



**As digital disruption
changes how we use
energy, shouldn't we
change how we manage
energy assets?**

Spotlight on power and utilities
infrastructure – formulas for success
Part 2: Maximizing asset performance in
a digital and more sustainable world

■ ■ ■
The better the question. The better the answer.
The better the world works.

EY

Building a better
working world



“The future competitiveness of power and utility businesses depends on extracting greater value from infrastructure assets.”

Safia Limousin

Global P&U Capital and
Infrastructure Lead, EY

Contents

- 1** Executive summary

- 2** Big picture changes

- 3** Utility perspectives

- 4** The heart of the matter: unlocking value

- 5** Seizing new opportunities

- 7** Leading practice: building blocks of excellence

- 11** Where to start?

- 12** Research methodology

- 14** EY contacts

Executive summary

Achieving excellence in asset management is critical to optimize return on investment in power and utility (P&U) organizations. This report explores the role of asset management in a transforming sector, highlighting three routes to unlock strategic value.

The challenge: balance cost, risk and performance

Aging infrastructure, the growing cost of power generation and the need to respond to disruptive technologies are all intensifying the pressure on utilities to invest in maintaining, growing and modernizing their service delivery assets.

With no letup in safety and service standards – or customer, shareholder and stakeholder expectations – utilities are increasingly challenged to do more with less.

The asset management capability needed to achieve the necessary optimization of cost, risk and performance is far greater than we have seen before. With sector transformation accelerating, and the value chain growing in complexity, investment in assets today has cost implications decades into the future. To maximize this investment, utilities need to understand and manage the whole-life cost, risk and value of assets.

Sector recognizes the need to respond

Research by EY reveals this to be a topic of key concern for P&U businesses.

Seventy percent of senior executives interviewed in a recent EY global survey said they view asset management as increasingly challenging, and that these challenges will persist as disruptive trends continue to impact the sector. But 68% also told us they had not identified specific innovations likely to improve asset management performance.¹

Major strategic benefits from a fresh approach

Leading asset management standards such as ISO 55000 have created a much broader appreciation of asset management that encompasses the whole organization and its stakeholders.

Studies have shown that adopting a leading approach to asset management can yield benefits equivalent to 20% of the total spending portfolio within three to five years.²

Results achieved by leading utilities worldwide demonstrate how focusing on intelligent asset management can significantly improve value. For example, one major MENA utility reduced its annual maintenance costs by 40% after integrating business systems on an enterprise asset management (EAM) platform.³

Three leading practices for better value

EY has identified three critical leading practices to transform asset management capability, performance and value:

- 1. Align asset strategy to corporate strategy** by taking a holistic, strategic approach to EAM. This means fully coordinating roles and responsibilities across all organizational levels, functions and supply chain partners to deliver effective, end-to-end asset management and generate consciousness of EAM's huge potential to build value. Integrating asset management within the wider strategic capability will be a key differentiator for tomorrow's leading utilities.
- 2. Turn data into insight**, recognize and manage data as an asset class, and deploy advanced analytics to generate actionable insight that supports good decisions and boosts value.
- 3. Revolutionize field workforce capabilities**, using advanced technology to improve productivity and unlock strong competitive advantage.

The sector needs a fresh approach to asset management to respond to current disruption. This is just the beginning of the journey to better value. Taking the initiative now to adopt an intelligent approach to asset management, refine capabilities and leverage new technologies will create value and set P&U organizations up to thrive as the sector transforms.

“New and existing infrastructure projects can transform value by embedding asset management throughout the organization, using data better and adopting new technology faster, learning from parallel industries.”

Igor Sadimenko
Asia-Pacific EAM Regional Lead, EY

1. EY research.

2. UMS Group Europe/IES Asset Management.

3. EY research.

Big picture changes

Many utility assets in operation today – particularly large-scale generation, transmission and distribution – were commissioned during the investment booms of the 1960s, '70s and '80s. But since then, investment levels have not always kept pace with the need to grow and replace asset bases, and the established and formerly stable value chain is now experiencing the disruptive effects of new technologies, which utilities increasingly need to leverage.

The P&U sector is undergoing a period of radical transformation, spurred on by technology innovation, shifting population dynamics and burgeoning economic growth.

Technology innovation

Disruption along the traditional value chain, from decentralized generation and demand-side operations to energy storage and the rise of electric vehicles, is changing the way utilities operate.

Population growth

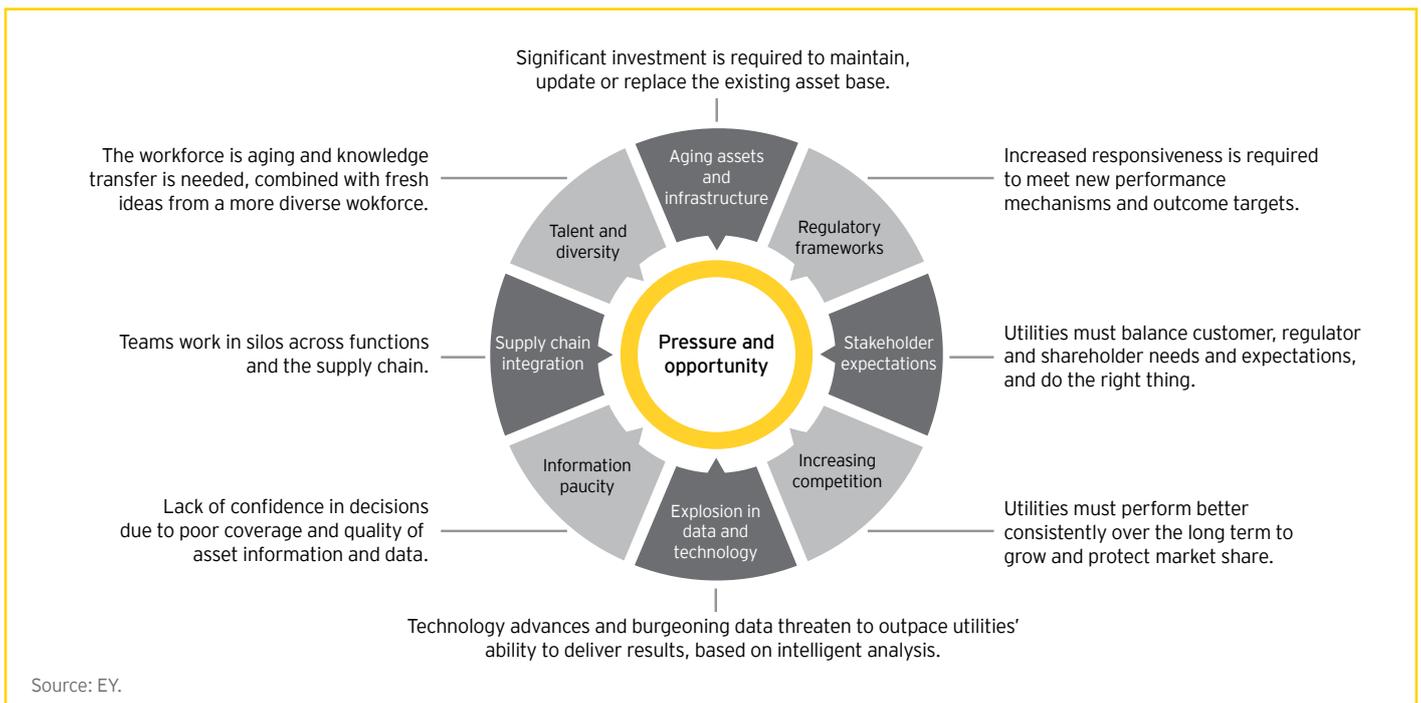
Global population is forecast to grow to **9.2 billion** by 2040,⁴ mostly in non-OECD countries where an increasing, aspirational middle class is driving greater energy demand.

World GDP growth

GDP is forecast to grow from **US\$74.5t in 2015 to US\$136.7t in 2040, an increase of 83%.**⁵ Past trends show a strong link between GDP and electricity demand.

Utilities are moving toward a new value chain, augmented and interconnected by digital technologies, with power and information flowing in both directions. These far-reaching changes in technologies, markets and public policies are transforming utilities and the challenges they face.

Figure 1: Utilities face transformational challenges and opportunities



4. International Energy Agency, World Energy Outlook 2016.

5. Oxford Economics, Global Data Workstation, 2016.

Utility perspectives

EY's survey of top sector executives sought to understand where they see challenges and improvement opportunities in managing infrastructure assets. While acknowledging that new technology is making asset management significantly more efficient, the vast majority of respondents told us that maximizing return on asset investment was an ongoing challenge. Respondents also confirmed that they had not identified specific innovations to overcome challenges in asset management.

Our research revealed that 70% of sector leaders believe asset management is becoming increasingly complex and challenging, and that the challenges faced today will persist as disruptive trends continue to impact the sector.

Figure 2 breaks down the most challenging aspects – with the biggest cited as demonstrating a return on investment (ROI) in line with the original business case. The capabilities of the asset management organization were another key concern. Data collection and confidence in asset condition data also ranked highly, with one in three sector executives placing it in their top three challenges.

In facing these challenges, utilities recognize the potential value of strong asset management and are taking steps to gather and analyze data to support infrastructure projects (see figure 3).

Advances in technology are enhancing these efforts: 71% of sector executives surveyed told us that new technology is making asset management significantly more efficient. But it is apparent that utilities still have some way to go, with nearly the same percentage (68%) saying that they had not identified specific innovations to improve asset management performance (see figure 4).

In the pages that follow, we identify how the sector can leverage leading practice and digital innovation to overcome key asset management challenges.

Top-rated challenges

1. Demonstrating business case ROI
2. Asset management capabilities
3. Data collection and quality

Figure 2: Demonstrating a return on investment in line with business case goals is identified as a major challenge

Q. Regarding your infrastructure projects or programs most recently completed, what are the top three challenges your organization faces in terms of maximizing a return on investment from the assets?

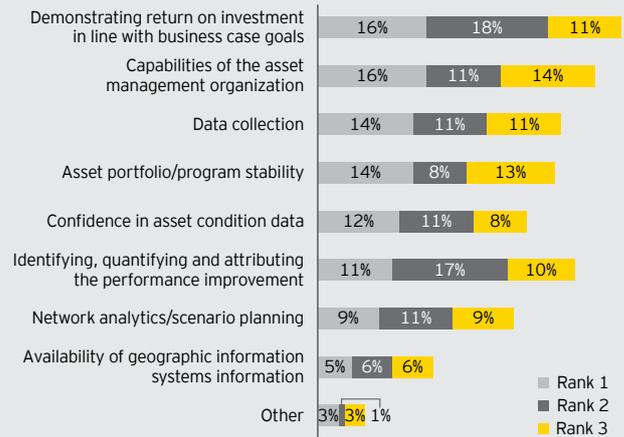


Figure 3: Utilities are taking steps to support their infrastructure projects through data analysis and security

Q. Thinking about how you manage data across your infrastructure projects, to what extent do you agree or disagree with the following statements?

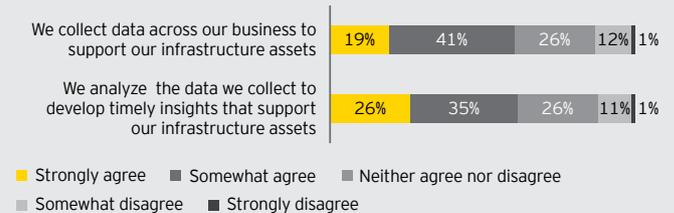
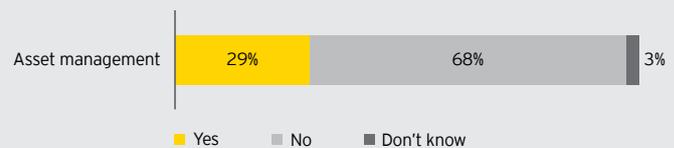


Figure 4: The sector has struggled to identify innovative practice to improve asset management performance

Q. Has your organization identified specific innovations that will be key to improving your asset management performance?



Source: EY research.

The heart of the matter: unlocking value

As the sector transforms, optimizing the commercial and strategic value of utility assets is a tough balancing act. Asset owners and operators need to deliver greater stakeholder value – in particular to customers – while reducing risk and minimizing costs.

In our executive survey, demonstrating ROI emerged as one of the greatest challenges, now and for the future. In markets where the wholesale price of electricity is falling below the level required to provide acceptable ROI in power plants, generators are challenged with optimizing whole-life costs.

Now is the time for utilities to take stock, develop and refine their asset management capabilities and leverage new technologies that will create value and set the business up to perform amid ongoing disruption. EY believes this can best be achieved through a fresh approach to people, processes and technology that:

- ▶ Leverages the power of asset management systems, using data and analytics as a strategic asset and differentiator, to drive informed decision-making and value creation
- ▶ Fully coordinates the roles all organizational levels and functions play in effective, end-to-end asset management, in a holistic way

Utilities that adopt these principles should be able to unlock value, gain competitive advantage and outperform their peers. Those that don't adopt them face a widening capability and stakeholder expectation gap on performance, service and cost.

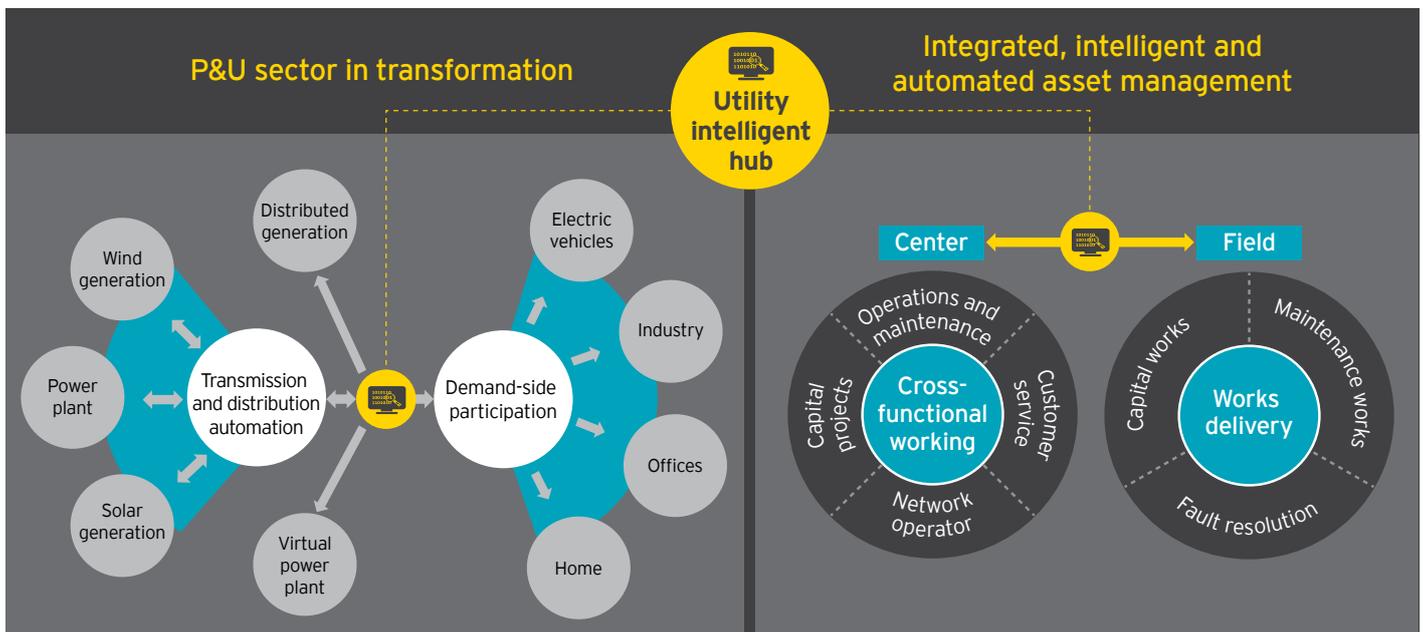
Intelligence drives value

The nature of asset management depends increasingly on intelligence and insight from data. New technologies are transforming how asset information is collected, collated and analyzed, providing a foundation for utilities to run operations in a completely new way from an “intelligent hub” (see figure 5). Physical distance between assets is less of an obstacle to operational efficiency, with devices now capable of remotely monitoring and transmitting asset data in real time. Complex analytics provide new, much more detailed insight on asset risk and performance, opening up new opportunities to deliver optimal performance and boost value.

“Now is the time to focus hard on developing intelligent asset management as a fundamental driver of value, for today and for the future.”

Claus Jensen
Global Program Management Lead, EY

Figure 5: Integrated, intelligent, automated – asset management is evolving as sector disruption demands new capabilities



Source: EY.

Seizing new opportunities

In today's transforming sector, utilities are increasingly challenged to make decisions based on intelligent asset management that fully grasps the relationship between asset cost, risk and performance and the entire organization and supply chain. This holistic approach provides executives with vital information to understand, manage and exploit asset portfolios better, gain greater control of costs, reduce risks and improve customer and shareholder value.

Intelligent asset management unlocks value

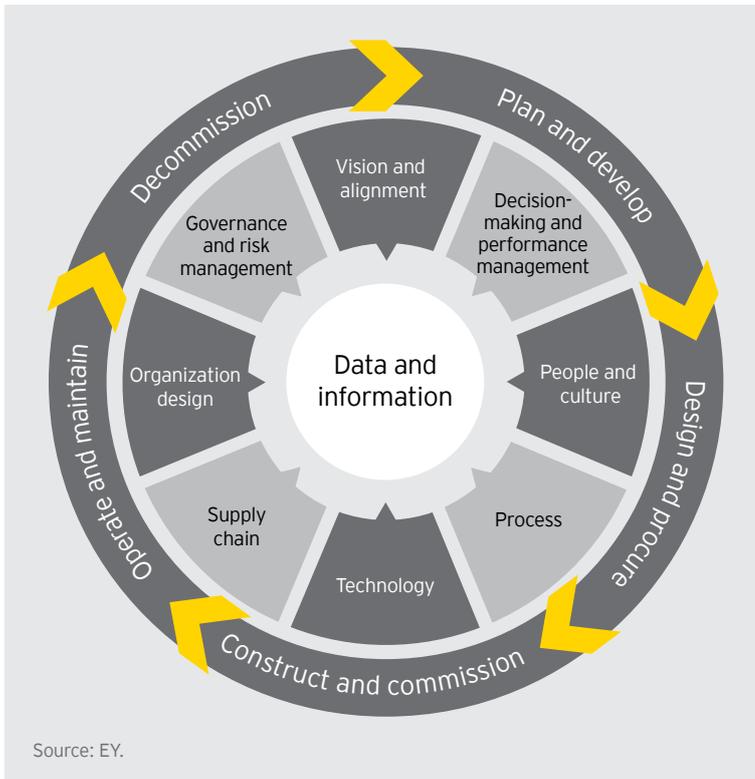
Organizational benefits	Case studies		
Ensures alignment between asset strategies and corporate objectives, which in turn maximize asset portfolio returns	Organizations that undertake improvement initiatives in asset management can reap significant rewards – boosting productivity and cutting down on maintenance and renewals costs, equipment downtime and costly reactive work.		
Reduces costs by identifying asset management inefficiencies	Company type	Improvement initiative	Benefits
Enables well-informed, confident decision-making from solid coverage and quality of asset information and data	UK water utility	Improving levels of preventative and scheduled maintenance	30% reduction in reactive work
Increases confidence of regulators, government and shareholders, and boosts value for customers	Major US electric utility	Implementing a new work and asset management solution	US\$9.6m annual savings in asset management costs
Enables accurate evaluation of potential success in any transformation program	Major electricity network owner	Transitioning from scheduled maintenance to condition-based maintenance	10% reduction in asset maintenance and renewals costs
Ensures overall adoption and increasing levels of business ownership of EAM	Major MENA electricity and water utility	Integration of business systems on an EAM platform	40% reduction in annual maintenance plan
Empowers key individuals to contribute to and drive business outcomes	Medium-sized energy and utilities company	Implementing an EAM solution for preventive maintenance and enterprise resource planning integration	5-10% improvement in labor utilization

Source: EY research.

Creating a broader appreciation of asset management

The evolution of the asset management discipline and its international standards (ISO 55000) provide a framework for leading practice and a reference for utilities to identify improvement opportunities. EY's Asset Excellence Model (figure 6) is a holistic, systemic approach aligned to ISO 55000. Based on a data-rich, risk-informed decision process, our model outlines the key components required to deliver a joined-up and systematic approach to asset management across the asset life cycle.

Figure 6: The EY Asset Excellence Model – a joined-up approach to boost value



Recent studies suggest that organizations that adopt a leading-practice approach to asset management can achieve financial benefits equivalent to roughly **20%** of their total spending portfolio within three to five years.

UMS Group Europe/IES Asset Management



Leading practice: building blocks of excellence

The goal is asset excellence, but where's the starting line? Our survey of senior executives identified three key challenges: asset ROI, asset data and asset management capabilities (see page 3). Based on our experience supporting major enterprise asset management programs worldwide, we identified three leading practices that could help to create new value and transform asset management performance, now and in the future.

Align asset strategy to corporate objectives

Leading practice 1

For asset management to be truly effective, it is critical to take a holistic, strategic approach to EAM, applying responsibilities across functional boundaries and from the boardroom through to the operative level. Utility leaders must ensure all parties are aligned, accountable and aware of these responsibilities.

To maximize the value of asset management, utilities should think holistically, designing and implementing a comprehensive approach that embraces not just the system but the people, processes and tools that underpin it.

Three key pillars support a holistic approach:

1. Strong recognition and support at board and executive level:

leadership teams drive and promote the asset management agenda as an essential component of corporate strategy, and ensure it is integrated with customer, commercial and other key agendas. Ideally, responsibility for asset management should be a board-level position.

2. A clear line of sight between strategic objectives and asset management activities:

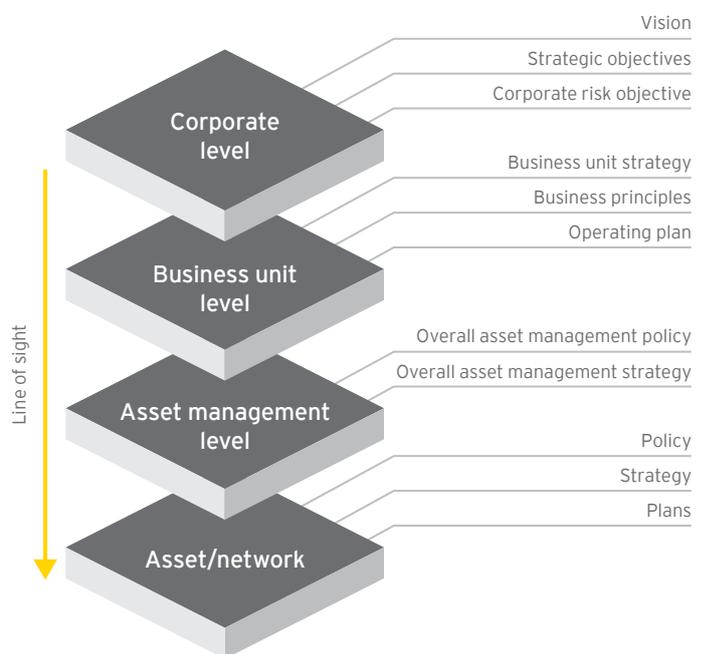
the top floor is connected to the shop floor. The route from corporate objectives all the way to the physical asset is mapped out and established (see figure 7). Individuals and teams understand how their day-to-day actions align with long-term corporate goals – and do not act in silos.

“To deliver optimum value, asset management needs to link effectively with the rest of the organization. This ensures that the asset advances corporate strategic objectives, and value isn't eroded by conflicting functional priorities.”

Kristen Westall
EMEIA EAM Regional Lead, EY

3. Long-term, strategic relationships with suppliers: these are focused on developing capabilities and optimizing value. Collaboration with suppliers is based on a shared understanding of goals and supported by technology that enables suppliers and asset owners to share information on the assets they have built. Incentive structures are based on success through interdependency.

Figure 7: Asset management “line of sight”



Source: EY.

Make the data work for you

Leading practice 2

Data informs every management decision throughout the asset life cycle and supply chain. It needs to flow effectively and lead to actionable insight. The more an organization values data and information as a strategic asset and a differentiator in its own right, the greater the efficacy of its asset management and the likelihood of maximizing ROI.

Exercising tight planning and controls to manage data quality makes organizations far better equipped for timely, cost-effective interventions. But collecting and managing the right data throughout the asset life cycle requires robust organizational discipline, particularly where large asset fleets are concerned, as these demands increase with the exponential growth in data volumes.

To turn asset management into asset excellence, leading organizations incorporate the following four data considerations into their asset strategy:

1 Treat data as an asset class

Data and data culture need to be key priorities for the organization. Data has strategic significance, can be leveraged and monetized, and requires appropriate management – so it should be valued as an asset in its own right.

2 Identify specific outcomes

- ▶ Identify, collect and standardize asset data critical to decision-making
- ▶ Establish governance and processes to manage information – how it is acquired, cleansed, stored, secured and evaluated
- ▶ Create a data-driven culture with accountability around data
- ▶ Take a commercial view of data and prioritize investment accordingly, balancing short- and long-term costs and benefits

“Improving asset information and data management remains a big opportunity. Proper risk assessment and mitigation can only be well understood if the right data exists to support it.”

Steve McCabe
Global P&U EAM Lead, EY

3 Seek out further opportunities to exploit data in the organization

Data should be integrated across platforms – such as operational technology, finance and asset systems – to unlock additional insight and promote truly joined-up thinking. Where appropriate, organizations should partner with specialists to gain cost-effective access to new data and analytical capabilities.

4 Pursue insight through enabling technologies and analytical capabilities

Organizations need to commit to consistent investment and development of enabling technologies (figure 8) across the P&U value chain (figure 9).

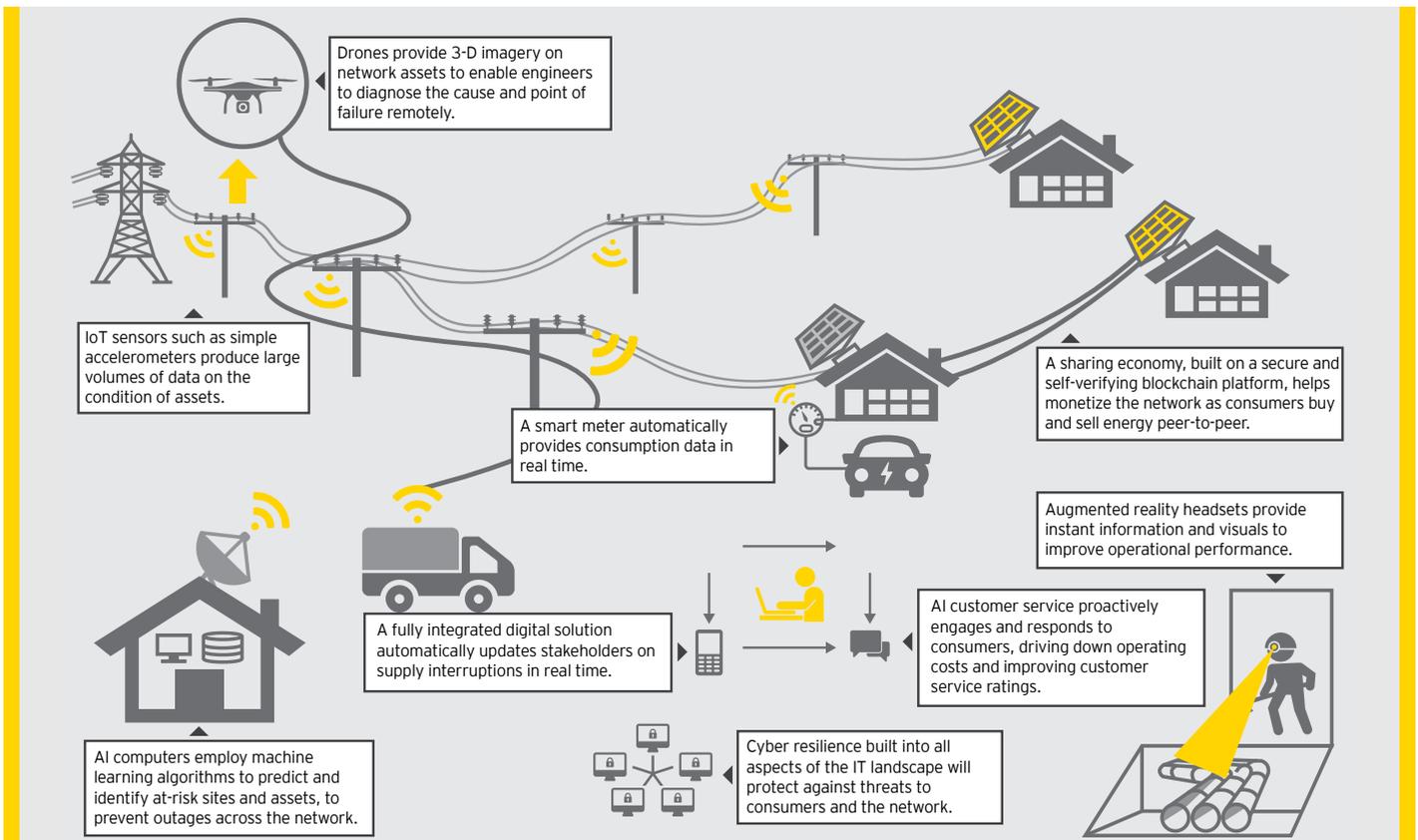


Figure 8: Current application of enabling technologies in asset management

Building information modeling/virtual construction	3-D and 4-D asset and plant models enable knowledge-based, concurrent engineering, improved supply chain collaboration, rapid prototyping and testing, construction sequencing and asset visualization	HD scanning and geolocation	Improved methods to collect input on existing physical layout and transform this into digital models, including all geolocation data, allowing rapid modeling
Analytics	Predictive asset analytics deliver intelligence and insight, and enable more effective decision-making	3-D printing	Development of design prototypes to enable engineering assurance and construction sequencing; on-site production of equipment and spare parts to avoid supply chain delays
Artificial intelligence (AI)	Advanced computing techniques based on cognitive computing and self-learning programming methods to optimize and support decision-making	Mobile	Enablement of the workforce with new technologies (mobile, toughbooks and cameras) to improve asset data collection, workforce productivity, learning and safety
Augmented reality	Enabling operations and maintenance through "smart glasses" – visualization of asset layout, parameters and procedures; use of augmented reality in training and work preparation	Smart labels	Use of smart tracking and tagging labels for assets and equipment, enabling supply chain synchronization and tracking of physical flow
IoT and sensors	Cloud-connected sensors, providing information in real time, enable faster control and response as well as "grid edge" self management	Robotic process automation	Robotic process automation software to automate repetitive, rule-based tasks across multiple systems and email, allowing automation of support processes
Operations centers	Development and enhancement of remote operations support and control centers, leveraging asset information to enable operations improvement and coordination	Autonomous vehicles	Use of self-driving vehicles – e.g., autonomous forklift trucks, cars, trucks, boats and planes
Robots and drones	Use of more intelligent, physical robots to enable more effective operations, e.g., pipeline management, remote inspection and hazardous area management	Blockchain	Leveraging blockchain technology to enable more secure data transfer, contracting and transaction integrity

Source: EY.

Figure 9: Enabling technologies are becoming a key differentiator across the value chain



Source: EY.

Revolutionize field force capabilities

Leading practice 3

Field force productivity plays a particularly significant role in the effective execution of asset management plans. But it is often hindered by a range of “human” factors – from site access and outdated ways of operating, to lengthy journey times and safety issues.

New technologies can help overcome these and other limitations and revolutionize many of the physical aspects of asset management while transforming the productivity, safety and job satisfaction of the field workforce (see figure 10).

Advanced technologies are changing how field work is done, enabling real-time interaction with users, devices and systems, and allowing operatives to take on more of a decision-making role. As a result, the role of the control center will become less “command and control” and more “empower and assure” – a significant operational and cultural shift.

Applying the right technology in the right way will boost the chances of reducing costs, maximizing ROI, maintaining operations and improving customer satisfaction.

“The P&U sector is at the start of a journey that will see the workforce empowered, and safety, compliance and productivity progressively transformed.”

Andre Winarto
Global Power & Utilities and
Energy Knowledge Lead, EY

Figure 10: Evolving technology and mobility revolutionize field force capability

 Technology	 Field application	 Field benefit
Remote and mobile devices	From smart meters to wireless sensors, remote devices share specific, real-time data from the business and its suppliers	Field operatives can take on more of a decision-making role
Unmanned aerial vehicles (UAVs, or drones)	Aerial surveys of assets provide detailed inspections and recording of information on asset condition and environmental factors	Substantial cost and safety advantages
Artificial intelligence	Computers employ machine-learning algorithms to predict and identify at-risk sites and assets	Prevents outages across the network, helping the field force move from costly reactive to efficient, risk-based predictive maintenance
Wearable technology	Allows remote tracking of field operatives’ location and vital signs	Monitoring of well-being and safety risks in real time
Blockchain	Digitally connected supply chain management systems and processes	Improved efficiency and reduced costs by establishing a “single version of the truth” about asset status

Source: EY.

Where to start?

There are big opportunities to realize the full potential of asset management to improve operations, reduce costs, better manage risk and meet overall corporate goals in today's data-driven, technology-enabled, connected world.

But first, "asset excellence" needs to be strategically prioritized on the board agenda. Crucially, the sector also needs more effective decision-making capability underpinned by better analytics to plan, forecast and optimize performance. Better integration across the business, and intelligent use of information and digital technologies across the entire asset life cycle, will also radically improve the value your infrastructure assets deliver.

So – where to start?

- ▶ **Benchmark:** a good basis for change is to benchmark your organization's performance. Running a maturity assessment of your asset excellence capability will reveal how much value you could be losing and help you decide what to target first.
- ▶ **Explore:** develop a view of how integrated your systems and data really are. Do you have a robust asset intelligence framework? Is your asset information complete and accurate? Are you able to integrate service delivery assets, risk and commercial data to drive better performance and improve strategic decision-making?
- ▶ **Align:** your data strategy must align with the processes and desired outcomes of your asset management function to unlock wider strategic and commercial value.
- ▶ **Move fast:** innovative technologies – analytics in particular – will create a disruption effect; early adoption will provide competitive advantage and help to secure your organization's short-term priorities and long-term goals. Consider the potential speed of technology and sector change and how your organization must adapt.

This is just the beginning of the journey to better value for power and utility organizations. Acting fast and focusing on integrating asset management with overall strategic capability will put utilities in a position of strength for the future.

"Transformational digital technologies provide a foundation to reinvent EAM, to create new information and customer-centric business models. With disruption come new competitors that are cash-rich, agile and aggressive. How are you preparing?"

Benoit Laclau
Global Power & Utilities Lead, EY

More capital projects insight from EY

This is the second report in EY's capital and infrastructure Spotlight series.

The first report, focusing on utility megaproject financing and delivery, is available at ey.com/spotlight.

For more information about our capital and infrastructure services for power and utility organizations, see ey.com/capitalandinfrastructure.

Research methodology

EY industry survey

In late 2016, EY conducted a survey of executives from P&U organizations with turnover categories from US\$900m to more than US\$5b, using a structured survey questionnaire. Of the 204 respondents, one in four was a C-suite executive, with the remainder at director level across five functional areas comprising finance, strategy, operations, procurement and projects/programs. The respondent geographical split was 23% from Asia-Pacific, 43% from EMEIA and 34% from the Americas. The study targeted executives working in different P&U segments: power generation (nuclear, hydro, coal, gas and renewables), transmission and distribution, and water.





EY contacts

For more information on how we can help you, talk to your regular EY contact or get in touch with one of our Capital and Infrastructure Team.



Benoit Laclau
Global Power & Utilities Leader
+44 207 951 8453
blaclau@uk.ey.com



Safia Limousin
Global P&U Capital and Infrastructure Lead
+33 1 46 93 61 58
safia.limousin@fr.ey.com



Claus Jensen
Global Program Management Lead
+44 7552 271165
cjensen@uk.ey.com



Steve McCabe
Global P&U EAM Lead
+1 678 429 5355
steve.mccabe@ey.com



Igor Sadimenko
Asia-Pacific EAM Regional Lead
+61 421 527 855
igor.sadimenko@au.ey.com



Kristen Westall
EMEIA EAM Regional Lead
+44 7768 752 018
kwestall@uk.ey.com



Richard Leyden
Manager EMEIA Power & Utilities
+44 7392 105945
rleyden@uk.ey.com



Andre Winarto
Global Power & Utilities and Energy
Knowledge Lead
+61 423 885 139
andre.winarto@au.ey.com



Alex Desbarres
Global Senior Strategic Analyst
+44 7971 193 830
adesbarres@uk.ey.com

Connect with us

ey.com/capitalandinfrastructure

@EY_PowerUtility

EY | Assurance | Tax | Transactions | Advisory

About EY

EY is a global leader in assurance, tax, transaction and advisory services. The insights and quality services we deliver help build trust and confidence in the capital markets and in economies the world over. We develop outstanding leaders who team to deliver on our promises to all of our stakeholders. In so doing, we play a critical role in building a better working world for our people, for our clients and for our communities.

EY refers to the global organization, and may refer to one or more, of the member firms of Ernst & Young Global Limited, each of which is a separate legal entity. Ernst & Young Global Limited, a UK company limited by guarantee, does not provide services to clients. For more information about our organization, please visit ey.com.

About EY's Global Power & Utilities Sector

In a world of uncertainty, changing regulatory frameworks and environmental challenges, utility companies need to maintain a secure and reliable supply, while anticipating change and reacting to it quickly. EY's Global Power & Utilities Sector brings together a worldwide team of professionals to help you succeed – a team with deep technical experience in providing assurance, tax, transaction and advisory services. The sector team works to anticipate market trends, identify their implications and develop points of view on relevant sector issues. Ultimately, this team enables us to help you meet your goals and compete more effectively.

© 2017 EYGM Limited.

All Rights Reserved.

EYG no. 05047-174GbI

BMC Agency
GA 1005514

ED None



In line with EY's commitment to minimize its impact on the environment, this document has been printed on paper with a high recycled content.

This material has been prepared for general informational purposes only and is not intended to be relied upon as accounting, tax or other professional advice. Please refer to your advisors for specific advice.

ey.com

The views of third parties set out in this publication are not necessarily the views of the global EY organization or its member firms. Moreover, they should be seen in the context of the time that they were made.