# Smart Grid Technologies

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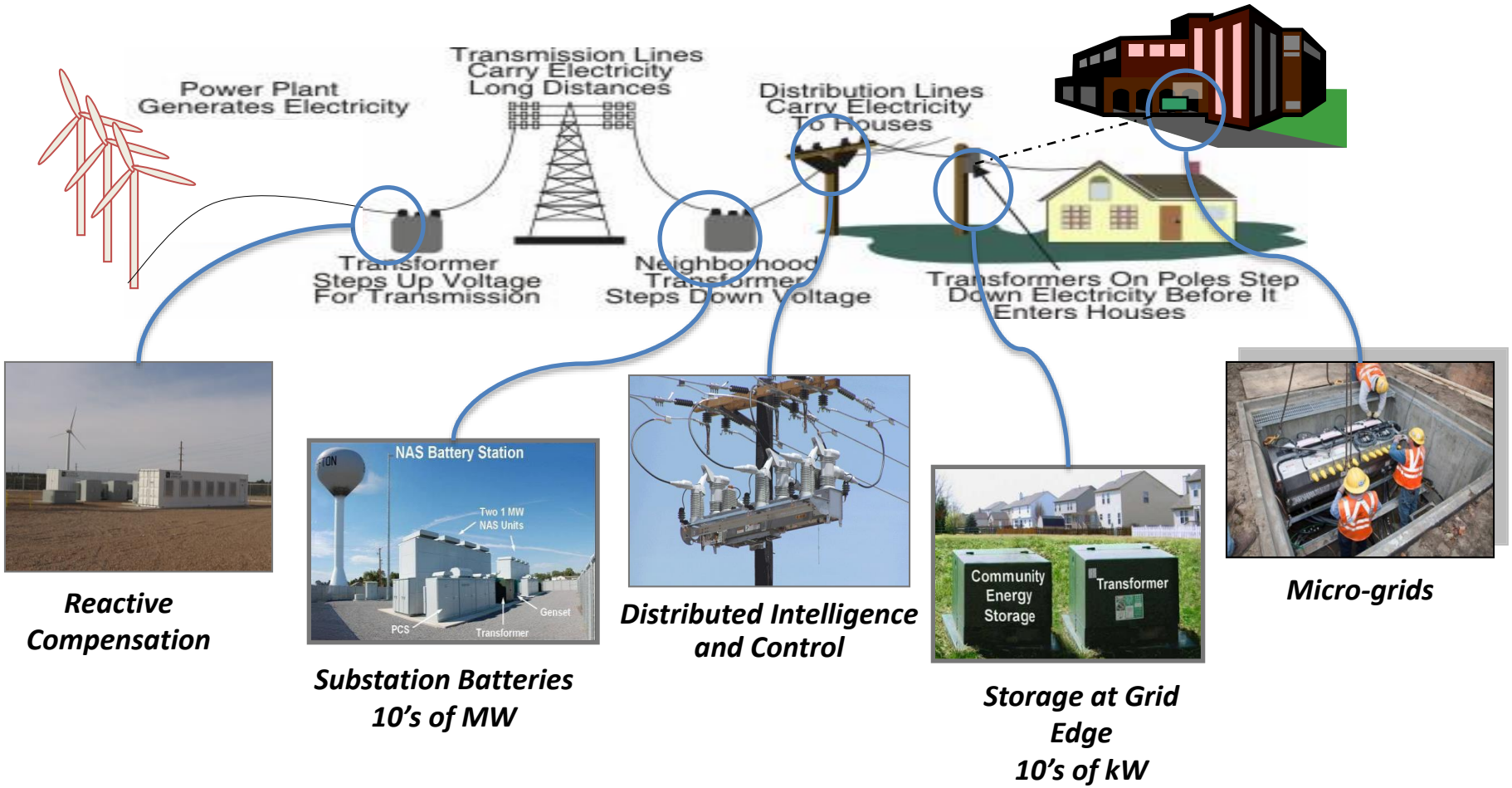
# Technology Drivers

- Increased pace of change, evolving technology
- Moving to a dynamic state with distributed generation
- More intelligent devices with lots of data
- Increasing desire for better reliability
- Better infrastructure utilization / functionality
- Greater resiliency and real-time capability

# S&C Smart Grid Technologies




***Reactive Compensation***

***Substation Batteries 10's of MW***

***Distributed Intelligence and Control***

***Storage at Grid Edge 10's of kW***

***Micro-grids***

# Implementation of Future Technologies

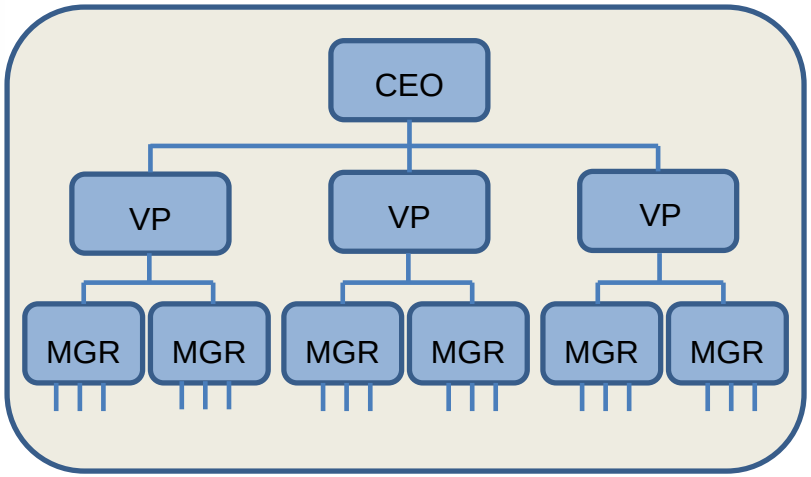
- Clear benefits with biggest impact
  - Efficiency, savings, reduced emissions, energy security, economic growth, reliability….
- Achieves value proposition and balance
  - Customers, policies, and markets
- My bets:
  - Grid automation + energy storage
  - Integration across applications
  - Optimized oversight with more local intelligence

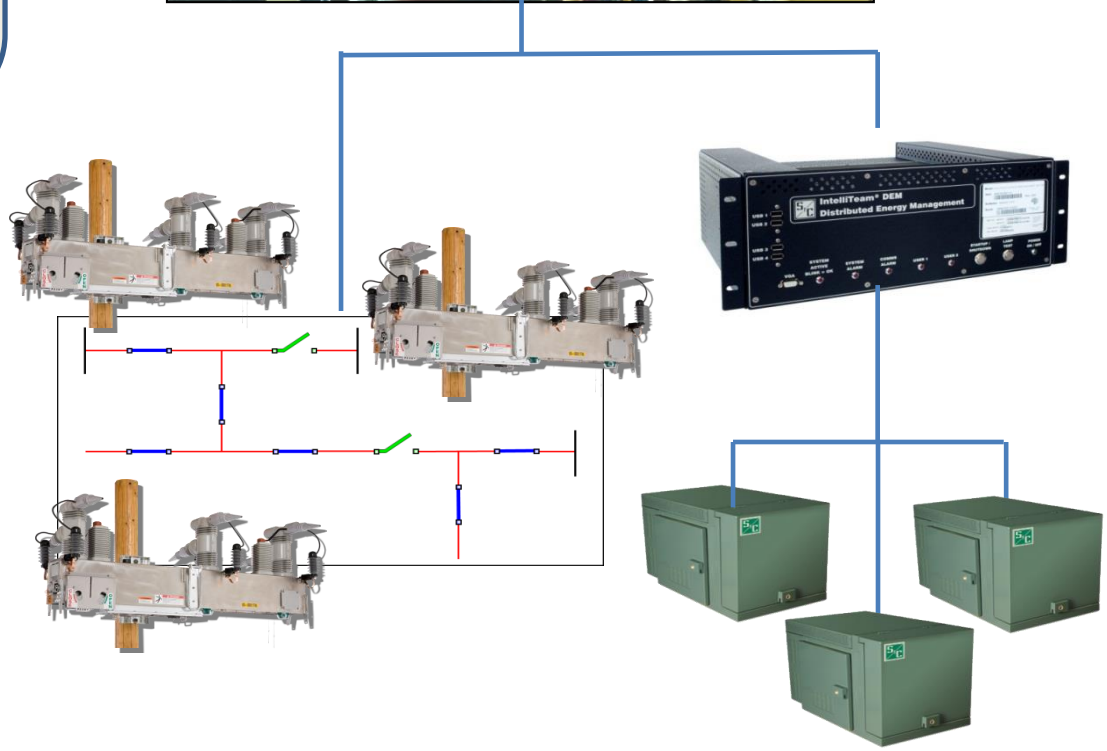
# Grid Automation and Energy Storage

- Self-healing grid automation using power from available sources
- Coupled with distributed energy storage for more sources
- Energy storage + self-healing = microgrid
- “Distributed” model
  - Reduce reliance on communications
  - Focus crews immediately
  - Differentiate service

*EPB Chattanooga saved $100MM per year, avoided 58 million customer minutes in July 2013 storm*

# Organization




- Centralized policy
- Local intelligence
- Occasionally matrixed

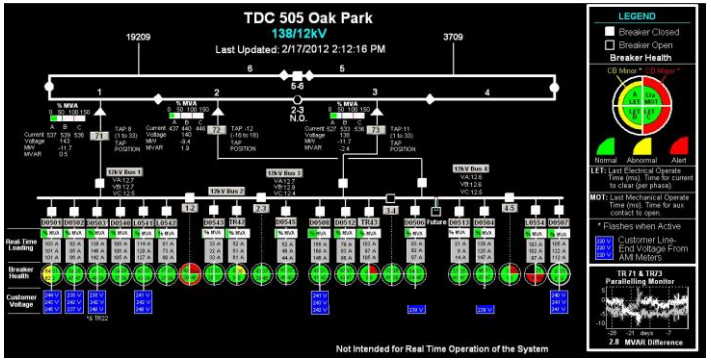
# ComEd Smart Grid Upgrades

*$1.3B Investment through the Illinois Energy Infrastructure Modernization Act (EIMA)*

- ✓ Smart Meters *(2013-2021)*
  - Replacing all 4 million meters on ComEd's system
  - Enables advanced time-variable rates and other energy-related products

- ✓ Distribution Automation *(2012-2016)*
  - Smart switches detect problems on the grid and re-route power
  - Installing 2,600 devices on 12kV and 34kV circuits

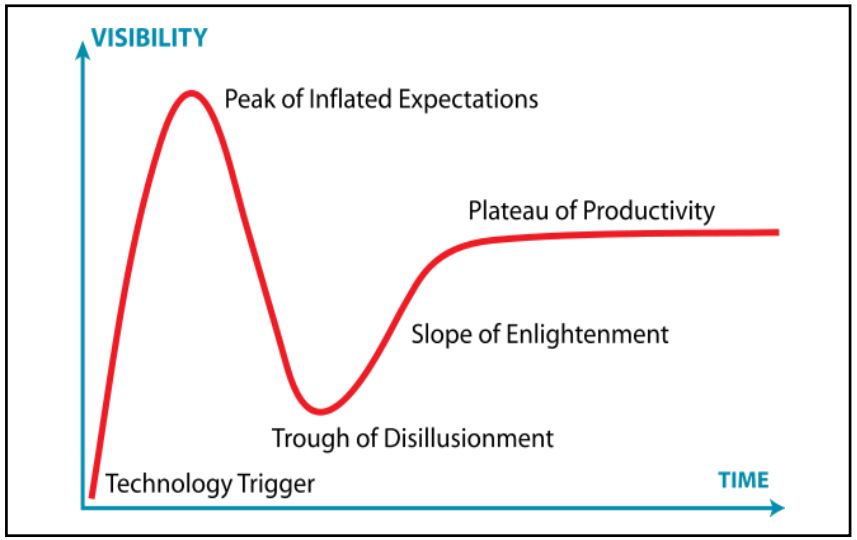
- ✓ Intelligent Substations *(2012-2017)*
  - Upgrading 10 of ComEd's transmission-connected substations
  - Includes microprocessor relay upgrades and real-time monitoring
  - Dashboard data analytics





# Manage the Deployment Journey

- Provide solutions that scale
  - Building on existing technology know-how and practices
  - Demonstrate successfully
  - Involve stakeholders early
  - Understand motivators
  - Consider scalability factors




- Achieve faster acceptance and successful, system-wide implementations

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