2322	2317.42	54.3699	0	4.08
52:15.5	2322	2317.44	54.2988	0	4.08
53:15.5	2322	2317.79	54.2615	0	4.08
54:15.5	2322	2317.82	54.2431	0	4.08
55:15.5	2322	2317.55	54.2601	0	4.08
56:15.5	2322	2317.5	54.2196	0	4.08
57:15.5	2322	2317.48	54.2088	0	4.08
58:15.5	2322	2317.25	54.1538	0	4.08
59:15.5	2322	2317.45	54.1541	0	4.08
00:15.5	2190	2187.33	54.0838	0	4.08
01:15.5	2190	2186.98	54.101	0	4.08
02:15.5	2190	2187.69	54.0728	0	4.08
03:15.5	2190	2187.58	53.963	0	4.08
04:15.5	2190	2187.36	53.975	0	4.08
05:15.5	2190	2187.08	53.9758	0	4.08
06:15.5	2190	2187.59	53.9214	0	4.08
07:15.5	2190	2188.21	53.8785	0	4.08
08:15.5	2190	2187.91	53.867	0	4.08
09:15.5	2190	2187.92	53.9018	0	4.08

Time	Simulated Power (W)	System Power (W)	Geyser Temperature (Degrees Celsius)	Water Valve	Time (Sync with Arduino)
10:15.5	**2190**	**2187.9**	**53.873**	**0**	**4.08**
11:15.5	**2190**	**2187.72**	**53.8135**	**0**	**4.08**
12:15.6	**2190**	**2188.23**	**53.8073**	**0**	**4.08**
13:15.5	**2190**	**2188.69**	**53.7689**	**0**	**4.08**
14:15.5	**2190**	**2188.44**	**53.7639**	**0**	**4.08**
15:15.5	**2190**	**2188.55**	**53.7183**	**1**	**4.08**
16:15.5	**2190**	**2188.36**	**53.7166**	**1**	**4.08**
17:15.6	**2190**	**2188.26**	**53.6746**	**0**	**4.08**
18:15.5	**2190**	**2188.22**	**53.6745**	**0**	**4.08**
19:15.5	**2190**	**2188.68**	**53.6154**	**0**	**4.08**
20:15.5	**2190**	**2188.17**	**53.6185**	**0**	**4.08**
21:15.5	**2190**	**2188.04**	**53.6355**	**0**	**4.08**
22:15.5	**2190**	**2189.01**	**53.6433**	**0**	**4.08**
23:15.5	**2190**	**2188.66**	**53.624**	**0**	**4.08**
24:15.5	**2190**	**2188.25**	**53.5688**	**0**	**4.08**
25:15.5	**2190**	**2188.49**	**53.5176**	**0**	**4.08**
26:15.5	**2190**	**2188.16**	**53.4664**	**0**	**4.08**
27:15.5	**2190**	**2188.43**	**53.4438**	**0**	**4.08**
28:15.5	**2190**	**2188.37**	**53.4201**	**0**	**4.08**
29:15.5	**2190**	**2188.41**	**53.3968**	**0**	**4.08**
30:15.5	**2396**	**2396.25**	**53.3682**	**0**	**4.08**
31:15.5	**2396**	**2395.803**	**53.3272**	**0**	**4.08**
32:15.5	**2396**	**2396.08**	**53.3398**	**1**	**4.08**
33:15.5	**2396**	**2396.268**	**53.2647**	**1**	**4.08**
34:15.5	**2396**	**2396.54**	**53.2467**	**0**	**4.08**
35:15.5	**2396**	**2397.048**	**53.2676**	**0**	**4.08**
36:15.5	**2396**	**2395.969**	**53.1831**	**0**	**4.08**
37:15.5	**2396**	**2396.905**	**53.1694**	**0**	**4.08**
38:15.5	**2396**	**2397.046**	**53.1257**	**0**	**4.08**
39:15.5	**2396**	**2396.556**	**53.1624**	**0**	**4.08**
40:15.5	**2396**	**2396.35**	**53.1547**	**0**	**4.08**
41:15.5	**2396**	**2396.875**	**53.07**	**0**	**4.08**
42:15.5	**2396**	**2396.34**	**53.0854**	**0**	**4.08**
43:15.5	**2396**	**2394.29**	**53.0272**	**0**	**4.08**
44:15.5	**2396**	**2394.549**	**52.9583**	**0**	**4.08**
45:15.5	**2927**	**2931.045**	**52.9512**	**0**	**4.12**
46:15.5	**2927**	**2931.111**	**52.9835**	**0**	**4.12**

Time	Simulated Power (W)	System Power (W)	Geyser Temperature (Degrees Celsius)	Water Valve	Time (Sync with Arduino)
48:15.6	2927	2931.156	52.9053	0	4.12
49:15.6	2927	2930.627	52.8727	0	4.12
50:15.6	2927	2930.801	52.8659	0	4.12
51:15.6	2927	2931.171	52.8512	0	4.12
52:15.6	2927	2930.932	52.8473	0	4.12
53:15.5	2927	2931.197	52.8125	0	4.12
54:15.5	2927	2930.873	52.787	0	4.12
55:15.5	2927	2930.594	52.7916	0	4.12
56:15.5	2927	2930.614	52.7432	0	4.12
57:15.5	2927	2931.107	52.7433	0	4.12
58:15.5	2927	2930.605	52.7005	0	4.12
59:15.5	2927	2930.473	52.6762	0	4.12
00:15.5	2927	2946.428	52.6432	0	4.12
01:15.5	2927	2946.419	52.6257	0	4.12
02:15.5	2927	2946.6	52.6027	0	4.12
03:15.5	2927	2946.05	52.5621	0	4.12
04:15.5	2927	2946.921	52.536	0	4.12
05:15.5	2927	2946.613	52.5476	0	4.12
06:15.5	2927	2946.19	52.5567	1	4.12
07:15.5	2927	2946.287	52.529	1	4.12
08:15.5	2927	2946.961	52.4747	0	4.12
09:15.5	2927	2946.635	52.4248	0	4.12
10:15.5	2927	2946.544	52.3794	0	4.12
11:15.5	2927	2946.805	52.39	0	4.12
12:15.5	2927	2946.332	52.4011	0	4.12
13:15.5	2927	2946.341	52.3556	0	4.12
14:15.5	2927	2946.4	52.3398	0	4.12
15:15.6	1071	1076.94	52.3428	0	4.12
16:15.6	1071	1077.17	52.3117	0	4.12
17:15.6	1071	1076.89	52.2776	0	4.12
18:15.6	1071	1076.96	52.2184	0	4.12
19:15.6	1071	1077.44	52.231	0	4.12
20:15.6	1071	1077.08	52.1894	0	4.12
21:15.6	1071	1077.12	52.1625	0	4.12
22:15.6	1071	1077.39	52.1385	0	4.12
23:15.6	1071	1076.79	52.1291	0	4.12
24:15.6	1071	1075.79	52.1378	0	4.12

Time	Simulated Power (W)	System Power (W)	Geyser Temperature (Degrees Celsius)	Water Valve	Time (Sync with Arduino)
25:15.6	1071	1076	52.1147	0	4.12
26:15.6	1071	1075.67	52.0732	0	4.12
27:15.6	1071	1076.1	52.0603	0	4.12
28:15.6	1071	1075.66	52.0289	0	4.12
29:15.6	1071	1076.3	52.0513	0	4.12
30:15.6	942	945.758	51.9897	0	4.12
31:15.6	942	945.79	51.9869	0	4.12
32:15.5	942	944.963	51.9139	0	4.12
33:15.5	942	945.595	51.8797	0	4.12
34:15.5	942	944.819	51.8409	0	4.12
35:15.5	942	944.764	51.8984	0	4.12
36:15.5	942	944.967	51.836	0	4.12
37:15.5	942	945.779	51.8046	0	4.12
38:15.5	942	944.865	51.7769	0	4.12
39:15.5	942	945.149	51.7606	0	4.12
40:15.5	942	945.664	51.7179	0	4.12
41:15.5	942	944.686	51.7107	0	4.12
42:15.6	942	945.125	51.6758	0	4.12
43:15.6	942	945.319	51.6834	0	4.12
44:15.6	942	945.539	51.6244	0	4.12
45:15.6	948	952.5	51.5888	0	4.16
46:15.6	948	951.64	51.6101	0	4.16
47:15.6	948	951.137	51.5561	0	4.16
48:15.6	948	951.43	51.4806	0	4.16
49:15.6	948	951.172	51.4776	0	4.16
50:15.6	948	952.049	51.4928	0	4.16
51:15.6	948	951.537	51.4643	0	4.16
52:15.6	948	951.382	51.4754	0	4.16
53:15.6	948	951.961	51.3886	0	4.16
54:15.6	948	951.465	51.3963	0	4.16
55:15.6	948	953.089	51.3774	0	4.16
56:15.6	948	953.149	51.3405	0	4.16
57:15.6	948	953.205	51.3876	0	4.16
58:15.6	948	952.869	51.3679	0	4.16
59:15.6	948	953.957	51.3638	0	4.16
00:15.6	1077	1083.99	51.3111	0	4.16

Time	Simulated Power (W)	System Power (W)	Geyser Temperature (Degrees Celsius)	Water Valve	Time (Sync with Arduino)
01:15.6	1077	1083.44	51.3071	0	4.16
02:15.6	1077	1083.32	51.2762	0	4.16
03:15.6	1077	1083.33	51.2446	0	4.16
04:15.6	1077	1083.19	51.2339	0	4.16
05:15.6	1077	1084.11	51.2256	0	4.16
06:15.6	1077	1083.53	51.1974	0	4.16
07:15.6	1077	1083.46	51.1723	0	4.16
08:15.6	1077	1083.77	51.1498	0	4.16
09:15.6	1077	1083.92	51.1119	0	4.16
10:15.6	1077	1084.01	51.0493	0	4.16
11:15.6	1077	1083.49	51.035	0	4.16
12:15.6	1077	1083.91	51.0474	0	4.16
13:15.6	1077	1083.96	51.0153	0	4.16
14:15.6	1077	1084.11	51.0056	0	4.16
15:15.6	948	953.226	50.9496	0	4.16
16:15.6	948	952.914	50.9094	0	4.16
17:15.6	948	953.059	50.9084	0	4.16
18:15.6	948	953.28	50.9019	0	4.16
19:15.6	948	953.479	50.877	0	4.16
20:15.6	948	953.669	50.8319	0	4.16
21:15.6	948	952.767	50.8178	0	4.16
22:15.6	948	952.892	50.7943	0	4.16
23:15.6	948	953.497	50.7778	0	4.16
24:15.6	948	953.3	50.7372	0	4.16
25:15.6	948	952.957	50.7486	0	4.16
26:15.7	948	953.076	50.7299	0	4.16
27:15.7	948	953.113	50.7398	0	4.16
28:15.7	948	953.39	50.6859	0	4.16
29:15.7	948	953.31	50.6542	0	4.16
30:15.7	948	953.093	50.6101	0	4.16
31:15.7	948	953.168	50.633	0	4.16
32:15.7	948	953.767	50.6789	0	4.16
33:15.7	948	953.346	50.6479	0	4.16
34:15.7	948	952.947	50.5688	0	4.16
35:15.7	948	953.264	50.5544	0	4.16
36:15.6	948	950.728	50.4691	0	4.16

Time	Simulated Power (W)	System Power (W)	Geyser Temperature (Degrees Celsius)	Water Valve	Time (Sync with Arduino)
37:15.6	948	950.962	50.4754	0	4.16
38:15.6	948	951.045	50.4937	0	4.16
39:15.6	948	951.537	50.4524	0	4.16
40:15.6	948	951.691	50.4029	0	4.16
41:15.6	948	951.494	50.3751	0	4.16
42:15.6	948	950.991	50.3403	0	4.16
43:15.6	948	951.078	50.313	0	4.16
44:15.6	948	950.847	50.3248	0	4.16
45:15.6	1077	1081.87	50.3231	0	4.2
46:15.6	1077	1082.23	50.2547	0	4.2
47:15.6	1077	1082.25	50.2402	0	4.2
48:15.6	1077	1081.68	50.2374	0	4.2
49:15.6	1077	1082.04	50.2544	0	4.2
50:15.6	1077	1081.59	50.2442	0	4.2
51:15.6	1077	1082.11	50.2117	0	4.2
52:15.6	1077	1081.27	50.1891	0	4.2
53:15.6	1077	1081.97	50.129	0	4.2
54:15.6	1077	1081.54	50.1418	0	4.2
55:15.6	1077	1081.98	50.155	0	4.2
56:15.6	1077	1081.42	50.0669	0	4.2
57:15.6	1077	1081.82	50.0992	0	4.2
58:15.6	1077	1081.86	50.085	0	4.2
59:15.6	1077	1081.43	50.0574	0	4.2
00:15.6	948	951.503	50.0589	0	4.2
01:15.6	948	950.516	49.9896	0	4.2
02:15.6	948	951.007	49.9906	0	4.2
03:15.6	948	950.618	49.9544	0	4.2
04:15.6	948	951.318	49.9127	0	4.2
05:15.6	948	951.008	49.9394	0	4.2
06:15.6	948	951.198	49.9134	0	4.2
07:15.6	948	954.185	49.905	0	4.2
08:15.6	948	953.272	49.83	0	4.2
09:15.6	948	953.872	49.8476	0	4.2
10:15.6	948	953.962	49.8363	0	4.2
11:15.6	948	953.809	49.7498	0	4.2
12:15.6	948	954.024	49.7324	0	4.2

Time	Simulated Power (W)	System Power (W)	Geyser Temperature (Degrees Celsius)	Water Valve	Time (Sync with Arduino)
13:15.6	948	953.761	49.713	0	4.2
14:15.6	948	953.425	49.7003	0	4.2
15:15.6	948	953.957	49.718	0	4.2
16:15.6	948	953.573	49.7077	0	4.2
17:15.6	948	953.647	49.6622	0	4.2
18:15.6	948	953.287	49.6456	0	4.2
19:15.7	948	954.127	49.6214	0	4.2
20:15.7	948	953.271	49.6486	0	4.2
21:15.7	948	953.677	49.5741	0	4.2
22:15.7	948	953.47	49.5837	0	4.2
23:15.7	948	953.789	49.5431	0	4.2
24:15.7	948	953.521	49.5377	0	4.2
25:15.7	948	953.674	49.5038	0	4.2
26:15.7	948	953.828	49.5356	0	4.2
27:15.7	948	953.291	49.4707	0	4.2
28:15.7	948	953.142	49.4581	0	4.2
29:15.7	948	953.714	49.4491	0	4.2
30:15.7	1077	1084.1	49.3992	0	4.2
31:15.7	1077	1084.12	49.3414	0	4.2
32:15.7	1077	1084.01	49.3797	0	4.2
33:15.7	1077	1084.04	49.3182	0	4.2
34:15.7	1077	1084.11	49.3547	0	4.2
35:15.7	1077	1083.67	49.3172	0	4.2
36:15.7	1077	1083.8	49.3144	0	4.2
37:15.7	1077	1084.02	49.3194	0	4.2
38:15.7	1077	1083.87	49.2884	0	4.2
39:15.7	1077	1083.82	49.2396	0	4.2
40:15.7	1077	1084.07	49.2531	0	4.2
41:15.7	1077	1084.41	49.188	0	4.2
42:15.7	1077	1084.12	49.1345	0	4.2
43:15.7	1077	1084.59	49.1229	0	4.2
44:15.7	1077	1083.67	49.1346	0	4.2
45:15.7	57	48.9017	49.0896	0	4.2
46:15.7	57	49.4335	49.0697	0	4.2
47:15.7	57	45.5787	49.0491	0	4.2
48:15.6	57	45.5662	49.0685	0	4.2

Time	Simulated Power (W)	System Power (W)	Geyser Temperature (Degrees Celsius)	Water Valve	Time (Sync with Arduino)
49:15.6	57	46.1935	49.0325	0	4.2
50:15.6	57	45.7832	49.0167	0	4.2
51:15.6	57	46.3931	48.9849	0	4.2
52:15.6	57	45.2465	49.0037	0	4.2
53:15.6	57	45.6492	48.952	0	4.2
54:15.6	57	45.8451	48.9417	0	4.2
55:15.6	57	45.879	48.9476	0	4.2
56:15.6	57	45.745	48.9156	0	4.2
57:15.6	57	46.5968	48.8853	0	4.2
58:15.6	57	45.6842	48.8838	0	4.2
59:15.6	57	45.7881	48.8805	0	4.2
00:15.6	57	45.6584	48.8157	0	4.2
01:15.6	57	46.1606	48.8099	0	4.2
02:15.6	57	45.607	48.7727	0	4.2
03:15.6	57	45.9402	48.7564	0	4.2
04:15.6	57	45.8799	48.7162	0	4.2
05:15.6	57	45.5272	48.6931	0	4.2
06:15.6	57	46.1033	48.7214	0	4.2
07:15.6	57	45.5973	48.6866	0	4.2
08:15.6	57	45.5576	48.7103	0	4.2
09:15.6	57	45.8842	48.6722	0	4.2
10:15.6	57	46.3729	48.6664	0	4.2
11:15.6	57	45.8409	48.6316	0	4.2
12:15.7	57	46.1978	48.6355	0	4.2
13:15.7	57	45.9494	48.6269	0	4.2
14:15.7	57	45.6208	48.6021	0	4.2
15:15.7	186	178.022	48.5688	0	4.2
16:15.7	186	178.256	48.5408	0	4.2
17:15.7	186	177.863	48.4932	0	4.2
18:15.7	186	178.137	48.4866	0	4.2
19:15.7	186	180.724	48.4951	0	4.2
20:15.7	186	180.574	48.4913	0	4.2
21:15.7	186	180.227	48.4498	0	4.2
22:15.7	186	180.44	48.437	0	4.2
23:15.7	186	179.806	48.412	0	4.2
24:15.7	186	180.487	48.3598	0	4.2

Time	Simulated Power (W)	System Power (W)	Geyser Temperature (Degrees Celsius)	Water Valve	Time (Sync with Arduino)
25:15.7	186	180.092	48.3205	0	4.2
26:15.7	186	179.964	48.3356	0	4.2
27:15.7	186	180.397	48.3134	0	4.2
28:15.7	186	180.357	48.2954	0	4.2
29:15.7	186	180.667	48.243	0	4.2
30:15.7	57	48.4503	48.2346	0	4.2
31:15.7	57	48.3524	48.2267	0	4.2
32:15.7	57	48.1909	48.2338	0	4.2
33:15.7	57	48.2556	48.1545	0	4.2
34:15.7	57	47.4583	48.1687	0	4.2
35:15.7	57	47.8156	48.1663	0	4.2
36:15.7	57	47.9633	48.1695	0	4.2
37:15.7	57	48.3172	48.1098	0	4.2
38:15.7	57	48.075	48.0896	0	4.2
39:15.7	57	48.5067	48.0964	0	4.2
40:15.7	57	47.7816	48.0835	0	4.2
41:15.7	57	48.119	48.0775	0	4.2
42:15.7	57	48.1095	48.0479	0	4.2
43:15.7	57	48.1835	48.0107	0	4.2
44:15.7	57	49.0662	48.0113	0	4.2
45:15.7	24	12.3842	47.9932	0	4.24
46:15.7	24	12.8716	47.9858	0	4.24
47:15.7	24	12.9648	47.9833	0	4.24
48:15.7	24	12.3481	47.927	0	4.24
49:15.7	24	12.9711	47.9225	0	4.24
50:15.7	24	12.7676	47.94	0	4.24
51:15.7	24	12.8128	47.9568	0	4.24
52:15.7	24	12.1791	47.9171	0	4.24
53:15.7	24	12.2178	47.8798	0	4.24
54:15.7	24	12.5358	47.8532	0	4.24
55:15.7	24	12.9166	47.9052	0	4.24
56:15.7	24	12.5469	47.8426	0	4.24
57:15.7	24	12.1134	47.8274	0	4.24
58:15.7	24	12.5808	47.7865	0	4.24
59:15.7	24	11.1046	47.771	0	4.24
00:15.7	153	143.763	47.7574	0	4.24

Time	Simulated Power (W)	System Power (W)	Geyser Temperature (Degrees Celsius)	Water Valve	Time (Sync with Arduino)
01:15.7	153	143.746	47.7722	0	4.24
02:15.7	153	144.09	47.7084	0	4.24
03:15.7	153	143.602	47.6821	0	4.24
04:15.7	153	143.869	47.613	0	4.24
05:15.6	153	143.849	47.6023	0	4.24
06:15.7	153	143.461	47.5473	0	4.24
07:15.7	153	143.624	47.5889	0	4.24
08:15.7	153	143.795	47.6129	0	4.24
09:15.7	153	143.477	47.5778	0	4.24
10:15.7	153	143.861	47.5594	0	4.24
11:15.7	153	143.57	47.4979	0	4.24
12:15.7	153	143.056	47.4706	0	4.24
13:15.7	153	143.767	47.4502	0	4.24
14:15.7	153	144.35	47.4092	0	4.24
15:15.7	24	11.1625	47.3918	0	4.24
16:15.7	24	10.9506	47.3776	0	4.24
17:15.7	24	11.0526	47.3984	0	4.24
18:15.7	24	10.3999	47.3488	0	4.24
19:15.7	24	11.1442	47.3391	0	4.24
20:15.7	24	11.121	47.3113	0	4.24
21:15.7	24	11.4307	47.3135	0	4.24
22:15.7	24	11.3725	47.2892	0	4.24
23:15.7	24	11.8315	47.2834	0	4.24
24:15.7	24	11.198	47.2547	0	4.24
25:15.7	24	11.3041	47.2532	0	4.24
26:15.7	24	11.165	47.2504	0	4.24
27:15.7	24	11.0551	47.2014	0	4.24
28:15.7	24	11.0419	47.1716	0	4.24
29:15.7	24	11.6891	47.1993	0	4.24
30:15.7	24	11.1176	47.1729	0	4.24
31:15.7	24	12.5243	47.146	0	4.24
32:15.7	24	12.4789	47.1421	0	4.24
33:15.7	24	12.7086	47.0887	0	4.24
34:15.7	24	13.2598	47.0949	0	4.24
35:15.7	24	12.9385	47.059	0	4.24
36:15.7	24	13.4091	47.0576	0	4.24

Time	Simulated Power (W)	System Power (W)	Geyser Temperature (Degrees Celsius)	Water Valve	Time (Sync with Arduino)
37:15.7	24	12.365	47.0304	0	4.24
38:15.7	24	12.9903	47.0108	0	4.24
39:15.7	24	13.1549	46.9788	0	4.24
40:15.7	24	12.8808	46.9713	0	4.24
41:15.7	24	12.481	46.9963	0	4.24
42:15.7	24	12.7094	47.0298	0	4.24
43:15.7	24	12.7101	47.0705	0	4.24
44:15.7	24	12.6681	46.9433	0	4.24
45:15.8	153	145.758	46.9187	0	4.28
46:15.7	153	145.901	46.877	0	4.28
47:15.7	153	145.459	46.8753	0	4.28
48:15.7	153	145.169	46.9014	0	4.28
49:15.8	153	145.799	46.8536	0	4.28
50:15.8	153	146.004	46.8165	0	4.28
51:15.8	153	145.517	46.7728	0	4.28
52:15.8	153	145.421	46.7916	0	4.28
53:15.8	153	144.684	46.7542	0	4.28
54:15.8	153	144.869	46.8099	0	4.28
55:15.8	153	145.696	46.7344	0	4.28
56:15.8	153	145.302	46.7298	0	4.28
57:15.8	153	145.329	46.7227	0	4.28
58:15.8	153	145.541	46.6921	0	4.28
59:15.8	153	145.166	46.659	0	4.28
00:15.8	24	12.3915	46.6881	0	4.28
01:15.7	24	12.4203	46.6528	0	4.28
02:15.7	24	12.7381	46.6187	0	4.28
03:15.7	24	13.1246	46.5831	0	4.28
04:15.7	24	12.4239	46.6062	0	4.28
05:15.7	24	13.2071	46.6006	0	4.28
06:15.7	24	12.9032	46.6108	0	4.28
07:15.7	24	12.5556	46.604	0	4.28
08:15.7	24	12.7597	46.5699	0	4.28
09:15.7	24	12.4412	46.5682	0	4.28
10:15.7	24	13.0603	46.5482	0	4.28
11:15.7	24	12.835	46.5028	0	4.28
12:15.7	24	11.9322	46.4925	0	4.28

Time	Simulated Power (W)	System Power (W)	Geyser Temperature (Degrees Celsius)	Water Valve	Time (Sync with Arduino)
13:15.7	24	12.5237	46.474	0	4.28
14:15.7	24	12.564	46.4689	0	4.28
15:15.7	24	12.1602	46.4414	0	4.28
16:15.7	24	12.4834	46.4502	0	4.28
17:15.7	24	12.4537	46.366	0	4.28
18:15.7	24	13.0951	46.3726	0	4.28
19:15.7	24	12.3981	46.349	0	4.28
20:15.7	24	12.8961	46.3499	0	4.28
21:15.7	24	12.9653	46.2965	0	4.28
22:15.7	24	12.4831	46.2873	0	4.28
23:15.7	24	12.7539	46.2566	0	4.28
24:15.7	24	12.9712	46.2778	0	4.28
25:15.7	24	13.2862	46.238	0	4.28
26:15.7	24	12.8463	46.2348	0	4.28
27:15.7	24	12.7515	46.191	0	4.28
28:15.7	24	13.405	46.174	0	4.28
29:15.7	24	12.6719	46.1987	0	4.28
30:15.7	153	145.279	46.1803	0	4.28
31:15.7	153	145.061	46.148	0	4.28
32:15.7	153	145.129	46.1104	0	4.28
33:15.7	153	145.117	46.1151	0	4.28
34:15.7	153	145.006	46.1136	0	4.28
35:15.7	153	145.177	46.1022	0	4.28
36:15.7	153	145.307	46.0809	0	4.28
37:15.7	153	145.277	46.0761	0	4.28
38:15.7	153	145.367	46.056	0	4.28
39:15.7	153	145.427	46.053	0	4.28
40:15.7	153	145.228	46.0254	0	4.28
41:15.7	153	145.074	46.0192	0	4.28
42:15.8	153	147.063	46.0044	0	4.28
43:15.8	153	147.457	45.9888	0	4.28
44:15.8	153	147.382	45.9909	0	4.28
45:15.8	24	15.3812	45.9392	0	4.32
46:15.8	24	15.5333	45.9611	0	4.32
47:15.8	24	15.163	45.946	0	4.32
48:15.8	24	15.1928	45.9338	0	4.32

Time	Simulated Power (W)	System Power (W)	Geyser Temperature (Degrees Celsius)	Water Valve	Time (Sync with Arduino)
49:15.8	24	14.9615	45.9223	0	4.32
50:15.8	24	15.372	45.8591	0	4.32
51:15.8	24	15.0426	45.875	0	4.32
52:15.8	24	15.2547	45.8505	0	4.32
53:15.8	24	15.1202	45.8711	0	4.32
54:15.8	24	15.498	45.879	0	4.32
55:15.8	24	15.0684	45.8486	0	4.32
56:15.8	24	14.6232	45.8025	0	4.32
57:15.8	24	15.0327	45.7995	0	4.32
58:15.8	24	15.6199	45.7463	0	4.32
59:15.8	24	15.6789	45.7215	0	4.32
00:15.8	24	15.6359	45.7015	0	4.32
01:15.8	24	15.8959	45.6906	0	4.32
02:15.8	24	15.2224	45.6646	0	4.32
03:15.8	24	14.9512	45.6592	0	4.32
04:15.8	24	15.0061	45.648	0	4.32
05:15.8	24	15.2011	45.6739	0	4.32
06:15.8	24	15.8136	45.6233	0	4.32
07:15.8	24	15.7518	45.6014	0	4.32
08:15.8	24	15.3967	45.5495	0	4.32
09:15.8	24	15.1964	45.6067	0	4.32
10:15.8	24	14.5832	45.5033	0	4.32
11:15.8	24	15.0157	45.5439	0	4.32
12:15.8	24	15.3338	45.5418	0	4.32
13:15.8	24	15.1013	45.4986	0	4.32
14:15.8	24	15.3034	45.5393	0	4.32
15:15.8	153	147.9	45.4836	0	4.32
16:15.8	153	148.182	45.4783	0	4.32
17:15.8	153	148.213	45.4388	0	4.32
18:15.8	153	147.698	45.4495	0	4.32
19:15.8	153	147.798	45.4263	0	4.32
20:15.8	153	147.449	45.3934	0	4.32
21:15.8	153	147.785	45.4098	0	4.32
22:15.8	153	147.629	45.4097	0	4.32
23:15.8	153	146.322	45.3643	0	4.32
24:15.8	153	146.905	45.2987	0	4.32

Time	Simulated Power (W)	System Power (W)	Geyser Temperature (Degrees Celsius)	Water Valve	Time (Sync with Arduino)
25:15.8	153	146.476	45.3767	0	4.32
26:15.8	153	146.431	45.3412	0	4.32
27:15.8	153	146.292	45.2781	0	4.32
28:15.8	153	146.503	45.2587	0	4.32
29:15.8	153	146.789	45.2805	0	4.32
30:15.8	24	13.9705	45.305	0	4.32
31:15.8	24	13.87	45.2421	0	4.32
32:15.8	24	14.122	45.2162	0	4.32
33:15.8	24	14.2224	45.1887	0	4.32
34:15.8	24	14.588	45.1792	0	4.32
35:15.8	24	14.6178	45.1829	0	4.32
36:15.8	24	14.0166	45.159	0	4.32
37:15.8	24	13.932	45.0738	0	4.32
38:15.8	24	15.0921	45.096	0	4.32
39:15.8	24	14.5343	45.0921	0	4.32
40:15.8	24	13.7058	45.1393	0	4.32
41:15.8	24	13.986	45.0525	0	4.32
42:15.8	24	14.4253	45.0258	0	4.32
43:15.8	24	14.4005	45.0331	0	4.32
44:15.8	24	13.2757	44.978	0	4.32
45:15.8	24	14.1337	44.9775	0	4.36
46:15.8	24	14.4466	44.9534	0	4.36
47:15.8	24	14.5001	44.9447	0	4.36
48:15.8	24	14.0004	44.9335	0	4.36
49:15.8	24	14.133	44.9003	0	4.36
50:15.8	24	14.3276	44.8821	0	4.36
51:15.8	24	14.6035	44.8826	0	4.36
52:15.9	24	14.1002	44.8832	0	4.36
53:15.9	24	13.9172	44.8664	0	4.36
54:15.9	24	19.0624	44.8811	0	4.36
55:15.9	24	19.4288	44.8484	0	4.36
56:15.9	24	19.8755	44.8622	0	4.36
57:15.9	24	18.8653	44.8091	0	4.36
58:15.9	24	19.1139	44.8122	0	4.36
59:15.9	24	19.3194	44.7788	0	4.36
00:15.9	153	151.41	44.7527	0	4.36

Time	Simulated Power (W)	System Power (W)	Geyser Temperature (Degrees Celsius)	Water Valve	Time (Sync with Arduino)
01:15.9	153	150.843	44.7121	0	4.36
02:15.9	153	150.969	44.7234	0	4.36
03:15.9	153	150.722	44.7169	0	4.36
04:15.9	153	151.496	44.7393	0	4.36
05:15.9	153	151.136	44.7417	0	4.36
06:15.9	153	151.351	44.6807	0	4.36
07:15.9	153	151.223	44.6919	0	4.36
08:15.9	153	151.774	44.6978	0	4.36
09:15.9	153	151.701	44.6461	0	4.36
10:15.9	153	151.485	44.6487	0	4.36
11:15.9	153	150.782	44.6133	0	4.36
12:15.9	153	151.344	44.6092	0	4.36
13:15.9	153	150.722	44.5766	0	4.36
14:15.9	153	150.698	44.5852	0	4.36
15:15.9	24	18.5606	44.5307	0	4.36
16:15.9	24	18.6184	44.5189	0	4.36
17:15.9	24	18.1412	44.5125	0	4.36
18:15.9	24	18.6863	44.5273	0	4.36
19:15.9	24	18.8579	44.5351	0	4.36
20:15.9	24	18.6367	44.4669	0	4.36
21:15.8	24	18.3448	44.4887	0	4.36
22:15.8	24	18.5928	44.4513	0	4.36
23:15.8	24	18.5664	44.4682	0	4.36
24:15.8	24	18.773	44.426	0	4.36
25:15.8	24	18.598	44.4295	0	4.36
26:15.8	24	18.33	44.438	0	4.36
27:15.8	24	19.2455	44.3418	0	4.36
28:15.8	24	18.4706	44.3753	0	4.36
29:15.8	24	18.4044	44.3269	0	4.36
30:15.8	24	18.7131	44.3208	0	4.36
31:15.8	24	19.216	44.2901	0	4.36
32:15.8	24	19.2085	44.305	0	4.36
33:15.8	24	18.375	44.2759	0	4.36
34:15.8	24	17.5612	44.282	0	4.36
35:15.8	24	18.3677	44.2843	0	4.36
36:15.8	24	17.5607	44.2728	0	4.36

Time	Simulated Power (W)	System Power (W)	Geyser Temperature (Degrees Celsius)	Water Valve	Time (Sync with Arduino)
37:15.8	24	18.0463	44.2535	0	4.36
38:15.8	24	17.8466	44.2268	0	4.36
39:15.8	24	18.0267	44.2899	0	4.36
40:15.8	24	17.5379	44.2357	0	4.36
41:15.8	24	17.7867	44.1712	0	4.36
42:15.8	24	17.3249	44.1619	0	4.36
43:15.8	24	17.5247	44.146	0	4.36
44:15.8	24	17.3983	44.1496	0	4.36
45:15.8	153	150.101	44.1808	0	4.4
46:15.9	153	150.463	44.1598	0	4.4
47:15.9	153	149.65	44.1544	0	4.4
48:15.9	153	150.076	44.0612	0	4.4
49:16.1	153	150.225	44.0996	0	4.4
50:15.9	153	149.987	44.0371	0	4.4
51:17.5	153	150.215	44.0511	0	4.4
52:16.0	153	150.415	44.0581	0	4.4
53:15.9	153	150.335	44.0594	0	4.4
54:15.9	153	150.699	44.0132	0	4.4
55:15.9	153	150.376	44.0297	0	4.4
56:16.6	153	149.802	43.9895	0	4.4
57:16.4	153	150.45	43.9639	0	4.4
58:16.8	153	149.581	43.9651	0	4.4
59:15.9	153	150.128	43.9131	0	4.4
00:15.9	24	17.814	43.9555	0	4.4
01:15.9	24	17.6082	43.9534	0	4.4
02:15.9	24	17.2932	43.9249	0	4.4
03:15.9	24	18.0447	43.9288	0	4.4
04:15.9	24	17.4525	43.8951	0	4.4
05:15.9	24	17.15	43.919	0	4.4
06:15.9	24	17.701	43.874	0	4.4
07:15.9	24	16.8039	43.8545	0	4.4
08:15.9	24	17.096	43.8284	0	4.4
09:15.9	24	16.666	43.8231	0	4.4
10:15.9	24	16.9708	43.8506	0	4.4
11:15.9	24	17.3654	43.7611	0	4.4
12:15.9	24	17.1905	43.7722	0	4.4

Time	Simulated Power (W)	System Power (W)	Geyser Temperature (Degrees Celsius)	Water Valve	Time (Sync with Arduino)
13:15.9	24	16.5221	43.7823	0	4.4
14:15.9	24	16.6596	43.7718	0	4.4
15:15.9	24	16.3495	43.7329	0	4.4
16:15.9	24	17.2273	43.7501	0	4.4
17:15.9	24	16.4458	43.7668	0	4.4
18:15.9	24	17.0512	43.6503	0	4.4
19:15.9	24	17.0846	43.6721	0	4.4
20:15.9	24	16.8043	43.6358	0	4.4
21:15.9	24	17.1857	43.5916	0	4.4
22:15.9	24	16.8505	43.6245	0	4.4
23:15.9	24	16.8241	43.588	0	4.4
24:15.9	24	16.8639	43.594	0	4.4
25:15.9	24	16.7245	43.5994	0	4.4
26:15.9	24	17.1791	43.5756	0	4.4
27:15.9	24	17.3744	43.5616	0	4.4
28:15.9	24	17.4357	43.5176	0	4.4
29:16.0	24	16.641	43.53	0	4.4
30:16.0	153	149.418	43.4824	0	4.4
31:16.0	153	149.657	43.5508	0	4.4
32:16.0	153	149.125	43.5206	0	4.4
33:16.0	153	149.963	43.4921	0	4.4
34:16.0	153	149.603	43.488	0	4.4
35:16.0	153	149.689	43.4771	0	4.4
36:16.0	153	149.772	43.4705	0	4.4
37:16.0	153	149.298	43.3699	0	4.4
38:16.0	153	149.044	43.3972	0	4.4
39:16.0	153	149.669	43.451	0	4.4
40:16.0	153	149.41	43.4261	0	4.4
41:16.0	153	149.264	43.4216	0	4.4
42:16.0	153	149.698	43.3626	0	4.4
43:16.0	153	149.9	43.364	0	4.4
44:16.0	153	149.756	43.3711	0	4.4
45:16.0	24	16.8225	43.346	0	4.44
46:16.0	24	14.4858	43.3342	0	4.44
47:16.0	24	14.9384	43.3426	0	4.44
48:16.0	24	14.4162	43.3079	0	4.44

Time	Simulated Power (W)	System Power (W)	Geyser Temperature (Degrees Celsius)	Water Valve	Time (Sync with Arduino)
49:16.0	24	14.7189	43.2355	0	4.44
50:16.0	24	14.277	43.2968	0	4.44
51:16.0	24	14.6621	43.2889	0	4.44
52:16.0	24	15.3089	43.2656	0	4.44
53:16.0	24	14.4243	43.2634	0	4.44
54:16.0	24	15.0636	43.2465	0	4.44
55:16.0	24	14.949	43.2366	0	4.44
56:16.0	24	15.1127	43.1936	0	4.44
57:16.0	24	14.3194	43.1519	0	4.44
58:16.0	24	15.0911	43.1754	0	4.44
59:16.0	24	14.3853	43.1699	0	4.44
00:16.0	24	15.142	43.1382	0	4.44
01:16.0	24	14.7987	43.1095	0	4.44
02:16.0	24	14.2048	43.1175	0	4.44
03:16.0	24	14.9682	43.0724	0	4.44
04:16.0	24	15.3532	43.0608	0	4.44
05:16.0	24	15.168	43.0524	0	4.44
06:16.0	24	14.6024	43.0348	0	4.44
07:16.0	24	14.9307	43.04	0	4.44
08:16.0	24	14.7647	42.9887	0	4.44
09:16.0	24	14.8264	43.0484	0	4.44
10:16.0	24	14.8539	43.0204	0	4.44
11:16.0	24	14.3767	42.9996	0	4.44
12:16.1	24	14.2989	42.985	0	4.44
13:16.1	24	14.3916	42.982	0	4.44
14:16.1	24	14.3706	42.9376	0	4.44
15:16.1	153	146.936	42.9225	0	4.44
16:16.1	153	147.612	42.9307	0	4.44
17:16.1	153	145.72	42.9642	0	4.44
18:16.1	153	146.217	42.9485	0	4.44
19:16.1	153	146.487	42.887	0	4.44
20:16.1	153	145.601	42.8609	0	4.44
21:16.1	153	145.809	42.8628	0	4.44
22:16.1	153	146.986	42.8413	0	4.44
23:16.1	153	145.833	42.8124	0	4.44
24:16.1	153	146.367	42.8002	0	4.44

Time	Simulated Power (W)	System Power (W)	Geyser Temperature (Degrees Celsius)	Water Valve	Time (Sync with Arduino)
25:16.1	153	145.322	42.7626	0	4.44
26:16.1	153	145.852	42.793	0	4.44
27:16.1	153	146.433	42.8241	0	4.44
28:16.1	153	146.113	42.8062	0	4.44
29:16.1	153	146.438	42.7735	0	4.44
30:16.1	24	13.3649	42.7363	0	4.44
31:16.1	24	14.2273	42.7361	0	4.44
32:16.1	24	14.1257	42.752	0	4.44
33:16.1	24	13.8632	42.7792	0	4.44
34:16.0	24	13.9404	42.73	0	4.44
35:16.0	24	13.1819	42.7511	0	4.44
36:16.0	24	13.8634	42.7029	0	4.44
37:16.0	24	13.9805	42.6401	0	4.44
38:16.0	24	13.7831	42.6395	0	4.44
39:16.0	24	14.3876	42.5913	0	4.44
40:15.9	24	14.0927	42.5919	0	4.44
41:15.9	24	13.9928	42.5969	0	4.44
42:15.9	24	14.1585	42.5722	0	4.44
43:15.9	24	14.1171	42.5779	0	4.44
44:15.9	24	14.013	42.5849	0	4.44
45:15.9	861	866.013	42.577	0	4.48
46:15.9	861	866.271	42.5311	0	4.48
47:15.9	861	866.598	42.5061	0	4.48
48:15.9	861	866.173	42.5233	0	4.48
49:15.9	861	865.722	42.5407	0	4.48
50:15.9	861	865.753	42.5099	0	4.48
51:15.9	861	865.63	42.488	0	4.48
52:15.9	861	865.888	42.4681	0	4.48
53:15.9	861	865.945	42.4731	0	4.48
54:15.9	861	865.915	42.4677	0	4.48
55:15.9	861	865.98	42.4536	0	4.48
56:15.9	861	866.13	42.4171	0	4.48
57:15.9	861	865.42	42.4126	0	4.48
58:15.9	861	865.588	42.4263	0	4.48
59:15.9	861	865.762	42.4282	0	4.48
00:15.9	990	994.715	42.4156	0	4.48

Time	Simulated Power (W)	System Power (W)	Geyser Temperature (Degrees Celsius)	Water Valve	Time (Sync with Arduino)
01:15.9	**990**	**994.839**	**42.3972**	**0**	**4.48**
02:15.9	**990**	**994.572**	**42.3255**	**0**	**4.48**
03:15.9	**990**	**995.073**	**42.3596**	**0**	**4.48**
04:15.9	**990**	**995.204**	**42.2789**	**0**	**4.48**
05:15.9	**990**	**994.646**	**42.3042**	**0**	**4.48**
06:15.9	**990**	**994.898**	**42.2495**	**0**	**4.48**
07:15.9	**990**	**995.277**	**42.3148**	**0**	**4.48**
08:15.9	**990**	**994.752**	**42.2851**	**0**	**4.48**
09:15.9	**990**	**995.096**	**42.2886**	**0**	**4.48**
10:15.9	**990**	**995.197**	**42.2818**	**0**	**4.48**
11:15.9	**990**	**994.835**	**42.2185**	**0**	**4.48**
12:15.9	**990**	**995.006**	**42.2445**	**0**	**4.48**
13:15.9	**990**	**994.916**	**42.2236**	**0**	**4.48**
14:15.9	**990**	**995.166**	**42.2396**	**0**	**4.48**
15:16.0	**861**	**865.641**	**42.2414**	**0**	**4.48**
16:16.0	**861**	**865.448**	**42.2198**	**0**	**4.48**
17:16.0	**861**	**865.705**	**42.1791**	**0**	**4.48**
18:16.0	**861**	**865.322**	**42.1874**	**0**	**4.48**
19:16.0	**861**	**865.408**	**42.112**	**0**	**4.48**
20:16.0	**861**	**865.11**	**42.0828**	**0**	**4.48**
21:16.0	**861**	**864.698**	**42.1001**	**0**	**4.48**
22:16.0	**861**	**865.508**	**42.109**	**0**	**4.48**
23:16.0	**861**	**864.995**	**42.1004**	**0**	**4.48**
24:16.0	**861**	**865.291**	**42.0963**	**0**	**4.48**
25:16.0	**861**	**865.103**	**42.0381**	**0**	**4.48**
26:16.0	**861**	**865.215**	**42.0262**	**0**	**4.48**
27:16.0	**861**	**865.623**	**42.0432**	**0**	**4.48**
28:16.0	**861**	**869.155**	**42.0124**	**0**	**4.48**
29:16.0	**861**	**869.342**	**41.987**	**0**	**4.48**
30:16.0	**861**	**868.926**	**42.0309**	**0**	**4.48**
31:16.0	**861**	**869.096**	**41.9806**	**0**	**4.48**
32:16.0	**861**	**869.113**	**41.9679**	**0**	**4.48**
33:16.0	**861**	**869.107**	**41.9825**	**0**	**4.48**
34:16.0	**861**	**869.069**	**41.9761**	**0**	**4.48**
35:16.0	**861**	**868.967**	**41.9444**	**0**	**4.48**
36:16.0	**861**	**869.505**	**41.8969**	**0**	**4.48**

Time	Simulated Power (W)	System Power (W)	Geyser Temperature (Degrees Celsius)	Water Valve	Time (Sync with Arduino)
37:16.0	861	868.41	41.9332	0	4.48
38:16.0	861	869.132	41.9383	0	4.48
39:16.0	861	869.284	41.8894	0	4.48
40:16.0	861	869.049	41.8712	0	4.48
41:16.0	861	868.433	41.9027	0	4.48
42:16.0	861	868.823	41.872	0	4.48
43:16.0	861	869.192	41.876	0	4.48
44:16.0	861	869.033	41.9182	0	4.48
45:16.0	2973	2981.91	41.9077	0	4.52
46:16.0	2973	2979.98	41.8366	0	4.52
47:16.0	2973	2978.62	41.8475	0	4.52
48:16.0	2973	2978.86	41.7952	0	4.52
49:16.0	2973	2978.21	41.7817	0	4.52
50:16.0	2973	2977.66	41.8139	0	4.52
51:16.0	2973	2978.04	41.7839	0	4.52
52:16.0	2973	2977.33	41.7579	0	4.52
53:16.0	2973	2978.45	41.7749	0	4.52
54:16.0	2973	2977.88	41.7386	0	4.52
55:16.0	2973	2977.95	41.7023	0	4.52
56:16.0	2973	2977.4	41.7063	0	4.52
57:16.0	2973	2977.9	41.7185	0	4.52
58:16.0	2973	2977.41	41.7195	0	4.52
59:16.1	2973	2977.53	41.7053	0	4.52
00:16.1	2842	2842.7	41.6418	0	4.52
01:16.1	2842	2843.11	41.6013	0	4.52
02:16.1	2842	2843.18	41.6531	0	4.52
03:16.1	2842	2843.94	41.6316	0	4.52
04:16.1	2842	2844.32	41.6144	0	4.52
05:16.1	2842	2843.57	41.5838	0	4.52
06:16.1	2842	2843.58	41.6152	0	4.52
07:16.1	2842	2843.52	41.5819	0	4.52
08:16.1	2842	2842.82	41.5583	0	4.52
09:16.1	2842	2842.74	41.6223	0	4.52
10:16.1	2842	2843.33	41.5562	0	4.52
11:16.1	2842	2842.57	41.4861	0	4.52
12:16.1	2842	2843.86	41.4906	0	4.52

Time	Simulated Power (W)	System Power (W)	Geyser Temperature (Degrees Celsius)	Water Valve	Time (Sync with Arduino)
13:16.1	2842	2843.24	41.4768	0	4.52
14:16.1	2842	2843.5	41.5004	0	4.52
15:16.1	2842	2842.57	41.4966	0	4.52
16:16.1	2842	2843.22	41.4974	0	4.52
17:16.1	2842	2842.94	41.4966	0	4.52
18:16.1	2842	2842.59	41.4657	0	4.52
19:16.1	2842	2843.23	41.4111	0	4.52
20:16.1	2842	2842.44	41.4599	0	4.52
21:16.1	2842	2843.37	41.4416	0	4.52
22:16.1	2842	2843.53	41.4301	0	4.52
23:16.1	2842	2843.16	41.4036	0	4.52
24:16.1	2842	2843.38	41.3977	0	4.52
25:16.1	2842	2843.52	41.3701	0	4.52
26:16.1	2842	2843.39	41.3844	0	4.52
27:16.1	2842	2843.43	41.3526	0	4.52
28:16.1	2842	2843.14	41.3419	0	4.52
29:16.1	2842	2843.81	41.3363	0	4.52
30:16.1	2972	2976.794	41.3626	0	4.52
31:16.1	2972	2976.685	41.4062	0	4.52
32:16.1	2972	2976.626	41.3172	0	4.52
33:16.1	2972	2977.229	41.3333	0	4.52
34:16.1	2972	2976.329	41.3107	0	4.52
35:16.1	2972	2977.126	41.2719	0	4.52
36:16.1	2972	2977.053	41.2782	0	4.52
37:16.1	2972	2977.604	41.2765	0	4.52
38:16.1	2972	2976.978	41.2241	0	4.52
39:16.1	2972	2976.926	41.2576	0	4.52
40:16.1	2972	2975.82	41.237	0	4.52
41:16.1	2972	2976.283	41.203	0	4.52
42:16.2	2972	2976.5	41.221	0	4.52
43:16.2	2972	2977.107	41.1896	0	4.52
44:16.2	2972	2976.943	41.1994	0	4.52
45:16.2	78	69.8329	41.2143	0	4.56
46:16.2	78	69.2764	41.1819	0	4.56
47:16.2	78	69.3411	41.1878	0	4.56
48:16.2	78	69.3419	41.1439	0	4.56

Time	Simulated Power (W)	System Power (W)	Geyser Temperature (Degrees Celsius)	Water Valve	Time (Sync with Arduino)
49:16.1	78	69.2603	41.1292	0	4.56
50:16.1	78	68.8974	41.1569	0	4.56
51:16.1	78	69.1972	41.1392	0	4.56
52:16.1	78	69.3962	41.109	0	4.56
53:16.1	78	69.3143	41.0738	0	4.56
54:16.0	78	69.5336	41.0785	0	4.56
55:16.0	78	69.2327	41.0792	0	4.56
56:16.0	78	69.0114	41.0483	0	4.56
57:16.0	78	69.3578	41.0549	0	4.56
58:16.0	78	69.5564	41.0406	0	4.56
59:16.0	78	69.6166	41.0182	0	4.56
00:16.0	78	69.3006	41.0185	0	4.56
01:16.0	78	69.3217	41.0015	0	4.56
02:16.0	78	69.3878	40.9913	0	4.56
03:16.0	78	69.4366	40.9279	0	4.56
04:16.0	78	69.2905	40.8812	0	4.56
05:16.0	78	69.1407	40.8467	0	4.56