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Smart grid partner projects

Advanced Distribution Management System
Low voltage network risk detection and management

7th Smart Grids & Cleanpower 2016
Cambridge 27-28 June
www.cir-strategy.com/events

Hydro One Networks

One of the largest transmission companies in North America.

- Employs approximately 4,000 employees.
- Customers are large industrials, remote communities, retail (residential, farms, small business), municipal utilities and generators.

Transmission:

28,600 km
Hydro One's transmission wires would measure this far if stretched end to end

96%
Hydro One owns and operates 96 per cent of Ontario's transmission assets, by capacity

276
Transformer Stations (TS) and Switching Stations (SS)

640,000 km²
Geographic area served

48,000
Towers

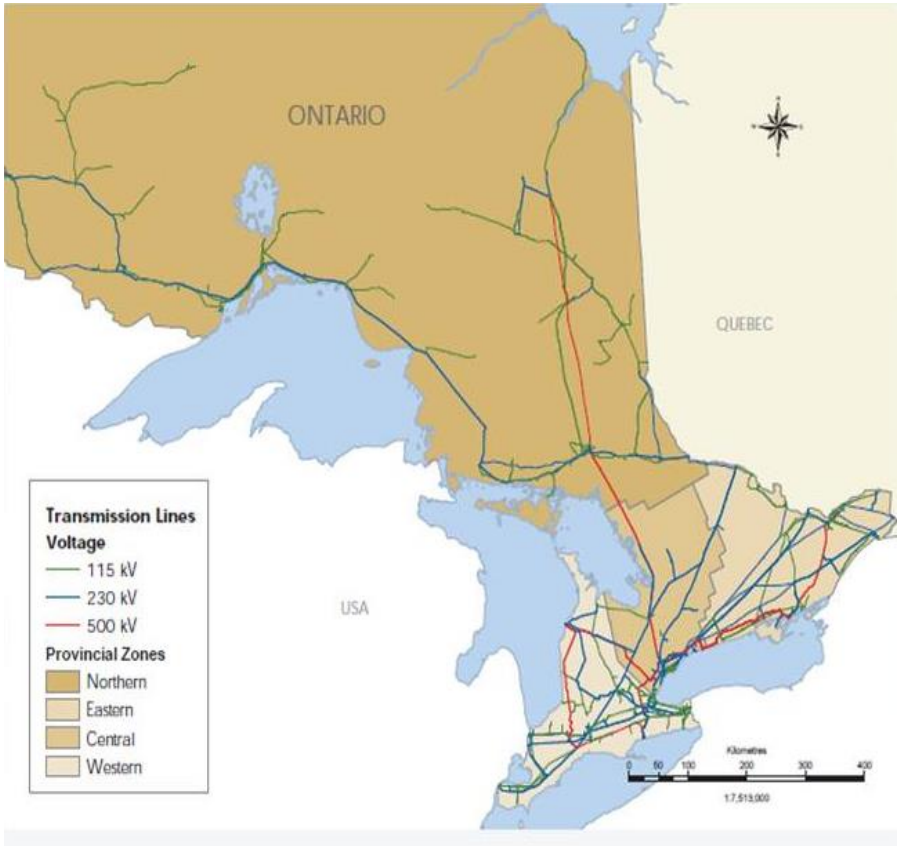
Customers:

112
Large industrial customers

1.3 million
Distribution customers (homes, farms, seasonal, small business)

20
Remote Communities served through 18 distribution systems

Subsidiaries:
Hydro One Networks Inc.
Hydro One Remote Communities Inc.
Hydro One Telecom Inc.
Hydro One Brampton Networks Inc.



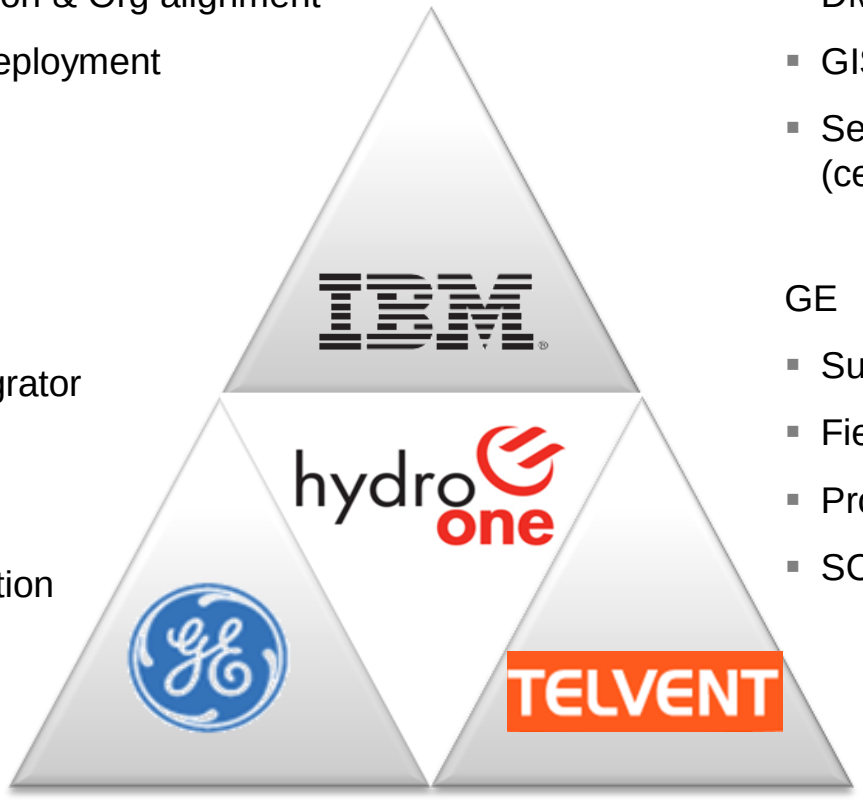
Partnering for Success - ADMS Program Roles

Hydro One

- Business transformation & Org alignment
- Civil engineering & Deployment
- IT Infrastructure
- Testing

IBM

- Overall Systems Integrator
- PMO
- Solution Architecture
- Business Transformation



Schneider (Telvent)

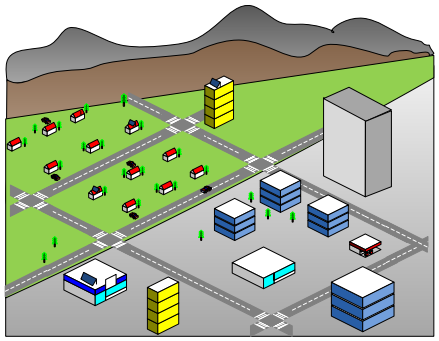
- DMS software solution
- GIS
- Services and customizations eSCADA (central office) & ICCP

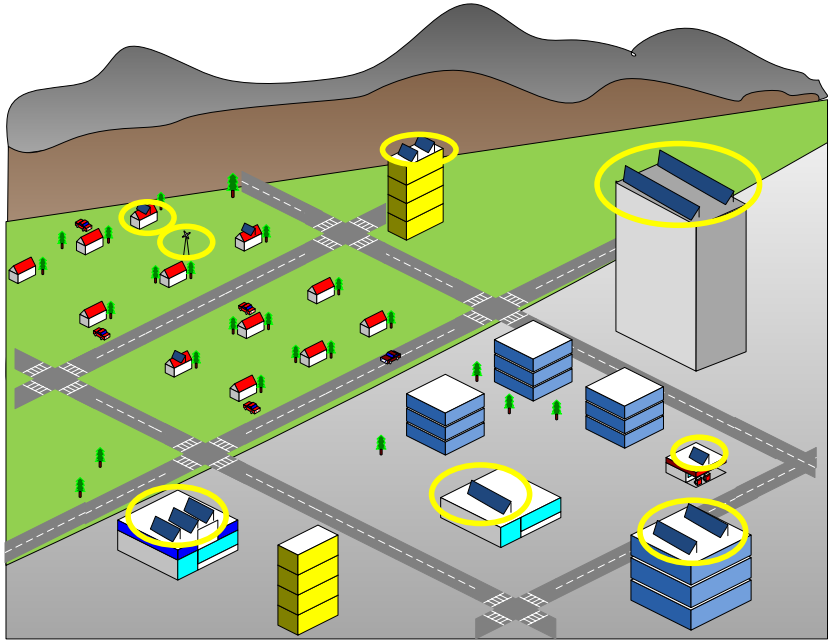
GE

- Substation automation
- Field automation
- Protection applications
- SCADA (stations & field)

ADMS was a large complex programme, focus here is on one aspect
Distribution grids were never engineered for intensive, intermittent local generation

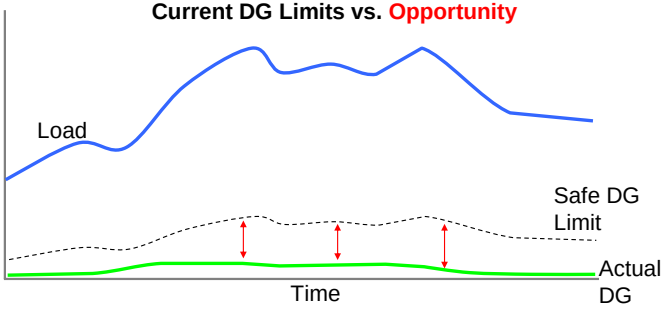
- Increased distributed generation (DG) density threatens stability limits
- Distribution operations requires real time control over dynamic generation levels, despite limited real time visibility
- The Answer: Predictive analytics help to safely realize DG opportunity



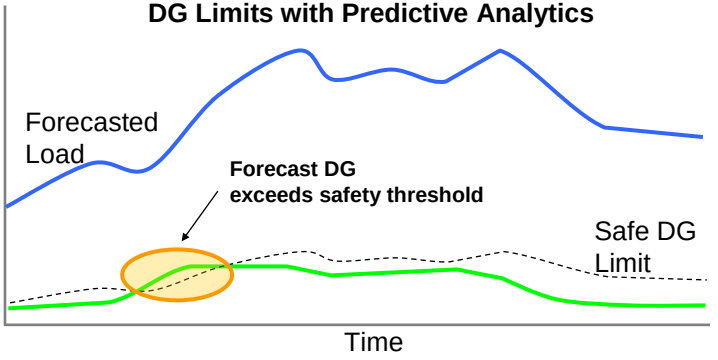


DG Limits with Predictive Analytics

Current DG Limits vs. Opportunity



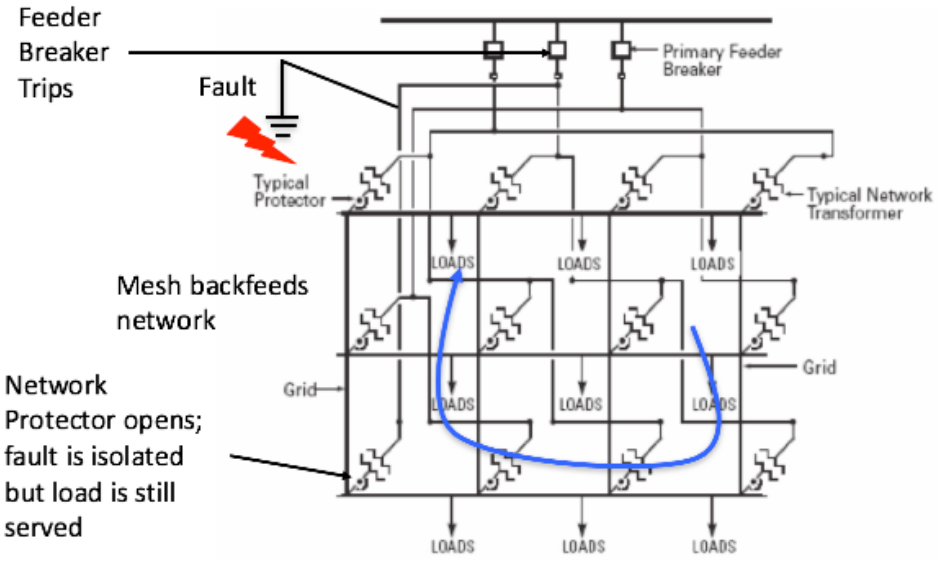
Sparse Distributed Energy Resources



Dense Distributed Energy Resources

Detect and manage asset risks for Low-Voltage Secondary Networks (LVSN) managed by a US electricity distributor in an urban environment

Meshed distribution networks provide significant resilience … but can hide asset or equipment problems.

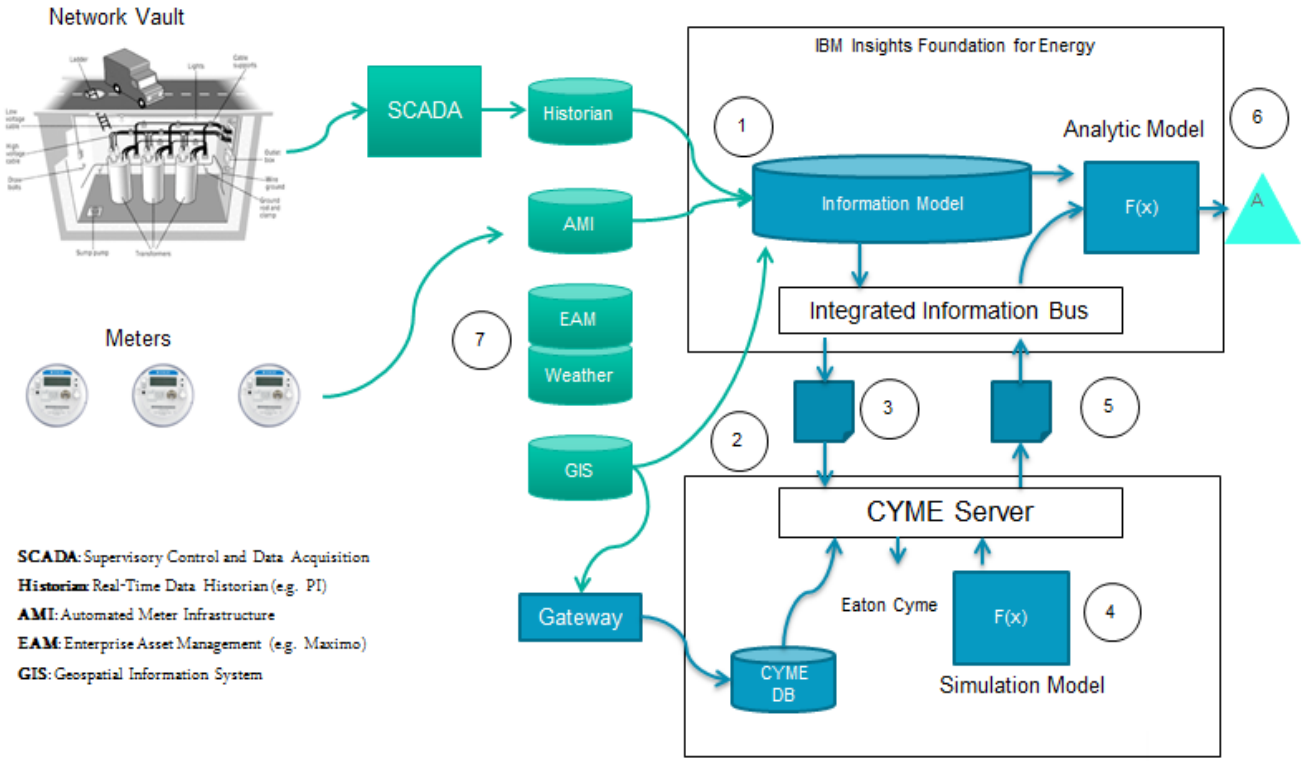


If a Network Protector (NP) fails the network is put at risk in the event of some underlying fault in the network.

In extreme cases, this can lead to underground fires!

Eaton Corporations and IBM are teaming to utilize and combine the best of statistical and simulation-based Predictive Analytics, combined with an Asset Management Strategy, to deliver a solution to give visibility to and insights for underground the LVSN and Network Protectors.

Eaton Corporation and IBM are partnering
Proposed architecture



1. IFE takes data about the network assets from many sources, and puts it into context.
2. GIS data contains network topography information: network connectivity
3. IFE bundles data to pass to CYME, via Integrated Information Bus
4. CYME does a network Distribution State Estimation, using the data passed to it by IFE and based on the static network database
5. CYME passes results back to IFE, via CYME Server
6. IBM Analytic Model compares network prediction with actual values
7. CYME model may need some information from Asset Management system (equipment ratings, data sheet, etc.)

CYME – Eaton's Power Engineering Software

IFE – IBM's *Insight Foundation for Energy* analytics platform

Projected benefits

- Reduced risk of catastrophic failure events, such as manhole explosions and fires, by identification of assets-at-risk.
  - We expect that even the initial deployment may find existing but hidden assets-at-risk, due to incomplete or incorrect configuration management of asset data.
  - Cost avoidance = assets replacement cost, crew cost, customer outages (reliability statistics improvement and fines avoidance), and accident costs: fire, safety, police; property damage, lawsuits (including injury or death).
- Overall maintenance costs reduced due to needs and risks-based maintenance, optimized maintenance practices and reliability-centered maintenance.