BEFORE
THE PUBLIC UTILITIES COMMISSION OF OHIO

In the Matter of the Application of Ohio Power Company for an Increase in Electric Distribution Rates.	)))	Case No. 20-585-EL-AIR
In the Matter of the Application of Ohio Power Company for Tariff Approval.	))	Case No. 20-586-EL-ATA
In the Matter of the Application of Ohio Power Company for Approval to Change Accounting Methods.	)))	Case No. 20-587-EL-AAM

INITIAL POST-HEARING BRIEF OF ARMADA POWER, LLC

June 14, 2021

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I. INTRODUCTION AND SUMMARY OF ARGUMENT

Armada Power, LLC ("Armada Power") presented an innovative pilot proposal using a proven, secure technology that would allow Ohio Power Company ("AEP Ohio") to explore the grid reliability benefits of controlling water heater load in its service territory to the benefit of ratepayers. This proposed pilot involves installation of additional distribution grid assets (water heater controllers containing revenue-grade meters and sophisticated software) at a sufficient scope to provide AEP Ohio with real-time, valuable data regarding the distribution grid and to allow the utility to implement a multitude of grid reliability measures in real-time. Armada Power's pilot proposal is more cost effective than typical grid reliability measures like battery storage, and it is less expensive than many of the reliability-related measures that AEP Ohio has planned for 2021.

Armada Power's pilot fits within multiple reliability-related programs that AEP Ohio has for 2021 in its Distribution Investment Rider ("DIR") Work Plan, fits squarely within the Public Utilities Commission of Ohio's ("Commission") stated purpose of the DIR itself, and uses technology that the Staff does not oppose. The pilot can also provide the same DIR data/reporting that is required for DIR projects and to which AEP Ohio committed in Section III.C.6 of the Joint Stipulation and Recommendation ("Stipulation").

Ohio law also supports exploration via a pilot of the grid reliability benefits of controlling water heater load. The pilot is consistent with multiple provisions of the energy policy of the State of Ohio because the technology will help ensure the availability to consumers of reliable retail electric service, encourage cost-effective and efficient access to information regarding the operation of the distribution system, provide a transparent means of incenting technologies that can adapt successfully to potential environmental mandates, and facilitates the State's

effectiveness in the global economy. .*See* Ohio Revised Code ("R.C") §§ 4928.02(A), (E), (J) and (N).

Importantly, the record supports the adoption of the pilot in this proceeding. Armada Power's expert witness Eric Rehberg testified unchallenged regarding the many grid reliability benefits of the Armada Power pilot proposal, establishing in the record that the pilot's benefits are consistent with the DIR Work Plan, the purpose of the DIR, and with Ohio's energy policy. He explained that the pilot will provide grid reliability benefits such as:

- Ability to shift load in real time to avoid "rebound peaks" after events;
- Ability to avoid a spike following an outage and improve the speed of outage recovery ("cold load pick-up spike"), which can improve the system average interruption duration index ("SAIDI") by reducing the likelihood of re-tripping protection devices that would extend the duration of the outage;
- Ability to provide real-time voltage data from each device, which provides visibility into circuit reconfiguration, VoltVar control, and emergency situations;
- Ability to shift load so that renewable energy can be consumed, which assists with balancing electric supply and demand; and
- Ability to reduce capacity constraints on circuits.

Approval of the Stipulation without also approving the pilot program proposed by Armada Power would not be reasonable or in the public interest. This opportunity to explore the benefits of Armada Power's water heater controllers advances the public interest and energy policy. This opportunity also promotes grid reliability, which benefits all classes of ratepayers of the utility – not just a select few like several terms in the Stipulation. Also, this opportunity provides data and valuable grid information to the utility, which is reasonable for system transparency and for AEP Ohio to fulfill its DIR-related reporting commitments in the Stipulation. This is an opportunity for innovation for the distribution system's reliability and control that supports the Ohio economy though technology engineered, invented, and manufactured in Ohio.

It is also important to note that the Stipulating Parties are advocating that the Commission favor certain technologies and/or services because the Stipulation contains provisions that provide specific support. For example, the Stipulation proposes a special plug-in electric vehicle ("PEV") pilot designed to encourage development of the electric vehicle industry and promote environmental concerns.[1] The Stipulating Parties even recommend the Commission approve a Stipulation provision under which AEP Ohio shareholders will specially fund marketing and education of the PEV tariff up to $100,000.[2] The Stipulation also proposes to waive fees for certain customers who are served under AEP Ohio's alternative feed service.[3] A final example is the agreement for certain parties to explore "potential retail and wholesale demand response programs for transmission customers."[4] By approving the Armada Power pilot as part of the Stipulation, the Commission would be acting in a manner that is consistent with the other terms of the Stipulation that support technologies and/or services with the added benefit of exploring the grid reliability benefits of controlling water heater load.

Altogether, additional value is warranted for the ratepayers and the public interest. The Stipulation is not in the public interest in its current form and must not be approved without the Commission also approving Armada Power's proposed pilot. Armada Power's innovative pilot proposal supports long-standing Ohio laws and policies, matches with existing DIR programs, and matches the purpose of the DIR. The Commission, therefore, should order implementation with AEP Ohio's costs recovered through the DIR. Armada Power is not seeking an order that adjusts the stipulated revenue requirement; rather, Armada Power recommends the Commission specifically order that the pilot proposal be part of the DIR.

[1] Joint Ex. 1 at 12 and Attachment C, Sheet 270-1.

[2] Joint Ex. 1 at 13.

[3] Joint Ex. 1 at 15.

[4] Joint Ex. 1 at 18.

II. ARGUMENT

To approve a stipulation, the Commission must conclude that the proposed Stipulation is reasonable considering, among other items, whether the settlement as a package benefits ratepayers and the public interest.[5] It would not be reasonable or in the public interest to approve the Stipulation without addressing the need for innovation in the DIR activities by also approving Armada Power's proposed pilot.

A. THE ARMADA POWER TECHNOLOGY AND PILOT PROPOSAL

Eric Rehberg provided sworn, expert testimony regarding Armada Power's technology and pilot proposal. Mr. Rehberg helped develop the core technology components used by Armada Power, is a founder of Armada Power, and is its Chief Engineer.[6] Relevant to his testimony regarding the Armada Power technology and pilot proposal, Mr. Rehberg has extensive expertise in developing and testing new technologies. Mr. Rehberg worked for years in the Dolan Technology Center of American Electric Power ("AEP"), during which he developed technologies for the AEP system.[7] He also worked at the globally recognized Battelle Memorial Institute, where his work included being the leader on projects in energy technology and research.[8] He also is an inventor in his own right, and holds numerous patents in the field of energy technology.[9] Mr.

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[5] While parties to Commission proceedings are authorized to enter into a stipulation pursuant to Ohio Adm.Code 4901-1-30, the stipulation is not binding on the Commission. *See Consumers' Counsel v. Pub. Util. Comm.* (1992), 64 Ohio St.3d 123, 125, citing *Akron v. Pub. Util. Comm.* (1978), 55 Ohio St.2d 155. Rather, the Commission must consider whether the agreement is reasonable and should be adopted. In considering the reasonableness of a stipulation, the Commission has used the following criteria:

(1) Is the settlement a product of serious bargaining among capable, knowledgeable parties?
(2) Does the settlement, as a package, benefit ratepayers and the public interest?
(3) Does the settlement package violate any important regulatory principle or practice?

The Supreme Court of Ohio has endorsed the Commission's analysis using these criteria. *Indus. Energy Consumers of Ohio Power Co. v. Pub. Util. Comm.* (1994), 68 Ohio St.3d 559 (citing *Consumers' Counsel, supra*, at 126).

[6] Armada Power Ex. 17 (Rehberg Direct Testimony) at 1, 2; Tr. IV at 669:7-9, 754:2-5, 802:17-20, 809:6-8.

[7] Armada Power Ex. 17 (Rehberg Direct Testimony) at 1-2.

[8] Tr. IV at 724:20-23, 727:1-2.

[9] Tr. IV at 658:6-9.

Rehberg detailed the deployment of the Armada technology in the PJM Interconnection region and other pilots elsewhere in the United States.[10] No other witness who testified at the hearing has the depth of knowledge or level of expertise regarding the technology and the value and benefits that the Armada Power pilot can provide for grid reliability. Accordingly, Mr. Rehberg's testimony, opinions and proposed pilot deserve substantial weight.

1. The technology of Armada Power's water heater controllers.

Mr. Rehberg deftly explained that the technology and pilot proposal involve a fleet-level deployment of utility-owned hardware that not only controls load, but also includes an integrated revenue-grade meter for accurate measurement and verification down to the single-unit level.[11] The details are as follows:

- The controllers are installed on common water heaters: Water heaters controllers would be installed on the AEP Ohio customers' water heaters, inside the home or business. Eligible water heaters would be standard, resistive electric tank water heaters, which are a common water heater.[12]

- The controllers are sophisticated: The controllers contain a revenue-grade meter that can meet ANSI accuracy standards. The meter was tested in the AEP test lab and meets PJM Interconnection's metering standards. With the hardware, the utility would purchase a license to Armada's proprietary software, thereby receiving real-time data and having control of the fleet of water heaters. (This is in contrast with traditional technology that does not allow the utility to have the same depth of information, such as knowledge of how much charge [hot water] is available or how much device-level performance is achieved.)[13]

- The controllers are durable and secure: The controllers are designed with industry-recognized cybersecurity best practices, and an integrated hardware security chip that stores unique certificates that enables authenticated communications and security controls. The controllers are rated for over four million full load-switching cycles,

[10] Armada Power Ex. 17 (Rehberg Direct Testimony) at 4, 12-13; Tr. IV at 689:23-25, 852:3-12.

[11] Armada Power Ex. 17 (Rehberg Direct Testimony) at 2-3, 12, 14, Tr. IV at 823:23-24, 836:1-7.

[12] Tr. IV at 707:11-12.

[13] Tr. IV at 718:18-19, 23-24, 835: 23-24.

can switch on or off instantly at any time, and do not require compressor cycle times to expire. (This is in contrast with traditional demand response switches that wear out after only a few thousand switches.)[14]

- The software is easy to use: Armada Power's algorithms and technology make it simple for grid operators at the utility to control the water heaters to schedule and configure demand response events, group water heaters to a specific circuit, see data via a dashboard to monitor fleet-level power consumption and status of charges on a real-time basis, see the details of individual water heaters, and respond timely. The system also provides full measurement and verification reports to augment forecasting and performance reporting.[15]

- The software can be stand-alone or integrated: Armada Power's software is a stand-alone technology that does not have to be integrated into AEP Ohio's existing systems to provide benefits and features. If selected, however, the integration is "very partner friendly."[16]

- The software can include additional beneficial capabilities: Armada Power's technology offers additional features and capabilities that can perform advanced grid functions and provide other benefits to the utility and the public, more than what is available through other similar technologies.[17]

To be clear, the Armada technology is not a "smart" technology designed specifically for in-home customer uses. Rather, it is designed to serve the utility's power grid.[18] Additional benefits, however, would be available for the customers who have controllers installed on their water heaters. Several of those benefits are:

- The utility's control over the water heaters is non-invasive because the Armada Power technology directly measures the temperature of water stored in the tank and uses algorithms to minimize customer

[14] Armada Power Ex. 17 (Rehberg Direct Testimony) at 6; Tr. IV at 691:8-10, 696:7-10, 722:5-15.

[15] Armada Power Ex. 17 (Rehberg Direct Testimony) at 5, 11; Tr. IV at 719:12-25, 720:6-7.

[16] Armada Power Ex. 17 (Rehberg Direct Testimony) at 9.

[17] Tr. IV at 710:14-16, 816:2-7.

[18] Tr. IV at 722:5-6. This is distinguishable from other programs originally proposed but later withdrawn by AEP Ohio that were designed to assist customers lower their peak demand, optimize their energy use, and the like. *See* ELCP Ex. 2 at 4, 6.

impact while maximizing performance on the grid. Customers will be largely unaffected.[19]

- If the utility opts to use the customer smart phone app, the customers may exercise some control over their water heater or access usage data and information. Under this option, customers can use a smart phone app to opt-in/opt-out of grid events, and set "away" modes when on vacation which reduces standby losses. The customer can also opt into time-of-day rates and maximize the value of their selected electric supply product, whether received from a competitive retail electric service ("CRES") provider or the utility.[20]

- Customers can receive maintenance alerts for the water heater, such as notification of a failed heating element or, if a leak sensor is included, leaks on/around the water heater.

- The technology turns an existing standard electric water heater into a superior device without the customer purchasing, at a "premium," a smart water heater or a heat pump water heater.[21]

- The customer would not need to pay for the controller and technology, and then receive a refund, like other smart initiatives for customers.

2. The pilot proposal's scope and cost.

Mr. Rehberg also testified regarding the details of the pilot proposal. The pilot is proposed to be implemented in stages, with a minimum goal of 4,000 controllers deployed annually for a period of at least five years such that the pilot would include an initial level of 20,000 controllers.[22] This scope is proposed to be of sufficient scale and ability to benefit AEP Ohio's grid. Additionally, this approach ensures the technology is installed during various grid events and scenarios, and over a sufficient period of time.

[19] Armada Power Ex. 17 (Rehberg Direct Testimony) at 10; Tr. IV at 832:22-833:2.

[20] CRES providers would be able to use the technology too, to support their time-of-use rate offerings. Armada Power Ex. 17 (Rehberg Direct Testimony) at 11-12; Tr. IV at 817:9-11. CRES providers would not directly participate in the pilot with their own technology. Tr. IV at 817:13-16.

[21] Tr. IV at 709:13-710:1.

[22] Armada Power Ex. 17 (Rehberg Direct Testimony) at 14.

Mr. Rehberg estimated the vast majority of the costs associated with the pilot, while acknowledging that some less-significant costs may also be incurred. This pilot would cost approximately $6 million for the controller hardware and a five-year software license if AEP Ohio deploys with Wi-Fi service.[23] It would cost approximately $7.74 million ($6.9 million plus $840,000) for the controller hardware and a five-year software license if AEP Ohio deploys with cellular service.[24] Other less-significant costs would be related to installation, software integration into AEP Ohio's system (if elected), or possible marketing/customer education. Although Mr. Rehberg did not have a cost estimate for installation costs, he testified that installation costs would not be significant since it takes only 15 to 30 minutes to install the controller. Similarly, Mr. Rehberg stated that costs to integrate into any AEP Ohio system would be minimal because, for example, integrating the technology into the PJM Interconnection system involved only approximately one week of engineering time.[25]

Mr. Rehberg also testified that the pilot is cost effective because the cost is significantly less than the investment costs for replacing traditional grid-reliability-related distribution equipment or for purchasing new battery storage equipment.[26] For example, Mr. Rehberg testified that the Armada Power pilot proposal is less than half the cost (on a per-kilowatt-hour basis) of a best-case lithium ion battery. And, the pilot might be even more economical if the current cost projections for lithium ion batteries do not include costs associated with life cycle (which depreciates with each use), installation and needed space/land.[27] AEP Ohio's plans for distribution-related reliability improvements in 2021 also confirm that the proposed pilot is a cost-

[23] Armada Power Ex. 17 (Rehberg Direct Testimony) at 7.

[24] Armada Power Ex. 17 (Rehberg Direct Testimony) at 7-9; Tr. IV at 818:23-25, 819:10-12, 823:13-16.

[25] Armada Power Ex. 17 (Rehberg Direct Testimony) at 8; Tr. IV at 819:20-820:2, 820:22-25, 852:8-12.

[26] Armada Power Ex. 17 (Rehberg Direct Testimony) at 3.

[27] Armada Power Ex. 17 (Rehberg Direct Testimony) at 3.

effective approach for grid reliability. In AEP Ohio's 2021 DIR Work Plan, the majority of the costs estimates for its reliability improvements for calendar year 2021 are greater than the pilot on an annual basis, with some being substantially more costly.[28] And, the pilot's cost would be a small fraction of the nearly $163 million in distribution-related, reliability improvements that AEP Ohio has planned for 2021 under that DIR Work Plan.[29]

B. IT WOULD BE UNREASONABLE AND NOT IN THE PUBLIC INTEREST TO APPROVE THE PROPOSED STIPULATION WITHOUT THE PILOT PROGRAM PROPOSED BY ARMADA POWER.

1. The Commission should not bypass the opportunity to include grid reliability benefits that the Stipulation does not provide.

The purpose of the pilot is to provide data and information on the practicality of addressing grid storage and grid reliability through water heater controllers.[30] The Stipulation does not offer any of the specific grid reliability benefits of the Armada Power technology and pilot proposal that Mr. Rehberg outlined, including droop control,[31] quick discharge, or shifting of load in real time as is done with storage assets. The Stipulation also does not address new technologies for "cold load pick-up," which allows a utility to avoid a spike following an outage and improve the speed of outage recovery – one of the performance measures to which AEP Ohio is subject (SAIDI). The Stipulation also does not offer the ability to use the water heater controllers for information regarding failing equipment and thereby decrease the duration of sustained outages, which is

[28] Armada Power Ex. 13 at 8-9.

[29] Armada Power Ex. 13 at 8-9. The other half of AEP Ohio's 2021 Work Plan includes programs that are identified as having no reliability impact. Altogether, AEP Ohio's 2021 Work Plan has an estimated price tag of more than $340 million. *Id*.

[30] Armada Power Ex. 17 (Rehberg Direct Testimony) at 2.

[31] "Droop control" regulates frequency by adjusting the power output.

measured by SAIDI.[32] In addition, the Stipulation does not address the value that the pilot provides with its real-time data and visibility into the distribution system.[33]

Approval of the Stipulation without also approving the pilot proposed by Armada Power would not be reasonable or in the public interest because these benefits would be foregone. It has been approximately ten years since the last AEP Ohio distribution rate case.[34] The Commission should incorporate new grid technologies into this distribution rate case. All classes of ratepayers of the utility would benefit from the pilot, and participating customers could receive the additional customer benefits. Altogether, the Armada Power pilot fits with the requirements of a distribution case, should be implemented as a component of the DIR that the Stipulating Parties recommend be continued, and should have specifically earmarked funds for distribution system reliability. The Commission should approve the Armada Power pilot as part of a DIR program to invest in the innovation of the Ohio distribution grid by deploying an Ohio invented, manufactured, and installed technology.

2. The Armada Power pilot proposal will explore grid reliability benefits.

a. Armada Power pilot uses technology that promotes grid reliability in multiple ways.

Armada Power's technology employs water heater controllers, combined with Armada Power's proprietary software, to address grid reliability.[35] The water heater control allows for the shifting in time of an electric load with little or no comfort impact to the end user.[36] For residential

[32] Tr. IV at 847:3-9.

[33] Tr. IV at 847:10-13.

[34] *In the Matter of the Application of Columbus Southern Power Company and Ohio Power Company, Individually and if their Proposed Merger is Approved, as a Merged Company (collectively, AEP Ohio) for an Increase in Electric Distribution Rates,* Case Nos. 11-351-EL-AIR et al., Opinion and Order (December 14, 2011).

[35] Armada Power Ex. 17 (Rehberg Direct Testimony) at 1-3.

[36] Armada Power Ex. 17 (Rehberg Direct Testimony) at 10; Tr. IV at 832:22-833:2.

customers, this typically controls the second largest energy load in the residence.[37] The visibility into real-time data, Armada Power's algorithms, and existing thermal insulation present in the water heater tanks collectively allow the utility to benefit from the capabilities of controlling a network of water heaters.[38]

Mr. Rehberg testified that Armada Power's algorithms and technology make it simple for a utility to manage demand at the fleet level and perform advanced grid functions.[39] He identified multiple benefits and grid functions that can be performed by Armada Power's technology:

- "So in regards to things like system reliability, there are a number of factors that come into play. One factor of reliability is the ability for the facility to serve the load as needed. So as you add additional capacity, being able to shift capacity in real time as you would with any storage asset is one of the benefits.

  "Another benefit would be once you do have an outage for whatever reason, something goes wrong, restoring that outage can cause a cold load pickup spike, so it's a synchronizing event where all of the load, where your refrigerator, your neighbor's refrigerator all kick on at the same time. That can exacerbate circuit restoration. And so the Armada Power technology has the ability of holding the water heaters off for a period of time to reduce that return spike which would then reduce your outage restoration time for circuits and make that recovery faster and then have an impact on things like your SAIDI matrix.

  "Another component would be the data you get from the devices, so it's a real-time feed and a real-time visibility out into the distribution system, so you can use that to support a wide range of distribution assets including circuit reconfiguration, Volt/VAR control, as well as in situations where you have system emergencies. If you take a look at pretty much every power system emergency over the last century, operators would like to have more information. So it's another check to make sure that your sensors and such are working across the system.

  "And then finally the components of electricity of balancing supply and demand in real time is also becoming more and more important. So as you add additional distributive resources like renewables, so solar and wind, they need to consume energy, or you need to consume energy then in time

[37] Armada Power Ex. 17 (Rehberg Direct Testimony) at 6.

[38] Armada Power Ex. 17 (Rehberg Direct Testimony) at 3-4, 14.

[39] Armada Power Ex. 17 (Rehberg Direct Testimony) at 12.

with when it's being produced, not necessarily when it's being dispatched. So having a low cost, flexible storage system like this on your system would then also improve your balance between supply and demand as well."[40]

- "Yes, absolutely [the technology can be used to assist constrained circuits]. So in a number of ways one would be the -- the load-shifting capabilities, so if you're near your capacity, but another benefit would be there's a concept called 'conservation voltage reduction' that's being deployed in many places. One of the challenges with that is as you begin dropping the voltage to reduce energy consumption on the circuit, you still have to maintain ANSI delivery limits, so by supplementing the data you get from end-of-line circuits with measurement points that you would take across the system with controllers on water heaters, you could then possibly approach the bottom end of that margin easier without going over it; thus, causing yet another efficiency gain for your system."[41]

- "[The technology] can indirectly [address the system average interruption frequency index ("SAIFI") index] in that with the data that we collect on the distribution circuit, you can use that to look for additional momentary outages you might have from certain failing equipment and then help crews pinpoint where that equipment might be failing on the circuit a little bit better. So by doing so that would then prevent some amount of sustained outages. And just, you know, to further elaborate, SAIFI would be the frequency index of sustained outages, so how often do you have a sustained outage. So I would say, yes, indirectly by using the data to assist maintenance, you would then have an impact over the long term on something like SAIFI."[42]

Mr. Rehberg's expert testimony was unwavering. The record establishes the multiple ways in which the Armada Power technology will promote grid reliability benefits.

b. Armada Power pilot uses Ohio technology that is proven and secure.

Armada Power is an Ohio-based company that uses Ohio manufacturing. The technology was developed in Columbus, Ohio, by Battelle Memorial Institute, and then was spun out into

[40] Tr. IV at 846:13-848:7.

[41] Tr. IV at 850:1-15.

[42] Tr. IV at 850:17-851:5.

Armada Power.[43] Armada Power is based in Columbus, Ohio, and its water heater controllers are manufactured in Ohio.[44]

Armada Power's technology works. Armada Power's technology was used in demonstration projects and proven through demonstration projects, such as a wind-farming resource in Hawaii, and as a "solar-sponging" resource in Arizona.[45] Armada Power's technology is installed and working in approximately 2,000 units in the PJM territory in Ohio and Virginia.[46] Armada Power also is involved in other pilot programs with utilities in other parts of the country.[47] To be clear, the purpose of the Armada Power pilot is not to test whether the technology will work – it is already a proven technology with thousands of units operating throughout the country.[48] What the proposed pilot is designed to provide is data and information on the practicality of addressing grid storage and grid reliability through water heater controllers.[49]

Armada Power's technology is secure. Security technology has been directly incorporated into Armada Power's technology. Mr. Rehberg explained that unique certificates are burned into the hardware, security chips are included in each device, and only authenticated communications are sent over an encrypted tunnel.[50] These securities measures are the best-in-class.[51] Mr. Rehberg also confirmed that, with the thousands of controllers deployed in the PJM region, there have been

[43] Armada Power Ex. 17 (Rehberg Direct Testimony) at 2.

[44] Armada Power Ex. 17 (Rehberg Direct Testimony) at 1.

[45] Armada Power Ex. 17 (Rehberg Direct Testimony) at 4.

[46] Armada Power Ex. 17 (Rehberg Direct Testimony) at 4.

[47] Armada Power Ex. 17 (Rehberg Direct Testimony) at 4.

[48] Tr. IV at 690:1-13, 699:14-23.

[49] Armada Power Ex. 17 (Rehberg Direct Testimony) at 2. *See also* Tr. IV at 690:4-13, 699:20-23.

[50] Tr. IV at 691:2-15.

[51] Tr. IV at 691:2-4.

no security issues.[52] The record clearly establishes the effectiveness and security of this Ohio-based technology.

c. The pilot would allow AEP Ohio, the Commission and the ratepayers to realize grid reliability benefits because it does not require customer behavior changes and because the comprehensive real-time data will provide accurate results of the pilot.

As discussed earlier, Armada Power's pilot proposal will allow for the realization of multiple grid reliability benefits. Like other distribution grid technologies, the use of the water heater is not subject to customers' comfort-related interference. This means the fleet of water heaters and the data are always available, making water heaters a reliable option for grid control. Armada Power's pilot proposal is not subject to or dependent on AEP Ohio's customers changing their electric usage or even selecting a special electric service rate schedule. AEP Ohio will only have to obtain customer consent to access the water heater for installation of the controller. Consumers want hot water when they need it. The proposed technology maintains that basic need while, at the same time, providing grid reliability. As Mr. Rehberg testified, the customers would be largely unaffected.[53]

Unlike the plug-in electric vehicle pilot program included in the Stipulation (*see* Stipulation Section III.E.16 and Schedule PEV),[54] the objectives under Armada Power's proposed pilot program are not dependent on electric consumers changing their behavior. Sara Rafalson testified on behalf of EVgo Services LLC in support of Schedule PEV and stated that "[electric vehicle] charging, particularly when guided by proper rate design such as the Time of Use ('TOU') rates

[52] Tr. IV at 852:3-7.

[53] Tr. IV at 832:22-833:2.

[54] Joint Ex. 1 at 12-13 and at Attachment C, Sheet 270-1.

included in the proposed PEV tariff, can increase the efficiency of the grid, reduce peak load…."[55] However, any grid reliability benefits from Schedule PEV are still wholly dependent on multiple changes being made by customers. For example, under the residential customer component of the PEV pilot, residential customers would have to change when they charge their electric vehicles, have to transition to electric vehicles, and have to affirmatively select the pilot.[56] For the public charging component of the pilot, the public charging stations (customers themselves under the PEV pilot) must have undertaken specific features at the station. They must install specific public station chargers, have installed separate metering and not include any other load sources.[57] They too have to affirmatively select the pilot. Armada Power is proposing a pilot program devoid of such numerous and arduous customer prerequisites – it is a program with a proven and secure technology that does not add load to the grid, but rather would shift load, for instance, in response to electric vehicle charging. The Armada Power pilot primarily focuses on grid reliability and is not dependent on numerous consumers changing their behaviors to achieve the benefits of the pilot.

The pilot will also satisfy the Stipulation's specific criteria for DIR performance, which must be met with data and information. Armada Power's software provides robust data – live data both at a fleet-level and at an individual device level.[58] A revenue-grade meter is contained in each of the controllers, and provides granular reporting – both real-time and historical.[59] This allows for measurement and verification as detailed and as often as the Commission and AEP Ohio

[55] EVgo Ex. 1 at 5. In Armada Power's view, the PEV pilot focuses primarily on growing the electric vehicle market in AEP Ohio's service territory and improving the environment with fewer emissions. Any grid reliability benefits of that pilot are likely tertiary or tangential.

[56] Joint Ex. 1 at Attachment C, Sheet 270-1.

[57] Joint Ex. 1 at Attachment C, Sheet 270-1.

[58] Armada Power Ex. 17 (Rehberg Direct Testimony) at 11.

[59] Armada Power Ex. 17 (Rehberg Direct Testimony) at 15.

needs it. As Mr. Rehberg explained, AEP Ohio will see the data via a dashboard[60] – showing such things as AEP Ohio's use of the controllers, the kilowatts shifted as a result of the utilization of the fleet of controllers, grouping of controllers by circuit, maintenance alerts, outage by unit if one is offline, and time-of-use utilization by customers for electric supply (whether supplied by their CRES provider or AEP Ohio). The data would also provide visibility into the distribution system, and such data can be used to monitor fleet-level power consumption and status of charges, monitor the details of individual water heaters,[61] and support a wide range of distribution grid functions, such as circuit reconfiguration and Volt/VAR control.[62] Armada Power also proposes, using directly measured data to provide quarterly data reports to AEP Ohio and Commission Staff within a few days of the end of each quarter, and such reports would provide additional clarity and transparency regarding the results of the pilot.[63] It is the coupling of controllers with the software (creating the data functions and visibility) that allows the software platform to turn thousands of connected water heaters into flexible energy storage-type devices for the power grid functions and to provide valuable grid insights.[64]

Armada Power's technology is exactly the type of technology that AEP Ohio, the Commission and ratepayers should want to explore through a pilot program to determine the benefits of such technology for AEP Ohio's grid, as the benefits are derived from the technology, will benefit the ratepayers as a whole, and are not only possible after an arduous endeavor of changing customers' behaviors.

[60] Armada Power Ex. 17 (Rehberg Direct Testimony) at 11.

[61] Armada Power Ex. 17 (Rehberg Direct Testimony) at 11.

[62] Tr. IV at 847:10-16.

[63] Armada Power Ex. 17 (Rehberg Direct Testimony) at 15.

[64] Armada Power Ex. 17 (Rehberg Direct Testimony) at 1-2.

d. The pilot program is consistent with and supports Ohio's energy policy.

Ohio law supports exploration via a pilot of the grid reliability benefits of controlling water heater load as Armada Power has proposed. In fact, the pilot proposal is consistent with multiple provisions of Ohio's energy policy. They include R.C. § 4928.02(A), which is the policy to ensure the availability to consumers of reliable retail electric service. Helping with and improving grid reliability via the proposed pilot will have a direct impact on the availability of reliable service for the customers of AEP Ohio.

Also, R.C. § 4928.02(E) states that it is a policy of Ohio to encourage cost-effective and efficient access to information regarding the operation of the distribution system. The pilot will provide robust data and information about the utility's distribution system. Mr. Rehberg affirmed directly:[65]

> Another component would be the data you get from the devices, so it's a real-time feed and a real-time visibility out into the distribution system, so you can use that to support a wide range of distribution assets including circuit reconfiguration, Volt/VAR control, as well as in situations where you have system emergencies.

The pilot will also support the policy in R.C. § 4928.02(J), which is to provide a transparent means of incenting technologies that can adapt successfully to potential environmental mandates. The pilot will include the ability to shift load so that renewable energy (e.g., energy generated from solar, wind, etc.) can be consumed, which assists with balancing electric supply and demand particularly if the supply were to be pursuant to an energy mandate. Finally, the pilot squarely supports R.C. § 4928.02(N), which is to facilitate the State's effectiveness in the global economy. As described earlier, Armada Power is based in Columbus, Ohio, and its water heater controllers are manufactured in Ohio.[66] The technology was even developed in Columbus, Ohio, (at Battelle

[65] Tr. IV at 847:10-16.

[66] Armada Power Ex. 17 (Rehberg Direct Testimony) at 1.

Memorial Institute), and then was spun out into Armada Power.[67] Supporting an Ohio-based technology company and the manufacturer to create a resilient power grid supports facilitating the state's effectiveness in the global economy.

e. Other utilities have pilot programs for water heater controllers.

Other state regulatory commissions, including those in California and Arizona, have approved pilots for water heater controllers to explore the benefits. *See, e.g.,* (i) *Application of Pacific Gas and Electric Company (U 39-E) for Approval of its 2018 Energy Storage Procurement and Investment Plan*, Public Utilities Commission of California Decision 19-06-032 (June 27, 2019) and Resolution E-5073 (January 14, 2021), approving implementation of a new electric water heating thermal energy storage program called WatterSaver Program by Pacific Gas and Electric Company to enable shifting of electric water heating load; and (ii) *In Matter of the Application of Arizona Public Service Company for a Ruling Relating to its 2020 Demand Side Management Implementation Plan*, Docket Number E-01345A-19-0088 before The Arizona Corporation Commission, Decision No. 77763 (October 2, 2020).[68] The Arizona Corporation Commission even approved the pilot program in that state, contrary to the recommendation of its Staff.[69] Importantly, those regulatory commissions recognized the value in learning and exploring the benefits to the distribution grid of a water heater controller pilot.

Mr. Rehberg acknowledged that those pilot programs are different as each utility's system needs differ – for example, solar sponging in the middle of the day in Phoenix or responding to storage-type issues in California.[70] In his words, there are "different value stacks that can accrue

[67] Armada Power Ex. 17 (Rehberg Direct Testimony) at 2.

[68] Armada Power Exhibit 17 (Rehberg Direct Testimony) at 12-13.

[69] Tr. IV at 837:2-9.

[70] Tr. IV at 844:23-25.

depending on the particular jurisdiction you are in, but that's essentially the purpose of the pilot that I proposed is to specifically determine the AEP [Ohio] benefits."[71]

The pilot program proposed by Armada Power need not be a first of its kind in the United States nor be identical to other programs. Rather, the public interest in Ohio would be served and the ratepayers can benefit by the pilot proposed by Armada Power in these proceedings for the AEP Ohio service territory.

3. Potential arguments against Armada Power's technology or pilot proposal do not withstand scrutiny.

a. Armada Power's technology does not pose any credible cybersecurity concerns, as such technology incorporates advanced security features, is proven on the PJM system and would not be connected to other distribution technology hardware of AEP Ohio.

Armada Power's technology is secure. Cybersecurity is not an issue with Armada Power's technology or the proposed pilot for several reasons: the technology includes multiple best-in-class countermeasures, Armada Power's team has extensive experience with developing sound countermeasures, the technology has been tested and used around the country and even in the PJM Interconnection territory, and there have been no security issues. Mr. Rehberg provided uncontroverted testimony explaining this. First, Mr. Rehberg explained the importance of cyber security to Armada Power, the experience of its team, and the multiple steps it has taken to ensure that its technology is secure:[72]

> Well, we take cybersecurity extremely seriously; that's why we've engineered a number of countermeasures that are **best-in-class** in our device.
>
> A number of the team members that have been and are part of Armada Power used to do projects for the Department of Defense at Battelle, so we incorporated a lot of those learnings. So all of our devices have a unique certificate burned into [the] hardware, a security chip on board each device,

[71] Tr. IV at 690:9-13. *See also* Tr. IV at 690:20-23, 845:1-5.

[72] Tr. IV at 691:2-15, emphasis added. *See also* Tr. IV at 696:7-10, 705:11-12, 711:10-14, 852:3-7.

> so every single communication is both authenticated to be sure that it's a genuine device as well as sent over an encrypted tunnel; so, to our knowledge, that's an extremely high bar of cybersecurity countermeasures.

Mr. Rehberg reaffirmed in the following additional exchange on cross-examination that the high level of cybersecurity with Armada Power's technology is a non-issue:[73]

> Q. Would AEP [Ohio]'s lack of testing of the Armada device to ensure it complies with AEP [Ohio]'s security protocols be a reasonable grounds for AEP [Ohio] to have concerns about adopting this pilot program?
>
> * * *
>
> A. No. And the reason why is that when you are doing [an] engineering analysis for system integration cybersecurity, what you are looking for is essentially adherence to industry best practices and standards, so things like TLS/SSL encryption, AES, these are known quantities in the cybersecurity world as being effective countermeasures for cybersecurity.
>
> So if they would like to verify that our technology implements it as stated, I think that's reasonable, but since the product is implementing those countermeasures I don't think it's -- I believe the way you stated it was would it be reasonable for them to not install, I disagree with that point….

A second reason why security is a non-issue is that AEP has already allowed Armada Power's controllers to be tested in AEP's facilities. Mr. Rehberg explained that Armada Power used AEP's own test lab to verify the controllers for PJM's metering standard.[74] A third reason why security is a non-issue is that other utilities, too, have already tested Armada Power's controllers for compliance with cybersecurity protocols.[75] Thousands of the controllers are currently in place and in commercial operation. In particular, Armada Power's technology is

[73] Tr. IV at 697:3-698:3.

[74] Tr. IV at 835:6-8.

[75] Tr. IV at 696:18-695:2.

already deployed on the PJM system, and Mr. Rehberg confirmed that there have been no issues regarding cybersecurity.[76]

A final reason why security is a non-issue is that the water heater controllers are not directly connected to other distribution hardware of the utility. As Mr. Rehberg explained by way of example, there is not "a path from a water heater into a smart recloser or something like that."[77] Consequently, the evidence of record is that there would be no increased risk of a cyberattack on the distribution grid or of a grid reliability disruption if AEP Ohio connected a fleet of Armada Power's water heater controllers. Mr. Rehberg's unchallenged testimony establishes the Armada Power technology is safe and proven. The record clearly establishes the effectiveness and security of the Armada Power technology.

b. The option to rely on Wi-Fi for connecting the controllers is a reasonable option.

Mr. Rehberg acknowledged that, if the controllers are connected through Wi-Fi, the customer may interrupt that connection if the customer were to disconnect their Wi-Fi or if the customer changes a Wi-Fi password.[78] Actual experience, however, has shown that the customers' Wi-Fi has been a reliable approach, in particular because customers change their Wi-Fi passwords infrequently.[79] Any remaining concern, however, is easy resolved with the other option presented by Mr. Rehberg – the controllers can be connected through cellular service, which option avoids any minor issues that may arise from the use of a Wi-Fi connection.

[76] Tr. IV at 852:3-7.

[77] Tr. IV at 704:15-23.

[78] Armada Power Exhibit 17 (Rehberg Direct Testimony) at 8, 10; Tr. IV at 834:12-15.

[79] Tr. IV at 834:6-8.

c. The costs of Armada Power's pilot have been explicitly set forth, along with opinions on ancillary costs based on prior experience.

Armada Power has very clearly set forth the cost of its pilot and also identified some ancillary items that are not included in such costs. The water heater controllers would be utility-owned. Twenty thousand Wi-Fi connected controllers, each with a five-year software license for the Armada Power software, would cost approximately $6 million.[80] Twenty thousand cellular-enabled controllers, each with a five-year software license for the Armada Power software, would cost approximately $7.74 million, which is the sum of $6.9 million for the controllers and license plus the cellular service costing an additional estimated $42 per annum per unit.[81] If elected, AEP Ohio would incur minimal additional technology costs to integrate the Armada Power software, as it took only a week of engineering to integrate Armada Power's technology into the PJM system.[82] Installation of the water heaters was not included in the prices set forth above, but would not be costly either because it takes only about 15 to 30 minutes to install one of its water heater controllers and Armada Power can provide installation services if AEP Ohio prefers to contract out the installations.[83]

d. The Distribution Investment Rider can and should be used to recover the costs of the pilot.

The DIR is an appropriate mechanism for recovering the costs of Armada Power's pilot for three reasons. First, the DIR will be continued if the Stipulation is adopted. The Stipulating Parties propose that the DIR continue.[84] They have agreed to caps on the DIR recovery over a 41-month period (January 2021-May 2024) to the tune of hundreds of millions of dollars, and even more

[80] Armada Power Ex. 17 (Rehberg Direct Testimony) at 7.

[81] Armada Power Ex. 17 (Rehberg Direct Testimony) at 7-8; Tr. IV at 819:10-12.

[82] Armada Power Ex. 17 (Rehberg Direct Testimony) at 4, 9; Tr. IV at 852:8-12.

[83] Armada Power Ex. 17 (Rehberg Direct Testimony) at 8.

[84] Joint. Ex. 1 at 6-8. *See also* AEP Ohio Ex. 6 at 6.

millions if AEP Ohio's performance under the SAIDI standard meets certain levels. Those caps are well above the cost of the pilot. Specifically, the Stipulation provides:[85]

Time Period	Stipulated DIR Cap Amount
Calendar Year 2021	$57 million
Calendar Year 2022	$91 million, but subject to increase to $96 million if the 2021 reliability standard is met in 2021.
Calendar Year 2023	$116 million, but subject to increase to (a) $121 million if both the 2021 and 2022 reliability standards are met in those years; and (b) $126 million if the 2022 reliability standard is met in 2022.
January - May 2024 (5 months)	$51.25 million, but subject to increase to (a) $53.25 million if the 2023 reliability standard is met; (b) $55.25 million if the 2021, 2022, 2023 reliability standards are each met in 2021, 2022 and 2023 as applicable; and (c) $57.25 million if both the 2021 and 2022 reliability standards are met in each of those years as applicable.
Total	$315.25 million - $336.25 million

Second, the purpose of the pilot is consistent with the purpose of the DIR and the measurements related to meeting that purpose. Mr. Rehberg testified that the purpose of Armada Power's pilot is to provide AEP Ohio and the industry with data and information on the practicality of addressing grid storage and grid reliability through water heater controllers.[86] He also testified that, among other things, the Armada Power technology can be used to support distribution assets such as circuit reconfiguration and Volt Var control.[87] As explained by the Commission in 2018, the DIR:[88]

> … facilitates the timely replacement of aging infrastructure, improving and maintaining service reliability; supports the installation of gridSMART technologies, including automated meter infrastructure, volt/VAR

[85] Joint Ex. 2 at 6.

[86] Armada Power Ex. 17 (Rehberg Direct Testimony) at 2.

[87] Tr. IV at 847:10-21; Armada Power Ex. 17 (Rehberg Direct Testimony) at 5.

[88] *In the Matter of the Application of Ohio Power Company for Authority to Establish a Standard Service Offer Pursuant to R.C. 4905.143 in the Form of an Electric Security Plan*, Case Nos. 16-1852-EL-SSO et al., Opinion and Order at ¶189 (April 25, 2018) (*ESP IV*).

> optimization, and distribution automation circuit reconfiguration; and will serve as the foundation for the installation of other advanced technologies in the future.

These purposes are entirely consistent with one another. Mr. Rehberg confirmed that the Armada Power pilot would fit with existing reliability measurements too. He specified that the Armada Power technology can affect the SAIDI by "holding the water heaters off for a period of time to reduce that return spike which would then reduce your outage restoration time for circuits and make that recovery faster and then have an impact on things like your SAIDI matrix."[89] The data collected through Armada Power technology can also help pinpoint failing equipment and prevent sustained outages, and thereby indirectly have an impact on the SAIFI.[90]

Third, the Armada technology is consistent with AEP Ohio's DIR Work Plan in general and fits within specific components. AEP Ohio's DIR Work Plan for 2021 focuses on proactive system infrastructure replacement and reliability improvements for customers:[91]

> Overall, the Plan is developed to provide a more proactive replacement plan that will maintain or improve reliability to customers.
>
> * * *
>
> [T]he goal is to prevent the outages that may occur in the future from happening. This is a proactive approach to ensure that things working now will continue to work and no further degradation of the system will result in further outages.

Similarly, Mr. Rehberg's unchallenged testimony establishes that Armada Power's pilot likewise would be a proactive plan to improve reliability, including through means of preventing outages

[89] Tr. IV at 847:3-9.

[90] Tr. IV at 850:17-851:5.

[91] Armada Power Ex. 13 at 3, 6.

from occurring and ensuring that the grid continues to work. And, AEP Ohio's 2021 Work Plan includes a variety of programs:[92]

Distribution Circuit Asset Improvement Includes Small Wire Replacement	Pole Reinforcement
Cutout & Arrester Program	Underground Duct and Manhole Facilities Rehab
Animal Mitigation - Station	Station Rebuild / Rehab Network Capacity
Lightning Mitigation	Capacity Additions
Underground Cable Rehab	Integrated Volt Var Systems
OVHD Circuit Inspection Repair Program	Customer Service Work
Station Breaker Replacement	Third Party Work Requests
Distribution Asset Improvement Associated w/ Transmission Work	Public Project Relocation
Pole Replacement	Service Restoration
Line Reclosers Maintenance	Forestry
Sectionalizing	Transformer Blanket
URD Remediation Program	Engineering & Field Line
Network Rehab	Customer Meter Blanket
Station Regulator Replacements	Revenue / Reimbursements
Targeted Danger Trees	Other

A review of the Work Plan demonstrates that Armada Power's technology falls within several components, including the following as described in the AEP Ohio Work Plan:[93]

- Sectionalizing: "This program is designed to enhance the over current protection scheme, operation of Distribution system and reduce the number of customers affected by an outage. It includes the installation/upgrade of sectionalizing devices on circuits, shortening of protection zones and providing additional isolation points. Approximately 41 circuits will be targeted in 2021 for work under this sectionalizing program." The estimated cost for 2021 is $2,466, 232.

- Integrated Volt Var Systems: "This program provides improved efficiency through voltage optimization. The program's primary focus is to reduce electrical demand and/or accomplish energy conservation." The estimated cost for 2021 is $0.

- Customer Service Work: "This component is for work necessary for providing customers electric service in AEP Ohio. It includes capital

[92] Armada Power Ex. 13 at 9-10.

[93] Armada Power Ex. 13 at 9-10.

dollars for providing service to new customers, as well as upgrades to existing commercial, industrial and residential customers." The estimated cost for 2021 is $41,593,000.

- Service Restoration: "This component includes day to day work for service restorations which are excluded from the major event category of outages. This would include capital dollars for such things as equipment replacement from an outage and capital dollars associated with minor storm events." The estimated cost for 2021 is $12,266,263.

Mr. Rehberg affirmed why the Armada Power technology supports multiple components in AEP Ohio's 2021 DIR Work Plan.[94] For instance, the Sectionalizing DIR component in AEP Ohio's 2021 DIR Work Plan is meant to reduce SAIFI.[95] The data collected by Armada Power's technology can be used to detect momentary outages that are indicators of failing equipment that contribute to sustained outages measured by SAIFI.[96] Next, the data collected from Armada Power's technology supports other distribution assets including circuit reconfiguration and Volt Var control.[97] Also, Armada Power's technology has the ability to support the capacity component in the 2021 Work Plan because the water heater controllers would allow the utility to shift capacity in real time to support additional load.[98] A final example is the service restoration component in the 2021 DIR Work Plan because Armada Power's technology has the ability of holding the controlled water heaters off for a period of time in the initial cold load pick-up following an outage, which in turn reduces outage restoration times for circuits and decreases risk of tripping out up-stream protection.[99]

[94] Tr. IV at 848:12-21.

[95] Armada Power Ex. 13 at 9.

[96] Tr. IV at 850:14-851:5.

[97] Tr. IV at 847:10-21; Armada Power Ex. 17 (Rehberg Direct Testimony) at 5.

[98] Tr. IV at 846:15-21.

[99] Tr. IV at 846:10-847:9; Armada Power Ex. 17 (Rehberg Direct Testimony) at 3.

The Armada Power pilot does not expand the purpose of the DIR. Staff witness Krystina Schaeffer admitted that she has limited familiarity with AEP Ohio's DIR Work Plan.[100] In her testimony, Ms. Schaeffer cited to a Commission decision in the AEP Ohio ESP II case from 2012 with a footnote citation to pre-filed direct testimony of a AEP Ohio witness in that proceeding.[101] That decision makes no mention that DIR investments are only limited to certain FERC accounts. Ms. Schaeffer also did not recall the Commission's subsequent statement in *ESP IV* explaining the broader purpose of the DIR:[102] As explained by the Commission in 2018, the DIR:[103]

> … facilitates the timely replacement of aging infrastructure, improving and maintaining service reliability; supports the installation of gridSMART technologies, including automated meter infrastructure, volt/VAR optimization, and distribution automation circuit reconfiguration; and will serve as the foundation for the installation of other advanced technologies in the future.

Ms. Schaeffer's also testified that Staff does not object to the pilot technology.[104] The record establishes that Armada Power's technology provides grid reliability benefits. Armada Power's pilot is consistent with the purpose of the DIR and with the purpose of the Work Plan and multiple components as proven in the record, and meets the 2018 Commission decision. The pilot will not expand the scope of the DIR because Armada Power's technology falls within the purpose and scope of the DIR, as well as the DIR Work Plan.

The Stipulating Parties' agreement for AEP Ohio to provide certain data reporting (*see* Stipulation Section III.C.6) would not be jeopardized with adoption of the pilot either. The technology has the capabilities to support and provide the same DIR data/reporting to which AEP Ohio committed. Specifically, the technology can provide/support information regarding: (a)

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[100] Tr. II at 315:9-11.

[101] Staff Exhibit 4 (Schaeffer Direct Testimony) at 3, footnote 3.

[102] Tr. II at 314:12-315:5.

[103] *ESP IV*, Opinion and Order at ¶189 (April 25, 2018).

[104] Staff Exhibit 4 (Schaeffer Direct Testimony) at 2-3.

circuit(s) impacted; (b) number of hours; (c) description of issue(s) being addressed; (d) outage history; (e) work completed; (f) whether equipment is new or replaced; (g) if available, the age and manufacturer of original equipment that is replaced; (h) if new, purpose of install; (i) expected reliability improvement; (j) how improvement will be measured and (k) circuit design capacity in megawatts, where available.

In sum, the Stipulation recommends continuation of the DIR with specific capped amounts and DIR-related information reporting.[105] Armada Power's proposed pilot falls within the purpose of the DIR and within components of AEP Ohio's 2021 DIR Work Plan and should be funded with DIR funds.[106] Armada Power's proposed pilot will also allow AEP Ohio to satisfy the stipulation data/reporting terms related to the DIR. For purposes of clarity, Armada Power is not advocating for an increase in the DIR caps set forth in the Stipulation.

III. CONCLUSION

Even though the Stipulating Parties recommend that the Commission resolve these proceedings on the terms of the Stipulation alone, the ratepayers and the public interest deserve more. Armada Power's pilot offers a unique opportunity for added grid reliability benefits. The technology uses control, data and information to provide advanced grid functions. These functions include: shifting load in real time to avoid "rebound peaks" after an outage or demand response event; avoiding a spike following an outage and improving the speed of outage recovery ("cold load pick-up spike") which can improve the SAIDI score; providing real-time voltage data, which provides visibility into circuit reconfiguration, VoltVar control, and emergency situations; shifting load so that renewable energy can be consumed, which assists with balancing electric supply and demand; and reducing capacity constraints on circuits.

[105] Joint Ex. 1 at 6.

[106] Tr. IV at 715:18-21, 825:1-5.

The pilot does not rely on customers purchasing special equipment or special services, it does not rely on changing customer behavior and it does not have a high price tag. This pilot, deployed at a fleet-level over a five-year period, would allow AEP Ohio to perform grid-related functions that can allow it to defer more expensive distribution facility replacements, and defer investments in other costly equipment. An analysis of the benefits of Armada's proven technology versus potential objections clearly weighs in favor of the pilot and illustrates why it is neither reasonable nor in the public interest to approve the Stipulation without also approving Armada Power's pilot. Finally, Armada Power's innovative technology and pilot fit within Ohio law and policy, they match with existing DIR programs, the purpose of the DIR, and stipulated DIR reporting requirements. As a result, Armada Power's pilot should be approved with a directive to implement with cost recovery under the DIR.

Respectfully submitted,

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CERTIFICATE OF SERVICE

The Public Utilities Commission of Ohio's e-filing system will electronically serve notice of the filing of this document on the parties referenced on the service list of the docket card who have electronically subscribed to the case. In addition, the undersigned certifies that a courtesy copy of the foregoing document is also being served (via electronic mail) on the 14th day of June 2021 upon all persons/entities listed below:

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