CONNECTIONS SUMMIT

AMI & Why Your Utility Should Deploy It!

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ELECTRICITIES of NORTH CAROLINA, INC.

Why Your Utility Should Deploy AMI!

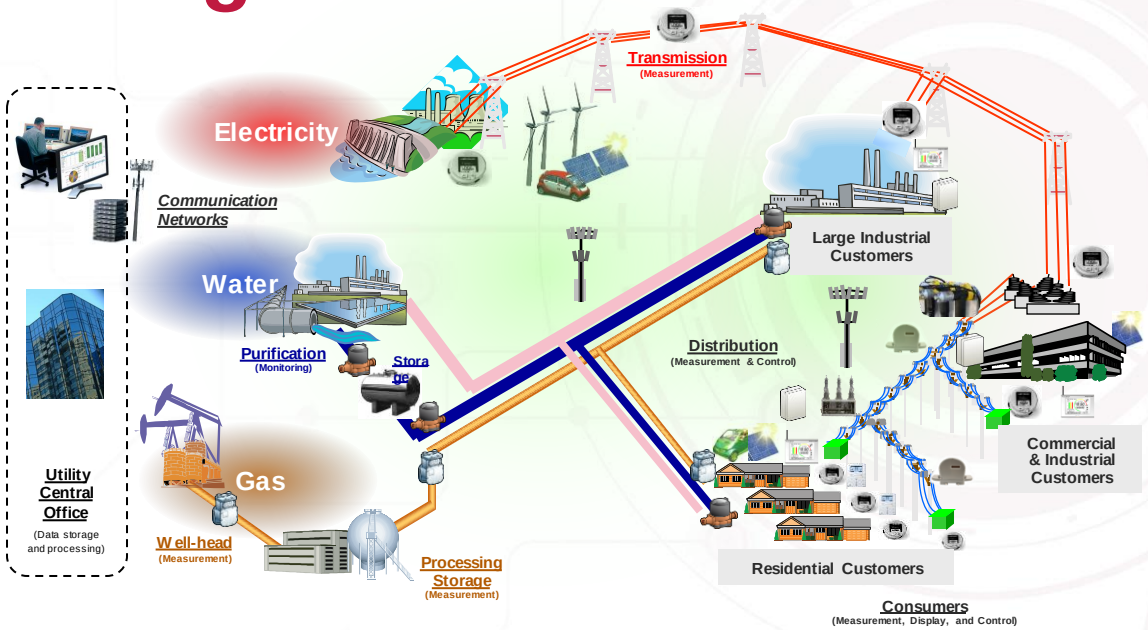
Will your utility require…

Better feedback and information for consumers
Support for consumer automation
Efficiency improvements
Peak management
More accurate and timely operational information and automation
Fewer outages, quicker response, quicker restorations, better consumer notification
Fewer losses
Better distribution network & equipment mapping, and maintenance
Better supply planning and dispatch
Validation of existing rates and evaluation of new rates
Support for EVs, solar, other Distributed Generation (DG), etc.
Support for supply deregulation

What is AMI? Advanced Metering Infrastructure

What it isn't -

Just **revenue metering**
Just **meter reading** (AMR)
Just **one** communications **technology**
A **single**, **stand-alone system**



What it is -

Improving the utility's **information from** and **control of** the **distribution system**
Information, **communications**, and **control** using **ubiquitous components** (metering infrastructure and other components) **on the distribution system**
Integration of Wide Area Networks (**WANs**), Neighborhood Area Networks (**NANs**), and Local Area Networks (**LANs**)
Part of **an integration** with **existing** and **future enterprise applications**

True AMI vs AMR

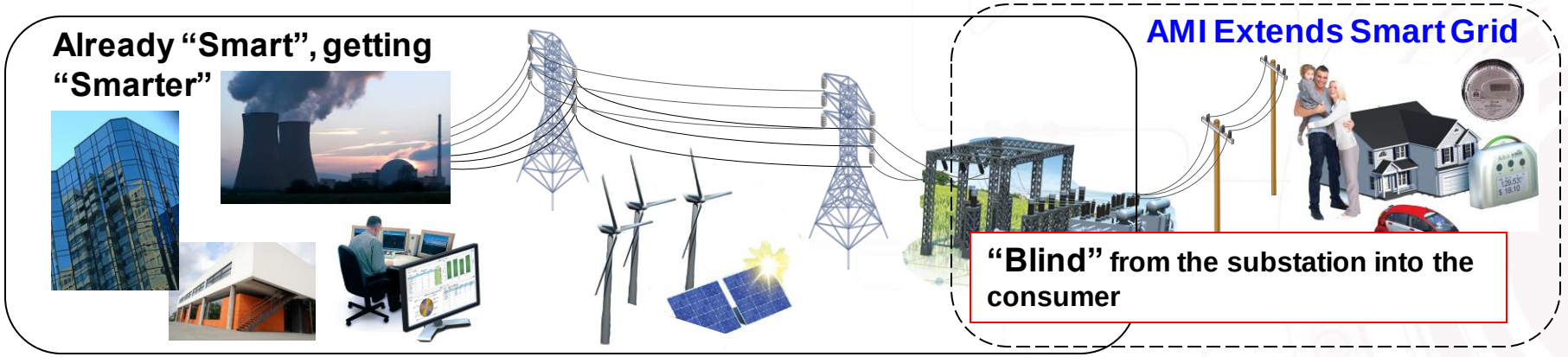
AMR -

Typically, **1-way**, or **1 ½ -way** communications – **limited** or **no messaging to endpoints**.
Mostly, **unsecured**, **slow speed**, **walk-by/drive-by** or **limited fixed network**.
Typically, endpoints have **no Real-Time-Clock** (RTC) - data cannot be precisely timestamped.
Limited functionality beyond kWh.
Replacement for one existing **function** – Meter Reading.

AMI -

True **2-way communications** – can easily **message endpoints** with programs or commands.
Secure, **fast**, **fixed network** communications.
Endpoints have **precise RTCs** allowing time synchronization of events and data.
Endpoints provide **broad capabilities** for revenue **metering**, **instrumentation**, and/or **control**.
An **integrated system** supporting the **utility's strategic plans**.

What is AMI?
AMI – Economically extends the Smart Grid



Utility Site

Field, Distribution system, Meter, Premise

Enterprise Applications

Customer information
Prepayment
Asset Management
Demand response
Outage Management
Planning
Control

Network Mgmt Systems

Data Acquisition
Meter Data Mgmt (MDM)
Data applications

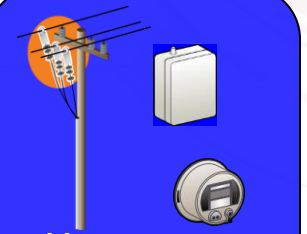
Wide Area Network (WAN) Technologies:
Fiber Optic, Private wireless, BPLC
Public Wireless - GPRS,CDMA, etc
Telephone, Satellite, others

AND

Multiple WAN Technologies:
See above

Gate-Ways

Multiple NANs & LANs
Utility Wireless
Utility PLC
WIFI, WIMAX
Wired - Ethernet



Measurement, Sensing, and Control Elements

Why AMI?

When properly implemented there are many AMI benefits

- Meter reading and maintenance cost reduction
- Automation of Service Connection and Disconnection, Prepayment
- Theft and other loss detection/prevention
- Outage management and avoidance
- Voltage Conservation
- Prepayment, new rates and consumer equipment support (Automation, EVs, Solar, etc.)
- Support for supplier deregulation
- Distribution Network mapping

Why AMI?

Some Utilities Justify AMI on Meter Reading and Maintenance

If **no AMR system**:

- Reduced **meter reading** and **system entry errors**
- Reduced personnel **safety issues**
- Reduced **field labor** and **support equipment**
- Checks and notification of **meter/site tampering**

Even **with existing AMR system**:

- AMI has **further meter reading personnel** and **equipment reductions** as **most AMR** is mobile or "bubble-up" and **doesn't support demand, TOU, or Interval Metering**, so meter readers were still required with related costs and safety concerns.
- Equipment **maintenance** is **reduced** as **programming and firmware updated** are handled remotely.
- **AMI** systems are **less tamper prone**, as there are **additional security checks and logs in real-time**; and **communications** is much more secure (**encrypted and monitored**).
- **More real-time information** for consumers
- Provides **common communications/system for traditional Direct Load Control** (DLC)

Why AMI?

Some Utilities Justify AMI on Integrated Service Switch

Service Connection and Disconnection:

- Many utilities have large **connection and disconnection costs** and often **cannot service** their demand for **connections and disconnections**.
- Some experience **real danger** or intimidation **with a disconnection order**
- Lack of timely disconnections cause **some consumers to have large negative balances** that they cannot address, resulting in **negative consumer views** of and **complaints** about the utility.
- **Service** connections and **disconnections** can be **automated** and planned for **specific times** of the day providing a consumer benefit and forcing the **consumer** to **address negative balances while small**; **minimizing arrears** and **complaints**.

Prepayment:

- An integrated service switch allows the **option of prepayment**, often **eliminating accounts in arrears**.
- If the **CIS system** allows positive and negative balances, it **can be linked with the AMI service switch** functionality to notify customer and open beyond a specific negative balance at a certain time/date, and close above a balance immediately or on a particular time/date or customer activity.
- Any **regular bill payment options can be used** for prepayment.
- **Slow or no pay** customers can be **placed on prepayment**, with **no need for a large security deposit**.

Why AMI?

Some Utilities Justify AMI on Theft or Other Loss Prevention

Theft is a major issue with some utilities:

- Ingenious consumers **tamper with meters** and/or **meter installations**.
- Some consumers **tap nearby distribution lines**.
- Some **industries develop helping** consumers **steal power** (sometimes utility employees are involved).
- More and more **illegal activities** (grow houses) require large amounts of **power** which is **unmetered**.
- **Equipment** is often **damaged during tampering**.

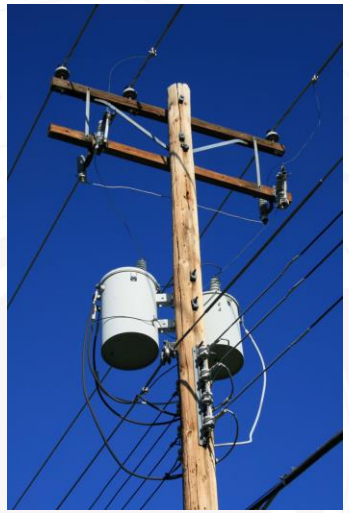
Other Losses (energy consumption and equipment failure):

- **Undersized, aging** or **defective equipment**.
- **Damaged lines** and/or **loose connections**.
- Normal **equipment consumption** and **line losses**. (More when discussing Voltage Conservation)

AMI Solutions:

- Equipment **tamper sensors** and **suspicious consumption/outages.**
- **Aggregate loads** and **compare** to other **feeder measurements** (like transformer/feeder metering).
- **Voltage measurements** across the feeder can identify over-voltages/under-voltages, and/or location of large current flows and potential locations of concern.

Why AMI?



Some Utilities Justify AMI on Outage Management and Avoidance

Reliability Information and Outage Notification:

- Configurable **CAIDI, CAIFI, MAIFI, MAIDI,** and **multi-second outage data** per consumer.
- **Improved SAIDI** and **SAIFI** calculations.
- **Configurable outage notification** to the **AMI headend** and from the headend to the **Outage Management System** (OMS)
- **Configurable restoration notification** to the **AMI headend** and from the headend to the **OMS**

Outage Management:

- **Better data for** identification of the outage **source** and **location**.
- Better **identification of needed personnel** to address the outage and **estimates on time**.
- **Validation** all **consumers are restored** prior to withdrawing the restoration crew.
- More **real-time information for consumers** (website or text messaging).
- **Cold-load pickup**, when desired

Outage Avoidance:

- Better data for **identification of overloaded** and/or **over-voltaged equipment**.
- Better **identification of limb issues**, **loose connections**, **damaged lines**.

Why AMI?

Some Utilities Justify AMI on Voltage Conservation

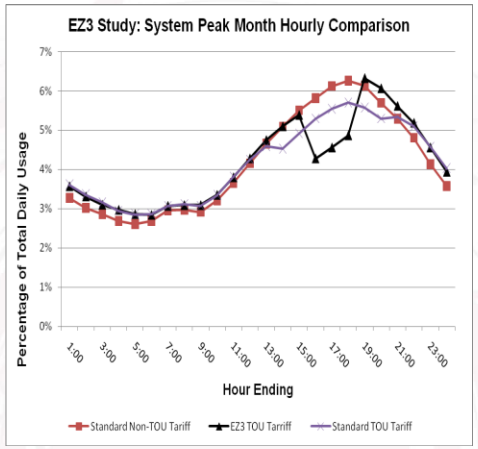
What is **Voltage Conservation**?

- **Many loads** are **more efficient with lower voltage** (until they malfunction).
- **Feeder voltages** are **conservatively set** to assure all consumers have sufficient voltage.
- **With feeder uplift**, some utilities have found the **feeder voltage** can be **reduced by 6-8%** (Ave.).
- **6-8% voltage reduction** has **resulted in 4-6% energy reduction**.

How it works:

- **AMI detects unusual voltages** on the feeder.
- **Utility personnel correct distribution issues**, like loose connections, damaged lines, overloaded infrastructure, high resistance shorts (squirrels, limbs, etc.).
- **AMI** nodes measure specific points on Distribution points **to provide feedback** and **voltage tap control**.
- **AMI nodes** can **monitor** and **report voltage** abnormalities / **outages** that might be new distribution issues that need correction.

Why AMI?



Some Utilities Justify AMI on <u>Load Control and/or New Rates/Information</u>

Load Control (LC):

- **Replace** aging or obsolete **Direct Load Control** (DLC) system
- **Support new loads** like Electric Vehicles (EVs), agricultural water pumps, etc.
- **Peak Reduction**
- **Home/Commercial Load Automation** for energy / bill reduction and/or consumer convenience

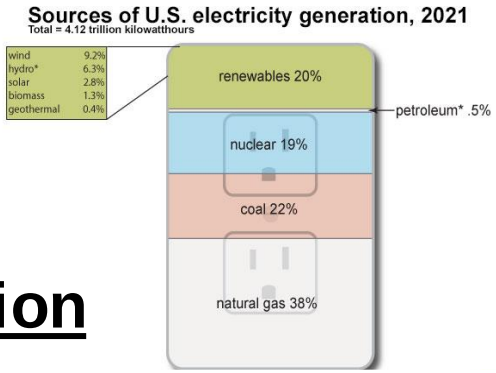
New Rates and/or **New Information**:

- **Regulatory, political, or consumer pressure to provide new rates**, like Time-of-Use (TOU), Real-Time-Pricing (RTP), consumer Load Profile (LP), and/or bi-directional metering to promote distributed generation (renewables).
- **Research** for potential **new rates** or rate changes.
- **Validate rate** performance.
- **More** real-time **use information** for consumers
- Support **aggregated metering** and **sub-metering** needs/requirements

Selective Rolling **Blackouts**:

- **Consumers can be selectively "blacked-out"** on or rotated around a feeder beyond the feeder switches.
- At times of limited supply or overloaded equipment, **consumers can be selectively maintained**, e.g. the corner gas station, or consumers with health concerns.
- **Minimal use consumers** can be **identified** and **maintained** since their service has limited impact.

Why AMI?



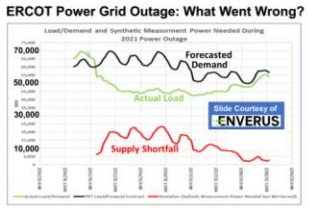
Some Utilities Justify AMI on Support for <u>Supplier Deregulation</u>

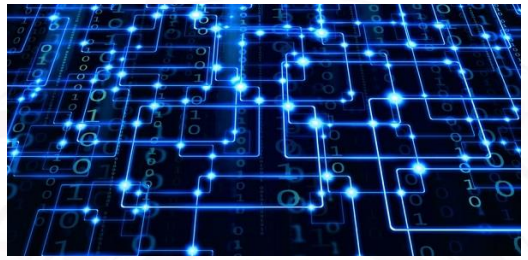
Supplier Deregulation:

- Some regulators allow **consumers** to **choose their energy supplier** (cost, available rates, use of renewables, political leanings, etc.)
- Deregulation is **complicated by changes in consumers' load profile** (new consumer loads/solar).
- Deregulation **complicates energy dispatch** and **financial settlement**.
- Deregulation **discourages over-capacity** availability.

AMI Provides:

- Flexibility to **support needed rates**, like demand, TOU, RTP, reactive, bidirectional, DLC, etc.
- **Better** consumer **load profile information** (individual and by demographic) for forecasting.
- **More** real-time **information** for automating **DLC/control by consumers.**
- Consumer **usage** and **forecasted requirements** can be **aggregated by supplier**.
- Similarly, with **supplier shortages**, just those **supplier's customers** can be "**blacked-out**" instead of everyone on a feeder (e.g., the Texas Blackouts).





Why AMI?

Some Utilities Justify AMI on Distribution Management

Many utilities have **limited Distribution Maps**:

- May not know **which consumers** are **on which Feeder/Transformer**
- Often do not know **which consumers** are **on which Phase/Rotation**
- Even **Distribution Controls** may **not** be well **mapped**.
- **Sectionalizers complicate** mapping.
- Limited mapping **complicates control, planning, and outage identification**
- Certain Mapping **may be a regulatory requirement**.

AMI:

- Some can be used to **map distribution equipment** and **consumers**.
- Can provide **low-cost communications to distribution equipment**.
- Can provide **low-cost sensors** and **controls for the distribution** network.
- Can **improve outage management** and **prevention** (as previously discussed)
- Supports **integration of EVs**, **renewables**, etc. (as previously discussed)
- **Deployment should** be used to **acquire GIS data** on all equipment.

Caution

Some AMI Deployments Fail

Some "AMI Systems" are not AMI, and Some Don't do Revenue Metering

AMI must be **part of** an **overall utility Strategy**:

- Future **information** and **control needs** across the utility.
- **AMI's role** in this Strategy.
- **Resources** and **system changes needed to implement** the Strategy.
- **Resources needed to maintain** that Strategy.

Selected **AMI System** must provide needed **Functionality**:

- **Anticipated future Revenue Metering**
- **Flexible measurement** and **notifications** for the **utility's needs**.
- Necessary **time synchronization of data** across the network.
- **Voltage measurements** across the system to identify over-voltages/under-voltages, and/or location of large current flows and potential locations of concern.

Ideally, selected **AMI System can adapt and grow**:

- **Integrate with existing systems** for today's functions, and **future systems per** the **ultimate Strategy**.
- **Flexible** and **secure communications** infrastructure for future utility needs
- Reliable **sourcing, support, and upgrades**

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ElectriCities GRIP AMI Application Overview

ELECTRICITIES of NORTH CAROLINA, INC.

GRIP Program Overview

- **Grid Resilience and Innovation Partnerships (GRIP) Program**
- **Part of Bipartisan Infrastructure Law (BIL) – $10.5 Billion total funding**
  - FY 22 and 23 funding = $3.8 Billion
- **Administered by DOE's Grid Deployment Office**
- **Three Topic Areas**
  - **Topic Area 1 – Grid Resilience Grants - $918 Million**
  - Topic Area 2 – Smart Grid Grants - $1.08 Billion
  - Topic Area 3 – Grid Innovation Program - $1.82 Billion
- **For more information:**
  - https://www.energy.gov/gdo/grid-resilience-and-innovation-partnerships-grip-program

ElectriCities AMI Project Application

- **ElectriCities is planning to submit a joint application on behalf of members looking to install Advanced Metering Infrastructure (AMI) - due April 6, 2023**
- **31 members expressed interest to join the Concept Paper (12/16/2022)**
- **Any member currently without fully deployed AMI can join the application**
- **Total project cost (to calculate funding amount) will include:**
  - AMI Equipment (communications, meters, etc.)
  - AMI Software
  - Project Management
  - Installation
  - Consultant costs
  - Any other staff costs

ElectriCities AMI Project Application

- **Cost share of at least 1/3 of grant amount is required, or 25% of total project cost**
  - Can be in the form of in-kind contributions or direct funding of the AMI project
- **Amount requested cannot exceed the previous 3 years of resiliency investments (2020 – 2022)**
- **Funding must be spent within ~60 months of receiving**
- **There will be a lot of requirements around the grant administration aspect of the project – documentation of project costs, invoices, submissions to DOE, etc.**

Questions

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Connections Summit Breakout Session #1 Feedback

ELECTRICITIES of NORTH CAROLINA, INC.

CONNECTIONS SUMMIT 2023

Thank You!