New England 2015 Regional System Plan (RSP15) Load, Energy and Capacity Resource Overview

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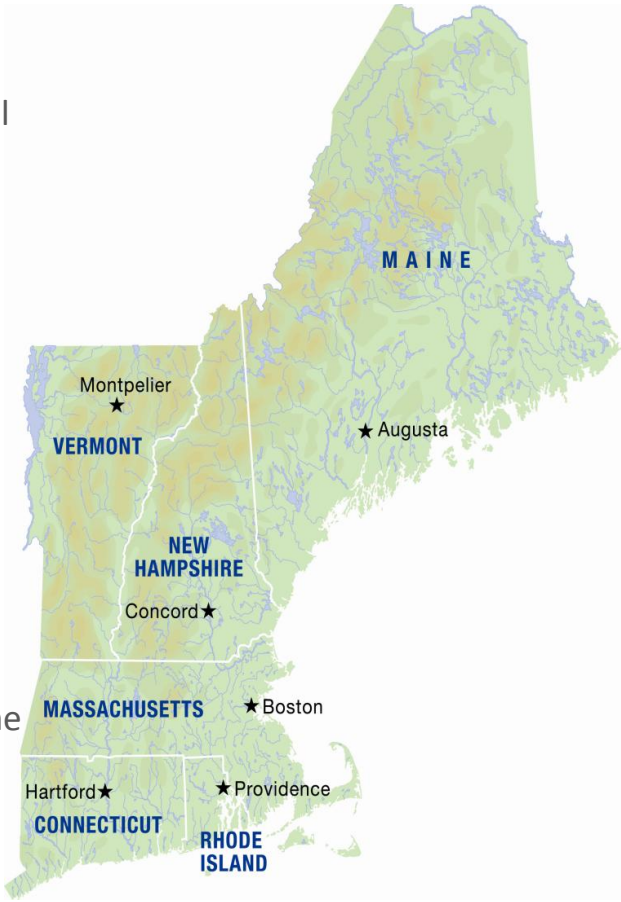
Summary

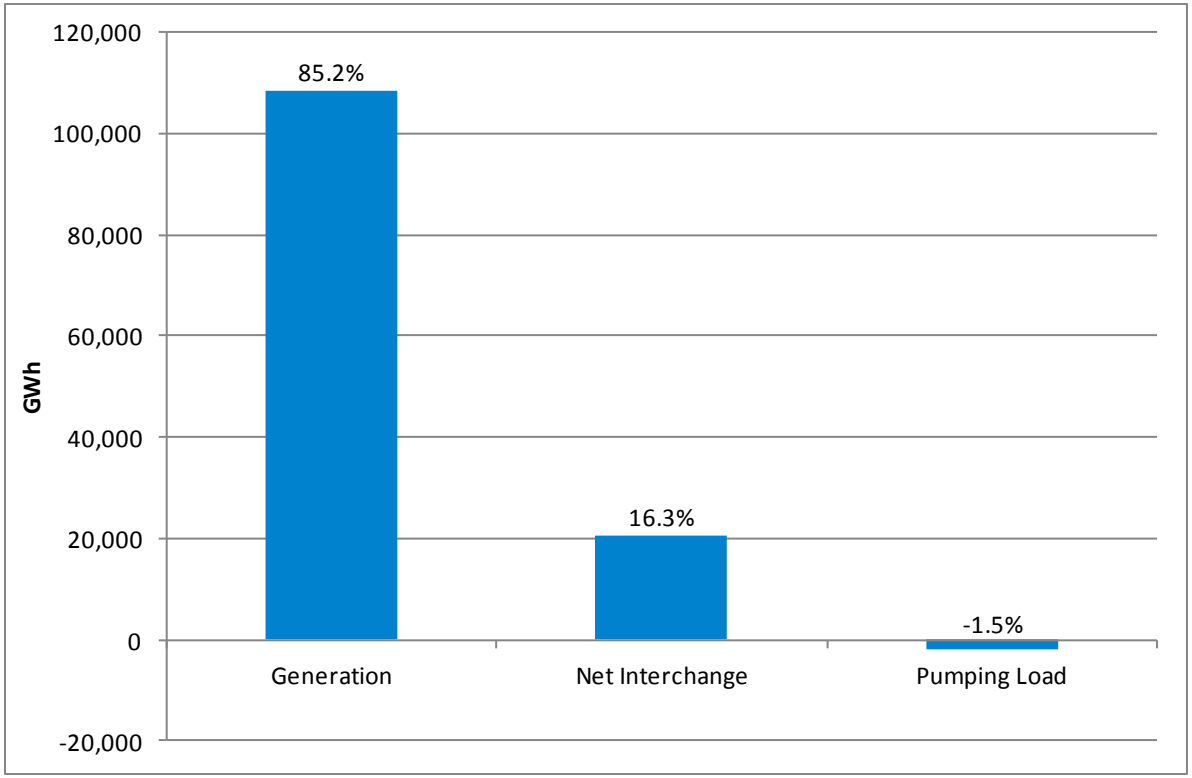
- The Regional System Plan (RSP) includes system data, which is used in analyses supporting RSP and throughout the year. This presentation highlights current and historical system data.
- Data reflected in this presentation corresponds to the 2015 Capacity, Energy, Loads, and Transmission (CELT) Report
- The CELT Report will be available by May 1, 2015 on the ISO website at: http://www.iso-ne.com/system-planning/system-plans-studies/celt
- The 2015 CELT Report summer capacity ratings are based on the January 1, 2015 generator Seasonal Claimed Capability (SCC) Report

New England's Electric Power Grid at a Glance

- 6.5 million households and businesses; population 14 million
- 127,108 GWh total annual demand in 2014 ; 136,355 GWh all-time highest total annual demand, set in 2005
- Approximately 350 generators making up 31,000 MW of generating resources ; 9,500 MW of proposed generating capacity and 3,500 MW of generating capacity retiring by 2018
- 8,500 miles of high-voltage transmission lines (115 kV and above)
- 13 interconnections to power systems in New York and Canada
- 1,200 MW of active demand response (DR) and 1,500 MW of energy efficiency through the capacity market
- All-time peak demand of 28,130 MW, set on August 2, 2006; 22,818 MW all-time winter peak demand, set on January 15, 2004
- Over 400 buyers and sellers in the wholesale electricity marketplace
- $10.5 billion traded in wholesale electric markets in 2014; $9.1 billion energy market, $1.1 billon capacity and $300 million ancillary services markets
- $7 billion in transmission investment since 2002; $4.5 billion planned through 2018

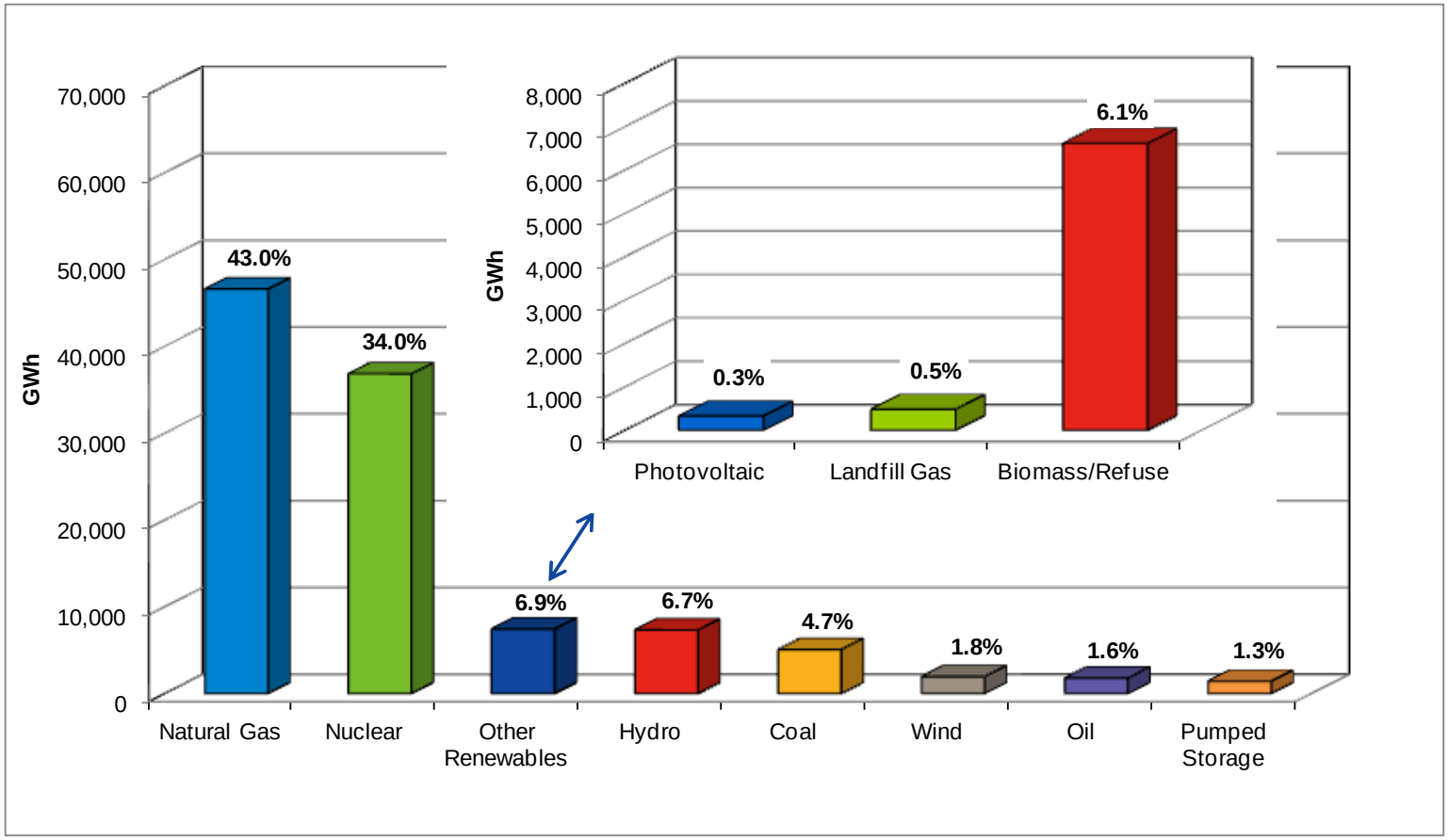


2014 Annual Net Energy for Load



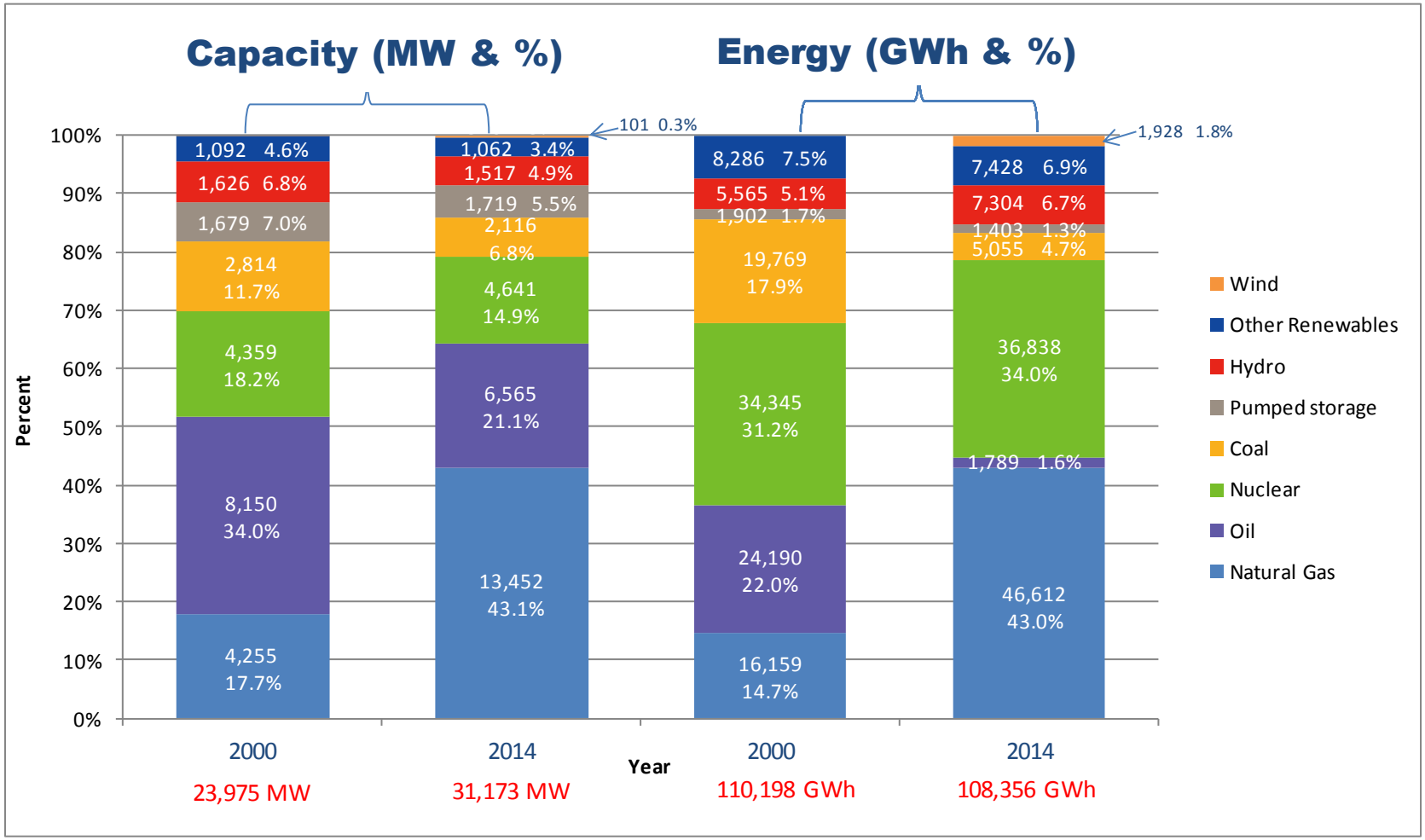
- Net Interchange refers to the net of imports and exports
- Pumping load is the off-peak load required to pump water into storage ponds
- Net Energy for Load (NEL) is calculated as the sum of generation + net interchange – pumping load
- For 2014 the formula is: 108,356 GWh + 20,660 GWh – 1,877 GWh = 127,138 GWh
- Data current as of March 1, 2015 90-day resettlement of 2014
- 2014 NEL decreased by 1.7% versus 2013 with energy from generators decreasing by 1.7% and imports increasing by 1.6% . Pumping load increased by 1.2%.

2014 Generator Energy Production by Fuel Type



- The "Other Renewables" category includes photovoltaic, landfill gas, biomass, and refuse (municipal solid waste, wood and wood-waste solids)
- Data current as of the March 1, 2015 90-day resettlement of 2014
- Based on primary fuel type of registered market resources reported in the 2015 CELT

2000 vs. 2014 New England Generating Capacity and Energy



- 2014 Capacity is from the 2014 CELT
- Energy data current as of March 1, 2015 90-day resettlement of 2014

INTERCONNECTION WITH NEIGHBORING SYSTEMS

New England External Interconnections

New England has 13 ties with neighboring power systems in the United States and Eastern Canada.

- Nine with New York (New York ISO)
  - 2-345 kV
  - 1-230 kV
  - 4-115 kV
  - 1-69 kV
  - One +/- 150 kV DC (Cross Sound Cable)
- Two 345 kV ties with the Maritimes (New Brunswick Power Corporation)
- Two ties with Quebec (Hydro-Quebec)
  - One 120 kV AC interconnection (Highgate) with a back-to-back converter station that converts alternating current to direct current and then back to alternating current
  - One +/- 450 kV DC interconnection (Phase II)

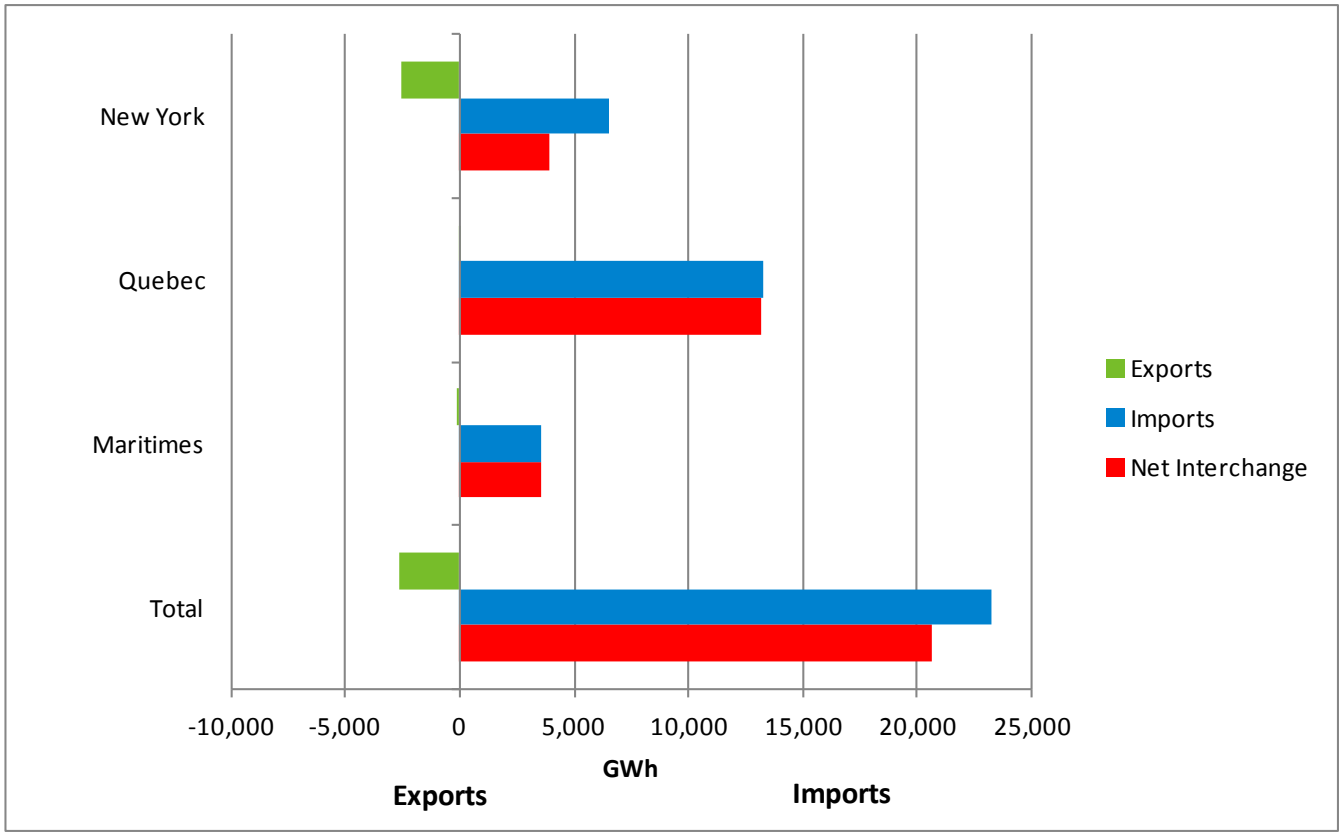
Assumed External Interface Import Capability Summer 2015 – 2024 (MW)

Interface	Assumed Import Capability Summer [1] 2015 - 2024 (MW)
New York – New England AC	
Energy Import Capability [2]	1,400
Capacity Import Capability	1,400
Cross Sound Cable (CSC)	
Energy Import Capability [3]	330
Capacity Import Capability	0
Maritimes – New England [4]	
Energy Import Capability	1,000
Capacity Import Capability	700
Quebec – New England (Highgate) [5]	
Energy Import Capability	217
Capacity Import Capability	200
Quebec – New England (Phase II)	
Energy Import Capability	2,000
Capacity Import Capability [6]	1,400

New England External Interconnections (cont.)

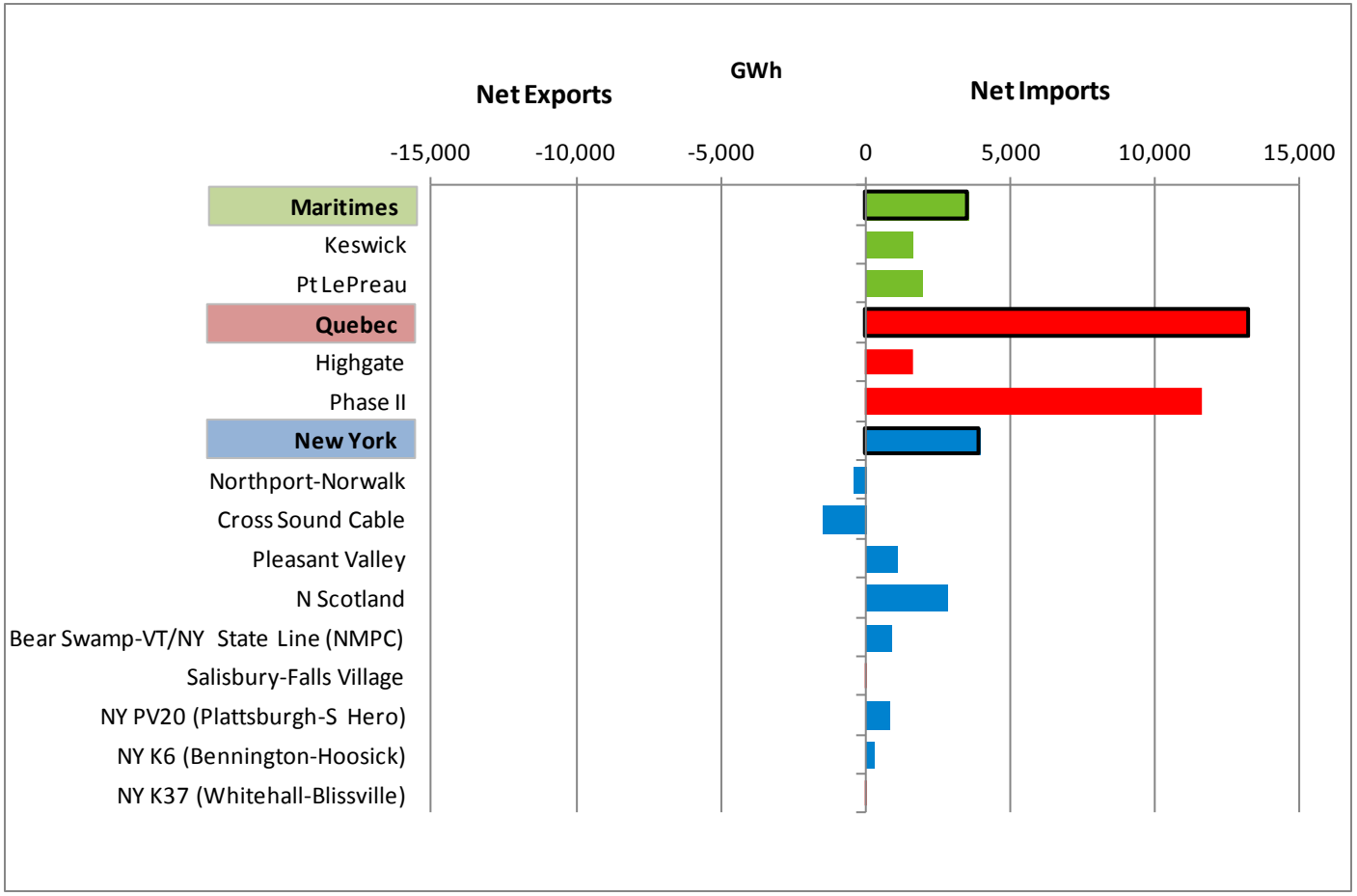
(1) Limits are for the summer period. These limits may not include possible simultaneous impacts, and should not be considered as “firm.”
(2) The import capabilities do not include Cross Sound Cable. In addition, the Northport Norwalk Cable is considered at 0 MW flow. Simultaneous importing into New England and Southwest Connecticut or Connecticut can lower the New York to New England capability (roughly estimated at a decrease of 200 MW).
(3) Import capability on the Cross Sound Cable is dependent on the level of local generation.
(4) The electrical limit of the New Brunswick – New England tie is 1,000 MW. When adjusted for the ability to deliver capacity to the greater New England control area, the New Brunswick – New England transfer capability becomes 700 MW.
(5) The capability for the Highgate facility is listed at the New England AC side of the Highgate terminal.
(6) The Hydro-Quebec Phase II interconnection is a DC tie with equipment ratings of 2,000 MW. Due to the need to protect for the loss of this line at full import level in the PJM and NY control areas’ systems, ISO-NE has assumed its transfer capability for capacity and reliability calculation purposes to be 1,400 MW. This assumption is based on the results of loss-of-source analyses conducted by PJM and NY.

2014 Energy Imports and Exports by External Area (GWh)



- Imports are shown as positive values and exports are shown as negative values
- Data current as of March 1, 2015 90-day resettlement of 2014

2014 Net Energy Interchange by Individual Ties (GWh)



- Net imports are shown as positive values and net exports are shown as negative values
- Data current as of March 1, 2015 90-day resettlement of 2014

Import Capacity Supply Obligations Covering FCA 6 (2015/2016) through FCA9 (2018/2019) Summer MW

Control Area	FCA6 2015/2016	FCA7 2016/2017	FCA 8 2017/2018	FCA9 2018/2019
New York	633	891	678	1054
Maritimes	248	290	202	177
Quebec	456	435	357	218
TOTAL	1,337	1,616	1,237	1,449

- The capacity imports from neighboring regions help New England meet Installed Capacity Requirements and promote FCM price competition.
- Imports provide resource diversity and lower regional generation emissions; many imports are hydro resources that could potentially be replacing generation from fossil fuel units in New England.

Tie Reliability Benefits Assumed from Neighboring Power Systems Summer (MW)

Tie Benefits (MW)	FCA6 2015/2016	FCA7 2016/2017	FCA 8 2017/2018	FCA9 2018/2019
New York	248	314	227	346
Maritimes	328	392	492	523
Quebec	1,048	1,164	1,151	1,101
TOTAL	1,624	1,870	1,870	1,970

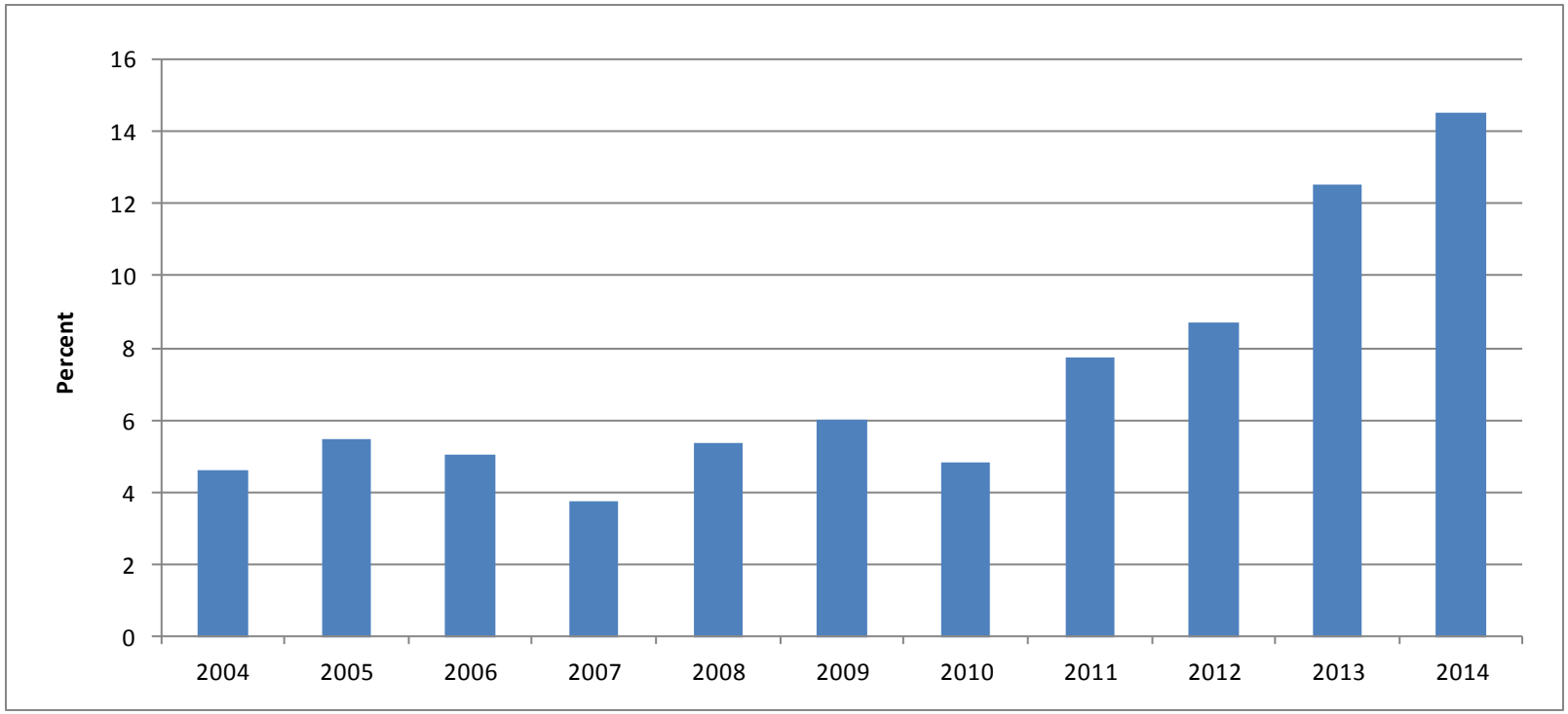
- External interconnections also provide tie reliability benefits that the region relies on to meet the 0.1 days per year LOLE resource planning reliability criterion, thus lowering the Installed Capacity Requirements and the associated FCM costs.

Annual Net Energy Imports in GWh and % of System Net Energy for Load 2010 – 2014

	2010	2011	2012	2013	2014
Net Energy Import (GWh)	5,539	10,142	12,648	18,961	20,660
System Net Energy For Load (GWh)	130,773	129,163	128,081	129,377	127,138
Net Energy Import %	4	8	10	15	16

- During the past 5 years, net energy imports increased from approximately 4% to 16% of the total New England net energy for load requirement.

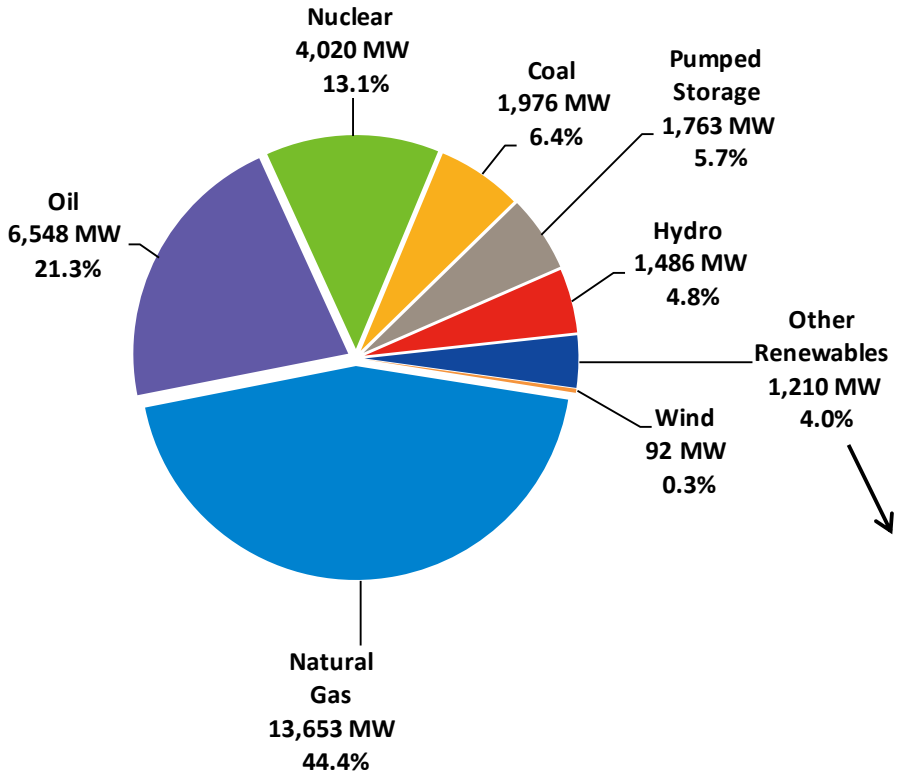
Historical Net Imports as a Percent of Daily Peak Load (%)



- This graph shows the annual average percent of imports occurring at the hour of the daily peak load since the start of hourly energy markets in 2003.

2015 CELT RESOURCE CAPACITY

2015 Summer CELT Generating SCC Capacity by Primary Fuel Type (MW and Percent) Total = 30,749 MW



Other Renewables		
	MW	Percent of Total ISO-NE Capacity
Biomass/Refuse	989.4	3.2%
Landfill Gas	58.0	0.2%
Photovoltaic	148.5	0.5%
Fuel Cell	14.1	0.1%
Energy Storage	0.5	0.0%

- Values include existing generation and expected generation capacity additions
- Values do not include 1,042 MW of Hydro-Québec Interconnection Capability Credits (HQICCs), CSOs of 2,326 MW of demand resources and1,337 MW of capacity import or 100 MW of capacity export
- The “Other Renewables” category includes fuel cell, photovoltaic, landfill gas, biomass, energy storage and refuse (municipal solid waste, wood and wood-waste solids)

2015 Summer: Generation Capacity Additions

- Generation Capacity Additions
  - expected in-service by this summer
  - based on the April 1, 2015 ISO-NE Generation Interconnection Queue (updated from 6/1/2015 to actual in-service date)

Project Name	Summer MW	Unit Type	Fuel Type	State	RSP Subarea	In-Service Date
Bucksport G3	73	Steam Turbine	Bio/Refuse	ME	BHE	4/16/15

Number and MW of Generating Unit Assets in New England – Summer 2015 by Fuel Type and In-Service Dates

Fuel Type	In-Service Date Prior to 1950		In-Service Date 1951 - 1970		In-Service Date 1971 - 1990		In-Service Date 1991 - 2000		In-Service Date 2001 - 2010		In-Service Date 2011 and after		Total	
	# of Assets	MW	# of Assets	MW	# of Assets	MW	# of Assets	MW	# of Assets	MW	# of Assets	MW	MW	Percent
Gas	3	54	1	94	9	1,271	21	3,611	36	8,004	4	620	13,653	44.4
Oil	2	9	57	1,847	21	3,868	8	128	17	379	7	317	6,548	21.3
Nuclear	0	0	0	0	4	4,020	0	0	0	0	0	0	4,020	13.1
Coal	0	0	9	1,976	1	0	0	0	0	0	0	0	1,976	6.4
Pumped Storage	1	29	0	0	6	1,735	0	0	0	0	0	0	1,763	5.7
Hydro	72	813	8	323	151	285	29	9	23	48	16	7	1,485	4.8
Other Renewables	0	0	1	43	28	581	20	176	42	43	479	367	1,211	4.0
Wind	0	0	0	0	0	0	1	0	22	31	38	61	92	0.3
Totals	**78**	**905**	**76**	**4,283**	**220**	**11,760**	**79**	**3,925**	**140**	**8,505**	**544**	**1,371**	**30,749**	**100.0**
Percent of Total MW		**2.9%**		**13.9%**		**38.2%**		**12.8%**		**27.7%**		**4.5%**		

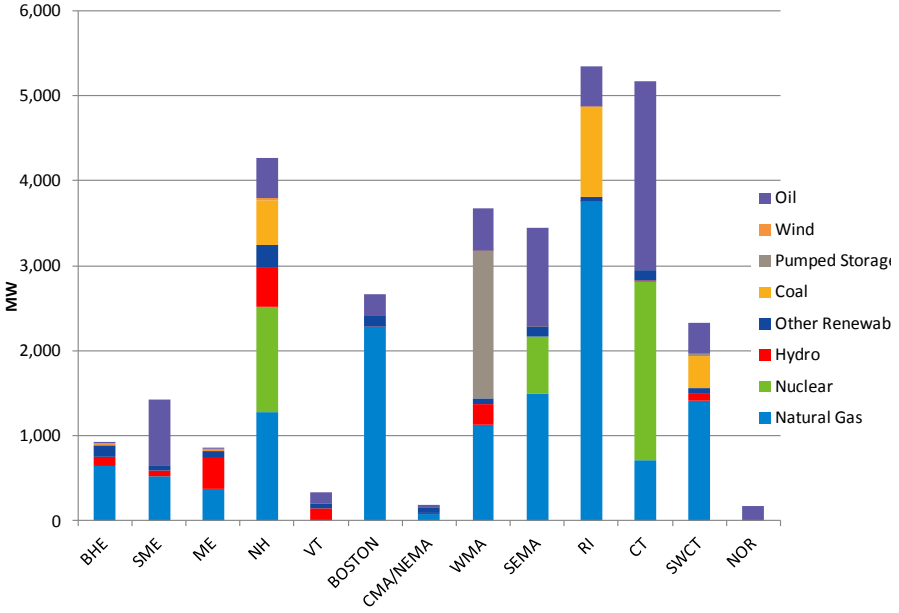
- Generator assets in this table may be power plants or individual units that make up power plants
- Values do not include HQICCs, demand resources or external imports and exports
- Based on the Seasonal Claimed Capabilities (SCC) of the assets as of April 1, 2015 and projected capabilities of assets expected to be in service by summer 2015

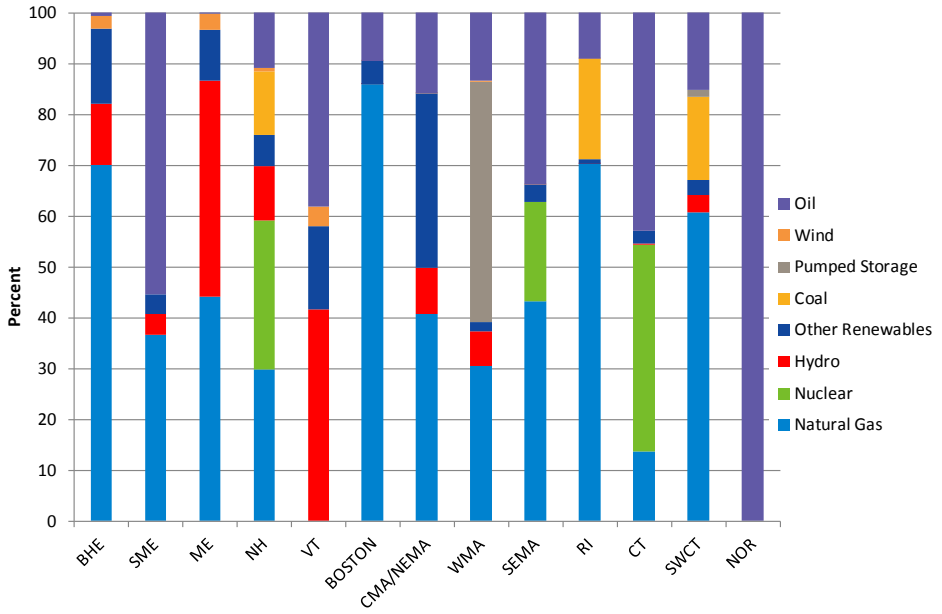
2015 CELT Generating SCC Capacity*
by RSP Subarea, State and Load Zone

*Values do not include HQICCs, demand resources or external imports and exports; totals may not equal to sum due to rounding

RSP AREA	STATE	LOAD ZONE	Summer Capacity Rating (MW)	Summer Percent of RSP Subarea (%)	Summer Percent of State (%)	Winter Capacity Rating (MW)	Winter Percent of RSP Subarea (%)	Winter Percent of State (%)
BHE			917	100	29	895	100	27
	Maine		917	100	29	895	100	27
		ME	917	100	29	895	100	27
ME			846	100	27	928	100	27
	Maine		846	100	27	928	100	27
		ME	846	100	27	928	100	27
SME			1,428	100	45	1,552	100	46
	Maine		1,428	100	45	1,552	100	46
		ME	1,428	100	45	1,552	100	46
	New Hampshire		0	0	0	0.4	0	0
		ME	0	0	0	0.4	0	0
NH			4,260	100	108	4,399	100	107
	Maine		<1	0	0	<1	0	0
		NH	<1	0	0	<1	0	0
	Massachusetts		16	0	0	17	0	0
		WCMA	16	0	0	17	0	0
	New Hampshire		4,209	99	100	4,344	99	100
		NH	4,209	99	100	4,344	99	100
	Vermont		35	1	8	37	1	7
		NH	1	0	0	1	0	0
		VT	34	1	8	36	1	7
VT			330	100	74	437	100	79
	New Hampshire		5	1	0	6	1	0
		NH	1	0	0	2	1	0
		VT	4	1	0	3	1	0
	Vermont		325	99	74	431	99	79
		NH	88	27	20	89	20	16
		VT	238	72	54	342	78	63
BOSTON			2,661	100	21	3,068	100	23
	Massachusetts		2,661	100	21	3,068	100	23
		NEMA	2,659	100	21	3,068	100	23
		WCMA	2	0	0	0	0	0
CMA/NEMA			183	100	1	173	100	1
	Massachusetts		183	100	1	173	100	1
		WCMA	183	100	1	173	100	1
WMA			3,671	100	46	3,898	100	43
	Massachusetts		3,593	98	28	3,822	98	29
		WCMA	3,593	98	28	3,822	98	29
	Vermont		78	2	18	77	2	14
		WCMA	78	2	18	77	2	14
SEMA			3,451	100	38	3,382	100	36
	Massachusetts		3,208	93	25	3,103	92	23
		RI	<1	0	0	0	0	0
		SEMA	3,208	93	25	3,103	92	23
	Rhode Island		243	7	13	279	8	13
		RI	243	7	13	279	8	13
RI			5,347	100	119	5,854	100	120
	Connecticut		753	14	9	857	15	10
		RI	753	14	9	857	15	10
	Massachusetts		2,950	55	23	3,152	54	24
		RI	0	0	0	0	0	0
		SEMA	2,950	55	23	3,152	54	24
	Rhode Island		1,644	31	87	1,844	32	87
		RI	1,644	31	87	1,844	32	87
CT			5,164	100	61	5,333	100	60
	Connecticut		5,164	100	61	5,333	100	60
		CT	5,164	100	61	5,333	100	60
SWCT			2,320	100	28	2,536	100	28
	Connecticut		2,320	100	28	2,536	100	28
		CT	2,320	100	28	2,536	100	28
NOR			170	100	2	192	100	2
	Connecticut		170	100	2	192	100	2
		CT	170	100	2	192	100	2
Total			**30,749**			**32,647**		

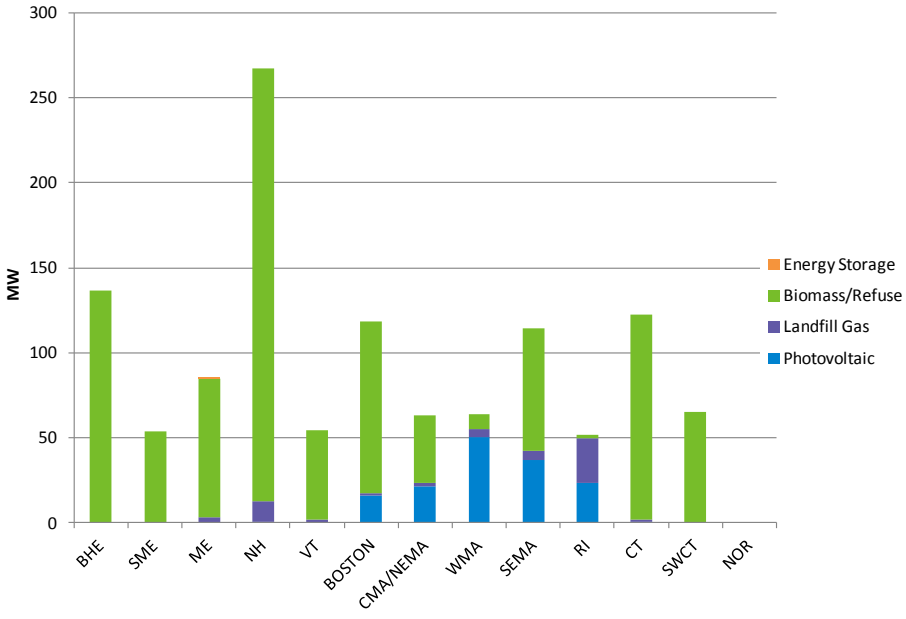
2015 CELT SCC Generating Capacity by Fuel Type in Each RSP Subarea by MW and Percent (%) of Total Capacity

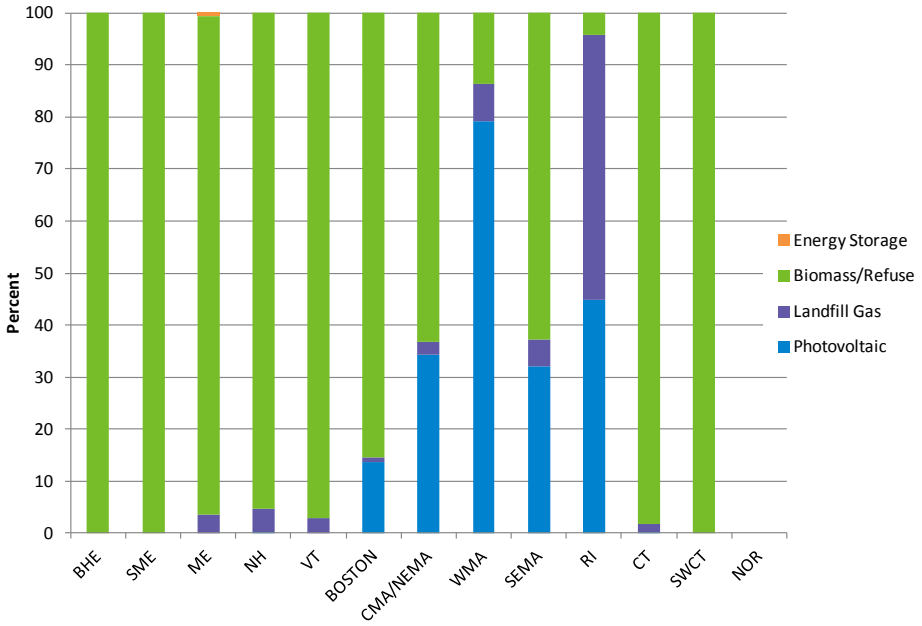




- Values do not include HQICCs, demand resources or external imports and exports

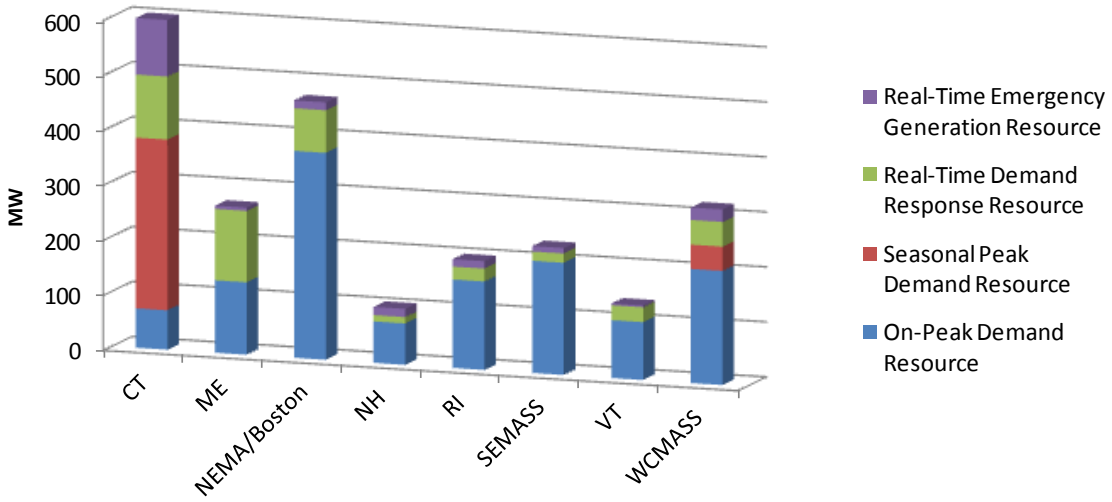
Breakout by Resource Type of the Other Renewable Category (MW) and Percent (%) of Total Capacity





2015 CELT Demand Resources CSO by Load Zone (MW)

Load Zone	On-Peak	Seasonal Peak	Real-Time Demand Response	Real-Time Emergency Generation	Total
CT	71.622	310.682	114.780	107.401	604.485
ME	131.820	-	129.844	6.031	267.695
NEMA/Boston	376.496	-	77.454	14.440	468.390
NH	75.286	-	11.596	15.064	101.946
RI	160.763	-	23.503	13.498	197.764
SEMASS	203.963	-	16.958	9.913	230.834
VT	105.118	-	27.130	3.124	135.372
WCMASS	207.534	44.174	44.821	22.836	319.365
Total	1,332.602	354.856	446.086	192.307	2,325.851



- Based on demand resources with Forward Capacity Market CSOs resulting from 2015/16 3rd Annual Reconfiguration Auction (Results posted 3/16/2015)
- Values are the summer CSOs which include the 8% Transmission & Distribution Gross-up

2015 CELT Net of Imports & Exports (MW)

Control Area	Summer 8/1/2015	Winter 1/1/2016
Quebec	456	445
New Brunswick	248	248
New York	633	633
New York (via Cross Sound Cable)	-100	-100
Net Imports	**1,237**	**1,226**

- Summer 2015 and winter 2015/2016 values are based on FCM CSOs
- A positive value indicates net imports and a negative value indicates net exports
- New York (via Cross Sound Cable) values reflect the 100 MW Administrative Export

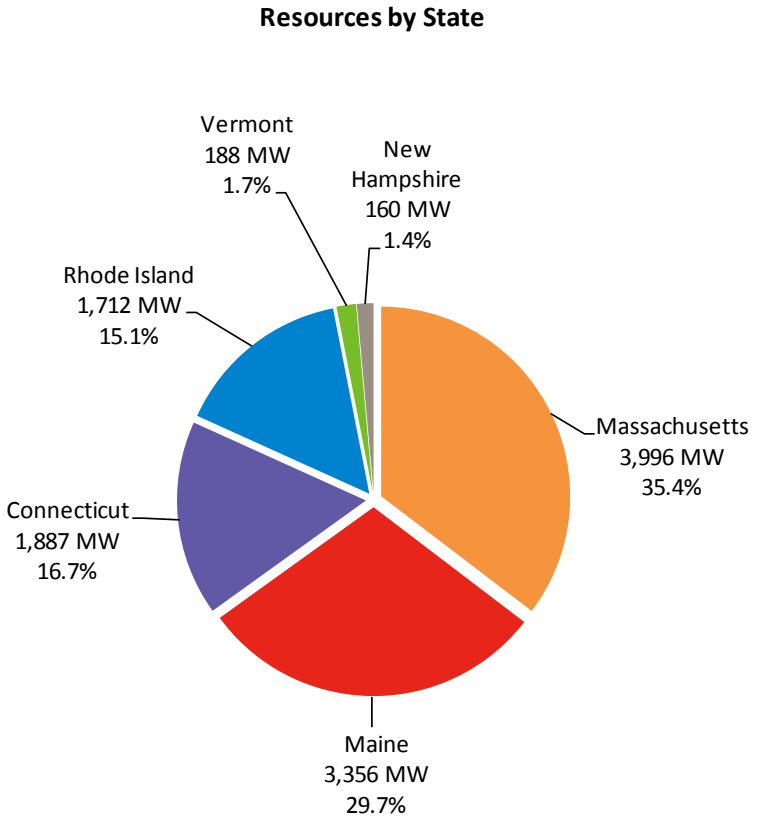
ISO NEW ENGLAND INTERCONNECTION QUEUE

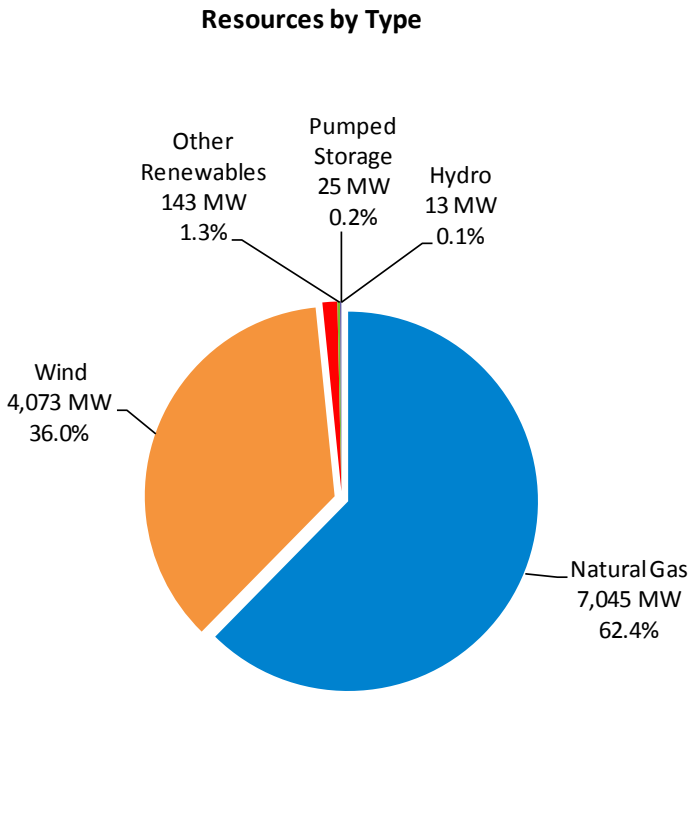
Resources in the Interconnection Queue

- Characteristics of ISO-NE's Interconnection Queue as of April 1, 2015
  - 79 generation projects totaling 11,299 MW
    - 18 dual fuel (gas & oil) projects ~ 4,772 MW
    - 36 wind projects ~ 4,073 MW
    - 15 natural gas-fired projects ~ 2,273MW
    - 1 Fuel cell project ~ 63 MW
    - 2 biomass projects ~ 70 MW
    - 5 hydro-electric projects ~ 13 MW
    - 1 Pumped Storage project ~ 25 MW
    - 1 solar project ~ 10 MW

- MW values shown based on project nameplate ratings

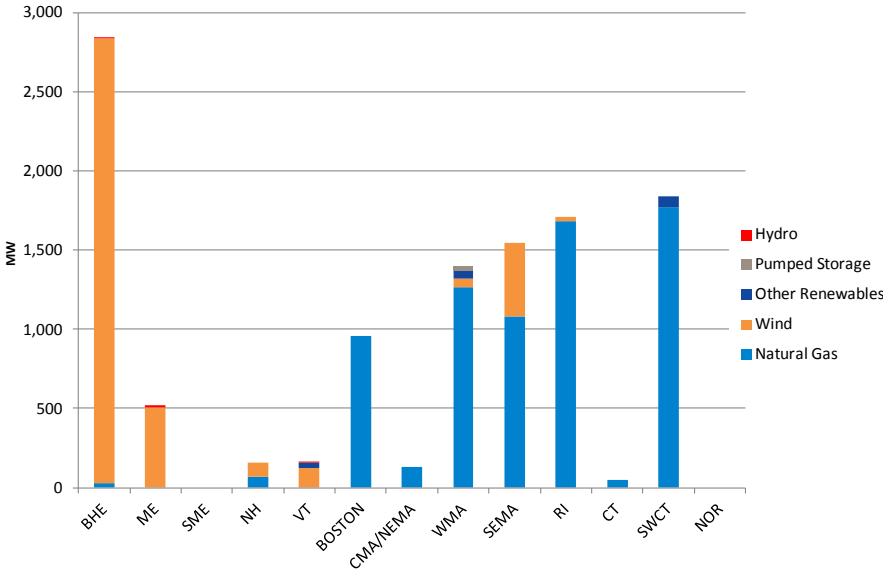
Resources in the ISO Generator Interconnection Queue by State and Fuel Type (MW & %)

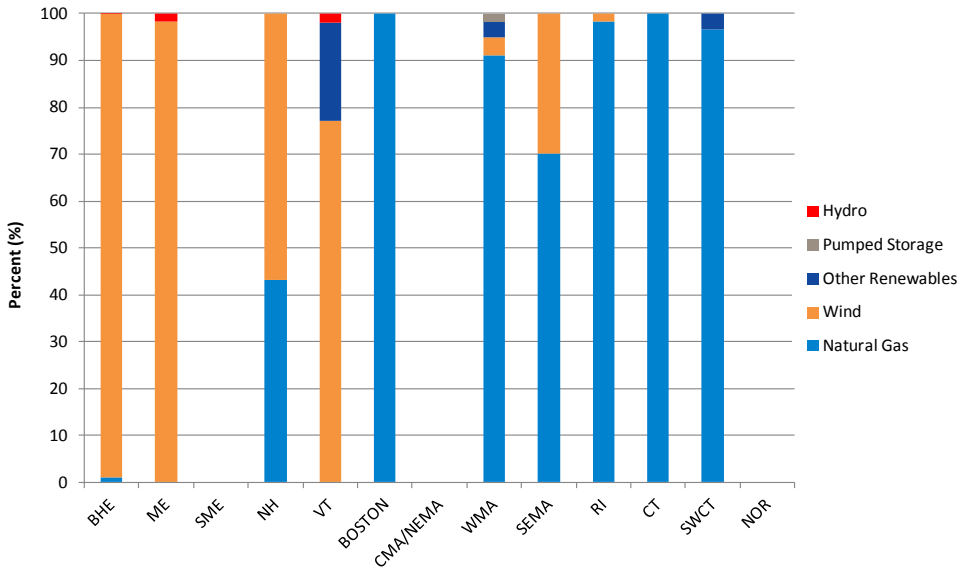




- Based on projects in the ISO-NE Interconnection Queue as of April 1, 2015
- The "Other Renewables" category includes photovoltaic, landfill gas, biomass, refuse (municipal solid waste, wood and wood-waste solids) and fuel cell.
- Out of the 7,045 MW of queue projects that are included in the natural gas category, 4,772 MW, or 68%, were specified as having dual fuel capability in their interconnection requests. It was assumed that natural gas will be the primary fuel for those dual-fuel units.

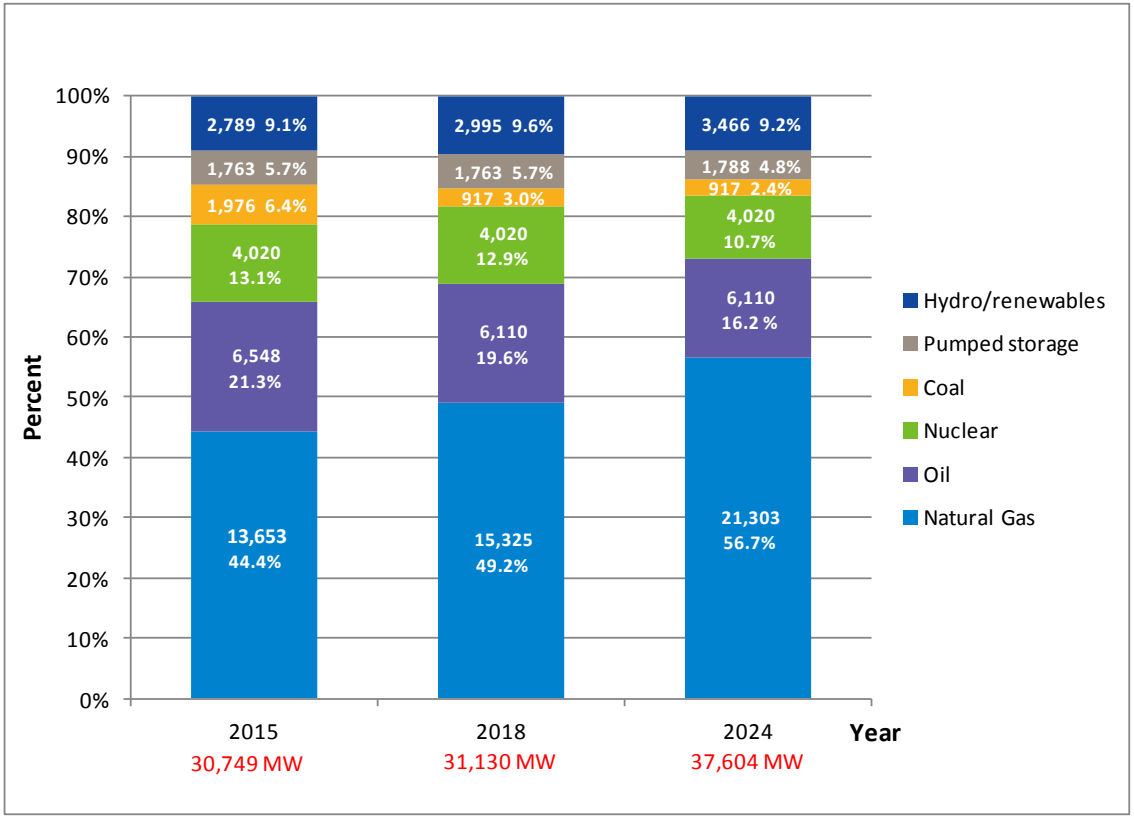
Queue Resources by Fuel Type in Each RSP Subarea by MW and Percent (%) of Total Capacity





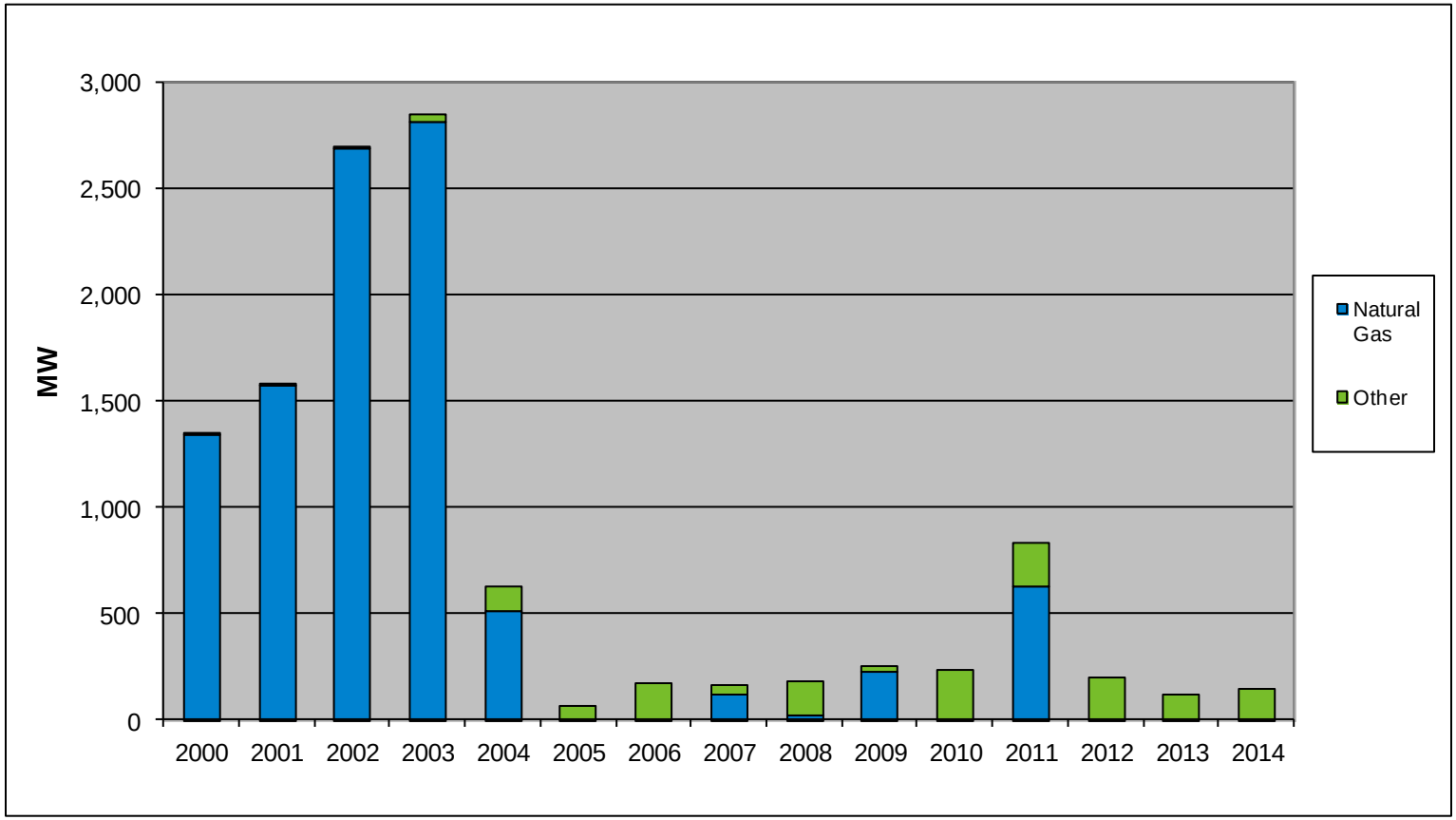
- Based on projects in the ISO-NE Interconnection Queue as of April 1, 2015
- Out of the 7,045 MW of queue projects that are included in the natural gas category, 4,772 MW (68%) were specified as having dual fuel capability in their interconnection requests. It was assumed that natural gas will be the primary fuel for those dual-fuel units.

Capacity by Fuel Type (MW & %)



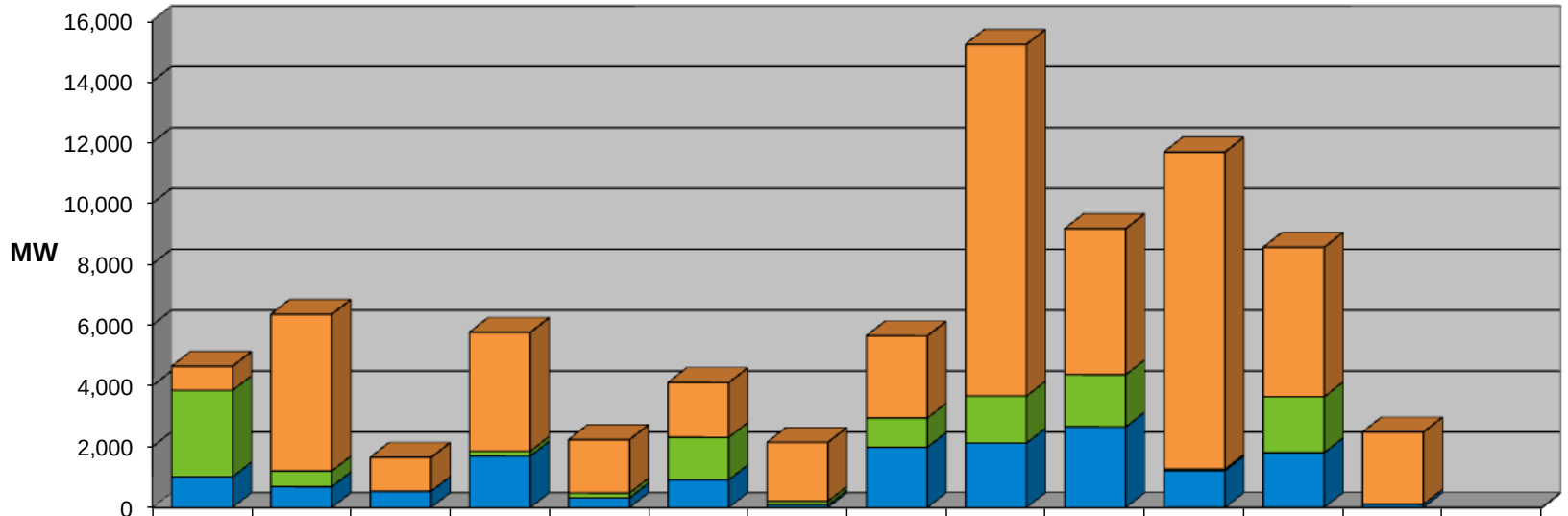
- Capacity in 2018 reflects the addition of Queue projects designated as "green" in the April 2015 COO Report as well as those FCM Resources with CSOs, and a reduction for Non-Price Retirements through the 2018/2019 FCA.
- Capacity in 2024 assumes the commercial operation of all other ("yellow") projects reported in the April 2015 COO Report.
- The capacity additions in 2018 and 2024 were calculated as follows: For FCM Resources, capacity is based on Qualified Capacity (QC). For non-FCM resources, on-shore wind is derated to 5% of nameplate capacity and offshore wind is derated to 20% of nameplate, while all other projects reflect the Queue net capability.

Generating Capacity Additions 2000 – 2014



- Other category includes wind, solar, hydro and biomass/refuse resources
- Capacity additions based on in-service dates and summer SCC values in the 2015 CELT Report

Capacity of Generation Interconnection Requests by RSP Subarea (MW)



	BHE	ME	SME	NH	VT	WMA	CMA	BOST	SEMA	RI	CT	SWCT	NOR	Total
Withdrawn	790	5,143	1,113	3,899	1,751	1,796	1,931	2,695	11,552	4,796	10,414	4,907	2,369	53,154
Active	2,838	518	0	160	158	1,393	130	960	1,543	1,712	50	1,837	0	11,299
Commercial	1,013	687	535	1,697	321	915	81	1,983	2,122	2,654	1,213	1,805	111	15,138

- Based on projects in the ISO-NE Interconnection Queue as of April 1, 2015 since Queue inception (Nov 1997)
- Projects involving only transmission or that did not increase an existing generator's capacity were excluded
- Projects with more than one listing in the queue, representing different interconnection configurations, were only counted once

Questions