Building a Thriving and Extended Utilities Value Chain

To transform from commodity power suppliers to innovative service providers, utilities must lead an emerging ecosystem that facilitates revenue decoupling, renewable energy and energy efficiency portfolio standards.

Executive Summary

The U.S. electric power sector stands at a crossroads, as numerous factors, both internal and external, challenge the traditional operating model. The utilities industry has remained unchanged for years, and for good reason: Business has remained extremely stable, predictable and insulated from most external macroeconomic events. Today, however, utilities face an array of challenges and opportunities amid a rapidly evolving information- and technology-driven environment. New approaches to serving customers by using less energy, cleaner energy and emerging technologies are taking hold, and at the same time, tried-and-true business-as-usual approaches have become more expensive, complicated and risky.

The challenges are unprecedented. The traditional goals of safety, efficiency and reliability have become even more important to attain, even while new global environmental issues arise, including climate change and national security concerns regarding foreign energy dependence. Meanwhile, future-thinking utilities must also support a growing desire by customers to have greater control over their energy use to reduce costs and decrease their environmental impact.

Meeting these demands and turning these challenges into opportunities requires a complete transformation of the traditional electric utility business model. So while delivering safe and reliable electricity will always form the bedrock of operations, the modern utility must now expand its vision and adapt to changing circumstances to deliver energy sustainably to customers and generate value for shareholders.

Traditional Business Imperatives

Traditionally, the utilities business model has revolved around the following four pillars (see Figure 1, next page).

- Grid security and service reliability: An electric grid has often been described as the world’s largest machine. Utilities perform the gargantuan task of managing this complex system every second of the day.
- Customer service: Serving customers is the foundation of the business, and in this heavily regulated industry, managing high levels of customer service is a tough task.
- Environmental responsibility: With 50% of the nation’s electricity needs still relying on coal as fuel, utilities have a major role to play in the environmental discussion.
• **Managing investments**: Utilities are among the most asset-intensive of all businesses, making it critical to maintain asset availability, increase asset productivity and enable a stronger return on investment.

Several significant and persistent trends are influencing and challenging the traditional utilities business model. Some of the most prominent ones include:

• **The imperative to reduce greenhouse gas (GHG) emissions** upwards of 80% by 2050. The electric power sector is the largest single source of global carbon dioxide emissions in the U.S., responsible for approximately 40% of total emissions (see Figure 2).

• **Projected growth in electricity needs.** Demand for electricity is projected to grow by about 30% in 2035 over 2005 levels. Most states in the U.S. support climate/clean energy policies, and federal action is likely in the near term that will further increase restrictions on fossil-fuel-based electricity generation (see Figure 3, next page). Japan’s March 2011 nuclear catastrophe raises further questions about the viability of nuclear generation as a sustainable clean generation source. Today’s utilities face significant challenges, from reducing dependency on fossil fuel and severely constrained capital expenditures, through heightened security requirements. This means relying on technology to optimize operations (such as the smart grid) and increasing collaboration with fellow utilities and technology providers to identify and develop alternative viable energy sources.

• **Continued declines in production costs** for renewable energy technologies.

• **Growing support and uptake of regulatory policies** to allow utilities to utilize large-scale energy efficiency as the lowest-cost energy resource.

• **Implementation of smart grid technologies** that offer utilities and their customers the information and tools to better manage electricity usage.

• **Growing interest and activity** in the development of plug-in electric vehicles (PEVs).

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**Assumed Economy-wide CO₂ Reduction Target**

![Figure 2](image-url)

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**Figure 1**

Utilities' Traditional Business Imperatives

![Diagram](image-url)
• Increasing recognition of domestic natural gas as a resource that is less carbon intensive than other fossil fuels for large-scale electricity generation, complementary to renewable energy resources and domestically abundant.

A utility that deals effectively with these trends will be better positioned to succeed in both the short and long terms. Further, such a utility is also more likely to provide better value to its customers and earn stronger returns for investors.

The far-reaching impact of these issues makes them more than just a utilities-only problem; solving these challenges will require close collaboration among customers, technologists, researchers and academia, as well as supportive regulatory policies that facilitate revenue decoupling, renewable energy and energy efficiency portfolio standards. The need exists for an ecosystem – an extended value chain – in which all stakeholders can thrive. Such an ecosystem will further support the ongoing transformation of utilities from simple, regimented, centralized brokers of commodity electric power to complex, diversified, innovative service providers equipped to face the future.

This necessary transformation brings into focus the important consideration of how utilities can create an ecosystem that optimizes expenditures, leverages the best skills and technologies and enables the realization of key business imperatives.

Traditionally, utilities have tended to develop business-technology capabilities in-house. Considering today’s uncertain economy and the vast challenges they face, utilities need to rethink their core operating assumptions. Given the considerable capital and skills requirements needed to modernize their business, utilities need to question the viability of relying solely on in-house capabilities to build all the new required capabilities vs. leveraging external skill sets that are proprietary in nature. Finding the best solution will be a delicate balancing act.

Before delving into understanding the solution, it is important to understand some of the structural changes happening in the industry that flow directly from the creation of an extended value chain.

The Extended Value Chain

As a form of energy, electricity offers diverse uses and has thus spawned numerous specialty industry sectors, with far-reaching downstream impacts (i.e., GHG emissions). As a result, extracting efficiency from the energy value chain now requires a holistic strategy that connects downstream and upstream sub-functions. Several

Solving these challenges will require close collaboration among customers, technologists, researchers and academia, as well as supportive regulatory policies that facilitate revenue decoupling, renewable energy and energy efficiency portfolio standards.

Electricity Demand Projection

![Electricity Demand Projection](image)
specialized business sectors are expanding the ability and purpose of the traditional value chain, such as:

- **Electronvolt (EV) and transportation infrastructure:** EV, battery switch, charging technology and other EV transportation infrastructure providers.
- **Energy management and demand curtailment:** Demand-side management (DSM) and load management solutions.
- **Carbon cap and trade:** Exchanges, traders, etc.
- **Energy storage:** Battery, flow battery, CAES, flywheel, ultra capacitors.
- **Distributed generation:** Individually owned generation and grid integrators.
- **Clean tech:** Solar, bio fuels, fuel cells.

Thus, the traditional value chain with upstream and downstream functions makes the extended value chain a reality (see Figure 4).

The smart grid has a key role to play as a value-chain integrator in the extended value chain. The likely benefits of extended value chain integration include:

- **Reliability:** An increase in the reliability of the electrical system through automatic outage notification, accelerated service restoration and improved grid asset management.
- **Environmental benefits:** Reduced emissions through enhanced grid efficiency and less need to build new generation, transmission and distribution facilities through increased system load factor and reduced peak demand.
- **Energy information marketplace:** Increased commercial benefits by encouraging the development of a new energy information marketplace that will provide the tools and services that consumers need to understand and manage their energy use.

**Structural Changes Enabling the Extended Value Chain**

It has never been more dire for our society to focus on extracting as much efficiency as possible from existing electricity infrastructure investments. For most utilities, this means increasing efficiency in generation, on the grid and also at the end-user level, while addressing the challenges posed by these mandates. To remain competitive, utilities must respond to the risks and opportunities presented by diverse and often conflicting objectives, such as the need to address climate change, carbon costs, fuel price volatility, emerging clean technologies, energy efficiency programs, customer expectations and competing third-party energy providers. Responding to
these challenges will require new core competencies and a remake of the industry’s value chain.

As stated previously, utilities cannot do this all alone. To succeed, they need to recognize and manage the emerging extended value chain. Figure 5 depicts how a utility that recognizes the extended value chain will differ from one that does not.

Thus, successful utilities will continue to own customers and their consumption, while new services and products will enable them to efficiently serve customers by successfully evolving and integrating new business capabilities into the extended value chain. This will create a single-channel delivery mechanism for all customer needs.4

The Skill Set/Specialization Landscape

The urgency of the challenges facing the utilities industry has resulted in increased attention from investors and the research community (see Figure 6). A tremendous amount of investment

<table>
<thead>
<tr>
<th>Factor</th>
<th>Traditional Utility</th>
<th>Utility That Recognizes the Extended Value Chain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Model</td>
<td>Simple, based on steadily increasing electricity sales, typically from an expanding asset base of centralized generation and traditional delivery infrastructure.*</td>
<td>Complex, integrated energy services serving diverse and evolving customer needs with an information-enabled infrastructure.</td>
</tr>
<tr>
<td>Services</td>
<td>Regimented commoditized services.</td>
<td>Diversified, innovative service provider.</td>
</tr>
<tr>
<td>Electricity Demand</td>
<td>Increasing.</td>
<td>Flattening (on a normalized base) with a potential decline, exception being the deployment of new electric vehicles.**</td>
</tr>
<tr>
<td>Capacity Cost</td>
<td>Average cost of new capacity stable or declining.</td>
<td>Average cost of new capacity increasing. ***</td>
</tr>
<tr>
<td>Utility Objectives</td>
<td>Reliability, customer service, affordability (low rates), returns to shareholders.****</td>
<td>Reliability, environmental quality, service quality, affordability (low bills), returns to shareholders.</td>
</tr>
<tr>
<td>Role of Consumer</td>
<td>Passive</td>
<td>Active, equipped with technology and incentives to manage energy consumption and generate energy.</td>
</tr>
</tbody>
</table>

* Although new technologies have been introduced, long equipment lifecycles, standardization and aversion to risk have tended to limit the implementation of innovative transmission and distribution system technology.

** New energy services, such as powering electric vehicles, may increase demand, but the net impact is currently unclear.

*** The cost of new capacity will be partially offset as low carbon-generating resources become commercially mature.

**** Investor-owned utilities, in addition to managing costs, have the goal of earning market-based returns for shareholders, while publicly owned utilities have the goal of minimizing cost for members.

Figure 5

Investments in Green Technologies

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The Skill Set/Specialization Landscape

The urgency of the challenges facing the utilities industry has resulted in increased attention from investors and the research community (see Figure 6). A tremendous amount of investment
and cutting-edge research has resulted in the rapid development of upstream and downstream technology specializations (see Figure 7).

Investments from outside the traditional utilities sector are pivoting around how energy is generated, transmitted and consumed – something that any utility can make extensive use of.

Figure 8 provides an overview of the specialization landscape that is emerging in the extended industry value chain. This is expected to evolve and mature as additional research is conducted and investments are made.

Regulatory Changes Amid the New Specialization Landscape

The regulatory environment may not be able to support the emerging extended value chain; however, it is widely anticipated that regulations will evolve as the industry changes and will encourage energy independence, renewable energy and energy efficiency. These policies, which fall within the purview of state governments and utility regulatory commissions, include:

- **Clean energy policies**: Set an overall direction to align clean energy goals across different government agencies, state and federal regulators and public service commissions and

### Utilities Industry Expansion

<table>
<thead>
<tr>
<th>Extended Value Chain Elements</th>
<th>Specialization Landscape</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric Vehicles and Transportation Infrastructure</td>
<td>Electric Vehicles Battery Technology Charging Technology EV Transportation Infrastructure</td>
</tr>
<tr>
<td>Energy Management and Demand Curtainment</td>
<td>Energy Efficiency Home Energy Management Load Management Load Curtailment Programs</td>
</tr>
<tr>
<td>Energy Storage</td>
<td>Battery Capacitor</td>
</tr>
<tr>
<td>Distributed Generation</td>
<td>Individually Owned Generation Grid Integrators</td>
</tr>
<tr>
<td>Clean Tech</td>
<td>Solar Fuel Cells Bio Fuels</td>
</tr>
</tbody>
</table>

Figure 8
drive changes that increase commitment to clean energy resources.

- **Renewable portfolio standards**: Incentivize compliance both at the consumption and generation stages and reward those parties that deliver results.
- **Revenue decoupling**: Create an innovative policy framework that removes utilities’ inherent disincentive for implementing large-scale energy efficiency frameworks.
- **Effective net metering**: Promote and incentivize distributed generation to facilitate consumer investment in on-site renewable energy generation.
- **Incentive rate-making**: Encourage long-term “right” investments by making provisions for premium returns.
- **Carbon footprint policies**: Set policies that incentivize customers and utilities to reduce their carbon footprints.

**A Strategic Framework for Assessing the Extended Value Chain**

How can a utility successfully build an ecosystem that uses the best industry elements? An integrated utility is in the best position to nurture this ecosystem and mentor partners to provide the highest levels of customer service. For this to happen, key questions must be considered, including:

- How can utilities design/build this ecosystem and weave it into their business strategy?
- How can they monetize their considerable investment to make this ecosystem possible? (Utilities’ investments in the extended value chain are said to exceed that of other members.) Regulators will play a defining role, without question.
- How does the ecosystem create standards and policies (with support of regulators) that enable its members to operate without conflicts?
- How can utilities ensure these efforts result in value to stakeholders?
- How can utilities develop strong internal capabilities, while leveraging the key capabilities of extended value chain members to maximize value to stakeholders?

We have developed an extended value chain framework that distills ecosystem development into a three-stage activity, comprising discovery, formulation and implementation phases.

- **Discovery**: In this stage, the ecosystem’s strategic intent is defined. After understanding the need, a situational analysis of the organization’s strengths, weaknesses, opportunities and threats (SWOT analysis) is conducted, and critical industry issues are raised. Finally, an external analysis—an assessment of the evolution of the extended value chain—is undertaken, noting that the ecosystem will evolve over time. This will give the utility an idea of the role and the degree of influence it has in creating the ecosystem.

Any gap that exists between a utility’s strategic intent, the strengths revealed through the SWOT analysis and the capabilities to be built into the extended value chain can be evaluated on the basis of the utility’s ability to deliver against these goals and its impact on the business. Additional aspects to consider include:

- **Developing an ecosystem hierarchy**, including creation of categories, roles and protocols.
- **Defining the extended value chain components** that must be considered as a part of the utility’s business.
- **Defining the relative importance** of the new extended value chain components to the utility’s business.

- **Formulation**: This stage involves the production of a clear set of recommendations, with supporting justification and supply strategies for accomplishing them. These findings lead into the prism assessment (see Figure 9, next page).

The prism helps utilities assess their unique capabilities, such as “ability to deliver,” which is the ability to deliver extended value chain benefits. It also ranks external extended value chain members in categories such as “participate, guide and mentor” in relation to utilities’ capabilities. This framework serves as a guideline for defining the in-house capabilities to be built, areas for collaboration and capabilities that are core to the utility’s business and should stay in-house.

- **Implementation**: This stage is based on the amount of “autonomy” a utility wants to build into the ecosystem. Accordingly, there are three approaches that can be followed.
**Approach 1:** Here, a utility creates an open playground for collaboration and innovation among technology, solution and service providers by extending access to its data within a legal and mutually acceptable commercial framework (see Figure 10). The most important aspect of this ecosystem is controlled and restricted access to data and the safeguarding of the utility’s privacy concerns and business interests. There are regulatory challenges and privacy concerns regarding access to customer consumption data.

It is important to build “openness” into the ecosystem that fosters innovation. This means anyone with an idea can be a part of the ecosystem, comply with the legal and commercial framework, partner with the ecosystem members and build an industry-leading solution.

There are several positive upsides to such an ecosystem:

- It offers high incentives for stakeholders, utilities and customers.
- The utility maintains control over and governs the ecosystem.
- Potential exists for large-scale innovation.
- The utility remains on the front end.

**Approach 1: Open Innovation**
Innovations likely to emerge from this ecosystem include:

- A charging station service provider can design locations, rates, etc., based on load, grid topography, etc.
- Customers can receive consumption alerts and notifications from a third-party (within the defined customer interaction framework).
- Customers can receive tailor-made solutions and services for functions such as energy efficiency, load control.
- Common interface and standards can be developed for interactions between EVs, appliances and the utility.
- Innovations can be developed, such as appliances that can communicate with the utility and the customer to determine the optimal timing for usage (such as a dryer, pool heater, etc.).
- For functions such as energy management, customers can choose from multiple vendors (ie. Google or Cisco), while utilities can use the tools they need to collect and manage data from the smart grid (à la iTunes).

**Approach 2:** This method is similar to Approach 1 but with a lot less openness (see Figure 11). In fact, Approach 2 is recommended when security and privacy issues are insurmountable. This approach allows for point-to-point interactions between the utility and ecosystem members. The additional layer of controls and governance constrains co-innovation and supports fewer ecosystem members. This may resemble the consortium approach followed by many industries for risk mitigation when pursuing unchartered waters.

The salient features of this ecosystem include:

- Limited to no data access.
- Utility involvement and investments; the responsibility for formulating problem statements rests with the utility.
- Fewer opportunities for innovation and incentives for participants.
- Similarities with existing one-to-one utility relationships/partnerships except that this model offers a common commercial and legal framework, expanding the opportunity for partners to co-innovate and collaborate for mutual benefit.

Innovations likely to come out of this ecosystem include:

- Utilities can certify and recommend a certain brand/type of LED lights, solar panels, charging stations, etc.
- Utilities can leverage a proprietary algorithm of an energy efficiency solution provider to deliver their DSM programs.
- Utilities can collaborate to develop and co-brand charging stations, battery switch stations, etc.
- Utilities can collaborate with distributed generation infrastructure providers and integrate their grid and back-end systems.
Approach 3: Point-to-Point Collaboration

In this approach, the utility attempts to enhance and fine-tune its strategic procurement process to fit the extended value chain (see Figure 12). This approach is recommended when there are legal and/or commercial challenges to building a multi-party ecosystem. Here, a utility builds a narrow consortium of (typically industry-leading) technology, solution and service providers. It collaborates individually, with or without other partners being involved. This significantly reduces innovation and solely relies on individual collaboration to boost the ecosystem.

Salient features of this ecosystem include:

- Access to data and utility problem statements may not be available to ecosystem members.
- Involvement and investments from the utility are significantly higher.
- Typically, the utility builds on its strengths and capabilities core to the business and collaborates with external stakeholders for the rest.
- Utilities may compete with external stakeholders for specific functions.
- Opportunities for innovation and incentives exist for fewer participants.

Looking Ahead

The extended value chain concept needs to be woven into a utility's strategy. To reach unprecedented vistas of operational innovation, utilities must find the right level of partner collaboration with stakeholders whose interests and capabilities are properly aligned. This wave of innovation stands to deliver on all macro-economic expectations and, most importantly, generate superior value to customers and investors.

Footnotes


4 Research from Cleantech Group.

About Cognizant

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