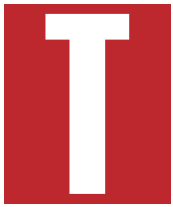


# Energy Cloud Playbook

Building  
Competitive Advantage  
for Grid of the Future

BY MACKINNON LAWRENCE AND JAN VRINS



The pace and impact of change in the energy industry are unrelenting. As echoed in Klaus Schwab's recent book, "The Fourth Industrial Revolution," the speed of current global breakthroughs across the physical, digital, and biological spheres has no historical precedent.

This revolution is unique in its velocity, scope, and complexity. Leveraging the pervasive power of technology and digitalization, innovations are evolving at an exponential pace.

Nearly every industry will be impacted. The energy industry is no exception. Already, the prolific rise of renewables and distributed energy resources, behind-the-meter smart devices, digital infrastructure, advanced controls and analytics, and changing customer demands are ushering in a new era of highly networked power.

The end result will be a whole-scale transformation in the way energy is produced and consumed. Moving away from one-way grid architecture powered solely by large centralized generation assets like fossil fuel, hydro, or nuclear power plants, toward a platform of two-way power flow and intelligent grid architecture. We call this the Energy Cloud.

Peer into a fully realized Energy Cloud. One can imagine an autonomous, self-healing grid leveraging the full capabilities of artificial intelligence and cyber-physical systems such as the Internet of Things, self-driving electric vehicles, and smart grid.

Leaving future predictions aside, the global march toward a cleaner, more distributed, and intelligent grid is showing no sign of slowing down.

### **Embracing Transformation**

Facing tectonic shifts in the industry, one certainty emerges. Yesterday's strategies and business models must evolve. Consider the following anticipated impacts of a mature Energy Cloud:

- Industry boundaries will be expanded. Barriers to entry will be lowered or eliminated. Markets will become increasingly segmented and inter-connected.

- New distribution channels and services will be created. Pricing for basic electricity versus incremental products and service will change. Pricing mechanisms will become more complex and diverse, and new products and services will proliferate.

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**Jan Vrins** is a managing director and Navigant's Global Energy practice leader. He advises utility executives on developing strategies for ensuring long-term operational and financial success in a rapidly changing landscape. Jan developed the Utility of the Future Framework to help clients understand how the trends in the market and evolving business models can improve their commercial and operational performance. His utilities industry experience includes investor and government owned utilities in North America, Europe and Latin America.

## **Toward a platform of two-way power flow and intelligent grid architecture, we call the Energy Cloud.**

While this evolution will be measured in decades, current innovations are sowing the seeds of disruption today. Disruption needs not imply negative consequences for incumbent players.

Utilities deeply invested in power infrastructure and directly serving diverse customers have much to gain. But they will need to embrace uncertainty and risk.

The good news is that among stakeholders, including utilities, there is now widespread consensus that the industry is facing profound change. However, industry surveys also suggest a lack of urgency among utilities.

More than half of respondents to a recent Navigant-PUF survey felt the role of regulated utilities would not undergo significant change in providing services to customers within the decade. And nearly fifty percent of industry respondents pointed to a supportive regulatory environment as the most important tipping point for moving aggressively into owning and operating distributed energy resources.

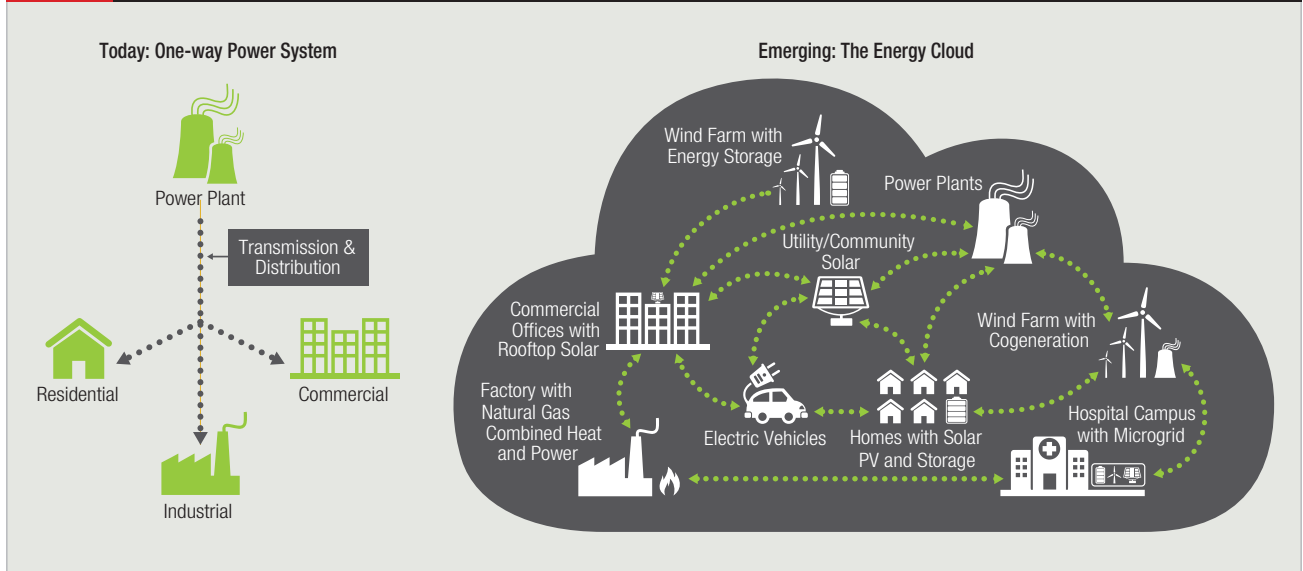
With digital innovation significantly lowering the barrier for market entry, competition will grow increasingly fierce. Consider that the most powerful and consumer savvy companies in the world, Apple, Amazon, Google, Oracle and others, are already staking out positions across the energy value chain.

Utilities that take a wait and see approach today will feel the impacts of this transformation most acutely. Worse, these utilities risk missing out on the expected growth opportunities that lie beyond the current purview.

To be sure, the path will not be easy. In the U.S. alone, where nearly \$400 billion worth of electricity is traded annually, an

**FIG. 1****THE ENERGY CLOUD**

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estimated \$850 billion worth of infrastructure is in dire need of upgrading. Meanwhile, the price tag for an all-in digital investment in the U.S. grid is estimated to be at least \$400 billion.

In many cases, utilities must make a choice. Do they perpetuate a predictable good system likely declining in value, or expose capital to yet-unproven solutions that have the potential to deliver improved power quality and revenue growth tomorrow?

### Energy Cloud Playbook

Predicting the future is always fraught with challenges, but we can begin to understand Energy Cloud transformation through the lens of clean, distributed, and intelligent energy. These trends describe broad paradigm shifts affecting how power is generated and consumed.

Facing an increasingly multivariable landscape and mass-produced technologies with ever-shorter life cycles, utilities must rethink many of the assumptions that have anchored strategic planning to date. This requires that utilities play both defense as well as offense to remain competitive.

An updated defensive strategy entails:

- Engaging with customers and regulators to understand customer choices vis-à-vis price and reliability. It also entails improving customer service and grid reliability at the lowest prices possible.

- It further entails finding equitable ways to charge distributed energy resources customers for transmission and distribution (services are also known as value of the grid.) And developing utility-owned renewable and distributed energy resources assets to appeal to environmentally conscious as well as prosumer customers, while diversifying asset base.

Playing offense is even more important. Utilities must:

- Create new revenue streams through the development

of new business models, products, and services, and transform their organizations and culture in order to fully integrate sales, customer services and operations.

- They must also continue to upgrade the grid and redesign operations to facilitate the integration of distributed energy resources, and invest in emerging technologies across the transmission and distribution grid. And take a holistic approach to planning that accounts for both current and future interdependence across technology, regulation, policy, economics, and customer demands.

The starting point is a holistic strategy planning process that seeks to outmaneuver disruption. Utilities must:

- Sponsor a cross functional team that will spearhead a strategy with a view toward a robust, integrated Energy Cloud planning, and assess how the Energy Cloud is evolving across markets in which the utility operates or has targeted for expansion.

- They must also identify inefficiencies in their current value chains and business models, and develop more efficient and cost-effective solutions. And finally, they must innovate relentlessly across their organization.

### The New SAIDI if You Will

#### 1. Sponsor a Team

Executive leadership of a utility should embrace the challenges and opportunities of the Energy Cloud. They should assign a cross-functional organization team that will assess the need to hone their understanding of the likely business environment in which they operate. This includes today as well as five, ten, and even twenty-five years into the future.

The team is responsible for developing an Energy Cloud playbook, working with internal and external stakeholders, based on scenario-planning linked to strategy, policy and

# UTILITY GRID REFORM

One example utility, that operates in what could be characterized as a Grid Reform state, with aggressive renewable and distributed policies, has taken a decidedly Energy Cloud mindset. Anticipating a more networked grid, this utility has begun developing new services, integrating electric vehicle charging with demand response, offering bring-your-own-device programs to customers, etc. To

serve an integrated, plug-and-play electricity system that it believes will enhance the value of individual assets across the network.

With the goal of shifting away from the traditional ratepayer model, this utility is taking steps to provide customers maximum flexibility and choice in how they use energy in order to maximize value across the network. To accomplish this, the utility has

proactively built collaborative partnerships with technology providers.

Or as one of the industry leaders in the recent *Public Utilities Fortnightly* report, “State and Future of the Power Industry” stated: “Utilities are between a rock and a hard place. Microgrids are not going away. But utilities should take the lead in every proposal. Lead rather than follow.” **–ML, JV**

regulation, integrated resource plans and operations and infrastructure planning.

Utilities in California and New York have assigned initial teams to support the Distribution Resource Plans and Distributed System Implementation Plans respectively. These teams will bring real focus to transformation and must do so by working across age old silos.

## 2. Assess Your Market

The potential for Energy Cloud disruption can be assessed by observing the impacts of clean, distributed, and intelligent energy within a market. These trends intersect five key dimensions affecting the utility business: customers, regulation and policy, business models, technology, and operations.

Each intersection across the matrix represents one of fifteen potential tipping points, based on the underlying drivers, in the Energy Cloud evolution.

The differences across markets can be assessed by asking specific questions pertaining to these intersections:

- What are the prevailing views of customers within my jurisdiction around the value of renewables?
- How are distributed energy resources solutions incentivized under the regulations and policies within my jurisdiction?
- What machine learning innovations have the potential to affect the utility industry?

By defining the scenarios most appropriate for their core or target markets today and in the future, utilities can evaluate strategic priorities to best position for long-term success.

A Business-as-Usual scenario will see minimal penetration of clean, distributed, and intelligent energy. Disruption may occur in only a limited number of the fifteen tipping points across the

Energy Cloud matrix.

Revenue allocation across the electric value chain remains mostly similar to existing percentages, such as generation accounting for nearly two-thirds of cost and revenue recovery.

Traditional forms of baseload generation will lead in these markets, with natural gas replacing coal, and moderate uptake of utility-scale renewables and penetration of distributed energy resources.

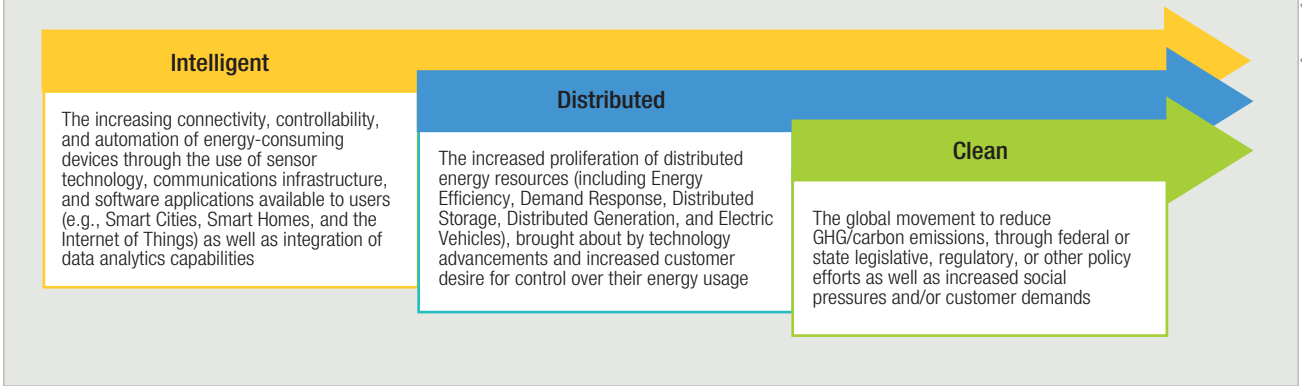
Smart grid digitalization efforts penetrate nearly all phases of grid operations, however, the focus is primarily on improving utility efficiency.

Incumbent utilities are expected to control a sizeable percentage of the value chain within these markets and successfully overcome threats to market share from third-party market entrants.



A Grid Reform scenario will see some penetration of clean, distributed, and intelligent energy, such as disruptions occurring in roughly half of the fifteen tipping points. Revenue allocation across the electric value chain shifts downstream on a limited basis with generation and retail accounting for roughly an equal share of cost and revenue recovery.

Additional revenue is attributed to digitally-enabled products



and services. Coal is likely to see aggressive phase-out. Utility-scale solar, wind, natural gas, and nuclear will fill much of the baseload void.

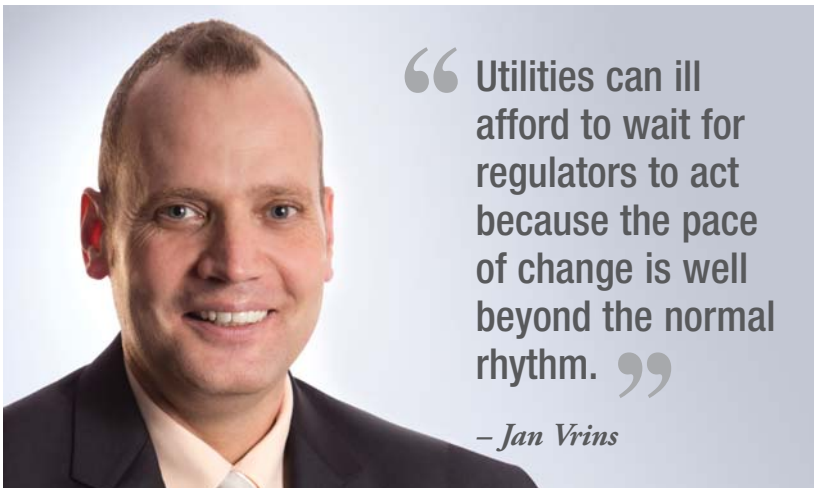
Adding to the mix, distributed energy resources uptake will be strong, with greater synchronization of technologies integrated into the grid. Grid operations are becoming more integrated, supporting individualized products and services, and enabled by advanced controls, including behind the meter tools and analytics.

A lack of harmonization of standards and protocols prevent autonomous grid operation. Utilities are likely to become moderately more specialized under this scenario, focusing predominately on infrastructure, services, and/or grid operations.

one hundred percent of total generation. Distributed energy resources uptake is accelerated, driven in part by robust market demand and prosumer engagement.

Grid operations are fully distributed and autonomous, and grid devices and networks are self-organizing and self-healing.

Utilities will likely own traditional assets such as poles and wires. And they will have an opportunity to forge a new vital role as an enabling platform for diverse market based offerings. Examples include enabling and facilitating transactions between and among market actors across the platforms such as transactive energy.



**3. Identify Inefficiencies**

With many utilities hemmed in by a regulatory model better tuned to the Business-as-Usual scenario, vulnerabilities abound across the energy value chain.

Because the Energy Cloud Playbook calls for evaluating inefficiencies in the current business, many questions arise:

- Do your customers feel they pay too much for your service and would they opt for a third party solution?
- Are your distribution assets fully optimized and could you save money by investing in data analytics?

It is important to link core assets to associated revenue in order to prioritize the assets which, if disrupted by a better solution in the marketplace offered by a competitor or new market entrant, would have a substantial impact on the organization’s bottom line.

An Energy Cloud scenario will see a convergence of clean, distributed, and intelligent energy across all five dimensions, with significant disruption occurring across all the fifteen tipping points.

Revenue allocation across the electric value chain shifts significantly downstream toward the customer, where current costs and revenues associated with generation and retail effectively swap. Customer acquisition costs and revenue recovery represents more than two-thirds of revenue.

Utility-scale and distributed renewables account for fifty to

**4. Develop More Efficient and Cost-Effective Solutions**

With value shifting significantly downstream, it is critical to develop more efficient and cost-effective solutions to optimize the current business. At the same time, utilities must create



## UTILITY BUSINESS AS USUAL

One example utility in a state representative of the Business-as-Usual scenario, stayed the course on investing in traditional generation assets and was reluctant to even pursue advanced metering investments. However, disappointing load growth and increased federal regulations targeting fossil generation of late, have begun undermining long-standing

assumptions, causing management to re-evaluate priorities.

This includes surveying distributed energy resources opportunities and contemplating shifting investments toward distribution automation assets and services. The questions remain whether these efforts will be too-little-too-late, as customers increasingly become targets for third-party

providers of energy services.

As another industry leader in the recent *Public Utilities Fortnightly* report, "State and Future of the Power Industry," stated: "The industry could go a number of different ways. But utilities could be blamed if things go poorly. The cost to consumers will be disruptive. And the additional expenses will start wearing on people." —ML, JV

investment space for new business models, products, services and technologies.

With some exceptions, utilities have generally not been granted much flexibility to take on significant risk when investing in emerging technologies. As with any such investment, the risk-reward trade-off is important.

And for physical assets, there is considerable value in being the second-mover or follower. But in the era of the Energy Cloud, where digital platforms have the potential to scale rapidly, latecomers could risk missing the boat.

The good news is that for utilities deepening their investment in emerging solutions, opportunities abound. With solutions proliferating across the value stream, utilities can protect upstream value while also creating new value downstream, especially on the customer side of the meter.

### 5. Innovate Relentlessly

Finally, the Energy Cloud Playbook calls for utility strategic planning to embrace the ability to fail fast, early, and often to keep pace with the acceleration of technology change. If innovation tells us anything, it is that many initiatives are bound to fail. Or even worse, return just enough to sustain interest and tie up resources for several years before finally flaming out.

The pursuit of new business models remains vitally important in this shifting landscape, whether regulated or not. But the utility opportunity lies more in the ability to continuously shape and prune distributed energy resources portfolios, embrace the rise of the digital prosumer, and capitalize aggressively on platform opportunities for bundled solutions.

To do so effectively, utilities must begin transforming their operations and business models today by simultaneously pursuing risk mitigation capabilities, and making bold bets on potentially high-growth product offerings.

And practically speaking, utilities can ill afford to wait for their regulators to act because the pace of change is well beyond the normal rhythm of the lawmaking and regulatory world.

Innovation by using an agile development framework and process provides a useful blueprint.

Agile innovation is focused on two objectives: accelerating the time to market readiness, and reliably producing high-quality results.

Agile innovation is designed to be highly iterative, enabling rapid adaptation to unfamiliar and turbulent environments. Sitting on the precipice of profound industry change, utilities that

embrace holistic planning while remaining flexible are likely to be the most successful at preserving and growing revenue.

## The good news for utilities deepening investment in emerging solutions, opportunities abound.

service provider, technology creator, and network orchestrator.<sup>1</sup>

Of these, network orchestrator has proven to be the most profitable and scalable by leveraging digital connectivity and delivering value through relationships or network capital. These companies create a platform that participants use to interact or transact across the network. Including high-growth ventures like Uber, Airbnb, and Spotify, these companies may sell products, build relationships, share advice, give reviews, collaborate and more.

To date, we have not seen network orchestrators at scale within the electric industry. As noted by Libert et al., physical things do not scale quickly, easily or cost-effectively. However, the emergence of the Energy Cloud means that anyone anywhere can sell energy services into an open market, typically on a forward-looking basis.

As proven many times over, network orchestrators are adept

### Will the Real Network Orchestrator Stand-Up?

According to Barry Libert, Jerry Yoram, and Megan Beck Fenley from the University of Pennsylvania's Wharton School, every company uses one or more of four business models: asset builder,

**FIG. 3**

**NAVIGANT'S ENERGY CLOUD MATRIX**

Source: Navigant Consulting

Dimension	CLEAN	DISTRIBUTED	INTELLIGENT
<b>Customers</b>	<ul style="list-style-type: none"> <li>■ Rise of Community Choice Aggregation (CCA)</li> <li>■ Demand for solar/wind</li> <li>■ Sustainability programs</li> </ul>	<ul style="list-style-type: none"> <li>■ Self-generation/storage</li> <li>■ Security/reliability</li> <li>■ Cost savings</li> </ul>	<ul style="list-style-type: none"> <li>■ Data access control</li> <li>■ Transactive energy</li> <li>■ Multiple communication channels</li> </ul>
<b>Regulation and Policy</b>	<ul style="list-style-type: none"> <li>■ Renewable Portfolio Standards</li> <li>■ Clean Power Plan (EPA 111[d])</li> <li>■ Paris Accord</li> </ul>	<ul style="list-style-type: none"> <li>■ Self-generation incentives</li> <li>■ Net Energy Metering</li> <li>■ Feed-in Tariffs (FITs)</li> </ul>	<ul style="list-style-type: none"> <li>■ Smart grid infrastructure investment</li> <li>■ Standardization</li> </ul>
<b>Business Models</b>	<ul style="list-style-type: none"> <li>■ Utility-scale renewables</li> <li>■ Green pricing</li> <li>■ Community aggregation</li> </ul>	<ul style="list-style-type: none"> <li>■ DER investment</li> <li>■ DSM/EE spend</li> <li>■ Energy services</li> </ul>	<ul style="list-style-type: none"> <li>■ Network orchestrator</li> <li>■ Variable rate design</li> <li>■ Performance-based incentives</li> </ul>
<b>Technology</b>	<ul style="list-style-type: none"> <li>■ Solar/wind adoption</li> <li>■ Cost decline</li> <li>■ Pairing: solar + storage</li> </ul>	<ul style="list-style-type: none"> <li>■ Distribution automation</li> <li>■ AMI</li> <li>■ DER</li> </ul>	<ul style="list-style-type: none"> <li>■ IT / data analytics</li> <li>■ Sensors / telecommunications</li> <li>■ Open vendor platforms</li> </ul>
<b>Operations</b>	<ul style="list-style-type: none"> <li>■ Integrated G,T&amp;D planning</li> <li>■ Renewables integration</li> <li>■ Load balancing</li> </ul>	<ul style="list-style-type: none"> <li>■ Distribution automation</li> <li>■ Volt/VAR</li> <li>■ Distr. VPP aggregation and dispatching</li> </ul>	<ul style="list-style-type: none"> <li>■ Customer engagement (e.g., BYOT)</li> <li>■ Cybersecurity as a foundation</li> <li>■ Data visualization &amp; controls</li> </ul>

industry disruptors. Funding, investors, customers and talent will continue to flow towards companies proving capable of capitalizing on digital networks and platforms.

As the Internet of Things, distributed energy resources, buildings, and prosumers proliferate across the edge of the grid, it is only a matter of time before an innovator leveraging ubiquitous digital connectivity establishes itself within the industry.

The utility industry must also adapt its culture. Composed of highly talented individuals largely trained in disciplines like electrical engineering, the industry must pivot rapidly toward a digital mindset.

For utilities embracing innovation, several fast-emerging platforms offer fertile testing grounds for new services and business models: virtual power plants (iDER – Integrated DER), smart cities, Internet of Things, zero-net-energy homes, buildings and the digital customer, transactive energy, and the energy communications superhighway.

Currently, many utilities are evaluating and making the initial investment in network orchestrator roles. In areas like virtual power plants, building energy management, microgrids, energy storage, and others. But these are just the beginning.

In all cases, there are numerous technology paths for utilities to pursue. However, network facilitation must be the focus of every strategy to maximize potential revenue returns in the Energy Cloud.

The concept of platform business models and multi-sided networks is at the heart of New York REV. The Distributed System Platform is their new structure for regulated utilities. We shall see how much this new role fits the archetype of the orchestrator model.

The scale and velocity of change facing the power sector has no precedent. But the payoff will be improved reliability, safety, cost, sustainability of power. And more importantly, long-term stakeholder value. **PUF**

## The scale and velocity of change facing the power sector has no precedent.

### Endnotes:

1. “What Airbnb, Uber, and Alibaba Have in Common,” by Barry Libert, Jerry Yoram and Megan Beck. *Harvard Business Review*, November 20, 2014.