ENVIRONMENTAL LAW & POLICY CENTER
Protecting the Midwest's Environment and Natural Heritage

June 27, 2018

Ms. Barcy F. McNeal
Docketing Division Chief
Public Utilities Commission of Ohio
180 East Broad Street
Columbus, Ohio 43215

RE: PUCO Case Nos. 17-32-EL-AIR, 17-33-EL-ATA, 17-34-EL-AAM, 17-872-EL-RDR, 17-873-EL-ATA, 17-874-EL-AAM, 17-1263-EL-SSO, 17-1264-EL-ATA, 17-1265-EL-AAM

Dear Ms. McNeal:

Enclosed please find the Direct Testimony of Mark Higgins on behalf of Environmental Law & Policy Center ("ELPC"). ELPC electronically filed this testimony in PUCO Docket No. 17-1263-EL-SSO and served it to the parties via e-mail on June 25, 2018, consistent with the procedural schedule for this consolidated proceeding, but inadvertently failed to file the testimony in all of the consolidated dockets. Accordingly, please accept the attached testimony for filing in PUCO Docket Nos. 17-32-EL-AIR, 17-33-EL-ATA, 17-34-EL-AAM, 17-872-EL-RDR, 17-873-EL-ATA, 17-874-EL-AAM, 17-1264-EL-ATA, and 17-1265-EL-AAM.

Sincerely,

/s/ Madeline Fleisher
Madeline Fleisher
Environmental Law & Policy Center
Mfleisher@elpc.org

Attachment

cc: Service List, Case Nos. 17-32-EL-AIR, 17-33-EL-ATA, 17-34-EL-AAM, 17-872-EL-RDR, 17-873-EL-ATA, 17-874-EL-AAM, 17-1263-EL-SSO, 17-1264-EL-ATA, 17-1265-EL-AAM

BEFORE
THE PUBLIC UTILITIES COMMISSION OF OHIO

In the Matter of the Application of Duke Energy Ohio, Inc. for an Increase in Electric Distribution Rates.	)	Case No. 17-32-EL-AIR
In the Matter of Application of Duke Energy Ohio, Inc. for Tariff Approval.	)	Case No. 17-33-EL-ATA
In the Matter of the Application of Duke Energy Ohio, Inc. for Approval to Change Accounting Methods.	)	Case No. 17-34-EL-AAM
In the Matter of the Application of Duke Energy Ohio, Inc., for Approval to Modify Rider PSR	)	Case No. 17-872-EL-RDR
In the Matter of the Application of Duke Energy Ohio, Inc., for Approval to Amend Rider PSR	)	Case No. 17-873-EL-ATA
In the matter of the Application of Duke Energy Ohio, Inc., for Approval to Change Accounting Methods	)	Case No. 17-874-EL-AAM
In the Matter of the Application of Duke Energy Ohio, Inc. for Authority to Establish a Standard Service Offer Pursuant to Section 4928.143, Revised Code, in the Form of an Electric Security Plan, Accounting Modifications and Tariffs for Generation Service.	)	Case No. 17-1263-EL-SSO
In the Matter of the Application of Duke Energy Ohio, Inc., for Authority to Amend its Certified Supplier Tariff, P.U.C.O. No. 20.	)	Case No. 17-1264-EL-ATA
In the Matter of the Application of Duke Energy Ohio, Inc., for Authority to Defer Vegetation Management Costs.	)	Case No. 17-1265-EL-AAM

DIRECT TESTIMONY OF MARK HIGGINS
ON BEHALF OF ENVIRONMENTAL LAW AND POLICY CENTER

Filed: June 25, 2018

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EXHIBITS

I. INTRODUCTION

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

A. My name is Mark Higgins. I am the Chief Operating Officer of Strategen Consulting, LLC. My business address is 2150 Allston Way, Suite 210, Berkeley, California 94704.

Q. Please summarize your professional and educational background.

A. I am currently the leader of Strategen's consulting team and oversee the firm's overall operations. Strategen's team is globally recognized for its thought leadership and deep expertise in grid modernization and new grid technologies, including distributed and centralized renewable energy, energy storage, and smart grid technologies. During my time at Strategen, I have personally overseen numerous client engagements, encompassing: electric vehicle ("EV") infrastructure proceedings; market design for distributed energy resources ("DER"); transactive energy; utility renewable energy customer program design; and a variety of corporate strategy engagements in the EV, renewable energy, and energy storage space.

Before joining Strategen in 2014, I held the position of Principal, ISO Relations and FERC Policy at Pacific Gas & Electric Company ("PG&E"). In that role, I led PG&E's work in key policy areas, including interconnection and transmission planning, and supported initiatives in a variety of other policy areas, such as energy storage, energy efficiency, demand response ("DR"), and solar energy. Prior to my work at PG&E, I held the position of Director, Utility West at SunEdison, where I led a portfolio of more than a gigawatt of renewable energy development assets in the Western U.S. I've also held previous roles in private equity, venture capital, and investment banking. I have a Master

of Pacific International Affairs from the University of California, San Diego, focused on International Economics and a Bachelor of Arts in Government from the University of Notre Dame. A full resume is attached as Exhibit 17-1263-MH-1.

Q. On whose behalf are you testifying?

A. I am testifying on behalf of the Environmental Law & Policy Center ("ELPC"). ELPC is the Midwest's leading public interest environmental legal advocacy organization.

Q. Have you ever testified before the Public Utility Commission of Ohio ("the Commission")?

A. No, I have not. However, I have testified before the Massachusetts Department of Public Utilities on an EV infrastructure proceeding. I have also represented numerous other clients by providing input for a wide range of proceedings and stakeholder processes in the electric power sector at state public utilities commissions, at the Federal Energy Regulatory Commission, and at the California ISO.

Q. What is the purpose of your testimony?

A. My testimony will address the provision in the April 13, 2018 Stipulation and Recommendation ("Stipulation") regarding the proposal by Duke Energy Ohio ("Company") for a pilot distribution energy battery storage system ("Battery System"). My testimony will examine the evaluation process used by the Company in proposing this pilot, provide context around best practices for evaluating non-wires solutions across the country, present a recommendation for an evaluation framework for non-wires

solutions, and assess the Company's proposed Battery System based on the recommended evaluation framework.

Q. Please further detail your experience with grid planning and the role of non-wires solutions.

A. I have worked on grid planning and non-wires solutions in several capacities, including:

- On behalf of Puget Sound Energy, I developed a methodology to evaluate energy storage as a non-wire solution for a transmission capacity deficit. The evaluation was conducted as part of an alternatives assessment for a large 230kV upgrade in an urban area. This was a first of its kind effort to look at the technical feasibility and cost-effectiveness for such a large application.
- On behalf of the Australian Energy Market Operator, which operates Australia's National Energy Market, I conducted a survey of global best practices for coordination between Transmission System Operators and Distribution System Operators and system architecture for enabling a high DER grid.
- On behalf of Energy Networks Australia and CSIRO, Australia's national research institution, I developed a white paper evaluating different price formation models for new grid technology and DER, system architecture and DER management platforms, and distribution-level market design to enable value stacking of services from DER. This report was used as an input that informed Australia's national Electricity Network Transformation Roadmap.

Q. How does your testimony relate to PowerForward, the grid modernization proceeding initiated by the Commission?

A. The PowerForward proceeding is putting the state of Ohio at the forefront of grid modernization leadership. The PowerForward process has focused on identifying "technological and regulatory innovation, to enhance the consumer electricity experience."[1] The intent of my testimony is to identify modifications to the Company's Battery System proposal that will complement that focus by providing a foundation for future innovation in electric distribution system planning, specifically non-wires solutions. Non-wires solutions – including battery storage but also demand response, energy efficiency, distributed generation, and other resources – can meet distribution system needs by deferring or replacing traditional wires solutions to the same system needs. For example, a utility could run a geographically targeted demand response or energy efficiency program to mitigate projected load growth that would otherwise cause a capacity constraint requiring a distribution system upgrade.

Since the Company proposes to use its Battery System as a non-wires solution to address distribution system needs, my testimony is aimed at helping the Commission to evaluate the Company's decision-making process and guide the development of a pilot that will produce useful information and learnings to support PowerForward's next steps, instead of proceeding wholly outside the Commission's overall grid modernization efforts, in order to maximize benefits to ratepayers and the public.

[1] WHAT IS POWERFORWARD, PUCO https://www.puco.ohio.gov/industry-information/industry-topics/powerforward/powerforward-faq/what-is-powerforward.

Q. Please summarize your findings and recommendations.

A. Overall, my conclusion regarding the Company's Battery System proposal is that it lacks the framework needed to produce information and lessons learned that could substantively inform development of a future non-wires solutions process in Ohio. Accordingly, my recommendations can be summarized as follows:

In this proceeding:

(1) The Commission should require the Company to work with a stakeholder collaborative group to develop a framework to screen, evaluate, solicit and procure potential non-wires solution projects;

(2) The Commission should evaluate the Company's proposed pilot project through that framework before any project approval, and should approve the Battery System only if the Company demonstrates that it meets the objectives established in Ohio Revised Code 4928.02 and if the Company commits to applying lessons learned from the Battery System toward developing a robust non-wires solutions process; and

(3) The Company should be required to periodically report on the procurement and performance monitoring aspect of the project as the pilot progresses.

In the long term:

(4) The Commission should establish an integrated electric distribution system planning process for utilities as part of the PowerForward process in order to ensure the most cost-effective outcome for future non-wires solutions consistent with Ohio state policy; and

(5) The Commission and Ohio's electric distribution utilities should use learnings from the Company's pilot project to inform and adjust the methodologies and procurement frameworks developed in PowerForward.

II. BACKGROUND AND CONTEXT OF THE COMPANY'S PROPOSED DISTRIBUTION ENERGY BATTERY STORAGE SYSTEM

Q. Please describe the Company's proposed Battery System.

A. The Company is proposing a distribution-level lithium-ion battery energy storage system of approximately 10 megawatts. The Company has indicated that the Battery System will be located in southwest of the Company's service territory[2] and will cost close to $20 million.[3] The Company has provided few additional details related to the proposed Battery System. Based on the Company's direct testimony and responses to parties' discovery requests, the Company has yet to select the exact location of the Battery System,[4] and has not yet determined the projected benefits and costs of the proposal[5] or even the methodology for such a benefit-cost analysis.[6]

Q. What is the Company's stated purpose for the proposed Battery System?

A. The Company seeks to gain operational knowledge on energy storage and to confirm the value energy storage can provide to the electric grid. The Company will primarily use the Battery System for distribution system benefits such as backup power.[7] The Battery System could also potentially delay protracted distribution station maintenance.[8] The

[2] Kuznar Dir. Test. 2:16-18 (June 1, 2017).The Company filed this testimony as part of its original application in Case Nos. 17-1263-EL-SSO *et al.*, rather than in support of the Stipulation. However, after the filing of the Stipulation including the Battery System proposal, the Company stated that "Duke Energy Ohio plans to continue with its original storage system proposal" from that application. ELPC-INT-01-001(a). (Exhibit 17-1236-MH-8).
[3] Kuznar Dir. Test.5:5.
[4] ELPC-INT-01-025(d). (Exhibit 17-1236-MH-8).
[5] ELPC-INT-01-001(b). (Exhibit 17-1236-MH-8).
[6] ELPC-INT-01-005(a). (Exhibit 17-1236-MH-8).
[7] Kuznar Dir. Test. 4:8-12.
[8] Henning Dir. Test, 21:22-22:2 (June 1, 2017).

Company will also test the Battery System in the frequency regulation market of PJM Interconnection, L.L.C. (PJM).[9]

Q. Did the Company utilize a framework or criteria to evaluate the proposed Battery System?

Based on the Company's direct testimony and responses to parties' discovery requests, it remains unclear whether the Company relied upon any evaluation framework or criteria to develop its Battery System proposal. The proposed Battery System was not developed in the context of an integrated electric distribution system planning process. The Company does not provide detail on whether the proposed Battery System will provide a solution to a distribution system need based on a comprehensive evaluation framework that encompasses the full range of non-wires solutions. The most detailed criteria offered by the Company is in response to ELPC-INT-01-025(d), where witness Kuznar states that a key factor in the determining the Battery System's location will be a benefit-cost analysis.

Q. What methodology did the Company utilize to assess the benefit-cost ratio of the proposed Battery System?

A. Based on both the Company's direct testimony and responses to parties' discovery requests, the Company has not conducted a benefit-cost assessment of the proposed Battery System. Company witness Kuznar's response to ELPC-INT-01-001(b) indicates that specific values for benefits of the proposed Battery System have not yet been

[9] *Id.* at 3:10-18.

quantified. Witness Kuznar did not provide detail as to what benefits or costs the Company would assess. In response to ELPC-INT-01-005(a), witness Kuznar states that the Company has not identified a modeling tool that will be used.[10] In fact, the Company has yet to collect specific project information necessary to conduct a benefit-cost analysis.[11]

Q. What is your understanding of the process for Commission review and evaluation of the proposed Battery System project?

A. My understanding is that, if the Commission approves the Stipulation, then any review of the project will occur after its implementation based on a prudency standard, rather than through a pre-approval process involving proactive and transparent consideration of best practices for project design. By contrast, I am aware that another Ohio utility, Dayton Power & Light, recently agreed to a settlement requiring pre-approval of battery energy storage projects by the Commission.[12]

[10] ELPC-INT-01-005(a). (Exhibit 17-1236-MH-8).
[11] ELPC-INT-01-008(a). (Exhibit 17-1236-MH-8).
[12] Case Nos. 15-1830-EL-AIR *et al*., Stipulation and Recommendation (June 18, 2018).

III. THE EVOLUTION OF ELECTRIC DISTRIBUTION SYSTEM PLANNING

Q. Please describe the goals of electric distribution system planning.

A. In general, the primary objective of electric distribution system planning is to design and build the distribution system to safely, reliably, and efficiently deliver electricity to customers within acceptable risk tolerances, while meeting policy requirements and evolving customer needs.

Q. Please describe the process of electric distribution system planning.

A. Electric distribution system planning involves a series of tasks to determine the distribution system infrastructure requirements necessary to support the goals described above. The planning functions include: load forecasting; scenario analysis and modeling; system design; power flow modeling; and load usage analysis. Traditionally the planning and operating functions of a utility have been sequential and, to a considerable extent, independent.

Q. How has the process of electric distribution system planning evolved to account for the changing grid?

A. In a recent GridLab white paper prepared in connection with his PowerForward presentation, Curt Volkmann articulated the importance of updating traditional utility distribution planning processes, since "[a]s customers increasingly adopt distributed energy resources such as energy efficiency, demand response, distributed generation, combined heat and power, electric vehicles, and storage, it becomes important for utilities

to proactively determine how to best take advantage of these resources to minimize costs while maintaining service quality."[13] Many jurisdictions are recognizing that need. According to BRIDGE Energy Group's 2018 BRIDGE Index, 73% of U.S. and Canadian utilities surveyed are implementing or currently developing grid modernization plans. Many states are requiring utilities to integrate their distribution planning processes, generally as a subset of grid modernization proceedings. According to a recent report from Lawrence Berkeley National Lab ("LBNL"),[14] there are many reasons why state regulatory agencies and utilities are seeking to make electric distribution system planning processes more methodical and transparent, and among those common reasons is the goal of modifying or replacing conventional methodologies and assumptions to account for and leverage the capabilities of new technologies.

Q. What are examples of jurisdictions across the country that have adopted changes to their electric distribution system planning processes?

A. LBNL[15] compares 16 jurisdictions (15 states, including Ohio, as well as Washington, D.C.) that are currently in the process of evaluating changes to their electric distribution planning processes. While certain states are fairly advanced in their reform processes (California, New York, Hawaii, Massachusetts, and Minnesota), many other states, including several that neighbor Ohio, have also begun grid modernization processes. Similar to Ohio, Illinois has begun a grid modernization proceeding. Illinois, Indiana, and

[13] Curt Volkmann, Integrated Distribution Planning: A Path Forward 4, *available at* https://gridlab.org/publications (last visited June 25, 2018).
[14] *See* A.L. Cooke et al., Distribution System Planning—State Examples by Topic, PACIFIC NORTHWEST NATIONAL LABORATORY 4.1 (May 2018), http://eta-publications.lbl.gov/sites/default/files/dsp_state_examples.pdf.
[15] *See id.*

Pennsylvania allow utilities to collect surcharges if they file distribution plans. While not in the Midwest, Rhode Island serves as an excellent example of a state with significant grid modernization activity underway through an active proceeding. Rhode Island is also particularly advanced in its requirements for utilities to evaluate non-wires solutions.

A sampling of utilities that have been integrating their electric distribution planning processes includes: the Joint Utilities of New York (as part of NY-REV); the three California investor-owned utilities (Pacific Gas & Electric, Southern California Edison, and San Diego Gas & Electric); Hawaii Electric Company (HECO); and Xcel Energy (Minnesota). An example of HECO's integrated electric distribution planning process can be seen in Exhibit **17-1263-MH-2**. An example of the Joint Utilities of New York's distributed system implementation plan (DSIP) framework is provided in Exhibit **17-1263-MH-3**. In Rhode Island, National Grid has been implementing a pilot non-wires solutions program since 2015,[16] and the utility's Efficiency and System Reliability Procurement Plan identifies that the utility will continue to screen for non-wires solutions during the timeframe of its current three-year plan. The utility also plans to develop a heat map via a GIS portal in order to allow members of the public to identify locations where non-wires solutions can be used to reduce or manage load.[17] In North Carolina, another Duke affiliate recently entered into a settlement to begin a $2.5 billion grid modernization pilot.[18]

[16] *See* 2018 System Reliability Report, NATIONAL GRID (Nov. 1, 2017). http://www.ripuc.org/eventsactions/docket/4756-NGrid-SRP2018_11-1-17.pdf (Exhibit 17-1236-MH-8).
[17] *See National Grid 2018-2020 Energy Efficiency and System Reliability Procurement Plan*, NATIONAL GRID 7 (Aug. 30, 2017), www.ripuc.org/eventsactions/docket/4684-NGrid-3-YearPlan(8-30-17).pdf.
[18] *See* Robert Walton, *Duke Agrees to cut North Carolina grid modernization plan by $5.3B*, UTILITY DIVE (June 4, 2018) https://www.utilitydive.com/news/duke-agrees-to-cut-north-carolina-grid-modernization-plan-by-53b/524818/.

Q. Please describe the objectives of an integrated electric distribution planning process.

A. Modernizing the electric distribution planning process often involves developing integrated distribution planning processes that will proactively consider DER in planning the distribution system. The integrated distribution planning process is an important roadmap to ensure that utilities factor DER in to their planning, because it impacts load forecasts, operation, and the capability of the distribution system. Effectively considering DER in an integrated distribution plan will allow utilities to more holistically and effectively assess the modern distribution grid, more effectively integrate DER, harness unique DER attributes, and also minimize duplication of services or system overbuild. An integrated distribution planning process also enables utilities to methodically analyze least-cost, best-fit non-wires DER solutions on an apples-to-apples basis with traditional solutions.

The integrated distribution plan can be broadly broken up into 5 main categories:

1. System Planning, including developing methodologies to plan for and evaluate non-wires solutions
2. System Operation
3. Interdependencies and Timing
4. Stimulating DER
5. Validation

IV. THE NEED FOR UPDATED EVALUATION PROCESSES FOR SOLUTIONS (NON-WIRES VS. TRADITIONAL WIRES) TO MEET SYSTEM NEEDS

Q. How have electric distribution utilities traditionally determined when additional infrastructure is needed on the distribution system?

A. As noted above, distribution utilities have generally had internal planning functions help them determine the distribution system infrastructure requirements. The planning functions include load forecasting, scenario analysis and modeling, system design, power flow modeling, and load usage analysis. Many upgrades are planned in advance; for example, when load forecasts indicate capacity constraints are likely to occur in the near future, or when the useful life of equipment is nearing its end. Historically this process has not required transparency for the general public because the grid operated in a unidirectional manner, and there were few consumers or third-parties that could offer solutions to address the system's needs.

Q. Please define a non-wires solution.

A. Traditionally electricity delivery investments are in the form of "lines and wires" – in other words, basic power equipment designed to transmit power from one place to another. Modern electronics have provided numerous ways to make that traditional infrastructure operate more efficiently. The US Department of Energy Electricity Advisory Committee defines non-wires solutions as "any action or strategy that could help defer or eliminate the need to construct or upgrade a transmission system and distribution sub-stations. . . .The non-wires solution options include, but are not limited

to: demand response, dynamic retail pricing, distributed generation, energy efficiency, application of technologies to expand the capacity of the system, and alternative power dispatch options."[19]

Q. How does a non-wires solution differ from a non-wires alternative?

A. The terms have effectively the same meaning. I choose to call them non-wires solutions rather than "alternatives," because, in the modern grid, I believe non-wires resources should be treated as part of a portfolio of solutions that are considered by system planners, rather than assuming a traditional solution is the default approach that should be taken.

Q. How do non-wires solutions compare to traditional wires solutions?

A. A systematic non-wires solution process, embedded within an integrated distribution planning process, that allows consideration of both traditional and non-wires solution options, may potentially achieve some combination of the following benefits:

- Reduced cost
- Increased competition
- Reduced burden on regulators
- Tracked cost and technology advances
- Stimulated DER and non-wires solutions markets
- Lowered risk of stranded assets

[19] Memorandum from Elec. Advisory Comm. to the Hon. Patricia Hoffman, Assistant Sec'y for Elec. Delivery and Energy Reliability, U.S. Dept. of Energy (Oct. 17, 2012), https://www.energy.gov/sites/prod/files/EAC%20Paper%20-%20Recommendations%20on%20Non-Wires%20Solutions%20-%20%20Final%20-25-Oct-2012.pdf

- Reduced emissions
- Improved reliability

Q. What role do non-wires solutions have in the integrated electric distribution system planning process?

A. Non-wires solutions are a new tool in an integrated distribution planning kit that can be compared side-by-side with traditional solutions. This allows utilities to select the solution that is most efficient and cost-effective for customers and that meets other state policy objectives, regardless of technology characteristics or ownership structures. In the case of Ohio, these policy objectives are established in Ohio Revised Code 4928.02.

Q. What are some examples of how utilities incorporate the assessment of non-wires solutions into their integrated distribution system planning process?

A. HECO's process is shown in Exhibit **17-1263-MH-2**. In step one, multiple scenario forecasts are developed. The outcomes of engineering planning analyses, as seen in Exhibit **17-1263-MH-2** with the green feedback arrow, can define what messages are delivered through stakeholder engagement.

At step two, the engineering results of planning are produced to identify incremental system needs. The engineering results and assumptions at this point can be reviewed with stakeholders. Traditional planning would be sequential, without the green feedback arrow seen in Exhibit **17-1263-MH-2**. However, with the advent of DER, two-way power flows create the potential for non-wires solutions. As such, consideration should be given as to what inputs might need to change at step one to achieve more favorable outcomes at step

two. For example, if the trend in engineering outputs suggest peak demand is driving more investment than in the past, this finding can prompt investigation into whether demand charges or critical peak pricing rates would impact the investments needed.

Step three then takes the outputs of the engineering requirements and considers traditional and non-wires solutions in parallel. Ultimately, non-wires solutions should become just another tool in the kit. When assessed side-by-side, the most efficient, cost-effective option between non-wires solutions and traditional solutions should be selected.

Q. What are the issues in the electric distribution system planning process that non-wires solutions can address?

A. Non-wires solutions can help address reliability issues, lower costs or meet public policy objectives. The most common issue that non-wires solutions address is typically a transmission or distribution capacity constraint. They can also provide power quality services such as voltage and frequency support.

Q. How do non-wires solutions address the issues listed above?

A. In the case of a transmission or distribution capacity constraint, typically non-wires solutions are used to defer or avoid an otherwise needed transmission or distribution line upgrade. Often this is because the non-wires solution (or bundle of solutions) is able to act in a peak-shaving function by reducing power flows at times when such flows would exceed equipment ratings. In the case of power quality issues, typically non-wires solutions would provide automated, instantaneously-responsive service controlled by a utility via an automated dispatch signal.

Q. Please provide an example of how a non-wires solution can improve grid reliability.

A. Non-wires solutions are beginning to be used more frequently for grid reliability functions. There are a wide range of use cases where non-wires solutions can help improve grid reliability and community resiliency. Examples range from energy storage at community centers or critical infrastructure, ensuring reliable power during severe weather, to non-wires solutions avoiding an upgrade of a weak line.[20] Central Maine Power's successful Boothbay pilot project is an excellent example of the latter. The utility used a wide range of non-wires solutions, including efficiency, demand response, and energy storage, to reduce peak load on specific transmission assets that helped the utility avoid an $18 million rebuild of the 34.5 kV line from Newcastle to Boothbay Harbor.[21]

Q. What are the challenges in implementing non-wires solutions?

A. There are several challenges to implementing non-wires solutions. First, electric distribution utilities have decades of experience implementing traditional solutions and require preliminary experience to understand both the procurement process and technical aspects such as timing, risk, and dependability of certain non-wires solutions. There can also be barriers where building traditional infrastructure is rewarded through rate-based cost recovery. Therefore, when utilities avoid building traditional infrastructure or targeted energy usage reductions to avoid a constraint, those utilities can lose revenues

[20] Here in Ohio, a combined solar and storage project in the Village of Minster produced significant distribution benefits for the local utility by avoiding the need for $350,000 of grid upgrades to improve power quality for large industrial customers. *See* K. Kaufman, *A small town in Ohio creates industry buzz with solar plus storage*, SMART ELECTRIC POWER ALLIANCE (May 12, 2016), https://sepapower.org/knowledge/a-small-town-in-ohio-creates-industry-buzz-with-solar-plus-storage/.

[21] *Final Report Boothbay Sub-Region Smart grid Reliability Pilot Project*, GRIDSOLAR, LLC (Jan. 19, 2016), http://www.neep.org/sites/default/files/resources/FINAL_Boothbay%20Pilot%20Report_20160119.pdf.

and potentially returns. It is important to provide a pathway to overcome these obstacles to ensure the benefits of non-wires solutions can be realized for all ratepayers. I will highlight other jurisdictions in this section to identify how they manage and implement non-wires solutions.

Q. Should non-wires solutions always be the preferred solution within an integrated distribution system planning process?

A. No. Non-wires solutions should be one option within a portfolio of options that system planners have available to maintain grid reliability and flexibility. The distribution planning process should enable all options to be evaluated side-by-side such that the most cost-effective and beneficial option is selected, regardless of technology or ownership model.

Q. How have grid planners evaluated non-wires solutions in jurisdictions outside of Ohio?

A. Generally, non-wires solutions processes are developed as part of a broader series of enhancements to distribution planning processes, as discussed in Section III. One of the more advanced process flows, developed by the Joint Utilities of New York, is shown in Exhibit **17-1263-MH-4**.

Typically, the first step is to determine distribution system needs (capacity and timing). Criteria are used as a filter on distribution system capital plans, as they are developed, to determine whether non-wires solutions are suitable to meet a given system need. This ensures sufficient time is available to consider non-wires solution without risking safety

and reliability of the system and that adequate value can be gained from the non-wires solutions. If a non-wires solution fails this filter, traditional solutions are pursued. However, if the non-wires solution passes, the opportunity is defined further, such as a summer capacity need between the hours of 4pm and 8pm, and requests for proposals (RFP) are sought. At any time, however, there may be a need to pursue a traditional solution when a non-wires solution opportunity becomes unviable. An example of suitability criteria developed by the Joint Utilities of New York for non-wires solutions is shown in Exhibit **17-263-MH-5**. The Joint Utilities have begun to consider non-wires solutions in this more systematic way, which ensures consistency, allows for the development of a suite of non-wires solutions, and begins to integrate non-wires solutions into the planning process. The suitability criteria for non-wires solutions facilitates the pursuit of realistic options under a cost threshold, prioritizes more valuable opportunities, and manages volume. Some aspects related to this process are discussed further below.

In Rhode Island, the Public Utilities Commission adopted a set of System Reliability Procurement Standards that establish a procedure and funding mechanism for identification of distributed and customer-side resources to better utilize the existing grid and improve reliability. The standards require that utilities prepare three-year System Reliability Procurement Plans ("SRPP"), incorporating the distribution utility's anticipated scope of non-wires solutions during the 3-year planning period. In addition, the SRPP enables the distribution utility to use non-wires solutions to reduce or manage peak load in cases where distribution infrastructure is either highly utilized, in a physically constrained area, needed for anticipated new load growth, or needed to replace or prolong the life of existing distribution infrastructure. National Grid compares non-

wires solutions in Rhode Island in parallel to traditional solutions using the following criteria:[22]

- Ability to meet the identified system needs;
- Anticipated reliability of the alternatives;
- Risks associated with each alternative;
- Potential for synergy savings based on alternatives that address multiple needs;
- Operational complexity and feasibility;
- Implementation issues; and
- Customer impacts.

Q. How should electric system planners assess when a non-wires solution is the best option for the system needs?

A. Grid planners should follow the best practices identified above. Once an evaluation methodology and filter criteria have been developed, infrastructure needs that pass the filter criteria can be released for solicitation. A non-wires solution would then be selected if it can be delivered in the required timeframe at a price that is below that of the traditional solution identified in the utility's capital plan. If no non-wires solutions are bid at a price that is below the cost of a traditional solution, the traditional solution would be selected.

[22] *See National Grid 2018-2020 Energy Efficiency and System Reliability Procurement Plan*, NATIONAL GRID (Aug. 30, 2017), www.ripuc.org/eventsactions/docket/4684-NGrid-3-YearPlan(8-30-17).pdf.

V. A RECOMMENDED EVALUATION FRAMEWORK TO ASSESS NON-WIRES SOLUTIONS IN FILLING SYSTEM NEEDS

Q. What are the best practices that the Commission should adopt to assess how utilities evaluate non-wires solutions?

A. The Commission should ensure that non-wires solutions are cost-effective versus traditional solutions, and that the most cost-effective non-wires solution is selected, regardless of ownership structure. For this to occur, the Commission should require the utility to take the following actions:

1. Determine what distribution system needs (capacity and timing) exist where non-wires solutions could plausibly meet the need, and develop criteria to determine whether a specific non-wires solution(s) is (are) technically feasible to meet the identified system need;
2. Develop a capital cost estimate for the traditional grid solution to meet the identified system need;
3. Identify and assess any additional system benefits that a non-wires solution could provide and whether those benefits would accrue to the utility or to a third-party;
4. Develop performance requirements and pro forma agreements for third-party non-wires solutions (an extract from ConEdison's non-wires program agreement[23] is shown in Exhibit **17-1263-MH-7**);

[23] *See* NON-WIRES ALTERNATIVES PROGRAM AGREEMENT, CONEDISON, https://www.coned.com/-/media/files/coned/documents/business-partners/business-opportunities/non-wires/non-wires-alternatives-program-agreement.pdf.

5. Conduct a solicitation for non-wires solutions and prepare a utility benchmark cost estimate for the non-wires solutions;
6. Evaluate the cost of each non-wires solution (net of benefits accrued to the utility); and
7. Select the solution with the lowest net cost, and consistent with any relevant legal constraints and policy aims.

Q. How should electric distribution utilities accommodate third-party developed non-wires solutions?

A. There are emerging best practices regarding procurement of third-party non-wires solutions that are taking hold in different states. ICF published a whitepaper highlighting these best practices that utilities should adopt. This includes the following:[24]

- Providing useful customer and system data;
- Providing anticipated device trigger/dispatch and notification requirements;
- Using demonstration projects to explore subsequent commercial terms;
- Giving third-party providers the right amount of lead time;
- Coordinating with other programs and markets;
- Offering vendor pre-qualification processes; and
- Using sample pro forma agreements to explore the optimal commercial standards.

Q. What requirements should third-party developed non-wires solutions be subject to?

[24] *See* Sam Hile et al., Procuring Distribution Non-Wires Alternatives: Practical Lessons from the Bleeding Edge, ICF (2017), https://www.icf.com/resources/white-papers/2017/nwa-utility-procurement

A. Utilities must be able to set requirements for commercial and operational standards that non-wires solutions must comply with to adequately meet distribution system needs. The Joint Utilities of New York have included these standards in respective program agreements,[25] as shown in Exhibit **17-1263-MH-7**. Another example is the recent Preferred Resources Pilot of Southern California Edison, which included agreements specific to each DER technology type.[26] These agreements include, but are not limited to, the following:

- Settlement terms;
- Measurement and verification procedures;
- Reward and penalty clauses;
- Anticipated device trigger/dispatch signals; and
- Notification requirements.

Q. What are the best practices that the Commission should adopt to ensure utility pilot programs in general are successful?

A. Rocky Mountain Institute attempted to answer this question in a recent white paper.[27] Their recommendations are that regulators should:

[25] *See* NON-WIRES ALTERNATIVES PROGRAM AGREEMENT, CONEDISON, https://www.coned.com/-/media/files/coned/documents/business-partners/business-opportunities/non-wires/non-wires-alternatives-program-agreement.pdf.

[26] *See* PRO FORMA PURCHASE AND SALES AGREEMENTS, SCE PRP RFO 2, https://sceprprfo.accionpower.com/_scedgpr_1501/documents.asp?Col=DateDown&strFolder=a.%20RFO%20Documents/iii.%20Pro%20Forma%20Purchase%20and%20Sale%20Agreements%20%5bPSAs%5d/&filedown=&HideFiles=.

[27] *See* Courtney Fairbrother et al., The Role of Pilots and Demonstrations in Reinventing the Utility Business Model (2017), *available at* https://www.rmi.org/insights/reports/pathwaysforinnovation/.

1. Direct utilities to publicly share lessons learned from pilot demonstrations, including recommendations for other utilities and opportunities for improvement, with allowances for intellectual property protection as warranted;
2. Create the expectation that utilities should incorporate lessons learned from across the industry into a project coming before regulators for approval, in order to minimize redundancy in pilots and demonstrations; and
3. Encourage utilities to promote and share their work with other utilities around the country in industry forums.

Utilities should:

1. Seek out relevant learning from other utilities and incorporate lessons learned, or where possible build on others' results to skip the pilot or demonstration phase and move quickly to rolling out a larger program;
2. Develop plans for evaluation, measurement and verification for disseminating pilot results from the outset of project design; and
3. Build collaboration and coalitions with other utilities for sharing best practices.

Q. What role can a well-designed pilot or demonstration project provide in moving Ohio towards an integrated distribution planning process?

A. Grid planning is incredibly complex; therefore, real world experience in the form of pilots and demonstrations can play a valuable role in informing development of optimal approaches. According to Volkmann, "In order for utilities to understand the opportunities and risks in an accelerated DER adoption environment and for their

customers to fully realize the benefits, utilities need to be addressing their planning frameworks and performing analyses, at least on a pilot basis, well in advance."[28]

Q. What criteria should be applied for the utility to determine a suitable pilot project candidate?

A. Suitable pilots should be preliminarily evaluated against the utility's capital infrastructure plan, with potential non-wires solutions evaluated based on: (a) their technical capability to meet the system's infrastructure need; (b) their ability to be completed within the timeframe necessary to meet the need; and (c) cost net of any additional system benefits that the non-wires solution would provide. Projects should be bid out in a competitive solicitation process, and, net of additional system benefits, the lowest cost solution should be adopted.

Q. What criteria should be used to determine if the Company's pilot proposal is meeting its objectives?

A. Given the Company's stated goal of "confirm[ing] the value energy storage can provide to the electric grid" through uses including "distribution upgrade deferral,"[29] the Company must establish an analytical framework in advance of proceeding with the project to ensure the pilot provides a foundation for realizing the value of such non-wires solutions through future, additional projects. This framework should serve as a pilot for how the Company would:

[28] *See* Volkmann, supra note 13.
[29] Kuznar Dir. Test. 3:6-7, 3:12-13.

- Determine the types of distribution system needs that would be eligible for consideration of a non-wires solution;
- Assess the full range of benefits that a specific non-wires solution would provide;
- Compare the benefits and costs of a non-wires solution to a traditional solution;
- Evaluate whether development of a non-wires solution is meeting necessary milestones to meet the infrastructure need;
- Evaluate whether the performance of a non-wires solution is meeting expectations (and whether a third-party solution is meeting its contractual obligations);
- Assess whether the non-wires solution resulted in net benefits to ratepayers; and
- Make adjustments to future non-wires solution procurements to better meet stated objectives.

Q. What will the result of the Company's Battery System project be if the Commission does not adopt these best practices?

A. At best, when pilot and demonstration projects are evaluated using the best practices above, they enable the electric power industry to test a variety of new technologies and business approaches to enabling new technologies that benefit customers and utilities. However, at worst, when pilot projects ignore national and international best practices, taking a "not invented here" approach, they often result in low-value projects that produce little in the way of results or redundant programs that "fail to learn from results from elsewhere in the industry."[30] In this case, the Company has the opportunity to structure this pilot to directly (a) learn from the substantial existing body of knowledge

[30] *See* Fairbrother, *supra* note 27.

on the topic that already exists, and (b) directly inform the practices and regulations developed in the PowerForward process. In order to ensure that outcome, the Commission must ensure this project is not approved as a one-off pilot without appropriate safeguards that ensure it produces useful results that benefit Ohio's consumers.

VI. RECOMMENDATIONS TO THE COMMISSION

Q. How can the Commission evaluate the Company's proposed Battery System?

A. Ideally the Commission would require the Company to adhere to the best practices outlined in Section V. If the Commission needs to conduct a more streamlined evaluation process, I recommend the following:

- Require the Company to establish a benefit-cost analysis that is transparent and consistent with the California Standard Practice Manual.[31]
- Establish that the Company should use the ratepayer impact measure ("RIM") test to compare the cost-effectiveness of projects by potential locations. By selecting the RIM test, the Company must evaluate value streams that align with the perspective of the RIM test.
- Require the Company to determine methodologies and modeling tools needed to calculate the value streams selected. The Company should be transparent about these methodologies and modeling tools and be open to stakeholder input.
- Require the Company, via the framework, to demonstrate that a proposed non-wires solution meets the policy objectives laid out in Ohio Revised Code 4928.02.

Given that one of the primary objectives of the proposal is as an educational pilot, the Commission should modify the Stipulation to require the Company to formally engage with a stakeholder collaborative group to determine best practice design for the pilot

[31] *See California Standard Practice Manual Economic Analysis of Demand-Side Programs and Projects*, California Public Utilities Commission (Oct. 2001), http://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/Utilities_and_Industries/Energy_-_Electricity_and_Natural_Gas/CPUC_STANDARD_PRACTICE_MANUAL.pdf

consistent with the best practices described above. The Commission should also require submission of a detailed project proposal for review and approval, as well as that the utility publicly share the screening and cost-effectiveness methodologies developed by the Company, which should be evaluated by the Commission before the pilot is approved. Finally, the Commission should require the Company to periodically file reports on project results to allow for evaluation of the procurement and performance monitoring aspect of the project as the pilot progresses. This pilot proposal comes at a very timely moment in Ohio's grid modernization efforts and can therefore play an important role in informing the PowerForward process. While we don't yet know the outcome of PowerForward, if it does result in steps toward an integrated distribution planning process in Ohio, the recommended modifications to the Company's Battery System proposal will provide a unique opportunity to ensure the framework and processes developed are effective and best meet Ohio's policy objectives as noted above. Meanwhile, if the Commission leaves the Battery System proposal as it stands today, the Stipulation's lack of any pre-approval process to ensure best practice project design or any periodic reporting requirements will prevent this pilot from effectively informing distribution planning in Ohio going forward.

Q. Going forward, how can the Commission most cost-effectively evaluate non-wires solutions as part of the portfolio of options utilities can utilize in integrated distribution system planning?

A. Based on my experience and understanding of best practices, it is my view that non-wires solutions are most effective at meeting policy objectives when they are procured as part

of a systematized process to consider DER in an integrated distribution plan. I therefore recommend a few actions to the Commission:

1. Establish an integrated electric distribution system planning process for utilities as outlined in Section III.
    a. This process can be established within the Power Forward proceeding to leverage the existing work there.
2. Require utilities to evaluate where non-wires solutions can technically solve distribution system issues.
3. Require utilities to create benchmark capital cost estimates for traditional solutions in areas of the distribution system where non-wires solutions are technically feasible.
4. Require utilities to create an open solicitation for procurement of solutions to distribution system needs that includes potential non-wires solutions.
    a. These solicitations should follow the best practices outlined in Section V and hold third-party providers to requirements memorialized in pro forma agreements.
5. Require utilities to select the most cost-effective solution from solicitation responses that meets the established requirements for reliability.

. Evaluating non-wires solutions as part of an integrated electric distribution plan will maximize the ratepayer and public benefits from non-wires solutions because it will:

- create the framework to widen the utility distribution planning toolkit for all projects that meet agreed-upon criteria;

- enable a methodic and holistic evaluation process to be universally used for distribution planning; and, lastly,
- enable sufficient lead time and transparency to stakeholders for the most cost-effective options to be selected and built, regardless of technology or ownership structure.

Q. Does this conclude your direct testimony?

A. Yes. However, I reserve the right to supplement my testimony in the event that additional testimony is filed, or if new information or data becomes available in connection with this proceeding.

CERTIFICATE OF SERVICE

I hereby certify that a true copy of the foregoing Direct Testimony of Mark Higgins submitted on behalf of the Environmental Law & Policy Center was served by electronic mail, upon the following Parties of Record, on June 25, 2018, and is hereby filed in PUCO dockets 17-32-EL-AIR, 17-33-EL-ATA, 17-34-EL-AAM, 17-872-EL-RDR, 17-873-EL-ATA, 17-874-EL-AAM, 17-1264-EL-ATA, and 17-1265-EL-AAM on June 27, 2018.

/s/ Madeline Fleisher
_____
Madeline Fleisher

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EXHIBIT 17-1263-MH-1

Mark Higgins Resume

STRATEGEN CONSULTING

Mark Higgins
Chief Operating Officer

Experience

Mark Higgins has worked in a diverse range of roles within the energy industry. Mark is the COO of Strategen Consulting and leads the company's consulting practice. Prior to Strategen, Mark led Pacific Gas & Electric Company's work in key policy areas including interconnection and transmission planning, and dealt with technologies ranging from distributed energy storage and demand response to large scale renewables developments. Prior to PG&E, Mark was the Director of Utility West at SunEdison, where he led a portfolio of more than a gigawatt of renewable energy development assets. Mark also held the role of Vice President of Finance of Hu Honua Bioenergy, a 215 MW biomass power redevelopment project in Hawaii. Mark has a strong private equity, venture capital and investment banking background, including placing over $125 million in equity for publicly traded companies and managing the launch of a $70 million Pacific-rim venture fund investing in the agricultural biotech and medical devices sectors. Mark holds a Master of Pacific International Affairs from UC-San Diego, and a Bachelor of Arts in Government from the University of Notre Dame.

Vice President & Chief Operating Officer
APR 2014 – Present
Strategen Consulting – Berkeley, CA

Partner
MAR 2016 – Present
Grid Edge Ventures – Berkeley, CA

Principal, ISO Relations and FERC Policy
AUG 2012 – APR 2014
Pacific Gas & Electric Company – San Francisco, CA

Director, Solar Project Development
MAY 2007 – AUG 2012
SunEdison – Belmont, CA

Vice President, Finance
APR 2008 – APR 2009
Hu Honua Bioenergy – Hawaii

Associate, Investment Banking
JAN 2006 – FEB 2007
Roth Capital Partners – Carlsbad, CA

Associate
APR 2004 – SEP 2005
Finistere Partners – San Diego, CA

EDUCATION

MPIA, International Economics
University of California, San Diego, 2004

BA, Government & Economics
University of Notre Dame, 2000

ADVISORY

Australian Energy Storage Alliance – Steering Committee

California Energy Storage Alliance – Senior Advisor

City of Lafayette, California – Environmental Commission

EXPERIENCE – 17 YEARS

Power Project Development

Management Consulting

Investment Banking

Venture Capital

Power Markets & Market Design

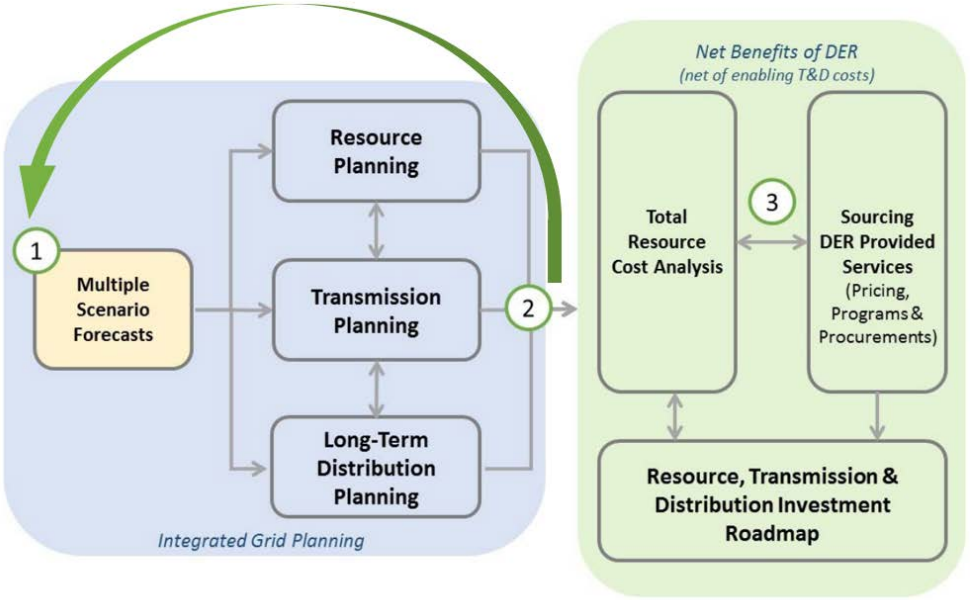
Energy Policy & Regulatory Strategy

Western US Transmission System

Advanced Grid Technologies

EXHIBIT 17-1263-MH-2

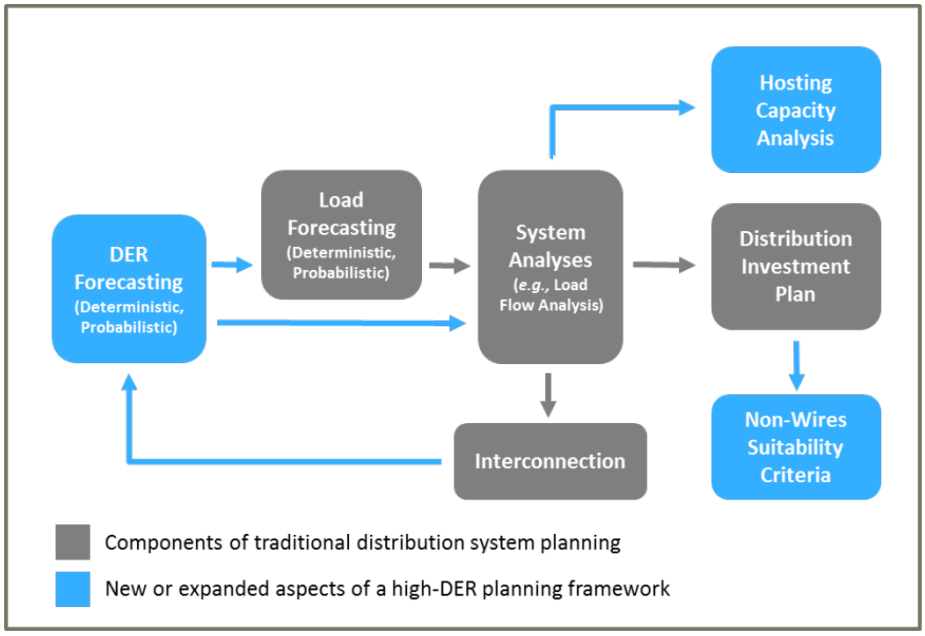
Example of HECO's Integrated Distribution Planning Process
August 2017 Grid Modernization Strategy



Source:
https://www.hawaiianelectric.com/Documents/about_us/investing_in_the_future/final_august_2017_grid_modernization_strategy.pdf

EXHIBIT 17-1263-MH-3

Joint Utilities of New York
Distributed System Implementation Plan (DSIP) framework



Source: http://jointutilitiesofny.org/wp-content/uploads/2016/10/3A80BFC9-CBD4-4DFD-AE62-831271013816.pdf

EXHIBIT 17-1263-MH-4

Joint Utilities of New York
Non-Wires Solution Process

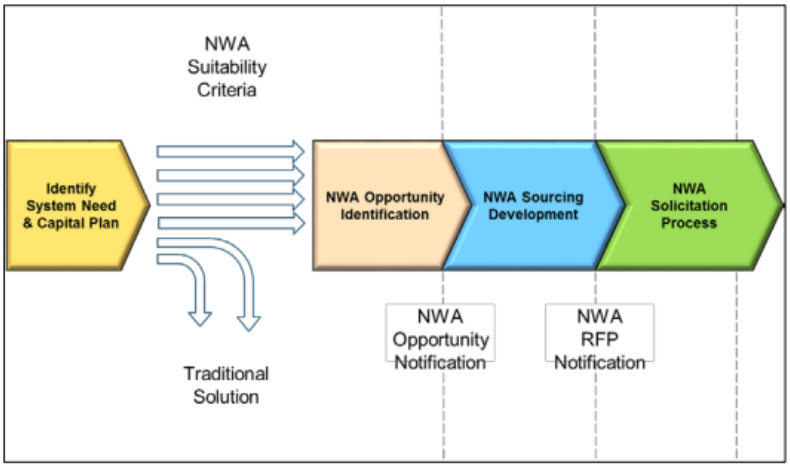


EXHIBIT 17-1263-MH-5

Joint Utilities of New York
Non-Wires Solution Suitability Criteria

Criteria	Potential Elements Addressed	
Project Type Suitability	• Project types include Load Relief and Reliability*. Other categories currently have minimal suitability and will be reviewed as suitability changes due to State policy or technological changes.	
Timeline Suitability	**Large Project**	• 36 to 60 months
	Small Project	• 18 to 24 months
Cost Suitability	**Large Project**	• ≥ $1M
	Small Project	• ≥ $300k

1

EXHIBIT 17-1263-MH-6

State Approaches to Electric Distribution Planning
Lawrence Berkeley National Lab, May 2018

Table ES.1. State Approaches to Electric Distribution System Planning

Planning Approaches	States With Advanced Practices					Other States' Approaches										
	California	Hawaii	Massachusetts	Minnesota	New York	D.C.	Florida	Illinois	Indiana	Maryland	Michigan	Ohio	Oregon	Pennsylvania	Rhode Island	Washington
Distribution system plan requirement[1]	√	√	√	*	√					√	√					
Grid modernization plan requirement	√	√	√	√	√											
Incentives reflecting locational value	√				√											
Hosting capacity analysis requirement	√	√		√	√											
Non-wires alternatives requirements	√				√										√	
Standardized calculations / processes	√				√											
Storm hardening requirements							√			√						
No planning requirement but proceeding underway[2]						√		√				√	√		√	√
Requirement to summarize current practice				√	√					√						
Voluntary distribution or grid modernization plans supporting surcharge/rider cost recovery								√	√			√		√		
Improved alignment / linking processes	√			*											*	*
Required reporting on poor-performing circuits and improvement plans							√	√				√		√	√	

√ is used to indicate the planning approach is applicable under the present regulatory or statutory requirements.
* is used to indicate that the planning approach would apply under pending proposals or proposed decisions.
[1] Requirements for one or more utilities.
[2] States noted in this row have processes underway which may result in adoption of one or multiple planning approaches listed in this table.

Source: Alan Cooke, Juliet Homer, Lisa C Schwartz. "Distribution System Planning – State Examples by Topic", May 2018, Lawrence Berkeley National Lab. https://emp.lbl.gov/publications/distribution-system-planning-state. Viewed June 22, 2018.

1

EXHIBIT 17-1263-MH-7

ConEdison's Non-Wires Alternatives Program Agreement Extract

conEdison

Non-Wires Alternatives Program Agreement

Participant Eligibility The Consolidated Edison Company of New York, Inc. ("Con Edison" or the "Company") customer ("Customer") identified in this Non-Wires Alternatives Program Agreement (as amended and in effect from time to time, this "Agreement") is a Con Edison electric account holder or a customer whose basis of eligibility to participate in the Company's Non-Wires Alternatives Program (hereinafter, "Program") is specified in Addendum 2. Con Edison will determine Customer's Program eligibility at its discretion in connection with Con Edison's review process. This Agreement may be completed by Customer or by an aggregator or other third party acting on Customer's behalf. (The party completing this Agreement is referred to herein as the "Applicant".) If the Applicant is a third party that has not provided Customer information below, Con Edison will determine Program eligibility based upon the eligibility of the Customer(s) identified in Addendum 1.

Project Requirements

Program incentives will be provided only in respect of projects or portfolios of projects that adhere to all Program requirements, including the following, unless otherwise specified in Addendum 2:

1. The project may not commence, and existing equipment to be replaced or made unnecessary by the project may not be removed or disconnected, until after the project is accepted by Con Edison, baseline conditions are confirmed, and pre-installation inspections (if required) have been completed.
2. Agreements may be approved for (i) single Customer projects in which Customer's load and project load reduction are clearly identified in the project plan, or (ii) a portfolio of projects, the project plans for which identify an aggregate load reduction target and provide detailed analyses thereof to be evaluated and approved by Con Edison.
3. The project must be installed and operational prior to the applicable Program milestone date. The Program milestone date will be identified by Con Edison, agreed to by the parties prior to the project's commencement, depend upon the project scope and deployment time, and be specified in Addendum 2.
4. All other requirements set forth in this Agreement, including those contained in the terms and conditions section hereof, must be satisfied.

For questions regarding projects related to the Program, please contact Con Edison at dsm@coned.com or via the Program Website coned.com/neighborhood

Non-Wires Alternatives Solution Details	
Project Name	
Network	
Network Peak Hour	
Reduction Load Year	
Quantity of Capability Years	

Duke Energy Ohio
Case No. 17-1263-EL-SSO
ELPC First Set Interrogatories
Date Received: September 13, 2017

ELPC-INT-01-001

REQUEST:

Refer to Witness Kuznar's testimony at 3:5-18, 4:19-22, and 5:17-19.

a. Please identify each unique "value to the distribution grid" that Duke intends the proposed storage system to provide.
b. Please explain how Duke identified, assessed, or quantified each "value" that it intends the proposed storage system to provide.
c. Is the proposed storage system intended to provide "distribution upgrade deferral" or to "delay the need for costly distribution investments or system upgrades"? If so, please identify the distribution investment(s) to be deferred.
d. Is the proposed storage system intended to provide integration of any specific renewable energy generation? If so, please identify the relevant current or planned renewable energy generation.
e. Is the proposed storage system intended to provide specific power quality improvement? If so, please identify the relevant power quality concern.
f. Is the proposed storage system intended to provide resiliency or reliability to any "critical loads" or "critical public infrastructure"? If so, please identify the critical loads or infrastructure and any associated resiliency or reliability concerns.
g. Is the proposed storage system intended to provide any ancillary services besides frequency regulation? If so, please identify those ancillary services.
h. Is the proposed storage system intended to provide any of the following "values": avoided fuel costs; avoided generator start-up and shut-down costs; avoided peak capacity; avoided operating reserves; avoided grid infrastructure and capital investments; reduced emissions; congestion relief; and risk management.
i. If the answer to (h) is yes for any of the listed "values," please explain Duke's basis for believing that the proposed storage system will provide that value.

RESPONSE:

a. Each unique value will be dependent upon the location and use case(s) selected. It is possible and likely that the project(s) will be capable of providing more than one value or function. The location(s) and use case(s) has not yet been selected.

Duke Energy Ohio
Case No. 17-1263-EL-SSO
ELPC First Set Interrogatories
Date Received: September 13, 2017

ELPC-INT-01-025

REQUEST:

Refer to Witness Kuznar's testimony at 4:1-5 and Duke's responses to OCC-INT-1-15 and IGS INT 1-4.

a. Please clarify whether Duke has evaluated and/or identified any potential locations for the proposed storage system.
b. If the answer to (a) is yes, please identify each potential location and the factors that Duke considered in selecting that potential location.
c. If Duke has rejected any potential locations for the proposed storage system that were initially under consideration, please identify each such location and the factors that Duke considered in selecting that potential location.
d. Please identify what factors Duke plans to consider in making a final selection of the location for the proposed storage system.

RESPONSE:

a. Duke Energy is currently evaluating potential locations for the proposed storage system(s).
b. Duke Energy has not selected a potential location at this time.
c. Duke Energy is early in the evaluation process and at this time has not rejected any potential locations.
d. A key factor will be the cost benefit analysis for the final selection of the location for the proposed storage system.

PERSON RESPONSIBLE: **Zachary Kuznar**

Duke Energy Ohio
Case No. 17-1263-EL-SSO
ELPC First Set Interrogatories
Date Received: September 13, 2017

ELPC-INT-01-005

REQUEST:

Has Duke identified the modeling tool or software package it intends to use to estimate the net value provided by the storage system?

RESPONSE:

Duke Energy has not identified the modeling tool that will be used. Duke Energy may use an internally developed tool or a tool developed by an external third party, such as the EPRI SVET.

PERSON RESPONSIBLE: **Zachary Kuznar**

Duke Energy Ohio
Case No. 17-1263-EL-SSO
ELPC First Set Interrogatories
Date Received: September 13, 2017

ELPC-INT-01-008

REQUEST:

Please refer to Witness Kuznar's response to OCC-INT-01-18.

a. Please identify any "projects" that Duke is developing or "information" that Duke has collected in order to "conduct a cost-benefit analysis as part of" the proposed storage system pilot.
b. Please identify any additional information that Duke plans to collect in order to be able to conduct a cost-benefit analysis for the proposed storage system pilot.

RESPONSE:

a. Duke Energy is currently in the process of identifying sites for a project(s) in conjunction with the filing. Duke Energy has not collected specific project information necessary to conduct a cost-benefit analysis at this point.
b. No additional information is currently expected to be collected.

PERSON RESPONSIBLE: **Zachary Kuznar**

Summary: Testimony of Mark Higgins electronically filed by Madeline Fleisher on behalf of Environmental Law & Policy Center