Guidehouse INSIGHTS

White Paper

The Power of AI for Energy Management

Analysis of Solutions for Customer Engagement and Meeting Utility Objectives

Commissioned by Bidgely

bidgely

Published 2Q 2020

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Section 1
Executive Summary

1.1 Energy Management Evolves

Energy management keeps evolving. A decade ago the notion of energy management within the utility sector focused on linking newly installed smart meters with a home area network to provide granular usage data. The idea was to help residential customers reduce energy consumption and became known as home energy management (HEM). Those solutions still exist, but newer approaches have gained traction and attention. Leading utilities are leveraging artificial intelligence (AI) approaches to provide more valuable customer insights, produce greater energy savings, and deepen their customer engagements. In this white paper, Guidehouse Insights[1] highlights this evolving trend, including how AI is helping utilities to meet their objectives and unlock added value for customers.

1.2 AI Becoming a Key Tool

For utilities, AI is becoming a key tool for helping customers optimize their energy consumption. With vast quantities of data of different types available, utilities are using branches of AI such as machine learning to discern usage patterns and provide targeted understanding to help customers more efficiently use energy.

Several utility case studies in this white paper reflect what is possible with AI-driven solutions. For example, Rocky Mountain Power (RMP) migrated a legacy home energy report (HER) platform to Bidgely's digital HER solution with noteworthy results:

- Email open rates averaging nearly double the industry norm
- Costs reduced 25% compared with the utility's legacy HER program

Other utilities have used AI-driven customer engagement solutions that have resulted in:

- 30% efficiency increase in targeting, increased demand in energy advisory services, higher perceived value from clients, and higher conversion rate from leads to sales.
- 11% uplift in scores in the bill and pricing categories of the utility's industry standard customer satisfaction surveys.

[1] Navigant Research is now Guidehouse Insights (April 2020). Guidehouse LLP completed its acquisition of Navigant Consulting, Inc. and its operating subsidiaries on October 11, 2019. For more information, see: https://guidehouse.com/news/corporate-news/2019/guidehouse-completes-acquisition-of-navigant

1.3 Guidehouse Insights Recommends Embracing AI

The key takeaway for utilities is to embrace AI tools to take advantage of large customer datasets. An intelligent strategy should begin with defining short- and long-term goals for adopting an AI solution. Utility managers should then outline specific actions to achieve those goals, create an AI roadmap, define costs, set performance goals, and select an experienced vendor partner to help drive AI initiatives. This type of effort often involves fundamental changes for a utility and its people, so there is a need to prepare for new challenges along the path toward a successful AI journey.

Section 2
Market Overview

2.1 Home Energy Management Is Evolving

The concept of home energy management (HEM) has changed since the early days of the smart grid around 2007. Back then, HEM technologies fit neatly into utility deployments of advanced metering infrastructure (AMI), otherwise known as smart meters. The goals of HEM could be met by connecting smart meters with a home area network and energy-related devices like digital displays or thermostats in the home. That concept never really took off at scale. Today, new behind-the-meter technologies have gained traction. For example, smart thermostats gathered momentum as a direct-to-consumer product, and utilities had to adapt.

Smart meters still matter for HEM—the data flowing from these meters remains an important tool. However, the number of other HEM information channels has grown in the past 5 years, altering market dynamics. More channels have meant an increase in the amount of energy management data as well as data that is more nuanced. For instance, combining data from a smart meter, a smart thermostat, and a home's physical aspects means the insights and potential actions can be much more personal to a home and its occupants. Instead of generic suggestions to multiple customers to reduce air conditioning (AC) consumption when outdoor temperatures rise, for example, a specific homeowner can be given an optimal setpoint or be informed of abnormalities in an AC unit that suggest it needs to be serviced or replaced.

2.1.1 Market Drivers

Some of the market drivers pushing HEM and advanced digital tools include the following:

- **Advances in customer engagement:** Ongoing customer engagement is taking place via mobile, online, and social network channels. Numerous touchpoints are now possible, enabling utilities to stay engaged with customers and provide timely and relevant information related to saving energy. Customer engagement has become a top strategic priority for utility executives.
- **Accessible hardware:** Homeowners and renters have access to more advanced hardware that provides improved energy monitoring and more granular control of energy use. For instance, smart thermostats are common and provide greater control of HVAC systems, which can lead to lower energy bills.
- **Smart meters:** Adoption of smart meters has been on the rise across all utilities. In the US, Guidehouse Insights expects penetration to reach 67% by the end of 2020. These meters enable advanced energy monitoring and might be able to intelligently control usage and provide a more automated approach to energy management in the future.

- **New HEM and smart home standard:** Until now, standards for HEM and smart home products have been relatively loose or nonexistent. That is about to change in the US. The US Environmental Protection Agency's ENERGY STAR program is developing specifications for smart HEM systems. Guidehouse Insights believes this standard will have a significant long-term impact on the HEM market.
- **Environmental concerns:** A growing number of consumers have a strong desire to protect the environment and are willing to spend money on HEM solutions to reduce energy consumption and simultaneously reduce their carbon footprint.
- **Changing customer expectations:** Influenced by digital tools (e.g., online and mobile) in their everyday lives, customers expect utilities to mirror these types of engagements. In this current context, customers assume their utility has detailed knowledge of energy usage and will keep the customer informed in a timely manner about potential high bills or other anomalies that can be acted upon early enough to reduce a burden.

2.1.2 Market Inhibitors

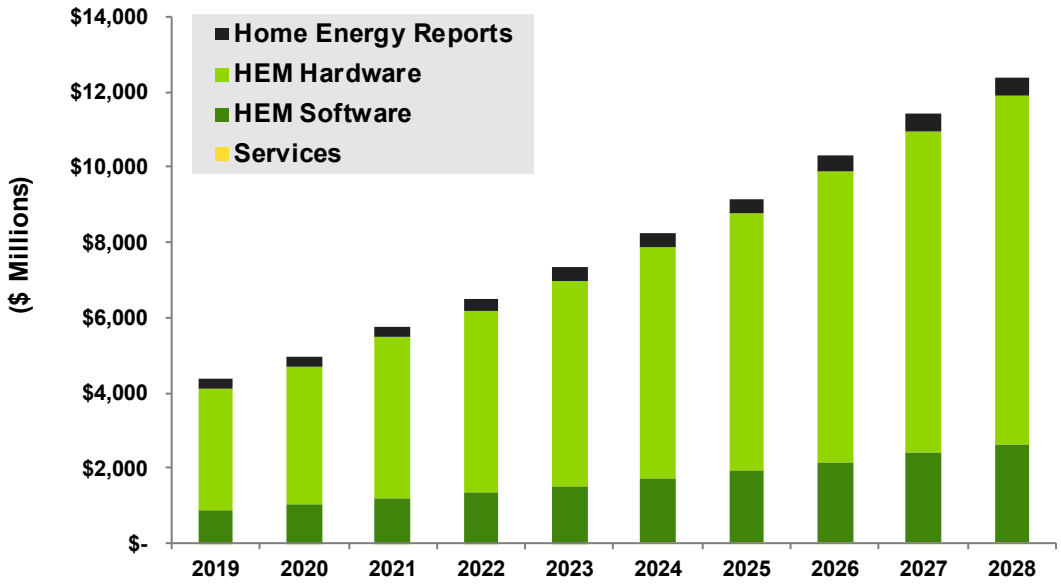
Inhibitors keeping this market in check are as follows:

- **Lack of device standardization:** Some HEM devices and the accompanying software lack the necessary standards to interoperate with other products or are part of point solutions that limit their usefulness.
- **Lack of data standardization:** Though many utilities have started investing in data lakes to standardize and democratize their digital intelligence, they still need to improve how they organize data and ensure the data is accurate, consistent, and of high granularity. The need for high quality standardized data is vital to providing optimal usage outcomes.
- **Slow-to-adopt utilities:** A long sales cycle at many utilities means advanced HEM solutions, or even AMI deployments, must wait many months or years for funding and approval. Valuable solutions can get stuck in lengthy trials, delaying the value to customers.
- **Cost:** Advanced HEM devices cost well beyond the price of a traditional product, meaning people of more modest means are likely to hold off adopting until prices soften.
- **Tepid consumer demand:** Not all customers are motivated to go out of their way to reduce energy consumption by adopting HEM products or solutions. They cannot justify the added expense or hassle for new hardware when the return on investment can be uncertain.

2.1.3 Market Size and Forecast

Guidehouse Insights expects healthy growth for the worldwide HEM market during the forecast period, 2019-2028, driven mainly by hardware shipments. Spending on software will also drive growth, as robust software will be crucial for unlocking the insights and energy savings from the large datasets that utilities and other stakeholders will need to manage and analyze in their efforts to boost energy efficiency in homes. On a global basis, overall HEM revenue is projected to grow from nearly $4.4 billion in 2019 to more than $12 billion in 2028, at a compound annual growth rate (CAGR) of 12.3%. Revenue from HEM hardware is expected to increase from $3.2 billion in 2019 to $9.3 billion in 2028, at a CAGR of 12.4%.

Chart 2-1. HEM Revenue by Segment, World Markets: 2019-2028



(Source: Guidehouse Insights)

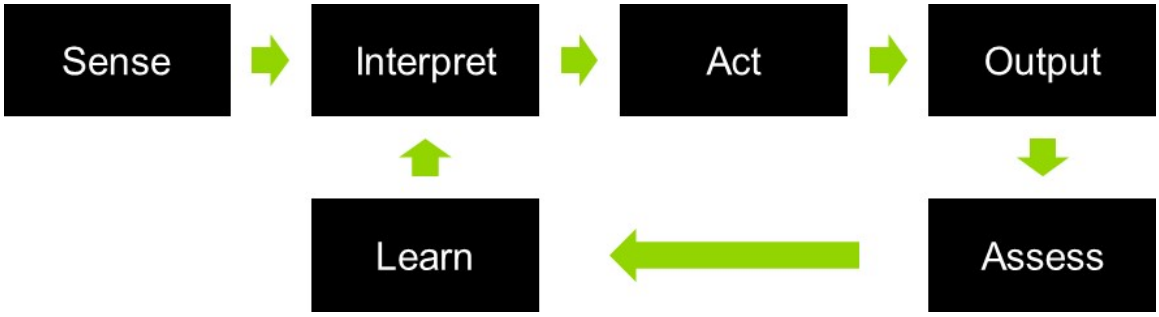
2.2 AI Is a Key Tool

No clear definition of artificial intelligence (AI) exists, but it typically represents a broad spectrum of computer science. AI is essentially an approach or a blend of technologies that extend human capabilities. The use of AI is having profound effects in nearly all sectors of society and industry. For utilities, AI is increasingly becoming a key tool for optimizing energy usage among customers.

2.2.1 AI Capabilities and Branches

AI enables machines to sense, comprehend, act, and learn to extend human capabilities. Vast quantities of data and multiple data types are required for these human-like processes to occur.

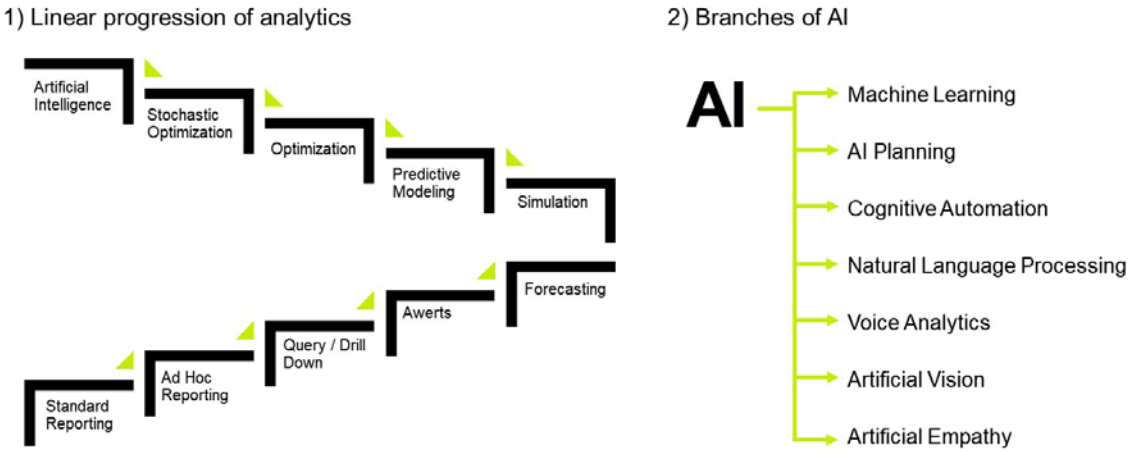
Figure 2-1. Cognitive Processes of AI



(Source: Guidehouse Insights)

AI has grown beyond simply processing structured data into many new fields. Instead of a linear progression in the evolution of data science, it is helpful to view the leading edge of AI as branches of parallel efforts (as Figure 2-2 shows). These branches, among others, include machine learning, AI planning, cognitive automation, natural language processing, voice analytics, artificial vision, and artificial empathy. These different branches of AI use different types of input and analyze different types of data for different purposes, thus the need for different analytical techniques.

Figure 2-2. Linear Evolution of Analytics and Branches of AI



(Sources: Guidehouse Insights, Honeywell)

There is no end state to AI, and no one true AI. AI stands out as the technology that turns data into value for both an enterprise and its customers.

2.2.2 AI for the Utility Sector

In the utility sector, managers and their engineering staffs are starting to use the various branches of AI to provide more valuable insights, produce greater energy savings, and deepen customer engagements. Their efforts coincide with an overarching new approach that places the customer at the center of data gathering and analysis and not having data remain in utility silos, as has been the traditional approach.

Another emerging idea utilities are adopting is creating a personal energy assistant for every home. Essentially, this is an individualized AI that optimizes outcomes for the residential customer in a comprehensive fashion. The goal is to prioritize comfort and help the customer save energy while simultaneously accounting for grid needs, such as lowering overall peak usage.

2.2.2.1 Bidgely's UtilityAI Platform

Several software vendors are leading the market with AI-based solutions to drive a deeper and more data-driven focus on utility customers. Among them is Bidgely. The company's platform is called UtilityAI, which employs patented machine learning algorithms to extract appliance-level usage data and then convert this data into useful insights.

The Bidgely platform uses information from smart meters or analog meters, obviating the need for additional expensive hardware sensors on the customer side of the meter. The load disaggregation updates dynamically according to a customer's usage patterns. For instance, if a customer leaves on vacation or upgrades an appliance, the platform's itemization functionality can reflect the changes. For residential customers, the platform provides precise information related to consumption, a projected bill, personalized recommendations, similar-home comparisons, EV charging, and solar disaggregation. For utilities, the platform features tools for analyzing high bills in support of customer service representatives, analytics for improving grid operations, and designing demand-side management programs.

The UtilityAI platform has been used to analyze data from about 15 million homes. The company has developed 15 patents during its 9 years of existence. Key learnings Bidgely has gained from using AI to improve HEM include the following:

- **Scalable personal energy advisement:** Via behavioral techniques, the customer receives personalized energy advice, removing guesswork and providing valuable expertise for managing a home's energy efficiency. AI can also be used to support the sale of new products and services, such as EVs, EV chargers, smart thermostats, HVAC systems, maintenance services, and security systems.

- **Customer satisfaction:** Giving customers personalization improves their overall perceptions of and loyalty to the utility. With AI, customers can receive tailored programs, products, services, rates, and rebates without spending hours researching these offerings by themselves. This also lowers PR and marketing costs to research and tailor messages manually.
- **OPEX cost reduction:** Personalization is more easily attainable at lower cost and higher consistency by leveraging AI. For instance, call centers can answer high bill questions with greater accuracy, reducing average call lengths and lowering wait times. Likewise, utilities can lower research costs by using Bidgely's AI for improved customer targeting and marketing for their demand-side management programs.

2.2.3 Home Energy Reports Use AI to Hyper-Personalize Engagement

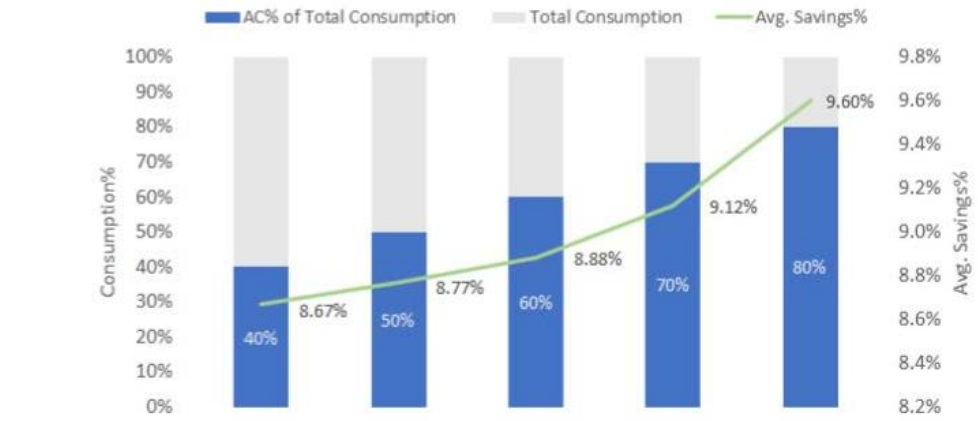
Home energy reports (HERs) have grown to become a key tool utilities use in their efforts to improve customer engagement. These detailed paper reports contain important data on a customer's usage patterns and tips for reducing energy consumption. HERs have become stale after a decade of more or less the same standard approach with diminishing savings over time. There is a need for improved methods to accomplish the same goals. Companies and utilities are looking to develop HER 2.0, or the next generation of HERs that feature greater value to both utilities and residential customers. Bidgely's AI-based HER 2.0 uses AI to generate more behavioral changes among customers by focusing on digital engagement, motivating customers, improving targeting techniques of potential savers, and hyper-personalizing engagements.

2.2.3.1 How AI Can Alter Market Perceptions

By analyzing large datasets, utilities can identify usage patterns that can alter market perceptions of what is possible for HEM.

Engaging based on high consumption alone does not yield the greatest savings: The common belief is homes with high consumption levels are the best ones to target for behavioral energy efficiency programs. This may not be true. Through its AI-enabled analysis, Bidgely found that homes with greater HVAC consumption, not just high consumption homes, saved more than similar homes with lower HVAC use—in this case for AC (see Figure 2-3). Customers with high consumption but low AC usage tended to save less energy. AC consumption correlates to savings potential as homes with lower AC use (40% of total consumption) but high consumption save 8.5%, while customers with high consumption and high AC use (80% of total) average 9.6%. Therefore, in the next generation of HERs, utilities should focus on high users of AC, not only users that have high overall consumption.

Figure 2-3. High Consumption Does Not Tell True Story – Analysis of More Than 50,000 Homes



Disaggregation allows utilities to identify users with higher AC usage which results in a better treatment group and higher potential savings.

(Source: Bidgely)

Digital home energy engagement can outperform traditional engagement methods: While sending traditional paper energy reports might generate desired savings, Bidgely finds email reports can outperform paper reports, generating 2 times the savings during peak months compared with paper-only reports. A hybrid approach of blending both email and paper also helps to reduce a utility's overall program costs: a roughly 25% reduction can be expected compared to paper-only based on Bidgely customer experiences.

Figure 2-4. Digital Usage Reports vs. Paper Can Deliver More Savings

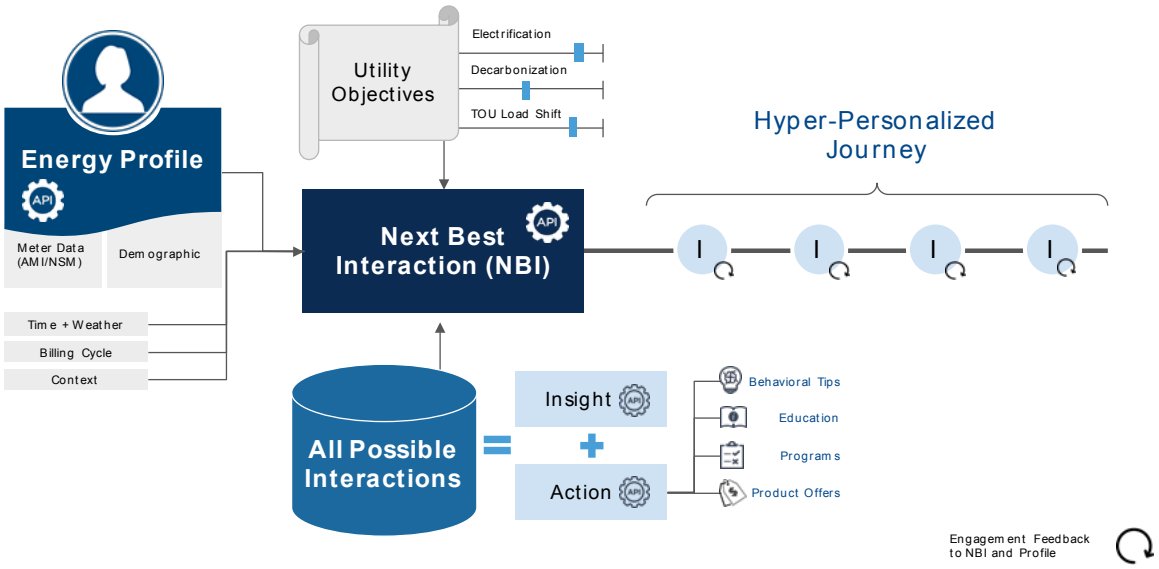
(Source: Bidgely)

2.2.4 HEM Drives Utility Operations

HEM by utilities has typically been handled in silos. For example, demand-side management program teams would develop customer engagement strategies solely for energy efficiency or demand response (DR) gains. Delivery teams would engage customers solely for outage alerting or service management, creating a disjointed customer experience. This experience makes it difficult for customers to know how best to manage their home energy usage and interact with their utility.

With AI and the benefit of smart meter technologies, utilities are developing more comprehensive approaches to HEM that address customer needs across multiple levels within a utility, creating a seamless personalized journey. Customer engagement is becoming a tool that handles several objectives, whether that be energy efficiency, decarbonization, electrification, load shifting, or DR.

Figure 2-5. Hyper-Personalized Journey Framework



(Source: Bidgely)

Bidgely developed an engine that uses AI to develop a hyper-personalized journey for every individual customer. This journey can account for all the different potential behaviors and insights a utility might know and want to communicate back to the customer, from energy savings tips to promotions of DR programs to smart thermostat rebate offerings. Having a strong two-way communication between customer and utility allows for more control of energy usage by influencing usage patterns for distributed energy generation (e.g., solar generation or EV charging) and DR controls or smart home technologies.

2.3 Regulatory Environment for AI

Few standards or regulations explicitly address how AI is used for HEM. The reason for a lack of regulatory involvement stems from the fact that AI is a newer discipline across the energy sector and for utilities in particular. Given the expected growth for AI related to HEM, it is reasonable to expect that regulators will want to ensure data privacy is respected for customers. For example, the widely known General Data Protection Regulation standard in Europe could be the basis for added standards related to how AI is used with customer information. In regions like North America, regulators are likely to follow suit but promulgate regionalized standards that reflect their own views on data usage and privacy. Vendors can contribute to the expected regulatory involvement by providing an open view of what takes place with AI. By demystifying what AI is recommending to users, AI becomes less of a black box to regulators and the general public. This might even become a requirement in the future.

Section 3
Case Studies

Utilities face mounting pressure to improve customer engagement and drive higher satisfaction scores. Various studies indicate that increasing customer satisfaction translates into bottom-line value for utilities, even those in captive markets. Several case studies illustrate how implementing AI solutions has helped utilities reach their goals for customer satisfaction and engagement.

3.1 Rocky Mountain Power

ROCKY MOUNTAIN POWER
A DIVISION OF PACIFICORP

Based in Salt Lake City, Rocky Mountain Power (RMP) provides electricity to nearly 1.1 million customers in Utah, Idaho, and Wyoming.

- **Challenge:** RMP wanted to upgrade its customer engagement initiatives and drive more customers toward a digital, two-way dialogue with the utility. Its first generation monthly paper HERs program had several limiting factors:
  - The high cost of printing, production, and postage limited the number of customers who could be targeted.
  - Non-smart meter technology prevented RMP from delivering actionable disaggregated insights and providing reports more frequently than once per month.
  - Because the legacy HERs included only whole home usage data, customers could not identify which behaviors or appliances were using the most energy, making it hard for them to take corrective actions.
  - Monthly mailings provided limited opportunities for customer feedback and did not facilitate RMP's ongoing efforts to improve customer engagement, a top priority.
- **Solution:** RMP selected Bidgely's UtilityAI solution to replace its legacy HERs program. The Bidgely software platform integrated local contextual data, a customer's historic energy usage, and AI. With this approach, RMP was able to deliver a more targeted, customer-centric behavioral program. Of key importance was the ability to provide the same level of insight to non-smart meter customers as those customers with a smart meter. As a result, every RMP customer with an online account could access detailed and highly relevant energy usage data via the utility's existing customer web portal. Customers also received personalized energy-saving tips based on their energy use, enabling them to take actions at the appliance level.

- Some 330,000 customers across RMP's service territory received outbound itemized HERs and personalized recommendations from the utility, of which more than 50% were delivered by email instead of traditional paper mailings.
- RMP also enhanced customer engagement through a new console for its call center. With quick access via the console to historic customer communications, customer-supplied profile data, and complete historic records of appliance-level usage, call center staff members could provide more accurate, targeted, and personalized recommendations the utility's customers. With more detailed customer information, staff members were also able to more effectively resolve high bill inquiries and other customer issues.

"With AI reports we were able to quickly shift from conventional methods of reporting, using general peer comparisons, to true energy empowerment with itemized energy bills and personalized savings tips, while at the same time moving customers to digital reports." – RMP executive

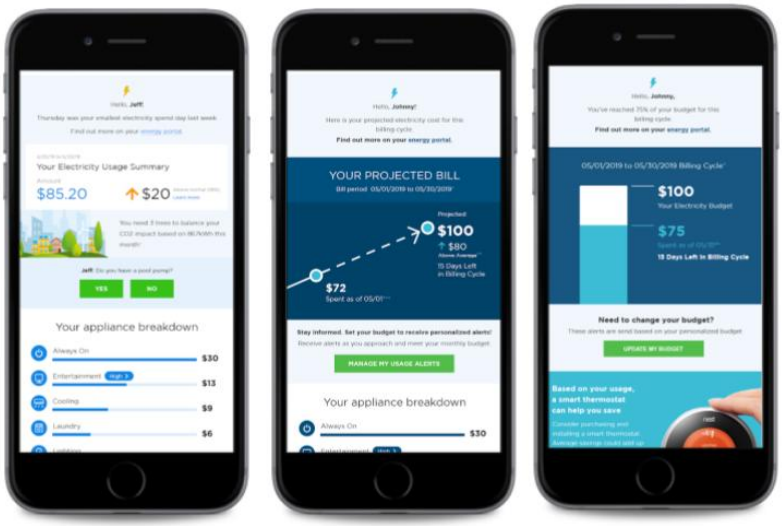
- **Impact:** RMP expanded the treatment group to all customers after migrating to the Bidgely solution. Metrics from the migration include the following:
  - Email open rates averaged 38%, nearly double the utility industry norm.
  - 80% of email recipients gave a thumbs-up to the digital communications.
  - 26% increase in traffic to RMP's enhanced customer web portal.
  - Regulators applauded the digitally enhanced program, recognizing RMP for extending the reach and benefits of its behavioral program.
  - Customers jointly saved more than 41 GWh of energy in less than 1 year, or the equivalent of eliminating CO_2 emissions from more than 31 million pounds of coal burned.
  - Energy savings of 1% among average consumption customers and greater savings among high energy consumption customers.
  - 25% cost reduction compared with first generation HER programs.
- **Customer quote:** "With AI reports we were able to quickly shift from conventional methods of reporting, using general peer comparisons, to true energy empowerment with itemized energy bills and personalized savings tips, while at the same time moving customers to digital reports." – RMP executive.

3.2 Tier 1 IOU in Northeastern US

A Tier 1 investor-owned utility (IOU) based in the Northeast provides electricity to more than 7 million retail customers across several states, making it one the largest electric power holding companies in the US.

- **Challenge:** The Tier 1 IOU, having invested in smart meter infrastructure, wanted to use this new data to engage its customers rather than relying on traditional methods. The approach needed to be more timely, modern, and digital for communicating with 21st century customers. The utility chose Bidgely to create data-driven personalized value for its customers.
- **Solution:** Utility executives decided to supplement its existing customer communications with a new program based on the Bidgely solution. The idea was to provide the utility's customers with helpful mobile energy usage alerts in a timely fashion. The mobile alerts program used meter data to automatically send customers an estimated electricity cost to date and a projected cost for the month halfway through a billing cycle (see Figure 3-1).
- **Impact:** More than 6 million alerts have been sent to customers, with the following results:
  - 11% uplift in scores in the bill and pricing categories of the utility's industry standard customer satisfaction surveys.
  - 92% positive customer reviews when asked for feedback on these alerts.

Figure 3-1. Screenshots of Energy Efficiency Alerts Sent to Mobile Phones



(Source: Bidgely)

3.3 VSE

VSE is Slovakia's leading utility, providing electricity and natural gas services to approximately 500,000 residential and commercial customers. The company is part of the Germany-based RWE Group.

- **Challenge:** VSE executives wanted to diversify the utility's offerings to non-commodity products and services such as energy efficient products (e.g., light bulbs, shower heads), comfort products (e.g., maintenance), and security products (e.g., fire alarms). Knowing these spaces are competitive, VSE sought to combine its efforts with digital home energy advisory services.

> *"Integrating AI technology into our services creates an even more personalized experience for our customers, pinpointing specific opportunities for increased efficiency in their home and uniting the customer experience across each interaction with us."*
> *– Miroslav Kulla, CCO, VSE-RWE*

- **Solution:** VSE selected Bidgely's UtilityAI solution to create an integrated, omni-channel experience for customers. Emails with itemized energy usage by appliance were sent to drive greater awareness of consumption in the home. A web platform provided further usage and an opportunity to complete home profiles for deeper personalization. With the solution in place, all VSE teams can know which interactions have taken place and what results have been achieved with each customer.
- **Impact:** The initial pilot showed high customer satisfaction with the services, yielding the following results:
  - 97% of customers want VSE to continue using Bidgely's digital engagement emails and 95% find them useful.
  - €150 ($160) annual average energy savings per household.
  - 30% efficiency increase in targeting, increased demand in energy advisory services, higher perceived value from clients, and higher conversion rate from leads to sales.
- **Customer quote:** "Integrating AI technology into our services creates an even more personalized experience for our customers, pinpointing specific opportunities for increased efficiency in their home and uniting the customer experience across each interaction with us." – Miroslav Kulla, CCO, VSE-RWE

Section 4
Recommendations

To harness the power of AI in the context of customer engagement and energy management, utilities must embrace the technology in its many forms and create a data-centric and customer-centric culture to derive value. Utilities have invested significantly in updated smart meter infrastructure and need to invest in using the data coming from this new infrastructure through AI. Managers and staff need to become familiar and comfortable with AI tools to exploit the increasing volumes of systemwide data to have a successful AI journey.

To capture the full value of an AI solution suite, Guidehouse Insights recommends utilities establish a strategy that builds a solid AI foundation. The strategy should define short-term and long-term goals and outline specific actions on how to achieve these goals. At a minimum, a strategy must answer several fundamental questions:

- Why should the business invest in a new data platform? Or, what is likely to happen if it does not make this investment? How will that affect the business' bottom line?
- What are the immediate and longer-term objectives the business expects to achieve with a data platform?
- What changes need to be made internally once the business adopts a new data platform (e.g., staffing, training, equipment)?

Further, utilities should take the following practical steps:

- **Define the costs and total cost of ownership:** Count new hard out-of-pocket costs (hardware, software, services, cloud fees, bandwidth) for digital transformation projects as well as the incremental increase existing costs such employee time lost to data management, report writing, ensuring data quality, and curating data that can be often overlooked.
- **Scope the monetary and non-monetary benefits of AI:** Return on investment can come from reduced costs, increased productivity without an investment in heavy capital, new revenue sources, or an accelerated time to market. There are often more elusive benefits such as enhanced safety, support for regulatory compliance, and increased satisfaction among staff and customers.

- **Develop a regulatory filing plan:** Create a plan for regulators that makes a solid and transparent case for using the latest digital technologies to provide customers the tools to optimally manage energy use. For instance, utilities could adopt language similar to what PSEG Long Island used in its filing in New York: "The purpose of the Plan is to implement energy efficiency measures, distributed generation, or advanced grid technology programs providing customers with tools to more efficiently and effectively manage their energy usage and utility bills, and improve system reliability and power quality."[2]
- **Do not rush and use a roadmap:** While there are many steps in adopting a new AI platform, a roadmap, even a simple roadmap, is essential to keep the initial phase on track and the people focused. This approach helps break the overall strategy into manageable pieces or steps. It also defines what is expected for various teams within the business to support a successful deployment.
- **Top-level management needs to fully support a new data platform:** Sponsorship from the C-suite is essential for such a fundamental shift in the use of data that potentially reaches every level of the organization. This type of support keeps teams focused and provides guidance on key spending decisions as those issues surface in the initial phases.
- **Share the AI strategy and roadmap internally with staff:** This is important all along the journey—staff members can understand the key objectives and aim for shared outcomes.
- **Select key partners to help drive AI adoption:** The volume and complexity of data management through AI can be daunting, and not many firms can manage on their own. Choose partners with a proven track record when it comes to a data platform that meets immediate business needs but is also durable and adaptable for the longer term.
- **Be flexible:** Becoming proficient with AI tools is not a trivial endeavor. The process of deploying this technology can involve fundamental changes to an organization and its people. A healthy dose of adaptability is in order.

[2] Notice Requesting Comments on PSEG LI 2019 Utility 2.0 Annual Update, July 15, 2019, link located at: https://www3.dps.ny.gov/W/PSCWeb.nsf/All/A4F227628F73D62F85257F57006320E3?OpenDocument

Section 5

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Section 7
Scope of Study

Bidgely commissioned Guidehouse Insights to analyze key market trends within the utility industry regarding HEM and customer engagement, including how digital technologies like AI are unlocking added value for customers. The white paper also includes Guidehouse Insights' recommendations for market stakeholders considering the digital tools needed as they create the evolving grid of the future.

This analysis does not represent an endorsement of the Bidgely UtilityAI platform. Rather, the white paper focuses on how AI can be an important tool for unlocking insights from data for the benefit of utilities and their customers.

Sources and Methodology

Guidehouse Insights' industry analysts utilize a variety of research sources in preparing Research Reports. The key component of Guidehouse Insights' analysis is primary research gained from phone and in-person interviews with industry leaders including executives, engineers, and marketing professionals. Analysts are diligent in ensuring that they speak with representatives from every part of the value chain, including but not limited to technology companies, utilities and other service providers, industry associations, government agencies, and the investment community.

Additional analysis includes secondary research conducted by Guidehouse Insights' analysts and its staff of research assistants. Where applicable, all secondary research sources are appropriately cited within this report.

These primary and secondary research sources, combined with the analyst's industry expertise, are synthesized into the qualitative and quantitative analysis presented in Guidehouse Insights' reports. Great care is taken in making sure that all analysis is well-supported by facts, but where the facts are unknown and assumptions must be made, analysts document their assumptions and are prepared to explain their methodology, both within the body of a report and in direct conversations with clients.

Guidehouse Insights is a market research group whose goal is to present an objective, unbiased view of market opportunities within its coverage areas. Guidehouse Insights is not beholden to any special interests and is thus able to offer clear, actionable advice to help clients succeed in the industry, unfettered by technology hype, political agendas, or emotional factors that are inherent in cleantech markets.

Notes

CAGR refers to compound average annual growth rate, using the formula:

$$CAGR = (End\ Year\ Value \div Start\ Year\ Value)^{(1/steps)} - 1.$$

CAGRs presented in the tables are for the entire timeframe in the title. Where data for fewer years are given, the CAGR is for the range presented. Where relevant, CAGRs for shorter timeframes may be given as well.

Figures are based on the best estimates available at the time of calculation. Annual revenues, shipments, and sales are based on end-of-year figures unless otherwise noted. All values are expressed in year 2020 US dollars unless otherwise noted. Percentages may not add up to 100 due to rounding.

Published 2Q 2020

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Note: Editing of this report was closed on April 17, 2020.