



SMART GRID: “KNOWLEDGE IN A NUTSHELL”

BY:

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BASIC CONCEPTS:

1. What is this “Grid” thing?
2. How is power bought and sold?
3. What is a “Smart Grid”?



WHAT IS THIS GRID THING?

- The grid can be defined as the interconnection of generation, transmission & distribution networks that supply power.
- The U.S. power grid is a large synchronous electric machine that operates system wide at 60 Hz.
- Events & operations on any one spot on the grid affect events & operations everywhere on the grid.
- Examples: Major system outages in 1965, 1977, 1996 & 2004 where a problem in one place knocked out entire regions due to the interconnections.
- Lesson: Stability is vital to grid operation.

HOW IS POWER BOUGHT & SOLD?



- Power is bought & sold based on two essential components of electrical energy: **Demand & Energy**
- **Demand:** Electric demand is the amount of power that is required at any one interval to run what is being served - measured in KW.
- **Energy:** Power multiplied by time to serve the load – measured in KWH.

DEMAND COMPONENTS:

- **Peak Demand:** Highest demand drawn by load.
- **Coincident Peak:** Demand of a specific load at the time of the power supplier peak demand.
- **Non-coincident peak:** Same as peak demand. Is the greatest demand of a load regardless of when it occurs. Usually greater than coincident demand.



ELECTRIC BILLING:

Electric bills to commercial, industrial & resale customers have the following components:

- Demand: Coincident or non-coincident
- Energy
- Facility charge that covers infrastructure required to serve a specific load.



WHAT IS A SMART GRID?

- The term “smart grid” refers to the ability to monitor & control the operation of the grid or a portion of the grid using technology to effect control of the grid’s operation.
- The term “Smart Grid” has been around for awhile.
- Examples include: SCADA systems, load management switches, electronic relaying & protective systems & power system communications systems.



WHAT'S THE BIG DEAL?

- The biggest “breakthrough” in power system technology has been in metering.
- Metering has gone from classical electromechanical devices read by power company employees to high powered electronic devices that can be read in a variety of ways.
- **First generation:** Automated meter reading (AMR). Done to reduce labor costs.
- **Present generation:** Automated Meter Infrastructure (AMI). Built on AMR technology. Extended to produce information & flexibility to both the power provider & the end user.



WHY SHOULD WE BE INTERESTED IN AMI?

- The ability to see load data in real time and use that data to measure & correlate to an end user's consumption habits.
- Anything that can be measured can be improved.
- Opens up a universe of cost savings possibilities to optimize power use, which can save money for both the end user & the power supplier.

HOW CAN AMI/SMART GRID SAVE YOU MONEY?

- Has the ability to utilize innovative rate designs like time of use rates (TOU) & interruptible rates.
- Has the ability to predict & move peak demand to effect lower demand charges.
- Has the ability to use alternative resources to move demand or get credits for “green” type power resources.
- Examples: Using onsite peaking generation at time of supplier peak & utilizing a solar or wind resource when available to get “green” credits.

WILL MY POWER COMPANY WORK WITH ME ON THIS?

- General answer is YES because they want to keep your business!
- This saves them as much as it saves you by deferring capital projects.
- Makes them look good with the regulators who want to make sure everything is being done to minimize rate pressure from major infrastructure projects (see the late 1970s and early 1980s with load management).

WHY IS THIS IMPORTANT TO ME?

- The current political climate will push back the schedule for required resources such as coal and nuclear power plants and this will drive up the costs of using electricity.
- The mandated use of renewable resources such as the N.C. Renewable Resource Portfolio which will drive up the cost of renewable power resources.
- Major grid upgrades, particularly transmission upgrades, will be necessary to provide grid stability to manage both scarcity of traditional resources & support “green” resources, thus placing upward pressure on costs.
- Electric power will become a more volatile commodity & smart grid technology will be necessary to give the end user & the provider a chance to control costs to some degree.

SMART GRID: THINGS TO LOOK FOR

- Interfacing “in house” energy management systems with power system AMI/SCADA.
- Information sharing & real time use for dispatch of resources at a specific site and/or across the grid.
- How it will give some degree of control over how the end user uses power & when.
- A lightning rod issue!
- Use of smart grid technology to improve system reliability on the grid.



TELL ME ABOUT THE LIGHTENING ROD:

- Control over the use of power has always been voluntary & should remain that way. Typically an end user receives an economic incentive to relinquish some control over his use of power.
- Given the scarcity of resources & to keep the grid stable, there would be some regulatory control using smart grid capabilities to control use of power.
- We already have some of this in place with emergency load shedding plans to preserve grid integrity & minimize major outages.

SYSTEM RELIABILITY BENEFITS:

- You can tell where a problem exists & switch major blocks of power to minimize the problem area. This is described as “self healing” capability.
- A product of AMI, improved SCADA technology, & upgraded system protection capabilities. Also related to internet & broadband capabilities.
- Recognizes that electricity is most expensive when it is not available!



SUMMARY:

- Smart grid has been around & will stay for the long term.
- It has some very important real benefits that can be used to minimize costs for all parties.
- It will constantly improve & will be an important tool to end users, power providers & regulators.

