DISTRIBUTION MODERNIZATION

BUILDING A SMARTER GRID

hydro one

Modernization of Distribution Assets

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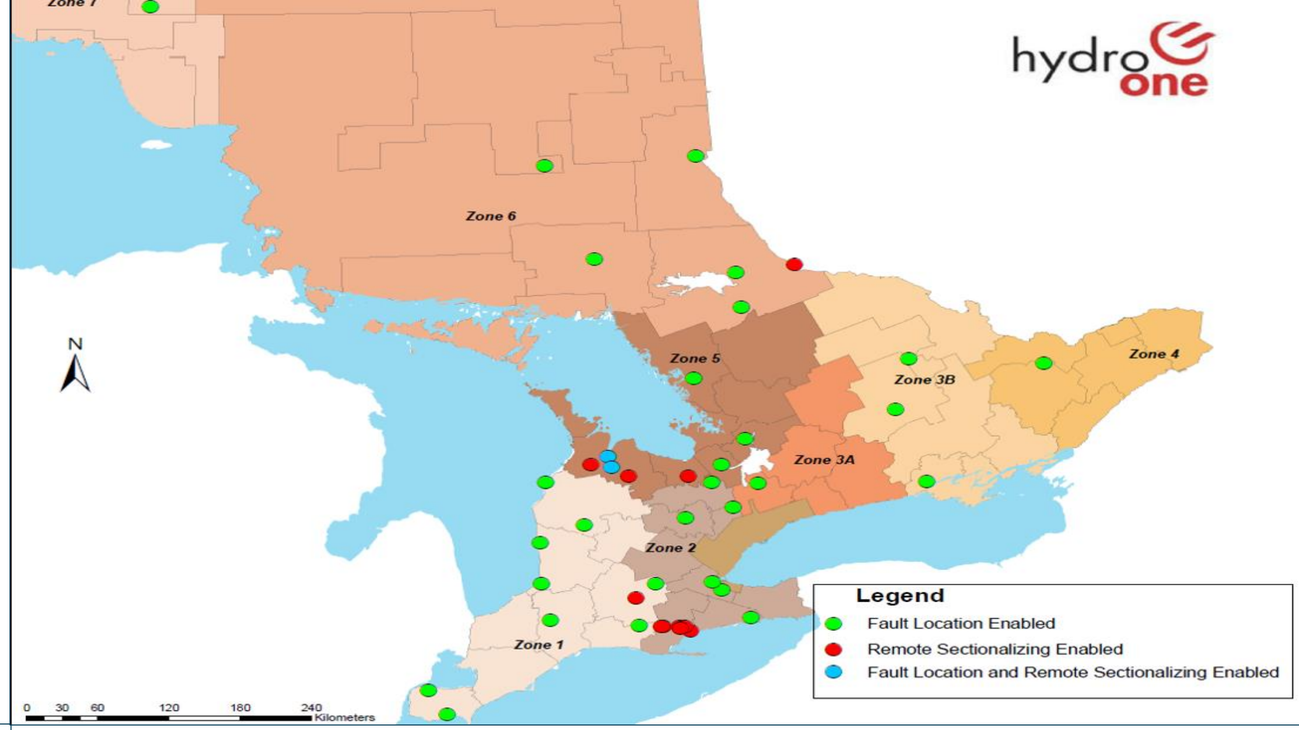
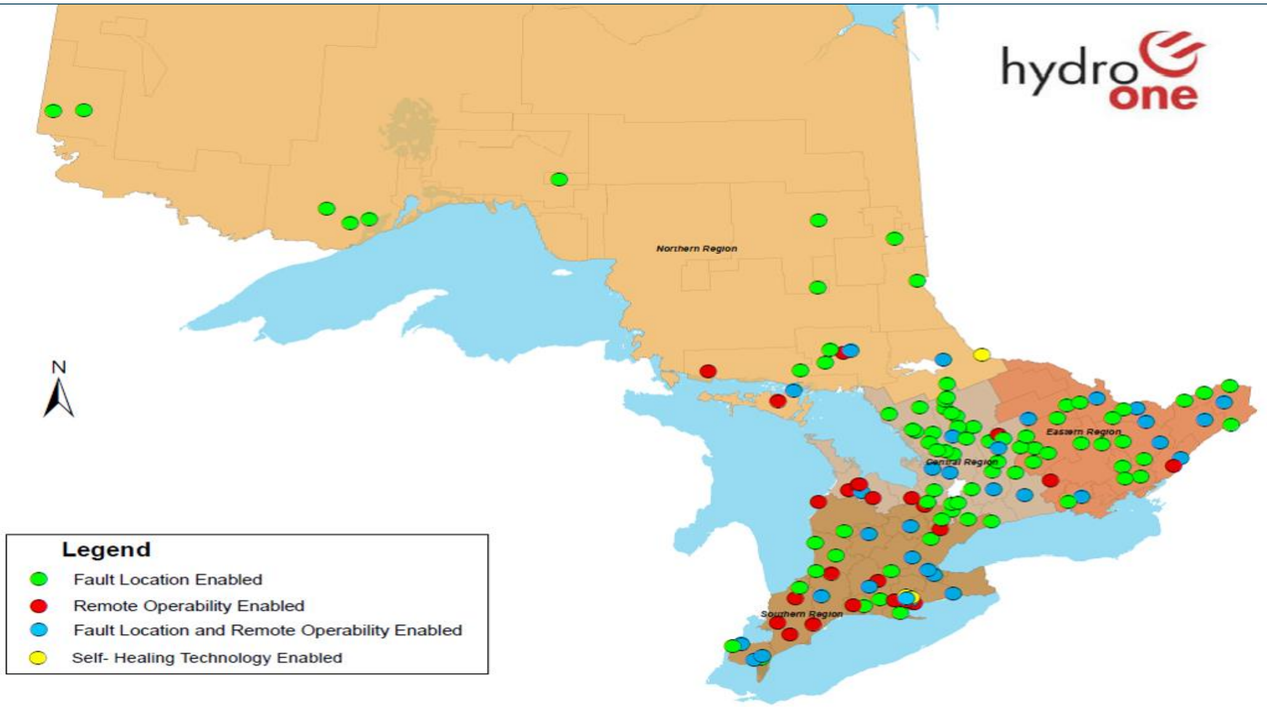
2018

In 2018, we told you about exciting new technologies, such as:

- Communication Fault Current Indicator (CFCI) sensors
- Switches
- Reclosers
- Distribution Management System (DMS)
- Distributed Energy Resource Management System (DERMS)





PRESENT

As of today, we have deployed…

Device Type	2018	2019	2020	Total
CFCIs	185	700	1,011	1,896
D60 Relays	76	63	5	144
In-Line Switches	15	86	100	201
Remote Vacuum Switches	0	18	29	47
In-Line Reclosers	0	30	21	51
DS Reclosers	7	8	20	35
Total	**283**	**905**	**1,049**	**2,372**

…and gone live with the DMS and DERMS systems.

Since 2018, we have **17,684,503** of Customer Minutes Interrupted (CMI) savings.

LESSONS LEARNED SO FAR

NETWORK MODEL DATA MAINTENANCE

- Maintaining an accurate data model is difficult
- Robust Change Control process is needed to maintain confidence in the data model

DEVICES

- Use of microprocessor-based devices results in multiple hardware/firmware version in service.
  - This hinders deployment and requires multiple engineering designs and standards
- Having only one vendor is a risk
- Even the best products can experience unexpected issues

TX PRACTICES

- Dx Modernization is a collision between the modular world of Dx and the customer engineered world of Tx.
- How do we bring Tx functionality into Dx, without losing the simplicity and speed of a Dx system?
- We need to adjust our expectations on how and how fast to deploy new functionality on Dx
- Need different skill set from your project management and construction crews

UNIT COSTS

- Initial focus is on deployment, result is high unit cost compared to North American peers.
- Now is a good time to step back and evaluate our processes
- We have initiated benchmarking activities to ensure we are aligned with the industry's best practices.

DERMS

- This has the potential to offer cheaper interconnection under condition of partial capacity.
- Customers are accustomed to firm connection capacity, so they hesitate to enroll for conditional connection capacity.
- Improved clarity of the conditions of the connections is critical to convincing customers to be controlled by a DERMS system.

ROADMAP TO MODERNISATION

MODERNIZATION OF INFRASTRUCTURE PLANNING

- Using sensor data, DMS state estimation and AMI data for planning purposes
- Using DER as a non-wires alternative for grid benefits.

ENERGY STORAGE FOR UTILITY BENEFITS

- Currently piloting three Energy Storage projects as a first attempt at non-wires alternatives for reliability improvement.
  - Utility-scale centralized storage project (1.5MW, 3MW)
  - Grid-Edge project (2x225kW, 550kW)
  - Behind the meter residential (100x5kW tesla poweralls)

USE ADVANCED FEATURES OF ADMS

- Automated FLISR (Fault Location, Isolation, and System Restoration)
- Faster evaluation of alternate configurations
- Better visibility to grid conditions

3RD PARTY DISTRIBUTED ENERGY RESOURCE (DER) & DER MANAGEMENT SYSTEM (DERMS)

- Offering flexible interconnection options for loads and DER
  - Cheaper interconntection cost, non-firm capacity
- Simplifying interconnection requirements related to anti-islanding

AMI 2.0 TELECOM NETWORK

- Hydro One's AMI metering infrastructure is due for replacement. Vendor selection is almost completed.
- This becomes a second option for communication to Distribution Automation devices


Elimination of Feed-In-Tariff Contracts in 2018
Distributors using DER to achieve Distribution rate-payer benefits
DER ACTIVITY IN ONTARIO
Customers installing Behind-the-Meter Generation and Storage for peak shaving
IESO looking to enable DERs to participate in energy markets
Vendors demand easier access to the grid and new market options for their DER products

THANK YOU

DxM
DISTRIBUTION
MODERNIZATION