



Post Winter 2016/17 Review

Electric/Gas Operations Committee

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SYSTEM PLANNING – RESOURCE ADEQUACY



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WINTER 2016/17 WEATHER, ENERGY AND PEAK LOADS



Winter 2016/17 Weather, Energy and Peak Loads*

- **December 2016:** Colder than previous December
 - Energy demand of 10,884 GWh is 6.8% higher than December 2015
 - Peak load of 19,647 MW is 7.9% higher than December 2015
 - Peak occurred on December 15, 2016 at HE 18:00 at 18° F at -9° DWPT
- **January 2017:** Milder than previous January
 - Energy demand of 10,724 GWh is -2.6% lower than January 2016
 - Peak load of 19,529 MW is 0.7% higher than January 2016
 - Peak occurred on January 9, 2017 at HE 18:00 at 17° F at 2° DWPT
- **February 2017:** Milder than previous February
 - Energy demand of 9,404 GWh is -7.1% lower than February 2016
 - Peak load of 18,130 MW is -7.3% lower than February 2016
 - Peak occurred on February 9, 2017 at HE 19:00 at 18° F at 9° DWPT
- **March 2017:** Colder than previous March
 - Energy demand of 10,386 GWh is 5.8% greater than March 2016
 - Peak load of 17,453 MW is 0.6% higher than March 2016
 - Peak occurred on March 15, 2017 at HE 20:00 at 23° F at 10° DWPT

(*) – All data obtained from the ISO-NE Net Energy and Peak Load Report located at:

<https://www.iso-ne.com/isoexpress/web/reports/load-and-demand/-/tree/net-ener-peak-load>

WINTER RELIABILITY PROGRAM



Winter 2016/17 Reliability Program (As of the Start of the Program on December 1, 2016)

- **Oil Program**

- Participation from 84 units for a total of 4.394 million barrels of oil
- 3.052 million barrels of the total inventory on December 1 are eligible for compensation per the winter reliability program rules
- Total oil program cost exposure is expected to be \$31.16M (@\$10.21/barrel)

- **LNG Program**

- Participation from 2 units, representing 171,000 MMBTU
- Total LNG program cost exposure is expected to be \$291K (@\$1.70/MMBTU)

- **DR Program**

- Participation from 6 assets providing 23.0 MW of interruption capability
- Total DR program cost exposure is anticipated to be \$70.5K



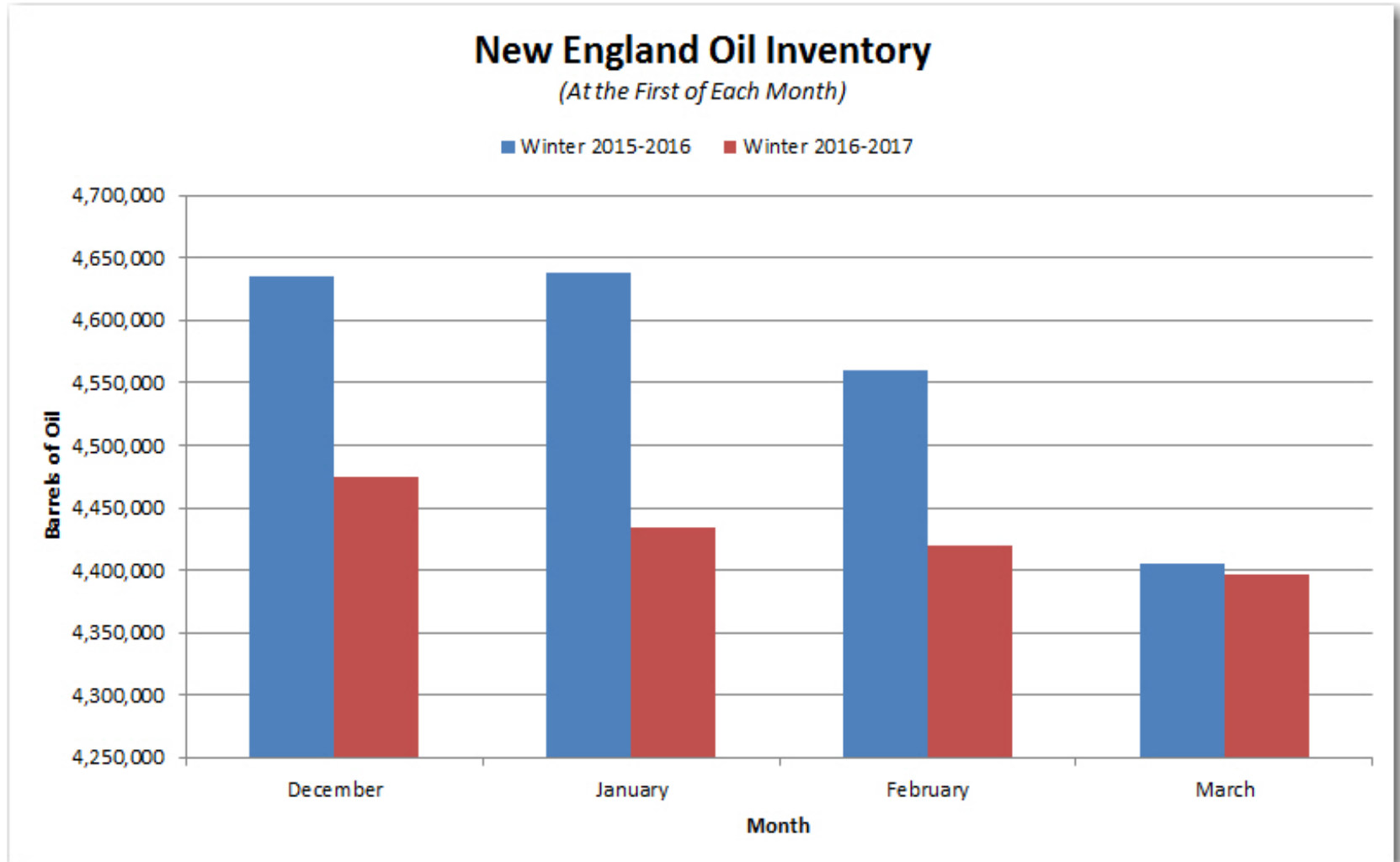
Winter 2016/17 Reliability Program Usage

- Winter Program Oil Inventory Use^(A)
 - Dec 2016: 76,967 BBLs
 - Jan 2017: 12,737 BBLs
 - Feb 2017: 18,663 BBLs
 - Mar 2017 : 5,643 BBLs
- Winter Program LNG Use:
 - December 2016 through March 2017 = None
- Winter Program DR Use (Events):
 - December 2016, February & March 2017 = None
 - January 10, 2017: 1 event - 6:39 AM – 8:00 AM, all assets dispatched (Pre-OP4 real-time-only cuts due to transmission/generation outages)
- Final Program Ending Oil Eligible Inventory^(B)
 - 3,034,668 BBLs

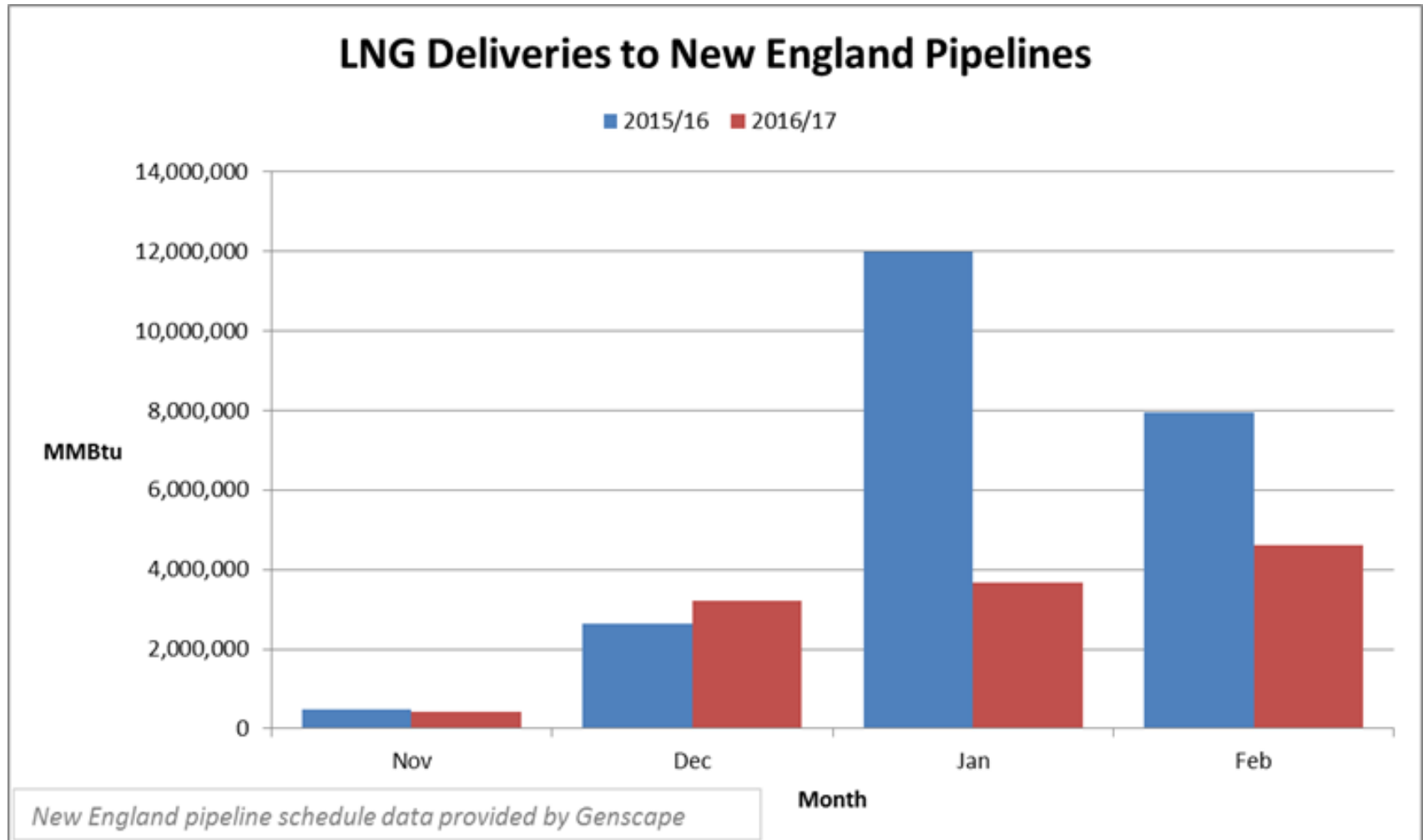
NOTES: (A) + (B) = Starting and ending oil inventories do not reflect monthly usage due to replenishment



Winter Power Plant Oil Inventories (All Units)



Winter LNG Utilization



WINTER 2016/17 ELECTRIC OPERATIONS REVIEW



Winter 2016/17 Electric Operations Review

Event Type	December 2016	January 2017	February 2017	March 2017
OP4	None	None	None	None
MLCC2 (Reason)	December 16 (Cap. Def. – All N.E.)	None	February 9 (Severe Weather)	March 13-14 (Severe Weather)
Peak Load Date (H.E.)	19,647 MW Dec 15 (18:00)	19,529 MW Jan 9 (18:00)	18,130 MW Feb 9 (19:00)	17,453 MW Mar 15 (20:00)
Minimum Generation Warning/Event	None	None	None	None



Electric System Operations – December 2016

<u>Weather Patterns</u>	Boston	Temperature: Below Normal (-1.6°F) Max: 58°F, Min: 4°F Precipitation: 3.23" – Below Normal Normal: 3.73" Snow: 5.79"	Hartford	Temperature: Below Normal (-1.9°F) Max: 57°F, Min: 3°F Precipitation: 2.74" - Below Normal Normal: 3.60" Snow: 16.34"
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<u>Peak Load:</u>	19,673 MW	Dec 16, 2016	18:00 (ending)
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MLCC2: December 16, 2016	Capacity Deficiency – All of New England	15:23 to 19:46
<u>OP-4</u> : None		

NPCC Simultaneous Activation of Reserve Events:

Date	Area	MW
12/01	ISO-NE	800
12/10	NYISO	580
12/11	IESO	800
12/12	IESO	500
12/18	ISO-NE	800



Electric System Operations – January 2017

<u>Weather Patterns</u>	Boston	Temperature: Above Normal (5.0°F) Max: 61°F, Min: 11°F Precipitation: 3.81” – Normal Normal: 3.80” Snow: 6.85”	Hartford	Temperature: Above Normal (5.4°F) Max: 56°F, Min: 1°F Precipitation: 3.07” - Below Normal Normal: 3.73” Snow: 4.96”
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<u>Peak Load:</u>	19,587 MW	Jan 9, 2017	18:00 (ending)
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<u>MLCC2:</u> None		
<u>OP-4 :</u> None		

NPCC Simultaneous Activation of Reserve Events:

Date	Area	MW
1/12	ISO-NE	1,500
1/17	ISO-NE	650
1/25	ISO-NE	750
1/26	NBSO	378



Electric System Operations – February 2017

<u>Weather Patterns</u>	Boston	Temperature: Above Normal (5.2°F) Max: 73°F, Min: 11°F Precipitation: 2.35” – Below Normal Normal: 3.18” Snow: 15.17”	Hartford	Temperature: Above Normal (5.1°F) Max: 72°F, Min: 4°F Precipitation: 2.43” - Below Normal Normal: 2.85” Snow: 20.16”
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<u>Peak Load:</u>	18,114 MW	Feb 9, 2017	19:00 (ending)
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<u>MLCC2:</u> February 9, 2017	Reason: Severe Weather	Declared: 08:00 Cancelled: 21:00
<u>OP-4:</u> None		

<u>NPCC Simultaneous Activation of Reserve Events:</u>		
Date	Area	MW
2/14/17	NE	560



Electric System Operations – March 2017

<u>Weather Patterns</u>	Boston	Temperature: Below Normal (-5.2°F) Max: 63°F, Min: 9°F Precipitation: 3.05" – Below Normal Normal: 3.85" Snow: 9.02"	Hartford	Temperature: Below Normal (-5.7°F) Max: 61°F, Min: 7°F Precipitation: 4.79" – Above Normal Normal: 3.88" Snow: 18.78"
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<u>Peak Load:</u>	17,454 MW	Mar 15, 2017	HE20
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<u>MLCC2:</u> March 13/14, 2017	Reason: Severe Weather	Declared: March 13, 2017 16:00 Cancelled: March 14, 2017 23:00
<u>OP-4:</u> None		
<u>NPCC Simultaneous Activation of Reserve Events:</u>		
3/15/17	NE	540 MW
3/16/17	IESO	825 MW



Winter Electric Operations Summary

- While system operations this winter were relatively uneventful, challenges remain for future winters with fuel security and pending retirements
- World LNG prices and contracts have an impact on how much fuel shows up in New England
 - Increased LNG injections are very helpful in maintaining grid reliability
- The Winter Reliability Program was instrumental in augmenting liquid fuel security for the region
 - Next winter will be the last Winter Reliability Program
 - Pay-For-Performance market design becomes effective in June 2018



WINTER 2016/17 NATURAL GAS SECTOR HIGHLIGHTS

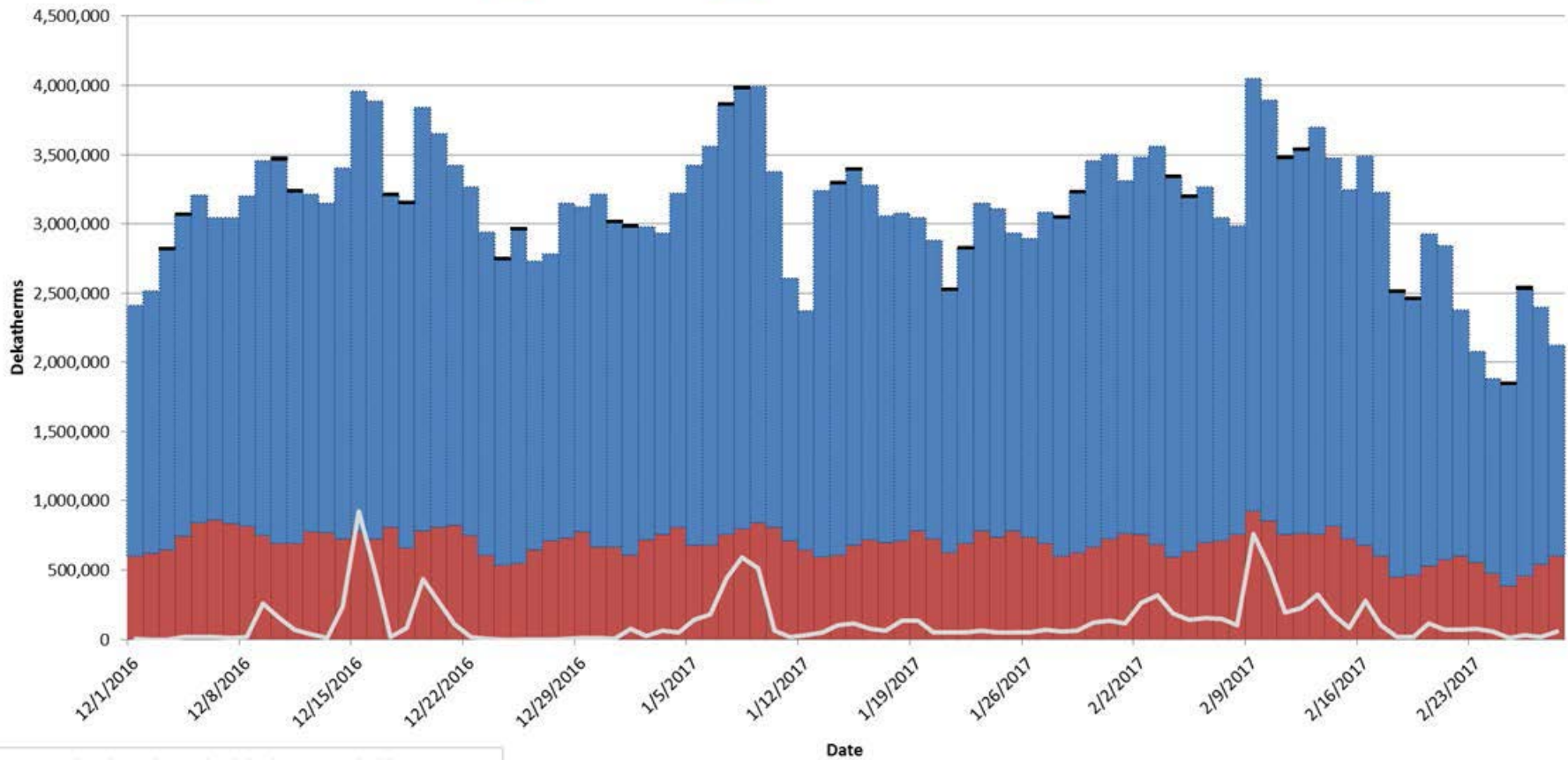
Winter 2016/17 Gas Operations Review

- Over the winter 2016/17, regional natural gas pipelines declared:
 - 6 Unplanned Outages – All related to partial or full compressor station outages
 - 15 - 20 Critical Notices (CNs) or Operational Flow Orders (OFOs) – All related to extreme weather
- The Critical Notices/OFOs posted during this winter were typical for natural gas pipeline operations during most winters

Winter 2016/17 Natural Gas Use

Natural Gas Schedules to Generators vs. Non-Power Use - Winter 2016 - 2017

Pipeline Generators Non Power Weekend LNG



New England pipeline schedule data provided by Genscape

Winter 2016/17 Natural Gas Sector Highlights

- Spectra Energy put the majority of the AIM project (245,000 Dth/d) into service on November 1, 2016, and subsequently put the final piece (Hudson River crossing = all 342,000 Dth/d) into service on January 7, 2017
- Spectra Energy put the Salem Lateral (for Footprint Power) into service on November 1, 2016
- February 27, 2017 – The Spectra Energy – Enbridge company merger was completed
- The Connecticut Expansion project (72,000 Dth/d) on Tennessee Pipeline was delayed until 2018
- March 27, 2017, FERC gave Algonquin Transmission LLC permission to begin building its Atlantic Bridge gas project connecting points in New Jersey and New York with New England and Canada's Maritime provinces. Approval was for Connecticut facilities only.
- Several open seasons took place for gas pipeline capacity releases (for the off-peak season of April - November)

Questions

