


The Future of Energy: Cleaner, Distributed and Customer-Centric

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INTRODUCTION

IN September 2019, over 25 participants gathered at the Chicago Connectory to discuss the global energy transition as part of The World Innovation Network (TWIN) Global, an annual gathering of innovation and growth leaders from across sectors and geographies. Participants included visionaries from inside and outside the energy sector, with representatives from industry leaders such as Exelon, Edison International, Dominion Energy, ConEdison, and Shell. Other pioneering companies across multiple sectors, premier academic institutions, think tanks, incubators, and investors driving change in energy industry also participated.

Through a combination of keynote perspectives, panel discussions, and collaborative breakouts, the diverse group of participants discussed the exciting future of energy. Topics included implications for climate change, distributed energy resources, the traditional utility business model, and the changing regulatory landscape.

The following is the first in a series of Technology Managers Notebook articles on insights and implications for managing technology and innovation in energy from various participating organizations.

INSIGHTS AND IMPLICATIONS

A Renaissance in Clean Tech Investing There's renewed interest and growing investments in clean tech. A steady reduction of computing costs combined with healthy Internet of Things (IoT) spend forecasts in this

industry creates a tailwind for investment. Utilities, oil and gas companies, manufacturers, automotive, and logistics companies are seeking innovative solutions at the intersection of physical assets and digital applications—a brave new cyber-physical world.

Venture investor Amy Francetic said that this “digital application layer” of the energy system can create profitable digital solutions that are capital-light, integrate hardware and software, and scale from energy applications to use-cases in other industrial verticals for additional revenue streams.

Transformation at the Nexus of Energy, Transportation, and the Built Environment

Transportation and building industry carbon footprints are prodigious. Utilities can help reduce these footprints. They can make major improvements to the grid to support a number of important industry transitions. These transitions include intermittent renewable generation, increased loads from electrification of other sectors like transportation and the built environment, and the novel load profiles from those sectors. Given these transformational factors and the urgency around decarbonization, it's clear that the future of energy runs through the utilities sector.

Four Key Trends That Could Create Value in the Energy Transition

It is likely that unforeseen technology developments—“unknown unknowns”—will play a significant role in the pace and scale of the energy transition. It is important to keep an eye on less established and emerging technology opportunities –

opportunities that could create or destroy value in the energy system.

Rocky Mountain Institute (RMI)'s Ned Harvey highlighted four trends: demand flexibility, the capital-light energy business model, the concept of convergence (hydrogen and other dense fuels changing the form factor of energy), and the rise of customer-centric energy. Each represents a potential value pool or destroyer of value.

FUTURES AND CHALLENGES

After a thought-provoking series of sessions, participants identified insights and challenges to realizing the benefits of the new energy future. The series of resulting themes included: a vision for the path to decarbonization; a call to action for utility risk-taking; taking stock of technology progress and gaps; and redefining the fundamental unit of value that energy and power companies provide.

Decarbonization Will Transform the Energy Market Absent clear federal climate policy, strong mandates for decarbonization from states, cities, and corporations will continue to dictate investment and policy decisions across the energy sector. These mandates are spurred by the urgent need for climate mitigation actions.

Energy markets will likely need to meet aggressive decarbonization goals by 2030 and beyond. Technology adoption—such as mass adoption of electric vehicles—must be accelerated while simultaneously maintaining affordability and equal access.

The first 50 percent of carbon emissions progress will come from “low-hanging fruit” that represent profitable business and technology advances. The second half of the decarbonization journey will likely

require even more disruption than the first half.

How Can Utilities Thrive in a Rapidly Changing Energy Market? Utilities face rapid change from all directions: from climate change to technology (renewables, storage, electrification, efficiency) to changing customer expectations to novel competition in former “monopoly” services like transmission, distribution, and generation. The regulatory nature of the U.S. utility often conspires to slow down adaptation, causing greater risk.

To keep pace, utilities must welcome new entrants while designing relationships that reward the utility for their investment in the assets they own.

Utilities are already engaging in broader conversations with community organizing bodies and regional transportation organizations. This engagement improves utilities' ability to adapt quickly.

They are also partnering with technology companies to speed up technology adoption and share risk in a way that satisfies regulators. As a part of that realignment, utilities will need to alter their corporate culture to reward learning from failure in the appropriate settings. Legislators and regulators also need to lean into their role as innovation drivers by designing policy that encourages the utility to move more nimbly.

Our Energy System Needs a Full Technology Portfolio and a Digital Layer To Manage It In meeting the challenge of decarbonizing the energy sector this century, technology poses an opportunity to unlock tremendous value. Encouragingly, we are experiencing a renaissance in energy technology venture investing. This investment is bolstered by tailwinds from the capital-light business model, the ability to draw revenue from sectors outside of energy, and

attractive paths to acquisition for these venture-backed startups.

Still, we need greater progress across a variety of fronts to achieve goals for decarbonization while providing safe, reliable and affordable energy to all.

Focus areas include:

- Accelerating energy-dense, carbon-free energy storage in the form of hydrogen fuels, batteries, or other technologies;
- Improving EV adoption and charging infrastructure for both light and heavy-duty vehicles;
- Advancing distributed energy resources by utilizing a flood of IoT data and software solutions to aggregate energy storage and create virtual power plants;
- Prioritizing carbon capture, which oil and gas companies are taking a strong lead on;
- Expanding nuclear, driven by increased research and development and venture capital to explore methods of prolonging the life of existing plants or reducing construction costs for new plants.

Redefining Utility Industry Value to Meet Customer Expectations

Driven by a proliferation of ultra-convenient consumer technology, customers expect personalization and “one-click” convenience. Utility customers will also change from energy consumers to energy producers via distributed energy resources and community ownership of solar energy. One thing won't change—customers will continue to seldom think about their utility, let alone kilowatt-hours.

The utility must redefine the value it provides. Value needs to include services that provide personalized customer benefits and outcomes, not just electrons.

Utilities can anticipate customer needs by listening to customers and engaging them, in order to help customers better understand the changes they will see in their energy system.

Utilities can keep pace with technology by accepting more risk, acting ahead of regulatory approval, and collaborating with third-party technology partners. They can start with white labeling—licensing a product from a third-party instead of developing it in-house.

However, there are occasions when utilities need to build technological capabilities in-house. For instance, utilities can invest in and own more EV infrastructure. The utilities need to ask themselves “How might we create new business models that drive EV adoption and transportation electrification?”

A PATH FORWARD

Following discussion of key challenges to achieving the group’s

vision for the future of energy, two key themes emerged for a path forward.

New Market Structures Can Accelerate Decarbonization To make progress in decarbonizing the energy sector by 2030, the U.S. needs a regulatory model based on environmental objectives to supersede the traditional regulatory benefit-cost analysis. The U.S. needs carbon pricing on a national level. State initiatives help, but issues as complex and large as climate change need broader structures to scale innovation economically. Political will, resulting from customers and utilities banding together, must drive the development of this market.

2030 and Beyond: Exponential Advancements in Technology and Adoption Harnessing the power of new technologies to decarbonize the grid, our transportation system and buildings will require new, cost-effective solutions that have not yet

been invented—for instance, hydrogen and advanced nuclear.

There needs to be more rapid adoption of the technologies that we have available now. Renewables coupled with energy storage and electric vehicles are existing and powerful exemplars.

This effort will require more capital flowing into energy technology. There needs to be rapid experimentation and implementation with a new mix of industry players to find those solutions. They need to drive costs down to the point they can be adopted broadly across the energy value chain.

Utilities must adopt new methods of innovation and identify new sources of value for their customers. Together, new market structures, advanced energy solutions, and more nimble, adaptive utilities can help realize the vision of a cleaner, more distributed and customer-centric energy system of the future.

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