



BELL LABS ADVISORY SERVICE FOR SMART GRID NETWORK TRANSFORMATION

STRATEGIC PLANNING FOR THE
MODERNIZATION OF UTILITY
COMMUNICATIONS NETWORKS

APPLICATION NOTE

SUMMARY

Bell Labs' Advisory Service for Smart Grid Network Evolution provides a utility with a customized, vendor-agnostic communications network evolution plan. This plan describes in detail the architecture of the modernized network and incremental steps that should be taken by the utility to evolve its existing communications networks to a modernized, reliable and secure network capable of supporting all legacy and currently-envisioned Smart Grid applications.

Bell Labs' Subject Matter Experts work in close partnership with the utility's Subject Matter Experts. Using network design and analysis capabilities developed by the Bell Labs team, utilities receive detailed analysis of the Total Cost of Ownership associated with candidate evolution scenarios. The Bell Labs team quantifies the costs associated with the utility's existing networks, giving utilities the information they need to take action. Accompanying analysis quantifies the costs and benefits of alternative evolution plans, wireless and wireline technology options, the use of private and public networks, and different operational models.

This service leverages Bell Labs Subject Matter Experts in Smart Grid applications, utility operations networks, wireless and wireline communications technologies, network security, network operations, network economics, reliability, and network planning.

QUANTIFYING THE FINANCIAL IMPACT OF NETWORK MODERNIZATION

From a recent Bell Labs Advisory Service engagement for a utility:
35% Total Cost of Ownership savings over the utility's 7 year planning horizon identified in Bell Labs Smart Grid network transformation plan by migrating portion of operational network from leased services to a modernized, private wide area network.

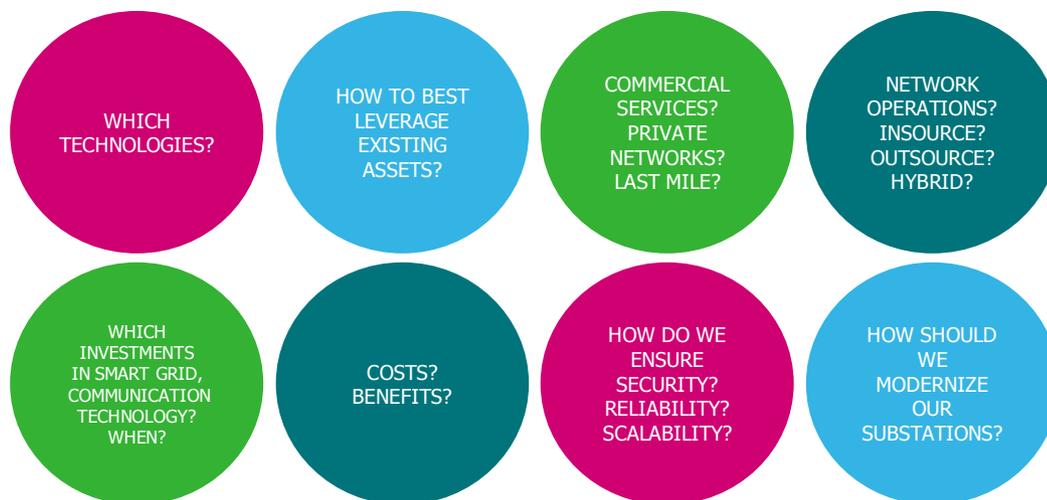
THE NEED FOR TRANSFORMATION

Introduction of Smart Grid applications over the next decade is driving utilities to fundamentally transform the way they operate their communications networks and provide services to their customers.

By transforming legacy utility communication networks to an integrated Smart Grid communication network, utilities can efficiently and economically support new Smart Grid applications, markedly improve network reliability and security, streamline network operations, and significantly reduce operations costs.

Advanced Metering Infrastructure, Substation Automation, Distribution Automation, Distributed Generation, Distributed Storage, Video Monitoring, Synchrophasors and other applications will increase the number of end points that must be monitored and controlled by 1,000-fold or more over the number of endpoints managed today. Plans to develop a highly secure, highly reliable, and high capacity network must be properly aligned with an overall strategic network evolution plan and network architecture. Such alignment helps ensure the proper amount of capacity is designed into the network, the proper features needed to support reliability and security are incorporated, costs are properly budgeted, and investments made in a way that optimizes capital outlay, operational expenses, and operational benefits.

Smart Grid Network Transformation: Weighing alternatives



The communications network transformation which lies in front of utilities is multi-faceted and complex. Bell Labs' Advisory Service assist utilities in the planning necessary to ready their networks for the introduction of Smart Grid applications. This vendor-agnostic service combines the in-depth expertise of the Bell Labs team in Smart Grid technologies and the underlying communications technologies with industry best practices in network analysis, network design, network operations, security network management, network planning, total cost of ownership modeling and network economics.

DATA-DRIVEN DECISION MAKING

Bell Labs' Subject Matter Experts work in close partnership with the utility's Subject Matter Experts and executive stakeholders to select the best alternatives for network transformation.

Highlights of the service include:

FORCES OF CHANGE

Many utility communication networks are ill-equipped to handle the >1,000-fold growth in devices and the communication requirements of new grid applications.

FINANCIAL IMPACT

Bell Labs recently developed a network transformation plan for utility. Bell Labs' analysis showed that the Total Cost of Ownership of this modernization plan was projected to save the utility 35% over the utility's 7 year planning horizon. The results of the study were used in part by the utility CFO team to justify the network transformation.

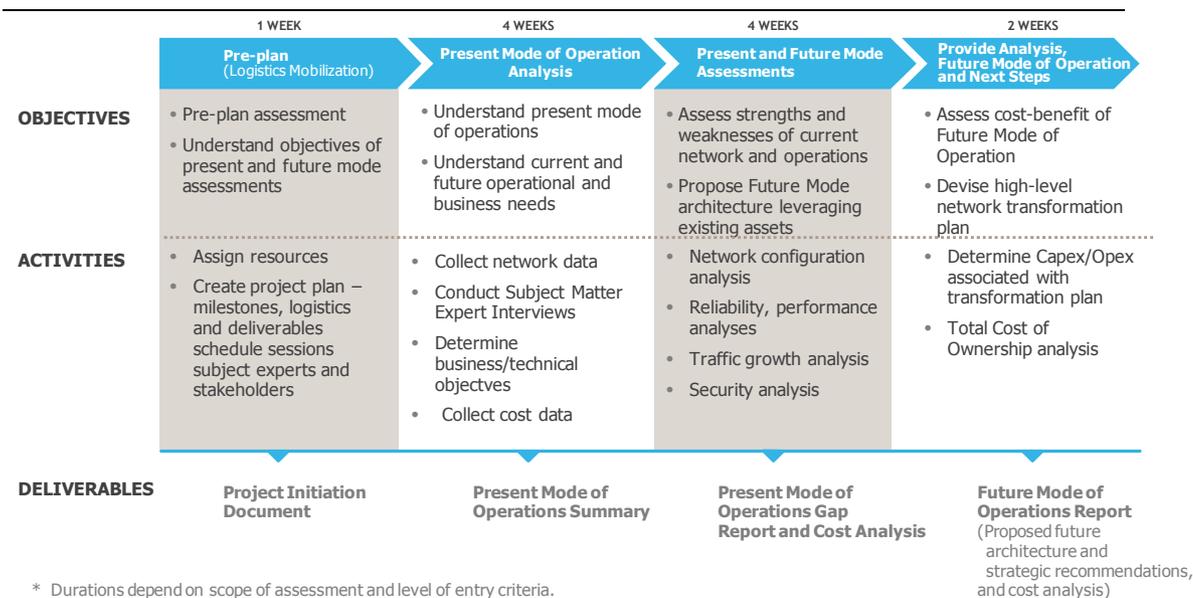
- A comprehensive, utility-driven requirements discovery process using templates and tools design by Bell Labs that have been refined through advisories conducted with utilities worldwide. Each utility’s Smart Grid evolution strategy will be driven by the utility’s unique business, customer, and regulatory environment. The discovery process is designed to extract requirements from all stakeholders across all lines of business.
- The use of field-proven, state-of-the-art tools in network design and costing, Smart Grid application traffic modeling, reliability analysis, and business modeling.
- Vendor-neutral analyses to clearly quantify the impact of supporting future Smart Grid applications, objectively assess the pros and cons of network evolution options, assess the level of investment required to support different migration options and network expansion scenarios, and assess the impact of the transformation on operations cost reductions.

Bell Labs’ network transformation methodology is focused on data-driven decision making. Costs and benefits of different network evolution scenarios and technology alternatives are quantified. Extensive sensitivity analyses help utilities know which variables have the greatest impact on the financial aspects of the network transformation, helping utilities mitigate risks and giving them the information they need to act.

SERVICE DELIVERY

The Bell Labs Advisory Service engagement typically is performed over an 8 to 14 week period. A typical 11 week project plan is shown below and consists of interviews with the utility subject matter experts, analysis of the present mode of operation, developing future mode target network architecture and network transformation plan, and financial analysis.

Typical service delivery timeline



BENEFITS

The vendor-agnostic Bell Labs Advisor Service provides actionable information for use by stakeholders across the utility:

- Development of a strategic network transformation plan consistent with the utility's Smart Grid vision. This plan serves as a detailed guide to the overall transformation.
- Documentation and assessment of the utility's existing network infrastructure and recommendations on required short-term remedies. Because of the siloed nature of many current utility communication networks, a holistic view of the utility's existing networks and costs is often not readily available to utility decision makers. Documentation prepared by the Bell Labs team describes in detail the utility's present mode of operation and associated cost.
- Development of a phased network modernization, expansion, and evolution plan aligned with utility business objectives.
- Recommendations on target network architecture and network design choices for network performance, reliability, security, and scalability. Some of the highlights include recommendations for quality of service, diversity and disaster recovery, network security zones, and management of introduction of new Smart Grid applications.
- Assessment of compliance with relevant security and reliability standards (e.g., NERC CIP in North America).
- Incorporation of existing utility network assets as well as support of legacy applications and systems.
- Total Cost of Ownership analysis and other financial analyses consistent with utility business practices, including sensitivity analysis to estimate the effect of variation in assumed input values of the business models. These financial analyses are performed at the level of detail needed for utilities to justify capital investment expenditures.

The documentation delivered by the Bell Labs Advisory Service team is a comprehensive resource useful throughout the utility's network transformation – all information is documented in one place.

WORLD-CLASS SUBJECT MATTER EXPERTISE

Bell Labs has been at the forefront of Smart Grid communications and Smart Grid network transformation. The Bell Labs Smart Grid Network Advisory Service Team:

- Is comprised of world-class Subject Matter Experts with extensive experience in network evaluation, improvement, and Smart Grid evolution studies with utilities across the globe.
- Is multi-disciplinary, with Subject Matter Experts in all areas needed for utility network transformation, including wireless, optical and IP networking, security, reliability, network design, network discovery, network architecture, network operations, Smart Grid applications, network economics, and grid applications. The service team includes experts in all these areas as well as in business planning and financial analysis.

WORLD-CLASS
SUBJECT MATTER
EXPERTISE
Drawing on our Smart Grid research and Smart Grid network transformation consulting experience, Bell Labs' authors recently published a book "Communication Networks for Smart Grids: Making Smart Grid Real" (Springer 2014)

