India Smart Grid Forum

# STATE TARIFF DESIGN USING REGULATORY SANDBOX APPROACH FOR ENHANCING RENEWABLE ENERGY DEMAND IN UTTAR PRADESH

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**Pankaj Kumar, IAS**
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## Message

I am delighted to extend my appreciation to India Smart Grid Forum (ISGF) for their exceptional demonstration project, which tested the viability of implementing Time of Use (ToU) tariff for electricity in Uttar Pradesh. In today's era, marked by the proliferation of renewable energy resources, understanding the intricate interplay between demand, generation capacity, and Consumers' willingness-to-pay has become imperative. These factors play a crucial role in effective planning of distribution operations and the design of tariff structures that align with the evolving energy landscape.

As we witness a significant increase in the deployment of distributed energy resources (DER) such as solar photovoltaic (PV) and wind power, coupled with the growing adoption of electric vehicles (EVs), utilities are going to experience unforeseen surge in demands. This creates considerable strain on the grid infrastructure. Real-time dynamic tariffs can help to enhance demand flexibility by responding to real-time price signals. This will also help to flatten the load curve and will contributes to deferring the infrastructure augmentation cost.

ISGF's pioneering pilot project has effectively substantiated these hypotheses, providing an invaluable resource for regulators and utilities alike. It equips them with the means to scrutinize an array of scenarios linked to peak load management via pricing signals and gauge their impact on utility revenue and customer billing.

I congratulate ISGF for this visionary initiative and wish them success in their future endeavours.

**Pankaj Kumar**

## Preface

**Reji Kumar Pillai**
President, India Smart Grid Forum
Chairman, Global Smart Energy Federation

The pricing of electricity poses a complex challenge when it comes to ensuring the smooth and efficient operation of the power sector. In India, electricity tariffs often fall short of accurately reflecting the genuine cost incurred in the processes of electricity generation, transmission, and distribution. To effectively plan the supply of electricity and create suitable tariff structures, it is imperative to possess a comprehensive understanding of the intricate relationship between demand and pricing, consumers' willingness to pay for electricity, and the ability to make precise demand forecasts.

As the utilization of distributed energy resources (DER) continues to grow, the power system must adapt to newfound requirements on both the supply and demand fronts. This adaptation is crucial for effectively managing peak demand and addressing the inherent intermittency associated with DERs. Unfortunately, the existing flat tariffs in place today fail to incentivize customers to shift their energy consumption to non-peak hours. Additionally, Time of Day (ToD) tariffs, currently applicable to commercial and industrial customers in select states, have proven to be less effective in managing demand, especially in light of the increased presence of intermittent DERs and the evolving patterns of peak demand due to shifting weather conditions and lifestyle changes.

Therefore, the need for a real-time or dynamic tariff for electricity becomes essential, and such a tariff would offer benefits to all stakeholders involved. ISGF, in this context had undertaken a study project titled "Design of a Robust Time of Use Framework for Electricity Tariff in Gujarat" in 2019-2020. This project rigorously examined the feasibility and potential impacts of implementing Time of Use (ToU) tariff scheme in the state of Gujarat. As part of that study, ISGF has developed a specialized ToU Tool that utilities, regulators, and other stakeholders can utilize to simulate various "what-if" scenarios with real-time tariffs. These scenarios included evaluating the extent to which peak load can be shifted and the consequential effects on utility revenue, reductions in peak power purchase costs, and impacts on customer bills. Furthermore, the project provided a comprehensive implementation framework and a practical roadmap for the adoption of ToU tariffs in the state. The study also delved into the utilization and consequences of the policy on peaking power plants and the reduction in the reliance on DG sets, which are typically employed to meet peak loads.

Based on the findings of that study in Gujarat and with support of Uttar Pradesh Electricity Regulatory Commission (UPERC) and Uttar Pradesh Power Corporation Limited (UPPCL), ISGF undertook the pilot demonstration of ToU tariff scheme to a set of customers in Lucknow City having smart meters (or AMR) who participated voluntarily in the pilot project. This included 50 customers (residential-30, commercial -17, and industrial-3) with a cumulative load of 24 MW. The ToU scheme was conducted for these customers from September 2022 to July 2023. The pricing signals for the 15-minutes intervals (96 blocks) for the following day was communicated to the participating customers before the midnight of the previous day. ToU prices were linked to the actual prices in the power exchange for

the day and the pricing signals offered rebates and surcharges in each 15-minute blocks based on the supply-demand balance on the grid. These rebates and surcharges were over and above the existing tariffs for these customers. It was observed that typically in the afternoon hours on most days, there was surplus power on the northern region grid and we could offer rebates of Rs 1.00 to Rs 4.00 per kWh; and during evening/morning peaks we applied surcharges of Rs 1.00 to Rs 4.00 per kWh. Customers could shift their variable loads such as cooling, water pumping, welding, washing etc during the periods of rebates; and reduce the loads during the peak hours when surcharge is applied. End of each month, we prepared shadow-bills for the participating customers based on their actual consumption per ToU price signals and found most customers could save substantial amounts in their electricity prices. We have also estimated huge savings for UPPCL from the ToU scheme as they will no longer need to buy electricity at a higher price from the market and distribute at the regulated tariffs which are lower than the market prices. In this scheme, the utility will be communicating the real-time prices in advance and offer the chance for the customers to shift their consumption to low tariff periods. During peak hours they will be paying surcharge which will adequately compensate the utility for the power bought from the market. From the results of this pilot demonstration, we estimate that 5% of the peak load can be shifted and about 30% of the total load can be moved to ToU scheme. Based on these we estimated an annual benefit to the tune of Rs 690 crore for UPPCL.

The project was very timely as Government of India has decided to move to variable tariff for commercial and industrial customers from April 2024 and complete customers (except agricultural) from April 2025. This policy suggests up to 20% rebates during high-solar generation hours and up to 20% surcharge during peak hours.

ToU tariffs hold immense potential for smoothing demand profiles, allowing power suppliers to reduce their investments in capacity addition, and facilitating more efficient planning of electricity generation and distribution. This real-time dynamic tariff scheme enables demand flexibility, flattening the load curve, improving asset utilization, and contributing to reduced emissions – a win-win scenario for all stakeholders involved.

Reji Kumar Pillai

# Authors and Acknowledgements

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We would like to thank Mr. Amrendra Singh Kushwaha, Director and Mr. A J Sidhqui, Chief Engineer, Uttar Pradesh State Load Dispatch Centre (UPSLDC) for providing necessary guidance to undertake this pilot project in Lucknow.

We also like to extend our sincere gratitude to the customers who participated voluntarily; and all other stakeholders for their cooperation and support during this project.


The India Smart Grid Forum (ISGF) is a Think-Tank of global repute on Smart Energy, Electric Mobility, Grid Modernization and Energy Transition. ISGF, established as a Public Private Partnership (PPP) initiative of Government of India in 2011, is spearheading the mission to accelerate electric grid modernization and energy transition in India. ISGF is registered as a Not-for-Profit Society under Indian Societies Act and has its head office at CBIP Building, Malcha Marg, Chanakyapuri, New Delhi 110021.

## Abbreviations

| | | |
|---|---|---|
| AMI | – | Advance Metering Infrastructure |
| AMR | – | Automatic Meter Reading |
| DG | – | Diesel Generator |
| DISCOM | – | Distribution Company |
| DSM | – | Demand Side Management |
| EESL | – | Energy Efficiency Service Limited |
| GHG | – | Green House Gas |
| GoI | – | Government of India |
| IEA | – | International Energy Agency |
| ISGF | – | India Smart Grid Forum |
| kWh | – | Kilowatt Hour |
| MVVNL | – | Madhyanchal Vidyut Vitaran Nigam Limited |
| MWh | – | Mega Watt Hour |
| NSGM | – | National Smart Grid Mission |
| RE | – | Renewable Energy |
| SLDC | – | State Load Dispatch Centre |
| ToD | – | Time of Day |
| ToU | – | Time of Use |
| UPERC | – | Uttar Pradesh Electricity Regulatory Commission |
| UPPCL | – | Uttar Pradesh Power Corporation Limited |
| UP SLDC | – | Uttar Pradesh State Load Despatch Centre |
| UI | – | Unscheduled Interchange |

## Executive Summary

In June 2023, Government of India (GoI) has introduced two changes to the electricity tariff system, through an amendment to the Electricity (Rights of consumers) Rules, 2020. These changes are introduction of Time of Day (ToD) Tariff, and rationalization of smart metering provisions. Under the ToD tariff system, tariff during high-solar hours of the day should be 10%-20% less than the normal tariff, while the tariff during peak hours should be 10%-20% higher. ToD tariff would be applicable for commercial and industrial customers having maximum demand of 10 kW and above, from 1st April, 2024 and for all other customers (except agricultural), latest from 1st April, 2025. ToD tariff should be made effective immediately after installation of smart meters.

Under the ToD scheme, separate tariffs for peak hours, high-solar hours, and normal hours will be communicated to consumers in advance to manage their load according to the tariff. With awareness and effective utilization of ToD tariff mechanism, consumers can reduce their electricity bills by shifting their interruptible loads to high-solar hours. Since solar power is cheaper, the tariff during the high-solar hours will be less, which will result in reduced power bills. During non-solar hours thermal and hydro power as well as gas-based capacity is used, their costs are higher than that of solar power, this will be reflected in ToD tariff. With the proposed new tariff scheme, consumers can plan their consumption in order to reduce their power costs and planning more activities during high-solar hours when power costs are less. Most of the State Electricity Regulatory Commissions (SERCs) have already implemented ToD tariffs for large commercial and industrial consumers in the country. With installation of smart meters, the ToD metering at domestic consumer level will be introduced as per the new Tariff Policy mandate. ToD tariff, is recognized globally as an important Demand Side Management (DSM) tool which is used as a means of incentivizing consumers to shift a portion of their loads from peak times to off-peak times, thereby improving the system load factor by reducing the demand on the system during peak periods.

ISGF had undertaken a study project titled "Design of a Robust Time of Use Framework for Electricity Tariff in Gujarat" in 2019-2020. This project rigorously examined the feasibility and potential impacts of implementing Time of Use (ToU) tariff scheme in the state of Gujarat. As part of that study, ISGF has developed a specialized ToU Tool that utilities, regulators, and other stakeholders can utilize to simulate various "what-if" scenarios with real-time tariffs. These scenarios included evaluating the extent to which peak load can be shifted and the consequential effects on utility revenue, reductions in peak power purchase costs, and impacts on customer bills. Furthermore, the project provided a comprehensive implementation framework and a practical roadmap for the adoption of ToU tariffs in the state. The study also delved into the utilization and consequences of the policy on peaking power plants and the reduction in the reliance on DG sets, which are typically employed to meet peak loads.

Based on the findings of that study in Gujarat and with support of Uttar Pradesh Electricity Regulatory Commission (UPERC) and Uttar Pradesh Power Corporation Limited (UPPCL), ISGF undertook the pilot demonstration of ToU tariff scheme to a set of customers in Lucknow City having smart meters (or AMR) who participated voluntarily in the pilot project. This included 50 customers (residential-30, commercial -17, and industrial-3) with a cumulative load of 24 MW. The ToU scheme was conducted for these customers from September 2022 to July 2023. The pricing signals for the 15-minutes intervals (96 blocks) for the following day was communicated to the participating customers before the midnight of the previous day. ToU prices were linked to the actual prices in the power exchange for the day and the pricing signals offered rebates and surcharges in each 15-minute blocks based on the supply-demand balance on the grid. These rebates and surcharges were over and above the existing tariffs for these customers. It was observed that typically in the afternoon hours on most days, there

was surplus power on the northern region grid and we could offer rebates of Rs 1.00 to Rs 4.00 per kWh; and during evening/morning peaks we applied surcharges of Rs 1.00 to Rs 4.00 per kWh. Customers could shift their variable loads such as cooling, water pumping, welding, washing etc during the periods of rebates; and reduce the loads during the peak hours when surcharge is applied. End of each month, we prepared shadow-bills for the participating customers based on their actual consumption per ToU price signals and found most customers could save substantial amounts in their electricity prices. We have also estimated huge savings for UPPCL from the ToU scheme as they will no longer need to buy electricity at a higher price from the market and distribute at the regulated tariffs which are lower than the market prices. In this scheme, the utility will be communicating the real-time prices in advance and offer the chance for the customers to shift their consumption to low tariff blocks. During peak hours they will be paying surcharge which will adequately compensate the utility for the power bought from the market. From the results of this pilot demonstration, we estimate that 5% of the peak load can be shifted and about 30% of the total load can be moved to ToU scheme. Based on these we estimated an annual benefit to the tune of Rs 690 crore for UPPCL. Similar benefits would have accrued to the customers as well in savings on their monthly electricity bills.

This pilot project examined the technical feasibility of implementing real-time pricing, including the necessary infrastructure, communication systems, and data management capabilities. It evaluated the reliability and accuracy of real-time price signals and ensured effective coordination between the utility, consumers, and relevant stakeholders. The results and findings from the pilot demonstration of real-time pricing served as a valuable foundation for future decision-making regarding the implementation of real-time pricing on a larger scale. The data collected, along with consumers feedback and utility performance evaluations, contributed to formulating effective policies, regulations, and market mechanisms to support the transition to dynamic pricing framework. The pilot demonstration of real-time pricing held immense potential to transform the energy landscape by incentivizing energy efficiency, demand response, and renewable energy integration. Through this pilot project, valuable insights were gathered, and the groundwork was laid for a more sustainable and responsive energy future. The project aimed to comprehensively analyse the ToU Pilot Project conducted at the Uttar Pradesh Power Corporation Limited (UPPCL), which served as a testing ground for new tariff designs using a regulatory sandbox approach.

**Layout of this Report:** The report comprises of following chapters:

**Chapter 1** lays out the foundation of the project and provide context and the current smart metering status in UPPCL. It also elaborates the project scope, objectives, approach, and methodology of the project.

**Chapter 2** of the report discusses the benefits of the ToU tariff and outlines the survey conducted in the MVVNL area to identify willing participants. It covers customer onboarding, engagement, enrolment, and training on understanding and using the ToU tariff to save electricity consumption.

**Chapter 3** focuses on the design and consultation process with UPPCL/MVVNL, UPERC, and SLDC, highlighting their valuable suggestions and guidance. It provides an overview of the existing tariff structure and involvement of key stakeholders and their collaboration in designing the Time of Use (ToU) tariff for the project.

**Chapter 4** depicts the design of Time of Use (ToU) pricing signals and shadow bills. It explains the process of market data analysis and the design of ToU pricing. It further details the data extraction from the Indian Energy Exchange (IEX) to gain insights into the regular demand and supply scenario during the project's duration. It also discusses the methodology employed for calculating pricing and how it was communicated to Consumers in advance. Additionally, it explains about the existing

structure of the UPPCL energy bills and the preparation of shadow bills, enabling Consumers to analyse their potential savings in a comprehensible manner.

**Chapter 5** describes the analysis of the Time of Use (ToU) pilot project results. It presents the obtained load curves, which provide valuable insights into the electricity consumption patterns during different time periods. Furthermore, the chapter highlights the potential cost saving and advantages that UPPCL may obtain in future, including improved grid management and reduced peak demand. It also discusses the positive impact of ToU pricing on reducing carbon footprint and achieving societal benefits, contributing to a more sustainable and environmentally friendly energy system.

**Chapter 6** gives the infrastructure requirement required for the successful implementation of ToU. It provides a comprehensive roadmap, beginning with Consumers enrolment, outlining the infrastructure needed, and concluding with feedback mechanisms. This chapter also recommends on the regulatory interventions and comprehensive roadmap for the implementation of Time of Use (ToU) tariffs, emphasizing the infrastructure requirements for a successful rollout.

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# 1 Introduction

## 1.1 Background

The problem of climate change is affecting everyone including the most powerful and influential economies as well as the developing ones in a way never. Rapid growth and urbanization have brought new challenges for the humanity. Electricity sector is one among the biggest emitters of the greenhouse gases. Countries across the globe are promoting renewable energy (RE) to decarbonize the power sector. Though demand side management (DSM) is an effective tool to reduce and manage the energy consumption at the Consumers end, Time of Use (ToU) or real-time tariffs can catalyse the DSM efforts. Traditionally popular methods for managing peak loads in India are the use of peaking power plants and/or load shedding and at prescheduled hours at select locations/regions. Usually, the goal of DSM is to encourage the Consumers to use less energy during peak hours, or to move the time of usage of certain appliances/equipment to off-peak times such as late night and holidays. Peak demand management does not necessarily decrease total energy consumption, but could be expected to reduce the need for load shedding and investments in networks upgrade and peaking power plants to meet the uncapped peak. Peaking plants are usually fossil fuel powered which emit pollutants. Same is the case with load shedding which trigger usage of diesel generators by customers. So, both these measures to control the peak load result in higher emissions. Also, the cost of power from peaking plants is very high owing to low utilization (few hundred hours per/year) of these peaking power plants.

Typically, in any city or utility, the last 100 MW of the peak load in a year is experienced for less than 100 hours. In order to service that load enhancement in generation, transmission and distribution is not commercially viable. One of the most innovative and economical DSM tools to reduce peak load as well as increase consumption during off-peak hours is the implementation of ToU or real-time tariff for electricity.

ToU tariff is a scheme in which higher, normal, or lower tariff are applied based on the real time load on the network instead of fixed daily hours as in the case of Time of Day (ToD) Tariff. In order to implement ToU tariff successfully, automated meter reading system with two-way communication facilities between the utility and the customers and related IT systems are required.

According to the latest International Energy Agency (IEA) projections, the Indian power system is set to grow to 823 GW by 2030 and 1584 GW by 2040; and 869 GW (out of the 1584 GW) is expected to be RE resources by 2040. Considering the larger share of RE in the generation portfolio, IEA estimates ±85% flexibility for the Indian power system by 2040 which will be a huge challenge to manage. All grid modernization being undertaken henceforth should be designed to enhance the capability of the grid to support flexibility in both generation and demand. ToU tariff or real-time pricing is an effective mechanism for creating flexibility – load reduction during peak hours and demand creation during periods of surplus generation. Today in India with over 125 GW of RE resources connected to the grid, there are several time slots during the days when there is surplus power. Though pricing signals (of rebates) customers can be incentivized to Consumed more electricity during such periods rather than curtailing RE generation. Customers can pre-cool their buildings, pump water, schedule cooking, washing and other industrial activities when electricity is cheap. With most middle-income households connected to internet, they can connect their appliances through smart plugs (which cost less than one thousand rupees) and remotely control the operation of the appliances. This will set forth a revolution of electrification and increase the share of electricity in the energy mix as well as help scaling up and integration of RE.

## 1.2 Purpose of the Pilot Project

Uttar Pradesh (UP) is one of the leading states of India for renewable energy in terms of existing generation capacity as well as future potential. As of May 2023, the total RE installed capacity stood 4.78 GW which includes 2.5 GW of solar power and 2.2 GW of biomass. UP has a Time of Day (ToD) tariff in place and the adoption of Time of Use (ToU) or real-time pricing is proposed as a test case to review the effect of real-time pricing of electricity on Consumers's behaviour and the subsequent impact on generation, transmission, and distribution DISCOMs, their assets, and revenues. Further, UP is also planning to upgrade its renewable portfolio by several thousand megawatts in line with the Government of India's ambitious target of 500 GW of renewable power by 2030. The ToU tariff could play a pivotal role in integrating and adopting renewable energy into the energy mix efficiently and contribute towards reducing the carbon emissions' footprint.

The elements of an economically efficient tariff fit for addressing the current and expected network challenges can be derived from long-established principles of good tariff design. Those principles dictate that tariffs should:

- Reflect long-run marginal costs
- Focus on usage-driven components
- Provide Consumers the information, the opportunity, and the incentive to Consumed in a manner that optimizes the utilization of grid infrastructure
- Be simple, predictable, and understandable
- Where possible and appropriate, provide for the recovery of system costs based on how much a customer uses, when they use it, and where they are located

A brief about the Uttar Pradesh power system is presented below:

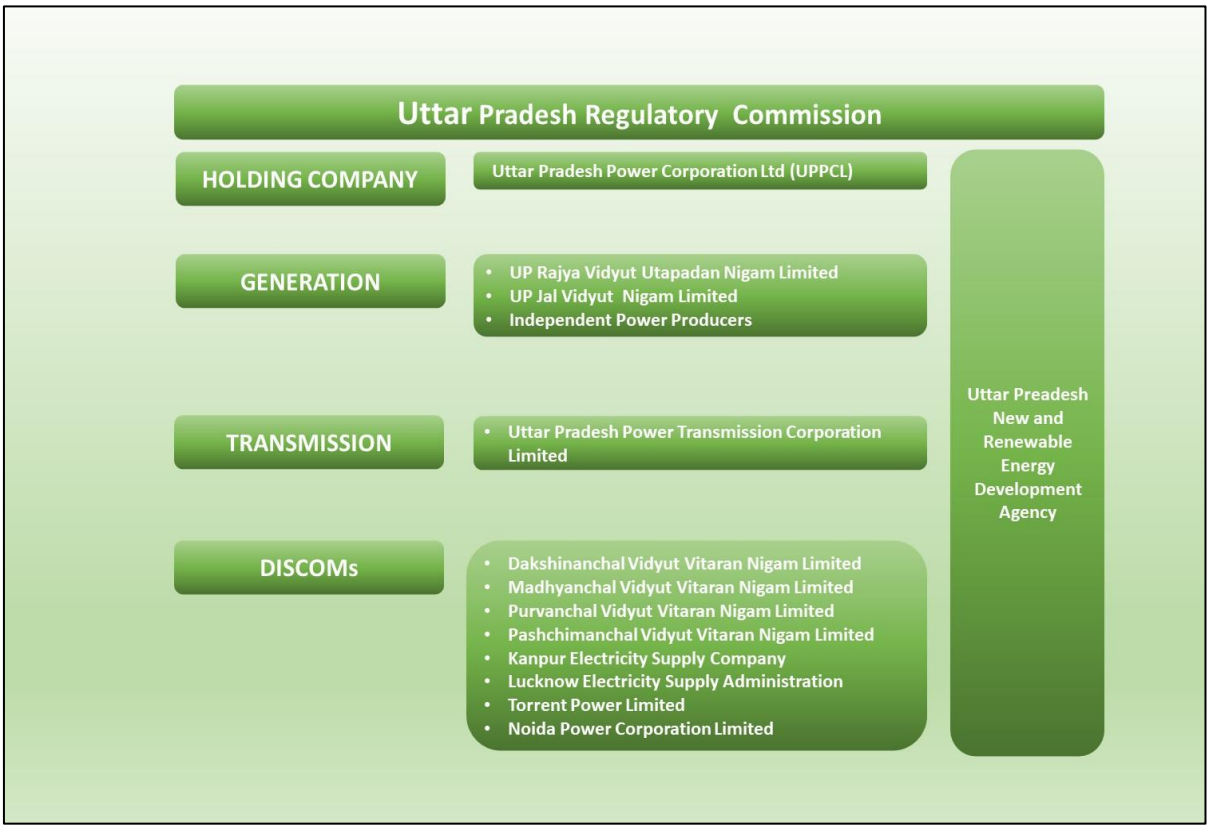



Figure 1-1: Power System Structure of Uttar Pradesh State

## 1.3 Smart Metering Status in Uttar Pradesh

Through Smart Meter National Program (SMNP), Energy Efficiency Service Limited (EESL) has installed 11,83,608 smart meters across Uttar Pradesh. Out of which 3,80,731 smart meters have been installed in Madhyanchal Vidyut Vitran Nigam Ltd (MVVNL) area in UP, which has led average revenue increase of INR 321 per month per meter for the MVVNL.

## 1.4 Project Objectives

The objective of this project is to examine the feasibility of real-time tariff for electricity based on near real-time pricing signals to customers through a pilot project in the retail market within the present legal framework of the Electricity Act, 2003. ToU tariff is recognized globally across electricity industries as an important DSM measure used to incentivize Consumers to shift a portion of their loads from peak times to off-peak times, thereby improving the system load factor by reducing the demand on the system during peak periods. It is expected that ToU tariff will reduce peak demand which will reduce the power purchase cost of the utility as the cost peaking power is very high. The purpose of this project is to pilot a new tariff mechanism under regulatory sandbox approach for enhancing the demand consumption of renewable energy and providing necessary recommendations to the regulator for large scale implementation. Key objective of implementing ToU Tariff were defined as below:

- Load balancing, promoting distributed energy resources
- Optimal network utilization, reduction in AT&C losses
- Consumers engagement and bill reduction opportunities
- Increased market adoption of innovative technologies
- Improved grid stability
- Reducing investments in grid reinforcement and peak capacity infrastructure
- Reduction in cost of power purchase as well as cost to serve

## 1.5 Project Scope

The scope of this project involved the identification and selection of customers with smart meters and interruptible loads who participated in testing the ToU tariff scheme. The methodology employed a regulatory sandbox approach to pilot and evaluate new tariff designs, leading to policy recommendations for the implementation of ToU tariffs in Uttar Pradesh. The pilot encompassed a thorough analysis of the outcomes of the ToU Pilot Project. It examined Consumers' load curve patterns, revealing insights into their electricity consumption behaviour and usage patterns. This analysis facilitated the identification of peak demand periods, off-peak hours, and overall load distribution during the project. The study also explored the benefits experienced by Consumers participating in the ToU tariff scheme, such as financial savings and improved energy efficiency. Furthermore, it evaluated the advantages gained by UPPCL, including enhanced load management, optimized grid utilization, and the potential for revenue generation. The project scope also extended to the societal benefits derived from the ToU scheme, emphasizing its contribution to reducing carbon footprints and achieving sustainability goals. The scope of the pilot focused on implementing ToU tariff schemes in Uttar Pradesh. It utilized a comprehensive methodology, including the selection of customers with smart meters and interruptible loads, a regulatory sandbox approach for testing new tariff designs, and an analysis of the project's outcomes to provide policy recommendations. The project also highlighted the societal benefits achieved through the ToU scheme, underscoring its role

in reducing carbon footprints and promoting sustainable practices. India Smart Grid Forum (ISGF) proposed to undertake a pilot Implementation of Time of Use (ToU) Tariff in Uttar Pradesh (UP) and created a practical implementation framework for the DISCOMs to implement ToU in their territories. This pilot was implemented under the regulatory sand-box approach where the regulator would provide permission for the customers who voluntarily participated in the project to use the ToU tariff scheme for a specified period. The proposed pilot project tested the effectiveness of ToU tariff by producing shadow bills under the ToU scheme. The shadow bills shown the customers their savings had the ToU been applied for actual billing. The pilot would also help the utility to determine how much load shifting can be achieved through ToU, reduction in power purchase cost and the difference in revenue. The pilot also tested customers willingness to participate in ToU and test "ideal" range of incentives and penalties for motivating customers to participate in ToU scheme.

The pilot project also calculated the carbon footprint reduction potential from the estimated peak demand shifting and reduction in number of hours of load shedding. The demand reduced/shifted during peak hour is from a thermal power plant and the emission reduction calculated based on the average emission per kWh of electricity produced from thermal plants in Northern India. Capacity of diesel generator (DG) sets being used by the customers participated in the ToU pilot is not known accurately. However, the DG sets capacities of other customers in the project area who have benefitted by reduced load shedding cannot be surveyed under the scope of this project. But certain data available in the public domain and with UPPCL relating to DG set penetration in the project area compiled and these data used for estimating the carbon footprint reduction from reduced usage of DG sets.

This pilot project will help with detailed feasibility analysis, potential impacts, and policy recommendations for ToU Tariff in the state of UP. An implementation framework and effective roadmap has created for the DISCOMs to understand the procedure and required infrastructure to implement ToU.

The scope of the pilot project covered:

- Identification and selection of customers having smart meters and interruptible loads; and connected to feeders that are overloaded during peak hours
- Customer engagement and education
    - Identification of potential customers for voluntary participation
    - Training to customers
- Onboarding of the selected customers voluntarily for the ToU pilot project
- ToU tariff design in consultation with UPPCL/MVVNL, Uttar Pradesh Electricity Regulatory Commission (UPERC) and State Load Dispatch Centre (SLDC)
- Pricing signal for participating customers, mobile application/SMS for sending real-time price signals for participating customers on their mobile phones
- Generation of shadow bills for the participating customers for the visibility of potential savings according to ToU price signals
- Communication of shadow bill with customer
- Detailed analysis on load reduced/shifted during peak hours, savings in power purchase cost for the distribution company (DISCOM), savings for the customers etc.
- Policy recommendations for ToU tariff implementation in Uttar Pradesh

## 1.6 Approach and Methodology

The pilot demonstration of real-time pricing aimed to assess the feasibility and effectiveness of implementing dynamic pricing strategies in Uttar Pradesh. The focus was on evaluating the impact of real-time pricing on Consumers behaviour, load management, grid utilization, and energy efficiency. During the pilot, a select group of customers with smart meters and interruptible loads participated in the program. These customers were exposed to real-time pricing, where electricity rates varied based on the time of day and the demand-supply dynamics of the grid. The objective was to observe how Consumers responded to price signals and adjusted their electricity consumption patterns accordingly.

The pilot employed a controlled environment to test and evaluate the effects of real-time pricing. The data collected during the pilot period provided valuable insights into load curve patterns, peak demand periods, and off-peak hours. This information helped identify opportunities for better load distribution and improved grid management. The results of the pilot demonstrated several benefits of real-time pricing. Consumers who actively engaged with the pricing signals were able to optimize their electricity usage and make informed choices about when to Consumed electricity. This resulted in financial savings for Consumers and increased energy efficiency overall. The utility company also experienced advantages, including improved load management, better utilization of the grid infrastructure, and the potential for revenue generation through innovative tariff structures. Furthermore, the pilot demonstrated the societal benefits of real-time pricing, particularly in terms of reducing carbon emissions and promoting sustainability.

By incentivizing Consumers to shift their electricity usage away from peak demand periods, the pilot contributed to a more efficient and environmentally friendly energy system. The pilot demonstration of real-time pricing provided valuable insights into the feasibility and benefits of implementing dynamic pricing strategies. The program involved a select group of customers, monitoring their response to real-time pricing signals and evaluating the impact on Consumers behaviour, load management, and energy efficiency. The results demonstrated the potential for real-time pricing to optimize electricity usage, improve grid management, and contribute to sustainability goals.

A well-designed research methodology was adopted for this project as outlined below:

**Step 1: Identification of the Target ToU Customers:** The project identified the 17 commercial customers, 30 residential customers and 3 industrial customers with significant load who have interruptible loads that could be shifted by a few hours – either prepone or postpone. ToU customers selected on feeders with maximum congestion during peak hours.

**Step 2: Data Collection:** Past consumption data of selected customers and feeder loading data of previous 1-3 years collected and fed into ToU Tool. This will help simulate scenarios and estimate load shifting potential of different customers.

**Step 3: Customer Engagement and Training:** Since the ToU tariff is a tool to help manage the load efficiently on the electric grid. Majority of the customers do not understand their electric bills. To reach customers more effectively, it is important for DISCOMs to know their customers and communicate how new rate structures can benefit them. With usage data analytics, DISCOMs can determine from an individual customer's electricity usage patterns and created an alternative bill if they had subscribed to various DSM programs and energy efficiency practices. This strategy known as shadow billing is very effective. It is one of the best tools that DISCOMs have, because it gives the information based on their

usage. ISGF has formulated different customer engagement programs through social media and direct contact programs to educate them the benefits of ToU scheme.

**Step 4: Enrolment of Customers:** Identified and selected customers has contacted and invited them to voluntarily join the ToU pilot program and they enrolled manually.

**Step 5: Pricing Signal for Participating Customers:** Day-ahead market data was fetched from IEX. An algorithm was formulated to compare the grid price with the market price. As a result, Time of Use (ToU) pricing was generated. Ultimately, a pricing chart was meticulously prepared, showcasing the ToU price, market price, and grid price.

**Step 6: Communication of Pricing Signals**: The ToU pricing signal chart, which includes incentives and surcharges, were communicated to customers through WhatsApp at mid-night every day.

**Step 7: Generation of Shadow bills:** Shadow bills of 50 Consumers were prepared showing ToU saving on a monthly basis from Sept 2022.

**Step 8: Communication of Shadow Bill with Customer:** The shadow bills, were shared with participating customers through both WhatsApp and emails.

# 2 Stakeholder Engagement and Collaboration

In FY 2020, ISGF undertook a study on "Design of Robust Time of Use (ToU) Tariff for electricity in Gujarat" with support from Shakti Sustainable Energy Foundation, a first of its kind study in India. This study examined the detailed feasibility and the possible impacts of the ToU tariff policy in the state of Gujarat. As part of this project, ISGF developed a ToU Tool that DISCOMs and regulators can use for analysing different "what-if" scenarios on how much peak load can be shifted and what impact it would have on the utility revenue, reduction in peak power purchase cost and impact on the customer's bills. An implementation framework and practical roadmap was also given in the ToU report. The study also assessed the use and the impact of the policy on peaking power plants and reduction in the use of DG sets that are used to meet peak loads.

ISGF, with the approval of the Uttar Pradesh Electricity Regulatory Commission (UPERC) and Uttar Pradesh Power Corporation Limited (UPPCL), implemented a pilot project on ToU tariff amongst the customers of Madhyanchal Vidyut Vitran Nigam Limited (MVVNL) in Lucknow Area in FY 2022-23.

To ensure effective participation and gather valuable insights from a wide range of stakeholders, ISGF organized a Stakeholder Consultation Workshop on August 18, 2022, in Lucknow, Uttar Pradesh. The workshop brought together officials from UPERC, UPPCL, State Load Dispatch Centre (SLDC), State DISCOMs (Distribution Companies), Consumers Forums, various associations, and other stakeholders in the state. The objective of the workshop was to create a platform for open and constructive dialogue, where stakeholders could share their perspectives, concerns, and suggestions related to the implementation of the ToU program. It provided an opportunity for stakeholders to contribute their insights, expertise, and experiences, helping to shape the development and refinement of the program. By organizing the Stakeholder Consultation Workshop, ISGF fostered collaboration and engagement among key stakeholders, enabling a more inclusive and comprehensive approach to the implementation of the ToU program in Uttar Pradesh.

ISGF organized multiple workshops with the aim of raising awareness among stakeholders about the ToU program. These workshops served as platforms for identifying and selecting customers who would be suitable for participating in the program. ISGF focused on engaging and onboarding these customers, ensuring their active involvement in the ToU implementation. Additionally, ISGF provided the necessary training to the selected customers to equip them with the knowledge and skills required to effectively participate in the ToU program. The training sessions covered various aspects of the program, including understanding the pricing structure, interpreting the price signals communicated through the WhatsApp group, and optimizing their energy usage accordingly. By conducting these workshops and training sessions, ISGF undertook many initiatives to build awareness, facilitating customer selection, and preparing customers for successful participation in the ToU program.

The key discussion points of the workshops were as follows:

- Knowledge about the demand-price relationship for electricity, Consumers "willingness-to-pay" for electricity, and demand forecasts are necessary for DISCOMs to plan their supply and tariff structures
- While flat rates provide customers with predictable and stable electricity bills, they may necessitate expensive additions to the generation capacity

- Effective scheduling of electrical load can help Consumers to reduce their electricity bills by increasing consumption when prices are low and reducing consumption when prices are high
- Demand patterns and elasticity of demand vary from Consumers to Consumers and thus segmentation of the electricity market can prove to be helpful
- Suppliers can offer suitable pricing schemes in properly segmented markets to boost their revenue
- Supporting technologies can further bridge the demand-supply gaps in electricity markets

## 2.1 Benefits of Time of Use (ToU) Tariff Scheme

ToU Tariff for electricity is a new concept in which customers are given price signals in advance (one hour or more) about the electricity tariff so that they can decrease or increase their electricity consumption. Typically, in a day there are time slots when electricity demand is more than available supply (peak-hours) which forces the utility to resort to load-shedding. There are also several time slots when the power on the grid is surplus. Customers with loads that can be interrupted or shifted for few hours can take advantage of the ToU scheme. During peak hours the utility will levy a surcharge to the normal tariff and during off-peak hours or surplus periods, the utility will offer a rebate. So, customers can switch off some of their machineries/appliances during peak hours and run them during off-peak hours when the rates are lower. This will help the utility to avoid load-shedding and reduce procurement of costly power during peak-hours at market rates. Thus, the ToU scheme will help reduce the monthly electricity bill of customers as well as power purchase cost of the utility.

The successful implementation of ToU tariff scheme can reduce the carbon footprint and lead to a cleaner environment in the following ways:

- Reduction in peak demand will avoid generation of electricity from peaking power plants which typically use coal or oil creating GHG emissions
- DISCOMs often resort to load shedding when they are unable to meet the peak demand which forces customers to run diesel generator (DG) sets. ToU scheme's potential to shift peak demand could reduce load shedding considerably which will reduce the use of DG sets and greenhouse gas (GHG) emissions
- Reduced load-shelling would avoid (or reduce) use of kerosene lamps and other alternate lighting arrangements which will reduce GHG emissions
- Reduced load-shedding and more reliable grid power will motivate customers to use electric vehicles and electric cooking which will in turn reduce GHG emissions
- Reduced load-shedding and more reliable grid power will motivate farmers to use electric irrigation pump (IP) sets instead of diesel engine/tractor powered IP sets for agricultural purposes
- More reliable power supply from the grid will help electrification of village level industries (rice and flour mills, diaries, medicine storage etc) which are otherwise supported by power from DG sets
- Reduced load-shedding and more reliable grid power will motivate entrepreneurs to setup repairs shops/service centres, photocopying and documentation centres, medical testing facilities etc. in rural areas which will prevent village people travelling to nearby towns. This will again reduce carbon footprint from reduced travel by people in the rural areas
- Increased flexibility of the grid through better demand management which will help integration and scaling up of renewable energy (RE) resources on the grid
- Reduction in AT&C losses by avoiding overloading of the feeders

- Reduction in power purchase cost for the DISCOMs (cost of power from peaking plants are much higher owing to their low plant load factor and high fuel charges)
- Deferral of transmission and distribution infrastructure upgrades (to meet the peak loads that are experienced for few hours in a day or few hundred hours in a year)
- Enhanced income for the utility from higher tariff during peak hours (from customers who are not participating in ToU scheme and not reducing their load according to the price signals)
- Avoidance of inverters and lead acid batteries at customer premises owing to reduced outages
- The inclusion of renewable energy (RE) as a base load through demand management according to ToU price signals.

## 2.2 Identification and Selection of Customers

MVVNL DISCOM, which took over the distribution of electricity in twenty-one districts from UPPCL in July 2003, is one of the seven distribution companies operating in Uttar Pradesh. Covering an area of 82472 sq. km, MVVNL is responsible for supplying electricity to 9 million customers across the twenty-one districts. As of March 2023, MVVNL has installed 3,72,000 smart meters within its jurisdiction. Given the presence of smart meters and the relative familiarity of customers with smart technologies, ISGF selected Lucknow for the ToU Pilot Demonstration Project.

ISGF, in collaboration with MVVNL, conducted a survey in Lucknow to identify potential customers for the ToU program. The survey aimed to find customers who already have smart meters or AMR meters and possess load flexibility for specific appliances. A total of 50 customers were identified, including 17 commercial customers, 30 residential customers, and 3 industrial customers. These customers own appliances such as air conditioners, water pumps, welding equipment, and cutting loads that can be adjusted by a few hours to optimize their energy usage. The load details of the customers are mentioned in the below Table 2-1

Table 2-1: Load details of Selected Customers

| Sl No | Name of the Customer | Sanctioned Load (kW) |
|---|---|---|
| **Commercial Consumers** | | |
| 1 | CC 1 | 1980 |
| 2 | CC 2 | 4279.5 |
| 3 | CC 3 | 1600 |
| 4 | CC 4 | 501 |
| 5 | CC 5 | 660 |
| 6 | CC 6 | 800 |
| 7 | CC 7 | 880 |
| 8 | CC 8 | 2200 |
| 9 | CC 9 | 830 |
| 10 | CC 10 | 350 |
| 11 | CC 11 | 1425 |
| 12 | CC 12 | 383 |
| 13 | CC 13 | 600 |
| 14 | CC 14 | 750 |
| 15 | CC 15 | 889.6 |
| 16 | CC 16 | 1332 |
| 17 | CC 17 | 440 |

| Residential Consumers | | |
|---|---|---|
| 1 | RC 1 | 5 |
| 2 | RC 2 | 10 |
| 3 | RC 3 | 5 |
| 4 | RC 4 | 2 |
| 5 | RC 5 | 10 |
| 6 | RC 6 | 20 |
| 7 | RC 7 | 3 |
| 8 | RC 8 | 4 |
| 9 | RC 9 | 1 |
| 10 | RC 10 | 10 |
| 11 | RC 11 | 2 |
| 12 | RC 12 | 2 |
| 13 | RC 13 | 2 |
| 14 | RC 14 | 2 |
| 15 | RC 15 | 5 |
| 16 | RC 16 | 13 |
| 17 | RC 17 | 14 |
| 18 | RC 18 | 10 |
| 19 | RC 19 | 8 |
| 20 | RC 20 | 15 |
| 21 | RC 21 | 10 |
| 22 | RC 22 | 8 |
| 23 | RC 23 | 12.5 |
| 24 | RC 24 | 18 |
| 25 | RC 25 | 15 |
| 26 | RC 26 | 15 |
| 27 | RC 27 | 10.4 |
| 28 | RC 28 | 18 |
| 29 | RC 29 | 7.95 |
| 30 | RC 30 | 3 |
| **Industrial Consumers** | | |
| 1 | IC 1 | 1917 |
| 2 | IC 2 | 144 |
| 3 | IC 3 | 2000 |
| **Total** | | 24221.95 |

## 2.3 Engaging and Onboarding of Customers

ISGF undertook various customer engagement initiatives, both through social media platforms and direct contact, to raise awareness and educate customers about the ToU tariff scheme. The aim was to inform customers about the benefits of participating in the ToU program and encourage their active involvement. As part of these efforts, ISGF created a dedicated customer guide specifically for the 'Pilot Project on Time of Use Tariff for Electricity in Uttar Pradesh.' This comprehensive guide provided customers with detailed information about the program, including its advantages and how they could actively participate. Through targeted communication strategies, ISGF successfully onboarded

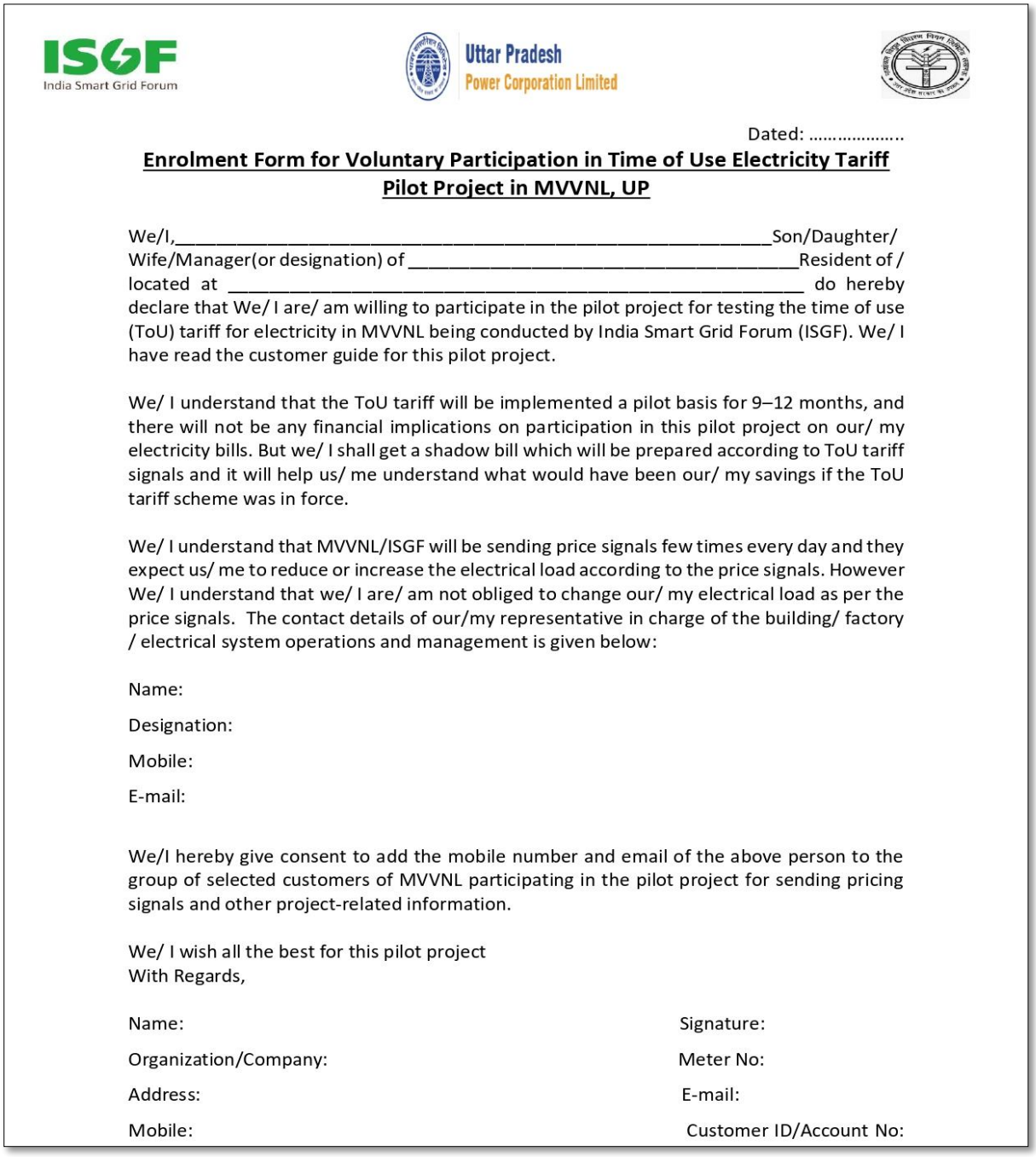
customers to voluntarily join the ToU program, ensuring they understood the concept and actively worked towards optimizing their energy usage.


Figure 2-1: Interaction Session for Onboarding Customers for the Pilot Project

The snapshots of Customer Guide English and Hindi versions are given in Appendix – A and Appendix -B.

## 2.4 Customer Enrolment and Training

ISGF in coordination with MVVNL identified and enrolled 50 customers. The voluntary enrolment form used is presented here at Figure 2-2:



India Smart Grid Forum

Uttar Pradesh Power Corporation Limited

Dated: .....

**Enrolment Form for Voluntary Participation in Time of Use Electricity Tariff Pilot Project in MVVNL, UP**

We/I,_____Son/Daughter/ Wife/Manager(or designation) of _____Resident of / located at _____ do hereby declare that We/ I are/ am willing to participate in the pilot project for testing the time of use (ToU) tariff for electricity in MVVNL being conducted by India Smart Grid Forum (ISGF). We/ I have read the customer guide for this pilot project.

We/ I understand that the ToU tariff will be implemented a pilot basis for 9–12 months, and there will not be any financial implications on participation in this pilot project on our/ my electricity bills. But we/ I shall get a shadow bill which will be prepared according to ToU tariff signals and it will help us/ me understand what would have been our/ my savings if the ToU tariff scheme was in force.

We/ I understand that MVVNL/ISGF will be sending price signals few times every day and they expect us/ me to reduce or increase the electrical load according to the price signals. However We/ I understand that we/ I are/ am not obliged to change our/ my electrical load as per the price signals. The contact details of our/my representative in charge of the building/ factory / electrical system operations and management is given below:

Name:

Designation:

Mobile:

E-mail:

We/I hereby give consent to add the mobile number and email of the above person to the group of selected customers of MVVNL participating in the pilot project for sending pricing signals and other project-related information.

We/ I wish all the best for this pilot project
With Regards,

Name: Signature:

Organization/Company: Meter No:

Address: E-mail:

Mobile: Customer ID/Account No:

Figure 2-2: Enrolment Form for Voluntary Participation in the Pilot Project

ISGF organized training sessions for customers to provide them with a comprehensive understanding of the ToU scheme and guide them on how to effectively utilize its benefits. Customers were familiarized with the scheme's details, enabling them to leverage it to their maximum advantage. To communicate the daily pricing information, price signals were shared with customers through a dedicated WhatsApp group at midnight (00:00 hrs). These signals included information about the rebate or surcharge on normal electricity rates for the upcoming 24 hours, divided into 96 blocks of

15 minutes each. During peak hours, a surcharge was applied on the normal rates, while off-peak hours offered a rebate on the normal rates. For instance, customers would receive a message indicating a rebate of INR 2 per unit (kWh) from 2 pm to 5 pm on the normal rates, or an additional surcharge of INR 2 per unit (kWh) from 6 pm to 9 pm above the normal rates. Based on these price signals, customers had the flexibility to shift their interruptible loads, such as air conditioners, water pumps, welding and cutting machines, washing machines, and dishwashers, to different time periods. They could pre-cool buildings, pump water, or perform laundry during rebate hours, while reducing electricity usage during peak hours by temporarily switching off air conditioning and other equipment.

During the pilot implementation phase, which took place from September 2022 to June 2023, customers received two types of electricity bills. The first bill was the regular bill based on the existing tariffs set by UPPCL. The second bill, referred to as the "shadow bill," was prepared by ISGF and reflected the ToU rates. However, as this was a pilot trial, customers were only required to pay the normal bill and were not obligated to pay the shadow bill.

The purpose of implementing the ToU tariff scheme on a pilot basis was to assess the potential for peak load reduction, determine the extent of savings in peak power purchase costs for the utility, and evaluate the impact on carbon emissions. By analysing the data and comparing the regular bills with the shadow bills, it was possible to estimate the effectiveness of the ToU scheme in reducing peak demand and its associated costs, as well as its contribution to reducing carbon emissions.

# 3 ToU Tariff Design in Consultation with UPPCL/MVVNL, UPERC and SLDC

## 3.1 Existing Time of Day (ToD) Tariff in Uttar Pradesh

The Time-of-Day (ToD) tariff has played a significant role in developing pricing mechanisms for setting up generation plants in Uttar Pradesh (UP) that can meet the system's peaking power requirements. During the day, when power demand is typically high, the ToD tariff helps discourage Consumers from using excess energy by imposing higher costs. This pricing strategy aims to balance the demand and supply dynamics during peak periods. Conversely, during the night, the ToD tariff incentivizes Consumers to utilize electricity by offering lower costs since power demand is relatively lower at that time. By implementing the ToD tariff, UP has been able to effectively manage its power resources, optimize energy usage, and promote a more balanced distribution of electricity throughout the day. The ToD tariff as applicable for major Consumers categories in Uttar Pradesh is summarized in the below table:

Table 3-1: Time of Day (ToD) Tariff in Uttar Pradesh

| **Time of Day (ToD) Tariff for Uttar Pradesh** | | | | | | |
|---|---|---|---|---|---|---|
| **Applicable Category** | Months | Normal Hours | Peak Hours | Surcharge on Energy | Off-Peak Hours | Rebate on Energy |
| **LMV-3 (Public Lamps)** | | | 06:00-18:00 hrs | 20% | | |
| **LMV-6 (Small and Medium Power)** | Summers 1-Apr to 30-Sep | 11:00 hrs to 17:00 hrs and 23:00 hrs to 05:00 hrs (next day) | 17:00 hrs to 23:00 hrs | 15% of energy charges | 05:00 hrs to 11:00 hrs | 15% of energy charges |
| | Winters 1-Oct to 31-Mar | 05:00 hrs to 17:00 hrs | 17:00 hrs to 23:00 hrs | 15% of energy charges | 23:00 hrs to 05:00 hrs | 15% of energy charges |
| **LMV – 11 (E.V. Charging)** | Summers 1-Apr to 30-Sep | 11:00 hrs to 17:00 hrs and 23:00 hrs to 05:00 hrs (next day) | 17:00 hrs to 23:00 hrs | 15% of energy charges | 05:00 hrs to 11:00 hrs | 15% of energy charges |
| | Winters 1-Oct to 31-Mar | 0500 hrs to 1700 hrs | 17:00 hrs to 23:00 hrs | 15% of energy charges | 23:00 hrs to 05:00 hrs | 15% of energy charges |
| **HV-2 (Large and Heavy Power)** | Summers 1-Apr to 30-Sep | 1100 hrs to 1700 hrs and 2300 hrs | 17:00 hrs to 23:00 hrs | 15% of energy charges | 05:00 hrs to | 15% of energy charges |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | to 0500 hrs (next day) | | | 11:00 hrs | |
| | Winters 1-Oct to 31-Mar | 0500 hrs to 1700 hrs | 17:00 hrs to 23:00 hrs | 15% of energy charges | 23:00 hrs to 05:00 hrs | 15% of energy charges |

As per the submissions made by UPPCL in ToD tariff the entire day is divided into four slots of six hours each. In the summer, from 11:00 hrs to 17:00 hrs and 23:00 hrs to 05:00 hrs there is a normal tariff, however there is a rebate of 15% on the normal tariff, from 05:00 hrs to 11:00 hrs and there is a surcharge of 15% on the normal tariff from 17:00 hrs to 23:00 hrs. For winters, from 05:00 hrs to 11:00 hrs and 11:00 hrs to 17:00 hrs there is a normal tariff, there will be a rebate of 15% on the normal tariff from 23:00 hrs to 5:00 hrs and there will be a surcharge of 15% on the normal tariff from 17:00 hrs to 23:00 hrs as mentioned in Table below.

For Industrial Consumers the day is divided into four ToD slots, namely ToD slot 1, ToD slot 2, ToD slot 3 and ToD slot 4. The energy charges are different in different slots. Below table shows all ToD slots and their timings during summer and winter months along with the energy charges (in Rs/kWh) for industrial Consumers:

Table 3-2: ToD slots and their timings during summer and winter months for Industrial Consumers

| **Summer Months (April to September)** | | | |
|---|---|---|---|
| **Slots** | **Hours** | **% of Energy Charges** | **Energy Charges (Rs/kWh)** |
| **ToD Slot 1** | 05:00 hrs – 11:00 hrs | (-) 15% | 6.04 |
| **ToD Slot 2** | 11:00 hrs – 17:00 hrs | 0% | 7.10 |
| **ToD Slot 3** | 17:00 hrs – 23:00 hrs | (+) 15% | 8.10 |
| **ToD Slot 4** | 23:00 hrs – 05:00 hrs | 0% | 7.10 |
| **Winter Months (October to March)** | | | |
| **Slots** | **Hours** | **% of Energy Charges** | **Energy Charges (Rs/kWh)** |
| **ToD Slot 1** | 05:00 hrs – 11:00 hrs | 0% | 7.10 |
| **ToD Slot 2** | 11:00 hrs – 17:00 hrs | 0% | 7.10 |
| **ToD Slot 3** | 17:00 hrs – 23:00 hrs | (+) 15% | 8.10 |
| **ToD Slot 4** | 23:00 hrs – 05:00 hrs | (-) 15% | 6.04 |

For Residential and commercial Consumers, the energy charges remain same throughout the day. Energy charges for residential and commercial Consumers are 6.50 Rs/kWh and 7.50 kWh respectively.

### 3.1.1 Tariff Design Consultation with Stakeholders

As part of the time of use (ToU) Project conducted in Uttar Pradesh, a crucial aspect was to engage in comprehensive consultations with various stakeholders to ensure a well-informed and inclusive tariff design process. The primary objective of the tariff design consultation was to gather valuable insights, perspectives, and recommendations from stakeholders in Uttar Pradesh. By involving stakeholders, such as electricity Consumers, industry representatives, regulatory bodies, and distribution companies,

the study aimed to develop a tariff structure that aligns with the needs and priorities of the state while promoting efficient and sustainable electricity consumption.

### 3.1.2 Stakeholders Involved

A comprehensive list of stakeholders was identified, including but not limited to:

- Residential, commercial, and industrial electricity Consumers
- Uttar Pradesh Electricity Regulatory Commission (UPERC)
- Madhyanchal Vidyut Vitaran Nigam Ltd. (MVVNL)
- Uttar Pradesh Power Corporation Ltd. (UPPCL)
- Uttar Pradesh State Load Despatch Centre (UP SLDC)

### 3.1.3 Utility Load Curve

Uttar Pradesh from Uttar Pradesh Power Corporation Limited (UPPCL) which has a net total generation of around 2,000 MW in 2020-21. However, the peak demand recorded in 2023 was around 28,000 MW. A load curve is plotted for the summer season as shown in below Figure.

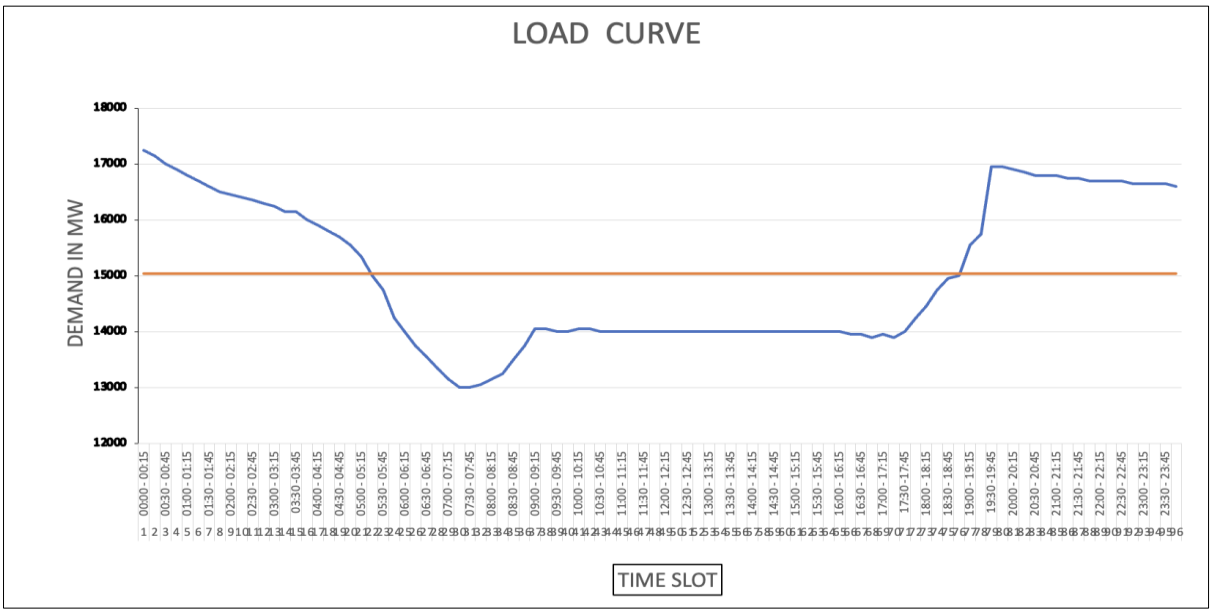



Figure 3-1: Utility Load Curve (April – October Month)

### 3.1.4 Time of Use (ToU) Tariff Design

With the help of utility load curve, the average load for the utility is calculated. To understand the real time load variance the load factor is calculated which describes the load deviation against the ideal load condition for the utility. Further the load factor is used to calculate the ToU tariff for ToD Consumers and non-ToD Consumers. For incentivising Consumers, the load factor is increased during non-peak hours. Unscheduled Interchange (UI) charges can help to understand actual benefit to the utility.

Load Factor = (Actual Demand – Average Demand)/ Average Demand*100)

The price of electricity has been assumed INR 6 for non-ToD Consumers whereas the ToD is calculated by applying surcharges and incentives across different time slots.

Table 3-3: Standard ToD Tariff

| Tariff Type | Price |
|---|---|
| Standard Tariff | 6 |
| Off Peak Tariff | 5.1 |
| Peak Hour Tariff | 6.9 |

Table 3-4: Calculated ToU tariff

| | | | | | | ToD Cons. | Non ToD Con. | |
|---|---|---|---|---|---|---|---|---|
| SLOT | TIME SLOT | Demand in MW | Avg. Dmd.MW | Load Facto | ToD Tariff | TOU Tariff | ToU Tariff | UI Charges |
| 1 | 00:00 - 00:15 | 17250 | 15040 | 14.69 | 6 | 7.76 | 7.76 | |
| 2 | 00:15 - 00:30 | 17150 | 15040 | 14.03 | 6 | 7.68 | 7.68 | |
| 3 | 00:30 - 00:45 | 17000 | 15040 | 13.03 | 6 | 7.56 | 7.56 | |
| 4 | 00:45 - 01:00 | 16900 | 15040 | 12.37 | 6 | 7.48 | 7.48 | |
| 5 | 01:00 - 01:15 | 16800 | 15040 | 11.7 | 6 | 7.4 | 7.4 | |
| 6 | 01:15 - 01:30 | 16700 | 15040 | 11.04 | 6 | 7.32 | 7.32 | |
| 7 | 01:30 - 01:45 | 16600 | 15040 | 10.37 | 6 | 7.24 | 7.24 | |
| 8 | 01:45 - 02:00 | 16500 | 15040 | 9.71 | 6 | 7.17 | 7.17 | |
| 9 | 02:00 - 02:15 | 16450 | 15040 | 9.38 | 6 | 7.13 | 7.13 | |
| 10 | 02:15 - 02:30 | 16400 | 15040 | 9.04 | 6 | 7.08 | 7.08 | |
| 11 | 02:30 - 02:45 | 16350 | 15040 | 8.71 | 6 | 7.05 | 7.05 | |
| 12 | 02:45 - 03:00 | 16300 | 15040 | 8.38 | 6 | 7.01 | 7.01 | |
| 13 | 03:00 - 03:15 | 16250 | 15040 | 8.05 | 6 | 6.97 | 6.97 | |
| 14 | 03:15 - 03:30 | 16150 | 15040 | 7.38 | 6 | 6.89 | 6.89 | |
| 15 | 03:30 -03:45 | 16150 | 15040 | 7.38 | 6 | 6.89 | 6.89 | |
| 16 | 03:45 - 04:00 | 16000 | 15040 | 6.38 | 6 | 6.77 | 6.77 | |
| 17 | 04:00 - 04:15 | 15900 | 15040 | 5.72 | 6 | 6.69 | 6.69 | |
| 18 | 04:15 - 04:30 | 15800 | 15040 | 5.05 | 6 | 6.61 | 6.61 | |
| 19 | 04:30 - 04:45 | 15700 | 15040 | 4.39 | 6 | 6.53 | 6.53 | |
| 20 | 04:45 - 05:00 | 15550 | 15040 | 3.39 | 6 | 6.41 | 6.41 | |
| 21 | 05:00 - 05:15 | 15350 | 15040 | 2.06 | 5.1 | 5.31 | 6.25 | |
| 22 | 05:15 - 05:30 | 15000 | 15040 | -0.27 | 5.1 | 5.06 | 5.95 | |
| 23 | 05:30 - 05:45 | 14750 | 15040 | -1.93 | 5.1 | 4.8 | 5.65 | |
| 24 | 05:45 - 06:00 | 14250 | 15040 | -5.25 | 5.1 | 4.3 | 5.06 | |
| 25 | 06:00 - 06:15 | 14000 | 15040 | -6.91 | 5.1 | 4.04 | 4.76 | |
| 26 | 06:15 - 06:30 | 13750 | 15040 | -8.58 | 5.1 | 3.79 | 4.46 | |
| 27 | 06:30 - 06:45 | 13550 | 15040 | -9.91 | 5.1 | 3.58 | 4.22 | |
| 28 | 06:45 - 07:00 | 13350 | 15040 | -11.24 | 5.1 | 3.38 | 3.98 | |
| 29 | 07:00 - 07:15 | 13150 | 15040 | -12.57 | 5.1 | 3.18 | 3.74 | |
| 30 | 07:15 - 07:30 | 13000 | 15040 | -13.56 | 5.1 | 3.03 | 3.56 | |
| 31 | 07:30 - 07:45 | 13000 | 15040 | -13.56 | 5.1 | 3.03 | 3.56 | |
| 32 | 07:45 - 08:00 | 13050 | 15040 | -13.23 | 5.1 | 3.08 | 3.62 | |
| 33 | 08:00 - 08:15 | 13150 | 15040 | -12.57 | 5.1 | 3.18 | 3.74 | |
| 34 | 08:15 - 08:30 | 13250 | 15040 | -11.9 | 5.1 | 3.28 | 3.86 | |
| 35 | 08:30 - 08:45 | 13500 | 15040 | -10.24 | 5.1 | 3.53 | 4.16 | |
| 36 | 08:45 - 09:00 | 13750 | 15040 | -8.58 | 5.1 | 3.79 | 4.46 | |
| 37 | 09:00 - 09:15 | 14050 | 15040 | -6.58 | 5.1 | 4.09 | 4.82 | |
| 38 | 09:15 - 09:30 | 14050 | 15040 | -6.58 | 5.1 | 4.09 | 4.82 | |
| 39 | 09:30 - 09:45 | 14000 | 15040 | -6.91 | 5.1 | 4.04 | 4.76 | |
| 40 | 09:45 - 10:00 | 14000 | 15040 | -6.91 | 5.1 | 4.04 | 4.76 | |
| 41 | 10:00 - 10:15 | 14050 | 15040 | -6.58 | 5.1 | 4.09 | 4.82 | |
| 42 | 10:15 - 10:30 | 14050 | 15040 | -6.58 | 5.1 | 4.09 | 4.82 | |
| 43 | 10:30 - 10:45 | 14000 | 15040 | -6.91 | 5.1 | 4.04 | 4.76 | |
| 44 | 10:45 - 11:00 | 14000 | 15040 | -6.91 | 5.1 | 4.04 | 4.76 | |
| 45 | 11:00 - 11:15 | 14000 | 15040 | -6.91 | 6 | 4.76 | 4.76 | |
| 46 | 11:15 - 11:30 | 14000 | 15040 | -6.91 | 6 | 4.76 | 4.76 | |
| 47 | 11:30 - 11:45 | 14000 | 15040 | -6.91 | 6 | 4.76 | 4.76 | |
| 48 | 11:45 - 12:00 | 14000 | 15040 | -6.91 | 6 | 4.76 | 4.76 | |

| SLOT | TIME SLOT | Demand in MW | Avg. Dmd.MW | Load Facto | ToD Tariff | TOU Tariff | ToU Tariff | UI Charges |
|---|---|---|---|---|---|---|---|---|
| 49 | 12:00 - 12:15 | 14000 | 15040 | -6.91 | 6 | 4.76 | 4.76 | |
| 50 | 12:15 - 12:30 | 14000 | 15040 | -6.91 | 6 | 4.76 | 4.76 | |
| 51 | 12:30 - 12:45 | 14000 | 15040 | -6.91 | 6 | 4.76 | 4.76 | |
| 52 | 12:45 - 13:00 | 14000 | 15040 | -6.91 | 6 | 4.76 | 4.76 | |
| 53 | 13:00 - 13:15 | 14000 | 15040 | -6.91 | 6 | 4.76 | 4.76 | |
| 54 | 13:15 - 13:30 | 14000 | 15040 | -6.91 | 6 | 4.76 | 4.76 | |
| 55 | 13:30 - 13:45 | 14000 | 15040 | -6.91 | 6 | 4.76 | 4.76 | |
| 56 | 13:45 - 14:00 | 14000 | 15040 | -6.91 | 6 | 4.76 | 4.76 | |
| 57 | 14:00 - 14:15 | 14000 | 15040 | -6.91 | 6 | 4.76 | 4.76 | |
| 58 | 14:15 - 14:30 | 14000 | 15040 | -6.91 | 6 | 4.76 | 4.76 | |
| 59 | 14:30 - 14:45 | 14000 | 15040 | -6.91 | 6 | 4.76 | 4.76 | |
| 60 | 14:45 - 15:00 | 14000 | 15040 | -6.91 | 6 | 4.76 | 4.76 | |
| 61 | 15:00 - 15:15 | 14000 | 15040 | -6.91 | 6 | 4.76 | 4.76 | |
| 62 | 15:15 - 15:30 | 14000 | 15040 | -6.91 | 6 | 4.76 | 4.76 | |
| 63 | 15:30 - 15:45 | 14000 | 15040 | -6.91 | 6 | 4.76 | 4.76 | |
| 64 | 15:45 - 16:00 | 14000 | 15040 | -6.91 | 6 | 4.76 | 4.76 | |
| 65 | 16:00 - 16:15 | 13999 | 15040 | -6.92 | 6 | 4.75 | 4.75 | |
| 66 | 16:15 - 16:30 | 13950 | 15040 | -7.25 | 6 | 4.7 | 4.7 | |
| 67 | 16:30 - 16:45 | 13950 | 15040 | -7.25 | 6 | 4.7 | 4.7 | |
| 68 | 16:45 - 17:00 | 13900 | 15040 | -7.58 | 6 | 4.64 | 4.64 | |
| 69 | 17:00 - 17:15 | 13950 | 15040 | -7.25 | 6.9 | 5.4 | 4.7 | |
| 70 | 17:15 - 17:30 | 13900 | 15040 | -7.58 | 6.9 | 5.33 | 4.64 | |
| 71 | 17:30 -17:45 | 14000 | 15040 | -6.91 | 6.9 | 5.47 | 4.76 | |
| 72 | 17:45 - 18:00 | 14250 | 15040 | -5.25 | 6.9 | 5.81 | 5.06 | |
| 73 | 18:00 - 18:15 | 14450 | 15040 | -3.92 | 6.9 | 6.09 | 5.29 | |
| 74 | 18:15 - 18:30 | 14750 | 15040 | -1.93 | 6.9 | 6.5 | 5.65 | |
| 75 | 18:30 - 18:45 | 14950 | 15040 | -0.6 | 6.9 | 6.78 | 5.89 | |
| 76 | 18:45 - 19:00 | 15000 | 15040 | -0.27 | 6.9 | 6.84 | 5.95 | |
| 77 | 19:00 - 19:15 | 15550 | 15040 | 3.39 | 6.9 | 7.37 | 6.41 | |
| 78 | 19:15 - 19:30 | 15750 | 15040 | 4.72 | 6.9 | 7.55 | 6.57 | |
| 79 | 19:30 -19:45 | 16950 | 15040 | 12.7 | 6.9 | 8.65 | 7.52 | |
| 80 | 19:45 - 20:00 | 16950 | 15040 | 12.7 | 6.9 | 8.65 | 7.52 | |
| 81 | 20:00 - 20:15 | 16900 | 15040 | 12.37 | 6.9 | 8.61 | 7.48 | |
| 82 | 20:15 - 20:30 | 16850 | 15040 | 12.03 | 6.9 | 8.56 | 7.44 | |
| 83 | 20:30 - 20:45 | 16800 | 15040 | 11.7 | 6.9 | 8.51 | 7.4 | |
| 84 | 20:45 - 21:00 | 16800 | 15040 | 11.7 | 6.9 | 8.51 | 7.4 | |
| 85 | 21:00 - 21:15 | 16800 | 15040 | 11.7 | 6.9 | 8.51 | 7.4 | |
| 86 | 21:15 - 21:30 | 16750 | 15040 | 11.37 | 6.9 | 8.47 | 7.36 | |
| 87 | 21:30 - 21:45 | 16750 | 15040 | 11.37 | 6.9 | 8.47 | 7.36 | |
| 88 | 21:45 - 22:00 | 16700 | 15040 | 11.04 | 6.9 | 8.42 | 7.32 | |
| 89 | 22:00 - 22:15 | 16700 | 15040 | 11.04 | 6.9 | 8.42 | 7.32 | |
| 90 | 22:15 - 22:30 | 16700 | 15040 | 11.04 | 6.9 | 8.42 | 7.32 | |
| 91 | 22:30 - 22:45 | 16700 | 15040 | 11.04 | 6.9 | 8.42 | 7.32 | |
| 92 | 22:45 - 23:00 | 16650 | 15040 | 10.7 | 6.9 | 8.38 | 7.28 | |
| 93 | 23:00 - 23:15 | 16650 | 15040 | 10.7 | 6 | 7.28 | 7.28 | |
| 94 | 23:15 - 23:30 | 16650 | 15040 | 10.7 | 6 | 7.28 | 7.28 | |
| 95 | 23:30 - 23:45 | 16650 | 15040 | 10.7 | 6 | 7.28 | 7.28 | |
| 96 | 23:45 - 24:00 | 16600 | 15040 | 10.37 | 6 | 7.24 | 7.24 | |

# 4 Design of ToU Pricing Signals and Shadow Bills

## 4.1 Market Data Analysis and Design of ToU Price Signals

Market study analysis is an essential component of the ToU tariff design as it helps to identify trends and patterns in Consumers behaviour that can inform the development of effective pricing strategies. By analysing market data, ISGF identified peak demand periods, Consumers preferences, and other factors that influence energy usage. This information has been used to design pricing plans that incentivize Consumers to reduce their energy consumption during peak periods and shift their usage to off-peak periods when electricity is less expensive. Effective pricing plans can help to reduce the strain on the grid during peak periods and promote more efficient energy use, resulting in cost savings for both Consumers and utility providers. Market study analysis is crucial for the success of ToU project, as it provides the information necessary to design effective pricing strategies that promote sustainable and efficient electricity use. ISGF, together with the Uttar Pradesh State Load Dispatch Centre (UP SLDC) and other stakeholders, carried out a study to analyse the day ahead market prices on the Indian Energy Exchange (IEX) website. This analysis aimed to investigate pricing signals and was conducted using data collected every 15 minutes from the IEX website. The study focused specifically on pricing signals for UP, with day ahead market (DAM) prices being updated at midnight in megawatt/hour. The analysis found that the DAM prices on the IEX website are influenced by various factors such as demand, supply, weather conditions, availability of resources, and grid stability. The prices are updated in 24 blocks of15-minute intervals, and the data from IEX is extracted daily to help make pricing signals for the ToU pilot project. This study provided valuable insights into the energy market and helps in informed decision-making processes for energy traders, policymakers, and other stakeholders. By understanding the dynamics of the electricity market and the factors that influence pricing signals, stakeholders can make more informed decisions regarding electricity trading, investment, and planning. This analysis by the ISGF and UP SLDC highlights the importance of understanding the dynamics of the electricity market and how pricing signals are influenced by various factors. It helped ISGF to explore the relationship between market prices and other factors that influence pricing signals, including regulatory policies, technological advancements, and Consumers behaviour.

## 4.2 Data Extraction from IEX

The IEX, as one of the leading energy trading platforms in India, meticulously maintains the Day-Ahead Market (DAM) data on a region-wise basis. The DAM, which facilitates the buying and selling of electricity a day in advance, is key to ensuring the reliability and efficiency of the power system. The IEX organizes and handles this vast lake of data by dividing it based on different regional load dispatch centers across the country. Each regional center's data includes vital information such as the electricity demand, supply, cleared volume, and market clearing price. By organizing the DAM data in a region-specific manner, the IEX enables electricity providers and Consumers to have precise and localized insights into the electricity market, thereby allowing them to plan their power generation, distribution, and consumption strategies more effectively. Furthermore, maintaining region-wise data helps in identifying demand-supply patterns, price variations, and load changes specific to each region, facilitating the development of more tailored and efficient energy solutions. Entire India is divided into 13 different regions. Below image and table explains all the 13 regions.

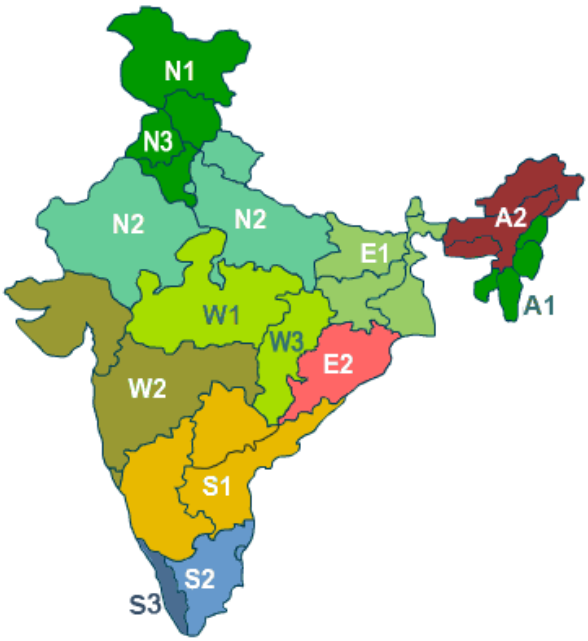



Figure 4-1: Region wise division of 13 regions in India

Table 4-1: Details of regions with state names

| Sl No. | Bid Area | Region | States covered under Bid Area |
|---|---|---|---|
| 1 | N1 | North Region | Jammu and Kashmir, Himachal Pradesh, Chandigarh, Haryana |
| 2 | N2 | North Region | Uttar Pradesh, Uttaranchal, Rajasthan, Delhi |
| 3 | N3 | North Region | Punjab |
| 4 | E1 | East Region | West Bengal, Sikkim, Bihar, Jharkhand |
| 5 | E2 | East Region | Orissa |
| 6 | W1 | West Region | Madhya Pradesh |
| 7 | W2 | West Region | Maharashtra, Gujarat, Daman and Diu, Dadar and Nagar Haveli, North Goa |
| 8 | W3 | West Region | Chhattisgarh |
| 9 | S1 | South Region | Andhra Pradesh, Telangana, Karnataka, Pondicherry (Yanam), South Goa |
| 10 | S2 | South Region | Tamil Nadu, Pondicherry (Puducherry), Pondicherry (Karaikal), Pondicherry (Mahe) |
| 11 | S3 | South Region | Kerala |
| 12 | A1 | North East Region | Tripura, Manipur, Mizoram, Nagaland |
| 13 | A2 | North East Region | Assam, Arunachal Pradesh, Meghalaya |

Uttar Pradesh falls under N2 region. By selecting the area as N2, the website provides the market data (i.e., energy rates) applicable in the N2 region for the day-ahead. The ISGF created a software program to analyse the market data that was collected, which was then input into an Excel spreadsheet. In this way the market data is extracted from IEX website every day. Below table shows the extracted data from IEX for the N2 region which is applicable for dd/mm/yy. This table provides the market rates in the N2 region for dd/mm. Rates are given for all the 96 slots of 15 min each for that specific day. The prices which are in Rs/MWh is converted to Rs/kWh.

Table 4-2: Market Data Rates on IEX for a particular day

| Slot No | Time Block | Price (INR/MWh) | Price (INR/kWh) |
|---|---|---|---|
| 1 | 00:00 - 00:15 | 0.00600079 | 6.00 |
| 2 | 00:15 - 00:30 | 0.00567787 | 5.68 |
| 3 | 00:30 - 00:45 | 0.00503856 | 5.04 |
| 4 | 00:45 - 01:00 | 0.00500058 | 5.00 |
| 5 | 01:00 - 01:15 | 0.00500009 | 5.00 |
| 6 | 01:15 - 01:30 | 0.00494913 | 4.95 |
| 7 | 01:30 - 01:45 | 0.00478057 | 4.78 |
| 8 | 01:45 - 02:00 | 0.00478638 | 4.79 |
| 9 | 02:00 - 02:15 | 0.00453881 | 4.54 |
| 10 | 02:15 - 02:30 | 0.00453808 | 4.54 |
| 11 | 02:30 - 02:45 | 0.00450045 | 4.50 |
| 12 | 02:45 - 03:00 | 0.00450052 | 4.50 |
| 13 | 03:00 - 03:15 | 0.00454517 | 4.55 |
| 14 | 03:15 - 03:30 | 0.00453884 | 4.54 |
| 15 | 03:30 - 03:45 | 0.00453848 | 4.54 |
| 16 | 03:45 - 04:00 | 0.00453886 | 4.54 |
| 17 | 04:00 - 04:15 | 0.00454982 | 4.55 |
| 18 | 04:15 - 04:30 | 0.00494966 | 4.95 |
| 19 | 04:30 - 04:45 | 0.0047873 | 4.79 |
| 20 | 04:45 - 05:00 | 0.00462994 | 4.63 |
| 21 | 05:00 - 05:15 | 0.00458016 | 4.58 |
| 22 | 05:15 - 05:30 | 0.00454864 | 4.55 |
| 23 | 05:30 - 05:45 | 0.00500042 | 5.00 |
| 24 | 05:45 - 06:00 | 0.00598946 | 5.99 |
| 25 | 06:00 - 06:15 | 0.00550074 | 5.50 |
| 26 | 06:15 - 06:30 | 0.00760038 | 7.60 |
| 27 | 06:30 - 06:45 | 0.012 | 12.00 |
| 28 | 06:45 - 07:00 | 0.012 | 12.00 |
| 29 | 07:00 - 07:15 | 0.012 | 12.00 |
| 30 | 07:15 - 07:30 | 0.012 | 12.00 |
| 31 | 07:30 - 07:45 | 0.012 | 12.00 |
| 32 | 07:45 - 08:00 | 0.012 | 12.00 |
| 33 | 08:00 - 08:15 | 0.012 | 12.00 |
| 34 | 08:15 - 08:30 | 0.012 | 12.00 |

| | | | |
|---|---|---|---|
| 35 | 08:30 - 08:45 | 0.01199982 | 12.00 |
| 36 | 08:45 - 09:00 | 0.00760031 | 7.60 |
| 37 | 09:00 - 09:15 | 0.00755975 | 7.56 |
| 38 | 09:15 - 09:30 | 0.00600045 | 6.00 |
| 39 | 09:30 - 09:45 | 0.00600083 | 6.00 |
| 40 | 09:45 - 10:00 | 0.00600086 | 6.00 |
| 41 | 10:00 - 10:15 | 0.00623076 | 6.23 |
| 42 | 10:15 - 10:30 | 0.00699831 | 7.00 |
| 43 | 10:30 - 10:45 | 0.00603117 | 6.03 |
| 44 | 10:45 - 11:00 | 0.00526091 | 5.26 |
| 45 | 11:00 - 11:15 | 0.00525287 | 5.25 |
| 46 | 11:15 - 11:30 | 0.00500056 | 5.00 |
| 47 | 11:30 - 11:45 | 0.0050001 | 5.00 |
| 48 | 11:45 - 12:00 | 0.00480076 | 4.80 |
| 49 | 12:00 - 12:15 | 0.00423537 | 4.24 |
| 50 | 12:15 - 12:30 | 0.00421061 | 4.21 |
| 51 | 12:30 - 12:45 | 0.00415428 | 4.15 |
| 52 | 12:45 - 13:00 | 0.00412777 | 4.13 |
| 53 | 13:00 - 13:15 | 0.00361861 | 3.62 |
| 54 | 13:15 - 13:30 | 0.00361862 | 3.62 |
| 55 | 13:30 - 13:45 | 0.00379086 | 3.79 |
| 56 | 13:45 - 14:00 | 0.00387032 | 3.87 |
| 57 | 14:00 - 14:15 | 0.00410068 | 4.10 |
| 58 | 14:15 - 14:30 | 0.0041104 | 4.11 |
| 59 | 14:30 - 14:45 | 0.00416933 | 4.17 |
| 60 | 14:45 - 15:00 | 0.00450035 | 4.50 |
| 61 | 15:00 - 15:15 | 0.00480084 | 4.80 |
| 62 | 15:15 - 15:30 | 0.00480041 | 4.80 |
| 63 | 15:30 - 15:45 | 0.00500025 | 5.00 |
| 64 | 15:45 - 16:00 | 0.0055006 | 5.50 |
| 65 | 16:00 - 16:15 | 0.00750908 | 7.51 |
| 66 | 16:15 - 16:30 | 0.00799809 | 8.00 |
| 67 | 16:30 - 16:45 | 0.00760093 | 7.60 |
| 68 | 16:45 - 17:00 | 0.00850074 | 8.50 |
| 69 | 17:00 - 17:15 | 0.00599951 | 6.00 |
| 70 | 17:15 - 17:30 | 0.00598921 | 5.99 |
| 71 | 17:30 - 17:45 | 0.00500025 | 5.00 |
| 72 | 17:45 - 18:00 | 0.00599934 | 6.00 |
| 73 | 18:00 - 18:15 | 0.00599985 | 6.00 |
| 74 | 18:15 - 18:30 | 0.00850003 | 8.50 |
| 75 | 18:30 - 18:45 | 0.012 | 12.00 |
| 76 | 18:45 - 19:00 | 0.012 | 12.00 |
| 77 | 19:00 - 19:15 | 0.012 | 12.00 |

| | | | |
|---|---|---|---|
| 78 | 19:15 - 19:30 | 0.01199928 | 12.00 |
| 79 | 19:30 - 19:45 | 0.00699979 | 7.00 |
| 80 | 19:45 - 20:00 | 0.00684918 | 6.85 |
| 81 | 20:00 - 20:15 | 0.00599995 | 6.00 |
| 82 | 20:15 - 20:30 | 0.00599907 | 6.00 |
| 83 | 20:30 - 20:45 | 0.00599917 | 6.00 |
| 84 | 20:45 - 21:00 | 0.00599954 | 6.00 |
| 85 | 21:00 - 21:15 | 0.00649691 | 6.50 |
| 86 | 21:15 - 21:30 | 0.00599992 | 6.00 |
| 87 | 21:30 - 21:45 | 0.00598964 | 5.99 |
| 88 | 21:45 - 22:00 | 0.00540966 | 5.41 |
| 89 | 22:00 - 22:15 | 0.00526073 | 5.26 |
| 90 | 22:15 - 22:30 | 0.00731013 | 7.31 |
| 91 | 22:30 - 22:45 | 0.00550075 | 5.50 |
| 92 | 22:45 - 23:00 | 0.0064994 | 6.50 |
| 93 | 23:00 - 23:15 | 0.00526049 | 5.26 |
| 94 | 23:15 - 23:30 | 0.00540929 | 5.41 |
| 95 | 23:30 - 23:45 | 0.00565329 | 5.65 |
| 96 | 23:45 - 24:00 | 0.0056775 | 5.68 |

## 4.3 Calculation of Pricing Signals

In this system, the real-time cost of electricity is tracked by obtaining market prices from the IEX. Here, the day is divided into 96 slots, each representing a 15-minute interval. The concept behind this is to get a precise and accurate view of how electricity prices fluctuate throughout the day. This market price is then compared with the grid price. The grid price is the rate at which the Distribution Company (DISCOM) sells power to Consumers which is regulated by the respective state electricity regulatory commissions (SERCs). The objective of this comparison is to understand the cost dynamics between the wholesale electricity market (IEX) and the retail market. The algorithm we developed then calculates an average price of the market and grid price. This average is referred to as the standard Time of Use (ToU) price. This ToU price is important because it forms a baseline against which Consumers usage costs can be compared and adjusted.

The grid price according to the regulated tariff and the market price from IEX were placed adjacent to each other on a spreadsheet and an average of both prices was calculated to arrive at Time of Use (ToU) price. A ToU chart was created that showed the market price, grid price, and ToU price. The ToU chart shown below represents how the market price, Grid price and ToU price vary during the entire day.

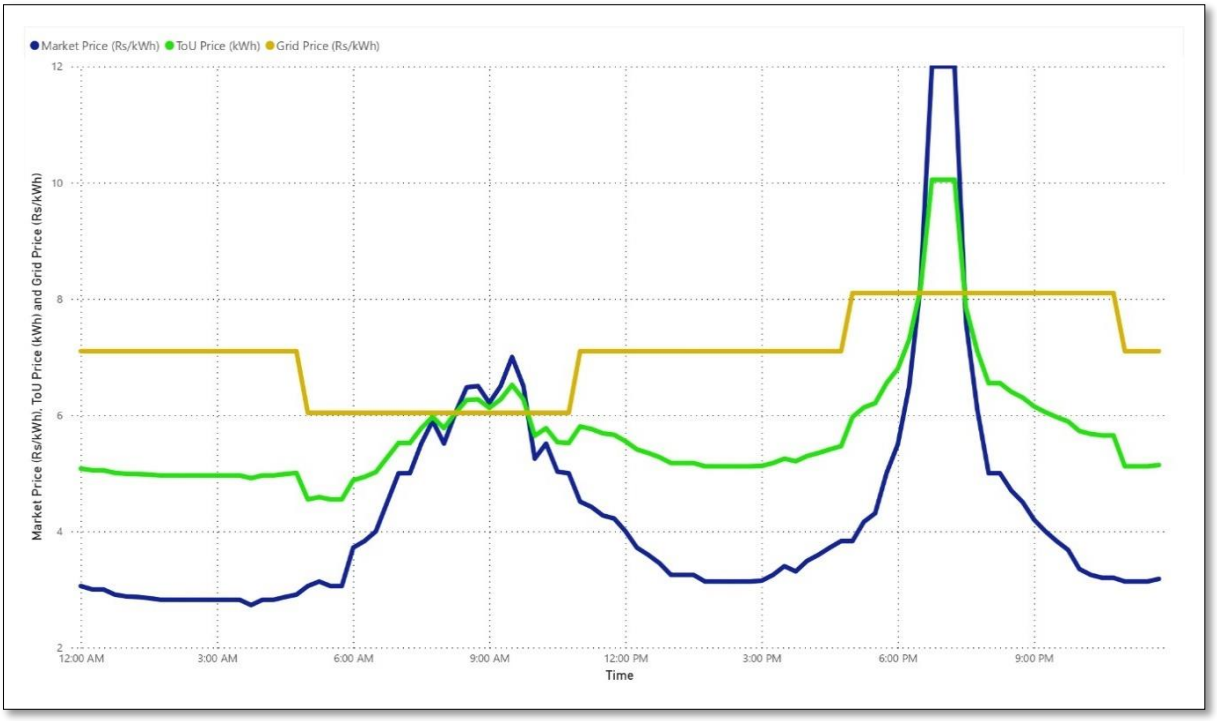



Figure 4-2: Variation in market price, Grid price and ToU price vary during the entire day

To arrive at the incentive and surcharge value, 'Difference value' is calculated. If grid price is greater than the ToU price,

Difference value = Grid price – ToU price

And if grid price is less than or equal to the ToU price,

Difference value = Grid price – Market price

This Difference value is calculated for each of the 15 min slot and all the 96 slots of the day as shown in table. Normalization of the Difference value is done to arrive at the incentive and surcharge values. Below table represents the Market price, Grid price, ToU price and the Incentive and surcharge values for each 15min slot and all 96 slots on 05 March 2023

Table 4-3: Market price, Grid price, ToU price and the Incentive and surcharge values for each 15min slot for all 96 slots on 05 March 2023

| Time Block | Slot No | Market Price (INR/kWh) | Grid Price (INR/kWh) | ToU Price (INR/kWh) | Difference Value | Incentive/ Surcharge (INR/kWh) |
|---|---|---|---|---|---|---|
| **00:00 - 00:15** | 1 | 10.50 | 7.10 | 8.80025 | -3.4005 | -3 |
| **00:15 - 00:30** | 2 | 9.96 | 7.10 | 8.53115 | -2.8623 | -3 |
| **00:30 - 00:45** | 3 | 8.28 | 7.10 | 7.692395 | -1.18479 | -1 |
| **00:45 - 01:00** | 4 | 7.74 | 7.10 | 7.419965 | -0.63993 | -1 |
| **01:00 - 01:15** | 5 | 7.24 | 7.10 | 7.17222 | -0.14444 | 0 |
| **01:15 - 01:30** | 6 | 6.77 | 7.10 | 6.935115 | 0.164885 | 0 |
| **01:30 - 01:45** | 7 | 6.00 | 7.10 | 6.549775 | 0.550225 | 0 |
| **01:45 - 02:00** | 8 | 6.00 | 7.10 | 6.54963 | 0.55037 | 0 |
| **02:00 - 02:15** | 9 | 5.02 | 7.10 | 6.058435 | 1.041565 | 1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **02:15 - 02:30** | 10 | 5.55 | 7.10 | 6.32295 | 0.77705 | 0 |
| **02:30 - 02:45** | 11 | 4.95 | 7.10 | 6.024655 | 1.075345 | 1 |
| **02:45 - 03:00** | 12 | 4.82 | 7.10 | 5.95996 | 1.14004 | 1 |
| **03:00 - 03:15** | 13 | 4.95 | 7.10 | 6.02465 | 1.07535 | 1 |
| **03:15 - 03:30** | 14 | 4.95 | 7.10 | 6.02487 | 1.07513 | 1 |
| **03:30 - 03:45** | 15 | 4.95 | 7.10 | 6.024565 | 1.075435 | 1 |
| **03:45 - 04:00** | 16 | 5.50 | 7.10 | 6.300055 | 0.799945 | 0 |
| **04:00 - 04:15** | 17 | 6.00 | 7.10 | 6.549615 | 0.550385 | 0 |
| **04:15 - 04:30** | 18 | 7.37 | 7.10 | 7.23273 | -0.26546 | 0 |
| **04:30 - 04:45** | 19 | 7.37 | 7.10 | 7.23279 | -0.26558 | 0 |
| **04:45 - 05:00** | 20 | 7.11 | 7.10 | 7.105075 | -0.01015 | 0 |
| **05:00 - 05:15** | 21 | 6.50 | 6.04 | 6.26805 | -0.4561 | 0 |
| **05:15 - 05:30** | 22 | 7.00 | 6.04 | 6.519715 | -0.95943 | -1 |
| **05:30 - 05:45** | 23 | 8.00 | 6.04 | 7.0193 | -1.9586 | -2 |
| **05:45 - 06:00** | 24 | 10.00 | 6.04 | 8.02 | -3.96 | -4 |
| **06:00 - 06:15** | 25 | 8.00 | 6.04 | 7.0194 | -1.9588 | -2 |
| **06:15 - 06:30** | 26 | 8.00 | 6.04 | 7.02019 | -1.96038 | -2 |
| **06:30 - 06:45** | 27 | 7.52 | 6.04 | 6.77983 | -1.47966 | -1 |
| **06:45 - 07:00** | 28 | 8.52 | 6.04 | 7.279835 | -2.47967 | -2 |
| **07:00 - 07:15** | 29 | 8.00 | 6.04 | 7.019415 | -1.95883 | -2 |
| **07:15 - 07:30** | 30 | 9.52 | 6.04 | 7.77975 | -3.4795 | -3 |
| **07:30 - 07:45** | 31 | 8.52 | 6.04 | 7.279695 | -2.47939 | -2 |
| **07:45 - 08:00** | 32 | 7.74 | 6.04 | 6.889845 | -1.69969 | -2 |
| **08:00 - 08:15** | 33 | 6.50 | 6.04 | 6.26833 | -0.45666 | 0 |
| **08:15 - 08:30** | 34 | 7.43 | 6.04 | 6.7365 | -1.393 | -1 |
| **08:30 - 08:45** | 35 | 7.37 | 6.04 | 6.702525 | -1.32505 | -1 |
| **08:45 - 09:00** | 36 | 7.74 | 6.04 | 6.88977 | -1.69954 | -2 |
| **09:00 - 09:15** | 37 | 8.50 | 6.04 | 7.27019 | -2.46038 | -2 |
| **09:15 - 09:30** | 38 | 8.50 | 6.04 | 7.27022 | -2.46044 | -2 |
| **09:30 - 09:45** | 39 | 8.50 | 6.04 | 7.270065 | -2.46013 | -2 |
| **09:45 - 10:00** | 40 | 7.60 | 6.04 | 6.82022 | -1.56044 | -2 |
| **10:00 - 10:15** | 41 | 7.37 | 6.04 | 6.702715 | -1.32543 | -1 |
| **10:15 - 10:30** | 42 | 6.00 | 6.04 | 6.01975 | 0.02025 | 0 |
| **10:30 - 10:45** | 43 | 5.85 | 6.04 | 5.945105 | 0.094895 | 0 |
| **10:45 - 11:00** | 44 | 5.85 | 6.04 | 5.94502 | 0.09498 | 0 |
| **11:00 - 11:15** | 45 | 5.85 | 7.10 | 6.47542 | 0.62458 | 0 |
| **11:15 - 11:30** | 46 | 5.00 | 7.10 | 6.050405 | 1.049595 | 1 |
| **11:30 - 11:45** | 47 | 5.00 | 7.10 | 6.04926 | 1.05074 | 1 |
| **11:45 - 12:00** | 48 | 4.65 | 7.10 | 5.87287 | 1.22713 | 1 |
| **12:00 - 12:15** | 49 | 4.44 | 7.10 | 5.76925 | 1.33075 | 1 |
| **12:15 - 12:30** | 50 | 4.16 | 7.10 | 5.63133 | 1.46867 | 1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **12:30 - 12:45** | 51 | 4.08 | 7.10 | 5.59178 | 1.50822 | 1 |
| **12:45 - 13:00** | 52 | 3.82 | 7.10 | 5.4605 | 1.6395 | 1 |
| **13:00 - 13:15** | 53 | 3.70 | 7.10 | 5.40005 | 1.69995 | 1 |
| **13:15 - 13:30** | 54 | 3.56 | 7.10 | 5.331475 | 1.768525 | 1 |
| **13:30 - 13:45** | 55 | 3.60 | 7.10 | 5.350395 | 1.749605 | 1 |
| **13:45 - 14:00** | 56 | 3.50 | 7.10 | 5.300485 | 1.799515 | 1 |
| **14:00 - 14:15** | 57 | 3.77 | 7.10 | 5.43373 | 1.66627 | 1 |
| **14:15 - 14:30** | 58 | 3.82 | 7.10 | 5.460485 | 1.639515 | 1 |
| **14:30 - 14:45** | 59 | 4.00 | 7.10 | 5.54955 | 1.55045 | 1 |
| **14:45 - 15:00** | 60 | 4.15 | 7.10 | 5.62603 | 1.47397 | 1 |
| **15:00 - 15:15** | 61 | 4.50 | 7.10 | 5.80044 | 1.29956 | 1 |
| **15:15 - 15:30** | 62 | 4.54 | 7.10 | 5.8192 | 1.2808 | 1 |
| **15:30 - 15:45** | 63 | 4.80 | 7.10 | 5.9497 | 1.1503 | 1 |
| **15:45 - 16:00** | 64 | 4.78 | 7.10 | 5.940465 | 1.159535 | 1 |
| **16:00 - 16:15** | 65 | 5.00 | 7.10 | 6.05011 | 1.04989 | 1 |
| **16:15 - 16:30** | 66 | 5.00 | 7.10 | 6.05024 | 1.04976 | 1 |
| **16:30 - 16:45** | 67 | 5.00 | 7.10 | 6.050125 | 1.049875 | 1 |
| **16:45 - 17:00** | 68 | 4.98 | 7.10 | 6.039945 | 1.060055 | 1 |
| **17:00 - 17:15** | 69 | 4.98 | 8.10 | 6.53992 | 1.56008 | 1 |
| **17:15 - 17:30** | 70 | 4.62 | 8.10 | 6.35976 | 1.74024 | 1 |
| **17:30 - 17:45** | 71 | 4.57 | 8.10 | 6.335405 | 1.764595 | 1 |
| **17:45 - 18:00** | 72 | 5.00 | 8.10 | 6.550415 | 1.549585 | 1 |
| **18:00 - 18:15** | 73 | 5.00 | 8.10 | 6.550315 | 1.549685 | 1 |
| **18:15 - 18:30** | 74 | 6.00 | 8.10 | 7.049605 | 1.050395 | 1 |
| **18:30 - 18:45** | 75 | 6.00 | 8.10 | 7.05035 | 1.04965 | 1 |
| **18:45 - 19:00** | 76 | 6.52 | 8.10 | 7.309795 | 0.790205 | 0 |
| **19:00 - 19:15** | 77 | 7.37 | 8.10 | 7.732835 | 0.367165 | 0 |
| **19:15 - 19:30** | 78 | 7.11 | 8.10 | 7.605405 | 0.494595 | 0 |
| **19:30 - 19:45** | 79 | 9.19 | 8.10 | 8.645715 | -1.09143 | -1 |
| **19:45 - 20:00** | 80 | 7.74 | 8.10 | 7.919795 | 0.180205 | 0 |
| **20:00 - 20:15** | 81 | 7.52 | 8.10 | 7.80988 | 0.29012 | 0 |
| **20:15 - 20:30** | 82 | 7.37 | 8.10 | 7.732865 | 0.367135 | 0 |
| **20:30 - 20:45** | 83 | 6.98 | 8.10 | 7.539535 | 0.560465 | 0 |
| **20:45 - 21:00** | 84 | 6.98 | 8.10 | 7.539525 | 0.560475 | 0 |
| **21:00 - 21:15** | 85 | 6.52 | 8.10 | 7.309655 | 0.790345 | 0 |
| **21:15 - 21:30** | 86 | 6.00 | 8.10 | 7.05002 | 1.04998 | 1 |
| **21:30 - 21:45** | **87** | **6.00** | **8.10** | **7.049855** | **1.050145** | **1** |
| **21:45 - 22:00** | 88 | 6.00 | 8.10 | 7.04983 | 1.05017 | 1 |
| **22:00 - 22:15** | **89** | **7.00** | **8.10** | **7.54938** | **0.55062** | **0** |
| **22:15 - 22:30** | 90 | 7.65 | 8.10 | 7.87503 | 0.22497 | 0 |
| **22:30 - 22:45** | **91** | **8.00** | **8.10** | **8.05005** | **0.04995** | **0** |

| | | | | | | |
|---|---|---|---|---|---|---|
| **22:45 - 23:00** | 92 | 8.00 | 8.10 | 8.05018 | 0.04982 | 0 |
| **23:00 - 23:15** | **93** | **7.74** | **7.10** | **7.41995** | **-0.6399** | **-1** |
| **23:15 - 23:30** | 94 | 8.47 | 7.10 | 7.783775 | -1.36755 | -1 |
| **23:30 - 23:45** | **95** | **8.50** | **7.10** | **7.79994** | **-1.39988** | **-1** |
| **23:45 - 24:00** | 96 | 9.06 | 7.10 | 8.082465 | -1.96493 | -2 |

Now, depending on whether the grid price is more or less than this standard ToU price, Consumers are given rebates or imposed surcharges penalties. If the grid price is higher, Consumers receive a rebate, or incentive, per slot, based on the price difference. Conversely, if the grid price is lower, Consumers face a surcharge, or penalty, per slot, also based on the price difference. The aim here is to encourage efficient use of electricity by incentivizing use during off-peak hours (when the demand, and therefore the cost, is lower) and penalizing use during peak hours (when the demand and cost is higher). A portion of the difference between the market price and grid price is given to Consumers as incentives.

This is intended to motivate them to shift their electricity use to periods of low demand. Conversely, during high demand periods, Consumers are charged according to the higher market price. This discourages them from using electricity during these peak hours. Though incentives and surcharges are influenced by the market price, they are structured in such a way that Consumers end up with a lower electricity bill at the end of the month. To facilitate the time-of-use pilot, both residential and industrial Consumers adopted several energy-saving practices. During the pilot, Consumers proactively pre-cooled their buildings and conducted water pumping tasks during off-peak hours. This approach aimed to minimize electricity consumption and reduce the reliance on appliances during on-peak hours when the demand is higher.

**Smart Plugs to Monitor and Automate the Load for Residential Consumers**

Additionally, to simplify the process for selected residential Consumers, ISGF provided smart plugs. These smart plugs automated the load shifting process, eliminating the need for manual adjustments to manage electricity usage effectively. These initiatives collectively contributed to optimizing energy utilization and promoting more efficient electricity consumption patterns during the pilot phase.

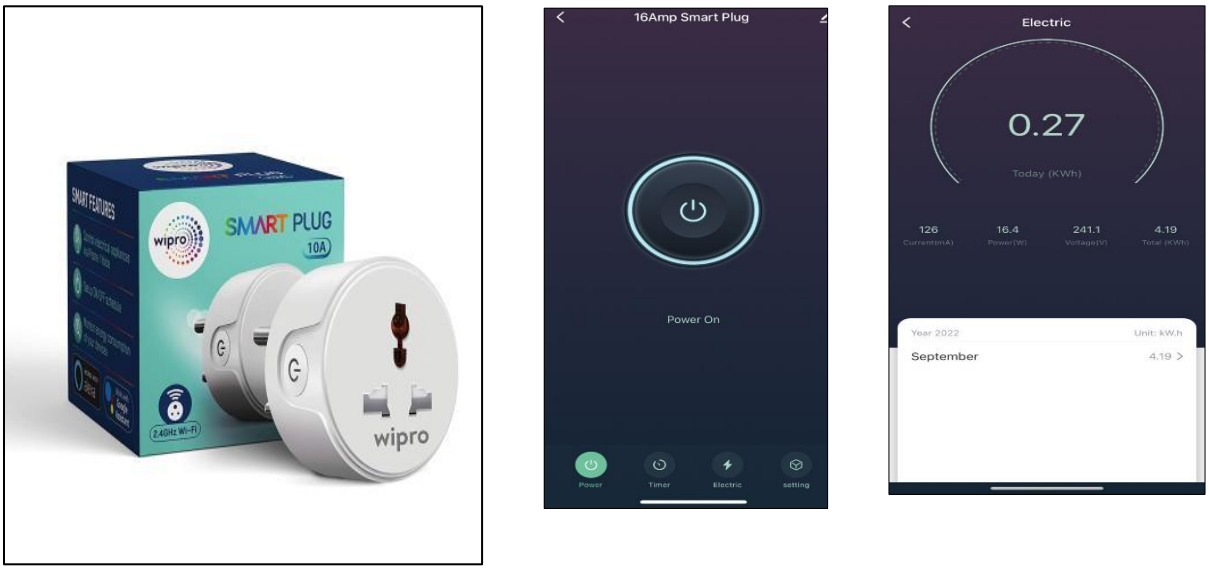



Figure 4-3: Smart Plug, App to automatically shift load and Online Monitoring

ISGF provided 16Amp smart plugs to some of the residential customers who wanted to actively participate in this pilot project. These smart plugs offered advanced features and capabilities to enhance electricity control within households. Residential customers effectively utilized these smart plugs by connecting their appliances to them and connecting the smart plugs with the internet at home. Through the accompanying smartphone app or central hub, customers could remotely monito and control their connected devices, enabling them to conveniently turn them on or off as needed. By leveraging the functionality of the smart plugs, residential customers were able to shift some of their demand to time slots when the ToU rebates were maximum.

A pricing signal chart was also prepared that showed the time slot against the incentive and surcharge values. Below is the pricing signal chart for 16th March, 2023.

**16 Mar 2023**

| Slot No. | Time Slot | Incentive/Surcharge | Slot No. | Time Slot | Incentive/Surcharge | Slot No. | Time Slot | Incentive/Surcharge | Slot No. | Time Slot | Incentive/Surcharge |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 00:00 - 00:15 | 0 | 25 | 06:00 - 06:15 | -1 | 49 | 12:00 - 12:15 | 1 | 73 | 18:00 - 18:15 | 1 |
| 2 | 00:15 - 00:30 | 0 | 26 | 06:15 - 06:30 | -1 | 50 | 12:15 - 12:30 | 1 | 74 | 18:15 - 18:30 | 0 |
| 3 | 00:30 - 00:45 | 0 | 27 | 06:30 - 06:45 | -2 | 51 | 12:30 - 12:45 | 1 | 75 | 18:30 - 18:45 | -2 |
| 4 | 00:45 - 01:00 | 0 | 28 | 06:45 - 07:00 | -2 | 52 | 12:45 - 13:00 | 1 | 76 | 18:45 - 19:00 | -4 |
| 5 | 01:00 - 01:15 | 0 | 29 | 07:00 - 07:15 | -2 | 53 | 13:00 - 13:15 | 1 | 77 | 19:00 - 19:15 | -4 |
| 6 | 01:15 - 01:30 | 0 | 30 | 07:15 - 07:30 | -2 | 54 | 13:15 - 13:30 | 1 | 78 | 19:15 - 19:30 | -4 |
| 7 | 01:30 - 01:45 | 0 | 31 | 07:30 - 07:45 | -1 | 55 | 13:30 - 13:45 | 1 | 79 | 19:30 - 19:45 | -1 |
| 8 | 01:45 - 02:00 | 1 | 32 | 07:45 - 08:00 | -1 | 56 | 13:45 - 14:00 | 1 | 80 | 19:45 - 20:00 | 0 |
| 9 | 02:00 - 02:15 | 1 | 33 | 08:00 - 08:15 | 0 | 57 | 14:00 - 14:15 | 1 | 81 | 20:00 - 20:15 | 0 |
| 10 | 02:15 - 02:30 | 1 | 34 | 08:15 - 08:30 | 0 | 58 | 14:15 - 14:30 | 1 | 82 | 20:15 - 20:30 | 0 |
| 11 | 02:30 - 02:45 | 1 | 35 | 08:30 - 08:45 | 0 | 59 | 14:30 - 14:45 | 1 | 83 | 20:30 - 20:45 | 0 |
| 12 | 02:45 - 03:00 | 1 | 36 | 08:45 - 09:00 | 0 | 60 | 14:45 - 15:00 | 1 | 84 | 20:45 - 21:00 | 0 |
| 13 | 03:00 - 03:15 | 1 | 37 | 09:00 - 09:15 | 0 | 61 | 15:00 - 15:15 | 1 | 85 | 21:00 - 21:15 | 0 |
| 14 | 03:15 - 03:30 | 1 | 38 | 09:15 - 09:30 | 0 | 62 | 15:15 - 15:30 | 1 | 86 | 21:15 - 21:30 | 0 |
| 15 | 03:30 - 03:45 | 1 | 39 | 09:30 - 09:45 | 0 | 63 | 15:30 - 15:45 | 1 | 87 | 21:30 - 21:45 | 1 |
| 16 | 03:45 - 04:00 | 1 | 40 | 09:45 - 10:00 | -1 | 64 | 15:45 - 16:00 | 1 | 88 | 21:45 - 22:00 | 1 |
| 17 | 04:00 - 04:15 | 1 | 41 | 10:00 - 10:15 | 0 | 65 | 16:00 - 16:15 | 0 | 89 | 22:00 - 22:15 | 1 |
| 18 | 04:15 - 04:30 | 1 | 42 | 10:15 - 10:30 | 0 | 66 | 16:15 - 16:30 | 0 | 90 | 22:15 - 22:30 | 0 |
| 19 | 04:30 - 04:45 | 0 | 43 | 10:30 - 10:45 | 0 | 67 | 16:30 - 16:45 | 0 | 91 | 22:30 - 22:45 | 0 |
| 20 | 04:45 - 05:00 | 0 | 44 | 10:45 - 11:00 | 0 | 68 | 16:45 - 17:00 | 0 | 92 | 22:45 - 23:00 | 0 |
| 21 | 05:00 - 05:15 | 0 | 45 | 11:00 - 11:15 | 1 | 69 | 17:00 - 17:15 | 1 | 93 | 23:00 - 23:15 | 0 |
| 22 | 05:15 - 05:30 | 0 | 46 | 11:15 - 11:30 | 1 | 70 | 17:15 - 17:30 | 1 | 94 | 23:15 - 23:30 | 0 |
| 23 | 05:30 - 05:45 | 0 | 47 | 11:30 - 11:45 | 1 | 71 | 17:30 - 17:45 | 1 | 95 | 23:30 - 23:45 | 0 |
| 24 | 05:45 - 06:00 | -1 | 48 | 11:45 - 12:00 | 1 | 72 | 17:45 - 18:00 | 1 | 96 | 23:45 - 24:00 | 0 |

Incentive in ₹

Surcharge in ₹

Figure 4-4: Pricing signal chart for 16th March 2023

The incentive value, shown in green, indicates off-peak hours when customers are encouraged to Consumed more electricity, while the surcharge value, shown in orange, indicates on-peak hours when customers can shift their interruptible loads to off-peak hours. Overall, the pricing signal chart provides customers with a clear picture of when to shift their loads to save electricity and reduce costs. This is an important step towards promoting sustainable and efficient energy use and can help to reduce the strain on the grid during peak periods. The software program developed by ISGF provides a useful tool for analysing market data and developing effective pricing strategies that promote sustainable energy practices.

## 4.4 Communication of ToU Pricing Signal

ISGF created a WhatsApp group where 50 Consumers voluntarily participated in this pilot project. Each night, when the day-ahead prices are updated on IEX, a pricing signal chart is created and sent to this group. This chart highlights the surcharges and incentives offered in each 15 min slots, helping to inform Consumers about the best times to use electricity. By receiving the price signals, customers can shift their energy consumption from peak hours to off-peak hours. To facilitate this pilot program, ISGF distributed smart plugs to several residential Consumers. These smart plugs enable users to control their electrical appliances, such as air conditioners, washing machines and geysers remotely through their smartphones. By adjusting usage based on the price signals chart, Consumers have been able to achieve significant savings on their monthly electricity bills.

## 4.5 Calculation of Adjustment Factor on Monthly Basis

The adjustment factor plays a crucial role in estimating the potential Additional Revenue to UPPCLs in rupees for a Consumers under the Time of Use (ToU) tariff scheme. It acts as a multiplier that determines the extent of savings based on the Consumers's electricity consumption in a given month. To calculate the Additional Revenue to UPPCLs in rupees, the adjustment factor is multiplied by the total billed units, measured in kilovolt-ampere-hours (kVAh), for that Consumers. This computation provides an estimate of the potential amount that the Consumers can save in that particular month by opting for the ToU tariff.

### 4.5.1 Adjustment Factor for Commercial and Residential Consumers

In Chapter 3, we discussed how pricing signals for commercial and residential Consumers are determined for each 15-minute time slot, covering all 96 slots in a day. Consumers receive the pricing signals regarding incentives or surcharges/penalties for their electricity usage in advance, specifically in the midnight preceding the day to which the signals apply. This timely communication ensures that Consumers are informed about the incentives or surcharges/penalties that will be applicable to their electricity consumption during each specific time slot.

The provided data showcases the pricing signals sent to residential Consumers on a specific day, such as March 16, 2023. The average of incentives and surcharges taken together for all 96 slots on that day is calculated. This average represents the savings in rupees per kWh of electricity consumption. Similarly, Average of Incentive and surcharge taken together is calculated for each day of the month.

Finally, the adjustment factor is computed by averaging the daily averages for the entire month. This calculation process is applied to both residential and commercial Consumers, resulting in the determination of the adjustment factor for that particular month.

**16 Mar 2023**

| Slot No. | Time Slot | Incentive/Surcharge | Slot No. | Time Slot | Incentive/Surcharge | Slot No. | Time Slot | Incentive/Surcharge | Slot No. | Time Slot | Incentive/Surcharge |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 00:00 - 00:15 | 0 | 25 | 06:00 - 06:15 | -1 | 49 | 12:00 - 12:15 | 1 | 73 | 18:00 - 18:15 | 1 |
| 2 | 00:15 - 00:30 | 0 | 26 | 06:15 - 06:30 | -1 | 50 | 12:15 - 12:30 | 1 | 74 | 18:15 - 18:30 | 0 |
| 3 | 00:30 - 00:45 | 0 | 27 | 06:30 - 06:45 | -2 | 51 | 12:30 - 12:45 | 1 | 75 | 18:30 - 18:45 | -2 |
| 4 | 00:45 - 01:00 | 0 | 28 | 06:45 - 07:00 | -2 | 52 | 12:45 - 13:00 | 1 | 76 | 18:45 - 19:00 | -4 |
| 5 | 01:00 - 01:15 | 0 | 29 | 07:00 - 07:15 | -2 | 53 | 13:00 - 13:15 | 1 | 77 | 19:00 - 19:15 | -4 |
| 6 | 01:15 - 01:30 | 0 | 30 | 07:15 - 07:30 | -2 | 54 | 13:15 - 13:30 | 1 | 78 | 19:15 - 19:30 | -4 |
| 7 | 01:30 - 01:45 | 0 | 31 | 07:30 - 07:45 | -1 | 55 | 13:30 - 13:45 | 1 | 79 | 19:30 - 19:45 | -1 |
| 8 | 01:45 - 02:00 | 1 | 32 | 07:45 - 08:00 | -1 | 56 | 13:45 - 14:00 | 1 | 80 | 19:45 - 20:00 | 0 |
| 9 | 02:00 - 02:15 | 1 | 33 | 08:00 - 08:15 | 0 | 57 | 14:00 - 14:15 | 1 | 81 | 20:00 - 20:15 | 0 |
| 10 | 02:15 - 02:30 | 1 | 34 | 08:15 - 08:30 | 0 | 58 | 14:15 - 14:30 | 1 | 82 | 20:15 - 20:30 | 0 |
| 11 | 02:30 - 02:45 | 1 | 35 | 08:30 - 08:45 | 0 | 59 | 14:30 - 14:45 | 1 | 83 | 20:30 - 20:45 | 0 |
| 12 | 02:45 - 03:00 | 1 | 36 | 08:45 - 09:00 | 0 | 60 | 14:45 - 15:00 | 1 | 84 | 20:45 - 21:00 | 0 |
| 13 | 03:00 - 03:15 | 1 | 37 | 09:00 - 09:15 | 0 | 61 | 15:00 - 15:15 | 1 | 85 | 21:00 - 21:15 | 0 |
| 14 | 03:15 - 03:30 | 1 | 38 | 09:15 - 09:30 | 0 | 62 | 15:15 - 15:30 | 1 | 86 | 21:15 - 21:30 | 0 |
| 15 | 03:30 - 03:45 | 1 | 39 | 09:30 - 09:45 | 0 | 63 | 15:30 - 15:45 | 1 | 87 | 21:30 - 21:45 | 1 |
| 16 | 03:45 - 04:00 | 1 | 40 | 09:45 - 10:00 | -1 | 64 | 15:45 - 16:00 | 1 | 88 | 21:45 - 22:00 | 1 |
| 17 | 04:00 - 04:15 | 1 | 41 | 10:00 - 10:15 | 0 | 65 | 16:00 - 16:15 | 0 | 89 | 22:00 - 22:15 | 1 |
| 18 | 04:15 - 04:30 | 1 | 42 | 10:15 - 10:30 | 0 | 66 | 16:15 - 16:30 | 0 | 90 | 22:15 - 22:30 | 0 |
| 19 | 04:30 - 04:45 | 0 | 43 | 10:30 - 10:45 | 0 | 67 | 16:30 - 16:45 | 0 | 91 | 22:30 - 22:45 | 0 |
| 20 | 04:45 - 05:00 | 0 | 44 | 10:45 - 11:00 | 0 | 68 | 16:45 - 17:00 | 0 | 92 | 22:45 - 23:00 | 0 |
| 21 | 05:00 - 05:15 | 0 | 45 | 11:00 - 11:15 | 1 | 69 | 17:00 - 17:15 | 1 | 93 | 23:00 - 23:15 | 0 |
| 22 | 05:15 - 05:30 | 0 | 46 | 11:15 - 11:30 | 1 | 70 | 17:15 - 17:30 | 1 | 94 | 23:15 - 23:30 | 0 |
| 23 | 05:30 - 05:45 | 0 | 47 | 11:30 - 11:45 | 1 | 71 | 17:30 - 17:45 | 1 | 95 | 23:30 - 23:45 | 0 |
| 24 | 05:45 - 06:00 | -1 | 48 | 11:45 - 12:00 | 1 | 72 | 17:45 - 18:00 | 1 | 96 | 23:45 - 24:00 | 0 |

Incentive in ₹

Surcharge in ₹

Figure 4-5: Incentives surcharges applicable as on 16th March 2023

Table 4-4: Calculation of adjustment factor for residential and commercial Consumers

| March-2023 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Day of Month** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** |
| **ToU Adjustment** | 0.3 | 0.5 | 0.6 | 0.19 | 0.8 | 0.8 | 0.79 | 0.4 | 0.25 |
| **Day of Month** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** |
| **ToU Adjustment** | 0.74 | 0.89 | 0.96 | 0.79 | 0.61 | 0.92 | 0.14 | 0.35 | 0.49 |
| **Day of Month** | **19** | **20** | **21** | **22** | **23** | **24** | **25** | **26** | **27** |
| **ToU Adjustment** | 0.53 | 0.72 | 0.54 | 0.92 | 0.69 | 0.62 | 0.57 | 0.84 | 0.97 |
| **Day of Month** | **28** | **29** | **30** | **31** | | | | | **Average Adjustment** |
| **ToU Adjustment** | 0.62 | 0.73 | 0.3 | 0.49 | | | | | **0.615** |

### 4.5.2 Adjustment Factor for Industrial Consumers

In Chapter 3, we discussed how pricing signals for Industrial Consumers are determined for each 15-minute time slot, covering all 96 slots in a day. Consumers receive the pricing signals regarding incentives or surcharges/penalties for their electricity usage in advance, specifically in the midnight preceding the day to which the signals apply. This timely communication ensures that Consumers are informed about the incentives or surcharges/penalties that will be applicable to their electricity consumption during each specific time slot. The provided data showcases the pricing signals sent to industrial Consumers on a specific day, such as March 2, 2023.

02 Mar 2023

| Slot No. | Time Slot | Incentive/Surcharge | Slot No. | Time Slot | Incentive/Surcharge | Slot No. | Time Slot | Incentive/Surcharge | Slot No. | Time Slot | Incentive/Surcharge |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 00:00 - 00:15 | 0 | 25 | 06:00 - 06:15 | 0 | 49 | 12:00 - 12:15 | 1 | 73 | 18:00 - 18:15 | 1 |
| 2 | 00:15 - 00:30 | 0 | 26 | 06:15 - 06:30 | 2 | 50 | 12:15 - 12:30 | 1 | 74 | 18:15 - 18:30 | 0 |
| 3 | 00:30 - 00:45 | 1 | 27 | 06:30 - 06:45 | 0 | 51 | 12:30 - 12:45 | 1 | 75 | 18:30 - 18:45 | -4 |
| 4 | 00:45 - 01:00 | 1 | 28 | 06:45 - 07:00 | 0 | 52 | 12:45 - 13:00 | 1 | 76 | 18:45 - 19:00 | -4 |
| 5 | 01:00 - 01:15 | 1 | 29 | 07:00 - 07:15 | 0 | 53 | 13:00 - 13:15 | 1 | 77 | 19:00 - 19:15 | -4 |
| 6 | 01:15 - 01:30 | 1 | 30 | 07:15 - 07:30 | 0 | 54 | 13:15 - 13:30 | 1 | 78 | 19:15 - 19:30 | -4 |
| 7 | 01:30 - 01:45 | 1 | 31 | 07:30 - 07:45 | 0 | 55 | 13:30 - 13:45 | 1 | 79 | 19:30 - 19:45 | 0 |
| 8 | 01:45 - 02:00 | 1 | 32 | 07:45 - 08:00 | 0 | 56 | 13:45 - 14:00 | 1 | 80 | 19:45 - 20:00 | 0 |
| 9 | 02:00 - 02:15 | 1 | 33 | 08:00 - 08:15 | 0 | 57 | 14:00 - 14:15 | 1 | 81 | 20:00 - 20:15 | 1 |
| 10 | 02:15 - 02:30 | 1 | 34 | 08:15 - 08:30 | 0 | 58 | 14:15 - 14:30 | 1 | 82 | 20:15 - 20:30 | 1 |
| 11 | 02:30 - 02:45 | 1 | 35 | 08:30 - 08:45 | 0 | 59 | 14:30 - 14:45 | 1 | 83 | 20:30 - 20:45 | 1 |
| 12 | 02:45 - 03:00 | 1 | 36 | 08:45 - 09:00 | -2 | 60 | 14:45 - 15:00 | 1 | 84 | 20:45 - 21:00 | 1 |
| 13 | 03:00 - 03:15 | 1 | 37 | 09:00 - 09:15 | -2 | 61 | 15:00 - 15:15 | 1 | 85 | 21:00 - 21:15 | 0 |
| 14 | 03:15 - 03:30 | 1 | 38 | 09:15 - 09:30 | 0 | 62 | 15:15 - 15:30 | 1 | 86 | 21:15 - 21:30 | 1 |
| 15 | 03:30 - 03:45 | 1 | 39 | 09:30 - 09:45 | 0 | 63 | 15:30 - 15:45 | 1 | 87 | 21:30 - 21:45 | 1 |
| 16 | 03:45 - 04:00 | 1 | 40 | 09:45 - 10:00 | 0 | 64 | 15:45 - 16:00 | 0 | 88 | 21:45 - 22:00 | 1 |
| 17 | 04:00 - 04:15 | 1 | 41 | 10:00 - 10:15 | 0 | 65 | 16:00 - 16:15 | 0 | 89 | 22:00 - 22:15 | 1 |
| 18 | 04:15 - 04:30 | 1 | 42 | 10:15 - 10:30 | -1 | 66 | 16:15 - 16:30 | -1 | 90 | 22:15 - 22:30 | 0 |
| 19 | 04:30 - 04:45 | 1 | 43 | 10:30 - 10:45 | 0 | 67 | 16:30 - 16:45 | -1 | 91 | 22:30 - 22:45 | 1 |
| 20 | 04:45 - 05:00 | 1 | 44 | 10:45 - 11:00 | 0 | 68 | 16:45 - 17:00 | -1 | 92 | 22:45 - 23:00 | 0 |
| 21 | 05:00 - 05:15 | 0 | 45 | 11:00 - 11:15 | 0 | 69 | 17:00 - 17:15 | 1 | 93 | 23:00 - 23:15 | 0 |
| 22 | 05:15 - 05:30 | 0 | 46 | 11:15 - 11:30 | 1 | 70 | 17:15 - 17:30 | 1 | 94 | 23:15 - 23:30 | 0 |
| 23 | 05:30 - 05:45 | 0 | 47 | 11:30 - 11:45 | 1 | 71 | 17:30 - 17:45 | 1 | 95 | 23:30 - 23:45 | 0 |
| 24 | 05:45 - 06:00 | 0 | 48 | 11:45 - 12:00 | 1 | 72 | 17:45 - 18:00 | 1 | 96 | 23:45 - 24:00 | 0 |

Incentive in ₹

Surcharge in ₹

Figure 4-6: Incentives surcharges applicable as on 2nd March 2023

To calculate the adjustment factors for industrial Consumers, the day is divided into four ToD slots as shown below:

Table 4-5: ToD Slot Duration and Timing for Industrial Consumers

| Slots | Hours |
|---|---|
| **ToD Slot 1** | 05:00 hrs – 11:00 hrs |
| **ToD Slot 2** | 11:00 hrs – 17:00 hrs |
| **ToD Slot 3** | 17:00 hrs – 23:00 hrs |
| **ToD Slot 4** | 23:00 hrs – 05:00 hrs |

Each ToD slot has a duration of 6 hours, divided into 24 slots of 15 minutes each. To determine the average of incentives and surcharges combined, we calculate this for each ToD slot. Specifically, we denote these averages as average1, average2, average3, and average4, representing ToD Slot 1, ToD Slot 2, ToD Slot 3, and ToD Slot 4, respectively, for a single day.

Similarly, we calculate the average of incentives and surcharges for each ToD slot on a daily basis throughout the month. Consequently, we obtain 30 averages for each ToD slot. To derive the adjustment factors, we take the average of these 30 daily averages for each ToD slot. This process results in four final averages: average ToD slot1, average ToD slot2, average ToD slot3, and average ToD slot4.

These four averages serve as adjustment factors for their respective ToD slots. To calculate the savings in rupees for each slot, we multiply the average calculated for a single slot over the entire month by the total electricity consumption for that slot during the entire month. Similarly, we perform this calculation for all four ToD slots. Consequently, the Additional Revenue to UPPCLs (in rupees) for an industrial Consumers is the sum of the savings for all four slots across the entire month.

Table 4-6: Calculation of adjustment factor for each ToU Slot

| March 2023 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** |
| **ToU 1** | 0.125 | 0.54 | 0.2 | 0.2 | 0.5 | 0.16 | 0.33 | 0.5 | 0.20 | 0.37 | 0.83 |
| **ToU 2** | 0.14 | 0.625 | 0.04 | 0.29 | 0.9 | 0.58 | 1 | 0.83 | 0.95 | 0.87 | 0.87 |
| **ToU 3** | 0.25 | 0.08 | 0.45 | 0.25 | 0.375 | 0.75 | 0.4 | 0.2 | 0.29 | 0.20 | 0.33 |
| **ToU 4** | 0.91 | 0.75 | 0.2 | 0.79 | 0.29 | 0.5 | 0.37 | 0.1 | 0.28 | 0.83 | 0.70 |
| | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **22** |
| **ToU 1** | 0.54 | 0.29 | 0.2 | 0.29 | 0.58 | 0.8 | 0.96 | 0.6 | 0.6 | 0.7 | 0.71 |
| **ToU 2** | 0.33 | 0.79 | 0.9 | 0.75 | 0.83 | 0.7 | 0.75 | 0.6 | 1.6 | 0.6 | 0.67 |
| **ToU 3** | 0.75 | 0.08 | 0.2 | 0.58 | 0.29 | 0.5 | 0.25 | 0.3 | 0.3 | 0.3 | 0.38 |
| **ToU 4** | 0.08 | 0.37 | 0.5 | 0.625 | 0.45 | 0.8 | 0.21 | 0.7 | 0.5 | 0.4 | 0.6 |
| | **23** | **24** | **25** | **26** | **27** | **28** | **29** | **30** | **31** | | **Average Adjustment** |
| **ToU 1** | 0.58 | 0.92 | 0.5 | 0.6 | 0.5 | 0.7 | 0.79 | 0.75 | 0.3 | | **0.51** |
| **ToU 2** | 0.71 | 0.8 | 0.3 | 0.5 | 0.79 | 0.1 | 0.46 | 0.5 | 0.5 | | **0.65** |
| **ToU 3** | 0.79 | 0.67 | 0.6 | 0.63 | 0.92 | 0.5 | 0.5 | 0.4 | 0.4 | | **0.41** |
| **ToU 4** | 0.41 | 0.17 | 0.8 | 0.5 | 0.83 | 0.8 | 0.79 | 0.5 | 0.6 | | **0.52** |

## 4.6 Shadow Bills

The MVVNL shared the original bills of 50 Consumers with ISGF on a monthly basis. Based on these original bills, a shadow bill was created for each Consumers that displayed the adjustment factor and the potential savings from the Time of Use (ToU) tariff scheme. The monthly adjustment rate was calculated and then multiplied by the units of energy Consumedd to derive the savings realized with the implementation of the ToU scheme. This saving amount was then deducted from the original bill's payable amount, resulting in the net bill amount. This net amount represented the Consumers's final bill after the ToU savings had been applied. The creation of these shadow bills and the computation of the ToU savings offered the Consumers to see the tangible benefits of shifting their energy consumption to off-peak hours, as encouraged by the ToU tariff scheme.

### 4.6.1 Existing Bill Analysis

The analysis of existing electricity bills involves examining and evaluating current bills to gain insights into energy consumption, costs, and patterns. It is a critical component in understanding energy usage, efficiency, and optimization. The MVVNL shared the original bills of 50 Consumers with ISGF on a monthly basis. These bills provide valuable information such as the total energy consumption in kilowatt-hours (kWh), billing period, tariff rates, and any additional charges or incentives.

The analysis process begins by organizing and summarizing the data from the electricity bills. This includes calculating the average energy consumption per billing period, identifying peak usage periods for industrial Consumers, and analyzing variations in energy consumption over time. Seasonal patterns and energy usage comparisons across different customer segments are also examined.

The next step involves studying the cost structure of the electricity bills. This involves identifying fixed charges, variable charges based on energy usage, and any demand-based charges. Researchers may calculate the average cost per unit of electricity (kWh) and assess the impact of tariff structures on overall costs.

The analysis of existing electricity bills plays a crucial role in understanding energy consumption patterns, costs, and efficiency levels.

**Electricity bill of Residential and Commercial Consumers**

Structure of the bill for commercial and residential Consumers is same. A sample bill of a residential Consumers is provided in the image below. The bill is divided into multiple sections (1, 2, 3, 4, and 5) to facilitate understanding and clarity.

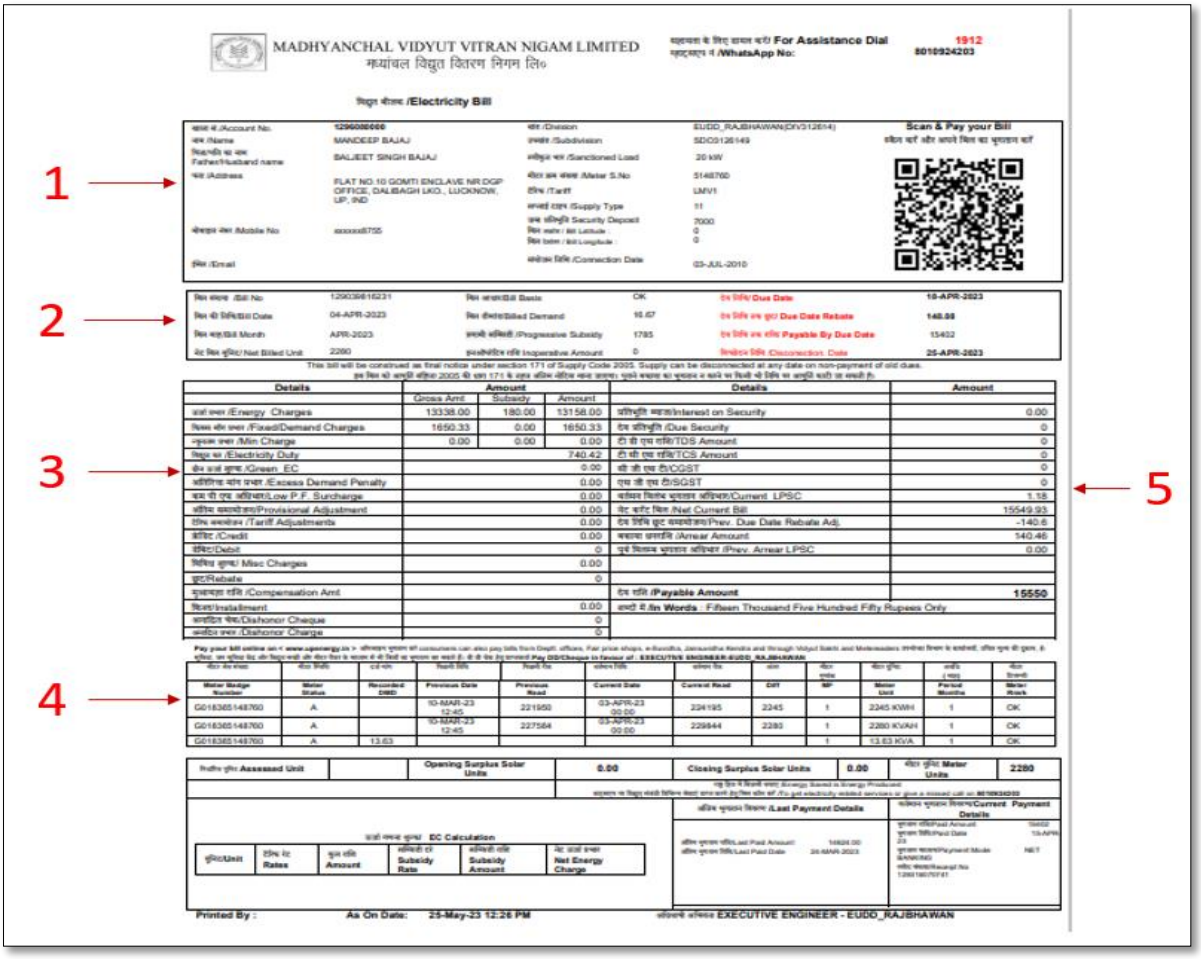



Figure 4-7: Sample Bill of a Residential/Commercial Category by UPPCL

Section 1 contains Consumers details such as name, address, contact information, account number, meter number, connection type/supply type, sanctioned load, and division and subdivision details.

Section 2 includes bill details like bill number, bill date, bill month, net billed units in kVAh, due date, and the amount payable by the due date.

Sections 3 and 5 provide a breakdown of the components comprising the payable amount. These sections explain how the total amount payable is calculated and include details such as energy charges, fixed demand charges, net current bill, and arrears.

Section 4 is the last section, which displays the meter readings, dates on which the readings were taken, and the total meter units for the billing period. It presents meter units in terms of Absolute Active Total kWh and Absolute Apparent kVAh.

**Electricity bill of Industrial Consumers**

The bill structure for industrial Consumers differs from that of commercial and residential Consumers. Below is a sample bill for an industrial Consumers, divided into multiple sections (1, 2, 3, and 4) to facilitate understanding and clarity.

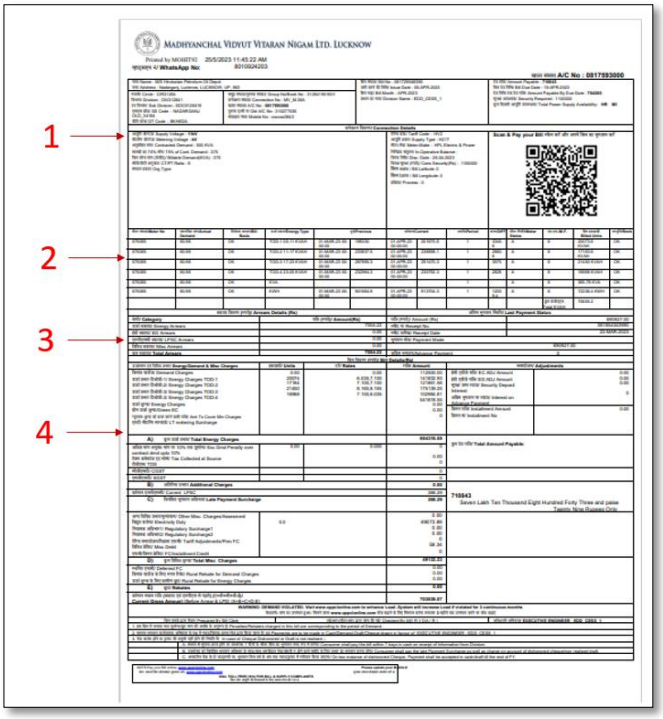



Figure 4-8: Sample Bill of an Industrial Category by UPPCL

Section 1 includes Consumers details such as name, address, contact information, bill number, meter number, connection type/supply type, sanctioned load, and division and subdivision details.

Section 2 presents the meter readings, dates of the readings, and the total meter units recorded for each Time of Day (ToD) slot during the given billing period. The meter units are provided in terms of Absolute Active Total kWh and Absolute Apparent kVAh.

Section 3 covers any arrear details and provides information about the consumers' last payment status.

Section 4 comprises the bill details and provides a breakdown of the components contributing to the payable amount. This section explains the calculation of the total amount payable, including energy charges for each ToD slot, fixed demand charges, additional charges etc.

The provided sections in the bill for industrial Consumers allow for a comprehensive understanding of Consumers details, meter readings, payment status, and the breakdown of charges for accurate billing and transparent communication.

### 4.6.2 Creation of Shadow Bills

As part of our time-of-use project, we have developed a system to generate shadow bills alongside the regular bills for each Consumers. These shadow bills were specifically created to analyse the impact of consumption patterns on energy costs.

After creating the pricing signal, adjustment factor for each billing period was calculated for all Consumers (i.e., residential, commercial, and industrial), we incorporated this factor into the shadow bill calculations.

MADHYANCHAL VIDYUT VITRAN NIGAM LIMITED
मध्यांचल विद्युत वितरण निगम लि०

सहायता के लिए डायल करें/ **For Assistance Dial** **1912**
व्हाट्सएप नं /**WhatsApp No:** **8010924203**

विद्युत बीजक /**Electricity Bill**

| | | | | |
|---|---|---|---|---|
| खाता सं./Account No. | XXXXXX9835 | खंड /Division | EUDD_GOMTINAGAR(DIV362622) | **Scan & Pay your Bill** |
| नाम /Name | XXXXXXXXXX | उपखंड /Subdivision | SDO3626221 | स्कैन करें और अपने बिल का भुगतान करें |
| पिता/पति का नाम Father/Husband name | | स्वीकृत भार /Sanctioned Load | 600 kW | |
| पता /Address | XXXXXXXXXXXXXXX | मीटर क्रम संख्या /Meter S.No | XXXXXX | |
| | | टैरिफ /Tariff | HV1 | |
| | | सप्लाई टाइप /Supply Type | H11 | |
| | | जमा प्रतिभूति Security Deposit | 800400 | |
| मोबाइल नंबर /Mobile No | xxxxx0707 | बिल अक्षांश / Bill Latitude : | 0 | |
| | | बिल देशांतर / Bill Longitude : | 0 | |
| ईमेल /Email | rxxxxxxxxv@marriott.com | संयोजन तिथि /Connection Date | 16-FEB-2015 | |

| | | | | | |
|---|---|---|---|---|---|
| बिल संख्या /Bill No | XXXXXXXXXXX | बिल आधार/Bill Basis | OK | देय तिथि/ Due Date | 15-APR-2023 |
| बिल की तिथि/Bill Date | 01-APR-2023 | बिल डीमांड/Billed Demand | 521.20 | देय तिथि तक छूट/ Due Date Rebate | 22027.87 |
| बिल माह/Bill Month | APR-2023 | प्रगामी सब्सिडी /Progressive Subsidy | | देय तिथि तक राशि/ Payable By Due Date | 2346020 |
| नेट बिल यूनिट/ Net Billed Unit | 237821 | इनऑपरेटिव राशि Inoperative Amount | 0 | विच्छेदन तिथि /Disconection. Date | 22-APR-2023 |

This bill will be construed as final notice under section 171 of Supply Code 2005. Supply can be disconnected at any date on non-payment of old dues.
इस बिल को आपूर्ति संहिता 2005 की धारा 171 के तहत अंतिम नोटिस माना जाएगा। पुराने बकाया का भुगतान न करने पर किसी भी तिथि पर आपूर्ति काटी जा सकती है।

| Details | Amount | | | Details | Amount |
|---|---|---|---|---|---|
| | Gross Amt | Subsidy | Amount | | |
| ऊर्जा प्रभार /Energy Charges | 1978670.72 | 0.00 | 1978670.72 | प्रतिभूति ब्याज/Interest on Security | 0.00 |
| फिक्स मॉग प्रभार /Fixed/Demand Charges | 224116.00 | 0.00 | 224116.00 | देय प्रतिभूति /Due Security | 0 |
| न्यूनतम प्रभार /Min Charge | 0.00 | 0.00 | 0.00 | टी डी एस राशि/TDS Amount | 0 |
| विद्युत कर /Electricity Duty | | | 165209.00 | टी सी एस राशि/TCS Amount | 0.00 |
| ग्रीन ऊर्जा शुल्क /Green_EC | | | 0.00 | सी जी एस टी/CGST | 0 |
| अतिरिक्त मांग प्रभार /Excess Demand Penalty | | | 0.00 | एस जी एस टी/SGST | 0 |
| कम पी एफ अधिभार/Low P.F. Surcharge | | | 0.00 | वर्तमन विलंभ भुगतान अधिभार/Current LPSC | 51.52 |
| अंतिम समायोजन/Provisional Adjustment | | | 0.00 | नेट करेंट बिल /Net Current Bill | 2368047.24 |
| टैरिफ समायोजन /Tariff Adjustments | | | 0.00 | देय तिथि छूट समायोजन/Prev. Due Date Rebate Adj. | -19043.14 |
| क्रेडिट /Credit | | | 0.00 | बकाया धनराशि /Arrear Amount | 19043.56 |
| डेबिट/Debit | | | 0 | पूर्व विलम्ब भुगतान अधिभार /Prev. Arrear LPSC | 0.00 |
| विविध शुल्क/ Misc Charges | | | 0.00 | | |
| छूट/Rebate | | | 0 | | |
| मुआवज़ा राशि /Compensation Amt | | | | देय राशि /**Payable Amount** | **2368048** |
| किश्त/Installment | | | 0.00 | शब्दों में /**In Words** : Twenty Three Lakh Sixty Eight Thousand Forty Eight Rupees Only | |
| अनाद्रित चेक/Dishonor Cheque | | | 0 | | |
| अनाद्रित प्रभार /Dishonor Charge | | | 0 | | |

**Pay your bill online on < www.upenergy.in >** ऑनलाइन भुगतान करें consumers can also pay bills from Deptt. offices, Fair price shops, e-Suvidha, Jansuvidha Kendra and through Vidyut Sakhi and Metereaders उपभोक्ता विभाग के कार्यालयों, उचित मूल्य की दुकान, ई-सुविधा, जन सुविधा केंद्र और विद्युत सखी और मीटर रीडर के माध्यम से भी बिलों का भुगतान कर सकते हैं। डी डी चेक हेतु प्राप्तकर्ता **Pay DD/Cheque in favour of : EXECUTIVE ENGINEER-EUDD_GOMTINAGAR**

| मीटर सेव संख्या | मीटर स्टेटस | दर्ज माप | पिछली तिथि | पिछली रीड | वर्तमान तिथि | वर्तमान रीड | अंतर | मीटर गुणांक | मीटर यूनिट | अवधि (माह) | मीटर टिप्पणी |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Badge Number | Meter Status | Recorded DMD | Previous Date | Previous Read | Current Date | Current Read | Diff | MF | Meter Unit | Period Months | Meter Rmrk |
| XXXXXXXXX | A | | 01-MAR-23 00:00 | 2216925.9 | 01-APR-23 00:00 | 2240310 | 23384.1 | 10 | 233841 KWH | 1 | OK |
| XXXXXXXXX | A | | 01-MAR-23 00:00 | 2257237.5 | 01-APR-23 00:00 | 2281019.6 | 23782.1 | 10 | 237821 KVAH | 1 | OK |
| XXXXXXXXX | A | 52.12 | | | | | | 10 | 521.2 KVA | 1 | OK |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| निर्धारित यूनिट **Assessed Unit** | | **Opening Surplus Solar Units** | **0.00** | **Closing Surplus Solar Units** | **0.00** | मीटर यूनिट **Meter Units** | **23782.1** |

राष्ट्र हित में बिजली बचाएं /Energy Saved is Energy Produced
वाट्सएप पर विद्युत संबंधी विभिन्न सेवाएं प्राप्त करने हेतु मिस कॉल करें /To get electricity related services or give a missed call on **8010924203**

ऊर्जा गणना शुल्क/ EC Calculation

| यूनिट/Unit | टैरिफ रेट Rates | कुल राशि Amount | सब्सिडी दरें Subsidy Rate | सब्सिडी राशि Subsidy Amount | नेट ऊर्जा प्रभार Net Energy Charge |
|---|---|---|---|---|---|

| अंतिम भुगतान विवरण /Last Payment Details | | वर्तमान भुगतान विवरण/Current Payment Details | |
|---|---|---|---|
| अंतिम भुगतान राशि/Last Paid Amount | 2030208.00 | भुगतान राशि/Paid Amount | 2346020 |
| अंतिम भुगतान तिथि/Last Paid Date | 13-MAR-2023 | भुगतान तिथि/Paid Date | 13-APR-23 |
| | | भुगतान माध्यम/Payment Mode | NET BANKING |
| | | रसीद संख्या/Receipt No | 579765490697 |

**Printed By :** **As On Date:** **25-May-23 12:09 PM**

अधिशाषी अभियंता **EXECUTIVE ENGINEER - EUDD_GOMTINAGAR**

Figure 4-9: Regular Bill Issued for Commercial Category Consumers by UUPCL

## SHADOW BILL WITH TIME OF USE (ToU) TARIFF

MADHYANCHAL VIDYUT VITRAN NIGAM LIMITED
मध्यांचल विद्युत वितरण निगम लि०

**Electricity Bill**

**For Assistance Dial** 1912
**WhatsApp No:** 8010924203

| | | | |
|---|---|---|---|
| Account No. | XXXXXX9835 | Division | EDDU_GOMTINAGAR(DIV312622 |
| Name | XXXXXXXXXX | Subdivision | SDO3126221 |
| Father's name | XXXXXXX | Sanctioned Load | 600 KW |
| Address | XXXXXXX | Meter S.No | XXXXXXX |
| Mobile No | XXXXXX0707 | Tariff | HV1 |
| Email | rxxxxxxxxv@marriott.com | Supply Type | H11 |
| | | Bill Latitude | 0 |
| | | Bill Longitude | 0 |
| | | Security Deposit | 800400 |
| | | Connection Date | 16/Feb/2015 |

| | | | | | |
|---|---|---|---|---|---|
| Bill No | XXXXXXXXXXX | Bill Basis | OK | Due Date | 15/Apr/2023 |
| Bill Date | 1/Apr/2023 | Billed Demand | 521.2 | Due Date Rebate | 22027.87 |
| Bill Month | Apr-23 | Progressive Subsidy Amount | 0 | Payable By Due Date | 2346020 |
| Net Billed Unit | 237821 | Inoperative Amount | 0 | Discon. Date | 22/Apr/2023 |

This bill will be construed as final notice under section 171 of Supply Code 2005. Supply can be disconnected at any date on non-payment of old dues.

| Details | Amount | | |
|---|---|---|---|
| | Gross Amt | Subsidy | Amount |
| Energy Charges | 1978670.72 | 0 | 1978670.72 |
| Fixed/Demand Charges | 224116 | 0 | 224116 |
| Min Charge | 0 | 0 | 0 |
| Electricity Duty | | | 165209 |
| Green_EC | | | 0 |
| Excess Demand Penalty | | | 0 |
| Low P.F. Surcharge | | | 0 |
| Provisional Adjustment | | | 0 |
| Tariff Adjustments | | | 0 |
| Credit | | | 0 |
| Debit | | | 0 |
| Misc Charges | | | 0 |
| Rebate | | | 0 |
| Compensation Amt | | | |
| Installment | | | 0 |
| Dishonor Cheque | | | 0 |
| Dishonor Charge | | | 0 |

| Details | Amount |
|---|---|
| Interest on Security | 0.00 |
| Due Security | 0.00 |
| TDS Amount | 0.00 |
| TCS Amount | 0.00 |
| CGST | 0.00 |
| SGST | 0.00 |
| Current LPSC | 51.52 |
| Net Current Bill | 2368047.24 |
| Prev. Due Date Rebate Adj. | -19043.14 |
| Arrear Amount | 19043.56 |
| Prev. Arrear LPSC | 0.00 |
| **Payable Amount** | 2368048.00 |
| **Total ToU Saving*** | **118910.50** |
| **Net Bill Amount after ToU Saving** | **2249137.50** |

**Pay your bill online on < www.upenergy.in > consumers can also pay bills from Deptt. offices, Fair price shops, e-Suvidha, Jansuvidha Kendra and through Vidyut Sakhi and Metereaders**

**Pay DD/Cheque in favour of : EXECUTIVE ENGINEER-EUDD_GOMTINAGAR**

| Meter Badge Number | Meter Status | Recorded DMD | Previous Date | Previous Read | Current Date | Current Read | Diff | MF | Meter Unit | Period Months | Meter Rmrk |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 559222EH8641 | A | | 1-Mar-23 | 2257237.5 | 1-Apr-23 | 2281019.6 | 23782.1 | 10 | 237821 KVAH | 1 | OK |
| 559222EH8641 | A | | 1-Mar-23 | 2216925.9 | 2-Apr-23 | 2240310 | 23384.1 | 10 | 233841 KWH | 1 | OK |
| **Assessed Unit** | **Opening Surplus Solar Units** | | | | 0 | **Closing Surplus Solar Units** | | **0** | | **Meter Units** | **237821** |

**Energy Saved is Energy Produced**

**Energy Saved is Energy Produced** — **To get electricity related services or give a missed call on 8010924203**

**EC Calculation**

| Unit | Rates | Amount | Subsidy Rate | Subsidy Amt | Net Energy Charge |
|---|---|---|---|---|---|
| | | | | | |

| Units considered for ToU Adjustment | Adjustment Rates | Amount Saved Under ToU Tariff |
|---|---|---|
| 237821 | 0.5 | 118910.50 |

**Last Payment Details**

| | |
|---|---|
| Last Paid Amount | 2030208 |
| Last Paid Date | 13-Mar-23 |

**Current Payment Details**

| | |
|---|---|
| Paid Amount | 2346020 |
| Paid Date | 13-Apr-23 |
| payment mode | NET Banking |
| Receipt No | 579765490697.00 |

* ToU savings is the rebate for electricity consumption during the periods when rebates on existing tariffs was offered through Pricing Signals by ISGF everyday morning

**Printed By : As On Date: 25-May-23 12:09 PM EXECUTIVE ENGINEER - EUDD_GOMTINAGAR**

Figure 4-10: Commercial Category Consumers Shadow Bill by ISGF

MADHYANCHAL VIDYUT VITARAN NIGAM LTD. LUCKNOW

Printed by MOHIT92 25/5/2023 11:45:22 AM
व्हाट्सएप नं/ WhatsApp No: 8010924203

खाता संख्या A/C No : XXXXXX3000

| | | |
|---|---|---|
| नाम/ Name : XXXXXXXXXX<br>पता/ Address : XXXXXXXXXXXXX | बिल संख्या/ Bill No : XXXXXXXXXXX<br>जारी करने की तिथि/ Issue Date : 05-APR-2023<br>बिल माह/ Bill Month : APR-2023<br>प्रभाग का नाम/ Division Name : EDD_CESS_1 | देय राशि/ Amount Payable : 710843<br>बिल देय तिथि/ Bill Due Date : 19-APR-2023<br>देय तिथि तक देय राशि/ Amount Payable By Due Date : 704300<br>सुरक्षा आवश्यक/ Security Required : 1100000<br>कुल बिजली आपूर्ति उपलब्धता/ Total Power Supply Availability: HR MI |
| मंडली/ Circle : CIR31284<br>विभाग/ Division : DIV312641<br>उप विभाग/ Sub Division : SDO3126419<br>एसएस कोड/ SS Code : NADARGANJ OLD_34164<br>डीटी कोड/ DT Code : BKHEDA | समूह संख्या/पुस्तक संख्या/ Group No/Book No : 312641901601<br>कनेक्शन संख्या/ Connection No : MV_M.36A<br>खाता संख्या/ A/C No : XXXXXX3000<br>पुराना ए/सी नं/ Old A/C No :<br>मोबाइल नंबर/ Mobile No : xxxxxx0843 | |

कनेक्शन विवरण/ Connection Details

| | | |
|---|---|---|
| आपूर्ति वोल्टेज/ Supply Voltage : 11kV<br>मीटरिंग वोल्टेज/ Metering Voltage : kV<br>अनुबंधित मांग/ Contracted Demand : 500 KVA<br>सामग्री का 75% मॉंग/ 75% of Cont. Demand : 375<br>बिल योग्य मांग (केवीए)/ Billable Demand(KVA) : 375<br>सीटी/पीटी अनुपात/ CT/PT Ratio : 6<br>संगठन प्रकार/ Org Type: | टैरिफ कोड/ Tariff Code : HV2<br>आपूर्ति प्रकार/ Supply Type : H21T<br>मीटर-मेक/ Meter-Make : HPL Electric & Power<br>निष्क्रिय संतुलन/ In-Operative Balance :<br>डिस्क तिथि/ Disc. Date : 26-04-2023<br>विपक्ष सुरक्षा (रुपये)/ Cons Security(Rs) : 1100000<br>बिल अक्षांश / Bill Latitude: 0<br>बिल देशांतर / Bill Longitude: 0<br>प्रक्रिया/ Process : 0 | Scan & Pay your Bill स्कैन करें और अपने बिल का भुगतान करें |

| मीटर संख्या/Meter No | वास्तविक मांग/Actual Demand | विधेयक आधार/Bill Basis | ऊर्जा प्रकार/Energy Type | पूर्व/Previous | | वर्तमान/Current | | अवधि/Period | अंतर/DIFF | मीटर स्थिति/Meter Status | एम.एफ./M.F. | बिल इकाईयाँ/ Billed Units | अभ्युक्ति/Rmrk |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| XXXXXX | 60.96 | OK | TOD-1 05-11 KVAH | 01-MAR-23 00:00:00 | 198330 | 01-APR-23 00:00:00 | 201675.6 | 1 | 3345.6 | A | 6 | 20073.6 KVAH | OK |
| XXXXXX | 60.96 | OK | TOD-2 11-17 KVAH | 01-MAR-23 00:00:00 | 233837.5 | 01-APR-23 00:00:00 | 236698.1 | 1 | 2860.6 | A | 6 | 17163.6 KVAH | OK |
| XXXXXX | 60.96 | OK | TOD-3 17-23 KVAH | 01-MAR-23 00:00:00 | 287895.3 | 01-APR-23 00:00:00 | 291470.3 | 1 | 3575 | A | 6 | 21450 KVAH | OK |
| XXXXXX | 60.96 | OK | TOD-4 23-05 KVAH | 01-MAR-23 00:00:00 | 232964.3 | 01-APR-23 00:00:00 | 235792.3 | 1 | 2828 | A | 6 | 16968 KVAH | OK |
| XXXXXX | 60.96 | OK | KVA | | | | | 1 | | A | 6 | 365.76 KVA | OK |
| XXXXXX | 60.96 | OK | KWH | 01-MAR-23 00:00:00 | 901664.9 | 01-APR-23 00:00:00 | 913704.3 | 1 | 12039.4 | A | 6 | 72236.4 KWH | OK |
| | | | | | | | | | | | कुल केवीएएच Total KVAH | 75655.2 | |

बकाया विवरण (रुपये)/ Arrears Details (Rs)

| श्रेणी/ Category | राशि (रुपये)/ Amount(Rs) |
|---|---|
| ऊर्जा बकाया/ Energy Arrears | 7004.22 |
| ईडी बकाया/ ED Arrears | 0.00 |
| एलपीएससी बकाया/ LPSC Arrears | 0.00 |
| विविध बकाया/ Misc Arrears | 0.00 |
| कुल बकाया/ Total Arrears | 7004.22 |

अंतिम भुगतान स्थिति/ Last Payment Status

| | |
|---|---|
| राशि (रुपये)/ Amount (Rs) | 690927.00 |
| रसीद नं/ Receipt No. | 081854343990 |
| रसीद तारीख/ Receipt Date | 22-MAR-2023 |
| भुगतान मोड/ Payment Mode | |
| 690927.00 | |
| अग्रिम भुगतान/Advance Payment | 0 |

बिल विवरण (रुपये)/ Bill Details(Rs)

| ऊर्जा/मांग एवं विविध प्रभार/ Energy/Demand & Misc Charges | इकाइयाँ/ Units | दरें/ Rates | राशि/ Amount |
|---|---|---|---|
| डिमांड चार्जेज/ Demand Charges | 0.00 | 0.00 | 112500.00 |
| ऊर्जा प्रभार टीओडी-1/ Energy Charges TOD-1 | 20074 | 6.035,7.100 | 141832.93 |
| ऊर्जा प्रभार टीओडी-2/ Energy Charges TOD-2 | 17164 | 7.100,7.100 | 121861.56 |
| ऊर्जा प्रभार टीओडी-3/ Energy Charges TOD-3 | 21450 | 8.165,8.165 | 175139.25 |
| ऊर्जा प्रभार टीओडी-3/ Energy Charges TOD-4 | 16968 | 7.100,6.035 | 102984.81 |
| ऊर्जा शुल्क/ Energy Charges | | | 541818.55 |
| ग्रीन ऊर्जा शुल्क/Green EC | | | 0.00 |
| न्यूनतम शुल्क को कवर करने वाली राशि/ Amt To Cover Min Charges | | | 0.00 |
| एलटी मीटरिंग सरचार्ज/ LT metering Surcharge | | | 0 |
| **A) कुल ऊर्जा प्रभार/ Total Energy Charges** | | | **654318.55** |
| अधिक मांग अनुबंध मांग पर 10% तक जुर्माना/ Exc Dmd Penalty over contract dmd upto 10% | 0.00 | 0.000 | 0 |
| टैक्स कलेक्टेड एट सोर्स/ Tax Collected at Source | | | 0.00 |
| टीडीएस/ TDS | | | 0 |
| सीजीएसटी/ CGST | | | 0 |
| एसजीएसटी/ SGST | | | 0 |
| **B) अतिरिक्त प्रभार/ Additional Charges** | | | **0.00** |
| वर्तमान एलपीएससी/ Current LPSC | | | 388.29 |
| **C) विलंबित भुगतान अधिभार/ Late Payment Surcharge** | | | **388.29** |
| अन्य विविध प्रभार/मूल्यांकन/ Other Misc. Charges/Assesment | | | 0.00 |
| विद्युत कर्तव्य/ Electricity Duty | 0.0 | | 49073.89 |
| नियामक अधिभार1/ Regulatory Surcharge1 | | | 0.00 |
| नियामक अधिभार2/ Regulatory Surcharge2 | | | 0.00 |
| टैरिफ समायोजन/पिछला एफसी/ Tariff Adjustments/Prev FC | | | 0 |
| विविध डेबिट/ Misc Debit | | | 58.34 |
| एफसी/किस्त क्रेडिट/ FC/Installment Credit | | | 0 |
| **D) कुल विविध शुल्क/ Total Misc Charges** | | | **49132.23** |
| स्थगित एफसी/ Deferred FC | | | 0.00 |
| डिमांड चार्जेज के लिए रूरल रिबेट/ Rural Rebate for Demand Charges | | | 0.00 |
| ऊर्जा शुल्क के लिए ग्रामीण छूट/ Rural Rebate for Energy Charges | | | 0.00 |
| **E) छूट/ Rebates** | | | **0.00** |
| वर्तमान सकल राशि (बकाया एवं एलपीएस से पहले) (ए+बी+सी+डी-ई)/ **Current Gross Amount** (Before Arrear & LPS) (A+B+C+D-E) | | | **703839.07** |

समायोजन/ Adjustments

| | |
|---|---|
| ईसी एडीजे राशि/ EC ADJ Amount | 0.00 |
| ईडी एडीजे राशि/ ED ADJ Amount | 0.00 |
| सुरक्षा जमा ब्याज/ Security Deposit Interest | 0.00 |
| अग्रिम भुगतान पर ब्याज/ Interest on Advance Payment | 0 |
| किस्त राशि/ Installment Amount | 0.00 |
| किस्त सं/ Installment No | |

कुल देय राशि/ Total Amount Payable:

**710843**

Seven Lakh Ten Thousand Eight Hundred Forty Three and paise Twenty Nine Rupees Only

**WARNING: DEMAND VIOLATED. Visit www.uppclonline.com to enhance Load .System will increase Load if violated for 3 continuous months**
चेतावनी: मांग का उल्लंघन हुआ। मिलने जाना www.uppclonline.com लोड बढ़ाने के लिए सिस्टम करेगा लगातार 3 महीने तक उल्लंघन करने पर लोड बढ़ाए

| बिल क्लर्क द्वारा तैयार/ Prepared By Bill Clerk | एई(आर)/डीए(आर) द्वारा जांच की गई/ Checked By AE( R )/ DA ( R ) | अधिशासी अभियंता/ EXECUTIVE ENGINEER : EDD_CESS_1 |
|---|---|---|

1. इस बिल में लगाया गया जुर्माना/छूट मांग की अवधि के अनुरूप है/ Penalties/Rebates charged in this bill are corresponding to the period of Demand.
2. समस्त भुगतान कार्यपालक अभियंता के पक्ष में नकद/डिमांड-ड्राफ्ट/चेक द्वारा किया जाना है/ All Payments are to be made in Cash/Demand-Draft/Cheque drawn in favour of EXECUTIVE ENGINEER : EDD_CESS_1
3. चेक बाउंस होने या ड्राफ्ट की वसूली नहीं होने की स्थिति में/ In case of Cheque Dishonored or Draft is not realized :-
   - A. संभाग से सूचना प्राप्त होने पर उपभोक्ता 7 दिनों के भीतर बिल का भुगतान नगद रूप में करेगा/ Consumer shall pay the bill within 7 days in cash on receipt of Information from Division.
   - B. उपभोक्ता को विलंबित भुगतान अधिभार के साथ-साथ अस्वीकृत चेक/वसूली न होने वाले मसौदे के लिए प्रभार का भुगतान करना होगा/ Consumer shall pay the late Payment Surcharge as well as charge on account of dishonored cheque/non realized draft.
   - C. अनादरित चेक के दो उदाहरणों पर, भुगतान बिल वर्ष के अंत तक नकद/ड्राफ्ट में स्वीकार किया जाएगा/ On two instance of dishonored Cheque, Payment shall be accepted in cash/draft till the end of FY.

NOTE:Pay your Bill online- www.uppclonline.com Please update your Mobile #
नोट: अपना बिल ऑनलाइन भुगतान करें- www.uppclonline.com कृपया अपना मोबाइल नम्बर अपडेट करें #
DIAL TOLL FREE 1912 FOR BILL & SUPPLY COMPLAINTS
बिल और सप्लाई से शिकायतें के लिए टोल फ्री नंबर 1912

Figure 4-11: Regular Bill Issued for Industrial Consumers by UPPCL

## SHADOW BILL WITH TIME OF USE (ToU) TARIFF

MADHYANCHAL VIDYUT VITRAN NIGAM LIMITED
मध्यांचल विद्युत वितरण निगम लि०

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Printed by | MOHIT92 25/5/2023 11:45:22 AM | | | | | A/C No : XXXXXX3000 | |
| WhatsApp No: | 8010924203 | | | | | | |
| Name | XXXXXXXXXXX | | | BILL NO | XXXXXXXXXXX | Amount Payable | 710843 |
| Address | XXXXXXXXXXX | | | Issue Date | 5-Apr-23 | Bill Due Date | 19-Apr-22 |
| Circle | CIR31264 | Group No/Book No: | 312641901601 | Bill Month | Apr-23 | Amount Payable By Due Date | 704300 |
| Division | DIV312641 | Connection No: | MV_M.36A | Division Name | EDD_CESS_1 | Security Required | 1100000 |
| Sub Division | SDO3126419 | A/C No: | xxxxxx0843 | | | Total Power Supply Availability | HR MI |
| SS Code | NDRGJNEW | Old A/C No: | 310277030 | | | | |
| DT Code | BKHEDA | Mobile No: | xxxxxx0843 | | | Total ToU Saving* | 42647 |

**Connection Details**

| | | | | | |
|---|---|---|---|---|---|
| Supply Voltage | 11 kV | Tariff Code | HV2 | WARNING: DEMAND VIOLATED. Visit www.uppclonline.com to enhance Load .System will increase Load if violated for 3 continuous months | |
| Metering Voltage | kV | Supply Type | H21T | | |
| Contracted Demand | 500 KVA | Meter-Make | HPL Electric & Power | | |
| 75% of Cont. Demand | 375 | In-Operative Balance | | | |
| Billable Demand(KVA) | 375 | Date | 7/8/2022 | | |
| CT/PT Ratio | 6 | Bill Latitude | 0 | | |
| Org Type | | Bill Longitude | 0 | | |
| | | Cons Security(Rs.) | 1100000 | | |
| | | Process | 0 | | |

| Meter No | Actual Demand | Bill Basis | Energy Type | Previous | | Current | | Period | DIFF | Meter Sta | M.F. | Billed Units | Rmrk |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| xxxxxx | 60.96 | OK | TOD-1 05-11 KVAH | 1-Mar-23 | 198330 | 1-Apr-23 | 201675.6 | 1 | 3345.6 | A | 6 | 20073.6 | OK |
| xxxxxx | 60.96 | OK | TOD-2 11-17 KVAH | 1-Mar-23 | 233837.5 | 1-Apr-23 | 236698.1 | 1 | 2860.6 | A | 6 | 17163.6 | OK |
| xxxxxx | 60.96 | OK | TOD-3 17-23 KVAH | 1-Mar-23 | 287895.3 | 1-Apr-23 | 291470.3 | 1 | 3575 | A | 6 | 21450 KVAH | OK |
| xxxxxx | 60.96 | OK | TOD-4 23-05 KVAH | 1-Mar-23 | 232964.3 | 1-Apr-23 | 235792.3 | 1 | 2828 | A | 6 | 16968 KVAH | OK |
| xxxxxx | 60.96 | OK | KVA | | | | | 1 | | A | 6 | 365.76 KVA | OK |
| xxxxxx | 60.96 | OK | KWH | 1-Mar-23 | 901664.9 | 1-Apr-23 | 913704.3 | | 12039.4 | A | 6 | 72236.4 KWH | OK |
| | | | | | | | | | | | Total KVAH | 75655.2 | |

**Arrears Details(Rs)**

| Category | Amount(Rs) |
|---|---|
| Energy Arrears | 7004.22 |
| ED Arrears | 0 |
| LPSC Arrears | 0 |
| Misc Arrears | 0 |
| Total Arrears | 7004.22 |

**Last Payment Status**

| | |
|---|---|
| Amount (Rs) | 690927 |
| Receipt No. | 818543 43990 |
| Receipt Date | 22-Mar-23 |
| Payment Mode | |
| 690927 | |
| Advance Payment | 0 |

**Bill Details(Rs)**

| Energy/Demand & Misc Charges | Units | Rates | Amount |
|---|---|---|---|
| Demand Charges | 0 | 0 | 112500 |
| Energy Charges TOD-1 | 20074 | 6.035,7.1 | 141832.93 |
| Energy Charges TOD-2 | 17164 | 7.1,7.1 | 121861.56 |
| Energy Charges TOD-3 | 21450 | 8.165,8.165 | 175139.25 |
| Energy Charges TOD-4 | 16968 | 7.100,6035 | 102984.81 |
| Energy Charges | | | 541818.55 |
| Amt To Cover Min Charges | | | 0 |
| LT metering Surcharge | | | 0 |
| **A) Total Energy Charges** | | | **654318.55** |
| Exc Dmd Penalty over contract dmd upto 10% | 0 | 0 | 0 |
| Tax Collected at Source | | | 0 |
| TDS | | | 0 |
| CGST | | | 0 |
| SGST | | | 0 |
| **B) Additional Charges** | | | **0** |
| Current LPSC | | | 388.29 |
| **C) Late Payment Surchar** | | | 388.29 |
| Other Misc. Charges/Assesment | | | 0 |
| Electricity Duty | 0 | | 49073.89 |
| Regulatory Surcharge1 | | | 0 |
| Regulatory Surcharge2 | | | 0 |
| Tariff Adjustments/Prev FC | | | 0 |
| Misc Debit | | | 58.34 |
| FC/Installment Credit | | | 0 |
| **D) Total Misc Charges** | | | **49132.23** |
| Deferred FC | | | 0 |
| Rural Rebate for Demand Charges | | | 0 |
| Rural Rebate for Energy Charges | | | 0 |
| **E) Rebates** | | | 0 |
| **Current Gross Amount (Before Arrear & LPS) (A+B+C+D-E-F)** | | | **703839.07** |

| Adjustments | |
|---|---|
| EC ADJ Amount | 0 |
| ED ADJ Amount | 0 |
| Security Deposit Interest | 0 |
| Interest on Advance Payment | |
| Installment Amount | 0 |
| Installment No | |

**Total Amount Payable**

**710843**

Seven Lakh Ten Thousand Eight Hundred Forty Three and paise Twenty Nine Rupees Only

| | |
|---|---|
| Total ToU saving | 42647 |
| Net bill amount after ToU saving | 668196 |

| Slots | Units | Adjustment Rates | ToU Tariff |
|---|---|---|---|
| TOU-1 | 20074 | 0.4 | 8029.6 |
| TOU-2 | 17164 | 0.7 | 12014.8 |
| TOU-3 | 21450 | 0.5 | 10725 |
| TOU-4 | 16968 | 0.7 | 11877.6 |
| Amount under ToU tariff | | | 42647 |

WARNING: DEMAND VIOLATED. Visit www.uppclonline.com to enhance Load .System will increase Load if violated for 3 continuous months

Prepared By Bill Clerk | Checked By AE( R )/ DA ( R ) | EXECUTIVE ENGINEER : EDD_CESS_1

1. Penalties/Rebates charged in this bill are corresponding to the period of Demand.
2. All Payments are to be made in Cash/Demand-Draft/Cheque drawn in favour of EXECUTIVE ENGINEER : EDD_CESS_1
3. In case of Cheque Dishonored or Draft is not realized :-
   A. Consumer shall pay the bill within 7 days in cash on receipt of Information from Division.
   B. Consumer shall pay the late Payment Surcharge as well as charge on account of dishonored cheque/non realized draft.
   C. On two instance of dishonored Cheque, Payment shall be accepted in cash/draft till the end of FY.

NOTE:Pay your Bill online- www.uppclonline.com Please update your Mobile #
DIAL TOLL FREE 1912 FOR BILL & SUPPLY COMPLAINTS

Figure 4-12: Industrial Category Consumers Shadow Bill by ISGF

MADHYANCHAL VIDYUT VITRAN NIGAM LIMITED
मध्यांचल विद्युत वितरण निगम लि०

सहायता के लिए डायल करें/ **For Assistance Dial** **1912**
व्हाट्सएप नं /**WhatsApp No:** **8010924203**

विद्युत बीजक /**Electricity Bill**

| | | | | |
|---|---|---|---|---|
| खाता सं./Account No. | XXXXXX0000 | खंड /Division | EUDD_RAJBHAWAN(DIV312614) | **Scan & Pay your Bill** |
| नाम /Name | | उपखंड /Subdivision | SDO3126149 | स्कैन करें और अपने बिल का भुगतान करें |
| पिता/पति का नाम Father/Husband name | XXXXXXXXXX | स्वीकृत भार /Sanctioned Load | 20 kW | |
| पता /Address | XXXXXXXXX | मीटर क्रम संख्या /Meter S.No | XXXXXX | |
| | | टैरिफ /Tariff | LMV1 | |
| | | सप्लाई टाइप /Supply Type | 11 | |
| | | जमा प्रतिभूति Security Deposit | 7000 | |
| मोबाइल नंबर /Mobile No | xxxxxx8755 | बिल अक्षांश / Bill Latitude : | 0 | |
| | | बिल देशांतर / Bill Longitude : | 0 | |
| ईमेल /Email | | संयोजन तिथि /Connection Date | 03-JUL-2010 | |

| | | | | | |
|---|---|---|---|---|---|
| बिल संख्या /Bill No | XXXXXXXXXXXX | बिल आधार/Bill Basis | OK | देय तिथि/ **Due Date** | **18-APR-2023** |
| बिल की तिथि/Bill Date | 04-APR-2023 | बिल डीमांड/Billed Demand | 16.67 | देय तिथि तक छूट/ **Due Date Rebate** | **148.08** |
| बिल माह/Bill Month | APR-2023 | प्रगामी सब्सिडी /Progressive Subsidy | 1785 | देय तिथि तक राशि/ **Payable By Due Date** | 15402 |
| नेट बिल यूनिट/ Net Billed Unit | 2280 | इनऑपरेटिव राशि Inoperative Amount | 0 | विच्छेदन तिथि /Disconection. Date | **25-APR-2023** |

This bill will be construed as final notice under section 171 of Supply Code 2005. Supply can be disconnected at any date on non-payment of old dues.
इस बिल को आपूर्ति संहिता 2005 की धारा 171 के तहत अंतिम नोटिस माना जाएगा। पुराने बकाया का भुगतान न करने पर किसी भी तिथि पर आपूर्ति काटी जा सकती है।

| **Details** | **Amount** | | | **Details** | **Amount** |
|---|---|---|---|---|---|
| | Gross Amt | Subsidy | Amount | | |
| ऊर्जा प्रभार /Energy Charges | 13338.00 | 180.00 | 13158.00 | प्रतिभूति ब्याज/Interest on Security | 0.00 |
| फिक्स मॉंग प्रभार /Fixed/Demand Charges | 1650.33 | 0.00 | 1650.33 | देय प्रतिभूति /Due Security | 0 |
| न्यूनतम प्रभार /Min Charge | 0.00 | 0.00 | 0.00 | टी डी एस राशि/TDS Amount | 0 |
| विद्युत कर /Electricity Duty | | | 740.42 | टी सी एस राशि/TCS Amount | 0 |
| ग्रीन ऊर्जा शुल्क /Green_EC | | | 0.00 | सी जी एस टी/CGST | 0 |
| अतिरिक्त मांग प्रभार /Excess Demand Penalty | | | 0.00 | एस जी एस टी/SGST | 0 |
| कम पी एफ अधिभार/Low P.F. Surcharge | | | 0.00 | वर्तमन विलंभ भुगतान अधिभार/Current LPSC | 1.18 |
| अंतिम समायोजन/Provisional Adjustment | | | 0.00 | नेट करेंट बिल /Net Current Bill | 15549.93 |
| टैरिफ समायोजन /Tariff Adjustments | | | 0.00 | देय तिथि छूट समायोजन/Prev. Due Date Rebate Adj. | -140.6 |
| क्रेडिट /Credit | | | 0.00 | बकाया धनराशि /Arrear Amount | 140.46 |
| डेबिट/Debit | | | 0 | पूर्व विलम्ब भुगतान अधिभार /Prev. Arrear LPSC | 0.00 |
| विविध शुल्क/ Misc Charges | | | 0.00 | | |
| छूट/Rebate | | | 0 | | |
| मुआवज़ा राशि /Compensation Amt | | | | देय राशि /**Payable Amount** | **15550** |
| किश्त/Installment | | | 0.00 | शब्दों में /**In Words** : Fifteen Thousand Five Hundred Fifty Rupees Only | |
| अनादृत चेक/Dishonor Cheque | | | 0 | | |
| अनादृत प्रभार /Dishonor Charge | | | 0 | | |

**Pay your bill online on < www.upenergy.in >** ऑनलाइन भुगतान करें consumers can also pay bills from Deptt. offices, Fair price shops, e-Suvidha, Jansuvidha Kendra and through Vidyut Sakhi and Metereaders उपभोक्ता विभाग के कार्यालयों, उचित मूल्य की दुकान, ई-सुविधा, जन सुविधा केंद्र और विद्युत सखी और मीटर रीडर के माध्यम से भी बिलों का भुगतान कर सकते हैं। डी डी चेक हेतु प्राप्तकर्ता **Pay DD/Cheque in favour of : EXECUTIVE ENGINEER-EUDD_RAJBHAWAN**

| मीटर बैज संख्या<br>Meter Badge Number | मीटर स्थिति<br>Meter Status | दर्ज मांग<br>Recorded DMD | पिछली तिथि<br>Previous Date | पिछली रीड<br>Previous Read | वर्तमान तिथि<br>Current Date | वर्तमान रीड<br>Current Read | अंतर<br>Diff | मीटर गुणांक<br>MF | मीटर यूनिट<br>Meter Unit | अवधि (माह)<br>Period Months | मीटर टिप्पणी<br>Meter Rmrk |
|---|---|---|---|---|---|---|---|---|---|---|---|
| XXXXXXXXXX | A | | 10-MAR-23 12:45 | 221950 | 03-APR-23 00:00 | 224195 | 2245 | 1 | 2245 KWH | 1 | OK |
| XXXXXXXXXX | A | | 10-MAR-23 12:45 | 227564 | 03-APR-23 00:00 | 229844 | 2280 | 1 | 2280 KVAH | 1 | OK |
| | A | 13.63 | | | | | | 1 | 13.63 KVA | 1 | OK |

| निर्धारित यूनिट **Assessed Unit** | | **Opening Surplus Solar Units** | **0.00** | **Closing Surplus Solar Units** | **0.00** | मीटर यूनिट **Meter Units** | **2280** |
|---|---|---|---|---|---|---|---|

राष्ट्र हित में बिजली बचाए /Energy Saved is Energy Produced
बाहरएप पर विद्युत संबंधी विभिन्न सेवाएं प्राप्त करने हेतु मिस कॉल करें /To get electricity related services or give a missed call on **8010924203**

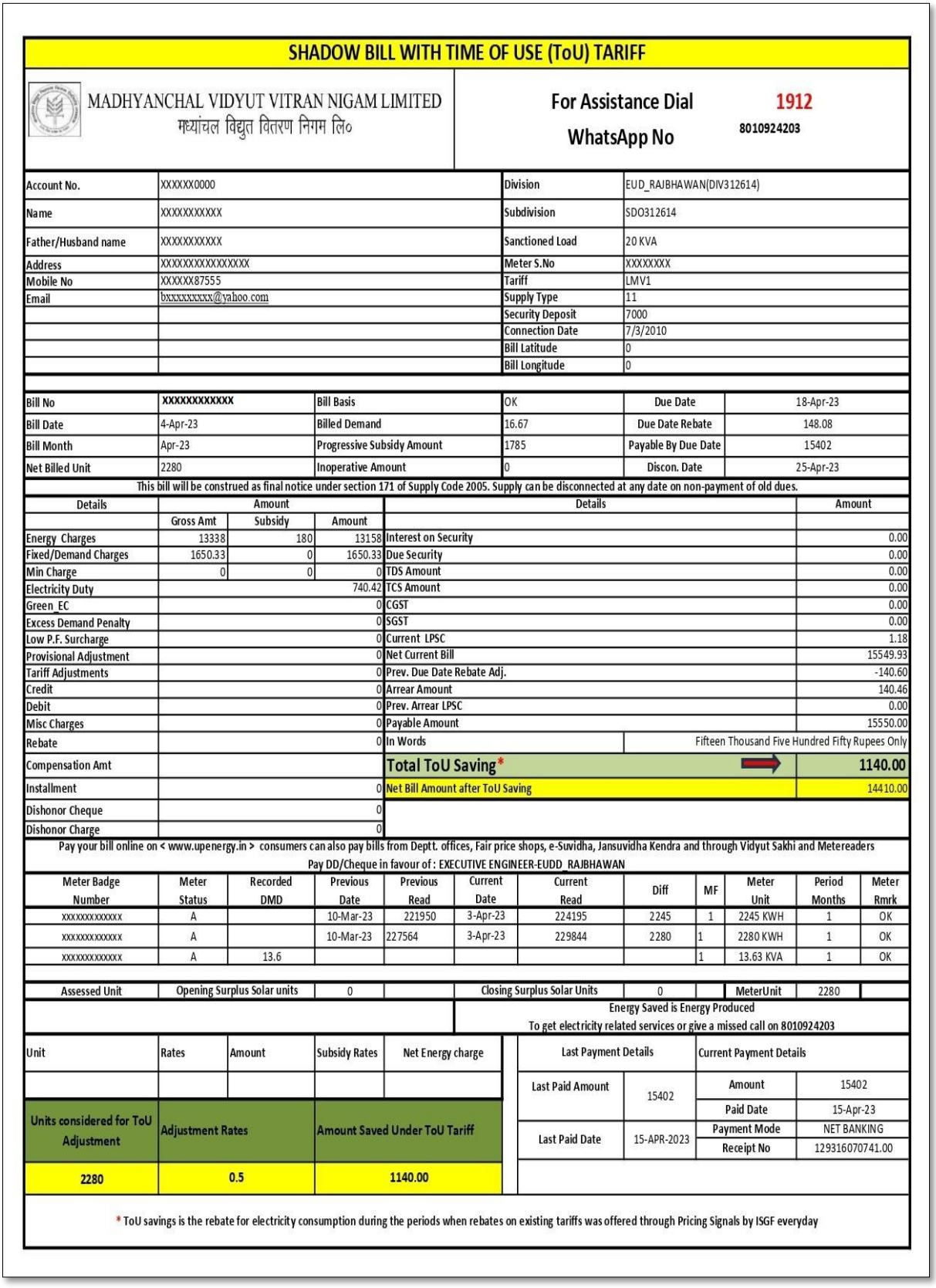
ऊर्जा गणना शुल्क/ EC Calculation

| यूनिट/Unit | टैरिफ रेट Rates | कुल राशि Amount | सब्सिडी दरें Subsidy Rate | सब्सिडी राशि Subsidy Amount | नेट ऊर्जा प्रभार Net Energy Charge |
|---|---|---|---|---|---|

| अंतिम भुगतान विवरण /Last Payment Details | | वर्तमान भुगतान विवरण/Current Payment Details | |
|---|---|---|---|
| अंतिम भुगतान राशि/Last Paid Amount | 14624.00 | भुगतान राशि/Paid Amount | 15402 |
| अंतिम भुगतान तिथि/Last Paid Date | 24-MAR-2023 | भुगतान तिथि/Paid Date | 15-APR-23 |
| | | भुगतान माध्यम/Payment Mode | NET BANKING |
| | | रसीद संख्या/Receipt No | 129316070741 |

**Printed By :** **As On Date:** **25-May-23 12:26 PM** अधिशाषी अभियंता **EXECUTIVE ENGINEER - EUDD_RAJBHAWAN**

Figure 4-13: Regular Bill Issued for Residential Customers by UPPCL



## SHADOW BILL WITH TIME OF USE (ToU) TARIFF

MADHYANCHAL VIDYUT VITRAN NIGAM LIMITED
मध्यांचल विद्युत वितरण निगम लि०

For Assistance Dial 1912
WhatsApp No 8010924203

| | | | |
|---|---|---|---|
| Account No. | XXXXXX0000 | Division | EUD_RAJBHAWAN(DIV312614) |
| Name | XXXXXXXXXX | Subdivision | SDO312614 |
| Father/Husband name | XXXXXXXXXX | Sanctioned Load | 20 KVA |
| Address | XXXXXXXXXXXXXXX | Meter S.No | XXXXXXXX |
| Mobile No | XXXXXX87555 | Tariff | LMV1 |
| Email | bxxxxxxxxx@yahoo.com | Supply Type | 11 |
| | | Security Deposit | 7000 |
| | | Connection Date | 7/3/2010 |
| | | Bill Latitude | 0 |
| | | Bill Longitude | 0 |

| | | | | | |
|---|---|---|---|---|---|
| Bill No | XXXXXXXXXXX | Bill Basis | OK | Due Date | 18-Apr-23 |
| Bill Date | 4-Apr-23 | Billed Demand | 16.67 | Due Date Rebate | 148.08 |
| Bill Month | Apr-23 | Progressive Subsidy Amount | 1785 | Payable By Due Date | 15402 |
| Net Billed Unit | 2280 | Inoperative Amount | 0 | Discon. Date | 25-Apr-23 |

This bill will be construed as final notice under section 171 of Supply Code 2005. Supply can be disconnected at any date on non-payment of old dues.

| Details | Amount | | | Details | Amount |
|---|---|---|---|---|---|
| | Gross Amt | Subsidy | Amount | | |
| Energy Charges | 13338 | 180 | 13158 | Interest on Security | 0.00 |
| Fixed/Demand Charges | 1650.33 | 0 | 1650.33 | Due Security | 0.00 |
| Min Charge | 0 | 0 | 0 | TDS Amount | 0.00 |
| Electricity Duty | | | 740.42 | TCS Amount | 0.00 |
| Green_EC | | | 0 | CGST | 0.00 |
| Excess Demand Penalty | | | 0 | SGST | 0.00 |
| Low P.F. Surcharge | | | 0 | Current LPSC | 1.18 |
| Provisional Adjustment | | | 0 | Net Current Bill | 15549.93 |
| Tariff Adjustments | | | 0 | Prev. Due Date Rebate Adj. | -140.60 |
| Credit | | | 0 | Arrear Amount | 140.46 |
| Debit | | | 0 | Prev. Arrear LPSC | 0.00 |
| Misc Charges | | | 0 | Payable Amount | 15550.00 |
| Rebate | | | 0 | In Words | Fifteen Thousand Five Hundred Fifty Rupees Only |
| Compensation Amt | | | | **Total ToU Saving*** | **1140.00** |
| Installment | | | 0 | Net Bill Amount after ToU Saving | 14410.00 |
| Dishonor Cheque | | | 0 | | |
| Dishonor Charge | | | 0 | | |

Pay your bill online on < www.upenergy.in > consumers can also pay bills from Deptt. offices, Fair price shops, e-Suvidha, Jansuvidha Kendra and through Vidyut Sakhi and Metereaders

Pay DD/Cheque in favour of : EXECUTIVE ENGINEER-EUDD_RAJBHAWAN

| Meter Badge Number | Meter Status | Recorded DMD | Previous Date | Previous Read | Current Date | Current Read | Diff | MF | Meter Unit | Period Months | Meter Rmrk |
|---|---|---|---|---|---|---|---|---|---|---|---|
| xxxxxxxxxxxx | A | | 10-Mar-23 | 221950 | 3-Apr-23 | 224195 | 2245 | 1 | 2245 KWH | 1 | OK |
| xxxxxxxxxxxx | A | | 10-Mar-23 | 227564 | 3-Apr-23 | 229844 | 2280 | 1 | 2280 KWH | 1 | OK |
| xxxxxxxxxxxx | A | 13.6 | | | | | | 1 | 13.63 KVA | 1 | OK |

| Assessed Unit | Opening Surplus Solar units | 0 | | Closing Surplus Solar Units | 0 | | MeterUnit | 2280 | |
|---|---|---|---|---|---|---|---|---|---|

Energy Saved is Energy Produced
To get electricity related services or give a missed call on 8010924203

| Unit | Rates | Amount | Subsidy Rates | Net Energy charge |
|---|---|---|---|---|
| | | | | |

| Units considered for ToU Adjustment | Adjustment Rates | Amount Saved Under ToU Tariff |
|---|---|---|
| 2280 | 0.5 | 1140.00 |

| Last Payment Details | | Current Payment Details | |
|---|---|---|---|
| Last Paid Amount | 15402 | Amount | 15402 |
| | | Paid Date | 15-Apr-23 |
| Last Paid Date | 15-APR-2023 | Payment Mode | NET BANKING |
| | | Receipt No | 129316070741.00 |

* ToU savings is the rebate for electricity consumption during the periods when rebates on existing tariffs was offered through Pricing Signals by ISGF everyday

Figure 4-14: Residential Category Customers Shadow Bill by ISGF

# 5 ToU Pilot Project Result Analysis

In this chapter, a thorough analysis of the outcomes and implications of the ToU Pilot Project was conducted, focusing on the evaluation of various aspects and outcomes to provide a comprehensive understanding of the project's effectiveness. To begin, a load curve analysis of Consumers was examined, which provided valuable insights into their electricity consumption patterns and usage behaviours. This analysis enabled identification of peak demand periods, off-peak hours, and the overall load distribution during the project duration. Subsequently, the benefits that Consumers derived from participating in the ToU tariff scheme were explored, including financial savings and increased energy efficiency. Additionally, an assessment of the advantages that the UPPCL experienced as a result of implementation of this pilot project was conducted. These advantages included improved load management; optimized grid utilization; and potential financial benefits. Furthermore, the societal benefits achieved through the ToU scheme were investigated, emphasizing its contribution to carbon footprint reduction and sustainability goals. By comprehensively examining these aspects, detailed outcomes and implications of the ToU Pilot Project were prepared.

## 5.1 Load Curve Analysis

The objective of the pilot project was to shift the load of peak periods to regular/off-peak periods to flatten the load curve with added incentives/surcharges to the Residential, Commercial, and Industrial Consumers. The ToU tariff design was calculated in such a way that there is no extra burden to DISCOMs.

Analysis of the monthly electricity consumption data of the 50 participating customers for the period from September 2022 to May 2023 (9 months) has been presented below. The 30 residential customers had smart meters and their 30-minute interval reads were shared by UPPCL with ISGF from the meter data management system (MDM) of the smart metering system. The 17 commercial customers and the 3 industrial customers had automated meter reading (AMR) and their 30-minute interval reads were shared by UPPCL with ISGF from the bulling system.

The calculation of the pricing signal for each 15-minute slot and the adjustment factor for the month were explained in detail in chapter 4. An analysis of the consumption data for each 15-minute[1] interval on daily basis and compared the load profile with the pricing signals was conducted. In general, it was observed that majority of the participating customers adjusted their load according to the pricing signals. The load shifting was more during peak hours when surcharge was applied. Although, surcharges were applied for both morning peak and evening peak, load shifting was more prominent during evening peak.

Further, the following periods have been used for defining peak, non-peak, and regular hours:

Table 5-1: Timing of existing ToD Tariff

| Loading | Time Duration |
|---|---|
| **Peak** | 5 pm to 11 pm |
| **Off -peak** | 11 pm to 5 am, 11 am to 5 pm |
| **Regular** | 5 am to 11 am |

[1] The actual load profile data received was for 30 minutes interval but it was converted to 15-minute interval for analysis purpose as pricing signals were calculated for every 15-minute intervals

### 5.1.1 Peak Load Shift

The peak load shifting pattern has been analyzed separately for Residential, Commercial, and Industrial customers and explained in the following sections.

**Residential Customers**

The consumption pattern was plotted for 13 residential Consumers whose interval data was collected for the previous year and for the current year. Below image shows the standard load profile of residential Consumers. As shown in this figure, for residential Consumers the peak comes around twice in a day.

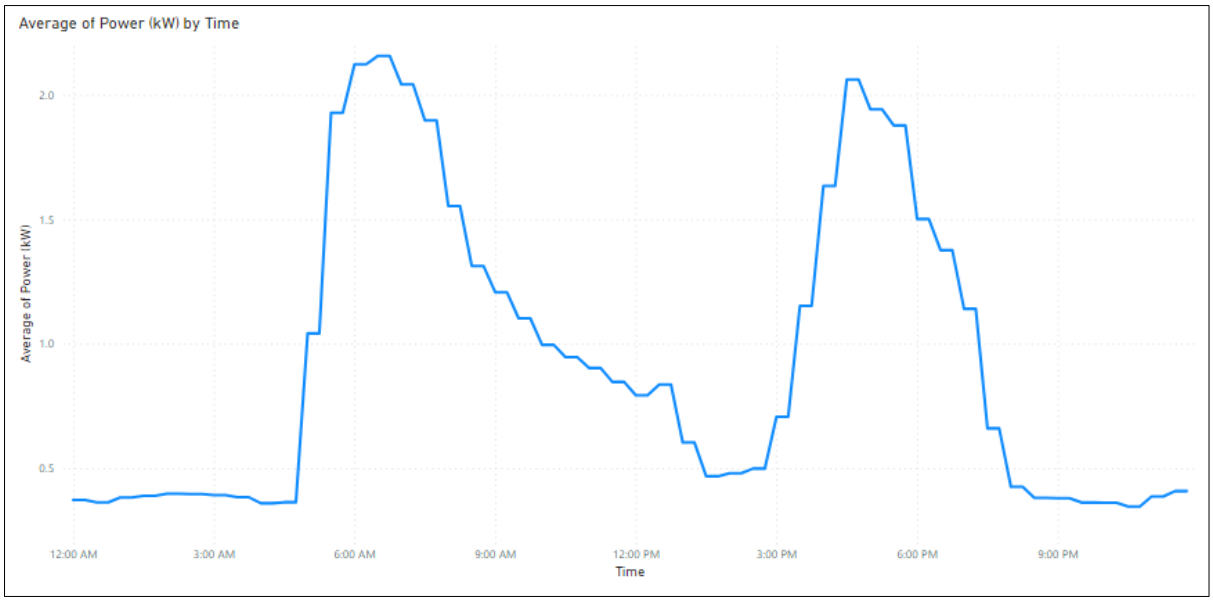



Figure 5-1: Standard pattern of load profile for residential Consumers in Lucknow

The pricing signals were sent to Consumers on daily basis since 08 September 2022.

The load survey data of 13 customers for each 15 min time slot was analysed and its was found that 4 residential customers (RC2, RC5, RC6 and RC 20) were closely following the pricing signals to adjust their loads during the project period. The graph below shows change in electricity consumption pattern for these residential Consumers w-r-t the previous year.

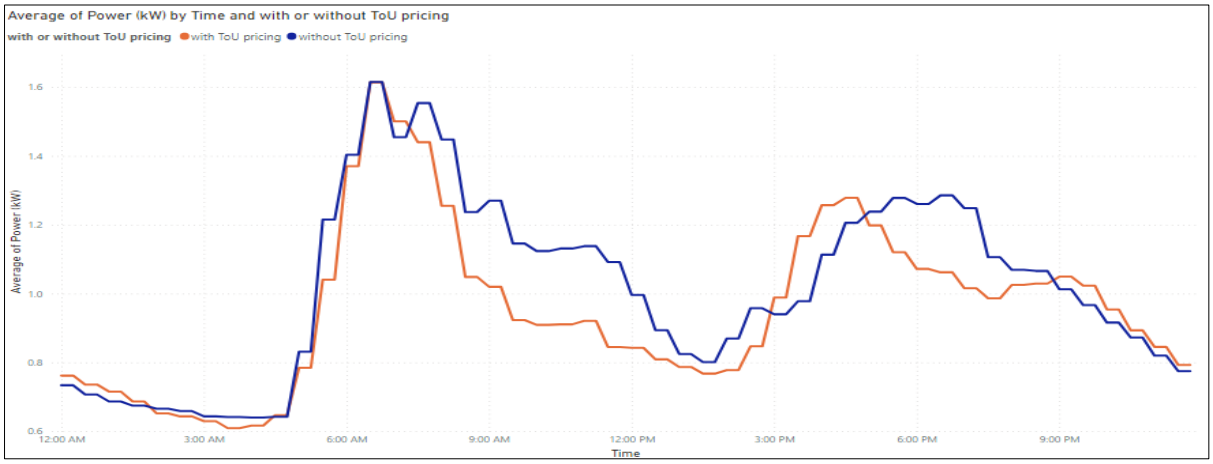



Figure 5-2: Load profile for residential Consumers considering all the months together (i.e., November, December, January, February, March) with ToU pricing and without ToU pricing

The orange line represents electricity consumption with ToU pricing whereas the blue line represents the consumption without ToU pricing in the previous year. Peak consumption for residential Consumers occurs twice in a day. Comparing with the previous year's data, it is being observed that when surcharge is applied during peak period (i.e., 5pm to 11pm) there is a significant reduction in the peak load whereas when rebates are offered, they have increased their consumption. Electricity consumption increased during the non-peak hours that is from 3pm to 5pm and during night from after 9pm onward till 1am when rebates were offered.

**Commercial Customers**

The consumption pattern was plotted for 10 commercial Consumers (previous year's data of only 10 commercial customers we could collect). Below image shows the standard load profile of commercial Consumers.

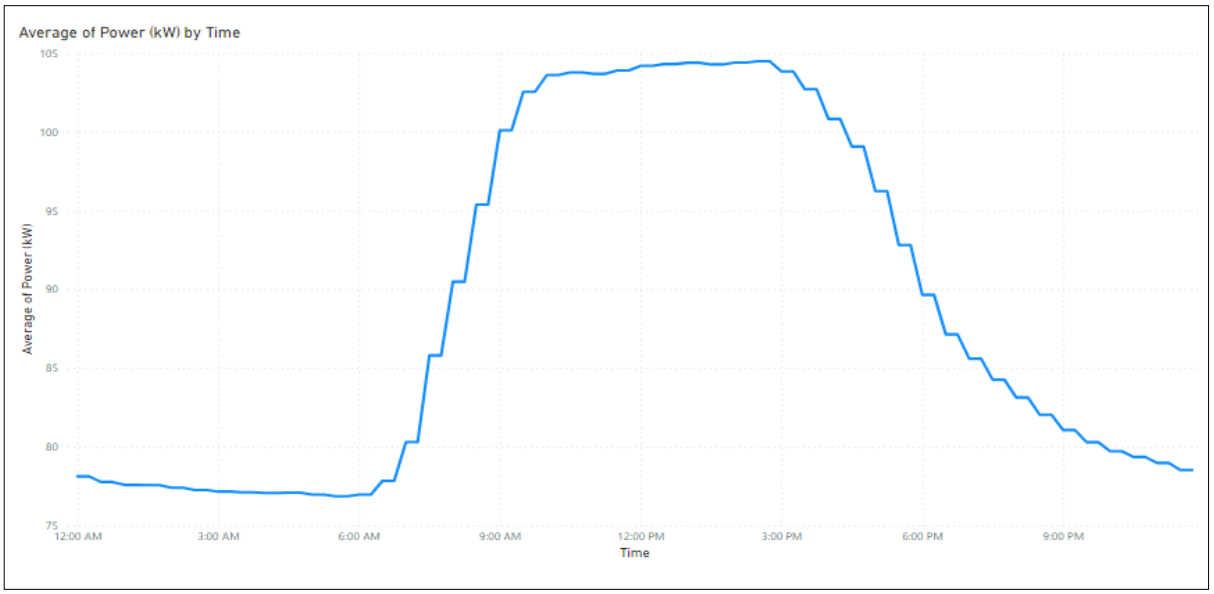



Figure 5-3: Standard pattern of load profile for commercial Consumers in Lucknow

The load survey data of 10 customers for each 15 min time slot is analysed. The graph below shows the electricity consumption pattern for commercial Consumers. It can be observed that the demand has considerably increased in 2022-23 period after covid lockdowns.

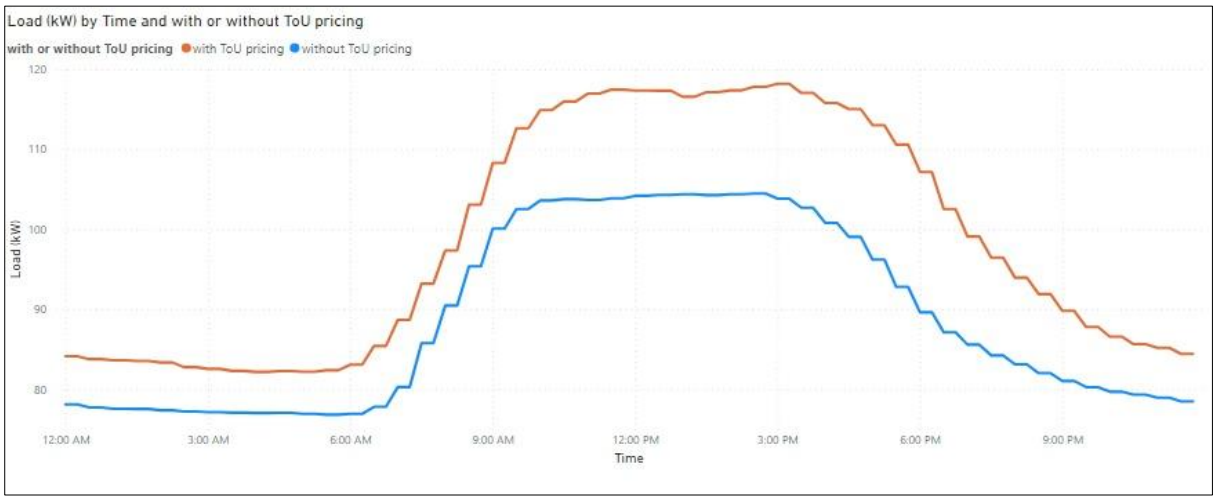



Figure 5-4: Load profile for commercial Consumers considering all the months together (i.e., November, December, January, February, March) with ToU pricing and without ToU pricing

It may be noted that all commercial customers are on flat tariff in UP. Hence commercial customers have no incentive for load shifting. Dedicated energy management teams are not assigned even in large commercial customers with MW-scale power connections. ToU price signals offered rebates during time slots in the afternoon when some of the commercial customers increased their air conditioning load to pre-cool the buildings and turned off the compressors of the centralized air conditioning system during the peak hours in the initial months of the project; but since there was no financial benefits to them, they did not make efforts to do the same in later months. However, in the overall demand curve, such load increase, do not reflect prominently because it is a small component of their total consumption. After witnessing the savings in the shadow bills presented by ISGF, most commercial customers were interested in ToU scheme.

**Industrial Customers**

Out of the three industrial customers who participated in the project, one is a cold storage who could not shift loads. We have analyzed the consumption pattern of the 2 industrial customers, which is given in the graph below.

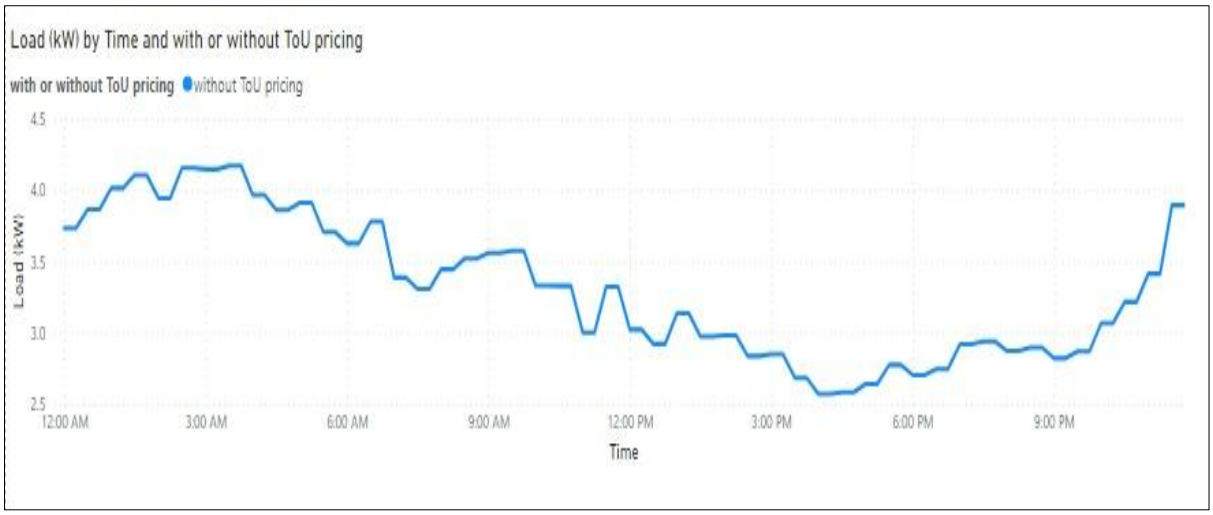



Figure 5-5: Standard load profile of industrial Consumers

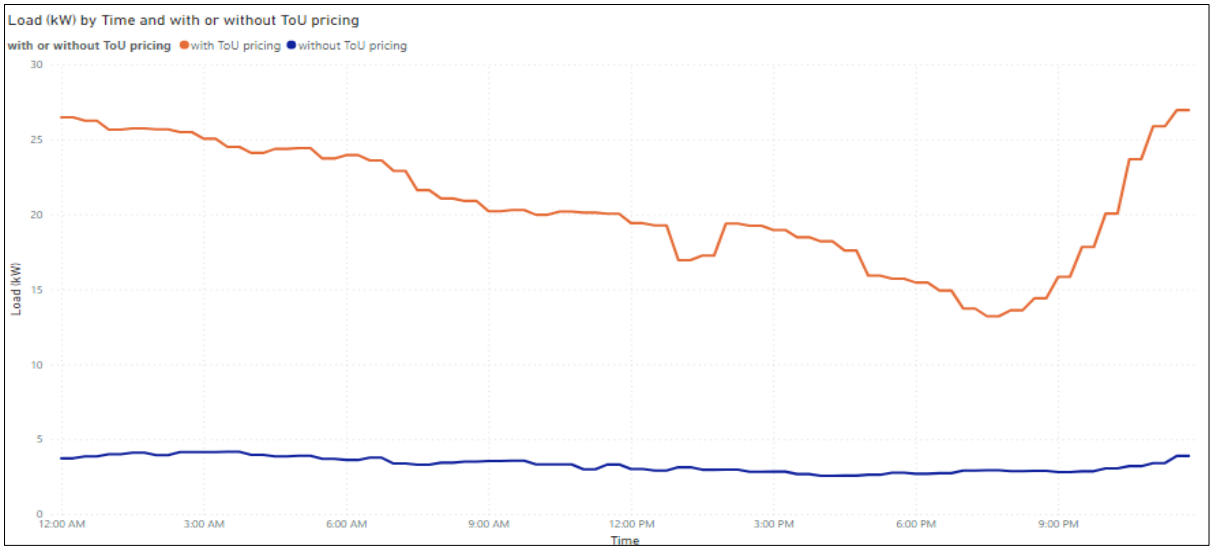



Figure 5-6: Load profile for the 2 industrial Consumers from November 2022 to March 2023 and for the same period for the previous year

The orange line represents electricity consumption with ToU pricing whereas the blue line represents the consumption without ToU pricing in the previous year. It is observed that during peak hours when surcharge is applied (i.e., 5pm to 11pm) there is a sharp reduction in electricity consumption for industrial Consumers.

### 5.1.2 Comparison of Consumption vis-à-vis ToU Price Signals

Load profile of participating Consumers (i.e., residential, commercial, and industrial Consumers) were plotted on monthly basis comparing it with the previous year's data.

**Residential Consumers**

Below graphs shows how the average load of residential Consumers varies during the typical day for November 2022 to March 2023 as compared to same months of previous year. And it also shows the average incentive and surcharge during the day for the above-mentioned months. The blue bar graph represents the average incentive given and the red bar graph represents average surcharge applied during different time slots.

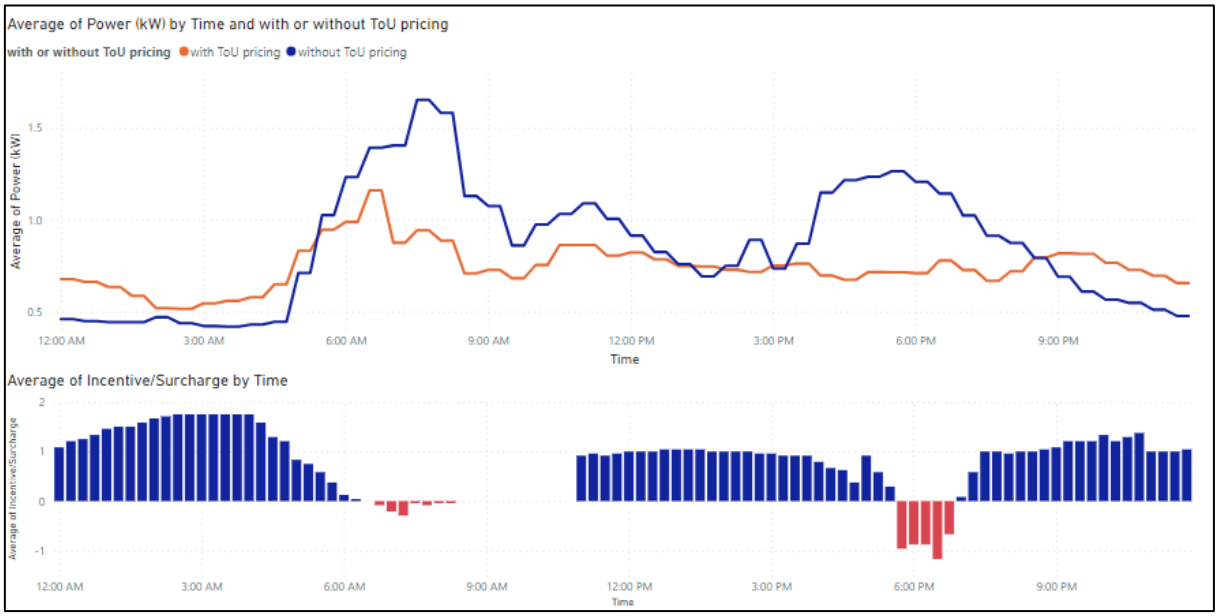



Figure 5-7: Load profile for residential Consumers for Nov-2022 (with ToU pricing) and Nov-2021 (Without ToU pricing)

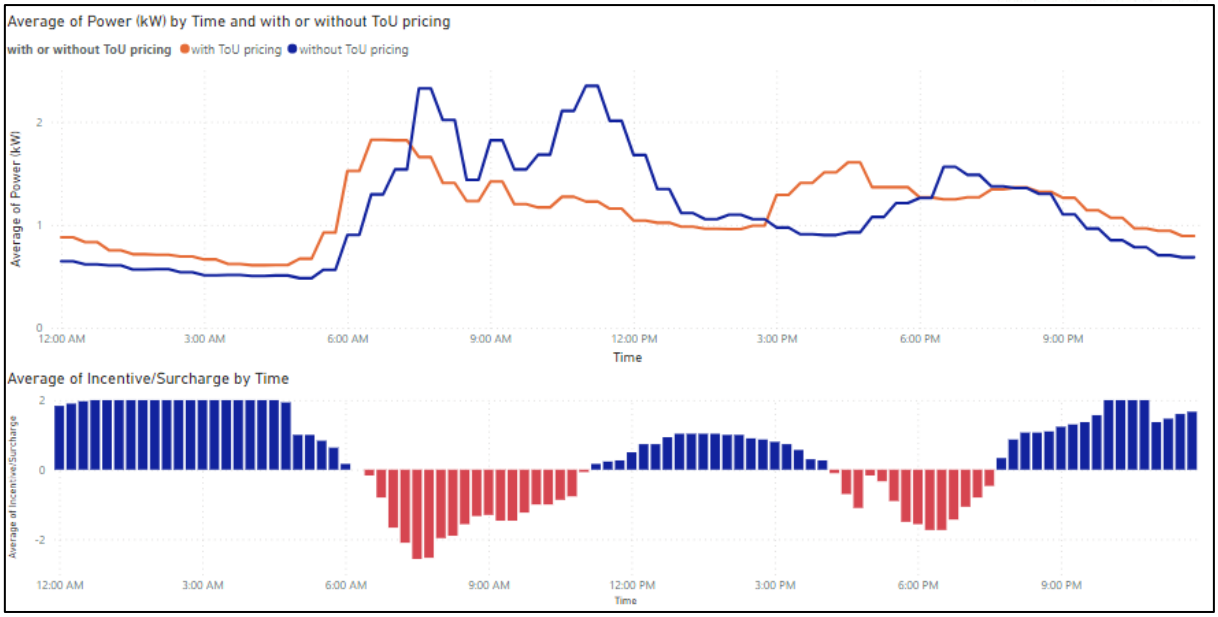



Figure 5-8: Load profile for residential Consumers for Dec-2022(with ToU pricing) and Dec-2021 (Without ToU pricing)

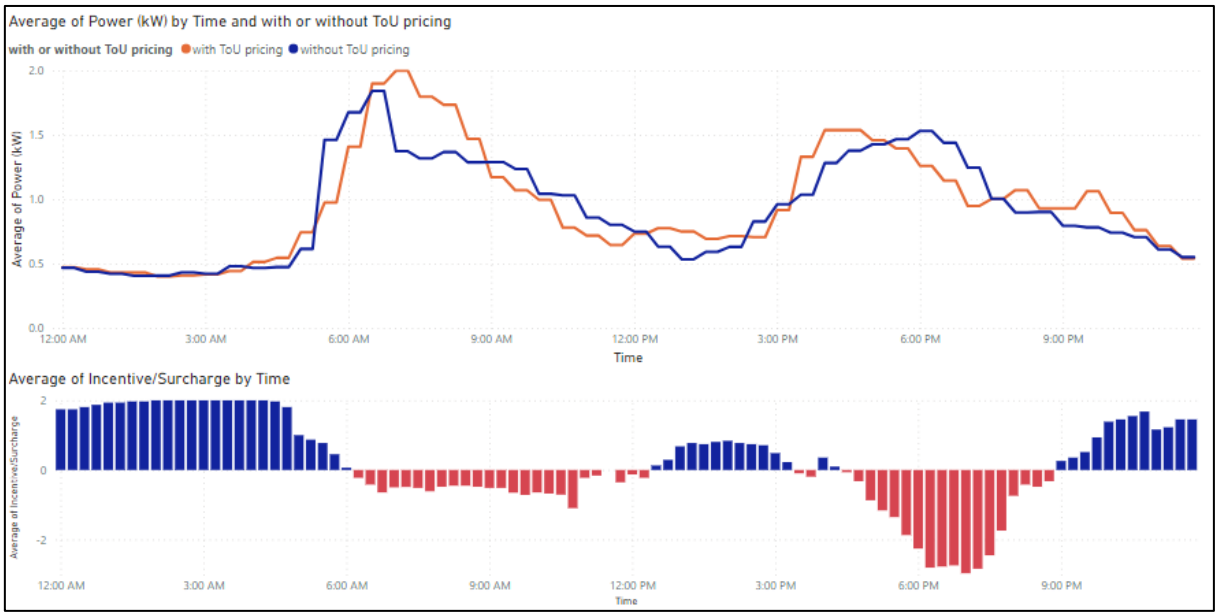



Figure 5-9: Load profile for residential Consumers for Jan-2023 (with ToU pricing) and Jan-2022 (without ToU pricing)

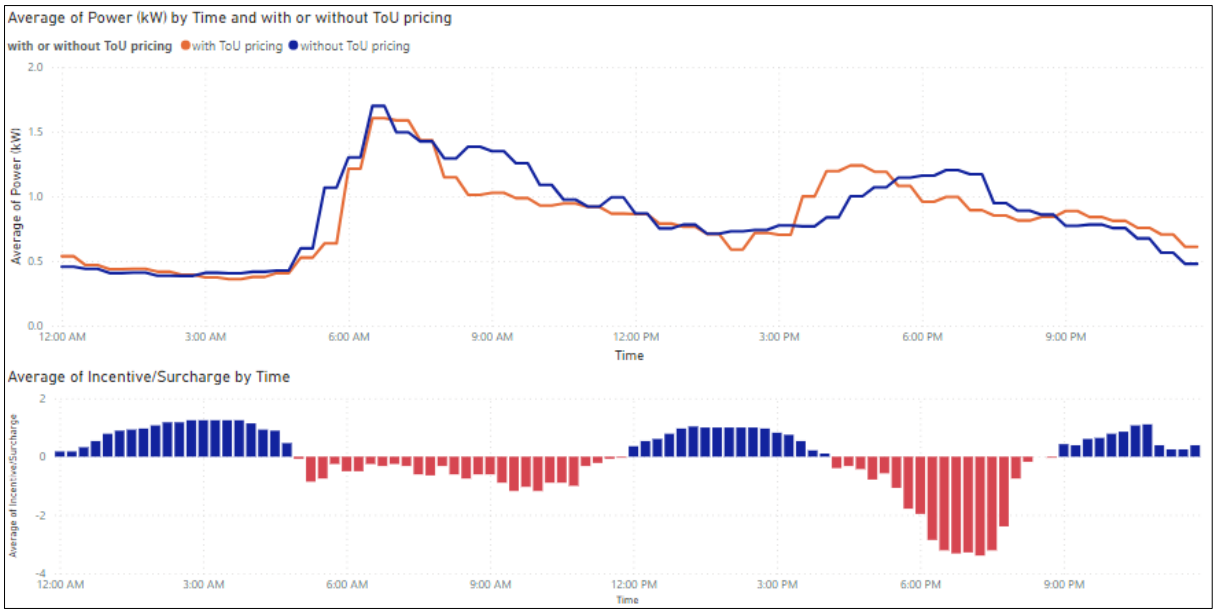



Figure 5-10: Load profile for residential Consumers for Feb-2023 (with ToU pricing) and Feb-2022 (without ToU pricing)

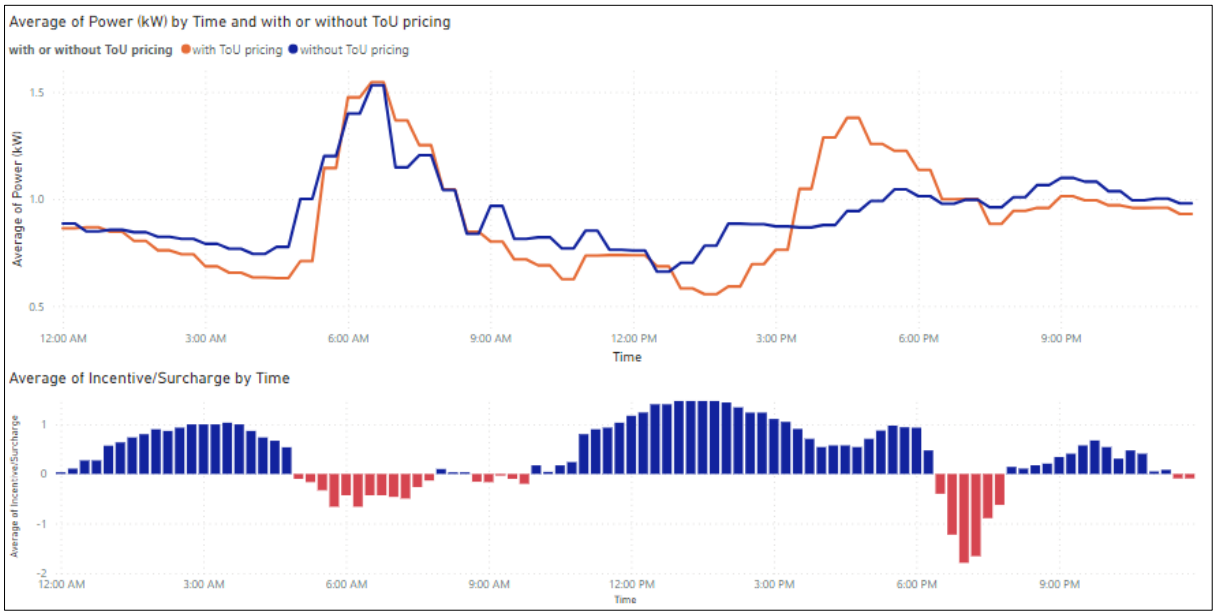



Figure 5-11: Load profile for residential Consumers for March-2023 (with ToU pricing) and March-2022 (Without ToU pricing)

**Commercial Consumers**

Below graphs shows how the average load of commercial Consumers varies during the typical day for Nov-22, Dec-22, Jan-23, Feb-23, and March-23 respectively as compared to same months of previous year. And it also shows the average incentive and surcharge during the day for the above-mentioned months. The blue bar graph represents the average incentive given and the red bar graph represents average surcharge applicable at the given time.

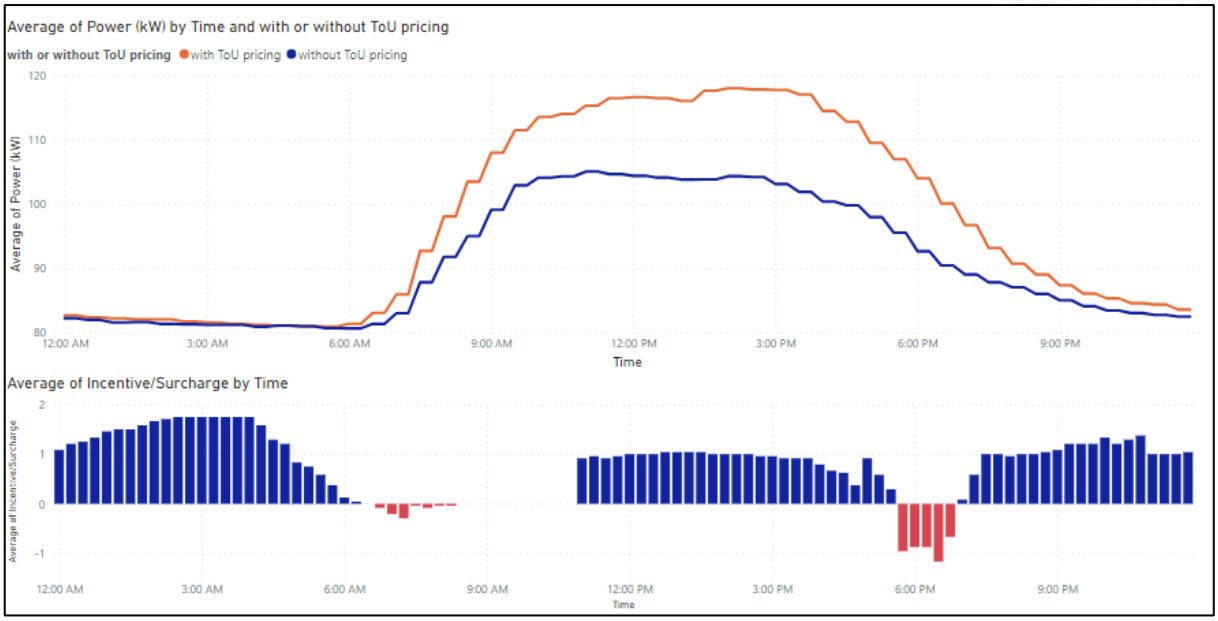



Figure 5-12: Load profile for commercial Consumers for Nov-2022(with ToU pricing) and Nov-2021 (without ToU pricing)

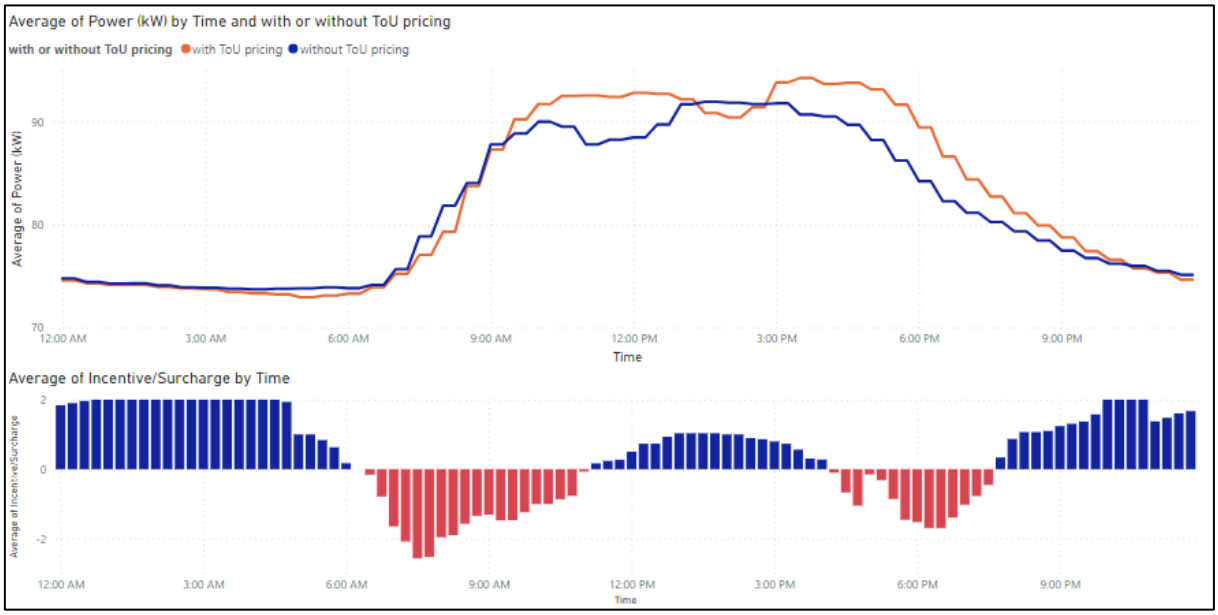



Figure 5-13: Load profile for commercial Consumers for Dec-2022(with ToU pricing) and Dec-2021 (without ToU pricing)

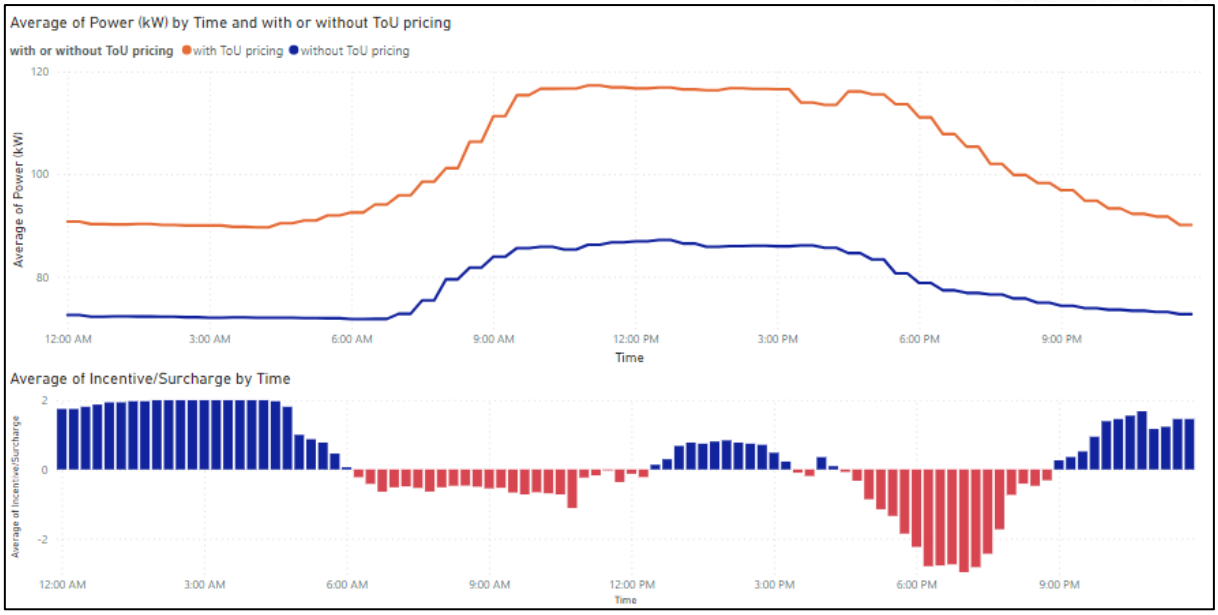



Figure 5-14: Load profile for commercial Consumers for Jan-2023(with ToU pricing) and Jan-2022 (without ToU pricing)

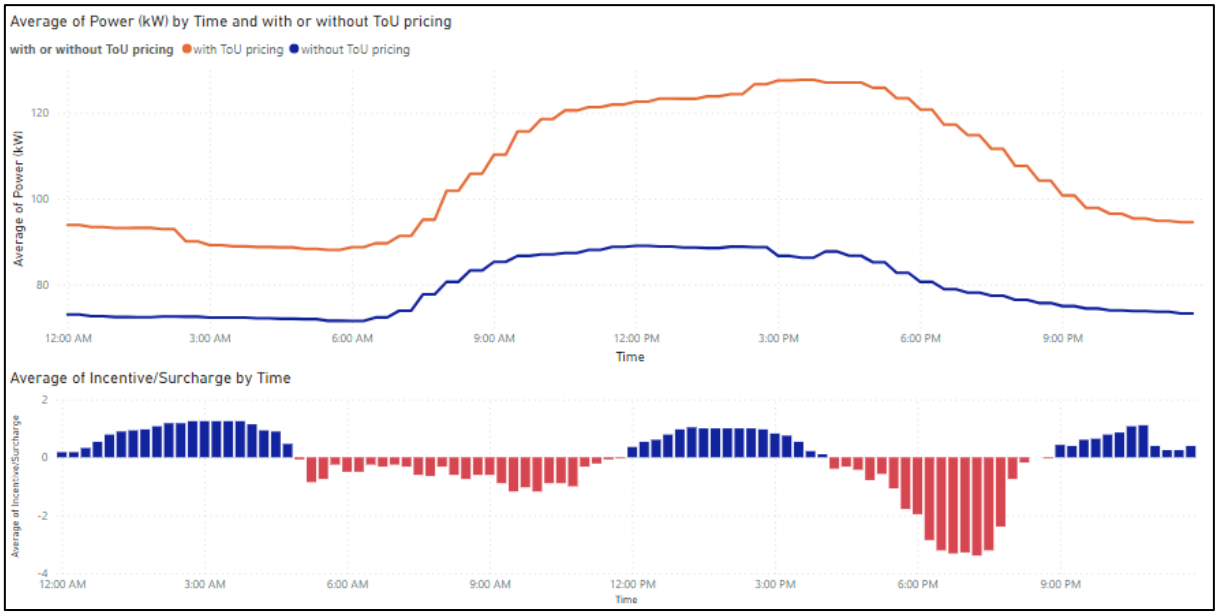



Figure 5-15: Load profile for commercial Consumers for Feb-2023(with ToU pricing) and Feb-2022 (without ToU pricing)

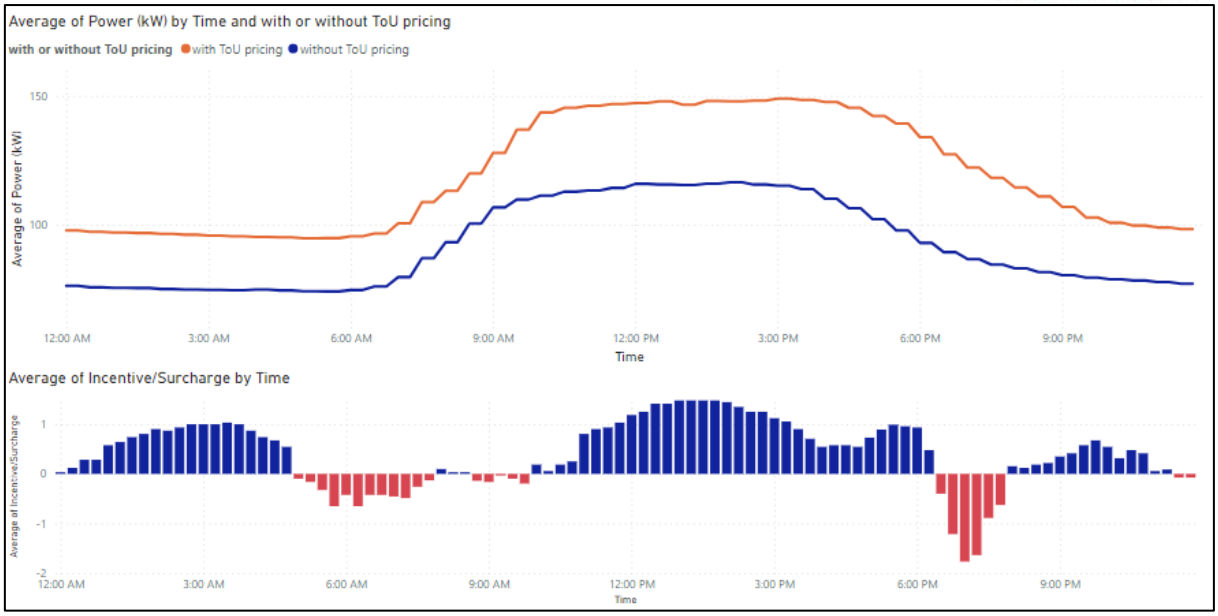



Figure 5-16: Load profile for commercial Consumers for March-2023(with ToU pricing) and March-2022 (without ToU pricing)

**Industrial Consumers**

Below graphs shows how the average load of industrial Consumers involved in manufacturing of steel products varies during the typical day form November 2022 to March 2023 as compared to same months of previous year. And it also shows the average incentive and surcharge during the day for the above-mentioned months. The blue bar graph represents the average incentive given and the red bar graph represents average surcharge applicable at the given time.

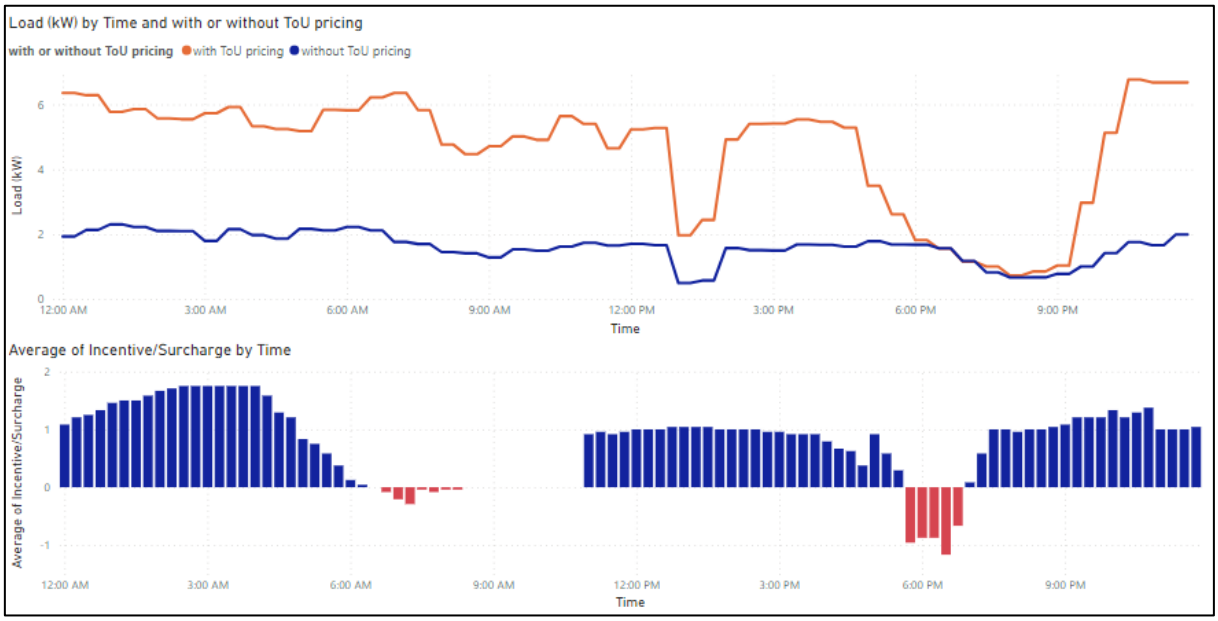



Figure 5-17: Load profile for industrial Consumers for Nov-2022 (with ToU pricing) and Nov-2021 (without ToU pricing)

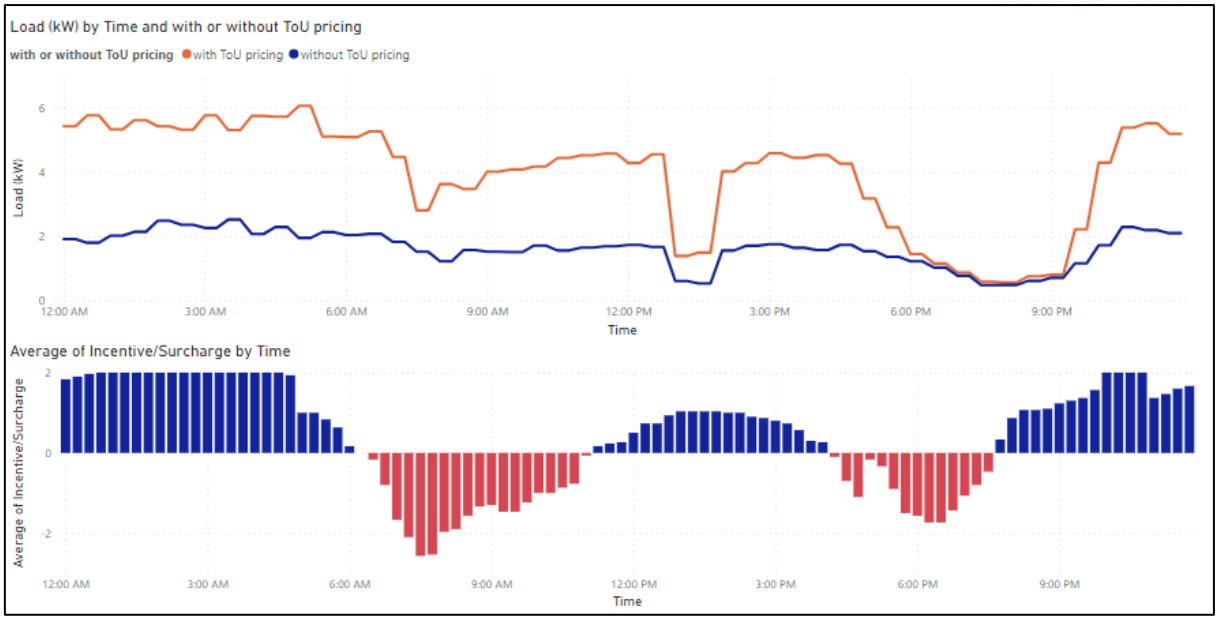



Figure 5-18: Load profile for industrial Consumers for Dec-2022 (with ToU pricing) and Dec-2021 (without ToU pricing)

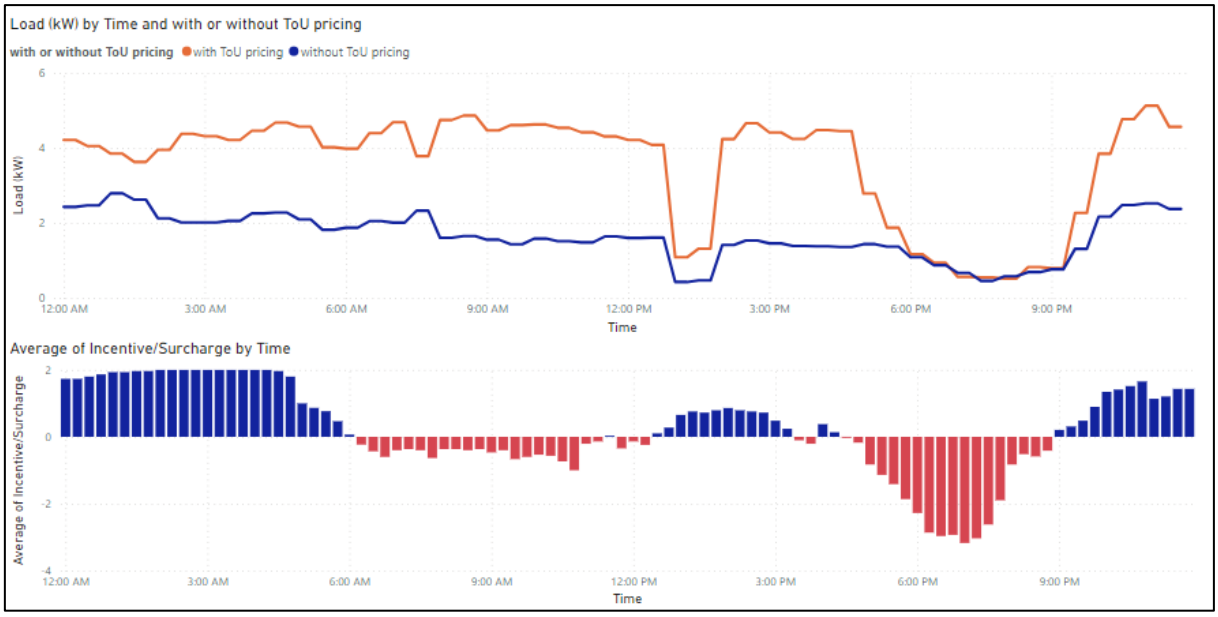



Figure 5-19: Load profile for industrial Consumers for Jan-2023 (with ToU pricing) and Jan-2022 (without ToU pricing)

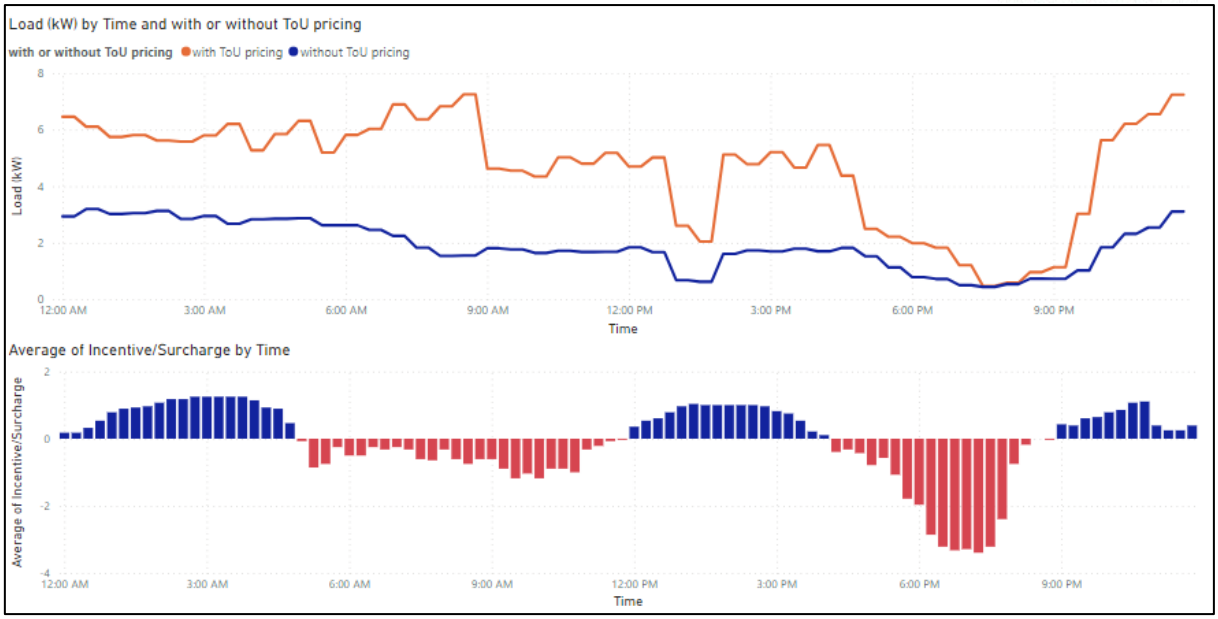



Figure 5-20: Load profile for industrial Consumers for Feb-2023 (with ToU pricing) and Feb-2022 (without ToU pricing)

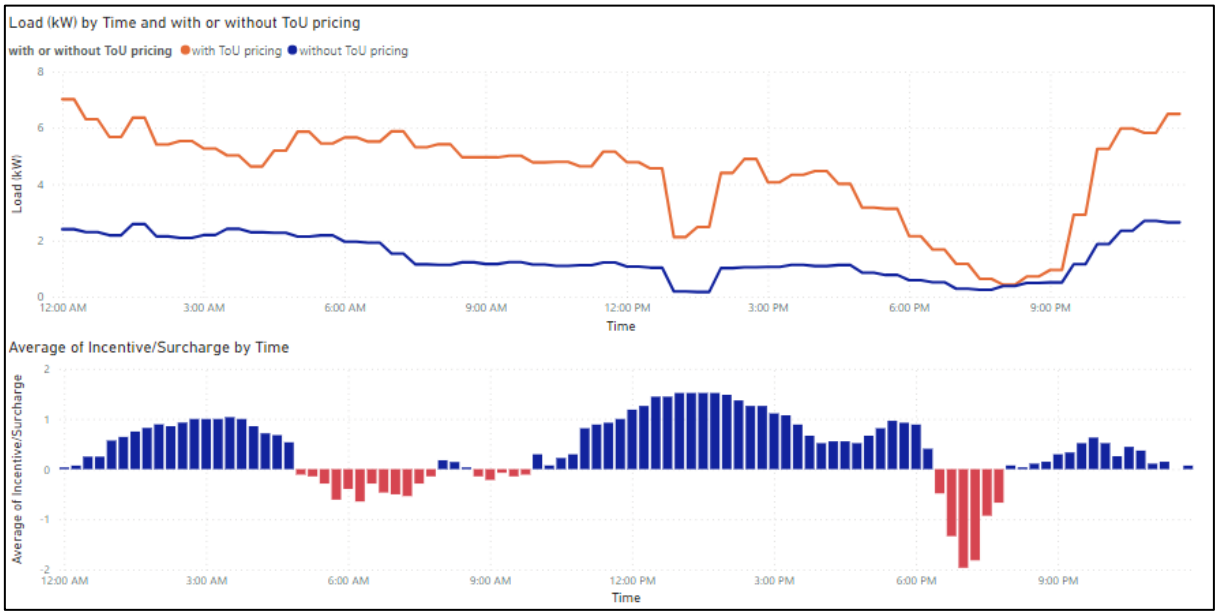



Figure 5-21: Load profile for industrial Consumers for March-2023 (with ToU pricing) and March-2022 (without ToU pricing)

The analysis conducted on the load of residential, commercial, and industrial Consumers reveals the following conclusions.

For residential Consumers, it can be inferred that there has been a significant reduction in peak load during the hours of 5:00 PM to 11:00 PM. This reduction signifies a notable shift in the peak load compared to previous years.

On the other hand, for industrial Consumers, there has also been a significant reduction in load during the same peak hours when surcharges are applied. Conversely, when incentives are given, there is a proportional increase in load.

### 5.1.3 Correlation Between Load and Incentive/Surcharge

Correlation signifies the strength and direction of the linear relationship between two variables. It measures how closely the variables are related to each other. Correlation is a statistical measure that helps to understand the degree of association between two variables. It is important to note that correlation does not imply causation, meaning that a strong correlation between variables does not necessarily imply a cause-and-effect relationship between them.

The correlation coefficient, ranges between -1 and 1. The sign of the correlation coefficient (+/-) indicates the direction of the relationship:

- A positive correlation indicates that as one variable increases, the other variable tends to increase as well. It suggests a direct or positive linear relationship.
- A negative correlation indicates that as one variable increases, the other variable tends to decrease. It suggests an inverse or negative linear relationship.

The magnitude (absolute value) of the correlation coefficient indicates the strength of the relationship:

- A correlation coefficient close to +1 or -1 suggests a strong relationship, where the variables are closely related and tend to vary together.
- A correlation coefficient close to 0, indicates a weak or no relationship, where the variables do not have a consistent linear relationship.

**Residential Consumers**

Following heat-map shows the correlation between power (i.e., load) and incentive/ surcharge applied during the mentioned period for residential Consumers. Load data of peak period (from 5 pm to 11 pm) is considered while finding the correlation between power (i.e., Load) and incentive/surcharge.

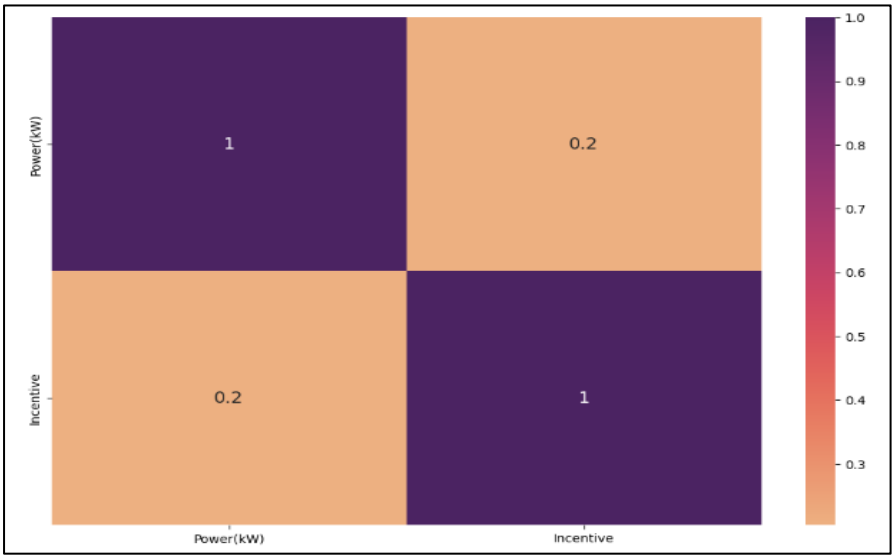



Figure 5-22: Correlation between load and incentive for residential Consumers

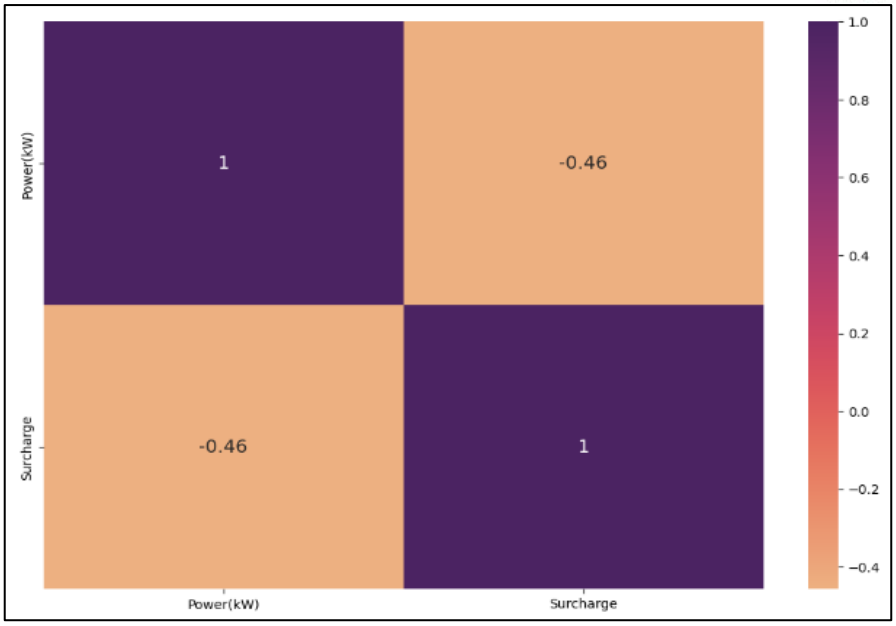



Figure 5-23: Correlation between load and surcharge for residential Consumers

Table 5-2: Correlation Matrix

| | Load (kW) | Incentive | Surcharge |
|---|---|---|---|
| **Load (kW)** | 1.00000 | 0.2 | -0.46 |
| **Incentive** | 0.2 | 1.00000 | NA |
| **Surcharge** | -0.46 | NA | 1.00000 |

The matrix explains the correlation between power (Consumedd) and incentive/surcharge for residential Consumers.

A correlation coefficient of -0.46 signifies a moderate negative correlation between the two variables (Load and Surcharge). The negative sign (-) indicates an inverse relationship between Load and Surcharge. As Surcharge increases, the Power consumption (Load) tends to decrease.
The magnitude (absolute value) of 0.46 suggests a moderate strength of the relationship. It indicates that the variables are somewhat related, but the relationship is not extremely strong.

**Commercial Consumers**

For the commercial category Consumers, no relationship between incentive/surcharged and electricity consumption was observed. As There is not much deviation in overall demand curve as compared to previous year, we have not calculated the correlation between pricing signals and the load.

**Industrial Consumers**

Following Heat map shows the correlation between Power (i.e., load) and incentive/ surcharge applied during the mentioned period for industrial Consumers. Load data of peak period (from 5 pm to 11 pm) is considered while finding the correlation between load and Incentive/Surcharge.

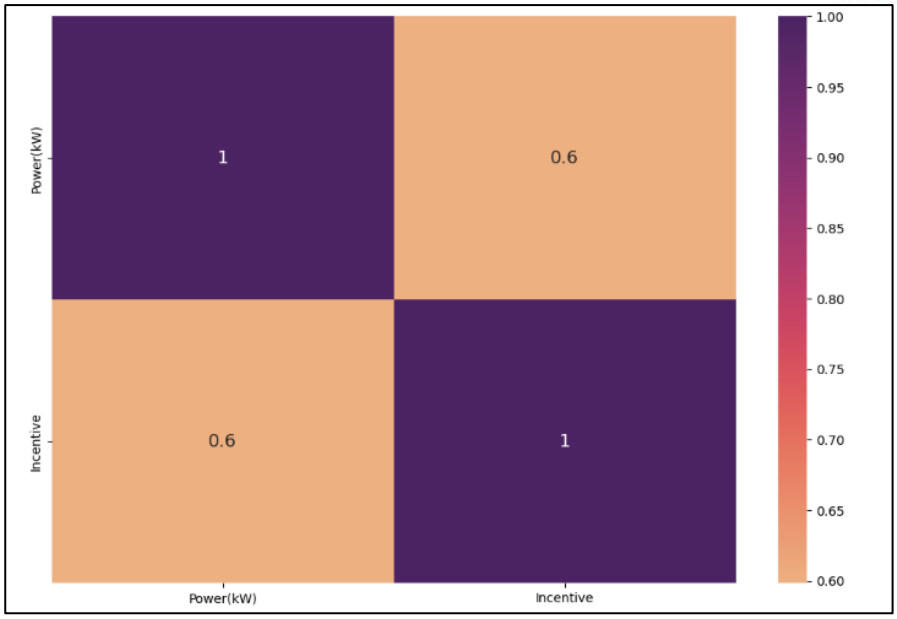



Figure 5-24: Correlation between load and incentive for Industrial Consumers

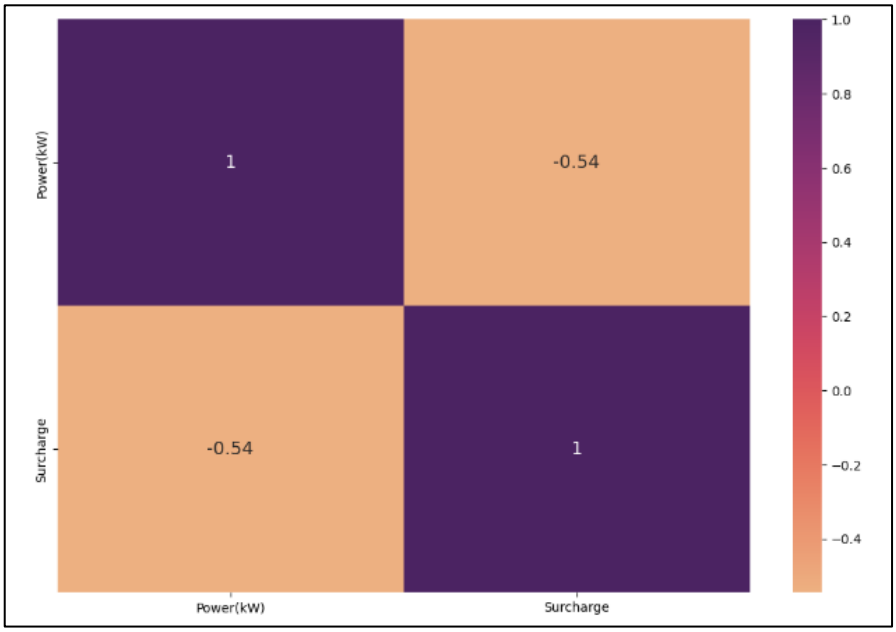



Figure 5-25: Correlation between load and surcharge for industrial Consumers

Table 5-3: Correlation Matrix

| | Load (kW) | Incentive | Surcharge |
|---|---|---|---|
| **Load (kW)** | 1.00000 | 0.60 | -0.54 |
| **Incentive** | 0.60 | 1.00000 | NA |
| **Surcharge** | -0.54 | NA | 1.00000 |

The matrix explains the correlation between power (consumed) and incentive/surcharge for industrial consumers.

A correlation coefficient of -0.54 signifies a moderate negative correlation between the two variables (Load and Surcharge). The negative sign (-) indicates an inverse relationship between Load and Surcharge. As Surcharge increases, the Power consumption (Load) tends to decrease.

The magnitude (absolute value) of 0.54 suggests a moderate strength of the relationship. It indicates that the variables are somewhat related, but the relationship is not extremely strong.

In this case, a correlation coefficient of 0.60 suggests a strong positive relationship between the variables (Load and Incentive). It indicates that as one variable increases, the other variable tends to increase as well, and the relationship is consistent.

When interpreting correlations, it is also important to consider the nature of the variables and the specific context. A correlation coefficient of 0.60 may be considered strong in some cases, while in other situations, it might be considered moderate or weak depending on the expectations and standards within a particular domain.

**Future Projection of Peak Demand**

As one of the most populous states in India, Uttar Pradesh has a significant and growing demand for electricity. The state experiences various consumption patterns based on the type of Consumers and the seasonal changes. Residential Consumers in Uttar Pradesh typically have higher energy consumption during the evening hours when households are engaged in various household activities. Commercial Consumers, such as offices and shops, tend to have relatively stable energy consumption patterns throughout the day, with a slight decrease during lunch breaks. Industrial Consumers often have consistent high-energy consumption during their operational hours, which can vary based on the specific industry.

To estimate the potential for peak load reduction through ToU price signals, several factors need to be considered:

1. **Awareness and Understanding:** The success of ToU Tariff Scheme depends on Consumers' awareness and understanding of the price signals and their willingness to adjust their behavior accordingly. Public awareness campaigns and education about the benefits of shifting energy usage can play a crucial role in encouraging Consumers participation.

2. **Price Differential:** The price difference between peak and off-peak periods should be significant enough to motivate Consumers to change their consumption patterns. If the price differential is too small, Consumers may not find it financially beneficial to shift their usage.

3. **Flexibility of Consumption:** The extent to which Consumers can adjust their electricity consumption patterns also influences the potential for load reduction. Usage of some appliances and activities can be shifted easily to off-peak periods (e.g., running dishwashers, doing laundry, water pumping's or charging electric vehicles), while others may have limited flexibility (e.g., essential lighting or cooling needs during peak periods).

4. **Infrastructure and Technology:** The availability and accessibility of advanced metering infrastructure (AMI) or smart meters are crucial for accurate measurement and implementation of ToU tariff scheme. Smart meters enable real-time monitoring of electricity consumption, making it easier to track and analyze Consumers behavior.

Based on the collected historical data of peak load in UP from 2012 to 2022, with a projected peak load of 40,273 MW for the year 2028, we made an attempt to estimate the potential for peak load reduction through ToU Tariff Scheme.

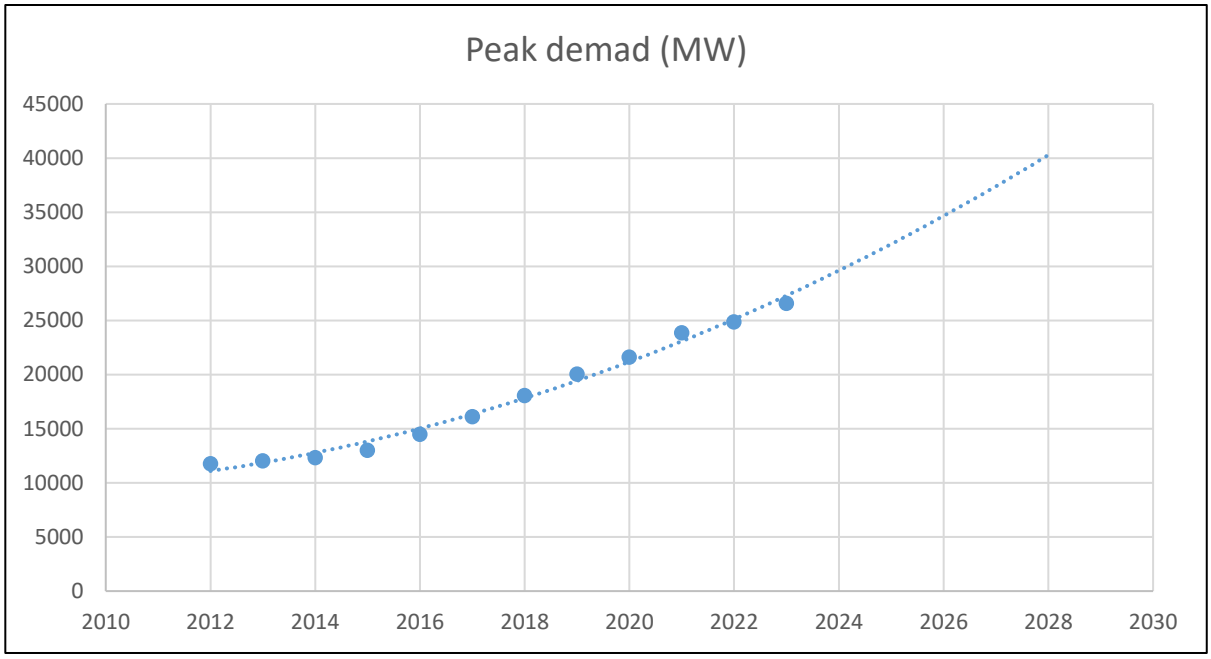



Figure 5-26: Peak Demand Analysis and future Projections

The historical data provides valuable insights into the peak demand trends in UP over the years. Additionally, the forecasted peak demand for the years 2024 to 2028 indicates an increasing trend, with a projected peak of 40,273 MW in 2028. This growth in peak demand necessitates measures to manage and reduce the strain on the grid during peak hours.

Since 2014, there has been an average shortfall of 6-7% in meeting peak electricity demand in Uttar Pradesh (UP) on specific days. This shortfall highlights a disparity between the supply and demand during peak load hours.

By implementing ToU tariff scheme and effectively incentivizing Consumers to shift their electricity usage from peak to off-peak periods, it is possible to reduce the peak demand.

Even a modest 5% reduction in peak demand can lead to a significant reduction of 2,000 MW from the projected peak demand of 40,273 MW in the year 2028. This reduction showcases the potential impact of load shifting through ToU pricing.

Considering the current peak demand of 28,000 MW a reduction of 1,400 MW in peak load signifies the avoidance of additional strain on the grid during peak hours. It not only helps in meeting the electricity demand but also ensures a more stable and reliable power supply for all Consumers.

By effectively managing peak load through ToU pricing, substantial environmental benefits can be achieved. A key advantage is the reduction in carbon footprint associated with electricity generation. Traditional power plants, particularly those relying on fossil fuels, emit greenhouse gases (GHGs) during operation. By reducing peak electricity demand, the need for additional power generation capacity, often met by fossil fuels, is mitigated. This, in turn, leads to a decrease in GHG emissions and contributes to the fight against climate change.

## 5.2 Benefits to Consumers

Additional Revenue to UPPCLs for each participating Consumers were calculated and an analysis was done to infer the possible benefits that Consumers may reap by opting for ToU tariff scheme. Below table indicates cumulative utility bill, cumulative ToU bill, and Additional Revenue to UPPCLs for a period of 6 months (September 2022 to March 2023).

Table 5-4: Additional Revenue to UPPCL for Participating Consumers

| Sl No | Consumers Category | Consumers ID | Connected Load (kW) | Cumulative Utility Bill (Sept 2022 to Mar 2023) (INR) | Cumulative ToU Bill (Sept 2022 to Mar 2023) (INR) | Additional Revenue to UPPCLs (INR) | Percentage Savings |
|---|---|---|---|---|---|---|---|
| 1 | Commercial | CC-1 | 1120 | 18027618 | 17512395 | 515223 | 2.86 |
| 2 | Commercial | CC-2 | 700 | 14243258 | 14182250 | 61008 | 0.43 |
| 3 | Commercial | CC-3 | 2200 | 17817595 | 17354122.48 | 463472.52 | 2.60 |
| 4 | Commercial | CC-4 | 600 | 13646200 | 13090215 | 555985 | 4.07 |
| 5 | Commercial | CC-5 | 1425 | 19113627 | 18415207 | 698420 | 3.65 |
| 6 | Commercial | CC-6 | 350 | 2576264 | 2500981 | 75283 | 2.92 |
| 7 | Commercial | CC-7 | 1665 | 5110624 | 4775614 | 335010 | 6.56 |
| 8 | Commercial | CC-8 | 990 | 2850165 | 2757281 | 92884 | 3.26 |
| 9 | Commercial | CC-9 | 800 | 10591580 | 10195487 | 396093 | 3.74 |
| 10 | Commercial | CC-10 | 1366 | 20758927 | 19906643 | 852284 | 4.11 |
| 11 | Commercial | CC-11 | 383 | 1434469 | 1399397 | 35072 | 2.44 |
| 12 | Commercial | CC-12 | 501 | 4450046 | 4312173 | 137873 | 3.10 |
| 13 | Commercial | CC-13 | 750 | 7733707 | 7547864 | 185843 | 2.40 |
| 14 | Commercial | CC-14 | 1112 | 11954023 | 11513534 | 440489 | 3.68 |
| 15 | Commercial | CC-15 | 550 | 4953137 | 4779928 | 173209 | 3.50 |
| 16 | Commercial | CC-16 | 2000 | 23655650 | 23045484.95 | 610165.05 | 2.58 |
| 18 | Commercial | CC-17 | 4279.5 | 74285693 | 72810996 | 1474697 | 1.99 |
| 19 | Industrial | IC-1 | 2000 | 187481 | 175616 | 11865 | 6.33 |
| 20 | Industrial | IC-2 | 2000 | 2468938 | 2268832 | 200106 | 8.10 |
| 21 | Residential | RC-1 | 18 | 173519 | 166577.7 | 6941.3 | 4.00 |
| 22 | Residential | RC-2 | 10 | 47017 | 45070.51 | 1946.49 | 4.14 |
| 23 | Residential | RC-3 | 2 | 18745 | 18199.95 | 545.05 | 2.91 |
| 24 | Residential | RC-4 | 2 | 10721 | 10269.01 | 451.99 | 4.22 |
| 25 | Residential | RC-5 | 5 | 21399 | 20208.42 | 1190.58 | 5.56 |
| 26 | Residential | RC-6 | 2 | 57042 | 53493.65 | 3548.35 | 6.22 |
| 27 | Residential | RC-7 | 1 | 8644 | 8455.31 | 188.69 | 2.18 |
| 28 | Residential | RC-8 | 4 | 17087 | 16178.37 | 908.63 | 5.32 |
| 29 | Residential | RC-9 | 2 | 86382 | 81106.14 | 5275.86 | 6.11 |
| 30 | Residential | RC-10 | 3 | 47739 | 46582.66 | 1156.34 | 2.42 |
| 31 | Residential | RC-11 | 10 | 42352 | 40803.48 | 1548.52 | 3.66 |
| 32 | Residential | RC-12 | 13 | 310152 | 301154.4 | 8997.6 | 2.90 |
| 33 | Residential | RC-13 | 2 | 6875 | 6341.88 | 533.12 | 7.75 |
| 34 | Residential | RC-14 | 17 | 87445 | 83345.24 | 4099.76 | 4.69 |
| 35 | Residential | RC-15 | 16 | 315770 | 312509.2 | 3260.8 | 1.03 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 36 | Residential | RC-16 | 5 | 13366 | 12657.18 | 708.82 | 5.30 |
| 37 | Residential | RC-17 | 10.67 | 52847 | 50793.18 | 2053.82 | 3.89 |
| 38 | Residential | RC-18 | 10 | 14439 | 13702.51 | 736.49 | 5.10 |
| 39 | Residential | RC-19 | 3 | 6860 | 6481.53 | 378.47 | 5.52 |
| 40 | Residential | RC-20 | 5 | 13051 | 12968.25 | 82.75 | 0.63 |
| 41 | Residential | RC-21 | 15 | 185087 | 178456.2 | 6630.8 | 3.58 |
| 42 | Residential | RC-22 | 10 | 426593 | 425543.99 | 1049.01 | 0.25 |
| 43 | Residential | RC-23 | 5 | 14362 | 13921.5 | 440.5 | 3.07 |
| 44 | Residential | RC-24 | 2 | 11404 | 10744.5 | 659.5 | 5.78 |
| 45 | Residential | RC-25 | 2 | 9444 | 8963.83 | 480.17 | 5.08 |
| 46 | Residential | RC-26 | 15 | 341410 | 328654 | 12756 | 3.74 |
| 47 | Residential | RC-27 | 15 | 36103 | 34391.23 | 1711.77 | 4.74 |
| 48 | Residential | RC-28 | 20 | 117243 | 110714.17 | 6528.83 | 5.57 |

As shown in the below table percentage savings for commercial, industrial, and residential Consumers are 2.81%, 7.98%, 3% respectively. Additional Revenue to UPPCLs in the utility bill for all Consumers is 2.86%.

Table 5-5: Average percentage saving

| Consumers Category | Cumulative Utility Bill (INR) | Additional Revenue to UPPCLs (INR) | Percentage Savings |
|---|---|---|---|
| **Commercial** | 253202583 | 7103010.57 | 2.81% |
| **Industrial** | 2656419 | 211971 | 7.98% |
| **Residential** | 2493098 | 74810.01 | 3.00% |
| **Grand Total** | 258352100 | 7389791.58 | 2.86% |

**Lower Electricity Bills for All**

ToU pricing typically involves different rates for different time periods, with peak periods having higher rates and off-peak periods having lower rates. By shifting energy-intensive activities, such as running appliances or charging electric vehicles, to off-peak hours, Consumers can take advantage of lower rates and reduce their overall electricity costs. The pricing encourages Consumers to be more mindful of their energy usage and to actively conserve electricity during peak hours. When faced with higher rates during peak periods, Consumers are motivated to adjust their behaviour and limit energy consumption. This can lead to reduced electricity usage and lower bills for all Consumers. The pricing allows Consumers to time-shift their electricity usage to align with lower-rate periods. For example, they can schedule activities like laundry, dishwashing, or running water pumps during off-peak hours. By capitalizing on lower rates, Consumers can decrease their electricity expenses.

**Freedom of Choice**

ToU pricing encourages Consumers to adjust their energy consumption behaviour in response to price signals. By providing higher rates during peak periods, Consumers are motivated to shift their electricity usage to off-peak hours when rates are lower. This behavioural adaptation allows Consumers to align their energy consumption patterns with the available pricing, giving them the freedom to optimize their electricity costs. The pricing allows Consumers to choose when they

Consumed electricity based on the available pricing options. By offering different rates for different time periods, Consumers have the freedom to decide when to use electricity based on their personal preferences and needs.

**Environmental Impacts**

Primary objective of the ToU tariff is to reduce peak load that could avoid running peaking power plants. Generally, all peaking plants are run on gas or oil which emits pollutants. ToU will contribute to reduction in emissions. This aspect also needs to be explained to customers that their choice to shift loads from peak hours to non-peak hours not only save money for them, but also save the planet. If the utility is not able to meet the peak loads, they resort to load shedding and several customers would run their diesel generating (DG) sets during such power outages. If peak load can be managed through ToU tariff scheme, that will reduce load shedding which in turn will reduce emissions from DG sets.

**Customer Impact**

Time of Use (ToU) pricing can have several impacts on customers. One of the primary impacts is the potential for cost savings. Customers who can shift their electricity usage to off-peak hours can take advantage of lower rates, leading to reduced overall electricity bills. However, this savings potential is contingent on individual consumption patterns and the ability to adjust energy usage to align with off-peak periods.

ToU implementation will impact a range of customers i.e., Large Commercial, Industrial, Schools/Colleges, Hotels, IT Parks, Institutes, Utilities (WTP, STP, Municipal Board, Jal Board), and Residential customers. Customer's participation in demand-side response will make a substantial contribution to utility load management and will improve operational efficiency of the DISCOM. It will help in future operational planning and infrastructure augmentation.

Pricing also offers customers increased control and flexibility over their electricity costs. With access to pricing information for different time periods, customers can make informed decisions about when to use energy-intensive appliances or engage in activities that require significant electricity consumption. This flexibility allows customers to align their energy usage with their preferred schedule and optimize their electricity expenses.

## 5.3 Benefits to UPPCL

It is expected that the peak load reduction through ToU will help reduce the power purchase cost of the DISCOM. Cost of peaking power is normally much higher than the regular power bought through long-term PPAs. As stated earlier, peak load reduction may not result in overall reduction in energy consumption as customers will use electricity during off-peak hours. Shifting part of the consumption to off-peak hours at lower tariff will reduce the overall bill of the customer; but DISCOM's net income will be higher as the power sold at reduced tariff will also have higher margin. The ToU pricing signals can be designed such a way that it will be a WIN-WIN situation for both customers and the DISCOM.

### 5.3.1 Reduced Losses by Shifting Load from Peak Hours to Off-Peak/Regular Hours

By aligning the cost of electricity with the time of consumption, DISCOMs can effectively manage their peak load, reduce losses, and enhance financial stability. We have examined the monetary benefits to UPPCL by implementing ToU tariff scheme, specifically focusing on the condition where UPPCL procure electricity from the power exchanges during peak hours at higher prices.

**Managing Peak Load and Reducing Losses**

During peak hours, when the demand for electricity is at its highest, UPPCL often purchase electricity from the power exchanges at higher prices. This procurement cost exceeds the standard tariff rates, leading to increased losses for UPPCL. However, by implementing ToU pricing, UPPCL can encourage Consumers to shift their consumption from peak hours to off-peak or regular hours, thus mitigating the burden of procuring expensive electricity during peak times. By applying surcharges during peak hours over and above the regular tariff under the ToU scheme, UPPCL can pass on the higher price of power procurement from the market to the Consumers. This avoids the situation of buying power at higher prices and selling to Consumers at lower prices.

**Average Incentives versus Peak Hour Losses**

It is important to strike a balance between the average incentive offered to the Consumers and the losses incurred by the UPPCL during peak hours to ensure that the overall monetary benefits are in favour UPPCL. While the average incentives offered to Consumers during non-peak hours is lesser than the losses incurred during peak hours, the aim is to create a situation where the overall financial gains outweigh the losses.

**AT&C Loss Reduction**

Aggregate Technical and Commercial (AT&C) losses refer to the losses that occur during the transmission and distribution of electricity, including technical losses and commercial losses such as theft or billing inefficiencies. When demand during peak hours is reduced, the load on the distribution infrastructure decreases, which can lead to lower technical ($I^2R$) losses. Implementing ToU tariff scheme helps UPPCL to strategically manage their peak load, reduce losses, and enhance financial stability.

### 5.3.2 Retention of Consumers Moving to Open Access or Power Exchanges

Large Consumers in India can directly purchase electricity from any power producers or traders under the open access policy which had a limit of minimum 1 MW demand. In 2022, Government of India has reduced this limit to 100kW for green energy under the Green Energy Open Access Rules 2022. Presently there are 3 energy exchanges in operation in India – Indian Energy Exchange (IEX), Power Exchange India Limited (PXIL) and Hindustan Power Exchange Limited (HPX). Customers could buy under open access from any sources on long/short term power purchase agreements (PPAs) or through these exchanges. In Uttar Pradesh, open access is being awarded to Consumers having a capacity above 1 MW connected to 11 kV and higher. However, for purchase of green electricity by customers with a demand of 100kW and above, there are separate guidelines.

These options can potentially motivate large Consumers to buy electricity at a significantly lower cost compared to the regular tariffs offered by UPPCL. However, offering incentives to Consumers during off-peak hours can discourage them from opting for electricity procurement from other sources.

These incentives can take the form of reduced tariffs or special pricing schemes designed to make the UPPCL's electricity rates more attractive to Consumers. This approach allows UPPCL to retain their customers and ensure a steady revenue stream.

### 5.3.3 Improved Demand Forecasting and Reduced Unscheduled Interchange Charges

ToU pricing presents a significant opportunity for UPPCL to enhance their demand forecasting capabilities and reduce unscheduled interchange (UI) charges. By aligning electricity rates with

different time periods based on demand patterns, UPPCL can incentivize Consumers to shift their electricity consumption to off-peak hours, leading to better forecasting accuracy and minimized grid imbalances.

Accurate demand forecasting is crucial for UPPCL to optimize grid operations and minimize costs associated with UI charges incurred when the actual electricity demand deviates from the scheduled demands, leading to additional costs for the system operator to balance the grid. ToU pricing encourages Consumers to shift their electricity usage to off-peak hours by offering lower electricity rates during those periods. As a result, UPPCL can observe more predictable and stable demand patterns, enabling them to improve their demand forecasting accuracy. By incentivizing Consumers to voluntarily adjust their consumption, UPPCL can anticipate and plan for the load more effectively, minimizing the UI charges.

### 5.3.4 Reduced Infrastructure Augmentation Cost

The implementation of ToU tariff scheme offers a significant advantage to UPPCL by reducing the infrastructure augmentation costs associated with expanding and upgrading the electricity grid. Typically, in every power system, the last 100 MW of the peak load is experienced for less than 100 hours in a year. Augmenting the generation, transmission, and distribution infrastructure to meet this peak load is too huge for the DISCOMs. By incentivizing Consumers to shift part of their electricity usage to off-peak hours, ToU tariff scheme can effectively manage peak load and defer the need for costly infrastructure upgrades by several years.

Benefits of Reduced Infrastructure Augmentation Costs:

1. **Cost Savings:** By managing and reducing peak load through ToU pricing, UPPCL can avoid or delay costly infrastructure augmentation projects, resulting in significant cost savings
2. **Efficient Resource Utilization:** ToU pricing optimizes the utilization of existing infrastructure by distributing the load more evenly throughout the day. This reduces strain on the grid during peak hours and minimizes the need for costly upgrades
3. **Environmental Impact:** By avoiding infrastructure expansion and utilizing existing resources more efficiently, ToU pricing contributes to environmental sustainability by reducing the environmental footprint associated with constructing new power plants, transmission system and distribution lines
4. **Consumers Affordability:** Reduced infrastructure augmentation costs help maintain affordable electricity rates for Consumers, as the burden of infrastructure investment is minimized

As there were no monetary benefits given to participating Consumers in this pilot project, it is observed that a large number of participants did not take serious efforts to shift their loads.

**Residential Consumers:** A pool of 30 residential Consumers participated in this pilot project, however we could receive load profile data of 13 Consumers only from UPPCL. A few residential Consumers (RC2, RC11, RC27 and RC28) were closely following the pricing signals to adjust their loads during the pilot period. A reduction of 17.5% in peak load was observed during peak hours (5pm to 11pm) as compared to previous year (refer figure 5-2). It is safe to say that on average 5-10% of peak reduction can be obtained among residential Consumers by enrolling them in ToU tariff scheme in Uttar Pradesh.

**Commercial Consumers:** Commercial Consumers in Uttar Pradesh continue to be charged at flat tariff rate (i.e., no ToD is applicable). Therefore, there is a lack of energy management resources or technologies are in place for load control and management. Though there is a considerable saving in shadow bills are observed, any significant change in consumption pattern could not be measured. The limited participation and the nature of their business was the reason for the same. This Consumers category can be motivated by applying ToD/ToU, so that they can achieve financial benefits through reductions in load during peak hours.

**Industrial Consumers:** Three industrial Consumers participated in this pilot project. One Consumers who is involved in manufacturing of steel products, has followed the pricing signals closely. When surcharge was applied during peak hours (5 pm to 11 pm), sharp reduction in electricity consumption was observed. Reduction from recent occurring peak (between 4 pm and 5 pm) was around 65% under the TOD tariff in the previous year. With application of surcharge under ToU, this reduction in peak has been much steeper at around 83% that we observed. So, there is 18% more reduction in load from recent occurring peak as compared to previous year with application of pricing signals (refer images 5-17 to 5-21). It is safe to say that on an average 5% reduction in electricity consumption can be obtained among industrial Consumers by applying ToU tariff in UP.

Table 5-6: Potential for peak reduction

| Consumers Category | Connected load of all participating Consumers | Total connected load in UP (2021-22) | Observed reduction in peak during peak hours (5pm to 11pm) | Potential for peak reduction |
|---|---|---|---|---|
| **Residential** | 0.26 MW | 40503.75 MW | 17.5 % | 8% |
| **Commercial** | 19.9 MW | 4931.474 MW | - | 5% |
| **Industrial** | 4.06 MW | 9108.572 MW | 18%[2] | 5% |

The participating residential Consumers have a connected load of 0.26 MW, contributing to a total connected load of 40,503.75 MW in Uttar Pradesh for the year 2021-22. During peak hours from 5 pm to 11 pm, residential Consumers have shown an observed reduction in peak load by 17.5%. It is safe to say that on average 8% of peak reduction can be obtained among residential Consumers.

On the other hand, participating commercial Consumers have a significantly higher connected load of 19.9 MW, contributing to a total connected load of 4,931.474 MW in Uttar Pradesh for the year 2021-22. Although the observed reduction in load during peak hours is not significant, it is safe to assume that the commercial sector has the potential to reduce peak demand by minimum 5%.

Similarly, the participating industrial Consumers have a connected load of 4.06 MW, contributing to a total connected load of 9,108.572 MW in Uttar Pradesh for the year 2021-22. During peak hours, one industrial Consumers has shown reduction in load by 18%. The commercial sector has the potential to reduce peak demand by 5%.

[2]Rather than the actual reduction it is the relative difference between the load during peak hour and the recent occurring peak non-peak hour (4pm – 5pm) as compared to the previous year.

**Reduction in Power Purchase Cost**

A peak load of 28,000 MW was observed in last week of June 2023 in Uttar Pradesh. Considering a modest 5% reduction in peak load, 1400 MW of reduction in peak demand can be achieved.

During peak hours, UPPCL typically procure electricity from external sources, such as the IEX, at higher prices. By reducing the demand during these hours, UPPCL can avoid purchasing expensive electricity.

Let us assume a reduction in power purchase cost of INR 4 per kWh due to the reduced demand during peak hours.

Savings due to reduction in load during peak hours is calculated below.
Demand reduction during peak hours (in MW) * Reduction in power purchase cost (INR/kWh) which is 1400 MW * INR 4/kWh = INR 56,00,000 per hour (during peak hours)

It is considered that the 1400 MW load is shifted to non-peak hours when INR 2.00/kWh rebate was offered. The cost incurred by giving incentive during off-peak hours is calculated below.
Average incentive (INR/kWh) * Load shifted from peak to off-peak/ regular hours
= INR 2/kWh * 1400 MW
= INR 28,00,000 per hour

Additional Revenue to UPPCLs by load shifting from peak hours to off-peak/regular hours
Savings due to reduction in load during peak hours - Cost incurred for giving incentive during off-peak/regular hours is INR 5,600,000 – INR 2,800,000 = INR 2,800,000 per hour

Considering 4 hours of peak in a day for 300 days in a year,

**Additional Revenue to UPPCL in a year = 4 * INR 28,00,000 * 300 = INR 336,00,00,000**

The important point to note that the additional cost of procuring peak power from external sources can be passed on to the customers through surcharges under the ToU tariff scheme.

**Saving Through Imposing Surcharges**

With ToU tariff, surcharges or incentives have been given under different time slot during the day based on market price conditions. The sample size taken for the pilot included 50 consumers with a cumulative load of 24 MW. A typical monthly saving for UPPCL from additional surcharge during peak hours is calculated (details in **Annexure C**) based on the grid tariff and surcharge for the 50 consumers (24 MW load) is around INR 98,36,537. The Table below shows the monthly savings and the average for the year.

| Additional Revenue to UPPCL | | |
|---|---|---|
| **Month** | **Total Benefit One day** | **Total Benefit per Month** |
| Sep'22 | 2,17,989 | 65,39,670 |
| Oct'22 | 72,663 | 21,79,890 |
| Nov'22 | 12,111 | 3,63,315 |
| Dec'22 | 36,332 | 10,89,945 |
| Jan'23 | 3,02,763 | 90,82,875 |

| | | |
|---|---|---|
| Feb'23 | 3,45,149 | 1,03,54,478 |
| Mar'23 | 1,33,216 | 39,96,465 |
| Apr'23 | 8,29,569 | 2,48,87,078 |
| May'23 | 1,45,326 | 43,59,780 |
| June'23 | 3,02,763 | 90,82,875 |
| July'23 | 3,45,149 | 1,03,54,478 |
| Aug'23 | 11,91,587 | 3,57,47,601 |
| Total Benefit | | 11,80,38,448 |
| Average Benefit Per Month | | 98,36,537 |
| Assuming 30 % of the load in UP will participate in ToU Scheme | | 3,54,11,53,452 |

In the calculations it is assumed that the average system load is 24,000 MW and out of this 30% load can be moved to ToU scheme. This could lead to a benefit to the tune of INR 354,11,53,452.

Thus, the total estimated benefit to UPPCL (5% Peak load shifting as mentioned in section 5.3.4 and additional revenue from surcharge applied during peak hours on 30% load) will be Rs. 336 Crore + 354 Crore = 690 Crore.

## 5.4 Societal Benefits and Carbon Foot Print Reduction

Cheaper Electricity to Industries and Reduced Cost of Products. Adopting ToU tariff for industries where electricity is a significant part of the product cost can contribute to further cost reductions and make end products more affordable for Consumers.

**Consumers Awareness and Behaviour:** Most electricity Consumers do not have any knowledge about the demand and supply scenario and its impact on the grid. This lack of awareness can lead to inefficient usage patterns, such as high consumption during peak hours (that could otherwise have been shifted to other time of the day like ironing the clothes or pumping water) without considering the strain it places on the grid. ToU tariff can educate and motivate Consumers about the importance of efficient electricity usage and the benefits of load balancing.

**Carbon Footprint Reduction:** ToU tariff scheme can contribute to the efficient management of peak load demand and reduce the share of electricity from peaking power plants which run on fossil fuels. ToU pricing encourages load shifting, where Consumers shift their electricity usage to off-peak hours, flattening the demand curve and reducing strain on the grid during peak periods. This optimization of demand helps utilize the available generation capacity more efficiently. To cater to the needs of the power consumption in Uttar Pradesh, out of the total power consumption almost around 81% is being met through thermal sources - 77.09% of the power requirement is met by coal fired power plants and 4.74% is met by the gas power plants. It has been observed that average specific $CO_2$ emission by coal fired power plant is 0.975 tonnes/MWh and for gas power plant it is 0.465 tonnes/MWh. Below table

indicates the power generation mix and $CO_2$ emissions by thermal power plants in Uttar Pradesh for May 2023.

Table 5-7: Power generation mix and $CO_2$ emissions by thermal power plants in Uttar Pradesh

| Mode-wise breakup | Energy Mix in UP | Installed Capacity (in MW) | Installed Capacity Percentage | Weighted average specific $CO_2$ emissions (tonnes/MWh) |
|---|---|---|---|---|
| **Thermal** | Coal | 24295 | 77.09% | 0.975 |
| | Gas | 1493.14 | 4.74% | 0.465 |
| | **Total** | 25788.14 | - | |
| **Renewable** | Hydro | 501.6 | 1.59% | |
| | RES (solar, wind, biomass etc) | 4786.15 | 15.19% | |
| | Nuclear | 440 | 1.40% | |
| | **Total** | 5727.75 | - | |
| **Grand Total** | | 31515.89 | - | |

As already explained in the section 5.3.4, it has been projected that with adoption of ToU pricing 1400 MWh peak load reduction can be achieved. And if it is considered that out of this 1400 MWh reduction, 81% will be the reduction in peak thermal generation, then about 1082 tonnes of $CO_2$ emission per hour can be reduced. Further if peak occurs for 4 hours a day and in a year, and it happens for 200 days then 8,65,525 tonnes of $CO_2$ emission can be reduced per year. The following table provide details on potential $CO_2$ reduction that can be achieved.

Table 5-8: Calculation of $CO_2$ emissions in a year

| Energy Mix in UP | Weighted average specific $CO_2$ emissions (tonnes/MWh) | Savings in $CO_2$ emissions considering peak load reduction of 1400 MWh (tonnes/MWh) | Per day savings in $CO_2$ emissions considering 4hrs of peak per day (tonnes/MWh) | Reduced $CO_2$ emission considering peak load reduction occurred on 200days (tonnes/MWh) |
|---|---|---|---|---|
| **Coal** | 0.975 | 1051.05 | 4204.2 | 840840 |
| **Gas** | 0.465 | 30.8574 | 123.4296 | 24685.92 |
| **Total** | 1.44 | 1081.9074 | 4327.6296 | 865525.92 |

**Renewable Energy Integration:** ToU tariff scheme promotes the integration of renewable energy sources by incentivizing demand response programs, and deployment of energy storage systems that would enhance the flexibility of the power system. ToU tariff with incentives during high-solar generation hours during the day could motivate customers to shift certain loads to high-solar hours. This would also help avoid curtailment of renewable energy generation. Increased utilization of renewable energy helps to lower the overall carbon footprint of the electricity sector.

**Better Power Quality and Improved Living Standard**: With ToU pricing, DISCOMs can optimize grid operations, reduce overloading, stabilize the grid, align infrastructure investments, and leverage smart grid technologies. The load shedding is also expected to be reduced or avoided. These measures collectively contribute to better power quality, reduced power cuts, and an overall improved electricity supply experience for Consumers giving them a better and improved living standard.

# 6 Recommendations

This chapter examines the necessary infrastructure for the successful implementation of ToU tariff scheme. Many DISCOMs are currently installing smart meters through different government initiatives. Additionally, regulatory interventions are crucial to develop an effective strategy for the adoption of ToU tariff scheme. The chapter presents a comprehensive roadmap, starting from Consumers enrolment, outlining the infrastructure needed, and concluding with feedback mechanisms.

## 6.1 Infrastructure Requirements ToU Tariff Implementation

**Metering, Billing and Other Infrastructure Requirements for ToU Tariff Implementation**

**Smart Meters**: To introduce ToU pricing, DISCOMs are required to install smart meters at Consumers premises. Smart meters are capable of recording and transmitting electricity usage data at regular intervals. This enables accurate billing based on consumption during different time periods in a day.

**Communication Network:** A robust communication network is required to facilitate the exchange of data between smart meters and utility companies. This network ensures that consumption data is collected in near real-time or at regular intervals for accurate billing and comprehensive analysis.

**Data Management System:** To handle the extensive volume of consumption data, gathered from Smart Meters, a robust data management system is necessary. This system allows DISCOMs to effectively analyse usage patterns, generate bills, and provide consumption feedback to customers.

**Billing and Customer Management System:** To implement ToU pricing effectively, DISCOMs require billing systems that can accurately calculate charges based on different time periods and tariff rates. This system should also have customer management functionalities such as managing customer profiles, tariff options, and providing usage reports.

**Customer Interface:** DISCOMs often provide customers with online portals or mobile applications to access their consumption data, view real-time pricing information, and manage their energy usage. These interfaces allow customers to make informed decisions about when to use electricity to optimize their costs.

**Customer Education and Support**: Educating and supporting customers is important when implementing ToU pricing. DISCOMs need to invest in customer education programs, support channels, and tools to help customers understand the new rate structure, benefits, and strategies for effectively managing their electricity consumption.

## 6.2 Regulatory Interventions

For the successful implementation of ToU tariff regime, certain regulatory interventions are necessary. Some of these interventions include:

- UPERC in consultation with the UP-Energy Department, UPPCL and the other UP State DISCOMs may establish a ToU Tariff regime. It is recommended to start with a simplified structure consisting three tariff structures – Regular, Peak, and Off-Peak. To account for the Peak period, a surcharge can be added to the regular tariff, while a rebate can be provided for Off-Peak rates. The precise values for different categories of customers can be analysed and finalized. Additionally, consultations with target ToU customers would be valuable in gathering customer feedback and insights during decision making.

- UPERC should monitor customer feedback and analysis systems to identify any necessary modifications in ToU Framework to ensure that the ToU structure remains responsive to customer needs and expectations.
- DISCOMs should keep a track of the savings in power purchase cost, reduction in peak load, and subsequent reduction in AT&C losses and emissions and monitored by UPERC. DISCOMs should also assess their revenue impact, both positive and negative, from the ToU customers and overall revenue impact from the scheme. Based on these assessments, DISCOMs can provide appropriate recommendations to UPERC for adjustments in the ToU tariff framework.
- As part of 100% smart metering scheme of GoI, smart metering rollout should be designed in a way that enables the meter data management systems to capture and aggregate the meter readings in specified time blocks with different tariffs in separate buckets. These systems should integrate seamlessly with the billing system to generate ToU bills during the billing cycle.
- Considering the interest of both the parties, i.e., Consumers and the DISCOMs, surcharge and incentive should be capped to a certain value to balance the trade.

## 6.3 ToU Implementation Roadmap

**The steps to implement ToU are explained below:**


**Selection of the Target ToU Customers**

DISCOM should identify the customers with significant loads (e.g., 10 kW and above) who could shift their load, part or full, by a few hours – either by advancing or delaying their usage. It is also crucial to assess the loading on the feeders. To select ToU customers effectively, priority should be given to customers located on feeders experiencing highest congestion in peak hours. This approach ensures that the ToU pricing scheme targets customers who can have the most significant impact on reducing peak demand and optimizing the utilization of the distribution network.


**Enrolment of Customers**

It is advised to educate the identified customers about the benefits of ToU tariff. To enrol for the customer for the ToU program, awareness about the enrolment process is important i.e., enrolment through the DISCOM's user-friendly web portal. By offering a mobile-friendly interface, it enhances services to customers and offers a number of advantages by providing numerous online services which customers can avail using their unique id. The web portal should facilitate online registration for customers and enable them track the following key functionalities:

| | | |
|---|---|---|
| Application for new | Status of application | Online bill payment |
| Online pricing signals | Online complaint | Tariff change |

Step 3

**Customer Engagement and Education**

Customer engagement is key to ensure success of the ToU tariff scheme. It is important to ensure that the ToU customer agreement is user-friendly and easy to understand. Avoid complex legal jargon that may confuse or discourage users from reading the ToU. Consider including a summary or highlights section at the beginning of the ToU agreement. This section can provide a concise overview of the most important points or terms that users should be aware of. An accompanying Frequently Asked Questions (FAQ) section or a dedicated help centre can be created on the website. This section can address common user queries, provide further explanations, and offer additional guidance on specific aspects covered in the ToU agreement. It allows users to find answers to their questions easily. To supplement the text-based ToU agreement, consider using visual aids or infographics to explain complex concepts, processes, or user rights.

Visual representations can often be more engaging and easier to understand, particularly for users who may not have a legal background. Instead of presenting the entire ToU agreement in a single, lengthy document, consider adopting a layered or interactive approach. This can involve breaking down the ToU into sections or providing hyperlinks to relevant sections for easier navigation. Users can click on specific topics of interest to access detailed information.

Step 4

**Smart Meter Rollout**

DISCOMs implementing ToU pricing need to implement advanced metering infrastructure (AMI) or smart metering. The AMI enables accurate measurement and billing of electricity consumption based on different time periods. With AMI, DISCOMs can collect real-time data on energy usage, facilitating the adoption of ToU pricing models where electricity rates vary based on peak and off-peak hours. DISCOMs can promote energy efficiency, incentivize consumers to shift their electricity usage to off-peak periods, and better manage peak demand, leading to a more sustainable and cost-effective electricity distribution system with AMI.

Step 5

**Integration with Billing System**

It is crucial to integrate the smart meter data collected from the ToU customers with the billing system for generating accurate bills based on ToU tariff. The ToU billing process can be implemented independently until it is scaled up, or it can be integrated with existing billing systems by incorporating appropriate provisions. This integration ensures that the billing system takes into account the time-based electricity consumption recorded by smart meters, allowing for the calculation of charges according to the ToU tariff structure. By integrating the two systems effectively, utility companies can streamline the billing process and provide customers with precise and transparent bills reflecting their actual electricity usage during different time periods.

Step 6

**Installation of Load Control Devices at Customer Premises**

The implementation of ToU tariff involves installation of load control devices at customer premises, which plays a critical role in the process. These devices are

designed to remotely manage and control the electricity consumption of specific appliances or equipment at the customer's location based on ToU rate schedules. By utilizing load control devices, DISCOMs can communicate with customers' devices, such as air conditioners or water heaters, to adjust their operation during peak demand periods or high-rate hours. By strategically shifting or reducing electricity consumption during these peak times, load control devices help customers optimize their energy usage, reduce costs, and support grid stability. The installation of these devices promotes energy efficiency, demand response, and overall system reliability, aligning with the objectives of ToU pricing programs.


**Go live**

After establishing the necessary infrastructure at customer premises and successfully integrating it with the back-end billing system, the ToU program can be launched and made live for customers. This involves activating the ToU pricing structure, notifying customers about the program and its benefits, and providing them with clear instructions on how to adapt their energy consumption patterns accordingly. Alongside the launch, effective customer communication and education initiatives should be implemented to ensure customers understand the ToU rates, the designated peak and off-peak hours, and any associated incentives or rewards. Regular monitoring and evaluation of the program's performance should also be conducted to make any necessary adjustments and continuously improve the ToU program's effectiveness.


**Feedback**

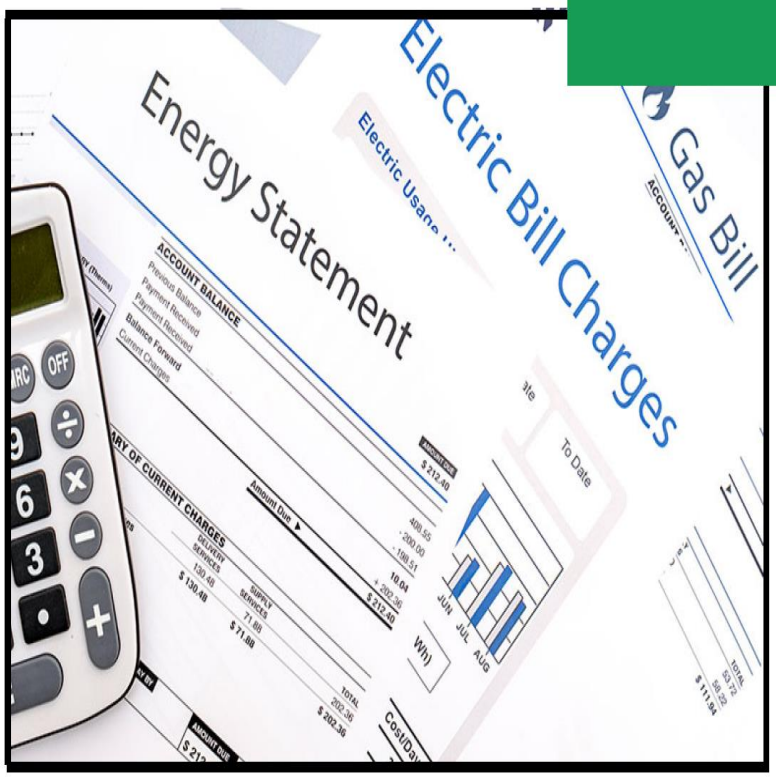
There should be provision of a 24X7 helpline to collect the feedback from the customers. A better ToU feedback will help DISCOMs to scale up the implementation across the utility.

## Appendix – A: English Version - Customer Guide for Pilot Project on Time of Use Tariff for Electricity in Uttar Pradesh

India Smart Grid Forum | Uttar Pradesh Power Corporation Limited

# Customer Guide for

# PILOT PROJECT ON TIME OF USE TARIFF FOR ELECTRICITY IN UTTAR PRADESH





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## Introduction

Time of Use (ToU) or Real-time Tariff for Electricity is a new concept in which customers are given price signals in advance (one hour or more) about the electricity tariff so that they can decrease or increase their electricity consumption. Typically, in a day there are time slots when electricity demand is more than available supply (peak-hours) which forces the utility to resort to load-shedding. There are also several time slots when the power on the grid is surplus. Customers with loads that can be interrupted or shifted for few hours can take advantage of the ToU scheme. During peak hours the utility will levy a surcharge to the normal tariff and during off-peak hours or surplus periods, the utility will offer a rebate. So, customers can switch off some of their machineries during peak hours and run them during off-peak hours when the rates are lower. This will help the utility to avoid load-shedding and reduce procurement of costly power during peak-hours at market rates. Thus, the ToU scheme will help reduce the monthly electricity bill of customers as well as power purchase cost of the utility.

Uttar Pradesh is the first state in India to launch a pilot project for ToU tariff implementation. The successful outcome of this pilot project will enable the government to frame regulations for ToU scheme in the state.

This pilot project will be implemented by India Smart Grid Forum (ISGF), a think tank established by Ministry of Power, Government of India (GoI) with the approval of the UP Electricity Regulatory Commission (UPERC) and Uttar Pradesh Power Corporation Limited (UPPCL); and will be undertaken amongst the customers of Madhyanchal Vidyut Vitran Nigam Limited (MVVNL).

## How the Pilot Project will be Executed?

ISGF in coordination with MVVNL will recruit 100 to 200 customers on voluntary basis. They will be provided training on the details of the scheme and how best they can leverage the ToU scheme to their maximum advantage. Everyday price signals will be communicated to the customers participating in the pilot project typically one or two hours in advance of the rebate or surcharge on the normal electricity rates. During peak-hours there will be a surcharge on the normal rates and during off-peak hours there will be a rebate on normal rates. For example, a message will be communicated to the customers that there will be a rebate of Rs 2 per unit (kWh) from 2pm to 5pm on the normal rates. Similarly, a message may be sent to customers around 4pm that from 6pm to 9pm there will be a surcharge of Rs 2 per unit (kWh) of electricity over and above the normal rates. According to these price signals, customers can shift their loads that are interruptible such as air-conditioners, water pumps, welding and cutting machines, washing machines and dish washers etc.

When the rebates are offered the buildings can be precooled, do water pumping or wash clothes etc; and when there is a surcharge during peak-hours, air-conditioning can be switched-off for few hours and other equipment and machineries can be turned-off.

Under the existing Time of Day (ToD) tariff, four different rates are applicable across the day for industrial and commercial customers. The rebates and surcharges will be applicable on these 4 slabs.

In order to implement ToU tariff successfully, AMR meter or smart meter with related IT infrastructure are required. Customers will be selected who already have smart meters or AMR meters. ToU tariff will be implemented on pilot basis for a period of 9 months. During this period, the participating customers will receive two electricity bills – the regular bills as per existing tariffs; and another bill as per ToU scheme. Since this is a pilot trial, customers will continue to pay the normal bill. But the ToU bill will indicate how much they could have saved based on the load shifting undertaken as per the ToU price signals.

The price signals will be communicated few times every day to the customers on Whats App (or SMS or email) in advance (one to two hours) so that they could reduce or increase their loads according to the surcharge and rebates notified.

ToU tariff scheme will help to estimate how much peak load reduction could be achieved; and consequently, how much savings in the peak power purchase cost for the utility and to what extent the carbon emissions could be reduced.

## Benefits of Time of Use (ToU) Tariff Scheme

- Lower Electricity Bills for All: ToU gives customers options to save by reducing and shifting electricity use to the time slots when tariff is lower. By paying more attention to the timing of energy use, customers could have a new means of lowering energy bills and reducing the use of costly peak power that usually comes from polluting power plants. Since peaking power plants are operated only during peak hours of the day during the summer months, their overall usage is typically 10-20%; and hence the power from those peaking power plants is very high (3-5 times from base load plants) and this cost is adjusted in the overall tariff. In fact, all customers are paying for this expensive power. If peak load can be reduced (or shifted) that could avoid/reduce the use of peaking power plants, overall savings for the customers will be significant. This will also reduce the carbon emissions.
- Freedom of Choice: Voluntary participation in ToU with the option to opt-in or opt-out, offers greater freedom to customers to choose how they want to use and pay for electricity.
- Savings to DISCOM: Reduction in power purchase cost and deferral/avoidance of electrical network enhancements to meet peak demands (that is avoided by ToU scheme)
- Though pricing signals (of rebates) customers can be incentivized to consume more electricity during periods when surplus electricity is available on the grid which will avoid curtailing renewable energy such as solar and wind generation. This will help scaling up pf renewable energy in the state


## FREQUENTLY ASKED QUESTIONS

**Do I need to change my meter for ToU tariff scheme?**

No. You do not have to change your existing meter, the ToU tariff scheme will work with the smart meter or AMR meter in your building.

**Do I need to shift my load as instructed by power distribution company (MVVNL)?**

You can shift load according to your convenience and feasibility

**Is there any additional infrastructure required and do I need to pay for that?**

No, no additional payments need to be made. Since this is a pilot project, all costs including additional infrastructure (if required) will be borne by the project.

**Can I set the terms/price for dynamic tariff?**

No, the price signals will be communicated by power distribution company (MVVNL)/ISGF team

**Will there be any separate bill for dynamic ToU tariff?**

Yes; a shadow bill will be generated to understand the financial benefit of ToU tariff scheme and the same will be shared with customers along with their regular bills.

**How will I get the pricing signal from Power distribution company (MVVNL)?**

ToU pricing signals will be communicated by MVVNL/ISGF through WhatsApp or SMS or Email as per the choice of the customer

**How much I will be able to save through ToU tariff scheme?**

The difference between regular bill and the shadow bill as per ToU tariff will show the savings.

## Appendix – B: Hindi Version - Customer Guide for Pilot Project on Time of Use Tariff for Electricity in Uttar Pradesh

ISGF India Smart Grid Forum

Uttar Pradesh Power Corporation Limited

ग्राहक गाइड

# उत्तर प्रदेश में बिजली के उपयोग के समय टैरिफ पर पायलट परियोजना


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## परिचय

बिजली के लिए उपयोग का समय (टीओयू) या रीयल-टाइम टैरिफ एक नई अवधारणा है जिसमें ग्राहकों को बिजली टैरिफ के बारे में अग्रिम (एक घंटे या अधिक) मूल्य संकेत दिए जाते हैं ताकि वे अपनी बिजली की खपत को कम या बढ़ा सकें। आमतौर पर, एक दिन में ऐसे समय होते हैं जब बिजली की मांग उपलब्ध आपूर्ति (पीक-ऑवर्स) से अधिक होती है, जो उपयोगिता को लोड-शेडिंग का सहारा लेने के लिए मजबूर करती है। ग्रिड पर बिजली सरप्लस होने पर कई टाइम स्लॉट भी होते हैं। लोड वाले ग्राहक जिन्हें कुछ घंटों के लिए बाधित या स्थानांतरित किया जा सकता है, वे टीओयू योजना का लाभ उठा सकते हैं। पीक ऑवर्स के दौरान यूटिलिटी सामान्य टैरिफ पर सरचार्ज लगाएगी और ऑफ-पीक ऑवर्स या सरप्लस अवधि के दौरान, यूटिलिटी छूट की पेशकश करेगी। इसलिए, ग्राहक अपनी कुछ मशीनरी को व्यस्त समय के दौरान बंद कर सकते हैं और उन्हें ऑफ-पीक घंटों के दौरान चला सकते हैं जब दरें कम होती हैं। यह उपयोगिता को लोड-शेडिंग से बचने में मदद करेगा और बाजार दरों पर पीक-आवर्स के दौरान महंगी बिजली की खरीद को कम करेगा। इस प्रकार, टीओयू योजना ग्राहकों के मासिक बिजली बिल के साथ-साथ उपयोगिता की बिजली खरीद लागत को कम करने में मदद करेगी।

उत्तर प्रदेश टीओयू टैरिफ कार्यान्वयन के लिए एक पायलट परियोजना शुरू करने वाला भारत का पहला राज्य है। इस पायलट परियोजना के सफल परिणाम से सरकार राज्य में टीओयू योजना के लिए नियम बनाने में सक्षम होगी।

यह पायलट प्रोजेक्ट इंडिया स्मार्ट ग्रिड फोरम (आईएसजीएफ) द्वारा कार्यान्वित किया जाएगा, जो बिजली मंत्रालय, भारत सरकार (जीओआई) द्वारा स्थापित एक थिंक टैंक है, जो यूपी विद्युत नियामक आयोग (यूपीईआरसी) और उत्तर प्रदेश पावर कॉर्पोरेशन लिमिटेड (यूपीपीसीएल) की मंजूरी के साथ है। ); और मध्यांचल विद्युत वितरण निगम लिमिटेड (एमवीवीएनएल) के ग्राहकों के बीच किया जाएगा।

## पायलट प्रोजेक्ट को कैसे अंजाम दिया जाएगा?

ISGF MVVNL के साथ मिलकर स्वैच्छिक आधार पर 100 से 200 ग्राहकों की भर्ती करेगा। उन्हें योजना के ब्योरे पर प्रशिक्षण प्रदान किया जाएगा और वे अपने अधिकतम लाभ के लिए टीओयू योजना का सर्वोत्तम लाभ कैसे उठा सकते हैं। आम तौर पर सामान्य बिजली दरों पर छूट या अधिभार से एक या दो घंटे पहले पायलट प्रोजेक्ट में भाग लेने वाले ग्राहकों को दैनिक मूल्य संकेतों के बारे में सूचित किया जाएगा। व्यस्त समय के दौरान सामान्य दरों पर अधिभार और ऑफ-पीक घंटों के दौरान सामान्य दरों पर छूट होगी। उदाहरण के लिए, ग्राहकों को एक संदेश दिया जाएगा कि सामान्य दरों पर दोपहर 2 बजे से शाम 5 बजे तक 2 रुपये प्रति यूनिट (kWh) की छूट होगी। इसी तरह, ग्राहकों को शाम 4 बजे के आसपास एक संदेश भेजा जा सकता है कि शाम 6 बजे से रात 9 बजे तक सामान्य दरों से ऊपर और ऊपर 2 रुपये प्रति यूनिट (kWh) बिजली का अधिभार होगा। इन मूल्य संकेतों के अनुसार, ग्राहक अपने लोड को स्थानांतरित कर सकते हैं जो कि बाधित हैं जैसे एयर कंडीशनर, पानी पंप, वेल्डिंग और काटने की मशीन, वाशिंग मशीन और डिश वाशर आदि।

जब छूट की पेशकश की जाती है तो इमारतों को पहले से ठंडा किया जा सकता है, पानी पंप करना या कपड़े धोना आदि; और जब व्यस्त समय के दौरान अधिभार होता है, तो एयर-कंडीशनिंग को कुछ घंटों के लिए बंद किया जा सकता है और अन्य उपकरण और मशीनरी को बंद किया जा सकता है।

मौजूदा टाइम ऑफ डे (टीओडी) टैरिफ के तहत, औद्योगिक और वाणिज्यिक ग्राहकों के लिए दिन भर में चार अलग-अलग दरें लागू होती हैं। इन 4 स्लैब पर छूट और सरचार्ज लागू होंगे।

टीओयू टैरिफ को सफलतापूर्वक लागू करने के लिए संबंधित आईटी इंफ्रास्ट्रक्चर के साथ एएमआर मीटर या स्मार्ट मीटर की आवश्यकता होती है। ऐसे ग्राहकों का चयन किया जाएगा जिनके पास पहले से ही स्मार्ट मीटर या एएमआर मीटर हैं। टीओयू टैरिफ 9 महीने की अवधि के लिए पायलट आधार पर लागू किया जाएगा। इस अवधि के दौरान, भाग लेने वाले ग्राहकों को दो बिजली बिल प्राप्त होंगे - मौजूदा टैरिफ के अनुसार नियमित बिल; और टीओयू योजना के अनुसार दूसरा बिल। चूंकि यह एक प्रायोगिक परीक्षण है, इसलिए ग्राहक सामान्य बिल का भुगतान करना जारी रखेंगे। लेकिन टीओयू बिल यह इंगित करेगा कि टीओयू मूल्य संकेतों के अनुसार किए गए लोड शिफ्टिंग के आधार पर वे कितनी बचत कर सकते थे।

व्हाट्स ऐप (या एसएमएस या ईमेल) पर ग्राहकों को हर दिन कुछ बार मूल्य संकेत अग्रिम रूप से (एक से दो घंटे) सूचित किए जाएंगे ताकि वे अधिसूचित अधिभार और छूट के अनुसार अपने भार को कम या बढ़ा सकें।

टीओयू टैरिफ योजना यह अनुमान लगाने में मदद करेगी कि पीक लोड में कितनी कमी हासिल की जा सकती है; और परिणामस्वरूप, उपयोगिता के लिए चरम बिजली खरीद लागत में कितनी बचत और कार्बन उत्सर्जन को किस हद तक कम किया जा सकता है।

## उपयोग के समय (टीओयू) टैरिफ योजना के लाभ

- सभी के लिए कम बिजली बिल: टीओयू ग्राहकों को बिजली के उपयोग को कम करने और टैरिफ कम होने पर समय स्लॉट में स्थानांतरित करके बचत करने का विकल्प देता है। ऊर्जा के उपयोग के समय पर अधिक ध्यान देकर, ग्राहकों के पास ऊर्जा बिलों को कम करने और महंगी पीक पावर के उपयोग को कम करने का एक नया साधन हो सकता है जो आमतौर पर प्रदूषणकारी बिजली संयंत्रों से आता है। चूंकि पीकिंग पावर प्लांट केवल गर्मी के महीनों के दौरान दिन के व्यस्ततम घंटों के दौरान ही संचालित होते हैं, उनका कुल उपयोग आमतौर पर 10-20% होता है; और इसलिए उन चरम बिजली संयंत्रों से बिजली बहुत अधिक है (बेस लोड प्लांट से 3-5 गुना) और इस लागत को समग्र टैरिफ में समायोजित किया जाता है। दरअसल, इस महंगी बिजली की कीमत सभी ग्राहक चुका रहे हैं. यदि पीक लोड को कम किया जा सकता है (या स्थानांतरित किया जा सकता है) जो पीकिंग पावर प्लांटों के उपयोग को टाल/कम कर सकता है, तो ग्राहकों के लिए समग्र बचत महत्वपूर्ण होगी। इससे कार्बन उत्सर्जन भी कम होगा।
- पसंद की स्वतंत्रता: ऑप्ट-इन या ऑप्ट-आउट के विकल्प के साथ टीओयू में स्वैच्छिक भागीदारी, ग्राहकों को यह चुनने की अधिक स्वतंत्रता प्रदान करती है कि वे बिजली का उपयोग और भुगतान कैसे करना चाहते हैं।
- DISCOM को बचत: बिजली की खरीद लागत में कमी और चरम मांगों को पूरा करने के लिए विद्युत नेटवर्क संवर्द्धन से बचाव / टालना (जो कि टीओयू योजना से बचा जाता है)
- हालांकि मूल्य निर्धारण संकेतों (छूट के) ग्राहकों को उस अवधि के दौरान अधिक बिजली का उपभोग करने के लिए प्रोत्साहित किया जा सकता है जब ग्रिड पर अधिशेष बिजली उपलब्ध हो, जो सौर और पवन उत्पादन जैसे नवीकरणीय ऊर्जा को कम करने से बचेगी। इससे राज्य में पीएफ अक्षय ऊर्जा को बढ़ाने में मदद मिलेगी


## बार बार पूछे जाने वाले प्रश्न

**क्या मुझे टीओयू टैरिफ योजना के लिए अपना मीटर बदलने की आवश्यकता है?**

नहीं। आपको अपना मौजूदा मीटर बदलने की जरूरत नहीं है, टीओयू टैरिफ योजना आपके भवन में स्मार्ट मीटर या एएमआर मीटर के साथ काम करेगी।

**क्या मुझे बिजली वितरण कंपनी (एमवीवीएनएल) के निर्देशानुसार अपना लोड शिफ्ट करने की आवश्यकता है?**

आप अपनी सुविधा और व्यवहार्यता के अनुसार लोड को शिफ्ट कर सकते हैं

**क्या किसी अतिरिक्त बुनियादी ढांचे की आवश्यकता है और क्या मुझे उसके लिए भुगतान करने की आवश्यकता है?**

नहीं, कोई अतिरिक्त भुगतान करने की आवश्यकता नहीं है। चूंकि यह एक पायलट परियोजना है, इसलिए अतिरिक्त बुनियादी ढांचे (यदि आवश्यक हो) सहित सभी लागतों को परियोजना द्वारा वहन किया जाएगा।

**क्या मैं डायनेमिक टैरिफ के लिए शर्तें/कीमत निर्धारित कर सकता हूं?**

नहीं, बिजली वितरण कंपनी (एमवीवीएनएल)/आईएसजीएफ टीम द्वारा मूल्य संकेतों का संचार किया जाएगा

**क्या डायनेमिक टीओयू टैरिफ के लिए कोई अलग बिल होगा?**

हाँ; टीओयू टैरिफ योजना के वित्तीय लाभ को समझने के लिए एक छाया बिल तैयार किया जाएगा और इसे ग्राहकों के साथ उनके नियमित बिलों के साथ साझा किया जाएगा।

**मुझे बिजली वितरण कंपनी (एमवीवीएनएल) से मूल्य निर्धारण संकेत कैसे मिलेगा?**

ग्राहक की पसंद के अनुसार व्हाट्सएप या एसएमएस या ईमेल के माध्यम से एमवीवीएनएल / आईएसजीएफ द्वारा टीओयू मूल्य निर्धारण संकेतों का संचार किया जाएगा।

**मैं टीओयू टैरिफ योजना के माध्यम से कितना बचत कर पाऊंगा?**

टीओयू टैरिफ के अनुसार रेगुलर बिल और शैडो बिल के बीच का अंतर बचत दिखाएगा।

## Appendix – C: Additional Revenue to UPPCL

| 15-09-22 Time Block | Unit Consumed (kWh) | Market Price | Grid Price | Surcharge | ToU Price | Additional Revenue to UPPCL |
|---|---|---|---|---|---|---|
| | | | | | | |
| 00:00-00:15 | 24221 | 3.41 | 7.10 | 0 | 7.10 | 0 |
| 00:15-00:30 | 24221 | 3.41 | 7.10 | 0 | 7.10 | 0 |
| 00:30-00:45 | 24221 | 3.41 | 7.10 | 0 | 7.10 | 0 |
| 00:45-01:00 | 24221 | 3.36 | 7.10 | 0 | 7.10 | 0 |
| 01:00-01:15 | 24221 | 3.36 | 7.10 | 0 | 7.10 | 0 |
| 01:15-01:30 | 24221 | 3.25 | 7.10 | 0 | 7.10 | 0 |
| 01:30-01:45 | 24221 | 3.36 | 7.10 | 0 | 7.10 | 0 |
| 01:45-02:00 | 24221 | 3.07 | 7.10 | 0 | 7.10 | 0 |
| 02:00-02:15 | 24221 | 3.10 | 7.10 | 0 | 7.10 | 0 |
| 02:15-02:30 | 24221 | 3.00 | 7.10 | 0 | 7.10 | 0 |
| 02:30-02:45 | 24221 | 3.00 | 7.10 | 0 | 7.10 | 0 |
| 02:45-03:00 | 24221 | 2.95 | 7.10 | 0 | 7.10 | 0 |
| 03:00-03:15 | 24221 | 2.90 | 7.10 | 0 | 7.10 | 0 |
| 03:15-03:30 | 24221 | 2.91 | 7.10 | 0 | 7.10 | 0 |
| 03:30-03:45 | 24221 | 2.83 | 7.10 | 0 | 7.10 | 0 |
| 03:45-04:00 | 24221 | 2.63 | 7.10 | 0 | 7.10 | 0 |
| 04:00-04:15 | 24221 | 2.88 | 7.10 | 0 | 7.10 | 0 |
| 04:15-04:30 | 24221 | 3.00 | 7.10 | 0 | 7.10 | 0 |
| 04:30-04:45 | 24221 | 3.00 | 7.10 | 0 | 7.10 | 0 |
| 04:45-05:00 | 24221 | 3.17 | 7.10 | 0 | 7.10 | 0 |
| 05:00-05:15 | 24221 | 3.36 | 6.04 | 0 | 6.04 | 0 |
| 05:15-05:30 | 24221 | 3.57 | 6.04 | 0 | 6.04 | 0 |
| 05:30-05:45 | 24221 | 4.02 | 6.04 | 0 | 6.04 | 0 |
| 05:45-06:00 | 24221 | 4.07 | 6.04 | 0 | 6.04 | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 06:00-06:15 | 24221 | 4.82 | 6.04 | 0 | 6.04 | 0 |
| 06:15-06:30 | 24221 | 5.02 | 6.04 | 0 | 6.04 | 0 |
| 06:30-06:45 | 24221 | 5.25 | 6.04 | 0 | 6.04 | 0 |
| 06:45-07:00 | 24221 | 5.07 | 6.04 | 0 | 6.04 | 0 |
| 07:00-07:15 | 24221 | 5.00 | 6.04 | 0 | 6.04 | 0 |
| 07:15-07:30 | 24221 | 4.33 | 6.04 | 0 | 6.04 | 0 |
| 07:30-07:45 | 24221 | 4.00 | 6.04 | 0 | 6.04 | 0 |
| 07:45-08:00 | 24221 | 3.07 | 6.04 | 0 | 6.04 | 0 |
| 08:00-08:15 | 24221 | 3.00 | 6.04 | 0 | 6.04 | 0 |
| 08:15-08:30 | 24221 | 2.68 | 6.04 | 0 | 6.04 | 0 |
| 08:30-08:45 | 24221 | 2.56 | 6.04 | 0 | 6.04 | 0 |
| 08:45-09:00 | 24221 | 2.16 | 6.04 | 0 | 6.04 | 0 |
| 09:00-09:15 | 24221 | 2.08 | 6.04 | 0 | 6.04 | 0 |
| 09:15-09:30 | 24221 | 2.08 | 6.04 | 0 | 6.04 | 0 |
| 09:30-09:45 | 24221 | 2.02 | 6.04 | 0 | 6.04 | 0 |
| 09:45-10:00 | 24221 | 2.02 | 6.04 | 0 | 6.04 | 0 |
| 10:00-10:15 | 24221 | 2.00 | 6.04 | 0 | 6.04 | 0 |
| 10:15-10:30 | 24221 | 2.00 | 6.04 | 0 | 6.04 | 0 |
| 10:30-10:45 | 24221 | 2.00 | 6.04 | 0 | 6.04 | 0 |
| 10:45-11:00 | 24221 | 1.99 | 6.04 | 0 | 6.04 | 0 |
| 11:00-11:15 | 24221 | 1.80 | 7.10 | 0 | 7.10 | 0 |
| 11:15-11:30 | 24221 | 1.50 | 7.10 | 0 | 7.10 | 0 |
| 11:30-11:45 | 24221 | 1.20 | 7.10 | 0 | 7.10 | 0 |
| 11:45-12:00 | 24221 | 1.20 | 7.10 | 0 | 7.10 | 0 |
| 12:00-12:15 | 24221 | 1.20 | 7.10 | 0 | 7.10 | 0 |
| 12:15-12:30 | 24221 | 1.20 | 7.10 | 0 | 7.10 | 0 |
| 12:30-12:45 | 24221 | 1.20 | 7.10 | 0 | 7.10 | 0 |
| 12:45-13:00 | 24221 | 1.20 | 7.10 | 0 | 7.10 | 0 |
| 13:00-13:15 | 24221 | 1.20 | 7.10 | 0 | 7.10 | 0 |
| 13:15-13:30 | 24221 | 1.20 | 7.10 | 0 | 7.10 | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 13:30-13:45 | 24221 | 1.20 | 7.10 | 0 | 7.10 | 0 |
| 13:45-14:00 | 24221 | 1.20 | 7.10 | 0 | 7.10 | 0 |
| 14:00-14:15 | 24221 | 1.20 | 7.10 | 0 | 7.10 | 0 |
| 14:15-14:30 | 24221 | 1.95 | 7.10 | 0 | 7.10 | 0 |
| 14:30-14:45 | 24221 | 2.00 | 7.10 | 0 | 7.10 | 0 |
| 14:45-15:00 | 24221 | 2.00 | 7.10 | 0 | 7.10 | 0 |
| 15:00-15:15 | 24221 | 2.16 | 7.10 | 0 | 7.10 | 0 |
| 15:15-15:30 | 24221 | 2.32 | 7.10 | 0 | 7.10 | 0 |
| 15:30-15:45 | 24221 | 2.52 | 7.10 | 0 | 7.10 | 0 |
| 15:45-16:00 | 24221 | 2.55 | 7.10 | 0 | 7.10 | 0 |
| 16:00-16:15 | 24221 | 2.82 | 7.10 | 0 | 7.10 | 0 |
| 16:15-16:30 | 24221 | 2.82 | 7.10 | 0 | 7.10 | 0 |
| 16:30-16:45 | 24221 | 2.72 | 7.10 | 0 | 7.10 | 0 |
| 16:45-17:00 | 24221 | 2.82 | 7.10 | 0 | 7.10 | 0 |
| 17:00-17:15 | 24221 | 2.90 | 8.10 | 0 | 8.10 | 0 |
| 17:15-17:30 | 24221 | 3.07 | 8.10 | 0 | 8.10 | 0 |
| 17:30-17:45 | 24221 | 3.17 | 8.10 | 0 | 8.10 | 0 |
| 17:45-18:00 | 24221 | 3.79 | 8.10 | 0 | 8.10 | 0 |
| 18:00-18:15 | 24221 | 4.07 | 8.10 | 0 | 8.10 | 0 |
| 18:15-18:30 | 24221 | 5.24 | 8.10 | 0 | 8.10 | 0 |
| 18:30-18:45 | 24221 | 8.50 | 8.10 | 0 | 8.10 | 0 |
| 18:45-19:00 | 24221 | 12.00 | 8.10 | 0 | 8.10 | 0 |
| 19:00-19:15 | 24221 | 12.00 | 8.10 | 4 | 12.10 | 96884 |
| 19:15-19:30 | 24221 | 12.00 | 8.10 | 4 | 12.10 | 96884 |
| 19:30-19:45 | 24221 | 12.00 | 8.10 | 4 | 12.10 | 96884 |
| 19:45-20:00 | 24221 | 12.00 | 8.10 | 4 | 12.10 | 96884 |
| 20:00-20:15 | 24221 | 8.83 | 8.10 | 4 | 12.10 | 96884 |
| 20:15-20:30 | 24221 | 8.41 | 8.10 | 4 | 12.10 | 96884 |
| 20:30-20:45 | 24221 | 8.31 | 8.10 | 4 | 12.10 | 96884 |
| 20:45-21:00 | 24221 | 8.31 | 8.10 | 4 | 12.10 | 96884 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 21:00-21:15 | 24221 | 6.77 | 8.10 | 4 | 12.10 | 96884 |
| 21:15-21:30 | 24221 | 6.77 | 8.10 | 0 | 8.10 | 0 |
| 21:30-21:45 | 24221 | 6.77 | 8.10 | 0 | 8.10 | 0 |
| 21:45-22:00 | 24221 | 5.97 | 8.10 | 0 | 8.10 | 0 |
| 22:00-22:15 | 24221 | 5.05 | 8.10 | 0 | 8.10 | 0 |
| 22:15-22:30 | 24221 | 4.55 | 8.10 | 0 | 8.10 | 0 |
| 22:30-22:45 | 24221 | 4.00 | 8.10 | 0 | 8.10 | 0 |
| 22:45-23:00 | 24221 | 3.70 | 8.10 | 0 | 8.10 | 0 |
| 23:00-23:15 | 24221 | 3.62 | 7.10 | 0 | 7.10 | 0 |
| 23:15-23:30 | 24221 | 3.53 | 7.10 | 0 | 7.10 | 0 |
| 23:30-23:45 | 24221 | 3.52 | 7.10 | 0 | 7.10 | 0 |
| 23:45-24:00 | 24221 | 3.49 | 7.10 | 0 | 7.10 | 0 |
| | | | | | | 2,17,989 |

| 15-10-22 Time Block | Unit Consumed (kWh) | Market Price | Grid Price | Surcharge | ToU Price | Additional Revenue to UPPCL |
|---|---|---|---|---|---|---|
| | | | | | | |
| 00:00-00:15 | 24221 | 3.96 | 7.10 | 0 | 7.10 | 0 |
| 00:15-00:30 | 24221 | 3.96 | 7.10 | 0 | 7.10 | 0 |
| 00:30-00:45 | 24221 | 3.71 | 7.10 | 0 | 7.10 | 0 |
| 00:45-01:00 | 24221 | 3.58 | 7.10 | 0 | 7.10 | 0 |
| 01:00-01:15 | 24221 | 3.58 | 7.10 | 0 | 7.10 | 0 |
| 01:15-01:30 | 24221 | 3.47 | 7.10 | 0 | 7.10 | 0 |
| 01:30-01:45 | 24221 | 3.33 | 7.10 | 0 | 7.10 | 0 |
| 01:45-02:00 | 24221 | 3.30 | 7.10 | 0 | 7.10 | 0 |
| 02:00-02:15 | 24221 | 3.16 | 7.10 | 0 | 7.10 | 0 |
| 02:15-02:30 | 24221 | 3.11 | 7.10 | 0 | 7.10 | 0 |
| 02:30-02:45 | 24221 | 3.03 | 7.10 | 0 | 7.10 | 0 |
| 02:45-03:00 | 24221 | 2.98 | 7.10 | 0 | 7.10 | 0 |
| 03:00-03:15 | 24221 | 2.80 | 7.10 | 0 | 7.10 | 0 |

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|---|---|---|---|---|---|---|
| 03:15-03:30 | 24221 | 2.75 | 7.10 | 0 | 7.10 | 0 |
| 03:30-03:45 | 24221 | 2.68 | 7.10 | 0 | 7.10 | 0 |
| 03:45-04:00 | 24221 | 2.62 | 7.10 | 0 | 7.10 | 0 |
| 04:00-04:15 | 24221 | 2.50 | 7.10 | 0 | 7.10 | 0 |
| 04:15-04:30 | 24221 | 2.62 | 7.10 | 0 | 7.10 | 0 |
| 04:30-04:45 | 24221 | 2.75 | 7.10 | 0 | 7.10 | 0 |
| 04:45-05:00 | 24221 | 2.82 | 7.10 | 0 | 7.10 | 0 |
| 05:00-05:15 | 24221 | 3.30 | 6.04 | 0 | 6.04 | 0 |
| 05:15-05:30 | 24221 | 3.74 | 6.04 | 0 | 6.04 | 0 |
| 05:30-05:45 | 24221 | 3.98 | 6.04 | 0 | 6.04 | 0 |
| 05:45-06:00 | 24221 | 3.99 | 6.04 | 0 | 6.04 | 0 |
| 06:00-06:15 | 24221 | 4.13 | 6.04 | 0 | 6.04 | 0 |
| 06:15-06:30 | 24221 | 4.13 | 6.04 | 0 | 6.04 | 0 |
| 06:30-06:45 | 24221 | 4.41 | 6.04 | 0 | 6.04 | 0 |
| 06:45-07:00 | 24221 | 4.41 | 6.04 | 0 | 6.04 | 0 |
| 07:00-07:15 | 24221 | 4.13 | 6.04 | 0 | 6.04 | 0 |
| 07:15-07:30 | 24221 | 4.13 | 6.04 | 0 | 6.04 | 0 |
| 07:30-07:45 | 24221 | 3.85 | 6.04 | 0 | 6.04 | 0 |
| 07:45-08:00 | 24221 | 3.47 | 6.04 | 0 | 6.04 | 0 |
| 08:00-08:15 | 24221 | 3.32 | 6.04 | 0 | 6.04 | 0 |
| 08:15-08:30 | 24221 | 3.32 | 6.04 | 0 | 6.04 | 0 |
| 08:30-08:45 | 24221 | 3.11 | 6.04 | 0 | 6.04 | 0 |
| 08:45-09:00 | 24221 | 2.95 | 6.04 | 0 | 6.04 | 0 |
| 09:00-09:15 | 24221 | 2.83 | 6.04 | 0 | 6.04 | 0 |
| 09:15-09:30 | 24221 | 2.87 | 6.04 | 0 | 6.04 | 0 |
| 09:30-09:45 | 24221 | 2.95 | 6.04 | 0 | 6.04 | 0 |
| 09:45-10:00 | 24221 | 2.93 | 6.04 | 0 | 6.04 | 0 |
| 10:00-10:15 | 24221 | 2.81 | 6.04 | 0 | 6.04 | 0 |
| 10:15-10:30 | 24221 | 2.75 | 6.04 | 0 | 6.04 | 0 |
| 10:30-10:45 | 24221 | 2.78 | 6.04 | 0 | 6.04 | 0 |

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|---|---|---|---|---|---|---|
| 10:45-11:00 | 24221 | 2.71 | 6.04 | 0 | 6.04 | 0 |
| 11:00-11:15 | 24221 | 2.64 | 7.10 | 0 | 7.10 | 0 |
| 11:15-11:30 | 24221 | 2.64 | 7.10 | 0 | 7.10 | 0 |
| 11:30-11:45 | 24221 | 2.64 | 7.10 | 0 | 7.10 | 0 |
| 11:45-12:00 | 24221 | 2.64 | 7.10 | 0 | 7.10 | 0 |
| 12:00-12:15 | 24221 | 2.58 | 7.10 | 0 | 7.10 | 0 |
| 12:15-12:30 | 24221 | 2.58 | 7.10 | 0 | 7.10 | 0 |
| 12:30-12:45 | 24221 | 2.50 | 7.10 | 0 | 7.10 | 0 |
| 12:45-13:00 | 24221 | 2.47 | 7.10 | 0 | 7.10 | 0 |
| 13:00-13:15 | 24221 | 2.30 | 7.10 | 0 | 7.10 | 0 |
| 13:15-13:30 | 24221 | 2.28 | 7.10 | 0 | 7.10 | 0 |
| 13:30-13:45 | 24221 | 2.39 | 7.10 | 0 | 7.10 | 0 |
| 13:45-14:00 | 24221 | 2.50 | 7.10 | 0 | 7.10 | 0 |
| 14:00-14:15 | 24221 | 2.71 | 7.10 | 0 | 7.10 | 0 |
| 14:15-14:30 | 24221 | 2.71 | 7.10 | 0 | 7.10 | 0 |
| 14:30-14:45 | 24221 | 2.75 | 7.10 | 0 | 7.10 | 0 |
| 14:45-15:00 | 24221 | 2.71 | 7.10 | 0 | 7.10 | 0 |
| 15:00-15:15 | 24221 | 2.81 | 7.10 | 0 | 7.10 | 0 |
| 15:15-15:30 | 24221 | 2.81 | 7.10 | 0 | 7.10 | 0 |
| 15:30-15:45 | 24221 | 2.87 | 7.10 | 0 | 7.10 | 0 |
| 15:45-16:00 | 24221 | 2.87 | 7.10 | 0 | 7.10 | 0 |
| 16:00-16:15 | 24221 | 3.32 | 7.10 | 0 | 7.10 | 0 |
| 16:15-16:30 | 24221 | 3.32 | 7.10 | 0 | 7.10 | 0 |
| 16:30-16:45 | 24221 | 3.40 | 7.10 | 0 | 7.10 | 0 |
| 16:45-17:00 | 24221 | 3.52 | 7.10 | 0 | 7.10 | 0 |
| 17:00-17:15 | 24221 | 3.62 | 8.10 | 0 | 8.10 | 0 |
| 17:15-17:30 | 24221 | 3.96 | 8.10 | 0 | 8.10 | 0 |
| 17:30-17:45 | 24221 | 4.45 | 8.10 | 0 | 8.10 | 0 |
| 17:45-18:00 | 24221 | 5.41 | 8.10 | 0 | 8.10 | 0 |
| 18:00-18:15 | 24221 | 7.50 | 8.10 | 0 | 8.10 | 0 |

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|---|---|---|---|---|---|---|
| 18:15-18:30 | 24221 | 9.50 | 8.10 | 0 | 8.10 | 0 |
| 18:30-18:45 | 24221 | 11.11 | 8.10 | 2 | 10.10 | 48442 |
| 18:45-19:00 | 24221 | 12.00 | 8.10 | 2 | 10.10 | 48442 |
| 19:00-19:15 | 24221 | 9.50 | 8.10 | 4 | 12.10 | 96884 |
| 19:15-19:30 | 24221 | 7.98 | 8.10 | 2 | 10.10 | 48442 |
| 19:30-19:45 | 24221 | 5.97 | 8.10 | 2 | 10.10 | 48442 |
| 19:45-20:00 | 24221 | 5.45 | 8.10 | 0 | 8.10 | 0 |
| 20:00-20:15 | 24221 | 4.65 | 8.10 | 0 | 8.10 | 0 |
| 20:15-20:30 | 24221 | 4.65 | 8.10 | 0 | 8.10 | 0 |
| 20:30-20:45 | 24221 | 4.44 | 8.10 | 0 | 8.10 | 0 |
| 20:45-21:00 | 24221 | 4.34 | 8.10 | 0 | 8.10 | 0 |
| 21:00-21:15 | 24221 | 4.60 | 8.10 | 0 | 8.10 | 0 |
| 21:15-21:30 | 24221 | 4.44 | 8.10 | 0 | 8.10 | 0 |
| 21:30-21:45 | 24221 | 4.30 | 8.10 | 0 | 8.10 | 0 |
| 21:45-22:00 | 24221 | 4.17 | 8.10 | 0 | 8.10 | 0 |
| 22:00-22:15 | 24221 | 4.44 | 8.10 | 0 | 8.10 | 0 |
| 22:15-22:30 | 24221 | 4.38 | 8.10 | 0 | 8.10 | 0 |
| 22:30-22:45 | 24221 | 4.16 | 8.10 | 0 | 8.10 | 0 |
| 22:45-23:00 | 24221 | 4.01 | 8.10 | 0 | 8.10 | 0 |
| 23:00-23:15 | 24221 | 3.96 | 7.10 | 0 | 7.10 | 0 |
| 23:15-23:30 | 24221 | 3.72 | 7.10 | 0 | 7.10 | 0 |
| 23:30-23:45 | 24221 | 3.69 | 7.10 | 0 | 7.10 | 0 |
| 23:45-24:00 | 24221 | 3.58 | 7.10 | 0 | 7.10 | 0 |
| | | | | | | 72663 |

| 15-11-22 Time Block | Unit Consumed (kWh) | Market Price | Grid Price | Surcharge | ToU Price | Additional Revenue to UPPCL |
|---|---|---|---|---|---|---|
| 00:00-00:15 | 24221 | 3.17 | 7.10 | 0 | 7.10 | 0 |
| 00:15-00:30 | 24221 | 3.17 | 7.10 | 0 | 7.10 | 0 |

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|---|---|---|---|---|---|---|
| 00:30-00:45 | 24221 | 3.17 | 7.10 | 0 | 7.10 | 0 |
| 00:45-01:00 | 24221 | 3.17 | 7.10 | 0 | 7.10 | 0 |
| 01:00-01:15 | 24221 | 3.05 | 7.10 | 0 | 7.10 | 0 |
| 01:15-01:30 | 24221 | 3.05 | 7.10 | 0 | 7.10 | 0 |
| 01:30-01:45 | 24221 | 3.05 | 7.10 | 0 | 7.10 | 0 |
| 01:45-02:00 | 24221 | 3.05 | 7.10 | 0 | 7.10 | 0 |
| 02:00-02:15 | 24221 | 3.05 | 7.10 | 0 | 7.10 | 0 |
| 02:15-02:30 | 24221 | 3.00 | 7.10 | 0 | 7.10 | 0 |
| 02:30-02:45 | 24221 | 3.00 | 7.10 | 0 | 7.10 | 0 |
| 02:45-03:00 | 24221 | 3.00 | 7.10 | 0 | 7.10 | 0 |
| 03:00-03:15 | 24221 | 3.00 | 7.10 | 0 | 7.10 | 0 |
| 03:15-03:30 | 24221 | 3.00 | 7.10 | 0 | 7.10 | 0 |
| 03:30-03:45 | 24221 | 3.00 | 7.10 | 0 | 7.10 | 0 |
| 03:45-04:00 | 24221 | 3.00 | 7.10 | 0 | 7.10 | 0 |
| 04:00-04:15 | 24221 | 3.05 | 7.10 | 0 | 7.10 | 0 |
| 04:15-04:30 | 24221 | 3.05 | 7.10 | 0 | 7.10 | 0 |
| 04:30-04:45 | 24221 | 3.17 | 7.10 | 0 | 7.10 | 0 |
| 04:45-05:00 | 24221 | 3.34 | 7.10 | 0 | 7.10 | 0 |
| 05:00-05:15 | 24221 | 3.62 | 6.04 | 0 | 6.04 | 0 |
| 05:15-05:30 | 24221 | 3.79 | 6.04 | 0 | 6.04 | 0 |
| 05:30-05:45 | 24221 | 3.79 | 6.04 | 0 | 6.04 | 0 |
| 05:45-06:00 | 24221 | 3.90 | 6.04 | 0 | 6.04 | 0 |
| 06:00-06:15 | 24221 | 4.09 | 6.04 | 0 | 6.04 | 0 |
| 06:15-06:30 | 24221 | 4.09 | 6.04 | 0 | 6.04 | 0 |
| 06:30-06:45 | 24221 | 4.25 | 6.04 | 0 | 6.04 | 0 |
| 06:45-07:00 | 24221 | 4.74 | 6.04 | 0 | 6.04 | 0 |
| 07:00-07:15 | 24221 | 5.30 | 6.04 | 0 | 6.04 | 0 |
| 07:15-07:30 | 24221 | 5.23 | 6.04 | 0 | 6.04 | 0 |
| 07:30-07:45 | 24221 | 4.50 | 6.04 | 0 | 6.04 | 0 |
| 07:45-08:00 | 24221 | 4.83 | 6.04 | 0 | 6.04 | 0 |

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|---|---|---|---|---|---|---|
| 08:00-08:15 | 24221 | 4.85 | 6.04 | 0 | 6.04 | 0 |
| 08:15-08:30 | 24221 | 4.83 | 6.04 | 0 | 6.04 | 0 |
| 08:30-08:45 | 24221 | 4.50 | 6.04 | 0 | 6.04 | 0 |
| 08:45-09:00 | 24221 | 4.30 | 6.04 | 0 | 6.04 | 0 |
| 09:00-09:15 | 24221 | 4.24 | 6.04 | 0 | 6.04 | 0 |
| 09:15-09:30 | 24221 | 4.74 | 6.04 | 0 | 6.04 | 0 |
| 09:30-09:45 | 24221 | 5.00 | 6.04 | 0 | 6.04 | 0 |
| 09:45-10:00 | 24221 | 4.95 | 6.04 | 0 | 6.04 | 0 |
| 10:00-10:15 | 24221 | 4.85 | 6.04 | 0 | 6.04 | 0 |
| 10:15-10:30 | 24221 | 4.85 | 6.04 | 0 | 6.04 | 0 |
| 10:30-10:45 | 24221 | 4.85 | 6.04 | 0 | 6.04 | 0 |
| 10:45-11:00 | 24221 | 4.94 | 6.04 | 0 | 6.04 | 0 |
| 11:00-11:15 | 24221 | 4.30 | 7.10 | 0 | 7.10 | 0 |
| 11:15-11:30 | 24221 | 4.25 | 7.10 | 0 | 7.10 | 0 |
| 11:30-11:45 | 24221 | 4.16 | 7.10 | 0 | 7.10 | 0 |
| 11:45-12:00 | 24221 | 4.35 | 7.10 | 0 | 7.10 | 0 |
| 12:00-12:15 | 24221 | 4.16 | 7.10 | 0 | 7.10 | 0 |
| 12:15-12:30 | 24221 | 4.09 | 7.10 | 0 | 7.10 | 0 |
| 12:30-12:45 | 24221 | 4.03 | 7.10 | 0 | 7.10 | 0 |
| 12:45-13:00 | 24221 | 3.79 | 7.10 | 0 | 7.10 | 0 |
| 13:00-13:15 | 24221 | 3.72 | 7.10 | 0 | 7.10 | 0 |
| 13:15-13:30 | 24221 | 3.72 | 7.10 | 0 | 7.10 | 0 |
| 13:30-13:45 | 24221 | 3.77 | 7.10 | 0 | 7.10 | 0 |
| 13:45-14:00 | 24221 | 3.77 | 7.10 | 0 | 7.10 | 0 |
| 14:00-14:15 | 24221 | 3.79 | 7.10 | 0 | 7.10 | 0 |
| 14:15-14:30 | 24221 | 3.90 | 7.10 | 0 | 7.10 | 0 |
| 14:30-14:45 | 24221 | 3.98 | 7.10 | 0 | 7.10 | 0 |
| 14:45-15:00 | 24221 | 4.03 | 7.10 | 0 | 7.10 | 0 |
| 15:00-15:15 | 24221 | 4.03 | 7.10 | 0 | 7.10 | 0 |
| 15:15-15:30 | 24221 | 4.03 | 7.10 | 0 | 7.10 | 0 |

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|---|---|---|---|---|---|---|
| 15:30-15:45 | 24221 | 4.16 | 7.10 | 0 | 7.10 | 0 |
| 15:45-16:00 | 24221 | 4.16 | 7.10 | 0 | 7.10 | 0 |
| 16:00-16:15 | 24221 | 3.88 | 7.10 | 0 | 7.10 | 0 |
| 16:15-16:30 | 24221 | 4.03 | 7.10 | 0 | 7.10 | 0 |
| 16:30-16:45 | 24221 | 4.09 | 7.10 | 0 | 7.10 | 0 |
| 16:45-17:00 | 24221 | 4.16 | 7.10 | 0 | 7.10 | 0 |
| 17:00-17:15 | 24221 | 4.83 | 8.10 | 0 | 8.10 | 0 |
| 17:15-17:30 | 24221 | 5.35 | 8.10 | 0 | 8.10 | 0 |
| 17:30-17:45 | 24221 | 5.80 | 8.10 | 0 | 8.10 | 0 |
| 17:45-18:00 | 24221 | 5.80 | 8.10 | 0 | 8.10 | 0 |
| 18:00-18:15 | 24221 | 7.52 | 8.10 | 0 | 8.10 | 0 |
| 18:15-18:30 | 24221 | 8.50 | 8.10 | 0 | 8.10 | 0 |
| 18:30-18:45 | 24221 | 9.00 | 8.10 | 1 | 9.10 | 24221 |
| 18:45-19:00 | 24221 | 9.00 | 8.10 | 1 | 9.10 | 24221 |
| 19:00-19:15 | 24221 | 7.52 | 8.10 | 0 | 8.10 | 0 |
| 19:15-19:30 | 24221 | 5.85 | 8.10 | 0 | 8.10 | 0 |
| 19:30-19:45 | 24221 | 5.36 | 8.10 | 0 | 8.10 | 0 |
| 19:45-20:00 | 24221 | 5.00 | 8.10 | 0 | 8.10 | 0 |
| 20:00-20:15 | 24221 | 4.50 | 8.10 | 0 | 8.10 | 0 |
| 20:15-20:30 | 24221 | 4.59 | 8.10 | 0 | 8.10 | 0 |
| 20:30-20:45 | 24221 | 4.43 | 8.10 | 0 | 8.10 | 0 |
| 20:45-21:00 | 24221 | 4.40 | 8.10 | 0 | 8.10 | 0 |
| 21:00-21:15 | 24221 | 4.50 | 8.10 | 0 | 8.10 | 0 |
| 21:15-21:30 | 24221 | 4.09 | 8.10 | 0 | 8.10 | 0 |
| 21:30-21:45 | 24221 | 4.09 | 8.10 | 0 | 8.10 | 0 |
| 21:45-22:00 | 24221 | 3.96 | 8.10 | 0 | 8.10 | 0 |
| 22:00-22:15 | 24221 | 4.09 | 8.10 | 0 | 8.10 | 0 |
| 22:15-22:30 | 24221 | 4.43 | 8.10 | 0 | 8.10 | 0 |
| 22:30-22:45 | 24221 | 4.32 | 8.10 | 0 | 8.10 | 0 |
| 22:45-23:00 | 24221 | 4.09 | 8.10 | 0 | 8.10 | 0 |

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|---|---|---|---|---|---|---|
| 23:00-23:15 | 24221 | 3.90 | 7.10 | 0 | 7.10 | 0 |
| 23:15-23:30 | 24221 | 3.80 | 7.10 | 0 | 7.10 | 0 |
| 23:30-23:45 | 24221 | 3.79 | 7.10 | 0 | 7.10 | 0 |
| 23:45-24:00 | 24221 | 3.77 | 7.10 | 0 | 7.10 | 0 |
| | | | | | | 12110 |

| 15-12-22 Time Block | Unit Consumed (kWh) | Market Price | Grid Price | Surcharge | ToU Price | Additional Revenue to UPPCL |
|---|---|---|---|---|---|---|
| 00:00-00:15 | 24221 | 2.80 | 7.10 | 0 | 7.10 | 0 |
| 00:15-00:30 | 24221 | 2.65 | 7.10 | 0 | 7.10 | 0 |
| 00:30-00:45 | 24221 | 2.57 | 7.10 | 0 | 7.10 | 0 |
| 00:45-01:00 | 24221 | 2.54 | 7.10 | 0 | 7.10 | 0 |
| 01:00-01:15 | 24221 | 2.47 | 7.10 | 0 | 7.10 | 0 |
| 01:15-01:30 | 24221 | 2.37 | 7.10 | 0 | 7.10 | 0 |
| 01:30-01:45 | 24221 | 2.37 | 7.10 | 0 | 7.10 | 0 |
| 01:45-02:00 | 24221 | 2.35 | 7.10 | 0 | 7.10 | 0 |
| 02:00-02:15 | 24221 | 2.16 | 7.10 | 0 | 7.10 | 0 |
| 02:15-02:30 | 24221 | 2.16 | 7.10 | 0 | 7.10 | 0 |
| 02:30-02:45 | 24221 | 2.11 | 7.10 | 0 | 7.10 | 0 |
| 02:45-03:00 | 24221 | 2.16 | 7.10 | 0 | 7.10 | 0 |
| 03:00-03:15 | 24221 | 2.16 | 7.10 | 0 | 7.10 | 0 |
| 03:15-03:30 | 24221 | 2.31 | 7.10 | 0 | 7.10 | 0 |
| 03:30-03:45 | 24221 | 2.35 | 7.10 | 0 | 7.10 | 0 |
| 03:45-04:00 | 24221 | 2.37 | 7.10 | 0 | 7.10 | 0 |
| 04:00-04:15 | 24221 | 2.54 | 7.10 | 0 | 7.10 | 0 |
| 04:15-04:30 | 24221 | 2.57 | 7.10 | 0 | 7.10 | 0 |
| 04:30-04:45 | 24221 | 2.80 | 7.10 | 0 | 7.10 | 0 |
| 04:45-05:00 | 24221 | 2.81 | 7.10 | 0 | 7.10 | 0 |
| 05:00-05:15 | 24221 | 3.00 | 6.04 | 0 | 6.04 | 0 |

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|---|---|---|---|---|---|---|
| 05:15-05:30 | 24221 | 3.23 | 6.04 | 0 | 6.04 | 0 |
| 05:30-05:45 | 24221 | 3.40 | 6.04 | 0 | 6.04 | 0 |
| 05:45-06:00 | 24221 | 3.81 | 6.04 | 0 | 6.04 | 0 |
| 06:00-06:15 | 24221 | 4.60 | 6.04 | 0 | 6.04 | 0 |
| 06:15-06:30 | 24221 | 5.00 | 6.04 | 0 | 6.04 | 0 |
| 06:30-06:45 | 24221 | 5.70 | 6.04 | 0 | 6.04 | 0 |
| 06:45-07:00 | 24221 | 5.97 | 6.04 | 0 | 6.04 | 0 |
| 07:00-07:15 | 24221 | 6.51 | 6.04 | 0 | 6.04 | 0 |
| 07:15-07:30 | 24221 | 7.18 | 6.04 | 1 | 7.04 | 24221 |
| 07:30-07:45 | 24221 | 7.81 | 6.04 | 2 | 8.04 | 48442 |
| 07:45-08:00 | 24221 | 7.70 | 6.04 | 2 | 8.04 | 48442 |
| 08:00-08:15 | 24221 | 6.50 | 6.04 | 0 | 6.04 | 0 |
| 08:15-08:30 | 24221 | 6.99 | 6.04 | 1 | 7.04 | 24221 |
| 08:30-08:45 | 24221 | 6.50 | 6.04 | 0 | 6.04 | 0 |
| 08:45-09:00 | 24221 | 5.60 | 6.04 | 0 | 6.04 | 0 |
| 09:00-09:15 | 24221 | 5.69 | 6.04 | 0 | 6.04 | 0 |
| 09:15-09:30 | 24221 | 6.00 | 6.04 | 0 | 6.04 | 0 |
| 09:30-09:45 | 24221 | 6.05 | 6.04 | 0 | 6.04 | 0 |
| 09:45-10:00 | 24221 | 6.00 | 6.04 | 0 | 6.04 | 0 |
| 10:00-10:15 | 24221 | 5.32 | 6.04 | 0 | 6.04 | 0 |
| 10:15-10:30 | 24221 | 5.41 | 6.04 | 0 | 6.04 | 0 |
| 10:30-10:45 | 24221 | 5.34 | 6.04 | 0 | 6.04 | 0 |
| 10:45-11:00 | 24221 | 5.07 | 6.04 | 0 | 6.04 | 0 |
| 11:00-11:15 | 24221 | 4.70 | 7.10 | 0 | 7.10 | 0 |
| 11:15-11:30 | 24221 | 4.58 | 7.10 | 0 | 7.10 | 0 |
| 11:30-11:45 | 24221 | 4.45 | 7.10 | 0 | 7.10 | 0 |
| 11:45-12:00 | 24221 | 4.45 | 7.10 | 0 | 7.10 | 0 |
| 12:00-12:15 | 24221 | 4.39 | 7.10 | 0 | 7.10 | 0 |
| 12:15-12:30 | 24221 | 4.29 | 7.10 | 0 | 7.10 | 0 |
| 12:30-12:45 | 24221 | 4.29 | 7.10 | 0 | 7.10 | 0 |

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|---|---|---|---|---|---|---|
| 12:45-13:00 | 24221 | 4.14 | 7.10 | 0 | 7.10 | 0 |
| 13:00-13:15 | 24221 | 4.01 | 7.10 | 0 | 7.10 | 0 |
| 13:15-13:30 | 24221 | 3.99 | 7.10 | 0 | 7.10 | 0 |
| 13:30-13:45 | 24221 | 4.00 | 7.10 | 0 | 7.10 | 0 |
| 13:45-14:00 | 24221 | 4.01 | 7.10 | 0 | 7.10 | 0 |
| 14:00-14:15 | 24221 | 4.03 | 7.10 | 0 | 7.10 | 0 |
| 14:15-14:30 | 24221 | 4.03 | 7.10 | 0 | 7.10 | 0 |
| 14:30-14:45 | 24221 | 4.03 | 7.10 | 0 | 7.10 | 0 |
| 14:45-15:00 | 24221 | 4.14 | 7.10 | 0 | 7.10 | 0 |
| 15:00-15:15 | 24221 | 4.14 | 7.10 | 0 | 7.10 | 0 |
| 15:15-15:30 | 24221 | 4.14 | 7.10 | 0 | 7.10 | 0 |
| 15:30-15:45 | 24221 | 4.72 | 7.10 | 0 | 7.10 | 0 |
| 15:45-16:00 | 24221 | 4.95 | 7.10 | 0 | 7.10 | 0 |
| 16:00-16:15 | 24221 | 4.82 | 7.10 | 0 | 7.10 | 0 |
| 16:15-16:30 | 24221 | 5.68 | 7.10 | 0 | 7.10 | 0 |
| 16:30-16:45 | 24221 | 5.41 | 7.10 | 0 | 7.10 | 0 |
| 16:45-17:00 | 24221 | 5.85 | 7.10 | 0 | 7.10 | 0 |
| 17:00-17:15 | 24221 | 5.85 | 8.10 | 0 | 8.10 | 0 |
| 17:15-17:30 | 24221 | 5.10 | 8.10 | 0 | 8.10 | 0 |
| 17:30-17:45 | 24221 | 6.05 | 8.10 | 0 | 8.10 | 0 |
| 17:45-18:00 | 24221 | 6.50 | 8.10 | 0 | 8.10 | 0 |
| 18:00-18:15 | 24221 | 6.50 | 8.10 | 0 | 8.10 | 0 |
| 18:15-18:30 | 24221 | 7.00 | 8.10 | 0 | 8.10 | 0 |
| 18:30-18:45 | 24221 | 7.00 | 8.10 | 0 | 8.10 | 0 |
| 18:45-19:00 | 24221 | 7.00 | 8.10 | 0 | 8.10 | 0 |
| 19:00-19:15 | 24221 | 6.50 | 8.10 | 0 | 8.10 | 0 |
| 19:15-19:30 | 24221 | 5.90 | 8.10 | 0 | 8.10 | 0 |
| 19:30-19:45 | 24221 | 5.00 | 8.10 | 0 | 8.10 | 0 |
| 19:45-20:00 | 24221 | 5.00 | 8.10 | 0 | 8.10 | 0 |
| 20:00-20:15 | 24221 | 5.00 | 8.10 | 0 | 8.10 | 0 |

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|---|---|---|---|---|---|---|
| 20:15-20:30 | 24221 | 4.83 | 8.10 | 0 | 8.10 | 0 |
| 20:30-20:45 | 24221 | 4.83 | 8.10 | 0 | 8.10 | 0 |
| 20:45-21:00 | 24221 | 4.76 | 8.10 | 0 | 8.10 | 0 |
| 21:00-21:15 | 24221 | 4.01 | 8.10 | 0 | 8.10 | 0 |
| 21:15-21:30 | 24221 | 4.01 | 8.10 | 0 | 8.10 | 0 |
| 21:30-21:45 | 24221 | 4.01 | 8.10 | 0 | 8.10 | 0 |
| 21:45-22:00 | 24221 | 3.80 | 8.10 | 0 | 8.10 | 0 |
| 22:00-22:15 | 24221 | 3.51 | 8.10 | 0 | 8.10 | 0 |
| 22:15-22:30 | 24221 | 3.45 | 8.10 | 0 | 8.10 | 0 |
| 22:30-22:45 | 24221 | 3.33 | 8.10 | 0 | 8.10 | 0 |
| 22:45-23:00 | 24221 | 3.23 | 8.10 | 0 | 8.10 | 0 |
| 23:00-23:15 | 24221 | 3.10 | 7.10 | 0 | 7.10 | 0 |
| 23:15-23:30 | 24221 | 3.00 | 7.10 | 0 | 7.10 | 0 |
| 23:30-23:45 | 24221 | 2.94 | 7.10 | 0 | 7.10 | 0 |
| 23:45-24:00 | 24221 | 2.91 | 7.10 | 0 | 7.10 | 0 |
| | | | | | | 36331 |

| 15-01-23 Time Block | Unit Consumed (kWh) | Market Price | Grid Price | Surcharge | ToU Price | Additional Revenue to UPPCL |
|---|---|---|---|---|---|---|
| | | | | | | |
| 00:00-00:15 | 24221 | 3.18 | 7.10 | 0 | 7.10 | 0 |
| 00:15-00:30 | 24221 | 3.12 | 7.10 | 0 | 7.10 | 0 |
| 00:30-00:45 | 24221 | 3.10 | 7.10 | 0 | 7.10 | 0 |
| 00:45-01:00 | 24221 | 3.06 | 7.10 | 0 | 7.10 | 0 |
| 01:00-01:15 | 24221 | 3.00 | 7.10 | 0 | 7.10 | 0 |
| 01:15-01:30 | 24221 | 3.00 | 7.10 | 0 | 7.10 | 0 |

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|---|---|---|---|---|---|---|
| 01:30-01:45 | 24221 | 2.94 | 7.10 | 0 | 7.10 | 0 |
| 01:45-02:00 | 24221 | 2.94 | 7.10 | 0 | 7.10 | 0 |
| 02:00-02:15 | 24221 | 2.91 | 7.10 | 0 | 7.10 | 0 |
| 02:15-02:30 | 24221 | 2.88 | 7.10 | 0 | 7.10 | 0 |
| 02:30-02:45 | 24221 | 2.86 | 7.10 | 0 | 7.10 | 0 |
| 02:45-03:00 | 24221 | 2.84 | 7.10 | 0 | 7.10 | 0 |
| 03:00-03:15 | 24221 | 2.84 | 7.10 | 0 | 7.10 | 0 |
| 03:15-03:30 | 24221 | 2.84 | 7.10 | 0 | 7.10 | 0 |
| 03:30-03:45 | 24221 | 2.84 | 7.10 | 0 | 7.10 | 0 |
| 03:45-04:00 | 24221 | 2.88 | 7.10 | 0 | 7.10 | 0 |
| 04:00-04:15 | 24221 | 2.91 | 7.10 | 0 | 7.10 | 0 |
| 04:15-04:30 | 24221 | 3.00 | 7.10 | 0 | 7.10 | 0 |
| 04:30-04:45 | 24221 | 3.08 | 7.10 | 0 | 7.10 | 0 |
| 04:45-05:00 | 24221 | 3.34 | 7.10 | 0 | 7.10 | 0 |
| 05:00-05:15 | 24221 | 3.76 | 6.04 | 0 | 6.04 | 0 |
| 05:15-05:30 | 24221 | 4.22 | 6.04 | 0 | 6.04 | 0 |
| 05:30-05:45 | 24221 | 4.37 | 6.04 | 0 | 6.04 | 0 |
| 05:45-06:00 | 24221 | 4.33 | 6.04 | 0 | 6.04 | 0 |

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|---|---|---|---|---|---|---|
| 06:00-06:15 | 24221 | 4.42 | 6.04 | 0 | 6.04 | 0 |
| 06:15-06:30 | 24221 | 4.64 | 6.04 | 0 | 6.04 | 0 |
| 06:30-06:45 | 24221 | 4.80 | 6.04 | 0 | 6.04 | 0 |
| 06:45-07:00 | 24221 | 6.51 | 6.04 | 0 | 6.04 | 0 |
| 07:00-07:15 | 24221 | 6.51 | 6.04 | 0 | 6.04 | 0 |
| 07:15-07:30 | 24221 | 8.50 | 6.04 | 2 | 8.04 | 48442 |
| 07:30-07:45 | 24221 | 12.00 | 6.04 | 0 | 6.04 | 0 |
| 07:45-08:00 | 24221 | 12.00 | 6.04 | 0 | 6.04 | 0 |
| 08:00-08:15 | 24221 | 12.00 | 6.04 | 0 | 6.04 | 0 |
| 08:15-08:30 | 24221 | 12.00 | 6.04 | 0 | 6.04 | 0 |
| 08:30-08:45 | 24221 | 12.00 | 6.04 | 0 | 6.04 | 0 |
| 08:45-09:00 | 24221 | 12.00 | 6.04 | 0 | 6.04 | 0 |
| 09:00-09:15 | 24221 | 12.00 | 6.04 | 0 | 6.04 | 0 |
| 09:15-09:30 | 24221 | 12.00 | 6.04 | 0 | 6.04 | 0 |
| 09:30-09:45 | 24221 | 10.02 | 6.04 | 4 | 10.04 | 96884 |
| 09:45-10:00 | 24221 | 10.39 | 6.04 | 4 | 10.04 | 96884 |
| 10:00-10:15 | 24221 | 10.30 | 6.04 | 4 | 10.04 | 96884 |
| 10:15-10:30 | 24221 | 10.00 | 6.04 | 4 | 10.04 | 96884 |

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|---|---|---|---|---|---|---|
| 10:30-10:45 | 24221 | 10.00 | 6.04 | 4 | 10.04 | 96884 |
| 10:45-11:00 | 24221 | 8.86 | 6.04 | 3 | 9.04 | 72663 |
| 11:00-11:15 | 24221 | 6.15 | 7.10 | 0 | 7.10 | 0 |
| 11:15-11:30 | 24221 | 6.22 | 7.10 | 0 | 7.10 | 0 |
| 11:30-11:45 | 24221 | 4.75 | 7.10 | 0 | 7.10 | 0 |
| 11:45-12:00 | 24221 | 7.00 | 7.10 | 0 | 7.10 | 0 |
| 12:00-12:15 | 24221 | 7.00 | 7.10 | 0 | 7.10 | 0 |
| 12:15-12:30 | 24221 | 6.15 | 7.10 | 0 | 7.10 | 0 |
| 12:30-12:45 | 24221 | 4.50 | 7.10 | 0 | 7.10 | 0 |
| 12:45-13:00 | 24221 | 4.00 | 7.10 | 0 | 7.10 | 0 |
| 13:00-13:15 | 24221 | 4.00 | 7.10 | 0 | 7.10 | 0 |
| 13:15-13:30 | 24221 | 4.00 | 7.10 | 0 | 7.10 | 0 |
| 13:30-13:45 | 24221 | 4.00 | 7.10 | 0 | 7.10 | 0 |
| 13:45-14:00 | 24221 | 3.95 | 7.10 | 0 | 7.10 | 0 |
| 14:00-14:15 | 24221 | 4.00 | 7.10 | 0 | 7.10 | 0 |
| 14:15-14:30 | 24221 | 4.00 | 7.10 | 0 | 7.10 | 0 |
| 14:30-14:45 | 24221 | 4.20 | 7.10 | 0 | 7.10 | 0 |
| 14:45-15:00 | 24221 | 4.81 | 7.10 | 0 | 7.10 | 0 |

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|---|---|---|---|---|---|---|
| 15:00-15:15 | 24221 | 5.00 | 7.10 | 0 | 7.10 | 0 |
| 15:15-15:30 | 24221 | 4.81 | 7.10 | 0 | 7.10 | 0 |
| 15:30-15:45 | 24221 | 6.51 | 7.10 | 0 | 7.10 | 0 |
| 15:45-16:00 | 24221 | 7.00 | 7.10 | 0 | 7.10 | 0 |
| 16:00-16:15 | 24221 | 7.15 | 7.10 | 0 | 7.10 | 0 |
| 16:15-16:30 | 24221 | 7.15 | 7.10 | 0 | 7.10 | 0 |
| 16:30-16:45 | 24221 | 7.00 | 7.10 | 0 | 7.10 | 0 |
| 16:45-17:00 | 24221 | 10.01 | 7.10 | 3 | 10.10 | 72663 |
| 17:00-17:15 | 24221 | 8.86 | 8.10 | 1 | 9.10 | 24221 |
| 17:15-17:30 | 24221 | 10.96 | 8.10 | 3 | 11.10 | 72663 |
| 17:30-17:45 | 24221 | 12.00 | 8.10 | 4 | 12.10 | 96884 |
| 17:45-18:00 | 24221 | 12.00 | 8.10 | 4 | 12.10 | 96884 |
| 18:00-18:15 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 18:15-18:30 | 24221 | 8.50 | 8.10 | 0 | 8.10 | 0 |
| 18:30-18:45 | 24221 | 8.01 | 8.10 | 0 | 8.10 | 0 |
| 18:45-19:00 | 24221 | 7.15 | 8.10 | 0 | 8.10 | 0 |
| 19:00-19:15 | 24221 | 10.29 | 8.10 | 2 | 10.10 | 48442 |
| 19:15-19:30 | 24221 | 8.01 | 8.10 | 0 | 8.10 | 0 |

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|---|---|---|---|---|---|---|
| 19:30-19:45 | 24221 | 8.49 | 8.10 | 0 | 8.10 | 0 |
| 19:45-20:00 | 24221 | 8.01 | 8.10 | 0 | 8.10 | 0 |
| 20:00-20:15 | 24221 | 8.01 | 8.10 | 0 | 8.10 | 0 |
| 20:15-20:30 | 24221 | 7.97 | 8.10 | 0 | 8.10 | 0 |
| 20:30-20:45 | 24221 | 9.94 | 8.10 | 2 | 10.10 | 48442 |
| 20:45-21:00 | 24221 | 10.39 | 8.10 | 2 | 10.10 | 48442 |
| 21:00-21:15 | 24221 | 8.93 | 8.10 | 1 | 9.10 | 24221 |
| 21:15-21:30 | 24221 | 8.93 | 8.10 | 1 | 9.10 | 24221 |
| 21:30-21:45 | 24221 | 7.97 | 8.10 | 0 | 8.10 | 0 |
| 21:45-22:00 | 24221 | 6.50 | 8.10 | 0 | 8.10 | 0 |
| 22:00-22:15 | 24221 | 5.60 | 8.10 | 0 | 8.10 | 0 |
| 22:15-22:30 | 24221 | 4.95 | 8.10 | 0 | 8.10 | 0 |
| 22:30-22:45 | 24221 | 4.69 | 8.10 | 0 | 8.10 | 0 |
| 22:45-23:00 | 24221 | 4.58 | 8.10 | 0 | 8.10 | 0 |
| 23:00-23:15 | 24221 | 4.29 | 7.10 | 0 | 7.10 | 0 |
| 23:15-23:30 | 24221 | 4.13 | 7.10 | 0 | 7.10 | 0 |
| 23:30-23:45 | 24221 | 3.81 | 7.10 | 0 | 7.10 | 0 |
| 23:45-24:00 | 24221 | 3.74 | 7.10 | 0 | 7.10 | 0 |

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|---|---|---|---|---|---|---|
| | | | | | | 302762 |

| 15-02-23 Time Block | Unit Consumed (kWh) | Market Price | Grid Price | Surcharge | ToU Price | Additional Revenue to UPPCL |
|---|---|---|---|---|---|---|
| | | | | | | |
| 00:00-00:15 | 24221 | 5.00 | 7.10 | 0 | 7.10 | 0 |
| 00:15-00:30 | 24221 | 5.00 | 7.10 | 0 | 7.10 | 0 |
| 00:30-00:45 | 24221 | 5.00 | 7.10 | 0 | 7.10 | 0 |
| 00:45-01:00 | 24221 | 5.00 | 7.10 | 0 | 7.10 | 0 |
| 01:00-01:15 | 24221 | 4.41 | 7.10 | 0 | 7.10 | 0 |
| 01:15-01:30 | 24221 | 4.23 | 7.10 | 0 | 7.10 | 0 |
| 01:30-01:45 | 24221 | 4.23 | 7.10 | 0 | 7.10 | 0 |
| 01:45-02:00 | 24221 | 4.23 | 7.10 | 0 | 7.10 | 0 |
| 02:00-02:15 | 24221 | 3.90 | 7.10 | 0 | 7.10 | 0 |
| 02:15-02:30 | 24221 | 3.90 | 7.10 | 0 | 7.10 | 0 |
| 02:30-02:45 | 24221 | 3.90 | 7.10 | 0 | 7.10 | 0 |
| 02:45-03:00 | 24221 | 3.84 | 7.10 | 0 | 7.10 | 0 |
| 03:00-03:15 | 24221 | 3.77 | 7.10 | 0 | 7.10 | 0 |
| 03:15-03:30 | 24221 | 3.77 | 7.10 | 0 | 7.10 | 0 |
| 03:30-03:45 | 24221 | 3.79 | 7.10 | 0 | 7.10 | 0 |
| 03:45-04:00 | 24221 | 3.84 | 7.10 | 0 | 7.10 | 0 |
| 04:00-04:15 | 24221 | 3.90 | 7.10 | 0 | 7.10 | 0 |
| 04:15-04:30 | 24221 | 4.04 | 7.10 | 0 | 7.10 | 0 |
| 04:30-04:45 | 24221 | 4.23 | 7.10 | 0 | 7.10 | 0 |
| 04:45-05:00 | 24221 | 4.73 | 7.10 | 0 | 7.10 | 0 |
| 05:00-05:15 | 24221 | 5.16 | 6.04 | 0 | 6.04 | 0 |
| 05:15-05:30 | 24221 | 6.50 | 6.04 | 0 | 6.04 | 0 |
| 05:30-05:45 | 24221 | 7.37 | 6.04 | 1 | 7.04 | 24221 |
| 05:45-06:00 | 24221 | 7.60 | 6.04 | 2 | 8.04 | 48442 |
| 06:00-06:15 | 24221 | 11.57 | 6.04 | 0 | 6.04 | 0 |

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|---|---|---|---|---|---|---|
| 06:15-06:30 | 24221 | 12.00 | 6.04 | 0 | 6.04 | 0 |
| 06:30-06:45 | 24221 | 12.00 | 6.04 | 0 | 6.04 | 0 |
| 06:45-07:00 | 24221 | 12.00 | 6.04 | 0 | 6.04 | 0 |
| 07:00-07:15 | 24221 | 12.00 | 6.04 | 0 | 6.04 | 0 |
| 07:15-07:30 | 24221 | 12.00 | 6.04 | 0 | 6.04 | 0 |
| 07:30-07:45 | 24221 | 12.00 | 6.04 | 0 | 6.04 | 0 |
| 07:45-08:00 | 24221 | 12.00 | 6.04 | 0 | 6.04 | 0 |
| 08:00-08:15 | 24221 | 12.00 | 6.04 | 0 | 6.04 | 0 |
| 08:15-08:30 | 24221 | 12.00 | 6.04 | 0 | 6.04 | 0 |
| 08:30-08:45 | 24221 | 12.00 | 6.04 | 0 | 6.04 | 0 |
| 08:45-09:00 | 24221 | 12.00 | 6.04 | 0 | 6.04 | 0 |
| 09:00-09:15 | 24221 | 12.00 | 6.04 | 0 | 6.04 | 0 |
| 09:15-09:30 | 24221 | 12.00 | 6.04 | 0 | 6.04 | 0 |
| 09:30-09:45 | 24221 | 12.00 | 6.04 | 0 | 6.04 | 0 |
| 09:45-10:00 | 24221 | 12.00 | 6.04 | 0 | 6.04 | 0 |
| 10:00-10:15 | 24221 | 12.00 | 6.04 | 0 | 6.04 | 0 |
| 10:15-10:30 | 24221 | 10.07 | 6.04 | 4 | 10.04 | 96884 |
| 10:30-10:45 | 24221 | 8.60 | 6.04 | 3 | 9.04 | 72663 |
| 10:45-11:00 | 24221 | 8.00 | 6.04 | 2 | 8.04 | 48442 |
| 11:00-11:15 | 24221 | 7.52 | 7.10 | 0 | 7.10 | 0 |
| 11:15-11:30 | 24221 | 7.52 | 7.10 | 0 | 7.10 | 0 |
| 11:30-11:45 | 24221 | 7.00 | 7.10 | 0 | 7.10 | 0 |
| 11:45-12:00 | 24221 | 6.75 | 7.10 | 0 | 7.10 | 0 |
| 12:00-12:15 | 24221 | 6.25 | 7.10 | 0 | 7.10 | 0 |
| 12:15-12:30 | 24221 | 5.77 | 7.10 | 0 | 7.10 | 0 |
| 12:30-12:45 | 24221 | 6.07 | 7.10 | 0 | 7.10 | 0 |
| 12:45-13:00 | 24221 | 5.07 | 7.10 | 0 | 7.10 | 0 |
| 13:00-13:15 | 24221 | 4.73 | 7.10 | 0 | 7.10 | 0 |
| 13:15-13:30 | 24221 | 4.40 | 7.10 | 0 | 7.10 | 0 |
| 13:30-13:45 | 24221 | 4.40 | 7.10 | 0 | 7.10 | 0 |

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|---|---|---|---|---|---|---|
| 13:45-14:00 | 24221 | 4.23 | 7.10 | 0 | 7.10 | 0 |
| 14:00-14:15 | 24221 | 4.41 | 7.10 | 0 | 7.10 | 0 |
| 14:15-14:30 | 24221 | 4.40 | 7.10 | 0 | 7.10 | 0 |
| 14:30-14:45 | 24221 | 4.34 | 7.10 | 0 | 7.10 | 0 |
| 14:45-15:00 | 24221 | 4.50 | 7.10 | 0 | 7.10 | 0 |
| 15:00-15:15 | 24221 | 4.41 | 7.10 | 0 | 7.10 | 0 |
| 15:15-15:30 | 24221 | 4.51 | 7.10 | 0 | 7.10 | 0 |
| 15:30-15:45 | 24221 | 4.66 | 7.10 | 0 | 7.10 | 0 |
| 15:45-16:00 | 24221 | 4.95 | 7.10 | 0 | 7.10 | 0 |
| 16:00-16:15 | 24221 | 4.77 | 7.10 | 0 | 7.10 | 0 |
| 16:15-16:30 | 24221 | 6.03 | 7.10 | 0 | 7.10 | 0 |
| 16:30-16:45 | 24221 | 7.60 | 7.10 | 1 | 8.10 | 24221 |
| 16:45-17:00 | 24221 | 9.61 | 7.10 | 3 | 10.10 | 72663 |
| 17:00-17:15 | 24221 | 5.99 | 8.10 | 0 | 8.10 | 0 |
| 17:15-17:30 | 24221 | 5.00 | 8.10 | 0 | 8.10 | 0 |
| 17:30-17:45 | 24221 | 6.21 | 8.10 | 0 | 8.10 | 0 |
| 17:45-18:00 | 24221 | 12.00 | 8.10 | 4 | 12.10 | 96884 |
| 18:00-18:15 | 24221 | 12.00 | 8.10 | 4 | 12.10 | 96884 |
| 18:15-18:30 | 24221 | 12.00 | 8.10 | 4 | 12.10 | 96884 |
| 18:30-18:45 | 24221 | 12.00 | 8.10 | 4 | 12.10 | 96884 |
| 18:45-19:00 | 24221 | 12.00 | 8.10 | 4 | 12.10 | 96884 |
| 19:00-19:15 | 24221 | 12.00 | 8.10 | 4 | 12.10 | 96884 |
| 19:15-19:30 | 24221 | 12.00 | 8.10 | 4 | 12.10 | 96884 |
| 19:30-19:45 | 24221 | 12.00 | 8.10 | 4 | 12.10 | 96884 |
| 19:45-20:00 | 24221 | 12.00 | 8.10 | 4 | 12.10 | 96884 |
| 20:00-20:15 | 24221 | 10.02 | 8.10 | 2 | 10.10 | 48442 |
| 20:15-20:30 | 24221 | 8.60 | 8.10 | 1 | 9.10 | 24221 |
| 20:30-20:45 | 24221 | 8.60 | 8.10 | 1 | 9.10 | 24221 |
| 20:45-21:00 | 24221 | 8.60 | 8.10 | 1 | 9.10 | 24221 |
| 21:00-21:15 | 24221 | 7.60 | 8.10 | 0 | 8.10 | 0 |

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|---|---|---|---|---|---|---|
| 21:15-21:30 | 24221 | 7.60 | 8.10 | 0 | 8.10 | 0 |
| 21:30-21:45 | 24221 | 7.00 | 8.10 | 0 | 8.10 | 0 |
| 21:45-22:00 | 24221 | 7.00 | 8.10 | 0 | 8.10 | 0 |
| 22:00-22:15 | 24221 | 7.00 | 8.10 | 0 | 8.10 | 0 |
| 22:15-22:30 | 24221 | 6.50 | 8.10 | 0 | 8.10 | 0 |
| 22:30-22:45 | 24221 | 5.80 | 8.10 | 0 | 8.10 | 0 |
| 22:45-23:00 | 24221 | 5.80 | 8.10 | 0 | 8.10 | 0 |
| 23:00-23:15 | 24221 | 5.50 | 7.10 | 0 | 7.10 | 0 |
| 23:15-23:30 | 24221 | 5.50 | 7.10 | 0 | 7.10 | 0 |
| 23:30-23:45 | 24221 | 5.04 | 7.10 | 0 | 7.10 | 0 |
| 23:45-24:00 | 24221 | 4.58 | 7.10 | 0 | 7.10 | 0 |
| | | | | | | 345149 |

| 15-03-23 Time Block | Unit Consumed (kWh) | Market Price | Grid Price | Surcharge | ToU Price | Additional Revenue to UPPCL |
|---|---|---|---|---|---|---|
| | | | | | | |
| 00:00-00:15 | 24221 | 7.37 | 7.10 | 0 | 7.10 | 0 |
| 00:15-00:30 | 24221 | 7.00 | 7.10 | 0 | 7.10 | 0 |
| 00:30-00:45 | 24221 | 6.00 | 7.10 | 0 | 7.10 | 0 |
| 00:45-01:00 | 24221 | 5.83 | 7.10 | 0 | 7.10 | 0 |
| 01:00-01:15 | 24221 | 5.05 | 7.10 | 0 | 7.10 | 0 |
| 01:15-01:30 | 24221 | 4.96 | 7.10 | 0 | 7.10 | 0 |
| 01:30-01:45 | 24221 | 4.95 | 7.10 | 0 | 7.10 | 0 |
| 01:45-02:00 | 24221 | 4.95 | 7.10 | 0 | 7.10 | 0 |
| 02:00-02:15 | 24221 | 4.95 | 7.10 | 0 | 7.10 | 0 |
| 02:15-02:30 | 24221 | 4.54 | 7.10 | 0 | 7.10 | 0 |
| 02:30-02:45 | 24221 | 4.54 | 7.10 | 0 | 7.10 | 0 |
| 02:45-03:00 | 24221 | 4.54 | 7.10 | 0 | 7.10 | 0 |
| 03:00-03:15 | 24221 | 4.54 | 7.10 | 0 | 7.10 | 0 |
| 03:15-03:30 | 24221 | 4.54 | 7.10 | 0 | 7.10 | 0 |

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|---|---|---|---|---|---|---|
| 03:30-03:45 | 24221 | 4.54 | 7.10 | 0 | 7.10 | 0 |
| 03:45-04:00 | 24221 | 4.54 | 7.10 | 0 | 7.10 | 0 |
| 04:00-04:15 | 24221 | 4.54 | 7.10 | 0 | 7.10 | 0 |
| 04:15-04:30 | 24221 | 4.96 | 7.10 | 0 | 7.10 | 0 |
| 04:30-04:45 | 24221 | 5.00 | 7.10 | 0 | 7.10 | 0 |
| 04:45-05:00 | 24221 | 5.20 | 7.10 | 0 | 7.10 | 0 |
| 05:00-05:15 | 24221 | 5.50 | 6.04 | 0 | 6.04 | 0 |
| 05:15-05:30 | 24221 | 6.02 | 6.04 | 0 | 6.04 | 0 |
| 05:30-05:45 | 24221 | 6.97 | 6.04 | 1 | 7.04 | 24221 |
| 05:45-06:00 | 24221 | 7.00 | 6.04 | 1 | 7.04 | 24221 |
| 06:00-06:15 | 24221 | 7.37 | 6.04 | 1 | 7.04 | 24221 |
| 06:15-06:30 | 24221 | 7.37 | 6.04 | 1 | 7.04 | 24221 |
| 06:30-06:45 | 24221 | 7.37 | 6.04 | 1 | 7.04 | 24221 |
| 06:45-07:00 | 24221 | 6.49 | 6.04 | 0 | 6.04 | 0 |
| 07:00-07:15 | 24221 | 7.37 | 6.04 | 1 | 7.04 | 24221 |
| 07:15-07:30 | 24221 | 7.37 | 6.04 | 1 | 7.04 | 24221 |
| 07:30-07:45 | 24221 | 6.50 | 6.04 | 0 | 6.04 | 0 |
| 07:45-08:00 | 24221 | 6.50 | 6.04 | 0 | 6.04 | 0 |
| 08:00-08:15 | 24221 | 5.50 | 6.04 | 0 | 6.04 | 0 |
| 08:15-08:30 | 24221 | 5.68 | 6.04 | 0 | 6.04 | 0 |
| 08:30-08:45 | 24221 | 5.68 | 6.04 | 0 | 6.04 | 0 |
| 08:45-09:00 | 24221 | 4.93 | 6.04 | 0 | 6.04 | 0 |
| 09:00-09:15 | 24221 | 5.47 | 6.04 | 0 | 6.04 | 0 |
| 09:15-09:30 | 24221 | 5.61 | 6.04 | 0 | 6.04 | 0 |
| 09:30-09:45 | 24221 | 5.68 | 6.04 | 0 | 6.04 | 0 |
| 09:45-10:00 | 24221 | 5.66 | 6.04 | 0 | 6.04 | 0 |
| 10:00-10:15 | 24221 | 4.54 | 6.04 | 0 | 6.04 | 0 |
| 10:15-10:30 | 24221 | 5.20 | 6.04 | 0 | 6.04 | 0 |
| 10:30-10:45 | 24221 | 5.31 | 6.04 | 0 | 6.04 | 0 |
| 10:45-11:00 | 24221 | 5.02 | 6.04 | 0 | 6.04 | 0 |

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|---|---|---|---|---|---|---|
| 11:00-11:15 | 24221 | 4.93 | 7.10 | 0 | 7.10 | 0 |
| 11:15-11:30 | 24221 | 4.93 | 7.10 | 0 | 7.10 | 0 |
| 11:30-11:45 | 24221 | 4.90 | 7.10 | 0 | 7.10 | 0 |
| 11:45-12:00 | 24221 | 4.90 | 7.10 | 0 | 7.10 | 0 |
| 12:00-12:15 | 24221 | 4.50 | 7.10 | 0 | 7.10 | 0 |
| 12:15-12:30 | 24221 | 4.30 | 7.10 | 0 | 7.10 | 0 |
| 12:30-12:45 | 24221 | 4.25 | 7.10 | 0 | 7.10 | 0 |
| 12:45-13:00 | 24221 | 4.15 | 7.10 | 0 | 7.10 | 0 |
| 13:00-13:15 | 24221 | 3.82 | 7.10 | 0 | 7.10 | 0 |
| 13:15-13:30 | 24221 | 3.62 | 7.10 | 0 | 7.10 | 0 |
| 13:30-13:45 | 24221 | 3.75 | 7.10 | 0 | 7.10 | 0 |
| 13:45-14:00 | 24221 | 3.65 | 7.10 | 0 | 7.10 | 0 |
| 14:00-14:15 | 24221 | 4.15 | 7.10 | 0 | 7.10 | 0 |
| 14:15-14:30 | 24221 | 4.15 | 7.10 | 0 | 7.10 | 0 |
| 14:30-14:45 | 24221 | 4.15 | 7.10 | 0 | 7.10 | 0 |
| 14:45-15:00 | 24221 | 4.30 | 7.10 | 0 | 7.10 | 0 |
| 15:00-15:15 | 24221 | 4.54 | 7.10 | 0 | 7.10 | 0 |
| 15:15-15:30 | 24221 | 4.54 | 7.10 | 0 | 7.10 | 0 |
| 15:30-15:45 | 24221 | 5.27 | 7.10 | 0 | 7.10 | 0 |
| 15:45-16:00 | 24221 | 5.20 | 7.10 | 0 | 7.10 | 0 |
| 16:00-16:15 | 24221 | 5.58 | 7.10 | 0 | 7.10 | 0 |
| 16:15-16:30 | 24221 | 6.70 | 7.10 | 0 | 7.10 | 0 |
| 16:30-16:45 | 24221 | 7.37 | 7.10 | 0 | 7.10 | 0 |
| 16:45-17:00 | 24221 | 7.37 | 7.10 | 0 | 7.10 | 0 |
| 17:00-17:15 | 24221 | 6.95 | 8.10 | 0 | 8.10 | 0 |
| 17:15-17:30 | 24221 | 6.95 | 8.10 | 0 | 8.10 | 0 |
| 17:30-17:45 | 24221 | 6.95 | 8.10 | 0 | 8.10 | 0 |
| 17:45-18:00 | 24221 | 6.00 | 8.10 | 0 | 8.10 | 0 |
| 18:00-18:15 | 24221 | 6.49 | 8.10 | 0 | 8.10 | 0 |
| 18:15-18:30 | 24221 | 7.37 | 8.10 | 0 | 8.10 | 0 |

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|---|---|---|---|---|---|---|
| 18:30-18:45 | 24221 | 9.38 | 8.10 | 1 | 9.10 | 24221 |
| 18:45-19:00 | 24221 | 11.38 | 8.10 | 3 | 11.10 | 72663 |
| 19:00-19:15 | 24221 | 12.00 | 8.10 | 4 | 12.10 | 96884 |
| 19:15-19:30 | 24221 | 12.00 | 8.10 | 4 | 12.10 | 96884 |
| 19:30-19:45 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 19:45-20:00 | 24221 | 9.02 | 8.10 | 1 | 9.10 | 24221 |
| 20:00-20:15 | 24221 | 8.25 | 8.10 | 0 | 8.10 | 0 |
| 20:15-20:30 | 24221 | 8.00 | 8.10 | 0 | 8.10 | 0 |
| 20:30-20:45 | 24221 | 8.00 | 8.10 | 0 | 8.10 | 0 |
| 20:45-21:00 | 24221 | 8.00 | 8.10 | 0 | 8.10 | 0 |
| 21:00-21:15 | 24221 | 8.32 | 8.10 | 0 | 8.10 | 0 |
| 21:15-21:30 | 24221 | 8.57 | 8.10 | 0 | 8.10 | 0 |
| 21:30-21:45 | 24221 | 8.57 | 8.10 | 0 | 8.10 | 0 |
| 21:45-22:00 | 24221 | 8.57 | 8.10 | 0 | 8.10 | 0 |
| 22:00-22:15 | 24221 | 7.37 | 8.10 | 0 | 8.10 | 0 |
| 22:15-22:30 | 24221 | 8.00 | 8.10 | 0 | 8.10 | 0 |
| 22:30-22:45 | 24221 | 8.00 | 8.10 | 0 | 8.10 | 0 |
| 22:45-23:00 | 24221 | 7.80 | 8.10 | 0 | 8.10 | 0 |
| 23:00-23:15 | 24221 | 6.91 | 7.10 | 0 | 7.10 | 0 |
| 23:15-23:30 | 24221 | 6.60 | 7.10 | 0 | 7.10 | 0 |
| 23:30-23:45 | 24221 | 6.57 | 7.10 | 0 | 7.10 | 0 |
| 23:45-24:00 | 24221 | 7.10 | 7.10 | 0 | 7.10 | 0 |
| | | | | | | 133215 |

| 15-04-23 Time Block | | | | | | |
|---|---|---|---|---|---|---|
| | Unit Consumed (kWh) | Market Price | Grid Price | Surcharge | ToU Price | Additional Revenue to UPPCL |
| | | | | | | |
| 00:00-00:15 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| 00:15-00:30 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |

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|---|---|---|---|---|---|---|
| 00:30-00:45 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| 00:45-01:00 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| 01:00-01:15 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| 01:15-01:30 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| 01:30-01:45 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| 01:45-02:00 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| 02:00-02:15 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| 02:15-02:30 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| 02:30-02:45 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| 02:45-03:00 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| 03:00-03:15 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| 03:15-03:30 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| 03:30-03:45 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| 03:45-04:00 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| 04:00-04:15 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| 04:15-04:30 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| 04:30-04:45 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| 04:45-05:00 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |

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| 05:00-05:15 | 24221 | 10.00 | 6.04 | 4 | 10.04 | 96884 |
| 05:15-05:30 | 24221 | 10.00 | 6.04 | 4 | 10.04 | 96884 |
| 05:30-05:45 | 24221 | 10.00 | 6.04 | 4 | 10.04 | 96884 |
| 05:45-06:00 | 24221 | 10.00 | 6.04 | 4 | 10.04 | 96884 |
| 06:00-06:15 | 24221 | 10.00 | 6.04 | 4 | 10.04 | 96884 |
| 06:15-06:30 | 24221 | 10.00 | 6.04 | 4 | 10.04 | 96884 |
| 06:30-06:45 | 24221 | 8.05 | 6.04 | 2 | 8.04 | 48442 |
| 06:45-07:00 | 24221 | 6.98 | 6.04 | 1 | 7.04 | 24221 |
| 07:00-07:15 | 24221 | 6.00 | 6.04 | 0 | 6.04 | 0 |
| 07:15-07:30 | 24221 | 4.54 | 6.04 | 0 | 6.04 | 0 |
| 07:30-07:45 | 24221 | 4.40 | 6.04 | 0 | 6.04 | 0 |
| 07:45-08:00 | 24221 | 4.26 | 6.04 | 0 | 6.04 | 0 |
| 08:00-08:15 | 24221 | 4.08 | 6.04 | 0 | 6.04 | 0 |
| 08:15-08:30 | 24221 | 4.11 | 6.04 | 0 | 6.04 | 0 |
| 08:30-08:45 | 24221 | 4.13 | 6.04 | 0 | 6.04 | 0 |
| 08:45-09:00 | 24221 | 4.08 | 6.04 | 0 | 6.04 | 0 |
| 09:00-09:15 | 24221 | 4.02 | 6.04 | 0 | 6.04 | 0 |
| 09:15-09:30 | 24221 | 4.00 | 6.04 | 0 | 6.04 | 0 |

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| 09:30-09:45 | 24221 | 3.87 | 6.04 | 0 | 6.04 | 0 |
| 09:45-10:00 | 24221 | 3.96 | 6.04 | 0 | 6.04 | 0 |
| 10:00-10:15 | 24221 | 3.62 | 6.04 | 0 | 6.04 | 0 |
| 10:15-10:30 | 24221 | 3.75 | 6.04 | 0 | 6.04 | 0 |
| 10:30-10:45 | 24221 | 3.65 | 6.04 | 0 | 6.04 | 0 |
| 10:45-11:00 | 24221 | 3.62 | 6.04 | 0 | 6.04 | 0 |
| 11:00-11:15 | 24221 | 3.53 | 7.10 | 0 | 7.10 | 0 |
| 11:15-11:30 | 24221 | 3.50 | 7.10 | 0 | 7.10 | 0 |
| 11:30-11:45 | 24221 | 3.40 | 7.10 | 0 | 7.10 | 0 |
| 11:45-12:00 | 24221 | 3.42 | 7.10 | 0 | 7.10 | 0 |
| 12:00-12:15 | 24221 | 3.30 | 7.10 | 0 | 7.10 | 0 |
| 12:15-12:30 | 24221 | 3.30 | 7.10 | 0 | 7.10 | 0 |
| 12:30-12:45 | 24221 | 3.30 | 7.10 | 0 | 7.10 | 0 |
| 12:45-13:00 | 24221 | 3.30 | 7.10 | 0 | 7.10 | 0 |
| 13:00-13:15 | 24221 | 3.05 | 7.10 | 0 | 7.10 | 0 |
| 13:15-13:30 | 24221 | 2.91 | 7.10 | 0 | 7.10 | 0 |
| 13:30-13:45 | 24221 | 3.03 | 7.10 | 0 | 7.10 | 0 |
| 13:45-14:00 | 24221 | 3.10 | 7.10 | 0 | 7.10 | 0 |

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| 14:00-14:15 | 24221 | 3.30 | 7.10 | 0 | 7.10 | 0 |
| 14:15-14:30 | 24221 | 3.33 | 7.10 | 0 | 7.10 | 0 |
| 14:30-14:45 | 24221 | 3.40 | 7.10 | 0 | 7.10 | 0 |
| 14:45-15:00 | 24221 | 3.53 | 7.10 | 0 | 7.10 | 0 |
| 15:00-15:15 | 24221 | 3.57 | 7.10 | 0 | 7.10 | 0 |
| 15:15-15:30 | 24221 | 3.96 | 7.10 | 0 | 7.10 | 0 |
| 15:30-15:45 | 24221 | 4.07 | 7.10 | 0 | 7.10 | 0 |
| 15:45-16:00 | 24221 | 4.13 | 7.10 | 0 | 7.10 | 0 |
| 16:00-16:15 | 24221 | 4.13 | 7.10 | 0 | 7.10 | 0 |
| 16:15-16:30 | 24221 | 4.44 | 7.10 | 0 | 7.10 | 0 |
| 16:30-16:45 | 24221 | 4.60 | 7.10 | 0 | 7.10 | 0 |
| 16:45-17:00 | 24221 | 5.10 | 7.10 | 0 | 7.10 | 0 |
| 17:00-17:15 | 24221 | 5.10 | 8.10 | 0 | 8.10 | 0 |
| 17:15-17:30 | 24221 | 5.10 | 8.10 | 0 | 8.10 | 0 |
| 17:30-17:45 | 24221 | 5.10 | 8.10 | 0 | 8.10 | 0 |
| 17:45-18:00 | 24221 | 7.00 | 8.10 | 0 | 8.10 | 0 |
| 18:00-18:15 | 24221 | 7.60 | 8.10 | 0 | 8.10 | 0 |
| 18:15-18:30 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |

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| 18:30-18:45 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 18:45-19:00 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 19:00-19:15 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 19:15-19:30 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 19:30-19:45 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 19:45-20:00 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 20:00-20:15 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 20:15-20:30 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 20:30-20:45 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 20:45-21:00 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 21:00-21:15 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 21:15-21:30 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 21:30-21:45 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 21:45-22:00 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 22:00-22:15 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 22:15-22:30 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 22:30-22:45 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 22:45-23:00 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |

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| 23:00-23:15 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| 23:15-23:30 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| 23:30-23:45 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| 23:45-24:00 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| | | | | | | 829569 |

| 15-05-23 Time Block | Unit Consumed (kWh) | Market Price | Grid Price | Surcharge | ToU Price | Additional Revenue to UPPCL |
|---|---|---|---|---|---|---|
| | | | | | | |
| 00:00-00:15 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| 00:15-00:30 | 24221 | 9.80 | 7.10 | 3 | 10.10 | 72663 |
| 00:30-00:45 | 24221 | 7.25 | 7.10 | 0 | 7.10 | 0 |
| 00:45-01:00 | 24221 | 5.67 | 7.10 | 0 | 7.10 | 0 |
| 01:00-01:15 | 24221 | 4.55 | 7.10 | 0 | 7.10 | 0 |
| 01:15-01:30 | 24221 | 4.15 | 7.10 | 0 | 7.10 | 0 |
| 01:30-01:45 | 24221 | 4.01 | 7.10 | 0 | 7.10 | 0 |
| 01:45-02:00 | 24221 | 3.70 | 7.10 | 0 | 7.10 | 0 |
| 02:00-02:15 | 24221 | 3.68 | 7.10 | 0 | 7.10 | 0 |
| 02:15-02:30 | 24221 | 3.60 | 7.10 | 0 | 7.10 | 0 |
| 02:30-02:45 | 24221 | 3.50 | 7.10 | 0 | 7.10 | 0 |
| 02:45-03:00 | 24221 | 3.36 | 7.10 | 0 | 7.10 | 0 |
| 03:00-03:15 | 24221 | 3.47 | 7.10 | 0 | 7.10 | 0 |
| 03:15-03:30 | 24221 | 3.23 | 7.10 | 0 | 7.10 | 0 |
| 03:30-03:45 | 24221 | 3.48 | 7.10 | 0 | 7.10 | 0 |
| 03:45-04:00 | 24221 | 3.44 | 7.10 | 0 | 7.10 | 0 |
| 04:00-04:15 | 24221 | 3.00 | 7.10 | 0 | 7.10 | 0 |
| 04:15-04:30 | 24221 | 3.48 | 7.10 | 0 | 7.10 | 0 |

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| 04:30-04:45 | 24221 | 3.55 | 7.10 | 0 | 7.10 | 0 |
| 04:45-05:00 | 24221 | 3.52 | 7.10 | 0 | 7.10 | 0 |
| 05:00-05:15 | 24221 | 3.79 | 6.04 | 0 | 6.04 | 0 |
| 05:15-05:30 | 24221 | 3.60 | 6.04 | 0 | 6.04 | 0 |
| 05:30-05:45 | 24221 | 3.65 | 6.04 | 0 | 6.04 | 0 |
| 05:45-06:00 | 24221 | 3.80 | 6.04 | 0 | 6.04 | 0 |
| 06:00-06:15 | 24221 | 3.85 | 6.04 | 0 | 6.04 | 0 |
| 06:15-06:30 | 24221 | 3.57 | 6.04 | 0 | 6.04 | 0 |
| 06:30-06:45 | 24221 | 3.51 | 6.04 | 0 | 6.04 | 0 |
| 06:45-07:00 | 24221 | 3.50 | 6.04 | 0 | 6.04 | 0 |
| 07:00-07:15 | 24221 | 3.31 | 6.04 | 0 | 6.04 | 0 |
| 07:15-07:30 | 24221 | 3.11 | 6.04 | 0 | 6.04 | 0 |
| 07:30-07:45 | 24221 | 3.20 | 6.04 | 0 | 6.04 | 0 |
| 07:45-08:00 | 24221 | 3.10 | 6.04 | 0 | 6.04 | 0 |
| 08:00-08:15 | 24221 | 3.00 | 6.04 | 0 | 6.04 | 0 |
| 08:15-08:30 | 24221 | 3.10 | 6.04 | 0 | 6.04 | 0 |
| 08:30-08:45 | 24221 | 3.08 | 6.04 | 0 | 6.04 | 0 |
| 08:45-09:00 | 24221 | 3.10 | 6.04 | 0 | 6.04 | 0 |
| 09:00-09:15 | 24221 | 3.00 | 6.04 | 0 | 6.04 | 0 |
| 09:15-09:30 | 24221 | 3.19 | 6.04 | 0 | 6.04 | 0 |
| 09:30-09:45 | 24221 | 3.20 | 6.04 | 0 | 6.04 | 0 |
| 09:45-10:00 | 24221 | 3.40 | 6.04 | 0 | 6.04 | 0 |
| 10:00-10:15 | 24221 | 3.30 | 6.04 | 0 | 6.04 | 0 |
| 10:15-10:30 | 24221 | 3.30 | 6.04 | 0 | 6.04 | 0 |
| 10:30-10:45 | 24221 | 3.40 | 6.04 | 0 | 6.04 | 0 |
| 10:45-11:00 | 24221 | 3.40 | 6.04 | 0 | 6.04 | 0 |
| 11:00-11:15 | 24221 | 3.40 | 7.10 | 0 | 7.10 | 0 |
| 11:15-11:30 | 24221 | 3.40 | 7.10 | 0 | 7.10 | 0 |
| 11:30-11:45 | 24221 | 3.45 | 7.10 | 0 | 7.10 | 0 |
| 11:45-12:00 | 24221 | 3.50 | 7.10 | 0 | 7.10 | 0 |

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|---|---|---|---|---|---|---|
| 12:00-12:15 | 24221 | 3.50 | 7.10 | 0 | 7.10 | 0 |
| 12:15-12:30 | 24221 | 3.50 | 7.10 | 0 | 7.10 | 0 |
| 12:30-12:45 | 24221 | 3.50 | 7.10 | 0 | 7.10 | 0 |
| 12:45-13:00 | 24221 | 3.40 | 7.10 | 0 | 7.10 | 0 |
| 13:00-13:15 | 24221 | 3.40 | 7.10 | 0 | 7.10 | 0 |
| 13:15-13:30 | 24221 | 3.40 | 7.10 | 0 | 7.10 | 0 |
| 13:30-13:45 | 24221 | 3.37 | 7.10 | 0 | 7.10 | 0 |
| 13:45-14:00 | 24221 | 3.40 | 7.10 | 0 | 7.10 | 0 |
| 14:00-14:15 | 24221 | 3.51 | 7.10 | 0 | 7.10 | 0 |
| 14:15-14:30 | 24221 | 3.57 | 7.10 | 0 | 7.10 | 0 |
| 14:30-14:45 | 24221 | 3.60 | 7.10 | 0 | 7.10 | 0 |
| 14:45-15:00 | 24221 | 3.75 | 7.10 | 0 | 7.10 | 0 |
| 15:00-15:15 | 24221 | 4.06 | 7.10 | 0 | 7.10 | 0 |
| 15:15-15:30 | 24221 | 4.06 | 7.10 | 0 | 7.10 | 0 |
| 15:30-15:45 | 24221 | 4.10 | 7.10 | 0 | 7.10 | 0 |
| 15:45-16:00 | 24221 | 4.06 | 7.10 | 0 | 7.10 | 0 |
| 16:00-16:15 | 24221 | 4.50 | 7.10 | 0 | 7.10 | 0 |
| 16:15-16:30 | 24221 | 4.50 | 7.10 | 0 | 7.10 | 0 |
| 16:30-16:45 | 24221 | 4.50 | 7.10 | 0 | 7.10 | 0 |
| 16:45-17:00 | 24221 | 4.50 | 7.10 | 0 | 7.10 | 0 |
| 17:00-17:15 | 24221 | 4.50 | 8.10 | 0 | 8.10 | 0 |
| 17:15-17:30 | 24221 | 4.00 | 8.10 | 0 | 8.10 | 0 |
| 17:30-17:45 | 24221 | 3.56 | 8.10 | 0 | 8.10 | 0 |
| 17:45-18:00 | 24221 | 3.53 | 8.10 | 0 | 8.10 | 0 |
| 18:00-18:15 | 24221 | 3.57 | 8.10 | 0 | 8.10 | 0 |
| 18:15-18:30 | 24221 | 4.44 | 8.10 | 0 | 8.10 | 0 |
| 18:30-18:45 | 24221 | 4.75 | 8.10 | 0 | 8.10 | 0 |
| 18:45-19:00 | 24221 | 4.86 | 8.10 | 0 | 8.10 | 0 |
| 19:00-19:15 | 24221 | 6.21 | 8.10 | 0 | 8.10 | 0 |
| 19:15-19:30 | 24221 | 6.21 | 8.10 | 0 | 8.10 | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 19:30-19:45 | 24221 | 6.21 | 8.10 | 0 | 8.10 | 0 |
| 19:45-20:00 | 24221 | 8.50 | 8.10 | 0 | 8.10 | 0 |
| 20:00-20:15 | 24221 | 7.25 | 8.10 | 0 | 8.10 | 0 |
| 20:15-20:30 | 24221 | 7.25 | 8.10 | 0 | 8.10 | 0 |
| 20:30-20:45 | 24221 | 7.42 | 8.10 | 0 | 8.10 | 0 |
| 20:45-21:00 | 24221 | 8.50 | 8.10 | 0 | 8.10 | 0 |
| 21:00-21:15 | 24221 | 8.00 | 8.10 | 0 | 8.10 | 0 |
| 21:15-21:30 | 24221 | 8.53 | 8.10 | 0 | 8.10 | 0 |
| 21:30-21:45 | 24221 | 8.50 | 8.10 | 0 | 8.10 | 0 |
| 21:45-22:00 | 24221 | 8.53 | 8.10 | 0 | 8.10 | 0 |
| 22:00-22:15 | 24221 | 8.00 | 8.10 | 0 | 8.10 | 0 |
| 22:15-22:30 | 24221 | 9.80 | 8.10 | 2 | 10.10 | 48442 |
| 22:30-22:45 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 22:45-23:00 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 23:00-23:15 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| 23:15-23:30 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| 23:30-23:45 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| 23:45-24:00 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| | | | | | | 145326 |

| 15-06-23 Time Block | Unit Consumed (kWh) | Market Price | Grid Price | Surcharge | ToU Price | Additional Revenue to UPPCL |
|---|---|---|---|---|---|---|
| | | | | | | |
| 00:00-00:15 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| 00:15-00:30 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| 00:30-00:45 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| 00:45-01:00 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| 01:00-01:15 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| 01:15-01:30 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| 01:30-01:45 | 24221 | 7.17 | 7.10 | 0 | 7.10 | 0 |

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|---|---|---|---|---|---|---|
| 01:45-02:00 | 24221 | 6.50 | 7.10 | 0 | 7.10 | 0 |
| 02:00-02:15 | 24221 | 6.21 | 7.10 | 0 | 7.10 | 0 |
| 02:15-02:30 | 24221 | 6.00 | 7.10 | 0 | 7.10 | 0 |
| 02:30-02:45 | 24221 | 5.75 | 7.10 | 0 | 7.10 | 0 |
| 02:45-03:00 | 24221 | 5.53 | 7.10 | 0 | 7.10 | 0 |
| 03:00-03:15 | 24221 | 5.97 | 7.10 | 0 | 7.10 | 0 |
| 03:15-03:30 | 24221 | 5.97 | 7.10 | 0 | 7.10 | 0 |
| 03:30-03:45 | 24221 | 5.73 | 7.10 | 0 | 7.10 | 0 |
| 03:45-04:00 | 24221 | 5.75 | 7.10 | 0 | 7.10 | 0 |
| 04:00-04:15 | 24221 | 5.51 | 7.10 | 0 | 7.10 | 0 |
| 04:15-04:30 | 24221 | 5.53 | 7.10 | 0 | 7.10 | 0 |
| 04:30-04:45 | 24221 | 5.75 | 7.10 | 0 | 7.10 | 0 |
| 04:45-05:00 | 24221 | 5.51 | 7.10 | 0 | 7.10 | 0 |
| 05:00-05:15 | 24221 | 5.97 | 6.04 | 0 | 6.04 | 0 |
| 05:15-05:30 | 24221 | 5.51 | 6.04 | 0 | 6.04 | 0 |
| 05:30-05:45 | 24221 | 5.51 | 6.04 | 0 | 6.04 | 0 |
| 05:45-06:00 | 24221 | 5.51 | 6.04 | 0 | 6.04 | 0 |
| 06:00-06:15 | 24221 | 4.24 | 6.04 | 0 | 6.04 | 0 |
| 06:15-06:30 | 24221 | 4.00 | 6.04 | 0 | 6.04 | 0 |
| 06:30-06:45 | 24221 | 3.66 | 6.04 | 0 | 6.04 | 0 |
| 06:45-07:00 | 24221 | 3.50 | 6.04 | 0 | 6.04 | 0 |
| 07:00-07:15 | 24221 | 3.15 | 6.04 | 0 | 6.04 | 0 |
| 07:15-07:30 | 24221 | 3.00 | 6.04 | 0 | 6.04 | 0 |
| 07:30-07:45 | 24221 | 2.60 | 6.04 | 0 | 6.04 | 0 |
| 07:45-08:00 | 24221 | 2.28 | 6.04 | 0 | 6.04 | 0 |
| 08:00-08:15 | 24221 | 2.00 | 6.04 | 0 | 6.04 | 0 |
| 08:15-08:30 | 24221 | 2.00 | 6.04 | 0 | 6.04 | 0 |
| 08:30-08:45 | 24221 | 2.00 | 6.04 | 0 | 6.04 | 0 |
| 08:45-09:00 | 24221 | 2.00 | 6.04 | 0 | 6.04 | 0 |
| 09:00-09:15 | 24221 | 2.00 | 6.04 | 0 | 6.04 | 0 |

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|---|---|---|---|---|---|---|
| 09:15-09:30 | 24221 | 2.00 | 6.04 | 0 | 6.04 | 0 |
| 09:30-09:45 | 24221 | 2.00 | 6.04 | 0 | 6.04 | 0 |
| 09:45-10:00 | 24221 | 2.00 | 6.04 | 0 | 6.04 | 0 |
| 10:00-10:15 | 24221 | 2.00 | 6.04 | 0 | 6.04 | 0 |
| 10:15-10:30 | 24221 | 2.00 | 6.04 | 0 | 6.04 | 0 |
| 10:30-10:45 | 24221 | 2.28 | 6.04 | 0 | 6.04 | 0 |
| 10:45-11:00 | 24221 | 2.70 | 6.04 | 0 | 6.04 | 0 |
| 11:00-11:15 | 24221 | 2.38 | 7.10 | 0 | 7.10 | 0 |
| 11:15-11:30 | 24221 | 2.70 | 7.10 | 0 | 7.10 | 0 |
| 11:30-11:45 | 24221 | 2.90 | 7.10 | 0 | 7.10 | 0 |
| 11:45-12:00 | 24221 | 2.95 | 7.10 | 0 | 7.10 | 0 |
| 12:00-12:15 | 24221 | 2.35 | 7.10 | 0 | 7.10 | 0 |
| 12:15-12:30 | 24221 | 2.38 | 7.10 | 0 | 7.10 | 0 |
| 12:30-12:45 | 24221 | 2.28 | 7.10 | 0 | 7.10 | 0 |
| 12:45-13:00 | 24221 | 2.27 | 7.10 | 0 | 7.10 | 0 |
| 13:00-13:15 | 24221 | 2.38 | 7.10 | 0 | 7.10 | 0 |
| 13:15-13:30 | 24221 | 2.38 | 7.10 | 0 | 7.10 | 0 |
| 13:30-13:45 | 24221 | 2.70 | 7.10 | 0 | 7.10 | 0 |
| 13:45-14:00 | 24221 | 2.38 | 7.10 | 0 | 7.10 | 0 |
| 14:00-14:15 | 24221 | 3.30 | 7.10 | 0 | 7.10 | 0 |
| 14:15-14:30 | 24221 | 3.35 | 7.10 | 0 | 7.10 | 0 |
| 14:30-14:45 | 24221 | 3.50 | 7.10 | 0 | 7.10 | 0 |
| 14:45-15:00 | 24221 | 3.61 | 7.10 | 0 | 7.10 | 0 |
| 15:00-15:15 | 24221 | 3.66 | 7.10 | 0 | 7.10 | 0 |
| 15:15-15:30 | 24221 | 3.72 | 7.10 | 0 | 7.10 | 0 |
| 15:30-15:45 | 24221 | 3.70 | 7.10 | 0 | 7.10 | 0 |
| 15:45-16:00 | 24221 | 3.72 | 7.10 | 0 | 7.10 | 0 |
| 16:00-16:15 | 24221 | 3.66 | 7.10 | 0 | 7.10 | 0 |
| 16:15-16:30 | 24221 | 3.78 | 7.10 | 0 | 7.10 | 0 |
| 16:30-16:45 | 24221 | 3.72 | 7.10 | 0 | 7.10 | 0 |

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|---|---|---|---|---|---|---|
| 16:45-17:00 | 24221 | 3.65 | 7.10 | 0 | 7.10 | 0 |
| 17:00-17:15 | 24221 | 3.66 | 8.10 | 0 | 8.10 | 0 |
| 17:15-17:30 | 24221 | 3.61 | 8.10 | 0 | 8.10 | 0 |
| 17:30-17:45 | 24221 | 3.61 | 8.10 | 0 | 8.10 | 0 |
| 17:45-18:00 | 24221 | 3.61 | 8.10 | 0 | 8.10 | 0 |
| 18:00-18:15 | 24221 | 4.02 | 8.10 | 0 | 8.10 | 0 |
| 18:15-18:30 | 24221 | 4.24 | 8.10 | 0 | 8.10 | 0 |
| 18:30-18:45 | 24221 | 4.50 | 8.10 | 0 | 8.10 | 0 |
| 18:45-19:00 | 24221 | 5.00 | 8.10 | 0 | 8.10 | 0 |
| 19:00-19:15 | 24221 | 6.00 | 8.10 | 0 | 8.10 | 0 |
| 19:15-19:30 | 24221 | 6.45 | 8.10 | 0 | 8.10 | 0 |
| 19:30-19:45 | 24221 | 7.17 | 8.10 | 0 | 8.10 | 0 |
| 19:45-20:00 | 24221 | 6.50 | 8.10 | 0 | 8.10 | 0 |
| 20:00-20:15 | 24221 | 6.50 | 8.10 | 0 | 8.10 | 0 |
| 20:15-20:30 | 24221 | 8.20 | 8.10 | 0 | 8.10 | 0 |
| 20:30-20:45 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 20:45-21:00 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 21:00-21:15 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 21:15-21:30 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 21:30-21:45 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 21:45-22:00 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 22:00-22:15 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 22:15-22:30 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 22:30-22:45 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 22:45-23:00 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 23:00-23:15 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| 23:15-23:30 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| 23:30-23:45 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| 23:45-24:00 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| | | | | | | 302762 |

| 15-07-23 Time Block | Unit Consumed (kWh) | Market Price | Grid Price | Surcharge | ToU Price | Additional Revenue to UPPCL |
|---|---|---|---|---|---|---|
| 00:00-00:15 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| 00:15-00:30 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| 00:30-00:45 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| 00:45-01:00 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| 01:00-01:15 | 24221 | 7.50 | 7.10 | 0 | 7.10 | 0 |
| 01:15-01:30 | 24221 | 5.97 | 7.10 | 0 | 7.10 | 0 |
| 01:30-01:45 | 24221 | 6.11 | 7.10 | 0 | 7.10 | 0 |
| 01:45-02:00 | 24221 | 5.50 | 7.10 | 0 | 7.10 | 0 |
| 02:00-02:15 | 24221 | 5.04 | 7.10 | 0 | 7.10 | 0 |
| 02:15-02:30 | 24221 | 4.77 | 7.10 | 0 | 7.10 | 0 |
| 02:30-02:45 | 24221 | 4.50 | 7.10 | 0 | 7.10 | 0 |
| 02:45-03:00 | 24221 | 4.25 | 7.10 | 0 | 7.10 | 0 |
| 03:00-03:15 | 24221 | 4.21 | 7.10 | 0 | 7.10 | 0 |
| 03:15-03:30 | 24221 | 4.21 | 7.10 | 0 | 7.10 | 0 |
| 03:30-03:45 | 24221 | 4.06 | 7.10 | 0 | 7.10 | 0 |
| 03:45-04:00 | 24221 | 4.00 | 7.10 | 0 | 7.10 | 0 |
| 04:00-04:15 | 24221 | 4.06 | 7.10 | 0 | 7.10 | 0 |
| 04:15-04:30 | 24221 | 4.21 | 7.10 | 0 | 7.10 | 0 |
| 04:30-04:45 | 24221 | 4.24 | 7.10 | 0 | 7.10 | 0 |
| 04:45-05:00 | 24221 | 4.25 | 7.10 | 0 | 7.10 | 0 |
| 05:00-05:15 | 24221 | 4.24 | 6.04 | 0 | 6.04 | 0 |
| 05:15-05:30 | 24221 | 4.77 | 6.04 | 0 | 6.04 | 0 |
| 05:30-05:45 | 24221 | 5.50 | 6.04 | 0 | 6.04 | 0 |
| 05:45-06:00 | 24221 | 6.50 | 6.04 | 0 | 6.04 | 0 |
| 06:00-06:15 | 24221 | 6.00 | 6.04 | 0 | 6.04 | 0 |
| 06:15-06:30 | 24221 | 6.50 | 6.04 | 0 | 6.04 | 0 |

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|---|---|---|---|---|---|---|
| 06:30-06:45 | 24221 | 6.50 | 6.04 | 0 | 6.04 | 0 |
| 06:45-07:00 | 24221 | 6.00 | 6.04 | 0 | 6.04 | 0 |
| 07:00-07:15 | 24221 | 5.09 | 6.04 | 0 | 6.04 | 0 |
| 07:15-07:30 | 24221 | 4.06 | 6.04 | 0 | 6.04 | 0 |
| 07:30-07:45 | 24221 | 3.57 | 6.04 | 0 | 6.04 | 0 |
| 07:45-08:00 | 24221 | 3.48 | 6.04 | 0 | 6.04 | 0 |
| 08:00-08:15 | 24221 | 3.31 | 6.04 | 0 | 6.04 | 0 |
| 08:15-08:30 | 24221 | 3.30 | 6.04 | 0 | 6.04 | 0 |
| 08:30-08:45 | 24221 | 3.22 | 6.04 | 0 | 6.04 | 0 |
| 08:45-09:00 | 24221 | 3.22 | 6.04 | 0 | 6.04 | 0 |
| 09:00-09:15 | 24221 | 3.32 | 6.04 | 0 | 6.04 | 0 |
| 09:15-09:30 | 24221 | 3.32 | 6.04 | 0 | 6.04 | 0 |
| 09:30-09:45 | 24221 | 3.34 | 6.04 | 0 | 6.04 | 0 |
| 09:45-10:00 | 24221 | 3.48 | 6.04 | 0 | 6.04 | 0 |
| 10:00-10:15 | 24221 | 3.34 | 6.04 | 0 | 6.04 | 0 |
| 10:15-10:30 | 24221 | 3.33 | 6.04 | 0 | 6.04 | 0 |
| 10:30-10:45 | 24221 | 3.33 | 6.04 | 0 | 6.04 | 0 |
| 10:45-11:00 | 24221 | 3.32 | 6.04 | 0 | 6.04 | 0 |
| 11:00-11:15 | 24221 | 3.44 | 7.10 | 0 | 7.10 | 0 |
| 11:15-11:30 | 24221 | 3.33 | 7.10 | 0 | 7.10 | 0 |
| 11:30-11:45 | 24221 | 3.37 | 7.10 | 0 | 7.10 | 0 |
| 11:45-12:00 | 24221 | 3.37 | 7.10 | 0 | 7.10 | 0 |
| 12:00-12:15 | 24221 | 3.32 | 7.10 | 0 | 7.10 | 0 |
| 12:15-12:30 | 24221 | 3.31 | 7.10 | 0 | 7.10 | 0 |
| 12:30-12:45 | 24221 | 3.32 | 7.10 | 0 | 7.10 | 0 |
| 12:45-13:00 | 24221 | 3.31 | 7.10 | 0 | 7.10 | 0 |
| 13:00-13:15 | 24221 | 3.31 | 7.10 | 0 | 7.10 | 0 |
| 13:15-13:30 | 24221 | 3.26 | 7.10 | 0 | 7.10 | 0 |
| 13:30-13:45 | 24221 | 3.31 | 7.10 | 0 | 7.10 | 0 |
| 13:45-14:00 | 24221 | 3.32 | 7.10 | 0 | 7.10 | 0 |

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|---|---|---|---|---|---|---|
| 14:00-14:15 | 24221 | 3.33 | 7.10 | 0 | 7.10 | 0 |
| 14:15-14:30 | 24221 | 3.41 | 7.10 | 0 | 7.10 | 0 |
| 14:30-14:45 | 24221 | 3.44 | 7.10 | 0 | 7.10 | 0 |
| 14:45-15:00 | 24221 | 3.47 | 7.10 | 0 | 7.10 | 0 |
| 15:00-15:15 | 24221 | 3.48 | 7.10 | 0 | 7.10 | 0 |
| 15:15-15:30 | 24221 | 3.48 | 7.10 | 0 | 7.10 | 0 |
| 15:30-15:45 | 24221 | 3.48 | 7.10 | 0 | 7.10 | 0 |
| 15:45-16:00 | 24221 | 3.48 | 7.10 | 0 | 7.10 | 0 |
| 16:00-16:15 | 24221 | 3.48 | 7.10 | 0 | 7.10 | 0 |
| 16:15-16:30 | 24221 | 3.48 | 7.10 | 0 | 7.10 | 0 |
| 16:30-16:45 | 24221 | 3.47 | 7.10 | 0 | 7.10 | 0 |
| 16:45-17:00 | 24221 | 3.48 | 7.10 | 0 | 7.10 | 0 |
| 17:00-17:15 | 24221 | 3.50 | 8.10 | 0 | 8.10 | 0 |
| 17:15-17:30 | 24221 | 3.50 | 8.10 | 0 | 8.10 | 0 |
| 17:30-17:45 | 24221 | 3.56 | 8.10 | 0 | 8.10 | 0 |
| 17:45-18:00 | 24221 | 3.94 | 8.10 | 0 | 8.10 | 0 |
| 18:00-18:15 | 24221 | 4.00 | 8.10 | 0 | 8.10 | 0 |
| 18:15-18:30 | 24221 | 4.49 | 8.10 | 0 | 8.10 | 0 |
| 18:30-18:45 | 24221 | 5.50 | 8.10 | 0 | 8.10 | 0 |
| 18:45-19:00 | 24221 | 9.00 | 8.10 | 1 | 9.10 | 24221 |
| 19:00-19:15 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 19:15-19:30 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 19:30-19:45 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 19:45-20:00 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 20:00-20:15 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 20:15-20:30 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 20:30-20:45 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 20:45-21:00 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 21:00-21:15 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 21:15-21:30 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |

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|---|---|---|---|---|---|---|
| 21:30-21:45 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 21:45-22:00 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 22:00-22:15 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 22:15-22:30 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 22:30-22:45 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 22:45-23:00 | 24221 | 10.00 | 8.10 | 2 | 10.10 | 48442 |
| 23:00-23:15 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| 23:15-23:30 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| 23:30-23:45 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| 23:45-24:00 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| | | | | | | 345149 |

| 21-08-23 Time Block | Unit Consumed (kWh) | Market Price | Grid Price | Surcharge | ToU Price | Additional Revenue to UPPCL |
|---|---|---|---|---|---|---|
| | | | | | | |
| 00:00-00:15 | 24221 | 10 | 7.10 | 3 | 10.10 | 72663 |
| 00:15-00:30 | 24221 | 10 | 7.10 | 3 | 10.10 | 72663 |
| 00:30-00:45 | 24221 | 10 | 7.10 | 3 | 10.10 | 72663 |
| 00:45-01:00 | 24221 | 10 | 7.10 | 3 | 10.10 | 72663 |
| 01:00-01:15 | 24221 | 10 | 7.10 | 3 | 10.10 | 72663 |
| 01:15-01:30 | 24221 | 10 | 7.10 | 3 | 10.10 | 72663 |
| 01:30-01:45 | 24221 | 10 | 7.10 | 3 | 10.10 | 72663 |
| 01:45-02:00 | 24221 | 10 | 7.10 | 3 | 10.10 | 72663 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 02:00-02:15 | 24221 | 10 | 7.10 | 3 | 10.10 | 72663 |
| 02:15-02:30 | 24221 | 10 | 7.10 | 3 | 10.10 | 72663 |
| 02:30-02:45 | 24221 | 10 | 7.10 | 3 | 10.10 | 72663 |
| 02:45-03:00 | 24221 | 10 | 7.10 | 3 | 10.10 | 72663 |
| 03:00-03:15 | 24221 | 10 | 7.10 | 3 | 10.10 | 72663 |
| 03:15-03:30 | 24221 | 10 | 7.10 | 3 | 10.10 | 72663 |
| 03:30-03:45 | 24221 | 7.52908 | 7.10 | 0 | 7.10 | 0 |
| 03:45-04:00 | 24221 | 7.00052 | 7.10 | 0 | 7.10 | 0 |
| 04:00-04:15 | 24221 | 6.99995 | 7.10 | 0 | 7.10 | 0 |
| 04:15-04:30 | 24221 | 9.79963 | 7.10 | 3 | 10.10 | 72663 |
| 04:30-04:45 | 24221 | 10 | 7.10 | 3 | 10.10 | 72663 |
| 04:45-05:00 | 24221 | 10 | 7.10 | 3 | 10.10 | 72663 |
| 05:00-05:15 | 24221 | 6.51021 | 6.04 | 0 | 6.04 | 0 |
| 05:15-05:30 | 24221 | 6.51051 | 6.04 | 0 | 6.04 | 0 |
| 05:30-05:45 | 24221 | 6.51099 | 6.04 | 0 | 6.04 | 0 |
| 05:45-06:00 | 24221 | 8.5001 | 6.04 | 2 | 8.04 | 48442 |
| 06:00-06:15 | 24221 | 8.51098 | 6.04 | 2 | 8.04 | 48442 |
| 06:15-06:30 | 24221 | 10 | 6.04 | 4 | 10.04 | 96884 |

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|---|---|---|---|---|---|---|
| 06:30-06:45 | 24221 | 10 | 6.04 | 4 | 10.04 | 96884 |
| 06:45-07:00 | 24221 | 10 | 6.04 | 4 | 10.04 | 96884 |
| 07:00-07:15 | 24221 | 10 | 6.04 | 4 | 10.04 | 96884 |
| 07:15-07:30 | 24221 | 10 | 6.04 | 4 | 10.04 | 96884 |
| 07:30-07:45 | 24221 | 10 | 6.04 | 4 | 10.04 | 96884 |
| 07:45-08:00 | 24221 | 10 | 6.04 | 4 | 10.04 | 96884 |
| 08:00-08:15 | 24221 | 10 | 6.04 | 4 | 10.04 | 96884 |
| 08:15-08:30 | 24221 | 6.01085 | 6.04 | 0 | 6.04 | 0 |
| 08:30-08:45 | 24221 | 5.58965 | 6.04 | 0 | 6.04 | 0 |
| 08:45-09:00 | 24221 | 5.62509 | 6.04 | 0 | 6.04 | 0 |
| 09:00-09:15 | 24221 | 5.74099 | 6.04 | 0 | 6.04 | 0 |
| 09:15-09:30 | 24221 | 5.74397 | 6.04 | 0 | 6.04 | 0 |
| 09:30-09:45 | 24221 | 5.78339 | 6.04 | 0 | 6.04 | 0 |
| 09:45-10:00 | 24221 | 5.84126 | 6.04 | 0 | 6.04 | 0 |
| 10:00-10:15 | 24221 | 5.59464 | 6.04 | 0 | 6.04 | 0 |
| 10:15-10:30 | 24221 | 5.49496 | 6.04 | 0 | 6.04 | 0 |
| 10:30-10:45 | 24221 | 5.22733 | 6.04 | 0 | 6.04 | 0 |
| 10:45-11:00 | 24221 | 5.39707 | 6.04 | 0 | 6.04 | 0 |

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|---|---|---|---|---|---|---|
| 11:00-11:15 | 24221 | 5.1353 | 7.10 | 0 | 7.10 | 0 |
| 11:15-11:30 | 24221 | 4.99952 | 7.10 | 0 | 7.10 | 0 |
| 11:30-11:45 | 24221 | 5.13568 | 7.10 | 0 | 7.10 | 0 |
| 11:45-12:00 | 24221 | 4.97053 | 7.10 | 0 | 7.10 | 0 |
| 12:00-12:15 | 24221 | 4.71 | 7.10 | 0 | 7.10 | 0 |
| 12:15-12:30 | 24221 | 4.70957 | 7.10 | 0 | 7.10 | 0 |
| 12:30-12:45 | 24221 | 4.78856 | 7.10 | 0 | 7.10 | 0 |
| 12:45-13:00 | 24221 | 4.78848 | 7.10 | 0 | 7.10 | 0 |
| 13:00-13:15 | 24221 | 4.54156 | 7.10 | 0 | 7.10 | 0 |
| 13:15-13:30 | 24221 | 4.50024 | 7.10 | 0 | 7.10 | 0 |
| 13:30-13:45 | 24221 | 4.64697 | 7.10 | 0 | 7.10 | 0 |
| 13:45-14:00 | 24221 | 4.65029 | 7.10 | 0 | 7.10 | 0 |
| 14:00-14:15 | 24221 | 5.26919 | 7.10 | 0 | 7.10 | 0 |
| 14:15-14:30 | 24221 | 5.7008 | 7.10 | 0 | 7.10 | 0 |
| 14:30-14:45 | 24221 | 5.95078 | 7.10 | 0 | 7.10 | 0 |
| 14:45-15:00 | 24221 | 6.25464 | 7.10 | 0 | 7.10 | 0 |
| 15:00-15:15 | 24221 | 6.34711 | 7.10 | 0 | 7.10 | 0 |
| 15:15-15:30 | 24221 | 6.79367 | 7.10 | 0 | 7.10 | 0 |

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|---|---|---|---|---|---|---|
| 15:30-15:45 | 24221 | 7.08084 | 7.10 | 0 | 7.10 | 0 |
| 15:45-16:00 | 24221 | 7.41066 | 7.10 | 0 | 7.10 | 0 |
| 16:00-16:15 | 24221 | 7.08509 | 7.10 | 0 | 7.10 | 0 |
| 16:15-16:30 | 24221 | 7.47925 | 7.10 | 0 | 7.10 | 0 |
| 16:30-16:45 | 24221 | 7.37487 | 7.10 | 0 | 7.10 | 0 |
| 16:45-17:00 | 24221 | 7.0029 | 7.10 | 0 | 7.10 | 0 |
| 17:00-17:15 | 24221 | 6.81047 | 8.10 | 0 | 8.10 | 0 |
| 17:15-17:30 | 24221 | 6.62777 | 8.10 | 0 | 8.10 | 0 |
| 17:30-17:45 | 24221 | 5.93856 | 8.10 | 0 | 8.10 | 0 |
| 17:45-18:00 | 24221 | 6.38727 | 8.10 | 0 | 8.10 | 0 |
| 18:00-18:15 | 24221 | 8.21014 | 8.10 | 0 | 8.10 | 0 |
| 18:15-18:30 | 24221 | 10 | 8.10 | 2 | 10.10 | 48442 |
| 18:30-18:45 | 24221 | 10 | 8.10 | 2 | 10.10 | 48442 |
| 18:45-19:00 | 24221 | 10 | 8.10 | 2 | 10.10 | 48442 |
| 19:00-19:15 | 24221 | 10 | 8.10 | 2 | 10.10 | 48442 |
| 19:15-19:30 | 24221 | 10 | 8.10 | 2 | 10.10 | 48442 |
| 19:30-19:45 | 24221 | 10 | 8.10 | 2 | 10.10 | 48442 |
| 19:45-20:00 | 24221 | 10 | 8.10 | 2 | 10.10 | 48442 |

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|---|---|---|---|---|---|---|
| 20:00-20:15 | 24221 | 10 | 8.10 | 2 | 10.10 | 48442 |
| 20:15-20:30 | 24221 | 10 | 8.10 | 2 | 10.10 | 48442 |
| 20:30-20:45 | 24221 | 10 | 8.10 | 2 | 10.10 | 48442 |
| 20:45-21:00 | 24221 | 10 | 8.10 | 2 | 10.10 | 48442 |
| 21:00-21:15 | 24221 | 10 | 8.10 | 2 | 10.10 | 48442 |
| 21:15-21:30 | 24221 | 10 | 8.10 | 2 | 10.10 | 48442 |
| 21:30-21:45 | 24221 | 10 | 8.10 | 2 | 10.10 | 48442 |
| 21:45-22:00 | 24221 | 10 | 8.10 | 2 | 10.10 | 48442 |
| 22:00-22:15 | 24221 | 10 | 8.10 | 2 | 10.10 | 48442 |
| 22:15-22:30 | 24221 | 10 | 8.10 | 2 | 10.10 | 48442 |
| 22:30-22:45 | 24221 | 10 | 8.10 | 2 | 10.10 | 48442 |
| 22:45-23:00 | 24221 | 10 | 8.10 | 2 | 10.10 | 48442 |
| 23:00-23:15 | 24221 | 10 | 7.10 | 3 | 10.10 | 72663 |
| 23:15-23:30 | 24221 | 10 | 7.10 | 3 | 10.10 | 72663 |
| 23:30-23:45 | 24221 | 10 | 7.10 | 3 | 10.10 | 72663 |
| 23:45-24:00 | 24221 | 10.00 | 7.10 | 3 | 10.10 | 72663 |
| | | | | | | 829569 |