

“SMART GRID” TECHNOLOGY USE AT EAST GRAND FORKS WATER AND LIGHT

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East Grand Forks
Water and Light Department

Your hometown utility since 1909

About East Grand Forks Water and Light

East Grand Forks Water and Light is a municipal electric and water utility serving the citizens of East Grand Forks, Minnesota, serving about 3500 customers.

East Grand Forks Water and Light was established in 1909 and is governed by a board of commissioners who are appointed by the Mayor.

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What is “SMART GRID”

- “Smart Grid” is a term recently coined to describe a collection of technologies to help the electric grid run more reliably and efficiently.
- “Smart Grid” technologies are used at all levels, including generation, transmission, distribution, and point of use.
- Many of the technologies and concepts are not new, but the coordination between systems and recent push to use such technologies has resulted in the “Smart Grid” branding.

“SMART GRID”
TECHNOLOGIES
CURRENTLY IN USE
AT EAST GRAND
FORKS WATER AND
LIGHT

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Load Management

- Load management is a form of *Demand Response*
- Reduces the need for additional generation, transmission and distribution lines by turning off loads during peak demand periods
 - 1 KW of controllable load has the same effect as adding 1KW of generation and line capacity
- Customers sign up to have selected loads shut off during high use periods in return for a reduced energy rate or credit on monthly bill.

Load Management

Examples of current load management programs

| Program | Description | Incentive |
|------------------|--|--|
| Air Conditioning | Cycles air conditioning on/off on a 15minute cycle during peak demand times | \$6/ month credit during summer months |
| Water Heating | Cycles water heater 10 minutes on, 30 minutes off during peak demand times | \$6/ month credit |
| Dual Fuel | Switches primary heat from electricity to backup fuel during peak demand times | Approx 2.2¢/KWh energy discount |
| Storage Heat | Switches heat generator off during peak demand times | Approx 2.2¢/ KWh energy discount |

Load Management

- Water and Light first started using load management in 1986, with technology upgrades in 1998 and 2003
- Current system utilizes distribution line carrier, where a signal is injected at the substation, which controls relays at the customer's premise
- Participating customers seem satisfied with the programs. Very few complaints during control periods.

SCADA

- SCADA is an acronym for *Supervisory Control And Data Acquisition*
- SCADA systems allow for real time monitoring, control, and data recording of connected devices
- EGF Water and Light presently utilizes SCADA mostly for substation monitoring and control
- EGF Water and Light first started utilizing SCADA in 1986, with a technology update in 1998, and is presently undergoing a update and rebuild

AMR/AMI

- AMR refers to *Automated Meter Reading* : the process of reading meters with greatly reduced labor requirements
- AMI refers to *Automated Metering Infrastructure* : the communications medium, hardware and software that allows communications to meters and other “endpoints”
- AMR/AMI technologies can greatly reduce the amount of fuel consumption and emissions created by sending meter readers out in trucks.
- AMR/AMI technologies also provide the framework for offering time of use rates, real time pricing, feedback to customers, and more.

AMR/AMI

- EGF Water and Light's first AMR system was put in use in 1987
 - A rate was designed for the utility's largest customers to reduce demand during high use periods. Instead of these customers paying their demand charge based on their individual monthly peak demand, their demand charge is based on the customer's demand during the system peak.
 - To accomplish this, recorders were placed on the customer's meter to read at 15 minute intervals and periodically “phoned home” using a customer provided phone line

AMR/AMI

- EGF Water and Light undertook a large scale AMR project in 2006
 - After evaluating many different technologies, it was determined that a utility owned, fixed-based, 2-way, radio frequency AMI system would best meet the utility's current and predicted future needs
 - The system chosen is a 900MHz licensed system, which has some “quasi-mesh” features – most endpoints communicate directly with the base stations, but can forward messages through other endpoints if unable to communicate directly.

AMR/AMI

- EGF Water and Light undertook a large scale AMR project in 2006
 - Nearly all utility customers have automatically read meters now. Most of these are read on an hourly basis, with some being read at a 15 minute interval.
 - The 2-way communications allow for true real-time data to be retrieved from meters, and also currently allow for meters with integrated disconnect circuits. There are also provisions for future integration to home automation systems, and relay controls.

AMR/AMI

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How East Grand Forks Water and Light is preparing for current and future Smart Grid technologies.

- In 2004, a utility owned fiber network was built between substations, water facilities, and most municipal buildings, using conduit placed in the ground during the major electric utility rebuild in the late 90's
- This provides very high speed communications ($> 1\text{Gbps}$) with very low latency ($< 1\text{ ms}$) between sites
- Fiber network is being expanded as opportunities present themselves during other utility construction projects

How East Grand Forks Water and Light is preparing for current and future Smart Grid technologies.

- A city-wide wireless network is being built to provide connectivity to sites without fiber termination.
- IT infrastructure planning, such as storage and data processing capacities. Don't forget backups, archives, and system availability issues.
- Teaching staff, policy makers, and customers the benefits of adopting such technologies.

Challenges to adopting “Smart Grid” technologies

- Lack of open standards

- ◆With many Smart Grid technologies, adopting a specific implementation results in vendor lock-in and perpetual licensing issues
- ◆Prevents true interoperability between different systems
- ◆Provides an obstacle to start-up companies and others wanting to enter the market
- ◆Some open standards are emerging and becoming common, such as DNP and MODBUS for SCADA systems, and Zigbee for home automation systems

Challenges to adopting “Smart Grid” technologies

- Vendor development and marketing cycles

- ◆ Recent projects and collaboration with other utilities have shown that, in general, vendors offering such technologies rarely deliver on-time, and almost never fully-functional when delivered.
- ◆ Most seem to have a disconnect between engineering, marketing, and sales. Much is sold before it is developed or tested, many in the process have little knowledge of how their products work, and marketing material is misleading (most of the time un-intentionally)
- ◆ Commonly, it seems to take years for vendors to deliver functionality as promised.

Challenges to adopting “Smart Grid” technologies

- Attitudes of people involved

- ◆ Many, from staff to policy makers to customers, can take a negative attitude towards such projects.
- ◆ Most often such attitudes come from not understanding the full extent of the technology
- ◆ Negative attitudes also develop from implementation problems

Q & A

Corey Thompson, Electronic and Information Systems Manager

cthompson@egf.mn

Bonnie Abel, Customer and Energy Services Manager

babel@egf.mn

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