**Itron**

A RESOURCEFULNESS INSIGHT REPORT

# MORE INTELLIGENCE & MORE POSSIBILITIES

## HOW REAL-TIME DATA AND ANALYTICS ARE **TRANSFORMING UTILITIES AND CITIES**

**2022 EDITION**

# TABLE OF CONTENTS

# CEO PERSPECTIVE
## WE NEED INSIGHTS TO **SOLVE** **OUR BIGGEST CHALLENGES**

**Welcome to the 2022 Itron® Resourcefulness Insight Report**, the latest installment in our Resourcefulness Report series. Itron began this research series nearly a decade ago to gain insights into what utility executives and consumers think about issues surrounding how energy and water are delivered and used.

Last year, we examined how climate disruption and our responses to it impacted grid reliability and resilience. This year, we're looking at several more challenges, but through a different lens: the need for real-time data analytics.

There has never been a better time to focus on this topic. More than nine out of 10 utility executives (93%) we surveyed view real-time data analytics as very or extremely important, and it is little wonder why: **Power and water providers the world over face disruption on a historic scale—and in virtually every aspect of their business**.

» Extreme and devastating weather, which only seems to worsen as time goes on, continues to threaten grid reliability.

» Integrating DERs complicates service delivery and load management, while leaving utilities to explore how they can monetize this unstoppable movement—but also moves our industry toward the promise of a cleaner, greener energy future.

» Urban areas around the world are growing rapidly, making smart city services like traffic management and air quality monitoring critical to ensuring the cities of the future are livable.

» The digital age has conditioned consumers to expect to know how they can reduce their energy and water bills even as they receive highly customized services.

» Utilities are trying to identify new revenue streams and develop strategic business plans to pursue them.

» And with rates set by regulators but operating costs rising, utilities everywhere are looking to drive inefficiencies out of their business wherever they can.

It is, in a sense, a perfect storm of market pressures, technology disruption and, yes, literal storms.

Yet for every challenge utilities face today, there is an answer. Real-time data analytics helps provide that answer. As this report makes clear, the insights analytics can provide offers numerous possibilities for improvements, efficiencies, and new products and services. They can help improve grid resiliency in the face of rising threats from weather, meet unpredictable demand from EVs and more.

Real-time data analytics maximizes the investments utilities have already made in data-producing sensors, advanced metering infrastructure (AMI) devices and more. Those investments lay an important foundation for the future, but it's a future marked by constant change. Analytics itself is evolving, and so is the very data utilities will use to navigate their future. First-generation AMI technology provided first-generation insights into things like interval data and outage notifications. Next-generation technology leveraging distributed—or edge—intelligence solutions place actionable insight at the point of service, offering utilities unprecedented visibility into the least visible corners of their networks to better understand and manage disruptors like EVs and DERs.

This report examines all these challenges and the opportunities that arise from solving them. It also explores key concerns among utility executives, from data storage to cybersecurity, and highlights where consumer expectations and utility priorities meet—and where they do not.

Every business is working to harness the full potential of data, and to extract from it the greatest possible business value. For utilities that contribute so much to the quality of life around the world, that mission is important to all. We hope you find this report helpful to yours.

Sincerely,

Tom Deitrich
President and CEO, Itron

## ABOUT THIS STUDY

This report examines the growing use of data analytics among utilities and municipalities—and how data-driven insights are helping those providers deliver better, more efficient services and unearth new opportunities. It builds on findings from surveys conducted for the 2018 Itron Resourcefulness Report and the subsequent Resourcefulness Insight Reports focusing on disaster preparedness and grid resilience. Inspired by select findings from these surveys, Itron commissioned additional research to explore the topic further.

The report consolidates perceptions of consumers and utility executives on an array of topics relating to the use of data, as well as consumer intentions regarding topics such as personalized services, data privacy and views on sustainability. A total of 1,200 online surveys were completed by 600 consumers and 600 utility executives in June of 2022.

**UTILITY EXECUTIVE RESPONDENTS** were mid-level managers or higher who have input on decision making for energy and water utility operations in the United States, Australia, U.K., Spain and India. Their areas of responsibility include selling products, buying commodities, working in operations, strategic planning, customer service and administrative services.

**CONSUMER RESPONDENTS** who completed this survey are 18 years and older and responsible for paying for utilities in their household, whose annual income was the equivalent of $50,000 U.S. or more. Respondents reported having a college degree or higher and were interested in news relating to city planning, construction, government, manufacturing and utility development.

The results of these surveys provide a unique view of what both groups think about emerging trends that are likely to impact the use of data in delivering and improving utility and city services.

100/100 U.K.

100/100 SPAIN

200/200 USA

100/100 INDIA

100/100 AUSTRALIA

**SURVEY DEMOGRAPHICS**

**600**
INFORMED CONSUMERS
AND UTILITY RATEPAYERS

**600**
UTILITY
EXECUTIVES

# EXECUTIVE SUMMARY

# EXECUTIVE SUMMARY

**AS DATA GROWS, SO DOES THE NEED TO MAKE STRATEGIC USE OF IT.**
For utilities and cities to make the most of their investments in smart technology, advanced metering infrastructure (AMI) and other assets that generate real-time data, they see data analytics as a vital next step in their evolution.

**VIRTUALLY ALL UTILITIES RECOGNIZE THE VALUE OF INSIGHTS FROM REAL-TIME DATA…**
More than nine out of 10 execs surveyed say the ability to gain insights from real-time data is extremely or very important. It's little wonder since disruptors are evolving quickly—and utilities must develop ways to keep up.

**YET NOT ALL ARE TAKING ADVANTAGE.**
Nearly one-fifth of utilities equipped with at least some analytics technology—even the most basic—aren't using it. Utilities cite data security/privacy, internal culture/ resistance to change, storage requirements, difficulties prioritizing investments, and labor and skills shortfalls among the barriers to deployment.

**GAINING INSIGHTS FROM REAL-TIME DATA IS AN EMERGING PRIORITY.**
Among all technology deployed by utilities for key use cases, data analytics ranks between third and sixth. But in five years, data analytics technology deployments will rank first for managing extreme weather, second for operational efficiency and for personalization, and third for sustainability.

**CONSUMERS AND UTILITIES SAY LOWERING COSTS IS THE PRIORITY, BUT ARE THEY TALKING ABOUT THE SAME THING?**
Three out of four consumers believe the most important use of real-time analytics is to provide efficient utility operations that can reduce energy and water bills. Utilities similarly prioritize efficiencies, but they're focused on reducing operating expenditures—and it's unclear whether lower OpEx would lead to lower bills for ratepayers and citizens. More realistic may be for utilities to pass along savings by keeping rates steady as demand increases.

**UTILITIES SAY THEY PROVIDE PERSONALIZED INSIGHTS. THAT'S NEWS TO MANY CONSUMERS.**
Though 92% of utilities say they use data to provide customers personalized insights only 65% of consumers say they're getting them and 24% say they receive none. In the countries we surveyed, consumers say personalized insights are most available in India (87%) and least available in Spain (51%) and the U.K. (54%).

**STILL, HALF OF CONSUMERS ARE WILLING TO PAY EXTRA FOR INSIGHTS.**
Consumers believe personalized insights are so important that half say they're willing to pay between 1% and 7% more on their bills to receive them—a potential new revenue stream for utilities and cities who previously assumed personalization was simply a cost of doing business.

**DUELING FAVES IN SMART CITIES: EV CHARGING VS. SMART STREETLIGHTS.**
Among smart city uses for data analytics, utilities rank EV charging as most valuable. Consumers prioritize smart streetlights. Even though both agree that air quality monitoring and traffic management are valuable, utilities are faced with preparing the grid for EV growth, whether consumers see it as valuable or not—or even as a potential threat to grid stability as more and more EVs are plugged into the grid.

# EXECUTIVE SUMMARY

**AMI REMAINS A KEY OPERATIONAL EFFICIENCY INVESTMENT.**
Overall, it's the top investment priority, followed by back-office analytics and distribution automation. In the U.K., predictive analytics leads the list.

**CONSUMERS WANT ANALYTICS TO SUPPORT INTEGRATING RENEWABLES AND PROMOTING SUSTAINABILITY.**
Three out of four say it's extremely or very important. In India, that number rises to 96%. (Last year, 87% of utilities said DER integration was a high or extremely high priority.)

**PROSUMERS MAY HELP WITH ENERGY STORAGE CHALLENGES.**
Of consumers who generate their own electricity, 77% have battery storage. Battery storage is most prevalent among urban dwellers (84%) and least in smaller cities and suburbs (60%).

**EDGE INTELLIGENCE WILL BE KEY FOR EXTREME WEATHER PLANNING AND RESPONSE.**
Though back-office analytics and data analysis are important today in managing extreme weather, utilities say it will be their No. 1 investment priority in five years. As utilities look to improve efficiency and respond faster to events, edge intelligence devices are poised to play a more prominent role.

**DATA PRIVACY IS TOP OF MIND FOR UTILITIES. FOR CONSUMERS, NOT SO MUCH.**
As utilities increasingly face ransomware and other attacks, execs see data security and privacy as their No. 1 barrier to implementing real-time data analytics; 81% of executives are extremely or very concerned about ensuring the privacy of customer data. Yet just 42% of consumers share the same concern, suggesting that consumers may simply assume utilities are keeping their data safe.

**AMONG UTILITIES AND CITIES, DATA EQUALS CYBERSECURITY CONCERNS.**
Losing enterprise and customer data, as well as falling victim to ransomware attacks and service interruptions, are top concerns. Other worries: Cryptojacking, cloud vulnerability and insider attacks.

**AMID CHANGE, A FUTURE OF INTELLIGENCE AND POSSIBILITIES.**
Utilities and cities face an array of constantly changing challenges. Solutions are available today to infuse more intelligence from the grid edge to the central office to help meet the challenges of tomorrow—and ultimately unlock more possibilities.
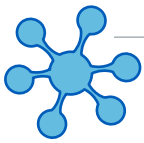
# INTRODUCTION

## MAPPING THE NEXT STEP FOR MODERN UTILITIES AND CITIES

### DATA-DRIVEN INSIGHTS WILL DEFINE THE FUTURE.

> By next year, the number of devices connected to networks **will outnumber human beings three times over**.

In the time it takes you to read this sentence, 11MB of new data will be produced for every person on earth.[1] That data comes from everywhere, including our mobile devices and apps, enterprise systems, household appliances, and gas, water and electric meters. And all those sources just keep multiplying: By next year, the number of devices connected to networks will outnumber human beings three times over. And in North America, there will be 13 connected devices for every person.[2]

None of this is lost on utility executives, city administrators and even consumers. Everyone knows that our machines increasingly spend their time talking to other machines. In fact, machine-to-machine (M2M) connections will represent half of all global device connections by 2023. That amounts to about 14.7 billion devices sending and receiving data all day, every day. Of that total, 1.9 billion will be low-voltage, wide-area connections such as smart meters and streetlights—a nearly 6X increase from 2018.[3]

FOR UTILITIES AND CITIES, A FUTURE SHAPED BY DATA

Any utility executive who oversees an advanced meter infrastructure (AMI) environment understands how quickly data can pile up. An AMI deployment connecting 100,000 meters and sending data at one-hour intervals produces 876 million data points annually. One million meters at 15-minute intervals? The total leaps to 36 billion data points.[4] In June of 2022, more than a billion messages were sent by smart meter networks in the United Kingdom. Utility operators there expect data traffic to surge 500% by 2026.[5]

## MAPPING THE NEXT STEP FOR MODERN UTILITIES AND CITIES

DATA-DRIVEN INSIGHTS WILL DEFINE THE FUTURE. (CONT.)

FOR UTILITIES AND CITIES, A FUTURE SHAPED BY DATA



### FIELD MEASUREMENT
Electricity, gas, water meters; phasor measurement units (PMUs); smart sensors; EV depots; smart meter and sensors

### OUTAGE MANAGEMENT
Outage / restoration systems; vegetation management; fire detection; water and gas leak detection

### WEATHER MEASUREMENT
Ground stations; radar; satellite; specialized systems (such as the National Lightning Detection Network)

### ASSET MANAGEMENT
Embedded sensors for condition-based monitoring; $CO_2$ sensors; pole tilt sensors; transformer monitoring devices

### DISTRIBUTED GENERATION
Solar panels and inverters; wind / turbine installations; microgrids; distributed battery storage

### SMART CITY DEVICES
Acoustic monitoring sensors; air quality / environmental sensors; traffic and parking sensors; smart streetlights

### BEHIND-THE-METER DEVICES
EV charging points (home and public); smart thermostats and appliances; demand response devices

## MAPPING THE NEXT STEP FOR MODERN UTILITIES AND CITIES

### DATA-DRIVEN INSIGHTS WILL DEFINE THE FUTURE. (CONT.)



The picture isn't much different in the United States, where 115 million electric smart meters were estimated to have been deployed by the end of 2021.[6] As service areas expand and more smart equipment (including behind-the-meter appliances and sensors) join the network, data growth is likely to increase exponentially.

Utilities and cities, of course, must store and manage their data—a challenge many of them are working to address now. But all that information about resource usage, consumer behavior, service area conditions and infrastructure status also holds within it something raw data alone can't provide.

HARNESSING THE POWER OF INSIGHTS

Hemmed in by regulatory mandates and economic realities, utilities and cities are facing an increasingly difficult future. Current challenges will only grow more complex. With the right tools, however, real-time data collected by today's smart meters and other sensors can be transformed into insights to streamline service delivery, predict outages or other threats to the grid or infrastructure, and reveal potential new revenue streams.

Those insights and actions can take place throughout the network: Data analytics software in the network operations center, analysis of data from back-office enterprise applications, and increasingly even from edge computing devices that can collect data, analyze it in real-time and then take action to resolve or even ward off problems at the very point of service. When the infrastructure is intelligent, and when it is equipped with the right technology throughout, analytics can add value anywhere—and everywhere.

This report examines how utilities, cities and consumers view the prospect of using real-time data to improve critical aspects of resourcefulness and quality of life. **In particular, the following pages will explore the six use cases utility executives say are most critical for real-time data analytics:**

1. Improving operational efficiency

2. Developing new revenue streams

3. Supporting sustainability and renewables

4. Providing personalized customer insights

5. Managing extreme weather

6. Enabling smart cities

# WHAT CAN ALL THIS DATA TELL US?

## OPPORTUNITIES ABOUND WITH THE RIGHT TECHNOLOGIES.

### OPERATIONAL EFFICIENCY

» Transformers at risk of overload
» Transformers incorrectly sized (large or small)
» Power quality fluctuation trends and causes
» Leverage solar storage networks
» Identify energy and water theft patterns
» EV charge balancing
» Vegetation management

### NEW REVENUE STREAMS

» Premium personalized consumer insights
» Online marketplaces
» Connected home programs
» Residential solar storage programs
» Peak load pricing
» Transmission ventures
» Expert consulting on weatherization, smart homes and smart offices
» Microgrid design and management

### SUSTAINABILITY & RENEWABLES

» Identify storage networks
» Identify and monitor behind-the-meter load
» Monitor voltage levels and power quality
» Microgrid design and management
» Detect water leaks

### PERSONALIZED CUSTOMER INSIGHTS

» Real-time alerts of outages and repair status
» Usage spike alerts
» Energy use by appliance
» Personalized savings guidance
» Time-of-use incentives
» Smart payment
» Expert consulting on weatherization, smart homes and smart offices

### MANAGING EXTREME WEATHER

» Optimal microgrid configuration
» Most vulnerable assets
» Safe or unsafe conditions for field workers
» Vegetation management
» Outage and restoration management

### SMART CITY SERVICES

» Flood/rain monitoring to identify emerging outages
» Air quality over time
» Key areas for EV charging
» Optimal traffic management schemes
» Smart streetlight efficiencies
» Parking management trends and opportunities

# EMERGING PRIORITIES

## UTILITIES SAY DEPLOYING DATA ANALYTICS IS CRITICAL

### BUT AT WHAT POINT WILL EMERGING CHALLENGES OVERWHELM YESTERDAY'S SOLUTIONS?

Proliferation of EVs will place more **unpredictable loads on the grid**.

Accommodating EVs, boosting customer satisfaction, improving efficiencies, preparing for and responding to disasters—it's not as if cities and utilities face a shortage of challenges. However, survey data clearly shows that utility executives recognize what it takes to unlock the answers to these challenges—and to identify new opportunities for services and revenues.

More than nine out of 10 utility executives say the ability to gain insights from real-time data is extremely or very important. Responses vary by only two percentage points across our five surveyed countries.

**That analytics is a top priority isn't in question**. What is more difficult to determine is how much of a presence analytics has in today's utility environment. As the timeframe for making operational decisions shrinks in the face of grid reliability threats and intermittent, distributed loads, situational analysis will become even more critical—and more automated. This will result in the need for even more grid sensors and more intelligence at the edge, in addition to more advanced analytics capabilities to help make sense of emerging disruptors and the data that comes with them. Utility managers will want high-fidelity information and reliable analysis at their fingertips as weather grows more severe, EVs place unpredictable loads on the grid, more DERs come online, and customers demand more granular and meaningful insights into how they can conserve their resource use and lower their bills.

### AN EYE ON OUTCOMES
**Operators may focus on applications, but business imperatives are key.**

What are utilities trying to achieve by analyzing real-time data? While operators often have specific applications in mind—such as AMI management, bill forecasting and time-of-use billing programs—they aren't losing sight of how those applications support business imperatives.

Executives say they're mostly using analytics to develop new revenue streams, improve operational efficiency and integrate renewables. When asked which uses or goals are most important, the results are largely the same, though operational efficiency emerges as most important.

| Goal | Current Use | Most Important Use |
|---|---|---|
| Developing new revenue streams | 62% | 53% |
| Improving operational efficiencies | 56% | 56% |
| Integrating renewables/promoting sustainability | 48% | 50% |
| Enabling smart city services | 45% | 45% |
| Providing customers personalized insights | 41% | 47% |
| Ensuring resiliency from extreme weather | 40% | 46% |

Current Use    Most Important Use

## CONSUMERS AND UTILITIES AGREE LOWERING COSTS IS THE PRIORITY

### BUT ARE THEY TALKING ABOUT THE SAME THING?

Three out of four consumers believe the most important use of real-time analytics is to provide efficient utility operations that can reduce energy and water bills. That's understandable. After all, who wouldn't prefer to pay less?

Utilities also name efficient operations as the most important use of analytics, but they're focused on reducing operating expenditures—and it's unclear whether lower OpEx would automatically lead to lower bills for ratepayers and citizens.

A more realistic scenario may be for utilities to pass along savings by keeping rates steady as demand increases. That may be tough: In the United States, retail residential electricity rates rose 14% between 2010 and 2020,[7] and predictions suggest rates will only continue to rise in the future.[8] And in Europe, disruption from the Russian invasion of Ukraine has caused energy costs to skyrocket to the point where the British government is imposing a cap on household energy contract rates. Meanwhile, Spain is subsidizing fossil fuel plant power costs to relieve pressure on household bills, cutting taxes, and providing direct aid and soft loans to ratepayers, all while building renewable capacity.[9]

**RESOURCEFULNESS INSIGHT**

Lower OpEx for utilities may not result in lower bills for consumers.

## ANALYTICS TECHNOLOGY IS AN EMERGING FORCE

LOOK FOR IT TO BECOME A MAJOR PRESENCE IN FOUR KEY AREAS.

Among all technology deployed by utilities, AMI solutions—a foundational element of an analytics-driven future—currently rank either first or second across **four key business use cases**:

| IMPROVING OPERATIONAL EFFICIENCY | MANAGING EXTREME WEATHER | PROVIDING PERSONALIZED CUSTOMER INSIGHTS | SUPPORTING SUSTAINABILITY AND RENEWABLES |
|---|---|---|---|

**That picture is changing**. While AMI will remain a popular investment in five years, back-office analytics and data analysis will have a much more prominent presence. For utilities, increasing investments in analytics only makes sense: Many technologies in the field today, from pressure monitoring systems to pole sensors and demand response technology, either generate data that can feed analytics applications or (in the case of distributed or edge intelligence) perform some analytics themselves. By moving analysis—and in many cases, control—to the edge, these technologies can evaluate collected data, make a determination of the action that needs to be taken, and then perform it in real-time at the edge of the system, without the need for data transport, analysis and decision-making processes at the back-office.

### AMONG ALL UTILITY TECH DEPLOYMENTS, ANALYTICS RANKS HIGH—BUT IT'S GOING TO RANK EVEN HIGHER.

| | TODAY | IN 5 YEARS |
|---|---|---|
| **OPERATIONAL EFFICIENCY** | 3rd | 2nd |
| **EXTREME WEATHER** | 3rd | 1st |
| **PERSONALIZATION** | 3rd | 2nd |
| **SUSTAINABILITY** | 6th | 3rd |

## UTILITY DATA ITSELF IS CHANGING

### REAL-TIME DATA INTRODUCES A DIFFERENT CLASS OF ANALYTICS— AND A CHANCE FOR MORE VALUABLE INSIGHTS.

5 of the 6 use cases outlined in this report **represent constantly evolving and intensifying** sources of change.

A decade ago, utilities everywhere began deploying AMI solutions that have helped them operate more efficiently and proactively, with smart meters and sensors enabling insights into usage, asset status, water quality and more.

**AMI is an excellent starting point, but data and analytics are evolving fast**. As critical as AMI is today, the forces of change bearing down on utilities will increasingly require insights that AMI systems deployed a decade ago, in the first wave of AMI, can't produce. Five of the six use cases outlined in this report represent constantly evolving and intensifying sources of change, from extreme weather and DER integration to the unstoppable reality of widespread EV adoption. In many respects, these grid and network disruptors are just getting started—even worse, they're all hitting utilities at once. Preparing infrastructure for their coming impacts will require new types of data and a different approach to analytics.

**Real-time data requires different solutions**. The nature of real-time data will greatly influence the architecture of data processing and analysis. Batch processing of meter usage data, for instance, tends to create large stores of data that are processed and analyzed over time. But real-time data, such as what can be provided by phasor measurement units (PMUs) that measure the phase angle of voltage and current, often is delivered as a stream—rather like streaming video. Its real-time use—such as providing ongoing decision support for grid operations—means waiting to analyze it later may not make sense. The result is real-time, streaming analytics, in which insights are derived as data arrives.[10]

## UTILITY DATA ITSELF IS CHANGING

REAL-TIME DATA INTRODUCES A DIFFERENT CLASS OF ANALYTICS— AND A CHANCE FOR MORE VALUABLE INSIGHTS. (CONT.)

**The changing landscape calls for new approaches.** Amid increasingly uncertain conditions from grid stressors, utilities are more likely to implement technologies like complex event processing (CEP) to achieve more accurate situational analysis. In a CEP environment, data from edge devices is often processed on the fly (and in some cases on the edge devices themselves). Utilities can automate the execution of complex queries across multiple data streams at once to identify conditions that fall outside of acceptable parameters. This allows appropriate actions to be taken in real time.[11]

**Edge intelligence and analytics can surface unexpected insights**. In a field test of three applications of distributed intelligence (DI) solutions from Itron, Tampa Electric Company (TEC) derived so many new insights into power quality and other factors that TEC was able to incorporate these insights into regulatory filings, load profiling, customer experience, distribution planning and troubleshooting. There were other benefits as well: By analyzing data from tests of a high impedance DI application, TEC realized many of its models incorporated outdated load assumptions based on older-generation appliances and lighting technology. When its tests returned hard data on the "phantom" load factor caused by the adoption of LED lightbulbs and more energy-efficient appliances, the utility was able to update its models to develop more accurate load forecasting and profiling.[12]
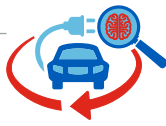
# WHY A STRONG ANALYTICS ENVIRONMENT IS A BUSINESS IMPERATIVE

## HOW ELSE CAN UTILITIES ANSWER QUESTIONS THEY'RE NOT EVEN ANTICIPATING TODAY?

The global EV market is expected to reach **233.9 million by 2027**.

Chances are, very few utility executives gave much thought to EVs 10 years ago. But when we surveyed utility execs in 2021 about the impact that EV adoption will have on grid resiliency and reliability over the next five years, between 77% and 95% expressed the highest levels of concern.[13] It's hardly a surprise: Though just 3 million EVs were sold in 2020, the global EV market is expected to reach 233.9 million by 2027.[14] The impact for the grid is clear. Analysts estimate that if every motorist in the United States switched to an electric passenger vehicle, utilities would have to find a way to generate 25% more electricity.[15]

Utilities will need a strong analytics environment to make sense of this new world. Predicting how much load certain areas will require at certain times generally is done using historical data. But real-time data offers so much more fidelity, and can be merged with demographic and economic data to anticipate future electrification needs impacted by a variety of factors, such as consumer upgrades and investments that could result in demand spikes. For example, an affluent suburban neighborhood is likely to need more power late in the day and overnight to accommodate their increasing numbers of EVs. Yet the growth of EVs often correlates to increases in rooftop solar adoption, which can offload some of that demand.[16]  Advanced analytics can help answer questions that many utilities aren't able to answer today using traditional means.

This doesn't even address DERs, which will require utilities to vastly improve their visibility, capacity, and accessibility to those energy resources, and then optimize the availability of the energy those DERs generate.

**The bottom line**: Without a robust and flexible infrastructure built on real-time intelligence and advanced analytics, the questions utilities will be asking in a few years may remain stubbornly unanswerable—especially because today they don't yet know all the questions they should be asking.

# BARRIERS
# & CONCERNS

# BARRIERS ARE PREVENTING FULL USE OF ANALYTICS

## WHY ARE NEARLY ONE IN FIVE UTILITIES NOT USING THE TOOLS THEY HAVE?

An array of obstacles is preventing operators from deploying or making full use of real-time data analytics applications.

Overall, security and data privacy is the No. 1 barrier, with internal culture/resistance to change claiming the No. 2 spot. Beyond that, executives name storage requirements, difficulty prioritizing technology investments and labor issues/skills shortages.

**On a country-by-country basis, challenges vary**. Lack of funding ranks first in Australia; in Spain, having proven technology to deploy tops the list. In the United States, an abundance of tech options seems to present its own unique challenge: Utilities struggle to prioritize which technologies will help them most.

### ACROSS THE COUNTRIES WE SURVEYED, BARRIERS VARY

|   | U.S. | AUSTRALIA | INDIA |
|---|------|-----------|-------|
| 1 | Difficulty prioritizing investment | Lack of funding | Security/data privacy |
| 2 | Internal culture/resistance | Storage requirements | Regulatory environment |
| 3 | » Labor issues/skills shortage<br>» Delayed investment Itron COVID | » Security/data privacy<br>» Internal culture/ resistance | Labor issues/skills shortage |

|   | SPAIN | U.K. |
|---|-------|------|
| 1 | Having proven tech to deploy | Internal culture/ resistance |
| 2 | » Security/data privacy<br>» Regulatory environment | » Difficulty prioritizing investment<br>» Having proven tech to depoy |
| 3 | Unsure where to begin | Storage requirements |

## UTILITIES HAVE MULTIPLE CONCERNS OVER DATA SECURITY

RANSOMWARE, INSIDER THREATS, CRYPTOJACKING… TAKE YOUR PICK. THERE'S PLENTY TO CHOOSE FROM.

In November 2021, Colorado's Delta-Montrose Electric Association lost 90% of its internal systems in a malicious cyber attack, which also wiped out 25 years of historical data.[17] Three months later, on Feb. 12, 2022, the U.S. Department of Homeland Security issued a "Shields Up" alert to critical infrastructure providers after they received indications that the heavily sanctioned Russian government may be targeting them: "Every organization in the United States," the alert read, "is at risk from cyber threats that can disrupt essential services and potentially result in impacts to public safety."[18]

**It's a global problem**. 87% of utilities have experienced at least one security breach in the past 36 months.[19] Identity theft attacks on manufacturing and utility organizations grew 217% from 2020 to 2021 in the United States alone.[20] But cyber threats are happening everywhere:

» Spain's energy giant Iberdrola was hit with a cyber attack in March 2022 that exposed personal (though not financial) information of 1.3 million customers.[21]

» In India, a Chinese-affiliated hacker group named Red Echo targeted India's state-owned power utility, penetrating its networks at multiple load dispatch points and intruding on control systems that provide power across the country.[22]

» More than half of the U.K.'s utilities suffered cyberattacks in 2021. Industry experts say utilities there are behind in moving their data to secure cloud platforms.[23]

» In Queensland, Australia, hackers spent nine months undetected inside a server at SunWater, which operates 19 major dams, 80 pumping stations and 1,600 miles of pipelines. Attackers weren't after data: They were using the server to increase traffic to a video site.[24]

**RESOURCEFULNESS INSIGHT**

Cryptojacking, where attackers gain control of utility systems to mine cryptocurrency, is a top security concern for 41% of utilities. In successful exploits, utilities are unaware it's even happening.

## SECURITY CONCERNS TRACK CLOSELY TO TRENDS

### THERE ARE PLENTY OF REASONS FOR **UTILITIES TO BE WORRIED**.

When it comes to security concerns expressed by utility executives, it's a crowded field. The worries they share are not unfounded.

**47%**
ENTERPRISE DATA,
EXPOSURE OR LOSS
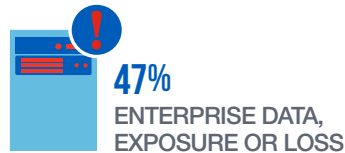
**Aging operational technology (OT) can make enterprise data vulnerable**. While enterprise IT systems are usually up to date and are harder to compromise, OT, some of which has been in the field for years and can be difficult to update, can create vulnerabilities as two-way traffic increases between OT and IT.[25] Also a concern: Third-party technologies and IoT devices outside the direct control of utilities, like solar panel systems and household smart devices, can also be targeted. These can lead to enterprise data loss, though this represents just 14% of data compromised in the energy and utility sector, according to a Verizon Business report.[26]

**45%**
CUSTOMER DATA THEFT,
EXPOSURE OR LOSS

**Customer data is hackers' No. 1 target**. Like virtually any industry in which money changes hands, utilities are entrusted with personally identifiable information about their customers. In 2021, customer data amounted to 58% of all data stolen from energy and utility firms, which was followed by credential information (much of which was likely used to steal customer data). Overwhelmingly (88%), the objective of attackers is financial gain.[27]

## SECURITY CONCERNS TRACK CLOSELY TO TRENDS

THERE ARE PLENTY OF REASONS FOR **UTILITIES TO BE WORRIED**. (CONT.)
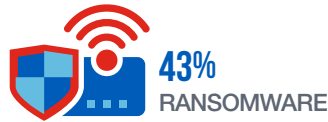
### 43% RANSOMWARE

**Ransomware attacks are common—and costly**. The 2022 State of Ransomware report from Sophos found that 75% of energy and utility sector organizations suffered ransomware attacks in the past year. Sophos found 55% of those attacked paid a ransom. Worldwide, utilities tie with manufacturing for the honor of highest average ransom payment: $2 million (U.S.).[28] Even more troubling: 80% of companies that pay a ransom are attacked again.[29]

### 42% CLOUD VULNERABILITY AND UNCERTAINTY
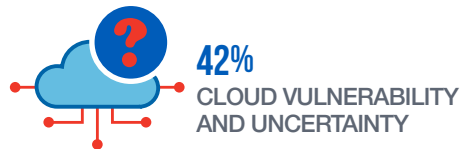
**Cloud adoption is rising, in part because it offloads security headaches**. According to Accenture, 84% of utilities have adopted software-as-a-service cloud solutions.[30] One reason is that it takes much of the burden of data security off the shoulders of utilities. It's not without risks. Though cloud software solutions like Salesforce.com have robust, constantly updated security protections and protocols, platform and infrastructure cloud services (such as SQL Server or cloud storage) may leave configuration to customers, which means utilities are largely responsible for securing those services.

### 41% INSIDER ATTACKS

**Employees are a massive vulnerability, though insider attacks are rare**. Social engineering attacks—usually phishing emails that trick utility employees into entering their user name and passwords on fake Outlook or SharePoint pages—and ransomware account for more than 60% of all breaches in the energy sector, which includes utilities. Even when employees receive cybersecurity training, they often fail to spot threats.[31] Insider attacks, however, actually represent just 4% of successful attacks.[32]

## SECURITY CONCERNS TRACK CLOSELY TO TRENDS

THERE'S PLENTY OF REASON FOR **UTILITIES TO BE WORRIED**. (CONT.)

### 41%
CRYPTOJACKING

**The danger is that it can harm more than utilities**. Cryptojacking is an often hidden way for crypto miners to create new coins using someone else's resources. It's attractive because mining new coins is enormously energy-intensive: It takes nine years' worth of a household's energy consumption to mine a single coin (think $12,000+ worth of extra energy use).[33] Utilities are right to be concerned: If their own systems are used to mine cryptocurrency, they bear the cost of that electricity. If customers are targeted, they'll likely see increases in their bills. And there's a good chance no one will know it's happening.

### 40%
SERVICE DISRUPTIONS

**Service interruptions are problematic, and potentially dangerous**. Ransomware and denial of service attacks hold the risk of preventing utilities from delivering energy and water to customers, and that could threaten everything from public safety to brand reputation. Most attacks are done for financial gain, but sometimes attackers just want to do damage: In February 2021, attackers infiltrated the network of the water utility serving Oldsmar, Florida, and adjusted the level of sodium hydroxide in the water from 100 parts per million to 11,000. An operator working for the utility noticed the change even before the company's security controls engaged, thus averting the water company from delivering water with lye levels so high that consumers could lose their vision or go into shock.[34]

## PROTECTING CONSUMER DATA IS TOP OF MIND FOR UTILITIES
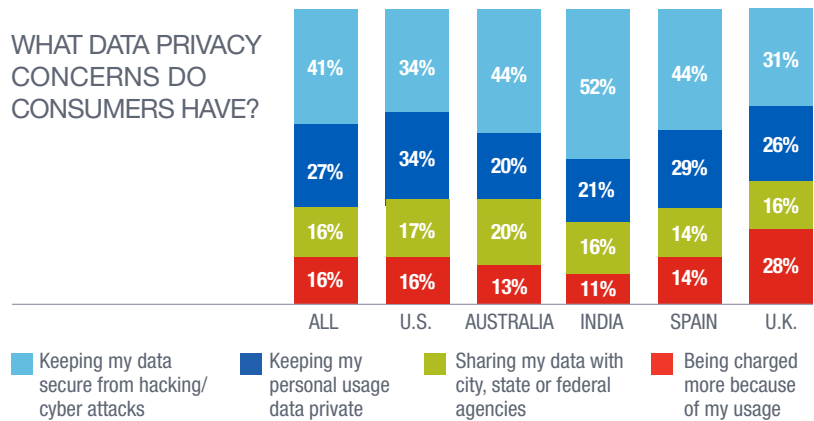### FOR CONSUMERS, NOT SO MUCH.

In the face of so many potential security threats, 81% of utility executives are extremely or very concerned about ensuring the privacy of customer data. Consumers are significantly less worried.

Just 42% of consumers say they are extremely or very worried about utilities having access to their energy and water usage data to personalize their customer experience, suggesting that in most countries, consumers may simply assume utilities will keep their data safe. Still, four in 10 highly concerned consumers may be enough to give utilities reason to ensure the highest safeguards are in place—and to communicate to consumers how they're protecting their data.

In India, concern levels are higher among both groups. Consumers (88%) and utilities (96%) are more closely aligned in their viewpoints.

**What are those worried actually worried about**? Among the 42% of consumers expressing concern, they list a variety of reasons why, with some hesitant to even share their personal usage data. In the U.K., one in four are worried their utilities will charge them higher rates based on their usage.

### WHAT DATA PRIVACY CONCERNS DO CONSUMERS HAVE?

| | ALL | U.S. | AUSTRALIA | INDIA | SPAIN | U.K. |
|---|---|---|---|---|---|---|
| Keeping my data secure from hacking/cyber attacks | 41% | 34% | 44% | 52% | 44% | 31% |
| Keeping my personal usage data private | 27% | 34% | 20% | 21% | 29% | 26% |
| Sharing my data with city, state or federal agencies | 16% | 17% | 20% | 16% | 14% | 16% |
| Being charged more because of my usage | 16% | 16% | 13% | 11% | 14% | 28% |

## WHAT UTILITIES CAN DO NOW TO PROTECT THEMSELVES

### FIND AND ADDRESS YOUR WEAKNESSES—**BEFORE THE BAD GUYS DO**.

High-profile cyber attacks tend to put everyone on alert, but the truth is every utility should already be persistently alert to cyber threats.

**Protect IT and OT from one another**. A 2021 study by Rapid 7 notes that for utilities, it's critical to build robust demilitarized zones (DMZs) between IT and OT environments. This will help prevent attackers from compromising one network to gain a foothold in the other. Even with DMZs in place, utilities should have backup options in place to contain infiltrations and continue operations in case of a successful attack.

**Shore up your biggest vulnerability of all—your colleagues**. While securing enterprise systems and networks is crucial, there's no need to make it easier than necessary on attackers by leaving the human perimeter unprotected. Standard defenses—spam filters, employee training, preventing Microsoft Office macros, anti-malware, endpoint detection and response, data loss prevention solutions, etc.—go a long way to making it tougher for bad actors to get in.

**Assess your most valuable targets, then layer extra defenses on them.** Advises Rapid 7: "Organizations should identify key assets within their networks that actors seek to compromise and supplement them with extra layers of defense, such as network segmentation, encryption or additional authentication requirements."[35] Another key protection: Establishing a zero-trust architecture, which begins with the assumption that nothing and no one can be trusted, then apply protocols to verify that devices, applications and users are safe to access networks and systems.

## MORE DATA MEANS MORE STORAGE, AND MORE DATA MANAGEMENT

### IT'S A BARRIER— AND AN OPPORTUNITY.

As utilities work with more data, they invariably must find solutions for storing that information. So it's no surprise that concerns about storage requirements rank third overall among the top barriers cited by utility executives. In Australia, it's the No. 2 barrier to adoption of real-time data analytics.

**An IT approach to OT data**. The challenge of data storage is that it's not just a matter of parking data on a storage system and forgetting about it. The problem is one of enterprise-class data management— and of integrating OT data from legacy assets with new IoT devices and sensors, and then turning all that into a cohesive whole capable of producing useful insights.

**Data lakes, warehouses and hubs—oh my. What's next**? Increasingly, utility executives will find themselves uttering phrases like data lakes (repositories for raw, unstructured data), data warehouses (stores of data are processed and categorized) and data hubs (essentially integrated data lakes). These terms have long been part of IT nomenclature, but they're migrating into the operations side—and for good reason, as leveraging data for efficiency gains and operational improvements are top of mind for both utilities and consumers.

# MORE DATA MEANS MORE STORAGE, AND MORE DATA MANAGEMENT

## IT'S A BARRIER—AND AN OPPORTUNITY. (CONT.)

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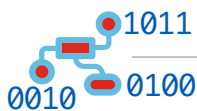
Among top-performing utilities, **high levels of data integration** are common.

**Silos are for grain—clouds are for data**. Older systems are no friends to data-driven insights, as they tend to be siloed and disconnected. Among top-performing utilities, high levels of data integration are common—which helps put data in a useful form. Most of these organizations achieve this by combining various data storage types into a hybrid model—a data mesh—that's flexible enough to meet evolving needs.[36] For many, this means subscribing to a cloud-based platform-as-a-service (PaaS). In fact, 79% of utilities surveyed by Accenture have adopted some type of PaaS, including for data storage and management.[37]

These cloud services may offer an opportunity to utilities looking not just to store data, but to store and use it strategically as their infrastructures develop.

### DATA MANAGEMENT IS VITAL FOR DEVELOPING DATA-DRIVEN INSIGHTS

Which of the following are reasons why your organization is not more effective of generating data-driven insights?



Top Performers: 0%

Legend: Laggards | Low | Medium | High | Top performers
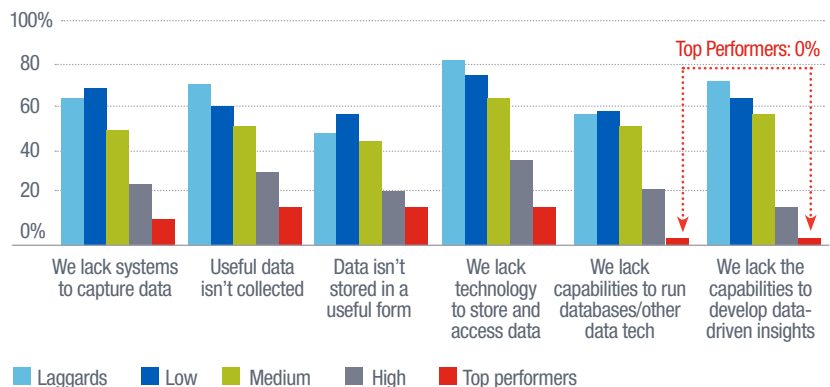
Source: Bain & Company research

Bain's findings should be encouraging to organizations eyeing investments in cloud-based solutions. A Zpryme survey found 57% of utilities plan to use cloud technology specifically to break down silos and share data, with 55% using interoperable systems (digital information to eliminate silos). And nearly half (46%) are clear about the application they want to enable most: analytics-based decision making.[38]

# A CULTURAL RESISTANCE TO CHANGE?

DIGITAL TRANSFORMATION AND ANALYTICS **REQUIRE CHANGES** TO THE STATUS QUO.

In three of the five countries we studied, utility executives list a resistance to change in their own internal culture, coupled with labor issues and skills shortages, as prime barriers to analyzing and leveraging real-time data. In the U.K., cultural resistance tops all other barriers.

Change is difficult in any industry, but it may be uniquely challenging in the utility sector, especially as it faces major disruption from integrating renewables, accommodating EVs and dealing with extreme weather. It doesn't help that most utility workforces—with an average age over 50[39]—have long been focused on keeping decades-old legacy assets operating. But digital transformation is inevitable—as is the adoption of analytics.

**A labor shortage is brewing**. The 2022 Global Energy Talent Index (GETI) report finds that one in three energy utility professionals sees changing the way utilities work as a top challenge, while nearly one in four (23%) cites the need for new digitally-enabled skills and competencies. "This is producing a skills shortage," notes the report, "with hiring managers now as likely to seek technical skills outside from the wider sector as in-house."[40]

Among the executives we surveyed, the skills shortage is a somewhat more substantial challenge, with 28% citing it as a top barrier. Concerns are highest in India with 33%, and lowest in Spain and the U.K. at 22%. A PSC Consulting survey found 52% of utility respondents name a lack of staffing resources (and conflicts with existing programs) as impediments to investing in smart infrastructure improvements like analytics.[41]

Still, the GETI study reports that just 18% of hiring managers are seeking workers with data analysis skills—a finding that may reflect the resistance to change so many executives are worried about.

**RESOURCEFULNESS INSIGHT**

Human barriers are proving just as significant as technical ones.

# IMPROVING OPERATIONAL EFFICIENCY

## KEY USE CASES: IMPROVING OPERATIONAL EFFICIENCY

## IMPROVING UTILITY PERFORMANCE WITH DATA

DATA-DRIVEN INSIGHTS ARE KEY TO **ACHIEVING OPERATIONAL EFFICIENCY**.

Improving operational efficiency is the most important use of data analytics among utility executives, with 56% citing it as one of their top three priorities. A Zpryme survey found that just as many (58%) see breaking down data silos—which enables effective data analytics—as key to achieving department-level operational efficiency, with 56% aiming to improve enterprise-level operational efficiency.[42]

> **RESOURCEFULNESS INSIGHT**
>
> Distributed—or edge—intelligence devices can be ideal for utilities seeking efficiency: By placing analytics at the device, edge intelligence reduces data backhaul, storage requirements and even lag time.

By gathering and utilizing intelligence from throughout the network, energy and water utilities can better understand consumption patterns to improve capacity planning and grid resilience, and streamline operations.

**AMI remains dominant**. When it comes to improving operational efficiency, AMI systems—a foundational layer of real-time data analytics—ranks as utilities' No. 1 investment priority today, and it will remain so in five years. Back-office analytics and data analysis solutions rank third today, but will rank second in five years. Predictive analytics rank highly in Australia and highest in the U.K.
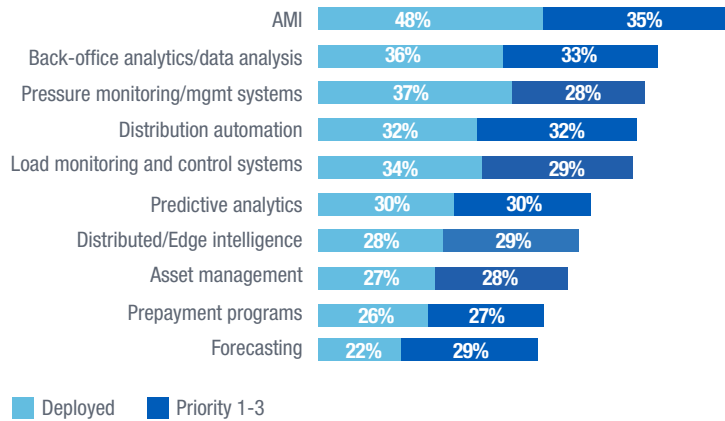
### TOP REAL-TIME ANALYTICS TECH TO INVEST IN FOR OPERATIONAL EFFICIENCY

| | ALL | U.S. | AUSTRALIA |
|---|---|---|---|
| 1 | AMI | Distribution automation | AMI |
| 2 | Back-office analytics | AMI | Predictive analytics |
| 3 | Distribution automation | » Distributed intelligence<br>» Asset management<br>» Prepayment programs | Asset management |

| | INDIA | SPAIN | U.K. |
|---|---|---|---|
| 1 | AMI | Back-office analytics | Predictive analytics |
| 2 | » Distributed intelligence<br>» Back-office analytics<br>» Pressure monitoring | Distributed intelligence | Forecasting |
| 3 | Load monitoring | Load monitoring | AMI |

## BUILDING ON EXISTING INVESTMENTS

### DATA-DRIVEN INSIGHTS ARE KEY TO **ACHIEVING OPERATIONAL EFFICIENCY**. (CONT.)

Virtually the entire list of utilities' priority investments is directly tied to the larger effort to derive insights from real-time data. These solutions either generate useful data or drive insights in their own right. In fact, Zpryme found that 56% of utility respondents say metering data, AMI, outage management and other solutions deliver data that is easy to access and share.[43]

### INVESTMENT PRIORITIES LINE UP WELL FOR ANALYTICS

| | Deployed | Priority 1-3 |
|---|---|---|
| AMI | 48% | 35% |
| Back-office analytics/data analysis | 36% | 33% |
| Pressure monitoring/mgmt systems | 37% | 28% |
| Distribution automation | 32% | 32% |
| Load monitoring and control systems | 34% | 29% |
| Predictive analytics | 30% | 30% |
| Distributed/Edge intelligence | 28% | 29% |
| Asset management | 27% | 28% |
| Prepayment programs | 26% | 27% |
| Forecasting | 22% | 29% |

■ Deployed ■ Priority 1-3

**AN EXELON COMPANY**

The right technology, analysis and process improvements is **helping ComEd save $100 million annually**.

## EFFICIENCIES DELIVER BENEFITS ACROSS THE BOARD



How does $2 billion in savings sound? You'll want to ask Commonwealth Edison (ComEd), which expects to save that much over 20 years from operational efficiencies and other improvements stemming from a single smart grid that supports multiple applications. For instance, ComEd deployed Itron's Operations Optimizer analytics modules for AMI operations, grid operations and revenue assurance across more than 4 million smart meters, 6,300 critical distributed automation (DA) devices, and 750 smart streetlights.

Through automation, analysis and process improvement, ComEd saves $100 million annually and returns those savings directly to customers. The company also expects to see a 65% reduction in smart streetlight OpEx.[44]

# DEVELOPING NEW REVENUE STREAMS

## DEVELOPING NEW REVENUE STREAMS IS A PRIORITY

UTILITIES WANT DATA ANALYTICS TO HELP SHOW THEM THE WAY.

This is a moment of fundamental change for energy and water utilities. The revenue shocks caused by COVID-19 lockdowns have largely passed, though some effects clearly remain: Utilities in the United States cite investment delays due to COVID as their No. 3 barrier to implementing data analytics.

But challenges remain, including rising OpEx, the costs associated with integrating DERs, grid hardening mandates and more. Not surprisingly, utilities are looking for new revenue streams—and they're looking for data analytics to help guide them.

In fact, developing new revenue streams is the top current use of data analytics among utilities we surveyed, with 62% citing it as a top use case. When asked which use case is most important, finding new revenues ranks second behind improving operational efficiencies.

### RESOURCEFULNESS INSIGHT

Developing new revenue streams is the No. 1 current use of analytics, and the No. 2 most important use.

# EXPERTS SAY THE ANSWER LIES WITH CUSTOMERS

## TO FIND FUTURE REVENUES, ANTICIPATE WHAT CUSTOMERS WILL WANT AND NEED.

No one is in a better position to **understand consumer energy use** than utilities.

The energy policy of the state of New York enables utilities to operate exchanges for buying and selling energy from DERs like solar panels. The policy is the result of many forces: the need for a more resilient grid; a goal to cut 80% of greenhouse gas emissions by 2050; a reaction to mercurial marketplace conditions; and a desire to incentivize innovation in the energy space. But it's also an acknowledgement that consumers don't just want more control over how their power is generated—they're exerting it.[45]

Therein may lie the answer to how utilities can best unearth new revenue streams. External factors will always influence the cost and constraints of doing business. But anticipating what customers will want and need appears to be at the heart of most business growth areas—and it makes analyzing real-time and trend data more important than ever.

**Show me the data**. No one is in a better position to understand consumer energy use than utilities—a point we'll cover in greater detail later in this report. For utilities to understand where their next revenue stream is coming from, it will help to derive insights from data they already have.

HERE ARE FOUR AREAS WHERE DATA ANALYTICS CAN HELP GROW AND EXPAND UTILITY BUSINESSES.

**ELECTRIFYING CARBON-INTENSIVE POWER SOURCES**

An obvious area is EV charging, which will increase sales (not to mention demand) as the EV market takes off. A typical light duty EV owner who drives 12,000 miles a year would consume between 3,000 and 4,000 kWh over 12 months[46] in net new sales. Utilities can also promote swapping fossil fuel-burning power sources with cold-climate heat pumps and other technology, some of which they may sell. **How analytics helps**: Utilities can predict payback timelines and even develop models to provide these offerings as a service rather than selling them outright—which would ensure ongoing revenue.

# EXPERTS SAY THE ANSWER LIES WITH CUSTOMERS

TO FIND FUTURE REVENUES, ANTICIPATE WHAT CUSTOMERS WILL WANT AND NEED. (CONT.)

FOUR AREAS WHERE DATA ANALYTICS CAN HELP GROW AND EXPAND UTILITY BUSINESSES.
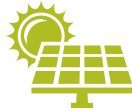
## MAKING THE MOST OF DERs

Depending on local regulations, options for monetizing DERs can include investing in wind and solar farms and selling that energy to consumers or even other grid operators. Utilities can install and lease solar panels to residential and commercial customers. Combined with distributed storage, this gives utilities more opportunities to grow and control revenues as well, while at the same time improving grid reliability and promoting the implementation of microgrids. Combined heat and power (CHP) installations offer another avenue for ongoing service revenues. **How analytics helps**: Determining optimal pricing schemes, developing microgrid options and identifying optimal locations for distributed storage.

## ONLINE MARKETPLACES

More utilities are getting in the business of selling and servicing smart devices—so much so that global utility online marketplaces will be a $468 million business by 2029.[47] Consumers can purchase smart thermostats, voice activated light bulbs, EV charging systems and complete smart home environments. While it's not easy to compete against big box stores, utilities have one big advantage: Half of consumers say they would turn to utilities first to purchase new energy solutions.[48] **How analytics helps**: Utilities can leverage household usage data to identify the consumers most likely to benefit from marketplace products, and market to them individually with energy cost savings forecasts and carbon reduction estimates.

### ONLINE UTILITY MARKETPLACE REVENUES ARE GROWING
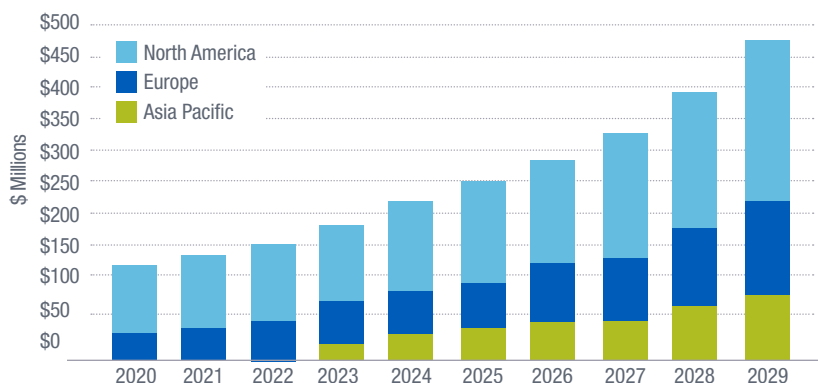


Source: Guidehouse Research

## EXPERTS SAY THE ANSWER LIES WITH CUSTOMERS

TO FIND FUTURE REVENUES, ANTICIPATE WHAT CUSTOMERS WILL WANT AND NEED. (CONT.)

FOUR AREAS WHERE DATA ANALYTICS CAN HELP GROW AND EXPAND UTILITY BUSINESSES.

**SELLING EXPERTISE** Utilities can sell their know-how via services like weatherization consulting (and associated upgrades) and smart home design and installation, either through their regulated business or via unregulated spin-offs. Some utilities even offer wiring and HVAC repair with special emphasis on maximizing energy efficiency.[49] **How analytics helps**: Analyzing granular usage data can help reveal consumers who would likely benefit from value-add services.

# SUPPORTING SUSTAINABILITY & RENEWABLES

## KEY USE CASES: SUPPORTING SUSTAINABILITY AND RENEWABLES

## RENEWABLES ARE WHERE THE GROWTH IS

### BUT ACCOMMODATING THEM ISN'T EASY.

If U.S. utilities and consumers needed a sign that the world's largest economy was getting serious about decarbonization, they likely received it late in 2021 when a newly signed infrastructure act earmarked $73 billion to upgrade America's power infrastructure, in part by making it more accommodating to distributed energy resources (DERs),[50] such as wind and solar energy.[51] In August of 2022, the U.S. Department of Energy said it will devote $26 million from that bill to fund 10 projects that will demonstrate how the electricity grid can reliably run exclusively from solar, wind and other DERs. The new law also set aside billions for electrifying school and transit buses and building a national electric vehicle (EV) charging network.

Sustainability, however, is a global phenomenon. As we noted in last year's Itron Resourcefulness Insight Report, 137 nations worldwide have committed to carbon neutrality targets, with Finland, Austria, Iceland, Germany and Sweden all aiming to get there by 2045. Some countries are already there.[52]

**DERs will drive capacity growth**. Renewables are expected to account for almost 95% of the increase in global power capacity through 2026, with half of it coming from solar. India, for instance, announced a goal of reaching 500 GW of renewable power capacity by 2030.[53]

Integrating DERs—which is turning the century-old, one-way generation/distribution paradigm on its head—is widely considered one of the most complex challenges facing utilities today. Utility executives worry about issues like power quality, backfeed, voltage surges, voltage sag and customer experience.[54]

**Now add the challenge of accommodating EVs**. Sales of electric vehicles (including fully electric and plug-in hybrids) doubled in 2021 to reach 6.6 million. And despite supply chain woes, sales remained strong into 2022 as automakers struggled to keep up with demand.[55]

EVs are a puzzle: Electric utilities can't control who buys them or when or where owners will want to charge them. Owners will simply want to plug in, and they'll expect the grid to deliver.

Utilities are looking for tools to simplify these challenges. And consumers are looking for them to succeed.

## CONSUMERS WANT A SUSTAINABLE FUTURE

### UTILITIES ARE BEING CALLED ON TO DELIVER IT.

Three out of four (75%) consumers say it is extremely or very important for utilities to deploy data analytics to drive conservation and sustainability efforts. Nowhere is this felt more strongly than in India, where nearly all consumers (96%) express the same level of sentiment. Even in countries where opinions are less strong, at least six out of 10 consumers are fully on board.

**For utilities to deliver as expected, they'll need help**. And they appear to recognize this. Integrating renewables and promoting sustainability is the No. 3 most important use of real-time data analytics cited by the utilities we surveyed. It appears in the top three for all surveyed countries except Spain, and it is No. 1 in the U.K.

Utilities say their investment priorities will change in the next five years. Data analytics will take a more prominent role, moving to the No. 3 spot for investment-worthy technology.

### TOP 3 SUSTAINABILITY TECHNOLOGIES
### (DEPLOYED TODAY AND IN 5 YEARS)

| | CURRENTLY DEPLOYED | HIGHEST PRIORITY OVER NEXT 5 YEARS |
|---|---|---|
| 1 | AMI | Time of use/demand response |
| 2 | Time of use/demand response | » AMI<br>» Water leak detection<br>» Real-time asset monitoring |
| 3 | » Load monitoring/ voltage mgmt<br>» Low voltage network mgmt | » Load monitoring/voltage mgmt<br>» Back-office data analytics |

## RATEPAYERS ARE STEPPING UP ON SUSTAINABILITY

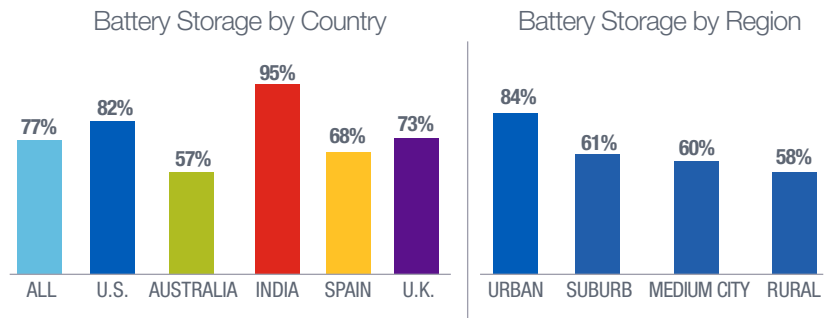### THEIR ACTIONS COULD HELP—OR NOT.

Urban dwellers are **more likely to generate and store their own energy.**

By adopting DERs like solar and carbon-reducing EVs, consumers aim to help stem the tide of climate disruption. Every action, of course, has implications for grid operators.

Among consumers we surveyed who generate their own electricity—often called prosumers—77% overall say they have battery storage. (This marks an increase from 2021, when 67% of prosumers we surveyed said they have battery storage.)[56] For the 95% of residential solar systems that are grid-tied, this gives consumers a way to store for later use any excess electricity that isn't sent back to the grid and offers a hedge against grid failures.[57] Interestingly, urban dwellers are more likely to generate and store their own energy. This may reflect a greater willingness among urbanites to invest in sustainable technologies—or perhaps a lack of confidence in the reliability of their local grid.

**Prosumer storage could be helpful**. While integrating DERs is challenging, behind-the-meter residential battery storage could help utilities gain another way to balance energy demand and supply. Utilities could conceivably link together residential batteries to potentially offload the grid at peak demand times when help is needed most. Notes a McKinsey study: "This could help utilities avoid more costly remedies such as firing up inefficient peaking plants or building extra grid infrastructure that may only be used infrequently."[58]

### MOST PROSUMERS HAVE THEIR OWN BATTERY STORAGE—ESPECIALLY IN CITIES

**Battery Storage by Country**

| ALL | U.S. | AUSTRALIA | INDIA | SPAIN | U.K. |
|-----|------|-----------|-------|-------|------|
| 77% | 82% | 57% | 95% | 68% | 73% |

**Battery Storage by Region**

| URBAN | SUBURB | MEDIUM CITY | RURAL |
|-------|--------|-------------|-------|
| 84% | 61% | 60% | 58% |

# PROVIDING PERSONALIZED CUSTOMER INSIGHTS

## KEY USE CASES: PROVIDING PERSONALIZED CUSTOMER INSIGHTS

## CAN UTILITIES DELIVER AN UBERIZED CUSTOMER EXPERIENCE?

THAT MEANS MORE ACCESS TO THE INFO THEY WANT, WHEN THEY WANT IT.

**64% of consumers** say personalized insights that **help them manage usage** is the most important use of data analytics.

Among consumers we surveyed about the most important use of data analytics, 64% name personalized insights that help them manage their usage. In fact, it's their No. 2 choice, even beating out improved service reliability and faster recovery from disasters.

Who could possibly be surprised to learn that consumers want to be catered to? They are, after all, used to it. Amazon, Apple, Netflix and others have set a high bar when it comes to personalized services, from highly-tuned recommendation engines to a 360-degree awareness of a customer's purchase history and interests. Research shows they expect similar treatment from their utility.[59]

**Consumers want real-time visibility—and lower bills**. In our survey of consumers, the ability to see energy and water usage in real time is the most valuable insight to reduce bills, with nearly six in 10 consumers (56%) putting it at the top of their lists. That result is consistent across our survey countries except in Spain, where 73% name it as most valuable, and in Australia at 42%. Nearly half (47%) also want timely alerts about usage spikes and potential leaks.

**Consumers want weekly updates (mostly)**. Across our survey countries, consumers show a preference for weekly updates, though India and Spain signal a desire for greater frequency.

HOW OFTEN DO CONSUMERS WANT TO RECEIVE UPDATES?

| | ALL | U.S. | AUSTRALIA | INDIA | SPAIN | U.K. |
|---|---|---|---|---|---|---|
| 1 | Weekly | Weekly | Weekly | Daily | Weekly | Weekly |
| 2 | Daily | Monthly | Monthly | Real-time/on-demand | » Daily » Real-time/on-demand | Monthly |
| 3 | Monthly | Daily | Daily | Weekly | Monthly | Daily |

**Consumers want transparency**. One customer service survey found 89% of utility customers want an "Uberized" experience, where they can see exactly when a service team will arrive. A third even would like to know where crews are located at a given moment. Many want to be able to rate service personnel following the engagement.[60]

## CAN UTILITIES DELIVER AN UBERIZED CUSTOMER EXPERIENCE?

### THAT MEANS MORE ACCESS TO THE INFO THEY WANT, WHEN THEY WANT IT. (CONT.)

**Consumers want simplicity**. The energy marketplace is changing, in part due to competition from ancillary competitors like Google Home, Tesla and solar panel suppliers. These entrants could threaten the relationship utilities have with consumers. But this confusion also may create an opportunity. Consumers today may be receptive to purchasing a customized bundle of energy-related services from their utility to help them lower costs and manage their usage in ways that fit the way they live. Once again: personalization.

**Consumers want granularity...** When asked which display of energy use would be most meaningful, consumers are nearly evenly split on their top choices. (Except in India, where 70% of consumers prioritize energy consumed and 63% want to see usage by appliance.)

**RESOURCEFULNESS INSIGHT**

By 2023, nearly half of the world's IoT data traffic will be generated by smart home devices and appliances.*

| ENERGY CONSUMED | USAGE ITEMIZED BY APPLIANCE | USAGE BY TIME OF DAY |
|:---:|:---:|:---:|
| **52%** | **51%** | **49%** |

**…though not as much for everything**. They say other details are somewhat less valuable.

| DOLLARS SPENT OR SAVED | USAGE COMPARED TO LAST YEAR | USAGE COMPARED TO OTHERS |
|:---:|:---:|:---:|
| **39%** | **38%** | **25%** |

## PERSONALIZED INSIGHTS RANK HIGH

CONSUMERS EVEN APPEAR READY TO PAY EXTRA FOR THEM.

Nearly half (43%) of consumers we surveyed think personalized cost savings and recommendations are the most valuable insights for helping them manage energy and water use. Another 44% value energy efficiency insights and recommendations, as well as home energy audits.

Younger ratepayers see more value in custom insights, with 82% of those between the ages of 25 and 44 rating the insights as extremely or very valuable. Just 59% of consumers 65 or older feel the same.

**Personalized insights are more common in cities and suburbs**. Some utilities are stepping up. In large cities or urban areas, 73% of consumers say they receive personalized insights that help them manage energy and water bills to reduce their bills, improve conservation and more.  In suburban areas, the number drops to 66% and falls further in medium-sized cities and small towns (46% and 48%, respectively). So there's plenty of room for utilities in most areas to broaden their personalized offerings.

**Many consumers are willing to pay extra**. Promising for utilities seeking new revenue streams is the finding that half of the consumers we surveyed say they would pay between 1% and 7% more for personalized insights that will help them manage usage. India and Spain are standouts: In India, seven in 10 consumers say they would pay between 4%-10% more. In Spain, 69% say they'd pay between 1%-7% more. One in four consumers, however, aren't interested in paying a thing for insights.



Itron smart meters **can monitor energy consumption** by individual appliances.

## IN GERMANY, INSIGHTS LEAD TO HAPPIER CONSUMERS



After installing next-generation edge intelligence meters to deliver insights to customers, E.ON Germany saw its Net Promoter Score (NPS) jump to 60 (an NPS higher than 30 is considered excellent). The Itron Riva meters can monitor energy consumption by individual appliances from washing machines to EV chargers. E.ON Germany applies further analytics to notify consumers when their EV starts to charge, and makes it possible for EV owners to shift charging to off-peak hours.[61]

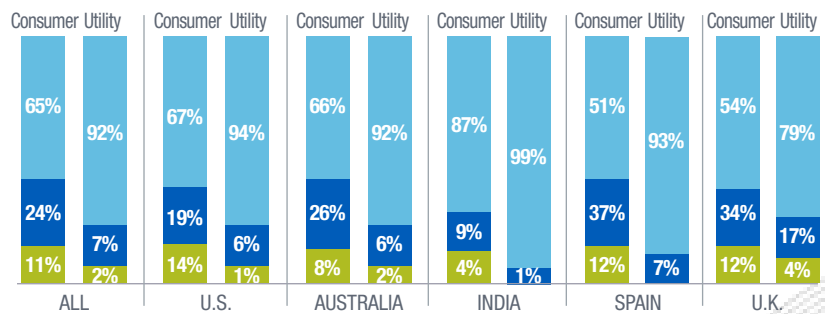# KEY USE CASES: PROVIDING PERSONALIZED CUSTOMER INSIGHTS

## UTILITIES AND CONSUMERS ARE MOSTLY IN SYNC ON THE VALUE OF INSIGHTS

### BUT THERE'S A DISCONNECT WHEN ASKING WHO REALLY GETS THEM.

Utilities and consumers aren't far off when it comes to which insights are most valuable for reducing bills. Both list real-time usage visibility as No. 1. Energy efficiency insights rank second for utilities and third for consumers. Personalized savings similarly trades spots in the top three: third for utilities, but second for consumers. Utilities in the U.S. and India list "comparison with other homes" in their top three, but consumers overall put that near the bottom of their list.

**Utilities may want to up their insight game**. Nine out of 10 utilities (92%) say they're already using real-time data analytics to provide personalized insights to consumers. But just 65% of consumers say they're receiving them. The disconnect may come from how those insights are delivered. Are they tucked in a multi-page bill that isn't read past page 1? Available on an app or portal many consumers don't know about? Utilities may want to survey their own customer base to see how they can improve awareness of services they already provide.

### UTILITIES SAY THEY PROVIDE INSIGHTS, BUT THIS IS NEWS TO MANY CUSTOMERS

| | Consumer | Utility |
|---|---|---|
| **ALL** | 65% / 24% / 11% | 92% / 7% / 2% |
| **U.S.** | 67% / 19% / 14% | 94% / 6% / 1% |
| **AUSTRALIA** | 66% / 26% / 8% | 92% / 6% / 2% |
| **INDIA** | 87% / 9% / 4% | 99% / 1% |
| **SPAIN** | 51% / 37% / 12% | 93% / 7% |
| **U.K.** | 54% / 34% / 12% | 79% / 17% / 4% |

**Utilities:** Do you provide personalized insights to manage energy and water usage?
**Consumers:** Are you getting personalized insights from your utility to manage energy and water usage?

■ YES  ■ NO  ■ DON'T KNOW

## ANALYTICS WILL BECOME A LARGER INVESTMENT FOR PERSONALIZATION

### UTILITY-SIDE INSIGHTS WILL HELP DELIVER EVEN MORE USEFUL INSIGHTS TO CONSUMERS.

With grid reliability, water conservation and DERs consuming so much attention and resources among utilities, it's no wonder that time-of-use and demand response programs rank as the top investment priority for delivering a more personalized customer experience over the next five years. Analytics will play a big role over that time, likely adding value to the other priority investments: AMI systems, bill forecasting and usage comparisons (all tied for second) and online portals rank third.

**ONLY U.S. UTILITIES NAME ANALYTICS AS A TOP INVESTMENT FOR ENABLING PRSONALIZED INSIGHTS TODAY**

|   | U.S. | AUSTRALIA | INDIA |
|---|---|---|---|
| 1 | Analytics/data analysis | Time-of-use/demand response | Time-of-use/demand response |
| 2 | Time-of-use/demand response | Online customer portals | Bill forecasts/usage comparisons |
| 3 | AMI | AMI | Online customer portals |

|   | SPAIN | U.K. |
|---|---|---|
| 1 | Time-of-use/demand response | AMI |
| 2 | Bill forecasts/usage comparisons | Online customer portals |
| 3 | Online customer portals | Prepayment portals |

## ANALYTICS WILL BECOME A LARGER INVESTMENT FOR PERSONALIZATION

UTILITY-SIDE INSIGHTS WILL HELP DELIVER EVEN MORE USEFUL INSIGHTS TO CONSUMERS. (CONT.)

**But analytics is an enabler**. And it is likely to support other existing personalization efforts as they evolve. With analytics, utilities can use behind-the-meter data to help consumers understand which appliances are sapping the most energy, incentivize consumers to use energy at off-peak times, even help predict when a customer might fall behind in payments. They can also identify which consumers would be open to pay-in-advance billing arrangements—an option that 42% of consumers prefer (along with more than half of Gen Z ratepayers).[62]

Improving customer engagement is bigger than just analytics, of course. Consumers seek a seamless customer experience, one that is similar across platforms, including web portals, apps, text messaging and, yes, even on the phone with human beings. They expect their utilities to know everything about their energy and water use—after all, what's all that smart technology for, anyway?

Even so, 62% of consumers report having experienced a problem using their energy provider's digital service, and 37% say they're not confident using them. That figure jumps to 50% for Gen Z—core ratepayers of tomorrow.[63]

As analytics plays a larger role in service delivery, it's possible utilities can unlock more important opportunities for engaging more closely and meaningfully with consumers.

# MANAGING EXTREME WEATHER

## WEATHER IS MORE CHALLENGING THAN EVER
### AND THE IMPACTS ON GRID RESILIENCE ARE TOO GREAT TO IGNORE.

The warnings about extreme heat came earlier than usual in 2022. Just three days into May, typically a month of mild spring temperatures and welcome rain, grid operators in Texas and elsewhere alerted consumers that an early heat wave could mean utilities may have a hard time keeping up with demand—this at a time when some generation facilities go offline for maintenance as energy suppliers gird the grid for summer.[64]

The extreme heat arrived all right, and not just in Texas. The following month, withering heat seemed to blanket the Northern Hemisphere, from continental Europe to China, delivering the warmest temperatures on record over much of the planet.[65]

» In January of 2022, the coastal Australian city of Onslow tied the record for the hottest temperature in the Southern Hemisphere: 123.3 degrees Fahrenheit.[66]

» In India, high temperatures in March set a 122-year record, and throughout April much of the country was engulfed in temperatures topping 100 degrees Fahrenheit.[67]

» In Spain, record-breaking—and heartbreaking—heat killed at least 360 people, marking what was expected to be one of the most devastating heat waves since 1757.[68]

» Few places, however, received more attention than the United Kingdom, where June highs reached a nearly unbelievable 104.5 degrees Fahrenheit. (The U.K.'s typical average high temperature for June? 65 degrees.[69])

## WEATHER IS MORE CHALLENGING THAN EVER

### AND THE IMPACTS ON GRID RESILIENCE ARE TOO GREAT TO IGNORE. (CONT.)

That doesn't include floods, wildfires, storms and tornadoes and other extreme weather that continues to pummel communities and grids around the world. In the U.S. alone, major weather calamities cost $145 billion and nearly 700 lives in 2021. Meanwhile, disasters keep happening. As Adam Smith, the U.S. government's lead scientist for analyzing billion-dollar disasters, told the Washington Post: "They are not slowing down."[70]

**Utilities know the impact of disasters on critical infrastructure**. The cost of response and recovery to extreme weather is a persistent worry for utility executives. A report by McKinsey notes that based on recent weather trends, a typical utility will sustain $1.3 billion in damage and lost revenue from extreme weather over a 20-year period. By 2050, the financial impacts will increase by 23%.[71]

In the *2021 Itron Resourcefulness Insight Report*, we looked at the implications of extreme weather on energy and water distribution networks. At the time, we found that 88% of utility executives were very or extremely concerned about the impact of extreme weather on the grid.[72]

Perhaps this is why so many utilities are looking to real-time data analytics for answers.

## KEY USE CASES: MANAGING EXTREME WEATHER

## WHEN IT COMES TO WEATHER, UTILITIES WANT INSIGHTS

### IN FIVE YEARS, ANALYTICS WILL BE THE TOP SOLUTION.

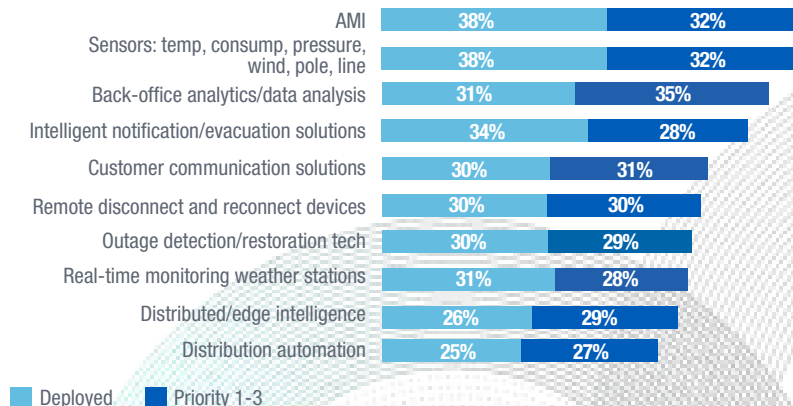It's hard to find a greater priority for utilities and consumers than ensuring grid resilience.

Everything rides on the grid, from revenue for utilities to public safety and needed services for consumers. And virtually everyone understands how extreme weather compromises that resilience.

Overall, three-quarters (77%) of consumers say improved service reliability and rapid recovery from extreme weather is a critical use of data analytics. (In India, 96% say it's extremely/very important.) And 46% of utility executives agree. Yet a recent Publicis Sapient study found that just 2% of U.S. utilities say they are fully prepared to collect and analyze extreme weather data from customers, including information on fallen trees and downed power lines.[73]

For the other 98%, the time for waiting is almost certainly past. Fortunately, investment in analytics is expected to grow.

**Investment priorities reveal plenty**. Though back-office analytics and data analysis ranks fourth in terms of current technology investment priorities for utilities, it will become the top priority in five years. Other technologies that will help generate insights—including edge intelligence, outage detection and restoration, sensors and of course AMI—are all in the mix. (Compared to five-year investment priorities cited last year by utilities, analytics moved from 5th place then to 3rd place today.)

### ANALYTICS BECOMES THE TOP INVESTMENT PRIORITY

| Technology | Deployed | Priority 1-3 |
|---|---|---|
| AMI | 38% | 32% |
| Sensors: temp, consump, pressure, wind, pole, line | 38% | 32% |
| Back-office analytics/data analysis | 31% | 35% |
| Intelligent notification/evacuation solutions | 34% | 28% |
| Customer communication solutions | 30% | 31% |
| Remote disconnect and reconnect devices | 30% | 30% |
| Outage detection/restoration tech | 30% | 29% |
| Real-time monitoring weather stations | 31% | 28% |
| Distributed/edge intelligence | 26% | 29% |
| Distribution automation | 25% | 27% |

■ Deployed   ■ Priority 1-3

# HOW WILL UTILITIES DEAL WITH EXTREME WEATHER?

## BY STAYING FLEXIBLE AND ANTICIPATING WHAT'S NEXT.

Many priority technologies named by utility executives will help operators plan for and respond to disasters. In fact, they all work together. Real-time data generating technologies can provide the necessary status information for utility operators to know what's happening where and respond accordingly.

Predictive analytics can help them model what-if scenarios so they can act swiftly and decisively as parts of the grid suffer outages. Analytics tools can also help utilities design vulnerability curves and risk heat maps, and to identify testing resilience measures. And a McKinsey study shows that working climate risks into models can help operators make the right calls at the right time.[74]

**Are microgrids on the way**? One approach may be to operate grids in smaller sections, making them more resilient and responsive. "This allows operators to restart smaller pockets of the grid more quickly," notes Alexandra Sascha von Meier, director of the California Institute for Energy and Environment's electric grid program. "As they configure some of the circuits, the network can be refigured based on what assets are working and what's not."[75]

KEY USE CASES

# ENABLING SMART CITIES

## WHY CITIES NEED TO GET SMARTER

### IN 30 YEARS, THEY'LL HOUSE 70% OF THE WORLD'S POPULATION.

By 2050, 70% of the world's population will be **living in cities and urban areas**.

If smart city solutions strike you as a high-tech luxury, a little demographic data might change your mind. By 2050, says the United Nations, 70% of the world's population will be living in cities and urban areas. So over the next three decades urban areas will add another 2.5 billion people around the world.[76]

All those people will rely on energy and water. Their EVs will need charging, their streets must remain safe to travel, their air safe to breathe. Smart city solutions, often deployed in partnership with energy or water utilities, will be essential to ensuring these necessities. And analytics will play a major role.

**Some cities are leading the way**. A look at how some smart cities are showing the rest of the world how it's done. Successful smart cities typically start by building a single network canopy capable of supporting multiple applications—avoiding problematic silos. Then their smart city infrastructure grows from there.

### GLASGOW
The city combines data streams from more than 60 different organizations into a central data warehouse. Its intelligent network streams lighting, traffic, noise and air quality data to the city's Open Data platform. Developers can use this data to build new solutions to address city challenges. Streetlights automatically brighten and dim depending on ambient light levels and nearby pedestrian traffic.

### COPENHAGEN
Ranked No. 8 on the 2022 Smart Cities Index, Copenhagen has upgraded and connected 19,000 lighting points, but that's just the beginning. The city has developed a system that monitors air quality, energy consumption, traffic, and waste management. It also connects parking systems, traffic lights, buildings, smart metering, and charging systems for electric vehicles to direct traffic in real time.

### TAMPA
A smart streetlight initiative has saved $2.5M per year and accelerated restoration response by more than 72%. Next up: Smart parking, traffic monitoring, water metering and gunshot detection.

## BEYOND SMART STREETLIGHTS
### EVERYONE SEEMS TO GET THAT INTELLIGENCE HAS A PLACE IN CITIES.

Air quality monitoring, traffic management, flood and rain monitoring—all these applications directly impact quality of life in modern cities. Both consumers and utilities appear to recognize this.

Consumers value smart streetlights over all other applications, and over EV charging by a two-to-one margin (47% vs. 23%). Utilities have a different view: EV charging is their No. 1 priority for investments over the next five years. This isn't surprising, since utilities are responsible for building out and provisioning EV charging infrastructure and consumers may be less likely to view it as something they need to worry about.

**RESOURCEFULNESS INSIGHT**

Tampa Electric Company is working with the University of Central Florida to create a program to pilot, evaluate and scale emerging smart city solutions.

# BEYOND SMART STREETLIGHTS

## EVERYONE SEEMS TO GET THAT INTELLIGENCE HAS A PLACE IN CITIES. (CONT.)

**Public Wi-Fi finds fans**. The service is consumers' No. 3 most valued application overall, and is No. 1 in the U.S. and U.K. In some countries, Public Wi-Fi is viewed as essential for broadening Internet access to more people. In India, for instance, the PM WANI public Wi-Fi project was approved in 2020 but is struggling to meet its hot spot targets.[77] Perhaps this is why public Wi-Fi ranks third among utility investment priorities in India.

## UTILITIES AND CONSUMERS IN FIVE COUNTRIES SEE A KEY ROLE FOR SMART CITY SOLUTIONS

| | UTILITY ALL | U.S. | AUSTRALIA |
|---|---|---|---|
| 1 | EV charging | Air quality monitoring | Flood/rainmonitoring |
| 2 | » Air quality monitoring » Flood/rain monitoring | » EV charging » Flood/rain monitoring | Parking mgmt |
| 3 | Traffic mgmt | Traffic mgmt | » EV charging » Digital signage |

| | INDIA | SPAIN | U.K. |
|---|---|---|---|
| 1 | EV charging | Parking mgmt | Air quality monitoring |
| 2 | » Traffic mgmt » Air quality monitoring | Traffic mgmt | EV charging |
| 3 | Public WiFi | » EV charging » Digital signage | Flood/rain monitoring |

| | CONSUMERS ALL | U.S. | AUSTRALIA |
|---|---|---|---|
| 1 | Smart streetlights | Public WiFi | Traffic mgmt |
| 2 | » Traffic mgmt » Air quality monitoring | Air quality monitoring | Smart streetlights |
| 3 | Public WiFi | » Smart streetlights » Traffic mgmt | Flood/rain monitoring |

| | INDIA | SPAIN | UK.. |
|---|---|---|---|
| 1 | Traffic mgmt | Smart streetlights | Public WiFi |
| 2 | Air quality monitoring | Air quality monitoring | Parking mgmt |
| 3 | Smart streetlights | Public WiFi | Traffic mgmt |

## KEY USE CASES: ENABLING SMART CITIES

## CAN DATA ANALYTICS HELP MAKE LIFE BETTER IN CITIES?
### THE DATA POINTS TO YES.

Nearly half (45%) of consumers we surveyed see air quality monitoring and traffic management as highly valued applications for smart cities. Utilities aren't far behind, with 40% of executives saying air quality monitoring will be a priority investment over the next five years, and 39% saying the same about traffic management.

**Applications like these relate directly to quality of life, especially as cities continue to grow.**

AIR QUALITY MONITORING. The City of San Antonio, along with CPS Energy, operated a pilot program in this smart city that expects to take in 1 million new residents by 2040. Along with air quality monitoring, a long list of other smart city applications have been deployed on a single intelligent network and are administered via a centralized management system. The project is noteworthy for SmartSA's vision—creating an inclusive, unified environment for smart city services in the seventh largest city in the U.S., and for a project that incorporates a host of partners all working toward the same goal.[78]  As its smart city environment evolves, SmartSA can derive greater value from its air quality monitoring system to see where pollution is at its worst in this fast-growing city, and recommend traffic rerouting and other alternatives to eliminate areas with unhealthy air.

TRAFFIC MANAGEMENT. The city council in Nanjing, China installed sensors in 10,000 taxis, 7,000 buses and 1 million private cars. Analyzing that traffic data allows officials to send updates to commuters and public transport drivers about traffic conditions in the city of 9 million people. But that analysis doesn't just solve problems on a single morning commute: The government used its insights to develop new traffic routes to reduce congestion—all without having to invest in new roads.[79]

## CAN DATA ANALYTICS HELP MAKE LIFE BETTER IN CITIES?

### THE DATA POINTS TO YES. (CONT.)

**PUBLIC SAFETY.** In Annapolis, MD, local law enforcement installed gunshot detection sensors on streetlights in high-crime areas where residents, despite struggling with gun violence, are hesitant to dial 911. Operating on the city's existing intelligent utility network, the sensors provide accuracy within two meters, so police know the precise location of firearm incidents at the moment they occur and can respond quickly. The sensors also record actual audio of the incident and deliver it to police in seconds, while smart cameras capture images that help officers identify shooters and potential witnesses.[80] Here, data analytics can help law enforcement be even more proactive by analyzing incident patterns across location, time, weather conditions and other factors to anticipate when, where, and under what conditions firearm incidents are most likely to occur. They can then resource those areas accordingly.[81]

# GAME PLAN

## HOW UTILITIES CAN TAKE THE NEXT STEP

### FROM PILOT PROGRAMS TO PARTNERSHIPS, OPTIONS ABOUND.

The use cases of real-time analytics present both opportunities and challenges. On one hand, analytics can produce insights that help utilities generate new revenues, develop a more resilient grid and water distribution network, drive inefficiencies out of their operations, better integrate renewables and EV charging, support and implement smart city initiatives, and deliver greater value to customers—many of whom say they're willing to pay for the privilege.

But next steps can be difficult. There is risk inherent in every new project, and as we've documented here, more data means greater concerns about privacy and security. But strategic use of real-time data does appear to separate high-flying organizations from the rest. The question is, where to start?

**Your journey starts at home**. Consulting and research firm Bain & Company looked at high-performing utilities and other organizations, and found they generally approach their future by following three key steps.

1. **Realize potential of your core business and current investments**. This means making the investments needed to ensure that your infrastructure is all it can be to support your business today—and is capable of supporting new opportunities in the future. Then invest in the opportunities that make sense.

2. **Invest carefully in core-adjacent markets.** For utilities looking to grow in ways that don't directly build on their current offerings, investments in related ventures (such as transmission ventures), or providing add-on services or partnerships could grow revenues beyond your state-regulated business. Bain's advice: Just don't stray too far from your core business.

3. **Stay flexible.** If one thing is for certain, it's that environmental, marketplace and regulatory conditions will change. The world moves quickly, so it's vital to remain open to new solutions designed to solve new challenges—and to pursue new opportunities.[82]

If Bain is right, then investing in core capabilities—ensuring networks and field assets are up to date—is a reasonable starting point. This will ensure that current infrastructures are up to the challenge of accommodating future capabilities—some of which are available today, like distributed intelligence that brings analysis and decision-making to the edge of the network, as well as analytics suites that give you better insights into the low-voltage distribution network, giving you more visibility into this part of your grid than ever before.

## HOW UTILITIES CAN TAKE THE NEXT STEP

FROM PILOT PROGRAMS TO PARTNERSHIPS, OPTIONS ABOUND. (CONT.)

**Utilities can build on their existing foundation**. In our survey, utilities identified the areas where they want to make investments over the next five years. So for them, the priorities may be clear. And many options are available for building the utilities of tomorrow.

**PILOTS.** Many new programs start as pilots—a fact larger utilities know well. This report mentions several. Pilots are a lower-risk way to test rollouts of new equipment and services, and make it easier to tweak what isn't working before deploying those new offerings to the full customer base or service area.

**PARTNERSHIPS.** Data analytics can be a very specific field, and hiring shortages make it even harder to build that expertise internally. By working with third parties, utilities can implement analytics solutions that don't need highly trained data scientists to operate.

**STRATEGIC INVESTMENTS.** Investing in ventures that are beneficial to a utility's business and customers is a reasonable place to find incremental revenue growth. It's especially advantageous when the revenues are generated outside the utility's regulated business.

## ANALYTICS ISN'T LIMITED TO THE CENTRAL OFFICE

DISTRIBUTED—OR EDGE—INTELLIGENCE CAN OFFER MORE INSIGHTS AND OPTIONS.

70% of utilities say **distributed intelligence is critical** to their future.

Utility executives considering investments in real-time data analytics often assume analytics takes place solely in the back-office. Not anymore—or at least not always.

Distributed intelligence, or edge intelligence, places analytics at the grid edge within meters and other smart devices. A Zpryme survey found 70% of utilities say distributed intelligence is critical to their future.[83] Here's why.

Edge intelligence solutions give utilities access to one-second data and peer-to-peer communications so utilities can more accurately pinpoint operating conditions. This can result in fewer occasions of inference (also known as guessing). Other benefits: By placing the point of insight at the device premise, utilities see less data backhaul and don't require as much data storage, network bandwidth for data transport, and analysis at headquarters. And because edge intelligence devices combine insight with action, utilities minimize the impact of lag time.

**Tampa proved its value**. Tampa Electric Company tested three edge intelligence applications: meter bypass theft detection; residential neutral fault detection; and high impedance detection. For every application, the edge intelligence analytics outperformed back-office analytics. Either the back-office failed to identify all use cases, or in some instances produced false positives. Tampa Electric Company executives noted how distributed intelligence is helping discover safety and customer impact issues that are otherwise undetectable by back-office analytics, while highlighting how the utility saves money by not having to identify false positives. Since the test, the company has rolled out new services based on edge analytics, including reduction of estimated bills, while eyeing applications that provide personalized services to customers.[84]

## USES CASES VARY, BUT IS THE SOLUTION THE SAME?

### INSIGHTS HELP WITH EVERY MAJOR USE CASE.

In this report, we've examined how real-time data analytics can surface insights for every major use case utility executives named as important. Analytics helps eliminate guesswork, while giving operators a way to anticipate future developments—without guessing. Whether the intelligence is at the network edge or at its very center, insights are vital for organizations trying to overcome what is arguably the most challenging operating environment in history. And with grid and service disruptors evolving faster than utilities' ability to keep up with them, the need to invest in a flexible, intelligent infrastructure built around advanced analytics may be the only practical approach to meet a future whose implications are impossible to know today.

Most utilities we surveyed are already on board. As for the rest, the question may not be if they implement next-generation analytics, but when and how.

# MORE INTELLIGENCE. MORE POSSIBILITIES.

# CONCLUSION: MORE INTELLIGENCE, MORE POSSIBILITIES

## UTILITIES ARE BUILDING THE FUTURE FOR ALL OF US

### THEY'LL NEED ALL THE HELP THEY CAN GET.



In this report, we've examined how real-time data analytics can surface insights for every major use case utility executives named as important. Analytics helps eliminate guesswork by giving operators a way to anticipate future developments. Whether the intelligence is located at the network edge or at its very center, insights are vital for organizations trying to navigate an increasingly challenging and unpredictable world.

And those challenges keep mounting: extreme weather, cyber-attacks, continued adoption of EVs and DERs, labor shortages, rising consumer expectations, and population growth in cities across the planet. The list goes on.

**Gaining insights from existing investments is the next step for utilities**. A significant majority of utilities not only acknowledge the value of real-time data analytics, but many have implemented at least some basic analytics capabilities.

Operators everywhere know how putting intelligence in the field—from sensors and AMI implementations to edge intelligence devices—gives them a way to gain visibility into the least visible areas of their service area. It also provides them with a foundation for a robust environment where real-time data can produce insights that pay dividends, possibly for decades. They know, too, that more intelligence introduces more possibilities for achieving operational efficiencies, engaging consumers with personalized experiences, and developing new revenue streams that are essential for their long-term success.

# RESOURCES
# & CITATIONS

# RESOURCES AND CITATIONS

## RESOURCES

### Utility Industry Trends

Annual Energy Outlook 2022,
U.S. Energy Information Association Report

The utilities cloud imperative, Accenture Insight

2022 Global Energy Talent Index Report, GETI

### Developing New Revenues

How utilities can monetize AMI data,
Smart Energy International Article

Utilities: The Road Ahead, Bain & Company Article

As consumers lead the way, how can energy
providers light the path?, EY Insight

### Extreme Weather, Renewables and EVs

Grid Resiliency: Preparing for the Unexpected
and the Inevitable, 2021 Itron Resourcefulness
Insight Report

Why, and how, utilities should start to manage
climate change risk, McKinsey & Company Insight

### Renewables and Sustainability

Managing the Growing Renewables Crisis,
Zpryme Report

Modernising the U.S. grid for peak renewables
and climate change, Power Technology Article

### Distributed (Edge) Intelligence

Distributed Intelligence: Creating the Future for Utilities,
Itron White Paper

Distributed Intelligence in Action, Itron Resources Page

On the Edge: Leveraging Distributed Intelligence,
Zpryme Insight

How Distributed Intelligence Demonstrates Value, Global
Power & Energy Elites 2022

### Cybersecurity

Utility Operations Cybersecurity Study,
Utilities Technology Council

Protecting Infrastructure: The 2021 Energy, Utilities, and
Industrials Cyber Threat Landscape Report, Rapid 7 White
Paper

ICS/OT Security for the Electric Utilities Industry,
Trend Micro White Paper

The State of Ransomware 2022, Sophos Report

### Personalized Customer Experiences

As consumers lead the way, how can energy providers
light the path?, EY Insight

### Data Storage and Management

How residential energy storage can help support the
power grid, McKinsey & Company Insight

### Smart Cities

Data Analytics in Smart Cities, Zigurat Innovation &
Technology Business School Blog

# RESOURCES AND CITATIONS

## CITATIONS

1  DOMO Data Never Sleeps 6.0 Report

2  Cisco Annual Internet Report (2018-2023)

3  Cisco Annual Internet Report (2018-2023)

4  Smart Meter Analytics

5  U.K.'s smart meter data traffic to surge 500% by 2026, IT Pro, Aug. 1, 2022

6  Electric Company Smart Meter Deployments: Foundation for a Smart Grid (2021 Update)

7  Is the price of residential electricity going up or down?, Energy Sage blog

8  Annual Energy Outlook 2022, U.S. Energy Information Association

9  Factbox: Europe's efforts to shield households from soaring energy costs, Reuters, Aug. 16, 2022

10 Utility Data Management & Intelligence: A Strategic Framework for Capturing Value from Data, Cisco Systems, May 2012

11 Utility Data Management & Intelligence: A Strategic Framework for Capturing Value from Data, Cisco Systems, May 2012

12 Positive Proof for Distributed Intelligence at the Grid Edge, Itron white paper, July 2022

13 Grid Resiliency: Preparing for the Unexpected and the Inevitable, Itron, 2021

14 Electric Vehicle (EV) Market by Vehicle Type (Passenger Vehicles, LCVs, HCVs, Two-wheelers, e-Scooters & Bikes), Propulsion Type (BEV,FCEV, PHEV, HEV), End Use (Private, Commercial, Industrial), Power Output, Charging Standard, and Geography - Global Forecast to 2027, Meticulous Research, April 2021

15 Electric Cars Are Coming, and Fast. Is the Nation's Grid Up to It?, New York Times, Aug. 3, 2021

16 3 ways data can help utility companies cope with extreme weather events and outages, VentureBeat.com, Feb. 13, 2022

17 DMEA: Cyberattack in investigators' hands, Montrose Press, June 17, 2022

18 U.S. utilities prepare for heightened cybersecurity risk from Russia, S&P Global Market Intelligence, March 1, 2022

19 Research finds 87% of utility and energy companies experienced OT network cybersecurity breaches in the last 36 months, Skybox Security, Jan. 4, 2022

20 2021 Annual Data Breach Report, Identity Theft Research Center

21 Iberdrola cyberattack compromises data of millions of customers in Spain, Spanish News Today, March 15, 2022

22 Chinese Cyber Exploitation in India's Power Grid—Is There a Linkage to Mumbai Power Outage?, Strategic Study India, January 2021 C

23 U.K. utilities under siege by hackers, Energy Live News, May 19, 2021

24 Hackers undetected for nine months on Queensland water supplier server, BleepingComputer, Nov. 11, 2021

25 New study sheds light on how utilities protect OT environment, Fortinet

26 2022 Data Breach Investigations Report, Verizon Business

# RESOURCES AND CITATIONS

27  2022 Data Breach Investigations Report, Verizon Business

28  The State of Ransomware 2022, Sophos

29  Ransomware: The True Cost to Business, Smart Energy International, Oct. 8, 2021

30  The utilities cloud imperative, Accenture, Jan. 18, 2021 31

31  The state of cybersecurity training TalentLMS, April 6, 2021

32  2022 Data Breach Investigations Report, Verizon Business

33  Bitcoin Uses More Electricity Than Many Countries, New York Times, Sept. 3, 2021

34  Roundup: 2021Energy and Utility Data Breaches and Defenses in the News, Security Intelligence, Oct. 28, 2021

35  Protecting Infrastructure: The 2021 Energy, Utilities, and Industrials Cyber Threat Landscape Report, Rapid 7, 2022

36  How utilities can create value from data across data hubs, data lakes and data warehouses, Smart Energy International, Oct. 8, 2021

37  The utilities cloud imperative, Accenture, Jan. 18, 2021

38  The Rise of the Cloud-ready Digital Utility, Zpryme, July 28,2021

39  The Graying Utility Workforce, energycentral.com, Aug. 10, 2020

40  2022 Global Energy Talent Index Report

41  Changing the current: How utilities are removing barriers and energizing smart infrastructure, PSC Consulting, February 2022

42  The Rise of the Cloud-ready Digital Utility, Zpryme, July 28,2021

43  The Rise of the Cloud-ready Digital Utility, Zpryme, July 28,2021

44  Improving Reliability and Efficiency, ComEd Case Study, Itron

45  DPS – Reforming the Energy Vision, State of New York,

46  U.S. Department of Energy Alternative Fuels Data Center

47  Guidehouse Insights Report Shows Utility Online Energy Marketplace Revenue Is Expected to Reach $468 Million by 2029, BusinessWire, April 16, 2020

48  As consumers lead the way, how can energy providers light the path?, EY, March 1, 2022

49  Revenue growth opportunities for utilities, ICF, June 1, 2020

50  Here's what's included in the bipartisan infrastructure law, NPR, Nov. 15, 2021

51  Biden-Harris Administration Announces $26 Million Program from Bipartisan Infrastructure Law to Demonstrate How U.S. Power Grid Can Run on 100% Clean Energy, Department of Energy, Aug. 2, 2022

52  Race to Net Zero: Carbon Neutral Goals by Country, visualcapitalist.com, June 8, 2021

53  Renewable electricity growth is accelerating faster than ever worldwide, supporting the emergence of the new global energy economy, International Energy Agency, Dec. 1, 2021

54  Managing the Growing Renewables Crisis, Zpryme, April 8, 2021

55  Global electric car sales have continued their strong growth in 2022 after breaking records last year, International Energy Agency, May 23, 2022

# RESOURCES AND CITATIONS

56  Grid Resiliency: Preparing for the Unexpected and the Inevitable, Itron, 2021

57  Solar Systems: Grid-Tied vs. Battery Backup, suncityenergy.com, June 23, 2021

58  How residential energy storage could help support the power grid, McKinsey & Co., March 20, 2019

59  So, You Want to be the Amazon of Energy?, Energy Central, May 30, 2019

60  Uberizing the utilities sector in the fourth industrial revolution, localz blog, Nov. 8, 2019

61  How utilities can monetize AMI data, Smart Energy International, May 17, 2022

62  As consumers lead the way, how can energy providers light the path?, EY, March 1, 2022

63  As consumers lead the way, how can energy providers light the path?, EY, March 1, 2022

64  ERCOT asks power plants to possibly cancel planned maintenance to meet demand of extreme heat anticipated this weekend, Click2Houston, May 3, 2022

65  State of the Climate: 2022 on track for a summer of extreme heat, Carbonbrief.org, July 25, 2022

66  Australia ties Southern Hemisphere's all-time heat record of 123 degrees Fahrenheit; epic heat cooks Argentina, Yale Climate Connections, Jan. 14, 2022

67  Media Reactions: South Asia's 2022 heat wave and the role of climate change, Carbonbrief.org, May 4, 2022

68  Death toll from brutal heat wave tops 350 in Spain, UPI, July 17, 2022

69  Average June Temperatures in the United Kingdom, Current Results

70  'They are not slowing down': The rise of billion-dollar disasters, Washington Post, Aug. 4, 2022

71  Why, and how, utilities should start to manage climate change risk, McKinsey & Co., April 24, 2019

72  Grid Resiliency: Preparing for the Unexpected and the Inevitable, Itron, 2021

73  3 ways data can help utility companies cope with extreme weather events and outages, VentureBeat, Feb. 13, 2022

74  Why, and how, utilities should start to manage climate-change risk, McKinsey & Co., April 24, 2019

75  Modernising the U.S. grid for peak renewables and climate change, Power Technology, Aug. 4, 2022

76  Which cities are smart cities? 5 examples of smart cities around the world, NEC, Feb. 14, 2022

77  Public Wi-Fi will be a win-win for all, The Hindu Business Line, April 29, 2022

78  Itron Announces CPS Energy as 2021 Innovator Award Winner, Itron newsroom, Oct. 6, 2021

79  Data Analytics in Smart Cities, Zigurat Innovation & Technology Business School

80  Databuoy Corporation and Itron, Inc. Partner to Deploy Gunshot Detection, Databuoy case study

81  Data Analytics in Smart Cities, Zigurat Innovation & Technology Business School

82  Utilities: The Road Ahead, Bain & Company, Feb. 22, 2012

83  On the Edge: Leveraging Distributed Intelligence, Zpryme, Dec. 8, 2020

84  How Distributed Intelligence Demonstrates Value, Global Power & Energy Elites 2022

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