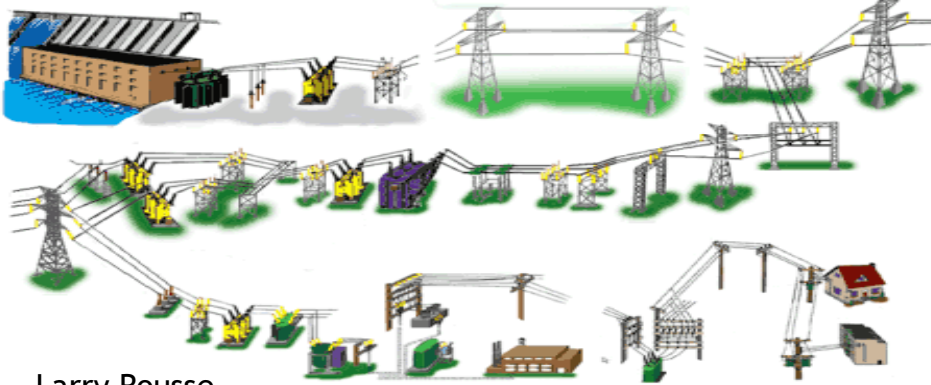


Distribution System Evolution



Larry Rouse

Manager, Ontario Grid Control Centre, Network Operating Division

Spring EEI Conference - April 12th



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F

Transmission

- Own and operate about 97% of the Transmission in the Province
- 18,000 km of transmission lines
- All time system peak 27,000MW (summer peaking)

Distribution

- 1.3M customers
- 122,000 km of distribution lines and 1.6 Million wood poles
- ~500 "M Class" feeders and ~3000 "F Class" Feeders (all "M Class" feeders have telemetry and automated control to the OGCC)
- Tx Operations and Dx Operations is presently combined under the same function, and Trouble Dispatch is separated but located in the same control room
- 1,010 Distribution Regulating Transformers

Control Systems

- Currently uses Areva for the Tx & Dx operation (at the TS level) and use CGI for our OMS

Note: the province of Ontario is roughly 2Xs the size of Texas; distance from our mostly northerly point, Thunder Bay to our Southern tip Windsor, is equivalent to Toronto to Florida



D C

Yesterday - Unintelligent System supplying Load.

Tomorrow - Smart Distribution System connecting Load and Renewable Generation

Smart Meter - Advanced Meter Infrastructure

- Provides Hydro One a communication backbone we never had (1.2 M smart meters by 2010 year-end)
- Investment in Wireless Communication Network (WIMAX)
- Customer Control to Time of Use Rates, CDM



Distributed Generation – high volume

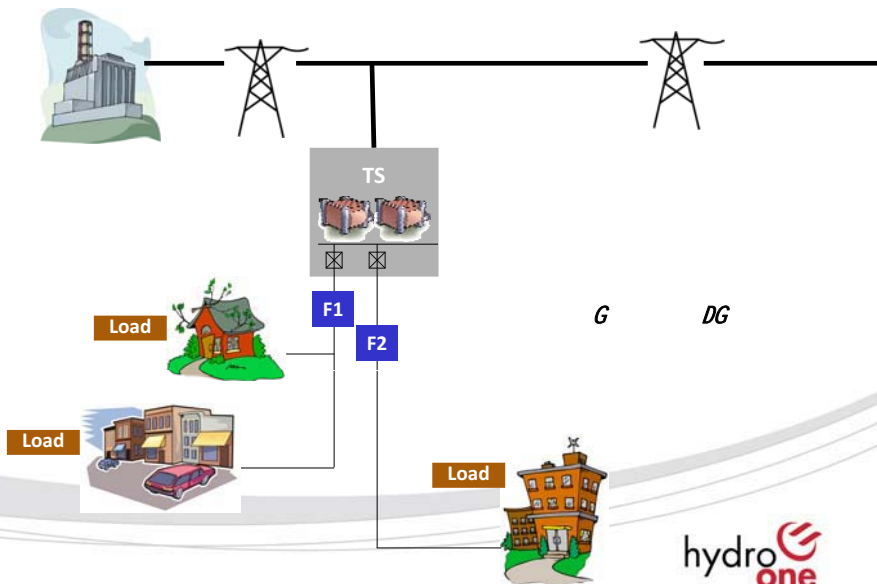
- Power flows both ways and loading changes
- Dispatch ability required (~ 2000 - 3000 MW)

Distribution Automation

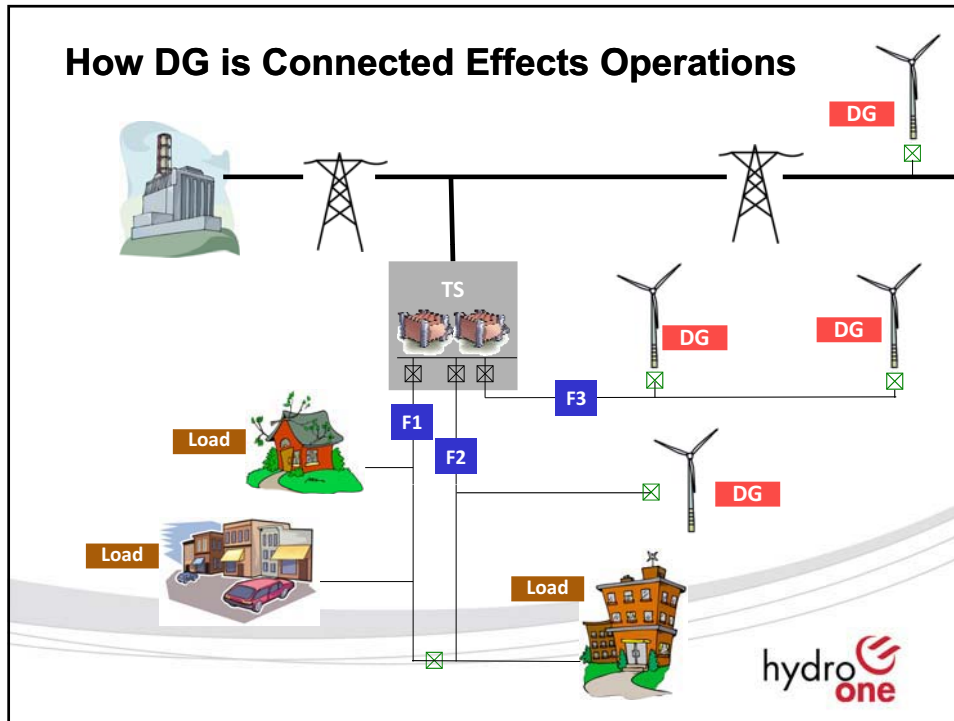
- Smart devices (i.e. switches, reclosures, regulators, etc)



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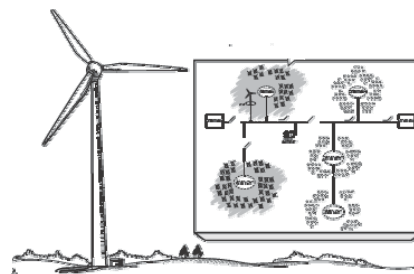


How DG is Connected Effects Operations



Emerging Operational Issues

- Dispatch for System Reliability
 - Generation curtailment during Surplus Base Generation i.e. low demand periods (spring & fall periods); maximum generation with wind in night hours
- Power Quality
 - Voltage sag on long rural feeders
 - Line angle converges to load angle on long feeders
- Volt/VAR Optimization
- Relationship with DG Customer
- Storm Restoration
- Fault localization and System Restoration
- Distribution Automation
 - Bi-directional voltage regulation
 - Adaptive protections to allow DGs to connect to alternate feeders
- Planned and Forced Outages

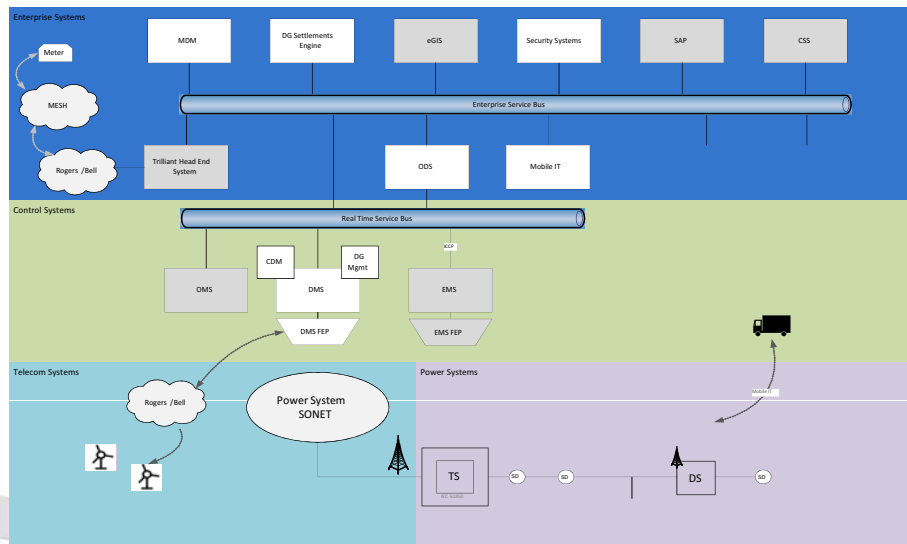


Meeting the Challenge with Smarter Grid

- Distribution Management System
 - State Estimator
 - Feeder analysis to ensure adequate relay coverage and voltage for any switching configurations in real time and study mode
 - SCADA control of distribution assets,
 - Dispatch of DG
- Integration of Key Enterprise Systems – SCADA, AMI, OMS, GIS, Mobile
- Design and installation of remote control of adaptive protections to allow DG connection on alternate feeds
- Bi-directional regulation

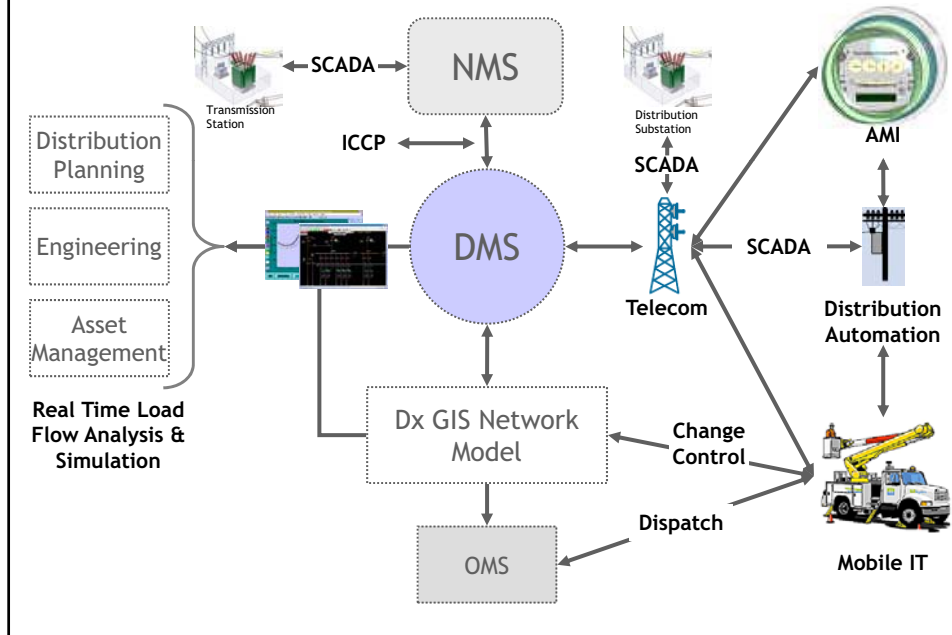


ADS – Potential Architecture



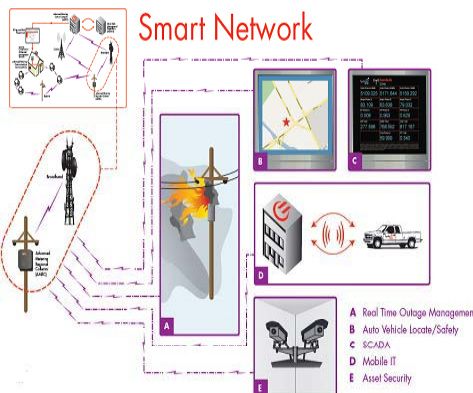
Future Operational Model with DMS

DMS is an integrated decision support tool for the Distribution System

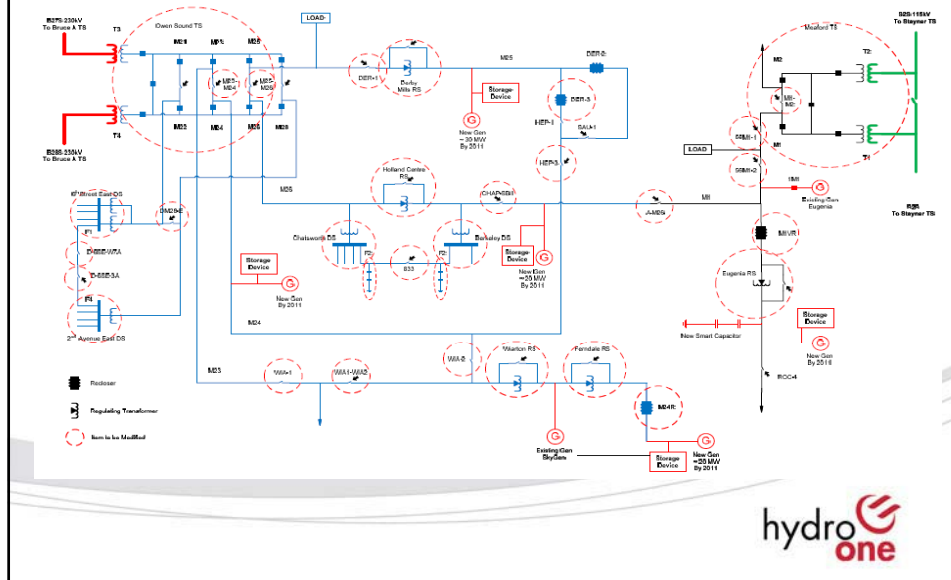


Owen Sound – Living Lab

- Living Lab covers 5,618 sq km and has a total population of about 110k (55% rural)
 - Hydro One serves 89% of the load
- Test bed for Hydro One’s ADS
 - Deploy and evaluate the DMS
 - Pilot and develop Intelligent Devices
 - Test business processes for scalability and effectiveness
 - Establish design parameters and standards prior to full rollout
- The ADS components which have undergone successful implementation and have confirmed business benefits will be rolled out to the rest of Hydro One’s service territory



Owen Sound - Living Lab



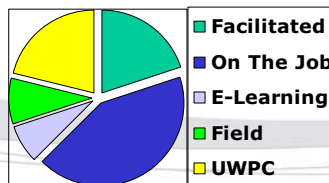
Control Room Training – Transmission Controllers

Curriculum Outline

- Progress to C1 within 3 years
- 5 separate terms
- Milestones progression for each term
- NERC Certification / Compliance
- UWPC Qualification
- CT Workbook/Checklist Completion

Learning Components

- E-learning lessons
- Classroom Facilitated Presentations
- Assigned Work
- Training Resource Documents
- CT Workbook Sections
- Field Rotations/Checkouts
- Operating Planning Rotations
- On-the-job Training
- 1-on-1 Mentorship
- CITP Website



Training Breakdown



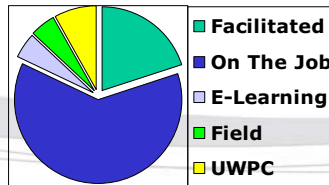
Control Room Training – Distribution Dispatchers

Curriculum Outline

- Progress to D1 within 2 years
- Milestones progression for each term
- Backup Control Centre Drills
- UWPC Overview
- Ongoing Career Development

Learning Components

- E-learning lessons
- Classroom Facilitated Presentations
- Assigned Work
- Training Resource Documents
- Field Visits
- On-the-job Training
- DITP Website



← Training Breakdown



The End

