

Smart Grid Advanced Metering Annual Implementation Progress Report

Submitted by:
Commonwealth Edison Company

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I. Introduction and Overview

Commonwealth Edison Company (“ComEd”) presents this Annual Implementation Progress Report (“Report” or “AIPR”) of its Smart Grid Advanced Metering Infrastructure (“AMI”) Deployment Plan (“AMI Plan” or “Plan”) to the Illinois Commerce Commission (“Commission” or “ICC”). ComEd’s original proposed AMI Plan was filed on April 23, 2012 in ICC Docket No. 12-0298. The Commission entered an Order approving ComEd’s AMI Plan with certain modifications on June 22, 2012 in ICC Docket No. 12-0298 (“June 2012 Order”). ComEd filed a modified AMI Plan in compliance with the June 2012 Order in ICC Docket No. 12-0298 on July 13, 2012 (“Modified AMI Plan”). On October 3, 2012, ComEd submitted a revised Modified AMI Plan on rehearing in ICC Docket No. 12-0298 (“Revised AMI Plan”). The Revised AMI Plan was approved by the Commission in its Order on Rehearing in ICC Docket No. 12-0298 dated December 5, 2012 (“December 2012 Order”). On April 1, 2013, ComEd submitted the 2013 AIPR, which included certain updates to the Revised AMI Plan (“2013 Revised AMI Plan”). On April 9, 2013, the ICC opened ICC Docket No. 13-0285 to investigate the 2013 AIPR. After the passage of PA 98-0015, the ICC entered an Interim Order on June 5, 2013 approving an accelerated deployment schedule in conformance with the new law. The 2013 AIPR was approved in the final Order entered on June 26, 2013 in ICC Docket No. 13-0285 (“2013 AIPR Order”).

On March 13, 2014, ComEd filed a petition with the Commission seeking approval to accelerate the deployment of AMI meters (throughout this document, the terms “AMI meters” and “smart meters” will be used interchangeably) that was assigned ICC Docket No. 14-0212. The Commission, on its own motion, reopened Docket Nos. 12-0298 and 13-0285 and consolidated those dockets with the acceleration petition as ICC Docket Nos. 14-0212, 13-0285, 12-0298 (Cons.) (“Deployment Acceleration Proceeding”). On April 1, 2014, ComEd submitted the 2014 AIPR, including updates to the 2013 Revised AMI Plan to reflect the incremental updates to be made if the Commission approved the proposed accelerated meter deployment schedule in the Deployment Acceleration Proceeding. The Commission approved the proposed accelerated deployment schedule in its final Order dated June 11, 2014, in Docket Nos. 14-0212, 13-0285, 12-0298 (cons.), and required certain modifications to the updated 2013 Revised AMI Plan to reflect that ComEd’s consumer education budget will be maintained and that ComEd will devote the same level of resources for education and outreach that it had planned under the acceleration schedule approved in Docket No. 13-0285. On July 2, 2014, in compliance with the Commission’s June 11, 2014 final Order, ComEd filed a Revised AMI Plan (“2014 Revised AMI Plan”) reflecting the changes approved and required by the Commission in the Deployment Acceleration Proceeding.

On April 1, 2015, ComEd submitted the 2015 AIPR, with updates to the 2014 Revised AMI Plan (“2015 Revised AMI Plan”). These updates presented a change to the operational tracking measure for customers with net metering and updated the AMI Deployment Schedule to reflect actual deployments to date (above planned deployment levels). The 2015 Revised AMI Plan was deemed accepted by the Commission by operation of law when an investigation of the 2015 AIPR was not commenced within 21 days of its filing.¹ On April 1, 2016, ComEd submitted the 2016 AIPR, with updates to the 2015 Revised AMI Plan (“2016 Revised AMI

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Plan”). These updates presented changes to the AMI Deployment Schedule to reflect actual deployments in 2015 (above planned deployment levels) and to update the estimated program costs. On April 20, 2016, ComEd submitted a supplemental filing, as indicated in the 2016 Revised AMI Plan, reflecting the results for updated Metric #9 regarding Green House Gas (“GHG”) emissions. The 2015 Revised AMI Plan was deemed accepted by the Commission by operation of law when an investigation of the 2016 AIPR was not commenced within 21 days of its filing. On April 3, 2017, ComEd submitted the 2017 AIPR, with updates to the 2016 Revised AMI Plan (“2016 Revised AMI Plan”). These updates presented changes to the AMI Deployment Schedule to reflect actual deployments in 2016 (above planned deployment levels) and to update the estimated program costs. On April 20, 2017, ComEd submitted a supplemental filing, as indicated in the 2016 Revised AMI Plan, reflecting the results for updated Metric #9 regarding Green House Gas (“GHG”) emissions. The 2016 Revised AMI Plan was deemed accepted by the Commission by operation of law when an investigation of the 2017 AIPR was not commenced within 21 days of its filing. On April 2, 2018, ComEd submitted the 2018 AIPR, with updates to the 2017 Revised AMI Plan (“2018 Revised AMI Plan”). These updates presented changes to the AMI Deployment Schedule to reflect actual deployments in 2017 (above planned deployment levels) and to update the estimated program costs. The 2017 Revised AMI Plan was deemed accepted by the Commission by operation of law when an investigation of the 2018 AIPR was not commenced within 21 days of its filing. On April 1, 2019, ComEd submitted the 2019 AIPR, with updates to the 2018 Revised AMI Plan (“2019 Revised AMI Plan”). These updates presented changes to the AMI Deployment Schedule to reflect completion of mass deployment in 2018. The 2018 Revised AMI Plan was deemed accepted by the Commission by operation of law when an investigation of the 2019 AIPR was not commenced within 21 days of its filing.

This Report summarizes the activities and achievements accomplished in 2019 and the activities and goals planned for 2020 in the areas of AMI Operational Deployment, Customer Applications, Customer Outreach and Education, and Metrics and Milestones. There are six (6) numerical attachments to this Report that are referenced in the Metrics and Milestones section. Additionally, there are four (4) appendices to this Report. Appendix A addresses issues and topics beyond those specified for inclusion in this Report by Section 16-108.6(e) of the Public Utilities Act (“PUA”), that the Commission originally directed ComEd to submit with its 2013 AIPR, and that ComEd has voluntarily chosen to update in this AIPR for informational purposes only. Appendix B is the eighth Biannual Report required by ComEd’s Rider NAM – Non-AMI Metering (“Rider NAM”). Appendices C and D contain updates to the 2018 Revised AMI Plan in legislative “redline” and “clean” forms, respectively, to reflect the upward adjustment to the AMI meter deployment volume for 2019, and corresponding downward adjustments to the deployment volumes planned for 2019 and 2020. Appendices C and D also contains small adjustments to the overall number of AMI Meters to be deployed and adjustments to Capital and O&M spend.

Operational Deployment

In April 2012, ComEd committed to install over four million smart meters across the service territory over a ten-year period. Through 2019, the Program has installed more than 4.1 million smart meters, exceeding target in each year of the Program's operation and fulfilling ComEd's commitment three years earlier than planned, under budget, and while ensuring the work was completed safely, productively, and of the highest quality. During 2019 ComEd's Operating Area Closeout Team (aka the "UTC Closeout" Team) spearheaded a comprehensive cross-functional effort that successfully resolved the final, most challenging 1,380 non-AMI meters left on the system via installation of a smart meter, enrollment in Rider Non-AMI Meter (NAM), or physical removal of the service, as appropriate.

ComEd also continued communications network optimization, drove improvements in meter read rates and network operations and ensured that the benefits from investments in AMI technologies are maximized. Furthermore, the team managed the smooth ramp down of project activities and resources ensuring an effective transition to steady state business operations and continued proactive resource management, supporting AMI Program personnel as they transition to new career opportunities elsewhere in the Company. As such, ComEd's AMI Operational Deployment Program officially concluded at the end of business December 31, 2019.

Customer Applications

In 2019, ComEd continued to improve, grow and introduce applications that provide customers with additional benefits from AMI deployment. Accomplishments include: (1) successful completion of the summer demand response season for the Peak Time Savings ("PTS") and AC Cycling Smart Thermostat programs; (2) growth of the Hourly Pricing program and smart LED streetlight service; and (3) launch of a community solar portal to help administrators manage their programs.

Key initiatives planned for 2020 include launching an Hourly Pricing Bill Protection Pilot, beginning enrollment in a Residential Time of Use Pricing Pilot, and expanding support for customers interested in community solar

Customer Outreach and Education

In 2019, the AMI team continued customer outreach and education to help customers take advantage of smart meter benefits. This included: (1) communications to educate refusal customers who had converted to a smart meter; (2) general education to provide customers with information on tools and programs enabled by smart meters; (3) continuing the use of messaging to educate customers about energy-saving tips and Energy Efficiency ("EE") programs; and (4) continued promotion of online energy-management and savings tools accessible through MyAccount. Outreach and education efforts in 2020 will focus on educating customers about EE programs and energy-management tools.

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Consultation with Smart Grid Advisory Council (“SGAC”)

As required by Section 16-108.6(e) of the PUA, 220 ILCS 5/16-108.6(e), ComEd consulted with the SGAC regarding this AIPR. ComEd provided a complete draft of the AIPR to the SGAC in advance of its March 16, 2018 meeting. ComEd also made a presentation on its AIPR at that meeting, and personnel were present that were knowledgeable on each relevant subject.

AMI Plan Revisions

The revisions to implement the updates to the 2019 Revised AMI Plan as discussed above are contained in Appendices C and D. The updates to the deployment volumes for 2019 and 2020, along with the updates to the program costs, are discussed above and explained in greater detail in Chapter 2 of this AIPR.

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II. AMI Operational Deployment

A. 2019 Activities and Accomplishments

In April of 2012, ComEd committed to install over four million smart meters across the service territory over a ten-year period. Through 2019, the Program has now installed more than 4.1 million smart meters, exceeding target in each year of the Program's operation and fulfilling ComEd's commitment three years earlier than planned, under budget, and while ensuring the work was completed safely, productively, and of the highest quality. During 2019 ComEd's Operating Area Closeout Team (aka UTC Closeout Team) spearheaded a comprehensive cross-functional effort that successfully resolved the final, most challenging 1,380 non-AMI meters left on the system via installation of a smart meter, enrollment in Rider Non-AMI Meter ("NAM"), or physical removal of the service, as appropriate.

ComEd also continued communications network optimization, drove improvements in meter read rates and network operations and ensured that the benefits from investments in AMI technologies are maximized. Furthermore, the team managed a smooth ramp down of project activities and resources, ensuring an effective transition to steady state business operations and continued proactive resource management, supporting AMI Program personnel as they transition to new career opportunities elsewhere in the Company.

ComEd's AMI Program has delivered on its commitments every year through its completion in 2019. The sections below contain the highlights of the Program's final year of activities. For continuity with preceding AIPR documents, included in these sections are Program costs (Capital and "O&M") and accomplishments made by all the groups that comprised the AMI Program including: (1) the Project Management Office ("PMO"), (2) AMI Network and Meter Deployment, (3) Customer Experience, AMI Information Technology ("IT") and Business Transformation, and (5) Change Management and Business Readiness. The results for specific metrics and milestones can be found in Chapter 5 of this report.

1. Project Management Office ("PMO")

The PMO function has played an integral role in ensuring the Program delivered on its commitments, and this was true again in 2019. Throughout the year, the PMO continued to focus on scope, schedule, and budget management along with providing overall guidance, planning, oversight, and identification and mitigation of risks and issues. Deployment tracking and reporting also remained a key focus of the PMO and was critical to managing the planful ramp-down of deployment and project closeout activities. The execution of resource management plans was of continued focus this year as the Program's field resource needs concluded mid-year. These plans have successfully integrated valuable and experienced field and back office resources from the AMI Program into other ComEd departments and functional areas, laying the foundation for seamless transfer of knowledge and responsibilities from the Program to those steady state business organizations.

The PMO continued its dedicated focus on financial scrutiny of spend across all AMI work streams, ensuring that project closeout requirements were completed within budget.

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Through the centralized management of field and back office contractors, both in terms of the safety and quality of the work performed, the PMO held contractors accountable for overall performance compared to contractual commitments and expectations. Reviews and field visits were conducted throughout the year and results were shared collaboratively with contracting partners to drive continuous improvement.

In 2019, ComEd continued relationships with a diverse group of vendors for various functions within the AMI Program. These vendors include rewarding and mutually beneficial partnerships with certified Minority-Business Enterprises (“MBEs”) and Women-Business Enterprises (“WBEs”). As noted in the table below and consistent with the planned ramp-down of field resources, there was a commensurate decrease in the total number of contractor resources in these areas.

Contractor Name	Services Provided to ComEd in 2019	2019 Headcount ¹
MZI	Electrician repairs to customer meter-related equipment (including A-Bases)	6
Durkin	Electrician repairs to customer meter-related equipment (including A-Bases)	0
Quantum	Electrician repairs to customer meter-related equipment (including A-Bases)	0
Loescher	Electrician repairs to customer meter-related equipment (including A-Bases)	2
LiveWire	Electrician repairs to customer meter-related equipment (including A-Bases)	0
Intren	Electrician repairs to customer meter-related equipment (including A-Bases)	3
Total		10

Table 1: Contracted Electrician Headcount

2. AMI Network and Meter Deployment

2019 marked the formal end of ComEd’s AMI field deployment with over 4.2 million smart meters safely installed across the system since 2009 delivering significant benefits in improved field/back office operations, outage management, reliability and customer programs.

¹ Values rounded to nearest whole number based on average headcount over the 12-month period.

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All 1,380 unable-to-complete (“UTC”) non-AMI meters that remained for 2019 were resolved before June 30, 2019 through either meter exchange, enrollment in Rider NAM (meter refusers), or service removal. Resolution of the remaining 1,380 non-AMI meters required a customized approach different from previous years with close coordination between a variety of departments (UTC team, F&MS, New Business, Revenue Protection, PMO, and AMI Engineering). Weekly check-in meetings with management of the previously listed departments ensured open communication lines and that best and alternative practices were utilized, while maintaining prioritized action plans on each remaining non-AMI meter. The team also continued to effectively execute the optimization of the AMI network across the system, helping ensure that performance benefits from this investment are maximized.

Network Deployment

In 2019, the team’s efforts focused on network optimization in completed areas. Network optimization activities are led by the AMI Operations team and are detailed in the corresponding section to follow.

Meter Deployment

As mass deployment efforts ramped down in 2018 and 2019 focused on the remaining UTC meters, the team also managed the closure of cross docks in areas where deployment had completed. Only the Romeoville cross dock remained open in 2019 to support the closeout process due to its centralized geographic location as the remaining 1,380 non-AMI meters were geographically dispersed throughout ComEd’s operating areas. All meter exchanges were completed through the strong partnership between ComEd and Union Local 15. Following the completion of UTC closeout activities, the Romeoville cross dock was safely decommissioned with the moving of all remaining vehicles equipment ahead of schedule.

Starting in 2019, project support and work planning services transitioned from partner Tribus Services to the internal ComEd employee resourced UTC team as they strategically resolved the remaining 1,380 non-AMI meters by deploying technicians to install AMI meters or complete via alternative options – enrollment in Rider NAM or service drop removal.

ComEd’s contracted electrician partners continued to support meter exchanges in 2019 for A-Base locations and other complex exchanges following the completion of electrician repairs. They continued to follow ComEd-approved processes, procedures, and material tracking protocols, consistent with prior years.

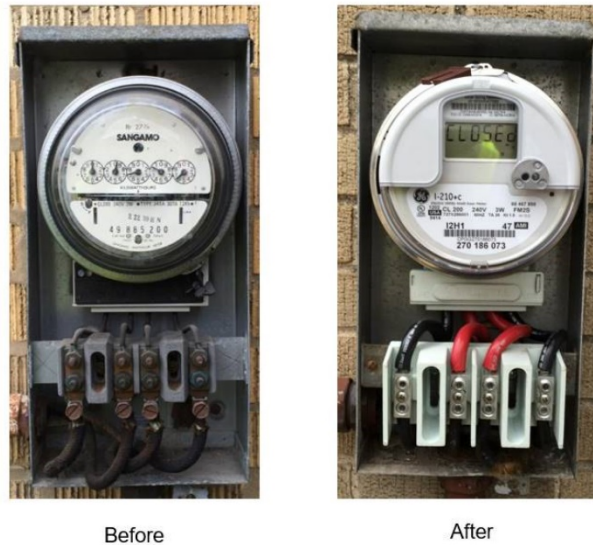


Figure 1: A-Base Exchange: Before and After

As noted in last year's update, fewer than two dozen supervisory control and data acquisition ("SCADA") meter exchanges remained for 2019, in accordance with NERC CIP V5 and Exelon's security requirements. ComEd's innovative approach to these specialized set of exchanges was again leveraged for this work. All exchanges were completed by early Q3 2019. To help ensure constant communication with the AMI meters at several SCADA sites, cold-sequence sleeves are being installed. This work started in Q3 2019 and will continue into 2020 as part of the ongoing (i.e., non-project) business.

Resolution of the remaining 1,380 non-AMI meters by the June 30, 2019 project completion date was the result of continued validation of pro-active management and supervision, and an operating culture focused on safety, efficiency, accountability, and continuous improvement. Limited turnover and strong commitment from a partnership with Local 15 has resulted in a seasoned and dedicated base of meter installers and a culture of continuous performance improvement.

The total number of AMI meters deployed via the AMI Program, including the AMI Pilot, in the ComEd service territory is 4.1 million as of December 31, 2019. The table below provides additional detail to reconcile to the overall system meter population of 4.2 million.

Year	Meters Deployed	Operating Area(s) / Comments
Pilot	127,857	Maywood
2013	70,882	Maywood
2014	540,744	Maywood, Chicago South, Glenbard, Mount Prospect, Chicago North
2015	1,077,758	Maywood, Chicago South, Glenbard, Mount Prospect, Chicago North, Crestwood, Skokie, Rockford
2016	1,165,742	Mount Prospect, Chicago North, Crestwood, Skokie, Libertyville, University Park, Elgin, Rockford, Aurora, Bolingbrook
2017	789,307	Chicago North, Bolingbrook, Aurora, Libertyville, University Park, Elgin, Joliet, Crystal Lake, Dixon, Rockford, Freeport, Streator
2018	335,231	University Park, Joliet, Crystal Lake, DeKalb, Rockford
2019	1,155	Clean-up of 1,380 UTCs
TOTAL	4,108,676 ²	AMI Program Total
<i>New Business Installations</i>	<i>110,608</i>	<i>Net New Business AMI Installations</i>
<i>Rider NAM</i>	<i>5,814</i>	<i>Meters in Rider NAM (Monthly Fee)</i>
Current Meter Population	4,225,098	Total System Meter Population

Table 2: AMI Meter Deployment Program Summary

Operating Area Close-out and Unable to Complete (“UTC”) Orders

The Operating Area Close-out Team (aka UTC Closeout Team), first formalized in 2017, continued to play an increasingly vital role in deployment operations as deployment was completed across the territory. The Close-out Team became highly proficient in dealing with these unique situations and its dedicated focus was due in large part to their experience working on the most complex meter installations. This team focused on access issues and other operational challenges that led to a small, scattered remaining population of only 1,380 non-AMI meters, all unique UTC locations. This equates to a UTC rate of only 0.03%, or only about 3.5% of the planned volume (i.e. 1,380 vs 39,797) entering 2019.

All of the remaining 1,380 non-AMI meters are classified as Unable-to-Complete (“UTC”) meters, which are often significantly more difficult and time consuming to complete than standard installations. Each UTC meter often requires individual attention, coordination, and management to identify and resolve barriers to installation. Despite these challenges, the team was extremely effective in resolving the remaining backlog of 1,380 non-AMI meters in 2019 through a wide range of tactics and evolving processes to create a tailored and customized

² Updated AMI Program projection adjusted to account for changes in system meter population as well as smart meter installations completed outside of the AMI program (new business installations, system revisions and deletions, etc.). Data as of 12/31/2019.

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approach with coordination among many groups within AMI and Customer Operations. Close coordination with leadership in New Business, Field & Meter Services, and Revenue Protection ensured that the most difficult of the remaining 1,380 non-AMI meters were prioritized, coordinated and evaluated on a weekly basis. In the most challenging instances, the Writ of Replevin process was implemented as an effective last resort. In 2019, 351 meters were resolved through the Writ of Replevin process.

Program Ramp-down

In alignment with resolution of the remaining 1,380 non-AMI meters entering 2019, the ComEd Operating Area and UTC Closeout team leveraged the customized, cross-functional, field and back office tactics proven successful since 2017 (see previous section for details) to complete the final work plan safely, with high quality, and before the June 30, 2019 target.

The new Smart Meter Operations (“SMO”) team was launched in January 2019 within the Customer Operations department to assume responsibility for the AMI Operations and Field and Meter Services functions as the AMI Program ended. The SMO team is comprised of the following groups: Field and Meter Services, AMI Operations, AMI Engineering & Testing, Data Analytics, and Revenue Protection. Establishing the new SMO team at the beginning of the year provided a sufficient transition period for personnel movement, business process optimization and knowledge transfer from the AMI Project environment to steady state business operations.

Repairs and Upgrades

The AMI deployment effort continued to make the ComEd service territory safer and more reliable in 2019 through the completion of electrician repairs and upgrades. AMI meter installers identified potential risks or issues and partnered with contracted electricians to resolve them at no additional cost to that specific retail customer (once the repairs are completed, the AMI meter exchange can then take place).

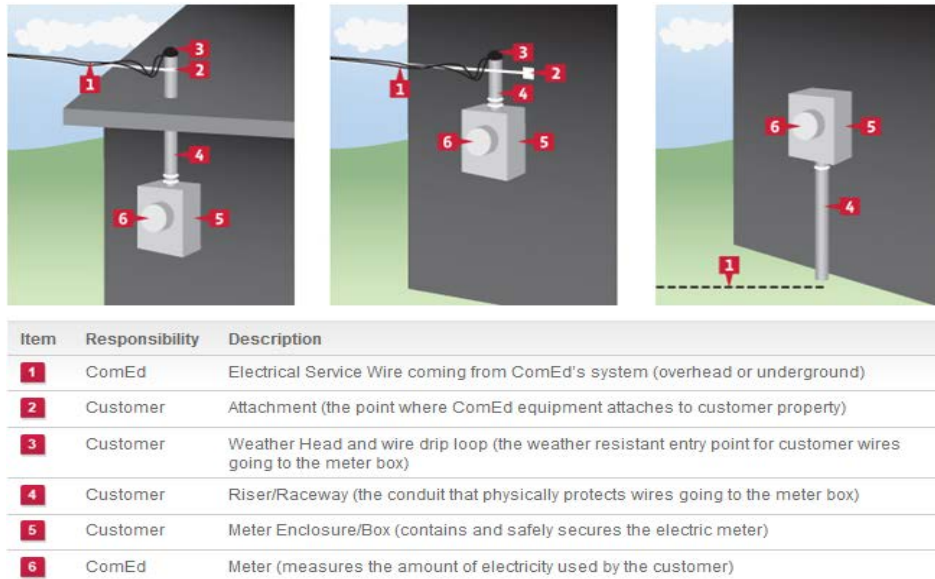


Figure 2: Socket-style meter Ownership and Responsibility

In previous years, the team focused on prioritizing Frost Loop repairs to ensure safe meter installations in these challenging situations. Having only 30 Frost Loop repairs in 2019 is a testament to the team's commitment to provide safe conditions and reliable service for ComEd's customers. In 2019, the team transitioned its focus to Elevated Temperature Monitoring-driven repairs. Additional details regarding the types and quantities of those repairs completed in 2019 are included in the table below.

Type of Repair	# of Repairs Completed in 2019
Service Change	64
Other Minor Repairs	247
A-Base	78
A-Base Kit	114
Block	418
Jaws	123
Frost Loop	30

Wire from Panel to Meter	34
Ground Rod	52
High Temperature	618
Outage	69
Reverse Wiring	14
Total	1,861

Table 3: 2019 Electrician Repair Details

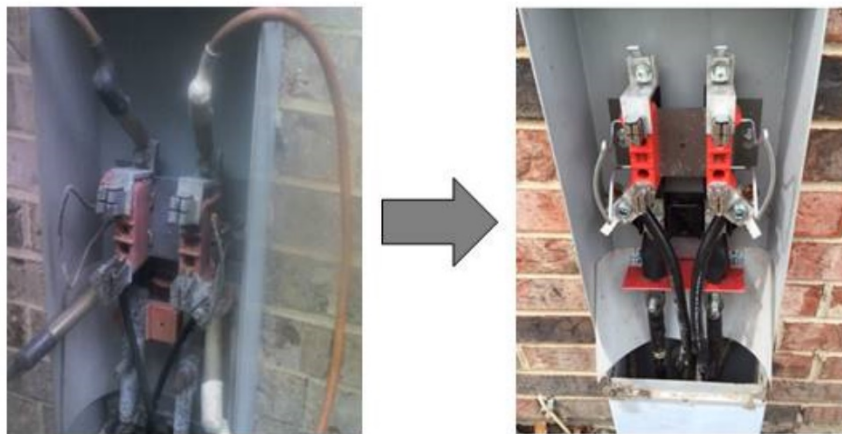


Figure 3: Electrician Repair: Before and After

The team continued to take advantage of the unique opportunity to visit every customer premise to prudently enhance the safety and operating conditions of customer equipment. In 2019, the team partnered solely with MZI, a veteran-owned and Illinois-based company, to provide consistency, drive safety, and improve productivity as the program ramped-down with the most difficult electrician repairs. These involved the most creative solutions and persistence to allow the retrofit or replacement of challenging double-tap A-Base repairs. Elevated Temperature driven investigations and minor repairs have gone down significantly, indicating that these efforts have been successful. These productivity improvements, in addition to dedicated focus and management, enabled the team to address over 618 Elevated Temperature repairs in 2019. While ensuring work was executed productively, the team also continued to drive a culture of commitment to employee safety, which resulted in zero Occupational Safety and Health Administration (“OSHA”) recordable incidents across all contracted electricians. To

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further the improvement of customer safety, UL-certified 3-phase adapters for A-Bases were deployed where appropriate.

Additionally, MZI was awarded the contract for steady-state, ongoing repairs, which represents a significant program milestone and ensures ComEd will be able to continue to provide customers with electrician repairs beyond AMI Deployment. MZI is uniquely positioned to transition to steady-state work that focuses on minor repairs, inspections, Elevated Temperature Investigations, and Writs in collaboration with the Operations Control Center (“OCC”), Overhead Electrician Specialists (“OES”) and Field & Meter Services (“F&MS”) following the AMI Project. MZI revamped its warehouse and inventory per ComEd’s request to drive workforce productivity. Through these initiatives, MZI continues to be a consistent partner in the Program, and ComEd looks forward to their continued support in enhancing customer safety.

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Safety

Safety remained a core component of the AMI Program operating culture in 2019, in alignment with ComEd's strong reputation in this area. The Program had another successful year via a focus on safety training, communications, lessons learned, and reinforcement of the core safety principles for field and back office employees via daily operational calls and other methods. Field reviews were again performed by management throughout the year to assess the performance of the team based on the established safety protocols.

The AMI team (labor and management) continued to participate in Safety Council meetings on a monthly basis at the ComEd Cross Dock, which provided an open forum for the discussion of safety topics, sharing ideas for improvement going forward, and executing the Behavior and Prevention Process ("BAPP") Driving Initiative, which educates drivers by addressing at-risk behaviors through peer-to-peer observations. This ongoing commitment to safety and transparency has led to employees being invested in the safety culture and continually striving to improve the work environment.

In 2019 the project team experienced zero OSHA recordable incidents, against a target of zero. ComEd continues to be recognized as an industry leader in safety thanks in part to the contributions of the AMI Team.

Meter Deployment Work Planning

Please reference the "Operating Area Close-out and Unable to Complete (UTC) Orders" section for details related to 2019 Meter Deployment Work Planning.

AMI Operations

In parallel to the increase in volume of meters deployed, the AMI Operations team continued to expand and enhance the supporting tools, technologies, and processes that they leverage to effectively manage this critical component of the ComEd operating system. As of December 31, 2019, the Year End ("YE") System Read Rate (including AMI and non-AMI, manually read meters) was 99.88% (0.09% favorable to target), which is best on record for this key performance indicator with many positive downstream impacts. This impressive result is driven by even stronger performance in the YE AMI Read Rate of 99.93% (0.02% favorable to target). This result was achieved through continued network optimization, advanced analytics tools, and process improvements.

This elevated Meter Read Rate performance level has significantly reduced the number of estimated bills (reduced from 12.1 million in 2010 to 134,660 in 2019) and delayed bills (nearly 93% reduction since 2010 -- from pre-AMI level of 0.99% to 0.0705%) to customers, while also serving as a clear indication of the overall health, stability, and reliability of the AMI network. Outage management capabilities (meter "pinging" and "last gasps") and the performance of remote commands and ability to capture data for pro-active analytics-driven improvements continue to be strong. As a result, customers are now able to reliably view interval level usage (load profiles) while also enabling ComEd to investigate more rigorous

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metrics for measuring operational performance, with a goal of driving an exceptional level of service.

The optimization process includes a detailed review and assessment of Itron mesh network performance in the fully-deployed state and the targeted deployment of additional network devices, as needed, to strengthen and sustain performance at and above the agreed upon service levels. Network optimization identified 14 new devices (Access Points and Relays) in 2019, beyond 82 previously identified devices from 2018, which would further strengthen the performance of the network. All 96 devices have been installed. Network optimization planning, design, and installation has been completed in all Operating Areas.

Beyond optimization, continued coverage expansion of the mesh network infrastructure to support additional meters (remediation) added both relays and APs to the network. A small number of additional remediation devices are expected in 2020 and will be addressed as part of ongoing business operations (i.e., non-project). Of the 96 devices installed in 2019, a breakdown by device type is reported below, along with a distribution across the Operating Areas.

Device Type	Number of Devices Installed in 2019	Total Number of AMI Devices
Access Point	20	1,178
Relay	76	2,624
Grand Total	96	3,802

Table 4A: Operating Area Network Optimization by Device Type

Operating Area	Number of Devices Installed in 2019
Rockford	25
Joliet	21
Freeport	17
Dixon	12
University Park	5
Dekalb	3
Mt. Prospect	2
Crestwood	2
Crystal Lake	2
Elgin	2
Skokie	1
Chicago South	1
Chicago North	1
Aurora	1
Bolingbrook	1

Grand Total	96
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Table 4B: Operating Area Network Optimization by Operating Area

The AMI Operations team continues to focus on leveraging data analytics tools, advanced machine learning, and AMI functionality to monitor meter temperatures and unsafe conditions. High meter temperatures are caused by defective customer-owned meter equipment, including loose jaws, broken blocks and high resistant lug connections. As a result of detailed root cause analysis and testing, high temperature findings have never been deemed to have been caused by ComEd’s UL certified and safety-tested smart meters. ComEd is proud to offer elevated temperature detection as an additional service for its customers.

This pro-active monitoring includes a two-pronged approach, the first of which is completing monitoring scans that leverage an algorithm on a data set of meter temperature, ambient temperature, and load to identify potential safety concerns. Emergency investigations are created for Field and Meter Services technicians to investigate instances that are identified through this monitoring. The second element of the approach is the creation of ‘AMI High Temperature Events’ using the Outage Management System (“OMS”) when temperatures are outside of a certain range. These tickets are then handled as ‘high priority’ by the on-call 24x7 Overhead Electrician Specialists (“OES”) in the field. Additional findings on the High Temperature Meter Investigations are included in the chart below.

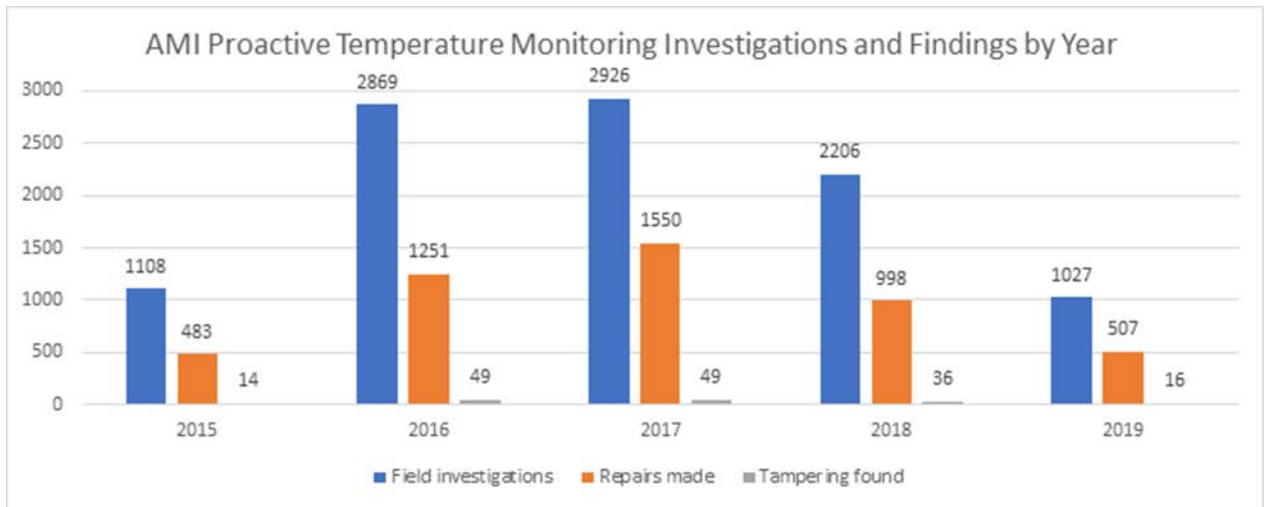


Figure 4: Proactive Temperature Monitoring Data

3. Smart City Lab

The Smart City Lab is designed to not only maximize the value of advanced metering infrastructure (AMI), but to improve and innovate on the way ComEd serves its customers. The

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lab supports smart streetlights and water meters, advanced energy efficiency technologies, customer-oriented innovation, and other emerging smart city solutions.

AMI Engineering & Testing utilizes a variety of specialized equipment within the Smart City Lab, including: two Radio Frequency Isolation Chambers, which enable our AMI Engineers to ensure equipment immunity and safety with external systems; a Temperature Chamber, which enabled AMI Engineers and Revenue Protection professionals to test equipment at extreme temperatures; Meter Test Boards, which simulated and replicated issues found in the field; to 3D Printers and Scanners, which allowed AMI Engineers to advance a patent-pending project from design stage to working prototype.

Engineers at the Smart City Lab completed over 600 tests in preparation of the UIQ Head End upgrade in May of 2019. Software testing was also completed to upgrade Street Light Vision. In addition to hosting tours for over 500 visitors in 2019, innovations from the Lab were exhibited at Exelon's Innovation Expo and the internal 2019 ComEd Engineering Conference. The Lab has also proven a popular site for executive level events for both internal and external audiences.



Figure 5: Smart City Lab Network Wall



Figure 6: Smart City Lab Street Lights



Figure 7: Smart City Lab Radio Frequency Isolation Chamber

Grid-related Applications and Processes Utilizing AMI Data

As noted in prior AIPRs, AMI infrastructure continues to bolster operations across the service territory that enables grid-related improvements to ComEd and its customers. This includes enabling ongoing monitoring of power factor to drive overall system efficiencies for commercial and industrial customers, allowing for efficient integration of distributed generation

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resources through hosting capacity analysis, leveraging data captured via the network for advanced data analytics and pro-active asset management, optimizing voltage levels through the use of AMI data, and verifying outage events and activities through the meter ‘pinging’ capability. These improvement areas and others will continue to derive value from the investment in AMI infrastructure as additional tools and functionality ‘use cases’ are identified and deployed.

4. Customer Experience

Call Center Operations

The transition from AMI Customer Experience to the main ComEd Call Center was completed in 2018. In 2019, the Program continued to thoughtfully transfer responsibilities and prepare organizations across ComEd for permanent support of the AMI infrastructure and processes.

Customer Experience

The Customer Experience function remained an integral component of the AMI Program in 2019, as the team continued to refine and execute the proactive outreach strategy to educate customers and communities on the benefits of AMI, resulting in a net refusal rate of only 0.14% for the Program, roughly one-tenth of the planned rate. Such a low refusal rate is also evidence of the effectiveness of the Commission’s prudent decision to adopt a Smart Meter Refusal Charge of \$21.53 in motivating customers accept a smart meter. As shown in Figure 8 below, the conversion of customers who initially refused the installation of a smart meter only to change their minds after speaking with a Customer Experience team member remained above 50%.

Once all remaining UTCs had been resolved, the team ceased operations July 1, 2019. Additional details regarding customer refusals as of that date are shown below.

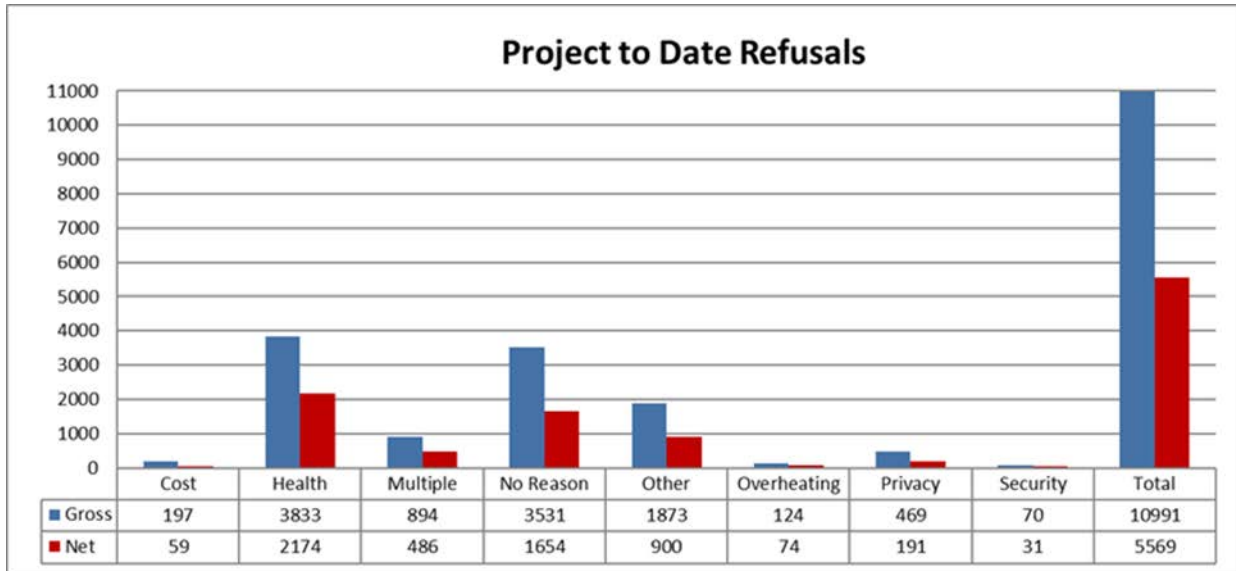


Figure 8: Project to Date Refusals

During the final six months of the AMI Program, the Customer Experience team continued leverage a strategy of sending personalized letters to customers who had refused the meter in the past, which included the cumulative amount each customer had incurred in smart meter refusal (“Rider NAM”) fees. The purpose of these letters was to educate the customer and raise awareness to the ongoing cost they were incurring to have their meter read manually each month. This letter was sent to over 6,500 RiderNAM customers. These efforts, combined with ongoing field and back office actions, contributed to driving conversions.

As part of the proposal developed for the ICC in 2015, ComEd has extended the smart meter deferral period from December 31, 2019 to June 30, 2022. The ComEd AMI PMO, Rider NAM, and Regulatory teams continue to design and evaluate nonstandard AMI meter offerings through 2020.

Since the outset of the AMI Program and other grid modernization activities, ComEd’s overall customer satisfaction performance has shown steady improvement. This is a result of an over-arching focus on the importance of driving a positive customer experience in every interaction with ComEd, including before, during, and after the AMI meter exchange process. The deployment of AMI has been a key enabler of the improvements made to the volume and quality of data and other information to and from customers, via an expanded set of outreach channels such as mobile apps, email, and text alerts.

5. AMI Information Technology (“IT”) and Business Transformation (“BT”)

Transformed Operations

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The delivery of the AMI Program has transformed internal operations and how ComEd interacts with customers every day. These investments have driven significant improvements to the customer experience while simultaneously improving operational efficiencies and reducing costs.

Prior to AMI, ComEd relied on a comparatively inefficient and costly process for the manual capture of meter reads, lacked the situational awareness required to pro-actively respond to customer outages, and relied on manual process steps and field visits for nearly every field-related issue. Through valuable and prudent investments in and deployment of AMI field and back office technology, ComEd is now able to read meters on an interval basis via a two-way wireless communications network, while also executing remote investigations and actions. This drives an improved customer experience through reducing estimated bills, offering new rate and program options such as Hourly Pricing and Peak Time Savings (PTS), and eliminating the long wait times that are often associated with start/stop of service, as well as other standard customer interactions.

ComEd also now delivers significantly faster outage restoration through increased situational awareness, allowing the company to proactively respond to outages rather than relying on customers reporting them on their own. AMI technology also facilitates increased communication during the restoration process to ensure customers have the most up-to-date information available.

Perhaps most importantly, the successful delivery of AMI has transformed the way ComEd interacts with customers, enabling a greatly increased, two-way flow of communications which enable customers to better understand and manage their energy use, proactively inform them of the status of their service and account, and provide innovative new programs and offerings in which customers can participate for even further benefits. The completion of the AMI mass deployment represents a significant milestone for ComEd, ensuring the Company has the tools necessary to provide a premier customer experience

The sections below contain details on specific areas of improvement that were delivered by the AMI IT and BT teams in 2019, in addition to diligent maintenance.

Outage Management

AMI meters continue to provide the ability to automatically created trouble reports for individual outage events. These reports come through the Outage Management System and the information is immediately communicated with the proper ComEd personnel to respond. AMI technology made the rapid communication of these events possible as previously it would have taken significantly longer for these events to have been discovered. The quick identification and response to these events improves customer satisfaction, safety, and reduces the impact of the event.

Since January 2015, ComEd has avoided over 217,000 truck rolls by using the “Meter Status Check” (“pinging”) functionality of the COMPASS (“OMS”) application, integrated with AMI systems. This enhanced functionality avoids the need to send employees to check outages

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in the field as that information can be communicated in real-time to the back office and allows for more efficient use of field resources during storm and non-storm restoration operations.

Incorporating the “Meter Status Check” capability into customer channels was recognized in the industry and is further evidence of ComEd’s commitment to innovation and driving a premier customer experience. This enhancement has avoided trouble reports allowing improved customer experience and first contact resolution for customer-side power interruptions. The AMI Program has been a key enabler of significant reliability improvements, along with overall ComEd grid modernization investments that reduce the impact of storms on customers.

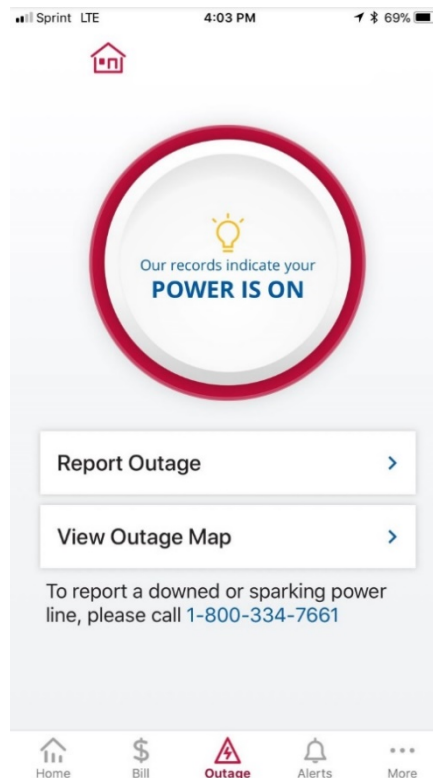


Figure 9: Outage Alert Mobile Functionality

Security and Redundancy of Data and Systems

Throughout 2019, the IT team continued to focus on redundancy and security for AMI systems and networks. Security efforts included ongoing testing and improvements to operations of the Itron networks in alignment with industry standards. The team enhanced network protection from external intrusion by continuously refining firewall configurations and the overall security architecture. These security enhancements were done along with vulnerability assessments and reviews of network flow patterns to proactively monitor network and system security.

Customer and Financial Benefits

AMI technology has proven to be valuable for ComEd and its customers. Below is a subset of notable benefit highlights that have been enabled by the AMI Program and ongoing ComEd grid modernization efforts. Details on the actual performance metrics can be found in the multi-year EIMA performance metric report.

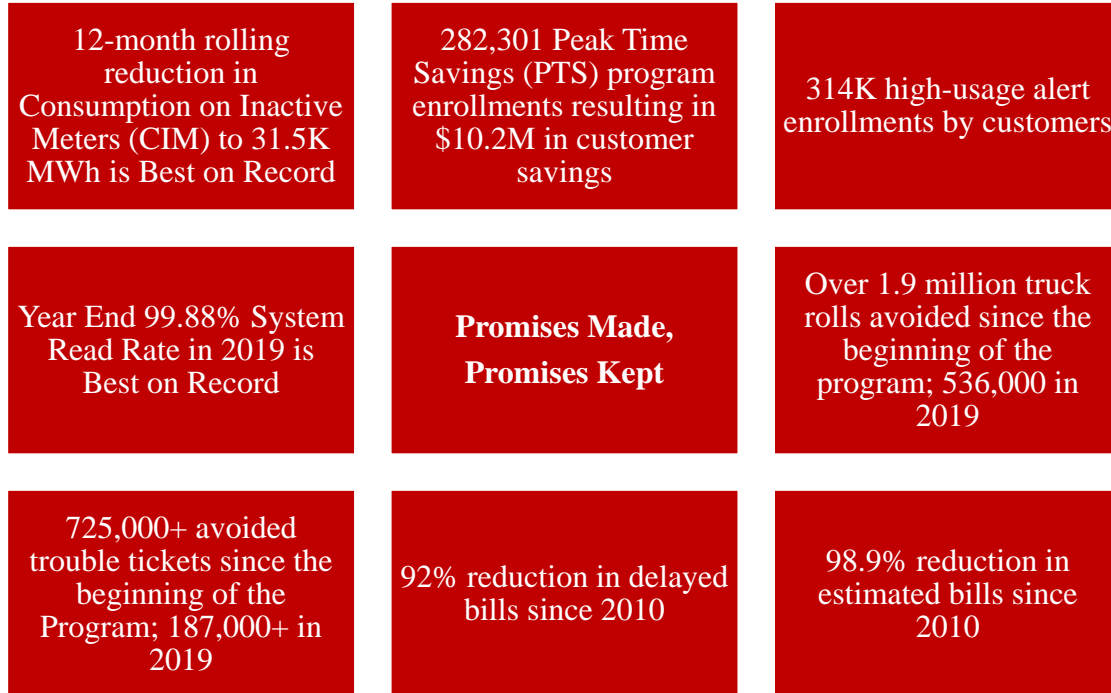


Figure 90: ComEd Performance Highlights

AMI meters provide customers with access to the digital tools needed to track energy use and leverage programs to save them energy and money. For example, the ComEd Hourly Pricing program has saved participants more than \$22.3 million in energy supply since the program debuted and, in 2019, there were more than 34,300 customers taking energy supply under this program.

The AMI Program has also been a technology enabler that has led to improvements to overall system reliability, in conjunction with other large-scale grid modernization investments by ComEd as part of the Energy Infrastructure Modernization Act (“EIMA”). These combined investments have resulted in record reliability for customers.

6. Change Management and Business Readiness

ComEd recognized the importance of employee engagement and communication through AMI Program conclusion in 2019. The Change Management and Business Readiness team focused on communicating, preparing, and training employees on how to effectively utilize the new tools and processes of AMI in the context of their day-to-day jobs.

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Communications

In 2019, the Change Management team remained proactive in driving awareness of the AMI Program through internal communication and outreach efforts as deployment concluded. They did so by creating and distributing job aids, newsletters, progress reports and regular communications throughout the organization.

B. 2020 Activities and Goals

Project Management Office

The AMI Program concluded 12/31/2019.

1. AMI Network and Meter Deployment

The AMI Program concluded 12/31/2019.

2. Customer Experience

The AMI Program concluded 12/31/2019.

3. AMI Information Technology and Business Transformation

The AMI Program concluded 12/31/2019.

4. Change Management and Business Readiness

The AMI Program concluded 12/31/2019.

D. Budget

Below are the budget tables updated with 2019, and Program final, actual results, along with the associated variance explanations for Capital and Operations and Maintenance (“O&M”).

Capital ³ (\$M)	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total
2019 AIPR Budget	0.3	42.6	151.6	243.6	234	148.5	69.1	15.6	4.2	4.2	913.7
Updated Budget	0.3	42.6	151.6	243.6	234	148.5	69.1	9.9	-	-	899.6
Variance (Increase) Decrease	-	-	-	-	-	-	-	5.7	4.2	4.2	14.1
O&M (\$M)	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total
2019 AIPR Budget	18.4	29.3	45.1	59.9	71.5	66.7	57.5	41.0	38.6	38.2	466.2
Updated Budget	18.4	29.3	45.1	59.9	71.5	66.7	57.5	33.5	-	-	381.9
Variance (Increase) Decrease	-	-	-	-	-	-	-	7.5	38.6	38.2	84.3

Table 5: Capital and O&M Spend Profile AMI Deployment

As noted in the table, there is a decrease in total projected Capital of \$14.1M from 2019 through 2021 when compared to the previous projection within the 2019 AIPR. This reduction is driven by several factors, including the reduction of smart meter purchases required versus plan, cold sequence fire pump adapter development and IT-related costs pending executive approval spend less than forecasted, and completing AMI Deployment two fiscal years ahead of schedule.

The O&M costs through the end of the Program decreased as well when compared to the 2019 AIPR. Similar to the reduction in projected Capital costs, the overall net reduction in O&M costs is primarily a result of electrician repairs, pole cuts, Itron Product Support, and process improvement spend less than forecasted as well as a decrease in projected spend for labor as resources have successfully ramped down earlier than planned.

³ The total spend amount captured in the table does not include costs associated with the Peak Time Savings (PTS) program, which is consistent with prior AIPRs.

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A culture of disciplined and transparent financial management continued to drive cost savings and reduced spending practices across the program.

D. List of AMI Investments

The AMI investments undertaken in 2019 are in the table below:

(\$ in 000's)	2019 (Actual)			2020 (Projected)		
	Capital	O&M	Total	Capital	O&M	Total
Meters and Deployment	5,383	2,719	8,102	-	-	-
Communication System	2,225	10,654	12,879	-	-	-
IT Applications and Operations	333	12,890	13,223	-	-	-
Project Management and Other Costs	1,950	7,233	9,183	-	-	-
Total	9,891	33,496	43,387	-	-	-

Table 6: List of AMI Investments

2019 – Actual Spend

Meters and Deployment

The meter costs for 2019 were again primarily related to the purchase and installation of meters. Consistent with prior years, other costs include tools and other materials associated with meter installation, meter inventory management, and electrician repairs to customer-owned meter-related equipment.

Communication System

Consistent with 2018, the Communication System costs for 2019 were primarily associated with the purchase and installation of field network equipment for the deployment of the AMI communication system. This category also contains charges for the AMI technology

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provider Itron, including materials, maintenance of the required Itron IT hosting environment, professional services support, software fees, and server costs.

IT Applications and Operations

IT Applications and Operations costs for 2019 included the ongoing IT maintenance of the hardware and software used to support the operation of the AMI meters installed and the associated data analytics as well as key functionality described earlier in this report (Outage Management, Billing, PTS, etc.).

Project Management and Other Costs

The Project Management and Other Costs for 2019 were again related to project management activities, contractor management efforts, operations of the meters installed, meter deployment planning, ongoing planning and execution of customer experience activities, and business transformation and change management activities. Additional cost components included ongoing planning and rollout of customer outreach and education activities and labor costs for revenue assurance work.

E. 2020 Projected Spend

Meters and Deployment

AMI Deployment completed two fiscal years early on December 31, 2019, and therefore there is no projected AMI spend moving forward.

Communication System

AMI Deployment completed two fiscal years early on December 31, 2019, and therefore there is no projected AMI spend moving forward.

IT Applications and Operations

AMI Deployment completed two fiscal years early on December 31, 2019, and therefore there is no projected AMI spend moving forward.

Project Management and Other Costs

AMI Deployment completed two fiscal years early on December 31, 2019, and therefore there is no projected AMI spend moving forward.

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III. Customer Applications

A. Introduction

With the completion of smart meter installations throughout ComEd's service territory, more than four million customers have the ability to benefit from the innovative programs and cost savings made possible by AMI. ComEd is continuously exploring improvements to existing offerings and considering new products and services that help customers realize tangible benefits from the investments in AMI.

To guide the selection and development of customer applications, ComEd follows the principle of using AMI capabilities to "Inform", "Facilitate", "Collaborate", "Enable", and "Deliver".






- Inform ComEd's customers and industry third parties of new energy products and services that can help them personalize their energy footprint. Provide customers with easy access to their hourly energy usage data and actionable insights for reducing their energy costs. Web tools and proactive notifications for demonstrate how ComEd is helping residential customers understand and act on their energy usage data.
- Facilitate the ability of customers and third parties to access AMI-enabled data, tools, products, and services. Provide a digital hub where customers and third parties can seek and share information. The Community Solar Portal is one example of how ComEd seeks to support third parties to better serve customers.
- Collaborate with entities who can introduce new ideas and help bring more value to customers. For example, the energy savings and new capabilities achieved by the Smart Streetlights project was made possible through close collaboration with municipalities.
- Enable third party development of applications, products, and services that can integrate with ComEd's existing platform or offerings. By making a Peak Time Savings and Hourly Pricing service available on the If This Then That platform, customers can customize and automate how their devices help them participate in these programs.
- Deliver AMI-enabled products and services directly to interested customers. Through pricing programs such as Peak Time Savings, Hourly Pricing, and a forthcoming Time of Use pilot, customers can earn bill credits and reduce their supply costs by adjusting when they use electricity.


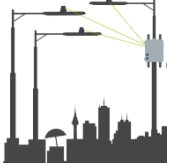




In 2020, ComEd will continue to assess existing customer applications, survey industry developments, and explore new ways to leverage AMI for customer solutions.

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B. 2019 Activities and Accomplishments

The table below summarizes products, services, and programs made possible by AMI that were available to customers in 2019.

2019 Customer Applications of AMI			
Inform and Facilitate	Residential Energy Management Tools	Opt-in notifications and reports, and web-based tools that provide residential customers with details on their energy usage and actionable tips for reducing energy costs.	
	Data Services	Allows customers to automate the transfer of their usage data to authorized third parties, based on opt-in customer consent and control with Green Button Connect. Offer external entities the ability to purchase anonymized interval data.	
	Digital Solar Toolkit	A suite of tools to assist customers and developers in their respective solar journeys.	
	ComEd Marketplace	Web-based "Beyond the Meter" Marketplace connecting customers with energy saving products and services.	
Collaborate and Enable	If This Then That (IFTTT)	Peak Time Savings and Hourly Pricing services on IFTTT enable customers to automate and customize control of their devices to more easily participate in these program.	

	Smart Meter Connected Devices	Allow customers to directly access their smart meter data through owned compatible devices operating on the Home Area Network.	
	Smart Streetlights	Deployment and operation of a smart LED streetlight solution that leverages ComEd's smart meter communications network.	
Deliver	Peak Time Savings (PTS)	Opt-in demand response program offered to residential customers with smart meters. Enrolled customers receive bill credits for reducing their electricity use during PTS Hours events, which are typically announced when demand for	
	Bring Your Own Thermostat (BYOT)	Option to participate in the AC Cycling program with a Nest smart thermostat instead of the traditional direct load control switch.	
	Hourly Pricing	Dynamic pricing option that lets residential customers with smart meters pay the hourly wholesale market price for electricity. By shifting usage to off-peak hours, participants are able to save money on their supply costs.	
	Capacity Guard Alert	Provides day-ahead notification of possible "coincident peak" (CP) hours to Hourly Pricing program participants to help them manage or reduce their capacity charge in the following year.	



	Residential Time of Use (TOU)	Pilot program to gauge customer interest, bill savings, and peak shaving impacts from a TOU rate with three fixed pricing periods. Enrollment to begin in 2020.	
	Emerging Technology Pilots	Pilots used to test the performance of new program designs and tools using AMI data on their potential to maximize customer energy savings.	

Table 7: Summary of 2019 customer applications stemming from AMI.

1. Inform and Facilitate
 - a. Residential Energy Management Tools

Currently, ComEd offers the following smart meter-enabled tools that give customers details about their energy usage. Customers can access these tools and set notifications and alerts by signing into their online ComEd account (available at: ComEd.com/MyAccount):

Online AMI Data Insights:

Customers can view their hourly and daily electricity usage and net metered generation. Information about weather, bill estimates, and comparisons to similar homes are provided to help customers understand their energy usage.

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Figure 10: Web tool provides residential customers with easy access to their hourly energy usage and costs as well as insights into their energy use patterns and benchmarks for comparison.

Weekly Usage Reports:

Weekly Usage Reports summarize daily electricity usage, provide a bill projection, and include personalized energy-saving tips.

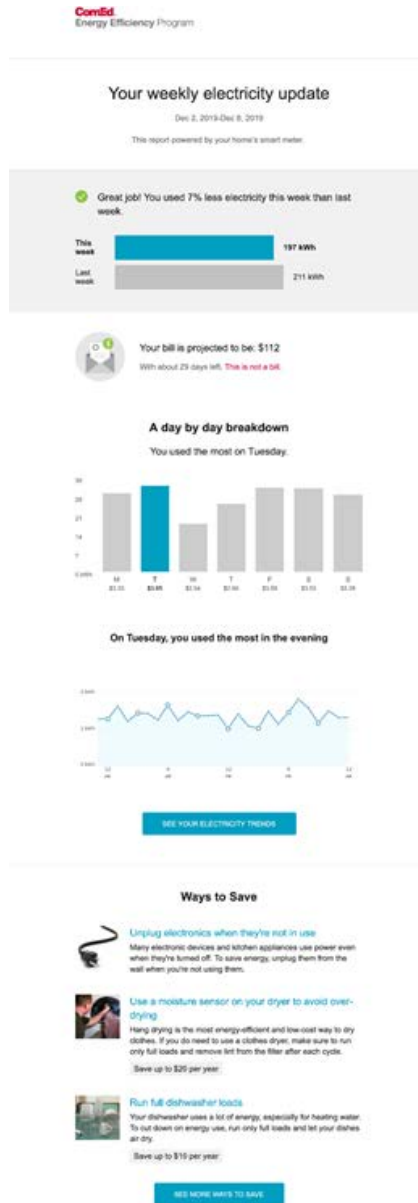


Figure 11: Weekly Usage Report

High-Usage Alerts:

High-Usage Alerts notify customers that their electricity usage is trending higher than usual, so they can make changes before their next bill arrives. High-Usage Alerts are available by text, phone call, or email.

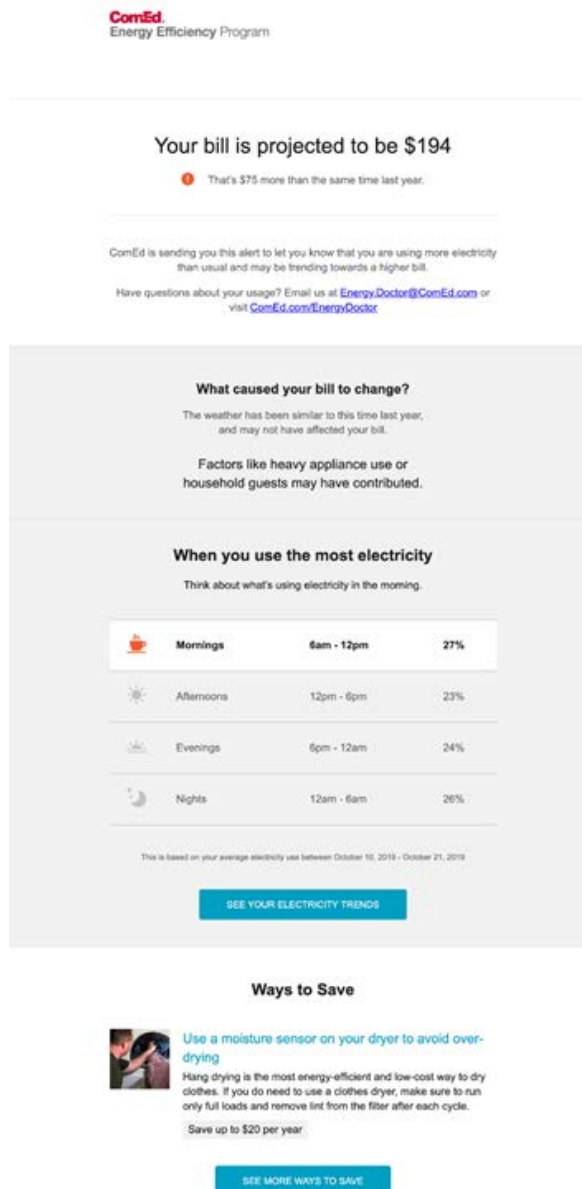


Figure 12: High Usage Alert

b. Data Services

Green Button Connect:

ComEd has enabled residential and commercial and industrial (“C&I”)⁴ customers to consent to the disclosure of their energy information to third parties through an electronic, web-based interface. Green Button is an industry initiative stemming from a White House call to action for utility companies to voluntarily provide customers with easy access to their energy

⁴ C&I customers up to 300kW of load can access GBC through ComEd.com.

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usage in a secure electronic format. Green Button Connect My Data allows customers to authorize third-party service providers to receive direct access to their energy usage analytics via the Green Button functionality. The ability to transfer data more seamlessly to third party developers will help accelerate applications and analytics that leverage smart meter data.



Pursuant to the ICC’s Final Order in Docket 15-0073 issued on March 23, 2015, ComEd deployed the Green Button Connect My Data solution in May 2016 to residential and small commercial customers through ComEd.com. Through the implementation of Green Button Connect, ComEd is providing C&I and residential customers with their detailed usage data to enable them to better manage their energy consumption.

Currently, three third-party vendors have completed the Green Button Connect testing process. ComEd is currently working with additional stakeholders on staging and production testing prior to being added to the website. Twenty-one third-parties have expressed interest in this offering and are in various stages of the enrollment process.

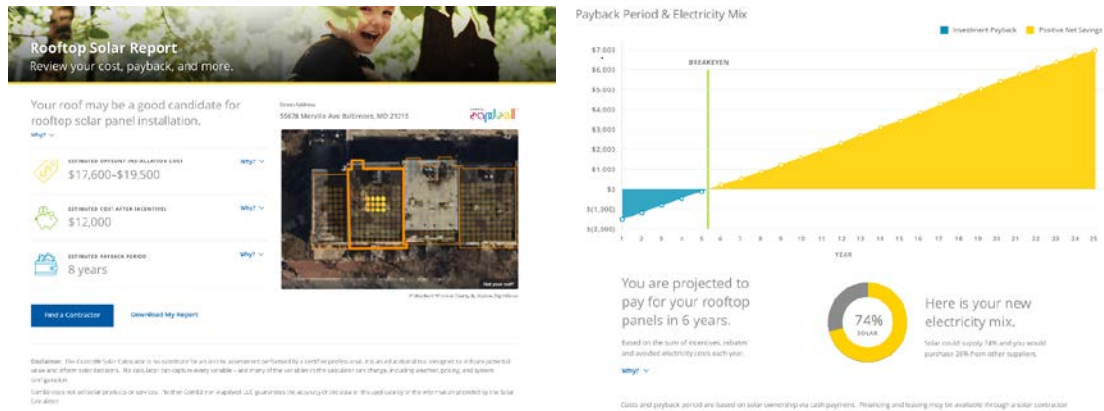
Anonymous Data:

In February 2017, ComEd implemented the Anonymous Data service. This enables external entities to access interval data anonymized per delivery service class per zip code using the 15/15 rule for the entire ComEd service territory for a fee. External entities are given access and permission to download files from a secure site for 35 days with an option to refresh after six (6) months. In 2019, four external entities have requested this data service.

c. Digital Solar Toolkit

In December of 2018, ComEd launched the Digital Solar Toolkit, a suite of online tools for customers to learn about what solar could mean for them. Descriptions of each tool are summarized below.

- Solar Calculator – An easy-to-use interactive tool that helps customers understand and explore their solar options. Based on the customer’s address, the solar calculator uses factors like the roof’s pitch and shading to evaluate their roof’s solar potential and the amount of energy a rooftop system could produce. Customers can receive personalized reports featuring the estimated number of solar panels needed, upfront installation costs, potential incentives, environmental benefits and more. Customers who log into their ComEd account can receive an estimate of their payback period based on their historic energy usage.



- Finding a Contractor – A page with tools, tips, and resources to help customers select qualified solar contractors.

ComEd powering lives

Research Projects Sign In To Your ComEd.com My Account

Rooftop Solar Report | Finding a Contractor

Finding a Contractor

The right contractor can save your time and money.

Use these tips to help you find the right contractor.

Hiring a contractor can be the most rewarding, yet challenging part of your solar buying experience. Licensed and qualified contractors can save you time and money, so selecting the right one is the most important decision that you will make.

Consider the following tips when selecting a contractor:

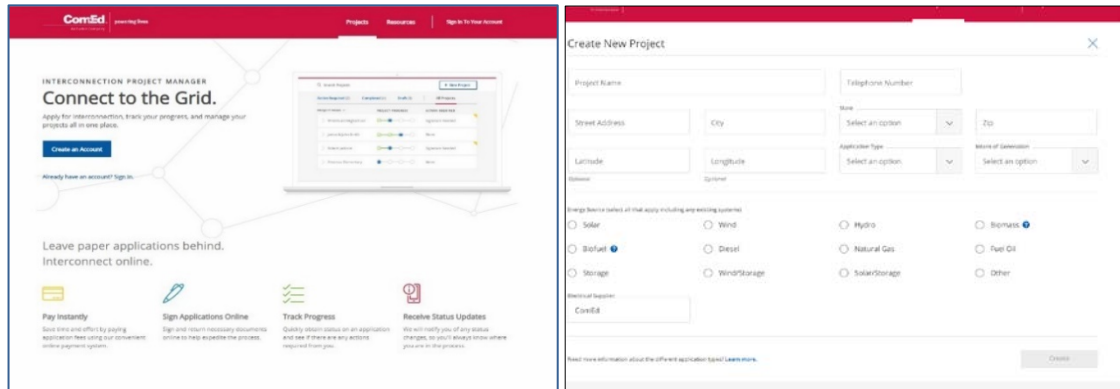
1. **Identify Qualified Contractors**
To install solar panels in Illinois, solar contractors are required to obtain a Distributed Generation Certificate through the Illinois Commerce Commission (or work with a sub-contractor who has obtained it). [View contractors with a certificate](#)
2. **Compare Proposals from Multiple Contractors**
When looking for a solar contractor, ComEd suggests getting at least three (3) proposal bids. Having multiple bids allows you to compare prices, judge response time, and gauge the overall professionalism of each contractor/company.

Attend a Public Education Webinar
Local non-profit, the Illinois Solar Energy Association, hosts monthly webinars to educate the public on solar energy. [View upcoming webinars](#)

ICC Certified Contractors
To install solar panels in Illinois, solar contractors are required to obtain a Distributed Generation Certificate through the ICC (or work with a sub-contractor who has obtained it). [View contractors with a certificate](#)

- Contractor Portal – A consolidated source for education and insights relevant to contractors to support them in their solar business.
- Project Tracker – Provide transparency among the utility, contractors, and customer around workflows to connect private solar panels to the electricity grid and to track solar projects through to completion.

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- Energy Dashboard (launched in 2019) – Allows customers enrolled in Net Metering to view their net metered credits and electricity costs in a single graph accessible through their online ComEd account.



- Community Solar Portal (launched in 2019) - Gives developers and Community Supply Facility Managers the ability to add subscribers to their community solar projects and to calculate the share of credits that are applied to each subscriber.

In effort to provide a premier customer experience, ComEd also assembled a group of experts called the Green Power Connection (“GPC”) Team. This team helps customers make informed decisions about going solar and provides each customer with a single point of contact. The GPC team handles complex solar questions escalated from the Care Center and provides a seamless end-to-end customer experience.

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d. ComEd Marketplace

In late 2016, ComEd partnered with Simple Energy to launch an online marketplace where customers could find, learn about, and purchase energy-efficiency related products and connected home devices.

In addition to instant, online access to rebates and free shipping on qualified orders, in 2019 the ComEd Marketplace was able to offer customers additional savings by providing customers of both Nicor and ComEd a combined rebate of (\$75) ComEd rebate and (\$25) Nicor rebate on smart thermostat purchases. In addition, the Marketplace increased awareness of Energy Efficiency programs by highlighting comparable product availability through Home Energy Assessments. In 2019, the ComEd Marketplace attracted more than 856,000 visitors and issued more than \$4.2 million in rebates on energy-efficiency products and smart technologies.

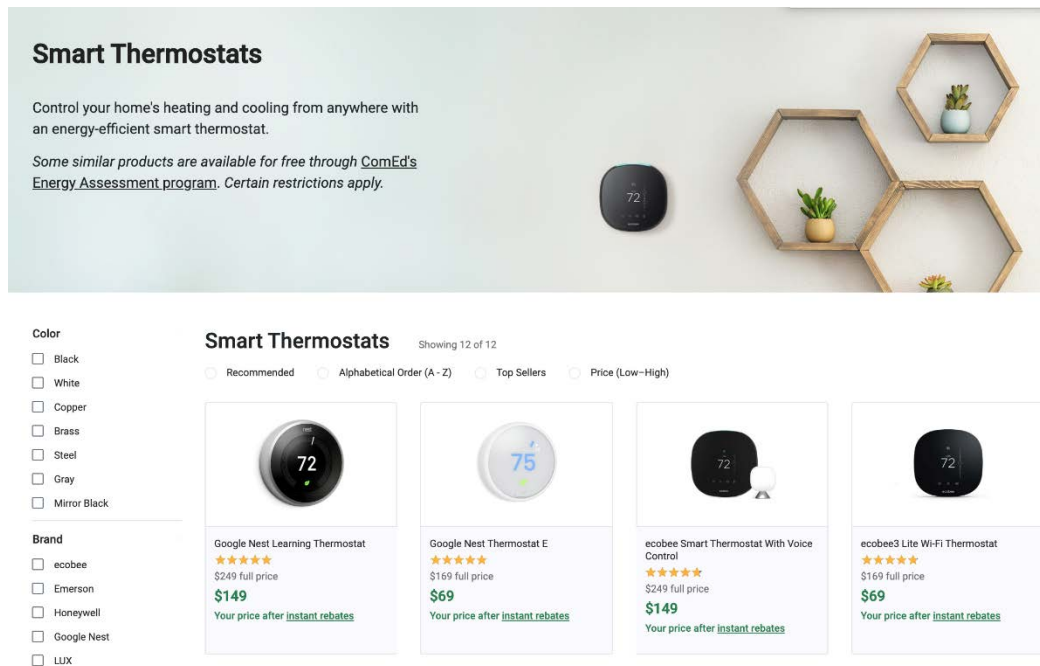


Figure 13 ComEd Energy Marketplace Smart Thermostats with Instant Rebates

2. Collaborate and Enable

a. If This Then That (“IFTTT”)

ComEd is one of the first utilities to leverage the If This Then That (“IFTTT”) platform for demand response and dynamic pricing programs. IFTTT is a free Internet of Things (“IoT”) platform where customers can subscribe to, share, and create custom applets capable of controlling a wide range of internet connected home devices like thermostats and smart plugs.

ComEd launched the Peak Time Savings (“PTS”) and Hourly Pricing services on IFTTT in 2017. The service creates a “set it and forget it” experience for ComEd customers with connected home devices such as smart appliances and smart thermostats. Use cases for IFTTT

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applets include automatically pre-cooling a home before a demand response curtailment event, or automatically shutting-off lighting when electricity prices reach a customizable price threshold. Although customers can create their own applets, ComEd also provides pre-configured applets to help customers more conveniently participate in demand response events or respond to price signals.

Close to 3,000 customers were signed up to use the ComEd PTS IFTTT applets in 2019, and to date, PTS applets have been run more than 21,000 times. The vast majority of users connect to the service using a smart thermostat (i.e. Ecobee or Nest) or use applets to receive a push notification or iOS reminder when a PTS event is announced.

For Hourly Pricing customers, IFTTT manipulates devices and sends notifications in response to hourly electricity prices. More than 2,300 Hourly Pricing customers are connected to the Hourly Pricing IFTTT service, which has led to more than 2,330,000 Hourly Pricing applet transactions since 2017. The ComEd Hourly Pricing IFTTT Channel has published 9 applets for customers, most of which are used to adjust Nest or Ecobee thermostats when the hourly price exceeds a high threshold.

Beginning in September of 2019, Google discontinued the Works with Nest program, which had previously allowed for integrations with Nest products via IFTTT. For existing subscribers to applets using the Nest service, Google has committed to preserving functionality for those who do not migrate their Nest account to a Google account and do not disconnect their Nest product from IFTTT. Several hundred PTS and Hourly Pricing customers remain subscribed to Nest smart thermostat applets, but this number is expected to decline as individuals migrate to Google Accounts and are prevented from connecting Nest thermostats to IFTTT.

b. Smart Meter Connected Devices (“SMCD”)

ComEd continues to facilitate customer access to near-real-time electricity usage information directly from the smart meter along with estimated electricity cost information by identifying compatible retail in-home wireless smart devices. ComEd launched the pilot in December 2014 as the SMCD Service.⁵ As of December 2019, the SMCD Service has 1,070 registered devices. With immediate access to information about their electricity use, customers can make changes to help manage their electric bills.

In 2019, the ComEd SMCD team completed the launch of an automated enrollment system. Customers are now able to enroll their devices with the SMCD service without any manual intervention from the ComEd SMCD team. This gives the participants the ability to enroll their devices 24/7.

⁵ See *Commonwealth Edison Co.*, ICC Docket No. 13-0495, Order (January 28, 2014) at 81.

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To participate, a customer must own a device that has been tested as compatible with ComEd’s smart meters and register the device through their online ComEd account. Once the device has been successfully registered, it can wirelessly receive data from the smart meter at the customer’s residence or business. The types of devices that qualify for the service include:

- In-Home Displays (“IHDs”): IHDs have the ability to display electricity usage and estimated cost information available from smart meters. This information appears on the digital display of the device shortly after electricity is used.
- Energate HolHom (Smart Thermostat). More than just a thermostat, these smart devices feature Wi-Fi connectivity to the internet. Features for these devices may include programmability to adjust temperature, display of energy usage, interactive mobile apps, web portal and live weather updates.

The following SMCDs have been tested by ComEd to be compatible with and receive electricity usage and estimated electricity cost information from ComEd smart meters: Rainforest Automation’s EMU-2, the AzTech IHD, and the Energate HolHom Smart Thermostat.



Figure 14: Pictured from left to right – Rainforest Automation EMU-2 and the AzTech IHD

c. Smart Streetlights

ComEd has been working to establish opportunities to offer smart LED streetlight service to communities within its service territory. Smart LED streetlights bring together highly efficient LED lighting technology with powerful smart-grid enabled lighting controls. These smart controls allow for remote monitoring and control of streetlights through central management software systems. Individually, the LED lights and the smart controls are great technological innovations, but their impacts are greatest when brought together as a system. For example, the LED lights and their control system contribute to energy efficiency, can quickly notify ComEd of maintenance needs, and can be controlled to brighten in emergencies.

In order to remotely monitor and control each streetlight individually, ComEd evaluated ways to leverage the wireless mesh communications network built as part of ComEd’s smart meter deployment. The ubiquitous nature of the network allows ComEd to reach all areas within its territory and extract additional value from the smart grid investments ComEd is already making.

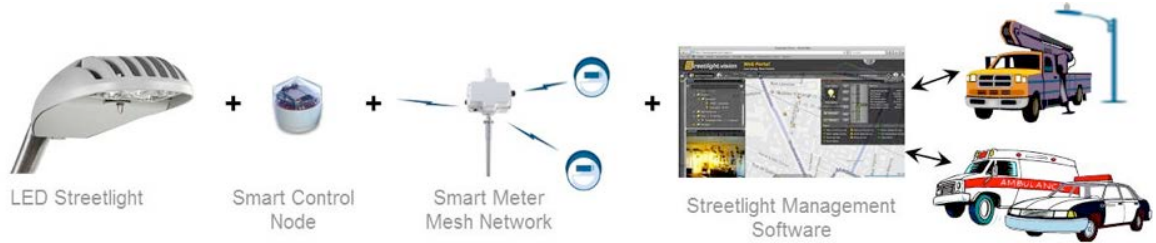


Figure 15: Overview of Smart Streetlight System

Through the Proof of Concept (“POC”) deployment, monitoring of operations, identifying and triaging of issues, and developing system enhancements with vendors, ComEd developed a thorough understanding of the technical capabilities of this technology. ComEd also evaluated customer preferences with respect to this potential new service offering. The results of the POC are being used to make informed decisions about the potential to deploy the technology on a broader scale.

In 2018, ComEd began its smart streetlight deployment program with a true up of streetlight assets by commissioning a mobile deployment application for crews to complement the management software. In addition, more than 24,000 smart streetlights were installed.

In 2019, ComEd completed Year 2 of its smart streetlight deployment. ComEd installed over 21,000 new smart LED streetlights and upgraded over 8,400 existing LED lights with smart capabilities. The program impacted 78 municipalities throughout the ComEd territory. Upon the installation, the municipalities and townships have updated street light records, reduced lighting outages, improved maintenance support, and savings on their utility bill.

The established working groups, business transformation, system integrations, device rollout and advanced metering infrastructure operations, are still engaged to monitor the deployment and ensure that the operations in place remain sustainable.

3. Deliver

a. Peak Time Savings (“PTS”)

In October 2014, ComEd launched enrollment for Peak Time Savings (“PTS”)⁶ – an opt-in demand response program offered to all residential customers with smart meters. PTS provides residential customers the opportunity to earn bill credits for reducing electricity use during specified curtailment periods referred to as PTS Hours. There is no cost to enroll, no requirement to own specific home energy management technologies, and no penalty for not reducing energy use. During PTS Hours, participants earn \$1 for every kilowatt hour (kWh) of electricity they reduce compared to their baseline usage. Credits earned during PTS Hours are

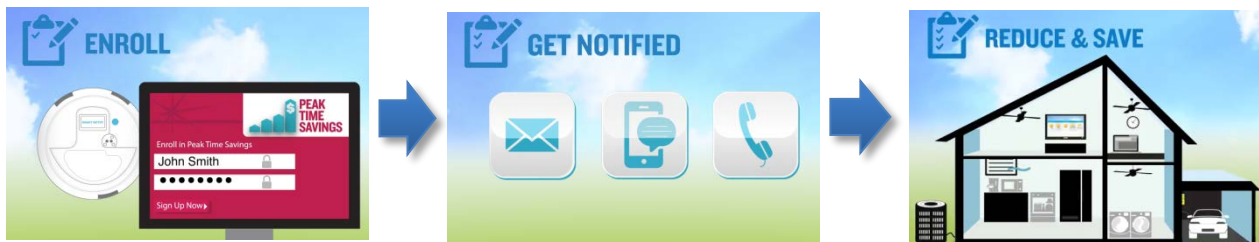
⁶ The Commission approved ComEd’s proposed Rider PTR – Peak Time Rebate (“Rider PTR”), marketed to customers as the “Peak Time Savings” or “PTS” program, in ICC Docket No. 12-0484.

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applied to the customer's next monthly energy bill. ComEd funds PTS bill credits by participating in PJM's capacity market as a curtailment service provider. Any surplus or deficit in funding for bill credits is carried into the next PTS season so that all PJM auction revenue is ultimately paid to PTS participants.

The program is the first-of-its-kind to be offered to customers in the Midwest and demonstrates to customers a direct benefit of ComEd's smart grid investments. Furthermore, managing peak loads in the ComEd service territory can help reduce the need for additional generation capacity, mitigate greenhouse gas ("GHG") emissions, and support grid reliability.

How Customers with a Smart Meter participate in Peak Time Savings:




The PTS season runs from June 1st through September 30th. On the morning of a PTS Hours event or at least 30 minutes prior to the start, PTS customers are sent notifications by autodialed phone call, email, and/or text message. The weekday after the event, participants are provided with feedback on the amount of energy they saved and the credit they earned. Customers are able to update how they receive PTS notifications at any time through the PTS webpage or through their ComEd online account via its MyAlerts menu. ComEd's social media team also announces event hours on Facebook and Twitter to drive additional awareness.

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Pre-Event Notifications:

Earn money by saving energy during today's Peak Time Savings Hours

July 19
2pm - 6pm



Don't miss out on Peak Time Savings bill credits!


270,886 Peak Time Savings participants earned a bill credit so far this summer.

What are Peak Time Savings (PTS) Hours?

PTS Hours are announced on days when electricity is in high demand. During PTS Hours, you can earn \$1 for each kWh you reduce compared to your recent energy use. There is no penalty for not participating. Within a few days, we'll follow up with how much you've saved.

[FIND OUT MORE](#)

Ways to Save



Minimize appliance use during Peak Time Savings Hours

Appliances can account for about 15% of your home's energy use and can produce heat that warms up your home. Wait until after Peak Time Savings Hours to run your dishwasher, clothes washer, dryer, and other electric appliances.

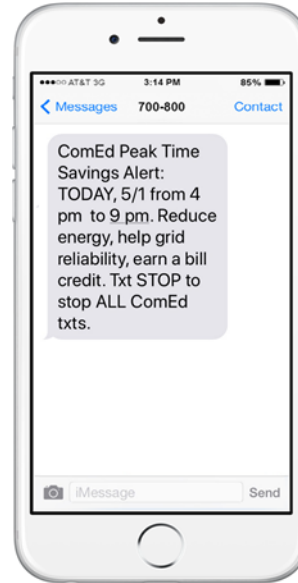


Figure 16: Pre-Event notifications are delivered by phone call, email, and text. In addition to PTS event start and end times, email notifications provide customers with personalized tips to reduce electricity usage during PTS Events.

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Post-Event Notifications:

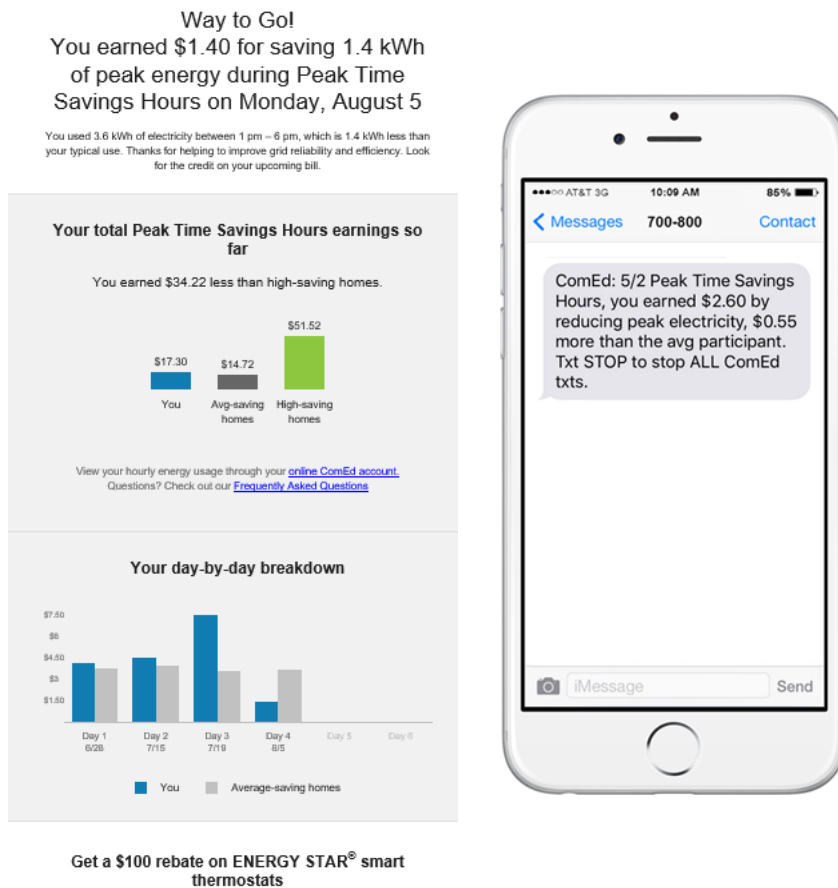


Figure 17: Post-event notifications provide customers with feedback on their PTS event performance to reinforce energy-saving actions and help encourage future participation.

Building on proven marketing tactics from previous years, nearly 29,000 customers enrolled in response to a direct mail and email marketing campaign in the spring of 2019. Over the 2019 season, 296,000 customers were enrolled during at least one PTS Hours event.

Through PJM’s Base Residual Auction held in 2016, ComEd secured \$6.2 million to fund PTS bill credits in the 2019 season. ComEd announced a total of six PTS Hours events, each of which were 4 or 5 hours in duration. Participating customers earned a total of \$4.6 million in PTS bill credits. Fifty percent of participants received between \$5.70 and \$20.60 on their summer bills and the median season credit earned was \$11.40. Since 2015, PTS participants have earned more than \$10.2 million in bill credits.

In conjunction with the Citizens Utility Board (“CUB”) and the Environmental Defense Fund (“EDF”), ComEd has developed a metric to measure the GHG emission reductions associated with smart meters. Using estimates of the energy saved during 2018 PTS Hours that

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compares PTS customers with a sample of similar non-PTS customers, the PTS program reduced an estimated **XX MT of CO₂** emissions (see Attachment 1, Metric #9).

In 2019, ComEd filed the annual evaluation for the Peak Time Savings program year 2018⁷. The evaluation assessed the program design, customer segments, load impacts, customer credits, and PJM revenues. The analysis estimated an average of 6.12% reduction in electric load during 2018 PTS event hours. The approximately 270,000 customers enrolled in each event contributed to an estimated average curtailment of 35.7 MW per event hour. Considering updated values for load impacts and projected PJM revenues, the program is expected to be cost effective over a forward looking 15-year period.

As required by Rider PTR, ComEd accompanied the 2019 annual report with a petition that the ICC initiate a proceeding to decide if the rider should remain in effect, be modified, or be terminated. The Agreed Draft Proposed Order to continue Rider PTR with no modifications until its statutory sunset date of 12/31/2022 is scheduled to be on the March 18 ICC voting meeting.

Following direction from FERC, PJM put all capacity auction activities for the 2022/23 deliver year on hold until a ruling is made on dockets EL16-49-000 and EL18-178-000 regarding minimum offer prices. As a result, the Base Residual Auction originally scheduled for May 2019 was postponed to a yet to be determined date. Resource planning, however, was permitted to continue as scheduled for the 2020/21 and 2021/22 delivery years; PTS cleared an additional 1.7 MW of capacity for the 2020/21 delivery year through the 2nd incremental auction.

b. Bring Your Own Thermostat (“BYOT”)

Beginning in the summer of 2014, ComEd partnered with Nest Labs, Inc. in offering up to \$140 in rebates for each customer who purchased a Nest Learning ThermostatTM and participated in ComEd’s Smart Ideas Central Air Conditioning (AC) Cycling Pilot program.⁸ The 2014 Nest Pilot program was expanded to allow customers with Nest or Xfinity thermostats to receive a \$40 incentive for participation from June 1st through September 30th, 2015. In 2015, 2,988 customers signed up for the summer’s AC Cycling Promotion and demand response pilot, and 316 customers signed up for Xfinity Home.

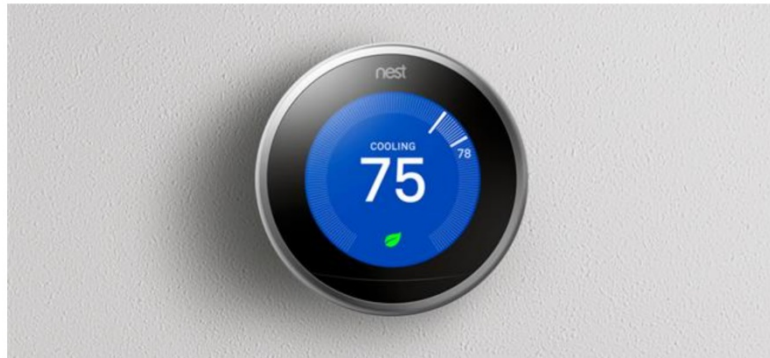
Smart thermostats moved from a pilot to a permanent option under AC Cycling on May 9, 2016 when the ICC approved a tariff change to Rider AC. Customers participating under the smart thermostat option using the Nest Smart Thermostat can receive an incentive of up to \$40

⁷ See “Commonwealth Edison Company’s Peak Time Savings Program Annual Report for the Year Ending May 31, 2019” in ICC Docket No. 12-0484.

⁸ The Commission allowed this program to become effective when it granted ComEd’s Petition for Special Permission to allow revisions to Rider AC – Residential Air Conditioner Load Cycling Program, ILL. C. C. No. 10, 1st Revised Sheet No. 335, et seq. (“Rider AC”) to become effective on less than 45 days’ notice by order dated March 6, 2014, in ICC Docket No. 14-0120.

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per summer from ComEd. Nest's brand name for its AC Cycling Smart Thermostat Option is Rush Hour Rewards.



The AC Cycling program has initiated the following demand response events under the Smart Thermostat Option (i.e. Nest Thermostat) since the summer of 2016:

- 8/19/2016 from 1 to 4 PM Central Time
- 9/15/2017 from 1 to 4 PM Central Time
- 9/17/2018 from 2 to 5 PM Central Time
- 8/07/2019 from 2 to 3 PM Central Time

As of 12/31/2019, 33,211 customers are enrolled in the AC Cycling Smart Thermostat Option.

c. Hourly Pricing

ComEd residential customers whose homes have smart meters have a choice between two supply electricity rates from ComEd: the standard fixed-price rate and Hourly Pricing. Customers are defaulted onto ComEd's standard fixed-price rate where the price of electricity is the same irrespective of when they consume it. In contrast, customers have the option to enroll in ComEd's Hourly Pricing program and purchase electricity at prices that vary each hour based on the wholesale market price of electricity. Customers selecting Hourly Pricing can save money versus the fixed-price rate by shifting their electricity consumption away from high-priced periods, like summer afternoons, to lower-priced periods, such as mornings, nights and weekends.

ComEd's Hourly Pricing program concluded 2019 with a record number of participants – more than 34,000 – an increase of more than 17 percent over the previous year. Additionally, since its debut, Hourly Pricing has delivered more than \$22 million in energy supply savings.

The program's growth has been attributed to two main factors: savvy target marketing and an increasing awareness of the Hourly Pricing program. Elevate Energy, the program administrators for Hourly Pricing, found that targeting PTS participants proved to be a particularly successful marketing tactic. Elevate Energy continued to target this segment of engaged customers through email and direct mail channels. The ComEd Connects newsletter

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features and the ComEd Homepage Carousel features were additional marketing initiatives that also contributed to the increase in program awareness and participation.

d. Capacity Guard Alert

Capacity charges are levied by PJM based upon each ComEd customer and reflect the costs to have adequate generation resources to ensure that the demand for electricity can be met at all times. Hourly Pricing's capacity charges are based on the customer's average electricity use during the five highest ComEd system demand hours and the five highest PJM (ComEd's regional transmission organization) system demand hours from the previous summer. These peak system hours are referred to as coincident peak hours, or "CP hours." An Hourly Pricing customer's Capacity Charge is based on these CP hours and they can significantly impact the participant's overall bill amount.

In 2017, realizing an opportunity to leverage data analytics to help customers manage, and potentially reduce, their capacity charges, ComEd debuted a sophisticated algorithm designed to predict CP hours the day before they occur. Internally, this algorithm was given the moniker, "Capacity Guard" and was offered as part of the program's Hourly Pricing Alerts package. For the second summer in a row, this alert provided customers with day-ahead notice of a possible coincident peak hour at the start of the summer (June 1) and remained active through the end of September. Because the alert gave participants day-ahead notification, customers could more effectively plan to lower their energy usage during the few hours that the alert specified and thereby manage – or even lower – their resultant calculated Capacity Charge for the following summer.

In 2019, more than 85 percent of Hourly Pricing participants were receiving this alert along with their real-time, high-price alerts.

Analysis of the effectiveness of ComEd's CP Hour predictive algorithm in helping Hourly Pricing participants reduce their capacity charges during the summer of 2018 (for capacity charge savings in 2019) showed that, on average, participants who received any type of alert in 2018 saw a slight decrease in absolute PLC value between 2018 and 2019.

The CP Hour predictive algorithm correctly predicted five of the 10 CP hours identified for the summer of 2019. An analysis of how much participants lowered their capacity charges as a result is not available as of this writing.

e. Residential Time of Use Pricing Pilot ("RTOUPP")

Many ComEd residential customers could realize savings by switching from a fixed-price energy supply rate to hourly pricing, or real-time pricing⁹. Price uncertainty, however, has been a barrier to enrollment in ComEd's hourly pricing program (Residential Real Time Pricing ("RRTP")). To strike a middle-ground, ComEd developed, and filed with the ICC, a four-year

⁹ <https://citizensutilityboard.org/wp-content/uploads/2017/11/FinalRealTimePricingWhitepaper.pdf>

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Residential Time of Use Pricing Pilot. The pilot seeks to determine if Time-of-Use (“TOU”) pricing (1) encourages customers to reduce or shift electricity usage from periods when prices are typically higher in the wholesale electricity market (2) motivates less electricity usage during periods of peak demand in the distribution and transmission systems (3) encourages electric vehicle owners to charge their electric vehicles in the Off Peak Period and (4) increases overall customer satisfaction with their electric service.

The TOU rate provides three fixed pricing periods, which encourage customers to use less during the system peak hours, and to shift that consumption to the off-peak hours. The pricing periods are as follows:

Super Peak Period: 2:00 PM – 7:00 PM CPT

Peak Period: 6:00 AM – 2:00 PM CPT and 7:00 PM – 10:00 PM CPT

Off Peak Period: 10:00 PM – 6:00 AM CPT

On October 2, 2019 the Commission approved the four-year TOU pilot with a cap of 1,900 participants¹⁰. However, ComEd has requested rehearing on the methodology for recovering generation related capacity costs. Regardless of the outcome in the order on rehearing (due by April 1, 2020), this new rate will be available starting with June 2020 bills. ComEd is in the process of preparing resources to educate customers on the TOU rate and to provide tips for how use less energy in the higher priced periods. To help customers in their enrollment decisions, ComEd is also developing a web-based bill comparison tool that will use AMI data to provide customers an estimate of their potential savings on the TOU rate.

f. Emerging Technology Pilots

Save and ShareTM Mobile App

In 2018, ComEd launched a pilot with the 20,000 residents in Bronzeville to test how a new mobile app and program incentives might help customers save on their energy bills. Save and Share combines EnergySavvy’s data analytic capabilities and MeterGenius’s mobile app to motivate, educate, and support customers in reaching personalized energy usage goals that are based on historic use and weather forecasts. Through the mobile app or a web browser, participants can view their energy usage from previous days in 30-minute intervals, track progress towards a weekly goal, access tips and information on relevant EE programs, and donate Save and Share dollars to participating local non-profits.

The app was promoted heavily throughout 2019 and an impressive slate of community organizations participated as recipient organizations, but unfortunately adoption was low. A number of barriers to participation were identified, including the need to have been living at a given residence for a time period (to provide sufficient baseline data for measuring program impacts), customer confusion over how the app works, and the need to link a user with a ComEd

¹⁰ https://www.comed.com/SiteCollectionDocuments/MyAccount/MyBillUsage/CurrentRates/75_Rate_RTOUPP.pdf

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account number. The pilot team is working with all stakeholders to document these barriers, identify solutions, and determine next steps.

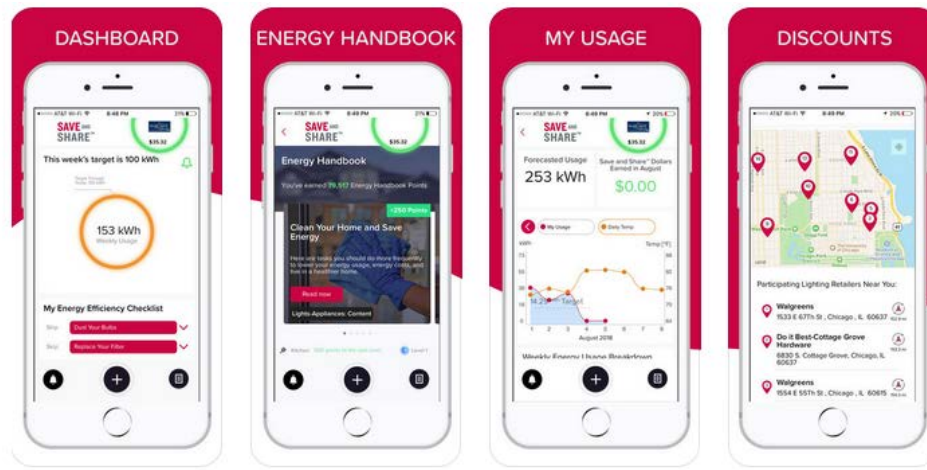


Figure 18: Dashboards from the Save and Share mobile app

Target Marketing and Data Analytics

ComEd is currently working with Uplight (formerly EnergySavvy) to pilot the use of a data analytics platform to test the potential value of AMI-data for improving the efficacy of Energy Efficiency programs. ComEd will test the ability of a Measurement and Verification 2.0 system to improve targeted marketing, enhance QA/QC for projects, assess contractor performance, and provide other program management benefits. ComEd's existing Small Business and Residential HVAC programs have been selected for this pilot. Completed analytical dashboards are expected to be delivered in Q1 2020.

C. 2020 Planned Activities

ComEd plans to use lessons learned in 2019 to improve in-market programs and services and to expand successful initiatives. In addition, ComEd will continue its iterative process of introducing, evaluating, and testing new customer applications of AMI to stay abreast of industry developments.

1. Continuing Programs and Services

- a. Residential Energy Management Tools, Data Services, Marketplace, IFTTT, SMCD, BYOT

These customer programs and services are expected to continue as-is in 2020.

- b. Digital Solar Toolkit

Building off community solar education tools made available to customers in 2019, ComEd plans to pursue additional ways to support the growth of community solar.

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c. Peak Time Savings (PTS)

With the completion of the mass deployment of smart meters, ComEd is shifting focus from the rapid growth of PTS to managing a slower-growing, mature program with high customer engagement and satisfaction. One component of this transition is to explore changes to the program recruitment that may help lower customer acquisition cost and increase overall cost effectiveness. Another component is gauging customer interest in participating in PTS as a way to contribute to a clean energy future. To provide direction on how to make this transition, ComEd plans to test ideas such as targeting customers with high peak load reduction potential for enrollment and communicating the environmental benefits of peak load reduction to participants.

Beginning in the 2020 season, PTS participants with the ComEd mobile app can choose to receive push notifications when PTS Hours are announced and when their results are available. Through surplus balance carried over from 2019 and expected capacity market revenue, ComEd projects that \$7.3 million will be available to fund bill credits in the 2020 PTS season. To distribute this revenue, ComEd is aiming to announce four to six events and reach a target of 30 PTS Hours, contingent on suitable weather and system conditions.

d. Capacity Guard Alert

ComEd expects the accuracy of the algorithm to continue to improve in 2020. In addition, Elevate Energy and ComEd will be considering additional customer communications to help improve participants' understanding of capacity charges and act upon this portion of the Hourly Pricing Alerts package.

e. Smart Streetlights

Smart streetlight deployments are planned to continue into the third year of the program. The scope is to complete 24,000 Smart LED streetlight installations and upgrade an additional 8,000 existing LED lights with smart capabilities. The current plan is scheduled to begin in January and will impact an estimated 130 municipalities territory wide.

2. Areas of Further Exploration

a. Hourly Pricing

The Hourly Pricing Bill Protection Pilot tariff was approved in September 2019. The pilot will identify fixed-price rate ComEd customers who would have saved on Hourly Pricing. A total of 30,000 prospective Hourly Pricing participants will receive a direct mail campaign that includes a shadow bill analysis. A test group will also receive a "risk-free guarantee" offer with a first-year guarantee of savings. After the first year, risk-free guarantee participants who paid more on Hourly Pricing than they would have on the fixed-price rate will be refunded the difference and returned to the fixed-price rate. The "risk-free guarantee" offer will be compared to the no-guarantee-of-savings control group to determine the offer's effectiveness. If this offer is deemed successful in increasing enrollments, while staying within acceptable financial costs

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and risks, ComEd may file changes to make it a permanent feature of the program. Marketing initiatives for the pilot will launch in 2020.

b. Innovation Lab

The ComEd Innovation Lab plans to test several new concepts for helping customers respond to price and carbon intensity signals to align their energy usage with their values. One concept being tested is to provide customers with tools to understand how the timing of energy use impacts carbon intensity and with automated ways to reduce their carbon footprints. ComEd also plans to test how customers with limited broadband internet can access information like price and carbon signals through existing communication infrastructure. Finally, the Innovation Lab will be assessing ways to provide customers with advanced analytics on energy use, to integrate battery storage into existing programs, and to expand the carbon reduction and connected home initiatives.

IV. Customer Outreach and Education

In 2019, ComEd continued smart meter outreach and education efforts in support of converting refusal customers to smart meter installations and providing customers with financial assistance information.

- (1) delivering communications after smart meter installation to provide customers with awareness, information and education about how to take advantage of online energy-management tools and programs;
- (2) promoting ComEd's CARE financial-assistance program designed to help eligible customers pay their energy bills.

Although regular smart meter installations have been completed; ComEd will continue to support, educate and engage all of its customers, including those who do not currently have a smart meter installed.

Outreach and education efforts planned for 2020 include:

- (1) continued focus on general education to provide customers with information about tools and programs enabled by smart meters;
- (2) continued use of messages that educate customers about energy-savings tips, the ComEd EE Program and financial assistance information;
- (3) continued promotion of online energy-management and savings tools accessible through MyAccount;

The accomplishments achieved in 2019 and the plans for 2020 are described in further detail in this chapter.

A. 2019 Activities and Accomplishments

1. Customer Outreach and Education

As previously noted, customer outreach and education efforts were delivered in support of refusal conversions to build awareness, strengthen understanding, promote engagement through participation, and encourage customers to advocate tools and programs enabled and available through smart meter technology.

2. Customer Education and Awareness

Throughout 2019, ComEd continued to provide customers with information to build awareness and education around energy management, and smart meter benefits. In addition, ComEd communicated specific actions that all customers can take to better manage their energy

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use, regardless of whether customers have smart meters. Channels for such information and education included the following:

Community Events & Outreach:

As AMI deployment was completed, ComEd participated in community events to educate customers about energy management and financial assistance programs. To do so, ComEd utilized direct interactions, brochures, and educational kiosks. Customers received information about online energy-management tools, such as High-Usage Alerts and Weekly Usage Reports. They also received information about programs such as PTS and Hourly Pricing, which are designed to help customers better manage their energy use.

Peak Time Savings Campaign:

In 2019, ComEd initiated multiple marketing campaigns in spring and summer to promote enrollment in its PTS program. The spring campaign involved direct mail followed up with a second touch email to customers, resulting in 28,987 new enrollees. Additional marketing tactics yielded 8,498 new enrollees for a total of 37,485 PTS enrollees in 2019.

PTS Marketing Campaigns: In March, ComEd launched a marketing blitz to 488,000 residential customers who were divided into four separate groups:

- Customers who received smart meters from September 2018 to December 2018
- Customers most likely to enroll in PTS based upon market research segmentation
- Former PTS customers who unenrolled in 2015 and 2016 or were unenrolled because they moved from one location to another
- Customers who are enrolled in Hourly Pricing

Distribution Date	Customer group	Total Sent	Response Rate	Total Response
March 2019	Letter to customers who received smart meters from 9/1/18 – 12/31/18	24,307	6.2%	1,508
March 2019	Letter to customers with smart meters whose demographic backgrounds make them likely candidates to enroll in PTS	442,337	5.1%	22,772
March 2019	Letter to customers who formerly enrolled in PTS but unenrolled because they moved	15,221	26.3%	4,006
March 2018	Letter to customers enrolled in Hourly Pricing	6,135	11.4%	701
Total Customers		285,850	488,000	5.9%

Table 8: PTS Marketing Response Rate

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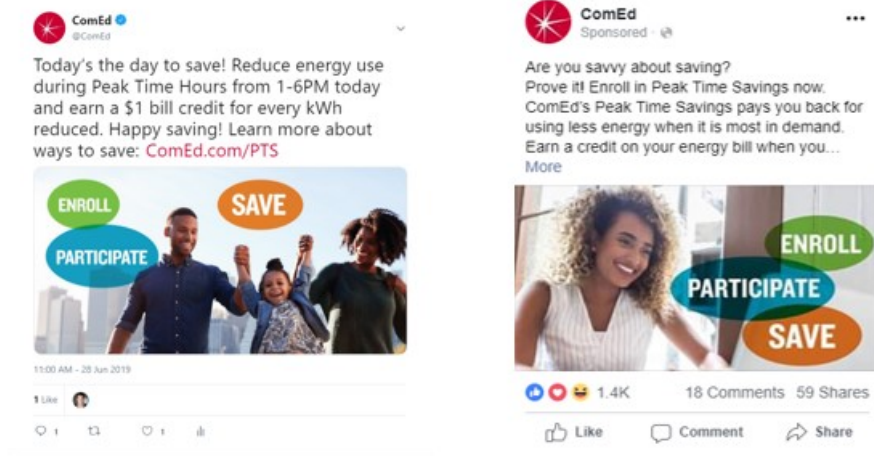


Figure 19: Social Media Posts



Figure xx: Smart Energy Hub at Chicago Training Center

ComEd's Smart Energy Hub: A Smart Energy Hub is located in each of ComEd's training centers in Rockford and Chicago's Bridgeport neighborhood. The Hub offers students of all ages opportunities to learn about smart meter-enabled tools and programs that can help customers manage energy bills and save money – as they learn about electricity, the smart grid, and energy

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management. With a curriculum based on Science, Technology, Engineering and Math (“STEM”), participants take field trips and learn through interactive exhibits and state-of-the-art technology that could not be duplicated in the classroom. In 2019, ComEd conducted 165 field trips to the Smart Energy Hub in Chicago and Rockford serving more than 4,500 participants.

Online/Web presence and customer newsletter:

ComEd continued to utilize online channels such as ComEd.com/SmartMeter to inform and educate customers about online energy-management tools and programs available to customers with smart meters, as well as ComEd.com/HomeSavings to educate customers about its EE Program.

ComEd also took advantage of social media – e.g., Facebook, Twitter – to promote ComEd festival appearances, locations, and dates to encourage customers to attend events to pose questions directly to ComEd representatives and learn more about energy-management programs. Additionally, the ComEd print newsletter reaches approximately 2.8 million customers. Articles focus on online account resources and tools, ways for customers to save, and smart energy tips and programs, as examples.

Municipal Outreach:

ComEd conducted outreach to municipal leaders and aldermen to inform them about activities ComEd planned for their communities. In turn, they worked with municipal leaders and alderman to help share this information with their constituents. This municipal outreach included one-on-one meetings and attendance at city council meetings. ComEd used one-on-one meetings to update municipal leaders and aldermen on how residents can take advantage of online energy-management tools and programs, as well as Energy Efficiency and CARE financial assistance programs.

Community Partners:

In 2019, ComEd continued to collaborate with the Illinois Science and Energy Innovation Foundation (“ISEIF”) to support grantee smart grid outreach and education activities. In January and July 2018, ISEIF provided grants to 27 organizations for outreach and education initiatives in the ComEd and Ameren territories.

With ISEIF in the lead, ComEd and Ameren shared program and initiative updates. ComEd participated in monthly meetings to help align utility and grantee educational activities, and to provide ISEIF with program updates, allowing grantees to leverage information utilities could provide them for their educational efforts.

3. Customer Messaging Efforts

Throughout the outreach and education activities mentioned above, ComEd attended events and distributed brochures to inform customers of the following initiatives and programs:

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- My Account: Online energy-management tools enable customers to compare their energy use against similarly sized homes in their areas and get personalized energy-saving tips. Customers with smart meters have access to enhanced online features, including High-Usage Alerts and Weekly Usage Reports, which can help customers manage their energy use.
- Peak Time Savings: This program, which began promotion in the fall of 2014 and launched in the summer of 2015, enables customers with smart meter to receive bill credits for using less electricity on select summer PTS Hours when electricity demand is typically high. Outreach efforts focused on promoting enrollment in PTS for the summer 2019 season, reminding customers of their enrollment and alerting enrolled customers of PTS events.

GET NOTIFIED
RECIBA NOTIFICACIONES

REDUCE & SAVE
REDUZCA Y AHORRE

EARN CREDITS
GANE CREDITOS

PEAK TIME SAVINGS SEASON IS APPROACHING

Get ready to save this summer!

You're already enrolled.
Now just reduce your use and save.

SE ACERCA LA TEMPORADA DE AHORROS EN HORAS DE MAYOR CONSUMO
¡Prepárese para ahorrar este verano!
Ya está inscrito. Ahora, sólo reduzca su uso y ahorre.

ComEd powering lives
An Exelon Company

THE 2018 PEAK TIME SAVINGS SEASON IS ABOUT TO BEGIN!
¡LA TEMPORADA DE AHORROS EN HORAS DE MAYOR CONSUMO DEL 2018 ESTÁ A PUNTO DE EMPEZAR!

TIPS FOR PEAK TIME SAVINGS HOURS:
CONSEJOS PARA LOS AHORROS EN HORAS DE MAYOR CONSUMO:

- ADJUST YOUR THERMOSTAT!** Set your thermostat 2 degrees higher - for the most effective way to save.
- TURN OFF UNUSUAL!** Turn off unused electronics - save energy and power usage.
- MINIMIZE APPLIANCE USE!** Run your dishwasher, clothes dryer and other appliances after the end of Peak Time Savings Hours.
- UPDATE YOUR NOTIFICATION PREFERENCE(S) ANYTIME!** Visit ComEd.com/PTS

ComEd powering lives
An Exelon Company

THE 2018 PEAK TIME SAVINGS SEASON IS ABOUT TO BEGIN!

Thank you for being a Peak Time Savings participant.

Between June 1 and September 30, ComEd will announce a few days with Peak Time Savings Hours, typically occurring for a few hours between 11 a.m. and 7 p.m.

You will be notified by phone, text (SMS) or email on the day Peak Time Savings Hours occur - as early as 9 a.m. or at least 30 minutes prior to the start - to update your notification preference(s). [Click here.](#)

Simply take action, reduce your use, and earn a credit on your energy bill.

CHECK OUT THESE PEAK TIME SAVINGS HOURS IDEA:

- Set your thermostat 10 degrees higher
- Delay running your dishwasher, clothes dryer and other appliances
- Turn off and unplug electronics

To update your notification preference(s), [click here.](#)

ComEd powering lives
An Exelon Company

Figure 20: PTS Reminder Materials

- Energy Efficiency: The ComEd EE Program provides instant discounts, rebates, home and facility assessments, technical services and whole-building solutions to help customers reduce energy use. Residential, commercial, industrial, and public sector customers have saved more than \$4.5 billion from its inception through Q4 2019.
- Hourly Pricing: This program gives customers the option to pay the hourly, market price for energy and save money by shifting energy use to off-peak times when the price is lower, such as nights and weekends.

4. AMI Deployment Communications

Refusal customers who converted to smart meters received a post-installation mailer describing how they can take advantage of smart meter-enabled tools and programs to help them manage energy use to save money on their bills, as well as ComEd’s CARE financial-assistance program that is designed to assist eligible customers pay their energy bills.

The number of customers participating in smart meter-enabled tools and programs include:

	Approximate enrollments as of 12/31/2018
Peak Time Savings	281,843
Hourly Pricing	34,351
High-Usage Alerts	313,852
Weekly Usage Reports	49,519

*Of the total unique customers, ComEd auto-enrolled 260,000 in High Usage Alerts.

Table 9: Number of Participating Customers in Smart Meter-Enabled Tools and Programs

B. 2020 Planned Activities

1. Customer Education and Awareness

ComEd will continue engaging customers through education and awareness about energy management programs and services, enabled by smart meter technology. Outreach methods may include email, customer bill newsletters, social media, and community events. Each tactic is designed to build awareness while reaching customers with relevant energy-management and savings offers, based on the customer’s interest, current program participation and past energy-management actions.

Peak Time Savings Campaign:

ComEd will apply lessons learned from its 2019 marketing campaign to improve overall marketing efforts in 2020. The goal is to continue to increase customer enrollment in ComEd’s PTS program, while improving preparedness and participation in PTS Hours.

- a. For the enrollment phase of its marketing efforts, which take place from February through April, ComEd will continue to send letters promoting enrollment in PTS to customers who most recently received smart meters. ComEd will also seek out additional demographic profiles that match customers who are most likely to enroll in PTS and send letters to those customers. These efforts will be supported by social media posts on Twitter and Facebook that promote participation in PTS.

Draft as of 3/9/2020

- b. Throughout the summer season, customers enrolled in PTS will receive reminder letters, supported by social media posts, to help prepare enrolled customers for upcoming PTS Hours. These letters include information on tools and programs that can help customers participate in and save energy during PTS Hours. To further encourage participation in PTS, ComEd's letter campaign will be supported by emails to customers who have email addresses on file with ComEd.

MyAccount:

ComEd will continue to promote online energy-management tools and programs, such as High Usage Alerts, PTS, Hourly Pricing and Weekly Usage Reports, which are accessible and available in MyAccount. Messaging methods may include customer bill newsletters, emails, and social media.

ISEIF:

ComEd will continue to collaborate with the Illinois Science and Energy Innovation Foundation ("ISEIF") and support its new and existing grantees on outreach and education activities and projects.

V. METRICS AND MILESTONES

The following table contains the set of tracking measures the Commission approved for inclusion in the AMI Plan, including measures that ComEd agreed to report on via collaborative sessions with external stakeholders. The purpose of the table is to provide the required information and demonstrate the progress made during the prior calendar year regarding these measures. Results will be refreshed in the AIPR filing over the seven-year deployment period. As a baseline for each measure, ComEd has been using the 2012 AMI Metrics data results - or the first year a measure is reported if other than 2012.

As also noted in Chapter II.A of this Report, the data in the table below indicates that the overall AMI meter program is progressing as scheduled, and the plan for full deployment is being executed on-time and within-budget. None of the data points captured indicate that ComEd will be unable to execute the deployment according to the approved plan. As meter deployment progresses throughout the service territory, many of the measures identified will become more meaningful and indicative of quantitative progress towards completing full deployment of AMI meters.

ComEd mapped the measures below to the Revised AMI Plan to the extent possible given that all the measures in the Revised AMI Plan are not centrally located in one section. Additionally, multiple measures that are tracked relating to a single issue are all identified under one number consistent with the numbering in the June 2012 Order and the Revised AMI Plan. For example, there are four items tracked under Measure 1. For ease of identification, letters are used to differentiate these related items (e.g., 1a, 1b, 1c, and 1d are used). Further, Attachments 1-6 are specifically referenced when they can provide additional information regarding a certain measure.

Yellow – Data Not Received
Grey – Uploaded on SharePoint but not Approved

2019 Tracking Metrics				
#	Issue	Tracking Metrics Description	“Baseline Data” (2012 Data Unless Otherwise Indicated)	2019 Annual AMI Metrics Data
1A	Customers enrolled in Peak Time Rebate, Real Time Pricing, and other dynamic/time variant prices	Residential Customers Number of customers on a time-variant or dynamic pricing tariff offered by ComEd. Expressed also as a percentage of customers in each delivery class.	The number of customers on a time-variant or dynamic pricing tariff offered by ComEd are as follows: Residential - Single: 8,473 (0.4%) Residential - Multi: 605 (0.1%) Residential - Single (Space Heat): 157 (0.5%) Residential - Multi (Space Heat): 155 (0.1%)	The number of customers on a time variant or dynamic pricing tariff offered by ComEd are as follows: Residential - Single: x (x%) Residential - Multi: x (x%) Residential - Single (Space Heat): x (x%) Residential - Multi (Space Heat): x (x%)
1B	Customers enrolled in Peak Time Rebate, Real Time Pricing, and other dynamic/time variant prices	Residential Customers Number of customers served by retail electric suppliers for which the supplier has requested monthly Electronic Data Interchange delivery of interval data. Expressed also as a percentage of customers taking supply from a retail electric supplier in each delivery class.	The number of residential customers served by retail electric suppliers for which the supplier has requested monthly Electronic Data Interchange delivery of interval data is zero (0% of customers taking supply from a retail electric supplier in each delivery class).	Please reference Attachment 1.

2019 Tracking Metrics				
#	Issue	Tracking Metrics Description	“Baseline Data” (2012 Data Unless Otherwise Indicated)	2019 Annual AMI Metrics Data
1C	Customers enrolled in Peak Time Rebate, Real Time Pricing, and other dynamic/time variant prices	Small Commercial Customers Number of customers on a time-variant or dynamic pricing tariff offered by ComEd. Expressed also as a percentage of customers in the delivery class.	Zero Watt-Hour customers are taking hourly service from ComEd out of 91,275 total customers in the Watt-Hour class (0% of the class). 1,946 Small Load Delivery (0-100kW) customers are taking hourly service from ComEd out of 247,581 total customers in the Small class (0.78% of the delivery class).	Watt-Hour customers taking hourly service: x out of x (x%) Small Load Delivery (0-100kW) customers taking hourly service: x out of x (x%)
1D	Customers enrolled in Peak Time Rebate, Real Time Pricing, and other dynamic/time variant prices	Small Commercial Customers Number of customers served by retail electric suppliers for which the supplier has requested monthly Electronic Data interchange delivery of interval data. Expressed also as a percentage of customers taking supply from a retail electric supplier in the delivery class.	The number of small commercial customers served by retail electric suppliers for which the supplier has requested monthly Electronic Data interchange delivery of interval data is zero (0% of customers taking supply from a retail electric supplier in the delivery class).	Please reference Attachment 1.

2019 Tracking Metrics				
#	Issue	Tracking Metrics Description	“Baseline Data” (2012 Data Unless Otherwise Indicated)	2019 Annual AMI Metrics Data
2	Customer-side-of-the-meter devices sending or receiving grid related signals	Number of ComEd AMI meters with consumer devices registered to operate with the Home Area Network (“HAN”) chip by tariffs under which customer receives delivery.	<p>The data provided for 2013 in the 2014 AIPR was the number of meters that were set up to join the device. For 2014 and subsequent years, the AIPR Metric for HAN connected devices will be the number of "live" devices due to software advances, now that the upgraded UIQ has this data. ComEd will also use the 2014 data for the number of live devices as the baseline data going forward due to the change in methodology and results.</p> <p>Residential – Single: 1 Residential – Multi: 1 Residential – Single (w/Space Heat): 0 Residential – Multi (w/Space Heat): 2</p> <p>Consumer devices registered through the Green Button Initiative is zero.</p>	<p>Number of "live" customer devices registered to operate with the HAN chip</p> <p>Residential – Single: x Residential – Multi: x Residential – Single (w/Space Heat): x Residential – Multi (w/Space Heat): x Total: x</p> <p>*previous reports showed number of new devices registered in the reporting year. Current report shows total number of live devices to better reflect metric description.</p> <p>Consumer devices registered through the Green Button Initiative is zero.</p>

2019 Tracking Metrics				
#	Issue	Tracking Metrics Description	“Baseline Data” (2012 Data Unless Otherwise Indicated)	2019 Annual AMI Metrics Data
3	AMI Meter failures	Number of advanced meter malfunctions where customer electric service is disrupted. (A “malfunction” is a malfunction that causes the meter to become inoperable but does not include cases of tampering, service panel and service entry equipment issues, house fires, etc.). ComEd will be able to determine which of the advanced meter malfunctions were due to voltage outside design criteria.	The number of advanced meter malfunctions where customer electric service is disrupted is zero.	The number of advanced meter malfunctions where customer electric service is disrupted is one, meter 272454104_G malfunctioned on 5/25 and self-disconnected.
4	AMI Meters replaced before the end of their expected useful life	Number of ComEd advanced meters replaced annually before the end of their expected useful life, including reasons for replacement that include ComEd errors. (“Replaced” means a replacement due to a malfunction that causes the meter to become inoperable, including tampering.)	The number of ComEd advanced meters replaced annually before the end of their expected useful life, itemized by tamper versus non-tamper is as follows: 334 meters replaced before the end of their expected useful life due to tampering 164 meters replaced before the end of their expected useful life due to reasons other than tampering TOTAL: 498 meters replaced before	The number of ComEd advanced meters replaced annually before the end of their expected useful life, itemized by tamper versus non-tamper is as follows: e number of ComEd advanced meters replaced annually before the end of their expected useful life, itemized by tamper versus non-tamper is as follows: 7,203 meters replaced before the end of their expected useful life due to tampering

			<p>the end of their expected useful life</p> <p>Note: ComEd worked with the external stakeholders, and it was determined that ComEd does not have the system capability to show detailed reason codes by type. If this is needed in the future, an IT enhancement would be required.</p>	<p>21,081 meters replaced before the end of their expected useful life due to reasons other than tampering</p> <p>TOTAL: 28,284 meters replaced before the end of their expected useful life in 2019</p> <p>Note: ComEd worked with the external stakeholders, and it was determined that ComEd does not have the system capability to show detailed reason codes by type. If this is needed in the future, an IT enhancement would be required.</p>
5	Customers with net metering	Number of customers enrolled on Net Metering tariff and the total aggregate capacity of the group.	<p>The number of unique customers enrolled on Net Metering tariff, Rider POGNM – Parallel Operation of Retail Customer Generating Facilities with Net Metering (“Rider POGNM”), as of December 31st 2012 are as follows:</p> <p>TOTAL: 381 unique customers (3.450 MW)</p> <p>345 Residential</p> <p>59 commercial</p> <p>The breakdown of generators by customer class and generator type are as follows:</p>	<p>The number of unique customers enrolled on Net Metering tariff, Rider POGNM- Parallel Operation of Retail Customer Generating Facilities with Net Metering ("Rider POGNM"), as of December 31st 2019 are as follows:</p> <p>TOTAL: 7,604 customers (93.61 MW)</p> <p>7,205 Residential</p> <p>332 commercial</p> <p>The breakdown of generators by customer class and generator type are</p>

			<p>Residential (Photovoltaic Source): 284 (1.216 MW)</p> <p>Residential (Wind Source): 61 (0.245 MW)</p> <p>Commercial (Photovoltaic Source): 49 (0.756 MW)</p> <p>Commercial (Wind Source): 10 (1.234 MW)</p> <p>Note: Some unique customers have both photovoltaic and wind source generators</p>	<p>as follows:</p> <p>Residential (Photovoltaic Source): 7,205 (52.01 MW)</p> <p>Residential (Wind Source): 56 (0.39 MW)</p> <p>Commercial (Photovoltaic Source): 332 (38.89 MW)</p> <p>Commercial (Wind Source): 11 (2.33 MW)</p> <p>Note: Some unique customers have both photovoltaic and wind source generators.</p>
6A	Customer premises capable of receiving information from the grid	Number of installed AMI Meters as of the last day of the calendar year that communicate back to the head end system.	The number of installed AMI Meters as of the last day of the calendar year that communicates back to the head end system is 127,114.	The number of installed AMI Meters as of the last day of the calendar year that communicate back to the head end system is 4,237,565.
6B	Customer premises capable of receiving information from the grid	Number of installed AMI Meters as of the last day of the calendar year that communicate back to the head end system, divided by the total number of AMI meters installed.	The number of installed AMI Meters as of the last day of the calendar year that communicate back to the head end system, divided by the total number of AMI meters installed is 99.50%	The number of installed AMI Meters as of the last day of the calendar year that communicate back to the head-end system, divided by the total number of AMI meters installed is 99.96%.

6C	Customer premises capable of receiving information from the grid	Number of customers who have accessed the web-based portal as of the last day of the calendar year as a percentage of customers with AMI Meters and as a percentage of ComEd customers in that delivery class.	Please reference Attachment 1.	Please reference Attachment 1.
6D	Customer premises capable of receiving information from the grid	Number of customers who can directly access their usage data as of the last day of the calendar year as a percentage of customers with AMI Meters and as a percentage of ComEd customers in that delivery class.	Please reference Attachment 1.	Please reference Attachment 1.
7	Peak load reductions enabled by demand response programs	Load impact in MW of peak load reduction from the summer peak due to AMI enabled, ComEd administered demand response programs such as the PTS program as a percentage of all demand response in ComEd's portfolio.	<p>The load impact in MW of peak load reduction from the summer peak due to AMI enabled, ComEd administered demand response programs such as the PTS program as a percentage of all demand response in ComEd's portfolio is zero.</p> <p>The RRTP estimated peak load reduction is .5KW X 9,390 customers = 4,695 KW</p> <p>For the desired %, 4,695 KW is divided by 1,342.4 MW (the DR portfolios total peak load reduction potential): 4.695 MW / 1,342.2</p>	<p>The estimated peak load reduction from PTS is x MW.</p> <p>For Single Family PTS Customers x kW X x customers = x MW</p> <p>For Multi Family PTS Customers x kW x x customers = x MW</p> <p>The RRTP estimated peak load reduction is x kW x x customers = x MW</p> <p>Total estimated peak load reduction from all ComEd AMI-enabled demand response programs is x MW</p> <p>Peak Load Reduction potential of full</p>

			<p>MW = .35%</p>	<p>DR portfolio = x MW AMI-enabled DR is x% of ComEd's DR portfolio</p>
8	Customer Complaints	<p>Number of formal ICC complaints, informal ICC complaints, and complaints escalated to ComEd's Customer Relations or Customer Experience departments related to AMI Meter deployment, broken down by type of complaint and resolution. AMI Meter deployment includes AMI Meter installation, functioning or accuracy of the AMI meter, and HAN device registration.</p>	<p>Formal ICC Complaints: One Smart Meter Refusal; Complaint remains in progress with resolution pending.</p> <p>Informal ICC Complaints: Four Smart Meter Refusals; ComEd has completed process for customer contact and resolution for each.</p> <p>Complaints escalated to ComEd AMI Customer Relations or Customer Experience departments: 52 smart meter refusals; ComEd has completed process for customer contact and resolution for 51; 1 remains open with clear next steps identified for resolution.</p>	<p>Customer Relations handled x Formal ICC Complaints. Customer relations originally escalated to Customer Experience during Informal stage, but ultimately completed process for customer contact and resolution.</p> <p>Informal ICC Complaints: x Informal ICC Complaints were received by AMI Customer Experience. ComEd has completed process for customer contact and resolution. Customer Relations handled x Informal ICC Smart Meter Complaints without escalation to AMI Customer Experience. ComEd has completed process for customer contact and resolved all.</p> <p>Complaints escalated to ComEd AMI Customer Relations or Customer Experience departments: x total Complaints, x Complaints related to customer dissatisfaction (including ICC Complaints above) and ComEd has completed the process for customer</p>

				contact and resolution for all x Smart Meter refusals (including ICC Complaints above); ComEd has completed process for customer contact and resolution for all.																					
9	Reduction in Greenhouse Gas Emissions enabled by smart grid	Reduction in Greenhouse Gas Emissions enabled by smart grid - ComEd worked collaboratively with CUB and EDF to operationalize this measure.	Please reference Attachment 1.	Metric reliant on PJM data that is not published until late March/early April.																					
10A	Distributed generation projects	Number of locations and total MWs of customer owned distributed generation connected to the transmission or distribution system, broken down by connection to transmission and distribution system. (“Distributed generation” locations are those where customers take service under Rider POG – Parallel Operation of Retail Customer Generating Facilities (“Rider POG”) or Rider POGNM or successor tariffs.)	Number of locations of customer owned distributed generation connected to the distribution system, broken down by connection to the distribution system is 104 locations. Total MWs of customer owned distributed generation connected to the distribution system, broken down by connection to the distribution system is 2.40959 MWs.	<p>Number of locations of customer owned distributed generations connected to the distribution System in 2019 was 7,009. The Total Capacity of customer owned distributed generation connected to the distribution system in 2019 was 109.7 MW.</p> <table border="1"> <thead> <tr> <th>Energy Source</th> <th>Count of Applications Connected</th> <th>Total Capacity (kW)</th> </tr> </thead> <tbody> <tr> <td>Natural Gas</td> <td>1</td> <td>800</td> </tr> <tr> <td>Other</td> <td>3</td> <td>21,458</td> </tr> <tr> <td>Solar</td> <td>6,995</td> <td>87,323</td> </tr> <tr> <td>Storage</td> <td>8</td> <td>148</td> </tr> <tr> <td>Wind</td> <td>2</td> <td>5</td> </tr> <tr> <td>Total</td> <td>7,009</td> <td>109,735</td> </tr> </tbody> </table>	Energy Source	Count of Applications Connected	Total Capacity (kW)	Natural Gas	1	800	Other	3	21,458	Solar	6,995	87,323	Storage	8	148	Wind	2	5	Total	7,009	109,735
Energy Source	Count of Applications Connected	Total Capacity (kW)																							
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Total	7,009	109,735																							
10B	Distributed generation projects	Number of locations and total MWs of customer owned	Regarding customer owned generation connected to the	There were 5 (five) customer owned distributed generation projects for a																					

		<p>distributed generation connected to the transmission or distribution system, broken down by connection to transmission and distribution system. (“Distributed generation” locations are those where customers take service under Rider POG or POG-NM or successor tariffs.)</p>	<p>transmission system, there were zero in 2012. There was generation added to the transmission system in 2012, but these generators were all wholesale generators in the business of generation. Based on ComEd’s assumptions, these would not count as customer owned generation connected to the transmission system.</p>	<p>total of 606 MW that connected to ComEd’s transmission system in 2019. Additionally, there are 4 (four) customer owned distributed generation projects for a total of 1,684 MW in the PJM interconnection queue with an executed Interconnection Service Agreement that is planned for interconnection with the ComEd transmission system in 2020 or later.</p>
11	<p>Load served by distributed resources</p>	<p>Total sales of electricity to the grid from distributed generation (Rider POG or POG-NM customers) divided by zone energy plus distributed generation sales, with all data provided in sortable format.</p>	<p>Rider POG sold back to the grid from Distributed Generation: Rider POG Sales is 754,177 megawatt hours (“MWhrs”) Residential Rider POG Sales is 100 MWhrs Non-Residential Rider POG Sales is 754,077 MWhrs TOTAL Zonal Energy plus Rider POG Sales is 102,367,754 MWhrs Percentage of Rider POG Sales to Total Zonal Energy is 0.74% The indicator of Distributed Generation that is behind the meter is going to be derived from the Annual Net Metering Report for Commonwealth Edison using the</p>	<p>RIDER POG sold back to the grid from Distributed Generation: Rider POG Sales is x MWhrs Residential Rider POG Sales is x MWhrs Non-Residential Rider POG Sales is x MWhrs TOTAL Zonal Energy plus Rider POG Sales is x MWhrs Percentage of Rider POG Sales to Total Zonal Energy is x% The indicator of Distributed Generation that is behind the meter is going to be derived from the Annual Net Metering Report for Commonwealth Edison using Average</p>

			<p>Average Capacity Factor data provided by EDF for 2013.</p> <p>Total Net Metering Solar Capacity = 1,460.14 kW * 18.5% Capacity Factor * 8760 Hours = 2,366 MWhrs</p> <p>Total Net Metering Wind Capacity = 1,462.31 kW * 18.5% Capacity Factor * 8760 Hours = 2,370 MWhrs</p> <p>Note: Further analysis and discussion will take place between ComEd and the external stakeholders to provide a fuller measure for future reports.</p>	<p>Capacity Factor data provided by EDF.</p> <p>Total Net Metering Solar Capacity = x kW * x% Capacity Factor * x Hours = x MWhrs</p> <p>Total Net Metering Wind Capacity = x kW * x% Capacity Factor * x Hours = x MWhrs</p> <p>Note: Further analysis and discussion will take place between ComEd and EDF to provide a fuller measure for future reports.</p>
12	System load factor and load factor by customer class	Total annual consumption for AMI meters (including, separately, small commercial customers) divided by the average demand across all AMI meters over the 5 peak hours multiplied by 8760 hours by customer class.(ComEd will work collaboratively with CUB and EDF to establish a similar measure for all system load.)	<p>Based on the AMI consumption data for 2012 and the 5 peak hours, the following results were calculated:</p> <p>Residential Load factor: 30.2%</p> <p>Commercial Load Factor: 50.5%</p> <p>Industrial Load Factor: 61.1%</p> <p>TOTAL Load Factor: 37.2%</p>	<p>Based on the AMI consumption data for 2019 and the 5 peak hours, the following results were calculated:</p> <p>Residential Load factor: 35.73%</p> <p>Commercial Load Factor: 70.13%</p> <p>Industrial Load Factor: 81.80%</p> <p>TOTAL Load Factor: 56.59%</p>
13	Products with end-to-end interoperability certification	ComEd will conduct an annual survey through a third-party provider to evaluate how products are being introduced in	In-depth interviews with industry participants on new product offerings of smart grid enabled products and secondary research will be conducted in 2013. This	<p>See Attachment 1 for the updated smart grid products and services industry assessment for 2018.</p> <p>See Attachment 3 for the test</p>

		<p>the smart grid enabled marketplace.</p>	<p>will be performed in lieu of a survey until the penetration of smart grid enabled products reaches a point that a survey produces meaningful data and becomes cost- effective. To date, no smart grid enabled products have been submitted for demonstration and evaluation through ComEd’s Test Bed. Please reference Attachment 3 (2014 AIPR) for HAN Device Interoperability.</p> <p>ComEd will continue to work with the external stakeholders to further evaluate how products are being introduced in the smart grid enabled marketplace.</p>	<p>bed/technology demonstrations report.</p> <p>See Attachment 5 for an updated HAN Device Interoperability report.</p>
14	<p>Network nodes and customer interfaces monitored in “real time”</p>	<p>Network nodes and customer interfaces monitored in “real time”</p>	<p>ComEd worked collaboratively with CUB and EDF to operationalize this measure, which yielded the following:</p> <p>Grid-side Network Nodes Measured as Total Number of DA Devices: 12kV DA = 2,125 and 34kV DA = 971 (DA devices) connected to the grid.</p> <p>Customer-side Network Nodes Measured as Total Number of</p>	<p>Grid-side livened Network Nodes measured as a total number of DA devices:</p> <p>12kV Devices= x</p> <p>34kV Devices= x</p> <p>Customer Interfaces Monitored in “RealTime”</p> <p>Residential – Single – x</p> <p>Residential – Multi - x</p>

			<p>Devices Registered to a Meter: 841 HAN devices for meters, though they are not actively "Monitored."</p>	<p>Residential- Single (w/Space Heat) - x</p> <p>Residential- Multi (w/Space Heat)- x</p> <p>Total – x</p>
15A	<p>Grid connected energy storage interconnected to utility facilities at the transmission or distribution system level</p>	<p>Number of locations and total MWs of utility owned or operated energy storage interconnected to the transmission or distribution system as measured at storage device electricity output terminals.</p>	<p>The number of locations and total MWs of utility owned or operated energy storage interconnected to the distribution system as measured at storage device electricity output terminals is zero. ComEd has not installed any storage on either the transmission or distribution system in 2012, nor has any energy storage been certified, tested or deployed in the ComEd test bed.</p> <p>The storage installed on the transmission and distribution system that is part of the PJM wholesale market is 1.5 MW at one location, and it participates directly as a supply resource as part of a wind development for 2012.</p> <p>Please note: Concerning measuring the storage installed on the transmission or distribution system participating in PJM wholesale markets, there are limitations in obtaining the information for</p>	<p>ComEd did not install any utility owned energy storage unit on the distribution system in 2019. There were no customer owned energy storage projects that interconnected to the Distribution system in 2019. There were no customer owned energy storage projects in the interconnection queue for connection to the ComEd Distribution system with executed Interconnection Agreements for participation in the PJM wholesale market in 2019. There were no customer owned energy storage projects, in the interconnection queue for connection to the ComEd Distribution system for participation in the PJM wholesale market in 2019.</p>

			<p>proprietary reasons. Storage assets directly participating in PJM markets will require interconnection agreements and ComEd will have the information to track if or when these types of supply resources enter the market. For behind-the-meter storage assets participating in the PJM through the demand response program, there is currently no requirement that PJM will share that information with ComEd. ComEd will only have knowledge of the customers that are participating in demand response, but not how customers are achieving load reductions. In terms of measuring the storage installed on the distribution system as part of the PJM wholesale market (behind-the-meter), it may not be possible unless the installation requires an interconnection agreement.</p>	
15B	<p>Grid connected energy storage interconnected to utility facilities at the transmission or distribution system level</p>	<p>Number of locations and total MWs of utility owned or operated energy storage interconnected to the transmission or distribution system as measured at storage device electricity output terminals.</p>	<p>The number of locations and total MWs of utility owned or operated energy storage interconnected to the transmission system as measured at storage device electricity output terminals is zero. ComEd has not installed any storage on either the transmission or distribution system in</p>	<p>ComEd has not installed any utility owned or operated energy storage on the transmission system, nor has any utility owned or operated energy storage been certified, tested or deployed in the ComEd test bed in 2019. There were 0 MW of customer owned energy storage interconnected</p>

			2012.	to the Transmission system in 2019. There were 14 (fourteen) customer owned energy storage projects for a total of 533 MW, in the interconnection queue for connection to the ComEd Transmission system for participation in the PJM wholesale market in 2019.						
15C	Grid connected energy storage interconnected to utility facilities at the transmission or distribution system level	ComEd will conduct an annual survey through a third-party provider to estimate similar measures of non-utility storage units.	In-depth interviews with industry participants in non-utility storage markets and secondary research will be conducted in 2013. This will be performed in lieu of a survey until the penetration of non-utility storage units reaches a size that a survey produces meaningful data and becomes cost-effective. ComEd will continue to work with the external stakeholders to further estimate similar measures of non-utility storage units.	Please reference Attachment 4.						
16A	Time required to connect distributed resources to grid	ComEd's response time to a distributed resource project application, and time from receipt of application until energy flows from project to grid (distribution.)	ComEd's response time to a distributed resource project application can be referenced in the ICC guidelines, as follows: Title 83: Public Utilities - Chapter I: Illinois Commerce Commission - Subchapter c: Electric Utilities - Part 466 - Electric Interconnection of Distributed Generation Facilities.	ComEd's response time to an Interconnect application is governed by the ICC Administrative Code Part 466/467. Refer to attached file for a detailed calculation of the average duration.						
				<table border="1"> <thead> <tr> <th>Energy Source</th> <th>Count of Applications Connected</th> <th>Average of Duration (Days)</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Energy Source	Count of Applications Connected	Average of Duration (Days)			
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			Please reference Attachment 1 for the time from receipt of application (using the application complete date as the start date for 2012 reporting) until energy flows from project to grid (distribution.)	<table border="1"> <tr> <td>Natural Gas</td> <td>1</td> <td>381.0</td> </tr> <tr> <td>Other</td> <td>3</td> <td>786.7</td> </tr> <tr> <td>Solar</td> <td>6,995</td> <td>113.3</td> </tr> <tr> <td>Storage</td> <td>8</td> <td>88.3</td> </tr> <tr> <td>Wind</td> <td>2</td> <td>144.5</td> </tr> <tr> <td>Total</td> <td>7,009</td> <td>113.6</td> </tr> </table>	Natural Gas	1	381.0	Other	3	786.7	Solar	6,995	113.3	Storage	8	88.3	Wind	2	144.5	Total	7,009	113.6
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Total	7,009	113.6																				
16B	Time required to connect distributed resources to grid	ComEd's response time to a distributed resource project application, and time from receipt of application until energy flows from project to grid (transmission.)	This does not apply since there were zero projects to apply this measurement.	This does not apply since there were zero projects to apply this measurement.																		
17	Voltage and VAR controls	Number and percentage of distribution lines using sensing from an AMI meter as part of ComEd's voltage regulation scheme.	<p>The number and percentage of distribution lines using sensing from an AMI meter as part of ComEd's voltage regulation scheme is as follows:</p> <p>Feeders that use sensing from an AMI meter as part of a voltage regulation scheme is 13 out of 5,456 (0.24%).</p>	<p>The number and percentage of distribution lines using sensing from an AMI meter as part of ComEd's voltage regulation scheme is as follows:</p> <p>he number and percentage of distribution lines using sensing from an AMI meter as part of ComEd's voltage regulation scheme is as follows:</p> <p>Feeders that use sensing from an AMI meter as part of a voltage regulation scheme is 388 out of 5,619 (6.9%) as of December 31, 2019.</p>																		

<p>18A</p>	<p>Grid assets that are monitored, controlled, or automated</p>	<p>Number and percentage of ComEd substations (Distribution Center Substations (“DCs”), Substations (“SSs”) Transmission Substations (“TSSs”) and Transmission Distribution Centers (“TDCs”)) monitored or controlled via Supervisory Control and Data Acquisition (“SCADA”) systems.</p>	<p>The number and percentage of ComEd substations (Distribution Center Substations (“DCs”), Substations (“SSs”) Transmission Substations (TSSs) and Transmission Distribution Centers (“TDCs”)) monitored or controlled via Supervisory Control and Data Acquisition (“SCADA”) systems is as follows:</p> <p>Number on SCADA: DC: 479 TDC: 115 SS: 51 TSS: 169 Generating Stations: 16 Relay Points: 5 Percentage on SCADA: DC: 99% TDC: 100% SS: 100% TSS: 100% Generating Stations: 100% Relay Points: 100%</p>	<p>The number and percentage of ComEd substations (Distribution Center Substations (“DCs”), Substations (“SSs”) Transmission Substations (TSSs) and Transmission Distribution Centers (“TDCs”)) monitored or controlled via Supervisory Control and Data Acquisition (“SCADA”) systems is as follows:</p> <p>he number and percentage of ComEd substations (Distribution Center Substations (“DCs”), Substations (“SSs”) Transmission Substations (TSSs) and Transmission Distribution Centers (“TDCs”)) monitored or controlled via Supervisory Control and Data Acquisition (“SCADA”) systems is as follows:</p> <p>Number on SCADA: DC: 480 TDC: 115 SS: 51 TSS: 171 Generating Stations: 16 Relay Points: 5 Percentage on SCADA: DC: 100% TDC: 100% SS: 100% TSS: 100% Generating Stations: 100%</p>
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				Relay Points: 100%.
18B	Grid assets that are monitored, controlled, or automated	Number and percentage of ComEd distribution circuits (4kV, 12kV and 34kV) equipped with automation or remote control equipment including monitor or control via SCADA systems.	The number and percentage of ComEd distribution circuits (4kV, 12kV and 34kV) equipped with automation or remote control equipment including monitor or control via SCADA systems is 5,168 distribution circuits (99% of total). Specifically, circuits with 12kV DA =1,169 circuits (24% of the system circuits.)	The number and percentage of ComEd distribution circuits (4kV, 12kV and 34kV) equipped with automation or remote control equipment including monitor or control via SCADA systems is 5,451 distribution circuits (99% of total). Specifically, circuits with 12kV DA =1,964 circuits (36% of the system circuits.)
19	Customers connected per automated circuit segment	Average number of customers per automated three phase 12kV line segment. (An “automated line segment” is a segment of 12 kV three phase mainline circuit between automated devices which include circuit breakers, reclosers, automated switches, etc.; A “customer” is a ComEd account connected on the automated 12kV three phase line segment.)	The average number of customers per automated three phase 12kV line segment is 638.	The average number of customers per automated three phase 12kV line segment is 496.

20	Improvement in line loss reductions enabled by smart grid technology	Improvement in line loss reductions enabled by smart grid technology - ComEd will research the uncertainty in line loss measurement collaboratively with CUB and EDF.	<p>ComEd will work with CUB and EDF to develop a full and practical measure of Line Loss Reductions as enabled by smart grid investments, by exploring the capability of calculating Line Loss reductions realized through items such as the following:</p> <ul style="list-style-type: none"> More efficient equipment Increased use of distributed generation that is located closer to the load Optimized power flows Volt/VAR optimization Improved power factor <p>The parties will hold stakeholder workshops in 2013 to identify the best approach to achieve this measure in Illinois, including strategies for better data collection.</p>	<p>In 2019, 65 stations were successfully integrated into our Volt/Var Optimization Program.</p> <p>Voltage Optimization is part of Future Energy Jobs Act beginning in 2017.</p>
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21	Tracking Actual Costs	The actual cost of the AMI deployment costs incurred by ComEd, including both one-time costs and on-going operating costs	<p>The actual cost of the AMI deployment costs incurred by ComEd, including both one-time costs and on-going operating costs is as follows:</p> <p>Actual Costs Incurred (000's), not including PTR:</p> <p>One-time CAP - \$272</p> <p>One-time O&M (if applicable) - \$12,410</p> <p>Ongoing CAP - \$22</p> <p>Ongoing O&M - \$6,023</p> <p>TOTAL- \$18,728</p>	<p>The actual cost of AMI deployment costs that ComEd has incurred, including both one-time costs and on-going costs is as follows:</p> <p>Actual Costs Incurred (000's):</p> <p>One-time CAP - \$7,689</p> <p>One-time O&M (if applicable) - \$4,192</p> <p>Ongoing Cap - \$2,200</p> <p>Ongoing O&M - \$29,305</p> <p>TOTAL - \$43,385</p>
22	Customer Applications	Bill impacts associated with the costs for implementation of ComEd's AMI Plan for low, average, and higher usage level customers pursuant to approved rates and surcharges. The usage level calculations will be values for a "typical" customer at the 25th, 50th, and 75th percentile of total usage for each applicable delivery service class.	Please reference Attachment 1 for the metric data and Attachment 2 for supporting documentation.	Please reference Attachment 1 for the metric data and Attachment 2 for supporting documentation.

23	Customer Applications	Number of customers that have created and viewed an account on ComEd.com – by usage levels, customer class, and low income customers. An account on ComEd.com is necessary for viewing the web portal.	Please reference Attachment 1.	Please reference Attachment 1.
24	Customer Applications	Number of customers with ComEd.com accounts that have viewed the web portal - by usage levels, customer class, and low income customers	Please reference Attachment 1.	Please reference Attachment 1.
25	Customer Applications	Change in customers’ energy consumption for customers that have viewed the web portal. ComEd will work with the web presentment vendor to define the business processes necessary to track an energy usage impact of accessing the web portal.	The "My Energy" Tools web portal became available to all ComEd residential customers through their ComEd.com account in September 2012. Given the short timeframe this was available to customers and the time needed to discern savings from customer billing data following their access to the web tools and subsequent actions taken to reduce their usage, there are no savings to report at this time. More robust analytics are expected as a greater number of customers begin accessing the My Energy Tools web portal and additional billing data can be utilized to measure savings in the future.	ComEd has continued to work with its webs presentment vendor to develop and vet a methodology for measuring energy savings by customers have viewed the web portal (ComEd.com/MyAccount. The 2019 methodology remain the same as the prior year. Please reference Attachment 1 for a full description of the methodology. 2019 Results The tables below display calendar year 2019 energy efficiency savings from web among ComEd customers who logged-in for the first time in calendar year 2019 and had sufficient data to be

				<p>included in the analysis.</p> <p>Table 1. Electric Savings Results</p> <ul style="list-style-type: none"> <input type="checkbox"/> Percentage Saving: (%): 1.26% +/- 0.2% <input type="checkbox"/> Savings per customer per day (kWh) 0.30 +/- 0.078 <input type="checkbox"/> Total Customers: 54,209 <input type="checkbox"/> Total savings (MWh): 3,129 +/- 804 <p>Note: Savings estimates are statistically significant at the > 95% level. Margin of error represents 95% confidence interval</p>
26	Customer Applications	Number of customers enrolled in the Residential Real Time Pricing (“RRTP”) program (ComEd’s hourly pricing program) by usage levels, customer class, and low income customers.	Please reference Attachment 1.	Please reference Attachment 1.
27	Customer Applications	Number of customers enrolled in any future Time of Use (“TOU”) program that ComEd might offer by usage levels, customer class, and low-income customers.	The number of customers enrolled in any future Time of Use (“TOU”) program that ComEd might offer by usage levels, customer class, and low-income customers is zero.	Number remains zero.
28	Customer Applications	Number of customers enrolled in ComEd’s PTR program by usage levels, customer class, and low	The number of customers enrolled in ComEd’s PTR program by usage levels, customer class, and low	Please reference Attachment 1.

		income customers.	income customers is zero.	
29	Customer Applications	Number of deposits required, disconnection notices, and disconnections for nonpayment for all customers and, if applicable, by low income customers. Other “key indicia associated with credit and collection activities targeted to low income customers” may be incorporated in the project plan’s business process redesigns for future implementation.	Please reference Attachment 1.	Please reference Attachment 1.
30	Customer Applications	If further information is required to allow ComEd to track vulnerable populations and that information is not easily available (or only at significant cost) then ComEd should provide an explanation of the barriers to tracking vulnerable populations.	Please reference Section IV of Appendix A to this Report - Vulnerable Customers.	Please reference Section IV of Appendix A to this Report - Vulnerable Customers.
31	Customer Applications	ComEd should further identify what measures would be necessary to protect consumer privacy in tracking vulnerable populations.	Please reference Section IV of Appendix A to this Report - Vulnerable Customers.	Please reference Section IV of Appendix A to this Report - Vulnerable Customers.
32	Customer Applications	The definition and identification of such groups should be discussed with stakeholders and Staff to develop a methodology	Please reference Section IV of Appendix A to this Report - Vulnerable Customers.	Please reference Section IV of Appendix A to this Report - Vulnerable Customers.

		to be included with the modified AMI Plan. To the extent that is not possible, it should be included with the first annual filing.		
33	Customer Outreach & Education	Awareness and Education - Awareness and understanding of AMI technology and benefits (survey metric)	6,032 surveys were collected for awareness and understanding of AMI technology and benefits.	As AMI deployment was completed in 2018, no surveys were conducted at community events in 2019.
34	Customer Outreach & Education	Customer Experience and Engagement - Understanding of AMI Technology (Customer Experience/Engagement Research and Customer Experience Tracking).	74 Community Events were conducted about Understanding AMI Technology.	As AMI deployment was completed in 2018, community event participation focused on other ComEd programs.
35	Customer Outreach & Education	Community Outreach - # of community events and # of direct interactions	Community Outreach included: 74 Community Events conducted and 50,871 direct interactions.	As AMI deployment was completed in 2018, community event participation focused on other ComEd programs.
36	Customer Outreach & Education	Local Media - # of articles that appear in local media	1,125 articles appeared in local media.	As AMI deployment completed in 2018, one media release was created, focusing on Peak Time Savings enabled by the smart grid and smart meter.
37	Customer Outreach & Education	Internal newsletter (# of articles in newsletter)	37 articles were included in the internal newsletter.	As AMI deployment completed in 2018, no related internal articles appeared in the newsletter.
38	Customer Outreach & Education	Customer Experience and Engagement - Meter Installations complaints/claims (Rapid	55 Meter Installations complaints/claims.	Received in 2018: x Meter installation complaints. Please reference data source attachment for Metric 8 for additional information related to meter

		Response Situational Assessments)		<p>installation complaints.</p> <p>x AMI attempted Claims in total. x Claims were handled by Claims and Collections with proper customer contact and resolution. x Claims were handled by Customer Experience.</p>
39	Customer Outreach & Education	Customer Experience and Engagement - # of installation appointments (tracked by AMI Deployment team)	Zero installation appointments.	AMI mass deployment was completed in 2018, therefore, this metric not tracked in 2019 (as per Dale Larkin and Susie Wolfram).
40	Customer Outreach & Education	Community Outreach - # of customer organizations contacted	1,098 organizations were contacted as part of Community Outreach.	As AMI deployment completed in 2018, outreach focused on CARE and the Smart Energy Hub, resulting in coordination with 204 organizations.
41	Customer Outreach & Education	Community Outreach - # of customer communication methods deployed	17 communication methods employed as part of Community Outreach.	Five communication methods were utilized as part of Community Outreach.
42	Customer Outreach & Education	Awareness and Education - # of advocates and ambassadors informed	70 Ambassadors were contacted and informed.	As AMI deployment was completed in 2018, Youth Ambassadors educated customers about solar energy.
43	Customer Outreach & Education	Awareness and Education - # of surveys completed at events	6,032 surveys were collected at events.	As AMI event outreach was discontinued, no surveys were conducted.

44	Customer Outreach & Education	Measurement of Energy Management Education & Outreach events + Interactive items	Community outreach included: 74 Community Events conducted and 50,871 direct interactions.	As AMI deployment was completed in 2018, community event participation focused on other ComEd programs.
45	Customer Outreach & Education	Measurement of the Speaker's Bureau Program	3,537 interactions related to the Speaker's Bureau Program.	A total of 38 CARE workshops and table events and 5,197 direct interactions.
46	Customer Outreach & Education	Measurement of the Youth Ambassador Program	2,332 direct contacts in the Youth program; 70 Youth Ambassadors.	As AMI deployment was completed in 2018, Youth Ambassadors educated customers about solar energy.
47	Customer Outreach & Education	Measurement of Faith-based and Low-Income Outreach	19 direct interactions; 900 organizations contacted for Faith-based and Low-Income Outreach.	A total of 38 CARE workshops and table events and 5,197 direct interactions.
48	Customer Outreach & Education	Measurement of Email Marketing	378,315 email subscribers; 7 emails sent to customers; 6,287 clicks.	Four emails were sent to 508,409 email subscribers, focusing on PTS and Hourly Pricing programs enabled by the smart grid and smart meter, resulting in 70,751 clicks to open.
49	Customer Outreach & Education	Measurement of Energy @ Home and Bill Inserts program	1 article developed for newsletter; 3.1M bill inserts for residential; 295,000 bill inserts for commercial as a part of the bill insert program.	One AMI article appeared in bill insert newsletter, reaching 2.8M customers.
50	Customer Outreach & Education	Measurement of Direct Mail for PTR and Web Tools	This does not apply to 2012.	350,000 energy management mailers were sent to customers. 4,484 welcome mailers were sent

				to refusal and unable-to-connect customers who converted to smart meters.
51	Customer Outreach & Education	Measurement of Videos and Brochures	5 videos created with 22,093 views.	As AMI deployment completed in 2018, no introductory mailers, pre-deployment letters, videos, or brochures were distributed.
52	Customer Outreach & Education	Measurement of Online and Social Media Outreach	<p>Online and Social Media Outreach Measurements:</p> <p>Number of Stories Promoted on ComEd Facebook page is 26.</p> <p>Number of Likes on Facebook is 295.</p> <p>Number of Times a Story was Shared on another Facebook page is 16.</p> <p>Number of Engaged Facebook Users (the # of people who have clicked on a post) is 375. Number of Facebook Users who saw a Post from ComEd in 2012 is 72,789. Number of Blog Stories and Conversations with Mommy bloggers is 1. Number of Facebook Interactions with Games is 4,489.</p> <p>Number of People who Visited ComEd.com/Smart Grid is 9,560.</p>	<p>As AMI deployment and community outreach completed in 2018, there were no related event posts in social media.</p> <p>55,398 visits to the ComEd Smart Meter web page.</p> <p>18,988 visits to the ComEd Smart Grid web page.</p> <p>6,236 visits to the ComEd municipal aggregation web page.</p>
53	Customer Outreach & Education	Measurement of Teacher Partnership	This does not apply to 2012.	Completed 165 Smart Energy Hub field trips at the Chicago and Rockford Training Centers,

				educating 4,567 attendees.
54	Customer Outreach & Education	Measurement of Municipal Toolkit and Experimental Marketing Materials	Municipal Toolkit and Experimental Marketing Materials Measurement is 120 Direct interactions.	445 informational meetings were held with customer groups. 577 informational meetings were held with local officials. 3 field tours were held with local officials.
55	Customer Outreach & Education	Measurement of Municipal Event Speakers, Bureau Town Halls	For Municipal Event Speakers and Bureau Town Halls there were: 2,601 informational meetings with customers. 1,000 informational meetings with local officials. 30 field tours with local officials.	445 informational meetings were held with customer groups. 577 informational meetings were held with local officials. 3 field tours were held with local officials.
56	Customer Outreach & Education	Measurement of Municipal Online Web	16,406 site visits to ComEd Municipal Website.	6,236 visits to the ComEd municipal aggregation web page.
57	Customer Outreach & Education	Measurement of Outreach Materials - Interactive items	38,752 interactive gameplay participants.	Games were discontinued in 2017.

58	Customer Outreach & Education	Measurement of Awareness Tracking	<p>The 2012 Baseline measurements for awareness tracking were:</p> <p>Percentage aware of Smart Grid: 43%</p> <p>Percentage aware of Smart Meter: 26%</p> <p>Percentage Knowledgeable among those aware of Smart Grid: 29%</p> <p>Percentage Knowledgeable among those aware of Smart Meter: 33%</p>	As AMI deployment completed in 2018, no awareness tracking was conducted.
59	Customer Outreach & Education	Measurement of Customer Experience and Message Testing	\$200,000 spent on market research and customer experience tracking.	As AMI deployment completed in 2018, market research and customer experience tracking was discontinued.
60	Customer Outreach & Education	Measurement of Staff dedicated to the program	4 dedicated FTEs for EIMA Program Customer Outreach.	As AMI deployment was completed in 2018, there were zero dedicated FTEs.

Smart Grid Advanced Metering Annual Implementation Progress Report

APPENDIX A – NIST REPORT

I. Introduction

Pursuant to the June 2012 Order, ComEd was directed to submit information with its Annual Implementation Progress Report (“AIPR”) concerning any updates since the submission of the AMI Plan to standards identified by the National Institute of Standards and Technology (“NIST”), including standards adopted by NIST’s Smart Grid Interoperability Panel (“SGIP”), and how ComEd is addressing them.¹¹ In addition, in that same June 2012 Order, the Commission also directed ComEd to address in its 2013 AIPR: (1) if a Time-of-Use (“TOU”) tariff will be proposed and the results of the dialogue with stakeholders regarding same; and (2) the development of a methodology to define and identify vulnerable customers and issues related to tracking information for vulnerable customers. ComEd did so, and in the order entered approving ComEd’s 2013 AIPR, the Commission decided that any further discussion of these two issues was outside the scope of an AIPR proceeding¹². Thus, while the TOU and potentially vulnerable customers are not issues in any proceeding that may be opened by the Commission to review ComEd’s 2016 AIPR, ComEd does present, for informational purposes only, a discussion of its further efforts in 2015 to address these two issues.

Similarly, in the June 2012 Order, the Commission also directed ComEd to work with interested parties to implement a map showing where distributed generation (“DG”) would be good or bad. While the Commission did not specifically direct ComEd to report on the progress of the DG mapping request with its AIPR and specifically indicated that any issues regarding DG mapping should be brought before the Commission in a separate filing or rulemaking, ComEd is reporting on the status of this effort for the convenience of the Commission and all interested parties.

A discussion of the status of each item described above is provided below.

II. Updated NIST Interoperability Standards

As noted above, in the June 2012 Order, the Commission directed ComEd to report on any updates to any applicable NIST standards and explain how it is addressing any such updates. The applicable NIST standards noted within the Revised AMI Plan are regularly reviewed by the Information Technology (“IT”) team at ComEd for completeness and accuracy. Each standard is studied to identify any updates or changes, and to determine whether it has been superseded by newer or more appropriate standards.

¹¹ June 2012 Order at 25

¹² 2013 AIPR Order at 10 and 15.

NISTIR 7628 Guidelines for Smart Grid Cybersecurity include:

- Finalized combined cyber-physical attacks descriptions, which now includes physical impacts resulting from cyber-based attacks
- Supplementary cybersecurity testing and certification approaches and guidelines
- Best practices for 3rd parties to manage smart grid data and privacy concerns
- Cybersecurity issues associated with communications between electric plug-in vehicles and the smart grid
- New security awareness and training guides and templates (for both external consumers and internal personnel)
- Emerging privacy risks regarding the advent of new technologies and activities that could leverage the smart grid

Updates within NIST 7761 Priority Action Plan 2: Guidelines for Assessing Wireless Standards for Smart Grid Applications include:

- Extended approach and framework for modeling and evaluating wireless technologies
- Additional toolsets and templates for modeling and evaluating wireless technologies
- Sensitivity analysis and impacts for input parameters
- Further guidance, information, and considerations pertaining to wireless standards and implementing associated technologies for smart grid network designers/planners

The IT team reviewed these revisions accordingly and determined that the Revised AMI Plan remains aligned with the applicable NIST requirements detailed within the updated standards. This includes NIST recommendations related to customer data and privacy. Furthermore, the IT team continues to assess and evaluate any supplementary considerations that are mentioned by NIST for informational purposes.

Additionally, standard IT security management activities are completed by the IT team as a component of the required support of AMI systems. Security management activities are completed to align with ComEd policies and industry

standards, and include activities such as deploying security system packages to allow for appropriate security and vulnerability monitoring, ensuring that deployed servers adhere to password and system control procedures, performing periodic server fixes and security updates, and performing vulnerability assessments as well as subsequent remediation steps to rectify any defects or findings.

III. Time of Use Rate

A. Consideration of Utility TOU Rates

1. Background

As reported in Appendix A to ComEd's 2013 AIPR, which was investigated in ICC Docket No. 13-0285, ComEd met with the Smart Grid Advisory Council ("SGAC") and other stakeholders at that time to discuss the development of time-of-use ("TOU") rates within Illinois' competitive market and reported the results of its meetings with stakeholders.¹³ As a result of those meetings, ComEd concluded that a utility-offered TOU rate would be a potential disruption to the competitive market, and committed to continue to work with stakeholders to enable Retail Electric Supplier ("RES") TOU offerings. The Commission agreed with ComEd's conclusion and in its 2013 AIPR Order declined to require ComEd to offer a TOU rate.¹⁴

On February 13, 2015, CUB and EDF filed a Petition to Initiate a Proceeding to Investigate the Adoption of a Utility Time of Use Rate that was assigned ICC Docket No. 15-0100. Interveners included Elevate Energy, ComEd, the Illinois Power Agency, the Illinois Competitive Energy Association ("ICEA"), Ameren Illinois Company ("Ameren"), and the Retail Energy Supply Association ("RESA"). A Final Order was entered by the Commission on September 16, 2015, and concluded that the Petition was premature and would unnecessarily disrupt the process previously adopted by the Commission.¹⁵ The Commission pointed to written guidance offered on March 14, 2012, in which the SGAC clearly recommended that stakeholders first work to enable RES TOU offerings, and to consider utility-offered TOU rates afterwards. That guidance stated:

Once the infrastructure and systems are in place to support TOU offerings by ARES, the initial question before the ICC will be how to determine whether the offerings of Illinois' alternative retail electric

¹³ 2013 AIPR, App. A at 2-4.

¹⁴ Docket No. 13-0285, final Order (June 26, 2013) at 15.

¹⁵ Docket No. 15-0100, final Order (Sept. 16, 2015) ("15-0100 Order").

suppliers (“ARES”) include a sufficient set of TOU rate options to adequately serve the public interest.¹⁶

The 15-0100 Order further stated that the competitive RES market had not had an opportunity to develop and, thus, based on this SGAC Guidance, the Petition was premature. The Commission ultimately dismissed the matter, finding that to initiate an investigation at this stage in time, before the stakeholder process is complete, would be inappropriate.¹⁷

1. Utility TOU Pilot

On November 19, 2018, ComEd filed Rate RTOUPP - Residential Time of Use Pricing Pilot (“Rate RTOUPP”) to effectuate a pilot residential time of use supply rate. The pilot, if approved, will extend for four years and will allow ComEd to examine if fixed-price supply rates with prices that differ during three different pricing periods will incentivize customers to shift energy consumption from higher cost (peak) periods to lower cost (off-peak) periods and save money in comparison to Rate BES – Basic Electric Service (“Rate BES”). The pricing methodology ComEd proposed is based upon PJM hourly market pricing with slight shifts in revenue recovery to create higher differentiation between the highest and lowest price periods and with generation related capacity costs recovered as they are incurred, with a kW-based charge.

On October 2, 2019 the Commission approved the four-year TOU pilot with a cap of 1,900 participants. However, ComEd has requested rehearing on the methodology for recovering generation related capacity costs because the final order assigned the generation related capacity costs primarily to the kWh based Super Peak Period price. Regardless of the outcome in the order on rehearing (due by April 1, 2020), this new rate will be available starting with June 2020 bills. ComEd is in the process of preparing resources to educate customers on the TOU rate and to provide tips for how use less energy in the higher priced periods. To help customers in their enrollment decisions, ComEd is also developing a web-based bill comparison tool that will use AMI data to provide customers an estimate of their potential savings on the TOU rate.

C. Facilitation of RES TOU Offerings

1. Background

¹⁶ ICC Docket 15-0100, Petition, Attachment A (March 14, 2012 Guidance Regarding Implementation of Time of Use Rates, Smart Grid Advisory Council) at 5-6.

¹⁷ 15-0100 Order at 9.

In ICC Docket No. 12-0484, the Commission investigated ComEd's Petition to seek approval of tariffs implementing ComEd's PTS program, pursuant to Section 16-108.6(g) of the PUA. In its Interim Order dated February 21, 2013, the Commission directed Staff to hold workshops with interested parties in order to address certain issues that arose during the investigation. Beginning in April 2013 and continuing on throughout 2014, 2015 and 2016, Staff hosted a series of "Enabling the Market" workshops that were attended by utilities, consumer groups, Retail Electric Suppliers ("RESs"), and other interested stakeholders. In addition to the items the Commission directed the parties to address, the workshops covered several AMI-related topics, including the release of customer-specific information by electric utilities and enabling RESs to offer TOU and other dynamic pricing products, which eventually led to the development of ComEd's Rider RMUD – Residential Meter Usage Data ("Rider RMUD"), which is discussed later in this section.

2. Release of Customer-Specific Information by Electric Utilities

Several of the initial issues discussed at the Staff-led workshops revolved around the question of electric utilities releasing customer-specific information to third parties. While one of those issues, i.e., identifying customers participating in ComEd's PTS program, had been raised in Docket No. 12-0484, additional issues were identified in the workshop discussions that focused on how Sections 16-122 and 16-108.6 of the PUA impacted a utility's ability to release customer-specific information to third parties.

Recognizing that these issues would not be resolved in the workshops, the Commission's Office of Retail Market Development ("ORMD") issued a report dated August 30, 2013 (the "Staff Report") requesting that the Commission investigate certain issues: (1) the release of aggregated, anonymous customer usage information; (2) the release of information identifying PTS and net metering customers; and (3) RES access to its customers' interval usage data that is not used for the purposes of billing a customer. The Commission initiated an investigation in these matters on September 4, 2013 in Docket No. 13-0506 ("Data Privacy Docket"), which culminated in a Commission Order on Rehearing dated July 30, 2014, effectively closing out this issue. ("Data Privacy Order on Rehearing").

a. Aggregated, Anonymous Data

In the Data Privacy Order on Rehearing, the Commission held that Section 16-122 and Section 16-108.6 of the PUA do not prohibit the release of anonymous customer usage information in accordance with the data protocol

adopted in the Final Order which protects customer privacy and is in the public interest.¹⁸

The Commission further found that, pursuant to Section 16-122, no fee is specifically required for this data; however, there is nothing in Section 16-122 to prevent the utilities from charging a reasonable fee when providing this information. Effective February 11, 2017, ComEd offers access to anonymous customer usage information as a data service. Through 2018, there are 19 third-parties who have received this service.

b. Identification of PTS and Net Metering Customers

From discussions during the workshops, there was an understanding that competitive suppliers have legitimate reasons to obtain certain information about individual customer accounts, and that freer access to various types of individual customer information could assist in realizing certain benefits available from the smart meter infrastructure. At the same time, ComEd and other parties expressed concerns related to customers' privacy interests – both in the obvious interest of adhering to state law and also because data privacy had been cited as a reason for customer refusals of smart meter deployment.

The Commission ruled that a customer's participation in PTS or net metering programs is billing data and that verifiable authorization from individual customers is required under the PUA before disclosure may occur. In the Data Privacy Order dated January 28, 2014, the Commission also found that the electric utilities should not be required to provide lists of customers that are PTS or net metering participants, as this would contravene Section 16-122. The Commission also determined that possession of an account number should be considered customer authorization to receive certain information about such customer's account, including whether the customer is a PTS or net metering customer, or a participant in any supply related or demand response program offered by the utility. Effective June 13, 2014, new indicators were added to the Summary Data request report and the Interval Usage Data request report available on the comed.com website as well as to the Municipal Aggregation Customer Report provided to communities implementing aggregation programs. The indicators were also added to the Customer Supply List available to RESs through the supplier portal. The indicators provide notification of customers currently receiving service under the following riders: Rider POGNM – Net Metering, Rider PTR - Peak Time Savings, and Rider A/C - A/C Cycling. As of 2015, this issue is considered implemented and closed.

¹⁸ Data Privacy Order on Rehearing at 10-11.

c. RES Access to Customer's Interval Data Not Used for Billing Purposes

The type of authorization required for RES access to non-billing interval data, as well as how RESs would verify to the electric utility that they obtained proper authorization, were discussed in the Enabling the Market workshops. These issues were or are being considered in two Commission proceedings, Docket Nos. 14-0701 and 15-0073. In Docket No. 14-0701, an investigation into the standard terms for customer authorization of access to interval usage data for non-billing purposes, the Commission approved standardized language that must be used to demonstrate RES authorization to access non-billing interval data. At Staff's direction, as a result of workshop discussions throughout 2014, the warrant forms and processes were developed to allow RESs to certify to the utilities that they have obtained such authorization. ComEd filed Rate DART - Data Access and Retrieval Tenants ("Rate DART") to provide the RESs access to up to twenty four consecutive months of AMI Historical Interval Usage not used for billing purposes for customers that they do not currently serve. The ICC approved the tariff on December 22, 2015 (Docket 15-0623). The warrant form is available to Retail Electric Suppliers for use of the data service and is available for their use in the Supplier Portal.

Docket No. 15-0073, an investigation into the customer authorization required for access to AMI interval data by third parties other than RESs. The Commission issued a Final Order on March 23, 2015 approving standardized authorization language that must be obtained by non-RES third parties from retail customers in order to access AMI interval data for non-billing purposes. The Commission also approved the Green Button method of authorization in its Order. Through 2018, thirty-eight (38) third parties have inquired about the Green Button Connect process with twenty (20) taking the first steps to begin the process with six (6) third parties moving forward with IT testing.

The "Enabling the Market" workshops also resulted in Supplier Portal enhancements which provide historical customer data for customers the RES serves. These enhancements included the ability for suppliers that register for Rider RMUD to obtain non-billing interval data for their customers daily instead of at the end of each billing period. Suppliers are now able to utilize a Supplier Portal to view this non-bill quality interval data on a daily basis (i.e. the day after) in addition to a one-time 24-month look back. The Portal retains a rolling 35 day historical interval usage for each customer on RMUD if the supplier would like to view the data. Since this data is not bill quality it may differ from the billing usage sent at the end of the monthly billing period via Electronic Data Interchange (EDI).

ICC Docket 15-0073, filed on January 28, 2015, addresses the investigation into the Customer Authorization Required for Access by Third Parties Other Than Retail Electric Suppliers to Advanced Metering Infrastructure Interval Meter Data, therefore any further comments on this topic should be addressed there.

3. RES TOU Offerings and Other Dynamic Pricing Products

a. Residential Meter Usage Data ("Rider RMUD")

As described in the 2015 AIPR, ComEd used the information and feedback from "Enabling the Market" workshop participants to design Rider RMUD – Residential Meter Usage Data ("Rider RMUD"). Beginning January 16, 2014, Rider RMUD authorized ComEd to provide granular residential meter usage data to authorized RESs taking service under Rate RESS – Retail Electric Supplier Service ("Rate RESS") serving those residential customers that they provide not only electric power and energy supply services, but also TOU pricing and/or demand response products, all as described in the tariff. Rider RMUD was initially filed and approved as a pilot tariff. ComEd completed the upgrade of the new meter data management system ("MDMS") in August of 2014, subsequently increased the number of customers for whom RESs could receive such data to 100,000 from 15,000 through the end of 2015, and eliminated the customer cap as of January 1, 2016 – at which point Rider RMUD is offered generally rather than on its original pilot basis. As of the end of 2018, 5 RESs were utilizing this service for a total of 366 customers; up slightly from the 312 customers at the end of 2017.

b. Peak Time Savings

Beginning in October 2014, and continuing through 2015, ComEd opened enrollment in the PTS program, which provided all customers with an AMI meter, regardless of supplier, the opportunity to begin receiving credits for energy curtailments during the summer months following enrollment. In March of 2016, ComEd filed tariff revisions related to the program, which were subsequently approved by the Commission and became effective on May 6, 2016, to allow for the ability to remotely control the temperature settings of Company-approved smart thermostats installed by individual residential customers to regulate their central air conditioning systems. The compensation provided to a residential customer is dependent upon measurements of actual reductions in the customer's demands for electric power and energy relative to a baseline level identified for the customer. As of the end of 2018, there were approximately 277,000 customers participating in this program.

4. Additional commitments to customized education related to TOU products:

ComEd's education and outreach efforts under the AMI Plan have included information on dynamic pricing products offered by ComEd and alternative suppliers and how customers can use them to achieve certain benefits. In addition to the customized education delivered to key customer segments describing ComEd offerings such as PTS, Hourly Pricing and web tools, the PlugInIllinois.com/smartmeter website continues to provide comprehensive details of RES offerings. As of December 2018, there were no TOU offerings presented on the PlugInIllinois site, however, ComEd has 5 RESs certified under Rider RMUD.

IV. Vulnerable Customers

As reported in previous AIPRs, stakeholders have agreed to define and identify vulnerable customers as customers belonging to the following customer groups:

1. Low income
2. Very young (from birth to age 5)
3. Older individuals (age 65 and older)
4. Those who have limited English proficiency or literacy
5. Individuals with a functional disability, such as impaired mobility
6. Persons who are socially isolated

ComEd makes best efforts to obtain information on vulnerable customers, but such information remains limited due to the unavailability of certain information – such as age and English fluency – that would enable identification of vulnerable customers based on the factors identified above. In addition, obtaining data on customers meeting any of the six criteria used to define vulnerable customers by zip code or census tract is not useful for purposes of the reporting requirements.

However, ComEd will continue to report on vulnerable customers using the limited information in its possession regarding low income customers (Group 1, above) and customers with qualifying life support equipment at the premises or having a certified medical condition in the household (Group 5, above) and will supplement such reports if additional verifiable data becomes available from other entities, such as the Department of Commerce and Economic Opportunity ("DCEO"). In addition, ComEd will continue to administer assistance programs and will engage in education and outreach for low income customers. Low

income customers are defined as those customers who participate in the Low Income Home Energy Assistance Program ("LIHEAP"), the Residential Special Hardship Program the Percentage of Income Payment Plan ("PIPP"), and the Chicago Housing Authority ("CHA") All Clear Program.

In 2018 there were no further developments in acquiring data for Groups 2, 3, 4 or 6. As in 2018, in 2019 ComEd will continue to evaluate outreach to customers in need, where there is data to identify such customers, through alerts, enhanced messaging and payment arrangements.

V. DG Mapping

In the June 2012 Order, the Commission determined that concerns raised by CUB and the ELPC about perceived barriers to the installation of DG needed to be addressed in a separate rulemaking. The Commission, however, directed ComEd to work with interested parties to implement their "request for a map showing where distributed generation would be good or bad."¹⁹ Following meetings with interested parties, ComEd created and posted a map tool on its website and notified interested parties on August 15, 2013 of the posting.²⁰ ComEd has upgraded the original map tool in October of 2018 with a new Hosting Capacity map and plans to update the map once per year. ComEd will consider more frequent updates if there is a large increase in DG interconnection activities in the future.

¹⁹ June 2012 Order at 50.

²⁰ <https://www.comed.com/customer-service/rates-pricing/interconnection/Pages/distribution-under-10000kva.aspx>.

APPENDIX B – RIDER NAM BIANNUAL REPORT

Introduction

ComEd's Rider NAM - Non-AMI Metering ("Rider NAM") requires that each year, beginning in 2014, ComEd submit a report to the Commission on or before April 1 and October 1 that summarizes the operation of the Rider for the preceding period. The biannual report that is filed by April 1 is to be included in the AIPR and will cover the period of July 1 through December 31 of the preceding year. The report that is filed on October 1 will cover the period of January 1 through June 30 of the same calendar year.

The biannual report must provide (a) the number of retail customers to which Rider NAM is applicable; (b) a description of the Company's efforts to address such retail customers; and (c) identification of the Company's costs that are associated with providing service under Rider NAM.

Report

ComEd's Rider NAM Biannual Report for the period July 1, 2018 through December 31, 2018 is provided below.

Smart Grid Advanced Metering Annual Implementation Progress Report

APPENDIX C - REVISED SMART GRID ADVANCED
METERING INFRASTRUCTURE DEPLOYMENT
PLAN - 2019 AIPR UPDATES - REDLINED

(Including Updates Per 2019 Annual
Implementation Progress Report)

(Redlined Version)

Smart Grid Advanced Metering Infrastructure Deployment Plan

APPENDIX D - REVISED SMART GRID ADVANCED METERING INFRASTRUCTURE DEPLOYMENT PLAN – 2019 AIPR UPDATES

(Including Updates Per 2019 Annual Implementation
Progress Report)

Smart Grid Advanced Metering Annual Implementation Progress Report

ATTACHMENT 1

Metrics and Milestones

Metric: 1B

Metric Description: Residential Customers-Number of customers served by retail electric suppliers for which the supplier has requested monthly Electronic Data Interchange delivery of interval data. Expressed also as a percentage of customers taking supply from a retail electric supplier in each delivery class.

Delivery Service Class	Customer Accounts	Accounts supplied by RES with AMI	Accounts supplied by RES (%)	Accounts for whom RES requested EDI delivery of interval data	% of RES customer
RESIDENTIAL SINGLE	x	x	x%	x	x%
RESIDENTIAL MULTI	x	x	x%	x	x%
RESIDENTIAL SINGLE (SPACE HEAT)	x	x	x%	x	x%
RESIDENTIAL MULTI (SPACE HEAT)	x	x	x%	x	x%
Total Residential	x	x	x%	x	x%
COM KWH ONLY	x	x	x%	x	x%
SMALL (0 - 100)	x	x	x%	x	x%
MED (100 - 400)	x	x	x%	x	x%
LARGE (400 - 1000)	x	x	x%	x	x%
VERY LARGE (1000 - 10,000)	x	x	x%	x	x%
EXTRA LARGE (> 10 MW)	x	x	x%	x	x%
HIGH VOLTAGE	x	x	x%	x	x%
RAILROAD	x	x	x%	x	x%
FIXTURE INCLUDED LIGHTS	x	x	x%	x	x%
DUSK TO DAWN	x	x	x%	x	x%
OTHER LIGHTS	x	x	x%	x	x%
Total	x	x	x%	x	x%

Metric: 1D

Metric Description: Small Commercial Customers. Number of customers served by retail electric suppliers for which the supplier has requested monthly Electronic Data interchange delivery of interval data. Expressed also as a percentage of customers taking supply from a retail electric supplier in the delivery class.

Delivery Service Class	Customer Accounts	Accounts supplied by RES	Accounts supplied by RES (%)	Accounts for whom RES requested interval data	% of RES customer
COM KWH ONLY (Watt Hour)	x	x	x%	x	x%
SMALL (0 - 100)	x	x	x%	x	x%
Total	x	x	x%	x	x%

Metric: 6C

Metric Description: Number of customers who have accessed the web - based portal as of the last day of the calendar year as a percentage of customers with AMI Meters and as a percentage of ComEd customers in that delivery class.

Number of Accounts with AMI Meters by Delivery Class			
Delivery Class	# of Accounts with AMI Meters Viewed Web	# of Accounts With AMI Meters	Viewed Web Portal as % of # of Accounts With
Single Family W/O Elec. Space Heat	x	x	x%
Multi Family W/O Elec. Space Heat	x	x	x%
Single Family With Elec. Space Heat	x	x	x%
Multi Family With Elec. Space Heat	x	x	x%

Number of Accounts by Delivery Class			
Delivery Class	# of Accounts Viewed Web Portal	# of Accounts in Class	Viewed Web Portal as % of # of Accounts in Class
Single Family W/O Elec. Space Heat	x	x	x%
Multi Family W/O Elec. Space Heat	x	x	x%
Single Family With Elec. Space Heat	x	x	x%
Multi Family With Elec. Space Heat	x	x	x%

Metric: 6D

Metric Description: Number of customers who can directly access their usage data as of the last day of the calendar year as a percentage of customers with AMI Meters and as a percentage of ComEd customers in that delivery class.

Number of Accounts with AMI Meters by Delivery Class			
Delivery Class	# of Accounts with AMI Meters and Can Directly Access Usage Data (1)	# of Accounts with AMI Meters	Accounts Can Directly Access Usage Data as % of # Accounts with AMI Meters
Single Family W/O Elec. Space Heat	x	x	x%
Multi Family W/O Elec. Space Heat	x	x	x%
Single Family With Elec. Space Heat	x	x	x%
Multi Family With Elec. Space Heat	x	x	x%
Watt-Hour	x	x	x%
Small Load	x	x	x%
Medium Load	x	x	x%
Large Load	x	x	x%
Very Large Load	x	x	x%
Extra Large Load	x	x	x%
High Voltage	x	x	x%
Railroad	x	x	x%
Fixture-Included Lighting	x	x	x%
Dusk to Dawn Lighting	x	x	x%
General Lighting	x	x	x %
Total	x	x	x %

Number of Accounts by Delivery Class			
Delivery Class	# of Accounts Can Directly Access Usage Data (1)	# of Accounts in Class	Accounts Can Directly Access Usage Data as %
Single Family W/O Elec. Space Heat	x	x	x%
Multi Family W/O Elec. Space Heat	x	x	x%
Single Family With Elec. Space Heat	x	x	x%
Multi Family With Elec. Space Heat	x	x	x%
Watt-Hour	x	x	x%
Small Load	x	x	x%
Medium Load	x	x	x%
Large Load	x	x	x%
Very Large Load	x	x	x%
Extra Large Load	x	x	x%
High Voltage	x	x	x%
Railroad	x	x	x%
Fixture-Included Lighting	x	x	x%
Dusk to Dawn Lighting	x	x	x%
General Lighting	x	x	x%
Total	x	x	x%

Notes:

(1) Only customers who have created an online ComEd.com account have direct access to energy usage data, but all customers have the option of creating an online account.

Metric: 9

GHG METRIC TO BE INSERTED

Metric: 13

2019 Update: Survey of AMI-enabled Customer Applications

INTRODUCTION

Advanced Metering Infrastructure (AMI) encompasses the suite of hardware and software that allow utilities to monitor and operate the distribution system with greater granularity and in near-real time. Core components include smart meters, distribution automation devices, and wireless mesh network, which together, generate more data on grid conditions, provide channels for the 2-way communication of information, and support the ability to manage distributed energy resources. Use cases for AMI technology like automated meter reads, remote connect/disconnect, precision in outage management, and voltage optimization improve the reliability and efficiency of electric service. In addition to improvements to basic electric service, the expanded capabilities have unlocked new products and services that create value for both customers and the utility.

For example, the finer data provided by smart meters are an opportunity for utilities to personalize energy offerings based on customers' needs and values. A robust communication network means that more behind the meter devices like wifi thermostats can be aggregated into demand response resources. And the combination of sensing and communication increases the ability for the distribution system to integrate and interact with behind the meter solar, battery storage, EV charging, and microgrids. In this future of a decentralized electricity system, AMI is the backbone necessary for the shared use of grid-connected resources and expansion in customer choice around energy.

This report provides an update of trends and developments in AMI-enabled customer applications with a focus on residential customers.

Customer applications are broadly grouped into three categories based on the type of value to the utility.

- 1) Personalized Utility Customer Relationship: Energy usage data + analytics
- 2) Demand Side Management to reduce capacity procurement and grid operation costs:
Enhanced communication network
- 3) Integration of DERs to prepare for the grid of the future: Data + analytics + communication

PERSONALIZED UTILITY CUSTOMER RELATIONSHIP

Central to the approval of AMI investments by state regulators are commitments to demonstrate benefits and savings for residential customers. Utilities have responded by setting company-wide visions to evolve into the role of a "trusted energy advisor". Key to this goal of becoming customer-centric is the use of smart meter data, especially hourly energy usage, to personalize the relationship between customers and their utilities. Specific applications include initiatives to encourage energy efficiency, tools to inform decisions around energy products and electric rates, and target marketing.

A. Energy Efficiency (EE)

Thus far, the most successful approach to realizing energy efficiency opportunities among residential customers has been behavioral EE programs, which utilities typically develop in partnership with vendors offering customer engagement, home energy management, or data analytics solutions. Behavioral EE programs use Home Energy Reports (HER), web/mobile tools, and proactive alerts to deliver personalized energy insights and recommended actions alongside

energy usage data. Compared with programs that involve smart meter connected in-home displays or highly proactive customers, behavioral EE programs emphasize simplicity and convenience.

According to Oracle Utilities Opower, a leader in the use of behavioral science, data, and user experience design for energy efficiency, their utility EE program offerings achieve energy savings of 3-5%¹. Following their acquisition by Oracle in 2016, Opower has solidified their presence in the power industry and now has contracts with over 100 utilities worldwide and expects to deliver 4 TWh of energy savings annually².

Several startups have sought to challenge Opower's market share by using non-intrusive load monitoring technology (i.e. disaggregation) to provide customers with energy insights at the appliance or living-space level. In Navigant's 2018 Home Energy Management Leaderboard, top disaggregation providers Tendril and Bidgely rank #2 and #4, respectively, behind Oracle Utilities Opower, who continues to defend the #1 spot³. Tendril now has contracts with 5 of the top 10 U.S. utilities⁴ whereas Bidgely now serves 25 utilities in 10 countries⁵.

However, presentation of disaggregated data has not resulted in significant increases in energy savings compared to aggregated data because the key barrier is motivating customers to access the program portal^{6,7}. As a result, Tendril and Bidgely are shifting their offerings to explore specialized use cases where capabilities like disaggregation and machine learning may have greater potential for added value. For example, Tendril is working with Indiana Michigan Power and Google to use disaggregated energy usage data to improve the responses of voice assistants to common questions such as⁸

Q: Why is my bill so high?

A: "Taking into account weather and billing cycles, you used [% more] energy compared to this time last year. Would you like to hear some recommendations for reducing your energy use?"

Q: How is my home using energy?

A: "We estimate that your home used energy in the following top categories: [category 1] saw [category 1 percent] usage, your [category 2] used [category 2 percent] and your [category 3] used [category 3 percent]. Would you like to hear some ways to save in [category 1]?"

Bidgely and Ecotagious have also developed solutions for personalized energy insights through voice assistants, but have yet to pilot any projects with utilities^{9,10}.

1 Opower's EE programs include HER, proactive alerts, energy management web tools, and peak management

2 <https://www.oracle.com/corporate/pressrelease/oracle-utilities-opower-101518.html>

3 <https://www.navigantresearch.com/reports/navigant-research-leaderboard-home-energy-management>

4 <https://www.greentechmedia.com/articles/read/tendril-lands-private-equity-investment-to-take-its-energy-management-to-th#gs.Nkn84iTV>

5 <https://www.greentechmedia.com/articles/read/bidgely-raises-27m-to-scale-its-energy-disaggregation-for-utilities>

6 <https://arxiv.org/pdf/1605.00962.pdf>

7 http://ilsagfiles.org/SAG_files/Evaluation_Documents/ComEd/ComEd_EPY9_Evaluation_Reports_Final/ComEd_PY

9 [Bidgely_Report_2018-08-16_Final.pdf](http://ilsagfiles.org/SAG_files/Evaluation_Documents/ComEd/ComEd_EPY9_Evaluation_Reports_Final/ComEd_PY_Bidgely_Report_2018-08-16_Final.pdf)

8 <https://www.greentechmedia.com/articles/read/tendril-and-google-unveil-the-talking-home-hub-as-smart-utility-customer-re#gs.R8aHRX8U>

9 <https://www.bidgely.com/blog/voice/>

10 <https://www.ecotagious.com/video-voice-assistant-for-utilities/>

Tendril is also differentiating itself from Opower by making strategic strides into back-end home energy automation and pivoting away from front-end customer engagement. According to Adrian Tuck, the CEO of Tendril,

“We’ve designed our solutions based on the idea that people largely don’t care, but they do like to see outcomes that we can deliver, saved money or greener or more comfortable homes. We need in small instances for people to care enough that they give us permission to manage their energy for them, but then we’d like to just sit back and enjoy the fruits of our labor.”¹¹

Following this vision, Tendril has partnered with Kansas City Power and Light and Indiana Michigan Power Co. to pilot smart thermostat DR programs that leverage the Orchestrated Energy platform to optimize peak load reduction and individual customer comfort. The ultimate goal is to make the DR events effectively invisible to the customer experience.

a. Trusted Energy Advisor v2.0

In contrast, Opower is taking a customer-facing approach to developing offerings beyond behavioral EE12. To help their utility clients strengthen their roles as energy advisors in the distributed grid of the future, Opower is introducing web tools for customers to view solar net metering credits, estimate costs of charging EVs, and compare electric bills under different rates¹³. WattPlan, a web tool built by Clean Power Research, is also a popular product that utilities in CA, OR, WA, HI, NY, and MD are using to make personalized EV or Solar calculators available to customers¹⁴.

b. Target Marketing

Another albeit minor way utilities have sought to create value from energy usage data is for targeted marketing of programs and home energy devices. Specifically, vendors suggest that their customer engagement solutions can help boost enrollment into demand response programs and interest in wifi thermostats, smart plugs, LED lights, and other energy efficient appliances¹⁵¹⁶. It is unclear, however, the extent to which utilities are using target marketing and the value of customer segmentation based on energy usage data compared to simple mass marketing. Using smart meter data to identify which customers own EVs, battery storage, or other DERs without an interconnection request may prove to be a more valuable use case.

A 2018 survey of U.S. households by Parks Associates suggests that there is room for utilities to improve their education and marketing of smart home devices. Roughly 13% of purchases take place through a utility marketplace while brick and mortar retail (40%) and online retail (20%) retail are much more popular channels. At the same time, a third of households with a smart home device agree that a utility program influenced their decision¹⁷. Surprisingly, only 25% of the

11 <https://www.tendrilinc.com/blog/energy-gang-customer-experience-podcast-transcript#caring>

12 <https://www.greentechmedia.com/articles/read/what-is-next-for-opower#gs.yBKPeWov>

13 <https://www.oracle.com/corporate/pressrelease/oracle-utilities-leader-home-energy-mgmt-062018.html>

14 <https://www.cleanpower.com/products/wattplan/>

15 <https://www.businesswire.com/news/home/20190129005261/en/EnergyHub-Bidgely-Partner-Bring-Unique-Integrated-Demand-Side>

16 <https://www.oracle.com/industries/utilities/products/opower-energy-efficiency-cloud-service/>

17 <https://www.peakload.org/dialogue--smart-home-and-dr>

surveyed population were aware of smart thermostat and home lighting control technologies. So while customers may seek conventional retailers for technologies that provide convenience or security, utility programs may have an important role in driving interest in efficient and dispatchable energy devices.

DEMAND SIDE MANAGEMENT FOR SAVINGS OPPORTUNITIES

Another type of customer application enhanced by AMI technology is demand-side management (DSM), which are programs where customers with flexible load are compensated for providing grid services. Two approaches are:

- Demand response: Customers receive incentives for participation in demand response events which are dispatched by the utility or grid operator
- Dynamic or time-varying rates: Customers are encouraged to adjust load from high to low priced periods through rates that reflect the impact of time of day on cost to serve

Although demand response and time-varying rates are not new concepts, AMI capabilities have allowed more residential customers to participate, unlocked new use cases, and improved confidence in DSM as a grid resource.

c. Demand Response

In 2018, regulators and stakeholders continued to express interest in DSM as a potentially low-cost resource for peak load management and reliability. As a result, utilities have been looking to modernize traditional switch-based programs and to develop Bring Your Own Device (BYOD) programs in an effort to improve the cost-effectiveness of DR resources.

According to SEPA's 2018 Utility DR Market snapshot, traditional AC switch programs, represent the largest share of mass market programs and 54% of all utility DR programs in 2017 (survey of 155 U.S. utilities). In the survey year, these programs were dispatched an average of 8 times, primarily to replace peak generation capacity. There is discussion about modernizing these programs to enable greater participation in wholesale markets and geographic dispatch for feeder-specific congestion relief. But considering the adoption of wifi thermostats, it is unclear whether the potential benefits justify the costs to upgrade the radio switches used in these legacy programs. As of 2018, approximately 13% of US households with broadband access has purchased a smart thermostat¹⁸. In response to this consumer trend, surveyed utilities are shifting toward thermostat programs for leveraging flexible residential AC load. For 2018, only 6 U.S. utilities have plans for new AC switch programs whereas 21 utilities have plans for new thermostat programs¹⁹. GTM research estimates that an achievable peak demand reduction from currently installed residential smart thermostats is around 8.3 GW²⁰.

¹⁸ <https://www.peakload.org/dialogue--smart-home-and-dr>

¹⁹ Includes a range of thermostat technologies (e.g. radio, PCT, wifi) and deployment models (e.g. direct-install, self-install/BYOT, hybrid)

²⁰ <https://www.greentechmedia.com/articles/read/distributed-energy-poised-for-explosive-growth-on-the-us-grid#gs.i2hsP53T>

Among recent thermostat programs, popular design features include the BYOT deployment model and use of analytics to customize the adjustments of each thermostat. Compared to programs using simple control strategies (e.g. uniform adjustments to setpoints across enrolled devices), advanced control strategies use machine learning to optimize both comfort of individual customers and aggregate peak load reduction. These trends reflect a new approach to residential DR programs where utilities seek to minimize customer acquisition costs and prioritize customer preferences while preserving program effectiveness.

Because in this case utilities do not own hardware for directly controlling ACs, growth requires collaboration with the many manufacturers of smart thermostats. Nest for example, maintains complete control over the participation of Nest thermostats in demand response programs through their Rush Hour Rewards platform. Other brands, however, allow DRMS/DERMS providers to develop custom control strategies. Forty US utilities now use EnergyHub's Mercury DERMS, which is compatible with 15 home-energy brands including Nest, ecobee, thinkco, Sonnen, Sunrun, and Chargepoint. By forming strong partnerships with a wide range of device manufacturers, EnergyHub is helping utilities overcome the challenge of siloed and brand-specific DR programs. In 2018, three NY utilities announced plans for new thermostat programs in partnership with EnergyHub to centralize management of radio, programmable, and wifi thermostats from several brands including Lux, Sensi, and Vivint²¹.

On the other hand, Kansas City Power & Light (KCP&L) is taking a patchwork approach to developing thermostat DR programs with advanced controls. In addition to integration with Nest's RHR program, KCP&L has partnered with Tendril to pilot a similar DR program where ecobee thermostats will be individually controlled²². Although AMI is not a prerequisite for DR programs that use intelligent control strategies, AMI has provided the measurements to validate the reliability of DR resources in which customer preferences are prioritized.

This trend of personalization and automation of residential DR is blurring the distinction between DR and EE programs. As mentioned previously, Tendril is positioning their Orchestrated Energy platform as a way for utilities to offer customers optimized and automated participation in both EE and DR programs. Bidgely and EnergyHub have also announced a partnership to pair disaggregated energy data with control of home energy devices (e.g. thermostat, water heater, EV, battery storage) and are now looking for utility partners with whom to pilot a combined EE and DR program²³. A key question will be the interplay between EE and DR as offered through customer programs, valued in wholesale markets, and managed within utilities.

d. Time-Varying Rates

After years of carefully designed and evaluated pilots, time-varying rates may be at a turning point. In 2019, the three California IOU's (PG&E, SDG&E, and SCE) will be implementing opt-out time of use (TOU) rates for all residential customers (over 20 million). Historically, utilities have offered time-varying rates to residential customers on an opt-in basis due to concerns from regulators around the impact on electric bills. Evaluation of TOU rate pilots by the Brattle Group, however,

²¹ <https://enrollmythermostat.com/faqs/srpflexrewards/>

²² <https://www.smart-energy.com/industry-sectors/energy-grid-management/kcpl-tendril-ecobee-smart-thermostat-enabled-dr-pilot/>

²³ <https://www.greentechmedia.com/articles/read/bidgely-and-energyhub-team-up-to-combine-home-energy-data-with-controls>

have found that customers demonstrate sufficient understanding of TOU rates and an ability to shift energy usage²⁴.

If evidence continues to support the benefits of well-designed TOU rates in managing peak loads and in giving customers opportunities to save money, more states are likely to make time-varying rates the default option. In the California utilities TOU pilots, 90 – 99% of participants chose to remain on the rate, suggesting that an opt-out program structure combined with education may be an effective way to scale. Opt-in TOU programs have on average an enrollment rate of 1%, and even outliers such as Arizona Public (APS) reach participation of just over 50% among residential customers²⁵.

In Minnesota, Xcel received approval to move forward with an opt-out TOU pilot for 2020 with strong support from stakeholders like CUB. The 3-tiered rate featured in the pilot proposal has won recognition from experts at RMI²⁶ and is designed to re-shape load to better align with wind generation.

INTEGRATION OF DERS TO PREPARE FOR THE GRID OF THE FUTURE

Finally, AMI is not sufficient, but does the lay the groundwork for the capabilities that distribution utilities need to prepare for the consumer-driven growth of DERs. Independent of utility programs, smart thermostats, small solar PV, home battery storage, EVs, and microgrids are gaining traction because of state policies, declining costs, and consumer values like convenience and self-reliance. GTM Research estimates that the peak demand reduction potential of DERs in the U.S. was 46.4 GW at the end of 2017 and could increase to 104 GW by 2023. Of the five classes of DERs identified, residential smart thermostats, distributed solar, and EVs are expected to see substantial growth over the next few years (On the other hand, CHP currently contributes 34% of peak demand reduction potential, but no new capacity is expected. Distributed storage is not predicted to truly enter the market until after 2023.)²⁷.

While DERs disrupt how utilities have previously maintained grid reliability and recovered infrastructure costs, their integration into the grid also presents opportunities for a more efficient way to meet energy needs. In theory, the costs and benefits of these DERs can be shared between utilities and customers with the help of third party aggregators. For example, EV charging can be managed so that vehicle batteries are charged when people need transportation and require charging when there is surplus generation from renewables. Behind the meter batteries and smart inverters can be tapped to provide voltage support to the grid without negatively impacting customer values like energy security or cost savings. In this way, investments by utilities to build a smart grid support the ability to capture additional value streams that help make these technologies more affordable for customers.

Optimization of values among stakeholders is the theory. In practice, two challenges are apparent. The first is that the threat and opportunity of grid-connected DERs are proportional to their number. Currently, adoption of DERs (besides smart thermostats) in the U.S. is concentrated in a handful of states and have yet to reach a tipping point in most places. Second, the future role and business

²⁴ <https://www.utilitydive.com/news/california-utilities-prep-nations-biggest-time-of-use-rate-roll-out/543402/>

²⁵ http://files.brattle.com/files/12658_the_national_landscape_of_residential_tou_rates_a_preliminary_summary.pdf

²⁶ <https://www.utilitydive.com/news/has-xcel-minnesota-designed-the-ideal-residential-time-of-use-rate/513235/>

²⁷ <https://www.greentechmedia.com/articles/read/distributed-energy-poised-for-explosive-growth-on-the-us-grid#gs.i2hsP53T>

model of a utility is unclear. As a result, there is uncertainty in how much money and in what capabilities utilities should invest.

What are utilities doing to support the integration of DERs and customer choice?

In states with large amounts of distributed solar or ambitious clean energy targets, utilities and regulators are taking steps to streamline the interconnection process and manage the growth of DERs. Key areas of exploration include

- Smart inverters to increase the distribution hosting capacity for solar and battery storage
- Siting of fleet and public EV charging infrastructure and monitoring home EV charging equipment
- Communication and control of aggregated DERs to provide grid services for the transmission and distribution systems

e. Smart Inverters

Hawaii became the first state to update interconnection standards in response to distributed solar when in 2014, regulators mandated that all projects use or be retrofitted with inverters capable of voltage and frequency ride-through²⁸. The California Public Utilities Commission (CPUC), meanwhile, formed a Smart Inverter Working Group in 2013, and developed the following three phase plan to enhance the requirements of all inverters in the interconnection queue²⁹:

- Phase 1 (effective Sept. 2017): Autonomous grid support functionalities like voltage and frequency ride through, ramp-rate controls, and dynamic Volt-VAR management³⁰
- Phase 2 (effective 2018): Communication Protocols for how inverters communicate with each other and the grid operator
- Phase 3 (TBD) Advanced Capabilities like data monitoring and alerts to distribution grid operator about abnormal grid conditions

At the national level, standard IEEE 1547-2018 was published and provides updated requirements for the interconnection of DERs, which include automated grid support functionalities and the ability to communicate and receive signals from the grid³¹. Standard IEEE 1547 is, however, voluntary and will require implementation by state regulators.

In addition, IL, MD, and MN have started to evaluate best practices for implementing smart inverters.

f. Electric Vehicle Charging

In 2018, state regulators approved \$880M in utility investments for EV charging infrastructure and programs compared to \$58M in 2017. An additional \$1.5B in EV investments were proposed and are pending approval by regulators³².

²⁸ <https://www.greentechmedia.com/articles/read/a-state-by-state-snapshot-of-utility-smart-solar-inverter-plans#gs.mrKQR0wz>

²⁹ <https://www.greentechmedia.com/articles/read/a-state-by-state-snapshot-of-utility-smart-solar-inverter-plans#gs.mrKQR0wz>

³⁰ <https://blog.aurorasolar.com/californias-new-smart-inverter-requirements-what-rule-21-means-for-solar-design>

³¹ <https://irecusa.org/2018/07/smart-inverter-update-new-ieee-1547-standards-and-state-implementation-efforts/>

³² <https://www.greentechmedia.com/articles/read/top-10-utility-regulation-trends-of-2018#gs.T3iqcaII>

On the whole, state regulators appear amenable to distribution infrastructure upgrades needed to support charging stations, customer programs to encourage vehicle electrification, and in some states, pilots of utility owned and operated fleet and public charging stations.

Highlights from 2018 and early 2019

- CA: \$738M of proposed \$1B investment approved by CPUC³³
 - Pilots of two EV charging rates
 - Infrastructure for fast charging stations and bus, truck, and forklift charging depots
 - Rebates and installation services for home charging stations
- MA: Approved \$23.8M³⁴
 - utility to build, own, and operate publicly accessible level-2 and fast-charging stations on utility side of meter
 - provide rebates for customer-owned charging infrastructure
 - Performance incentives for utility cost-recovery (e.g. number of charging stations in use)
- MD: Approved plans for 5-yr pilot³⁵
 - Deploy over 5,000 Level-2 and DC fast-charging stations
 - Own and operate select public charging stations
 - Customer rebates for EV chargers
- Utilities in D.C, South Carolina, and Minnesota have proposed transportation electrification plans (pending approval)

Over the next few years, the results of these pilots can help the industry learn about the real-world challenges and opportunities that EV charging brings to the grid.

g. DER Aggregation and Management

In parallel with improving the interconnection of DERs, utilities, vendors, and regulators are working to develop the monitoring and control systems needed to maintain reliability and ideally, to dispatch DERs to help with grid operations.

Transmission System

Aggregated ACs and electric water heaters are fairly well-established in wholesale electricity markets as DR resources. DERs like EV charging and storage, however, are thought to be undervalued because they have new characteristics and parameters that existing market rules do not accommodate. In a landmark decision, FERC passed order 841 in February of 2018, mandating that ISO/RTOs “remove barriers to the participation of electric storage resources” and ensure that the “participation model is eligible to provide all capacity, energy, and ancillary services that the resource is technically capable of providing”³⁶.

Following Order 841 and close collaboration with ISO-NE to develop requirements for hybrid resources, Sunrun cleared 20 MW of distributed solar + storage in ISO-NE’s 2022/23 Forward Capacity Auction. Sunrun’s win marks the first time that behind-the-meter resources (i.e. virtual

33 <https://www.latimes.com/business/la-fi-electric-vehicles-utilities-20180531-story.html>

34 <https://www.nrdc.org/experts/noah-garcia/massachusetts-approves-new-ev-program>

35 https://www.psc.state.md.us/wp-content/uploads/MD-PSC-Approves-Modified-Utility-EV-Charging-Portfolio_01142019-1.pdf

36 <https://www.ferc.gov/whats-new/comm-meet/2018/021518/E-1.pdf>

powerplant) cleared an open auction as a generator, competing against conventional sources of power³⁷.

Distribution System

A popular vision among Utility of the Future thought leaders is implementation of a Distributed Energy Resource Management System (DERMS). A true DERMS can monitor, control, and coordinate DERs in response to real-time conditions in the distribution system. There are still many technical, regulatory, and business challenges and the implementation of a true DERMS remains in the scoping and early pilot phase.

In February of 2018, the Grid Management Working Group convened by SEPA in 2016 published DERMS Requirements v1.0 and then v2.0 in early 2019 to guide innovation by DERMS vendors. Even if these requirements are met, other technical challenges include insufficient GIS and AMI data quality within utilities, bandwidth in existing communication networks, and computational power to model power flows. Nonetheless, initial pilots are underway and should provide valuable insight into the feasibility and real-world value of a DERMS.

After the initial announcement in 2016, National Grid finally launched their high-profile pilot of a transactive energy marketplace using Opus One Solution's "intelligent energy networking platform", GridOS³⁸. In this pilot, DERs on a medical campus are given opportunities to provide local distribution grid services at a market rate. For 2019, National Grid plans to expand the pilot to additional locations in order to test the integration of different DER technologies with GridOS. The pilot, which is part of NY's Reforming the Energy Vision initiative, is planned to continue until October of 2019³⁹.

Outside of NY, APS announced a DERMS pilot to use EnergyHub's Mercury platform to "enroll, monitor, and control DERs across several DER programs"⁴⁰. For example, APS plans to use Mercury to

- To develop charging schedules for water heaters and battery storage that align with forecasts of solar generation
- Remotely manage smart inverters to provide voltage and frequency support and automate curtailment in response to negative wholesale prices
- Manage Cool Rewards (BYOT demand response program) including enrollment, DR event dispatch, and intelligent control of thermostats that optimizes for TOU pricing

³⁷ <https://www.greentechmedia.com/articles/read/sunrun-wins-new-england-capacity-auction-with-home-solar-and-batteries#gs.2YkRl61h>

³⁸ <https://www.globenewswire.com/news-release/2018/06/28/1531244/0/en/National-Grid-Launches-Distributed-System-Platform-With-Buffalo-Niagara-Medical-Campus-Members.html>

³⁹ <https://nyrevconnect.com/utility-profiles/national-grid/>

⁴⁰ <https://www.energyhub.com/blog/arizona-public-service-energyhub-mercury-derms>

Metric: 16 A Continued

Metric Description: ComEd’s response time to a distributed resource project application, and time from receipt of application until energy flows from project to grid (distribution.)

Issue ID	Date Application Received	Certificate of Completion Date	Year Completed	Duration	Fuel Type	Final Level Assigned
1423	5/18/2016	11/14/2018	2018	910	Solar	Level 1
1698	3/8/2017	2/23/2018	2018	352	Solar	Level 2
17-00036	8/21/2017	7/20/2018	2018	333	Solar	Level 1
17-00041	8/15/2017	3/8/2018	2018	205	Solar	Level 1
17-00049	8/15/2017	10/22/2018	2018	433	Solar	Level 2
17-00050	8/15/2017	10/22/2018	2018	433	Solar	Level 2
17-00051	8/15/2017	10/22/2018	2018	433	Solar	Level 2
17-00052	8/15/2017	10/22/2018	2018	433	Solar	Level 2
17-00053	8/15/2017	10/22/2018	2018	433	Solar	Level 2
17-00054	8/15/2017	10/22/2018	2018	433	Solar	Level 2
17-00074	8/18/2017	1/25/2018	2018	160	Solar	Level 1
17-00081	8/18/2017	3/5/2018	2018	199	Solar	Level 1
17-00135	9/6/2017	6/4/2018	2018	271	Solar	Level 1
17-00136	9/6/2017	1/5/2018	2018	121	Solar	Level 1
17-00137	9/12/2017	6/8/2018	2018	269	Solar	Level 1
17-00138	9/6/2017	2/8/2018	2018	155	Solar	Level 1
17-00146	9/7/2017	2/8/2018	2018	154	Solar	Level 1
17-00147	9/21/2017	5/17/2018	2018	238	Solar	Level 1
17-00201	10/2/2017	4/19/2018	2018	199	Solar	Level 1
17-00220	10/4/2017	1/5/2018	2018	93	Solar	Level 1
17-00225	10/13/2017	1/24/2018	2018	103	Solar	Level 1
17-00232	10/12/2017	1/26/2018	2018	106	Solar	Level 1
17-00233	10/16/2017	2/28/2018	2018	135	Solar	Level 1
17-00244	10/11/2017	11/27/2018	2018	412	Solar	Level 1
17-00253	10/12/2017	2/8/2018	2018	119	Solar	Level 1
17-00254	10/11/2017	1/5/2018	2018	86	Solar	Level 1
17-00258	11/3/2017	6/7/2018	2018	216	Solar	Level 1
17-00261	10/16/2017	7/13/2018	2018	270	Solar	Level 1
17-00290	10/24/2017	1/5/2018	2018	73	Solar	Level 1
17-00311	10/31/2017	1/11/2018	2018	72	Solar	Level 1
17-00312	10/24/2017	2/2/2018	2018	101	Solar	Level 1
17-00313	10/24/2017	1/12/2018	2018	80	Solar	Level 1
17-00327	11/3/2017	3/28/2018	2018	145	Solar	Level 1

Metric: 22

Metric Description: Bill impacts associated with the costs for implementation of ComEd’s AMI Plan for low, average, and higher usage level customers pursuant to approved rates and surcharges.⁶¹ The usage level calculations will be valued for a “typical” customer at the 25th, 50th, and 75th percentile of total usage for each applicable delivery service class.

Change from January 2018 to January 2019 for Typical Customer			
Customer Class or Type	Monthly	Annual	Percent
Single Family Residential Without Electric Space Heat	x	x	x
Multi-Family Residential Without Electric Space Heat	x	x	x
Single Family Residential With Electric Space Heat	x	x	x
Multi-Family Residential With Electric Space Heat	x	x	x
Non-Residential Watt hour	x	x	x
Non-Residential Small Load (0-100 kW)	x	x	x

Change from January 2018 to January 2019 at Percentile (Low/Median/High Usage)				
Customer Class or Type	Percentile	Monthly	Annual	Percent
Single Family Residential Without Electric Space Heat (low usage)	x	x	x	x
Single Family Residential Without Electric Space Heat (median usage)	x	x	x	x
Single Family Residential Without Electric Space Heat (high usage)	x	x	x	x
Multi-Family Residential Without Electric Space Heat (low usage)	x	x	x	x

Change from January 2018 to January 2019 at Percentile (Low/Median/High Usage)				
Customer Class or Type	Percentile	Monthly	Annual	Percent
Multi-Family Residential Without Electric Space Heat (median usage)	x	x	x	x
Multi-Family Residential Without Electric Space Heat (high usage)	x	x	x	x
Single Family Residential With Electric Space Heat (low usage)	x	x	x	x

⁶¹ The customer rate impacts reflect a comparison of ComEd’s total bill year-to-year for the rates in effect for January 2016 to January 2017 (including energy supply and delivery, of which AMI is a component). This is the same manner in which ComEd has been responding to this metric in previous submissions, as agreed upon by stakeholders.

Single Family Residential With Electric Space Heat (median usage)	x	x	x	x
Single Family Residential With Electric Space Heat (high usage)	x	x	x	x
Multi-Family Residential With Electric Space Heat (low usage)	x	x	x	x
Multi-Family Residential With Electric Space Heat (median usage)	x	x	x	x
Multi-Family Residential With Electric Space Heat (high usage)	x	x	x	x
Nonresidential Watthour (low usage)	x	x	x	x
Nonresidential Watthour (median usage)	x	x	x	x
Nonresidential Watthour (high usage)	x	x	x	x
Nonresidential Small Load (0-100 kW) (low usage)	x	x	x	x
Nonresidential Small Load (0-100 kW) (median usage)	x	x	x	x
Nonresidential Small Load (0-100 kW) (high usage)	x	x	x	x

Metric: 23

Metric Description: Number of customers that have created and viewed an account on ComEd.com – by usage levels, customer class, and low income customers. An account on ComEd.com is necessary for viewing the web portal.

Number of Accounts by Delivery Class	
Delivery Class	Total Number of Accounts
Single Family W/O Elec. Space Heat	1,073,889
Multi Family W/O Elec. Space Heat	661,212
Single Family With Elec. Space Heat	16,257
Multi Family With Elec. Space Heat	87,978
Watt-Hour	20,897
Small Load	107,616
Medium Load	5,512
Large Load	1,360
Very Large Load	619
Extra Large Load	26
High Voltage	31
Dusk to Dawn Lighting	171

General Lighting	90
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Number of Accounts by Usage Level for Residential, Watt-hour, and Small Load Delivery						
Delivery Class	Total	Number of Accounts by Usage Level				NA(1)
		Quartile 1	Quartile 2	Quartile 3	Quartile 4	
Single Family w/o Elec. Space Heat	1,062,991	197,538	230,193	252,755	264,561	117,944
Multi Family w/o Elec. Space Heat	649,551	101,358	109,318	117,796	124,362	196,717
Single Family With Elec. Space Heat	16,031	3,373	3,540	3,585	3,487	2,046
Multi Family With Elec. Space Heat	87,369	14,958	15,631	16,198	15,679	24,903
Watt-Hour	19,973	3,780	4,452	5,156	4,685	1,900
Small Load	103,764	22,709	22,496	23,307	22,990	12,262

Number of Low Income Accounts by Usage Level for Residential Delivery Classes(2)						
Delivery Class	Total	Number of Accounts by Usage Level				NA(1)
		Quartile 1	Quartile 2	Quartile 3	Quartile 4	
Single Family Without Space Heat	19,547	4,988	4,504	4,350	3,835	1,870
Multi Family Without Space Heat	14,450	2,668	2,814	3,184	3,786	1,998
Single Family With Space Heat	405	80	81	84	90	70
Multi Family With Space Heat	3,081	731	612	579	686	473

Accounts on Life Support and Medical Condition by Usage Level for Residential Delivery Classes(3)						
Delivery Class	Total	Number of Accounts by Usage Level				NA(1)
		Quartile 1	Quartile 2	Quartile 3	Quartile 4	
Single Family Without Space Heat	1,745	109	180	276	445	735
Multi Family Without Space Heat	625	15	19	57	144	390
Single Family With Space Heat	41	3	5	8	10	15
Multi Family With Space Heat	131	2	9	10	32	78

Notes for Metric 23:

- (1) These accounts did not have bills for all 12 months of 2019 to determine their usage quartile.
- (2) Low income accounts are those accounts that participated in the Low Income Home Energy Assistance Program (LIHEAP), and Percentage of Income Payment Program (PIPP).
- (3) Customers on Medical Condition or Medical Certificate are based on data for 2019 and customers on Life Support are determined based on accounts on Life Support in January 2020. Some accounts in the Life Support and Medical Condition or Medical Certificate group may also be in the low-income group.

Metric: 24

Metric Description: Number of customers with ComEd.com accounts that have viewed the web portal - by usage levels, customer class, and low income customers.

Sort	Revised Category	Total Viewed Portal
1	RESIDENTIAL SINGLE	390,863
2	RESIDENTIAL MULTI	247,382
3	RESIDENTIAL SINGLE (SPACE HEAT)	6,803
4	RESIDENTIAL MULTI (SPACE HEAT)	38,487

Number of Accounts by Usage Level for Residential Delivery Classes						
Number of Accounts by Usage Level						
Delivery Class	Total	Quartile 1	Quartile 2	Quartile 3	Quartile 4	NA(1)
SingleFamily W/O Elec. Space Heat	390,863	66,967	83,605	93,934	100,305	46,052
Multi Family W/O Elec. Space Heat	247,382	32,102	39,560	44,023	48,509	83,188
SingleFamily With Elec. Space Heat	6,803	1,257	1,544	1,571	1,524	907
Multi Family With Elec. Space Heat	38,487	5,944	6,725	7,285	7,163	11,370

Number of Low Income Accounts by Usage Level for Residential Delivery Classes(2)						
Number of Accounts by Usage Level						
Delivery Class	Total	Quartile 1	Quartile 2	Quartile 3	Quartile 4	NA(1)
Single Family W/O Elec. Space Heat	8,884	1,962	2,034	2,057	1967	864
Multi Family W/O Elec. Space Heat	5,966	854	1,044	1,364	1863	841
Single Family With Elec. Space Heat	203	36	43	36	57	31
Multi Family With Elec. Space Heat	1,273	226	257	248	343	199

Accounts on Life Support and Medical Condition by Usage Level for Residential Delivery Classes(3)						
Number of Accounts by Usage Level						
Delivery Class	Total	Quartile 1	Quartile 2	Quartile 3	Quartile 4	NA(1)

Single Family W/O Elec. Space Heat	387	39	54	103	187	4
Multi Family W/O Elec. Space Heat	93	3	6	17	51	16
Single Family With Elec. Space Heat	8	2	2	2	2	0
Multi Family With Elec. Space Heat	19	1	4	2	11	1

Notes for Metric 24:

- (1) These accounts did not have bills for all 12 months of 2019 to determine their usage quartile.
- (2) Low income accounts are those accounts that participated in the Low Income Home Energy Assistance Program (LIHEAP), and Percentage of Income Payment Program (PIPP).
- (3) Customers on Medical Condition or Medical Certificate are based on data for 2019 and customers on Life Support are determined based on accounts on Life Support in January 2020. Some accounts in the Life Support and Medical Condition or Medical Certificate group may also be in the low-income group.

Metric: 25

Metric Description: ComEd has worked with its web presentment vendor to develop and vet a methodology for measuring energy savings by customers that have viewed the web portal (ComEd.com/MyAccount). The 2019 methodology remains the same as the prior year. The methodology is explained below.

Methodology description:

I. Propensity Score Matching

Logging in to the web is a self-selected, opt-in action and therefore not easily subject to random assignment as in an experimental evaluation approach (i.e., randomized controlled trial). Therefore, this analysis employs a quasi-experimental evaluation method which seeks to match customers who log in to the web (“treatment customers”) to very similar customers who did not log in to the web (“matched control customers”). Matched controls are drawn from a larger set of candidate control customers. Because customers log in to the web on a rolling basis, the matching procedure repeats for each “cohort” of treatment customers defined by month of login.

The matching algorithm follows Imbens and Rubin (2015) and begins by selecting customer characteristics for estimation of a propensity score. The propensity score is the predicted probability of receiving the treatment - logging in to the web. Matching customers based on nearly identical propensity scores serves to balance the distribution of

the included customer characteristics among the treatment and matched control populations. This approach effectively attempts to mimic the balancing that occurs via a randomized controlled trial.

An important limitation of this method is that treatment customers may still differ from matched control customers along unobserved dimensions (e.g., attitudes toward energy efficiency). Such unobserved differences can bias results if they remain imbalanced. Despite this limitation, propensity score matching is an accepted method in the DOE SEE Action guidelines and widely used in other disciplines.

The algorithm considered inclusion of each of the previous 12 months of energy usage data prior to the login month, customer tenure, and recipient status in each particular Home Energy Report (HER) wave. All first and second order terms are considered for inclusion by the algorithm.⁶² Customers who were missing data for these characteristics were excluded from the analysis.

Once the propensity score is estimated across customers, each treatment customer is matched to the control customer with the closest propensity score (their “nearest neighbor”) on a 1:1 basis. Not all customers who log in are successfully matched largely due to not having 12 months of pre-login usage data. These customers are not matched due to the concern that they can not be matched well. As a result, the analysis measures the average treatment effect on the treated for those customers who visited the web and who could be matched well; it is not a measurement of the effect of web on all customers who visited the web.⁶³ The final result of this process is a treatment and a control group that are statistically equivalent across characteristics strongly related to both the outcome variable, energy usage, and the likelihood of web login.

II. Estimation of the Treatment Effect

Following matching, savings estimation is conducted using the same model that Opower uses for the savings measurement of Home Energy Report (HER) programs. Robustness checks are conducted using a customer fixed effect model. These models incorporate pre-treatment energy usage data and serve as another opportunity to correct for differences between treatment and matched control customers. Please see Imbens and Rubin (2015) for the benefits of pairing matching with regression estimation to achieve “double robustness”.

III. Results

⁶² Please see Imbens and Rubin (2015) for a detailed description of the algorithm.

⁶³ Crump et. al. (2006) argue that restricting the set of customers included in the analysis to those who can be matched well is an important step in reducing bias.

The tables below display calendar year 2019 energy efficiency savings from web among ComEd customers who logged-in for the first time in calendar year 2019 and had sufficient data to be included in the analysis.

Electric Savings Results

- Percent savings (%): 1.26% +/- 0.2%
- Savings per customer per day (kWh): 0.30 +/- 0.078
- Total customers: 54,209
- Total savings (MWh): 3,129 +/- 804

Note: Savings estimates are statistically significant at the > 95% level. Margin of error represents 95% confidence interval.

IV. References

Crump, Richard, et al. "Moving the goalposts: Addressing limited overlap in the estimation of average treatment effects by changing the estimand." (2006).

Imbens, Guido W., and Donald B. Rubin. *Causal Inference in Statistics, Social, and Biomedical Sciences*. Cambridge University Press, 2015.

State and Local Energy Efficiency Action Network. 2012. *Evaluation, Measurement, and Verification (EM&V) of Residential Behavior-Based Energy Efficiency Programs: Issues and Recommendations*. Prepared by A. Todd, E. Stuart, S. Schiller, and C. Goldman, Lawrence Berkeley National Laboratory. <http://behavioranalytics.lbl.gov>.

Metric: 26

Metric Description:

Number of customers enrolled in the Residential Real Time Pricing (RRTP) program (ComEd's hourly pricing program) as of 12/31/2018 by usage levels, customer class, and low income customers.

Delivery Service Class	Hourly
RESIDENTIAL SINGLE	x
RESIDENTIAL MULTI	x
RESIDENTIAL SINGLE (SPACE HEAT)	x
RESIDENTIAL MULTI (SPACE HEAT)	x

Number of Accounts by Usage Level for Residential Delivery Classes						
Delivery Class	Total	Number of Accounts by Usage Level				NA(1)
		Quartile 1	Quartile 2	Quartile 3	Quartile 4	
Single Family W/O Elec. Space Heat	x	x	x	x	x	x
Multi Family W/O Elec. Space Heat	x	x	x	x	x	x
Single Family With Elec. Space Heat	x	x	x	x	x	x
Multi Family With Elec. Space Heat	x	x	x	x	x	x

Number of Low Income Accounts by Usage Level for Residential Delivery Classes(2)						
Delivery Class	Total	Number of Accounts by Usage Level				NA(1)
		Quartile 1	Quartile 2	Quartile 3	Quartile 4	
Single Family W/O Elec. Space Heat	x	x	x	x	x	x
Multi Family W/O Elec. Space Heat	x	x	x	x	x	x
Single Family With Elec. Space Heat	x	x	x	x	x	x
Multi Family With Elec. Space Heat	x	x	x	x	x	x

Accounts on Life Support and Medical Condition by Usage Level for Residential Delivery Classes(3)						
Delivery Class	Total	Number of Accounts by Usage Level				NA(2)
		Quartile 1	Quartile 2	Quartile 3	Quartile 4	
Single Family W/O Elec. Space Heat	x	x	x	x	x	x
Multi Family W/O Elec. Space Heat	x	x	x	x	x	x
Single Family With Elec. Space Heat	x	x	x	x	x	x
Multi Family With Elec. Space Heat	x	x	x	x	x	x

Notes for Metric 26:

- (1) Usage quartile for these accounts could not be determined because they did not have bills for all 12 months of 2018.
- (2) Low income customers are accounts that participated in the Low Income Home Energy Assistance Program (LIHEAP) and Percentage of Income Payment Program (PIPP).
- (3) Customers on Life Support or Medical Condition/Certificate are identified based on data for 2018. Customer accounts can be in both low income programs and on Life Support or Medical Condition/Certificate.

Metric: 28

Metric Description:

Number of customers enrolled in ComEd's Peak Time Rebate (i.e. Peak Time Savings) program as of 12/31/2018 by usage levels, customer class, and low income customers.

Delivery Service Class	PTS	% of Total PTS
RESIDENTIAL SINGLE	x	x%
RESIDENTIAL MULTI	x	x%
RESIDENTIAL SINGLE (SPACE HEAT)	x	x%
RESIDENTIAL MULTI (SPACE HEAT)	x	x%
Total	x	

Number of Accounts by Usage Level for Residential Delivery Classes						
Delivery Class	Total	Number of Accounts by Usage Level				
		Quartile 1	Quartile 2	Quartile 3	Quartile 4	NA
Single Family W/O Elec. Space	x	x	x	x	x	x
Multi Family W/O Elec. Space	x	x	x	x	x	x
Single Family With Elec. Space	x	x	x	x	x	x
Multi Family With Elec. Space	x	x	x	x	x	x

Number of Low Income Accounts by Usage Level for Residential Delivery Classes(2)						
Delivery Class	Total	Number of Accounts by Usage Level				
		Quartile 1	Quartile 2	Quartile 3	Quartile 4	NA
Single Family W/O Elec. Space Heat	x	x	x	x	x	x
Multi Family W/O Elec. Space Heat	x	x	x	x	x	x
Single Family With Elec. Space Heat	x	x	x	x	x	x
Multi Family With Elec. Space Heat	x	x	x	x	x	x

Accounts on Life Support and Medical Condition by Usage Level for Residential Delivery Classes(3)						
Delivery Class	Total	Number of Accounts by Usage Level				
		Quartile 1	Quartile 2	Quartile 3	Quartile 4	NA
Single Family W/O Elec. Space Heat	x	x	x	x	x	x
Multi Family W/O Elec. Space Heat	x	x	x	x	x	x
Single Family With Elec. Space Heat	x	x	x	x	x	x
Multi Family With Elec. Space Heat	x	x	x	x	x	x

Notes for Metric 28:

(1) Usage quartile for these accounts could not be determined because they did not have bills for all 12 months of 2018.

- (2) Low income customers are accounts that participated in the Low Income Home Energy Assistance Program (LIHEAP) and Percentage of Income Payment Program (PIPP).
- (3) Customers on Life Support or Medical Condition/Certificate are identified based on data for 2018. Customer accounts can be in both low income programs and on Life Support or Medical Condition/Certificate.

Metric: 29

Metric Description: Number of deposits required, disconnection notices, and disconnections for nonpayment for all customers and, if applicable, by low income customers. Other “key indicia associated with credit and collection activities targeted to low income customers” may be incorporated in the project plan’s business process redesigns for future implementation.

Part 1: Number of Deposits Required in 2019 - by usage levels, customer class, and low income customers.	
Number of Accounts by Delivery Class	
Delivery Class	Total Number of Accounts
Single Family W/O Elec. Space Heat	12,293
Multi Family W/O Elec. Space Heat	22,411
Single Family With Elec. Space Heat	294
Multi Family With Elec. Space Heat	3,456
Watt-Hour	1,335
Small Load	7,858
Medium Load	195
Large Load	37
Very Large Load	21
High Voltage	2

Notes for Deposits: Total accounts and low income accounts presented were active as of December 31, 2019. Inactive accounts are not presented. In total, including inactive, there were 58,632 new distinct accounts with deposits quoted in 2019.

Number of Accounts by Usage Level for Residential, Watt-hour, and Small Load Delivery Classes						
		Number of Accounts by Usage Level				
Delivery Class	Total	Quartile 1	Quartile 2	Quartile 3	Quartile 4	NA(1)
Single Family W/O Elec. Space Heat	12,293	117	61	44	28	12,043
Multi Family W/O Elec. Space Heat	22,411	130	100	79	47	22,055
Single Family With Elec. Space Heat	294	7	2	2	1	282
Multi Family With Elec. Space Heat	3,456	13	12	10	5	3,416
Watt-Hour	1,335	14	15	7	7	1,292
Small Load	7,858	72	50	54	40	7,642

Number of Low Income Accounts by Usage Level for Residential Delivery Classes (2)						
		Number of Accounts by Usage Level				
Delivery Class	Total	Quartile 1	Quartile 2	Quartile 3	Quartile 4	NA(1)
Single Family W/O Elec. Space Heat	424	3	3	2	0	416
Multi Family W/O Elec. Space Heat	496	5	3	1	3	484
Single Family With Elec. Space Heat	9	0	0	0	0	9
Multi Family With Elec. Space Heat	123	0	0	0	0	123

Accounts on Life Support and Medical Condition by Usage Level for Residential Delivery Classes						
		Number of Accounts by Usage Level				
Delivery Class	Total	Quartile 1	Quartile 2	Quartile 3	Quartile 4	NA(1)
Single Family	26	0	0	0	0	26
Multi Family	15	0	0	0	0	15
Multi Family With Elec. Space Heat	3	0	0	0	0	3

Part 2: Number of Disconnection Notices in 2019 - by usage levels, customer class, and low income customers.	
Number of Accounts by Delivery Class	
Delivery Class	Total Number of Accounts
Single Family W/O Elec. Space Heat	287,716
Multi Family W/O Elec. Space Heat	147,838
Single Family With Elec. Space Heat	5,017
Multi Family With Elec. Space Heat	21,779
Watt-Hour	2,332
Small Load	26,271
Medium Load	1,570
Large Load	415
Very Large Load	209
Extra Large Load	3
High Voltage	11
Dusk to Dawn Lighting	45
Other Lights	15

Notes for Disconnection Notices: Total accounts and low income accounts presented were active as of December 31, 2019. Inactive accounts are not presented. In total, including inactive, there were 602,808 distinct accounts receiving disconnect notices in 2019.

Number of Accounts by Usage Level for Residential, Watt-hour, and Small Load Delivery Classes						
Delivery Class	Total	Number of Accounts by Usage Level				
		Quartile 1	Quartile 2	Quartile 3	Quartile 4	NA(1)
Single Family W/O Elec. Space Heat	287,716	43,313	56,114	70,900	85,324	32,065
Multi Family W/O Elec. Space Heat	147,838	16,679	24,185	32,434	44,407	30,133
Single Family With Elec. Space Heat	5,017	809	1,102	1,219	1,204	683
Multi Family With Elec. Space Heat	21,779	2,001	3,783	5,706	6,247	4,042
Watt-Hour	2,332	272	461	478	735	386
Small Load	26,271	3,365	5,090	6,690	7,107	4,019

Number of Low Income Accounts by Usage Level for Residential Delivery Classes(2)						
Delivery Class	Total	Number of Accounts by Usage Level				
		Quartile 1	Quartile 2	Quartile 3	Quartile 4	NA(1)
Single Family W/O Elec. Space Heat	16,272	2,819	3,482	3,821	3,705	2,445
Multi Family W/O Elec. Space Heat	10,976	925	1,615	2,420	3,793	2,223
Single Family With Elec. Space Heat	265	41	44	63	54	63
Multi Family With Elec. Space Heat	1,714	162	297	411	518	326

Accounts on Life Support and Medical Condition by Usage Level for Residential Delivery Classes(3)						
Delivery Class	Total	Number of Accounts by Usage Level				
		Quartile 1	Quartile 2	Quartile 3	Quartile 4	NA(1)
Single Family W/O Elec. Space Heat	1,197	138	183	263	430	183
Multi Family W/O Elec. Space Heat	577	41	58	105	260	113
Single Family With Elec. Space Heat	24	3	6	7	5	3
Multi Family With Elec. Space Heat	98	10	18	22	35	13

Part 3: Number of Disconnections in 2019 - by usage levels, customer class, and low income customers.	
Number of Accounts by Delivery Class	
Delivery Class	Total Number of Accounts
RESIDENTIAL SINGLE	69,366
RESIDENTIAL MULTI	43,767
RESIDENTIAL SINGLE (SPACE HEAT)	1,191
RESIDENTIAL MULTI (SPACE HEAT)	6,320
COM KWH ONLY	1,196
SMALL (0 - 100)	5,832
MED (100 - 400)	5
LARGE (400 - 1000)	1

Notes for Disconnection: Total accounts and low income accounts presented were active as of December 31, 2019. Inactive accounts are not presented. In total, including inactive, there were 176,489 distinct accounts suspended in 2019.

Part 3: Number of Disconnections in 2019 - by usage levels, customer class, and low income customers.						
Number of Accounts by Usage Level for Residential, Watt-hour, and Small Load Delivery Classes						
Delivery Class	Total	Number of Accounts by Usage Level				
		Quartile 1	Quartile 2	Quartile 3	Quartile 4	NA(1)
Single Family W/O Elec. Space Heat	69,366	11,458	13,366	16,314	19,289	8,939
Multi Family W/O Elec. Space Heat	43,767	4,962	7,202	9,657	13,961	7,985
Single Family With Elec. Space Heat	1,191	199	275	299	196	222
Multi Family With Elec. Space Heat	6,320	577	1,130	1,656	1,872	1,085
Watt-Hour	1,196	123	234	234	348	257
Small Load	5,832	1,251	1,599	1,324	489	1,169

Number of Low Income Accounts by Usage Level for Residential Delivery Classes (2)						
Delivery Class	Total	Number of Accounts by Usage Level				
		Quartile 1	Quartile 2	Quartile 3	Quartile 4	NA(1)
Single Family W/O Elec. Space Heat	4,343	740	951	976	1,045	631
Multi Family W/O Elec. Space Heat	3,097	236	406	646	1,211	598
Single Family With Elec. Space Heat	65	13	9	18	6	19
Multi Family With Elec. Space Heat	444	32	73	103	145	91

Accounts on Life Support and Medical Condition by Usage Level for Residential Delivery Classes(3)						
Delivery Class	Total	Number of Accounts by Usage Level				
		Quartile 1	Quartile 2	Quartile 3	Quartile 4	NA(1)
Single Family W/O Elec. Space Heat	242	27	36	51	84	44
Multi Family W/O Elec. Space Heat	128	9	9	28	59	23
Single Family With Elec. Space Heat	5	1	0	3	0	1
Multi Family With Elec. Space Heat	22	2	6	4	8	2

Supporting Documentation EIMA Bill Comparison Vulnerable Customers

ATTACHMENT 2

Smart Grid Advanced Metering Annual Implementation Progress Report

ATTACHMENT 3

Test Bed / Technology Demonstrations

Smart Grid Advanced Metering Annual Implementation Progress Report

Industry & Customer Research: Non-Utility Owned Storage Units

ATTACHMENT 4

Smart Grid Advanced Metering Annual Implementation Progress Report

HAN Device Interoperability

ATTACHMENT 5

Smart Grid Advanced Metering Annual Implementation Progress Report

ATTACHMENT 6