

Mizuho Americas  
Investment & Corporate Banking

MIZUHO

# Digital Horizons: Power, Energy and Infrastructure

Investing in the new frontier  
of digital transformation



# When Old Economy Becomes New Age

When thinking about digital transformation, we typically do not consider sectors like energy, power and utilities (P&U) and infrastructure as being at the forefront of digitalization. However, new digital technology is increasingly drilling into these foundational industries and having an outsized impact on productivity, efficiency and stability.



## Eat or be Eaten: Investing in the Digitalization of Infrastructure

Embracing technology is imperative as those who don't transform will find themselves as targets for unicorns, disruptors or the efficient producers. It is the integration of infrastructure and digital technologies that will allow businesses to operate more efficiently, thus generating greater profits. In 2020, the P&U sector spent \$3.2 billion on software alone<sup>1</sup> for utilities and is already seeing major improvements:



**Greater Cost-Efficiency:** McKinsey estimates that these efforts to improve infrastructure operations and systems can lead to a 25% reduction in operating expenses, “potentially saving approximately \$80 billion per year worldwide.”<sup>2</sup> Several companies have achieved this improvement in efficiency by reducing the cost from one to four cents per kilowatt-hour in power and by \$2 to \$12 per barrel in upstream oil and gas production.<sup>3</sup>



**Rising Production:** In settings where energy companies have digitalized successfully, they have seen between 2 to 10 percent improvements in production and yield.<sup>4</sup> McKinsey claims that the companies that listed digital transformation as a top priority were 1.5 times more likely to outperform expectations of profit.<sup>5</sup>



**Improved Operations:** Companies that have implemented digitalized infrastructure have seen gains in key safety, reliability and compliance metrics. For example, KPMG found that annual distribution transformer failure rates can be as high as 13.5%,<sup>6</sup> compared to 1 percent for mature utilities, but their use of Internet-of-Things (IoT) technology will allow them to reduce these rates.

These enhancements in efficiency, production and operations will lead to lower cost of capital and greater revenue, making energy, P&U and infrastructure increasingly attractive investments as they continue to digitalize.



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<sup>1</sup> Source: Bloomberg. NEF. <https://about.bnef.com/blog/power-sector-to-spend-5-billion-on-software-by-2025/>

<sup>2</sup> Source: McKinsey. <https://www.mckinsey.com/business-functions/operations/how-we-help-clients/capital-excellence>

<sup>3</sup> Source: McKinsey. <https://www.mckinsey.com/industries/oil-and-gas/our-insights/digital-transformation-in-energy-achieving-escape-velocity>

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<sup>5</sup> Source: McKinsey. <https://www.mckinsey.com/~/media/McKinsey/Business%20Functions/McKinsey%20Digital/Our%20Insights/Digital%20transformation%20Improving%20the%20odds%20of%20success/Digital-transformation-Improving-the-odds-of-success-final.pdf#:~:text=Among%20the%20digital%20transformations%20we%20studied%2C%20expectation-%20beating,also%20reserve%20sufficient%20funds%20for%20their%20digital%20transformations>

<sup>6</sup> Source: KPMG. <https://assets.kpmg/content/dam/kpmg/in/pdf/2018/12/The-power-of-digital.pdf>

## Transforming Energy: Fueling Change

There are 2.1 million miles of pipeline in the U.S. alone, and effective, safe maintenance of these pipelines' structural integrity presents ongoing challenges. New technologies are allowing companies to more efficiently manage these pipelines and ensure that issues are remedied immediately.

One of the most notable of these new technologies are Geographical Information Systems (GIS), which utilizes various photographs, maps and GPS technology to outline, implement and repair pipelines in demanding environments. This technology allows for enhanced efficiency and facilitates the job of the workers, lowering costs for the companies.

Another impressive technological development is Smart Pigs: adding microprocessor-based technology to the devices that travel through pipelines to identify any physical issues. Smart Pigs improve leak prevention, avoiding environmental damage, pipeline downtime and costly repairs. In addition to pipelines, energy companies are using automation, digitalization and IoT to improve efficiency, energy yield and safety on oil and gas operations.

Shell is at the forefront of this digitalization. They use drones to monitor their oil fields and pipelines, allowing them to reduce the amount of time on the road, man-hours used and potential for accidents, including leaks that add to emissions.

Done right and at scale, digital will materially affect competitiveness.

Narrow investments in digital across the P&U and energy sectors have shown ~2% to 10% yield improvements and ~10% to 30% cost improvements in capital, supply chain and operations. **What is the cost efficiency opportunity if these impacts hold at scale?**

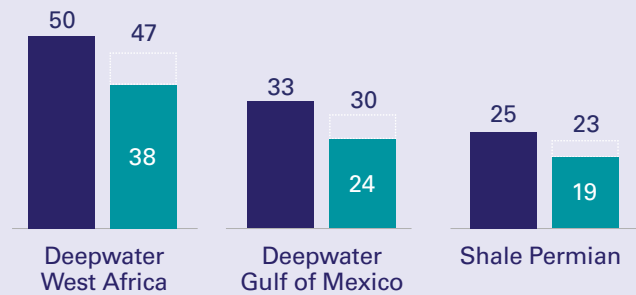
### Illustrations of potential operating cost impact

■ Baseline ■ Digitally enabled

#### Power,<sup>1</sup> \$/KWh



#### Oil and gas upstream,<sup>2</sup> \$/Kboe



Source: DOE 2018 US Wind Technologies report; Berkeley 2019 Utility Scale Solar report; Lazard levelized cost of energy v13; EIA; Rystad Ucube, McKinsey analysis

<sup>1</sup> Assumes US average figures for all operating plants, and midrange capex from listed sources for new build.





The global smart grid market, valued at \$29 billion in 2020, is poised to grow to over \$140 billion in 2028, with a CAGR of 21.9% over that period.<sup>7</sup>

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### Transforming P&U: A “Smart” Idea

Digitalization in P&U starts with managing the entire electricity grid and trickles down to the smart plugs on our bedside lamps.

The global smart grid market, valued at \$29 billion in 2020, is poised to grow to over \$140 billion in 2028, with a CAGR of 21.9% over that period.<sup>7</sup>

Smaller household technologies such as smart thermostats, plugs, lights and water sensors allow users to more easily control and reduce their energy usage. Furthermore, the development of smart meters lets homeowners keep track of their energy usage tendencies, allowing them to understand the breakdown of costs on their electricity bill and creating more transparency between them and the electric companies.

In addition to these customer benefits, the data gained from the use of smart energy devices in homes and businesses can be used for building energy load prediction, as well as enabling fault detection and diagnosis. It could also track

customers’ energy usage and the way in which individual communities are using home automation. Additionally, this data can provide predictive analytics that could provide outlines for future grid planning and digital development.

### Transforming Distributed Energy: Poised for Major Growth

What do rooftop solar, on-site batteries and grid-interactive water heaters have in common? They are in the category of distributed energy, which is estimated to grow to nearly 400 GW in the U.S. by 2025,<sup>8</sup> much greater than the amount of coal or nuclear power capacity in the U.S. today. Total investment in this space will top \$110 billion by 2026. Formerly dominated by non-residential capacity, residential installment will soon make up the majority of distributed energy resources. This technology will save power that is wasted during transmission, as well as be able to more rapidly adapt to energy needs by compensating for fluctuations in the power grid.

<sup>7</sup> Source: Fortune Business Insights. <https://www.globenewswire.com/en/news-release/2022/06/28/2470218/0/en/Smart-Grid-Market-Size-to-Hit-USD-140-53-Billion-by-2028-Exhibit-a-CAGR-of-21-9.html>

<sup>8</sup> Source: Green Tech Media. <https://www.greentechmedia.com/articles/read/coming-wave-of-der-investments-in-us>

## Transforming Infrastructure: What's Coming Down the Road

With the passing of the bipartisan infrastructure law in 2021, the U.S. government is investing \$1 trillion (\$550B of new funds) to rebuild America's roads, bridges and rails, expand access to clean drinking water, boost the electric vehicle market and expand access to high-speed internet. The language in the legislation asserts that America must address

issues such as poverty and climate change, while supporting interstate commerce in order to be globally competitive. Companies including broadband, automobile manufacturers and infrastructure / construction are set to gain from this funding. So where does digital transformation play in all of this?

### The Breakdown

## Infrastructure Investment and Jobs Act (IIJA)

**\$1 Trillion Total**

**\$550 Billion New Spend**

### Bill Highlights



**New spend**

\$550 billion



**Infrastructure resilience**

\$50 billion



**Roads, bridges and major projects**

\$110 billion



**Rail modernization**

\$66 billion



**Ports and airports**

\$42 million



**Power infrastructure upgrade**

\$65 billion



**Network of EV chargers**

\$7.5 billion



**Pollution removal**

\$21 billion



**Increase public transport accessibility**

\$90 billion



**Broadband infrastructure and development**

\$65 billion



**Clean drinking water**

\$55 billion

Transportation infrastructure is only beginning to scratch the surface of what is possible with the help of technological innovation. Upgrades in tolling infrastructure, smart roads, shipment tracking, electric charging stations and autonomous vehicles are just a few examples of all the new technological developments which can lead to increased efficiency and profit.

While toll roads have existed in the U.S. since the 1800s, modern toll collection began with the creation of the interstate highway systems in the 1950s. Digitalization of tolls began with the introduction of transponders like EZ Pass and SunPass, but speed of tolls has been increased by implementation of total cashless tolling and high-speed readers. Modern digital tolling creates the option for faster entrances and exits, automatic billing and the potential for flexible pricing related to different variables of a trip.

Smart roads are a new technology that is currently in the early stages in countries including China, the U.S. and the Netherlands. They will monitor wear and tear of highways, detect traffic jams and summon help when accidents occur. While the cost is substantially higher compared to traditional roads, the sale of traffic information obtained by smart roads could help defray the premium expense.

Another key development has been in the actual design of the physical infrastructure. New computer software allows for 3D models that combine design,

construction and operations, allowing everyone involved with projects to work off the same model simultaneously. Using this software, national road 3/25 Loten-Elverum in Norway was finished three months ahead of schedule and saved \$167 million.<sup>9</sup>

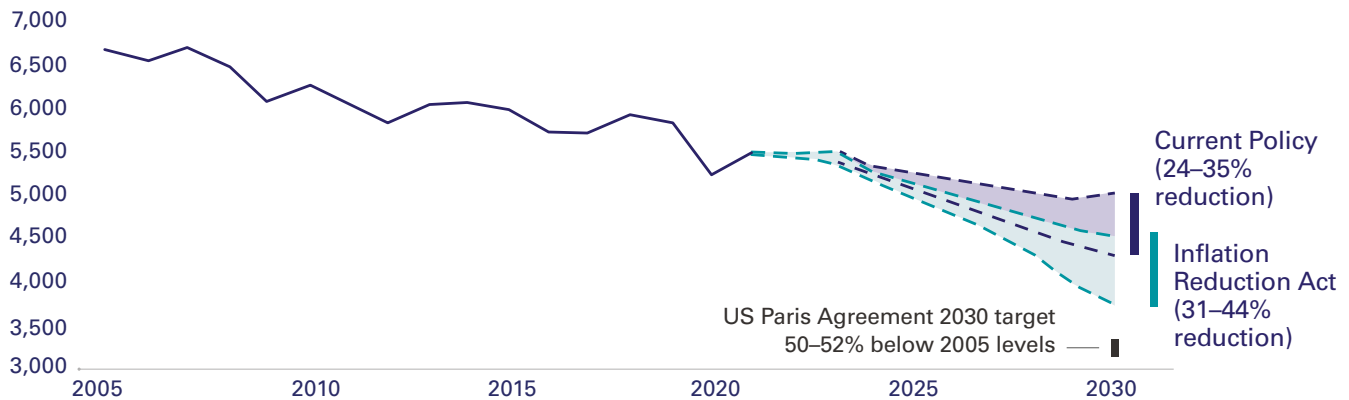
Industry participants are now focused on the Inflation Reduction Act (IRA), which brings additional government support to the renewables and nuclear sectors. The Act, signed into law in August 2022, incentivizes companies to make the switch to cleaner fuel sources such as wind and solar through a variety of tax credits that won't expire until the middle of the next decade. And by adding domestic content provisions, it helps create jobs in the U.S. and provides incremental tax benefits.

An independent analysis by the Rhodium Group, a think tank believes the IRA will help reduce emissions by 31–44% below 2005 levels by 2030. Other think tanks such as Energy Innovation believe the greenhouse gas reduction is closer to 37–41%.

These think tanks all agree on one point, that the IRA has the potential to be the most significant climate action ever taken by Congress.

With the implementation of the IRA and the expected growth in renewables, maintaining the grid via digitalization makes sense, especially from the vantage of being a predictive and reliability tool.

### Estimates for US Greenhouse Gas Emissions



Source: Rhodium Group

<sup>9</sup> Source: Forbes. <https://www.forbes.com/sites/forbestechcouncil/2022/02/09/the-time-is-now-how-technology-can-optimize-americas-infrastructure-opportunity/?sh=5917e0e177eb>

## Facing Headwinds: Challenges with Digitalization

Utilities face heavy government regulation, so the ability and incentive to monetize data, as technology and consumer companies have, is not as evident or compelling. Utility companies have significant information on habits and routines from energy consumption data, but it can be challenging to translate this into new growth opportunities or improved profit margins.

Digitalization has an enormous role to play in autonomous vehicles, but this space is still in its infancy. In order to support technological enhancements, several components need to be created or expanded in the current infrastructure ecosystem, including charging and service stations, staging areas for vehicle fleets, curb modifications and mobility hubs to switch between different modes of transportation. And then there is always the need for adaption and public confidence in the technology.

## Paving the Path Forward

Energy, P&U and infrastructure management teams have a generational opportunity to leverage digitalization to transform their businesses. They can seek out technology partners or acquisitions, invest in innovation labs or industry-focused start-ups, create industry consortiums to accelerate digital implementation, and work with public agencies to create public-private partnerships and help set supportive policy. Investors are likely to see these efforts as forward thinking and reward management for their efforts.



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## Beyond The Obvious Takeaways

### Infrastructure creates opportunities for inflation-linked investment

In a rising rate environment, the inflation protection offered by many infrastructure digitization investments is particularly attractive. Many such assets have long-term contracts that are directly linked to measures like GDP. The asset class more broadly is viewed as a strong inflation hedge due to the critical nature of the assets.

### Communications will be the glue holding everything together

None of the advancement in digital infrastructure will be possible without the required communications infrastructure. Data centers, towers and fiber provide

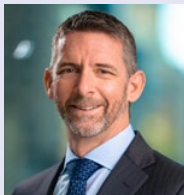
the groundwork for digital infrastructure to grow and develop. Data centers provide the storage necessary to run all the segments of these systems. The towers and fiber provide the connectivity to support the infrastructure. Energy smart grids will provide two-way communication between the utility and its customers.

### Digitalization can pave a road to prosperity

Beyond the financial benefits of digitalization, it can also enhance connectivity and accelerate access to resources through more efficient and widespread infrastructure in poor communities. Digitalization can improve health and safety by reducing pollution and provide cheaper energy to low-income communities.

## Look Beyond The Obvious

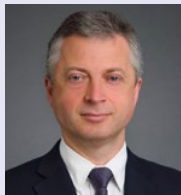
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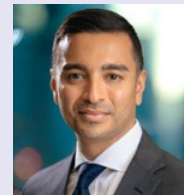
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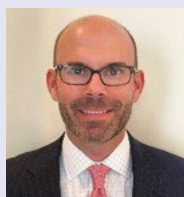
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The logo consists of the word "MIZUHO" in a bold, white, sans-serif font. Below the text is a white, curved line that starts under the 'M', arches over the 'I', 'Z', and 'U', and ends under the 'O'.