STATE OF INDIANA

INDIANA UTILITY REGULATORY COMMISSION

PETITION OF SOUTHERN INDIANA GAS AND ELECTRIC COMPANY D/B/A VECTREN ENERGY DELIVERY OF INDIANA, INC. FOR APPROVAL OF A TARIFF RATE FOR THE PROCUREMENT OF EXCESS DISTRIBUTED GENERATION PURSUANT TO IND. CODE § 8-1-40 ET SEQ.	**)))))))**	**CAUSE NO. 45378**

DIRECT TESTIMONY OF WILLIAM D. KENWORTHY

ON BEHALF OF

CITIZENS ACTION COALITION OF INDIANA, ENVIRONMENTAL LAW AND POLICY CENTER, SOLAR UNITED NEIGHBORS, AND VOTE SOLAR

("JOINT INTERVENORS")

AUGUST 20, 2020

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I. QUALIFICATIONS AND SUMMARY

Q. Please state your name, business name and address.

A. My name is William D. Kenworthy. My business address is 332 South Michigan Avenue, 9th Floor, Chicago, Illinois 60604.

Q. By whom are you employed and in what capacity?

A. I serve as Regulatory Director, Midwest, for Vote Solar. I oversee policy development and implementation related to large scale and distributed solar generation in the region. I also review regulatory filings, perform technical analyses, and testify in commission proceedings on issues relating to solar generation.

Vote Solar is an independent 501(c)3 nonprofit working to repower the U.S. with clean energy by making solar power more accessible and affordable through effective policy advocacy. Vote Solar seeks to promote the development of solar at every scale, from distributed rooftop solar to large utility-scale plants. Vote Solar has over 90,000 members nationally, including 509 members in Indiana. Vote Solar is not a trade organization nor does it have corporate members.

Q. On whose behalf are you submitting this direct testimony?

A. I appear here in my capacity as an expert witness on behalf of Citizens Action Coalition of Indiana ("CAC"), the Environmental Law & Policy Center ("ELPC"), Solar United Neighbors ("SUN"), and Vote Solar (collectively, "Joint Intervenors" or "JI").

Q. Please summarize your educational background.

A. I received a Master of Public & Private Management degree from the Yale University School of Management with a concentration in Regulation and Competitive Strategy. My research in graduate school focused on regulatory theory and practice. I also have a Bachelor of Science in Foreign Service from Georgetown University.

Q. Please summarize your professional experience.

A. I have nearly 30 years of experience in the energy industry in both the public and private sectors working in the renewable energy business and in energy policy. Of that experience, I spent eight years in solar energy project development working primarily on commercial and industrial distributed solar projects in the Midwest.

Prior to Vote Solar, I was Managing Director – Midwest for Microgrid Energy, where I was responsible for leading Microgrid Energy's expansion of its solar project development capabilities into markets in the Midwest. As a solar project developer, I analyzed financial and economic aspects of projects. This involved understanding all aspects of project finance and economics for our customers, partners, and financiers. My project development experience includes project finance, rate analysis, economic modeling, risk assessment, regulatory compliance, sales, and customer relations.

During my tenure at Microgrid Energy, we completed the Solar Chicago program, a residential bulk purchase program, as well as a number of commercial projects ranging in size from 25 kW to 2 MW. Prior to that, I was a partner with Tipping Point Renewable Energy based in Dublin, Ohio, where we developed what was at the time the largest rooftop solar project in Ohio for the City of Columbus.

In addition, my tenure at Microgrid Energy was punctuated with a one-year hiatus during which time I served as President of Infer Energy, currently Root3 Technologies. Infer Energy provided energy optimization services to large commercial and industrial energy users. We used advanced data analytics and machine learning algorithms to optimize complex energy systems.

Prior to joining the solar energy industry, I worked on energy policy at the federal and state level for over 20 years. As a consultant, I represented electric utilities and other industry participants before Congress, the Department of Energy, the Nuclear Regulatory Commission, the Environmental Protection Agency, and the Office of Management and Budget. I began my career as a Professional Staff Member to the House Energy & Commerce Committee, where I represented Chairman John D. Dingell and other majority members of the Committee in negotiations and legislative drafting on nuclear regulatory matters, the Clean Air Act Amendments of 1990, and electric industry structure issues, among others.

Q. Have you testified before the Indiana Utility Regulatory Commission previously?

A. No.

Q. Have you testified or provided comments in similar state regulatory proceedings?

A. Yes. I have provided testimony in cases related to the valuation and compensation for distributed generation before the Illinois Commerce Commission, the Iowa Utilities Board, the Michigan Public Service Commission, and the Wisconsin Public Service Commission.

I also have provided comments in numerous proceedings before the Illinois Commerce Commission, the Illinois Power Agency, the Michigan Public Service Commission, the Minnesota Public Utility Commission, and the Wisconsin Public Service Commission.

A list of testimony and comments that I have filed is included as Attachment WDK-1.

Q. Are you sponsoring any attachments?

A. Yes, I am sponsoring the following attachments:

- Attachment WDK-1: Summary of Testimony and Comments of William D. Kenworthy
- Attachment WDK-2: Billing Methodology Illustration
- Attachment WDK-3: Vectren Attachment to OUCC Data Request 1.2 "Excess DG Rate Calculation"
- Attachment WDK-4: Vectren Attachment to Solarize Indiana Data Request 1.17 "SI 1.17_2020 Avoided Costs.xlsx"

II. PURPOSE AND SUMMARY

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to evaluate the Petition of Southern Indiana Gas and Electric Company D/B/A Vectren Energy of Indiana, Inc. for Approval of a Tariff Rate for Procurement of Excess Distributed Generation Pursuant to Ind. Code § 8-1-40-16. I evaluate the structure of Vectren's proposed Rider EDG, the methodology proposed by the Company to calculate the proposed credit for excess distributed generation, the impact on customers, and identify a number of significant issues with the proposal offered by the Company.

Q. What have you reviewed in preparing this testimony?

A. I have reviewed the complete filing offered by the Company, including the direct testimony and exhibits of Company Witnesses Justin M. Joiner and J. Cas Swiz in addition to the responses provided by the Company to discovery requests by the Joint Intervenors and other intervenors in this Cause.

Q. Please summarize your testimony.

A. In Section III, I will discuss a number of issues that I have identified with respect to the implementation of the proposed Excess Distributed Generation Tariff. In particular, I will evaluate the Company's proposal to calculate customer bills by "instantaneously" measuring the inflow and outflow of energy from a customer's property (otherwise known as the Dual-channel Billing method) and compare it to other methodologies that would better align with sound rate design principles. In Section IV, I will discuss the impact that this transition to the proposed Rider EDG would have on Vectren's customers and the likely impact it would have on the market for distributed generation in Vectren's service territory. In Section V, I will discuss the value of distributed energy resources, including distributed generation, and how this value could inform current and future policy and regulatory decisions involving distributed generation. In Section VI, I will conclude and provide a summary of recommendations.

III. VECTREN'S IMPLEMENTATION ISSUES

A. Billing Methodology

1. Vectren's Proposed Dual-channel Billing Calculation Methodology

Q. What methodology has the Company proposed for calculating the billing of customers with distributed generation in proposed Rider EDG?

A. As described by Company Witness Swiz, the Company proposes to use instantaneous netting, or what is also called Dual-channel Billing. In his direct testimony, Mr. Swiz described the measurement process as follows:

> Vectren South will instantaneously measure the flow of energy via its Advanced Metering Infrastructure ("AMI") metering equipment. The electricity supplied by Vectren to the customer is defined as "inflow", and the electricity supplied by the customer to Vectren is defined as "outflow". Because the meter can only register the instantaneous measurement of electricity in either direction, each unit of power

can only be either inflow and outflow (or net zero in the case of perfect matching of generation to consumption).[1]

A screenshot from the workpaper provided for Mr. Swiz, labeled as “JI DR1.2 - Swiz Illustrative Impact Tables.xlsx”, is shown below and illustrates a representation of the data from which volumetric billing determinants [2] are calculated.

	A	B	C	D	E	F	G
1	PREMISES	METER_NO	MSRMT_LOCAL_DTTM	MULTIPLIER	KWH (DEL)	KWH (REC)	
2	[redacted]	[redacted]	03/27/2019 16:00:00	1	0	9.562	
3			03/27/2019 17:00:00	1	0	6.152	
4			03/27/2019 18:00:00	1	0.004	1.988	
5			03/27/2019 19:00:00	1	1.723	0	
6			03/27/2019 20:00:00	1	3.635	0	
7			03/27/2019 21:00:00	1	2.642	0	
8			03/27/2019 22:00:00	1	3.195	0	
9			03/27/2019 23:00:00	1	3.102	0	
10			03/28/2019 00:00:00	1	4.244	0	
11			03/28/2019 01:00:00	1	2.648	0	
12			03/28/2019 02:00:00	1	2.355	0	
13			03/28/2019 03:00:00	1	2.448	0	
14			03/28/2019 04:00:00	1	3.77	0	

Figure 1: Screenshot from "JI DR1.2 - Swiz Illustrative Impact Tables.xlsx"

The Company’s advanced metering infrastructure (“AMI”) meters register two channels. In the Figure above, Columns E and F are titled “KWH (DEL)” and “KWH (REC).” These are kilowatt-hours “delivered” and kilowatt-hours “received,” and they correspond to the “inflow” and “outflow” referred to on page 15 of Mr. Swiz’s direct testimony. For purposes of my testimony, I use the terms “inflow” and “outflow” because

[1] Petitioner’s Ex. 2 (Swiz Direct) at 12.
[2] “Billing determinants” are the detailed customer data used to calculate the customer’s bill. The *volumetric* billing determinants are the kilowatt hour (kWh) values (numbers) that are used to calculate the charges that appear on the bill. As described in detail in the following questions, the Company’s proposed billing methodology translates the customer’s raw meter data to kWh values to which charges are applied. In these calculations, the volumetric billing determinants are the kWh values used to calculate the monetary charges.

the terms “delivered” and “received” can be interpreted differently depending on the perspective of the author (i.e. whether the kWh in question is delivered by the utility to the customer or delivered by the customer to the utility).

In addition, in response to discovery, the Company provided meter data for existing net metering customers.[3] This data response included similar two channel information for each hourly interval.

Q. Is the instantaneous billing method required by statute?

A. I am not a lawyer but have been advised by counsel that Ind. Code § 8-1-40 *et. seq*. (the “DG Statute”) does not require the Company to propose an instantaneous billing methodology. The statute defines “excess distributed generation” as “the difference between the electricity that is supplied by an electricity supplier to a customer that produces distributed generation, and the electricity that is supplied back to the electricity supplier by the customer.”[4] I have been advised by counsel that the concept of **some** netting period is implied by the use of the word “difference,” and that the netting period is not specified in the statute.

To the extent that an EDG tariff is required to be adopted by the Company, there are different billing methodologies that align more closely with sound rate design principles than the one proposed by the Company and thus should be adopted in order to produce a just and reasonable result. I will discuss this in greater detail after describing alternative billing methodologies and their impacts on customers.

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[3] My aggregation of this data from 50+ spreadsheets is shown in my workpaper submission.
[4] Ind. Code § 8-1-40-5.

2. *Alternative Volumetric Billing Methodologies*

Q. Please describe and differentiate the different billing methodologies that you will compare in your testimony.

A. I will compare five different bill calculation methodologies, described in detail below:

- Full retail net metering;
- Buy all / sell all;
- Dual-channel Billing;
- Hourly Net Billing; and
- Monthly Net Billing.

Attachment WDK-2 illustrates the methodological difference between traditional full net metering, instantaneous measurement (also called Dual-channel Billing), and hourly netting over the course of one day for an example customer. Each of these is discussed below.

Q. Please describe the calculation of volumetric billing determinants for Net Metering.

A. This is Vectren's current billing method for DG customers and is relevant as a point of comparison. This method has been in place in Indiana since 2004. In this billing methodology, the billed kilowatt-hours at the end of the month are simply the registered usage at the end of the month less the registered usage at the beginning of the month. The billing determinant (in this case, Net kWh) is determined by calculating the difference between the electricity that is supplied by the utility to a DG customer over the course of a month and the electricity that the DG customer supplies back to the utility during that same month.[5] This method is understandable for customers and predictable.

[5] In older meters, there was only one value (the register reading at a particular time) that was used to bill the customer for kWh. Now, with AMI, the meter not only stores values periodically (typically at hourly intervals) but also registers the inflow and outflow in separate data channels, as described above in the discussion of "JI DR1.2 - Swiz Illustrative Impact Tables.xlsx."

Thus, it aligns well with the principles of sound rate design discussed in Section VI of my testimony.

The calculation of full retail net metering using AMI meter data is shown on Page 1 of Attachment WDK-2. For illustrative purposes, I have added two columns to the data provided for one day (April 4, 2019) in “JI DR1.2 - Swiz Illustrative Impact Tables.xlsx” that show hypothetical register readings at the beginning and end of each hour in the example. For full retail net metering, the volumetric billing determinants in this example would be the difference between the reading at the beginning of the period in Column E, Line 2, and the reading at the end of the period in Column F, Line 25. In an actual bill calculation, this billing period would be one month. For the day used in this example, the customer would pay $1.79 for the volumetric portion of their bill.

Q. Please describe the calculation of volumetric billing determinants for Buy All / Sell All.

A. The Buy All / Sell All method was offered by Company Witness Swiz as a point of comparison to the Company’s proposed Dual-channel Billing. Buy All / Sell All requires a separate meter to measure the generation output from the distributed generation. In this billing methodology, the customer purchases all of their electricity from the utility and the on-site generation does not offset any of the customer’s site load. All DG output is purchased by the utility at a separate rate. I have not illustrated this billing calculation because it does not allow customers to utilize their distributed generation to offset site load. While the Feed In Tariff programs adopted elsewhere in the state are structurally similar to the Buy All / Sell All calculation, the Buy Rates in those programs were designed to account for the unique program structure in which customers voluntarily elected to forgo their right to use electricity that they produced on their own property.

Q. Please describe the calculation of volumetric billing determinants for Dual-channel Billing.

A. This methodology, also called instantaneous billing, is the method proposed by the Company for use in determining bills under Rider EDG. In the Dual-channel Billing methodology, the Company separately measures all inflow and all outflow from the customer site at a single meter instead of measuring the difference between inflows and outflows over a period of time. At any given moment in time, power flow may be inflow or outflow and it registers as such in the appropriate channel register. Thus, during the course of any given hour, especially during the shoulder hours of a day (morning and evening), there may be both inflow and outflow. Instead of registering the difference between inflows and outflows during that hour, the Dual-channel Billing method registers all inflows and outflows separately and uses each of those values as separate billing determinants using one rate to charge for inflow and another rate to credit for outflow.

Page 2 of Attachment WDK-2 illustrates the calculation of the volumetric billing determinants under Dual-channel Billing for the same customer on the same day for the customer used in the net metering example above. Arithmetically, this calculation can either be conducted by going across rows to calculate delivered cost and received credit per billing sub-period (in this case hourly) or by separately summing all inflow and outflow kWh at the end of the billing period and multiplying by the inflow and outflow rates respectively to arrive at inflow cost and outflow credit for the billing period. In the example used here, the customer would be charged $7.34 for their inflow during the course of the day and would be credited $1.03 for their outflow. Thus, their net for the day would be a $6.30 charge.

Q. Please describe the calculation of volumetric billing determinants for Hourly Net Billing.

A. In the Hourly Net Billing methodology, the volumetric billing determinants are calculated on an hourly basis as the net difference between inflow and outflow during that particular hour. Each hour may have either inflow or outflow at any particular moment, but the net difference between them for any given hour can only be either net inflow or net outflow. So, in the example on Page 3 of Attachment WDK-2, Columns D and E are conditional values. If the Inflow (Column B) is greater than the Outflow (Column C), then the difference between Inflow and Outflow becomes the Hourly Net Inflow (Column D). Otherwise, the value in the Hourly Net Inflow column is zero. If the Inflow is less than the Outflow, then the difference between them is recorded as a positive value in the Hourly Net Outflow column (Column E). Otherwise, the Hourly Net Outflow is zero.

At the end of the billing period, the Inflow Cost is the product of the sum of Hourly Net Inflow (Column D, Row 26 of Page 3 of Attachment WDK-2) times the Inflow Rate. In this example, the Inflow Cost for the day is $5.29. The Outflow Credit is the product of the sum of all Hourly Net Outflow (Column E, Row 26, of Page 3 of Exhibit 1) times the Outflow rate. In this example, the Outflow Credit for the day is $0.98. The net cost for this customer on this day using the Hourly Net Billing method would thus be a $4.30 charge.

Q. Please describe the calculation of volumetric billing determinants for Monthly Net Billing.

A. Monthly Net Billing is the same as Net Energy Metering except that net outflows over the course of the month are given a monetary credit at the Outflow Rate instead of a kilowatt hour credit that carries forward from month-to-month. Monetary credits are then applied to the remainder of that month's bill or carried forward to the next billing period. Because the example in Attachment WDK-2 was simplified to show only a single day, I have not illustrated Monthly Net Billing here, but the calculation is functionally the same as the calculation done for the Hourly Net Billing example, but over the course of a month instead of the day as in that example.

Q. What do you conclude from your comparison of different billing methodologies?

A. The comparison of bill calculation methodologies above and in Attachment WDK-2 illustrates the very different outcomes that can result from the application of different billing methodologies using the exact same set of underlying raw meter data. In light of the alternative methodologies available, it becomes incumbent on the Company to propose one that will:

- Be consistent with the underlying statute;
- Produce a just and reasonable outcome for its customers;
- Be consistent with the principles of sound rate design; and
- Align with the measurements of cost causation in the setting of rates for all customers (as discussed fully by JI Witness Douglas Jester).

In the remainder of my testimony, I will examine the impacts of the various options on prospective customers to help the Commission understand whether the alternatives result in a just and reasonable outcome and align with sound rate design principles.

3. *Customer Impacts of Alternative Billing Methods*

Q. Did the Company perform an analysis of the impacts of these different methodologies for calculating volumetric billing determinants used to implement its proposed Rider EDG?

A. In his testimony, Mr. Swiz provides illustrative examples of the impact of the proposed Rider EDG compared to Net Energy Metering and the Buy All / Sell All billing methodologies. The Company also provided workpapers that Mr. Swiz used to develop these illustrative comparisons shown in his testimony as Tables JCS-3 and JCS-4. However, the Company did not conduct an analysis of the customer impacts of the alternatives discussed above that calculate customer bills using the difference between inflows and outflows during the course of the relevant netting or billing period (i.e. Hourly Net Billing and Monthly Net Billing).

Q. Does the customer impact analysis offered by Mr. Swiz in his testimony provide a complete picture of the impact of Rider EDG on prospective distributed generation customers?

A. No. There are several shortcomings in the analysis offered by the Company which illustrate problems with the transparency and fairness of the proposed methodology.

To begin with, the modeling tools simply do not exist to simulate Vectren's proposal to simultaneously measure inflow and outflow from a customer's site on a basis that is more granular than one hour. Standard software tools available for licensing by distributed generation developers and installers can provide hourly production estimates, not sub-hourly or "instantaneous" estimates. Likewise, with the exception of very large customers, site load interval data is only available to customers on an hourly basis, rarely is it sub-hourly.

The Company's analysis contains several problems that complicate modeling of projected economic performance for prospective solar customers. For example, Vectren's analysis of the Buy All / Sell All billing methodology may or may not be representative given that Vectren witness Mr. Swiz used a DG production estimate "based on the sized capacity for the customer and the anticipated capacity factor for this area and investment."[6] Because the Company does not have generation data for its net metering customers, Mr. Swiz's estimates of generation data applicable to the Buy Rate in Table JCS-3 are based on hypothetical estimates that may or may not be realistic for the hypothetical customer being illustrated.

While the Company does not propose to use the Buy All / Sell All methodology and, I understand from counsel that it would be inconsistent with PURPA even if proposed, the shortcomings of this analysis illustrate the problem with making comparisons between methodologies without accurate data from actual customers. Also, because Vectren only has access to site load after being offset by on-site generation, we do not know the actual site load that is being offset by the customer's generation. Therefore, I cannot determine what the customer's bill would have been in the absence of the solar array – the "no solar" scenario – to any of the proposed methodologies.

However, it is possible to do an analysis of the difference between Retail Net Metering, Hourly Net Billing, Monthly Net Billing and the Company's proposed Dual-

[6] Footnote 4 to Petitioner's Exhibit No. 2 (Swiz Direct), page 15.

channel Billing methodologies using the data that Vectren provided. That analysis is provided in Part 4 of this Section of my testimony (4. Impact of Dual-channel Billing Compared to Hourly Net Billing and Monthly Net Billing).

Q. What other problems does the Company's proposed billing methodology present for customers?

A. Over the long run (life of a system), distributed generation production estimates have proven to be accurate enough for installers and developers to provide reliable projections of economic value for their customers. But because of the variability introduced with shorter and shorter netting periods, that becomes increasingly difficult. Economic value estimates based on hourly production estimates include some uncertainly already, but when that granularity goes to the sub-hourly level, the uncertainty increases significantly.

The analysis in the next section will illustrate the impact that shorter netting periods have on the billing results using the current inflow rates for residential customers and an updated estimate of the Marginal Price of Electricity for the outflow rate. While it is typically possible to predict over the course of a month how much energy a particular appliance might use, it is not technically feasible for customers to predict on a sub-hourly basis how their energy use aligns with moment to moment energy generation patterns. Accommodating these very small variations in use and generation are normal in the operation of the grid, but billing at a netting interval that is beyond the customers' ability to manage eliminates the customer's ability to respond to price signals and conflicts with principles of good rate design. Vectren's proposal to calculate bills on an "instantaneous" basis is based on an unreasonable expectation of the customer's ability to manage their load on a moment by moment basis.

Vectren's proposal also creates a barrier to accurately estimating the economic value of a projected distributed generation system. Even at the hourly level, production estimates can vary significantly from actual results. The additional economic uncertainty introduced by Vectren's proposal is bad for consumers and bad for the market. This will be further discussed below in Subsection III.E of this testimony.

4. <u>Impact of Dual-channel Billing Compared to Hourly Net Billing and Monthly Net Billing</u>

Q. Did you conduct an analysis of the economic impact of Dual-channel Billing Compared to Hourly Net Billing, and Monthly Net Billing?

A. Yes. I conducted an analysis of the impact that four of the five billing methods above would have on customers. As mentioned in the description, I do not have the data available to compare either the "No Solar" or "Buy All / Sell All" cases. However, given the customer net metering data that was provided by the Company in response to Joint Intervenors Data Request No. 1.4(g), I was able to estimate the impact that the different billing methodologies would have had on existing customers had they been used to calculate the volumetric portion of their bill.[7]

The data set provided in response to Joint Intervenors' Data Request 1.4(g) included the hourly inflow and outflow data for all net metering customers for 2018 and 2019. The Company also provided data for those customers through June 2020. The data set begins with 81 distinct meters (customers) in April 2018 and grows as the number of DG customers increases to 636 customers by the end of the analysis period at the end of June 2020.

[7] My aggregation of this data from 50+ spreadsheets is shown in my workpaper submission.

In order to conduct the analysis, I filtered the data set that was provided to include only residential customers (i.e. using the SE01 and SE03 rate codes) and also only customers that had data for 95% of the hours during the year starting July 1, 2019, and ending June 30, 2020. That resulted in a fairly robust sample of 402 customers. I assumed an Inflow Charge equal to $0.1434/kWh[8] and an Outflow Credit of $0.02668/kWh.[9] I then calculated the billing determinants for the full set of customers using each of the four billing methods and divided the results by the number of customers to arrive at monthly average values for each month in the analysis and each billing method. These results are presented in my Workpaper 2 – CONFIDENTIAL and summarized below in Table 1: Comparison of Billing Methodologies for Average Existing Residential Distributed Generation Customer.

[8] Rate RS – Residential Service, Standard Customers and including used in the National Renewable Energy Laboratory ("NREL") System Advisor Model ("SAM") analysis conducted below and downloaded from Open EI. Includes currently applicable riders. Available at: http://en.openei.org/apps/IURDB/rate/view/5d1cb8d05457a3bf05a745b5.

[9] 2020 EDG updated estimate provided in Vectren Response to OUCC Data Request No. 1.2, Attachment OUCC DR 1.2 (included as Attachment WDK-3).

Table 1: Comparison of Customer Bills Under Different Billing Methodologies for Average Existing Residential Distributed Generation Customer

Month Start	Net Metering	Monthly Net Billing	Hourly Net Billing	Dual-channel Billing
July 1, 2019	$64.14	$64.14	$122.92	$148.10
August 1, 2019	$70.84	$70.84	$128.91	$150.38
September 1, 2019	$58.96	$58.96	$121.89	$142.33
October 1, 2019	$26.82	$26.82	$91.93	$102.44
November 1, 2019	$99.71	$99.71	$138.14	$148.98
December 1, 2019	$136.49	$136.49	$161.87	$171.70
January 1, 2020	$145.46	$145.46	$167.46	$176.49
February 1, 2020	$102.22	$102.22	$142.36	$152.22
March 1, 2020	$44.78	$44.78	$101.64	$113.14
April 1, 2020	-$18.82	-$3.50	$70.33	$82.54
May 1, 2020	$4.11	$4.11	$81.85	$97.35
June 1, 2020	$42.03	$42.03	$110.11	$131.19
Total	**$776.74**	**$792.06**	**$1,439.40**	**$1,616.86**

Q. What are the findings of your analysis?

A. As expected, the granularity of the netting period has a significant impact on the average customer's expected savings from their distributed generation system. Over the course of a year, an average full net metering customer in this dataset would pay $776.74 for the volumetric portion of their electricity bill. Using the same raw meter data, the average DG customer would pay $1,616.86 for the volumetric portion of their bill using the Company's proposed billing methodology -- more than double the cost that would be charged under net metering.

5. *Impact of Transition from Net Metering on Customer Paybacks*

Q. Have you estimated the impact that these alternative billing methodologies would have on prospective DG customer payback periods for their DG investments?

A. Yes. In order to illustrate the impact of the Company's proposed methodology and other methodologies on DG customer paybacks in the long run, I simulated an analysis of a hypothetical customer in Evansville, Indiana, using publicly available data and tools.

Again, because the tools to simulate continuous DG production and site load data are not readily available, the estimates are based on comparing No Solar, Hourly Net Billing, Monthly Net Billing and Full Retail Net Metering. It is not possible to provide an estimate of the Company's proposed Dual-channel (instantaneous measurement) method, but given the analysis provided in the previous section, I would estimate that the annual bill for an average customer under the Dual-channel Billing methodology would be approximately 12% more than the average customer would pay under the Hourly Net Billing methodology.[10]

This bill impact analysis combines a typical customer load profile for a base-use electricity customer in the Company's service territory with a rooftop solar installation sized to meet nearly all the customer's annual load. For the solar production data, I modeled a 9 kW system located in Evansville, Indiana, using default settings normal for an optimally situated residential array using NREL's System Advisor Model ("SAM").[11]

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[10] Based on the difference between the annual cost for energy between Hourly Net Billing and Dual-channel Billing shown in Table 1: Comparison of Billing Methodologies for Average Existing Residential Distributed Generation Customer, above.

[11] The National Renewable Energy Laboratory's *System Advisory Model* is available at: https://sam.nrel.gov.

Using those default settings, SAM calculated the array would generate 12,476 kWh in the first year.

I then selected a typical customer load profile using a data set available from the Department of Energy ("DOE") within the SAM software. The DOE dataset *Commercial and Residential Hourly Load Profiles for all TMY3 Locations in the United States* includes representative energy use profiles for residential customers throughout the United States.[12] The "base" residential load profile for this location is a customer that uses 12,813 kWh per year.

Finally, to compare apples to apples in the analysis, I modeled the current electricity rates, the updated Rider EDG Outflow rate used in the previous analysis, and the 2020 Investment Tax Credit rate for residential customers of 26% to compare the total bills and simple payback between net metering and the Company's proposed Rider EDG to further illustrate the adverse impact of the Company's proposal.

SAM can model five different methods for compensating system owners for electricity generated by their system. For this analysis, I used the "net energy metering," "net billing with carryover to next month," and "net energy metering with $ credits" to approximate the difference between the Company's current net metering tariff, Hourly Net Billing and Monthly Net Billing, respectively.

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[12] SAM software retrieves data on residential and C&I buildings from two different Department of Energy databases via the *Commercial and Residential Hourly Load Profiles for all TMY3 Locations in the United States* via the NREL Open EI database. For this analysis, I used the following settings: Sector type: RESIDENTIAL LOAD DATA. Building type: BASE TMY3 file: USA_IN_Evansville.Rgnl.AP.724320_TMY3 The database is accessible at https://openei.org/doe-opendata/dataset/commercial-and-residential-hourly-load-profiles-for-all-tmy3-locations-in-the-united-states

Q. What were the results of your analysis?

A. A comparison of the financial outlook of the customers in each example is shown in Table 2:

	No Solar	Net Metering	Monthly Net Billing	Hourly Net Billing	EDG Estimate
Annual Electricity Bill (Year 1)	$1,993	$273	$342	$1,081	$1,211
Net Present Value		$2,118	$1,039	($8,840)	($9,901)
Simple Payback		10.7 years	11.3 years	22.5 years	25.2 years

The EDG estimate column is shaded because, as noted above, there is simply no good way to model the Dual-channel Billing method. For purposes of this analysis, I used the 12% difference between the Hourly Net Billing method and the Dual-channel Billing method from Table 1: Comparison of Billing Methodologies for Average Existing Residential Distributed Generation Customer, to extrapolate results presented in this Table 2. While it is an imperfect analysis, it vividly illustrates not only the adverse impact of the Dual-channel Billing method but also the unacceptable level of uncertainty that it introduces for ratepayers in estimating the economic performance of prospective DG investments, and the significant adverse impact it has on expected financial performance of distributed generation.

This analysis shows that a typical customer sizing a solar array to meet their annual energy usage would pay nearly $1,000 per year more on their electricity bill using the Company's proposed EDG billing methodology than if that same customer were receiving service under net metering. Put another way, over the life of the system, simple payback of the customer's investment in this DG system would go from 10.7 years to 25.2 years based on the switch from net metering to the Company's Rider EDG proposal.

Q. Please summarize your concerns about the Company's proposed billing method for its proposed Rider EDG.

A. In my opinion, Vectren's proposed Dual-channel Billing method is not just and reasonable for several reasons. First, it would have a significant adverse impact on the economic value of distributed generation for Vectren's customers. Second, as will be discussed by JI Witness Douglas Jester, monthly netting more accurately reflects cost of service. Finally, Vectren's proposal reduces transparency and predictability, which will harm customers and the DG market in Vectren's service territory. As further discussed below in Section IV of my testimony, I recommend that the Company adopt the Monthly Net Billing approach for calculating excess distributed generation.

B. Interconnection and Access

Q. Do you have concerns about the site access and control requirements in the proposed Rider EDG?

A. Yes. Section 2 of the "Terms and Conditions of Service" specifies:

> 2. Customer shall agree that Company shall at all times have immediate access to Customer's metering, control and protective equipment.[13]

This provision is overly broad and is not justified for small inverter-based, UL 1741 certified systems. UL-1741 inverters already automatically disconnect from the grid in the event of loss of grid power. While practices vary across states, I am not aware of any

[13] Petitioner's Exhibit No. 2 (Swiz Direct), Attachment JCS-2, page 4.

that require immediate access at all times to the full range of metering, control and protective equipment, particularly for small systems using UL 1741 certified systems.

Recognizing the difference between large and small systems impacts, 170 IAC 4-4.1-7 does require that utilities must have immediate access for large systems connected to the grid under Rule 4.1 called "Cogeneration and Alternate Energy Production Facilities." However, the applicable rule for Customer-Generator Interconnection Standards (170 IAC 4-4.3) contains no such requirement or authorization. In addition, I understand from counsel that the outcome of the customer complaint filed in Cause 44344 against the Company was that small systems are not required to install a disconnect switch, consistent with practices of many other jurisdictions around the country. I recommend deletion of the provision in Section 2 of the proposed Terms and Conditions requiring the Company be granted immediate access to a customer's "metering, control and protective equipment" (an even broader set of customer equipment than the disconnect switch at issue in Cause 44344) because it is overly broad and superfluous.

Notably, the Interstate Renewable Energy Council ("IREC") published updated Model Interconnection Procedures in 2019.[14] The Model Procedures were intended to provide guidance to states on best practices for safe and efficient interconnection procedures. The Model Procedures include language to ensure reasonable utility access to DG customer premises:

[14] Interstate Renewable Energy Council, Inc., *Model Interconnection Procedures (2019)*, available at https://irecusa.org/publications/irec-model-interconnection-procedures-2019.

> 2.6 Right of Access. At reasonable hours, and upon reasonable notice, or at any time without notice in the event of an emergency or hazardous condition, the Utility shall have reasonable access to the Interconnection Customer's premises for any reasonable purpose in connection with the performance of the obligations imposed on the Utility under this Agreement, or as is necessary to meet a legal obligation to provide service to customers.[15]

I recommend that the Commission require the Company to replace Section 2 of the proposed "Terms and Conditions of Service" with language similar to that recommended by the IREC Model Procedures described above.

Q. Do you have concerns with the requirements for disconnecting devices?

A. Yes, similar to my concerns outlined above. Section 5 of Vectren's proposed "Terms and Conditions" provides:

> 5. A disconnecting device must be located at the point of common coupling for all Level 3 interconnections and applicable Level 2 interconnections as determined by Company. For three-phase interconnections, the disconnecting device must be gang operated. The disconnecting device must be accessible to Company personnel at all times and be suitable for use by Company as a protective tagging location. The disconnecting device shall have a visible open gap when in the open position and be capable of being locked in the open position. The cost and ownership of the main disconnect switch shall reside with Customer.[16]

Certain requirements in Vectren's proposed provision are unnecessary and inconsistent with best practices in interconnection standards. Subsection IV.F.5 of the Model Procedures specify:

> A Utility shall not require an Applicant to install additional controls (other than a utility accessible disconnect switch for non-inverter-based Generating Facilities[27]), or to perform or pay for additional tests not identified herein to obtain approval to interconnect.[17]

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[15] *Ibid.* IREC. Attachment 5 / Level 2, Level 3, and Level 4 Interconnection Agreement - Page 3.
[16] Petitioner's Exhibit No. 2 (Swiz Direct), Attachment JCS-2, page 4.
[17] *Ibid*, IREC. Pg. 28.

The footnote (27) is also applicable to this issue. It reads:

> A number of states have allowed Utilities to require external disconnect switches but specified that the Utility must reimburse Applicants for the cost of the switch. Several states have specified that an external disconnect switch may not be required for smaller inverter-based Generating Facilities. Recognizing that non-inverter-based Generating Facilities might present a hazard, Utilities may require a switch for these Generating Facilities.[18]

While it is appropriate that the Company does not appear to require disconnect switches for Level 1 systems, that should be clarified in the proposed EDG tariff, particularly because UL-1741 inverters already automatically disconnect from the grid in the event of loss of grid power. In addition, to the extent that it does require disconnect switches for Levels 2 and 3 systems, the Company should adopt the Model Procedures' recommended approach of reimbursing customers for the cost of the switch.

C. Loss of EDG Credits

Q. Does the Company propose to allow the full amount of excess monetary EDG credits to be carried forward?

A. No. In his direct testimony, Mr. Swiz indicates, "Customers will receive the EDG Billing Credit up to the point where the total net bill reaches the Minimum Monthly Charge as defined in the customer's applicable Rate Schedule."[19] At that point, the EDG Billing Credit has a monetary value and is carried forward. Mr. Swiz further clarifies the treatment of EDG billing credits two questions later:

> …[A]as long as the customer continues service with the Company, any unused EDG Billing Credit will be held in a balance to be used in a subsequent period. If the customer discontinues service with the Company,

[18] *Ibid.*, IREC. Pg. 28.
[19] Petitioner's Ex. 2 (Swiz Direct), page 14.

> any remaining EDG Billing Credit balance will revert to the Company and such balance will be credited to the FAC.[20]

Q. Is the proposed carry forward method fair and consistent with statute?

A. I understand from counsel that IC § 8-1-40-18 says:

> Sec. 18. An electricity supplier shall compensate a customer from whom the electricity supplier procures excess distributed generation (at the rate approved by the commission under section 17 of this chapter) through a credit on the customer's monthly bill. Any excess credit shall be carried forward and applied against future charges to the customer for as long as the customer receives retail electric service from the electricity supplier at the premises.

The Company's proposed practice to confiscate any remaining credits when the customer discontinues service would deprive departing customers of earned EDG credits without any clear justification. I recommend that earned EDG credits should be refundable to customers upon termination of service.

D. Three Phase Meter Requirement

Q. Do you have concerns about the requirement that the customers receiving three-phase service bear the cost of installing a meter to meet the requirements of Rider EDG?

A. It is my understanding that Advanced Metering Infrastructure ("AMI") adoption has been nearly completed in Vectren's service territory. As I understand it, this means that appropriate advanced meters have been installed for virtually all of the Company's customers. As such, there is no reason of which I am aware of that additional metering would be required. This is a superfluous and costly requirement. I recommend that this language be deleted.

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[20] *Id.*

E. Financial Performance Estimate Problems

Q. What is your understanding of the requirements in Indiana statute related to requirements for installers to provide estimates of the financial performance of systems they propose?

A. I have been advised by counsel that Ind. Code § 8-1-40-23 sets out certain rights of prospective DG customers. In particular, Section 23 establishes:

> The right to know the rate at which the customer will be credited for electricity produced by the customer's distributed generation equipment and delivered to a public utility (as defined in IC 8-1-2-1).[21]

I support this provision and support the inclusion of vigorous consumer protections in the sale of distributed generation. However, given the uncertainty introduced by the Rider EDG as proposed by the Company and illustrated above, there will be considerable additional uncertainly in the estimates that installers must provide. It is unfair to establish a billing system that measures energy use at a level that is more granular than the tools available for modeling the systems' expected performance. Vectren's proposed billing methodology will make it more difficult for customers trying to understand their options and installers seeking to provide good faith estimates of systems they are proposing. This is yet another reason that the Company should adopt a more predictable, transparent and fair method for compensating DG owners.

[21] Ind. Code § 8-1-40-23 (2017).

IV. CUSTOMER IMPACT

A. Inconsistency with Principles of Rate Design

Q. What are the foundational principles of sound rate design?

A. Rate simplicity and stability are two of the founding principles of electricity regulation that enable customers to make informed long-term investments that spur economic growth. In his seminal work that defined best practices in regulation, *Principles of Public Utility Rate Design*, Professor James Bonbright enumerated a number of principles of rate design.[22] While they are often categorized and summarized differently, he suggests that rates should:

- Reflect simplicity, understandability, public acceptability, and feasibility of application and interpretation;
- Be effective at yielding total revenue requirements;
- Provide revenue and cash flow stability on a year over year basis;
- Be stable and prevent "rate shock";
- Fairly apportion cost of service among different customers;
- Avoid "undue discrimination"; and
- Promote efficient use of energy and competing services and products.[23]

Taken together, these are acknowledged as the foundational principles for just and reasonable rate design.

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[22] James C. Bonbright, *Principles of Public Utility Rate*s, Columbia Univ. Press (1961).
[23] *Ibid.*, Bonbright. Pg. 291.

In further expounding on the meaning of "excessive complexity," Professor Bonbright speaks directly to the requirement that rates should provide stability and predictability.

> But even if, through the miracles of electronic computers and of modern techniques of mathematical analysis, all significant cost differentials could be measured without inordinate expense, they would then be found far too numerous, too complex, and too volatile to be embodied in rate differentials. Stability and predictability of the charges for public utility services are desirable attributes; and up to a certain point -- or rather, up to an indeterminate point -- they are worth attaining even at the sacrifice of nice attempts to bring rates into accord with current production costs. Indeed, unless rate-making policies are sufficiently stable to permit a consumer to predict with some confidence what his charges will be *if he decides* to equip his home or his factory to take the contemplated service and then to buy the service, a cost-price system of rate -making will be self-defeating when viewed as a means of securing a rational control of demand.[24]

Q. Why are the principles of sound rate design applicable in this case?

A. While the Commission is obliged to follow the statutory requirements related to the implementation of an excess distributed generation rate, I understand from counsel that the Commission is also obliged to establish just and reasonable rates. The Company and the Commission have an obligation when implementing the DG Statute to apply sound rate design principles to the extent possible.

Q. Is the proposed Rider EDG consistent with the principles of just and reasonable rate design?

A. No. Vectren's proposed Rider EDG lacks transparency in both the data that is used as inputs to the calculation and the process that is used to generate that data. While I cannot speak to the relative legal weight that these principles should take in the Commission's consideration of whether the Dual-channel Billing method proposed in Rider EDG is just

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[24] *Ibid.*, Bonbright. Pg. 297.

and reasonable, I find that the Dual-channel Billing method violates the principles of sound rate design upon which the just and reasonable finding should be based.

As has been demonstrated in the discussion of billing calculation methodologies, the Monthly Net Billing methodology provides the greatest stability and predictability for customers and as such adheres more closely to the principles of sound rate design.

Q. Aside from the uncertainty and unpredictability of the modeling of Dual-channel Billing, is using a locational marginal price ("LMP") based compensation rate consistent with Bonbright's principles?

A. No. LMP is unsuitable as a consumer rate mechanism for a number of reasons. Fundamentally, LMP is a wholesale market rate. Wholesale energy markets are notoriously volatile and unpredictable. One of the key benefits of regulated electricity markets is protecting consumers from the volatility and unpredictability in wholesale markets. In fact, the testimony of Company Witness Joiner enumerates many of the uncertainties associated with LMP in addressing the factors that could drive changes to Average LMP on an annual basis:

> The LMP represents a market rate that is driven by multiple factors. Pricing of fuel for generation, specifically natural gas prices over recent periods, and peak loads, which drive usage and overall demand, are two prominent factors that will drive LMP changes year-over-year. In addition, congestion on the system impacts the LMP, and in recent periods network upgrades, outage timing, and market-to-market coordination efforts have helped to mitigate congestion concerns on the system.[25]

Thus, without making any recommendation on the legal basis for the proposed rate, I conclude that, from a rate design perspective, the LMP based compensation rate is

[25] Petitioner's Ex. 1 (Joiner Direct), page 5.

inconsistent with the principles of sound rate design because it violates the principles of stability and predictability discussed above.

V. FULL AND FAIR VALUATION OF DISTRIBUTED GENERATION RESOURCES

Q. What utility costs does the DG Statute address?

A. Ind. Code § 8-1-40-15 requires electricity suppliers to procure excess distributed generation produced by customer-generators at a rate specified in Ind. Code § 8-1-40-17. The rate established in Ind. Code § 8-1-40-17 is set at the "average marginal price of electricity" paid by the electricity supplier during the most recent calendar year; multiplied by one and twenty-five hundredths (1.25). Lastly, the "marginal price of electricity" is defined as "the hourly market price for electricity as determined by a regional transmission organization of which the electricity supplier serving a customer is a member."[26]

Company Witness Joiner explains the application of these provisions to the Company's calculation of proposed EDG rate:

> The marginal price of electricity paid by Vectren South for the most recent calendar year was determined by averaging the 2019 hourly Locational Marginal Price (LMP) at Vectren South's SIGE.SIGW load node. This node was most appropriate to use because this is the node at which Vectren South is charged for energy. For 2019, the average LMP at the SIGE.SIGW load node was $25.47 per megawatt-hour (MWh).[27]

As described by Witness Joiner, the Company has interpreted the statute to address the "energy" costs of electricity.

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[26] Ind. Code § 8-1-40-6.
[27] Petitioner's Ex. 1 (Joiner Direct), page 4.

Q. Does the calculation of marginal cost of electricity described in the statute include other components of the delivered electricity prices?

A. No. The marginal cost of electricity would only compensate customers for the energy value of the outflow provided to the utility.

Q. Are energy costs the only component of electricity costs?

A. No. As discussed below, delivered electricity includes a number of other components, all of which are part of the full stack of value that the Company provides in its role as a service provider.

Q. Does the DG Statute prohibit electricity suppliers from providing compensation for additional values beyond the value of the energy produced?

A. That is a legal question and I am not a lawyer, but I understand from counsel that the statute only describes the energy value of the outflow from the customer's distributed generation, it does not proscribe fair compensation for other components of the energy value stack.

Q. Has the Company conducted a study of the cost to serve distributed generation customers?

A. Not to my knowledge.

Q. Why is analyzing the cost to serve distributed generation customers relevant in this proceeding?

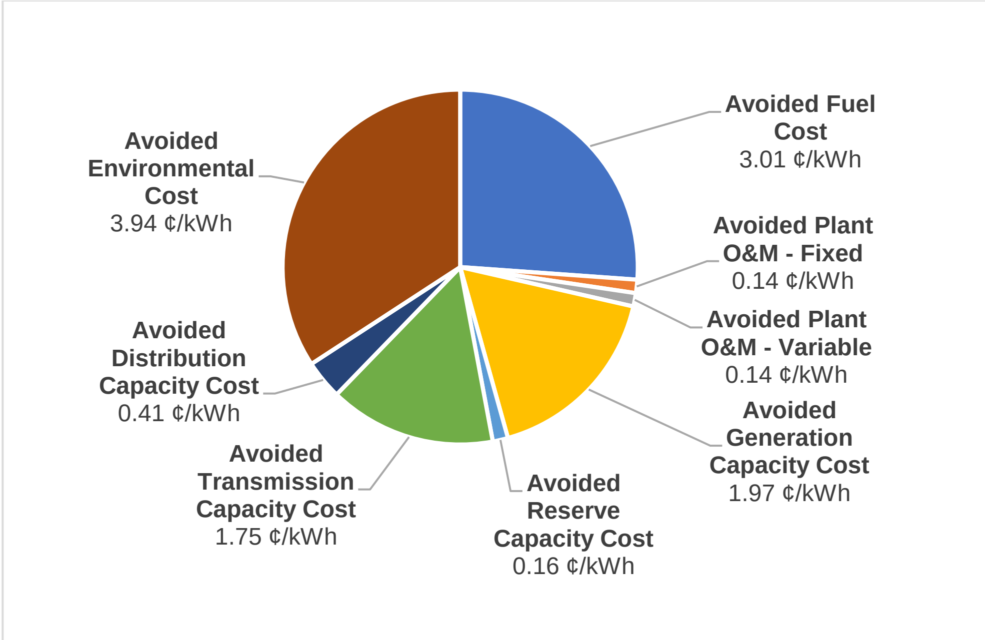
A. I concur with the findings of JI Witness Douglas Jester that the Commission should consider the lower cost to serve customer-generators not only in determining the appropriate outflow rate in this proceeding, but also potentially to determine a different (lower) inflow rate for distributed generation customers.

I also recommend that the Commission initiate a process to calculate the value of distributed energy resources to the grid. A comprehensive investigation into the value of distributed generation would provide a sound basis to accurately reflect the full range of values that distributed generation provides. To do otherwise would be fundamentally unfair to the providers of those benefits.

Q. How have other states in the Midwest sought to calculate the value of distributed generation?

A. The State of Minnesota has been engaged in a multi-year, rigorous process to set a full and fair annual Value of Solar in the Xcel Energy service territory. The Minnesota Public Service Commission opened Docket No. E002/M-13-867 which calculates annual values for the Value of Solar in 2013. The process produces a robust value for solar generation that balances the inputs of the utility, ratepayers, and stakeholders. It provides a useful illustration of a process for setting a just and reasonable compensation rate as well an outcome that includes all of the cost components that should be considered to fully and fairly value distributed generation.[28]

[28] The 2020 Value of Solar values for each component were approved the Minnesota Public Service Commission's March 4, 2020 *Order Approving Xcel's Update to the 2020 Value of Solar Rate*, in Docket No. E-002/M-13-867.



There are other methodologies currently in development in New York and California. In addition, here in the Midwest, Illinois is actively working to determine value for the delivery portion of customers' bills to replace the value of net metering when the State's utilities reach a 5% DG penetration level.

Q. Are there other proceedings in which the Company is a party that shed light on the avoided costs of electricity?

A. Yes. In its recently filed Integrated Resource Plan ("IRP") at Section 11.3.5, the Company provided Avoided Costs that could inform the Commission's understanding of the value of avoided costs. Figure 11.34 in the IRP shows avoided costs used in modeling the Company's long-term resource plan. The values in that table from the IRP were provided by the Company in response to a discovery request in this proceeding by Solarize Indiana.[29] Table 3 below recreates those values:

[29] Vectren Response and Attachment "SI 1.17_2020 Avoided Costs.xlsx" to Solarize Indiana Data Request 1.17 (included as Attachment WDK-4).

Avoided Costs in Nominal $

Year	Avoided Capital/ O&M Cost $/kW	Avoided Fixed O&M $/kW	Transmission & Distribution Avoided Capital Cost $/kW	Total Capacity Avoided Cost $/kW	Natural Gas Forecast $/MMBtu	System Marginal Cost $/MWh
2020	$148.60	$161.85	$6.36	**$154.96**	$2.98	$28.63
2021	$151.87	$168.97	$6.43	**$158.30**	$3.16	$30.06
2022	$155.21	$176.47	$6.55	**$161.76**	$3.37	$34.99
2023	$158.63	$184.36	$6.73	**$165.35**	$3.63	$35.77
2024	$162.12	$192.37	$6.71	**$168.82**	$3.83	$36.81
2025	$165.68	$200.90	$6.83	**$172.51**	$4.00	$38.82
2026	$169.33	$209.84	$6.99	**$176.31**	$4.19	$39.80
2027	$173.05	$219.18	$7.15	**$180.20**	$4.35	$44.04
2028	$176.86	$228.95	$7.32	**$184.18**	$4.52	$46.36
2029	$180.75	$239.16	$7.50	**$188.25**	$4.68	$48.37
2030	$184.73	$249.76	$7.63	**$192.36**	$4.87	$50.18
2031	$188.79	$260.88	$7.81	**$196.60**	$5.06	$51.76
2032	$192.94	$272.49	$7.98	**$200.93**	$5.27	$52.59
2033	$197.19	$284.61	$8.16	**$205.35**	$5.51	$54.94
2034	$201.53	$297.27	$8.34	**$209.87**	$5.73	$56.60
2035	$205.96	$310.49	$8.52	**$214.48**	$6.02	$59.93
2036	$210.49	$324.31	$8.71	**$219.20**	$6.23	$61.52
2037	$215.12	$338.73	$8.90	**$224.02**	$6.48	$64.69
2038	$219.86	$353.80	$9.10	**$228.95**	$6.70	$69.00
2039	$224.69	$369.54	$9.30	**$233.99**	$6.90	$72.04

Q. Is this information useful for understanding the value of distributed energy resources on the Company's system?

A. Yes. These values reflect the Company's best understanding of the full value of avoided costs. The energy value in the proposed Rider EDG calculation is roughly comparable to the "System Marginal Cost $/MWh" in the last column. Importantly, the "Total Capacity Avoided Cost $/kW" could provide a starting point for understanding the value of distributed resources in the Company's system.

Assuming that the Company's calculation of avoided generation, transmission and distribution system, and capacity costs are accurate, the $154.96/kW for avoided capacity costs would seem a reasonable starting point for valuing the non-energy components of the value of distributed energy resources in Vectren's service territory.

Q. Do you believe that the Avoided Costs laid out in the Company's 2020 Integrated Resource Plan provide the basis for considering supplemental compensation for distributed generation customers?

A. Yes. As has been demonstrated in my testimony and in the testimony of JI Witness Douglas Jester, there is ample evidence that proposed Rider EDG would not only have an adverse impact on customers and businesses in the Company's service territory, but also systematically undervalues distributed generation. To implement that rate in the absence of additional measures that fully and fairly value the outflow from distributed generation customers' systems cannot be considered just and reasonable.

First, the Commission should – at a minimum – in implementing Rider EDG require the Company to use the Monthly Net Billing method for calculating excess distributed generation.

Second, I recommend that the Commission initiate a value of distributed generation investigation to fully and fairly value distributed generation exported by DG owners in Vectren's service territory. Such an investigation could inform future policy and regulatory decisions based on objective and robust study of the value of DG and could provide the basis for a just and reasonable tariff that protects program participants and non-participants alike.

VI. CONCLUSION AND SUMMARY

Q. Please summarize your conclusions.

A. In my professional opinion, the tariff proposed by the Company in this case is not just and reasonable in that it does not provide a sufficiently transparent and predictable framework for ratepayers to understand the rates available to them, and it does not fully and fairly compensate customers for the value they provide to the grid with exported distributed generation.

I have made several recommendations in this testimony summarized as:

- I recommend that the Commission require the Company to adopt the Monthly Net Billing approach for calculating excess distributed generation.
- I recommend several changes to the interconnection terms and conditions in the proposed Rider EDG.
- I recommend that earned EDG credits be refundable to customers upon termination of service and that no minimum bill be established.
- I recommend deletion of the requirement that customers be required to pay for three phase meters.
- Finally, I recommend that the Commission initiate a value of distributed generation investigation to fully and fairly value distributed generation exported by DG owners in Vectren's service territory.

Q. Does this conclude your testimony?

A. Yes.

VERIFICATION

I, William D. Kenworthy, affirm under penalties of perjury that the foregoing representations are true and correct to the best of my knowledge, information and belief.

______________________________ August 20, 2020________________

William D. Kenworthy

ATTACHMENT WDK-1

Testimony and Comments of William D. Kenworthy

Regulatory Director, Midwest
Vote Solar
July 29, 2020

Testimony

Rebuttal Testimony of William D. Kenworthy on behalf of the Environmental Law and Policy Center, the Ecology Center, the Solar Energy Industries Association, and Vote Solar, *In the matter of the application of CONSUMERS ENERGY COMPANY for approval of Voluntary Green Pricing programs pursuant to Section 61 of 2016 PA 342*, Michigan Public Service Commission, Case No. U-20649, June 25, 2020.

Direct Testimony of William D. Kenworthy on behalf of the Environmental Law and Policy Center, the Ecology Center, the Great Lakes Renewable Energy Association, the Solar Energy Industries Association, and Vote Solar. *In the matter of the application of CONSUMERS ENERGY COMPANY for authority to increase its rates for the generation and distribution of electricity and for other relief*, Michigan Public Service Commission, Case No. U-20697, June 24, 2020.

Direct Testimony of William D. Kenworthy on behalf of the Environmental Law and Policy Center, the Ecology Center, the Solar Energy Industries Association, and Vote Solar, *In the matter of the application of CONSUMERS ENERGY COMPANY for approval of Voluntary Green Pricing programs pursuant to Section 61 of 2016 PA 342*, Michigan Public Service Commission, Case No. U-20649, May 28, 2020.

Rebuttal Testimony of William D. Kenworthy on behalf of the Environmental Law & Policy Center and Vote Solar, *In the matter of Proposed Revisions to Rider Parallel Operation of Retail Customer Generating Facilities Community Supply*, Illinois Commerce Commission, Docket No. 19-1121, April 23, 2020.

Direct Testimony of William D. Kenworthy on behalf of the Environmental Law & Policy Center and Vote Solar, *In the matter of Proposed Revisions to Rider Parallel Operation of Retail Customer Generating Facilities Community Supply*, Illinois Commerce Commission, Docket No. 19-1121, February 21, 2020.

Direct Testimony of William D. Kenworthy on behalf of the Environmental Law and Policy Center, the Ecology Center, the Solar Energy Industries Association, and Vote Solar, *In the matter of the Application of DTE Electric Company for authority to increase its rates, amend its rate schedules and rules governing the distribution and supply of electric energy, and for miscellaneous accounting authority.* Michigan Public Service Commission, Case No. U-20561, November 6, 2019.

Direct Testimony of William D. Kenworthy on behalf of the Environmental Law and Policy Center, the Ecology Center, the Solar Energy Industries Association, and Vote Solar, *In the matter of the Application of Indiana Michigan Power Company for authority to increase its rates for the sale of electric energy and for approval of depreciation rates and other related matters,* Michigan Public Service Commission, Case No. U-20359, October 17, 2019.

Rebuttal Testimony of William D. Kenworthy on Behalf of the Environmental Law and Policy Center and Vote Solar*, In the Matter of the Joint Application of Wisconsin Power Company, Wisconsin Gas LLC, and Wisconsin Public Service Corporation to Adjust Electric, Natural Gas and Steam Rates,* Wisconsin Public Service Commission, Docket No. 5-UR-109, October 4, 2019.

Rebuttal Testimony of William D. Kenworthy on behalf of the Environmental Law and Policy Center and the Iowa Environmental Council*, In re: Interstate Power & Light Compan*y, Iowa Utilities Board, Docket No. RPU-2019-001, September 10, 2019.

Direct Testimony of William D. Kenworthy on Behalf of the Environmental Law and Policy Center and Vote Solar*, In the Matter of the Joint Application of Wisconsin Power Company, Wisconsin Gas LLC, and Wisconsin Public Service Corporation to Adjust Electric, Natural Gas and Steam Rates,* Wisconsin Public Service Commission, Docket No. 5-UR-109, August 23, 2019.

Rebuttal Testimony of Will Kenworthy on behalf of the Environmental Law and Policy Center, the Ecology Center, the Solar Energy Industries Association, and Vote Solar, *In the matter of Application of DTE ELECTRIC COMPANY for approval of its integrated resource plan pursuant to MCL 460.6t and for other relief*, Michigan Public Service Commission, Case No. U-20471, August 21, 2019.

Direct Testimony of William D. Kenworthy on behalf of the Environmental Law and Policy Center and the Iowa Environmental Council, *In re: Interstate Power & Light Company*, Iowa Utilities Board, Docket No. RPU-2019-001, August 1, 2019.

Rebuttal Testimony of Will Kenworthy on behalf of the Environmental Law and Policy Center, the Ecology Center, the Solar Energy Industries Association, and Vote Solar, *In the matter of the Application of DTE Electric Company for authority to increase its rate schedules and rules governing the distribution and supply of electric energy, and for other relief,* Michigan Public Service Commission, Case No. U-20162, November 28, 2018.

Direct Testimony of Will Kenworthy on behalf of the Environmental Law and Policy Center, the Ecology Center, the Solar Energy Industries Association, and Vote Solar, *In the matter of the Application of DTE Electric Company for authority to increase its rate schedules and rules governing the distribution and supply of electric energy, and for other relief,* Michigan Public Service Commission, Case No. U-20162, November 7, 2018.

Comments

Comments of Vote Solar in the Matter of Updating Generic Standards for Utility Tariffs for Interconnection and Operation of Distributed Generation Facilities Established Under Minn. Stat. § 216B.1611, Minnesota Public Service Commission Docket No: E-999/CI-16-521, September 19, 2018.

Comments of Vote Solar, the Environmental Law and Policy Center, Natural Resources Defense Council, and Plugged In Strategies on the Michigan Distributed Planning Framework: MPSC Report. *In the matter, on the Commission's own motion, to open a docket for certain regulated electric utilities to file their five-year distribution investment and maintenance plans and for other related, uncontested matters.* Case No. U-20147, October 5, 2018.

Comments of Vote Solar, the Environmental Law and Policy Center, Natural Resources Defense Council, and Plugged In Strategies on the Indiana Michigan Power Company's draft *Michigan Five Year Distribution Plan for 2019-2023* per the Commission's November 21, 2018 Order in Case No. U-20147, December 21, 2018.

Comments of Vote Solar in the Matter of the Commission's Inquiry into Standby Service Tariffs, Minnesota Public Service Commission Docket No: E999/CI-15-115, February 19, 2019.

Comments of Vote Solar in the Matter of a Commission Investigation to Identify and Develop Performance Metrics, and Potentially, Incentives for Xcel Energy's Electric Utility Operations, , Minnesota Public Service Commission Docket No: E002/CI-17-401, May 6, 2019.

Reply Comments of Vote Solar in the Matter of a Commission Investigation to Identify and Develop Performance Metrics, and Potentially, Incentives for Xcel Energy's Electric Utility Operations, , Minnesota Public Service Commission Docket No: E002/CI-17-401, June 6, 2019.

Supplemental Comments of Vote Solar in the Matter of the Commission's Inquiry into Standby Service Tariffs, Minnesota Public Service Commission Docket No: E999/CI-15-115, September 23, 2019.

ATTACHMENT WDK-2

Applicable Rate Example	
Outflow Rate	$ 0.0267
Inflow Rate	$ 0.1434

NET ENERGY METERING

	A	B	C	D	E	F
1	**Date**	**KWH (DEL) - Inflow**	**KWH (REC) - Outlfow**		**Register reading beginnon of hour**	**Register Reading End of Hour**
2	4/4/19 12:00 AM	5.431	—		1000.000	1005.431
3	4/4/19 1:00 AM	2.802	—		1005.431	1008.233
4	4/4/19 2:00 AM	2.472	—		1008.233	1010.705
5	4/4/19 3:00 AM	3.844	—		1010.705	1014.549
6	4/4/19 4:00 AM	2.883	—		1014.549	1017.432
7	4/4/19 5:00 AM	2.945	—		1017.432	1020.377
8	4/4/19 6:00 AM	2.487	—		1020.377	1022.864
9	4/4/19 7:00 AM	2.598	—		1022.864	1025.462
10	4/4/19 8:00 AM	1.268	0.042		1025.462	1026.688
11	4/4/19 9:00 AM	1.192	1.538		1026.688	1026.342
12	4/4/19 10:00 AM	—	7.349		1026.342	1018.993
13	4/4/19 11:00 AM	0.001	7.956		1018.993	1011.038
14	4/4/19 12:00 PM	—	9.195		1011.038	1001.843
15	4/4/19 1:00 PM	—	6.904		1001.843	994.939
16	4/4/19 2:00 PM	—	4.241		994.939	990.698
17	4/4/19 3:00 PM	0.534	1.414		990.698	989.818
18	4/4/19 4:00 PM	1.459	0.018		989.818	991.259
19	4/4/19 5:00 PM	2.343	—		991.259	993.602
20	4/4/19 6:00 PM	2.762	—		993.602	996.364
21	4/4/19 7:00 PM	2.744	—		996.364	999.108
22	4/4/19 8:00 PM	2.873	—		999.108	1001.981
23	4/4/19 9:00 PM	3.391	—		1001.981	1005.372
24	4/4/19 10:00 PM	4.447	—		1005.372	1009.819
25	4/4/19 11:00 PM	2.682	—		1009.819	1012.501
26	**Sum**	**51.158**	**38.657**			

# of Billed kWH	12.501
Cost for the Day	**$ 1.79**

Applicable Rate Example	
Outflow Rate	$ 0.0267
Inflow Rate	$ 0.1434

DUAL CHANNEL BILLING (INSTANTANEOUS MEASUREMENT)

	A	B	C	D	E
1	Date	KWH (DEL) - Inflow	KWH (REC) - Outlfow	Delivered Cost	Received Credit
2	4/4/19 12:00 AM	5.431	—	$ 0.78	$ -
3	4/4/19 1:00 AM	2.802	—	$ 0.40	$ -
4	4/4/19 2:00 AM	2.472	—	$ 0.35	$ -
5	4/4/19 3:00 AM	3.844	—	$ 0.55	$ -
6	4/4/19 4:00 AM	2.883	—	$ 0.41	$ -
7	4/4/19 5:00 AM	2.945	—	$ 0.42	$ -
8	4/4/19 6:00 AM	2.487	—	$ 0.36	$ -
9	4/4/19 7:00 AM	2.598	—	$ 0.37	$ -
10	4/4/19 8:00 AM	1.268	0.042	$ 0.18	$ 0.00
11	4/4/19 9:00 AM	1.192	1.538	$ 0.17	$ 0.04
12	4/4/19 10:00 AM	—	7.349	$ -	$ 0.20
13	4/4/19 11:00 AM	0.001	7.956	$ 0.00	$ 0.21
14	4/4/19 12:00 PM	—	9.195	$ -	$ 0.25
15	4/4/19 1:00 PM	—	6.904	$ -	$ 0.18
16	4/4/19 2:00 PM	—	4.241	$ -	$ 0.11
17	4/4/19 3:00 PM	0.534	1.414	$ 0.08	$ 0.04
18	4/4/19 4:00 PM	1.459	0.018	$ 0.21	$ 0.00
19	4/4/19 5:00 PM	2.343	—	$ 0.34	$ -
20	4/4/19 6:00 PM	2.762	—	$ 0.40	$ -
21	4/4/19 7:00 PM	2.744	—	$ 0.39	$ -
22	4/4/19 8:00 PM	2.873	—	$ 0.41	$ -
23	4/4/19 9:00 PM	3.391	—	$ 0.49	$ -
24	4/4/19 10:00 PM	4.447	—	$ 0.64	$ -
25	4/4/19 11:00 PM	2.682	—	$ 0.38	$ -
26	**Sum**	**51.158**	**38.657**	**$ 7.34**	**$ 1.03**

	KWH	Cost
Inflow (Delivered)	51.158	$ 7.34
Outflow (Received)	38.657	$ 1.03
Cost for the Day		**$ 6.30**

Applicable Rate Example	
Outflow Rate	$ 0.0267
Inflow Rate	$ 0.1434

HOURLY NET BILLING

	A	B	C	D	E
1	**Date**	**KWH (DEL) - Inflow**	**KWH (REC) - Outlfow**	**Hourly Net Inflow KWh**	**Hourly Net Outflow**
2	4/4/19 12:00 AM	5.431	—	5.431	—
3	4/4/19 1:00 AM	2.802	—	2.802	—
4	4/4/19 2:00 AM	2.472	—	2.472	—
5	4/4/19 3:00 AM	3.844	—	3.844	—
6	4/4/19 4:00 AM	2.883	—	2.883	—
7	4/4/19 5:00 AM	2.945	—	2.945	—
8	4/4/19 6:00 AM	2.487	—	2.487	—
9	4/4/19 7:00 AM	2.598	—	2.598	—
10	4/4/19 8:00 AM	1.268	0.042	1.226	—
11	4/4/19 9:00 AM	1.192	1.538	—	0.346
12	4/4/19 10:00 AM	—	7.349	—	7.349
13	4/4/19 11:00 AM	0.001	7.956	—	7.955
14	4/4/19 12:00 PM	—	9.195	—	9.195
15	4/4/19 1:00 PM	—	6.904	—	6.904
16	4/4/19 2:00 PM	—	4.241	—	4.241
17	4/4/19 3:00 PM	0.534	1.414	—	0.880
18	4/4/19 4:00 PM	1.459	0.018	1.441	—
19	4/4/19 5:00 PM	2.343	—	2.343	—
20	4/4/19 6:00 PM	2.762	—	2.762	—
21	4/4/19 7:00 PM	2.744	—	2.744	—
22	4/4/19 8:00 PM	2.873	—	2.873	—
23	4/4/19 9:00 PM	3.391	—	3.391	—
24	4/4/19 10:00 PM	4.447	—	4.447	—
25	4/4/19 11:00 PM	2.682	—	2.682	—
26	**Sum**			**49.371**	**36.870**

	KWH	**Cost**
Inflow (Delivered) Cost		$ 5.29
Outflow (Received) Credit		$ 0.98
Cost for the Day		**$ 4.30**

ATTACHMENT WDK-3

Please see separately filed Excel document.

ATTACHMENT WDK-4

Please see separately filed Excel document.