AMI IN REVIEW

Informing the Conversation

Advanced Grid Research

OFFICE OF ELECTRICITY
US DEPARTMENT OF ENERGY

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EXECUTIVE SUMMARY

Advanced Metering Infrastructure (AMI) is different from traditional utility investments. It has forward-looking benefits whose value depends on how it is deployed and implemented. It can enable new opportunities, allow for more customer options, respond to customer expectations to manage and generate their own electricity, and provide data to maintain and improve the operation of the distribution system.

However, doubts persist about its cost and value to customers. While numerous AMI investments have been approved, there have been noteworthy rejections or denials in recent years. The U.S. Department of Energy understands the role AMI can play in grid modernization; therefore, the Advanced Grid Research division undertook a phased research study to investigate regulatory applications from various parties' perspective. The research looked at utility applications, filings, and commission orders from 2010 – 2019. In addition, the study conducted regional workshops and individual meetings with stakeholders to understand their perspectives and rationale, including an evaluation of what is and is not in the record. The research included reviewing more than 100 AMI applications and talking with more than 120 individuals from commissions, utilities, and customer advocates.

The report identifies themes that were uncovered through the research and reflect what was found through the analysis and conversations. The report is organized around five main chapters:

- **How are utilities approaching the strategic plan for AMI?**
- **What analysis factors into an AMI justification?**
- **How are benefits discussed and presented?**
- **How expectations around collaboration and transparency are changing?**
- **What is the interaction between AMI and the customer?**

Each chapter provides findings and captures the collective insights and perspectives of participants. The report also includes a set of elements utilities and state commissions can consider when developing or evaluating an AMI investment proposal.

A goal of this report is to help inform the public, utilities, state commissions, and consumer advocates about AMI, and to help stakeholders understand each other's perspective in order to identify opportunities for success and illuminate the evolving nature of regulatory proceedings. The intent is ***not*** to advocate for or against any position since the final outcomes and the value of an investment remain the responsibility of the various parties in the states.

The aim is to help inform the evolution, bridge perspectives, and provide some clarity about technology's impact on the evolving nature of the regulatory process.

INTRODUCTION

Electricity has been fundamental to America's way of life for the past 150 years – powering everything from lighting, air conditioning, and home electronics to heavy manufacturing, high technology, and transportation. It is a vital commodity for customers of all scales, from individual households to multinational corporations. This commodity is so pervasive and integrated into our economy that it directly accounts for nearly 5% of GDP and contributes substantially to the remaining 95%.[1] Customers rely on utilities to generate, transmit, and distribute electricity reliably and affordably. Electricity is an indispensable part of our national and global economy.

Starting about a quarter century ago, a wave of technological innovation began to alter the utility marketplace, increasing both customers' reliance on electricity and their interaction with electric utilities. Digital and mobile technologies have changed the daily lives of most Americans. Distributed energy resources (DER)[2] are becoming increasingly pervasive, with many customers generating, storing, and managing their electricity to a degree not previously imagined. Where customers once were relatively unengaged and passive consumers of electricity, they are now increasingly active consumers interested in utilizing data, information, and new technologies to better manage energy usage. In many cases, they are also direct participants in producing and managing their own energy.

[1] M.J. Bradley & Associates (2017) Powering America. See: https://www.mjbradley.com/about-us/case-studies/powering-america

[2] DER is a resource sited close to customers that can provide all or some of their immediate electric and power needs and can also be used by the system to either reduce demand (such as energy efficiency) or provide supply to satisfy the energy, capacity, or ancillary service needs of the distribution grid. NARUC Manual on Distributed Energy Resources Rate Design and Compensation https://pubs.naruc.org/pub/19FDF48B-AA57-5160-DBA1-BE2E9C2F7EA0

In the midst of this transition, advanced metering infrastructure (AMI) emerged as a new technology. In 2010, the U.S. Department of Energy's (DOE) Office of Electricity, with utility cost-share, funded the installation of more than 15 million advanced meters to help modernize the infrastructure and demonstrate the benefits and value of the technology. This funding helped accelerate deployment of AMI systems, and today there are more than 88 million meters installed in the U.S. covering over 70% of U.S. households.[3]

Advanced meters, the technology at the core of AMI, have the capability to not only measure electric usage (the previous industry standard), but can collect, store, and communicate usage as well as other data (such as voltage, reactive power, and current) at more frequent intervals along with alerts that notify the utility to an outage or potential issue. Interval data from the meter can be used and analyzed to detect anomalies or improve operational efficiencies, to give customers more information and control over their energy choices, and to enable new products and services. Couple these capabilities against the backdrop of an increasingly engaged customer base and there is the potential for AMI to revolutionize operations of the electric grid while simultaneously transforming the relationship between utilities and their customers.

Numerous utilities have sought regulatory approval to invest in AMI, which includes advanced meters integrated with communication and data management systems. The cost and implementation of these systems is significant, and because AMI enables a wide range of potential uses and is often proposed prior to the end of the useful life of the current metering system, the introduction of AMI into the regulatory environment brings a complicated set of questions that, in many ways, represent uncharted territory for utilities, regulatory commissions, businesses, customers, and consumer advocates.

What is AMI?

Advanced metering infrastructure (AMI) is defined by U.S. DOE as an integrated system of smart meters, communications networks, and data management systems with automated, two-way communication between the meter and the utility.

Many commissions across the U.S. have approved AMI investments, but in recent years, some state utility commissions have rejected or denied utility AMI investment applications. Those recent rejections are noteworthy and garnered significant industry and media attention. In some cases, the denials elicited editorials and thought pieces questioning the commissions' actions. To those authors, the rejections were holding back needed investments in the utility distribution system and the customer benefits that new, advanced technologies like AMI offer.

[3] The Edison Foundation, Institute for Electric Innovation, Electric Company Smart Meter Deployments: Foundation for a Smart Grid (2019 Update) https://www.edisonfoundation.net/-/media/Files/IEI/publications/IEI_Smart-Meter-Report_2019_FINAL.ashx

Without seeking to offer an opinion on these state actions, DOE's Advanced Grid Research Division (AGR) decided to explore the recent history of AMI investment regulatory applications from the various parties' perspectives. The objective was to understand concerns, investigate how investments are being evaluated, and determine if there was additional data or information that could assist in the development or evaluation of AMI proposals going forward. Recognizing the transformative potential of AMI, DOE AGR also wanted to explore whether AMI and other grid modernization investments are resulting in a different regulatory approach from other more traditional utility investments.

Building on previously successful approaches that utilized DOE's convening authority and position as a neutral observer,[4] DOE AGR funded a phased research study to assess and analyze public filings, designed to provide a comprehensive understanding of recent utility AMI proposals and supporting business cases, and to speak with the different parties involved (i.e., commissions, advocates, utilities, and other stakeholders) to understand their perspectives and rationale.

This report aims to provide insights and perspectives on how AMI applications are being developed and evaluated, ***not to advocate for a position as final outcomes or the value of an investment remains the responsibility of the various parties in the states***. The hope is that this study will be informative to new and experienced practitioners and will provide perspective and insight into the vast and complicated questions surrounding an AMI regulatory review.[5]

[4] Two other successful U.S. Department of Energy collaborative stakeholder initiatives include the Voices of Experience and DataGuard® Energy Data Privacy Program. Information about these can be found at https://www.smartgrid.gov

[5] A regulatory review applies to investor-owned utilities as municipal and cooperative utilities are not typically regulated by the state. In some states, cooperatives are regulated by the state, so many of the lessons learned in this document may also apply in this instance.

RESEARCH METHODOLOGY

The research took a two-pronged approach: 1) analysis of public records and directives for AMI proposals and 2) conversations with stakeholders to gather additional details and intent that cannot be gleaned from the review of public documents alone.

Analysis of Public Filings

The U.S. electric utility industry is a complex and multifaceted combination of different utility types, market structures, and state regulatory frameworks, requiring both a utility-specific and a state-specific approach for the research methodology. The state context was particularly important due to its direct impact on both the process and the criteria that regulators apply when evaluating proposals.

The utility landscape in the United States is heterogeneous with multiple forms of utility ownership ranging from regulated investor-owned utilities to municipal utilities that are owned and operated by the local government to rural electric cooperatives that are owned and directed by their members.

An initial screening was done to identify those utilities that would be included in the analysis. They were screened based on revenue and utility structure, resulting in an initial pool of more than 200 utilities, including both investor-owned (owned by approximately 50 utility holding companies), and large public power utilities. Municipal and rural cooperative utilities are largely self-governed, so were not included in the analysis. Therefore, the pool of utilities was then further reduced to a subset of approximately 80 investor-owned utilities that had proposed AMI since 2010. The regulatory

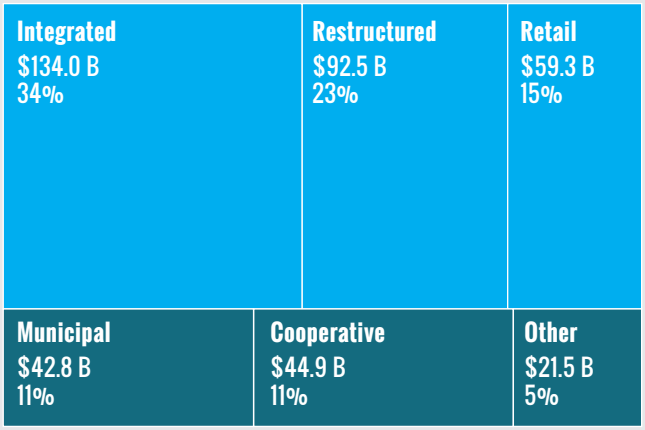
Utility Landscape in the U.S.

In the earliest days of electric companies, customers located in urban areas were served by either private companies (such as the Edison Illuminating Company in New York City) or by publicly-owned municipal utilities. The early decades of the 20th Century experienced tremendous growth and consolidation of private companies and resulted in the emergence of regulation. By 1930, nearly every state had established a public utility commission that regulated investor-owned utilities. In order to bring electric power to rural areas the federal government established programs and federal authorities to support the development of electric cooperatives. With electric power largely available to all customers, the industry continued to grow over the next several decades. However, beginning in the 1970s and continuing into the 1990s, a series of legislative and federal regulatory actions set the foundation for an evolution of the electric industry.

As a result of this evolution, we now identify six broad classes of utilities that customers interact with for their electric service:

1. **Integrated**: vertically-integrated utilities that own assets from generation to the customer meter
2. **Restructured**: utilities where customers have choice of retail electricity suppliers and that may no longer own generation
3. **Retail**: retail suppliers that deliver commodity electricity supply to customer, using the distribution systems of restructured utilities to deliver power
4. **Municipal**: utilities owned and managed by local municipal government
5. **Cooperative**: utilities owned by customers in a cooperative structure
6. **Other**: utilities owned and managed by a variety of government entities or public power districts

ELECTRICITY MARKET BY RETAIL SALES



U.S. Electricity Sales:
- $395.0 B annual retail sales
- ~$1.1 B per day

Investor-owned (72%)
- 34% integrated
- 23% restructured
- 15% retail

Publicly-owned (28%)
- 11% municipal
- 11% cooperative
- 5% other public power

Private Ownership Public Ownership =$1B annual revenue

filings of this subset were then examined in-depth to extract more specific details. Public documents between 2010 and 2019 that were reviewed as part of the analysis included:

- State Commission decisions and accompanying record
- State legislation or policy directives
- Cost-benefit analysis and proposed business case

Initial observations from the detailed reviews of the regulatory filings for utilities that proposed significant AMI deployments since 2010 served as the foundation for discussions with regulators, utility staff, and advocate stakeholders. The analysis combined with information from conversations with stakeholders informed the report findings.

As part of this study, 80 utility entities were identified as having proposed significant AMI deployment. These utilities were screened for detailed review of regulatory filings and associated cost-benefit information. In addition, highlights or short summary information is provided for over 60 utilities that either deployed AMI before 2010 or are not under the jurisdiction of regulatory commissions. Summary information about these utility entities is provided as an appendix to this report in an indexed, categorical review (see APPENDIX A: Index of Utility Entities Reviewed) and in a more detailed format which includes select holding company deployment strategies (see APPENDIX B: Utility Entity and Holding Company Summaries). Also included as an Appendix to this report are summaries that provide overviews of significant actions and policy developments related to AMI across the fifty states (see APPENDIX C: State Summaries). Each of these appendices includes links to notable resources that were identified as relevant for either the state or specific utility companies.

Analysis Categories

- **Detailed Analysis**: Regulatory filings and other proceeding information were reviewed with the primary objective of identifying the quantified benefits proposed. Simultaneously, other complementary categories (such as the methodology for quantifying benefits; the existing metering technology and proposed AMI capabilities; qualitative benefits identified, etc.) were captured.
- **Summary Analysis**: Many notable utilities were not included for detailed analysis. Most commonly, those were municipal or cooperative utilities or utilities with AMI proposals submitted before 2010. While the analysis of these utilities is not as extensive, a short summary is included as a reference.

While the research attempted to identify the specific benefits proposed by the utility in the context of a business case, it also sought to identify other, complementary benefits that were presented in the regulatory filings. In order to provide specific reference materials, an additional compendium is provided. It includes detailed notes regarding the regulatory filings, including proceeding summaries, cost recovery details, notable reports, utility applications, and key commission orders (see COMPENDIUM: Filing Documents) as well as comprehensive utility notes for the 80 "detailed" entities, scoping stakeholder engagement processes, business case elements, cost recovery methodology, docket format, deployment strategy, opt-out provisions, complementary technology, qualitative and quantitative AMI cost-benefit information, commission comment, and other notable trends(see COMPENDIUM: Detailed Review Notes). In cases where utilities filed joint applications, information is summarized under the largest utility. This information is provided in an effort to develop a reference database that could support regulators, policy makers, and industry participants in future AMI approval and deployment discussions.

Summary of Reviewed AMI Business Cases
Breakdown by revenue and review type

Revenue ($B)	Detailed	Summary
>$5.0	3	5
$2.5-5.0	14	5
$1.0-2.5	30	18
$0.25-1.0	31	21
<$0.25	2	12
TOTAL	80	61

Conversations with Various Parties to Understand Perspectives

While the public documents tell one part of the story, they do not tell the entire story. To get to the core of the question, it was necessary to hear the opinions of the participants and to understand what is not included in the written documents and record. These conversations sought to better understand the motivations and strategies of the involved parties, which allowed an opportunity for reflection on the process. Therefore, discussions and meetings with the various parties were an essential element of the research to understand what went into the process and resulting outcomes. Participants represented state regulatory commissions (commissioners and staff), consumer advocates, utilities, state attorneys general offices, and state energy offices in order to capture a broad range of perspectives.

Open, frank conversations were essential for eliciting meaningful insights, so to foster an environment where participants felt comfortable speaking freely without fear of attribution, the meetings adhered to Chatham House Rules, where comments are not attributable to specific individuals. The intent of the effort was to capture the collective parties' perspectives, not to evaluate or provide an opinion on specific state or utility actions. To reduce the potential for attribution to a specific state, commission, advocate or other stakeholder, the nearly 125 individuals from almost 50 entities from across the country who participated have been kept confidential.

Discussions included calls or meetings with specific individuals as well as meetings that convened a single stakeholder group from multiple states. Conversations covered a broad range of topics, and did not solely focus on the commissions' orders themselves. The conversations included individuals from across the country both in cases where AMI had been approved as well as cases where AMI had been rejected or denied. This offered a broad view and was done to more fully characterize the dynamics taking place. It was also important for identifying opinions, collective frustrations, outside pressures and influences, successful approaches, as well as potential options for improvements. Discussion topics included general thoughts about AMI, the nature of the regulatory process, and observations on the utility application, as well as other topics related to AMI.

The overarching questions used to frame the conversations were the following:

- Do investments in AMI and other foundational technologies require a different approach than traditional utility investments? If so, what do utilities need to show in order to justify the investment?
- Are traditional cost-benefit analyses capturing the benefits appropriately?
- What is the importance of intangible benefits (e.g., reduced outage times, increased customer convenience, etc.)?
- How can costs be specified for multi-state implementation to help satisfy concerns about equitable distribution of costs across states for back office systems?
- Can a collaborative process help educate stakeholders and address key concerns? What are the important components for the process and what are the main issues that can derail the application?

REGULATORY ENVIRONMENT FOR AMI

Several key aspects of the general regulatory environment as well as aspects specific to AMI are important for providing context and perspective on the regulatory review process.

The General Regulatory Context

At its essence, the state regulatory process is designed to mimic the pressures of a competitive marketplace upon utility monopolies to ensure customer needs for service are being met in a just and reasonable manner. To administer this function, state public utility commissions carefully weigh utility investment applications, taking into account input from advocates and other parties. The analysis of filings, testimony, and commission orders and decisions, along with discussions with various parties, identified a number of regulatory characteristics that impact the consideration of AMI around the country and the interaction of participants. Following are the noteworthy observations:

Prudent skepticism is inherent to the regulator and advocate roles. The roles of both the regulator and the advocate are to review and evaluate utility investments; to ask questions and examine assumptions to determine – to the best of their ability – whether an investment is well-thought out, will be implemented well, and will cost effectively provide value while simultaneously meeting consumer needs.

Every state is unique; there is no "standard" or "generic" process. Each state has different cultural and operational practices, and each utility's operational characteristics are unique. These cultural perspectives inform and influence the view of technology and its future value; however, commonalities exist.

Regulation is a quasi-judicial, litigated proceeding. The litigious nature of the regulatory process is significant. It often defines the relationship between the utility, advocates, and the commission, and can determine the amount of collaboration, transparency, and openness that can occur. Issues or specific items can become sensitive or litigious very quickly which can stifle openness or limit what people are willing to say.

Precedent is an important factor. The fact that any compromise or concession can establish a legal precedent that may have long-lasting implications can limit the exchange of information, or impact a more collaborative approach, that would otherwise be beneficial to the review process of new grid modernization investments.

Previous experience impacts participants' perspective. Few individuals enter a proceeding without some past experience. This experience acts as a lens through which statements or arguments are viewed or interpreted. The relationship of the utility, the commission and the other stakeholders based on past proceedings can also impact the level and quality of collaboration, and even how the application might be judged. A proven track record of partnership success can help facilitate, but will not necessarily reduce the level of questions or need for extensive justification.

Some voices can be underrepresented in the proceeding. Participation by some parties can be limited due to resource constraints. This puts the commission in the position of trying to expand a record to include multiple perspectives that may be absent from proceedings.

Policy and politics can be factors. The dynamics of any commission are complicated and include elements of policy and politics. Some commissions are elected while others are appointed. These factors can all impact the regulatory review.

The AMI-Specific Regulatory Context

The fundamental characteristics of the regulatory process bring into focus some of the difficulties and challenges with AMI proceedings and highlight the need for clarity and transparency into the regulatory review process. As quasi-judicial bodies, commissions rely upon development of a substantial record to justify decision-making. With new technology emerging across the electricity eco-system, traditional roles and practices within the regulatory environment may limit the ability of the regulator to more appropriately consider costs and benefits. However, the commission (and other participants) may also have access to more information than ever before.

Below are several noteworthy observations and factors that contribute to the changing regulatory dynamic:

Commissions can only rule on what is in the application. Even if the regulators and other parties in the state seem favorable to AMI, a detailed record is vital, requiring sufficient explanation and justification to warrant approval. An incomplete record will complicate and limit a detailed analysis. Regulators need this information up front, not in rebuttal. While this might seem obvious, reliance on an incomplete record to justify approval was often cited as a major factor contributing to commission frustrations.

Role of the commission is changing. Not only are commissioners being turned to as the implementer of policy, but the nature of the investments they have to review are changing. Many new grid modernization investments are forward-looking. Commissions, therefore, have to evaluate the value of future benefits today and whether the record provides sufficient justification to support that value. This is leading to increased scrutiny from commissioners and advocates. It is means that commission are identifying and evaluating which factors or objectives to optimize. To do this, they are utilizing models that can illustrate how the factors and objectives interact with each other so they can compare outputs and make a selection based on the result of these analyses and record.

Some current cost recovery mechanisms transfer investment risk to the consumer. The possibility of consumers bearing the risk for an investment's cost recovery is an inherent aspect of a commission's approval because the utility can recover all approved costs via rates unless the commission rejects or disallows specific costs. While this has become standard practice with utilities accustomed to seeking approval in advance, commissions are beginning to question the prudence of this as it makes customers the sole bearer of risk for new technologies.

AMI is different than other utility investments and is an early indicator of how the review process is changing. AMI is part of a suite of technologies that enable electric system operations with two-way flow of data, DER, and more involved consumers. AMI, with its many forward-looking future benefits, has the potential to provide a foundation for a future that can enable new products and services. To enable that future grid, AMI is often proposed to replace functioning equipment. These factors, coupled with AMI's numerous value streams that depend on how it is implemented, the capabilities of other utility systems, and how the utility proposes to use or allow access to the data are affecting how an AMI investment is reviewed or assessed. AMI reviews offer a preview of the changing nature of utility investments which have identifiable costs, but uncertain future benefits. It reflects not only how the technology is changing but also potential changes to the traditional utility role as DER growth continues. Commissions and advocates will have to increasingly grapple with greater uncertainty in benefits and outcomes.

The view of AMI's role as a foundational technology can be significant. The degree to which the commission and advocacy groups agree on the timing of a transition to a more distributed energy and consumer-centric electricity system, which is designed around consumer needs and more consumer involvement, has an impact on the review of an investment, such as AMI, that relies on future uses. Traditional investments, like transformers and distribution substations, reflect the basic purpose of the need to provide service. AMI, as both a meter with multiple uses cases and an enabler of new products and services makes the business case more multi-faceted and with differing elements from other utility investments.

Commissions' and utilities' role can create differing perspectives on value. Commissions and utilities can view the role of an investment differently due to the two parties' differing roles. Commissions are tasked with looking more broadly at the market as a whole, whereas, the utility will often focus on how the utility itself can meet customer needs and expectations. The transition to a more distributed energy, consumer-centric electricity system has introduced new players into the utility's traditional natural monopoly. Regulators may take a more holistic view, evaluating value both in terms of what the utility can provide along with how the capabilities and functionalities of the investment might enable a market for additional products and services. This can create a healthy tension because this broader view can compete with utility interests of being the sole provider of products and services.

Policy and politics matter. Each commission is tasked with implementing public policy and protecting the public interest. How commissions interpret their statutory mandate combined with any laws that have been passed by the legislature can influence how a commission views an investment like AMI and the level of detail necessary for review.

News travels fast and bad news lingers. News reports about utility actions or implementation often highlight the negative aspect of the story and due to technology complexity might not always accurately reflect exactly what happened or provide a full explanation of the issue. These bad news stories can linger and cast doubt over new AMI proceedings or requests.

FINDINGS AND OBSERVATIONS

As the research began, the expectation was that the analysis of public documents would reveal common approaches or specific benefits that lead to an AMI approval. Identifying and cataloging the business cases, testimony, and commission orders to identify commonalities and differences proved more challenging than anticipated. As noted previously, many AMI applications simply did not include a business case or any information illustrating the costs and benefits of the investment, further highlighting the lack of consistent methodologies used by utilities. In addition, the analysis revealed that the path to approval or the reason for denial was not necessarily straightforward. Further exploration through conversations and discussions discovered many more topics and experiences which form the underlying narrative of this report. Below are the overarching takeaways and findings. Additional findings and observations about specific elements in an AMI regulatory review are provided in the following sections.

There is no standard regulatory template for AMI applications. Perhaps not surprisingly, proposals before regulatory commissions do not follow a standard template or format. Proposals for investment in AMI systems were presented in a wide range of regulatory filings, from rate cases to grid modernization proposals to stand-alone applications. In some instances, investments in AMI were reported after the utility had installed the new equipment. The diversity of regulatory approaches reflects both the diversity of state regulatory environments and the differing strategies of the utilities involved.

There are no consistent evaluation criteria. Similar to the wide range of regulatory approaches, there were no consistent criteria applied to AMI proposals that allowed for easy comparisons from state to state. Utilities and commissions, in turn, applied a wide range of metrics to assess the costs and benefits of the technology. While there are some common techniques, such as the development of a cost-benefit assessment, there is no standard approach to determining the costs and benefits.

Quantified benefits were dominated by operational benefits. Where there were identified benefits, they were overwhelmingly dominated by operational benefits that, in many respects, were not directly visible to the customer. Of the more than 80 utilities where filings received a detailed analysis, only slightly more than half provided any quantified assessment of benefits. Of those identified benefits, more than 70% were operational benefits, most notably reduction in meter reading and service calls. The remaining 30% were attributed to capital benefits such as deferred investments or financial benefits such as recovery of bad debt or reduced theft.

Inconsistent implementation results have increased review scrutiny. The value that can be achieved from AMI varies. There are utilities that have deployed AMI and are realizing benefits for customers and across the utility enterprise. There are also examples of utilities that have not achieved the benefits included in the business case or that are using AMI solely to measure and bill consumption. These inconsistencies – even if it is only one example – are sowing the seeds of doubt in the minds of some commissions, advocates, and other stakeholders. While utilities may have a track record of prudent investments, this uncertainty, along with AMI's significant cost, is raising new questions and increasing skepticism of AMI's value.

Lack of a sufficient record hampers approval and increases frustration. Increasingly educated commissions, advocates, and other stakeholders, along with the inconsistent results, are increasing expectations around the level of details and specificity needed from utilities in a proposal. For utilities, this can seem like commissions and others are wandering into the utility's domain as the technical expert or micromanaging business decisions. However, AMI's multiple value streams that depend on where the utility put its focus and how AMI is implemented, are leading to the need for more specifics in the initial proposal and not in response to questions in the rebuttal phase of the proceeding.

AMI is a big project that needs a multidisciplinary team with executive support. AMI's potential to revolutionize operations of the electric grid while simultaneously transforming the relationship between utilities and their customers means that AMI will reverberate throughout the organization and touch more departments than just metering. Justifying future or speculative benefits can require cross-departmental conversations to consider future scenarios and opportunities. Explaining AMI's role in the utility's vision can require a shift from business as usual and how past proposals were developed. The regulators' general impression is that some utilities are not putting their best foot forward but are relying on earlier utility approvals or the assumption that commissions already see AMI's value.

Value is being left on the table. Experience from utilities has seen the emergence of new AMI value streams. This is increasing expectations about what should be included to justify an investment. Commissions and others want to understand the initial value the utility will achieve, as well as future value streams that will be pursued, as opposed to only being provided with enough value to justify the business case. While plans might change depending on what a utility learns from their data, parties expressed interest in understanding specifics about the intended path forward. Utilities note that including future value streams is a balancing act. There is sometimes a reluctance to commit given the speculative nature of some benefits because if it is not possible for the utility to achieve them, it might be viewed as a failure.

A cost-benefit analysis is a decision tool and is not necessarily a means in and of itself. Unsurprisingly, different commissioners perceive AMI and grid modernization technologies differently and have different expectations for what needs to be included in a utility application. While all regulators share similar core fiduciary and customer protection responsibilities, each commission and, indeed, each individual regulator, advocate, or other party will weigh potential benefits differently. Some will rely more heavily on a specific numerical cost-benefit analysis while others will rely instead on the narrative. Some commissions have greater flexibility in their rules than others, which can also impact the assessment and consideration of the investment.

Pre-application stakeholder processes can be valuable but depend on approach. Parties reported that a pre-application stakeholder process can be a beneficial mechanism for providing transparency and explaining the technology and implementation plans. They can prove even more valuable – not only as a one-way flow of information – but as a means for gathering the insights and perspectives of other parties. Collaboratives, or a collaborative stakeholder process, where engineers and other utility personal are available to answer questions can be a worthwhile mechanism for addressing concerns sooner and outside of the litigated proceeding.

Experience from AMI Investments funded through the American Reinvestment and Recovery Act (ARRA) have had mixed results in informing regulatory proceedings. ARRA investments in AMI have been a significant component of regulators and advocates' perspective and perception about the technology and its benefits. Recovery Act investments helped prove the benefits and value; however, a lack of reporting on the results of those early business cases, as well as some examples of utilities that are using AMI solely as a metering system, have increased skepticism.

"A bad proposal for a good technology is still a bad proposal."

-Commission

HOW ARE UTILITIES APPROACHING THE STRATEGIC PLAN FOR AMI?

The pathway to AMI deployment can originate from multiple places and via several means. These rationales and approaches will have an impact on the methodology and strategy of the utility, advocate, and regulatory worlds. Assessment of utility applications and conversations with participants showed that the impetus for AMI typically originates in one of three places: the utility, the legislature, or the commission. A utility that sees the role AMI can play in better managing the distribution system or otherwise improving electric service may propose an AMI investment. In some cases, legislative acts have directed the deployment of AMI as the base metering standard. A commission may ask utilities to submit an AMI application in order to enable particular policies or to receive more information about potential AMI uses. Regardless of its starting point, the investment, costs, and benefits will encompass some regulatory review.

Once the spark for AMI has taken hold, the next step is deciding on an approach for approval before the state regulatory commission. The analysis of public documents reflects that, again, there is no singular approach. Utilities have proposed AMI on a stand-alone basis, as part of a standard rate case, or as part of an overarching grid modernization proposal.

Type of Application Where AMI Was Proposed	
AMI Proposal	26
Grid Modernization or Bundled Proposal	39
Rate Case	15
TOTAL	**80**

The analysis also showed that no one avenue was significantly different from the others with regard to the outcome of final regulatory decision. Each utility will have to determine the approach that is best for it, taking into account any minimum requirements that were set by the state. This determination will be based on a number of internal and external factors, such as any stated public policy goals, internal planning about AMI's role in the utility's future vision, and the remaining useful life of existing infrastructure for meters as well as other technologies and systems that will integrate with or use AMI data and communication networks.

AMI is unlike other metering technology. It can collect and then transmit data to the utility (e.g., usage, voltage, reactive power) for specified intervals.[6] AMI data gives utilities more visibility into how the grid is operating, customer load requirements, and even how much electricity customer-owned generation is supplying to the distribution grid. AMI and its communications network can serve as a platform for additional products and services and to support the integration of distributed energy resources (DER). It offers multiple value streams that depend on how it is implemented. It touches the customer in ways that other investments do not. The potential of AMI alone makes it unlike other utility investments.

It also comes with a significant cost. The promise and potential of AMI's many associated use cases coupled with its significant cost is driving not only increasing expectations for more details and specifics, but also an expectation for new types of information. This may include questions about AMI's role in the company's vision, how AMI will be used to achieve policy and/or legislative objectives, what future investments will be needed, and – most importantly – what it means for customers. Meeting these expectations so that commissions and other parties have the reassurance they need to approve an application is no small task.

One of the results of these costs and potential value streams from AMI is the recognition that AMI is a precursor or recognition of a changing electricity system in response to changing customer preferences, growth of DER, and its impacts on the utility monopoly model. Regulators and utilities are in the beginning stages of trying to best identify those

> **"We had an executive sponsorship that understood the magnitude of changes and made it a business priority. This was critical."**
>
> *– Utility*

[6] Interval data is typically recorded in 15, 30, or 60 minute intervals that is then transmitted to utility back offices periodically during the day.

technologies that are likely to be needed in response to these changes. That comes with a significant amount of uncertainty, putting regulators and the utility in difficult positions to balance historical roles of the utility and regulation against a future more focused on balancing future customer actions and market opportunities, the benefits of which are harder to quantify.

Through the analysis of public filings and conversations with various parties, four major elements stood out about what commissions and parties are looking for in an AMI proposal:

- Explaining the vision
- Putting customers at the forefront
- Providing sufficient detail to support the record
- Making commitments and accepting risk

The Vision for AMI

Irrespective of a utility's approach, a key part of the public explanation and the implementation plan is the company's vision for AMI and how it will meet the vision and expectations laid out by a legislature or commission, when applicable. Presenting a holistic picture of the interconnected relationship between AMI and other utility systems, how AMI's associated data will be used across the utility enterprise, and future investments that will be needed to achieve specified benefits can provide a broader context of the overall investment needs and help demonstrate a utility's understanding of the magnitude of change required to achieve value.

Elements that can help provide context

1. The role of AMI for the utility's future business
2. Other systems that will integrate with AMI or use AMI
3. Future investments that will be necessary to realize benefits (e.g., new customer system)
4. New capabilities needed to achieve benefits (e.g., data storage and analytics)

While articulating the vision might, at first glance, seem simple, further exploration and conversations with utilities showed that it is not. Many questions arise when trying to determine the right balance of what to include, and utilities struggle with how to choose the right approach for having that conversation: Will laying out the entire vision inspire confidence, or will the costs be too daunting? Is it better to parcel the vision into multiple, smaller applications? Will too many details and the total investment make it harder to get approval? Or will a parceled approach leave commissions, advocates, and others with too many unanswered questions?

While there is no sure-fire, one-size-fits all answer, many commissions indicated that a well-articulated vision and transparency about potential future investments, even when in a stand-alone AMI proposal or rate case, can help to alleviate concerns and reduce speculation about the full cost and value of AMI.

Customers at the Forefront

Initial AMI business cases focused on operational savings such as reduced truck rolls; however, utilities noted that AMI's value has evolved from its early days. This evolution has also changed the lens through which commissions, advocates, and others view AMI. They feel that AMI proposals are too often focused on a small number of operational benefits that directly benefit the utility without an explicit connection to the benefits customers would receive, and that proposals have not necessarily evolved from early business cases to align with new found value streams. While operational benefits do provide value to the utility, all parties recognized their value to customers through increased convenience and shorter duration of outages all of which reduce customer costs. Commissions and advocates expressed interest in having an application make a direct connection between operational benefits and benefits to customers – putting them at the forefront rather than relying on the commission to infer or hear it during exploratory questions (e.g., predictive analytics can reduce unplanned outages increasing customer convenience or satisfaction).

> **"A full grid modernization proposal – the big picture – can be scary."**
>
> – *Utility*

Unintended (and potentially incorrect) assumptions can be made about the utility's commitment to consumers and the necessity of the investment depending on the speed with which a utility wants recovery for the investment or if value is dependent on changes in customer behavior. For one utility, the approach for their application changed as a result of feedback from stakeholder discussions. They shifted the entire focus to the customer; even operational savings and efficiencies were explained in terms of value to the customer. Another utility noted that they pledged to work constructively with the advocates in the state to develop a customer-centric plan for AMI after the consumer advocate expressed significant opposition and wondered where the customer benefits were. While operational savings can be important for justifying costs, grounding the vision in the value for the customer was identified as a critical component.

Providing Sufficient Detail

AMI is a highly technical investment that requires integration with other utility systems and its value depends on how it is implemented and utilized. For regulators to approve the investment, the application must reflect sufficient planning for prudent implementation and instill confidence that value will continue to be realized over time. Insufficient details upfront, that require the record to be built on commission data requests during the rebuttal phase, can give the impression of a poorly planned investment or lack of commitment to future value.

> **"When the commission helps build the business case through data requests, staff then has to say, 'based on questions I asked.' Including the information upfront makes a smoother process"**
>
> – *Commission*

Advocates who may already be reluctant to support a large capital expenditure are looking for even more details about utility plans and how customers will benefit. This discussion, at its core, is the result of a historical regulatory process where experts fight over numbers and the utility is the technical expert. Increasingly, that presumption is being challenged as regulators and advocates continue to learn more about AMI and its potential. This means that the description and detail of AMI benefits must evolve in response. The level of information that might have been sufficient for other investments is no longer sufficient from the regulator and advocate perspective regarding AMI.

> **"Without firm commitments, the regulator has to assume the risk of making sure benefits are realized. Old school strategies don't work for new technologies."**
>
> – *Commission*

The level of detail and scrutiny AMI proposals are receiving and the questions posed by regulatory staff and others can seem like micromanagement for utilities who are the technical experts on operating their system and can seem unnecessary because advanced meters are becoming the baseline meter technology. However, regulators and advocates noted that AMI's complexities and its forward-looking benefits that depend on how it is implemented requires a deeper technical understanding of what is involved and what will be achieved in order to prudently evaluate a proposal's merits.

Making Commitments and Balancing Risk

Two reoccurring and interconnected themes among regulators was the desire for specific commitments – not only during deployment but for achieving future value – and the allocation of risk. Both of these are a deviation from previous practice and highlight the paradigm shift that AMI, and, more broadly, other grid modernization technologies are causing. Becoming comfortable with this increased level of uncertainty is new for regulators, advocates, and utilities.

Conversations with various parties showed a disparity around the expectations and perspectives related to utility commitments. Many value streams are forward-looking and depend on specific operational characteristics, organizational changes, or changes in customer behavior, and that is creating uncertainty. Another contributing factor is the inconsistencies in results or lack of reporting from past AMI deployments. And because bad news travels fast and lingers, even one example where a utility-included benefit either went unrealized or was realized later than stated can cast doubts over new proceedings. This is leading to growing expectations and a desire for utility commitments. Well-defined metrics and additional reporting can give commissions and advocates confidence and level-set expectations about when proposed benefits will be realized. This observation is underscored by the analysis of regulatory filings, which found that proposals that were resolved with a settlement agreement typically included metrics and provisions that bound the utility to specific commitments regarding timelines and AMI functionality.

The second major challenge for regulators, advocates, and utilities relates to the allocation of risk. According to basic ratemaking principles, costs that a regulator deems as prudent will be recovered from customers via rates, thus transferring the risk from the utility or its investors to ratepayers (i.e., customers). This transferring of risk is inherent in the ratemaking process; however, AMI's reliance on future value streams is causing a reassessment of this principle.

Two typical approaches for a utility to recover costs

1. begin deploying AMI using shareholder funding, seeking cost-recovery at a later time, or
2. obtain regulatory approval of the costs prior to deployment, then recovering the approved costs in rates.

When AMI was first introduced, its significant cost and the unknowns related to its value might have driven the need for pre-approval. However, as AMI is becoming the standard baseline metering technology and as utilities that have deployed AMI have uncovered value, commissions are beginning to question whether customers should be the sole bearer of risk or if the utility should accept more risk, especially on upfront costs, in order to insulate customers from technology risks and the potential for unrealized benefits.

The question of risk revealed a variety of utility perspectives. Inherently, utilities have a lower risk tolerance and the rate of return on investments reflects that. Utilities noted that applications for pre-approval and/or expedient cost recovery are applicable under the existing ratemaking model, do not deviate from traditional practices, and are consistent given the size of the investment and the utility's fiduciary responsibility to shareholders. However, for regulators, an AMI proposal with a request for cost recovery over fewer years or front-loaded, or an apparent unwillingness to deploy AMI without pre-approval, can raise questions (warranted or not) about the utility's belief in the value of the technology and the utility's commitment to achieving future value.

> **"Regulated electric utilities are trying to best respond to these changes considering the historical preference for less risk-taking. AMI benefits are harder to predict, but collaboration can help address this issue."**
>
> – *Utility*

The risk associated with AMI's forward-looking benefits that depend on how a utility implements the technology and leverages the data is at the crux of the shifting regulatory paradigm and brings to light the natural push-pull of the regulatory process.

HOW ARE UTILITIES APPROACHING THE STRATEGIC PLAN FOR AMI?

Insights and Perspectives

These insights and perspectives attempt to capture the collective views heard through the many conversations and discussions with commissions, advocates, and other stakeholders.

Commitments amid uncertainty. For regulators, it is no longer sufficient to describe what a utility might do to achieve value. They want to know what a utility plans to do. While acknowledging the speculative nature of benefits, it was difficult for regulators to understand the reluctance to include firm commitments given the growing body of experience demonstrating AMI's value, especially for utilities that had pilots that could help provide some clarity. However, utilities noted that utility operations are different. Depending on numerous factors, the value one utility can achieve by implementing AMI might not necessarily be possible or cost-effective for another.

Supporting documentation is lacking. Utilities reported the usefulness of talking with other utilities that have implemented AMI. These conversations were worthwhile in increasing their understanding of what to expect and challenges they might encounter, and new requirements or skillsets that might be needed. However, a lack of documentation from previously approved applications that report whether the included benefits and costs were achieved because reporting usually ends when deployment is complete can make it difficult to point to other utility savings to support future value at their utility.

Clear commitments may require utility-specific information. Demonstrated value from other utilities shows what is possible; however, because each utility operation is different, savings from one utility may not translate to similar savings at their utility. The engineers that plan and implement many of these solutions require a significant amount of data and experience to ensure a positive outcome for the utility and customer. There was an understanding of the challenges of trying to determine future value with a lack of utility-specific data, but one regulator offered that a utility describe these benefits in terms of "if we do this, then we think this will happen," and then show the associated costs and benefits.

Need for flexibility given the dynamic nature of AMI implementation. Utilities noted that some amount of flexibility might be necessary due to implementation complexity and AMI's transformative nature. There can be unanticipated challenges during implementation and new skillsets may take time that might result in changing timeliness or shifting value streams. Generally, commissions recognized the need for flexibility; however, for them, it did not eliminate the need for clearly defined commitments. The inflexible nature of the regulatory process may need to change to accommodate the uncertainty that accompanies implementation of these transformative technologies.

Include details upfront. A proposal needs to stand on its own merits. A lack of specificity and details upfront in the application can raise numerous questions during the rebuttal phase of the proceeding to develop a sufficient enough record for the commission to issue a decision. This can put regulators and their staff in an uncomfortable position (i.e., having to use exploratory questions in rebuttal to make the utility's business case). To avoid this outcome, better documentation of benefits, technologies, and timelines, for example, are needed in the original filing.

Future use cases can demonstrate a utility's commitment to continued value. With growing knowledge about the new uses for AMI data (i.e., better forecasting, predictive analytics, understanding the impact of new rates), regulators and others emphasized the importance of including specific plans for future use cases because it can provide evidence of the wide-ranging value of AMI. Failing to include such plans can give the impression of a lack of contemplation of the full range of AMI use cases. Numerous commissions stressed the need to understand how AMI data would be provided and made accessible to customers and other market players. This was especially true for parties that see AMI's capabilities as instrumental for meeting policy objectives and providing a foundation for a new energy future.

Value and concerns vary. Thinking about the AMI application through the lens of different stakeholder groups can be beneficial for anticipating questions or areas of contention that might need to be addressed.

Risk allocation can be perceived as an indicator of technology risk. When reviewing a proposal, some commissions noted that a utility application that demonstrates a willingness to accept some of the investment risk can underscore the utility's belief that the investment is necessary and worthwhile.

Risk allocation may affect the utility cost of capital. Utilities receive a return on their investment (ROI) that reflects their inherently lower risk tolerance. Investing up front without preapproval carries the risk of a commission denying certain costs, which increases uncertainty about investment returns. Asking the utility, and hence shareholders, to bear more of the investment risk, could, in theory, equate to a need for a greater ROI to reflect the increased risk. Increasing uncertainty about ROI may have a negative effect on a utility's credit rates and ability to raise credit.

Technology innovation involves inherent risks that should be encouraged. Several commissions did recognize that new technologies are emerging fast and that the regulatory construct may not be responsive enough to match the increased speed of technology innovation. This could prevent a utility from trying new technologies that could offer significant value to consumers but carry some risk.

Transformation can require creativity and new thinking. Consumer behavior can be unpredictable, so not every new idea or program will be as successful as anticipated. Utilities need flexibility to change or eliminate unsuccessful programs, and to learn from missteps or programs that did not achieve the expected results. The perception that every idea or attempt has to be successful can stifle innovation.

Reporting beyond deployment can be worthwhile. The granular data AMI provides about distribution operations takes time to understand and evaluate. Reporting that extends beyond deployment can help shed light on new value streams and provide a better understanding of how the utility continues to achieve value. A lack of ongoing information is proving a substantial challenge for utilities that seek to leverage examples but lack the ability to cite other utilities' experiences and benefits.

WHAT ANALYSIS FACTORS INTO AN AMI JUSTIFICATION?

Utility proposals to deploy AMI systems have been subject to new forms of regulatory review when compared to requests for traditional analog meter technology. Analog meters were most commonly reviewed and approved as part of the utility rate case with well-defined uses, asset lifecycle, and costs. Deploying new meters or replacing existing ones were typically justified by demonstrating an operational need or that the existing meters had reached the end of their useful life. AMI systems, in contrast, play a more complicated role that can transform both utility operations and the utility-customer relationship. As a result, regulatory review may not be quite so straightforward and may even depend on benefits that can be difficult to quantify using a traditional cost-benefit framework.

Investments in AMI systems are typically subject to more rigorous analysis by regulators and advocates than other traditional capital investments. While AMI benefits include operational components, which indirectly benefit the customer through reduced fees or added conveniences, AMI can also include direct benefits to the customer, such as access to more detailed information about their energy use and the ability to participate in new programs and services. This can make the review of an AMI application more complex with advocates and regulators looking at the utility proposal differently. Advocates want to ensure that customers see a net benefit from the investment without an adverse or significant impact on a customer's bill. Regulators evaluate the utility's decisions and choices to understand if the investment will help achieve public policy goals and/or specific customer benefits while continuing to provide affordable, reliable electricity. As a result, AMI review often includes two components: a specific cost-benefit analysis and a technical review.

Some advocates are more open to accounting for hard to quantify benefits or seeing AMI as a foundational investment for the future utility system. Other advocates worry about cost pressure on utility bills and want to ensure customers are not paying more than they need or should for the technology. In these cases, arguments about a utility proposal fall into a set of traditional regulator arguments such as: depreciation of assets, return on equity, cost recovery, and obsolescence.

Cost Benefit Analysis

While the justification of costs and benefits is the cornerstone of most AMI requests (and other utility investments), analysis of public filings found that there is no one common template. Instead, there was a wide range of utility approaches. Some filings included – and some states required – detailed cost-benefit calculations. Other filings did not include any publicly available cost-benefit analysis information. Still other filings included some cost-benefit data, but it may not have been consolidated into a cohesive analytic framework. The great variety of regulatory approaches with regard to cost and benefit data highlights the diversity of regulatory frameworks in various states and the degree to which regulatory bodies rely on both specific benefits calculations as well as a more descriptive narrative about benefits.

What Costs and Benefits Were Included	
	Count
AMI Benefits Only	39
AMI Costs Only	49
Net Benefits	27
Cost, Benefits, and Net Benefits Provided	25

*Of the 80 AMI applications that received a detailed review, when provided, quantified AMI-specific costs and benefits were recorded. Two applications provided net benefits without specific, categorized amounts.

As the table shows, while there is a wide range of approaches utilities take to present cost-benefit analysis, state regulators have a similarly wide range of approaches and flexibility in how they review applications. Some require a cost-benefit analysis while others do not. Some commissions view a cost-benefit analysis as the critical aspect of their review, whereas other commissions view it as informative, but not necessarily determinative. Some commissions require a positive cost-benefit evaluation, but other commissions exhibit flexibility to produce a positive business case based on intangible benefits. Still others may approve an AMI investment proposal even with a negative cost-benefit analysis based on their determination of the future value that AMI's capabilities will provide for implementing policy goals or meeting customer expectations.

Regardless of how the analysis is applied by the regulator in their decision-making process, a specific cost-benefit analysis can be an effective tool for decision-making, providing transparency and insight into the utility's justification and reasoning. A cost-benefit analysis can assist the utility, regulators, and advocates in better understanding the key areas of the proposal, the utility's strategy, and the relative size of potential benefits. Similarly, a detailed cost-benefit analysis can help a commission justify approval of an investment proposal if the analysis provides sufficient information for them to reach that decision.

Many factors related to the utility's current technology and their vision for the future will contribute to the cost-benefit analysis. The ease or challenge associated with developing a cost-benefit analysis can depend on the utility's system and current metering technology. Some utility's will propose AMI as a replacement for aging, analog metering technology, making the cost-benefit analysis somewhat easier because the utility can rely on more direct cost reductions, like reduced truck rolls or the elimination of monthly meter reads. Other utilities might propose AMI to replace current metering technology that still has significant useful life in order to realize the potential that AMI offers, making the cost-benefit analysis more challenging.

Many factors related to the utility's current technology and their vision for the future will contribute to the cost-benefit analysis. The ease or challenge associated with developing a cost-benefit analysis can depend on the utility's system and current metering technology. Some utilities will propose AMI as a replacement for aging, analog metering technology, making the cost-benefit analysis somewhat easier because the utility can rely on more direct cost reductions, like reduced truck rolls or the elimination of monthly meter reads. Other utilities might propose AMI to replace current metering technology that still has significant useful life in order to realize the potential that AMI offers, making the cost-benefit analysis more challenging.

A cost-benefit analysis can be even more difficult for utilities that have been effective in reducing inefficiencies in their system by installing sensors or deploying automatic meter reading (AMR) technology.[7] Perhaps ironically, these strategies can take away some of those costs savings that are most easy to calculate explicitly and might otherwise be attributed to AMI, thus requiring the utility to justify the AMI investment based on more intangible benefits. Complicating matters further, many existing meters may still have useful life remaining, further eroding a business case that a utility needs AMI to provide basic operations of delivering and maintaining reliable service. Instead, cases like these require emphasis on how AMI will meet future customer expectations or will implement state policy.

The utility's specific operations and equipment might put more focus on the need for a more descriptive cost-benefit analysis with an emphasis on AMI's role as a foundational technology for grid modernization and an enabler of new customer programs. And even when not required, the process of developing a specific cost-benefit analysis can assist the utility in identifying potential gaps in a proposal. Defining and quantifying the potential societal and intangible benefits can be an important element – whether to achieve a positive cost-benefit analysis or to demonstrate the full breadth of the proposal and how alternatives were considered. One regulator noted that including intangible benefits can be the deciding factor in approving an AMI deployment.

Several areas of a cost-benefit analysis can be contentious in a proceeding and can derail or significantly hinder a process. Topics include depreciation of assets with existing useful life, amortization time of new assets, the speed of cost recovery, and the lifespan (or obsolescence) of the new meter.

[7] EIA defines AMR, or Automated Meter Reading, as a term denoting electricity meters that collect data for billing purposes only and transmit this data one way, usually from the customer to the distribution utility. https://www.eia.gov/tools/glossary/

Financial Regulatory Topics

i. **Rate of return on both old and new assets.** AMI replaces other customer meters. In some cases, those meters have not yet reached the end of their useful life and have not been fully depreciated, so the utility will request a return on the remaining life of both the old and new assets.

ii. **Amortization of new assets.** Amortization time for new assets is a component that will factor into the calculation of rates and impact on customer bills. The timeframe for recovering costs can vary, and a shorter amortization period would result in a higher monthly cost to customers than a longer schedule.

iii. **Cost recovery.** Recovering costs from an AMI meter typically occurs either through an additional rider on the customer bill or by getting rolled into the ratebase. Each of these has different considerations and concerns.

iv. **Obsolescence:** Obsolescence takes on a new significance because the pace of technological change is much faster with digital technologies than with analog equipment. It also raises questions about the potential for new technology advancements that might replace a still functioning meter.

Of these topics, obsolescence can be a major concern for both regulators and advocates, but is a relatively new concern for utility investments as utility equipment is typically used until failure. Advanced meters offer new functionality and capabilities and are sometimes proposed prior to the end of the useful life of the existing meters because AMI's capabilities and functionality might be seen as essential for achieving specific policy goals or responding to changing customer expectations. However, regulators and advocates expect the meters to last through the end of their useful life, and not be technologically surpassed within a few years. This is raising concerns that a new technology might render AMI obsolete before the investment has been fully recovered. Because a cost-benefit analysis will also include the remaining costs of the existing metering infrastructure, it can sometimes be difficult to achieve a positive value if the existing meters are not near the end of their useful life.

Another challenge for regulators is cost allocation for utilities with service territories in multiple states. AMI is more than the meter. It also includes a communications and back office system to transmit and process data, which can be significant contributors to the overall project cost. Some utilities operating in multiple jurisdictions have proposed a common back office solution to achieve economies of scale (e.g., buying a larger quantity of meters can be more cost effective on a per meter basis). However, allocating costs across service territories can be challenging. Some commissions are concerned that if theirs is the first state to deploy, their customers will carry a disproportionate burden of costs. Regulators

expressed a desire for a clearer understanding of how these economies of scale provide value to the customers in their state. One commissioner wondered why it would not be cost effective for their utility to have separate back office systems if municipal and rural cooperative utilities could do it. However, while utilities acknowledged that multi-state implementation can create concerns for the first state to deploy, they underscored the efficacy of a common system. Regulators identified a need to work together better to ensure that multi-state utilities are equitably allocating costs across the appropriate customers in the given states because a collaborative approach to discuss and resolve issues could be helpful; however, commissions are often limited based on regulatory laws and constraints.

"I expect to see an AMI application that is as detailed as something a utility manager would provide to the utility's financial officer."

– *Commission*

Technical analysis

The second analysis taking place is an evaluation of the technical capabilities of the technology itself. This level of detail and scrutiny of the utility's technology choices often introduces an unfamiliar dynamic. Regulators and advocates need a baseline understanding of the technology to determine if the investment will perform as described and accomplish the proposed utility and state goals. For example, if a regulator approves AMI with the expectation that the utility will propose new energy efficiency or demand response programs, regulators have a particular interest in ensuring that the meter will be able to support that program. For example, if a utility proposes a time of use rate, the regulator expects the meter and associated utility technologies to be capable of implementing that rate design.

Another factor in the increased scrutiny is AMI's potential role in grid modernization efforts and the parties' vision for the future electricity system. AMI investments can be significant and justification might rely on future benefits that respond to changing customer expectations. However, some benefits might require additional investments to upgrade legacy equipment or require new system functionality. Without these additional investments, it might not be possible for a utility to realize certain benefits (e.g., a new customer information system might be required to implement new rates or to integrate AMI data so that customer service representatives can better respond to customer calls). Details about implementation carry new importance because all of these raise the risk of increasing costs, which can significantly impact low-income customers. Therefore, commissions and advocates need a better understanding about how the technology works and the implications of different choices in order to evaluate whether the investment, with its associated functionality and capabilities, will provide sufficient value to consumers.

WHAT ANALYSIS FACTORS INTO AN AMI INVESTMENT?

Insights and Perspectives

The insights and perspectives attempt to capture the collective views heard through the many conversations and discussions with commissions, advocates, and other stakeholders.

A cost-benefit analysis provides a tool for decision making but is not necessarily a means in and of itself. An explanation of the reasoning behind what was included, and what wasn't, can help provide transparency into the utility's thinking and reasoning as well as utility priorities.

A positive cost-benefit analysis is not necessarily enough. In the past, gaining approval required utilities to show a positive business case; however, many commissions and advocates want much more information about an AMI investment. Rather than being satisfied that benefits outweigh costs, regulators, advocates, and others want to understand the full range of benefits the utility will pursue so that value from the investment does not go unrealized.

Prioritizing customer value. AMI offers various benefits for both operations and the customer. Not all value streams can be realized immediately and some will take time because the utility must become familiar with the data and what it means for their system. Commissions and advocates are looking for details about both near- and long-term benefits, a timeline for when those benefits will be realized, and what it will take to achieve them. They emphasized the importance of achieving benefits for customers sooner rather than later.

Data from an AMI pilot can be useful for substantiating projections. Data from an AMI pilot – even a small pilot – can be useful for demonstrating different value streams or explaining lessons learned or a new approach. Failure to use pilot data can give the perception of a rushed proposal or a proposal that has not been well-thought out.

There is a need for regulators to understand AMI's functionality to properly evaluate a proposal. More details about the utility investment are increasingly necessary and important to ensure the utility can implement their proposals in a way that provides the customer benefits and value. Providing details can address concerns about cost recovery, obsolescence, and useful life of the asset.

The view of AMI as a necessary investment for the future can influence the consideration. AMI is typically a forward-looking investment with accompanying future benefits that provides a foundation for new products and services. The degree to which the commission and advocacy groups agree on the timing and need for this change has an impact on the review of an AMI business case.

Perceptions about cost recovery may be different than intended. A quick cost recovery can appear as a lack of confidence in the technology's value. However, focus groups with consumers or requests for proposal to obtain technology cost estimates were steps that could demonstrate a utility's confidence in the technology's value and a willingness to bear some risk.

Conversations can benefit from broad perspective and different voices. A variety of stakeholders with different priorities and interests provide input to the commission. The utility is the one party with in-depth knowledge about the distribution grid, its operations, and its interdependencies and complexities. Transparent dialogue to explain challenges and costs for implementation and open conversations about new opportunities for value can assist the commission in their evaluation of a proposal.

Planning for Obsolescence. The pace of technological change is heightening concerns around AMI about the possibility of having to replace a meter prior to the end of its useful life. Including a discussion of planned obsolescence and how meters will be appropriately and effectively swapped out when necessary can help address concerns.

HOW ARE BENEFITS DISCUSSED AND PRESENTED?

Utility proposals reference a wide range of customer and system benefits that are balanced against the cost of implementing an AMI system. Regulators use evaluations of the stated benefits as a major consideration as they determine whether to approve or deny an investment of ratepayer capital. Similarly, consumer advocates have an interest in ensuring that customer value is balanced with rate impacts for a given customer class. Benefits can encompass both those that are easily quantifiable, such as operational benefits, and those that support policy priorities or a vision for the future and cannot be quantified so easily. Both can be an essential aspect to an application's review and evaluation, but they also present challenges and uncertainty for developing a business case. While all regulators share similar core fiduciary and customer protection responsibilities, each commission and, indeed, each individual regulator, advocate, or other stakeholders will weigh these potential benefits differently. Some will rely more heavily on a specific numerical cost-benefit analysis while others will rely less on the calculations in favor of the narrative description.

For most utility applications, benefits fall into two broad categories: 1) operational and system benefits and 2) direct customer benefits. The majority of benefits identified in utility applications were operational benefits with no stated connection to the customer, which in many instances may be easier to quantify. For example, among the AMI applications that included quantified benefits, on average more than 70% of the benefits were operational in nature, with the remaining benefits split roughly evenly between deferred capital investments and customer service benefits. Not surprisingly, commissions, advocates, and other parties emphasized that they want to know how the consumer – not just the utility – will benefit directly and recognized that intangible benefits can be a significant factor for an AMI business case.

Utilities identified benefits that typically included those with quantifiable value and those that, when included, were more commonly discussed in the proposal narrative. While the categories are presented as distinct and separate, they are not mutually exclusive. The benefits that frequently had calculated values associated with them are operational benefits, customer benefits, and capital benefits. Benefits that were included in utility proposals and were discussed in the utility narrative but did not typically have calculated monetary value were intangible benefits, cross-department benefits, and benefits that would enable a broader market for consumer products and services. These difficult to quantify benefits were commonly brought up in stakeholder conversations.

Analysis Benefit Categories

Benefits that typically included calculated value:

- **Operational benefits:** Benefits that improve operational efficiencies or enhanced distribution operations. These typically include reduction in truck rolls, in-field service visits, and improved outage recovery.
- **Customer benefits:** Benefits that are associated with directly serving the customer, including call center operations and customer programs.
- **Capital benefits:** Benefits that include deferred capital investment and financial considerations, such as reduced debt service, theft, or uncollectible debt.

Benefits typically discussed in the narrative with no calculated value:

- **Intangible Benefits: T**hese benefits are more difficult to estimate or quantify but can provide significant societal or customer value. Benefits include increased convenience (e.g., meter ping functionality and data that allow for diagnostics without having to send a crew thus reducing inconvenience to customers), more information that results in customer behavioral changes, and increased visibility enabling more proactive rather than reactive grid management.
- **Cross-department benefits:** AMI can be valuable for departments beyond metering operations and billing. For example, utilities can use AMI data to improve planning, to enhance forecasts, or to assist customer service representatives when talking with a customer about a high bill.
- **Market enablement benefits:** AMI can enable a market for third-party products and services. These can be viewed as a significant benefit to customers by regulators and advocates; however, they can be extremely challenging to identify and often provide no direct value to the utility. Data availability and access can require costs that might not be readily apparent to those outside the utility, making a discussion of potential plans and their associated costs and benefits essential.

Challenges

The cultural shift that AMI portends, and the significant amount of new data AMI generates, is raising expectations of regulators, advocates, and the utility about the types and timing of benefits. Regulators want customers to realize benefits from the investment sooner rather than later. While it can be difficult to assign numbers to intangible benefits, developing a methodology and providing estimates for these benefits can demonstrate that a utility has thought through what AMI will mean not only for customers but also for the business. It can give confidence that the utility understands the magnitude of what will be needed in terms of data storage or integration with other systems and can help identify future investment requirements for realizing value. Utilities worry this can be another point of contention, and regulators recognized it can be challenging; however, analysis can provide a level of transparency and give regulators the backing they need to approve a case.

> **"Utilities that deployed AMI promised benefits that haven't been realized. Now we wonder, is the investment worth the cost?"**
>
> – *Advocate*

At the end of the day, transparency and information around costs and benefits is essential. The utility is the expert about the AMI rollout and the only entity in the proceeding with a deep knowledge of its system, its technical capabilities and challenges, and specifics about how AMI can be leveraged. Openness about all future value streams and an explicit description about the operational and customer benefits upfront can help regulators and advocates better understand the overall value to customers in order to build and support a more complete record that is necessary for approval.

HOW ARE BENEFITS DISCUSSED AND PRESENTED?

Insights and Perspectives

Below is a summary of the insights and perspectives various parties shared through our discussions:

Some benefits take longer to realize than others. Utilities reported that there can be unrealistic expectations about how quickly benefits can be achieved. For some benefits, it takes time to implement the technology, learn and understand what the data means, and then apply that learning to utility operations and processes. While regulators and advocates recognize that some value streams might take time but others can be achieved more quickly. They stressed the importance of customers seeing some value from their investment sooner rather than later.

A clear timeline for realizing benefits can help to align expectations. Some benefits require integration of AMI with legacy systems, some benefits may rely upon additional policies or investments, and some value streams cannot be realized until the rollout of AMI is complete, which can take years depending on the size of the utility's service territory. Thoroughly explaining timelines or potential challenges in the narrative, as well as in the specific cost-benefit analysis, can help level-set expectations among the parties.

Intangible benefits can tip the scale to achieve a positive cost-benefit analysis. AMI business cases often hinge on intangible benefits. Quantifying those can help develop the record to support approval. Working through the process to assign numbers, while difficult, can demonstrate that a utility has thought through what AMI will mean both for customers and the business. It can help identify future investments that will be required and demonstrate that the utility understands the magnitude of what will be needed in terms of data storage or integration with other systems. Utilities worried it could be another point of contention. Regulators recognized it can be challenging, but it can provide a level of transparency and give regulators the backing they need to approve a case.

Think about benefits through the lens of the consumer. Explaining benefits in terms of value to customers can demonstrate a consumer-focused application. Even operational improvements (like predictive maintenance for transformers) can provide value to consumers (by reducing unplanned outages) even though the benefit might be indirect.

Customers are not homogeneous. Customers are different with varying expectations and different appetites for technology. They will prioritize value differently. Focus groups with customers can help the utility understand which programs hold the most value for different customers.

Past experience can impact future proposals. If a state has historically been reluctant to support future or hard to quantify benefits, then utility proposals will typically reflect this and might focus solely on quantitative operational benefits.

Some benefits may be difficult to achieve. While AMI offers a variety of benefits, the realization and or timing of some benefits will depend on the specific utility operations and legacy equipment. And while some benefits might be achievable, achieving them might not be cost effective. In addition, some benefits may accrue directly to customers or the market, but not the utility.

HOW EXPECTATIONS AROUND COLLABORATION AND TRANSPARENCY ARE CHANGING?

New grid modernization technologies like AMI are shifting the regulatory dynamic and changing expectations about the level and type of information commissions, advocates, and other stakeholders want to see. It is also creating new expectations for how parties interact and exchange information. Rather than being spectators who only listen and evaluate the final plan, parties increasingly want more details and want a voice in the programs and value streams a utility might pursue.

Deploying AMI and integrating it with other utility systems is complex. Understanding what it takes to achieve specific benefits or what is required to implement new programs can depend on the capabilities and limitations of legacy equipment. This can make understanding utility plans challenging and sometimes frustrating for those outside the utility that don't have the day-to-day knowledge of the system. Utility personnel, as the technical experts, have inside knowledge about system complexities and interdependencies, what it will take to achieve value, or the challenges and difficulties that might arise. Because AMI – and the data and programs it enables – connects to customers in new ways, and because the topics are varied and the technology choices are many, commissions and advocates want a window into this knowledge. In addition, a solid grasp of the technology's capabilities and limitations can be important for understanding utility choices and stakeholder viewpoints. This level of engagement and scrutiny around investment details is new for the utility.

Open communication and increased transparency can foster trust and instill confidence. It can help commissions and advocates understand how the technology and data will be used for the benefit of all – either directly through new programs or indirectly through improved operations. It can

give utilities insight into high priority programs or aspects in a proposal that could pose concerns. While commissions can ask questions via interrogatories, data requests, or orders asking for more information, sole reliance on the regulatory process to educate commissions and stakeholders on technologies like AMI can make the evaluation process and determination of whether its planned implementation will achieve policy goals difficult. In addition, sometimes the nature of the regulatory process and indeed the laws that govern it can create barriers that limit collaboration and a free-flow exchange of information. And the litigious, sometimes adversarial relationship between commissions, advocates, and other stakeholders that can result from the inherent push-pull of the regulatory process can lead to distrust and skepticism. Breaking down these barriers can help foster trust that will facilitate more constructive conversations and provide insights into utility motivations and choices, dispel misperceptions, and bring clarity.

Whether during a pre-approval stakeholder process or during a proceeding, each interaction offers an opportunity to build trust or instill doubt. The position of the individuals, their responses, and even their demeanor can have an impact on the credibility, authenticity, or confidence in a utility's response, whether in testimony or during meetings with stakeholders. Transparency, a detailed proposal, and a collaborative stakeholder process can help build trust and alleviate concerns.

Collaborative Stakeholder Processes

Stakeholder processes can be an important element for fostering collaboration and building trust. When done well, a stakeholder process can be an effective mechanism for bridging perspectives and bringing the parties together, increasing the chance for approval. When poorly executed, it can increase frustration and skepticism.

"What happened during the stakeholder process didn't translate into the application. Concerns weren't incorporated."

– Advocate

At its most valuable, a collaborative process can allow a utility to share their plans, to educate about the technology's capabilities and limitations, to communicate the complexities and interdependencies, to hear stakeholder feedback and concerns, and to level set expectations around benefits. Utilities can use it to explain the reasoning behind specific decisions and the timelines for meter deployments. It, along with access to engineers and others within the utility, can help to alleviate concerns by providing more explanation about what is actually required. What might seem straightforward and easy from outside the utility might be more complicated and difficult when actually implementing it.

Some states provide greater opportunities to engage with utilities before and during applications than other states. Some states allow staff to take active roles in organizing and leading workshops to better educate themselves and stakeholders; other states prefer a hands-off role for commission staff, instead relying upon stakeholders to ask questions during workshops. A lack of collaborative engagement where parties outside the utility can provide feedback or voice concerns can sour the regulatory

process as stakeholders attempt, through the regulatory and litigation process, to get information, understand motivations, and express their opinion and preferences through the docket and record. It can exacerbate existing tensions between stakeholders and utilities.

A stakeholder process, which may be inside or outside of the regulatory process, may be more efficient than discovery requests for gaining a better understanding of utility implementation plans because it allows questions to be asked in a less formal manner. This informality – and the fact that statements are not part of the official process that the commission relies upon for decision-making – can lead to more cooperation and free-flow of information. It can create an environment for constructive dialog that can help bring the parties together and increase communication and transparency. It can also help clarify differences that might not be possible to resolve, allowing the proceeding to focus on areas of significant disagreement. It can lead to a more comprehensive proposal and a more informed set of stakeholders that can result in more informed decision-making.

> **"We had presentations with stakeholders and kept them as part of the decision-making."**
> – *Utility*

A well-designed stakeholder process provides a forum for a two-way flow of information and ideas. While it may take more time and effort, it can be an important process for building trust and alleviating stakeholder concerns. While the deeper understanding that can take place does not replace the need for a well-developed record, it can provide additional context and background for understanding complex technical decisions, thus fostering a more collaborative environment.

Successful Approaches

Reported Characteristics

- Two-way flow of information
- Decision makers present plans and the value for customers and operations.
- Engineers available to explain complexities, interdependencies, or limitations
- Stakeholders ask questions and provide input

Potential Outcomes

- Provide transparency into decision-making
- Level-set expectations
- Understand stakeholder perspectives and concerns
- Narrow the list of disputes
- Identify elements for a customer engagement plan

HOW EXPECTATIONS AROUND COLLABORATION AND TRANSPARENCY ARE CHANGING?

Insights and Perspectives

The items below reflect the collective the insights and perspectives heard during conversations with the various parties.

A collaborative process that fosters two-way dialog can increase understanding and bridge perspectives. Access to utility personnel who can answer questions can be a worthwhile mechanism for informing stakeholders about the technology and addressing concerns before and outside of the litigated proceeding. It can also correct misperceptions that a utility proposal for AMI is motivated by its appeal as a capital project to achieve ROI rather than its appeal to fundamentally offer significant customer value.

Corporate demeanor matters. The corporate demeanor of utility staff can influence the value of the process. A more formal corporate demeanor can stifle impressions of openness and the free-flow of information because participants might doubt the willingness to listen and incorporate their views and perspectives when possible. The demeanor of commissions, advocates, and other stakeholders and their openness to utility plans and constraints can be equally important for achieving an open, constructive dialog.

Who manages the process can make a difference. How the process is led and managed can either encourage or hinder two-way conversation. It can influence its meaningfulness and the openness of the conversations. The rules governing commission interactions can hinder a commission-run process and make it difficult to allow non-parties adequate participation.

Agreement on all areas is a lofty but unlikely goal. Indeed, the parties recognized there might be areas of disagreement and that it might not be possible to achieve agreement between all the parties. However, all parties were interested in a more collaborative, constructive dialog that allowed for their voices to be heard and considered.

Mitigating surprises through continued collaboration. Don't necessarily limit the stakeholder process to pre-approval or an AMI deployment. Advocates and commissions do not like surprises, or waiting until a utility filing to hear about issues. An ongoing stakeholder process that continues through deployment and beyond completion, can provide a forum for continual collaboration and be valuable for keeping stakeholders informed on progress or challenges that may arise and could impact the implementation timeline or speed with which benefits can be achieved.

Collaboration can help utilities think through value from all perspectives. Collaboration with stakeholders or focus groups with customers can provide important insight into what programs or value streams are most important to various parties or what concerns they may have. This insight can lead to a stronger proposal and assist utilities in providing responses to advocates' or other parties' questions.

Past experiences matter. The relationship between the utility, the commission, and the other parties can impact the level and quality of collaboration that is possible. However, this characteristic also demonstrates the importance of a less formal stakeholder process. Providing a forum where parties can break out of the quasi-judicial regulatory process can reset expectations and relationships to enable a more transparent exchange of information.

Addressing stakeholder concerns can enable more productive future interactions. A trusted process that allows stakeholder questions to be heard and considered, and a resulting application that responds to those questions or concerns can increase trust and confidence resulting in more lasting and constructive communication that could flow into other proceedings.

Tensions exist around the capital intensive nature of AMI. AMI's large capital expenditure can create concern from commissions and advocates about the reason a utility might propose AMI and whether the investment is unduly influenced by utility financial incentives. A collaborative, transparent, and open stakeholder process can provide a mechanism for sharing program details, hearing concerns, and increasing the understanding around utility intent for the investment and the value to customers.

Utility preference for its own programs. Utilities may focus on up-front expenses and programs that directly benefit the utility and in turn the customer through lower rates. However, delaying discussion of new rates or access to data until after deployment of capital infrastructure may give the impression of valuing shareholder value over customer value.

Allow engineers and technology experts to present, not only lawyers. Having individuals that can speak knowledgeably about the technology and the reason for decisions can demonstrate transparency and increase the level of confidence in the answers. Allowing engineers – not just lawyers – to discuss plans and implementation options can demonstrate candor and openness, and give credence to responses. When the response to a commission question is too often: "I'll get back with you," commissions can begin to question the willingness to respond.

Carefully chosen words can make authenticity illusive. Utilities recognized that being too careful when choosing words can make it difficult to come across as authentic and can give the appearance that the utility is not being fully forthcoming. In a process where a misinterpretation or misunderstanding can have significant financial consequences, however, the need for measured, deliberate responses is vital. While utilities like to be accurate and precise, and provide answers based on data from their own system, a hesitant or careful response to a seemingly basic question can give the appearance that the implementation plan had not been thoroughly thought through. This might result because the response requires numerous caveats or covers some uncertainty, making it difficult for a specific or direct response.

Responding amidst unpredictability. Implementation of new technologies carries a certain amount of risk, including potential delays in implementation. While commissions recognized the need for flexibility and acknowledged that the speculative nature of many AMI benefits can cause costs and plans to change, utilities were reluctant to make statements they were not certain they could fulfill. This can be difficult because what may seem like an unwillingness to respond may be a result of the speculative nature of some aspects of AMI.

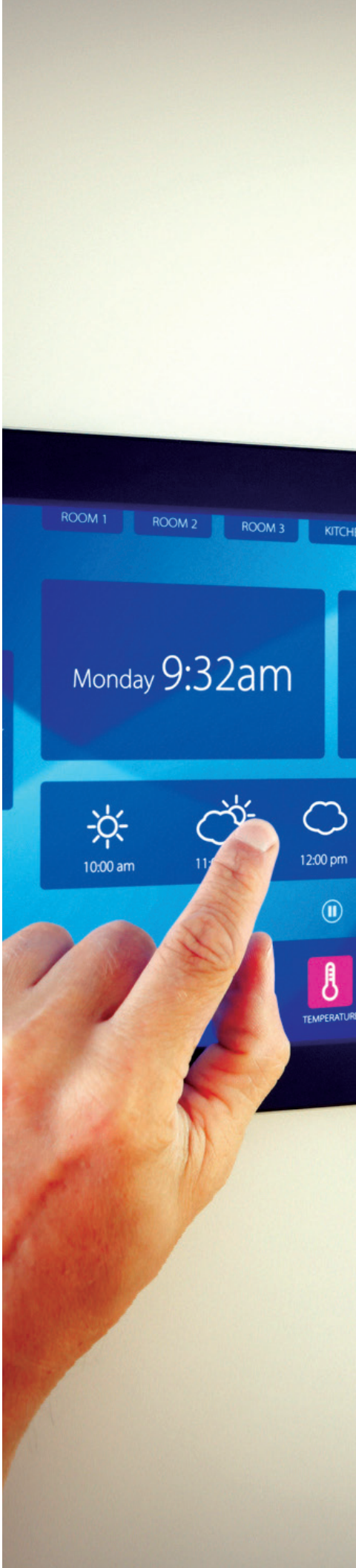
Greater need for reporting through and beyond AMI implementation. Reporting on progress and benefits can be burdensome for utilities that already have significant reporting requirements pursuant to statute or other commission requirements. However, reports on deployment progress, status changes, or delays in benefit realization can be beneficial for building trust and confidence. Reporting, whether in a documented report or part of an ongoing stakeholder collaborative, can be useful for communicating challenges or changes due to unforeseen complexities.

WHAT IS THE INTERACTION BETWEEN AMI AND THE CUSTOMER?

A central question of any AMI business case is, “What impact will AMI have on the customer experience?” This one question brings to light the shift that is taking place within the electricity sector. Customers are changing. Their expectations are changing. They are more engaged and want more choices. Increasingly advanced technology is allowing them to actively engage with the electric system in ways they would not have been possible in the past. While they may not be asking specifically for an advanced meter, they are seeking the capabilities, data, and outcomes that AMI provides.

AMI has the potential to help utilities respond to these changing customer expectations. Its data can be used to improve the customer experience, to support customer decision making, to enhance utility operations, and to allow the utility and third-parties to offer new, innovative products and services. AMI’s capabilities and the way it touches the consumer make it unique from other equipment typically installed by the utility. This is driving a more consumer-centric focus – where value is not only evaluated on the utility’s ability to provide safe, affordable, reliable electricity but on its responsiveness to changing customer needs and direct value to the customer.

With this wide reach, AMI is not viewed by regulators and stakeholders as merely another traditional utility investment. Instead, they are weighing the significant cost of an AMI investment against the potential to improve the customer experience, enable new customer programs, and integrate a widening array of consumer devices. As a result, AMI has uncovered a number of customer-facing topics that, on the surface, might seem straightforward, but can present areas of significant disagreement and contention. In most situations, the consideration and resolution of these issues has a direct impact on the success and acceptance of the AMI



proposal itself. Four broad classes of issues were most prominent in the analysis of proceedings and conversations with the various parties, including:

1. Enabling customer capabilities and technology
2. Customer choice and opt-out
3. Impacts to vulnerable or disadvantaged customers
4. Education and engagement

Many of the projected savings or benefits from an AMI proposal depend on customer programs and participation. This creates a relationship between the customer and the AMI system that contributes to the increased sensitivities surrounding an AMI proposal, requiring lengthy conversations that can delay or even derail a proposal unless participants have the opportunity to adequately address them.

The complexity of these topics often benefits from detailed discussions that occur in separate proceedings or stakeholder processes where impacts can be more fully discussed and strategies can be developed collaboratively. However, these separate proceedings can also create challenges or introduce tensions for participants whose support for AMI is often contingent on the outcome or implementation details of these related discussions. It can also have an impact on the parties' negotiating strategy, making it difficult to achieve key areas of interest if an AMI investment has already been approved.

Elements of the topics can also have a direct impact on the utility business case and cost-benefit assessments that rely on customer savings and hard-to-quantify customer benefits, further contributing to many regulators' and stakeholders' concerns about firm commitments and accountability. As a result, establishing a clear and compelling understanding of how implementation and education will support customer acceptance becomes a critical aspect of a well-informed commission decision.

Many of these topics accentuate the increased attention and priority on customer education and engagement plans. Customers might not be asking for an advanced meter specifically, but they may expect the capabilities and data AMI offers to meet their changing expectations. Education and interaction with customers to understand the new capabilities and program can be vital for achieving overall value.

Enabling Customer Capabilities and Technology

A unique aspect of AMI's functionality is that it can enable new capabilities for customers, allowing them to participate in utility programs or to use non-utility technology solutions in their homes or businesses. This is leading to increased scrutiny of the utility's technology choices to determine the ability for the customer to integrate with devices in their home. An AMI system that can connect with devices purchased by consumers introduces a new set of complexities and interoperability challenges that may not be present with other utility programs, but which can be seen as essential for providing optionality for the consumer in the context of AMI.

Therefore, AMI's capability to deliver more granular data to the consumer in a meaningful way becomes a central consideration. AMI data is not only valuable for the utility and its operations, but also offers value through new programs or services provided by either the utility or a third-party vendor. This adds an unusual element to a regulatory review. It is expanding the commission's and advocates' views of value. Regulators want to understand not only the value beyond that which can be achieved through utility programs, but also how access to value can be achieved more broadly. Regulators and advocates are assessing how an investment will best serve customers at large and what option might be most cost-effective for consumers, whether that is a utility solution or a third-party product or service.

AMI data can be valuable for customers, but often the level of value can depend on a customer's or third party's ability to access that information. To evaluate the value customers will realize from an investment in AMI both from utility and third-party offerings, regulators and advocates are increasingly interested in specific utility plans to provide customers access to their usage information in an easily accessible, standardized format. They want to understand what the process will be, in what format, and how customers can provide consent to third parties in order to access the customer's data?

Discussions about data access often go hand-in-hand with discussions about consumer privacy. Utilities, commissions, and advocates alike are interested in protecting customer data from illicit usage or access without customer consent. However, perspectives on access and the attention it received in filings vary greatly. Some applications did not address customer data access except in the context of utility platforms or websites. Some did not include any discussion about making usage data available. Others provided high-level summaries of how data would be made available, but treated data availability as a future concern rather than a core component of the AMI proposal under consideration. Conversations with advocates spanned the spectrum as well. Nevertheless, providing a set of clear expectations, specifics about the implementation, and a time-frame for allowing customers to access their data and the process for authorizing third parties access can show a responsiveness to customer needs.

> **"How will I know that a utility will use the investment to increase value if that isn't in the proposal?"**
> – *Advocate*

In this context, many regulators raised concerns about the ability of the consumer to utilize the Home Area Network (HAN) capabilities of the AMI system. The ability of the meter to communicate in real-time with the consumer devices through a HAN system is a benefit where customers can see value most directly because it allows an instantaneous feed of usage information and event notification (such as for demand response) directly to the customer's devices. Regulators saw this is an opportunity to give the customer greater control of their usage and to enable additional product offerings to customers.

Customer Options and Opt-Out

Early AMI deployments saw significant pushback from customers who did not want an advanced meter, typically for reasons related to privacy or health concerns. This uncovered another new area for utility-owned technology – the idea of giving customers technology options. Customer opt-out policies are a common strategy to complement AMI deployment in response to customer concerns. The underlying premise is that the customer has an option to "opt-out" of having a fully functioning advanced meter installed at their property. Utility proposals and commission decisions about specific fees, the options available, or whether opt-out is even allowable vary across the country. Some commissions have not allowed opt-out while the majority of approved AMI opt-out programs include some recurring fee that customers who have opted out of having an advanced meter must pay to cover the cost for maintaining separate systems for meter reading, bill generation, maintenance, and installation of that meter.

Customer engagement activities to educate consumers about the technology and its benefits have been found to minimize the number of opt-out cases, underscoring interest in utility customer engagement plans. However, this education has not necessarily diminished the contentiousness of discussions regarding fees.

Impacts to Vulnerable and Disadvantaged Customers

While one of the primary benefits of AMI is the ability to enable functions or new rate designs, such as time-of-use rates, advocates often raise concerns about the impact of these new rates on vulnerable and disadvantaged customers. Some see alternative rate designs as a means for implementing state policy, reducing fossil fuel consumption, or for saving consumers money. Others worry that time-of-use rates, if not thoughtfully implemented, will impact customers who do not have the flexibility to change their consumption pattern to take advantage of lower prices. As a result, commissions and advocates often want more information about the design of new rates, how they would be implemented, and what choices consumers would have. Our discussions revealed that AMI proposals that did not address these issues were often met with more skepticism. For example, details related to the kinds of online tools, bill comparisons, customer bill alerts, and other analytical tools that can assist the customer to better manage their bill and usage were viewed as critical. Nevertheless, advocates and regulators both expressed interest in having these programs and identified them as important customer-related benefits.

Advanced meters can include remote connect and disconnect capabilities. While this function can provide significant value to the utility and convenience to the customer, similar to new rate designs, it raised questions about how disadvantaged customers might be disproportionately affected. Since the utility no longer needs to roll a truck to connect or disconnect service, utilities can save time and money

[8] Cold and hot weather rules limit the ability of the utility to disconnect service during defined cold weather periods and hot weather periods.
[9] Last knock rules require the utility to send a representative to the customer's home and provide one last chance to pay any outstanding balance before disconnection.

through reduced gasoline and maintenance costs, increased worker safety with fewer crews in the field, reduced fees, and lower greenhouse gas emissions. Customers can benefit through lower fees, quicker reconnection times for non-payment, and the added convenience of not having to wait around for connection after moving to a new residence. At the same time, many advocates worry that low-income customers may be harmed and that hard-won customer protections like cold and hot weather rules[8] and last knock rules[9] may be diminished or removed although utilities noted that they still typically provide notifications and abide by seasonal rules.

Another often proposed rate program is prepay or pay-as-you-go. As with time-of-use rates, these programs rely on the capabilities of the AMI system, but raise consumer concerns. Prepay – as the name suggests – allows customers to pay for electricity in advance. As electricity is used, the customer's balance is reduced and if a customer does not add additional funds before they are depleted, then service is disconnected. While prepay programs are not new, they are gaining attention because AMI data and functionality offer new features such as daily alerts about how much energy has been used, projections on how long funds might last, and when funds are about to run out. These programs can offer more flexibility, lower fees, and no surprises at the end of the month. This, in turn, can reduce a utility's bad debt, leading to lower rates for all customers. Some consumer advocates have expressed concerns that prepay programs will target low-income customers who many not understand the implications of the program, who may have less flexibility to change their behavior to decrease usage, and who could be adversely impacted if vital consumer protections are lost. Noting advocate concerns, some utilities were reluctant to propose prepay as a solution, worrying that inclusion could derail an AMI proposal. Some commissions, however, expressed interest in the benefits that a well-designed program could offer. Collaborative discussions can be crucial for alleviating concerns and developing a program that benefits customers while maintaining essential consumer protections.

Customer Education and Engagement

Early deployments of AMI brought to light the new importance of utility-customer engagement programs. AMI has the potential to transform the utility-customer relationship from one where customers passively use utility-provided electricity to one with a more active, engaged consumer. AMI can provide data to inform customer decisions about managing their electricity, to integrate with new products, or to enable innovative products and services by utilities and third parties.

Understanding a utility's plan can be instrumental for providing confidence that customers will see value from the investment because sufficient education and engagement can give customers the knowledge they need to ensure the uptake of new programs or that customers understand how a new rate may impact their bill. This is heightening expectations around utility customer education and engagement plans. This is especially true when a utility business case relies on cost savings from customer behavioral changes. Underscoring this concern, the review of regulatory filings found that of the more than 20 AMI proposals that were resolved by a settlement agreement between the parties, elements of the customer engagement plan were addressed as stipulations within the agreements in nearly every one.

WHAT IS THE INTERACTION BETWEEN AMI AND THE CUSTOMER?

Insights and Perspectives

These insights and perspectives attempt to capture the collective views heard through the many conversations and discussions with commissions, advocates, and other stakeholders.

AMI data can be useful for showing the impacts of new rates on customers. One benefit of AMI is that granular usage information can be used to understand the impacts or results of various rate designs on customers. Using data from AMI pilots or explaining how data gathered as meters are deployed (for utilities that have not performed a pilot) can be used to better understand or develop new rates and can instill confidence that rates will achieve value without inadvertently impacting certain customer classes.

With innovation comes uncertainty. New rate designs that offer new options for customers to save money and can provide system benefits are an often cited customer benefit. AMI data can help inform new options and provide insights for utilities to develop innovative, creative solutions that regulators and other parties want to see. However, outcomes and results depend on customer behavior, which is uncertain and is not always as anticipated. This means that some rate designs might not achieve expected results. Regulators and advocates underscore the importance of including detailed plans, while utilities noted the need for flexibility to encourage innovation because some ideas might not be as effective as anticipated.

Customer education and engagement is critical for participation. Providing details on customer engagement and education plans can show that a utility has thoughtfully planned for potential impacts to customers and how vulnerable populations will be educated and informed so they can participate and see value.

Consumer protections are essential. All states have consumer protection laws in place. While the installation of an advanced meter with a remote connect/disconnect switch might present new options for notifying consumers, the mere presence of AMI does not, itself change any effective rules. Plans that include details about how customer protections will be maintained can be critical for alleviating concerns and demonstrating a customer-centric plan that places customer value at the forefront.

AMI can enable new customer interaction, but it requires education and engagement. A detailed customer education and engagement plan can demonstrate the changes and involvement that will be required to achieve customer value from AMI. AMI can transform the utility-customer interaction and improve customer service. It can provide opportunities for new programs that save customers money or new services that respond to changing customer expectations. And some customer benefits depend on customer behavioral changes or the uptake for a new program. However, to achieve positive results, customers need sufficient knowledge of new capabilities and what new programs and services will mean for them. A detailed customer engagement plan can help explain utility plans and provide confidence that results and value will be achieved.

A clear data access plan demonstrates a commitment to direct customer value. Many commissions see access to data as an important element of customer value in the context of AMI. Therefore, utility plans that directly address and include details on the type of data that will be made available, the means by which it will be made available to the customer, and the process for providing access to third parties authorized and designated by the customer can provide confidence in broader customer value streams.

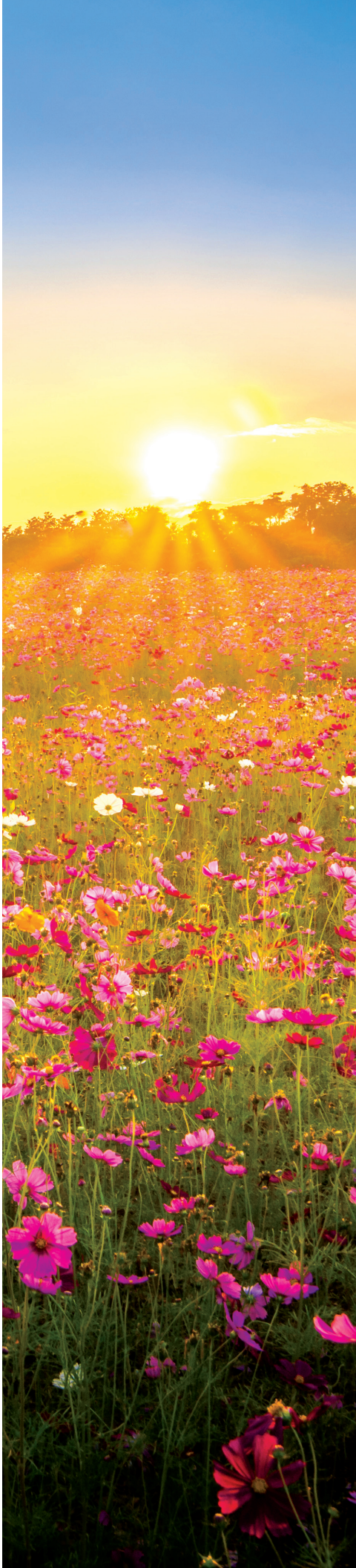
Concerns about privacy have not dissipated, but in some cases the focus has shifted. During early AMI deployments, some customers expressed significant privacy concerns about how the meters enabled the collecting of very granular energy usage information. Precisely because this information reveals much about the customer's operations or lifestyle, it is both sensitive and valuable at the same time. Some early customer concerns centered on whether collection of the information was overly intrusive. Discussions with the various parties revealed a shift. Commissions and vendors recognize how data can be utilized to provide customer benefits, but with a continued attention on the need for additional privacy protections for that data. Some utilities and stakeholders promote data protection strategies that focus on limiting access solely to the utility and customer, while others view these strategies as leaving significant value untapped for the consumer and the market.

A **well-articulated data policy framework can facilitate the data privacy and access discussion**. Within the context of this growing interest to balance customer value and privacy protections, it can be useful to establish an overall data policy framework developed through meaningful discussions about the types of data being collected, how that information will be used by the utility, and the mechanisms allowing customers access to their data for their own use and by third parties that they authorize. Components of data policy that were commonly cited in discussions include the implementation of standards-based data sharing protocols, enablement of home area network functions, uses of value-added services to be implemented by the utility, and the expected roles of customers and customer-authorized third parties.

MOVING FORWARD

AMI has garnered attention because of the size of the investment, the forward-looking, speculative nature of benefits, and its unique, wide-ranging benefits that are highly dependent on how the technology is implemented and the value streams pursued. Conversations with stakeholders across the country, together with the analysis of the regulatory filings, revealed a range of priorities and perspectives. For some, AMI's capabilities and functionality are seen as an essential platform for a future electric system that responds to the changing needs and expectations of customers, who want more information and options and who are increasingly engaged in their energy choices. For others, it is an expensive investment that offers opportunities but comes with significant costs, raising concerns about the impact and value to consumers.

AMI touches the customer in ways other investments do not and requires a substantial investment in communication, data collection and storage, and even upgrades to other utility systems. In addition, the context under which these investments are being considered is changing. This is leading to increased scrutiny from commissions and advocates that want more specific details about utility plans, including technology descriptions, deployment plans, and clear commitments regarding the timing of capabilities and benefits for customers. A desire for specific commitments arose frequently during discussions due to the variable nature of benefits and because much of the value of AMI reaches beyond the utility boundaries and has implications for the consumer during a period of tremendous change. For example, data generated by AMI can be used by the utility, customers, and other third-party service providers, each of which can build value from the data in different ways. As previously noted, this makes AMI unique from other utility investments, and the increased scrutiny is a deviation from the process for other more traditional grid infrastructure investments.



In addition, analysis of filings and conversations confirmed that the inherent structure of the regulatory review process can create barriers that limit the engagement and interaction needed to address the complex issues raised by an AMI proposal. The quasi-judicial nature of these proceedings means that the prospect of litigation and concerns about precedent are never far out of mind. This can stifle openness, transparency, and collaboration.

Conversations with the various parties uncovered common questions and elements to consider regarding AMI proposals as well as some helpful resources. Those have been compiled to provide a possible resource for utilities developing their proposals or for commissions and advocates reviewing a filing. These are not meant as guidelines or a method for ensuring approval. Each AMI application must be evaluated through the regulatory process in each particular jurisdiction with careful assessment of the proposal's merit and value weighed against costs and impact to customers. The hope is that the insights and perspectives in this report can help inform the conversation, bridge perspectives, and assist all parties as they continue their efforts to provide safe, reliable and affordable electricity in response to changing customer and societal expectations.

Helpful Resources

- Voices of Experience|Insights on Smart Grid Customer Engagement, (September 2013) https://www.energy.gov/sites/prod/files/2013/07/f2/VoicesofExperience.pdf
- Voices of Expeirence|Leveraging AMI Networks and Data (March 2019) https://www.smartgrid.gov/document/VOE_Leveraging_AMI_Networks_Data
- NARUC Resolution on Smart Grid, (July 2011) https://pubs.naruc.org/pub.cfm?id=53985C3E-2354-D714-51A8-281C62A21700.
- DataGuard|Energy Data Privacy Program, https://dataguardprivacyprogram.org/
- Smart Grid Interoperability: Prompts for State Regulators to Engage Utilities, National Association of Regulatory Utility Commissioners (April 2020). https://pubs.naruc.org/pub/28950636-155D-0A36-313C-73CCEA2D32C1
- Value of Customer Data Access: Market Trends, Challenges, and Opportunities, National Association of Regulatory Utility Commissioners, prepared by Navigant (April 2015). https://pubs.naruc.org/pub/536E2D7C-2354-D714-5129-435231D889E0
- Distributed Energy Resources Rate Design and Compensation: A Manual Prepared by the NARUC Staff Subcommittee on Rate Design (November 2016). https://pubs.naruc.org/pub/19FDF48B-AA57-5160-DBA1-BE2E9C2F7EA0

Elements to Consider When Developing a Proposal

A clearly articulated, well laid out plan with sufficient detail can make an application easier to evaluate. The compiled list below reflects the overarching elements expressed during discussions with commissions, advocates, and other stakeholders.

- ☐ **Put your best foot forward by pulling together individuals from across the organization to develop the proposal.** CEO or upper management buy-in is critical because developing a robust proposal requires a vision for the future as well as input and collaboration from multiple departments across the utility enterprise.
- ☐ **Do your homework.** Perform focus groups, conduct demographic surveys, get bids for technology costs, talk to other utilities about the value they are achieving, and ask stakeholders what benefits are important to them. This might seem like excessive detail, but details can give commissions and other parties assurance in the plan.
- ☐ **Include the rationale or reasoning for decisions.** Other parties don't have the benefit of knowing what trade-offs were made or the reasoning behind a given decision. If it's not in the application, they won't know.
- ☐ **Remember that what may seem clear, might not be.** Make sure information is clear and easy to understand for those outside the utility.
- ☐ **Present alternatives and different scenarios.** Explain other options or what the alternative might be and what this will mean for the customer. Understanding tradeoffs can help demonstrate future value.
- ☐ **Be clear if additional investments will be required to realize a specific benefit.** Commissions and advocates don't like surprises that come up at a later time and expressed frustration when the realization of a benefit in the original application depends on a future capital investment that was not included at the outset.
- ☐ **Address those 'lingering stories' or unfavorable reports.** Acknowledging areas where there have been actual – or perceived – missteps can help to calm concerns.
- ☐ **Think through customer engagement plans.** A detailed customer education and engagement plan can emphasize commitment to consumer value and responsiveness to consumer needs. Customer engagement plans were often required in settlement agreements.
- ☐ **Support decisions with benchmarks or examples from other utilities.** Look at how long the implementation took, the value they achieved, and what was the timeline for achieving benefits. But remember that what was convincing to one commission might not be apparent or relevant for another case.

- ☐ **Use data from pilots.** Explaining how data was used or what lessons or insights it provided can demonstrate a commitment to future value. It can help substantiate assumptions, provide insights into data storage or management needs, offer lessons learned about customer engagement, or analyzed to investigate future use cases (like informing planning or the development of new rates).
- ☐ **Input from focus groups can help show a utility understands customers' needs.** It also demonstrates commitment to the technology and willingness to accept some risk by performing work prior to commission approval.
- ☐ **Assign values to intangible benefits can show a well thought-out plan.** Savings from reduced truck rolls can be easy to justify; calculating more intangible benefits can be difficult. Thinking through what might happen or how data might be used can be challenging but it can uncover how departments will need to work together and interdependencies or new system requirements. It can demonstrate an understanding of what will be required to achieve future value.
- ☐ **Be clear on the timeline between meter installation and customer benefits.** Regulators and advocates expect customers to see benefits soon after meters are installed. Articulating and providing a clear timeline for when different benefits will be achieved and why some might take longer than others can help level-set expectations.
- ☐ **Talk about data.** Commissions and other stakeholders know AMI generates vast amounts of data. They want to know how the data will be handled, stored, and utilized. Will it be used across departments? How will it be made available?
- ☐ **Consider whether the proposal addresses questions others might have.** For example, what is the incremental cost of going to AMI rather than swapping out an old meter kind–for-kind? What are the incremental benefits associated with the upgrade?
- ☐ **Think about the interest areas of different commissioners.** Do they like numbers? Are they more focused on customer benefits? A proposal that doesn't satisfy commission questions in a way that aligns with their priorities can make approval more difficult.
- ☐ **Identify risks and plan to mitigate them.** Explain the impact and the overall technology value for customers if some assumptions don't work out as expected or if customer behavior is different than anticipated.
- ☐ **Consider commitments in the face of uncertainty.** It's difficult to make commitments based on future projections, but commissions and advocates both expect a utility to include a plan and commitments about the benefits to be pursued and a timeline for achieving them.

Questions for Regulators or Advocates When Reviewing an AMI Investment

Below is a list of potential questions a regulator or advocate may ask when reviewing a utility AMI application. The list, while not exhaustive, represents the many questions or concerns discussed in conversations with various parties.

- What is the vision for AMI? How will it support future utility plans and state or commission policy goals?
- Is there sufficient reasoning, analysis, and substantial record evidence to support the investment and why it is needed?
- What will be the impact to customer rates across all customer classes?
- Does the proposal provide details about how AMI and its data will be utilized and implemented? How will data be managed and stored?
- Does the proposal describe how AMI will integrate with other systems (e.g., Customer Information System or Advanced Distribution Management System) and how data will be used across the enterprise? Are challenges related to integration or use of data explained?
- Does the proposal contain an identifiable set of costs and benefits? Are a full range of benefits presented including future use cases and integration with other technologies that provide customer value?
- Does the proposal include a timeline for achieving customer benefits in the near term, mid-term, and long-term, including a timeframe for additional capital investments that might be needed to enable those benefits?
- If AMI will replace aging meters and is seen as a technology upgrade, what will be the incremental cost to customers above an in-kind replacement? What associated benefits will customers see for the additional cost?
- If the proposal replacing analog meters or AMR meters, what is the remaining useful life of those meters?
- If AMI will enable new rates, how will those alternate rate structures be developed? Will rate designs benefit customers while simultaneously providing system benefits? Will new systems or systems be needed to implement the rate designs?
- What will proposed operational improvements mean for the customer? Will AMI enhance the ability of the utility to respond to new and evolving customer needs?

- How are consumer protections addressed and safeguarded if proposing remote connect/disconnect?
- Is there a mechanism for communicating delays or technology difficulties with stakeholders after the filing/application has been approved?
- How does the utility plan to engage and educate customers so they understand the technology and the benefits it will provide so they can fully access value?
- What are the utility plans for customer access to usage for both utility and non-utility programs, services, and technologies? What will be the process for a customer to authorize access to their data by a third party?
- What communication standards will be used to provide access or to support a Home Area Network or other customer technology choices? Are the standards proprietary or open?
- Does the application identify how the utility will address interoperability of the AMI system with its existing systems, such as, for example, billing, outage management, and geographic information systems?

APPENDIX A:
Index of Utility Entities Reviewed
and associated regulatory proceedings

The following report provides an index of the 80 utilities that received a detailed review. It includes the utility, utility holding company, when applicable, annual revenue ($B), links to relevant proceedings, types of costs and benefits in the application, status of decision, and number of meters deployed. Revenue and meter numbers were obtained from EIA form 861 (2018) . The Compendium: Entity Review Notes document provides additional information about specific links relevant proceedings and notable resources, as well as more details about what was included in an application, such as cost-benefit methodology, technology proposed, policy notes, etc.

State	Utility / Holding Co.	$B	Class	Year	ben/cost/net	app	deny	sett	pend	AMI Meters

Entity Study Status: Detailed

Count: 80

State	Utility / Holding Co.	$B	Class	Year	ben/cost/net	app	deny	sett	pend	AMI Meters
AR	**Entergy Arkansas** Entergy Related Proceedings: Entergy AMI (2016): http://e9radar.link/gqoq	$1.7	Integrated	2016	• • •	✓		✓		511
CO	**Public Service Company of Colorado (PSCo)** Xcel Related Proceedings: PSCo Advanced Grid Intelligence (2016): http://e9radar.link/uwhr	$2.7	Integrated	2016	• • •	✓		✓		12,374
CT	**United Illuminating** Avangrid Related Proceedings: United Illuminating Rate Increase (2016): http://e9radar.link/qbrw	$0.8	Restructured	2011		✓				230,870
CT	**Connecticut Light & Power** Eversource Related Proceedings: CL&P Rate Pilots (2007): https://e9radar.link/8m0x	$2.9	Restructured	2010	• • •		✓			
FL	**Duke Energy Florida** Duke Related Proceedings: Duke Energy AMI Opt-Out (2018): https://e9radar.link/00vci Duke Energy Florida Revised 2017 Settlement Agreement (2017): https://goo.gl/dxr3ur	$4.5	Integrated	2017		✓		✓		77,429
FL	**Tampa Electric** Emera Related Proceedings: TECO AMI Depreciation (2019): https://e9radar.link/n3c9 TECO AMI Opt-Out (2019):	$2.0	Integrated	2016		✓				4,885
HI	**Hawaii Electric Light Company** HEI	$0.4	Integrated	2018		✓				
HI	**Maui Electric** HEI	$0.4	Integrated	2018		✓				30

State	Utility / Holding Co.	$B	Class	Year	ben/cost/net	app	deny	sett	pend	AMI Meters
HI	**Hawaiian Electric** HEI	$1.8	Integrated	2018	•	✓				
	Related Proceedings: HECO Phase 1 Grid Modernization Project (2018): https://e9radar.link/fc555 Grid Modernization Strategy (2017): https://goo.gl/TsvB2W HECO Smart Grid Foundation Project (2016): http://e9radar.link/stqo									
IA	**Interstate Power and Light** Alliant	$1.6	Integrated	2017	• •				✓	
	Related Proceedings: IPL 2019 Rate Case (2019): http://e9radar.link/3fed IPL AMI Opt-Out Program (2018): https://e9radar.link/1a3rv									
IL	**Commonwealth Edison** Exelon	$5.0	Integrated	2012	• • •	✓				3,854,111
	Related Proceedings: Third Party Process to Access Customer AMI Data (2017): https://e9radar.link/xn7or Complaint Regarding ComEd's AMI Plan (2015): http://e9radar.link/cz30 Access to Data Authorization (2015): http://e9radar.link/l6j2 Open Data Access Framework (2014): http://e9radar.link/isa2 GHG Metric for Smart Grid AMI Deployment Plans (2014): http://e9radar.link/0nfz ComEd Acceleration of AMI Deployment (2014): http://e9radar.link/51zr Investigation Regarding Aggregated Data and Privacy (2013): http://e9radar.link/uesy Commonwealth Edison AMI (2012): https://e9radar.link/roh5									
IL	**Ameren Illinois** Ameren	$1.5	Restructured	2012	• •	✓				702,956
	Related Proceedings: Third Party Process to Access Customer AMI Data (2017): https://e9radar.link/xn7or Complaint Regarding Ameren's AMI Progress (2016): http://e9radar.link/o3ym Access to Data Authorization (2015): http://e9radar.link/l6j2 Open Data Access Framework (2014): http://e9radar.link/isa2 GHG Metric for Smart Grid AMI Deployment Plans (2014): http://e9radar.link/0nfz Investigation Regarding Aggregated Data and Privacy (2013): http://e9radar.link/uesy Ameren AMI Deployment Plan (2012): http://e9radar.link/ywxo									
IN	**Indianapolis Power & Light** AES Corporation	$1.4	Integrated	2019	• • •				✓	105,134
IN	**Indiana Michigan Power** American Electric Power	$1.4	Integrated	2019	•				✓	11,176
	Related Proceedings: I&M 2020 Rate Case (2019): https://e9radar.link/adge									
IN	**Southern Indiana Gas & Elec Co** Centerpoint Energy	$0.5	Integrated	2017	• • •	✓		✓		
	Related Proceedings: Vectren South TDSIC and 7-year Electric Plan (2017): http://e9radar.link/wreg									

State	Utility / Holding Co.	$B	Class	Year	ben/cost/net	app	deny	sett	pend	AMI Meters
IN	**Duke Energy Indiana** Duke	$2.7	Integrated	2015	• •	✓		✓		271,688
	Related Proceedings: Duke Indiana 2019 Rate Increase (2019): https://e9radar.link/sd9 Duke Indiana AMI Opt-Out (2017): https://e9radar.link/3dql Duke Indiana Updated 7-Year TDSIC Plan (2015): http://e9radar.link/1rp1 Duke Indiana 2014 7-Year TDSIC Plan (2014):									
KS	**Kansas City Power & Light Co** Evergy	$0.8	Integrated	2015	• •	✓				236,744
	Related Proceedings: Investigation of Metering Infrastructure and Digital Electric Meters (2018): https://e9radar.link/c9iu3 KCP&L Smart Meter Complaints (2014): https://e9radar.link/mmws Investigation into Smart Meters (2006): https://e9radar.link/npgr									
KS	**Kansas Gas & Electric Co** Evergy	$1.0	Integrated	2014		✓				288,656
	Related Proceedings: Investigation of Metering Infrastructure and Digital Electric Meters (2018): https://e9radar.link/c9iu3									
KS	**Westar Energy** Evergy	$1.1	Integrated	2014		✓				318,830
	Related Proceedings: Investigation of Metering Infrastructure and Digital Electric Meters (2018): https://e9radar.link/c9iu3 Westar AMI Privacy Policies (2018): https://e9radar.link/q4qa4 Westar and KSE 2015 Rate Case (2014): https://e9radar.link/4lz9 Westar AMI Pilot Program (2011): https://e9radar.link/nedo Westar Application for Generation Facility (2006): https://e9radar.link/dgj2 Investigation into Smart Meters (2006): https://e9radar.link/npgr									
KY	**Kentucky Utilities** PPL	$1.5	Integrated	2018			✓	✓		2,509
	Related Proceedings: KU and LGE AMI (2018): https://e9radar.link/zspg									
KY	**Louisville Gas & Electric** PPL	$1.1	Integrated	2018	• • •		✓	✓		4,493
	Related Proceedings: KU and LGE AMI (2018): https://e9radar.link/zspg LG&E 2016 Rate Case (2016): http://e9radar.link/9b6l									
KY	**Duke Energy Kentucky** Duke	$0.3	Integrated	2016	• • •	✓		✓		59,059
	Related Proceedings: Duke Kentucky AMI Modernization (2016): http://e9radar.link/3hxo									

State	Utility / Holding Co.	$B	Class	Year	ben/cost/net	app	deny	sett	pend	AMI Meters
LA	**Entergy Louisiana** Entergy Related Proceedings: Entergy AMI Program (2016): https://goo.gl/SSwb1e	$3.7	Integrated	2016	• • •	✓		✓		11,684
LA	**Cleco Power LLC** Cleco Power	$0.9	Integrated	2010	• • •	✓				286,186
MA	**Massachusetts Electric** National Grid Related Proceedings: National Grid Grid Modernization Plan (2015): https://e9radar.link/9f3af	$2.3	Restructured	2015	• • •		✓			15,467
MA	**Western Massachusetts Electric** Eversource Related Proceedings: Eversource Grid Modernization Plan (2015): https://e9radar.link/caf03		Restructured	2015			✓			
MA	**NSTAR Electric Company** Eversource Related Proceedings: Eversource Grid Modernization Plan (2015): https://e9radar.link/caf03	$2.9	Restructured	2015			✓			
MI	**Indiana Michigan Power Co** American Electric Power Related Proceedings: I&M 2020 Rate Case (2019): https://e9radar.link/hlbw I&M AMI Opt-Out (2018): https://e9radar.link/z9125	$0.3	Integrated	2019	•				✓	
MI	**DTE Electric Company** DTE Related Proceedings: DTE 2019 Rate Case (2019): https://e9radar.link/zz06 DTE 2016 Rate Case (2016): https://e9radar.link/e3wld DTE Rate Increase 2009 (2009): https://e9radar.link/pvz7 DTE Rate Increase 2007 (2007): https://e9radar.link/qy8e	$5.1	Integrated	2012	• •	✓				?
MI	**Consumers Energy** CMS Related Proceedings: Consumers Energy 2014 Rate Case (2012): Consumers Energy 2011 Rate Case (2011): Consumers Energy 2010 Rate Case (2010):	$4.4	Integrated	2011	• • •	✓				1,823,628

State	Utility / Holding Co.	$B	Class	Year	ben/cost/net	app	deny	sett	pend	AMI Meters
MN	**Northern States Power** Xcel Related Proceedings: Xcel MN 2019 Integrated Distribution Plan (2019): Distribution System Planning for Xcel Energy MN (2018): https://goo.gl/NkaQqn	$3.3	Integrated	2019	• •	☐	☐	☐	☑	
MN	**Minnesota Power Inc** Allete Related Proceedings: Minnesota Power 2020 Rate Case (2019): https://e9radar.link/dlkkw Minnesota Power 2016 Rate Case (2016): http://e9radar.link/sn5c Smart Grid Standards and Definitions (2008):	$0.7	Integrated	2010		☑	☐	☐	☐	67,631
MO	**Empire District Electric Co** Liberty Utilities Related Proceedings: Empire 2019 Triennial IRP (2018): https://e9radar.link/jl2r	$0.5	Integrated	2019		☐	☐	☐	☑	
MO	**Union Electric Company** Ameren Related Proceedings: Ameren Missouri 2019 Rate Case (2019): https://e9radar.link/qsu4 Ameren Smart Energy Plan (2018): https://e9radar.link/5kdo	$3.2	Integrated	2019	•	☐	☐	☐	☑	0
MO	**Kansas City Power & Light Co** Evergy Related Proceedings: KCP&L 2015 IRP (2015): https://e9radar.link/4d17	$1.0	Integrated	2015		☑	☐	☐	☐	284,417
MO	**KCP&L Greater Missouri Operations Co.** Evergy	$0.8	Integrated	2015		☑	☐	☐	☐	193,027
MS	**Entergy Mississippi** Entergy Related Proceedings: Entergy Mississippi AMI Program (2016): http://e9radar.link/3byq	$1.3	Integrated	2016	• • •	☑	☐	☑	☐	68
MS	**Mississippi Power Co** Southern Company Related Proceedings: Mississippi Power Company AMI Application (2009): http://e9radar.link/dmpr	$0.9	Integrated	2016	• •	☑	☐	☑	☐	20

State	Utility / Holding Co.	$B	Class	Year	ben/cost/net	app	deny	sett	pend	AMI Meters
NC	**Duke Energy Progress - (NC)** Duke Related Proceedings: Rulemaking for Electric Meters (AMI) (2017): https://e9radar.link/m9t2x 2016 IRP and RES Plan (2016): http://e9radar.link/xc1z	$3.6	Integrated	2017	• • •	✓				
NC	**Duke Energy Carolinas** Duke Related Proceedings: Duke Energy Carolinas 2017 General Rate Case (2017): https://goo.gl/28p3Hp Rulemaking for Electric Meters (AMI) (2017): https://e9radar.link/m9t2x 2016 IRP and RES Plan (2016): http://e9radar.link/xc1z	$4.9	Integrated	2016	•	✓				1,028,611
NH	**Public Service Company of New Hampshire** Eversource Related Proceedings: New Hampshire Grid Modernization (2015): http://e9radar.link/2qvd	$1.0	Restructured	2015					✓	
NJ	**Public Service Electric & Gas (PSEG)** PSEG Related Proceedings: PSE&G Clean Energy Future Cloud Program (2018): https://e9radar.link/3wq6	$3.7	Restructured	2018	• • •				✓	15,062
NM	**Public Service Company of New Mexico** PNM Resources Related Proceedings: PNM AMI Program (2015): http://e9radar.link/tepc	$1.0	Integrated	2016			✓			0
NV	**Nevada Power** MidAmerican Related Proceedings: Nevada Power & Sierra Pacific Advanced Metering (2014): http://e9radar.link/g8vn NV Energy Smart Meter Complaints (2011): http://e9radar.link/b512	$2.1	Integrated	2010	• •	✓				918,964
NV	**Sierra Pacific Power Co** MidAmerican Related Proceedings: Nevada Power & Sierra Pacific Advanced Metering (2014): http://e9radar.link/g8vn	$0.7	Integrated	2010		✓				343,053
NY	**New York State Electric & Gas** Iberdrola Related Proceedings: NYSEG 2020 Rate Case (2019): https://e9radar.link/lk7b NYSEG AMI Program (2016): http://e9radar.link/h7q6 Reforming the Energy Vision (REV) (2014): http://e9radar.link/e4kn	$1.2	Restructured	2019	• • •				✓	

State	Utility / Holding Co.	$B	Class	Year	ben/cost/net	app	deny	sett	pend	AMI Meters
NY	**Niagara Mohawk Power** National Grid	$2.2	Restructured	2019	• •	☐	☐	☐	☑	3,337
	Related Proceedings: National Grid 2017 Rate Case (2017): http://e9radar.link/6drs Reforming the Energy Vision (REV) (2014): http://e9radar.link/e4kn									
NY	**Long Island Power Authority** PSEG	$3.6	Other	2016	• • •	☑	☐	☐	☐	63,546
	Related Proceedings: LIPA/PSE&G 2015 Rate Case (2015): http://e9radar.link/y1ry LIPA/PSE&G Utility 2.0 (2014): http://e9radar.link/4mu1									
NY	**Orange & Rockland Utilities** ConEd	$0.5	Restructured	2016	• • •	☑	☐	☑	☐	44,202
	Related Proceedings: O&R 2017 AMI Program (2017): https://e9radar.link/vi6kf Reforming the Energy Vision (REV) (2014): http://e9radar.link/e4kn									
NY	**Rochester Gas & Electric Corp** Iberdrola	$0.6	Restructured	2016		☐	☐	☐	☑	
	Related Proceedings: Reforming the Energy Vision (REV) (2014): http://e9radar.link/e4kn									
NY	**Consolidated Edison** ConEd	$8.0	Restructured	2015	• • •	☑	☐	☑	☐	
	Related Proceedings: ConEd 2017 Rate Case (2016): http://e9radar.link/ix0j ConEd 2015 Rate Case (2015): http://e9radar.link/eut7 Reforming the Energy Vision (REV) (2014): http://e9radar.link/e4kn									
OH	**Dayton Power & Light Co** AES Corporation	$0.7	Restructured	2018	• • •	☐	☐	☑	☑	
	Related Proceedings: Dayton Power and Light Distribution Modernization Plan (2018): https://e9radar.link/o17n									
OH	**Cleveland Electric Illum Co** First Energy	$1.0	Restructured	2016		☑	☐	☑	☐	34,204
	Related Proceedings: FirstEnergy Grid Modernization Business Plan (2016): http://e9radar.link/1f33									
OH	**Ohio Edison** First Energy	$1.4	Restructured	2016	• • •	☑	☐	☑	☐	12
	Related Proceedings: FirstEnergy Distribution Platform Modernization Plan (2017): https://e9radar.link/disca78a7 FirstEnergy Grid Modernization Business Plan (2016): http://e9radar.link/1f33									

State	Utility / Holding Co.	$B	Class	Year	ben/cost/net	app	deny	sett	pend	AMI Meters
OH	**Toledo Edison Company** First Energy Related Proceedings: FirstEnergy Grid Modernization Business Plan (2016): http://e9radar.link/1f33	$0.4	Restructured	2016		✓		✓		0
OK	**Public Service Co of Oklahoma** American Electric Power	$1.5	Integrated	2013	• •	✓		✓		549,206
OK	**Oklahoma Gas & Electric** OGE Related Proceedings: PSO Rate Case and AMI Tariff (2013): http://e9radar.link/j37l OG&E Smart Grid Deployment (2010):	$1.9	Integrated	2010	•	✓		✓		793,937
OR	**PacifiCorp** Berkshire Hathaway Related Proceedings: PacifiCorp AMI Charges (2018): https://e9radar.link/rzyiy PacifiPower Rule 8 and Schedule 300 AMI Revisions (2017): https://e9radar.link/n61t PacifiCorp : Smart Grid Report(s) (2011): http://e9radar.link/w9l5	$1.3	Integrated	2016		✓				47
PA	**Metropolitan Edison Co** FirstEnergy Related Proceedings: Met-Ed Smart Meter Deployment Plan (2012): http://e9radar.link/b5qs FirstEnergy Smart Meter Technology Plan Filings (2009): http://e9radar.link/tvt7	$0.8	Restructured	2014	•	✓		✓		326,410
PA	**Pennsylvania Electric Co** First Energy Related Proceedings: Penelec Smart Meter Charge (2014): http://e9radar.link/97mm Penelec Smart Meter Deployment Plan (2012): http://e9radar.link/7q3z FirstEnergy Smart Meter Technology Plan Filings (2009): http://e9radar.link/tvt7	$0.9	Restructured	2014		✓		✓		513,043
PA	**PPL Electric Utilities** PPL Related Proceedings: PPL 2016 Smart Meter Report (2017): http://e9radar.link/1x6d PPL Smart Meter Plan (2014): http://e9radar.link/kwef PPL Smart Meter Charge (2014): http://e9radar.link/au3m PPL Smart Meter Technology Plan (2009): http://e9radar.link/p08v	$1.9	Restructured	2014	•	✓				?
PA	**Pennsylvania Power Co** First Energy Related Proceedings: PennPower Smart Meter Charge (2014): http://e9radar.link/l7yz Penn Power Smart Meter Deployment Plan (2012): http://e9radar.link/gjzx FirstEnergy Smart Meter Technology Plan Filings (2009): http://e9radar.link/tvt7	$0.3	Restructured	2014		✓		✓		167,639

State	Utility / Holding Co.	$B	Class	Year	ben/cost/net	app	deny	sett	pend	AMI Meters
PA	**West Penn Power Company** First Energy	$1.0	Restructured	2014		✓				387,973
	Related Proceedings: West Penn Smart Meter Deployment Plan (2012): http://e9radar.link/fzre West Penn Smart Meter Technology Plan (2009): http://e9radar.link/oeoz									
PA	**PECO Energy** Exelon	$2.2	Restructured	2013	• • •	✓		✓		1,669,061
	Related Proceedings: PECO 2017 Smart Meter Cost Recovery (2017): http://e9radar.link/zcd4 PECO's Smart Meter Cost Recovery Surcharge (2014): http://e9radar.link/8pwb PECO Smart Meter Charge (2014): http://e9radar.link/3h0h PECO Smart Meter Cost Recovery Surcharge 2014 (2014): http://e9radar.link/xhk1									
PA	**Duquesne Light Co** Duquesne Light	$0.9	Restructured	2012	•	✓				501,594
	Related Proceedings: Duquesne Smart Meter Adjustment (2016): http://e9radar.link/efdk Duquesne 2016 Smart Meter Charge (2016): http://e9radar.link/a5bf Duquesne Light's Smart Meter Charge Adjustment (2014): http://e9radar.link/htl2 Duquesne Smart Meter Adjustment (2014): http://e9radar.link/5ymu Duquesne Smart Meter Charge Supplement (2014): http://e9radar.link/uydp									
RI	**Narragansett Electric** National Grid	$1.0	Restructured	2017	• •				✓	257
	Related Proceedings: National Grid 2017 Rate Case (2017): https://e9radar.link/gveup National Grid Power Sector Transformation Plan (2017): https://e9radar.link/q4grh Investigation Into the Changing Distribution System (2016): http://e9radar.link/pqcm									
SC	**South Carolina Electric & Gas** Dominion	$2.3	Integrated	2019		✓				17,784
	Related Proceedings: Dominion Deferral of AMI Costs (2019):									
SC	**Duke Energy Progress - (SC)** Duke	$0.6	Integrated	2018	•	✓		✓		
	Related Proceedings: DEP Deferral of AMI Costs (2018): https://e9radar.link/60g2									
SC	**Duke Energy Carolinas** Duke	$1.8	Integrated	2016	• •	✓				520,261
	Related Proceedings: DEP 2018 Rate Case (2018): https://e9radar.link/2ykj DEC 2018 Rate Case (2018): https://e9radar.link/ttq1 DEC Deferral of AMI Costs (2016): https://e9radar.link/uhy6									

State	Utility / Holding Co.	$B	Class	Year	ben/cost/net	app	deny	sett	pend	AMI Meters
TX	**El Paso Electric Co** El Paso Electric	$0.6	Integrated	2018	•	✓				0
TX	**Entergy Texas** Entergy Related Proceedings: Entergy Smart Meter Texas Plan (2018): https://e9radar.link/4x0h Entergy AMS Deployment Plan (2017): https://goo.gl/hMkZEg	$1.4	Integrated	2017	• • •	✓				
VA	**Virginia Electric & Power** Dominion Related Proceedings: Dominion Grid Transformation Projects (2019): https://e9radar.link/b9bd6 Dominion Grid Transformation Plan (2018): https://e9radar.link/6bz2b	$7.5	Integrated	2019	• • •				✓	381,483
VA	**Appalachian Power** American Electric Power Related Proceedings: APCo Grid Transformation Plan (2018): http://www.scc.virginia.gov/docketsearch#caseDetails/139352	$1.4	Integrated	2018		✓				54,453
VT	**Green Mountain Power Corp** Green Mountain Power Related Proceedings: CVPS AMI Plan (2010): http://e9radar.link/tnoh GMP AMI Plan (2011): Smart Metering and Alternative Rate Design (2007): https://goo.gl/SyNu7T	$0.6	Restructured	2010	• •	✓				265,682
WA	**Puget Sound Energy** PSE Related Proceedings: Puget Sound Opt-Out Tariff (2018): PSE 2016 Smart Grid Tech Report (2016):	$2.2	Integrated	2018	•	✓				5,125
WA	**Avista Corp** Avista Related Proceedings: Avista AMI Proposal (2017): https://e9radar.link/c1x3 Avista 2016 Rate Case (2016): http://e9radar.link/545d	$0.5	Integrated	2017	• • •	✓				
WI	**Wisconsin Electric Power** WE Energies Related Proceedings: Retention of Meters and Meter Reading Records (2009): http://e9radar.link/yxm7	$2.8	Integrated	2018		✓				463,124
WI	**Wisconsin Public Service** WE Energies	$1.0	Integrated	2016	• •	✓				

State	Utility / Holding Co.	$B	Class	Year	ben/cost/net	app	deny	sett	pend	AMI Meters
WV	**Appalachian Power** American Electric Power	$1.2	Integrated	2017		✓				1,210
	Related Proceedings: West Virginia's Smart Grid Investigation (2008): http://e9radar.link/a3ji									
WV	**Wheeling Power Co** American Electric Power	$0.3	Integrated	2017		✓				115

State	Utility / Holding Co.	$B	Class	Year	ben/cost/net	app	deny	sett	pend	AMI Meters

Entity Study Status: Summary

Count: 61

State	Utility / Holding Co.	$B	Class	Year	ben/cost/net	app	deny	sett	pend	AMI Meters
AL	**Alabama Power** Southern Company	$5.5	Integrated	2008						1,447,521
AR	**Southwestern Electric Power** American Electric Power	$0.3	Integrated							0
AR	**Oklahoma Gas & Electric Co** OGE Related Proceedings: OG&E Smart Meter (2010): http://e9radar.link/8zpp	$0.2	Integrated		• • •	✓				68,732
AZ	**Tucson Electric Power Co** Fortis Related Proceedings: Smart Meter Customer Information and Privacy (2014): http://e9radar.link/bm3k	$1.0	Integrated							0
AZ	**Salt River Project**	$2.9	Other	2009						?
AZ	**Arizona Public Service** Pinnacle West Related Proceedings: Smart Meter Customer Information and Privacy (2014): http://e9radar.link/bm3k APSCo AMI Opt-Out (2013): https://e9radar.link/pz7h	$3.5	Integrated	2008						1,215,804
CA	**Sacramento Municipal Utility District**	$1.4	Other	2010	• •					623,918
CA	**Southern California Edison** Edison International Related Proceedings: SCE Grid Resiliency Program (2018): https://e9radar.link/q06x5 SCE AMI (2007): https://e9radar.link/ewrv	$11.8	Restructured	2006						5,110,245
CA	**Pacific Gas & Electric** PG&E Related Proceedings: PG&E Costs to Deploy Advanced Metering Infrastructure (2005): http://e9radar.link/dxs7	$13.6	Restructured	2005						?

State	Utility / Holding Co.	$B	Class	Year	ben/cost/net	app	deny	sett	pend	AMI Meters
CA	**San Diego Gas & Electric** Sempra Related Proceedings: SDG&E AMI (2005): https://e9radar.link/z23x	$3.8	Restructured	2005						1,435,218
CA	**Los Angeles Department of Water & Power**	$3.8	Municipal							50,934
CO	**Black Hills Colorado** Black Hills Corporation	$0.2	Integrated	2010						95,951
DC	**Potomac Electric Power Co** Exelon Related Proceedings: Rulemaking: Modernizing Energy Delivery (2015): https://e9radar.link/cvfl Pepco DSM and AMI Surcharge (2007): http://e9radar.link/06g6	$0.8	Restructured	2007						277,998
DE	**Delmarva Power** Exelon	$0.6	Restructured	2007		✓				293,663
FL	**JEA**	$1.2	Municipal	2018						215,348
FL	**Florida Power & Light** NextEra Related Proceedings: FPL 2009 Rate Case (2009): https://e9radar.link/cc364	$10.7	Integrated	2009		✓				?
FL	**Gulf Power** NextEra Related Proceedings: Gulf Power 2016 Depreciation Rates (2016):	$1.2	Integrated	2009						461,710
GA	**Georgia Power** Southern Company Related Proceedings: Georgia Power 2007 Rate Case (2007): https://e9radar.link/3b07	$7.8	Integrated	2006						?
IA	**MidAmerican Energy** MidAmerican	$1.7	Integrated							
ID	**Idaho Power** Idacorp Related Proceedings: Idaho Power Smart Meter Complaints (2012): IP AMI Proposal (2008): https://e9radar.link/n2o9 IP AMR Report (2006): https://e9radar.link/3q5z AMR and TOU Pricing (2002):	$1.1	Integrated	2007	• •					517,930

State	Utility / Holding Co.	$B	Class	Year	ben/cost/net	app	deny	sett	pend	AMI Meters
IN	**City of Auburn - (IN)**	$0.0	Municipal	2012		☐	☐	☐	☐	7,557
IN	**Northern Indiana Public Service** NiSource	$1.6	Integrated			☐	☐	☐	☐	
KY	**Kentucky Power Co** American Electric Power	$0.6	Integrated			☐	☐	☐	☐	
LA	**Entergy New Orleans Inc** Entergy Related Proceedings: Entergy AMI Program (2016): https://goo.gl/SSwb1e	$0.6	Integrated	2017		☐	☐	☐	☐	3,986
LA	**Southwestern Electric Power Co** American Electric Power	$0.6	Integrated			☐	☐	☐	☐	0
MD	**Baltimore Gas & Electric** Exelon Related Proceedings: BG&E Smart Grid Initiative and Cost Recovery (2009): http://e9radar.link/2rw6	$2.1	Restructured	2009	• •	✓	☐	☐	☐	1,272,169
MD	**Delmarva Power** Exelon Related Proceedings: Pepco & Delmarva AMI Deployment (2009): http://e9radar.link/fzsb	$0.4	Restructured	2009	• •	✓	☐	☐	☐	
MD	**Potomac Electric Power** Exelon Related Proceedings: Pepco 2017 Rate Case (2017): https://goo.gl/jzZ1MK Pepco 2016 Rate Case (2016): http://e9radar.link/2a2b Pepco & Delmarva AMI Deployment (2009): http://e9radar.link/fzsb	$1.3	Restructured	2007	• •	✓	☐	✓	☐	555,443
MD	**Potomac Edison Company** FirstEnergy Related Proceedings: Potomoc 2018 Rate Case (2018): https://e9radar.link/uroi	$0.5	Restructured			☐	☐	☐	☐	
ME	**Central Maine Power Co** Iberdrola Related Proceedings: CMP AMI Opt-Out Update (2019): https://e9radar.link/32ffb CMP Alternative Rate Plan Revision (2007):	$0.9	Restructured	2007		✓	☐	☐	☐	627,734
ME	**Emera Maine** Emera	$0.2	Restructured	2005		☐	☐	☐	☐	120,556

State	Utility / Holding Co.	$B	Class	Year	ben/cost/net	app	deny	sett	pend	AMI Meters
MT	**NorthWestern Energy LLC - (MT)** Northwestern	$0.7	Integrated							
NC	**Virginia Electric & Power** Dominion Related Proceedings: Rulemaking for Electric Meters (AMI) (2017): https://e9radar.link/m9t2x	$0.4	Integrated							4,951
ND	**Northern States Power Co - Minnesota** Xcel	$0.2	Integrated							
NE	**Omaha Public Power District**	$1.0	Other							5
NJ	**Atlantic City Electric** Exelon	$1.0	Restructured							
NJ	**Jersey Central Power & Light** First Energy	$1.7	Restructured							0
NM	**Southwestern Public Service** Xcel Related Proceedings: Southwestern Rate Case (2015): http://e9radar.link/xgfl	$0.4	Integrated							2
NY	**Central Hudson Gas & Elec Corp** Fortis Related Proceedings: Distributed System Implementation Plans (2016): http://e9radar.link/amxk Reforming the Energy Vision (REV) (2014): http://e9radar.link/e4kn	$0.6	Restructured							140
OH	**Duke Energy Ohio** Duke Related Proceedings: DEO Electric Security Plan 2018-2024 (2017): https://e9radar.link/disca3ead	$1.0	Restructured	2008	• • •	✓		✓		716,590
OH	**Ohio Power** American Electric Power Related Proceedings: Ohio Power gridSMART® Phase 2 Update (2017): http://e9radar.link/7qnq AEP OH 2008 ESP (2008):	$2.8	Restructured	2008						146,965
OR	**Portland General Electric** PGE Related Proceedings: PGE Advanced Metering Infrastructure Operational Savings Report (2012): http://e9radar.link/g6eo	$1.8	Integrated	2007		✓		✓		869,863

State	Utility / Holding Co.	$B	Class	Year	ben/cost/net	app	deny	sett	pend	AMI Meters
SD	**Black Hills Power Inc** Black Hills Corporation	$0.2	Integrated	2009		☐	☐	☐	☐	69,492
SD	**Northern States Power Co - Minnesota** Xcel	$0.2	Integrated			☐	☐	☐	☐	
TN	**City of Memphis**	$1.3	Municipal	2013		☐	☐	☐	☐	314,603
TN	**Nashville Electric Service**	$1.3	Municipal	2012		☐	☐	☐	☐	304,032
TX	**City of San Antonio**	$2.2	Municipal	2014		☐	☐	☐	☐	674,155
TX	**AEP Texas Central** American Electric Power Related Proceedings: AEP Texas 2019 Rate Case (2019): https://e9radar.link/zptp		Integrated	2009	• •	✓	☐	✓	☐	837,964
TX	**AEP Texas North** American Electric Power Related Proceedings: AEP Texas 2019 Rate Case (2019): https://e9radar.link/zptp		Integrated	2009		☐	☐	☐	☐	190,085
TX	**Austin Energy**	$1.2	Municipal	2008		☐	☐	☐	☐	475,626
TX	**CenterPoint** Centerpoint Energy		Restructured	2008		✓	☐	✓	☐	?
TX	**Oncor** Sempra		Restructured	2007		☐	☐	☐	☐	?
TX	**Southwestern Electric Power Co** Xcel	$0.6	Integrated			☐	☐	☐	☐	0
TX	**Southwestern Public Service Co** American Electric Power	$0.9	Integrated			☐	☐	☐	☐	56
UT	**PacifiCorp** Berkshire Hathaway Related Proceedings: RMP STEP Act Initiatives (2016): http://e9radar.link/87ig Utah Consideration of EISA 2007 (2008):	$2.0	Integrated			☐	☐	☐	☐	
WI	**Madison Gas & Electric** MGE Energy	$0.4	Integrated	2009		☐	☐	☐	☐	8,225

State	Utility / Holding Co.	$B	Class	Year	ben/cost/net	app	deny	sett	pend	AMI Meters
WI	**Wisconsin Power & Light** Alliant	$1.1	Integrated	2007		☐	☐	☐	☐	470,507
	Related Proceedings: WPL Application for AMI (2007): https://e9radar.link/46gt									
WI	**Northern States Power Co** Xcel	$0.7	Integrated			☐	☐	☐	☐	
WV	**Monongahela Power Co** FirstEnergy	$1.1	Integrated			☐	☐	☐	☐	
	Related Proceedings: West Virginia's Smart Grid Investigation (2008): http://e9radar.link/a3ji									
WV	**Potomac Edison Company** FirstEnergy	$0.3	Integrated			☐	☐	☐	☐	
	Related Proceedings: West Virginia's Smart Grid Investigation (2008): http://e9radar.link/a3ji									
WY	**Cheyenne Light Fuel & Power Co** Black Hills Corporation	$0.2	Integrated	2009		☐	☐	☐	☐	42,130

APPENDIX B:
Utility Entity and Holding Company Summaries

The following appendix provides an overview of utility AMI proposals and regulatory history. It is organized by utility holding company, with each operating company listed subsequently. The overview for utilities not owned by a holding company is listed at the end of the document. Those utilities receiving a detailed review include more information than those utilities that did not. The report includes the following information: holding company AMI strategy, state the utility operates, annual revenue ($B), state regulatory structure, number of meters deployed (per EIA 2018 Form 861 data), research category (detailed or summary), overview of utility specific AMI proceedings. Those utilities receiving a detailed analysis met the following threshold based on data from EIA 2018 form 861 data: annual sales above $0.25 billion, more than 100,000 AMI meters installed, AMI proposed after 2010, and was a regulated utility.

Holding Company: **AES Corporation**

State	$B	Entity	Class	AMI meters	Analysis
IN	$1.4	**Indianapolis Power & Light**	Integrated	105,134	Detailed

Indianapolis Power & Light (IPL) deployed 10,000 meters, a MDMS, communications system, and web portal as part of its SGIG project in 2010-2013. In May 2019, IPL included a full meter replacement project in its 2020 Transmission, Distribution and Storage System Improvements Charges (TDSIC) plan. IPL noted that its AMR failure rate would rise in 2019, and that the replacement of AMR with AMI mitigated the risk of failures while improving the distribution system.

2020 UPDATE:
In March 2020, the IURC approved Indianapolis Power & Light (IPL)'s Transmission, Distribution, and Storage System Improvements Charge (TDSIC) plan. The 2019 plan included a meter replacement project to address its AMR failure rates. In the final order, the commission cited concerns with opt-out programs, and opened a new sub-docket to house the creation of an opt-out program.

OH	$0.7	**Dayton Power & Light Co**	Restructured		Detailed

In DP&L's third Electric Security Plan, the commission directed the company to file a comprehensive Distribution Infrastructure Modernization Plan (DMP). In December 2018, DP&L filed its DMP, which was framed around enhancing customer benefits. The DMP included AMI deployment in addition to other grid modernization upgrades.

Holding Company: **Allete**

State	$B	Entity	Class	AMI meters	Analysis
MN	$0.7	**Minnesota Power Inc**	Integrated	67,631	Detailed

Minnesota Power began to evaluate AMI technology in 2007. In 2010-2014, the company expanded upon a 2008 pilot by deploying AMI endpoints and infrastructure. A $1.5M SGIG helped fund $1M of the $5.4M project. Following the 2010 expansion, Minnesota Power provided information on the gradual deployment of AMI in commission-mandated smart grid reports and rate cases. An outage management system was integrated into the AMI system in 2011, and communications infrastructure was fully functional by 2019. A MDMS system was also installed in 2019. Purchase and deployment of AMI was estimated to continue through 2023, and the project was largely funded through Minnesota Power's depreciation budgets. In December 2019, Minnesota Power requested a reconnection pilot program in order to waive reconnection fees for certain residential customers with AMI meters. At the time, 60% of Minnesota Power's residential customers had AMI technology.

Holding Company: **Alliant**

State	$B	Entity	Class	AMI meters	Analysis
IA	$1.6	**Interstate Power and Light**	Integrated		Detailed

Interstate Power and Light (IPL) began evaluating AMI in 2009, and incorporated deployment into its strategic planning in 2017. IPL's initial plan was to deploy AMI from 2018-2019, but the company decided to accelerate deployment to begin in 2017 due to meter replacement needs. IPL filed full AMI deployment plans with the commission in its 2017 opt-out tariff request, and requested cost recovery for the project in its 2019 rate case. IP&L cited AMI as an enabling technology; key to addressing customer preferences and grid modernization strategy. By March 2019, IPL had installed 470,000 residential and small commercial electric meters and approximately 30,000 commercial and industrial electric meters.

2020 UPDATE:
In January 2020, the IUB approved the non-unanimous stipulation agreement in IPL's rate case. The approval included AMI investment, and stated: "while the settlement does not specifically address the amount of AMI investment included in rate base, the schedules supporting the settlement include IPL's 2020 test year rate base balances, which include AMI investment." Under the Settlement, IPL agreed to review process with the settling parties to determine further applications of AMI to enhance customer solutions or grid benefits.

WI	$1.1	**Wisconsin Power & Light**	Integrated	470,507	Summary

In August 2007, the holding company of Wisconsin Power & Light (Alliant Energy) announced that it would deploy AMI to over 1M of its customers. In October 2007, Alliant filed an application in Wisconsin to replace its AMR system with 173,000 gas and 455,000 electric meters in two phases over three years. The application noted that commission approval was not required for the electric portion of the project. The project was estimated to be complete in 2010, and to cost $91M ($71.6M for its

electric portion). Benefits were described on an annual basis. WPL described AMI as a necessary technology to gather energy, consumption usage, and billing data to enhance customer service, operational efficiency, and accelerate the revenue cycle.

Holding Company: **Ameren**

State	$B	Entity	Class	AMI meters	Analysis
IL	$1.5	**Ameren Illinois**	Restructured	702,956	Detailed

Following implementation of Illinois' smart grid legislation, Ameren Illinois elected to become a participating utility in the state's electric infrastructure investment program. As a result, Ameren was ordered to invest $625M into distribution over 10 years and file a Smart Grid AMI Deployment Plan with the commission. In August 2011, Ameren filed a mandatory evaluation report on its pilot program, and in March 2012, Ameren filed a 10-year Infrastructure Investment Program to the Smart Grid Advisory Council after review by the Smart Grid Advisory Council. Ameren's CBA estimated $153M in net benefits over a 20-year analysis period (2021-2031). In May 2012, the commission ruled that the plan could not be determined as cost effective, and Ameren filed a revised plan and CBA in June. In December 2012, the commission approved the modifications, which included an accelerated schedule, less reliance on shared benefits from gas customers, modified cost accounting, and quantification of additional operational, customer, and societal benefits. In 2016, Ameren reopened its AMI docket to amend its deployment timeline to achieve 100% AMI deployment by the end of 2019 instead of the planned 62%.

MO	$3.2	**Union Electric Company**	Integrated	0	Detailed

In its February 2019 rate case, Union Electric company (Ameren) filed its five-year capital investment plan; the Smart Energy Plan, the largest infrastructure plan in the history of the company. The plan included a system-wide 1.3M smart meter deployment through 2020-2025. In August 2019, Ameren requested an exemption from meter testing requirements in order to conserve resources for anticipated early 2020 AMI deployment.

2020 UPDATE:
In March 2020, the Missouri PSC approved two stipulation agreements in Ameren's 2020 rate case and Smart Energy Plan. The first stipulation and agreement outlined a rate design plan to accompany AMI meter installment, including TOU rates. The stipulation also directed Ameren to notify customers of installment and rate options, and to provide notice of the opt-out program.

Holding Company: American Electric Power

American Electric Power (AEP) delivers electricity to more than 5M customers in 11 states, including AEP Ohio, AEP Texas, Appalachian Power (Virginia, West Virginia, Tennessee), Indiana Michigan Power, Kentucky Power, Public Service Co. of Oklahoma, and Southwestern Electric Power Co. (Arkansas, Louisiana, and Texas). AEP uses the program title "gridSMART®" across its entities to house its grid modernization projects. AEP's 2019 Energy & Technology report describes AMI as a "foundational technology of the modern grid that enables other technologies and grid modernization efforts." The report also stated a long-term goal of installing AMI across its entire territory. AEP Ohio began installing AMI as part of its gridSMART®, SGIG-funded demonstration project in 2008, followed by additional deployment in phases of the gridSMART® plan in 2013 and 2019. In 2009, AEP Texas received approval for its AMS deployment application. Public Service Co. of Oklahoma included AMI as part of its gridSMART® plan in its 2014 rate case. In 2017, Appalachian Power (APCo) filed information about AMI deployment in its West Virginia territory. In 2018, APCo submitted a Grid Transformation Plan with an AMI component in its Virginia territory, but withdrew its petition in 2019, stating an intent to file in the future. Indiana Michigan Power Co. included AMI deployment in its 2020 rate cases in both states. In 2019, Southwestern Electric Power Co. confirmed that AMI was not installed in its Arkansas or Texas territories, but that recent cost recovery legislation in Texas will help their plans proceed. As of January 2019, AEP companies had deployed 2.6M meters, with intention to deploy 537,000 more.

State	$B	Entity	Class	AMI meters	Analysis
AR	$0.3	**Southwestern Electric Power**	Integrated	0	Summary

In September 2019, the CEO of American Electric Power, SWEPCO's parent company, confirmed in a Q2 earnings call that the SWEPCO Arkansas region does not yet utilize AMI technology. The CEO noted that SWEPCO territories recently implemented AMR technology, and the company hopes to align the timing of AMR replacement with AMI deployment.

IN	$1.4	**Indiana Michigan Power**	Integrated	11,176	Detailed

In 2009, Indiana Michigan Power Co. (I&M) launched a 10,000 meter pilot project. In May 2019, I&M included a provision for AMI deployment in its 2020 rate case. I&M noted that 35% of its AMR meters would reach the end of their design life by the proposed start of AMI deployment, and that AMI will provide visibility into its distribution grid and reliability.

2020 UPDATE:
In March 2020, the IURC issued a final order in Indiana Michigan Power Co. (I&M)'s 2020 rate case which expressed general support for AMI technology, but ultimately dismissed the AMI project as presented. The commission noted that I&M deployed AMR technology relatively recently, and that ratepayers should not have to finance the new technology which is "not necessary to provide service to its customers." The commission determined that I&M did not show a net benefit from the proposed AMI installation plan; instead, the commission found that a traditional test year to test year rate case transition would allow the company to incrementally deploy the technology.

KY	$0.6	**Kentucky Power Co**	Integrated		Summary

In July 2005, Kentucky Power installed 22,500 AMR meters as part of a pilot program. In 2008, Kentucky Power testified that it converted all residential meters to AMR technology in 2006 and would not convert to AMI until 2012 or later. Kentucky Power also noted that deploying HAN technology at the same time as AMI

would deliver the most benefits.

LA $0.6 **Southwestern Electric Power Co** Integrated 0 Summary

The SWEPCO LA's 2015 IRP notes an ongoing analysis of AMI deployment, but no AMI proposal has been released.

MI $0.3 **Indiana Michigan Power Co** Integrated Detailed

In Indiana Michigan Power Co. (I&M)'s 2020 rate case, I&M applied to deploy AMI across its Michigan service territory over a two-year period from 2019 through 2020. I&M cited AMI as a foundational technology to enable the incorporation of DERS at scale, and noted that the application was filed at a time of declining cost and enhanced functionality of AMI technology.

2020 UPDATE:
In January 2020, the Michigan PSC approved an unanimous settlement agreement in I&M's rate case. The settlement gave I&M direction for AMI deployment without pre-approving costs, stating that, "if I&M begins deployment of AMI in Michigan prior to, or proposes to deploy AMI as part of its next general rate case, I&M will present a cost/benefit study… If I&M begins deployment of AMI in Michigan prior to its next general rate case, I&M will not defer for future recovery the implementation expenses incurred or the return on the AMI investment made between this case and next." I&M agreed not to file a rate case prior to January 2022. Additionally, I&M was given pre-approval to recover the costs associated with undepreciated AMR meter retirement balance, and the opt-out rate was set at $9.75. The approved rate increase of $36.4M was 38% lower than the initial request.

OH $2.8 **Ohio Power** Restructured 146,965 Summary

In AEP Ohio's July 2008 Electric Security Plan, the company announced implementation of gridSMART® Phase 1. The gridSMART® initiative included AMI, HAN, and DA. Phase 1 included a three-year installation of these technologies in certain residential communities (110,000 meters, cited as part of its SGIG demonstration project). The net cost of implementing this bundled program estimated at $109M. In its ESP testimony, AEP Ohio notes that it did not quantify the societal benefits for its gridSMART® plan due to the implication of SB-221, which "suggests that the General Assembly has already recognized the potential customer and societal benefits." In September 2013, AEP Ohio's gridSMART® Phase 2 filing proposed an additional 894,000 meters, VVO, and DA circuit reconfiguration. Phase 2 provided a business case with a section dedicated to AMI. In July 2019, AEP Ohio filed its gridSMART® Phase 3 plan, which included final deployment of AMI to the rest of its 475,000 customers in addition to a variety of other technologies.

OK $1.5 **Public Service Co of Oklahoma** Integrated 549,206 Detailed

In 2010, PSO began deploying AMI at residential and business locations as part of their gridSMART® program. This program also included DA, VVO, in-home devices and a customer web portal. In November 2013, Public Service company of Oklahoma (PSO) filed its 2014 rate case, which included the costs of a full AMI deployment program. The three-year deployment was estimated to cost $148.4M through the end of 2016. Projected savings in labor, vehicles, and overheads in the first year totaled $11M. AMI was described as a foundational investment for voluntary consumer programs to reduce energy usage and for future grid investments (esp.

DA and VVO). PSO agreed in a June 2014 joint stipulation to provide Home Energy Reports for any requesting customer with an AMI meter.

TX	$0.9	**Southwestern Public Service Co**	Integrated	56	Summary

In September 2019, the CEO of American Electric Power, SWEPCO's parent company, confirmed in a Q2 earnings call that AMI was installed in the ERCOT portion of Texas but not in the SWEPCO territory. The company noted that 2019 legislation created an opportunity to recovery reasonable costs for deploying AMI, and that the company intended to proceed soon.

TX		**AEP Texas Central**	Integrated	837,964	Summary

In April 2009, AEP Texas Center and AEP Texas North company (together, AEP Texas) filed a petition and application for an AMS deployment plan and an associated AMS surcharge tariff, which was requested to last for eleven years through 2020. The AMS installment plan included a four year deployment plan (2009-2013) for revenue requirements of $291.7M for TCC and $68.4M for TNC. At the time of the proposal, AEP Texas noted that a customer education plan was already underway. Meter reading was cited as the primary cost saving category, which would save $6M for TCC and $2M for TNC, respectively. AEP Texas reached a stipulation agreement with various stakeholders in November 2009. The plan was approved in December 2009.

TX		**AEP Texas North**	Integrated	190,085	Summary

See AEP Texas Central for details.

VA	$1.4	**Appalachian Power**	Integrated	54,453	Detailed

Pursuant to 2018 legislation, in 2018 Appalachian Power Co. (APCo) submitted a Grid Transformation plan in response to the Grid Transformation and Security Act. The plan noted that though legislation did not mandate a CBA, Dominion was criticized for not producing one; APCo stated that many project benefits were "not easily quantifiable." The plan demonstrated that APCo began transitioning end-of-life AMR to AMI in 2017, and its transition would be complete by 2022. In March 2019, APCo withdrew its Grid Transformation petition, citing the recent denial of Dominion's Grid plan. APCo stated that it intends to file a more robust proposal in the future. In 2019, APCo's website stated that the company was continuing to deploy AMI meters in its Virginia, West Virginia, and Tennessee territories.

WV	$1.2	**Appalachian Power**	Integrated	1,210	Detailed

In June 2017, Appalachian Power Co. (APCo) and Wheeling Power Co. jointly filed their Annual Smart Grid Matters report. The report discussed the parent company AEP's gridSMART® plan to integrate advanced distribution technologies, including AMI deployment. In West Virginia, the companies described deployment of DA circuit reconfiguration, VVO, and 540,000 AMI meters in 2017. The AMI "Phase I" project included a customer information access portal.

WV	$0.3	**Wheeling Power Co**	Integrated	115	Detailed

See Appalachian Power Co. for details.

Holding Company: **Avangrid**

State	$B	Entity	Class	AMI meters	Analysis
CT	$0.8	**United Illuminating**	Restructured	230,870	Detailed

In 2010, United Illuminating (UI) began deploying a hybrid AMR/AMI solution and mesh network. According to a review of 2014 Connecticut IRPs, the Department of Energy & Environmental Protection stated that as of January 2015, UI had replaced 161,000 of its 350,000 meters with AMI, with projected completion in 2020. UI's parent company at the time, UIL Holdings company, also committed to installing 210,000 AMI gas meters in its subsidiary territories by 2015. In UI's 2016 rate case, the company cited installation of grid technology that build off of AMI.

ME	$0.9	**Central Maine Power Co**	Restructured	627,734	Summary

In April 2007, Central Maine Power proposed a $190M smart meter deployment project within its alternative rate plan revision case. The PUC issued a conditional order in July 2009 which approved AMI installation, contingent on recipient of a DOE grant. After the grant was finalized, CMP's business case was reconsidered, and in February 2010 the PUC approved deployment. Two cases were opened to house and address several smart meter complaints against CMP. In December 2014, the commission determined that smart meters are safe and consistent with federal and state policies. After several appeals, the Maine Supreme Court affirmed this decision. CMP completed its installment of 632,000 meters in 2012.

NY	$1.2	**New York State Electric & Gas**	Restructured		Detailed

In December 2016, New York State Electric & Gas Corporation (NYSEG) and Rochester Gas and Electric Corporation (RG&E) jointly proposed an AMI deployment plan, petitioning for 1.8M meters deployed over four years (2018-2021), including meter deployment in a REV demonstration project. In March 2017, the commission put a temporary hold on case action in order to address severe weather impacts in the state. In May 2019, the companies opened a joint 2020 rate case that included recovery of its electric and gas AMI investment in addition to an updated business case. The commission determined that the 2016 AMI docket was duplicative, and closed the case in order to consider the updated rate case proposal. For all four businesses (gas and electric for NYSEG and RG&E), the companies estimated a cost of $549.2M and benefits of $829.9M.

2020 UPDATE:
In June 2020, NYSEG, RG&E, the New York PSC and other stakeholders filed a joint proposal to solve the electric and gas rate case issues in light of COVID-19. According to the proposal, AMI deployment was delayed by one year, to commence in 2022 and finish in 2025. The proposal reaffirmed various benefits and capabilities of AMI technology. AMI capital costs were subject to a cuulative capital spend cap of $489.1M. Additionally, the proposal described gas rate decreases from May 2020-April 2021, followed by increases for 2021-2023, and increases in electric rates over the 3-year period. Over the rate period, the companies requested a $219M increase for NYSEG electric and $74M for RG&E electric.

NY	$0.6	**Rochester Gas & Electric Corp**	Restructured		Detailed

See NYSEG for details.

Holding Company: **Avista**

State	$B	Entity	Class	AMI meters	Analysis
WA	$0.5	**Avista Corp**	Integrated		Detailed

In 2009, Avista implemented a SGIG-funded smart meter project in addition to a smart grid demonstration project which included the installation of 13,000 meters. In February 2016, Avista filed a rate case with a petition to approve its Washington AMI Project. Avista estimated a total project cost of $215.2M with $241.7M in benefits (PV). Avista further elaborated on its plans to integrate AMI into its systems in its September 2016 Smart Grid Technology Report. In December 2016, the commission rejected the AMI project, requested a different business case, noted a lack of stakeholder engagement, and recommended that Avista file a request for deferred accounting treatment. In May 2017, following commission advice, Avista filed a petition requesting deferred accounting treatment for legacy meters and AMI deployment. In September 2017, stakeholders helped form an amended petition which narrowed the scope of its requests and deferred full revenue requirement considerations to a future rate case. The amended petition was approved in September 2017.

Holding Company: **Berkshire Hathaway**

Berkshire Hathaway Energy serves nearly 4M customers across nine states through MidAmerican Energy Co. (Iowa, Illinois, South Dakota), Nevada Power and Sierra Pacific Power Co., Pacificorp (also known as Rocky Mountain Power or Pacific Power in Idaho, Oregon, Washington, Wyoming, California), in addition to gas transmission, real estate, power generation, and international utilities. In 2010, Nevada Power and Sierra Pacific Power Co. filed an IRP which proposed the installation of 1.5M AMI meters, aided by a SGIG. Pacificorp completed deployment in Oregon in 2017-2019 with 608,000 meters, in addition to the full deployment of 40,000 meters in its California territory by the end of 2019. At the close of 2018, 41% of Berkshire Hathaway's electric customers had smart meters. In MidAmerican's 2019 Sustainability Report, the parent company noted that 0% of its territory had smart meters installed in its 2017 assessment.

State	$B	Entity	Class	AMI meters	Analysis
IA	$1.7	**MidAmerican Energy**	Integrated		Summary

In a 2012 report, MidAmerican described a variety of potential AMI-enabled programs, but could not quantify potential savings due to insufficient data. In 2018, MidAmerican noted the installment of 350 'smart sensors' to electric lines in Iowa.

NV	$2.1	**Nevada Power**	Integrated	918,964	Detailed

In 2006, the Nevada commission directed Nevada Power to study costs and benefits of the Southern California Edison residential smart metering programs in order to implement smart meters into its service territory. The commission also expressed support for NVE's SGIG application in 2009, which included provisions for both

Nevada Power company and Sierra Pacific Power company (sister companies of NVE). In March 2010, NVE filed its Triennial IRP for 2010-2029. Within the IRP, the Advanced Service Delivery initiative included AMI rollout, initially estimated to cost $301M for both companies. Nevada Power's cost was offset to $95.4M due to its $110.3M share of the $138M SGIG grant given to NVE.

State	$B	Entity	Class	AMI meters	Analysis
NV	$0.7	**Sierra Pacific Power Co**	Integrated	343,053	Detailed

See Nevada Power for details.

State	$B	Entity	Class	AMI meters	Analysis
OR	$1.3	**PacifiCorp**	Integrated	47	Detailed

Pacific Power (PacifiCorp) began developing an AMI business case in 2014. In the PUC's order approving PacifiCorp's 2015 annual smart grid report, the commission requested that the company continue to provide updates on AMI project development. In August 2016, PacifiCorp filed a confidential business case analysis for AMI deployment in its annual smart meter report. The report provided an AMI deployment strategy, cost saving categories, functionalities, and other details. In December 2016, the commission approved the smart grid report and required PacifiCorp to provide an "Oregon AMI Roadmap" with costs, cost savings, reconnection times, analysis of data, and other provisions. PacifiCorp included these items in the 2017 annual smart grid report, and this report was accepted in February 2018.

State	$B	Entity	Class	AMI meters	Analysis
UT	$2.0	**PacifiCorp**	Integrated		Summary

In response to Utah PUC directives, Pacificorp (doing business as Rocky Mountain Power, or RMP) filed Smart Grid Reports from 2011-2015. These reports included evaluation of a variety of smart grid technologies, including AMI. In 2014, RMP cited exploration of AMI deployment and an initial rollout in Oregon. In RMP's business case, RMP stated that installation of IT upgrades would be necessary prior to AMI rollout and that AMI benefits were only "marginally positive". RMP determined that AMI rollout was unnecessary at the time. Smart Grid reporting requirements were discontinued the following year. In November 2018, RMP proposed its Advanced Resiliency Management System (ARMS) project under the Sustainable Transportation and Energy Plan Act. The ARMS project opted to install AMR throughout Utah, as opposed to AMI. The petition was approved in June 2019.

Holding Company: **Black Hills Corporation**

State	$B	Entity	Class	AMI meters	Analysis
CO	$0.2	**Black Hills Colorado**	Integrated	95,951	Summary

In 2008, Black Hills Energy Colorado (BHE) launched a 56,000 meter pilot project, and added additional meters in 2009. In 2010, Black Hills Corporation was awarded $20.7M from the DOE for AMI support in Colorado, South Dakota and Wyoming. A few months later, the holding company announced a system-wide deployment through its Colorado, Iowa, Nebraska, and Kansas territories.

SD	$0.2	**Black Hills Power Inc**	Integrated	69,492	Summary

In 2009, Black Hills Power was one of three Black Hills Power subsidiaries to be awarded a SGIG. The SGIG covered $9.3M of the $18.6M project, which included AMI, MDMSS, a web portal, and outage management system development in South Dakota and Wyoming. The project replaced 69,000 electric meters.

WY	$0.2	**Cheyenne Light Fuel & Power Co**	Integrated	42,130	Summary

In 2009, Cheyenne Light, Fuel & Power was one of three Black Hills Power subsidiaries to be awarded a SGIG. The SGIG covered $5M of the $10M project, which included AMI, MDMS, a web portal, and outage management system development. The company replaced 39,700 meters by 2011.

Holding Company: **Centerpoint Energy**

State	$B	Entity	Class	AMI meters	Analysis
IN	$0.5	**Southern Indiana Gas & Elec Co**	Integrated		Detailed

Southern Indiana Gas & Electric Co. (Vectren) proposed AMI deployment in its 2017 Transmission, Distribution, and Storage System Improvements Charges (TDSIC) plan. In September 2017, the Indiana commission approved a settlement agreement for the TDSIC which removed AMI recovery from the TDSIC plan and deferred a maximum recovery of $39M to its next rate case. The commission and stakeholders did not oppose AMI deployment; cost recovery was the primary issue. Vectren's 2017 rate case was in process at the same time as the TDSIC, and did not include AMI recovery.

TX		**CenterPoint**	Restructured	2,452,977	Summary

In May 2008, CenterPoint Energy Houston Electric (CEHE) filed an application to deploy a limited AMS. The proposal offered to install approximately 250,000 meters when requested by retail electric providers, and claimed that CEHE would consider full deployment once the AMS market was more mature. In December 2008, the company filed a stipulation agreement which included a revised AMS plan to fully deploy 2.4M smart meters through its territory. Costs were estimated at $639.6M in capital and $207.9M in O&M from 2007-2021. The revised plan and stipulation were approved in December 2008. In 2009, CEHE was awarded a $200M SGIG to support its AMS deployment, DA upgrades, ADMS, and other intelligent grid switching devices.

Holding Company: **Cleco Power**

State	$B	Entity	Class	AMI meters	Analysis
LA	$0.9	**Cleco Power LLC**	Integrated	286,186	Detailed

In 2008, Cleco Power began a small demand response study using smart meters and in-home smart thermostats. In 2009, the DOE selected Cleco to receive a $20M

SGIG, and in 2010 Cleco filed its system-wide AMI proposal. The Cleco application was approved in February 2011.

Holding Company: CMS

State	$B	Entity	Class	AMI meters	Analysis
MI	$4.4	**Consumers Energy**	Integrated	1,823,628	Detailed

In 2007, Consumers Energy began creating the Balanced Energy Initiative as a 20-year energy planning vision. AMI was cited as a foundational technology for other smart grid applications and technologies. The company conducted its design phase from 2007-2008, followed by two early deployment programs in 2008-2009. The company's Smart Grid/AMI program was first proposed in a January 2010 rate case. In November 2010, the Michigan commission denied full AMI deployment, adopted eleven policy recommendations by staff, and encouraged Consumers to reapply in their next rate case. The policy recommendations included issues with cost recovery, pilot programs, and cost/benefit analyses. In June 2011, Consumers filed a new rate case which included implementation of Phase 2 of the Smart Grid/AMI project: full replacement of the company's 1.8M gas and electric meters and communication modules between from 2012-2019. The business case estimated $38M in net benefits. The commission approved the request in June 2012. In June 2013, the Michigan PSC approved a separate Consumer Energy rate case which contained an opt-out program.

Holding Company: ConEd

Consolidated Edison serves 10M customers through Consolidated Edison Co. New York (CECONY) and Orange & Rockland (New York, New Jersey), in addition to its energy services companies. CECONY was approved to deploy 4.7M smart meters through 2017-2022 through its 2015 rate case, while Orange & Rockland was granted AMI approval in 2017 for installation of 400,000 meters through 2017-2020. As of 2019, Con Edison had installed 2M smart meters. Its smart grid initiative budgets $1.4B for 5.3M meters.

State	$B	Entity	Class	AMI meters	Analysis
NY	$8.0	**Consolidated Edison**	Restructured		Detailed

Consolidated Edison (ConEd) began an AMI pilot project in 2010. ConEd proposed a system-wide rollout of 3.6M advanced electric meters, in addition to 1.2M gas meters, in their 2015 rate case. In June 2015, the commission approved the rate case with the stipulation that ConEd form an AMI collaborative and write an AMI business case. Once the business case was produced in October 2015, the commission further requested a customer engagement plan in addition to an updated CBA which reflects a new statewide template. An updated BCA framework was filed in August 2016.

NY	$0.5	**Orange & Rockland Utilities**	Restructured	44,202	Detailed

In November 2014, O&R filed a rate case which included Phase One of O&R's AMI program and associated recovery of $23.7M. Phase One included a 5-year installation of 116,000 electric and 91,000 gas AMI meters. O&R noted that Phase

October 2015 included the provision to create an AMI Business Plan and BCA, and noted that the outcome of O&R's Distributed System Implementation Plan (DSIP), which included the company's AMI plans, may impact commission approval for full deployment. The AMI Business Plan, filed in June 2016 in both the rate case and DSIP, added MDMSS and modified the implementation timeline from 5 to 4 years. In July 2017, O&R filed a revised BCA which reported net benefits of $15.6M. In November 2017, the commission approved the updated AMI proposal.

Holding Company: **Dominion**

State	$B	Entity	Class	AMI meters	Analysis
NC	$0.4	**Virginia Electric & Power**	Integrated	4,951	Summary

In October 2014, in compliance with commission rules, Dominion North Carolina Power filed its Smart Grid Technology Plan. Dominion noted that it installed 260,000 smart meters by 2009 and would install up to 2% of its North Carolina territory by 2019. Dominion did not make a formal business proposal to fully deploy AMI.

SC	$2.3	**South Carolina Electric & Gas**	Integrated	17,784	Detailed

In July 2019, South Carolina Electric & Gas (Dominion) filed a petition seeking an accounting order to defer costs associated with AMI deployment. The accounting order request explained Dominion's plan to deploy 760,000 AMI meters for a cost of $98M. Dominion also requested that $59M of existing meter value be placed in an unrecovered plant regulatory asset, to be recovered under basic rates. In August 2019, the commission approved the request and directed Dominion to file a customer education plan and an opt-out tariff which included a provision for a medical waiver for opt-out fees. Dominion reiterated its plans for AMI in its 2020 IRP, filed in February 2020.

VA	$7.5	**Virginia Electric & Power**	Integrated	381,483	Detailed

Pursuant to 2018 legislation, in January 2018 Virginia Electric & Power (Dominion) filed a Grid Transformation Plan (GT) that included AMI deployment. Dominion's application did not include a complete cost benefit analysis; Dominion opted for excluding a traditional cost-benefit analysis due to the significant non-quantifiable benefits. In January 2019, the Virginia commission denied the application. In January 2019, Dominion filed a new grid modernization plan, budgeting $594M for a variety of projects, including a 6-year, 2.1M smart meter installation plan. The plan will use the AMI head-end system already in place, retiring AMR head-end systems. Dominion cited AMI as a foundational investment for the rest of its GT. In December 2019, Dominion filed a separate application for the approval of experimental TOU rates for 10,000 customers, which would rely on the implementation of AMI.

2020 UPDATE:
In January 2020, Dominion filed updated cost/benefit testimony for its Grid Transformation Plan. In March 2020, the Virginia SCC issued a final order, reducing the 10-year, $7B plan to a cost of $212M. As part of the order, the commission denied Dominion's AMI proposal and criticized the program for its lack of a comprehensive TOU rate program, as directed in the final 2018 Grid Mod order. Dominion filed a standalone TOU rate pilot in December 2019 for 10,000 customers, but the

commission found that without a full TOU program, AMI was not cost-effective. In April 2020, the SCC denied Dominion's petition for rehearing, stating, ""despite being invited to offer a second [AMI] proposal, the Commission has concluded in both proceedings that the alleged benefits remain too speculative and uncertain for the Commission to choose to approve such a large expenditure at this time."

Holding Company: **DTE**

State	$B	Entity	Class	AMI meters	Analysis
MI	$5.1	**DTE Electric Company**	Integrated	2,527,380	Detailed

Following a 2008 AMI pilot project, in 2010, Detroit Edison Electric Co (DTE) was awarded $84M in SGIG funds ($168M total project value) to deploy a network of 660,000 smart meters. DTE continued to expand its pilot program in its 2010 rate case, which approved AMI spending and requested a business case in future proceedings. In April 2012, the Court of Appeals ruled in favor of parties that filed appeals against the final order, ruling that inadequate AMI benefit evidence was presented. The commission reopened the case in September 2012, and after presentation of additional evidence, cost recovery for the pilot program was awarded in October 2013. DTE thereafter pursued AMI gradually; by late 2015, DTE had installed over 2.2M electric meters (approximately 50% of its territory), and in its 2016 rate case requested the final replacement of 938,000 meters over two years. The rate case was approved in December 2015. DTE filed an additional request in February 2016 to upgrade technology prior to AMI deployment, and in its 2019 rate case requested a provision to upgrade AMI communications from 3G to 4G.

Holding Company: **Duke**

Duke Energy serves 7.4M customers in six states through its subsidiaries: Duke Energy Carolinas (North and South Carolina), Duke Energy Progress (North and South Carolina), Duke Energy Ohio, Duke Energy Kentucky, Duke Energy Indiana, and Duke Energy Florida, in addition to its renewables, retail, and international entities. In 2017, Duke announced its ten-year Power/Forward Carolinas grid modernization plan, which included AMI technology. In addition to this commitment, in press releases and stakeholder materials Duke described comprehensive plans to invest $25B over the next ten years to replace grid infrastructure in its South and Midwest service areas. Duke Energy Ohio was the first Duke entity to begin installing smart meters in 2009-2014, while Duke Energy Carolinas began installing AMI as early as 2014. Duke Energy Carolinas subsequently filed information about its planning deployment with commissions in North and South Carolina in 2016. Duke Energy Indiana first applied for AMI within its Grid Modernization Plan in 2014, which was rejected. The second submission of the Indiana plan received commission approval to deploy AMI in 2016. In Kentucky, Duke proposed AMI in 2016 as a metering upgrade program, and received approval in 2017. Duke Energy Florida included AMI installments in a second revised settlement agreement in 2017. Finally, Duke Energy Progress filed information about its planned AMI deployment in its North Carolina rate case in 2017 and in 2018 filed for AMI cost recovery in South Carolina. As of 2018, 62% of Duke's customers had smart meter technology, with a goal of full deployment in all territories by 2021.

State	$B	Entity	Class	AMI meters	Analysis
FL	$4.5	**Duke Energy Florida**	Integrated	77,429	Detailed

In August 2017, Duke Energy Florida filed a second revised settlement agreement to address adjustments in its base rates and several new programs. The second settlement agreement included brief information about AMI deployment at a cost of

$336M. As settled, upon completion of AMI meter deployment, Duke will introduce a residential Time of Use rate. Details relating to AMI were limited.

IN $2.7 **Duke Energy Indiana** Integrated 271,688 Detailed

The IURC initially denied Duke Energy Indiana's proposal for AMI deployment within its 2014 transmission, distribution and storage system plan (T&D plan), proposed in August 2014. The commission stated that the plan did not provide sufficient detail. Duke filed a second version of its T&D plan in December 2015. Duke reached a settlement agreement for its plan in March 2016, which included its commitment to deploy smart meters. The commission approved the settlement in June 2016. In July 2017, Duke filed an application for an opt-out program, which the commission approved.

KY $0.3 **Duke Energy Kentucky** Integrated 59,059 Detailed

In April 2016, Duke Energy Kentucky proposed AMI through a metering upgrade program for its electric and combination customers, proposing to install electric AMI meters at an estimated cost of $49M. Per a December 2016 stipulation, Duke committed to allowing its customers to have access to their own usage information through its web portal as part of the AMI project, as well as offering opt-out tariffs. The commission approved the stipulation and proposal in May 2017.

NC $3.6 **Duke Energy Progress - (NC)** Integrated Detailed

In October 2016, DEP cited an internal investigation of AMI technology in its Smart Grid Technology Plan (SGTP). DEP subsequently requested cost recovery in its 2017 rate case. In this proceeding, DEP contested that it did not file rate design programs alongside its AMI proposal due to the premature nature of the new technology. In February 2018, the commission approved portions of a stipulation agreement, which included cost recovery for the replacement of AMR meters with AMI. DEP filed an updated CBA in the SGTP case in June 2018.

NC $4.9 **Duke Energy Carolinas** Integrated 1,028,611 Detailed

In its 2014 Smart Grid Technology Plan (SGTP), DEC proposed a $102M AMI deployment to build off of its 2013 SGIG AMI project. In its 2016 SGTP, DEC claimed that 252,000 AMI meters were installed and that the company was evaluating full deployment over a five-year period or annual deployment of 150,000 meters. The commission approved the proposal with conditions for information on full deployment, a 20-year cost-benefit analysis, and subsequent filing of rate design pilots. The commission later noted that deployment began prior to the submission of a CBA. Subsequently, in a 2017 rate case filing, DEC requested a regulatory asset for AMI. In April 2017, Duke Energy, DEC's holding company, released its ten-year Power / Forward Carolinas grid modernization initiative, which includes full smart meter deployment. DEC's 2020-2022 Grid Improvement Plan, included in its 2020 rate case, cites AMI as "a foundational investment that enables further programs, such as rate design and peak-shaving."

OH $1.0 **Duke Energy Ohio** Restructured 716,590 Summary

In Duke Energy Ohio's 2008 Electric Security Plan (ESP), Duke introduced a new Distribution Security rider to recover costs associated with the deployment of smart

grid infrastructure. The technology included AMI, which primarily delivered the benefit of reduced meter reading. In Duke's 2018 ESP, the company requested meter upgrades from the node environment to the mesh environment.

SC	$0.6	**Duke Energy Progress - (SC)**	Integrated		Detailed

In June 2018, Duke Energy Progress (DEP) filed a petition to defer $1.4M of AMI deployment costs into a regulatory asset for future recovery. Later that year, DEP filed its 2018 rate case, which requested an increase in retail revenues of $59M, which includes $5.1M and $5.8M for grid investments in 2020 and 2021. Between rate cases, DEP requested additional accounting orders relating to AMI deployment recovery. At the time of application, DEP had deployed 38,000 smart meters, and planned to deploy the remaining 128,000 meters. The case also requested approval of AMI-enabled programs, such as the Prepaid Advantage Pilot Program. Through the April 2019 stipulation, DEP agreed to supply an annual report on quantified customer benefits. The stipulation also requested that DEP examine an opt-out program similar to its North Carolina program.

SC	$1.8	**Duke Energy Carolinas**	Integrated	520,261	Detailed

In 2013, Duke Energy was awarded a SGIG to deploy AMI in its North and South Carolina territories. Upon its first official AMI cost deferral filing in 2016, DEC had deployed 95,000 meters and committed to deploying 490,000 more in a two-year period. DEC noted that it had 'already begun' full deployment. A 2016 cost recovery filing requested deferral of $45M of AMI costs, and noted that deployment was nearly complete. In DEC's 2018 rate case, DEC was allowed to recover $15M in May 2019.

Holding Company: **Duquesne Light**

State	$B	Entity	Class	AMI meters	Analysis
PA	$0.9	**Duquesne Light Co**	Restructured	501,594	Detailed

Duquesne Light Co. proposed an initial smart meter procurement plan in 2009 which requested a grace period through 2012 to conduct smart meter research and utilize their AMR system. Duquesne filed several research updates, and in July 2010 filed their first CBA for AMI deployment. In August 2015, Duquesne filed an additional docket to request approval for major changes to its plan to add outage communication and voltage monitoring capabilities. Duquesne filed a modification to their plan in 2015 for implementation of an enhanced outage communication and voltage monitoring capabilities.

Holding Company: **Edison International**

State	$B	Entity	Class	AMI meters	Analysis
CA	$11.8	**Southern California Edison**	Restructured	5,110,245	Summary

Southern California Edison Co. (SCE) utilized AMR meters in the early 2000s prior to

filing an AMI business case in 2004. In 2005, SCE engaged in collaborative processes with meter and communication system vendors, and in July 2007, SCE filed an application to approve its Edison SmartConnect™ meter deployment program. The program proposed to deploy 5.3M meters to all residential and business customers under 200 kW during a five-year period, beginning in 2008. SCE noted that meters would enable TOU pricing options. SCE requested $1.7B for its meter deployment costs (Phase III of its project), and estimated $109M in net benefits (PVRR).

Holding Company: El Paso Electric

State	$B	Entity	Class	AMI meters	Analysis
TX	$0.6	**El Paso Electric Co**	Integrated	0	Detailed

El Paso Electric Co. proposed AMI in its 2018 IRP. The IRP emphasizes the need for AMI to implement TOU and dynamic pricing structures in addition to other customer programs. The IRP was not subject to commission approval.

Holding Company: Emera

State	$B	Entity	Class	AMI meters	Analysis
FL	$2.0	**Tampa Electric**	Integrated	4,885	Detailed

In 2003, Tampa Electric Co. implemented an AMR system across its territory. In November 2015, the company filed a tariff with the Florida commission to provide an optional AMI meter as part of its "Advanced Metering Program" for residential owners of PV systems. In 2017, Tampa Electric began to deploy approximately 800,000 electric AMI meters, with estimated functionality in 2021-2022. As the company deployed AMI, it installed back-end systems concurrently. In January 2019, Tampa Electric filed a petition for an opt-out tariff, and in April 2019 filed a petition to begin tracking AMI program asset depreciation.

ME	$0.2	**Emera Maine**	Restructured	120,556	Summary

Emera Maine began a smart meter roll out in 2005. The utility installed 112,000 meters across its service territory.

Holding Company: **Entergy**

Entergy delivers electricity to 2.9M customers across four states through Entergy Arkansas, Entergy Louisiana, Entergy Mississippi, Entergy New Orleans, and Entergy Texas. In 2016, Entergy Louisiana was approved deployment of 981,000 meters from 2018-2022, and Entergy New Orleans installed a smart meter pilot project with a SGIG in 2010, with full deployment in 2019-2021. Entergy Mississippi applied for AMI in 2016 and received approval in 2017. In 2017, the Arkansas commission approved Entergy Arkansas's 2019-2021 AMI deployment. In 2017, Entergy Texas filed an application to install AMS from 2019-2021. In Energy's 2018 Integrated Report, the holding company committed to deploy AMI to 30% of its customers in 2019 (1m meters) and to 100% of its 3M customers by 2021. Entergy also described advanced meters as "the foundation for the next generation of grid technologies" in its 2019 Climate Scenario Analysis.

State	$B	Entity	Class	AMI meters	Analysis
AR	$1.7	**Entergy Arkansas**	Integrated	511	Detailed

In August 2016, Entergy Arkansas Inc. (Entergy) proposed a three-phase/five-year AMI Plan, which included an outage management and distribution management system. In August 2017, Entergy, commission staff, and the attorney general submitted a settlement agreement. The settlement was approved in October 2017, and Pre-Deployment Customer Education Materials were submitted in August 2018. The PSC approved the education materials in December 2018.

LA	$3.7	**Entergy Louisiana**	Integrated	11,684	Detailed

Entergy Louisiana filed a petition for a full, three-year deployment of an AMS system and accompanying technology in November 2016. The application was approved in August 2017.

LA	$0.6	**Entergy New Orleans Inc**	Integrated	3,986	Summary

In 2009, Entergy New Orleans (ENO) was awarded a $4.8M SGIG to support an AMI pilot which included 4,700 smart meters, smart devices, and a web portal. In May 2017, ENO filed an application with the New Orleans City Council to deploy gas and electric AMI, defer costs, establish regulatory treatment, approve an opt-out program, and develop other project aspects. The project was estimated to cost $76.6M, executed in three phases from 2018-2020. In January 2018, ENO and council advisors filed a stipulated settlement and term sheet, which was approved in February 2018.

MS	$1.3	**Entergy Mississippi**	Integrated	68	Detailed

In November 2016, Entergy Mississippi proposed system-wide AMI deployment. In May 2017, the commission approved Entergy's application. The commission's order accepted and adopted a May 2017 Joint stipulation between the company and commission Staff, holding the company responsible for updating its Formula Rate Plan through September 2019.

TX	$1.4	**Entergy Texas**	Integrated		Detailed

In July 2017, Entergy Texas, Inc. (ETI) filed an application for an AMS, opt-out provision, an AMS surcharge tariff, and approval of its deployment plan. The

application contained a customer engagement plan, data security considerations, and other key details. In October 2017, ETI filed an agreement resolving intervenor issues, including to consider joining Smart Meter Texas and data issues in a future case, reduction of the AMS surcharge by $10M, allowance for customers to keep existing meters, investment in low-income programs, and exclusion of opt-out customer rate-case expenses from future cases. ETI agreed to defer issues around data management and privacy, the customer web-based portal, and membership to Smart Meter Texas (considered in an October 2018 docket).

Holding Company: **Evergy**

State	$B	Entity	Class	AMI meters	Analysis
KS	$0.8	**Kansas City Power & Light Co**	Integrated	236,744	Detailed

KCP&L first deployed 14,000 meters as part of its SGIG demonstration project in June 2011. In 2014, KCP&L included AMI in its 2015 rate case, which proposed the inclusion of AMI costs in its base rates. No other AMI deployment dockets were cited. The company described AMI as a necessary infrastructure upgrade that enables demand-management programs. In KCP&L's Missouri-filed 2015 IRP, the parent company confirmed 100% deployment in KCP&L by 2016 as part of its demand-side resource plan.

KS	$1.0	**Kansas Gas & Electric Co**	Integrated	288,656	Detailed

See Westar Energy for details.

KS	$1.1	**Westar Energy**	Integrated	318,830	Detailed

In 2009, Westar and Kansas Gas & Electric company (together, Westar) received a $19M grant from the SGIG to support a pilot project. In its 2015 rate case, Westar proposed two more phases of smart meter installments and requested recovery of undepreciated costs of the legacy analog meters. Recovery of the legacy meters was approved in September 2015.

MO	$1.0	**Kansas City Power & Light Co**	Integrated	284,417	Detailed

Kansas City Power & Light Co. (KCP&L) was awarded a DOE grant ($19M of the $40M cost) to support its Smart Grid Demonstration Project in 2015. In April 2015, KCP&L and KCP&L Greater Missouri Operations Co. filed a joint IRP which included an AMI deployment plan. The IRP described AMI as an infrastructure improvement that enables other key technology and software. As of 2015, 50% of AMI was deployed through KCP&L Kansas and Missouri territories, and the companies cited plans to finish deployment by 2020. The IRP was approved in December 2015.

MO	$0.8	**KCP&L Greater Missouri Operations Co.**	Integrated	193,027	Detailed

See Kansas City Power & Light Co. for details.

Holding Company: **Eversource**

State	$B	Entity	Class	AMI meters	Analysis
CT	$2.9	**Connecticut Light & Power**	Restructured		Detailed

In March 2007, CL&P proposed AMI deployment in compliance with a DPUC order in their TOU rate proposal, which was also created under a DPUC directive. In July, CL&P filed a Revised AMI Plan to comply with the Energy Efficiency Act, which included several options for deployment. In December 2007, the PUC approved several pilot programs. Study results were published in 2009. In August 2010, CL&P proposed system-wide rollout in conjunction with a review of its pilot programs. A draft decision in August 2011 recommended gradual deployment of smart meters due to the low cost-benefit ratio of the proposal; additionally, the DPU found a net negative CBA from its own analysis. The decision directed CL&P to generate four reports on the latest advancements in AMI technology in 2012-2013. This case was put on hold as the newly-created Department of Energy and Environmental Protection considered statewide clean energy goals. Though a final decision was not published, AMI was effectively denied. In October 2019, PURA reopened CL&P's rate pilot case and requested the development of a statewide AMI deployment business case.

MA		**Western Massachusetts Electric**	Restructured		Detailed

See NSTAR Electric company for details.

MA	$2.9	**NSTAR Electric Company**	Restructured		Detailed

In August 2015 Western Massachusetts Electric and NSTAR Electric Co. (Eversource) proposed an opt-in AMI program bundled with major technology upgrades and activation of TVR pricing. The model assumed a 5% opt-in participation rate. Grid-facing investments were approved in the May 2018 order, but the opt-in AMI program was rejected. The Eversource grid modernization plan was criticized by stakeholders and the DPU for rolling $400M of its grid improvements into its rate case. Additionally, the commission cited concerns citing concerns with the legacy AMR system, billing system capabilities, data-sharing plans, and ability to realize dynamic rate benefits.

NH	$1.0	**Public Service Company of New Hampshire**	Restructured		Detailed

In response to legislation directing an investigation of grid modernization, Public Service Co. of New Hampshire (Eversource) filed plans which included a petition for AMI deployment. In September 2019, after several years of commission-run stakeholder processes, commission staff issued a recommendation for an AMI opt-in policy. Staff noted that they do not see the need for full AMI as a foundational technology for the state's grid modernization goals.

Holding Company: **Exelon**

Exelon serves 10M customers in five states and Washington D.C. through its subsidiaries: Atlantic City Electric (New Jersey), Baltimore Gas and Electric (Maryland), Commonwealth Edison (Illinois), Delmarva Power (Delaware and Maryland), Philadelphia Electric Company (Pennsylvania), Potomac Electric Power Company (Washington, D.C.). Exelon also operates a variety of nuclear power plants and other generating stations. Baltimore Gas & Electric proposed full AMI deployment in 2007, and during the pendency of its application was awarded a SGIG. Delmarva Power and Atlantic City Electric (prior to the Pepco Holdings-Exelon merger in 2016) filed Blueprint for the Future plans in their respective states in 2007, which began AMI deployment in 2009-2010. Amidst consideration of the Blueprints, Pepco Holdings received a SGIG to stimulate smart grid development in D.C., Maryland, and New Jersey. In 2012, Commonwealth Edison proposed its AMI plan in addition to a petition for accelerated deployment through 2018. In compliance with state legislation, Philadelphia Electric Company began deploying smart meters in 2012. Atlantic City Electric completed an AMI business case in 2018, and committed to applying for full deployment over the next five years in Exelon's 2018 Corporate Social Responsibility report. The report also described smart meter integration in each entity and stated that 98.9% of its territory had smart meters installed in 2018.

State	$B	Entity	Class	AMI meters	Analysis
DC	$0.8	**Potomac Electric Power Co**	Restructured	277,998	Summary

In April 2007, Pepco filed an application to approve a DSM and AMI surcharge. Within this case, Pepco included its Blueprint For The Future, which laid out a long-term strategy for the company. Pepco's AMI plan included the deployment of 280,000 meters over two years, a cost estimate of $60M, the creation of an AMI Advisory Group, and recovery through an AMI Adjustment Mechanism. Pepco emphasized the importance of integrating smart meters with smart thermostats and other DSM programs. Revenue requirement of costs over fifteen years was estimated at $52.2M, and revenue requirement of operating benefits was estimated at $28M. The commission responded with requests for additional information, especially initial business case components. In February 2012, the commission requested an updated installment plan to address meter deployment delays.

DE	$0.6	**Delmarva Power**	Restructured	293,663	Summary

In February 2007, Delmarva presented its holding company plan for smart meter deployments in its Blueprint for the Future proposal (see Delmarva-Maryland for further details). The proposal included smart meter deployment for Delmarva's 300,000 customers. In September 2008, the Delaware Public Service commission authorized the cost recovery and investment return plan for the smart meter program. See Delmarva-Maryland for details of the Blueprint for the Future proposal.

IL	$5.0	**Commonwealth Edison**	Integrated	3,854,111	Detailed

Commonwealth Edison (ComEd) first proposed its AMI plan in April 2012. The petition was approved with modifications in June 2012. In response to a commission ruling in a concurrent rate case, ComEd filed a petition in July 2012 for approval to accelerate the deployment timeline. In response, the commission reopened and consolidated two ComEd dockets. In June 2014, the commission approved the proposed AMI acceleration, maintaining the consumer education budget and modifying the level of resources for education and outreach that it had planned for its original scenario. ComEd's 4M meter rollout was completed in 2018 rather than 2021, and was part of the utility's $2.6B grid modernization initiative.

MD $2.1 **Baltimore Gas & Electric** Restructured 1,272,169 Summary

In January 2007, Baltimore Gas & Electric (BG&E) filed their Smart Energy Savers Program (SESP), which included AMI and smart energy pricing pilots. In July 2009, BG&E filed an application to deploy AMI and other smart gird initiatives as a follow-up to the SESP. As the case was in process, BG&E received a $200M grant from the DOE for the Smart Grid Initiative. In June 2010, the commission rejected BGE's proposal and outlined four conditions for a revised proposal, noting concerns with smart grid technology, calculated benefits and missing costs. BG&E's application for rehearing the following month modified cost recovery, additional costs, projected benefits, meter lifetime, and more. The case was approved in August 2010.

MD $0.4 **Delmarva Power** Restructured Summary

Delmarva Power filed its AMI requests alongside Pepco, another Pepco Holdings Inc. (PHI) company. Delmarva's 2007 Blueprint for the Future plan proposed a demand response, advanced metering and energy efficiency plan, though this case did not include an AMI timeline or business case. In 2009, the PHI companies filed separate AMI proposals and business plans in a joint case. The commission's initial review of the Delmarva BCA determined that, without the federal grant Pepco received, operational savings did not offset the costs of deploying AMI. The commission also criticizes the lack of a customer education and communications program, and required an updated business case with a ten-year project life. In order to balance Delmarva's proposal and concerns of the low cost-benefit ratio, Delmarva was permitted to recover start-up costs, but that all other recovery must be presented in a rate case after demonstration of AMI cost-effectiveness.

MD $1.3 **Potomac Electric Power** Restructured 555,443 Summary

Potomac Electric Power Co. (Pepco) filed its AMI plan jointly with Delmarva in Maryland, together as Pepco Holdings Inc. (PHI) companies. Pepco's 2007 Blueprint for the Future plan proposed a demand response, advanced metering and energy efficiency plan, though this case did not include an AMI timeline or business case. Pepco requested an expedited ruling to aid its application for the DOE Smart Grid Investment Grant program. DOE later awarded Pepco $104.8M, $68.3M of which was allocated to AMI. A subsequent case was opened to consider establishment of a regulatory asset, which was initially rejected. The commission approved the AMI deployment and future cost recovery, pending a re-filing of the business case with a ten-year post-deployment life.

NJ $1.0 **Atlantic City Electric** Restructured Summary

In November 2007, Atlantic City Electric (ACE) filed its Blueprint for the Future application with the BPU, which included deployment of 540,000 AMI meters and MDMS. Deployment costs were estimated at $128M and included the creation of an ACE AMI Advisory Group and a formal business case. AMI was cited as a key technology to enable energy efficiency/management and DR programs. Remote meter reading was cited as the largest source of benefits. In the 2018 Exelon Corporate Sustainability Report, the parent company noted that ACE was planning on applying for installation of AMI in the rest of its territory (571,000 meters) within five years. In September 2019, ACE delivered comments on the New Jersey draft 2019 Energy Master Plan, noting that acceleration of AMI deployment is key to achieving state climate goals.

PA	$2.2	**PECO Energy**	Restructured	1,669,061	Detailed

In August 2009, PECO Energy requested commission approval for its Smart Meter Plan to deploy 600,000 smart meters and its accompanying cost recovery surcharge mechanism. The original cost of AMI deployment was estimated at $215 -225M depending on certain costs. During the pendency of the application, PECO was awarded a $200M SGIG. PECO divided its Smart Meter Plan into three requests, each with their own petition and settlement agreement: a technology procurement and testing phase, development of dynamic pricing, and universal deployment of AMI. PECO's initial request in August 2009 was for its technology procurement phase and deployment of 100,000 smart meters. PECO filed a request for its dynamic pricing plan in October 2010, and in January 2013, PECO filed a formal request to deploy 1.2M smart meters to the rest of its service territory. Net benefits of universal deployment were estimated at $59.7M. In August 2013, the commission approved the universal meter deployment portion of the plan.

Holding Company: FirstEnergy

FirstEnergy serves 6M customers through ten distribution companies located in Ohio (Ohio Edison, Toledo Edison, Electric Illuminating Co.), Pennsylvania (Pennsylvania Electric Co., Metropolitan Edison, Penn Power, West Penn), New Jersey (Jersey Central Power & Light), and West Virginia (Potomac Power, Monongahela Power). FirstEnergy has deployed distinctly different strategies for AMI deployment through each state. The Pennsylvania entities petitioned to deploy AMI to more than 2M customers in 2014 as part of a state-mandated initiative. Following the implementation of its gridSMART demonstration project in 2010-2013, FirstEnergy's Ohio entities submitted a grid modernization plan in 2016, which included deployment of 700,000 meters and received approval in 2019. Jersey Central Power & Light, FirstEnergy's sole New Jersey entity, engaged in a smart grid demonstration project and was directed by the commission to pursue AMI in 2020. The West Virginia utilities have not yet filed applications for AMI deployment.

State	$B	Entity	Class	AMI meters	Analysis
MD	$0.5	**Potomac Edison Company**	Restructured		Summary

In the Potomac Edison Co. (PE)'s 2018 rate case, PE included a proposal for a Meter Ownership Rider opt-in program for customers which have a demand greater than 300 kW. The rate case was approved in March 2019.

NJ	$1.7	**Jersey Central Power & Light**	Restructured	0	Summary

In 2010, FirstEnergy deployed limited AMI, DA, VVO, and direct load control devices in the Jersey Central Power & Light territory through a SGIG.

OH	$1.0	**Cleveland Electric Illum Co**	Restructured	34,204	Detailed

See Ohio Edison for First Energy's joint application for full AMI deployment. In 2010, FirstEnergy deployed limited AMI, DA, VVO, and direct load control devices in the Cleveland Electric Illuminating Co. territory through a SGIG.

OH	$1.4	**Ohio Edison**	Restructured	12	Detailed

In August 2014, Ohio Edison company, The Cleveland Electric Illuminating company and The Toledo Edison company (collectively, FirstEnergy) filed their fourth Electric Security Plan entitled “Powering Ohio’s Progress," which contained a commitment to

file a grid modernization plan in 2016. In February 2016, FirstEnergy proposed a full deployment of AMI for its Ohio entities as a foundational part of a grid modernization proposal. While the initial application only included net present value for the full grid modernization program, the stipulation, which also resolved concerns with a parallel distribution modernization plan, provided more detailed info on costs and benefits. The stipulation was approved in July 2019.

OH	$0.4	**Toledo Edison Company**	Restructured	0	Detailed

See Ohio Edison for First Energy's joint application.

PA	$0.8	**Metropolitan Edison Co**	Restructured	326,410	Detailed

The Pennsylvania FirstEnergy companies (Metropolitan Edison Co., Pennsylvania Electric Co., and Pennsylvania Power company [Penn Power]) filed their smart meter implementation plan (SMIP) jointly in August 2009. This plan created described company actions for the commission-approved 30-month grace period. During the grace period in 2010, FirstEnergy deployed limited AMI, DA, VVO, and direct load control devices in the MetEd territory through a SGIG. In January 2013, the FirstEnergy companies proposed a smart meter deployment plan, which included an assessment period which studied an initial deployment in the Penn Power service territory and full deployment over three years. The plan also added plans to deploy AMI in West Penn Power territory, which was recently acquired by FirstEnergy. The plan was approved in March 2014, but was quickly followed by a petition from the FirstEnergy companies to accelerate the deployment timeline by one year. The commission accepted the accelerated plan in June 2014. Debate around cost recovery and annual tariff adjustments continued in several dockets after the approval of the deployment plan.

PA	$0.9	**Pennsylvania Electric Co**	Restructured	513,043	Detailed

See Metropolitan Edison Co. for details.

PA	$0.3	**Pennsylvania Power Co**	Restructured	167,639	Detailed

See Metropolitan Edison Co. for details.

PA	$1.0	**West Penn Power Company**	Restructured	387,973	Detailed

West Penn filed its smart meter implementation plan (SMIP) in August 2009. During the pendency of the SMIP proceeding, FirstEnergy and West Penn's corporate parent, Allegheny Energy, announced their intent to merge. West Penn's smart meter deployment was included in the FirstEnergy smart meter planning dockets (see Metropolitan Edison Co. for full details) as a result of a joint settlement in its original docket in June 2011. West Penn agreed to conduct an independent CBA, decelerate its deployment plan, review/revise its EE/DR plans, and consider cost recovery aspects independently from the other companies. Most of West Penn's planning development costs were approved for recovery in the initial docket, but an additional $5.1M was approved through the FirstEnergy case.

WV	$1.1	**Monongahela Power Co**	Integrated	Summary

Monongahela Power Co. (MonPower) was awarded a DOE grant to complete its "West Virginia Super Circuit" smart grid demonstration project, which was proposed to demonstrate improved performance and reliability through the integration of distributed resources and advanced technology, which included AMI. The project was estimated at $9.8M over four years (2010-2014) and was funded 57% through the DOE. In 2014, Potomac Edison and MonPower Co. stated in a joint response to a request for information that the companies had not completed an evaluation of AMI for West Virginia, "nor are the companies aware of any statute or commission rule requiring their use in West Virginia." MonPower also stated that because AMI was not deployed on a utility-scale, the CBAs could not be completed.

State	$B	Entity	Class		Analysis
WV	$0.3	**Potomac Edison Company**	Integrated		Summary

In Potomac Edison's annual smart grid reports, the company does not include information on AMI deployment in its territory. See Monongahela Power Co. for sister company details.

Holding Company: **Fortis**

State	$B	Entity	Class	AMI meters	Analysis
AZ	$1.0	**Tucson Electric Power Co**	Integrated	0	Summary

In 2013, Tucson Electric Power Co. (TEP) began installing an AMR system across its territory. TEP offers an opt-out tariff option in its base rates.

NY	$0.6	**Central Hudson Gas & Elec Corp**	Restructured	140	Summary

Central Hudson began installing AMR technology in the 1990. Central Hudson analyzed AMI benefits and costs in their 2016 Distribution System Implementation Platform, but asserted that deployment costs outweighed benefits. A 2017 REV CONNECT Utility Profile on Central Hudson noted that AMF is available in an opt-in basis. In October 2017, the New York DPS ruled that Central Hudson could no longer offer an AMR opt-out fee to its customers. In response, Central Hudson filed information in its 2018 DSIP on its Insights+ program, a subscription based service for the installation of advanced meters. This opt-in program collects measurement and verification information for NWA programs, supports value stack compensation, and enables TOU rates.

Holding Company: **Green Mountain Power**

State	$B	Entity	Class	AMI meters	Analysis
VT	$0.6	**Green Mountain Power Corp**	Restructured	265,682	Detailed

In September 2008, the Vermont Public Service Board approved a stipulation between Central Vermont Public Service Corp. (CVPS merged with Green Mountain Power, or GMP, in 2012), committing CVPS to AMI implementation "as fast as it reasonable could." CVPS filed an AMI Plan within its SmartPower Plan in April 2009 and noted plans to collaborate with GMP for networking capabilities. CVPS'

application was approved in August 2010. GMP filed its own AMI Implementation Plan in December 2010 which included the supporting business case, measurement and verification plan, qualitative description of benefits, and communications plan. The plan was approved in July 2011, when GMP began implementing AMI throughout its entire service territory. GMP partnered with other Vermont utilities to submit an application for SGIG funds; GMP's share of the grant was $19.2M, of which GMP allocated $11M for AMI deployment. The SGIG award provided funding for approximately 50% of the project costs. The estimated net cost to GMP for AMI was $10.6M with the remaining approximately $8M to be used to implement grid automation and customer information system projects. GMP's overall Smart Grid efforts are comprised of three separate projects: AMI; grid automation; and CIS overhaul.

Holding Company: HEI

State	$B	Entity	Class	AMI meters	Analysis
HI	$0.4	**Hawaii Electric Light Company**	Integrated		Detailed
		See Hawaiian Electric for details.			
HI	$0.4	**Maui Electric**	Integrated	30	Detailed
		See Hawaiian Electric for details.			
HI	$1.8	**Hawaiian Electric**	Integrated		Detailed

HECO's AMI proposal, which was included in the Phase One Grid Modernization Plan, was approved in March 2019. The approval was preceded by the denial of their Smart Grid Foundation Project in January 2017, in which the commission required HECO to develop a Grid Modernization Strategy (GMS) with stakeholder input. The commission advised HECO to consider grid investments separately, as part of a broader strategy which identifies technology priority, minimized risk, customer benefits, and DER/renewable energy integration. The GMS was approved in February 2018, and was followed by separate applications for the phases of technology deployment. HECO's Phase I application for AMI deployment was filed in June 2018 and included a telecommunications network and MDMS.

Holding Company: Idacorp

State	$B	Entity	Class	AMI meters	Analysis
ID	$1.1	**Idaho Power**	Integrated	517,930	Summary

In August 2007, Idaho Power filed an AMI Implementation Plan within a commission-mandated report on AMR. The company followed the plan with a CPCN request in August 2008, which was approved in February 2009. This application evolved from its compliance filings from the Phase One AMI System pilot projects. Idaho Power filed an updated cost/benefit analysis and 3-year implementation plan in May and August 2007 in the Phase One case. The commission originally directed Idaho Power

to implement AMI in 2002, encouraging deployment "as soon as possible, commencing in 2003." Idaho Power completed deployment in both its Idaho and Oregon territories with a total of 546,000 meters.

Holding Company: **Liberty Utilities**

State	$B	Entity	Class	AMI meters	Analysis
MO	$0.5	**Empire District Electric Co**	Integrated		Detailed

In 2019, Liberty-Empire wrote in its triennial IRP that after years of evaluating AMI, it would begin to deploy smart meters in 2020. The AMI initiative is part of Liberty-Empire's five-year capital plan and is coordinated with the Liberty Utilities corporate-wide rollout of AMI.

2020 UPDATE:
In April 2020, Liberty-Empire and other stakeholders filed a joint agreement regarding its IRP. The agreement stated that AMI data may inform various planning studies, and that Liberty-Empire will continue to explore ways to maximize benefits to customers. In May 2020, the commission approved the agreement.

Holding Company: **MGE Energy**

State	$B	Entity	Class	AMI meters	Analysis
WI	$0.4	**Madison Gas & Electric**	Integrated	8,225	Summary

In 2009, Madison Gas & Electric (MGE) was awarded a SGIG for $5.5M to assist in its $11.1M Customer Driven Design of Smart Grid Capabilities project. The project deployed 4,000 AMI meters, an AMI communications system, DMS, and other technology. As of 2019, MGE reported 9,000 AMI meters installed in its territory.

Holding Company: **National Grid**

State	$B	Entity	Class	AMI meters	Analysis
MA	$2.3	**Massachusetts Electric**	Restructured	15,467	Detailed

In compliance with Section 85 of the Green Communities Act, Massachusetts Electric (dba National Grid) filed for a smart grid pilot program in December 2011 which contained smart meters. In August 2015, National Grid filed their Grid Modernization Plan (GMP), which included investments in AMI, SCADA, advanced distribution automation, and voltage management. In May 2018, the DPU issued an order denying the AMI portion of National Grid, Unitil, and Eversource's plans, though grid-facing improvements were approved. DPU cited concerns with unrealistic benefit predictions, but expressed openness to AMI with further study. Other stakeholders noted that Massachusetts EDCs already have automated meter reading devices, which eliminated meter-reading benefits (typically a large portion of AMI benefits), in addition to concerns about TVR benefits and billing capabilities.

State	$B	Entity	Class	AMI meters	Analysis
NY	$2.2	**Niagara Mohawk Power**	Restructured	3,337	Detailed

Niagara Mohawk (dba National Grid) first described plans to deploy AMI in its 2016 Distribution Implementation System Platform plan. In 2017, National Grid deployed limited AMI as part of a REV demonstration project, and in its 2017 rate case, National Grid filed an updated AMI business case with a proposal for full deployment of 1.7M meters. After a lengthy stipulation process, National Grid agreed with staff that its AMI plan was not ready for consideration and agreed to resubmit its business plan. The commission approved this notion in March 2018 and required more stakeholder engagement. In September 2019, National Grid filed a supplemental filing which updated its AMI cost and benefit projections, lowering cost and adding new benefit categories.

RI	$1.0	**Narragansett Electric**	Restructured	257	Detailed

In November 2017, Narragansett Electric (National Grid) proposed a Power Sector Transformation Plan (PSTP) and an associated rate case which outlined several grid-related investment plans. The PSTP included AMF deployment. In June 2018, parties submitted a settlement agreement in the PSTP proceeding. The AMI portion of the PSTP settlement agreement included a requirement for National Grid to file a revised business case, including a cost benefit analysis, data governance plan, and a detailed customer engagement plan. The settlement also requires the cost benefit analysis to incorporate the cost/benefit framework filed in May 2017 in the electric distribution system investigation docket. The commission approved the settlement in June 2018, which acknowledged that AMI is a foundational part of grid modernization, though it didn't explicitly authorize deployment. In compliance with the settlement, starting in 2018, National Grid engaged in several stakeholder processes to develop a new AMI business case and implementation plan. In National Grid's 2018/2019 Annual Report, the company committed to filing an updated request for AMF approval and business case in 2020.

Holding Company: NextEra

NextEra Energy serves 10M customers across Florida (Florida Power & Light Co. and Gulf Power Co.) in addition to owning wholesale electricity supply and renewable energy subsidiaries. Florida Power & Light began deploying smart meters in 2007, and proposed full deployment of 4.5M meters through 2009-2013. As of 2019, NextEra had deployed more than 5M smart meters.

State	$B	Entity	Class	AMI meters	Analysis
FL	$10.7	**Florida Power & Light**	Integrated	4,994,535	Summary

FPL began the process of replacing electromechanical and digital meters with smart meters through two separate early deployment programs initiated in 2007 and 2008. Each of these programs involved the installation of approximately 50,000 smart meters. Thereafter, the smart meter rollout to all residential and small business customers commenced in September of 2009. FPL's smart meter project was reviewed and approved by the commission in FPL's 2009 rate case. The commission approved FPL's AMI project, and deployment began in 2009. In March 2010, the DOE awarded FPL a $200M grant from the American Recovery and Reinvestment Act ("ARRA") stimulus funds for its Emergency Support Function (ESF) proposal, which incorporated smart meter functionality.

State	$B	Entity	Class	AMI meters	Analysis
FL	$1.2	**Gulf Power**	Integrated	461,710	Summary

Gulf Power initiated an AMI pilot program in 2008, and completed full deployment from 2009-2012. In its 2016 depreciation study, the company noted various AMI node failures and costs. Gulf Power also stated that it did not record any retirements, gross salvage, or cost of removal in any other rate case during the installation process.

Holding Company: NiSource

State	$B	Entity	Class	AMI meters	Analysis
IN	$1.6	**Northern Indiana Public Service**	Integrated		Summary

In 2014, Northern Indiana Public Service Co. (NIPSCO) began upgrading its meters to AMR. NIPSCO cited in its 2016 IRP that it was evaluating AMI, but no significant AMI deployment was proposed.

Holding Company: Northwestern

State	$B	Entity	Class	AMI meters	Analysis
MT	$0.7	**NorthWestern Energy LLC - (MT)**	Integrated		Summary

In 2009, NorthWestern Energy participated in the SGIG-funded Pacific Northwest Smart Grid Demonstration Project. NorthWestern published reports on its demand response pilot, which included limited deployment of 200 smart meters.

Holding Company: OGE

State	$B	Entity	Class	AMI meters	Analysis
AR	$0.2	**Oklahoma Gas & Electric Co**	Integrated	68,732	Summary

In 2009 OG&E began a demonstration project, regarded as "Phase I" of its planned system-wide deployment. In December 2010, OG&E submitted its application for Smart Grid development, which cites OG&E's 2009 award of a $130M DOE smart grid investment grant for implementation in Arkansas and Oklahoma. OG&E committed to the DOE to spending $357.4M over a three-year period (2010-2012). The project was approved in August 2011.

OK	$1.9	**Oklahoma Gas & Electric**	Integrated	793,937	Detailed

Oklahoma Gas & Electric Co. (OG&E) began investigating smart grid technologies in 2007. Following a demonstration project, OG&E requested approval of an expanded smart grid program in Norman, OK in a 2008 rate case. In 2009, OG&E received a $130M SGIG to develop an integrated smart grid in Oklahoma and Arkansas, which

included the installation 800,000 smart meters. In 2010, "to fully take advantage of the DOE funding," OG&E requested commission approval for full deployment of smart grid technology, including AMI, and cost recovery over three years. AMI was cited as a foundational technology to implement DR and other smart grid technologies in later phases. Project costs were estimated at $360M. OG&E requested additional cost recovery in 2013.

Holding Company: PG&E

State	$B	Entity	Class	AMI meters	Analysis
CA	$13.6	**Pacific Gas & Electric**	Restructured	5,262,080	Summary

Pacific Gas and Electric (PG&E) began to discuss the benefits of AMI and other related technologies in a June 2002 commission rulemaking docket. In November 2004, PG&E filed its first AMI business case, followed by several revisions. PG&E filed its own docket to house its AMI application in June 2005, and filed a revision that modified cost recovery mechanisms the following October. PG&E expected deployment to take five years for the installation of 5.3M meters, with total estimated costs of $1.7B and $2.0B of benefits. In June 2006, after several settlement procedures, the commission approved PG&E's application and permitted commencement in 2007.

Holding Company: PGE

State	$B	Entity	Class	AMI meters	Analysis
OR	$1.8	**Portland General Electric**	Integrated	869,863	Summary

Portland General Electric (PGE) first installed 3,500 smart meters in 2001. The Oregon PUC approved PGE's expanded AMI program in May 2008 through a stipulation which covers ancillary programs, project management, and best practices for a variety of scenarios (remote disconnect, outage situations, etc.). PGE completed full deployment of 888,000 meters in 2010. In 2014, PGE received reports of meter-sparked fires, prompting the replacement of 70,000 meters.

Holding Company: Pinnacle West

State	$B	Entity	Class	AMI meters	Analysis
AZ	$3.5	**Arizona Public Service**	Integrated	1,215,804	Summary

Arizona Public Service Co. (APS) began installing automated metering systems in its service territory in 2001. In 2004, the company began a formal pilot program, and in 2006 APS began a phased deployment of smart meters in specific areas of their territory. In March 2013, APS proposed an opt-out tariff which was rolled into its 2015 rate case. APS completed the deployment of 1.2M meters in March 2016.

Holding Company: PNM Resources

State	$B	Entity	Class	AMI meters	Analysis
NM	$1.0	**Public Service Company of New Mexico**	Integrated	0	Detailed

In February 2016, PNM proposed an AMI installation project. PNM described manual meter deficiencies and a series of failed tests. In March 2018, the application was recommended for denial, citing a lack of several components: energy efficiency considerations, public participation process, public benefit (esp. financial savings), evaluation of alternatives, options for health-concerned customers, proximity to other rate-increases, and other categories. In May 2017, PNM filed a request in the same docket for allowance to issue a new RFP to update its cost-benefit analysis, which updated the cost of the project to $95.1M.

Holding Company: PPL

State	$B	Entity	Class	AMI meters	Analysis
KY	$1.5	**Kentucky Utilities**	Integrated	2,509	Detailed

As part of Kentucky Utilities (KU) and Louisville Gas & Electric (LG&E)'s joint 2014 DSM-EE program, each company deployed 5,000 AMS meters as a voluntary pilot program. Following the pilot, LG&E independently proposed AMS deployment as part of its November 2016 rate case. In April 2017, LG&E and KU signed a stipulation in the rate case which withdrew the AMS CPCN; established an AMS collaborative; and approved the joint DA project. Criticism of the AMS program questioned the benefit calculations, analysis periods and customer engagement projections. The stipulation was formally accepted in June 2017. In 2018, KU and LG&E jointly proposed full AMS deployment to replace 531,000 electric meters at a cost of $146M. In August 2018, the commission denied the application, citing concerns about the existing meters obsolescence and the net benefits that might result in "wasteful duplication."

KY	$1.1	**Louisville Gas & Electric**	Integrated	4,493	Detailed

See Kentucky Utilities for details.

PA	$1.9	**PPL Electric Utilities**	Restructured	1,429,090	Detailed

In response to the commission's order to develop a smart meter technology plan, in August 2009 PPL Electric Utilities filed a Smart Meter Technology Plan which included pilot programs and attested that its current system was compliant with commission standards. After several months of consideration, the commission denied the request for exemption and ordered PPL to file a full Smart Meter Plan by December 2012. PPL delayed the application of their updated Smart Meter Plan until June 2014, at which time it proposed to implement a new mesh network, AMI meters, MDMSS, and a variety of other technologies. In September 2015, the commission approved PPL's application with a few modifications, including the provision that PPL track and quantify system benefits.

Holding Company: **PSE**

State	$B	Entity	Class	AMI meters	Analysis
WA	$2.2	**Puget Sound Energy**	Integrated	5,125	Detailed

Puget Sound Energy (PSE) completed its installation of 1.5M AMR meters in 2000. PSE began replacing its AMR platform with AMI in 2016 as part of its six-year Meter Upgrade Project, and its 2016 Smart Grid Technology Report cited the formation of an AMI strategy and business case. The project included replacement of 1.1M electric and 800,000 gas meters, to be completed in 2023. PSE stated that the project mitigated the risk of aging infrastructure and provided a framework for grid modernization. In October 2018, PSE submitted a petition for an opt-out tariff, which was approved in January 2019.

Holding Company: **PSEG**

Public Service Enterprise Group (PSEG) serves 3.3M customers through its subsidiaries: Public Service Electric and Gas (PSE&G, New Jersey) and PSEG Long Island (New York). In 2016, PSEG Long Island filed its intention to install AMI throughout its territory from 2015-2018. In 2018, PSE&G introduced its six-year Clean Energy Future plan in New Jersey, which included the installation of 2.2M AMI meters.

State	$B	Entity	Class	AMI meters	Analysis
NJ	$3.7	**Public Service Electric & Gas (PSEG)**	Restructured	15,062	Detailed

In September 2018, PSE&G submitted its six-year, $4B Clean Energy Future plan, which included an "Energy Cloud" program to install 2.2M smart meters. The Energy Cloud tranche estimated $800M for the smart meter investment, and $1.7B in benefits (net benefits of $937M) over 20 years. PSE&G submitted its application despite the moratorium on AMI development set by the BPU in August 2017, and the company stated several reasons the moratorium should be lifted. The Energy Cloud program was described as a foundational component of the company's transition towards a smart utility.

2020 UPDATE:
In February 2020, the BPU filed an order in Rockland Electric Co.'s AMI docket that ordered all utilities to file or update previously-filed petitions for AMI implementation. In April 2020, PSE&G complied by filing an updated verified petition the Clean Energy Future - Energy Cloud program. The updated program modified the deployment schedule, inflation adjustments, and incorporated 2018 rate case results. The updated petition delayed implementation by 3 years (now set for 2021-2025), and adjusted cost estimates to $714M for capital and $71M in O&M costs.

NY	$3.6	**Long Island Power Authority**	Other	63,546	Detailed

In 2010, Long Island Power Authority (LIPA) began installing a Smart Energy Corridor which was funded in part through a SGIG. The corridor project included smart meters, monitoring equipment, and DA. In 2014, LIPA proposed to deploy 25,000 AMI meters in its annual Utility 2.0 filing. In its 2017 Utility 2.0 Update, LIPA instituted a formal, long-term phased approach to AMI. CBAs were proposed in both the 2017 and 2018 cases. In its 2019 Update, LIPA proposed to replace 250,000

meters per year through 2022.

Holding Company: **Sempra**

State	$B	Entity	Class	AMI meters	Analysis
CA	$3.8	**San Diego Gas & Electric**	Restructured	1,435,218	Summary

San Diego Gas & Electric Co. first filed a draft AMI business case in October 2004 in the commission's AMI investigation docket. SDG&E formally proposed its 1.4M smart meter project in March 2005. The project was approved in April 2007 for approximately through a stipulation agreement for $572M over a five-year deployment period (2007-2011). Net benefits were estimated between $40-51M. In September 2010, SDG&E petitioned for cost recovery and a slight delay in the implementation schedule, which were granted. In 2010, SDG&E was awarded a SGIG to upgrade its communications infrastructure to build off of its AMI.

TX		**Oncor**	Restructured	3,493,799	Summary

In 2005, Oncor Electric Delivery Co. (Oncor) announced a plan to install AMR throughout its territory. After the Texas PUC adopted its advanced meter ruling, Oncor revised its plans to comply with the new regulations. Its updated Smart Texas project requested approval to install 3.4M AMS meters. The six-year project (2008 -2012) was designed to help with reliability and achieve economic and conservation benefits. The program was approved in 2008. After the development of a settlement agreement, the commission approved the application in August 2008.

Holding Company: **Southern Company**

Southern Co. operates seven utilities which serve 9M customers in six states, not including its gas distribution, wholesale generation, and telecommunications companies. Southern Co.'s electric utilities include Alabama Power, Georgia Power, and Mississippi Power. Georgia Power requested the deployment of 2.5M AMI meters through a redacted rate case in 2007. In 2008, Southern Co. announced a contract with a meter vendor to deploy 4.3M meters across its territory. Alabama Power began installing AMI without a regulatory filing in 2008. Mississippi Power submitted its initial request to deploy AMI in 2009, though the case was not approved until 2018 following a supplemental petition in 2016. As of 2019, Southern Co. cited deployment of more than 4.6M smart meters in the Southeast.

State	$B	Entity	Class	AMI meters	Analysis
AL	$5.5	**Alabama Power**	Integrated	1,447,521	Summary

In January 2008, Alabama Power (Southern Co.) announced an AMI vendor contract to provide 4.3M meters to its southeast customers. Approximately 1.5M meters were deployed in Alabama territory. According to an internal presentation to a DA working group in early 2008, Alabama Power began planning for AMI in 2007, and deployment was completed between 2008-2010, followed by additional proposals for DA technologies.

GA	$7.8	**Georgia Power**	Integrated	2,461,469	Summary

Georgia Power proposed AMI in its 2007 rate case, though specific costs and benefit data is marked as confidential. In December 2007, the Georgia Public Service commission approved Georgia Power's request to replace 2.5M mechanical meters in its distribution system over six years. In January 2008, Georgia Power's parent company, Southern company, announced an agreement to purchase 4.3M meters and noted that Georgia Power began deploying at this time. Georgia Power finished deployment in 2012.

MS	$0.9	**Mississippi Power Co**	Integrated	20	Detailed

In 2009, Mississippi Power submitted its initial request to deploy AMI across its territory - approximately 189,000 meters. No commission action was taken in this case for several years. In April 2016, Mississippi Power filed a supplemental petition to replace its AMR with AMI. The updated analysis revealed $3.6B in net savings over a seventeen-year period. In May 2018, the commission issued an order approving the supplemental petition as modified by a stipulation.

Holding Company: **WE Energies**

State	$B	Entity	Class	AMI meters	Analysis
WI	$2.8	**Wisconsin Electric Power**	Integrated	463,124	Detailed

In January 2018, Wisconsin Electric Power Co (We Energies) filed a report with the Securities and Exchange commission which included the description of its Wisconsin AMI program. The program was estimated to cost $200M over two years, and the company's interstate capital plan cited a budget of $0.4B on automated meters from 2018-2022. In 2019, We Energies announced a partnership with a smart meter vendor in 2019 to deploy AMI to its 500,000 Wisconsin gas and electric customers.

WI	$1.0	**Wisconsin Public Service**	Integrated		Detailed

In 2003, Wisconsin Public Service Co. (WPS) deployed gas and electric AMR throughout its territory. In December 2016, WPS filed an application to replace its gas AMR meters with AMI. The application noted that although the company had no statutory requirement to file a request for electric meter replacement, some details on its electric meters were included. WPS also described a steadily increasing meter module failure rate. The application was approved in four months, in April 2017.

Holding Company: Xcel

Xcel Energy serves 3.3M customers across eight states through Northern States Power Co. (Minnesota, North Dakota, South Dakota, Wisconsin), Public Service Co. of Colorado, and Southwestern Electric Power Co. (Texas, New Mexico). Xcel's filings for its Advanced Grid Intelligence and Security (AGIS) initiatives in Minnesota and Colorado contain provisions for AMI deployment. Public Service Co. of Colorado proposed its AGIS in 2016, and after approval petitioned to delay smart meter deployment to 2019-2024. In October 2019, Xcel committed to deploying smart meters across its service territories within five years. Following this announcement, Northern States Power Co. in Minnesota filed an Integrated Distribution Plan with AMI rollout scheduled for 2021-2024. Xcel's 2018 quantitative IEE report showed 0% deployment in 2018, with goals of 50% system-wide deployment by 2023 and 100% deployment by 2027.

State	$B	Entity	Class	AMI meters	Analysis
CO	$2.7	**Public Service Company of Colorado (PSCo)**	Integrated	12,374	Detailed
		PSCo first became involved with the smart grid in 2008 through a Smart Grid City pilot. In 2016, PSCo proposed its "Our Energy Future" plan which emphasizes an intelligent, interactive grid. Later that year, PSCo filed an application for its Advanced Grid Intelligence and Security (AGIS) initiative, which included integrated Volt-VAr Optimization, Field Area Network, and the installation of 1.5M advanced meters over 2016-2021. PSCo later asked to delay AMI deployment to 2019.			
MN	$3.3	**Northern States Power**	Integrated		Detailed
		In May 2018, the Minnesota commission approved Northern States Power Co. (Xcel)'s 2017 Distribution Grid Modernization report, which contained a TOU pilot program with 17,500 AMI meters. In November 2018, Xcel filed its first Integrated Distribution Plan. The plan foreshadowed upcoming distribution system investments, including full AMI deployment and FAN for $450-$600M as part of its Advanced Grid Intelligence and Security (AGIS) initiative. In November 2019, Xcel filed an updated Integrated Distribution Plan (IDP). The AGIS initiative was described to build upon the current ADMS implementation project through the deployment of 1.6M meters. Xcel stated that the AGIS initiative supported IDP directives outlined by the commission in July 2019. On the same day of its IDP submission, Xcel filed its 2020 rate case, which included cost recovery for AMI through 2022.			
ND	$0.2	**Northern States Power Co - Minnesota**	Integrated		Summary
		In 2019, the parent company of Northern States Power Co. (Xcel Energy) announced a goal of full AMI deployment across its subsidiaries. Northern States Power Co. has not submitted any other public AMI plans, though its Minnesota branch requested approval for its AMI project in 2019.			
NM	$0.4	**Southwestern Public Service**	Integrated	2	Summary
		SPS initiated a pilot project in 2012. In their 2015 rate case, SPS cited the commission's interest in creating pilot projects or initiating full deployments, but SPS determined they would continue evaluation of their previous project. In 2019, the parent company of Southwestern Public Service Co. (Xcel Energy) announced a goal of full AMI deployment across its subsidiaries.			

SD	$0.2	**Northern States Power Co - Minnesota**	Integrated		Summary

In 2019, the parent company of Northern States Power Co. (Xcel Energy) announced a goal of full AMI deployment across its subsidiaries. Northern States Power Co. has not submitted any other public AMI plans, though its Minnesota branch requested approval for its AMI project in 2019.

TX	$0.6	**Southwestern Electric Power Co**	Integrated	0	Summary

In May 2018, Southwestern Electric Power Co. (SWEPCO) offered an opt-in AMI tariff to its customers. Customers who opt-in to use smart meters were also required to pay for electrical service on the meter.

WI	$0.7	**Northern States Power Co**	Integrated		Summary

In 2019, the parent company of Northern States Power Co. (Xcel Energy) announced a goal of full AMI deployment across its subsidiaries. Northern States Power Co. has not submitted any other public AMI plans, though its Minnesota branch requested approval for its AMI project in 2019.

Holding Company:

State	$B	Entity	Class	AMI meters	Analysis
AZ	$2.9	**Salt River Project**	Other	1,033,279	Summary

In 2009, the Salt River Project was awarded a $56.9M SGIG to help double its AMI penetration rate (addition of 459,000 meters) from 2010-2012. The project also included MDMSS and an energy management web portal for an estimated total cost of $114M. Implementation of TOU pricing was also a goal of the project.

CA	$3.8	**Los Angeles Department of Water & Power**	Municipal	50,934	Summary

In March 2018, Los Angeles Department of Water & Power responded to a motion to submit a report on the feasibility of developing a power outage program. The company noted that it was in the planning stage of a system-wide rollout of smart meters as part of a grid modernization project.

CA	$1.4	**Sacramento Municipal Utility District**	Other	623,918	Summary

In 2007, Sacramento Municipal Utility District (SMUD) created its first internal AMI business case. The project estimated $108M in investment costs over a two-year deployment and $64M in net benefits over 15 years. 52% of benefits were attributed to meter reading. In 2008, SMUD released an AMI RFP, and in 2009 the board of directors considered contract negotiations with AMI meter and network vendors. After an initial testing of 50,000 meters, the company proceeded with full deployment from 2010-2011.

FL	$1.2	**JEA**	Municipal	215,348	Summary

JEA began investigating alternatives to their AMR water and electric systems in 2004. Around 2010, JEA began automating its technology and developing a smart grid foundation with AMR technology. In March 2018, JEA signed a contract with a meter vendor to deploy 250,000 AMI meters in addition to other expanded data capabilities with the meter vendor.

IN	$0.0	**City of Auburn - (IN)**	Municipal	7,557	summary

The City of Auburn municipal utility was awarded a SGIG in 2009 to support its SmartGRID program. The City began deploying AMI in September 2012. The utility invited the City of Auburn's Information Technology Department and a consultant certified by the DOE determine data security and privacy policies.

NE	$1.0	**Omaha Public Power District**	Other	5	Summary

In 2006, Omaha Public Power District began deploying an AMR system in its territory.

TN	$1.3	**City of Memphis**	Municipal	314,603	Summary

In 2013, Memphis Light, Gas and Water (MLGW) deployed 60,000 electric, gas, and water meters and associated technology for a cost of $10.2M. Approximately 3.6% of customers chose to opt-out in this phase. In December 2015, the Memphis City Council voted to approve MLGW's $240M contract to install 1M electric, gas, and water smart meters, to be installed through 2020. The utility claimed that it would save the company $40M per year

TN	$1.3	**Nashville Electric Service**	Municipal	304,032	Summary

In October 2011, Nashville Electric Service announced a contract to deploy a communications network and 30,000 smart meters throughout its territory. Deployment began in 2012.

TX	$1.2	**Austin Energy**	Municipal	475,626	Summary

In 2008, Austin Energy received approval for amendments to its $36M, 15-year contract with a technology vendor to replace its AMR network with 410,000 AMI meters. Austin Energy's smart grid project included AMI deployment, MDMS, DSM, outage management system, SCADA, and DSM/DR development. AMI deployment occurred over 2008-2009.

TX	$2.2	**City of San Antonio**	Municipal	674,155	Summary

In June 2014, CPS Energy, the municipal utility of San Antonio, presented its monthly grid optimization program and solar distributed generation program briefing to the city council. The presentation described a partnership with a smart meter vendor to implement four components of the smart grid: 740,000 electric and 340,000 gas AMI meters; grid automation; enhanced networking/telecommunications; and new information technology. Meters replacement was scheduled for a four year period from 2014-2018 and would build off of the recently-installed mesh network. The company also described a communication plan and an opt-out option.

APPENDIX C:
State Summaries

The following report provides state policy summaries for the fifty U.S. states and Washington D.C., drawing on directives for AMI deployment, business case formats, and reporting requirements. . In most cases, utility-specific information was not included except when the commission's response impacted other entities in the state (i.e., an order which creates new AMI standards). The report includes the following information:

- Total electricity sales per state (per EIA 2018 Form 861 data, Sales to Ultimate Customers)
- State where utility operates
- Summary of AMI policies
- List of screened entities, including annual revenue in billions of U.S. dollars (per EIA 2018 Form 861 data, Sales to Ultimate Customers)
- Total number of AMI meters in the state (per EIA 2018 Form 861 data, Advanced Metering)

$B	State	AMI meters
$8.4	**Alabama**	1,899,576

At this time, there is no specific guidance from either the state legislature or commission with regard to AMI.

Screened Entities:
$5.5: Alabama Power
$.5: City of Huntsville - (AL)

$B	State	AMI meters
$1.1	**Alaska**	144,671

In October 2009, the Alaska Energy Policy Group recommended that the state establish large smart meter programs, and several pilot programs launched later in 2014 and 2017.

Screened Entities:
$.2: Golden Valley Elec Assn Inc
$.2: Chugach Electric Assn Inc

Notable Resources:
Alaska Smart Meters 2017: https://e9radar.link/6p5d
Alaska Q&A: https://e9radar.link/83wa

$B	State	AMI meters
$8.1	**Arizona**	2,458,796

In 2013, a commission-requested study found that "exposure to electric meters is not likely to harm the health of the public," though some opponents cite weak associations described in the report. In 2014, over 20,000 APS customers refused smart meter installments.

Screened Entities:

$3.5: Arizona Public Service
$2.9: Salt River Project
$1: Tucson Electric Power Co
$.1: Navajo Tribal Utility Authority

Notable Resources:
Removal of opt-out: https://e9radar.link/j0z3
Smart Meter Criticism: https://e9radar.link/hvov
ADHS Report: https://e9radar.link/ofzx

$B	State	AMI meters
$3.8	**Arkansas**	500,134

In October 2008, the Arkansas PSC opened an exploratory docket to explore the expanded development of Sustainable Energy Resources (SER) in order to create a Sustainable Energy Resources Guide. This case requested utility comments and created workshops relating to smart grid, demand response, and AMI development. In 2010, the state established a docket to house utility smart grid reports.

Screened Entities:
$1.7: Entergy Arkansas
$.3: Southwestern Electric Power
$.2: Oklahoma Gas & Electric Co
$0: Woodruff Electric Coop Corp

Notable Resources:
Exploratory Docket: https://e9radar.link/1kh

$B	State	AMI meters
$40.4	**California**	12,877,813

In June 2002, the commission opened up a rulemaking proceeding to consider policies and comments regarding demand response, AMI, and dynamic pricing. In 2006, the California Public Utilities commission approved the 2005 PG&E petition for deployment of ten million smart meters. California implemented smart meter data policies with the passage of a commission rulemaking and legislative action Senate Bill 674 in 2011. A 2011 rulemaking established standards for data access and privacy concerns (third-party and customer-initiated), and required customer consent for data sharing. These policies required that utilities submit smart grid plans and business cases by July 2011. The state also experienced backlash against smart meters from customers who cited health issues. In 2011, smart meter deployments were halted as Assembly Bill 37 (AB -37) was considered. AB-37 required utilities to provide customers with technical details of their meters and an option for meter opt-out. A requested study found no causation between health risks and smart meter radio frequencies.

Screened Entities:
$13.6: Pacific Gas & Electric
$11.8: Southern California Edison
$3.8: Los Angeles Department of Water & Power
$3.8: San Diego Gas & Electric
$1.4: Sacramento Municipal Utility District
$.4: Imperial Irrigation District
$.4: City of Santa Clara - (CA)
$.4: City of Anaheim - (CA)
$.3: Modesto Irrigation District
$.3: City of Riverside - (CA)
$.3: Turlock Irrigation District
$.2: City of Glendale - (CA)
$.2: City of Burbank Water and Power

Notable Resources:
CPUC Smart Meters: http://bit.ly/2LCM12E
AB-37: https://e9radar.link/gmjr
CA Grid History: https://e9radar.link/2etr

$B	State	AMI meters
$5.5	**Colorado**	601,871

In August 2009, the Colorado PUC opened an investigatory docket to consider smart meter technology data and privacy issues. The commission opened a separate investigatory docket in March 2010 to inform regulatory issues, research, technology evaluation methodologies, and requirements for smart grid and AMI applications. The Colorado legislature passed SB 10-180 in June 2010 to create an interim task force to study smart grid development issues. The study called for technology and data protocols for smart meters. After a formal rulemaking procedure, data privacy and security policies were approved in January 2012.

Screened Entities:
$2.7: Public Service Company of Colorado (PSCo)
$.4: City of Colorado Springs - (CO)
$.3: Intermountain Rural Elec Assn
$.2: Black Hills Colorado
$.1: City of Fort Collins - (CO)

Notable Resources:
2015 Smart Grid Report: https://e9radar.link/3vee
Boulder Smart Grid City: https://e9radar.link/6yva

$B	State	AMI meters
$5.2	**Connecticut**	250,727

In 2007, the Energy Efficiency Act (PA 07-242) required large electric utilities to submit advanced metering deployment plans and provide TOU price options. In response, United Illuminating Co. planned to use its existing system to support net metering and other functions, while Connecticut Light & Power Co. was directed to study advanced metering further through pilot programs. While CL&P's pilot programs were under consideration, the newly-created Department of Energy and Environmental Protection (DEEP) requested suspension of all smart meter cases while Public Act No. 11-80 was considered. This 2011 legislation directed DEEP to set energy policy through two proceedings, which included smart meter policy development: the Comprehensive Energy Plan and Integrated Resource Plans. The act also required utilities to implement demand-side management programs and notification of TOU meter availability. In October 2019, the PURA approved its Framework for an Equitable Modern Grid to advance Connecticut's "green economy" and support a decarbonized future. This framework reopened several grid-related cases, including a renewed investigation into statewide AMI deployment and a modern business plan.

Screened Entities:
$2.9: Connecticut Light & Power
$.8: United Illuminating
Connecticut Mun Elec Engy Coop

Notable Resources:
Grid Mod Article: https://e9radar.link/pyep
AG Press Release: https://e9radar.link/79l7
Public Act 07-242: https://e9radar.link/vkc1

$B	State	AMI meters

$1.3 **Delaware** 309,651

The nonprofit Sustainable Energy Utility (SEU) was created in June 2007 through SB 18 to advance energy efficiency and affordable energy programs in the state. When Delmarva announced its smart meter plans in 2008, it noted that the meters would help achieve SEU goals and programs.

Screened Entities:
$.6: Delmarva Power

Notable Resources:
State AMI Page: https://e9radar.link/q3zj

$B State AMI meters

$1.4 **District of Columbia** 277,998

The Washington D.C. PSC approved an initial test of smart meters and time-varying rates in 2005 through the PowerCentsDC program. In March 2007, the commission issued order 14239 to create a Smart Meter Working Group to address AMI technology. In 2009, the legislature passed D.C. Act 18-107, AMI Implementation and Cost Recovery Authorization Emergency Act of 2009, to authorize electric companies to implement and recovery costs for AMI projects for a limited time, provided that the company obtain sufficient funding through the ARRA. The legislation was extended through several additional emergency acts. In 2012, the DC Office of People's Council and a City Councilmember requested a study to determine the safety of smart meters. The results found no credible, scientific threats of radiofrequency radiation from PEPCO meters.

Screened Entities:
$.8: Potomac Electric Power Co

Notable Resources:
OPC Smart Meter Page: https://e9radar.link/a4cd
AMI Act: https://e9radar.link/0370

$B State AMI meters

$24.8 **Florida** 6,418,106

In September 2012, the Florida PSC held a workshop to consider smart meter concerns and commission jurisdiction. Following the workshop, the commission published a memorandum which addressed smart meter jurisdiction, health, and data/privacy concerns. Utilities are required to use accurate metering devices and the commission "cannot mandate metering technology deployed by IOU." Additionally, the FPSC declares that energy consumption data must be encrypted, confidential except for regulated business purposes, and must omit customer identification information. Smart meter installations began in 2009, and by May, 2012 four counties passed anti smart meter resolutions. In 2012, the FPSC held an opt-out workshop and created a brief to summarize customer concerns, but no formal policy was generated.

Screened Entities:
$10.7: Florida Power & Light
$4.5: Duke Energy Florida
$2: Tampa Electric
$1.2: Gulf Power
$1.2: JEA
$.7: Orlando Utilities Comm
$.4: Withlacoochee River Elec Coop
$.4: Lee County Electric Coop, Inc
$.4: Sumter Electric Coop, Inc
$.4: Clay Electric Cooperative, Inc
$.3: City of Lakeland - (FL)

$.3: City of Tallahassee - (FL)
$.2: Gainesville Regional Utilities
$.1: Talquin Electric Coop, Inc
$.1: City of Leesburg - (FL)

Notable Resources:
Smart Meter Brief: https://e9radar.link/9i0il
FP&L Completion: https://e9radar.link/u5yt
State Website: https://e9radar.link/8f2h

$B	State	AMI meters
$13.2	**Georgia**	4,322,276

In 2011, Georgia established its Energy Assurance Plan to address cybersecurity and grid resiliency issues.

Screened Entities:
$7.8: Georgia Power
$.6: Jackson Electric Member Corp - (GA)
$.4: Cobb Electric Membership Corp
$.4: Sawnee Electric Membership Corporation
$.3: Walton Electric Member Corp
$.3: GreyStone Power Corporation

Notable Resources:
PSC Page: http://bit.ly/2KhuYlx
State Brief: https://e9radar.link/a7l

$B	State	AMI meters
$2.5	**Hawaii**	31,519

In January 2017, after the first submission of their Smart Grid Foundation Project, the Hawaii PUC rejected HECO's initial plan. The order directed the HECO companies to develop a comprehensive and holistic grid modernization strategy. In June 2018, the HECO companies filed the first phase of their Grid Modernization Strategy implementation plan, proposing to deploy Phase 1 in a targeted manner. In September 2019, HECO filed their Phase 2 component, which consists of system-wide ADMS deployment.

Screened Entities:
$1.8: Hawaiian Electric
$.4: Hawaii Electric Light Company
$.4: Maui Electric

$B	State	AMI meters
$1.9	**Idaho**	614,360

In 2002, the Idaho Public Utilities commission ordered Idaho Power and the collaborative Energy Efficiency Advisory Group to investigate TOU pricing mechanisms. The commission ordered Idaho Power to develop and deploy AMI "as quickly as possible, commencing in 2003." In early 2012, the commission dismissed customer complaints about smart meter installations, effectively shutting down opt-out policy adoption.

Screened Entities:
$1.1: Idaho Power
$.3: PacifiCorp

Notable Resources:
Pending case: https://e9radar.link/h4n5

AMI Summary: https://e9radar.link/segi

$B	State	AMI meters
$13.2	**Illinois**	4,781,065

In 2006, the Illinois Commerce commission amended the Illinois Customer Choice and Rate Relief Law of 1997 to require utilities to provide customers hourly-recording smart meters. The following year, the commission filed an order which required the formation of the Illinois Statewide Smart Grid Collaborative (ISGC). The report filed by the ISGC included recommendations for smart grid definitions, recovery mechanisms, technical requirements, privacy, data access, and a strategy for building the grid. In 2011, the General Assembly overrode a Governor veto to pass the Energy Infrastructure Modernization Act, which instituted regulatory reform, new ratemaking procedures, reliability performance metrics, and mandatory smart grid investment. This Act required utilities to develop AMI and energy efficiency/demand response plans and associated budgets. The commission issued its "Utility of the Future" report in 2016, directing the commission's "NextGrid" Grid Modernization Study. Following the 2016 Future Energy Jobs Act, the NextGrid project created pilot projects and working groups related to smart grid advancements. In March 2016, the commission issued an order in its data access proceeding which directed Ameren and Commonwealth Edison to provide customers with electronic access to smart meter electricity usage data.

Screened Entities:
$5: Commonwealth Edison
$1.5: Ameren Illinois
$.2: City of Naperville - (IL)

Notable Resources:
Research: https://e9radar.link/9bci
EIMA News: https://e9radar.link/lizb
History: https://e9radar.link/0flm
EIMA Summary: https://e9radar.link/m87r
NextGrid study: https://e9radar.link/ufxe

$B	State	AMI meters
$9.6	**Indiana**	907,885

In 2013, Indiana legislators passed SEA 560 to encourage utilities to improve aging transmission and distribution infrastructure through a multiyear cost recovery framework: Transmission, Distribution, and Storage System Improvements Charges (TDSIC). Indiana utilities began to file informational TDSIC plans as a form of resource and investment planning. In 2019, HEA 1470 updated the TDSIC rules to require the inclusion of new technology investments that support grid modernization, including smart meters.

Screened Entities:
$2.7: Duke Energy Indiana
$1.6: Northern Indiana Public Service
$1.4: Indiana Michigan Power
$1.4: Indianapolis Power & Light
$.5: Southern Indiana Gas & Elec Co
$0: City of Auburn - (IN)

Notable Resources:
Smart Grid Paper: https://e9radar.link/bbq3
State Investments/AMI Site: https://e9radar.link/dy3n

$B	State	AMI meters

$4.0 **Iowa** 190,641

In 1999, the Iowa legislature modified its administrative code to require that utilities assess potential energy and capacity savings from available technology. In 2008 and 2012, the Iowa Utility Board's compliance reports studied AMI-enabled DR and EE programs. The reports also tracked Alliant and MidAmerican program advancements.

Screened Entities:
$1.7: MidAmerican Energy
$1.6: Interstate Power and Light

Notable Resources:
Alliant opt-out: https://e9radar.link/9cdm
Iowa Brief: https://e9radar.link/o6vc
2012 Energy/Capacity Savings Study: https://e9radar.link/nc8t

$B State AMI meters

$4.1 **Kansas** 1,170,840

In August 2006, the Kansas commission opened a proceeding to investigate advanced metering in response to federal policies. One year later, the commission determined that it would not mandate smart meter installation. The 2009 legislative session implemented HR 6005-0, which established a goal to make 25% of electric meters smart grid compliant with two-way communication capabilities. This goal was reached in the cooperative utility sector in 2011. In July 2018, the commission opened a general investigation into AMI opt-out programs. The investigation was closed in March 2019 when the commission determined that utilities are not required to offer opt-out programs.

Screened Entities:
$1.1: Westar Energy
$1: Kansas Gas & Electric Co
$.8: Kansas City Power & Light Co

$B State AMI meters

$6.2 **Kentucky** 776,630

In 2006, the Kentucky PSC first considered whether to adopt federal standards set forth in the Energy Policy Act of 2005. The act addressed a number of issues, including whether utilities should be required to offer optional rates that varied with the time of day, as well as the necessary advanced meters. The commission again addressed AMI as part of its October 2012 proceeding to consider the implementation of smart grid technologies and dynamic pricing. Per the April 2016 final order, the commission determined it was best to allow the utilities flexibility in deciding how to deploy smart grid technologies, deciding against adopting uniform standards for smart grid investments and the types of information to be provided. Additionally, the order required the utilities to develop and maintain internal privacy and cybersecurity procedures; decided against mandating dynamic pricing for residential customers; encouraged the utilities to provide customers with detailed usage information; required utilities to develop future smart grid investment plans; and permitted the utilities to set opt-out policies for AMI. The Kentucky Public Service commission requires utilities to file for a Certificate of Public Convenience and Necessity (CPCN) before making significant investments that impact customer rates. Seventy percent of the states customers served by cooperative and municipal utilities in Kentucky are served by AMI. Duke Energy Kentucky received full AMI deployment approval in January 2019.

Screened Entities:
$1.5: Kentucky Utilities
$1.1: Louisville Gas & Electric

$.6: Kentucky Power Co
$.4: Kenergy Corp
$.3: Duke Energy Kentucky
$.1: South Kentucky Rural E C C

Notable Resources:
Utility Dive: http://bit.ly/2KlsKlr
SB121: https://e9radar.link/175cd

$B	State	AMI meters
$7.1	**Louisiana**	470,117

The commission expressed support for AMI in an April 2007 rulemaking, but determined that deployment of advanced meters and demand response programs should be executed on a voluntary basis unless ordered by the commission. The ruling determined minimum technology requirements, application needs, and biannual reporting requirements.

Screened Entities:
$3.7: Entergy Louisiana
$.9: Cleco Power LLC
$.6: Southwestern Electric Power Co
$.6: Entergy New Orleans Inc
$.2: City of Lafayette - (LA)
$0: City of Ruston - (LA)

$B	State	AMI meters
$1.5	**Maine**	749,745

Maine's 2010 Smart Grid Policy Act declared that the state government is responsible for the development, implementation, availability and use of smart grid functions, including electronic metering. The act also directed the Maine PUC to open a proceeding to determine if Maine should have more smart grid coordinators. This case examined eligibility, functions, exemptions, data access/collection, and the relationship of a smart grid coordinator to transmission and distribution utilities. Maine legislators addressed cybersecurity concerns through Legislative Decision 756 in 2011, which required the commission to address regulatory gaps between federal and state smart meter laws. In January 2012, the commission issued a report which recommended clearer utility proposals for the management of customer information through dynamic pricing programs. The independent organization Efficiency Maine was given statutory authority to use meter data for energy efficiency program analysis. Additionally, the commission mandated through a Central Maine Power Co. case that utilities provide opt-out options for customers.

Screened Entities:
$.9: Central Maine Power Co
$.2: Emera Maine

Notable Resources:
Cybersecurity: https://e9radar.link/k7ix
State Brief: https://e9radar.link/spv9
Commission Report: https://e9radar.link/c73y
ME Energy Assurance Plan: https://e9radar.link/d6ko

$B	State	AMI meters
$7.5	**Maryland**	2,044,133

In 2008, Maryland passed the EmPOWER Maryland Energy Efficiency Act, which set a target reduction of 15% in per capita energy consumption and demand by 2015 and

provided $290M to efficiency and conservation projects over the 2009-2015 period. In 2015, this initiative was renewed to 25% reduction by 2020. This policy provided incentive to utilities to manage demand through AMI. Though there are no other AMI-specific requirements, a September 2007 order in an investigative case established minimum requirements for any proposal to implement an AMI system, including the utilization of four cost-effective methodologies. The Maryland PSC requested customer engagement and communications plans, incorporation of in-home devices into costs, further analysis of rate cases in all AMI proposals. The PSC also approved mandatory opt-out policies in 2013, setting a standard of a $77 one-time fee and $11-17 monthly fee, depending on the utility. In September 2016, the PSC initiated a public conference to review distribution system planning, including AMI, rate design, renewable energy, DER, and other topics.

Screened Entities:
$2.1: Baltimore Gas & Electric
$1.3: Potomac Electric Power
$.5: Potomac Edison Company
$.4: Delmarva Power
$.4: Southern Maryland Elec Coop Inc

Notable Resources:
State AMI Website: https://e9radar.link/qx3v
EmPOWER Initiative: https://e9radar.link/pjkz

$B	State	AMI meters
$9.4	**Massachusetts**	147,545

The Massachusetts Department of Public Utilities (DPU) opened an investigative case on smart grid development in 2012. Through this case, the DPU ordered Massachusetts' IOUs to file grid modernization plans and budgets no later than August 2015. Analysis of the plans and stakeholder meetings continued for more than two years. In May 2018, DPU rejected the AMI portion of three mandated-grid modernization proposals, citing "weaknesses in the business case for advanced metering functionality, issues with customer data, billing limitations, and uncertainty of customer participation." The DPU refined its statewide grid modernization objectives to place additional focus on distributed energy resources and a three-year evaluation of AMI projects. DPU noted that it does not want to abandon AMI initiatives, and that current AMR technology provides adequate benefits. DPU encouraged the utilities to re-submit proposals when the business case was stronger.

Screened Entities:
$2.9: NSTAR Electric Company
$2.3: Massachusetts Electric
$0: Town of Danvers
$0: City of Marblehead - (MA)
Western Massachusetts Electric

Notable Resources:
Utility Dive: http://bit.ly/2Kkc91j
Utility Dive: http://bit.ly/2KikH8R

$B	State	AMI meters
$11.1	**Michigan**	4,647,128

The Michigan Public Service commission formed a Smart Grid Collaborative in 2007 to consider standards for smart grid development, including AMI, dynamic pricing, and distribution automation pilot projects. In 2012, the MPSC opened up a docket to consider public and local government concerns about smart meters. The filing required the utilities to submit AMI plans with accompanying business cases, and a September

2012 order required opt-out policies and deferment of cybersecurity/data plans to general rate cases. In 2018, the MPSC required the state's two largest utilities, Consumers Energy and DTE Electric company, to file five-year distribution plans which address grid modernization, including solar, storage, and EV integration. The MPSC followed review of these plans with a report which outlines distribution grid issues and six objectives, including utilization of Green Button Connect standards for AMI.

Screened Entities:
$5.1: DTE Electric Company
$4.4: Consumers Energy
$.3: Indiana Michigan Power Co
$.3: City of Lansing - (MI)

Notable Resources:
2018 Report and Recommendations: https://e9radar.link/wxga
State Brief: https://e9radar.link/t0ja

$B	State	AMI meters
$6.5	**Minnesota**	624,420

Minnesota first investigated the smart grid in 2008 in an investigative docket, which adopted a smart grid definition and enacted new policies in June 2009. Requirements include annual reports, cost recovery petitions, information transparency for customers, and stakeholder involvement through public meetings. Minnesota also defined goals and reporting requirements for grid modernization through the 2025 Energy Action Plan and its collaborative Energy and Policy Conservation Quadrennial Reports. In March 2016, the commission released the Staff Report on Grid Modernization, which instigated an integrated distribution system planning process in April 2018.

Screened Entities:
$3.3: Northern States Power
$.7: Minnesota Power Inc
$0: Sioux Valley SW Elec Coop

Notable Resources:
Energy Reports: https://e9radar.link/v2t6
Data Access Article: https://e9radar.link/jshl

$B	State	AMI meters
$4.7	**Mississippi**	534,901

In 2016, Entergy Mississippi proposed AMI in their territory, which was approved through a stipulation in 2019. Also in 2016, a dormant 2009 Mississippi Power application for AMI was resubmitted, which was approved via a stipulation in 2018. Prior to these developments, in 2009, the Mississippi Development Authority Energy Division (MDA-ED) received an allocation of DOE grant funds to address resiliency and energy assurance planning - one of the approved projects was the replacement of 1,500 meters across its government buildings.

Screened Entities:
$1.3: Entergy Mississippi
$.9: Mississippi Power Co
South Mississippi El Pwr Assn

Notable Resources:
Smart Grid RFP: https://e9radar.link/7f81
Government meters: https://e9radar.link/uixa

$B	State	AMI meters

$7.9 **Missouri** 1,017,619

In June 2018, Missouri passed Senate Bill 564 to modernize Missouri energy policies. The legislation enabled utilities to defer certain investment costs, mandated five-year capital investment plan filings for IOUs, required that no more than 6% of plan budget be allocated to smart meter deployment, and required at least 25% allocation to smart grid modernization projects. Ameren's Smart Energy Plan, proposed in August 2018, was designed to implement the new policies.

Screened Entities:
$3.2: Union Electric Company
$1: Kansas City Power & Light Co
$.8: KCP&L Greater Missouri Operations Co.
$.5: Empire District Electric Co
$.3: City Utilities of Springfield - (MO)
$0: City of Fulton - (MO)

Notable Resources:
PSC Report: http://e9radar.link/ck7f
Missouri Data : https://e9radar.link/0ei7
Fulton Grid Rights: https://e9radar.link/t18i

$B State AMI meters

$1.3 **Montana** 136,874

In April 2019, the Montana legislature passed HB 267, which established data, opt-out, and notification policies for advanced metering. The commission opened up a proceeding to investigate implementation of the standards in December 2019.

Screened Entities:
$.7: NorthWestern Energy LLC - (MT)

$B State AMI meters

$2.7 **Nebraska** 222,093

The Nebraska Public Power District began installing AMI in 2018. Omaha Power District and Northwestern Power began installing smart meters in 2018 as well. In 2018, a Nebraska-based lawsuit reached the 7th US Circuit Court and affirmed that smart meter installations to not require warrants.

Screened Entities:
$1: Omaha Public Power District
$.3: Lincoln Electric System
$.2: Nebraska Public Power District
$0: Stanton County Public Pwr Dist

Notable Resources:
State Brief: https://e9radar.link/en29

$B State AMI meters

$3.4 **Nevada** 1,267,868

In 2006, the Nevada commission directed Nevada Energy to study the costs and benefits of smart meter deployment from the neighboring utility Southern California Edison. Three years later, the commission continued to request smart meter deployment from Nevada Energy sister companies in the review of their SGIG application.

Screened Entities:

$2.1: Nevada Power
$.7: Sierra Pacific Power Co

Notable Resources:
PUC Website: https://e9radar.link/ad5

$B	State	AMI meters
$1.8	**New Hampshire**	162,500

In 2012, the New Hampshire legislature passed a smart meter opt-in rule, SB-266-FN, that mandates utilities obtain written consent of the person or person who owns the home/business before installing a smart meter. In July 2015, HB 614 was enacted to implement goals of New Hampshire's 10-year energy strategy. This bill required the commission to open a docket on grid modernization, which included AMI-specific analysis, before August 2015. In April 2016, the PUC directed a working group to consider advanced meter technology and functionalities. The 2019 staff recommendation concluded that utilities may offer opt-in interval metering services and conduct a cost/benefit analyses of AMI. This proceeding determined that AMR was sufficient to realize other smart grid capabilities. SB 284, signed into law in July 2019, mandated the creation of a multi-use, online data platform for New Hampshire opt-in customers to view their energy usage. The state's three IOUs were directed to develop the database: Eversource, Liberty, and Unitil.

Screened Entities:
$1: Public Service Company of New Hampshire
$.1: New Hampshire Elec Coop Inc

Notable Resources:
SB 284: https://e9radar.link/hyi

$B	State	AMI meters
$10.4	**New Jersey**	38,489

The New Jersey Board of Public Utilities (BPU) created a Master Plan goal in 2011 to expand smart meters and time variant pricing, and in 2015 the board called for a re-evaluation of smart meter specifications, standards, security, and cost/benefit analyses. The BPU also recommended that distribution automation and smart grid technologies complement smart meter deployments. In 2017, the BPU called for a moratorium on AMI deployment until the results of the Rockland Electric pilot project were analyzed. In July 2018, BPU staff directed Jersey Central Power & Light, Public Service Electric & Gas and Atlantic City Electric to file AMI CBAs in order to address storm response issues. New Jersey's stakeholder-led draft 2019 Energy Master Plan, published in June 2019, reaffirmed state support for AMI deployment in order to achieve clean energy goals. In February 2020, the BPU lifted the moratrium on AMI and ordered the state's largest IOUs (PSE&G, ACE, and JCP&L) to file or update AMI plans by August 2020.

Screened Entities:
$3.7: Public Service Electric & Gas (PSEG)
$1.7: Jersey Central Power & Light
$1: Atlantic City Electric

Notable Resources:
2015 Plan: https://e9radar.link/sr9e
Staff Report (winter storms): https://e9radar.link/sccl
GE Report for BPU: https://e9radar.link/v4li
Order lifting mortatorium: https://e9radar.link/8923f
Order Lifting Moratorium: https://e9radar.link/bebd5

$B	State	AMI meters

$2.2 **New Mexico** 111,549

In 2006, the Public Regulation commission required all New Mexico utilities to file AMI reports. In utility AMI proposals, the commission cited customer health concerns as a reason for smart meter rejection, as the technology, "does not promote the public interest."

Screened Entities:
$1: Public Service Company of New Mexico
$.4: Southwestern Public Service
$0: Navajo Tribal Utility Authority

$B State AMI meters

$22.9 **New York** 130,207

New York utilities typically propose AMI in rate cases. The Reforming the Energy Vision (REV) strategy encourages clean energy innovation and challenges utilities with a variety of objectives, especially the goal to reduce carbon emissions by 80% in 2050. In the REV proceeding, the PSC determined that AMI "encourages" demand response, energy efficiency, DER, and also enables some of the Distributed System Platform functionalities. In July 2016, the PSC issued an order creating a Distributed System Implementation Plan (DSIP) framework which required utilities to disclose information about AMI deployment over the next five years. Subsequent utility DSIP filings contain summaries of AMI deployment status and other integrated technologies. All New York AMI proposals are required to follow a strict BCA template and procedure, which was finalized in the REV proceeding.

Screened Entities:
$8: Consolidated Edison
$3.6: Long Island Power Authority
$2.2: Niagara Mohawk Power
$1.2: New York State Electric & Gas
$1: New York Power Authority
$.6: Rochester Gas & Electric Corp
$.6: Central Hudson Gas & Elec Corp
$.5: Orange & Rockland Utilities

Notable Resources:
NY REV Website: https://e9radar.link/ssoj
REV Docket : https://e9radar.link/465s
DSIP Docket: https://e9radar.link/amxk

$B State AMI meters

$12.7 **North Carolina** 2,166,601

In 2013, the North Carolina Utilities commission mandated that utilities file Smart Grid Technology Plans as part of their biennial IRPs. These plans contain descriptions of smart grid and pilot projects, accompanying business cases, and privacy policies, but are not considered as official proposals. The commission initiated a rulemaking regarding AMI cybersecurity in 2017.

Screened Entities:
$4.9: Duke Energy Carolinas
$3.6: Duke Energy Progress - (NC)
$.4: Virginia Electric & Power
$.3: EnergyUnited Elec Member Corp
$0: Tri-State Electric Member Corp

Notable Resources:

SGTP Article: https://e9radar.link/7bj6

$B	State	AMI meters
$1.6	**North Dakota**	111,001

At this time, there is no specific guidance from either the state legislature or commission with regard to AMI.

Screened Entities:
$.2: Northern States Power Co - Minnesota
$.2: Montana-Dakota Utilities Co

Notable Resources:
State Brief: https://e9radar.link/85lt
Energy Policy Act Article: https://e9radar.link/15xt

$B	State	AMI meters
$15.0	**Ohio**	1,146,220

In 2007, Ohio enacted the Energy, Jobs and Progress plan to modernize Ohio's energy infrastructure. Following this plan, SB-221 restructured Ohio's competitive retail electric service market and established advanced energy resource standards. SB-221 encouraged the implementation of AMI. Duke Energy Ohio proposed a rider in 2008 to modernize its grid infrastructure. The Ohio PUC also considered AMI necessity and data concerns, which resulted in a memo that expressed support for statewide AMI deployment. Ohio's 2018 PowerForward initiative describes a vision to upgrade Ohio's grid infrastructure.

Screened Entities:
$2.8: Ohio Power
$1.4: Ohio Edison
$1: Cleveland Electric Illum Co
$1: Duke Energy Ohio
$.7: Dayton Power & Light Co
$.4: Toledo Edison Company
$.3: South Central Power Company
$0: City of Wadsworth - (OH)

Notable Resources:
AMI Ruling: https://e9radar.link/72kw
PowerForward : http://e9radar.link/sjch

$B	State	AMI meters
$5.0	**Oklahoma**	1,757,545

In 2011, Oklahoma passed HB 1079 to allow utilities to utilize customer-identifiable usage data without customer consent for certain business operations.

Screened Entities:
$1.9: Oklahoma Gas & Electric
$1.5: Public Service Co of Oklahoma

$B	State	AMI meters
$4.1	**Oregon**	1,126,865

In 2009, the Oregon Smart Grid Resiliency Initiative established a Workforce Development Plan and Oregon PUC docket to investigate smart grid applications. In 2012, the commission issued an order in its smart grid objectives docket establishing

smart grid policy goals, objectives, and annual smart grid reporting requirements. Oregon experienced smart meter backlash in 2014 when PGE meters sparked several fires throughout the state, resulting in the replacement of 70,000 meters. Despite this event, Pacificorp's 2016 rollout was approved.

Screened Entities:
$1.8: Portland General Electric
$1.3: PacifiCorp
$.1: Central Lincoln People's Ut Dt
Pacific Northwest Generating Coop

Notable Resources:
Article- replacements: https://e9radar.link/zrnp

$B	State	AMI meters
$15.2	**Pennsylvania**	5,221,850

In January 2008, HB 2200 proposed that utilities file initial smart meter technology procurement and installation plans for approval by August 2009. HB 2200 was signed into law as Act 129 in October 2008, and included provisions for the adoption of smart meter technology over a period no longer than fifteen years. This legislation also states that customers may not opt-out of smart meter deployments. In June 2009, the commission established standards for smart meter implementation and identified fifteen functionalities which smart meters should support. Subsequent AMI filings did not present full business cases or benefits calculations. The Pennsylvania Public Utilities commission requires that all customers receive smart meters and pay utility-specific smart meter surcharges until full deployment is completed in 2023, in accordance with Act 129.

Screened Entities:
$2.2: PECO Energy
$1.9: PPL Electric Utilities
$1: West Penn Power Company
$.9: Duquesne Light Co
$.9: Pennsylvania Electric Co
$.8: Metropolitan Edison Co
$.3: Pennsylvania Power Co
$0: Wellsborough Electric Co

Notable Resources:
House Bill 2200: https://e9radar.link/71l
PUC Page: https://e9radar.link/df3g
Act 129: https://e9radar.link/dbpr

$B	State	AMI meters
$1.3	**Rhode Island**	257

In April 2017, Rhode Island Public Utilities commission announced the Power Sector Transformation Initiative. As part of its November 2017 Phase 1 report, the PUC recommended the utilities invest in AMI and other grid connectivity services, noting, "As we modernize the electric grid, we have the opportunity to create greater intelligence at the grid edge that may fundamentally transform the capabilities, costs, and control... To take advantage of this opportunity, Rhode Island must invest in Advanced Meter Functionality (AMF) and software platforms." In response, in November 2017, National Grid filed its Power Sector Transformation Plan, which outlined a vision which includes AMI. In 2019, National Grid began a stakeholder engagement process which may shape how the state regulates AMI.

Screened Entities:

$1: Narragansett Electric

$B	State	AMI meters
$7.8	**South Carolina**	1,033,990

South Carolina IOUs file information about AMI deployment plans primarily in cost recovery dockets. Coops in South Carolina have significant AMI development (>90%).

Screened Entities:
$2.3: South Carolina Electric & Gas
$1.8: Duke Energy Carolinas
$.7: South Carolina Public Service Authority
$.6: Duke Energy Progress - (SC)
$.3: Berkeley Electric Coop Inc

$B	State	AMI meters
$1.2	**South Dakota**	190,028

South Dakota's 2009 S 60 initiative authorized the PUC to address smart grid policies at the commission-level according to the 2007 Energy Independence and Security Act of 2007. Following this legislation, the South Dakota PUC established standards for resource planning and smart grid reports in 2010. This case required utilities to file annual reports of their smart grid deployment opportunities, plans, considerations, costs, cost savings, and decision-making processes. This provision only lasted from 2010-2012, and submissions were brief.

Screened Entities:
$.2: Northern States Power Co - Minnesota
$.2: Black Hills Power Inc
$.2: NorthWestern Energy - (SD)
$.1: Sioux Valley SW Elec Coop

Notable Resources:
Order for Smart Grid standards: https://e9radar.link/c2y2

$B	State	AMI meters
$9.3	**Tennessee**	2,317,208

In 2011, Tennessee approved a change in wholesale rate structure which provided opportunity for TOU rate options. Several Tennessee utilities cite TOU rates as the impetus for their AMI programs. Tennessee's non-profit utility boards began installing AMI throughout their territories as early as 2010.

Screened Entities:
$1.3: City of Memphis
$.6: Middle Tennessee E M C
$.6: Knoxville Utilities Board
$.6: City of Chattanooga - (TN)
$.3: Cumberland Elec Member Corp
$.3: Tennessee Valley Authority
$0: Tri-State Electric Member Corp

Notable Resources:
Deployment Article: https://e9radar.link/78ny
TVA: https://e9radar.link/st1q

$B	State	AMI meters
$34.6	**Texas**	10,086,570

In 2005, the Texas Legislature adopted HB 2129 to create a cost recovery framework for AMS deployment within the Electric Reliability Council of Texas (ERCOT) region. In July 2005, the PUC opened a proceeding to consider the new directives, and in May 2007, the PUC issued an order which created minimum standards for AMI proposals, including communication equipment, data privacy and access policies, and functionality requirements. Additionally, in September 2007, energy efficiency legislation HB 3693 included a section which directed utilities to deploy net metering and advanced meter information networks "as rapidly as possible." In January 2010, Texas released the first version of its statewide online data portal: SmartMeterTexas.com. In May 2019, three bills (HB 853, HB 986, and HB 1595) extended the applicability of PURA to electric utilities outside of ERCOT. These modifications created new cost recovery opportunities, and reinforced legislative request for rapid deployment. The commission opened a rulemaking in July 2019 to implement the changes.

Screened Entities:
$2.2: City of San Antonio
$1.4: Entergy Texas
$1.2: Austin Energy
$.9: Southwestern Public Service Co
$.6: Pedernales Electric Coop, Inc
$.6: El Paso Electric Co
$.6: Southwestern Electric Power Co
$.5: Denton County Elec Coop, Inc
Oncor
CenterPoint
AEP Texas Central
AEP Texas North
Golden Spread Electric Cooperative, Inc

Notable Resources:
TX AMI Report 2008: https://e9radar.link/unf
TX AMI Report 2010: https://e9radar.link/2ctc
AMS History, Oncor: https://e9radar.link/l2hw
HB 2129: https://e9radar.link/bryk
HB 3693: https://e9radar.link/czm9

$B	State	AMI meters
$2.6	**Utah**	113,840

In 2008, the Utah Public Utilities commission (PUC) opened a docket to consider the PUC's authority to control ratemaking and other utility actions. This docket established a series of workshops and stakeholder groups to discuss smart grid development. Utah's utilities filed comments that generally supported AMI deployment. The commission decided against mandatory smart grid implementation, though the data-access-oriented Smart Grid Information Standard was enacted. In 2011-2015, Rocky Mountain Power filed reports included a variety of commission-mandated topics, including EV integration, report of smart grid activities, demand-side programs, and AMI implementation. In February 2016, in response to Rocky Mountain Power and other intervenors, the commission discontinued smart meter reporting requirements.

Screened Entities:
$2: PacifiCorp
$0: Navajo Tribal Utility Authority

$B	State	AMI meters
$0.8	**Vermont**	301,057

In April 2007, the Vermont PUC initiated a docket to investigate smart meter

technology, alternative rate designs, opt-out provisions and energy efficiency. In 2009, Vermont Transco's utility-wide, $69M SGIG application was approved. This grant initiated smart meter deployment for Vermont's IOUs and created the eEnergy Vermont collaborative, which consists of members of all twenty distribution utilities, energy efficiency utilities, and the state's transmission utility. The legislature authorized access of some smart meter data by the Department of Public Service in order to produce a comprehensive smart meter report in March 2016, which supported the business case for AMI in the state. Vermont requires utilities to provide written notices of smart meter installation and free opt-out provisions, according to a 2012 law (Act 0170).

Screened Entities:
$.6: Green Mountain Power Corp
Vermont Electric Trans Co Inc

Notable Resources:
2016 Statewide Report: https://e9radar.link/4uc1
eEnergy Vermont: https://e9radar.link/1020
SGIG Page: https://e9radar.link/7itg
State AMI Plans: https://e9radar.link/woov1

$B	State	AMI meters
$10.4	**Virginia**	848,075

In 2018, the Grid Transformation and Security Act (SB 966) declared that electric distribution grid transformation projects are in the public interest. This bill established a framework for incentives and cost recovery mechanisms for grid modernization, including AMI technology. This Act required utilities to submit 10-year modernization plans to the commission. Virginia's largest utilities, Appalachian Power and Dominion, each proposed system-wide AMI deployments in 2018, but Dominion's petitions was rejected and two months later APCo withdrew its petition. In 2019, the General Assembly also passed HB 2547, requiring Dominion to convene a stakeholder process to develop time-varying rates and other related topics.

Screened Entities:
$1.4: Appalachian Power
$.5: Northern Virginia Elec Coop
$.4: Rappahannock Electric Coop
$7.5: Virginia Electric & Power

Notable Resources:
SCC Press Release: http://bit.ly/31myUHA
SB 966: https://e9radar.link/cf3k

$B	State	AMI meters
$6.7	**Washington**	349,908

In May 2009, HB 2289 modified the energy freedom program, Washington's bioenergy research and development program, to receive federal funding for smart grid technologies. The following year, the Washington PUC investigated smart grid definitions and requirements. This established a requirement for electric utilities to file reports on smart grid implementation in 2011, 2014, and 2017. In April 2018, the commission issued a policy statement which declared smart meters a "foundational technology" and mandated that opt-out tariffs be provided. In July 2018, the commission issued a notice of proposed rulemaking on other AMI issues, including data privacy, remote disconnection, and customer notification.

Screened Entities:
$2.2: Puget Sound Energy
$.9: City of Seattle

$.6: PUD 1 of Snohomish County
$.5: Avista Corp
$.4: PUD No 1 of Clark County - (WA)
$.4: City of Tacoma - (WA)
$.3: PacifiCorp
$.3: PUD No 1 of Cowlitz County

Notable Resources:
PNW Project: https://e9radar.link/p64z

$B	State	AMI meters
$2.6	**West Virginia**	8,303

At this time, there is no specific guidance from either the state legislature or commission with regard to AMI.

Screened Entities:
$1.2: Appalachian Power
$1.1: Monongahela Power Co
$.3: Potomac Edison Company
$.3: Wheeling Power Co

Notable Resources:
Investigation: https://e9radar.link/2c5

$B	State	AMI meters
$7.5	**Wisconsin**	1,193,054

In January 2017, the Wisconsin PSC ordered the administration of a smart meter survey to all IOU and municipal utilities. Topics covered include upcoming meter replacement and project upgrades, AMI-enabled programs, MDMS, and meter capabilities. The survey revealed that 78% of meters in the state used AMR or AMI; approximately 39% employed AMI. Later in 2017, the commission issued an additional grid modernization priority survey to utilities and various stakeholders. AMI use and benefits emerged as a top priority in both groups, and the commission affirmed stakeholders' interest in AMI-enabled information services through meetings with respondents. Wisconsin Public Service company noted in a December 2016 application that the state of Wisconsin does not have a statutory requirement to file an AMI application.

Screened Entities:
$2.8: Wisconsin Electric Power
$1.1: Wisconsin Power & Light
$1: Wisconsin Public Service
$.7: Northern States Power Co
$.4: Madison Gas & Electric

Notable Resources:
WPSC Strategic Energy Assessment: https://e9radar.link/qrd
Grid Modernization Survey: https://e9radar.link/6aua

$B	State	AMI meters
$1.4	**Wyoming**	89,471

At this time, there is no specific guidance from either the state legislature or commission with regard to AMI.

Screened Entities:
$.7: PacifiCorp
$.2: Cheyenne Light Fuel & Power Co

Notable Resources:
SGIGs: https://e9radar.link/ygx6

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