



# IAGT 2015 SYMPOSIUM

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## The Union Gas Parkway West Project

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- Major Canadian natural gas storage, transmission and distribution company based in Ontario
- Over 100 years of experience and safe service to customers
- Dawn Storage facility – largest underground storage facility in Canada
- Dawn Hub, one of the top-5 physically traded hubs in North America
- Assets of \$7 billion, ~1.4 million customers, ~2,200 employees
- One of Canada's Top 100 Employers 2011-2015
- A Spectra Energy (NYSE: SE) company

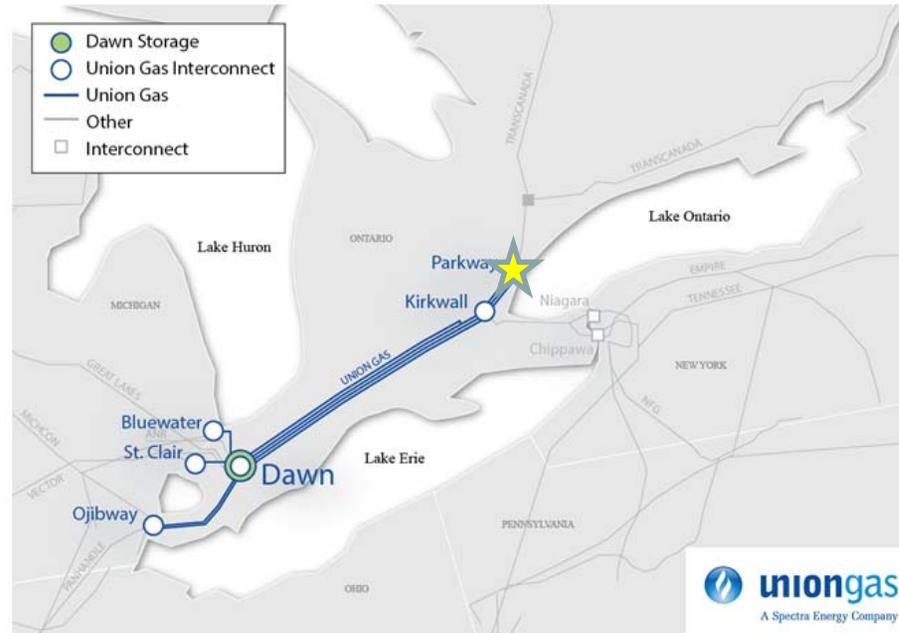


Retail Customers	1.4 million
2014 Pipeline Throughput	1.2 Tcf
Distribution Pipe	64,200 km / 39,870 mi
Storage Capacity	157 Bcf
Transmission Pipe	4,811 km / 2,988 mi



- Dawn is the largest integrated natural gas storage facility in Canada
- 157 BCF of underground storage immediately accessible from dawn
- Gas is imported and stored from multiple North American sources and exported to Ontario, Quebec, and the North Eastern United States
- Takeaway capacity for Dawn is now 6.4 BCFD mostly across Dawn-Parkway System

# Parkway Compressor Station

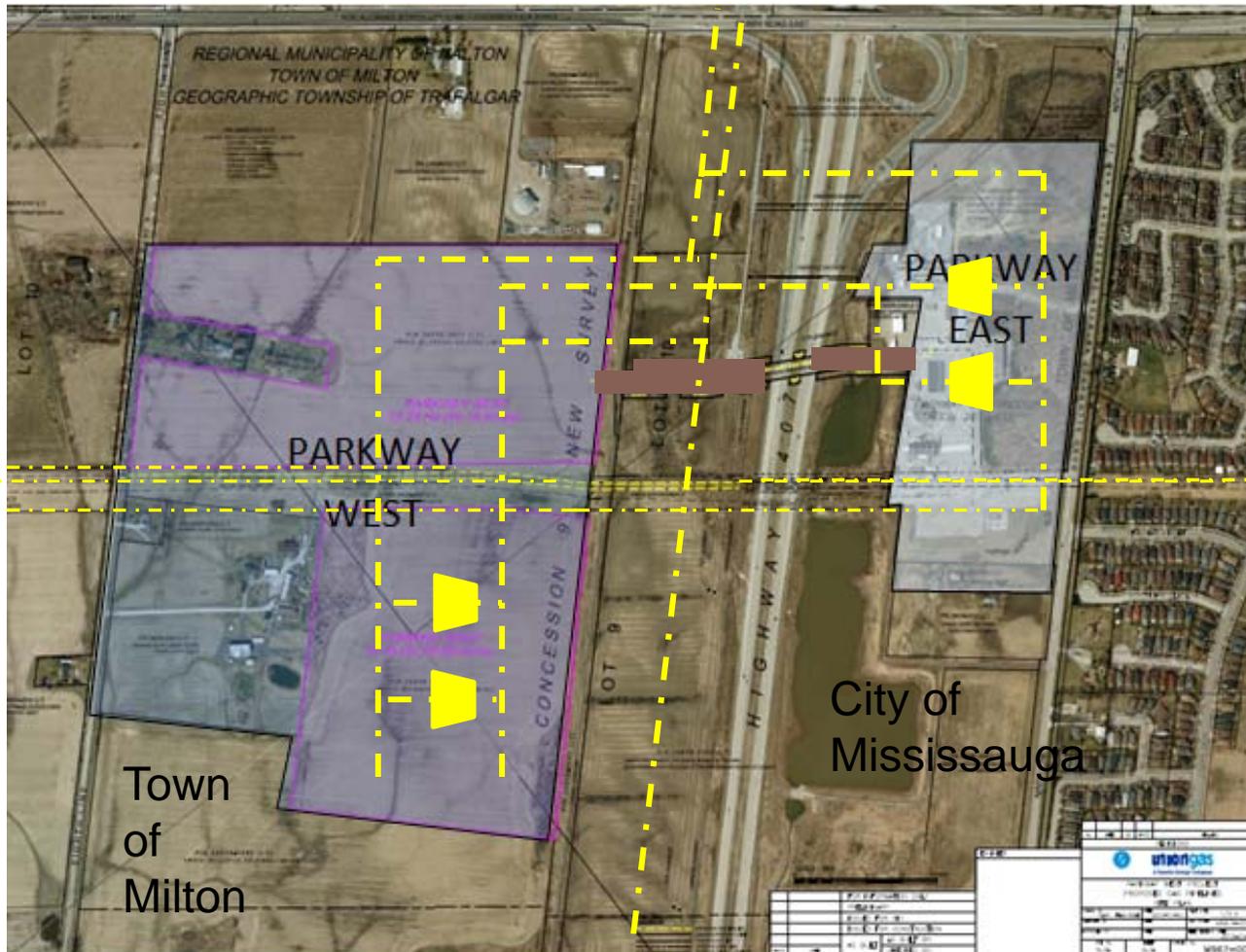


- Original Parkway Compressor Station consisted of one Avon 1534 RT48 driven RFBB30 compressor (~18,200 hp)
- In 2007 Union installed the Parkway B Compressor (RB211-24GTDLE-RT61-2xRFBB36 ~ 44,500 hp)
- Parkway B Compressor had no back-up in the event of a failure
- The Parkway station and pipelines east of Parkway presented a bottleneck for Dawn gas to get to eastern markets.



# History of Parkway and Parkway West

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- Heritage designation of two homes and potentially one barn – restoration/maintenance
- Engagement with area First Nations – 1 Acre Native Healing Garden
- Neighbours concerned over property values, environmental impacts, safety and ability to develop adjacent lands in the future

- Regulated tributary through site and adjacent wetland created significant challenges in obtaining site plan approvals and approvals to cross with utilities
- 34 of 119 acres designated Environmental Protection Area and 5 acres dedicated to Storm Water Retention
- All site works drawings had to be reformatted to meet municipal requirements and over 100 additional drawings had to be generated
- Significant challenges with building permits – NFPA 13 sprinkler designs, plant process pipe details requested, designated pedestrian walkways, etc.





# Compressor Package Design

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- Prior to 2006, Union gas had not installed any new turbines since 1993.
- Emissions regulations had changed both noise and air emissions requirements since that time.
- In 2007-2008, Union installed 4 new RB211-24G/GT DLE turbines outfitted with acoustic enclosures.
- The new arrangements revealed some operation/maintenance challenges never before experienced.
- The C & D project offered an opportunity to improve the design to correct many of these issues. Changes made to the base design for Parkway C and D would become the standard “Union Gas” package design.



# Compressor Package Design

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Issue	Solution
Sticking bypass solenoid starving power turbine oil distribution system of pressure with no indication of position	Added differential pressure gauge across solenoid for easy troubleshooting
Oil misting from coupling cooling air vents into compressor building	Power vented demister
No in-line oil sampling connections	Added lube oil sample connections at LO return lines just past bearings for the power turbine and compressor journal bearings
Standard on tank lube oil level transmitter requires tank to be drained for calibration	Added a small off-tank reservoir for the level transmitter that could be isolated from the tank and drained independently
Standard installation for gas generator lube oil skid and associated transmitters is inside the turbine enclosure beneath the gas generator. Access for skid for inspection/repair is restricted.	Moved the console off-skid allowing easy access for removal of pumps with a small lift.
250 hp starter pump and motor located directly below the combustion air inlet duct so access with the overhead crane is impossible without removal of the duct	Relocate the starter motor to the gas generator lube oil skid and situate for access by building overhead crane should removal become necessary
Vertically mounted enclosure ventilation fans make removal difficult	Relocate the fans and reorient horizontally to allow the fans to be lifted directly by the building crane
Inspection hatches in the air inlet ducting inaccessible without cat walks which would need to be mounted to the enclosure	Integrated enclosure catwalk/ladder system that was compatible with the surrounding building catwalk system
Systemic charger card failures for UPS inverter	Rolls Royce changed card manufacturers and had the assembly recertified by CSA
Turbine enclosure ventilation exhaust duct mounted gas detector located over turbine output shaft,	Relocate duct mounted gas detector to the enclosure side of duct for accessibility from enclosure catwalk system
Hysteresis causing oscillations and eventual failure of fuel metering valves	On-skid control boxes reducing communication cable length and capacitance



# Compressor Package Design

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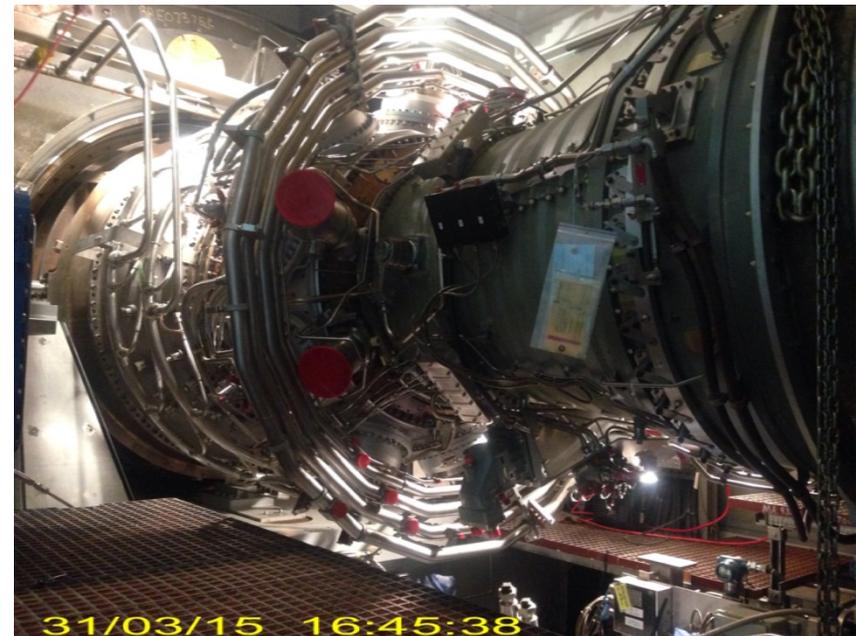
Duct Mounted Gas Detector in Old Design



Duct Mounted Gas Detector removed and relocated to Opposite Side

# Construction by the Numbers

- 119 acre site
- Over 250 workers on site at peak
- 21 buildings built
- 2 ponds holding 8.2M litres of water





# Construction

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Start: Fall 2013





# Site Infrastructure IAGT 2015 SYMPOSIUM



## South Pond



## Firewater Pumphouse

# Station Piping

- 1.7km NPS 48
- 1.8km NPS 42
- 96,000 dia inches of welding



- 17 runs of NPS 20 ultrasonic meters
- Ability to import or export gas
- Metering capacity  $>20,000 \text{ km}^3/\text{hr}$  (0.75 BCFH)
- Each compressor has “in-line” meter for testing



## Compressor buildings

- Pre-engineered steel
- Modular construction
- 500 m<sup>2</sup> Parkway C
- 600 m<sup>2</sup> Parkway D



## Precast concrete buildings

- Set in-place or assembled on site





# Compression Equipment IAGT 2015 SYMPOSIUM

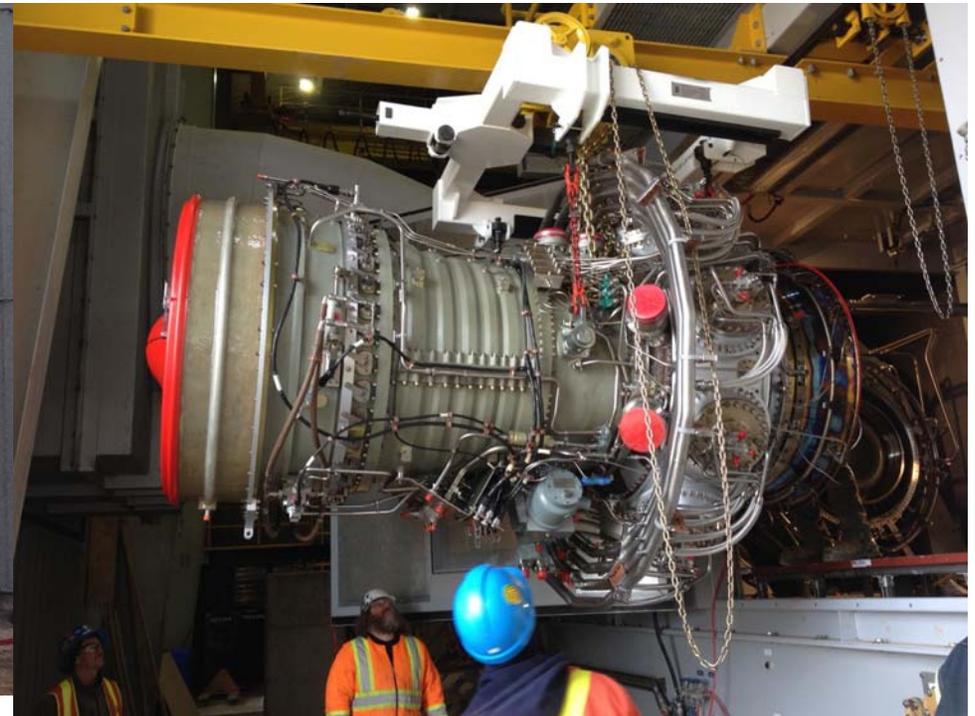
## Lube Oil Cooler





# Compression Equipment IAGT 2015 SYMPOSIUM

## Gas Generator Installation



# Compressor Installation





# Completion: Summer 2015

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# Lessons Learned

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- Early stakeholder engagement is critical in removing potential roadblocks
- Approach greenfield compressor sites as a land development and hire experts in the field to interface with the municipalities
- Understand the Official Plan for the land being developed and potential implications of future development to your site design
- Consult with your operating staff before and during the design phase of the project
- Consult with turbine manufacturers regarding their ability to customize their compressor package to fit your company's O&M needs at the bid phase of the project
- Attempt to predict and quantify all potential project risks at the project development phase and maintain a plan of action to respond should these risks come to fruition