UNIVERSITY OF AGDER

# Proper Sizing of Energy Storage for Grid Connected Photovoltaic System

A. G. Bernard Sisara Gunawardana

Supervisor

Professor. Mohan Lal Kolhe

Department of Engineering Science
Faculty of Engineering and Science
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# Abstract

The requirement of an energy storage to a grid connected PV system, is highly desirable in cases like power outages. Another importance is to reduce the peak time electricity buying from the utility grid and discharging the battery stored energy to the load. This project investigates the optimum dimensioning of a battery energy storage in a grid connected Photovoltaic system, for the customers who purchase and sell the electricity to the utility grid. The aim was to provide an optimal method that helps electricity customers equipped with PV systems, in making decisions to install economically sized battery energy storage. This study used the load, PV and the utility electricity tariff data of a typical customer, during a typical year. The daily average load demand of the customer is found as 27.31 kWh. The PV system installed on the rooftop of the customer's residence is determined as a 5kWP system. The daily average PV production is found as 20.69 kWh.

The energy flow decision program of the grid connected PV system was developed with the comparison of available PV power and the load demand. According to the peak and off peak hours, the decision was changed to minimize the operating cost of the grid connected PV system with battery energy storage. The energy flow decision programme of the PV system was realized in the Matlab software. Optimizing the energy flow schedule performed under two different energy flow control strategies as case A and case B. Under the Case A, the battery energy has been released to the utility grid, during the daytime, only up to a predefined value of the state of charge. Under the Case B, the battery is allowed to discharge its energy on peak hours, even up to the minimum charge state. The optimum battery capacity relevant to the case A and B, were calculated as 14.4 kWh and 19.2 kWh respectively.

These results represented that, proper sizing the battery used in grid connected PV system extremely depend on the electricity tariff and the battery degradation cost. When compared both the cases in one for one tariff scheme, case A was much beneficial to adopt. The case B generated higher financial benefits compared to case A, when incentives were given in feed in tariff or for the battery investment cost. When considered the one for one tariff scheme, the PV system without the battery energy storage was much more beneficial to adopt by the financial point of view, but not from the operational point of view.

# Preface

This thesis has been submitted in partial fulfilment of the degree of Master of Science in Renewable Energy at the University of Agder, Grimstad, Norway, containing work done from January 2014 to June 2014. The thesis' main intention has been to proper sizing of energy storage for grid connected Photovoltaic system. The work describes here has been conducted under the supervision of Professor Mohan Lal Kolhe and Program coordinator Stein Bergsmark.

I would like to express my sincere gratitude to my supervisor, Professor Mohan Lal Kolhe for his continued guidance and encouragement throughout the course of this research for sharing with me his expertise, experience, and research knowledge. My special thanks also go to our program coordinator Stein Bergsmark for providing valuable guidance when writing this thesis. His comments and suggestions have greatly helped me to improve my writing. I would like to thank to the PhD student Aimie Nazmin Azmi for his support throughout the research. Last but not least, I would like to thank my wife K. M. Iromi Ranaweera and colleagues who helped me in numerous ways to make this thesis a success.

A.G Bernard Sisara Gunawardana
University of Agder
Grimstad, Norway
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# Nomenclature

| | |
|---|---|
| AC | Alternating Current |
| AGM | Absorbed Glass Mat |
| BESS | Battery Energy Storage System |
| CRF | Capital Recovery Factor |
| DC | Direct Current |
| ES | Energy Storage |
| ESS | Energy Storage System |
| FIT | Feed In Tariff |
| MPPT | Maximum Power Point Tracking |
| NPV | Net Present Value |
| NREL | National Renewable Energy Laboratory |
| NSRDB | National Solar Radiation Data Base |
| PCC | Point Of Common Coupling |
| PV | Photo-Voltaic |
| SOC | State Of Charge |
| TOU | Time Of Use |
| TOUD | Time Of Use With Peak Demand |
| VRLA | Valve Regulated Lead Acid |

# Chapter 1

# Introduction

Since solar power entered as an alternative energy response to the ordinary power sources, the use of that power in different conditions has made a tremendous impact on the improvement of the energy sector. Photovoltaic power accounts for less than 1 percentage of electricity supply in the world [1], but the recent expansion in the sector has been unexpected. Due to solar intermittency by reason of the variations in weather and grid power interruptions, energy storages being used as a backup in present PV systems. Therefore, to have an economical PV system, it is desirable to have properly sized energy storage

## 1.1. Motivation

The fast diminution of fossil-fuel resources on a universal basis has demanded an urgent look for substitute energy sources. Through those many alternatives, renewable energy sources have been adopted as a capable substitute toward meeting the current increasing demand for energy. Research is being conducted in the growth of technologies to utilize these resources to obtain the maximum output energy. Among the renewable technologies, Photovoltaic application has achieved great consideration in research, because it appears to be one of the better efficient solutions to these crises. PV systems are usually classified according to their functional and operational necessities, the way components are configured, and how the equipment is connected to electrical loads.

Depending on the components which are connected to the system between PV panels and load, the four basic configurations of PV systems are classified as follows.

### Direct PV systems

These are directly coupled PV panels and directly wired to the load. Due to fewer additional components, the system is low in cost. These systems operate only when the sun shines. Common applications are water pumping and ventilation.

### Stand-alone PV systems (Off-Grid PV)

These systems are frequently built on residential households with batteries as energy storages (ES). Even at night and stormy weather conditions, they provide the energy to the load. A charge controller is used in the system to prevent overcharging and deep discharge of the batteries. These systems generally include an inverter, which converts the DC voltage of PV modules into AC voltage for direct use with the appliances

### Grid-Connected PV system without an ES

Grid connected PV systems are mostly installed in this configuration [2]. Due to least maintenance, environmental friendliness and cost effectivity, people tend to adopt these systems. The main shortcoming of this kind of system is, when there is a power outage during the night time or a cloudy day, the system has to shut down the operation until the grid power is available. The inverter converts the DC voltage from the PV panel into AC voltage to directly use on appliances or send to the utility grid to earn the feed in tariff compensation.

### Grid-Connected PV system with an ES

These systems are similar to stand-alone systems except for the connection of the system to the utility grid. Due to the interconnection with the utility grid, a system can reap several benefits like selling the excess PV electricity production to the grid, battery system charging at off peak hours and buying power whenever the PV and battery power are deficient to feed the loads. Even though there is an extra investment cost for the battery system, by scheduling the battery operation in a smart way, the overall benefits of the system can get increased.

The main drawbacks of Photovoltaic power are nature dependent power supply and the occasion of energy production is not essentially in line with the time when energy is exactly needed. These drawbacks could be overcome by including battery energy storage devices into the system. It is desirable to comprise with suitable energy storage devices, the local consumption of PV produced energy could be boosted by storing surplus energy at times of peak production and using this energy when and it is not enough or not exist. Batteries are frequently used in PV systems for compensating the power during outages and in the intention of storing the excess energy generated by the PV modules during the day time. Then the stored power in batteries can deliver it to electrical loads as and when it is needed (during the night and intermittent weather conditions). Alternatively, batteries are implanted in PV systems to function the PV system close to its maximum power point to feed electrical loads. Most of the times, a battery charge controller is used in these kind of systems to keep the battery from overcharge and over discharge.

Figure 1.1. Grid Connected PV System with a Battery Energy Storage System1

Figure 1.1 describes about a typical grid connected PV system with a back up battery energy storage. As it is shown in the figure, Photovoltaic flat panel collector receives the energy from the sun and the current generated in the panel send through the inverter to the AC bus. The power at the AC bus feed to the load and the excess will be sent to the battery back up or to the utility grid through an export meter. When the battery back up and PV panel doesn't have enough power to feed the load, the grid power has to be imported to feed the load.

## 1.2. Problem Statement

The most important factor which changes the PV output of the panel is the solar irradiance. Even if two similar PV systems have been installed in two different places, the system output can be altered due to the difference of the solar irradiance in those two

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[1] https://www.builtsmartresources.com/grid-tied.html

places. Due to that fact, the optimum size of the battery energy storage is also changing with the location.

In different ways grid connected PV system with battery energy storage will provide additional advantages than the same system without battery. While there is a power drop in the utility grid or during a cloudy day, the system load has to be driven by using the battery. On the other hand energy storage can store electricity during off peak hours from the PV systems or from the utility grid and discharge it to the grid for a higher price at the peak hours.

By having a low sized battery would be inexpensive when it considers the investment cost of the battery. But that may not be help to have a minimum operating cost when the stored power is not enough to supply the load. On the other hand by having an oversized battery would increase the investment cost of the battery. When evaluating the overall system profit with considering the maximum PV battery lifetime of around 7-15 years [3] (varies with the way of Charging and Discharging), higher investment for the battery will not profitable. Therefore, proper sizing the battery of a grid connected PV system is essential to a have a minimum operating cost. Here in this study it is needed to discover an optimal value for the battery energy storage size such that the total operation cost remains at a minimum. If the battery size is larger or smaller than the optimal battery size, the total operation cost is getting increased.

During this study it is decided to analyse the load data, PV data and Electricity price data of a residential customer, who own a grid connected PV system with a battery energy storage, at San Francisco, California (37.8 Latitudes and -122.2 Longitude). The daily average demand of electricity to occupy his residential loads is 27.31kWh.

By using the data of that particular customer its needed to find an optimum size for the battery energy storage. In that case it is needed to find the optimum battery capacity, which minimizes the cost associated with the operation of the PV system. Initially, it is necessary to find an appropriate rough size of the PV panel, which is adapted to the location and the load. Then by using the load data, PV data and electricity price data it is needed to find the optimum way to flow the energy.

By optimizing the energy flow between each component of the PV system, the two main objectives has to be achieved.

- Minimize the cost associated with purchasing electricity from the utility grid.
- Minimize the battery capacity loss cost due to the ageing effects of the battery.

By accomplishing the two above main objectives, it is able to minimize the total operation cost and can determine the optimum value for the battery capacity where the operational cost goes to its minimum.

## 1.3. Key Assumptions and Limitations

The scope of this thesis is limited when considering all the minor parameters which is not highly affected to the final result of the optimization. While performing the key objective of minimizing the operational cost of the system, the process has to keep some parameters as constants. While some other assumptions taken from the previous research works. All of those which considered as assumptions and limitations have been described in below.

- Energy losses in the system like power transmission loss and loss due to heat are assumed to be zero
- Minimum charge state of the battery is taken as 30 % and the maximum charge is as 90%.
- During the basic analysis the utility grid tariff for importing & exporting electricity is considered as the same.
- Conversion efficiencies of both the battery and PV inverter are taken as constant of 94 % and 97 % respectively.
- When the battery capacity decreased to 100 % of its reference capacity, then the battery life will be ended. Which means the minimum state of health of the battery is equal to zero.
- Deep cycle VRLA gel type lead acid battery will be used for the PV system energy storage and the self discharging factor is taken as 2.5 % per month.
- All week days are assumed to be normal working days.
- Battery ageing occurs only when electricity is discharged from the battery [4].
- When calculating a value for the battery lifetime time, it is assumed that the cumulative battery capacity loss occurred during the selected year is similar to other years of battery life.
- The Maintenance cost of the Grid connected PV system with battery storage is assumed as zero.
- When Converting PV output from DC to AC through the inverter, It is only considered the efficiency of the PV module and Inverter. Other all installation efficiencies assumed as the value of one.
- The size of the PV system installed on the building is taken as a 5kWdc system.

- It is assumed that the PV system is installed on the roof top of the building, with fixed type mounting and the angle of tilt is considered as the latitude of the concerned location (San Francisco, California).

The limitations are,

- When the battery charging rate differs from the nominal charge or discharge rate, the available battery capacity is also changing according to the Peukert's law. That change is considered as negligible and the battery capacity loss due to the ageing process has been considered in this study.
- When there is a grid power outage while there is not enough PV power to feed the residential load, the battery power will not be enough to cover the load requirement.

## 1.4. Research Method

The main target sector of this thesis problem is mainly residential customers who have a grid connected PV system behind their electricity meter. In this case initially it is needed to find out a specific customer who belongs to the above category and need to collect his load data and electricity price data together with the global irradiance data of the location during the selected period.

The PV system installed on the building is to be taken as a 5kWdc system.Afterward by putting the values of the tilt angle of the PV panel, mounting type, azimuth angle and derate factor to the PV watts calculator of National Renewable Energy Laboratory[2], PV module area size can be calculated. The above mentioned approach has to use only for calculating a rough size of PV panel. Because the main target of this thesis is to obtain a proper size for the battery storage. Therefore the PV system parameters effect and PV system sizing will not be discussed in this study.

PV module output is to be represented as a linear power source of global horizontal irradiation [5].

$$P_{PV}(d,t) = \frac{G_I(d,t) \times A \times \eta_S}{100}, \tag{1.1}$$

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[2] http://pvwatts.nrel.gov/pvwatts.php

where,

| | |
|---|---|
| $P_{PV}(d,t)$ | Output power of PV panel [kW] |
| $G_I(d,t)$ | Global horizontal Irradiation [kW/m$^2$] |
| $A$ | Area of the PV module [m$^2$] |
| $\eta_S$ | PV system efficiency [%] |

By substituting PV module area to the equation 1.1, PV output energy throughout the year has to be calculated. Hereinafter under the whole study when (d,t) is attached with any parameter, it represents the value of that parameter on day $d$ at hour $t$.

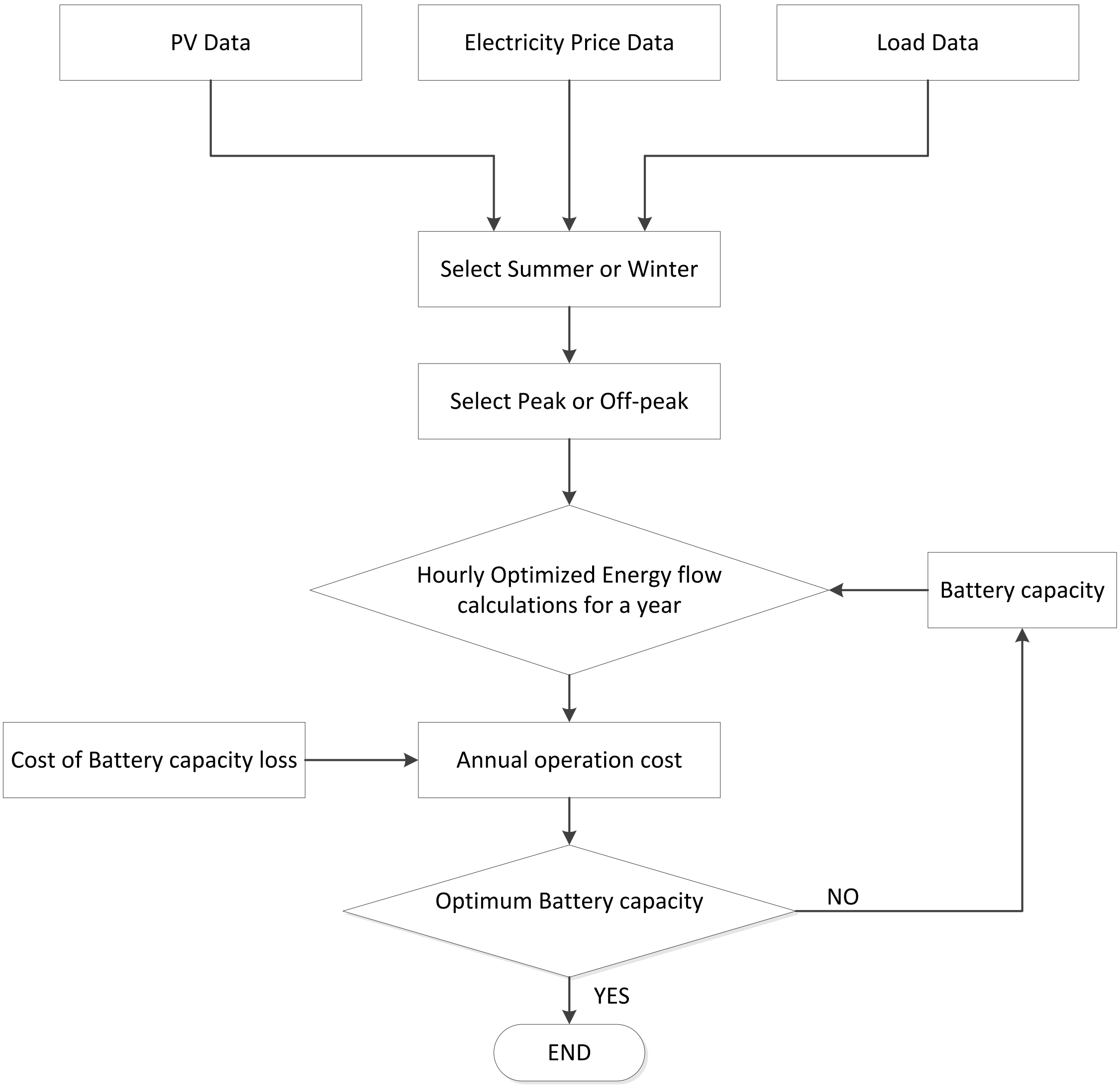

Figure 1.2. Flow chart for determination of optimum battery capacity

Figure 1.2 shows the basic method flow chart for determination of the battery capacity. Initially the load data, PV data and the electricity price should be separated according to the summer and winter season. Then again, it should be separated according to the peak and off peak hours. Then by selecting a random sized battery, hourly optimized energy flow at the AC Bus of the grid connected PV system has to be calculated. The Matlab written algorithm is to be used for the optimization process.

The electrical energy generated by PV, electrical energy obtained from the utility grid and the discharged electrical energy from the battery are used to recover the load of the customer. The priority will be given to the self generated PV power to occupy for loads. When PV generation is high in an off peak hour, excess electricity generated by the PV is used to charge the battery. When PV generation is high in a peak hour, excess electricity is sent to the utility grid. When PV generated power and battery discharging power are not sufficient to occupy the load, utility grid power has to be purchased to supply to the load.

This optimization process should be repeated throughout all the hours of the selected year and the total annual operating cost is to be calculated. Then the battery capacity, which generates the minimum annual operating cost, is to be selected as the optimum battery capacity.

## 1.5. Thesis Outline

The thesis basically focuses for properly sizing an energy storage system which connected to a grid connected PV system. The thesis consists of 7 chapters and they are arranged in the following way.

Chapter 1 gives the introduction to the thesis work.

Chapter 2 briefly describes about the grid connected PV systems. During the chapter, it discussed about the way these systems are working and later on discuss about the system components of the system. Finally, it discussed about the technical aspects of the grid connected PV system.

Chapter 3 describes about the energy storage PV system energy storages. During that chapter, it describes about the different types of energy storage technologies. Finally, it gives a brief idea about deep cycle batteries. Following that the chapter describes about the battery parameters and battery types used in PV systems.

Chapter 4 describes about the method of optimizing the battery size. Following that, the method of data acquired and the system configuration are discussed. Then it discusses about the optimized energy flow schedule, which has been adapted to simulate in Matlab. Then it describes the simulation method and operational cost have been calculated. Finally, it describes about the way of determining the battery capacity.

Chapter 5 describes about the simulation results after implementing the energy flow decision on Matlab software. During the chapter, it describes about the obtained results of PV system with and without battery storage. Under the section of PV system with battery storage, it describes the results about two cases as optimum energy flow with peak shaving and without peak shaving. Following that the chapter discuss about the benefits under two different incentive schemes given in the feed in tariff and to the battery investment cost.

Finally, the Chapter 6 gives the discussion and Chapter 7 states the conclusions and the future scope of the work.

# Chapter 2

# Grid Connected PV Systems

Grid-connected PV systems are the most popular PV based systems in the industry. These are two basic types as grid connected PV systems with and without batteries. Further, all of these systems can be categorized into three main size ranges as large, medium and small sizes. Mainly small and medium size PV systems installed on the rooftops of households and commercial buildings.

## 2.1. Background

These PV systems deliver electricity all the way from panels through an inverter straight to the household and to the utility grid. If the PV system generates more power than required for active load (devices which are operating) needs, then power is delivered to the utility grid. At the end of the month customer has to pay for the net amount of electricity what he has consumed. This describes as feed in tariff [6]. Grid-connected PV installations are specific since it works on the basis of power exchange with the local electrical grid. In reality, at daytime hours the consumer utilizes the electrical power produced by their own PV installation (self-consumed). Whereas when there is no sun or the PV power is insufficient for the load, then the customer needs more power than the generated power from the PV system. In that case the electrical utility grid assures the delivery of required electrical power to the loads. Alternatively, when the PV system generates more power than required by the system loads, power can be pumped from the PV system to the utility grid.

During the last decades, significant growth of grid connected PV systems can be observed, especially in developed and industrialized EU countries. Except to the benefits which stated above in this report some other reasons also have been affected. Due to the reduction of the component cost of PV systems, specifically the average cost of PV panels and Inverters, there have been some rapid progresses of adopting these systems by the customers. Manufacturers are also concerned and addressed about the technical problems associated with solar components and the grid integration PV systems.

## 2.2. How Grid Connected PV systems Work

During the daytime of sunny days, the PV panels generated electricity with higher amount of power. During the night time and cloudy days active loads needed to be performed by means of the utility grid or by the energy storage. In a grid connected PV system, grid performs as the battery by supplying the required power, when PV power is not available. The energy generated by the PV system supplies for the domestic loads and surplus energy will be sent to the utility grid while getting energy benefits. The PV inverter used in the system, converts the DC voltage into AC voltage to use on the AC bus. Because the home appliances and the utility grid are operating in AC conditions. Grid-connect inverters are rather complicated. Because it includes additional safety elements, and need to be making sure that the frequency generated equivalent to the frequency of the utility. Even though the grid connected systems are in different sizes, the main components which are included in the system like PV panels, inverters, net meters and utility grid are same and required for wiring and mounting.

## 2.3. System Components

As discussed in the section 2.2, grid connected PV systems are included mainly with the following major components.

### 2.3.1. Utility Grid

The utility grid is a combined network for transporting electrical energy from utility to the consumers. It includes power stations, high-voltage distribution lines which transmit power from remote sources through transmission lines to individual consumers. The generated electric power at the power station is increased up through a transformer to a higher voltage, when it transmits through the transmission network. The transmission network carries the electricity through a lengthy distance, until it meets its general consumer.

When it reaches to a substation, the electricity power decreased down through a transformer to distribution level voltage. Then after reaching to the consumer, the electricity is decreased down to the necessary service voltage.

### 2.3.2. PV Array

A PV module includes of several PV cells, which are interconnected in parallel and series, to enhance current and voltage respectively. The module consists with a harder glass on the front surface, and with a shielded material on the back surface. There is a connection box in the back of the module providing power connections. A PV Array includes different amounts of PV modules, which are interconnected together in a series or parallel connectivity to supply the required power. A PV array can be different in sizes with the amount of PV modules attached to the array. The major purpose of the PV array is to convert the power of the sun rays into DC power.

### 2.3.3. Inverter

The major purpose of the inverters are conversion of DC power into AC, adjusting the frequency of the output AC power, and controlling of the effective value of the output voltage. The significant characteristics of a PV inverter are its reliability and its efficiency. The inverters are manufactured to operate approximately at the maximum power point of the PV system. Generally, inverter efficiencies are varying from 90% to 96% at full load. When finalizing a size to the inverters used in grid connected PV systems, the efficiency and ability to withstand in overload situation has to be considered.

### 2.3.4. Net Metering

The Net metering is a type of billing mechanism, which refers both the electricity buying and selling through the electricity meter of the house. The customer has to pay only for the net amount of the electricity which he used for his loads and charging the energy storage. During this case, the PV owned customer sell the excess electricity generates by the PV system and getting energy benefits at the end of the month.

## 2.4. Technical aspects of Grid Connected PV systems

Grid connected PV systems can create undesirable impacts to the distribution grid, especially when the PV penetration level increases. The major problems are the overvoltage along the distribution feeder due to reverse power flow, voltage fluctuations at Point of common coupling (PCC), due to intermittent power generation of the PV systems, frequency variations in small power systems, low power factor of operation of the distribution transformer and voltage and current harmonics generated by the inverters.

### 2.4.1. Voltage disturbances

When there is a significant amount of PV power penetration in the distribution feeder, the power starts to flow in the reverse direction, especially during peak sunshine hours. That will result an increase in voltage at PCC. When there are many PV systems connected along a particular feeder, the voltage along the distribution feeder from the transformer is increasing. Hence, necessary actions should be taken to avoid voltage violations at PCC against the regulations.

### 2.4.2. Islanding

The PV inverter of the grid connected PV system, continued its operation when there is a power outage in the grid or partially turned off the grid. This is called as Islanding operation. This can highly influence the loads and the equipments in the network and simultaneously creates electric shock to consumers or utility line workers who are working on the utility grid. Due to this, PV inverters be required to recognize a grid error or disconnection and need to disconnect the output at once.

There were many researches about Islanding protection on grid connected PV systems [7]. Currently, most viable inverters comprise the adequate Islanding protection ability acquired by an addition of different control methods.

### 2.4.3. DC injection into the grid

In grid connected PV systems the DC power at the panel has kept without leaking to the AC bus or to the grid by using the inverter. Several inverter systems comprise transformers within the inverter holding back any DC addition into the grid. There are personal safety enhancements by keeping out the DC from the utility grid, prevention of disturbances on the grid and avoidance of saturation on inductive load.

The number of inverters where the transformer is not included, has been rising up in the market, because of technological and price advantages. Most of the countries isolation transformers has not been used for small sized grid connected PV systems [8].

Nevertheless, in most of the time isolation transformers has been used for medium and large sized grid connected PV systems.

# Chapter 3

# Energy Storage in PV Systems

A Residence with a PV system and energy storage, can obtain a greater autonomy from the utility grid. That is getting the ability to use the generated energy in the same system by compensating the load and the battery deficiency. The energy storage gives the ability to expand efficient and cost-effective result targeted to address the energy requirements of any building, assuring a partial or full autonomy from the utility grid. The purpose of a battery engaged in a PV system is to deliver the power when the PV power is not enough to compensate the load in a peak hour. Several aspects have to be considered to find out the required capacity and the amount of cells needed for an acceptable battery for the PV system.

## 3.1. Energy Storage Technologies

Since the founding of electrical energy, different effective technologies has been found out to store it and to use when there is a demand for that. During the recent past, the energy storage industry has continued to develop and get used to varying energy needs and progresses in technology. Energy storages offer a broad range of technical approaches to controlling the power supply, in order to create a flexible energy infrastructure and achieve cost savings to the grid owners and customers. There are different types of energy storage approaches being used in the present world. The four main categories of energy storage types are discussed under this section.

### 3.1.1. Electrochemical Energy Storage

Currently, this is the most general form of energy storage used in most of the applications [9]. Batteries and fuel cells are the two main types in electrochemical energy storages. In electrochemical energy storages the chemical energy is transformed into electrical energy. Batteries can be classified into two main types as rechargeable and non-rechargeable batteries. Rechargeable batteries are used in renewable energy systems to store excess production.

The Fuel cell is a device which converts the chemical energy of the fuel into electrical energy. All the fuel cells consist with anode, cathode and electrolyte. Hydrogen and hydrocarbons used as the fuel for the fuel cells. Fuel cells are dissimilar from batteries such a way that needs a continuous fuel supply to maintain the chemical reaction. The fuel cell is generating electricity as long as fuel is supplied to the anode of the fuel cell.

### 3.1.2. Electrical Energy Storage

An electric field is used to store the energy in electrical energy storages. Those are mainly classified as capacitors and super capacitors. Even though the electric charge energy is stored in each of the devices, the super capacitors have the ability to store more charge energy density compared to common capacitors. The capacitor is normally used as a temporary backup, whereas the super capacitor is used usually to provide energy for large engines. Super capacitors are used to operate low power equipments such as computer memory cards, portable players, etc.

Superconducting magnetic energy storage is an another electrical energy storage, which stores energy within a magnetic field, generated by the flow of DC in a superconducting coil. During this procedure, the temperature of the superconducting coil decreases below the critical temperature of the superconductor.

### 3.1.3. Chemical Energy Storage

The potential energy of some chemicals is used as energy storages. The popular chemicals are mainly liquid nitrogen, hydrogen and Oxy hydrogen. Liquid nitrogen shows possibility as a basis of energy and it is utilized as a type of energy storage. Liquid nitrogen is used to produce electric energy or refrigeration and cooling. Hydrogen has a potential as a source of energy. The smallest amount of hydrogen is kept in pressurized vessels and large amounts are stored in underground caves. Oxy-hydrogen is a combination of hydrogen and oxygen, which discharges higher temperature and pressure steam, which can be used to produce electricity. Other than those above mentioned chemicals hydrogen peroxide and vanadium pentoxide are also used as chemical storages.

### 3.1.4. Mechanical Energy Storage

The kinetic or potential energy of different sources used to store the electricity in this type of storage systems. Pumped hydroelectric energy storage, hydraulic accumulator and flywheel energy storage are the main types of mechanical energy storages used in the industry. The pumped hydroelectric energy storage is the oldest energy storage type used in the world. Its easiness of design, comparatively low cost and the equality to hydroelectric energy has happened to sustain its operation during such a long period. These systems operate by pumping water into a higher reservoir and using its potential energy as and when required.

Hydraulic accumulator is a type of mechanical energy storage where non-compressible fluids are stored with a lower pressure. Compressed air energy storage is the most generally used hydraulic accumulator. The contained pressurized gas, like nitrogen, is released when electricity is needed to be produced. The flywheel energy storage is a technique to store energy all the way through a flywheel. This kind of energy storage is used to accumulate grid power and power which is produced by the wind plants.

### 3.1.5. Thermal Energy Storage

Thermal energy storage consists of different types of methods. Basically, this shows the methods which are used to store thermal energy with the aim of utilizing to decrease or increase the heat amount of the buildings. When compared to chemical and mechanical energy storages, this type has many advantages like minor capital cost and higher operating efficiencies.

The steam accumulator, storage heater and hot water storage tank are the examples for thermal energy storage. The steam accumulator is a kind of steel tank which include low pressure steam inside the tank. This is used to make it steady the increment and decrement of the demand for steam. The storage heater is an electric heater which collects the energy at night time and releases it in the daytime, when the electricity price is high. The hot water storage tank uses its heat mainly for space heating, and cleaning purposes. These are a general inclusion of the solar thermal collectors and wood furnaces.

## 3.2. Batteries for Energy Storage in PV system

When selecting batteries for the energy storage in a PV system, different kinds of aspects have to be considered. Mainly it is needed to be known that the system is connected to the grid or operating as a standalone system. If it is not connected to the grid, the battery needs to have the capability to withstand any occasion, where the PV power is not available. In a grid connected PV system, the battery is used as the backup when power outage has taken place in the utility grid. When the grid electricity price is high to purchase for the load, the battery power can be used to supply for the load. Subsequently the numbers of charging/discharging cycles also depend on the way that the battery is used in the system.

### 3.2.1. Deep Cycle Batteries

Renewable energy systems mainly used the deep cycle batteries for the energy storage system. A battery system has to be able to supply reasonably steady power when there is a power outage or during PV system is generating less power output. If the charging and discharging of the battery occurs frequently in any battery system, it is recommended to use deep cycle batteries for such type of systems. Because a deep-cycle battery can be deeply charged and discharged several cycles throughout its lifetime. Deep cycle batteries aimed specially for giving power to the electrical equipment throughout extended periods of time. A starting battery is aimed for short bursts of excessive current and cannot withstand for more deep discharges before failure.

Deep cycle batteries can be categorized as sealed, absorbed glass mat (AGM) and flooded plate types. Deep cycle batteries engaged in renewable energy systems present consistent performance with good care and maintenance. That gives a longer lifespan of the battery. Overcharging or overdischarging, higher temperature of the system, severe vibration can be the reason for early failure of the battery.

### 3.2.2. Battery types used in PV systems

Renewable energy systems generally use three major types of lead acid batteries, according to their individual benefit. Those are Flooded type, gelled electrolyte Sealed and AGM batteries. Flooded type batteries are the economical and the broadly engaged batteries in PV systems. They need continuous maintenance and must be used in ventilated location, and highly suited to renewable energy systems. The gelled electrolyte type and the AGM type are coming under sealed type batteries. Both of the sealed batteries are free of maintenance and free of venting. Therefore, it suits for the closed type systems where continuous maintenance is complicated.

- **Flooded type battery**

  The most generally used batteries in Photovoltaic applications are flooded type lead acid battery. The lifetime of these batteries is very high and at the same time these batteries are much more economical when compared to other batteries. The main drawback of these systems is the regular maintenance. These battery cells are frequently named as wet cells. These are two types as serviceable and non serviceable.

- **Gelled Electrolyte Sealed battery**

  These batteries apply silica gel to harden the electrolyte solution. This battery is a kind of valve regulated lead acid (VRLA) battery and sometimes called as silicone batteries. These batteries are mainly used for deep cycle with deep discharge applications like in marine trolling, sail boats and electrical vehicles. The voltage of recharging for these batteries is comparably less than other lead acid battery types. The nominal charging rate of these batteries is not so high. Because, When these batteries charged at a higher rate, gas pockets can be created and electrolyte can be pushed out from the plate [10].

- **Sealed Absorbed Glass Mat (AGM) battery**

  This battery is a kind of valve regulated lead acid (VRLA) and the electrolyte is kept within the glass mats. The AGM battery is different from conventional lead-acid battery, and it doesn’t include liquid electrolyte. Instead, its electrolyte is inserted in spongy cell separators. These batteries have a higher power density and due to that Ampere-hour capacity of this type of battery is higher than a flooded type battery. The main drawback of this type battery is the higher cost. These batteries are mainly used for motor home, marine and robotic applications [11].

### 3.2.3. Battery parameters

- **Battery Capacity**

  The amount of energy/charge that can be extracted from the battery bank from its fully charged state to the zero charged state is known as the battery capacity and usually, it is measured in Amphere hours (Ah). The capacity of the battery is not constant and it varies significantly depending on several factors such as the rate of discharge, age, temperature and the past history of the battery.

- **State of Charge (SOC)**

  The percentage amount of energy stored in the battery with respect to the nominal battery capacity, is known as the state of the charge of the battery. This is the main parameter that reveals about the current battery energy which stored in the battery. This is basically the opposite of the depth of discharge.

- **Charging and Discharging Rate**

  The amount of charge added/extracted from the battery per unit time is known as charging/discharging rate, which is measured in Ampheres which is same as Coulombs/Sec. However, charging/ discharging rate is also defined in terms of the hours that takes to fully discharge the battery. For example, C20=500 means that the battery capacity is 500 Ah, when it is fully discharged in 20 hours.

- **Battery Efficiency**

  The efficiency of the battery is described in two ways, that is coulombic efficiency and the voltage efficiency. Coulombic efficiency is the ratio of the amount of charge that enter the battery when it is charging for the amount of charge that can be extracted from the battery when it is discharging. The voltage efficiency is the ratio of the discharged average voltage to the charged average voltage. The round-trip efficiency is defined as the ratio of the energy extracted from the battery to the energy send into the device. Due to the battery is included energy losses these efficiencies are never equal to the 100 %.

# Chapter 4

# Method of Optimizing the Battery size

Optimization of battery energy storage size relating to the operation after setting up the system is essential to fully achieve the cost-effective advantages of battery storage in a grid connected PV system. Efficient energy flow within the PV system should be capable of reacting to regular and dynamic load variations [12]. On the other hand, battery ageing is also a source of the battery capacity loss in the discharging process [4]. That must also take into consideration when optimizing the energy flow in the PV system.

## 4.1. Introduction

In this thesis problem, the aim is to find a proper size for the energy storage by minimizing annual operation cost. This needs to find an optimal method for facilitating the customers with PV arrays equipped on rooftops of residential homes to install a cost-effective sized battery. The Figure 1.2 shows the flow chart for determining the optimum battery capacity. Initially, load data and electricity price data together with the global irradiance data were collected on the location during a typical year.

In this chapter 4, data acquisition and preprocessing, system configuration, optimized energy flow schedule and the way of determining battery capacity are explained. The optimization process is repeated for all the possible sizes of battery capacity and the optimum size, which minimizes the annual operating cost of the system, is selected. Time of use (TOU) tariff system is considered when pricing the electricity from the grid and assuming that the PV feed in tariff is in a one-to-one system.

## 4.2. Data Acquisition and Preprocessing

When optimizing energy storage the data used in the process must to be accurate and reliable. Therefore, with the availability and access to hourly solar data and load data throughout a year, I have chosen to use as the basis for this study a residential customer with a PV array behind the meter. San Francisco, California (37.8 Latitudes and -122.2 Longitude) and used the load data (Appendix B), PV data (Appendix C) and electricity price data (Table 4.2) for the whole year from 1st January to 31st December of 2010.

During the year, summer period is considered as from 1st May – 31st October and the remaining months of the year are considered as winter period. During the day, the peak hours are defined as 7 a.m. to 1 p.m. and 4 p.m. to 10 p.m. All the remaining hours are considered as off-peak hours. The off-peak and peak energy pricing has been given in section 4.2.4.

### 4.2.1. Load Data

The hourly varying electricity load profile of the typical customer during the year 2010 is taken from E7 dynamic load profile category of Pacific gas and electric company[3] of San Francisco, California. Pacific Gas and Electric Company is also the utility customer who delivers the grid electricity to that particular customer. It has been given in Appendix A.

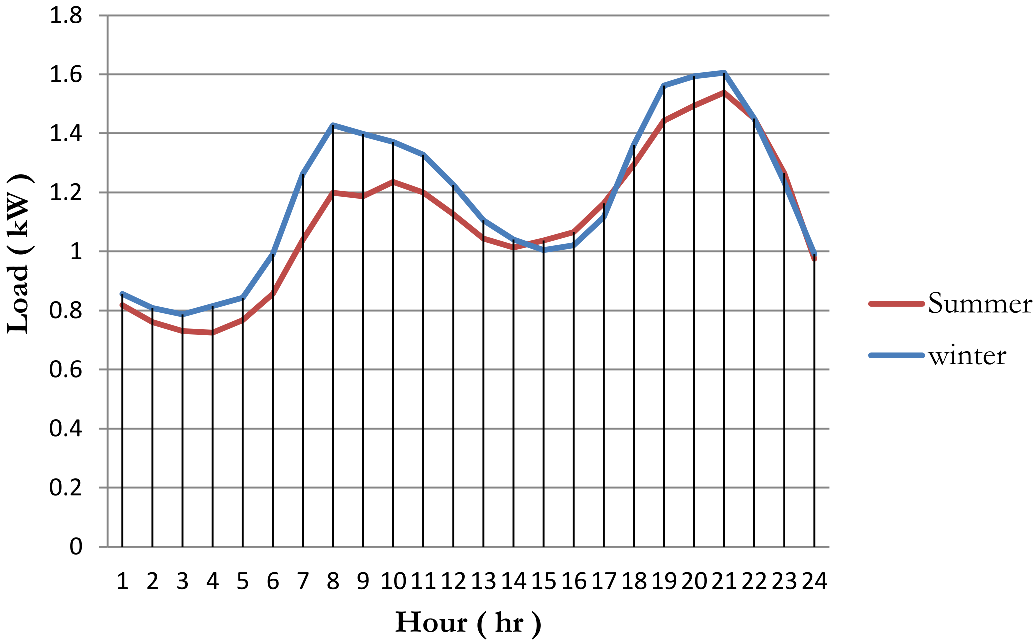

Figure 4.1. Average hourly load profile of the household in summer and winter day

Figure 4.1 shows the average load profile of the residence in summer and winter seasons. Average daily consumption in summer days is 26.43 kWh and the same in winter is 28.2 kWh. Average daily energy consumption throughout the year is 27.31 kWh.

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[3] http://www.pge.com/tariffs/energy_use_prices.shtml

### 4.2.2. PV Data

PV output data of the system were generated by using the PV system size and the global horizontal irradiance data at San Francisco in the year 2010. I have assumed that the PV system size, which is installed at the residence, is as a 5 $kW_P$ system. Then the relevant area of the PV panel is calculated by using the PV watts calculator of the National Renewable Energy Laboratory[4].

Table 4.1. PV watt calculator inputs

| | |
|---|---|
| PV system size (kW) | 5 |
| Array type | Fixed-roof mount |
| DC-to-AC derate factor[5] | 0.77 |
| Tilt angle(deg) | 37.8 |
| Azimuth (deg) | 180 |

Initially, the location is given as the basic input to the calculator and the other inputs to the calculator are given as in the Table 4.1. When these inputs are given, automatically calculated area for the PV panel is as 33 $m^2$.

Global Irradiance data in San Francisco in the year 2010 has been taken from the National solar irradiance database (NSRDB)[6]. The PV module efficiency is taken as 15%. PV output energy data throughout the year has been found (Appendix B).

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[4] http://pvwatts.nrel.gov/pvwatts.php

[5] http://rredc.nrel.gov/solar/calculators/pvwatts/version1/change.html#derate

[6] http://rredc.nrel.gov/solar/old_data/nsrdb/1991-2010/hourly/list_by_state.html

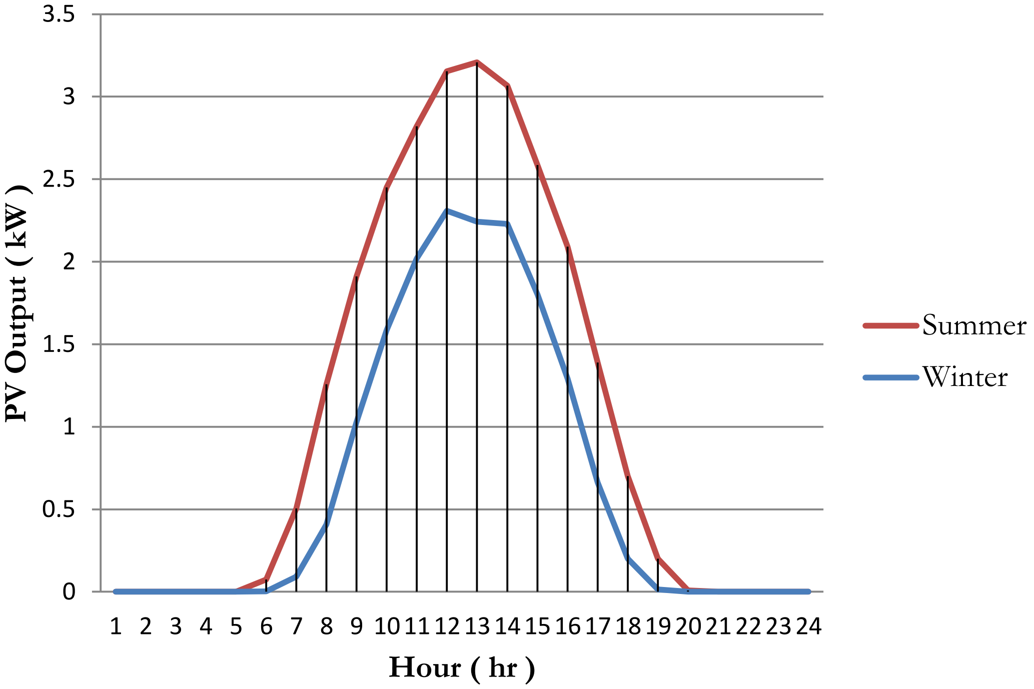

Figure 4.2. Average hourly PV output profile of the system for summer and winter day

Figure 4.2 shows the average PV output profile of the system during the summer and winter seasons. The annual daily average peak PV output in the summer season is approximately 3.2 kW and the same in winter season is 2.25 kW. The average daily PV energy output is 20.69 kWh. This value is around 75% of the average daily energy consumption.

### 4.2.3. Battery data

During this study, different sizes of battery capacities are being used for finding the optimum size. In every case the battery specifications are considered with respect to VRLA deep cycle batteries[7]. The Nominal voltage of the battery in each case is taken as 12V and the self discharging factor[8] of the battery is as 2.5 % per month. Minimum and maximum state of charge is taken as 30 % and 90 %, respectively. The nominal charging rate is taken as 10 hour rate and round trip efficiency is taken as 81 % [13]. Battery charge and discharge efficiencies are taken as 90 %. The battery inverter cost rate is considered as

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[7] http://www.solarenergyproducts.com.au/files/PDF_uploads/NPG200-12.pdf
[8] http://batteryuniversity.com/learn/article/elevating_self_discharge

606 $/kW and assumed the battery inverter lifetime is as 10 years [14] . The battery investment cost rate of 200 $/kWh [15]

### 4.2.4. Electricity Energy Price Data

Different tariff systems are used by a typical utility company for electrical energy. In this study the typical utility company is Pacific gas and Electric Company[9] in San Francisco, California.The company charges and purchases at one for one feed in tariff rate (Table 4.2) for the electrical energy. The charge rate system is based on time of use (TOU). The buy rate and the sell rates are equal.

Table 4.2. Time of use rates for the electricity

| | **Summer** | | **Winter** | |
|---|---|---|---|---|
| | On-Peak (7 a.m. -1 p. m). & (4 p.m. -10 p.m.) | Off-Peak (1 a.m. -4 p. m). & (10 p.m. -7 a.m.) | On-Peak (7 a.m. -1 p. m). & (4 p.m. -10 p.m.) | Off-Peak (1 a.m. -4 p. m). & (10 p.m. -7 a.m.) |
| Electricity Charge: ($/kWh) | 0.35146 | 0.10330 | 0.13695 | 0.10691 |

When compare, the rates in summer and winter peak hours, the electricity energy rate seems to be around 2.6 times higher in summer time. In the summer season peak hour electricity tariffs are around 3.4 times higher than the off peak electricity charge. This is totally different in the winter season. There is no great difference in peak and off-peak charges during the winter season.

### 4.3. System Configuration

There are different kinds of topologies used in grid connected PV systems. According to the topology, the function of the battery will be varied. Some systems use direct charging method for the battery by using the DC voltage in PV panels. In that case the MPPT charge controller is installed between the PV panel and the battery. In this study the battery is connected to the AC bus bar through the inverter/charger unit and the PV panel output also sends through the inverter to convert the DC voltage into AC voltage.

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[9] http://www.pge.com/nots/rates/tariffs/electric.shtml#RESELEC_TOU

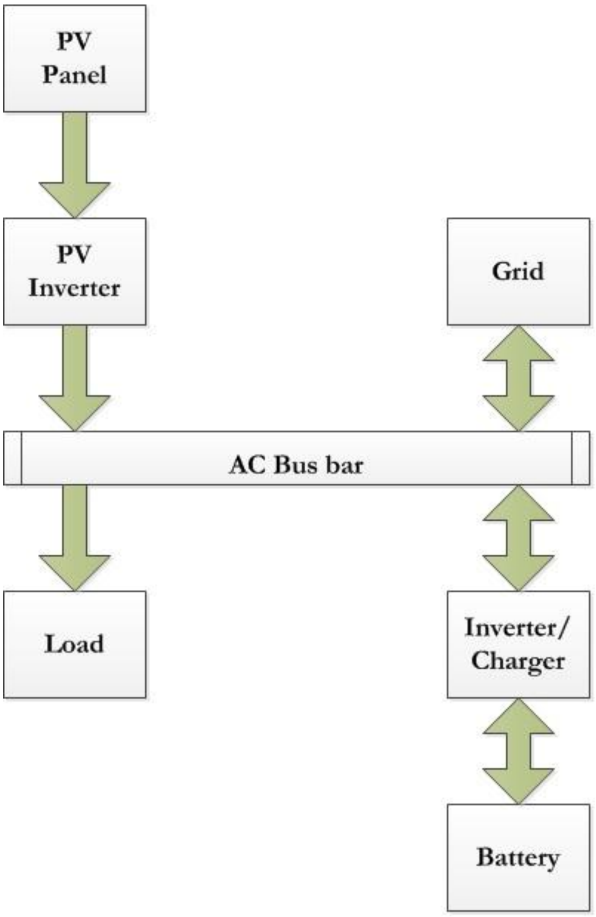


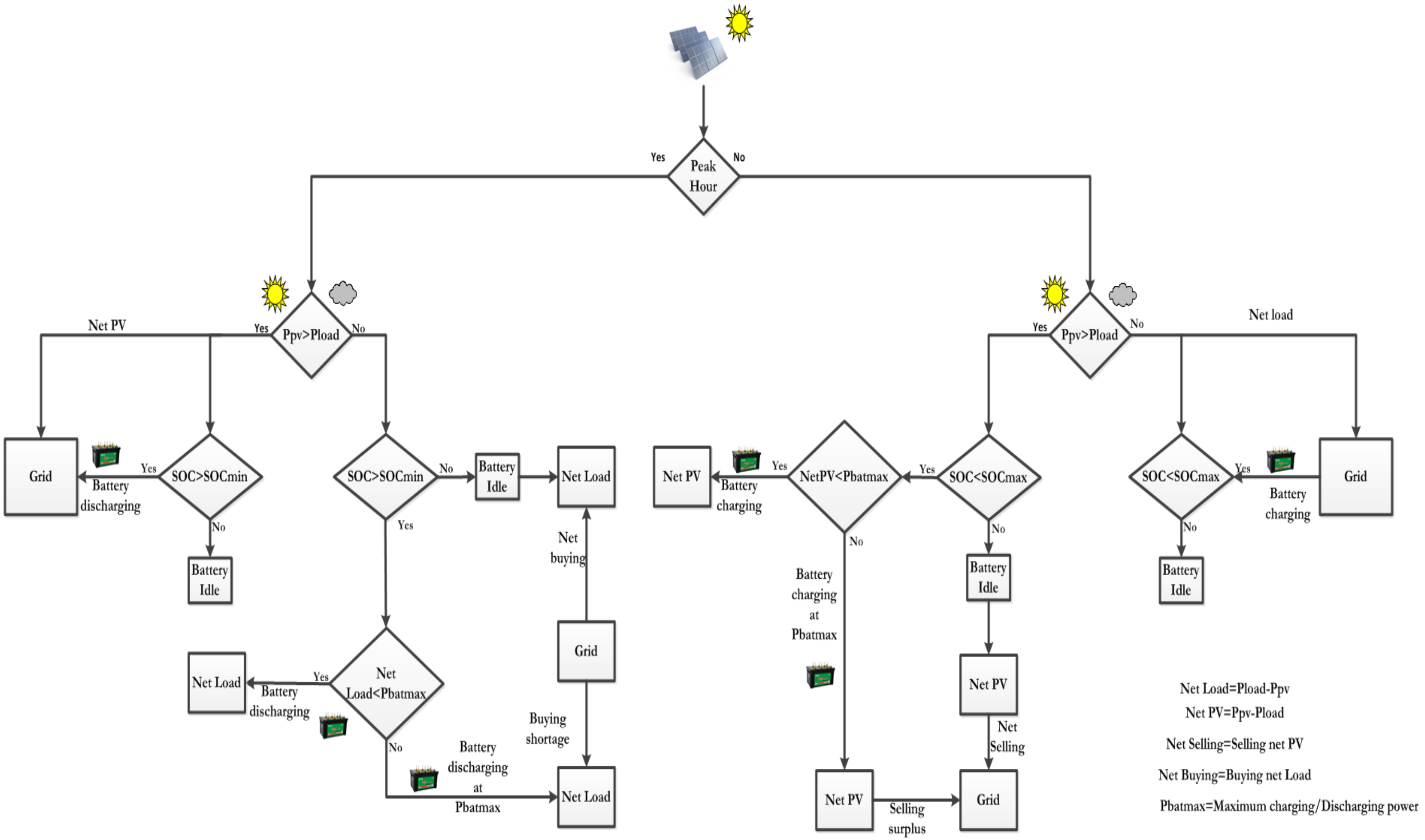
Figure 4.3. Basic Topology of the Grid Connected PV System with BESS

The basic topology of the grid-connected PV system with a battery, which has used for this study, is shown in Figure 4.3. The PV modules, the utility grid, the battery bank and the load appliances are connected to a common AC bus bar. This topology has been selected in the way of minimizing the component efficiencies.A PV inverter has been used to convert the DC output of the PV modules into AC output at the AC bus. The battery works on DC conditions, therefore an inverter/charger unit has been used between battery and AC bus to convert AC to DC and DC to AC, while charging and discharging the battery.

## 4.4. Optimized Energy Flow Schedule

The main objective of managing the energy flow schedule is to lower the daily operating cost of the customer owning the PV system. The process requires data of the PV output, electricity price and the customer load during the whole year. The cost of the battery capacity loss, which occurs due to ageing of the battery, is also considered when optimizing the energy flow [16].

During a typical day, due to the variations in weather, PV power delivered by the system can be changed. Accordingly, all other energy flow in the system is going to change.The energy flow chart for such type of system is given in Figure 4.4. The sampling time is taken as one hour. Note that, peak hours are defined as hours between 7 a.m. to 1 p.m. and 4 p.m. to 10 p.m. All the remaining hours of the day are considered to be off-peak hours.



Net Load=Pload-Ppv

Net PV=Ppv-Pload

Net Selling=Selling net PV

Net Buying=Buying net Load

Pbatmax=Maximum charging/Discharging power

Figure 4.4. Flow Chart For Optimizing Energy Flow Decisions in Grid Connected PV System With Battery Storage

Figure 4.4 shows a flowchart of the Optimized Energy flow decision of Grid Connected PV System with battery energy storage. According to the Figure 4.4, it will automatically manage the charging and discharging process according to the logic at each sampling time ($\Delta t = 1$ hour). Due to safeguard the battery from overcharging and over discharging, this optimized energy flow schedule will automatically manage battery charge state within selected minimum and maximum levels of SOCmin and SOCmax, correspondingly.

This energy dispatch schedule of the battery will also increase income by using the stored energy to deliver for the loads during peak hours of the day when the cost of electricity is high and purchase low-priced electricity from the grid during off peak hours at night to charge the battery for using it during the peak hours of the day. The complete method of the flow chart in Figure 4.4, is described under the simulation method of section 4.4.2.

### 4.4.1. Variables and Equations

This section describes the basic equation that has used for proper sizing the battery attached to the grid connected PV system.

The DC electricity generated at the PV array is converted through PV inverter in to AC power at the AC bus.

$$P_{PV,AC}(d,t) = \eta_{inv} \times P_{PV,DC}(d,t) \tag{4.1}$$

where,

| | |
|---|---|
| $P_{PV,DC}(d,t)$ | Power output from the PV panel (kW) |
| $P_{PV,AC}(d,t)$ | PV power at the AC bus (kW) |
| $\eta_{inv}$ | PV inverter efficiency (%) |

The charge and discharge power transfer to and from the battery in a particular sampling hour can be defined as in equation (4.2).

$$P_{DC,bat}(d,t) = \frac{E_{bat}(d,t) - E_{bat}(d,t-\Delta t)}{\Delta t}, \tag{4.2}$$

where,

| | |
|---|---|
| $P_{DC\_bat}$ | Charge/Discharge power of the battery (kW) |

| | |
|---|---|
| $E_{bat}$ | Stored energy in the battery (kWh) |

When the battery is charging, the stored energy of the battery is also increased ( $P_{DC\_bat}$>0 ) and vice versa, when the battery is discharging, the stored energy of the battery decreased ( $P_{DC\_bat}$<0 ).

In the same way as the PV power considered in the AC bus, battery DC power is also converted into AC power when it discharges through the inverter/charger unit to the AC side. AC power at the AC bus is converted into DC when it passes through the inverter/charger unit as shown in Figure 4.3. The conversion efficiency of the inverter $\eta_{bat}$ is assumed to be constant while charging and discharging the battery

$$P_{AC\_bat}(d,t) = \begin{cases} \eta_{bat}\, P_{DC,bat}(d,t), & P_{DC,bat}(d,t) < 0 \\ \dfrac{P_{DC,bat}(d,t)}{\eta_{bat}}, & P_{DC,bat}(d,t) > 0 \end{cases} \tag{4.3}$$

where,

| | |
|---|---|
| $P_{AC\_bat}$ | Charge/Discharge rate of the battery on the AC bus (kW) |
| $P_{DC\_bat}$ | Charge/Discharge rate of the battery (kW) |
| $\eta_{bat}$ | Battery inverter efficiency (%) |

The charge state of the battery is updated each sampling hour with the charging and discharging of power to and from the battery.

Charging,

$$SOC(d,t) = SOC(d,t-\Delta t)\times(1-a) + \eta_{charge}\frac{P_{DC,bat}(d,t)}{C_{bat}(d,t)\,V}\Delta t\,, \tag{4.4}$$

Discharging,

$$SOC(d,t) = SOC(d,t-\Delta t)\times(1-a) + \frac{P_{DC,bat}(d,t)}{\eta_{discharge}\, C_{bat}(d,t)\,V}\Delta t\,, \tag{4.5}$$

where,

| | |
|---|---|
| $C_{bat}$ | Usable battery capacity (Ah) |
| $P_{DC\_bat}$ | Charge/Discharge rate of the battery (kW) |
| $a$ | Self discharging factor |

Following equation of 4.6 describes the cumulative battery capacity loss at the charging and discharging process of the battery [14].

$$C_{loss,cumi}(d,t) = \begin{cases} C_{loss,cumi}(d,t-\Delta t) - Z\ P_{DC,bat}\ \Delta t, & P_{DC,bat}(d,t) < 0 \\ \mathrm{C}_{\mathrm{loss,cumi}}(d,t-\Delta t), & P_{DC,bat}(d,t) > 0 \end{cases} \tag{4.6}$$

where,

| | |
|---|---|
| $C_{loss,cumi}$ | Cumulative battery capacity loss (kWh) |
| $Z$ | Ageing coefficient |

Battery capacity loss during any sampling time can be found by using the equation mentioned below.

$$C_{loss}(d,t) = C_{loss.,cumi}(d,t) - C_{loss,cumi}(d,t-1) \tag{4.7}$$

where,

| | |
|---|---|
| $C_{loss}$ | Battery capacity loss (kWh) |

The above equation 4.7 updates the cumulative battery capacity loss of each hour and that loss have to be deducted from the nominal battery capacity to get the usable battery capacity for the next hour.

$$C_{bat}(d,t) = C - \frac{C_{loss\_cumi}(d,t) \times 1\mathrm{e}\text{-}3}{V}, \tag{4.8}$$

where,

| | |
|---|---|
| $C$ | Nominal battery capacity (Ah) |
| $C_{bat}$ | Usable battery capacity (Ah) |
| $C_{loss\_cumi}$ | Cumulative battery capacity loss (kWh) |

The cumulative battery capacity loss in the Equation 4.8 is measured as a kWh value. That is converted into Ah value by multiplying it $1\mathrm{e}-3$ and dividing it by the nominal voltage of the battery.

When calculating a value for the battery lifetime time, it is assumed that the cumulative battery capacity loss occurred during the selected year is similar to other years of battery life.

$$\text{Lifetime of the battery} = \frac{C \times V}{C_{loss\_cumi\_year}} \times 10^{-3} \tag{4.9}$$

where,

| | |
|---|---|
| $C$ | Nominal battery capacity (Ah) |
| $V$ | Nominal voltage of the battery (V) |
| $C_{loss\_cumi\_year}$ | Annual cumulative battery capacity loss (kWh) |

Equation 4.9 is derived by using the above mentioned assumption and can be used to evaluate the battery lifetime.

During this study, the variables used for optimizing energy schedule will be shown and explained in Table 4.3. Thus a complete overview of the simulation performed with these variables will be obtained.

Table 4.3. Input Parameter values for Matlab optimization

| Variable | Notation | Value |
|---|---|---|
| Ageing coefficient | $Z$ | $5\times10^{-4}$ |
| Minimum state of charge | $SOC_{min}$ | 30 % |
| Maximum state of charge | $SOC_{max}$ | 90 % |
| Self-discharging factor | $a$ | 2.5% per month |
| Minimum charging/ discharging time | $t_{min}$ | 10 hours |
| PV inverter efficiency | $\eta_{inv}$ | 97 % |
| Battery inverter efficiency | $\eta_{bat}$ | 94 % |
| Battery charging efficiency | $\eta_{ch}$ | 90 % |
| Battery discharging efficiency | $\eta_{disch}$ | 90 % |
| Nominal battery voltage | $V$ | 12 V |

| | | |
|---|---|---|
| Sampling time interval | $\Delta t$ | 1 hour |
| Capital recovery factor | $CRF$ | 0.1233 |
| Real interest rate | $i$ | 4 % per annum |
| Inverter Lifetime | $N$ | 10 years |
| Battery investment cost rate | | 200 $/kWh |

When the simulation has been performed for different nominal battery capacities (C), the above mentioned variables will be kept as constants.

### 4.4.2. Simulation method

The sampling time interval ($\Delta t = 1$ hour) in each energy transfer is considered to be one hour throughout the whole simulation. Therefore, during each hour *t*, energy transfer will be equal to the power transfer. The basic algorithm which will optimize the energy flow in the grid connected PV system is realized as a Matlab simulation programme. Initially annual load data, PV data and Electricity price data are given as inputs to the Matlab programme. Then the other input parameter values and equations are provided as discussed in Section 4.4.1.

The two variables Netload and NetPV are defined below to make it simple to describe the method.

$$NetLoad(d,t) = P_{load}(d,t) - P_{pv}(d,t) \tag{4.10}$$

$$NetPV(d,t) = P_{pv}(d,t) - P_{load}(d,t) \tag{4.11}$$

According to Figure 4.4, the power flow variation is split into the four basic scenarios below. Those are intended to generate the optimized energy flow within the grid connected PV system.

- Scenario 1: $P_{pv} > P_{load}$, during an on-peak hour of the day
- Scenario 2: $P_{pv} < P_{load}$, during an on-peak hour of the day
- Scenario 3: $P_{pv} > P_{load}$, during an off-peak hour of the day
- Scenario 4: $P_{pv} > P_{load}$, during an off-peak hour of the day

**Scenario1**

During peak hours, when the PV power delivered by the panels is larger than the load, then the net PV power what is consumed in loads will be sent to the utility grid. Since the electricity rate is higher at the peak hours, if the state of the charge of the battery is higher than the minimum, the battery is also discharged and the energy sent to the utility grid to get energy benefits. Otherwise the battery will be left in its idle condition.

**Scenario2**

During peak hours, when the PV power delivered by the panels is less than the load, priority is given to discharge energy from the battery, to reduce the net load. It follows that the charge state of the battery should be higher than the minimum. In that case, if the net load is less than the maximum discharging rate of the battery, the battery will discharge to cover the net load at a rate which equals to net load. If the above conditions are not satisfied, the battery will  discharge at its maximum discharging rate.

$$P_{DC\_bat,ch,\max}(d,t) = P_{DC\_bat,disch,\max}(d,t) = \frac{C_{bat}(d,t)\times V}{t_{\min}} \tag{4.12}$$

where,

| | |
|---|---|
| $P_{DC\_bat,ch,\max}(t)$ | Maximum battery charge rate at DC side (kW) |
| $P_{DC\_bat,disch,\max}(t)$ | Maximum battery discharge rate at DC side (kW) |
| $C_{bat}(t)$ | Usable Battery capacity (Ah) |
| $V$ | Battery Nominal voltage (V) |
| $t_{\min}$ | Minimum charge/ discharge time (hours) |

If the battery capacity is not high enough to cover the net load, then grid electricity is purchased from the utility grid to power the net load

**Scenario3**

During off-peak hours, when PV power delivered by the panels is larger than the load, the net PV power after covering the loads will be used to charge the battery. It follows that the battery charge state should be less than the maximum. In that case, also like in scenario 2, if the net PV is less than the maximum charging rate of the battery, the battery will charge at a rate which equals the net PV. If the above load condition is not satisfied the battery will charge at its maximum charging rate. If the batteries are fully charged, then the excess net PV will be sold to the utility grid.

### Scenario4

During off-peak hours, when PV power is not sufficient to supply the loads, the electricity must be bought from the utility grid. It is profitable to buy electricity from the grid even if the battery is charged enough to deliver the energy for loads. Because battery discharge involves aging capacity loss of the battery, which will be added as degradation cost to the total operating cost. At the same time, if the battery is not fully charged, then grid electricity will be purchased to charge the batteries.

The energy flow schedule, as stated in Figure 4.4, is optimized within the Matlab programme and it is simulated throughout all the 8760 hours (365*24 hours) of the year to update all the variable parameters with $(d,t)$.

The grid connected PV system with battery energy storage contains different costs and benefits, when calculating the annual operating cost or benefit. That includes the electricity purchased cost or electricity sold benefit, the cost of the battery capacity loss and the inverter cost. Here, the main objective is to find out the minimum annual operating cost of the system. That has to be achieved by minimizing the particular costs as mentioned above and maximizing the electricity benefit by selling the electricity to the utility grid.

## 4.5. Calculation of Operational costs and benefits

Grid connected PV systems with an energy storage provide operational costs and benefits to the system owner. Operational costs, mainly include the cost of electricity purchase and the cost of the battery capacity loss. Operational benefits of the system include selling excess PV production to the utility grid, selling battery stored energy to the utility grid at the peak time of the day and using the battery stored energy for self consumption by the load at peak hours instead of buying the energy from the utility grid.

Battery capacity loss due to discharging process will be accumulated day by day and after some years back, the usable battery capacity will be getting finished. When considered the battery investment cost and the lifetime of the battery, battery degradation cost is a considerable cost in the daily operation cost of the grid connected PV system.

Ref. [14] Presented an equation to estimate the cost of the battery capacity loss during any particular hour of the system operates.

$$BCL_{\cos t}(d,t) = \frac{C_{loss}(d,t) \times B_{invest\_\cos t}}{1 - SOH_{\min}} \tag{4.13}$$

where,

| | |
|---|---|
| $BCL_{\cos t}$ | Cost of battery capacity loss ($) |
| $B_{invest\_\cos t}$ | Investment cost rate of the battery ($/kWh) |

Minimum state of health of the battery(SOH$_{\min}$) is taken as Zero.

Electricity cost due to purchasing from the grid and benefit due to selling to the grid, can be calculated by using the equation stated below. Sampling time ($\Delta t$) is equal to 1 hour as stated earlier in the chapter. Therefore the power transfer is equal to energy transfer.

$$E_{\cos t,benefit}(d,t) = E_{price}(d,t) \times P_{grid}(d,t) \times \Delta t \tag{4.14}$$

where,

| | |
|---|---|
| $E_{\cos t,benefit}$ | Cost or benefit of Electricity ($) |
| $E_{price}$ | Electricity tariff ($/kWh) |
| $P_{grid}$ | Power transfer to and from the grid (kW) |

When electricity is purchased from the utility grid it is considered that $P_{grid} > 0$ and when electricity is sold to the grid it is considered that $P_{grid} < 0$.

### 4.5.1. Annualised Costs

The NPV of a system can be transformed into identical annual costs widen over the lifetime of the system. This is called as the annualised cost. The annualised cost of a system is determined by calculating its NPV and then converting this results into annuity over the lifetime of the system. If the lifetime of a system is $N$ years and the annual real interest rate is *i*, the annualised cost is calculated as follows [17].

$$\text{Annualised inverter cost} = \text{Inverter capital cost} \times CRF\,, \tag{4.15}$$

where,

| | |
|---|---|
| $CRF$ | Capital recovery factor |

CRF can be found by using the Equation 4.16

$$\mathrm{CRF}(i,N) = \frac{i(1+i)^N}{(1+i)^N-1}\,, \tag{4.16}$$

where,

| | |
|---|---|
| $N$ | Lifetime (years) |
| $i$ | the real interest rate, that is the discount rate used to convert between one-time costs and annualised costs. |

$i$ can be calculated using the following formula,

$$i = \frac{d-i'}{1+i'} \tag{4.17}$$

where,

The real interest rate is determined using the nominal interest rate (*d*) and the annual inflation rate ($i'$) by the following formula [17]

The annual operating cost of the system,

$$\begin{aligned}\text{Annual operation cost} = {} & \sum_{d=1}^{365}\sum_{t=1}^{24} E_{\cos t, benefit}(d,t) + \sum_{d=1}^{365}\sum_{t=1}^{24} BCL_{\cos t}(d,t) \\ & + \text{Annualised inverter cost}\end{aligned} \tag{4.18}$$

where,

| | |
|---|---|
| $\sum_{d=1}^{365}\sum_{t=1}^{24} E_{\cos t, benefit}(d,t)$ | Annual Electricity cost and benefit ($) |
| $\sum_{d=1}^{365}\sum_{t=1}^{24} BCL_{\cos t}(d,t)$ | Cost of annual battery capacity loss ($) |

Both of the above mentioned battery degradation cost, electricity cost and benefits are calculated in every hour of the day from 1st of January to 31st of December. The annual operating cost is calculated by adding the annualised inverter cost, annual electricity cost and benefit to annual battery capacity loss cost as in the equation 4.18.

After the battery capacity and annual battery capacity loss is found by using the annual operating cost of the system, the life time of the battery can be calculated by using the Equation 4.9. Then, knowing the lifetime and the annual real interest rate, CRF can be calculated for the battery by using the Equation 4.16.

Here, it is assumed that the sum of the cost of annual battery capacity loss from the beginning to end of the lifetime of the battery, is equal to the battery investment cost.

$$\text{Annualised battery cost} = \text{Battery investment cost} \times CRF\ , \tag{4.19}$$

Annualised battery cost can be calculated by using the Equation 4.19. After replacing annualised battery cost instead of the cost of annual battery capacity loss in Equation 4.18, total annualised operation cost can be evaluated.

$$\begin{aligned}\text{Total annualised operation cost} = {} & \sum_{d=1}^{365} \sum_{h=1}^{24} E_{\cos t, benefit}(d,t) + \text{Annualised battery} \\ & \text{cost} + \text{Annualised inverter cost}\end{aligned} \tag{4.20}$$

When comparing the total annualised operating cost of the grid connected PV system with and without storage, PV system investment cost, PV inverter cost and installation cost are avoided for the comparison. The reason is all those three variables are common for both of the cases.

### 4.6. Determination of ES Capacity

The main objective of this work is to find a proper battery size for a grid connected PV system. It has been accomplished by managing the energy flow schedule/decision of this system.(Figure 4.4).

In this method, we are utilizing annual Electricity cost and benefit, the annual cost of the battery capacity loss and annualised inverter cost. It is assumed that the sum of the cost of annual battery capacity loss from the beginning to end of the lifetime of the battery, is equal to the battery investment cost. After the battery capacity and annual battery capacity loss are found, the life time of the battery can be calculated by using the Equation 4.9. Then, knowing the lifetime and the annual real interest rate, CRF can be calculated for the battery by using the Equation 4.16. In the utilized method, operation of the battery after installation in the system was considered in the sizing optimization of the battery storage

In this work the size of battery storage has been determined by considering the energy flow of the system and lowering down the daily operating cost of the customer owning the PV system. The main purpose  of managing the energy flow in the grid connected PV system with a battery energy storage, is to get a minimum annualised operating cost for a particular battery size. That cost also varies with the different sizes of the battery capacities. For different battery capacity sizes starting with 100Ah to 2500Ah is entered in the Matlab programme and annual operating cost for each of the battery size is obtained. Among all the battery sizes, one critical size of battery is taken, which gave the minimum annual operation cost for the system. When, the battery capacity size increase or decrease from the critical value, the annual operating cost of the system will be increased. This critical value is the optimum size of the battery capacity to be installed in the relevant grid connected PV system.

# Chapter 5

# Simulation Results

During the earlier chapter, the data acquisition and preprocessing, system configuration, optimized energy flow schedule and the way of determining battery capacity was explained. The optimized flow schedule and the relevant equations for evaluating each and every parameter are also discussed during the earlier chapter. The TOU tariff system has been considered for pricing the electricity from the grid and assuming that the PV feed in tariff is as a one-to-one system.

The basic results obtained from the Matlab simulation programme are the battery size, annualised operating cost and cumulative battery capacity loss. By using the cumulative battery capacity loss of the selected year, the battery lifetime is achieved using the Equation 4.9. Those values are generated with respect to two scenarios as stated below at section 5.1.1 and section 5.1.2.

The simulation results are taken separately from the Matlab programme for the grid connected PV system with and without battery energy storage.The grid connected PV system, when incentives have offered, is also calculated under this chapter.

## 5.1. PV System with battery storage

In this section all the results are taken from the Matlab programme by including the battery energy storage to the grid connected PV system.The Optimum battery capacity of the grid connected system is calculated under two different scenarios. The battery discharging sequence in these two scenarios is being done differently to each other. The electricity imports from the grid is considered as E_grid>0 and the electricity export to the grid is considered as E_grid>0. Battery charging is considered as E_battery_dc>0 and battery discharging is considered as E_battery_dc<0.

When calculating a value for the battery lifetime time, it is assumed that the cumulative battery capacity loss occurred during the selected year is similar to other years of battery life. Normally, the battery lifetime is varied according to the way of operating the battery. Battery investment cost is taken as 200 $/kWh [15].Battery inverter/charger unit cost is taken as 606 $/kW and the lifetime is assumed as 10 years [14].

Under this section 5.1, we are discussing about  Matlab simulation results of battery energy storage included grid connected PV system, with respect to two different control strategies of the energy flow.

### 5.1.1. Case A: Optimum energy flow with peak shaving

In this case, the main consideration is given to reduce the energy purchase from the utility grid during peak time. The priority is given to discharge the battery energy at peak time to feed the load when PV power is not sufficient or not available. Therefore, at the day time battery releases its energy to the utility grid only up to a predefined value of the state of charge (SOC >70 %). The above predefined value has selected in the way the total annualised operating cost is taking its minimum value.The remaining capacity is reserved to compensate the peak load consumption at night time. According to the Figure 4.4, during peak time battery releases its energy to the grid up to SOC min. It has been taken that battery will discharge the energy till SOC >70 % and the energy flow schedule will follow the decision as per Figure 4.4.

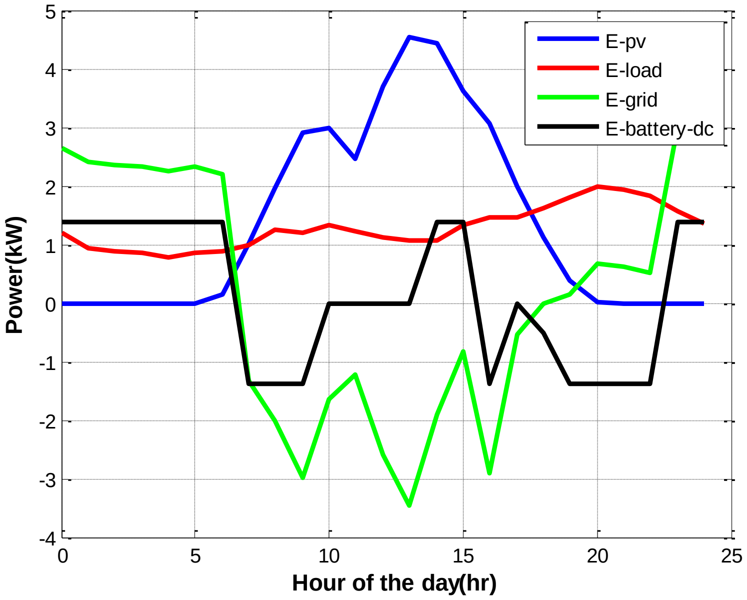


Figure 5.1. Power transfer sequence of the PV system during a typical summer day, with respect to Case A

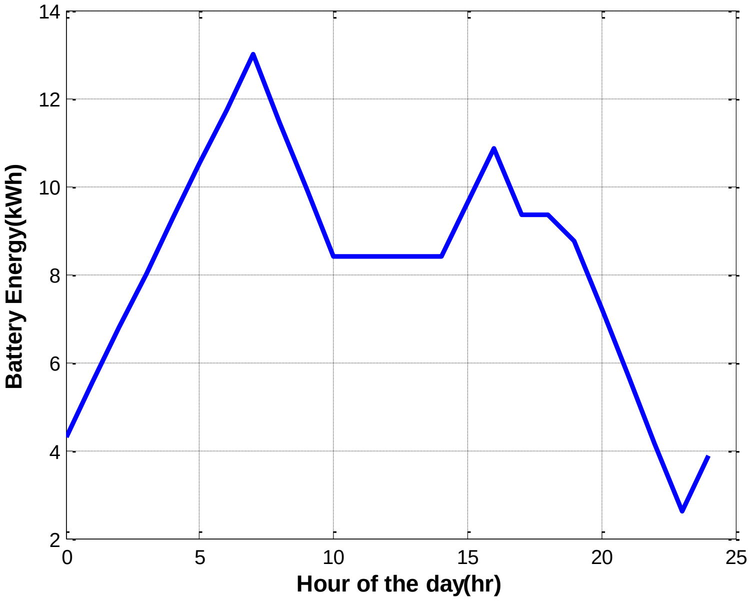


Figure 5.2. Battery Energy variations during a typical summer day, with respect to Case A

Figure 5.1and Figure 5.2 shows the power transfer sequence of the grid connected PV system with a battery energy storage in a typical summer day (196th day of the year) and the battery stored energy variation during the same day respectively. E-pv, E-load, E-grid and E-battery-dc are represented the energy transfer to and from each of the components in the particular hour. According to Figure 5.1, during off peak hours until 7 a.m., the required energy to perform the load is fed by the utility grid. During that time battery is charging with the maximum charging rate. The PV power which is generated after 5 a.m. is added to the grid power to compensate the load. According to Figure 5.2, from 7 a.m. - 10 a.m., battery discharges power to the utility grid until the battery state of charge is becoming to 70 %. Subsequently the battery is kept idle until 1 p.m. and keep its energy to release at the night peak hours. After that, the battery charges again until 4 p.m. by using the PV power at off peak time. Then the battery discharges the energy to the grid from 4 p.m. to 5 p.m., until the SOC is becoming 70 % of its capacity. Then the battery is kept idle until 6 p.m. and during that time the load is covered by the PV power. The battery discharges its energy to shave the peak of the load from 6 p.m. to 10 p.m. Then again during off peak time from 10 p.m. onwards the battery is charged by the utility grid energy.

According to the Figure 5.1, PV power is available from 5 a.m. to 8 p.m. on the day and the maximum PV power of 4.55 kW is received at 1p.m.During the same time battery is kept at its idle position and load consumes 1.1 kW out of 4.55 kW of PV power. The excess PV production of 3.45kW is sold to the utility grid.

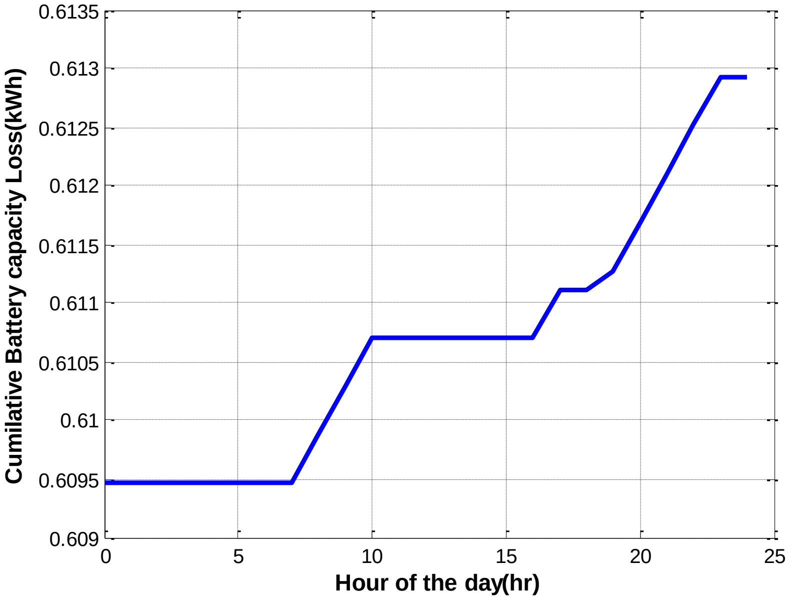


Figure 5.3. Cumulative battery capacity loss variations during a typical summer day, with respect to Case A

Figure 5.3 shows the cumulative battery capacity loss of the grid connected PV system in a typical summer day (196th day of the year). When the day is started, the cumulative battery capacity loss is shown as 0.6095 kWh. That value has retained its same value until the discharging of the battery is started at 7 a.m. During the battery is discharged from 7 a.m. to 10 a.m., battery capacity is getting reduced due to the ageing effect (Equation 4.6). There is no any battery capacity loss between 10 a.m. to 4 p.m. That is because from 10 a.m.- 2 p.m., battery is kept in its idle condition and the battery is charged from 2 p.m. to 4 p.m. The loss of battery capacity, due to the discharging of the battery from 4 p.m. to 5 p.m., is added to the cumulative battery capacity loss. The battery is kept idle from 5 p.m. to 6 p.m. After that battery discharges its energy from 6 p.m. to 10 p.m. This is added more capacity loss to the cumulative battery capacity loss. At the end of the day, battery cumulative battery capacity loss is shown as 0.6129 kWh and during the day the sum of the battery capacity loss is calculated as 3.4 Wh.

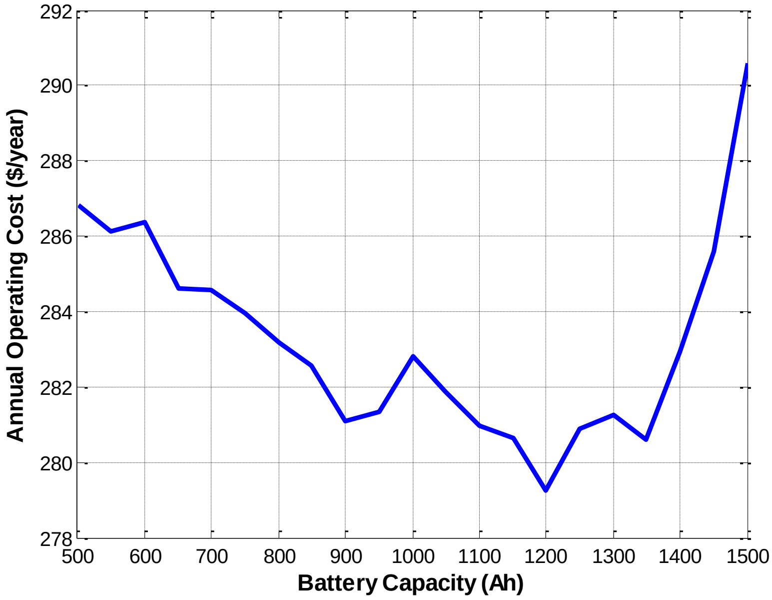


Figure 5.4. Variation of annual operating cost with different battery capacities, with respect to Case A

Figure 5.4 shows the variation of annual operating cost with different battery capacities with respect to case A. During this case, for different battery capacity sizes starting with 500Ah to 1500Ah is entered in the Matlab programme and annual operating cost for each of the battery size is obtained. The critical size of the battery, which gave the minimum annual operating cost of the system, is selected as 1200Ah. Due to the nominal voltage of the battery is 12V, the optimum size of the battery capacity can be written as 14.4 kWh. The annual operating cost of the system by using the 14.4 kWh battery is 279.24 $.

Table 5.1. Annual operating cost breakdown of the 14.4 kWh battery, with respect to case A

| **Name of Operation cost / benefit** | **Value ($/year)** |
|---|---|
| Annual Electricity benefit | 48.74 |
| Annual battery capacity loss cost | 220.39 |
| Annualised inverter cost | 107.59 |
| Annual operating cost | 279.24 |

The annual operating cost consists of the above costs and benefits. The addition of both of the cost of annual battery capacity loss and annualised inverter cost is 327.98 $. The annual electricity selling amount by the PV system has recorded a higher value than the electricity purchasing amount from the utility grid. Therefore, the electricity benefit for the customer is 48.74 $ as shown in the Table 5.1.

When calculating the cost of annual battery capacity loss, real interest rate (discount rate) is not taken into account. Until the battery capacity size is finalized, the lifetime of the battery can't be revealed. The CRF can't be found without knowing the lifetime of the battery. Once we found the optimum battery size is 14.4 kWh and the annual cumulative battery capacity loss is 1.102 kWh, we calculated the lifetime of the battery as 13 years by using the Equation 4.9. This value is near the range of life expectancy of VRLA batteries at 25 °C [3]. The real interest rate is assumed as 4 %. Then by using the Equation 4.16, the CRF value of the battery is calculated as 0.1001. The battery investment cost is calculated as 2880 $, by using the battery investment cost rate of 200 $/kWh and the battery size of 14.4 kWh. Then by using the Equation 4.19, the annualised cost or the cost of real battery capacity loss is calculated as 288 $. Therefore, instead of the cost of annual battery capacity loss of 220.39 $, the annualised battery cost of 288 $ is needed to be substituted for evaluating the total annualised operating cost. The total annualised operating cost of the PV system, with an optimum battery capacity of 14.4 kWh, is calculated as 346.85 $.

### 5.1.2. Case B: Optimum energy flow without peak shaving

During this case optimum energy flow schedule performs as we discussed in Section 4.4.2. When optimum energy schedule is running without considering about the peak shaving, the battery discharges its energy at peak hours, even up to the minimum SOC. This is considered as the normal optimized energy flow technique during this study.

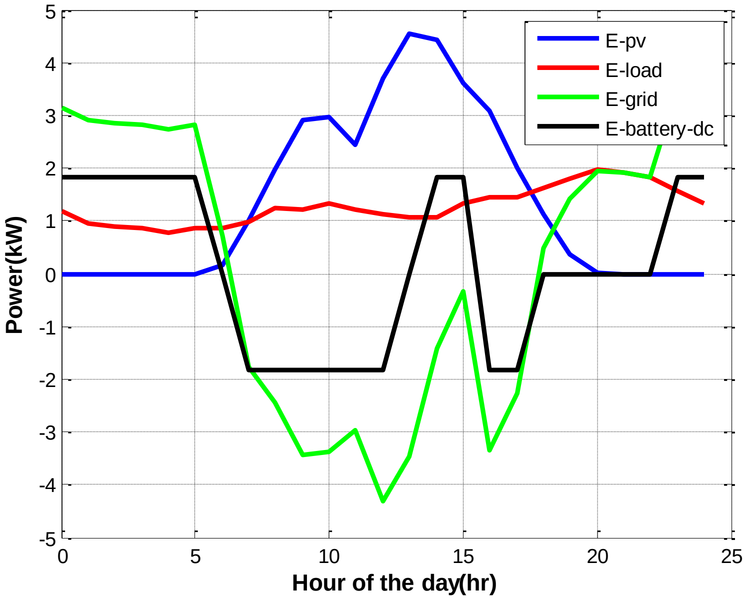


Figure 5.5. Power transfer sequence of the PV system during a typical summer day, with respect to Case B

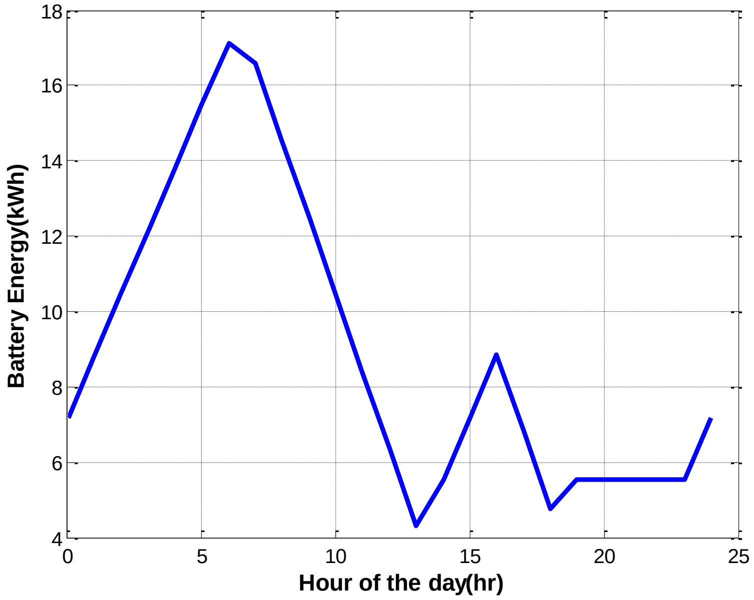


Figure 5.6. Battery Energy variations during a typical summer day, with respect to Case B

Figure 5.5 and Figure 5.6 shows the power transfer sequence of the grid connected PV system with a battery energy storage in a typical summer day (196th day of the year) and the battery stored energy variation during the same day respectively. E-pv, E-load, E-grid and E-battery-dc are represented the energy transfer to and from each of the components in the particular hour. According to Figure 5.5, during off peak hours until 7 a.m., the required energy to perform the load is fed by the utility grid. During that time battery is charging with the maximum charging rate. The PV power which is generated after 5 a.m. is added to the grid power to compensate the load until 7 a.m.

When compared the battery energy curve of the typical day in both the situations of case A and B, energy discharge at the daytime of the battery is limited by a specific value (8.4 kWh) according to Figure 5.2. But during case B battery energy has discharged up to the minimum level of the battery.

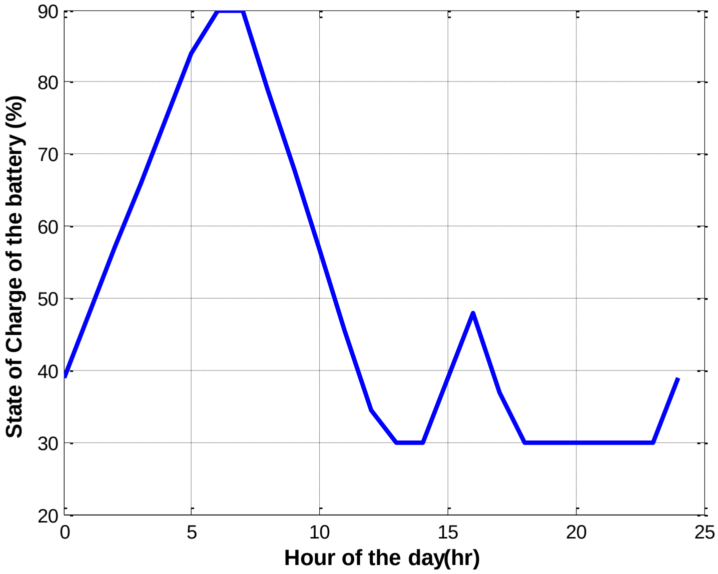


Figure 5.7. Battery SOC variations during a typical summer day, with respect to Case B

Figure 5.7 shows, the battery charge state variations of the grid connected PV system with a battery energy storage, in a typical summer day (196th day of the year). According to Figure 5.7, from 7 a.m.- 12 p.m., battery discharges power to the utility grid with the maximum discharge rate and from 12 p.m.- 1 p.m. at a slower rate. During this peak hour period customer sell all his battery power of 12 kWh (from 17.1kWh to 4.3kWh) to the utility grid, until the battery state of charge is becoming to the minimum of the SOC. Subsequently the battery is kept idle from 1 p.m. - 2 p.m. After that, the battery is charged again until 4 p.m. by using the PV power at off peak time. Then the battery discharges the energy to the grid from 4 p.m. to 6 p.m., until the SOC is becoming $SOC_{min}$. During 6 p.m. - 10 p.m., the peak load is compensated mostly by using the grid power and the battery is kept at that time. Then again during off peak time from 10 p.m. onwards the battery is charged by the utility grid energy.

According to the Figure 5.5, PV power is available from 5 a.m. to 8 p.m. and the maximum PV power of 4.55 kW is received at 1p.m.During the same time battery is kept at its idle position and load consumes 1.1 kW out of 4.55 kW of PV power. The excess PV production of 3.45 kW is sold to the utility grid.

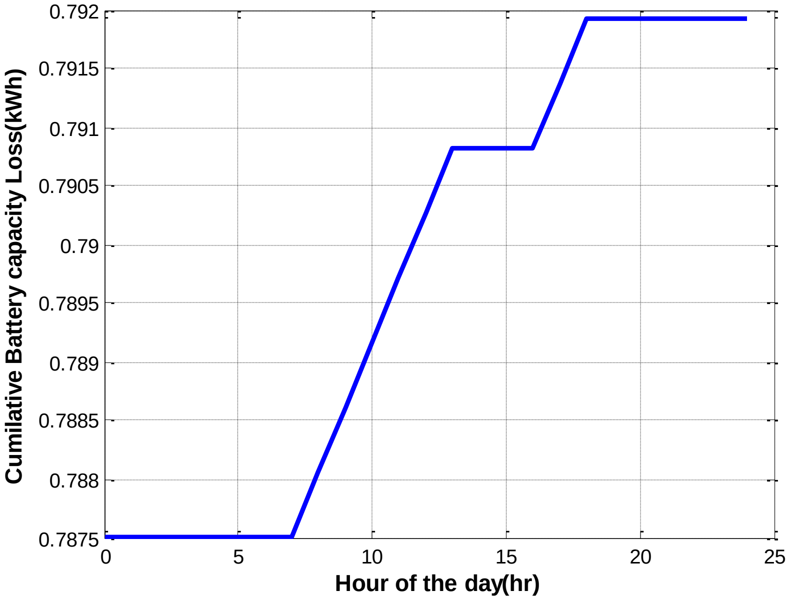


Figure 5.8. Cumulative battery capacity loss variations during a typical summer day, with respect to Case B

Figure 5.8 shows the cumulative battery capacity loss of the grid connected PV system in a typical summer day (196th day of the year).When the day is started, the cumulative battery capacity loss is shown as 0.7875 kWh. That value has retained its same value until the discharging of the battery is started at 7 a.m. During the battery discharges its energy from 7 a.m. to 1 p.m., battery capacity is getting reduced due to the ageing effect. There is no any capacity loss between 1 p.m. to 4 p.m. The battery gets charged during the off-peak time from 1 p.m. to 4 p.m. The loss of battery capacity, due to the discharging of the battery from 4 p.m. to 6 p.m., is added to the cumulative battery capacity loss. At the end of the day, battery cumulative battery capacity loss is shown as 0.7919 kWh and during the day the sum of the battery capacity loss is calculated as 4.4 Wh.

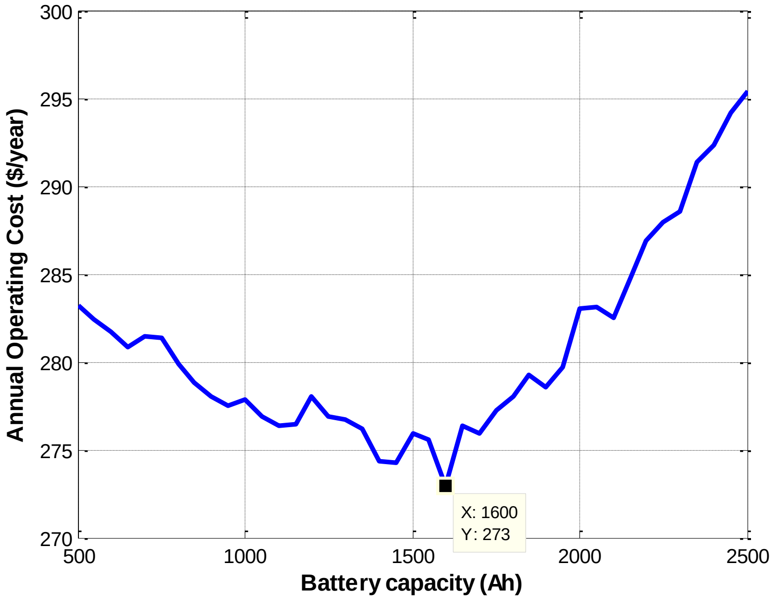


Figure 5.9. Variation of annual operating cost with different battery capacities, with respect to Case B

Figure 5.9 shows the variation of annual operating cost with different battery capacities with respect to case B. During this case, for different battery capacity sizes starting with 500 Ah to 2500 Ah is entered in the Matlab programme and annual operating cost for each of the battery size is obtained. The critical size of the battery, which gave the minimum annual operating cost of the system, is selected as 1600 Ah. Due to the nominal voltage of the battery is 12 V, the optimum size of the battery capacity can be written as 19.2 kWh. The annual operating cost of the system by using the 19.2 kWh battery is 272.97 **$.**

Table 5.2. Annual operating cost breakdown of the 19.2 kWh battery, with respect to case B

| **Name of Operation cost / benefit** | **Value ($/year)** |
|---|---|
| Annual Electricity benefit | 155.55 |
| Annual battery capacity loss cost | 285.07 |
| Annualised inverter cost | 143.45 |
| **Annual operating cost** | **272.97** |

The annual operating cost consists of the above costs and benefits. The addition of both of the cost of annual battery capacity loss and annualised inverter cost is 428.52 **$.** The annual electricity selling amount by the PV system has recorded a higher value than the electricity purchasing amount from the utility grid. Therefore, the electricity benefit for the customer is 155.55 $ as shown in Table 5.2.

When calculating the cost of annual battery capacity loss, real interest rate (discount rate) is not taken into account. Until the battery capacity size is finalized, the lifetime of the battery can't be revealed. The CRF can't be found without knowing the lifetime of the battery. Once we found the optimum battery size as 19.2 kWh and the annual cumulative battery capacity loss is 1.4254 kWh, we calculated the lifetime of the battery as 13.5 years by using the Equation 4.9. This value is near the range of life expectancy of VRLA batteries at 25 $^0$C [3]. The real interest rate is assumed as 4 %. Then by using the Equation 4.16, the CRF value of the battery is calculated as 0.0975. The battery investment cost is calculated as 3840 $, by using the battery investment cost rate of 200 $/kWh and the battery size of 19.2 kWh. Then by using the Equation 4.19, the annualised cost or the cost of real battery capacity loss is calculated as 374.4 $. Therefore, instead of the cost of annual battery capacity loss of 285.07 $, the annualised battery cost of 374.4 $ is needed to be substituted for evaluating the total annualised operating cost. The total annualised operating cost of the PV system, with an optimum battery capacity of 19.2 kWh, is calculated as 362.35 $.

### 5.2. PV System without battery storage

During this configuration, there is no any additional energy storage to store the excess production of PV power during the off-peak time. The utility grid is performing as the energy storage and the excess production has to be provided to the grid. When the PV production is not sufficient or not available to cover the load, utility grid is acting as the energy source to supply the load. When there is a power outage in the utility grid at the night time or a cloudy day, all the operational loads have to be shut down. That is the key disadvantage of these systems.

Under this section 5.2, we are discussing about Matlab simulation results of grid connected PV system without energy storage.The energy flow sequence of the PV system both summer and winter days are discussed.

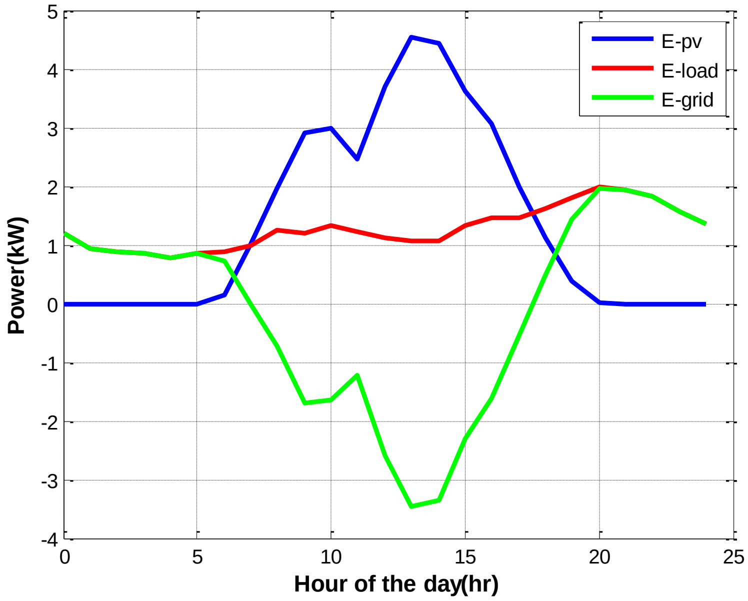


Figure 5.10. Power transfer sequence of the grid connected PV system without a battery energy storage, during a typical summer day

Figure 5.10 shows the power transfer sequence of the grid connected PV system without a battery energy storage in a typical summer day (195th day of the year). E-pv, E-load and E-grid are represented the energy transfer to and from each of the components in the particular hour. According to Figure 5.10, during off peak hours until 5 a.m., the required energy to perform the load is totally fed by the utility grid. After 5 a.m., PV power starts to be available and used for the load. The PV power available from 5 a.m.- 7 a.m., is not sufficient to fully cover the load demand and the shortage of the power is supplied by the utility grid. The load is totally compensated by the PV power from 7 a.m.- 5 p.m. and the excess PV production is sold to the utility grid. The maximum PV power of 4.55 kW is received at 1p.m. The load consumes 1.1 kW out of 4.55 kW of PV power and the excess PV production of 3.45kW is sold to the utility grid.

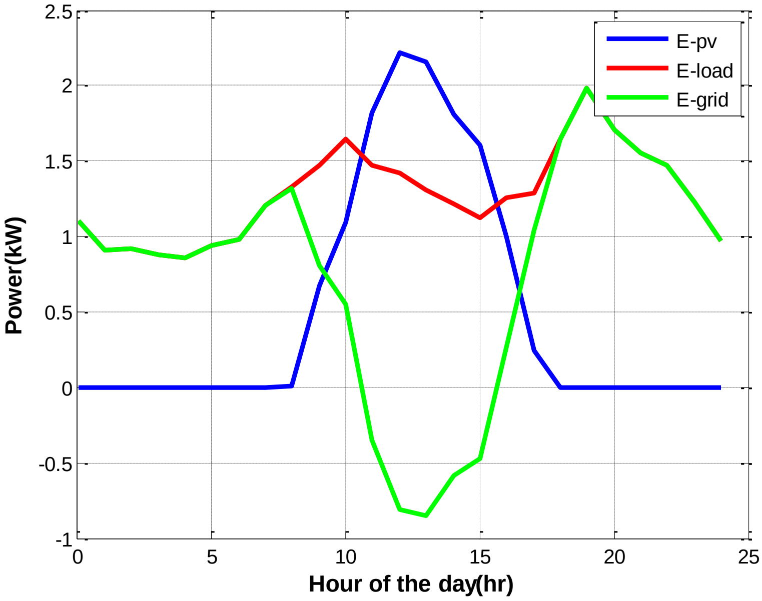


Figure 5.11. Power transfer sequence of the grid connected PV system without a battery energy storage, during a typical winter day

Figure 5.11 shows the power transfer sequence of the grid connected PV system without a battery energy storage in a typical winter day (3rd day of the year). According to the Figure 5.11, during off peak hours until 7 a.m. and peak hours from 7 a.m.-8 a.m., the required energy to perform the load is totally fed by the utility grid. After 8 a.m., PV power starts to be available and used for the load. The PV power available from 8 a.m.- 10 a.m., is not sufficient to fully cover the load demand and the shortage of the power is supplied by the utility grid.The load is totally compensated by the PV power from 11 a.m.- 15 p.m. and the excess PV production is sold to the utility grid. The maximum PV power of 2.223 kW is received at 12 p.m. The load consumes 1.417 kW out of 2.223 kW of PV power and the excess PV production of 0.806 kW is sold to the utility grid

When comparing the annualised operating cost of the grid connected PV system with and without storage, PV system investment cost, PV inverter cost and installation cost have been avoided from the comparison. The reason is all these three variables are common for both of the cases. Therefore, annual electricity cost or benefit is the only operation cost or benefit involving with the annual operating cost in this case. The annual operating cost when battery energy storage is not connected to the grid connected PV system is found as 300.45 $.

## 5.3. Grid connected PV systems with battery : under incentives

The following two typical incentive schemes are considered in analysing the grid connected PV system with battery storage.

### 5.3.1. Feed in tariff (FIT)

As an incentive, it is assumed that the government pays higher credit [18] to the customer for the self generated electricity, which exports to the grid than to the price what imports from the grid. Here, it is assumed that the export tariffs in peak hours of both summer and winter are 10% higher than the import tariffs. Both import and export tariffs at off-peak hours remain at the same tariffs. Energy import prices and Suggested energy export prices are tabulated in Table 5.3and Table 5.4.

Daily electricity charge over the year: 0.14784 USD/day

Table 5.3. Import Energy prices from the Utility Grid

| | **Summer** | | **Winter** | |
|---|---|---|---|---|
| | On-Peak | Off-Peak | On-Peak | Off-Peak |
| Electricity Charge: ($/kWh) | 0.35146 | 0.10330 | 0.13695 | 0.10691 |

Table 5.4. Export Energy prices to the Utility Grid with FIT incentive

| | **Summer** | | **Winter** | |
|---|---|---|---|---|
| | On-Peak | Off-Peak | On-Peak | Off-Peak |
| Electricity Charge: ($/kWh) | 0.3866 | 0.10330 | 0.1506 | 0.10691 |

The above mentioned FITs are used in the two different cases which we discussed under section 5.1.1 and section 5.1.2. When the tariffs used in section 5.1.1 with an optimum battery size of 14.4 kWh, the annual electricity benefit is increased from 48.74 $ to 146.18 $. Then the total annualised operating cost of the PV system is decreased from 346.85 $ to 249.41 $.

When the above tariffs used in section 5.1.2 with an optimum battery size of 19.2 kWh, the annual electricity benefit is increased from 155.55 $ to 307.86 $. Then the total annualised operating cost of the PV system is decreased from 362.3 $ to 210 $.

If we use the incentives in the above schemes the optimum battery capacities also will change.We have used the same battery capacity, in Case A and Case B, just to present the variation of the minimum annual operating cost.

### 5.3.2. Battery investment cost

These types of programmes are already adopted by some countries[10] for encouraging the customers to install their own PV systems to self consume their load demands. Here, it is assumed that the government gives 30 % discount on battery investment cost as an incentive to the customers who purchase solar batteries for grid connected PV systems.

When we used the above discount for the battery of 14.4 kWh, which stated in section 5.1.1, the new investment cost of the battery is decreased from 2880 $ to 2016 $. That gives an anualised battery cost of 201.8 $ with the CRF value of 0.1001. Then the total annualised operating cost of the PV system is decreased from 346.85 $ $ to 260.65 $.

When we used the above discount for the battery of 19.2 kWh, which stated in section 5.1.2, the new investment cost of the battery is decreased from 3840 $ to 2688 $. That gives an anualised battery cost of 262.08 $ with the CRF value of 0.0975. Then the total annualised operating cost of the PV system is decreased from 362.35 $ $ to 249.98 $.

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[10] http://cleantechnica.com/2013/04/17/germanys-energy-storage-incentive-to-start-may-1/

# Chapter 6

# Discussion

The key objective of the thesis aimed to properly size the battery energy storage in a grid connected PV system. That has been performed by using the customer's data, global horizontal irradiance data and the utility electricity price data in San Francisco, California, during the whole year of 2010. During the year, from 1st May – 31st October have been considered as the summer period and the remaining months as winter period. The peak hours were defined as 7 a.m. to 1 p.m. and 4 p.m. to 10 p.m. and all the remaining hours of the day were considered as off-peak hours.

The annual daily average load demand of the customer is found as 27.31 kWh. The PV system, which has been installed on the rooftop of the customer's residence is determined as a 5kWP system. The annual daily average PV production is found as 20.69 kWh and that is calculated as approximately 75 % of the annual daily average load demand. The energy flow has been optimized within the grid connected PV system to get the minimum annual operating cost.

Determination of the optimum battery capacity has been carried out under two cases. Two cases as A and B have been created for managing the energy flow in the system with and without peak shaving. During each of these two cases, the energy flow within the whole PV system has been optimized in two different ways. Under the Case A, the battery energy has been released to the utility grid, during the daytime, only up to a predefined value of the state of charge (SOC >70 %). The above predefined value has selected in the way the total annualised operating cost is taking its minimum value. Under the Case B, the battery is allowed to discharge its energy on peak hours, even up to the minimum charge state (SOCmin). Therefore, Case B is operated under the normal optimized energy flow scheduling. Peak shaving, at the night time, has been prioritised in Case A. The Case B, has given its priority to maximize the income by selling the stored energy to the grid, during peak hours of the day.

The minimum of the total annualised system operating cost[11] relevant to the Case A and B, has been calculated as 346.85 $ and 362.35 $ respectively. The optimum battery capacity relevant to the Case A and B, is calculated as 14.4 kWh and 19.2 kWh respectively. The annual cumulative battery capacity loss under Case A and B is determined as 1.102 kWh and 1.4254 kWh respectively. Accordingly, the lifetime of the batteries are also found as 13 years and 13.5 years in both Case A and B. When compared the Case A and B, the discharging energy amount of the battery has been increased in Case B than A. Due to that, the cost of the battery capacity loss has been increased and the electricity benefit from the utility grid has been increased. Under the normal scheduling or under Case B, due to higher amount of discharging during the daytime, the cost of battery capacity loss increment seems to be much higher than the benefit acquiring from the utility grid. That is what the reason to have a minor difference in annnualised operating costs between both of the cases.

The annual operating cost (only electricity cost) of the system, without using an energy storage, has been found as 300.45 $. The annual cost of the battery capacity loss before annualising the battery cost, in Case A and B, has been found to be 220.39 $ and 285.07 $ respectively. The annualised operating cost of the system in both the occasions of Case A and B, found to be higher than the annual operating cost of the system without a battery energy storage. Due to the PV owned customer's buy rate and sell rate of electricity is similar, it has been difficult to get credits by selling the excess electricity or the stored electricity to the utility grid. When one to one feed in tariff system is used or incentives are not given to customers, the PV production has to be maximally used within the system.

When the customer has obtained 10% increment in the FIT rate, during peak time, the total annualised operating cost of the PV system in Case A, has decreased from 346.85 $ to 249.41 $. Under the same incentive, the total annualised operating cost of the PV system in Case B has decreased from 362.3 $ to 210 $. Therefore the decrement in Case B is considerably larger than Case A. The reason is Case B has given the priority for exporting the electricity to the grid and achieved the advantage of 10 % FIT increment.

When the government has provided 30% discount for the investment cost of the battery, the total annualised operating cost of the PV system in Case A, has decreased from 346.85 $ to 260.65 $. Under the same incentive, the total annualised operating cost of the PV

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[11] When taking the total annualized operating cost of the grid connected PV system with and without battery, PV system investment cost, PV inverter cost and installation cost have been avoided. Battery degradation cost, battery inverter cost and electricity cost/benefit have been included.

system in Case B, has decreased from 362.35 $ to 249.98 $. Therefore the decrement in Case B is considerably larger than case A. The reason is Case B has incurred higher battery investment cost compared to Case A. In both Case A and B, when incentives are involved, the PV system has generated profit compared to the system without using a battery energy storage.

# Chapter 7

# Conclusions

The aim of the thesis investigated a proper size for the energy storage in a grid connected PV system. That was accomplished by optimizing the energy flow schedule in the system and lowering down the daily operating cost of the customer owning the PV system. The process used the data of the PV output, electricity price and the load of a residential customer with a PV array behind the meter in San Francisco, California during the whole year of 2010. One for one buy and sell rate (feed in tariff) under time of using the electricity has been used by the utility grid

Optimizing the energy flow schedule performed under two different energy flow control strategies as Case A and Case B. Under the case A, the battery energy released to the utility grid during the daytime, only up to a predefined value of the charge state (SOC >70 %). This gave the priority to keep the stored energy, to discharge for peak loads at peak periods. Under the Case B, the battery allowed to discharge its energy on peak hours, even up to the minimum charge state (SOCmin). This gave the priority to sell the stored energy to gain energy benefits at peak periods. The basic method for managing the power flow has been realized in the Matlab software with the sequence of operation. The energy flow decision programme realized in Matlab, has decided the act of operation (battery charging/discharging and grid power exchanging) by comparing the amount of available PV power, and the load demand.

The minimum total annualised operating cost in case A and B, was calculated as 346.85 $ and 362.35 $ respectively. The optimum battery capacity relevant to the Case A and B, were calculated as 14.4 kWh and 19.2 kWh respectively. The lifetime of the batteries was found as 13 years in Case A and 13.5 years in Case B. The annual operating cost of the system, without an energy storage, was found as 300.45 $. When the customer obtained 10% increment in the FIT rate, the total annualised operating cost decreased about 28 % in Case A and 42 % in Case B. When the government provided 30% discount for the investment cost of the battery, the total annualised operating cost decreased about 25 % in Case A and 31 % in case B.

These results represented that, proper sizing the battery used in grid connected PV system extremely depend on the electricity tariff and battery degradation cost. Therefore, by considering both the Cases A and B, we can conclude that during one for one electricity tariff scheme, it was beneficial neither to sell the electricity to the grid nor to use the stored energy to shave the peak. When compared both the cases in one for one tariff scheme, the 14.4 kWh battery in Case A, was much beneficial to adopt. The Case B with an optimum battery size of 19.2 kWh generated higher financial benefits compared to Case A during each of the mentioned incentive schemes. When considered the one for one tariff scheme, the PV system without the battery energy storage was much more beneficial to adopt by the financial point of view. Nevertheless, with giving incentives for the electricity  or giving incentives for the battery storages in PV systems to the system owners, practical setting for these systems could be established.

Even though, the energy optimizing process has been done with respect to a particular PV capacity and particular data set, this Matlab programme can be used to find out the optimum battery capacity of a PV system in any location with any PV capacity.

For the future work the energy flow optimization under the time of use tariff rate can be extended to the time of use with peak demand charge tariff systems. In that situation the Case A we have discussed earlier could be much beneficial to implement for that. Because the peak shaving will be much beneficial when demand charge is considered for the peak demand. The other study  is to analyse the deviation of the available battery capacity to the changing of the charging/discharging rate under Peukerts law. That also needed to be added when sizing the battery capacity. During this study,  I have used the data throughout a particular year. But if we have the data of 4-5 years, the result what we got will be much more accurate than the current one.

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# Appendix A

## Basic Matlab Programme for minimizing the annual operation cost

```
close all;
clear all;
clc;


P_pv=importdata('Ppv.txt','\t');
E_pv_dc=P_pv.data;
P_load=importdata('Pload.txt','\t');
E_load=P_load.data;

% ..................User inputs...............

%nominal_voltage='Battery nominal Voltage (V):';
V_bat_nominal=12;%input(nominal_voltage);
nominal_Ah='Battery nominal capacity (Ah):';
E_bat_nominal_Ah=input(nominal_Ah);
%min_SOC='Battery minimum state of charge (%):';
SOC_min=0.3;%input(min_SOC)/100;
%self_discharging_factor='Battery self discharging factor:';
a=0.000035;%input(self_discharging_factor);
%min_charging_time='Nominal time takes to fully charge the battery (hours):';
t_charging_min=10;%input(min_charging_time);
%min_discharging_time='Nominal time takes to fully discharge the battery (hours):';
t_discharging_min=10;%input(min_discharging_time);
%pv_inv_eff='Solar inverter efficiency (%):';
eff_pv_inverter=0.97;%input(pv_inv_eff)/100;
%bat_inv_eff='Battery inverter efficiency (%):';
eff_bat_inverter=0.94;%input(bat_inv_eff)/100;

E_pv_ac=eff_pv_inverter*E_pv_dc;                          % energy from PV at AC bus
E_bat_nominal_kWh=E_bat_nominal_Ah*V_bat_nominal*1e-3;     % nominal battery capacity
in kWh

Max_power_bat=E_bat_nominal_kWh/t_charging_min;            % Maximum power of the
battery

% --------------   initial conditions -----------------------------------

Z_age_coeff=3e-4 ;               % Battery ageing coefficient
SOHmin=0;                        % Minimum State of Health of the Battery
Bat_investment_cost=200;         % Battery Investment cost

i=0.04;                          % Real interest rate
N=10;                            % Inverter lifetime
CRF=(i*(1+i)^N)/(((1+i)^N)-1);   % Capital replacement factor
Bat_inverter_cost_rate=606;      % Rate of battery inverter cost

Bat_eff_charging=0.9;            % Efficieny of the Battery at Charging
Bat_eff_discharging=0.9;         % Efficieny of the Battery at Disharging

delta_t=1;                       % Time interval is 1 hour........Hence, Power equal to
Energy
SOC_max=0.9;                     % Maximum State of Charge


% ........... battery bank ............

E_battery_DC(1,1)=0;    % energy transfer to or from the battery at the beginning (at
0000h on 1st January)
SOC(1,1)=0.5;

E_bat_present_kWh(1,1)=E_bat_nominal_kWh;
E_bat_present_Ah(1,1)=E_bat_present_kWh(1,1)/(V_bat_nominal*1e-3);

charging_rate_max(1,1)=E_bat_present_Ah(1,1)/t_charging_min;
% maximum charging current (A)
discharging_rate_max(1,1)=E_bat_present_Ah(1,1)/t_discharging_min;
% maximum discharging current (A)
```

```
E_batDC_Usable_kWh_discharge_hourly_max(1,1)=V_bat_nominal*discharging_rate_max(1,1)*1e-
3;  % maximum energy output from the battery in DC side per hour
E_batDC_Usable_kWh_charge_hourly_max(1,1)=V_bat_nominal*charging_rate_max(1,1)*1e-3;
% maximum energy input to the battery in DC side per hour

Delta_E_bat(1,1)=0;    % Intial Cumilative battery capacity loss


% ...................................... Grid
................................................

E_grid=E_load;      % assume the load is fully supplied by the grid at the beginning
(at 0000h on 1st January)

% -------------------------------------------------------------------------


%  ......  Generate hourly Electricity price based on peak/ off peak hours
.........................


Basic_daily_Customer_Charge=0.14784;


for day=1:365

    if day>=121 && day<=304;

        for t=1:24

            if  (t>=7 && t<=13) ||(t>=16 && t<=22);

                E_price(day,t)=0.35146;

            else

                E_price(day,t)=0.10330;

            end

        end


    else

        for t=1:24

            if  (t>=7 && t<=13) ||(t>=16 && t<=22);

                E_price(day,t)=0.13695;

            else

                E_price(day,t)=0.10691;

            end

        end

    end

end


% ........... Energy flow simulation for a year
....................................................


for day=1:365

    for t=1:24

        % .............  check peak/off peak  hours
...............................................

        if (t>=7 && t<=13) ||(t>=16 && t<=22);
```

```
            % ------------------ peak hours -------------------------------

            if E_pv_ac(day,t) >= E_load(day,t)

                E_grid_1(day,t)=-(E_pv_ac(day,t)-E_load(day,t));  % sell net energy to
the grid

                if SOC(day,t)> SOC_min;

                    E_battery_DC(day,t)=-E_batDC_Usable_kWh_discharge_hourly_max(day,t);
% battery discharging
                    E_battery_AC(day,t)=eff_bat_inverter*E_battery_DC(day,t);
% Battery discharging Energy at AC bus
                    E_grid_2(day,t)=E_battery_AC(day,t);
% selling battery energy to the grid

                else SOC(day,t)= SOC_min;

                    E_battery_DC(day,t)=0;
                    E_battery_AC(day,t)=eff_bat_inverter*E_battery_DC(day,t);
                    E_grid_2(day,t)=E_battery_AC(day,t);

                end

                E_grid(day,t)=E_grid_1(day,t)+E_grid_2(day,t);


            else E_pv_ac(day,t) <= E_load(day,t);

                if SOC(day,t)> SOC_min

                    if (E_load(day,t)-
E_pv_ac(day,t))<(E_batDC_Usable_kWh_discharge_hourly_max(day,t)*eff_bat_inverter);

                        E_battery_AC(day,t)=-(E_load(day,t)-E_pv_ac(day,t));   % battery
discharging
                        E_battery_DC(day,t)=E_battery_AC(day,t)/eff_bat_inverter;
                        E_grid(day,t)=0;

                    else %(E_load(day,t)-
E_pv_ac(day,t))>=(E_batDC_Usable_kWh_discharge_hourly_max(day,t)*eff_bat_inverter);

                        E_battery_DC(day,t)=-
E_batDC_Usable_kWh_discharge_hourly_max(day,t);      % battery discharging
                        E_battery_AC(day,t)=E_battery_DC(day,t)*eff_bat_inverter;
                        E_grid(day,t)=E_load(day,t)-E_pv_ac(day,t)+E_battery_AC(day,t);
% Energy buying from the grid after fully discharing the battery


                    end


                else SOC(day,t) = SOC_min;

                    E_battery_DC(day,t)=0;
                    E_battery_AC(day,t)=eff_bat_inverter*E_battery_DC(day,t);
                    E_grid(day,t)=E_load(day,t)-E_pv_ac(day,t);       % energy is buying
from the grid to supply the load

                end

            end

        else

            % ------------------- Off peak hours --------------------------

            if E_pv_ac(day,t) >= E_load(day,t)

                if SOC(day,t)< SOC_max

                    if (E_pv_ac(day,t)-
E_load(day,t))<(E_batDC_Usable_kWh_charge_hourly_max(day,t)/eff_bat_inverter);

                        E_battery_AC(day,t)=(E_pv_ac(day,t)-E_load(day,t));   % battery
charging
                        E_battery_DC(day,t)=E_battery_AC(day,t)*eff_bat_inverter;
```

```
                        E_grid(day,t)=0;

                    else% (E_pv_ac(day,t)-
E_load(day,t))>=(E_batDC_Usable_kWh_charge_hourly_max(day,t)/eff_bat_inverter);

                        E_battery_DC(day,t)=E_batDC_Usable_kWh_charge_hourly_max(day,t);
% battery charging
                        E_battery_AC(day,t)=E_battery_DC(day,t)/eff_bat_inverter;
                        E_grid(day,t)=-(E_pv_ac(day,t)-E_load(day,t)-
E_battery_AC(day,t));   % sell exccess energy to the grid

                    end

                else SOC(day,t)=SOC_max;

                    E_battery_DC(day,t)=0;
                    E_battery_AC(day,t)=E_battery_DC(day,t)/eff_bat_inverter;
                    E_grid(day,t)=-(E_pv_ac(day,t)-E_load(day,t));          % selling PV
energy directly to the grid

                end

            else E_pv_ac(day,t) <= E_load(day,t);

                E_grid_1(day,t)=E_load(day,t)-E_pv_ac(day,t);  % buying energy from the
grid

                if SOC(day,t)< SOC_max

                    E_battery_DC(day,t)=E_batDC_Usable_kWh_charge_hourly_max(day,t);  %
battery is charging in maximum charging rate
                    E_battery_AC(day,t)=E_battery_DC(day,t)/eff_bat_inverter;
                    E_grid_2(day,t)=E_battery_AC(day,t);

                else SOC(day,t)=SOC_max;

                    E_battery_DC(day,t)=0;
                    E_battery_AC(day,t)=E_battery_DC(day,t)/eff_bat_inverter;
                    E_grid_2(day,t)=0;

                end

                E_grid(day,t)=E_grid_1(day,t)+E_grid_2(day,t);

            end


        end

        %------------------------------------ State of Charge(SOC) ---------------------
--------------------------------------------------------------


        if E_battery_DC(day,t)< 0

            SOC(day,t+1)= (SOC(day,t)*(1-a))-
(abs(E_battery_DC(day,t))/(Bat_eff_discharging*E_bat_present_kWh(day,t)));  % battery
discharging

        else

            SOC(day,t+1)= (SOC(day,t)*(1-
a))+((Bat_eff_charging*abs(E_battery_DC(day,t)))/E_bat_present_kWh(day,t));  % battery
charging

        end

        %------------------ Cumilative Battery capacity loss(CBCL) ---------------------
----------------------------------------------


        if E_battery_DC(day,t)< 0

            Delta_E_bat(day,t+1)= Delta_E_bat(day,t)-(Z_age_coeff*E_battery_DC(day,t));
% CBCL at battery discharging

        else
```

```
            Delta_E_bat(day,t+1)= Delta_E_bat(day,t);
% CBCL at battery charging

        end
        %------------------  Battery capacity Loss(BCL) --------------------------------
--------------------------------------------

        BCL(day,t+1)=Delta_E_bat(day,t+1)-Delta_E_bat(day,t);


        BCL_cost(day,t+1)=[Bat_investment_cost*BCL(day,t+1)]/(1-SOHmin);
% Battery capacity lost cost


        %------------------ Present Usable Battery capacity ----------------------------
------------------------------------------------


        E_bat_present_kWh(day,t+1)=E_bat_nominal_kWh-Delta_E_bat(day,t+1);
%Present Battery capacity
        E_bat_present_Ah(day,t+1)=(E_bat_present_kWh(day,t)/V_bat_nominal)*1e3;

        %----------------- Present Maximum Charging/Discharging rates-------------------
--------------------------------------------------

        charging_rate_max(day,t+1)=E_bat_present_Ah(day,t+1)/t_charging_min;
        discharging_rate_max(day,t+1)=E_bat_present_Ah(day,t+1)/t_discharging_min;


E_batDC_Usable_kWh_discharge_hourly_max(day,t+1)=V_bat_nominal*discharging_rate_max(day,
t+1)*1e-3;  % maximum energy output from the battery in DC side per hour

E_batDC_Usable_kWh_charge_hourly_max(day,t+1)=V_bat_nominal*charging_rate_max(day,t+1)*1
e-3 ;       % maximum energy input to the battery in DC side per hour

        %----------------- Present stored Energy of the battery-------------------------
--------------------------------------------

        Energy_bat(day,t+1)=SOC(day,t+1)*E_bat_present_kWh(day,t+1);






    end


    Delta_E_bat(day+1,1)=Delta_E_bat(day,25);
    BCL(day+1,1)=BCL(day,25);
    BCL_cost(day+1,1)=BCL_cost(day,25);
    E_bat_present_kWh(day+1,1)=E_bat_present_kWh(day,25);

E_batDC_Usable_kWh_charge_hourly_max(day+1,1)=E_batDC_Usable_kWh_charge_hourly_max(day,2
5);
    SOC(day+1,1)=SOC(day,25);
    Energy_bat(day+1,1)=Energy_bat(day,25);

end

SOC_percentage=SOC(1:365,1:24).*100;  % SOC as a percentage


% convert 2D data array to 1D array with number of elements 8760 for  plotting

E_pv_ac_year=E_pv_ac(1,:);
E_load_year=E_load(1,:);
E_grid_year=E_grid(1,:);
E_battery_year=E_battery_DC(1,:);
SOC_year=SOC_percentage(1,:);
BCL_year=BCL(1,1:24);
Delta_E_bat_year=Delta_E_bat(1,1:24);
Energy_bat_year=Energy_bat(1,1:24);
electricity_price_year=E_price(1,:);
```

```
for i=2:365

    E_pv_ac_year=cat(2,E_pv_ac_year,E_pv_ac(i,:));
    E_load_year=cat(2,E_load_year,E_load(i,:));
    E_grid_year=cat(2,E_grid_year,E_grid(i,:));
    E_battery_year=cat(2,E_battery_year,E_battery_DC(i,:));
    SOC_year=cat(2,SOC_year,SOC_percentage(i,:));
    BCL_year=cat(2,BCL_year,BCL(i,1:24));
    Delta_E_bat_year=cat(2,Delta_E_bat_year,Delta_E_bat(i,1:24));
    Energy_bat_year=cat(2,Energy_bat_year,Energy_bat(i,1:24));
    electricity_price_year=cat(2,electricity_price_year,E_price(i,:));

end

%----------------------------------   Invidual Annual Costs   --------------------------
--------------
%***************************************************************************************
**************

%.......................................................................................
......
for day=1:365

    Daily_BCL_cost(day)=sum(BCL_cost(day,2:25));
    Annual_BCL_cost=sum(Daily_BCL_cost(:));                 % Annual Battery capacity
loss cost

end


%.......................................................................................
........

for day=1:365

    for t=1:24

        Electricity_cost(day,t)=E_price(day,t).* E_grid(day,t);

    end
    Daily_Elctricity_cost(day)=sum(Electricity_cost(day,:));

Annual_Elctricity_cost=sum(Daily_Elctricity_cost(:))+Basic_daily_Customer_Charge*365;
% Annual Electricity cost
end

%.............................................................................

%...........................Annualized inverter
cost....................................................................

Bat_inverter_cost=Bat_inverter_cost_rate*Max_power_bat;     % Battery inverter cost

Annualized_bat_inverter_cost=Bat_inverter_cost*CRF;
% Annualized battery inverter cost

%.......................................................................................
.......................




%----------------------------------   Total Annual Operation Cost   --------------------
--------------------
%***************************************************************************************
********************

Total_Annual_op_cost=Annual_Elctricity_cost+Annual_BCL_cost+Annualized_bat_inverter_cost
;

%.............................................................................



% plot data from start_hour to end_hour
```

```
start_hour=24*195;
end_hour=24*196;

plot((start_hour:end_hour)-
start_hour,E_pv_ac_year(start_hour:end_hour),'b','linewidth',2.5);
grid on;
xlabel('Hour of the day(hr)','fontSize',11,'fontweight','bold');
ylabel('Power(kW)','fontSize',11,'fontweight','bold');

hold on;
plot((start_hour:end_hour)-
start_hour,E_load_year(start_hour:end_hour),'r','linewidth',2.5);

hold on;
plot((start_hour:end_hour)-
start_hour,E_grid_year(start_hour:end_hour),'g','linewidth',2.5);

hold on;
plot((start_hour:end_hour)-
start_hour,E_battery_year(start_hour:end_hour),'black','linewidth',2.5);

legend('E-pv','E-load','E-grid','E-battery-dc');

figure;
plot((start_hour:end_hour)-start_hour,SOC_year(start_hour:end_hour),'linewidth',2.5);
grid on;
xlabel('Hour of the day(hr)','fontSize',11,'fontweight','bold');
ylabel('State of Charge of the battery (%)','fontSize',11,'fontweight','bold');

figure;
plot((start_hour:end_hour)-
start_hour,Delta_E_bat_year(start_hour:end_hour),'linewidth',2.5);
grid on;
xlabel('Hour of the day(hr)','fontSize',11,'fontweight','bold');
ylabel('Cumilative Battery capacity Loss(kWh)','fontSize',11,'fontweight','bold');

figure;
plot((start_hour:end_hour)-
start_hour,Energy_bat_year(start_hour:end_hour),'linewidth',2.5);
grid on;
xlabel('Hour of the day(hr)','fontSize',11,'fontweight','bold');
ylabel('Battery Energy(kWh)','fontSize',11,'fontweight','bold');

figure;
plot((start_hour:end_hour)-
start_hour,electricity_price_year(start_hour:end_hour),'linewidth',2.5);
grid on;
xlabel('Hour of the day(hr)','fontSize',11,'fontweight','bold');
ylabel('Electricity charge (USD/kWh)','fontSize',11,'fontweight','bold');


% ................ print results.....................

 E_bat_nominal_Ah_start=E_bat_nominal_Ah
 E_bat_nominal_Ah_end=E_bat_present_Ah(365,24)
 E_bat_nominal_kWh_start=E_bat_nominal_kWh
 E_bat_nominal_kWh_end=E_bat_present_kWh(365,24)
 Total_Annual_op_cost
 Battery_life_years=round(E_bat_nominal_kWh_start/(E_bat_nominal_kWh_start-
E_bat_nominal_kWh_end))
```

# Appendix B

## Annual hourly load data (2010)

| Date | 1:00 AM | 2:00 AM | 3:00 AM | 4:00 AM | 5:00 AM | 6:00 AM | 7:00 AM | 8:00 AM | 9:00 AM | 10:00 AM | 11:00 AM | 12:00 PM | 1:00 PM | 2:00 PM | 3:00 PM | 4:00 PM | 5:00 PM | 6:00 PM | 7:00 PM | 8:00 PM | 9:00 PM | 10:00 PM | 11:00 PM | 12:00 AM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 01-01-10 | 1.09015 | 1.05115 | 0.94405 | 0.83975 | 0.8088 | 0.88895 | 1.0803 | 1.22575 | 1.20075 | 1.58685 | 1.6113 | 1.5634 | 1.48145 | 1.3152 | 1.20375 | 1.1233 | 1.298 | 1.6716 | 1.9534 | 1.8108 | 1.60455 | 1.40505 | 1.1809 | 0.9378 |
| 02-01-10 | 0.80965 | 0.81345 | 0.7905 | 0.8036 | 0.81655 | 0.8929 | 1.0627 | 1.28135 | 1.46465 | 1.41135 | 1.50725 | 1.4203 | 1.44135 | 1.2998 | 1.2238 | 1.149 | 1.1816 | 1.6023 | 1.91795 | 1.7298 | 1.61995 | 1.5657 | 1.19375 | 1.0992 |
| 03-01-10 | 0.9092 | 0.91945 | 0.8793 | 0.85705 | 0.9386 | 0.9799 | 1.20465 | 1.3321 | 1.47635 | 1.6446 | 1.4706 | 1.41665 | 1.3069 | 1.21505 | 1.1284 | 1.25755 | 1.2859 | 1.6504 | 1.98205 | 1.70905 | 1.5533 | 1.4727 | 1.22865 | 0.965 |
| 04-01-10 | 0.90925 | 0.85625 | 0.853 | 0.9178 | 0.86965 | 0.98445 | 1.4817 | 1.59095 | 1.4075 | 1.35235 | 1.38645 | 1.25655 | 1.25625 | 1.0127 | 0.89485 | 1.047 | 1.1497 | 1.54485 | 1.8544 | 1.8952 | 1.63865 | 1.44655 | 1.29635 | 1.03965 |
| 05-01-10 | 0.85695 | 0.905 | 0.86605 | 0.9017 | 0.90675 | 1.0746 | 1.554 | 1.63945 | 1.47095 | 1.43775 | 1.4169 | 1.3651 | 1.1882 | 1.10365 | 0.9878 | 1.05365 | 1.1288 | 1.42515 | 1.77655 | 1.8584 | 1.5912 | 1.4664 | 1.2516 | 1.0609 |
| 06-01-10 | 0.92495 | 0.91065 | 0.8599 | 0.8924 | 0.85435 | 1.0303 | 1.4234 | 1.7001 | 1.5518 | 1.4555 | 1.40295 | 1.26905 | 1.13015 | 1.0108 | 0.9969 | 1.05555 | 1.1574 | 1.4228 | 1.99195 | 1.76165 | 1.7656 | 1.5106 | 1.29605 | 0.94775 |
| 07-01-10 | 0.82075 | 0.83565 | 0.86295 | 0.94455 | 0.87435 | 0.98415 | 1.40135 | 1.67615 | 1.56005 | 1.55405 | 1.39155 | 1.2322 | 1.041 | 1.02525 | 0.9843 | 1.12005 | 1.3049 | 1.59975 | 1.818 | 1.74075 | 1.68905 | 1.6102 | 1.278 | 0.89235 |
| 08-01-10 | 0.84715 | 0.8439 | 0.8294 | 0.8619 | 0.8124 | 1.02015 | 1.3873 | 1.69745 | 1.5171 | 1.52805 | 1.52135 | 1.40135 | 1.2912 | 1.1801 | 1.07975 | 1.12515 | 1.1224 | 1.5214 | 1.7455 | 1.6439 | 1.58935 | 1.5228 | 1.2576 | 1.1014 |
| 09-01-10 | 0.92535 | 0.9073 | 0.93345 | 0.9178 | 0.84255 | 1.0465 | 1.23615 | 1.44925 | 1.55465 | 1.6794 | 1.67495 | 1.53525 | 1.40255 | 1.33885 | 1.29075 | 1.31015 | 1.36405 | 1.6124 | 1.8412 | 1.7183 | 1.62965 | 1.45 | 1.2027 | 1.12865 |
| 10-01-10 | 0.89335 | 0.83835 | 0.8617 | 0.83725 | 0.8764 | 0.97785 | 1.19265 | 1.3091 | 1.40245 | 1.5579 | 1.4403 | 1.304 | 1.471 | 1.2452 | 1.2314 | 1.23665 | 1.3286 | 1.611 | 1.8124 | 1.71415 | 1.7391 | 1.56535 | 1.3097 | 0.9729 |
| 11-01-10 | 0.834 | 0.80255 | 0.81895 | 0.7996 | 0.7942 | 1.03895 | 1.383 | 1.38225 | 1.418 | 1.29985 | 1.27525 | 1.22815 | 0.9968 | 0.901 | 0.9021 | 0.9737 | 1.1135 | 1.26225 | 1.7494 | 1.72675 | 1.69615 | 1.5782 | 1.24025 | 1.01005 |
| 12-01-10 | 0.836 | 0.77185 | 0.7986 | 0.80405 | 0.84035 | 1.02415 | 1.40215 | 1.42195 | 1.3147 | 1.28305 | 1.37635 | 1.11795 | 1.0242 | 1.01245 | 1.00005 | 1.01955 | 1.109 | 1.4048 | 1.7003 | 1.61375 | 1.53775 | 1.298 | 1.2089 | 1.01075 |
| 13-01-10 | 0.8057 | 0.7747 | 0.7384 | 0.7235 | 0.79045 | 0.90305 | 1.3791 | 1.3743 | 1.25565 | 1.2368 | 1.125 | 1.0082 | 0.96825 | 0.8165 | 0.87465 | 0.8874 | 1.05565 | 1.2596 | 1.77325 | 1.66545 | 1.65945 | 1.4342 | 1.2212 | 1.0467 |
| 14-01-10 | 0.84495 | 0.81485 | 0.7958 | 0.82105 | 0.82105 | 1.0056 | 1.4027 | 1.60745 | 1.40175 | 1.32875 | 1.28915 | 1.0452 | 0.91105 | 0.91435 | 0.9897 | 0.99845 | 1.01395 | 1.4311 | 1.86685 | 1.7708 | 1.5955 | 1.42415 | 1.2257 | 0.91105 |
| 15-01-10 | 0.78265 | 0.82595 | 0.7935 | 0.82405 | 0.90355 | 1.1364 | 1.5115 | 1.56335 | 1.37055 | 1.3521 | 1.26595 | 1.13595 | 0.9033 | 0.9092 | 0.9669 | 1.01105 | 1.10225 | 1.57795 | 1.76845 | 1.67545 | 1.62375 | 1.36845 | 1.18605 | 0.97115 |
| 16-01-10 | 0.9176 | 0.82785 | 0.85605 | 0.8453 | 0.8642 | 1.0301 | 1.1976 | 1.313 | 1.4846 | 1.45615 | 1.45825 | 1.43975 | 1.35825 | 1.3328 | 1.22205 | 1.24565 | 1.36525 | 1.79015 | 1.88255 | 1.5814 | 1.62525 | 1.53085 | 1.3062 | 1.04045 |
| 17-01-10 | 0.89455 | 0.8047 | 0.8165 | 0.8017 | 0.7992 | 0.87695 | 1.0422 | 1.20935 | 1.33285 | 1.62405 | 1.70715 | 1.40475 | 1.47395 | 1.56475 | 1.3947 | 1.3746 | 1.32295 | 1.59765 | 1.84875 | 1.5616 | 1.5503 | 1.43985 | 1.12655 | 0.98725 |
| 18-01-10 | 0.77945 | 0.78755 | 0.76825 | 0.78975 | 0.85485 | 0.96555 | 1.13455 | 1.346 | 1.52315 | 1.5277 | 1.4918 | 1.52215 | 1.33485 | 1.1379 | 1.1432 | 1.1017 | 1.2345 | 1.55105 | 1.97375 | 1.73635 | 1.65315 | 1.50755 | 1.2731 | 0.9434 |
| 19-01-10 | 0.81775 | 0.7661 | 0.76245 | 0.8387 | 0.84575 | 1.10655 | 1.44285 | 1.4366 | 1.5058 | 1.36315 | 1.3734 | 1.16075 | 1.06055 | 1.13015 | 1.0275 | 1.0833 | 1.3415 | 1.5445 | 1.8136 | 1.8841 | 1.6959 | 1.55135 | 1.2383 | 1.02745 |
| 20-01-10 | 0.8445 | 0.77825 | 0.7517 | 0.81995 | 0.8743 | 1.01545 | 1.35305 | 1.4968 | 1.49405 | 1.45275 | 1.3821 | 1.24425 | 1.1953 | 1.0114 | 1.047 | 1.24515 | 1.33175 | 1.5356 | 1.7983 | 1.7968 | 1.65425 | 1.55985 | 1.20585 | 0.98205 |
| 21-01-10 | 0.87825 | 0.80765 | 0.79735 | 0.803 | 0.8794 | 1.00675 | 1.36515 | 1.4988 | 1.4823 | 1.4719 | 1.37165 | 1.23115 | 1.23275 | 1.25775 | 1.26555 | 1.3336 | 1.31215 | 1.53245 | 1.8496 | 1.706 | 1.7389 | 1.56755 | 1.2406 | 0.9855 |
| 22-01-10 | 0.9196 | 0.8622 | 0.86155 | 0.8975 | 0.91285 | 1.14125 | 1.5563 | 1.6962 | 1.7371 | 1.5608 | 1.4153 | 1.3018 | 1.20735 | 1.1312 | 1.131 | 1.10975 | 1.1245 | 1.4136 | 1.6615 | 1.7854 | 1.7626 | 1.55325 | 1.2848 | 1.08905 |
| 23-01-10 | 0.95975 | 0.89445 | 0.895 | 0.89825 | 0.96755 | 1.0936 | 1.2525 | 1.38865 | 1.49585 | 1.63205 | 1.61595 | 1.50105 | 1.3164 | 1.3786 | 1.27005 | 1.33105 | 1.19075 | 1.63735 | 1.6578 | 1.5779 | 1.62875 | 1.5499 | 1.3251 | 1.1374 |
| 24-01-10 | 0.9266 | 0.8928 | 0.87905 | 0.8941 | 0.88905 | 1.03265 | 1.28155 | 1.44865 | 1.6745 | 1.5153 | 1.60205 | 1.5204 | 1.7184 | 1.6209 | 1.4734 | 1.5045 | 1.4914 | 1.70915 | 1.81965 | 1.7832 | 1.7895 | 1.64755 | 1.29705 | 0.984 |
| 25-01-10 | 0.7602 | 0.7504 | 0.72405 | 0.8128 | 0.80505 | 1.00345 | 1.30295 | 1.33785 | 1.38435 | 1.30925 | 1.2966 | 1.1943 | 1.11895 | 1.06755 | 1.03075 | 1.0832 | 1.0963 | 1.40935 | 1.7091 | 1.73335 | 1.8023 | 1.54055 | 1.2747 | 0.98875 |
| 26-01-10 | 0.8716 | 0.78765 | 0.7678 | 0.81975 | 0.813 | 1.0304 | 1.40035 | 1.43595 | 1.27615 | 1.2433 | 1.35335 | 1.0958 | 1.02075 | 0.90355 | 0.9085 | 0.96395 | 1.03585 | 1.3507 | 1.66995 | 1.80855 | 1.70915 | 1.48085 | 1.29075 | 1.0495 |
| 27-01-10 | 0.83545 | 0.82905 | 0.77315 | 0.81375 | 0.82765 | 1.00675 | 1.33225 | 1.44175 | 1.47795 | 1.37475 | 1.3291 | 1.19415 | 0.9885 | 0.99825 | 0.9975 | 0.9269 | 1.1446 | 1.32975 | 1.7064 | 1.8229 | 1.739 | 1.54895 | 1.08255 | 0.8808 |
| 28-01-10 | 0.7721 | 0.74215 | 0.69905 | 0.78785 | 0.79575 | 0.99155 | 1.3493 | 1.54865 | 1.44235 | 1.42775 | 1.26285 | 1.18395 | 1.0593 | 0.9319 | 0.8959 | 0.90725 | 1.1002 | 1.2948 | 1.66445 | 1.7226 | 1.76885 | 1.46095 | 1.2033 | 0.98305 |
| 29-01-10 | 0.7903 | 0.74645 | 0.75405 | 0.78085 | 0.8131 | 0.9854 | 1.3872 | 1.6498 | 1.57235 | 1.42445 | 1.397 | 1.2121 | 1.04955 | 0.9626 | 0.9286 | 0.8943 | 1.10545 | 1.3732 | 1.59935 | 1.6244 | 1.53415 | 1.50955 | 1.29605 | 1.0697 |
| 30-01-10 | 0.8734 | 0.81065 | 0.80155 | 0.77495 | 0.86485 | 1.0039 | 1.1231 | 1.3589 | 1.46185 | 1.51 | 1.60075 | 1.32755 | 1.3843 | 1.38005 | 1.18905 | 1.19295 | 1.10175 | 1.39995 | 1.60425 | 1.44175 | 1.5811 | 1.36075 | 1.19815 | 1.0417 |
| 31-01-10 | 0.90715 | 0.8348 | 0.7369 | 0.8031 | 0.8647 | 0.89275 | 1.18955 | 1.35455 | 1.5256 | 1.495 | 1.5191 | 1.3534 | 1.33965 | 1.2483 | 1.1311 | 1.00525 | 1.0725 | 1.4637 | 1.81075 | 1.75665 | 1.6922 | 1.5974 | 1.30575 | 0.9615 |
| 01-02-10 | 0.7741 | 0.7384 | 0.72565 | 0.77655 | 0.812 | 0.91755 | 1.47505 | 1.57335 | 1.3394 | 1.212 | 1.4124 | 1.21355 | 0.9608 | 0.9169 | 0.86635 | 0.9642 | 1.1203 | 1.36255 | 1.5999 | 1.7392 | 1.6142 | 1.57975 | 1.315 | 1.0069 |
| 02-02-10 | 0.8884 | 0.7891 | 0.75715 | 0.7872 | 0.81415 | 1.0205 | 1.3326 | 1.6082 | 1.4833 | 1.59425 | 1.2541 | 1.038 | 0.9374 | 0.92265 | 0.931 | 0.8409 | 0.9099 | 1.33545 | 1.5733 | 1.57465 | 1.5545 | 1.51945 | 1.2369 | 1.03175 |
| 03-02-10 | 0.8342 | 0.73705 | 0.71595 | 0.77865 | 0.7766 | 1.02965 | 1.30805 | 1.4638 | 1.4688 | 1.4346 | 1.2644 | 1.1943 | 1.01235 | 0.9205 | 0.88705 | 0.8753 | 0.91845 | 1.3124 | 1.7576 | 1.7261 | 1.61115 | 1.45625 | 1.1964 | 0.9715 |
| 04-02-10 | 0.8409 | 0.7736 | 0.7293 | 0.77415 | 0.8363 | 0.972 | 1.33885 | 1.54715 | 1.47425 | 1.3147 | 1.24925 | 1.18975 | 1.10185 | 1.0448 | 1.0336 | 0.9987 | 1.10745 | 1.3519 | 1.67405 | 1.67515 | 1.631 | 1.41145 | 1.2499 | 0.9804 |
| 05-02-10 | 0.7746 | 0.7523 | 0.73115 | 0.79985 | 0.83075 | 1.0194 | 1.2758 | 1.648 | 1.3693 | 1.1818 | 1.0711 | 1.0866 | 1.0049 | 1.0262 | 0.96525 | 0.9037 | 1.0338 | 1.2814 | 1.52075 | 1.60335 | 1.5444 | 1.3791 | 1.17325 | 0.94725 |
| 06-02-10 | 0.8379 | 0.7903 | 0.7538 | 0.7853 | 0.8197 | 0.90275 | 1.01825 | 1.37925 | 1.47845 | 1.4784 | 1.38935 | 1.51765 | 1.39155 | 1.3116 | 1.32375 | 1.43545 | 1.3264 | 1.435 | 1.61695 | 1.5877 | 1.547 | 1.4549 | 1.17435 | 1.055 |
| 07-02-10 | 0.87595 | 0.78415 | 0.7661 | 0.79985 | 0.83495 | 0.9949 | 1.107 | 1.38045 | 1.61975 | 1.4793 | 1.49445 | 1.3189 | 1.35045 | 1.31935 | 1.1987 | 1.14055 | 1.1675 | 1.41485 | 1.56005 | 1.60865 | 1.7853 | 1.5136 | 1.1874 | 0.9483 |

| | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 08-02-10 | 0.82195 | 0.76395 | 0.72865 | 0.74675 | 0.80015 | 0.92495 | 1.33345 | 1.64905 | 1.575 | 1.43415 | 1.2842 | 1.2126 | 1.0699 | 1.0453 | 0.9829 | 0.93275 | 1.0905 | 1.41255 | 1.77635 | 1.82795 | 1.70705 | 1.49725 | 1.14585 | 0.9111 |
| 09-02-10 | 0.79785 | 0.74875 | 0.74055 | 0.7709 | 0.8265 | 1.04185 | 1.44515 | 1.49595 | 1.3859 | 1.2968 | 1.30995 | 1.1224 | 1.0202 | 1.05985 | 0.9041 | 0.8753 | 1.04905 | 1.3043 | 1.58305 | 1.66525 | 1.67415 | 1.43965 | 1.1603 | 0.9619 |
| 10-02-10 | 0.87675 | 0.8515 | 0.8542 | 0.9013 | 0.9108 | 1.10705 | 1.44955 | 1.69395 | 1.5083 | 1.292 | 1.2521 | 1.37175 | 1.0934 | 0.97265 | 0.8861 | 0.88665 | 1.0032 | 1.1905 | 1.6712 | 1.6967 | 1.69755 | 1.4125 | 1.12215 | 0.8523 |
| 11-02-10 | 0.81155 | 0.761 | 0.7561 | 0.78435 | 0.80785 | 1.05445 | 1.3895 | 1.53235 | 1.30285 | 1.18915 | 1.0857 | 1.08235 | 1.00755 | 0.9851 | 0.968 | 0.9178 | 0.9782 | 1.2876 | 1.6429 | 1.66675 | 1.6074 | 1.3768 | 1.22275 | 0.975 |
| 12-02-10 | 0.8042 | 0.7559 | 0.7631 | 0.79285 | 0.7933 | 0.99015 | 1.29165 | 1.48975 | 1.4544 | 1.27045 | 1.2137 | 1.12795 | 0.9898 | 0.84835 | 0.9735 | 0.8766 | 0.96235 | 1.21295 | 1.6084 | 1.66295 | 1.58035 | 1.3628 | 1.2459 | 0.98065 |
| 13-02-10 | 0.8491 | 0.76155 | 0.71855 | 0.7563 | 0.83665 | 0.96855 | 1.0766 | 1.35605 | 1.50965 | 1.3093 | 1.3636 | 1.4883 | 1.17315 | 1.1668 | 1.2054 | 1.1616 | 1.1495 | 1.26395 | 1.48745 | 1.49455 | 1.45915 | 1.3437 | 1.1457 | 0.9407 |
| 14-02-10 | 0.8273 | 0.7508 | 0.70955 | 0.75745 | 0.7445 | 0.91845 | 1.06355 | 1.25595 | 1.54835 | 1.4344 | 1.33535 | 1.3371 | 1.14625 | 1.3149 | 1.2053 | 1.08245 | 1.16975 | 1.43505 | 1.73565 | 1.6083 | 1.602 | 1.4059 | 1.2494 | 0.95405 |
| 15-02-10 | 0.7714 | 0.71795 | 0.6944 | 0.71175 | 0.77665 | 0.96185 | 1.1512 | 1.3123 | 1.3449 | 1.3345 | 1.37825 | 1.3885 | 1.29135 | 1.147 | 0.95245 | 0.8812 | 0.99615 | 1.0879 | 1.4986 | 1.57425 | 1.58135 | 1.475 | 1.05445 | 0.9307 |
| 16-02-10 | 0.7665 | 0.71945 | 0.6659 | 0.72125 | 0.7392 | 1.10635 | 1.2843 | 1.32975 | 1.23905 | 1.249 | 1.1303 | 0.99035 | 0.85435 | 0.88675 | 0.8894 | 0.8091 | 0.8898 | 1.1548 | 1.4747 | 1.59365 | 1.55805 | 1.3587 | 1.05945 | 0.89635 |
| 17-02-10 | 0.79835 | 0.75065 | 0.78145 | 0.73415 | 0.81915 | 1.03405 | 1.3694 | 1.3785 | 1.3136 | 1.1512 | 1.1023 | 0.9949 | 0.88565 | 0.8085 | 0.80945 | 0.88735 | 0.9291 | 1.16595 | 1.59315 | 1.5667 | 1.51335 | 1.32545 | 1.1048 | 0.93235 |
| 18-02-10 | 0.7751 | 0.7235 | 0.65935 | 0.72705 | 0.7474 | 0.9862 | 1.3385 | 1.461 | 1.2907 | 1.11305 | 1.12625 | 0.99485 | 0.8741 | 0.8309 | 0.81845 | 0.83135 | 0.88615 | 1.0327 | 1.523 | 1.6027 | 1.5703 | 1.3615 | 1.1973 | 0.9295 |
| 19-02-10 | 0.8534 | 0.7521 | 0.7322 | 0.7335 | 0.80705 | 0.93865 | 1.2166 | 1.2394 | 1.3893 | 1.3016 | 1.2757 | 1.3121 | 1.0905 | 1.03145 | 0.9548 | 0.89805 | 1.0951 | 1.33035 | 1.54985 | 1.577 | 1.5208 | 1.3184 | 1.13645 | 1.0091 |
| 20-02-10 | 0.89555 | 0.785 | 0.7806 | 0.8002 | 0.85455 | 0.8512 | 1.05835 | 1.3496 | 1.42005 | 1.4547 | 1.42575 | 1.33315 | 1.25065 | 1.41585 | 1.2549 | 1.16885 | 1.2199 | 1.44445 | 1.685 | 1.55865 | 1.6315 | 1.47335 | 1.3118 | 0.986 |
| 21-02-10 | 1.00195 | 0.8149 | 0.8426 | 0.81305 | 0.83195 | 0.92665 | 1.14615 | 1.33065 | 1.4006 | 1.3833 | 1.3694 | 1.40825 | 1.3036 | 1.32545 | 1.32485 | 1.26875 | 1.48095 | 1.5896 | 1.8109 | 1.8006 | 1.7885 | 1.6465 | 1.27885 | 0.98475 |
| 22-02-10 | 0.85475 | 0.81265 | 0.8058 | 0.85245 | 0.8495 | 1.0758 | 1.33045 | 1.45305 | 1.26045 | 1.3011 | 1.3241 | 1.18865 | 1.00785 | 0.93965 | 0.8815 | 0.88085 | 0.8553 | 1.15535 | 1.6423 | 1.65145 | 1.63925 | 1.60975 | 1.3151 | 1.0082 |
| 23-02-10 | 0.8387 | 0.7751 | 0.79685 | 0.788 | 0.86405 | 1.1085 | 1.4143 | 1.49675 | 1.4394 | 1.3711 | 1.16795 | 1.11315 | 0.9778 | 0.9526 | 1.01955 | 1.04955 | 1.2642 | 1.431 | 1.919 | 1.7894 | 1.58225 | 1.52515 | 1.2379 | 0.9885 |
| 24-02-10 | 0.8669 | 0.7882 | 0.76725 | 0.7913 | 0.8299 | 0.985 | 1.32865 | 1.4631 | 1.4569 | 1.2714 | 1.26335 | 1.1198 | 1.0332 | 1.0186 | 1.01175 | 0.9931 | 1.0946 | 1.1642 | 1.65075 | 1.69915 | 1.61805 | 1.60735 | 1.2258 | 0.96975 |
| 25-02-10 | 0.81995 | 0.7615 | 0.7465 | 0.805 | 0.76905 | 0.99855 | 1.37195 | 1.34085 | 1.4134 | 1.1755 | 1.1445 | 1.00175 | 0.9086 | 0.8472 | 0.82775 | 0.83175 | 0.88 | 1.098 | 1.5458 | 1.67675 | 1.54065 | 1.49685 | 1.1763 | 0.90605 |
| 26-02-10 | 0.7682 | 0.71605 | 0.7461 | 0.79945 | 0.8084 | 0.97165 | 1.3079 | 1.39355 | 1.3402 | 1.28905 | 1.1674 | 1.0797 | 1.1007 | 1.0682 | 1.1267 | 1.16165 | 1.05645 | 1.1657 | 1.47125 | 1.6824 | 1.61085 | 1.57035 | 1.38095 | 1.08975 |
| 27-02-10 | 0.89985 | 0.79125 | 0.7652 | 0.7501 | 0.81055 | 0.8723 | 1.21295 | 1.41125 | 1.428 | 1.4764 | 1.59385 | 1.4679 | 1.40835 | 1.19375 | 1.2087 | 1.1805 | 1.2456 | 1.45125 | 1.62665 | 1.54175 | 1.51415 | 1.4094 | 1.21705 | 0.9717 |
| 28-02-10 | 0.82535 | 0.76855 | 0.759 | 0.75965 | 0.79405 | 0.8955 | 1.1624 | 1.26595 | 1.41585 | 1.35035 | 1.37195 | 1.151 | 1.1317 | 1.2198 | 1.1265 | 0.9588 | 0.9347 | 1.15715 | 1.7329 | 1.6183 | 1.5454 | 1.44545 | 1.1622 | 0.8172 |
| 01-03-10 | 0.7582 | 0.72515 | 0.69275 | 0.72305 | 0.77295 | 0.92445 | 1.2994 | 1.39965 | 1.36845 | 1.2813 | 1.26605 | 1.10395 | 1.0091 | 0.93205 | 0.88215 | 0.93055 | 1.0364 | 1.1681 | 1.7244 | 1.6304 | 1.56435 | 1.3689 | 1.25105 | 0.9 |
| 02-03-10 | 0.8177 | 0.7589 | 0.7376 | 0.76135 | 0.7601 | 0.97645 | 1.27735 | 1.37075 | 1.30995 | 1.24015 | 1.3711 | 1.237 | 1.06585 | 0.98595 | 1.03485 | 1.04165 | 1.11065 | 1.3131 | 1.7615 | 1.7857 | 1.6105 | 1.45295 | 1.2939 | 1.0717 |
| 03-03-10 | 0.8573 | 0.812 | 0.83135 | 0.8255 | 0.8521 | 1.05535 | 1.4311 | 1.49365 | 1.4148 | 1.41275 | 1.27345 | 1.2372 | 1.01745 | 0.98035 | 1.0034 | 1.02425 | 1.1118 | 1.31705 | 1.68855 | 1.7435 | 1.6688 | 1.61065 | 1.2958 | 1.0852 |
| 04-03-10 | 0.89615 | 0.87155 | 0.8679 | 0.87485 | 0.88815 | 1.1356 | 1.52085 | 1.47985 | 1.31435 | 1.20195 | 1.2214 | 1.1202 | 0.95 | 0.89865 | 0.94355 | 0.967 | 0.9687 | 1.10805 | 1.6215 | 1.69685 | 1.6484 | 1.5258 | 1.23195 | 0.9839 |
| 05-03-10 | 0.8543 | 0.78455 | 0.8006 | 0.84765 | 0.91125 | 1.0757 | 1.4694 | 1.4466 | 1.4289 | 1.2985 | 1.3989 | 1.4136 | 1.0852 | 1.01185 | 1.0065 | 1.0096 | 1.13765 | 1.2276 | 1.6707 | 1.53705 | 1.541 | 1.4374 | 1.2086 | 0.94045 |
| 06-03-10 | 0.86665 | 0.84235 | 0.8021 | 0.80365 | 0.8737 | 0.98185 | 1.1957 | 1.2496 | 1.47955 | 1.39525 | 1.5322 | 1.369 | 1.2623 | 1.12105 | 1.04855 | 1.08015 | 1.1667 | 1.17565 | 1.5449 | 1.48145 | 1.46865 | 1.38365 | 1.15945 | 0.9488 |
| 07-03-10 | 0.8225 | 0.7557 | 0.73425 | 0.75185 | 0.8586 | 0.9749 | 1.2652 | 1.2831 | 1.2797 | 1.29615 | 1.41155 | 1.1526 | 1.11825 | 1.1178 | 1.07875 | 1.1117 | 1.35375 | 1.3383 | 1.7591 | 1.6728 | 1.5563 | 1.5175 | 1.1931 | 0.969 |
| 08-03-10 | 0.80315 | 0.78025 | 0.75015 | 0.7679 | 0.8032 | 1.03185 | 1.5269 | 1.5019 | 1.3695 | 1.22325 | 1.3444 | 1.3044 | 1.23085 | 1.0853 | 0.9512 | 0.8785 | 0.9368 | 1.19825 | 1.88885 | 1.7654 | 1.699 | 1.6195 | 1.2108 | 0.9593 |
| 09-03-10 | 0.82955 | 0.7971 | 0.7844 | 0.85355 | 0.90715 | 1.0791 | 1.5119 | 1.5205 | 1.3298 | 1.33745 | 1.34695 | 1.1377 | 0.9794 | 0.88495 | 0.9361 | 1.0285 | 1.02275 | 1.3999 | 1.8483 | 1.7139 | 1.6364 | 1.4964 | 1.2214 | 0.95225 |
| 10-03-10 | 0.87985 | 0.84495 | 0.8648 | 0.8449 | 0.95165 | 1.0137 | 1.41375 | 1.54315 | 1.35575 | 1.2526 | 1.29735 | 1.28685 | 1.0682 | 1.0148 | 0.97935 | 0.9866 | 0.98535 | 1.10045 | 1.55535 | 1.62655 | 1.6086 | 1.5737 | 1.2375 | 0.93535 |
| 11-03-10 | 0.9246 | 0.9317 | 0.87705 | 0.90435 | 0.92385 | 1.1322 | 1.60685 | 1.5701 | 1.33285 | 1.2862 | 1.23915 | 1.02825 | 0.99265 | 0.82015 | 0.80045 | 0.947 | 0.973 | 1.116 | 1.561 | 1.74655 | 1.65535 | 1.473 | 1.27015 | 0.92805 |
| 12-03-10 | 0.8681 | 0.8114 | 0.81245 | 0.817 | 0.89115 | 1.0213 | 1.4027 | 1.36465 | 1.32745 | 1.30435 | 1.3182 | 1.29835 | 1.23415 | 1.07845 | 1.0519 | 1.04625 | 1.1301 | 1.30705 | 1.56745 | 1.504 | 1.4639 | 1.46985 | 1.267 | 1.0083 |
| 13-03-10 | 0.9783 | 0.91005 | 0.87055 | 0.9296 | 0.9454 | 1.09905 | 1.2853 | 1.5383 | 1.72955 | 1.55875 | 1.5334 | 1.44105 | 1.4056 | 1.24 | 1.05145 | 1.0486 | 1.0992 | 1.2219 | 1.6151 | 1.59515 | 1.6355 | 1.46445 | 1.37535 | 1.1061 |
| 14-03-10 | 0.89715 | 0.89055 | 0 | 0.858 | 0.91015 | 0.9461 | 1.03025 | 1.2911 | 1.44655 | 1.4786 | 1.42795 | 1.34545 | 1.2548 | 1.08 | 1.0675 | 1.0251 | 1.0787 | 1.2049 | 1.3879 | 1.6935 | 1.86325 | 1.67845 | 1.3021 | 1.00125 |
| 15-03-10 | 0.8137 | 0.80085 | 0.75885 | 0.76905 | 0.8096 | 0.9134 | 1.3328 | 1.4731 | 1.31595 | 1.2253 | 1.2588 | 1.21225 | 1.01825 | 0.88195 | 0.8967 | 0.9187 | 0.95235 | 0.989 | 1.15395 | 1.5227 | 1.60985 | 1.5149 | 1.21635 | 0.9692 |
| 16-03-10 | 0.7745 | 0.7252 | 0.71285 | 0.76225 | 0.79735 | 0.97565 | 1.19985 | 1.54415 | 1.39485 | 1.20755 | 1.20775 | 1.08875 | 0.87985 | 0.83125 | 0.79905 | 0.8419 | 0.86505 | 0.95545 | 1.114 | 1.3367 | 1.4859 | 1.32635 | 1.1523 | 0.85375 |
| 17-03-10 | 0.724 | 0.71315 | 0.6837 | 0.6982 | 0.7119 | 0.8575 | 1.1018 | 1.42395 | 1.2135 | 1.15175 | 0.98855 | 0.86255 | 0.79735 | 0.8634 | 0.83885 | 0.84705 | 0.89125 | 0.95775 | 1.05195 | 1.31795 | 1.4835 | 1.27495 | 1.14095 | 0.96175 |
| 18-03-10 | 0.7539 | 0.71905 | 0.6841 | 0.69185 | 0.741 | 0.86435 | 1.1425 | 1.36885 | 1.14975 | 1.22 | 1.0447 | 0.94075 | 0.7957 | 0.69205 | 0.6937 | 0.76725 | 0.85575 | 0.97595 | 1.2108 | 1.44475 | 1.44415 | 1.22235 | 1.1249 | 0.8737 |
| 19-03-10 | 0.70855 | 0.67345 | 0.678 | 0.68285 | 0.7817 | 0.9179 | 1.1739 | 1.45925 | 1.20495 | 1.1875 | 1.1348 | 1.01345 | 0.8475 | 0.7357 | 0.7688 | 0.7745 | 0.7461 | 0.8641 | 1.06835 | 1.17245 | 1.4155 | 1.1705 | 1.08875 | 0.96085 |
| 20-03-10 | 0.768 | 0.6974 | 0.7015 | 0.6956 | 0.73985 | 0.79665 | 0.9317 | 1.2095 | 1.26095 | 1.43845 | 1.5577 | 1.3539 | 1.19795 | 1.0114 | 1.1076 | 1.07755 | 1.0999 | 1.1226 | 1.09695 | 1.21525 | 1.45455 | 1.3054 | 1.1758 | 0.96205 |
| 21-03-10 | 0.7799 | 0.7702 | 0.71465 | 0.73015 | 0.74415 | 0.74365 | 0.89895 | 1.1723 | 1.28235 | 1.3765 | 1.3942 | 1.3621 | 1.23295 | 1.12685 | 1.27345 | 1.08945 | 1.0546 | 1.14575 | 1.1946 | 1.35585 | 1.57755 | 1.4251 | 1.26375 | 0.9547 |
| 22-03-10 | 0.73265 | 0.7227 | 0.71215 | 0.74345 | 0.7666 | 0.9128 | 1.2977 | 1.427 | 1.21925 | 1.2149 | 1.0674 | 1.0917 | 0.9084 | 0.8796 | 0.7791 | 0.73945 | 0.81165 | 0.9066 | 1.1731 | 1.26535 | 1.5847 | 1.3889 | 1.22525 | 0.8849 |
| 23-03-10 | 0.7785 | 0.70295 | 0.69695 | 0.7298 | 0.7884 | 0.8973 | 1.1838 | 1.384 | 1.1764 | 1.162 | 1.0087 | 0.871 | 0.7936 | 0.75045 | 0.7102 | 0.7123 | 0.74305 | 0.971 | 1.0536 | 1.42415 | 1.43575 | 1.33785 | 1.16585 | 0.90595 |
| 24-03-10 | 0.83225 | 0.7049 | 0.73095 | 0.7541 | 0.79525 | 0.8723 | 1.1404 | 1.3886 | 1.2313 | 1.30755 | 1.02385 | 0.9267 | 0.7257 | 0.77515 | 0.8093 | 0.7728 | 0.7948 | 0.92205 | 1.077 | 1.23915 | 1.46885 | 1.3843 | 1.17305 | 0.87315 |
| 25-03-10 | 0.7719 | 0.7216 | 0.71385 | 0.74595 | 0.77935 | 0.82855 | 1.0666 | 1.4081 | 1.38505 | 1.3196 | 1.20575 | 1.01765 | 0.84785 | 0.81145 | 0.84505 | 0.8913 | 0.85555 | 0.9708 | 1.2127 | 1.33205 | 1.5849 | 1.3609 | 1.2866 | 0.9274 |
| 26-03-10 | 0.76145 | 0.74945 | 0.7748 | 0.845 | 0.86605 | 0.925 | 1.2455 | 1.3529 | 1.3463 | 1.1998 | 1.21595 | 1.1123 | 0.9732 | 0.8388 | 0.75995 | 0.80805 | 0.82365 | 1.0155 | 0.99725 | 1.20035 | 1.6083 | 1.28955 | 1.25315 | 1.1073 |
| 27-03-10 | 0.91095 | 0.8208 | 0.8977 | 0.83025 | 0.88745 | 0.9524 | 1.12135 | 1.36765 | 1.40025 | 1.4486 | 1.2983 | 1.2947 | 1.113 | 1.0493 | 1.0273 | 0.90375 | 0.89695 | 1.05195 | 1.19095 | 1.2661 | 1.43555 | 1.1749 | 1.07675 | 0.9642 |

| | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 28-03-10 | 0.78845 | 0.7084 | 0.6855 | 0.75195 | 0.79215 | 0.7893 | 0.9971 | 1.1694 | 1.4021 | 1.2873 | 1.2208 | 1.21805 | 1.13955 | 1.04095 | 0.9904 | 0.92065 | 1.06145 | 1.1807 | 1.24445 | 1.3104 | 1.5839 | 1.43925 | 1.1658 | 0.98305 |
| 29-03-10 | 0.766 | 0.73205 | 0.72875 | 0.7005 | 0.75015 | 0.83575 | 1.06325 | 1.3692 | 1.20735 | 1.3426 | 1.1536 | 1.08215 | 0.95005 | 0.8718 | 0.90975 | 0.91515 | 0.9939 | 1.0815 | 1.3104 | 1.44245 | 1.5654 | 1.3461 | 1.16015 | 0.8749 |
| 30-03-10 | 0.7457 | 0.68965 | 0.7049 | 0.72675 | 0.7222 | 0.8156 | 1.0839 | 1.3665 | 1.2913 | 1.3027 | 1.18385 | 1.0511 | 0.93195 | 0.7623 | 0.84395 | 0.8587 | 0.93605 | 0.9809 | 1.2521 | 1.5308 | 1.55605 | 1.35305 | 1.2466 | 0.91945 |
| 31-03-10 | 0.82 | 0.76935 | 0.8089 | 0.8363 | 0.83525 | 0.8952 | 1.26115 | 1.6013 | 1.4228 | 1.2343 | 1.22245 | 1.2052 | 1.0058 | 0.8655 | 0.90295 | 0.9037 | 0.93355 | 1.2235 | 1.3372 | 1.53405 | 1.78195 | 1.53795 | 1.32285 | 0.96415 |
| 01-04-10 | 0.93305 | 0.84545 | 0.8635 | 0.8616 | 0.90405 | 0.96245 | 1.14815 | 1.53775 | 1.4132 | 1.27715 | 1.3605 | 1.01185 | 1.0034 | 0.98345 | 0.94505 | 0.89925 | 0.94415 | 1.0485 | 1.2293 | 1.4834 | 1.58075 | 1.38455 | 1.17685 | 1.0827 |
| 02-04-10 | 0.87695 | 0.75915 | 0.81355 | 0.80165 | 0.83305 | 0.8998 | 1.1073 | 1.57245 | 1.5017 | 1.52435 | 1.51985 | 1.47275 | 1.2857 | 1.22645 | 1.19315 | 1.1357 | 1.0409 | 1.1642 | 1.21165 | 1.42915 | 1.5622 | 1.5074 | 1.28965 | 1.0082 |
| 03-04-10 | 0.8673 | 0.86495 | 0.87205 | 0.8385 | 0.8623 | 0.89375 | 1.07495 | 1.46075 | 1.5232 | 1.5619 | 1.6906 | 1.60355 | 1.37675 | 1.21915 | 1.03955 | 1.0321 | 1.0818 | 1.19115 | 1.30065 | 1.4179 | 1.5839 | 1.5404 | 1.2768 | 1.0307 |
| 04-04-10 | 0.9222 | 0.8565 | 0.8672 | 0.86225 | 0.8917 | 0.94605 | 1.16435 | 1.3909 | 1.4344 | 1.64155 | 1.71715 | 1.45525 | 1.3336 | 1.3823 | 1.3898 | 1.2168 | 1.2207 | 1.5303 | 1.55605 | 1.6144 | 1.63655 | 1.46485 | 1.28655 | 1.14665 |
| 05-04-10 | 0.8946 | 0.808 | 0.85195 | 0.87935 | 0.86655 | 0.94305 | 1.1661 | 1.3991 | 1.2898 | 1.5061 | 1.25565 | 1.16445 | 0.9388 | 0.9184 | 0.877 | 0.9034 | 0.93295 | 1.14215 | 1.21415 | 1.51975 | 1.7239 | 1.58535 | 1.38655 | 1.0342 |
| 06-04-10 | 0.86085 | 0.8232 | 0.809 | 0.90655 | 0.951 | 1.1433 | 1.35785 | 1.5569 | 1.35415 | 1.30635 | 1.2047 | 1.17985 | 1.0051 | 0.8787 | 0.81655 | 0.7984 | 1.02445 | 1.0676 | 1.17895 | 1.29005 | 1.6534 | 1.50535 | 1.2247 | 0.8785 |
| 07-04-10 | 0.78495 | 0.7498 | 0.7793 | 0.82215 | 0.84375 | 1.01145 | 1.27695 | 1.41155 | 1.37955 | 1.3401 | 1.24535 | 1.1361 | 1.0357 | 0.9585 | 0.7898 | 0.7075 | 0.82155 | 0.96495 | 1.11765 | 1.34385 | 1.6437 | 1.3693 | 1.2877 | 0.95365 |
| 08-04-10 | 0.8133 | 0.71645 | 0.76535 | 0.77505 | 0.7983 | 0.94135 | 1.1881 | 1.42275 | 1.3115 | 1.12415 | 1.04345 | 0.89535 | 0.81045 | 0.8347 | 0.7132 | 0.7664 | 0.7915 | 0.96565 | 1.2186 | 1.22635 | 1.48505 | 1.35615 | 1.21905 | 0.93105 |
| 09-04-10 | 0.7774 | 0.81085 | 0.75335 | 0.79305 | 0.79315 | 0.97075 | 1.28515 | 1.3767 | 1.2478 | 1.30825 | 1.17205 | 0.9929 | 0.76075 | 0.83805 | 0.71865 | 0.79395 | 0.82685 | 0.85565 | 1.1026 | 1.19405 | 1.45475 | 1.24845 | 1.16975 | 0.92295 |
| 10-04-10 | 0.7988 | 0.76325 | 0.77955 | 0.7769 | 0.79125 | 0.85235 | 1.02225 | 1.3037 | 1.24305 | 1.36815 | 1.3482 | 1.2739 | 1.2242 | 1.27175 | 1.22845 | 1.1216 | 1.2695 | 1.1712 | 1.30615 | 1.3465 | 1.4806 | 1.3932 | 1.29865 | 1.0127 |
| 11-04-10 | 0.84645 | 0.74545 | 0.7703 | 0.7632 | 0.83515 | 0.8611 | 1.13115 | 1.30935 | 1.25255 | 1.42225 | 1.40465 | 1.43045 | 1.326 | 1.51445 | 1.39915 | 1.29265 | 1.4062 | 1.51585 | 1.5486 | 1.6341 | 1.64455 | 1.44145 | 1.31445 | 0.99985 |
| 12-04-10 | 0.7943 | 0.7822 | 0.78875 | 0.82065 | 0.81325 | 0.8971 | 1.2444 | 1.45005 | 1.3317 | 1.34625 | 1.3526 | 1.29605 | 1.13045 | 0.93085 | 0.9674 | 1.04625 | 1.0603 | 1.17265 | 1.44445 | 1.49495 | 1.6544 | 1.4454 | 1.2181 | 1.00275 |
| 13-04-10 | 0.78415 | 0.7582 | 0.761 | 0.8143 | 0.8205 | 0.93065 | 1.27075 | 1.4311 | 1.3068 | 1.35655 | 1.16025 | 1.0759 | 0.933 | 0.7869 | 0.77625 | 0.8299 | 0.8509 | 1.01445 | 1.1727 | 1.36345 | 1.5008 | 1.3995 | 1.2573 | 0.86925 |
| 14-04-10 | 0.76025 | 0.7357 | 0.7581 | 0.81365 | 0.76145 | 0.8901 | 1.27995 | 1.3833 | 1.2804 | 1.27315 | 1.1788 | 1.08105 | 0.9594 | 0.92455 | 0.8957 | 0.93275 | 0.94645 | 1.01535 | 1.18675 | 1.50205 | 1.5139 | 1.4076 | 1.217 | 0.9334 |
| 15-04-10 | 0.8289 | 0.7958 | 0.80145 | 0.7982 | 0.84415 | 0.8997 | 1.27345 | 1.5475 | 1.34195 | 1.27955 | 1.13345 | 1.0002 | 0.81905 | 0.80895 | 0.79475 | 0.8727 | 0.82665 | 0.94625 | 1.1652 | 1.2802 | 1.4863 | 1.25025 | 1.09305 | 0.85905 |
| 16-04-10 | 0.7571 | 0.66045 | 0.6808 | 0.73165 | 0.708 | 0.8701 | 1.2699 | 1.53825 | 1.213 | 1.14455 | 1.1497 | 0.98805 | 0.98165 | 0.7864 | 0.7301 | 0.7304 | 0.8029 | 0.8813 | 0.98855 | 1.22455 | 1.2997 | 1.2746 | 1.1022 | 0.9433 |
| 17-04-10 | 0.81545 | 0.73615 | 0.6972 | 0.71765 | 0.6852 | 0.8516 | 1.03455 | 1.24895 | 1.33525 | 1.2933 | 1.27905 | 1.0501 | 1.1179 | 1.0699 | 0.89375 | 0.86485 | 0.88725 | 1.13785 | 1.14085 | 1.2765 | 1.3696 | 1.2616 | 1.1995 | 0.8378 |
| 18-04-10 | 0.7699 | 0.68985 | 0.64085 | 0.6853 | 0.70065 | 0.75875 | 0.87595 | 1.19775 | 1.3674 | 1.4131 | 1.47315 | 1.16255 | 1.0906 | 1.00725 | 0.96085 | 1.06145 | 1.052 | 1.14185 | 1.22555 | 1.30535 | 1.5425 | 1.3213 | 1.144 | 0.87255 |
| 19-04-10 | 0.7253 | 0.68235 | 0.69155 | 0.69205 | 0.672 | 0.78765 | 1.1417 | 1.408 | 1.3124 | 1.12015 | 1.22995 | 1.02775 | 0.8276 | 0.74195 | 0.706 | 0.7277 | 0.85455 | 1.0009 | 1.2941 | 1.3769 | 1.5164 | 1.33245 | 1.20845 | 0.88 |
| 20-04-10 | 0.7164 | 0.6907 | 0.66055 | 0.71325 | 0.7318 | 0.8332 | 1.1796 | 1.3669 | 1.3228 | 1.3527 | 1.34805 | 1.1875 | 1.08955 | 0.89925 | 0.84565 | 0.8824 | 0.95425 | 1.15015 | 1.29595 | 1.5571 | 1.5714 | 1.36595 | 1.18735 | 0.91195 |
| 21-04-10 | 0.8 | 0.7866 | 0.7656 | 0.7913 | 0.769 | 0.88765 | 1.3732 | 1.40655 | 1.3085 | 1.4106 | 1.21405 | 1.0405 | 0.92915 | 0.9058 | 0.91555 | 1.0063 | 1.1413 | 1.2231 | 1.3585 | 1.471 | 1.5371 | 1.492 | 1.3949 | 0.94925 |
| 22-04-10 | 0.8153 | 0.8158 | 0.7672 | 0.859 | 0.83045 | 0.9916 | 1.3653 | 1.4947 | 1.34915 | 1.2794 | 1.22645 | 0.9889 | 0.90115 | 0.8973 | 0.76795 | 0.77855 | 0.77965 | 0.94055 | 1.1296 | 1.3873 | 1.5467 | 1.3958 | 1.2888 | 0.9504 |
| 23-04-10 | 0.78445 | 0.69495 | 0.72485 | 0.76675 | 0.7306 | 0.827 | 1.1047 | 1.47415 | 1.37195 | 1.29995 | 1.02105 | 0.8719 | 0.83355 | 0.78875 | 0.7327 | 0.7414 | 0.77815 | 0.8084 | 1.07755 | 1.08195 | 1.2284 | 1.24675 | 1.07815 | 0.96965 |
| 24-04-10 | 0.8199 | 0.7303 | 0.70845 | 0.7162 | 0.7557 | 0.84125 | 1.09235 | 1.23 | 1.35075 | 1.39875 | 1.27115 | 1.2242 | 1.1011 | 1.0003 | 1.0188 | 0.95245 | 0.94595 | 1.0239 | 1.1304 | 1.10085 | 1.2417 | 1.1068 | 1.0667 | 0.90595 |
| 25-04-10 | 0.7877 | 0.6867 | 0.669 | 0.65175 | 0.68155 | 0.7137 | 0.8711 | 1.22715 | 1.3593 | 1.37845 | 1.24185 | 1.18835 | 1.0783 | 1.01085 | 0.99955 | 0.919 | 1.01375 | 1.19955 | 1.18525 | 1.13345 | 1.3829 | 1.3109 | 1.1303 | 0.86875 |
| 26-04-10 | 0.71955 | 0.6775 | 0.6686 | 0.66585 | 0.68945 | 0.74105 | 1.08995 | 1.25935 | 1.16765 | 1.1343 | 1.1276 | 0.9711 | 0.80905 | 0.80555 | 0.76745 | 0.8271 | 0.8254 | 0.91695 | 1.1074 | 1.19215 | 1.25445 | 1.24355 | 1.1413 | 0.7982 |
| 27-04-10 | 0.68865 | 0.63435 | 0.65475 | 0.69405 | 0.67615 | 0.8466 | 1.03765 | 1.18705 | 1.31745 | 1.22505 | 1.10715 | 1.0898 | 0.89735 | 0.8771 | 0.8387 | 0.8107 | 0.87525 | 1.0054 | 1.18075 | 1.36375 | 1.59315 | 1.4186 | 1.2302 | 0.85215 |
| 28-04-10 | 0.7383 | 0.71535 | 0.715 | 0.7268 | 0.7533 | 0.90305 | 1.23825 | 1.46465 | 1.4204 | 1.34775 | 1.1926 | 1.05105 | 1.0153 | 0.93495 | 1.01015 | 0.92385 | 0.98735 | 1.15095 | 1.24535 | 1.23905 | 1.66495 | 1.4813 | 1.34215 | 0.8999 |
| 29-04-10 | 0.86605 | 0.78185 | 0.76195 | 0.80445 | 0.87295 | 0.95765 | 1.36615 | 1.5807 | 1.36805 | 1.4117 | 1.20885 | 1.0894 | 0.86385 | 0.8213 | 0.78465 | 0.807 | 0.94075 | 1.04595 | 1.24175 | 1.36485 | 1.6715 | 1.41415 | 1.2602 | 1.01325 |
| 30-04-10 | 0.83615 | 0.7719 | 0.6964 | 0.74945 | 0.83365 | 0.9204 | 1.31035 | 1.34585 | 1.40405 | 1.2453 | 1.15435 | 1.07605 | 0.8689 | 0.8604 | 0.76155 | 0.70335 | 0.76 | 0.9224 | 1.0615 | 1.06585 | 1.24345 | 1.2702 | 1.1508 | 0.8361 |
| 01-05-10 | 0.7798 | 0.7079 | 0.71365 | 0.7336 | 0.76735 | 0.7838 | 0.98575 | 1.3071 | 1.50135 | 1.32815 | 1.1796 | 1.0691 | 1.0424 | 0.99235 | 0.97835 | 0.94015 | 0.9551 | 1.00775 | 1.15835 | 1.1798 | 1.39715 | 1.22945 | 1.1008 | 0.9173 |
| 02-05-10 | 0.79225 | 0.7163 | 0.7224 | 0.7495 | 0.7713 | 0.77795 | 0.87635 | 1.1969 | 1.4688 | 1.43025 | 1.3156 | 1.1537 | 1.12345 | 1.04645 | 1.09205 | 1.02685 | 1.01365 | 1.1082 | 1.10205 | 1.2609 | 1.5091 | 1.4775 | 1.2255 | 0.87005 |
| 03-05-10 | 0.73675 | 0.6814 | 0.7201 | 0.7245 | 0.71635 | 0.899 | 1.1337 | 1.356 | 1.22605 | 1.2152 | 0.98285 | 0.972 | 0.9315 | 0.82015 | 0.8007 | 0.779 | 0.86595 | 0.94005 | 1.2332 | 1.36525 | 1.5124 | 1.3729 | 1.2006 | 0.87785 |
| 04-05-10 | 0.69685 | 0.66525 | 0.65345 | 0.6951 | 0.6834 | 0.86895 | 1.10925 | 1.23335 | 1.0834 | 1.1565 | 1.09335 | 0.92675 | 0.78765 | 0.7313 | 0.732 | 0.86335 | 0.92015 | 1.07865 | 1.1223 | 1.25415 | 1.3944 | 1.35345 | 1.147 | 0.91555 |
| 05-05-10 | 0.7782 | 0.66565 | 0.67415 | 0.7248 | 0.7086 | 0.84695 | 1.1255 | 1.23955 | 1.26755 | 1.18725 | 1.11715 | 1.0193 | 0.7977 | 0.7681 | 0.7969 | 0.86585 | 0.86485 | 0.90965 | 1.07205 | 1.1466 | 1.31795 | 1.361 | 1.27575 | 0.852 |
| 06-05-10 | 0.74335 | 0.6883 | 0.69025 | 0.73275 | 0.7246 | 0.8094 | 1.15875 | 1.34725 | 1.27895 | 1.19595 | 0.9864 | 1.0469 | 0.82155 | 0.79035 | 0.7428 | 0.7643 | 0.818 | 0.9843 | 1.12655 | 1.2825 | 1.3688 | 1.33265 | 1.13985 | 0.91695 |
| 07-05-10 | 0.7602 | 0.7268 | 0.72155 | 0.7377 | 0.7426 | 0.86535 | 1.0878 | 1.3627 | 1.36915 | 1.29115 | 1.05765 | 0.9344 | 0.74665 | 0.7197 | 0.74265 | 0.7 | 0.7653 | 0.9028 | 1.06865 | 1.18125 | 1.33185 | 1.2293 | 1.13895 | 0.87865 |
| 08-05-10 | 0.7271 | 0.7098 | 0.7203 | 0.70745 | 0.7362 | 0.77215 | 0.915 | 1.3076 | 1.41715 | 1.3824 | 1.2372 | 1.31565 | 1.18915 | 1.23085 | 1.03575 | 1.04495 | 1.08295 | 1.23205 | 1.2713 | 1.29125 | 1.4223 | 1.4227 | 1.2424 | 0.96435 |
| 09-05-10 | 0.78035 | 0.7179 | 0.7337 | 0.7117 | 0.6835 | 0.73015 | 0.9006 | 1.26535 | 1.43575 | 1.4495 | 1.36565 | 1.33845 | 1.2614 | 1.08945 | 1.13775 | 0.975 | 1.13895 | 1.16575 | 1.2752 | 1.2288 | 1.4218 | 1.39535 | 1.1405 | 0.8995 |
| 10-05-10 | 0.80605 | 0.69985 | 0.7262 | 0.7997 | 0.76645 | 0.9074 | 1.18435 | 1.41225 | 1.3465 | 1.37945 | 1.3791 | 1.1812 | 0.9637 | 0.93945 | 1.0011 | 0.93255 | 1.02635 | 1.15145 | 1.2856 | 1.3731 | 1.63165 | 1.55255 | 1.3604 | 0.9984 |
| 11-05-10 | 0.83075 | 0.8018 | 0.79645 | 0.8499 | 0.85025 | 0.9892 | 1.3518 | 1.5771 | 1.30915 | 1.30205 | 1.027 | 1.00635 | 0.89595 | 0.74875 | 0.76935 | 0.82835 | 0.8653 | 0.9823 | 1.181 | 1.29705 | 1.4042 | 1.3636 | 1.185 | 0.88625 |
| 12-05-10 | 0.75605 | 0.67965 | 0.6652 | 0.7277 | 0.7607 | 0.8457 | 1.2064 | 1.5328 | 1.41225 | 1.1945 | 1.1068 | 0.91585 | 0.8125 | 0.75435 | 0.79465 | 0.7878 | 0.90285 | 1.01325 | 1.15195 | 1.24785 | 1.4121 | 1.35765 | 1.1589 | 0.8435 |
| 13-05-10 | 0.75035 | 0.7286 | 0.7237 | 0.7408 | 0.78855 | 0.9652 | 1.2425 | 1.42545 | 1.1928 | 1.20115 | 1.11375 | 0.9077 | 0.73205 | 0.7183 | 0.73685 | 0.79745 | 0.77495 | 0.86995 | 1.088 | 1.10515 | 1.4735 | 1.34495 | 1.1476 | 0.8777 |
| 14-05-10 | 0.7188 | 0.6561 | 0.66205 | 0.6995 | 0.7446 | 0.86555 | 1.1824 | 1.36245 | 1.1988 | 1.3044 | 1.1141 | 1.0683 | 0.93425 | 0.85135 | 0.78975 | 0.81465 | 0.8376 | 0.97765 | 1.1661 | 1.22575 | 1.269 | 1.27985 | 1.2581 | 0.95175 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15-05-10 | 0.7561 | 0.75555 | 0.73865 | 0.747 | 0.7643 | 0.8509 | 1.0745 | 1.2843 | 1.3985 | 1.385 | 1.1724 | 1.0584 | 0.9892 | 1.02255 | 1.11985 | 1.0743 | 1.0924 | 1.18635 | 1.32125 | 1.2858 | 1.35085 | 1.35995 | 1.20255 | 0.9343 |
| 16-05-10 | 0.78575 | 0.76225 | 0.702 | 0.7224 | 0.80515 | 0.84015 | 1.0046 | 1.32965 | 1.26265 | 1.31435 | 1.111 | 1.14405 | 1.28615 | 1.13665 | 1.06405 | 1.1788 | 1.1554 | 1.1519 | 1.3329 | 1.5655 | 1.50405 | 1.3609 | 1.32905 | 0.9665 |
| 17-05-10 | 0.7849 | 0.7078 | 0.6881 | 0.7623 | 0.7859 | 0.8838 | 1.22175 | 1.3821 | 1.2904 | 1.25185 | 1.05565 | 0.95455 | 1.0351 | 0.86795 | 0.8467 | 0.9386 | 0.9532 | 1.1036 | 1.35105 | 1.4117 | 1.58305 | 1.40365 | 1.10825 | 0.83395 |
| 18-05-10 | 0.737 | 0.6925 | 0.7081 | 0.7697 | 0.7808 | 0.90355 | 1.16995 | 1.23525 | 1.08815 | 1.1851 | 1.19265 | 0.98615 | 0.9443 | 0.80435 | 0.75955 | 0.7735 | 0.8289 | 0.9365 | 1.12925 | 1.2279 | 1.37315 | 1.38625 | 1.15455 | 0.7778 |
| 19-05-10 | 0.72185 | 0.64215 | 0.647 | 0.73235 | 0.7077 | 0.8455 | 1.09105 | 1.32395 | 1.12605 | 1.0863 | 0.94035 | 0.90515 | 0.7303 | 0.8897 | 0.8566 | 0.8828 | 0.89805 | 0.9396 | 1.14785 | 1.16885 | 1.4996 | 1.34095 | 1.1863 | 0.9534 |
| 20-05-10 | 0.72335 | 0.6471 | 0.65395 | 0.75575 | 0.78555 | 0.9535 | 1.33035 | 1.2642 | 1.1678 | 1.15875 | 0.97055 | 0.85055 | 0.79115 | 0.68285 | 0.70565 | 0.71555 | 0.7611 | 0.88795 | 1.0116 | 1.1818 | 1.39965 | 1.2869 | 1.1406 | 0.9156 |
| 21-05-10 | 0.7619 | 0.67865 | 0.6393 | 0.7117 | 0.7292 | 0.8802 | 1.19265 | 1.36335 | 1.2144 | 1.2457 | 1.0238 | 1.02495 | 0.9243 | 0.8151 | 0.764 | 0.7744 | 0.82035 | 0.94125 | 1.13805 | 1.0721 | 1.34245 | 1.3082 | 1.30365 | 1.02565 |
| 22-05-10 | 0.8663 | 0.78065 | 0.7991 | 0.77955 | 0.81705 | 0.9563 | 1.01205 | 1.28155 | 1.4234 | 1.54245 | 1.53105 | 1.2207 | 1.2034 | 1.20645 | 1.25715 | 1.10505 | 1.11135 | 1.17545 | 1.24315 | 1.4407 | 1.50385 | 1.3307 | 1.19135 | 0.99645 |
| 23-05-10 | 0.8035 | 0.7858 | 0.8117 | 0.7791 | 0.8543 | 0.8873 | 1.15225 | 1.31955 | 1.30885 | 1.49215 | 1.23105 | 1.16175 | 1.20365 | 1.22775 | 1.14235 | 1.0597 | 1.0802 | 1.2118 | 1.21255 | 1.15265 | 1.45915 | 1.3398 | 1.1886 | 0.93195 |
| 24-05-10 | 0.7404 | 0.72105 | 0.71085 | 0.78645 | 0.793 | 0.9234 | 1.18455 | 1.2558 | 1.2337 | 1.2029 | 1.1889 | 1.1395 | 0.9259 | 0.89295 | 0.87745 | 0.86005 | 0.9091 | 0.9934 | 1.16805 | 1.2115 | 1.3824 | 1.3107 | 1.28155 | 1.00425 |
| 25-05-10 | 0.7727 | 0.7014 | 0.74905 | 0.73065 | 0.76735 | 0.8767 | 1.1742 | 1.28765 | 1.19875 | 1.208 | 1.2075 | 1.01245 | 0.8747 | 0.8572 | 0.9007 | 0.9501 | 0.95455 | 1.09955 | 1.1671 | 1.2707 | 1.36935 | 1.3492 | 1.1327 | 0.9131 |
| 26-05-10 | 0.7997 | 0.7104 | 0.70265 | 0.74185 | 0.7466 | 0.87395 | 1.1686 | 1.31865 | 1.19175 | 1.15955 | 1.0958 | 1.0294 | 0.84825 | 0.73825 | 0.75065 | 0.81265 | 0.84755 | 1.0467 | 1.041 | 1.1473 | 1.36975 | 1.30825 | 1.1641 | 0.93985 |
| 27-05-10 | 0.7773 | 0.7512 | 0.6927 | 0.76785 | 0.81915 | 0.9179 | 1.21055 | 1.4666 | 1.2965 | 1.32605 | 1.2835 | 1.07275 | 0.9898 | 0.9151 | 0.91095 | 0.85655 | 0.91825 | 1.0262 | 1.1829 | 1.2031 | 1.3539 | 1.38725 | 1.2926 | 0.9288 |
| 28-05-10 | 0.7621 | 0.71045 | 0.73735 | 0.75775 | 0.7574 | 0.85565 | 1.1765 | 1.4325 | 1.38905 | 1.37405 | 1.31465 | 1.09565 | 0.9629 | 0.8917 | 0.8897 | 0.80165 | 0.80075 | 0.8984 | 1.0606 | 1.05405 | 1.16445 | 1.2441 | 1.17395 | 0.95755 |
| 29-05-10 | 0.85525 | 0.7593 | 0.7317 | 0.75775 | 0.8108 | 0.8527 | 0.96765 | 1.2693 | 1.23575 | 1.3423 | 1.17185 | 1.10615 | 1.1359 | 1.0956 | 1.0736 | 0.91435 | 1.0155 | 0.99855 | 0.98955 | 1.0325 | 1.2108 | 1.3255 | 1.15095 | 0.9025 |
| 30-05-10 | 0.7537 | 0.66785 | 0.63215 | 0.63685 | 0.6811 | 0.8086 | 0.87935 | 1.09825 | 1.2201 | 1.13015 | 1.18895 | 1.2369 | 1.20325 | 1.09025 | 0.99985 | 1.017 | 0.98455 | 1.0751 | 1.16115 | 1.103 | 1.30335 | 1.2486 | 1.2055 | 0.92695 |
| 31-05-10 | 0.74475 | 0.64205 | 0.65225 | 0.6245 | 0.65605 | 0.767 | 0.8912 | 1.06295 | 1.18175 | 1.38025 | 1.3066 | 1.24995 | 1.08355 | 1.04935 | 1.03015 | 0.94025 | 1.05155 | 1.124 | 1.2884 | 1.21655 | 1.4248 | 1.33585 | 1.08735 | 0.8703 |
| 01-06-10 | 0.7334 | 0.7248 | 0.68135 | 0.73095 | 0.7719 | 0.87055 | 1.09715 | 1.1976 | 1.0488 | 0.99885 | 0.96815 | 0.88885 | 0.76405 | 0.84085 | 0.80755 | 0.7403 | 0.8052 | 0.96055 | 1.04135 | 1.17895 | 1.42515 | 1.41855 | 1.1572 | 0.85295 |
| 02-06-10 | 0.739 | 0.6961 | 0.6851 | 0.696 | 0.71925 | 0.88345 | 1.10085 | 1.3906 | 1.2372 | 1.18615 | 1.22825 | 1.10755 | 0.89435 | 0.82565 | 0.8197 | 0.7726 | 0.80475 | 1.01795 | 1.11615 | 1.18115 | 1.29385 | 1.3907 | 1.29995 | 0.87825 |
| 03-06-10 | 0.7385 | 0.6757 | 0.65955 | 0.6917 | 0.7459 | 0.92985 | 1.07975 | 1.2129 | 1.2217 | 1.1424 | 0.9344 | 0.92965 | 0.80775 | 0.8718 | 0.85905 | 0.9554 | 0.93545 | 1.0787 | 1.2452 | 1.2871 | 1.4216 | 1.4278 | 1.21855 | 0.8974 |
| 04-06-10 | 0.8046 | 0.7622 | 0.6879 | 0.7207 | 0.7664 | 0.9033 | 1.13175 | 1.2987 | 1.2204 | 1.29665 | 1.2222 | 1.12325 | 0.9583 | 0.8616 | 0.92785 | 1.02515 | 1.02695 | 1.06745 | 1.1955 | 1.20555 | 1.39275 | 1.2783 | 1.15755 | 0.9388 |
| 05-06-10 | 0.83435 | 0.7633 | 0.71985 | 0.6907 | 0.7145 | 0.84285 | 0.93015 | 1.2048 | 1.22685 | 1.21155 | 1.23425 | 1.2015 | 1.3018 | 1.2983 | 1.19495 | 1.35215 | 1.37415 | 1.46115 | 1.5579 | 1.53305 | 1.50755 | 1.5118 | 1.37875 | 1.01575 |
| 06-06-10 | 0.83225 | 0.8195 | 0.75265 | 0.71585 | 0.8078 | 0.79585 | 0.94115 | 1.08955 | 1.19975 | 1.22595 | 1.33115 | 1.25815 | 1.17665 | 1.2279 | 1.31515 | 1.3156 | 1.33655 | 1.4751 | 1.54935 | 1.41525 | 1.5254 | 1.5194 | 1.3024 | 1.1314 |
| 07-06-10 | 0.9132 | 0.78125 | 0.7473 | 0.7654 | 0.7591 | 0.81975 | 1.0566 | 1.2661 | 1.1761 | 1.17425 | 1.10375 | 1.10565 | 1.0079 | 0.99 | 1.0614 | 1.05085 | 1.1011 | 1.16855 | 1.24395 | 1.33345 | 1.38725 | 1.54255 | 1.3479 | 0.94075 |
| 08-06-10 | 0.8158 | 0.78845 | 0.73515 | 0.7489 | 0.7517 | 0.8021 | 1.07345 | 1.30365 | 1.19175 | 1.04505 | 1.1236 | 0.99865 | 0.92945 | 0.90315 | 0.9561 | 0.97265 | 0.96505 | 1.1821 | 1.33715 | 1.2605 | 1.3748 | 1.3781 | 1.15575 | 0.85745 |
| 09-06-10 | 0.74185 | 0.6949 | 0.6736 | 0.71805 | 0.71405 | 0.8061 | 1.04845 | 1.24185 | 1.19055 | 1.1453 | 1.10785 | 0.99325 | 0.83875 | 0.77285 | 0.88445 | 0.9542 | 1.0231 | 1.0069 | 1.08015 | 1.21145 | 1.2325 | 1.35895 | 1.235 | 0.9177 |
| 10-06-10 | 0.74795 | 0.71205 | 0.68325 | 0.7249 | 0.7746 | 0.8986 | 1.09605 | 1.25545 | 1.1577 | 1.1109 | 1.0872 | 1.00075 | 0.7836 | 0.7726 | 0.78915 | 0.7746 | 0.8718 | 0.88075 | 1.0203 | 0.98815 | 1.14835 | 1.33685 | 1.1595 | 0.85895 |
| 11-06-10 | 0.75835 | 0.6734 | 0.6486 | 0.67545 | 0.7315 | 0.8465 | 1.0497 | 1.224 | 1.26455 | 1.3145 | 1.2205 | 1.0341 | 1.01215 | 0.8501 | 0.91955 | 0.79995 | 0.89885 | 1.04725 | 1.11705 | 1.1298 | 1.30785 | 1.31325 | 1.22745 | 0.97655 |
| 12-06-10 | 0.8385 | 0.8186 | 0.79385 | 0.79985 | 0.7655 | 0.86225 | 0.9463 | 1.1762 | 1.26505 | 1.31855 | 1.31165 | 1.15615 | 1.242 | 1.17285 | 1.2657 | 1.3573 | 1.2889 | 1.30955 | 1.455 | 1.4158 | 1.4692 | 1.4066 | 1.3738 | 1.0299 |
| 13-06-10 | 0.8072 | 0.73275 | 0.7222 | 0.7174 | 0.79125 | 0.8175 | 0.9488 | 1.17895 | 1.20095 | 1.13925 | 1.209 | 1.15105 | 1.22665 | 1.18045 | 1.37295 | 1.42905 | 1.509 | 1.5185 | 1.61135 | 1.56485 | 1.61315 | 1.6926 | 1.44955 | 1.0829 |
| 14-06-10 | 0.855 | 0.7652 | 0.70315 | 0.73695 | 0.76315 | 0.81685 | 1.0364 | 1.181 | 1.1599 | 1.225 | 1.2086 | 1.06135 | 1.05185 | 1.03705 | 1.1383 | 1.1469 | 1.3002 | 1.28345 | 1.4634 | 1.48975 | 1.53005 | 1.49295 | 1.44395 | 1.0949 |
| 15-06-10 | 0.93485 | 0.74755 | 0.73405 | 0.737 | 0.754 | 0.8168 | 1.04115 | 1.2289 | 1.20435 | 1.1898 | 1.09665 | 0.99005 | 0.88415 | 0.80655 | 0.8885 | 0.8827 | 1.0379 | 1.17125 | 1.35415 | 1.442 | 1.4236 | 1.35575 | 1.34255 | 0.89385 |
| 16-06-10 | 0.73545 | 0.66115 | 0.6466 | 0.6633 | 0.69365 | 0.77285 | 1.0608 | 1.22245 | 1.2545 | 1.31105 | 1.15865 | 0.9418 | 0.82045 | 0.8182 | 0.8168 | 0.80665 | 0.89785 | 0.9934 | 1.19145 | 1.16145 | 1.2771 | 1.3199 | 1.14865 | 0.8371 |
| 17-06-10 | 0.7007 | 0.6569 | 0.6432 | 0.69975 | 0.75365 | 0.77255 | 0.98665 | 1.2134 | 1.10565 | 1.08145 | 1.17575 | 0.99075 | 0.87025 | 0.8619 | 0.89745 | 0.86435 | 0.94095 | 0.97965 | 1.2463 | 1.23055 | 1.34285 | 1.3443 | 1.2649 | 0.96905 |
| 18-06-10 | 0.79565 | 0.7222 | 0.6758 | 0.6939 | 0.7381 | 0.8025 | 1.02495 | 1.1976 | 1.33905 | 1.27005 | 1.23465 | 1.00115 | 0.9144 | 0.97955 | 0.895 | 0.9208 | 1.0528 | 1.1239 | 1.28765 | 1.30255 | 1.3133 | 1.3533 | 1.1969 | 0.9413 |
| 19-06-10 | 0.8258 | 0.74015 | 0.68055 | 0.68635 | 0.72 | 0.7479 | 0.90255 | 1.1109 | 1.28165 | 1.2649 | 1.3481 | 1.144 | 1.0262 | 1.0686 | 0.97815 | 0.9673 | 1.024 | 1.11285 | 1.2145 | 1.17565 | 1.20885 | 1.32155 | 1.298 | 0.97985 |
| 20-06-10 | 0.79235 | 0.7127 | 0.67315 | 0.66555 | 0.7277 | 0.77375 | 0.88465 | 1.0675 | 1.20275 | 1.221 | 1.4058 | 1.1716 | 1.21435 | 1.1446 | 1.0715 | 1.0578 | 1.0173 | 1.10725 | 1.24995 | 1.35245 | 1.3065 | 1.2741 | 1.19725 | 0.91335 |
| 21-06-10 | 0.76355 | 0.68535 | 0.6542 | 0.7047 | 0.73545 | 0.82395 | 0.9924 | 1.1543 | 1.25645 | 1.21035 | 1.15265 | 1.03955 | 1.0533 | 0.9699 | 1.00975 | 0.93935 | 1.01655 | 1.17795 | 1.34635 | 1.3944 | 1.4109 | 1.356 | 1.24685 | 0.9439 |
| 22-06-10 | 0.8135 | 0.7019 | 0.6571 | 0.7114 | 0.7421 | 0.80565 | 0.99755 | 1.14365 | 1.1252 | 1.15395 | 1.12495 | 1.04025 | 0.89495 | 0.90125 | 0.95755 | 0.96665 | 1.1991 | 1.29735 | 1.4781 | 1.6061 | 1.6815 | 1.6255 | 1.3561 | 1.0052 |
| 23-06-10 | 0.7898 | 0.68535 | 0.68275 | 0.7221 | 0.73755 | 0.823 | 1.04035 | 1.2508 | 1.2772 | 1.24375 | 1.12235 | 1.0812 | 0.99125 | 0.97855 | 1.06065 | 1.0681 | 1.3651 | 1.3299 | 1.5388 | 1.6171 | 1.7971 | 1.746 | 1.3924 | 1.0186 |
| 24-06-10 | 0.847 | 0.7403 | 0.72095 | 0.78675 | 0.85035 | 0.92455 | 1.1013 | 1.3156 | 1.26145 | 1.22305 | 1.28575 | 1.0853 | 0.94425 | 0.95825 | 0.98445 | 0.99645 | 1.0977 | 1.21565 | 1.43725 | 1.41765 | 1.5944 | 1.4266 | 1.3159 | 1.05135 |
| 25-06-10 | 0.86575 | 0.76025 | 0.7302 | 0.738 | 0.80495 | 0.85425 | 1.05315 | 1.2663 | 1.1292 | 1.2179 | 1.3325 | 1.09115 | 1.011 | 0.95965 | 0.96935 | 0.948 | 1.06395 | 1.21415 | 1.3767 | 1.4919 | 1.5519 | 1.50815 | 1.4143 | 1.056 |
| 26-06-10 | 0.96665 | 0.7982 | 0.71035 | 0.6997 | 0.78475 | 0.7802 | 0.9982 | 1.235 | 1.43215 | 1.4262 | 1.4179 | 1.30055 | 1.3154 | 1.33335 | 1.22 | 1.23265 | 1.3456 | 1.48525 | 1.69795 | 1.66985 | 1.69265 | 1.64835 | 1.4195 | 1.02905 |
| 27-06-10 | 0.85045 | 0.79015 | 0.69645 | 0.7 | 0.7657 | 0.8215 | 1.0567 | 1.1669 | 1.30545 | 1.38935 | 1.5775 | 1.6513 | 1.5237 | 1.58525 | 1.661 | 1.75045 | 1.7014 | 1.93405 | 2.11725 | 2.0898 | 2.05385 | 2.07505 | 1.6191 | 1.2684 |
| 28-06-10 | 1.07675 | 0.9371 | 0.8342 | 0.78785 | 0.8258 | 0.9934 | 1.15945 | 1.33675 | 1.2323 | 1.3205 | 1.68015 | 1.80195 | 1.49635 | 1.56005 | 1.7011 | 1.85585 | 1.9976 | 2.11235 | 2.39945 | 2.1689 | 2.1351 | 1.889 | 1.6223 | 1.3107 |
| 29-06-10 | 1.06715 | 0.9231 | 0.91585 | 0.85615 | 0.83995 | 0.91425 | 1.18015 | 1.4165 | 1.42855 | 1.4893 | 1.4639 | 1.34805 | 1.20795 | 1.1602 | 1.30235 | 1.53145 | 1.7171 | 1.67885 | 1.8865 | 1.96 | 1.88945 | 1.7011 | 1.57695 | 1.12175 |
| 30-06-10 | 0.9371 | 0.8559 | 0.7834 | 0.7614 | 0.75975 | 0.8593 | 1.0445 | 1.27515 | 1.2785 | 1.38325 | 1.2994 | 1.23535 | 0.96695 | 0.95875 | 1.0699 | 1.1632 | 1.35655 | 1.51985 | 1.6761 | 1.5195 | 1.55165 | 1.49 | 1.33245 | 1.0423 |
| 01-07-10 | 0.87995 | 0.7945 | 0.69345 | 0.6908 | 0.7647 | 0.89725 | 1.07995 | 1.1569 | 1.1168 | 1.2257 | 1.13015 | 1.0631 | 0.93415 | 0.87365 | 0.9389 | 0.9736 | 1.1014 | 1.21605 | 1.31425 | 1.3692 | 1.39895 | 1.5574 | 1.2526 | 0.9566 |

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| 02-07-10 | 0.82305 | 0.75635 | 0.71095 | 0.71515 | 0.78055 | 0.8731 | 1.0536 | 1.27765 | 1.28305 | 1.35355 | 1.32325 | 1.23545 | 1.14385 | 1.1104 | 1.14255 | 1.08845 | 1.10925 | 1.2618 | 1.3464 | 1.38175 | 1.548 | 1.4041 | 1.31555 | 1.07065 |
| 03-07-10 | 0.8553 | 0.7735 | 0.7197 | 0.6861 | 0.81465 | 0.8338 | 0.89475 | 1.162 | 1.17235 | 1.3845 | 1.4232 | 1.41985 | 1.27305 | 1.25035 | 1.23985 | 1.2944 | 1.3974 | 1.573 | 1.5405 | 1.49475 | 1.456 | 1.42005 | 1.29875 | 0.9912 |
| 04-07-10 | 0.8745 | 0.7626 | 0.73695 | 0.7023 | 0.7432 | 0.7955 | 0.92165 | 1.1147 | 1.28165 | 1.3082 | 1.24095 | 1.0865 | 1.1135 | 1.13375 | 1.2347 | 1.3203 | 1.4246 | 1.4611 | 1.44135 | 1.48495 | 1.4388 | 1.3189 | 1.32115 | 1.1079 |
| 05-07-10 | 0.8172 | 0.75855 | 0.70925 | 0.6806 | 0.7347 | 0.806 | 0.89445 | 1.03585 | 1.2238 | 1.2845 | 1.43835 | 1.2927 | 1.1606 | 1.2689 | 1.2192 | 1.382 | 1.4345 | 1.51915 | 1.7382 | 1.7715 | 1.70935 | 1.5461 | 1.35065 | 1.08675 |
| 06-07-10 | 0.88275 | 0.8568 | 0.76765 | 0.7176 | 0.7803 | 0.8828 | 0.9412 | 1.11685 | 1.1692 | 1.2226 | 1.1567 | 1.13195 | 0.9473 | 0.9367 | 1.1181 | 1.02055 | 1.2034 | 1.2809 | 1.61545 | 1.64895 | 1.7953 | 1.53655 | 1.3103 | 1.02605 |
| 07-07-10 | 0.83495 | 0.7468 | 0.70415 | 0.7007 | 0.72615 | 0.86865 | 0.93985 | 1.15745 | 1.1716 | 1.35775 | 1.35825 | 1.16395 | 0.9344 | 0.89855 | 0.90925 | 0.97375 | 1.21745 | 1.31165 | 1.33635 | 1.5743 | 1.75155 | 1.6476 | 1.394 | 1.1656 |
| 08-07-10 | 0.94055 | 0.84655 | 0.8094 | 0.73965 | 0.77 | 0.81165 | 0.97255 | 1.2316 | 1.21905 | 1.3104 | 1.16105 | 1.12905 | 0.93005 | 0.89505 | 0.99845 | 1.1061 | 1.33055 | 1.39585 | 1.53375 | 1.6513 | 1.7185 | 1.70345 | 1.4807 | 1.197 |
| 09-07-10 | 0.91395 | 0.8697 | 0.7906 | 0.73735 | 0.75495 | 0.85555 | 1.04255 | 1.28945 | 1.17575 | 1.289 | 1.27165 | 1.15475 | 1.0725 | 1.0871 | 1.1204 | 1.1468 | 1.28255 | 1.4356 | 1.4546 | 1.5819 | 1.7463 | 1.56025 | 1.41275 | 1.15355 |
| 10-07-10 | 1.00475 | 0.8839 | 0.83065 | 0.75265 | 0.81715 | 0.80805 | 0.9411 | 1.12285 | 1.25275 | 1.3868 | 1.441 | 1.3193 | 1.24225 | 1.37765 | 1.5132 | 1.6116 | 1.77925 | 1.96535 | 1.8786 | 1.81145 | 1.7878 | 1.65025 | 1.3289 | 1.00915 |
| 11-07-10 | 0.913 | 0.86885 | 0.79585 | 0.74205 | 0.8226 | 0.80065 | 0.88105 | 1.10935 | 1.18775 | 1.2736 | 1.3168 | 1.221 | 1.3548 | 1.4774 | 1.4589 | 1.7177 | 1.9161 | 2.064 | 2.08975 | 2.05725 | 1.9161 | 1.65535 | 1.4409 | 1.09815 |
| 12-07-10 | 0.9403 | 0.8443 | 0.80945 | 0.70555 | 0.7165 | 0.79385 | 0.95635 | 1.10705 | 1.1864 | 1.22665 | 1.21785 | 1.27275 | 1.1147 | 1.08225 | 1.06775 | 1.2067 | 1.44545 | 1.50055 | 1.7865 | 1.90355 | 1.7838 | 1.64565 | 1.42535 | 1.0396 |
| 13-07-10 | 0.94465 | 0.82325 | 0.80865 | 0.753 | 0.7485 | 0.81695 | 0.9769 | 1.1028 | 1.12285 | 1.2569 | 1.12765 | 1.07185 | 1.02545 | 0.9899 | 1.0042 | 1.13245 | 1.151 | 1.2716 | 1.5045 | 1.6844 | 1.58515 | 1.6317 | 1.3916 | 1.0743 |
| 14-07-10 | 0.8949 | 0.86655 | 0.80905 | 0.80475 | 0.80175 | 0.86765 | 1.0296 | 1.18775 | 1.10795 | 1.15915 | 1.12255 | 1.12 | 1.05735 | 1.11235 | 1.1099 | 1.24305 | 1.36675 | 1.5521 | 1.76275 | 1.9026 | 1.8645 | 1.8905 | 1.45015 | 1.1859 |
| 15-07-10 | 0.94525 | 0.88335 | 0.85155 | 0.77815 | 0.8536 | 0.8724 | 0.99195 | 1.2488 | 1.20135 | 1.33565 | 1.2158 | 1.11155 | 1.07795 | 1.0784 | 1.31635 | 1.46125 | 1.45515 | 1.6173 | 1.79855 | 1.9802 | 1.9257 | 1.8187 | 1.5583 | 1.3442 |
| 16-07-10 | 1.01925 | 0.9759 | 0.94855 | 0.90235 | 0.93245 | 1.03735 | 1.1147 | 1.2732 | 1.31765 | 1.4535 | 1.41865 | 1.4191 | 1.44235 | 1.51095 | 1.585 | 1.73525 | 1.7489 | 1.8016 | 1.96175 | 1.9455 | 1.8324 | 1.7159 | 1.4571 | 1.2089 |
| 17-07-10 | 0.9864 | 0.9377 | 0.9232 | 0.88495 | 0.8475 | 0.88095 | 0.9531 | 1.11415 | 1.3404 | 1.46165 | 1.4446 | 1.6535 | 1.5858 | 1.5751 | 1.6875 | 1.78875 | 1.8888 | 1.9615 | 2.0234 | 2.0133 | 2.06955 | 1.90145 | 1.52825 | 1.19615 |
| 18-07-10 | 0.9779 | 0.9661 | 0.8247 | 0.8397 | 0.8784 | 0.90645 | 0.955 | 1.1529 | 1.24135 | 1.32755 | 1.33405 | 1.42835 | 1.55745 | 1.76405 | 1.86785 | 1.8983 | 1.91825 | 2.09865 | 2.1312 | 2.0637 | 1.98785 | 1.8636 | 1.55085 | 1.1955 |
| 19-07-10 | 0.91675 | 0.83195 | 0.7843 | 0.75245 | 0.8461 | 0.88015 | 1.0003 | 1.10585 | 1.09385 | 1.35385 | 1.30615 | 1.2665 | 1.2098 | 1.10115 | 1.18575 | 1.38625 | 1.57275 | 1.6583 | 1.88855 | 1.78205 | 1.89935 | 1.73865 | 1.5158 | 1.0929 |
| 20-07-10 | 0.96065 | 0.82355 | 0.79445 | 0.76745 | 0.81175 | 0.8933 | 0.99745 | 1.08185 | 1.15195 | 1.18775 | 1.1743 | 1.1824 | 1.03175 | 1.0738 | 1.23215 | 1.2849 | 1.4196 | 1.6061 | 1.7987 | 1.8096 | 1.8071 | 1.6664 | 1.37965 | 1.06085 |
| 21-07-10 | 0.92785 | 0.7905 | 0.7825 | 0.75355 | 0.81475 | 0.8717 | 0.93455 | 1.17555 | 1.23795 | 1.2273 | 1.23625 | 1.2479 | 1.1192 | 1.029 | 1.04945 | 1.20615 | 1.32865 | 1.4748 | 1.68425 | 1.6689 | 1.7542 | 1.63815 | 1.44545 | 0.9875 |
| 22-07-10 | 0.8852 | 0.862 | 0.78685 | 0.7771 | 0.85975 | 0.91795 | 0.9715 | 1.1158 | 1.2078 | 1.3268 | 1.22075 | 1.0328 | 1.04655 | 1.0404 | 1.01625 | 1.13095 | 1.2552 | 1.4088 | 1.5268 | 1.72185 | 1.77355 | 1.7474 | 1.51965 | 1.09545 |
| 23-07-10 | 0.892 | 0.8319 | 0.76885 | 0.7703 | 0.82485 | 0.8397 | 1.02115 | 1.1893 | 1.2048 | 1.4596 | 1.4814 | 1.59445 | 1.3461 | 1.27915 | 1.25295 | 1.367 | 1.45095 | 1.5928 | 1.7319 | 1.69105 | 1.77135 | 1.6207 | 1.36065 | 1.09495 |
| 24-07-10 | 0.96215 | 0.8713 | 0.82655 | 0.8394 | 0.8772 | 0.89025 | 1.0396 | 1.2169 | 1.2386 | 1.30175 | 1.3047 | 1.3834 | 1.3548 | 1.37185 | 1.4268 | 1.53755 | 1.7235 | 1.70505 | 1.79545 | 1.7067 | 1.6835 | 1.6229 | 1.42275 | 1.124 |
| 25-07-10 | 0.92545 | 0.8404 | 0.80465 | 0.77175 | 0.8194 | 0.8589 | 0.952 | 1.03165 | 1.17365 | 1.2636 | 1.2595 | 1.35485 | 1.44315 | 1.3071 | 1.5108 | 1.57415 | 1.7894 | 1.99425 | 2.15495 | 1.97335 | 1.8572 | 1.7576 | 1.52575 | 1.1363 |
| 26-07-10 | 0.91655 | 0.8544 | 0.80265 | 0.76375 | 0.8283 | 0.92605 | 1.0662 | 1.15845 | 1.22965 | 1.3349 | 1.5084 | 1.38795 | 1.18105 | 1.1695 | 1.12275 | 1.15435 | 1.29515 | 1.385 | 1.6233 | 1.5677 | 1.67255 | 1.56105 | 1.3867 | 1.09455 |
| 27-07-10 | 0.9082 | 0.80815 | 0.765 | 0.7521 | 0.77805 | 0.91805 | 0.96185 | 1.1539 | 1.32825 | 1.24305 | 1.26405 | 1.1149 | 1.0669 | 0.95965 | 0.97645 | 1.0107 | 1.15125 | 1.28065 | 1.47065 | 1.54175 | 1.56345 | 1.60255 | 1.35495 | 1.037 |
| 28-07-10 | 0.8012 | 0.74965 | 0.76285 | 0.7096 | 0.75435 | 0.87265 | 0.93475 | 1.133 | 1.2229 | 1.3515 | 1.18775 | 1.17915 | 0.97955 | 0.90685 | 0.90915 | 1.00125 | 1.1903 | 1.2388 | 1.582 | 1.6816 | 1.69665 | 1.569 | 1.47955 | 1.1326 |
| 29-07-10 | 0.8664 | 0.78585 | 0.77305 | 0.75465 | 0.79295 | 0.8663 | 1.01085 | 1.13465 | 1.23135 | 1.34795 | 1.1618 | 1.1035 | 1.07455 | 0.9786 | 1.01425 | 1.0703 | 1.16375 | 1.28125 | 1.55395 | 1.7233 | 1.60395 | 1.56205 | 1.51195 | 1.02615 |
| 30-07-10 | 0.8957 | 0.821 | 0.7279 | 0.7365 | 0.7594 | 0.8279 | 0.9568 | 1.15285 | 1.1987 | 1.23 | 1.15505 | 1.1918 | 1.07845 | 1.0849 | 1.1632 | 1.1167 | 1.34395 | 1.3861 | 1.72545 | 1.67975 | 1.7532 | 1.49735 | 1.3656 | 1.1558 |
| 31-07-10 | 0.83885 | 0.7926 | 0.7129 | 0.732 | 0.80055 | 0.8362 | 0.8808 | 1.10405 | 1.22005 | 1.37065 | 1.42705 | 1.4167 | 1.2831 | 1.16035 | 1.11605 | 1.2139 | 1.3691 | 1.3806 | 1.6435 | 1.61925 | 1.56595 | 1.52095 | 1.4048 | 1.01345 |
| 01-08-10 | 0.88455 | 0.78335 | 0.73195 | 0.738 | 0.7914 | 0.84965 | 0.8591 | 1.08945 | 1.28695 | 1.3141 | 1.33855 | 1.20085 | 1.28465 | 1.29175 | 1.26715 | 1.40815 | 1.56065 | 1.6194 | 1.781 | 1.7028 | 1.56495 | 1.47405 | 1.4393 | 1.12745 |
| 02-08-10 | 0.81795 | 0.7328 | 0.7037 | 0.7308 | 0.7523 | 0.8705 | 0.99755 | 1.1439 | 1.1137 | 1.20915 | 1.18235 | 1.20335 | 1.1054 | 1.00055 | 1.02985 | 1.0671 | 1.2106 | 1.4712 | 1.8031 | 1.8524 | 1.8108 | 1.6362 | 1.55025 | 1.0783 |
| 03-08-10 | 0.9026 | 0.82855 | 0.7351 | 0.7361 | 0.77455 | 0.8423 | 1.0514 | 1.1774 | 1.16135 | 1.1348 | 1.18135 | 1.11275 | 1.067 | 1.11045 | 1.14705 | 1.13625 | 1.2972 | 1.50895 | 1.74855 | 1.8641 | 1.79415 | 1.7087 | 1.4564 | 1.11905 |
| 04-08-10 | 0.8435 | 0.81395 | 0.73085 | 0.70275 | 0.7813 | 0.85465 | 0.99235 | 1.12865 | 1.2973 | 1.2903 | 1.14045 | 1.14575 | 1.0889 | 1.00725 | 1.1323 | 1.2082 | 1.3201 | 1.34715 | 1.59215 | 1.64725 | 1.6485 | 1.5447 | 1.35305 | 1.0798 |
| 05-08-10 | 0.8992 | 0.82095 | 0.7826 | 0.7707 | 0.8238 | 0.87685 | 1.01265 | 1.1476 | 1.2107 | 1.34235 | 1.2899 | 1.18185 | 1.05485 | 0.997 | 1.06835 | 1.02535 | 1.19755 | 1.2517 | 1.44555 | 1.37105 | 1.43385 | 1.52655 | 1.38855 | 0.9795 |
| 06-08-10 | 0.8384 | 0.7476 | 0.7202 | 0.7424 | 0.7688 | 0.85325 | 0.99915 | 1.1186 | 1.19145 | 1.24275 | 1.11295 | 1.2482 | 1.0749 | 1.0873 | 1.03715 | 1.0709 | 1.24185 | 1.39725 | 1.64265 | 1.68 | 1.63995 | 1.51755 | 1.32225 | 1.0081 |
| 07-08-10 | 0.84785 | 0.8042 | 0.78455 | 0.74175 | 0.7824 | 0.81695 | 0.9203 | 1.0078 | 1.10855 | 1.2754 | 1.37665 | 1.16255 | 1.13425 | 1.1779 | 1.1931 | 1.33775 | 1.372 | 1.6012 | 1.7002 | 1.6543 | 1.57985 | 1.39245 | 1.23665 | 0.9752 |
| 08-08-10 | 0.81735 | 0.8095 | 0.78055 | 0.80065 | 0.81215 | 0.8096 | 0.9003 | 1.08075 | 1.12425 | 1.3033 | 1.3778 | 1.30395 | 1.29685 | 1.1883 | 1.1671 | 1.25885 | 1.41025 | 1.5334 | 1.5204 | 1.4761 | 1.6891 | 1.6279 | 1.35415 | 1.0914 |
| 09-08-10 | 0.90935 | 0.79155 | 0.70875 | 0.7246 | 0.7193 | 0.8392 | 0.91845 | 1.13175 | 1.13 | 1.1982 | 1.30145 | 1.377 | 1.11235 | 0.9792 | 0.9595 | 0.9407 | 1.08715 | 1.2819 | 1.52225 | 1.5282 | 1.6481 | 1.46205 | 1.3496 | 1.02385 |
| 10-08-10 | 0.785 | 0.73985 | 0.73605 | 0.71515 | 0.74755 | 0.84695 | 1.01225 | 1.12395 | 1.0078 | 1.10665 | 1.1445 | 1.08305 | 1.00845 | 0.8771 | 1.01265 | 1.07965 | 1.1512 | 1.34165 | 1.59555 | 1.4049 | 1.5347 | 1.43035 | 1.33165 | 1.0151 |
| 11-08-10 | 0.80155 | 0.7645 | 0.71145 | 0.7062 | 0.7765 | 0.8597 | 0.97595 | 1.1401 | 1.1101 | 1.12425 | 1.1032 | 1.03265 | 0.8996 | 0.9013 | 0.933 | 0.9188 | 1.0616 | 1.10925 | 1.26465 | 1.35955 | 1.5329 | 1.4385 | 1.297 | 1.0034 |
| 12-08-10 | 0.8534 | 0.75665 | 0.6925 | 0.70615 | 0.7277 | 0.81575 | 1.0235 | 1.1404 | 1.10135 | 1.2457 | 1.0647 | 0.97825 | 0.9098 | 0.96065 | 0.9602 | 0.99555 | 1.1653 | 1.34055 | 1.5908 | 1.42415 | 1.60115 | 1.5684 | 1.37985 | 1.0276 |
| 13-08-10 | 0.8324 | 0.7769 | 0.7206 | 0.75245 | 0.8023 | 0.88625 | 0.9639 | 1.12985 | 1.14095 | 1.19755 | 1.19125 | 1.26895 | 0.93815 | 1.03275 | 1.09675 | 1.1205 | 1.2576 | 1.41975 | 1.61315 | 1.6402 | 1.6909 | 1.5013 | 1.3653 | 1.0291 |
| 14-08-10 | 0.7925 | 0.77665 | 0.792 | 0.72075 | 0.80395 | 0.8462 | 0.93075 | 1.147 | 1.1552 | 1.36825 | 1.37145 | 1.3191 | 1.20285 | 1.22065 | 1.0846 | 1.33445 | 1.3271 | 1.57675 | 1.6931 | 1.51785 | 1.5856 | 1.5341 | 1.4095 | 1.09105 |
| 15-08-10 | 0.8151 | 0.75275 | 0.7182 | 0.7358 | 0.7135 | 0.7606 | 0.85025 | 1.00935 | 1.12525 | 1.324 | 1.2682 | 1.149 | 1.06635 | 1.13835 | 1.2952 | 1.28205 | 1.44465 | 1.69975 | 1.6535 | 1.59415 | 1.691 | 1.57785 | 1.38045 | 1.04705 |
| 16-08-10 | 0.82085 | 0.7471 | 0.724 | 0.73225 | 0.7154 | 0.825 | 0.9781 | 1.0433 | 1.15395 | 1.2858 | 1.16585 | 1.16855 | 1.1186 | 1.0863 | 1.0939 | 1.1142 | 1.30805 | 1.47525 | 1.67295 | 1.7552 | 1.7859 | 1.61615 | 1.34585 | 1.0666 |
| 17-08-10 | 0.91035 | 0.8577 | 0.81835 | 0.74015 | 0.74225 | 0.7898 | 1.0178 | 1.20895 | 1.1964 | 1.23965 | 1.16035 | 1.13255 | 1.00825 | 1.0442 | 1.17545 | 1.20985 | 1.32095 | 1.49505 | 1.5919 | 1.552 | 1.60055 | 1.6809 | 1.49195 | 1.07205 |
| 18-08-10 | 0.8882 | 0.808 | 0.73375 | 0.72605 | 0.71355 | 0.8324 | 1.00895 | 1.2883 | 1.20555 | 1.18925 | 1.12765 | 1.16105 | 1.03785 | 1.00195 | 1.03025 | 1.0811 | 1.3523 | 1.41505 | 1.6745 | 1.65895 | 1.71285 | 1.53465 | 1.3361 | 1.0305 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19-08-10 | 0.86905 | 0.8133 | 0.75025 | 0.76475 | 0.76705 | 0.8191 | 1.00975 | 1.16005 | 1.05355 | 1.2944 | 1.1625 | 0.98655 | 0.95635 | 1.00355 | 0.9864 | 1.0318 | 1.18995 | 1.39455 | 1.5766 | 1.6244 | 1.74645 | 1.5044 | 1.25045 | 0.9922 |
| 20-08-10 | 0.88275 | 0.8436 | 0.73845 | 0.7091 | 0.73895 | 0.85205 | 1.0168 | 1.1688 | 1.13875 | 1.2523 | 1.26565 | 1.1433 | 1.08385 | 1.0383 | 1.08265 | 1.1261 | 1.32895 | 1.4216 | 1.5621 | 1.59365 | 1.5655 | 1.4907 | 1.35865 | 1.05765 |
| 21-08-10 | 0.91455 | 0.85795 | 0.78575 | 0.732 | 0.7764 | 0.77955 | 0.91175 | 1.0349 | 1.15665 | 1.2884 | 1.33325 | 1.43085 | 1.37705 | 1.2233 | 1.1722 | 1.11745 | 1.24155 | 1.46745 | 1.3441 | 1.3416 | 1.4509 | 1.386 | 1.15715 | 0.9592 |
| 22-08-10 | 0.85095 | 0.80075 | 0.7479 | 0.7264 | 0.75355 | 0.7684 | 0.8879 | 1.08755 | 1.08905 | 1.13535 | 1.1724 | 1.0202 | 1.1534 | 1.2927 | 1.09525 | 1.13075 | 1.29725 | 1.47545 | 1.46465 | 1.44535 | 1.6197 | 1.39395 | 1.29315 | 0.9367 |
| 23-08-10 | 0.8403 | 0.74445 | 0.71855 | 0.729 | 0.74615 | 0.85355 | 1.0301 | 1.1559 | 1.1029 | 1.0907 | 1.14675 | 1.0392 | 0.9484 | 0.95165 | 1.01225 | 1.18865 | 1.29625 | 1.4796 | 1.7402 | 1.62475 | 1.6958 | 1.42635 | 1.32865 | 1.0082 |
| 24-08-10 | 0.8784 | 0.87185 | 0.79635 | 0.7682 | 0.7743 | 0.8697 | 1.0897 | 1.1993 | 1.21565 | 1.18795 | 1.2889 | 1.4594 | 1.1848 | 1.216 | 1.4067 | 1.4671 | 1.80475 | 2.0203 | 2.35945 | 2.3106 | 2.32005 | 1.90035 | 1.61085 | 1.1982 |
| 25-08-10 | 0.97355 | 0.8737 | 0.8692 | 0.8341 | 0.9188 | 0.97465 | 1.13005 | 1.30265 | 1.34035 | 1.6087 | 1.434 | 1.59585 | 1.51055 | 1.63015 | 1.7846 | 1.99415 | 2.0934 | 2.21965 | 2.49105 | 2.44885 | 2.28535 | 1.9415 | 1.5134 | 1.1873 |
| 26-08-10 | 0.9998 | 1.0195 | 0.94315 | 0.87905 | 0.9103 | 0.9973 | 1.1397 | 1.24965 | 1.2102 | 1.34525 | 1.25105 | 1.3751 | 1.268 | 1.3091 | 1.3855 | 1.473 | 1.59145 | 1.82705 | 1.79565 | 1.8118 | 2.00665 | 1.8124 | 1.43245 | 1.0272 |
| 27-08-10 | 0.9031 | 0.83755 | 0.7789 | 0.7496 | 0.79155 | 0.83725 | 1.0104 | 1.18025 | 1.1023 | 1.2905 | 1.3136 | 1.1048 | 1.20945 | 1.00225 | 1.0387 | 1.13225 | 1.3397 | 1.4216 | 1.5274 | 1.4767 | 1.50675 | 1.3885 | 1.30265 | 0.98655 |
| 28-08-10 | 0.80375 | 0.7353 | 0.71085 | 0.69935 | 0.7929 | 0.8039 | 0.91335 | 1.1261 | 1.1501 | 1.24075 | 1.254 | 1.121 | 1.07825 | 1.006 | 1.03515 | 0.94675 | 0.9477 | 1.085 | 1.2929 | 1.3314 | 1.3925 | 1.2751 | 1.04605 | 0.83915 |
| 29-08-10 | 0.7718 | 0.7336 | 0.71535 | 0.6728 | 0.71675 | 0.7686 | 0.88475 | 0.9881 | 1.21345 | 1.25885 | 1.27165 | 1.13595 | 1.05225 | 1.23355 | 1.07105 | 1.00365 | 1.0698 | 1.22175 | 1.26205 | 1.38855 | 1.539 | 1.4133 | 1.38945 | 0.96935 |
| 30-08-10 | 0.821 | 0.79865 | 0.70445 | 0.7116 | 0.7859 | 0.8854 | 1.08915 | 1.13045 | 1.1675 | 1.11965 | 1.1074 | 1.04335 | 0.88615 | 0.8258 | 0.84665 | 0.86795 | 0.9331 | 1.13685 | 1.28475 | 1.29515 | 1.5029 | 1.3091 | 1.28835 | 0.8936 |
| 31-08-10 | 0.73125 | 0.75595 | 0.6833 | 0.6887 | 0.79545 | 0.88585 | 1.0881 | 1.21725 | 1.1368 | 1.0855 | 1.09425 | 0.97975 | 0.82475 | 0.8311 | 0.9055 | 0.8629 | 0.9981 | 1.167 | 1.31815 | 1.3363 | 1.59365 | 1.48555 | 1.2297 | 0.9624 |
| 01-09-10 | 0.7388 | 0.74775 | 0.70255 | 0.73175 | 0.7723 | 0.9624 | 1.16265 | 1.12235 | 1.0669 | 1.11125 | 1.0507 | 1.0509 | 0.9468 | 0.94545 | 0.9615 | 1.0673 | 1.19715 | 1.3929 | 1.62305 | 1.7249 | 1.90235 | 1.56595 | 1.36805 | 0.9747 |
| 02-09-10 | 0.84895 | 0.81905 | 0.76925 | 0.7472 | 0.80035 | 0.8544 | 1.08355 | 1.1723 | 1.22385 | 1.2218 | 1.1769 | 1.0328 | 1.03825 | 1.11375 | 1.24805 | 1.39215 | 1.6322 | 1.8285 | 1.986 | 1.85635 | 1.97285 | 1.75585 | 1.4769 | 1.14285 |
| 03-09-10 | 0.88485 | 0.7967 | 0.766 | 0.7261 | 0.7977 | 0.9012 | 1.08215 | 1.13815 | 1.1325 | 1.18385 | 1.2882 | 1.1388 | 1.1366 | 1.15125 | 1.19625 | 1.37145 | 1.59875 | 1.6606 | 1.66095 | 1.75185 | 1.6798 | 1.5561 | 1.3261 | 1.0864 |
| 04-09-10 | 0.91855 | 0.80145 | 0.80975 | 0.77595 | 0.8462 | 0.8488 | 0.87555 | 1.02375 | 1.23195 | 1.1837 | 1.27385 | 1.29895 | 1.27425 | 1.33005 | 1.29095 | 1.51075 | 1.6511 | 1.8591 | 1.7456 | 1.8093 | 1.6546 | 1.56165 | 1.37175 | 1.00995 |
| 05-09-10 | 0.8304 | 0.7663 | 0.7687 | 0.72945 | 0.7376 | 0.8416 | 0.89755 | 0.98385 | 1.19235 | 1.38405 | 1.42595 | 1.4145 | 1.2738 | 1.2492 | 1.3214 | 1.42065 | 1.43175 | 1.6977 | 1.67605 | 1.59325 | 1.72205 | 1.66855 | 1.32375 | 0.9755 |
| 06-09-10 | 0.76515 | 0.7574 | 0.71495 | 0.69385 | 0.74635 | 0.8281 | 0.90785 | 1.09795 | 1.17525 | 1.21865 | 1.3496 | 1.3955 | 1.41805 | 1.26125 | 1.38015 | 1.37055 | 1.42775 | 1.65075 | 1.7793 | 1.76245 | 1.7196 | 1.55715 | 1.2158 | 0.93565 |
| 07-09-10 | 0.8307 | 0.773 | 0.73795 | 0.70305 | 0.75645 | 0.89585 | 1.132 | 1.2567 | 1.097 | 1.0509 | 1.0492 | 0.9661 | 0.86115 | 0.8067 | 0.85465 | 0.96495 | 1.11465 | 1.40775 | 1.5594 | 1.45995 | 1.65965 | 1.39075 | 1.1633 | 0.92065 |
| 08-09-10 | 0.78305 | 0.75195 | 0.72175 | 0.72655 | 0.7848 | 0.94205 | 1.1812 | 1.22865 | 1.12965 | 1.17005 | 1.1428 | 1.03195 | 0.87645 | 0.80465 | 0.87925 | 0.83225 | 0.9785 | 1.0946 | 1.2458 | 1.3992 | 1.5858 | 1.39585 | 1.17175 | 0.9352 |
| 09-09-10 | 0.78045 | 0.77325 | 0.749 | 0.74125 | 0.78665 | 0.8868 | 1.0956 | 1.21005 | 1.07435 | 1.11645 | 1.07815 | 0.9494 | 0.80475 | 0.73965 | 0.7996 | 0.7659 | 0.8678 | 0.9484 | 1.18325 | 1.3262 | 1.4344 | 1.3316 | 1.16775 | 0.95495 |
| 10-09-10 | 0.7618 | 0.7479 | 0.71345 | 0.71215 | 0.8228 | 0.94255 | 1.0493 | 1.20775 | 1.27 | 1.27335 | 1.11295 | 1.09785 | 1.0031 | 0.95575 | 0.90585 | 0.89165 | 0.88165 | 1.0342 | 1.2774 | 1.33235 | 1.40705 | 1.3331 | 1.1888 | 0.939 |
| 11-09-10 | 0.83715 | 0.77785 | 0.77525 | 0.74555 | 0.7749 | 0.85445 | 0.9016 | 1.1867 | 1.20415 | 1.2032 | 1.10235 | 1.1333 | 1.2128 | 1.164 | 1.17295 | 1.19905 | 1.2712 | 1.2975 | 1.3402 | 1.4785 | 1.5755 | 1.4176 | 1.2163 | 1.0101 |
| 12-09-10 | 0.86805 | 0.7713 | 0.69695 | 0.6917 | 0.74625 | 0.8093 | 0.87975 | 1.0418 | 1.1543 | 1.3728 | 1.28025 | 1.1032 | 1.19475 | 1.20635 | 1.23025 | 1.25225 | 1.32955 | 1.6383 | 1.64665 | 1.7393 | 1.66605 | 1.4924 | 1.1501 | 0.92805 |
| 13-09-10 | 0.8139 | 0.81245 | 0.791 | 0.75885 | 0.7838 | 0.98825 | 1.1616 | 1.23045 | 1.1806 | 1.27505 | 1.12655 | 1.0504 | 0.96385 | 0.95465 | 1.0352 | 0.94965 | 1.08315 | 1.29245 | 1.5215 | 1.7139 | 1.69295 | 1.4857 | 1.3222 | 0.94015 |
| 14-09-10 | 0.7982 | 0.85035 | 0.80585 | 0.76235 | 0.7983 | 0.9317 | 1.2356 | 1.2294 | 1.1432 | 1.23525 | 1.14625 | 1.0769 | 0.9235 | 0.8434 | 0.8127 | 0.8478 | 0.9227 | 1.0081 | 1.23215 | 1.31815 | 1.42545 | 1.35685 | 1.277 | 0.85635 |
| 15-09-10 | 0.7359 | 0.7248 | 0.6897 | 0.71775 | 0.7535 | 0.9159 | 1.06965 | 1.2069 | 1.1025 | 1.1602 | 0.9573 | 0.89215 | 0.78455 | 0.7368 | 0.78345 | 0.8076 | 0.9327 | 1.0292 | 1.18125 | 1.4393 | 1.55145 | 1.4109 | 1.1595 | 0.89115 |
| 16-09-10 | 0.7709 | 0.72825 | 0.7335 | 0.71275 | 0.76955 | 0.9231 | 1.05215 | 1.1506 | 1.04785 | 0.99865 | 1.00535 | 0.87615 | 0.86505 | 0.75875 | 0.76845 | 0.7844 | 0.91765 | 0.96595 | 1.09935 | 1.3874 | 1.54295 | 1.35275 | 1.1955 | 0.8403 |
| 17-09-10 | 0.7302 | 0.72545 | 0.66135 | 0.64885 | 0.6959 | 0.8721 | 1.0386 | 1.1863 | 1.18825 | 1.20715 | 1.3187 | 1.14285 | 0.93215 | 0.8521 | 0.8319 | 0.9098 | 0.9693 | 1.18965 | 1.30735 | 1.34865 | 1.3146 | 1.36805 | 1.21125 | 0.9561 |
| 18-09-10 | 0.7886 | 0.7836 | 0.7359 | 0.7011 | 0.74225 | 0.7837 | 0.92285 | 1.0232 | 1.1895 | 1.2417 | 1.20695 | 1.15815 | 1.1484 | 1.10505 | 1.0578 | 0.9912 | 1.19455 | 1.19845 | 1.3644 | 1.4028 | 1.4196 | 1.33815 | 1.3083 | 0.9399 |
| 19-09-10 | 0.79295 | 0.7453 | 0.6978 | 0.63505 | 0.67845 | 0.74665 | 0.8546 | 1.05715 | 1.19065 | 1.1982 | 1.16505 | 1.22485 | 1.0845 | 1.16795 | 1.17615 | 1.1019 | 1.144 | 1.28525 | 1.4169 | 1.49535 | 1.4647 | 1.3495 | 1.0869 | 0.9242 |
| 20-09-10 | 0.73345 | 0.6687 | 0.67865 | 0.6466 | 0.7084 | 0.8814 | 1.08705 | 0.9739 | 0.95975 | 0.99955 | 1.04015 | 0.92245 | 0.87155 | 0.8168 | 0.8264 | 0.7566 | 0.82145 | 1.00875 | 1.2357 | 1.2833 | 1.3698 | 1.2877 | 1.15355 | 0.8343 |
| 21-09-10 | 0.7318 | 0.715 | 0.70595 | 0.68765 | 0.7402 | 0.88185 | 1.0388 | 1.1515 | 0.99155 | 1.0974 | 1.05275 | 1.0061 | 0.84585 | 0.80705 | 0.7926 | 0.7585 | 0.8652 | 1.0712 | 1.1793 | 1.311 | 1.35605 | 1.2674 | 1.1715 | 0.86735 |
| 22-09-10 | 0.75455 | 0.68985 | 0.67425 | 0.62795 | 0.68835 | 0.8408 | 1.0872 | 1.20105 | 1.0364 | 1.04185 | 1.02265 | 0.95405 | 0.93285 | 0.7611 | 0.74215 | 0.73315 | 0.76525 | 0.9109 | 1.09515 | 1.3134 | 1.24395 | 1.235 | 1.07055 | 0.82055 |
| 23-09-10 | 0.69545 | 0.68165 | 0.73235 | 0.71 | 0.7665 | 0.93885 | 1.1506 | 1.1217 | 1.2214 | 1.12595 | 1.10225 | 0.9657 | 0.88875 | 0.74835 | 0.75785 | 0.7924 | 0.87905 | 0.95915 | 1.0984 | 1.1863 | 1.2826 | 1.2856 | 1.1949 | 0.9119 |
| 24-09-10 | 0.73185 | 0.6851 | 0.68775 | 0.64015 | 0.70275 | 0.8129 | 1.03555 | 1.08195 | 1.00165 | 1.0464 | 1.08085 | 0.90985 | 0.8253 | 0.7602 | 0.76825 | 0.76585 | 0.8175 | 0.9768 | 1.1833 | 1.3152 | 1.27635 | 1.17855 | 1.0533 | 0.84215 |
| 25-09-10 | 0.75535 | 0.70515 | 0.68335 | 0.64945 | 0.7249 | 0.73275 | 0.84685 | 1.08895 | 1.0786 | 1.18155 | 1.23705 | 1.1118 | 0.9764 | 1.0274 | 1.12585 | 1.16745 | 1.40975 | 1.36195 | 1.4656 | 1.523 | 1.51365 | 1.3785 | 1.17125 | 0.88325 |
| 26-09-10 | 0.8203 | 0.74835 | 0.7574 | 0.7064 | 0.71935 | 0.75785 | 0.8363 | 0.9922 | 1.07655 | 1.2244 | 1.211 | 1.2422 | 1.2986 | 1.26975 | 1.31355 | 1.34255 | 1.4433 | 1.5787 | 1.65745 | 1.68195 | 1.7464 | 1.5715 | 1.1993 | 0.98525 |
| 27-09-10 | 0.77765 | 0.76595 | 0.7503 | 0.72005 | 0.7485 | 0.89185 | 1.10595 | 1.23015 | 1.1735 | 1.134 | 1.08755 | 1.018 | 1.0233 | 1.00045 | 1.07085 | 1.1913 | 1.3741 | 1.50865 | 1.68155 | 1.7162 | 1.6854 | 1.564 | 1.27045 | 1.0792 |
| 28-09-10 | 0.85525 | 0.74985 | 0.7324 | 0.7366 | 0.74245 | 0.8966 | 1.1622 | 1.17745 | 1.05005 | 1.12795 | 1.11335 | 1.03365 | 1.02925 | 1.0485 | 1.10525 | 1.25105 | 1.4868 | 1.63505 | 1.952 | 2.1749 | 1.9305 | 1.68575 | 1.29075 | 0.97625 |
| 29-09-10 | 0.81105 | 0.7933 | 0.75215 | 0.7603 | 0.78065 | 0.9263 | 1.103 | 1.17295 | 1.05275 | 1.1702 | 1.15815 | 1.138 | 1.1424 | 1.0881 | 1.1547 | 1.31755 | 1.4899 | 1.6404 | 1.65385 | 1.5956 | 1.57215 | 1.54895 | 1.33405 | 0.95755 |
| 30-09-10 | 0.78095 | 0.75305 | 0.7636 | 0.72125 | 0.7715 | 0.8868 | 1.15585 | 1.2021 | 1.01005 | 1.15125 | 1.16535 | 0.99415 | 0.9006 | 0.9407 | 1.0001 | 1.01165 | 1.26995 | 1.4366 | 1.64205 | 1.7732 | 1.6572 | 1.61005 | 1.2221 | 0.9419 |
| 01-10-10 | 0.85695 | 0.7849 | 0.72175 | 0.7128 | 0.7667 | 0.8804 | 1.0922 | 1.24855 | 0.99935 | 1.1988 | 1.17045 | 1.1128 | 0.9523 | 0.9005 | 0.90885 | 0.88315 | 1.0173 | 1.30545 | 1.24005 | 1.46195 | 1.4397 | 1.35675 | 1.18475 | 1.0262 |
| 02-10-10 | 0.83145 | 0.8121 | 0.7366 | 0.6842 | 0.74695 | 0.7646 | 0.9453 | 1.18125 | 1.2715 | 1.1786 | 1.2512 | 1.1572 | 1.32745 | 1.18565 | 1.2643 | 1.2151 | 1.2498 | 1.3447 | 1.43255 | 1.52005 | 1.3704 | 1.3533 | 1.09405 | 0.91725 |
| 03-10-10 | 0.80525 | 0.72385 | 0.6963 | 0.6959 | 0.74835 | 0.7816 | 1.01555 | 1.0269 | 1.0393 | 1.2139 | 1.2928 | 1.22055 | 1.17325 | 1.2907 | 1.24175 | 1.12635 | 1.1911 | 1.4678 | 1.4988 | 1.5965 | 1.4676 | 1.3338 | 1.07355 | 0.87145 |
| 04-10-10 | 0.81705 | 0.74015 | 0.6556 | 0.69375 | 0.72585 | 0.90485 | 1.0679 | 1.2446 | 1.09155 | 1.2032 | 1.07065 | 1.0272 | 0.92295 | 0.8261 | 0.78005 | 0.7781 | 0.93115 | 1.0711 | 1.32325 | 1.4931 | 1.5152 | 1.35275 | 1.10355 | 0.93245 |
| 05-10-10 | 0.7567 | 0.7712 | 0.75465 | 0.7429 | 0.81675 | 0.96245 | 1.1849 | 1.2509 | 1.04645 | 0.99915 | 1.0985 | 1.081 | 0.8573 | 0.701 | 0.77715 | 0.7988 | 0.8801 | 1.0093 | 1.2666 | 1.4457 | 1.44165 | 1.32285 | 1.00345 | 0.812 |

| | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 06-10-10 | 0.7499 | 0.701 | 0.69705 | 0.66725 | 0.7326 | 0.8898 | 1.15155 | 1.2392 | 1.14175 | 1.0468 | 1.052 | 0.9794 | 0.77285 | 0.8031 | 0.77665 | 0.84 | 0.86205 | 1.012 | 1.15475 | 1.2117 | 1.24735 | 1.2907 | 1.10015 | 0.8128 |
| 07-10-10 | 0.6999 | 0.6824 | 0.68075 | 0.7072 | 0.732 | 0.81725 | 1.08635 | 1.22905 | 1.1824 | 1.1586 | 1.1101 | 0.9502 | 0.86095 | 0.8191 | 0.8196 | 0.78295 | 0.8952 | 1.0221 | 1.0966 | 1.3204 | 1.2495 | 1.18025 | 0.9953 | 0.82635 |
| 08-10-10 | 0.69845 | 0.674 | 0.6727 | 0.6695 | 0.7052 | 0.8399 | 1.16465 | 1.18865 | 1.1078 | 1.0926 | 1.03365 | 0.89635 | 0.8922 | 0.78965 | 0.7822 | 0.73025 | 0.80605 | 0.8623 | 1.00105 | 1.2545 | 1.3234 | 1.22555 | 1.0208 | 0.83795 |
| 09-10-10 | 0.70115 | 0.69525 | 0.70565 | 0.6925 | 0.7006 | 0.83065 | 0.94175 | 1.1358 | 1.2111 | 1.2983 | 1.1406 | 1.1995 | 0.96165 | 0.85885 | 0.9303 | 0.88155 | 0.8971 | 1.1268 | 1.2417 | 1.3896 | 1.2523 | 1.13115 | 1.0273 | 0.8731 |
| 10-10-10 | 0.78475 | 0.73275 | 0.7 | 0.6713 | 0.70325 | 0.77675 | 0.92965 | 1.05805 | 1.05265 | 1.1207 | 1.04365 | 1.0118 | 0.93005 | 1.00385 | 0.97105 | 0.9402 | 0.98965 | 1.14625 | 1.2893 | 1.3726 | 1.3348 | 1.31415 | 1.14985 | 0.8414 |
| 11-10-10 | 0.81885 | 0.71425 | 0.6558 | 0.6684 | 0.72085 | 0.8245 | 1.033 | 1.08265 | 1.07025 | 1.2736 | 1.1998 | 0.94565 | 0.87795 | 0.85905 | 0.91895 | 0.909 | 0.97415 | 1.13035 | 1.31775 | 1.4241 | 1.3479 | 1.25805 | 1.1124 | 0.84525 |
| 12-10-10 | 0.69835 | 0.7 | 0.7038 | 0.68075 | 0.72725 | 0.8549 | 1.1166 | 1.1693 | 1.04005 | 1.0417 | 1.06115 | 0.98185 | 0.86645 | 0.9213 | 0.86815 | 0.90095 | 0.9673 | 1.12845 | 1.27415 | 1.5174 | 1.49395 | 1.44885 | 1.0888 | 0.8377 |
| 13-10-10 | 0.77325 | 0.69055 | 0.653 | 0.64695 | 0.7001 | 0.83625 | 1.10675 | 1.17905 | 1.05295 | 0.98 | 1.0211 | 0.8883 | 0.829 | 0.80975 | 0.84945 | 0.8424 | 0.92255 | 1.08745 | 1.2982 | 1.53745 | 1.3848 | 1.2509 | 1.12335 | 0.86715 |
| 14-10-10 | 0.7607 | 0.67305 | 0.65195 | 0.6944 | 0.7489 | 0.8112 | 1.177 | 1.2054 | 1.00885 | 1.06055 | 0.9651 | 0.95875 | 0.84255 | 0.84175 | 0.90805 | 0.82435 | 1.0466 | 1.244 | 1.40755 | 1.5921 | 1.42665 | 1.3214 | 1.21305 | 0.85185 |
| 15-10-10 | 0.715 | 0.6748 | 0.6704 | 0.6468 | 0.68505 | 0.8411 | 1.10615 | 1.2319 | 1.08165 | 1.1252 | 1.0813 | 1.10755 | 0.93595 | 0.90955 | 0.93915 | 0.9723 | 1.04565 | 1.115 | 1.25255 | 1.29025 | 1.21575 | 1.1859 | 1.05295 | 0.9249 |
| 16-10-10 | 0.74595 | 0.715 | 0.66865 | 0.6906 | 0.77785 | 0.7808 | 0.9861 | 1.12895 | 1.1159 | 1.2614 | 1.19505 | 1.17075 | 1.16545 | 1.11815 | 1.0806 | 1.065 | 1.12515 | 1.2171 | 1.40515 | 1.5131 | 1.46095 | 1.26435 | 1.12415 | 0.87355 |
| 17-10-10 | 0.73135 | 0.70735 | 0.68525 | 0.70695 | 0.7569 | 0.78595 | 0.8642 | 1.00075 | 1.1584 | 1.2446 | 1.2097 | 1.0934 | 1.2073 | 1.2837 | 1.30165 | 1.19105 | 1.08745 | 1.2388 | 1.42445 | 1.47615 | 1.36775 | 1.26175 | 1.09445 | 0.8476 |
| 18-10-10 | 0.75605 | 0.64965 | 0.65815 | 0.6399 | 0.6914 | 0.84025 | 1.15105 | 1.1603 | 1.14365 | 1.2419 | 1.03355 | 0.97805 | 1.0232 | 0.90865 | 0.84295 | 0.7315 | 0.83205 | 1.0095 | 1.25305 | 1.45695 | 1.39005 | 1.1542 | 1.0181 | 0.83245 |
| 19-10-10 | 0.7145 | 0.7016 | 0.68925 | 0.6683 | 0.75625 | 0.818 | 1.21695 | 1.23515 | 1.108 | 1.01605 | 1.1255 | 0.9861 | 0.8321 | 0.76365 | 0.77685 | 0.71425 | 0.83575 | 1.0393 | 1.1567 | 1.3925 | 1.2603 | 1.1744 | 1.05855 | 0.8292 |
| 20-10-10 | 0.71535 | 0.6917 | 0.67975 | 0.67165 | 0.74635 | 0.8975 | 1.1857 | 1.3299 | 1.06375 | 1.12095 | 1.01365 | 0.97105 | 0.7476 | 0.737 | 0.74225 | 0.8186 | 0.8562 | 0.9513 | 1.2293 | 1.4161 | 1.4135 | 1.2344 | 1.0081 | 0.80435 |
| 21-10-10 | 0.6674 | 0.7461 | 0.6752 | 0.65505 | 0.77805 | 0.8223 | 1.1987 | 1.3123 | 1.10145 | 1.2007 | 1.08575 | 0.883 | 0.8288 | 0.78525 | 0.80815 | 0.8348 | 0.93065 | 1.12955 | 1.3799 | 1.37315 | 1.29045 | 1.31715 | 1.0258 | 0.84395 |
| 22-10-10 | 0.7589 | 0.71065 | 0.69015 | 0.6742 | 0.73975 | 0.8506 | 1.1592 | 1.40225 | 1.19645 | 1.14255 | 1.1358 | 0.99145 | 0.79835 | 0.84535 | 0.80535 | 0.8126 | 1.01335 | 1.11695 | 1.38415 | 1.2997 | 1.25095 | 1.16465 | 1.12965 | 1.0477 |
| 23-10-10 | 0.8525 | 0.76195 | 0.76235 | 0.74375 | 0.85055 | 0.8951 | 0.99555 | 1.2502 | 1.35385 | 1.44805 | 1.34575 | 1.2241 | 1.11465 | 1.08925 | 1.12015 | 1.07005 | 1.174 | 1.29365 | 1.35395 | 1.39085 | 1.2555 | 1.236 | 1.0961 | 0.9067 |
| 24-10-10 | 0.77105 | 0.72075 | 0.6699 | 0.71355 | 0.72995 | 0.8029 | 0.8811 | 1.1186 | 1.12245 | 1.1993 | 1.1838 | 1.1828 | 1.25835 | 1.2313 | 1.1137 | 1.1806 | 1.10925 | 1.3238 | 1.4283 | 1.537 | 1.3787 | 1.2094 | 1.0172 | 0.82025 |
| 25-10-10 | 0.7385 | 0.66345 | 0.64635 | 0.65305 | 0.7318 | 0.83665 | 1.19215 | 1.26295 | 1.0948 | 1.136 | 1.195 | 0.9696 | 0.9625 | 0.8551 | 0.8238 | 0.8383 | 0.8915 | 1.10545 | 1.3945 | 1.45925 | 1.40005 | 1.2729 | 1.1304 | 0.79565 |
| 26-10-10 | 0.74575 | 0.7177 | 0.70425 | 0.69195 | 0.84335 | 0.90165 | 1.19385 | 1.31265 | 1.1667 | 1.21065 | 1.2888 | 0.98345 | 0.88115 | 0.7659 | 0.8181 | 0.7393 | 0.84365 | 1.17725 | 1.37 | 1.48915 | 1.4793 | 1.4003 | 1.0757 | 0.84865 |
| 27-10-10 | 0.794 | 0.72565 | 0.73265 | 0.68425 | 0.774 | 1.01185 | 1.24185 | 1.39395 | 1.1451 | 1.2929 | 1.05575 | 1.06205 | 0.94625 | 0.8411 | 0.8619 | 0.81125 | 0.89225 | 1.1025 | 1.39335 | 1.5363 | 1.4244 | 1.4068 | 1.1238 | 0.89155 |
| 28-10-10 | 0.7792 | 0.7475 | 0.7741 | 0.71295 | 0.8138 | 0.9396 | 1.23205 | 1.3264 | 1.1891 | 1.1494 | 1.1314 | 0.9753 | 0.8575 | 0.7612 | 0.8007 | 0.747 | 0.87065 | 1.13265 | 1.3338 | 1.5216 | 1.39335 | 1.2564 | 1.05935 | 0.8509 |
| 29-10-10 | 0.7072 | 0.69015 | 0.68605 | 0.65925 | 0.75505 | 0.88525 | 1.15215 | 1.4595 | 1.1502 | 1.25655 | 1.12185 | 1.1334 | 0.9747 | 0.79505 | 0.7575 | 0.8341 | 0.91855 | 1.0923 | 1.22435 | 1.38005 | 1.3772 | 1.2239 | 1.0318 | 0.97335 |
| 30-10-10 | 0.76625 | 0.75315 | 0.76745 | 0.70755 | 0.7587 | 0.8505 | 0.9418 | 1.2195 | 1.1614 | 1.2231 | 1.2464 | 1.19655 | 1.1809 | 1.1838 | 1.1469 | 1.0432 | 1.09445 | 1.20005 | 1.34435 | 1.355 | 1.25795 | 1.16375 | 1.02895 | 0.81775 |
| 31-10-10 | 0.7323 | 0.7127 | 0.7127 | 0.65685 | 0.73295 | 0.83035 | 0.9405 | 1.11615 | 1.14185 | 1.2686 | 1.225 | 1.19965 | 1.28085 | 1.03545 | 1.10195 | 1.12255 | 1.23515 | 1.36695 | 1.25255 | 1.3355 | 1.231 | 1.20435 | 1.02395 | 0.9132 |
| 01-11-10 | 0.7338 | 0.6612 | 0.7163 | 0.66485 | 0.71745 | 0.90275 | 1.116 | 1.41605 | 1.22305 | 1.1488 | 1.1914 | 1.0343 | 0.90645 | 0.8501 | 0.8114 | 0.7847 | 0.83035 | 0.97415 | 1.2244 | 1.39095 | 1.2718 | 1.2371 | 1.0379 | 0.77075 |
| 02-11-10 | 0.6898 | 0.6695 | 0.71465 | 0.67075 | 0.7636 | 0.882 | 1.11875 | 1.3641 | 1.13225 | 1.2633 | 1.14195 | 0.9324 | 0.79325 | 0.81295 | 0.7188 | 0.69965 | 0.8306 | 1.00655 | 1.26875 | 1.4466 | 1.30635 | 1.23845 | 1.02815 | 0.8436 |
| 03-11-10 | 0.69205 | 0.6304 | 0.6611 | 0.6567 | 0.7037 | 0.84 | 1.1124 | 1.28405 | 1.13615 | 1.02945 | 0.9488 | 1.0079 | 0.85195 | 0.8515 | 0.8164 | 0.80565 | 0.82365 | 0.97805 | 1.2304 | 1.55175 | 1.55205 | 1.13055 | 0.9446 | 0.77685 |
| 04-11-10 | 0.66565 | 0.6852 | 0.66335 | 0.6533 | 0.7362 | 0.83685 | 1.0603 | 1.2414 | 1.0457 | 1.08465 | 1.0325 | 0.96775 | 0.81395 | 0.7918 | 0.89175 | 0.79635 | 0.8976 | 1.01965 | 1.3115 | 1.396 | 1.37925 | 1.32705 | 1.0077 | 0.79305 |
| 05-11-10 | 0.71525 | 0.6374 | 0.66895 | 0.62055 | 0.66045 | 0.8496 | 1.1134 | 1.20365 | 1.1208 | 0.99525 | 1.0052 | 0.87655 | 0.812 | 0.7445 | 0.772 | 0.7791 | 0.9035 | 1.10815 | 1.2687 | 1.30925 | 1.269 | 1.16505 | 1.0227 | 0.89505 |
| 06-11-10 | 0.7802 | 0.7216 | 0.6935 | 0.685 | 0.77785 | 0.7823 | 0.8774 | 1.1457 | 1.16395 | 1.22845 | 1.234 | 1.28565 | 1.24705 | 1.12265 | 1.05255 | 1.06225 | 0.9968 | 1.2364 | 1.4233 | 1.4002 | 1.35865 | 1.24065 | 1.1354 | 0.91545 |
| 07-11-10 | 0.7182 | 0.7287 | 0.6976 | 0.75185 | 0.778 | 0.8539 | 1.04775 | 1.15095 | 1.2669 | 1.2671 | 1.19815 | 1.12805 | 1.16945 | 1.33895 | 1.3059 | 1.27395 | 1.34435 | 1.53465 | 1.62105 | 1.5653 | 1.5057 | 1.23445 | 1.02625 | 0.8015 |
| 08-11-10 | 0.72015 | 0.73045 | 0.6657 | 0.73565 | 0.7482 | 0.97115 | 1.3408 | 1.35395 | 1.27785 | 1.20995 | 1.26495 | 1.1452 | 0.92365 | 0.9265 | 0.762 | 0.8495 | 1.08325 | 1.3616 | 1.4735 | 1.5073 | 1.53625 | 1.2645 | 1.1689 | 0.90295 |
| 09-11-10 | 0.86255 | 0.8996 | 0.81595 | 0.8553 | 0.9069 | 1.05965 | 1.3586 | 1.3741 | 1.3291 | 1.24665 | 1.2307 | 1.10295 | 0.8799 | 0.9015 | 0.8578 | 0.90055 | 1.09985 | 1.536 | 1.61095 | 1.55885 | 1.455 | 1.3683 | 1.05005 | 0.869 |
| 10-11-10 | 0.7471 | 0.7883 | 0.7277 | 0.7256 | 0.79155 | 0.955 | 1.34035 | 1.29195 | 1.27795 | 1.2059 | 1.12955 | 0.92295 | 0.9169 | 0.92175 | 0.80795 | 0.8367 | 1.01305 | 1.33375 | 1.35945 | 1.408 | 1.4559 | 1.24295 | 1.0208 | 0.8528 |
| 11-11-10 | 0.82835 | 0.8655 | 0.7654 | 0.789 | 0.81965 | 0.9821 | 1.19075 | 1.2664 | 1.41115 | 1.35565 | 1.0447 | 0.94455 | 0.8497 | 0.90295 | 0.86935 | 0.97275 | 1.05325 | 1.31585 | 1.5512 | 1.55275 | 1.45515 | 1.26245 | 1.0291 | 0.8236 |
| 12-11-10 | 0.73165 | 0.7814 | 0.70385 | 0.77085 | 0.80465 | 0.8867 | 1.2527 | 1.4322 | 1.38525 | 1.2208 | 1.1788 | 1.1911 | 0.8804 | 0.7963 | 0.7647 | 0.8293 | 1.01515 | 1.3347 | 1.573 | 1.46545 | 1.42705 | 1.3173 | 1.19885 | 0.86685 |
| 13-11-10 | 0.88725 | 0.8873 | 0.8016 | 0.84365 | 0.8351 | 0.90185 | 1.1147 | 1.209 | 1.45 | 1.36185 | 1.38605 | 1.27095 | 1.0109 | 0.90985 | 0.8745 | 0.95975 | 1.085 | 1.3543 | 1.4042 | 1.52135 | 1.406 | 1.174 | 1.10735 | 0.9211 |
| 14-11-10 | 0.82425 | 0.8257 | 0.74535 | 0.76275 | 0.78655 | 0.854 | 0.9631 | 1.1606 | 1.265 | 1.4014 | 1.2928 | 1.1564 | 1.1443 | 1.1326 | 1.07555 | 1.03615 | 1.20335 | 1.41615 | 1.47525 | 1.37295 | 1.39735 | 1.23585 | 1.05555 | 0.8016 |
| 15-11-10 | 0.68045 | 0.706 | 0.6608 | 0.715 | 0.7171 | 0.95325 | 1.16955 | 1.2608 | 1.1505 | 1.1739 | 1.1725 | 1.0322 | 0.85765 | 0.78805 | 0.69125 | 0.7107 | 0.90595 | 1.24165 | 1.42665 | 1.4724 | 1.363 | 1.18405 | 0.9656 | 0.82935 |
| 16-11-10 | 0.7612 | 0.752 | 0.72775 | 0.73965 | 0.8289 | 0.9244 | 1.15645 | 1.1993 | 1.19515 | 1.0789 | 1.0997 | 1.0001 | 0.77895 | 0.7429 | 0.75845 | 0.8011 | 0.97175 | 1.3648 | 1.39425 | 1.51115 | 1.4951 | 1.2991 | 1.0814 | 0.92635 |
| 17-11-10 | 0.7592 | 0.84545 | 0.732 | 0.79625 | 0.82605 | 1.0484 | 1.32845 | 1.2718 | 1.17045 | 1.0589 | 1.036 | 0.9294 | 0.89065 | 0.81935 | 0.70185 | 0.7284 | 0.8975 | 1.2875 | 1.2928 | 1.3995 | 1.28725 | 1.19005 | 1.02875 | 0.89765 |
| 18-11-10 | 0.88415 | 0.86915 | 0.7872 | 0.8193 | 0.88685 | 1.00475 | 1.2657 | 1.3475 | 1.15555 | 1.0803 | 1.14045 | 1.02935 | 1.0029 | 0.95145 | 0.80875 | 0.7567 | 0.9373 | 1.1986 | 1.3657 | 1.54575 | 1.46515 | 1.4289 | 1.15585 | 1.03025 |
| 19-11-10 | 0.88595 | 0.8732 | 0.78805 | 0.8202 | 0.8496 | 1.0213 | 1.3499 | 1.3089 | 1.24315 | 1.22615 | 1.12035 | 1.03365 | 1.07475 | 0.9675 | 0.9326 | 0.96555 | 1.1792 | 1.49435 | 1.62115 | 1.5712 | 1.44325 | 1.3508 | 1.1725 | 1.00085 |
| 20-11-10 | 0.9387 | 0.98775 | 0.9359 | 0.94325 | 0.92335 | 1.037 | 1.23595 | 1.4131 | 1.5935 | 1.66425 | 1.55155 | 1.6231 | 1.4668 | 1.44535 | 1.1193 | 1.2801 | 1.5776 | 1.82535 | 1.6693 | 1.52285 | 1.459 | 1.3752 | 1.17335 | 1.1097 |
| 21-11-10 | 0.97295 | 0.9061 | 0.8692 | 0.90845 | 0.91005 | 1.1251 | 1.15135 | 1.3813 | 1.45265 | 1.5081 | 1.55195 | 1.4615 | 1.451 | 1.2644 | 1.25975 | 1.1737 | 1.3474 | 1.6858 | 1.6396 | 1.6161 | 1.7269 | 1.4317 | 1.1848 | 0.94955 |
| 22-11-10 | 0.87015 | 0.803 | 0.87625 | 0.83625 | 0.83095 | 1.10065 | 1.2823 | 1.5168 | 1.3754 | 1.47765 | 1.4274 | 1.26755 | 1.1788 | 1.0592 | 0.8954 | 0.94615 | 1.0821 | 1.4076 | 1.52595 | 1.4526 | 1.56075 | 1.4094 | 1.1213 | 0.9599 |

| | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 23-11-10 | 0.87465 | 0.7865 | 0.83425 | 0.88 | 0.8963 | 1.10185 | 1.3356 | 1.3669 | 1.47035 | 1.4275 | 1.39075 | 1.3296 | 1.087 | 0.9993 | 0.9383 | 0.98975 | 1.1799 | 1.5439 | 1.65635 | 1.7538 | 1.68755 | 1.4998 | 1.2515 | 1.0568 |
| 24-11-10 | 0.93885 | 0.8463 | 0.9169 | 0.94275 | 0.98915 | 1.23255 | 1.5137 | 1.5057 | 1.4209 | 1.4131 | 1.33915 | 1.274 | 1.0102 | 0.9307 | 1.0842 | 1.1362 | 1.24565 | 1.51365 | 1.7499 | 1.92225 | 1.75865 | 1.58975 | 1.4504 | 1.3482 |
| 25-11-10 | 1.2412 | 1.09865 | 1.1507 | 1.0976 | 1.179 | 1.2932 | 1.4431 | 1.87665 | 1.8067 | 1.90355 | 1.8573 | 1.7611 | 1.66855 | 1.5323 | 1.4454 | 1.3657 | 1.5333 | 1.75475 | 1.58815 | 1.67935 | 1.5808 | 1.46015 | 1.3759 | 1.18805 |
| 26-11-10 | 1.1018 | 1.0423 | 1.0008 | 1.0591 | 1.05705 | 1.3059 | 1.28705 | 1.63225 | 1.60055 | 1.5009 | 1.4402 | 1.37605 | 1.16335 | 1.17955 | 1.1246 | 1.0848 | 1.38555 | 1.69185 | 1.7585 | 1.65715 | 1.5964 | 1.39445 | 1.27185 | 1.0434 |
| 27-11-10 | 0.93185 | 0.99235 | 0.95645 | 0.9581 | 0.96565 | 1.15035 | 1.30115 | 1.43355 | 1.44765 | 1.59905 | 1.63875 | 1.6037 | 1.6892 | 1.6229 | 1.5195 | 1.6887 | 1.6137 | 1.8604 | 1.83985 | 1.8104 | 1.6548 | 1.40735 | 1.3589 | 1.19155 |
| 28-11-10 | 1.05085 | 1.0229 | 0.9749 | 1.03165 | 1.00445 | 1.2169 | 1.32275 | 1.45725 | 1.4325 | 1.68435 | 1.595 | 1.4829 | 1.30955 | 1.42255 | 1.3495 | 1.6324 | 1.5826 | 1.93575 | 1.9932 | 1.78435 | 1.7609 | 1.7592 | 1.3724 | 1.1881 |
| 29-11-10 | 1.1085 | 1.0654 | 1.0174 | 1.11415 | 1.09835 | 1.2894 | 1.6379 | 1.6396 | 1.64615 | 1.50365 | 1.50285 | 1.39115 | 1.31235 | 1.01875 | 0.9667 | 1.03875 | 1.2035 | 1.89885 | 1.8858 | 2.04825 | 1.96365 | 1.6424 | 1.39245 | 1.17355 |
| 30-11-10 | 1.1275 | 1.052 | 1.05225 | 1.0905 | 1.12285 | 1.36935 | 1.6114 | 1.77285 | 1.5971 | 1.5105 | 1.4803 | 1.2899 | 1.13115 | 1.0318 | 1.03065 | 1.1675 | 1.37445 | 1.8165 | 1.7523 | 1.68605 | 1.7854 | 1.63585 | 1.28225 | 1.05795 |
| 01-12-10 | 0.91965 | 0.8747 | 0.87395 | 0.9351 | 0.98955 | 1.3841 | 1.58275 | 1.71035 | 1.526 | 1.46085 | 1.25775 | 1.1912 | 0.93725 | 0.79225 | 0.82755 | 0.9473 | 1.1956 | 1.6938 | 1.6997 | 1.82555 | 1.7136 | 1.51705 | 1.33395 | 1.04315 |
| 02-12-10 | 0.9379 | 0.92945 | 0.87675 | 0.87605 | 0.9749 | 1.16075 | 1.56725 | 1.67165 | 1.42685 | 1.38175 | 1.2321 | 1.14285 | 0.9913 | 0.84125 | 0.9562 | 1.00695 | 1.2612 | 1.6397 | 1.83835 | 1.94625 | 1.77435 | 1.58575 | 1.26165 | 1.0311 |
| 03-12-10 | 0.86475 | 0.80965 | 0.78875 | 0.7864 | 0.82635 | 1.06675 | 1.3692 | 1.63295 | 1.50125 | 1.4696 | 1.3827 | 1.22295 | 1.09825 | 0.9221 | 0.9451 | 0.96345 | 1.18435 | 1.50155 | 1.64235 | 1.56975 | 1.52775 | 1.3672 | 1.24155 | 1.03915 |
| 04-12-10 | 0.91975 | 0.8691 | 0.8107 | 0.79255 | 0.8172 | 0.9339 | 1.2141 | 1.4005 | 1.3995 | 1.53885 | 1.42295 | 1.34845 | 1.24685 | 1.1977 | 1.1589 | 1.18165 | 1.29535 | 1.59315 | 1.609 | 1.4799 | 1.5283 | 1.3577 | 1.2455 | 0.96135 |
| 05-12-10 | 0.85285 | 0.82925 | 0.76365 | 0.76055 | 0.8538 | 0.96095 | 1.1224 | 1.21855 | 1.3733 | 1.5453 | 1.33655 | 1.31285 | 1.15515 | 1.2455 | 1.2346 | 1.3114 | 1.4719 | 1.7045 | 1.74055 | 1.73265 | 1.69365 | 1.39115 | 1.1845 | 1.0279 |
| 06-12-10 | 0.8294 | 0.7872 | 0.71815 | 0.79555 | 0.8397 | 0.95445 | 1.32815 | 1.4046 | 1.2991 | 1.21895 | 1.2883 | 1.1592 | 1.0267 | 0.87875 | 0.9041 | 0.87135 | 1.07155 | 1.51455 | 1.64765 | 1.64585 | 1.51835 | 1.41775 | 1.29065 | 1.028 |
| 07-12-10 | 0.8987 | 0.8243 | 0.81675 | 0.8575 | 0.9077 | 1.08535 | 1.3182 | 1.4211 | 1.37235 | 1.3396 | 1.26825 | 1.06005 | 0.9522 | 0.8296 | 0.8263 | 1.0042 | 1.17285 | 1.7079 | 1.6895 | 1.72055 | 1.646 | 1.3881 | 1.1823 | 1.01515 |
| 08-12-10 | 0.91365 | 0.7927 | 0.7822 | 0.87045 | 0.86275 | 1.02115 | 1.2354 | 1.43035 | 1.43345 | 1.3476 | 1.29525 | 1.20645 | 1.06855 | 0.9296 | 0.97335 | 1.064 | 1.21525 | 1.6253 | 1.71145 | 1.7017 | 1.63785 | 1.36135 | 1.1552 | 1.0103 |
| 09-12-10 | 0.88955 | 0.7764 | 0.7461 | 0.8114 | 0.80945 | 0.9744 | 1.31705 | 1.3867 | 1.2746 | 1.1739 | 1.18345 | 1.1474 | 0.96855 | 0.84175 | 0.8125 | 0.87015 | 1.16005 | 1.52915 | 1.5074 | 1.65155 | 1.59635 | 1.38205 | 1.159 | 0.9811 |
| 10-12-10 | 0.76905 | 0.7024 | 0.73745 | 0.7135 | 0.7395 | 0.95155 | 1.211 | 1.34365 | 1.2087 | 1.19825 | 1.1857 | 1.14195 | 0.96505 | 0.87085 | 0.9297 | 1.04555 | 1.2032 | 1.56575 | 1.5281 | 1.531 | 1.49105 | 1.48875 | 1.24165 | 1.06615 |
| 11-12-10 | 0.9288 | 0.8305 | 0.7674 | 0.829 | 0.85305 | 1.01965 | 1.1054 | 1.3365 | 1.4303 | 1.3325 | 1.16535 | 1.24885 | 1.2746 | 1.05875 | 0.9851 | 1.096 | 1.3144 | 1.5385 | 1.50015 | 1.5392 | 1.47265 | 1.42775 | 1.2163 | 0.97545 |
| 12-12-10 | 0.8494 | 0.7221 | 0.71645 | 0.73845 | 0.75715 | 0.93025 | 1.0589 | 1.3086 | 1.53855 | 1.5337 | 1.28215 | 1.2324 | 1.23185 | 1.11655 | 1.11105 | 1.1153 | 1.37335 | 1.6399 | 1.81555 | 1.6888 | 1.70925 | 1.44055 | 1.18735 | 0.9692 |
| 13-12-10 | 0.80535 | 0.75665 | 0.75055 | 0.7478 | 0.7809 | 0.9133 | 1.2529 | 1.35275 | 1.42215 | 1.3348 | 1.3357 | 1.146 | 1.0002 | 0.96385 | 1.035 | 1.0191 | 1.25965 | 1.67615 | 1.79165 | 1.73045 | 1.8044 | 1.6682 | 1.3508 | 1.0846 |
| 14-12-10 | 0.9433 | 0.8448 | 0.7947 | 0.79115 | 0.8143 | 0.9868 | 1.3608 | 1.6021 | 1.3653 | 1.2941 | 1.34665 | 1.1083 | 0.9448 | 0.95735 | 0.94315 | 1.09655 | 1.2133 | 1.72025 | 1.8172 | 1.77675 | 1.66045 | 1.53475 | 1.3288 | 1.08815 |
| 15-12-10 | 0.9616 | 0.8229 | 0.8183 | 0.8104 | 0.8266 | 1.03035 | 1.5175 | 1.54725 | 1.43825 | 1.3023 | 1.2479 | 1.23675 | 1.0339 | 0.89945 | 0.981 | 0.90165 | 1.18275 | 1.792 | 1.8324 | 1.7421 | 1.8409 | 1.6883 | 1.3379 | 1.07465 |
| 16-12-10 | 0.9699 | 0.98245 | 0.96115 | 1.0066 | 1.0507 | 1.2287 | 1.70115 | 1.8032 | 1.4904 | 1.53135 | 1.46945 | 1.33755 | 1.1616 | 1.00315 | 0.91285 | 1.08365 | 1.23785 | 1.66505 | 1.9353 | 2.0065 | 2.04535 | 1.91385 | 1.3965 | 1.1506 |
| 17-12-10 | 0.9924 | 0.88955 | 0.89235 | 0.93305 | 0.9703 | 1.16835 | 1.51675 | 1.58405 | 1.5836 | 1.4237 | 1.5237 | 1.4635 | 1.32155 | 1.2683 | 1.3067 | 1.3097 | 1.51035 | 1.88145 | 1.86005 | 1.764 | 1.87075 | 1.7137 | 1.4419 | 1.13165 |
| 18-12-10 | 1.04585 | 0.9978 | 0.9531 | 1.0259 | 1.03555 | 1.1085 | 1.24105 | 1.45465 | 1.5556 | 1.59375 | 1.7137 | 1.55745 | 1.59225 | 1.4976 | 1.4503 | 1.5383 | 1.72275 | 1.9422 | 1.81545 | 1.8691 | 1.82835 | 1.654 | 1.4613 | 1.25075 |
| 19-12-10 | 1.01335 | 0.9649 | 0.85165 | 0.8393 | 0.87455 | 1.02085 | 1.1973 | 1.38195 | 1.4329 | 1.5144 | 1.56185 | 1.6668 | 1.66855 | 1.583 | 1.5446 | 1.56055 | 1.6182 | 1.9408 | 2.063 | 1.8603 | 1.9287 | 1.7213 | 1.3844 | 1.07675 |
| 20-12-10 | 0.97275 | 0.88915 | 0.8695 | 0.8516 | 0.8644 | 1.0627 | 1.26855 | 1.47305 | 1.6125 | 1.564 | 1.52835 | 1.65495 | 1.30235 | 1.2717 | 1.2394 | 1.26625 | 1.4102 | 1.8667 | 1.9802 | 1.94445 | 1.8524 | 1.7196 | 1.46865 | 1.1833 |
| 21-12-10 | 1.01275 | 0.9736 | 0.9689 | 1.00005 | 0.97655 | 1.15625 | 1.36935 | 1.47975 | 1.5513 | 1.5359 | 1.3776 | 1.2596 | 1.00545 | 1.09455 | 1.07845 | 1.25705 | 1.4067 | 1.85785 | 1.98185 | 1.91445 | 1.9697 | 1.7576 | 1.51 | 1.2316 |
| 22-12-10 | 1.0144 | 0.9058 | 0.8595 | 0.9124 | 0.933 | 1.10025 | 1.2823 | 1.597 | 1.52535 | 1.55965 | 1.6045 | 1.3512 | 1.14805 | 1.06865 | 1.06455 | 1.1147 | 1.3669 | 1.7799 | 1.9834 | 1.9991 | 2.0222 | 1.82945 | 1.60675 | 1.44195 |
| 23-12-10 | 1.19135 | 1.0196 | 0.87645 | 0.9093 | 0.88395 | 1.11725 | 1.23125 | 1.40115 | 1.52045 | 1.41065 | 1.471 | 1.42955 | 1.23705 | 1.14505 | 1.0733 | 1.04085 | 1.2717 | 1.8048 | 1.89385 | 1.88275 | 1.88935 | 1.7601 | 1.5538 | 1.1846 |
| 24-12-10 | 1.04735 | 0.9894 | 0.9345 | 0.9947 | 1.0851 | 1.24585 | 1.48695 | 1.6829 | 1.6934 | 1.52875 | 1.6189 | 1.49145 | 1.4202 | 1.40165 | 1.34175 | 1.40015 | 1.51605 | 1.7956 | 1.8856 | 1.78905 | 1.7681 | 1.78305 | 1.6545 | 1.37125 |
| 25-12-10 | 1.1186 | 1.03785 | 0.92235 | 0.9829 | 1.04455 | 1.1977 | 1.3606 | 1.5785 | 1.80085 | 1.9354 | 1.9519 | 1.90555 | 1.73475 | 1.8345 | 1.6766 | 1.8226 | 1.9058 | 1.97125 | 1.88555 | 1.88495 | 1.89965 | 1.6929 | 1.4065 | 1.1196 |
| 26-12-10 | 0.98875 | 0.9406 | 0.88845 | 0.90615 | 0.95735 | 1.0066 | 1.25135 | 1.40265 | 1.4607 | 1.53195 | 1.47665 | 1.52995 | 1.54185 | 1.345 | 1.29945 | 1.2398 | 1.26635 | 1.796 | 1.8741 | 1.82245 | 1.8712 | 1.57815 | 1.3358 | 1.15695 |
| 27-12-10 | 1.02875 | 0.89825 | 0.9442 | 0.9192 | 0.9634 | 1.11815 | 1.3113 | 1.461 | 1.5462 | 1.60665 | 1.44795 | 1.31615 | 1.1917 | 1.0086 | 0.94715 | 0.94185 | 1.28205 | 1.7889 | 1.9474 | 1.8889 | 1.8277 | 1.6175 | 1.41945 | 1.1202 |
| 28-12-10 | 0.94335 | 0.8621 | 0.8608 | 0.85205 | 0.91555 | 1.11485 | 1.16335 | 1.33495 | 1.58755 | 1.58045 | 1.49165 | 1.4111 | 1.32045 | 1.17035 | 1.25115 | 1.35945 | 1.44955 | 1.88345 | 1.7173 | 1.87565 | 1.8702 | 1.7206 | 1.4872 | 1.02695 |
| 29-12-10 | 0.9401 | 0.8864 | 0.85125 | 0.8987 | 0.8607 | 1.05945 | 1.1335 | 1.36715 | 1.5145 | 1.4688 | 1.59785 | 1.5233 | 1.3434 | 1.14175 | 1.09245 | 1.20115 | 1.3825 | 1.86105 | 1.95775 | 1.9801 | 1.9313 | 1.75975 | 1.5336 | 1.2862 |
| 30-12-10 | 1.07085 | 1.04455 | 1.03525 | 1.0834 | 1.0896 | 1.33275 | 1.4621 | 1.5513 | 1.661 | 1.7054 | 1.50555 | 1.32895 | 1.32905 | 1.2266 | 1.1963 | 1.1947 | 1.28515 | 1.78255 | 1.90425 | 1.9516 | 1.89035 | 1.66335 | 1.4657 | 1.20965 |
| 31-12-10 | 1.0296 | 1.04095 | 1.0785 | 1.1178 | 1.14055 | 1.31345 | 1.48015 | 1.68475 | 1.8496 | 1.8254 | 1.71725 | 1.6683 | 1.305 | 1.31995 | 1.2804 | 1.51425 | 1.61375 | 2.02255 | 1.99955 | 1.9661 | 1.88775 | 1.71055 | 1.505 | 1.25165 |

# Appendix C

## Annual hourly PV data (2010)

| Date | 1:00 AM | 2:00 AM | 3:00 AM | 4:00 AM | 5:00 AM | 6:00 AM | 7:00 AM | 8:00 AM | 9:00 AM | 10:00 AM | 11:00 AM | 12:00 PM | 1:00 PM | 2:00 PM | 3:00 PM | 4:00 PM | 5:00 PM | 6:00 PM | 7:00 PM | 8:00 PM | 9:00 PM | 10:00 PM | 11:00 PM | 12:00 AM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 01-01-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.1287 | 0.53955 | 0.5445 | 0.74745 | 0.46035 | 0.8316 | 0.47025 | 0.5742 | 0.099 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 02-01-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.297 | 0.5544 | 0.46035 | 0.66825 | 0.891 | 1.7028 | 1.4751 | 0.63855 | 0.11385 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 03-01-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0099 | 0.693 | 1.12365 | 1.87605 | 2.29185 | 2.22255 | 1.8612 | 1.6533 | 1.0296 | 0.2475 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 04-01-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0099 | 0.6732 | 1.46025 | 2.0592 | 2.30175 | 2.12355 | 2.27205 | 1.77705 | 1.0692 | 0.26235 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 05-01-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.36135 | 0.9207 | 1.9305 | 1.6236 | 2.02455 | 2.04435 | 1.7919 | 0.8217 | 0.20295 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 06-01-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.693 | 1.4652 | 2.0691 | 2.0394 | 2.5146 | 1.3761 | 0.80685 | 0.594 | 0.1485 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 07-01-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.30195 | 0.7326 | 0.96525 | 2.08395 | 1.6929 | 1.8117 | 0.76725 | 0.75735 | 0.19305 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 08-01-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0396 | 0.55935 | 1.05435 | 0.9999 | 1.49985 | 1.76715 | 2.1879 | 1.49985 | 1.12365 | 0.297 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 09-01-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.37125 | 0.75735 | 1.16325 | 1.16325 | 0.51975 | 0.9405 | 0.8613 | 1.0197 | 0.27225 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10-01-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.59895 | 0.76725 | 1.5741 | 1.61865 | 1.0197 | 1.59885 | 0.34155 | 0.51975 | 0.1386 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11-01-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.02475 | 0.34155 | 1.22265 | 1.4256 | 1.6038 | 0.51975 | 0.5445 | 1.17315 | 0.2079 | 0.0594 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12-01-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.6831 | 1.4256 | 1.03455 | 0.64845 | 0.8019 | 1.2969 | 0.3564 | 0.3861 | 0.03465 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 13-01-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0099 | 0.70785 | 1.46025 | 1.9503 | 1.53945 | 2.37105 | 1.5345 | 1.9107 | 1.09395 | 0.09405 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 14-01-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0099 | 0.65835 | 1.35135 | 2.0295 | 2.52945 | 2.5443 | 1.37115 | 0.99495 | 0.9999 | 0.37125 | 0.00495 | 0 | 0 | 0 | 0 | 0 | 0 |
| 15-01-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0099 | 0.3168 | 0.8514 | 1.0197 | 1.48005 | 1.16325 | 1.08405 | 0.8316 | 0.6633 | 0.26235 | 0.00495 | 0 | 0 | 0 | 0 | 0 | 0 |
| 16-01-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.01485 | 0.5346 | 1.188 | 1.6632 | 1.72755 | 0.7128 | 1.0098 | 1.6137 | 0.6336 | 0.1683 | 0.00495 | 0 | 0 | 0 | 0 | 0 | 0 |
| 17-01-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.01485 | 0.30195 | 0.693 | 0.44055 | 0.5544 | 0.4554 | 0.42075 | 0.75735 | 0.3465 | 0.1782 | 0.00495 | 0 | 0 | 0 | 0 | 0 | 0 |
| 18-01-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.1287 | 0.2574 | 0.8712 | 0.64845 | 1.35135 | 0.7128 | 0.62865 | 1.13355 | 0.06435 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 19-01-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.2079 | 1.00485 | 2.0889 | 2.25225 | 1.99485 | 2.08395 | 0.37125 | 1.21275 | 0.25245 | 0.00495 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20-01-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.01485 | 0.13365 | 0.59895 | 0.4158 | 2.5443 | 0.4752 | 0.7227 | 0.7326 | 0.51975 | 0.4257 | 0.01485 | 0 | 0 | 0 | 0 | 0 | 0 |
| 21-01-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.1386 | 0.26235 | 0.3861 | 0.48015 | 0.47025 | 0.4356 | 0.38115 | 0.26235 | 0.19305 | 0.00495 | 0 | 0 | 0 | 0 | 0 | 0 |
| 22-01-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.42075 | 0.7326 | 1.21275 | 0.4851 | 2.2869 | 2.0988 | 1.87605 | 0.2475 | 0.30195 | 0.0099 | 0 | 0 | 0 | 0 | 0 | 0 |
| 23-01-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0396 | 0.75735 | 1.6038 | 1.1781 | 1.0494 | 2.7225 | 2.3562 | 2.0988 | 1.4058 | 0.53955 | 0.0198 | 0 | 0 | 0 | 0 | 0 | 0 |
| 24-01-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.01485 | 0.2277 | 0.4851 | 0.5643 | 0.83655 | 0.73755 | 1.45035 | 0.4356 | 0.3069 | 0.1089 | 0.00495 | 0 | 0 | 0 | 0 | 0 | 0 |
| 25-01-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0099 | 0.1386 | 0.40095 | 0.7425 | 0.7326 | 0.58905 | 0.45045 | 0.69795 | 0.29205 | 0.4554 | 0.0198 | 0 | 0 | 0 | 0 | 0 | 0 |
| 26-01-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0198 | 0.1881 | 0.5544 | 0.8118 | 0.7524 | 1.2969 | 1.17315 | 0.91575 | 1.3167 | 0.42075 | 0.0198 | 0 | 0 | 0 | 0 | 0 | 0 |
| 27-01-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.03465 | 0.2079 | 0.5247 | 0.5148 | 0.9306 | 1.05435 | 1.52955 | 1.2771 | 0.5544 | 0.3663 | 0.0198 | 0 | 0 | 0 | 0 | 0 | 0 |
| 28-01-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.06435 | 0.82665 | 1.4652 | 2.22255 | 2.772 | 2.49975 | 2.32155 | 1.27215 | 0.5247 | 0.53955 | 0.0297 | 0 | 0 | 0 | 0 | 0 | 0 |
| 29-01-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0693 | 0.7326 | 0.9306 | 1.7523 | 0.8118 | 1.4157 | 2.7225 | 1.03455 | 0.27225 | 0.1782 | 0.0099 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30-01-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0693 | 0.5346 | 1.44045 | 1.485 | 2.7027 | 2.5443 | 2.4156 | 2.15325 | 1.4949 | 0.4851 | 0.0297 | 0 | 0 | 0 | 0 | 0 | 0 |
| 31-01-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0792 | 0.4455 | 1.5345 | 2.38095 | 1.9602 | 2.9601 | 2.76705 | 2.25225 | 0.9801 | 0.6435 | 0.04455 | 0 | 0 | 0 | 0 | 0 | 0 |
| 01-02-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.02475 | 0.7029 | 0.99495 | 2.39085 | 1.5444 | 2.3067 | 1.1088 | 0.93555 | 0.87615 | 0.6237 | 0.00495 | 0 | 0 | 0 | 0 | 0 | 0 |
| 02-02-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.06435 | 0.71775 | 0.68805 | 1.9305 | 0.9702 | 1.00485 | 1.4652 | 1.22265 | 1.60875 | 0.6336 | 0.0099 | 0 | 0 | 0 | 0 | 0 | 0 |
| 03-02-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.11385 | 0.7128 | 1.69785 | 1.65825 | 2.36115 | 2.67795 | 2.8017 | 2.3562 | 0.91575 | 0.61875 | 0.0099 | 0 | 0 | 0 | 0 | 0 | 0 |
| 04-02-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.05445 | 0.16335 | 0.29205 | 0.4257 | 0.80685 | 0.495 | 0.5247 | 0.47025 | 0.297 | 0.3069 | 0.0099 | 0 | 0 | 0 | 0 | 0 | 0 |

| | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 05-02-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.13365 | 0.98505 | 1.77705 | 0.50985 | 2.18295 | 2.31165 | 1.40085 | 1.1682 | 0.4851 | 0.44055 | 0.01485 | 0 | 0 | 0 | 0 | 0 | 0 |
| 06-02-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0396 | 0.6237 | 0.51975 | 1.2771 | 0.48015 | 2.61855 | 2.8413 | 2.2968 | 1.38105 | 0.6336 | 0.0297 | 0 | 0 | 0 | 0 | 0 | 0 |
| 07-02-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.16335 | 1.02465 | 1.7424 | 2.4651 | 2.64825 | 2.7225 | 2.7918 | 2.45025 | 1.65825 | 0.75735 | 0.0396 | 0 | 0 | 0 | 0 | 0 | 0 |
| 08-02-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.05445 | 0.4356 | 0.81675 | 1.08405 | 1.57905 | 1.53945 | 1.74735 | 1.2771 | 0.69795 | 0.3465 | 0.0198 | 0 | 0 | 0 | 0 | 0 | 0 |
| 09-02-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1881 | 1.04445 | 0.64845 | 2.2869 | 2.2077 | 2.53935 | 2.98485 | 2.49975 | 1.386 | 0.75735 | 0.05445 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10-02-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1188 | 0.62865 | 0.34155 | 1.53945 | 1.07415 | 0.71775 | 2.3364 | 1.94535 | 0.8712 | 0.56925 | 0.0495 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11-02-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.11385 | 0.6138 | 1.1781 | 1.00485 | 1.52955 | 2.37105 | 3.00465 | 2.5344 | 1.8117 | 0.8811 | 0.08415 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12-02-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.099 | 0.35145 | 1.01475 | 1.5543 | 2.5641 | 1.77705 | 1.6236 | 1.3563 | 0.99 | 0.41085 | 0.04455 | 0 | 0 | 0 | 0 | 0 | 0 |
| 13-02-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.22275 | 1.1088 | 1.82655 | 2.5245 | 2.73735 | 2.4651 | 2.59875 | 2.4552 | 1.46025 | 0.7425 | 0.0891 | 0 | 0 | 0 | 0 | 0 | 0 |
| 14-02-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.198 | 1.14345 | 1.98 | 2.04435 | 2.5839 | 2.7324 | 3.0393 | 2.56905 | 1.8216 | 0.79695 | 0.099 | 0 | 0 | 0 | 0 | 0 | 0 |
| 15-02-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.25245 | 1.14345 | 2.0493 | 2.76705 | 1.82655 | 2.1186 | 1.96515 | 1.38105 | 0.75735 | 0.6039 | 0.07425 | 0 | 0 | 0 | 0 | 0 | 0 |
| 16-02-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.18315 | 1.21275 | 2.06415 | 2.7423 | 2.72745 | 2.6235 | 2.77695 | 2.52945 | 1.42065 | 0.8316 | 0.10395 | 0 | 0 | 0 | 0 | 0 | 0 |
| 17-02-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.3069 | 1.2276 | 2.1186 | 2.8215 | 2.93535 | 2.98485 | 3.11355 | 2.7027 | 1.95525 | 0.8118 | 0.10395 | 0 | 0 | 0 | 0 | 0 | 0 |
| 18-02-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0594 | 0.3465 | 0.54945 | 0.6336 | 0.7029 | 0.61875 | 0.6831 | 0.9207 | 0.84645 | 0.51975 | 0.0693 | 0 | 0 | 0 | 0 | 0 | 0 |
| 19-02-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.06435 | 0.4356 | 0.9207 | 0.98505 | 0.7821 | 0.5643 | 0.594 | 0.6633 | 1.36125 | 0.91575 | 0.1287 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20-02-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1287 | 0.3267 | 0.49995 | 0.49005 | 0.68805 | 0.6732 | 0.8217 | 0.9801 | 0.7029 | 0.57915 | 0.08415 | 0 | 0 | 0 | 0 | 0 | 0 |
| 21-02-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1089 | 0.4752 | 0.495 | 0.6138 | 0.7326 | 0.7821 | 1.31175 | 1.2177 | 0.7326 | 0.77715 | 0.11385 | 0 | 0 | 0 | 0 | 0 | 0 |
| 22-02-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.3762 | 1.3563 | 2.25225 | 2.95515 | 3.39075 | 3.51945 | 3.32145 | 2.5938 | 1.64835 | 0.7029 | 0.10395 | 0 | 0 | 0 | 0 | 0 | 0 |
| 23-02-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.09405 | 0.23265 | 0.3663 | 0.5049 | 0.54945 | 0.5742 | 0.6633 | 0.72765 | 0.5049 | 0.4356 | 0.0693 | 0 | 0 | 0 | 0 | 0 | 0 |
| 24-02-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.11385 | 0.4653 | 1.36125 | 1.23255 | 1.00485 | 0.9207 | 1.7622 | 2.5047 | 2.0097 | 0.9999 | 0.1584 | 0 | 0 | 0 | 0 | 0 | 0 |
| 25-02-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.2475 | 0.83655 | 2.33145 | 3.0393 | 3.4749 | 3.6036 | 3.40065 | 2.47005 | 1.85625 | 0.65835 | 0.1089 | 0 | 0 | 0 | 0 | 0 | 0 |
| 26-02-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0792 | 0.33165 | 0.52965 | 0.51975 | 0.5643 | 0.58905 | 0.6237 | 0.5742 | 1.86615 | 1.06425 | 0.1782 | 0 | 0 | 0 | 0 | 0 | 0 |
| 27-02-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.08415 | 0.25245 | 0.3861 | 1.1088 | 3.0195 | 1.2078 | 3.42045 | 0.8712 | 2.12355 | 1.24245 | 0.21285 | 0 | 0 | 0 | 0 | 0 | 0 |
| 28-02-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0099 | 0.4851 | 1.44045 | 2.3562 | 2.9898 | 3.25215 | 1.87605 | 2.8314 | 2.45025 | 1.32165 | 1.19295 | 0.2079 | 0 | 0 | 0 | 0 | 0 | 0 |
| 01-03-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.1287 | 0.39105 | 0.42075 | 0.6633 | 0.56925 | 0.6534 | 1.5543 | 1.1286 | 0.90585 | 0.57915 | 0.13365 | 0 | 0 | 0 | 0 | 0 | 0 |
| 02-03-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.13365 | 0.4653 | 1.4553 | 1.02465 | 2.6334 | 2.4651 | 2.71755 | 2.8314 | 1.4949 | 0.21285 | 0.0495 | 0 | 0 | 0 | 0 | 0 | 0 |
| 03-03-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.15345 | 0.88605 | 2.14335 | 2.03445 | 3.2868 | 0.594 | 1.2177 | 0.51975 | 1.0494 | 1.25235 | 0.30195 | 0 | 0 | 0 | 0 | 0 | 0 |
| 04-03-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0198 | 0.6138 | 1.54935 | 2.4255 | 3.0888 | 3.3066 | 3.17295 | 3.3561 | 2.7423 | 1.87605 | 0.9504 | 0.23265 | 0 | 0 | 0 | 0 | 0 | 0 |
| 05-03-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.01485 | 0.35145 | 0.89595 | 1.48995 | 2.35125 | 2.2671 | 1.54935 | 1.38105 | 1.8414 | 1.19295 | 0.9009 | 0.2277 | 0 | 0 | 0 | 0 | 0 | 0 |
| 06-03-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.01485 | 0.37125 | 1.37115 | 1.6236 | 1.61865 | 2.8611 | 3.30165 | 3.48975 | 2.51955 | 1.9701 | 0.9801 | 0.25245 | 0 | 0 | 0 | 0 | 0 | 0 |
| 07-03-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0099 | 0.20295 | 0.6039 | 0.74745 | 1.69785 | 3.04425 | 2.5839 | 3.267 | 3.02445 | 1.0494 | 0.78705 | 0.0495 | 0 | 0 | 0 | 0 | 0 | 0 |
| 08-03-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.01485 | 0.297 | 1.1979 | 2.6136 | 3.3264 | 3.75705 | 3.44025 | 3.25215 | 3.13335 | 0.49995 | 0.2277 | 0.0594 | 0 | 0 | 0 | 0 | 0 | 0 |
| 09-03-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0396 | 0.7326 | 1.67805 | 2.52945 | 3.1482 | 3.7818 | 3.88575 | 2.87595 | 1.5444 | 0.65835 | 1.21275 | 0.2376 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10-03-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.04455 | 0.73755 | 1.7622 | 2.6037 | 3.3165 | 3.6036 | 3.4848 | 3.50955 | 2.97 | 2.3562 | 1.39095 | 0.3762 | 0.00495 | 0 | 0 | 0 | 0 | 0 |
| 11-03-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.7821 | 1.78695 | 2.6829 | 3.2373 | 3.5046 | 3.4551 | 3.63825 | 2.99475 | 2.4057 | 1.45035 | 0.40095 | 0.00495 | 0 | 0 | 0 | 0 | 0 |
| 12-03-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.01485 | 0.18315 | 0.4158 | 0.44055 | 0.54945 | 1.0395 | 0.6534 | 0.6336 | 0.51975 | 0.42075 | 0.24255 | 0.20295 | 0.00495 | 0 | 0 | 0 | 0 | 0 |
| 13-03-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.01485 | 0.82665 | 1.8315 | 2.69775 | 3.3264 | 3.76695 | 3.4947 | 3.6135 | 2.9799 | 2.40075 | 1.4949 | 0.4554 | 0.0099 | 0 | 0 | 0 | 0 | 0 |
| 14-03-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.02475 | 0.8613 | 1.8711 | 2.7126 | 3.4155 | 3.65805 | 3.48975 | 3.762 | 3.17295 | 2.17305 | 1.42065 | 0.396 | 0.0099 | 0 | 0 | 0 | 0 | 0 |
| 15-03-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0297 | 0.891 | 1.84635 | 2.81655 | 3.5145 | 3.77685 | 4.04415 | 3.82635 | 3.2868 | 2.41065 | 1.41075 | 0.3465 | 0.00495 | 0 | 0 | 0 | 0 | 0 |
| 16-03-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0297 | 0.62865 | 1.6929 | 2.68785 | 3.53925 | 3.75705 | 4.02435 | 3.84615 | 3.09375 | 1.4058 | 1.25235 | 0.26235 | 0.00495 | 0 | 0 | 0 | 0 | 0 |
| 17-03-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.02475 | 0.792 | 1.89585 | 2.80665 | 3.35115 | 3.6333 | 3.99465 | 3.57885 | 3.00465 | 2.53935 | 1.43055 | 0.4257 | 0.0099 | 0 | 0 | 0 | 0 | 0 |
| 18-03-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0594 | 0.9405 | 1.88595 | 2.8413 | 3.564 | 3.7422 | 4.1184 | 3.8907 | 3.2076 | 2.45025 | 1.40085 | 0.42075 | 0.0099 | 0 | 0 | 0 | 0 | 0 |
| 19-03-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.08415 | 0.99495 | 2.01465 | 2.92545 | 3.62835 | 4.0491 | 4.14315 | 3.9105 | 3.37095 | 2.574 | 1.4256 | 0.3564 | 0.0099 | 0 | 0 | 0 | 0 | 0 |
| 20-03-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0198 | 0.495 | 1.1385 | 1.4355 | 3.06405 | 3.267 | 3.3066 | 3.3858 | 2.86605 | 2.46015 | 0.594 | 0.5544 | 0.0198 | 0 | 0 | 0 | 0 | 0 |

| | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 21-03-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.04455 | 0.32175 | 1.02465 | 1.92555 | 2.9007 | 3.33135 | 3.37095 | 2.8116 | 1.76715 | 2.46015 | 1.47015 | 0.4455 | 0.01485 | 0 | 0 | 0 | 0 | 0 |
| 22-03-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1287 | 1.07415 | 2.04435 | 3.00465 | 3.7026 | 4.1184 | 4.2174 | 3.9798 | 3.43035 | 2.62845 | 1.65825 | 0.46035 | 0.0198 | 0 | 0 | 0 | 0 | 0 |
| 23-03-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1485 | 1.0593 | 2.0889 | 2.91555 | 3.6432 | 3.71745 | 3.762 | 3.8214 | 3.07395 | 2.5938 | 1.40085 | 0.49005 | 0.0198 | 0 | 0 | 0 | 0 | 0 |
| 24-03-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.10395 | 0.67815 | 1.24245 | 3.00465 | 3.5145 | 3.5046 | 2.99475 | 2.55915 | 2.9304 | 1.92555 | 0.74745 | 0.4455 | 0.0198 | 0 | 0 | 0 | 0 | 0 |
| 25-03-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.08415 | 0.87615 | 1.56915 | 1.90575 | 3.70755 | 2.9898 | 4.13325 | 3.63825 | 3.48975 | 2.26215 | 0.74745 | 0.57915 | 0.02475 | 0 | 0 | 0 | 0 | 0 |
| 26-03-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.198 | 1.1682 | 2.1285 | 3.0393 | 3.6828 | 3.82635 | 4.15305 | 3.89565 | 3.25215 | 2.6532 | 1.6632 | 0.5346 | 0.02475 | 0 | 0 | 0 | 0 | 0 |
| 27-03-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.20295 | 1.16325 | 2.1978 | 3.14325 | 3.75705 | 3.96 | 4.00455 | 4.0392 | 3.4452 | 2.71755 | 1.64835 | 0.5445 | 0.0297 | 0 | 0 | 0 | 0 | 0 |
| 28-03-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.13365 | 1.03455 | 2.0394 | 2.9997 | 3.79665 | 3.9204 | 4.26195 | 3.42045 | 2.72745 | 2.33145 | 1.62855 | 0.396 | 0.0198 | 0 | 0 | 0 | 0 | 0 |
| 29-03-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.13365 | 0.59895 | 1.0989 | 1.38105 | 1.584 | 2.90565 | 2.23245 | 2.7423 | 2.1978 | 1.20285 | 0.891 | 0.40095 | 0.02475 | 0 | 0 | 0 | 0 | 0 |
| 30-03-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1584 | 0.40095 | 2.31165 | 3.05415 | 2.63835 | 3.3066 | 3.7917 | 3.65805 | 1.8612 | 2.19285 | 1.0692 | 0.68805 | 0.0396 | 0 | 0 | 0 | 0 | 0 |
| 31-03-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.2871 | 1.30185 | 2.1978 | 3.0789 | 2.6631 | 1.70775 | 2.03445 | 1.13355 | 0.57915 | 0.8415 | 0.69795 | 0.3564 | 0.02475 | 0 | 0 | 0 | 0 | 0 |
| 01-04-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.2772 | 1.24245 | 2.2671 | 3.04425 | 3.65805 | 4.07385 | 4.0392 | 4.17285 | 3.6135 | 2.8017 | 1.71765 | 0.62865 | 0.0396 | 0 | 0 | 0 | 0 | 0 |
| 02-04-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.099 | 0.2673 | 1.21275 | 0.95535 | 1.38105 | 2.23245 | 1.36125 | 1.4157 | 0.9504 | 0.94545 | 1.0989 | 0.63855 | 0.00495 | 0 | 0 | 0 | 0 | 0 |
| 03-04-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.2475 | 0.58905 | 0.84645 | 1.07415 | 1.68795 | 3.4551 | 3.9996 | 3.9204 | 3.48975 | 2.72745 | 1.75725 | 0.792 | 0.0099 | 0 | 0 | 0 | 0 | 0 |
| 04-04-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.24255 | 0.68805 | 1.4256 | 1.0296 | 0.63855 | 0.88605 | 1.0692 | 0.91575 | 0.594 | 0.59895 | 1.08405 | 0.29205 | 0.00495 | 0 | 0 | 0 | 0 | 0 |
| 05-04-10 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.4257 | 0.4851 | 2.4156 | 3.1383 | 3.76695 | 4.15305 | 4.5045 | 4.0986 | 3.4353 | 2.87595 | 1.87605 | 0.78705 | 0.01485 | 0 | 0 | 0 | 0 | 0 |
| 06-04-10 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.4257 | 1.4157 | 2.4255 | 3.2472 | 3.94515 | 4.455 | 4.5243 | 4.16295 | 3.52935 | 2.8908 | 1.8018 | 0.7623 | 0.0198 | 0 | 0 | 0 | 0 | 0 |
| 07-04-10 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.4356 | 1.48005 | 2.51955 | 3.28185 | 4.0887 | 4.4748 | 4.53915 | 4.28175 | 3.7224 | 2.90565 | 1.9206 | 0.7821 | 0.02475 | 0 | 0 | 0 | 0 | 0 |
| 08-04-10 | 0 | 0 | 0 | 0 | 0 | 0.0099 | 0.49995 | 1.51965 | 2.5443 | 3.44025 | 4.1085 | 4.4946 | 4.55895 | 4.15305 | 3.73725 | 2.85615 | 1.93545 | 0.8019 | 0.03465 | 0 | 0 | 0 | 0 | 0 |
| 09-04-10 | 0 | 0 | 0 | 0 | 0 | 0.0099 | 0.4752 | 1.49985 | 2.45025 | 3.2076 | 3.7026 | 4.22235 | 4.08375 | 4.2174 | 3.5541 | 2.93535 | 1.7721 | 0.8217 | 0.0396 | 0 | 0 | 0 | 0 | 0 |
| 10-04-10 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.1683 | 0.37125 | 0.6237 | 0.61875 | 0.88605 | 1.1682 | 1.98495 | 1.4553 | 2.9799 | 1.49985 | 0.76725 | 0.44055 | 0.02475 | 0 | 0 | 0 | 0 | 0 |
| 11-04-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.09405 | 0.26235 | 0.42075 | 0.5544 | 0.65835 | 0.7227 | 0.72765 | 0.7425 | 0.63855 | 0.6336 | 1.69785 | 0.79695 | 0.0495 | 0 | 0 | 0 | 0 | 0 |
| 12-04-10 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.1683 | 0.35145 | 1.2573 | 0.7029 | 2.3067 | 3.9303 | 2.80665 | 3.7917 | 3.60855 | 2.91555 | 1.6929 | 0.72765 | 0.0495 | 0 | 0 | 0 | 0 | 0 |
| 13-04-10 | 0 | 0 | 0 | 0 | 0 | 0.01485 | 0.41085 | 1.5939 | 2.65815 | 3.54915 | 4.2075 | 4.5738 | 4.58865 | 4.25205 | 3.49965 | 2.94525 | 1.85625 | 0.85635 | 0.06435 | 0 | 0 | 0 | 0 | 0 |
| 14-04-10 | 0 | 0 | 0 | 0 | 0 | 0.0099 | 0.3168 | 1.584 | 2.47995 | 3.44025 | 3.9402 | 4.2768 | 4.15305 | 4.257 | 3.6729 | 2.92545 | 1.90575 | 0.81675 | 0.0693 | 0 | 0 | 0 | 0 | 0 |
| 15-04-10 | 0 | 0 | 0 | 0 | 0 | 0.0198 | 0.5346 | 1.57905 | 2.2473 | 3.35115 | 4.0392 | 3.5937 | 4.2768 | 4.40055 | 3.59865 | 2.8314 | 1.34145 | 0.1782 | 0.01485 | 0 | 0 | 0 | 0 | 0 |
| 16-04-10 | 0 | 0 | 0 | 0 | 0 | 0.02475 | 0.60885 | 1.67805 | 2.7225 | 3.6036 | 4.26195 | 4.62825 | 4.6827 | 4.32135 | 3.80655 | 3.03435 | 2.0394 | 0.82665 | 0.08415 | 0 | 0 | 0 | 0 | 0 |
| 17-04-10 | 0 | 0 | 0 | 0 | 0 | 0.0297 | 0.64845 | 1.7226 | 2.7423 | 3.6234 | 4.03425 | 4.21245 | 3.88575 | 3.96 | 3.11355 | 2.92545 | 2.00475 | 0.93555 | 0.10395 | 0 | 0 | 0 | 0 | 0 |
| 18-04-10 | 0 | 0 | 0 | 0 | 0 | 0.03465 | 0.7029 | 1.74735 | 2.76705 | 3.6432 | 4.2966 | 4.47975 | 4.2273 | 4.44015 | 3.79665 | 3.0591 | 2.0196 | 0.9405 | 0.1089 | 0 | 0 | 0 | 0 | 0 |
| 19-04-10 | 0 | 0 | 0 | 0 | 0 | 0.0198 | 0.3762 | 0.93555 | 1.8711 | 3.33135 | 3.7026 | 1.66815 | 2.52945 | 4.0491 | 1.485 | 1.7424 | 1.22265 | 0.6039 | 0.0693 | 0 | 0 | 0 | 0 | 0 |
| 20-04-10 | 0 | 0 | 0 | 0 | 0 | 0.01485 | 0.22275 | 0.9108 | 2.673 | 3.52935 | 2.2077 | 4.3362 | 3.4848 | 3.99465 | 3.2868 | 1.64835 | 0.7227 | 0.87615 | 0.10395 | 0 | 0 | 0 | 0 | 0 |
| 21-04-10 | 0 | 0 | 0 | 0 | 0 | 0.03465 | 0.5742 | 1.24245 | 1.06425 | 0.69795 | 0.9702 | 2.1285 | 1.07415 | 1.98 | 3.37095 | 1.9503 | 1.3068 | 0.3762 | 0.0495 | 0 | 0 | 0 | 0 | 0 |
| 22-04-10 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.7623 | 1.78695 | 2.7918 | 1.386 | 1.42065 | 4.22235 | 4.20255 | 4.2372 | 3.66795 | 3.10365 | 1.9899 | 0.9405 | 0.12375 | 0 | 0 | 0 | 0 | 0 |
| 23-04-10 | 0 | 0 | 0 | 0 | 0 | 0.0099 | 0.72765 | 1.65825 | 1.287 | 1.74735 | 2.28195 | 4.7322 | 4.16295 | 1.6731 | 1.53945 | 1.6137 | 1.16325 | 0.4158 | 0.05445 | 0 | 0 | 0 | 0 | 0 |
| 24-04-10 | 0 | 0 | 0 | 0 | 0 | 0.01485 | 0.8316 | 1.8711 | 2.8809 | 3.74715 | 4.0491 | 4.37085 | 4.5441 | 4.51935 | 3.94515 | 3.1284 | 2.1483 | 1.01475 | 0.1386 | 0 | 0 | 0 | 0 | 0 |
| 25-04-10 | 0 | 0 | 0 | 0 | 0 | 0.0198 | 0.79695 | 1.8216 | 2.8116 | 3.5739 | 3.9996 | 4.4451 | 4.7223 | 4.45005 | 3.9501 | 3.14325 | 2.12355 | 1.0296 | 0.14355 | 0 | 0 | 0 | 0 | 0 |
| 26-04-10 | 0 | 0 | 0 | 0 | 0 | 0.0198 | 0.65835 | 1.4157 | 2.52945 | 3.36105 | 3.19275 | 4.07385 | 1.64835 | 2.21265 | 2.3463 | 2.64825 | 0.9504 | 0.60885 | 0.08415 | 0 | 0 | 0 | 0 | 0 |
| 27-04-10 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.19305 | 0.3267 | 0.6534 | 1.74735 | 1.5147 | 3.19275 | 0.78705 | 0.89595 | 2.01465 | 3.0294 | 2.03445 | 0.92565 | 0.13365 | 0 | 0 | 0 | 0 | 0 |
| 28-04-10 | 0 | 0 | 0 | 0 | 0 | 0.0495 | 0.49995 | 1.74735 | 2.7324 | 3.4353 | 3.62835 | 3.9996 | 4.17285 | 2.45025 | 2.9898 | 1.01475 | 2.1978 | 1.01475 | 0.1485 | 0 | 0 | 0 | 0 | 0 |
| 29-04-10 | 0 | 0 | 0 | 0 | 0 | 0.0594 | 0.9207 | 1.9602 | 2.9601 | 3.82635 | 4.455 | 4.45995 | 4.84605 | 4.45005 | 3.66795 | 3.12345 | 1.9899 | 1.00485 | 0.1485 | 0 | 0 | 0 | 0 | 0 |
| 30-04-10 | 0 | 0 | 0 | 0 | 0 | 0.0693 | 0.91575 | 1.97505 | 2.8314 | 3.56895 | 4.1382 | 4.5837 | 4.4154 | 4.57875 | 4.0095 | 3.20265 | 2.01465 | 0.94545 | 0.14355 | 0 | 0 | 0 | 0 | 0 |
| 01-05-10 | 0 | 0 | 0 | 0 | 0 | 0.07425 | 0.82665 | 1.85625 | 2.9304 | 3.65805 | 4.1877 | 4.47975 | 4.85595 | 4.3857 | 4.00455 | 3.0294 | 2.14335 | 1.1187 | 0.17325 | 0 | 0 | 0 | 0 | 0 |
| 02-05-10 | 0 | 0 | 0 | 0 | 0 | 0.07425 | 0.92565 | 1.94535 | 2.92545 | 3.7917 | 4.42035 | 4.76685 | 4.8015 | 4.52925 | 3.95505 | 3.0096 | 2.02455 | 1.07415 | 0.17325 | 0 | 0 | 0 | 0 | 0 |
| 03-05-10 | 0 | 0 | 0 | 0 | 0 | 0.0891 | 0.9009 | 1.9602 | 2.87595 | 3.61845 | 4.13325 | 4.2669 | 4.64805 | 4.53915 | 3.6828 | 3.069 | 2.08395 | 1.0098 | 0.1683 | 0 | 0 | 0 | 0 | 0 |

| | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 04-05-10 | 0 | 0 | 0 | 0 | 0 | 0.08415 | 0.95535 | 1.97505 | 2.93535 | 3.7026 | 4.27185 | 4.78665 | 4.8213 | 4.32135 | 3.06405 | 2.8017 | 2.15325 | 1.0494 | 0.1782 | 0 | 0 | 0 | 0 | 0 |
| 05-05-10 | 0 | 0 | 0 | 0 | 0 | 0.1089 | 0.9702 | 1.9899 | 2.9502 | 3.6828 | 4.2471 | 4.57875 | 4.8015 | 4.554 | 3.87585 | 3.18285 | 2.18295 | 1.08405 | 0.24255 | 0 | 0 | 0 | 0 | 0 |
| 06-05-10 | 0 | 0 | 0 | 0 | 0 | 0.099 | 0.97515 | 2.00475 | 2.99475 | 3.7125 | 4.3164 | 4.7421 | 4.56885 | 4.44015 | 3.8511 | 3.19275 | 2.2275 | 1.089 | 0.2475 | 0 | 0 | 0 | 0 | 0 |
| 07-05-10 | 0 | 0 | 0 | 0 | 0 | 0.0891 | 0.6633 | 1.75725 | 2.51955 | 3.79665 | 4.1382 | 4.81635 | 4.84605 | 4.56885 | 4.00455 | 3.1977 | 2.22255 | 1.0296 | 0.2376 | 0 | 0 | 0 | 0 | 0 |
| 08-05-10 | 0 | 0 | 0 | 0 | 0 | 0.0495 | 0.5544 | 1.56915 | 2.3265 | 1.86615 | 3.9105 | 4.11345 | 3.9699 | 3.42045 | 2.94525 | 2.82645 | 1.3068 | 0.5742 | 0.13365 | 0 | 0 | 0 | 0 | 0 |
| 09-05-10 | 0 | 0 | 0 | 0 | 0 | 0.0495 | 0.47025 | 1.87605 | 2.3661 | 3.7818 | 3.7422 | 4.12335 | 4.6233 | 4.3065 | 3.29175 | 2.75715 | 1.0296 | 0.48015 | 0.11385 | 0 | 0 | 0 | 0 | 0 |
| 10-05-10 | 0 | 0 | 0 | 0 | 0 | 0.0495 | 0.41085 | 0.94545 | 1.6731 | 1.36125 | 0.9009 | 0.7623 | 0.9702 | 4.29165 | 3.7818 | 2.4057 | 0.50985 | 0.43065 | 0.10395 | 0 | 0 | 0 | 0 | 0 |
| 11-05-10 | 0 | 0 | 0 | 0 | 0 | 0.1683 | 1.04445 | 2.0691 | 3.00465 | 3.77685 | 4.25205 | 4.4847 | 4.47975 | 4.4253 | 4.00455 | 3.2373 | 2.1582 | 1.09395 | 0.27225 | 0 | 0 | 0 | 0 | 0 |
| 12-05-10 | 0 | 0 | 0 | 0 | 0 | 0.17325 | 1.0593 | 1.6632 | 3.0591 | 3.89565 | 4.5144 | 4.79655 | 3.93525 | 3.70755 | 3.01455 | 2.29185 | 2.0592 | 0.73755 | 0.18315 | 0 | 0 | 0 | 0 | 0 |
| 13-05-10 | 0 | 0 | 0 | 0 | 0 | 0.0693 | 0.3366 | 0.79695 | 1.8216 | 3.90555 | 4.4055 | 3.65805 | 2.1978 | 2.06415 | 3.5541 | 1.9404 | 1.1979 | 0.7821 | 0.0495 | 0 | 0 | 0 | 0 | 0 |
| 14-05-10 | 0 | 0 | 0 | 0 | 0 | 0.03465 | 0.1881 | 0.41085 | 0.5742 | 1.5246 | 1.0395 | 1.1385 | 1.26225 | 1.089 | 1.188 | 1.38105 | 1.1781 | 0.5445 | 0.2574 | 0.00495 | 0 | 0 | 0 | 0 |
| 15-05-10 | 0 | 0 | 0 | 0 | 0 | 0.0594 | 0.31185 | 0.6336 | 0.86625 | 1.27215 | 1.21275 | 1.3959 | 1.4157 | 1.42065 | 1.02465 | 1.1187 | 0.8415 | 0.7821 | 0.15345 | 0 | 0 | 0 | 0 | 0 |
| 16-05-10 | 0 | 0 | 0 | 0 | 0 | 0.0396 | 0.2277 | 0.61875 | 0.84645 | 1.44045 | 1.74735 | 2.3859 | 1.9503 | 2.24235 | 1.2375 | 1.6038 | 0.9999 | 0.61875 | 0.2475 | 0.00495 | 0 | 0 | 0 | 0 |
| 17-05-10 | 0 | 0 | 0 | 0 | 0 | 0.0396 | 0.2277 | 0.3663 | 0.50985 | 0.62865 | 0.71775 | 1.089 | 0.9801 | 0.79695 | 0.6633 | 0.94545 | 1.7424 | 0.5247 | 0.29205 | 0.00495 | 0 | 0 | 0 | 0 |
| 18-05-10 | 0 | 0 | 0 | 0 | 0 | 0.1485 | 0.67815 | 0.76725 | 2.0097 | 2.66805 | 3.2967 | 4.19265 | 4.3065 | 4.30155 | 2.58885 | 1.84635 | 1.50975 | 0.9009 | 0.1485 | 0 | 0 | 0 | 0 | 0 |
| 19-05-10 | 0 | 0 | 0 | 0 | 0 | 0.23265 | 1.11375 | 2.15325 | 3.05415 | 2.4255 | 1.10385 | 2.66805 | 1.9701 | 2.2671 | 0.75735 | 0.92565 | 1.2078 | 0.65835 | 0.25245 | 0.00495 | 0 | 0 | 0 | 0 |
| 20-05-10 | 0 | 0 | 0 | 0 | 0 | 0.1188 | 0.58905 | 2.05425 | 3.1284 | 3.95505 | 4.5639 | 4.9005 | 4.9302 | 4.21245 | 4.10355 | 3.2274 | 2.19285 | 1.25235 | 0.3465 | 0.00495 | 0 | 0 | 0 | 0 |
| 21-05-10 | 0 | 0 | 0 | 0 | 0 | 0.23265 | 1.0692 | 1.98495 | 2.3661 | 1.86615 | 1.7028 | 3.19275 | 4.7916 | 4.1085 | 3.8016 | 3.3264 | 2.376 | 1.2573 | 0.35145 | 0.0099 | 0 | 0 | 0 | 0 |
| 22-05-10 | 0 | 0 | 0 | 0 | 0 | 0.2475 | 1.1682 | 2.17305 | 3.1383 | 3.7917 | 4.3362 | 4.4649 | 3.9996 | 4.3164 | 4.1184 | 3.2868 | 2.3859 | 1.3761 | 0.35145 | 0.0099 | 0 | 0 | 0 | 0 |
| 23-05-10 | 0 | 0 | 0 | 0 | 0 | 0.26235 | 1.17315 | 2.178 | 3.14325 | 3.83625 | 4.57875 | 4.851 | 4.86585 | 4.3758 | 4.12335 | 2.9799 | 2.04435 | 1.26225 | 0.3564 | 0.0099 | 0 | 0 | 0 | 0 |
| 24-05-10 | 0 | 0 | 0 | 0 | 0 | 0.17325 | 0.68805 | 2.1087 | 3.12345 | 3.8214 | 3.8412 | 4.2768 | 4.14315 | 4.0293 | 4.13325 | 3.07395 | 2.36115 | 0.91575 | 0.3861 | 0.0099 | 0 | 0 | 0 | 0 |
| 25-05-10 | 0 | 0 | 0 | 0 | 0 | 0.099 | 0.20295 | 0.71775 | 0.68805 | 0.75735 | 0.7425 | 0.94545 | 0.90585 | 0.74745 | 1.02465 | 1.5444 | 1.53945 | 0.4158 | 0.3861 | 0.0099 | 0 | 0 | 0 | 0 |
| 26-05-10 | 0 | 0 | 0 | 0 | 0 | 0.23265 | 0.69795 | 2.178 | 2.5344 | 3.7917 | 4.2867 | 4.43025 | 4.3956 | 4.3461 | 3.762 | 3.0096 | 1.60875 | 0.8118 | 0.1584 | 0.00495 | 0 | 0 | 0 | 0 |
| 27-05-10 | 0 | 0 | 0 | 0 | 0 | 0.0495 | 0.20295 | 0.3762 | 0.64845 | 2.6631 | 2.81655 | 3.12345 | 4.752 | 4.69755 | 4.1481 | 3.37095 | 2.4354 | 1.36125 | 0.3762 | 0.0099 | 0 | 0 | 0 | 0 |
| 28-05-10 | 0 | 0 | 0 | 0 | 0 | 0.297 | 1.19295 | 2.2077 | 3.168 | 3.9897 | 4.5936 | 4.9302 | 4.96485 | 4.69755 | 4.15305 | 3.38085 | 2.4453 | 1.4157 | 0.42075 | 0.01485 | 0 | 0 | 0 | 0 |
| 29-05-10 | 0 | 0 | 0 | 0 | 0 | 0.2871 | 1.21275 | 2.21265 | 3.1086 | 3.9105 | 4.3956 | 4.6332 | 4.91535 | 4.6926 | 4.14315 | 3.267 | 2.41065 | 1.37115 | 0.37125 | 0.01485 | 0 | 0 | 0 | 0 |
| 30-05-10 | 0 | 0 | 0 | 0 | 0 | 0.2574 | 0.8415 | 2.2176 | 3.1779 | 3.99465 | 4.59855 | 4.93515 | 4.9698 | 4.4154 | 4.0986 | 3.30165 | 2.4552 | 1.2078 | 0.4158 | 0.01485 | 0 | 0 | 0 | 0 |
| 31-05-10 | 0 | 0 | 0 | 0 | 0 | 0.1485 | 0.49995 | 1.01475 | 1.4256 | 1.59885 | 2.0592 | 2.17305 | 2.1681 | 2.5938 | 1.8117 | 2.4453 | 1.1385 | 0.80685 | 0.3168 | 0.01485 | 0 | 0 | 0 | 0 |
| 01-06-10 | 0 | 0 | 0 | 0 | 0 | 0.1089 | 0.3069 | 0.6435 | 1.33155 | 2.03445 | 3.26205 | 4.93515 | 4.9797 | 4.25205 | 4.0887 | 2.87595 | 1.56915 | 1.29195 | 0.36135 | 0.01485 | 0 | 0 | 0 | 0 |
| 02-06-10 | 0 | 0 | 0 | 0 | 0 | 0.10395 | 0.495 | 1.5345 | 3.1581 | 3.97485 | 3.45015 | 4.0788 | 3.72735 | 2.05425 | 2.3859 | 1.51965 | 1.8414 | 0.73755 | 0.37125 | 0.01485 | 0 | 0 | 0 | 0 |
| 03-06-10 | 0 | 0 | 0 | 0 | 0 | 0.10395 | 0.7623 | 1.3959 | 2.3067 | 2.9205 | 3.9501 | 4.1976 | 4.54905 | 3.3957 | 2.4651 | 2.44035 | 1.90575 | 0.81675 | 0.3465 | 0.01485 | 0 | 0 | 0 | 0 |
| 04-06-10 | 0 | 0 | 0 | 0 | 0 | 0.20295 | 0.30195 | 0.5445 | 1.1682 | 3.36105 | 1.45035 | 2.1978 | 1.53945 | 2.5839 | 1.7523 | 1.4949 | 1.98 | 1.0395 | 0.40095 | 0.0198 | 0 | 0 | 0 | 0 |
| 05-06-10 | 0 | 0 | 0 | 0 | 0 | 0.1188 | 0.60885 | 1.48995 | 2.6037 | 3.7818 | 3.94515 | 4.16295 | 4.0689 | 4.6926 | 4.1679 | 2.9502 | 2.47005 | 1.4454 | 0.49995 | 0.02475 | 0 | 0 | 0 | 0 |
| 06-06-10 | 0 | 0 | 0 | 0 | 0 | 0.1287 | 0.6237 | 1.0494 | 1.5444 | 2.0097 | 2.9304 | 2.4255 | 1.7226 | 2.18295 | 1.7622 | 1.7127 | 1.21275 | 0.78705 | 0.34155 | 0.0198 | 0 | 0 | 0 | 0 |
| 07-06-10 | 0 | 0 | 0 | 0 | 0 | 0.099 | 0.57915 | 0.74745 | 1.16325 | 1.6632 | 2.00475 | 1.9899 | 2.7027 | 2.14335 | 1.80675 | 2.3463 | 1.46025 | 0.74745 | 0.4653 | 0.02475 | 0 | 0 | 0 | 0 |
| 08-06-10 | 0 | 0 | 0 | 0 | 0 | 0.0594 | 0.4059 | 0.74745 | 1.14345 | 1.37115 | 1.4157 | 1.4454 | 1.50975 | 2.1186 | 1.6731 | 1.98 | 1.48005 | 0.8118 | 0.3861 | 0.0198 | 0 | 0 | 0 | 0 |
| 09-06-10 | 0 | 0 | 0 | 0 | 0 | 0.12375 | 0.29205 | 0.47025 | 0.891 | 1.01475 | 1.6038 | 3.97485 | 4.4352 | 4.7124 | 3.95505 | 3.4254 | 2.4651 | 1.2672 | 0.42075 | 0.02475 | 0 | 0 | 0 | 0 |
| 10-06-10 | 0 | 0 | 0 | 0 | 0.00495 | 0.31185 | 1.2177 | 2.21265 | 3.069 | 3.86595 | 4.57875 | 4.9203 | 4.66785 | 4.71735 | 3.98475 | 3.43035 | 1.8117 | 0.99 | 0.5148 | 0.0297 | 0 | 0 | 0 | 0 |
| 11-06-10 | 0 | 0 | 0 | 0 | 0.00495 | 0.31185 | 1.2177 | 2.21265 | 3.1581 | 3.92535 | 4.57875 | 4.92525 | 4.9698 | 4.7223 | 3.9402 | 3.44025 | 2.4651 | 1.4652 | 0.5346 | 0.0297 | 0 | 0 | 0 | 0 |
| 12-06-10 | 0 | 0 | 0 | 0 | 0.00495 | 0.3465 | 1.2276 | 2.21265 | 3.1581 | 3.9798 | 4.57875 | 4.92525 | 4.9698 | 4.7223 | 4.19265 | 3.44025 | 2.5245 | 1.53945 | 0.5841 | 0.03465 | 0 | 0 | 0 | 0 |
| 13-06-10 | 0 | 0 | 0 | 0 | 0.00495 | 0.33165 | 1.2276 | 2.21265 | 3.12345 | 3.97485 | 4.57875 | 4.9203 | 4.83615 | 4.4352 | 2.9502 | 3.4452 | 2.4552 | 1.4256 | 0.47025 | 0.0297 | 0 | 0 | 0 | 0 |
| 14-06-10 | 0 | 0 | 0 | 0 | 0 | 0.13365 | 0.5148 | 0.90585 | 1.2771 | 1.93545 | 2.01465 | 2.5641 | 3.5937 | 4.2966 | 2.99475 | 3.3759 | 2.44035 | 1.4652 | 0.5049 | 0.0297 | 0 | 0 | 0 | 0 |
| 15-06-10 | 0 | 0 | 0 | 0 | 0 | 0.14355 | 0.5643 | 1.2969 | 1.98495 | 3.40065 | 4.455 | 4.80645 | 4.8807 | 4.66785 | 4.2075 | 3.45015 | 2.53935 | 0.92565 | 0.4455 | 0.0297 | 0 | 0 | 0 | 0 |
| 16-06-10 | 0 | 0 | 0 | 0 | 0.00495 | 0.3168 | 1.2276 | 2.2077 | 3.15315 | 3.9699 | 4.57875 | 4.9203 | 4.97475 | 4.72725 | 4.11345 | 3.4551 | 2.4552 | 1.55925 | 0.48015 | 0.0297 | 0 | 0 | 0 | 0 |

| | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17-06-10 | 0 | 0 | 0 | 0 | 0.00495 | 0.3366 | 1.22265 | 2.20275 | 3.15315 | 3.9699 | 4.5738 | 4.9203 | 4.97475 | 4.7322 | 4.21245 | 3.46005 | 2.5443 | 1.5642 | 0.57915 | 0.0396 | 0 | 0 | 0 | 0 |
| 18-06-10 | 0 | 0 | 0 | 0 | 0 | 0.0792 | 0.27225 | 0.68805 | 1.10385 | 1.7622 | 1.78695 | 2.2473 | 2.6532 | 4.7322 | 4.0986 | 1.88595 | 1.4157 | 0.6336 | 0.2673 | 0.0198 | 0 | 0 | 0 | 0 |
| 19-06-10 | 0 | 0 | 0 | 0 | 0 | 0.1386 | 0.4257 | 1.05435 | 2.83635 | 3.15315 | 2.1186 | 3.3363 | 2.376 | 2.1483 | 4.16295 | 2.9898 | 2.5542 | 1.2474 | 0.33165 | 0.02475 | 0 | 0 | 0 | 0 |
| 20-06-10 | 0 | 0 | 0 | 0 | 0.00495 | 0.2772 | 1.2177 | 2.0988 | 3.14325 | 3.96 | 4.5738 | 4.8708 | 4.7421 | 4.72725 | 3.82635 | 3.3561 | 2.41065 | 1.35135 | 0.495 | 0.03465 | 0 | 0 | 0 | 0 |
| 21-06-10 | 0 | 0 | 0 | 0 | 0 | 0.26235 | 0.9306 | 1.65825 | 2.38095 | 2.9898 | 3.36105 | 4.29165 | 4.97475 | 4.73715 | 4.2174 | 3.38085 | 2.56905 | 1.4652 | 0.5049 | 0.03465 | 0 | 0 | 0 | 0 |
| 22-06-10 | 0 | 0 | 0 | 0 | 0 | 0.1188 | 0.4257 | 0.7722 | 1.23255 | 3.5442 | 2.19285 | 2.88585 | 2.09385 | 1.8513 | 1.38105 | 1.0593 | 0.4356 | 0.8415 | 0.35145 | 0.02475 | 0 | 0 | 0 | 0 |
| 23-06-10 | 0 | 0 | 0 | 0 | 0 | 0.24255 | 0.40095 | 0.69795 | 1.39095 | 1.5741 | 2.1384 | 2.11365 | 1.6731 | 2.18295 | 1.9305 | 1.7226 | 2.0097 | 0.46035 | 0.22275 | 0.01485 | 0 | 0 | 0 | 0 |
| 24-06-10 | 0 | 0 | 0 | 0 | 0 | 0.17325 | 0.297 | 0.6732 | 0.8415 | 1.2177 | 1.2276 | 1.41075 | 1.4157 | 1.5345 | 1.28205 | 1.38105 | 0.92565 | 0.7524 | 0.41085 | 0.0297 | 0 | 0 | 0 | 0 |
| 25-06-10 | 0 | 0 | 0 | 0 | 0 | 0.0792 | 0.3663 | 0.7821 | 1.3068 | 1.4454 | 2.18295 | 1.8018 | 2.4948 | 2.23245 | 1.94535 | 1.4157 | 0.89595 | 0.7326 | 0.36135 | 0.02475 | 0 | 0 | 0 | 0 |
| 26-06-10 | 0 | 0 | 0 | 0 | 0 | 0.08415 | 0.36135 | 0.89595 | 2.12355 | 2.60865 | 3.63825 | 3.4056 | 2.14335 | 2.0295 | 1.5741 | 1.42065 | 1.38105 | 0.8316 | 0.43065 | 0.0297 | 0 | 0 | 0 | 0 |
| 27-06-10 | 0 | 0 | 0 | 0 | 0 | 0.18315 | 0.78705 | 1.6632 | 3.1185 | 3.93525 | 4.18275 | 4.9104 | 4.9698 | 4.73715 | 4.2273 | 3.4848 | 2.5641 | 1.47015 | 0.52965 | 0.0396 | 0 | 0 | 0 | 0 |
| 28-06-10 | 0 | 0 | 0 | 0 | 0 | 0.28215 | 1.18305 | 2.1582 | 3.11355 | 3.52935 | 4.54905 | 4.39065 | 3.87585 | 4.3956 | 4.19265 | 2.73735 | 2.4948 | 1.5939 | 0.5445 | 0.0396 | 0 | 0 | 0 | 0 |
| 29-06-10 | 0 | 0 | 0 | 0 | 0 | 0.27225 | 1.0791 | 2.0988 | 2.8116 | 3.83625 | 4.53915 | 4.83615 | 4.9599 | 4.73715 | 4.23225 | 3.4848 | 2.57895 | 1.51965 | 0.56925 | 0.0396 | 0 | 0 | 0 | 0 |
| 30-06-10 | 0 | 0 | 0 | 0 | 0 | 0.28215 | 1.1682 | 2.1483 | 3.0789 | 3.90555 | 4.3857 | 4.85595 | 4.6629 | 4.7025 | 4.158 | 3.4848 | 2.57895 | 1.6038 | 0.48015 | 0.03465 | 0 | 0 | 0 | 0 |
| 01-07-10 | 0 | 0 | 0 | 0 | 0 | 0.297 | 1.16325 | 2.14335 | 3.09375 | 3.91545 | 4.53915 | 4.9005 | 4.9698 | 4.73715 | 4.23225 | 3.48975 | 2.56905 | 1.58895 | 0.56925 | 0.0396 | 0 | 0 | 0 | 0 |
| 02-07-10 | 0 | 0 | 0 | 0 | 0 | 0.1287 | 1.1484 | 2.12355 | 2.16315 | 2.178 | 3.1482 | 4.57875 | 4.9401 | 4.7124 | 4.2075 | 3.46995 | 2.56905 | 1.58895 | 0.51975 | 0.03465 | 0 | 0 | 0 | 0 |
| 03-07-10 | 0 | 0 | 0 | 0 | 0 | 0.2871 | 1.14345 | 2.1186 | 3.069 | 3.88575 | 4.50945 | 4.8708 | 4.70745 | 4.70745 | 4.2075 | 3.46995 | 2.56905 | 1.58895 | 0.5346 | 0.0396 | 0 | 0 | 0 | 0 |
| 04-07-10 | 0 | 0 | 0 | 0 | 0 | 0.28215 | 1.1385 | 2.1087 | 3.06405 | 3.79665 | 4.5045 | 4.86585 | 4.93515 | 4.70745 | 4.20255 | 3.46995 | 2.5641 | 1.58895 | 0.55935 | 0.0396 | 0 | 0 | 0 | 0 |
| 05-07-10 | 0 | 0 | 0 | 0 | 0 | 0.1386 | 1.09395 | 2.10375 | 3.05415 | 3.7125 | 3.7323 | 4.8609 | 4.93515 | 4.70745 | 4.20255 | 3.46995 | 2.41065 | 1.1583 | 0.36135 | 0.02475 | 0 | 0 | 0 | 0 |
| 06-07-10 | 0 | 0 | 0 | 0 | 0 | 0.07425 | 0.66825 | 2.0988 | 3.04425 | 3.87585 | 4.30155 | 3.67785 | 3.5937 | 2.57895 | 3.2868 | 3.27195 | 2.12355 | 1.584 | 0.5049 | 0.03465 | 0 | 0 | 0 | 0 |
| 07-07-10 | 0 | 0 | 0 | 0 | 0 | 0.1386 | 1.06425 | 2.0889 | 3.0393 | 3.8709 | 4.4946 | 3.80655 | 4.10355 | 3.8214 | 3.61845 | 1.82655 | 1.3068 | 0.8613 | 0.47025 | 0.0297 | 0 | 0 | 0 | 0 |
| 08-07-10 | 0 | 0 | 0 | 0 | 0 | 0.08415 | 0.71775 | 1.6236 | 1.53945 | 1.21275 | 1.67805 | 2.4651 | 1.95525 | 2.0493 | 1.9602 | 1.95525 | 1.1385 | 0.8811 | 0.34155 | 0.02475 | 0 | 0 | 0 | 0 |
| 09-07-10 | 0 | 0 | 0 | 0 | 0 | 0.13365 | 1.07415 | 2.07405 | 2.78685 | 3.09375 | 4.2471 | 3.8511 | 3.4155 | 2.8611 | 2.475 | 1.69785 | 1.23255 | 0.87615 | 0.297 | 0.0198 | 0 | 0 | 0 | 0 |
| 10-07-10 | 0 | 0 | 0 | 0 | 0 | 0.11385 | 1.01475 | 1.7919 | 1.82655 | 1.88595 | 2.30175 | 2.68785 | 2.26215 | 1.77705 | 1.7028 | 1.9404 | 1.2969 | 0.95535 | 0.44055 | 0.0297 | 0 | 0 | 0 | 0 |
| 11-07-10 | 0 | 0 | 0 | 0 | 0 | 0.0693 | 0.8316 | 2.0592 | 2.82645 | 3.6135 | 2.4948 | 3.76695 | 3.27195 | 2.079 | 1.9404 | 1.72755 | 1.188 | 0.85635 | 0.3762 | 0.02475 | 0 | 0 | 0 | 0 |
| 12-07-10 | 0 | 0 | 0 | 0 | 0 | 0.1089 | 0.89595 | 2.05425 | 3.0096 | 3.8412 | 4.45005 | 4.8411 | 4.356 | 4.3263 | 2.772 | 2.3067 | 1.35135 | 0.8613 | 0.3663 | 0.02475 | 0 | 0 | 0 | 0 |
| 13-07-10 | 0 | 0 | 0 | 0 | 0 | 0.0594 | 0.51975 | 2.0394 | 3.00465 | 3.8313 | 4.45995 | 4.83615 | 4.91535 | 4.6926 | 4.1877 | 3.45015 | 2.54925 | 1.5642 | 0.4257 | 0.02475 | 0 | 0 | 0 | 0 |
| 14-07-10 | 0 | 0 | 0 | 0 | 0 | 0.15345 | 1.05435 | 2.03445 | 2.9898 | 3.82635 | 4.45995 | 4.8312 | 4.9104 | 4.68765 | 4.18275 | 3.4452 | 2.5443 | 1.55925 | 0.50985 | 0.0297 | 0 | 0 | 0 | 0 |
| 15-07-10 | 0 | 0 | 0 | 0 | 0 | 0.15345 | 1.0494 | 2.02455 | 2.98485 | 3.07395 | 2.5245 | 3.80655 | 4.68765 | 4.57875 | 3.72735 | 3.168 | 2.0592 | 1.1583 | 0.38115 | 0.02475 | 0 | 0 | 0 | 0 |
| 16-07-10 | 0 | 0 | 0 | 0 | 0 | 0.08415 | 0.82665 | 2.0196 | 2.80665 | 2.2473 | 2.43045 | 2.19285 | 2.58885 | 2.2869 | 2.63835 | 1.584 | 1.52955 | 0.96525 | 0.36135 | 0.0198 | 0 | 0 | 0 | 0 |
| 17-07-10 | 0 | 0 | 0 | 0 | 0 | 0.08415 | 0.76725 | 2.0097 | 2.10375 | 2.28195 | 1.9602 | 2.59875 | 2.9007 | 2.90565 | 2.22255 | 1.8216 | 1.15335 | 0.8217 | 0.3366 | 0.0198 | 0 | 0 | 0 | 0 |
| 18-07-10 | 0 | 0 | 0 | 0 | 0 | 0.10395 | 1.0197 | 1.9998 | 2.34135 | 2.1087 | 2.5047 | 3.1878 | 3.37095 | 3.71745 | 3.85605 | 2.95515 | 2.51955 | 1.2078 | 0.4158 | 0.0198 | 0 | 0 | 0 | 0 |
| 19-07-10 | 0 | 0 | 0 | 0 | 0 | 0.10395 | 0.9306 | 1.8117 | 1.82655 | 1.2969 | 1.485 | 1.46025 | 1.2969 | 1.34145 | 1.0296 | 1.11375 | 0.90585 | 0.68805 | 0.35145 | 0.0198 | 0 | 0 | 0 | 0 |
| 20-07-10 | 0 | 0 | 0 | 0 | 0 | 0.05445 | 0.5742 | 1.35135 | 1.0791 | 0.9603 | 1.17315 | 1.37115 | 2.09385 | 2.3067 | 1.94535 | 1.6335 | 1.16325 | 0.792 | 0.37125 | 0.0198 | 0 | 0 | 0 | 0 |
| 21-07-10 | 0 | 0 | 0 | 0 | 0 | 0.05445 | 0.594 | 1.50975 | 1.0296 | 1.0989 | 1.2276 | 1.2078 | 1.11375 | 1.25235 | 0.9405 | 1.02465 | 0.85635 | 0.6732 | 0.21285 | 0.0099 | 0 | 0 | 0 | 0 |
| 22-07-10 | 0 | 0 | 0 | 0 | 0 | 0.07425 | 0.9108 | 1.96515 | 2.6532 | 3.7719 | 4.4154 | 4.7916 | 4.87575 | 4.40055 | 3.70755 | 2.18295 | 1.82655 | 0.9504 | 0.34155 | 0.01485 | 0 | 0 | 0 | 0 |
| 23-07-10 | 0 | 0 | 0 | 0 | 0 | 0.0792 | 0.7029 | 1.65825 | 1.64835 | 1.4256 | 2.58885 | 2.1978 | 2.3166 | 2.77695 | 2.27205 | 2.2968 | 1.5939 | 0.9405 | 0.3663 | 0.01485 | 0 | 0 | 0 | 0 |
| 24-07-10 | 0 | 0 | 0 | 0 | 0 | 0.05445 | 0.8712 | 1.94535 | 2.0592 | 1.61865 | 1.53945 | 2.14335 | 1.7226 | 1.87605 | 1.5543 | 1.5543 | 1.12365 | 1.0098 | 0.3267 | 0.01485 | 0 | 0 | 0 | 0 |
| 25-07-10 | 0 | 0 | 0 | 0 | 0 | 0.0495 | 0.69795 | 1.485 | 1.67805 | 1.48995 | 1.73745 | 2.5839 | 3.2076 | 2.9007 | 3.1284 | 1.9107 | 1.3068 | 0.94545 | 0.3366 | 0.01485 | 0 | 0 | 0 | 0 |
| 26-07-10 | 0 | 0 | 0 | 0 | 0 | 0.0495 | 0.5445 | 1.2375 | 1.26225 | 1.1682 | 1.40085 | 2.71755 | 3.92535 | 2.7522 | 1.9404 | 1.6929 | 1.2276 | 0.84645 | 0.33165 | 0.01485 | 0 | 0 | 0 | 0 |
| 27-07-10 | 0 | 0 | 0 | 0 | 0 | 0.0495 | 0.55935 | 1.4454 | 2.13345 | 1.94535 | 4.04415 | 4.7619 | 4.6035 | 4.61835 | 4.11345 | 3.366 | 2.45025 | 1.4553 | 0.3564 | 0.01485 | 0 | 0 | 0 | 0 |
| 28-07-10 | 0 | 0 | 0 | 0 | 0 | 0.05445 | 0.9207 | 1.90575 | 2.6136 | 3.4749 | 4.37085 | 4.75695 | 4.6431 | 4.61835 | 4.1085 | 3.3561 | 2.44035 | 1.45035 | 0.37125 | 0.0099 | 0 | 0 | 0 | 0 |
| 29-07-10 | 0 | 0 | 0 | 0 | 0 | 0.0396 | 0.62865 | 1.2375 | 1.44045 | 1.22265 | 1.57905 | 3.1482 | 2.1582 | 2.86605 | 1.7523 | 1.61865 | 1.06425 | 0.74745 | 0.27225 | 0.0099 | 0 | 0 | 0 | 0 |
| 30-07-10 | 0 | 0 | 0 | 0 | 0 | 0.05445 | 0.67815 | 1.56915 | 1.48995 | 1.25235 | 1.1484 | 1.39095 | 1.5741 | 1.5642 | 1.2078 | 1.48995 | 1.11375 | 0.6831 | 0.3267 | 0.0099 | 0 | 0 | 0 | 0 |

| | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 31-07-10 | 0 | 0 | 0 | 0 | 0 | 0.03465 | 0.69795 | 1.87605 | 2.0097 | 1.9602 | 2.6631 | 2.2275 | 2.0295 | 2.3562 | 2.40075 | 2.29185 | 1.48995 | 0.90585 | 0.2376 | 0.00495 | 0 | 0 | 0 | 0 |
| 01-08-10 | 0 | 0 | 0 | 0 | 0 | 0.02475 | 0.28215 | 0.7722 | 1.3662 | 1.9503 | 1.8612 | 2.9502 | 3.0492 | 3.0492 | 2.2374 | 1.9701 | 1.18305 | 0.7128 | 0.1584 | 0.00495 | 0 | 0 | 0 | 0 |
| 02-08-10 | 0 | 0 | 0 | 0 | 0 | 0.0198 | 0.47025 | 0.8712 | 0.9504 | 1.37115 | 1.39095 | 1.60875 | 2.0493 | 1.95525 | 1.287 | 1.4553 | 1.14345 | 0.60885 | 0.14355 | 0.00495 | 0 | 0 | 0 | 0 |
| 03-08-10 | 0 | 0 | 0 | 0 | 0 | 0.0198 | 0.4356 | 1.287 | 1.9701 | 2.45025 | 2.56905 | 2.6136 | 2.96505 | 2.43045 | 2.1681 | 1.48005 | 1.01475 | 0.72765 | 0.15345 | 0.00495 | 0 | 0 | 0 | 0 |
| 04-08-10 | 0 | 0 | 0 | 0 | 0 | 0.0198 | 0.29205 | 1.23255 | 1.29195 | 1.5345 | 1.53945 | 1.71765 | 1.60875 | 1.8315 | 1.386 | 1.27215 | 0.9108 | 0.5544 | 0.16335 | 0.00495 | 0 | 0 | 0 | 0 |
| 05-08-10 | 0 | 0 | 0 | 0 | 0 | 0.01485 | 0.4752 | 1.2969 | 1.6533 | 1.8117 | 1.45035 | 1.287 | 2.23245 | 1.7226 | 1.4751 | 1.21275 | 0.8019 | 0.44055 | 0.1782 | 0.00495 | 0 | 0 | 0 | 0 |
| 06-08-10 | 0 | 0 | 0 | 0 | 0 | 0.0198 | 0.5841 | 1.3959 | 1.7622 | 2.27205 | 3.05415 | 3.93525 | 4.30155 | 4.54905 | 2.7225 | 1.62855 | 1.1682 | 0.66825 | 0.198 | 0.00495 | 0 | 0 | 0 | 0 |
| 07-08-10 | 0 | 0 | 0 | 0 | 0 | 0.01485 | 0.4158 | 1.31175 | 2.4453 | 3.65805 | 4.3065 | 4.41045 | 4.76685 | 2.98485 | 1.90575 | 1.69785 | 1.0692 | 0.6336 | 0.18315 | 0 | 0 | 0 | 0 | 0 |
| 08-08-10 | 0 | 0 | 0 | 0 | 0 | 0.02475 | 0.7227 | 1.52955 | 2.51955 | 2.41065 | 3.56895 | 2.45025 | 2.63835 | 2.81655 | 2.19285 | 1.7919 | 0.99 | 0.78705 | 0.1683 | 0 | 0 | 0 | 0 | 0 |
| 09-08-10 | 0 | 0 | 0 | 0 | 0 | 0.0099 | 0.60885 | 1.1979 | 1.782 | 3.6036 | 2.00475 | 2.3166 | 3.00465 | 2.21265 | 1.5741 | 1.69785 | 1.06425 | 0.65835 | 0.16335 | 0 | 0 | 0 | 0 | 0 |
| 10-08-10 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.30195 | 0.83655 | 0.98505 | 2.18295 | 3.2076 | 2.4255 | 4.1976 | 1.85625 | 1.5147 | 1.188 | 0.9306 | 0.45045 | 0.1089 | 0 | 0 | 0 | 0 | 0 |
| 11-08-10 | 0 | 0 | 0 | 0 | 0 | 0.0099 | 0.57915 | 0.93555 | 2.2572 | 1.386 | 2.77695 | 1.47015 | 3.8016 | 1.7919 | 2.05425 | 1.584 | 0.8811 | 0.5148 | 0.12375 | 0 | 0 | 0 | 0 | 0 |
| 12-08-10 | 0 | 0 | 0 | 0 | 0 | 0.0099 | 0.49995 | 1.03455 | 1.95525 | 1.92555 | 1.80675 | 2.0889 | 3.13335 | 3.0096 | 1.8711 | 1.683 | 1.1286 | 0.50985 | 0.1188 | 0 | 0 | 0 | 0 | 0 |
| 13-08-10 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.34155 | 1.4058 | 2.0691 | 2.08395 | 2.92545 | 3.1185 | 3.49965 | 2.5938 | 1.72755 | 1.5147 | 0.87615 | 0.6237 | 0.14355 | 0 | 0 | 0 | 0 | 0 |
| 14-08-10 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.3861 | 1.07415 | 1.05435 | 1.36125 | 0.9702 | 1.70775 | 3.0987 | 2.8215 | 2.3463 | 1.60875 | 1.08405 | 0.6435 | 0.14355 | 0 | 0 | 0 | 0 | 0 |
| 15-08-10 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.297 | 0.68805 | 1.0791 | 1.1484 | 1.28205 | 1.85625 | 2.91555 | 1.92555 | 1.4751 | 1.77705 | 1.12365 | 1.1583 | 0.25245 | 0 | 0 | 0 | 0 | 0 |
| 16-08-10 | 0 | 0 | 0 | 0 | 0 | 0.02475 | 0.3762 | 1.4256 | 1.35135 | 1.41075 | 1.67805 | 1.84635 | 2.35125 | 2.15325 | 2.0196 | 1.52955 | 0.9009 | 0.59895 | 0.099 | 0 | 0 | 0 | 0 | 0 |
| 17-08-10 | 0 | 0 | 0 | 0 | 0 | 0.0198 | 0.3465 | 0.99495 | 1.30185 | 2.29185 | 3.0195 | 4.4847 | 4.66785 | 4.4253 | 3.88575 | 3.1086 | 2.1681 | 1.089 | 0.17325 | 0 | 0 | 0 | 0 | 0 |
| 18-08-10 | 0 | 0 | 0 | 0 | 0 | 0.02475 | 0.39105 | 1.20285 | 1.99485 | 2.277 | 3.861 | 4.5837 | 4.653 | 4.41045 | 3.8709 | 3.09375 | 2.0691 | 0.54945 | 0.08415 | 0 | 0 | 0 | 0 | 0 |
| 19-08-10 | 0 | 0 | 0 | 0 | 0 | 0.01485 | 0.2871 | 0.95535 | 1.4355 | 1.74735 | 3.7719 | 3.1383 | 3.50955 | 2.83635 | 1.61865 | 1.35135 | 0.83655 | 0.52965 | 0.0792 | 0 | 0 | 0 | 0 | 0 |
| 20-08-10 | 0 | 0 | 0 | 0 | 0 | 0.0198 | 0.36135 | 1.01475 | 1.0098 | 1.3959 | 1.2672 | 1.79685 | 1.9602 | 2.277 | 1.4256 | 1.1781 | 0.8118 | 0.42075 | 0.0594 | 0 | 0 | 0 | 0 | 0 |
| 21-08-10 | 0 | 0 | 0 | 0 | 0 | 0.03465 | 0.6633 | 0.495 | 0.77715 | 0.9009 | 1.2177 | 1.82655 | 2.2671 | 2.3067 | 2.00475 | 2.58885 | 1.94535 | 0.99 | 0.13365 | 0 | 0 | 0 | 0 | 0 |
| 22-08-10 | 0 | 0 | 0 | 0 | 0 | 0.0198 | 0.44055 | 1.6434 | 2.39085 | 3.5046 | 3.15315 | 4.41045 | 4.59855 | 4.35105 | 3.80655 | 3.0195 | 2.0691 | 1.00485 | 0.13365 | 0 | 0 | 0 | 0 | 0 |
| 23-08-10 | 0 | 0 | 0 | 0 | 0 | 0.0297 | 0.6435 | 1.6335 | 2.6235 | 3.4947 | 4.1481 | 4.51935 | 4.5837 | 4.3362 | 3.78675 | 2.9997 | 2.0196 | 0.96525 | 0.12375 | 0 | 0 | 0 | 0 | 0 |
| 24-08-10 | 0 | 0 | 0 | 0 | 0 | 0.0297 | 0.6336 | 1.61865 | 2.6136 | 3.47985 | 4.13325 | 4.5045 | 4.5738 | 4.3164 | 3.7719 | 2.9799 | 1.90575 | 0.88605 | 0.1089 | 0 | 0 | 0 | 0 | 0 |
| 25-08-10 | 0 | 0 | 0 | 0 | 0 | 0.02475 | 0.61875 | 1.60875 | 2.59875 | 3.46995 | 4.12335 | 4.4946 | 4.55895 | 4.30155 | 3.75705 | 2.9601 | 2.00475 | 0.54945 | 0.0693 | 0 | 0 | 0 | 0 | 0 |
| 26-08-10 | 0 | 0 | 0 | 0 | 0 | 0.0099 | 0.2376 | 0.68805 | 0.91575 | 1.1187 | 0.9009 | 1.32165 | 1.23255 | 1.46025 | 1.089 | 1.0593 | 0.693 | 0.46035 | 0.05445 | 0 | 0 | 0 | 0 | 0 |
| 27-08-10 | 0 | 0 | 0 | 0 | 0 | 0.0099 | 0.2574 | 0.87615 | 1.21275 | 1.7622 | 1.8414 | 2.03445 | 2.7522 | 3.9105 | 3.46995 | 2.24235 | 1.4949 | 0.8316 | 0.08415 | 0 | 0 | 0 | 0 | 0 |
| 28-08-10 | 0 | 0 | 0 | 0 | 0 | 0.0198 | 0.5841 | 1.5741 | 2.5641 | 1.51965 | 4.08375 | 4.455 | 3.5838 | 3.41055 | 3.6927 | 2.72745 | 1.89585 | 0.51975 | 0.04455 | 0 | 0 | 0 | 0 | 0 |
| 29-08-10 | 0 | 0 | 0 | 0 | 0 | 0.01485 | 0.3861 | 1.48995 | 2.5542 | 3.17295 | 4.0689 | 3.7026 | 2.6037 | 2.1978 | 2.33145 | 2.8809 | 1.8909 | 0.77715 | 0.0594 | 0 | 0 | 0 | 0 | 0 |
| 30-08-10 | 0 | 0 | 0 | 0 | 0 | 0.0198 | 0.55935 | 1.54935 | 2.53935 | 3.4056 | 4.05405 | 1.67805 | 1.16325 | 0.9603 | 0.72765 | 0.78705 | 0.86625 | 0.49995 | 0.03465 | 0 | 0 | 0 | 0 | 0 |
| 31-08-10 | 0 | 0 | 0 | 0 | 0 | 0.0099 | 0.4059 | 1.45035 | 2.5245 | 1.881 | 2.84625 | 2.7918 | 4.059 | 3.8214 | 2.52945 | 2.8314 | 1.87605 | 0.7029 | 0.0396 | 0 | 0 | 0 | 0 | 0 |
| 01-09-10 | 0 | 0 | 0 | 0 | 0 | 0.01485 | 0.53955 | 1.51965 | 2.5146 | 3.38085 | 4.02435 | 4.3956 | 4.4451 | 4.1778 | 3.61845 | 2.8116 | 1.8711 | 0.75735 | 0.03465 | 0 | 0 | 0 | 0 | 0 |
| 02-09-10 | 0 | 0 | 0 | 0 | 0 | 0.01485 | 0.52965 | 1.5345 | 2.5245 | 3.39075 | 4.0392 | 4.4055 | 4.455 | 4.18275 | 3.5838 | 2.27205 | 0.8415 | 0.4554 | 0.01485 | 0 | 0 | 0 | 0 | 0 |
| 03-09-10 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.21285 | 0.7524 | 1.62855 | 2.1483 | 1.96515 | 2.10375 | 2.1384 | 1.83645 | 1.0989 | 1.1385 | 0.7326 | 0.46035 | 0.0099 | 0 | 0 | 0 | 0 | 0 |
| 04-09-10 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.12375 | 0.4257 | 0.74745 | 0.91575 | 0.9702 | 1.16325 | 1.06425 | 1.12365 | 0.93555 | 1.0098 | 0.7326 | 0.39105 | 0.00495 | 0 | 0 | 0 | 0 | 0 |
| 05-09-10 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.3267 | 1.2771 | 2.33145 | 3.14325 | 3.67785 | 4.03425 | 3.90555 | 4.1283 | 3.35115 | 2.71755 | 1.65825 | 0.65835 | 0.00495 | 0 | 0 | 0 | 0 | 0 |
| 06-09-10 | 0 | 0 | 0 | 0 | 0 | 0.0099 | 0.49005 | 1.48005 | 2.47005 | 3.3363 | 3.861 | 4.0293 | 3.9303 | 4.1085 | 3.40065 | 2.7225 | 1.6632 | 0.5544 | 0.03465 | 0 | 0 | 0 | 0 | 0 |
| 07-09-10 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.21285 | 0.60885 | 0.9504 | 1.75725 | 1.11375 | 1.0098 | 1.53945 | 1.7325 | 1.26225 | 0.7326 | 0.35145 | 0.26235 | 0.01485 | 0 | 0 | 0 | 0 | 0 |
| 08-09-10 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.24255 | 0.38115 | 0.7227 | 1.30185 | 1.881 | 2.60865 | 1.1979 | 2.376 | 1.4553 | 0.92565 | 0.6138 | 0.27225 | 0.01485 | 0 | 0 | 0 | 0 | 0 |
| 09-09-10 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.21285 | 0.93555 | 2.08395 | 3.18285 | 3.61845 | 4.09365 | 3.8016 | 2.43045 | 2.75715 | 2.1681 | 1.15335 | 0.52965 | 0.02475 | 0 | 0 | 0 | 0 | 0 |
| 10-09-10 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.4158 | 1.32165 | 1.6434 | 2.2671 | 2.6433 | 3.6432 | 3.68775 | 4.02435 | 3.3363 | 2.61855 | 1.4949 | 0.36135 | 0.01485 | 0 | 0 | 0 | 0 | 0 |
| 11-09-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.2376 | 1.188 | 1.92555 | 2.91555 | 3.9006 | 4.2471 | 4.2867 | 3.20265 | 2.78685 | 2.28195 | 1.0098 | 0.48015 | 0.0198 | 0 | 0 | 0 | 0 | 0 |
| 12-09-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1287 | 0.6237 | 1.22265 | 3.06405 | 2.72745 | 2.6631 | 2.59875 | 2.7126 | 2.3661 | 1.27215 | 0.82665 | 0.27225 | 0.0099 | 0 | 0 | 0 | 0 | 0 |

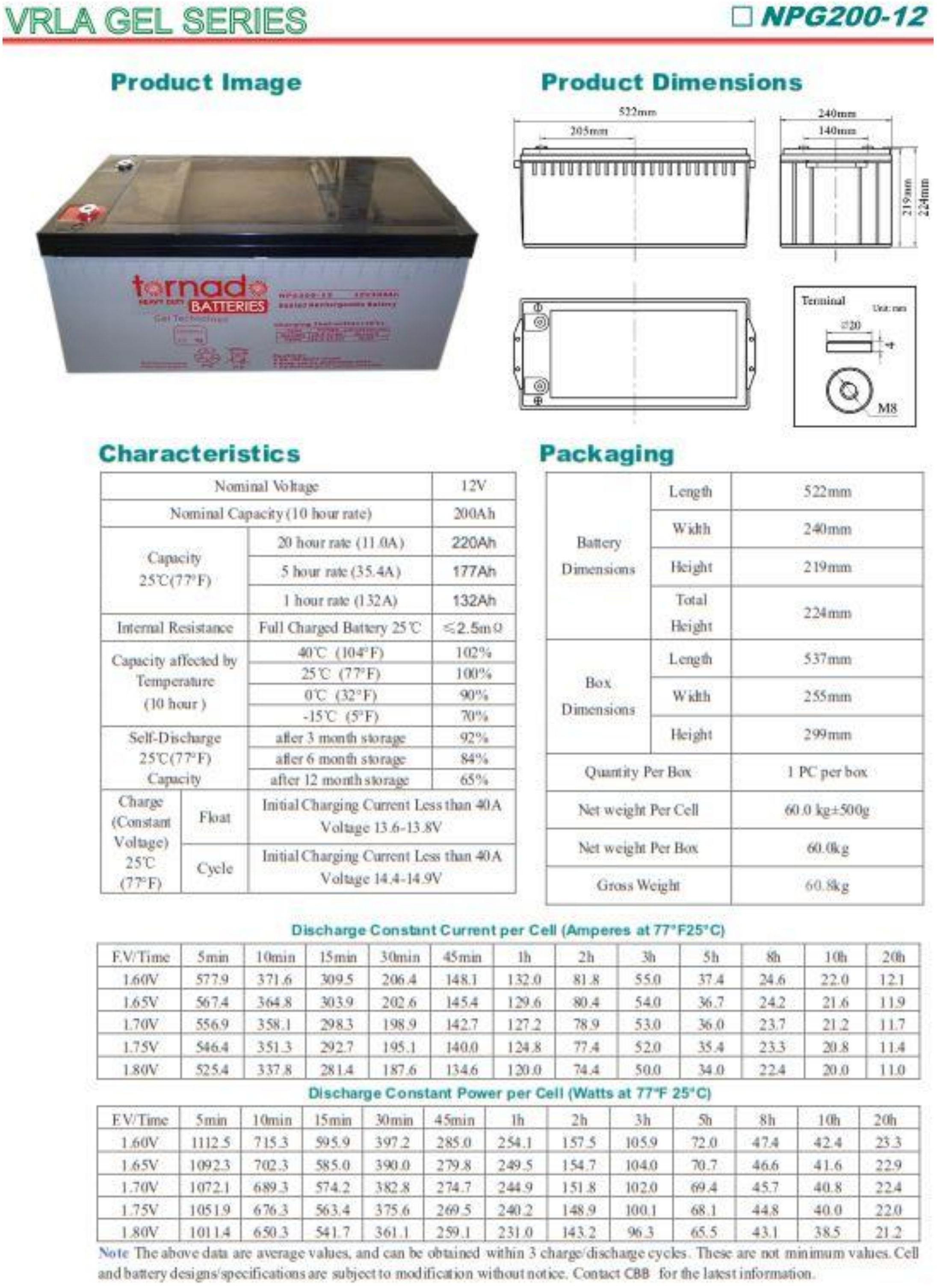
| | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13-09-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1089 | 0.3663 | 1.16325 | 1.62855 | 3.19275 | 3.12345 | 3.0096 | 3.5739 | 2.45025 | 2.4948 | 1.43055 | 0.3465 | 0.0099 | 0 | 0 | 0 | 0 | 0 |
| 14-09-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1881 | 0.59895 | 1.00485 | 1.96515 | 2.13345 | 2.21265 | 1.8216 | 1.95525 | 1.14345 | 1.04445 | 0.8811 | 0.2376 | 0.00495 | 0 | 0 | 0 | 0 | 0 |
| 15-09-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1485 | 0.5148 | 0.6138 | 0.9108 | 0.9009 | 1.6038 | 2.05425 | 2.376 | 1.0098 | 1.07415 | 0.57915 | 0.2178 | 0.00495 | 0 | 0 | 0 | 0 | 0 |
| 16-09-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.16335 | 0.60885 | 1.09395 | 1.4949 | 1.06425 | 1.6929 | 1.8513 | 1.37115 | 1.3365 | 1.24245 | 0.9207 | 0.33165 | 0.00495 | 0 | 0 | 0 | 0 | 0 |
| 17-09-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.16335 | 0.44055 | 0.65835 | 1.0197 | 1.11375 | 1.45035 | 2.0097 | 1.74735 | 2.13345 | 1.40085 | 0.70785 | 0.29205 | 0.00495 | 0 | 0 | 0 | 0 | 0 |
| 18-09-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0891 | 0.5643 | 1.485 | 1.287 | 1.66815 | 2.6334 | 3.05415 | 2.7324 | 2.7621 | 2.03445 | 1.3365 | 0.21285 | 0.00495 | 0 | 0 | 0 | 0 | 0 |
| 19-09-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.099 | 0.80685 | 0.7425 | 0.7722 | 0.78705 | 1.91565 | 0.9801 | 1.5246 | 0.9702 | 0.9801 | 0.78705 | 0.14355 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20-09-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.20295 | 1.1583 | 2.14335 | 2.35125 | 2.8116 | 3.7224 | 3.2967 | 2.90565 | 3.0294 | 2.31165 | 1.28205 | 0.17325 | 0 | 0 | 0 | 0 | 0 | 0 |
| 21-09-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1188 | 0.62865 | 2.2473 | 3.09375 | 3.7125 | 4.00455 | 3.95505 | 3.762 | 3.01455 | 1.64835 | 0.891 | 0.22275 | 0 | 0 | 0 | 0 | 0 | 0 |
| 22-09-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.22275 | 1.24245 | 2.09385 | 2.8215 | 3.15315 | 3.5541 | 4.04415 | 3.65805 | 2.871 | 2.16315 | 1.23255 | 0.30195 | 0 | 0 | 0 | 0 | 0 | 0 |
| 23-09-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.2376 | 1.2276 | 2.21265 | 2.99475 | 3.3165 | 3.6927 | 4.0194 | 3.7125 | 3.1086 | 2.277 | 1.30185 | 0.31185 | 0 | 0 | 0 | 0 | 0 | 0 |
| 24-09-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.2772 | 1.22265 | 2.09385 | 3.04425 | 3.65805 | 3.9897 | 3.94515 | 3.60855 | 3.08385 | 2.25225 | 1.27215 | 0.29205 | 0 | 0 | 0 | 0 | 0 | 0 |
| 25-09-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.2574 | 1.2078 | 2.178 | 3.0195 | 3.6234 | 3.7323 | 3.2967 | 3.65805 | 3.05415 | 2.22255 | 1.17315 | 0.2871 | 0 | 0 | 0 | 0 | 0 | 0 |
| 26-09-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.198 | 1.1187 | 1.9503 | 2.62845 | 3.069 | 3.5442 | 3.2373 | 3.564 | 3.0096 | 2.178 | 1.07415 | 0.2475 | 0 | 0 | 0 | 0 | 0 | 0 |
| 27-09-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.20295 | 1.15335 | 1.9602 | 2.6829 | 3.2769 | 3.48975 | 3.267 | 3.60855 | 2.87595 | 2.14335 | 0.9603 | 0.21285 | 0 | 0 | 0 | 0 | 0 | 0 |
| 28-09-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.2178 | 1.13355 | 2.02455 | 2.93535 | 3.5442 | 3.9006 | 3.88575 | 3.3957 | 2.97495 | 1.90575 | 0.92565 | 0.19305 | 0 | 0 | 0 | 0 | 0 | 0 |
| 29-09-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1683 | 1.02465 | 1.6533 | 2.63835 | 2.0691 | 2.0988 | 2.92545 | 3.25215 | 1.5246 | 1.58895 | 0.82665 | 0.1584 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30-09-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.099 | 0.6435 | 1.02465 | 1.32165 | 1.39095 | 1.82655 | 1.6731 | 1.23255 | 0.8514 | 0.98505 | 0.5148 | 0.09405 | 0 | 0 | 0 | 0 | 0 | 0 |
| 01-10-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1386 | 0.28215 | 0.5049 | 0.5544 | 0.72765 | 1.02465 | 0.96525 | 1.1583 | 0.9801 | 0.90585 | 0.51975 | 0.0891 | 0 | 0 | 0 | 0 | 0 | 0 |
| 02-10-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.03465 | 0.54945 | 0.4158 | 0.72765 | 1.4454 | 1.7721 | 0.9405 | 1.3266 | 0.87615 | 1.0098 | 0.50985 | 0.0792 | 0 | 0 | 0 | 0 | 0 | 0 |
| 03-10-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0693 | 0.27225 | 0.71775 | 1.3563 | 1.55925 | 1.4256 | 1.485 | 2.20275 | 0.88605 | 0.792 | 0.47025 | 0.0693 | 0 | 0 | 0 | 0 | 0 | 0 |
| 04-10-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0891 | 0.6336 | 1.1682 | 2.0394 | 3.3462 | 3.76695 | 3.63825 | 3.2769 | 2.7027 | 1.8909 | 0.85635 | 0.11385 | 0 | 0 | 0 | 0 | 0 | 0 |
| 05-10-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.15345 | 1.04445 | 2.04435 | 2.87595 | 3.4749 | 3.78675 | 3.7719 | 3.168 | 2.3265 | 0.78705 | 0.7425 | 0.0891 | 0 | 0 | 0 | 0 | 0 | 0 |
| 06-10-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1188 | 1.04445 | 1.9404 | 2.7918 | 3.45015 | 3.72735 | 3.7422 | 3.2373 | 1.95525 | 1.94535 | 0.8712 | 0.09405 | 0 | 0 | 0 | 0 | 0 | 0 |
| 07-10-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1188 | 1.0494 | 1.93545 | 2.5245 | 3.39075 | 3.7323 | 3.7224 | 3.267 | 2.64825 | 1.82655 | 0.7326 | 0.0693 | 0 | 0 | 0 | 0 | 0 | 0 |
| 08-10-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.099 | 0.8316 | 1.98495 | 2.8017 | 3.3858 | 3.70755 | 3.69765 | 3.2571 | 2.6037 | 1.8513 | 0.81675 | 0.06435 | 0 | 0 | 0 | 0 | 0 | 0 |
| 09-10-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1089 | 1.01475 | 1.96515 | 2.7126 | 3.16305 | 3.68775 | 3.66795 | 3.3363 | 2.7126 | 1.8612 | 0.55935 | 0.0396 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10-10-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0792 | 0.792 | 1.23255 | 1.9404 | 1.7325 | 2.6433 | 2.6532 | 3.0789 | 2.5641 | 1.5642 | 0.50985 | 0.0297 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11-10-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.09405 | 0.9801 | 1.8711 | 2.7225 | 3.29175 | 3.63825 | 3.6135 | 3.27195 | 2.64825 | 1.8117 | 0.8019 | 0.03465 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12-10-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.08415 | 0.9306 | 1.7721 | 2.7126 | 3.2868 | 3.60855 | 3.58875 | 3.25215 | 2.40075 | 1.58895 | 0.6039 | 0.0198 | 0 | 0 | 0 | 0 | 0 | 0 |
| 13-10-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0693 | 0.94545 | 1.8909 | 2.7027 | 3.2868 | 3.5838 | 3.55905 | 3.16305 | 2.6037 | 1.7622 | 0.69795 | 0.01485 | 0 | 0 | 0 | 0 | 0 | 0 |
| 14-10-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.04455 | 0.5148 | 1.86615 | 2.67795 | 3.26205 | 3.55905 | 3.33135 | 3.1977 | 2.53935 | 1.6137 | 0.4752 | 0.00495 | 0 | 0 | 0 | 0 | 0 | 0 |
| 15-10-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.06435 | 0.792 | 0.97515 | 1.8117 | 1.6335 | 1.4751 | 1.1286 | 1.14345 | 1.0098 | 0.77715 | 0.396 | 0.02475 | 0 | 0 | 0 | 0 | 0 | 0 |
| 16-10-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0099 | 0.25245 | 0.5643 | 0.8712 | 1.1682 | 1.4454 | 1.5939 | 1.0395 | 0.6039 | 0.5742 | 0.1881 | 0.0099 | 0 | 0 | 0 | 0 | 0 | 0 |
| 17-10-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0099 | 0.25245 | 0.3069 | 0.46035 | 0.5643 | 0.6633 | 1.06425 | 1.2276 | 0.44055 | 0.59895 | 0.33165 | 0.0198 | 0 | 0 | 0 | 0 | 0 | 0 |
| 18-10-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0297 | 0.5643 | 0.7623 | 1.1088 | 1.18305 | 1.27215 | 1.60875 | 1.1979 | 1.1088 | 0.9207 | 0.29205 | 0.01485 | 0 | 0 | 0 | 0 | 0 | 0 |
| 19-10-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0099 | 0.4059 | 0.84645 | 2.52945 | 1.584 | 1.28205 | 0.78705 | 0.94545 | 0.9207 | 0.72765 | 0.4158 | 0.0198 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20-10-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0099 | 0.4059 | 0.61875 | 0.7623 | 1.0692 | 2.00475 | 1.584 | 0.95535 | 0.85635 | 0.9108 | 0.3465 | 0.01485 | 0 | 0 | 0 | 0 | 0 | 0 |
| 21-10-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.6138 | 1.683 | 1.18305 | 1.40085 | 1.89585 | 2.54925 | 2.45025 | 0.73755 | 0.58905 | 0.12375 | 0.00495 | 0 | 0 | 0 | 0 | 0 | 0 |
| 22-10-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.3861 | 0.5445 | 0.4653 | 1.48005 | 0.7425 | 0.74745 | 0.83655 | 1.27215 | 0.50985 | 0.27225 | 0.0099 | 0 | 0 | 0 | 0 | 0 | 0 |
| 23-10-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.2376 | 1.3167 | 1.4157 | 0.72765 | 0.6336 | 0.6336 | 0.58905 | 0.6831 | 0.68805 | 0.25245 | 0.0099 | 0 | 0 | 0 | 0 | 0 | 0 |
| 24-10-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0099 | 0.14355 | 0.28215 | 0.4356 | 0.53955 | 0.62865 | 0.6237 | 0.53955 | 0.41085 | 0.55935 | 0.23265 | 0.00495 | 0 | 0 | 0 | 0 | 0 | 0 |
| 25-10-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.03465 | 0.5841 | 1.3761 | 2.3067 | 2.8512 | 3.1086 | 3.05415 | 2.9007 | 2.28195 | 1.46025 | 0.495 | 0.01485 | 0 | 0 | 0 | 0 | 0 | 0 |
| 26-10-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0396 | 0.693 | 1.5444 | 2.376 | 2.84625 | 3.17295 | 3.0492 | 2.7027 | 1.92555 | 1.41075 | 0.30195 | 0.0099 | 0 | 0 | 0 | 0 | 0 | 0 |

| | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 27-10-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0396 | 0.7029 | 1.5345 | 2.39085 | 1.45035 | 0.6138 | 0.8712 | 0.6039 | 0.8811 | 0.6039 | 0.3069 | 0.00495 | 0 | 0 | 0 | 0 | 0 | 0 |
| 28-10-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.03465 | 0.63855 | 1.32165 | 0.6534 | 0.91575 | 1.69785 | 1.4652 | 1.4454 | 1.5048 | 0.59895 | 0.28215 | 0.00495 | 0 | 0 | 0 | 0 | 0 | 0 |
| 29-10-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0099 | 0.23265 | 0.31185 | 1.0296 | 1.27215 | 0.6039 | 0.95535 | 0.71775 | 1.1979 | 0.3762 | 0.1782 | 0.00495 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30-10-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.01485 | 0.28215 | 0.6435 | 0.66825 | 0.99495 | 3.15315 | 1.7721 | 0.891 | 0.8613 | 0.6732 | 0.11385 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 31-10-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0297 | 0.62865 | 1.4949 | 1.7325 | 2.6928 | 3.06405 | 2.9799 | 2.7522 | 2.13345 | 1.10385 | 0.22275 | 0.00495 | 0 | 0 | 0 | 0 | 0 | 0 |
| 01-11-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.02475 | 0.5643 | 1.4058 | 2.1087 | 2.73735 | 2.9403 | 3.06405 | 2.72745 | 2.11365 | 1.0692 | 0.17325 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 02-11-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.02475 | 0.6039 | 1.46025 | 2.277 | 2.8314 | 3.1086 | 3.069 | 2.25225 | 1.98 | 1.1682 | 0.31185 | 0.00495 | 0 | 0 | 0 | 0 | 0 | 0 |
| 03-11-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0198 | 0.594 | 1.2078 | 2.05425 | 2.4552 | 2.74725 | 2.4156 | 2.42055 | 1.6335 | 1.21275 | 0.3168 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 04-11-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.01485 | 0.4158 | 1.2969 | 2.19285 | 2.78685 | 3.03435 | 2.07405 | 2.56905 | 2.0394 | 1.15335 | 0.297 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 05-11-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.1782 | 0.62865 | 0.6831 | 1.39095 | 2.30175 | 2.78685 | 1.7127 | 1.4751 | 0.83655 | 0.21285 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 06-11-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.01485 | 0.52965 | 0.594 | 0.9009 | 2.20275 | 1.85625 | 1.9305 | 1.89585 | 0.6237 | 1.0197 | 0.25245 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 07-11-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.099 | 0.23265 | 0.35145 | 0.5049 | 0.49005 | 0.6534 | 0.4752 | 1.78695 | 1.0791 | 0.26235 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 08-11-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0099 | 0.48015 | 1.35135 | 2.0889 | 2.68785 | 2.89575 | 2.8908 | 2.40075 | 1.65825 | 1.05435 | 0.25245 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 09-11-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0099 | 0.4257 | 1.3167 | 1.9404 | 2.34135 | 2.475 | 2.34135 | 2.3364 | 0.97515 | 0.7425 | 0.17325 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10-11-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0099 | 0.47025 | 1.3365 | 2.09385 | 2.6433 | 2.91555 | 2.8809 | 2.37105 | 1.5939 | 1.01475 | 0.2376 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11-11-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.45045 | 1.3167 | 2.07405 | 2.57895 | 2.89575 | 2.85615 | 2.48985 | 1.7325 | 1.0296 | 0.1782 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12-11-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.44055 | 1.29195 | 2.05425 | 2.4453 | 2.871 | 2.83635 | 2.0889 | 1.55925 | 1.07415 | 0.18315 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 13-11-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.3762 | 1.25235 | 1.9008 | 2.4849 | 2.8017 | 2.8017 | 2.31165 | 1.2474 | 0.9207 | 0.15345 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 14-11-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.3465 | 1.20285 | 1.85625 | 2.4948 | 2.8116 | 2.79675 | 2.25225 | 1.5642 | 0.92565 | 0.15345 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 15-11-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.3861 | 1.20285 | 1.87605 | 2.50965 | 2.53935 | 2.67795 | 2.26215 | 1.8513 | 0.8811 | 0.14355 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 16-11-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.3663 | 1.1286 | 1.86615 | 2.50965 | 2.72745 | 2.1879 | 2.17305 | 1.54935 | 0.891 | 0.1386 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 17-11-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.3564 | 0.7722 | 1.03455 | 1.6731 | 1.43055 | 1.59885 | 1.30185 | 0.6534 | 0.5544 | 0.08415 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 18-11-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.29205 | 1.06425 | 1.73745 | 2.13345 | 2.37105 | 2.3067 | 1.80675 | 1.485 | 0.9504 | 0.1485 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 19-11-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0891 | 0.5247 | 0.31185 | 0.4257 | 0.4455 | 0.4851 | 0.495 | 0.44055 | 0.34155 | 0.0495 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20-11-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0693 | 0.95535 | 0.72765 | 2.1087 | 2.05425 | 1.11375 | 2.36115 | 1.2474 | 0.49005 | 0.07425 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 21-11-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1881 | 0.1881 | 0.5148 | 0.64845 | 2.20275 | 1.5543 | 2.15325 | 1.63845 | 0.9999 | 0.1485 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 22-11-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.2376 | 0.86625 | 0.8712 | 2.0889 | 2.21265 | 2.1186 | 2.25225 | 1.7028 | 0.9207 | 0.13365 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 23-11-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1584 | 0.28215 | 1.51965 | 2.3364 | 2.6433 | 2.58885 | 2.2176 | 1.37115 | 0.792 | 0.11385 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 24-11-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.25245 | 1.0692 | 1.7127 | 2.1681 | 2.3661 | 2.5245 | 2.2968 | 1.7226 | 0.9009 | 0.1287 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 25-11-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.22275 | 0.98505 | 1.59885 | 2.03445 | 2.3067 | 2.3265 | 2.1681 | 1.43055 | 0.8712 | 0.1188 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 26-11-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1089 | 0.6732 | 1.5939 | 2.0988 | 2.10375 | 2.13345 | 1.81665 | 1.6137 | 0.86625 | 0.1188 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 27-11-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1782 | 0.9405 | 0.4356 | 0.38115 | 0.54945 | 0.4455 | 1.80675 | 0.5841 | 0.9306 | 0.1287 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 28-11-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.20295 | 0.98505 | 1.7325 | 2.0196 | 2.07405 | 1.6731 | 1.7226 | 1.683 | 0.8712 | 0.1188 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 29-11-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1881 | 0.98505 | 1.71765 | 2.26215 | 2.47995 | 2.51955 | 2.2374 | 1.6731 | 0.7326 | 0.099 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30-11-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.11385 | 0.6633 | 1.34145 | 2.22255 | 1.80675 | 1.9305 | 1.94535 | 0.52965 | 0.19305 | 0.02475 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 01-12-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1683 | 0.9504 | 1.68795 | 2.23245 | 2.40075 | 1.79685 | 1.21275 | 0.9108 | 0.60885 | 0.0792 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 02-12-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.09405 | 0.40095 | 0.92565 | 1.68795 | 1.30185 | 0.95535 | 0.4356 | 0.42075 | 0.2178 | 0.0297 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 03-12-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1089 | 0.28215 | 0.73755 | 1.2078 | 1.91565 | 0.8811 | 0.7722 | 0.5445 | 0.43065 | 0.0594 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 04-12-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0792 | 0.33165 | 0.35145 | 0.3861 | 0.4752 | 1.46025 | 1.3464 | 1.1781 | 0.64845 | 0.08415 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 05-12-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1287 | 0.2178 | 0.36135 | 0.3663 | 1.5642 | 0.43065 | 0.62865 | 0.297 | 0.21285 | 0.0297 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 06-12-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.06435 | 0.88605 | 1.6137 | 2.19285 | 2.4849 | 2.48985 | 2.1978 | 1.6533 | 0.5346 | 0.0693 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 07-12-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1089 | 0.8514 | 1.4553 | 1.9305 | 2.47005 | 1.9602 | 2.19285 | 1.188 | 0.80685 | 0.1089 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 08-12-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.03465 | 0.1485 | 0.35145 | 0.3861 | 0.4257 | 0.4653 | 0.42075 | 0.51975 | 0.37125 | 0.0495 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 09-12-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0594 | 0.32175 | 0.7227 | 0.86625 | 0.9405 | 2.0592 | 1.4058 | 0.693 | 0.75735 | 0.099 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10-12-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.01485 | 0.2178 | 0.79695 | 0.8019 | 0.9603 | 0.84645 | 1.20285 | 0.693 | 0.3861 | 0.0495 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11-12-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.04455 | 0.4455 | 0.6831 | 1.3167 | 2.44035 | 2.4552 | 2.17305 | 1.63845 | 0.6633 | 0.0891 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12-12-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.03465 | 0.39105 | 0.81675 | 2.00475 | 2.42055 | 1.11375 | 1.16325 | 1.485 | 0.8118 | 0.1089 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 13-12-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0297 | 0.2178 | 0.6039 | 0.7029 | 0.7029 | 0.68805 | 0.68805 | 0.5445 | 0.7524 | 0.099 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 14-12-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0099 | 0.14355 | 0.5346 | 0.4356 | 0.4158 | 0.62865 | 0.7821 | 0.30195 | 0.26235 | 0.03465 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 15-12-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0495 | 0.39105 | 1.4454 | 1.9998 | 2.41065 | 1.26225 | 1.97505 | 1.63845 | 0.9207 | 0.1287 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 16-12-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0495 | 0.7821 | 1.4355 | 2.0097 | 2.4057 | 2.4354 | 2.1681 | 1.0692 | 0.46035 | 0.06435 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 17-12-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.01485 | 0.13365 | 0.396 | 0.37125 | 0.4653 | 0.4158 | 0.42075 | 0.40095 | 0.3465 | 0.0495 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 18-12-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0099 | 0.13365 | 0.35145 | 0.4554 | 0.54945 | 0.73755 | 0.47025 | 0.45045 | 0.2574 | 0.03465 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 19-12-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.1287 | 0.2475 | 0.34155 | 0.792 | 0.53955 | 0.47025 | 0.792 | 0.52965 | 0.07425 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20-12-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.06435 | 0.7524 | 1.30185 | 1.12365 | 0.8514 | 1.19295 | 1.5048 | 0.46035 | 0.3663 | 0.05445 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 21-12-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.01485 | 0.31185 | 1.11375 | 0.9108 | 1.30185 | 0.79695 | 1.1682 | 0.9504 | 0.72765 | 0.1089 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 22-12-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0198 | 0.14355 | 0.58905 | 0.47025 | 0.48015 | 0.7326 | 0.8019 | 0.42075 | 0.6138 | 0.0891 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 23-12-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.02475 | 0.7326 | 1.48005 | 2.0493 | 2.19285 | 2.43045 | 2.18295 | 1.66815 | 0.594 | 0.0891 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 24-12-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0198 | 0.6435 | 1.2771 | 1.85625 | 2.11365 | 1.8216 | 1.9701 | 1.4058 | 0.7326 | 0.11385 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 25-12-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0099 | 0.16335 | 0.24255 | 0.4653 | 0.41085 | 0.42075 | 0.4257 | 0.30195 | 0.297 | 0.04455 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 26-12-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0198 | 0.67815 | 1.4652 | 2.0493 | 1.5147 | 0.5544 | 1.3068 | 1.48005 | 0.4851 | 0.0792 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 27-12-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.01485 | 0.49005 | 1.0494 | 1.72755 | 2.376 | 2.28195 | 1.6236 | 1.2672 | 0.9405 | 0.1485 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 28-12-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00495 | 0.1683 | 0.34155 | 0.4851 | 0.8019 | 0.42075 | 0.4653 | 0.4158 | 0.33165 | 0.05445 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 29-12-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.01485 | 0.32175 | 0.98505 | 1.21275 | 0.65835 | 2.3463 | 2.0493 | 1.54935 | 1.0098 | 0.1683 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30-12-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.01485 | 0.67815 | 1.46025 | 1.96515 | 1.67805 | 2.3958 | 2.2176 | 1.6137 | 0.79695 | 0.13365 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 31-12-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0099 | 0.53955 | 0.86625 | 1.19295 | 0.63855 | 0.6336 | 0.7722 | 0.58905 | 0.28215 | 0.0495 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# Appendix D

Battery specification sheet



## VRLA GEL SERIES

## ☐ NPG200-12

### Product Image

### Product Dimensions

### Characteristics

| | | |
|---|---|---|
| Nominal Voltage | | 12V |
| Nominal Capacity (10 hour rate) | | 200Ah |
| Capacity 25℃(77°F) | 20 hour rate (11.0A) | 220Ah |
| | 5 hour rate (35.4A) | 177Ah |
| | 1 hour rate (132A) | 132Ah |
| Internal Resistance | Full Charged Battery 25℃ | ≤2.5mΩ |
| Capacity affected by Temperature (10 hour) | 40℃ (104°F) | 102% |
| | 25℃ (77°F) | 100% |
| | 0℃ (32°F) | 90% |
| | -15℃ (5°F) | 70% |
| Self-Discharge 25℃(77°F) Capacity | after 3 month storage | 92% |
| | after 6 month storage | 84% |
| | after 12 month storage | 65% |
| Charge (Constant Voltage) 25℃ (77°F) | Float | Initial Charging Current Less than 40A<br>Voltage 13.6-13.8V |
| | Cycle | Initial Charging Current Less than 40A<br>Voltage 14.4-14.9V |

### Packaging

| | | |
|---|---|---|
| Battery Dimensions | Length | 522mm |
| | Width | 240mm |
| | Height | 219mm |
| | Total Height | 224mm |
| Box Dimensions | Length | 537mm |
| | Width | 255mm |
| | Height | 299mm |
| Quantity Per Box | | 1 PC per box |
| Net weight Per Cell | | 60.0 kg±500g |
| Net weight Per Box | | 60.0kg |
| Gross Weight | | 60.8kg |

### Discharge Constant Current per Cell (Amperes at 77°F25°C)

| F.V/Time | 5min | 10min | 15min | 30min | 45min | 1h | 2h | 3h | 5h | 8h | 10h | 20h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.60V | 577.9 | 371.6 | 309.5 | 206.4 | 148.1 | 132.0 | 81.8 | 55.0 | 37.4 | 24.6 | 22.0 | 12.1 |
| 1.65V | 567.4 | 364.8 | 303.9 | 202.6 | 145.4 | 129.6 | 80.4 | 54.0 | 36.7 | 24.2 | 21.6 | 11.9 |
| 1.70V | 556.9 | 358.1 | 298.3 | 198.9 | 142.7 | 127.2 | 78.9 | 53.0 | 36.0 | 23.7 | 21.2 | 11.7 |
| 1.75V | 546.4 | 351.3 | 292.7 | 195.1 | 140.0 | 124.8 | 77.4 | 52.0 | 35.4 | 23.3 | 20.8 | 11.4 |
| 1.80V | 525.4 | 337.8 | 281.4 | 187.6 | 134.6 | 120.0 | 74.4 | 50.0 | 34.0 | 22.4 | 20.0 | 11.0 |

### Discharge Constant Power per Cell (Watts at 77°F 25°C)

| F.V/Time | 5min | 10min | 15min | 30min | 45min | 1h | 2h | 3h | 5h | 8h | 10h | 20h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.60V | 1112.5 | 715.3 | 595.9 | 397.2 | 285.0 | 254.1 | 157.5 | 105.9 | 72.0 | 47.4 | 42.4 | 23.3 |
| 1.65V | 1092.3 | 702.3 | 585.0 | 390.0 | 279.8 | 249.5 | 154.7 | 104.0 | 70.7 | 46.6 | 41.6 | 22.9 |
| 1.70V | 1072.1 | 689.3 | 574.2 | 382.8 | 274.7 | 244.9 | 151.8 | 102.0 | 69.4 | 45.7 | 40.8 | 22.4 |
| 1.75V | 1051.9 | 676.3 | 563.4 | 375.6 | 269.5 | 240.2 | 148.9 | 100.1 | 68.1 | 44.8 | 40.0 | 22.0 |
| 1.80V | 1011.4 | 650.3 | 541.7 | 361.1 | 259.1 | 231.0 | 143.2 | 96.3 | 65.5 | 43.1 | 38.5 | 21.2 |

Note The above data are average values, and can be obtained within 3 charge/discharge cycles. These are not minimum values. Cell and battery designs/specifications are subject to modification without notice. Contact CBB for the latest information.