
# TWACS® and the Smart Grid

Ron Rundstedt
AMR Supervisor

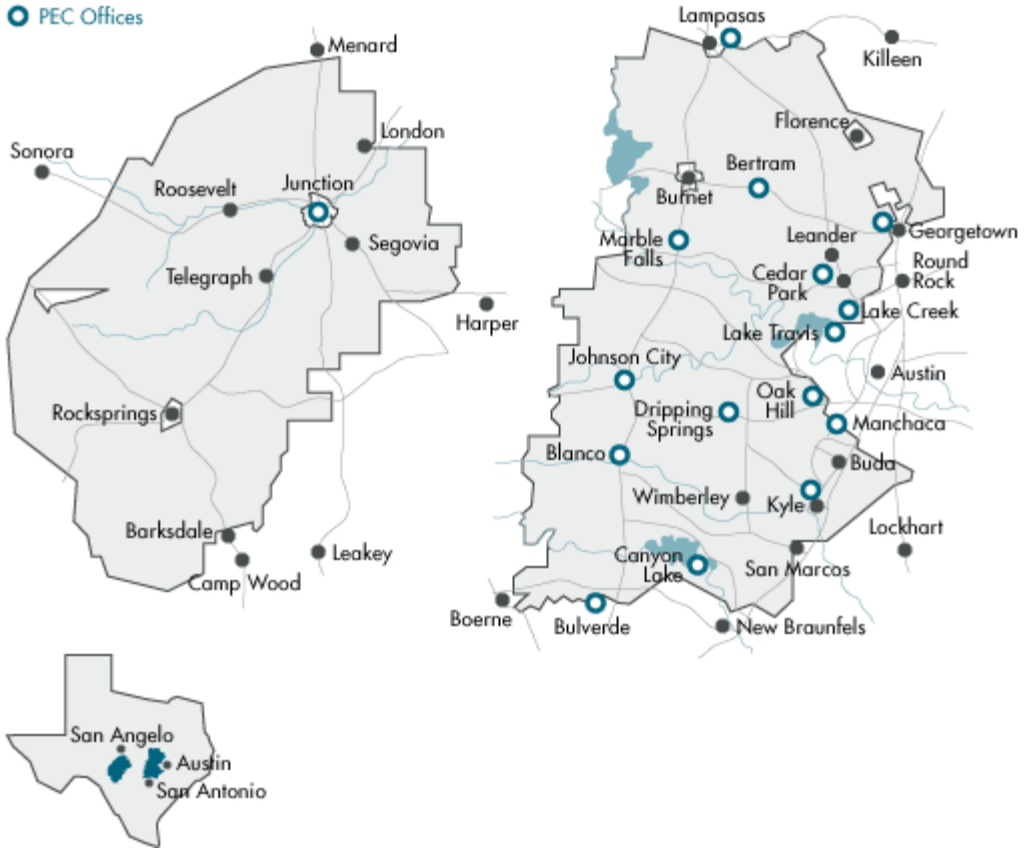
(830) 868-6034
ron.rundstedt@peci.com

# Overview

- **Smart Grid**
- **TWACS® System**
- **TWACS® AMR and Beyond**
- **PEC Now**
- **PEC Future**

# Pedernales Electric Cooperative, Inc.

- **Number of meters – 236,000**
- **Size of area – 8,100 square miles**
- **AMI System – TWACS® since 1997**



# Smart Grid

# 2003 NORTHEAST BLACKOUT

- August 2003
- Lasted 3 days
- Affected 50 million
    - 10 million Canada
    - 40 million in U.S
    - Eastern US and Canada
    - Detroit to New York City and Toronto
    - $10 billion (USD) in economic loses
    - 3,000 fire calls in NYC alone
- 11 deaths
- 12 airports partially or completely closed

# Other reliability incidents since…

## Florida's Blackout: A Warning Sign?

By TIM PADGETT/MIAMI Wednesday, Feb. 27, 2008

**Related**
Stories
- Lights Out

More Related
- Can We Prevent Another Blackout?
- How Vulnerable Is the Power Grid? Less Than Some Fear, Experts Say
- Miami's Smart Grid: A Blueprint for the Nation's Power Future

A substation located next to Florida Power and Light headquarters is shown in Miami, Tuesday, February 26, 2008. Florida experienced a widespread power outage on Tuesday.
Alan Diaz / AP

**More than 1 Million without power for more than an hour!!!**

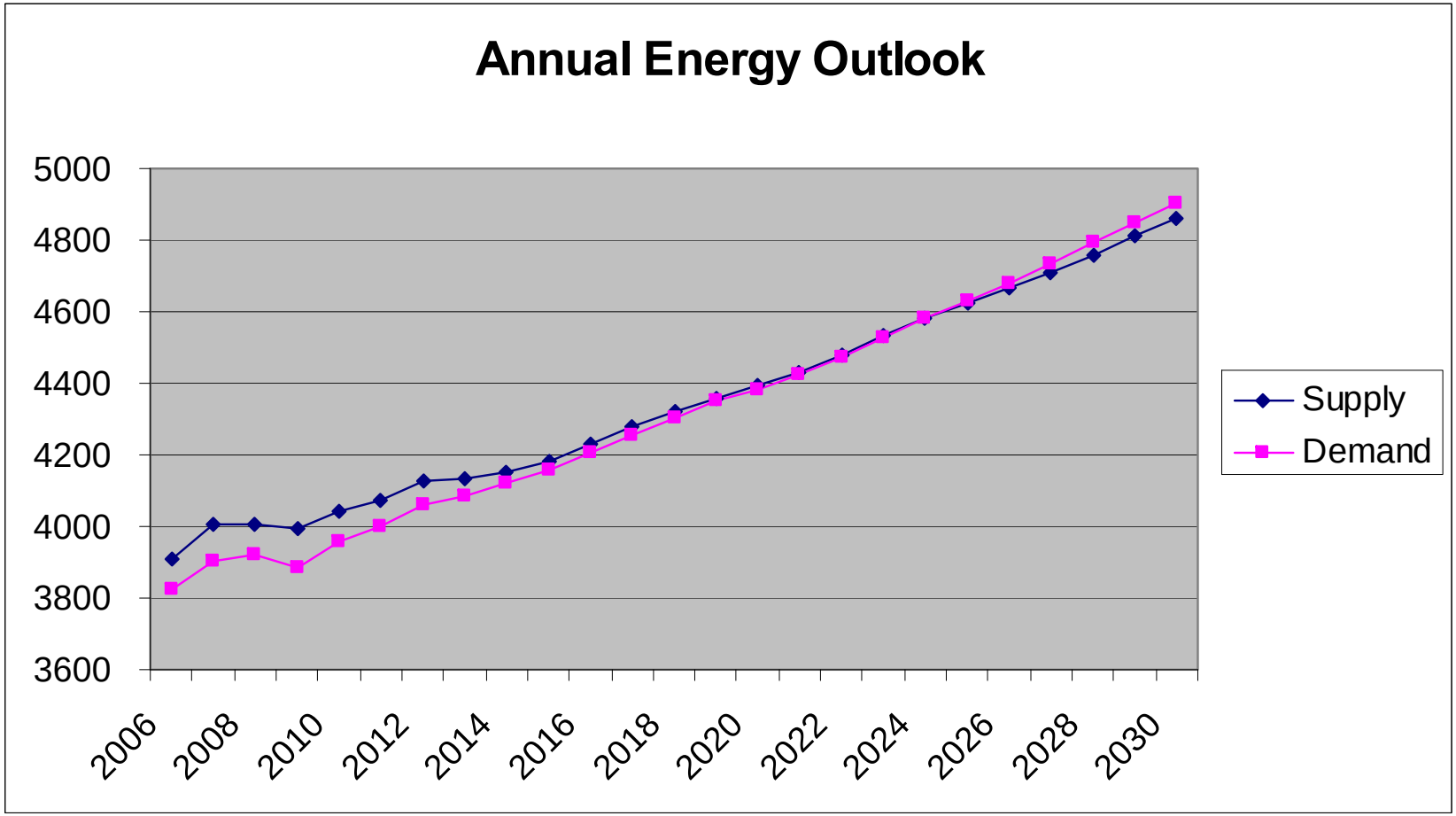
**1,100 MW curtailed in 10 min!**

## Loss of wind causes Texas power grid emergency

HOUSTON
Wed Feb 27, 2008 8:11pm EST

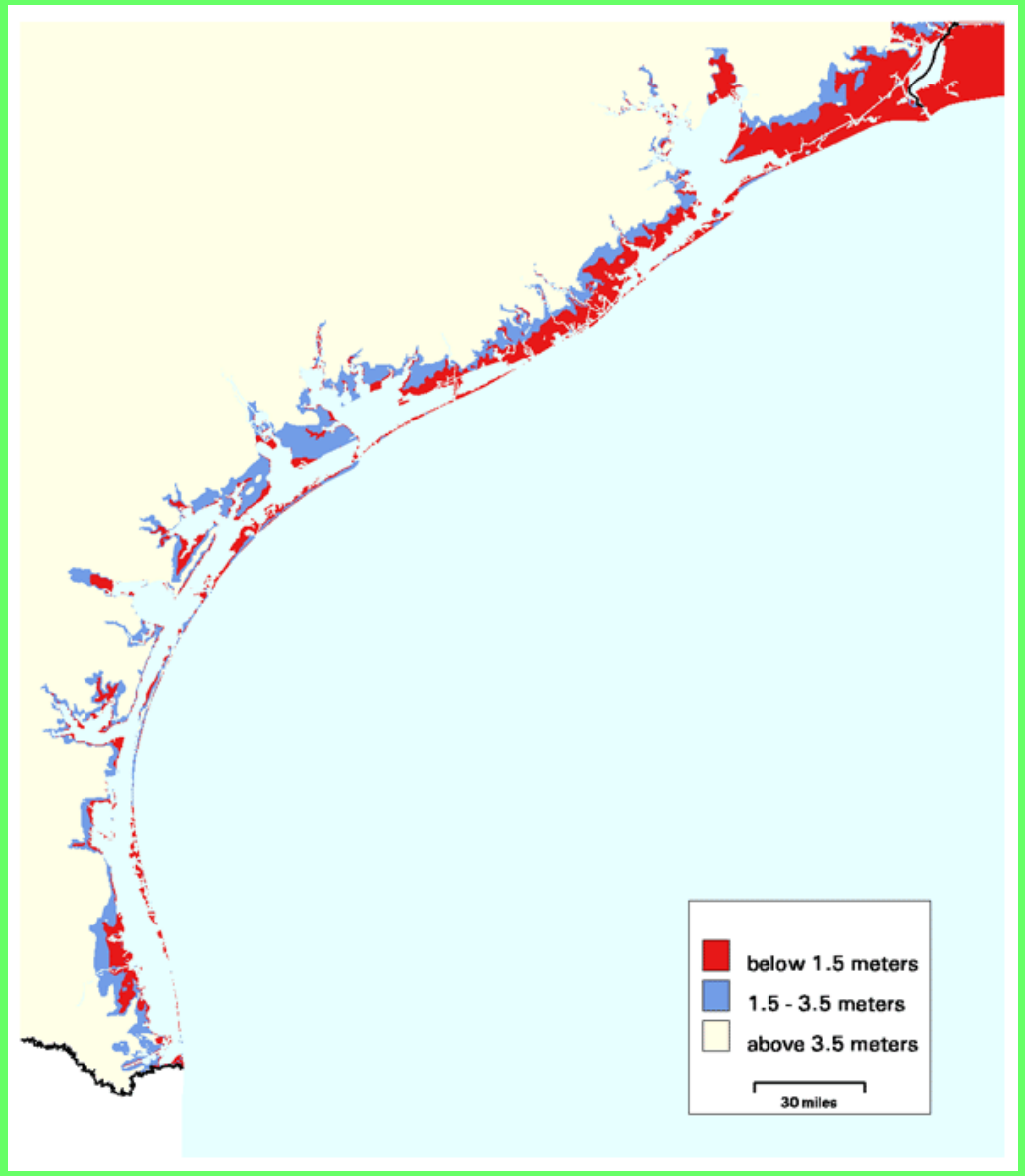
(Reuters) - A drop in wind generation late on Tuesday, coupled with colder weather, triggered an electric emergency that caused the Texas grid operator to cut service to some large customers, the grid agency said on Wednesday.

# EIA's forecast to 2030




Energy Demand starts to outstrip supply in 2024.

# Sea Level Rise for Texas Coast



# Legislation

- **EPACT 2005**
  - Established a definition for Smart Metering / Advanced Metering that included hourly interval data
- **EISA 2007**
  - Title XIII established Smart Grid concepts in law and first mentions matching grant money for Smart Grid investments
  - Directs NIST to come up with Interoperability Standards
- **ARRA 2009**
  - Provides funding for EPACT 2005 and EISA 2007 provisions
- ***FUTURE***
  - Cap and Trade, Carbon Tax

# Really, What is a Smart Grid?

A. Anything a vendor tells you that Smart Grid is (it also happens to be what the vendor is selling)

B. Anything you want to call Smart Grid

C. Whatever Congress, the PUC, State Legislature, or DOE wants it to be
   - We'll call whatever we're doing Smart Grid if you send us cash

D. None of the above

# NETL Modern Grid Vision: Characteristics

- Self-heals
- Motivates & includes the consumer
- Resists attack
- Provides power quality for 21st century needs
- Accommodates all generation and storage options
- Enables markets
- Optimizes assets and operates efficiently

| Today's Grid | Principal Characteristic | Modern Grid |
|---|---|---|
| Responds to prevent further damage. Focus is on protection of assets following system faults. | **Self-heals** | Automatically detects and responds to actual and emerging transmission and distribution problems. Focus is on prevention. Minimizes consumer impact. |
| Consumers are uninformed and non-participative with the power system. | **Motivates & includes the consumer** | Informed, involved and active consumers. Broad penetration of Demand Response. |
| Vulnerable to malicious acts of terror and natural disasters. | **Resists attack** | Resilient to attack and natural disasters with rapid restoration capabilities. |
| Focused on outages rather than power quality problems. Slow response in resolving PQ issues. | **Provides power quality for 21st century needs** | Quality of power meets industry standards and consumer needs. PQ issues identified and resolved prior to manifestation. Various levels of PQ at various prices. |
| Relatively small number of large generating plants. Numerous obstacles exist for interconnecting DER. | **Accommodates all generation and storage options** | Very large numbers of diverse distributed generation and storage devices deployed to complement the large generating plants. "Plug-and-play" convenience. Significantly more focus on and access to renewables. |
| Limited wholesale markets still working to find the best operating models. Not well integrated with each other. Transmission congestion separates buyers and sellers. | **Enables markets** | Mature wholesale market operations in place; well integrated nationwide and integrated with reliability coordinators. Retail markets flourishing where appropriate. Minimal transmission congestion and constraints. |
| Minimal integration of limited operational data with Asset Management processes and technologies. Siloed business processes. Time based maintenance. | **Optimizes assets and operates efficiently** | Greatly expanded sensing and measurement of grid conditions. Grid technologies deeply integrated with asset management processes to most effectively manage assets and costs. Condition based maintenance. |

**Table 1: Comparison between Today's Grid and the Modern Grid**

# A Smart Grid Technology Framework

**Smart Grid =**

**Sensing & Measurement**

**Intelligence**

**Automation**

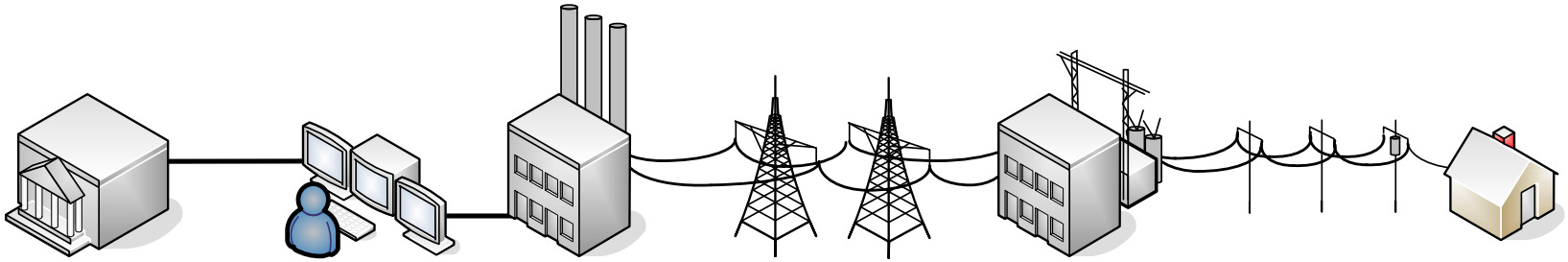
**Integrated Communication**

**Interoperable**

**Secure**

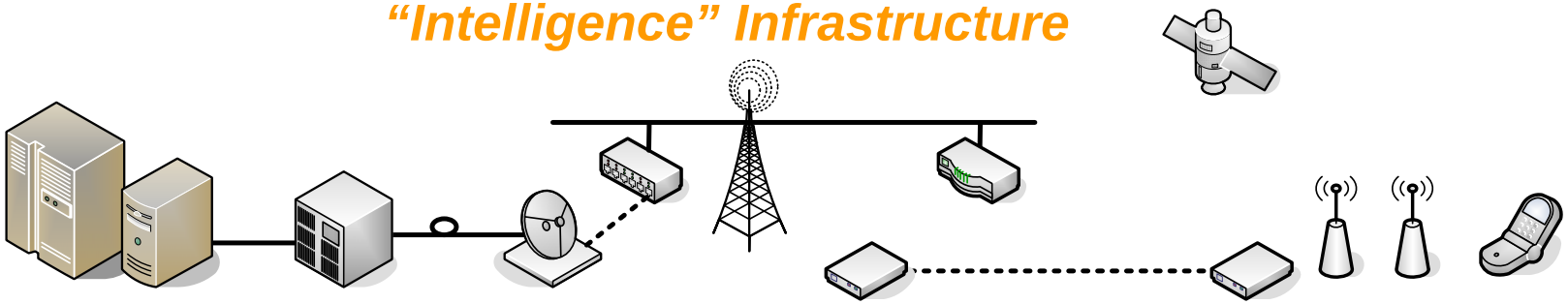
Advanced Metering---Demand Response---Distribution Automation---Outage Management---Distributed Renewable Energy---Plug-in Hybrid Electric Vehicles

# What does the concept of Smart Grid look like?



***Electrical Infrastructure***

***“Intelligence” Infrastructure***

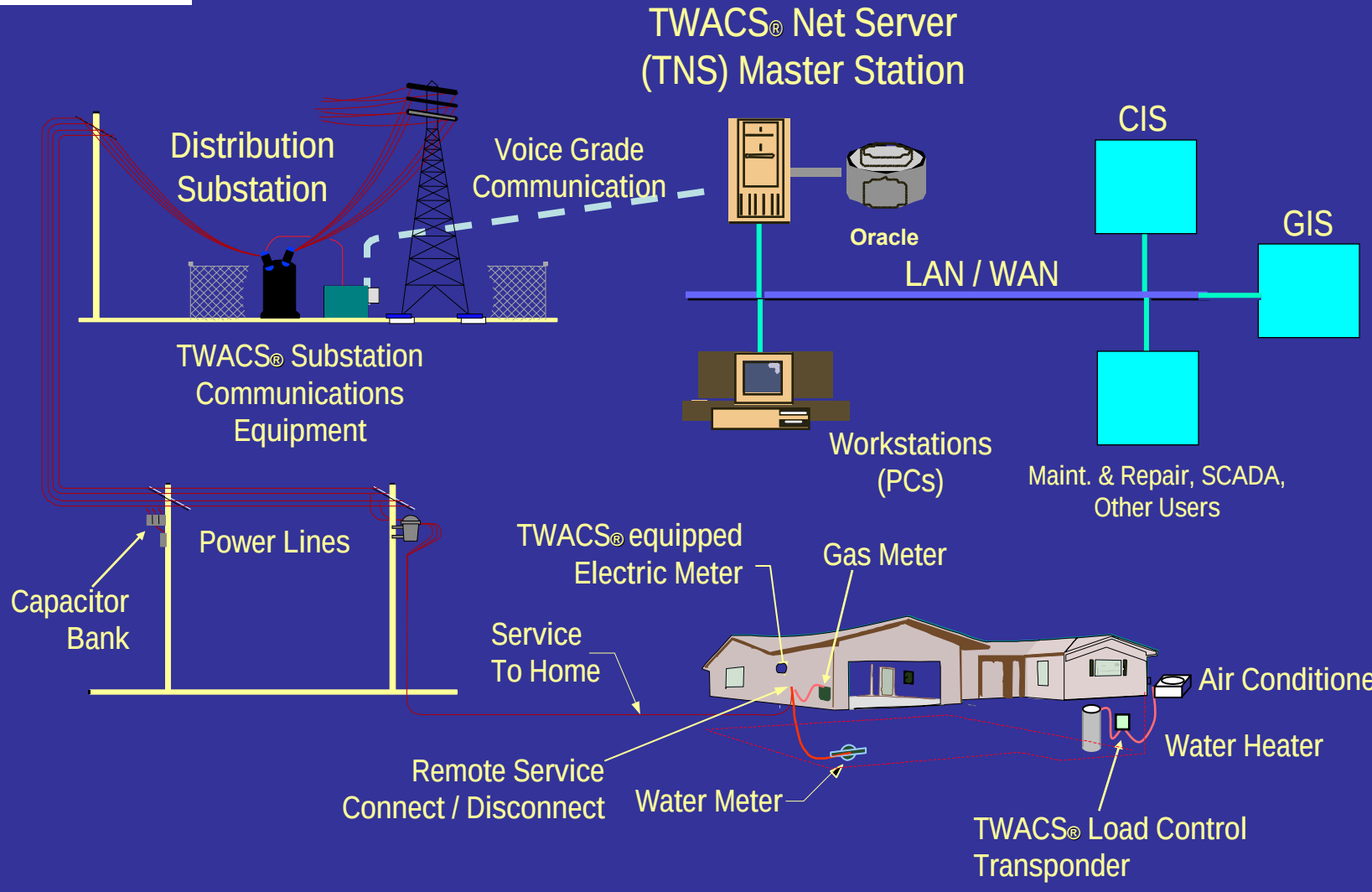


# Technology Comparisons

**No single technology or single vendor's solution will be able to do everything…**

**no matter what the vendor says!**

# TWACS® System



# TWACS® AMR and Beyond

- **What else is possible beyond AMR?**
  - **Member Services and Demand Side Management**
  - **Improvement of Service Reliability and Optimization of Energy Delivery**
  - **Supporting Functions**
- **Can an AMR be economically expanded or upgraded to implement future added-value capabilities?**

# Data Points

- **Q (t, s, b, f, Φ, $l_x$, g, etc.)**

**Where:**

**t = time stamped information (kWh, kW, voltage, PF, etc.)**

**s = substation name**

**b = bus**

**f = feeder number**

**Φ = phase**

**$l_x$ = location, or line segment, on the electrical circuit**

**g = geographical location**

- **Data warehousing and accessibility - storage must be organized.**

# TWACS® AMR and Beyond

- **Member Services and Demand Side Management**
  - **Electric Metering**
  - **Gas, Water, Propane Metering**
  - **Remote Service Connect/Disconnect**
  - **Prepay Metering**
  - **Load Management/Demand Response**
  - **Advanced Metering**
  - **Time of Use/Peak Pricing**
  - **Theft Detection**
  - **Alarms**

# TWACS® AMR and Beyond

- **Improvement of Service Reliability and Optimization of Energy Delivery**
  - **Outage Management and System Restoration**
  - **Integrated Voltage and VAR Control**
  - **Remote Breaker and Switch Control**
  - **Power Quality Monitoring**
  - **Distributed Generation**

# TWACS® AMR and Beyond

- **Supporting Functions**
  - **Extension of SCADA capability into the distribution network**
  - **Area Map/Facilities Management**

# PEC Now

- **Low billing estimates – <0.05%**
- **Daily, On-request reads – 8-20 seconds**
- **Data availability**
- **Remote service connect/disconnect**
- **Tamper/theft detection**
- **Cross utility reads**
- **Outage Assessment**
- **Improved system maintenance – blink program**

# PEC Future

- Increased growth of system
- Integration of TWACS® with GIS
- Member usage on bills
- Prepay metering
- Hourly/15 minute reads
- Time of Use/Peak Pricing
- Load control
- Capacitor switching


# Questions ?