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I. INTRODUCTION

The purpose of my testimony is to set forth San Diego Gas & Electric Company’s (“SDG&E”) proposal to conduct an experimental time-of-use (“TOU”) pilot for its residential customers. The proposal is in support of and consistent with the California Public Utilities Commission’s (“Commission” or “CPUC”) ten guiding rate design principles for optimal rate design\(^1\) and the Energy Division Staff Proposal for Residential Rate Reform (“ED Staff Proposal”).\(^2\) SDG&E’s proposal will evaluate the on-peak load shifting effects of three different TOU rates with differing TOU period lengths and pricing structures. The information and insights gained from this study will be used in creating the default TOU rate structure that SDG&E is proposing to begin in 2018 as well as optional TOU rates, consistent with CPUC policy priorities and in compliance with Assembly Bill (“AB”) 327. This testimony will provide a brief overview of SDG&E’s current residential TOU rates, relevant residential TOU rate studies and why SDG&E should conduct a TOU pilot, followed by a general description of SDG&E’s TOU study pilot design.

II. BACKGROUND OF SDG&E’S RESIDENTIAL TOU

SDG&E currently has less than 1% of its residential class on a TOU rate, which is in itself an important reason to conduct an experimental TOU pilot in preparation for default TOU rates in 2018. SDG&E has offered its current residential TOU rate, Schedule DR-
TOU, since 1983. While the rate has undergone various iterations throughout the years, DR-TOU is currently tiered and the rates differ by season. The on-peak period is weekdays from noon to 6pm and off-peak is all other hours plus weekends and holidays. Other optional residential TOU rates include Schedule DR-SES for SDG&E’s solar customers, which is a three part TOU rate that has a summer on-peak period of 11am to 6pm Monday through Friday excluding holidays. SDG&E has five electric vehicle (“EV”) TOU rates, one whole house TOU rate and four individually metered electric vehicle charging rates. SDG&E’s EV-TOU2 schedule is a whole house three part TOU with the on-peak period between noon to 6pm weekdays excluding holidays. There is no distinction for the on-peak period between summer and winter. Schedule EV-TOU is a rate for separately metered EV charging. The on-peak period is from noon to 8pm weekdays excluding holidays and has no distinction for the on-peak period between summer and winter. There are three experimental EV rates for separately billed EV charging that were created with the explicit intent to conduct a pricing study for electric vehicles. These EV rates (Schedule EPEV-X, Schedule EPEV-Y, and Schedule EPEV-Z) have an on-peak period from noon to 8pm all days of the year, a “super” off-peak period that encourages EV charging from midnight to 5am, and an off-peak period from 8pm to midnight and from 5am to noon. A summary of SDG&E’s current TOU rate offerings is provided in the tables below:

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3 SDG&E previously had TOU rates in 1979, but those rates are no longer offered. Schedule DR-TOU was made available in 1983; however, the first customer to actually go onto the rate was in 1989.
### Schedule DR-TOU

<table>
<thead>
<tr>
<th>Season</th>
<th>Tier</th>
<th>On-Peak Noon - 6pm Weekdays (cents/kWh)</th>
<th>Off-peak All Other (cents/kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter</td>
<td>Baseline</td>
<td>0.15</td>
<td>0.15</td>
</tr>
<tr>
<td></td>
<td>101%-130% Baseline</td>
<td>0.16</td>
<td>0.16</td>
</tr>
<tr>
<td></td>
<td>131%-200% Baseline</td>
<td>0.31</td>
<td>0.31</td>
</tr>
<tr>
<td></td>
<td>200%+ Baseline</td>
<td>0.37</td>
<td>0.36</td>
</tr>
<tr>
<td>Summer</td>
<td>Baseline</td>
<td>0.17</td>
<td>0.15</td>
</tr>
<tr>
<td></td>
<td>101%-130% Baseline</td>
<td>0.18</td>
<td>0.16</td>
</tr>
<tr>
<td></td>
<td>131%-200% Baseline</td>
<td>0.36</td>
<td>0.33</td>
</tr>
<tr>
<td></td>
<td>200%+ Baseline</td>
<td>0.47</td>
<td>0.36</td>
</tr>
</tbody>
</table>

### Schedule DR-SES

<table>
<thead>
<tr>
<th>Season</th>
<th>TOU Name</th>
<th>TOU Hours</th>
<th>Rate (cents/kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter</td>
<td>Semi-Peak</td>
<td>6am-6pm</td>
<td>0.21</td>
</tr>
<tr>
<td></td>
<td>Off-Peak</td>
<td>6pm-6am</td>
<td>0.20</td>
</tr>
<tr>
<td>Summer</td>
<td>On-Peak</td>
<td>11am - 6pm</td>
<td>0.30</td>
</tr>
<tr>
<td></td>
<td>Semi-Peak</td>
<td>All other</td>
<td>0.22</td>
</tr>
<tr>
<td></td>
<td>Off-Peak</td>
<td>10pm-6am</td>
<td>0.20</td>
</tr>
</tbody>
</table>
## Electric Vehicle Tariffs

<table>
<thead>
<tr>
<th>Tariff</th>
<th>TOU Name</th>
<th>TOU Hours</th>
<th>Winter Weekday (cents/kWh)</th>
<th>Winter Weekend (cents/kWh)</th>
<th>Summer Weekday (cents/kWh)</th>
<th>Summer Weekend (cents/kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EV-TOU2</td>
<td>On-Peak</td>
<td>Noon to 6pm</td>
<td>0.20</td>
<td>0.20</td>
<td>0.29</td>
<td>0.29</td>
</tr>
<tr>
<td></td>
<td>Off-Peak</td>
<td>All Other</td>
<td>0.19</td>
<td>0.19</td>
<td>0.19</td>
<td>0.19</td>
</tr>
<tr>
<td></td>
<td>Super Off-Peak</td>
<td>Midnight to 5am</td>
<td>0.17</td>
<td>0.17</td>
<td>0.17</td>
<td>0.17</td>
</tr>
<tr>
<td>EV-TOU</td>
<td>On-Peak</td>
<td>Noon to 8pm</td>
<td>0.20</td>
<td>0.20</td>
<td>0.29</td>
<td>0.29</td>
</tr>
<tr>
<td></td>
<td>Off-Peak</td>
<td>All Other</td>
<td>0.19</td>
<td>0.19</td>
<td>0.19</td>
<td>0.19</td>
</tr>
<tr>
<td></td>
<td>Super Off-Peak</td>
<td>Midnight to 5am</td>
<td>0.17</td>
<td>0.17</td>
<td>0.17</td>
<td>0.17</td>
</tr>
<tr>
<td>EPEV-X</td>
<td>On-Peak</td>
<td>Noon to 8pm</td>
<td>0.20</td>
<td>0.20</td>
<td>0.31</td>
<td>0.31</td>
</tr>
<tr>
<td></td>
<td>Off-Peak</td>
<td>All Other</td>
<td>0.19</td>
<td>0.19</td>
<td>0.19</td>
<td>0.19</td>
</tr>
<tr>
<td></td>
<td>Super Off-Peak</td>
<td>Midnight to 5am</td>
<td>0.16</td>
<td>0.16</td>
<td>0.15</td>
<td>0.15</td>
</tr>
<tr>
<td>EPEV-Y</td>
<td>On-Peak</td>
<td>Noon to 8pm</td>
<td>0.28</td>
<td>0.28</td>
<td>0.33</td>
<td>0.33</td>
</tr>
<tr>
<td></td>
<td>Off-Peak</td>
<td>All Other</td>
<td>0.19</td>
<td>0.19</td>
<td>0.21</td>
<td>0.21</td>
</tr>
<tr>
<td></td>
<td>Super Off-Peak</td>
<td>Midnight to 5am</td>
<td>0.09</td>
<td>0.09</td>
<td>0.09</td>
<td>0.09</td>
</tr>
<tr>
<td>EPEV-Z</td>
<td>On-Peak</td>
<td>Noon to 8pm</td>
<td>0.39</td>
<td>0.39</td>
<td>0.44</td>
<td>0.44</td>
</tr>
<tr>
<td></td>
<td>Off-Peak</td>
<td>All Other</td>
<td>0.15</td>
<td>0.15</td>
<td>0.17</td>
<td>0.17</td>
</tr>
<tr>
<td></td>
<td>Super Off-Peak</td>
<td>Midnight to 5am</td>
<td>0.08</td>
<td>0.08</td>
<td>0.08</td>
<td>0.08</td>
</tr>
</tbody>
</table>

SDG&E proposes to combine the best attributes of its TOU rate offerings so that it can prepare for and provide optimal default TOU rates in 2018 as well as optional TOU rates. One of the main purposes of this pilot is to gain insights into customer response to different TOU pricing structures while also providing customers with rate choices that benefit both the customer and SDG&E. SDG&E will apply various aspects of the TOU studies described in Section III below and utilize best practices from other TOU programs.
III. TOU STUDIES

A. Phoenix, Arizona

Although TOU rates for residential customers have been offered since the 1980’s in the Phoenix area, recent TOU studies have been conducted at Salt River Project (“SRP”) and Arizona Public Service (“APS”) which are relevant to SDG&E’s experimental TOU proposal. Both utilities serve the Phoenix area, and have had TOU rates in place for many years. High residential air conditioning loads contribute to peak demands, and TOU rates have helped both utilities manage their peaks. Similarly, SDG&E’s peaks are also driven by extremely warm temperatures and higher than normal residential air-conditioning use.

Both Arizona utilities have a significant proportion of their residential customers on TOU for several years and both utilities consider their TOU rates to be successful. APS has over 50% of its residential customers on TOU and SRP has over 20%. The original TOU rate structures that were implemented in the 1980’s had long 12 hour on-peak periods.\(^4\) APS still offers a 12 hour on-peak rate while SRP has moved to a seven hour on-peak period (1pm to 8pm) for its longest TOU on peak option. Both utilities now have a variety of TOU options ranging from 12 hours to 3 hours to help manage their peak loads. SRP’s on-peak to off-peak rate differentials range from 3 to 1 for its seven hour TOU, up to 4.5 to 1, and their EZ3 – 3 hour TOU rate– which offers three three-hour TOU on-peak periods that is targeted to their larger users those that had at least 1,800 kWh a month. Coincident demand load impacts from SRPs experimental TOU rate study were 11% for customers that moved from its residential standard non TOU tiered rate (E23) to the seven hour TOU rate (E26), and

large use customers that moved from either E23 or E26 to the three hour EZ3 rates had 25% impacts.\(^5\)

**B. Sacramento Municipal Utility District (“SMUD”)**

SMUD recently presented first year results of their “Smart Pricing Options Pilot.” SMUD utilized two recruiting strategies, an “opt in” and a “default” strategy. Specifically, they used a randomized control trial design (recruit and delay) as well as a randomized default encouragement design. Because SMUD adhered to strict experimental design, the insights gained from its pilot can be applied to all residential customers within SMUD’s service territory. One of the important features of SMUD’s pilot was that a representative sample of residential customers was randomly selected and defaulted onto one of three rates – which included both TOU and Critical Peak Pricing (“CPP”) rate options. The design allowed SMUD to accurately estimate what the “opt out” rates would look like if all of its customers were defaulted onto any of the three rate options. Additionally, SMUD’s default treatment groups display extremely high enrollment rates, ranging from a low of almost 93% for the TOU-CPP rate to a high of almost 98% for the TOU rate\(^6\).

**C. Ontario Power Authority (“OPA”)**

OPA is one of the only regions where full scale Smart Meter deployment was immediately followed by TOU rates for all its residential customers.\(^7\) First year results indicate that residential customers showed a consistent pattern of load shifting behavior across the Local Distribution Companies (“LDCs”) analyzed. Generally, residential

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\(^7\) Impact Evaluation of Ontario’s Time-of-Use Rates: First Year Analysis, Brattle Group, November 26, 2013, Executive Summary, at p. iv.
customers shifted energy usage from peak periods to off-peak periods. Overall, on-peak
demand impacts ranged from 1.3% to 5.6%, and summer on-peak impacts ranged from 2.6%
to 5.7% depending on LDC.\footnote{\textit{Id.}, at p. vi.} OPA’s on-peak reductions in usage are consistent with other
TOU pilots that have been conducted in the U.S. in recent years. OPA has commissioned a
three-year study and results for both year 2 and year 3 will build on the foundation of the
first year study.

\section*{D. Statewide Pricing Pilot (“SPP”)}

SPP was conducted largely to the response of the 2000-2001 energy crisis. California had little ability to react to California’s Power Exchange price spikes as there
were virtually no dynamic rates implemented at the time. SDG&E participated in the pilot
along with PG&E and SCE. SPP conducted residential pricing experiments for critical peak
pricing rates and TOU rates throughout California. One of the tracks studied was a TOU
only rate where the on-peak to off-peak price differential was about 2 to 1. The TOU track
looked at one summer on-peak period that was from 2pm -7pm. First year results showed
that modest reductions of 5.9% were seen during on-peak period during the “inner” summer
months (July, August and September). Those results also closely matched the TOU effect of
the dynamic rate of CPP-F track. However, during the second year of the study those peak
period impacts were close to zero and the authors warn of small sample sizes and being able
to draw conclusions from the TOU track itself.\footnote{Impact Evaluation of the California Statewide Pricing Pilot, Charles River Associates, March 16, 2005, at pp. 8-10.} In 2003, SPP was the best pricing
experiment conducted; however, it is now over 10 years old and more information as well as
updated information is needed in order for SDG&E to make a successful transition into
default TOU for its residential customers.

IV. SDG&E’S EXPERIMENTAL TOU PILOT PROPOSAL

As further explained in the direct testimony of SDG&E witness Chris Yunker,
SDG&E’s goal is consistent with ED’s in that “TOU time periods and rate design need to
carefully developed in the context of GRC’s, or comparable rate setting proceedings.”\(^{10}\) To
accomplish this, SDG&E needs to answer several important research questions that can be
addressed in an experimental TOU pilot. Some of these questions are similar to those asked
in the ED’s Staff Proposal. Such questions include the following:

1. Are there statistically significant reductions in energy use at time of
   SDG&E’s monthly system peaks?

2. Are there statistically significant load reductions in monthly on-peak energy
   use?

3. Are there statically significant load increases in monthly semi-peak and off-
   peak energy use?

4. How do the changes in energy use differ between the three TOU rates?

5. For the customers enrolled in the four hour on-peak time of use rates are
   there statistically significant increases in energy use during the other three
   hours that are part of the on-peak period of the seven-hour TOU rate?

6. Do the combined shorter TOU rate options provide more on-peak load
   reduction than the seven hour rate option?

\(^{10}\) ED Staff Proposal, at p. 16.
7. Is there an increase in energy usage immediately after the end of the on-peak period and is the increase in energy snapback higher in the seven-hour TOU or the two four-hour TOU rates?

8. What are the opt-out rates and how do the opt-out rates differ between the three TOU rates?

It is important that SDG&E understands how a default TOU program will impact peak hours during normal system conditions as well as peak load conditions. Successful implementation of on-peak TOU rates will promote lasting load shifts and improve SDG&E’s overall system load factor. The success of long-term TOU rates implemented in 2018 will depend on SDG&E’s ability to understand customer opt-out rates and associated load shifts prior to 2018 implementation of default TOU. SDG&E plans to examine its proposed optional seven hour summer on-peak period along with two four-hour on-peak windows within the seven hour summer on-peak period.

SDG&E proposes to conduct a pilot where it will recruit a representative sample of residential customers to participate in the TOU pilot. Before enrolling, customers will be informed that as part of the pilot they will be randomly assigned to one of three TOU rates. Once enrolled, each participant will be randomly assigned to one of the three TOU rates. This method will ensure that the customer response to the different time of use rates can be compared without complications of selection bias. While SDG&E’s proposed opt-in pilot design is not SDG&E’s first preference, a default TOU pilot is not allowable under
AB 327. Nonetheless, SDG&E believes that there are significant benefits in conducting an experimental TOU pilot. The pilot will provide important quantitative information about the difference in customer response to on-peak time of use periods of different lengths that will inform future rate design. SDG&E plans to leverage its opt-in study findings with other utilities’ opt-in studies such as SMUD’s, SRP’s, Ontario Power Authority’s to assess how a default TOU might reduce overall consumption during SDG&E’s peak periods.

SDG&E plans to utilize residential smart meter interval data in the evaluation of this pilot. Nearly 99% of SDG&E’s residential customers are on Schedule DR and Schedule DR-CARE and not on a TOU rate. SDG&E anticipates that the hourly and subsequent 15 minute data will be extremely useful in gaining insights in changes or reductions to customer usage patterns on the experimental TOU rates. The fact that non-TOU pre-treatment interval data for nearly all of SDG&E’s residential population is available is unique. SDG&E expects that this experimental TOU study will be able to use pre-treatment smart meter data for nearly all of its residential customers. This is truly a special opportunity in that SDG&E will have excellent baseline information for those customers defaulted into the randomized experimental TOU pilot. SDG&E also may compare the energy use of pilot participants to a control group of customers who were not defaulted onto the rate in order to estimate the load impacts for the TOU rates.

SDG&E requires an aggressive schedule to implement its experimental TOU rates so that the evaluation of its experimental pilot can be completed in time to inform its TOU proposals. Costs associated with implementing SDG&E’s proposed TOU pilot program will

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11 AB327 “The commission shall not establish a mandatory or default time-variant pricing tariff for any residential customer except as authorized in subdivision (c). (c) Beginning January 1, 2018, the commission may require or authorize an electrical corporation to employ default time-of-use pricing for residential customers”…
be provided in SDG&E’s March 21, 2014 filing in this docket, where SDG&E will put forth
specific proposals for its experimental TOU pilot along with timelines.

This concludes my testimony.
V. QUALIFICATIONS

My name is Leslie Willoughby. My business address is 8306 Century Park Court, San Diego, California 92123. I am employed by San Diego Gas & Electric Company (“SDG&E”) as Electric Load Analysis Manager in the Strategic Analysis and Pricing Department. In my current position, I am responsible for managing and conducting load and energy research analysis.

I attended San Diego State University in San Diego, CA, where I graduated with a Bachelor of Science in Business Administration in 1983. I continued to attend San Diego State University where I graduated with an MA in Economics in 1989. In 1990, I was employed by SDG&E to work in the Load Research Section of the Marketing Department as an Associate Economic Analyst. Over the past 20 years I have held positions of increasing responsibility within the company that have included Load and Energy Research.

I have previously testified before the Commission.