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BEFORE THE PUBLIC SERVICE COMMISSION OF UTAH

In the Matter of the Application of Rocky Mountain Power for Approval of changes to Renewable Avoided Costs Methodology for Qualifying Facilities Projects Larger than Three Megawatts	**DOCKET NO. 12-035-100** **COMMENTS IN RESPONSE TO DIRECT TESTIMONY**

SUNEDISON, LLC

COMMENTS IN RESPONSE TO DIRECT TESTIMONY

MAY 14, 2013

SunEdison appreciates this opportunity to provide comments on Docket No. 12-035-100 regarding Rocky Mountain Power's (RMP) proposed revisions to the Schedule 38 Large Qualified Facility (Large QF) Tariff.

I. Company Overview

SunEdison is a 55-year old company headquartered in Belmont, California that specializes in global manufacturing of polysilicon and silicon wafers used in the application of the SunEdison Solar modules as well as semiconductors for the electronics industry. Further, SunEdison is the second largest solar developer in the world, with over 1.2 GW of solar under management worldwide and another 2.3 GW under development. SunEdison designs, builds, manufactures, develops, finances, installs, operates and manages solar plants ranging from residential and commercial rooftop systems to 300 MW utility scale facilities.

As a leading solar developer in both the distributed generation and utility scale fields, SunEdison has been engaging with RMP to build solar facilities under both the Schedule 37 and Schedule 38 tariffs, as well as developing commercial opportunities under the provisions of Senate Bill 12 (SB-12).

It is SunEdison's goal to bring near *and* long-term economic development opportunities to Utah in a cost-effective way that enhances RMP's system reliability and resource portfolio diversity. For example, the 80 MW of solar SunEdison developed in New Mexico brought employment to over 850 people during the construction and installation phase and brought in an estimated $286 Million in economic development dollars to the state through direct, indirect and induced economic activities.

II. Overview of SunEdison's Comments

As an experienced solar developer, SunEdison is optimistic about the strong solar potential in Utah and solar's ability to add to a balanced, diverse resource portfolio for PacifiCorp and more

specifically, RMP. However, SunEdison is concerned that the proposed changes to Schedule 38 are premature and the broad conceptual changes are inaccurately valuing solar's resource characteristics as provided to the PacifiCorp system. Further, while the proposed methodology change in Schedule 38 might be appropriate for wind due to fulfillment of an IRP target, SunEdison also recognizes that there still remain IRP targets for solar in PacifiCorp's recently filed IRP[1] and while not selected in the "Preferred Portfolio", various scenario runs do demonstrate that solar could fall within the least cost/least risk portfolio which would determine that a methodology change from the market proxy to Proxy/PDDRR methodology may be premature.

It is SunEdison's position that while the Market Proxy method might still be appropriate, should the Proxy/PDDRR methodology by adopted for solar Large QFs, the following matters remain of concern:

1. Capacity value analysis was incorrectly calculated in RMP's testimony[2] and reflects inaccurately low capacity contribution from solar photovoltaic resources.
2. Due to the nature of being a fuel-free resource, solar provides Utah ratepayers an insurance against the volatile pricing of traditional fuel resources and this hedge value should be provided to solar Large QFs.
3. Capacity payments should be provided today for solar Large QFs due to the nature of deferring expensive, peak-time front-office transactions for energy and capacity.
4. Energy payments for solar Large QFs should be based on the market price calculated in the Grid model, and not revert to the price of the energy of the next deferrable thermal resource when the thermal asset comes online.

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[1] PacifiCorp 2013 Integrated Resource Plan, Volume I, Pg 11
http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Integrated_Resource_Plan/2013IRP/PacifiCorp-2013IRP_Vol1-Main_4-30-13.pdf

[2] Docket No. 12-035-100. Rocky Mountain Power's "Direct Testimony of Gregory N. Duvall, Exhibit A." January 31, 2013.

III. Errors in the Application of the *Capacity Factor Assumption Model* to Determine Capacity Value Reflect Inaccurately Low Solar Capacity Value for Solar

In the Exhibit presented in Mr. Duvall's testimony, RMP demonstrates the use of an approximation method to determine solar capacity value (capacity contribution) called the *Capacity Factor Assumption Model*[3]*(CFAM).* While SunEdison is supportive of more industry-standard utility planning models to determine solar capacity value, such as the Effective Load Carrying Capability (ELCC)[4] and Equivalent Conventional Power (ECP)[5], the Capacity Factor Assumption Model is a reasonable method to use as long as the formula is correctly applied using accurate inputs. In Mr. Duvall's testimony, SunEdison has noticed several misinterpretations in the application of the Capacity Factor Assumption Model that have resulted in inaccurately low capacity values for solar. When capacity values for solar are incorrectly calculated, this has a direct impact on the PacifiCorp's resource planning efforts and results in inaccurate reserve margin planning: this directly translates to ratepayers paying for unnecessary ancillary services and reserves. If modeled correctly to truly reflect solar's capacity value, RMP ratepayers will pay the true avoided costs associated with accomplishing PacifiCorps' Integrated Resource Planning (IRP) objectives.

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[3] "*Comparison of Capacity Value Methods for Photovoltaics in the Western United States*", Madaeni, Sioshani, Denholm. 2012, pg 14, http://www.nrel.gov/docs/fy12osti/54704.pdf

[4] "ELCC represents a generators ability to effectively increase the generating capacity available to a utility without increasing the utility's loss of load risk....For PV, the ELCC can be significant because the PV generation may be reliably available at critical demand times and thus may effectively increase the utility's generating capacity." "*Update: Effective Load Carrying Capability of Photovoltaics in the United States*", Perez, Perez, Margolis, Shaw, Kmieciek, Schwab. 2006. http://www.nrel.gov/docs/fy06osti/40068.pdf

[5] "One of the most robust and widely accepted definitions of capacity value is the ECP of a generator. The ECP of a generator is defined as the amount of a different generating technology that can replace the new generator while maintaining the same system reliability level. In the context of a renewable generator, this is attractive because it allows the capacity value of a renewable generator to be measured in terms of a conventional dispatchable generator." "*Comparison of Capacity Value Methods for Photovoltaics in the Western United States*," Madaeni, Sioshani, Denholm. 2012, http://www.nrel.gov/docs/fy12osti/54704.pdf

Overview of Capacity Factor Assumption Model

The CFAM is an approximation technique to determine a generator's likelihood to be available during a period when the system on which the generator is located faces a high loss of load probability (LOLP). In this technique, the highest load hours are considered and the capacity factors in those hours are normalized. Essentially, this weights the generator's performance based on the hours when the LOLP is highest, thereby more accurately capturing the generator's value in its ability to maintain the system's reliability at the most critical hours. When the appropriate numbers of hours are considered, the results of the CFAM are reasonably comparable to performing an ELCC calculation.

The weight is determined by taking the hourly LOLP for each hour of the model and weighting them against each other accordingly. Based on the weights determined through the LOLP, the solar capacity factor (or energy production) for each of those hours is then weighted based on the correlated LOLP weighting during the highest load hours.

Below is a summary of how the CFAM is calculated, based on the National Renewable Energy Laboratory (NREL) as well as a table indicating the outcome of their analysis for Western States.

[intentionally left blank]

$$w_i = \frac{LOLP_i}{\sum_{j=1}^{T} LOLP_j} \qquad (5)$$

where w_i is the weight in hour i, $LOLP_i$ is the LOLP in hour i, and T is the number of hours in the study. These weights are then used to calculate the weighted average capacity factor of the PV plant in the highest-load hours as:

$$CV = \sum_{i=1}^{T'} w_i C_i \qquad (6)$$

where T' is the number of hours used in the approximation and CV is the weighted generation of the PV plant during the high-load hours and is considered as an approximation for capacity value.

Summary of CFAM Method as Explained by NREL[6]

PV Site	Fixed-Axis	Single-Axis Tracking	Double-Axis Tracking
Bartsow, CA	60.4	71.8	75.5
Congress, AZ	70.4	77.1	79.7
Yucca Flat, NV	57.9	69.4	72.8
Hanover, NM	57.3	65.2	68.1
Cheyenne, WY	57.3	75.5	75.9
Salt Lake City, UT	67.7	81.4	84.4
Boise, ID	72.6	84.5	86.5
Los Angeles, CA	56.8	73.9	74.9
San Francisco, CA	61.2	77.0	78.4
Seattle, WA	66.2	82.8	86.0
Denver, CO	61.6	71.0	73.9
Albuquerque, NM	69.8	80.6	82.1
Phoenix, AZ	65.9	71.6	74.2
Las Vegas, NV	62.8	78.1	79.5

Summary of annual capacity value based on Capacity Factor Assumption Model as calculated by the NREL[7]

[6] *"Comparison of Capacity Value Methods for Photovoltaics in the Western United States,"* Madaeni, Sioshani, Denholm. 2012, pg 14, http://www.nrel.gov/docs/fy12osti/54704.pdf

[7] *"Comparison of Capacity Value Methods for Photovoltaics in the Western United States,"* Madaeni, Sioshani, Denholm. 2012, Table 5 http://www.nrel.gov/docs/fy12osti/54704.pdf

Capacity Factor Assumption Model as It was Conducted by RMP

In general, SunEdison does not oppose RMP's use of the CFAM. We believe, that when accurately calculated, the capacity values derived from the CFAM will more truly reflect solar's capacity value in RMP's service territory though not as accurately as the ELCC or ECP methodologies. However, in the Exhibit[8] to Mr. Duvall's testimony, SunEdison believes many components of the CFAM were incorrectly applied and without these errors corrected, the PacifiCorp system is incorrectly and discriminatorily valuing solar. With that said, we believe many of these errors can be easily corrected.

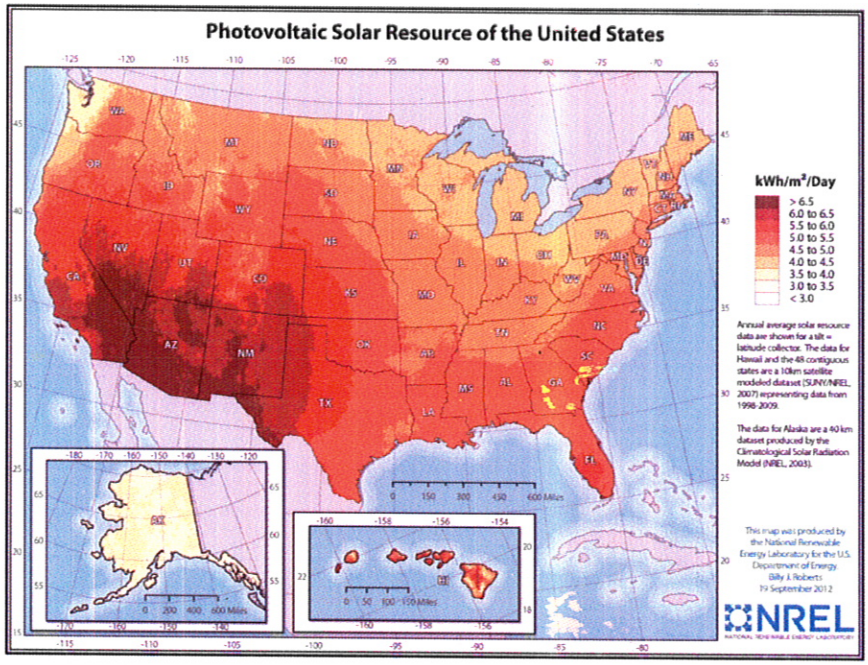
Specifically, SunEdison finds the following assumptions and CFAM model inputs to be erroneous:

1. The solar capacity factors were not weighted based on the LOLP, rather they were based on a ninety-percent exceedance probability (P-90) which is inconsistent with resource planning and inconsistent with how the CFAM is statistically calculated. While we believe it is unfair to extend this measure of availability (as a proxy for reliability) from conventional generation to renewable generation, if an exceedance probability is to be applied to determine generation, then a P-50 may be more appropriate and consistent with how other peak generation resources are calculated. Exceedance probability as a measure of reliability inherently disadvantages renewable generation and resources with low capacity factors because it measures how often a resource is available rather than whether the resource will be available when the system most needs.

2. Capacity value for solar is determined on a regional, if not project-specific, basis and not over a geographically diverse territory as presented in Mr. Duvall's exhibit. As you can see in the graphic below, the solar resource in Utah is stronger than any other state or region in

[8] Docket No. 12-035-100. Rocky Mountain Power's "Direct Testimony of Gregory N. Duvall, Exhibit A." January 31, 2013.

PacifiCorp's territory. Therefore, the capacity value for solar projects located in Utah are incorrectly low when based off a five state average and Utah projects are not accurately being valued through the CFAM model.



Photovoltaic Solar Resource Map of the United States[9]

3. The Top 100 Summer Load Hours were calculated based on a PacifiCorp system-wide basis, rather than a Utah specific Top 100 Summer Load Hours. This provides for inconsistency in the numbers being compared. If a solar resource is located in Utah, it is used to first provide power to the RMP portion of the PacifiCorp system. The solar production is based on Utah solar irradiance and weather and should be aligned with the Utah load. The solar irradiance is stronger in Utah than any other PacifiCorp state, therefore the solar plants located in Utah that provide power to the RMP grid are offsetting RMP load. In order for this to be an apples-to-apples comparison, wherever the solar irradiance is measured

[9] http://www.nrel.gov/gis/solar.html

(Utah), it must be compared against the same regional LOLP (Utah). This is consistent with how the CFAM is applied.

4. The generic production data PacifiCorp used from PVWatts is a simplified tool to estimate system production. PVsyst™ provides the user greater flexibility in modeling system specific design parameters to determine a solar plants projected output. This could be helpful when comparing different technology options and also incorporating site specific production impacts, since PVWATTS only allows adjustments using the DC:AC derate.
   Further, PVWatts uses TMY3[10] or Solar Prospector[11] weather data, whereas PVsyst™ allows for actual satellite-derived weather data or actual historic daily weather data to be input. The issue with TMY3 data being used in this analysis is that TMY3 data takes the typical meteorological weather expectancy derived from the average weather patterns from 1976 to 2005. While in some applications this is appropriate, for the CFAM analysis this is again a place where the analogy is incongruous. The error occurs in that the capacity factor (energy produced) that is derived from PVWatts is being based on what the average PV system would have performed if these were the "average" weather conditions. However, this "average" is being compared against PacifiCorp's *actual* system load from that hour. Additionally, because the PVWatts data and associated TMY3 data weren't reflective of actual potential project locations, they should inherently be re-evaluated using PVsyst™. Using PVsyst™ and specific weather for a site or satellite data allows for actual capacity

[10] Typical meteorological year (TMY) is a collation of selected weather data for a specific location, generated from a data bank much longer than a year in duration. It is specially selected so that it presents the range of weather phenomena for the location in question, while still giving annual averages that are consistent with the long-term averages for the location in question. TMY3 data takes the average from 1976 to 2005, whereas TMY2 data takes the average from 1961 to 1991.

[11] The Solar Prospector is a mapping and analysis tool designed to provide access to geospatial data relevant to the solar industry in general and for the siting of utility-scale solar plants in particular. Solar Prospector also provides the ability for users to download solar resource data in a variety of formats for further exploration and analysis. The tool has been online since 2009 and has been updated periodically since that time with new data and new analysis capabilities.

factor to be determined for the exact system HLH to which it is being compared in a location where the solar will realistically be deployed.

5. While it is typical for residential and small commercial and industrial solar installations to use a fixed-tilt installation, it is commonplace for utility-scale solar projects to utilize single-axis tracking (SAT) technologies to optimize system production. As it pertains to the large QF projects in RMP territory, special focus should be paid to the capacity values associated with tracking technologies and their generation profile.

6. The generic production data used by PacifiCorp from PVWatts has not been adjusted to account for the impact of daylight savings time. This causes PacifiCorp to look at the expected solar power production at a time that does not match the hourly load events. This underestimates the production and capacity factor during those load events.

7. Finally, the system locations to evaluate production and capacity value for Schedule 38 are currently based on population centers, and not the ideal solar production locations. For Utah, it is unlikely that a utility-scale solar project will be located in Salt Lake City or within the Wasatch Basin. Instead, the facilities will likely be located in the southern portion of the state where the solar insolation is highest. This is counter to how PacifiCorp values the capacity contribution of wind, which is based on actual locations where the resource is best. To truly understand the capacity value of a large solar generator, PacifiCorp needs to look where the resource is best within its territory.

IV. Solar Provides PacifiCorp an Insurance Product by Avoiding Fuel Costs and Reduces Balance Sheet Risk Exposure

Frequently, renewable generation is described as providing a "hedge value" against the volatile fuel associated with traditional, non-renewable generators given that renewable generators

have no fuel costs. Beyond just providing a hedge value, which is often based on a short-term scale, solar provides a long-term insurance policy against fuel price volatility and environmental policy impacts. By having no fuel price, customers are protected from the fuel risk over the life of the solar asset and this "insurance policy" reduces balance sheet risk exposure. The concept of a solar providing insurance is comparable to that of how a life insurance policy works. The challenging component is how to value this "insurance policy." SunEdison suggests one possible way to value this is to look at a levelized twelve-year strip of the NYMEX curve and then for years thirteen to twenty-five, take a similar shape as to the forward NYMEX predictions and then turn this into an annual revenue requirement.

As such, SunEdison also believes that RMP should be eligible to receive regulatory approval for the cost-recovery of this "insurance policy" as it represents a true long-term hedge value and provides ratepayers less exposure to fuel price volatility.

V. Levelized Capacity Payment Should be Paid Today Because they Offset Expensive Front Office Transactions for Peak Capacity

As currently proposed, RMP has argued that QF capacity payments should only begin once the next deferrable thermal resource is scheduled to come online. Though the IRP identifies the next deferrable thermal resource in 2025, it is important to note that an average of 1,108 MW[12] of front-office transactions (FOT) are scheduled to be purchased annually by RMP before the next thermal asset is scheduled to be built. The reason for these purchases is to provide needed energy and capacity to maintain system reliability. While these do not represent a new asset to be constructed, it is important to note that the FOTs are typically purchased in sixteen hour blocks, despite a shorter time period need. Solar *does* offset these purchases. When purchasing a sixteen hour block, and possibly only using eight hours, often times ratepayers are

[12] PacifiCorp 2013 Integrated Resource Plan, Volume I, Pg 11
http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Integrated_Resource_Plan/2013IRP/PacifiCorp-2013IRP_Vol1-Main_4-30-13.pdf

left paying for a product that is unused or is sold back into the market at prices lower than the purchase price. Solar helps offset these costs in addition to deferring new capacity scheduled to be constructed. For these reasons, it's important to provide solar resources with capacity payments today based on their capacity contribution.

VI. Energy Payments Should Continue to be Paid Based on Market Prices Rather than Adjusted to the Energy Price of the Next Deferrable Resource

In the Grid model, energy payments for resources are based on the deferral of market purchases up until the new thermal asset comes online, at which time the energy payment is then calculated based on the forward natural gas prices and the deferral of energy associated with that thermal asset. SunEdison believes this energy payment calculation should not change just due to the new asset coming online, as PacifiCorp still identifies FOT for energy being made in years after the thermal asset is built in 2025. Therefore, the QF is still avoiding FOTs and market purchases for energy even after the capital asset is constructed and should continue to receive market-based pricing after the deferrable resource comes online.

VII. Conclusion

SunEdison applauds both RMP and the Public Service Commission for the progressive work already done on implementing Schedule 38. As an active market participant in many states with QF programs, SunEdison recognizes that RMP's Schedule 38 tariff has been a successful tool in facilitating the deployment of wind projects and has the potential to serve as an equally important tool to facilitate the deployment of needed peak solar generation. When appropriately modeled and valued, Schedule 38 will enable the installation of solar at the utility's true avoided costs and provide ratepayers with critical, cost-effective insurance against traditional fuel volatility.

Respectfully Submitted,

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