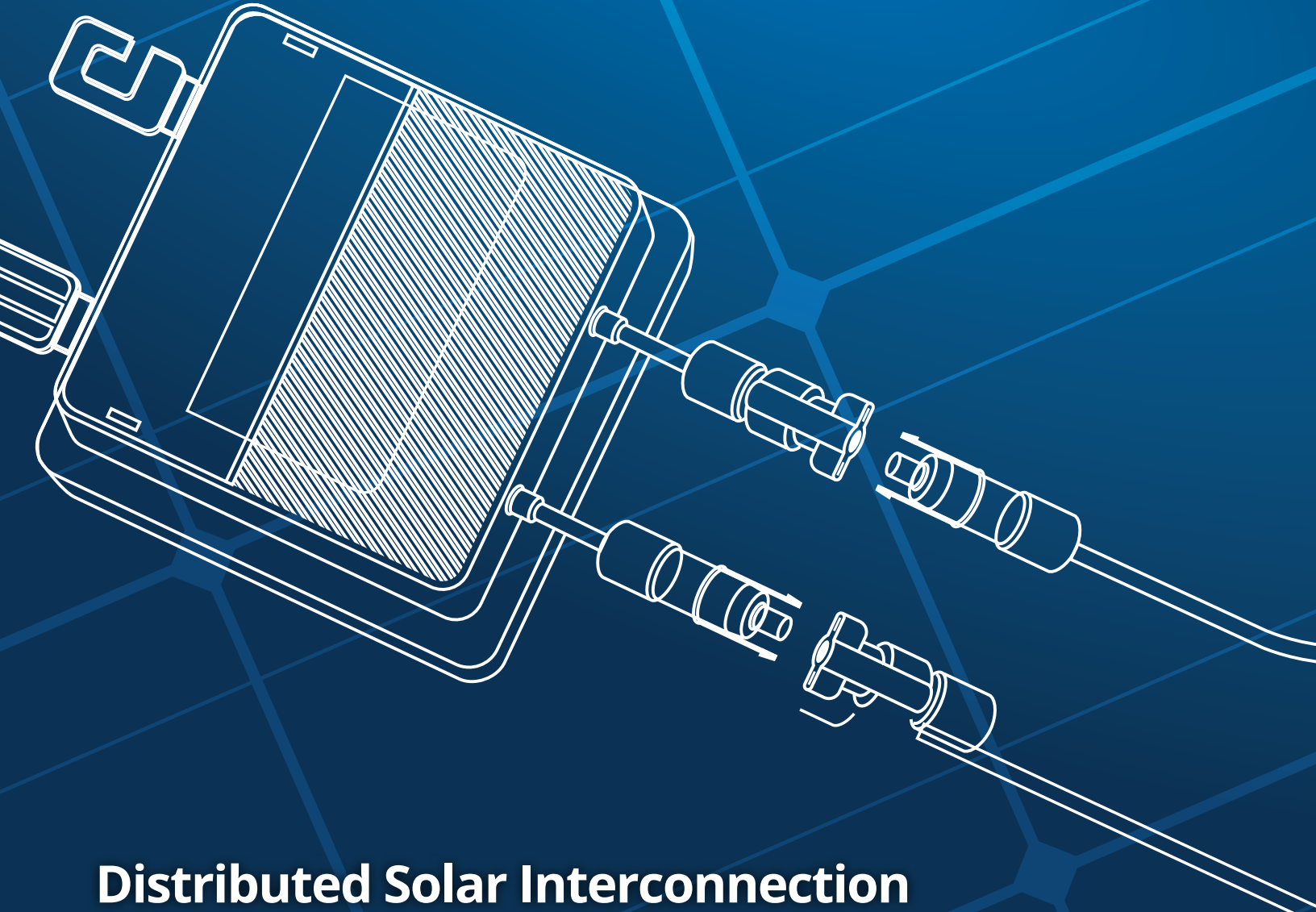




SEPA

solar electric power association



Distributed Solar Interconnection Challenges and Best Practices



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U.S. Department of Energy

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DISTRIBUTED SOLAR INTERCONNECTION CHALLENGES AND BEST PRACTICES

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DISTRIBUTED SOLAR INTERCONNECTION CHALLENGES AND BEST PRACTICES

EXECUTIVE SUMMARY

The continued growth of the distributed solar market in the United States has spurred electric utilities, regulators and stakeholders to consider improvements to distributed generation (DG) interconnection processes.¹

More than 475,000 solar energy systems were interconnected in the U.S. by the end of 2013 but 1 million are expected by the end of 2017.²

Based on the current trajectory set forth under the purview of the U.S. Department of Energy SunShot Initiative, permitting, inspection and interconnection (PII) soft costs are expected to drop from a current cost of \$0.17/watt to \$0.14/watt by 2020.³

While the actual cost metrics for utility PII are undetermined, they are real. A survey and interviews conducted by Solar Electric Power Association (SEPA) in 2014 have uncovered utility initiatives to lower the administrative costs of DG interconnection, making the process of connecting to the grid simpler and more transparent for customers.

KEY TAKEAWAYS ▼

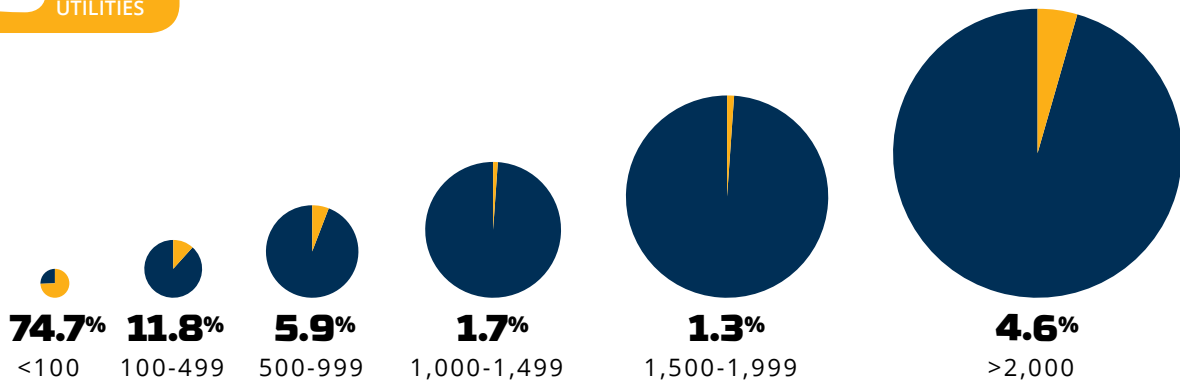
- 1. The market is highly concentrated,** with 75 percent of distributed solar power interconnections processed by fewer than 5 percent of utilities.
- 2. About 15 percent of utilities have optimized processing high numbers of interconnections in short periods of time,** so there is opportunity for utilities to improve interconnection processes and reduce soft costs for both utilities and the solar industry.
- 3. Utilities are facing common challenges as they move towards more streamlined interconnection application processing,** including: keeping customers up-to-date on the status of their application (status transparency); ensuring application accuracy and completeness; communicating with customers; and reporting.
- 4. Only 17 percent of utilities are able to process applications online,** but many utilities indicated they are planning to move to an online platform.
- 5. Utilities offering an online application platform are able to process applications twice as quickly** as utilities only accepting emailed, mailed or in-person applications.⁵

1 | CURRENT INTERCONNECTION LANDSCAPE

HOW MANY SYSTEMS ARE INTERCONNECTED ANNUALLY PER UTILITY?

78%
OF INTERCONNECTIONS WERE PROCESSED BY
<5%
OF UTILITIES

NUMBER OF SOLAR INTERCONNECTION APPLICATIONS UTILITIES PROCESSED IN 2013 ▼



- Utilities receiving 500 interconnection applications per year see an equivalent of two applications per business day, compared to utilities receiving 10,000 applications per year that see an equivalent of 40 applications per work day.
- In a prior survey, residential installations accounted for 93 percent of interconnections in 2013, making them likely candidates for fast-track interconnection processing where it exists.
- One utility noted that as the number of interconnected customers has increased, processes have become more streamlined, including the use of smart meters (for remote meter programming) and online application procedures. In spite of this modernization, it found that interconnected customers often still require direct one-on-one communication to complete the process, which adds up as the number of interconnections increase.
- With 75 percent of distributed solar power interconnections processed by fewer than 5 percent of utilities, soft cost reductions resulting from improved interconnection processes for these

larger programs can have a significant impact on the solar industry.

- Today more than 86 percent of utilities are processing fewer than 500 solar interconnection applications, but with the rapid growth of solar, these utilities may consider preparing for growing volumes of applications, and determine how to effectively integrate higher levels of distributed solar generation in the near future.

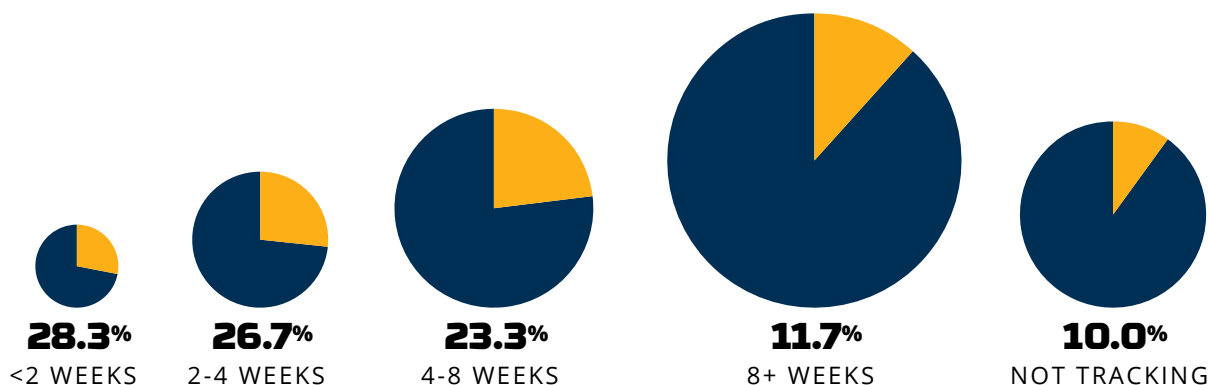
INTERCONNECTION TOUCH POINTS

- | | |
|---|--|
| Utility departments participating in the interconnection process in order of most to least commonly involved: | <ol style="list-style-type: none"> 1. Metering department 2. Distribution engineering 3. Field inspection 4. Interconnection administration 5. Incentive administration 6. Grid planning 7. Legal |
|---|--|

1 | CURRENT INTERCONNECTION LANDSCAPE

HOW LONG DOES IT TAKE FOR UTILITIES TO PROCESS INTERCONNECTION APPLICATIONS?

HOW LONG, ON AVERAGE, UTILITIES TAKE TO COMPLETE A RESIDENTIAL INTERCONNECTION—FROM APPLICATION TO APPROVAL ▼



- It takes an average of about four weeks from submittal of an interconnection application to utility approval in 2014. This is the same amount of time it took in 2008. The average drops to less than two weeks for utilities using an online platform.
- For utilities receiving fewer than 500 applications, 41 percent of them process applications within two weeks, whereas only 15 percent of utilities with more than 500 applications average a two-week turnaround from request to approval to interconnect.

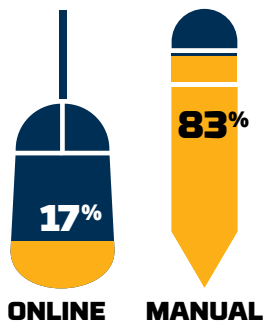
TYPICAL STEPS IN THE DISTRIBUTED SOLAR INTERCONNECTION APPROVAL PROCESS

1. Customer submits interconnection application.
2. Utility reviews application and determines eligibility for net energy metering (NEM) or other programs. Depending on system size and location, and interconnection requirements, studies may be required prior to proceeding.
3. After distributed solar system is installed, customer submits as-built information to utility.
4. Interconnection agreement is executed between the utility and distributed solar customer.
5. Customer sends the utility a building and/or electrical permit.
6. If required, utility inspects installed system.
7. Distributed solar customer receives interconnection approval from the utility.

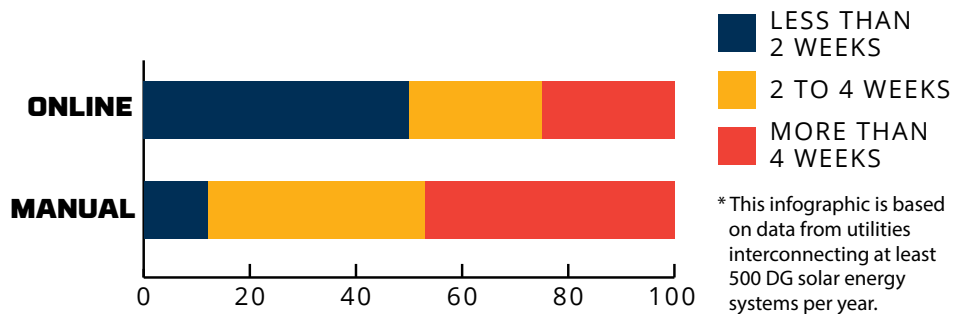
2 | APPROACHES TO INTERCONNECTION PROCESSING

HOW ARE APPLICATIONS PROCESSED?

APPLICATION PROCESS USED ▼



HOW LONG IT TAKES UTILITIES TO PROCESS AN INTERCONNECTION APPLICATION (ONLINE VS MANUAL) ▼



- When looking at a sample of utilities that process applications online, 50 percent interconnect their customers in less than two weeks, compared with the utility average of 28 percent for that same time frame.
- One utility reported that an online application process resulted in fewer customer inquiries, an ability to handle a higher volume of applications, better integration with internal departments, better overall customer service, and better records management compared with its legacy application system (NV Energy).



BENEFITS OF AN ONLINE APPLICATION PROCESS

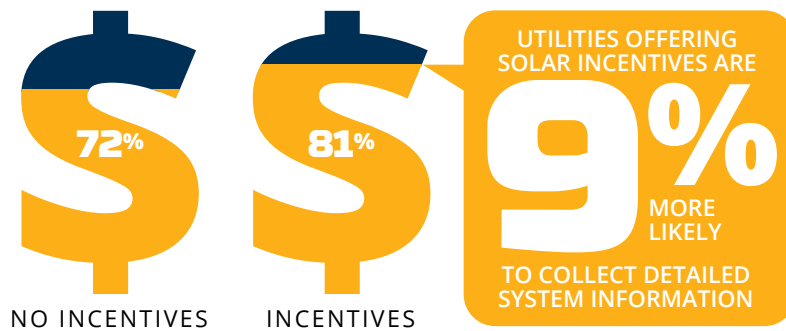
Incorporating an online application process may help utilities alleviate some of the biggest challenges in the interconnection process. Online tools can:

- Restrict submissions to fully completed applications—prompting applicants when information is missing.
- Capture data once, and auto-fill forms, documents and other information to eliminate errors.
- Give customers online access to track the status of their application.
- Automate communications so that program administrators can easily keep customers informed.
- Store data in secure databases and make it accessible for analysis, reporting and operational integration.

2 | APPROACHES TO INTERCONNECTION PROCESSING

WHAT IS THE ROLE OF INCENTIVES IN GATHERING INFORMATION?

PERCENTAGE OF UTILITIES COLLECTING DETAILED SYSTEM INFORMATION BY WHETHER INCENTIVES ARE OFFERED ▼



- Respondents were asked what kinds of information they collect for non-incentivized systems through interconnection applications. PV system installation details may vary between interconnection and incentive applications, unless the two are combined into one document (see example to the right).
- Decline of incentive programs is leading to loss of detailed installed DG information that is important internally to the utility as well as well as the solar market overall.
- As state or utility incentive programs are phased out utilities may consider the value of detailed PV system information, and potentially increase the amount of information collected on interconnection applications.
- PV system information needs to be accessible for a variety of uses (market intelligence, operations)—typically that means putting it into an accessible database.

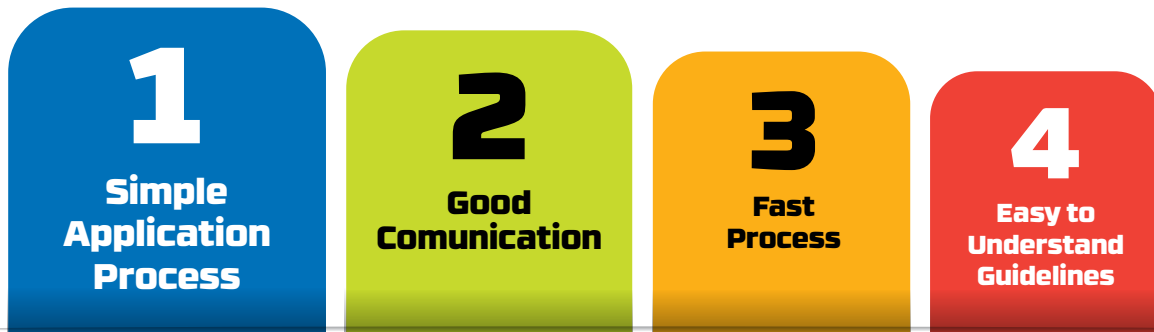
MOST COMMON INFORMATION BEING COLLECTED BY UTILITIES

RANK IN SURVEY	INCENTIVE (EXAMPLE)	INTERCONNECTION (EXAMPLE)
1. INVERTER MANUFACTURER AND MODEL	■	■
2. MODULE MANUFACTURER AND MODEL	■	■
3. PV MODULE NAMEPLATE RATING	■	TOTAL SYSTEM ONLY
4. INVERTER QUANTITY	■	
5. INVERTER NAMEPLATE RATING	■	
6. PV MODULE QUANTITY	■	■
7. ESTIMATED ANNUAL PRODUCTION (kWh)	■	
8. SYSTEM COST		
9. ORIENTATION (LOCATION, TILT, AZIMUTH)	■	
10. SYSTEM SHADING		

3 | DISTRIBUTED INTERCONNECTION CHALLENGES

WHAT ARE UTILITY CUSTOMERS SAYING?

WHAT CUSTOMERS WANT IN THE INTERCONNECTION PROCESS ▼



- Utilities noted that a lack of application status transparency is the biggest gripe that customers have with the interconnection process.
 - Public Service Electric & Gas Company is addressing this by developing an online portal for customers to check status in real-time.
 - NV Energy is using PowerClerk Interconnect, which it said is increasing transparency.
- Many utilities pointed out that the interconnection processing timeline is perceived by their customers as taking too long.

"BEST PRACTICES" TIP

For the past four years, Central Hudson Gas and Electric of New York has held an annual solar summit that provides an educational opportunity for local solar installation companies working within the region. One focus of its summit has been increasing awareness of technical challenges that the utility sometimes faces during the interconnection process. SEPA considers Central Hudson's annual summit a best practice in proactively engaging the solar industry in meaningful discussions for the benefit of increased transparency and coordination.

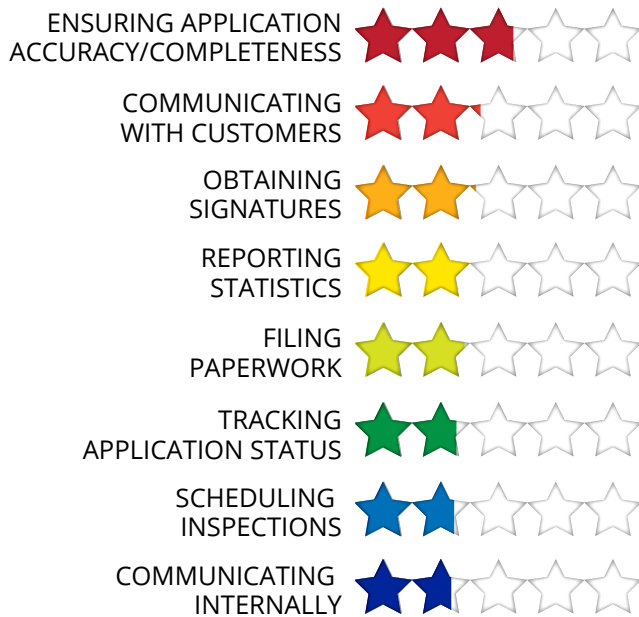
MOST NEEDED IMPROVEMENT:

**APPLICATION STATUS
TRANSPARENCY**

3 | DISTRIBUTED INTERCONNECTION CHALLENGES

WHAT ARE THE BIGGEST INTERCONNECTION CHALLENGES FOR UTILITIES?

RANKING OF INTERCONNECTION CHALLENGES FROM MOST CHALLENGING TO LEAST CHALLENGING ▼



- The survey revealed that utilities are facing a common set of challenges as they ramp up their solar interconnection processes.
- Incomplete or inaccurate applications led the list of challenges in processing both residential and commercial applications. Common problems include customers using outdated forms, not sending in all the required forms, and filling out forms incorrectly.
- Obtaining signatures, particularly in commercial installations, was cited as the second biggest challenge. Physical signatures (as opposed to electronic signatures) tend to delay the interconnection process.

APPLICATION CHALLENGE EXAMPLE

1. Multiple utilities reported receiving a notable number of interconnection applications after a project has already been fully installed.
2. One utility stated that (for technical reasons) there have been cases where it has denied applications for projects that are already fully operational, causing a lot of avoidable customer confusion. That utility prefers to resolve these situations via direct communication with the customer and interconnection process reminders for the project developer.
3. Another utility is looking to address this challenge through early engagement with their customers via an interactive, online software application that allows customers to explore the costs and benefits of solar for their unique situation.

BIGGEST CHALLENGE:

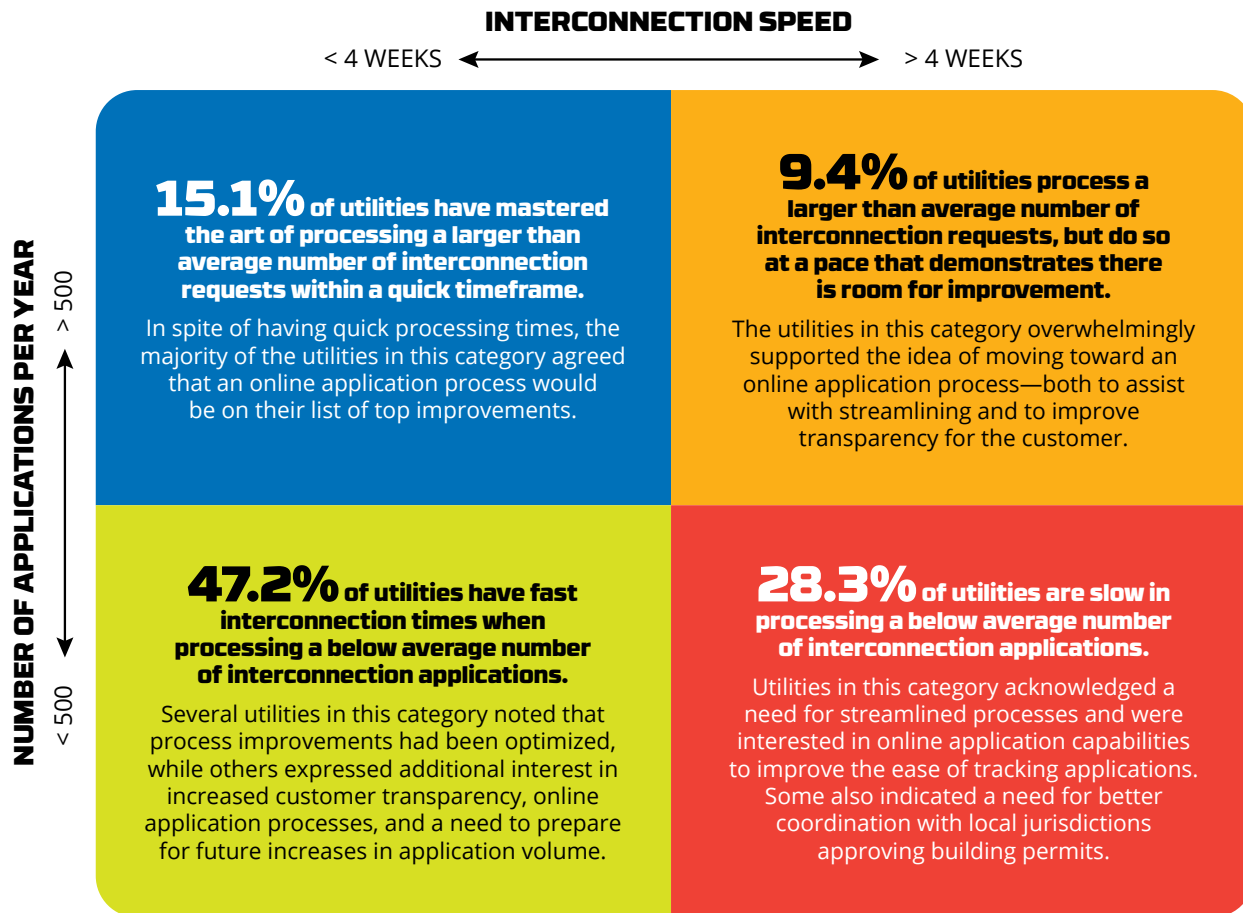
ENSURING APPLICATION ACCURACY & COMPLETENESS

2ND BIGGEST CHALLENGE
 FOR RESIDENTIAL INSTALLATIONS
COMMUNICATING WITH CUSTOMERS

2ND BIGGEST CHALLENGE
 FOR COMMERCIAL INSTALLATIONS
OBTAINING SIGNATURES

DISTRIBUTED SOLAR INTERCONNECTION CHALLENGES AND BEST PRACTICES

CONCLUSION



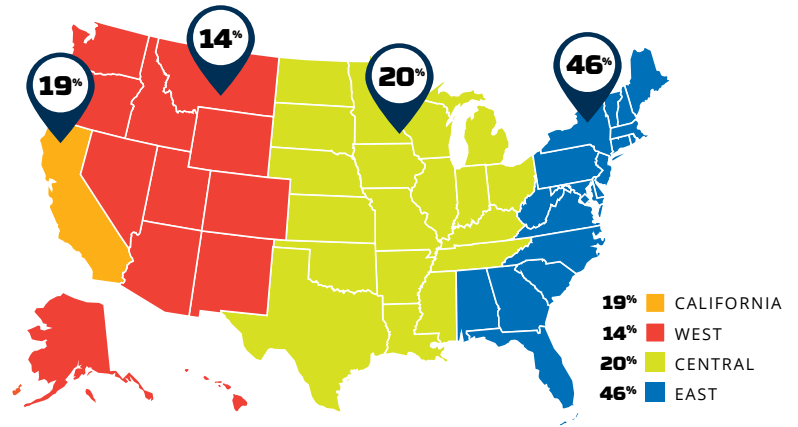
- Only 15 percent of utilities have mastered the art of the interconnection process while 85 percent have considerable room for improvement.
- While several utilities said they would like to be able to offer online processing for interconnection applications, only 17 percent currently do.
- The considerable projected growth in the solar market implies that utilities—no matter how many incentive applications they are processing today—may consider giving additional attention to streamlining their interconnection procedures to handle increasing volumes of applications.
- Taking DG interconnection online reduces soft costs for the solar industry through simpler application processes, and a shorter time to interconnection.
- Utility-side soft costs associated with DG interconnection are also addressed with online application processing by enabling utilities to handle larger volumes of applications, and reducing time spent correcting errors, tracking down customers, responding to customer inquiries and reporting.

DISTRIBUTED SOLAR INTERCONNECTION CHALLENGES AND BEST PRACTICES

BACKGROUND & SOURCES

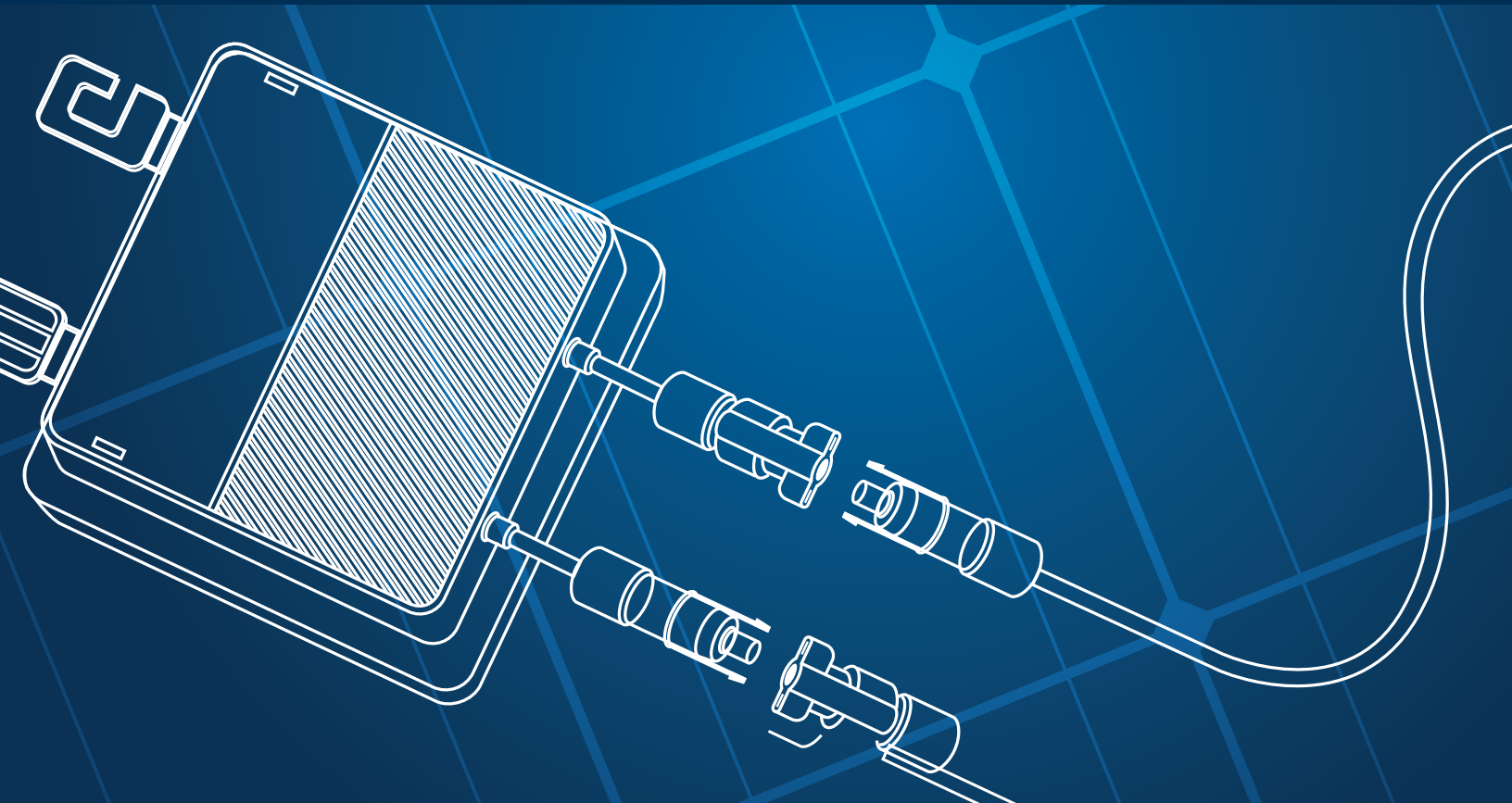
- In July and August 2014, SEPA surveyed 400 utilities seeking information about interconnection processes, including: annual volume of applications, processing timelines, submission methods, and notable strengths and challenges. The response rate was 16 percent from utilities representing an array of utility ownership types, located in 25 states. SEPA also interviewed several utilities over the phone to support the online survey with qualitative responses and information.
- Demographics from SEPA's annual utility solar survey and the interconnection survey informing this report are closely aligned based on number of annual interconnection and utility ownership type.

WHERE RESPONDING UTILITIES OPERATE ▼



SOURCES ▼

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