Southern California Edison
A.09-09-022 – Alberhill PTC & CPCN

DATA REQUEST SET CPUC Supplemental Data Request -004

To: CPUC
Prepared by: Spencer Edmiston
Job Title: Senior Advisor
Received Date: 5/13/2020

Response Date: 5/29/2020

Question DG-G-2:
Please explain why SCE used 10% for the weighted cost of capital. Additionally, please describe the weighting methodology. Does the weighted cost of capital include payment of taxes on profits?

Response to Question DG-G-2:
The 10% discount rate is equal to SCE's incremental cost of capital, which is intended to be a forward-looking long-term cost of capital. This differs from SCE's authorized cost of capital, which largely reflects the cost of existing financing. SCE uses its incremental cost of capital as a proxy for the customer rate of discount. The 10% does not include taxes.

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To: CPUC
Prepared by: Spencer Edmiston
Job Title: Senior Advisor
Received Date: 5/13/2020

Response Date: 6/3/2020

Question DG-G-3:
Why is the discount rate set at the weighted aggregate cost of capital, rather than return on equity?

Response to Question DG-G-3:
The appropriate discount rate for any present value analysis, including the development of the revenue requirement for this project, must be set at the opportunity cost that investors face in making a particular investment. This opportunity cost is best represented by the weighted average cost of capital, which is comprised of the weighted costs of *all* sources of capital for the investment. For SCE these are common equity, preferred equity, and long-term debt. The cost of equity, also known as the ROE, only represents the cost of one of the sources of capital that SCE uses to fund its investments. In order to develop the discount rate to calculate the revenue requirement for the Alberhill project, the ROE would need to be combined with the cost of preferred equity and the cost of long-term debt, using the respective relative proportions of each in SCE's authorized capital structure.

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To: CPUC
Prepared by: Paul Mccabe
Job Title: Senior Advisor
Received Date: 5/13/2020

Response Date: 5/22/2020

Question DG-A-2:
In the Load Forecast (Data submission item A) it states, "For the Conventional Forecast, DER, energy efficiency (EE), and demand-side management (DSM) are considered implicitly based on an assumed continuation of their adoption trend reflected in recent historical load data. Importantly, increased rates of PV adoption due to the California Net Zero Energy mandate for new residential homes beginning in 2020, or increased load due to future plug-in electric vehicles (PEV) adoption, are not explicitly captured in this forecast. Like DER, EE, and DSM, the historical trends of PV and PEV adoption are assumed to continue into the future." does this mean that the CEC future DER growth forecasts are not used, just historical trends are carried forward?

Response to Question DG-A-2:

Yes, however, that approach applies only to the Quanta Conventional forecast. The Quanta Spatial Load forecast incorporates the CEC IEPR-developed DER growth forecasts through 2030 (which is the horizon year of the IEPR forecast used) and is then extended to the year 2048 as described in Section 5.4 of SCE's response to Item C (A.09-09-022 ED-Alberhill-SCE-JWS-4: Item C). The Conventional forecast was provided primarily for comparative purposes to the DER-adjusted Spatial Load forecast and SCE Load forecast. All three forecast indicate a need date of 2022, but the increased adoption of DERs included in the SCE Load forecast and Spatial Load forecast result in lower compound annual growth rates (0.74% per year and 0.88% per year, respectively) than the Conventional forecast (1.09%).

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To: CPUC
Prepared by: Paul Mccabe
Job Title: Senior Advisor
Received Date: 5/13/2020

Response Date: 5/22/2020

Question DG-G-4:
Please explain why Effective PV, spatial load forecast, and PV Watts lead to such radically different growth projections over 30 years.

Response to Question DG-G-4:
The varying growth projections of each load forecast are due to the use of different DER growth rates. A detailed discussion on the development of each forecast is provided in Section 2 of Quanta Technology's "Deliverable 3: Benefit Cost Analysis of Alternatives" report. The Spatial Base load forecast assumes that historical and current DER adoption rates which are embedded in historical load data continue throughout the 30-year horizon with no significant change. Consistent with the California Energy Commission's (CEC) California Energy Demand (CED) forecast (taken from the Integrated Energy Policy Report (IEPR)), the Spatial Effective PV and Spatial PVWatts load forecasts incorporate projected DER adoption rates for the energy efficiency, photovoltaic, electric vehicle, energy storage, and load modifying demand response categories. Section 2.2 of the referenced Quanta Technology report provides the annual adoption in megavolt-amperes (MVA) for each DER category from 2019 to 2028. These values are based on SCE's disaggregation of the 2018 IEPR forecast. The Spatial Effective PV and Spatial PVWatts load forecasts incorporate all DER categories identically, except for the PV category. As described in SCE's response to A.09-09-022 CPUC-Supplemental Data Request-001 Question DG-C-5, SCE has developed a methodology that adjusts the PV adoption values in the IEPR,[1] which results in a PV forecast that has less reduction on peak demand than the IEPR methodology. Since the IEPR does not project DER adoption rates out to 2048 (the end of the 30-year horizon used in the cost-benefit analysis), the DER adoption rates past 2028 are based on other sources, primarily the California PATHWAYS model and other industry data. The specific methodology for each DER category is discussed in Section 2.3 of the referenced Quanta Technology report.

The cumulative impact of each DER category is added to the Spatial Base load forecast to develop the Spatial Effective PV load forecast (which uses SCE's methodology for PV adoption) and Spatial PVWatts load forecast (which uses the IEPR methodology for PV adoption). The Spatial Base forecast yields the highest peak demands and is representative of a scenario in which increased

[1] Please see the attached document titled "A.09-09-022 CPUC-Supplemental Data Request-004 Q.DG-G-4.pdf" which is an excerpt from SCE's 2021 General Rate Case workpapers relevant to the load growth. This section explains SCE's PV dependability determination process.

growth rates of transportation electrification and building electrification offset the impact of load-reducing DERs. The Spatial Effective PV yields mid-level peak demands relative to the other two forecasts, is representative of the most-likely load forecast based on current industry data and models, and serves as the basis for the load forecast used in the cost-benefit analysis. The Spatial Effective PV Watts forecast yields the lowest peak demands, and is representative of a scenario in which the adoption rates of load-reducing DERs significantly outpaces transportation and building electrification.

The Spatial Base and Spatial PVWatts load forecasts were developed in order to study how sensitive the cost-benefit model results were to different load forecast scenarios. The Spatial Base load forecast yields a 2048 peak demand (1,474 MVA) that is approximately 7% greater than the Spatial Effective PV load forecast (1,378 MVA), while the Spatial PVWatts load forecast yields a 2048 peak demand (1,302 MVA) that is approximately 6% less than the Spatial Effective PV load forecast. This spread in peak demand values between the three forecasts is expected and reasonable, considering that growth in load and load modifying DER is compounded over 30 years, as well as the fact that all load forecasts are based on a combination of historical DER adoption trends with various, industry-based assumptions for future DER adoption trends.

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2021 General Rate Case
A.19-08-_____

Workpapers

Load Growth, Transmission Projects, and Engineering
SCE-02 Volume 04, Part 02, Chapter II, Book A

August 2019

Workpaper Title:

SCE's Dependable Photovoltaic Generation Methodology

Purpose

The purpose of this paper is to describe SCE's current methodology for calculating the dependable PV generation and explain the evolution of the calculation of the dependable PV generation.

Background

As PV systems are increasingly being used to generate power, SCE's reliance on their output must be quantified. Since the PV systems rely on environmental factors that are outside the control of SCE, there is a need to determine the amount of generation that can be reasonably relied upon when adverse conditions occur, such as cloud cover. These impacts are localized, and it is difficult to predict when or where they will occur. To limit the negative impacts of these variables on the ability for SCE to maintain the most reliable service to SCE customers, a series of studies have been performed to determine how much generation can be considered dependable, specifically when it impacts days with high loading.

Methodology

Methodology from Previous GRCs

In 2012, SCE performed a study to determine the maximum and minimum output of a typical PV system within the SCE service territory. This study incorporated 184 PV installations throughout the SCE service territory. The sample set provided a representation of different size PV installations and climate zones. The data gathered from these PV installations included output data during the months of June – September for years 2010 and 2011. The data was gathered during summer months because most of the SCE service territory is a summer peaking utility, as higher temperatures result in higher loading conditions. The average of the minimum output of the PV systems was determined to be ~18% at 12:15 PM. This study was utilized to develop SCE's 2015 General Rate Case Testimony.

This methodology has been referred to as the "Average of the Minimums" and has been refined over subsequent years by implementing additional data clean-up. In 2015, SCE re-evaluated the data used for the 2012 PV dependability study. SCE discovered some recorded data displaying zero generation output during times when PV would expect to be producing energy. SCE assumed that some of these systems had inaccuracies and removed them from the original 2012 study. This resulted in removing 18 PV systems from the original 184 leaving the 2015 study to analyze 166 total PV systems. The result of these changes provided a peak dependability of ~19%. This study was utilized to develop SCE's 2018 General Rate Case Testimony.

Methodology for 2021 GRC

As more information becomes available, SCE continues to refine the PV dependability methodology used for Distribution & Sub-Transmission system planning. Over the years, SCE has moved away from the "Average of the Minimums" methodology to utilizing a percentile-based approach. The current methodology utilizes data from 860 PV systems spread over the entire SCE territory. This data comes from customers that participate in the California Solar Initiative (CSI) program that selected the Performance Based Incentive (PBI) and provide separate solar generation data to SCE. The data was analyzed during summer months from 2014 to 2015. Below are some of the key differences between the PV dependability methodology utilized in the 2018 GRC and SCE's current methodology utilized to develop the 2021 GRC.

1. Expanded Data Set
   SCE has increased the amount of systems included in its PV Dependability methodology from 187 systems to 860 systems.

2. Enhanced Geographical Representation
   Instead of producing a single curve used for the entire SCE territory, the current methodology develops 8 curves representing each of SCE's planning regions to better represent geographical differences in PV output. Each planning region is mapped a set of unique meter data customers and the data for each region was used to develop the specific regional curve.

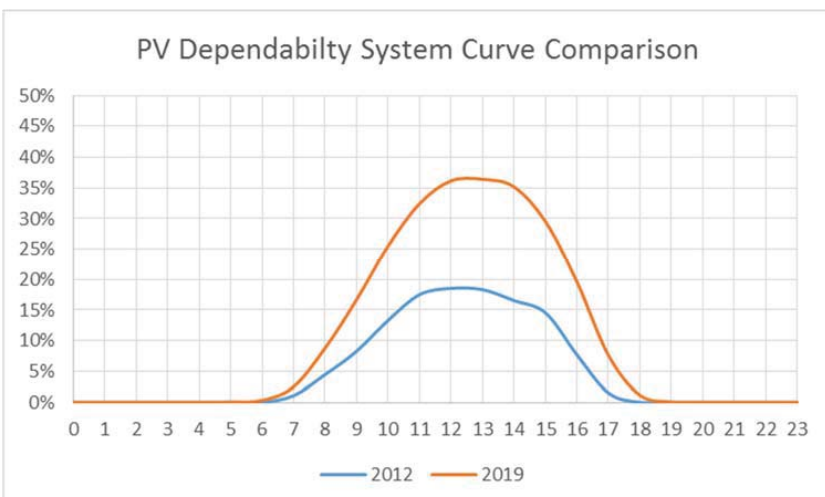
3. Additional Data Cleansing
   In the 2018 GRC, SCE removed 18 systems with values that appeared erroneous, but did not remove zero values from remaining 166 systems. In the current study, all zero values and values greater than 101% were excluded.

4. Profile Shape Development

   As described above, SCE has moved away from an average of the minimums toward a more standard statistical methodology by utilizing a percentile approach. The 10th percentile was selected to represent the PV output that can be reliably depended on to serve load 90% of the time during peak summer months.

Utilizing these improvements, SCE developed eight regional dependability curves. The 10th percentile for each 15-minute interval was calculated from the cleansed data to generate a 24-hour curve for each planning region. The PV profile shapes that were developed for each region can be found in Appendix A. The SCE territory shape is calculated by using all data from all regions and only included for comparison between the curves used in the 2018 filing versus the 2021 filing (See Figure 1), each respective curve is labeled "2012" and "2019" respectively); the SCE territory curve was not used for planning purposes. Utilizing a 10th percentile approach provided a dependability of ~36% at 12:00 PM. This is an increase of about 17% at noon from the approach used to develop the 2018 GRC.

Figure 1. PV Dependability System Curve Comparison



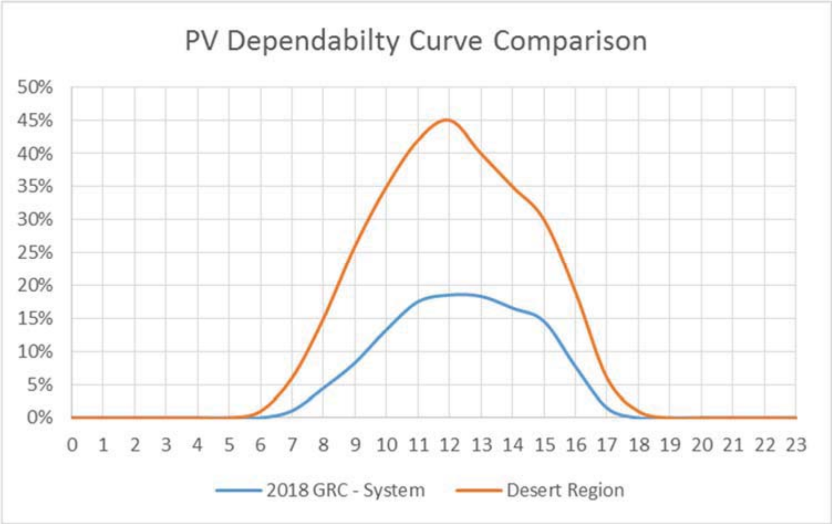
Conclusion

SCE continues to evaluate and enhance its PV dependability methodology as more information becomes available. The methodology has significantly evolved from 2015 GRC to

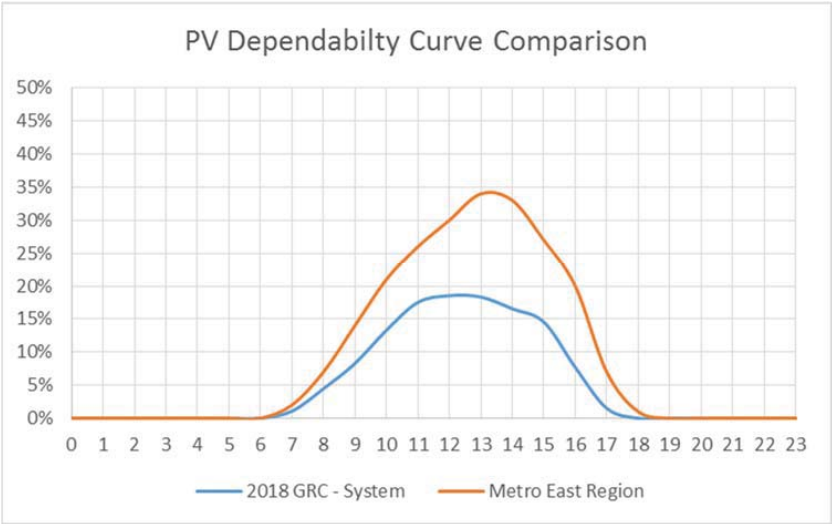
2021 GRC. The previous methodologies used a single system curve where the current methodology deploys a regional curve, which more closely resembles individual system performance. In the current study, the cleansing effort removed data that contained values ≤0% & ≥101% of nameplate. Finally, the shift to a 10th percentile analysis has resulted in a more standard statistical method to better represent the data distribution. SCE will continue to review its methodology and make improvements where appropriate.

Appendix

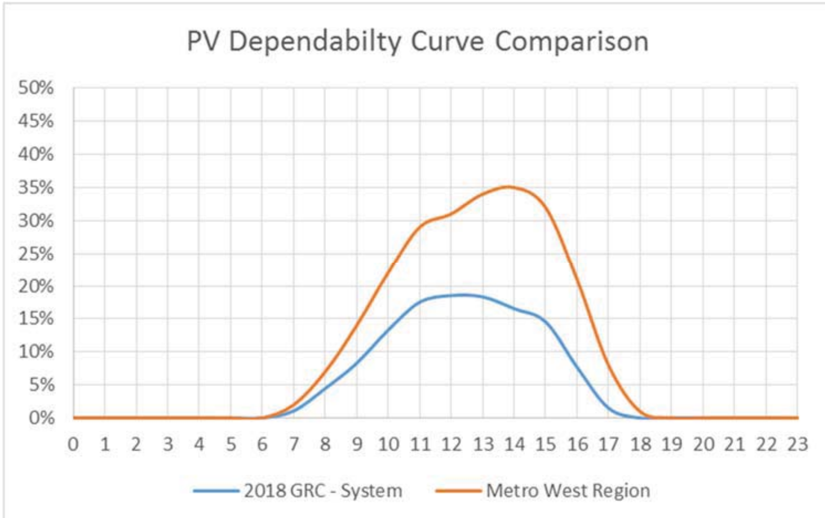
Desert Region Profile



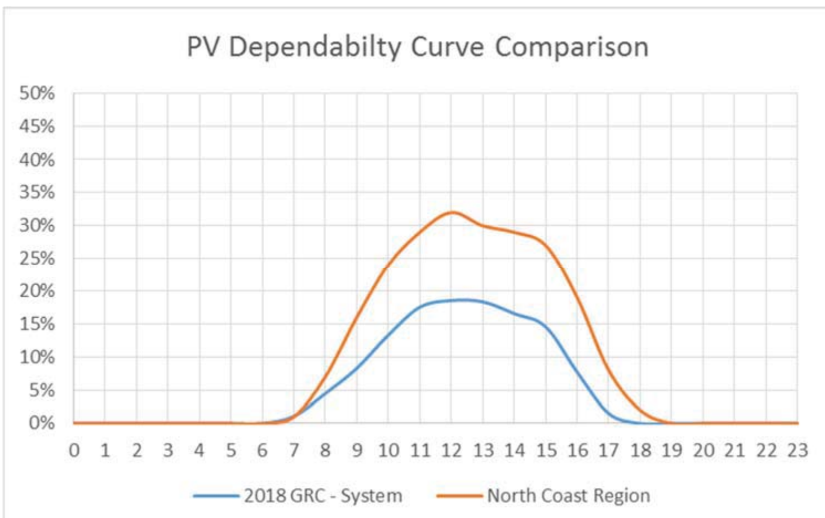
Metro East Region Profile



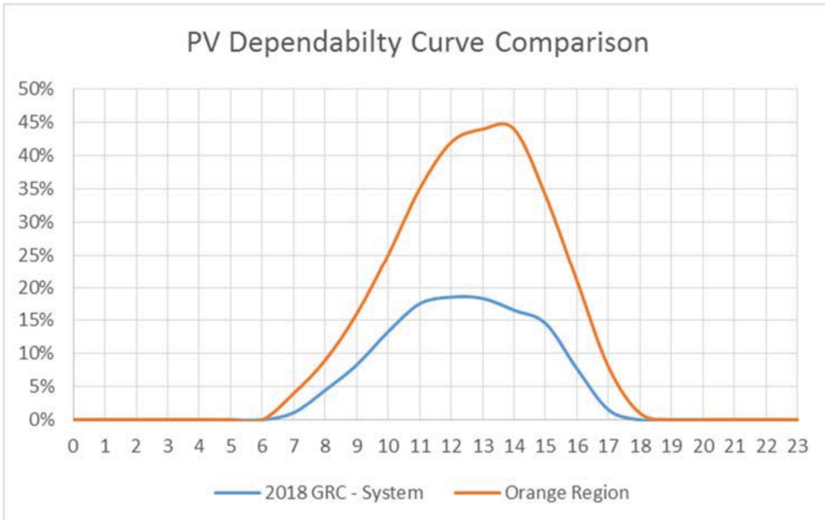
Metro West Region Profile



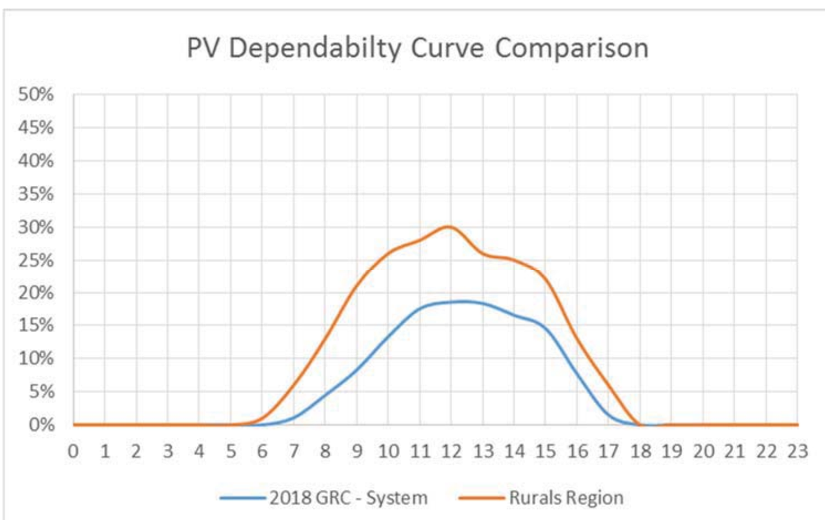
North Coast Region Profile



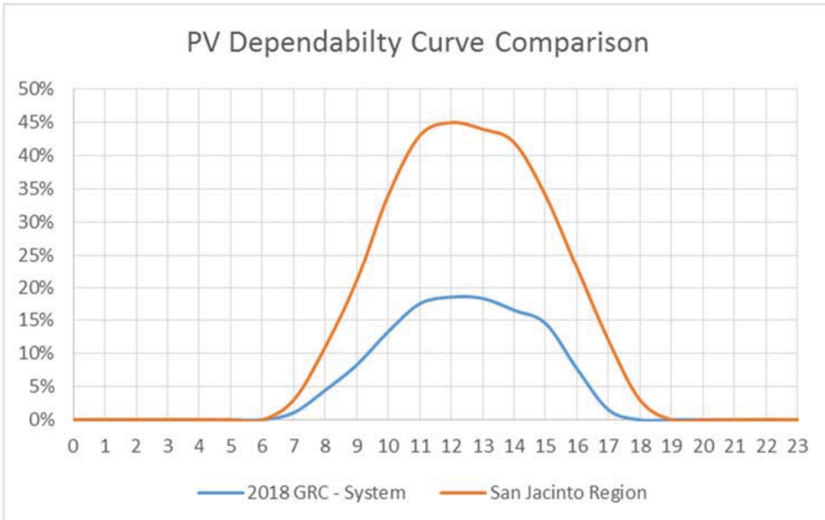
Orange Region Profile



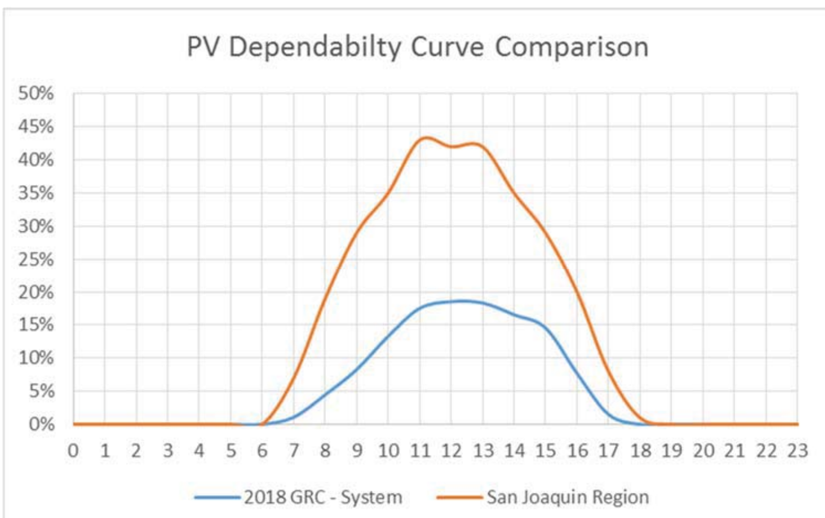
Rurals Region Profile



San Jacinto Region Profile



San Joaquin Region Profile



Regional Profile Hourly Values

10th Percentile Dependable PV Curves by Region by hour

Hour	Desert Region	Metro East Region	Metro West Region	North Coast Region	Orange Region	Rurals Region	San Jacinto Region	San Joaquin Region
0	0%	0%	0%	0%	0%	0%	0%	0%
1	0%	0%	0%	0%	0%	0%	0%	0%
2	0%	0%	0%	0%	0%	0%	0%	0%
3	0%	0%	0%	0%	0%	0%	0%	0%
4	0%	0%	0%	0%	0%	0%	0%	0%
5	0%	0%	0%	0%	0%	0%	0%	0%
6	1%	0%	0%	0%	0%	1%	0%	0%
7	6%	2%	2%	1%	4%	6%	3%	7%
8	15%	7%	7%	7%	9%	13%	11%	19%
9	26%	14%	14%	16%	16%	21%	21%	29%
10	35%	21%	22%	24%	25%	26%	34%	35%
11	42%	26%	29%	29%	35%	28%	43%	43%
12	45%	30%	31%	32%	42%	30%	45%	42%
13	40%	34%	34%	30%	44%	26%	44%	42%
14	35%	33%	35%	29%	44%	25%	42%	35%
15	30%	27%	32%	27%	34%	22%	34%	29%
16	19%	20%	21%	19%	21%	13%	23%	20%
17	6%	7%	8%	8%	8%	6%	12%	8%
18	1%	1%	1%	2%	1%	0%	3%	1%
19	0%	0%	0%	0%	0%	0%	0%	0%
20	0%	0%	0%	0%	0%	0%	0%	0%
21	0%	0%	0%	0%	0%	0%	0%	0%
22	0%	0%	0%	0%	0%	0%	0%	0%
23	0%	0%	0%	0%	0%	0%	0%	0%

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DATA REQUEST SET CPUC Supplemental Data Request -004

To: CPUC
Prepared by: John Keelin
Job Title: Click here to enter text.
Received Date: 5/13/2020

Response Date: 5/21/2020

Question DG-C-18:
Why did SCE choose to use a value of service (VOS) metric to represent customer value for the Flex criteria?

Response to Question DG-C-18:
SCE interprets this question as inquiring about the use of a Value of Service study as the basis for monetizing the Flex-1 and Flex-2 metrics of the cost/benefit analysis. Note that all metrics are based on a computation of Expected Energy Not Served (EENS N-0, EENS N-1, Flex-1, Flex-2-1 and Flex-2-2), and all metrics use the Value of Service Study to estimate the customer value of an electric service outage. The Value of Service Study[1] collects detailed outage cost information from SCE's residential, small and medium business, and large commercial and industrial customer classes to estimate the costs customers incur during power outages. The study was commissioned to inform the cost-effectiveness of grid modernization programs designed in part to reduce customer minutes of interruption, which are outlined in SCE's 2021 General Rate Case. Given that the supplemental analysis studies the cost-effectiveness of various subtransmission projects to reduce the amount of energy that would go unserved during customer outages, the results of the Value of Service Study are appropriate as a basis for monetizing the EENS N-0, EENS N-1, Flex-1, Flex-2-1 and Flex-2-2 metrics.

Additionally, the present value revenue requirement (PVRR) model was used to estimate the costs of the project alternatives. The PVRR model provides a cost estimate from the perspective of

[1] See Grid Modernization, Grid Technology, Energy Storage - WP SCE-02, Vol. 4, Pt. 1, Ch. II – Book A. The Value of Service Study is provided on pp. 12 – 109. (http://www3.sce.com/sscc/law/dis/dbattach5e.nsf/0/6DB2147FA69AEC768825846600789960/$FILE/WPSCE02V04Pt01ChIIBkA.pdf).

ratepayers, i.e., the ratepayer revenue required to repay an investment over its life. Thus, both the costs and benefits of all project alternatives are determined from the perspective of the customer.