



Integrating the Future

Mike Winters, SVP & CIO

Hydro One Networks, Inc.



Our Evolving Utility

Hydro One continues to innovate to improve its business capabilities.

1990

2008

2012

Customer Service



Meter Reading



Outage Management



Asset Management
Work Execution



Power System Management



Renewing Ontario's Power Grid

People, process and technology aligned with the strategic plan.



HYDRO ONE STRATEGIC PLAN
2010 - 2014

*Innovation & Leadership:
Renewing Ontario's Power Grid*

Our mission and vision

*We will be an innovative and trusted
company delivering electricity
safely, reliably, and efficiently to
create value for our customers*

Our Strategic Plan builds on the company's strong commitment to the Province of Ontario and is shaped by our Values. It lays out a set of clear objectives to position Hydro One to achieve its Mission and Vision.



*Injury-Free
Satisfying Our Customers
Continuous Innovation
Reliable Tx and Dx
Protecting the Environment
Employee Engagement
Shareholder Value
Productivity & Cost Effectiveness*

Target Business Capabilities

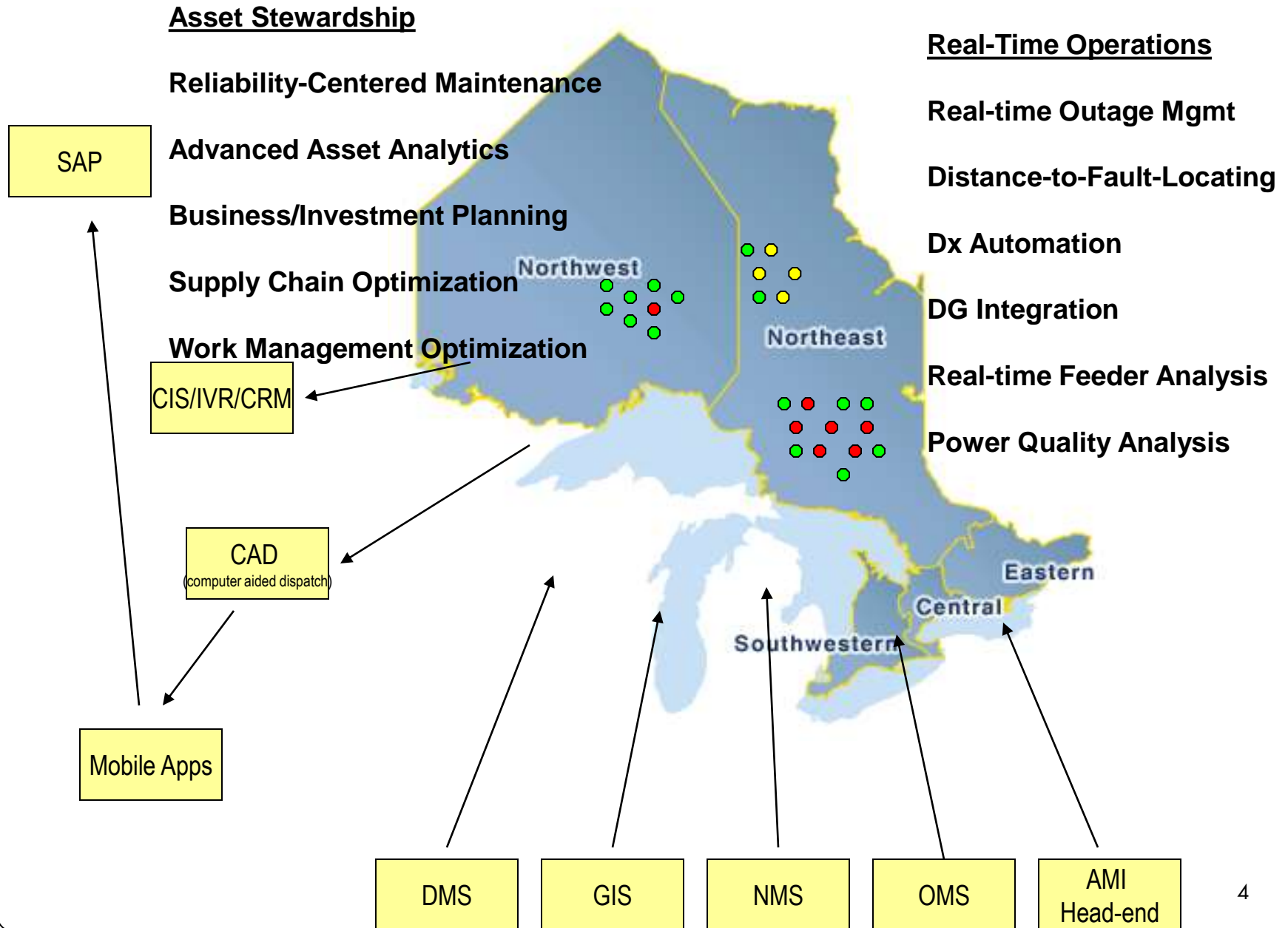
Customer Service	✓	✓				
Asset Management	✓		✓	✓	✓	✓
Demand Management	✓		✓	✓	✓	✓
Metering	✓	✓	✓	✓		✓
Work Execution	✓		✓	✓	✓	✓
Power System Operations	✓	✓	✓	✓	✓	✓
Power System Enhancement		✓	✓	✓		✓

Transformational Technology

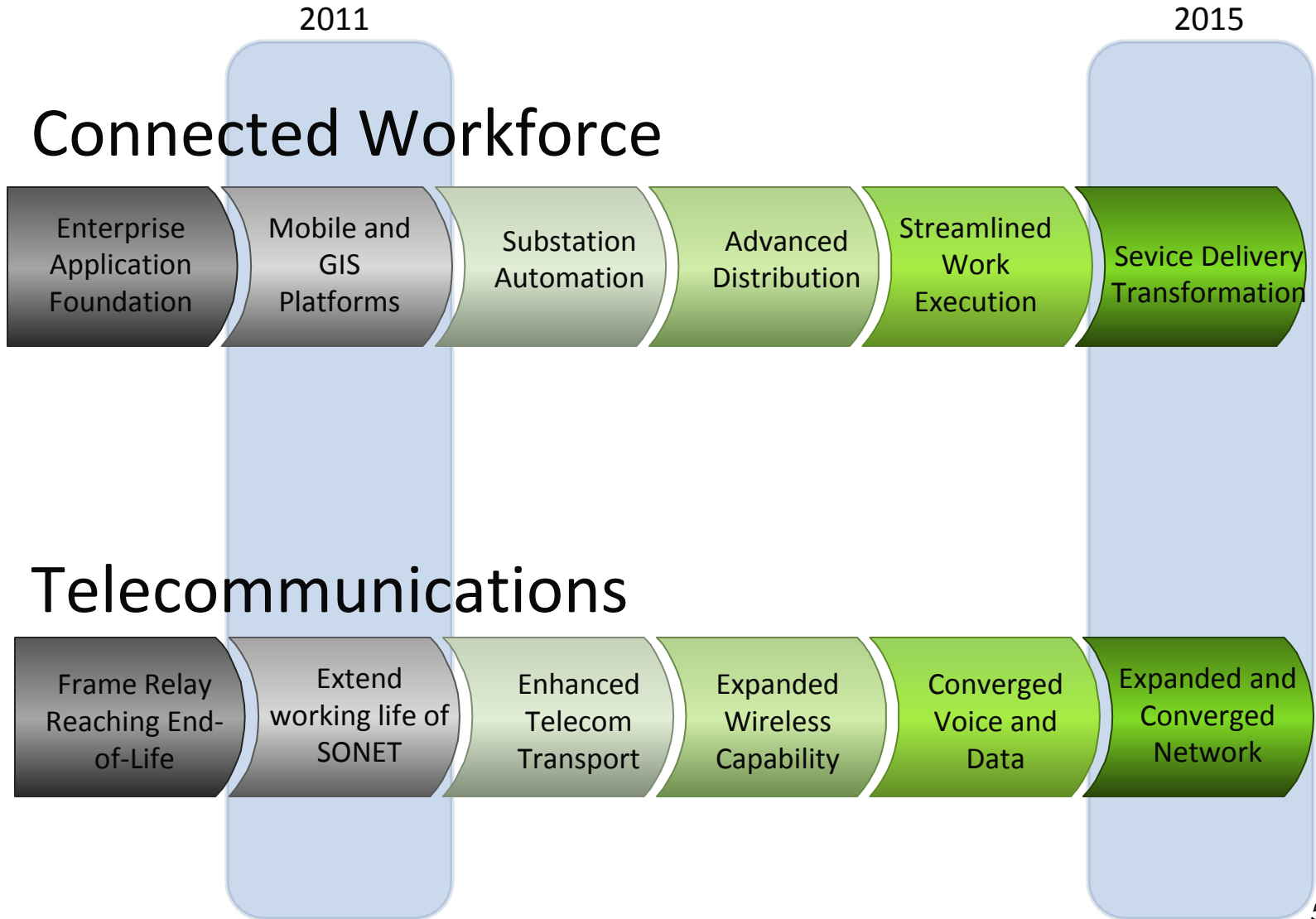
Enterprise Applications		✓	✓	✓	✓	✓	✓
Geo-spatial Information Systems	✓	✓	✓	✓	✓	✓	✓
Intelligent Electronic Devices	✓		✓	✓	✓	✓	✓
Smart Meter	✓	✓	✓		✓	✓	✓
Smart Grid	✓	✓	✓	✓	✓	✓	✓
Unified Communications	✓		✓		✓	✓	✓
Mobile IT	✓		✓	✓	✓	✓	✓
Business Intelligence		✓			✓	✓	✓
Advanced Data Networks		✓	✓	✓		✓	✓
Enterprise Content Management		✓	✓		✓	✓	✓
Customer Information System		✓	✓		✓	✓	✓

Bringing ICT Together for Utility Operations

B/BW-enabled Business Process Management and Performance Management



Leveraging existing investments to ensure strategic objectives can and are being met with a robust telecommunications foundation



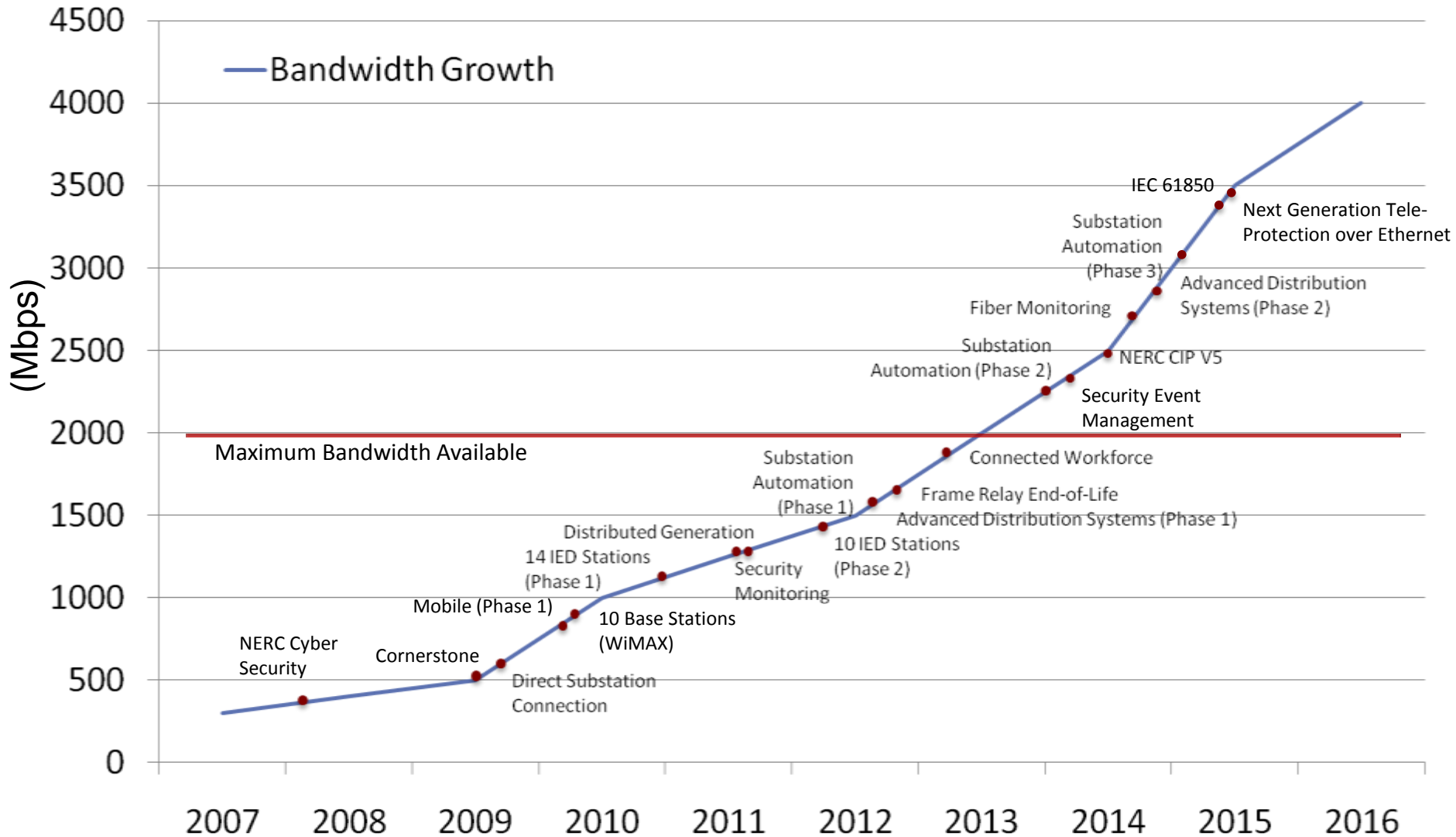
The Need for Advanced Dx

- Renewable Generation
 - ❖ North Americans produce 25% of the world's carbon emissions— electricity generation accounts for 40% of these emissions
 - ❖ Ontario's Green Energy and Green Economy Acts are significantly stimulating investment in clean Distributed Generation
 - 500 Feed In Tariff (FIT) applications
 - 25,000 Micro FIT applications
 - ❖ The distribution system needs to be modernized to safely incorporate distributed generators on the system while maintaining reliability
- Aging Infrastructure
 - ❖ We operate in a 21st century digital economy built on a 100 year old electromechanical distribution system with many components reaching the end of their lifespan. It only makes sense to make the incremental investment to modernize as replacement is needed.



Network Demand and Evolution

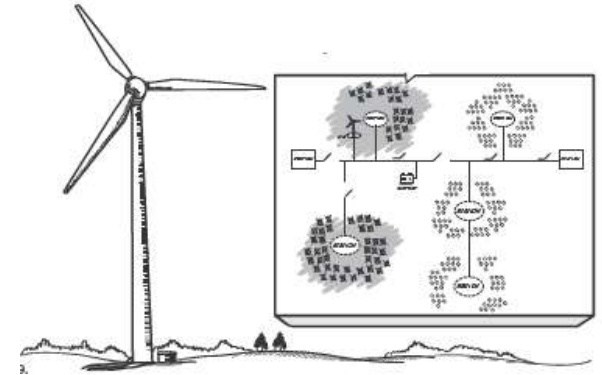
Bandwidth Growth



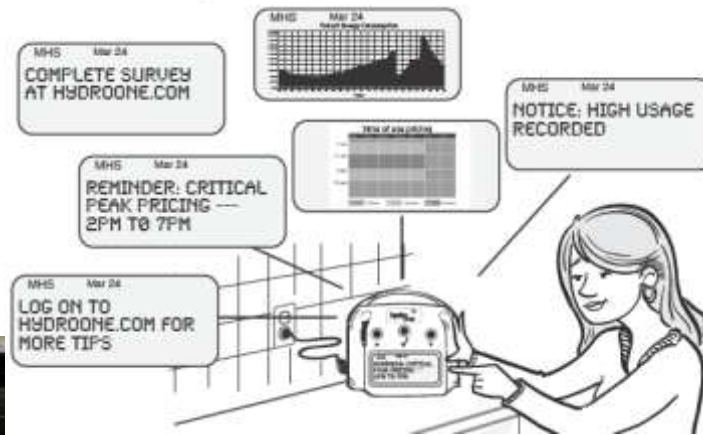
ICT-enabled capabilities in a Smart Grid



Distribution System Reliability & Operations



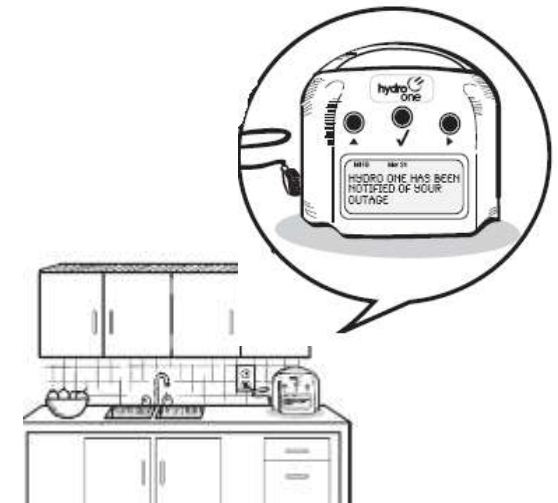
Distributed Generation Integration



Customer Enablement



Plug In Hybrid Electric Vehicles (PHEV)



Real-time Outage Management

Solution: Advanced Distribution System (ADS) Project

ADS
PROJECT =

information
technology

+

power
systems
technology

+

operations
technology

- program management
- solution architecture
- application integration
- quality assurance
- organizational alignment

- IEC61850 substations
- distribution automation
- engineering
- protection systems

- distribution management system
- distribution SCADA
- GIS integration
- DG management

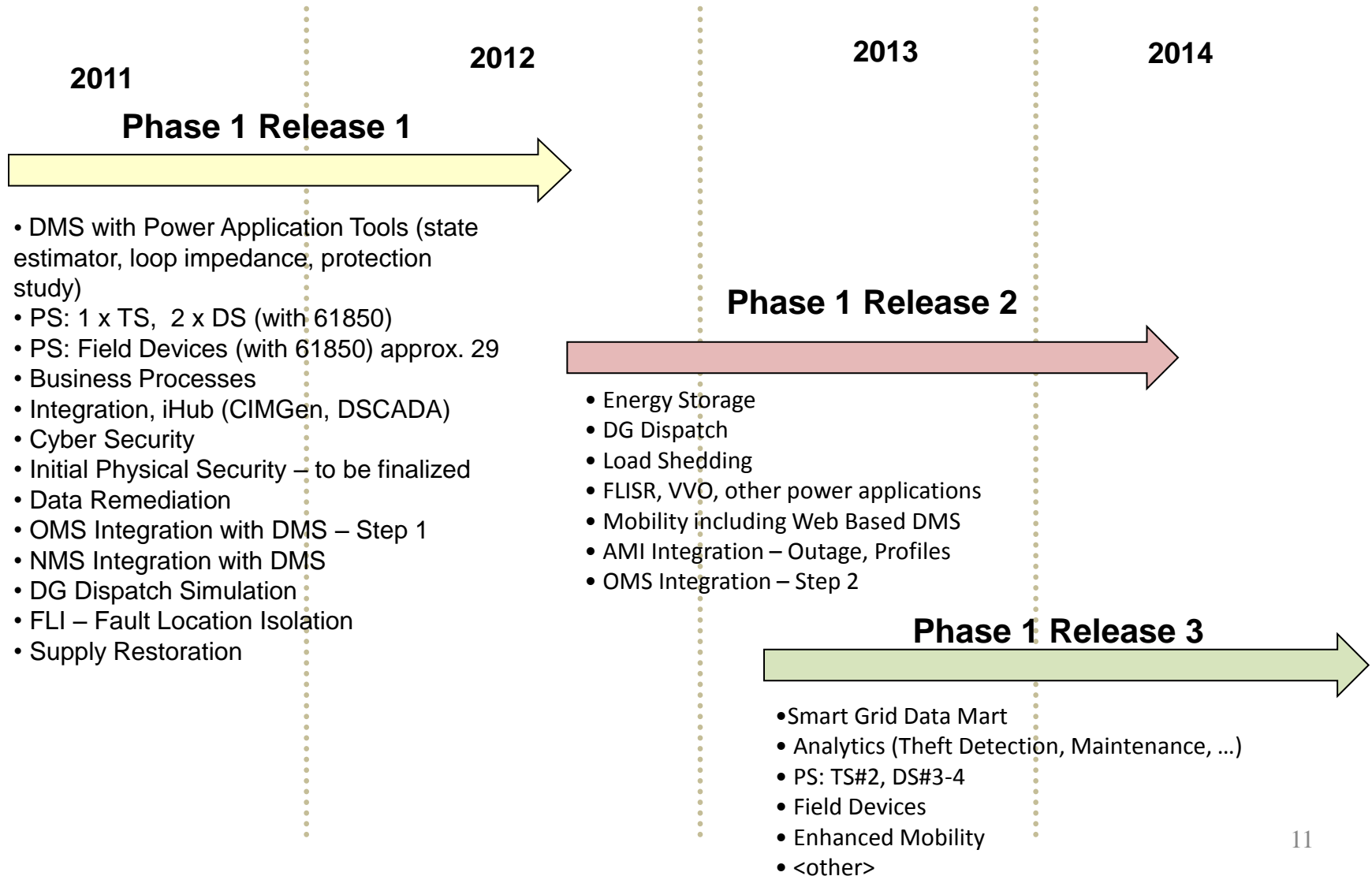
project team



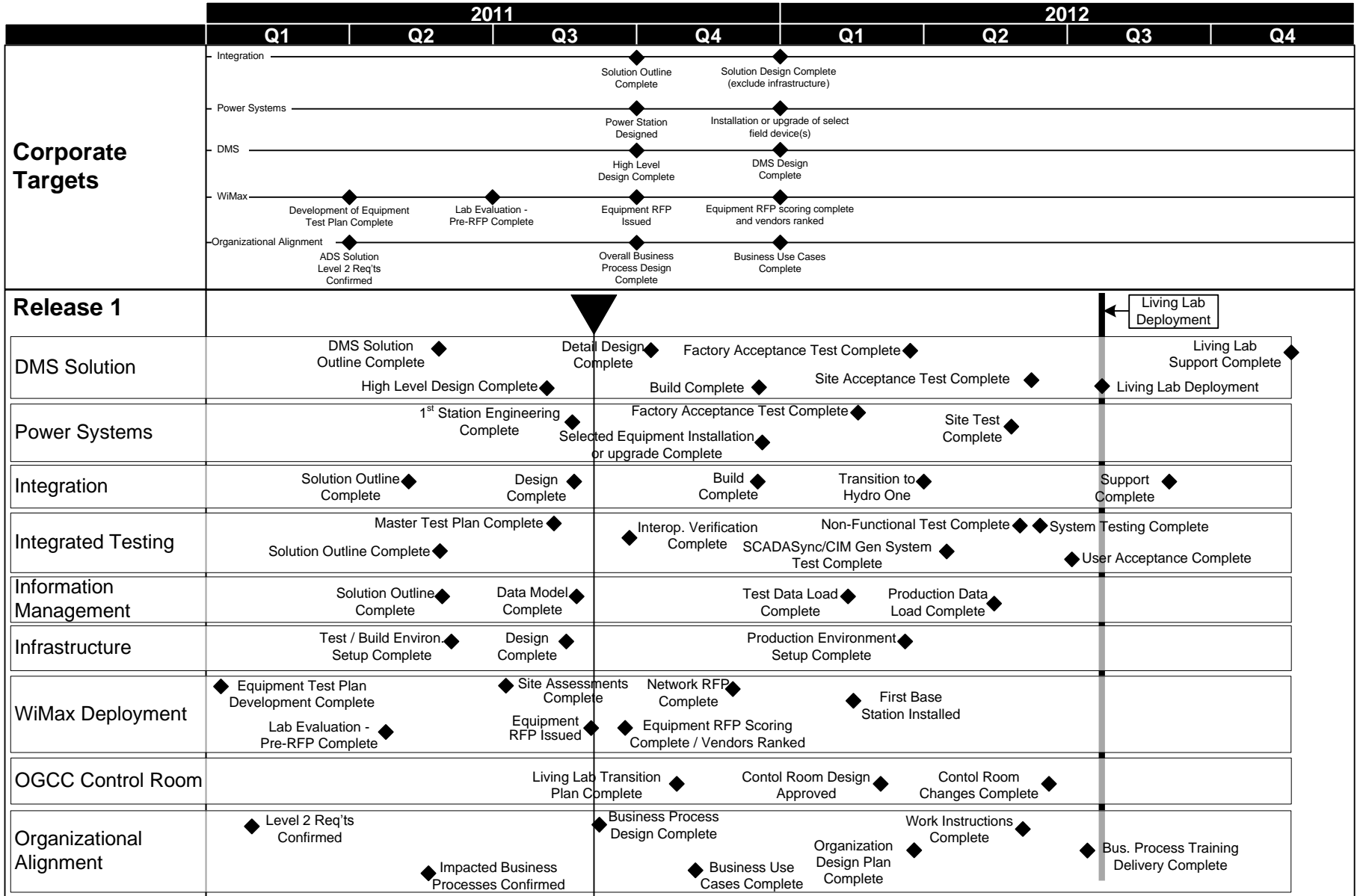
ADS Phase 1 Release 1: Objectives

- ✓ Optimize connection of Distributed Generators (DGs) into HONI's rural distribution system
- ✓ Improve Distribution Reliability and Operations
- ✓ Optimize Outage Restoration
- ✓ Optimize Network Asset Planning

ADS Roadmap



Advanced Distribution System Program Timeline

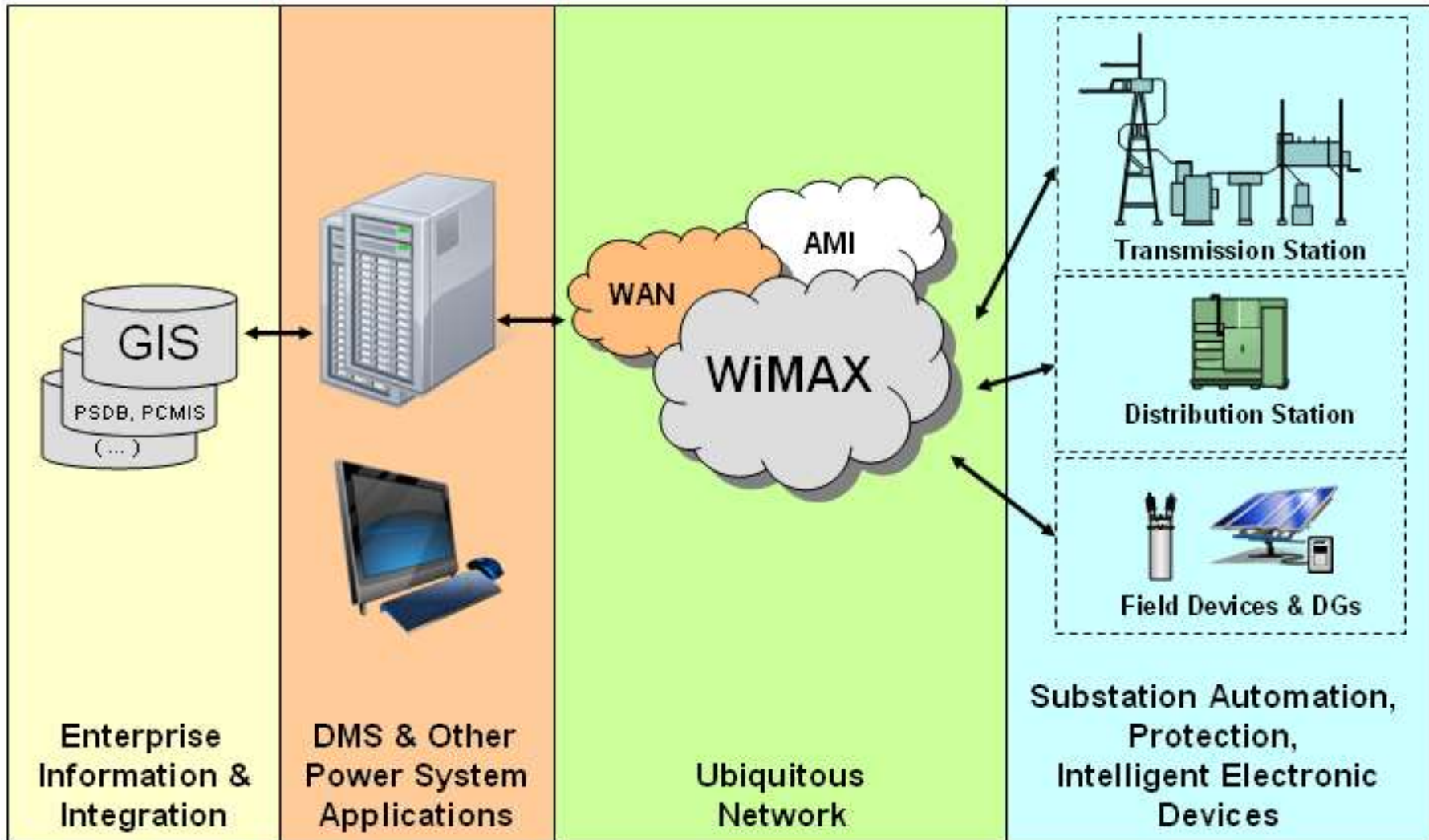


ADS Phase 1 Release 1: Scope Overview

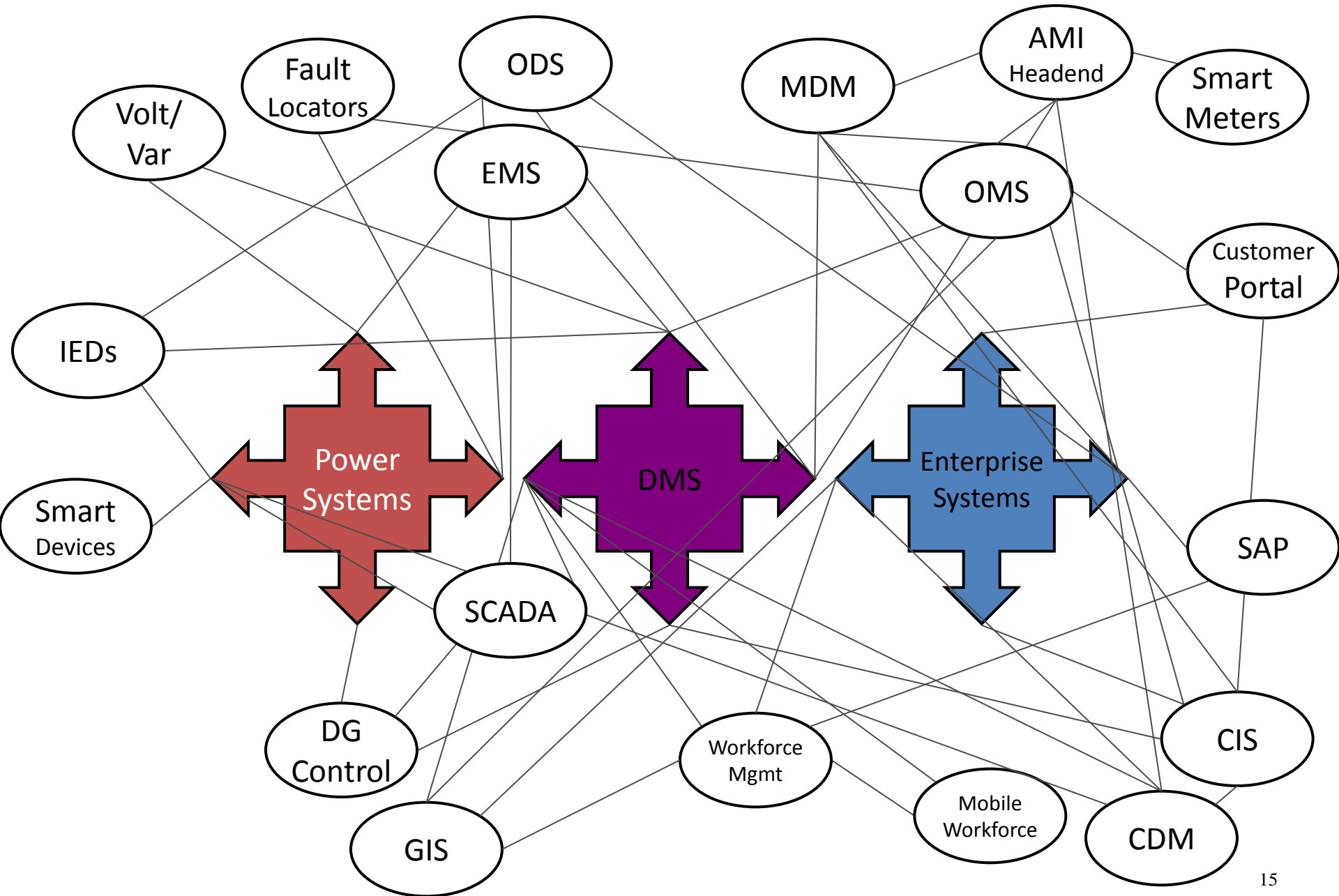
- Implement Distribution Management System
- Build out communications infrastructure
- In the Owen Sound Area:
 - 21st century upgrades to Transformer and Distribution Stations
 - Automate feeders with intelligent devices
- IT integration
 - Includes data remediation and DMS data change control



ADS Four Technology Pillars



The Information System Pieces

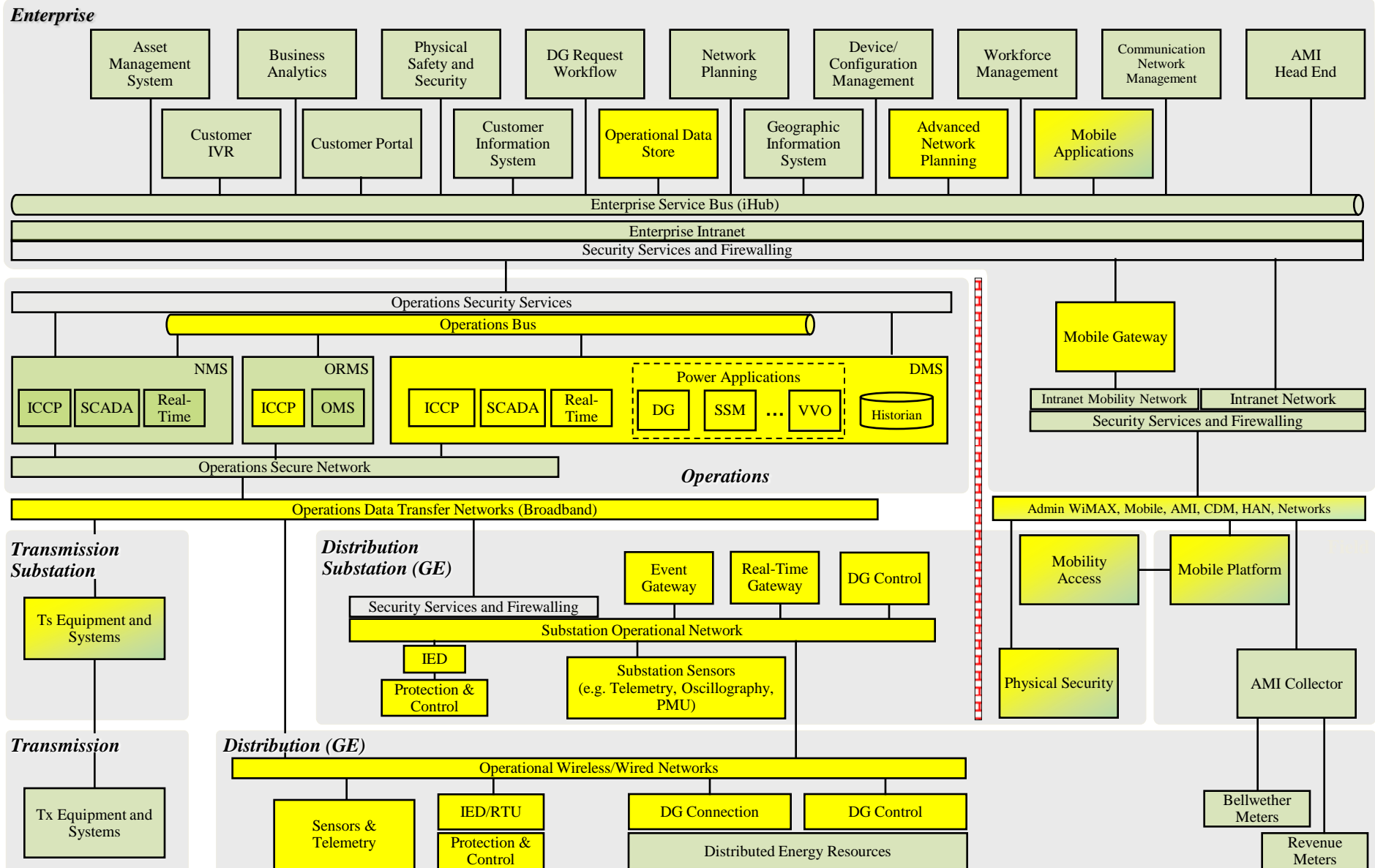


Putting the Information System Pieces Together

Existing System

New System

Enhanced System



IT Integration, Data, Infrastructure

- Architect, design, build, test, and deploy interfaces required to exchange data with the DMS and peripheral systems
 - ❖ Network Management System (NMS)
 - ❖ Outage Response Management System (ORMS)
 - ❖ Numerous databases (GIS, ArcFM, PSDB)
- Remediate data required for DMS
- Physical and Cyber Security
- IT infrastructure

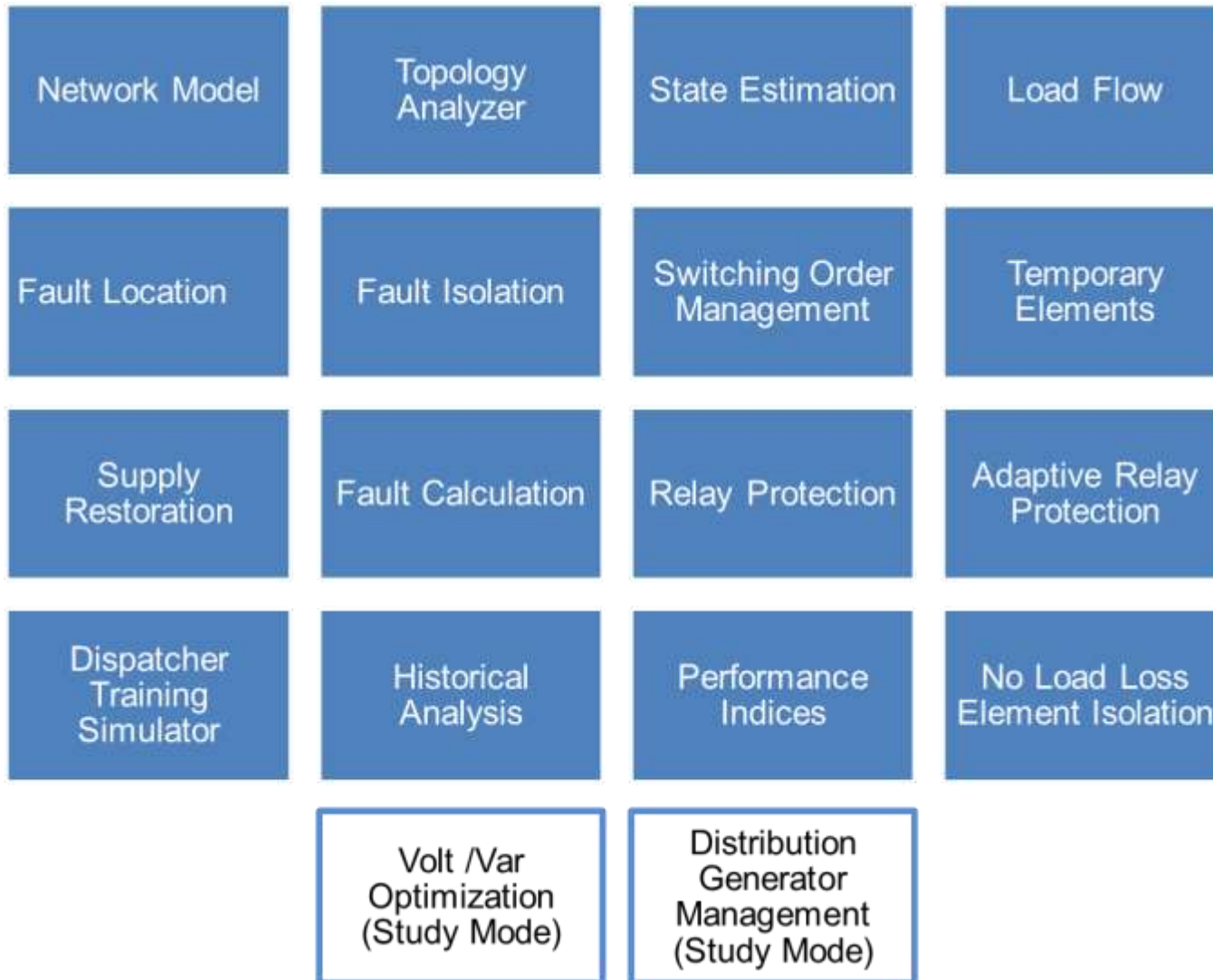


Distribution Management System (DMS)

- DMS provides the foundation for the Advanced Distribution System of the future
- DMS is a software application providing real time information about the distribution network, enabling real-time analysis, monitoring, and remote operation of equipment
- DMS planned to model, monitor, and control the distribution system from the Feeder Breaker inside the station fence in the Owen Sound area

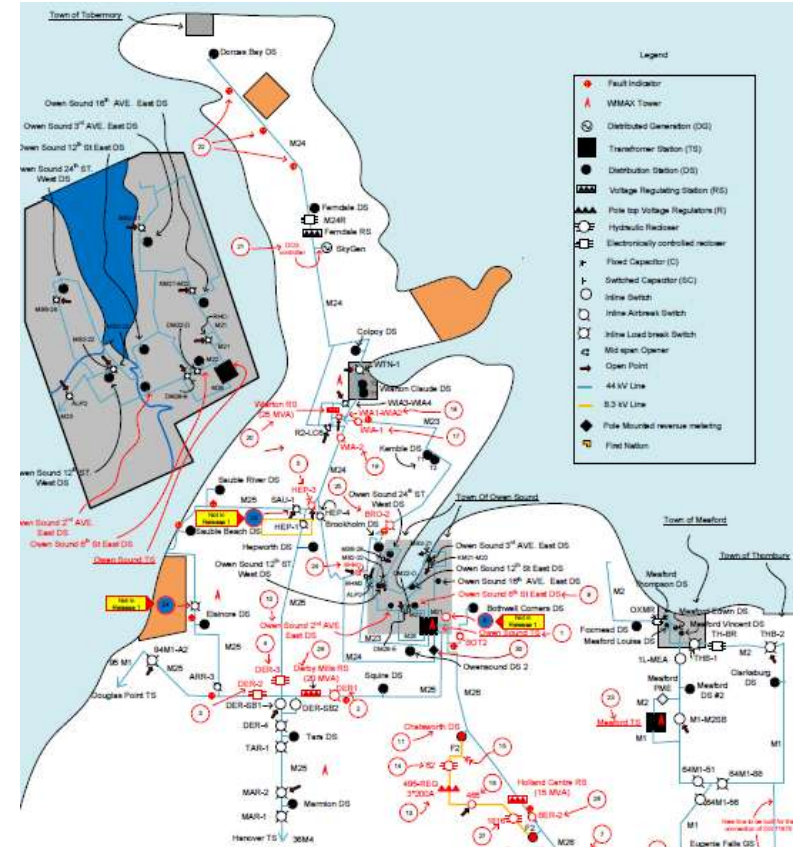


DMS Modules: Phase 1 Release 1



Modernization of Stations

- Modernization of Owen Sound TS and Chatsworth and Berkely DS
 - International Electrotechnical Commission (IEC) 61850
 - Protocol providing standardized method of communication and integration to support systems networked together to perform monitoring, integration, and control



Automation of Feeders

- Automation of 8 “M” Class and 2 “F” Class Feeders
 - Enhanced fault detection
 - Bi-directional regulators
 - Automated Reclosers

Automated Reclosers



Pole Top

Station Mount



Pad Mount

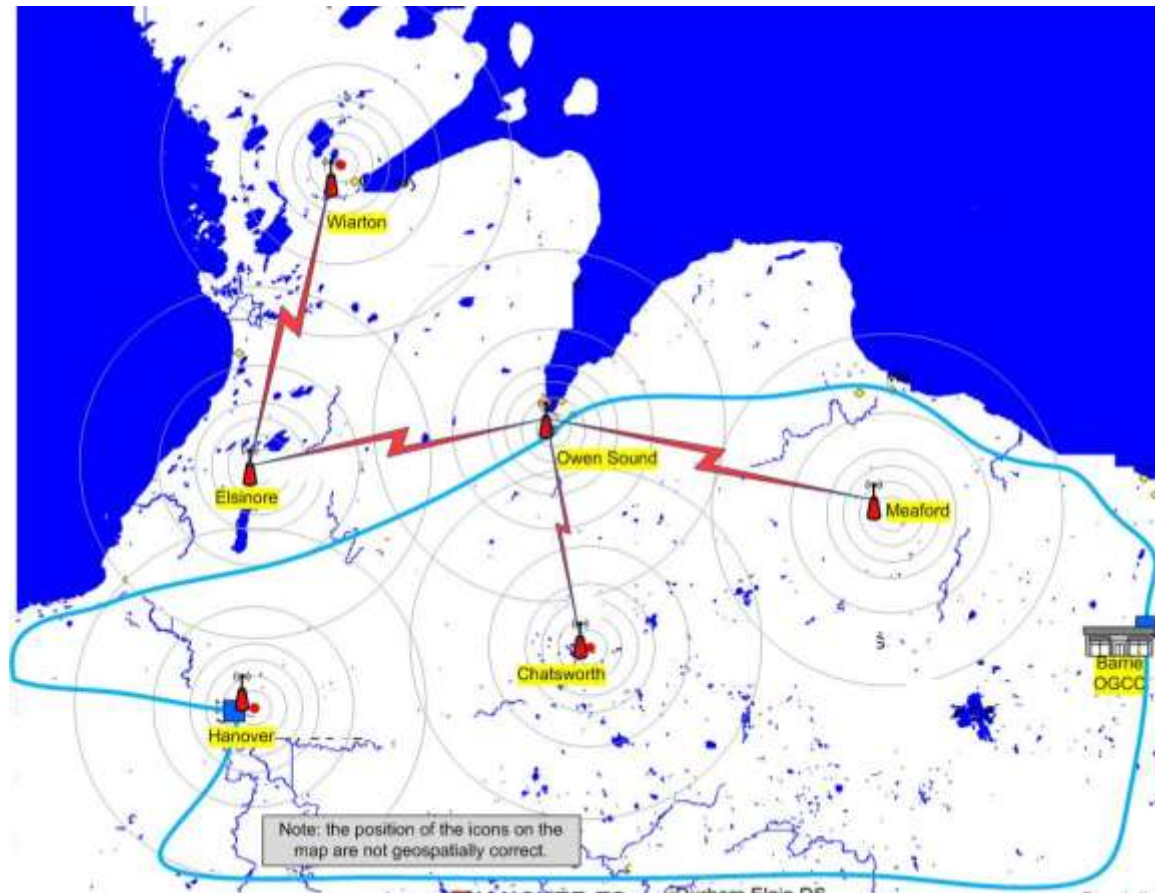


Communication Infrastructure

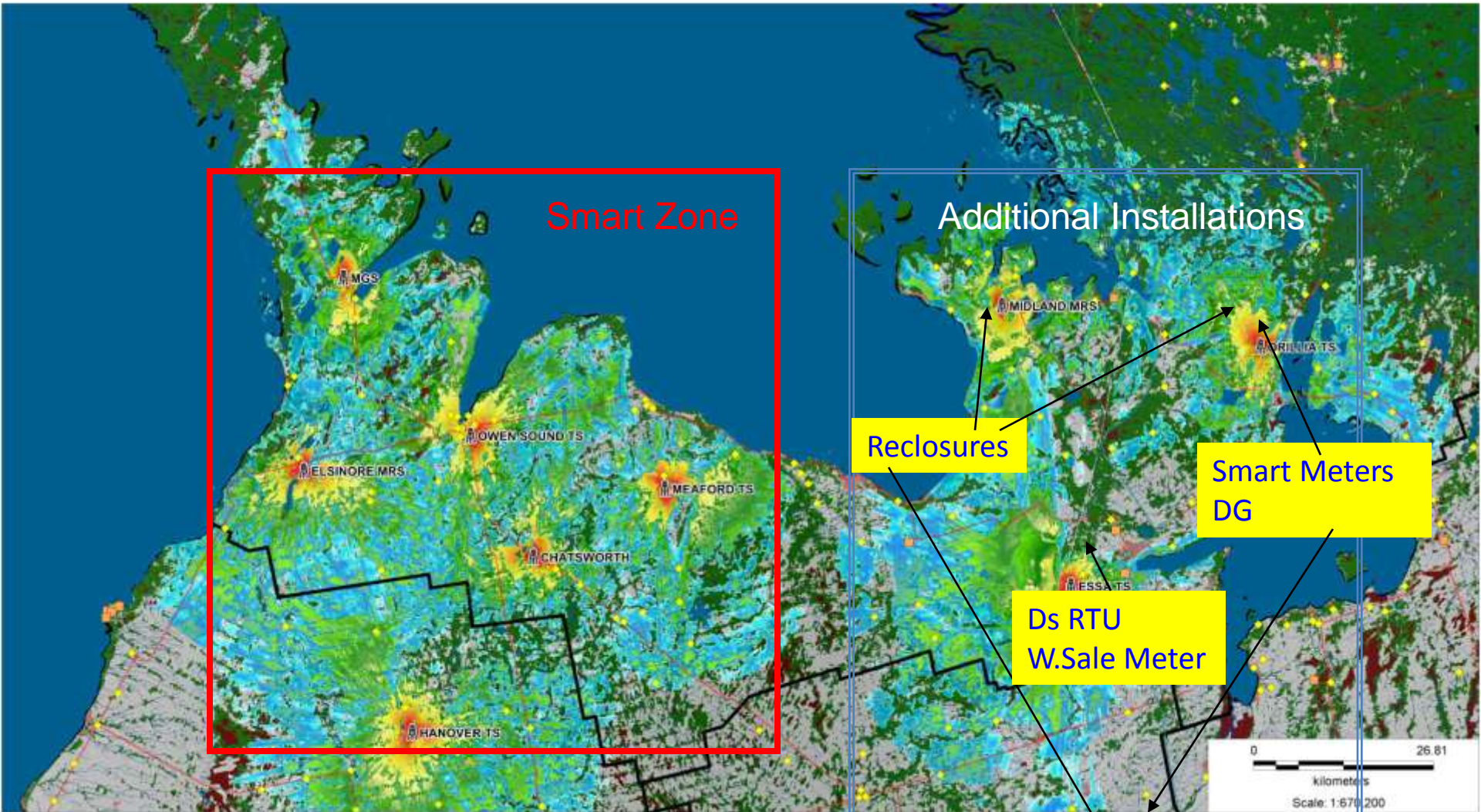
- Communication infrastructure provides the “backbone” for modernizing the distribution system
- Six WiMAX base stations constructed in Owen Sound area will provide the two-way communication network for newly deployed systems and equipment
- WiMAX is a standards-based wireless telecommunications protocol
 - ❖ Permits usage at much greater distances than Wi-fi



Communications Infrastructure: WiMAX Base Stations



WiMAX Deployments



Smart Zone

Additional Installations

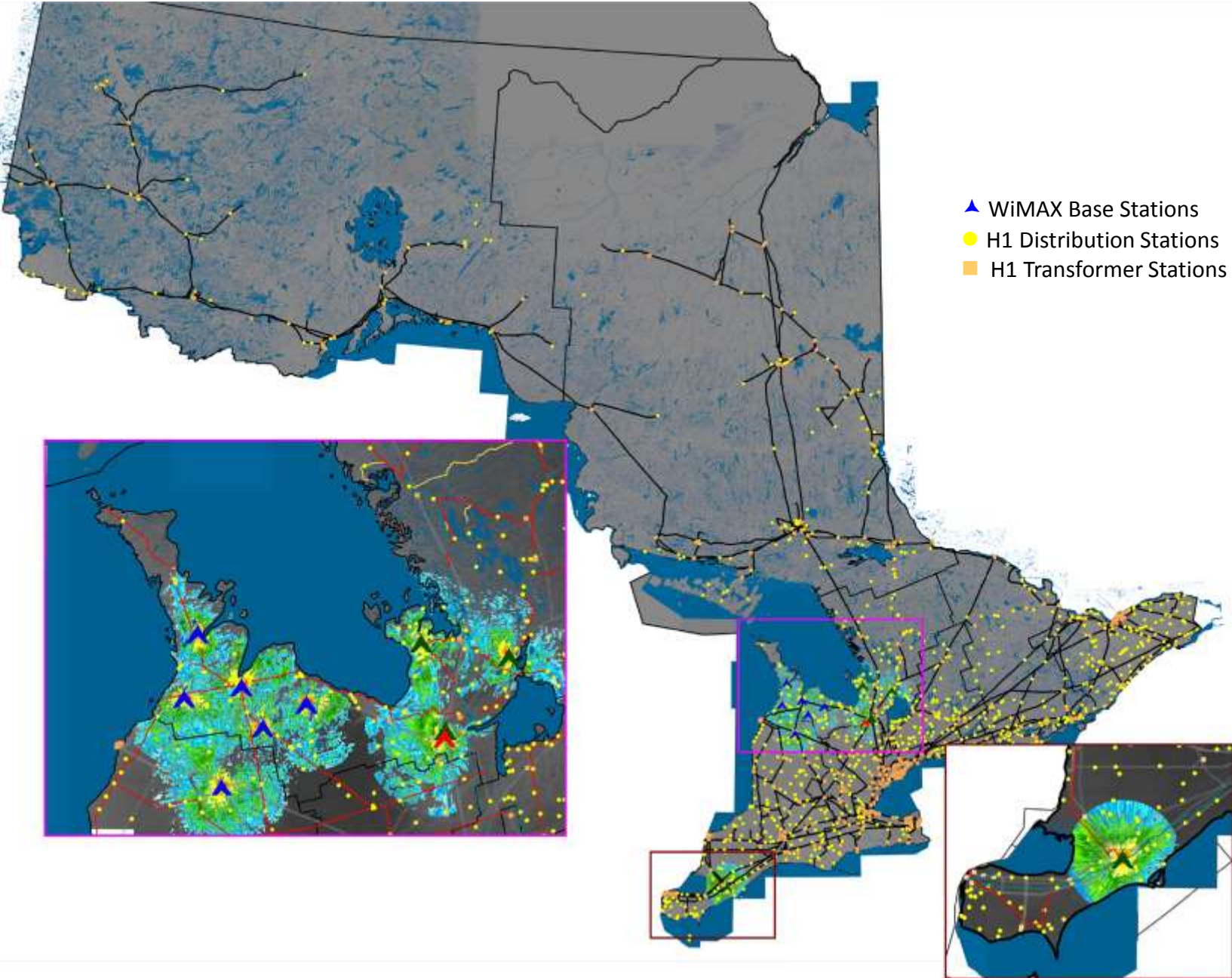
Reclosures

Smart Meters
DG

Ds RTU
W.Sale Meter

Another installation in southern Ontario

Putting it into perspective



Organizational Alignment

- Designing Business Processes, Facilitating the creation of Procedures and Work Instructions
- Requirements definition and management
- Developing and executing internal and external communications, change management, stakeholder engagement, training, and organizational design strategy and plans



Key Challenges

- Data requirements for DMS have been extensive and they evolve
- Need for data governance and change control
- Integration of OT/IT (different paradigms)
- Detail design has been iterative for DMS, IT integration, and Power Systems
- Transformational in nature and Corporate wide impacts
- Balancing a long term view vs. immediate term reality
- Managing interdependencies with in-flight projects
- Culture change needed to properly manage new technology
- Data storage, data privacy, cyber security...

Cyber Security and Customer Data Privacy need to be factored into every step of the design



Virus Experts Warn of Stuxnet Variant "Duqu" - October 18, 2011

Virus researchers at Symantec Corp. have discovered a variant of the Stuxnet worm, dubbed Duqu, that is designed to steal information about industrial control systems. Symantec said the malware, which has turned up on more than one customers' network, could be used to gather data for a future attack.

Hacker group threatens industrial computer systems

The Washington Times - Monday, October 17, 2011

The Department of Homeland Security (DHS) is warning that hackers from the loose online protest collective called Anonymous have threatened attacks against the computer systems that run factories, power stations, chemical plants, and water and sewage facilities.

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“This targeting could likely extend beyond Anonymous to the broader [hacker activist] community, resulting in larger-scope actions against energy companies,” warns the bulletin, issued last month and posted Monday by the website Public Intelligence.

Conclusion

- Hydro One's Advanced Distribution System (ADS) project marks an important first step in modernizing the distribution system.
- Will require a series of measured and prudent investments over many years— it will not be a big bang approach.
- ADS Phase 1 Release 1 “Go Live” currently scheduled for late 2012

