



**EPRI** | ELECTRIC POWER  
RESEARCH INSTITUTE

# *Evolving* The <sup>^</sup>Interoperable Smart Grid

June 22, 2009

MACRUC Annual Education Conference

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# The Electric Power Research Institute

## RD&D Consortium for the Electricity Industry

- Independent, unbiased, tax-exempt collaborative research organization
- Full spectrum industry coverage
  - *Nuclear*
  - *Generation*
  - *Environment*
  - *Power Delivery & Utilization*
- 460 participants in over 40 countries
- Major offices in Palo Alto, CA; Charlotte, NC and Knoxville, TN



# Objectives

1. What is a Smart Grid?
2. How will it evolve?
3. Security
4. What are we doing?
5. What can you do?



# What is The Smart Grid?

Many Definitions - But One **VISION**

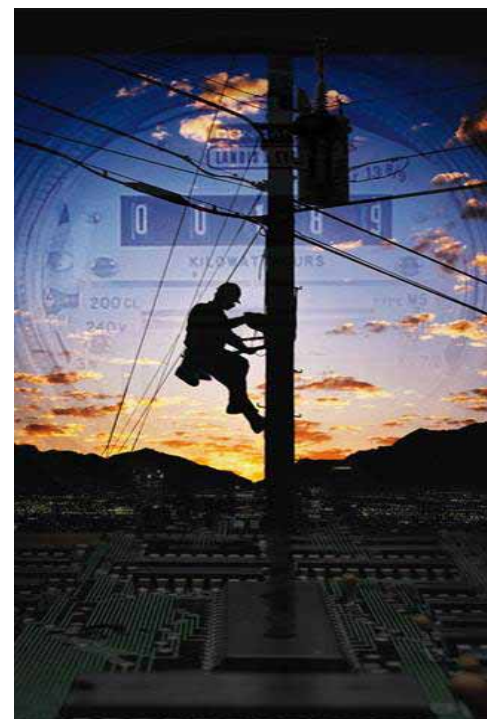
- Engaging Consumers
- Enhancing Efficiency
- Ensuring Reliability
- Enabling Renewables

Highly Instrumented with Advanced Sensors and Computing

Interconnected by a Communication Fabric that Reaches Every Device

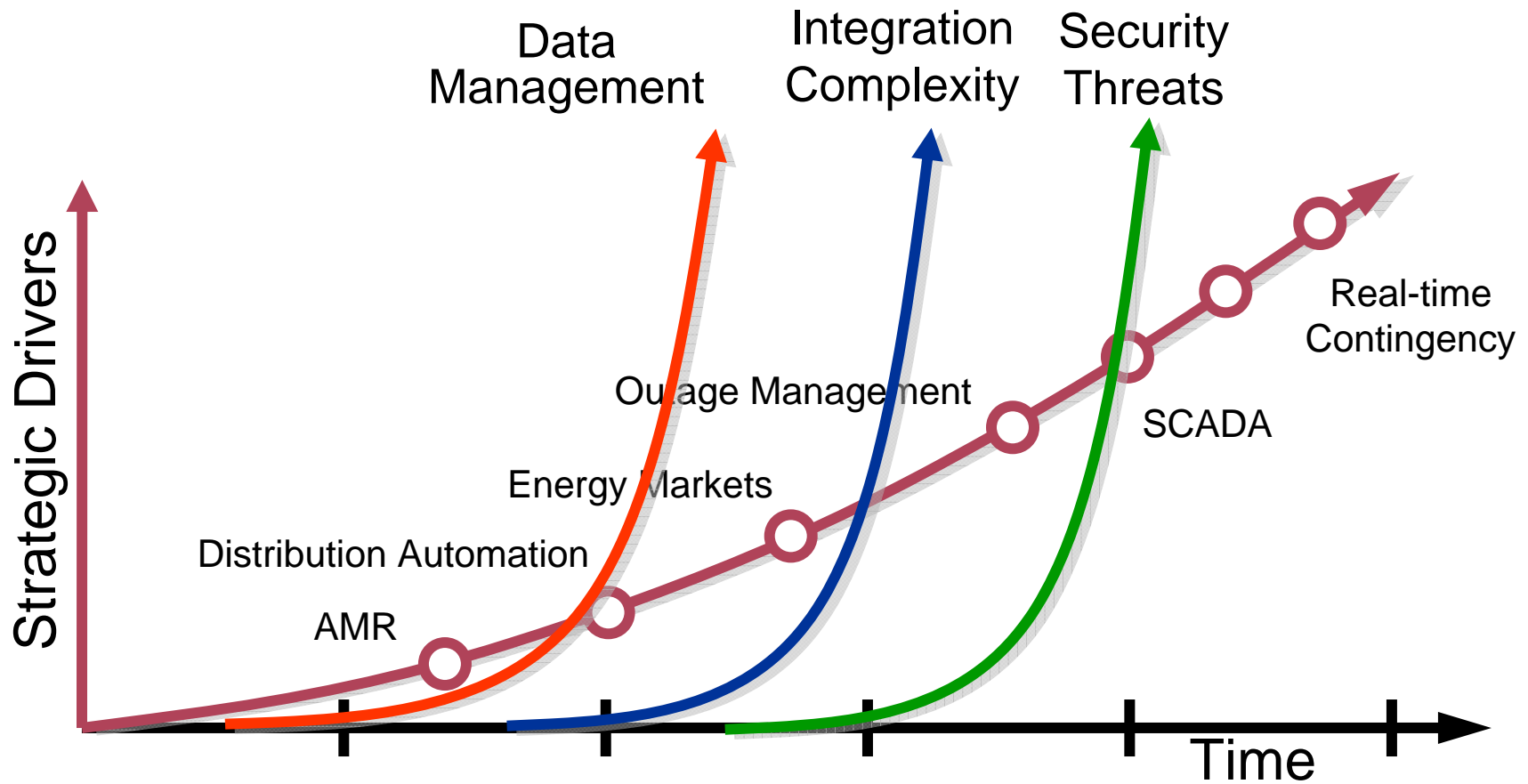
# EPRI's Smart Grid Leadership

- 36 Year RD&D Focused on Enhancing Power Quality and Reliability
- IntelliGrid Architecture
  - Foundation and Methodology
  - Accelerated Standards Development
- AMI Security Requirements and Best Practices
- Smart Grid Demonstration Projects
  - Integration of distributed energy resources

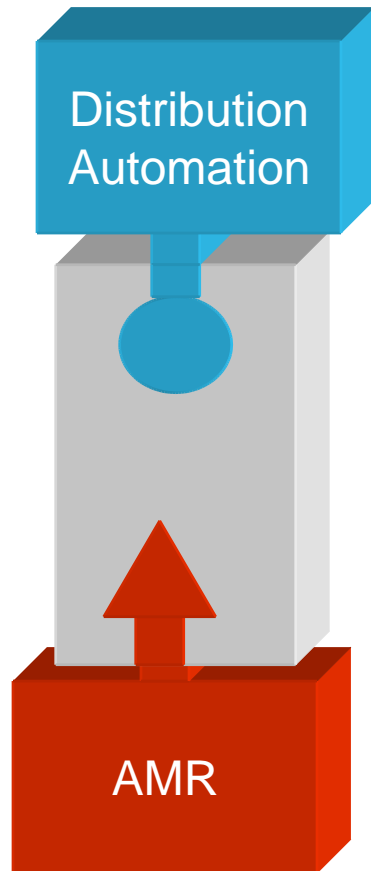


# How does a Smart Grid evolve?

Evolves over time - no single approach

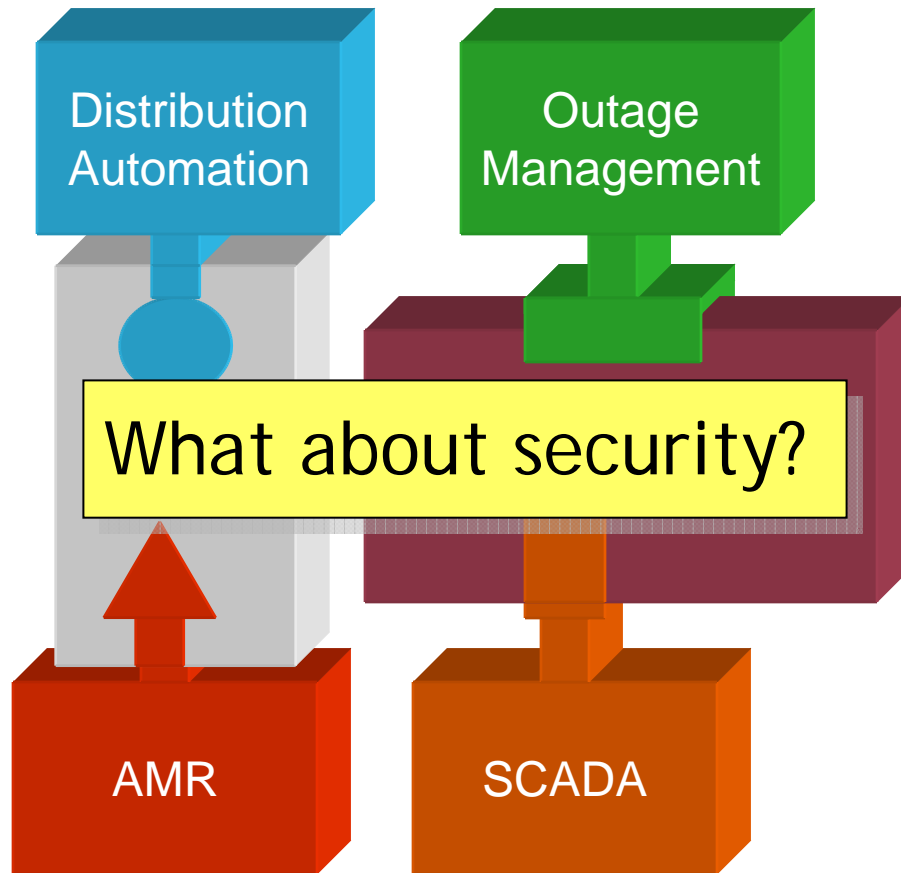


# How is it Done Today?



- Develop systems separately
  - Traditionally the most “cost effective” solution
- Integration done later
  - Business and regulatory strategic drivers
  - Data mining for valued information leading to action

# How is it Done Today?



- What about other applications?
- First make the old system expandable
- *Transition Point* between a “small” system and a fully integrated system

# Security - Key Takeaways

- Security requires many different solutions
  - Not just encryption and password protection
- Threats come from many direction
  - Most dangerous “attacker” is the disgruntled employee

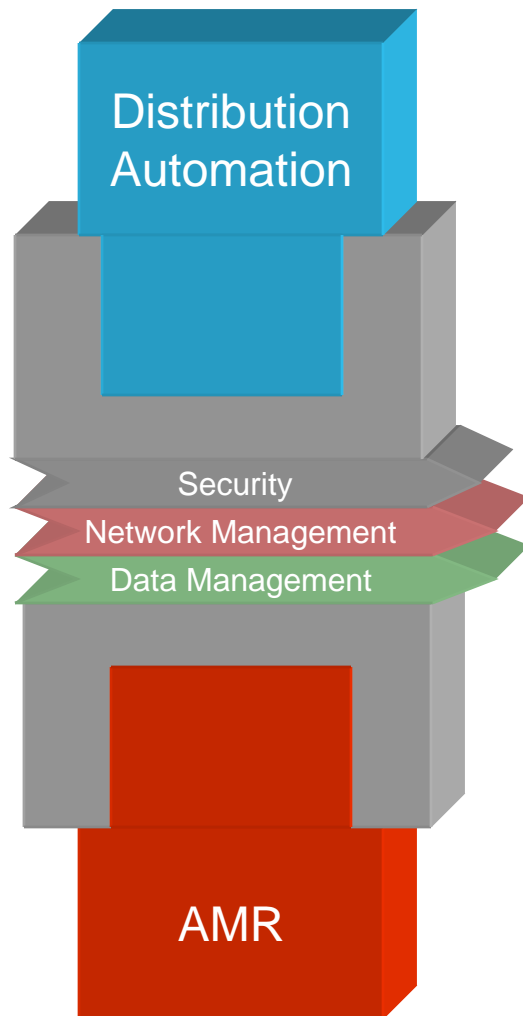


# Security - Key Takeaways

- Security solutions must be *end-to-end* and layered
  - If one layer is breached, the next should provide protection
- Security will **ALWAYS** be breached at some time
  - What is the contingency plan?
  - What is the recovery plan?
  - Protect the worst-case scenario



# Better Solution: A Systems Approach

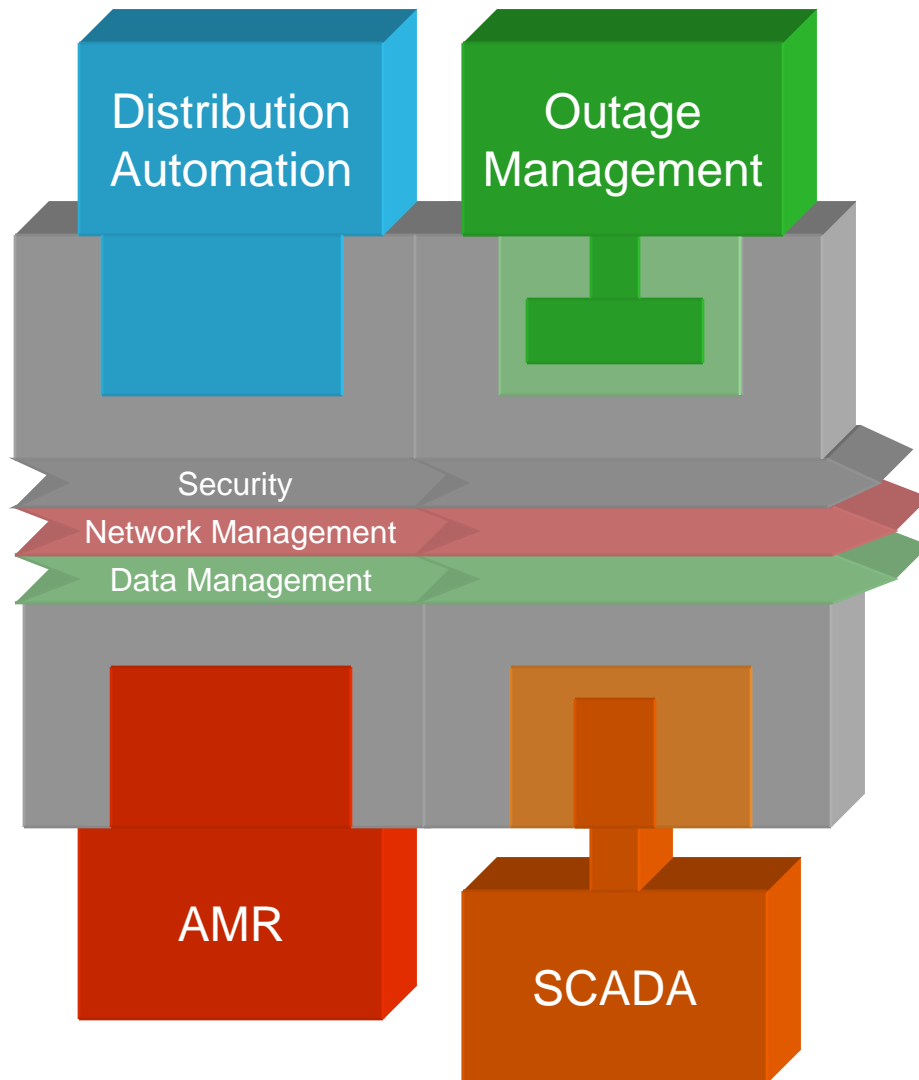


- Determine the Applications - What do you want to do?
- Identify requirements to support the Applications

## IntelliGrid Architecture Methodology

- Incorporate Security, Network Management and Data Management from BEGINNING
- New applications build directly into existing architecture

# Better Solution: A Systems Approach



- Re-use the development from the first phase
- Expansion is expected
- Adaptation to legacy systems is planned in advance

# What's Needed?

## Interoperability



- *Plug and Work* devices and software

## Open Architecture

- Non-proprietary infrastructure - no vendor lock-in

## Industry-Accepted Standards

- Encourages confident infrastructure investment
- Reduces risk of obsolescence

# What's Happening With Standards?

- NIST - Responsible for recommending Smart Grid standards
- Contracted with EPRI to facilitate development of interim Smart Grid Standards Interoperability Roadmap
  - High-level Smart Grid architecture
  - Priorities for interoperability standards
  - Initial set of standards
- Stakeholder workshops April 28-29 & May 19-20
- Interim roadmap delivered Wednesday, June 17



**<http://www.nist.gov/smartgrid/InterimSmartGridRoadmapNISTRestructure.pdf>**

# What Can You Do?

- Understand the **VISION** for an **evolving** Smart Grid
- Understand the issues and need for interoperability standards
- Become familiar with interoperability standard developments lead by NIST
- Ask questions



# Summary - Evolving the Smart Grid

- Smart Grid has many definitions but one **VISION**
  - Engaging Consumers    Enhancing Efficiency
  - Ensuring Reliability    Enabling Renewables
- Smart Grid will **evolve**
  - *Built at the speed of value*
- Security must be part of the **DESIGN**
- Working with industry stakeholders to develop the NIST **Smart Grid Standards Interoperability Roadmap**





# Together...Shaping the Future of Electricity