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Quebec gas markets deliverability study

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- Jen Snyder brings to Wood Mackenzie over 15 years of experience analyzing the North American gas industry. She directed the launch of Wood Mackenzie's North American gas service in 2003. She has presented to numerous board and senior level strategy groups, as well as to major industry conferences. Jen currently serves on EPRI's Advisory Council Executive Committee. She is a recognized industry expert on gas markets, and currently acts as Principal Analyst for the North American gas team.
- Prior to joining Wood Mackenzie, Jen was the Director of North American Gas research at CERA, where she led development of short and long term market analysis. Previously, Jen worked for the National Economic Research Associates, Inc., where she analyzed rate design, cost classification, and allocation and service options for domestic and international natural gas clients.
- Jen Snyder holds a BS from the Massachusetts Institute of Technology and an MA from the University of Pennsylvania.

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Agenda

1. Resource adequacy
2. Current and planned infrastructure
3. Peak demand growth
4. Peak demand and infrastructure

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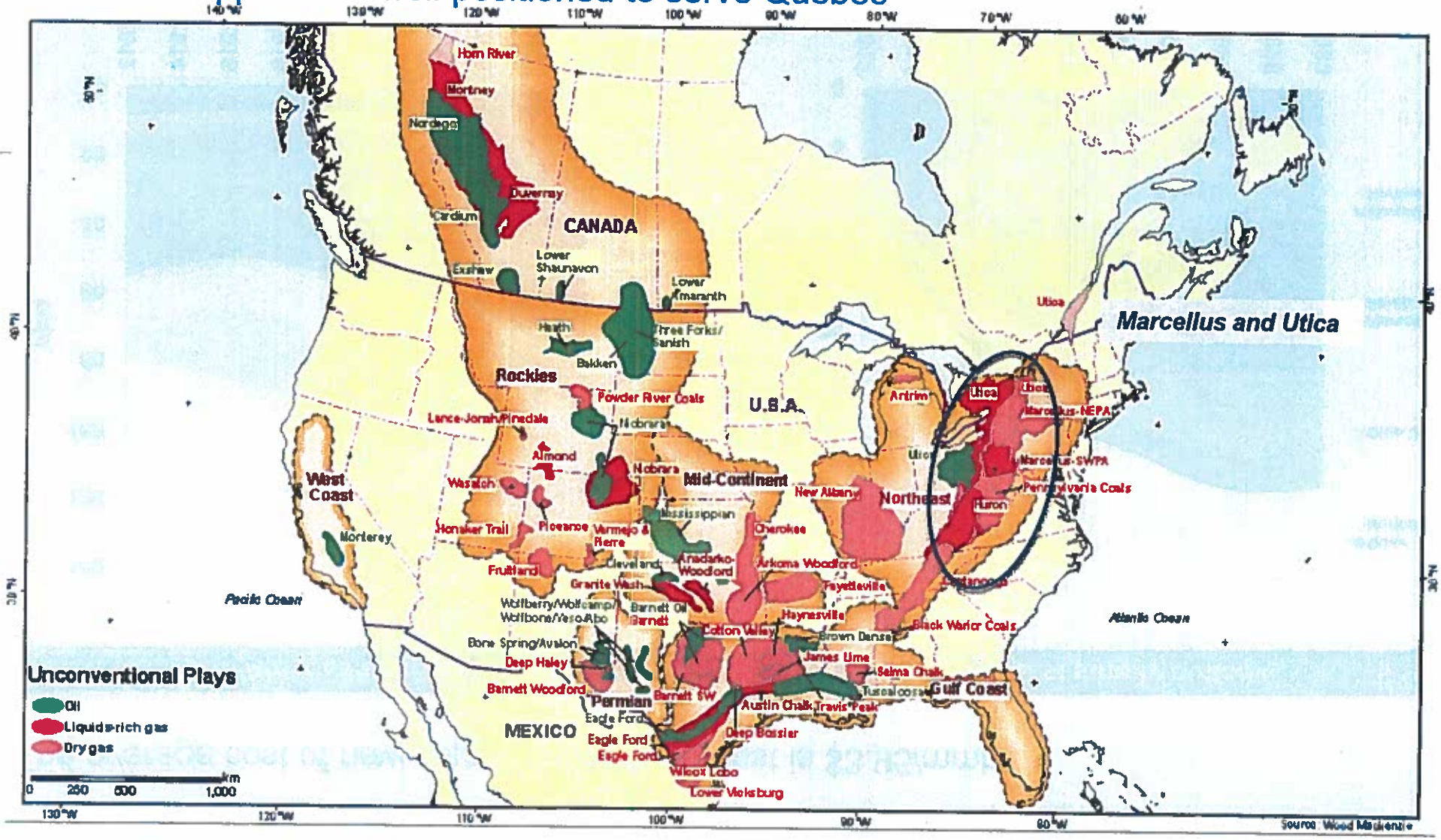
The North American resource base is robust

Northeast supplies are well-positioned to serve Quebec



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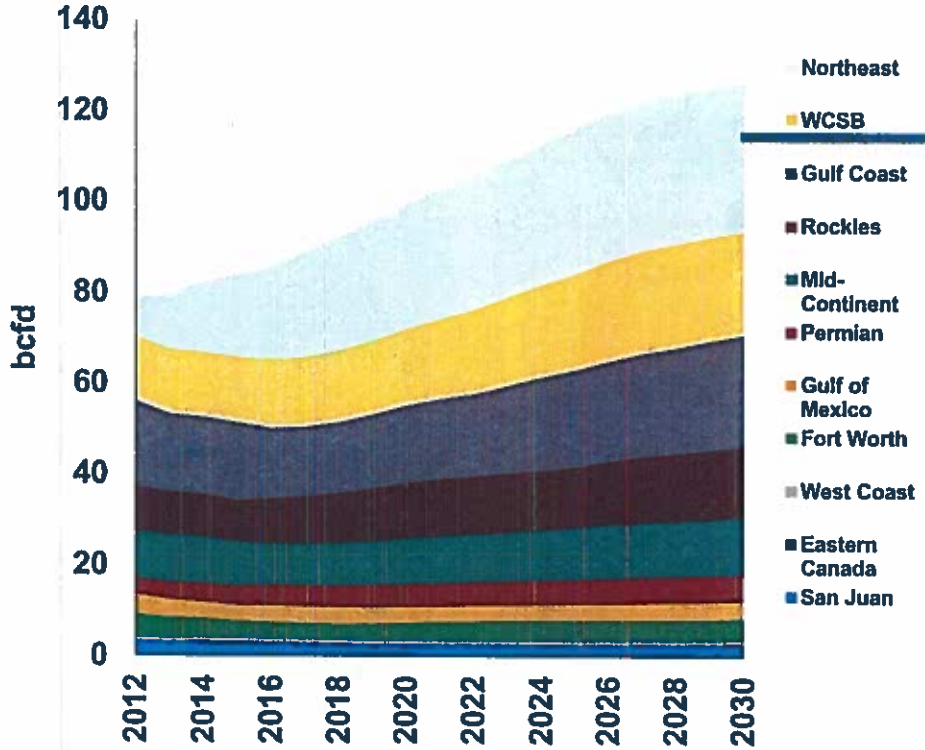
Economics support aggressive supply development

The average cost of new supply in the Northeast is $3.95/mmbtu

North American supply outlook



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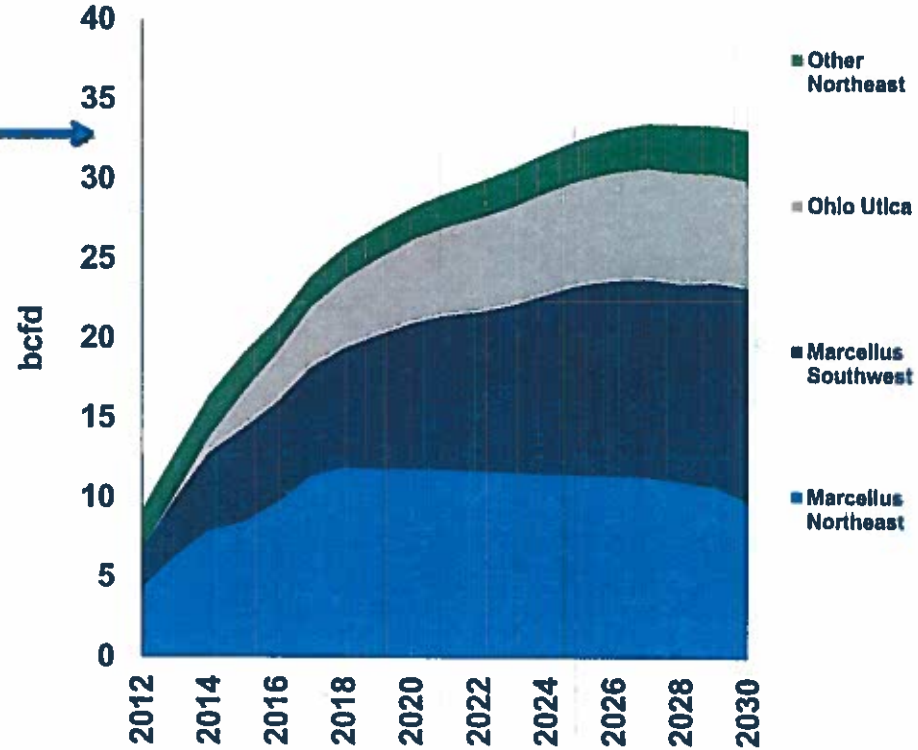
Northeast supply outlook



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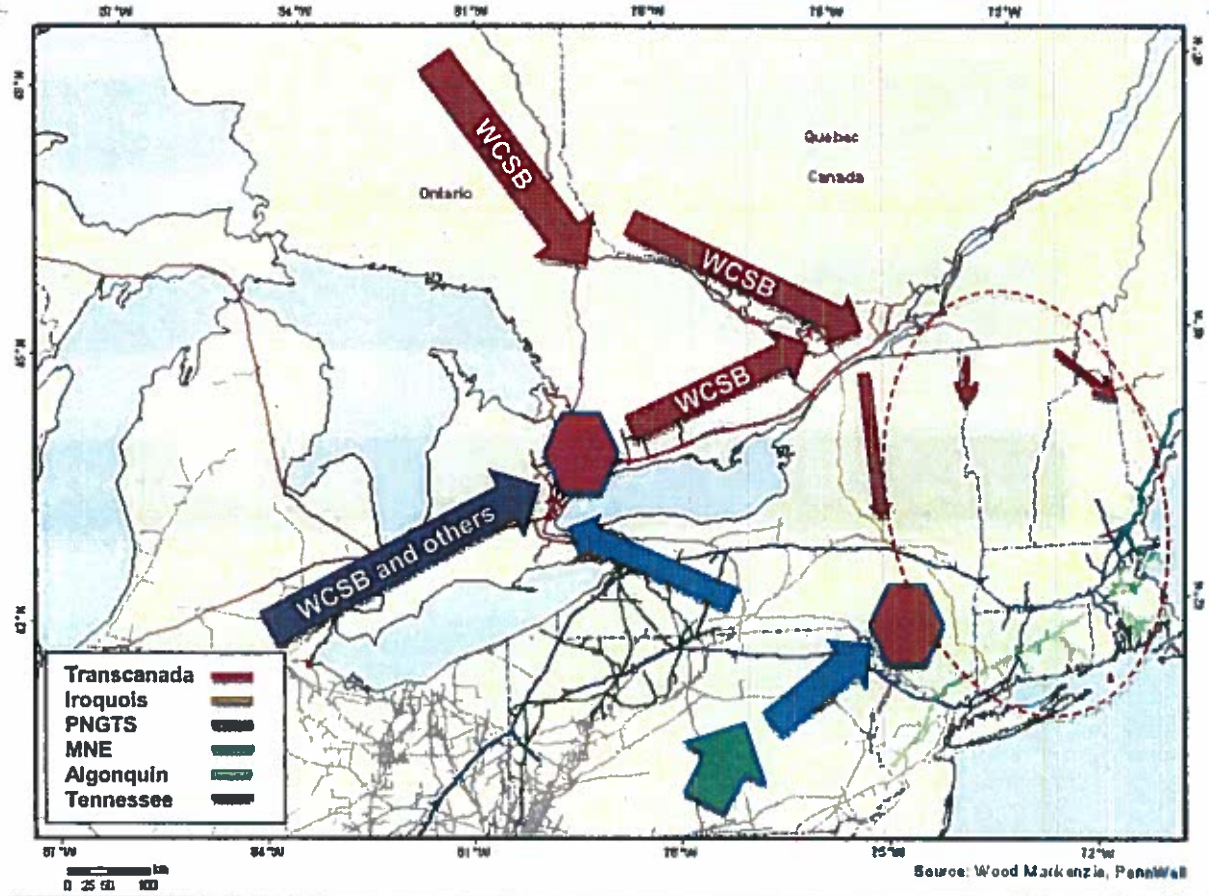
In the past, WCSB served the EDA zone and New England markets year-round

Northeast supplies increasingly serve proximate markets, but WCSB is key in winter

- In 2009, WCSB supplied nearly all of Quebec's requirements
- Currently, the Northeast supplies 15% of provincial demand
- Pipelines of note
  - » Transcanada
  - » Iroquois
  - » PNGTS
  - » Maritimes and Northeast
  - » Algonquin
  - » Tennessee

Northeast supplies are constrained into the EDA Zone and New England during winter

EDA Zone and downstream markets



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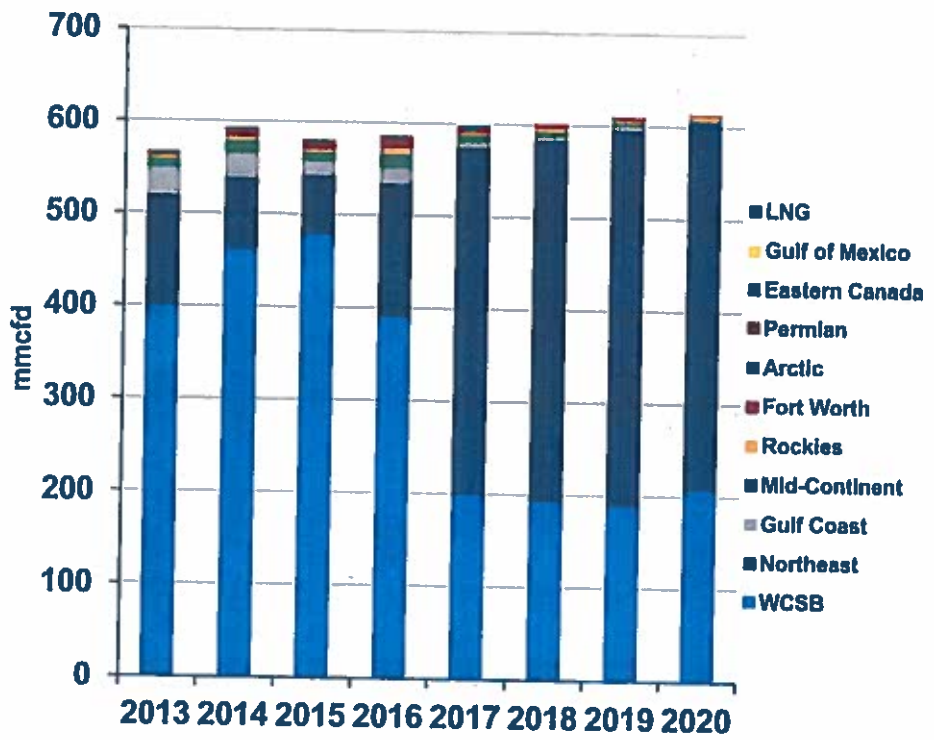
The Northeast has already influenced Quebec's supply mix

Further change depends on pipeline expansions

- Over 40 pipeline projects are planned to connect supply to demand in the Northeast
- Not all of these projects will progress, but 2 are critical for delivering additional gas into Quebec and Eastern Ontario (EDA Zone)
  - » GTA Project Segment A and King's North
  - » Eastern Mainline
- Based on Wood Mackenzie's analysis, the Northeast makes up over 60% of Quebec's gas supply by 2017

Understanding markets and expansions downstream of EDA are also critical to assessing supply deliverability

Sources of supply in Quebec



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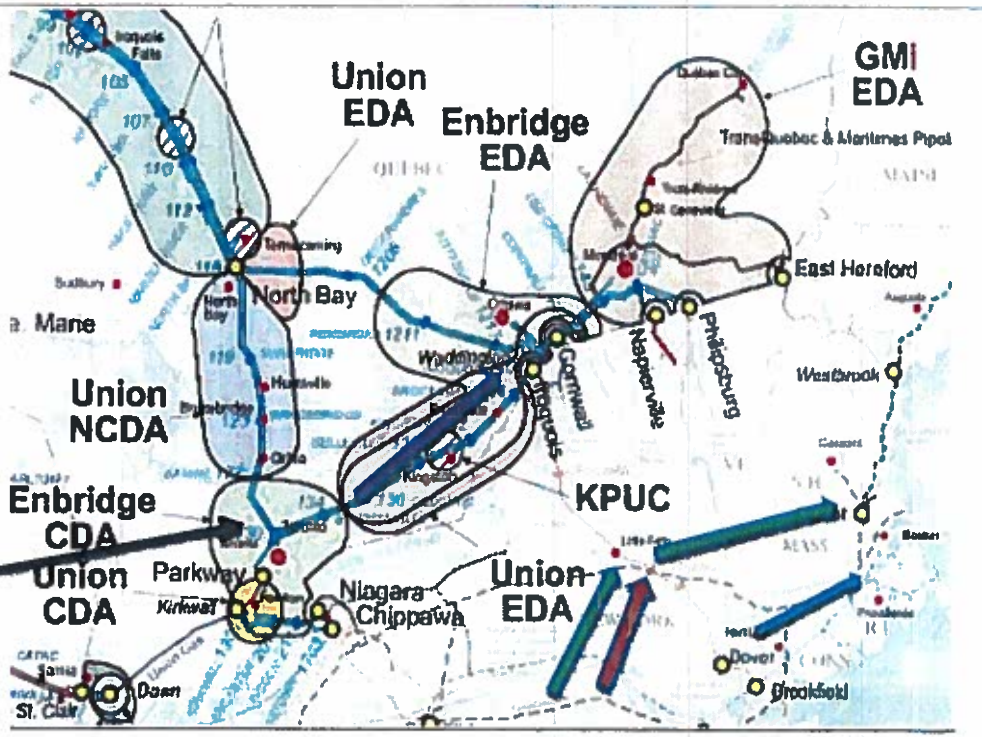
Quebec and EDA zone deliverability depends on downstream markets

Adequacy of pipeline capacity overall depends on export markets served through EOT infrastructure

- Eastern Ontario and Quebec (the EDA Zone) are served through the Eastern Ontario triangle with supplies delivered from Parkway in the south and North Bay in the northwest
  - » Parkway supplies are sourced from various basins
- Other markets are served through the EOT
  - » Kingston Public Utility (KPUC)
  - » LDCs at Cornwall, Napierville and Phillipsburg
  - » Iroquois
  - » Portland Natural Gas Transmission System (PNGTS)
- Two expansions are critical for increasing Northeast supplies into Quebec
  - » 1. GTA Project Segment A and King's North
  - » 2. In case Energy East happens, **Eastern Mainline**
- Numerous projects are planned in and around the Northeast. Three are critical for markets downstream of the EDA zone
  - » Algonquin Incremental Market (AIM)
  - » Constitution
  - » Northeast Energy Direct (NED)

EDA Zone and downstream markets



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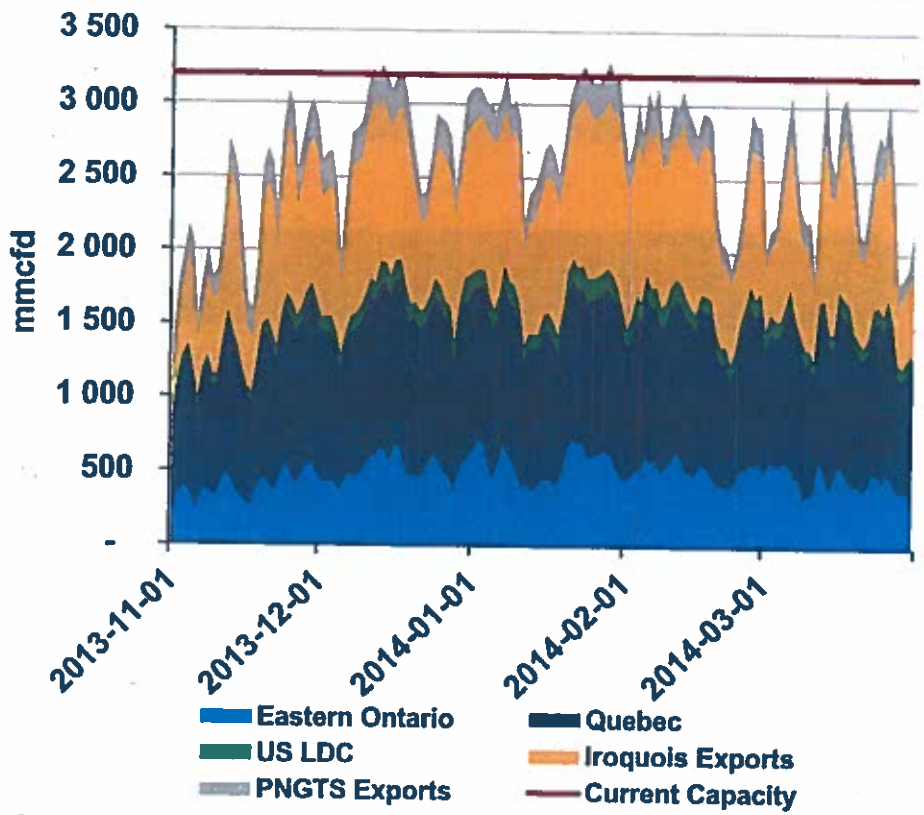
Capacity utilization into EDA zone and downstream markets has been 100% on cold winter days

Cold days are concurrent

- Peak demand in the region is nearly concurrent. Cold days in Ontario and Quebec are cold days in New England
- Utilization reached 100% on numerous days in the past two winters
- Extremely high prices reflected the constraints
- On cold winter days, New England requires power plants that are not served with firm pipeline capacity

Flow into EDA Zone and downstream markets winter 2013/14



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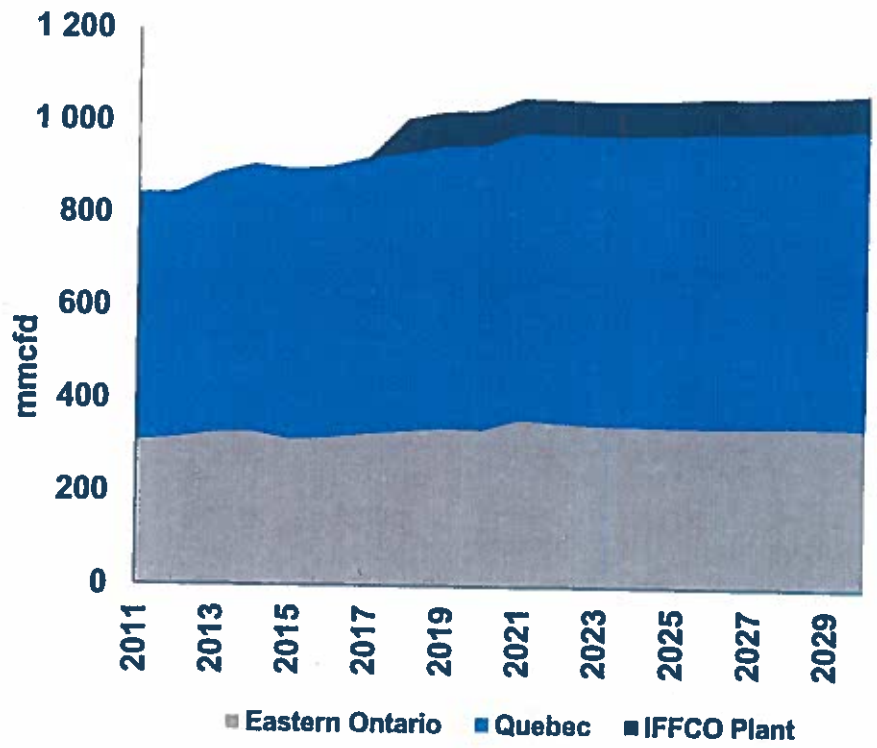
Demand growth in Quebec and Eastern Ontario markets reflects access to low-cost resources

Markets look set to expand on an annual and peak basis

- Demand growth in Ontario is broad-based. The province adds new power demand, new residential and commercial customers, and new industrial load
- Demand growth in Quebec reflects GDP-based industrial growth, transport demand, and some residential and commercial demand
  - » IFFCO represents the province's largest increment of new demand
  - » Becancour power plant would be demothballed in 2016, but should rarely be called
- Annual demand climbs 208 mmcfd 2015 to 2020

Quebec and Ontario annual demand



Source: Wood Mackenzie

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Peak demand in Ontario and Quebec reflects the same trend while New England deliveries reflect pipeline status

Iroquois deliveries could decline over time

- Annual demand growth in Ontario and Quebec translates into peak demand growth
- US LDCs served out of Cornwall, Napierville and Phillipsburg remain at historic peaks
- Exports into New England pipes depend on New England market conditions

Peak day demand EDA and downstream markets

	Eastern Ontario	Quebec	IFFCO	Iroquois Exports	US LDC	PNGTS Exports	Total
11/12 Winter	665	1,045		1,204	122	211	3,246
12/13 Winter	757	1,035		1,219	125	190	3,326
13/14 Winter	720	1,030		1,151	152	217	3,270
14/15 Winter	757	1,130		1,050	155	282	3,374
15/16 Winter	757	1,133		1,050	155	282	3,377
16/17 Winter	774	1,149		725	155	282	3,085
17/18 Winter	780	1,154	72	725	155	282	3,167
18/19 Winter	788	1,165	72	725	155	282	3,187
19/20 Winter	785	1,165	72	725	155	282	3,185
20/21 Winter	798	1,176	72	725	155	282	3,208
21/22 Winter	791	1,181	72	725	155	282	3,207

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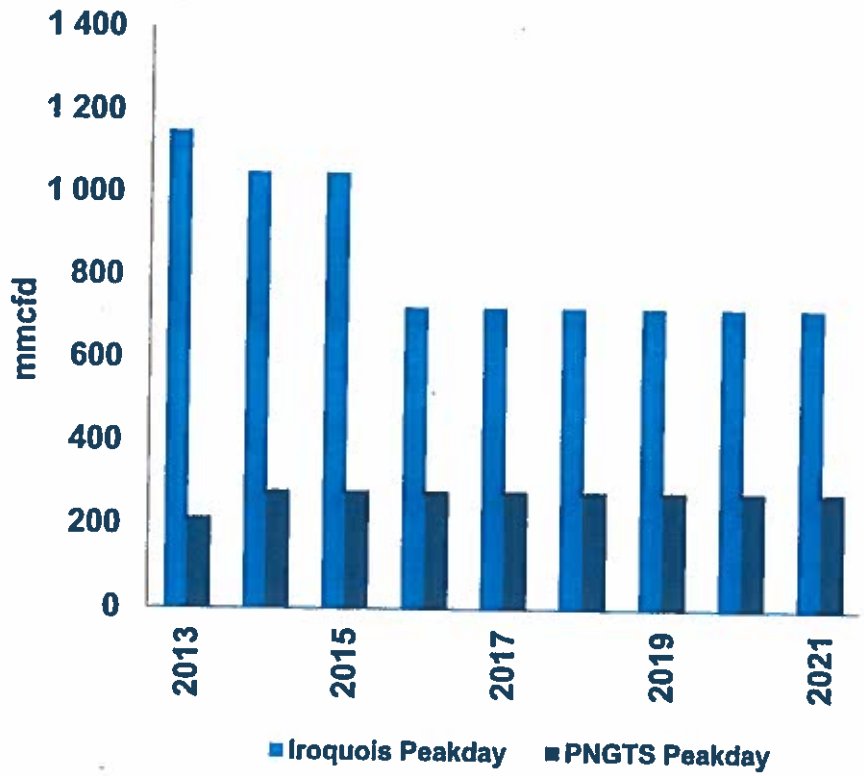
Although Marcellus supplies target New England, the market remains constrained

Iroquois will continue to attract flows at Waddington even after Constitution

- New England is extremely constrained
- Ensuring power reliability requires gas-fired generation from plants, and many of these plants do not hold firm pipeline capacity
- Although Constitution pipeline can replace some Waddington supply, the added gas supply will also open new markets

Waddington and East Hereford peak flows



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Energy East proposal

Converts North Bay shortcut capacity to oil service

	Capacity (mmcfd)		
	Prairie Section	Northern Ontario	EDA
Existing Capacity	6,800	3,200	3,200
Energy East Conversion	(800)	(1,000)	(1,200)
Capacity post Energy East	6,000	2,200	2,000

- Energy East converts 800, 1,000, and 1,200 mmcfd of west to east gas capacity to oil capacity
- Only the North Bay shortcut conversion impacts Quebec customers

Energy East oil conversion

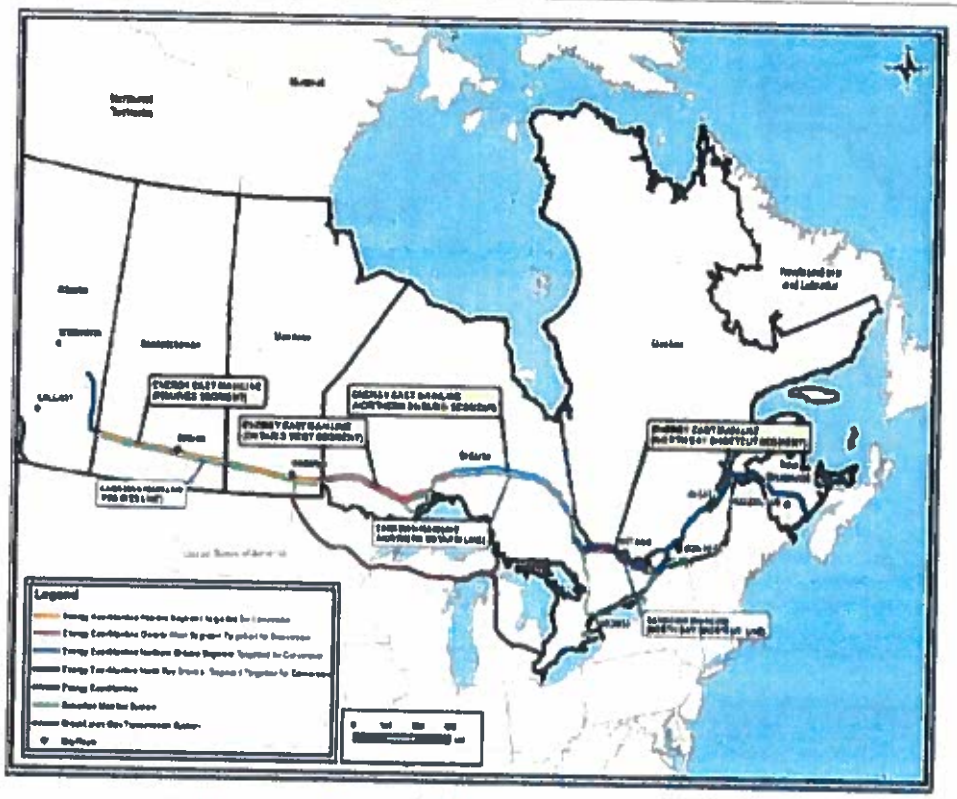

Figure 2-14: Existing Canadian Mainline Sections Targeted for Conversion

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Eastern Mainline proposal

Adds deliverability along the eastern leg of the EOT

	Capacity (mmcfd)
Existing EDA Capacity	**3,200**
Energy East Conversion	(1,200)
Eastern Mainline	600
EDA Capacity post Energy East	**2,600**

- The Eastern mainline expansion adds 600 mmcfd of deliverability along the Eastern leg of the EOT triangle
- Transcanada has suggested that they will size the project according to firm contracts

Eastern Mainline expansion

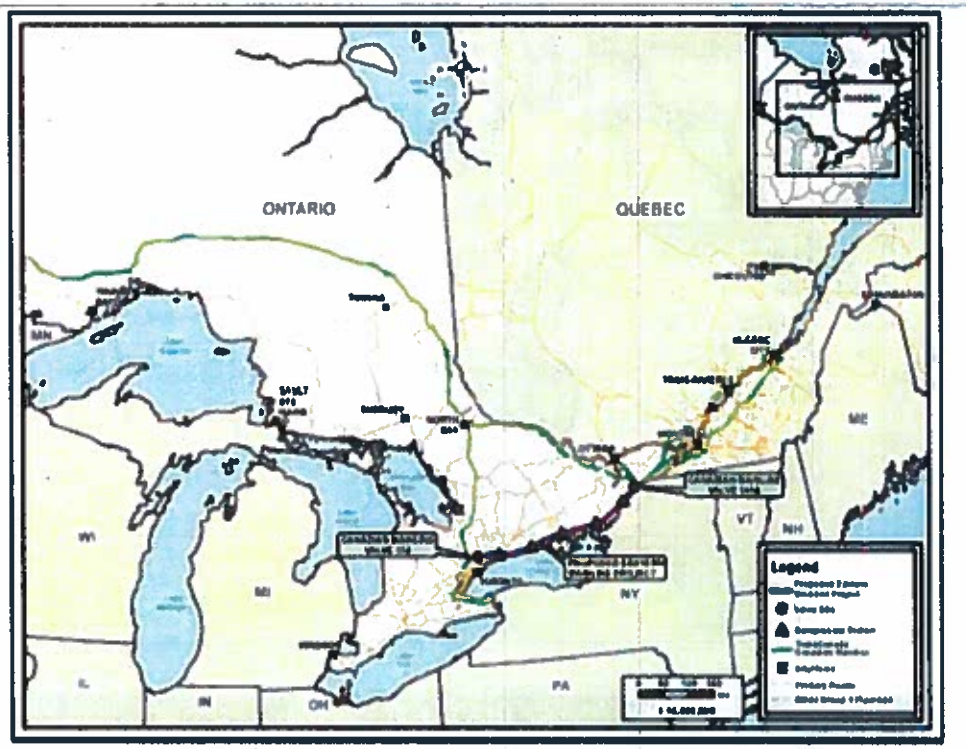

Figure 1-1: Overview Map of Proposed Project

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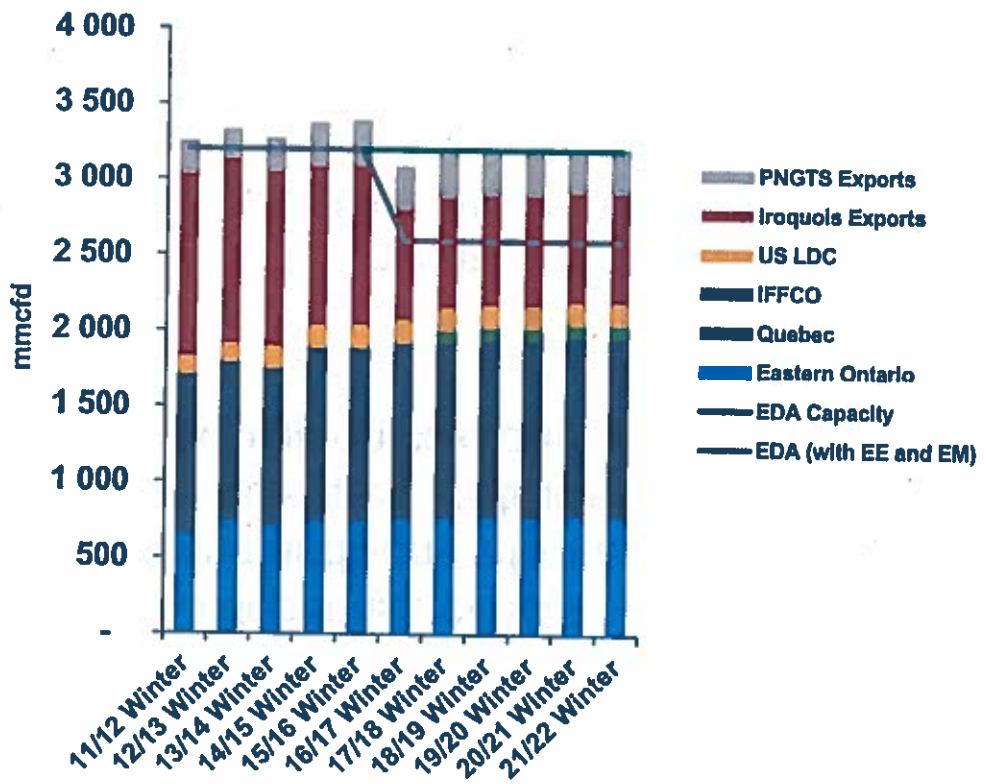
Peak day flows to EDA and downstream markets

Deliverability falls below expected peak day demand

- Without the Energy East conversion, capacity is adequate to meet new markets and reliability increases relative to today's levels
- With the Energy East conversion and a 600 mmcfd Eastern mainline expansion not all peak day markets can be served. Reliability declines relative to today's level
- The most likely flows to decline are Iroquois, but unless New England projects come online in time, the markets in the East will be even tighter than last winter, raising fears of risks to security of supply

Peak day demand and capacity



Source: Wood Mackenzie

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In Conclusion

Maintaining reliable and economic supplies requires capacity above the planned Eastern Mainline expansion

- Deliverability into the Quebec and the EDA Zone depends not only on projects serving the market directly, but also on the pace of pipeline additions into New England markets served through EDA infrastructure. Until new projects are constructed, utilization on pipelines into New England will remain extremely high on cold days and the region will compete with Quebec for supplies.
- New capacity into southern New England not simply offset the need for supplies from the North; New England markets are growing. Despite abundant proximate shale gas supply, New England is short pipeline capacity during the winter months and needs TransCanada Mainline supplies delivered through the EDA infrastructure.
- Although alternatives to pipeline capacity exist to serve excess peak day demand, the costs of those alternatives, both in terms of securing back up service, and the number of end-users requiring that back up, must be considered

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