QUANTA TECHNOLOGY

STRATEGIC AND TECHNOLOGY ROADMAPS

Advisory Services

Grid Modernization

The landscape of the traditional electric utility industry is changing (some might say we're experiencing earthquake-level seismic shifts). Customers demand more: more choice, more control, more information, more reliability, more renewables, and so on. To meet these new customer demands, as well as to keep pace with the capabilities available for operating and maintaining an electric grid, electric utility companies understand the need to significantly improve their ability to adapt to changing technologies and markets. In some cases, the necessary changes are relatively simple technology upgrades; in others, the changes may involve major paradigm shifts in how business at traditional electric utilities is executed. As market needs and technologies evolve, so must utilities. However, this industry evolution is a moving target that can often be a challenge to address. Changing regulatory policies, emerging technologies, market competition, and customer expectations all contribute to the shifting environment to which a utility must adapt.

The development of grid modernization plans may involve a portion, or all the functions summarized below:

Investigation & Analysis of Evolving Issues

- Renewables integration
- Energy storage
- Data analytics
- Electric vehicles infrastructure
- Policy and regulation impact
- Cyber-security requirements
- Advanced metering infrastructure, distribution automation, substation automation

Telecommunications

Development of a telecommunications strategy and plan to support grid modernization requirements at the grid edge or wide-area network.

- Distributed processing intelligence and associated distributed architecture
- Communications for DERs and renewable energy resources
- Advanced metering infrastructure, distribution automation, substation automation
- Integration into overall communications strategy

ISO Support with Market Design, Software, and Controls

- Integration of DERs into ISO wholesale marketplace
- Key issues or considerations for large-scale DER penetrations: aggregation, communications architecture, and technology.
- Changes in key practices for ISO metering, telemetry, and communications.
- DER market participation architectures: business models and use cases

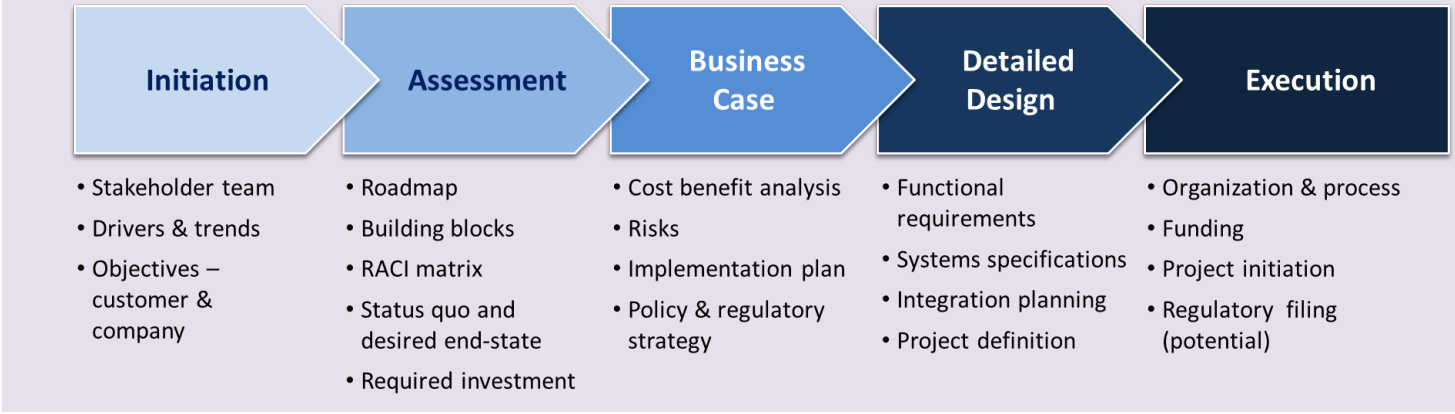
Benefit-Cost Analysis

- Benefits identification: a benefit is any project impact that provides value to a firm, household, or society in general. To gauge the magnitude of a "Grid Mod" project impact, benefits should be quantified.
- Develop benefit-cost model over a period of time (e.g., 5- to 10-year planning horizon) to capture payback periods of grid modernization projects
- Develop an implementation plan with project timings and yearly investments required to achieve desired target grid-modernized architecture

Strategic and Technology Roadmaps

- Research key-emerging, less-mature, developing technologies that could impact a utility's business and operations, be potentially "disruptive" game changers, have the potential to improve business, or have negative impact if no action is taken.
- Disruptive technology examples include:
  - Distributed energy resources (DERs), distributed control and peer-to-peer communications
  - Advanced communications: 5G, Internet of Things (IoT), fiber, etc.
  - Energy storage
  - Artificial intelligence, machine learning, and Blockchain
  - Electric vehicle (EV) fleet charging and aggregation
- Perform a risk assessment to prioritize and categorize technologies with respect to their potential value to a utility's business and to establish feasible timeframes for introduction.

Phases in the Quanta Technology Grid Modernization Program



Grid Modernization

There is no "silver bullet" to address the changes impacting the US utility industry, because, at its core, there is no single factor or element at which to take aim. Rather, the need for grid modernization is being driven by the aggregation of various effects of the industry's numerous components. The challenges associated with these often-disparate elements require a coordinated strategy to address them in a manner that achieves the greatest synergy. Identifying the key industry trends and drivers behind the need a grid modernization strategy is easy (renewal generation, advanced grid technology, energy storage, microgrids, electric vehicles, aging infrastructure, energy demand growth, data analytics, and policy and regulation, as well as many others);); developing the strategy to expertly address these trends and drivers is not so easy and requires some of the best minds in the business.

Why Quanta Technology?

Quanta Technology's comprehensive approach and understanding of the "big picture" makes our offerings distinct from other firms. Unlike management consultants, we perform detailed model-based engineering analyses, which enable our studies to be more practical and feel "more real." Unlike pure engineering firms, Quanta Technology can offer detailed benefit-cost analyses. We are also capable of performing testing and implementation of technologies through our Sustainable Technology Integration Laboratory (QT-STIL).

Consultant Capabilities

The professionals at Quanta Technology have expert knowledge in numerous industry subject areas with years of experience working alongside major utilities in this field. Our team members have extensive domain knowledge and a relevant track record in various aspects of this study: regulatory/market rules, business practices, standards and protocols, technology, architecture design, and cost assessment.

Our SMEs closely follow industry trends and are recognized as thought leaders in the industry, through active participation and leadership roles in organizations such as the IEEE and CIGRE, including IEEE Working Group on Distributed Resources Integration, IEEE 1547.7, and 1547.8 Working Groups, CIGRE C6, NIST/DOE SGIP, and others.

Project Experience: We have been involved in developing grid modernization plans for the entire spectrum of industry organizations including major utilities, individual municipalities, small and large co-ops, and even an entire country. Projects have included strategy development, benefit-cost analysis for DER valuation, and roadmaps for energy storage, grid of the future, smart-grid architecture, life-cycle management and value-based maintenance, and even complete organizational redesigns.

About Quanta Technology

Quanta Technology is an independent technology, consulting, and testing company providing business and technical expertise, along with advanced methodologies and processes, to utilities and others in the power and energy industries. Our mission is to provide unparalleled value to our clients in every engagement across the value chain by using advanced software and hardware, laboratories, and custom tools for a holistic approach to practical service and the most insightful thought leadership in the industry.

For Additional Information Contact:

Northeast (USA) and Québec
Mike Longrie: MLongrie@Quanta-Technology.com

South/Southeast (USA) and Ontario
Diana Prkacin: DPrkacin@Quanta-Technology.com

Central (USA and Canada)
Evan Estes: EEstes@Quanta-Technology.com

West (USA and Canada)
Reza Nasri: RNasri@Quanta-Technology.com

International (outside USA and Canada)
David Elizondo: DElizondo@Quanta-Technology.com

Smart Solutions
Practical Results

QUANTA TECHNOLOGY