New York Interconnection Online Application Portal Functional Requirements

BACKGROUND

In Phase I of the New York State Public Service Commission's (PSC) Reforming the Energy Vision initiative (REV), the state's investor-owned utilities have been tasked with streamlining their interconnection application processes for distributed generation projects.[1] Related to these reforms, New York State has an existing Standardized Interconnection Requirements (NY SIR), which was established in 1999 and periodically revised since. Building on the NY SIR the REV Phase I effort facilitates the development of uniform contract terms and procedures, aims to expedite the processing of interconnection applications and agreements, and to provide greater certainty to all parties.

The REV's Phase I objectives reflect a rising need to adapt to a changing energy landscape. DG grid interconnections in New York are, for example, growing at an accelerating rate, with deployments, particularly of solar photovoltaic (PV) systems, reaching new heights over the last 6-8 months (see Figures 1). Meanwhile, an increasing number of innovative information technologies, electronic controls, and other digital economy advances are demonstrating their potential to benefit electric distribution system operations and management.

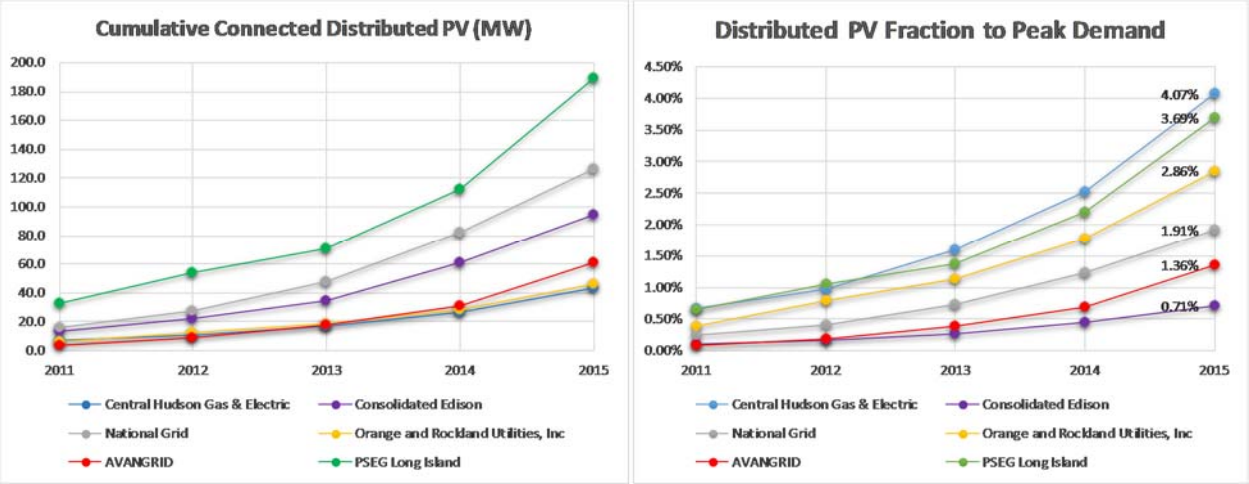


Figure 1 Annual growth of distributed generation (kW) in New York State, 2011 –2015 (Source: Joint Utilities of New York)

Central to the aims of Phase I for interconnection is the development of a utility-customer engagement web platform, the New York Interconnection Online Application Portal (IOAP). Each utility is required to implement an IOAP that allows for online application submittal, along with automated management and screening—including any needed impact studies such as load flow or fault level based on the distributed generation (DG) penetration levels. Moreover, the

[1] See Case 14-M-0101, Order Adopting Regulatory Policy Framework and Implementation Plan (February 26, 2015). Phase II of the REV on planning for DG is not addressed in this study. However, some data collected during the interconnection process will be needed with higher penetration, and for utilities' integration of DG into their system planning and operations.

online portal and its integrated processes are expected to furnish customers with greater transparency about the overarching interconnection process as well as accelerate utility feedback on their applications.[2]

For a number of reasons, the scope, comprehensiveness, and degree of automation of each state utility's current interconnection procedure is variable. Last year, EPRI, in partnership with NYSERDA, NY DPS, and NY utilities, performed a gap analysis to discern the existing capabilities of New York's utilities to design, develop, and implement an IOAP, as defined by the REV Order—and to do so in such a way that complements broader REV objectives (e.g., structural market reforms). This report takes the work a step farther outlining the functional specifications for an IOAP and a roadmap to achieve it based on the current state-of-the-art.

The Electric Power Research Institute (EPRI) was commissioned by the New York Department of Public Service (DPS) and the New York State Energy Research and Development Authority (NYSERDA) to define functional requirements for the IOAP to meet the REV requirements, define the current state of the art and challenges associated, and outline an implementation plan based on that.

Background: NY Standardized Interconnection Requirements

The New York State Standardized Interconnection Requirements (NY SIR) were established in 1999—and most recently updated in March 2016—to provide a framework for processing applications to interconnect distributed generation systems. The NY SIR's jurisdiction currently encompasses systems up to 5 MW. Applicable to the state's investor-owned utilities (IOUs)[3], the NY SIR lays out 6-step and 11-step procedures by which utilities are mandated to process interconnection applications. The 6-step procedure is intended to facilitate expedited application processing for DG systems 50 kW or less, while the 11-step approach provides a more detailed application processing arrangement for larger systems (50 kW to multi-MW) that likely require impact study, known as coordinated electric system interconnection reviews (CESIRs). Per a revision instituted in 2009, the NY SIR also requires that the application for utility interconnection be available online in a web-based format.

The NY SIR was developed to define the steps along with their associated timelines for completing the interconnection application process. However, existing utility approaches for receiving, evaluating, and approving PV interconnection applications are not uniform, adding time, cost, and uncertainty to DG project development. Accordingly, improvements that support a quicker, more transparent interconnection application process is needed to better align growing clean distributed energy resource interconnection applications with REV goals.

NY IOAP Objectives

Phase I of REV explicitly calls for a streamlining of New York State's current interconnection approval processes to reduce the administrative burden, increase transparency, and adequately prepare for greater amounts of DG deployment. In Phase I, using the NY SIR as a framework,

[2] Each utility is required to have a functional IOAP in operation by the time of their initial Distributed System Implementation Plan (DSIP) filing. Progress reports must be filed by July 1, 2015, and completion demonstrated in each utility's DSIP filed on December 15, 2015.

[3] PSEG Long Island is technically not an IOU. PSEG Long Island currently operates the Long Island Power Authority's (LIPA) transmission and distribution system under a 12-year contract.

PSC's February 26, 2015 Order (Order) asserts that each utility must establish the following functionalities while working toward a consistent state-wide look and feel for the public facing IOAP:

1. Ability to apply online
2. Automatically managing the application approval process
3. Responding in a consistent and timely manner
4. Providing standardized contract forms and terms
5. Enabling transparency into the process
6. Supporting the status tracking of times to approval and who is responsible
7. Sharing information via a publicly maintained queue
8. Providing automated technical screening and impact studies
9. Improved timeliness for identification of study requirements

This report outlines required functionality in the interconnection process and challenges associated with achieving this goal. It distills the current state of the art based on eight vendor interviews about tools currently available. Finally, it recommends a phased approach to implementing the IOAP with near term activities and longer term recognizing the evolving capabilities of both utilities and vendors.

Summary: Current State-of-the-Art

In order to manage increasing numbers of interconnection applications, and to improve the overall review process, NY utilities are considering a variety of homegrown and commercial tools. Vendors have stepped up to develop off-the-shelf tools that can assist utilities through the application management and the technical evaluations that are needed to make interconnection decisions. As part of this effort, EPRI interviewed eight vendors to understand the current capabilities and state of readiness to meet the IOAP automation goals in NY. Some vendors focus on application management, others on technical screening, and some on both.

Readiness was evaluated on several defined functional criterion and as was previously defined in the REV objectives. The functional readiness criterion included four components: speed of automation procession, ability to validate data, thoroughness of technical review, and time to integrate with utility systems described below. The conclusion – there is no single or ready-made solution available today that meets all the objectives as outlined in the Phase I REV order.

1. **Speed of application processing – *limitations are related to the technical review.***

   Improving the speed of processing interconnection applications through automation is a central theme to the REV objectives. REV calls for automation in both the application management process as well as the technical review. For the available tools and systems reviewed, we found that the application management process is ready to be directly automated, while the technical review process is much more problematic.

   Application management tools are available, both commercially and in several NY utility home-grown tools. The speed of processing depends on effectively interfacing with data sources, fixing non-technical screens and managing missing data or other errors flagged during the process. So far none of the technical screening tools have not been developed to operate quickly. Availability of data, interfaces, and manual checking are the key

limitations. Individual screens that require calculations varied in processing time over the range of minutes to weeks across the vendors.

Given this contrast of readiness between application processing compared to technical assessments. ***A phased approach is recommended, first automate the application process and then integrate with a technical process.***

2. **Ability to validate system data – *varies for vendors and utilities, generally not ready.***

   The dataset used for interconnection processing is the foundation to accurately determine impacts. This data includes electrical models of the distribution system, current configurations and settings as well as load and DG forecasts. The dataset is constantly changing as operating parameters and circuit configurations change, new DG connections are added and other distribution automations are utilized. The most accurate and up to date dataset will always reside at the utility which should be the source for interconnection decisions.

   This suggests that data for application processing and screening of interconnection requests needs to be directly derived from utility in more or less real time. In some cases, tools available today aim to recreate datasets. Since data handoffs may be problematic and can add delay time to processing, we recommend using data direct from utility database. Otherwise data transfer becomes a limiting factor and may affect accuracy of the evaluation. ***Provision for data enhancement and minimizing the need for data handoff should be incorporate into the IOAP to promote continuous improvement and simplify validation.***

3. **Thoroughness of technical review – *varies in both breadth and depth of analysis.***

   A critical component in the interconnection process is the ability to perform technical analysis relevant to the applications. This process can begin by implementing SIR standard screens or, in the future, through a hosting capacity analysis. There are specific impacts that must be considered to adequately screen proposed interconnections in a comprehensive way. These include voltage, thermal capacity, protection, energy, and safety/reliability. Most vendors have made provisions for these reviews. The breadth and depth of analysis varies.

   Limits or triggers are typically based on engineering experience, industry consensus or standards. A main limitation in many of the technical review processes is that they require an engineer to drive the process, to validate the data and to check the results. Often available data is sparse or not available. This then requires more engineering judgement.

   Assuming that data will improve over time, it is expected that appropriate screens and other technical reviews can be identified and incorporated into a number of tools. At present none of the tools have an automated way to thoroughly review interconnect concerns with increasing DG penetration levels. Similarly, the evaluation of hosting capacity is not well established and easily done with most available tools. ***Technical review practices need to further develop and to consider the range of voltage, protection, capacity, and energy impacts with enough depth of analysis to account for growing DG penetration levels.***

4. **Time to integrate with utility systems – *will be needed.***

In order to have an automated interconnection process, the ability for management and technical process to integrate into existing utility system and tools is crucial. The portal must be able to pull information related to the applicant (CIS), pull information about the location of the applications (GIS), perform technical analysis utilizing system data, and initial processes after an application is approved (work order management, meter management).

Experience with automating existing tools has been limited and integration with existing utility data and systems has only been done in limited pilot demonstrations. The scale of integration called for in a statewide requirement will be a first of its kind implementation for each vendor. ***Due to the complexity, it is recommended that a phased approach to integration be employed.***

Secondly, the readiness in terms of REV objectives was assessed. Table 1 below provides a summary of these findings. The main outcome is that of the seven objectives identified, five are focused around application management where tools currently exist. The remaining two that are more focused on the technical review process do are not have readily available tools.

Table 1 Vendor readiness to meet REV objectives

Objectives in REV	Vendor Readiness
Transparency	The solutions that have an application management component (3) provide the customer with visibility into the status of their application and this can be customized based on SIR requirements.
Consistent look & feel	The solutions that have an application management component (3) each have a different look and feel but can be customized somewhat for each utility and SIR process.
Consistent information sharing	The solutions that have an application management component (3) each have the ability to share information and can set the timing and points of sharing. It can be fixed based on SIR requirements and changed over time.
Ability to apply online	Of the solutions, three of the eight solutions had a front end that allowed the customer to apply online. The others were capable of linking to a front end.
Ability to manage, screen, and perform impact studies in an automated fashion	Three solutions are able to automatically manage the application process. In the case of the technical, none of the solutions can automatically perform technical screens currently with validated data. In order for the screens to be automated each utility must define thresholds.
Standardized interconnection requirements	The SIR process would have to be implemented into the solutions (are not currently). Additionally, in order to utilize the SIR screens the utilities would need to define thresholds to apply.
Standardized contract documents	The solutions with application management (3) can be customized to utilize the contract documents as spelled out in the SIR.

FUNCTIONAL REQUIREMENT ASSESSMENT

With the current state of the art in mind, as well as the knowledge of gaps on the utility side, this section defines the functional requirements of the IOAP to meet the objectives of NY REV. This section will identify the core functionality, what is possible, and challenges to reaching these functionalities.

Currently two tracks are defined in the NY SIR, the expedited and non-expedited. The main difference is in the expected complexity and technical review requirements. Implementation of a more automated application process is therefore divided into two different functional activities: the ***application management activity*** and the ***technical review activity***:

The **application management activity** is comprised of processing steps and procedures used to manage DG interconnection applications, from submittal and approval notification, installation acceptance and documentation for grid changes. Automating this management activity needs to address both the smaller, expedited, as well as larger, more complex interconnection applications. Application processing steps are guided by the NY SIR. It defines the specific steps, timeframes to complete each step, and the required communication with the customer at each step in the process. Most of these activities can be automated.

For example, if the DG is less than 50kW there are normally 6 application processing steps from initial submittal to final acceptance. This 6 step is intended as an expedited process and may include inverter-connected DG systems up to 300kW. The SIR includes a time limit exception for non-inverter and an eligibility exception for systems to be installed in LV networks. For 50kW up to 5MW there is a more detailed procedure (non-expedited) with up to 11 application processing steps and processing time deadlines defined in the SIR. An eligibility exception is noted for interconnection into low-voltage network-connected systems.

The **technical review activity** is comprised of checking feasibility, confirming DG plant requirements and conducing detailed technical screenings that depend on the plant rating and interconnection circumstances. Initial feasibility is based primarily on service capacity and transformer size. DG plant requirements are specified in the NY SIR section II. Technical screening includes checks for: equipment certification, rating, penetration screens, voltage fluctuations, power quality, and safety. Some of these activities can be automated and others will require experienced staff and engineering judgement to review drawings, check any exceptions, and sign off approvals.

For example, if the DG is less than 50kW (or less than 300kW inverter-connected) technical review includes checking the scope, relative size, compliance with SIR Section II requirements (also appendix F technical data), acceptance of system diagrams, determination of metering requirements, witness testing and on-site verifications. Larger DG system's technical review includes all of the above, preliminary technical screening (4 preliminary screens) and an evaluation if interconnection facilities or distribution upgrades are needed. When preliminary screening fails a supplemental screening analysis (3 supplemental screens) may be requested. If this supplemental screening fails, a CESIR may be requested.

The IOAP must address both technical and management activities in an integrated fashion for public facing (applicant/developer use) and for utility facing interfaces. The public facing interface is made up of functional elements that enable application submittal, tracking and

information sharing by the applicant, while the utility facing elements enable the site location and capacity validation, screening, and approval process.

All public facing elements need to reflect a homogeneous process, with common steps and requirements across each of the NY utilities, and provide consistency and uniformity for developers and end-users. Utility facing elements then address system specific feasibility, validation, screening, approvals, supplemental studies, cost estimations and documentation of changes or additions to the electric grid.

Each of these interfaces (for public and utility facing) have four key functional components. The figure below provides a summary of the core functionalities of an IOAP. It also shows at which steps data exchange and integration of different systems is required. Finally, the figure indicates when human interaction drives the process in three steps including application submittal (by the customer), application approval (utility engineer), and CESIR study (utility engineer).

Figure 2 illustrates key functional components in pubic, utility facing and the inclusion of a detailed study when necessary.

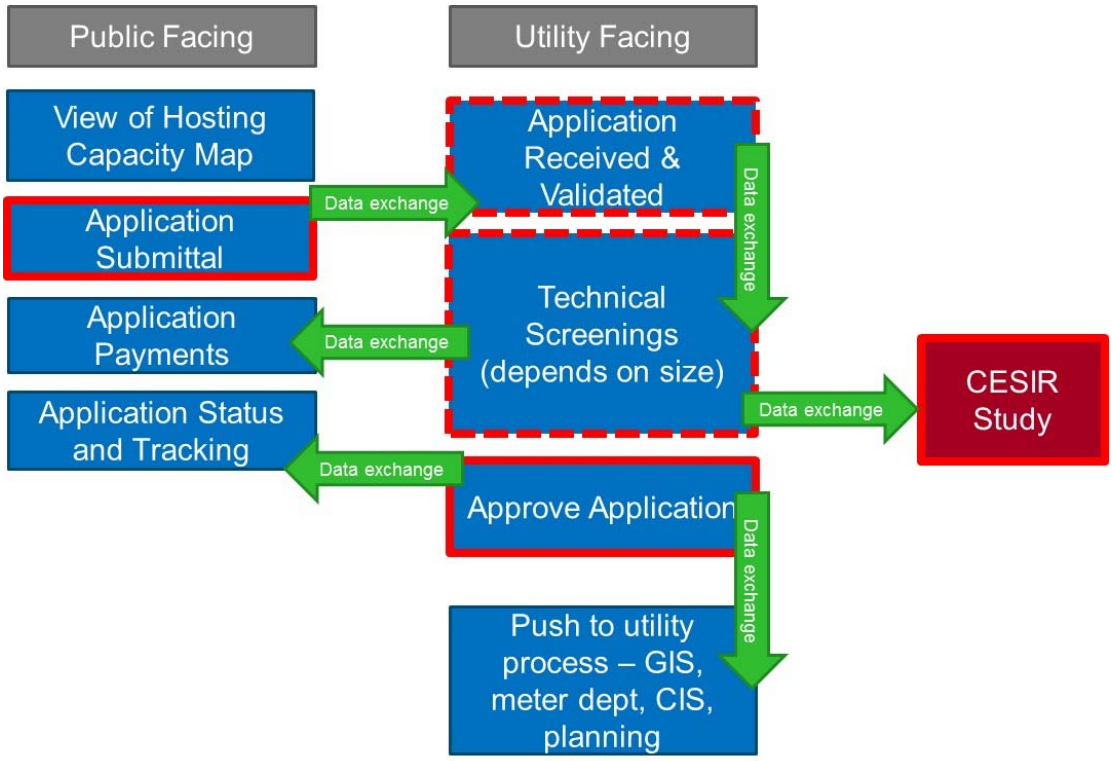


Figure 2 IOAP Core Functionality

Public Facing

The public facing functionality is the portion of the IOAP that is primarily used by the applicant or developer to interface with the utility as it relates to interconnection applications. The primary functionality within this portion of the IOAP is application submittal, tracking, payments, and viewing information about interconnection challenges within the utility service area. Integration is required so that data can be exchanged from the public facing side of the portal to the utility facing side. The following section goes through the core functionality in each of these

components to provide more understanding of (1) what each is, (2) the current state of the art, and (3) the challenges to meeting it within the IOAP.

Application Submittal

Application submittal is the main functionality of the public facing IOAP. The objective of the IOAP is for the applicant to be able to submit an application for any type of distributed generation for review by the utility. The application submittal process should follow the standard template and fields that are spelled out in the NY SIR. These gather data about the customer, the technology being applied for, as well as details about the DG system itself. In some cases, the applicant could be either a customer or a developer on behalf of the customer. When submitting the application, an electronic signature is required as well as the ability to submit a payment if it is warranted. The tracking of this application will begin upon submittal and will be linked to that customer identification.

Currently, there are readily available solutions that provide this functionality in a very flexible manner. The solutions allow an application to be submitted based on defined categories than can be changed over time as the process may change. Additionally, these solutions can be branded or integrated to meet the needs of multiple utilities. In some cases, solutions have been created by the utility to handle this portion and have similar functionality. For NY, selecting solutions that can have a consistent look a feel while maintaining the flexibility of different utility systems can be achieved.

Application Tracking

Once the application is submitted, tracking must be initiated to provide visibility into where each customer is in the application process. This functionality in the IOAP also provides a framework to process the applications on the timelines outlines in the SIR. Once an application is submitted the steps that is follows and timelines associated depend on the size of the system and the IOAP must initiate this. There are up to eleven steps depending on the DG system size in the SIR process with milestones within each that include time windows for responding to the customer.

The steps that should be made visible include:

- Application Submitted
- Application Received
- Application in Process
- Application in Technical Review
- Awaiting Documentation
- Application Approved
- Pending Verification Testing
- Set Meter Request Pending
- Permission to Operate

In the IOAP, there must be flexibility to which steps are made visible to the applicant and the timeline associated with the step. The utility should have greater visibility into a more detailed look at the status and can communicate to the applicant. The application should be able to login and see the status of any application they have submitted by location. In addition, if approved by the customer, the developer should be able to login and view the status of any applications submitted at the utility.

Currently, there are readily available solutions that provide this functionality and can be flexible for the steps that are made visible to the applicant throughout the process. As the SIR requirements change, so will the IOAP. The solutions also provide the ability to put time limitations on each of the steps to provide more consistent processing across the state. The main challenge associated with this functionality is integrating it with utility systems to enable more automated tracking of applications, particularly those systems that are smaller.

Applications Payments

In addition to being able to submit payments upon application submittal, there may be a need to submit a payment at some point in the application review process. At several points in the interconnection application process, there may be a need to submit payment. This could occur at the application submittal stage as a fee, during the technical review stage is a more detailed study is needed, or after study if mitigation is needed to install the system. The IOAP must be able to accept applications at any point in the application review/tracking process and be able to initiate that process with the customer upon request of the utility. The solution will need to be able to accept payments by customers and connect with the utilities financial system to process this payment.

Currently, there are readily available solutions that provide the ability to submit payment during the application process. This tends to be flexible to accommodate payment when needed and by several methods. The extent to which this process can be fully integrated with a utility customer information or billing system presents challenges.

View Hosting Capacity Map

Another objective of the IOAP is for the applicant to be able to look at maps that provide indication of whether or not there are areas of the utility system that can accommodate more or less amounts of DG. These maps represent this by displaying hosting capacity for each feeder. Hosting capacity is the amount of DG than can be accommodate on a system without causing adverse impacts on power quality, reliability, or safety. The ability to provide maps, similar to what has been done in California, has been a central discussion point as it relates to streamlining interconnection processing in NY. Having a defined hosting capacity method gives developers/public the ability to understand better/worse locations for DER on the system as an indicator of potential costs. These maps would need to be updated on a regular basis to account for existing DG as levels increase and change with changing operating conditions at the utility.

Currently, there are solutions that provide this functionality. However, in most cases, the analysis required to get hosting capacity maps can vary widely in how long it takes to perform. This speed allows for more frequent updates of the solution to reflect current capabilities for the application.

There some challenges with this process that must be understood. The first is that the posted maps are only as good as the latest analysis of the hosting capacity. This means that any new applications that have been approved or installed may not be represented and may change the hosting capacity. Any change the utility operation on particular portions of the feeder may also change the hosting capacity. The IOAP should be clear about the posted map and have an established update process as frequently as necessary based on their system. The other challenges are the integration with the utility systems that is required to provide regular updates. The utility planning tool as well as the GIS system will need to be integrated to ensure the latest and most up to date hosting capacity is posted. In the near term, distribution indictors such as substation

back feed and voltage limits can help inform applicants while the data and tools evolve allowing full hosting capacity implementation.

Utility Facing

The utility facing functionality is the portion of the IOAP that is used by the utility engineers to review, process and approve interconnection applications. The primary functionality within this portion of the IOAP is to review and validate the application as well as review the technical impact depending on system size. A higher level of integration is required so that data can be exchanged from the public facing side of the portal to the utility facing side and so that technical reviews can be performed. The following section goes through the core functionality in each of these components to provide more understanding of (1) what each is, (2) the current state of the art, and (3) the challenges to meeting it within the IOAP.

Application Management

The first step on the utility facing IOAP is to validate DG applications after they are submitted by the applicant/received by the utility. The IOAP should be able to perform a basic level of validation prior to utility review. Without integration with the utility the IAOP can validate that the application is for a valid address/location, verify completeness of the application itself, and confirm that the application meets the inverter certification requirements defined in the SIR. With integration into the utility customer information system, the IOAP should validate the customer identification number and address, and even perform basic technical review like checking the transformer size relative to the application. This process requires a secure connection with the systems at the utility that houses the customer information. It could be the customer information system, the geographical information system, or both. Being able to access these in real-time is a precursor to automating this process. In addition, it requires that the data be available at the utility.

Currently, there are tools that can perform validation, but the level of integration varies. In theory solutions today can integrate with utility systems to automate this process, but it has not been done on a wide scale at this point. The main challenge is the time required to do this integration with multiple utility systems. Some of the validation is basic and does not require integration and this level can be achieved sooner.

Technical Review

A key part for a utility processing the application is to be able to perform a technical review to understand if it will have any adverse impact on the system. The technical review process and the automation surrounding it will vary based on the size of the system being submitted. For systems less than 50 kW, the items reviewed could be achieved in the validation step once it is received. This level of screening can be automated with integration into utility systems. If not integrated, the transformer sizing check would occur as part of the technical review process by the utility engineer. The screens recently defined in the NY SIR are:

Preliminary Screens

- Screen A: IS the PCC on a Networked Secondary System
- Screen B: Is Certified Equipment Used?
- Screen C: Is the Electric Power System (EPS) Rating Exceeded?
- Screen D: Is the Line Configuration Compatible with the Interconnection Type?
- Screen E: Simplified Penetration Test

- Screen F: Simplified Voltage Fluctuation Test

Supplemental Screens

- Screen G: Supplemental Penetration Test
- Screen H: Power Quality Tests
- Screen I: Safety and Reliability Tests

For systems greater than 50 kW, there are nine screening steps defined in the SIR beyond the initial checks. The preliminary screens A – C, are more easily automated as the data needed to perform this is typically available at the utilities. However, preliminary screens D-F are not as readily automated. These screens require peak load, voltage conditions at the interconnection point, as well as the configuration of the distribution line itself. This data may not be available for all feeders in a service territory currently. If available, the tool must interface with the utility GIS and/or planning tool to determine if an application passes. These screens require calculations to be performed and this process can be time consuming depending on the solution used. Similarly, the supplemental screens (G-I) are challenging to automate given the data requirements. These screens also require an analysis to be done of the impact to the distribution system. In order to do this, load flow analysis must be performed. Depending on the tool, the analysis can range from minutes to days. If an application does not pass the screening process, the tool must push the application to a CESIR study process at the utility.

An important consideration in the automation of these screens is the need for engineering review. For systems that are larger and require the more data intensive screens, the step to check the solution is critical to ensuring any unforeseen issues. This check is particularly important as the data gap is filled.

Solutions that exist today have a wide range of technical screening abilities implemented many of which require an engineer to drive it through the process. Work should be done to ensure the screening needs in NY are implemented in these tools. The biggest challenge will be integrating the IOAP into multiple utility systems that may perform this technical screening and filling the data gap currently present for each utility.

Approve Application

Once an application is received and processed based on the size of technology type, there is an approval step. Application approval needs to be flexible in its implementation. In some cases, an automated approval process is acceptable particularly with systems that are less than 50 kW that can pass through the transformer sizing check through integration with utility systems. However, for systems greater than 50 kW or feeders with considerable DG penetration, the ability for a utility engineer to review and approve or reject an application is needed. After passing through the technical review in an automated fashion, a utility engineer can review the results and approve the application or require more study. As the data that is available and validated is more complete, the automation can be reviewed.

Update Utility Tools and Initiative Meter Process

Once an application is approved, there are a series of steps that must be triggered automatically. The first is pushing the information to the meter setting department so that a work order can be created and the process can begin. The second is to push it to several utility systems that need to

be updated with this new information like the GIS system, planning system, and customer information system.

This step requires integration with the utility systems that must be updated. Currently, tools have not integrated to this level, but it may be achieved in the future

Detailed Study
If an application does not pass the technical review process, it may need to move to a detailed CESIR study. In this instance, the IOAP cannot be used. CESIR studies require a detailed review to determine the impacts of the application. The IOAP should push applications that do not pass the review process to a utility engineer with a report on which of the technical review steps it did not pass. This report will help the engineer determine how to focus their CESIR study. The CESIR studies themselves will be done using various utility tools in a manual fashion.

ROADMAP TO IOAP

Based on the objectives of NY REV, the IOAP functionality defined, and the current state of the art, there are several key factors that will impact the implementation of the IOAP. These cross both utility and vendor domains and are outlined below:

1. **Automating application management can be achieved first, and in some cases is already in process.**
   Software is available that can be customized to interface with unique utility work management systems. Several utilities have developed online interconnection portals that already interface with existing processes and provide the customer with a method for application submittal and review of the current status. Vendor solutions available today are generally flexible and can be customized to meet SIR requirements and interface with utility systems. The level of automation depends on effective integration with utility systems. This further automation will require ongoing investment and time to complete.
2. **Automating the technical screening process is just starting, needs future definition and will take time for both utilities and vendors.**
   Effective automation of the technical screening process is not very far along. Progress has been made via concepts like hosting capacity analysis which works very well for planning purposes. To automate day to day technical acceptance, both utilities and vendors have work to do. For the utilities, updated data must be obtained about the system that does not currently exist. For the vendors, the tools need to be able to perform calculation-based screens faster than is currently available. Together the integration of the utility system data and knowhow with automated decision making tools is an appropriate future goal.
3. **Integration of vendor solutions and tools with utility systems won't be homogeneous.**
   To date, full integration with utility systems on such a wide scale as is called for in NY has not been done. Only pilot implementations have been completed, therefore this next step is expected to be first of a kind, challenging by nature and require time to complete. Each utility will have unique challenges associated with integration and will be on different schedules to implement. Each utility uses multiple systems and databases to manage distribution. CESIR's address different interface requirements. These legacy systems have different makes, manufacturers, and vintages that lack a common input and output. Over time, these systems will evolve and become more integrated, utility by utility. While this is not expected to

happen uniformly in the short term, longer term the state initiative is expected advance the state of the art.

4. **One size doesn't fit all**
   Each utility has made investments and uses multiple tools (some developed in-house) to review and study interconnection applications for their system. Automation will require integration with each of these existing system, processes and data. Additionally, some utilities have in-house web portals that have been developed. To meet the IOAP objectives in the most cost-effective manner, each utility should be tasked to design an IOAP that meets REV objectives, fits the existing electrical system needs and systems while implementing a consistent experience for developers.

Phased Implementation

Considering these key factors, a three-phased approach is recommended to effectively implement the IOAP in NY. The first phase objective is completing automation of application management processing in existing utility systems. In the second phase the aim is to automate SIR interconnection screening with links to utility and customer technical databases. The third phase integrates technical decision making processes to distribution planning software in order to automate additional technical screening and to better account for change penetration levels.

Each NY utility is in a different place when it comes to implementing these phases. Data, interfaces with existing systems, evolution and updating to new systems and processes must be established to reach these goals and will happen at different places. This section will outline specific functionality and define each phase:

- **Phase 1: Automate Application Management** – Automate application management and proceed towards integrating the site availability and installation readiness validations (system requirements checks and sizing compatibilities) into existing utility interconnection application processing database and systems (for all Applications 0-5MW). The timing for completion of automated management in 2016 – 2017.
- **Phase 2: Automate SIR Technical Screening** – Automate the SIR technical screening with links to both utility technical and customer databases (Applications >50kW). In this phase, the time required to achieve automation of the SIR screens will vary by utility, depending on data accessibility and gaps as well as internal system integration challenges. Suggested timing is by the end of 2017.
- **Phase 3: Full Automation of all Processes** – Integrated application processing for larger systems with distribution planning, hosting capacity results and feeder analysis. Speed of implementation will depend on closing data gaps, integration of feeder analysis and planning with penetration data and interconnection evaluations in 2017 – 2019.

Phase 1 – Automate Application Management

The first phase of the implementation is to achieve semi-automation. Based on the solutions available, it is clear that automating the public facing application process can be achieved. This would also include the application management portion of the utility facing tool for all applications (0 – 5MW). In this phase, integration with the utility system would be required to fully automate the applications for systems less than 50 kW. That basic integration may take longer to achieve for some utilities, but should be a goal in the phase 1 process.

Figure 3 provides a wiring diagram of the process for applications in Phase 1 of the roadmap. For applications less than 50 kW, the application is submitted and the IOAP will automatically

perform the basic validation defined in the application management table. It will also walk it through the 6 steps outlined in the SIR. Depending on the level of integration achieved by the utility, these six steps may require an engineer to complete. In the case where this information is readily automated, the application could be approved without engineering review and automatically pass back to the customer. If the application passes the applicant will receive the approval in the tracking function. If it fails, a more detailed study process is needed by the engineer. For applications greater than 50 kW, the IOAP would automatically perform the 11 steps defined in the SIR. All systems greater than 50 kW must also go through the SIR screens which will not be automated in this step. In Phase 1, this step is driven by an engineer and not automated. If the application passes the screens, it will be approved and the IOAP will notify the customer, if not it will pass to a CESIR study and notify the customer.

The level of integration and automation across the utilities will vary in this phase based on data and readiness. In order to reach phase 1, a public facing solution must be obtained by the utilities and requirements for validation must be outlined.

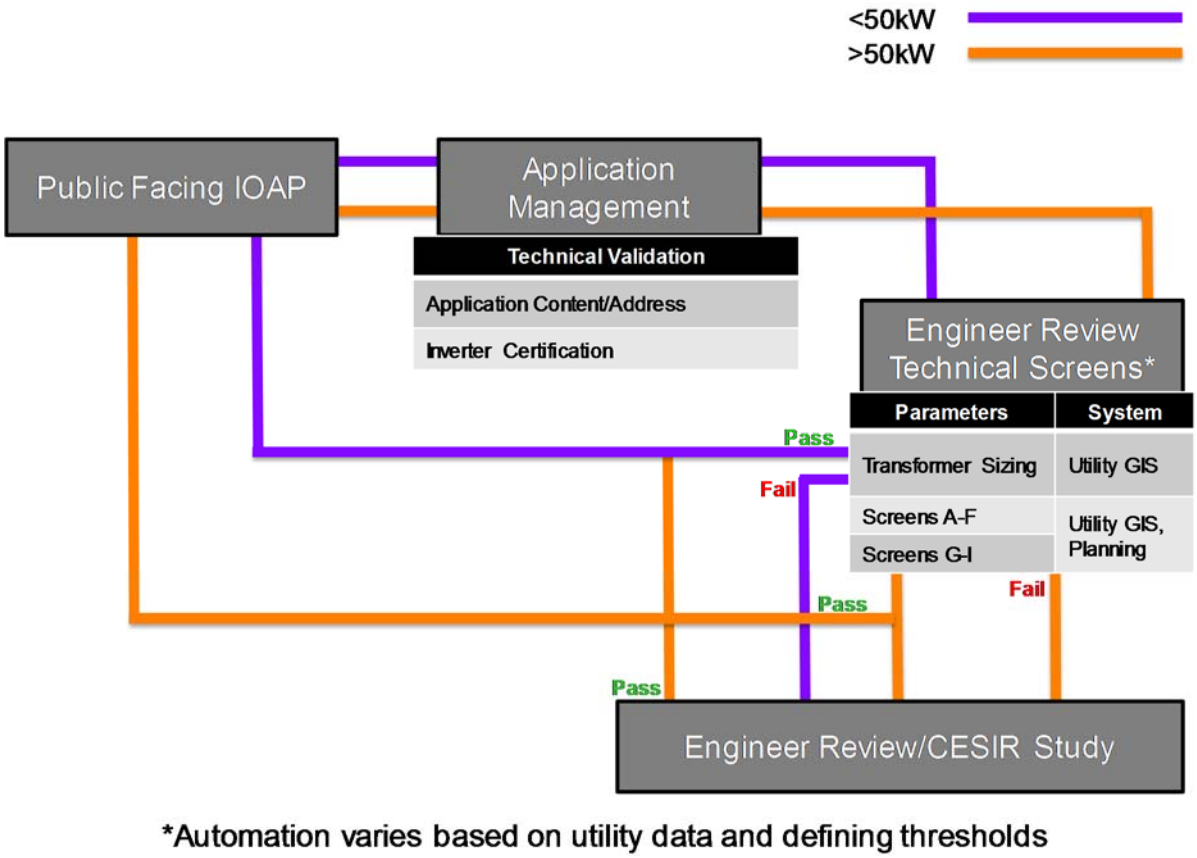


Figure 3 Phase 1 application flow diagram

Phase 2 – Automate SIR Technical Screening

The second phase of the implementation is to achieve full automation of the SIR defined screens. This requires more data than in phase one with more detail of the distribution feeders themselves and integration with tools at the utility. To reach phase 2, utilities must work on integrating the public facing IOAP with customer information systems, geographical information systems, and tools used to do technical review like the utility planning tool. This level of integration will take

time to ensure it is reliable and secure. For this integration to be useful, there is data that must also be obtained. Each utility is in a different place when it comes to data and models of their system. To reach phase 2, there will be a need for data on transformers, feeder loads, as operated conditions of distribution equipment.

Figure 4 provides a wiring diagram of the process for applications in Phase 2 of the roadmap. For applications less than 50 kW, the application is submitted and the IOAP will automatically perform the basic validation defined in the previous phase. This requires integration with the utility to check the transformer sizing. If the application passes these checks, it will automatically be approved and notify the customer. If it fails, it will move to engineering review. For applications greater than 50 kW, it will pass through application management in the same way as smaller applications. The IOAP will then process through the SIR screens. The level of automation in the technical screening step will vary by utility based on data and integration. By the end of phase 2, this automation should be achieved. Once the technical screens are reviewed, a report will be sent to the engineer to review and approve. If a screen was failed, the engineer will also get a report to help direct the CESIR study process. Once approved, the applicant will be notified.

The level of integration and automation of the technical screens will vary based on data availability and integration.

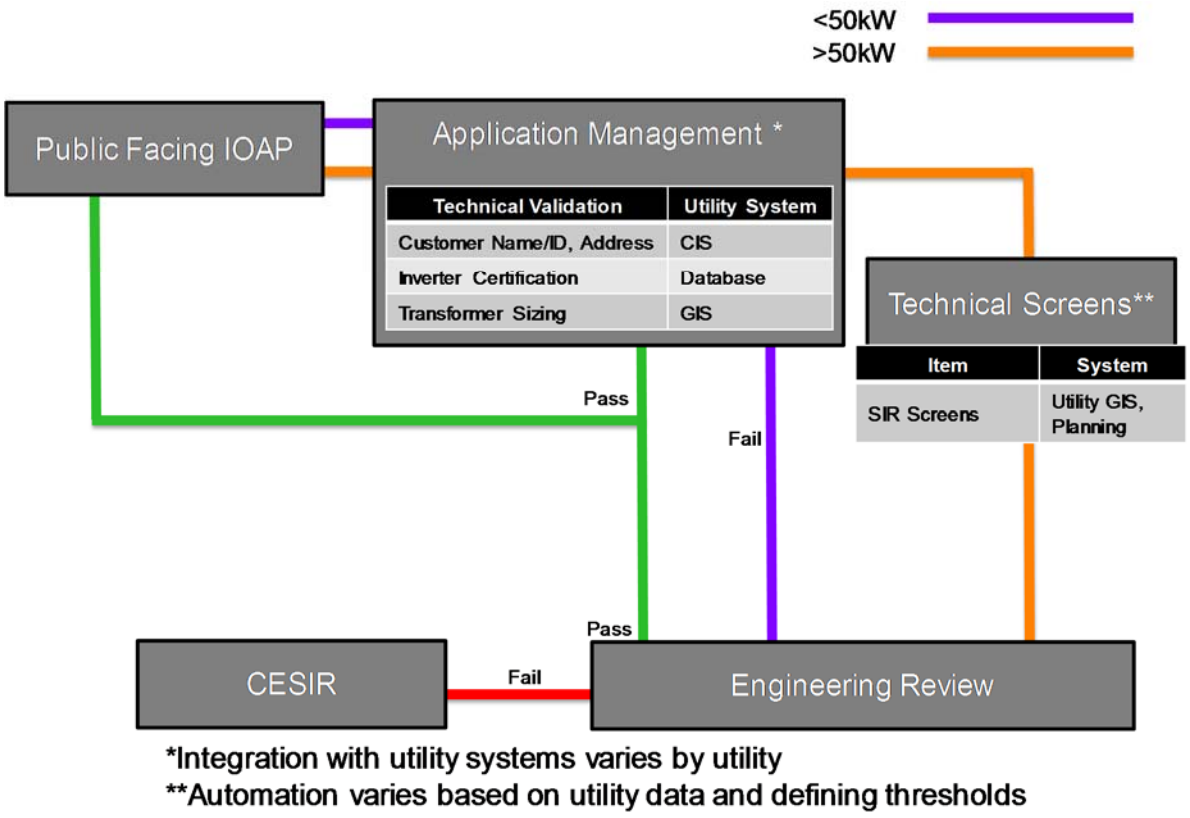


Figure 4 Phase 2 application flow diagram

Phase 3 – Full Automation of all Processes

The third phase of the implementation is for integrating the interconnection process with the distribution planning process. The non-technical screens in the SIR can become part of the

application management step because the IOAP will be fully integrated. The technical screens (screens E-I) that require calculations to be performed more readily than in Phase 2. There are multiple ways to perform this step in an automated way. The first is through the automation of the screens themselves using the utility tool. The second is by utilizing the output of hosting capacity analysis used in distribution planning. The result can serve as a lookup when interconnection applications come in to quickly see if a request can be accommodated and what the limitations are at the point of connection. Additionally, these results can be refreshed quickly and on a regular basis. The result is also used for mapping on the public facing page.

To reach phase 3, there will be a need for models of the entire distribution system with data on the as operated conditions. It will require that the utility GIS system and utility planning systems be integrated to provide the latest information.

Figure 5 provides a wiring diagram of the process for applications in Phase 3 of the roadmap. For applications less than 50 kW, the application is submitted and the IOAP will automatically perform the validation defined in the application management table. This requires integration with the utility to check the non-technical screens in the SIR. If the application passes these checks, it will automatically be approved and notify the customer. If it fails, it will move to engineering review. For applications greater than 50 kW, it will pass through application management. The IOAP will then process through the SIR screens E-I in an automated way OR check the hosting capacity at that location and limitations on the feeder. These processes will be fully automated and push the results to a utility engineer for review. If approved that applicant will be notified via the IOAP. If it fails, the engineer will perform a CESIR study utilizing the results of the technical screens to focus the study on areas of impact.

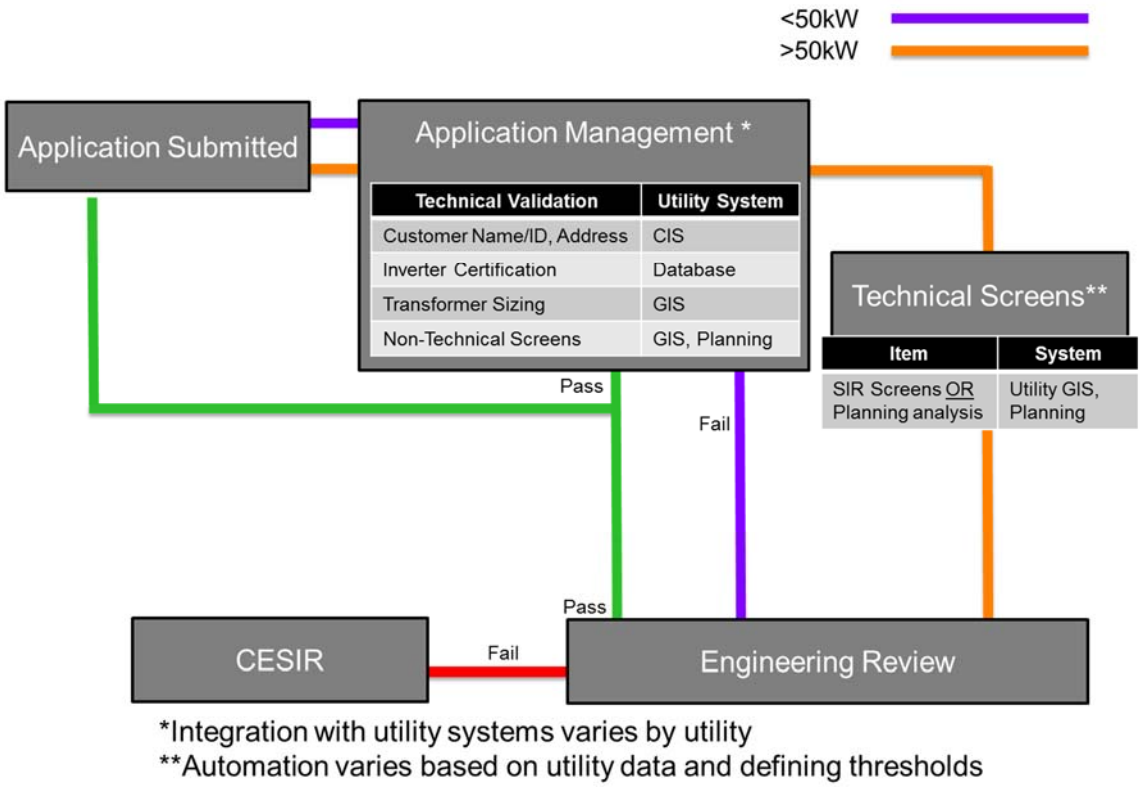


Figure 5 Phase 3 application flow diagram

As defined above the implementation of the IOAP is made up of three phases. These phases are driven by challenges that must be overcome for both the utilities and the vendors. Figure 6 provides a roadmap to achieving full automation and the gaps that must be filled in each phase by the utility. Because each utility has unique challenges, the timeline to reach Phase 3 will vary.

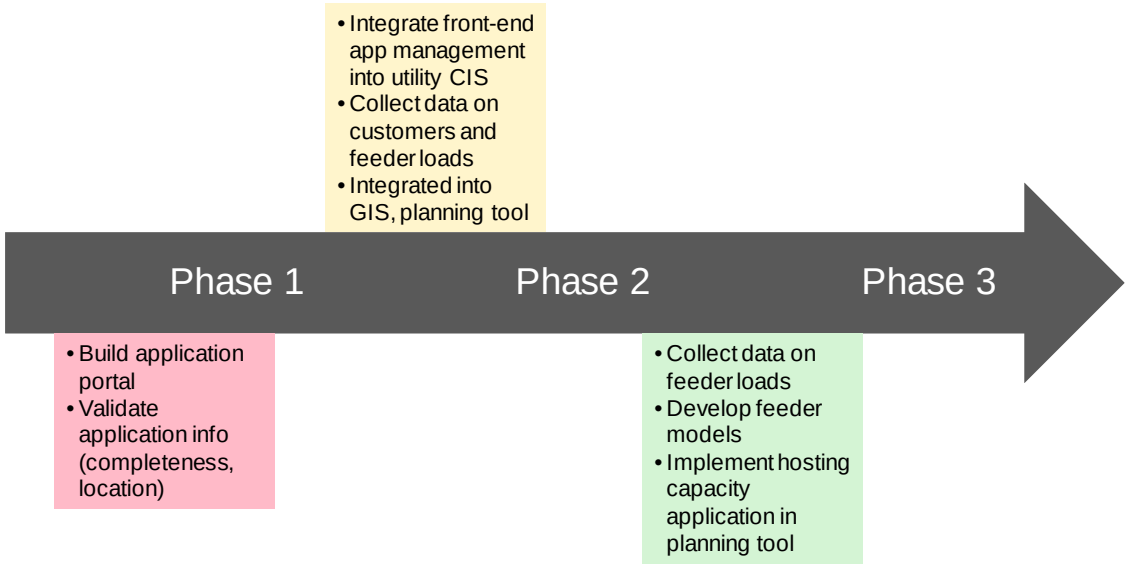


Figure 6 Roadmap for Implementation of IOAP

Appendix A: Specification of Interconnection Online Application Portal Functions and Timing

FUNCTIONAL REQUIREMENTS

New York's Department of Public Service February 2015 Order describes the on-line interconnection application objectives and lists core functionalities. The NY Standardized Interconnection Requirements and Application Process, March 2016, provides additional requirements for application and interconnection of DG including technical screening. Deployment of an Interconnection Online Application Portal (IOAP) is specified. Further, the NY SIR specifies that utilities maintain a web-based system to provide customers and contractors current information regarding the status of their applications.

Currently two tracks are defined in the NY SIR, the expedited and non-expedited. The main difference in these tracks is in the expected complexity of the technical review requirements of the connection. Implementation and specification of a more automated application process is therefore divided into two different functional activities; the ***application management activity*** and the ***technical review activity.*** Generally, application management functional requirements are the same for all connection requests while the implementation of technical review process and timing to incorporating in the IOAP varies with the size and complexity.

The **application management activity** is comprised of processing steps and procedures used to manage DG interconnection applications, from submittal and approval notification, installation acceptance and documentation for grid changes. Automating this management activity needs to address both smaller, expedited, as well as larger, more complex interconnection applications. Application processing steps are guided by the NY SIR. It defines specific steps, timeframes to complete each step, and the required communication with applicants at each step in the process. Most of these activities can be automated in the near term.

For example, if the DG is less than 50kW there are normally 6 application processing steps from initial submittal to final acceptance. This 6-step process is intended to be expedited and include inverter-connected DG systems up to 300kW. The SIR specifies a time limit exception for non-inverter and an eligibility exception for systems to be installed in LV networks. For 50kWs up to 5MWs, there is a more detailed procedure (non-expedited) with up to 11 application processing steps, and processing time deadlines defined in the SIR. An eligibility exception is noted for connections to low-voltage network systems.

The **technical review activity** is comprised of checking feasibility, confirming DG plant requirements and conducing detailed technical screenings that depend on the plant rating and interconnection circumstances. Initial feasibility is based primarily on service capacity and transformer size. DG plant requirements are specified in the NY SIR, section II. Technical screening includes checks for: equipment certification, rating, penetration screens, voltage fluctuations, power quality, and safety. Some of these activities can be automated and others will require experienced staff and engineering judgement on tasks such as review drawings, check for any exceptions, and sign-off on approvals.

For example, if the DG is less than 50kW (or less than 300kW inverter-connected) technical review includes checking the scope, relative size, compliance with SIR Section II requirements (also appendix F technical data), acceptance of system diagrams, and determination of metering

requirements, witness testing and on-site verifications. Larger DG system's technical review includes all of the above, preliminary technical screening (4 preliminary screens) and an evaluation if interconnection facilities or distribution upgrades are needed. When preliminary screening fails a supplemental screening analysis (3 supplemental screens) may be requested. If this supplemental screening fails, a CESIR may be requested.

Moving to increased automation, the IOAP must address both technical and management activities in an integrated fashion for public facing (applicant/developer use) and for utility facing interfaces. The public facing interface is made up of functional elements that enable application submittal, tracking and information sharing by the applicant, while the utility facing elements enable the site location and capacity validation, screening, and approval process.

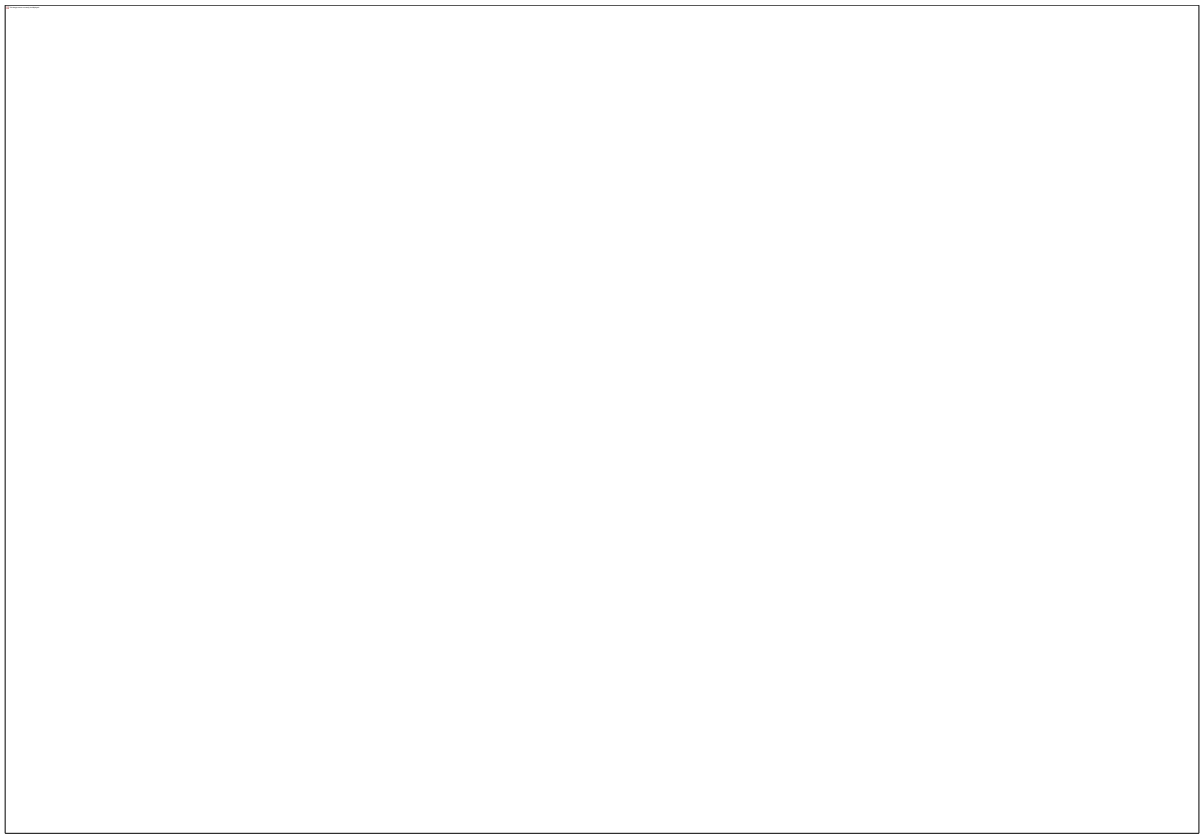
All public facing elements need to reflect a homogeneous process, with common steps and requirements across each of the NY utilities. They also need to provide consistency and uniformity for developers and end-users. The utility facing elements address system specific feasibility validation, screening, approvals, supplemental studies, cost estimations and documentation of changes or additions to the electric grid. These elements need to provide flexibility to accommodate existing utility data resources, legacy systems and unique technical aspects of the specific connections.

Each of these interfaces (for public and utility facing) have four key functional components. The figure below provides a summary of the core functionalities of an IOAP. It also shows at which steps data exchange and integration of different systems is required. Finally, the figure indicates when human interaction drives the process in three steps including application submittal (by the customer), application approval (utility engineer), and CESIR study (utility engineer).

Figure A1 illustrates key functional components in pubic, utility facing and the inclusion of a detailed study when necessary.

PHASED IMPEMENTATION AND TIMING OF IOAP

The public facing interface of the IOAP must be homogeneous (same application steps and timing) across different utility companies and power system characteristics in NY state. This is an essential first step to the New York IOAP. Automation of the technical screening, checking hosting limits, and studying specific interconnection impacts are expected to be added to the IOAP in the future.



Therefore, a phased implementation schedule is recommended. This accommodates differences exist among different utility portal development status and availability of and access to needed power system data. This recommendation is based on 1) meeting the all objectives of NY REV, 2) utility readiness to deploy IOAP functionalities, and 3) the current commercial industry state of the art. Current status and planning factors for the IOAP include both utility and vendor domains as follows:

1. **Automating application management can be achieved first, and in most cases is already in process** – Software is available that can be customized to interface with utility unique work management systems.
2. **Automating the technical screening process is a work in progress requiring improvements in both access to system technical data and further definition of quantitative screens.** These are addressed in future in this specification. Generally, automation of this technical screening process is not very far along.
3. **Required investments and time to integration vendor solutions and tools with utility systems in NY will be variable –** To date, full integration with utility systems on such a wide scale as is called for in NY has not been done.
4. **One size doesn't fit all –** Each utility has made investments in automation and use multiple tools (some developed in-house) to review and study interconnection applications for their system.

Considering these key factors, a three-phased implementation schedule is recommended to evolve the IOAP in NY. The first phase objective is to complete automation of application management processes for connection to existing utility systems. In the second phase the aim is

to automate SIR interconnection screening with links to utility technical and customer information databases. The third phase integrates technical decision making processes to distribution planning software in order to automate additional technical screening and to better account for change penetration levels.

Since each NY utility is in a different place when it comes to implementing these phases, data, interfaces with existing systems, evolution of automated systems and processes will happen at different paces. Establishing effective data interfaces is critical to move automated application management to more technical screening and high penetration connection decisions. This section will outline specific functionality and define each phase:

- **Phase 1: Automate Application Management** – Automate application management and proceed towards integrating the site availability and installation readiness validations (system requirements checks and sizing compatibilities) into existing utility interconnection application processing database and systems (for all Applications 0-5MW). The timing for completion of automated management in 2016 – 2017.
- **Phase 2: Automate SIR Technical Screening** – Automate the SIR technical screening with links to both utility technical and customer databases (Applications >50kW). In this phase, the time required to achieve automation of the SIR screens will vary by utility, depending on data accessibility and gaps as well as internal system integration challenges. Suggested timing is by the end of 2017.
- **Phase 3: Full Automation of all Processes** – Integrated application processing for larger systems with distribution planning, hosting capacity results and feeder analysis. Speed of implementation will depend on closing data gaps, integration of feeder analysis and planning with penetration data and interconnection evaluations in 2017 – 2019.

Each phase builds on previous phases and further integrates and automates the interconnection process. There are base line needs that must be met to achieve these goals, particularly data to preform analysis on the entire distribution system. What follows are the core functional requirements for an IOAP. Each utility will use their existing IOAPs as a starting point.

FUNCTIONAL CHECKLIST

Phase 1: Automate Application Management

This phase of the interconnection portal evolution establishes a well-functioning portal that is scalable and flexible. The focus of this automation is related to the application management activities for all applications. Objectives include;

1. Improved public facing experience in the application process including navigation, accuracy and timeliness of status, application guides, privacy and security of site information.
2. Improved efficiency for interfacing with internal processes, reducing number of manual steps, feeding a DG deployment database, consistency in interconnection requirements and reporting (utility facing).

Specific Requirements for Phase 1

Application Submittal – The main purpose of the public facing portal is to allow applicants (customer or developer) to fill out and submit an application online.

- Required fields – Allows fields to be marked as required in order to be submitted and is flexible for required fields to be changed over time as requirements change. Including approval from customer if developer submitted.
- Consistent fields – Provides flexibility for fields to be consistent across the utilities with different tools.
- Editable fields – Allows the user to save and edit fields prior to submittal or after submittal.
- Accept e-signature – Accepts e-signature on application submittal

Application Validation and Approval (utility facing) – Ability to validate the application fields for basic characteristics. Ability to approve applications that are less than 50kW based on well-defined set of parameters.

- Site and Customer information – validate customer information (including customer id number, name, and address) via the utility CIS system. Ensure no duplication.
- Inverter specification – validate inverter meets certification requirements defined in the SIR from a reference list
- Transformer Sizing – validate system does not violate transformer sizing (via link to utility CIS or GIS).
- Check compatibility of the proposed connection with feeder requirements.

Application Tracking – allows user (public and utility facing) to view the status of their application.

- Visibility into status by different users - ability to limit visibility by user type
- Capable of linking to utility systems to track progress of application including but not limited to the customer information system.
- Allows utility intervention in the process to review, check, approve applications
- Generate approval documents to send to customers.
- The following steps will be made visible to the customer or their designee and the utility in the application process. Additionally, portal will allow for time limits to be set based on application size and monitored on each step to ensure process are moving on schedule. The time limits stated in the SIR will be fixed for each step with reminders to the utility when a deadline is approaching.
    - Application Submitted – once application is submitted before being validated
    - Application Received – once application is received and is being processed
    - Application in Process – once application is being validated
    - Application Approved – once application is approved
    - Application in Technical Review – once application has moved from validation to technical screening
    - Application in CESIR Study – once application as moved from technical screening (supplemental).

- Awaiting Documentation – when utility has requested further data and is waiting on input from the applicant
- Awaiting Payment – when utility has requested payment
- Pending Inspection – when the application is approved and is being installed before inspection
- Set Meter Request Pending – after application is approved and once meter request is set
- Permission to Operate – after inspection and verified

User Restrictions – for privacy and security, allows different users to have different access based on need to know and roles. (limited public facing)

- Create individual accounts – allows applicants to set up accounts to login and save information including developers and customers.
- Differentiate access and visibility by user – ability to restrict access by user for read/write

Cost estimates, status of payments and pay on-line – allow applicants visibility on cost, status and to submit payments online (limited public facing)

- Submit payments at different points – users/applicants can submit payments at the time of application submittal or at points during the application process

Update Utility Tools and Initiate Meter Install Processes (utility facing)

- Ability to push application information to utility GIS
- Ability to push application information to work management system and meter department to initiate meter set process
- Ability to push application information to customer information system for updated billing

Viewing Maps – allow the public to view maps of the system where it may be better or worse to install DER (public facing)

- Capable of displaying a map of red zones or hosting capacity. The hosting capacity calculation should be consistent with the methodology defined in the DSIP filings.
- Capable of updating the map on a reoccurring basis defined by the utility (requires integration with utility GIS)

Reporting capability and options – allow utility to run reports on applications and to export for sharing results with other entities such as NYSERDA and NY Department of Public Service (utility facing)

- Create reports by size, technology – ability to create reports such as number of applications in the queue, those in technical review, applications approved and/or installed, as well as, by technology type and size.
- Provide export capability of reports – ability to export to XLS, CSV or other database formats for aggregation and analysis

Interoperable with utility systems – allow the public placing portal to integrate with utility tools through an API to enable automation (utility facing)

- Link into different utility systems (GIS, CIS, work management system, etc.) – ability to integrate (push and pull data) with different utility systems included CIS, GIS, work management system, etc.).
- Enable data transfer in common formats to streamline process and reduce error.

Expandable portal architecture that is flexible, scalable, and transparent (both public and utility facing)

- Future ability to adapt to phase 2 and 3 of the roadmap to integrate more with utility systems and streamline automation
- Ability to function with a growing number of applications and queue
- Ability to provide visibility for both the public and utility engineers

Phase 2: Automate SIR Technical Screening

This phase builds on the prior phase to automate the SIR technical screening with links to both utility technical and customer databases (Applications >50kW). In this phase, the time required to achieve automation of the SIR screens will vary by utility, depending on data accessibility and gaps as well as internal system integration challenges. Objectives include:

- Improved public facing experience in the application process including navigation, accuracy and timeliness of status, application guides, privacy and security of site information.
- Improved efficiency for interfacing with internal processes, reducing number of manual steps, feeding a DG deployment database, consistency in interconnection requirements and reporting (utility facing).

Specific Requirements for Phase 2

Further integration with utility systems – allow the public facing portal to integrate with utility tools through an API to enable automation (utility facing)

- Link into different utility systems (GIS, CIS, work management system, etc.) – ability to integrate (push and pull data) with different utility systems included CIS, GIS, work management system, etc.).
- Enable data transfer in common formats to streamline process and reduce error.

Implement SIR technical screens A through F

- Implement the ability to calculate SIR screens based on utility data and recognize as pass or fail
- Push applications to engineer if fails any SIR screen or if data does not exist to complete SIR screen

Phase 3: Full Automation of all Processes

The third phase builds on phase 1 and 2 to integrate technical decision making processes with distribution planning software in order to automate additional technical screening and to better

account for change penetration levels. Integrated application processing for larger systems with distribution planning, hosting capacity results and feeder analysis. This phase of the interconnection portal evolution brings in technical screening by applying the screening criterion in the SIR. The focus of this automation is for applications 50 kW and up to 5 MW, where specific screening steps (4 preliminary screens and 3 supplemental screens) have been defined. Specific objectives include:

- Improved public facing experience in the application process including navigation, accuracy and timeliness of status, application guides, privacy and security of site information.
- Improved efficiency for interfacing with internal processes, reducing number of manual steps, feeding a DG deployment database, consistency in interconnection requirements and reporting (utility facing).
- Improved consistency across utility systems and data

Integrate with output of load flow in utility planning tools

- Integrate the application review process with output of utility load flow analysis (hosting capacity) to check application size against defined amount.
- Update analysis on a regular basis to keep up with new data, new operating conditions, or new applications
- Implement technical screens G though I