5 reasons

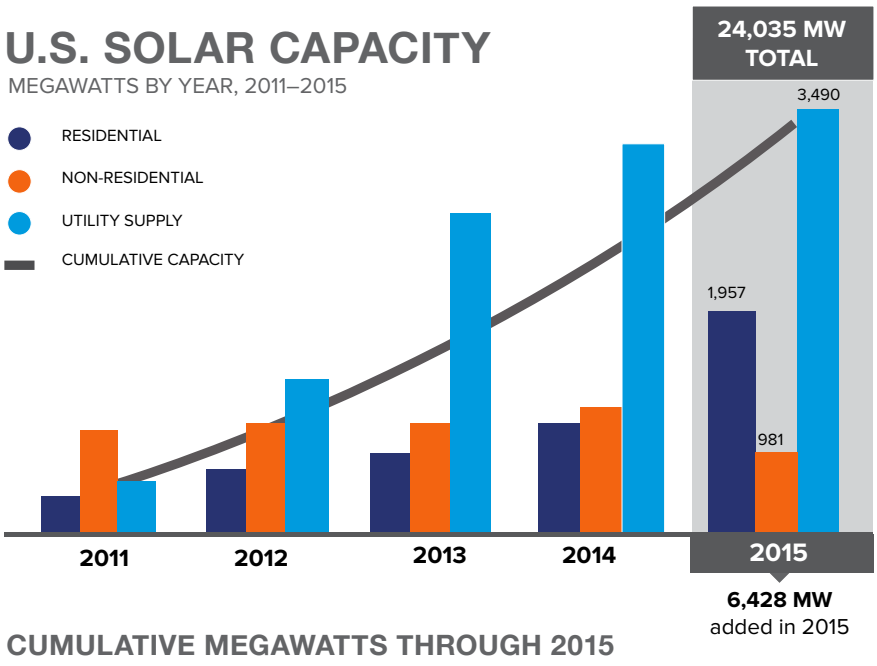
TO START STREAMLINING INTERCONNECTION NOW

Clean Power Research®

Why Focus on Interconnection?

The volume of distributed generation (DG), particularly photovoltaic solar (PV), being interconnected to distribution grids across the country continues to rise. In 2015 more than 330,000 residential and commercial PV systems were interconnected in the U.S., with a total capacity of nearly 3 GW. Volumes are continuing to grow, with 119% solar market growth expected in 2016.

Source: Smart Electric Power Alliance 2015 Solar Market Snapshot



Prior to receiving permission to begin generating, each system must pass through an electric utility's interconnection process. Interconnection processes require significant amounts of customer data, as well as technical service and generator detail. Often, review and approval is required from multiple utility departments.

The rising volumes of interconnection requests are stretching utility renewable and customer service departments beyond their limits. Inefficiencies and unnecessary complexity in utility processes, as well as a lack of technology to streamline data transactions and application processing, are being exposed. This leads to avoidable delays, and decaying customer satisfaction.

This e-book highlights the five reasons utilities should start to streamline interconnection processes now to get ahead of challenges presented by growing distributed solar. We'll also describe how taking interconnection administration fully online enables utilities to make the most of its distributed resources.

> *"It took us 40 years to get to 1 million installations, and it will take us only two years to get to 2 million. This is a time to mark when the solar industry started to accelerate at warp speed."*

Dan Whitten
vice president of communications at the Solar Energy Industries Association (SEIA)

In this e-book, we'll cover:

- ✔ What "online" actually means when it comes to interconnection application processing.
- ✔ Five reasons to start streamlining interconnection processes now:
  - Scale with growing volumes: solar is here to stay
  - Keep customers informed when tariffs change
  - Provide great customer service
  - Establish a system-of-record
  - Better integrate distributed solar into grid operations
- ✔ Steps to successful streamlining.

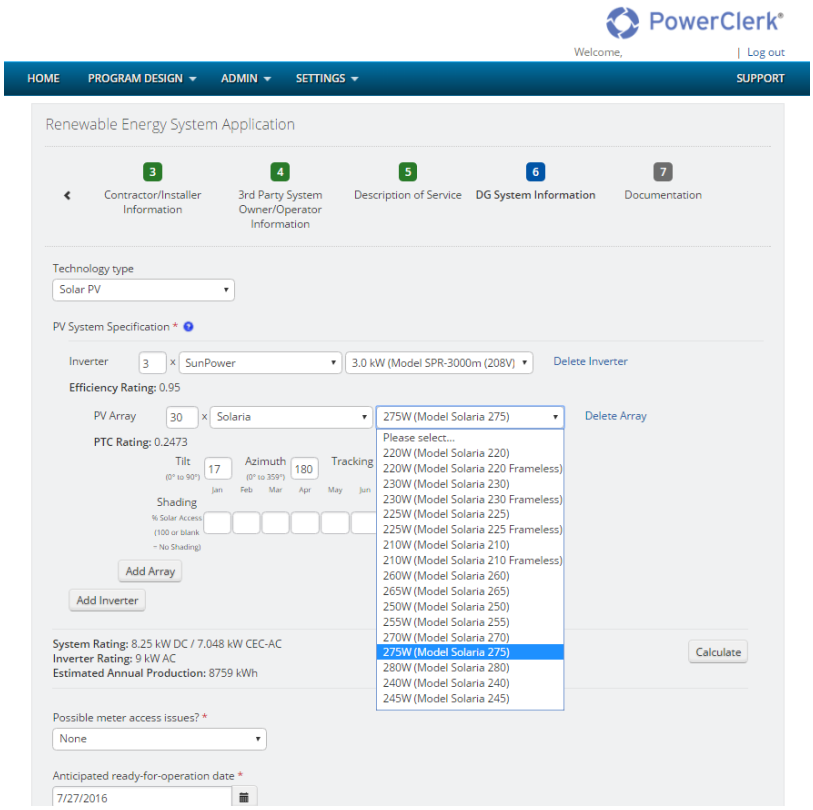
What Does “Online” Really Mean?

In the era of web-based technologies that streamline business processes and enable automation, the natural solution to handling complicated application processes is an online platform. But what does ‘online’ really mean? Based on over a decade serving more than 30 utilities and energy agencies operating energy programs, we’d like to take a stab at answering that question.

An online distributed generation platform should offer the capability to:

- **Fill out forms online.** Online platforms should enable the creation of dynamic, web-based forms (not fillable pdfs) for applicants to use when submitting applications, and for administrators to use when reviewing the submitted projects. Application forms should validate data entered into fields, should never require duplicate data entry, and should dynamically change to collect the appropriate data and documentation for each type of application.

Web forms can validate information at time of submission



- **See project statuses online.** Each project’s status and review details should be up-to-date and visible to applicants 24/7/365 online.

- **Automatically send notifications.** Notifications should automatically be sent to appropriate stakeholders as frequently as each status change, keeping them informed of updates, and aware of additional requirements.

- **Automatically notify of approaching deadlines.** Automatic deadlines should notify stakeholders when approaching important process deadlines or before reaching an expiration date.

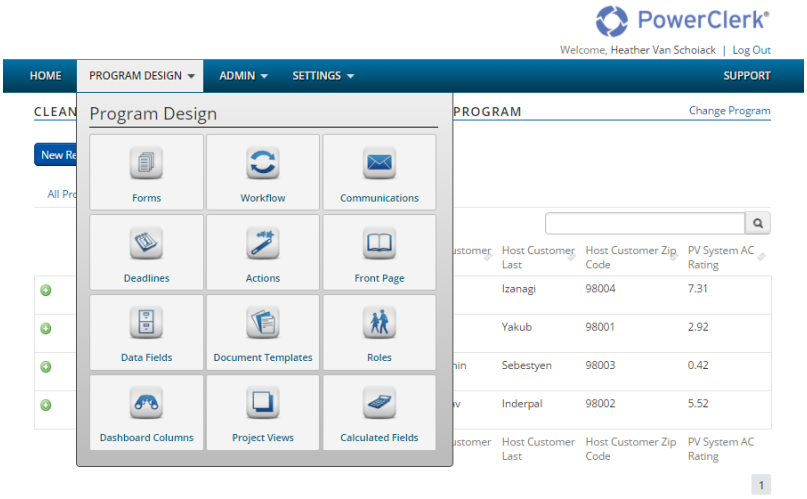
- **Automate key process steps.** The administrator should be able to define actions (such as notifications, deadlines and more) that are triggered automatically when a project's status changes.

- **Create a database of application information.** The system's database should be the single system-of-record for distributed generation data and documentation. Data should be accessible for reporting, communication generation, documentation creation and dashboards.

- **Secure integration options via web services.** The system should have the capability to be operated standalone or integrated with external systems (e.g., CIS, ERP, GIS, distribution planning software and more) with modern security and communication protocols. The system should also support integration with applicant CRM systems to automate application submission and review.

- **Easily configure processes and automation.** Administrators should be able to configure processes and automation at will online without requiring IT or consultant involvement.

Straightforward program design that is configurable by administrators (no IT required)



- ✔ **Set user access options.** Role-based access that enables data control and inter-departmental collaboration required to operate an interconnection process
- ✔ **Utilize eSignatures.** Contracts and other documentation requiring signature should be automatically generated (filled-in with data), and should be executed in an integrated eSignatures process.

With online application systems, paper copies, fillable PDF forms and wet-signatures are a thing of the past. Online systems capture and verify information via the web, store it securely, and make it available to the right people at the right time. Online systems also automate key process steps, streamlining workflows and enabling programs to easily scale with growing program volumes.

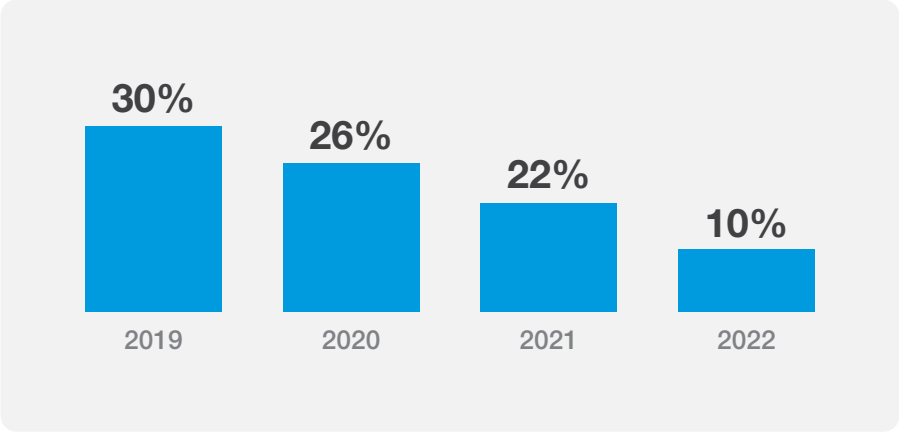
By taking interconnection online as described above, utilities are well positioned to meet the challenges and opportunities described in this e-book.

REASON 1

Scale with Growing Volumes: Solar Is Here to Stay

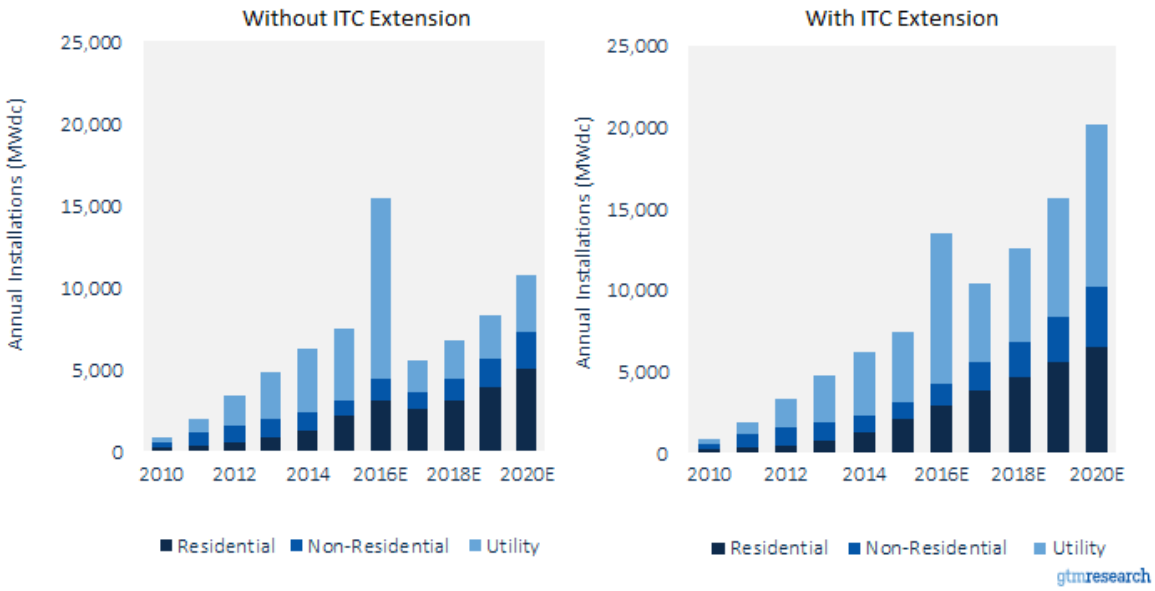
Utilities large and small need to be prepared to handle distributed generation, particularly solar. A key contributor to the increase is the extension of the Investment Tax Credit by the U.S. Federal government in 2015.

The 30% Federal Investment Tax Credit was extended in 2015, and will be phased out by 2023



Another contributor is the continued decrease in the costs of going solar. As a result, forecasts through 2020 project more than 50% growth in solar.

GTM Research estimates of U.S. PV installations with and without the ITC extension

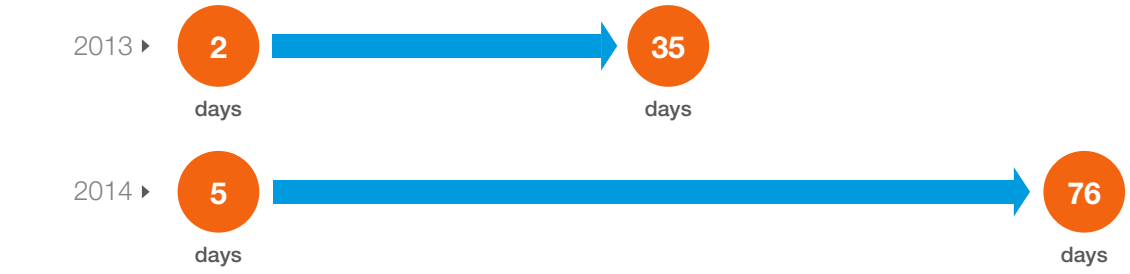


Additionally, when combining solar with other distributed energy resources (DERs) like storage, electric vehicles (EVs) and smart devices, the return on investment can be even greater, creating even more challenges and opportunities for utilities.

As the increase in volume continues, the strain on overwhelmed interconnection and customer service resources commonly leads to increasing backlogs and wait times for utility customers and their installers.

According to an EQ Research study, the length of time it took to obtain Permission to Operate (PTO) increased from a range of 2 to 35 days in 2013, to a range of 5 to 76 days in 2014. The median waiting period jumped from 18 days to 25 days during the same time. While the trend cited was for 2013 to 2014, anecdotally we saw this trend continuing at many utilities in 2015.

Average days from PV interconnection application submittal to Permission to Operate.
Source: EQ Research



Median waiting period

Although wait times are rising, customer expectations for interconnection process time have not changed. By taking interconnection online with a proven solution, utilities in emerging markets can get ahead of the backlog problem, and those in more mature markets can reduce, halt and reverse growth of the backlog.

REASON 2

Keep Customers Informed When Tariffs Change

With the steep growth in distributed PV, many utilities are finding themselves challenged to efficiently manage the transition from one tariff to another. This can lead to surprised customers who learn too late that their newly installed PV system is not going to be on the expected tariff, such as a Net Energy Metering (NEM) rate. Customer frustration can set in quickly when it becomes apparent that a tariff change is impacting return on investment.

In November of 2015, 27 states were either studying or changing their net metering policies. Many utility customers will be impacted by these changing rates in the near future, whether they know it or not.

As a tariff change approaches, application volumes will swell and customer patience will be thin. Implementing an online interconnection system will enable your team to make tariff changes transparent by providing real-time information about tariff availability.

Interconnection best practices during tariff changes

Create public-facing dashboards that update in real-time.

- Display a graphic that shows how much capacity is left under the current tariff.

- Automate an application queue that shows each project's position in the queue relative to others. Queue information can be displayed publicly, or to specific project owners.

- Display alerts on the dashboard as NEM caps approach. Make it clear to applicants when NEM eligibility ends, and what that means to them.
- Understand the economic and energy impact of interconnecting a PV system under both the legacy and successor tariff before purchasing equipment.

  Example: "As the NEM cap is approaching, note that interconnecting systems will soon no longer be eligible for the net metering tariff. Utilize our online calculator to find out how the new rate will impact the economics of your proposed PV system before purchasing equipment. Note that application submission is not a guarantee of net energy metering."

Keep stakeholders up-to-date in real-time via personal (not public) applicant dashboards, automatic communications (emails) and online logins.

- Configure an online login for contractors to see the status of all their projects, fill out forms and upload attachments.

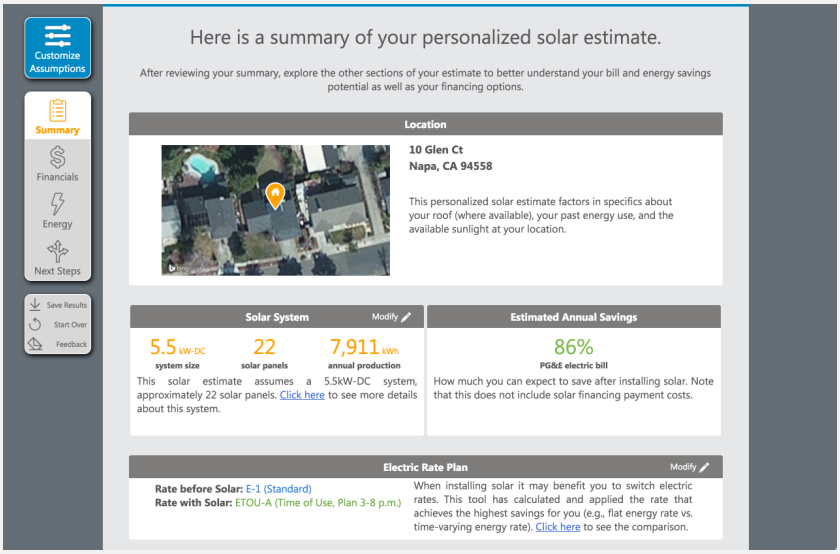
Implement a system that's flexible enough to adapt to rapid process changes/evolutions.

- Easily update requirements, forms, workflow and documentation once the successor tariff begins.
- Easily and immediately deactivate a rate once its cap/deadline is reached.
- Edit, enable or create new rate options within the application workflow as they come into effect.

Inform customers how changing rates may affect their return on investment before a decision is made to purchase a PV system.

- Provide self-service web tools such as WattPlan® for customers to objectively analyze the financial implications of rate options.

WattPlan helps utility customers analyze how changing tariffs will impact solar and electric vehicle investments



REASON 3

Provide Great Customer Service

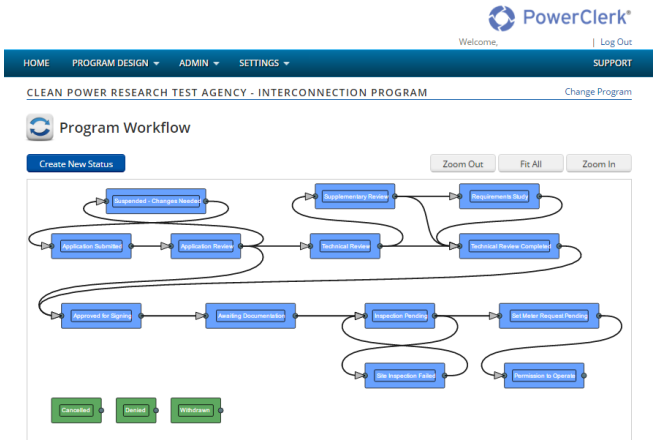
As digital has become a way of life, today's energy consumers are expecting more from their utility. That means high visibility early and often, seamless application processes and faster response times.

Online services are easy to use and preferred. According to Accenture's New Energy Consumer research program, consumers prefer low-touch channels for the majority of interactions with their utility. While in most interconnection programs the customer's installer or contractor submits the application, customers still expect to be kept well informed about the status.

> *"70% of [energy] consumers prefer a 'do-it-yourself' self-service approach to interactions – a key determinant of satisfaction and loyalty."*
>
> Accenture
> "The New Energy Consumer: Architecting for the Future"

Creating a streamlined interconnection process with dynamic, online form submission, automated email notifications and eSignatures makes the applicant's experience feel modern and easy while automatically providing customers the information they need. For example, with eSignatures, customers can review and sign agreements online without the need to meet face-to-face with the contractor or the utility. With an online system, applicants can interact with the process on their schedule, from anywhere they have access to the internet.

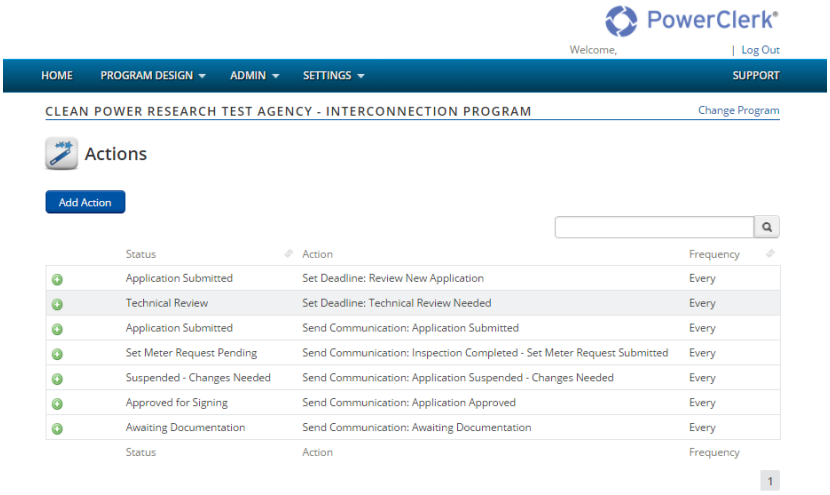
Streamline the workflow with online submission and eSignatures



As application volumes grow, a common problem utilities face is the erosion of available resources as more and more time is consumed manually providing status updates. Because an online system enables instantaneous status updates, the need to respond to status inquiries via phone and email is eliminated. In addition, the installer or contractor does not have to serve as the middleman communicating between the utility and the utility customer: all stakeholders can be individually notified through automatic emails.

Online application systems also enable better communication between internal stakeholders, reducing review cycle times and speeding-up permission to operate approvals.

Provide automatic updates to customers at key points in the application review process



REASON 4

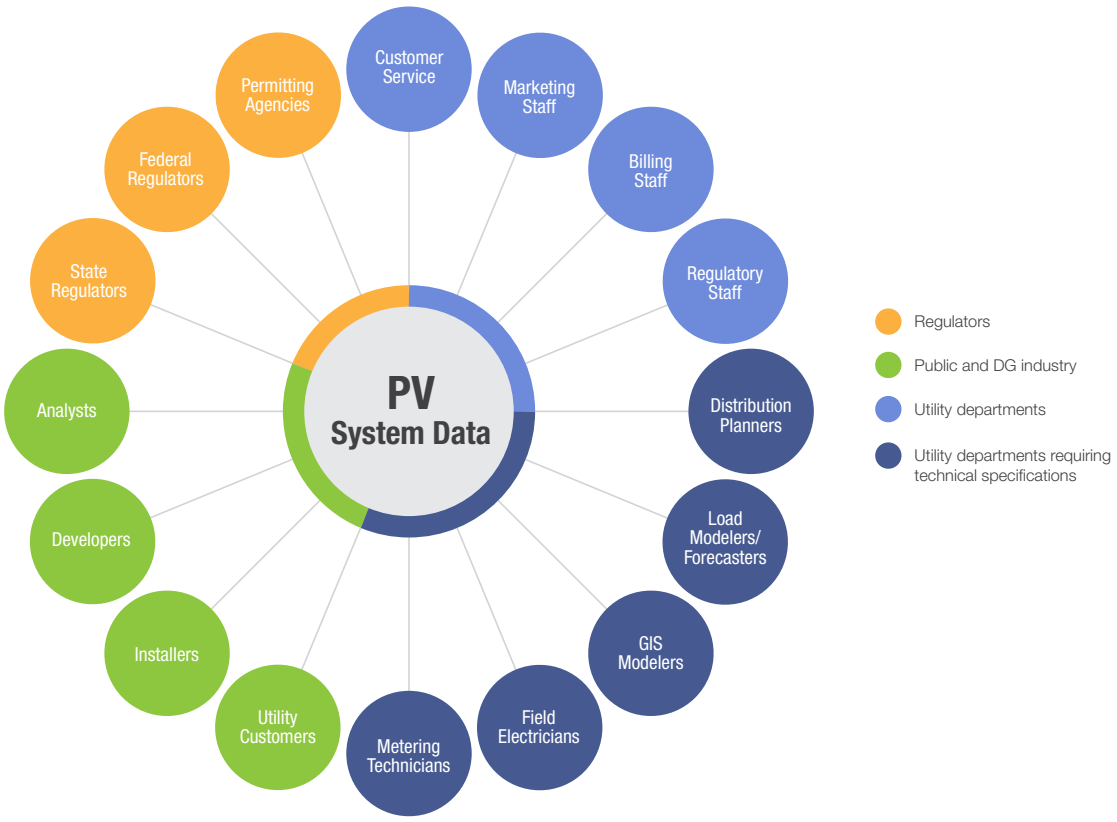
Establish a System-of-Record

From the time an interconnection request for a generating system is submitted to the point when permission to operate is granted, PV system information needs to be leveraged by a number of decision makers. This information ranges from contact information for the installer and customers, to highly technical information about the PV system itself, such as location, orientation, capacity, equipment make and model.

Inside the utility, stakeholders include:

- Customer service representatives, billing staff, customer engagement specialists, etc.
- Geographic information system (GIS) modelers, distribution planners, load modelers/forecasters, etc.
- Metering technicians, field electricians, etc.
- Regulatory staff.

Ecosystem of distributed solar data stakeholders



The process isn't complete when permission to operate is granted; the utility must still manage customer address changes, generator additions or modifications, and generator decommissions. Interconnection agreements typically have a 20-year lifetime, making it crucial for utilities to maintain a system of record that will automatically keep internal and external utility stakeholders in the loop.

The data obtained during the interconnection process also drives a number of decisions made external to the utility by customers, contractors, developers, state and federal regulators, analysts, permitting authorities and others.

Forward-thinking interconnection teams are today systematically collecting and sharing PV system information within their organizations using online application systems. When applications are filled-out and submitted online, system-of-record data can be validated at time of entry, ensuring data integrity. Instead of being transcribed from PDF files (potentially introducing errors) or stored in file cabinets, data is stored in databases that can be accessed directly by:

- ✔ Viewing a particular application.
- ✔ Accessing reports or dashboards that show program information.
- ✔ Integration with other utility systems such as customer information and billing systems, and planning and operational software tools.

Creating a system-of-record early gives utilities the information they need to manage and reliably integrate distributed energy resources over the long-term.

REASON 5

Better Integrate Distributed Solar into Grid Operations

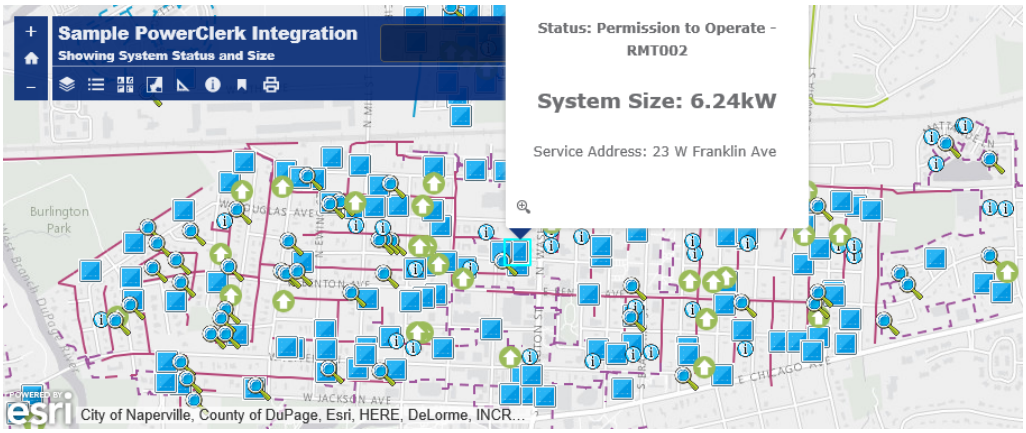
As distributed PV capacity continues to increase, the operational and economic issues associated with the intermittent nature of PV become much more significant to reliable grid operation. Impacts can be felt at the local level, and across an entire grid.

At the feeder level, concerns arise when power generated from distributed sources exceeds the feeder load, causing voltages to rise, or when feeder currents approach or exceed equipment design limits. In the U.S., a commonly used rule of thumb allows distributed PV systems to power up to 15% of the peak load on a feeder without a detailed impact study.[1]

To ensure reliability and safety at the feeder level, utilities need to analyze the distribution of new PV systems before they are interconnected. With an online workflow, distribution analysis and application screening can be automated by exchanging information on individual interconnection applications with distribution planning software. This makes it possible for engineering to rapidly perform distribution planning analysis on each proposed system, and provide results to the applicant automatically.

In addition, utilities can use interconnected PV system specifications to create and share circuit capacity maps with developers. This gives developers the information they need to target their sales efforts in areas that still have capacity for distributed PV. Utilities can also use the information to target distributed energy resource program offerings to help balance loads and avoid infrastructure updates.

Sample circuit capacity map (source: Esri)



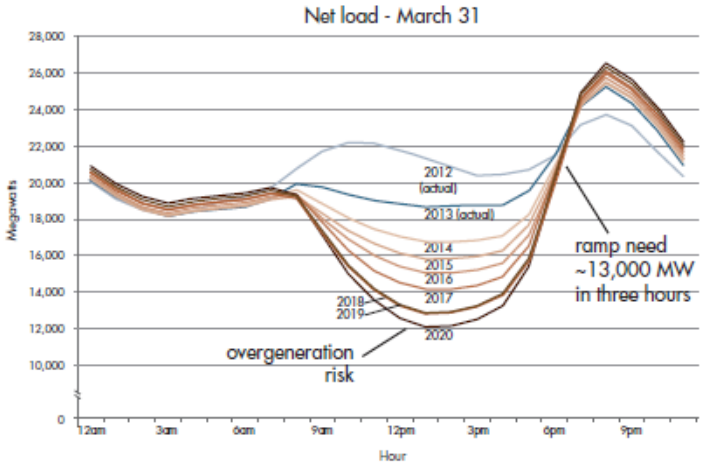
[1] http://www.nrel.gov/docs/fy12osti/55094.pdf

At the utility or independent system operator (ISO) level, high-penetrations of distributed PV can change load curves, as the California ISO famously illustrated with the "Duck Curve." High-levels of PV can lead to over-generation as the sun reaches its zenith, and sharper peak loads later in the day when solar generation has waned.

As illustrated by the Duck Curve, high-levels of grid-connected PV reduce the demand for energy from the grid that varies based on time of day. These reductions, as well as the variable nature of solar power generation, can have a measurable impact on overall load forecasts. This loss of forecast accuracy can result in short-term market exposure and raise costs to market participants.

As the penetration of distributed solar increases, utilities will increasingly need to report on their installed fleets, and forecast how these variable resources impact their loads on a day-by-day, hour-by-hour basis. Forecasting production of behind-the-meter systems requires system specifications for a utility's installed PV fleet in a format that is readily accessible for use by applications such as SolarAnywhere® FleetView®.

The duck curve shows steep ramping needs and overgeneration risk
(Source: California Independent System Operator)



Steps to Successful Streamlining

As distributed solar continues its strong growth, utilities across the U.S. will feel the impacts—from interconnection administration, billing and customer service, to planning and operations. Utilities that streamline processes now will be prepared to meet the demand, improve customer satisfaction and establish a system-of-record to aid in long-term management of their distributed resources.

Key steps to streamlining interconnection include:

- ✔ Eliminating all unnecessary process work.
- ✔ Re-engineering broken processes.
- ✔ Improving interdepartmental collaboration.
- ✔ Implementing the right tools.