

DOCKETED

Docket Number:	23-LMS-01
Project Title:	Load Management Standards Implementation
TN #:	253402
Document Title:	Sacramento Municipal Utility District Comments - SMUD's Load Management Standard (LMS) Compliance Plan (Attachment A)
Description:	N/A
Filer:	System
Organization:	Sacramento Municipal Utility District
Submitter Role:	Public Agency
Submission Date:	11/30/2023 1:24:40 PM
Docketed Date:	11/30/2023

*Comment Received From: Sacramento Municipal Utility District
Submitted On: 11/30/2023
Docket Number: 23-LMS-01*

SMUD's Load Management Standard (LMS) Compliance Plan

SMUD's Load Management Standard (LMS) Compliance Plan

Additional submitted attachment is included below.

Load Management Standard Compliance Plan

September 29, 2023

A Sacramento Municipal Utility District Publication

Load Management Standard Compliance Plan

September 29, 2023

Prepared by: Sacramento Municipal Utility District's

Revenue Strategy Department

Under the direction of: Paul Lau, CEO & General Manager

1	Executive Summary	5
2	Introduction	7
2.1	About SMUD	7
2.1.1	SMUD’s Zero Carbon Plan	7
2.1.2	Role of Load Flexibility	8
2.1.3	SMUD’s ADMS/DERMS Platform	8
2.2	Load Management Standards	8
2.2.1	SMUD’s Compliance Plan Roadmap	9
2.2.2	SMUD’s Compliance Plan Administration	10
3	Access to Price Signals	12
3.1	Publication of Machine-Readable Rates in MIDAS.....	12
3.1.1	Upload of time-dependent rates.....	12
3.1.2	Provide RINs to Customers.....	13
3.1.3	Statewide RIN Access Tool.....	13
4	Dynamic Rates.....	15
4.1	Overview of Current Time-Dependent Rates.....	15
4.1.1	Residential Rates	15
4.1.2	Commercial and Industrial (C&I) Time of Day Rates	17
4.1.3	Agricultural Time of Day (TOD) Rate	17
4.2	SMUD’s Rate Development Process.....	17
4.2.1	Strategic Direction on Competitive Rates	17
4.2.2	Rate Design and Implementation.....	18
4.3	Evaluation of New Dynamic Rates	21
4.3.1	Cost Effectiveness Evaluation	21
4.3.2	Equity	28
4.3.3	Technological Feasibility.....	29
4.3.4	Benefits to the Grid and Customers.....	32
4.3.5	Compliance Approach	35
5	Load Flexibility Programs	36
5.1	Overview of SMUD Load Flexibility Programs.....	36
5.1.1	Residential Programs.....	37
5.1.2	Nonresidential Programs.....	38
5.2	Evaluation of Programs	40

5.2.1	Cost-Effectiveness	40
5.2.2	Equity	43
5.2.3	Technological Feasibility.....	44
5.2.4	Benefits to the Grid and Customers.....	45
5.2.5	Compliance Approach	46
6	Public Information Program	47
6.1	SMUD’s Communications Approach	47
6.2	Current Outreach and Marketing.....	47
6.3	Compliance Approach	50
7	Delay and Modification of Compliance Requirements	51
7.1	Providing RINs to Customers.....	51
7.2	Statewide RIN Access Tool	51
7.2.1	Development of Statewide Tool.....	51
7.2.2	Implementation of Statewide Tool.....	52
7.3	Dynamic Rates.....	52
7.4	Dynamic Response Load Flexibility Programs	53
7.4.1	Identification of Cost-Effective Load Flexibility Programs	53
7.4.2	Voluntary Participation in Cost-Effective Load Flexibility Programs.....	53
Appendix A	55

1 Executive Summary

The goal of the California Energy Commission's (CEC) Load Management Standard (LMS) regulation, which went into effect in April of 2023, is to: 1) encourage the use of energy at off-peak hours; 2) promote load flexibility; 3) encourage the control of daily and seasonal peak loads to improve electric system efficiency and reliability; 4) lessen or delay the need for new electrical capacity; and, 5) reduce fossil fuel consumption and greenhouse gas emissions.

To accomplish these goals, the LMS regulation requires California's Large Investor Owned Utilities (IOUs), Large Publicly Owned Utilities (POUs), defined as SMUD and the Los Angeles Department of Water and Power, and Large Community Choice Aggregators (CCAs) to develop and propose rate structures that change at least hourly based upon marginal costs. If, after performing an evaluation, a utility determines not to propose new rates because offering such rates to its customers would not materially reduce peak load, the utility must offer cost-effective load flexibility programs, including programs that allow its customers to automatically respond to hourly or sub-hourly marginal cost-based rates, marginal prices, or greenhouse gas (GHG) signals from the CEC-maintained Market Informed Demand Automation Server (MIDAS) database, where the utility determines such programs would materially reduce peak load.

Each utility must develop a compliance plan describing how they will meet the various requirements of the LMS regulation. The POUs and CCAs may delay or modify compliance with such requirements if they can show that despite good faith effort, the regulatory requirements must be modified to provide a more technologically feasible, equitable, safe, or cost-effective way to achieve the LMS regulation goals.

SMUD strongly supports the intent and goals of the LMS regulation and is working towards similar goals through our ambitious 2030 Zero Carbon Plan, where we are striving to eliminate all carbon emissions from our power supply by 2030. Reducing peak load through price signals like our time-based rates, has proven to be highly effective at reducing system peak, stress on the grid, carbon emissions, and saving customers money. SMUD is actively pursuing additional methods of achieving these goals through new programs and industry-leading pilots, which are helping us understand how we can most effectively partner with customers with behind-the-meter devices in a way that maximizes the resource and is supportive of our customer experience.

SMUD's compliance plan (Plan) includes considerations of the specified marginal cost-based rate structures and programs, as described in the LMS regulation, and evaluates each with respect to cost-effectiveness, equity, technological feasibility, benefits to the grid and to customers. In this filing, SMUD will meet the objectives of the LMS regulation with our existing time-dependent rates, and our current and planned portfolio of load flexibility programs.

Based on SMUD's evaluation, we cannot conclude that implementing complex new rate structures that change at least hourly by January 1, 2026, would result in material reductions in peak load reduction relative to SMUD's existing time-dependent rates and programs, or be cost effective. This is, in large part, because SMUD's existing rates, coupled with our current and planned load flexibility programs and pilots, capture a substantial portion of the available load shift benefits from SMUD's customers. In addition, implementation of unfamiliar and complex rate structures without sufficient testing and refinement of the new rate designs would likely result in low customer adoption, further limiting

realization of any potential added load shift benefits. Similarly, SMUD's evaluation cannot conclude that implementing new programs that allow for automated response to MIDAS signals would result in incremental reductions in peak load or be cost-effective, relative to SMUD's current and planned load flexibility programs and pilots.

In this Plan SMUD sets forth, based on the evaluation of dynamic rates and programs that follow, what it has determined to be a more cost-effective, customer centric and technologically feasible way for SMUD to, in good faith, achieve the LMS regulation goals. Accordingly, SMUD will continue offering our time-dependent rates and current and planned load flexibility programs, and reevaluate the specified rate and program designs in the next update of our Plan, informed by the results from our pilots. While new dynamic rates and new programs with automated response to MIDAS are not required where they have not been demonstrated to materially reduce peak load, SMUD sets forth in this Plan how the LMS requirements are modified to provide its more cost-effective, customer centric and technologically feasible solution.

SMUD's Plan was submitted to the SMUD Board within six months of April 1, 2023, and was adopted by the SMUD Board in a duly noticed public meeting on November 16, 2023. This decision was made by SMUD's Board acting as its rate-approving body. SMUD will review the Plan every three years following adoption, and material Plan updates will be submitted to the SMUD Board for approval. This Plan will be filed with the CEC.

2 Introduction

2.1 About SMUD

SMUD is a not-for-profit, publicly owned, electric utility (POU) headquartered in Sacramento, California. As a POU, SMUD is governed by a seven-member popularly elected Board of Directors (Board) that determines policy and appoints the Chief Executive Officer and General Manager who is responsible for SMUD’s overall management and operations. Responsibility for the development and implementation of this Plan is delegated to SMUD’s Chief Strategy Officer.

SMUD’s service area covers approximately 900 square miles and includes parts of Sacramento County, and small adjoining portions of Placer and Yolo Counties. The service area includes Sacramento, the State Capital, and the populous areas to the northeast and south of the City of Sacramento, and the agricultural areas to the north and south. In total, SMUD serves a population of approximately 1.5 million and has four (4) distinct customer classes – residential, commercial & industrial, agricultural, and street lighting & traffic signals (lighting). The default rate for all SMUD customers, with the exception of lighting and agricultural customers, are marginal cost-based time-dependent rates. This includes SMUD’s successful residential Time-of-Day (TOD) rate which encourages customers to reduce their electricity use between 5 p.m. and 8 p.m. All of SMUD’s rate schedules are posted on SMUD’s website ([Rate Information \(smud.org\)](https://www.smud.org)).

As a POU, SMUD’s Board is its rate-approving body. The Board has authority to establish rates and charges for all SMUD services, and such rates are not subject to oversight by other governmental agencies, federal, state or local. SMUD engages in a comprehensive and robust public process prior to adopting new or revised rates and service regulations. This 3-month public process includes media and public outreach at various community events. The process kicks-off with notice published in the local papers and release of a report detailing the proposed rate changes together with the expected impacts to customer bills. As part of this process, SMUD holds two public workshops, a public hearing and conducts a final Board vote on the rate proposal.

2.1.1 SMUD’s Zero Carbon Plan

In July 2020, SMUD’s Board declared a climate emergency and adopted a resolution calling for SMUD to take significant and consequential actions to reduce its carbon footprint by 2030. On April 28, 2021, the Board approved SMUD’s 2030 Zero Carbon Plan (the “Zero Carbon Plan”). The Zero Carbon Plan is SMUD’s roadmap to completely eliminating Greenhouse Gas (GHG) emissions from our electricity supply by 2030, while maintaining reliable service and affordable rates. To achieve these goals, the Zero Carbon Plan focuses on four main areas: natural gas generation repurposing; proven clean technologies; new technologies and business models, including load flexibility; and financial impacts and options. We are partnering with our customers, communities, and a wide range of stakeholders to ensure that our entire community has the opportunity to benefit from a carbon-free economy.

As we pursue our Zero Carbon Plan, SMUD is committed to keeping electric service affordable and rate increases at or below the rate of inflation. To accomplish this, the Zero Carbon Plan estimates the need for SMUD to realize sustained annual savings. SMUD currently plans to achieve these sustained annual

savings by exploring the implementation of operational savings strategies, leveraging innovative approaches including load flexibility, and pursuing partnership and grant opportunities.

2.1.2 Role of Load Flexibility

Enabling load flexibility is a key strategy in achieving SMUD’s Zero Carbon Plan goals. Load flexibility programs support reduced carbon emissions, reduce the need for new peak resources, help SMUD manage and operate the system, and save customers money. SMUD is focused on fully utilizing our intermittent resources when they are available and reducing peak usage at times when such resources are scarce. The Zero Carbon Plan forecasts that customer-owned resources and SMUD customer-focused programs will contribute between 364 and 1,325 MW of capacity to SMUD’s grid by 2030, and as such, SMUD is leaning in on programs and learning from cutting-edge pilots to maximize cost-effective resources that can be achieved through partnership with our customers.

2.1.3 SMUD’s ADMS/DERMS Platform

To support the expansion of load flexibility resources and their critical role in supporting our Zero Carbon Plan, SMUD has made, and continues to make, significant investments in technology to enable distributed energy resource (DER) integration. In 2022, after years of planning, SMUD deployed our Advanced Distribution Management System (ADMS) and initial phase of our Distributed Energy Resource Management (DERMS) platform technology. With these two systems online and working together, SMUD will shift from a one-way centralized distribution system to a two-way decentralized distribution system that allows us to manage and optimize distributed energy resources that include battery storage, demand response programs, smart thermostats, connected appliances, electric vehicles (EVs) and more.

SMUD is currently building out DERMS functionality and continuing to evaluate device partners and aggregators that can integrate product offerings into DERMS. In the next few years, SMUD anticipates that our DERMS system will enable full DER integration across bulk and distribution system value streams. These include, but are not limited to, advanced distribution system management applications, scheduling DERs based on economic and reliability considerations, scheduling DER Virtual Power Plants (VPPs) into electricity markets, and integrating with aggregator platforms that allow customers to participate in programs that control and leverage behind-the-meter DERs to respond to grid needs.

2.2 Load Management Standards

The CEC’s LMS regulation encourages shifting electricity use from times of day when it is expensive and polluting to times when it is cheaper and cleaner. Load management, or demand flexibility, can save customers money on their energy bills, reduce greenhouse gas emissions, and help strengthen the resiliency of the electricity grid. Load management is defined as “any utility program or activity that is intended to reshape deliberately a utility’s load duration curve” (Public Resources Code, section 25132). Also known as demand management and load flexibility, load management reduces the need for new large electrical generation and backup generation devices. It is also a key strategy to ensure a reliable grid, keep energy costs down, integrate renewable energy resources, and reduce greenhouse gas (GHG) emissions. The intent of load management standards is to encourage electricity customers to shift electricity demand away from high demand periods, when peaking power plants and other polluting generators are in use, to times when lower-cost clean electricity is available.

Amendments to the LMS regulation became effective in April 2023. These amendments require the largest investor and publicly owned utilities, and community choice aggregators, to give all customers access to rates and programs that provide the information needed to optimize their energy use. Specifically, the revised LMS regulation requires Large POUs, defined as SMUD and the Los Angeles Department of Water and Power, to develop “marginal cost-based rates or public programs” with “marginal cost” defined as “the change in current and future electric system cost that is caused by a change in electricity supply and demand during a specified time interval at a specified location,” and the calculation of total marginal cost prescribed as:

“the sum of the marginal energy cost, the marginal capacity cost (generation, transmission, and distribution), and any other appropriate time and location dependent marginal costs, including the locational marginal cost of associated greenhouse gas emissions, on a time interval of no more than one hour. Energy cost computations shall reflect locational marginal cost pricing as determined by the associated balancing authority, such as the Los Angeles Department of Water and Power, the Balancing Authority of Northern California, or other balancing authority. Marginal capacity cost computations shall reflect the variations in the probability and value of system reliability of each component (generation, transmission, and distribution)”.

In this Plan, SMUD uses the term “dynamic rates” or “dynamic price signals” to capture the idea of responding to these marginal cost signals on an hourly or sub-hourly basis.

2.2.1 SMUD’s Compliance Plan Roadmap

Section 1623.1(c) requires SMUD, along with the other regulated entities, to prepare a compliance plan consistent with the LMS requirements. Following is a roadmap identifying where each regulatory requirement is addressed within SMUD’s LMS Plan.

Regulation Section	Requirement	Plan Section
§1623.1(c)	Within three months of regulation effective date, upload existing time-dependent rates to the MIDAS database	3.1
§1623.1(a)(1)	Within six months of regulation effective date, develop and submit compliance plan addressing how SMUD plans to comply with LMS requirements, and including evaluation of marginal cost-based rates and programs, to SMUD’s Board. The plan must be considered for adoption within 60 days after submission.	2.2.2.1
§1623.1(a)(3)(A)	Submit compliance plan to CEC within 30 days of adoption of the plan. Respond to requests for additional information and/or recommendations with 90 days.	2.2.2.2
§1623(c)	Within one year of regulation effective date, provide customers access to their Rate Identification Numbers (RIN) on billing statements and in online accounts using both text and QR	3.1.2

§1623(c)	Within 18 months of regulation effective date, develop and submit to the CEC, in conjunction with the other obligated utilities, a single statewide standard tool for authorized rate data access by third parties, and the terms and conditions for using the tool. Upon CEC approval, maintain and implement the tool.	3.1.3
§1623.1(b)(3)	Within 18 months of regulation effective date, submit to the CEC a list of load flexibility programs deemed cost effective by SMUD. The portfolio of programs must provide at least one option to automate response to MIDAS signals for each customer class where SMUD’s Board has determined such a program would materially reduce peak demand.	5.2.5.1
§1623.1(a)(3)(C)	Submit annual reports to the CEC demonstrating implementation of plan, as approved by the Board	2.2.2.4
§1623.1(b)(2)	Within two years of the regulation effective date, submit at least one marginal cost-based rate to Board for approval for any customer class(es) where such a rate will materially reduce peak load.	4.3.5
§1623.1(b)(2)	Within three years of the regulation effective date, offer customers voluntary participation in either a marginal cost-based rate, if approved by the Board, or a cost-effective load flexibility program	4.3.5 and 5.2.5.2
§1623.1(b)(5)	Conduct a public information program to inform and educate affected customers why marginal cost-based rates or load flexibility programs and automation are needed, how they will be used, and how these rates and programs can save customers money	6.3
§1623.1(a)(1)(C)	Review the plan at least once every 3 years after the plan is adopted and submit a plan update to the Board if there is a material change	2.2.2.3

2.2.2 SMUD’s Compliance Plan Administration

2.2.2.1 *Plan development and Board approval process*

Section 1623.1(a) requires each Large POU to submit to its rate-approving body a compliance plan that is consistent with the applicable requirements of the LMS regulation. The plan must be submitted within six months of the regulation effective date, which is October 1, 2023, and must be considered for adoption by the rate-approving body in a duly noticed public meeting within 60 days of submission.

This Plan meets the requirements of the CEC regulation, Section 1623.1(a). The description of how SMUD complies with each of the elements is provided in the subsequent sections. The Plan was submitted to the Board prior to October 1, 2023, and presented to the SMUD Board at duly noticed meetings on October 18 and November 16, 2023. The SMUD Board approved this Plan by resolution XX.

2.2.2.2 CEC review process

Section 1623.1(a)(3) specifies that, upon adoption by the POU rate approving-body, the plan must be submitted to the CEC Executive Director within 30 days for review. Note that the SMUD Board is the sole authority to approve rates; in this regulatory proceeding, the CEC's role is limited to determining whether the plan that the SMUD Board has adopted complies with the regulation.

Following the Plan presentation and adoption by the SMUD's Board on November 16, 2023, the Plan will be submitted to the CEC by December 16, 2023, for review. Any requests for additional information or recommended changes will be addressed and a written response submitted to the CEC within 90 days as required in the regulation.

2.2.2.3 Triennial plan review

Section 1623.1(a)(1)(C) requires each Large POU to review its compliance plan at least once every three years. Where there is a material change to the factors considered in evaluating marginal cost-based rates and programs, the Large POU must submit a plan update to its rate-approving body. Material revisions to the plan shall follow the same process as the initial plan approval.

This Plan will be reviewed by SMUD every three years following the date of adoption and material Plan updates will be submitted to the SMUD Board for approval. This Plan and any approved material updates will be duly submitted to the CEC.

2.2.2.4 Annual reporting

Section 1623.1(a)(3)(C) requires each Large POU to submit to the CEC Executive Director demonstrating implementation of its Load Management Standards compliance plan. Each POU must submit the initial report one year after adoption of the plan by the POU's rate-approving body, and annually thereafter.

SMUD will timely submit annual reports to the CEC Executive Director describing the implementation of this Plan.

3 Access to Price Signals

3.1 Publication of Machine-Readable Rates in MIDAS

The CEC developed the MIDAS database alongside the LMS regulation for the purpose of allowing customers and automation service providers to link flexible loads to a machine-readable database of rates and other grid signals to automate demand flexibility. The LMS regulation requires the obligated utilities to populate rate information into MIDAS and take steps to facilitate access to MIDAS signals for customers and their authorized third parties. This section of SMUD's Plan describes how SMUD will meet these requirements.

3.1.1 Upload of time-dependent rates

Section 1623.1(c) requires each Large POU to upload existing time-dependent rates to the CEC's MIDAS database within three months of the regulation effective date, which is July 1, 2023. As part of the MIDAS upload process, each rate must be assigned a Rate Identification Number (RIN). The RIN is used to uniquely identify the rate in the CEC's MIDAS database. When provided a RIN, the MIDAS database will return information about the rate and any associated marginal signals to which the customer may automate response.

Large POUs are also required to upload new time-dependent rates, or changes to existing rates, prior to the effective date of that rate. The time-dependent rates uploaded to the MIDAS database must include all applicable time-dependent cost components, including generation, distribution, and transmission.

3.1.1.1 Existing rates uploaded to MIDAS

On June 30, 2023, SMUD staff successfully uploaded the 75 rate permutations of our time-dependent residential and non-residential rates. A list of our current time-dependent rates and their RINs can be found in Appendix A.

A message of success was returned for each rate file loaded to MIDAS. SMUD also performed random retrieval of rates as a second point of confirmation to the successful rate upload and to validate accuracy of rates recorded in MIDAS. SMUD has provided some feedback and suggestions to the CEC to improve the rate upload experience, including removal or increase of data set limits, token valid periods and file loading features.

3.1.1.2 Future rate uploads

Going forward, SMUD will upload rates as needed to reflect rate changes. SMUD will also upload new rates as new time-dependent rates or rate components are developed. SMUD will follow a process similar to that successfully used for our initial upload in June 2023. Staff will create rate files in csv format, convert them to XML format and load them to MIDAS through the application programming interface (API).

Rate uploads for each rate permutation may take place annually, or quarterly where constrained by MIDAS' 50,000 per rate ValueData group limits. Rates with more dynamic rate changes, such as SMUD's Critical Peak Pricing rate, may be uploaded more frequently during the summer months.

SMUD is working toward solutions that will streamline the upload process of its time-dependent rates to MIDAS to provide resource savings and more fully utilize potential MIDAS capabilities.

3.1.2 Provide RINs to Customers

Section 1623(c)(4) requires each Large POU to provide customers access to their RIN(s) on customer billing statements and online accounts using both text and quick response (QR) or similar machine-readable digital code. This access must be provided within one year of the regulation effective date, which is April 1, 2024.

3.1.2.1 Implementation plan

Currently, SMUD issues electricity charges on two different billing statements, the Customer Bill and the Collective Bill. The Customer Bill is the standard presentment of electricity billing statements to customers. The Collective Bill is the presentment issued to customers who have multiple accounts that elect to receive their electricity bills mailed together. Customers also have access to billing statements through their protected on-line accounts.

SMUD plans to make the RINs available in text and QR form on both the Customer Bill and the Collective Bill statements on or before April 1, 2024. This will allow customers to access their RIN on the billing statement received by mail or accessed online.

Existing billing statement designs are not structured to support this additional information. SMUD is working with its bill print vendor to identify and implement solutions that are cost effective and easily understood by the customer.

To prevent costly and confusing bill redesign changes, SMUD plans to leverage the existing bill layout and designs to present the RIN text and QR code for both the Customer Bill and Collective Bill statements. SMUD has entered into an agreement with our bill print vendor to update applications to generate QR codes for Collective Bill statements, determine the best location to place QR codes and encode the RIN code within the specific QR code. Staff also plans to procure professional services in the fourth quarter of 2023 to support developments for the Customer Bill statements. These services will include programming changes to update Customer Bill files with RINs and QR codes.

Based on vendor's scope of work and estimated completion timeframes, SMUD anticipates including RIN text and QR codes on customer billing statements starting on or before the April 2024 billing cycle.

3.1.2.2 Remediation of potential delays

A technical review of both the Collective Bill and Customer Bill design structure will be performed to determine best placement of RIN text and a QR code on the bill. If the review shows that placement of the RIN information on the bills will require a bill redesign, presentment of QR codes on billing statements will be delayed and only the RIN in text form will be available on the bill by April 1, 2024. A full bill redesign evaluation would be needed to explore bill redesign options, cost, and new timing for making RINs available in QR code on the bills.

3.1.3 Statewide RIN Access Tool

Section 1623(c) requires the Large IOUs, Large POUs, and Large CCAs to collaboratively develop a single statewide standard tool for authorized rate data access by third parties, along with a single set of terms and conditions for third parties using the tool. The tool must do all of the following:

- Provide the RIN(s) for the rate(s) applicable to a customer’s premises.
- Provide any RIN(s) for the rate(s) to which the customer is eligible to be switched.
- Provide estimated average or annual bill amounts based on the customer’s current rate and any other rate(s) for the customer is eligible to be switched if such calculation tools already exist.
- Enable authorized third parties, upon direction and consent of the customer, modify the customer’s applicable rate, to be reflected in the next billing cycle.

The tool must also incorporate reasonable and applicable cybersecurity measures, minimize enrollment barriers, and be accessible in a digital, machine-readable format according to best practices and standards.

The tool must be submitted to the CEC for approval within 18 months of the regulation effective date, which is October 1, 2024. Once the tool is approved by the CEC, each Large IOU, Large POU, and Large CCA must implement and maintain the tool.

3.1.3.1 Statewide tool development

SMUD will collaborate with the other regulated parties to meet the regulatory requirements by October 1, 2024. Once our Plan is approved by our Board, SMUD expects that our subject matter experts will be more fully available to engage in this effort.

At the time of this filing, SMUD has committed staff to join the working group to collaborate with other utilities for the development of a statewide tool for third party access. SMUD is in the process of compiling its internal infrastructure needs and business requirements to prepare for the working group discussions.

SMUD participated in a working group meeting held on September 20, 2023, and is currently awaiting input from the other utilities about the scope, funding, and coordination for the project. As a POU, SMUD does not earn a rate of return on its infrastructure investments. Any costs incurred by SMUD associated with developing this Statewide tool would be spread among all SMUD customers. If additional funding were needed, other work would need to be delayed or cancelled to absorb unplanned costs associated with the statewide tool beyond staffing and internal operational resources.

3.1.3.2 Implementation of statewide tool

In order to implement the statewide tool, once approved, SMUD’s internal infrastructure must be updated to integrate and support the tool. SMUD is unable to specifically identify the full scope of integration work until the final tool is designed and approved by the CEC. Concurrent with the development process, however, SMUD is reviewing its internal infrastructure and scheduling budget requests. Implementation projects will be added to SMUD’s annual work prioritization process. While SMUD anticipates complying with this requirement, any delays in development of the tool could result in implementation delays. Similarly, if the costs of integrating the tool result in an undue hardship to SMUD or its customers, SMUD may seek to delay or modify compliance with this requirement. Certain events could also cause a delay in implementation because resources would have to be used elsewhere. Some examples could include an emergency rate action or a climate related event, such as the storms experienced in January 2023.

4 Dynamic Rates

The LMS regulation identifies dynamic hourly or sub-hourly rates as a central tool for achieving the goals of encouraging off-peak energy usage, encouraging control of daily and seasonal peak loads, lessening, or delaying the need for new electrical capacity, and reducing fossil fuel consumption and associated GHGs. Section 1623.1(b)(2) of the regulation directs the Large POUs to seek approval from their Boards for at least one dynamic rate for each customer class for which its rate-approving body determines such rate will materially reduce peak load. The application must be submitted within two years of the regulation effective date, or by April 1, 2025. Approved rates would be implemented the following year, or by April 1, 2026, in accordance with section 1623.1(b)(4).

Section 1623.1(a)(1) first requires each Large POU to evaluate, as part of its compliance plan, the cost effectiveness, equity, technological feasibility, benefits to the grid, and benefits to customers, of dynamic rates for each customer class. After evaluating such rates, the Large POU may instead propose and evaluate specified programs and/or delay or modify compliance with the LMS requirements.

This section of SMUD's Plan provides an overview of SMUD's current time-dependent rates, describes SMUD's rate development process, and addresses the requirement to evaluate the implementation of dynamic rates on the timeframes specified in the LMS regulation.

4.1 Overview of Current Time-Dependent Rates

SMUD currently offers at least one marginal cost-based time-dependent rate to nearly all of our customers. As previously described, SMUD has four customer classes: residential; commercial and industrial (C&I); agricultural; and lighting. With the exception of lighting and unmetered customers, all customers have access to Time-of-Day (TOD) rates. Excluding lighting and unmetered customers, 96% of our customers are on TOD rates. Some customers have access to additional time-dependent rate options based on enabling devices and technology. Moreover, SMUD's time-dependent rates are not the only mechanism we use to encourage customer peak load shift; as further described in Section 5, we offer several load flexibility programs that incorporate time-varying marginal cost-based signals and are developing new pilot offerings, some of which test response to different price signals.

Following is a summary of our time-dependent rates currently available to customers.

4.1.1 Residential Rates

SMUD's residential TOD rate is the standard rate for our residential customers. Customers with enabling devices also have the opportunity to participate in two additional time-dependent rates: our Critical Peak Pricing (CPP) and our Electric Vehicle (EV) rate adder.

4.1.1.1 Standard Time-of-Day (TOD) Rate

Under SMUD's residential TOD rate, customers pay different rates depending on the season, day, and hours of energy use. During the summer months (June 1 through September 30), there are three rate periods: Peak (weekdays 5 pm – 8 pm), Mid-Peak (weekdays 12 pm – 5 pm and 8 pm – 12 am), and Off-Peak (weekdays 12 am – 12 pm, weekends, and holidays). In the non-summer months (October 1 – May

31), there are two rate periods: Peak (weekdays 5 pm – 8 pm) and Off-Peak (weekdays 12 pm – 5 pm and 8 pm – 12 am, weekends, and holidays). These time periods were selected because they best aligned with highest peak loads and marginal electricity prices, while also being simple and easy for customers to understand.

SMUD’s residential TOD was implemented between the fall of 2018 and spring of 2019 following an extensive pilot study, SmartPricing Options, and has been extremely successful. Currently, approximately 97% of our residential customers are enrolled in the rate. The high adoption and retention of this rate has yielded significant benefits for SMUD and our customers. We estimate an annual peak load reduction of 4-8% (75-130 MW) attributable to the residential TOD rate, corresponding to approximately 12,000 tonnes of avoided GHG emissions and approximately \$11-16 million in commodity cost savings.

4.1.1.2 Optional Critical Peak Pricing (CPP) Rate

SMUD’s residential TOD rates are designed to provide price signals to customers to let them know when conserving energy is most beneficial and will save them money. However, these price signals are designed for conditions seen on days with average energy use, not for those few hours during the year when the demand for energy is so high it puts stress on the grid, such as during a heat wave. To address the costs and environmental impact of those few hours, SMUD began offering the Critical Peak Pricing (CPP) rate in June 2022 for customers that participate in qualifying device automation programs.

The CPP rate builds off the residential TOD rate structure, with several key pricing differences. Participating customers receive a per-kWh discount for Mid-Peak and Off-Peak prices during the summer months and pay a fixed per-kWh price premium for usage during a program event. SMUD can call program events during any hour of the day during summer months, up to 50 hours per summer and no more than once per day, and the events may span multiple time-of-day periods. The event prices and discounts are posted on SMUD’s website and may be updated annually to respond to changes in market conditions and customer enrollments.

Customers participating in the CPP rate must enroll in a qualifying SMUD program that allows for automatic adjustments of enrolled devices. SMUD’s programs also further customer participation through an upfront signup reward or an incentive toward the purchase of enabling technology.

This rate will be evaluated for effectiveness in the first quarter of 2024. Depending on the results of the evaluation, we could adjust the CPP rate discount and premium to stay current with costs and promote more customer participation, if needed.

4.1.1.3 Optional EV Rate

SMUD offers an EV rate adder to the residential TOD rate structure that is available for owners of plug-in EVs. Under this adder, customers can receive an additional 1.5¢ per kWh credit for charging EVs between midnight and 6 a.m. every day, all year long. This shifts the plug-in EV charging load to lower usage hours when it costs SMUD less to serve the customer, reduces the possibility of overloading local distribution transformers, and helps reduce the need for additional generation, transmission, and distribution capacity. Approximately half of all SMUD EV customers have enrolled in this rate. Separate from our EV rate option, SMUD is piloting a Managed EV Charging program, which is discussed further in Section 5.1.1.5

4.1.2 Commercial and Industrial (C&I) Time of Day Rates

SMUD's C&I customer class includes all commercial and industrial customers. Within this customer class, individual tariffs are available based on customer load size. SMUD's current C&I TOD rates are available to all commercial and industrial customers, except those that are unmetered. The rates are similar in concept to the residential TOD, except the rate periods differ. During the summer, there are two rate periods: Peak (weekdays 4 pm – 9 pm) and Off-Peak (weekdays 9 pm – 4 pm, weekends, and holidays). During the non-summer months, the rate periods are Peak (weekdays 4 pm – 9 pm), Off-Peak Saver (weekdays, weekends, and holidays 9 am – 4 pm), and Off-Peak (all other hours).

SMUD has offered time-dependent rates to C&I customers for decades, and our customers have adapted to the rates and price signals that the rates provide. In 2019, SMUD's Board approved a rate restructure that included changing the TOD rate periods to better reflect marginal cost-based pricing signals, a higher price per kWh when electricity is most expensive to provide, and a lower price when it costs less. This realignment gives customers the opportunity to manage their usage and bills while helping reduce peak energy use and the need to buy power from less environmentally sustainable sources.

SMUD began implementing these changes to our C&I TOD customers at the end of 2021 and the full rollout was completed in the first quarter of 2022. Staff will be evaluating the effectiveness of our newly restructured C&I rates within the next year.

4.1.3 Agricultural Time of Day (TOD) Rate

SMUD also offers a TOD rate for agricultural customers. During the summer months (May through October), the Peak period is 7 am – 10 am and 5 pm – 8 pm on weekdays. In the winter months (November through April), the Peak period is 2 pm – 8 pm on weekdays. All other hours are considered Off-Peak, including holidays and weekends.

4.2 SMUD's Rate Development Process

4.2.1 Strategic Direction on Competitive Rates

The rate development process at SMUD is guided by our Board policy, first adopted in 2003 and most recently revised in 2021. SMUD's Strategic Direction 2, Competitive Rates (SD-2) includes the following objectives:

- Establish rate targets that are 18% below Pacific Gas and Electric (PG&E) system average rates and at least 10% below PG&E published rates for each customer class.
- Be competitive with other local utilities on a system average rate basis.
- Reflect the cost of energy when it is used or exported to the grid.
- Reduce consumption during periods of high system demand.
- Encourage energy efficiency, conservation and carbon reduction.
- Encourage cost-effective and environmentally beneficial DER.
- Minimize the rate of change in the transition from one rate design to another.
- Provide customers flexibility and choices.

- Be as simple and easy to understand as possible.
- Address the needs of people with low incomes and severe medical conditions.
- Equitably allocate costs across and within customer classes.

When designing rates, SMUD must balance all of these competing objectives – many of which are reflected in the objectives of the LMS regulation. While our direction includes developing marginal cost-based rates that reflect the cost of energy and reduce consumption during peak demand, it also requires us to consider customer experience, such as by ensuring rates are as simple and easy to understand as possible and avoiding abrupt transitions in rate design or bills.

4.2.2 Rate Design and Implementation

Consistent with our SD-2 guidance, SMUD takes deliberate measures to ensure that any new rate we develop will be successful, effective, and accepted by our customers. This includes conducting pilots to determine the effectiveness of different rate options and improve upon customer experience prior to adopting and implementing new rates. It also includes iteratively developing and executing on communications and outreach strategies, new educational tools, rate comparison reports, and any technology or billing system enhancements that are needed to ensure that the implementation of a new rate, once designed, is smooth and successful.

While, in practice, this can be a lengthy and costly process, SMUD attributes the success of current time-dependent rates, including high customer acceptance and consistent load shift benefits, to our careful and comprehensive approach to planning, implementation, and customer experience. In addition, even after rate implementation, SMUD continues to monitor the effectiveness of our rates with respect to shifting peak load.

To illustrate this process, following summarizes the development and implementation of SMUD’s two current time-dependent residential rates.

4.2.2.1 *SmartPricing Options Pilot*

In summer 2012 and 2013, SMUD conducted a comprehensive SmartPricing Options¹ (SPO) pilot, which evaluated the impacts of time-based rates, enabling technology, and recruitment methods on energy consumption and peak demand, as part of our broader Consumer Behavior Study. The SPO pilot tested three time-varying pricing plans (time of use with a 4 pm – 7 pm peak, critical peak pricing, and a combination of both) and two recruitment strategies (opt-in or default). The pilot included a seven-month recruitment period and over a year and half of planning before the pricing plans took effect.

The results of the study, released in September 2014, showed that both experimental TOD and CPP rates were effective, but customers preferred the experimental TOD rate by about 2 to 1 given the choice. The pilot and study were so successful that it became a national and international resource used by laboratories and universities to conduct research on time-of-day rates and behavioral studies.

¹ The SPO pilot was a component of SMUD’s Consumer Behavior Study. See the final evaluation dated Sep 5, 2014. <https://www.smud.org/-/media/Documents/Corporate/About-Us/Energy-Research-and-Development/research-SmartPricing-options-final-evaluation.ashx>

4.2.2.2 Residential TOD

Based on the successful results of the SPO pilot, SMUD decided to pursue the development of TOD rates. However, significant additional planning and development was needed to ensure we could successfully roll out the rates with positive customer acceptance and maximal efficacy. At the time of rollout, SMUD was the only utility in the state to plan and roll out standard TOD rates for all its residential customers. Eventually, and given the success story from SMUD, the California Public Utilities Commission (CPUC) ordered the IOUs to follow the same trend with the adoption of time-based rates for their residential customers. SMUD was a pioneer in rate design and our success was the result of several years of planning after the SPO pilot was concluded.

In 2016, SMUD introduced an optional time-of-day rate (4 pm – 7 pm peak) for all residential customers, with the goal to test systems and processes before the actual roll out of the standard TOD rate. Planned implementation was phased over two years, starting with a small subset of residential customers. This staging allowed staff time to provide customers with education on time-of-use rates, develop new customer tools, and upgrade systems and processes needed to prepare for a larger number of customers transitioning to the rate.

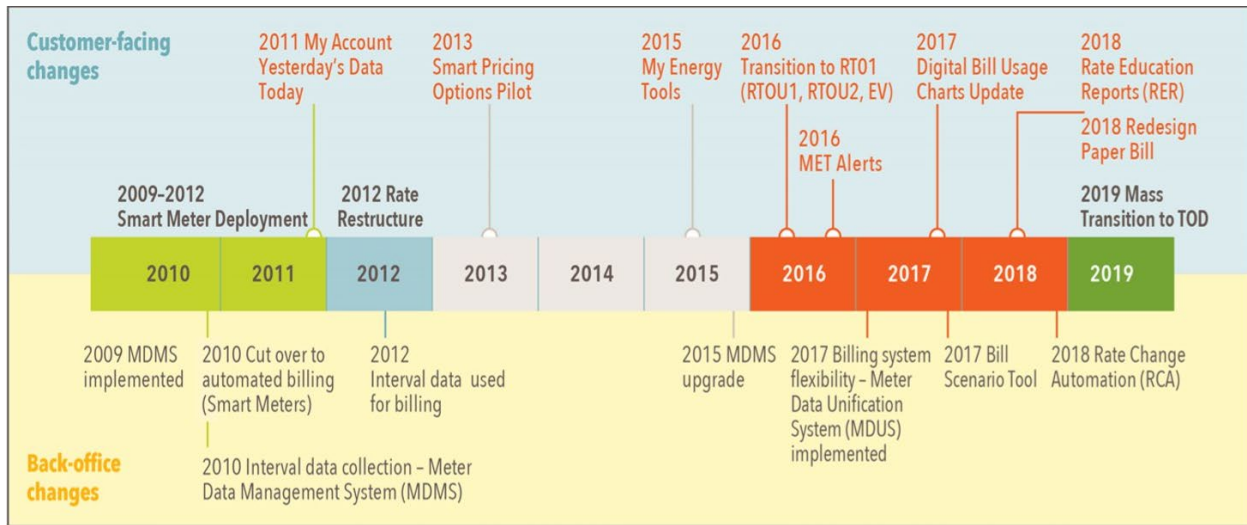
Concurrently, SMUD staff performed research and analysis to refine the rate in support of developing a future standard for all residential customers. The results of this analysis shifted the peak period to 5 pm – 8 pm to better align with the highest peak loads and marginal costs. The rate design was also influenced by the feedback received from the community and subject matter experts in the industry to balance a number of rate principles and customer experience.

SMUD's Board approved the standard TOD rate in 2017 and SMUD began another staged rollout beginning in late 2018 and completing in 2019. Based on our experience with the pilots and the optional TOD rate, SMUD developed additional customer tools, including an interactive TOD cost estimator, redesigned the billing experience, developed and launched a phased marketing campaign with simple, easy-to-understand messages, and undertook targeted outreach efforts. The education and marketing campaign was the most comprehensive campaign we have ever conducted in the transition from one rate design to another and was key to the successful completion of that milestone.

Each year since full residential TOD implementation, the results with respect to enrollment, peak load reduction, and carbon reduction have met or exceeded expectations based on the pilot. SMUD attributes the continued success of our residential TOD rates to the time invested testing and refining rates, educational tools, and attention to the customer experience. In addition, the TOD implementation process reaffirmed our understanding that rate simplicity and customer engagement and satisfaction drives the adoption and ultimate success of a rate.

Below is a timeline outlining some of the key milestones leading up to the implementation of SMUD's residential TOD rate, starting with the deployment of enabling technology that preceded the SPO pilot.

Figure 1 – Residential TOD Planning and Implementation Timeline



4.2.2.3 Critical Peak Pricing (CPP)

The results of the SPO pilot showed that a CPP rate with an underlying time-of-day rate structure could achieve an overall load reduction of 20.9% during event hours. However, the development of this optional rate followed both the successful implementation of our residential TOD rate structure and the increased availability of enabling technology, such as programmable thermostats and battery storage, that would allow customers to respond automatically or manually to event signals.

SMUD’s Board approved the optional CPP rate in 2021, and SMUD began offering it in June 2022 for customers that participate in qualifying programs. SMUD does extensive outreach to encourage customers to choose the CPP rate, and for customers already on the CPP rate, we run individual reports and reach out to customers to help them identify ways they can save money by changing the way they use energy. As noted previously, SMUD plans to review the rate in 2024.

4.2.2.4 C&I Rate Development

In 2019, the SMUD Board authorized restructuring the C&I rates, which re-aligned the time-of-day periods with marginal cost signals, aligned variable rate components to fixed rate components to reflect costs, and simplified pricing structure across rate categories to improve customer experience when moving from one rate to the next. To improve customer experience, we limited bill impacts to no more than 5% for 95% of customers. Stated another way, only 5% of customers could have bill impacts greater than 5% as a result of the rate restructure. To accomplish this while still meeting the goals of the restructure, we implemented the restructure over the course of up to eight years, depending on the rate category. SMUD identified the customers with bill impacts larger than 5% and conducted additional outreach to these customers about the new rates, the associated benefits, and potential impacts. SMUD worked with these customers to identify solutions to manage the impacts, including education and participation in a program to help them reduce costs through energy efficiency upgrades or other means.

SMUD is still implementing steps of the multi-year rate transition. The full rate transition for our smallest commercial customers will be completed in year 2028, which includes the gradual implementation of demand charges to encourage load reduction. Consistent with prior rate transitions, SMUD is currently

working on the rate education and outreach plan for the successful implementation of this component of the rate change which begins in 2024.

4.3 Evaluation of New Dynamic Rates

This section evaluates the cost-effectiveness, equity, technological feasibility, and benefits of dynamic rates for each customer class, consistent with the requirements of the LMS regulations. For purposes of this evaluation, SMUD will assume that these rates would be implemented on the schedule specified in the LMS regulation, which includes applying for approval of dynamic rates by April 1, 2025, and offering voluntary participation in those rates to all customers by April 1, 2026, where such a rate is determined to materially reduce peak load.

SMUD's evaluation detailed below cannot yet conclude that proposing and implementing dynamic rates on this schedule would be cost effective or provide incremental benefits relative to SMUD's existing rates and programs. This is, in large part, due to the significant load shift benefits that SMUD already receives, and uncertainties related to the level of incremental load shift potential, customer response to market price risks, and customer acceptance of a complex new rate design. Based on the results of this evaluation, SMUD plans to defer the proposal and adoption of new dynamic rates at this time. SMUD will reevaluate dynamic rates with the benefit of additional information from our CPP and C&I rate evaluations and our pilot programs in the next update of our Plan.

4.3.1 Cost Effectiveness Evaluation

The first evaluation factor specified in the section 1623.1(a)(1)(A) is cost effectiveness. SMUD will qualitatively estimate the costs and benefits to SMUD, and thereby to our customers, that are associated with new dynamic rates for each rate class. This approach is necessary because, as of the time of the preparation of this first Plan, SMUD does not have data to support a full quantitative analysis.

To assess cost effectiveness, it is necessary to consider the costs associated with designing, implementing, and maintaining new rates for each customer class, as well as the ongoing benefits associated with implementation. To demonstrate cost effectiveness, the expected benefits for each rate must exceed the costs of implementation.

Typically, when assessing the cost-effectiveness of a new rate, such as TOD, SMUD would conduct a comprehensive pilot study to test and gather data on different rate options, which would likely require several years and a multimillion-dollar investment. SMUD believes it is necessary to conduct our own pilots, rather than rely on the results other utilities' studies, to accurately estimate costs and benefits because customers respond differently given differences in weather conditions, local economy, local energy policies, and other factors. SMUD has not conducted such a pilot on dynamic rate options and thus does not have supporting data on estimated implementation costs or benefits. Some of SMUD's pilots are testing responses to price signals, which could help inform assessments of potential costs and benefits, but results are not yet available. As a result, SMUD's evaluation of cost effectiveness is based on qualitative assessments. SMUD anticipates exploring opportunities to expand data access and/or refine estimates to inform future updates of our Plan.

4.3.1.1 *Estimated Costs*

Implementing new rates for all customer classes, particularly rates that are far more complex than any other currently available rate, would require significant investment in planning, customer education and marketing, and technology development. SMUD has identified several cost categories associated with implementing dynamic rates:

- *Rate design costs* would include the costs of initial market research, implementing pilots to test rate options, and analyzing the results of those pilots to refine the final design. Once the pilot is complete and analyzed, the final rate recommendation needs to be designed. In the event of a new rate recommendation, a rate action would be needed for it to be approved, adding to the costs.
- *Setup costs* include one-time costs like Information Technology (IT) system updates to enable settlement over new intervals, data integration, updating the bill presentment to reflect these intervals, and developing new or updating existing customer tools. For example, when SMUD implemented our residential TOD rate, we designed tools to allow customers to view their cost and usage history, set high bill alerts, and receive home energy reports in order to help them understand the impacts associated with the rate. Having tools available for customers to self-service and monitor their costs and usage will be important for success with hourly rates, which would be significantly more complex and volatile than TOD rates.
- *Recruitment and retention costs* include marketing and enrollment costs. For example, prior to rolling out our standard residential TOD rate, SMUD spent over two years educating residential customers through an extensive, phased marketing campaign and targeted outreach in a variety of languages. This effort was successful both due to the significant time and funds invested and, crucially, TOD had the benefit of a simple and easy-to-understand message – avoid energy usage from 5 pm to 8 pm. Shifting to complex hourly rates while maintaining a positive customer experience – which is key for adoption and longer-term retention of the rate – will require informing and educating customers to become savvy users that, at minimum, understand and can monitor hourly rate and temperature trends that may significantly impact their bills.

At this time, SMUD anticipates the above costs to make a dynamic rate available are fixed and do not vary by load, electricity usage or enrollment level. While SMUD does not currently have pilot results to inform implementation costs, we estimate needing significant resources to develop, implement, and maintain hourly rates for residential, C&I, agricultural, and traffic signal customers.² For example, SMUD estimates that implementing our residential and C&I TOD rates cost a combined \$16 million. Depending on the scope of the costs, implementing complex new rates could necessitate a rate increase to bring in additional revenue.

4.3.1.2 *Estimated Benefits*

This section describes the potential benefits associated with implementing new dynamic rates and the estimated realization of incremental benefits based on design effectiveness, adoption levels, and additional load shift capacity available to be captured.

² SMUD generally categorizes street lighting and traffic signals in the same rate class; however, only street lighting is expressly exempt from the LMS regulation.

4.3.1.2.1 Potential Benefits

SMUD has identified the primary financial benefits of new dynamic rates as:

- Avoided capacity costs resulting from a reduction in the need for new capacity additions or resource adequacy procurement.
- Avoided energy costs resulting from shifting demand from higher-cost periods to lower-cost periods.

Secondary benefits can also flow from the realization of avoided capacity and energy purchase needs. For example, to the extent that load shifting reduces the need for new capacity and wholesale energy purchases during peak periods, these reductions can also contribute to:

- Avoided transmission in the form of reduced need for capacity investments to deliver energy during peak periods.
- Avoided GHG compliance costs associated with a reduction in generating or purchasing energy from fossil fueled resources that may otherwise be tapped to serve load during peak periods.
- Improved air quality, public health, and environmental outcomes associated with a reduction in operations of fossil fueled resources.

While the last category of benefits does not accrue directly to SMUD, they provide value to our community and society more broadly.

4.3.1.2.2 Realization of Benefits

As a vertically integrated utility, SMUD anticipates that the greatest potential direct financial benefits would derive from avoided capacity costs. However, the realization of any of the above-identified benefits from new dynamic rates is highly dependent on several factors:

- The effectiveness of the rate design in shifting customer usage patterns.
- The operational value of the load shift.
- The adoption levels of the new rates.
- The customer experience on the new rate.
- The incremental available load shift potential relative to SMUD's existing time-dependent rates and load flexibility programs.

In addition, with respect to avoided GHG compliance costs and improved air quality, public health, and environmental outcomes, the realization of benefits also depends on the relative utilization of fossil fueled resources to serve peak load versus periods of lower demand.

Following is a discussion of each factor's expected effect on the benefits attributable to developing new dynamic rates.

4.3.1.2.2.1 Estimated Design Effectiveness

Effective rate design is necessary to achieve predictable load shift during the most valuable hours. The risk of not having sufficient generation, which spurs the need for new capacity additions or resource adequacy procurement, is typically concentrated in a small number of hours each year when serving peak load is most challenging. Accordingly, to realize any avoided capacity benefits, it is vitally important that a new rate design can achieve consistent and meaningful load reductions during those hours. Reducing

energy purchases during peak periods relies on consistent shift in demand patterns, although some benefits can still be realized through less dependable load shift.

Time to develop and test the effectiveness of rate design options will be especially important when shifting to a complex new rate structure that could include several price signal changes within a peak period or even within an hour. Part of the reason that SMUD's TOD rates are so successful is because they are simple and easy to understand. If customers do not understand the signals or the time periods during which they are provided, their response may not be predictable, leading to reduced efficacy and potentially adverse bill impacts. In addition, SMUD has not yet studied whether the issuance of multiple real-time price signals to our customers over a peak period would result in material benefits relative to a single signal for the peak period. As described previously, SMUD's typical rate development process includes multiple steps, including market research, testing the effectiveness of different rate options through pilots, analyzing the results, and considering refinements before proposing a rate. Completing these steps can exceed five years but is important to ensure that the rate sends the right signals and understand customers' response.

The LMS regulation directs Large POUs to propose new dynamic rates for every customer class to our Board by April 1, 2025. That timeline does not provide sufficient time for SMUD to design a pilot, test responses to different rate options, and analyze the results for even one rate class. Without the results of a pilot study that tests these options for each customer class, SMUD cannot conclude that a complex new rate design would result in any incremental, dependable load shift or ensure a positive customer experience for any of SMUD's customers.³

4.3.1.2.2.2 Estimated Adoption Level

The estimated adoption level of new hourly dynamic rates directly affects the magnitude, and thus value, of load shift benefits. Based on the information currently available, SMUD anticipates that dynamic rates rolled out to customers by April 1, 2026, would likely have low adoption and retention levels. SMUD's assumption is based on several key factors, including the uncertainty in bill impacts from complex new rate structures, the time needed to educate customers to promote a positive experience, and the cost and limited accessibility of enabling behind-the-meter automation technology.

- *Bill impacts.* Bill savings are a significant driver for customer rate adoption. The predictability of bill impacts gives customers the assurance of how they can leverage a rate to see bill savings. SMUD's current rate structures help serve as a hedge against price shock and uncertainty for our customers. SMUD locks in prices for most of our expected energy needs and passes on only the limited remaining market exposure to customers over the course of a year, reducing the impact to customer bills. With dynamic rates, customers take on the full risk of price fluctuations, which may not be sustainable long term.

SMUD has previously offered real-time pricing rates, which had low customer acceptance. For example, in 1995, SMUD implemented an experimental real time pricing rate for commercial customers as part of an economic retention measure. The rate was available for three years and no customers opted in. While the rate offered the customers more control over their bills, the hourly pricing risk outweighed the benefits, so no customers were enrolled on the rate during those three

³ SMUD does not expect a new dynamic hourly rate would create any load shift for traffic signal customers, as this load is not sensitive to price signals.

years. Subsequently, SMUD tested another version of real time rates for commercial customers beginning in 1998. The new real time rate had two parts – billing of a baseline usage quantity by time period priced at stable time of use rates, and billing of incremental load above the baseline at real time prices. The new rate better managed the potential risk of real time pricing by applying real time prices to the variances above or below the customer’s baseline. In 1999, SMUD made modifications to the rate and adopted the price for zone NP15 (DAPX MCP NP15) as the real time pricing. However, the rate enrollment was not successful due to the inherent risk from the real time pricing rates. While some customers did opt into the rate, once prices started to rise due to the energy crisis in the early 2000s, customers were not able to avoid significantly higher bills, no longer wanted to participate in the real time pricing rate and switched back to the standard time-dependent rates at that time. Eventually, SMUD stopped offering the real time rate options.

While the landscape has changed significantly since the early 2000s, SMUD anticipates that many customers would still be hesitant to accept the added price risk that can lead to unpredictable and high bills, similar to the experience we observed with our past real time pricing options, and what was observed in Texas in the winter of 2021 when prices spiked due to an extreme winter storm⁴. Based on our prior experience, we also expect that retention would fall fast after price spikes or energy crises.

- *Customer understanding.* One method of mitigating the uncertainty of bill impacts from new dynamic rates is to fully educate and inform customers. SMUD has embraced a culture of delivering the best possible customer experience when transitioning customers from one rate structure to another or when offering optional rates. As part of this, we provide the opportunity for customer input from focus groups and market research so we can increase customer comfort levels as we develop any future rates.

However, limited time to engage and educate customers on new complex hourly rates, and the potential benefits and risks associated with participation, may lead to confusion about bill impacts and low uptake. Our experience with offering real-time rates in the late 1990s and early 2000s taught us that the proper evaluation of rate pilots, testing alternate new programs, and strong education and marketing campaigns are necessary prior to proposing and implementing new rates. Customer experience is a priority for SMUD, and negative experiences may have a deterrence effect both on current and future initiatives, plus unintended negative impacts to our brand.

- *Technology availability.* Realizing the benefits of dynamic rates is dependent on customers’ ability to access and embrace enabling technology. SMUD’s Zero Carbon Plan includes multiple strategies to significantly increase customer adoption of those devices that are able to automate load reductions, especially with equity considerations in mind. However, there are still challenges and uncertainties associated with tapping into those devices for grid services, as further discussed in Section 4.3.3.2. SMUD expects that limited adoption of the needed technology would translate to limited benefits from dynamic rates, and accessibility of customer-owned automated devices that allow for response to hourly or sub-hourly signals is a near-term constraint.

<https://www.npr.org/sections/live-updates-winter-storms-2021/2021/02/21/969912613/after-days-of-mass-outages-some-texas-residents-now-face-huge-electric-bills>

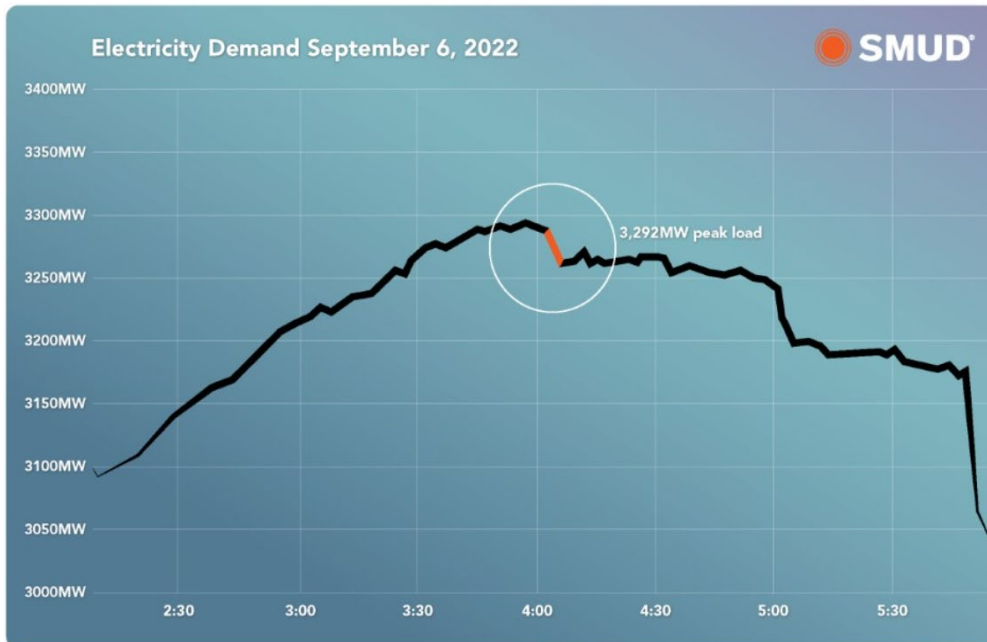
4.3.1.2.2.3 Estimated Incremental Load Shift Capability

As noted previously, the primary potential benefits of dynamic rates are based on reducing the need for new capacity additions and associated avoided wholesale energy costs, which may carry additional benefits associated with reduced transmission costs, reduced GHG compliance costs, and improved air quality, public health, and environmental outcomes. SMUD's existing time-dependent rates and load flexibility programs are likewise designed to capture these same benefits, but on a less granular timeframe and without relying solely on a real-time market price mechanism. They are also designed to create a customer-friendly experience that is simple and easy-to-understand, and have been supported with extensive customer outreach and education. Any incremental benefits associated with implementing dynamic rates rely on achieving incremental load shift relative to SMUD's existing rates and programs. Following summarizes the current load shift capability of SMUD's rates and programs and potential incremental load shift opportunities.

- *Existing load shift capability.* SMUD's residential TOD rate was designed around expected hourly marginal costs and has consistently reduced peak load by 4-8% year after year since implementation, reducing grid stress and resulting in significant financial benefits. Currently, we estimate the combined energy and capacity savings from residential TOD is approximately \$11-\$16 million annually. SMUD also offers a variety of load flexibility and demand response programs that allow customers to respond to signals that incorporate day-ahead marginal prices, weather, and grid conditions. These programs complement our TOD rate structure and provide SMUD additional load shift benefit on a day-ahead basis and, in some cases, on a same-day basis for emergency scenarios. SMUD's programs and pilots are discussed further in Section 5.

To illustrate the current load shift benefits provided by SMUD's time-dependent rates and programs, the chart below shows SMUD's system load on September 6, 2022. The region experienced 10 straight days of extreme heat and Sacramento reached an all-time high temperature of 116°F on that day. There is a clear reduction in load from our demand response programs starting around 4 pm, and load declined as customers were responding to TOD price signals from 5 – 8 pm. The benefits from our existing TOD rates and load flexibility programs is evident. This consistent load reduction on our peak days allows us to reduce our long-term resource adequacy requirements and save on energy costs. The chart shows that significant load reduction was observed on that day due to the combination of demand response, TOD rates, load curtailment agreements, and customer education.

Figure 2 – Load Reduction Observed on September 6, 2022



- *Incremental load shift benefits.* While SMUD is piloting more dynamic price signals to devices to dispatch those devices as part of our programs, SMUD has not yet conducted pilots to evaluate more complex dynamic rate options in which hourly market price risk is passed directly to the customers. However, based on our current time-dependent rates and the trajectory of our load flexibility programs, which can be dispatched on a day-ahead and/or emergency basis, SMUD anticipates that a new dynamic hourly rate would need to result in consistent load shift in response to rapidly changing prices (5- to 10-minute timeframe) in the real-time market to generate any incremental load shift benefits. Without the benefit of pilot results, and given the inherent complexity of new dynamic rates, the risk of adverse bill impacts, and the existence of more customer-friendly rates and programs, SMUD cannot conclude that such rates would be likely to result in incremental load shift benefits.

4.3.1.3 Discussion

Based on the information we currently have available, SMUD’s evaluation cannot conclude that implementing dynamic rates for any customer class on the LMS regulation timeline would be cost effective, especially in light of the benefits SMUD already experiences from our existing time-dependent rates and load flexibility programs and pilots. While dynamic rates have the potential to provide benefits over what we are already receiving from current rates and programs, there are significant uncertainties both in the magnitude of this potential and our ability to realize it based on design efficacy, how customers would react to hourly market risks, and expected adoption levels. SMUD anticipates that developing dynamic rates would result in significant costs and could require a rate increase to bring additional revenue to develop and implement the rates. Without testing a pilot and performing a comprehensive analysis similar to what we did in the Smart Pricing Pilot, SMUD cannot confirm the costs of rate development, the estimated benefits, or whether those benefits would be likely to offset the costs. SMUD also anticipates the cost of setting up a dynamic rate pilot will be nearly as high as

developing a program for passing through dynamic rates. In addition, given our experience with passing hourly price risk to customers in the late 1990's, if after incurring the costs to develop dynamic rates no customers remain on the rate after experiencing bill increases, SMUD's rate development costs will become sunk costs. Given the benefits and success of our current TOD rates and load flexibility programs and pilots, we don't see a need to take this risk at this time.

SMUD will continue to gather information to inform evaluation of future rate and program design. We are taking a measured approach by first testing dynamic rate signals to devices in its load flexibility pilots and compensating customers through programmatic payments, which will help SMUD assess the opportunities without subjecting customers to the volatility of dynamic pricing. As more data becomes available from these pilots, SMUD anticipates exploring additional cost-effectiveness analyses and/or enhancements to the estimates provided here.

4.3.2 Equity

The second criterion by which to evaluate dynamic rates is equity. Since SMUD does not currently have pilot study data to support quantifying load shift and bill impacts for different customer groups, SMUD will qualitatively evaluate the equity impacts of these rates by considering customers' ability to benefit directly and indirectly from the rates.

4.3.2.1 Equitable Access to Direct Benefits

The ability to directly benefit from a dynamic rate depends on several factors, such as access to enabling technology, ability to shift load away from high-cost periods, and ability to benefit from the rate and absorb potential bill shocks.

- *Technology access.* The ability to participate in a dynamic rate hinges upon customers' access to technology with specific characteristics that enables response to hourly or sub-hourly price signals. Currently, the high upfront cost of this technology may pose a limitation, particularly for lower income customers. In addition, customers that rent or lease their home or business may face additional constraints with respect to securing permission for technology installations. To help address these barriers, SMUD offers different incentive programs and has developed strategies within its Community Impact Plan, and is also seeking grant funding to append to SMUD's investment to help further broaden access.
- *Rapid, flexible load shift ability.* The ability to quickly shift load away from high price periods will affect whether participating customers can directly benefit from a dynamic rate. As market signals would be dynamic with potentially very large changes in prices between hours, customers that cannot or do not adopt and/or utilize and embrace enabling technology could see very large bill impacts.
- *Ability to absorb potential bill shocks.* Participating customers in a dynamic rate run the risk of bill shocks if they are unable to shift load away from high price hours. SMUD anticipates that lower income customers and small businesses, who face greater barriers in implementing enabling technology, would be most exposed and least able to absorb potential bill shocks.

By contrast, SMUD's TOD rates provide customers the opportunity to save money without requiring specific technology or exposure to market risks and bill shocks if load is not sufficiently flexible. Similarly, SMUD's programs are designed to ensure that participating customers see predictable, consistent benefits, while ensuring cost-effectiveness relative to the value of the resource.

4.3.2.2 *Equitable Access to Indirect Benefits*

As previously described in Section 4.3.1.2.1, dynamic rates may offer benefits to all of SMUD's customers, to the extent such rates reduce overall capacity costs, contribute to reliability, and reduce reliance on fossil fueled resources. These benefits could serve as a downward pressure on rates and result in improved air quality, public health, and environmental outcomes, and are accessible to all of SMUD's customers. However, as discussed in Section 4.3.1.2.2, SMUD is unable to conclude at this time that dynamic rates implemented on the LMS regulation timeframe would yield incremental benefits, particularly considering that we are already receiving a large share of those benefits from existing TOD rates and programs.

4.3.2.3 *Discussion*

Based on the information currently available, SMUD's evaluation cannot conclude that implementing dynamic rates would result in any incremental equity benefits. At this time, the availability of such rates is likely to disproportionately benefit higher-income customers, early adopters of technology and businesses that own their property, have upfront capital to purchase enabling technology, and can absorb the risk of bill shocks. In addition, while SMUD's entire customer base could potentially benefit from the any incremental avoided system costs and improved air quality, public health, and environmental outcomes, the magnitude and uncertainty of these benefits are uncertain, which is why we are conducting pilots. Currently, 97% of our low-income customers are on TOD rates and some our low-income customers are participating in our new load flexibility pilots and programs. We would not anticipate this level of acceptance and adoption of dynamic, hourly or sub-hourly rates from low-income customers.

4.3.3 Technological Feasibility

The third evaluation factor for dynamic rates is technological feasibility. SMUD's evaluation assesses the technological feasibility of implementing dynamic rates for all customers on the schedule specified in the LMS regulations. SMUD's evaluation considers the feasibility of both the internal technology systems needed to support implementation of dynamic rates and to the external customer technology that is needed to enable response to hourly or sub-hourly signals.

4.3.3.1 *SMUD's Technology Systems*

The primary internal technology systems needed to support dynamic rates are advanced metering infrastructure (AMI), SMUD's Customer Relationship Management software, and SMUD's billing system software (SAP ECC). SMUD also relies on internal and external software from third parties to develop customer educational tools and provide functionality to communicate with and control enabling technologies. Following is a feasibility assessment of each technology component:

- *Meters.* SMUD's meters are capable of providing hourly and sub-hourly interval data for all our customers, though some would currently require reprogramming to provide sub-hourly interval data. Additional network infrastructure would also be required. Moving to sub-hourly interval data significantly increases the amount of data transmitted over the AMI network. To avoid disruptions and maintain system performance, an assessment of the AMI network communication infrastructure would be required to identify additional equipment to be installed to support the increased volume.
- *Billing system.* SMUD estimates that our billing system, with implementation of the necessary system configuration, is technologically capable of generating customer bills utilizing hourly or

sub-hourly settlement data. However, SMUD anticipates it will be necessary to develop enhancements to SMUD's online tools and services to help customers understand the rate changes and minimize confusion.

- *Customer educational tools and control.* As noted previously, updating existing customer tools and developing new tools would be key to supporting a positive customer experience when implementing dynamic rates. Some of our existing tools and our current enabling technology controls are managed by external vendors, which SMUD will engage to assess the technological feasibility of and timeframes necessary to modify tools to support dynamic rates.
- *Information Technology Roadmap.* SMUD has developed a roadmap for its next generation AMI Platform, which includes increasing levels of analytic transformation and enablement of use cases to support near real time customer insights and advanced DER functionality and control, leading to distributed intelligence and grid edge controls that will support achievement of our Zero Carbon Plan and is consistent with intended benefits under the LMS regulation. This includes continuing to implement additional functionality for DERMS, deploying new meters with increased granularity of data (5 minute Commercial, 15 minute Residential) as we replace AMI meters that will be reaching the end of their useful life and supporting systems to leverage the increased data. SMUD is also currently in the initial stages of a major software update to our main enterprise application software from SAP. These major technology projects would need to be carefully coordinated with any IT enhancements necessary to communicate, bill, manage, and educate customers on dynamic rates.

In sum, SMUD anticipates that our internal technology systems, with the necessary infrastructure deployments and system configuration implementations, are technologically capable of supporting dynamic rates. SMUD's IT Roadmap includes additional enhancements, upgrades, and additional functionality that will be needed to ensure the optimal benefits realization of dynamic controls and a positive customer experience.

4.3.3.2 *Enabling Customer Technology*

Realizing the potential incremental benefits of dynamic rates depends on customer participation and the widespread availability of devices and technology that can support real time response to hourly or sub-hourly price signals. Currently, technology with this kind of capability is being piloted and evaluated by SMUD through programs to consider customer response and long term commitment to their response under these programs, which will inform us on how we can utilize them for resource adequacy and electric system emergencies and consequently how we should approach scale. Following is a list of common load flexibility technologies in SMUD's service area which SMUD currently includes in our programs, along with their capabilities and constraints. SMUD anticipates these same technologies participating in our current programs would be needed to respond to new dynamic rates.

- *Smart thermostats.* Wi-fi enabled smart thermostats are currently by far the most widely adopted load flexibility technology. These devices are able to receive and respond to dispatch signals within 15-30 minutes; however, doing so could end up sacrificing customer comfort, as market price signals may not allow time for the home to precool. SMUD currently relies on day-ahead and/or more real time marginal costs and system conditions to inform the dispatch of resources in our load flexibility programs.
- *Battery energy storage systems.* Battery energy storage systems are being adopted with increasing frequency by both residential and non-residential customers, particularly as an add-on to solar PV

installations. Batteries have much greater ability to be dispatched on short notice, and SMUD views these as critical to creating load flexibility resources to reach our Zero Carbon Plan. SMUD is proactively seeking to accelerate this adoption and reduce the payback period for solar + storage deployments through financial incentives. SMUD is currently offering initial incentives of up to \$2,500 per premises coupled with ongoing capacity payments to promote storage adoption and allow utility dispatch to leverage the storage resource. However, the current adoption rates are relatively low, and it will likely be years before storage is affordable for a majority of SMUD customers.

- *Two-way air conditioning (AC) switches.* Air conditioning (AC) switches are one of the oldest distributed resource technologies and have been deployed since the 1970s. SMUD currently has upwards of 35,000 customers enrolled in its ACLM program, also known as PeakCorps. SMUD has begun to replace existing AC switches with more advanced two-way AC switches that provide data back to SMUD and have increased functionality through its recently launched PeakConserve Program. SMUD is also increasing accessibility by providing participation options for customers that have barriers such as lack of internet access. While SMUD expects these new switches to open up new functionality relative to the older technologies, this program is still in pilot stage at this time.
- *Electric Vehicles (EVs).* EVs are an emerging source of load flexibility across the SMUD system, and the rate of customer adoption is increasing. There is significant potential for further growth given SMUD and statewide goals for zero emissions vehicles by 2030. SMUD recently launched a pilot to test the efficacy of sending hourly price signals to participating EVs via telematics and compensating the customer through a quarterly payment. Specifically, SMUD simulates the modeled hourly prices based on energy supply and locational capacity we expect to experience once SMUD achieves its zero-carbon goal and large-scale transportation electrification. The learnings from this pilot will inform how SMUD rolls out a full-scale managed charging program later in 2024-2025. SMUD hopes to demonstrate and refine use cases such as to mitigate overload of service transformers, consume excess low-cost renewable energy, and reduce system peak impact.

SMUD's existing programs and new pilot programs will inform our understanding of how we can most effectively engage with customers with behind-the-meter devices, considering different technologies, customer needs and preferences, and other factors. SMUD anticipates these new offerings, along with our existing programs, will help increase the acceptance and adoption levels of enabling technologies as well as testing their response to utility signals and dispatch.

SMUD is piloting and testing a host of new technologies that we anticipate scaling for wider adoption over the next three years. How hourly price signals may play a role in these opt-in new programs and offerings is still being evaluated, the results of which will also inform future consideration of dynamic rates.

4.3.3.3 Discussion

Based on the information currently available, SMUD believes the technology exists to implement some level of dynamic rates on the LMS timeframe. However, the capabilities of enabling behind-the-meter device technology, along with the impacts on customer experience, are still being tested. SMUD believes that reassessing the technological feasibility of dynamic rates after we have results from our pilot

programs would better inform the likelihood of positive customer acceptance and material load shift benefits.

SMUD anticipates that our internal systems, with the necessary infrastructure deployments and system configuration implementations, are technically capable of processing settlements for dynamic hourly rate data, but additional time to enhance the billing experience, develop customer tools, and enhance our DER functionality and control would create a better experience, improve the likelihood of acceptance of the new rates, and support improved realization of both customer and grid benefits in alignment with LMS desired outcomes. In addition, SMUD anticipates that the penetration of enabling device automation technology will increase with time and decreasing device costs, expanding the potential for load shift benefits.

4.3.4 Benefits to the Grid and Customers

The final two criteria for evaluating dynamic rates are benefits to the grid and benefits to customers. SMUD is evaluating these factors together because many grid benefits also have pass-through benefits to customers.

Following is a summary of anticipated grid and customer benefits associated with implementation of new dynamic rates on the timeframe specified in the LMS regulation. SMUD's evaluation of each benefit considers the expected effectiveness of the rate design, the expected adoption rate, and the incremental benefits relative to SMUD's existing time-dependent rates and load flexibility programs. The realization of each benefit depends, in significant part, on whether dynamic rates would result in material load shift relative to SMUD's existing time-dependent rates and programs. However, as discussed in Section 4.3.1.3, SMUD is unable to conclude, based on the information currently available, that implementing dynamic rates at this time would yield incremental load shift benefits.

- *Avoided capacity needs.* Realizing the incremental benefits of avoided capacity costs, in the form of reduced need to construct new generation capacity or procure resource adequacy (RA), depends significantly on an effective rate design that delivers meaningful, dependable load shift in response to hourly or sub-hourly signals. Shifting demand away from peak periods also has the potential to relieve grid strain and contribute to reliability. As further discussed in Section 4.3.1.2.2.3, SMUD is unable to conclude that implementing dynamic rates would result in incremental capacity cost savings, given the uncertainty around design effectiveness, adoption levels, and the magnitude of load shift potential beyond the benefits already provided by SMUD's time-dependent rates and load flexibility programs.
- *Avoided energy purchase costs.* Similarly, realizing the incremental benefits of avoided energy costs relies on a rate design that effectively encourages customers to shift from high-cost (high GHG) periods to lower cost (low GHG) periods. This allows for more efficient use of cheaper solar energy when it is generated and reduces the higher costs of energy associated with serving peak load. However, as further discussed in Section 4.3.1.2.2.3, SMUD cannot conclude that implementing dynamic rates would result in incremental avoided energy costs.
- *Avoided transmission needs.* As many of the DER programs are still in pilot, how they and rate designs impact the need for various transmission services is still uncertain. Because SMUD cannot conclude that dynamic rates would result in incremental avoided capacity costs on the implementation schedule specified in the LMS regulation, it cannot conclude that any

transmission cost savings are likely to materialize.

- *Avoided GHG costs.* To the extent that dynamic rates can shift energy use from time periods in which fossil fueled resources serve load to time periods with greater renewable energy generation, there is the potential for reduced costs to SMUD (and thereby our customers) associated with the cost of GHG emissions. SMUD incurs GHG compliance costs associated with operating our thermal power plants and some out-of-state energy imports. In addition, the cost of carbon is incorporated into the price of any energy that we purchase through CAISO markets. Reducing our own thermal operations and/or limiting market purchases when the grid has a greater carbon intensity can save costs for SMUD and our customers.

However, any incremental GHG cost savings depend on the realization of incremental reductions in capacity needs and/or in energy purchases during high-cost/high-emitting periods. Because SMUD is unable to conclude that implementing dynamic rates would result in material incremental load shift, any GHG cost savings benefits are also uncertain. In addition, as SMUD pursues implementation of our Zero Carbon Plan and removes carbon from our power supply, we anticipate increasingly less difference between the GHG emissions profiles of resources serving our customers during the peak and in periods of lower demand.

- *Improved air quality, public health, and environmental outcome.* As with avoided GHG cost savings, the potential air quality, public health, and environmental benefits associated with dynamic rates depends on such rates reducing the capacity needs or energy purchases during time periods when the grid has a higher carbon intensity. However, as discussed above, SMUD cannot conclude that a material incremental increase in these benefits will accrue on the timeline specified in the LMS regulation. In addition, as noted above, the difference in the emissions profile of resources serving load at times of peak or load demand should decrease as SMUD implements its Zero Carbon Plan.
- *Customer bill impacts.* With dynamic rates, customers have the potential to save money by shifting their usage out of the most expensive hours. However, there are risks to dynamic rates, even if customers can largely rely on device automation to manage their demand. SMUD locks in prices for most of the power we anticipate needing, effectively providing a hedge for customer energy costs, as described previously. With dynamic rates, customers take on the full risk of market price fluctuations, which could have severe impacts on customer bills especially during times of extreme market volatility. There will be times when prices are high for an extended period of time, such as in December 2022. During such times, customers may not be able to rely on their enabling technology or adjust their usage enough to prevent excessively large bills. Residential customers cannot simply stop using electricity, nor can commercial customers stop operating for an extended period of time to avoid a large electric bill driven by spikes in energy prices.

To illustrate this, the table below shows the North Path 15 (NP-15) average monthly market prices during daytime hours (7 a.m. – 10 p.m.) and nighttime hours (10 p.m. – 7 a.m.). A significant price increase can be seen in December, when prices are approximately double summer peak prices and up to five times greater than summer off-peak prices. The impact of these price increases would have been significant for customers on a dynamic hourly rate.

Table 1 – 2022 Average Monthly Market Prices (NP-15)

Month	Avg. Daytime Price (\$/MWh)	Avg. Nighttime Price (\$/MWh)
January	\$ 54.89	\$ 50.17
February	\$ 48.43	\$ 46.58
March	\$ 48.09	\$ 45.24
April	\$ 63.40	\$ 63.44
May	\$ 67.86	\$ 65.06
June	\$ 77.34	\$ 68.66
July	\$ 80.59	\$ 67.34
August	\$ 104.93	\$ 87.21
September	\$ 130.24	\$ 96.46
October	\$ 73.36	\$ 65.75
November	\$ 93.51	\$ 88.70
December	\$ 271.06	\$ 256.14

Source: 2022 Day ahead NP-15 average prices.

- Customer experience.* As described previously, SMUD staff balances multiple SD-2 objectives when designing rates, including “reflect the cost of energy when it is used” with “be as simple and easy to understand as possible.” While dynamic rates would reflect the cost of energy at the time it is used, they would also be very complex and difficult for customers to understand, as customers are not experts in energy market dynamics. The likely result of this complexity is confusion and potential negative bill impacts, particularly if there is also insufficient time for SMUD to fully educate customers on the potential benefits and risks of marginal cost-based rates. This, in turn, adversely impacts acceptance, retention, and benefits associated with the rate, and the erosion of trust can hinder future load shift efforts as well.

4.3.4.1 Discussion

Based on the information currently available, SMUD’s evaluation is unable to conclude that implementing dynamic rates on the timeframe specified in the LMS would yield material incremental benefits to the grid or to SMUD’s customers. Currently, SMUD’s time-dependent rates and load flexibility programs are designed to capture a significant portion of potential peak load shift benefits. Any incremental benefits associated with dynamic rates that enable response on sub-hourly signals are uncertain.

Moreover, relative to SMUD’s current time dependent rates and programs, dynamic rates could adversely affect customer experience and bills. Premature introduction of dynamic rates may cause confusion and shift market price risk from SMUD onto our customers, creating a poor customer experience that may hinder adoption of both the new rate and longer-term load flexibility initiatives. SMUD’s current time-dependent rates offer customers the ability to save money through a simple, easy-to-understand rate structure and do not require specific technology to use. In fact, the success of SMUD’s TOD rates, as previously noted, can be attributed largely to its simple, easy-to-understand message, our careful testing and refinement of both rate options and customer experience, and our significant outreach and education efforts. A rushed implementation of a complex and untested dynamic hourly rate structure is unlikely to result in any positive benefits to SMUD or our customers.

4.3.5 Compliance Approach

Based on the results of this evaluation, SMUD plans to continue offering our time-dependent rates, including reviewing our C&I rates and our residential CPP rate for effectiveness within the next year. SMUD also plans to continue expanding our load flexibility programs and pilots that will help us better understand how best we can engage with behind-the-meter customer devices. From these learnings, SMUD may consider developing a pilot rate offering dynamic pricing to one or more customer classes in the future.

SMUD will defer developing and proposing adoption of new dynamic rates beyond April 1, 2025, and offering voluntary participation in any such rates beyond April 1, 2026. Based on the information currently available, SMUD cannot conclude that proposing and implementing dynamic rates as proposed in the LMS schedule cited above would result in material incremental reductions in peak load; be cost-effective; yield equity benefits; be technologically feasible; or yield any cost savings or emissions-related benefits for SMUD and our customers. Moreover, the risks of premature implementation include adversely impacting participating customers' bills, overall experience, and SMUD's image and reputation.

At this time, SMUD plans to revisit the timeline for proposing and implementing dynamic rates no later than the triennial review of our LMS Plan. At such time, we will also consider updates to our evaluations of cost-effectiveness, equity, technological feasibility, benefits to the grid, and benefits to customers.

5 Load Flexibility Programs

The LMS regulation recognizes that load flexibility programs may provide an alternative pathway to achieve the objectives of encouraging off-peak energy usage, controlling peak load to improve reliability and system efficiency, lessening, or delaying the need for new capacity, and reducing fossil fuel consumption.

Section 1623.1(a)(1)(B) requires each Large POU to propose and evaluate programs that enable automated responses to marginal cost-based signals for each customer class, if the Large POU does not propose the development of marginal cost-based rates. The programs must be evaluated based on cost effectiveness, equity, technological feasibility, benefits to the grid, and benefits to customers.

Section 1623.1(b)(3) requires each Large POU to submit a list of cost-effective MIDAS-integrated load flexibility programs to the CEC Executive Director by October 1, 2024. The portfolio of load flexibility programs must provide at least one option to automate response to MIDAS signals (that indicate, for example, hourly marginal cost-based rates, marginal prices, or hourly or sub-hourly GHG emissions) for every customer class where such a program is determined by its rate-approving body to materially reduce peak load.

Finally, each Large POU is required to offer customers, by April 1, 2026, voluntary participation in a dynamic hourly rate, if approved by its rate-approving body, or a cost-effective MIDAS-integrated load flexibility program identified according to with Section 1623.1(b)(3).

This section of SMUD's Plan provides an overview of SMUD's current load flexibility programs and addresses the requirement to evaluate and propose specified programs on the timeframes set forth in the LMS regulation. It also addresses the requirement to submit a list of cost-effective MIDAS-integrated load flexibility programs to the CEC.

5.1 Overview of SMUD Load Flexibility Programs

Load flexibility is a key strategy in helping SMUD achieve our Zero Carbon Plan, particularly in enabling our customers to be part of the solution. As such, we have developed and are piloting a number of leading edge options for our customers.

In recent years, SMUD has focused on expanding our existing programs and piloting new load management offerings because they are simple, effective, flexible, and allow for us to make rapid progress in unlocking peak load reduction potential. We have also worked to innovate with technology and software providers to advance functionality that will allow for broad participation and help us maximize potential resources, optimized for customer and grid needs. When SMUD designs programs, we can tailor the programs to specific customer segments or needs to maximize responsiveness beyond just price alone. We can identify where the need is and how we can design the program to have the greatest potential for mutual benefit, since programs must provide benefits to both the customer and SMUD to be effective. To that end, we are piloting multiple approaches and the learning from these pilots will inform future program designs and the technology needed to scale adoption.

SMUD currently offers a portfolio of load flexibility programs with a diversity of enabling technologies, and different tiers of engagement in order to provide options that best fit with each customer segment's needs. The portfolio includes at least one load flexibility program offering for our residential, C&I, and agricultural customer classes.

Following is a list of current and planned program offerings, including several pilots that are being tested for reliability, load reduction and customer adoption.

5.1.1 Residential Programs

5.1.1.1 *My Energy Optimizer (MEO) Partner*

SMUD's MEO Partner program is SMUD's fastest growing load flexibility program. It leverages the high adoption rate of smart thermostats in our territory and provides both upfront and ongoing annual incentives to customers with qualifying smart thermostats who agree to have their thermostat setpoint raised during periods of high demand. Participating customers may also enroll in the CPP rate, discussed in Section 4.2.2.3. In addition to scaling more rapidly than many other utilities, SMUD is currently testing novel approaches to the way these thermostats are dispatched to maximize their contribution to reliability within SMUD territory. Day-ahead marginal prices represent one of several factors that contribute to device dispatch, including forecasted weather and grid conditions.

5.1.1.2 *My Energy Optimizer Partner +*

MEO Partner+ is SMUD's premier residential Virtual Power Plant (VPP) program and the first program of its kind in California. Eligible participants can receive a \$250/kWh upfront incentive, up to \$2,500, for allowing SMUD to control their behind-the-meter battery storage system throughout the entire year using Swell's VPP Control system. Participants also receive ongoing quarterly payments for allowing SMUD to use their battery capacity for myriad grid needs. Batteries are available for dispatch any time except from 10 am – 3 pm, ensuring they are fully charged with solar energy. Batteries may be dispatched a maximum of 30 events per month, or 240 events per year. Just like all of SMUD's load flexibility programs, MEO Partner+ batteries are dispatched by SMUD based on factors that include, but are not limited to, day-ahead marginal prices. This program design provides SMUD's solar + storage customers a meaningful path to value for their investment while creating a maximally flexible resource for SMUD to utilize throughout the year. Developed as a true market transformation program, the incentive decreases gradually over 5 years to align with the expected reduction in battery storage costs over time.

5.1.1.3 *PeakCorps*

PeakCorps is SMUD's legacy air conditioning load management (ACLM) program, originally implemented in the 1970s. Currently there are upwards of 35,000 customers enrolled in program, which utilizes one-way AC switches. This program allows SMUD to maintain reliability during emergency situations by allowing a SMUD installed device to turn off the AC unit when reduction of the overall amount of electricity being used during an emergency is necessary. Resources are dispatched only during critical periods where there is extreme demand on the electricity grid.

The legacy ACLM switches are unable to respond to hourly price signals; however, SMUD is in the process of transitioning this program to PeakConserve (described below) and replacing the switches with those that have more advanced capabilities.

5.1.1.4 PeakConserve

PeakConserve is an updated ACLM program that offers customers a \$50 sign-up bonus and an additional post-season annual bonus for agreeing to the installation of a two-way switch to allow for cycling of their air conditioning compressor during summer periods of high demand. The new switches utilize SMUD's mesh meter network to communicate, negating the need for additional communication systems or customer WiFi, which broadens our customer base that can participate in load management programs. Broadening potential participation also improves equity given populations that cannot afford or do not have internet access, and addresses technology barriers for some that cannot or will not use smart thermostats.

During conservation days, when supply of resources is expected to be limited and market prices are very expensive, SMUD sends a signal to cycle off participating air conditioners up to 40 minutes an hour to help flatten demand and keep prices of electricity down. SMUD anticipates a maximum of 15 conservation events each summer, depending on grid conditions. Day-ahead marginal prices are a factor that contribute to the automated dispatch of participating devices.

5.1.1.5 Managed Electrical Vehicle Charging

SMUD anticipates that, over the next 3-7 years, EVs will represent the majority of the load flexibility potential in our territory. In order to determine the highest value approach to managing EV load, SMUD is currently piloting a residential EV managed charging program with multiple vendors and manufacturers. This pilot is testing the ability of EVs to respond to simulated day-ahead hourly price signals modeled on projected future system needs as renewables penetration dramatically increases. While the price signals sent to EVs via telematics are dynamic and change on an hourly basis, customers are not financially exposed to these price fluctuations and are instead paid via a traditional incentive framework.

The learnings from this pilot will inform how SMUD rolls out a full-scale managed charging program later in 2024-2025. SMUD hopes to demonstrate and refine use cases such as mitigation of service transformer overloading, consuming excess low-cost renewable energy, and reducing system peak impacts.

5.1.2 Nonresidential Programs

5.1.2.1 PowerDirect

PowerDirect is a summer-only automated demand response (ADR) program is available to C&I and agricultural customers. The program initiates pre-programmed building controls that are chosen and implemented by the customer, such as thermostat setpoints. In exchange for reducing load, customers are paid a capacity payment based upon their demand commitment. The PowerDirect ADR system has been in effect for approximately 10 years and connects directly to participating customer's energy management, lighting and heating, ventilation and air conditioning (HVAC) systems to automatically scale back energy use. Program response has reduced peak load on days the grid is most stressed and marginal costs are highest.

5.1.2.2 Commercial Virtual Power Plant (Under development)

SMUD is in the process of developing a load flexibility program for commercial customers with behind-the-meter batteries. The program will include enrollment and ongoing incentives to customers, based on

enrolled capacity, for allowing SMUD to automate their battery’s response to dispatch signals. SMUD envisions this program operating in a similar fashion to MEO Partner+, described above.

5.1.2.3 Commercial Vehicle to Grid

In addition to managed electric vehicle charging, SMUD is conducting a number of activities testing out Vehicle to Grid bi-directional charging (V2X) capabilities. V2X has the opportunity to provide substantial resources in the future given the expected trajectory of vehicle electrification as part of our Zero Carbon Plan and statewide policy. Currently, SMUD is piloting V2X technology on school buses in partnership with a local school district, which is assessing the school bus’s ability to respond to a combination of TOD, CPP, and event-based price signals. Light duty V2X fleet technical testing is also underway at SMUD, and a plan to pilot utility-managed V2X within a commercial fleet and for workplace charging is currently proposed and will expand to residential as CEC listed products become available.

5.1.2.4 Key Program Metrics

SMUD's goal is to develop load flexibility programs and pilots that allow us to leverage customer resources to avoid building for example 473 MW power plant by 2030. The following table lists SMUD’s current and planned load flexibility programs and their expected impact in 2030; as these programs demonstrate their ability to serve as more cost-effective investments compared to utility scale resources, contributions could be substantially higher.

Table 2 – List of Current and Planned Load Flexibility Programs

Load Flexibility Program	Segment	Technology	Capacity in MWs (2030)
My Energy Optimizer Partner	Residential	Wi-fi thermostats	60
My Energy Optimizer Partner Plus	Residential	Battery storage	75
Peak Conserve	Residential	2-way AC switches	16
Power Direct	Non-Residential	Building EMS	30
Commercial VPP	Non-Residential	Battery Storage	17
EV Managed Charging	All	Electric Vehicles	135
Vehicle-to-Grid	All	Electric Vehicles	140
Total			473

5.2 Evaluation of Programs

SMUD maintains and continues to develop a robust portfolio of load flexibility programs that strike the right balance between customer needs and grid benefits. As summarized above, this portfolio provides at least one option for our residential, C&I, and agricultural customer classes to automate response to dispatch signals from SMUD. These signals are based on several factors, including day-ahead marginal prices. SMUD is also in the process of building out our DERMS technology platform, which we anticipate will optimize and automate dispatch of DER on our system, as well as investing in next generation metering and technology platforms to enable grid edge intelligence and control.

Our programs are piloting how we could automate customer response to dynamic price signals in addition to other system events, with some pilots utilizing our Price Communication Application (PCA). We developed the PCA in 2018, recognizing the need for a simple API that provides machine readable price schedules for enabling technologies so SMUD could research price-based signals to devices. However, our pilots are not currently ready for full scale implementation, nor do they use MIDAS signals to automate customer response.

This section evaluates the cost-effectiveness, equity, technological feasibility, and benefits to the grid and customers of implementing programs that enable automated response to dispatch signals, including MIDAS signals, year-round, that are available to every customer class by April 1, 2026. SMUD's evaluation does not demonstrate that adding new programs or modifying existing programs to enable automated dispatch based on MIDAS signals is likely to provide material incremental reduction of peak load, or other benefits relative to SMUD's current programs at this time.

5.2.1 Cost-Effectiveness

The first evaluation factor is cost-effectiveness. SMUD will assess cost-effectiveness of new programs by comparing the anticipated costs and incremental benefits associated with designing and implementing new load flexibility programs that allow for response to dynamic price signals, including MIDAS signals, year-round for each customer class.⁵ To demonstrate cost effectiveness, the expected benefits for each program must exceed the costs of design and implementation.

5.2.1.1 Estimated Costs

The costs associated with implementing a new load flexibility program include program development, implementation, and administration costs.

- *Program development.* This includes the costs associated with program design and setup, including integrating new programs with the CEC's MIDAS database and SMUD's ADMS/DERMS technology platform to the extent feasible.
- *Program administration.* This includes ongoing costs to administer the program, including marketing, customer recruitment, customer education, development and maintenance of customer tools, and any upfront or ongoing incentive payments that are part of the design.

⁵ Note that the determination of whether a given load flexibility program is cost-effective for SMUD is substantially different from the manner in which this is assessed by the Investor-Owned Utilities (IOU) in California. While the IOUs use a CPUC-created cost-effectiveness tool and prescribed inputs, factors, etc., SMUD's programs must directly tap into avoided cost value streams for a given program to be cost-effective and not result in rate increases.

- *Technology and implementation costs.* Each new load flexibility program requires significant investments in new technology platforms. These include external software systems that must be procured in order to communicate with and dispatch devices, as well as internal systems which must be developed and configured to integrate the external software.

SMUD anticipates these cost categories would apply regardless of customer class. Quantifying the magnitude of these costs is challenging, because setting up an automated marginal cost/price stream to dispatch devices could either take the form of a modification to existing programs, or the establishment of an entirely new program.

5.2.1.2 *Estimated Benefits*

This section describes the potential benefits associated with implementing programs that allow for automated response to dynamic price signals, including MIDAS signals, and the estimated realization of such benefits based on the additional load shift capacity available to be captured.

5.2.1.2.1 *Potential Benefits*

Programs that allow for automated response to specific dynamic price signals could enable the following types of incremental load shift potential relative to SMUD’s current and planned programs:

- Greater magnitude of load reduction, to the extent direct exposure to high prices drives greater load flexibility response.
- More granular load shift intervals, to the extent enabling devices are accessible and widely embraced.
- Load shift beyond the seasonal and/or maximum event limits in SMUD’s current programs, to the extent that increased participation does not result in customer fatigue, affect customer comfort, and/or erode dependability of response.

The potential benefits associated with implementing programs that achieve incremental load shift include avoided capacity costs, avoided energy costs, improved reliability during peak periods, avoided GHG compliance costs, and avoided air quality, public health, and environmental costs associated with a reduction in fossil fuel generation, consistent with the benefits discussed in Section 4.3.4.⁶ These potential benefits are not unique to programs implemented for any one customer class.

5.2.1.2.2 *Realization of Benefits*

Currently, there are several uncertainties and barriers associated with realizing the above-identified incremental load shift potential, and its associated benefits. SMUD expects these barriers and uncertainties apply across residential, C&I, and agricultural customer classes. These include:

- *Resource availability.* While there has been a rapid increase in the number of devices on the market that are able to automate load reductions, SMUD is not aware of any devices capable of effectively responding to real-time (5- to 10-minute) signals without significantly compromising customers’ daily activities. For example, battery storage devices require advance notice in order to ensure they are adequately charged; thermostats require advanced notice in order to pre-cool

⁶ While some of these cost savings do not accrue financially to SMUD and are typically not included in our program cost-effectiveness assessments, they benefit our customers and community more broadly.

the home before an event; and EVs require advanced notice to ensure they are sufficiently charged to meet customers' transportation needs.

- *Customer experience.* All of SMUD's current load flexibility programs limit the maximum number of program events, and many also limit the participation season. While removing these limits may open up additional load flexibility to SMUD, frequent device dispatch without first understanding the impacts on customer experience runs the risk of eroding participation and satisfaction in the program. SMUD has developed multiple program tiers in order to provide our customers options, and we are utilizing pilots to learn how changes or removal of these thresholds could affect customer participation.
- *Incremental value of dynamic price exposure.* Currently, our load flexibility programs offer customers upfront and/or ongoing incentives in exchange for allowing SMUD to dispatch their participating devices. Some customers may also enroll in our optional CPP rate, which includes prices that are higher but still predictable if a conservation event is called. SMUD anticipates that directly exposing participants to market prices could result in deeper load reductions than are available to our current programs, to the extent that increasing prices drive customers to shift more load away from the peak. However, the magnitude of additional load reduction as a function of price is not yet known. In addition, higher customer risk with dynamic prices is likely to reduce participation and benefits.
- *Incremental benefit of granular load shift intervals.* Our current load flexibility programs dispatch based on factors that include day-ahead prices, forecasted weather, and grid conditions. SMUD anticipates that new programs would have to tap into load shift on 5- to 10- minute intervals to create incremental benefits relative to our programs. However, SMUD has not directly tested customer responses, so it is not yet known whether the issuance of multiple price signals over a peak period, or higher prices over the same period, would result in material incremental benefits.
- *Incremental value of responses to MIDAS signals.* As noted previously, SMUD is in the process of building out our DERMS system to co-optimize dispatch of different technologies and programs to support bulk and distribution system needs. At this time, it is uncertain whether enabling automated dispatch in response to MIDAS signals would result in incremental load shift benefits relative to the DERMS system optimization of DER dispatch.

5.2.1.2.3 Expected Incremental Benefits

Based on the above factors, following is a discussion of expected incremental benefits associated with programs that allow for automated response to dynamic price signals:

- *Avoided capacity costs.* Currently, the primary value stream for SMUD's load flexibility programs is RA avoidance. To the extent a given program can generate MWs that meet the resource characteristics needed to avoid RA capacity purchases, these avoided costs can be credited against the costs associated with implementing the program. While programs that expose customers to dynamic price signals may drive incremental load reductions when prices are highest, it is unknown how much and how reliable that incremental reduction would be. Moreover, the magnitude of the load shift depends on significant adoption and acceptance of enabling technology. Without demonstrating significant, reliable load reduction to dynamic price signals, including MIDAS signals, we are unable to reduce RA requirements.
- *Avoided energy purchase costs.* SMUD's current program pilots are evaluating and determining the right program structure and incentive levels to ensure customers and SMUD benefit from load flexibility. To the extent that new program structures and technology allow for faster load shift in

response to short price spikes or drive greater load shift away from peak periods, SMUD could see reductions in energy purchase costs, but this is currently not yet known. Future program design will seek to maximize the energy savings associated with customer load flexibility, balanced against technological capability, customer acceptance and impact on the overall energy system.

- *Improved reliability, avoided transmission costs, avoided GHG compliance costs, avoided public health, air quality, and environmental costs.* SMUD is unable to determine whether there would be incremental benefits associated with further reducing demand during peak periods from programs with automated response to hourly price signals versus existing programs and pilots, given uncertainties around customer response to dynamic price signals and current penetration of enabling technology.

5.2.1.3 Discussion

Based on the foregoing evaluation, SMUD cannot conclude that the development of new programs that allow for automated responses to dynamic price signals would be cost-effective at this time. Developing new programs or modifying existing programs would require SMUD to incur costs associated with design and implementation, along with new technology costs. While these costs could potentially be offset with capacity, energy, or transmission cost savings, the magnitude of those benefits are uncertain. Moreover, SMUD anticipates that any incremental benefits will be limited in the near-term, while new technology is continuing to grow. However, as SMUD continues to learn from, refine, and propose new pilots, and as the penetration of enabling technology grows, SMUD will continue to assess the expected incremental costs and benefits associated with incorporating more dynamic price signals and/or allowing resources to be dispatched by MIDAS signals.

5.2.2 Equity

The second criterion by which to evaluate new programs is equity. SMUD will qualitatively evaluate whether programs that enable automated response to dynamic prices, including MIDAS signals, are likely to lead to more equitable outcomes than SMUD's current programs.

5.2.2.1 Equitable Access to Direct Program Benefits

When designing load flexibility programs, SMUD ensures that all aspects of program design take equity into account. SMUD has articulated its commitment to equity and the specific strategies for addressing it in SMUD's Community Impact Plan (CIP). The CIP seeks to ensure that no community is left behind in the transition to 100% clean energy, and enshrines affordability, equitable access, and community engagement as key pillars for accomplishing this. The CIP also contains specific equity goals and accompanying strategies for electrifying and weatherizing homes in disadvantaged communities, workforce training for members of underprivileged groups, providing access to public EV charging infrastructure in disadvantaged communities, and much more.

To this end, SMUD's new ACLM, PeakConserve, seeks to remove financial and technological barriers to participation in load flexibility by installing AC switches free of charge and providing upfront and ongoing participation incentives. This program was explicitly designed to ensure customers who may not have a wi-fi thermostat and/or broadband internet access are still able to benefit from load flexibility initiatives at SMUD. Similarly, many of SMUD's programs include significant upfront enrollment incentives and/or discounts in SMUD's Energy Store to lower participation barriers.

SMUD anticipates that careful attention to equity would be particularly important when designing programs that allow for response to dynamic signals, given the current access barriers and risk of price exposure that may disproportionately be experienced by lower income customers.

5.2.2.2 Equitable Access to Indirect Program Benefits

Program design also plays a major role in determining whether a program delivers incremental load shift benefits that carry cost savings and improved air quality, public health, and environmental outcomes that accrue to all of SMUD's customers. However, as SMUD cannot yet conclude that dynamic price signals would result in incremental load shift benefits relative to SMUD's current rates and programs, the realization of any indirect benefits is also uncertain.

5.2.2.3 Discussion

Based on the foregoing evaluation, SMUD is unable to conclude that implementing new programs that allow for automated response to dynamic price signals, including MIDAS signals, would materially address equity. Programs can be designed to ensure equitable access to participation and benefits whether or not they incorporate sending dynamic signals directly to customers. Furthermore, the risk of price exposure from dynamic rates could potentially exacerbate equitable outcomes

5.2.3 Technological Feasibility

The third evaluation factor for programs is technological feasibility. SMUD's evaluation assesses the technological feasibility of implementing programs that allow for automated response to dynamic price signals on the schedule specified in the LMS regulations. SMUD's evaluation considers the feasibility of both the systems needed to dispatch dynamic price signals, including MIDAS signals, and to the external customer technology that is needed to enable response to hourly or sub-hourly signals.

5.2.3.1 Technology Platforms

As described previously, SMUD launched the initial phase of our DERMS technology platform in 2022, and over the next several years we are building out its capabilities as well as additional advanced functionality towards distributed intelligence and grid edge control. At this time, SMUD anticipates that it will be technologically feasible to incorporate programs that enable automatic response to dynamic price signals, including MIDAS signals, into our DERMS platform.

5.2.3.2 Enabling Customer Devices

The incremental benefits derived from implementing new programs that allow for response to dynamic price signals hinge on customer participation and the widespread availability and acceptance of devices that can respond to sub-hourly price signals without compromising customer experience. Refer to Section 4.3.3.2 for a detailed description of common load flexibility technologies that SMUD currently includes in our programs, as well as their capabilities and challenges.

5.2.3.3 Discussion

Based on our evaluation, SMUD believes the technology and platforms needed to enable programs that allow for response to dynamic price signals exist or could be updated on the LMS timeframe. However, we anticipate that re-evaluating the proposal of such programs after we have results from our pilots that test different technology capabilities would better inform our expectations of potential benefits. In

addition, SMUD anticipates that the penetration of enabling device automation technology will increase with time, expanding the potential participation in such programs resulting in greater load shift.

5.2.4 Benefits to the Grid and Customers

The final two criteria for evaluating dynamic rates are benefits to the grid and benefits to customers. SMUD is evaluating these factors together because many grid benefits also have pass-through benefits to customers.

5.2.4.1 *Grid Benefits*

To the extent that new programs enabling responses to dynamic price signals result in consistent, material incremental load reduction, following are potential grid benefits:

- Deferred or reduced need to construct new generation capacity or procure RA resources.
- Deferred or reduced need for wholesale energy purchases to meet peak demand.
- Deferred or reduced need to upgrade transmission capacity to deliver energy to meet peak demand.
- Increased reliability associated with reducing grid strain during periods of peak demand.

These benefits all depend, in significant part, on whether new programs would result in material incremental load shift relative to SMUD's existing programs. However, as discussed in Section 5.2.1, SMUD's current program pilots are still evaluating and determining the right program structure and incentive levels to ensure customers and SMUD, including SMUD's grid, benefit from load flexibility. Mutual benefit is necessary for effective, consistent load shift. Without these analyses, SMUD is unable to conclude that offering new MIDAS-integrated programs would result in material incremental load shift benefits relative to SMUD's current and planned load flexibility programs and pilots. Moreover, automated device dispatch in response to MIDAS signals, rather than the co-optimization of resources through SMUD's ADMS/DERMS platform, could actually have a limiting effect on grid reliability benefits.

5.2.4.2 *Customer Benefits*

Following is a summary of potential customers benefits associated with implementing new programs that allow for automated response to dynamic price signals:

- Pass-through cost savings associated with the realization of a reduced need for generation capacity, transmission upgrades, and higher-price wholesale energy purchases to meet peak load.
- Pass-through cost savings associated with avoided GHG compliance costs, to the extent that the incremental load shift reduces the need to rely on fossil fuel resources to meet peak demand. SMUD anticipates these savings will become less significant as we transition off fossil-fueled resources as part of our Zero Carbon Plan.
- Pass-through increased reliability, to the extent this grid benefit is realized.
- Improved public health, air quality, and environmental outcomes, to the extent that the incremental load shift reduces the need to rely on fossil fuel resources to meet peak demand.
- Cost savings associated with participation, to the extent that devices automatically shift load away from higher price periods.

While customers may benefit from cost savings associated with program participation, it is unclear how those cost savings would compare to the fixed upfront and ongoing participation incentives that customers can currently receive from allowing SMUD to optimize dispatch of their device. In addition, based on the uncertainty in whether the new programs would yield any incremental load reduction benefits, SMUD is unable to conclude that there would be any incremental pass-through cost savings or reliability benefits to customers, based on the uncertainty in realizing incremental grid benefits relative to SMUD's current and planned programs. Similarly, SMUD anticipates that any incremental air quality, public health, and environmental benefits would also be uncertain, as discussed in Section 5.3.1.

5.2.5 Compliance Approach

This section describes how SMUD plans to address the requirements to identify cost-effective programs that allow for automated response to dynamic price signals and offer customers voluntary participation in these programs, based on our evaluation of such programs.

5.2.5.1 Identification of Cost-Effective Load Flexibility Programs

Consistent with the LMS requirements, SMUD will submit to the CEC, no later than October 1, 2024, a list of cost-effective load flexibility programs that enable automated response to MIDAS signals for each customer class, if any, where such a program is determined by SMUD's Board to materially increase peak load reduction. SMUD plans to include all cost-effective load flexibility programs offered by SMUD, not solely load flexibility programs that allow for automated response to MIDAS signals, within this list.

SMUD is unable to determine, based on the information currently available, that adding new programs or modifying existing programs to allow response to MIDAS signals would materially reduce peak load for any customer class relative to SMUD's existing programs or exceed the costs of implementation. SMUD will continue to evaluate the cost-effectiveness and incremental peak load reduction potential associated with incorporating automated response to MIDAS signals into new pilots and include on our list as appropriate.

5.2.5.2 Voluntary Participation in Cost-Effective Load Flexibility Programs

Based on the foregoing, SMUD will continue to offer our customers voluntary participation in load flexibility programs, and does not at this time anticipate offering programs that enable automated response to MIDAS signals. SMUD plans to defer offering voluntary participation in load flexibility programs that enable automated response to MIDAS signals because SMUD is currently unable to demonstrate that offering such programs beginning April 1, 2026, would be cost effective or result in material peak load reduction relative to SMUD's existing and planned load flexibility programs. However, as noted above, SMUD will continue to assess the cost-effectiveness and peak load reduction potential of programs that enable automated response to MIDAS signals as we develop and refine load flexibility programs, particularly based upon the pilots which we are conducting to inform our load flexibility approach.

6 Public Information Program

Section 1623.1(a)(5) requires each Large POU to conduct a public information program to inform and educate affected customers about dynamic rates or load flexibility programs. Specifically, the information program must explain why such rates or programs, and their automation, are needed, how they will be used, and how they can save the customer money. This section addresses how SMUD will comply with the public information program requirements.

6.1 SMUD's Communications Approach

Providing broad outreach and communication to SMUD's customers and maintaining a high level of customer relations are core values of SMUD. Specifically, SMUD's Strategic Direction on Outreach and Communication (SD-15) requires that:

- SMUD shall provide its customers the information, education and tools they need to best manage their energy use according to their needs.
- SMUD will use an integrated and consistent communication strategy that recognizes the unique customer segments that SMUD serves.
- SMUD's communication and community outreach activities shall reflect the diversity of the communities we serve. SMUD shall use a broad mix of communication channels to reach all customer segments. This communication shall be designed to ensure that all groups are aware of SMUD's major decisions and programs.

6.2 Current Outreach and Marketing

SMUD recognizes the importance of collaboration and public outreach. We know we cannot achieve ambitious climate goals alone and our customers must be part of the solution to decarbonize our region. SMUD communicates in a wide variety of channels and languages throughout the year to help ensure customers are aware of our time-dependent rates and load flexibility programs, and how they can help customers save money.

For example, TOD rates have been the standard rate for residential SMUD customers since 2018. When SMUD rolled out its residential TOD rate, we developed a comprehensive marketing and education campaign that was translated into 13 different languages, took nearly 18 months, and leveraged multiple channels, as shown in the figures below.

Figure 3 – TOD Marketing and Education Campaign Timeline

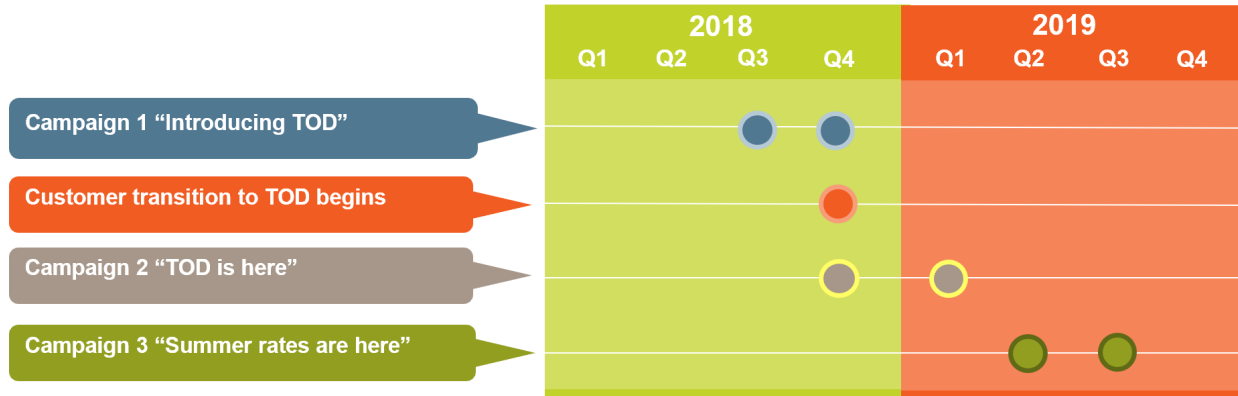


Figure 4 – TOD Awareness and Education Campaigns



SMUD’s public information campaign did not stop after the rollout of TOD implementation. SMUD continues to communicate extensively throughout the year about the significant benefits to customers and the utility to reducing energy usage between 5 and 8 pm. Throughout the summer rate months (June 1 to Sept. 30) SMUD undertakes extensive marketing and communications efforts to encourage customers to reduce energy usage during peak hours, highlighting the bill savings and benefits to the grid and environment from doing so. Key channels include media, social media, billboards, email, bill inserts, digital ads, SMUD’s website and more.

Figure 5 – Example of TOD Messaging

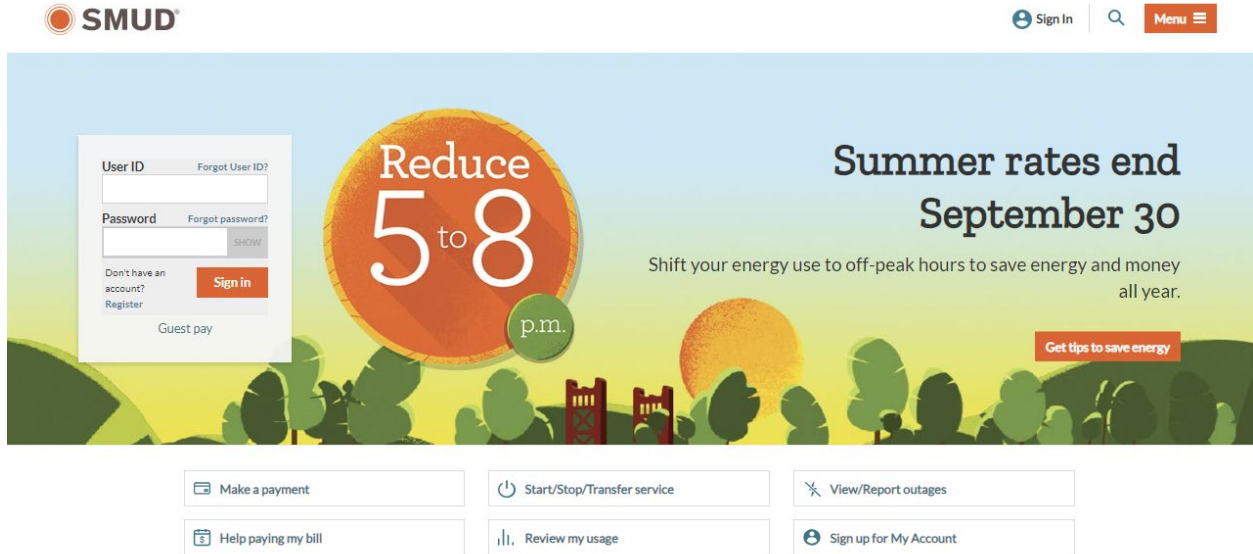
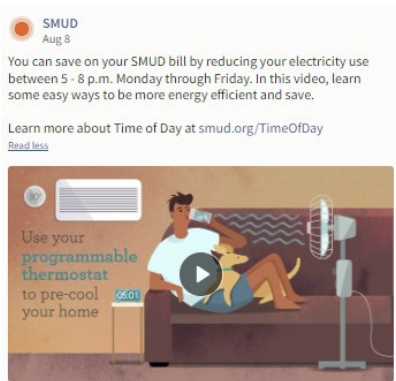


Figure 6 – Information About TOD Available on smud.org



In addition, SMUD has educated our customers on how they can participate in support of SMUD’s Zero Carbon Plan, which includes a range of new load flexibility programs which we market to customers on an ongoing basis. Key messages include a focus on how these programs help customers save energy and money.

In summer 2023, we launched a new multi-channel, multi-language marketing campaign to let customers know about our MEO Partner+ load flexibility program, which includes incentives for battery storage.

Figure 7 – Example of Information on Battery Storage Incentives



Recruitment and marketing for other load flexibility programs, including our new PeakConserve program and thermostat load flexibility program (MEO Partner) are ongoing.

SMUD also recently expanded our EV managed charging pilot to include Tesla, with a range of communications, including media, to support the expansion of the program.

Continuing to educate customers on the benefits of peak load reduction through time-dependent rates and load flexibility programs, how they work and how they can save the customer money, is an important element for achieving decarbonization goals.

SMUD will continue its award-winning communication and outreach efforts to fully maximize carbon reductions, grid savings and customer savings.

6.3 Compliance Approach

SMUD will continue with existing communication practices to maintain its outreach, education and marketing of rates, programs and pilots that support load flexibility and recognize the benefits of reducing our peak load. SMUD will also update our education and marketing to incorporate discussion of new rates, programs and pilots, along with the role of automation as appropriate, as they are developed.

7 Delay and Modification of Compliance Requirements

Section 1623.1(a)(2) of the LMS regulation specifies that a Large POU may approve a compliance plan, or material revisions to an approved plan, that delays or modifies compliance with certain LMS regulation requirements. To do so, the compliance plan must demonstrate one of the following factors: that despite good faith efforts to comply, requiring timely compliance would result in extreme hardship; requiring timely compliance would result in reduced system reliability, equity, safety, or efficiency; requiring timely compliance would not be technologically feasible or cost-effective to implement; or despite good faith efforts to implement a compliance plan, it must be modified to provide a more technologically feasible, equitable, safe, or cost-effective way to achieve the LMS requirements or the plan's goals.

This section addresses how SMUD's Plan delays or modifies compliance with certain elements of the LMS regulation.

7.1 Providing RINs to Customers

Section 1623(c)(4) requires each Large POU to provide customers access to their RIN(s) on billing statements and in online accounts by April 1, 2024, using both text and QR code. As detailed in Section 3.1.2 of this Plan, SMUD plans to make the RINs available to customers in the required formats within the designated time. SMUD has already begun engaging with our bill print vendor on the necessary changes and anticipates procuring professional services in the fourth quarter of 2023 to support this effort.

While SMUD does not anticipate needing to modify the RIN access requirement at this time, based on the scope of work and estimated completion timelines, compliance could be delayed if, for example, SMUD's current bill design constrains the inclusion of the RIN in text and/or QR code, and the redesign cannot be timely completed, tested, and implemented by the same deadline, or the cost of completion would create an extreme hardship for SMUD or its customers. In such circumstances, SMUD would need to modify the deadline for providing RINs to customers in both text and QR code because implementing this requirement by April 1, 2024, would not be technologically feasible.

7.2 Statewide RIN Access Tool

7.2.1 Development of Statewide Tool

Section 1623(c) requires the Large IOUs, Large POUs, and Large CCAs to develop a single statewide standard tool for authorized rate data access by third parties, along with a single set of terms and conditions for third parties using the tool, for submission to the CEC by October 1, 2024, for approval. As discussed in Section 3.1.3, SMUD plans to collaborate with the other regulated utilities and has committed staff to participate in the working group.

While SMUD anticipates that developing a single statewide tool that can perform the specified requirements and integrate with each regulated utility's system will be a challenging and complex task, at

this time SMUD intends to comply with the requirement. Because the tool development requirement is jointly held by the Large IOUs, Large POU, and Large CCAs, SMUD is optimistic that progress will be made and does not seek to delay or modify this requirement within this Plan. Should the need for an extension arise, SMUD anticipates that the regulated entities would approach the CEC Executive Director collectively in accordance with section 1623(c)(2)(B) of the LMS regulation, which allows the CEC Executive Director to extend the submission deadline upon a showing of good cause.

7.2.2 Implementation of Statewide Tool

Section 1623(c)(3) also requires the Large POU and other regulated entities to implement and maintain the tool, upon its approval by the CEC. At this time SMUD does not anticipate needing to modify compliance with this requirement. However, SMUD notes that integration of the approved tool with our internal systems could be delayed if the development and/or CEC approval of the tool are delayed, because integrating the tool before it is finalized and approved would not be technologically feasible, or if the cost of integrating the tool would cause extreme hardship for SMUD or our customers.

7.3 Dynamic Rates

Section 1623.1(b)(2) directs each Large POU to apply for approval from its Board by April 1, 2025, of at least one dynamic rate for the customer class(es) for which the Board determines such rate will materially reduce peak load. Section 1623.1(b)(4) requires POU to offer customers voluntary participation in such a rate or a specified load flexibility program by April 1, 2026. As discussed in Section 4.3, based on its evaluation of dynamic rates, SMUD cannot currently conclude that developing and implementing such rates on the LMS timeframe for any customer class would result in material incremental reductions in peak load relative to SMUD's existing time-dependent rates and programs, or be cost effective. This is, in large part, due to the following:

- SMUD's existing TOD and other time-dependent rate offerings capture a substantial portion of the available load shift benefits. We are also piloting new program approaches to test additional options for reducing peak load.
- At this time, there is a significant market risk to customers on dynamic rates, even with enabling technology that is capable of shifting load.
- Customers understand SMUD's time-dependent rates and programs better than a dynamic, market-based rate that fluctuates hourly.

While dynamic rates have the potential to provide incremental load shift and related benefits, there are significant uncertainties in the magnitude of such benefits relative to SMUD's existing rates, programs, and new pilots that we are testing, as well as the achievability of benefits. Implementation of unfamiliar and complex rate structures without sufficient testing and refinement of new rate designs, as well as thorough education, is likely to cause customer confusion, risking low adoption and limiting any incremental load shift benefits. Realization of incremental load shift benefits is made more uncertain by additional risks customers may bear with dynamic rates, especially if new enabling technology is not widely adopted.

While SMUD is not required to propose dynamic rates where such rates are not determined to materially reduce peak load, SMUD has determined that, for the reasons set forth in this Plan, the LMS requirements

must be modified to provide a more cost-effective and technologically feasible way for SMUD to, in good faith, achieve the LMS requirements and plan's goals.

SMUD's modifications to the dynamic rate requirements of the LMS include deferring the development or proposal of new hourly or sub-hourly rate options. Offering new rates to our customers would be likewise deferred. SMUD believes proposing dynamic rates to our Board by April 1, 2025, to implement by April 1, 2026, is premature, especially given the rollout of our many new load flexibility programs and pilots over the next two years. SMUD will continue offering our suite of TOD rates and load flexibility programs, while testing opportunities through new program pilots. The results of our pilots will help us better understand the effectiveness of our current approach, how customers with different technologies respond to different dispatch signals, and to what extent incremental load shift opportunities exist beyond our time-dependent rates and current and planned programs. As SMUD starts to receive and analyze results from our new pilots, we will be better positioned to evaluate the cost-effectiveness and flexibility of dynamic rates. SMUD will review dynamic rates in our next LMS Plan update.

7.4 Dynamic Response Load Flexibility Programs

7.4.1 Identification of Cost-Effective Load Flexibility Programs

Section 1623.1(b)(3) requires each Large POU to submit a list of cost-effective MIDAS-integrated load flexibility programs to the CEC Executive Director by October 1, 2024. The portfolio of load flexibility programs must provide at least one option to automate response to MIDAS signals (that indicate, for example, hourly marginal cost-based rates, marginal prices, or hourly or sub-hourly GHG emissions) for every customer class where such a program would materially reduce peak load.

As discussed in Section 5.3, adding or modifying programs to allow response to MIDAS signals has not yet been determined to result in material incremental reductions in peak load for any customer class relative to our existing time-dependent rates and load flexibility programs, or to be cost effective. This is in part due to the uncertainties in incremental peak load reduction potential and customer acceptance when introducing hourly or sub-hourly price signals and exposure to market price spikes and volatility.

SMUD is required to identify MIDAS-integrated dynamic load flexibility programs for customer classes where such programs are determined to be cost-effective and materially reduce peak load. Because SMUD's evaluation has not concluded that developing and implementing programs or pilots with automated response to MIDAS would be cost-effective or materially reduce peak load, SMUD anticipates submitting a list by October 1, 2024, that includes our current and planned load flexibility programs and pilots that achieve LMS goals without automated response to MIDAS signals. SMUD has determined that modifying this requirement is necessary to provide a more cost-effective and feasible way of achieving the LMS requirements and plan's goals. SMUD will continue to evaluate the cost-effectiveness and incremental peak load reduction potential associated with incorporating automated response to MIDAS signals into new pilots and include on our list as appropriate.

7.4.2 Voluntary Participation in Cost-Effective Load Flexibility Programs

Each Large POU is required to offer customers voluntary participation in either a dynamic rate, if approved by our Board, or cost-effective MIDAS-integrated load flexibility program by April 1, 2026, in accordance with Section 1623.1(b)(4).

SMUD is required to offer voluntary participation in cost-effective load flexibility programs that materially reduce peak load. As discussed in Sections 5 and 7.4.1 above, SMUD's evaluation has been unable to conclude that developing and implementing new load flexibility programs or pilots with automated response to MIDAS signals would be cost effective or materially reduce peak load beyond reductions already captured through SMUD's existing rates, programs and pilots. SMUD has determined that, for the reasons set forth in this Plan, the LMS program participation requirements must be modified to provide a more cost-effective and technologically feasible way for SMUD to in good faith achieve the LMS requirements and plan's goals. SMUD modifies this requirement to include voluntary participation in *any* load flexibility program or pilot, not just programs that allow for automated response to MIDAS signals. SMUD will continue to assess the cost-effectiveness and peak load potential of programs that enable automated response to MIDAS signals as we develop and refine load flexibility programs.

Appendix A

The following are the RINs associated with each of SMUD’s residential and non-residential rates and rate permutations that were uploaded to MIDAS by June 30, 2023.

RIN	Residential Rate Permutation
USCA-SMSM-CS00-0000	CITS-0
USCA-SMSM-CS01-0000	CITS-1
USCA-SMSM-CS02-0000	CITS-2
USCA-SMSM-CS03-0000	CITS-3
USCA-SMSM-CS04-0000	CITS-4
USCA-SMSM-CP02-0000	CITP-2
USCA-SMSM-CP03-0000	CITP-3
USCA-SMSM-CP04-0000	CITP-4
USCA-SMSM-CT03-0000	CITT-3
USCA-SMSM-CT04-0000	CITT-4
USCA-SMSM-AN00-0000	AON
USCA-SMSM-AD00-0000	AOD
USCA-SMSM-R200-0000	RT02
USCA-SMSM-RC00-0000	RTC1 (CPP rate)
USCA-SMSM-RE00-0000	RT02 w/EV
USCA-SMSM-RCE0-0000	RTC1 w/EV (CPP rate)
USCA-SMSM-CS0N-0000	CITS-0 NEM1
USCA-SMSM-CS1N-0000	CITS-1 NEM1
USCA-SMSM-CS2N-0000	CITS-2 NEM1
USCA-SMSM-CS3N-0000	CITS-3 NEM1
USCA-SMSM-CS4N-0000	CITS-4 NEM1
USCA-SMSM-CP2N-0000	CITP-2 NEM1
USCA-SMSM-CP3N-0000	CITP-3 NEM1
USCA-SMSM-CP4N-0000	CITP-4 NEM1
USCA-SMSM-CT3N-0000	CITT-3 NEM1
USCA-SMSM-CT4N-0000	CITT-4 NEM1
USCA-SMSM-R2N0-0000	RT02 w/NEM1
USCA-SMSM-RCN0-0000	RTC1 w/NEM1 (CPP rate)
USCA-SMSM-R2NE-0000	RT02 w/NEM1 &EV
USCA-SMSM-RCNE-0000	RTC1 w/NEM1 &EV (CPP rate)
USCA-SMSM-RCS0-0000	RTC1 w/SSR (CPP rate)
USCA-SMSM-RCSE-0000	RTC1 w/SSR & EV (CPP rate)

RIN	Non-residential Rate Permutation
USCA-SMSM-CSE0-0000	CITS-0 w/EAPR 15% discount
USCA-SMSM-CSE1-0000	CITS-1 w/EAPR 15% discount
USCA-SMSM-CSE2-0000	CITS-2 w/EAPR 15% discount
USCA-SMSM-GS00-0000	CITS-0 w/Greenergy 0.005/kWh
USCA-SMSM-GS01-0000	CITS-1 w/Greenergy 0.005/kWh
USCA-SMSM-GS02-0000	CITS-2 w/Greenergy 0.005/kWh
USCA-SMSM-GS03-0000	CITS-3 w/Greenergy 0.005/kWh
USCA-SMSM-GS04-0000	CITS-4 w/Greenergy 0.005/kWh
USCA-SMSM-GP02-0000	CITP-2 w/Greenergy 0.005/kWh
USCA-SMSM-GP03-0000	CITP-3 w/Greenergy 0.005/kWh
USCA-SMSM-GP04-0000	CITP-4 w/Greenergy 0.005/kWh
USCA-SMSM-GT03-0000	CITT-3 w/Greenergy 0.005/kWh
USCA-SMSM-GT04-0000	CITT-4 w/Greenergy 0.005/kWh
USCA-SMSM-S000-0000	CITS-0 w/Greenergy 0.01/kWh
USCA-SMSM-S001-0000	CITS-1 w/Greenergy 0.01/kWh
USCA-SMSM-S002-0000	CITS-2 w/Greenergy 0.01/kWh
USCA-SMSM-S003-0000	CITS-3 w/Greenergy 0.01/kWh
USCA-SMSM-S004-0000	CITS-4 w/Greenergy 0.01/kWh
USCA-SMSM-P002-0000	CITP-2 w/Greenergy 0.01/kWh
USCA-SMSM-P003-0000	CITP-3 w/Greenergy 0.01/kWh
USCA-SMSM-P004-0000	CITP-4 w/Greenergy 0.01/kWh
USCA-SMSM-T003-0000	CITT-3 w/Greenergy 0.01/kWh
USCA-SMSM-T004-0000	CITT-4 w/Greenergy 0.01/kWh
USCA-SMSM-GSN0-0000	CITS-0 NEM1 & Greenergy 0.005/kWh
USCA-SMSM-GSN1-0000	CITS-1 NEM1 & Greenergy 0.005/kWh
USCA-SMSM-GSN2-0000	CITS-2 NEM1 & Greenergy 0.005/kWh
USCA-SMSM-GSN3-0000	CITS-3 NEM1 & Greenergy 0.005/kWh
USCA-SMSM-GSN4-0000	CITS-4 NEM1 & Greenergy 0.005/kWh
USCA-SMSM-GPN2-0000	CITP-2 NEM1 & Greenergy 0.005/kWh
USCA-SMSM-GPN3-0000	CITP-3 NEM1 & Greenergy 0.005/kWh
USCA-SMSM-GPN4-0000	CITP-4 NEM1 & Greenergy 0.005/kWh
USCA-SMSM-GTN3-0000	CITT-3 NEM1 & Greenergy 0.005/kWh
USCA-SMSM-GTN4-0000	CITT-4 NEM1 & Greenergy 0.005/kWh
USCA-SMSM-SN00-0000	CITS-0 NEM1 & Greenergy 0.01/kWh
USCA-SMSM-SN01-0000	CITS-1 NEM1 & Greenergy 0.01/kWh
USCA-SMSM-SN02-0000	CITS-2 NEM1 & Greenergy 0.01/kWh
USCA-SMSM-SN03-0000	CITS-3 NEM1 & Greenergy 0.01/kWh
USCA-SMSM-SN04-0000	CITS-4 NEM1 & Greenergy 0.01/kWh
USCA-SMSM-PN02-0000	CITP-2 NEM1 & Greenergy 0.01/kWh
USCA-SMSM-PN03-0000	CITP-3 NEM1 & Greenergy 0.01/kWh
USCA-SMSM-PN04-0000	CITP-4 NEM1 & Greenergy 0.01/kWh
USCA-SMSM-TN03-0000	CITT-3 NEM1 & Greenergy 0.01/kWh
USCA-SMSM-TN04-0000	CITT-4 NEM1 & Greenergy 0.01/kWh