NYSERDA Smart Grid Evaluation Case Study: Interconnection Technical Working Group (ITWG)

Final

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NYSERDA Smart Grid Evaluation Case Study: An evaluation of the Interconnection Technical Working Group's efforts to streamline the DER interconnection process in New York

Key Results

- The Interconnection Technical Working Group (ITWG) representatives reported that the ITWG's efforts have led to implementation of advanced technology and process improvements that have allowed more and larger distributed energy resource (DER) projects to be interconnected in New York State.
- Prior to the ITWG, a frequent cause of failed Coordinated Electric System Interconnection Review (CESIR) screenings was the way utilities analyzed voltage flicker. This issue was undertaken through the working group and a flicker analysis model was developed and adopted by the utilities which allowed larger projects to be approved by the utilities (from 2MW to 5MW).
- ITWG stakeholders reported that the ITWG's two engineering consultants, whose efforts in the working group are funded by NYSERDA, are "essential" and have been "very active and very helpful in resolving issues."
- Analysis of New York Department of Public Service (DPS) data revealed interconnection cost reductions on a per-kW basis for several utilities and on a per-project basis for one utility.
    - For example, National Grid's solar per-project costs fell from \$20,000+ to approximately \$8,000 (a 65% decline) while storage per-project costs fell from \$20,000+ to approximately \$9,000 (a 55% decline). These cost declines are likely the result of ITWG efforts, but they could have also resulted from expected learning and efficiency improvements within utilities that might have happened without the ITWG.
- The ITWG provides a valuable forum for strengthening developer-utility relationships, building shared understanding of interconnection processes, and expanding knowledge regarding interconnection challenges and solutions in New York.
- Knowledge sharing and greater understanding of utility and developer processes has translated to streamlined project design for developers and greater selectivity in the projects they submit for interconnection, thus reducing the risk of backlogs.

Introduction

The New York Interconnection Technical Working Group (ITWG) consists of distributed energy resource (DER) project developers, representatives of NY utilities, NYSERDA, and the New York State Department of Public Service (DPS).[1] This group meets regularly to create

[1] Distributed energy resources (DERs) are defined as energy generation units that are located on the consumer's side of the electric meter. DERs can include solar photovoltaic (PV) arrays, wind power generating units, battery energy storage systems, and electric vehicles (EVs). Note that an energy-consuming unit, such as an EV, may be considered a DER if it offers flexible load control options and/or the ability to export power back to the grid under certain conditions. Some, but not all, DERs generate renewable energy. DERs can range in size from small rooftop solar arrays (less than about 10 kW) to large multi-MW installations owned and operated by private operators.

consensus-based solutions for potentially costly, complex, and time-consuming issues associated with connecting distributed energy resources (DERs) to the electric grid while maintaining grid safety and reliability. NYSERDA has supported this working group with financial resources for technical consultants as well as by serving as Co-Chair of the ITWG alongside DPS. NYSERDA has provided approximately $5 million in Smart Grid R&D funding for the ITWG since 2015.[2] Most of this amount was costs for technical support and studies addressing interconnection issues and development of new standards for the working group, which has carried out its activities with additional investments from the joint utilities and developers.

Per the ITWG's governance documents, its official mission is to "identify, discuss, and resolve technical barriers and challenges associated with the DER interconnection process and the Standardized Interconnection Requirements in New York State in an efficient and effective manner." The group, which first met in 2015, considers the following objectives to be the three main pillars of its work:

- Increasing grid DER hosting capacity[3]
- Reducing grid DER interconnection costs
- Reducing grid DER interconnection timelines

To meet the objectives identified above, the ITWG provides a platform and facilitation process to collaboratively address pressing technical, process, and other relevant issues regarding DER interconnection. Per the ITWG's process, stakeholders from both the developer and utility communities can raise issues they would like to discuss with representatives of each group. These topics are discussed among a small group consisting of the ITWG's co-chairs and the utility and developer liaisons during agenda-setting calls and may be presented to the larger working group if it is determined that there is value in more broadly discussing the topics in question.

Between 2016 and 2022, the ITWG worked on several topics related to the DER interconnection process. Approximately 60% of their time was focused on hosting capacity, with the remainder of the time spent on efforts to reduce the time and/or cost of interconnecting a DER project to the electric grid. A selection of the topics discussed by the ITWG is shown below:

- Anti-islanding protections (direct transfer trip, or DTT)[4]
- Shadow or voltage flicker[5]
- Interconnection hardware equipment costs
- Hosting capacity maps (by providing feedback to the utilities)
- Interactive Online Application Portal (IOAP) (by providing feedback to the utilities)

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[2] The $5 million includes annual funding of $50,000 for consultants EPRI and Pterra.

[3] "Hosting capacity" is defined as the amount of new production or consumption that can be connected to the grid without endangering the reliability or voltage quality for electric utility customers.

[4] Anti-islanding protections are measures designed to prevent an energized DER from unsafely back-feeding power to the grid during a power outage or other critical event, or from asynchronously reconnecting to the grid upon power being restored. Direct transfer trip (DTT) is a technology that prevents unsafe islanding conditions by automatically disconnecting a DER when a fault (an abnormal electrical current) is detected on a circuit and reconnecting the DER synchronously ("in sync") with the grid's operating frequency when it is safe to do so.

[5] Voltage variations that can arise from some DER projects and negatively impact power quality.

This case study highlights qualitative and quantitative findings regarding the effectiveness of the ITWG and the potential benefits flowing from the ITWG's efforts, including fostering consensus between DER project developers and the utilities responsible for approving interconnection requests. It places these findings and the associated analysis against the backdrop of the Climate Leadership and Community Protection Act (Climate Act) signed into law in 2019 for New York State, which mandates the goal of 70 percent renewable energy generation by 2030 and 100% zero-emission electricity by 2040. Information for this case study was collected through interviews with NYSERDA, the DPS, the NY Solar Energy Industry Association (NYSEIA), National Grid, and several DER project developers; review of publicly available interconnection application and approval data provided by DPS (including application and interconnection study timelines as well as interconnection study and project costs); and supplementary research.

1 Interconnection Overview and ITWG Background

Interconnection is part of the process of getting a new DER project connected to the grid. The term "interconnection" typically encompasses the physical and administrative processes of connecting a DER project to the electric grid to ensure that the new DER project adheres to all technical standards required for safe and reliable grid operation. When DER projects are proposed to a utility, the proposed projects enter an interconnection queue for processing by utility staff and potential additional analysis by utility engineers, as needed. As part of the interconnection process, NY utilities conduct a series of screening tests and analyses designed to evaluate a DER project's potential impacts on the grid. If a project does not pass all the initial screens and the utility and developer cannot agree on a solution, the project developer can initiate a process known as the Coordinated Electric System Interconnection Review (CESIR). CESIR studies provide developers with a detailed review and explanation of the project's impacts and the utility's proposed solutions. The cost of the CESIR study is paid by the project developer; the developer may also be required to pay for upgrades or changes to the DER project design.

Two of the ITWG's key objectives are to reduce the cost of CESIR studies and to reduce the time associated with a CESIR study. These dual objectives are intended to reduce DER project costs and, by reducing CESIR study timelines, minimize the risk of an interconnection queue backlog that substantively impacts project timelines, costs, financing, and/or feasibility.

Climate Leadership and Community Protection Act

Introduced in 2019, New York State's Climate Leadership and Community Protection Act (Climate Act) is a comprehensive energy strategy for New York State that lays out a path to carbon neutrality to make the energy system cleaner, more resilient, and more affordable, while committing to environmental justice, benefiting disadvantaged communities, and ensuring a just transition to zero carbon electricity. The programs and initiatives directed by the Climate Act are designed to help the state achieve these energy goals:

- 85% reduction in greenhouse gas emissions from 1990 levels by 2050
- 70% of electricity generation from renewable sources by 2030 and 100% zero-carbon electricity by 2040

The ITWG has met regularly since 2015; it was created as part of New York State's Reforming the Energy Vision (REV) DPS proceedings in response to the rapid increase in the deployment of solar photovoltaic (PV) projects in New York at the time. Prior to the ITWG's inception, utilities statewide had begun to receive a large influx of DER interconnection applications. This rapid influx of interconnection applications presented both technical issues in processing received applications and uncertainty regarding technical challenges and solutions, including anti-islanding protections and shadow or voltage flicker. A need for overall standardization of technical interconnection processes and interconnection applications by utilities across the state was identified. Today, the ITWG continues to provide value by helping NY utilities work toward New York's Climate Act goals (described in the box above).

2 ITWG Structure

Overall, the ITWG consists of 15 core members who participate regularly in standing meetings and over 100 general members who participate less frequently but are included on the group's email distribution list. The group's membership includes:

- **State agencies.** NYSERDA and DPS serve as co-chairs of the working group. The New York Power Authority (NYPA) and New York Independent System Operator (NYISO) also provide one representative each.
- **Electric utilities.** Each of the Joint Utilities (Central Hudson, Con Edison, National Grid, NYSEG, Orange & Rockland, and RGE) have one primary and one secondary representative. The Long Island Power Authority (LIPA) and PSEG-LI also have one primary representative. In addition, the electric utilities group designates a Liaison who represents the Joint Utilities and is selected from amongst the primary representatives.
- **DER industry and developers.** Five to seven primary representatives come from the developer side. This group also selects a Liaison who represents the developers' perspectives. The developers' current Liaison was appointed by the NY chapter of the Solar Energy Industry Association (NYSEIA).
- **Technical consultants.** Two technical consultants – EPRI and Pterra – provide technical expertise on specific topics needing resolution by the ITWG. EPRI's and Pterra's contributions to the ITWG's work are funded by NYSERDA. The consultants have, according to the DPS Co-chair, "been very active and very helpful in resolving issues," assisting the group to make better decisions and better understand industry interconnection best practices.

Per the ITWG's governance documents, the decision-making principles are as follows:

1. The group first aims to arrive at consensus among the ITWG members on substantive decisions, with consensus defined as all representatives "willing to live with a decision" made by the group without dissent. Representatives who dissent are expected to explain their reasoning and attempt to offer a positive alternative.
2. EPRI and/or Pterra provide background on national best practices to help resolve differences of opinion among groups (utilities and developers). These consultants elaborate on national best practices and experience and provide unbiased recommendations and/or positions on specific technical subjects.
3. At the end of the process, the ITWG identifies and describes all areas of consensus. On topics where consensus could not be reached, the ITWG co-chairs deliberate the subject matter, with the DPS and/or the New York Public Service Commission (PSC) having final say on the eventual decision. Once this process is complete, members of the ITWG will apply these solutions to their DER design and interconnection review processes.

3 Benefits of Improving the Interconnection Process

Potential benefits resulting from the ITWG's efforts to improve hosting capacity, reduce interconnection costs, and reduce interconnection timelines include:

- Decreased DER project costs, resulting in more projects being economically viable
- Accelerated environmental benefits of DER projects from bringing DER projects "online" faster

DER projects provide environmental benefits by displacing conventional and fossil fuel-based generating sources with clean and renewable energy sources. These environmental benefits may also result in economic and human health benefits. It is important to note that the ITWG's purview is limited to identifying and resolving technical barriers and challenges within the interconnection process, thereby lowering or removing hurdles that would prevent or delay greater deployment of clean and resilient DER projects. However, many non-ITWG market transformation activities being undertaken by NYSERDA and other stakeholders throughout New York State, as well as broader market trends, over the same time period as the ITWG's activities support greater DER deployment to achieve New York's climate goals.

Lack of DER generation data (i.e., project-level interval kW data) prevented quantifying the environmental, economic, or health impacts of the ITWG's efforts directly; however, the team was able to identify benefits from a greater number of larger DER projects and interconnection costs (for some types of DERs and for some NY utilities). These benefits indicate that the ITWG has made progress on its key objectives, which were to increase grid DER hosting capacity and reduce grid interconnection costs and timelines, thereby helping to accelerate New York's DER market and make it more cost competitive.

Overall, the individuals interviewed for this case study all were of the opinion that the ITWG has been successful in its efforts to date, not only due to its successful identification and resolution of several technical interconnection challenges, but also because it has created shared understanding and knowledge transfer between DER project developers and the utilities. By providing a forum and process for raising and collaboratively addressing issues, both developers and utilities have benefited. Specific ITWG accomplishments include:

- **DER Project Developers have greater understanding of interconnection application processes and requirements,** including what equipment is needed in their designs and the utility screening and CESIR process.
- **Electric Utilities have begun to streamline and standardize project design and interconnection approvals**, using common analysis approaches across the state, compiling and sharing average interconnection equipment cost data to streamline project design and interconnection approval, and revising interconnection screening tools to allow more and larger DER projects to be interconnected without negatively impacting grid safety and reliability.

4 Hosting Capacity Benefits

Multiple interviewees stated that increasing hosting capacity was the most important objective of the ITWG. Here, "hosting capacity" is defined as the amount of new, typically distributed, production or consumption that can be connected to the grid without endangering the reliability or voltage quality for other electric customers. Hosting capacity can be increased through upgrades to the grid's physical infrastructure, by deploying advanced grid load management equipment and technologies, and by more accurately assessing the grid's ability to absorb additional load or generation safely and reliably, helping utilities realize there is more existing hosting capacity than they previously thought.

The impact of the ITWG's efforts to increase grid hosting capacity can be observed by analyzing DPS interconnection data. Two key trends assessed through the case study analysis point to increased hosting capacity:

- Increasing numbers of DER projects approved for interconnection
- Increasing average size (MW) of approved projects

Analysis of DPS interconnection data across NYS and stakeholder interviews shows that the ITWG's efforts played a role in driving progress on both fronts. This section describes these efforts.

> "EPRI and Pterra were essential in pushing the updated voltage flicker analysis and helping us understand why our projects were failing the screening tests."
>
> - Developer representative, ITWG

Prior to the ITWG, a frequent cause of failed CESIR screenings was the way utilities analyzed voltage flicker. When the issue of voltage flicker was raised through the working group, EPRI and Pterra worked to develop a flicker analysis model that was tailored to solar PV (the most common type of DER project application in NYS). Prior to this analysis, flicker had only been studied from a theoretical standpoint, and the utilities' screening requirements were considered overly conservative by the developers. The model developed by EPRI and Pterra was adopted by the utilities, which changed how utilities conducted their flicker screening analysis. This new model allowed larger projects to be approved by the utilities, increasing the largest approved projects from 2 MW to 5 MW in size. The analysis, shown in Figure 1, provides evidence of the increased volume of larger projects.[6,7] According to one developer, "EPRI and Pterra were essential in pushing the updated voltage flicker analysis" and in helping developers understand the underlying reasons their projects were failing flicker screening tests (such as distance from an electrical substation), which allowed developers to proactively update their project designs to avoid failing CESIR screening tests.

Figure 1. Number of applications for solar projects greater than or equal to 2MW – all utilities

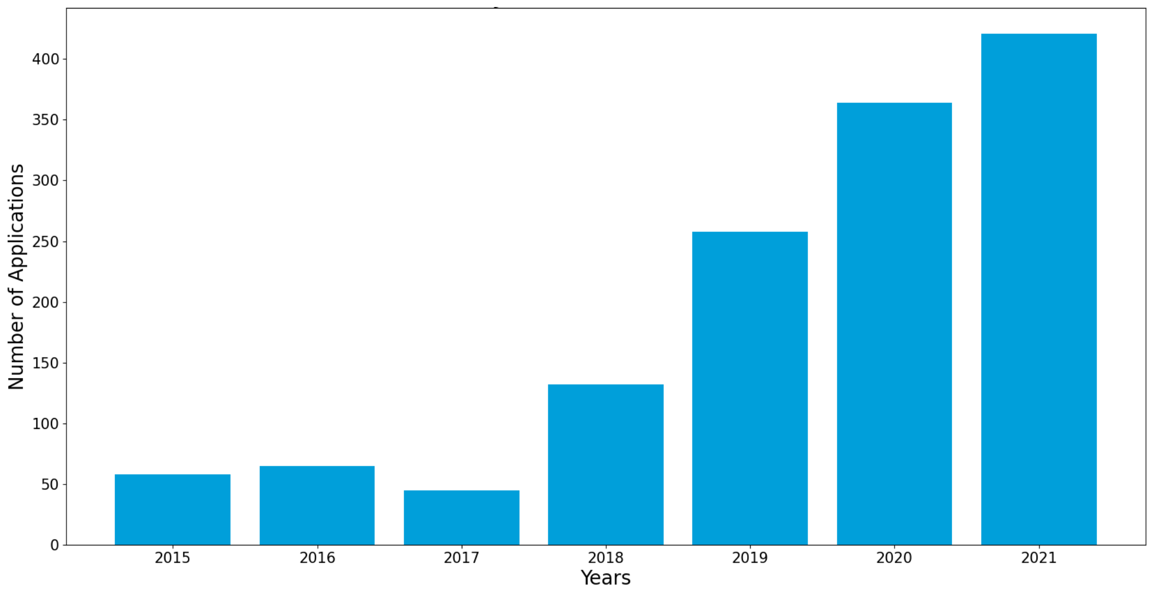

Figure 2, on the next page, also shows that the average capacity (kW per project) of solar projects has grown over time across the utilities.[8] Average solar project sizes for National Grid, NYSEG, Orange & Rockland, and RGE have all reached or exceeded 4,000 kW (4 MW) since 2019, compared to average project sizes of approximately 2,000 kW (2 MW) in 2016-2017. The other utilities – Con Edison, Central Hudson, and PSEG-LI – have average solar project sizes of less than 1,400 kW (1.4 MW), likely because these utilities serve more densely developed downstate areas with higher land costs and lower land availability, making it more costly and difficult to deploy multi-MW utility-scale DER projects. Additionally, strict fire codes in New York City have historically made it difficult to implement certain types of DER projects, such as battery energy storage systems. Still, utilities operating in and around New York City have also shown a general increase in average solar project sizes, with some year-to-year variation, further highlighting the ITWG's progress in helping utilities accommodate larger DER projects. As the ITWG continues its work, discussions about further expanding hosting capacity have continued.

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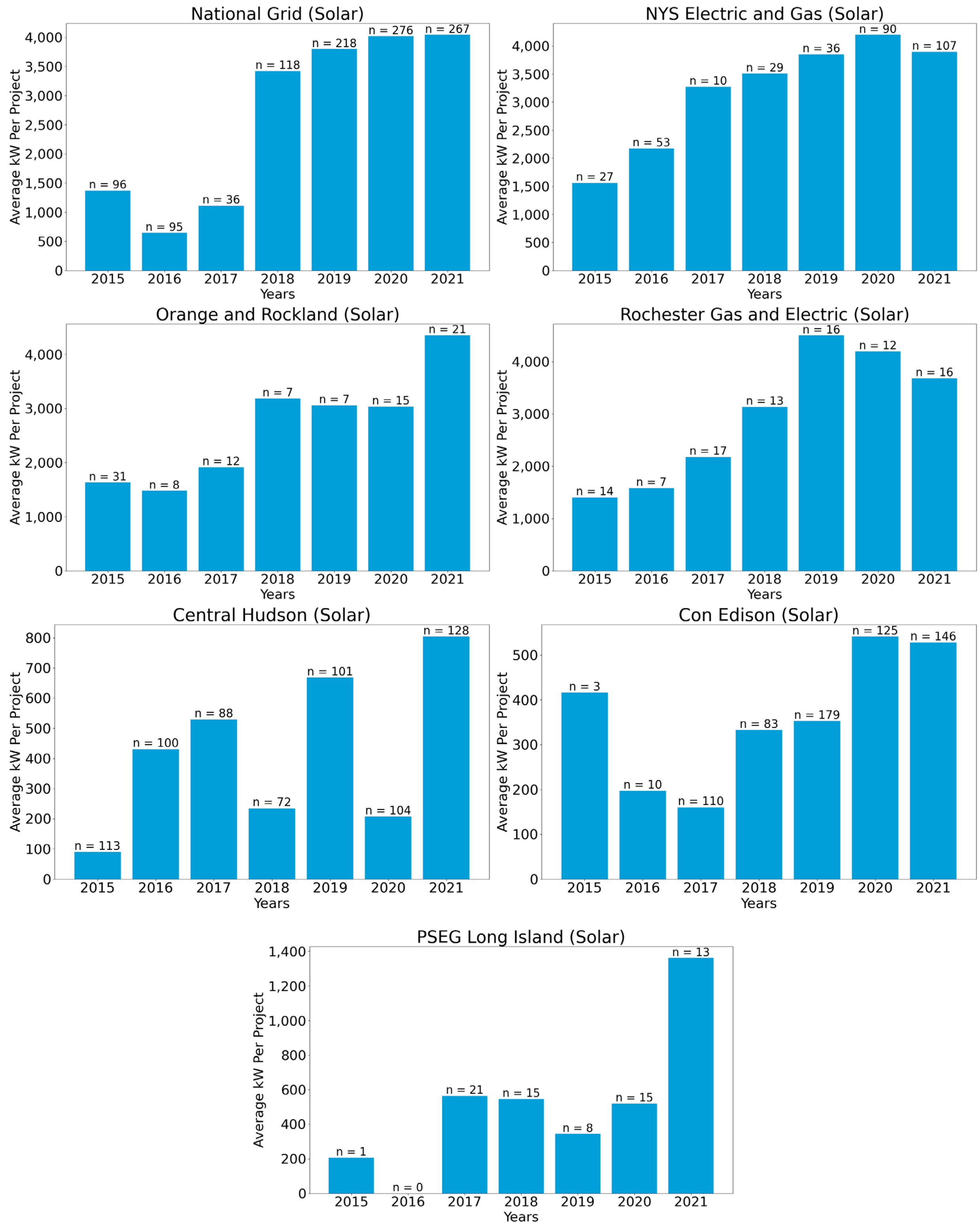
[6] Note that only projects with documentation of application dates and sizes (kW) were included.

[7] While easing voltage flicker analysis requirements certainly helped increase the volume of large DER projects, other factors such as concurrent technology improvements, DER project incentives, and efforts undertaken by other NYS agencies also contributed to this trend.

[8] Note that only projects with documentation of application dates and sizes (kW) were included.

Figure 2. Average project size over time (2015–2021)



5 Interconnection Cost Benefits

The ITWG's efforts have reduced interconnection costs in multiple ways. One of the most significant ways that costs were reduced is the development and communication of clearer CESIR requirements by utilities to developers working in New York State. According to the available DPS data, a CESIR screening costs developers roughly $10,000 to $20,000 per project. While these CESIR costs represent a relatively small share of total project costs – especially for multi-MW projects – developers were able to achieve some cost savings through a clearer understanding of the interconnection screening and CESIR guidelines from utilities during the project design stage.[9] By becoming better informed on CESIR guidelines and interconnection processes, developers were able to design projects with a higher likelihood of interconnection approval, thus reducing the time and cost spent on redesigning their projects after going through a CESIR study.

Additionally, as project sizes have increased, average CESIR costs have tended to fall on a per-kW basis. This trend is observable in Figure 3, which shows that the CESIR per-kW cost decreased over time for National Grid, Con Edison, and Central Hudson.[10] The cost data available for the other utilities was insufficient to draw similar conclusions.

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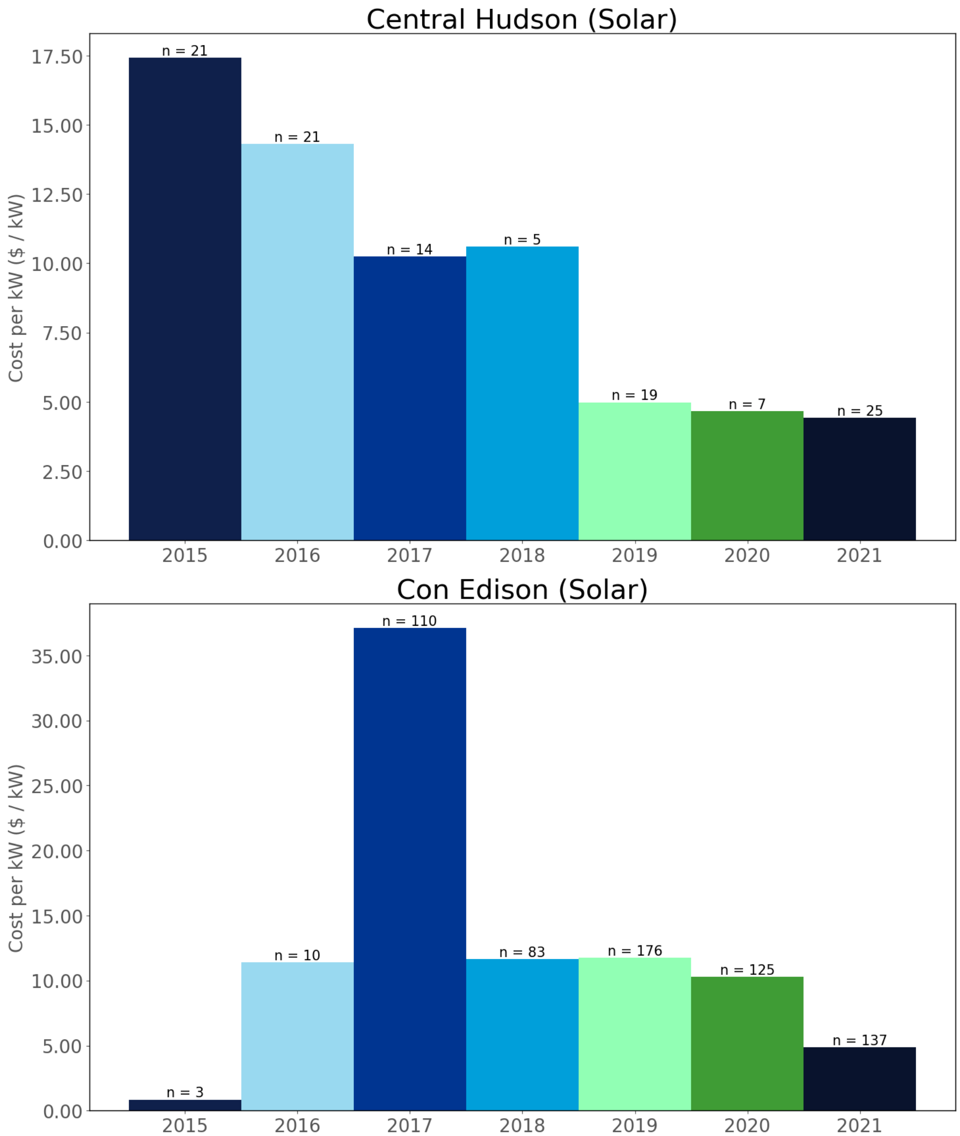
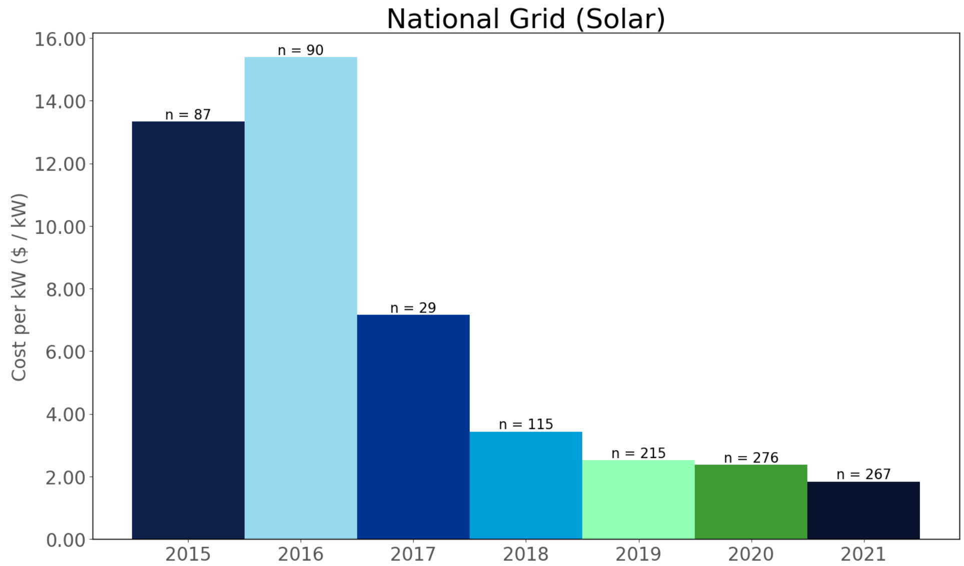
[9] This numerical data was not provided by the developers. In interviews, developers mentioned that having a clearer understanding of CESIR screenings saved them time and, as a result, money. Figure 3 shows CESIR costs per kW over time. These seem to be causally related, but the relationship is not 1:1 due to the myriad factors that can impact per-project per-kW costs.

[10] Note that only projects with documentation of application dates, sizes (kW), and cost data were included in these figures.

Figure 3. CESIR cost to customer per-kW over time (2015–2021)





Analysis of DPS data also showed that per-project CESIR study costs fell between 2015 and 2021 for National Grid's solar and energy storage projects that were greater than 500 kW. One utility representative noted that utilities appeared to exhibit a "learning effect" as they were required to process growing numbers of interconnection applications for a given DER technology. This learning effect resulted in internal process improvements and efficiencies that helped to drive down per-project interconnection costs. It should be noted, however, that not all utilities exhibited the same decline in CESIR costs, and not all utilities saw equivalent increases in the amount of interconnection applications.

Figures 4 and 5 show the per-project CESIR cost declines for National Grid's solar and energy storage projects exceeding 500 kW, respectively, between 2015 and 2021.[11] Figure 4 shows that the average solar CESIR study cost fell from over $20,000 in 2015, when National Grid received 66 applications, to below $10,000 in 2021, when they received 245 applications. A similar cost reduction was observed for energy storage projects (Figure 5), which increased in number from six in 2017 to 44 in 2019.

[11] Note that only projects with documentation of application dates, sizes (kW), and cost data were included in these figures.

Figure 4. National Grid solar CESIR cost to customer per-project over time (2015–2021)

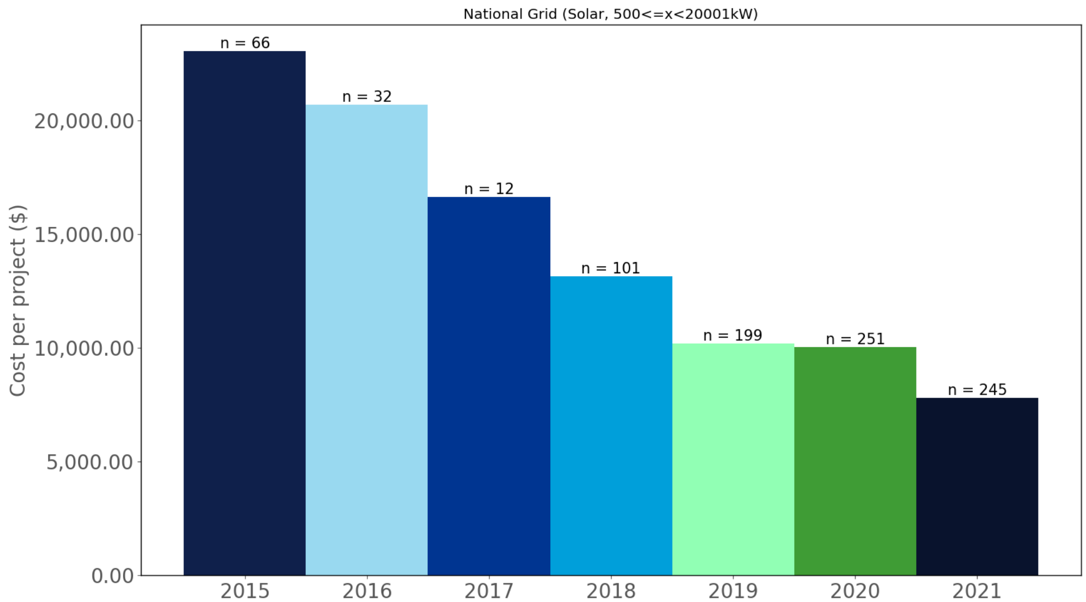
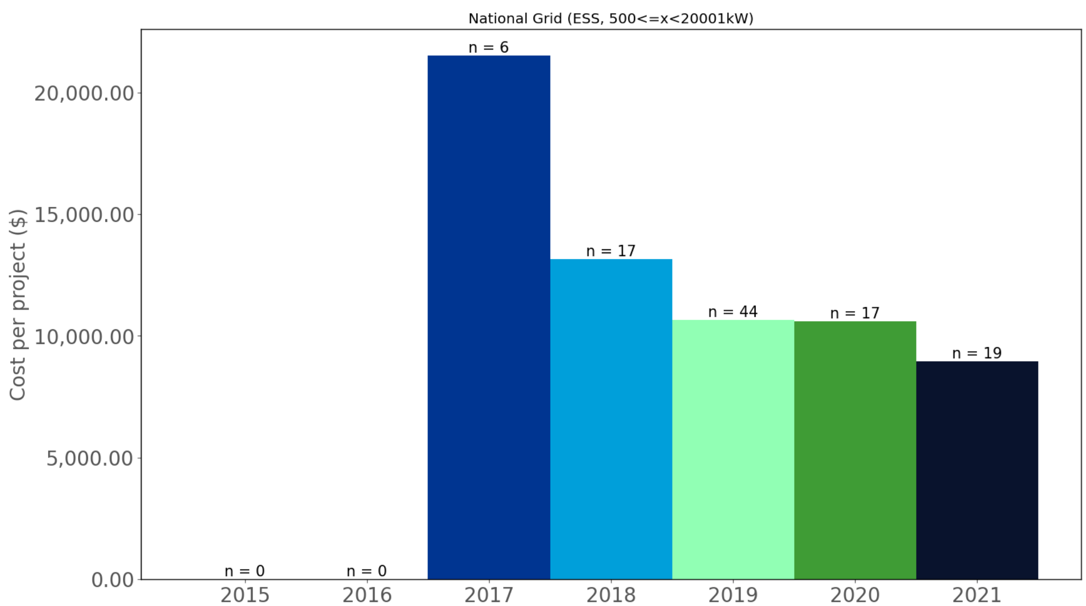


Figure 5. National Grid energy storage (ESS) CESIR cost to customer per-project over time (2015–2021)



6 Interconnection Timeline Benefits

The main effort the ITWG made to reduce project timelines involved clarifying the utilities' requirements for DER project design and interconnection applications. Utilities have many technical and/or grid protection requirements needed to approve an interconnection application, but developers were either unaware of these requirements or did not know the cost of implementing acceptable solutions, thus preventing them from being able to determine project viability at an early stage. Delays and additional costs resulted whenever utilities denied an application and requested that developers revisit their project design to include the technology in question.

> "We have developed a more formal process to standardize costs to provide to developers, which shortens the project timeline because developers can determine the viability of a project earlier in the process."
>
> - Utility representative, ITWG

One example is direct transfer trip (DTT), a technology that prevents unsafe islanding conditions[12] by automatically disconnecting a DER when a fault (an abnormal electrical current) is detected on a circuit and reconnecting the DER synchronously ("in sync") with the grid's operating frequency when it is safe to do so. Several interviewees mentioned that by discussing anti-islanding requirements in general, DTT technology specifically, and utility CESIR processes in ITWG meetings, the developers were able to more efficiently design DER projects, potentially saving costs downstream in the process. As a result, utilities were able to safely approve more interconnection applications. Some utilities, including National Grid, also compiled and shared standard costs for technologies like these to aid developers during the project design and pricing stage.

Several interviewees mentioned that the ITWG's efforts to increase transparency and knowledge-sharing between developers and utilities potentially reduced CESIR timelines. However, it was not possible to identify a reduction in CESIR timelines between 2015 and 2021 using DPS data. This may be due in part to the fact that CESIR study timelines in New York are already considered to be relatively short; multiple interviewees mentioned that New York State already had some of the best timelines and interconnection policies in the country. One developer with experience working in New York as well as other states noted that interconnection applications in New York State are processed in approximately 60 business days, while neighboring states can take two to three times as long. Therefore, it may not be possible to reduce the existing timelines much further.

It was not possible to draw interconnection timeline comparisons across utility service territories due to a lack of available data and fundamental differences in how different utilities handle interconnections. However, it is worth noting that in other grid regions, such as the PJM Independent System Operator's territory, lengthy interconnection backlogs have led to calls for a

[12] An unsafe islanding condition might arise when an energized DER attempts to send power to a deenergized grid/circuit during a power outage. This event could create unsafe conditions for line workers attempting to restore power to the grid/circuit.

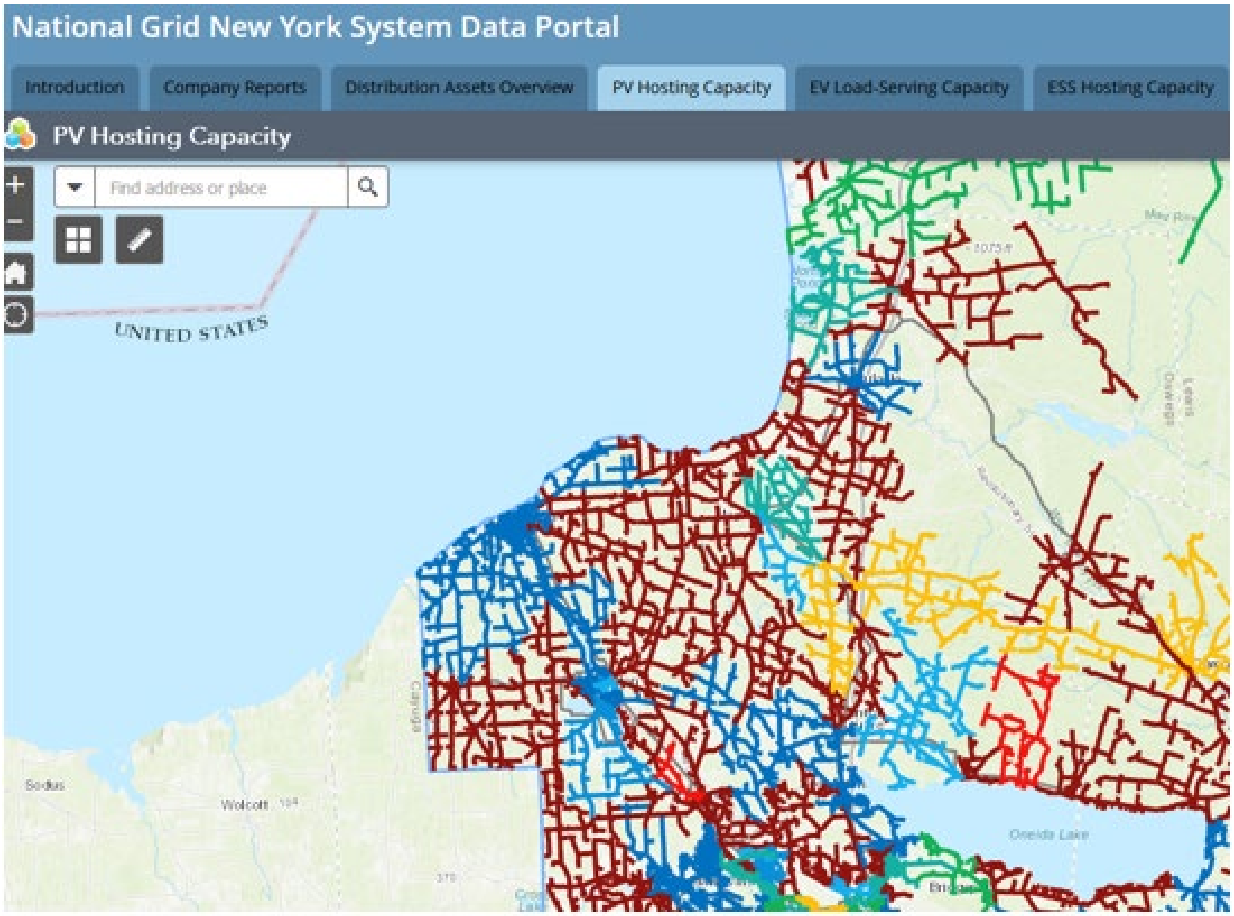
redesign of the interconnection process and delays that may jeopardize the viability of projects already in the queue.[13]

Beyond focusing on reducing interconnection timelines, the ITWG has also led efforts to decrease project timelines, are listed below:

- The ITWG connected developers with manufacturers of meter sockets, which are used to reduce the time developers spend configuring residential storage systems. The ITWG was able to help developers simplify project deployment and save time through the creation of multiple industry pilot programs that supported the use of meter sockets and demonstrated their value.
- The ITWG also provided an opportunity for developers to share feedback with the utilities to improve the utilities' online hosting capacity maps, which identify the amount of available hosting capacity on utilities' systems. As an example, Figure 6 provides a screenshot from National Grid's hosting capacity maps. Several interviewees mentioned that these maps reduced the amount of time and effort developers had to put into deciding where to build and how to size their projects. Additionally, some ITWG representatives believe that the hosting capacity maps have improved the developer decision-making process and helped developers to be more selective in the projects they submit for interconnection, thus lowering the risk of applications being denied as well as the risk of interconnection backlogs.

[13] https://www.bayjournal.com/news/climate_change/more-than-800-solar-projects-in-bay-states-stuck-waiting-for-review/article_71a4375a-af6a-11ec-9071-03d4665eb07b.html?utm_medium=email

Figure 6. Screenshot of National Grid's Hosting Capacity Maps

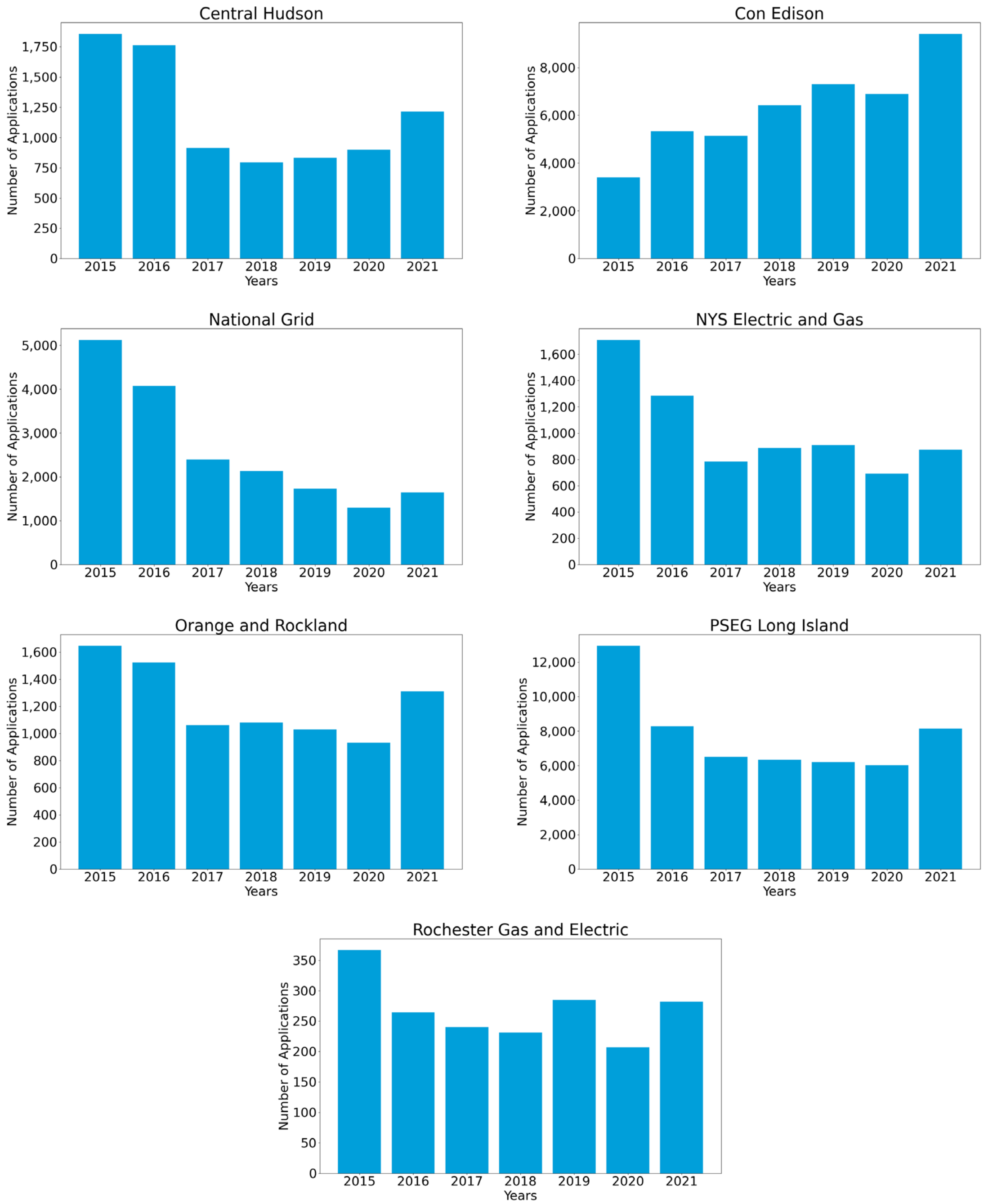


https://www.nationalgridus.com/Business-Partners/NY-System-Portal

While it was not possible to quantify any reduction in project timelines stemming from developers' increased selectivity in the projects proposed, the analysis does show that the number of project applications has decreased over time while project size has increased for most utilities (see Figure 7. Number of Applications Received (2015–2021), below), suggesting the availability of the hosting capacity maps has allowed developers to submit fewer but larger and higher quality projects for interconnection.[14] The ability to more strategically submit projects located in areas with more hosting capacity may also prevent developers from needing to update their designs with grid protection equipment after failing a CESIR screening, thus potentially saving downstream capital costs while streamlining the DER deployment process.

[14] Note that only projects with documentation of application dates were included in this analysis.

Figure 7. Number of Applications Received (2015–2021)



7 Additional ITWG Benefits

Beyond the tangible benefits of the ITWG discussed in the previous sections, representatives of utilities, developers, and state agencies reported that the ITWG's existence alone is valuable, noting that the ITWG provides value by allowing representatives from across the industry to:

- Proactively raise interconnection issues and challenges

- Collaboratively and consistently discuss potential solutions/ideas
- Better understand where "the other side" (whether developers or utilities) is coming from
- Strengthen relationships between developers and utilities

Finally, one interviewee mentioned another, often "underappreciated," benefit of the ITWG: education. According to this stakeholder, the working group has provided members of the group that have a less technical background with a significantly better understanding of the intricacies of DER interconnection, allowing them to make more informed decisions going forward. Another interviewee shared the opinion that ITWG discussions could benefit from a greater number of technical representatives to avoid stalemates around technical issues resulting from not enough technical experts participating in discussions. Both technical and non-technical representatives currently participate in the ITWG, with the technical participants bringing deep knowledge of the electric grid and the non-technical representatives providing valuable context regarding the state's and utilities' policies, goals, and processes. Since both technical and non-technical representatives participate in the ITWG's work, it is encouraging to hear that the non-technical representatives are acquiring a fuller understanding of the technical challenges and solutions surrounding interconnection through their participation in the ITWG.

8 Total Benefits of NYSERDA ITWG Funding

This section summarizes the qualitative benefits described in the previous sections. The ITWG's efforts have contributed to the following benefits:

- Increased the maximum DER project size from 2 MW to 5 MW
- Increased average DER project sizes for all the NY utilities from 2015 to 2021
- Lower interconnection costs at several utilities (including Central Hudson, Con Edison, and National Grid) on a per-kW basis
- Streamlined the project design process for developers and allowed developers to be more selective in the projects they submit for interconnection, thus reducing the risk of interconnection application denials and backlogs
- Stronger developer-utility relationships, greater understanding of all stakeholders' project design and interconnection analysis processes, and general knowledge-sharing, all of which have improved the interconnection process in NYS

9 Conclusions

This case study assessed the key benefits associated with the ITWG, including increasing grid hosting capacity, reducing interconnection costs, and taking steps to streamline DER project design timelines for developers (while not having a significant direct impact on interconnection study timelines, which are already short). NYSERDA's support and funding helped overcome technical barriers and create solutions to previous DER interconnection challenges. It supported the development of critical protocols to streamline the utilities' interconnection screening and analysis processes and enabled valuable knowledge-sharing across the DER industry within New York State. These efforts have driven increases in average and maximum DER project sizes and, in some cases, helped reduce interconnection costs. Moreover, by convening a working group of decision-makers from across the DER stakeholder spectrum, including state agencies, electric utilities, and project developers, NYSERDA's efforts have supported the development of a framework that will continue to identify and address barriers to DER deployment and support New York's energy and climate goals.

10 Sources

NYS Interconnection Technical Working Group (ITWG) Mission, Governance, & Operations. January 2021. https://www3.dps.ny.gov/W/PSCWeb.nsf/96f0fec0b45a3c6485257688006a701a/def2bf0a236b946f85257f71006ac98e/$FILE/70950409.docx/ITWG%20Governance%20Jan%202021.docx

Bollen, Math H.J. and Sarah K. Ronnberg. "Hosting Capacity of the Power Grid for Renewable Electricity Production and New Large Consumption Equipment." 2 September 2017. *Energies.*

Email communication with DPS staff. June 28, 2022.

Interview with ITWG Co-Chairs. April 19, 2022.

Developer interview. July 7, 2022.

Developer interview. July 12, 2022.

Utility staff interview. July 28, 2022.

Developer interview. August 24, 2022.

Developer interview. September 9, 2022.