

# Electric Company Smart Meter Deployments: Foundation for A Smart Grid

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## HIGHLIGHTS

- Electric companies had installed 65 million smart meters, covering more than 50 percent of U.S. households, as of year-end 2015.
- Deployments are projected to reach 70 million smart meters by the end of 2016 and 90 million by 2020.
- More than 30 electric companies in the United States have fully deployed smart meters.
- Smart meters enable two-way power and information flows to improve visibility into the energy grid.
- Electric companies are using smart meter data today to improve grid operations, integrate distributed energy resources (DERs), provide customer services, and support innovative pricing.
- Smart meters provide a digital link between electric companies and their customers and open the door to new and expanded services, such as time-based pricing, load control, budget billing, high usage alerts, push notifications, and web services for energy management.
- Electric companies are focused on modernizing the energy grid and are projected to invest \$32 billion in the distribution system in 2016.
- A digital energy grid is essential to seamlessly integrate DERs, ensure reliability, reinforce resiliency, and provide more services to customers.

## EXECUTIVE SUMMARY

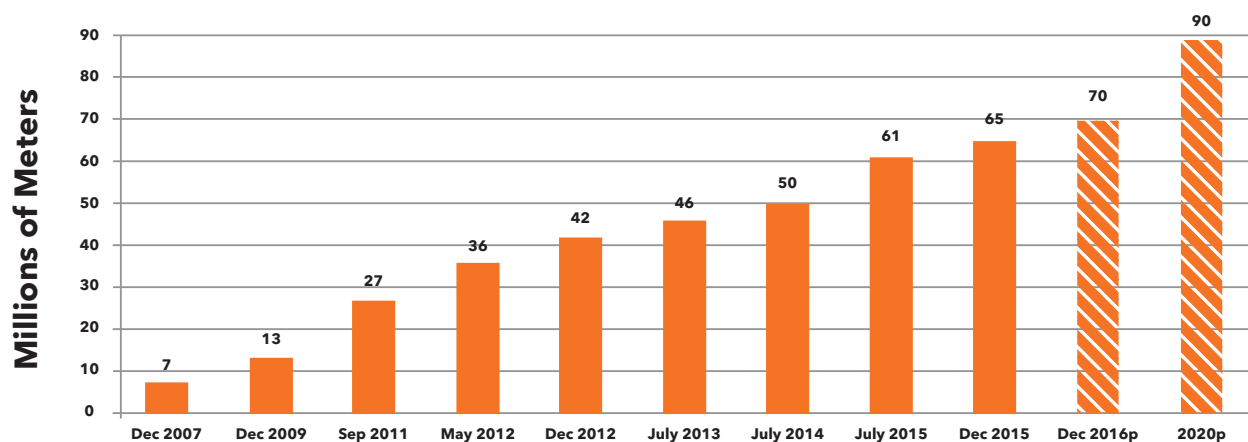
The energy grid is becoming increasingly digital. Electric companies are investing in smart meters, advanced communication and data management systems, digital sensing and control capabilities, and data analytics as part of a smarter energy infrastructure.<sup>1</sup> These investments, in particular smart meters, are the foundation for a modern and digital energy grid.

As shown in Figure 1, smart meter installations have grown dramatically since 2007. What benefits do smart meters provide to both the customer and electric company? In this report, we discuss some of the innovations, benefits, and capabilities enabled by smart meters; summarize the results of The Institute for Electric Innovation's (IEI's) 2015 Smart Meter Survey; and, provide our perspective on how smart meters are a key component of innovation in the electric power sector.

As of year-end 2015, electric companies had installed 65 million smart meters, covering more than 50 percent of U.S. households. Deployments are projected to reach 70 million smart meters by the end of 2016 and 90 million by 2020. Figure 2 shows smart meter deployments by state on a percentage basis. More than 30 of the largest electric companies in the U.S. have fully deployed smart meters.<sup>2</sup>

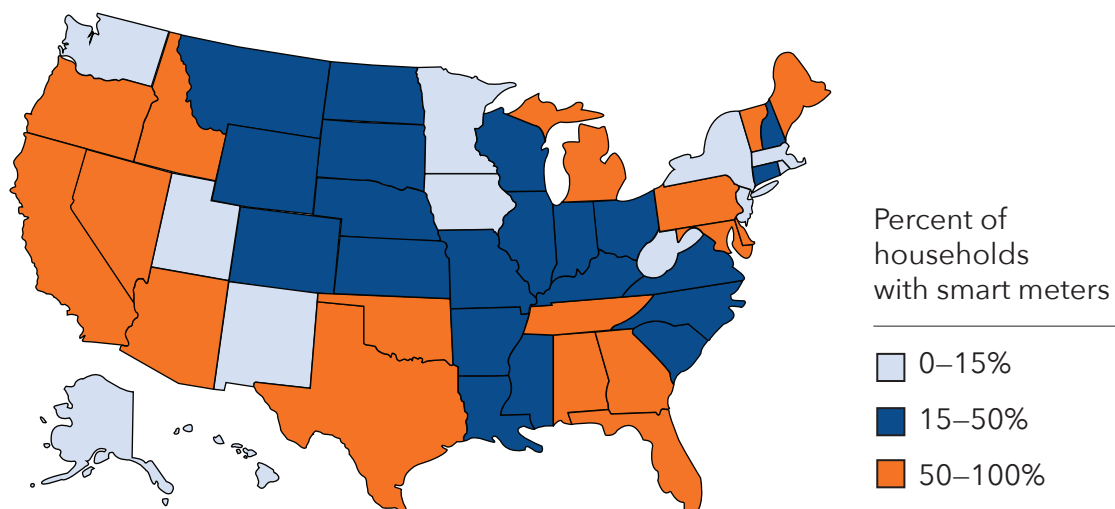
Smart meters are the new business as usual. Electric companies across the U.S. are leveraging smart meter data to better monitor the health of the energy grid, more quickly restore electric service when outages occur, integrate distributed energy resources (DERs), deliver energy information to customers, and provide smart pricing options to customers.

**Figure 1: Smart Meter Installations in the U.S. Approach 70 Million; Projected to Reach 90 Million by 2020**



1. Smart Meters, or Advanced Metering Infrastructure (AMI), are digital meters that measure and record electricity usage data hourly, or more frequently, and allow for two-way communication between the electric companies and their customers.
2. An in-depth list of smart meter deployments by electric company starts on page 8.

### Figure 2: Smart Meter Deployments by State 2015 <sup>3</sup>



# INTRODUCTION

This report describes (1) how electric companies are using smart meter data today to improve grid operations, integrate DERs, provide customer services, and support innovative pricing, and (2) also describes the growing importance of the distribution system.

## IMPROVING GRID OPERATIONS

Having a reliable supply of electricity is more than just a convenience; it's a necessity. Our economy – and our way of life – depend on it. Smart meters are changing the ways electric companies respond to problems on the energy grid, and the results speak for themselves.

The data from smart meters, when integrated with other enterprise data and systems – such as Geographic Information Systems (GIS), Customer Information Systems (CIS), Outage

Management Systems (OMS), Distribution Management Systems (DMS), and/or Demand Response Management Systems (DRMS) – give electric companies “visibility” into the distribution grid that allows them to proactively solve problems.

As part of its continued investments in smart grid technology, which include the deployment of 4.8 million smart meters and 36,000 other intelligent devices that offer improved visibility of the electric system, Florida Power & Light Company (FPL) saved more than \$46 million in operational costs in 2015 – a 50 percent increase from the \$30 million saved in 2014. Part of these savings were the result of avoided restoration trips, and unnecessary costs associated with dispatching trucks and other related costs – more than 200,000 fewer field visits since 2012.

3. This map does not include automatic meter reading (AMR) installations. The data that is represented in this report was compiled from IEL survey responses, EIA forms 861 and 826, and Department of Energy Smart Grid Investment Grant reports. Readers are encouraged to verify the most recent developments by contacting the company.

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***"We have made remarkable strides in our ability to monitor and manage the electric system today compared to just a few years ago. Thanks to smart grid technology, we have unprecedented visibility across the grid so we can more quickly detect and prevent many issues before they become problems for our customers."***

*-Eric Silagy, President and CEO, FPL*

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For several years, FPL has been using predictive analytics to deliver real-time data directly to technicians in the field and engineers in the company's diagnostic centers to measure and improve grid performance. In fact, smart grid technology is helping FPL identify power outages, and prevent some before they occur, further improving service restoration times and operational efficiencies.

In February 2014, when the Philadelphia region was hit with a devastating ice storm, smart meters helped PECO Energy field crews restore service to customers approximately 2-3 days faster.

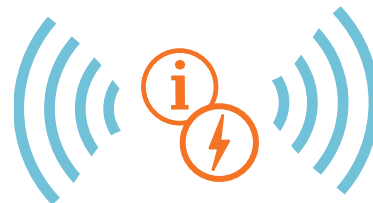
Another example is CenterPoint Energy in Houston, TX, which has avoided more than 100 million minutes of customer outages since 2011 due to smart meter and other technology investments.

Several electric companies also offer outage notifications to customers via preferred communication channels (e.g., text or email), keeping customers informed about the progress being made to restore service.

By integrating smart meter data with Distribution Management Systems (DMS), electric companies have implemented distribution automation and circuit reconfiguration, volt/VAR management, device monitoring, and predictive asset maintenance capabilities. This integration leverages the communications provided by smart meters to automate distribution services and allows for more aggressive voltage optimization practices. The more voltage the system can conserve (i.e., by matching voltage supplied with voltage demanded), the greater the cost savings, all while delivering the same supply and power quality. American Electric Power, Baltimore Gas & Electric, Dominion, and several other electric companies are using voltage and power quality data collected and transmitted by smart meters for voltage optimization and proactive identification of distribution transformers that are at risk to fail.

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Smart meters enable two-way power and information flows



to improve visibility into the health of the energy grid

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Electric companies are also cross-referencing smart meter data with billing systems to reduce uncollectable expenses, reduce consumption from inactive meters, and better detect energy theft. As a result of CenterPoint Energy's integration of smart meter data with its billing system, the company has recovered or protected \$6 million of electricity charges for its Retail Electric Providers and \$2 million in delivery charges.

Lastly, smart meters dramatically reduce the need to send an employee in a vehicle to a customer site – also known as a “truck roll”. These savings are the result of no longer physically reading the meter and also remotely troubleshooting connectivity problems.

These examples demonstrate how integrating smart meter data with other systems has multiple benefits for the customer and improves grid operation.

## INTEGRATING DISTRIBUTED ENERGY RESOURCES

As distributed energy resources, such as private or rooftop solar PV, energy storage systems, electric vehicles, and connected home devices like smart thermostats and smart appliances, continue to grow, electric companies will need greater visibility into the performance of these systems to better utilize resources in efficient distribution grid operations. The data generated by smart meters provide basic information for seamlessly integrating these distributed resources and modeling their behavior.

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Smart meters connect distributed energy resources to the energy grid



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***“The next steps in leveraging smart meters are for demand response, distributed generation, and other DER services.”***

*-Kenny Mercado, SVP, Electric Operations, CenterPoint Energy*

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Going forward, the computing power in each smart meter opens the door to applications beyond traditional metering services. Using smart meters and communication nodes as platforms for distributed analytics and decision making on the grid edge is one example of how companies such as Duke Energy envision tying smart meters into a Distributed Energy Resource Management System (DERMS) framework.

## CUSTOMER SERVICES

Smart meters provide a digital link between electric companies and their customers and open the door to new or expanded services.

Today, electric companies are providing the following services to customers with smart meters with varying degrees of engagement:

- Online access to view and download energy use information.
- Budget setting options that allow customers to set spending goals and that provide weekly updates to show how they are performing against their goals.
- High usage alerts that provide customers an early warning if their bill is projected to be higher than normal.

- Fewer estimated bills for a better customer experience.
- Power alerts that notify customers if their power is out, provide an estimated time to restore service, and deliver a final notice to affected customers when the problem has been resolved and power is back on.
- Remote connect and disconnect services which help customers who are moving receive faster and more convenient electric service.

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Smart meters provide customers control & flexibility over their energy use



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- Time-based pricing and load management services that provide an economic incentive to customers to shift usage and/or respond to price signals. These services are described in more detail in the next section.

Smart meters also help customers leverage smart home technologies like smart thermostats and smart charging for plug-in electric vehicles to better manage how and when these devices use electricity and automatically respond to the smart energy grid. Customers can benefit from smart meters in many different ways, yet just getting customers' interested in energy usage and management options is sometimes a challenge. An oft-cited statistic is that customers spend less than 10 minutes per year thinking about their energy use. Hence,

for electric companies, making the most of the precious few minutes when customers choose to engage is critical for delivering services.

The next opportunity to advance customer services is through more digital engagement with customers. According to Accenture's July 2015 Study, *The New Energy Consumer: Unleashing Business Value in a Digital World*, only 44 percent of customers are digitally engaged (having interacted with their electric companies online at least once during the past 12 months). Even fewer have an electric-company-provided energy app. Focusing on moving customers to online platforms and app-based engagement, supported by smart meter data, is an opportunity for delivering more customers services and solutions.

## INNOVATIVE PRICING

Smart pricing programs are growing across the U.S. Today, millions of customers with smart meters across the United States are enrolled in time-based pricing programs that reward participants for voluntarily reducing energy consumption during designated peak days when demand for electricity is expected to be especially high.

One example of a successful, innovative pricing plan is OG&E's SmartHours program. Approximately 120,000 OG&E customers (about 1 out of 8) are enrolled in SmartHours. The program is designed to let customers determine how to manage their bills and encourages customers to shift their kilowatt usage from peak hours of 2-7 p.m. weekdays to off-peak periods (i.e., any other time of the day/week). Through a combination of a well-designed rate structure and enabling technology (web portal, programmable controllable thermostat, smart meters),

SmartHours' customers help reduce the summer peak and defer the need to build additional generation. About 99 percent of enrolled customers save money, averaging \$150 a year.



of U.S. households have  
a smart meter

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While the majority of customers enrolled in smart pricing programs are responding to time-of-day, or peak pricing signals today, smart meters can support residential rates with demand charges. Demand information can be utilized by customers to better inform their usage decisions. Residential customers have proven time and again that they are smart and willing to participate in pricing programs and satisfied when they do participate.

Finally, demand response programs that preceded smart meters, are benefitting from the deployment of smart meters and two-way communication, enabling electric companies to get accurate feedback on demand reductions.

## **GROWING IMPORTANCE OF DISTRIBUTION SYSTEMS**

Grid modernization is primarily about the electric power distribution system. The growth and intersection of intelligent grid operation technology, information technology, and new energy technology such as DERs provide an opportunity to change the way resources are planned for and integrated into the grid.

Electric companies in states such as California, Colorado, Hawaii, Minnesota, and New York are working on distribution resource plans so that distribution system planning and operations identify and prioritize grid modernization investments (both software and hardware) that must be made to keep pace with growth in DERs. In all of these plans, smart meters are identified as a critical technology investment to support the energy grid.

## **CONCLUSION**

Building a solid, smart foundation for a more distributed, increasingly clean, and increasingly digital energy grid allows electric companies to deliver new services to customers. Investing in smart meters is one of the first steps in building a smarter energy infrastructure.

This report demonstrates how smart meters are the building block for improving grid operations, integrating distributed energy resources, and offering customers more choices.

As electric companies continue to manage, operate, and invest in an increasingly digital energy grid, the next step is to improve grid management and to offer new customer services by more fully utilizing the massive amounts of data generated from networked devices on the grid.



### Summary of Smart Meter Installations and Projected Deployments

| Electric Company Type                  | Meters Installed (2015) | Projected Meters Installed (2016) | Projected Meters Installed (2020) |
|----------------------------------------|-------------------------|-----------------------------------|-----------------------------------|
| <b>Investor-Owned</b>                  | 49,470,000              | 52,756,300                        | 68,189,000                        |
| <b>Municipal and Cooperative-Owned</b> | 16,102,000              | 17,243,700                        | 21,811,000                        |
| <b>U.S. Total</b>                      | <b>65,572,000</b>       | <b>70,000,000</b>                 | <b>90,000,000</b>                 |

### Smart Meter Installations and Projected Deployments by Investor-Owned Electric Companies

| Electric Company               | State                | Meters Installed (2015) | Projected Meters Installed (2020) | Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Resources                                           |
|--------------------------------|----------------------|-------------------------|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| <b>American Electric Power</b> | IN<br>OH<br>OK<br>TX | 1,577,000               | 2,647,000                         | AEP's Indiana Michigan Power subsidiary has deployed 10,200 meters to customers in South Bend, IN; AEP Ohio has deployed 132,000 in the Columbus area; AEP Texas reached full deployment of 1,046,000; and AEP's Public Service Company of Oklahoma has deployed 385,000 meters. Timing for the remaining deployments will depend on specific conditions in each of the operating company subsidiaries and approval by the relevant state regulatory commissions. | IEI Smart Meter Survey 2015                         |
| <b>Alliant Energy</b>          | IA<br>MN             | 442,300                 | 442,300                           | Wisconsin Power & Light, a subsidiary of Alliant Energy, reached full deployment in 2011. Interstate Power & Light has a 1,000 meter pilot supporting the Sustain Dubuque Initiative, which fully deployed in 2010. Additional smart meter deployment in IA and MN has not commenced.                                                                                                                                                                             | IEI Smart Meter Survey 2015                         |
| <b>Ameren Illinois</b>         | IL                   | 209,000                 | 1,200,000                         | Ameren Illinois has installed 209,000 meters and anticipates 1,200,000 meters installed by December 2019.                                                                                                                                                                                                                                                                                                                                                         | IEI Smart Meter Survey 2015; ICC Docket No. 12-0244 |



| Electric Company                    | State                | Meters Installed (2015) | Projected Meters Installed (2020) | Notes                                                                                                                                                                                                                                                                                   | Resources                                      |
|-------------------------------------|----------------------|-------------------------|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|
| <b>Avista Utilities</b>             | WA                   | 13,000                  | 263,000                           | Avista has installed 13,000 smart meters in Pullman, WA, as part of a five-state, five-year demonstration project leveraging Department of Energy Smart Grid Demonstration Grant funds. Avista is in the early planning stages of a full rollout of 263,000 meters in Washington.       | IEI Smart Meter Survey 2013                    |
| <b>Arizona Public Service</b>       | AZ                   | 1,227,000               | 1,227,000                         | APS achieved full deployment May 2014.                                                                                                                                                                                                                                                  | IEI Smart Meter Survey 2015                    |
| <b>Baltimore Gas &amp; Electric</b> | MD                   | 1,230,000               | 1,270,000                         | BG&E installed 1,230,000 smart meters through December 2015 and is 97 percent deployed.                                                                                                                                                                                                 | IEI Smart Meter Survey 2015                    |
| <b>Black Hills Energy</b>           | CO<br>MT<br>SD<br>WY | 209,000                 | 209,000                           | Black Hills Energy has fully installed 209,000 smart meters in its service territory across four states.                                                                                                                                                                                | IEI Smart Meter Survey 2015                    |
| <b>CenterPoint Energy</b>           | TX                   | 2,323,000               | 2,323,000                         | CenterPoint Energy received approval in 2008 to install an advanced metering system across its service territory. It completed deployment in July 2012 and currently has 2,323,000 smart meters installed.                                                                              | IEI Smart Meter Survey 2015; PUCT Docket 36699 |
| <b>Central Maine Power</b>          | ME                   | 626,000                 | 626,000                           | Central Maine Power Company completed its smart meter deployment in 2012 and currently has 626,000 smart meters installed.                                                                                                                                                              | IEI Smart Meter Survey 2015                    |
| <b>Cleco Power</b>                  | LA                   | 289,000                 | 289,000                           | Cleco Power fully deployed smart meters across the company's entire service territory, after receiving approval from the Louisiana Public Service Commission in 2011.                                                                                                                   | IEI Smart Meter Survey 2015                    |
| <b>Commonwealth Edison</b>          | IL                   | 1,817,000               | 4,172,000                         | In June 2013, ComEd received regulatory approval for full deployment of smart meters. 1,817,000 smart meters have been deployed with full deployment to more than 4 million customers to be completed by 2018, three years in advance of the originally scheduled 2021 completion date. | IEI Smart Meter Survey 2015                    |

| Electric Company               | State                      | Meters Installed (2015) | Projected Meters Installed (2020) | Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Resources                                 |
|--------------------------------|----------------------------|-------------------------|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|
| <b>Consolidated Edison</b>     | NY                         | 4,100                   | 3,600,000                         | ConEdison received approval to deploy 3,600,000 smart meters between 2017 and 2022.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Case 15-E-0050                            |
| <b>Consumers Energy</b>        | MI                         | 789,000                 | 1,800,000                         | As of December 2015, 789,000 smart meters had been deployed, with full deployment of 1.8 million meters anticipated by 2018.                                                                                                                                                                                                                                                                                                                                                                                                                                                  | IEI Smart Meter Survey 2015               |
| <b>Dominion</b>                | VA                         | 365,000                 | 2,704,000                         | Dominion has completed installation of 365,000 smart meters in Virginia. The AMI business case and full deployment plans for 2.7 meters are still under development.                                                                                                                                                                                                                                                                                                                                                                                                          | IEI Smart Meter Survey 2015               |
| <b>DTE Energy</b>              | MI                         | 2,400,000               | 2,600,000                         | 2,400,000 meters have been installed with full deployment of 2,600,000 expected by the end of 2016.                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | IEI Smart Meter Survey 2015               |
| <b>Duke Energy</b>             | FL<br>KY<br>NC<br>OH<br>SC | 1,335,700               | 1,335,700                         | Duke has fully deployed 717,000 smart meters in Ohio. In other jurisdictions, Duke has achieved targeted deployments of 75,600 meters in Florida; 39,000 in Kentucky; 416,400 in North Carolina; and, 87,700 in South Carolina. Duke is still in its planning stages for deployment in Indiana.                                                                                                                                                                                                                                                                               | IEI Smart Meter Survey 2015; EIA Form 826 |
| <b>Emera Maine</b>             | ME                         | 120,600                 | 120,600                           | Emera Maine has fully deployed 120,600 smart meters in its service territory.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | EIA Form 826                              |
| <b>Entergy Corporation</b>     | LA                         | 18,400                  | 19,800                            | Entergy has deployed 18,400 smart meters, of which 4,000 were used in a dynamic pricing pilot for low-income households in New Orleans.                                                                                                                                                                                                                                                                                                                                                                                                                                       | EIA Form 826                              |
| <b>FirstEnergy Corporation</b> | MD<br>OH<br>PA<br>WV       | 225,600                 | 2,153,000                         | Pennsylvania Act 129 (2008) requires electric distribution companies with more than 100,000 customers to install smart meter technology. FirstEnergy subsidiary Penn Power is fully deployed with 170,000 meters. West Penn Power piloted 23,000 smart meters with full deployment starting in 2017. MetEd and Penelec will start deployments in 2017 and finish in 2022. FirstEnergy operating company The Illuminating Company in Cleveland installed 34,300 meters as part of a pilot. Pilot activities in Morgantown, WV, and Urbana, MD, are testing 1,140 smart meters. | IEI Smart Meter Survey 2015               |

| Electric Company                         | State    | Meters Installed (2015) | Projected Meters Installed (2020) | Notes                                                                                                                                                                                                                                                                                                                     | Resources                                 |
|------------------------------------------|----------|-------------------------|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|
| <b>Florida Power &amp; Light Company</b> | FL       | 4,880,000               | 4,880,000                         | FPL has fully deployed 4,880,000 smart meters to residential, commercial, and industrial customers.                                                                                                                                                                                                                       | IEI Smart Meter Survey 2015               |
| <b>Green Mountain Power</b>              | VT       | 260,600                 | 260,600                           | Green Mountain Power has deployed 260,600 smart meters to customers across Vermont.                                                                                                                                                                                                                                       | EIA Form 826                              |
| <b>Hawaiian Electric Company</b>         | HI       | 5,200                   | 467,000                           | Hawaiian Electric Installed 5,200 smart meters during the first phase of its smart grid program. The company filed a grid modernization plan with its state regulatory commission to install 467,000 total smart meters across all five of the companies' service territory islands.                                      | Docket No. 2016-0087                      |
| <b>Idaho Power</b>                       | ID<br>OR | 520,000                 | 520,000                           | Idaho Power has fully deployed 520,000 smart meters across its service territory in Idaho and Oregon.                                                                                                                                                                                                                     | EIA Form 826                              |
| <b>Indianapolis Power &amp; Light</b>    | IN       | 34,900                  | 80,000                            | IPL has installed 34,900 smart meters, and will strategically deploy smart meters where needed.                                                                                                                                                                                                                           | IEI Smart Meter Survey 2015; EIA Form 826 |
| <b>Kansas City Power &amp; Light</b>     | MO       | 14,000                  | 14,000                            | KCP&L completed the installation of 14,000 smart meters in 2011 for its Smart-Grid Demonstration project in midtown Kansas City, MO. The project includes piloting in-home displays, demand response thermostats, a web portal, and investments in distributed energy resources, distribution, and substation automation. | IEI Smart Meter Survey 2015               |
| <b>Madison Gas &amp; Electric</b>        | WI       | 6,500                   | 6,500                             | MGE installed a small-scale smart grid network, including 6,500 meters, EV charging stations, and in-home energy management systems.                                                                                                                                                                                      | IEI Smart Meter Survey 2015; EIA Form 826 |
| <b>Minnesota Power</b>                   | MN       | 46,000                  | 83,000                            | Minnesota Power deployed 46,000 smart meters in northeast Minnesota.                                                                                                                                                                                                                                                      | EIA Form 826                              |

| Electric Company                   | State          | Meters Installed (2015) | Projected Meters Installed (2020) | Notes                                                                                                                                                                                                                                                                                                                                                                            | Resources                                 |
|------------------------------------|----------------|-------------------------|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|
| <b>National Grid</b>               | MA             | 15,000                  | 1,300,000                         | National Grid's pilot was approved by the Department of Public Utilities in August 2012. 15,000 smart meters have been installed in Worcester, MA, for a pilot demonstration. The company's Grid Modernization Plan includes two investment scenarios with full smart meter deployment.                                                                                          | EIA Form 826                              |
| <b>NV Energy</b>                   | NV             | 1,278,000               | 1,278,000                         | NV Energy has fully deployed 1,278,000 smart meters.                                                                                                                                                                                                                                                                                                                             | EIA Form 826                              |
| <b>Oklahoma Gas &amp; Electric</b> | AR<br>OK       | 871,700                 | 871,700                           | OG&E has fully installed 871,700 meters: 804,070 in Oklahoma and 67,630 in Arkansas.                                                                                                                                                                                                                                                                                             | SmartGrid.gov; EIA Form 826               |
| <b>Oncor</b>                       | TX             | 3,365,000               | 3,365,000                         | Oncor has fully deployed 3,365,000 smart meters across its service territory.                                                                                                                                                                                                                                                                                                    | EIA Form 861; PUCT Project 36157          |
| <b>Pacific Gas &amp; Electric</b>  | CA             | 5,209,000               | 5,209,000                         | PG&E deployed 5,209,000 meters and completed its SmartMeter Project on December 31, 2013. Customers with smart meters can participate in PG&E's Smart-Rate plan, a voluntary critical peak pricing rate plan that will help manage system load during hot summer days, and receive EnergyAlerts that notify customers when they are moving into higher-priced electricity tiers. | IEI Smart Meter Survey 2015               |
| <b>Pacific Power</b>               | OR             | 0                       | 590,000                           | Pacific Power plans to install 590,000 smart meters for Oregon customers in 2018-2019.                                                                                                                                                                                                                                                                                           | Press Release                             |
| <b>PECO</b>                        | PA             | 1,720,000               | 1,720,000                         | PECO fully deployed 1,720,000 smart meters.                                                                                                                                                                                                                                                                                                                                      | IEI Smart Meter Survey 2015               |
| <b>Pepco</b>                       | DC<br>DE<br>MD | 1,357,000               | 1,360,000                         | Pepco has reached full deployment in the District of Columbia with 279,000 meters installed; and, Pepco and Delmarva Power in Maryland have reached full deployment, with 763,000 meters installed. Delmarva Power has reached full deployment in Delaware with 315,000 meters installed. There is no active smart meter project in New Jersey.                                  | IEI Smart Meter Survey 2014; EIA Form 826 |

| Electric Company                    | State                | Meters Installed (2015) | Projected Meters Installed (2020) | Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                | Resources                                                 |
|-------------------------------------|----------------------|-------------------------|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| <b>Portland General Electric</b>    | OR                   | 841,000                 | 841,000                           | PGE's smart meter program was approved by the state regulatory commission in 2008; full deployment was completed by the fall of 2010.                                                                                                                                                                                                                                                                                                                | EIA Form 826                                              |
| <b>PPL</b>                          | PA                   | 1,418,000               | 1,418,000                         | PPL is in compliance with PA Act 129 and has fully deployed 1,418,000 smart meters in its service territory. The PA electric distribution companies are engaged in a collaborative process to develop standards and formats for electronic communication of meter data and access by customers and third parties.                                                                                                                                    | IEI Smart Meter Survey 2014; PA Docket No. M-2009-2092655 |
| <b>San Diego Gas &amp; Electric</b> | CA                   | 1,428,000               | 1,428,000                         | SDG&E has fully deployed 1,428,000 meters across its service territory.                                                                                                                                                                                                                                                                                                                                                                              | IEI Smart Meter Survey 2015                               |
| <b>Southern California Edison</b>   | CA                   | 5,034,000               | 5,034,000                         | SCE has fully deployed more than 5 million smart meters and will continue to accommodate population growth. SCE's SmartConnect program uses the meters to offer Critical Peak Pricing and Peak Time Rebate rates to customers with enabling technology.                                                                                                                                                                                              | EIA Form 826                                              |
| <b>Southern Company</b>             | AL<br>FL<br>GA<br>MS | 4,388,000               | 4,570,000                         | Southern Company's Georgia Power, Alabama Power, and Gulf Power (FL) are fully deployed. Georgia Power reached full deployment in 2012 and has 2,420,000 meters. Alabama Power reached full deployment in 2010 and has 1,508,000 meters. Gulf Power reached full deployment in 2012 and has 453,000 meters. Mississippi Power has installed 6,700 meters and is awaiting approval from the Public Service Commission for full deployment of 187,000. | IEI Smart Meter Survey 2015                               |
| <b>Texas New Mexico Power</b>       | TX                   | 215,000                 | 240,000                           | In July 2011, TNMP received commission approval for full deployment of 240,000 meters in Texas by 2016. It is using smart meters to facilitate outage detection/restoration and remote connect/disconnect.                                                                                                                                                                                                                                           | PUCT Project 39772                                        |
| <b>United Illuminating</b>          | CT                   | 184,300                 | 350,000                           | United Illuminating has installed roughly 184,300 of its projected 350,000 smart meters.                                                                                                                                                                                                                                                                                                                                                             | EIA Form 826                                              |

| Electric Company     | State    | Meters Installed (2015) | Projected Meters Installed (2020) | Notes                                                                                                                                                                                                                                                                                                                                     | Resources                                                |
|----------------------|----------|-------------------------|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|
| <b>Unitil</b>        | MA<br>NH | 103,000                 | 103,000                           | Unitil has fully deployed 103,000 smart meters across its service territory around Concord, NH and Fitchburg, MA. It has used this technology to, among other things, implement a time-of-use pricing pilot.                                                                                                                              | EIA Form 826                                             |
| <b>Westar Energy</b> | KS       | 250,000                 | 705,000                           | Westar piloted smart meters in its Smart-Star project in Lawrence, KS, and is deploying meters to additional customers. Currently, Westar has 250,000 smart meters installed residential with a goal of fully deploying 705,000 smart meters by the end of 2018.                                                                          | IEI Smart Meter Survey 2015                              |
| <b>Xcel Energy</b>   | CO       | 23,700                  | 1,400,000                         | Xcel Energy has completed deployment of 23,700 residential smart meters and 700 commercial meters as part of its SmartGridCity initiative pilot project in Boulder, CO. Xcel Energy filed a request to deploy 1.4 million smart meters across Colorado between 2017 and 2021 as part of its "Advanced Grid Intelligence Security" filing. | EIA Form 826                                             |
| <b>Other</b>         |          | 805,000                 | 1,093,000                         | Limited deployments by multiple operating companies account for 598,000 smart meter installations through end of 2015 and 1,093,000 by end of 2020.                                                                                                                                                                                       | IEI Smart Meter Survey 2015; EIA Form 826; SmartGrid.gov |
| <b>U.S. Total</b>    |          | 49,470,000              | 68,189,000                        |                                                                                                                                                                                                                                                                                                                                           |                                                          |

Note: U.S. total is rounded.

**Smart Meter Installations by Electric Company Type and State (December 2015)**

| State | Investor-Owned Electric Company Smart Meters Installed | Municipal and Cooperative Smart Meters Installed | Total      |
|-------|--------------------------------------------------------|--------------------------------------------------|------------|
| AK    | -                                                      | 39,100                                           | 39,100     |
| AL    | 1,508,000                                              | 364,700                                          | 1,872,700  |
| AR    | 69,000                                                 | 390,900                                          | 459,900    |
| AZ    | 1,227,400                                              | 1,063,600                                        | 2,291,000  |
| CA    | 11,676,000                                             | 973,000                                          | 12,649,000 |
| CO    | 120,600                                                | 270,500                                          | 391,100    |
| CT    | 184,300                                                | 64,200                                           | 248,500    |
| DC    | 279,000                                                | -                                                | 279,000    |
| DE    | 315,000                                                | 15,000                                           | 330,000    |
| FL    | 5,409,000                                              | 744,240                                          | 6,153,200  |
| GA    | 2,420,500                                              | 1,648,200                                        | 4,068,700  |
| HI    | 5,200                                                  | 30,600                                           | 35,800     |
| IA    | 1,000                                                  | 168,100                                          | 169,100    |
| ID    | 502,700                                                | 93,100                                           | 595,800    |
| IL    | 2,104,000                                              | 227,400                                          | 2,331,400  |
| IN    | 45,100                                                 | 485,100                                          | 530,200    |
| KS    | 250,000                                                | 208,100                                          | 458,100    |
| KY    | 39,200                                                 | 535,100                                          | 574,300    |
| LA    | 313,200                                                | 165,300                                          | 478,500    |
| MA    | 43,800                                                 | 52,900                                           | 96,700     |
| MD    | 1,992,000                                              | -                                                | 1,992,000  |
| ME    | 746,600                                                | -                                                | 746,600    |
| MI    | 3,221,000                                              | 224,400                                          | 3,445,400  |
| MN    | 46,200                                                 | 317,300                                          | 363,500    |
| MO    | 273,000                                                | 353,900                                          | 626,900    |
| MS    | 6,800                                                  | 457,400                                          | 464,200    |
| MT    | 200                                                    | 100,100                                          | 100,200    |
| NC    | 416,400                                                | 889,400                                          | 1,305,800  |



| State             | Investor-Owned Electric Company Smart Meters Installed | Municipal and Cooperative Smart Meters Installed | Total             |
|-------------------|--------------------------------------------------------|--------------------------------------------------|-------------------|
| ND                | 200                                                    | 115,800                                          | 116,000           |
| NE                | -                                                      | 150,500                                          | 150,500           |
| NH                | 74,300                                                 | 84,100                                           | 158,400           |
| NJ                | 13,500                                                 | 23,300                                           | 36,800            |
| NM                | -                                                      | 124,000                                          | 124,000           |
| NV                | 1,277,700                                              | 1,800                                            | 1,279,500         |
| NY                | 12,500                                                 | 28,900                                           | 41,400            |
| OH                | 872,700                                                | 152,100                                          | 1,024,800         |
| OK                | 1,169,400                                              | 329,300                                          | 1,498,700         |
| OR                | 869,600                                                | 214,800                                          | 1,084,400         |
| PA                | 3,505,600                                              | 184,600                                          | 3,690,200         |
| RI                | 250                                                    | -                                                | 250               |
| SC                | 97,900                                                 | 455,000                                          | 552,900           |
| SD                | 66,900                                                 | 101,900                                          | 168,800           |
| TN                | -                                                      | 1,601,700                                        | 1,601,700         |
| TX                | 7,041,500                                              | 1,812,600                                        | 8,854,100         |
| UT                | -                                                      | 87,300                                           | 87,300            |
| VA                | 365,300                                                | 348,900                                          | 714,200           |
| VT                | 262,600                                                | 34,500                                           | 297,100           |
| WA                | 17,800                                                 | 169,300                                          | 187,100           |
| WI                | 563,000                                                | 150,000                                          | 713,000           |
| WV                | 1,600                                                  | 6,900                                            | 8,500             |
| WY                | 42,400                                                 | 42,500                                           | 85,900            |
| <b>U.S. Total</b> | <b>49,470,000</b>                                      | <b>16,102,000</b>                                | <b>65,572,000</b> |

Note: U.S. total is rounded.

## APPENDIX

### *Smart Meter Opt-Out Policies*

Several states have implemented policies that allow customers to opt out of smart meters, but these customers typically pay an initial fee and a monthly opt-out fee. The number of customers who have officially requested to opt-out of a smart meter installation is very low (less than 1 percent). In some states, opt-out policies are still pending public service commission review.

### *IEI 2015 Smart Meter Survey Limits and Interpretation*

Twenty-seven electric companies (representing 48 operating companies) provided responses to IEI's 2015 Smart Meter survey. These electric companies account for roughly 29 million of the 65 million smart meters captured in this report. The remaining information on smart meter deployments was obtained from the Energy Information Administration (Forms 826 & 861) and Smartgrid.gov's project information.

This report identifies general trends and examples of how electric companies are using smart meters. The report does not attempt to cover all of the ways in which electric companies are leveraging investments in their smart meters.

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## About the Institute for Electric Innovation

The Edison Foundation Institute for Electric Innovation focuses on advancing the adoption and application of new technologies that will strengthen and transform the energy grid. IEI's members are the investor-owned electric companies that represent about 70 percent of the U.S. electric power industry. The membership is committed to an affordable, reliable, secure, and clean energy future.

IEI promotes the sharing of information, ideas, and experiences among regulators, policy makers, technology companies, thought leaders, and the electric power industry. IEI also identifies policies that support the business case for the adoption of cost-effective technologies.

IEI is governed by a Management Committee of electric industry Chief Executive Officers. In addition, IEI has a Strategy Committee made up of senior electric industry executives and more than 30 smart grid technology company partners.

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