Why Cisco And Smart Grid?

Q. **What is smart grid?**

A. Smart grid is the term generally used to describe the integration of all elements connected to the electrical grid with an information infrastructure, offering numerous benefits for both the providers and consumers of electricity.

Smart grid can be considered an intelligent future electricity system that connects all supply, grid, and demand elements through an intelligent communication system. The backbone of a successful smart-grid operation is a reliable, resilient, highly secure, and manageable standards-based, open communication infrastructure that intelligently links the elements of the grid while participating in the decision making that delivers value to the utility and supply and demand entities connected to it.

Q. **What is the current state of power distribution and management?**

A. Much of today's systems are one-way. Power is generated and distributed through the utility (or leased) transmission and distribution lines, and either consumed or not. There is no storage capability, so power-generating facilities need to have excess capacity in order to meet peak demands, or consumers experience service disruptions. Feedback on energy consumption is limited, and consumers may or may not have access to current energy consumption (demand) and pricing considerations.

In short, much of today's electrical generation capability is one-way: Produce as much as you think you need to meet the peak demand without any feedback, but make sure you have enough so the consumer does not go without.

Q. **What are the concerns and inefficiencies in today's approach?**

A.

- Energy consumption is rising and is anticipated to rise even more as consumers use more energy-consuming devices (imagine a plug-in hybrid vehicle in every garage that gets plugged in to recharge every night at 9 p.m.) The generating utility must meet anticipated peak demand.

- Consumers are exploring alternate sources of energy (wind, solar, etc.) and may be able to give excess power back to their utility, or could significantly reduce their consumption, complicating the forecasting ability of the utility while raising pricing concerns for both the utility and the consumer.

- The utility must begin to anticipate these new sources of energy as well as the questions related to them.

- Base energy costs to generate electricity are rising or in some cases inconsistent, complicating the forecasting task for many utility companies.

- Regulations from respective governments may complicate emissions, allowable price to the consumer, etc.

- In simplest terms, the generating facility lacks visibility to the end devices and consumption across its grid and suffers operational inefficiency, leading to potentially higher costs as well as inability to supply.

- Utilities are also deploying a variety of "smart sensors" or intelligent end devices (such as programmable thermostats) to help them sense and manage demand. These intelligent sensors present a communications need to the utilities that often does not presently exist. Many utilities are also installing or contemplating the installation of automated meter reading, both to provide more accurate real-time data and to reduce the cost of manually reading meters. However, in many cases there is no communications infrastructure to get this data back to an operations center.

Q. **What are the various nodes in the power network?**

A. Power utilities have some sort of generating facility where raw fuel is converted to electricity. A transmission line and associated substation carries the electricity from the generating location out to be consumed. A distribution network breaks down the high-voltage electricity for consumption by consumers, commercial buildings, and manufacturing facilities. Inside each of these consuming locations is some sort of feeder box that provides local control of the electricity.

A variety of communications occurs between these places—including Ethernet, wired serial communications, and wireless. Sometimes they are based on proprietary networks, sometimes open. In some cases an existing Supervisory Control and Data Acquisition (SCADA) system exists through part of the grid management system. In some cases an existing distributed control system (DCS) controls part of the existing grid.

Q. **What are the benefits of smart grid to different stakeholders?**

A. Smart grid offers the utility and the consumer bidirectional communication and visibility to better control electricity supply and demand as well as the cost associated with it. Both consumers and utilities will be better able to manage their energy costs, and future expansion of the "grid" to allow new capabilities will be enhanced.

Q. **What components are needed to deliver a smart grid? What are the gaps and opportunities?**

A. A secure, integrated communications network from the generating station to the end device is critical. Providing secure communication among all the various entities that may exist (or may not, depending on the local regulatory and utility operation) is also a critical component of any solution for smart grid.

This scenario translates to secure Ethernet switching and routing, secure wireless, secure access to meter reading, secure access to end devices in the home or business, trust between the consumer and the utility, secure unified communications between the utility and remote workers or facilities, and potentially intelligent messaging to the consumer or remote workers—in other words, everything that Cisco does well today.

Q. **What is Cisco's vision and strategy for smart grid?**

A. In many ways we see this scenario as analogous to the birth of the Internet. Islands of operations are spread throughout the "grid" area. These islands may be (and include) the generating facility, the transmissions substation, the distribution substation, the home, the commercial building, the manufacturing plant, and the network operations center (perhaps multiple centers per utility).

We see our opportunity as one of providing intelligent, transparent communication infrastructure between these various entities. The infrastructure includes unified communications between workers and facilities, extending into the home or commercial building to enhance their ability to control energy usage as well as enhance their communications and control through an integrated network, and securing the entire enterprise with Cisco security products.

We see an opportunity to provide thought leadership to all of the entities involved, whether they be utility, consumer, business manager, industrial plant manager, or others.

This architecture will take the form of a proven documentable and replicable architecture on which to securely build a smart grid that will remain secure as capacity is added.

Our plan is to build a Cisco Validated Design for Smart Grid that is replicable and proven.

Q. **Why is Cisco relevant in this market? What is Cisco's value add?**

A. Cisco is the world's leading supplier of communications products that have led the development of the Internet. The communication needs of the utility industry are similar to the challenges that our expertise and solutions have helped overcome in the past, working in concert with customers and partners to develop a solution that grows over time.

Cisco is very well-known in the enterprise, meaning that business customers know us as a valued supplier, and we continue to grow in the home and business sectors.

Cisco is well-positioned to provide an end-to-end solution. We have demonstrated the ability to work with important partners to accelerate solutions geared to customer needs, combining the best of the best to provide highly secure, integrated solutions.

Americas Headquarters	Asia Pacific Headquarters	Europe Headquarters
Cisco Systems, Inc.	Cisco Systems (USA) Pte. Ltd.	Cisco Systems International BV
San Jose, CA	Singapore	Amsterdam, The Netherlands

Cisco has more than 200 offices worldwide. Addresses, phone numbers, and fax numbers are listed on the Cisco Website at www.cisco.com/go/offices.

Printed in USA

C67-532319-00   04/09