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PREPARED TESTIMONY OF CALIFORNIA SOLAR AND STORAGE ASSOCIATION, OHMCONNECT, INC., AND CALIFORNIA ENERGY STORAGE ALLIANCE ("JOINT ADVANCED RATE PARTIES")

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OVERVIEW OF TESTIMONY

The July 11, 2019 Scoping Memo and Ruling of Assigned Commissioner identified "real-time pricing or other dynamic pricing rate options" to be in scope of this proceeding.[1] The enclosed testimony proposes an RTP rate based on the real-time market prices of electricity to be made to all customer classes on an opt-in basis. **Chapter 2** reviews the value of a real-time pricing (RTP) tariff to SDG&E customers and the California grid above and beyond the currently available time-of-use (TOU) rates. **Chapter 3** describes in detail the proposed structure of an RTP rate. Finally, **Chapter 4** reviews the technical requirements necessary to offer such a rate to SDG&E customer.

[1] June 11, 2019 Scoping Memo and Ruling of Assigned Commissioner in A. 19-03-002 at p. 2.

CHAPTER 2

VALUE OF REAL-TIME PRICING

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Q: SDG&E's residential customers have been defaulted to TOU rates and most non-residential customers are on mandatory TOU. SDG&E also offers a critical peak price option that allows up to 18 events to be called per year. Why is RTP needed?

A: Although TOU prices are superior to non-time-dependent prices for sending more accurate price signals to customers about the value of consuming, or conserving, electricity at different times of the day and year, they offer a very blunt signal compared to prices observed in the wholesale market. Due to the volatility of wholesale energy prices, economists estimate that even well-designed TOU rates capture only a fraction of the potential economic efficiencies provided by RTP.[1] TOU time periods cannot encourage customers to reduce usage more during especially high-priced periods (or shift load to especially low-priced periods) or to respond to high wholesale prices that occur outside of the peak TOU time period, which can occur due to abnormal weather conditions or unplanned generation or transmission outages.

Even compared to less sophisticated dynamic rates, such as SDG&E's Time of Use Plus (TOU+) program (sometimes referred to as "Critical Peak Pricing" (CPP) or "Reduce Your Use"), RTP has several advantages. Under TOU+, customers may be exposed to up to 18 TOU+ events per year. During these events, SDG&E charges customers a commodity cost of $1.16 per kWh consumed in addition to the otherwise applicable delivery costs. In exchange, customers enrolled in TOU+ receive a discount for all non-event hours.

While TOU+ may incentivize load reductions similar to RTP on the days of highest demand, its effectiveness is limited by certain features of its program design. TOU+ cannot capture hours of high market prices that occur on non-event days, which could occur either because SDG&E has called the maximum number of events in the year,

[1] William Hogan. (2014). "Time-of-Use Rates and Real-Time Prices." https://sites.hks.harvard.edu/fs/whogan/Hogan_TOU_RTP_Newark_082314.pdf.

loads significantly exceed the day-ahead forecast, or unexpected contingencies have occurred.[2]

The enhanced accuracy of RTP would help facilitate the integration of large shares of renewable energy in California's portfolio by unleashing the capability of customer-sited storage and load management technologies to respond to sudden changes in renewable energy output or other contingencies, because only RTP can incentivize customers to adjust loads with sufficient precision. This capability is particularly enhanced by basing RTP tariffs on the real-time five-minute market. As California obtains increasing shares of its electric supply from renewable energy, more short-term load flexibility will be needed to integrate the growing share of energy from variable sources. High penetrations of variable renewable energy tend to lower average wholesale prices but increase price volatility and the cost of ancillary services.[3] As the costs of storage and automated demand response technologies decline, more customers will have the ability to shift loads over short time horizons in response to granular price signals.

Compared to TOU and TOU+ tariffs, the potential benefits of RTP are increasing due to mid-day wholesale price suppression from the abundant supplies of solar energy, resulting in a growing incidence of negative pricing events.[4] Neither TOU nor TOU+ can send price signals that reflect especially low, or even negative, wholesale pricing events.[5] Availability of RTP would enable customers with storage or other flexible loads to take full advantage of low prices during periods of oversupply in addition to reducing loads in response to high prices.

Q: What are the implications of RTP for greenhouse gas emissions?

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[2] We do not intend to suggest that RTP should necessarily replace TOU+. Rather, we believe that RTP and TOU+ (or a similar dynamic rate) should serve as complements, with RTP passing through accurate, granular energy prices, and another dynamic rate component conveying a price signal related to the capacity needed to serve the highest system-wide peaks of the year.

[3] Joachim Seel, Andrew Mills, Ryan Wiser, Sidart Deb, Aarthi Asokkumar, Mohammad Hassanzadeh, Amirsaman Aarabali. (2018). "Impacts of High Variable Renewable Energy Futures on Wholesale Electricity Prices and on Electric-Sector Decision Making." Lawrence Berkeley National Laboratory, LBNL-2001163. https://emp.lbl.gov/publications/impacts-high-variable-renewable.

[4] According to data from CAISO's OASIS website, there were 4,488 five-minute intervals in 2019 with negative pricing at the SDG&E DLAP.

[5] Andrew Mills and Ryan Wiser. (2014). "Strategies for Mitigating the Reduction in Economic Value of Variable Generation with Increasing Penetration Levels." Lawrence Berkeley National Laboratory, LBNL-6590E.

A: Availability of RTP tariffs would also send the right price signals to customers about marginal GHG emission rates and could induce substantial GHG reductions compared to other, less granular options. Due to the composition of California's electricity supply, wholesale prices and GHG emission rates are closely correlated because the wholesale price is usually set by the bid of the least-efficient gas-fired generator that clears the market, although instances of solar PV being on the margin are growing. The rough approximations of wholesale prices embedded in TOU rates are not accurate enough to extract the full potential GHG savings achievable by storage systems and flexible loads.

Inaccurate price signals were the primary factor underlying the findings in impact evaluations of the Self-Generation Incentive Program (SGIP) that many participating storage systems increased GHG emissions.[6] Two factors in particular incentivized storage systems to charge and discharge at inappropriate times: out-of-date TOU time periods, and the presence of non-coincident peak demand charges in many non-residential tariffs. E3's modeling of Southern California Edison Company's (SCE's) RTP option and SDG&E's dynamic Grid Integration Rate Modeling for the impact evaluation report, as well as modeling performed by EnerNOC (now part of Enel X) and PG&E for the SGIP GHG Signal Working Group Final Report[7], suggests that an RTP rate would be highly effective at incentivizing storage systems to reduce GHG emissions and deliver utility system cost savings. The report concluded:

> The hypothetical version of SDG&E AL-TOU (NEW) featuring day-ahead wholesale energy prices achieved a degree of consistent GHG emissions reduction not found using any of the current or proposed retail rates. These modeling results support the idea that it would be beneficial for some form of real-time pricing to be available as an option to both residential and non-residential customers, as was suggested by some participants at the December 2017 CPUC Rate Design Forum.[8]

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[6] Itron. (2019). 2018 SGIP Advanced Energy Storage Impact Evaluation at 1-7 (note page numbering is "chapter-page" format). https://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/Utilities_and_Industries/Energy/Energy_Programs/Demand_Side_Management/Customer_Gen_and_Storage/SGIP%20Advanced%20Energy%20Storage%20Impact%20Evaluation.pdf.

[7] AESC, Inc. (2018). "SGIP GHG Signal Working Group Final Report" at 161-162, 169-170.

[8] *Ibid*. at 170.

The 2018 SGIP impact evaluation, which compared GHG performance and avoided costs of the standard non-residential TOU rate to the most dynamic rate available for each utility, reinforced the previous conclusions of the GHG Working Group. The evaluation found that:

> For the two hourly dynamic rates (SCE and SDG&E), GHG emissions were substantially lower and the system cost savings more than doubled relative to the default TOU rate. The event-based PG&E Peak Day Pricing rate that is limited to 15 calls per summer did not reduce GHG emissions and increased system cost savings by only 25 percent. These results show that hourly dynamic rates can realize significant GHG emission and system cost benefits relative to TOU and event-based rate designs.[9]

Figure 1 depicts an example of how RTP could yield significantly higher economic efficiency and superior environmental outcomes compared to less sophisticated alternatives. The chart in the middle shows the 5-minutes prices from CAISO for the SDG&E Default Load Aggregation Point (DLAP) and the bottom chart shows the corresponding marginal GHG emissions from WattTime for March 11, 2019. The top chart shows the retail prices for SDG&E's AL-TOU rate schedule. Like most of SDG&E's current rate schedules, AL-TOU includes a weekday super-off-peak at night and, in March and April, from 10 am to 2 pm to capture periods that often experience solar overgeneration. (The weekend super-off-peak extends from midnight to 2 pm every day.)

[9] Itron. (2019) at 1-9 (note page numbering is "chapter-page" format).

Figure 1. Real-Time Prices and Marginal GHG Emissions at SDG&E DLAP with TOU Commodity Price for March 11, 2019

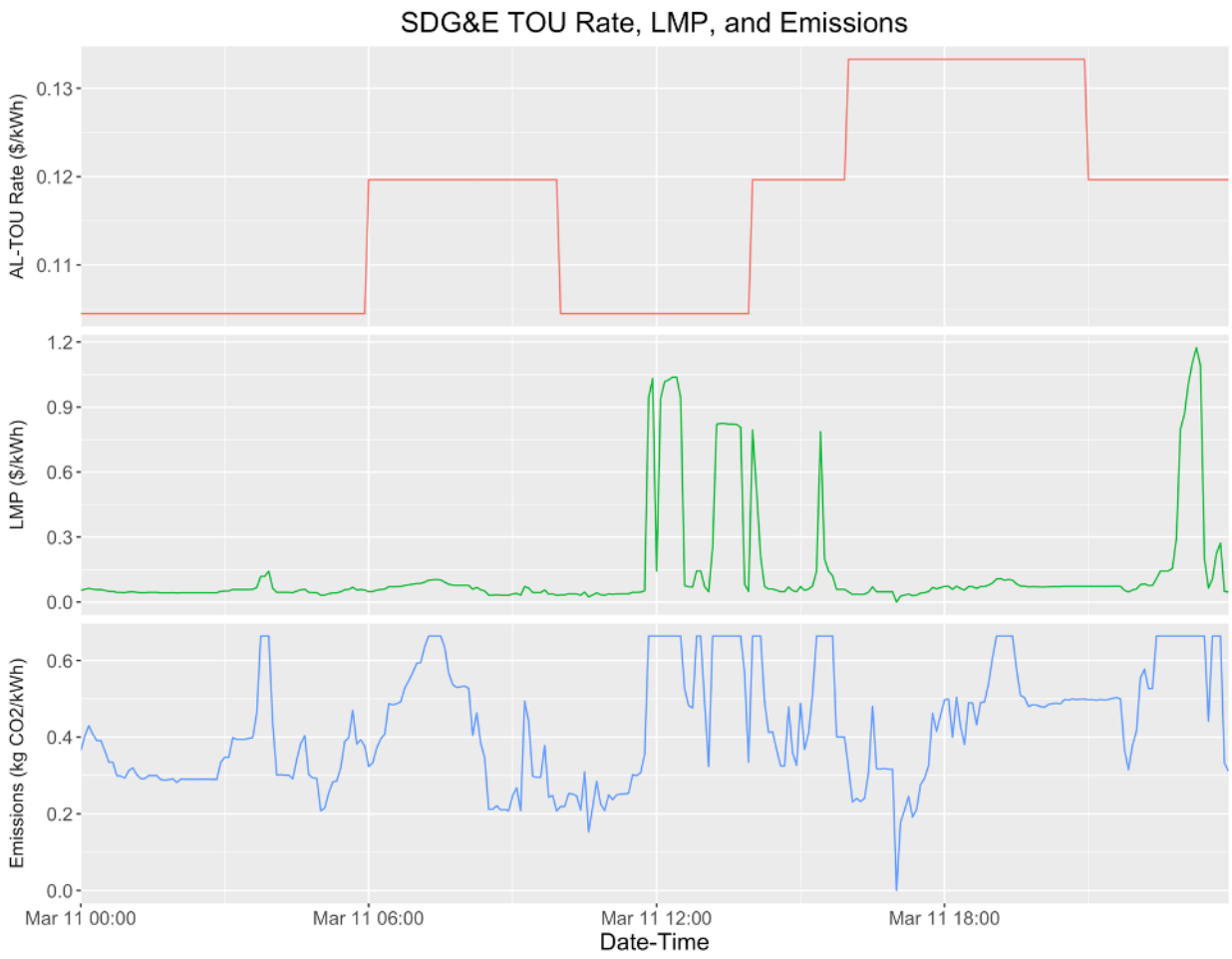

Figure 1 illuminates several interesting points. First, the figure shows the very tight correlation between wholesale prices and marginal GHG emission rates, which generally reach the maximum rate allowed by the model as the wholesale price approaches 15 cents per kWh. Second, Figure 1 shows the significant shortcomings of TOU. On this particular day, wholesale prices climbed to over 75 cents per kWh on three separate occasions during the daytime super-off-peak period. With the exception of one brief spike after 3 pm, wholesale prices fell back to a range of between 0 and 10 cents during most of the peak period. Although this is an anomaly, the pricing pattern on March 11 was the opposite of the price signal embedded in the TOU rates. Third, wholesale markets are often extremely volatile over short time periods. No TOU or relatively "blocky" dynamic price like TOU+ can convey sufficiently accurate price signals to capture the economic

and environmental efficiencies achievable by enabling load response to real-time conditions.

Q: What customer and market transformation benefits could RTP provide?

A: Exposing customers to the volatility of the wholesale market allows customers to maximize the bill savings opportunities of managing their loads. The increased savings opportunities compared to TOU or TOU+ rates will promote adoption of energy storage, electric vehicles, and automated demand response.

Q: How are customers likely to respond to RTP? What evidence is there regarding customer bill savings and retention?

A: Unfortunately, because RTP is not widespread, we have not found many rigorous studies on customer response to RTP. With energy storage, electric vehicles, and automated demand response becoming increasingly common, the potential for customers to provide meaningful load response to a highly granular dynamic rate is growing. Below we offer evidence of the potential for customer response to RTP using a mix of studies of RTP and other dynamic rates.

At the Commission's Advanced Rate Design Forum in December 2017, SCE gave a presentation describing their "RTP" rate. It is important to note that what SCE refers to as RTP is not a true RTP based on actual wholesale prices. Instead, it is a generation rate schedule with seven different hourly price profiles that vary based on season, day of the week (weekday/weekend), and temperature.[10] SCE notifies participants which price profile it will activate on a day-ahead basis. According to SCE, customers enrolled in the RTP option of tariff TOU-8-SEC reduced peak hour loads compared to other TOU-8-SEC customers by 48% and 43% respectively when SCE put "extremely hot" and "very hot" prices into effect. By managing their loads in response to these price signals, RTP customers saved 15% on their bills.[11]

[10] Southern California Edison. (2018) "Real Time Pricing." https://www.sce.com/sites/default/files/inline-files/RTP%20Fact%20Sheet%200918_WCAG%20%287%29.pdf.

[11] Robert Thomas. (2017). "CPUC Advanced Rate Design Forum: Designing and Implementation of Real-Time Pricing and Other Advanced Dynamic Rates" at slide 2. https://www.cpuc.ca.gov/uploadedFiles/CPUC_Website/Content/Utilities_and_Industries/Energy/Energy_Programs/

Oklahoma Gas & Electric (OG&E) offers an optional rate called SmartHours-Variable Peak Pricing (VPP) that combines elements of TOU and dynamic rates. On SmartHours-VPP, OG&E residential customers in Arkansas and Oklahoma are charged one off-peak rate during the summer, but one of four different weekday peak period (2 pm – 7 pm) prices that range from 5 cents to 41 cents per kWh. Like SCE's RTP rate, the price schedules are called on a day-ahead basis. Initially, participating customers could receive a free programmable communicating thermostat that responds to price signals automatically according to customer preferences. Participants can also choose to receive day-ahead notices by any combination of phone, text, or email.[12] OG&E currently has 120,000 residential accounts on SmartTemp-VPP, which is about one-sixth of its residential customer base.[13]

An evaluation of Smart Hours-VPP revealed that SmartTemp customers (those with communicating thermostats) on the rate reduced loads by 1.41 kW during critical price events and 0.77 kW during high price events. The critical price response is equivalent to approximately 40% load reduction compared to the business-as-usual peak load of 4 kW.[14] Non-SmartTemp customers reduced peak loads by 0.37 kW and 0.06 kW during critical and high price events respectively, considerably less than SmartTemp customers.[15] This finding is similar to other studies, which consistently show much greater load response from customers with automated demand response technologies. On average, customers participating in SmartTemp-VPP saved $150 per year on their bills, savings OG&E attributes to load response rather than participants being structural benefiters. Participants seem to be satisfied with the rate, with an active opt-out rate of only 2%.[16]

Electric_Rates/CPUC%20Rates%20Forum%202017-12-12%20RTP%20Panel%20Robert%20Thomas%20SCE%20presentation.pdf.

[12] For SmartHours FAQs and price schedules see https://oge.com/wps/portal/oge/save-energy/smarthours.

[13] Emails from Shane King, Customer Programs at OG&E to Scott Murtishaw dated October 14, 2019.

[14] Ahmad Faruqui. (2017) "Dynamic Pricing: What can We Learn from Other Jurisdictions?" at slide 2. https://www.cpuc.ca.gov/uploadedFiles/CPUC_Website/Content/Utilities_and_Industries/Energy/Energy_Programs/Electric_Rates/Faruqui%20Rate%20Design%20Panel%203%20Presentation.pdf

[15] Emails from Shane King, Customer Programs at OG&E to Scott Murtishaw dated October 14, 2019.

[16] *Ibid.*

Ameren and ComEd, two electric utilities in Illinois, also offer real-time pricing to residential customers. Both programs are administered by Elevate Energy, a non-profit organization that designs and implements energy efficiency, solar, and smart energy management programs.[17] Ameren's program uses day-ahead hourly prices as the basis of the energy component of its RTP rate, while ComEd uses the real-time five-minute market. Since the residential meters are only programmed to record hourly usage, the actual prices levied are based on the real-time prices averaged across each hour. There are currently over 40,000 participating residential customers across both utilities, up from about 30,000 participants circa 2016.[18, 19] As of 2017 participants had saved over $28 million,[20] and ComEd estimates that participating customers have saved about 15% on their electric bills on average.

In order to facilitate customer awareness and understanding, ComEd posts estimated prices the preceding day and allows customers to sign up for phone, email or text alerts. ComEd sends high price alerts the day before when the day-ahead market indicates high prices the following day and sends day-of alerts when prices are trending higher than expected.[21] Ameren's program also offers similar alerts, but since its prices are based on the day-ahead market, there are no day-of notifications.

[17] Elevate Energy. (2018). About Elevate Energy. https://www.elevateenergy.org/about.
[18] Scott Murtishaw. (2019). "RTP and Dynamic Rates in Other Jurisdictions." https://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=6442462899.
[19] Jeff Zethmayr and David Kolata. (2017). "The Costs and Benefits of Real-Time Pricing." https://citizensutilityboard.org/wp-content/uploads/2017/11/FinalRealTimePricingWhitepaper.pdf.
[20] *Ibid.*
[21] ComEd. (2020). "ComEd's Hourly Pricing Program: FAQs." https://hourlypricing.comed.com/faqs.

CHAPTER 3

DESCRIPTION OF THE PROPOSED REAL-TIME PRICING (RTP) TARIFF

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Q: Which customer classes should have access to RTP tariffs? Should RTP be opt-in or should it be implemented on default or mandatory basis for certain customer classes?

A: Joint Parties believe that all customer classes should have access to RTP on an opt-in basis.

Q: How should the RTP tariff be structured?

A: The basic structure that Joint Parties propose would mostly affect the generation (or commodity) portion of customers' otherwise applicable tariffs (OATs). Customers would continue to pay the same fixed, distribution, transmission, public purpose, and other non-bypassable charges from the OAT. The RTP rate would in many ways be similar to the Schedule VGI rate that SDG&E currently offers for electric vehicle (EV) charging through its Vehicle-Grid Integration Pilot Program.[1] However, since Schedule VGI can only be used for separately-metered EV charging, it was designed as a stand-alone rate schedule that does not depend on an underlying delivery schedule. Below, I describe how the RTP overlay should be applied to an underlying residential or general service rate schedule.

For residential customers, I use the default TOU rate (TOU-DR1) to illustrate how RTP would be implemented.[2] The Utility Delivery Charges (UDC) would be the same, except that there would be no Total Rate Adjustment Component (TRAC) because the RTP rate would not be tiered, which is consistent with the residential EV TOU rates that SDG&E offers. The DWR-Bond charge and DWR credits would also apply as they do to TOU-DR1. These two sets of charges cover transmission, distribution, public purpose program, and other non-bypassable costs.

[1] SDG&E Schedule VGI. http://regarchive.sdge.com/tm2/pdf/ELEC_ELEC-SCHEDS_VGI.pdf.

[2] SDG&E Schedule TOU-DR-1 at sheets 2-3. http://regarchive.sdge.com/tm2/pdf/ELEC_ELEC-SCHEDS_TOU-DR1.pdf.

This leaves three primary components that need to be recovered through the generation portion of the rate (referred to as the Electric Energy Commodity Costs or "EECC"): marginal energy prices, energy capacity costs (both system and flexible), and above-market stranded costs. The first component, marginal energy costs, would simply consist of the wholesale real-time price with a gross-up to account for line losses. For energy capacity costs, SDG&E would recover a portion based on minimum system loads through a flat volumetric component, similar to the commodity base rate in Schedule VGI. Capacity costs associated with the capacity above minimum load should be recovered via day-ahead adders. The day-ahead top 150 hours mechanism used in Schedule VGI is a good starting point although it would need to be reduced by the embedded marginal energy costs so that it only reflects capacity costs.

Joint Parties recommend that the day-ahead capacity adder be more granular than the adder used in either Schedule VGI or TOU+ like OG&E's SmartHours-VPP rate, which has four different peak TOU prices, or SCE's RTP. A minimum TOU adder would apply to peak hours every day with at least one, but preferably two or three, peak period adder(s) that vary according to day-ahead load forecasts. In other words, the base commodity rate would be higher every day during peak hours to reflect a base level of capacity and flexible capacity needs. On higher load days in the summer, the capacity adder would increase.

Joint Parties propose that, like SCE's RTP, the capacity adder be differentiated on an hourly basis to concentrate capacity costs in the specific hours likely to have the highest loads. Looking at SCE's TOU-GS-3-RTP rate as an example, generation costs on the "hot summer weekday" schedule increase modestly from $0.07/kWh during the hour ending 4 pm to about $0.10/kWh the following hour. However, from 5 pm to 7 pm, the price jumps to well over $3.50/kWh before falling to about $0.92/kWh from 7 pm to 8 pm.[3]

Regarding stranded costs, it is helpful to examine the Renewables Portfolio Standard (RPS) portion of SDG&E's portfolio separately from the fossil-based and unspecified portions. Since RTP customers remain bundled customers, SDG&E must continue to

[3] SCE. (2020). "Schedule TOU-GS-3-RTP" at sheet 3.

purchase RPS-compliant energy on their behalf. Joint Parties recommend that, at the start of the calendar year, SDG&E estimate the share of RPS-eligible energy that it anticipates will be in its portfolio for the year and allocate the same ratio to each billing interval. RTP customers would pay the average price of the RPS portfolio for that share of energy. For example, in 2018 SDG&E's portfolio consisted of 44% RPS-eligible energy.[4] For an RTP participant, 44% of the energy consumed in each billing period would be charged at the average portfolio price, including any mark-up necessary to cover SDG&E's administration of the contracts.

With this arrangement for RPS energy, RTP customers would essentially buy only the non-RPS share of their loads from the wholesale market. This leaves the possibility of some stranded costs associated with non-RPS long-term contracts or utility-owned generation in SDG&E's portfolio. Joint Parties suggest that the non-RPS portion of the Power Charge Indifference Adjustment (PCIA) could serve as the basis for a stranded cost adder that would apply to the RTP rate.

To summarize, an RTP tariff would consist of the following elements:

Table 1. Elements of RTP Tariff

RTP Tariff Element	**Description**
Delivery charge	Taken from UDC of OAT
Fixed charge*	Taken from UDC of OAT
DWR bond charge	Taken from default tariff
Non-generation demand charges*	Taken from UDC of OAT
Marginal energy cost	From CAISO real-time market, plus line-loss gross up
Generation capacity cost	Day-ahead adder during peak hours, summer should have a base adder and at least two higher peak adders based on day-ahead load forecasts

[4] CPUC. (2019). 2019 Annual Renewables Portfolio Standard Annual Report, November 2019 at 4. https://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/Utilities_and_Industries/Energy_-_Electricity_and_Natural_Gas/2019%20RPS%20Annual%20Report.pdf.

RPS Allocation	Average price of SDG&E RPS portfolio, covers same percent of participant's consumption as RPS portfolio share
Non-RPS Cost Responsibility	PCIA for the non-RPS share of participant's consumption

[*] *Not applicable for residential rates*

Although not essential to the preliminary implementation of an RTP tariff, Joint Parties encourage SDG&E to consider time differentiating the distribution component in addition to the generation component. In this regard, the VGI rate also serves as a good model because it includes a circuit-specific top 200 hour distribution capacity adder. Joint Parties realize that this would be a difficult undertaking to implement across SDG&E's entire territory and would include many circuits that are rarely, if ever, congested. However, SDG&E should evaluate the feasibility of incorporating a distribution adder for circuits that experience peak loads near their rated capacities.

Q: With the mismatch between 5-minute wholesale prices and the billing intervals recorded by meters, how will the wholesale prices be converted to prices for customers?

A: SDG&E's billing system will need to average the wholesale prices over each billing interval. For non-residential RTP customers whose meters record consumption every 15 minutes, the billing system will take the average of the three 5-minute wholesale DLAP prices that occur in each interval. ComEd's "Hourly Pricing" residential RTP rate works in a similar way. The prices are based on the 5-minute real-time market, but they are averaged on an hourly basis to match the meters' billing intervals.[5]

Customers should have the option to request that SDG&E reprogram their meters to record consumption in shorter intervals to enable them to capture additional bill savings from acting on the price volatility that occurs within hourly or fifteen-minute time frames. SDG&E should reprogram the meters of participating residential customers from hourly to 15 minute intervals to enable more precise load response. (Meter reprogramming is discussed in greater detail in Chapter 4 of this testimony.) Additionally, both non-residential and residential customers could opt to have their

[5] https://hourlypricing.comed.com/live-prices/

meters record data every five minutes. Customers requesting this option should compensate SDG&E for the reasonable cost of reprogramming the meter and managing the larger billing data sets.

Q: Is RTP likely to result in cost-shifting to other customers?

A: An RTP rate structured in the way Joint Parties have proposed should ensure that RTP participants cover their cost of service. Joint Parties have tried to construct an RTP tariff that aligns participants private costs with grid costs as much as possible. Bill savings that RTP customers achieve through load reducing or load shifting actions would be based directly on avoided wholesale energy costs and avoided capacity costs

CHAPTER 4

IMPLEMENTATION OF THE RTP TARIF

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Q: What is the case for SDG&E to develop a core set of capabilities to offer an RTP rate while leveraging third-party providers to help customers optimize their savings on such a tariff?

A: Both regulated utilities and competitive retail energy service providers are implementing RTP rates across the country with varying degrees of complexity. Generally, the universe of possible program components can be bifurcated into: 1) a core set of requirements and capabilities that are essential for customers to be able to take advantage of an RTP rate option, and 2) additional, or "extra", features that are not essential but, when available, improve the customer experience and help customers who opt into a real-time rate maximize its benefits.

Core capabilities include meter reprogramming to ensure that the meters of RTP customers can collect energy usage data at intervals consistent with the RTP option, the creation of a rate portal that presents up-to-date electricity price information to customers, and adjustments to the utility's billing system that enable billing based on real-time prices. *Additional features* may include device integrations that automate load shift based on real-time price signals, text message or app-based alerts that notify customers of impending high prices, tailored communications and advice based on customers' unique energy usage patterns, and bill comparisons between the RTP and other available tariff options, among many others. Implementation of some or all of these features carries trade-offs between a customer's experience on an RTP rate and the cost of implementing the rate to the utility and ratepayers.

The Joint Advanced Rate Parties propose that: 1) SDG&E be required to implement a core set of RTP capabilities to allow customers to take advantage of RTP rates, and 2) third parties be permitted to offer more comprehensive energy management services to customers to maximize their success on these rates. By limiting the amount of new capabilities that SDG&E will be required to develop, this proposal would minimize the financial impact of adopting the tariff on ratepayers while, at the same time, maximizing

the opportunity for the introduction of new and innovative approaches to improve customer response to real-time price signals.

The sections below detail the basic set of capabilities that SDG&E will be required to develop in order to offer an RTP rate to customers and outline the role that third parties can play in optimizing the RTP experience for customers who enroll in the real-time rate option.

Q: What capabilities will SDG&E be required to develop in order to implement an RTP tariff?

A: *Meter Reprogramming:* Settlement in the California Independent System Operator (CAISO) real-time market is commensurate with the dispatches of power plants that occur every fifteen (the Fifteen Minute Market, or FMM) and five minutes (the Real-Time Dispatch, or RTD). Due to this fifteen-minute and five-minute settlement granularity, the meters of all customers participating in the RTP tariff whose meters currently transmit only hourly data should be reprogrammed to at least a fifteen-minute interval reading.

It is our informed understanding that SDG&E already possesses the technical capability to reprogram residential meters to 15-minute increment reads. In SDG&E's testimony for its approved Application (A.) 14-06-002, witness Tony Rafati stated that meters can be converted by using Remote Meter Configuration ("RMC").[1] To support the RTP tariff, SDG&E should leverage this capability to the meter of any customer participating in the tariff that has not yet had their meter reprogrammed to at least fifteen minute granularity.

RTP Rate Portal: SDG&E will need to build an online portal that shows the prevailing price of electricity to customers who choose to enroll in an RTP rate. The platform will need to pull from the CAISO OASIS API, and display to users, all relevant market prices available via the RTP tariff(s) (e.g., day-ahead, FMM, RTD). To allow customers to track prices over time, the portal should have the following views: day, month, and year. Customers should be able to navigate to previous days, months and years to see historic prices and trends. Finally, SDG&E should develop a set of APIs that push RTP signals to

[1] May 11, 2015 Testimony of Tony Rafati, Application 14-06-002, at p. 5 Line 14-15.

anyone who would like to subscribe to the API. The Hourly Pricing Program offered by ComEd to its customers in Illinois offers a useful example of what an RTP Rate Portal could look like.[2]

Billing System Adjustments: SDG&E will be required to update its billing system to be able to bill customers based on the available RTP rate(s). Because the rate options included in this proposal do not impact transmission, distribution, and other charges, the Utility Distribution Company (UDC) Total Rate components of a customer's bill would not require adjustments and could continue to be calculated and reported on customer bills as they are today. Likewise, the Department of Water Resources Bond Charge (DWR-BC) and DWR revenue adjustment will also remain unchanged from the manner in which these are calculated and reported today.

The proposed changes would affect the calculation of the Electric Energy Commodity Cost (EECC) component of the tariff, reported as "Electricity Generation" on a customer's bill. Specifically, SDG&E would be required to separate the "Electricity Generation" calculation into at least three different line items for billing purposes: the electricity generation, electricity capacity charges, and above-market stranded costs. The *first* will represent the cost of electricity generation based on the real-time pricing option selected by the customer. This will simply be the total energy usage multiplied by the relevant real-time price of electricity in each applicable time interval, summed over the entire billing period. The *second* will charge the customer for costs associated with procuring generation capacity. The charge will be calculated as a volumetric multiple of a time-based rate. The *third* charge will cover the RPS-compliant energy that SDG&E will continue to have to purchase on behalf of its customers. This charge will be calculated by multiplying about 44% of an RTP customer's total energy use by the average portfolio price, including any mark-up necessary to cover SDG&E's administration of the contracts. Each of these is described in greater detail in Chapter 3 of this testimony. A detailed breakdown of the electricity generation component of the bill (i.e., cost of electricity and usage in each interval of the billing cycle) would not need to appear on the

[2] ComED's Hourly Pricing Portal: https://hourlypricing.comed.com/live-price

bill. However, this data should be available for download from a customer's SDG&E online account.

Insofar as stakeholders are concerned about the time and cost needed to implement such changes, SDG&E need not develop comprehensive RTP billing capabilities internally. There is an established ecosystem of billing system vendors who service retail electricity providers in competitive choice states like Texas. Many of these vendors already support "complex" billing for time-sensitive rate structures like RTP.

Q: What value can third parties provide customers?

A: While SDG&E, as the distribution utility and load serving entity, must develop a core set of capabilities to serve customers on an RTP tariff, third-party providers may be better suited to optimize the RTP experience for customers. Specifically, third parties can create a marketplace in which they compete for RTP customers, offering additional energy management services that help customers shift their electricity usage and save money on the RTP rate versus other rate options. These services could include text alerts that notify customers of impending high (or low) prices beyond a user-specified threshold, device integrations that allow smart devices to turn on/off or change settings in response to real-time price signals (much as is currently done for demand response), customized views of a customer's historic energy usage compared to the prevailing price of electricity, education materials related to money-saving load shift options, and bill comparisons against other SDG&E rate options, among many others. Third parties would be free to develop their own business models to attract customers and compete for their business based on the usefulness of their services in helping those customers manage their energy use on an RTP rate. While SDG&E could also develop these capabilities in-house, third parties may be able to do so more cost-effectively and without passing on the majority of this cost to ratepayers. Finally, a marketplace where energy service providers compete for customers based on their ability to save them money relative to other rate options is beneficial to California's grid and its broader decarbonization goals. A customer will only continue paying for the services of an energy management company if this company is truly helping them maximize their success on an RTP rate. In the context of real-time electricity pricing, success means substantial reductions in peak-time usage, especially in

the summer months, and general load shift to lower-priced periods in the middle of the day or overnight. These are the desired outcomes of any RTP tariff.

Q: Is Commission action required to allow third parties to play a supporting role in implementing an RTP tariff?

A: Although third parties are already able to offer some of the services described above without Commission action, they will not be able to provide a fully customized experience without access to customer meter data. Fortunately, the CPUC has already put in place systems that allow customers to authorize third parties access to their energy usage data for the purposes of demand response (DR). Through A.14-06-001, the CPUC adopted Electric Rule 24 (for Pacific Gas and Electric & Southern California Edison) and Electric Rule 32 (for San Diego Gas & Electric) (collectively, "Rule 24/32") to facilitate direct customer participation in DR programs. Access to meter data is a core component of any such program. Under Rule 24/32, demand response providers (DRPs) are required to obtain customer consent to share their data through the Customer Information Service Request for Demand Response Providers (CISR-DRP) form, in either paper format or a straightforward electronic authorization, or "OAuth", process. Importantly, Rule 24/32 also lays out the roles and requirements of DRPs and the meter data management agents (MDMAs)—in this case, the utilities—when it comes to sharing and handling customer meter data and outlines a set of requirements meant to provide consumer protection. The latter includes an obligation that all DRPs maintain a valid registration at the CPUC and post a performance bond in an amount commensurate with the number of customers served.

The existing Rule 24/32 requirements—including the systems already built by SDG&E and other utilities to comply with them—can be leveraged to allow RTP customers to grant third parties access to their meter data for the purposes of providing general energy management services. For example, PG&E's Share My Data platform, including the click-through process, facilitates data delivery of customer data for all authorized third parties. However, in testimony submitted in 2018, witness Raghav Murali of SDG&E stated that "SDG&E believes that the [click-through process] should not yet be expanded

for use by DERPs"[3], where "DERPs" is meant to include non-Demand Response providers. Unless SDG&E's stance has changed, the Commission should rule that SDG&E must use its existing infrastructure to support third parties that seek to better empower customers on real-time rates to manage their electricity consumption outside of demand response.

Finally, if third parties are permitted to play a role in helping customers maximize savings on an RTP tariff as proposed, the data elements transmitted via Rule 24/32 should be reviewed to ensure that they include everything required to reproduce a customer's bill. While the majority of the necessary data elements are indeed already part of the Rule 24/32 data stream, some important components (e.g., a customer's baseline territory) may need to be added.

[3] A.18-11-017 (SDG&E) Prepared Direct Testimony of Raghav Murali, at p. RM-9.

APPENDIX A

WITNESS QUALIFICATIONS

PREPARED TESTIMONY OF THE JOINT ADVANCED RATE PARTIES
CHAPTER 5
WITNESS QUALIFICATIONS

STATEMENT OF QUALIFICATIONS OF SCOTT MURTISHAW

Q: Please state for the record your name, position, and business address.

A: My name is Scott Murtishaw. I am the Senior Advisor for Regulatory Affairs at the California Solar & Storage Association (CALSSA). My business address is 1107 9th Street, Suite 820, Sacramento, CA 95814.

Q: Please describe your experience and qualifications.

A: I have 20 years of experience working in the energy industry. I spent eight years at the Lawrence Berkeley National Laboratory as a researcher in the Energy Analysis Department. From 2007 to 2010 I worked on cap and trade and renewable energy policy in the Commission's Energy Division. From 2010 to 2018, I served as an advisor to Presidents Peevey and Picker. During that time, I initiated Rulemaking 12-06-013 on residential rate reform, and I handled all rate cases assigned to the President's office, including several Phase 2 rate case and Rate Design Window applications. For the last two years I have worked at CALSSA, where I cover rate design, net energy metering, and storage-related proceedings before the Commission.

Q: On whose behalf are you testifying?

A: I am testifying on behalf of the Joint Advanced Rate Parties (Joint Parties): which consist of CALSSA, the California Energy Storage Alliance (CESA), and OhmConnect Inc.

Q: What are the topics of your testimony?

A: I am testifying in support of having San Diego Gas & Electric Company (SDG&E) offer an optional real-time pricing (RTP) tariff for all customer classes. We are also recommending that SDG&E adopt optional versions of their C&I tariffs with daily demand charges, similar Pacific Gas and Electric Company's Option S rates adopted in D.18-08-013.

STATEMENT OF QUALIFICATIONS OF MARIA BELENKY

Q: Please state for the record your name, position, and business address.

A: My name is Maria Belenky. I am a Senior Market Analyst at OhmConnect, Inc. My business address is 350 Townsend St. Suite 424, San Francisco, CA 94107.

Q: Please describe your experience and qualifications.

A: I have been employed by OhmConnect for two years, where I cover rate design, demand response, and resource adequacy proceedings before the Commission. Previously, I was a Director of Research & Policy at Climate Advisers, where I led efforts to track and measure the impacts of U.S. climate and clean energy policy on national GHG emissions. I have a BA in Economics and International Relations from the University of Pennsylvania and an MA in Energy, Resources and the Environment from John Hopkins University, School of Advanced International Studies.

Q: Have you testified previously before the Commission?

A: Yes. I previously prepared OhmConnect's testimony in Track 2 of Rulemaking (R.) 19-09-020, to Oversee the Resource Adequacy Program for the 2019 and 2020 Compliance Years.

Q: On whose behalf are you testifying?

A: I am testifying on behalf of the Joint Advanced Rate Parties: which consists of CALSSA, the California Energy Storage Alliance (CESA), and OhmConnect Inc.

Q: What are the topics of your testimony?

A: I am testifying in support of having San Diego Gas & Electric Company (SDG&E) offer an optional real-time pricing (RTP) tariff for all customer classes. The purpose of my testimony is to describe the basic set of capabilities that SDG&E will be required to develop in order to offer an RTP rate to customers and outline the role that third-parties can play in optimizing the RTP experience for customers that enroll in the real-time rate option.