It's all about the network

An Illinois Smart Grid Initiative Thought Paper

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Silver Spring Networks builds standards-based, Internet Protocol (IP) networks for the Smart Grid that enable utilities to make the business change necessary today to improve efficiency, reliability and customer service while also reducing costs.

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It's all about the network.

Ask a dozen people today what the smart grid is all about, and you'll get a dozen different answers. Everyone has their favorite smart grid function, ranging from advanced metering and demand response to distribution automation and plug-in hybrid electric vehicles. Smart grid stakeholders must recognize that these *applications* all have in common a reliance on *networks* in order to succeed.

Start Smart. Stay Smart.

Already, many are nervous about the cost of smart grid investments, reminding us how important it is to build the smart grid right from the start. With foresight, we can maximize the usefulness of smart grid applications by designing them to share a common network infrastructure. Conversely, we can minimize the cost of the information infrastructure by ensuring that a single network, utilizing open standards and employing diverse technology options, can run a variety of smart grid applications. Think about the modern personal computer: it connects to the Internet easily and enables a wide range of useful applications, such as emailing, instant messaging, social networking, web surfing, etc.

It is essential to plan robust smart grid networks from the start. Otherwise, we risk building competing, redundant networks for each smart grid application. The result would be economically unnecessary and politically indefensible costs. Imagine buying one computer for email, a second one for web surfing, one more for social networking, and yet another for instant messaging!

Networks are boring. Why not focus on smart grid applications?

It is natural for us, as smart grid stakeholders, to be drawn to the promise of new, innovative services. After all, personal computers became useful to mass market consumers only after the first "killer app," word processing, was invented.

But consider what happens when enthusiasm for applications comes at the expense of careful thinking about the underlying infrastructure. Back when PCs entered the mainstream marketplace in the 1980s, incumbent typewriter companies realized that "word processing" could destroy their industry. In response to this competitive threat, many typewriter manufacturers focused on developing rival word processing products.

The result was little more than a typewriter with screen, and it delivered basic word processing at a lower up-front cost than a personal computer. But it couldn't do much more than what it was built for, and as demand for other applications grew, consumers ultimately had to buy a PC anyway to run other applications, such as spreadsheets,

desktop publishing, etc. In the long run, standalone word processors proved to be poor investments, due to their focus on a single application and the simple fact that they were not networked. In contrast, PCs showed themselves to be far more interoperable platforms capable of running a variety of applications, ultimately remotely upgradeable over a powerful networking platform called the Internet.

This example reinforces the notion that we must get the underlying infrastructure –the smart grid network – right first before we get too caught up in smart grid applications.

How do we get the network right, then?

It's not going to be easy. Regulators and their staffs must become fluent in a technical domain outside their traditional expertise. Rate recovery has traditionally favored "steel-in-the-ground" projects over less physically tangible investments. Utilities often minimize up-front capital costs, without sufficient foresight toward long-term implications, in order to secure rate approvals. Vendors are scrambling to gain market share, paying little heed to the risks of technology failures. Customers generally discount the potential individual and societal benefits that would result from grid modernization, but are sensitive to the costs of such investments. And many stakeholders are caught up in their enthusiasm for smart grid applications, underestimating the need to begin by building a solid network foundation first.

A handful of guiding principles can help us to start smart, stay smart:

- Separate decision-making about networks from selection of applications. (i.e., smart meters are just endpoints on networks)
- Reserve sufficient bandwidth for future smart grid services (i.e., buy a size up, in order to leave room to grow into it)
- Minimize latency to provide enough performance for real-time, on-demand services (i.e., think milliseconds, not minutes)
- Favor proven technologies that can scale (i.e., requirements for moving data grow exponentially as networks grow from tens of thousands to millions of endpoints)
- Prioritize upgradeable solutions (i.e., consider how much effort and time it takes to upgrade firmware across the network)
- Emphasize open standards and universal protocols for interoperability (i.e., make sure the network all speaks one well-known language, so that newcomers can join easily). For example, Internet Protocol (IP) has been proven at scale, offers industrial-strength security, and leverages hundreds of billions of dollars of collective R&D.

Conclusion

Standards-based, interoperable network technology exists today, and is being deployed by leading utilities in the smart grid. *Start smart* by building robust networks, making it easier to *stay smart* by developing applications to improve our lives, strengthen our energy system, and protect the environment through the smart grid. *It's all about the network!*