

Redding Electric Utility

City of Redding Net Energy Metering Rate Update

Final Report

November 5, 2019

Prepared by:



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November 5, 2019

Ms. Holly Spaner
City of Redding
3611 Avtech Pkwy
Redding, California 96002

SUBJECT: Update Net Energy Metering 2.0 Study

Dear Ms. Spaner:

It is with pleasure that we submit the Final Update Net Energy Metering (NEM) 2.0 Study for the City of Redding.

We would like to acknowledge and thank you and the staff at Redding Electric for the support in developing this review.

Very truly yours,

A handwritten signature in blue ink, appearing to read "Amber Nyquist".

Amber Nyquist
Manager, Economic Evaluations

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Executive Summary

In early 2019, Redding Electric Utility (REU) requested a review of the proposed NEM successor rate design (REU Solar 2.0) focusing on the cost to serve aspect of the rate developed for REU Solar 2.0 as well as reviewing the rate methodology used to develop the REU Solar 2.0 credit rate. EES provided a review that supported a 3.8 cent/kWh credit rate for excess generation on distributed solar resources. Since that study was completed, REU expanded its perspective to include cost-to-serve aspects not previously quantified. Specifically, REU's NEM 2.0 credit rate should be based not only on quantified costs as incurred by the utility, but should also include any societal benefits resulting from NEM resources. This report includes the original analysis and also adds value for impacts not directly incurred by the utility such as local economic development.

Under the proposed REU Solar 2.0 credit rate, customers would receive a credit for excess electricity sent to the grid based on REU's avoided cost plus some societal impacts. The proposed value of the credit for energy sent to the grid is 6.37 cents per kilowatt-hour (kWh) for 2019. This rate is designed to compensate the customer for the energy charges, avoided transmission charges, avoided transmission and distribution system losses, local economic impacts resulting from increased distributed generation, and environmental attributes.

Based on the information provided and a review of the pricing methodology, the resulting REU Solar 2.0 rate is cost-based and follows the methodology used by other utilities developing their NEM Successor rate. Other utilities have employed a similar cost-based approach where avoided costs, not directly incurred by the utility are included in the credit rate. For example, Marin Clean Energy includes a \$0.1/kWh adder to the credit rate for benefits of local renewable generation.

Introduction

In early 2019, Redding Electric Utility (REU) requested a review of the proposed NEM successor rate design (REU Solar 2.0) focusing on the cost to serve aspect of the rate developed for REU Solar 2.0 as well as reviewing the rate methodology used to develop the REU Solar 2.0 credit rate. EES provided a review that supported a 3.8 cent/kWh credit rate for excess generation on distributed solar resources. Since that study was completed, REU expanded its perspective to include cost-to-serve aspects not previously quantified. Specifically, REU's NEM 2.0 credit rate should be based not only on quantified costs as incurred by the utility, but should also include any societal benefits resulting from NEM resources. This report includes the original analysis and also adds value for impacts not directly incurred by the utility such as local economic development.

Net energy metering is a billing mechanism that allows eligible customers to be compensated at the full retail rate for electricity generated by their eligible on-site generation systems such as solar photovoltaic (solar PV) systems. The terms and conditions of NEM are defined in California Public Utilities Code Section 2827 (PUC 2827), including the ability to receive credit for eligible on-site customer generation at the retail rate, to have the credits roll over month-to-month over a 12-month period, and to have the option to cash-out any net surplus generation that exists at the end of the 12-month period.

After an electric utility meets its NEM cap as defined in PUC 2827, then the terms and conditions of a NEM successor rate would be developed and adopted through the utility's normal rate making processes. Redding City Council rate policies that guide the development of rates for electric customers are the following:

- Cost-Based
- Fair & Equitable
- Adequate
- Incremental

The review of the proposed NEM successor rate design focuses on the cost to serve aspect of the rate developed for REU Solar 2.0 as well as including other quantifiable impacts from local solar development.

Proposed REU Solar 2.0 Rate and Cost Basis

When a customer installs on-site generation, there are three types of energy flows that must be considered during every hour: 1) the customer generates energy to meet their own power needs; 2) the customer does not generate enough energy to meet their own power needs and purchases power supplied from REU; and 3) the customer generates energy in excess of their own power needs. Each of these situations will need to be considered from a cost based perspective.

In order for the proposed REU Solar 2.0 rate to be implemented, new meters will have to be installed. These meters will measure both the energy delivered from the customer to the grid and the energy delivered by Redding Electric Utility to the customer and meet the California Energy Commission's (CEC) 2% meter accuracy requirements.¹

When the REU Solar 2.0 customer's on-site generation system is generating energy to meet the customer's instantaneous on-site load, the REU Solar 2.0 customer avoids the full utility retail rate for the power generated to meet their own use under the proposed NEM successor rate. This credit provides the greatest benefit to the REU Solar 2.0 customer by off-setting both the commodity and distribution rate components associated with the avoided use.

If a REU Solar 2.0 customer does not generate enough energy to meet their own instantaneous power needs, under the proposed NEM successor rate, the REU Solar 2.0 customer will be billed for the energy used from the grid based on the current Redding Electric Utility retail rate. This methodology is consistent with the treatment of all other customers on the same rate schedule, and the cost-based retail rates collect sufficient revenues to cover the cost of service to customers for that rate schedule.

Under the proposed REU Solar 2.0 rate, customers would receive a credit for all electricity sent to the grid rather than being able to roll over the surplus generation from month to month. The proposed value of the credit for energy sent to the grid is 6.37 cents per kilowatt-hour (kWh) for 2019. This rate is designed to compensate the customer for the energy charges, avoided transmission/ancillary service charges, avoided transmission and distribution system losses, local economic impacts, and avoided environmental costs.

Cost Basis for REU Solar 2.0 Rate

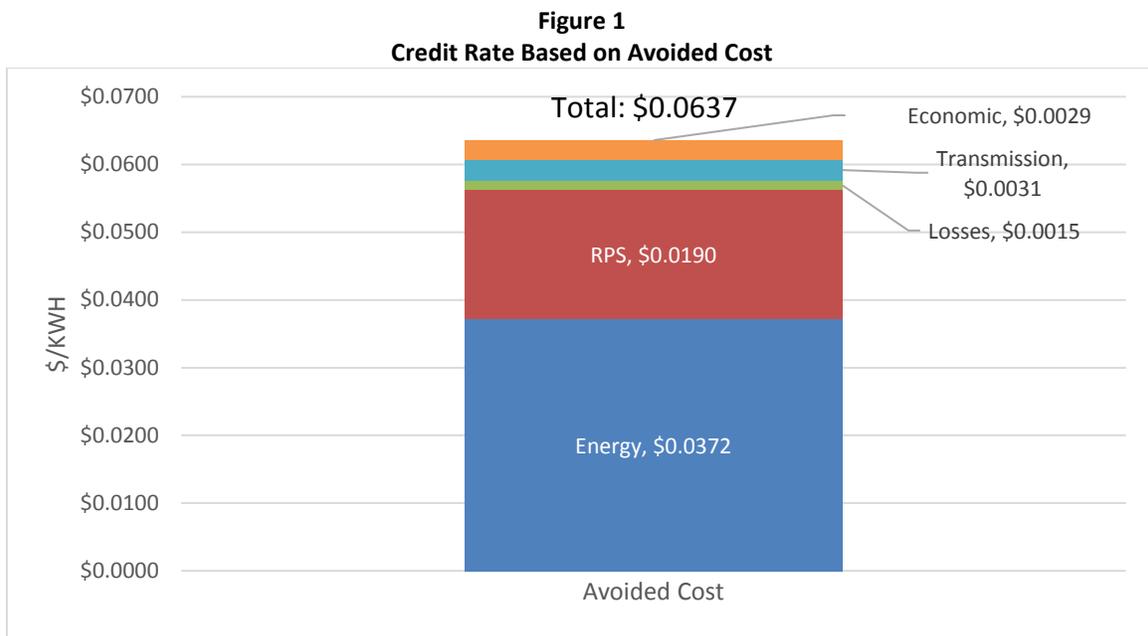
When the customer is generating power to meet their own load, the customer is essentially reducing the energy used from the grid as well as reducing the use of the utility infrastructure.

¹ From the CEC's RPS Eligibility Requirement Guidebook Ninth Edition. Available here: [file:///C:/Users/birkeland/Downloads/TN217317_20170427T142045_RPS_Eligibility_Guidebook_Ninth_Edition_Revised%20\(2\).pdf](file:///C:/Users/birkeland/Downloads/TN217317_20170427T142045_RPS_Eligibility_Guidebook_Ninth_Edition_Revised%20(2).pdf)

This is similar to a customer that is conserving energy in other ways and therefore avoiding the full retail rate. To be consistent from a cost perspective, the REU Solar 2.0 customer, like the energy-conserving customer, can off-set both the commodity and distribution rate components associated with the avoided use.

As stated above, charging the REU Solar 2.0 customer for energy used from the grid at the current retail rate is also consistent with the treatment of all other customers on the same rate schedule. The REU Solar 2.0 customer is grouped with similar customers in the rate schedule and is charged the appropriate rate for any energy consumption obtained from the utility. The retail rates are calculated based on the most recent cost of service study, which determines the cost to serve for each group of customers in a rate class.

The rate used to credit the REU Solar 2.0 customer for energy delivered to the grid is calculated to compensate the customer for the energy, avoided transmission charges, avoided transmission and distribution system losses, local economic impacts, and avoided environmental costs. A stacked bar chart of the credit rate is shown in Figure 1, and each component is described in greater detail in the following subsections.



Avoided Energy & Fuel

REU calculated the avoided cost of energy based on the lower price forecast of two markets: California Oregon Border (COB) or NP15. REU is positioned to purchase wholesale energy from either of these markets. Hydropower production significantly affects both of these markets. Due to the relatively dry conditions in the Pacific Northwest, and the rainy conditions in California, the NP15 forward prices are lower compared with COB. Therefore, REU proposes to utilize the NP15 prices for energy as that is the market it would most likely transact due to lower prices for wholesale energy purchases.

The energy value is calculated based on an annual published strip of electric market for NP-15 weighted to REU's annual load profile² at the time of expected solar generation weighted to account for a locally sited solar systems Effective Load Carrying Capacity (ELCC). This methodology reflects the incremental spot market purchases avoided by REU due to solar generation from NEM customers. The 2019 avoided market price was estimated at \$0.0372 per kWh. This value is slightly higher than the value estimated in the first NEM 2.0 review due to changes in market prices since the previous report was completed.

These market prices are consistent with the market prices used for REU financial planning and rate setting. This valuation methodology is internally-consistent with the way in which REU manages its entire electric portfolio: Redding Electric Utility utilizes load and resource forecasts to determine how much energy to buy and when on the spot market. The solar generation delivered to the grid from NEM customers reduce the amount of energy REU would need to purchase.

Avoided Environmental Costs

Public Utilities Code (PUC) 2827(h) allows publicly owned utilities, for those utilities with an established net surplus electricity compensation valuation for net surplus customer generators,³ ownership of renewable energy credits from net surplus electricity purchased by the utility. Further, section PUC 2827(h)(6)(B) allows utilities with an established net surplus compensation valuation to count purchased surplus generation toward the "electric utilities renewable energy portfolio standard annual procurement targets" per PUC section 399.30.

The REU Solar 2.0 credit rate therefore includes the reduction in renewable energy credit cost as a result of decreased retail sales in addition to associate REC value of the energy. For 2019, REU is required to meet 31 percent of retail load with renewable resources.⁴ The value of environmental benefits – or the renewable component of the generated energy – was calculated using a forecast of Power Content Category 1 (PCC1) RECs prices. PCC1 REC prices are assumed since REU can aggregate RECs from distributed resources and count those RECs toward its compliance requirement. The price forecast for PCC1 RECs is approximately \$19/MWh in 2019. This value is consistent with recent market transactions for short-term renewable energy and the methodology is consistent with the costs that REU avoids by purchasing RECs from local generation. In this update to the NEM 2.0 study, the full value of the REC is included in the credit rate. Previously, only a share of the REC was included as REU would need to register the resources with WREGIS in order to claim the associated purchased RECs. This study assumes that REU would complete the registration and count the RECS toward its RPS requirement.

² REU's Annual load profile was derived from REU's 2019 IRP.

³ With a rate that is "just and reasonable compensation for the value of net surplus electricity, while leaving other ratepayers unaffected" PUC 2827(h)(5)(A), found here:

http://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?sectionNum=2827.&lawCode=PUC

⁴ Interpolated amount based on 33% requirement in 2020.

Avoided Transmission

Behind the meter (BTM) solar resources reduce transmission costs since the energy is not being transported on transmission lines into REU's service territory. Additionally, as BTM solar, being located at the same location as the load it is serving, does not incur transmission line losses. The ELCC is used to estimate the transmission kW-month and line losses avoided via REU's point-to-point (PTP) contract on the Central Valley Projection transmission line. Prices for transmission are also based on the PTP contract and start around \$2/kW-month in 2019 and escalate for future years. The resulting avoided transmission cost is estimated at \$0.0031/kWh for 2019.

Avoided Transmission and Distribution System Losses

Avoided costs for transmission losses are based on the transmission loss factor of 1.6% per REU's point to point contract. The avoided transmission loss value is calculated based on the 1.6% losses using the wholesale market price from the avoided energy cost component. This methodology is cost based and represents the avoided costs to REU of reduced retail load.

Due to distributed generation's delivery of generation at or near the customer, both the avoided transmission and distribution losses are included in this analysis. While, arguably, distributed generation does utilize distribution infrastructure, if generation isn't used behind a customer generators meter, any exported energy is typically used at the next nearest available load, most often a customer generator's neighbor. REU's distribution loss factor is derived from publicly available Energy Information Agency (EIA) 2017 Form 861 operational data. After first subtracting estimated self-generation within REU's service territory,⁵ REU's distribution loss factor was estimated at 2.39%. Combined, REU's T&D loss factor is estimated at 3.99%.

Local Economic Impact

Numerous studies have been conducted on the macroeconomic impacts the solar industry has on local economies. A broader literature review of various Value of Solar (VOS) efforts by Rocky Mountain Institute (RMI)⁶ found that while numerous VOS studies acknowledge the value of increased local taxes and job growth resulting from solar, few studies attempted to quantify this value. The two quantitative figures included in RMI's study estimate local economic impacts between \$0.01-\$0.045/kWh.

⁵ Estimated from REU's reported 2017 totally NEM capacity (9.052 mW's), multiplied first by 8760 and then by an estimated PV capacity factor of 20%.

⁶ "A Review of Solar PV Benefits and Costs", Rocky Mountain Institute. Available here: https://rmi.org/wp-content/uploads/2017/05/RMI_Document_Repository_Public-Reports_eLab-DER-Benefit-Cost-Deck_2nd_Edition131015.pdf

The most widely used public tool available for quantifying this impact is the National Renewable Energy Laboratory’s Jobs & Economic Development Impact Model (JEDI).⁷ Using publicly available data from NREL, REU’s 2019 IRP, and the US Energy Information Agency (EIA), the resulting economic impact is estimated at \$0.0029/kWh for local economic impacts for behind the meter solar resources.⁸

Charges Considered, but Not Quantified in the Avoided Cost

In addition to determining credit value for the components listed above, REU explored additional components for the credit calculation. At this time, the value of these additional components is either:

- Not an avoided cost
- Already included above or
- Not quantifiable at this time

Avoided Power Supply Capacity

REU considered including avoided capacity costs associated with behind the meter solar; however, REU determined that no costs would be avoided. The inclusion of capacity value assumes REU would pay for (short position) or sell (long position) capacity in an active market. BANC does not have a capacity market like the CAISO. REU has occasionally sold capacity to other BANC counterparties, but this has been limited to third quarter months and was strictly valued for the hours of 4-9pm. Solar production requires capacity to be procured as a backstop. Therefore, REU will not be making firm capacity sale commitments based on behind the meter solar installations (which may or may not be online). In sum, REU would not avoid capacity expenses due to the installation of behind the meter solar resources, so these expenses are not included in the credit rate for NEM 2.0.

Avoided Ancillary Services (AS)

Behind the meter resources can impact spinning and non-spinning reserves. For spin and non-spin reserves, procurement requirement is based on REU's load ratio share (LRS) of the WAPA system. A reduction of LRS is, therefore, a reduction in spinning and non-spinning reserve requirements.

Additionally, there may also be an increase in cost for frequency and regulation service required to integrate the intermittency of behind the meter solar. These costs may offset the reduced

⁷ Available here: <https://www.nrel.gov/analysis/jedi/>

⁸ Future years included a 2% annual escalator.

reserve requirement benefits above. as the data needed for these impacts was not available at the time of this study.

Congestion Costs

REU does not have any congestion costs other than what is already included in the avoided energy rate provided above.

Avoided Criteria Pollutant

Criteria pollutant cost is priced in the wholesale market rate and included in avoided energy. The forward market prices include the all-in cost of natural gas generation. REU has no additional costs associated with this component.

Avoided CO₂ Emissions

Avoided CO₂ emission allowance cost is priced in the wholesale market rate and included in avoided energy. REU has no additional costs associated with this component.

Avoided Fuel Hedging

REU does not have any realized benefit for reduction in fuel hedging as a result of reduced load. There are therefore no avoided costs associated with this component.

Avoided Distribution Capacity

The peak solar contributions do not generally occur at the time of REU's peak periods. REU's system design methodology assumes solar generation is not *reliably* available during peak periods and, therefore, no distribution investment cost savings can be realized due to solar generation. Due to the unreliability of solar output at the time of REU's system peak, avoided costs associated with this component are not included in the credit rate.

Avoided Voltage & Power Quality

The variability of solar generation due to changing cloud cover makes voltage control along distribution feeders more difficult than it would be without solar. At this point, REU has not experienced additional issues from solar generation on the system. However, in the future, REU may need to review the impact of solar on voltage and power quality on the system. At that time, the credit may be reduced by the increased cost due to the solar generation. For the REU Solar 2.0 rate estimated, there are currently no avoided costs associated with this component.

Conservation Voltage Reduction

Currently, REU does not employ conservation voltage reduction. Therefore, there are no avoided costs associated with this component.

Reliability and Resilience

At this time, the current solar systems do not provide reliability support on REU's system. There are, therefore, no cost impacts associated with this component.

NEM 2.0 Rate Survey Update

Literature Review

NEM rates are established to encourage investment in distributed generation (DG); however, utilities are then tasked with designing rates that minimize cost shifting from NEM customers to other customers. Within California, utilities establish rates consistent with the NEM 2.0 criteria for valuing net excess generation and all rates must be cost-based. The rate proposal developed by REU attempts to quantify the costs and benefits of solar DG so that the resulting rates are fair and equitable to REU customers.

The CPUC established a rate structure for the investor-owned utility NEM net surplus compensation rate in D.11-06-016 pursuant to Assembly Bill (AB) 920. The basis for the avoided energy purchases is the day-ahead spot market price averaged over heavy load hours. This methodology is consistent with REU's proposal to use forecast wholesale market prices for avoided energy costs.

The American Public Power Association's report on Rate Design for Distributed Generation, Net Metering Alternatives, uses case studies to provide examples of how public utilities are compensating distributed generation owners for net excess generation.⁹ While not all examples are within the state of California, the methodologies used to value the excess generation apply.

- Austin Energy: Loss savings + Energy Savings + generation capacity savings + fuel price hedge value + transmission and distribution system savings + environmental benefits
- Lincoln Electric System: Comparison of with and without solar cases to produce a compensation rate that does not burden other customers
- Concord Light: wholesale energy rate only

Based on the above review, the components included in REU's proposed credit rate are comprehensive.

Rate Survey

Table 1 provides a an update to the high-level comparison of NEM successor rates that have been adopted by other POU's in California.

⁹ https://www.publicpower.org/system/files/documents/ppf_rate_design_for_dg.pdf

**Table 1
Comparison of 2019 Credit Rates**

Utility	Program	Credit Rate	Status
Palo Alto	Net metering 2.0	\$0.1009	Adopted
Anaheim	Net metering 2.0	\$0.0647	Adopted
Modesto Irrigation District	Net metering 2.0	\$0.076	Adopted
Turlock Irrigation District	Buy/Sell	Monthly Short run Marginal Cost	Adopted
Lodi	Net metering 2.0	\$0.0687	Adopted
Alameda	Buy/Sell	\$0.06961	Adopted
Imperial Irrigation District (IID)	Net metering 2.0	\$0.0698	Adopted
Redding	Net metering 2.0	\$0.0637	Proposed
Shasta Lake	Net metering A-2	\$0.0175	Adopted
Roseville	Net metering 2.0	\$0.0598	Adopted

Most of the POU's that have considered NEM successor rate have developed a rate construct similar to the one developed by REU. The City of Palo Alto has detailed their methodology for calculating the credit rate to include the following:

- Energy and Congestion: Market price for NP15 weighted by hourly solar load profile plus congestion fees paid for imports. Note that REU does not have congestion charges.
- Capacity: Local and system resource adequacy requirements at the time of system peak
- Transmission and Ancillary Services: CAISO transmission access charge (TAC) plus grid management charge (GMC) and ancillary services
- Transmission and Distribution System Losses: historic distribution losses at 3.3% included at NP15 forecast price plus historic transmission losses
- Environmental Benefits: forecast PCC1 prices, applied to all energy as the City purchases the renewable component (similar to the proposed REU rate).

REU's methodology and assumptions are similar to the City of Palo Alto except where differences occur in marginal costs such as the renewable attributes and generation capacity. Overall, REU's resulting credit rate is in line with other POU's in California.

Another notable NEM program currently available within California is offered by Marin Clean Energy (MCE). MCE's NEM program compensates all NEM customers for excess generation at MCE's premium Deep Green¹⁰ rate regardless of whether a particular NEM customer is purchasing power on that rate schedule. Currently the deep green residential rate is \$0.097/kWh for basic service. Finally, MCE's NEM program design allows for monthly billing rather than the annual true-up utilized by most utilities. MCE also allows NEM customer to continuously roll over accumulated credits (up to a \$5,000 limit).

¹⁰ MCE's 100% renewable rate.

Summary

Based on the information provided and a review of the pricing methodology, the proposed REU Solar 2.0 rate is cost-based and follows the methodology used by other utilities developing their NEM Successor rate. The updated rate is greater than what was estimated in the first NEM 2.0 Study (October 2019), due to the following changes:

- Included 3.99% for transmission and distribution losses
- Updated market prices for energy value
- Included full value of RECs purchased through credit rates
- Included local economic development impacts based on other studies.

The proposed energy rate for energy provided to the grid is based on market price estimates and specific avoided REU costs plus societal benefits. The resulting rate is similar to many other POU's in California.