STATE OF ILLINOIS
ILLINOIS COMMERCE COMMISSION

ILLINOIS COMMERCE COMMISSION On its Own Motion vs AMEREN ILLINOIS COMPANY d/b/a Ameren Illinois Investigation under Section 16-107.6(e) of the Public Utilities Act into an annual process and formula for the calculation of distributed generation rebates	)))))))))))	Docket No. 20-0389

REBUTTAL TESTIMONY OF
CURT VOLKMANN

ON BEHALF OF

THE ENVIRONMENTAL LAW AND POLICY CENTER
VOTE SOLAR
AND
NATURAL RESOURCES DEFENSE COUNCIL

February 5, 2021

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I. INTRODUCTION AND WITNESS QUALIFICATIONS

Q. Please state your name and business address.

A. My name is Curt Volkmann. My business address is 132 Lake Vista Circle, Fontana, Wisconsin, 53125.

Q. On whose behalf are you testifying in this proceeding?

A. I am testifying on behalf of the Environmental Law & Policy Center, Vote Solar, and the Natural Resources Defense Council (collectively "Joint NGOs" or "JNGO").

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

A. I am President and founder of New Energy Advisors, LLC, an independent consulting firm. I work with clients in a variety of regulatory proceedings related to distribution system planning, distributed energy resources, and grid modernization.

Q. Please summarize your education and professional experience.

A. I have a BS in Electrical Engineering from the University of Illinois with a concentration in Electrical Power Systems. I also have an MBA from the University of California at Berkeley with a concentration in Finance. I have 36 years of experience in the utilities industry, primarily in electric transmission and distribution. My work experience includes nine years at Pacific Gas & Electric in various transmission and distribution engineering roles and eighteen years at Accenture with several positions including Executive Director in the North American Utilities practice. Since 2015, I have worked independently and supported clients in distribution-related regulatory proceedings around the country. JNGO Exhibit 3.01 provides a statement of my qualifications and experience.

Q. Have you previously testified before the Illinois Commerce Commission?

A. Yes. I testified before the ICC in:

- The Ameren IL proceeding for approval of its Energy Efficiency and Demand Response Plan in Docket No. 13-0498.
- The Commonwealth Edison proceeding for approval of its Energy Efficiency and Demand Response Plan in Docket No. 13-0495.
- Its investigation into Commonwealth Edison's cost of service in Docket No. 14-0384.
- The Ameren IL proceeding for approval of its customer generation rebate and customer generation charge in Docket No. 18-0537.
- The Commonwealth Edison proceeding for approval of its customer generation rebate and customer generation charge in Docket No. 18-0753.

Q. Have you previously testified before other regulatory commissions?

A. Yes. In the past five years, I have testified and commented before regulatory commissions in Arizona, Arkansas, California, Iowa, Michigan, Minnesota, New York, Ohio, Utah, and Virginia. JNGO Exhibit 3.02 provides a summary of my prior testimony and contributions to comments.

Q. Are you providing any exhibits with your testimony?

A. Yes. I am sponsoring the following exhibits:

- JNGO Exhibit 3.01: Curt Volkmann's Statement of Qualifications and Experience
- JNGO Exhibit 3.02: Prior Testimony and Contributions to Comments by Curt Volkmann

- JNGO Exhibit 3.03: Compiled responses to discovery requests

II. PURPOSE OF TESTIMONY AND SUMMARY OF RECOMMENDATIONS

Q. What is the purpose of your rebuttal testimony?

A. My rebuttal testimony summarizes my assessment of the Distributed Generation ("DG") Rebate Valuation Framework ("Framework") proposed by the Ameren Illinois Company ("AIC", "Ameren", or "Company") and described in the Company's direct testimony.

Q. What did you review in preparing your rebuttal testimony and forming your conclusions and recommendations?

A. I reviewed all parties' direct testimony and exhibits and the Company's responses to discovery requests issued by all parties.

Q. Please summarize your conclusions regarding AIC's proposed DG Rebate Valuation Framework.

A. I conclude that the proposed Framework is overly complex and opaque, flawed, and too narrowly focused. My criticisms of the Framework include the following:

- AIC has not sufficiently calculated values using the proposed Framework to determine its reasonableness. No party in this proceeding, including the Company, has any idea what the resulting values would be for the vast majority of AIC's customers.
- AIC does not intend to fully calculate the values until the Commission approves the methodology.
- AIC's proposed approach for determining short-term locational capacity deferral value is flawed.

- The Framework fails to account for the significant impacts of solar paired with storage on the value of solar DG systems.
- The Framework fails to reflect the full value of distributed energy resources ("DER") to AIC's distribution system. At best, and with the changes I recommend in my testimony, the Framework offers a potential methodology for calculating short-term locational values that could be adders to a more comprehensive base rebate.

Q. Please provide a brief summary of your recommendations.

A. I recommend that the Commission:

1) Determine that AIC's proposed Framework is incomplete and produces only short-term locational value adders, not rebate values reflecting the full value of DER to the distribution system.
2) Require AIC to modify its proposed Framework for determining short-term locational value adders to:
    a. Include the impact on the value of DG when it is paired with storage.
    b. Build flexibility into the Framework that allows AIC to reflect, in rebate values, the impact of other load-modifying DER on the value of solar DG paired with storage, as those impacts are better understood and quantified in the future.
    c. Incorporate the revised DG Value Matrix shown in Figure 5 of my rebuttal testimony.
3) Require AIC to calculate and publish all short-term locational value adders resulting from its proposed Framework for all of AIC's customers, prior to Commission approval of the methodology.

4) Require AIC to establish a transparent process for ongoing Commission, Staff, and stakeholder review and Commission approval of the data and calculations supporting the Framework's short-term locational value adders and Non-standard Rebates[1]. This should preferably be part of the robust and transparent Integrated Distribution Planning process recommended by JNGO witnesses Kenworthy[2] and Sandoval[3].

5) Order AIC to begin working with Staff, stakeholders, and an independent third party facilitator, to conduct a comprehensive and transparent Value of DER analysis to determine the full DER base rebate value.

6) To the extent the Company has not completed the Value of DER analysis before DG penetration reaches 5% in AIC's service territory, order AIC to establish an initial base rebate value equivalent to the value of delivery-service netting, as recommended and further detailed in JNGO witness Kenworthy's testimony.[4]

III. THE COMPANY'S PROPOSED FRAMEWORK IS OVERLY COMPLEX AND OPAQUE

Q. What is your understanding of how AIC approached the development of its proposed Framework?

A. I understand that AIC began to assemble a Framework team in 2017 and has worked on the methodology for the last 2-3 years. In response to a data request, AIC provided several

[1] The Company states that, for DG installations that utilize non-standard smart inverter settings, AIC may adjust the available rebate by mutual agreement of the Customer and the Company ("Non-standard Rebates"). I discuss these Non-standard Rebates at p. 20 of my testimony.
[2] JNGO Exhibit 1.0 lines 34:14-36:13
[3] JNGO Exhibit 2.0 lines 31:17-34:3
[4] JNGO Exhibit 1.0 lines 38:16-39:5

internal team documents from AIC's early work.[5] One of the guidelines from the 2018 AIC team kickoff was, "Do not reinvent the wheel – Leverage what others have already accomplished in this field".[6]

Q. Has AIC adhered to this guideline?

A. No. In my opinion, AIC's proposed Framework does "reinvent the wheel". It is unlike anything I have seen before.

Q. What is the scope of AIC's proposed Framework?

A. AIC's proposed Framework is focused only on short-term[7] value components in locations with identified system needs. It is also very granular, as AIC proposes to analyze 1.45 million distribution system components each year[8] and update the $/kW rebate values annually for each of its 371,461 distribution transformers.[9] As I will describe later, the Framework fails to address the full value of DG and other DER to the Company's distribution system. I agree with Joint Solar Parties witness Rábago who states, "The Company's work is a good starting point for calibrating locational adders to the DG rebate, even if it fails to address the full value of the DG to the distribution system at the location that it is interconnected."[10]

[5] JNGO Exhibit 3.03, AIC response to ELPC-VS 5.01(a).
[6] JNGO Exhibit 3.03, AIC response to ELPC-VS 5.01, Attach 4_DER Valuation Team Kick-off.pdf, pp. 7-9.
[7] The Framework only accounts for the locational impact of DG over AIC's 5-year distribution planning horizon while ignoring any impacts beyond that 5-year horizon and over the remainder of the life of the DG assets.
[8] JNGO Exhibit 3.03, AIC response to ELPC-VS 4.11.
[9] JNGO Exhibit 3.03 AIC response to ELPC-VS 1.01(i).
[10] JSP Exhibit 1.0, lines 543-545.

Q. What are the short-term locational value adder components of AIC's proposed Framework?

A. AIC has identified four short-term locational value adder components in its proposed Framework, specifically:

- Distribution capacity value;
- Voltage support value;
- Subtransmission contingency planning value, and;
- Loss reduction value.

I will address AIC's proposed approach to calculating each short-term locational value adder component below.

1. AIC has not determined its proposed short-term distribution capacity values

Q. Please explain distribution capacity value and your understanding of AIC's proposed methodology for calculating this component.

A. Distribution capacity value reflects the ability of DG to reduce peak loads and defer the replacement of distribution assets that might otherwise be overloaded. My understanding of AIC's proposed methodology for this component is the following:

1. AIC, through its annual planning process, will collect distribution system information, load forecasts, as well as current and future committed DG information. AIC will update its distribution system models to reflect the current system status. AIC will prepare the best available (real-time historic or modeled data) load data and DG profiles.
2. Using the information and data prepared in Step 1, AIC will utilize its existing power system analysis tool to determine potential asset-specific planning criteria violations

(i.e., where the loading or voltage is projected to be outside of the acceptable range within the forecast period).

3. For each distribution system asset with a potential planning criteria violation, AIC will:
   i. Determine the normal and emergency ratings.
   ii. Determine the 5-year forecasted load profile for the asset in 8,760 hourly intervals each year, scaled up for both estimated load growth and temperature correction, and determine the asset's "Before DG" peak load each forecast year.
   iii. Determine the expected generator output for 1 kW of DG from PVWatts,[11] multiply the expected unit generator output profile by a factor of 100 to represent an addition of 100 kW, then subtract the result from the forecasted 8,760 load profile values.
   iv. Repeat this calculation in increments of 100 kW from 200 kW to 10,000 kW.
   v. Determine the new highest measured "After DG" peak load value for each 100 kW incremental addition of DG.
   vi. From the "After DG" incremental peak load values, determine the magnitude of the change in measured peak load between each incremental addition of DG. When the change in measured peak load drops below 10 kW for a 100 kW addition due to diminishing returns, record both the new measured "After DG" peak load value and the amount of DG added for the previous incremental addition.
   vii. Determine the present year estimated upgrade/replacement cost of the asset, and translate the upgrade/replacement cost into the appropriate year future cost using a 2% inflation rate.
   viii. Determine the Value Multiplier and Rebate Value by applying the upgrade cost, normal rating, emergency rating, "Before DG" peak load value, and "After DG" peak load value to a "DG Value Matrix".

[11] PVWatts is a tool developed by the National Renewable Energy Lab for estimating the production of solar PV systems. See https://pvwatts.nrel.gov.

ix. Calculate the Eligible Facility Value per kW in the forecast year by dividing the Rebate Value by the amount of DG required to reach the point where an addition of 100 kW reduces the magnitude of the measured peak load by less than 10 kW.

x. Convert the Eligible Facility Value per kW to a present value using the Company's weighted average cost of capital, which is currently 6.393%.

xi. Apply the calculated Eligible Facility Value per kW to each downstream distribution transformer.

4. Once AIC has calculated all Eligible Facility Value per kW values, including other distribution capacity contributions, voltage support value, and subtransmission value elements that apply to each customer, it will sum them and round up to the nearest $25/kW increment to determine the Rebate Amount to be paid to the customer.[12]

Q. In step 3.vi above, you mention diminishing returns. What is this?

A. AIC assumes that as more solar DG is installed on a circuit, after a certain point, the peak load-reducing impact of each incremental addition of DG is less than previous installations. As the Company explains:

> "The concept of diminishing returns … is directly related to time-varying differences between the energy output of the DG and load profile of the circuit. In the example of solar, the energy output is restricted to a specific set of hours based on the availability of sunlight …When there is very little nameplate solar production capacity installed on a feeder, there is a significantly higher likelihood of overlap between load on the circuit and the ability of solar DG to reduce that load. As more solar is added on the same feeder, the measured loading on the feeder decreases only during the hours the solar is producing energy. Over time, this shifts the timing of the measured peak load to be later in the evening or earlier in the morning, when load is still relatively high but there is less sunlight available to stimulate solar production. Once this occurs, the impact on the measured peak load of each incremental addition of solar is much lower than earlier installations, and eventually reaches a point where the DG does not have a

[12] Ameren Exhibit 2.1.

significant impact on the measured peak load value. After that point is reached, additional DG does not provide any significant capacity value."[13]

Q. How has AIC factored diminishing returns into its Framework?

A. Diminishing returns is a foundational concept in AIC's proposed Framework. As AIC explains, "The idea of diminishing returns is used as a means of determining a specific cut-off point beyond which the value provided by an incremental addition of DG does not significantly contribute to the overall value available at a specific asset. This cut-off point is used to determine both the magnitude of impact of the DG to the peak load and the denominator of the '$/kW' value calculation. Within the framework, a 10% criteria was selected for this cut-off point, which is defined by the point at which an incremental addition of 100kW of generation results in less than 10kW of peak load reduction on a particular component."[14]

Q. In step 3.viii above, you mention a DG Value Matrix. What is this?

A. The DG Value Matrix is a method that Ameren proposes for determining the "value multiplier" that it would apply to upgrade costs in order to determine rebate values. The concept underlying Ameren's DG Value Matrix is that DG value must be prorated such that compensation corresponds with the degree of capacity relief the DG provides.

The Company explains, "Overload reduction value calculations (for distribution capacity deferral) will be based on the actual average upgrade cost of the asset, the severity of the overload condition, and the degree to which the DG reduces the overload condition. The

[13] Ameren Exhibit 2.0, lines 250-264.
[14] Ameren Exhibit 2.0, lines 278-284.

value available is linearly prorated, with no value at the normal rating; and maximum value, totaling the cost of replacing the asset, available at the emergency rating."[15] Figure 1 below illustrates this concept.

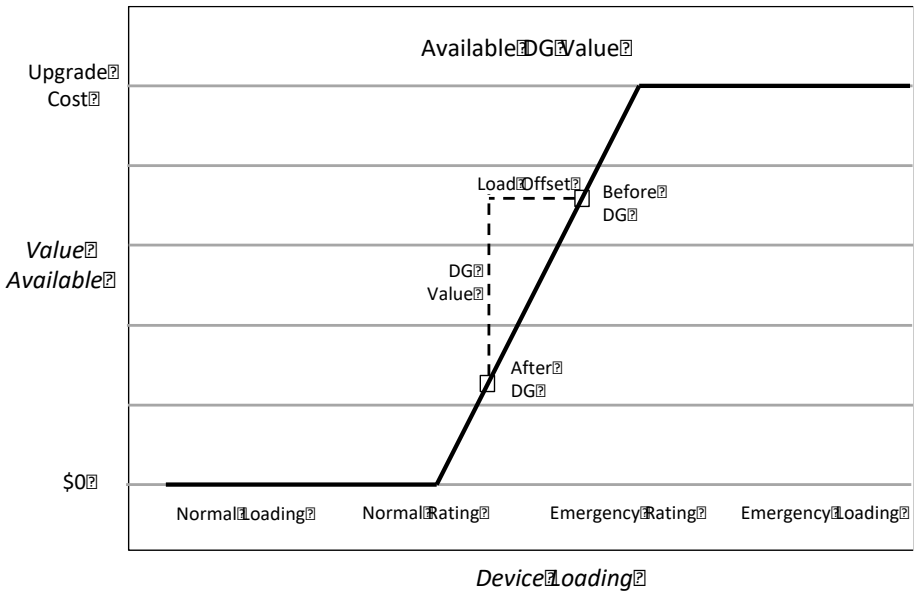

Figure 1 – AIC's Proposed DG Value Proration[16]

AIC further explains, "The value of a DG installation on an overloaded facility is the difference in loading due to the DG divided by the value proration factor (from the DG Value Matrix in Figure 2 below), then multiplied by the cost of upgrading the affected asset."[17]

[15] Ameren Exhibit 1.2, p. 6.
[16] Ameren Exhibit 1.2, p. 7.
[17] *Id.*

		Under Normal	Over Normal	Over Emergency	Value Description	Value Multiplier
Case 1	Before DG	X			No Overload	No Value
	After DG	X				
Case 2	Before DG		X		Eliminated Overload	(Before Load − Normal Rate) / [Emergency Rate − Normal Rate)
	After DG	X				
Case 3	Before DG			X	Eliminated Emergency	Full Upgrade Value
	After DG	X				
Case 4	Before DG		X		Reduced Overload	(Before Load − After Load) / [Emergency Rate − Normal Rate)
	After DG		X			
Case 5	Before DG			X	Reduced Emergency	1 − [(After Load − Normal Rate) / [Emergency Rate − Normal Rate)]
	After DG			X		
Case 6	Before DG			X	Over Emergency	No Value
	After DG			X		
						Rebate Value = Upgrade Cost * Value Multiplier

Figure 2 – AIC's Proposed DG Value Matrix[18]

Q. What value or range of values can customers expect for the distribution capacity component of the rebate?

A. I don't know and neither does AIC. The Company provided only one example of the fully operationalized methodology for distribution capacity, including the diminishing returns and present value calculations, for a substation transformer overload ("Operationalized Example"). As shown in Figure 3 below, this Operationalized Example results in a rebate value of $25.99/kW, which AIC would round up to $50/kW.

[18] *Id.*

Transformer Overload DER Value Example				
	2022	2023	2024	2025
TC Peak Load	9.02	9.12	9.222	9.32
Normal Rating (MVA)	9	9	9	9
Emergency Rating (MVA)	10.7	10.7	10.7	10.7
10% DR Nameplate PV MW	4.2	4.3	4.3	4.4
10% DR Peak Load Reduction (MW)	0.941	0.943	0.963	0.979
Replacement Cost	$780,300	$795,906	$811,824	$828,061
Available Rebate Value ($)	$9,180.00	$56,181.60	$106,014.68	$155,870.23
Rebate Value ($/kW)	$2.19	$13.07	$24.65	$35.43
Present Year Rebate Value ($/kW)	$1.93	$10.85	$19.24	$25.99

Figure 3 – Operationalized Example[19]

However, AIC also states that the example calculation is "intended to provide clarity and insight into the actual computations in the framework, and do(es) not necessarily represent expected general rebate values. Ameren Illinois will complete the proposed analysis for its entire distribution system once the methodology is approved."[20]

Q. What do you conclude?

A. I conclude the AIC's proposed methodology for calculating distribution capacity value is overly complicated and opaque. AIC has not provided visibility into key inputs for the calculations (i.e., load forecasts, equipment loading and ratings, equipment upgrade/replacement costs). More importantly, no party in this proceeding, including the

[19] Ameren Exhibit 2.1, p. 1.
[20] Ameren Exhibit 1.2, p. 11.

Company, has any idea what the resulting distribution capacity values would be for AIC's customers.

2. AIC has not determined its proposed voltage support values

Q. Please explain the voltage support value and AIC's proposed methodology for calculating this component.

A. Through its annual planning process, the Company identifies locations on its distribution system that require additional voltage support, reactive-power capacity support, or other power factor correction through capacitor bank placement.[21] AIC proposes to include a voltage support value component for DG with smart inverters installed in these locations. Specifically, AIC proposes a flat $/kW adder for all locations with modeled voltage below 117 volts over the 5-year planning horizon.[22]

Q. What value or range of values can customers expect for the voltage support adder?

A. I don't know and neither does AIC. The Company's illustrative calculation results in a value of $23.04/kW for all locations with modeled voltage below 117 volts, and $0/kW (no adder) for all other locations.[23] However, the Company also states, "A specific $/kW value for the voltage adder has not yet been determined for the present year or any future years."[24]

[21] JNGO Exhibit 3.03, AIC response to ELPC-VS 1.20.
[22] Ameren Exhibit 2.3.
[23] Ameren Exhibit 2.3.
[24] JNGO Exhibit 3.03, AIC response to ELPC-VS 4.10.

Q. What percentage of customer locations on AIC's circuits does the Company expect to receive a voltage support adder?

A. I don't know and neither does the Company, as it has not conducted sufficient analysis to answer this question.

3. AIC has not determined its proposed subtransmission contingency planning Value

Q. Please explain the subtransmission contingency planning value and AIC's proposed methodology for calculating this component.

A AIC identifies opportunities for capacity deferral on its subtransmission system[25] by modeling the system under a variety of loading conditions and contingency configurations. While the Company acknowledges that distributed generation has subtransmission contingency planning value, the Company explains, "Currently, there are no commercial modeling tools available that can model time-series load profiles and contingency switching scenarios simultaneously. This limitation, when considered alongside the relative complexity of the necessary process, makes specific calculations [of subtransmission contingency planning values] impractical."[26] Instead, Ameren proposes to calculate a flat value adder to be applied to all customer locations that impact identified subtransmission contingency planning criteria violations.[27]

[25] Within AIC, the subtransmission system includes facilities operating at 34 kV or 69 kV.
[26] Ameren Exhibit 1.2, p. 10.
[27] Ameren Exhibit 2.2.

Q. What values or range of values can customers expect for the subtransmission contingency planning adder?

A. I don't know and neither does AIC. In response to a data request, the Company stated, "Ameren Illinois has not performed sufficient calculations at this time to provide an accurate flat value adder expectation."[28]

Q. What percentage of customer locations on AIC's circuits does the Company expect to receive a subtransmission contingency planning adder?

A. I don't know and neither does AIC, as it has not conducted sufficient analysis to determine the percentage.

4. AIC has not calculated the Line Loss Reduction Value

Q. Please explain the line loss reduction value and AIC's proposed methodology for calculating this component.

A. The energy produced by DG to serve local load reduces the energy that flows along the subtransmission and distribution system, thus reducing line losses. AIC explains, "Since the impact of losses on distribution capacity are highly locational, it is impractical to calculate a specific magnitude for this value without modeling each application individually. Simplifying assumptions must be made in order to ensure this value is included in the calculations in a way that is practical."[29] AIC asserts that the line loss reduction value is captured indirectly as part of the round-up approach instead of through direct calculation.[30]

[28] JNGO Exhibit 3.03, AIC response to ELPC-VS 5.16.
[29] Ameren Exhibit 1.2, p. 9.
[30] Ameren Exhibit 2.0, lines 426-428.

Q. What are the implications of this approach for AIC's customers?

A. Accounting for the value of reduced line losses by "rounding up" to the nearest $25/kW increment means that, for example, a DG system providing $99/kW of capacity, contingency, and voltage support value to the grid would effectively receive $1/kW for line loss reduction value. A similar DG system providing $101/kW of capacity, contingency, and voltage support value to the grid would effectively receive $24/kW for line loss reduction value. In both cases, compensation for line loss reduction value would not necessarily have any relationship with the actual loss reductions that the particular DG system provides.

5. AIC has not determined its proposed total rebate values

Q. What is a reasonable estimate of what customers can expect for the total short-term locational value adders resulting from the proposed Framework?

A. Once again, I don't know and neither does AIC. As I previously explained, the Company has provided only one full example, the Operationalized Example, resulting in $50/kW for distribution capacity. However, this example does not include voltage support or subtransmission contingency planning flat value adders.[31] It also assumes that line loss reduction value is captured through the round-up approach.

Q. Has the Company provided any other estimates of what the total rebate values might be for customers?

A. In response to a Staff data request, AIC provided rebate values for 1,856 distribution service transformers serving a total of 6,016 customer locations, and the results are shown

[31] Ameren Exhibit 2.1.

in Figure 4 below. These calculations do not include any potential subtransmission contingency planning adder.

Value Block	# of Customers	% of Customers
$0/kW	2,490	42%
$25/kW	174	3%
$50/kW	2,777	47%
$75/kW	264	4%
$100/kW	215	4%
$125/kW and above	0	0%

Figure 4 – Estimated Rebate Values[32]

The Company states, "Ameren Illinois' calculations to date have primarily been focused on specific equipment or locations where forecasted planning criteria violations have been identified, and are not representative of the distribution system as a whole."[33] The Company also states that it does not intend to calculate rebate values for all distribution service transformers on its distribution system prior to the expected date for the Commission's final Order.[34]

Q. Why hasn't AIC calculated rebate values for all distribution service transformers across its distribution system?

A. In response to a data request, the Company stated "Ameren Illinois considers it imprudent to dedicate resources, time and effort to calculate rebate values for all distribution service transformers on its distribution system without a Commission order approving Ameren Illinois' methodology. Ameren Illinois conducted a sufficient number of calculations to

[32] JNGO Exhibit 3.03, derived from AIC response to POL 1.17S.
[33] JNGO Exhibit 3.03, AIC response to POL 1.17S.
[34] JNGO Exhibit 3.03, AIC response to ELPC-VS 3.06(a).

demonstrate proof of concept, and is prepared to perform the full-scale calculation of DG values should the Commission approve its methodology."[35]

6. AIC will not seek future Commission approval of the unknown rebate values

Q. If the Commission approves the Framework and AIC calculates rebate values across its distribution system, does the Company intend to seek Commission approval of these rebate values?

A. No. The Company states, "AIC expects the Commission to approve the methodology for calculating actual rebate values, not the rebate values themselves."[36] The Company also states, "AIC understands the Commission will be reviewing a methodology and series of calculations in this proceeding which will result in rebate values in the initial year and subsequent years. Therefore, AIC believes the Commission will be approving the rebate values by virtue of approving a methodology and standardized calculations."[37]

Q. Does AIC intend to share its future DG rebate value calculations with the Commission, Staff and stakeholders?

A. Only if asked. In response to a data request, AIC states that it does not intend to file, publish, disclose, or otherwise make any "supporting data from the value calculation process" available to the Commission or Staff unless requested by the Commission or Staff.[38]

[35] JNGO Exhibit 3.03, AIC response to ELPC-VS 4.18.
[36] JNGO Exhibit 3.03, AIC response to ELPC-VS 3.06(d).
[37] JNGO Exhibit 3.03, AIC response to ELPC-VS 4.20.
[38] JNGO Exhibit 3.03, AIC response to ELPC-VS 5.04.

Q. Is the Company proposing exceptions to the DG rebate values?

A. Yes. AIC explains, "The ability for customers to utilize non-standard (smart inverter) settings would, in some cases, allow for a customer to interconnect their proposed DG facility without triggering the need for grid upgrades that would otherwise be necessary if default settings were utilized instead. This results in reduced interconnection costs for the customer."[39] The Company further states that, for DG installations that utilize non-standard smart inverter settings, AIC may adjust the available rebate by mutual agreement of the Customer and the Company (I refer to this in my testimony as "Non-standard Rebates").[40]

Q. Does AIC intend to seek Commission approval for such Non-standard Rebates?

A. No. AIC states, "The Company does not intend to seek Commission approval for any such rebate, as it does not believe Commission approval to be necessary where a mutual agreement is able to be reached between the Company and the Customer."[41]

Q. What do you conclude?

A. I agree with JNGO witness Kenworthy who stated, "I am concerned that Ameren's methodology – which proposes to assign different rebate values for each of the several thousand distribution transformers across its service territory – would be unreasonably complex, opaque, and challenging for customers to understand."[42] I am also concerned that the Company does not intend to establish a transparent process for the Commission, Staff, and stakeholders to review and the Commission to approve future standard rebate and Non-standard Rebate calculations. As in other tariff or ratemaking proceedings, parties should

[39] Ameren Exhibit 2.0, lines 480-483.
[40] *Id.*, lines 494-495.
[41] JNGO Exhibit 3.03, AIC response to ELPC-VS 7.18(c).
[42] JNGO Exhibit 1.0, lines 42:10-13.

have the opportunity to review and understand the inputs to the calculations, as well as the results of the calculations.

Given the limited calculations and examples provided by Ameren, not knowing the resulting short-term locational values, and the lack of transparency into future calculations, it is premature for the Commission to approve the Framework.

Q. What do you recommend?

A. I recommend that the Commission:

1) Require AIC to calculate and publish all short-term locational value adders resulting from its proposed Framework for all of AIC's customers, prior to Commission approval of the methodology.

2) Require AIC to establish a transparent process for ongoing Commission, Staff, and stakeholder review and Commission approval of the data and calculations supporting the Framework's short-term locational value adders and Non-standard Rebates. This should preferably be part of the robust and transparent Integrated Distribution Planning process recommended by JNGO witnesses Kenworthy and Sandoval.

IV. AIC'S PROPOSED FRAMEWORK IS FLAWED

Q. Do you consider AIC's proposed Framework to be conceptually correct?

A. No. Specifically, I believe the Company's proposed DG Value Matrix is flawed, as it incorporates both normal and emergency equipment ratings. Given the way AIC plans and operates its distribution system, I believe only the normal rating of equipment, not the emergency rating, is relevant for determining distribution capacity deferral value. I also

404 believe that Ameren's proposed approach ignores additional value from DG reducing
405 equipment loading below its normal rating.

406 **Q. Please explain once again what the DG Value Matrix is.**

407 A. AIC's proposed DG Value Matrix, shown in Figure 2 above, combines DG's contribution
408 to reducing equipment overloads with the equipment's upgrade/replacement cost to
409 determine the prorated distribution capacity value component of the short-term locational
410 value adder.

411 **Q. Do you agree with AIC's approach to the DG Value Matrix?**

412 A. No. As I previously explained, AIC proposes to use an asset's normal and emergency rating
413 as the lower and upper bound for determining its prorated capacity deferral value. I believe
414 only the normal rating of an asset, not the emergency rating, is relevant for determining
415 distribution capacity deferral value. The normal rating is what triggers investment
416 decisions for AIC, not the emergency rating. As the Company explains, "The normal rating
417 for a component generally represents the highest degree of loading that can be sustained
418 indefinitely without any appreciable reduction in the expected useful life of the asset. It is
419 also the point where, when the forecast loading on a component exceeds the normal rating,
420 a mitigation project is identified and appropriately added to future year investment plans."[43]

421 **Q. What is the Company's rationale for including the emergency rating in determining**
422 **distribution capacity deferral value?**

423 A. AIC explains, "The emergency rating is representative of the point at which substantial
424 loss of equipment life, up to and potentially including the failure of the equipment, will

[43] Ameren Exhibit 2.0 lines 204-207.

occur. If the emergency rating were to be exceeded in the present year, absent the ability to upgrade equipment in time to accommodate the loading, the critical goal of a mitigation measure would be the reduction of the loading to at least below the emergency rating, and ideally below the normal rating, in order to preserve the integrity of the equipment and prevent any capacity related outage to customers."[44]

Q. Do you agree?

A. No. AIC takes action to replace an asset when loading is forecasted to exceed its normal rating, not its emergency rating. As the Company explains, "Ameren Illinois does not plan to operate assets above their normal rating when the system is in its normal configuration … For normal, non-contingency configuration overloads, Ameren Illinois typically replaces assets that are forecasted to be over their normal rating within the window of time that would be necessary to plan and execute the replacement project."[45]

Q. As shown in Figure 2, three of the six cases in AIC's proposed DG Value Matrix involve the emergency rating. Should they be included?

A. No, because these cases do not exist. In response to a data request, the Company admits, "Ameren Illinois does not have any known locations where examples of Case 3, Case 5, and Case 6 occur."[46] AIC further explains, "In practice, it is unlikely that most components will reach a point where the loading is forecasted to exceed the emergency rating, as distribution capacity investments are typically placed in-service before any normal ratings are actually exceeded in the present year."[47] By including cases that relate to irrelevant

[44] JNGO Exhibit 3.03, AIC response to ELPC-VS 4.07(b).
[45] JNGO Exhibit 3.03, AIC response to POL 1.10.
[46] JNGO Exhibit 3.03, AIC response to ELPC-VS 4.07(a)
[47] Ameren Exhibit 2.0, lines 240-243.

asset emergency ratings in the DG Value Matrix, AIC distorts the distribution capacity deferral value of DG.

Q. Do you have additional concerns with AIC's proposed DG Value Matrix?

A. Yes. Ameren's proposed proration approach ignores additional value from DG reducing asset loading below its normal rating.

Q. Please explain further.

A. Consider a hypothetical scenario of an asset with a normal rating of 600 amps, emergency rating of 660 amps, "Before DG" load of 610 amps, and "After DG" load of 580 amps. In this scenario, the DG has eliminated 100% of the overload plus an additional 20 amps of load relief, yet according to the proposed DG Value Matrix, AIC would only offer 17%[48] of the upgrade cost as a rebate.[49] In other words, AIC's approach credits DG for deferring only a small fraction of a projected asset replacement cost, even when in reality, the DG has deferred the full cost of the asset replacement. This approach understates the short-term locational capacity deferral value that DG provides.

Q. What do you recommend?

A. The DG Value Matrix should exclude cases involving asset emergency ratings, since AIC acknowledges these cases do not exist. It should also fully reflect the value of DG reducing asset loading below its normal rating. I recommend that the Commission require AIC to modify its Framework to reflect the revised DG Value Matrix shown in Figure 5 below.

[48] [(610-600)/(660-600)] = 17%.
[49] JNGO Exhibit 3.03, AIC response to ELPC-VS 4.07(c).

		Under Normal	Over Normal	Over Emergency	Value Description	Value Multiplier
Case 1	Before DG	X		NA	No Overload	No Value
	After DG	X		NA		
Case 2	Before DG		X	NA	Eliminated Overload	Full Upgrade Value
	After DG	X		NA		
Case 3	Before DG		X	NA	Reduced Overload	(Before Load - After Load) / (Before Load - Normal Rate)
	After DG		X	NA		
						Rebate Value = Upgrade Cost * Value Multiplier

Figure 5 – Revised DG Value Matrix

Q. Please provide an illustrative example of how this revised DG Value Matrix would impact short-term locational value adders.

A. Applying the revised DG Value Matrix to the Operationalized Example would increase the short-term locational value adder from $25.99/kW (which AIC would round up to $50/kW) to $138.05/kW (which AIC would round up to $150/kW) as shown in Figure 6 below.

Transformer Overload DER Value Example					
	2022	2023	2024	2025	2025
TC Peak Load	9.02	9.12	9.222	9.32	9.32
Normal Rating (MVA)	9	9	9	9	9
Emergency Rating (MVA)	10.7	10.7	10.7	10.7	NA
10% DR Nameplate PV MW	4.2	4.3	4.3	4.4	4.4
10% DR Peak Load Reduction (MW)	0.941	0.943	0.963	0.979	0.979
Replacement Cost	$780,300	$795,906	$811,824	$828,061	$828,061
Available Rebate Value ($)	$9,180.00	$56,181.60	$106,014.68	$155,870.23	$828,061
Rebate Value ($/kW)	$2.19	$13.07	$24.65	$35.43	$188.20
Present Year Rebate Value ($/kW)	$1.93	$10.85	$19.24	$25.99	$138.05

Figure 6 – Revised Operationalized Example

V. AIC'S PROPOSED FRAMEWORK IS TOO NARROWLY FOCUSED

Q. Do you consider AIC's proposed Framework to be sufficiently complete?

A. No. I agree with JNGO witness Kenworthy who stated, "A proposal that only values the short-term, locational value of solar PV is incomplete. It ignores much of the value that DER can provide to the distribution grid"[50]

Q. Do other parties in this proceeding also agree?

A. Yes. JNGO witness Sandoval explains the range of values from DER[51], and Joint Solar Parties ("JSP") witness Rábago describes the DER value components identified by other utilities.[52] The Company also initially identified the need to develop a valuation framework for the wide range of services available from different types of DER.

Q. How broad did AIC initially intend its Framework to be?

A. It appears that, early on, AIC intended to develop a broad framework that accounts for different types of DER. The October 2018 PNNL white paper summarizing the workshops and comments from Staff's DG valuation stakeholder engagement process states, "The differences between this proposed (Ameren) approach and the Minnesota example … include that Minnesota's process only applies to solar, whereas Ameren's is intended to be more widely applied to different types of DERs."[53]

[50] JNGO Exhibit 1.0, lines 41:9-10.
[51] JNGO Exhibit 2.0, pp. 20-25.
[52] JSP Exhibit 1.0, Table KRR-2, p. 31.
[53] Ameren Exhibit 1.1, p. 35 of 61.

Q. What DER types did the AIC team originally consider in developing the Framework?

A. Ameren's internal Team Summary document shows a wide variety of DER types and services, including distributed generation (solar PV, gas-fired Sterling engines), combined heat and power, energy storage, demand response, and smart EV charging.[54] The document states, "… the team needs to assess the different services each DER technology can support, and provide a valuation framework for it."[55]

1. The Framework should consider the impact of other DER, particularly solar-plus-storage, on the value of DG

Q. Does AIC's proposed Framework include all DER technologies?

A. No. AIC's proposed Framework includes only DG (primarily solar)[56], which AIC describes as the "immediate need".[57] The Company explicitly excluded storage from the Framework because, according to its interpretation of Illinois law, batteries or other forms of storage are not "distributed generation".[58]

Q. Do you agree with this approach?

A. No. Ameren's pivot from considering a wide variety of DER types to focusing only on solar DG unfortunately risks establishing a valuation Framework that is inflexible and incapable of reflecting the full impact of various DER combinations on the value of DG. In particular, the valuation Framework should account for the impact of solar paired with energy storage ("hybrid systems") on the value of DG.

[54] JNGO Exhibit 3.03, AIC response to ELPC-VS 5.01 Attach 5, Table 2, p. 4.
[55] JNGO Exhibit 3.03, AIC response to ELPC-VS 5.01 Attach 5, p. 4.
[56] Ameren Exhibit 1.0, lines 591-597.
[57] JNGO Exhibit 3.03, AIC response to ELPC-VS 5.01 Attach 5, p. 1.
[58] Ameren Exhibit 1.0, lines 598-601.

Q. Why is it important to reflect the impact of storage in the Framework?

A. As JNGO witness Kenworthy explains, "While distributed generation can provide … benefits on its own, those benefits are enhanced when the distributed generation is coupled with energy storage. For example, while rooftop solar on its own has a very predictable generation profile over a long period, on any given day it may have more or less availability depending on the sun. However, when paired with storage, the likelihood of the systems' ability to provide generation or other services at times of highest demand increases dramatically. As such, its value as a distribution system asset is enhanced."[59]

Q. Has any jurisdiction quantified the enhanced value of solar-plus-storage?

A. Yes. In Connecticut, a 2020 draft value of DER study found that the 25-year levelized value of solar DG is $0.141 per kWh and the value of solar DG paired with storage is $0.228 per kWh, a 62% increase in value.[60]

Q. Are customers increasingly purchasing hybrid systems?

A. Yes. Due to declining costs and the reliability/resilience benefits of energy storage, customers are increasingly choosing to pair their solar installation with batteries. In their most recent U.S. Solar Market Insight report, SEIA and Wood Mackenzie state that, by 2025, one-fifth of new utility PV systems, one-third of new residential solar systems, and one-quarter of new non-residential solar systems will be paired with energy storage.[61]

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[59] JNGO Exhibit 1.0, lines 28:4-10.

[60] *Value of Distributed Energy Resources in Connecticut*, CT Department of Energy and Environmental Protection, CT Public Utilities Regulatory Authority, at 10, Figure 1, July, 2020, http://www.dpuc.state.ct.us/dockcurr.nsf/8e6fc37a54110e3e852576190052b64d/56d151da9f6343af852585980063329d/$FILE/Value%20of%20DERs%20in%20Connecticut%20-%20Draft%20Study.pdf.

[61] Wood Mackenzie/SEIA U.S. Solar Market Insight®, September 2020, p. 5.

Sunrun's CEO Lynn Jurich recently stated that the company is laying the groundwork for "what we believe will be a market where in two or three years every solar system has a battery."[62]

Q. What are the implications of this growth in hybrid systems?

A. AIC and other utilities will have a significant opportunity to take advantage of these customer-financed resources to benefit its grid and thereby reduce costs for all customers. In doing so, it is important that AIC compensate its DER customers fairly.

Q. What are some examples of utilities compensating customers for the use of their storage or hybrid systems?

A. Green Mountain Power ("GMP") in Vermont has a bring-your-own-device program offering incentives in exchange for control of customer-owned batteries during peak periods. GMP's incentive is $850/kW for a three-hour discharge and $950/kW for a four-hour discharge. Batteries in areas of the state where load relief is needed most can get an extra payment of $100/kW enrolled.[63]

Another example is National Grid's ConnectedSolutions bring-your-own-battery program in Massachusetts and Rhode Island. Customers enroll their hybrid systems in the program and allow the utility to discharge the batteries during 30-60 peak events each year. Unlike the one-time upfront incentives offered by GMP, National Grid offers annual pay-for-

[62] Comments from Sunrun CEO Lynn Jurich during the Q3 2020 Earnings Call on November 5, 2020. Transcript available at https://seekingalpha.com/article/4385636-sunrun-inc-run-ceo-lynn-jurich-on-q3-2020-results-earnings-call-transcript.

[63] Green Mountain Power. Bring Your Own Device. Available at: https://greenmountainpower.com/rebates-programs/home-energy-storage/bring-your-own-device/.

performance incentives based on the average available capacity of the customer-owned batteries during peak events. The annual incentive is $225/kW in Massachusetts[64] and $400/kW in Rhode Island.[65]

Q. What would be the impact if AIC were to account for hybrid systems in its Framework?

A. I believe that appropriately accounting for hybrid systems would require AIC to fundamentally change its Framework methodology. Hybrid systems have a different operating profile than stand-alone solar. A solar-plus-storage system's output is not limited to hours of the day when the sun is shining. With the right incentives, customers with solar-plus-storage will charge their batteries during the day, then discharge their batteries to serve their own and adjacent customers' load at times of circuit peaks whenever they may occur. Operating in this way, solar-plus-storage upends the concept of diminishing returns, which as I explained earlier in my testimony, is one of the key concepts underpinning AIC's proposed Framework. Incremental additions of hybrid systems do not result in declining contributions to circuit peak loads.

[64] National Grid. Battery Program. Available at: https://www.nationalgridus.com/MA-Home/Connected-Solutions/BatteryProgram.
[65] National Grid. Use Your Battery Storage Device to Make the Grid More Sustainable. Available at: https://www.nationalgridus.com/RI-Home/ConnectedSolutions/BatteryProgram.

Q. Does AIC acknowledge the impact of hybrid systems on the concept of diminishing returns?

A. Yes. In response to a data request, AIC states "PV paired with storage would have a different operating profile than solar alone and therefore would change the impact of diminishing returns."[66]

Q. Why has AIC not included the impact of hybrid systems in its Framework?

A. As I explained previously, AIC disregards storage because, under the Company's interpretation of Illinois law, storage technologies are not distributed generation.

Q. Does AIC consider hybrid systems to be distributed generation?

A. In response to a data request, Ameren responded: "The Company considers the solar PV to be 'distributed generation' as defined by the statute, but does not understand the storage components that augment the output profiles of distributed generation to qualify as 'distributed generation' as defined by the statute. Storage can provide benefits to customers with DG but AIC does not understand the statute to permit it to be included in the DG rebate calculations."[67]

In other words, AIC acknowledges that storage modifies the output profiles of solar DG and provides incremental value, but does not feel it can reflect that reality in its proposed DG rebate. I am not a lawyer and cannot offer a legal interpretation of the statute, but I believe any framework for determining DG rebates should account for the unique impacts of storage on the operating characteristics and value of solar DG.

[66] JNGO Exhibit 3.03, AIC response to ELPC-VS 4.06(a).
[67] JNGO Exhibit 3.03, AIC response to ELPC-VS 7.08(e).

Q. Has AIC attempted to model the potential impact of hybrid systems on the concept of diminishing returns in its Framework?

A. No. The Company states, "Within a specific feeder, the impact of storage is highly dependent on the power rating, energy rating, operating profile, and system configuration. In addition, its behavior cannot be easily generalized (as is possible with solar or wind DER operating with a smart inverter meeting Ameren Illinois specifications), since customers on a specific feeder could operate their storage in a variety of different ways without direct utility control. Therefore, it would be speculative to determine how storage paired with PV could impact the diminishing returns of incremental PV additions."[68]

Q. Should AIC account for other DER in its proposed Framework?

A. Yes. Load-modifying DER, such as controllable thermostats and water heaters, could affect the dispatch parameters of a storage resource in the same home or building, thereby impacting the value of a hybrid system.[69] While today's Illinois DER market is still maturing, it is likely that customers will deploy future DER in increasingly creative combinations to provide optimal distribution grid value. With that future state in mind, AIC should establish a Framework that is flexible and can reflect the impacts of various DER on solar DG paired with storage.

Q. What do you conclude?

A. AIC's failure to account for the impacts of hybrid systems on the value of solar DG, as well as its failure to account for the impacts of any other types of load-modifying DER, is

[68] JNGO Exhibit 3.03, AIC response to ELPC-VS 4.06(a).
[69] NESP, *National Standard Practice Manual for Benefit-Cost Analysis of Distributed Energy Resources*, National Energy Screening Project, p. 11-12, August, 2020, https://www.nationalenergyscreeningproject.org/wp-content/uploads/2020/08/NSPM-DERs_08-24-2020.pdf.

a significant deficiency in its proposed Framework. I completely agree with Staff witness Clausen who states, "the different output profile of DG projects that are connected to storage should be accounted for in the calculation of the DG rebate values."[70]

2. DG rebates should include additional long-term, system-wide DER value

Q. What values should AIC include in the full DG rebate?

A. The full DG rebate value should include value components derived from a comprehensive Value of DER analysis. JNGO witness Sandoval explains that a comprehensive Value of DER analysis includes a quantification of long- and short-run avoided capacity costs, avoided line losses, reliability/resilience benefits, and voltage support services[71] over the lifetime of the DER.[72] Mr. Sandoval[73] and JSP witness Rábago[74] provide summaries of the value components included in Value of DER studies conducted by other utilities.

Q. Does AIC's Framework reflect DER value over its lifetime?

A. No. The Company's Framework only considers the short-term locational value contribution from DG over AIC's 5-year distribution planning horizon and ignores value beyond that point in time. Solar panels have a typical useful life of at least 25 years.[75] I agree with Staff witness Clausen who states, "I am skeptical … that the value of a DG resource drops to zero in years six and beyond for every single project."[76]

[70] ICC Staff Exhibit 1.0, lines 162-163.
[71] JNGO Exhibit 2.0, pp. 20-25.
[72] *Id*., line 19:10.
[73] *Id*., Figure 1, p. 16.
[74] JSP Exhibit 1.0, Table KRR-2, p. 31.
[75] Solar Reviews. "How long do solar panels actually last?" Available at: https://www.solarreviews.com/blog/how-long-do-solar-panels-last.
[76] ICC Staff Exhibit 1.0, lines 99-101.

Q. Does AIC's Framework reflect system-wide DER value?

A. No. JNGO witness Sandoval explains that DER provide "unspecified" value across the distribution system regardless of its location.[77] AIC's failure to include this system-wide DER value is another deficiency in its proposed Framework.

Q. What do you recommend?

A. I recommend that the Commission:

1) Determine that AIC's proposed Framework is incomplete and produces only short-term locational value adders, not rebate values reflecting the full value of DER to the distribution system.

2) Require AIC to modify its proposed Framework for determining short-term locational value adders to include the impact of solar paired with storage and other load-modifying DER.

3) Order AIC to begin working with Staff, stakeholders, and an independent 3rd party facilitator, to conduct a comprehensive and transparent Value of DER analysis to determine the full DG base rebate value.

Q. Is conducting a comprehensive and transparent Value of DER analysis a lengthy process?

A. Based on what I've seen in other states, the analysis could take a while. Given the transition to value-based compensation once AIC reaches a 5% DG penetration, it is important to be prepared to establish an initial base rebate value regardless of the status of the analysis. If the Company has not completed the Value of DER analysis before reaching 5% penetration

[77] JNGO Exhibit 2.0, lines 10:8-11:2 .

in its service territory, I recommend that the Commission require AIC to establish an initial base rebate value equivalent to the value of delivery-service netting, as recommended and further detailed in JNGO witness Kenworthy's testimony.

VI. SUMMARY OF RECOMMENDATIONS

Q. Please summarize your recommendations.

A. I recommend that the Commission:

1) Determine that AIC's proposed Framework is incomplete and produces only short-term locational value adders, not rebate values reflecting the full value of DER to the distribution system.

2) Require AIC to modify its proposed Framework for determining short-term locational value adders to:
   a. Include the impact on the value of DG when it is paired with storage.
   b. Build flexibility into the Framework that allows AIC to reflect, in rebate values, the impact of other load-modifying DER on the value of solar DG paired with storage, as those impacts are better understood and quantified in the future.
   c. Incorporate the revised DG Value Matrix shown in Figure 5.

3) Require AIC to calculate and publish all short-term locational value adders resulting from its proposed Framework for all of AIC's customers, prior to Commission approval of the methodology.

4) Require AIC to establish a transparent process for ongoing Commission, Staff, and stakeholder review and Commission approval of the data and calculations supporting the Framework's short-term locational value adders and Non-standard Rebates. This

should preferably be part of the robust and transparent Integrated Distribution Planning process recommended by JNGO witnesses Kenworthy and Sandoval.

5) Order AIC to begin working with Staff, stakeholders, and an independent 3rd party facilitator to conduct a comprehensive and transparent Value of DER analysis to determine the full DG base rebate value.

6) To the extent the Company has not completed the Value of DER analysis before DG penetration reaches 5% in AIC's service territory, order AIC to establish an initial base rebate value equivalent to the value of delivery-service netting, as recommended and further detailed in JNGO witness Kenworthy's testimony.

Q. Does this conclude your testimony?

A. Yes.