Developing a Comprehensive Generation Connection Process

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Hani Taki

Project Lead, Distributed Generation & Protection and Control

Horizon Utilities Corporation

Outline

1. About Horizon Utilities
2. DG and the Evolution of Distribution Systems
3. Comprehensive Generation Connection Process
4. Summary

Horizon Utilities

- Serves Hamilton and St. Catharines
- 426 square kilometres
- 234,000 customers
  - 212,000 residential
  - 22,000 commercial
- Four facilities
- 390 employees

Horizon Utilities

- 1,500 circuit-km of overhead lines
- 1,800 circuit-km of underground cable
- 27.6 kV, 13.86 kV, 8.32 kV, 4.16 kV
- 31 substations
- Connected to 17 transformer stations

Existing Embedded Generation

Type		#	MVA
Hydro		4	21.9
Co-generation	Natural Gas	4	29.1
	Steam	2	3.7
	Biogas	1	2.0
Total		***11***	***56.7***

- 6 solar PV micro generation: 5 net metering, 1 microFIT
- 3 wind micro generation

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Evolution of Distribution Systems

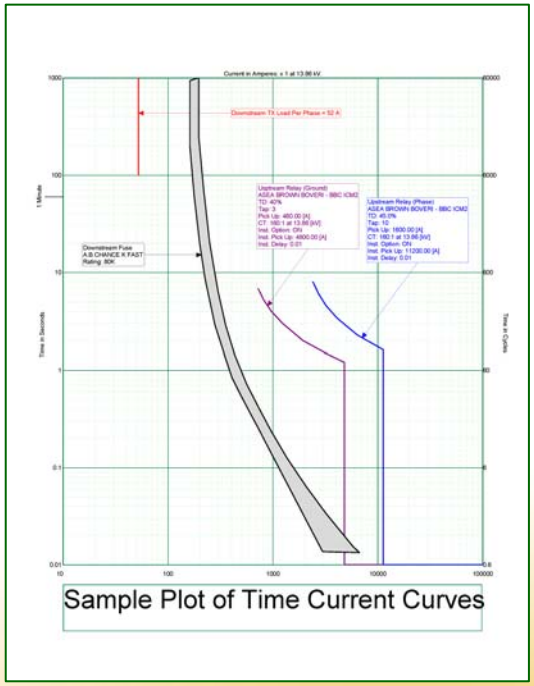
Increase in:

- Control & automation
- Information
- Distributed Generation
  - Co-generation
  - RESOP
  - Green Energy Act
    - Feed-in Tariff program
    - LDCs can own generation

Evolution of Distribution Systems

Impacts of DG on Distribution Systems:

- Bi-directional power flow
- Feeder/station loading
- Voltage profile
- Power factor
- Fault currents
- Protection coordination
- Safety hazards



Sample Plot of Time Current Curves

Evolution of Distribution Systems

- Distribution systems are changing to accommodate more DG → passive role
  - Bi-directionality
  - Voltage regulation
  - Protection coordination
- With DG expected to increase, distribution utilities need to think about reaping the benefits of DG
  → active role

Evolution of Distribution Systems

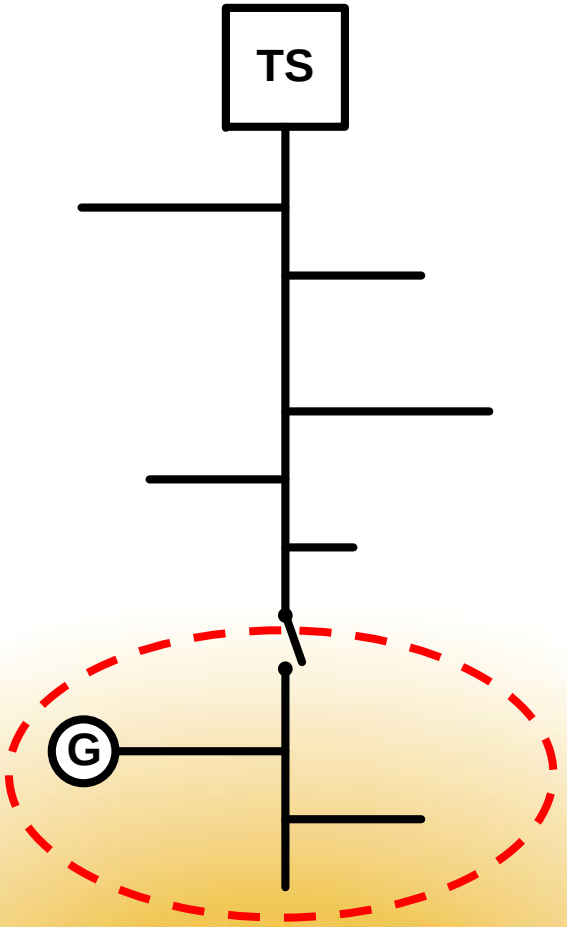
1. Planning
   - Capacity planning → defer feeder and station expansions by considering DG
   - Security planning → consider DG
     - Depends on anti-islanding protection

Evolution of Distribution Systems

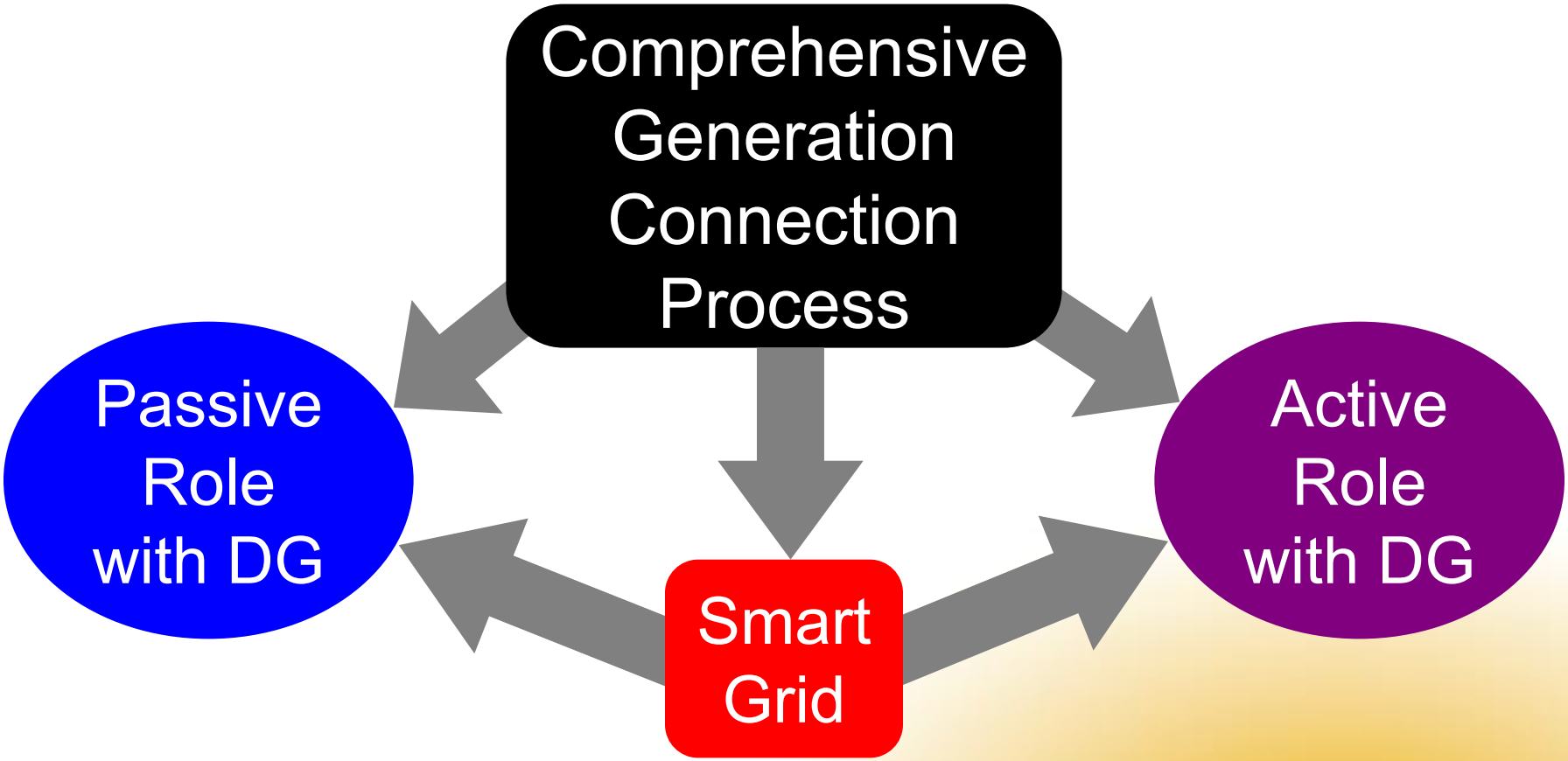
2. Loss Reduction / Demand Response
   - Locate DG near load centres
   - Reconfigure feeders
   - Perform real-time switching with DG
     - Depends on anti-islanding protection
   - May involve forecasting generation
   - Energy storage

Evolution of Distribution Systems

3. Microgrid
   - Islanding a portion of the distribution system
   - Increased reliability
   - Voltage and frequency control
   - Synchronization with grid



Evolution of Distribution Systems



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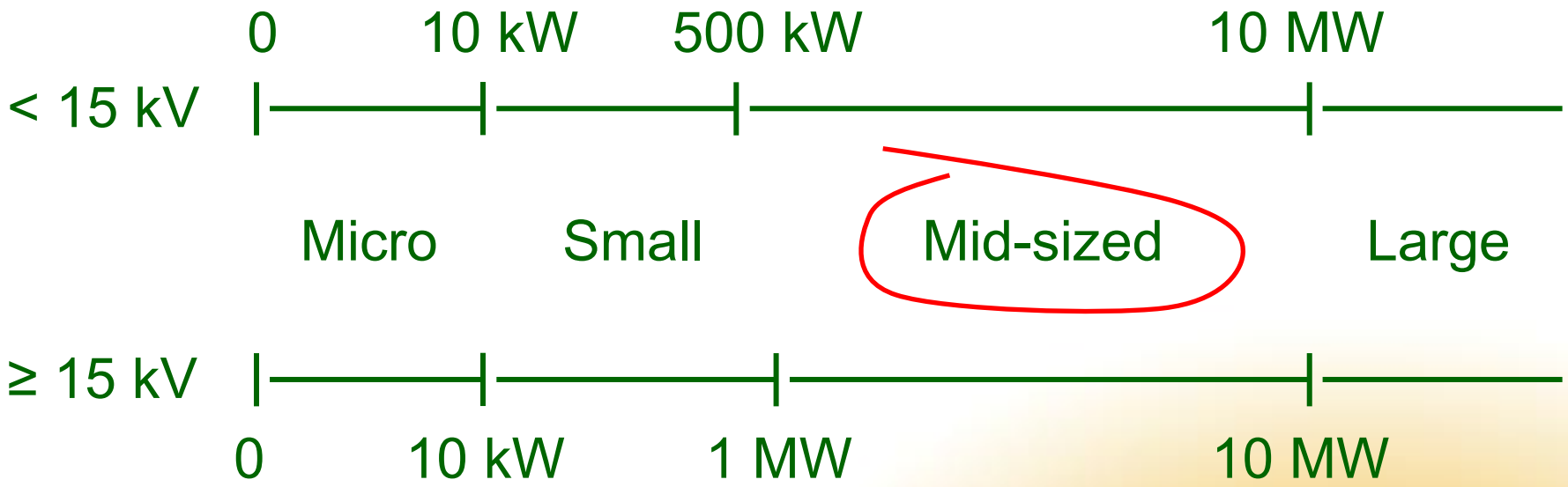
Generation Connection Process

Distribution System Code Categories



Generation Connection Process

1. Inquiry
2. Preliminary Meeting
3. Impact Assessment
4. Cost Estimate & Offer to Connect
5. Connection Cost Agreement
6. Construction / Design Review
7. Connection Agreement
8. Commissioning
9. Connection

Distribution System Code Section 6.2

Generation Connection Process

Comprehensive generation connection process:

- Involve appropriate departments
- Define roles and responsibilities
- Document process and sub-processes
- Prepare forms/templates
- Obtain/develop required tools

Generation Connection Process

Benefits of comprehensive generation connection process:

- Effective, efficient, timely connection of DG
- Find gaps, catch oversights in advance
- Support more active role with DG

Generation Connection Process

1. Inquiry
   - Information on website
   - Call management process
   - Updated information package
   - Departments involved:

     Engineering, Metering, Regulatory/Legal, Communications, Customer Service

Horizon Utilities | Connect To Distribution - Windows Internet Explorer

http://www.horizonutilities.com/HHSC/html/business/ConnectToDistribution.jsp

File Edit View Favorites Tools Help

Favorites | Horizon Utilities | Connect To Distribution

I'm a Residential customer

I'm a Business customer

find out more about Conservation

Sustainable Development

Your Options for Buying Electricity

Customer Satisfaction Survey
Please let us know how we are doing

Please select an area below...

- Business Home
- Online Account Access

INFORMATION:
Payment Options
Read Schedule
Billing Inserts
Credit Policy
Service Charges

FORMS:
Problem Notification
Payment Notification
Change of Address
Preauthorized Payment
Update my Meter Read

- Conditions of Service
- Interval Meters
- Links
- Meter Services for Business

CONNECTING GENERATION:
Connect to Distribution
Generation Connection Process - Micro
Generation Connection Process - Small
Generation Connection Process - Mid-Sized and Large
Roles of Government Agencies and Organizations
Generation Capacity Limits

ELECTRICITY:
- Commercial Credit Policy
- Current Market Conditions
- Rates
- Time-of-Use Rates
- Energy Options
- Energy Saving Tips
- Energy Services
- Provincial Benefit and OPG Rebate
- Reading Your Bill

WATER:

Connecting Generation to Horizon's Distribution System

Interested in Earning Money by Generating Electricity and Selling it to the Grid?

If you are exploring generating your own green energy (solar, wind, water or biomass), and selling it to the electricity grid, this section will provide information and explain the process, requirements and options for connecting generation facilities to Horizon Utilities' distribution system.

Connecting Generation Facilities to Horizon Utilities' Distribution System

Selling Electricity to the Grid

Customers have a number of options for selling electricity to the grid. Click here to learn more.

Generation Connection Process

The process for connecting a generation facility to Horizon Utilities' distribution system depends on the size of the generation facility. Choose a size category from the table below to learn more about the connection process:

Size Category	Size of Generation Facility
Micro	Up to 10 kW
Small	Greater than 10 kW, and up to 500 kW connected at less than 15 kV OR up to 1 MW connected at 15 kV or higher
Mid-sized	Greater than 500 kW connected at less than 15 kV OR greater than 1 MW connected at 15 kV or higher, and up to 10 MW
Large	Greater than 10 MW

Technical Requirements

Customers interested in connecting a generation facility to Horizon Utilities' distribution system must ensure that the design and operation of the facility meets Horizon Utilities' technical requirements. For more information on technical requirements, including questions regarding metering, please contact us at: 1-866-458-1236 or email: info@horizonutilities.com.

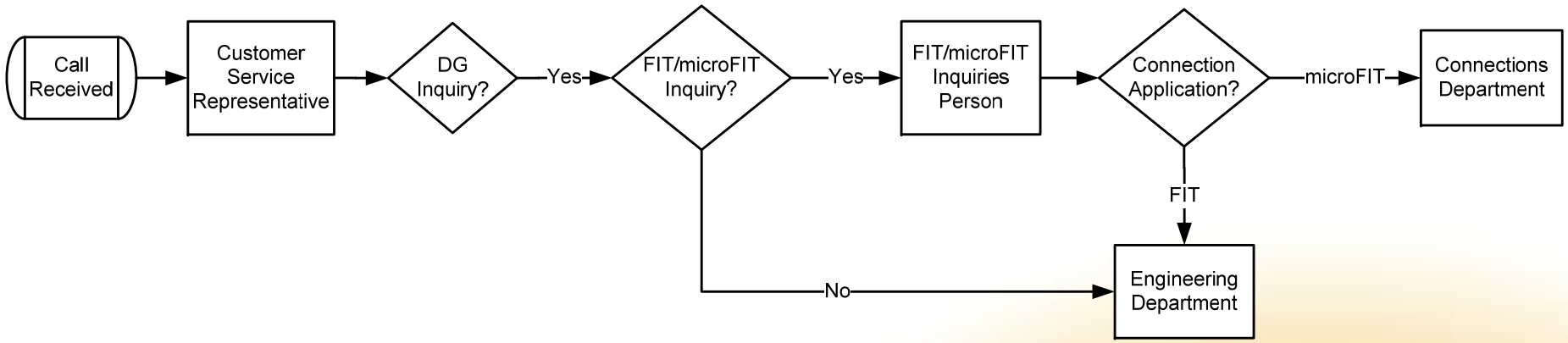
Government Organizations

A number of government agencies and organizations also play a role in connecting generation facilities. Click here to learn more.

Generation Connection Process

1. Inquiry

- Call management process



Generation Connection Process

2. Preliminary Meeting (optional)

- Application form
- Provide system and feeder information to customer
  - System model required
  - Available generation capacity
- Must meet customer within 15 days
- Departments involved:

  Engineering

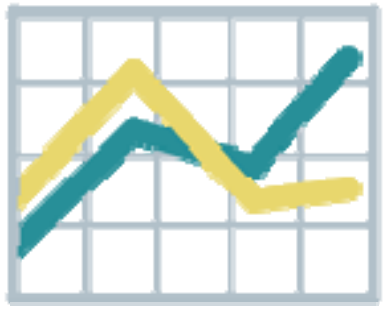
Generation Connection Process

3. Impact Assessment

- Application form
- Capacity availability check
- Flat fee or deposit?
- Impact Assessment Study Agreement
- Coordination with Hydro One (if applicable)

Generation Connection Process

3. Impact Assessment



- Consultant or in-house?
  - System model required
  - Training
- Must be completed within 60 days
- Capacity allocation management
- Departments involved:

  Engineering, Operating, Finance, Regulatory/Legal

Generation Connection Process

4. Cost Estimate & Offer to Connect

- Flat fee or deposit?
- Cost Estimate Agreement
- Coordination with Hydro One (if applicable)
- Must be completed within 90 days
- Departments involved:

  Engineering, Connections, Finance, Regulatory/Legal

Generation Connection Process

5. Connection Cost Agreement

- Template
- Capacity allocation management
- Coordination with Hydro One (if applicable)
- Departments involved:

  Engineering, Connections, Finance, Regulatory/Legal

Generation Connection Process

6. Construction / Design Review

- Build expansion, make modifications/upgrades
  - Protections: anti-islanding, directional, etc.
- Consultant or in-house?
- Metering & settlement
- Coordination with Hydro One (if applicable)
- Departments involved:

  Engineering, Connections, Construction, Metering, Billing

Generation Connection Process

7. Connection Agreement

- Template
- Control/monitoring of switching devices
- Primary/backup feeders
- Startup/shutdown
- Dispatching
- Departments involved:

  Engineering, Operating, Regulatory/Legal

Generation Connection Process

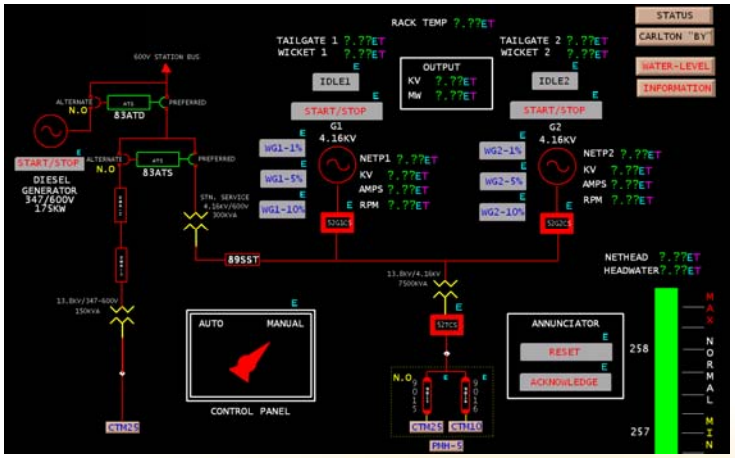
8. Commissioning

- Witness or verify?
- Consultant or in-house?
- Hydro One COVER
- Departments involved:
  - Engineering

Generation Connection Process

9. Connection

- SCADA
- GIS
- Map of generators



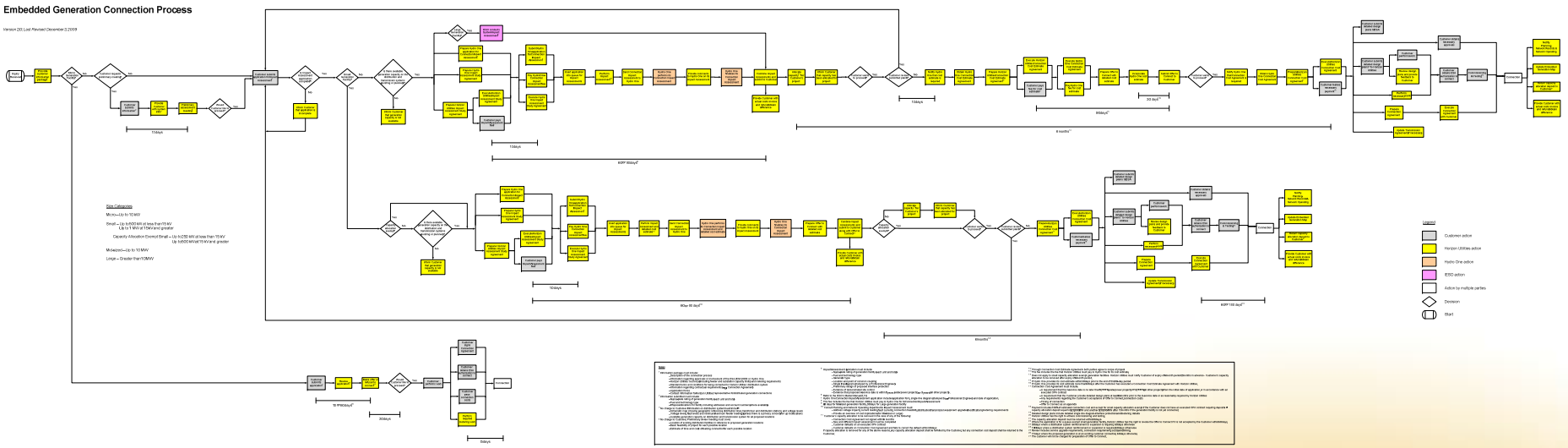
Generation Connection Process

Horizon Utilities' experience:

- Internal communications
- Safe work procedures
- ERP DG project structure
- Map out process

Generation Connection Process

Generation Connection Process Map



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Summary

Distribution systems are changing:

- Smart grid
- Increase in DG
- We have to accommodate DG
- We should start thinking about taking advantage of DG
- A comprehensive generation connection process is essential

Summary

Comprehensive generation connection process:

- Understand
- People, processes, tools
- Efficiency
- Engage
- Forward-looking

Summary

"We cannot direct the wind…

But we can adjust the sails."

Thank You

Company of the Year
Ontario Energy Association

Questions?