A PERFORMANCE STUDY OF THE PHOTOVOLTAIC INTEGRATED WITH HYBRID BATTERY SYSTEM FOR PEAK POWER REDUCTION

PRAPHUN PIKULTONG

A Thesis Submitted to the Graduate School of Naresuan University
in Partial Fulfillment of the Requirements
for the Doctor of Philosophy in Smart Grid Technology
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has been approved by the Graduate School as partial fulfillment of the requirements for the Doctor of Philosophy in Smart Grid Technology of Naresuan University

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Title	A PERFORMANCE STUDY OF THE PHOTOVOLTAIC INTEGRATED WITH HYBRID BATTERY SYSTEM FOR PEAK POWER REDUCTION
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ABSTRACT

One of the greatest practices in energy management is the Energy Storage System (ESS). ESS can be used for renewable energy control as well as peak shaving in the build-up of a Smart Grid. The cost of a lithium ion battery is more than 200 percent greater than that of a lead-acid battery, which is a significant barrier to project start-up. This paper discusses the use of a hybrid energy storage system that includes a lithium-ion battery and a lead-acid battery. This work presents the hybrid energy storage using lithium-ion battery and lead-acid battery, which aims at reducing costs of the project. However, usability that requires high current power supply considerably affects the usable capacity of a lead-acid battery. According to the test, it was found that the ratio 68.63: 31.37 was the most suitable among 7 ratios, compared to the model building installed a 50kW solar power generator on the rooftop, in the worst case scenario when the batter have 85% DoD per cycle .The EOL for hybrid energy storage is about 4 years lifespan with the 0.5C and 0.2C for LFP and AGM respectively. In terms of economic evaluation, hybrid energy storage could initially reduce the project cost by 47.5%.

Most large and controlled buildings require high power demand with long period. However, there are restrictions on building facilities and image when it comes to reducing electricity consumption. Another option is to install a roof-top solar power

system, though due to the small installation area, it will only partially reduce energy use. Hybrid energy storage systems in combination with AGM batteries and LFP batteries are now offered as a lower cost energy management solution. AGM batteries are constrained in their ability to produce current, hence a larger current supply will reduce the battery's useable capacity. Therefore, in order to respond to high demand with long period, this research proposed a separate multi-level threshold control of the battery packs, and used the control factor in the form of current ratio to divide the load response for each battery type: On-Peak in AGM: LFP at 0.7 : 0.3, Off-Peak in AGM : LFP at 0.5 : 0.5. And when one battery was not ready for use, the other battery would be run at full capacity. The results showed that the AGM battery had a peak discharge current of 12.7A, or approximately 0.5C when coupled with an LFP battery, and when processing power storage system capacity, a loss of 8.99 kWh occurred, the hybrid energy storage system had an efficiency of 93.20%, And when taking the electricity produced from the solar power generation system compared to the incident solar radiation, it would be found that the efficiency of the solar power generation system would be 76.74%. Therefore, when considering the total efficiency of the solar power generation system combined with the hybrid energy storage system, the efficiency was 71.52%.

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The author would like to dedicate this thesis to all benefactors for the values and advantages that should be gained from it. The author hopes that this research will be more or less beneficial to the country and those who are interested.

Praphun Pikultong

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CHAPTER I

INTRODUCTION

Background and Significance of the Study

Economic development, urbanization, technical advancement, and improved people's quality of life have all been part of the country's progress, all of which have necessitated increased electricity usage. However, to increase the power production rate to meet the demand properly, it is important to consider the basis of usage by time. Practically, it is possible to rely on statistical data to produce electric power because of the inconstant user's behavior of electricity consumption. The inconsistent use of power could be caused by many reasons, such as different working time, different machine operation time, different types of machines that required uneven power with load and unload ranges according to usage conditions, or weather conditions (during summer with hot temperature, all air conditioners will be used at the same time, causing the demand for electricity to increase to its peak), etc. Even in a short period, these causes create an imbalance between electricity generation and user demand, which will directly affect the performance of the whole system.

According to Thailand's electricity consumption data, the peak of demand for electricity was around the end of April because of the weather condition and the shutdown of natural gas supply from Myanmar for maintenance during the time. Therefore, if there is no more efficient energy management instead of increasing the power generation capacity, the energy security of the country may be impacted. The government has foreseen the energy crisis and continuously encouraged the use of renewable energy to generate more electricity, such as solar power, wind power, or small hydropower. Although there are support and cooperation with the private sector for more power capacity installed every year, but the energy sources are uncertain and not available at all time due to many involved factors, such as different climate and seasons. It further emphasized the importance of monitoring and optimizing for better condition of production capacity and the actual power usage.

As mentioned, the problem of electricity security and increase in electricity demand in Thailand can be implemented according to the policy that supports renewable energy to generate electricity by adding the measurement of power capacity and energy consumption for further improvement in efficiency of electric power management. However, it is interesting to connect the power generation system with the energy storage technology system, because it will increase the system stability and the management efficiency. This can be used to reduce the power generation capacity during high demand for electricity each day by saving up electricity during low power usage and releasing it during high demand period. The benefits of energy management by combination of renewable energy and energy storage technology can be summarized as follows;

1. The power stability of the renewable energy system affected by environmental change
2. The increase in stability and flexibility of power generation and distribution
3. The reduced limitation or the increased potential of the power transmission line system during high electricity demand
4. The efficient management of power generation during peak power demand that can reduce the demand for peak electricity.

Due to the policy that supports the installation of solar roof-top promoting the use of renewable energy to generate electricity from the private sector and reduce the electricity load generated by the Electricity Generating Authority; this research is therefore a model presenting systems and methods for energy management to reduce the peak electricity demand by relying on combination of solar energy and electric energy storage system. It is expected to be a private power generation and backup network that can work with the Electricity Generating Authority to manage the production and use of energy efficiently. Therefore, this research has an idea to study, develop and create a commercial used electrochemical energy storage technology that is suitable for practical applications in Thailand, which is Lithium-based batteries. The research also aimed to develop the power generation system from solar energy, one of the renewable energies for energy charging and storage systems, as an

additional source of power for the system. In addition, the objectives are to design and develop the control systems to keep the electric power stable and able to respond to changes in the environment promptly, as well as manage the energy by processing energy consumption to reduce peak power demand during the day and comparing the working efficiency with the actual electricity consumption of the building system. This will greatly benefit Thailand, now and in the future, as it will increase the stability and flexibility of the country's electric power system management, especially for delivering electricity during high or peak power demand. It is also considered as another way to promote the use of renewable energy.

Objectives

1. To study the Photovoltaic system performance integrated with hybrid batteries: lead and lithium batteries integrated to system for peak power consumption reduction.
2. To assess the economic aspect of the hybrid batteries in this research.

Scope

The system will be used in the study consisting of an 80 kWh lead-acid battery, a 50 kWh lithium-ion battery, and a 50 kW solar power system. The system will be installed at the Faculty of Science, Naresuan University as shown in Figures 1 and 2. The details of the various equipment in the system are shown in Table 1. The system has the ability to work in two directions. In other words, the system will be powered by grid power and renewable energy produced by solar including 2 different types of energy storage systems. There are 3 sets of DC power systems as inputs of the system, with AC power outputs. The power conversion system consists of specialized equipment such as a battery charger for lead-acid batteries, a battery charger for lithium-ion batteries, a maximum power tracker capacitor, inverter, pressure stabilization system and control system with a system for measuring and recording data to help control as shown in Figure 3: A diagram of the photovoltaic power generation system in combination with a hybrid energy storage system.

Figure 1 The roof-top area of the Administration Building, Faculty of Science, Naresuan University

Figure 2 Hybrid energy storage system , Faculty of Science, Naresuan University

Table 1 Details of the equipment in the photovoltaic power generation system with the hybrid energy storage system.

Device list	Characteristics
Solar panel	50 kW Mono crystalline silicon type
Hybrid inverter	SEG 5k Hybrid type
Inverter	SOFAR25000TL-G2 PV String Grid Model
Lithium-ion phosphate battery	Cylindrical cell type 50 kWh Lithium Ion 48V 10 Ah Battery with Capacity of 480 Wh
Lead-acid battery	GEL type 80 kWh GEL type 12V 100 Ah Battery with Capacity of 1,200 Wh

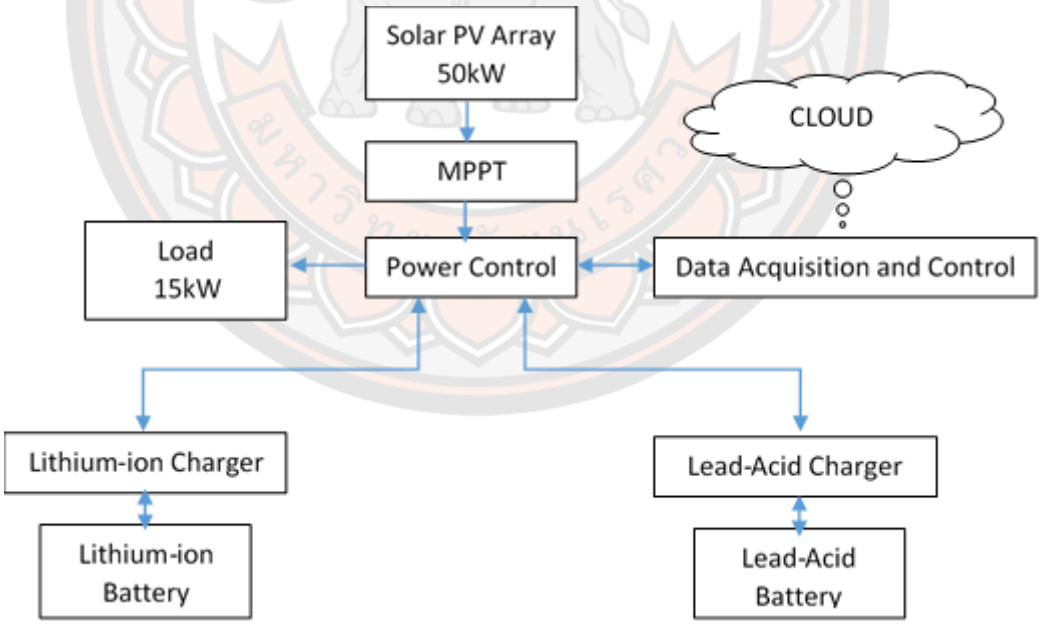

Figure 3 Diagram of the photovoltaic integrated with hybrid battery system

Preliminary agreement

The hybrid electric power storage system for renewable solar energy generation system can increase the stability of electric power by reducing the volatility due to environmental and weather conditions that directly affect solar energy.

Definition and terminology

Hybrid energy storage system refers to the electrical energy storage system that combined a lead-acid battery with a lithium-ion battery.

AGM battery refers to a glass fiber-absorbed lead-acid battery.

LFP battery refers to a LiFePO4 lithium-ion battery.

Depth of Discharge refers to the level of depth for discharge.

Cost of Energy refers to a cost per unity of energy

LCOE refers to levelized cost of electricity.

EoL refers to end of life cycle of products; the final stage of a product's existence.

SOC refers to state of charge; the level of charge of an electric battery relative to its capacity.

E_{sh} refers to electrical energy of electrical load that can be saved.

k refers to Peukert constant.

Hypothesis

The hybrid energy storage system can respond promptly to changes in the environment, and manage energy by processing power consumption to reduce peak daily power demand.

CHAPTER II

LITERATURE REVIEW

The development of knowledge and technology in energy storage system has continued and developed in terms of size to respond to larger systems, as well as being used in conjunction with renewable energy sources. However, there are differences in the control system and design to support the usage conditions in each country. To design a control system and simulate a high power demand scenario, A. Mishra et al. designed and developed a feedback control system, implemented it to reduce peak power demand by up to 18%, and improved the system with more stability (1). In addition, S. Son and H. Song further developed their project by connecting the power storage system to renewable energy sources, and used a fuzzy logic control system to control the compression and discharge of the power storage system. According to their predicted amount of electricity generated from real-time wind energy combined with the energy stored in the battery, and supplied to the grid, to reduce peak demand; it was found that the peak power demand could be reduced and postponed (2). Similar to solar power generation systems, J. Neubauer and M. Simpson conducted a small-scale storage system that jointly supplied electricity during peak power demand for a short period of time. It was found that the method had a huge cost advantage regardless of the energy from the solar power generation system, which could reduce the peak power demand for a short period of time by 2.5% (3)

Because the control system was very important to energy management to reduce the peak power demand, so the installation of measuring instruments was necessary to show the information of the energy produced and the energy consumption at the time. However, the energy consumption assessment was not very accurate. Thus, there was need to over-produce the electricity in large quantities to support the case of higher amount of consumption than expected. Also, the amount of electricity produced from renewable energy sources as co-energy sources could not be estimated accurately. Therefore, relying on measuring instruments alone could not

lead to effective energy management to its full potential. F.A.T. Al-Saedi conducted a research on the Internet (Yahoo Weather Forecast); then evaluated and applied statistical data, trends and weather data to jointly process the main control system of the energy management system. The researcher showed an example of using and enhancing the system in smart home electrical management system, such as turning on and off the lights to reduce energy consumption (4).

Power storage system or battery has been developed in parallel with the control system. In this research project, the selected lithium battery was a battery with a high energy capacity per area and widely use for energy storage. The European Commission Joint Research Center in cooperation with frontier Economics tested the lithium battery in power applications, and found that its efficiency was as high as 85% (5). This was consistent with the experiment of S.M. Schoenung and W.V. Hassenzahl (6). Also, during the self discharge rate test, L. Beurskens found that the lithium battery had a relatively low self-discharge rate (0.03-0.1% per day) (7). Meanwhile, the type of battery had many disadvantages, such as asy deterioration, temperature sensitiveness, as well as high price, easy ignition when in contact with high temperature, or electrolyte leakage. The design was therefore necessary to prevent and support such conditions. In addition, the study of the electric power storage system for reducing the peak power demand in Thailand was considered as research that is consistent with the government's energy policy, which had not been implimented much. This project was therefore very beneficial to Thailand, now and in the future, as it would increase the stability and flexibility of the country's electric power system management, especially to supply electricity during peak power demand periods. It also promoted more usage of renewable energy as well.

In terms of economics research, J. Eyer and G. Corey calculated the costs incurred during compression and discharge of an electric power storage system, and found that the 4¢/kWh electric energy discharged the electricity at 9.33¢/kWh, when charged into a hybrid battery energy storage system with 75% efficient. Therefore, this was another way to consider and select a time for energy storage and discharge to reduce the peak power demand (8).

Hybrid energy storage system was an energy storage system technology formed by the integration of two or more energy storage systems to work together

with the aim of combing the advantages of each energy storage system (9). A hybrid energy storage system might consist of energy storage systems with different characteristics; such as electric energy storage system - thermal energy storage system, electric energy storage - mechanical energy storage system, electric energy storage system - hydrogen energy storage system, electric energy storage system - magnetic energy storage system, electric energy storage system - electric energy storage system, etc. It could be seen that the electric power storage system was the core of the hybrid energy storage system because of its flexibility of usage, easy energy application and suitability with a variety of applications.

N. Mukherjee and D. Strickland conducted research on hybrid electric energy storage system as a collaboration between Super Capacitor and battery with the aim of increasing the power supply capacity and prolonging the battery life by presenting a voltage level conversion system and a control system to increase flexibility in operation, which achieved the objectives (10). In addition, hybrid electric energy storage systems were developed with different types of batteries. H. Arita et al. designed a hybrid electric power storage system combining lead-acid and lithium-ion batteries by using a control system to respond to changes in electric power demand and reduce the volatility of the wind power generation system, which could reduce the cost of power storage systems by up to 40% (11). For remote areas far away from transmission lines or places with unstable power system, the energy storage systems played a role in reducing the uncertainty of electric power by reducing the use of fuel-operated generators. For example, healthcare facilities in Africa had adopted a hybrid electric energy storage system consisting of lithium-ion and lead-acid batteries along with a solar power generation system to use as an additional source of energy. From the experimental-designed model, C. Rahe found that the hybrid energy storage system would have a longer lifespan with lower cost (12).

Moslem Uddin, Mohd Fakhizan Romlie, Mohd Faris Abdullah, Syahirah Abd Halim, Ab Halim Abu Bakar and Tan Chia Kwang conducted a study on 3 ways to reduce peak power, including using energy storage system, bringing electric vehicles into use and load management, and found the difference in types and sizes of energy storage systems. The introduction of electric vehicles into the system and load management had resulted in the reduction of peak power costs (13). Meanwhile,

Enrico Telaretti and Luigi Dusonchet introduced and applied the Battery Energy Storage System (BESS), which was charged up at night with low electricity costs and used for service during the day when electricity costs were more expensive. This could reduce the peak power that occurred during the day (14).

Alexandre Oudalov et al. conducted research to determine the optimal size and management of the Battery Energy Storage System (BESS) to reduce peak power, and found that the suitable size of the battery to store energy depended on the maximum power that needed to be reduced. Also, by using the battery system to store energy, the result of savings would depend on power demand and battery life. When a 250 kWh lead-acid battery was used with the simulated load of an industrial plant, it could reduce energy costs by 4% (15). Meanwhile, O. Lavrova et al. applied a 0.50 MW solar power system with an energy storage battery system to reduce the peak power in New Mexico city with the goal of reducing the peak power cost by 15% (16).

Hyung Tae kim et al. conducted research the capacity of battery energy storage systems (BESS) is expected to increase for power system applications. However, as the cost of BESS is high, economic feasibility must be considered when using BESS in grid applications. Load leveling with BESS is one such application for which the economic implications have been analyzed in the literature. The results in this study lead to some guidelines for designing a policy related to the BESS for load leveling. First, it should not simply be assumed that BESS with a high cumulative capacity is always economically beneficial even if the investment cost in BESS is low enough. Second, load leveling with the BESS may rather increase the total cost of electricity provision, particularly in a competitive electricity market environment. In this case, the load leveling needs to be linked to other purposes than economic benefit to justify the validity of using the BESS. Third, when a large number of distributed BESS are integrated into the power system, the pricing mechanism of electricity should be elaborately designed to prevent the synchronized operation of the BESS. This is necessary to ensure systems remain sufficiently profitable and that the power system is reliable (17).

Panyawoot Boonluk et al. conducted research to optimal siting and sizing of a battery energy storage system (BESS) in a distribution network with renewable energy sources (RESs) of distribution network operators (DNO) are presented to

reduce the effect of RES fluctuations for power generation reliability and quality. The optimal siting and sizing of the BESS are found by minimizing the costs caused by the voltage deviations, power losses, and peak demands in the distribution network for improving the performance of the distribution network (18).

Daniel Kucevic et al studied an implementation strategy for energy storage battery systems targeting industrial consumers to achieve both the improvement of the power distribution system and savings on electricity costs for industrial users, aiming to reduce the maximum power output. The results indicate that the maximum power could be reduced significantly. The objective is to reduce the peak power at the point of common coupling in existing distribution grids by adapting the control of the battery energy storage system at individual industrial consumer sites. An open-source simulation tool, which enables a realistic simulation of the effects of storage systems in different operating modes on the distribution grid, has been adapted as part of this work. Further information on the additional stress on the storage system is derived from a detailed analysis based on six key characteristics. The results show that, with the combined approach, both the local peak load and the global peak load can be reduced, while the stress on the energy storage is not significantly increased (19).

Jin Sol Hwang et al. studied an optimal energy storage system (ESS) scheduling algorithm focusing on how to reduce peak load using ESS and load prediction which will lead to actual building energy forecasts. In the study, it was expected that the maximum load was reduced, the electrical cost was reduced, and the service life of the ESS was extended. And considering the age of the ESS, it was found that it depends on the charge and discharge of the ESS as importance In the optimization problem, the objective function and constraints are defined such that the peak load is reduced; the cost for electricity is minimized; and the ESS's lifetime is elongated considering the accuracy-enhanced load forecast, real-time electricity price, and the state-of-charge of the ESS. For the purpose of demonstrating the effectiveness of the proposed ESS scheduling method, it is implemented using a real building load power and temperature data. The simulation results show that the proposed method can reduce the peak load and results in smooth charging and discharging, which is important for the ESS lifetime (20).

Lu Feng et al. studied the operation of a microgrid system, which combined renewable electricity with a hybrid energy storage system (HESS), where renewable energy came from wind and solar power, while the hybrid energy storage system was a combination of lithium-ion (Li-ion) battery, super capacitor (SC) and compressed air energy storage (CAES). The system was used in remote areas and islands. The results showed that the wind-PV-HESS can better meet the power demand of users with a good economic performance. Based on the capacity configuration results of the wind-PV-Li-ion battery system, the power curve of source-load differential was obtained. The differential power was divided into high frequency, medium frequency and low frequency parts by the method of quadratic moving average filtering, which were then undertaken by SC, Li-ion battery and CAES system, respectively. Through Fig. 12. Capacity proportion of HESS. the sensitivity analysis of the total annual cost of wind-PV-Li ion battery system and wind-PV-HESS, it was concluded that the annual cost of wind-PV-HESS was lower than that of wind PV-Li-ion battery system under different confidence levels (21).

Md Masud Rana et al. investigated solar power generation systems and hybrid storage battery systems by improving working life, cost reduction analysis, optimizing sizing. The existing research conducted with a hybrid PV-BESS system is considered in this review study to find out its potentiality for power system application as well as to improve its further operations. A simulation case study has also been undertaken to evaluate the potentiality of an existing peak shaving strategy. Finally, insights into future directions are provided for further advancement of hybrid PV-BESS systems. This research has analyzed the current status of hybrid photovoltaic and battery energy storage system along with the potential outcomes, limitations, and future recommendations. The practical implementation of this hybrid device for power system applications depends on many other factors. However, more detailed investigation is required before implementing the hybrid PV-BESS system in any specific field. Currently, optimal energy sharing among different power system components and this hybrid device is a vital power system obligation. The overall performance, economic potentiality, system requirement, capital investment and etc. of this hybrid system should be analyzed in depth to implement for optimal power

sharing applications. Therefore, the future extension of this study will discuss the feasibility analysis of hybrid PV-BESS system for optimal power sharing (22).

According to the findings of a study of the types of batteries typically used in Thailand, batteries may be classified into two types based on the features of the electrolyte:

1. Dry cell: It uses a paste-like electrolyte with just the right amount of moisture to allow an electric current to travel. Dry cell can be used in any configuration as it does not contain liquid substances which will spill or leak outside the battery.
2. Wet cell or storage battery: It uses some kind of liquid electrolyte that can be charged, such as a lead-acid battery in a car.

Furthermore, based on the battery's usage characteristics, the battery can be classified into two types:

1. Primary battery: It is a battery that, once it has been used, cannot be recharged for use again, such as Alkaline batteries or lithium batteries, also known by the general term that "Batteries" for use in radios, watches or television remote
2. Secondary battery: It is a battery that, after being used, it can be reused for reuse, for example, lithium ion (Li-ion) batteries used in mobile phones or notebook computers or car batteries.

Secondary battery has both wet and dry type. The most commonly used types are lead-acid battery, lithium or lithium-ion battery, and nickel-based battery, each of which has different internal chemistry and usage characteristics.

Most lead-acid batteries consist of six cells with a voltage of 2 volts per cell, with electrodes made of lead. When charged, the lead plates connected to the positive terminal of the battery will react with the sulfuric acid (H_2SO_4) electrolyte to yield Pb^{2+} which combines with oxygen to produce lead (IV) oxide. The lead plate containing PbO_2 then acts as the anode while the other lead plate acts as the cathode. This type of battery is commonly used in various types of vehicles such as cars, boats,

motorcycles. It is also commonly used in uninterruptible power supplies and automatic voltage regulators (UPS) and energy storage devices in solar power plants.

Dealing with deteriorated lead-acid batteries requires proper handling as lead and acid are toxic to living organisms. Users may take the deteriorated lead-acid battery to an antique dealer or take it to a battery shop when purchasing a new battery for further recycling.

Figure 4 Example of a lead-acid battery

Lithium battery or lithium-ion battery requires lithium as the internal component of the battery because lithium is the element with the best electron distribution ability. This type of battery is characterized by its light weight. It has a high capacity-to-weight and has no memory effect that allows recharging while retaining the original charge, which prevents the battery from reaching its maximum capacity ever charged.

The anode or cathode of a lithium-ion battery is made of compounds containing lithium, such as Lithium Cobalt Oxide (LiCoO,) Lithium Manganese Oxide (LiMn,O) Lithium Iron Phosphate ($LiFePO_4$), each of which provides different properties of a lithium-ion battery.

The negative electrode or anode of a battery is made of graphite, a crystal of carbon. The electrolyte is an organic solution containing lithium salts.

The most popular lithium-ion batteries used in cell phones, tablets and notebook computers are the ones that have a cathode made of Lithium Cobalt Oxide ($LiCoO_2$), which undergoes a chemical reaction when an electric current is applied.

This battery is commonly used in portable devices such as mobile phones, tablets and notebook computers, as well as in electric vehicles, hybrid vehicles. When handling used lithium-ion batteries, they can be disposed of with general waste. But since the substances in lithium-ion batteries are recyclable, if there is a collection point for used batteries for recycling nearby, please drop the lithium-ion batteries to the collection point.

Figure 5 An example of a lithium ion (Li-ion) battery

For a nickel-based battery, the anode or cathode of a nickel battery is made of nickel compounds, mainly nickel oxide hydroxide (NiO(OH)), coated on top of nickel metal; while the cathode, or anode, is made of different chemicals, for example, a nickel-cadmium (NiCd or Ni-Cd) battery uses cadmium metal as the anode, nickel metal hydride (NIMH or Ni-MH) battery uses an alloy that absorbs hydrogen as the anode and the electrolyte as an alkaline which is mainly potassium hydroxide

This battery is commonly used in portable devices such as calculators, cameras, and wireless lasers. The handling of used nickel batteries should be separated as toxic waste as cadmium is a heavy metal that is harmful to living organisms. After that, take them to the disposal point of the department store or the used battery collection point for the relevant parties to proceed with proper disposal.

Figure 6 Example of a nickel-metal hydride battery (NiMH)

When considering energy storage systems that are popular in Thailand, they can be divided into 3 types as follows.

1. Battery Energy Storage System (BESS)

Battery Energy Storage System (BESS) is an energy storage system that uses batteries as part of its components. The battery will collect excess energy from the transmission system by storing the charge in the battery during times when the demand for electricity is low so that it can be used to supply power during the time needed to help reduce intermittent problems of electricity generation from renewable energy sources. The battery energy storage system will reduce fluctuations in electricity and enable the system to supply more stable and continuous electricity.

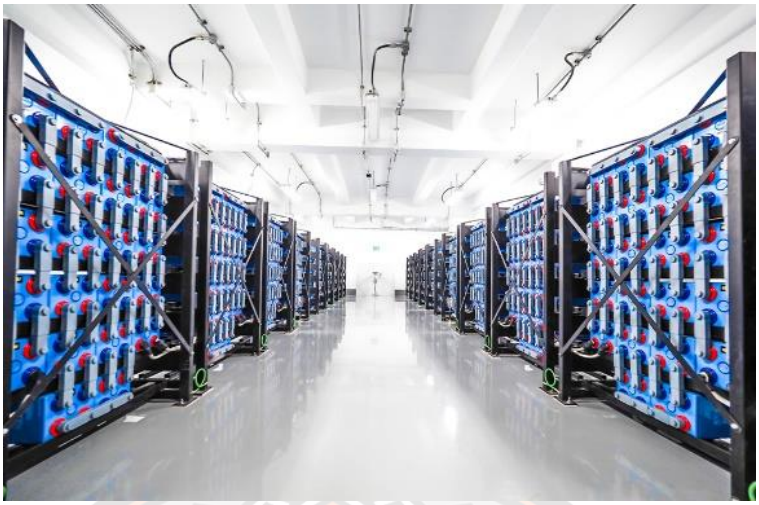

Figure 7 An example of an energy storage system using a battery

2. Pumped Storage Hydro Plant

It is a hydroelectric power station with water pumps. Its working principle is to bring electricity from the production system during the period when there is less electricity to use to pump water from the existing reservoir up to store it in the newly built upper reservoir. Then let the water come down through the generator to generate electricity during the daily high demand for electricity. It is considered a form of electrical energy storage system that has low cost per unit of electricity and emits less CO_2 from electricity generation than other systems.

Figure 8 Example of pumped storage hydro plant application

3. Wind-Hydrogen Hybrid System

It is the storage of electrical energy in the form of hydrogen gas. When the wind turbine produces more electricity than the system demand, the electricity is supplied to the electrolyzer, which will split water into oxygen gas and hydrogen gas. The hydrogen gas will be stored in tanks and used to produce electricity through a hydrogen fuel cell to supply electricity during times of high electricity demand.

Figure 9 An example of the use of the Wind-Hydrogen Hybrid System

Without an energy storage system, the power generation system will have to bear the responsibility of generating electricity as needed for the time period. This means that the greater the demand for electricity, the more electricity the system must produce to meet the demand. An imbalance can mean insufficient power usage or wastage of excess power produced and supplied to the system. Therefore, the energy storage system is like a backup power source that will strengthen the system when the demand for electricity increases, helping to meet the needs of electricity usage immediately 24 hours a day, as well as reducing the energy wasted from power generation by storing it in an energy storage system and can be returned to the system in times of high demand to provide flexibility and stability to the electricity system. It also reduces fluctuations in electricity generated from renewable energy to be more stable, resulting in a stable, reliable power system and improved energy efficiency leading to a better energy management. Thus, it can be regarded that the energy storage system is truly the key to the future power system.

In addition, the Energy Storage System can be applied in a variety of ways depending on the needs of the power system, which generally have the following basics:

1. Energy Arbitrage changes or manages electricity consumption at the right time such as Peak Shaving, TOU (Time of Use), Energy Management or Demand Charge reduction from the system. Most of them are used to reduce electricity bills and manage energy. e.g. using less power during On-Peak time; and using more power during off-peak times.
2. Renewable Energy Storage System can help to make renewable energy more stable and able to reuse surplus energy when needed. It is usually used in conjunction with Solar Energy and Wind Energy.
3. Frequency Regulation Energy Storage System can help adjust the frequency of the power system to be more stable, prevent power outages, suitable for power systems with low stability, such as remote areas or on islands.
4. Backup/Emergency Energy Storage System can be used for emergency power backup similar to a UPS system in the event of a power outage.
5. Off Grid/Microgrid Energy Storage Systems can be used as Standalone or Islanding and can also be connected to a wide range of production sites.

According to past research studies, energy storage system was important for energy conservation and energy stability enhancement. The problem encountered in the implementation of each type of energy storage system was that the characteristics of each type of energy storage system had different advantages and disadvantages. As a result, there were limitations in use. One solution is to combine the strengths of each energy storage system to work together to increase the efficiency of the energy storage system. This research was a study of the interaction of lithium-ion battery and lead-acid battery with a total capacity of 130 kWh to find the optimal battery ratio and economic advantages. The model was installed in an experimental building with energy supplied by grid power and an installed 50 kW capacity solar power generation system. This hybrid energy storage system was tested for its responsiveness to reduce peak power demand of the building.

CHAPTER III

RESEARCH METHOD

The objectives of this research are to study the efficiency of solar system for power generation working collaboratively with lead-acid battery and lithium-ion battery in order to reduce the maximum electricity consumption of the building (the peak of electrical energy consumption) and to evaluate economic cost-benefit (economic evaluation) of those batteries. Details of the research methodology were shown in Figure 10.

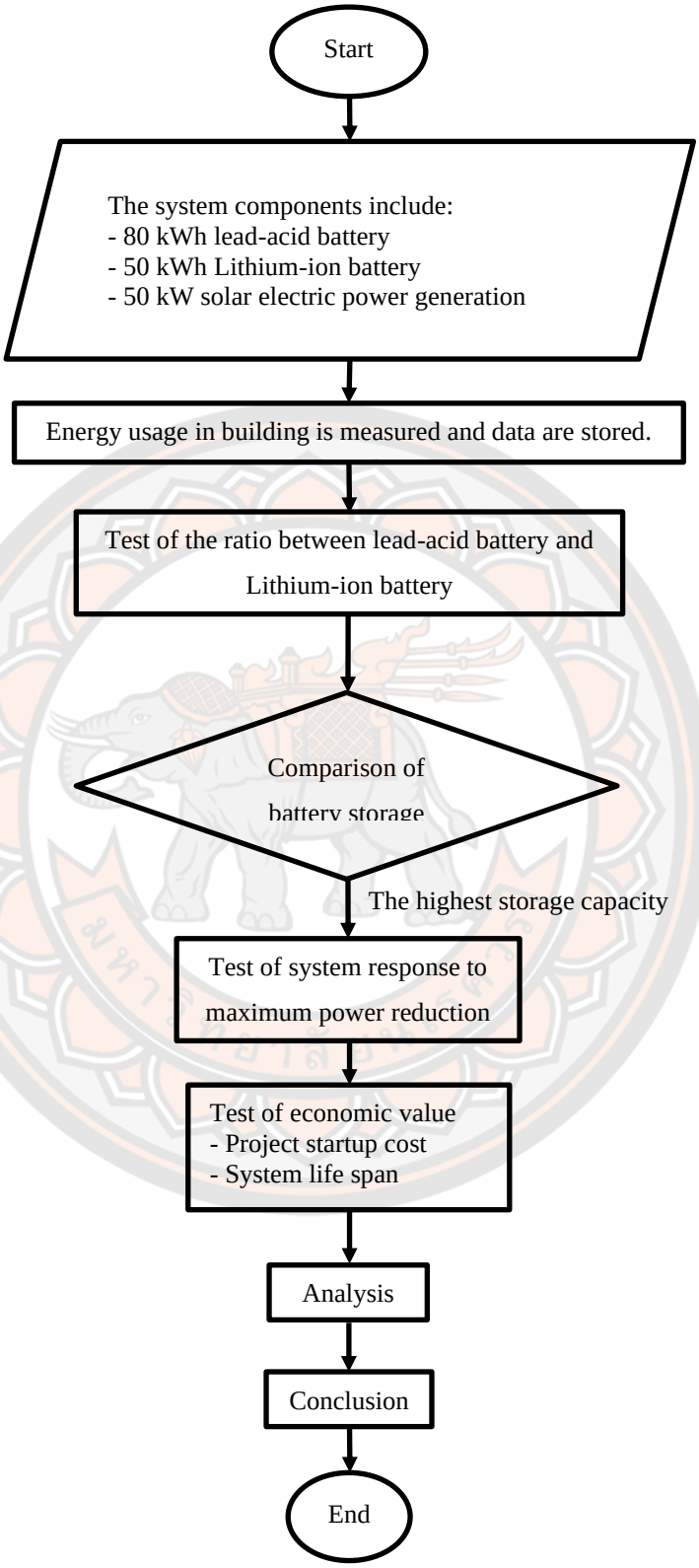

Figure 10 Research methodology.

Measurement and data collection of electricity consumption of the building

This procedure aimed to study electricity consumption of the building in each period of time. The measured electrical energy shall describe a specific period of time having the high and low amount of electrical energy consumed in the building. Such energy consumption behavior shall have an effect on the use of the hybrid energy storage system accordingly. The measurement of electricity consumption was implemented in the building of Department of Physics, Faculty of Science, Naresuan University, consisting of classrooms, meeting rooms, work rooms, and laboratory rooms.

Test of usable capacity efficiency by varying the hybrid battery ratio

Test of usable capacity efficiency by varying the hybrid battery ratio is important to this research since it is a procedure indicating the system efficiency and becomes data for economic cost-benefit analysis accordingly. Since this hybrid energy storage system consists of lead-acid battery and lithium-ion battery, the properties of each module are 1 module of lead-acid battery with 100Ah 12V 1,200 Wh and 1 module of lithium-ion battery with 10Ah 48V 480Wh. Therefore, the ratio of lead-acid battery and lithium-ion battery are determined for testing usable capacity efficiency presented in Table 2.

Table 2 The ratio between AGM battery and LFP battery in the test

AGM Battery Capacity (Wh)	LFP Battery Capacity (Wh)	Capacity Ratio
168	19.2	89.74 : 10.26
252	38.4	86.78 : 13.22
84	19.2	81.40 : 18.60
168	57.6	74.47 : 25.53
84	38.4	68.63 : 31.37
84	57.6	59.32 : 40.68
84	76.8	52.24 : 47.76

The test of usable capacity efficiency is essential for system efficiency assessment since usable capacity efficiency of the system shall directly affect the system usage. It is necessary that usable capacity efficiency results must be confirmed in the actual operations. Usable capacity efficiency was tested through programmable resistive load for being able to set discharge current. The diagram of system testing at laboratory level is shown in Figure 11. Both types of batteries were connected independently to prevent the current delivery between the batteries which can cause damage.

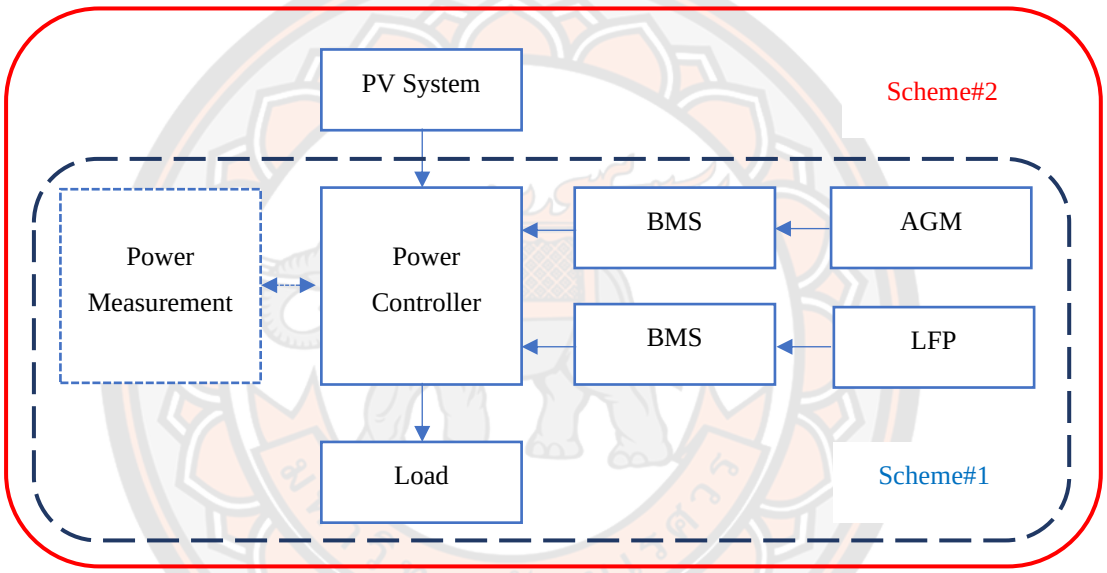

Figure 11 Diagram showing usable capacity efficiency testing.

Since the operations require a high current, it has a huge effect on usable capacity efficiency of lead-acid batteries, contributing to the usage and design of the size of the energy storage system, including the command menu to control the operations. Therefore, consideration of efficiency of the hybrid energy storage system in which lead-acid battery and lithium-ion battery work collaboratively in terms of usable capacity efficiency is in the top priority towards system capacity assessment.

Usable capacity efficiency is the comparison of energy storage system efficiency by referring to usable storage capacity of batteries when tested to deliver electric current compared to the usable storage capacity identified by a manufacturer.

Usable capacity efficiency can be compared from Normalized Discharge Capacity as shown in the equation 1.

$$C_n = \frac{C_{dis}}{C_r} \tag{1}$$

when C_n is Normalized Discharge Capacity

C_{dis} is Discharge Capacity (Wh)

C_r is Current Rated Capacity (Wh)

However, precision of battery capacity depends on Peukert constant as seen in equation 2 ((Peukert, W, 1897). Peukert equation describes battery capacity when Peukert constant is equal to 1, battery usable capacity depends on the current charged, and when Peukert constant is greater than 1, battery usable capacity shall be reduced.

$$\boldsymbol{t = H\left(\frac{C_r}{IH}\right)^k} \tag{2}$$

when H is the rated discharge time (h)

C_r is the rated capacity at that discharge rate (Ah)

I is discharge current (A)

k is the Peukert constant (dimensionless)

t is the discharge time (h).

Peukert constant depends on types of battery. Peukert constant for lead-acid battery ranges from 1.0 to 1.3 and for lithium-ion battery ranges from 1.0 to 1.28 (N. Omar, P. V. d. Bossche, T. Coosemans, and J. V. Mierlo, 2013.)

In this research, usable capacity efficiency to lifespan is analyzed, which is an important of economic evaluation of the hybrid energy storage system by testing with absorbent glass material (AGM) lead-acid battery and lithium iron phosphate (LFP) battery among 7 ratios; 12V 7Ah AGM battery and 3.2V 6Ah LFP battery.

Figure 12 Programable Resistive Load.

Figure 13 Battery Capacity Performance Test.

Economic cost-benefit analysis (Economic Evaluation)

Economic evaluation is divided into 2 steps as consideration of initial project cost and lifespan test of the hybrid energy storage system. The consideration of initial project cost plays a vital role in economic evaluation of the hybrid energy storage system since typically lithium-ion batteries are more expensive than lead-acid batteries. Thus, to calculate the initial project cost, lifespan and maintenance of both types of batteries should be taken into consideration.

According to expense information and life span of the batteries in Table 3, it can be seen that the initial project cost in terms of pure LFP energy storage system is

300% higher than that of pure AGM energy storage system, contributing to a huge effect on investment on a large scale energy storage system. As a result, it can be said that the hybrid energy storage system working collaboratively with lead-acid battery and lithium-ion battery can reduce the initial project cost budget. Due to lifespan problem of lead-acid batteries, the hybrid energy storage system has a higher cost throughout the lifespan from changing batteries by the time they are in use. However, as they are independently connected, lifespan evaluation is performed more conveniently, including changing of batteries according to the cycle life of batteries.

Table 3 The comparison of specific characteristics between lead-acid battery and lithium-ion battery (Altenergymag, 2002, V. Avelar and M. Zacho, 2016, Powertech, 2022)

	lead acid (AGM)	**Lithium-ion (LFP)**
Energy Density (Wh/L)	100	250
Specific Energy (Wh/kg)	40	150
Battery materials cost ($/kWh)	107	428
Transportation cost ($/kWh)	34.6	12.36
Electric utility cost ($/kWh)	0.15	0.15
Battery installation cost ($/kWh)	0.012	0.012
Battery maintenance	10%	1.5%
Cycle Life	1,000 @ 60% DoD	1,800 @ 60% DoD
Typical state of charge window	50%	80%
Temperature sensitivity	Degrades significantly above 25°C	Degrades significantly above 45°C
Efficiency	100% @20-hr rate 80% @4-hr rate 60% @1-hr rate	100% @20-hr rate 99% @4-hr rate 92% @1-hr rate

Figure 14 Battery lifespan test.

With regard to lifespan test of the hybrid energy storage system, IEEE Standard determines an expired battery as at any time a battery cannot produce an electrical current at 80% of the battery capacity expressed in Ampere-Hour (Ah), the battery is considered end of life (EOL). However, EOL value is determined by manufacturers, which most likely ranging from 70-80% (Eric Wood, 2011) (SAFT, 2014) (Tesla, 2017) of the capacity. In a test, it is set to stop delivering an electrical current when the state of charge (SOC) of the battery is lower than the level determined by the manufacturer or some manufacturers determine as electrical value across the lifespan of a battery for referring to a test condition of EOL (Tesla, 2017). At the same time, information identified by a test performed by a manufacturer is a battery's cycle life, the number of charge and discharge cycles that a battery can complete before losing performance. Therefore, a test of lifespan of the energy storage system is performed by considering a situation that any type of batteries needs to work alone until the control system cuts the operations. End of discharge voltage is set at 10.5V for AGM battery and 2.6V for LFP battery. Since usable storage capacity of AGM battery has high variation towards the ratio of electric current discharged, the actual storage capacity of the battery cannot be seen for consideration of battery EOL. Therefore, the battery's storage capacity is measured based on a 20-hour rate discharge rate according to the storage capacity test information by the manufacturer. Measurement is performed at every 50 charge-discharge cycles of AGM battery. In

every cycle of the discharge in the test, the cells shall be rested for 4 hours before the next cycle of the test shall be started.

Table 4 Details of battery lifespan test.

Factor	Number of Level	Value of Level
Current	2	LFP 0.5C, 1C
		AGM 0.16C, 0.5C, 1C
Battery Type	2	LFP 3.2V 6Ah, AGM 12V 7Ah
Environment		Atmospheric/Room Temperature
Cycle Life	n/a	1, 100, 200, 300, …
Battery Capacity	n/a	measure

Testing of system response to reduce the maximum electricity consumption

When the ratio of the hybrid energy storage system with the maximum usable capacity efficiency was obtained, the hybrid energy storage system was tested its response to reduce the maximum electricity consumption of the building. In this research, emphasis is placed on the hybrid energy storage system response to reduce the maximum electricity consumption of a large building with a long period of time energy used by working collaboratively with solar panels mounted on the rooftop of the building which is smaller than the experimental building as shown in Figure 15 (above). It can be seen that the highest electricity demand period of the building was most likely on peak and solar energy could partially reduce energy consumption. Figure 15 (below) shows differences of electric power consumed energy from grid with a threshold (N) for making a comparison and controlling the energy storage system to discharge to the building. The gray shaded areas show energy discharged from the energy storage system as shown in equation 3.

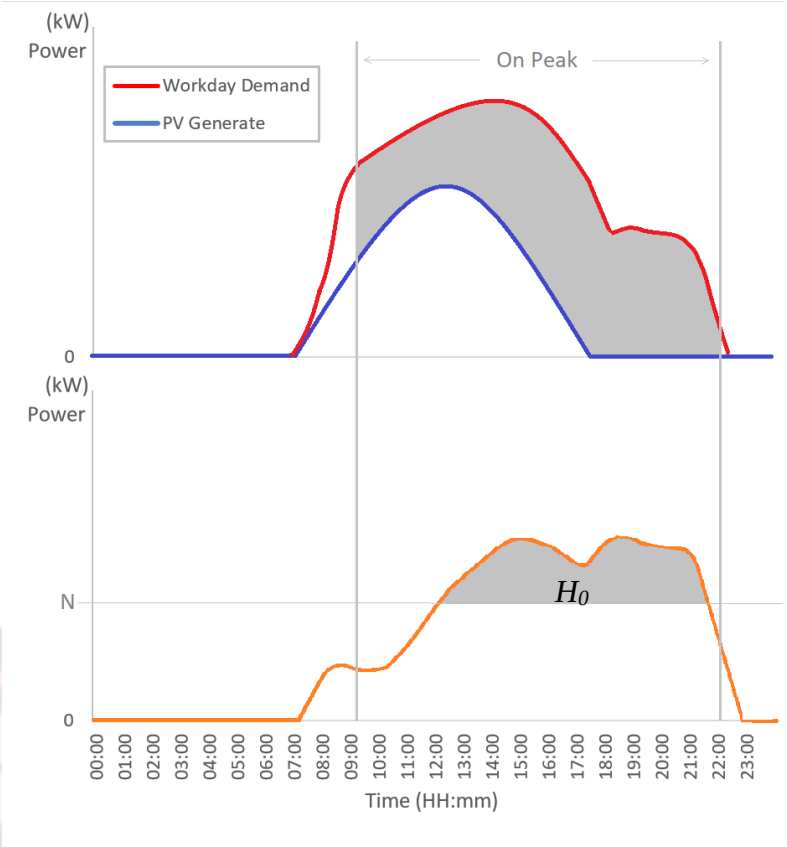

Figure 15 Data of electric power demand of the building compared to electric power generated from solar panels.

$$\boldsymbol{E_{sh} = \sum_{h=H_0}^{H} \left(P_{l,h} - P_{PV,h} - N \right)} \quad (3)$$

When E_{sh} is Energy of Load needed to shaved (kWh)

$P_{l,h}$ is Power of load at hour h (kW)

$P_{PV,h}$ is Power of PV system at hour h (kW)

H is the number of hours

N is the threshold level (kW)

From the equation, threshold values shall majorly control peak shaving. In this regard, consideration should be made to capacity of the energy storage system and the quantity of electric current delivered. Based on the idea of load leveling energy management, to balance the load to have equal electric power demand from the grid continuously is quite difficult since an energy storage system must be designed to be

large enough to compensate uncertainty of electrical energy generated from solar panels that may depend on weather and environment. In this research, the hybrid energy storage system was designed to work collaboratively with LFP and AGM batteries, 130 kWh total capacity, controlled by multi-step threshold in response to a period of time and conditions of electricity demand of the building.

Data analysis

In this research, emphasis is placed on economic evaluation of a hybrid battery and the use of the hybrid battery to work collaboratively with solar system for power generation to reduce the maximum electricity consumption.

Economic evaluation of the hybrid battery shall consider from the ratio of AGM battery and LFP battery, usable capacity efficiency, system lifespan, and initial project cost. The initial project cost is evaluated using a fixed rate and TOU rate and levelized cost of electricity (LCOE) is calculated using the equation 4.

$$LCOE = \frac{sum\ of\ costs\ over\ lifetime}{sum\ of\ electrical\ energy\ produced\ over\ lifetime} \quad (4)$$

when sum of costs over lifetime = sum of costs over lifetime

sum of electrical energy produced over lifetime = sum of electrical energy produced over lifetime

The hybrid battery working collaboratively with the solar power is tested system response to the reduction of the maximum electricity consumption by considering situations in which the building consumers a high amount of electricity for a long time. The obtained results shall be used to analyze energy saving results that really occur. Using the obtained results to analyze the actual savings and the overall efficiency of the system. The efficiency of the solar power generating system was calculated from Equation 5.

$$Eff = \left(\frac{P_{AC}}{GA}\right) x\ 100 \quad (5)$$

When Eff is the efficiency of the system (%)

P_{AC} is AC power from the inverter (W)

G is the incident solar radiation (W/m^2)

A is the total solar panel area (m^2)

Commercial use results are evaluated using SWOT analysis by considering.

Strengths: outstanding features or the quality of being strong (advantages) from internal factors caused by company internal environment, such as financial strength, manufacturing advantages, and human resources. The company shall utilize its strength to determine marketing strategies.

Weakness: a flaw or weak point or disadvantages from internal factors. It includes problems or defects caused by company internal environment, such as a lack of funds, uncertain policies and service directions or unqualified personnel. The company needs to seek a method to make improvement or eliminate those problems for the benefits of the company.

Opportunities: are caused by external factors, resulted from external environment of the company that support or promote the company operations. Opportunities are different from strength since opportunities result from external environment while strength results from internal environment. Smart business operators should always seek opportunities by analyzing external environment that seems to change at all times, such as economy, society, politics, technologies and competitions in the market, and utilize those opportunities.

Threats are caused by external factors. They are limitations caused by external environment that contribute to bad effects on business, such as rising fuel prices, higher interest rates, economic slowdown, etc. Business operators need to adjust their marketing strategies to be consistent and make an effort to combat ongoing obstacles.

CHAPTER IV

RESEARCH RESULTS

According to the research objectives that aimed to study usable capacity efficiency and lifespan of the hybrid energy storage system, the experimental results can be procedurally classified into 3 parts as usable capacity efficiency of each type of batteries, lifespan of each type of batteries, and economic cost-benefit evaluation (Economic evaluation).

Results of measuring electricity consumption of the building

According to data collection of electricity consumption of the building of Department of Physics, Faculty of Science, Naresuan University, data related to electric power demand during 11-17 November 2019 were collected as shown in Figure 16. It was found that the building consumed electric power over a period of time each day. The building had a similar electricity consumption pattern in each week according to teaching and learning schedules. High electricity consumption in the building was found during Monday to Friday, compared to electricity consumption during Saturday and Sunday as teaching and learning schedules were available during daytime and electricity was consumed at nighttime as students conducted their research. The average electricity consumption was 253 kWh/day and electric power increased was found during afternoon to evening each day, the highest electric power was around 45 kW.

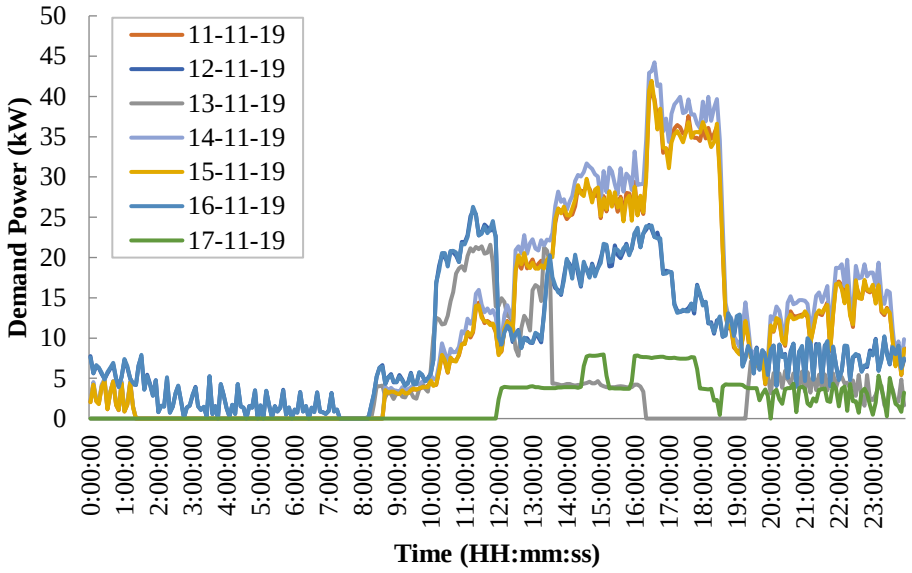

Figure 16 Electrical load of the office building (Department of Physics, Naresuan University)

Testing results of usable capacity efficiency

The test of usable capacity efficiency of the batteries are important since usable capacity efficiency is a dimensionless parameter that helps evaluate the usability ratio of each type of batteries in the hybrid energy storage system. It is associated with the cost and lifespan of the system so as to be used for evaluating economic cost-benefit of the project. Table 5 shows overall normalized discharge capacity of the system. A dummy load was used to simulate an electrical load at 3.5 A, 7A, and 14A in accordance with battery packs classified by types of batteries and capacity. End of discharge voltage was set at 10.5 V for AGM battery and 2.6 V for LFP battery. Electrical energy discharged was measured. Data recorded show the average value from the 5-time repeated test.

Table 5 Usable capacity efficiency of the hybrid energy storage system at different ratios.

Battery Ratio (%)		Total Capacity (Wh)	Usable Capacity @ Discharge Current (Wh)			Normalized Discharge Capacity		
AGM	LFP		3.5 A	7 A	14 A	3.5 A	7 A	14 A
89.74	10.26	187.2	134.9	124.5	104.1	0.72	0.67	0.56
86.78	13.22	290.4	211.9	195.8	164.7	0.73	0.67	0.57
81.40	18.60	103.2	77.1	71.4	61.6	0.75	0.69	0.60
74.47	25.53	225.6	173.2	161.9	139.9	0.77	0.72	0.62
68.63	31.37	122.4	97.9	91.9	79.5	0.80	0.75	0.65
59.32	40.68	141.6	114.3	108.6	93.3	0.81	0.77	0.66
52.24	47.76	160.8	132.2	124.8	107.8	0.82	0.78	0.67

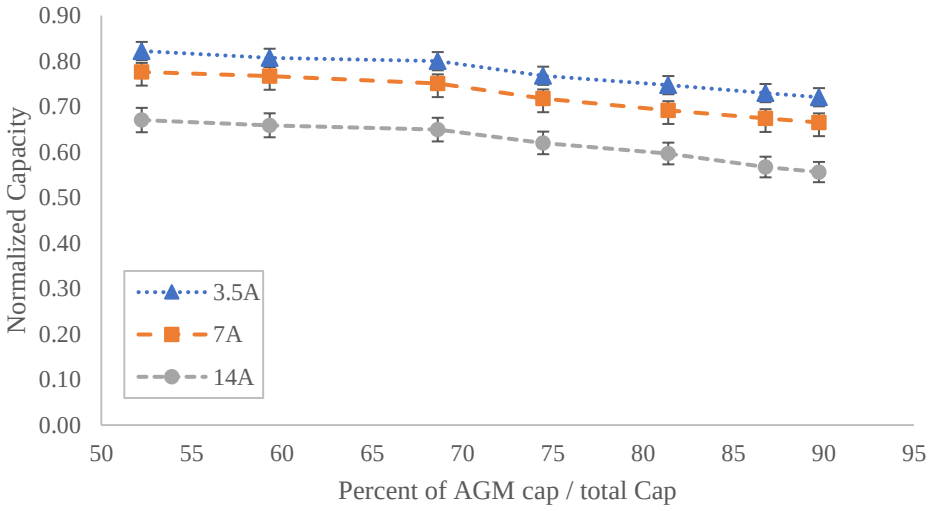

Figure 17 Normalized Capacity of Difference AGM ratio in various discharge current.

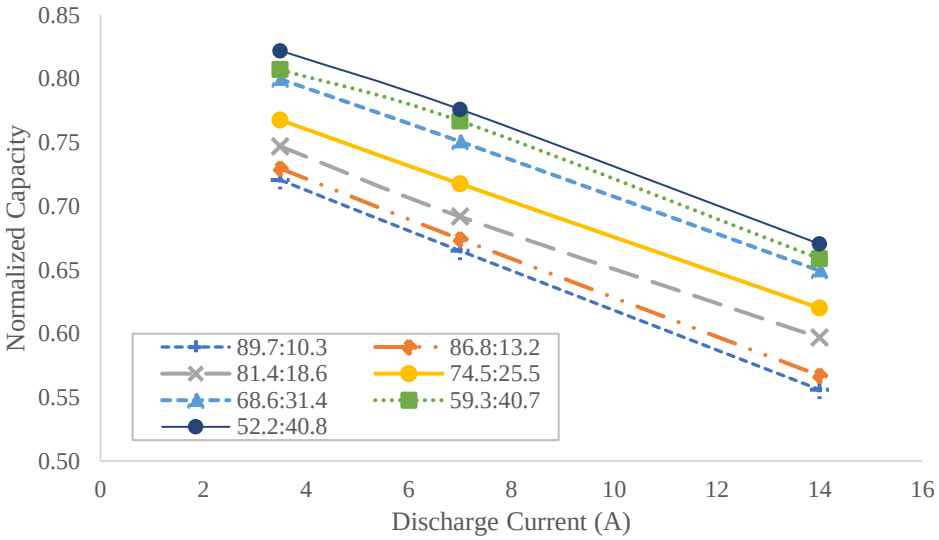

Figure 18 Normalized Capacity of different discharge current in various AGM:LFP ratio.

According to the test results of electrical power delivering to find usable capacity efficiency, it was found that the ratio of AGM battery was higher, usable capacity efficiency tended to decrease. Similarly, when the discharge rate of the battery was increased, power delivered from the battery was low. The ratio of AGM : LFP at 68.63 : 31.37(Figure 17) shows a changing point of the slope of the graph which can be found in the 3 values of power delivered. Plotting the relationship of usable capacity efficiency, compared to the discharge rate classified by ratios, found data were divided into 2 groups. It was found that the ratio of AGM:LFP at 68.63 : 31.37 and the ratio with higher lithium-ion battery had significant differences of usable capacity (Figure 18) while the ratio of LFP battery was increased by 5.9% only.

In addition, Consideration of the cost of the energy storage system consisting of the ratio of 68.63: 31.37 indicated it was the most suitable from the 7 ratios to be used for designing the energy storage system consisting of lead-acid battery and lithium-ion battery. In other words, the most suitable ratio is 70: 30.

Test results of the energy storage system lifespan

Consideration was given to a situation that any type of batteries needs to work alone until the control system cuts the operations. The end of discharge voltage was set at 10.5V for AGM battery and 2.6V for LFP battery, considered the worst case scenario. Data recorded show power delivered from the batteries compared to the initial capacity of the batteries and tested at 3 levels of the discharge rate.

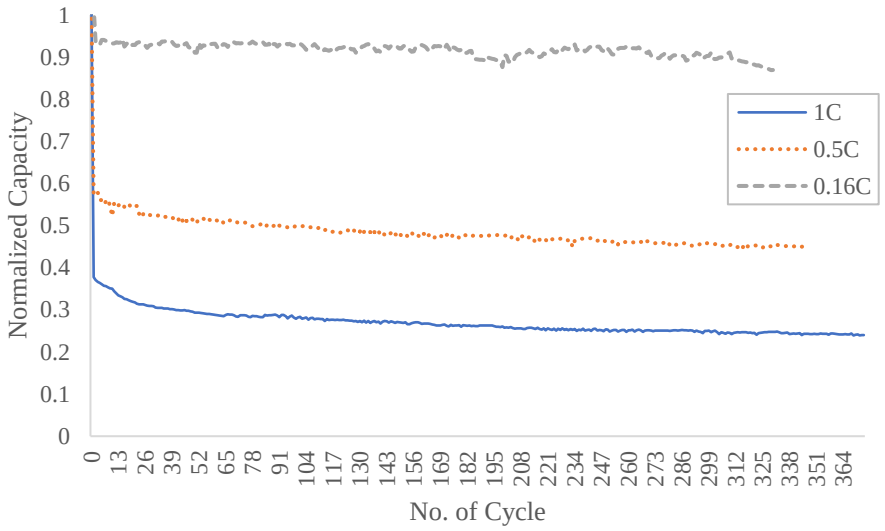

Figure 19 Test results of AGM battery life span.

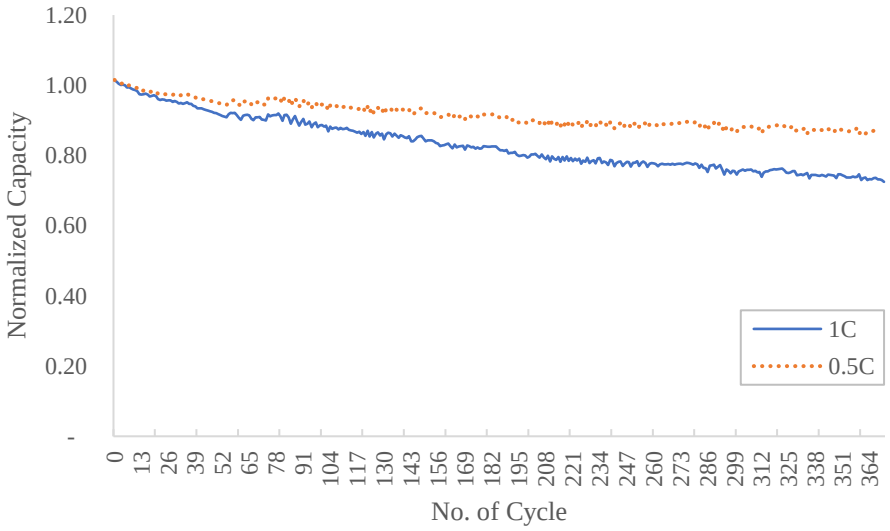

Figure 20 Test results of LFP battery lifespan.

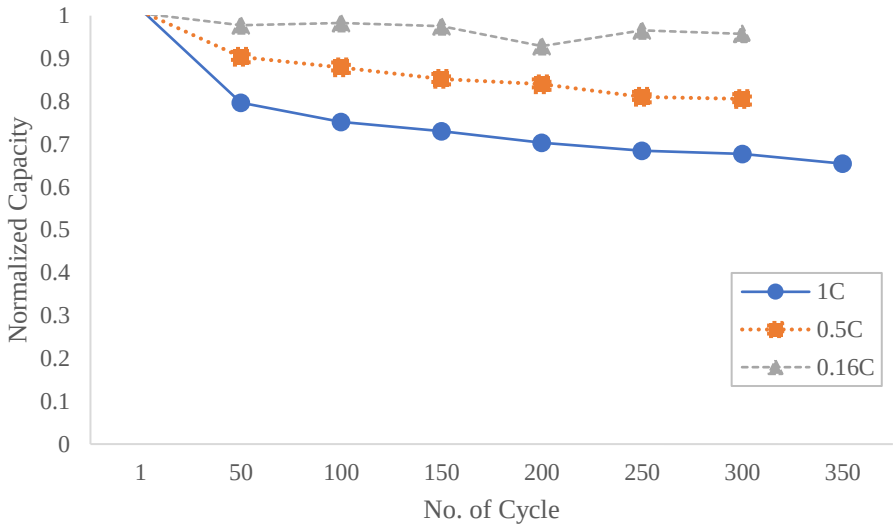

Figure 21 Test results of AGM battery lifespan from the repeated test based on a 20hr. discharge rate.

Test results are shown in Figure 19 and Figure 20 for AGM battery and LFP battery, respectively. Since usable storage capacity of AGM battery has high variation towards the ratio of electrical current delivered, the actual storage capacity of the battery cannot be seen for consideration of battery EOL. Therefore, the battery's storage capacity is measured based on a 20-hour rate discharge rate according to the storage capacity test information by the manufacturer. Measurement is performed at every 50 charge-discharge cycles of AGM battery, which can be seen in Figure 21.

Based on the evaluation of battery lifespan using EOL criterion or the number of cycles that batteries cannot produce an electrical current at 80% of the battery capacity expressed in Ampere-Hour (Ah), it was found that LFP battery had 1 year lifespan with a 1C discharge rate, and its lifespan is longer when a discharge rate is lower. In terms of AGM battery, usable storage capacity shall vary directly to a delivering rate. Consequently, it is necessary to perform a repeated test with reference to the 20hr. rate specified by manufacturers. In this test, the discharge rate was constant at 0.05C in every 50 cycles of the charge-discharge to measure correct usable capacity. Figure 21 shows AGM battery lifespan, 200 cycles (according to EOL conditions). Consideration given to 0.2C used to test usable capacity efficiency at

92% usable capacity found if the discharge rate is limited or the operations are well controlled, its lifespan can be extended about 100%.

The above-mentioned tests shall be taken into consideration when a battery has a lower voltage than the end of discharge voltage or compared to a battery that has discharged its full capacity, or DoD is 100% in both types of batteries, contributing to shorter lifespan than normal. When the discharge rate of a battery is controlled, no more than 80% DoD, its lifespan shall be extended. Compared to test results of LFP battery manufacturers, its lifespan is 3,000 cycles, based on a limited discharge rate, and AGM battery lifespan is 2,700 cycles, based on a limited discharge rate. The lifespan can be extended by the limitation of the depth of discharge as well.

Results of economic evaluation

According to the test results of lifespan, they can be used to design the rated capacity of batteries of energy storage system to suit usability. Demands of electric current and usable capacity efficiency should be taken into consideration. This research studied the use of hybrid energy storage system in conjunction with a rooftop solar power system in response to office building load pattern, with reference to 50lW rooftop solar power system and office building load pattern of Department of Physics, Naresuan University. The average electrical power consumption of the office building is 253 kWh/day. Details about main materials and equipment were collected to conclude the cost of production. Equipment unnecessary to the use of end users was deleted. The budget is shown in Table 6. The total cost is 4,975,000 baht, transportation expenses and installation charges are included.

Table 6 Details of main materials and equipment and the cost of production

No.	List of equipment	Budget (baht)
1	50kW solar panels	240,000
2	100kWh hybrid energy storage system	2,485,000
3	energy management system and electric power system	2,000,000
4	container-style greenhouse equipped with air-conditioning system	150,000
5	remote output and monitoring system	100,000
	Total	**4,975,000**

To evaluate battery lifespan, the operating conditions and the depth of discharge could bring about some errors. Therefore, consideration was given to the system lifespan by means of statistical data by collecting solar energy value all day from the 50kW rooftop solar power system at Faculty of Science, Naresuan University with the frequency of 1 minute time series data, throughout 30 days, during 5 June to 5 July 2021 (it is in the rainy season which may most affect electricity generation of the solar power system). The frequency is considered under the condition that electric power changes more than 10% of the installed production capacity in 1 minute, which can be seen in Table 7.

Table 7 Solar power variability within 30 days at Naresuan University.

Variables	Solar power variability within 30 days		
	minimum value	**maximum value**	**mean**
frequency (time per hour)	4	45	24
period (minute per time)	1	80	6.5
decreased electric power (%)	10	90	28
energy produced per day (kWh)	66	226	184

Based on battery specifications, how LFP operates in the day time to maintain stability of electrical energy was considered since there might be variability from the solar power system for electricity generation related to frequency of charge and discharge cycles. According to Table 6, variability of solar power produced was 51.52kWh per day on the average or to deliver electric power 5.72kW on the average. Calculation of the average electrical energy produced per day found there was electrical energy left enough to charge electricity back to the energy storage system. In other words, LFP battery consumed energy around 20% to respond to the variability of the solar power system.

AGM had the lower average lifespan than LFP battery; therefore, it was designed to operate in response to high demands of electrical energy only. Consideration of the average demand of electrical energy of office building at 253kWh/day when electrical energy was produced 184 kWh on the average, energy consumption in the energy storage system was 69 kWh. Based on such electrical energy, discharge rate of AGM battery was limited and cut-off voltage was set. From evening time to night time, energy consumption was from LFP battery. In the off-peak period, the energy storage system was charged back. As the evaluation took place in the situation with high variability of solar power, it was unable to bring electrical energy left from the operations to fully charge the energy storage system, making the situation evaluation conducted per cycle of operation at 10% to 85% DoD per cycle, electric current delivered was at 0.5C and 0.2C for LFP battery and AGM battery, respectively. Lifespan evaluation of the hybrid energy storage system can be conducted according to the EOL at 4 years.

As for cost estimation of electricity generation from solar power system in conjunction with the hybrid energy storage system, it can be estimated from the lifespan of the system at 20 years. The cost of the system across the lifespan including maintenance, system management, and battery replacement cost was 17,050,250.00 Bath (at the exchange rate of 35THB / 1USD), generating electricity 1,375,857.81 kWh throughout the lifespan. Deterioration rate of solar panels was 1%. (According to a study conducted by Jordan et.al., (2016), deterioration rate of silicon solar panels was 0.81%-0.69.% on the average). Cost of maintenance was calculated from the evaluation of equipment and the energy storage system with 3 years lifespan (to its

full capacity of electric current delivery), and an inflation rate upon time value of money at 7% according to the investment in the system.

From Table 8 and Table 9, the cost was calculated based on a fixed rate plan and TOU rate plan of electricity expenses, respectively and it was found that there was no payback since the estimated lifespan of the energy storage system brought about expenses relate to equipment replacement (batteries) in the maintenance category, making such system is not worth investment since the system value was not convergent or showed profitability within 10 years or the half of the lifespan. It is proved that due to the current situation of the value of electricity, the energy storage system can help guarantee energy risks and increase energy security.

Table 8 Calculating payback of the system based on fixed rate electricity plan.

Year	Balance brought forward (baht)	Maintenance expense (baht)	Electrical energy generated (kWh)	Electrical energy value generated (baht)	Reduced demand charge (baht)	Current value (baht)
0						4,975,000
1	4,975,000	142,350	74,843	261,952	34,723	4,820,675
2	4,820,675	142,350	74,095	259,333	34,723	4,668,969
3	4,668,969	142,350	73,354	256,739	34,723	4,519,857
4	4,519,857	2,485,000	72,621	254,172	34,723	6,715,962
5	6,715,962	142,350	71,894	251,630	34,723	6,571,959
6	6,571,959	142,350	71,175	249,114	34,723	6,430,472
7	6,430,472	142,350	70,464	246,623	34,723	6,291,476
8	6,291,476	2,485,000	69,759	244,157	34,723	8,497,596
9	8,497,596	142,350	69,061	241,715	34,723	8,363,508
10	8,363,508	142,350	68,371	239,298	34,723	8,231,838
11	8,231,838	142,350	67,687	236,905	34,723	8,102,560
12	8,102,560	2,485,000	67,010	234,536	34,723	10,318,301
13	10,318,301	142,350	66,340	232,190	34,723	10,193,737
14	10,193,737	142,350	65,677	229,869	34,723	10,071,496
15	10,071,496	142,350	65,020	227,570	34,723	9,951,553
16	9,951,553	2,485,000	64,370	225,294	34,723	12,176,536
17	12,176,536	142,350	63,726	223,041	34,723	12,061,122
18	12,061,122	142,350	63,089	220,811	34,723	11,947,938
19	11,947,938	142,350	62,458	218,603	34,723	11,836,962
20	11,836,962	4,975,000	74,843	261,952	34,723	16,515,287

Table 9 Calculating payback of the system based on TOU rate electricity plan.

Year	Balance brought forward (baht)	Maintenance expense (baht)	Electrical energy generated (kWh)	Electrical energy value generated (baht)	Reduced demand charge (baht)	Current value (baht)
0						4,975,000
1	4,975,000	142,350	74,843	306,858	34,723	4,775,769
2	4,775,769	142,350	74,095	303,790	34,723	4,579,606
3	4,579,606	142,350	73,354	300,752	34,723	4,386,481
4	4,386,481	2,485,000	72,621	297,744	34,723	6,539,014
5	6,539,014	142,350	71,894	294,767	34,723	6,351,874
6	6,351,874	142,350	71,175	291,819	34,723	6,167,682
7	6,167,682	142,350	70,464	288,901	34,723	5,986,408
8	5,986,408	2,485,000	69,759	286,012	34,723	8,150,673
9	8,150,673	142,350	69,061	283,152	34,723	7,975,148
10	7,975,148	142,350	68,371	280,320	34,723	7,802,455
11	7,802,455	142,350	67,687	277,517	34,723	7,632,565
12	7,632,565	2,485,000	67,010	274,742	34,723	9,808,100
13	9,808,100	142,350	66,340	271,994	34,723	9,643,732
14	9,643,732	142,350	65,677	269,275	34,723	9,482,085
15	9,482,085	142,350	65,020	266,582	34,723	9,323,130
16	9,323,130	2,485,000	64,370	263,916	34,723	11,509,491
17	11,509,491	142,350	63,726	261,277	34,723	11,355,841
18	11,355,841	142,350	63,089	258,664	34,723	11,204,804
19	11,204,804	142,350	62,458	256,077	34,723	11,056,354
20	11,056,354	4,975,000	74,843	306,858	34,723	15,689,772

The average cost of per unit generation of electrical energy was estimated to find electricity costs suitable for investing in the hybrid energy storage system. It was

found that its payback period throughout the system lifespan is 20 years, electrical energy value is 11.52 baht/kWh. Table 10 shows the comparison of the average cost of per unit generation of electrical energy between 100% LFP energy storage system and the hybrid energy storage system. It was found that the average cost of per unit generation of electrical energy from 100% LFP energy storage system was 9.01 baht/kWh, cheaper than that of the hybrid energy storage system but the initial investment of the system shall increase accordingly. Considering the initial cost of the project, the hybrid energy storage system was more than 50% cheaper than the LFP energy storage system and had more life cycle cost at 1.2 times.

Table 10 Comparison between ESS type on economical

ESS	Starting Cost (ratio)	Lifetime Cost (ratio)	LCOE (THB/kWh)
Pure LFP	1	1	9.01
Hybrid @ 70 : 30	0.525	1.278	11.52

Evaluation results of commercial development

System SWOT analysis results

S analysis

- Make the cost of the energy storage system decreased clearly to be a reinforcing factor encouraging energy conservation and efficient energy consumption.
- Increase energy management ability of the solar system for electricity generation.
- The system should be separated for easy maintenance or replacement when it reaches the end of lifespan.

W analysis

- Lithium-ion energy storage system needs monitoring system to prevent the leakage of liquid electrolytes or too high temperature.
- Patterned and efficient control is required to achieve cost advantages throughout the system lifespan.

O analysis

- Lead-acid batteries are produced domestically with a low cost. Its technology can be further developed.
- Lithium-ion energy storage system tends to be more popular in the market. Mass production enable the cost to be decreased continually, enabling magnifying outcomes to be implemented in industrial and household sectors in the near future and payback shall occur shortly.
- Consistency with government policies promoting renewable energy and energy consumption.

T analysis

- Lithium-ion energy storage system has a high cost and is an important factor driving domestic consumption.

Internal and external factor analysis results found weakness of the system. It is characteristics of each type of energy storage system that are different, especially lead-acid battery energy storage system that has operating limitations regarding a discharge rate at high rates of electric current. The research can make a design to avoid such weakness by using a control system to bring out outstanding points of each type of energy storage system to work consistently and systematically. However, the system operations require the control system as the key and the system cannot work when the control system has abnormal conditions or is damaged. In this part, it is considered one of safety policies of the system to prevent a short circuit between batteries and/or working beyond the capacity that may produce heat or fire. The control system has a protection system at BMS other than the main control system to ensure there shall not be limitations in installation and operations in sub-systems, such as in houses. Therefore, it is necessary to install a monitoring system to measure various variables, including a control system to separate the system in case of urgency, which can prevent the burning in each cell.

With regard to external factors related to threats, lithium-ion energy storage system tends to gain more popularity in the market, contributing to a decreased cost and the use of lithium-ion batteries in the energy storage system shall increase due to energy efficiency and usable capacity efficiency of lithium-ion batteries that are more

advantageous than the hybrid energy storage system working collaboratively with lead-acid batteries. However, lead-acid battery technology is still further developed. In the past 5 years, there were research studies on developing lead-acid batteries to be more efficient with longer lifespan. In this regard, the hybrid energy storage system is important. Besides, the obtained body of knowledge can be applied to other types of energy storage system. Economic studies on a short payback period of the developed system will enable the wide use, beneficial to the country overall energy conservation and there is no opportunity cost while waiting for the cost of lithium-ion batteries to be lower only.

System testing results for reducing the maximum electric power

Testing the operations of the hybrid energy storage system is focused on the operations that can respond to a high demand of electric power over a long period, one of the limitations of the energy storage system consisting of lead-acid batteries. The building chosen in the test was the building of Department of Physics, Faculty of Science, Naresuan University with the installation of 50kW solar panels on the rooftop. Electric power demand data on weekday were recorded, the days with overtime (OT) were chosen as seen in Figure 22. Each point is data measured and the red line graph shows the mean score of the data set from February-March 2022, similar to Figure 17 that shows the data of electrical energy generated from the solar system on those days. Each point is data measured and the red line graph is the mean score of the data set.

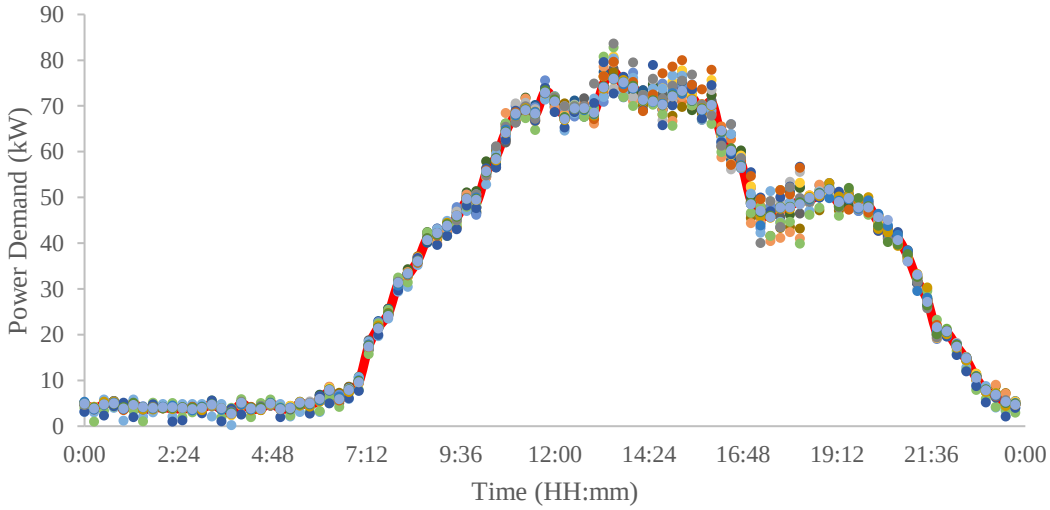

Figure 22 Data about the demand of electric power on weekday in which the days with overtime (OT) were chosen.

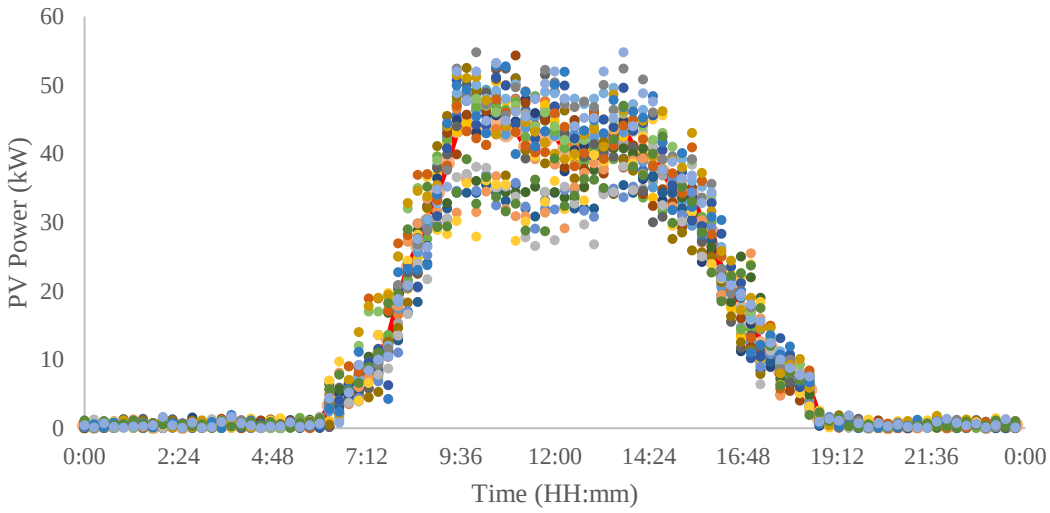

Figure 23 Data about electric power generated from the solar system on the same days to the data set in Figure 22.

From the higher demand of electric power in conjunction with the data about testing results of the ratios of the energy storage system, it outstanding indicates an increase in usable capacity efficiency based on the ratio of AGM : LFP at 68.63 : 31.37, making the total capacity of the energy storage system and the ratio adjusted to

meet electric power demand of the building, with the use of 80 kWh AGM batteries and 50 kWh LFP batteries. In other words, the ratio of AGM : LFP at 61.5 : 38.5.

From Figure 23, it can be noticed that the building consumed energy quite constantly. It is possible that electrical appliances were used routinely and in the same period of temperature change, making air-conditioners worked and consumed similar energy level. Similarly, the research conducted by Jin Sol Hwang et al.,(20) mentioning temperature outside the building that affects energy consumption of the building significantly. However, the solar power system showed variation explicitly. Such variation shall affect the actual electric power demand of the building $P_{(l,h)}-P_{(PV,h)}$ and the operations of the energy storage system.

In relation to the control system, a period of time is used to determine the operations of the energy storage system. The times of day when electricity consumption is at its highest (on peak) were 13 hours (9:00. – 22:00 hrs.) and a time period when less electricity is demanded (off peak) is any time outside those periods since the data about electric power demand of the tested building varied as seen in Table 11. The operations were determined to deliver electric current in the form of ratios so as to reduce the burden of AGM batteries to deliver electric power that will affect usable capacity efficiency. Any type of batteries are not ready for being operated or has low SoC, another type of batteries shall be replaced to deliver electric power to its full capacity.

In terms of setting the threshold, the data about electric power demand of the building and electric power generated from the solar system mounted on the rooftop were input to evaluate the actual electric power demand of the building and usable capacity efficiency of the energy storage system, according to the equation 3. Off-Peak period was determined to set a threshold for charging back power to the energy storage system to have 25 kW for AGM batteries and 20 kW for LFP batteries. The threshold for AGM batteries was set higher as the total usable capacity of the system has the higher ratio of AGM. Preparedness should be made before implementing other procedures.

Table 11 Operating conditions of the energy storage system

Condition	AGM	LFP
Threshold > Demand	Charge	
Demand > Threshold	Discharge	
Working SoC	20% - 95%	10% - 95%
On-peak Threshold	40 kW	40 kW
Off-Peak Threshold	25 kW	20 kW
Load Response		
- On-Peak	0.7	0.3
- Off-Peak	0.5	0.5
- LFP Low SoC	1	0
- AGM Low SoC	0	1

In order to test the operations of the energy storage system in the tested building, initial capacity of both types of batteries was set at 20%. Electric power demanded by the building was measured after being compensated by electric power generated by the solar system, electric power from the grid, and electric power flowing in-out of each type of batteries, as seen in Figure 24. Line graphs representing the operations of AGM battery and LFP battery are shown in orange line graph and gray line graph respectively. When negative line graphs are displayed, it means batteries are discharged for peak shaving. When off-peak starts each type of batteries is charged again. State of charge of each type of batteries is displayed to a period of time and compared to net demand for electric power of the building (Secondary Vertical Axis) as seen in Figure 25 showing immediate reduced battery capacity in AGM batteries during 15.00 to 17.00 hrs. and during 18.00 to 20.00 hrs. due to a higher electric discharge.

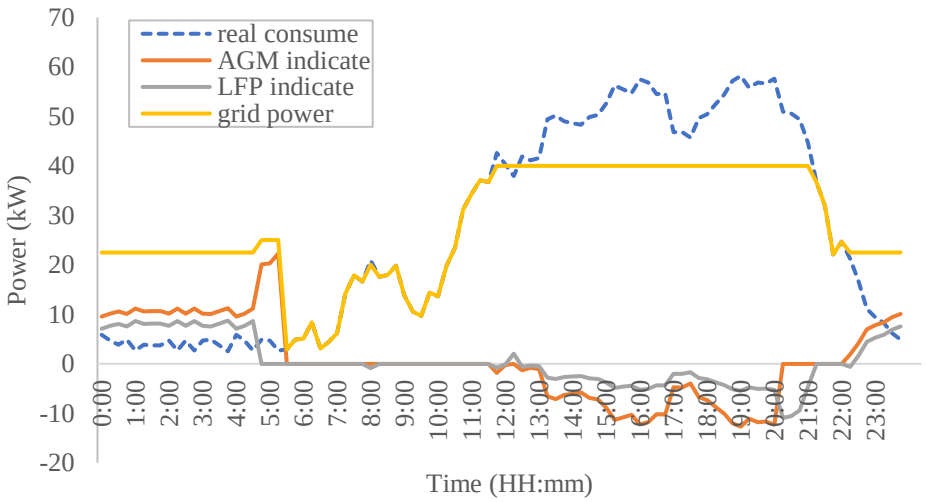

Figure 24 System response to high and continuous demand of electric power.

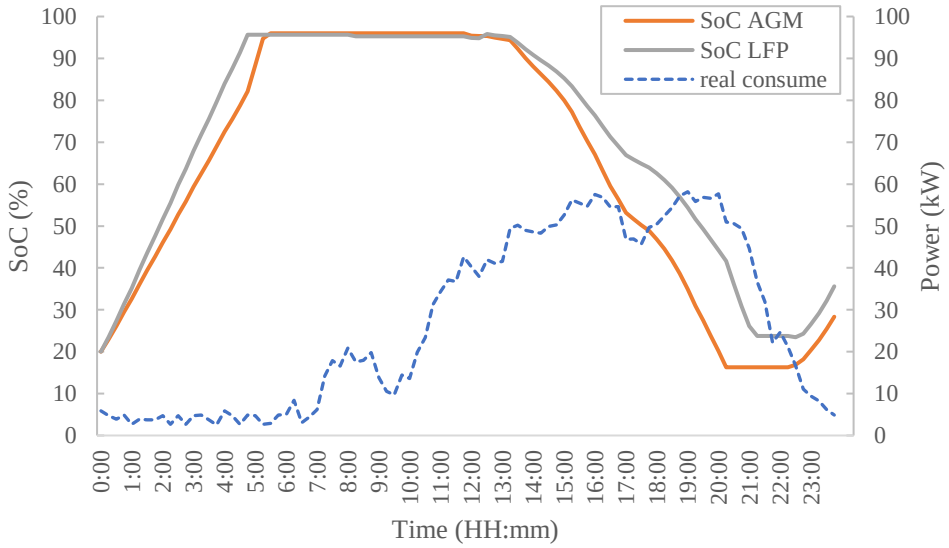

Figure 25 Capacity of the energy storage system throughout the operations of electric power.

Consideration of the separation of electric current ratios in response to load, the maximum electric current delivery for AGM batteries was 12.7A or about 0.5C when working collaboratively with LFP batteries. According to the test, AGM battery capacity decreased until electric current could not be delivered (lower than 20% SoC), making LFP batteries had to deliver electric current to its full potential, its maximum

electric current delivery was 10.9A or about 0.1C. The processing of the energy storage system capacity found 8.99 kWh lost. In case of LFP battery malfunction, AGM batteries need to work to their potential and the maximum electric current delivery is 18.18A or about 0.7C, having a huge effect on usable capacity efficiency or usable capacity efficiency is only 60% out of the total capacity.

Considering the incurred losses of the hybrid energy storage system, 8.99 kWh accounted for 6.80% of the total capacity or the hybrid energy storage system had a 93.20% efficiency. And when comparing the electricity produced from the solar power generation system with the incident solar radiation according to equation xxx, it was found that the efficiency of the solar power generation system would be 76.74%. Therefore, when considering the total efficiency of the solar power generation system combined with the hybrid energy storage system, the efficiency was 71.52%.

The economic cost-benefit evaluation found each day (consideration was made to the days with over time only) a TOU rate plan was calculated according to the rates advised by Provincial Electricity Authority (PEA). The difference of electrical energy between on peak and off peak was around 1.5 baht per kWh. Therefore, energy management using peak shaving through the hybrid energy storage system could save 164 baht/day on average, without calculation the reduction of demand charge in each month. Evaluating levelized cost of electricity to find electricity expense suitable for the investment in the hybrid energy storage system controlled by batteries found its payback period throughout the system lifespan is 20 years, electrical energy value is 8.88 baht/kWh lower than the use of 100% LFP energy storage system, electrical energy value is 9.11 baht/kWh. Details are shown in Table 12.

Table 12 Shows the calculation of levelized cost of electricity of the controlled energy storage system.

System	Life time cost (20 y)	Time value of money	Life time energy production (kWh)	Levelized cost of electricity (LCOE)
Hybrid	13,144,500	12,224,385	1,375,857	8.88
LFP 100%	13,488,100	12,543,933	1,375,857	9.11

CHAPTER V

CONCLUSION

Conclusion

This research focused on studying usable capacity efficiency towards lifespan, a significant part of economic cost-benefit evaluation of the hybrid energy storage system, collaborative working between lead-acid battery and lithium-ion battery. The study was conducted on the ratios of battery operations of both types of batteries, initial cost, usable capacity efficiency, and lifespan of the system. The study was also conducted on collaborative working of the 130 kWh energy storage system consisting of 80 kWh AGM battery and 50 kWh LFP battery, namely, the ratio AGM battery to LFP battery at 61.5 : 38.5, installed at the tested building using electrical power from the grid and the 50 kW solar power generation system. The hybrid energy storage was tested the system response to reduce the maximum electric power of a large sized building that is demanded during a long period, controlled by multi-threshold method.

The study results of experimental results can be divided into 3 parts, i.e. usable capacity efficiency of each type of batteries, lifespan of each type of batteries, and economic cost- benefit evaluation. The test of usable capacity efficiency of the operating system with 7 ratios of AGM and LFP batteries and a dummy load to simulate electrical load at 3.5A, 7A, and 14A found the ratio of 68.63: 31.37 was the most suitable since it explicitly indicated an increase in usable capacity compared to other ratios with the change of the increasing LFP battery ratio only 5.9% only.

In terms of battery lifespan, referred to the office building load pattern with the installation of solar panels on the rooftop and the evaluation was performed in the situation of high variability of solar power, electrical energy left from the operations could not be used to fully charge the energy storage system, the situation evaluation per cycle of the operations was 10% to 85% DoD per cycle. Electric current was delivered at 0.5C and 0.2C for LFP batteries and AGM batteries, respectively. Compared to the laboratory test results of battery lifespan, it was found that AGM battery lifespan at 0.2C discharge rate and LFP battery lifespan at 0.5C discharge rate

were quite similar, compared with the data from the manufacturers of both types of batteries, their lifespan had a deviation from the technical datasheet by 6% and 10% for LFP battery and AGM battery respectively. Such deviation is possibly caused by temperature during the test was performed. Therefore, the lifespan can be evaluated according to EOL for hybrid energy storage at about 4 years based on operating situation and the ratio of electric current evaluated.

As for economic cost-benefit evaluation of the solar power generation system installed in conjunction with the hybrid energy storage system, it was evaluated using a fix rate plan and a TOU rate plan and found there was no payback since the estimated lifespan of the energy storage system brought about expenses relate to equipment replacement (batteries) in the maintenance category, making such system is not worth investment since the system value was not convergent or showed profitability within 10 years or the half of the lifespan. It is proved that due to the current situation of the value of electricity, the energy storage system can help guarantee energy risks and increase energy security only. It was found that its payback period throughout the system lifespan is 20 years, electrical energy value is 11.52 baht/kWh. The average cost of per unit generation of electrical energy from 100% LFP energy storage system was 9.01 baht/kWh.

When the 130 kWh energy storage system was brought to work collaboratively with the 50 kW solar system to study the reduction of the maximum electric power of the building using multi-level threshold control in which the operations of batteries were independent, with the use of factor control in the form of the ratios of electric current to separate response to load for each type of batteries, i.e. on-peak in the form of AGM : LFP at 0.70 : 0.30, off-peak in the form of AGM : LFP at 0.50 : 0.50. When any type of batteries is not ready for being operated, another type of battery shall work to its full potential. The adjustment of threshold levels to allow the hybrid energy storage system response is flexible and work independently contributed to a good effect on the operations when any system is not ready for the operations or requires maintenance. Separated ratios of electric current that were added in the operations of each type of batteries enable the energy storage system to maintain its potential to deliver electric current in response to load by reducing effects on usable capacity caused by a decrease in the ratio of electric current in lead-acid

batteries and the loss of usable capacity throughout the day was 8.99 kWh only or 6.80% of the total capacity. If the hybrid energy storage system loses the operations of LFP batteries, AGM batteries shall work to their full potential and the maximum electric current delivered is 18.18 A or about 0.7C, having a huge effect on usable capacity. Considering the incurred losses of the hybrid energy storage system of 8.99 kWh, the hybrid energy storage system had an efficiency of 93.20%, And when taking the electricity produced from the solar power generation system compared to the incident solar radiation, it would be found that the efficiency of the solar power generation system would be 76.74%. Therefore, when considering the total efficiency of the solar power generation system combined with the hybrid energy storage system, the efficiency was 71.52%.

The economic cost-benefit evaluation found each day (consideration was made to the days with over time only) a TOU rate plan was calculated according to the rates advised by Provincial Electricity Authority (PEA). The difference of electrical energy between on peak and off peak was around 1.5 baht per kWh (18). Therefore, energy management using peak shaving through the hybrid energy storage system could save 164 baht/day on average, without calculation the reduction of demand charge in each month.

This research showed a time-based control pattern with reference to on-peak and off-peak to be able to magnify the outcomes to other types of building with inconstant demand of electric power each day. Load forecast system is necessary in response to a large-scale load over a long period of time in an efficient manner.

Discussion

According to the study on the operations of the hybrid energy storage system, consideration of economic cost-benefit in terms of project initial cost found usable capacity efficiency is an important variable contributing to the most effect since it is related to the ratios of each type of batteries that reflect project initial cost. It is certain that an increase in the ratio of a high efficiency battery like LFP battery shall give an increase in usable capacity efficiency accordingly. An in-depth observation of the test results found the explicit range of usable capacity efficiency at the ratio of 68.63: 31.37 or 70: 30. Compared to the groups with lower usable capacity efficiency, the

ratio of LFP batteries increased by 5.9% only. This ratio can reduce the project initial cost by 47.5%.

According to the economic cost-benefit evaluation, the designed hybrid energy storage system can reduce the project initial cost but the evaluation of the budget used throughout its lifespan including the maintenance in which batteries need to be replaced found the system could not present a payback period since the LFP energy storage system is quite expensive compared to current electrical energy value. The system is worth investment when electrical energy value is at 11.52 baht/kWh while the 100% LFP energy storage shall enable the system worth investment with electrical energy value at 9.01 baht/kWh, cheaper than that of the hybrid energy storage system, making the project initial cost higher accordingly.

The consideration of the test of system response to the load in a large building found the use of the hybrid energy storage energy system with collaborative working between AGM and LFP batteries using multi-level threshold shall give payback throughout the system lifespan at 20 years, when electrical energy value is 8.88 baht/kWh, compared to the 100% LFP energy storage system, the system shall give payback when electrical energy value is 9.11 baht/kWh while the hybrid energy storage system gives the lower value.

Suggestion

This research revealed the test of the operations of the hybrid energy storage system working collaboratively with the solar power generation system to develop the operations to reach maximum efficiency and reduce the cost of electrical energy storage system by using batteries manufactured in the country. The anticipated benefits of the research revealed that energy management based on the energy storage system shall increase the stability of solar power system for electricity generation and the use of solar power in a more efficient manner. Besides, the research can be further developed energy storage technology to be widely used by applying to other systems with a high demand of electricity, such as electric car charging station, office building to increase stability and flexibility in generating and delivering electricity, reducing a power brownout or a power blackout, which shall reduce the operations of generators and fuel consumption in areas away from transmission lines or areas

without access to electricity. In order to increase the energy storage system, the government sector should formulate a policy that promotes private sector to invest in the energy storage system by determining the adder cost for electricity delivered from the energy storage system when the country electricity demand is high or reducing electrical energy value or a tax rate. However, In the future a functional test of the system should be carried out throughout its lifetime to see the impact that occurred.

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APPENDIX

Appendix A Measurement results of building energy consumption of the department of physics, faculty of science, Naresuan University between 11-17 November 2019.

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
11/11/2019	0:00	50.03	227.33	7.00	2.70	0.00	6.90	1,479.12	593.11	0.00	2,072.23	32,178.15
11/11/2019	0:05	50.02	227.30	3.00	16.20	0.00	15.80	645.82	3,615.33	0.00	4,261.15	32,533.25
11/11/2019	0:10	50.04	227.70	6.10	4.00	0.00	6.40	1,292.72	908.78	0.00	2,201.50	32,716.71
11/11/2019	0:15	50.02	227.33	8.80	0.00	0.00	8.80	1,861.78	0.00	0.00	1,861.78	32,871.86
11/11/2019	0:20	50.03	227.53	9.70	8.80	0.00	14.00	2,057.73	1,947.26	0.00	4,005.00	33,205.61
11/11/2019	0:25	50.02	227.60	7.10	13.80	0.00	14.30	1,498.23	3,075.11	0.00	4,573.34	33,586.72
11/11/2019	0:30	50.02	227.63	5.60	0.00	0.00	5.70	1,173.26	0.00	0.00	1,173.26	33,684.49
11/11/2019	0:35	50.00	227.60	7.00	8.10	0.00	12.70	1,479.24	1,789.14	0.00	3,268.39	33,956.85
11/11/2019	0:40	50.01	227.67	4.60	16.30	0.00	15.90	981.61	3,631.13	0.00	4,612.74	34,341.25
11/11/2019	0:45	50.01	227.67	7.80	0.10	0.00	8.10	1,658.91	31.53	0.00	1,690.44	34,482.12
11/11/2019	0:50	50.02	227.97	4.90	0.00	0.00	5.00	1,038.52	0.00	0.00	1,038.52	34,568.66
11/11/2019	0:55	50.00	227.97	6.60	12.90	0.00	15.70	1,407.40	2,886.71	0.00	4,294.11	34,926.51
11/11/2019	1:00	50.01	228.07	3.20	0.80	0.00	3.20	677.22	200.27	0.00	877.49	34,999.63
11/11/2019	1:05	50.02	228.23	8.20	0.00	0.00	8.70	1,748.26	0.00	0.00	1,748.26	35,145.32
11/11/2019	1:10	50.03	228.43	8.10	12.30	0.00	13.40	1,732.22	2,715.98	0.00	4,448.20	35,516.00
11/11/2019	1:15	50.03	228.50	0.00	6.40	0.00	6.50	0.00	1,421.12	0.00	1,421.12	35,634.43
11/11/2019	1:20	50.03	228.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	1:25	50.03	228.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	1:30	50.01	228.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	1:35	49.98	228.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	1:40	50.00	228.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	1:45	50.02	228.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	1:50	50.02	228.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	1:55	50.02	228.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	2:00	50.01	228.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	2:05	50.01	228.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	2:10	50.01	228.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	2:15	50.02	229.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	2:20	49.97	228.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	2:25	50.02	229.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	2:30	50.00	228.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	2:35	50.01	229.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	2:40	50.01	229.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	2:45	50.00	229.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	2:50	50.02	229.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	2:55	50.00	228.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	3:00	50.00	228.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	3:05	49.98	228.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
11/11/2019	3:10	50.02	228.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	3:15	50.02	229.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	3:20	49.99	228.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	3:25	50.02	228.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	3:30	50.02	228.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	3:35	50.01	229.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	3:40	50.00	228.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	3:45	50.02	229.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	3:50	50.00	229.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	3:55	50.01	228.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	4:00	49.99	228.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	4:05	50.01	228.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	4:10	50.00	228.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	4:15	50.01	228.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	4:20	50.00	228.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	4:25	49.97	228.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	4:30	50.00	228.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	4:35	49.97	228.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	4:40	50.02	228.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	4:45	50.01	228.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	4:50	50.00	227.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	4:55	50.00	227.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	5:00	50.02	227.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	5:05	49.98	227.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	5:10	49.96	226.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	5:15	49.96	226.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	5:20	49.96	226.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	5:25	49.98	226.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	5:30	50.00	226.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	5:35	49.96	226.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	5:40	49.96	226.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	5:45	50.00	226.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	5:50	50.01	226.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	5:55	49.96	225.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	6:00	49.98	225.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	6:05	49.99	225.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	6:10	50.02	226.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	6:15	50.00	226.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	6:20	50.01	226.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	6:25	50.01	226.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	6:30	50.01	226.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	6:35	50.01	227.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
11/11/2019	6:40	50.00	227.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	6:45	50.02	227.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	6:50	50.03	227.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	6:55	50.03	227.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	7:00	50.02	227.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	7:05	50.00	227.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	7:10	49.96	227.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	7:15	50.00	227.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	7:20	50.00	227.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	7:25	49.96	227.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	7:30	50.01	227.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	7:35	49.99	227.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	7:40	49.96	226.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	7:45	49.98	226.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	7:50	50.03	226.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	7:55	50.02	226.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	8:00	49.98	226.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	8:05	49.95	226.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	8:10	49.96	227.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	8:15	49.95	227.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	8:20	49.96	226.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	8:25	49.99	226.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	8:30	49.98	226.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	8:35	50.02	227.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
11/11/2019	8:40	50.00	227.13	7.50	9.90	0.00	12.60	1,531.46	1,990.07	0.00	3,521.53	35,927.89
11/11/2019	8:45	49.96	226.60	2.80	12.50	0.00	14.10	578.77	2,528.98	0.00	3,107.75	36,186.87
11/11/2019	8:50	49.98	226.80	4.30	12.60	0.00	14.20	868.81	2,552.33	0.00	3,421.14	36,471.96
11/11/2019	8:55	50.02	226.80	3.60	12.30	0.00	13.80	739.14	2,525.23	0.00	3,264.38	36,743.99
11/11/2019	9:00	50.03	226.73	2.50	12.20	0.00	13.80	524.66	2,512.85	0.00	3,037.51	36,997.12
11/11/2019	9:05	50.02	226.30	2.70	12.20	0.00	13.60	548.14	2,504.18	0.00	3,052.32	37,251.48
11/11/2019	9:10	50.01	225.93	4.90	12.60	0.00	13.90	1,011.39	2,555.96	0.00	3,567.35	37,548.76
11/11/2019	9:15	49.97	225.40	2.50	13.00	0.00	14.10	510.10	2,629.85	0.00	3,139.96	37,810.42
11/11/2019	9:20	49.96	225.20	2.60	12.80	0.00	14.00	552.15	2,606.07	0.00	3,158.23	38,073.61
11/11/2019	9:25	50.02	225.17	4.00	12.90	0.00	14.30	829.37	2,626.70	0.00	3,456.08	38,361.61
11/11/2019	9:30	50.00	225.10	3.70	14.70	0.00	15.80	770.91	2,848.11	0.00	3,619.02	38,663.20
11/11/2019	9:35	49.98	225.70	2.20	16.60	0.00	17.40	471.79	3,086.16	4.26	3,562.21	38,960.05
11/11/2019	9:40	49.97	225.97	3.10	16.20	0.00	16.90	630.59	3,016.50	0.00	3,647.09	39,263.97
11/11/2019	9:45	49.96	225.87	4.20	16.20	0.00	16.80	878.76	2,999.45	0.00	3,878.21	39,587.16
11/11/2019	9:50	49.98	225.83	2.30	18.20	0.00	17.70	502.02	3,425.27	0.00	3,927.29	39,914.43
11/11/2019	9:55	50.01	227.10	2.80	18.40	0.00	17.80	580.47	3,452.38	0.00	4,032.85	40,250.50
11/11/2019	10:00	50.00	227.27	5.50	18.50	0.00	17.90	1,171.36	3,480.81	0.00	4,652.17	40,638.18
11/11/2019	10:05	50.02	227.33	2.90	18.60	0.00	17.60	618.92	3,525.29	0.00	4,144.22	40,983.54

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
11/11/2019	10:10	49.99	226.83	3.00	18.70	0.00	17.60	636.82	3,532.28	0.00	4,169.10	41,330.96
11/11/2019	10:15	49.97	226.73	4.70	25.50	0.00	23.50	979.46	4,943.07	5.70	5,928.24	41,824.98
11/11/2019	10:20	50.00	226.67	4.00	35.80	0.00	32.70	841.59	7,171.54	0.00	8,013.13	42,492.74
11/11/2019	10:25	49.97	226.40	3.00	32.10	0.00	29.60	630.57	6,397.39	0.00	7,027.96	43,078.40
11/11/2019	10:30	50.01	226.47	2.70	17.60	9.60	16.00	556.45	3,307.21	1,831.00	5,694.67	43,552.96
11/11/2019	10:35	50.00	226.53	4.80	16.70	17.80	12.30	1,008.71	3,119.99	3,439.29	7,567.99	44,183.63
11/11/2019	10:40	50.01	226.77	2.70	16.90	17.70	13.00	570.51	3,174.07	3,427.64	7,172.22	44,781.31
11/11/2019	10:45	50.02	226.30	2.70	17.10	17.80	13.00	559.80	3,229.33	3,449.21	7,238.34	45,384.51
11/11/2019	10:50	50.03	226.60	5.30	17.30	17.80	12.30	1,102.81	3,269.37	3,463.41	7,835.59	46,037.47
11/11/2019	10:55	50.02	226.40	2.60	26.90	18.30	20.20	546.49	5,240.17	3,545.83	9,332.49	46,815.18
11/11/2019	11:00	50.01	226.27	2.60	33.50	10.70	27.50	549.71	6,631.83	2,085.13	9,266.67	47,587.40
11/11/2019	11:05	50.02	226.40	5.50	34.00	15.20	26.20	1,137.92	6,729.08	2,927.07	10,794.08	48,486.91
11/11/2019	11:10	50.01	226.20	2.60	34.20	14.10	27.50	547.21	6,784.31	2,716.88	10,048.40	49,324.27
11/11/2019	11:15	50.01	226.30	2.70	35.80	15.30	30.00	559.52	7,129.28	3,002.09	10,690.88	50,215.18
11/11/2019	11:20	50.00	226.27	4.40	36.50	26.80	27.40	912.17	7,284.32	5,399.93	13,596.41	51,348.22
11/11/2019	11:25	50.02	226.40	3.40	36.00	31.80	27.70	706.51	7,183.42	6,485.11	14,375.04	52,546.14
11/11/2019	11:30	50.04	226.53	2.40	35.90	25.20	28.00	510.02	7,187.80	5,091.35	12,789.16	53,611.90
11/11/2019	11:35	50.01	226.83	2.90	35.70	20.60	26.80	606.59	7,128.36	4,096.11	11,831.06	54,597.82
11/11/2019	11:40	50.01	227.10	4.70	35.40	20.50	25.50	998.51	7,061.64	4,080.64	12,140.78	55,609.55
11/11/2019	11:45	50.03	227.40	2.60	35.80	20.70	26.90	545.39	7,172.21	4,120.52	11,838.12	56,596.06
11/11/2019	11:50	50.01	227.30	2.40	35.50	20.00	26.70	514.44	7,090.43	3,986.03	11,590.90	57,561.97
11/11/2019	11:55	50.01	227.57	5.10	29.00	20.00	20.60	1,063.02	5,698.52	3,985.20	10,746.74	58,457.53
11/11/2019	12:00	50.03	227.73	2.60	19.40	19.30	14.10	540.29	3,642.56	3,836.66	8,019.50	59,125.82
11/11/2019	12:05	50.03	228.07	2.30	19.80	20.50	15.30	492.38	3,725.36	4,102.24	8,319.98	59,819.16
11/11/2019	12:10	50.03	228.30	2.50	19.90	32.70	21.90	528.47	3,746.23	6,721.64	10,996.33	60,735.52
11/11/2019	12:15	50.02	228.33	5.30	21.20	33.90	20.10	1,122.99	4,017.80	7,001.76	12,142.54	61,747.40
11/11/2019	12:20	50.00	228.23	2.50	21.20	33.20	21.30	537.88	4,028.91	6,841.22	11,408.01	62,698.06
11/11/2019	12:25	50.01	227.93	2.60	21.60	28.70	18.90	561.41	4,114.59	5,881.49	10,557.49	63,577.85
11/11/2019	12:30	50.02	227.97	21.00	35.20	33.70	17.50	4,399.32	7,023.95	6,933.90	18,357.17	65,107.62
11/11/2019	12:35	50.00	227.87	23.00	39.00	33.60	16.80	4,848.24	7,909.49	6,912.67	19,670.40	66,746.82
11/11/2019	12:40	49.96	227.53	23.80	37.00	29.30	16.70	5,010.38	7,583.36	5,998.85	18,592.59	68,296.20
11/11/2019	12:45	49.97	227.27	23.80	36.90	36.40	15.10	5,015.54	7,592.69	7,533.62	20,141.85	69,974.69
11/11/2019	12:50	49.97	227.47	24.50	36.70	29.40	15.80	5,062.73	7,571.19	6,020.74	18,654.66	71,529.24
11/11/2019	12:55	49.96	227.37	24.70	36.60	32.50	14.50	5,053.17	7,521.78	6,683.73	19,258.68	73,134.13
11/11/2019	13:00	49.97	226.50	24.70	37.40	34.00	15.10	5,071.15	7,694.74	6,989.35	19,755.24	74,780.40
11/11/2019	13:05	49.94	227.87	25.10	36.10	29.40	14.90	5,170.23	7,424.92	6,035.45	18,630.60	76,332.95
11/11/2019	13:10	49.96	227.90	24.90	36.00	32.40	14.00	5,107.83	7,390.76	6,688.85	19,187.44	77,931.91
11/11/2019	13:15	49.99	227.63	25.60	36.40	33.40	13.80	5,244.93	7,480.07	6,889.29	19,614.29	79,566.43
11/11/2019	13:20	50.00	227.40	26.90	37.00	28.70	14.30	5,523.32	7,645.53	5,874.36	19,043.21	81,153.37
11/11/2019	13:25	49.98	227.20	27.30	36.90	31.40	14.40	5,615.93	7,610.13	6,457.24	19,683.29	82,793.64
11/11/2019	13:30	49.97	227.03	26.50	36.40	34.30	13.20	5,431.80	7,472.46	7,063.88	19,968.15	84,457.65
11/11/2019	13:35	49.97	227.10	32.90	36.70	29.70	13.50	6,818.96	7,542.06	6,073.63	20,434.65	86,160.54

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
11/11/2019	13:40	50.01	227.13	39.30	46.10	30.70	19.20	8,261.17	9,719.60	6,309.89	24,290.67	88,184.76
11/11/2019	13:45	49.97	226.90	40.00	49.80	34.20	17.70	8,437.79	10,606.98	7,044.39	26,089.16	90,358.86
11/11/2019	13:50	50.00	227.07	40.60	50.50	30.80	21.10	8,593.48	10,798.63	6,333.50	25,725.61	92,502.66
11/11/2019	13:55	50.01	227.00	40.90	50.80	29.40	22.30	8,659.02	10,874.57	6,029.76	25,563.35	94,632.94
11/11/2019	14:00	50.02	227.10	33.80	50.60	33.10	19.90	7,083.23	10,836.60	6,830.57	24,750.40	96,695.47
11/11/2019	14:05	50.01	227.10	34.90	50.80	34.00	20.90	7,320.76	10,874.95	7,008.37	25,204.07	98,795.81
11/11/2019	14:10	50.02	227.00	38.10	51.60	30.50	22.70	8,019.45	11,023.26	6,269.49	25,312.19	100,905.16
11/11/2019	14:15	49.98	226.83	33.60	61.50	31.00	33.00	7,020.96	12,963.28	6,387.75	26,371.98	103,102.83
11/11/2019	14:20	49.99	226.80	32.80	68.70	35.80	37.00	6,838.95	14,414.34	7,421.73	28,675.02	105,492.41
11/11/2019	14:25	49.99	226.57	34.10	69.50	31.50	40.10	7,131.31	14,584.25	6,522.27	28,237.82	107,845.56
11/11/2019	14:30	50.01	226.97	35.80	69.30	29.70	39.30	7,507.17	14,555.38	6,134.15	28,196.70	110,195.29
11/11/2019	14:35	50.01	227.00	35.60	68.70	33.80	36.00	7,461.27	14,453.09	7,004.26	28,918.63	112,605.17
11/11/2019	14:40	50.01	227.10	34.30	68.50	33.30	36.70	7,192.52	14,432.94	6,905.67	28,531.13	114,982.77
11/11/2019	14:45	50.01	227.23	33.10	68.40	30.70	39.30	6,922.85	14,416.75	6,335.80	27,675.40	117,289.05
11/11/2019	14:50	50.02	227.27	33.20	68.20	30.50	39.30	6,952.63	14,357.88	6,302.11	27,612.62	119,590.10
11/11/2019	14:55	50.02	227.23	32.70	66.40	35.50	35.30	6,825.67	13,933.52	7,364.02	28,123.21	121,933.70
11/11/2019	15:00	50.02	227.47	34.60	53.70	32.80	24.10	7,197.11	10,922.40	6,783.30	24,902.81	124,008.94
11/11/2019	15:05	50.02	227.67	34.20	67.70	30.10	36.90	7,140.45	14,247.03	6,231.08	27,618.56	126,310.48
11/11/2019	15:10	50.02	227.83	32.20	59.20	33.00	28.40	6,693.37	12,185.30	6,846.36	25,725.03	128,454.24
11/11/2019	15:15	49.98	227.70	35.00	64.20	34.90	31.70	7,324.00	13,378.48	7,238.57	27,941.05	130,782.66
11/11/2019	15:20	49.96	227.67	38.00	61.90	30.80	32.30	7,955.07	12,811.59	6,350.35	27,117.01	133,042.41
11/11/2019	15:25	49.97	227.67	36.50	62.30	32.80	30.80	7,625.91	12,914.01	6,760.06	27,299.98	135,317.41
11/11/2019	15:30	49.99	227.97	31.80	57.70	35.10	26.90	6,590.68	11,829.19	7,248.49	25,668.36	137,456.44
11/11/2019	15:35	50.01	228.07	34.10	66.10	31.90	35.80	7,124.51	13,828.87	6,580.08	27,533.46	139,750.89
11/11/2019	15:40	50.02	228.20	33.10	58.60	30.50	29.10	6,883.97	12,049.42	6,293.33	25,226.71	141,853.12
11/11/2019	15:45	50.00	228.27	37.40	62.90	34.10	29.70	7,863.83	13,070.42	7,072.93	28,007.18	144,187.05
11/11/2019	15:50	50.01	228.40	33.70	66.00	34.10	33.70	7,030.76	13,830.36	7,070.93	27,932.05	146,514.72
11/11/2019	15:55	50.02	228.70	32.70	58.20	30.50	28.60	6,813.65	11,963.82	6,306.75	25,084.22	148,605.07
11/11/2019	16:00	50.02	228.70	32.10	76.90	31.60	47.50	6,708.61	16,132.75	6,531.44	29,372.80	151,052.80
11/11/2019	16:05	50.01	228.77	33.10	54.30	35.60	24.70	6,879.31	10,993.86	7,365.58	25,238.75	153,156.03
11/11/2019	16:10	50.02	229.17	33.50	63.60	32.40	34.60	6,962.12	13,237.92	6,676.68	26,876.72	155,395.76
11/11/2019	16:15	50.01	229.47	34.20	58.10	30.80	28.00	7,083.43	11,937.98	6,376.10	25,397.51	157,512.22
11/11/2019	16:20	50.01	229.57	46.60	67.10	33.80	38.10	9,703.33	14,039.74	7,066.96	30,810.02	160,079.72
11/11/2019	16:25	50.03	229.87	61.30	78.70	48.50	43.10	13,172.36	16,272.64	10,062.58	39,507.57	163,372.02
11/11/2019	16:30	50.02	230.00	64.20	83.30	45.60	49.00	13,884.62	17,374.20	9,456.00	40,714.82	166,764.92
11/11/2019	16:35	50.03	230.73	65.10	78.60	44.00	46.60	14,140.25	16,424.10	9,112.54	39,676.89	170,071.33
11/11/2019	16:40	50.01	229.37	64.70	65.90	45.80	36.60	13,964.16	13,556.08	9,481.08	37,001.33	173,154.77
11/11/2019	16:45	50.03	229.77	62.00	73.00	43.70	40.70	13,388.10	15,287.97	9,058.29	37,734.36	176,299.30
11/11/2019	16:50	50.00	230.17	57.10	63.20	37.50	38.90	12,311.07	12,915.21	7,752.68	32,978.95	179,047.55
11/11/2019	16:55	50.02	230.63	56.50	74.20	27.50	52.40	12,175.55	15,610.46	5,753.63	33,539.65	181,842.52
11/11/2019	17:00	50.03	230.00	60.10	65.50	26.50	48.90	12,948.16	13,530.94	5,560.04	32,039.14	184,512.45
11/11/2019	17:05	50.03	228.13	64.50	72.80	26.60	54.10	13,841.21	15,268.66	5,549.41	34,659.27	187,400.72

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
11/11/2019	17:10	50.03	227.37	77.00	68.00	26.40	57.60	16,421.36	14,124.34	5,480.46	36,026.16	190,402.90
11/11/2019	17:15	50.01	227.00	79.70	66.20	27.50	58.40	17,010.94	13,680.48	5,748.66	36,440.08	193,439.57
11/11/2019	17:20	50.01	227.00	81.10	63.80	27.40	59.60	17,338.92	13,110.77	5,715.24	36,164.92	196,453.32
11/11/2019	17:25	50.01	226.97	77.00	64.30	27.30	56.90	16,447.44	13,226.01	5,688.36	35,361.80	199,400.13
11/11/2019	17:30	49.98	226.77	77.60	64.50	27.40	57.20	16,558.89	13,264.32	5,727.63	35,550.83	202,362.70
11/11/2019	17:35	49.95	226.40	83.60	68.10	26.90	63.10	17,889.11	14,077.77	5,603.39	37,570.26	205,493.56
11/11/2019	17:40	49.94	225.77	77.30	64.40	27.00	57.90	16,426.90	13,144.39	5,633.56	35,204.85	208,427.29
11/11/2019	17:45	49.95	226.20	77.10	62.70	27.00	57.70	16,419.41	12,810.68	5,626.64	34,856.74	211,332.02
11/11/2019	17:50	49.95	225.70	77.20	63.20	26.60	58.10	16,412.40	12,924.58	5,531.67	34,868.66	214,237.74
11/11/2019	17:55	50.01	225.20	75.90	62.00	26.90	57.10	16,201.14	12,674.51	5,575.26	34,450.91	217,108.65
11/11/2019	18:00	50.02	226.97	79.10	65.30	27.10	60.80	17,016.22	13,439.04	5,638.42	36,093.68	220,116.46
11/11/2019	18:05	49.96	226.13	75.50	63.80	26.90	57.50	16,151.80	13,080.74	5,565.22	34,797.76	223,016.27
11/11/2019	18:10	49.96	228.60	79.10	65.30	26.60	60.70	17,083.47	13,468.05	5,541.14	36,092.67	226,024.00
11/11/2019	18:15	49.95	229.17	78.20	57.80	30.00	56.40	16,892.19	11,645.26	6,220.23	34,757.68	228,920.47
11/11/2019	18:20	49.95	229.30	76.10	57.10	36.30	48.70	16,416.04	11,462.80	7,472.09	35,350.93	231,866.38
11/11/2019	18:25	49.96	228.23	75.50	61.90	36.10	49.60	16,252.86	12,586.15	7,426.06	36,265.06	234,888.47
11/11/2019	18:30	49.96	228.13	61.30	55.80	31.30	41.00	13,209.60	11,314.78	6,432.15	30,956.54	237,468.18
11/11/2019	18:35	50.01	228.47	37.00	42.40	23.10	27.70	7,897.00	8,473.00	4,733.26	21,103.26	239,226.79
11/11/2019	18:40	50.02	228.67	7.40	35.90	19.00	24.00	1,551.99	7,442.76	3,763.27	12,758.02	240,289.95
11/11/2019	18:45	50.01	228.77	0.00	35.90	18.90	25.30	13.62	7,457.43	3,726.05	11,197.10	241,223.04
11/11/2019	18:50	50.01	228.93	0.00	36.10	18.90	25.10	0.00	7,491.63	3,749.08	11,240.71	242,159.77
11/11/2019	18:55	50.02	229.13	0.00	24.90	18.20	17.30	0.00	5,247.42	3,587.65	8,835.07	242,896.03
11/11/2019	19:00	50.03	229.27	1.50	21.70	18.20	15.40	275.88	4,576.23	3,594.06	8,446.16	243,599.87
11/11/2019	19:05	50.02	229.33	13.50	21.50	4.60	16.70	2,619.21	4,565.39	912.43	8,097.03	244,274.63
11/11/2019	19:10	50.01	229.33	22.20	22.30	4.40	16.20	4,334.10	4,714.62	864.24	9,912.95	245,100.71
11/11/2019	19:15	50.01	229.40	22.10	21.30	18.60	9.20	4,335.40	4,511.57	3,661.82	12,508.80	246,143.11
11/11/2019	19:20	50.02	229.40	10.60	20.40	18.40	13.10	2,092.09	4,362.64	3,601.82	10,056.55	246,981.15
11/11/2019	19:25	50.02	229.70	0.00	18.80	18.10	16.90	0.00	4,097.30	3,516.65	7,613.96	247,615.65
11/11/2019	19:30	50.00	230.03	0.00	18.60	17.80	16.40	0.00	4,051.80	3,461.56	7,513.35	248,241.76
11/11/2019	19:35	50.03	230.10	0.00	15.40	17.70	15.40	6.15	3,348.17	3,452.66	6,806.97	248,809.01
11/11/2019	19:40	50.01	230.30	0.00	12.40	17.80	14.50	7.16	2,668.60	3,472.46	6,148.23	249,321.36
11/11/2019	19:45	49.98	228.73	0.00	18.70	17.80	14.70	0.00	4,078.66	3,471.33	7,549.99	249,950.53
11/11/2019	19:50	50.00	227.23	0.00	19.40	0.20	15.30	0.00	4,221.17	48.52	4,269.69	250,306.33
11/11/2019	19:55	50.01	226.80	6.00	19.00	6.40	14.40	1,068.74	4,153.63	1,229.17	6,451.55	250,843.96
11/11/2019	20:00	50.01	226.93	9.70	28.60	18.10	19.10	1,734.80	5,993.74	3,507.40	11,235.94	251,780.29
11/11/2019	20:05	50.02	226.97	9.50	27.40	18.10	17.30	1,709.60	5,570.10	3,508.15	10,787.85	252,679.28
11/11/2019	20:10	50.02	227.27	9.40	33.10	17.80	22.10	1,696.92	6,988.90	3,453.10	12,138.92	253,690.86
11/11/2019	20:15	50.00	227.43	9.50	32.50	17.70	21.50	1,711.82	6,866.73	3,430.91	12,009.46	254,691.64
11/11/2019	20:20	50.01	227.77	9.50	32.60	6.70	24.70	1,729.67	6,882.11	1,307.89	9,919.67	255,518.28
11/11/2019	20:25	50.02	228.00	9.80	33.50	1.00	27.00	1,794.66	7,084.26	157.62	9,036.54	256,271.33
11/11/2019	20:30	50.01	227.83	10.00	34.30	18.00	22.20	1,805.32	7,223.79	3,587.34	12,616.45	257,322.70
11/11/2019	20:35	50.02	227.83	9.90	34.80	21.00	21.80	1,760.43	7,314.55	4,260.37	13,335.35	258,433.98

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
11/11/2019	20:40	50.01	228.03	9.80	34.90	18.60	23.00	1,748.82	7,336.30	3,626.54	12,711.66	259,493.28
11/11/2019	20:45	50.03	228.27	9.80	35.30	18.10	23.40	1,751.01	7,414.60	3,533.55	12,699.16	260,551.55
11/11/2019	20:50	50.00	227.77	10.80	35.80	17.70	22.80	1,916.37	7,460.22	3,438.06	12,814.66	261,619.44
11/11/2019	20:55	50.03	228.07	10.40	37.00	17.60	24.10	1,837.58	7,645.74	3,420.88	12,904.19	262,694.78
11/11/2019	21:00	50.02	228.43	10.40	37.10	17.50	24.20	1,840.60	7,666.02	3,406.47	12,913.09	263,770.88
11/11/2019	21:05	50.00	228.63	10.40	37.10	16.30	24.60	1,842.31	7,668.01	3,173.06	12,683.37	264,827.82
11/11/2019	21:10	50.01	228.93	10.50	36.80	0.00	30.10	1,864.38	7,611.33	5.28	9,481.00	265,617.91
11/11/2019	21:15	50.01	229.23	11.00	37.30	8.10	27.40	1,940.46	7,693.97	1,573.23	11,207.66	266,551.88
11/11/2019	21:20	50.02	229.73	11.20	37.10	17.80	23.60	1,961.36	7,639.93	3,459.37	13,060.66	267,640.27
11/11/2019	21:25	50.01	229.67	11.20	37.00	17.80	23.20	1,969.24	7,612.70	3,476.44	13,058.38	268,728.47
11/11/2019	21:30	49.97	228.87	11.10	36.30	17.50	22.70	1,956.46	7,474.89	3,414.32	12,845.66	269,798.94
11/11/2019	21:35	49.95	228.30	15.70	35.70	17.40	21.00	2,987.18	7,344.31	3,391.14	13,722.63	270,942.49
11/11/2019	21:40	49.96	228.60	19.50	34.80	17.40	19.10	3,883.26	7,112.13	3,391.96	14,387.36	272,141.44
11/11/2019	21:45	49.95	229.03	18.60	23.80	1.80	21.90	3,682.46	4,360.32	359.21	8,401.99	272,841.60
11/11/2019	21:50	50.00	227.33	16.00	47.70	1.40	40.50	3,178.77	9,682.33	271.19	13,132.28	273,935.96
11/11/2019	21:55	50.02	227.13	15.00	50.70	18.10	35.30	2,955.90	10,394.06	3,524.54	16,874.49	275,342.17
11/11/2019	22:00	50.00	227.03	15.00	51.30	18.20	35.80	2,934.68	10,527.13	3,545.35	17,007.16	276,759.43
11/11/2019	22:05	49.94	225.97	15.70	49.60	17.60	34.00	3,067.10	10,115.27	3,415.83	16,598.20	278,142.61
11/11/2019	22:10	49.96	226.03	17.50	38.90	17.70	23.80	3,461.25	7,534.10	3,446.77	14,442.12	279,346.12
11/11/2019	22:15	49.96	226.00	15.30	51.70	17.40	36.30	3,005.91	10,635.38	3,370.06	17,011.35	280,763.74
11/11/2019	22:20	49.99	226.30	16.80	44.60	4.60	35.30	3,299.90	8,965.91	905.95	13,171.76	281,861.38
11/11/2019	22:25	50.03	226.67	18.70	37.80	1.10	31.90	3,744.98	7,388.63	219.52	11,353.12	282,807.48
11/11/2019	22:30	50.01	226.43	14.20	50.30	18.10	35.30	2,736.31	10,411.19	3,518.89	16,666.40	284,196.34
11/11/2019	22:35	50.01	226.70	14.50	44.50	18.40	29.50	2,801.09	9,034.41	3,586.87	15,422.37	285,481.54
11/11/2019	22:40	50.00	226.53	16.00	41.20	18.40	26.00	3,128.37	8,146.96	3,602.27	14,877.61	286,721.34
11/11/2019	22:45	49.97	226.13	16.10	49.70	17.80	33.90	3,188.04	10,210.35	3,483.26	16,881.65	288,128.14
11/11/2019	22:50	49.95	226.23	15.10	46.30	18.00	30.70	2,941.56	9,413.90	3,513.16	15,868.61	289,450.53
11/11/2019	22:55	50.01	226.70	18.40	42.40	18.00	26.00	3,649.91	8,475.44	3,539.05	15,664.41	290,755.90
11/11/2019	23:00	49.99	226.97	12.90	49.40	18.00	34.30	2,425.88	10,185.31	3,542.18	16,153.38	292,102.01
11/11/2019	23:05	49.97	227.13	14.10	41.90	18.30	26.10	2,668.30	8,310.55	3,584.06	14,562.91	293,315.59
11/11/2019	23:10	50.01	227.53	16.90	49.30	18.60	32.60	3,327.03	10,115.64	3,646.50	17,089.17	294,739.68
11/11/2019	23:15	49.99	227.67	14.60	44.20	7.80	34.60	2,801.77	8,893.77	1,532.31	13,227.85	295,842.00
11/11/2019	23:20	50.02	227.93	15.10	48.30	0.00	41.30	2,962.64	9,876.70	0.00	12,839.33	296,911.95
11/11/2019	23:25	50.02	227.93	13.30	44.40	11.80	32.20	2,529.78	8,906.93	2,320.38	13,757.09	298,058.37
11/11/2019	23:30	50.02	228.10	16.80	32.50	17.70	19.80	3,300.23	6,346.02	3,480.74	13,126.99	299,152.29
11/11/2019	23:35	50.01	228.33	10.90	30.20	7.90	22.10	2,162.13	6,056.84	1,544.00	9,762.97	299,965.87
11/11/2019	23:40	50.02	228.53	12.70	21.80	0.00	23.20	2,585.71	4,036.56	0.00	6,622.27	300,517.73
11/11/2019	23:45	50.03	227.97	10.50	31.70	0.00	27.50	2,075.18	6,510.83	0.00	8,586.02	301,233.23
11/11/2019	23:50	50.03	228.60	10.40	19.90	0.00	18.50	1,821.95	3,588.34	0.00	5,410.29	301,684.08
11/11/2019	23:55	50.03	229.03	14.60	29.60	0.00	27.10	2,827.21	5,967.27	0.00	8,794.48	302,416.96
12/11/2019	0:00	50.00	228.67	13.70	26.20	0.00	23.50	2,596.87	5,140.81	0.00	7,737.68	303,061.76
12/11/2019	0:05	50.03	229.07	12.00	17.00	0.00	18.50	2,356.54	3,250.54	0.00	5,607.08	303,529.02

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
12/11/2019	0:10	50.00	228.93	8.20	23.60	0.00	20.70	1,671.37	4,849.72	0.00	6,521.09	304,072.45
12/11/2019	0:15	50.01	229.10	0.00	29.40	0.00	25.00	0.00	6,266.01	0.00	6,266.01	304,594.61
12/11/2019	0:20	50.03	229.33	6.70	20.60	0.00	18.30	1,377.20	4,157.81	0.00	5,535.01	305,055.86
12/11/2019	0:25	50.03	229.57	8.40	16.60	0.00	17.50	1,734.70	3,202.31	0.00	4,937.00	305,467.28
12/11/2019	0:30	50.02	229.83	10.10	18.10	0.00	19.20	2,078.08	3,533.13	0.00	5,611.22	305,934.88
12/11/2019	0:35	50.02	229.87	0.00	29.10	0.00	25.60	0.00	6,194.95	0.00	6,194.95	306,451.13
12/11/2019	0:40	50.02	230.00	7.60	25.00	0.00	21.50	1,572.70	5,143.62	0.00	6,716.32	307,010.82
12/11/2019	0:45	50.00	229.93	7.70	18.10	0.00	17.90	1,576.31	3,333.58	0.00	4,909.89	307,419.98
12/11/2019	0:50	50.00	229.93	2.60	18.60	0.00	17.50	540.46	3,419.41	0.00	3,959.87	307,749.97
12/11/2019	0:55	49.98	229.87	8.50	18.50	0.00	19.10	1,779.29	3,403.64	0.00	5,182.93	308,181.88
12/11/2019	1:00	49.99	230.03	8.20	26.90	0.00	25.20	1,716.03	5,468.52	0.00	7,184.55	308,780.59
12/11/2019	1:05	50.01	230.40	0.00	30.30	0.00	27.30	0.00	6,324.24	0.00	6,324.24	309,307.61
12/11/2019	1:10	49.96	230.37	7.60	18.50	0.00	18.70	1,585.22	3,399.71	0.00	4,984.93	309,723.02
12/11/2019	1:15	50.02	230.57	4.50	18.10	0.00	17.60	949.24	3,327.33	0.00	4,276.57	310,079.40
12/11/2019	1:20	49.99	230.50	3.50	18.60	0.00	17.70	733.38	3,425.60	0.00	4,158.98	310,425.98
12/11/2019	1:25	50.00	230.53	8.90	24.20	0.00	24.20	1,842.72	4,774.99	0.00	6,617.71	310,977.46
12/11/2019	1:30	50.01	230.63	6.50	30.40	0.00	27.10	1,354.60	6,327.81	0.00	7,682.42	311,617.66
12/11/2019	1:35	50.00	230.77	0.00	20.00	0.00	18.10	0.00	3,635.43	0.00	3,635.43	311,920.61
12/11/2019	1:40	50.01	230.90	8.40	20.60	0.00	20.40	1,741.05	3,709.27	0.00	5,450.32	312,374.81
12/11/2019	1:45	49.98	230.90	7.60	14.80	0.00	15.30	1,591.57	2,703.10	0.00	4,294.67	312,732.70
12/11/2019	1:50	50.00	230.60	5.40	8.00	0.00	11.40	1,129.29	1,743.70	0.00	2,872.99	312,972.11
12/11/2019	1:55	50.02	230.73	4.20	17.70	0.00	18.60	916.19	3,877.09	0.00	4,793.28	313,371.55
12/11/2019	2:00	50.01	230.83	1.00	2.60	0.00	2.60	227.25	574.62	0.00	801.87	313,438.38
12/11/2019	2:05	50.01	230.90	7.30	0.00	0.00	7.90	1,586.80	0.00	0.00	1,586.80	313,570.61
12/11/2019	2:10	50.01	230.87	6.70	0.30	0.00	7.50	1,432.18	73.29	0.00	1,505.47	313,696.06
12/11/2019	2:15	50.00	230.90	4.60	18.30	0.00	18.60	998.21	3,993.96	0.00	4,992.16	314,112.08
12/11/2019	2:20	50.03	231.23	0.30	3.00	0.00	3.10	83.35	667.60	0.00	750.95	314,174.66
12/11/2019	2:25	50.00	231.30	6.80	0.00	0.00	7.10	1,475.96	5.41	0.00	1,481.37	314,298.10
12/11/2019	2:30	49.98	228.83	8.10	6.70	0.00	11.90	1,738.83	1,462.55	0.00	3,201.38	314,564.89
12/11/2019	2:35	50.01	228.87	0.00	18.40	0.00	19.50	0.00	4,012.70	0.00	4,012.70	314,899.28
12/11/2019	2:40	50.02	229.00	5.30	4.60	0.00	10.60	1,139.27	1,011.77	0.00	2,151.04	315,078.53
12/11/2019	2:45	50.02	229.27	0.30	0.00	0.00	0.40	74.23	0.00	0.00	74.23	315,084.72
12/11/2019	2:50	49.99	229.03	6.30	0.00	0.00	6.90	1,378.69	0.00	0.00	1,378.69	315,199.61
12/11/2019	2:55	50.01	229.13	7.40	0.00	0.00	7.70	1,600.09	0.00	0.00	1,600.09	315,332.95
12/11/2019	3:00	50.02	229.20	6.80	6.50	0.00	9.30	1,460.33	1,421.31	0.00	2,881.64	315,573.08
12/11/2019	3:05	50.01	229.37	0.00	18.10	0.00	18.80	0.00	3,934.56	0.00	3,934.56	315,900.96
12/11/2019	3:10	50.01	228.53	2.30	4.80	0.00	7.50	488.45	1,061.36	0.00	1,549.81	316,030.12
12/11/2019	3:15	49.99	227.87	5.00	0.00	0.00	5.40	1,087.31	0.00	0.00	1,087.31	316,120.72
12/11/2019	3:20	49.99	227.90	6.70	0.00	0.00	7.20	1,433.44	0.00	0.00	1,433.44	316,240.18
12/11/2019	3:25	50.00	228.03	0.90	0.30	0.00	1.00	192.02	73.70	0.00	265.71	316,262.32
12/11/2019	3:30	50.00	227.97	6.60	17.50	0.00	18.10	1,445.24	3,809.38	0.00	5,254.62	316,700.21
12/11/2019	3:35	49.99	228.03	0.00	2.50	0.00	2.70	0.00	562.78	0.00	562.78	316,747.10

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
12/11/2019	3:40	49.99	227.93	7.20	0.00	0.00	7.60	1,537.57	0.00	0.00	1,537.57	316,875.24
12/11/2019	3:45	50.00	228.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	316,875.24
12/11/2019	3:50	50.01	227.93	7.50	12.20	0.00	17.70	1,605.29	2,634.12	0.00	4,239.41	317,228.52
12/11/2019	3:55	50.01	227.93	0.00	13.60	0.00	12.80	4.21	2,947.05	0.00	2,951.26	317,474.46
12/11/2019	4:00	50.02	228.03	6.30	0.00	0.00	6.50	1,302.20	0.00	0.00	1,302.20	317,582.98
12/11/2019	4:05	50.01	227.87	1.20	0.00	0.00	1.30	254.71	0.00	0.00	254.71	317,604.20
12/11/2019	4:10	49.97	227.73	8.30	0.00	0.00	8.40	1,713.22	0.00	0.00	1,713.22	317,746.97
12/11/2019	4:15	49.97	227.57	2.90	0.00	0.00	2.90	593.60	0.00	0.00	593.60	317,796.44
12/11/2019	4:20	49.98	227.53	5.40	14.40	0.00	16.40	1,119.70	3,120.70	0.00	4,240.39	318,149.80
12/11/2019	4:25	49.97	227.53	0.00	7.00	0.00	6.70	0.00	1,521.49	0.00	1,521.49	318,276.59
12/11/2019	4:30	49.95	227.43	6.50	0.00	0.00	6.80	1,344.03	0.00	0.00	1,344.03	318,388.60
12/11/2019	4:35	49.98	227.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	318,388.60
12/11/2019	4:40	49.97	227.30	7.60	0.00	0.00	7.80	1,557.97	0.00	0.00	1,557.97	318,518.43
12/11/2019	4:45	50.01	227.37	0.00	6.20	0.00	5.80	0.00	1,338.00	0.00	1,338.00	318,629.93
12/11/2019	4:50	49.99	227.23	6.10	10.20	0.00	9.50	1,273.36	2,209.05	0.00	3,482.42	318,920.13
12/11/2019	4:55	49.97	226.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	318,920.13
12/11/2019	5:00	49.99	227.03	7.80	0.00	0.00	7.80	1,616.07	0.00	0.00	1,616.07	319,054.80
12/11/2019	5:05	49.95	226.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	319,054.80
12/11/2019	5:10	49.97	226.87	8.10	8.00	0.00	13.30	1,671.53	1,733.87	0.00	3,405.41	319,338.59
12/11/2019	5:15	49.98	226.80	0.00	7.70	0.00	7.40	0.00	1,681.49	0.00	1,681.49	319,478.71
12/11/2019	5:20	49.99	227.50	0.70	0.00	0.00	0.70	140.75	0.00	0.00	140.75	319,490.44
12/11/2019	5:25	49.98	227.47	7.40	0.00	0.00	7.60	1,543.49	0.00	0.00	1,543.49	319,619.06
12/11/2019	5:30	49.99	227.27	4.30	0.00	0.00	4.30	888.98	0.00	0.00	888.98	319,693.14
12/11/2019	5:35	49.97	226.93	3.70	2.60	0.00	6.20	775.93	565.13	0.00	1,341.06	319,804.90
12/11/2019	5:40	49.96	226.73	0.00	16.50	0.00	15.50	0.00	3,586.05	0.00	3,586.05	320,103.74
12/11/2019	5:45	49.95	226.37	1.20	1.00	0.00	2.20	255.67	223.17	0.00	478.83	320,143.64
12/11/2019	5:50	49.97	226.27	6.50	0.00	0.00	6.70	1,356.20	0.00	0.00	1,356.20	320,256.66
12/11/2019	5:55	49.98	225.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	320,256.66
12/11/2019	6:00	49.98	225.80	5.50	0.00	0.00	5.60	1,137.19	0.00	0.00	1,137.19	320,351.42
12/11/2019	6:05	49.97	226.17	3.60	0.00	0.00	3.60	751.23	0.00	0.00	751.23	320,414.02
12/11/2019	6:10	49.97	226.37	0.00	15.20	0.00	14.70	0.00	3,305.10	0.00	3,305.10	320,689.45
12/11/2019	6:15	50.02	226.77	0.00	4.10	0.00	3.90	0.00	891.07	0.00	891.07	320,763.70
12/11/2019	6:20	50.00	227.23	7.60	0.00	0.00	7.60	1,557.01	0.00	0.00	1,557.01	320,893.46
12/11/2019	6:25	50.01	227.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	320,893.46
12/11/2019	6:30	50.02	227.87	6.60	0.00	0.00	6.70	1,356.35	0.00	0.00	1,356.35	321,006.49
12/11/2019	6:35	50.01	228.17	0.80	2.90	0.00	3.60	163.16	657.90	0.00	821.05	321,074.91
12/11/2019	6:40	50.02	228.40	0.00	14.50	0.00	14.00	0.00	3,275.84	0.00	3,275.84	321,347.89
12/11/2019	6:45	50.01	228.60	4.20	0.00	0.00	4.10	880.98	0.00	0.00	880.98	321,421.31
12/11/2019	6:50	50.00	228.70	3.80	0.00	0.00	3.70	780.22	0.00	0.00	780.22	321,486.33
12/11/2019	6:55	50.00	228.60	2.90	0.00	0.00	2.90	595.42	0.00	0.00	595.42	321,535.94
12/11/2019	7:00	49.99	228.60	3.50	1.00	0.00	4.60	733.61	221.06	0.00	954.67	321,615.50
12/11/2019	7:05	49.99	228.50	0.00	14.20	0.00	14.10	0.00	3,192.31	0.00	3,192.31	321,881.53

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
12/11/2019	7:10	49.99	228.43	1.90	2.10	0.00	4.20	397.06	491.15	0.00	888.21	321,955.54
12/11/2019	7:15	50.00	228.40	5.40	0.00	0.00	5.60	1,110.10	0.00	0.00	1,110.10	322,048.05
12/11/2019	7:20	49.99	228.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	322,048.05
12/11/2019	7:25	49.99	228.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	322,048.05
12/11/2019	7:30	50.00	228.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	322,048.05
12/11/2019	7:35	49.96	227.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	322,048.05
12/11/2019	7:40	50.00	227.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	322,048.05
12/11/2019	7:45	49.99	227.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	322,048.05
12/11/2019	7:50	50.03	227.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	322,048.05
12/11/2019	7:55	50.02	227.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	322,048.05
12/11/2019	8:00	50.01	226.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	322,048.05
12/11/2019	8:05	50.02	226.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	322,048.05
12/11/2019	8:10	49.96	227.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	322,048.05
12/11/2019	8:15	49.95	227.23	5.00	3.00	0.00	5.00	974.72	602.62	0.00	1,577.35	322,179.50
12/11/2019	8:20	49.96	227.13	2.60	12.10	0.00	12.50	514.65	2,439.90	0.00	2,954.55	322,425.71
12/11/2019	8:25	49.96	226.87	2.30	12.10	12.20	13.00	470.14	2,443.73	2,306.04	5,219.91	322,860.70
12/11/2019	8:30	49.97	226.43	2.30	13.90	16.80	12.90	457.12	2,672.50	3,189.03	6,318.66	323,387.26
12/11/2019	8:35	49.96	225.80	4.80	11.90	17.30	13.20	940.92	2,412.01	3,308.47	6,661.40	323,942.38
12/11/2019	8:40	49.99	226.53	2.40	12.00	7.30	12.60	477.90	2,438.71	1,391.86	4,308.47	324,301.41
12/11/2019	8:45	50.00	227.83	2.40	12.30	11.10	13.50	486.56	2,514.11	2,123.59	5,124.26	324,728.44
12/11/2019	8:50	50.00	227.80	2.40	12.60	13.00	13.20	477.68	2,569.86	2,473.81	5,521.35	325,188.55
12/11/2019	8:55	50.01	227.57	2.70	13.00	6.70	13.50	546.62	2,652.68	1,278.22	4,477.52	325,561.67
12/11/2019	9:00	50.02	227.33	2.30	13.00	7.40	13.40	465.47	2,656.28	1,428.43	4,550.18	325,940.86
12/11/2019	9:05	50.02	227.03	2.50	12.60	12.00	13.30	502.40	2,574.67	2,314.74	5,391.81	326,390.17
12/11/2019	9:10	50.02	226.70	2.20	12.40	9.60	13.40	443.68	2,550.90	1,844.35	4,838.93	326,793.42
12/11/2019	9:15	50.02	226.50	2.40	12.10	6.10	13.30	480.27	2,477.23	1,180.67	4,138.17	327,138.27
12/11/2019	9:20	49.99	226.17	2.40	11.90	7.90	12.20	483.77	2,436.42	1,533.80	4,454.00	327,509.43
12/11/2019	9:25	49.98	227.97	2.60	12.00	14.10	12.70	516.91	2,447.30	2,710.29	5,674.50	327,982.31
12/11/2019	9:30	50.00	228.23	2.70	12.20	7.00	12.40	541.69	2,508.43	1,338.82	4,388.94	328,348.05
12/11/2019	9:35	49.99	227.87	2.90	12.50	5.80	11.60	586.95	2,560.58	1,112.27	4,259.80	328,703.04
12/11/2019	9:40	49.96	227.57	3.00	12.70	12.80	12.20	618.85	2,598.32	2,480.31	5,697.48	329,177.83
12/11/2019	9:45	49.96	227.37	3.00	12.60	11.50	13.10	604.07	2,573.61	2,213.49	5,391.16	329,627.09
12/11/2019	9:50	49.98	227.23	4.50	12.70	5.90	12.50	908.62	2,604.95	1,133.92	4,647.49	330,014.38
12/11/2019	9:55	50.02	227.53	3.40	12.80	8.60	13.70	712.22	2,637.79	1,672.84	5,022.84	330,432.95
12/11/2019	10:00	50.01	227.40	2.30	12.80	12.90	13.30	492.42	2,624.41	2,483.16	5,599.99	330,899.62
12/11/2019	10:05	50.01	226.97	12.40	14.20	10.20	14.50	2,404.39	2,924.71	1,960.22	7,289.32	331,507.06
12/11/2019	10:10	50.00	226.63	44.50	29.00	6.60	39.90	9,521.78	5,955.42	1,275.26	16,752.45	332,903.10
12/11/2019	10:15	49.97	226.43	51.20	30.60	8.20	43.00	11,051.71	6,302.10	1,600.24	18,954.06	334,482.60
12/11/2019	10:20	49.98	226.60	52.90	31.30	12.50	41.90	11,465.47	6,449.49	2,447.54	20,362.50	336,179.48
12/11/2019	10:25	50.00	226.80	54.60	31.00	8.70	45.90	11,882.01	6,386.69	1,698.23	19,966.94	337,843.39
12/11/2019	10:30	49.99	226.63	54.80	31.10	5.60	47.60	11,928.30	6,422.09	1,099.70	19,450.09	339,464.23
12/11/2019	10:35	49.99	226.50	55.80	32.20	10.50	46.20	12,140.07	6,589.12	2,055.01	20,784.20	341,196.25

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
12/11/2019	10:40	50.01	226.60	53.60	32.40	12.30	43.60	11,647.24	6,582.35	2,390.95	20,620.54	342,914.63
12/11/2019	10:45	50.02	226.77	54.00	34.10	7.10	46.40	11,769.93	7,071.11	1,395.12	20,236.16	344,600.97
12/11/2019	10:50	50.01	226.57	55.10	30.90	5.10	48.00	12,015.30	6,411.48	1,006.30	19,433.07	346,220.39
12/11/2019	10:55	49.99	226.60	59.70	31.10	12.40	48.20	13,095.73	6,450.65	2,412.51	21,958.88	348,050.30
12/11/2019	11:00	50.00	226.67	59.30	32.00	11.30	48.60	13,004.59	6,638.91	2,216.86	21,860.36	349,872.00
12/11/2019	11:05	50.00	226.60	58.20	33.80	16.00	45.50	12,770.54	7,008.55	2,991.26	22,770.35	351,769.53
12/11/2019	11:10	50.00	226.50	58.60	34.00	26.00	37.60	12,856.26	7,034.63	5,218.63	25,109.52	353,861.99
12/11/2019	11:15	50.02	226.60	58.50	33.40	29.60	34.50	12,845.61	6,914.11	6,021.23	25,780.95	356,010.40
12/11/2019	11:20	50.01	226.50	57.50	33.20	29.30	33.90	12,559.59	6,860.42	5,954.83	25,374.84	358,124.97
12/11/2019	11:25	50.02	226.67	49.80	33.50	25.00	30.80	10,783.93	6,891.69	5,072.27	22,747.90	360,020.63
12/11/2019	11:30	50.02	226.80	49.50	32.60	27.90	28.10	10,718.99	6,734.80	5,696.32	23,150.11	361,949.80
12/11/2019	11:35	50.02	226.80	50.60	34.10	29.90	27.90	10,961.74	7,001.51	6,137.96	24,101.21	363,958.24
12/11/2019	11:40	50.02	226.83	51.50	33.20	27.90	30.00	11,165.48	6,865.14	5,703.97	23,734.59	365,936.12
12/11/2019	11:45	50.01	226.93	51.70	33.20	25.90	31.30	11,201.01	6,872.46	5,281.10	23,354.57	367,882.33
12/11/2019	11:50	50.03	226.97	50.30	33.40	29.30	27.60	10,907.25	6,930.38	5,993.79	23,831.42	369,868.29
12/11/2019	11:55	50.02	227.27	45.50	31.60	30.80	25.70	9,763.46	6,546.92	6,329.93	22,640.31	371,754.98
12/11/2019	12:00	50.04	228.00	5.30	15.70	27.40	19.50	1,035.42	3,255.47	5,544.57	9,835.46	372,574.60
12/11/2019	12:05	50.03	228.77	2.90	15.90	24.90	17.60	591.17	3,270.02	5,038.08	8,899.27	373,316.21
12/11/2019	12:10	50.01	228.70	3.50	16.10	33.70	24.00	697.18	3,284.59	6,944.80	10,926.57	374,226.75
12/11/2019	12:15	50.02	228.90	4.80	16.40	33.70	23.50	981.61	3,348.43	6,968.65	11,298.69	375,168.31
12/11/2019	12:20	50.00	228.73	3.50	16.50	33.70	23.80	712.06	3,380.41	6,944.58	11,037.05	376,088.07
12/11/2019	12:25	50.01	228.73	3.10	15.70	27.90	19.60	629.44	3,199.88	5,670.90	9,500.22	376,879.75
12/11/2019	12:30	49.98	228.47	3.00	16.10	32.50	22.90	604.52	3,283.13	6,645.15	10,532.80	377,757.48
12/11/2019	12:35	49.97	228.40	3.10	16.30	34.30	24.30	627.16	3,336.56	7,055.93	11,019.65	378,675.79
12/11/2019	12:40	49.99	228.37	3.10	16.70	23.50	16.20	636.46	3,451.36	4,730.17	8,817.99	379,410.62
12/11/2019	12:45	49.97	228.23	3.20	16.30	29.10	20.30	657.53	3,360.84	5,947.51	9,965.89	380,241.11
12/11/2019	12:50	49.97	228.00	3.20	16.40	29.20	20.80	648.05	3,374.95	5,956.15	9,979.15	381,072.71
12/11/2019	12:55	49.96	227.80	5.10	16.50	24.80	16.70	1,031.76	3,397.16	5,006.82	9,435.73	381,859.02
12/11/2019	13:00	49.95	227.40	3.70	16.70	25.60	17.70	766.96	3,456.93	5,154.98	9,378.86	382,640.59
12/11/2019	13:05	49.94	226.63	3.00	17.90	30.60	20.90	611.77	3,603.21	6,224.95	10,439.93	383,510.58
12/11/2019	13:10	49.96	226.57	3.10	18.20	28.70	19.10	629.35	3,653.26	5,820.77	10,103.37	384,352.53
12/11/2019	13:15	50.00	226.47	3.10	17.90	25.80	17.40	635.60	3,627.39	5,200.04	9,463.03	385,141.12
12/11/2019	13:20	49.99	226.17	19.20	19.40	25.90	14.70	4,010.04	4,030.43	5,230.55	13,271.02	386,247.04
12/11/2019	13:25	49.95	225.80	22.90	30.70	29.10	15.30	4,838.34	6,626.52	5,927.51	17,392.37	387,696.40
12/11/2019	13:30	49.97	225.77	24.40	40.00	29.40	19.80	5,167.32	8,479.85	6,024.14	19,671.32	389,335.68
12/11/2019	13:35	50.00	225.73	16.80	39.50	25.30	25.40	3,535.46	8,414.04	5,112.52	17,062.02	390,757.51
12/11/2019	13:40	49.98	225.53	18.00	32.40	26.50	19.30	3,818.39	6,986.39	5,360.87	16,165.64	392,104.65
12/11/2019	13:45	49.97	225.47	12.70	33.00	30.60	22.40	2,682.48	7,069.68	6,216.73	15,968.90	393,435.39
12/11/2019	13:50	49.99	225.37	11.90	33.40	28.20	21.60	2,499.41	7,148.34	5,705.83	15,353.58	394,714.86
12/11/2019	13:55	49.99	225.40	14.30	44.60	26.00	28.40	3,023.84	9,369.51	5,265.52	17,658.86	396,186.43
12/11/2019	14:00	49.98	225.30	18.00	49.40	27.10	29.50	3,789.01	10,339.60	5,519.96	19,648.57	397,823.81
12/11/2019	14:05	50.01	225.40	12.70	49.50	30.00	32.00	2,689.43	10,385.05	6,139.19	19,213.66	399,424.95

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
12/11/2019	14:10	49.97	225.30	8.90	49.60	27.80	33.30	1,841.82	10,403.89	5,667.96	17,913.68	400,917.75
12/11/2019	14:15	50.02	225.50	19.60	49.80	26.20	30.10	4,146.75	10,466.44	5,330.48	19,943.67	402,579.73
12/11/2019	14:20	50.02	225.57	9.70	49.40	27.40	33.90	2,043.33	10,378.27	5,564.81	17,986.41	404,078.59
12/11/2019	14:25	49.98	225.40	11.60	49.50	18.50	35.50	2,428.68	10,393.48	3,544.36	16,366.52	405,442.47
12/11/2019	14:30	49.96	225.27	16.00	50.00	26.20	33.50	3,379.14	10,494.13	5,230.29	19,103.56	407,034.44
12/11/2019	14:35	50.01	225.27	12.90	49.20	27.40	31.30	2,704.31	10,339.05	5,573.91	18,617.27	408,585.87
12/11/2019	14:40	49.99	225.53	7.90	50.10	26.80	33.90	1,655.87	10,526.62	5,467.56	17,650.06	410,056.71
12/11/2019	14:45	50.00	225.27	11.00	50.30	31.00	33.00	2,324.05	10,565.41	6,355.65	19,245.11	411,660.47
12/11/2019	14:50	50.00	225.60	8.60	49.80	28.90	33.50	1,795.91	10,471.85	5,920.48	18,188.23	413,176.16
12/11/2019	14:55	50.00	225.57	12.40	51.00	26.50	32.00	2,621.04	10,653.51	5,401.75	18,676.30	414,732.52
12/11/2019	15:00	50.02	225.60	15.30	52.80	28.30	35.50	3,132.76	11,014.24	5,779.08	19,926.08	416,393.02
12/11/2019	15:05	50.01	225.90	15.80	53.40	33.40	33.80	3,245.53	11,145.70	6,871.86	21,263.08	418,164.95
12/11/2019	15:10	50.01	225.87	18.50	53.90	30.80	34.00	3,839.48	11,220.18	6,326.06	21,385.72	419,947.09
12/11/2019	15:15	49.96	225.77	17.30	53.70	21.40	39.20	3,552.12	11,157.66	4,159.34	18,869.12	421,519.52
12/11/2019	15:20	49.98	226.00	17.90	53.50	21.10	36.60	3,657.36	11,149.37	4,159.47	18,966.20	423,100.03
12/11/2019	15:25	50.01	226.10	18.50	53.70	31.90	33.40	3,784.12	11,165.42	6,565.02	21,514.56	424,892.91
12/11/2019	15:30	50.02	226.13	15.20	52.70	30.30	33.80	3,072.21	11,024.85	6,230.33	20,327.39	426,586.86
12/11/2019	15:35	50.01	226.27	15.40	52.30	28.20	34.10	3,147.73	10,981.81	5,782.08	19,911.63	428,246.16
12/11/2019	15:40	50.03	226.33	18.10	52.00	29.70	31.40	3,743.83	10,909.97	6,078.79	20,732.59	429,973.88
12/11/2019	15:45	50.02	226.13	19.50	52.20	32.80	30.70	4,034.90	10,950.73	6,730.47	21,716.10	431,783.55
12/11/2019	15:50	50.02	226.30	16.70	51.70	30.40	32.10	3,435.73	10,829.91	6,222.90	20,488.54	433,490.93
12/11/2019	15:55	50.02	226.43	22.00	51.60	27.90	30.90	4,525.70	10,805.13	5,723.02	21,053.85	435,245.42
12/11/2019	16:00	50.00	226.57	30.70	51.40	29.50	22.90	6,186.43	10,756.83	6,055.21	22,998.47	437,161.96
12/11/2019	16:05	50.01	226.37	33.80	51.70	27.40	26.00	6,852.58	10,828.72	5,545.58	23,226.87	439,097.53
12/11/2019	16:10	50.01	226.83	35.40	51.90	16.90	32.50	7,210.54	10,855.73	3,198.49	21,264.76	440,869.60
12/11/2019	16:15	50.01	226.97	32.90	51.60	27.10	24.90	6,665.24	10,814.93	5,515.17	22,995.33	442,785.87
12/11/2019	16:20	50.00	226.97	33.40	51.50	28.80	25.20	6,773.63	10,780.50	5,884.71	23,438.85	444,739.11
12/11/2019	16:25	50.01	227.03	33.00	51.70	31.80	21.90	6,686.57	10,815.56	6,532.86	24,034.99	446,742.03
12/11/2019	16:30	49.97	227.37	30.20	51.60	32.40	21.40	6,052.71	10,787.83	6,651.20	23,491.74	448,699.67
12/11/2019	16:35	49.99	228.20	30.20	51.50	27.80	24.30	6,057.47	10,781.40	5,697.68	22,536.55	450,577.72
12/11/2019	16:40	50.01	228.70	32.00	51.50	28.40	23.10	6,472.85	10,792.28	5,827.58	23,092.70	452,502.11
12/11/2019	16:45	50.02	229.13	32.00	50.50	23.30	25.70	6,416.39	10,571.87	4,745.26	21,733.51	454,313.24
12/11/2019	16:50	50.02	229.67	33.00	49.00	7.00	35.60	6,613.95	10,294.65	1,078.96	17,987.57	455,812.20
12/11/2019	16:55	50.02	230.03	33.70	49.10	8.80	35.80	6,741.86	10,299.64	1,329.98	18,371.49	457,343.16
12/11/2019	17:00	50.04	230.63	33.10	48.20	9.50	34.90	6,626.56	10,162.91	1,439.28	18,228.75	458,862.22
12/11/2019	17:05	50.04	231.10	33.10	48.10	9.30	36.00	6,641.12	10,150.60	1,359.29	18,151.01	460,374.80
12/11/2019	17:10	50.02	231.17	17.30	46.70	6.50	37.50	3,426.12	9,888.58	933.97	14,248.67	461,562.19
12/11/2019	17:15	50.01	230.57	16.50	46.40	2.20	36.80	3,251.72	9,831.36	302.58	13,385.66	462,677.66
12/11/2019	17:20	50.00	228.77	16.50	46.40	1.00	37.00	3,295.70	9,810.25	146.09	13,252.03	463,782.00
12/11/2019	17:25	50.00	228.67	17.10	46.40	1.10	36.90	3,422.50	9,790.39	154.32	13,367.21	464,895.93
12/11/2019	17:30	49.98	228.57	16.40	46.50	2.70	37.10	3,276.72	9,798.04	384.40	13,459.16	466,017.53
12/11/2019	17:35	49.96	228.53	14.60	46.90	6.90	37.70	2,864.73	9,879.84	973.20	13,717.77	467,160.68

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
12/11/2019	17:40	49.95	228.20	17.20	46.90	7.00	37.10	3,423.24	9,859.28	987.09	14,269.60	468,349.81
12/11/2019	17:45	49.95	227.93	16.30	38.80	11.00	27.90	3,220.53	7,924.34	1,915.89	13,060.76	469,438.21
12/11/2019	17:50	49.95	226.93	15.60	45.50	20.00	29.20	3,068.05	9,588.84	3,969.91	16,626.80	470,823.78
12/11/2019	17:55	49.94	225.97	9.50	44.00	19.90	30.20	1,988.82	9,320.45	3,969.36	15,278.63	472,096.99
12/11/2019	18:00	49.95	225.43	10.00	40.20	19.90	26.70	2,087.67	8,433.14	3,944.74	14,465.56	473,302.46
12/11/2019	18:05	49.97	225.80	11.40	38.20	19.90	25.10	2,398.02	8,019.52	3,957.88	14,375.41	474,500.41
12/11/2019	18:10	49.96	225.20	8.30	29.50	18.60	21.00	1,761.66	6,400.66	3,628.81	11,791.13	475,483.00
12/11/2019	18:15	49.94	225.40	9.50	29.00	18.80	19.30	2,006.62	6,292.37	3,652.00	11,951.00	476,478.92
12/11/2019	18:20	49.97	225.50	9.60	22.70	19.50	14.70	2,010.03	4,729.68	3,801.48	10,541.19	477,357.35
12/11/2019	18:25	49.97	225.37	8.00	31.40	19.60	22.00	1,694.94	6,699.82	3,818.98	12,213.74	478,375.16
12/11/2019	18:30	49.96	225.13	8.70	31.40	19.20	21.60	1,846.82	6,706.50	3,749.65	12,302.97	479,400.41
12/11/2019	18:35	50.00	225.10	7.40	23.40	19.20	15.20	1,557.26	4,831.72	3,744.01	10,132.99	480,244.83
12/11/2019	18:40	49.98	224.80	7.50	24.80	19.40	16.00	1,562.81	5,063.71	3,781.17	10,407.69	481,112.13
12/11/2019	18:45	50.00	224.90	12.10	30.50	19.20	19.50	2,568.72	6,396.49	3,745.02	12,710.23	482,171.32
12/11/2019	18:50	50.02	225.03	9.00	31.90	19.50	21.40	1,894.14	6,739.83	3,810.66	12,444.62	483,208.37
12/11/2019	18:55	50.02	225.23	9.60	21.50	19.80	13.50	2,022.99	4,278.78	3,868.61	10,170.38	484,055.90
12/11/2019	19:00	50.00	225.40	7.60	32.50	19.70	22.40	1,621.92	6,892.18	3,836.96	12,351.06	485,085.16
12/11/2019	19:05	50.02	225.60	9.40	32.70	19.80	21.90	1,999.19	6,953.83	3,851.70	12,804.72	486,152.22
12/11/2019	19:10	50.01	225.67	8.30	5.40	19.60	13.70	1,753.00	1,086.89	3,806.95	6,646.84	486,706.12
12/11/2019	19:15	50.02	225.93	4.40	13.90	19.30	16.40	945.41	2,985.47	3,740.00	7,670.88	487,345.36
12/11/2019	19:20	50.02	226.03	2.50	21.10	18.90	18.60	546.81	4,543.31	3,669.60	8,759.72	488,075.34
12/11/2019	19:25	50.02	226.27	6.00	16.50	18.80	15.70	1,280.70	3,547.20	3,636.79	8,464.68	488,780.73
12/11/2019	19:30	50.02	226.53	8.30	0.70	19.20	13.60	1,748.51	143.02	3,711.81	5,603.34	489,247.67
12/11/2019	19:35	50.02	226.57	5.50	18.30	19.30	16.50	1,164.38	3,927.33	3,737.85	8,829.55	489,983.47
12/11/2019	19:40	49.98	226.53	7.00	4.80	19.30	14.80	1,416.14	1,016.19	3,731.82	6,164.15	490,497.15
12/11/2019	19:45	50.01	226.67	1.30	21.00	19.00	17.90	277.20	4,519.32	3,673.31	8,469.82	491,202.97
12/11/2019	19:50	50.02	226.73	5.80	14.90	18.70	14.50	1,178.29	3,195.87	3,617.00	7,991.15	491,868.90
12/11/2019	19:55	50.02	227.03	6.50	1.80	18.70	14.10	1,330.76	357.71	3,619.89	5,308.37	492,311.26
12/11/2019	20:00	50.03	227.13	2.80	21.30	18.80	17.10	572.46	4,576.83	3,656.25	8,805.54	493,045.06
12/11/2019	20:05	50.02	227.40	5.00	20.40	18.80	16.10	1,026.15	4,395.16	3,641.52	9,062.83	493,800.29
12/11/2019	20:10	50.02	227.67	0.80	0.70	19.30	15.30	181.67	132.08	3,753.44	4,067.18	494,139.22
12/11/2019	20:15	50.01	227.57	6.70	18.80	19.40	15.50	1,361.79	4,048.07	3,759.39	9,169.25	494,903.33
12/11/2019	20:20	50.02	227.80	6.00	12.50	19.50	17.20	1,215.63	2,698.43	3,796.34	7,710.40	495,545.86
12/11/2019	20:25	50.01	227.80	3.40	16.80	19.00	15.80	702.26	3,613.62	3,709.95	8,025.83	496,214.68
12/11/2019	20:30	50.01	227.97	2.50	3.60	18.60	14.00	508.22	790.07	3,616.75	4,915.03	496,624.27
12/11/2019	20:35	50.01	228.27	9.40	13.10	18.80	14.90	1,890.95	2,805.83	3,652.43	8,349.20	497,320.03
12/11/2019	20:40	50.02	227.97	6.10	20.70	18.60	14.70	1,247.16	4,447.43	3,600.18	9,294.77	498,094.60
12/11/2019	20:45	50.02	228.00	0.30	1.70	18.80	14.70	74.39	361.05	3,643.79	4,079.23	498,434.53
12/11/2019	20:50	50.00	227.83	9.00	13.20	19.00	15.70	1,828.48	2,824.07	3,670.21	8,322.76	499,128.10
12/11/2019	20:55	50.01	228.13	2.70	20.90	19.20	17.00	543.01	4,491.44	3,719.21	8,753.67	499,857.57
12/11/2019	21:00	50.02	228.50	2.90	1.30	19.00	14.50	597.04	271.34	3,686.70	4,555.08	500,237.16
12/11/2019	21:05	50.02	228.60	7.60	21.10	18.40	14.00	1,537.80	4,555.13	3,581.22	9,674.15	501,043.34

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
12/11/2019	21:10	50.01	228.80	6.30	21.10	18.60	14.50	1,266.66	4,537.22	3,615.91	9,419.79	501,828.32
12/11/2019	21:15	50.02	229.00	4.40	2.80	18.40	14.00	890.89	525.44	3,560.65	4,976.97	502,243.07
12/11/2019	21:20	50.02	228.40	6.40	20.30	18.50	14.90	1,304.99	4,378.36	3,599.07	9,282.43	503,016.60
12/11/2019	21:25	50.01	227.30	5.80	19.10	19.00	15.00	1,179.83	4,113.03	3,691.09	8,983.94	503,765.27
12/11/2019	21:30	49.97	227.57	4.00	0.00	18.90	15.00	818.06	0.00	3,651.50	4,469.56	504,137.73
12/11/2019	21:35	49.99	227.50	6.10	19.40	19.00	15.40	1,231.75	4,198.83	3,680.11	9,110.69	504,896.95
12/11/2019	21:40	50.01	227.30	6.60	19.90	18.90	14.80	1,338.29	4,324.69	3,679.86	9,342.84	505,675.52
12/11/2019	21:45	50.02	227.37	1.20	1.20	18.50	15.30	245.38	266.78	3,588.36	4,100.52	506,017.23
12/11/2019	21:50	50.02	227.50	9.30	15.40	18.50	14.80	1,896.04	3,348.40	3,603.57	8,848.02	506,754.57
12/11/2019	21:55	50.01	227.37	3.80	10.40	18.50	16.00	766.35	2,269.05	3,596.78	6,632.18	507,307.25
12/11/2019	22:00	50.00	227.37	6.60	0.00	18.50	14.90	1,338.15	6.06	3,584.11	4,928.32	507,717.94
12/11/2019	22:05	49.94	226.73	8.00	3.30	18.90	14.20	1,614.42	710.92	3,652.82	5,978.15	508,216.12
12/11/2019	22:10	49.96	227.10	4.60	20.30	18.90	15.30	929.43	4,387.99	3,655.09	8,972.51	508,963.83
12/11/2019	22:15	49.98	227.20	3.90	20.20	18.90	15.80	804.33	4,359.24	3,673.31	8,836.88	509,700.24
12/11/2019	22:20	50.02	227.30	2.20	3.30	18.60	14.60	452.18	723.40	3,632.69	4,808.26	510,100.93
12/11/2019	22:25	50.01	227.33	8.00	11.20	18.50	13.50	1,615.90	2,431.25	3,597.13	7,644.28	510,737.95
12/11/2019	22:30	49.97	227.10	0.00	19.60	18.30	17.00	0.00	4,236.59	3,559.34	7,795.93	511,387.61
12/11/2019	22:35	49.97	227.07	0.00	19.70	18.50	16.70	6.12	4,259.07	3,616.28	7,881.48	512,044.40
12/11/2019	22:40	49.97	226.93	5.20	5.20	19.00	14.00	1,046.92	1,132.40	3,692.09	5,871.41	512,533.68
12/11/2019	22:45	49.98	227.17	8.50	5.10	18.90	15.80	1,711.46	1,098.29	3,673.19	6,482.94	513,073.93
12/11/2019	22:50	50.00	227.27	0.00	13.10	18.50	16.10	0.00	2,832.80	3,561.68	6,394.48	513,606.80
12/11/2019	22:55	49.96	227.27	10.20	13.10	18.50	13.90	2,063.67	2,838.57	3,567.61	8,469.85	514,312.62
12/11/2019	23:00	49.98	227.40	0.00	20.60	18.20	17.30	0.00	4,488.09	3,523.19	8,011.28	514,980.23
12/11/2019	23:05	50.00	227.67	9.20	20.80	18.10	13.70	1,860.51	4,530.06	3,506.32	9,896.89	515,804.97
12/11/2019	23:10	49.95	227.40	3.30	8.10	18.20	15.20	670.37	1,752.98	3,543.33	5,966.68	516,302.19
12/11/2019	23:15	50.00	227.67	7.60	11.10	18.00	12.80	1,544.55	2,410.30	3,487.40	7,442.25	516,922.38
12/11/2019	23:20	50.02	227.87	11.50	18.40	18.90	12.60	2,325.61	4,001.48	3,680.18	10,007.27	517,756.32
12/11/2019	23:25	50.02	228.50	0.00	20.80	18.80	17.70	0.00	4,540.67	3,652.37	8,193.04	518,439.07
12/11/2019	23:30	50.02	229.30	7.00	7.40	19.00	14.20	1,404.01	1,621.17	3,699.38	6,724.57	518,999.45
12/11/2019	23:35	49.96	229.20	12.90	13.60	18.30	13.10	2,605.51	2,966.80	3,560.81	9,133.12	519,760.55
12/11/2019	23:40	49.99	228.60	0.00	21.00	18.00	17.30	0.00	4,589.46	3,486.79	8,076.26	520,433.57
12/11/2019	23:45	49.99	227.83	6.90	19.00	17.70	14.40	1,395.69	4,148.78	3,420.15	8,964.62	521,180.62
12/11/2019	23:50	50.02	227.90	10.10	3.10	17.70	13.80	2,054.22	682.17	3,428.17	6,164.55	521,694.33
12/11/2019	23:55	50.00	228.03	2.90	14.40	18.20	15.70	592.65	3,143.48	3,518.47	7,254.59	522,298.88
13/11/2019	0:00	49.97	228.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	0:05	50.01	228.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	0:10	50.02	229.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	0:15	50.01	229.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	0:20	50.00	228.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	0:25	49.97	228.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	0:30	49.98	229.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	0:35	50.02	229.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
13/11/2019	0:40	50.02	229.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	0:45	50.02	229.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	0:50	50.03	229.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	0:55	50.02	229.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	1:00	50.01	229.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	1:05	49.97	229.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	1:10	50.02	229.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	1:15	50.00	229.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	1:20	50.00	229.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	1:25	50.01	229.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	1:30	49.99	229.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	1:35	50.02	229.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	1:40	50.01	229.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	1:45	50.01	230.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	1:50	50.02	230.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	1:55	50.05	230.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	2:00	50.03	230.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	2:05	49.97	230.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	2:10	50.02	230.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	2:15	50.05	230.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	2:20	50.08	231.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	2:25	50.12	231.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	2:30	50.16	228.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	2:35	50.10	227.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	2:40	50.00	226.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	2:45	50.04	227.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	2:50	50.04	227.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	2:55	49.99	226.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	3:00	49.98	227.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	3:05	49.99	227.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	3:10	50.02	227.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	3:15	50.00	227.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	3:20	50.04	227.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	3:25	50.00	227.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	3:30	50.04	227.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	3:35	50.03	227.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	3:40	50.00	227.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	3:45	50.04	227.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	3:50	50.05	227.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	3:55	50.01	227.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	4:00	50.05	227.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	4:05	50.06	227.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
13/11/2019	4:10	50.07	227.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	4:15	50.02	226.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	4:20	50.04	227.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	4:25	50.01	226.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	4:30	50.00	226.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	4:35	50.01	226.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	4:40	50.00	226.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	4:45	50.02	226.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	4:50	49.99	225.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	4:55	49.96	225.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	5:00	49.96	225.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	5:05	49.97	226.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	5:10	49.95	229.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	5:15	49.97	228.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	5:20	50.03	229.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	5:25	49.95	228.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	5:30	49.97	228.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	5:35	50.02	228.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	5:40	49.99	228.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	5:45	49.95	228.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	5:50	49.96	229.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	5:55	49.95	229.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	6:00	50.01	229.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	6:05	49.98	229.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	6:10	49.99	229.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	6:15	50.03	229.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	6:20	49.94	229.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	6:25	49.97	230.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	6:30	49.97	230.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	6:35	50.01	230.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	6:40	50.02	231.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	6:45	50.02	231.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	6:50	50.03	231.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	6:55	49.99	231.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	7:00	49.97	231.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	7:05	49.99	228.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	7:10	49.94	228.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	7:15	49.95	228.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	7:20	49.97	228.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	7:25	49.96	228.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	7:30	49.95	227.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	7:35	49.94	227.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
13/11/2019	7:40	49.95	227.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	7:45	49.98	227.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	7:50	50.00	227.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	7:55	50.01	227.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	8:00	49.99	227.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	590,995.18
13/11/2019	8:05	50.01	227.77	0.00	0.00	0.40	0.40	0.00	0.00	60.24	60.24	591,000.20
13/11/2019	8:10	49.94	227.33	0.00	0.00	1.60	1.80	0.00	0.00	228.42	228.42	591,019.24
13/11/2019	8:15	49.98	226.93	0.00	0.00	0.20	0.20	0.00	0.00	33.46	33.46	591,022.03
13/11/2019	8:20	49.96	226.10	0.00	0.00	8.70	8.40	0.00	0.00	1,685.90	1,685.90	591,162.52
13/11/2019	8:25	49.99	225.77	0.00	0.00	20.30	19.20	0.00	0.00	3,999.48	3,999.48	591,495.81
13/11/2019	8:30	49.95	227.40	0.00	0.00	20.40	19.20	0.00	0.00	4,038.16	4,038.16	591,832.32
13/11/2019	8:35	49.94	228.07	0.00	0.00	20.70	19.40	0.00	0.00	4,095.63	4,095.63	592,173.62
13/11/2019	8:40	49.94	227.80	0.00	0.00	14.40	14.00	0.00	0.00	2,612.28	2,612.28	592,391.31
13/11/2019	8:45	49.99	227.87	0.00	0.00	18.70	18.00	0.00	0.00	3,624.42	3,624.42	592,693.35
13/11/2019	8:50	50.01	227.80	0.00	0.00	15.90	15.80	0.00	0.00	3,016.27	3,016.27	592,944.70
13/11/2019	8:55	50.00	227.53	0.00	0.00	13.30	13.40	0.00	0.00	2,413.59	2,413.59	593,145.84
13/11/2019	9:00	50.02	227.47	0.00	0.00	16.50	16.30	0.00	0.00	3,160.38	3,160.38	593,409.20
13/11/2019	9:05	50.03	227.40	0.00	0.00	17.30	16.90	0.00	0.00	3,340.07	3,340.07	593,687.54
13/11/2019	9:10	50.02	227.17	0.00	0.00	14.70	14.70	0.00	0.00	2,689.97	2,689.97	593,911.71
13/11/2019	9:15	49.99	226.83	0.00	0.00	14.40	14.60	0.00	0.00	2,624.81	2,624.81	594,130.44
13/11/2019	9:20	49.95	226.53	0.00	0.00	17.70	17.20	0.00	0.00	3,398.70	3,398.70	594,413.67
13/11/2019	9:25	49.95	226.27	0.00	0.00	17.20	16.50	0.00	0.00	3,270.68	3,270.68	594,686.22
13/11/2019	9:30	49.95	226.30	0.00	0.00	14.30	14.30	0.00	0.00	2,626.44	2,626.44	594,905.09
13/11/2019	9:35	49.94	226.03	0.00	0.00	13.70	13.60	0.00	0.00	2,480.92	2,480.92	595,111.84
13/11/2019	9:40	49.96	226.07	0.00	0.00	18.50	17.70	0.00	0.00	3,667.89	3,667.89	595,417.49
13/11/2019	9:45	49.95	226.00	0.00	0.00	21.70	20.20	0.00	0.00	4,411.85	4,411.85	595,785.15
13/11/2019	9:50	49.96	225.63	0.00	0.00	18.80	17.60	0.00	0.00	3,731.45	3,731.45	596,096.10
13/11/2019	9:55	49.97	225.63	0.00	3.10	14.70	13.40	0.00	665.99	2,678.44	3,344.43	596,374.80
13/11/2019	10:00	49.96	226.63	0.00	15.50	14.60	16.30	0.00	3,422.37	2,638.50	6,060.87	596,879.88
13/11/2019	10:05	49.99	227.10	0.00	17.90	30.40	25.90	0.00	3,944.86	6,148.24	10,093.10	597,720.97
13/11/2019	10:10	49.99	227.00	0.00	19.90	39.90	33.20	6.69	4,353.24	8,180.29	12,540.22	598,765.99
13/11/2019	10:15	49.97	226.73	0.00	20.40	38.20	31.00	0.00	4,450.95	7,885.25	12,336.20	599,794.00
13/11/2019	10:20	49.96	226.60	0.00	20.30	35.10	28.40	0.00	4,439.08	7,232.82	11,671.90	600,766.66
13/11/2019	10:25	49.95	226.47	0.00	20.50	35.40	28.80	0.00	4,482.00	7,287.68	11,769.68	601,747.47
13/11/2019	10:30	49.95	226.67	0.00	20.90	39.80	33.20	0.00	4,555.18	8,195.86	12,751.03	602,810.05
13/11/2019	10:35	49.96	226.67	0.00	31.20	38.90	34.70	0.00	6,637.16	7,959.26	14,596.42	604,026.42
13/11/2019	10:40	49.96	226.53	0.00	40.70	34.90	36.90	0.00	8,617.53	7,087.86	15,705.39	605,335.20
13/11/2019	10:45	49.97	226.53	0.00	51.70	34.60	43.60	0.00	10,979.51	7,020.53	18,000.04	606,835.21
13/11/2019	10:50	50.00	226.70	0.00	53.00	36.50	45.20	0.00	11,258.94	7,400.51	18,659.45	608,390.16
13/11/2019	10:55	49.98	226.67	0.00	51.30	39.20	44.80	0.00	10,913.08	7,996.56	18,909.63	609,965.96
13/11/2019	11:00	50.02	226.70	0.00	51.30	36.50	44.30	0.00	10,896.58	7,455.03	18,351.61	611,495.26
13/11/2019	11:05	50.02	226.60	0.00	63.10	34.10	51.50	0.00	13,247.57	6,948.93	20,196.49	613,178.31

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
13/11/2019	11:10	50.01	226.57	0.00	66.00	35.90	55.70	0.00	13,898.70	7,257.89	21,156.59	614,941.36
13/11/2019	11:15	50.00	226.53	0.00	65.70	34.20	54.90	0.00	13,855.07	6,912.02	20,767.08	616,671.95
13/11/2019	11:20	50.00	226.77	0.00	65.50	36.80	54.90	0.00	13,825.05	7,465.58	21,290.63	618,446.16
13/11/2019	11:25	50.01	226.70	0.00	65.60	35.50	54.60	0.00	13,846.88	7,196.87	21,043.75	620,199.81
13/11/2019	11:30	49.97	226.50	0.00	65.70	37.10	54.80	0.00	13,867.72	7,536.02	21,403.75	621,983.46
13/11/2019	11:35	50.03	226.80	0.00	66.10	32.30	54.90	0.00	13,958.72	6,523.98	20,482.70	623,690.35
13/11/2019	11:40	50.03	227.13	0.00	66.10	32.80	55.10	0.00	13,974.34	6,633.62	20,607.96	625,407.68
13/11/2019	11:45	50.02	227.50	0.00	66.20	37.50	55.50	0.00	13,992.99	7,594.91	21,587.90	627,206.67
13/11/2019	11:50	50.03	227.57	0.00	54.30	38.80	46.30	0.00	11,410.67	7,910.43	19,321.10	628,816.76
13/11/2019	11:55	50.03	227.97	0.00	34.10	32.40	31.80	5.48	7,334.49	6,584.53	13,924.50	629,977.14
13/11/2019	12:00	50.04	228.43	0.00	33.30	33.30	31.90	0.00	7,199.41	6,799.58	13,998.99	631,143.72
13/11/2019	12:05	50.04	229.10	0.00	33.10	38.00	34.30	0.00	7,149.37	7,798.42	14,947.79	632,389.37
13/11/2019	12:10	49.98	228.63	0.00	33.20	35.70	33.10	0.00	7,165.17	7,322.97	14,488.15	633,596.71
13/11/2019	12:15	50.02	228.27	0.00	24.60	36.00	32.60	0.00	5,347.92	7,396.39	12,744.31	634,658.74
13/11/2019	12:20	50.02	227.33	0.00	25.80	34.20	30.20	0.00	5,585.54	6,968.94	12,554.48	635,704.95
13/11/2019	12:25	49.99	226.63	0.00	32.20	24.60	29.70	0.00	6,946.33	4,842.91	11,789.25	636,687.38
13/11/2019	12:30	50.00	226.50	0.00	31.20	9.70	28.00	0.00	6,775.77	1,886.97	8,662.74	637,409.28
13/11/2019	12:35	49.99	226.47	0.00	25.90	11.70	23.80	0.00	5,672.61	2,118.40	7,791.01	638,058.53
13/11/2019	12:40	49.98	226.30	0.00	22.60	31.60	30.50	0.00	4,953.90	6,289.63	11,243.54	638,995.49
13/11/2019	12:45	50.00	226.37	0.00	33.70	27.90	32.20	0.00	7,312.67	5,467.37	12,780.04	640,060.49
13/11/2019	12:50	49.97	226.07	0.00	29.50	29.30	32.10	0.00	6,420.95	5,759.43	12,180.38	641,075.52
13/11/2019	12:55	49.95	225.90	0.00	22.90	29.80	27.10	6.56	4,997.01	5,921.03	10,924.59	641,985.91
13/11/2019	13:00	49.94	225.37	0.00	45.00	32.20	38.50	0.00	9,597.18	6,360.23	15,957.41	643,315.69
13/11/2019	13:05	49.94	224.97	5.30	44.80	30.70	36.50	964.84	9,564.01	6,056.90	16,585.76	644,697.84
13/11/2019	13:10	49.94	225.80	9.20	39.10	31.70	34.00	1,662.44	8,379.07	6,313.33	16,354.85	646,060.74
13/11/2019	13:15	49.98	227.40	9.60	33.20	28.70	27.40	1,703.63	7,185.38	5,703.44	14,592.45	647,276.78
13/11/2019	13:20	50.01	227.13	9.30	61.40	32.00	49.20	1,700.47	13,121.78	6,402.35	21,224.59	649,045.50
13/11/2019	13:25	49.99	226.87	9.40	59.90	32.10	46.90	1,740.41	12,709.33	6,404.94	20,854.68	650,783.38
13/11/2019	13:30	49.95	227.30	11.40	51.80	31.00	38.70	2,106.68	10,983.00	6,194.91	19,284.58	652,390.43
13/11/2019	13:35	50.00	227.10	0.00	19.80	0.00	19.20	0.00	4,329.17	0.00	4,329.17	360.76
13/11/2019	13:40	50.02	227.17	0.00	19.80	0.00	19.20	0.00	4,321.78	0.00	4,321.78	720.91
13/11/2019	13:45	50.02	227.07	0.00	19.40	0.00	18.70	0.00	4,239.35	0.00	4,239.35	1,074.19
13/11/2019	13:50	49.98	226.93	0.00	19.00	0.00	18.40	0.00	4,152.09	0.00	4,152.09	1,420.20
13/11/2019	13:55	49.97	227.97	0.00	19.10	0.00	18.50	0.00	4,170.95	0.00	4,170.95	1,767.78
13/11/2019	14:00	50.01	228.50	0.00	19.60	0.00	19.00	0.00	4,286.24	0.00	4,286.24	2,124.97
13/11/2019	14:05	50.02	228.57	0.00	19.60	0.00	19.10	0.00	4,301.59	0.00	4,301.59	2,483.43
13/11/2019	14:10	50.02	228.73	0.00	19.00	0.00	18.70	0.00	4,167.40	0.00	4,167.40	2,830.71
13/11/2019	14:15	49.97	228.43	0.00	18.70	0.00	18.60	0.00	4,099.05	0.00	4,099.05	3,172.30
13/11/2019	14:20	49.95	228.17	0.00	19.00	0.00	18.80	0.00	4,168.92	0.00	4,168.92	3,519.71
13/11/2019	14:25	49.97	228.13	0.00	19.10	0.00	19.00	0.00	4,192.32	0.00	4,192.32	3,869.07
13/11/2019	14:30	49.95	228.03	0.00	19.90	0.00	19.60	0.00	4,320.72	0.00	4,320.72	4,229.13
13/11/2019	14:35	49.99	228.10	0.00	20.50	0.00	19.90	0.00	4,430.34	0.00	4,430.34	4,598.33

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
13/11/2019	14:40	50.01	228.10	0.00	21.30	0.00	20.60	0.00	4,587.56	0.00	4,587.56	4,980.62
13/11/2019	14:45	50.00	228.13	0.00	20.30	0.00	19.70	0.00	4,384.78	0.00	4,384.78	5,346.02
13/11/2019	14:50	49.98	228.20	0.00	20.20	0.00	19.70	0.00	4,376.42	0.00	4,376.42	5,710.72
13/11/2019	14:55	50.02	228.53	0.00	21.40	0.00	20.70	0.00	4,635.37	0.00	4,635.37	6,097.00
13/11/2019	15:00	50.01	228.67	0.00	19.20	0.00	18.90	0.00	4,170.52	0.00	4,170.52	6,444.55
13/11/2019	15:05	49.98	228.50	0.00	18.20	0.00	18.20	0.00	4,004.98	0.00	4,004.98	6,778.30
13/11/2019	15:10	50.01	228.77	0.00	17.70	0.00	17.60	0.00	3,905.81	0.00	3,905.81	7,103.78
13/11/2019	15:15	50.02	228.93	0.00	17.60	0.00	17.60	0.00	3,896.41	0.00	3,896.41	7,428.48
13/11/2019	15:20	50.01	228.93	0.00	17.70	0.00	17.50	0.00	3,906.94	0.00	3,906.94	7,754.06
13/11/2019	15:25	50.00	228.73	0.00	17.70	0.00	17.30	0.00	3,904.60	0.00	3,904.60	8,079.44
13/11/2019	15:30	50.02	228.77	0.00	18.00	0.00	17.60	0.00	3,977.23	0.00	3,977.23	8,410.88
13/11/2019	15:35	49.99	228.70	0.00	18.10	0.00	17.70	0.00	3,999.27	0.00	3,999.27	8,744.15
13/11/2019	15:40	50.02	228.93	0.00	18.10	0.00	17.60	0.00	3,984.21	0.00	3,984.21	9,076.17
13/11/2019	15:45	49.99	228.77	0.00	17.70	0.00	17.10	0.00	3,905.98	0.00	3,905.98	9,401.67
13/11/2019	15:50	49.98	228.77	0.00	17.50	0.00	17.20	0.00	3,875.06	0.00	3,875.06	9,724.59
13/11/2019	15:55	49.97	228.60	0.00	17.80	0.00	17.40	0.00	3,898.90	0.00	3,898.90	10,049.50
13/11/2019	16:00	50.00	228.60	0.00	19.30	0.00	18.90	0.00	4,198.69	0.00	4,198.69	10,399.39
13/11/2019	16:05	50.02	228.87	0.00	19.50	0.00	20.10	0.00	4,222.16	0.00	4,222.16	10,751.23
13/11/2019	16:10	49.96	228.57	0.00	18.20	0.00	19.30	0.00	3,991.13	0.00	3,991.13	11,083.83
13/11/2019	16:15	50.00	228.83	0.00	15.10	0.00	15.80	0.00	3,340.43	0.00	3,340.43	11,362.20
13/11/2019	16:20	50.00	228.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11,362.20
13/11/2019	16:25	49.99	228.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11,362.20
13/11/2019	16:30	49.98	228.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11,362.20
13/11/2019	16:35	49.99	229.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11,362.20
13/11/2019	16:40	50.01	229.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11,362.20
13/11/2019	16:45	50.02	229.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11,362.20
13/11/2019	16:50	50.02	229.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11,362.20
13/11/2019	16:55	50.03	230.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11,362.20
13/11/2019	17:00	50.02	230.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11,362.20
13/11/2019	17:05	50.02	230.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11,362.20
13/11/2019	17:10	49.98	230.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11,362.20
13/11/2019	17:15	50.00	230.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11,362.20
13/11/2019	17:20	49.99	229.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11,362.20
13/11/2019	17:25	49.97	229.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11,362.20
13/11/2019	17:30	49.97	229.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11,362.20
13/11/2019	17:35	49.96	229.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11,362.20
13/11/2019	17:40	50.00	228.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11,362.20
13/11/2019	17:45	49.98	227.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11,362.20
13/11/2019	17:50	49.98	226.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11,362.20
13/11/2019	17:55	49.98	227.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11,362.20
13/11/2019	18:00	49.94	227.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11,362.20
13/11/2019	18:05	49.95	228.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11,362.20

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
13/11/2019	18:10	49.96	227.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11,362.20
13/11/2019	18:15	50.00	228.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11,362.20
13/11/2019	18:20	50.00	228.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11,362.20
13/11/2019	18:25	50.00	228.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11,362.20
13/11/2019	18:30	49.99	228.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11,362.20
13/11/2019	18:35	49.97	228.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11,362.20
13/11/2019	18:40	49.98	228.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11,362.20
13/11/2019	18:45	50.01	228.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11,362.20
13/11/2019	18:50	50.00	228.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11,362.20
13/11/2019	18:55	50.02	228.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11,362.20
13/11/2019	19:00	50.02	228.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11,362.20
13/11/2019	19:05	50.02	228.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11,362.20
13/11/2019	19:10	50.01	228.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11,362.20
13/11/2019	19:15	50.02	228.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11,362.20
13/11/2019	19:20	50.01	229.10	3.30	14.30	0.00	14.80	680.15	3,023.04	0.00	3,703.18	11,670.80
13/11/2019	19:25	50.00	229.07	13.80	19.20	0.00	19.10	2,956.69	4,122.43	0.00	7,079.12	12,260.72
13/11/2019	19:30	50.02	229.37	14.60	18.80	0.00	19.20	3,158.34	4,053.83	0.00	7,212.17	12,861.74
13/11/2019	19:35	50.00	229.37	15.40	18.90	0.00	19.40	3,334.74	4,078.46	0.00	7,413.20	13,479.50
13/11/2019	19:40	49.97	229.37	15.70	18.20	0.00	18.40	3,385.99	3,960.76	0.00	7,346.76	14,091.73
13/11/2019	19:45	49.99	229.47	15.90	18.20	0.00	18.50	3,448.53	3,972.50	0.00	7,421.03	14,710.15
13/11/2019	19:50	50.02	229.70	15.90	7.80	0.00	18.30	3,444.06	1,690.94	0.00	5,135.00	15,138.07
13/11/2019	19:55	50.00	229.63	15.80	8.60	0.00	18.30	3,420.50	1,874.93	0.00	5,295.43	15,579.36
13/11/2019	20:00	50.02	230.27	7.00	7.60	0.00	15.50	1,512.02	1,651.62	0.00	3,163.63	15,842.99
13/11/2019	20:05	50.01	230.07	7.20	18.80	0.00	19.10	1,561.67	4,087.29	0.00	5,648.95	16,313.74
13/11/2019	20:10	49.99	229.83	6.50	19.30	0.00	19.40	1,394.06	4,214.72	0.00	5,608.78	16,781.14
13/11/2019	20:15	50.02	229.97	6.60	19.20	0.00	19.20	1,410.06	4,188.93	0.00	5,598.99	17,247.72
13/11/2019	20:20	50.01	230.10	7.00	10.60	0.00	10.40	1,506.90	2,330.58	0.00	3,837.48	17,567.51
13/11/2019	20:25	50.02	230.50	11.10	16.10	0.00	17.10	2,379.91	3,535.37	0.00	5,915.28	18,060.45
13/11/2019	20:30	50.01	230.43	6.30	16.10	0.00	15.90	1,348.73	3,545.44	0.00	4,894.17	18,468.30
13/11/2019	20:35	50.03	230.20	9.30	10.50	0.00	13.40	1,986.66	2,312.80	0.00	4,299.46	18,826.58
13/11/2019	20:40	50.00	230.20	6.90	18.80	0.00	18.60	1,476.87	4,122.00	0.00	5,598.88	19,293.16
13/11/2019	20:45	50.01	230.47	7.40	17.80	0.00	17.60	1,592.88	3,910.03	0.00	5,502.91	19,751.73
13/11/2019	20:50	50.02	230.63	8.70	9.80	0.00	10.40	1,871.87	2,135.02	0.00	4,006.89	20,085.64
13/11/2019	20:55	50.02	230.93	6.30	20.60	0.00	20.10	1,355.68	4,485.21	0.00	5,840.88	20,572.38
13/11/2019	21:00	50.02	229.77	7.00	8.40	0.00	14.40	1,498.37	1,825.35	0.00	3,323.72	20,849.36
13/11/2019	21:05	50.02	229.00	6.60	20.10	0.00	19.80	1,415.40	4,368.96	0.00	5,784.36	21,331.39
13/11/2019	21:10	50.01	229.20	6.60	8.20	0.00	8.70	1,414.28	1,793.51	0.00	3,207.79	21,598.70
13/11/2019	21:15	50.02	229.37	6.60	19.80	0.00	19.50	1,413.93	4,297.06	0.00	5,710.99	22,074.62
13/11/2019	21:20	50.02	229.47	6.80	9.60	0.00	11.30	1,456.47	2,081.89	0.00	3,538.36	22,369.48
13/11/2019	21:25	50.01	229.70	7.70	17.30	0.00	18.50	1,651.66	3,779.34	0.00	5,431.00	22,822.07
13/11/2019	21:30	50.01	229.73	6.30	10.40	0.00	10.40	1,345.93	2,288.24	0.00	3,634.17	23,124.91
13/11/2019	21:35	49.99	229.80	8.70	16.60	0.00	18.30	1,858.53	3,617.38	0.00	5,475.91	23,581.24

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
13/11/2019	21:40	49.98	229.83	6.60	9.50	0.00	9.50	1,413.12	2,084.31	0.00	3,497.43	23,872.69
13/11/2019	21:45	49.98	229.97	9.40	16.60	0.00	18.60	1,999.23	3,575.65	0.00	5,574.88	24,337.27
13/11/2019	21:50	50.01	230.43	5.90	19.70	0.00	18.80	1,250.10	4,351.69	0.00	5,601.79	24,804.08
13/11/2019	21:55	50.00	230.47	6.40	11.20	0.00	10.60	1,359.62	2,473.45	0.00	3,833.07	25,123.50
13/11/2019	22:00	49.99	230.57	6.70	16.70	0.00	16.00	1,416.60	3,654.84	0.00	5,071.44	25,546.12
13/11/2019	22:05	49.98	230.10	7.20	16.60	0.00	15.80	1,536.58	3,637.71	0.00	5,174.29	25,977.31
13/11/2019	22:10	50.00	230.10	9.80	10.10	0.00	13.30	2,076.45	2,265.99	0.00	4,342.44	26,339.18
13/11/2019	22:15	50.01	230.37	6.20	13.90	0.00	12.90	1,311.82	3,125.03	0.00	4,436.85	26,708.92
13/11/2019	22:20	49.98	230.20	8.70	8.70	0.00	10.60	1,833.49	1,946.47	0.00	3,779.96	27,023.92
13/11/2019	22:25	49.96	230.20	6.10	15.30	0.00	14.40	1,290.07	3,438.21	0.00	4,728.28	27,417.94
13/11/2019	22:30	49.96	230.47	10.30	3.00	0.00	10.00	2,166.26	670.82	0.00	2,837.08	27,654.37
13/11/2019	22:35	50.01	231.00	7.50	16.90	0.00	16.10	1,592.32	3,808.79	0.00	5,401.11	28,104.46
13/11/2019	22:40	49.99	231.10	7.50	4.70	0.00	11.30	1,589.27	1,062.33	0.00	2,651.60	28,325.42
13/11/2019	22:45	50.03	231.53	6.80	0.70	0.00	6.60	1,444.25	166.78	0.00	1,611.02	28,459.68
13/11/2019	22:50	50.03	229.40	7.50	17.20	0.00	16.10	1,585.11	3,842.28	0.00	5,427.39	28,911.96
13/11/2019	22:55	50.02	229.40	5.00	5.60	0.00	6.80	1,067.26	1,264.95	0.00	2,332.21	29,106.31
13/11/2019	23:00	50.02	229.50	10.90	0.00	0.00	10.50	2,318.76	0.00	0.00	2,318.76	29,299.54
13/11/2019	23:05	50.02	229.50	13.80	0.00	0.00	13.70	2,941.62	0.00	0.00	2,941.62	29,544.67
13/11/2019	23:10	50.02	229.77	8.60	9.60	0.00	9.70	1,834.88	2,133.79	0.00	3,968.67	29,875.40
13/11/2019	23:15	50.00	229.60	6.30	12.20	0.00	15.80	1,355.17	2,721.89	0.00	4,077.05	30,215.15
13/11/2019	23:20	50.02	229.70	7.80	0.00	0.00	7.50	1,655.83	0.00	0.00	1,655.83	30,353.14
13/11/2019	23:25	50.02	229.60	5.60	0.00	0.00	5.40	1,186.04	0.00	0.00	1,186.04	30,451.97
13/11/2019	23:30	50.02	229.87	9.50	9.90	0.00	16.70	2,050.12	2,204.12	0.00	4,254.24	30,806.49
13/11/2019	23:35	50.02	230.03	5.90	10.60	0.00	10.40	1,249.48	2,373.76	0.00	3,623.24	31,108.43
13/11/2019	23:40	50.02	230.23	10.20	0.00	0.00	10.20	2,162.37	0.00	0.00	2,162.37	31,288.63
13/11/2019	23:45	50.01	230.17	9.50	0.40	0.00	9.60	2,027.95	91.37	0.00	2,119.32	31,465.24
13/11/2019	23:50	49.98	227.17	6.20	15.80	0.00	15.60	1,324.57	3,513.53	0.00	4,838.09	31,868.41
13/11/2019	23:55	49.97	227.33	7.80	0.00	0.00	7.90	1,644.66	0.00	0.00	1,644.66	32,005.47
14/11/2019	0:00	49.95	228.10	6.79	2.70	0.00	6.83	1,464.33	593.11	0.00	2,051.51	32,499.93
14/11/2019	0:05	49.94	227.31	2.97	15.71	0.00	15.64	626.45	3,579.18	0.00	4,218.54	31,882.59
14/11/2019	0:10	50.19	225.42	6.10	4.00	0.00	6.59	1,292.72	890.60	0.00	2,135.46	32,389.54
14/11/2019	0:15	50.03	227.33	8.89	0.00	0.00	8.80	1,917.63	0.00	0.00	1,805.93	33,200.58
14/11/2019	0:20	50.19	226.02	9.80	8.80	0.00	13.72	2,078.31	1,966.73	0.00	3,964.95	32,873.55
14/11/2019	0:25	50.16	225.31	6.96	14.21	0.00	14.44	1,543.18	3,105.86	0.00	4,710.54	32,579.12
14/11/2019	0:30	49.97	224.59	5.77	0.00	0.00	5.81	1,149.79	0.00	0.00	1,149.79	33,347.65
14/11/2019	0:35	50.08	231.39	6.79	7.86	0.00	12.57	1,464.45	1,842.81	0.00	3,301.07	33,277.71
14/11/2019	0:40	50.06	231.46	4.69	16.46	0.00	15.74	991.43	3,631.13	0.00	4,612.74	35,028.08
14/11/2019	0:45	49.99	226.92	7.64	0.10	0.00	7.86	1,658.91	32.16	0.00	1,724.25	34,826.94
14/11/2019	0:50	49.94	228.73	4.90	0.00	0.00	5.00	1,048.91	0.00	0.00	1,059.29	34,914.35
14/11/2019	0:55	50.16	227.95	6.40	12.64	0.00	15.39	1,435.55	2,944.44	0.00	4,379.99	34,227.98
14/11/2019	1:00	50.03	225.03	3.14	0.78	0.00	3.26	663.68	196.26	0.00	886.26	36,049.62
14/11/2019	1:05	49.94	227.48	8.04	0.00	0.00	8.96	1,730.78	0.00	0.00	1,695.81	36,199.68

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
14/11/2019	1:10	49.93	228.44	8.02	12.55	0.00	13.67	1,697.58	2,743.14	0.00	4,448.20	36,581.48
14/11/2019	1:15	50.17	229.28	0.00	6.53	0.00	6.57	0.00	1,435.33	0.00	1,392.70	34,565.40
14/11/2019	1:20	50.06	231.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36,703.46
14/11/2019	1:25	50.12	226.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,990.77
14/11/2019	1:30	50.00	225.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34,565.40
14/11/2019	1:35	50.19	226.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34,921.74
14/11/2019	1:40	49.95	227.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,278.09
14/11/2019	1:45	49.97	230.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
14/11/2019	1:50	50.02	229.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
14/11/2019	1:55	50.12	227.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36,703.46
14/11/2019	2:00	49.95	227.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34,921.74
14/11/2019	2:05	50.01	227.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36,347.12
14/11/2019	2:10	50.18	230.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,990.77
14/11/2019	2:15	50.09	226.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36,703.46
14/11/2019	2:20	50.04	231.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,990.77
14/11/2019	2:25	50.15	230.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
14/11/2019	2:30	49.98	227.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34,565.40
14/11/2019	2:35	50.07	228.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36,347.12
14/11/2019	2:40	49.99	230.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,278.09
14/11/2019	2:45	50.02	226.91	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34,565.40
14/11/2019	2:50	50.00	231.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34,921.74
14/11/2019	2:55	50.19	226.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36,347.12
14/11/2019	3:00	50.11	225.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36,703.46
14/11/2019	3:05	50.05	231.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,278.09
14/11/2019	3:10	50.07	228.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34,565.40
14/11/2019	3:15	50.09	227.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34,565.40
14/11/2019	3:20	50.16	227.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36,347.12
14/11/2019	3:25	50.06	228.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34,921.74
14/11/2019	3:30	50.09	232.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,990.77
14/11/2019	3:35	50.16	229.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36,703.46
14/11/2019	3:40	49.99	228.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36,703.46
14/11/2019	3:45	49.96	228.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,990.77
14/11/2019	3:50	50.06	223.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34,565.40
14/11/2019	3:55	50.00	228.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,278.09
14/11/2019	4:00	50.12	222.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36,703.46
14/11/2019	4:05	49.97	225.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34,565.40
14/11/2019	4:10	49.93	229.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,990.77
14/11/2019	4:15	50.03	226.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34,565.40
14/11/2019	4:20	50.02	228.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,278.09
14/11/2019	4:25	50.06	229.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
14/11/2019	4:30	50.12	223.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36,703.46
14/11/2019	4:35	50.09	226.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,278.09

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
14/11/2019	4:40	50.17	229.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34,921.74
14/11/2019	4:45	50.19	223.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,990.77
14/11/2019	4:50	49.97	224.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36,347.12
14/11/2019	4:55	49.97	231.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,990.77
14/11/2019	5:00	49.98	224.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36,703.46
14/11/2019	5:05	49.95	224.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,990.77
14/11/2019	5:10	49.94	227.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,990.77
14/11/2019	5:15	50.14	232.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34,565.40
14/11/2019	5:20	49.98	224.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,990.77
14/11/2019	5:25	50.08	224.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36,703.46
14/11/2019	5:30	50.13	229.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
14/11/2019	5:35	50.10	227.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
14/11/2019	5:40	49.96	226.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36,703.46
14/11/2019	5:45	50.01	225.66	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34,565.40
14/11/2019	5:50	50.16	223.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
14/11/2019	5:55	50.02	230.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,278.09
14/11/2019	6:00	50.18	223.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36,703.46
14/11/2019	6:05	50.07	220.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34,565.40
14/11/2019	6:10	50.15	226.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
14/11/2019	6:15	50.18	223.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36,347.12
14/11/2019	6:20	49.98	231.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,990.77
14/11/2019	6:25	50.16	222.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
14/11/2019	6:30	49.94	228.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36,347.12
14/11/2019	6:35	50.06	231.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34,565.40
14/11/2019	6:40	49.94	227.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
14/11/2019	6:45	50.13	233.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,278.09
14/11/2019	6:50	50.11	227.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34,565.40
14/11/2019	6:55	50.19	231.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,278.09
14/11/2019	7:00	50.16	227.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
14/11/2019	7:05	50.00	227.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,278.09
14/11/2019	7:10	50.06	228.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36,347.12
14/11/2019	7:15	50.13	226.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36,347.12
14/11/2019	7:20	50.18	226.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36,703.46
14/11/2019	7:25	50.06	225.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36,703.46
14/11/2019	7:30	50.12	221.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34,565.40
14/11/2019	7:35	50.05	232.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36,347.12
14/11/2019	7:40	50.13	227.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36,703.46
14/11/2019	7:45	50.15	226.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34,921.74
14/11/2019	7:50	49.96	221.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36,703.46
14/11/2019	7:55	49.93	224.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43
14/11/2019	8:00	50.12	219.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,990.77
14/11/2019	8:05	50.04	223.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,634.43

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
14/11/2019	8:10	50.16	233.91	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36,703.46
14/11/2019	8:15	50.19	228.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34,921.74
14/11/2019	8:20	50.06	224.96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36,347.12
14/11/2019	8:25	50.08	227.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,990.77
14/11/2019	8:30	50.02	226.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,278.09
14/11/2019	8:35	49.99	229.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35,278.09
14/11/2019	8:40	50.18	221.83	7.50	10.10	0.00	12.73	1,516.15	2,049.77	0.00	3,556.75	36,646.45
14/11/2019	8:45	50.09	231.13	2.72	12.25	0.00	13.82	590.35	2,503.69	0.00	3,200.98	36,548.74
14/11/2019	8:50	50.05	229.07	4.30	12.47	0.00	14.06	860.12	2,552.33	0.00	3,352.72	36,107.24
14/11/2019	8:55	50.02	228.31	3.64	12.42	0.00	13.80	761.31	2,499.98	0.00	3,362.31	37,846.31
14/11/2019	9:00	50.10	228.25	2.45	11.83	0.00	13.52	524.66	2,437.46	0.00	3,128.64	38,107.03
14/11/2019	9:05	49.99	227.80	2.75	12.44	0.00	14.01	553.62	2,554.26	0.00	3,021.80	38,369.02
14/11/2019	9:10	50.14	228.20	4.90	12.85	0.00	13.90	1,031.62	2,581.52	0.00	3,496.00	37,548.76
14/11/2019	9:15	49.93	230.66	2.58	12.61	0.00	14.38	494.80	2,682.45	0.00	3,108.56	37,432.32
14/11/2019	9:20	50.07	223.71	2.57	12.80	0.00	13.86	541.11	2,553.95	0.00	3,158.23	37,312.14
14/11/2019	9:25	50.19	222.17	4.12	12.77	0.00	14.44	829.37	2,626.70	0.00	3,559.76	39,512.46
14/11/2019	9:30	50.02	225.86	3.74	14.99	0.00	16.12	747.78	2,876.59	0.00	3,727.59	39,823.10
14/11/2019	9:35	50.07	230.22	2.24	16.27	0.00	17.92	467.07	2,993.58	4.17	3,597.83	39,349.65
14/11/2019	9:40	50.18	229.73	3.04	16.36	0.00	17.07	624.28	3,016.50	0.00	3,756.50	38,478.69
14/11/2019	9:45	49.96	223.61	4.28	16.36	0.00	17.14	869.97	2,939.46	0.00	3,916.99	38,795.42
14/11/2019	9:50	49.93	224.33	2.23	18.20	0.00	17.70	486.96	3,459.52	0.00	3,888.02	39,116.14
14/11/2019	9:55	50.14	227.09	2.88	18.40	0.00	17.44	597.88	3,383.33	0.00	3,911.86	41,055.51
14/11/2019	10:00	50.10	228.79	5.67	18.87	0.00	17.72	1,159.65	3,446.00	0.00	4,745.21	40,638.18
14/11/2019	10:05	49.94	225.05	2.87	18.79	0.00	17.07	612.73	3,419.53	0.00	4,061.34	40,983.54
14/11/2019	10:10	50.14	224.56	2.91	18.51	0.00	17.95	624.08	3,532.28	0.00	4,252.48	40,917.65
14/11/2019	10:15	50.10	223.72	4.79	25.50	0.00	23.27	989.25	4,844.21	5.53	5,928.24	42,243.23
14/11/2019	10:20	49.93	221.37	3.92	35.08	0.00	33.68	816.34	7,028.11	0.00	7,933.00	41,217.96
14/11/2019	10:25	49.95	224.14	2.91	31.78	0.00	28.71	617.96	6,205.47	0.00	7,238.80	43,509.18
14/11/2019	10:30	50.17	221.94	2.70	17.60	9.79	15.84	567.58	3,274.14	1,849.31	5,751.62	42,246.37
14/11/2019	10:35	50.06	225.03	4.85	16.87	18.16	12.30	978.45	3,119.99	3,336.11	7,567.99	43,299.96
14/11/2019	10:40	50.12	229.03	2.78	17.07	18.05	13.13	559.10	3,205.81	3,359.09	7,172.22	44,333.50
14/11/2019	10:45	50.13	228.55	2.73	17.27	17.98	13.26	571.00	3,326.21	3,414.72	7,093.57	44,930.66
14/11/2019	10:50	50.12	224.33	5.14	16.78	17.27	12.30	1,091.78	3,367.45	3,463.41	7,992.30	46,037.47
14/11/2019	10:55	50.07	225.64	2.63	26.09	17.93	20.00	535.56	5,292.57	3,545.83	9,239.17	48,219.64
14/11/2019	11:00	50.05	229.29	2.63	33.50	10.91	27.23	560.70	6,698.15	2,105.98	9,266.67	47,111.53
14/11/2019	11:05	50.12	223.39	5.39	32.98	14.74	26.99	1,149.30	6,527.21	2,927.07	10,686.14	48,971.78
14/11/2019	11:10	50.08	220.92	2.65	34.88	13.96	28.05	547.21	6,784.31	2,662.54	10,349.85	49,324.27
14/11/2019	11:15	49.93	228.56	2.78	36.52	14.84	29.10	559.52	7,343.16	3,002.09	10,904.70	50,717.33
14/11/2019	11:20	49.96	227.78	4.36	36.14	27.60	27.67	921.29	7,211.48	5,561.93	14,004.30	51,861.70
14/11/2019	11:25	50.03	231.68	3.30	35.64	31.80	27.70	692.38	7,255.25	6,549.96	14,087.54	52,546.14
14/11/2019	11:30	50.08	228.80	2.47	36.26	24.95	27.16	525.32	7,331.56	4,989.52	12,533.38	53,075.78
14/11/2019	11:35	50.11	222.30	2.96	36.41	21.22	26.00	606.59	7,057.08	4,014.19	12,067.68	52,959.89

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
14/11/2019	11:40	50.15	228.62	4.56	34.34	19.89	24.99	1,008.50	6,991.02	4,162.25	12,019.37	56,165.65
14/11/2019	11:45	49.93	228.16	2.63	36.52	21.32	27.71	556.30	7,315.65	4,120.52	11,601.36	58,293.94
14/11/2019	11:50	50.13	222.00	2.42	35.15	20.60	25.90	504.15	7,019.53	4,065.75	11,822.72	56,410.73
14/11/2019	11:55	50.14	225.30	5.05	29.87	19.40	21.01	1,084.28	5,527.56	4,025.05	10,854.21	57,872.95
14/11/2019	12:00	50.13	229.24	2.63	19.59	19.11	13.96	540.29	3,678.99	3,836.66	7,859.11	57,943.30
14/11/2019	12:05	50.05	228.82	2.35	20.00	20.30	15.30	482.53	3,725.36	4,143.26	8,486.38	59,220.97
14/11/2019	12:10	50.14	228.30	2.53	19.30	33.35	21.24	512.62	3,671.31	6,788.86	11,106.29	60,128.16
14/11/2019	12:15	50.15	227.56	5.35	21.62	34.24	20.30	1,100.53	3,977.62	7,001.76	12,021.11	61,129.93
14/11/2019	12:20	50.17	226.71	2.45	21.84	33.20	21.94	554.02	4,109.49	6,841.22	11,750.25	62,071.08
14/11/2019	12:25	50.09	225.65	2.65	21.17	28.70	18.90	561.41	4,155.74	5,822.68	10,874.21	65,485.19
14/11/2019	12:30	49.95	224.17	21.42	34.14	33.36	16.98	4,399.32	7,234.67	6,725.88	18,357.17	65,107.62
14/11/2019	12:35	50.07	228.63	23.69	40.17	32.59	16.30	4,751.28	7,988.58	6,981.80	20,260.51	64,744.42
14/11/2019	12:40	50.19	229.05	23.56	37.37	29.89	16.37	4,860.07	7,735.03	6,058.84	19,150.37	68,979.16
14/11/2019	12:45	50.14	231.06	24.04	37.27	35.31	14.95	4,865.07	7,668.62	7,458.28	20,544.69	70,674.44
14/11/2019	12:50	50.09	228.23	24.75	36.33	29.99	16.27	5,163.98	7,571.19	5,960.53	19,027.75	70,098.66
14/11/2019	12:55	50.11	225.10	23.96	37.70	31.85	14.94	5,002.64	7,597.00	6,750.57	18,680.92	74,596.81
14/11/2019	13:00	50.18	230.27	24.95	37.77	33.32	15.25	4,969.73	7,925.58	6,779.67	19,360.14	76,276.01
14/11/2019	13:05	50.13	228.62	25.60	37.18	30.28	15.20	5,325.34	7,424.92	6,156.16	18,630.60	76,332.95
14/11/2019	13:10	50.07	224.86	24.15	35.28	31.75	13.86	5,158.91	7,612.48	6,621.96	18,611.82	78,711.23
14/11/2019	13:15	50.18	228.39	25.60	35.67	34.40	13.66	5,402.28	7,405.27	6,682.61	19,025.86	79,566.43
14/11/2019	13:20	49.97	227.40	27.44	36.63	28.41	14.44	5,689.02	7,492.62	5,874.36	18,662.35	82,776.44
14/11/2019	13:25	50.16	224.93	28.12	37.64	31.09	14.11	5,559.77	7,381.83	6,328.10	19,683.29	81,965.70
14/11/2019	13:30	50.19	224.76	25.71	36.76	34.99	12.80	5,268.85	7,547.18	7,134.52	20,167.83	86,146.80
14/11/2019	13:35	49.99	224.84	32.57	36.33	29.70	13.37	6,682.58	7,617.48	5,952.16	20,025.96	87,022.15
14/11/2019	13:40	49.94	221.83	40.09	47.02	31.31	18.82	8,095.95	9,719.60	6,246.79	24,776.48	87,302.91
14/11/2019	13:45	49.99	225.39	40.40	49.30	34.54	17.88	8,353.41	10,606.98	7,185.28	26,089.16	87,648.09
14/11/2019	13:50	49.96	224.79	39.38	51.01	30.49	21.31	8,679.41	10,798.63	6,396.84	25,468.35	95,277.74
14/11/2019	13:55	50.11	225.48	40.08	49.78	28.52	21.63	8,745.61	10,983.32	5,969.46	26,330.25	96,525.60
14/11/2019	14:00	50.14	225.58	33.80	52.12	34.09	20.50	7,295.73	10,728.23	6,898.88	25,245.41	93,794.61
14/11/2019	14:05	50.11	226.36	34.90	51.31	35.02	20.27	7,247.55	10,657.45	7,148.54	25,204.07	98,795.81
14/11/2019	14:10	50.13	233.81	39.24	53.15	29.89	22.47	8,260.03	10,913.03	6,332.18	26,071.56	100,905.16
14/11/2019	14:15	50.08	223.05	33.26	60.89	31.93	32.34	6,810.33	13,222.55	6,579.38	27,163.14	100,009.75
14/11/2019	14:20	50.19	226.79	31.82	69.39	36.87	37.37	6,838.95	14,558.48	7,421.73	28,961.77	106,547.33
14/11/2019	14:25	50.19	223.55	34.78	70.89	31.82	39.70	7,131.31	14,584.25	6,522.27	27,955.44	111,080.93
14/11/2019	14:30	49.99	226.97	34.73	70.69	30.00	39.30	7,732.39	14,118.72	6,134.15	27,632.77	106,889.43
14/11/2019	14:35	50.08	226.24	34.89	66.64	33.12	36.72	7,386.66	14,886.68	6,864.17	29,786.19	114,857.27
14/11/2019	14:40	50.10	231.64	33.96	69.87	34.30	37.43	7,336.37	14,865.93	6,836.61	28,245.82	116,132.60
14/11/2019	14:45	49.94	228.00	32.11	66.35	29.78	38.91	6,784.39	13,984.25	6,525.87	26,845.14	117,289.05
14/11/2019	14:50	50.19	229.55	34.20	66.84	30.50	40.09	7,161.21	14,788.62	6,428.15	28,441.00	123,177.80
14/11/2019	14:55	50.05	224.96	31.72	65.74	36.21	34.59	6,757.41	13,794.18	7,364.02	28,685.67	118,275.69
14/11/2019	15:00	50.18	228.98	34.25	52.09	33.46	23.38	7,125.14	10,703.95	6,986.80	25,151.84	122,768.85
14/11/2019	15:05	49.94	232.22	33.17	68.38	30.70	36.16	7,354.66	14,104.56	6,418.01	27,342.37	128,836.69

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
14/11/2019	15:10	49.94	224.80	32.84	58.02	33.66	28.40	6,760.30	12,550.86	7,051.75	25,982.28	128,454.24
14/11/2019	15:15	50.17	229.22	35.35	62.27	35.95	32.65	7,250.76	13,779.83	7,166.18	28,220.46	134,706.14
14/11/2019	15:20	50.10	226.15	37.24	62.52	30.49	32.95	7,875.52	12,939.71	6,413.85	26,303.50	129,051.14
14/11/2019	15:25	49.97	225.39	36.87	60.43	32.14	30.49	7,778.43	12,784.87	6,962.86	28,118.98	135,317.41
14/11/2019	15:30	50.17	229.49	30.85	55.97	34.40	26.36	6,524.77	11,592.61	7,031.04	26,181.73	134,707.31
14/11/2019	15:35	50.11	228.83	35.12	66.76	32.54	35.44	7,195.76	14,105.45	6,580.08	27,258.13	143,943.42
14/11/2019	15:40	50.06	225.92	33.76	57.43	29.89	28.23	7,021.65	12,290.41	6,419.20	24,469.91	144,690.18
14/11/2019	15:45	50.09	226.75	37.40	61.01	34.78	29.70	7,863.83	12,939.72	7,214.39	27,166.96	148,512.66
14/11/2019	15:50	49.97	234.49	33.70	66.00	35.12	34.71	7,101.07	14,106.97	7,141.64	27,652.73	149,445.01
14/11/2019	15:55	49.98	227.17	33.03	58.20	30.50	28.89	6,949.92	12,083.46	6,117.55	24,582.54	147,119.02
14/11/2019	16:00	50.08	234.80	32.42	76.13	30.65	46.08	6,708.61	15,648.77	6,335.50	28,785.34	152,563.33
14/11/2019	16:05	50.16	226.48	32.11	55.39	36.67	25.44	6,879.31	11,213.74	7,365.58	25,238.75	157,750.71
14/11/2019	16:10	50.05	229.16	33.50	62.33	31.75	33.91	6,892.50	13,502.68	6,476.38	27,683.02	150,733.89
14/11/2019	16:15	49.94	225.64	34.88	58.10	31.42	27.44	7,083.43	11,579.84	6,567.38	25,651.49	152,786.85
14/11/2019	16:20	50.15	228.80	45.67	65.09	32.79	38.10	9,703.33	13,618.55	7,137.63	29,885.72	156,878.13
14/11/2019	16:25	50.01	226.04	61.30	78.70	48.50	44.39	13,304.08	15,784.46	9,961.95	40,692.80	160,104.58
14/11/2019	16:30	50.06	230.77	66.13	83.30	46.97	50.47	13,468.08	17,374.20	9,172.32	41,936.26	161,761.97
14/11/2019	16:35	50.09	231.51	67.05	77.81	44.00	45.67	14,281.65	15,931.38	9,203.67	39,280.12	164,969.19
14/11/2019	16:40	50.11	227.84	65.99	65.24	44.43	35.87	13,545.24	13,284.96	9,196.65	35,891.29	174,886.32
14/11/2019	16:45	49.93	231.30	63.86	73.00	45.01	41.92	13,120.34	15,287.97	9,058.29	38,489.05	181,588.28
14/11/2019	16:50	49.99	234.01	56.53	65.10	37.13	39.29	12,311.07	12,527.75	7,907.73	33,638.53	177,257.07
14/11/2019	16:55	50.04	232.17	58.20	73.46	26.95	52.40	12,419.06	15,922.67	5,581.02	33,539.65	178,205.67
14/11/2019	17:00	50.05	225.40	61.30	63.54	27.30	50.37	13,207.12	13,395.63	5,726.84	31,077.97	188,202.70
14/11/2019	17:05	50.06	228.90	66.44	72.80	26.87	54.10	13,564.39	15,268.66	5,660.40	34,312.68	181,778.70
14/11/2019	17:10	49.98	229.63	75.46	68.68	26.40	59.33	16,914.00	14,548.07	5,425.66	35,305.64	184,690.81
14/11/2019	17:15	50.06	223.97	80.50	64.21	26.68	58.98	17,181.05	13,817.28	5,576.20	35,711.28	197,308.36
14/11/2019	17:20	50.10	228.52	78.67	63.80	26.58	59.00	17,512.31	13,110.77	5,600.94	35,079.97	192,524.25
14/11/2019	17:25	49.93	227.73	75.46	62.37	26.75	58.04	16,447.44	13,622.79	5,688.36	34,300.95	199,400.13
14/11/2019	17:30	49.93	233.57	79.15	65.79	27.67	56.63	16,558.89	13,662.25	5,727.63	35,550.83	202,362.70
14/11/2019	17:35	50.06	228.66	85.27	66.74	26.90	63.10	18,068.00	14,359.33	5,603.39	36,818.85	207,548.50
14/11/2019	17:40	50.18	225.02	76.53	66.33	27.00	59.64	16,262.63	13,275.83	5,577.22	34,852.80	204,258.74
14/11/2019	17:45	50.10	226.96	75.56	63.33	27.54	55.97	16,091.02	12,682.57	5,514.11	35,553.87	211,332.02
14/11/2019	17:50	50.16	230.22	75.66	63.83	26.87	59.26	16,412.40	12,924.58	5,365.72	35,566.03	207,810.61
14/11/2019	17:55	49.95	226.71	74.38	63.86	26.36	55.39	16,201.14	12,928.00	5,463.75	35,484.44	219,279.74
14/11/2019	18:00	50.19	226.22	79.89	65.30	27.91	59.58	17,186.38	13,304.65	5,525.65	36,815.55	217,915.30
14/11/2019	18:05	50.01	226.87	77.01	61.89	27.17	55.78	16,474.84	12,688.32	5,398.26	35,841.69	223,016.27
14/11/2019	18:10	49.93	225.56	80.68	63.34	26.87	60.70	17,425.14	13,333.37	5,707.37	35,009.89	230,544.48
14/11/2019	18:15	50.04	232.99	78.98	58.96	29.70	56.96	16,554.35	11,412.35	6,344.63	33,714.95	235,788.08
14/11/2019	18:20	49.98	233.13	77.62	58.81	36.66	48.70	15,923.56	11,118.92	7,621.53	34,290.40	238,822.37
14/11/2019	18:25	50.02	227.47	75.50	61.28	36.82	48.11	16,577.92	12,334.43	7,574.58	36,627.71	239,586.24
14/11/2019	18:30	49.95	231.19	59.46	54.13	32.24	41.00	13,341.70	10,975.34	6,432.15	30,027.84	239,842.86
14/11/2019	18:35	49.97	233.04	37.00	43.67	23.56	27.98	7,739.06	8,473.00	4,827.93	21,103.26	236,834.52

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
14/11/2019	18:40	50.08	224.09	7.33	36.26	18.43	24.72	1,505.43	7,591.62	3,876.17	12,885.60	237,887.05
14/11/2019	18:45	50.04	229.52	0.00	36.62	18.71	25.81	13.89	7,233.71	3,651.53	11,421.04	246,047.50
14/11/2019	18:50	49.93	231.21	0.00	36.46	18.90	24.35	0.00	7,641.46	3,711.59	11,353.12	237,316.57
14/11/2019	18:55	50.06	229.14	0.00	25.15	18.56	17.65	0.00	5,142.47	3,480.02	9,100.12	245,324.99
14/11/2019	19:00	50.03	231.57	1.46	21.48	18.56	15.71	273.12	4,576.23	3,594.06	8,361.70	236,291.87
14/11/2019	19:05	49.97	233.91	13.37	21.72	4.51	17.03	2,566.83	4,519.74	912.43	7,935.09	246,717.38
14/11/2019	19:10	50.16	227.81	21.98	21.85	4.53	16.36	4,247.42	4,761.77	838.31	9,813.82	242,649.70
14/11/2019	19:15	49.96	230.15	21.88	21.73	18.79	9.29	4,378.75	4,421.34	3,771.67	12,133.54	251,065.97
14/11/2019	19:20	50.01	228.64	10.39	21.01	18.77	12.84	2,154.85	4,362.64	3,601.82	10,358.25	254,390.58
14/11/2019	19:25	49.96	227.38	0.00	18.61	17.74	16.56	0.00	4,015.35	3,586.98	7,613.96	250,091.81
14/11/2019	19:30	50.11	231.55	0.00	19.16	18.33	15.91	0.00	3,930.25	3,496.18	7,287.95	253,206.60
14/11/2019	19:35	50.12	231.65	0.00	15.55	17.88	15.86	6.27	3,281.21	3,521.71	6,875.04	256,273.28
14/11/2019	19:40	50.16	234.15	0.00	12.28	17.80	14.79	7.37	2,641.91	3,507.18	6,209.71	246,828.15
14/11/2019	19:45	49.95	227.97	0.00	18.33	17.80	14.55	0.00	3,997.09	3,575.47	7,549.99	254,949.54
14/11/2019	19:50	50.09	228.75	0.00	19.79	0.20	15.15	0.00	4,347.81	49.49	4,355.08	255,312.46
14/11/2019	19:55	50.06	226.82	5.82	19.57	6.40	14.26	1,100.80	4,112.09	1,241.46	6,387.03	243,318.64
14/11/2019	20:00	50.03	226.93	9.51	29.46	17.74	19.67	1,717.45	6,053.68	3,472.33	11,573.02	244,226.88
14/11/2019	20:05	50.04	226.94	9.41	28.22	18.64	17.47	1,692.50	5,403.00	3,543.23	10,895.73	255,206.07
14/11/2019	20:10	50.07	228.04	9.12	32.11	18.16	22.54	1,662.98	6,779.23	3,556.69	12,503.09	248,617.04
14/11/2019	20:15	49.96	230.45	9.60	33.15	18.23	21.72	1,694.70	6,866.73	3,362.29	12,249.65	262,332.39
14/11/2019	20:20	50.04	230.80	9.60	31.62	6.57	23.96	1,746.97	6,744.47	1,307.89	9,622.08	255,518.28
14/11/2019	20:25	50.03	230.28	9.80	34.51	0.99	26.19	1,758.77	7,225.95	156.04	9,217.27	253,708.62
14/11/2019	20:30	50.10	232.39	10.10	34.30	18.18	21.98	1,841.43	7,079.31	3,587.34	12,237.96	249,603.02
14/11/2019	20:35	50.17	224.80	10.10	35.50	21.42	22.24	1,778.03	7,095.11	4,217.77	12,935.29	258,433.98
14/11/2019	20:40	50.13	225.75	9.60	34.55	19.16	22.77	1,696.36	7,262.94	3,662.81	12,330.31	256,898.35
14/11/2019	20:45	50.11	226.00	9.60	34.95	17.74	23.87	1,768.52	7,637.04	3,604.22	12,445.18	252,735.00
14/11/2019	20:50	50.12	225.48	10.69	36.52	17.17	23.48	1,897.21	7,236.41	3,472.44	12,686.51	266,851.83
14/11/2019	20:55	50.13	231.10	10.61	36.63	17.78	24.34	1,782.45	7,722.20	3,489.30	12,646.11	267,948.68
14/11/2019	21:00	50.08	227.68	10.40	37.10	17.50	23.47	1,840.60	7,896.00	3,406.47	13,300.48	266,408.59
14/11/2019	21:05	50.09	221.77	10.09	36.36	16.46	24.60	1,823.89	7,668.01	3,236.52	12,810.20	272,772.65
14/11/2019	21:10	50.08	231.23	10.19	37.54	0.00	30.70	1,808.45	7,611.33	5.23	9,386.19	265,617.91
14/11/2019	21:15	50.09	228.48	10.67	36.55	8.26	27.40	1,998.67	7,463.15	1,573.23	11,095.58	271,882.92
14/11/2019	21:20	50.08	228.99	10.86	36.36	18.33	23.60	2,020.20	7,869.13	3,493.96	12,930.05	259,611.06
14/11/2019	21:25	50.07	232.74	11.54	37.00	17.27	22.74	1,910.16	7,764.95	3,372.15	13,450.13	276,790.32
14/11/2019	21:30	50.08	231.91	10.99	35.57	17.15	22.70	1,976.02	7,474.89	3,311.89	13,102.57	277,892.91
14/11/2019	21:35	49.94	223.73	15.86	36.41	16.88	21.00	3,017.05	7,344.31	3,357.23	13,722.63	270,942.49
14/11/2019	21:40	50.07	227.83	19.70	34.80	16.88	18.53	3,844.43	7,325.49	3,290.20	14,099.61	269,420.03
14/11/2019	21:45	49.96	232.84	19.16	23.32	1.85	22.12	3,792.93	4,229.51	369.99	8,570.03	281,026.85
14/11/2019	21:50	50.19	227.32	16.32	46.27	1.39	40.50	3,083.41	9,682.33	273.90	13,000.96	279,414.68
14/11/2019	21:55	49.93	224.09	14.55	49.18	17.92	35.30	2,926.34	10,498.00	3,489.29	16,705.75	267,081.90
14/11/2019	22:00	49.97	230.05	14.55	51.81	17.84	35.80	2,875.99	10,421.86	3,474.44	16,837.09	273,991.84
14/11/2019	22:05	50.04	219.94	16.01	50.59	17.42	32.98	3,036.43	10,216.42	3,484.15	16,100.25	269,798.33

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
14/11/2019	22:10	50.16	229.79	17.85	38.12	17.88	23.09	3,461.25	7,534.10	3,377.83	14,297.70	287,726.50
14/11/2019	22:15	50.00	220.72	15.30	53.25	17.57	35.94	3,096.09	10,529.03	3,336.36	16,501.01	289,186.65
14/11/2019	22:20	50.05	227.06	17.14	44.15	4.55	34.95	3,332.90	8,965.91	924.07	12,776.61	279,042.77
14/11/2019	22:25	50.07	223.64	18.70	38.93	1.12	32.54	3,670.08	7,610.29	217.32	11,693.71	282,807.48
14/11/2019	22:30	49.95	227.96	14.34	51.81	17.74	36.36	2,763.67	10,307.08	3,589.27	17,166.39	292,722.23
14/11/2019	22:35	50.04	231.23	14.50	45.84	18.95	30.39	2,801.09	8,763.38	3,479.26	14,959.70	279,771.91
14/11/2019	22:40	50.16	225.78	16.16	40.79	18.95	26.52	3,034.52	8,065.49	3,566.25	14,877.61	283,854.13
14/11/2019	22:45	50.18	226.89	16.26	50.69	17.98	34.58	3,283.68	10,414.56	3,552.93	17,219.28	282,365.58
14/11/2019	22:50	50.17	226.24	15.40	47.23	18.36	31.31	2,941.56	9,131.48	3,583.42	16,027.30	292,345.04
14/11/2019	22:55	50.02	228.21	18.22	42.82	17.82	26.78	3,686.41	8,729.70	3,432.88	15,821.05	284,940.78
14/11/2019	23:00	50.10	229.25	13.29	47.92	18.00	34.99	2,353.10	10,185.31	3,471.34	16,637.98	289,180.99
14/11/2019	23:05	50.11	232.43	14.24	42.32	17.75	26.62	2,588.25	8,476.76	3,548.22	14,271.65	290,382.43
14/11/2019	23:10	49.98	226.78	17.24	50.29	18.79	33.58	3,393.57	10,419.11	3,646.50	16,576.49	288,844.89
14/11/2019	23:15	49.94	226.90	15.04	45.08	7.57	34.25	2,829.79	8,982.71	1,547.63	13,492.41	301,758.84
14/11/2019	23:20	50.13	227.17	14.95	47.33	0.00	41.71	2,873.76	9,777.93	0.00	13,096.12	288,004.59
14/11/2019	23:25	50.12	230.22	13.57	45.29	11.92	32.52	2,555.08	8,906.93	2,273.97	13,619.52	292,097.20
14/11/2019	23:30	50.09	227.34	17.30	32.83	17.17	19.80	3,234.23	6,282.56	3,376.32	13,126.99	293,169.24
14/11/2019	23:35	50.13	229.84	10.57	30.50	8.14	21.44	2,140.51	6,177.98	1,544.00	9,665.34	305,965.19
14/11/2019	23:40	50.07	227.00	12.45	22.02	0.00	23.43	2,534.00	4,157.66	0.00	6,489.82	306,528.08
14/11/2019	23:45	49.96	232.52	10.40	31.70	0.00	28.33	2,075.18	6,315.51	0.00	8,586.02	307,257.89
14/11/2019	23:50	50.10	223.27	10.71	19.90	0.00	18.13	1,821.95	3,552.46	0.00	5,464.39	298,667.24
14/11/2019	23:55	50.13	225.98	14.75	29.90	0.00	26.29	2,827.21	6,086.62	0.00	8,618.59	302,416.96
15/11/2019	0:00	49.94	224.09	13.43	26.99	0.00	23.27	2,518.96	5,295.03	0.00	7,582.93	306,092.38
15/11/2019	0:05	49.94	229.83	12.36	16.49	0.00	17.95	2,356.54	3,250.54	0.00	5,663.15	297,458.44
15/11/2019	0:10	49.97	226.64	7.95	23.13	0.00	21.32	1,621.23	4,849.72	0.00	6,651.51	304,072.45
15/11/2019	0:15	50.05	226.04	0.00	29.69	0.00	24.25	0.00	6,328.67	0.00	6,328.67	313,732.45
15/11/2019	0:20	50.00	226.28	6.63	20.19	0.00	17.93	1,335.88	4,074.65	0.00	5,701.06	314,207.54
15/11/2019	0:25	50.11	230.32	8.32	16.93	0.00	17.33	1,682.66	3,106.24	0.00	4,838.26	305,467.28
15/11/2019	0:30	50.18	226.01	10.10	17.56	0.00	19.39	2,119.64	3,603.79	0.00	5,779.56	296,756.83
15/11/2019	0:35	50.14	234.47	0.00	28.81	0.00	25.86	0.00	6,380.80	0.00	6,318.85	315,644.66
15/11/2019	0:40	49.98	227.72	7.83	25.50	0.00	20.86	1,556.97	5,195.06	0.00	6,917.81	297,800.50
15/11/2019	0:45	50.11	231.47	7.85	17.56	0.00	18.44	1,623.60	3,233.57	0.00	4,958.99	298,197.38
15/11/2019	0:50	50.01	230.70	2.57	18.97	0.00	18.03	524.25	3,419.41	0.00	3,880.67	301,594.97
15/11/2019	0:55	50.00	230.64	8.76	18.13	0.00	18.72	1,761.50	3,505.75	0.00	5,131.10	305,100.06
15/11/2019	1:00	50.11	236.16	8.45	26.36	0.00	24.70	1,681.71	5,359.15	0.00	7,400.09	308,780.59
15/11/2019	1:05	50.00	231.17	0.00	30.30	0.00	27.30	0.00	6,261.00	0.00	6,513.97	315,493.76
15/11/2019	1:10	50.19	235.75	7.75	18.13	0.00	19.26	1,632.78	3,331.72	0.00	4,984.93	315,917.48
15/11/2019	1:15	50.09	228.28	4.59	18.10	0.00	17.95	930.26	3,294.06	0.00	4,404.87	303,877.81
15/11/2019	1:20	50.08	232.82	3.40	18.97	0.00	18.23	755.38	3,357.09	0.00	4,158.98	307,321.72
15/11/2019	1:25	50.06	231.28	8.99	23.72	0.00	23.96	1,787.44	4,870.49	0.00	6,485.36	314,087.23
15/11/2019	1:30	49.94	232.17	6.50	29.79	0.00	26.29	1,327.51	6,454.37	0.00	7,912.89	311,617.66
15/11/2019	1:35	49.98	230.76	0.00	19.60	0.00	17.56	0.00	3,708.14	0.00	3,562.72	305,682.20

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
15/11/2019	1:40	50.06	235.52	8.57	20.60	0.00	20.60	1,706.23	3,672.18	0.00	5,286.81	312,374.81
15/11/2019	1:45	50.00	233.97	7.68	15.10	0.00	14.99	1,575.65	2,784.19	0.00	4,165.83	306,478.05
15/11/2019	1:50	50.04	232.91	5.45	8.16	0.00	11.06	1,106.70	1,708.83	0.00	2,815.53	303,582.95
15/11/2019	1:55	50.18	224.58	4.28	18.23	0.00	18.60	925.35	3,993.40	0.00	4,745.35	307,104.12
15/11/2019	2:00	50.18	232.38	1.01	2.65	0.00	2.68	227.25	591.86	0.00	793.85	307,169.61
15/11/2019	2:05	50.07	229.35	7.37	0.00	0.00	8.06	1,570.93	0.00	0.00	1,602.67	319,842.02
15/11/2019	2:10	49.99	231.62	6.50	0.30	0.00	7.65	1,432.18	73.29	0.00	1,475.36	316,833.02
15/11/2019	2:15	50.04	233.20	4.55	17.75	0.00	18.97	978.25	3,993.96	0.00	5,141.92	317,253.20
15/11/2019	2:20	50.05	229.69	0.29	3.03	0.00	3.04	85.85	674.28	0.00	728.42	314,174.66
15/11/2019	2:25	50.17	228.99	6.73	0.00	0.00	6.89	1,490.72	5.30	0.00	1,525.81	311,155.12
15/11/2019	2:30	50.16	230.37	8.34	6.77	0.00	11.66	1,686.67	1,491.80	0.00	3,169.37	305,127.94
15/11/2019	2:35	50.06	232.69	0.00	18.95	0.00	19.31	0.00	4,052.83	0.00	4,092.95	305,452.30
15/11/2019	2:40	50.14	226.71	5.30	4.55	0.00	10.92	1,150.66	1,032.01	0.00	2,108.02	321,380.10
15/11/2019	2:45	50.06	226.21	0.30	0.00	0.00	0.41	74.97	0.00	0.00	73.49	324,537.26
15/11/2019	2:50	50.15	227.50	6.11	0.00	0.00	6.83	1,420.05	0.00	0.00	1,364.90	315,199.61
15/11/2019	2:55	49.98	229.90	7.33	0.00	0.00	7.78	1,616.09	0.00	0.00	1,632.09	324,792.94
15/11/2019	3:00	49.93	230.73	6.73	6.31	0.00	9.30	1,474.93	1,463.95	0.00	2,968.09	306,105.89
15/11/2019	3:05	50.12	233.19	0.00	17.56	0.00	18.80	0.00	3,895.21	0.00	3,816.52	315,900.96
15/11/2019	3:10	50.13	223.97	2.28	4.70	0.00	7.28	488.45	1,050.75	0.00	1,534.31	319,190.42
15/11/2019	3:15	50.17	228.64	4.90	0.00	0.00	5.56	1,109.06	0.00	0.00	1,087.31	319,281.93
15/11/2019	3:20	50.12	227.15	6.83	0.00	0.00	7.06	1,390.44	0.00	0.00	1,476.44	316,240.18
15/11/2019	3:25	50.07	224.23	0.93	0.31	0.00	0.98	186.26	74.44	0.00	257.74	322,587.57
15/11/2019	3:30	50.10	226.45	6.80	17.15	0.00	17.56	1,430.79	3,733.19	0.00	5,254.62	319,867.21
15/11/2019	3:35	49.97	226.50	0.00	2.58	0.00	2.75	0.00	568.41	0.00	562.78	310,412.16
15/11/2019	3:40	50.07	225.66	7.06	0.00	0.00	7.60	1,506.82	0.00	0.00	1,506.82	307,368.98
15/11/2019	3:45	50.11	228.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	310,537.74
15/11/2019	3:50	50.04	224.89	7.73	12.32	0.00	18.23	1,605.29	2,660.46	0.00	4,281.80	310,883.95
15/11/2019	3:55	50.17	227.95	0.00	13.60	0.00	12.54	4.08	2,947.05	0.00	2,862.72	326,998.69
15/11/2019	4:00	50.01	224.23	6.17	0.00	0.00	6.57	1,263.13	0.00	0.00	1,315.22	311,231.32
15/11/2019	4:05	50.02	231.67	1.20	0.00	0.00	1.34	257.26	0.00	0.00	247.07	317,604.20
15/11/2019	4:10	50.12	225.44	8.22	0.00	0.00	8.48	1,696.09	0.00	0.00	1,730.35	311,392.03
15/11/2019	4:15	50.01	226.04	2.87	0.00	0.00	2.87	587.66	0.00	0.00	575.79	317,796.44
15/11/2019	4:20	50.08	230.56	5.45	13.97	0.00	16.73	1,142.09	3,058.29	0.00	4,282.79	327,694.29
15/11/2019	4:25	50.06	229.05	0.00	7.21	0.00	6.90	0.00	1,567.13	0.00	1,506.28	315,093.82
15/11/2019	4:30	50.11	225.93	6.44	0.00	0.00	6.80	1,344.03	0.00	0.00	1,344.03	324,756.37
15/11/2019	4:35	50.04	232.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	308,836.94
15/11/2019	4:40	50.01	230.32	7.52	0.00	0.00	7.57	1,604.71	0.00	0.00	1,511.23	328,073.98
15/11/2019	4:45	50.07	225.08	0.00	6.14	0.00	5.92	0.00	1,378.14	0.00	1,338.00	318,629.93
15/11/2019	4:50	50.19	224.98	6.16	10.10	0.00	9.79	1,260.63	2,142.78	0.00	3,482.42	325,298.53
15/11/2019	4:55	49.97	227.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	312,541.73
15/11/2019	5:00	49.95	225.52	8.03	0.00	0.00	7.64	1,567.59	0.00	0.00	1,616.07	319,054.80
15/11/2019	5:05	50.07	228.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	315,864.25

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
15/11/2019	5:10	49.94	230.65	7.86	8.00	0.00	12.90	1,671.53	1,681.85	0.00	3,473.52	312,951.82
15/11/2019	5:15	49.93	229.83	0.00	7.55	0.00	7.33	0.00	1,631.05	0.00	1,647.86	322,673.50
15/11/2019	5:20	50.18	227.51	0.71	0.00	0.00	0.69	144.97	0.00	0.00	142.16	313,100.63
15/11/2019	5:25	50.03	232.76	7.40	0.00	0.00	7.37	1,558.92	0.00	0.00	1,497.19	326,011.44
15/11/2019	5:30	49.97	226.50	4.17	0.00	0.00	4.30	915.65	0.00	0.00	862.31	310,102.35
15/11/2019	5:35	50.06	233.74	3.74	2.68	0.00	6.32	783.69	582.08	0.00	1,341.06	319,804.90
15/11/2019	5:40	50.19	224.45	0.00	16.34	0.00	15.35	0.00	3,621.91	0.00	3,478.47	313,701.67
15/11/2019	5:45	50.03	222.60	1.22	0.98	0.00	2.24	258.23	218.71	0.00	493.19	310,539.33
15/11/2019	5:50	50.14	229.29	6.44	0.00	0.00	6.77	1,383.32	0.00	0.00	1,383.32	329,864.36
15/11/2019	5:55	49.93	228.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	329,864.36
15/11/2019	6:00	50.18	225.04	5.50	0.00	0.00	5.54	1,103.07	0.00	0.00	1,103.07	313,944.39
15/11/2019	6:05	50.06	226.17	3.64	0.00	0.00	3.53	728.69	0.00	0.00	728.69	320,414.02
15/11/2019	6:10	50.05	224.86	0.00	15.50	0.00	14.85	0.00	3,338.15	0.00	3,272.05	323,896.34
15/11/2019	6:15	50.07	224.48	0.00	4.06	0.00	3.82	0.00	917.80	0.00	864.34	323,971.34
15/11/2019	6:20	50.17	228.01	7.45	0.00	0.00	7.60	1,510.30	0.00	0.00	1,557.01	320,893.46
15/11/2019	6:25	49.95	225.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	330,520.26
15/11/2019	6:30	50.18	225.61	6.80	0.00	0.00	6.50	1,315.66	0.00	0.00	1,356.35	321,006.49
15/11/2019	6:35	49.97	228.91	0.82	2.99	0.00	3.71	168.05	651.32	0.00	812.84	327,496.41
15/11/2019	6:40	50.03	230.69	0.00	14.21	0.00	14.00	0.00	3,243.08	0.00	3,243.08	318,134.41
15/11/2019	6:45	50.10	226.32	4.20	0.00	0.00	4.18	880.98	0.00	0.00	872.17	318,207.10
15/11/2019	6:50	50.03	230.22	3.84	0.00	0.00	3.81	788.02	0.00	0.00	756.81	315,056.60
15/11/2019	6:55	50.19	230.12	2.93	0.00	0.00	2.84	607.33	0.00	0.00	577.56	331,182.02
15/11/2019	7:00	50.05	227.85	3.47	0.98	0.00	4.60	726.27	223.27	0.00	935.58	318,399.35
15/11/2019	7:05	49.97	228.50	0.00	14.48	0.00	13.96	0.00	3,224.23	0.00	3,160.39	321,881.53
15/11/2019	7:10	49.98	225.39	1.92	2.12	0.00	4.12	408.97	481.33	0.00	870.45	315,516.43
15/11/2019	7:15	49.98	229.93	5.45	0.00	0.00	5.54	1,076.80	0.00	0.00	1,110.10	325,268.53
15/11/2019	7:20	50.08	226.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	312,386.61
15/11/2019	7:25	49.93	226.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	312,386.61
15/11/2019	7:30	50.09	224.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	312,386.61
15/11/2019	7:35	49.99	223.91	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	315,607.09
15/11/2019	7:40	49.97	228.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	331,709.49
15/11/2019	7:45	50.06	232.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	318,827.57
15/11/2019	7:50	49.96	228.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	325,268.53
15/11/2019	7:55	50.13	227.85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	322,048.05
15/11/2019	8:00	50.12	230.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	312,386.61
15/11/2019	8:05	49.97	228.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	325,268.53
15/11/2019	8:10	50.14	233.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	312,386.61
15/11/2019	8:15	50.07	228.00	4.90	3.09	0.00	5.05	964.97	614.67	0.00	1,624.67	315,735.91
15/11/2019	8:20	50.01	227.13	2.63	11.98	0.00	12.75	514.65	2,391.10	0.00	2,984.10	328,874.22
15/11/2019	8:25	50.16	226.86	2.37	12.10	12.57	13.26	460.74	2,394.86	2,329.10	5,219.91	316,403.49
15/11/2019	8:30	49.94	221.91	2.23	14.32	17.30	13.29	452.55	2,592.33	3,220.92	6,318.66	329,855.01
15/11/2019	8:35	50.10	229.56	4.80	11.78	16.95	12.80	950.33	2,460.25	3,374.64	6,461.56	323,942.38

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
15/11/2019	8:40	50.07	226.53	2.38	11.76	7.45	12.47	482.68	2,511.87	1,405.78	4,308.47	330,787.44
15/11/2019	8:45	50.09	232.39	2.47	11.93	10.77	13.77	481.69	2,539.25	2,123.59	5,124.26	324,728.44
15/11/2019	8:50	50.04	230.07	2.42	12.22	13.00	13.07	468.13	2,544.16	2,548.02	5,355.71	321,936.66
15/11/2019	8:55	50.07	228.32	2.70	13.39	6.83	13.50	563.02	2,679.21	1,316.57	4,611.85	322,306.05
15/11/2019	9:00	50.17	228.85	2.37	12.74	7.47	13.00	451.51	2,735.97	1,457.00	4,504.68	325,940.86
15/11/2019	9:05	50.09	225.52	2.45	12.22	11.88	12.90	517.47	2,600.42	2,268.45	5,230.06	332,917.97
15/11/2019	9:10	50.15	226.69	2.16	12.03	9.31	13.80	452.55	2,525.39	1,825.91	4,742.15	330,061.35
15/11/2019	9:15	50.08	224.99	2.33	11.86	6.10	13.30	480.27	2,452.46	1,204.28	4,055.41	317,324.12
15/11/2019	9:20	50.03	226.16	2.47	12.14	7.82	12.08	474.09	2,509.51	1,579.81	4,364.92	320,959.24
15/11/2019	9:25	49.99	228.73	2.57	11.76	14.52	12.45	501.40	2,398.35	2,737.39	5,561.01	324,702.49
15/11/2019	9:30	50.17	225.19	2.62	11.83	7.21	12.03	547.11	2,458.26	1,365.60	4,301.16	325,064.57
15/11/2019	9:35	50.03	227.12	2.96	12.75	5.97	11.95	598.69	2,611.79	1,134.52	4,302.40	325,416.01
15/11/2019	9:40	49.97	226.05	3.03	13.08	12.80	12.57	618.85	2,572.34	2,554.72	5,754.45	329,177.83
15/11/2019	9:45	50.05	228.89	3.03	12.85	11.85	13.10	598.03	2,573.61	2,147.09	5,445.07	332,923.36
15/11/2019	9:50	50.16	231.02	4.37	12.45	6.08	12.88	917.71	2,526.80	1,156.60	4,601.02	330,014.38
15/11/2019	9:55	50.12	230.56	3.47	13.18	8.60	13.29	712.22	2,716.92	1,723.03	4,972.61	337,041.61
15/11/2019	10:00	50.06	229.68	2.32	12.80	13.16	13.17	477.65	2,650.65	2,433.50	5,543.99	337,517.61
15/11/2019	10:05	49.95	227.73	12.65	13.77	10.20	14.50	2,332.26	2,983.20	1,940.62	7,289.32	338,137.20
15/11/2019	10:10	50.01	228.15	44.06	29.58	6.73	41.10	9,807.43	5,895.87	1,275.26	16,919.97	326,245.04
15/11/2019	10:15	49.98	227.19	49.66	30.60	7.95	43.00	11,051.71	6,239.08	1,632.24	18,385.44	337,827.43
15/11/2019	10:20	50.17	225.09	52.37	31.61	12.25	41.48	11,121.51	6,256.01	2,520.97	20,566.13	336,179.48
15/11/2019	10:25	50.01	232.09	55.69	31.00	8.61	46.36	11,882.01	6,514.42	1,732.19	20,565.95	334,464.96
15/11/2019	10:30	50.04	225.88	54.25	32.03	5.43	47.12	11,570.45	6,614.75	1,077.71	18,866.59	346,253.51
15/11/2019	10:35	50.15	231.03	55.24	32.84	10.71	47.12	11,775.87	6,720.90	2,096.11	20,784.20	344,608.21
15/11/2019	10:40	50.04	222.83	51.99	31.75	12.42	43.60	11,530.77	6,384.88	2,367.04	20,826.75	336,056.34
15/11/2019	10:45	50.17	223.75	54.00	33.42	7.03	45.01	11,416.83	7,000.40	1,409.07	20,640.88	341,154.96
15/11/2019	10:50	49.98	226.56	54.55	30.59	5.15	48.96	11,895.15	6,219.14	1,036.49	19,433.07	339,295.98
15/11/2019	10:55	50.05	228.11	60.89	31.10	12.65	48.20	13,095.73	6,644.17	2,364.26	21,739.29	351,530.80
15/11/2019	11:00	50.11	227.42	57.52	31.36	11.64	47.14	12,614.45	6,771.69	2,216.86	21,641.76	339,375.84
15/11/2019	11:05	50.16	225.85	59.36	34.14	15.52	46.87	12,515.13	6,868.38	2,961.35	22,542.65	358,804.92
15/11/2019	11:10	50.10	228.02	59.77	32.98	26.26	38.73	12,470.57	7,034.63	5,114.26	24,607.33	360,939.23
15/11/2019	11:15	50.13	230.38	57.92	34.07	29.60	34.85	12,974.07	6,983.25	6,081.44	26,296.57	352,450.30
15/11/2019	11:20	50.12	223.48	59.23	32.54	28.71	34.92	12,936.38	6,723.21	6,133.47	25,374.84	368,868.72
15/11/2019	11:25	49.96	224.40	51.29	32.50	25.00	31.72	10,891.77	7,098.44	5,072.27	22,747.90	352,820.22
15/11/2019	11:30	50.13	225.29	50.99	32.27	28.18	27.26	10,611.80	6,802.15	5,639.36	22,918.61	361,949.80
15/11/2019	11:35	50.00	223.78	49.59	33.76	30.80	28.18	11,071.36	6,931.49	5,953.82	23,860.20	363,958.24
15/11/2019	11:40	49.97	225.32	53.05	33.86	27.34	29.70	11,277.13	6,865.14	5,818.05	23,022.55	376,914.20
15/11/2019	11:45	50.16	225.42	51.70	33.53	26.42	31.61	11,537.04	7,078.63	5,281.10	23,588.12	360,524.68
15/11/2019	11:50	49.96	232.27	51.31	33.73	29.59	28.15	11,234.47	7,068.99	5,993.79	24,546.36	377,265.66
15/11/2019	11:55	49.94	223.48	46.87	31.60	29.88	26.21	9,665.83	6,677.86	6,203.33	22,413.91	375,472.53
15/11/2019	12:00	49.99	225.73	5.25	15.39	27.40	20.09	1,004.36	3,255.47	5,378.23	10,130.52	372,574.60
15/11/2019	12:05	50.12	229.53	2.90	15.42	25.15	18.13	608.91	3,368.12	5,138.84	9,166.25	377,049.37

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
15/11/2019	12:10	50.11	229.46	3.50	16.58	33.36	24.00	718.10	3,251.74	7,083.70	10,708.04	385,453.55
15/11/2019	12:15	50.15	228.89	4.70	16.07	32.69	23.50	961.98	3,281.46	6,759.59	11,524.66	382,671.68
15/11/2019	12:20	49.94	227.20	3.57	16.67	34.04	23.32	712.06	3,414.21	7,152.92	11,147.42	376,088.07
15/11/2019	12:25	49.97	227.97	3.04	15.54	27.90	19.99	623.15	3,263.88	5,557.48	9,690.22	373,110.95
15/11/2019	12:30	50.04	224.66	3.00	15.62	31.53	23.36	610.57	3,217.47	6,778.05	10,532.80	373,979.91
15/11/2019	12:35	50.09	230.68	3.07	16.63	34.64	23.81	614.62	3,236.46	6,844.25	10,909.45	390,036.06
15/11/2019	12:40	50.18	229.90	3.01	16.37	23.27	15.71	655.55	3,382.33	4,730.17	8,729.81	390,792.94
15/11/2019	12:45	49.98	229.76	3.30	15.97	28.81	19.89	644.38	3,394.45	5,828.56	10,065.55	391,648.34
15/11/2019	12:50	49.99	228.76	3.30	16.73	29.49	20.59	648.05	3,273.70	5,896.59	9,679.78	392,504.89
15/11/2019	12:55	50.11	230.09	5.15	16.01	24.30	16.37	1,062.71	3,431.13	5,106.96	9,530.09	381,859.02
15/11/2019	13:00	50.16	227.40	3.77	16.87	24.83	17.52	782.30	3,456.93	5,309.63	9,472.65	374,987.78
15/11/2019	13:05	50.14	225.13	3.06	18.26	31.21	21.32	624.01	3,711.31	6,100.45	10,648.73	391,180.79
15/11/2019	13:10	50.18	226.55	3.07	18.38	29.56	18.53	616.76	3,616.73	5,704.35	10,406.47	395,883.11
15/11/2019	13:15	50.04	225.71	3.16	18.26	25.54	17.57	622.89	3,554.84	5,356.04	9,746.92	385,141.12
15/11/2019	13:20	50.06	223.90	19.01	19.40	25.64	14.70	4,090.24	3,990.13	5,335.16	12,872.89	393,971.98
15/11/2019	13:25	50.16	223.54	22.21	30.39	28.52	14.84	4,886.72	6,493.99	5,868.23	17,566.29	391,573.36
15/11/2019	13:30	50.02	221.25	23.91	38.80	29.99	20.39	5,115.65	8,649.45	5,963.90	20,261.46	377,655.61
15/11/2019	13:35	50.13	224.22	16.30	38.71	25.81	24.89	3,535.46	8,245.76	5,214.77	17,573.88	402,480.24
15/11/2019	13:40	50.02	224.77	17.64	32.08	25.71	19.30	3,856.57	7,126.12	5,521.70	16,488.95	388,183.60
15/11/2019	13:45	50.09	223.21	12.83	32.67	31.52	22.62	2,628.83	7,281.77	6,341.06	15,649.52	397,369.74
15/11/2019	13:50	49.93	224.61	11.54	32.73	28.20	21.17	2,449.42	6,933.89	5,591.71	15,507.12	398,662.01
15/11/2019	13:55	50.08	222.38	14.44	44.15	25.74	28.40	3,084.32	9,369.51	5,423.49	17,129.09	396,186.43
15/11/2019	14:00	49.96	226.04	17.46	48.91	27.10	29.21	3,864.79	10,546.39	5,464.76	19,845.06	397,823.81
15/11/2019	14:05	50.06	223.15	13.08	49.01	30.00	32.96	2,716.32	10,488.90	6,139.19	18,829.39	387,442.20
15/11/2019	14:10	49.94	226.05	8.81	49.10	27.52	32.30	1,878.66	10,299.85	5,838.00	17,376.27	408,936.11
15/11/2019	14:15	50.11	224.76	19.01	48.80	26.72	29.80	4,063.82	10,780.43	5,383.78	20,342.54	410,631.32
15/11/2019	14:20	49.97	227.83	9.89	50.39	27.67	34.24	2,063.76	10,170.70	5,509.16	18,526.00	408,119.38
15/11/2019	14:25	49.94	221.65	11.83	50.49	17.95	36.57	2,355.82	10,705.28	3,473.47	16,530.19	409,496.89
15/11/2019	14:30	50.00	226.77	15.52	49.00	25.68	34.51	3,277.77	10,179.31	5,387.20	19,485.63	411,104.78
15/11/2019	14:35	50.14	226.03	13.29	49.69	28.22	31.93	2,704.31	10,339.05	5,462.43	18,431.10	412,671.73
15/11/2019	14:40	50.09	227.80	7.82	51.60	26.53	33.90	1,606.19	10,210.82	5,358.21	17,473.56	405,956.14
15/11/2019	14:45	50.08	220.76	11.00	50.30	31.62	33.99	2,277.57	10,882.37	6,419.21	19,052.66	424,010.28
15/11/2019	14:50	50.19	228.60	8.51	49.30	28.61	34.17	1,759.99	10,157.69	5,979.68	17,642.58	404,912.64
15/11/2019	14:55	49.94	221.81	12.52	52.53	25.71	31.68	2,647.25	10,653.51	5,239.70	18,676.30	418,879.85
15/11/2019	15:00	49.93	227.85	15.45	51.22	28.87	36.21	3,164.09	11,124.38	5,779.08	19,328.30	428,884.81
15/11/2019	15:05	50.09	229.66	15.64	53.40	32.73	34.14	3,342.90	11,145.70	6,803.14	21,688.34	409,801.65
15/11/2019	15:10	50.08	224.36	18.13	53.90	31.42	33.32	3,954.66	11,332.38	6,326.06	21,599.58	411,548.15
15/11/2019	15:15	50.13	225.78	16.78	52.63	21.61	39.20	3,658.68	11,046.08	4,117.75	19,435.19	408,873.93
15/11/2019	15:20	49.93	224.50	17.90	54.57	20.47	36.60	3,693.93	10,926.38	4,117.88	19,535.19	427,331.03
15/11/2019	15:25	49.93	223.09	19.06	52.63	32.22	34.07	3,746.28	11,388.73	6,761.97	21,084.27	416,395.05
15/11/2019	15:30	50.14	225.39	15.05	52.70	30.00	32.79	2,980.04	11,135.10	6,230.33	20,937.21	439,384.47
15/11/2019	15:35	50.07	230.03	15.09	53.87	28.48	34.10	3,179.21	10,981.81	5,782.08	20,309.86	423,963.70

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
15/11/2019	15:40	50.16	226.33	18.46	52.00	30.29	30.77	3,818.71	11,237.27	5,896.43	21,147.24	434,273.62
15/11/2019	15:45	50.16	226.89	19.50	52.20	33.46	30.39	3,994.55	10,731.72	6,663.17	21,498.94	444,737.06
15/11/2019	15:50	50.07	223.28	17.20	51.70	29.49	31.14	3,401.37	11,154.81	6,160.67	20,283.65	424,821.11
15/11/2019	15:55	50.08	223.42	22.00	50.57	27.90	31.21	4,570.96	11,021.23	5,723.02	21,264.39	443,950.33
15/11/2019	16:00	50.18	223.55	30.09	50.37	28.62	23.36	6,000.84	10,756.83	6,176.31	22,998.47	445,905.20
15/11/2019	16:05	50.08	227.11	33.46	50.67	27.40	26.52	6,989.63	10,720.43	5,656.49	23,691.41	425,924.60
15/11/2019	16:10	50.00	226.07	35.05	53.46	17.41	31.85	6,994.22	10,638.62	3,166.51	21,264.76	449,686.99
15/11/2019	16:15	49.97	230.00	32.90	51.60	27.64	24.90	6,798.54	10,598.63	5,404.87	22,995.33	429,502.29
15/11/2019	16:20	50.16	223.94	33.73	51.50	27.94	25.20	6,773.63	11,103.92	5,767.02	23,907.63	453,633.89
15/11/2019	16:25	50.01	230.81	33.00	53.25	32.44	21.68	6,552.84	11,140.03	6,402.20	23,794.64	455,676.87
15/11/2019	16:30	50.05	226.61	30.20	51.60	31.43	21.19	6,113.24	10,895.71	6,717.71	23,961.57	448,699.67
15/11/2019	16:35	50.08	229.72	29.90	51.50	28.36	24.06	5,996.90	10,673.59	5,640.70	22,536.55	450,577.72
15/11/2019	16:40	50.19	229.46	31.68	50.99	28.12	23.10	6,537.58	10,576.43	5,827.58	22,399.92	438,927.05
15/11/2019	16:45	50.19	229.14	32.64	49.49	24.00	26.21	6,608.88	10,783.31	4,745.26	22,385.52	454,313.24
15/11/2019	16:50	50.09	224.31	33.33	48.02	7.00	35.96	6,812.37	10,500.54	1,089.75	17,987.57	460,370.32
15/11/2019	16:55	50.04	235.40	33.70	47.63	8.89	35.08	6,809.28	10,402.64	1,329.98	18,004.06	461,916.59
15/11/2019	17:00	49.98	230.64	33.10	49.65	9.31	35.25	6,626.56	10,264.54	1,468.07	18,228.75	449,684.98
15/11/2019	17:05	49.98	228.02	33.43	47.62	9.39	36.00	6,707.53	10,455.12	1,332.10	18,151.01	446,563.56
15/11/2019	17:10	49.93	231.16	16.78	45.30	6.50	36.75	3,426.12	9,789.69	961.99	14,106.18	447,715.32
15/11/2019	17:15	50.03	230.56	16.17	47.79	2.13	35.70	3,251.72	10,126.30	305.61	13,117.95	448,797.33
15/11/2019	17:20	50.10	224.19	16.01	46.40	0.97	36.63	3,328.66	10,006.46	147.55	13,252.03	449,868.54
15/11/2019	17:25	50.09	227.15	16.93	46.40	1.08	36.16	3,388.28	9,496.68	149.69	13,500.88	464,895.93
15/11/2019	17:30	49.94	233.90	15.91	46.04	2.73	37.47	3,342.25	9,602.08	380.56	13,324.57	461,357.35
15/11/2019	17:35	50.12	229.29	14.75	46.90	6.76	37.70	2,950.67	9,583.44	953.74	13,306.24	453,145.86
15/11/2019	17:40	49.96	230.48	17.03	46.90	6.79	37.84	3,525.94	10,155.06	987.09	14,269.60	473,033.31
15/11/2019	17:45	50.10	226.41	15.97	39.58	11.00	27.06	3,188.32	7,845.10	1,973.37	13,452.58	460,049.45
15/11/2019	17:50	50.05	220.13	15.44	46.87	20.20	28.32	3,160.09	9,588.84	3,930.21	16,460.53	461,407.30
15/11/2019	17:55	50.13	225.96	9.41	44.88	19.50	30.80	2,028.60	9,134.04	4,048.75	15,584.20	476,817.96
15/11/2019	18:00	50.07	225.42	10.00	38.99	19.50	26.17	2,150.30	8,264.48	3,944.74	14,031.59	482,768.51
15/11/2019	18:05	50.06	227.29	11.40	38.96	20.30	25.60	2,374.04	8,019.52	4,076.62	14,519.16	483,990.42
15/11/2019	18:10	50.01	225.18	8.13	28.91	18.04	21.42	1,744.04	6,528.67	3,556.23	11,909.04	475,483.00
15/11/2019	18:15	49.94	229.90	9.50	29.87	19.36	19.69	1,966.49	6,481.14	3,615.48	11,711.98	476,478.92
15/11/2019	18:20	50.10	223.24	9.60	22.47	19.31	14.85	1,949.73	4,635.09	3,725.45	10,752.01	491,678.07
15/11/2019	18:25	50.14	226.88	7.76	30.77	19.99	21.34	1,728.84	6,565.82	3,780.79	11,847.33	483,158.91
15/11/2019	18:30	49.97	224.40	8.70	32.03	19.01	21.60	1,865.29	6,907.70	3,637.16	12,672.06	469,812.40
15/11/2019	18:35	50.09	225.85	7.62	22.93	19.39	15.35	1,510.54	4,735.09	3,669.13	10,234.32	480,244.83
15/11/2019	18:40	49.99	224.06	7.65	24.30	18.82	16.32	1,578.44	5,063.71	3,894.61	10,303.61	476,301.01
15/11/2019	18:45	50.13	225.66	11.74	31.11	19.20	18.92	2,645.78	6,524.42	3,670.12	13,091.54	472,527.89
15/11/2019	18:50	50.07	222.03	9.27	30.94	19.11	21.19	1,950.96	6,807.23	3,696.34	12,320.17	497,704.62
15/11/2019	18:55	50.06	223.72	9.41	21.93	20.20	13.77	2,043.22	4,407.14	3,945.98	10,272.08	484,055.90
15/11/2019	19:00	50.03	227.65	7.45	32.18	19.50	21.95	1,605.70	6,823.26	3,721.85	12,721.59	494,786.86
15/11/2019	19:05	50.01	225.60	9.40	33.35	19.40	21.46	1,999.19	7,092.91	3,851.70	12,932.77	471,567.65

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
15/11/2019	19:10	50.15	225.66	8.05	5.45	19.21	13.97	1,735.47	1,097.76	3,730.81	6,447.43	486,706.12
15/11/2019	19:15	50.04	226.70	4.31	14.04	18.72	16.89	964.32	2,955.62	3,852.20	7,440.75	482,471.91
15/11/2019	19:20	49.97	229.05	2.45	20.89	18.90	18.97	557.75	4,679.61	3,596.21	9,022.51	497,836.85
15/11/2019	19:25	50.13	226.28	6.00	16.01	18.24	16.17	1,255.09	3,476.26	3,600.42	8,295.39	498,556.34
15/11/2019	19:30	49.93	225.04	8.22	0.70	19.58	14.01	1,766.00	144.45	3,674.69	5,603.34	503,925.10
15/11/2019	19:35	50.09	227.31	5.39	17.93	19.11	16.83	1,152.74	3,888.06	3,625.71	8,652.96	499,783.14
15/11/2019	19:40	50.06	225.79	7.21	4.80	19.88	14.36	1,387.82	985.70	3,694.50	6,040.87	500,307.09
15/11/2019	19:45	50.14	227.43	1.33	20.58	18.81	18.08	274.43	4,609.71	3,673.31	8,469.82	496,115.00
15/11/2019	19:50	50.05	225.98	5.92	14.60	18.51	14.50	1,142.94	3,195.87	3,508.49	7,831.33	486,950.21
15/11/2019	19:55	50.14	229.31	6.70	1.85	18.89	13.82	1,304.14	361.29	3,656.09	5,414.54	507,080.60
15/11/2019	20:00	50.01	225.61	2.83	21.94	19.36	17.10	566.74	4,714.13	3,583.13	8,541.37	478,253.71
15/11/2019	20:05	49.95	230.44	5.00	19.79	18.24	16.26	1,005.63	4,351.21	3,677.94	9,062.83	483,924.28
15/11/2019	20:10	49.94	230.70	0.82	0.70	19.88	14.84	183.49	133.40	3,828.51	4,107.85	489,197.83
15/11/2019	20:15	50.01	229.07	6.57	18.24	19.79	15.66	1,334.55	4,169.51	3,759.39	9,169.25	504,801.40
15/11/2019	20:20	50.01	228.56	5.82	12.50	19.89	17.37	1,179.16	2,752.40	3,910.23	7,633.30	490,590.40
15/11/2019	20:25	50.14	224.75	3.43	16.97	18.81	15.64	681.19	3,649.76	3,598.65	7,865.31	506,138.97
15/11/2019	20:30	50.19	227.96	2.48	3.64	18.97	14.42	523.47	782.17	3,580.58	5,062.48	486,691.78
15/11/2019	20:35	50.11	228.25	9.21	12.71	19.36	15.35	1,947.68	2,833.89	3,615.91	8,098.72	487,373.63
15/11/2019	20:40	50.07	227.19	6.10	21.11	18.97	14.85	1,234.69	4,536.38	3,708.19	9,294.77	488,132.71
15/11/2019	20:45	50.18	227.24	0.30	1.72	18.99	14.55	73.65	361.05	3,753.10	3,956.85	508,403.22
15/11/2019	20:50	50.07	226.32	9.18	13.46	19.38	15.54	1,791.91	2,880.55	3,780.32	8,322.76	499,128.10
15/11/2019	20:55	50.17	231.18	2.70	20.69	19.58	17.51	548.44	4,401.61	3,756.40	9,016.28	509,854.72
15/11/2019	21:00	50.07	227.74	2.87	1.31	19.38	14.50	585.10	263.20	3,797.30	4,646.18	495,234.79
15/11/2019	21:05	50.07	228.60	7.75	20.68	18.03	14.14	1,553.18	4,464.03	3,617.03	9,964.37	511,064.21
15/11/2019	21:10	50.09	224.23	6.11	20.68	18.41	14.79	1,266.66	4,673.34	3,615.91	9,419.79	511,864.89
15/11/2019	21:15	50.11	229.77	4.44	2.72	18.22	14.42	917.62	509.68	3,596.26	4,827.66	517,310.36
15/11/2019	21:20	50.03	230.69	6.21	20.10	18.50	15.35	1,331.09	4,465.93	3,671.05	9,003.96	503,016.60
15/11/2019	21:25	50.04	228.82	5.80	18.91	18.43	14.70	1,156.23	4,030.77	3,617.27	9,253.46	513,840.58
15/11/2019	21:30	50.14	228.34	3.96	0.00	18.90	15.00	793.52	0.00	3,578.47	4,514.26	509,179.11
15/11/2019	21:35	49.96	228.27	5.92	19.40	18.62	15.71	1,207.12	4,282.81	3,680.11	8,928.48	489,750.04
15/11/2019	21:40	50.09	228.04	6.47	20.10	18.90	14.50	1,351.67	4,324.69	3,716.66	9,623.13	495,562.01
15/11/2019	21:45	50.08	228.88	1.24	1.19	17.95	15.45	247.83	266.78	3,480.71	4,018.51	495,896.89
15/11/2019	21:50	49.98	231.29	9.58	14.94	18.32	14.50	1,952.92	3,314.92	3,639.61	8,936.50	521,957.21
15/11/2019	21:55	50.03	229.64	3.80	10.09	18.13	16.32	766.35	2,291.74	3,524.84	6,565.86	492,088.03
15/11/2019	22:00	49.95	226.62	6.53	0.00	18.87	15.20	1,298.01	6.24	3,619.95	4,780.47	497,563.58
15/11/2019	22:05	50.19	225.98	7.92	3.23	19.47	14.06	1,646.71	689.59	3,543.24	5,978.15	498,051.80
15/11/2019	22:10	50.02	223.32	4.60	20.30	19.47	15.45	929.43	4,519.63	3,655.09	9,062.24	514,053.47
15/11/2019	22:15	50.05	226.43	3.86	19.80	18.52	15.33	780.20	4,359.24	3,710.04	9,013.62	494,409.23
15/11/2019	22:20	50.08	230.32	2.27	3.40	18.41	15.04	447.66	730.63	3,596.36	4,760.18	494,797.90
15/11/2019	22:25	50.09	226.57	8.00	11.54	19.06	13.64	1,632.06	2,358.31	3,525.19	7,644.28	515,845.33
15/11/2019	22:30	49.93	230.14	0.00	19.21	18.12	16.83	0.00	4,236.59	3,630.53	8,029.81	501,159.86
15/11/2019	22:35	49.97	231.61	0.00	19.11	18.13	16.70	6.24	4,344.25	3,724.77	7,723.85	501,803.51

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
15/11/2019	22:40	49.97	223.14	5.36	5.36	18.62	14.28	1,078.33	1,098.43	3,765.93	5,812.70	507,408.34
15/11/2019	22:45	49.99	221.87	8.59	4.95	18.52	16.27	1,762.80	1,120.26	3,599.73	6,612.60	513,073.93
15/11/2019	22:50	49.93	228.78	0.00	12.71	18.50	16.10	0.00	2,889.46	3,597.30	6,586.31	503,334.66
15/11/2019	22:55	50.19	222.73	10.30	12.71	18.87	13.90	2,125.58	2,895.34	3,638.96	8,215.75	519,455.75
15/11/2019	23:00	50.09	226.64	0.00	20.39	18.38	17.65	0.00	4,532.97	3,417.49	7,851.05	504,680.63
15/11/2019	23:05	49.95	225.39	9.48	21.42	18.28	13.56	1,804.69	4,575.36	3,471.26	9,797.92	531,279.12
15/11/2019	23:10	49.98	228.15	3.33	7.94	18.38	15.35	663.67	1,805.57	3,437.03	5,907.01	505,976.15
15/11/2019	23:15	50.01	226.90	7.83	11.21	17.82	12.67	1,590.89	2,362.09	3,487.40	7,218.98	506,583.93
15/11/2019	23:20	50.10	231.66	11.27	18.03	18.71	12.60	2,302.35	4,001.48	3,606.58	10,207.42	502,223.63
15/11/2019	23:25	50.11	225.45	0.00	21.42	19.36	17.88	0.00	4,631.48	3,761.94	7,947.25	533,992.24
15/11/2019	23:30	49.95	223.96	7.14	7.55	19.57	13.77	1,389.97	1,572.53	3,662.39	6,791.82	534,569.43
15/11/2019	23:35	50.12	230.72	12.51	13.46	18.30	12.97	2,605.51	2,996.47	3,525.20	8,859.13	509,365.34
15/11/2019	23:40	50.19	233.17	0.00	21.42	17.64	17.13	0.00	4,497.67	3,382.19	7,995.50	510,024.90
15/11/2019	23:45	49.97	224.79	6.90	19.57	17.88	14.40	1,367.78	4,107.29	3,420.15	9,054.27	515,968.81
15/11/2019	23:50	49.95	228.65	10.10	3.10	17.35	13.39	2,054.22	661.70	3,428.17	6,226.20	506,043.50
15/11/2019	23:55	50.08	224.99	2.90	14.40	18.75	16.17	592.65	3,080.61	3,412.92	7,472.23	537,967.85
16/11/2019	0:00	50.06	228.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	0:05	50.12	228.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	0:10	49.94	228.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	0:15	50.07	228.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	0:20	50.02	228.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	0:25	50.18	228.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	0:30	50.06	228.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	0:35	49.95	229.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	0:40	50.07	229.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	0:45	49.96	229.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	0:50	50.14	228.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	0:55	50.13	228.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	1:00	49.97	228.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	1:05	50.18	228.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	1:10	49.96	228.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	1:15	49.94	228.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	1:20	50.10	228.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	1:25	50.05	228.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	1:30	49.95	228.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	1:35	49.98	228.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	1:40	50.01	228.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	1:45	50.00	229.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	1:50	50.06	229.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	1:55	50.16	229.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	2:00	50.00	229.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	2:05	50.09	229.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
16/11/2019	2:10	50.12	229.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	2:15	50.04	229.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	2:20	50.01	229.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	2:25	49.95	229.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	2:30	50.10	229.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	2:35	50.06	229.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	2:40	50.10	229.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	2:45	49.99	230.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	2:50	50.12	230.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	2:55	50.17	230.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	3:00	49.99	230.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	3:05	50.05	230.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	3:10	49.96	229.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	3:15	49.98	230.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	3:20	50.13	230.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	3:25	50.18	230.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	3:30	49.94	229.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	3:35	50.10	229.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	3:40	50.15	230.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	3:45	50.19	230.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	3:50	50.00	230.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	3:55	50.19	229.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	4:00	49.93	229.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	4:05	50.09	229.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	4:10	50.18	230.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	4:15	49.93	230.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	4:20	50.11	229.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	4:25	50.14	229.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	4:30	49.96	229.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	4:35	50.04	229.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	4:40	50.03	230.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	4:45	50.09	230.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	4:50	50.17	230.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	4:55	50.11	230.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	5:00	50.12	229.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	5:05	50.11	229.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	5:10	50.04	230.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	5:15	50.06	229.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	5:20	50.17	229.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	5:25	50.02	229.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	5:30	50.12	229.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	5:35	49.93	229.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
16/11/2019	5:40	50.06	229.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	5:45	50.10	229.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	5:50	50.00	229.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	5:55	50.19	228.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	6:00	49.98	229.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	6:05	49.93	229.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	6:10	50.04	229.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	6:15	49.93	230.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	6:20	50.18	230.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	6:25	50.07	229.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	6:30	50.19	229.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	6:35	50.09	229.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	6:40	49.93	230.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	6:45	49.98	230.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	6:50	50.10	230.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	6:55	50.09	230.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	7:00	50.02	230.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	7:05	50.16	230.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	7:10	49.95	231.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	7:15	49.97	231.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	7:20	49.97	231.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	7:25	50.04	231.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	7:30	49.95	231.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	7:35	49.99	231.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	7:40	50.18	231.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	7:45	50.09	231.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	7:50	50.16	231.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	7:55	50.08	229.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	8:00	50.12	229.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	8:05	50.11	228.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	8:10	50.16	228.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	8:15	50.07	228.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	8:20	50.13	227.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	8:25	50.19	227.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	8:30	50.15	226.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	8:35	50.07	226.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	8:40	50.12	226.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	8:45	49.94	227.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	8:50	50.19	227.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	8:55	50.09	227.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	9:00	49.94	227.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	9:05	50.03	227.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
16/11/2019	9:10	50.00	227.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	9:15	49.93	227.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	9:20	50.13	227.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	9:25	50.01	226.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	9:30	49.93	226.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	9:35	49.99	226.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	9:40	50.16	226.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	9:45	49.96	227.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	9:50	49.96	227.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	9:55	50.14	228.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	10:00	50.17	229.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	10:05	50.18	229.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	10:10	50.10	228.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	10:15	49.96	228.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	10:20	50.05	228.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	10:25	50.11	228.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	10:30	50.18	228.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	10:35	50.01	228.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	10:40	50.04	229.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	10:45	50.06	229.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	10:50	50.02	229.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	10:55	50.11	228.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	11:00	50.09	229.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	11:05	49.99	228.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	11:10	49.99	228.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	11:15	49.93	228.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	11:20	50.05	229.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	11:25	50.07	229.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	11:30	49.95	229.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	11:35	50.17	229.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	11:40	50.07	229.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	11:45	50.02	229.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	11:50	50.03	229.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
16/11/2019	11:55	50.14	229.47	0.00	0.00	0.00	0.00	4.34	0.00	0.00	4.34	540,338.97
16/11/2019	12:00	49.96	229.33	0.00	10.60	0.00	10.10	0.00	2,375.72	0.00	2,375.72	540,536.95
16/11/2019	12:05	50.13	229.40	0.00	16.90	0.00	16.30	0.00	3,794.40	0.00	3,794.40	540,853.15
16/11/2019	12:10	50.06	229.30	0.00	17.50	0.00	16.80	0.00	3,939.50	0.00	3,939.50	541,181.44
16/11/2019	12:15	50.17	229.43	0.00	17.20	0.00	16.60	0.00	3,890.75	0.00	3,890.75	541,505.67
16/11/2019	12:20	50.16	229.30	0.00	17.10	0.00	16.50	0.00	3,855.53	0.00	3,855.53	541,826.96
16/11/2019	12:25	50.15	229.10	0.00	17.10	0.00	16.50	0.00	3,853.39	0.00	3,853.39	542,148.08
16/11/2019	12:30	50.14	229.00	0.00	17.10	0.00	16.50	0.00	3,862.15	0.00	3,862.15	542,469.93
16/11/2019	12:35	49.93	229.00	0.00	17.10	0.00	16.50	0.00	3,855.95	0.00	3,855.95	542,791.25

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
16/11/2019	12:40	50.10	229.33	0.00	17.00	0.00	16.40	0.00	3,856.42	0.00	3,856.42	543,112.62
16/11/2019	12:45	49.94	229.17	0.00	17.00	0.00	16.30	0.00	3,847.18	0.00	3,847.18	543,433.22
16/11/2019	12:50	49.95	229.07	0.00	17.10	0.00	16.40	0.00	3,857.20	0.00	3,857.20	543,754.65
16/11/2019	12:55	50.04	228.93	0.00	17.60	0.00	17.00	0.00	3,969.48	0.00	3,969.48	544,085.44
16/11/2019	13:00	50.05	228.80	0.00	17.80	0.00	17.20	0.00	4,004.27	0.00	4,004.27	544,419.13
16/11/2019	13:05	49.95	228.73	0.00	17.40	0.00	16.90	0.00	3,919.33	0.00	3,919.33	544,745.74
16/11/2019	13:10	50.19	228.53	0.00	17.30	0.00	16.90	0.00	3,886.11	0.00	3,886.11	545,069.59
16/11/2019	13:15	49.99	228.73	0.00	17.00	0.00	16.70	0.00	3,838.56	0.00	3,838.56	545,389.47
16/11/2019	13:20	50.00	228.43	0.00	16.80	0.00	16.40	0.00	3,791.72	0.00	3,791.72	545,705.44
16/11/2019	13:25	50.10	228.47	0.00	16.80	0.00	16.40	0.00	3,784.87	0.00	3,784.87	546,020.85
16/11/2019	13:30	49.97	228.63	0.00	16.80	0.00	16.50	0.00	3,788.14	0.00	3,788.14	546,336.53
16/11/2019	13:35	49.94	228.73	0.00	16.80	0.00	16.50	0.00	3,780.59	0.00	3,780.59	546,651.58
16/11/2019	13:40	49.98	228.57	0.00	16.80	0.00	16.20	0.00	3,781.26	0.00	3,781.26	546,966.68
16/11/2019	13:45	50.09	228.30	0.00	17.20	0.00	16.60	0.00	3,867.76	0.00	3,867.76	547,289.00
16/11/2019	13:50	49.97	227.90	0.00	17.20	0.00	16.60	0.00	3,855.71	0.00	3,855.71	547,610.30
16/11/2019	13:55	50.05	228.60	0.00	17.40	0.00	16.70	0.00	3,908.43	0.00	3,908.43	547,936.01
16/11/2019	14:00	50.15	229.20	0.00	17.30	0.00	16.60	0.00	3,909.64	0.00	3,909.64	548,261.81
16/11/2019	14:05	49.94	229.27	0.00	17.30	0.00	16.60	0.00	3,906.24	0.00	3,906.24	548,587.33
16/11/2019	14:10	50.09	229.27	0.00	17.30	0.00	16.70	0.00	3,905.66	0.00	3,905.66	548,912.80
16/11/2019	14:15	49.97	229.33	0.00	17.30	0.00	16.70	0.00	3,910.08	0.00	3,910.08	549,238.64
16/11/2019	14:20	49.95	229.33	0.00	17.00	0.00	16.40	0.00	3,834.81	0.00	3,834.81	549,558.21
16/11/2019	14:25	50.09	229.40	0.00	17.60	0.00	16.90	0.00	3,946.35	0.00	3,946.35	549,887.07
16/11/2019	14:30	50.07	229.33	13.40	18.20	0.00	15.80	2,489.37	4,036.38	0.00	6,525.75	550,430.88
16/11/2019	14:35	50.03	229.60	19.10	18.70	0.00	15.10	3,579.33	4,146.84	0.00	7,726.17	551,074.73
16/11/2019	14:40	50.15	229.50	19.30	18.90	0.00	15.30	3,636.44	4,191.10	0.00	7,827.54	551,727.03
16/11/2019	14:45	49.99	229.63	19.40	18.60	0.00	15.10	3,677.08	4,136.29	0.00	7,813.37	552,378.14
16/11/2019	14:50	50.03	229.67	19.50	18.50	0.00	14.90	3,701.69	4,104.01	0.00	7,805.71	553,028.62
16/11/2019	14:55	49.99	229.83	19.50	18.50	0.00	14.90	3,713.24	4,112.40	0.00	7,825.63	553,680.75
16/11/2019	15:00	49.96	229.83	19.50	19.00	0.00	15.20	3,706.69	4,222.02	0.00	7,928.70	554,341.48
16/11/2019	15:05	50.07	230.17	19.60	19.00	0.00	15.30	3,737.32	4,220.95	0.00	7,958.27	555,004.67
16/11/2019	15:10	50.18	230.73	19.70	7.20	0.00	17.60	3,734.71	1,598.44	0.00	5,333.15	555,449.10
16/11/2019	15:15	50.07	230.90	19.80	0.00	0.00	19.30	3,759.57	0.00	0.00	3,759.57	555,762.39
16/11/2019	15:20	50.19	230.73	19.90	0.00	0.00	19.60	3,779.26	0.00	0.00	3,779.26	556,077.33
16/11/2019	15:25	49.93	230.63	19.80	0.00	0.00	19.60	3,747.86	0.00	0.00	3,747.86	556,389.65
16/11/2019	15:30	50.08	230.30	19.80	0.00	0.00	19.30	3,743.53	0.00	0.00	3,743.53	556,701.61
16/11/2019	15:35	50.01	230.23	19.70	0.00	0.00	19.20	3,736.06	0.00	0.00	3,736.06	557,012.95
16/11/2019	15:40	50.18	229.93	19.60	0.00	0.00	19.10	3,700.13	0.00	0.00	3,700.13	557,321.30
16/11/2019	15:45	50.18	230.57	19.60	0.00	0.00	19.00	3,702.07	0.00	0.00	3,702.07	557,629.80
16/11/2019	15:50	50.16	231.00	19.60	0.00	0.00	19.10	3,683.21	0.00	0.00	3,683.21	557,936.74
16/11/2019	15:55	49.97	229.40	19.40	4.10	0.00	18.60	3,662.05	900.33	0.00	4,562.38	558,316.94
16/11/2019	16:00	49.98	229.20	19.10	18.90	0.00	15.50	3,597.25	4,179.88	0.00	7,777.13	558,965.03
16/11/2019	16:05	49.96	229.13	19.10	19.20	0.00	15.30	3,587.54	4,235.68	0.00	7,823.22	559,616.96

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
16/11/2019	16:10	49.99	229.20	18.90	18.60	0.00	14.70	3,544.61	4,119.10	0.00	7,663.70	560,255.61
16/11/2019	16:15	49.96	228.93	18.90	18.60	0.00	14.70	3,531.63	4,117.95	0.00	7,649.58	560,893.07
16/11/2019	16:20	50.12	228.90	18.80	18.60	0.00	14.60	3,507.13	4,119.81	0.00	7,626.94	561,528.65
16/11/2019	16:25	50.16	228.80	18.70	18.70	0.00	14.70	3,490.55	4,121.25	0.00	7,611.80	562,162.97
16/11/2019	16:30	50.04	228.73	18.70	18.20	0.00	14.80	3,486.81	4,030.24	0.00	7,517.06	562,789.39
16/11/2019	16:35	50.13	228.77	19.00	18.30	0.00	14.90	3,549.52	4,050.13	0.00	7,599.65	563,422.69
16/11/2019	16:40	49.97	228.77	19.30	18.30	0.00	14.70	3,603.00	4,051.82	0.00	7,654.82	564,060.59
16/11/2019	16:45	50.00	228.73	19.40	18.30	0.00	14.60	3,625.55	4,044.80	0.00	7,670.35	564,699.79
16/11/2019	16:50	50.02	228.63	19.40	18.30	0.00	14.60	3,618.46	4,048.59	0.00	7,667.05	565,338.71
16/11/2019	16:55	49.96	228.47	19.10	18.30	0.00	14.30	3,525.41	4,041.89	0.00	7,567.30	565,969.32
16/11/2019	17:00	49.96	228.33	18.90	18.30	0.00	14.40	3,492.23	4,040.48	0.00	7,532.71	566,597.04
16/11/2019	17:05	50.17	227.97	18.90	18.40	0.00	14.50	3,464.13	4,052.99	0.00	7,517.12	567,223.47
16/11/2019	17:10	50.09	227.63	18.80	18.60	0.00	14.60	3,450.35	4,106.41	0.00	7,556.76	567,853.20
16/11/2019	17:15	50.19	229.27	18.90	18.10	0.00	14.00	3,450.32	4,020.92	0.00	7,471.24	568,475.80
16/11/2019	17:20	50.17	229.67	18.90	18.00	0.00	13.60	3,413.98	4,013.03	0.00	7,427.01	569,094.72
16/11/2019	17:25	49.95	230.50	18.80	18.00	0.00	13.50	3,404.41	4,024.81	0.00	7,429.22	569,713.82
16/11/2019	17:30	50.04	230.93	18.90	18.00	0.00	13.40	3,396.56	4,022.59	0.00	7,419.14	570,332.08
16/11/2019	17:35	50.14	230.97	19.40	17.70	0.00	13.70	3,504.71	3,960.82	0.00	7,465.53	570,954.21
16/11/2019	17:40	50.10	230.20	20.40	17.70	0.00	14.20	3,706.50	3,949.23	0.00	7,655.74	571,592.19
16/11/2019	17:45	50.13	229.60	20.40	17.60	0.00	14.10	3,686.32	3,921.32	0.00	7,607.65	572,226.16
16/11/2019	17:50	49.99	228.47	12.70	17.30	0.00	14.60	2,296.58	3,850.85	0.00	6,147.43	572,738.45
16/11/2019	17:55	50.14	228.07	0.00	16.60	0.00	17.40	0.00	3,743.94	0.00	3,743.94	573,050.44
16/11/2019	18:00	49.93	228.53	0.00	16.50	0.00	17.50	0.00	3,707.31	0.00	3,707.31	573,359.38
16/11/2019	18:05	50.04	227.63	0.00	16.30	0.00	17.40	0.00	3,665.26	0.00	3,665.26	573,664.82
16/11/2019	18:10	50.16	228.87	0.00	16.10	0.00	17.20	0.00	3,629.17	0.00	3,629.17	573,967.25
16/11/2019	18:15	49.99	228.77	0.00	16.50	0.00	17.50	0.00	3,711.98	0.00	3,711.98	574,276.58
16/11/2019	18:20	50.02	229.57	0.00	9.80	0.00	10.50	0.00	2,226.53	0.00	2,226.53	574,462.13
16/11/2019	18:25	50.09	230.30	0.00	10.20	0.00	10.70	0.00	2,297.00	0.00	2,297.00	574,653.55
16/11/2019	18:30	50.11	229.27	0.00	2.00	0.00	2.10	0.00	455.42	0.00	455.42	574,691.50
16/11/2019	18:35	50.07	227.57	0.00	17.80	0.00	17.60	0.00	3,985.25	0.00	3,985.25	575,023.60
16/11/2019	18:40	50.14	227.83	0.00	18.80	0.00	18.10	0.00	4,238.57	0.00	4,238.57	575,376.82
16/11/2019	18:45	50.02	228.23	0.00	18.60	0.00	17.80	0.00	4,205.90	0.00	4,205.90	575,727.31
16/11/2019	18:50	50.18	228.40	0.00	18.60	0.00	17.80	0.00	4,213.73	0.00	4,213.73	576,078.45
16/11/2019	18:55	50.03	228.27	0.00	18.70	0.00	17.90	0.00	4,223.16	0.00	4,223.16	576,430.38
16/11/2019	19:00	50.09	228.37	0.00	18.70	0.00	17.80	0.00	4,225.93	0.00	4,225.93	576,782.54
16/11/2019	19:05	49.99	227.83	0.00	18.70	0.00	18.00	0.00	4,230.02	0.00	4,230.02	577,135.05
16/11/2019	19:10	50.18	227.80	0.00	18.60	0.00	17.80	0.00	4,191.83	0.00	4,191.83	577,484.36
16/11/2019	19:15	49.98	227.80	0.00	17.40	0.00	16.80	0.00	3,917.19	0.00	3,917.19	577,810.80
16/11/2019	19:20	50.15	227.80	0.00	16.90	0.00	16.30	0.00	3,792.25	0.00	3,792.25	578,126.82
16/11/2019	19:25	50.03	228.07	0.00	16.90	0.00	16.30	0.00	3,796.39	0.00	3,796.39	578,443.18
16/11/2019	19:30	50.02	228.13	0.00	16.80	0.00	16.20	0.00	3,777.60	0.00	3,777.60	578,757.98
16/11/2019	19:35	49.98	228.17	0.00	16.80	0.00	16.40	0.00	3,778.41	0.00	3,778.41	579,072.85

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
16/11/2019	19:40	49.93	228.43	0.00	10.00	0.00	9.30	4.74	2,251.49	0.00	2,256.23	579,260.87
16/11/2019	19:45	50.06	228.10	0.00	13.60	0.00	12.20	0.00	3,045.35	0.00	3,045.35	579,514.65
16/11/2019	19:50	50.12	226.83	0.00	16.20	0.00	14.70	0.00	3,632.30	0.00	3,632.30	579,817.34
16/11/2019	19:55	50.02	227.10	0.00	12.50	0.00	11.30	0.00	2,813.47	0.00	2,813.47	580,051.80
16/11/2019	20:00	50.08	227.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	580,051.80
16/11/2019	20:05	49.96	226.87	0.00	14.60	0.00	13.20	0.00	3,248.78	0.00	3,248.78	580,322.53
16/11/2019	20:10	49.95	227.00	0.00	16.10	0.00	14.60	0.00	3,594.31	0.00	3,594.31	580,622.05
16/11/2019	20:15	50.01	226.77	0.00	10.70	0.00	9.90	0.00	2,391.25	0.00	2,391.25	580,821.32
16/11/2019	20:20	50.18	226.77	0.00	8.10	0.00	7.50	0.00	1,819.26	0.00	1,819.26	580,972.93
16/11/2019	20:25	50.03	227.00	0.00	16.40	0.00	15.10	0.00	3,660.16	0.00	3,660.16	581,277.94
16/11/2019	20:30	50.17	227.23	0.00	16.90	0.00	15.10	5.63	3,766.14	0.00	3,771.77	581,592.26
16/11/2019	20:35	50.15	227.37	0.00	16.90	0.00	14.80	0.00	3,786.73	0.00	3,786.73	581,907.82
16/11/2019	20:40	50.02	227.47	0.00	19.50	0.00	17.20	0.00	4,338.69	0.00	4,338.69	582,269.38
16/11/2019	20:45	50.06	227.37	0.00	3.70	0.00	3.70	0.00	807.09	0.00	807.09	582,336.63
16/11/2019	20:50	49.99	227.73	0.00	16.90	0.00	15.10	0.00	3,761.82	0.00	3,761.82	582,650.12
16/11/2019	20:55	50.14	227.67	0.00	17.90	0.00	15.80	0.00	3,989.08	0.00	3,989.08	582,982.54
16/11/2019	21:00	49.95	227.33	0.00	16.50	0.00	14.50	0.00	3,683.37	0.00	3,683.37	583,289.49
16/11/2019	21:05	50.19	227.13	0.00	8.20	0.00	7.30	0.00	1,853.98	0.00	1,853.98	583,443.99
16/11/2019	21:10	50.01	227.40	0.00	6.90	0.00	6.10	0.00	1,545.69	0.00	1,545.69	583,572.79
16/11/2019	21:15	50.15	227.67	0.00	11.20	0.00	10.00	0.00	2,520.05	0.00	2,520.05	583,782.80
16/11/2019	21:20	50.10	227.80	0.00	9.50	0.00	9.00	0.00	2,110.44	0.00	2,110.44	583,958.67
16/11/2019	21:25	50.16	227.43	0.00	15.90	0.00	14.30	0.00	3,574.73	0.00	3,574.73	584,256.56
16/11/2019	21:30	50.18	226.33	0.00	16.30	0.00	14.70	0.00	3,650.65	0.00	3,650.65	584,560.78
16/11/2019	21:35	49.93	226.57	0.00	16.80	0.00	14.80	5.66	3,749.60	0.00	3,755.26	584,873.72
16/11/2019	21:40	50.13	226.63	0.00	9.80	0.00	8.60	0.00	2,200.21	0.00	2,200.21	585,057.07
16/11/2019	21:45	50.04	227.17	0.00	9.30	0.00	8.40	0.00	2,085.12	0.00	2,085.12	585,230.83
16/11/2019	21:50	50.01	227.03	0.00	19.30	0.00	17.30	0.00	4,346.59	0.00	4,346.59	585,593.05
16/11/2019	21:55	49.99	227.07	0.00	16.50	0.00	14.80	0.00	3,701.10	0.00	3,701.10	585,901.47
16/11/2019	22:00	50.08	226.80	0.00	6.80	0.00	6.10	0.00	1,527.61	0.00	1,527.61	586,028.77
16/11/2019	22:05	49.97	226.43	0.00	16.70	0.00	15.00	0.00	3,709.71	0.00	3,709.71	586,337.92
16/11/2019	22:10	50.18	227.37	0.00	17.80	0.00	16.10	0.00	3,964.94	0.00	3,964.94	586,668.33
16/11/2019	22:15	49.93	227.10	0.00	4.30	0.00	4.10	0.00	948.64	0.00	948.64	586,747.38
16/11/2019	22:20	49.99	227.20	5.70	14.30	0.00	12.90	1,126.67	3,172.48	0.00	4,299.15	587,105.64
16/11/2019	22:25	49.95	227.27	8.30	2.10	0.00	7.90	1,665.61	470.78	0.00	2,136.39	587,283.68
16/11/2019	22:30	50.06	227.37	10.70	0.00	0.00	10.60	2,153.05	0.00	0.00	2,153.05	587,463.10
16/11/2019	22:35	50.14	227.43	3.50	0.00	0.00	3.50	710.74	0.00	0.00	710.74	587,522.33
16/11/2019	22:40	49.99	227.43	11.90	4.00	0.00	15.00	2,404.59	895.26	0.00	3,299.85	587,797.31
16/11/2019	22:45	50.13	227.73	0.00	16.50	0.00	15.00	0.00	3,694.38	0.00	3,694.38	588,105.18
16/11/2019	22:50	50.00	227.77	8.30	6.30	0.00	7.90	1,697.85	1,410.55	0.00	3,108.39	588,364.21
16/11/2019	22:55	50.05	227.70	8.20	0.00	0.00	8.00	1,674.31	0.00	0.00	1,674.31	588,503.74
16/11/2019	23:00	50.08	227.83	2.40	0.00	0.00	2.40	489.38	0.00	0.00	489.38	588,544.52
16/11/2019	23:05	49.97	227.93	8.20	1.50	0.00	9.60	1,679.66	328.26	0.00	2,007.92	588,711.85

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
16/11/2019	23:10	49.94	228.13	8.20	16.30	0.00	15.50	1,686.86	3,645.74	0.00	5,332.60	589,156.23
16/11/2019	23:15	50.19	228.37	0.00	16.70	0.00	15.30	0.00	3,726.57	0.00	3,726.57	589,466.78
16/11/2019	23:20	50.10	228.80	8.20	2.30	0.00	10.20	1,677.29	519.54	0.00	2,196.83	589,649.85
16/11/2019	23:25	50.02	228.93	1.30	0.00	0.00	1.30	275.96	0.00	0.00	275.96	589,672.84
16/11/2019	23:30	49.94	228.80	8.40	14.90	0.00	15.80	1,736.64	3,326.82	0.00	5,063.46	590,094.80
16/11/2019	23:35	50.06	228.77	0.00	15.00	0.00	13.80	0.00	3,351.02	0.00	3,351.02	590,374.05
16/11/2019	23:40	50.01	228.87	8.90	0.00	0.00	9.00	1,821.58	0.00	0.00	1,821.58	590,525.85
16/11/2019	23:45	50.02	228.97	7.70	0.00	0.00	7.70	1,566.46	0.00	0.00	1,566.46	590,656.39
16/11/2019	23:50	49.97	229.03	4.10	0.00	0.00	4.10	834.84	0.00	0.00	834.84	590,725.96
16/11/2019	23:55	49.97	229.00	11.00	4.40	0.00	10.50	2,252.22	978.53	0.00	3,230.75	590,995.18
17/11/2019	0:00	49.95	227.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	0:05	50.03	227.85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	0:10	50.11	229.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
17/11/2019	0:15	49.94	226.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	0:20	49.94	228.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	0:25	50.05	229.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
17/11/2019	0:30	50.04	228.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
17/11/2019	0:35	50.14	229.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
17/11/2019	0:40	50.13	228.91	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	0:45	50.15	228.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	0:50	50.12	227.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	0:55	50.18	229.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	1:00	49.93	229.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	1:05	50.15	230.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
17/11/2019	1:10	49.99	229.96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	1:15	50.00	229.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
17/11/2019	1:20	49.97	227.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	1:25	49.94	228.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	1:30	50.14	230.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
17/11/2019	1:35	50.00	227.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	1:40	50.07	229.66	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	1:45	50.09	226.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	1:50	50.15	228.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	1:55	49.96	230.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
17/11/2019	2:00	50.08	228.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
17/11/2019	2:05	50.06	230.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
17/11/2019	2:10	50.09	228.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	2:15	50.03	231.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	2:20	50.19	228.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	2:25	50.12	229.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	2:30	50.05	229.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
17/11/2019	2:35	50.05	230.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
17/11/2019	2:40	50.05	229.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	2:45	50.10	229.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	2:50	50.11	231.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	2:55	50.12	229.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	3:00	50.00	228.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	3:05	49.98	229.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	3:10	50.11	229.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
17/11/2019	3:15	50.14	229.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
17/11/2019	3:20	49.97	230.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	3:25	50.14	230.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
17/11/2019	3:30	50.03	230.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	3:35	49.98	228.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
17/11/2019	3:40	50.17	230.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	3:45	50.13	231.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	3:50	50.02	228.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	3:55	50.11	229.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	4:00	50.11	229.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	4:05	50.05	228.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
17/11/2019	4:10	50.08	229.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	4:15	50.19	230.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	4:20	50.18	230.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	4:25	49.94	229.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	4:30	49.93	227.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	4:35	50.11	229.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
17/11/2019	4:40	50.00	229.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	4:45	50.01	230.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
17/11/2019	4:50	50.03	230.91	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	4:55	50.16	229.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	5:00	49.98	227.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	5:05	49.96	230.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	5:10	50.00	228.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	5:15	50.12	231.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
17/11/2019	5:20	50.08	228.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	5:25	49.99	230.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
17/11/2019	5:30	50.12	230.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	5:35	50.07	228.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	5:40	50.05	228.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
17/11/2019	5:45	49.99	228.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	5:50	50.14	228.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	5:55	50.08	230.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	6:00	50.09	228.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	6:05	49.97	229.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
17/11/2019	6:10	50.06	231.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	6:15	50.10	231.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	6:20	49.96	229.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	6:25	50.11	229.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
17/11/2019	6:30	49.97	228.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
17/11/2019	6:35	50.03	229.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
17/11/2019	6:40	50.11	229.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	6:45	50.14	232.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	6:50	50.09	230.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	6:55	50.16	229.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
17/11/2019	7:00	50.11	232.91	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	7:05	50.00	230.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	7:10	50.06	230.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
17/11/2019	7:15	50.17	231.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	7:20	50.19	230.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
17/11/2019	7:25	50.08	232.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	7:30	50.12	233.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	7:35	50.14	231.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	7:40	50.06	230.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
17/11/2019	7:45	49.95	231.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
17/11/2019	7:50	50.09	231.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	7:55	49.94	230.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	8:00	49.97	229.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
17/11/2019	8:05	50.13	228.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	8:10	50.19	226.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	8:15	49.96	227.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
17/11/2019	8:20	50.01	225.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	8:25	49.96	226.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	8:30	49.93	226.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	8:35	50.11	226.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	8:40	50.04	226.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	8:45	50.06	228.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	8:50	49.99	226.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	8:55	50.09	225.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	9:00	50.11	227.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	9:05	49.96	227.89	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	9:10	50.18	227.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
17/11/2019	9:15	50.07	228.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	9:20	50.02	225.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	9:25	50.14	226.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	9:30	49.93	227.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
17/11/2019	9:35	50.01	227.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
17/11/2019	9:40	50.08	226.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
17/11/2019	9:45	49.97	228.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	9:50	50.08	227.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	9:55	50.06	228.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	10:00	50.00	230.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	10:05	50.01	229.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	10:10	50.02	226.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	10:15	49.98	230.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	10:20	50.02	229.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
17/11/2019	10:25	49.96	227.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	10:30	50.03	229.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	10:35	50.03	229.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	10:40	50.11	227.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	10:45	50.02	230.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	10:50	50.07	229.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	10:55	50.02	228.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	540,338.61
17/11/2019	11:00	50.11	229.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	11:05	49.97	230.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	11:10	50.06	229.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	11:15	50.02	229.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	11:20	50.05	229.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	11:25	50.13	230.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	11:30	50.02	227.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	11:35	50.14	229.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	545,742.00
17/11/2019	11:40	50.09	230.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	11:45	50.00	231.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	11:50	49.95	229.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534,935.22
17/11/2019	11:55	49.96	229.47	0.00	0.00	0.00	0.00	4.38	0.00	0.00	4.30	534,935.58
17/11/2019	12:00	50.10	228.57	0.00	10.49	0.00	10.10	0.00	2,375.72	0.00	2,399.48	535,131.58
17/11/2019	12:05	50.18	229.41	0.00	16.90	0.00	16.46	0.00	3,832.34	0.00	3,756.46	540,853.15
17/11/2019	12:10	50.03	230.06	0.00	17.50	0.00	16.63	0.00	3,900.11	0.00	3,978.90	546,593.25
17/11/2019	12:15	50.07	229.44	0.00	17.03	0.00	16.43	0.00	3,851.84	0.00	3,890.75	546,920.73
17/11/2019	12:20	50.12	227.77	0.00	16.93	0.00	16.50	0.00	3,855.53	0.00	3,855.53	547,245.23
17/11/2019	12:25	50.05	229.10	0.00	17.10	0.00	16.34	0.00	3,814.86	0.00	3,891.92	536,726.60
17/11/2019	12:30	49.96	229.00	0.00	16.93	0.00	16.67	0.00	3,900.77	0.00	3,862.15	537,045.23
17/11/2019	12:35	49.99	230.53	0.00	17.27	0.00	16.34	0.00	3,817.39	0.00	3,855.95	537,363.34
17/11/2019	12:40	49.93	227.81	0.00	17.17	0.00	16.56	0.00	3,817.86	0.00	3,894.98	537,681.49
17/11/2019	12:45	50.18	229.16	0.00	17.17	0.00	16.14	0.00	3,847.18	0.00	3,808.71	537,998.89
17/11/2019	12:50	50.09	227.54	0.00	16.93	0.00	16.40	0.00	3,895.77	0.00	3,895.77	538,317.10
17/11/2019	12:55	50.03	228.93	0.00	17.78	0.00	17.17	0.00	3,969.48	0.00	4,009.17	538,644.59
17/11/2019	13:00	49.93	228.80	0.00	17.62	0.00	17.37	0.00	3,964.23	0.00	4,044.31	549,863.32
17/11/2019	13:05	50.03	229.49	0.00	17.40	0.00	16.90	0.00	3,880.14	0.00	3,880.14	550,193.20

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
17/11/2019	13:10	50.19	228.53	0.00	17.13	0.00	17.07	0.00	3,886.11	0.00	3,924.97	539,618.89
17/11/2019	13:15	49.96	227.21	0.00	17.17	0.00	16.87	0.00	3,838.56	0.00	3,800.17	539,935.58
17/11/2019	13:20	50.05	228.43	0.00	16.80	0.00	16.40	0.00	3,829.64	0.00	3,753.80	540,248.39
17/11/2019	13:25	50.13	226.95	0.00	16.97	0.00	16.40	0.00	3,747.02	0.00	3,784.87	546,020.85
17/11/2019	13:30	50.07	226.35	0.00	16.97	0.00	16.50	0.00	3,826.02	0.00	3,788.14	546,336.53
17/11/2019	13:35	50.02	227.21	0.00	16.97	0.00	16.67	0.00	3,780.59	0.00	3,818.40	552,118.10
17/11/2019	13:40	50.09	228.57	0.00	16.80	0.00	16.36	0.00	3,781.26	0.00	3,781.26	546,966.68
17/11/2019	13:45	49.96	228.29	0.00	17.37	0.00	16.60	0.00	3,867.76	0.00	3,867.76	547,289.00
17/11/2019	13:50	50.12	227.90	0.00	17.03	0.00	16.43	0.00	3,894.27	0.00	3,817.15	547,610.30
17/11/2019	13:55	49.94	227.08	0.00	17.23	0.00	16.53	0.00	3,947.51	0.00	3,869.35	542,456.65
17/11/2019	14:00	50.12	229.20	0.00	17.13	0.00	16.43	0.00	3,870.54	0.00	3,948.74	553,744.43
17/11/2019	14:05	50.16	229.27	0.00	17.47	0.00	16.60	0.00	3,945.30	0.00	3,945.30	543,101.46
17/11/2019	14:10	50.06	230.03	0.00	17.13	0.00	16.70	0.00	3,905.66	0.00	3,866.60	548,912.80
17/11/2019	14:15	50.06	228.57	0.00	17.47	0.00	16.53	0.00	3,910.08	0.00	3,870.98	554,731.03
17/11/2019	14:20	50.00	229.34	0.00	16.83	0.00	16.56	0.00	3,873.16	0.00	3,873.16	544,062.63
17/11/2019	14:25	50.19	229.40	0.00	17.78	0.00	16.73	0.00	3,985.81	0.00	3,946.35	555,385.94
17/11/2019	14:30	49.94	227.80	13.27	18.02	0.00	15.96	2,514.26	3,996.02	0.00	6,525.75	550,430.88
17/11/2019	14:35	49.97	229.60	19.10	18.51	0.00	15.25	3,579.33	4,188.31	0.00	7,648.91	556,585.48
17/11/2019	14:40	49.94	228.73	19.11	18.90	0.00	15.15	3,600.08	4,149.19	0.00	7,905.82	557,244.30
17/11/2019	14:45	49.93	229.64	19.21	18.41	0.00	15.10	3,640.31	4,094.93	0.00	7,891.50	557,901.92
17/11/2019	14:50	50.07	229.66	19.50	18.50	0.00	14.75	3,701.69	4,062.97	0.00	7,883.77	547,498.33
17/11/2019	14:55	49.97	232.13	19.50	18.50	0.00	14.90	3,676.11	4,071.28	0.00	7,747.37	559,217.56
17/11/2019	15:00	50.14	230.60	19.70	19.19	0.00	15.35	3,669.62	4,264.24	0.00	8,007.99	554,341.48
17/11/2019	15:05	50.03	229.40	19.60	19.00	0.00	15.15	3,699.95	4,178.74	0.00	8,037.85	555,004.67
17/11/2019	15:10	50.14	229.96	19.90	7.27	0.00	17.78	3,697.36	1,582.46	0.00	5,279.82	561,003.59
17/11/2019	15:15	50.19	230.90	20.00	0.00	0.00	19.49	3,759.57	0.00	0.00	3,721.97	561,320.01
17/11/2019	15:20	49.97	229.96	19.70	0.00	0.00	19.60	3,741.47	0.00	0.00	3,741.47	550,516.56
17/11/2019	15:25	50.16	231.41	19.80	0.00	0.00	19.60	3,785.34	0.00	0.00	3,785.34	556,389.65
17/11/2019	15:30	50.12	231.84	20.00	0.00	0.00	19.49	3,780.97	0.00	0.00	3,780.97	562,268.63
17/11/2019	15:35	50.02	229.47	19.90	0.00	0.00	19.20	3,698.70	0.00	0.00	3,698.70	557,012.95
17/11/2019	15:40	50.07	228.40	19.60	0.00	0.00	19.29	3,663.13	0.00	0.00	3,663.13	562,894.51
17/11/2019	15:45	49.95	232.10	19.80	0.00	0.00	18.81	3,739.09	0.00	0.00	3,665.05	557,629.80
17/11/2019	15:50	49.94	230.23	19.60	0.00	0.00	18.91	3,720.04	0.00	0.00	3,646.38	563,516.11
17/11/2019	15:55	49.98	230.93	19.40	4.14	0.00	18.41	3,662.05	900.33	0.00	4,516.76	558,316.94
17/11/2019	16:00	50.17	229.97	18.91	18.71	0.00	15.50	3,597.25	4,179.88	0.00	7,777.13	553,375.38
17/11/2019	16:05	50.07	229.13	19.10	19.20	0.00	15.15	3,623.42	4,235.68	0.00	7,901.45	554,020.79
17/11/2019	16:10	50.06	228.43	19.09	18.60	0.00	14.55	3,509.16	4,119.10	0.00	7,587.06	554,653.05
17/11/2019	16:15	50.15	228.93	19.09	18.60	0.00	14.85	3,531.63	4,076.77	0.00	7,649.58	560,893.07
17/11/2019	16:20	50.11	230.43	18.99	18.60	0.00	14.45	3,542.20	4,078.61	0.00	7,703.21	561,528.65
17/11/2019	16:25	50.03	229.56	18.89	18.89	0.00	14.55	3,455.64	4,080.04	0.00	7,687.92	562,162.97
17/11/2019	16:30	50.02	227.97	18.70	18.38	0.00	14.95	3,486.81	4,070.54	0.00	7,592.23	557,161.50
17/11/2019	16:35	49.95	228.77	19.19	18.12	0.00	15.05	3,585.02	4,050.13	0.00	7,675.65	563,422.69

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
17/11/2019	16:40	49.94	228.01	19.11	18.12	0.00	14.70	3,639.03	4,051.82	0.00	7,578.27	558,419.98
17/11/2019	16:45	50.02	227.97	19.59	18.12	0.00	14.60	3,589.29	4,004.35	0.00	7,593.65	559,052.79
17/11/2019	16:50	50.06	229.40	19.59	18.30	0.00	14.45	3,582.28	4,048.59	0.00	7,743.72	570,992.10
17/11/2019	16:55	50.13	226.95	19.29	18.12	0.00	14.16	3,560.66	4,001.47	0.00	7,642.97	560,309.63
17/11/2019	17:00	50.06	228.34	19.09	18.48	0.00	14.54	3,457.31	4,080.88	0.00	7,608.04	560,931.07
17/11/2019	17:05	50.03	227.97	18.90	18.22	0.00	14.65	3,464.13	4,093.52	0.00	7,592.29	561,551.24
17/11/2019	17:10	49.95	227.64	18.99	18.41	0.00	14.45	3,450.35	4,065.35	0.00	7,632.33	567,853.20
17/11/2019	17:15	50.14	230.03	18.71	18.10	0.00	14.00	3,450.32	4,020.92	0.00	7,471.24	562,791.04
17/11/2019	17:20	49.93	228.91	18.71	18.00	0.00	13.46	3,413.98	4,053.16	0.00	7,427.01	563,403.77
17/11/2019	17:25	49.99	230.50	18.61	18.18	0.00	13.64	3,404.41	4,024.81	0.00	7,429.22	569,713.82
17/11/2019	17:30	50.05	231.70	18.90	18.00	0.00	13.27	3,362.59	3,982.36	0.00	7,344.95	576,035.40
17/11/2019	17:35	50.12	231.74	19.40	17.88	0.00	13.56	3,469.66	4,000.43	0.00	7,465.53	570,954.21
17/11/2019	17:40	50.05	230.97	20.40	17.88	0.00	14.20	3,706.50	3,909.74	0.00	7,732.30	577,308.11
17/11/2019	17:45	50.18	230.37	20.40	17.78	0.00	13.96	3,649.46	3,960.53	0.00	7,607.65	572,226.16
17/11/2019	17:50	49.96	227.71	12.83	17.13	0.00	14.60	2,319.55	3,889.36	0.00	6,208.90	572,738.45
17/11/2019	17:55	50.18	225.79	0.00	16.60	0.00	17.40	0.00	3,743.94	0.00	3,706.50	578,780.94
17/11/2019	18:00	50.10	228.53	0.00	16.50	0.00	17.50	0.00	3,670.24	0.00	3,670.24	579,092.97
17/11/2019	18:05	50.08	226.87	0.00	16.46	0.00	17.57	0.00	3,628.61	0.00	3,628.61	579,401.47
17/11/2019	18:10	50.11	228.86	0.00	16.26	0.00	17.37	0.00	3,665.46	0.00	3,665.46	573,967.25
17/11/2019	18:15	50.06	227.25	0.00	16.67	0.00	17.50	0.00	3,674.86	0.00	3,674.86	568,533.81
17/11/2019	18:20	49.98	228.81	0.00	9.90	0.00	10.40	0.00	2,204.26	0.00	2,204.26	574,462.13
17/11/2019	18:25	50.00	228.76	0.00	10.20	0.00	10.70	0.00	2,274.03	0.00	2,274.03	568,907.01
17/11/2019	18:30	50.13	227.74	0.00	2.02	0.00	2.10	0.00	455.42	0.00	450.87	580,438.42
17/11/2019	18:35	49.98	228.33	0.00	17.98	0.00	17.60	0.00	4,025.10	0.00	4,025.10	580,773.84
17/11/2019	18:40	50.01	227.07	0.00	18.99	0.00	18.10	0.00	4,196.18	0.00	4,196.18	569,623.05
17/11/2019	18:45	50.14	229.76	0.00	18.41	0.00	17.98	0.00	4,247.96	0.00	4,205.90	575,727.31
17/11/2019	18:50	50.10	229.16	0.00	18.60	0.00	17.62	0.00	4,171.59	0.00	4,171.59	570,317.67
17/11/2019	18:55	50.18	227.50	0.00	18.89	0.00	17.90	0.00	4,265.39	0.00	4,223.16	576,430.38
17/11/2019	19:00	49.99	229.89	0.00	18.70	0.00	17.98	0.00	4,183.67	0.00	4,225.93	576,782.54
17/11/2019	19:05	50.15	229.35	0.00	18.70	0.00	18.18	0.00	4,230.02	0.00	4,272.32	577,135.05
17/11/2019	19:10	50.04	227.80	0.00	18.79	0.00	17.62	0.00	4,149.91	0.00	4,149.91	571,709.52
17/11/2019	19:15	50.04	228.56	0.00	17.40	0.00	16.97	0.00	3,956.36	0.00	3,917.19	572,032.69
17/11/2019	19:20	50.13	229.32	0.00	16.90	0.00	16.14	0.00	3,754.33	0.00	3,754.33	572,345.55
17/11/2019	19:25	50.13	228.06	0.00	16.90	0.00	16.14	0.00	3,796.39	0.00	3,758.43	578,443.18
17/11/2019	19:30	50.19	227.38	0.00	16.63	0.00	16.36	0.00	3,739.82	0.00	3,815.38	572,970.40
17/11/2019	19:35	49.93	228.17	0.00	16.80	0.00	16.24	0.00	3,816.19	0.00	3,816.19	573,282.12
17/11/2019	19:40	50.10	229.18	0.00	10.00	0.00	9.21	4.79	2,228.98	0.00	2,278.79	579,260.87
17/11/2019	19:45	50.08	227.34	0.00	13.46	0.00	12.32	0.00	3,075.80	0.00	3,075.80	585,309.80
17/11/2019	19:50	49.97	226.83	0.00	16.36	0.00	14.85	0.00	3,632.30	0.00	3,632.30	585,615.51
17/11/2019	19:55	49.94	226.34	0.00	12.38	0.00	11.19	0.00	2,841.60	0.00	2,785.34	574,251.28
17/11/2019	20:00	49.99	227.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	585,852.32
17/11/2019	20:05	50.15	227.61	0.00	14.45	0.00	13.07	0.00	3,248.78	0.00	3,216.29	574,519.30

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
17/11/2019	20:10	50.02	225.48	0.00	15.94	0.00	14.60	0.00	3,558.37	0.00	3,558.37	574,815.83
17/11/2019	20:15	50.02	226.76	0.00	10.59	0.00	9.80	0.00	2,415.16	0.00	2,391.25	580,821.32
17/11/2019	20:20	50.00	229.03	0.00	8.18	0.00	7.58	0.00	1,801.07	0.00	1,801.07	575,163.20
17/11/2019	20:25	50.11	227.77	0.00	16.24	0.00	15.10	0.00	3,696.76	0.00	3,696.76	581,277.94
17/11/2019	20:30	49.99	227.24	0.00	16.90	0.00	15.25	5.63	3,803.80	0.00	3,809.49	587,408.18
17/11/2019	20:35	50.06	227.36	0.00	17.07	0.00	14.80	0.00	3,786.73	0.00	3,824.60	581,907.82
17/11/2019	20:40	49.97	227.48	0.00	19.70	0.00	17.37	0.00	4,338.69	0.00	4,382.08	588,092.07
17/11/2019	20:45	49.96	226.61	0.00	3.66	0.00	3.74	0.00	807.09	0.00	815.16	576,513.26
17/11/2019	20:50	50.01	226.98	0.00	16.90	0.00	15.10	0.00	3,724.20	0.00	3,799.44	588,476.62
17/11/2019	20:55	50.06	228.42	0.00	18.08	0.00	15.96	0.00	3,989.08	0.00	3,949.19	582,982.54
17/11/2019	21:00	49.93	228.85	0.00	16.34	0.00	14.36	0.00	3,683.37	0.00	3,683.37	577,456.60
17/11/2019	21:05	50.18	226.37	0.00	8.28	0.00	7.30	0.00	1,835.44	0.00	1,853.98	577,609.55
17/11/2019	21:10	50.02	227.41	0.00	6.90	0.00	6.10	0.00	1,561.15	0.00	1,545.69	577,737.06
17/11/2019	21:15	50.05	226.91	0.00	11.09	0.00	10.10	0.00	2,545.25	0.00	2,494.85	577,944.97
17/11/2019	21:20	50.15	227.80	0.00	9.41	0.00	9.09	0.00	2,089.34	0.00	2,089.34	589,798.26
17/11/2019	21:25	49.93	226.68	0.00	15.74	0.00	14.30	0.00	3,610.48	0.00	3,574.73	584,256.56
17/11/2019	21:30	49.98	226.33	0.00	16.30	0.00	14.70	0.00	3,614.14	0.00	3,650.65	590,406.39
17/11/2019	21:35	49.95	227.33	0.00	16.80	0.00	14.95	5.72	3,749.60	0.00	3,717.71	579,024.98
17/11/2019	21:40	50.12	226.63	0.00	9.70	0.00	8.60	0.00	2,178.21	0.00	2,178.21	579,206.50
17/11/2019	21:45	50.16	228.69	0.00	9.21	0.00	8.32	0.00	2,085.12	0.00	2,064.27	591,083.14
17/11/2019	21:50	50.06	227.04	0.00	19.49	0.00	17.30	0.00	4,390.06	0.00	4,390.06	591,448.98
17/11/2019	21:55	50.02	226.31	0.00	16.50	0.00	14.80	0.00	3,701.10	0.00	3,738.11	580,042.46
17/11/2019	22:00	50.04	228.31	0.00	6.87	0.00	6.10	0.00	1,542.89	0.00	1,527.61	586,028.77
17/11/2019	22:05	49.96	226.44	0.00	16.87	0.00	15.00	0.00	3,746.81	0.00	3,709.71	586,337.92
17/11/2019	22:10	49.97	228.12	0.00	17.62	0.00	16.10	0.00	4,004.59	0.00	3,964.94	592,535.01
17/11/2019	22:15	49.97	227.09	0.00	4.26	0.00	4.10	0.00	948.64	0.00	939.15	580,879.91
17/11/2019	22:20	50.17	227.20	5.76	14.44	0.00	12.90	1,126.67	3,140.76	0.00	4,342.14	592,976.70
17/11/2019	22:25	50.05	226.52	8.38	2.12	0.00	7.82	1,648.95	475.49	0.00	2,157.75	593,156.52
17/11/2019	22:30	50.05	225.86	10.81	0.00	0.00	10.60	2,153.05	0.00	0.00	2,131.52	587,463.10
17/11/2019	22:35	50.07	226.67	3.50	0.00	0.00	3.47	703.63	0.00	0.00	717.85	581,647.11
17/11/2019	22:40	50.00	226.68	11.90	4.00	0.00	15.15	2,404.59	904.21	0.00	3,266.85	587,797.31
17/11/2019	22:45	50.08	228.50	0.00	16.67	0.00	15.00	0.00	3,657.44	0.00	3,731.32	588,105.18
17/11/2019	22:50	49.97	230.04	8.38	6.36	0.00	7.90	1,680.87	1,424.66	0.00	3,139.47	594,247.85
17/11/2019	22:55	50.19	227.70	8.20	0.00	0.00	8.00	1,691.05	0.00	0.00	1,691.05	582,618.70
17/11/2019	23:00	50.08	230.11	2.40	0.00	0.00	2.42	494.27	0.00	0.00	484.49	588,544.52
17/11/2019	23:05	50.12	226.42	8.28	1.49	0.00	9.50	1,662.86	324.98	0.00	1,987.84	594,598.97
17/11/2019	23:10	50.12	228.13	8.20	16.30	0.00	15.35	1,669.99	3,645.74	0.00	5,279.27	583,264.67
17/11/2019	23:15	50.13	227.61	0.00	16.53	0.00	15.45	0.00	3,726.57	0.00	3,763.84	589,466.78
17/11/2019	23:20	50.13	230.33	8.28	2.32	0.00	10.10	1,660.52	514.34	0.00	2,218.80	583,753.35
17/11/2019	23:25	50.19	228.93	1.30	0.00	0.00	1.31	275.96	0.00	0.00	275.96	589,672.84
17/11/2019	23:30	50.19	228.81	8.32	14.90	0.00	15.64	1,754.01	3,293.55	0.00	5,012.83	595,995.75
17/11/2019	23:35	50.14	231.05	0.00	15.00	0.00	13.66	0.00	3,351.02	0.00	3,384.53	590,374.05

Date	Time	Freq. Hz)	V avg (V)	A1 (A)	A2 (A)	A3 (A)	A N-E (A)	W1 (W)	W2 (W)	W3 (W)	W Total (W)	Wh Total (Wh)
17/11/2019	23:40	50.03	228.86	8.99	0.00	0.00	9.09	1,839.80	0.00	0.00	1,839.80	584,620.59
17/11/2019	23:45	50.02	227.44	7.70	0.00	0.00	7.62	1,582.12	0.00	0.00	1,582.12	590,656.39
17/11/2019	23:50	50.08	227.51	4.06	0.00	0.00	4.10	826.49	0.00	0.00	834.84	596,633.22
17/11/2019	23:55	50.03	228.99	11.11	4.40	0.00	10.50	2,252.22	968.74	0.00	3,198.44	596,905.13

Appendix B Measurement results of solar power generation systems combined with hybrid energy storage systems during February – March 2022.

Date	Time	Demand (kW)	PV (kW)	AGM Discharge (kW)	LFP Discharge (kW)	Accum (kWh)	SoC AGM (%)	SoC LFP (%)	Grid power (kW)
28/2/2022	0:00	4.88	0.00	0.00	0.00	0.00	20.00	20.00	22.50
28/2/2022	0:15	3.90	0.27	0.00	0.00	0.00	22.99	23.53	22.50
28/2/2022	0:30	4.88	0.51	0.00	0.00	0.00	26.16	27.35	22.50
28/2/2022	0:45	4.88	0.21	0.00	0.00	0.00	29.46	31.38	22.50
28/2/2022	1:00	3.90	0.24	0.00	0.00	0.00	32.60	35.16	22.50
28/2/2022	1:15	4.88	0.69	0.00	0.00	0.00	36.08	39.49	22.50
28/2/2022	1:30	3.90	0.30	0.00	0.00	0.00	39.38	43.51	22.50
28/2/2022	1:45	3.90	0.06	0.00	0.00	0.00	42.71	47.59	22.50
28/2/2022	2:00	3.90	0.36	0.00	0.00	0.00	46.04	51.66	22.50
28/2/2022	2:15	3.90	0.24	0.00	0.00	0.00	49.21	55.49	22.50
28/2/2022	2:30	3.90	0.27	0.00	0.00	0.00	52.69	59.81	22.50
28/2/2022	2:45	3.90	0.78	0.00	0.00	0.00	55.86	63.63	22.50
28/2/2022	3:00	3.90	0.27	0.00	0.00	0.00	59.35	67.96	22.50
28/2/2022	3:15	4.88	0.48	0.00	0.00	0.00	62.52	71.78	22.50
28/2/2022	3:30	3.90	0.15	0.00	0.00	0.00	65.66	75.56	22.50
28/2/2022	3:45	2.93	0.06	0.00	0.00	0.00	68.99	79.63	22.50
28/2/2022	4:00	4.88	0.18	0.00	0.00	0.00	72.50	84.00	22.50
28/2/2022	4:15	3.90	0.36	0.00	0.00	0.00	75.49	87.53	22.50
28/2/2022	4:30	3.90	0.33	0.00	0.00	0.00	78.66	91.35	22.50
28/2/2022	4:45	4.88	0.30	0.00	0.00	0.00	82.14	95.68	25.00
28/2/2022	5:00	3.90	0.36	0.00	0.00	0.00	88.43	95.68	25.00
28/2/2022	5:15	3.90	0.60	0.00	0.00	0.00	94.77	95.68	25.00
28/2/2022	5:30	4.88	0.72	0.00	0.00	0.00	96.00	95.68	2.88
28/2/2022	5:45	4.88	1.20	0.00	0.00	0.00	96.00	95.68	4.88
28/2/2022	6:00	5.85	1.44	0.00	0.00	0.00	96.00	95.68	5.06
28/2/2022	6:15	7.80	6.40	0.00	0.00	0.00	96.00	95.68	8.41
28/2/2022	6:30	5.85	5.60	0.00	0.00	0.00	96.00	95.68	3.06
28/2/2022	6:45	7.80	6.40	0.00	0.00	0.00	96.00	95.68	4.41
28/2/2022	7:00	9.76	8.00	0.00	0.00	0.00	96.00	95.68	6.16
28/2/2022	7:15	17.56	10.40	0.00	0.00	0.00	96.00	95.68	14.18
28/2/2022	7:30	21.46	13.60	0.00	0.00	0.00	96.00	95.68	17.88
28/2/2022	7:45	24.39	16.80	0.00	0.00	0.00	96.00	95.68	16.61
28/2/2022	8:00	31.22	20.80	0.00	-0.85	0.00	96.00	95.68	20.00
28/2/2022	8:15	33.17	27.20	0.00	0.00	-0.21	96.00	95.25	17.60
28/2/2022	8:30	36.10	28.80	0.00	0.00	-0.21	96.00	95.25	17.93
28/2/2022	8:45	40.98	30.40	0.00	0.00	-0.21	96.00	95.25	19.81
28/2/2022	9:00	41.95	31.20	0.00	0.00	-0.21	96.00	95.25	13.79
28/2/2022	9:15	43.90	32.80	0.00	0.00	-0.21	96.00	95.25	10.54

Date	Time	Demand (kW)	PV (kW)	AGM Discharge (kW)	LFP Discharge (kW)	Accum (kWh)	SoC AGM (%)	SoC LFP (%)	Grid power (kW)
28/2/2022	9:30	45.85	34.40	0.00	0.00	-0.21	96.00	95.25	9.69
28/2/2022	9:45	49.76	36.00	0.00	0.00	-0.21	96.00	95.25	14.40
28/2/2022	10:00	49.76	36.00	0.00	0.00	-0.21	96.00	95.25	13.60
28/2/2022	10:15	55.61	36.00	0.00	0.00	-0.21	96.00	95.25	19.86
28/2/2022	10:30	58.54	35.20	0.00	0.00	-0.21	96.00	95.25	23.39
28/2/2022	10:45	64.39	34.40	0.00	0.00	-0.21	96.00	95.25	31.25
28/2/2022	11:00	68.29	34.40	0.00	0.00	-0.21	96.00	95.25	34.35
28/2/2022	11:15	69.27	34.40	0.00	0.00	-0.21	96.00	95.25	37.13
28/2/2022	11:30	68.29	35.20	0.00	0.00	-0.21	96.00	95.25	36.75
28/2/2022	11:45	73.17	34.40	-1.84	-0.79	-0.21	96.00	95.25	40.00
28/2/2022	12:00	71.22	34.40	-0.20	-0.08	-0.87	95.42	94.86	40.00
28/2/2022	12:15	67.32	33.60	0.00	0.00	-0.94	95.36	94.82	40.00
28/2/2022	12:30	69.27	33.60	-1.35	-0.58	-0.94	95.36	95.83	40.00
28/2/2022	12:45	69.27	35.20	-0.79	-0.34	-1.42	94.94	95.54	40.00
28/2/2022	13:00	68.29	37.60	-1.09	-0.47	-1.71	94.69	95.37	40.00
28/2/2022	13:15	74.15	39.20	-6.59	-2.82	-2.09	94.35	95.14	40.00
28/2/2022	13:30	76.10	40.80	-7.12	-3.05	-4.45	92.29	93.72	40.00
28/2/2022	13:45	75.12	40.80	-6.29	-2.70	-6.99	90.07	92.20	40.00
28/2/2022	14:00	74.15	40.00	-6.03	-2.58	-9.24	88.10	90.85	40.00
28/2/2022	14:15	71.22	40.80	-5.80	-2.48	-11.39	86.22	89.56	40.00
28/2/2022	14:30	71.22	40.80	-6.92	-2.96	-13.46	84.41	88.32	40.00
28/2/2022	14:45	70.24	37.60	-7.21	-3.09	-15.93	82.25	86.83	40.00
28/2/2022	15:00	72.20	36.80	-8.86	-3.80	-18.51	79.99	85.29	40.00
28/2/2022	15:15	73.17	33.60	-11.36	-4.87	-21.67	77.22	83.39	40.00
28/2/2022	15:30	71.22	31.20	-10.84	-4.64	-25.73	73.67	80.95	40.00
28/2/2022	15:45	69.27	28.80	-10.31	-4.42	-29.60	70.29	78.63	40.00
28/2/2022	16:00	70.24	26.40	-12.25	-5.25	-33.28	67.06	76.42	40.00
28/2/2022	16:15	64.39	22.40	-11.79	-5.05	-37.66	63.23	73.80	40.00
28/2/2022	16:30	60.49	18.40	-10.18	-4.36	-41.87	59.55	71.27	40.00
28/2/2022	16:45	56.59	25.00	-10.24	-4.39	-45.51	56.37	69.09	40.00
28/2/2022	17:00	48.78	22.00	-4.78	-2.05	-49.16	53.17	66.89	40.00
28/2/2022	17:15	46.83	19.00	-4.81	-2.06	-50.87	51.67	65.87	40.00
28/2/2022	17:30	45.85	12.00	-3.99	-1.71	-52.59	50.17	64.84	40.00
28/2/2022	17:45	47.80	7.20	-6.75	-2.89	-54.01	48.93	63.98	40.00
28/2/2022	18:00	47.80	9.20	-7.31	-3.13	-56.42	46.81	62.54	40.00
28/2/2022	18:15	48.78	6.00	-8.70	-3.73	-59.04	44.53	60.97	40.00
28/2/2022	18:30	49.76	4.80	-10.08	-4.32	-62.14	41.81	59.11	40.00
28/2/2022	18:45	50.73	1.80	-12.02	-5.15	-65.74	38.66	56.95	40.00
28/2/2022	19:00	50.73	1.02	-12.72	-5.45	-70.04	34.90	54.37	40.00
28/2/2022	19:15	48.78	0.78	-11.08	-4.75	-74.58	30.93	51.64	40.00
28/2/2022	19:30	48.78	0.48	-11.78	-5.05	-78.54	27.47	49.27	40.00

Date	Time	Demand (kW)	PV (kW)	AGM Discharge (kW)	LFP Discharge (kW)	Accum (kWh)	SoC AGM (%)	SoC LFP (%)	Grid power (kW)
28/2/2022	19:45	47.80	0.06	-11.65	-4.99	-82.74	23.79	46.75	40.00
28/2/2022	20:00	47.80	0.48	-12.35	-5.29	-86.90	20.15	44.25	40.00
28/2/2022	20:15	43.90	0.00	0.00	-10.94	-91.31	16.28	41.60	40.00
28/2/2022	20:30	41.95	0.24	0.00	-10.59	-94.05	16.28	36.13	40.00
28/2/2022	20:45	40.98	0.60	0.00	-9.41	-96.70	16.28	30.84	40.00
28/2/2022	21:00	37.07	0.60	0.00	-4.71	-99.05	16.28	26.13	40.00
28/2/2022	21:15	31.22	0.06	0.00	0.00	-100.23	16.28	23.78	36.65
28/2/2022	21:30	27.32	0.78	0.00	0.00	-100.23	16.28	23.78	31.94
28/2/2022	21:45	20.00	0.12	0.00	0.00	-100.23	16.28	23.78	22.12
28/2/2022	22:00	20.49	0.12	0.00	0.00	-100.23	16.28	23.78	24.71
28/2/2022	22:15	17.56	0.60	0.00	-0.59	-100.23	16.28	23.78	22.50
28/2/2022	22:30	14.63	0.78	0.00	0.00	-100.37	16.88	23.49	22.50
28/2/2022	22:45	10.85	0.84	0.00	0.00	-100.37	18.19	24.32	22.50
28/2/2022	23:00	7.80	0.36	0.00	0.00	-100.37	20.36	26.55	22.50
28/2/2022	23:15	6.83	0.36	0.00	0.00	-100.37	22.80	29.20	22.50
28/2/2022	23:30	5.12	0.48	0.00	0.00	-100.37	25.42	32.14	22.50
28/2/2022	23:45	4.88	0.30	0.00	0.00	-100.37	28.36	35.60	22.50
1/3/2022	0:00	4.68	0.48	0.00	0.00	0.00	28.00	35.00	22.50
1/3/2022	0:15	3.80	0.12	0.00	0.00	0.00	30.99	38.53	22.50
1/3/2022	0:30	4.68	0.96	0.00	0.00	0.00	34.16	42.35	22.50
1/3/2022	0:45	4.88	0.18	0.00	0.00	0.00	37.46	46.38	22.50
1/3/2022	1:00	4.00	1.08	0.00	0.00	0.00	40.60	50.16	22.50
1/3/2022	1:15	4.68	0.60	0.00	0.00	0.00	44.08	54.49	22.50
1/3/2022	1:30	4.20	0.54	0.00	0.00	0.00	47.38	58.51	22.50
1/3/2022	1:45	4.10	0.30	0.00	0.00	0.00	50.71	62.59	22.50
1/3/2022	2:00	4.20	0.48	0.00	0.00	0.00	54.04	66.66	22.50
1/3/2022	2:15	3.90	0.96	0.00	0.00	0.00	57.21	70.49	22.50
1/3/2022	2:30	4.20	0.12	0.00	0.00	0.00	60.69	74.81	22.50
1/3/2022	2:45	3.90	1.20	0.00	0.00	0.00	63.86	78.63	22.50
1/3/2022	3:00	3.90	0.60	0.00	0.00	0.00	67.35	82.96	22.50
1/3/2022	3:15	5.18	0.90	0.00	0.00	0.00	70.52	86.78	22.50
1/3/2022	3:30	3.90	0.54	0.00	0.00	0.00	73.66	90.56	22.50
1/3/2022	3:45	3.23	0.18	0.00	0.00	0.00	76.99	94.63	22.50
1/3/2022	4:00	4.88	0.00	0.00	0.00	0.00	80.50	99.00	25.00
1/3/2022	4:15	3.70	0.60	0.00	0.00	0.00	86.47	99.00	25.00
1/3/2022	4:30	3.80	0.96	0.00	0.00	0.00	92.82	99.00	25.00
1/3/2022	4:45	4.78	0.06	0.00	0.00	0.00	99.78	99.00	4.88
1/3/2022	5:00	3.80	0.24	0.00	0.00	0.00	99.78	99.00	4.71
1/3/2022	5:15	4.00	0.72	0.00	0.00	0.00	99.78	99.00	2.71
1/3/2022	5:30	4.78	1.50	0.00	0.00	0.00	96.00	99.00	2.88
1/3/2022	5:45	4.68	0.18	0.00	0.00	0.00	96.00	99.00	4.88

Date	Time	Demand (kW)	PV (kW)	AGM Discharge (kW)	LFP Discharge (kW)	Accum (kWh)	SoC AGM (%)	SoC LFP (%)	Grid power (kW)
1/3/2022	6:00	6.05	0.00	0.00	0.00	0.00	96.00	99.00	5.06
1/3/2022	6:15	7.70	3.00	0.00	0.00	0.00	96.00	99.00	8.41
1/3/2022	6:30	5.75	5.20	0.00	0.00	0.00	96.00	99.00	3.06
1/3/2022	6:45	7.80	7.00	0.00	0.00	0.00	96.00	99.00	4.41
1/3/2022	7:00	9.66	7.60	0.00	0.00	0.00	96.00	99.00	6.16
1/3/2022	7:15	17.36	8.20	0.00	0.00	0.00	96.00	99.00	14.18
1/3/2022	7:30	21.46	9.60	0.00	0.00	0.00	96.00	99.00	17.88
1/3/2022	7:45	24.29	13.60	0.00	0.00	0.00	96.00	99.00	16.61
1/3/2022	8:00	31.52	18.00	0.00	-0.85	0.00	96.00	99.00	20.00
1/3/2022	8:15	33.37	21.60	0.00	0.00	-0.21	96.00	98.58	17.60
1/3/2022	8:30	35.90	26.80	0.00	0.00	-0.21	96.00	98.58	17.93
1/3/2022	8:45	40.98	27.60	0.00	0.00	-0.21	96.00	98.58	19.81
1/3/2022	9:00	43.15	39.60	0.00	0.00	-0.21	96.00	98.58	13.79
1/3/2022	9:15	44.30	42.00	0.00	0.00	-0.21	96.00	98.58	10.54
1/3/2022	9:30	46.25	47.60	0.00	0.00	-0.21	96.00	98.58	9.69
1/3/2022	9:45	50.96	50.00	0.00	0.00	-0.21	96.00	98.58	14.40
1/3/2022	10:00	48.96	46.80	0.00	0.00	-0.21	96.00	98.58	13.60
1/3/2022	10:15	55.61	49.00	0.00	0.00	-0.21	96.00	98.58	19.86
1/3/2022	10:30	56.94	46.80	0.00	0.00	-0.21	96.00	98.58	23.39
1/3/2022	10:45	63.59	46.40	0.00	0.00	-0.21	96.00	98.58	31.25
1/3/2022	11:00	69.89	47.60	0.00	0.00	-0.21	96.00	98.58	34.35
1/3/2022	11:15	71.67	42.40	0.00	0.00	-0.21	96.00	98.58	37.13
1/3/2022	11:30	70.69	48.40	0.00	0.00	-0.21	96.00	98.58	36.75
1/3/2022	11:45	71.57	44.80	-1.84	-0.79	-0.21	96.00	98.58	40.00
1/3/2022	12:00	69.62	43.20	-0.20	-0.08	-0.87	95.42	98.18	40.00
1/3/2022	12:15	68.92	40.80	0.00	0.00	-0.94	95.36	98.14	37.98
1/3/2022	12:30	69.27	44.40	-1.35	-0.58	-0.94	95.36	98.14	40.00
1/3/2022	12:45	67.07	38.80	-0.79	-0.34	-1.42	94.94	97.85	40.00
1/3/2022	13:00	69.39	40.80	-1.09	-0.47	-1.71	94.69	97.68	40.00
1/3/2022	13:15	77.45	41.60	-6.59	-2.82	-2.09	94.35	97.45	40.00
1/3/2022	13:30	76.10	39.20	-7.12	-3.05	-4.45	92.29	96.04	40.00
1/3/2022	13:45	78.42	44.40	-6.29	-2.70	-6.99	90.07	94.51	40.00
1/3/2022	14:00	77.45	39.20	-6.03	-2.58	-9.24	88.10	93.16	40.00
1/3/2022	14:15	72.32	33.60	-5.80	-2.48	-11.39	86.22	91.87	40.00
1/3/2022	14:30	69.02	38.00	-6.92	-2.96	-13.46	84.41	90.63	40.00
1/3/2022	14:45	72.44	31.60	-7.21	-3.09	-15.93	82.25	89.15	40.00
1/3/2022	15:00	70.00	36.00	-8.86	-3.80	-18.51	79.99	87.60	40.00
1/3/2022	15:15	73.17	32.00	-11.36	-4.87	-21.67	77.22	85.70	40.00
1/3/2022	15:30	72.32	33.60	-10.84	-4.64	-25.73	73.67	83.27	40.00
1/3/2022	15:45	70.37	30.80	-10.31	-4.42	-29.60	70.29	80.94	40.00
1/3/2022	16:00	69.14	30.00	-12.25	-5.25	-33.28	67.06	78.73	40.00

Date	Time	Demand (kW)	PV (kW)	AGM Discharge (kW)	LFP Discharge (kW)	Accum (kWh)	SoC AGM (%)	SoC LFP (%)	Grid power (kW)
1/3/2022	16:15	63.29	23.20	-11.79	-5.05	-37.66	63.23	76.11	40.00
1/3/2022	16:30	58.29	20.40	-10.18	-4.36	-41.87	59.55	73.58	40.00
1/3/2022	16:45	55.49	14.40	-10.24	-4.39	-45.51	56.37	71.40	40.00
1/3/2022	17:00	49.88	14.40	-4.78	-2.05	-49.16	53.17	69.20	40.00
1/3/2022	17:15	47.23	10.40	-4.81	-2.06	-50.87	51.67	68.18	40.00
1/3/2022	17:30	45.05	10.40	-3.99	-1.71	-52.59	50.17	67.15	40.00
1/3/2022	17:45	47.80	9.60	-6.75	-2.89	-54.01	48.93	66.30	40.00
1/3/2022	18:00	49.00	6.80	-7.31	-3.13	-56.42	46.81	64.85	40.00
1/3/2022	18:15	47.98	8.40	-8.70	-3.73	-59.04	44.53	63.28	40.00
1/3/2022	18:30	48.96	4.00	-10.08	-4.32	-62.14	41.81	61.42	40.00
1/3/2022	18:45	50.73	0.96	-12.02	-5.15	-65.74	38.66	59.26	40.00
1/3/2022	19:00	50.73	0.42	-12.72	-5.45	-70.04	34.90	56.68	40.00
1/3/2022	19:15	47.98	0.90	-11.08	-4.75	-74.58	30.93	53.96	40.00
1/3/2022	19:30	47.98	0.60	-11.78	-5.05	-78.54	27.47	51.58	40.00
1/3/2022	19:45	47.80	0.06	-11.65	-4.99	-82.74	23.79	49.06	40.00
1/3/2022	20:00	47.00	0.36	-12.35	-5.29	-86.90	20.15	46.56	40.00
1/3/2022	20:15	43.10	0.00	0.00	-10.94	-91.31	16.28	43.91	40.00
1/3/2022	20:30	41.55	0.24	0.00	-10.59	-94.05	16.28	38.44	40.00
1/3/2022	20:45	40.88	0.60	0.00	-9.41	-96.70	16.28	33.15	40.00
1/3/2022	21:00	37.17	0.60	0.00	-4.71	-99.05	16.28	28.44	40.00
1/3/2022	21:15	31.52	0.18	0.00	0.00	-100.23	16.28	26.09	36.65
1/3/2022	21:30	27.12	0.54	0.00	0.00	-100.23	16.28	26.09	31.94
1/3/2022	21:45	19.80	0.00	0.00	0.00	-100.23	16.28	26.09	22.12
1/3/2022	22:00	20.29	0.24	0.00	0.00	-100.23	16.28	26.09	24.71
1/3/2022	22:15	17.36	0.48	0.00	-0.59	-100.23	16.28	26.09	22.50
1/3/2022	22:30	14.53	0.42	0.00	0.00	-100.37	16.88	25.80	22.50
1/3/2022	22:45	10.85	0.00	0.00	0.00	-100.37	18.19	26.64	22.50
1/3/2022	23:00	7.80	0.00	0.00	0.00	-100.37	20.36	28.86	22.50
1/3/2022	23:15	7.03	0.12	0.00	0.00	-100.37	22.80	31.51	22.50
1/3/2022	23:30	4.92	0.24	0.00	0.00	-100.37	25.42	34.45	22.50
1/3/2022	23:45	4.98	0.42	0.00	0.00	-100.37	28.36	37.91	22.50
2/3/2022	0:00	4.58	0.93	0.00	0.00	0.00	28.36	37.91	22.50
2/3/2022	0:15	3.70	0.21	0.00	0.00	0.00	31.35	41.44	22.50
2/3/2022	0:30	4.78	0.87	0.00	0.00	0.00	34.52	45.26	22.50
2/3/2022	0:45	4.98	0.27	0.00	0.00	0.00	37.82	49.29	22.50
2/3/2022	1:00	4.30	0.72	0.00	0.00	0.00	40.96	53.07	22.50
2/3/2022	1:15	5.18	0.90	0.00	0.00	0.00	44.44	57.40	22.50
2/3/2022	1:30	4.30	0.27	0.00	0.00	0.00	47.74	61.42	22.50
2/3/2022	1:45	4.20	0.24	0.00	0.00	0.00	51.07	65.50	22.50
2/3/2022	2:00	4.10	0.00	0.00	0.00	0.00	54.40	69.57	22.50
2/3/2022	2:15	4.00	1.29	0.00	0.00	0.00	57.57	73.40	22.50

Date	Time	Demand (kW)	PV (kW)	AGM Discharge (kW)	LFP Discharge (kW)	Accum (kWh)	SoC AGM (%)	SoC LFP (%)	Grid power (kW)
2/3/2022	2:30	3.70	0.09	0.00	0.00	0.00	61.05	77.72	22.50
2/3/2022	2:45	4.10	1.56	0.00	0.00	0.00	64.22	81.54	22.50
2/3/2022	3:00	4.20	0.30	0.00	0.00	0.00	67.71	85.87	22.50
2/3/2022	3:15	4.98	0.24	0.00	0.00	0.00	70.88	89.69	22.50
2/3/2022	3:30	3.90	0.48	0.00	0.00	0.00	74.02	93.47	22.50
2/3/2022	3:45	3.33	0.18	0.00	0.00	0.00	77.35	97.54	25.00
2/3/2022	4:00	4.78	0.09	0.00	0.00	0.00	84.37	97.54	25.00
2/3/2022	4:15	3.90	1.05	0.00	0.00	0.00	90.35	97.54	25.00
2/3/2022	4:30	3.80	0.87	0.00	0.00	0.00	96.69	97.54	2.71
2/3/2022	4:45	4.98	0.24	0.00	0.00	0.00	96.69	97.54	4.88
2/3/2022	5:00	4.00	0.75	0.00	0.00	0.00	96.69	97.54	4.71
2/3/2022	5:15	3.70	1.17	0.00	0.00	0.00	96.69	97.54	2.71
2/3/2022	5:30	4.88	0.75	0.00	0.00	0.00	96.00	97.54	2.88
2/3/2022	5:45	4.88	0.24	0.00	0.00	0.00	96.00	97.54	4.88
2/3/2022	6:00	5.65	0.72	0.00	0.00	0.00	96.00	97.54	5.06
2/3/2022	6:15	7.60	0.20	0.00	0.00	0.00	96.00	97.54	8.41
2/3/2022	6:30	6.15	5.10	0.00	0.00	0.00	96.00	97.54	3.06
2/3/2022	6:45	8.00	4.70	0.00	0.00	0.00	96.00	97.54	4.41
2/3/2022	7:00	10.06	4.10	0.00	0.00	0.00	96.00	97.54	6.16
2/3/2022	7:15	17.96	9.00	0.00	0.00	0.00	96.00	97.54	14.18
2/3/2022	7:30	21.86	8.30	0.00	0.00	0.00	96.00	97.54	17.88
2/3/2022	7:45	24.19	11.20	0.00	0.00	0.00	96.00	97.54	16.61
2/3/2022	8:00	31.32	18.10	0.00	-0.85	0.00	96.00	97.54	20.00
2/3/2022	8:15	32.87	24.20	0.00	0.00	-0.21	96.00	97.12	17.60
2/3/2022	8:30	36.50	29.80	0.00	0.00	-0.21	96.00	97.12	17.93
2/3/2022	8:45	41.28	30.40	0.00	0.00	-0.21	96.00	97.12	19.81
2/3/2022	9:00	42.25	36.40	0.00	0.00	-0.21	96.00	97.12	13.79
2/3/2022	9:15	43.70	43.70	0.00	0.00	-0.21	96.00	97.12	10.54
2/3/2022	9:30	45.55	44.90	0.00	0.00	-0.21	96.00	97.12	9.69
2/3/2022	9:45	49.46	48.50	0.00	0.00	-0.21	96.00	97.12	14.40
2/3/2022	10:00	50.06	43.10	0.00	0.00	-0.21	96.00	97.12	13.60
2/3/2022	10:15	55.41	45.50	0.00	0.00	-0.21	96.00	97.12	19.86
2/3/2022	10:30	58.44	45.60	0.00	0.00	-0.21	96.00	97.12	23.39
2/3/2022	10:45	64.79	44.10	0.00	0.00	-0.21	96.00	97.12	31.25
2/3/2022	11:00	68.39	44.70	0.00	0.00	-0.21	96.00	97.12	34.35
2/3/2022	11:15	69.47	47.90	0.00	0.00	-0.21	96.00	97.12	37.13
2/3/2022	11:30	68.59	45.90	0.00	0.00	-0.21	96.00	97.12	36.75
2/3/2022	11:45	73.57	45.30	-1.84	-0.79	-0.21	96.00	97.12	40.00
2/3/2022	12:00	71.02	46.80	-0.20	-0.08	-0.87	95.42	96.72	40.00
2/3/2022	12:15	67.52	37.40	0.00	0.00	-0.94	95.36	96.68	37.98
2/3/2022	12:30	69.07	40.50	-1.35	-0.58	-0.94	95.36	96.68	40.00

Date	Time	Demand (kW)	PV (kW)	AGM Discharge (kW)	LFP Discharge (kW)	Accum (kWh)	SoC AGM (%)	SoC LFP (%)	Grid power (kW)
2/3/2022	12:45	69.07	41.10	-0.79	-0.34	-1.42	94.94	96.39	40.00
2/3/2022	13:00	68.39	39.40	-1.09	-0.47	-1.71	94.69	96.22	40.00
2/3/2022	13:15	73.85	40.70	-6.59	-2.82	-2.09	94.35	95.99	40.00
2/3/2022	13:30	75.80	42.30	-7.12	-3.05	-4.45	92.29	94.58	40.00
2/3/2022	13:45	75.52	44.80	-6.29	-2.70	-6.99	90.07	93.05	40.00
2/3/2022	14:00	74.35	37.90	-6.03	-2.58	-9.24	88.10	91.70	40.00
2/3/2022	14:15	70.92	36.30	-5.80	-2.48	-11.39	86.22	90.41	40.00
2/3/2022	14:30	71.12	36.70	-6.92	-2.96	-13.46	84.41	89.17	40.00
2/3/2022	14:45	70.24	33.20	-7.21	-3.09	-15.93	82.25	87.69	40.00
2/3/2022	15:00	72.40	36.70	-8.86	-3.80	-18.51	79.99	86.14	40.00
2/3/2022	15:15	73.07	29.90	-11.36	-4.87	-21.67	77.22	84.24	40.00
2/3/2022	15:30	71.62	33.70	-10.84	-4.64	-25.73	73.67	81.81	40.00
2/3/2022	15:45	69.07	24.20	-10.31	-4.42	-29.60	70.29	79.49	40.00
2/3/2022	16:00	70.24	25.80	-12.25	-5.25	-33.28	67.06	77.28	40.00
2/3/2022	16:15	64.39	19.40	-11.79	-5.05	-37.66	63.23	74.65	40.00
2/3/2022	16:30	60.29	20.50	-10.18	-4.36	-41.87	59.55	72.12	40.00
2/3/2022	16:45	56.49	11.20	-10.24	-4.39	-45.51	56.37	69.94	40.00
2/3/2022	17:00	48.88	15.20	-4.78	-2.05	-49.16	53.17	67.75	40.00
2/3/2022	17:15	46.83	8.40	-4.81	-2.06	-50.87	51.67	66.72	40.00
2/3/2022	17:30	46.15	8.90	-3.99	-1.71	-52.59	50.17	65.69	40.00
2/3/2022	17:45	48.10	10.90	-6.75	-2.89	-54.01	48.93	64.84	40.00
2/3/2022	18:00	47.80	6.40	-7.31	-3.13	-56.42	46.81	63.39	40.00
2/3/2022	18:15	48.58	5.80	-8.70	-3.73	-59.04	44.53	61.82	40.00
2/3/2022	18:30	50.16	6.30	-10.08	-4.32	-62.14	41.81	59.96	40.00
2/3/2022	18:45	51.13	0.33	-12.02	-5.15	-65.74	38.66	57.80	40.00
2/3/2022	19:00	50.43	0.78	-12.72	-5.45	-70.04	34.90	55.22	40.00
2/3/2022	19:15	48.88	1.32	-11.08	-4.75	-74.58	30.93	52.50	40.00
2/3/2022	19:30	48.88	0.33	-11.78	-5.05	-78.54	27.47	50.12	40.00
2/3/2022	19:45	47.50	0.36	-11.65	-4.99	-82.74	23.79	47.60	40.00
2/3/2022	20:00	47.60	0.03	-12.35	-5.29	-86.90	20.15	45.10	40.00
2/3/2022	20:15	44.30	0.45	0.00	-10.94	-91.31	16.28	42.46	40.00
2/3/2022	20:30	41.85	0.33	0.00	-10.59	-94.05	16.28	36.99	40.00
2/3/2022	20:45	41.28	0.87	0.00	-9.41	-96.70	16.28	31.69	40.00
2/3/2022	21:00	37.47	0.03	0.00	-4.71	-99.05	16.28	26.99	40.00
2/3/2022	21:15	31.22	0.90	0.00	0.00	-100.23	16.28	24.63	36.65
2/3/2022	21:30	27.22	0.36	0.00	0.00	-100.23	16.28	24.63	31.94
2/3/2022	21:45	20.00	0.27	0.00	0.00	-100.23	16.28	24.63	22.12
2/3/2022	22:00	20.19	0.18	0.00	0.00	-100.23	16.28	24.63	24.71
2/3/2022	22:15	17.36	0.78	0.00	-0.59	-100.23	16.28	24.63	22.50
2/3/2022	22:30	14.63	0.00	0.00	0.00	-100.37	16.88	24.34	22.50
2/3/2022	22:45	10.55	0.63	0.00	0.00	-100.37	18.19	25.18	22.50

Date	Time	Demand (kW)	PV (kW)	AGM Discharge (kW)	LFP Discharge (kW)	Accum (kWh)	SoC AGM (%)	SoC LFP (%)	Grid power (kW)
2/3/2022	23:00	7.90	0.12	0.00	0.00	-100.37	20.36	27.41	22.50
2/3/2022	23:15	6.83	0.81	0.00	0.00	-100.37	22.80	30.05	22.50
2/3/2022	23:30	5.02	0.21	0.00	0.00	-100.37	25.42	32.99	22.50
2/3/2022	23:45	4.78	0.60	0.00	0.00	-100.37	28.36	36.45	22.50
3/3/2022	0:00	5.12	0.03	0.00	0.00	0.00	28.36	36.45	22.50
3/3/2022	0:15	3.78	0.57	0.00	0.00	0.00	31.35	39.98	22.50
3/3/2022	0:30	4.76	0.06	0.00	0.00	0.00	34.52	43.80	22.50
3/3/2022	0:45	4.88	0.69	0.00	0.00	0.00	37.82	47.83	22.50
3/3/2022	1:00	4.14	0.36	0.00	0.00	0.00	40.96	51.61	22.50
3/3/2022	1:15	5.12	0.21	0.00	0.00	0.00	44.44	55.94	22.50
3/3/2022	1:30	4.14	0.15	0.00	0.00	0.00	47.74	59.96	22.50
3/3/2022	1:45	3.78	0.63	0.00	0.00	0.00	51.07	64.04	22.50
3/3/2022	2:00	3.90	0.18	0.00	0.00	0.00	54.40	68.11	22.50
3/3/2022	2:15	4.14	0.21	0.00	0.00	0.00	57.57	71.94	22.50
3/3/2022	2:30	3.78	0.51	0.00	0.00	0.00	61.05	76.26	22.50
3/3/2022	2:45	4.02	1.02	0.00	0.00	0.00	64.22	80.08	22.50
3/3/2022	3:00	4.02	0.60	0.00	0.00	0.00	67.71	84.41	22.50
3/3/2022	3:15	4.88	0.75	0.00	0.00	0.00	70.88	88.23	22.50
3/3/2022	3:30	4.14	1.35	0.00	0.00	0.00	74.02	92.01	22.50
3/3/2022	3:45	2.93	0.36	0.00	0.00	0.00	77.35	96.08	25.00
3/3/2022	4:00	4.88	0.03	0.00	0.00	0.00	84.37	96.08	25.00
3/3/2022	4:15	3.90	0.12	0.00	0.00	0.00	90.35	96.08	25.00
3/3/2022	4:30	3.78	1.14	0.00	0.00	0.00	96.69	96.08	2.71
3/3/2022	4:45	5.12	1.26	0.00	0.00	0.00	96.69	96.08	4.88
3/3/2022	5:00	4.14	0.96	0.00	0.00	0.00	96.69	96.08	4.71
3/3/2022	5:15	3.90	1.02	0.00	0.00	0.00	96.69	96.08	2.71
3/3/2022	5:30	5.12	0.39	0.00	0.00	0.00	96.00	96.08	2.88
3/3/2022	5:45	5.12	0.09	0.00	0.00	0.00	96.00	96.08	4.88
3/3/2022	6:00	5.97	0.09	0.00	0.00	0.00	96.00	96.08	5.06
3/3/2022	6:15	8.04	3.70	0.00	0.00	0.00	96.00	96.08	8.41
3/3/2022	6:30	5.73	4.00	0.00	0.00	0.00	96.00	96.08	3.06
3/3/2022	6:45	7.68	5.50	0.00	0.00	0.00	96.00	96.08	4.41
3/3/2022	7:00	9.88	5.00	0.00	0.00	0.00	96.00	96.08	6.16
3/3/2022	7:15	17.80	7.80	0.00	0.00	0.00	96.00	96.08	14.18
3/3/2022	7:30	21.70	10.20	0.00	0.00	0.00	96.00	96.08	17.88
3/3/2022	7:45	24.27	11.10	0.00	0.00	0.00	96.00	96.08	16.61
3/3/2022	8:00	31.22	13.30	0.00	-0.85	0.00	96.00	96.08	20.00
3/3/2022	8:15	33.05	24.00	0.00	0.00	-0.21	96.00	95.66	17.60
3/3/2022	8:30	36.10	22.50	0.00	0.00	-0.21	96.00	95.66	17.93
3/3/2022	8:45	41.22	32.30	0.00	0.00	-0.21	96.00	95.66	19.81
3/3/2022	9:00	41.83	33.80	0.00	0.00	-0.21	96.00	95.66	13.79

Date	Time	Demand (kW)	PV (kW)	AGM Discharge (kW)	LFP Discharge (kW)	Accum (kWh)	SoC AGM (%)	SoC LFP (%)	Grid power (kW)
3/3/2022	9:15	43.90	43.00	0.00	0.00	-0.21	96.00	95.66	10.54
3/3/2022	9:30	45.85	39.90	0.00	0.00	-0.21	96.00	95.66	9.69
3/3/2022	9:45	49.64	45.70	0.00	0.00	-0.21	96.00	95.66	14.40
3/3/2022	10:00	49.64	49.30	0.00	0.00	-0.21	96.00	95.66	13.60
3/3/2022	10:15	55.85	46.20	0.00	0.00	-0.21	96.00	95.66	19.86
3/3/2022	10:30	58.78	52.30	0.00	0.00	-0.21	96.00	95.66	23.39
3/3/2022	10:45	64.63	46.00	0.00	0.00	-0.21	96.00	95.66	31.25
3/3/2022	11:00	68.29	54.30	0.00	0.00	-0.21	96.00	95.66	34.35
3/3/2022	11:15	69.51	47.40	0.00	0.00	-0.21	96.00	95.66	37.13
3/3/2022	11:30	68.29	44.10	0.00	0.00	-0.21	96.00	95.66	36.75
3/3/2022	11:45	73.05	44.90	-1.84	-0.79	-0.21	96.00	95.66	40.00
3/3/2022	12:00	71.34	49.00	-0.20	-0.08	-0.87	95.42	95.26	40.00
3/3/2022	12:15	67.56	38.00	0.00	0.00	-0.94	95.36	95.22	37.98
3/3/2022	12:30	69.51	44.90	-1.35	-0.58	-0.94	95.36	95.22	40.00
3/3/2022	12:45	69.15	37.80	-0.79	-0.34	-1.42	94.94	94.93	40.00
3/3/2022	13:00	68.17	46.10	-1.09	-0.47	-1.71	94.69	94.76	40.00
3/3/2022	13:15	74.39	37.10	-6.59	-2.82	-2.09	94.35	94.53	40.00
3/3/2022	13:30	75.98	42.80	-7.12	-3.05	-4.45	92.29	93.12	40.00
3/3/2022	13:45	75.12	38.00	-6.29	-2.70	-6.99	90.07	91.59	40.00
3/3/2022	14:00	74.39	41.20	-6.03	-2.58	-9.24	88.10	90.24	40.00
3/3/2022	14:15	71.22	34.10	-5.80	-2.48	-11.39	86.22	88.95	40.00
3/3/2022	14:30	71.46	32.40	-6.92	-2.96	-13.46	84.41	87.71	40.00
3/3/2022	14:45	70.24	34.80	-7.21	-3.09	-15.93	82.25	86.23	40.00
3/3/2022	15:00	72.08	32.90	-8.86	-3.80	-18.51	79.99	84.68	40.00
3/3/2022	15:15	73.29	29.20	-11.36	-4.87	-21.67	77.22	82.78	40.00
3/3/2022	15:30	71.10	35.10	-10.84	-4.64	-25.73	73.67	80.35	40.00
3/3/2022	15:45	69.51	28.90	-10.31	-4.42	-29.60	70.29	78.03	40.00
3/3/2022	16:00	70.24	25.10	-12.25	-5.25	-33.28	67.06	75.82	40.00
3/3/2022	16:15	64.63	22.00	-11.79	-5.05	-37.66	63.23	73.19	40.00
3/3/2022	16:30	60.73	20.60	-10.18	-4.36	-41.87	59.55	70.66	40.00
3/3/2022	16:45	56.71	16.00	-10.24	-4.39	-45.51	56.37	68.48	40.00
3/3/2022	17:00	48.90	11.80	-4.78	-2.05	-49.16	53.17	66.29	40.00
3/3/2022	17:15	47.07	11.30	-4.81	-2.06	-50.87	51.67	65.26	40.00
3/3/2022	17:30	45.73	12.70	-3.99	-1.71	-52.59	50.17	64.23	40.00
3/3/2022	17:45	48.04	7.90	-6.75	-2.89	-54.01	48.93	63.38	40.00
3/3/2022	18:00	47.92	5.40	-7.31	-3.13	-56.42	46.81	61.93	40.00
3/3/2022	18:15	48.66	4.00	-8.70	-3.73	-59.04	44.53	60.36	40.00
3/3/2022	18:30	49.64	5.20	-10.08	-4.32	-62.14	41.81	58.50	40.00
3/3/2022	18:45	50.97	1.44	-12.02	-5.15	-65.74	38.66	56.34	40.00
3/3/2022	19:00	50.61	0.69	-12.72	-5.45	-70.04	34.90	53.76	40.00
3/3/2022	19:15	48.66	0.42	-11.08	-4.75	-74.58	30.93	51.04	40.00

Date	Time	Demand (kW)	PV (kW)	AGM Discharge (kW)	LFP Discharge (kW)	Accum (kWh)	SoC AGM (%)	SoC LFP (%)	Grid power (kW)
3/3/2022	19:30	48.90	1.02	-11.78	-5.05	-78.54	27.47	48.66	40.00
3/3/2022	19:45	48.04	0.60	-11.65	-4.99	-82.74	23.79	46.14	40.00
3/3/2022	20:00	47.80	0.21	-12.35	-5.29	-86.90	20.15	43.64	40.00
3/3/2022	20:15	43.78	1.11	0.00	-10.94	-91.31	16.28	41.00	40.00
3/3/2022	20:30	42.19	0.12	0.00	-10.59	-94.05	16.28	35.53	40.00
3/3/2022	20:45	40.98	0.18	0.00	-9.41	-96.70	16.28	30.23	40.00
3/3/2022	21:00	36.95	0.72	0.00	-4.71	-99.05	16.28	25.53	40.00
3/3/2022	21:15	31.34	0.45	0.00	0.00	-100.23	16.28	23.17	36.65
3/3/2022	21:30	27.20	0.78	0.00	0.00	-100.23	16.28	23.17	31.94
3/3/2022	21:45	20.12	0.54	0.00	0.00	-100.23	16.28	23.17	22.12
3/3/2022	22:00	20.61	0.03	0.00	0.00	-100.23	16.28	23.17	24.71
3/3/2022	22:15	17.68	0.51	0.00	-0.59	-100.23	16.28	23.17	22.50
3/3/2022	22:30	14.87	0.09	0.00	0.00	-100.37	16.88	22.88	22.50
3/3/2022	22:45	10.85	0.27	0.00	0.00	-100.37	18.19	23.72	22.50
3/3/2022	23:00	7.80	0.75	0.00	0.00	-100.37	20.36	25.95	22.50
3/3/2022	23:15	7.07	0.27	0.00	0.00	-100.37	22.80	28.59	22.50
3/3/2022	23:30	5.24	0.60	0.00	0.00	-100.37	25.42	31.53	22.50
3/3/2022	23:45	5.00	0.81	0.00	0.00	-100.37	28.36	34.99	22.50
4/3/2022	0:00	4.78	0.42	0.00	0.00	0.00	28.36	34.99	22.50
4/3/2022	0:15	4.20	0.75	0.00	0.00	0.00	31.35	38.52	22.50
4/3/2022	0:30	4.78	0.90	0.00	0.00	0.00	34.52	42.34	22.50
4/3/2022	0:45	5.08	0.81	0.00	0.00	0.00	37.82	46.37	22.50
4/3/2022	1:00	3.80	1.32	0.00	0.00	0.00	40.96	50.15	22.50
4/3/2022	1:15	4.88	0.45	0.00	0.00	0.00	44.44	54.48	22.50
4/3/2022	1:30	4.20	1.35	0.00	0.00	0.00	47.74	58.50	22.50
4/3/2022	1:45	3.80	0.75	0.00	0.00	0.00	51.07	62.58	22.50
4/3/2022	2:00	4.20	0.48	0.00	0.00	0.00	54.40	66.65	22.50
4/3/2022	2:15	3.90	1.23	0.00	0.00	0.00	57.57	70.48	22.50
4/3/2022	2:30	4.10	0.15	0.00	0.00	0.00	61.05	74.80	22.50
4/3/2022	2:45	4.00	0.84	0.00	0.00	0.00	64.22	78.62	22.50
4/3/2022	3:00	3.70	0.75	0.00	0.00	0.00	67.71	82.95	22.50
4/3/2022	3:15	4.98	0.54	0.00	0.00	0.00	70.88	86.77	22.50
4/3/2022	3:30	4.00	0.12	0.00	0.00	0.00	74.02	90.55	22.50
4/3/2022	3:45	3.13	0.63	0.00	0.00	0.00	77.35	94.62	22.50
4/3/2022	4:00	4.78	0.60	0.00	0.00	0.00	80.86	98.99	25.00
4/3/2022	4:15	3.70	0.51	0.00	0.00	0.00	86.83	98.99	25.00
4/3/2022	4:30	3.90	0.72	0.00	0.00	0.00	93.18	98.99	25.00
4/3/2022	4:45	4.68	0.48	0.00	0.00	0.00	100.14	98.99	4.88
4/3/2022	5:00	4.00	0.51	0.00	0.00	0.00	100.14	98.99	4.71
4/3/2022	5:15	3.90	0.09	0.00	0.00	0.00	100.14	98.99	2.71
4/3/2022	5:30	4.88	0.93	0.00	0.00	0.00	96.00	98.99	2.88

Date	Time	Demand (kW)	PV (kW)	AGM Discharge (kW)	LFP Discharge (kW)	Accum (kWh)	SoC AGM (%)	SoC LFP (%)	Grid power (kW)
4/3/2022	5:45	4.88	0.30	0.00	0.00	0.00	96.00	98.99	4.88
4/3/2022	6:00	5.95	0.42	0.00	0.00	0.00	96.00	98.99	5.06
4/3/2022	6:15	7.90	0.20	0.00	0.00	0.00	96.00	98.99	8.41
4/3/2022	6:30	5.95	5.90	0.00	0.00	0.00	96.00	98.99	3.06
4/3/2022	6:45	7.70	6.20	0.00	0.00	0.00	96.00	98.99	4.41
4/3/2022	7:00	9.66	8.80	0.00	0.00	0.00	96.00	98.99	6.16
4/3/2022	7:15	17.76	5.80	0.00	0.00	0.00	96.00	98.99	14.18
4/3/2022	7:30	21.56	8.60	0.00	0.00	0.00	96.00	98.99	17.88
4/3/2022	7:45	24.59	12.50	0.00	0.00	0.00	96.00	98.99	16.61
4/3/2022	8:00	31.52	18.40	0.00	-0.85	0.00	96.00	98.99	20.00
4/3/2022	8:15	32.97	22.70	0.00	0.00	-0.21	96.00	98.57	17.60
4/3/2022	8:30	35.90	22.70	0.00	0.00	-0.21	96.00	98.57	17.93
4/3/2022	8:45	41.18	32.40	0.00	0.00	-0.21	96.00	98.57	19.81
4/3/2022	9:00	39.95	37.90	0.00	0.00	-0.21	96.00	98.57	13.79
4/3/2022	9:15	43.10	39.90	0.00	0.00	-0.21	96.00	98.57	10.54
4/3/2022	9:30	46.65	44.00	0.00	0.00	-0.21	96.00	98.57	9.69
4/3/2022	9:45	49.76	50.00	0.00	0.00	-0.21	96.00	98.57	14.40
4/3/2022	10:00	50.16	48.70	0.00	0.00	-0.21	96.00	98.57	13.60
4/3/2022	10:15	55.61	48.90	0.00	0.00	-0.21	96.00	98.57	19.86
4/3/2022	10:30	57.74	50.90	0.00	0.00	-0.21	96.00	98.57	23.39
4/3/2022	10:45	62.79	52.40	0.00	0.00	-0.21	96.00	98.57	31.25
4/3/2022	11:00	68.09	51.00	0.00	0.00	-0.21	96.00	98.57	34.35
4/3/2022	11:15	69.47	39.30	0.00	0.00	-0.21	96.00	98.57	37.13
4/3/2022	11:30	68.19	40.60	0.00	0.00	-0.21	96.00	98.57	36.75
4/3/2022	11:45	73.37	51.50	-1.84	-0.79	-0.21	96.00	98.57	40.00
4/3/2022	12:00	71.02	50.10	-0.20	-0.08	-0.87	95.42	98.17	40.00
4/3/2022	12:15	67.22	42.90	0.00	0.00	-0.94	95.36	98.13	37.98
4/3/2022	12:30	69.57	38.40	-1.35	-0.58	-0.94	95.36	98.13	40.00
4/3/2022	12:45	69.37	39.50	-0.79	-0.34	-1.42	94.94	97.84	40.00
4/3/2022	13:00	68.59	41.40	-1.09	-0.47	-1.71	94.69	97.67	40.00
4/3/2022	13:15	74.35	40.50	-6.59	-2.82	-2.09	94.35	97.44	40.00
4/3/2022	13:30	76.00	39.50	-7.12	-3.05	-4.45	92.29	96.03	40.00
4/3/2022	13:45	75.32	39.30	-6.29	-2.70	-6.99	90.07	94.50	40.00
4/3/2022	14:00	74.15	40.90	-6.03	-2.58	-9.24	88.10	93.15	40.00
4/3/2022	14:15	71.52	34.60	-5.80	-2.48	-11.39	86.22	91.86	40.00
4/3/2022	14:30	71.32	30.00	-6.92	-2.96	-13.46	84.41	90.62	40.00
4/3/2022	14:45	70.24	30.80	-7.21	-3.09	-15.93	82.25	89.14	40.00
4/3/2022	15:00	72.10	34.80	-8.86	-3.80	-18.51	79.99	87.59	40.00
4/3/2022	15:15	73.07	35.30	-11.36	-4.87	-21.67	77.22	85.69	40.00
4/3/2022	15:30	71.52	33.30	-10.84	-4.64	-25.73	73.67	83.26	40.00
4/3/2022	15:45	69.37	27.20	-10.31	-4.42	-29.60	70.29	80.93	40.00

Date	Time	Demand (kW)	PV (kW)	AGM Discharge (kW)	LFP Discharge (kW)	Accum (kWh)	SoC AGM (%)	SoC LFP (%)	Grid power (kW)
4/3/2022	16:00	70.14	28.10	-12.25	-5.25	-33.28	67.06	78.72	40.00
4/3/2022	16:15	64.39	18.90	-11.79	-5.05	-37.66	63.23	76.10	40.00
4/3/2022	16:30	60.29	15.50	-10.18	-4.36	-41.87	59.55	73.57	40.00
4/3/2022	16:45	56.49	11.70	-10.24	-4.39	-45.51	56.37	71.39	40.00
4/3/2022	17:00	49.08	13.50	-4.78	-2.05	-49.16	53.17	69.19	40.00
4/3/2022	17:15	46.83	11.00	-4.81	-2.06	-50.87	51.67	68.17	40.00
4/3/2022	17:30	45.65	10.20	-3.99	-1.71	-52.59	50.17	67.14	40.00
4/3/2022	17:45	47.70	8.40	-6.75	-2.89	-54.01	48.93	66.29	40.00
4/3/2022	18:00	47.70	6.70	-7.31	-3.13	-56.42	46.81	64.84	40.00
4/3/2022	18:15	49.08	5.20	-8.70	-3.73	-59.04	44.53	63.27	40.00
4/3/2022	18:30	49.76	6.60	-10.08	-4.32	-62.14	41.81	61.41	40.00
4/3/2022	18:45	50.93	1.53	-12.02	-5.15	-65.74	38.66	59.25	40.00
4/3/2022	19:00	50.33	0.21	-12.72	-5.45	-70.04	34.90	56.67	40.00
4/3/2022	19:15	47.98	1.05	-11.08	-4.75	-74.58	30.93	53.95	40.00
4/3/2022	19:30	49.18	0.57	-11.78	-5.05	-78.54	27.47	51.57	40.00
4/3/2022	19:45	48.20	1.35	-11.65	-4.99	-82.74	23.79	49.05	40.00
4/3/2022	20:00	48.20	0.75	-12.35	-5.29	-86.90	20.15	46.55	40.00
4/3/2022	20:15	43.90	0.21	0.00	-10.94	-91.31	16.28	43.90	40.00
4/3/2022	20:30	43.15	0.36	0.00	-10.59	-94.05	16.28	38.43	40.00
4/3/2022	20:45	40.98	0.69	0.00	-9.41	-96.70	16.28	33.14	40.00
4/3/2022	21:00	37.87	0.51	0.00	-4.71	-99.05	16.28	28.43	40.00
4/3/2022	21:15	30.42	0.69	0.00	0.00	-100.23	16.28	26.08	36.65
4/3/2022	21:30	28.12	0.54	0.00	0.00	-100.23	16.28	26.08	31.94
4/3/2022	21:45	19.60	0.96	0.00	0.00	-100.23	16.28	26.08	22.12
4/3/2022	22:00	20.69	0.21	0.00	0.00	-100.23	16.28	26.08	24.71
4/3/2022	22:15	17.76	0.93	0.00	-0.59	-100.23	16.28	26.08	22.50
4/3/2022	22:30	14.93	0.69	0.00	0.00	-100.37	16.88	25.79	22.50
4/3/2022	22:45	10.65	1.17	0.00	0.00	-100.37	18.19	26.63	22.50
4/3/2022	23:00	8.10	0.96	0.00	0.00	-100.37	20.36	28.85	22.50
4/3/2022	23:15	6.83	0.75	0.00	0.00	-100.37	22.80	31.50	22.50
4/3/2022	23:30	5.42	0.09	0.00	0.00	-100.37	25.42	34.44	22.50
4/3/2022	23:45	4.88	0.27	0.00	0.00	-100.37	28.36	37.90	22.50
7/3/2022	0:00	5.08	0.36	0.00	0.00	0.00	28.36	37.90	22.50
7/3/2022	0:15	3.80	0.12	0.00	0.00	0.00	31.35	41.43	22.50
7/3/2022	0:30	4.98	0.51	0.00	0.00	0.00	34.52	45.25	22.50
7/3/2022	0:45	4.88	0.99	0.00	0.00	0.00	37.82	49.28	22.50
7/3/2022	1:00	4.10	0.18	0.00	0.00	0.00	40.96	53.06	22.50
7/3/2022	1:15	4.98	0.60	0.00	0.00	0.00	44.44	57.39	22.50
7/3/2022	1:30	4.10	1.02	0.00	0.00	0.00	47.74	61.41	22.50
7/3/2022	1:45	4.10	0.69	0.00	0.00	0.00	51.07	65.49	22.50
7/3/2022	2:00	4.10	0.45	0.00	0.00	0.00	54.40	69.56	22.50

Date	Time	Demand (kW)	PV (kW)	AGM Discharge (kW)	LFP Discharge (kW)	Accum (kWh)	SoC AGM (%)	SoC LFP (%)	Grid power (kW)
7/3/2022	2:15	3.90	1.08	0.00	0.00	0.00	57.57	73.39	22.50
7/3/2022	2:30	3.80	0.63	0.00	0.00	0.00	61.05	77.71	22.50
7/3/2022	2:45	3.90	1.08	0.00	0.00	0.00	64.22	81.53	22.50
7/3/2022	3:00	4.00	0.51	0.00	0.00	0.00	67.71	85.86	22.50
7/3/2022	3:15	5.08	0.78	0.00	0.00	0.00	70.88	89.68	22.50
7/3/2022	3:30	4.10	0.51	0.00	0.00	0.00	74.02	93.46	22.50
7/3/2022	3:45	3.03	1.08	0.00	0.00	0.00	77.35	97.53	25.00
7/3/2022	4:00	4.88	0.99	0.00	0.00	0.00	84.37	97.53	25.00
7/3/2022	4:15	3.80	0.12	0.00	0.00	0.00	90.35	97.53	25.00
7/3/2022	4:30	4.00	0.00	0.00	0.00	0.00	96.69	97.53	2.71
7/3/2022	4:45	4.78	0.42	0.00	0.00	0.00	96.69	97.53	4.88
7/3/2022	5:00	4.00	0.84	0.00	0.00	0.00	96.69	97.53	4.71
7/3/2022	5:15	4.10	0.27	0.00	0.00	0.00	96.69	97.53	2.71
7/3/2022	5:30	4.98	0.42	0.00	0.00	0.00	96.00	97.53	2.88
7/3/2022	5:45	4.78	0.06	0.00	0.00	0.00	96.00	97.53	4.88
7/3/2022	6:00	5.75	1.14	0.00	0.00	0.00	96.00	97.53	5.06
7/3/2022	6:15	7.80	0.50	0.00	0.00	0.00	96.00	97.53	8.41
7/3/2022	6:30	5.95	3.40	0.00	0.00	0.00	96.00	97.53	3.06
7/3/2022	6:45	8.00	6.60	0.00	0.00	0.00	96.00	97.53	4.41
7/3/2022	7:00	9.96	4.40	0.00	0.00	0.00	96.00	97.53	6.16
7/3/2022	7:15	17.46	4.50	0.00	0.00	0.00	96.00	97.53	14.18
7/3/2022	7:30	21.36	5.30	0.00	0.00	0.00	96.00	97.53	17.88
7/3/2022	7:45	24.39	12.60	0.00	0.00	0.00	96.00	97.53	16.61
7/3/2022	8:00	31.32	14.60	0.00	-0.85	0.00	96.00	97.53	20.00
7/3/2022	8:15	33.27	18.30	0.00	0.00	-0.21	96.00	97.11	17.60
7/3/2022	8:30	36.20	26.40	0.00	0.00	-0.21	96.00	97.11	17.93
7/3/2022	8:45	40.98	32.10	0.00	0.00	-0.21	96.00	97.11	19.81
7/3/2022	9:00	40.35	41.10	0.00	0.00	-0.21	96.00	97.11	13.79
7/3/2022	9:15	43.10	45.50	0.00	0.00	-0.21	96.00	97.11	10.54
7/3/2022	9:30	47.05	48.30	0.00	0.00	-0.21	96.00	97.11	9.69
7/3/2022	9:45	47.76	52.50	0.00	0.00	-0.21	96.00	97.11	14.40
7/3/2022	10:00	49.76	49.20	0.00	0.00	-0.21	96.00	97.11	13.60
7/3/2022	10:15	55.21	41.30	0.00	0.00	-0.21	96.00	97.11	19.86
7/3/2022	10:30	55.34	47.90	0.00	0.00	-0.21	96.00	97.11	23.39
7/3/2022	10:45	63.19	36.80	0.00	0.00	-0.21	96.00	97.11	31.25
7/3/2022	11:00	67.69	50.90	0.00	0.00	-0.21	96.00	97.11	34.35
7/3/2022	11:15	69.47	40.50	0.00	0.00	-0.21	96.00	97.11	37.13
7/3/2022	11:30	68.29	43.30	0.00	0.00	-0.21	96.00	97.11	36.75
7/3/2022	11:45	73.37	38.60	-1.84	-0.79	-0.21	96.00	97.11	40.00
7/3/2022	12:00	71.32	38.60	-0.20	-0.08	-0.87	95.42	96.71	40.00
7/3/2022	12:15	67.52	46.30	0.00	0.00	-0.94	95.36	96.67	37.98

Date	Time	Demand (kW)	PV (kW)	AGM Discharge (kW)	LFP Discharge (kW)	Accum (kWh)	SoC AGM (%)	SoC LFP (%)	Grid power (kW)
7/3/2022	12:30	69.17	36.40	-1.35	-0.58	-0.94	95.36	96.67	40.00
7/3/2022	12:45	69.37	35.10	-0.79	-0.34	-1.42	94.94	96.38	40.00
7/3/2022	13:00	68.49	45.50	-1.09	-0.47	-1.71	94.69	96.21	40.00
7/3/2022	13:15	74.35	41.70	-6.59	-2.82	-2.09	94.35	95.98	40.00
7/3/2022	13:30	76.30	34.10	-7.12	-3.05	-4.45	92.29	94.57	40.00
7/3/2022	13:45	75.12	39.10	-6.29	-2.70	-6.99	90.07	93.04	40.00
7/3/2022	14:00	74.25	37.50	-6.03	-2.58	-9.24	88.10	91.69	40.00
7/3/2022	14:15	71.12	39.60	-5.80	-2.48	-11.39	86.22	90.40	40.00
7/3/2022	14:30	71.22	38.30	-6.92	-2.96	-13.46	84.41	89.16	40.00
7/3/2022	14:45	70.44	37.60	-7.21	-3.09	-15.93	82.25	87.68	40.00
7/3/2022	15:00	72.40	27.60	-8.86	-3.80	-18.51	79.99	86.13	40.00
7/3/2022	15:15	73.17	28.50	-11.36	-4.87	-21.67	77.22	84.23	40.00
7/3/2022	15:30	71.22	25.90	-10.84	-4.64	-25.73	73.67	81.80	40.00
7/3/2022	15:45	69.17	25.60	-10.31	-4.42	-29.60	70.29	79.48	40.00
7/3/2022	16:00	70.34	24.90	-12.25	-5.25	-33.28	67.06	77.27	40.00
7/3/2022	16:15	64.59	21.30	-11.79	-5.05	-37.66	63.23	74.64	40.00
7/3/2022	16:30	60.59	16.30	-10.18	-4.36	-41.87	59.55	72.11	40.00
7/3/2022	16:45	56.69	12.50	-10.24	-4.39	-45.51	56.37	69.93	40.00
7/3/2022	17:00	48.98	11.40	-4.78	-2.05	-49.16	53.17	67.74	40.00
7/3/2022	17:15	46.93	7.90	-4.81	-2.06	-50.87	51.67	66.71	40.00
7/3/2022	17:30	45.85	12.20	-3.99	-1.71	-52.59	50.17	65.68	40.00
7/3/2022	17:45	47.70	4.90	-6.75	-2.89	-54.01	48.93	64.83	40.00
7/3/2022	18:00	47.90	9.60	-7.31	-3.13	-56.42	46.81	63.38	40.00
7/3/2022	18:15	48.68	5.90	-8.70	-3.73	-59.04	44.53	61.81	40.00
7/3/2022	18:30	49.76	7.90	-10.08	-4.32	-62.14	41.81	59.95	40.00
7/3/2022	18:45	50.73	0.87	-12.02	-5.15	-65.74	38.66	57.79	40.00
7/3/2022	19:00	50.33	0.42	-12.72	-5.45	-70.04	34.90	55.21	40.00
7/3/2022	19:15	49.58	1.86	-11.08	-4.75	-74.58	30.93	52.49	40.00
7/3/2022	19:30	49.58	0.09	-11.78	-5.05	-78.54	27.47	50.11	40.00
7/3/2022	19:45	47.40	0.99	-11.65	-4.99	-82.74	23.79	47.59	40.00
7/3/2022	20:00	47.40	0.63	-12.35	-5.29	-86.90	20.15	45.09	40.00
7/3/2022	20:15	44.30	0.45	0.00	-10.94	-91.31	16.28	42.45	40.00
7/3/2022	20:30	41.95	0.12	0.00	-10.59	-94.05	16.28	36.98	40.00
7/3/2022	20:45	40.98	0.60	0.00	-9.41	-96.70	16.28	31.68	40.00
7/3/2022	21:00	37.87	0.48	0.00	-4.71	-99.05	16.28	26.98	40.00
7/3/2022	21:15	31.62	0.90	0.00	0.00	-100.23	16.28	24.62	36.65
7/3/2022	21:30	27.72	0.54	0.00	0.00	-100.23	16.28	24.62	31.94
7/3/2022	21:45	20.00	0.63	0.00	0.00	-100.23	16.28	24.62	22.12
7/3/2022	22:00	20.49	0.21	0.00	0.00	-100.23	16.28	24.62	24.71
7/3/2022	22:15	17.76	0.27	0.00	-0.59	-100.23	16.28	24.62	22.50
7/3/2022	22:30	14.73	0.45	0.00	0.00	-100.37	16.88	24.33	22.50

Date	Time	Demand (kW)	PV (kW)	AGM Discharge (kW)	LFP Discharge (kW)	Accum (kWh)	SoC AGM (%)	SoC LFP (%)	Grid power (kW)
7/3/2022	22:45	10.95	1.11	0.00	0.00	-100.37	18.19	25.17	22.50
7/3/2022	23:00	7.90	0.45	0.00	0.00	-100.37	20.36	27.40	22.50
7/3/2022	23:15	6.83	0.36	0.00	0.00	-100.37	22.80	30.04	22.50
7/3/2022	23:30	5.12	0.84	0.00	0.00	-100.37	25.42	32.98	22.50
7/3/2022	23:45	4.98	0.93	0.00	0.00	-100.37	28.36	36.44	22.50
8/3/2022	0:00	4.78	0.30	0.00	0.00	0.00	28.32	36.41	22.50
8/3/2022	0:15	3.80	0.60	0.00	0.00	0.00	31.31	39.94	22.50
8/3/2022	0:30	5.08	0.00	0.00	0.00	0.00	34.48	43.76	22.50
8/3/2022	0:45	5.08	0.00	0.00	0.00	0.00	37.78	47.79	22.50
8/3/2022	1:00	3.70	0.30	0.00	0.00	0.00	40.92	51.57	22.50
8/3/2022	1:15	5.08	0.60	0.00	0.00	0.00	44.40	55.90	22.50
8/3/2022	1:30	3.90	0.00	0.00	0.00	0.00	47.70	59.92	22.50
8/3/2022	1:45	3.80	0.00	0.00	0.00	0.00	51.03	64.00	22.50
8/3/2022	2:00	3.90	0.00	0.00	0.00	0.00	54.36	68.07	22.50
8/3/2022	2:15	3.70	0.30	0.00	0.00	0.00	57.53	71.90	22.50
8/3/2022	2:30	4.00	0.72	0.00	0.00	0.00	61.01	76.22	22.50
8/3/2022	2:45	3.70	0.00	0.00	0.00	0.00	64.18	80.04	22.50
8/3/2022	3:00	3.90	0.60	0.00	0.00	0.00	67.67	84.37	22.50
8/3/2022	3:15	4.68	0.30	0.00	0.00	0.00	70.84	88.19	22.50
8/3/2022	3:30	3.80	0.00	0.00	0.00	0.00	73.98	91.97	22.50
8/3/2022	3:45	2.73	0.60	0.00	0.00	0.00	77.31	96.04	25.00
8/3/2022	4:00	4.88	0.90	0.00	0.00	0.00	84.33	96.04	25.00
8/3/2022	4:15	4.00	0.30	0.00	0.00	0.00	90.31	96.04	25.00
8/3/2022	4:30	3.90	0.60	0.00	0.00	0.00	96.65	96.04	2.71
8/3/2022	4:45	4.98	0.30	0.00	0.00	0.00	96.65	96.04	4.88
8/3/2022	5:00	4.00	0.00	0.00	0.00	0.00	96.65	96.04	4.71
8/3/2022	5:15	3.90	0.90	0.00	0.00	0.00	96.65	96.04	2.71
8/3/2022	5:30	4.78	0.00	0.00	0.00	0.00	96.00	96.04	2.88
8/3/2022	5:45	4.98	0.75	0.00	0.00	0.00	96.00	96.04	4.88
8/3/2022	6:00	5.85	0.90	0.00	0.00	0.00	96.00	96.04	5.06
8/3/2022	6:15	7.70	3.20	0.00	0.00	0.00	96.00	96.04	8.41
8/3/2022	6:30	5.65	3.00	0.00	0.00	0.00	96.00	96.04	3.06
8/3/2022	6:45	7.70	4.00	0.00	0.00	0.00	96.00	96.04	4.41
8/3/2022	7:00	9.66	5.60	0.00	0.00	0.00	96.00	96.04	6.16
8/3/2022	7:15	17.56	7.20	0.00	0.00	0.00	96.00	96.04	14.18
8/3/2022	7:30	21.36	8.00	0.00	0.00	0.00	96.00	96.04	17.88
8/3/2022	7:45	24.19	10.40	0.00	0.00	0.00	96.00	96.04	16.61
8/3/2022	8:00	31.22	12.80	0.00	-0.85	0.00	96.00	96.04	20.00
8/3/2022	8:15	33.27	16.80	0.00	0.00	-0.21	96.00	95.62	17.60
8/3/2022	8:30	36.30	18.40	0.00	0.00	-0.21	96.00	95.62	17.93
8/3/2022	8:45	40.98	24.00	0.00	0.00	-0.21	96.00	95.62	19.81

Date	Time	Demand (kW)	PV (kW)	AGM Discharge (kW)	LFP Discharge (kW)	Accum (kWh)	SoC AGM (%)	SoC LFP (%)	Grid power (kW)
8/3/2022	9:00	42.05	29.71	0.00	0.00	-0.21	96.00	95.62	13.79
8/3/2022	9:15	42.00	32.00	0.00	0.00	-0.21	96.00	95.62	10.54
8/3/2022	9:30	46.05	34.29	0.00	0.00	-0.21	96.00	95.62	9.69
8/3/2022	9:45	49.26	34.29	0.00	0.00	-0.21	96.00	95.62	14.40
8/3/2022	10:00	49.96	34.29	0.00	0.00	-0.21	96.00	95.62	13.60
8/3/2022	10:15	56.71	35.43	0.00	0.00	-0.21	96.00	95.62	19.86
8/3/2022	10:30	59.24	34.29	0.00	0.00	-0.21	96.00	95.62	23.39
8/3/2022	10:45	63.59	33.14	0.00	0.00	-0.21	96.00	95.62	31.25
8/3/2022	11:00	68.19	35.43	0.00	0.00	-0.21	96.00	95.62	34.35
8/3/2022	11:15	69.27	32.00	0.00	0.00	-0.21	96.00	95.62	37.13
8/3/2022	11:30	68.39	30.86	0.00	0.00	-0.21	96.00	95.62	36.75
8/3/2022	11:45	72.97	33.14	-1.84	-0.79	-0.21	96.00	95.62	40.00
8/3/2022	12:00	71.42	34.29	-0.20	-0.08	-0.87	95.42	95.22	40.00
8/3/2022	12:15	67.22	32.00	0.00	0.00	-0.94	95.36	95.18	37.98
8/3/2022	12:30	69.17	32.00	-1.35	-0.58	-0.94	95.36	95.18	40.00
8/3/2022	12:45	69.37	32.00	-0.79	-0.34	-1.42	94.94	94.89	40.00
8/3/2022	13:00	68.39	32.00	-1.09	-0.47	-1.71	94.69	94.72	40.00
8/3/2022	13:15	74.35	34.29	-6.59	-2.82	-2.09	94.35	94.49	40.00
8/3/2022	13:30	76.10	34.29	-7.12	-3.05	-4.45	92.29	93.08	40.00
8/3/2022	13:45	75.32	35.43	-6.29	-2.70	-6.99	90.07	91.55	40.00
8/3/2022	14:00	74.25	34.29	-6.03	-2.58	-9.24	88.10	90.20	40.00
8/3/2022	14:15	71.02	36.57	-5.80	-2.48	-11.39	86.22	88.91	40.00
8/3/2022	14:30	71.02	36.57	-6.92	-2.96	-13.46	84.41	87.67	40.00
8/3/2022	14:45	70.44	34.29	-7.21	-3.09	-15.93	82.25	86.19	40.00
8/3/2022	15:00	73.30	34.29	-8.86	-3.80	-18.51	79.99	84.64	40.00
8/3/2022	15:15	73.17	32.00	-11.36	-4.87	-21.67	77.22	82.74	40.00
8/3/2022	15:30	71.42	32.00	-10.84	-4.64	-25.73	73.67	80.31	40.00
8/3/2022	15:45	69.37	29.71	-10.31	-4.42	-29.60	70.29	77.99	40.00
8/3/2022	16:00	70.44	27.43	-12.25	-5.25	-33.28	67.06	75.78	40.00
8/3/2022	16:15	64.19	21.71	-11.79	-5.05	-37.66	63.23	73.15	40.00
8/3/2022	16:30	60.49	21.71	-10.18	-4.36	-41.87	59.55	70.62	40.00
8/3/2022	16:45	56.59	19.00	-10.24	-4.39	-45.51	56.37	68.44	40.00
8/3/2022	17:00	48.68	17.14	-4.78	-2.05	-49.16	53.17	66.25	40.00
8/3/2022	17:15	46.63	10.40	-4.81	-2.06	-50.87	51.67	65.22	40.00
8/3/2022	17:30	45.75	9.60	-3.99	-1.71	-52.59	50.17	64.19	40.00
8/3/2022	17:45	48.00	7.80	-6.75	-2.89	-54.01	48.93	63.34	40.00
8/3/2022	18:00	48.00	9.40	-7.31	-3.13	-56.42	46.81	61.89	40.00
8/3/2022	18:15	48.98	6.70	-8.70	-3.73	-59.04	44.53	60.32	40.00
8/3/2022	18:30	49.96	3.20	-10.08	-4.32	-62.14	41.81	58.46	40.00
8/3/2022	18:45	50.53	1.35	-12.02	-5.15	-65.74	38.66	56.30	40.00
8/3/2022	19:00	50.83	1.17	-12.72	-5.45	-70.04	34.90	53.72	40.00

Date	Time	Demand (kW)	PV (kW)	AGM Discharge (kW)	LFP Discharge (kW)	Accum (kWh)	SoC AGM (%)	SoC LFP (%)	Grid power (kW)
8/3/2022	19:15	48.58	0.48	-11.08	-4.75	-74.58	30.93	51.00	40.00
8/3/2022	19:30	48.88	0.93	-11.78	-5.05	-78.54	27.47	48.62	40.00
8/3/2022	19:45	47.60	0.18	-11.65	-4.99	-82.74	23.79	46.10	40.00
8/3/2022	20:00	47.80	0.27	-12.35	-5.29	-86.90	20.15	43.60	40.00
8/3/2022	20:15	43.90	0.60	0.00	-10.94	-91.31	16.28	40.96	40.00
8/3/2022	20:30	41.75	0.00	0.00	-10.59	-94.05	16.28	35.49	40.00
8/3/2022	20:45	40.98	0.00	0.00	-9.41	-96.70	16.28	30.19	40.00
8/3/2022	21:00	37.07	0.00	0.00	-4.71	-99.05	16.28	25.49	40.00
8/3/2022	21:15	31.32	0.30	0.00	0.00	-100.23	16.28	23.13	36.65
8/3/2022	21:30	27.42	0.30	0.00	0.00	-100.23	16.28	23.13	31.94
8/3/2022	21:45	20.10	0.60	0.00	0.00	-100.23	16.28	23.13	22.12
8/3/2022	22:00	20.89	0.00	0.00	0.00	-100.23	16.28	23.13	24.71
8/3/2022	22:15	17.76	0.00	0.00	-0.59	-100.23	16.28	23.13	22.50
8/3/2022	22:30	15.03	0.30	0.00	0.00	-100.37	16.88	22.84	22.50
8/3/2022	22:45	11.55	0.60	0.00	0.00	-100.37	18.19	23.68	22.50
8/3/2022	23:00	7.60	0.00	0.00	0.00	-100.37	20.36	25.91	22.50
8/3/2022	23:15	7.13	0.00	0.00	0.00	-100.37	22.80	28.55	22.50
8/3/2022	23:30	4.62	0.00	0.00	0.00	-100.37	25.42	31.49	22.50
8/3/2022	23:45	5.08	0.30	0.00	0.00	-100.37	28.36	34.95	22.50

Appendix C Efficiency calculation results of solar power generation system

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Grid-Connected System: Simulation parameters

Project :	**Naresuan University**				
Geographical Site	**Naresuan University**			Country	**Thailand**
Situation	Latitude	16.74° N		Longitude	100.19° E
Time defined as	Legal Time	Time zone UT+7		Altitude	40 m
	Albedo	0.20			
Meteo data:	**Naresuan University**	Meteonorm 7.2 (1991-2010), Sat=100% - Synthetic			
Simulation variant :	**South-East**				
	Simulation date	28/12/20 10h34			
Simulation parameters	System type	**Tables on a building**			
Collector Plane Orientation	Tilt	10°		Azimuth	-30°
Sheds configuration	Nb. of sheds	15		Identical arrays	
	Sheds spacing	3.80 m		Collector width	2.02 m
Shading limit angle	Limit profile angle	11.0°		Ground cov. Ratio (GCR)	53.2 %
Models used	Transposition	Perez		Diffuse	Perez, Meteonorm
Horizon	Free Horizon				
Near Shadings	Linear shadings				
User's needs :	Unlimited load (grid)				

PV Arrays Characteristics (2 kinds of array defined)

PV module	Si-poly	Model	**CS3U-330P-AG**		
Original PVsyst database		Manufacturer	Canadian Solar Inc.		
Sub-array "Sub-array #1"					
Number of PV modules		In series	20 modules	In parallel	6 strings
Total number of PV modules		Nb. modules	120	Unit Nom. Power	330 Wp
Array global power		Nominal (STC)	**39.6 kWp**	At operating cond.	35.9 kWp (50°C)
Array operating characteristics (50°C)		U mpp	686 V	I mpp	52 A
Sub-array "Sub-array #2"					
Number of PV modules		In series	18 modules	In parallel	2 strings
Total number of PV modules		Nb. modules	36	Unit Nom. Power	330 Wp
Array global power		Nominal (STC)	**11.88 kWp**	At operating cond.	10.76 kWp (50°C)
Array operating characteristics (50°C)		U mpp	617 V	I mpp	17 A
Total	Arrays global power	Nominal (STC)	**51 kWp**	Total	156 modules
		Module area	**310 m²**	Cell area	276 m²

Inverter		Model	**Sunny Tripower 25000TL-30**		
Original PVsyst database		Manufacturer	SMA		
Characteristics		Operating Voltage	390-800 V	Unit Nom. Power	25.0 kWac
Sub-array "Sub-array #1"		Nb. of inverters	3 * MPPT 50 %	Total Power	38 kWac
				Pnom ratio	1.06
Sub-array "Sub-array #2"		Nb. of inverters	1 * MPPT 50 %	Total Power	12.5 kWac
				Pnom ratio	0.95
Total		Nb. of inverters	2	Total Power	50 kWac

PV Array loss factors

Array Soiling Losses				Loss Fraction	2.0 %
Thermal Loss factor		Uc (const)	27.0 W/m²K	Uv (wind)	0.0 W/m²K / m/s

Grid-Connected System: Simulation parameters

Wiring Ohmic Loss	Array#1	293 mOhm	Loss Fraction	2.0 % at STC
	Array#2	791 mOhm	Loss Fraction	2.0 % at STC
	Global		Loss Fraction	2.0 % at STC
LID - Light Induced Degradation			Loss Fraction	1.0 %
Module Quality Loss			Loss Fraction	1.0 %
Module Mismatch Losses			Loss Fraction	1.0 % at MPP
Strings Mismatch loss			Loss Fraction	0.10 %

Incidence effect (IAM): User defined profile

10°	20°	30°	40°	50°	60°	70°	80°	90°
0.998	0.998	0.995	0.992	0.986	0.970	0.917	0.763	0.000

System loss factors

	Wires: 3x16.0 mm² 54 m	Loss Fraction	2.0 % at STC
Unavailability of the system	3.0 days, 3 periods	Time fraction	0.8 %

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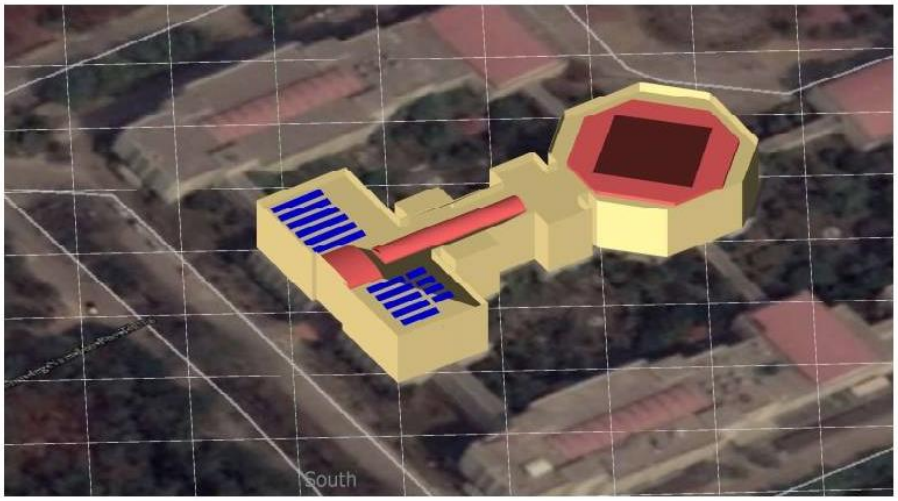
Grid-Connected System: Near shading definition

Project : **Naresuan University**

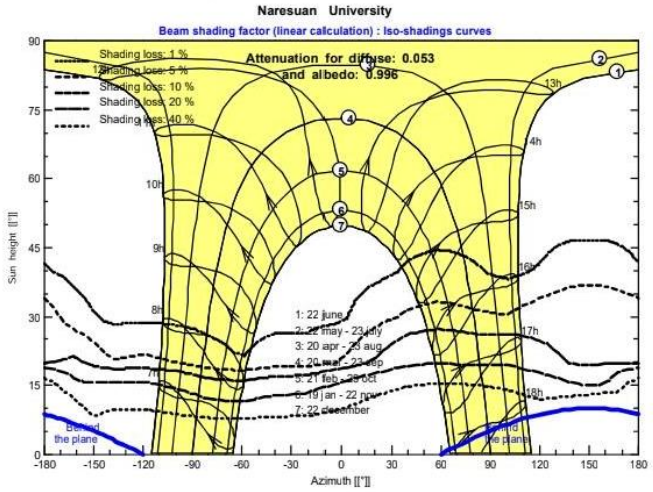
Simulation variant : **South-East**

Main system parameters	System type	**Tables on a building**		
Near Shadings	Linear shadings			
PV Field Orientation	tilt	10°	azimuth	-30°
PV modules	Model	CS3U-330P-AG	Pnom	330 Wp
PV Array	Nb. of modules	156	Pnom total	**51.5 kWp**
Inverter	Model	Sunny Tripower 25000TL-30		25.00 kW ac
Inverter pack	Nb. of units	2.0	Pnom total	**50.0 kW ac**
User's needs	Unlimited load (grid)			

Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram



Grid-Connected System: Main results

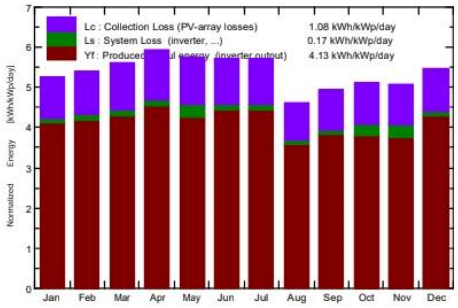
Project : **Naresuan University**

Simulation variant : **South-East**

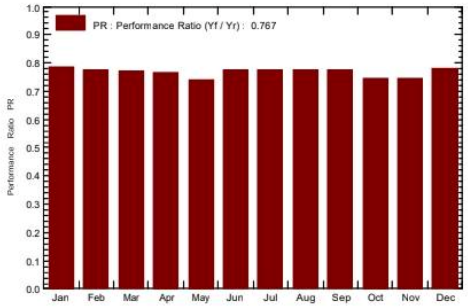
Main system parameters	System type	**Tables on a building**		
Near Shadings	Linear shadings			
PV Field Orientation	tilt	10°	azimuth	-30°
PV modules	Model	CS3U-330P-AG	Pnom	330 Wp
PV Array	Nb. of modules	156	Pnom total	**51.5 kWp**
Inverter	Model	Sunny Tripower 25000TL-30		25.00 kW ac
Inverter pack	Nb. of units	2.0	Pnom total	**50.0 kW ac**
User's needs	Unlimited load (grid)			

Main simulation results				
System Production	**Produced Energy**	**77.56 MWh/year**	Specific prod.	1507 kWh/kWp/year
	Performance Ratio PR	76.74 %		

Normalized productions (per installed kWp): Nominal power 51.5 kWp



Performance Ratio PR



South-East

Balances and main results

	GlobHor kWh/m²	DiffHor kWh/m²	T_Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray MWh	E_Grid MWh	PR
January	147.5	56.30	24.68	162.9	150.7	6.769	6.568	0.783
February	141.8	67.20	26.78	151.0	140.0	6.218	6.036	0.777
March	168.2	85.90	28.90	173.2	160.3	7.065	6.860	0.769
April	177.3	89.20	30.37	177.6	165.1	7.210	6.996	0.765
May	182.2	89.10	29.40	178.5	165.4	7.283	6.816	0.742
June	176.9	87.80	28.49	171.6	159.1	7.058	6.849	0.775
July	182.9	84.80	28.46	177.5	164.8	7.305	7.087	0.776
August	144.5	84.70	28.29	142.7	131.9	5.875	5.701	0.776
September	145.9	81.10	27.69	147.7	136.6	6.083	5.904	0.777
October	151.3	76.60	28.11	158.5	147.0	6.529	6.068	0.743
November	139.2	51.30	26.19	152.2	140.9	6.288	5.839	0.745
December	151.2	47.10	24.97	169.7	157.2	7.046	6.834	0.782
Year	1908.9	901.10	27.70	1963.1	1819.0	80.728	77.558	0.767

Legends:

GlobHor	Horizontal global irradiation	GlobEff	Effective Global, corr. for IAM and shadings
DiffHor	Horizontal diffuse irradiation	EArray	Effective energy at the output of the array
T_Amb	Ambient Temperature	E_Grid	Energy injected into grid
GlobInc	Global incident in coll. plane	PR	Performance Ratio

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Grid-Connected System: Loss diagram

Project : **Naresuan University**

Simulation variant : **South-East**

Main system parameters	System type	**Tables on a building**		
Near Shadings	Linear shadings			
PV Field Orientation	tilt	10°	azimuth	-30°
PV modules	Model	CS3U-330P-AG	Pnom	330 Wp
PV Array	Nb. of modules	156	Pnom total	**51.5 kWp**
Inverter	Model	Sunny Tripower 25000TL-30		25.00 kW ac
Inverter pack	Nb. of units	2.0	Pnom total	**50.0 kW ac**
User's needs	Unlimited load (grid)			

Loss diagram over the whole year