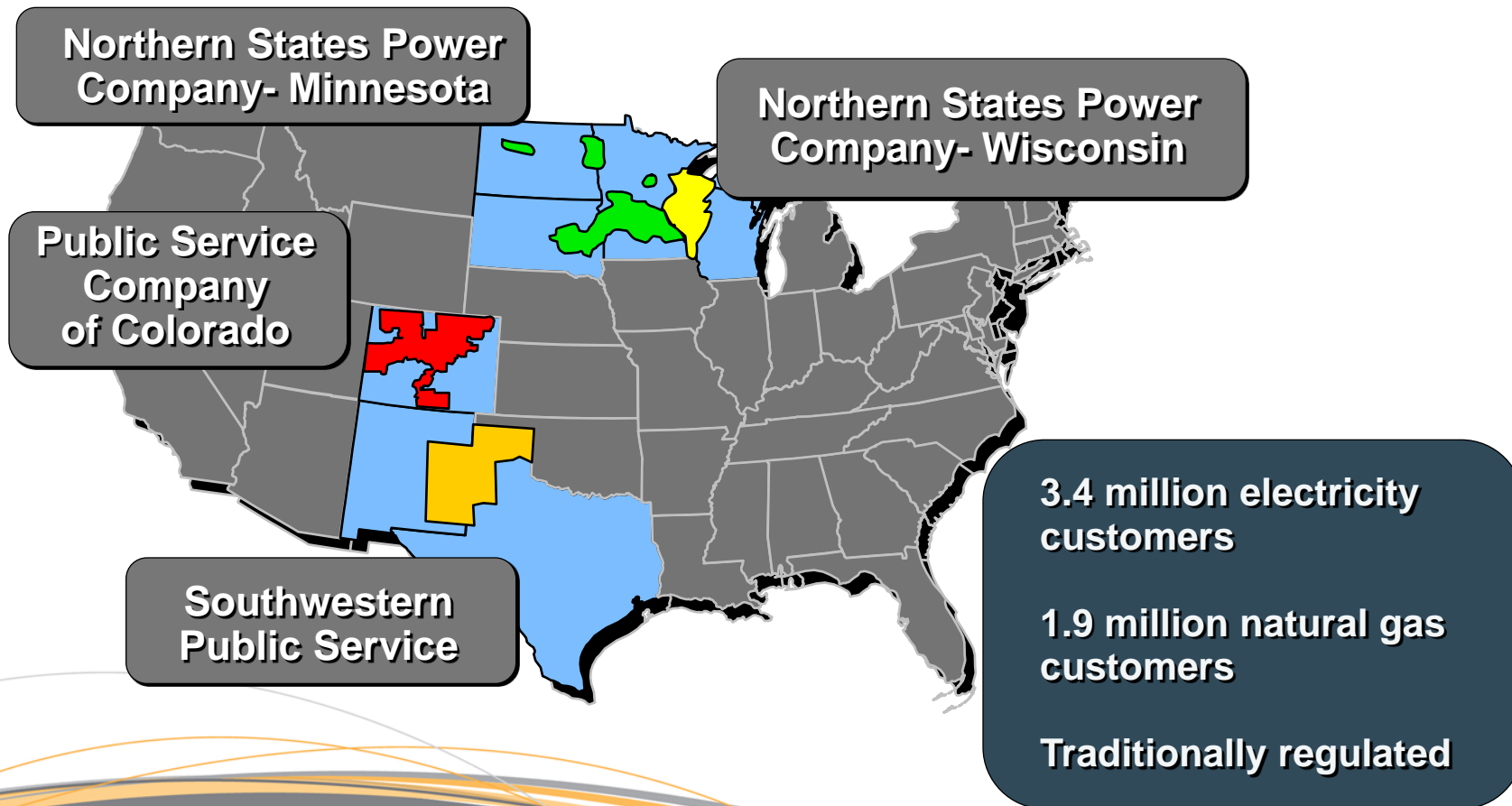# Reinventing Substations Around the Smart Grid: What Happens When Metering and Operations Finally Meet

Greg Lovelace
Commercial Operations IT, Xcel Energy

OSIsoft User Group Meeting
October 19, 2010
Denver, CO

About Xcel Energy

Northern States Power Company- Minnesota

Northern States Power Company- Wisconsin

Public Service Company of Colorado

Southwestern Public Service

3.4 million electricity customers
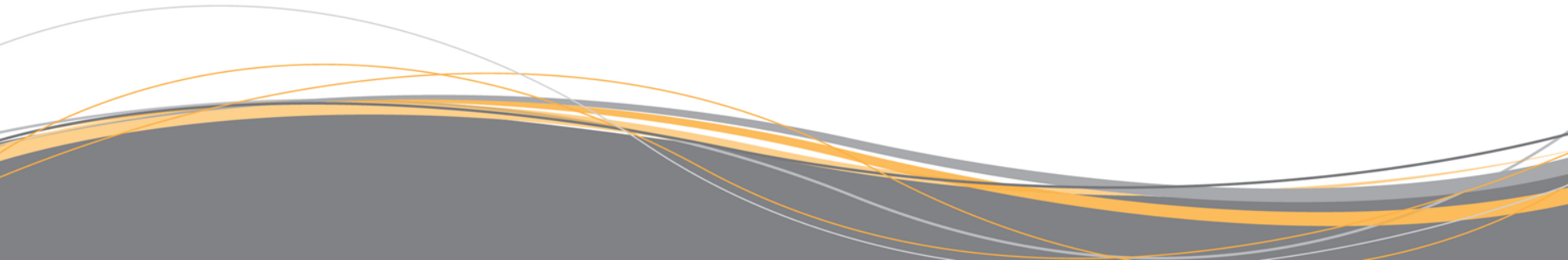
1.9 million natural gas customers

Traditionally regulated

What is SmartGridCity™?

A Technology Pilot to:

- **Improve distribution system operational efficiency and reliability**

- **Facilitate expansion of energy efficiency and demand response by customers**

- **Prepare for integration of higher levels of on-site renewable generation**

Goals

- **Create a test bed**
- **Build skills and experience**
- **Prove (or disprove) hypotheses**
- **Evaluate benefits**
- **Leverage talent**
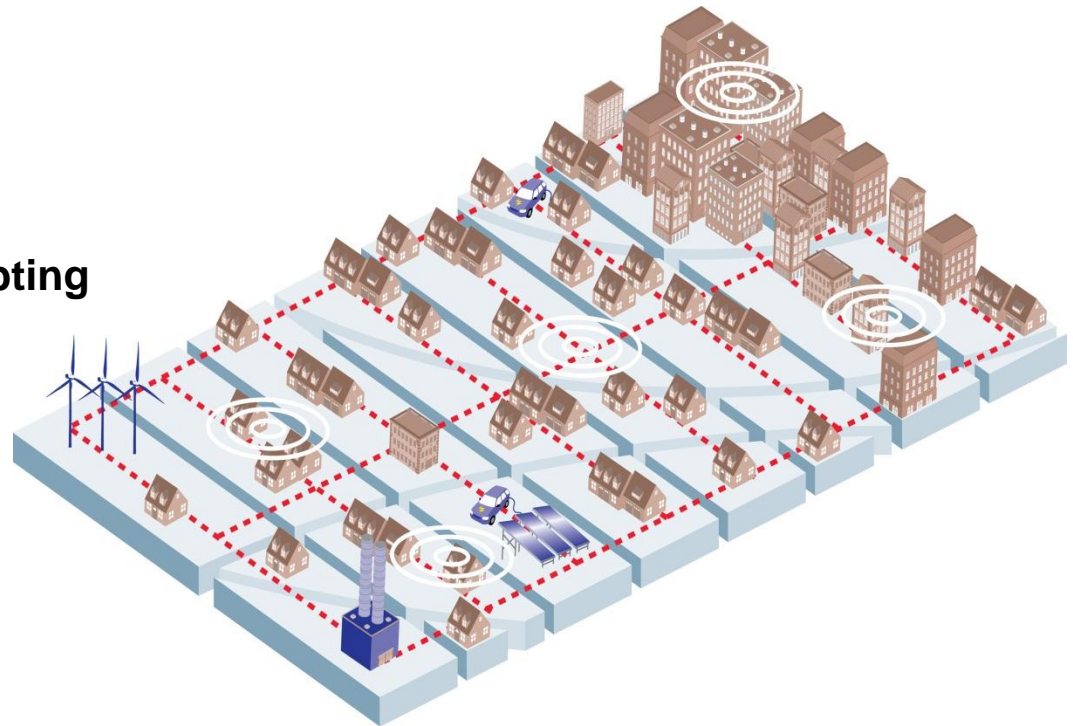
SmartGridCity Infrastructure

- **New IT Infrastructure**
- **Communication Network**
- **Real-Time Grid Monitoring**
- **Real-Time Grid Control**
  - ◆ **Smart Substation**
  - ◆ **Self Healing and Self Adapting**
- **Visualization & Reporting**
- **Smart Metering**
- **Smart Customer Solutions**

Substations: The Core of a Smart Grid Strategy

Substations have to get smarter and play a central role in grid operations

Past & Present

- **Centralized Decision Making**
- **Forecast-based**
- **Reactive**
- **Limited, multiple & disjointed sources of information**
- **Limited or no views**

Future

- **Distributed decision making**
- **Real-time based**
- **Proactive**
- **Sub acts as local information hub**
- **Views satisfy multiple business units**

The Hurdle: Rethinking the Business

- **Getting to value is hard!**
  - ◆ **Volumes of Measurement Data are increasing at an alarming rate**
 - ◆ **The business lacks real-time, Situational Awareness at the distribution level**
- **What is needed:**
  - ◆ **The right type and amount of data & the strategic thought processes around it**
  - ◆ **Comprehensive, at-a-glance views w/ roll-up metrics and pro-active alarming**
  - ◆ **An architecture that supports all the above**

Integrated Data Architecture
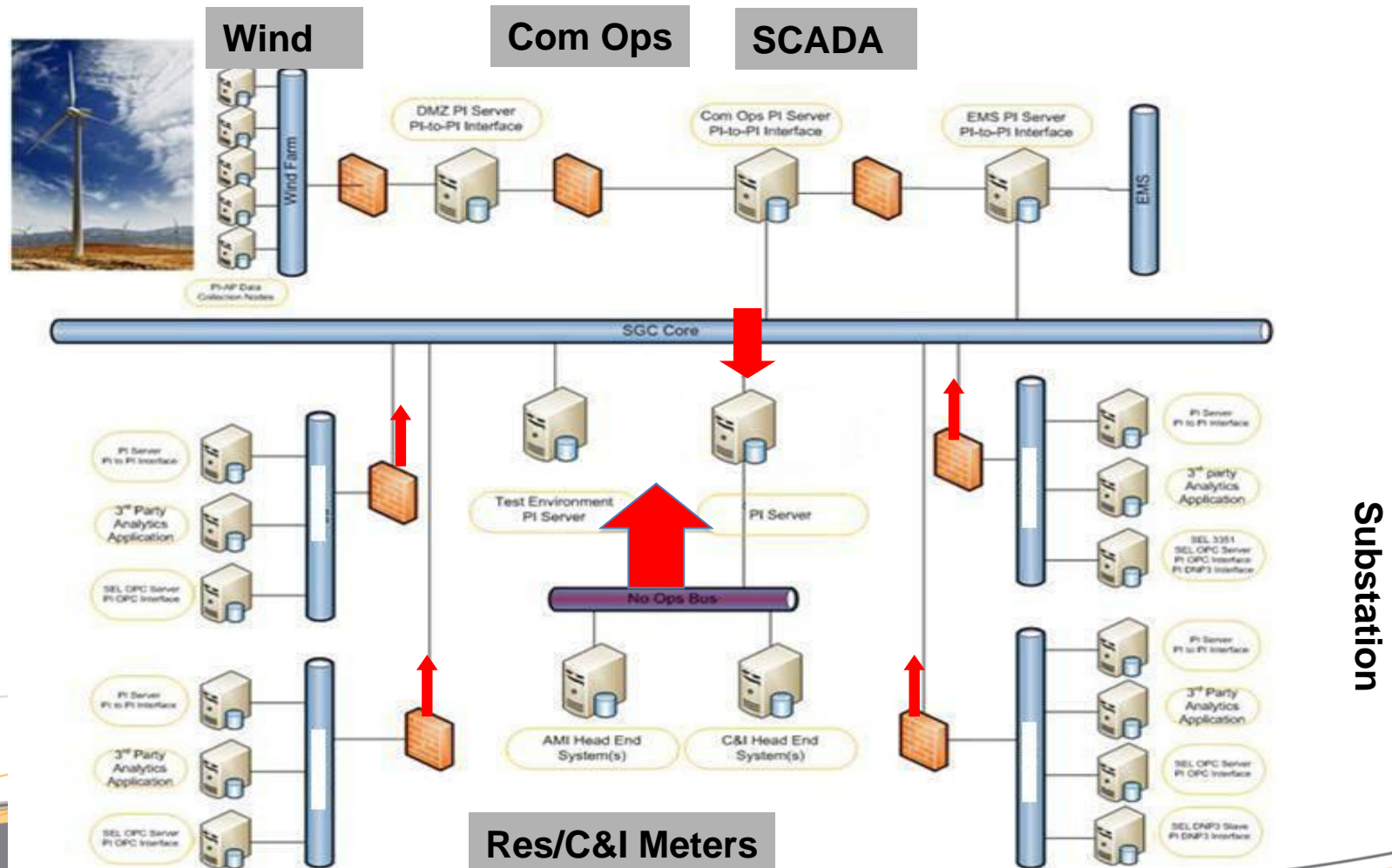
Getting to Value: Understanding the "Roll-up" Mechanism: Net KWh Roll-Up
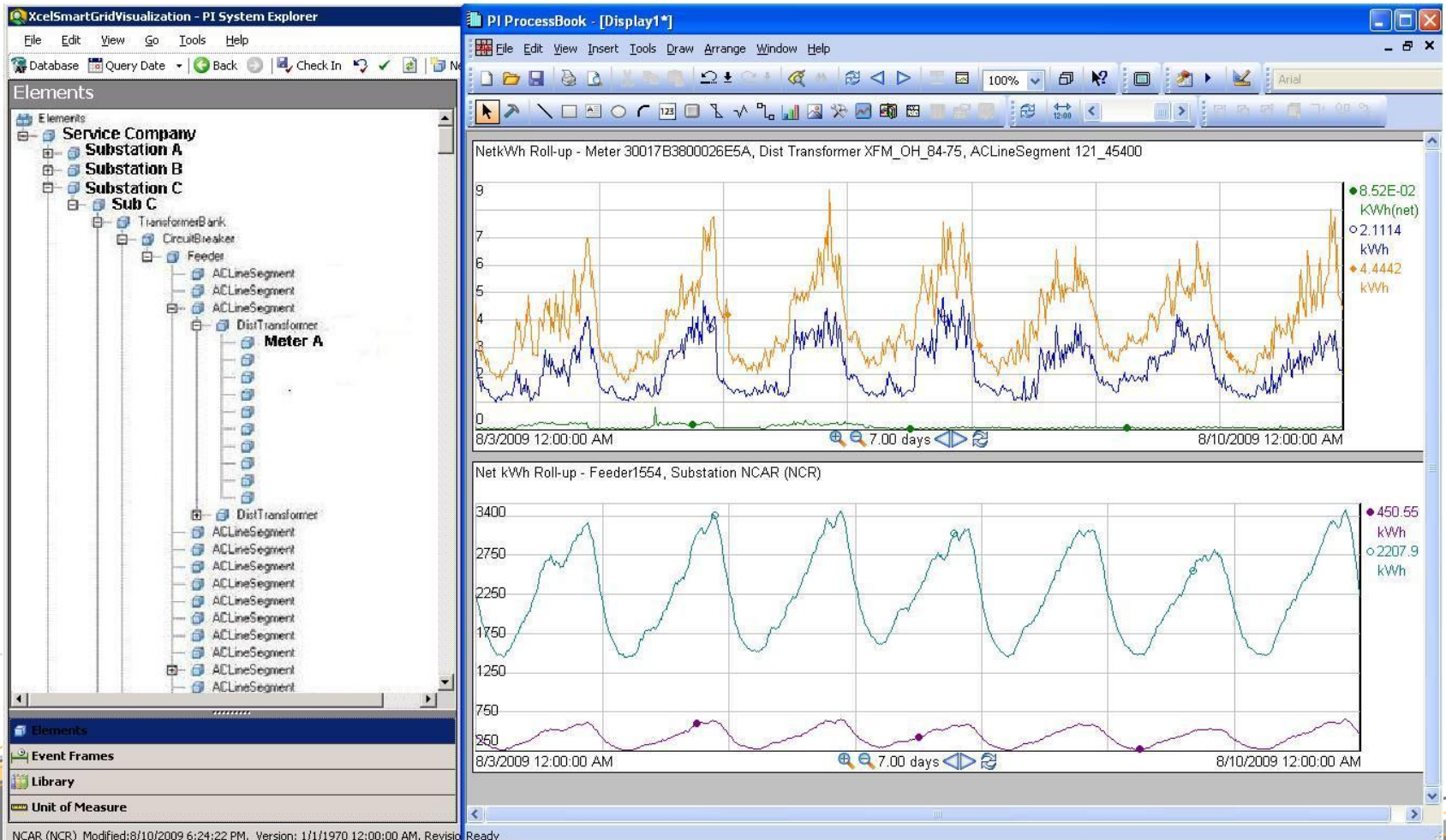
Situational Awareness at SmartGridCity

■ **When implementing substation solution there were four objectives:**

- ◆ **Provide data access for basic engineering at the sub**
  - ■ **Current, Voltage, MWh, MVAR, Breaker status, etc.**
- ◆ **Take advantage of the advance calculations in the relays**
  - ■ **%LOL on Transformers, % Breaker wear, etc**
- ◆ **Provide a vision of the future in a real deployment**
  - ■ **Incorporate Smart Grid Metrics**
- ◆ **Provide value to the business today, position for tomorrow**

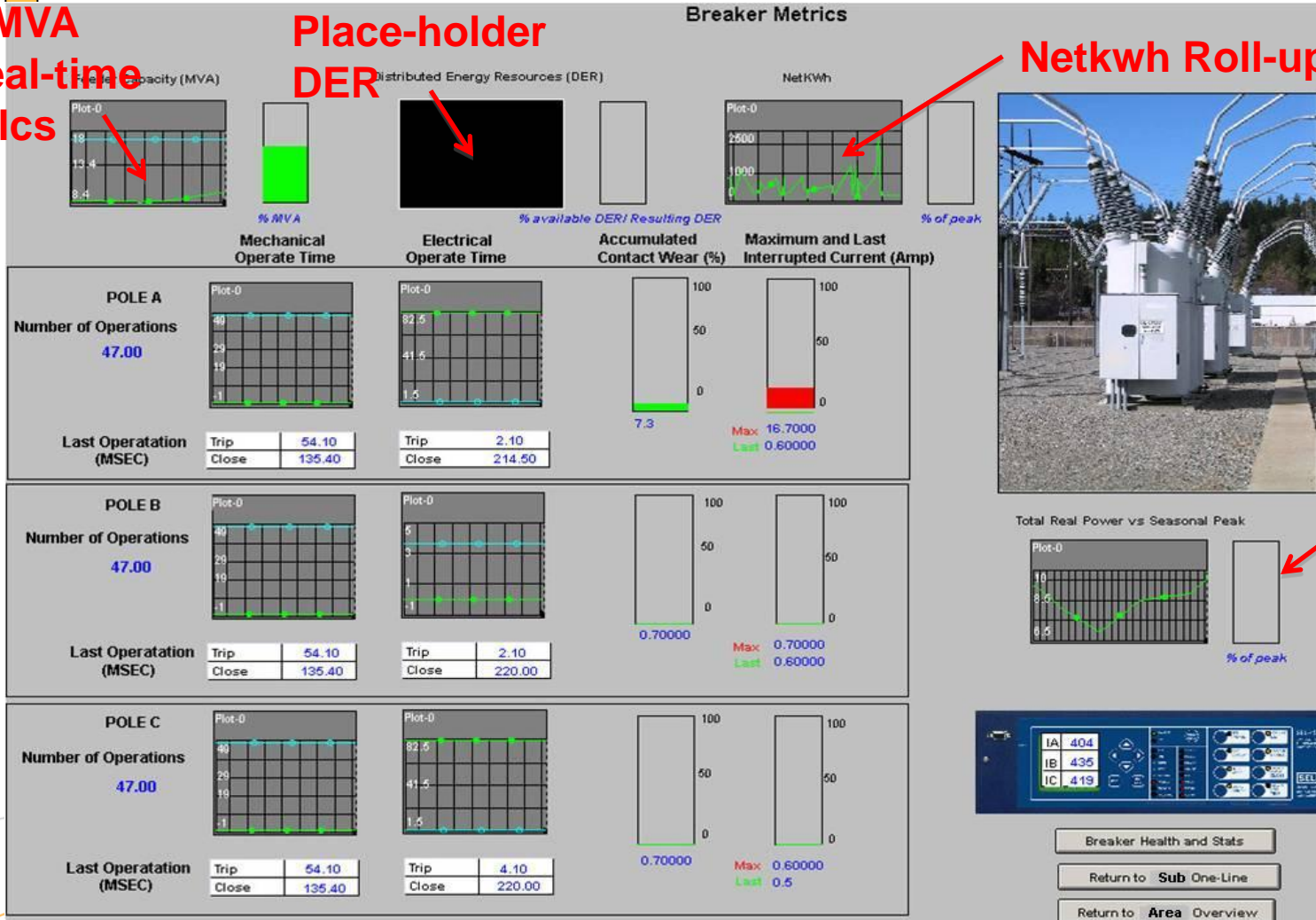# Where Metering Meets Operations: Breaker Metrics
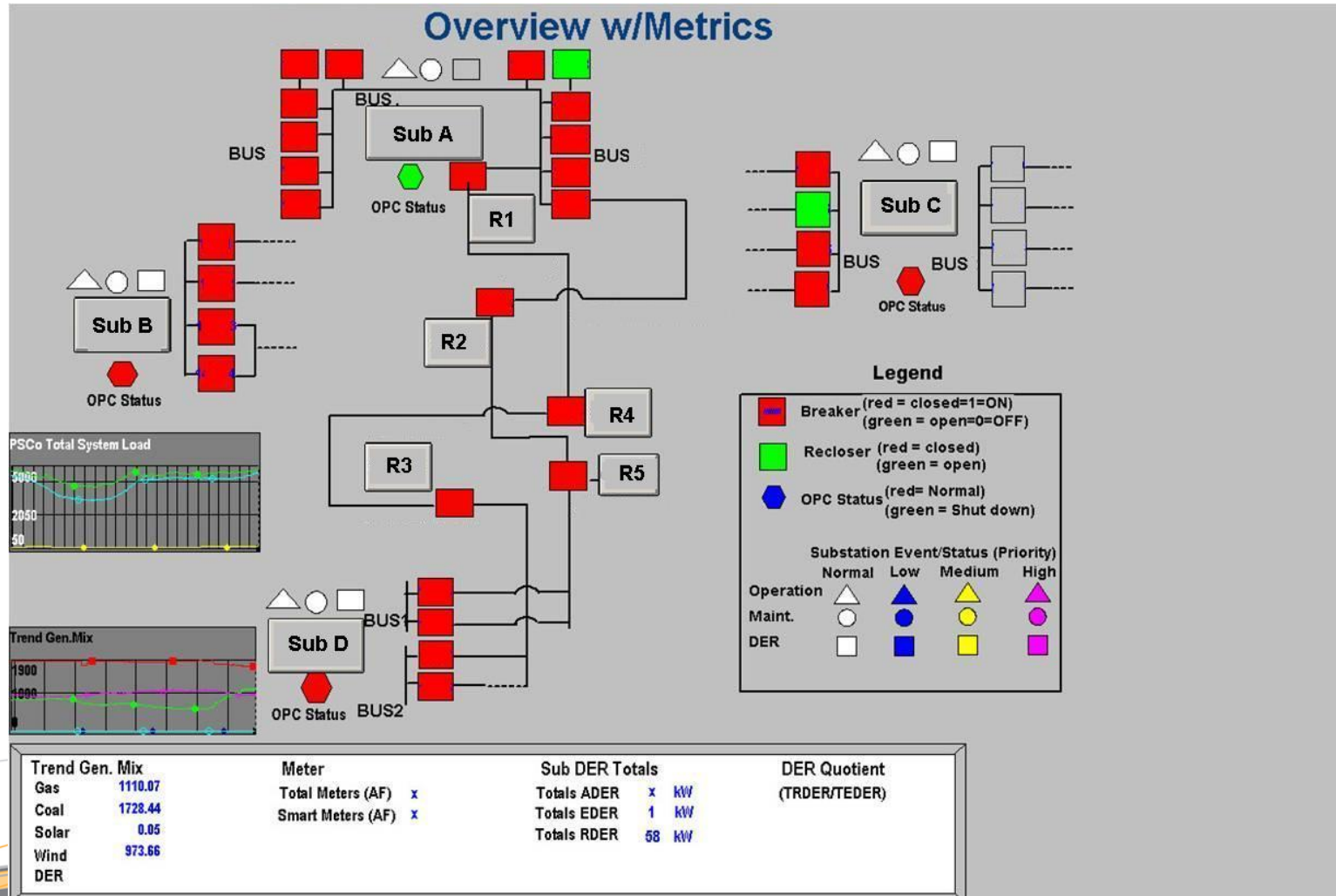
Substation One Line: The "Roll Up" Report Card
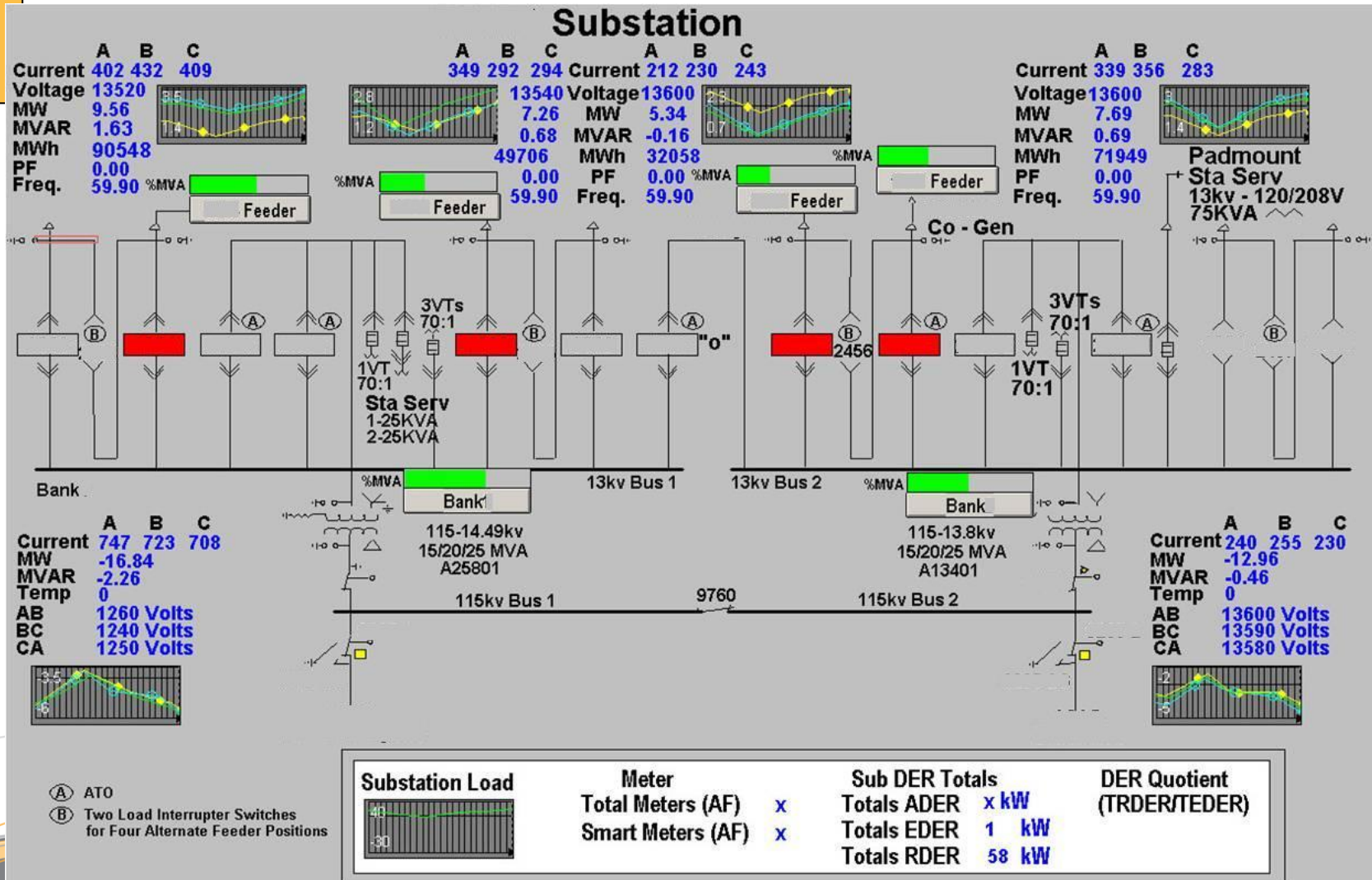
Overview "Roll-up" From Substations Provides Real-time, Situational Awareness

Where are We Today?

- **Data Managed**
  - ◆ **Seamless view**
  - ◆ **Correlate events (PQM with breaker values)**
- **Improved Situational Awareness**
  - ◆ **No need to drive to substation**
  - ◆ **If communications is lost, data are buffered at the subs**
  - ◆ **The right information at the right time is available**
  - ◆ **Real-time problem-solving w/ cross-team collaboration**
    - ■ **Same investigational methodology will work for DG, DR, meters, etc.**
  - ◆ **Feeding other applications and processes**

www.xcelenergy.com/smartgridcity