A Review of the Value of Solar Study Performed by GDS Associates for Pedernales Electric Cooperative

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I. Introduction

The Perryman Group (TPG) was recently asked to review a study performed for Pedernales Electric Cooperative (PEC) related to the benefits of avoided costs associated with distributed generation (DG) by members. As described in further detail below, the purpose of the study was to determine the reduced costs to PEC associated with DG which, in turn, assists in determining the appropriate level of compensation to be paid to members.

An important aspect of supporting the deployment of renewable energy is programs such as the one offered by PEC which pays members for excess power their equipment generates. At the same time, such programs must be carefully crafted to ensure their fairness and sustainability. Basic economic principles indicate that (1) rates which would produce ongoing losses to the system are not viable as a long-term policy and (2) prices should serve a signal to market participants to incentivize rational decisions. Rates that are set above or below appropriate levels will result in inefficiency and inappropriate resource allocations.

II. Background

With increasing use of distributed generation among customers, electricity providers must determine the appropriate method and amount of compensation to provide these customers. The compensation must be fair and equitable to all customers. In addition, it must cover associated costs to make the programs economically feasible and sustainable.

Pedernales Electric Cooperative has been evaluating rates associated with distributed generation (DG) which is the interconnection of an electrical generating facility (such as solar, wind, or battery power) located at a member's service location. As of October 2021, PEC had more than 363,0000 members; over 6,200 members had distributed generation, almost all of which was solar.

In April 2016, the Board approved interconnection rates for systems below 50 kW. Since inception, limitations in the billing system, metering software and infrastructure greatly limited rate design options. In December 2020, the Board approved a new rate design intended to reduce cost recovery inequities. However, following member feedback in July 2021, the Board rescinded the previously approved changes and requested a new rate design proposal that meets the requirements set out in Board Resolution #2021-312.

The Board resolved that new rates must be (1) guided by the Rate Policy objectives of the Cooperative, including equitable rates, sufficient cost recovery, sending accurate price signals, and stability in rates; and (2) equitable so that costs for the distribution system are paid in a just, reasonable, and non-discriminatory manner by all members and with equity as to the surplus energy buy-back rate.

To address these issues, PEC hired GDS Associates to perform a value of solar study to determine an annual value per kW of solar from members. The study identifies and develops the avoided cost benefits of member-owned distributed generation (DG) with a focus on solar facilities with capacities of 50 kW or less. The study results are being used to determine a rate design to appropriately compensate members with DG for the cost-based value of their excess energy that is supplied to the PEC system. The Perryman Group reviewed this value of solar study in order to assess the metrics used and other aspects of the report, including the cost-based value of energy.

III. TPG Qualifications

The Perryman Group has more than 40 years of experience in examining issues related to electric utilities and other regulated industries. Specifically within the power sector, the firm has examined major investments in generation throughout the US (wind, solar, coal, natural gas, and nuclear) as well as major investments in transmission and distribution systems (including, among other, the Community Renewable Energy Zones (CREZ) initiative in Texas and major investments in the Southwest Power Pool (SPP) and the Southeastern Electric Reliability Council (SERC) regions). TPG has also examined rate structures and design, usage patterns, appropriate rates of return, and similar issues on numerous occasions and provides forecasts and planning information to numerous major utilities. Studies of regulatory structures and avoided costs have been performed in numerous sectors, including electric power. Most recently, the firm has been involved in extensive analysis of the effects of Winter Storm Uri.

Dr. M. Ray Perryman, founder and president of TPG, has testified on energy matters before the Congress of the United States, the US Department of Energy, the US Department of Agriculture, the Federal Energy Regulatory Commission, and legislative and regulatory bodies in several states. In addition, he frequently addresses major energy companies and trade associations.

The Perryman Group has also maintained a detailed modeling system and provided ongoing forecasts of the area served by PEC since the early 1980s and has completed dozens of specialized projects in the area.

IV. The GDS Associates Study

GDS developed a value of distributed generation model (VDGM) that considers the three primary functions of a utility grid: generation, transmission, and distribution. “The model recognizes that when a member installs a behind-the-meter generator, and that system generates power, PEC’s costs are potentially reduced through reduced energy and ancillary

service purchases in the ERCOT market, reduced transmission access expense, and avoided investment and operations and maintenance expense on the distribution system. The VODG [Value of Distributed Generation], then, is a computation of avoided costs of the generation, transmission, ancillary services, and distribution functions. Additionally, the DG may allow PEC to avoid certain regulatory costs."[1]

The study found that the aggregate value of DG for PEC ranged from approximately $77 to $112 per kW-year in the 2018-2020 period. The three-year average is about $84 per kW-year. The components of the cost savings include avoided energy costs, avoided transmission costs, and avoided ancillary service costs.

The 3-year average cost savings from avoided energy costs due to PEC purchasing a smaller amount of wholesale energy due to the members' solar DG installations is $62.31 per kW year. The charges for PEC to access the ERCOT transmission system were also reduced because of the members producing energy through solar DG installation; the study found the 3-year average avoided transmission costs to be $18.63 per kW year. The study also found avoided ancillary service costs for PEC of $3.17 per kW year over the 3-year period due to member solar DG installations. The study found no avoided costs associated with generation demand, distribution, or regulatory requirements. The study concluded that for each kW installed at a member's location, PEC avoids spending $84.11 each year.

The following table summarizes the findings of the report.

[1] Pedernales Electric Cooperative, Inc., Value of Solar Study, GDS Associates Inc., October 4, 2021.

Key Findings from the GDS Associates Study				
	2018 (costs per kW year)	2019 (costs per kW year)	2020 (costs per kW year)	3-Year Average (costs per kW year)
Avoided Energy Costs	$56.85	$88.78	$41.31	$62.31
Avoided Transmission Costs	$18.14	$18.14	$19.61	$18.63
Avoided Ancillary Services Costs	$2.49	$5.36	$1.66	$3.17
Avoided Capacity or Demand Costs	0	0	0	0
Avoided Distribution Costs	0	0	0	0
Avoided Regulatory Costs	0	0	0	0
Total Value of Distributed Generation	$77.48	$112.28	$62.58	$84.11
Source: "Pedernales Electric Cooperative, Inc. Value of Solar Study," GDS Associates, October 4, 2021.				

V. TPG Review

TPG has reviewed the report and finds the results reasonable.

The model developed by GDS using generation, transmission, and distribution, the three primary functions of a utility grid, is appropriate. The specific costs included in the model of energy costs, transmission costs, ancillary services costs, capacity or demands costs, distribution costs, and regulatory costs are appropriate based on a review of other studies of the value of distributed generation. TPG conducted a review of the research related to the value of distributed generation and concluded that, based on the relevant literature, the model developed by GDS is reasonable and appropriate.[2]

[2] See for example, Pitt, Damian and Gilbert Michaud," Assessing the Value of Distributed Solar Energy Generation," Urban Planning, July 19, 2015, https://link.springer.com/article/10.1007/s40518-015-0030-0; Orrell, AC, JS Homer, and Y Tang, "Distributed Generation Valuation and Compensation," White Paper, Pacific Northwest National Laboratory, February 2018,

The GDS model captures the relevant avoided costs to PEC. The items with no avoided costs (capacity or demand, regulatory, and distribution) are also reasonable. The review of the literature, including the studies cited in the GDS study, indicates that avoided costs from these items of zero is appropriate.

Although currently there is no avoided generation capacity cost value for generation demand or market-based demand, it is reasonable for GDS to include this element in its model with a zero value as stated in the report for future use in "the event either ERCOT adopts some form of a capacity market or PEC changes its supply options or contracts in such a way that they have marginal capacity cost exposure," which would then "become appropriate at that time for PEC to update its VODG model and incorporate the avoided cost impacts." The potential for a capacity market has gained additional attention and consideration in the wake of Winter Storm Uri.[3]

Similarly, currently PEC has no avoided regulatory costs, but based on changes in the future by a regulatory body there could be a requirement that would be impacted by member-owned DG. It would then be appropriate for PEC to update its VODG model and incorporate the avoided cost impacts.

Finally, with respect to avoided distribution costs, as stated in the report and other studies included in the report and reviewed by TPG, determining any avoided distribution cost is extremely difficult. As mentioned in the report, DG could lead to decreased spending on distribution or increased costs depending on the situation. Various attempts to determine a

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https://www.districtenergy.org/HigherLogic/System/DownloadDocumentFile.ashx?DocumentFileKey=0103ebf1-2ac9-7285-b49d-e615368725b2&forceDialog=0; Shavel, Ira, Ahmad Faruqui, and Yingxia Yang, "Valuing and Compensating Distributed Energy Resources in ERCOT." The Brattle Group, March 28, 2019, https://3vq5kdns38e1qxlmvvqmrzsi-wpengine.netdna-ssl.com/wp-content/uploads/2019/03/TCEC-Brattle-study-DER-in-ERCOT-28-March-2019-FINAL.pdf; and "Distributed Energy Resources," American Public Power Association, Issue Brief, June 2021, https://www.publicpower.org/system/files/documents/June%202021%20-%20Distributed%20Energy%20Resources.pdf.

[3] See, for example, O'Hanlon, Morgan, "PUC Weighs Options in First Major Discussion of Electricity Market Overhaul Since Deregulation." The Dallas Morning News, August 26, 2021, https://www.dallasnews.com/news/politics/2021/08/26/puc-weighs-options-in-first-major-discussion-of-electricity-market-overhaul-since-deregulation/ and Perryman, Ray, "It's Time to Stop Pointing Fingers and Take Steps to Make the Texas Grid More Reliable," The Dallas Morning News, February 28, 2021, https://www.dallasnews.com/opinion/commentary/2021/02/28/its-time-to-stop-pointing-fingers-and-take-steps-to-make-the-texas-grid-more-reliable/.

cost have resulted in a wide range of values from 0 to more than $170 per Kw year. Similarly, another study indicates "increased solar energy use could have potential positive or negative impacts on electricity transmission and distribution (T&D) systems. However, these impacts would be highly location-specific and are difficult to quantify in broad terms."[4] Moreover, any potential "savings would only be possible if the solar energy is produced at peak demand periods."[5] The discussion in the report regarding distribution costs and the fact that "PEC's planning engineers, like much of the industry, have concluded that the distribution system costs are predominantly fixed and will not decline with a decrease in load resulting from the operation of DG at current levels" is compelling. As stated in the report, the "distribution investment must be sufficient to meet system peak demands at any time throughout the year," and "although DG could be producing output during certain peaks of the year, especially in summer months for PV [photovoltaic] systems, they are not consistently producing output during the single highest peaks of the year and therefore do not provide a firm and consistent reduction in peak demand that can be counted on to delay investment in distribution system infrastructure." Based on these factors a value of 0 for avoided distribution costs is appropriate.

A variable which has been suggested for consideration is the potential effect of carbon reduction credits. The market for carbon credits is still evolving, and policy changes are affecting future development. The values of such carbon reduction cannot be readily quantified, and the monetary benefits of any carbon would likely accrue to the owners of the DG. For these reasons, it is not appropriate to include carbon reduction credits in PEC's assessment of appropriate compensation to owners of DG.

VI. Conclusion

[4] Pitt, Damian and Gilbert Michaud," Assessing the Value of Distributed Solar Energy Generation," Urban Planning, July 19, 2015, https://link.springer.com/article/10.1007/s40518-015-0030-0.
[5] Pitt, Damian and Gilbert Michaud," Assessing the Value of Distributed Solar Energy Generation," Urban Planning, July 19, 2015, https://link.springer.com/article/10.1007/s40518-015-0030-0.

In summary, The Perryman Group reviewed the study and found no material problems with the calculations and methods. The values from the report were also appropriately used to calculate the potential rate to be used.

Compensation to members with solar generation for the excess power generated is appropriate. However, rates must be fair to all members. In addition, rates must reflect avoided costs in order for PEC's program to be sustainable. The analysis in the GDS study appears to be methodologically appropriate to support these goals and to facilitate a rate design that is consistent with sustainability, efficiency, and long-term investment in solar energy in a manner consistent with proper resource allocation.