nationalgrid

Thomas R. Teehan
Senior Counsel

September 25, 2013

VIA HAND DELIVERY & ELECTRONIC MAIL

Luly E. Massaro, Commission Clerk
Rhode Island Public Utilities Commission
89 Jefferson Boulevard
Warwick, RI 02888

RE: Docket 4404 – Commission Review into the Adequacy of Renewable Energy Supplies Pursuant to R.I. General Laws §39-26-6

Dear Ms. Massaro:

On behalf of Narragansett Electric Company d/b/a/ National Grid ("the Company"), I have enclosed ten (10) copies of the Company's pre-filed direct testimony in the above-referenced proceeding.

This submittal comprises of the testimony of Margaret M. Janzen and the testimony and attachments of Paul H. Flemming of ESAI Power, LLC, providing an assessment of Rhode Island's resource adequacy for renewable energy in the 2015 compliance year.

Thank you for your attention to this transmittal. If you have any questions, please feel free to contact me at (401) 784-7667.

Very truly yours,

Thomas R. Teehan

Enclosures

cc: Docket 4404 Service List
Leo Wold, Esq.
Steve Scialabba, Division

280 Melrose Street, Providence, RI 02907
T: 401-784-7667 ■ thomas.teehan@nationalgrid.com ■ www.nationalgrid.com

Certificate of Service

I hereby certify that a copy of the cover letter and/or any materials accompanying this certificate were electronically transmitted to the individuals listed below. Copies of this filing were hand delivered to the RI Public Utilities Commission and to the RI Division.

September 25, 2013

Docket No. 4404 – Commission's Review Into the Adequacy of Renewable Energy Supplies Pursuant to RIGL 39-26-6(d), to go into effect 2015

Service list updated on 9/18/13

Name/Address	**E-mail Distribution List**	**Phone**
Karen Lyons, Esq. Dept. of Attorney General 150 South Main St. Providence, RI 02903	Klyons@riag.ri.gov dmacrae@riag.ri.gov Jmunoz@riag.ri.gov	401-222-2424
Jon Hagopian, Esq. Division of Public Utilities and Carriers	Jhagopian@ripuc.state.ri.us Jspirito@ripuc.state.ri.us Sscialabba@ripuc.state.ri.us Dstearns@ripuc.state.ri.us acontente@ripuc.state.ri.us	
Thomas R. Teehan, Esq. Celia O'Brien, Esq. National Grid 280 Melrose St. Providence, RI 02907	Thomas.teehan@nationalgrid.com Celia.obrien@nationalgrid.com Joanne.scanlon@nationalgrid.com Margaret.janzen@nationalgrid.com	401-784-7667
Richard Hahn LaCapra Associates One Washington Mall, 9th floor Boston, MA 02108	rhahn@lacapra.com	617-778-2467
Jerry Elmer, Esq. Conservation Law Foundation 55 Dorrance Street Providence, RI 02903	Jelmer@clf.org	401-351-1102
File an original & 10 copies w/: Luly E. Massaro, Commission Clerk Public Utilities Commission 89 Jefferson Blvd. Warwick RI 02889	Luly.massaro@puc.ri.gov Cynthia.WilsonFrias@puc.ri.gov Alan.nault@puc.ri.gov Nicholas.ucci@puc.ri.gov Dilip.shah@puc.ri.gov	401-780-2107

Interested Parties:		
Eric Johnson, ISO-New England	Ejohnson@iso-ne.com	
Eric Krathwohl, Esq.	ekrathwohl@richmaylaw.com	
George Wood Oak Point Energy Associates, LLC	george4wood@verizon.net	
Christopher Kearns, OER	Christopher.Kearns@energy.ri.gov	
Dave Owens	do@stateside.com	
Stephan Wollenberg, Energy Consumers Alliance of NE	stephan@massenergy.org	
Carolyn O'Connor HQUS	Oconnor.carolyn@hydro.qc.ca	
Deborah Donovan, Sr. Senior Consultant Sustainable Energy Advantage	Ddonovan@seadvantage.com pyuen@seadvantage.com	
Francis Pullaro, Executive Director Renewable Energy New England, Inc.	fpullaro@renew-ne.org	646-734-8768
Scott Albert, GDS Associates	Scott.Albert@gdsassociates.com	
Bob Grace, Sustainable Energy Advantage	bgrace@seadvantage.com	

PRE-FILED DIRECT TESTIMONY

OF

MARGARET M. JANZEN

September 25, 2013

TABLE OF CONTENTS

I. Introduction and Qualifications

Q. Please state your name and business address.

A. My name is Margaret M. Janzen, and my business address is 100 East Old Country Road, Hicksville, NY 11801.

Q. Please state your position with and describe your duties at National Grid.

A. I am the Director of Wholesale Electric Supply for National Grid USA Service Company, Inc. I oversee the procurement of energy, capacity and ancillary services, portfolio hedging strategies and other energy supply-related activities for National Grid's operating companies, including The Narragansett Electric Company d/b/a/ National Grid ("Narragansett" or "Company"). For Narragansett, these activities include the procurement of power for Standard Offer Service ("SOS") as well as the procurement of Renewable Energy Certificates ("RECs") for meeting the obligations of the Rhode Island Renewable Energy Standard ("RES").

Q. Will you describe your educational background and training?

A. I graduated from The Cooper Union in 1993 with a Bachelor of Engineering in Civil Engineering. I received a Masters in Business Administration in Finance from Baruch College in 2000.

Q. What is your professional experience?

A. In July 1993, I joined the Brooklyn Union Gas Company as a management trainee and have held various positions of increasing responsibility at KeySpan Corporation and National Grid in the areas of Engineering, Strategic Planning, Treasury, Investor Relations, and Regulatory. In March 2008, I assumed my current role as Director of Wholesale Electric Supply.

Q. Have you previously testified before the Rhode Island Public Utilities Commission ("Commission")?

A. Yes.

Q. Have you testified before any other state regulatory agencies?

A. Yes. I have testified before the Massachusetts Department of Public Utilities and the New Hampshire Public Utilities Commission, and have also submitted pre-filed direct testimony with the New York Public Service Commission, regarding electric supply and renewable procurement activities.

II. <u>Purpose of Testimony</u>

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to describe National Grid's response to the August 7, 2013 Memorandum issued by the Commission regarding Docket 4404 – Review into the

Adequacy of Renewable Energy Supplies pursuant to R.I. Gen. Laws §39-26-6(d). This provision in the Rhode Island General Laws requires that the Commission determine on or before January 1, 2014, the adequacy or potential adequacy of renewable energy supplies to meet the increase in percentage requirement of energy from renewable energy supplies to go into effect in 2015.

III. Background

Q. Please describe National Grid's obligation to procure RECs to meet its RES requirements.

A. National Grid procures RECs in order to satisfy its RES obligations, in accordance with R.I.G.L. § 39-26.1-5(d). On or before March 1st of every year, the Company files for Commission approval a proposed Procurement Plan for the following calendar year. This Procurement Plan satisfies Section 8.2 of the Commission's Rules and Regulations Governing the Implementation of a Renewable Energy Standard ("RES Regulations"). Under Section 8.2, the Company is required to annually submit a Renewable Energy Standard Procurement Plan that sets out its procedures for obtaining resources that satisfy its obligations under the RES (R.I. Gen. Laws § 39-26-1 et seq.).

Q. Why is National Grid participating in this assessment of resource adequacy?

A. National Grid is an obligated entity as defined under R.I.G.L §39-26-2(16) and the Commission's RES Regulations.

Q. Did National Grid direct the preparation of an assessment by an independent consultant?

A. Yes. National Grid engaged ESAI Power LLC, located in Wakefield, MA, to prepare an assessment addressing the requirements of R.I.G.L. §39-26-6(d). The resulting report is an exhibit to the filed testimony of Paul Flemming of ESAI Power LLC ("ESAI"). His testimony describes the methodology and findings of that assessment.

IV. National Grid Procurement for RES

Q. Please provide a brief overview of National Grid's 2014 RES Procurement Plan as approved by the Commission in Docket No. 4393.

A. National Grid's 2014 RES Procurement Plan, approved in RIPUC No. 4393, provides for procurement of RECs to meet its RES requirements. This plan consists of purchasing RECs through full requirements service contracts, standalone RES solicitations, or through brokers.

In addition to these procurement options to satisfy its RES obligations, the Company will utilize the RECs produced by the renewable generation projects that have executed contracts with the Company under the Long-Term Contracting Standard for Renewable Energy, R.I. Gen. Laws § 39-26.1-1 *et seq*. and the Commission's implementing Rules and Regulations Governing Long-Term Contracting Standards for Renewable Energy. This includes Distributed Generation Standard Contracts as provided for under R.I. Gen. Laws § 39-26.2-1 *et seq*. (collectively, these contracts are referred to as "Long-Term Renewable Contracts"). RECs generated by these projects can satisfy RES obligations from new renewable energy resources ("New RECs").

Although the Company has not yet submitted its 2015 RES Procurement Plan, which is due to be filed March 1, 2014, the Company anticipates that it will continue to use the New RECs obtained through Long-Term Renewable Contracts for its RES obligations. The Company anticipates procuring the remaining RECs required to meet its RES obligations through a series of standalone RES solicitations or through brokers. This may include any shortfall in New RECs and the RECs necessary to satisfy the Existing obligations of the RES ("Existing RECs").

Q. Please provide a brief explanation of National Grid's plans to apply Renewable Energy Certificates procured through long-term contracts entered into under the Long-Term Contracting Standard for Renewable Energy and the Distributed Generation Standard Contracts Act.

A. In order to comply with the procurement targets for Long-Term Renewable Contracts, the Company enters into transactions with renewable energy resources that include New RECs. As approved in Docket No. 4315, the Company will continue to utilize these RECs to partially satisfy its RES New requirements for the SOS load. The Company believes SOS customers will benefit from this approach because it minimizes transaction expenses.

As described in Docket No. 4338, the Company determines the market cost of these RECs for reconciliation by utilizing the most representative data sources, such as recent solicitation results, broker sheets, and market indices. This market cost will be charged to SOS customers for their RES obligation.

Q. With respect to Long-Term Renewable Contracts that the Company has entered into, please update the response to Commission Data Request 2-1 in Docket No. 4371 (In re: Long-Term Contracting for Renewable Energy Recovery Factor) to include any contracts entered into since the filing of that Data Response.

A. Please see the table in Schedule 1, which provides an update to the Company's response to the data request.

Q. Have you prepared a schedule, which shows National Grid's projected Renewable Energy Standard obligation for the period 2014 through 2020 together with a current year by year projection of the percentage that will be met through Renewable Energy Certificate procurements from Distributed Generation and Long-Term Renewable Energy Contracts?

A. Yes. Table 1 below shows the Company's estimated RES obligation and a forecast of the percentage of the RES New obligation expected to be met through RECs supplied from Long-Term Renewable Contracts for the period of 2014 through 2020. As described in the Company's approved 2014 RES Procurement Plan, for any year that the Company has more RECs than the requirement, it will bank up to the allowable amount for the given Compliance Year and then sell the remainder into the New England REC marketplace.

Table 1

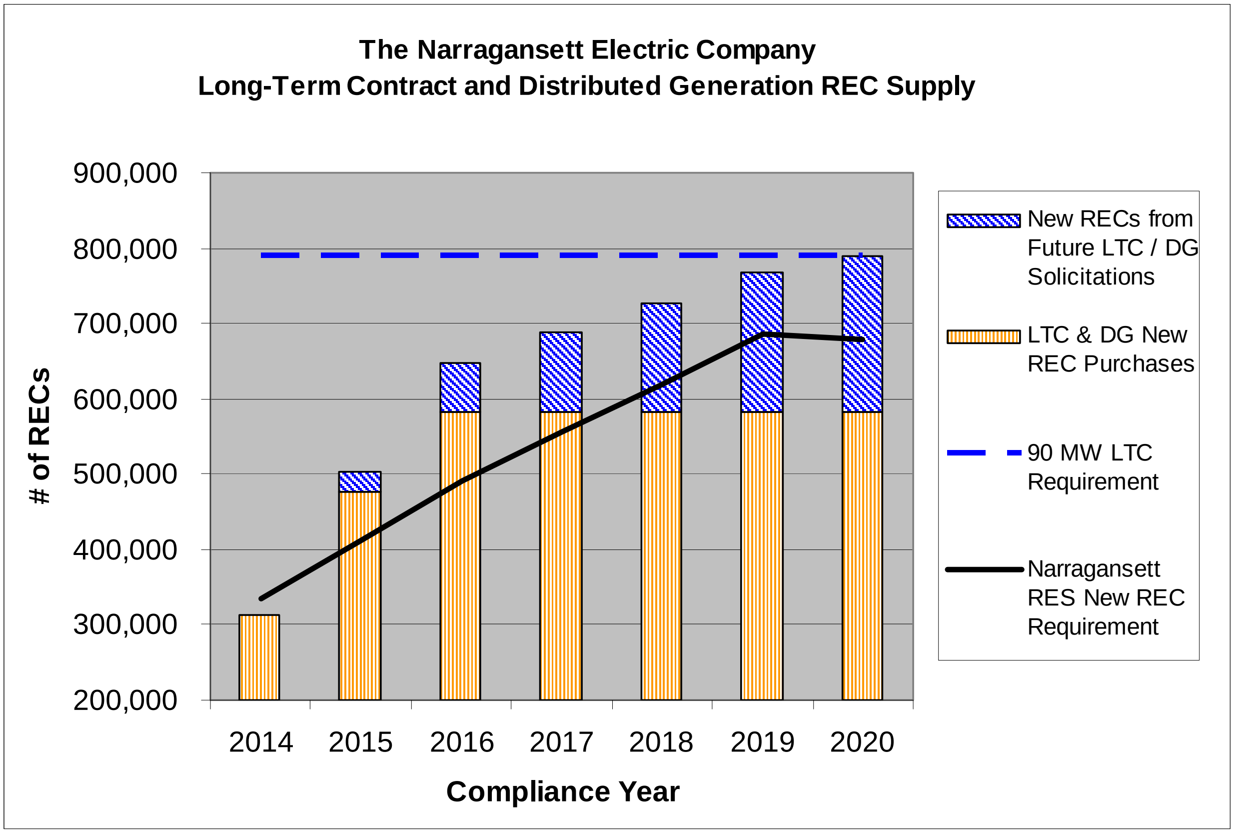
The Narragansett Electric Company									
RES New REC Requirement and LTC & DG REC Supply									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Standard Offer Load Forecast (MWh)	RES New % Obligation	Narragansett RES New REC Requirement	Forecast New RECs from LTCs	Forecast New RECs from DG Projects	LTC & DG New REC Purchases	New RECs from Future LTC / DG Solicitations	Total LTC & DG REC Purchases Current plus Future	Percent of RES New Requirement met through LTCs
2014	5,141,486	6.50%	334,197	287,640	25,147	312,787	0	312,787	94%
2015	5,156,969	8.00%	412,558	452,579	25,147	477,726	25,000	502,726	122%
2016	5,160,374	9.50%	490,236	557,699	25,147	582,846	65,000	647,846	132%
2017	5,059,911	11.00%	556,591	557,699	25,147	582,846	105,000	687,846	124%
2018	4,941,722	12.50%	617,716	557,699	25,147	582,846	145,000	727,846	118%
2019	4,893,293	14.00%	685,062	557,699	25,147	582,846	185,000	767,846	112%
2020	4,845,339	14.00%	678,348	557,699	25,147	582,846	205,554	788,400	116%

Column Notes:

(a)	RES Compliance Year
(b)	Narragansett Electric Standard Offer Load Forecast
(c)	RI RES New Requirement
(d)	Column (b) times Column (c)
(e)	Executed Renewable LTC PPAs
(f)	Executed DG Standard Contract PPAs
(g)	Column (e) plus Column (f)
(h)	Estimate of LTC REC supply from future solicitations & enrollments
(i)	Column (g) plus Column (h)
(j)	Column (I) divided by Column (d)

The following graph is a representation of the data in the table above.

Graph 1



Q. Based on this analysis of supply from Long-Term Renewable Contracts, does the Company anticipate making an Alternative Compliance Payment ("ACP") for compliance years 2015 through 2020?

A. No, the Company does not anticipate making an ACP for the years 2015 through 2020, based on the oversupply projection of New RECs from its Long-Term Renewable Contracts.

Q. In Commission Docket Nos. 4315 and 4391, the Company submitted a response to Record Request No. 3, which provided the total cost of RES compliance each year since inception. Please update the information that the Company provided to the Commission at that time.

A. The table below shows the Company's REC costs and ACP costs associated with the RES for compliance years 2007 through 2012. These costs include compliance of the New and Existing obligations of RES.

Table 2

The Narragansett Electric Company			
Actual Rhode Island Renewable Energy Standard (RES) Costs			
RI RES Compliance Year	TOTAL RI RES Costs	RI RES REC Costs (New & Existing)	RI RES ACP Costs
2007	**$ 3,976,389.50**	$ 3,976,389.50	$ -
2008	**$ 5,254,430.30**	$ 5,254,430.30	$ -
2009	**$ 5,507,809.50**	$ 5,507,809.50	$ -
2010	**$ 2,096,152.00**	$ 2,096,152.00	$ -
2011	**$ 8,426,723.96**	$ 3,898,751.69	$ 4,527,972.27
2012	**$12,803,595.04**	$ 12,803,595.04	$ -

Q. In Docket Nos. 4315 and 4391, the Company also provided the Commission a response to Record Request No. 4, which provided the expected annual RES compliance cost using the current ACP and the projected load growth/decline for each year from 2015 through 2020. Would you also please update the information that was provided to the Commission at that time?

A. Please see the table below for the expected annual RES compliance cost 2015 through 2020.

Table 3

The Narragansett Electric Company Rhode Island Renewable Energy Standard (RES) Expected Costs 2015-2020						
Year	RI RES New Requirement	RI RES Existing Requirement	Standard Offer Load Forecast (MWh)	RI RES New REC Obligation	RI RES Existing REC Obligation	Total Expected RES Compliance Costs*
2015	8.0%	2.0%	5,156,969	412,558	103,139	$ 27,030,767.45
2016	9.5%	2.0%	5,160,374	490,236	103,207	$ 32,100,881.04
2017	11.0%	2.0%	5,059,911	556,590	101,198	$ 36,429,841.93
2018	12.5%	2.0%	4,941,722	617,715	98,834	$ 40,417,108.72
2019	14.0%	2.0%	4,893,293	685,061	97,866	$ 44,811,799.68
2020	14.0%	2.0%	4,845,339	678,347	96,907	$ 44,372,644.04

*Expected cost assumes current 2013 ACP of $65.27 for New requirement and estimated market price of $1.00 for Existing requirement

Q. Please provide observations on regional REC supply constraints, not taking into account what National Grid expects to obtain through Long-Term Renewable Contracts.

A. For 2012 and 2013 to date, National Grid has found REC supplies adequate to meet its obligations in Rhode Island, and for most classes in Massachusetts. The ESAI report presents a base case forecast that indicates a tightening of supplies in New England by 2015 as the renewable requirements of those states increase, with a potential shortfall of approximately 12% forecasted under base case assumptions. The base case assumptions are conservative, as described in the ESAI report, with respect to the addition of generation, load growth, wind availability, and imports from adjacent control areas.

Q. Please explain the extent of National Grid's past reliance on imports from adjacent control areas and any changes since the Docket No. 4050 review of the adequacy of renewable energy supply which has negatively impacted that supply.

A. The table below shows National Grid's past reliance on imports from adjacent control areas for the RES compliance years 2010, 2011 and 2012. The Company collected this REC data on imported renewables from its purchases for RES compliance in each year. In the NEPOOL Generator Information System ("GIS"), locational and generator-specific data are available for each REC. The table below shows that imported RECs purchased by the Company declined in 2011 from 2010 levels, and then increased greatly in 2012.

Table 4

The Narragansett Electric Company		RES Compliance Year		
		2010	2011	2012
Imported RECs procured by fuel type	Landfill Gas - NY	17,000	31,031	27,451
	Wind - NY	30,000	-	115,841
	Digester Gas - NY	-	-	195
Total # of RECs		**47,000**	**31,031**	**143,487**
RI RES New Obligation		142,399	194,400	237,285
% of Imports of total RI RES New Obligation		33.0%	16.0%	60.5%

The table above reflects the Company's procurement, and the regional supply from imports is described in the ESAI report in Section 3.2.2 on page 18. ESAI points out that as New England-based production grows, imports represent a declining percentage of the total production. The Company's change from year to year in the amount of its procured imported RECs does not correlate with the change in the proportion of imports to regional supply because the Company does not procure based on location. Besides RECs from Long-Term Renewable Contracts, the Company bases its purchases of RECs on price only.

Q. Please explain the extent of National Grid's past reliance on biomass units and the impact of lower natural gas prices and environmental regulations in New England on the availability of RECs from those units.

A. Please see the table below which shows National Grid's past reliance on biomass units for the RES compliance years 2010, 2011 and 2012. The Company collected this REC data on imported renewables from its purchases for RES compliance in each year. The table below shows that the number of biomass RECs purchased by the Company increased slightly in 2011 from 2010 levels, and then declined in 2012. The Company's change from year to year in its reliance on biomass RECs does not correlate with the change in the proportion of biomass RECs to regional supply. This is because the Company does not base its procurement of RECs on fuel type; only price is considered. Thus, the Company's reliance on biomass RECs to meet its RES obligation is not necessarily a function of regional biomass production. For a description of regional supply from biomass generators, please see the ESAI report in Section 3.2.1 on page 15.

Table 5

The Narragansett Electric Company		RES Compliance Year		
		2010	2011	2012
Biomass RECs procured by type	Landfill Gas	17,000	58,021	28,144
	Wood	89,406	52,800	40,000
	Digester Gas	-	-	195
Total # of RECs		**106,406**	**110,821**	**68,339**
RI RES New Obligation		142,399	194,400	237,285
% of Biomass of total RI RES New Obligation		74.7%	57.0%	28.8%

IV. National Grid Outlook on RES Adequacy

Q. In light of National Grid's historical procurement mix as described above, what negative impact, if any, does National Grid expect for future compliance?

A. Since the Company does not see a correlation of its historical procurement mix to the regional supply mix, it recommends that it would be more appropriate to reference a regional perspective regarding reliance on biomass production and imports. The ESAI report, on page 15, points out that most of the biomass production is located in Maine, and that most of it is used internally to meet the "more relaxed" Maine biomass standard. Furthermore, as the ESAI report observes on page 7, the recent Massachusetts regulations governing biomass facilities have discouraged development of new facilities regionally.

Q. Will the New RECs obtained under the Long-Term Renewable Contracts satisfy the Company's 2015 RES requirements?

A. Similar to the analysis presented in its 2014 RES Procurement Plan, the Company analyzed its RES New requirement and how it might be met by RECs obtained under the Long-Term Renewable Contracts. This analysis is shown above in Graph 1 (on page 9) named "The Narragansett Electric Company Long-Term Contract and Distributed Generation REC Supply." In its analysis, the Company made various assumptions regarding its Long-Term Renewable Contracts including commercial operation dates, project size, output, and contract capacity. The graph shows that the forecasted output of New RECs from the Long-Term Renewable Contracts will meet most of the Company's RES New requirement for 2014. Starting in 2015 and continuing thereafter, the supply of New RECs from Long-Term Renewable Contracts will likely meet and exceed the RES New requirement.

To the extent that the underlying assumptions in the Company's analysis were to change, such that New RECs from Long-Term Renewable Contracts would be generated sooner than forecasted, the Company proposed that any excess New RECs beyond the RES requirements be "banked" for future obligations or sold into the market, depending on market prices for different compliance years. According to the RES Regulations, thirty percent of the New RES Obligation for a compliance year may be banked in order to satisfy the RES requirement over the following two years. Based on current assumptions, in 2016 the Company anticipates that the New RECs obtained from the Long-Term

Renewable Contracts will exceed the RES obligation as well as the banking allowance. Therefore, it will be necessary to sell the excess New RECs in the market.

As described above, the Company has estimated its load obligation and RES requirement, its Long-Term Renewable Contracts and the balance of contracts yet to be entered for the the balance of the 90 MW requirement. This analysis projects a New REC supply surplus for RES requirements for Narragansett Electric from year 2015 through 2020.

VII. Conclusion

Q. What is the Company's recommendation to the Commission regarding Rhode Island resource adequacy?

A. While the ESAI forecast suggests that there may be a shortage of renewable energy supplies in the region in 2015, the Company believes that it is more likely than not that Rhode Island will still be able to meet its requirements. According to ESAI, a possible regional shortage of "Tier I" or New RECs would have a significantly mitigated impact on Rhode Island because the shortfall would not be proportional across the New England states and be higher in Connecticut and New Hampshire. This observation, in addition to the Company's arrangements for sufficient (and possibly excess) "self-supply" of New RECs from its Long-Term Renewable Contracts, leads the Company to conclude that Rhode Island will likely be able to meet its RES requirements in 2015.

National Grid supports the State of Rhode Island's policy to support the development of renewable energy supplies through its Renewable Energy Standard legislation, and makes the recommendation that the Commission make a determination that there is a potential for adequacy of renewable energy supplies to meet the increase in the percentage requirement of energy from renewable energy sources to go into effect in 2015, and that the scheduled percentage increase should not be delayed.

Q. Does this conclude your testimony?

A. Yes.

SCHEDULE 1

Contracts Entered Under the Long-Term Contracting Standard for Renewable Energy and the Distributed Generation Standard Contracts Act

Schedule 1

The Narraganset Electric Company

Contracts Executed Under the Long-Term Contracting Standard for Renewable Energy and the Distributed Generation Standard Contracts Act

Seller	Project Name	Location of Project	Generation type/Technology	Date Contract was signed	Date Contract approved by RI PUC	Nameplate Capacity (MW)	Expected Annual Capacity Factor	Expected Contract Capacity (MW)	Expected Annual MWh generation	Expected COD	Price ($/MWh)	Escalation (%)	Price Adjustments	Contract Term (years)
Deepwater Wind Black Island, LLC	Deepwater Wind	Off the coast of Block Island, RI	Wind Farm	June 30, 2010	August 11, 2010	30	40.0%	12.0	105,120	Jan-2016	$235.70	3.50%	Y	20
Rhode Island Landfill Gas, LLC	RI LFG Genco	Johnston, RI	Combined Cycle Combustion Turbine Generating Facility fueled by landfill gas at the Central Landfill	May 21, 2010	July 9, 2010*	32.098	85.0%	27.3	239,002	**June 1, 2013 actual**	$119.80	2.50%	N	15
Orbit Energy Rhode Island, LLC	Orbit Energy HSAD	Johnston, RI	Generating Facility fueled by biogas produced through high solids anaerobic digestion (HSAD)	May 26, 2011	July 28, 2011	3.2	82.6%	2.6	23,160	Apr-2014	$95.00	2.00%	Y	15
Black Bear Development Holdings, LLC	Black Bear Hydro	Orono, Maine	Hydroelectric, Run-of-River	May 7, 2012	May 11, 2012	3.958	90.2%	3.6	31,268	Nov-2013	$91.00	2.00%	N	15
Champlain Wind, LLC	Bowers Wind Project	Carroll Plantation and Kossuth Township, Maine	Wind Farm	August 2, 2013	TBD	48	37.8%	18.2	159,149	Jan-2015	$78.00	0.00%		15
WED NK Green, LLC	North Kingstown Green	North Kingstown, RI	DG - Wind	December 28, 2011	November 30, 2011	1.5	24.0%	0.36	3,095	**March 1, 2013 actual**	$133.50	0.00%	N	15
ACP Land, LLC	Jacome Way	Middletown, RI	DG - Solar PV	December 28, 2011	November 30, 2011	0.5	14.0%	0.07	613	**July 18, 2013 actual**	$316.00	0.00%	N	15
Con Edison Development, Inc.	Westerly Power	Westerly, RI	DG - Solar PV	December 28, 2011	November 30, 2011	1	14.0%	0.14	1,226	**Terminated**	$265.00	0.00%	N	15
Con Edison Development, Inc.	Plain Meeting House	West Greenwich, RI	DG - Solar PV	December 28, 2011	November 30, 2011	2	14.0%	0.28	2,453	**July 19, 2013 actual**	$275.00	0.00%	N	15
Nexamp Capital, LLC	Compass Circle	North Kingstown, RI	DG - Solar PV	May 10, 2012	March 15, 2012	2.34	14.0%	0.33	2,870	Sep-2013	$236.99	0.00%	N	15
Forbes Street Solar LLC	Forbes Street Landfill Solar	East Providence, RI	DG - Solar PV	May 10, 2012	March 15, 2012	3.71	14.0%	0.52	4,550	Jan-2014	$239.00	0.00%	N	15
Altus Power Funds RI I, LLC	Comtram Cable Plant	Cumberland, RI	DG - Solar PV	August 30, 2012	March 15, 2012	0.499	14.0%	0.07	612	Oct-2013	$316.00	0.00%	N	15
CoxCom, LLC	CCI New England 181kW	West Warwick, RI	DG - Solar PV	August 30, 2012	March 15, 2012	0.181	14.0%	0.03	222	Oct-2013	$316.00	0.00%	N	15
CoxCom, LLC	CCI New England 500 kW	Portsmouth, RI	DG - Solar PV	August 30, 2012	March 15, 2012	0.498	14.0%	0.07	611	Oct-2013	$316.00	0.00%	N	15
Bonollo Solar I LLC	Bonollo's Solar Project	Providence, RI	DG - Solar PV	August 30, 2012	March 15, 2012	0.149	14.0%	0.02	183	Nov-2013	$333.50	0.00%	N	15
Soltas Energy Corporation	0 Martin Solar	Cumberland, RI	DG - Solar PV	August 30, 2012	March 15, 2012	0.5	14.0%	0.07	613	Oct-2013	$316.00	0.00%	N	15
Soltas Energy Corporation	225 Dupont Solar	Providence, RI	DG - Solar PV	August 30, 2012	March 15, 2012	0.3	14.0%	0.04	368	Oct-2013	$316.00	0.00%	N	15
Soltas Energy Corporation	100 Dupont Solar	Providence, RI	DG - Solar PV	August 30, 2012	March 15, 2012	1.5	14.0%	0.21	1,840	Sep-2013	$209.00	0.00%	N	15
Soltas Energy Corporation	45 Bank Solar	Hopkinton, RI	DG - Solar PV	August 30, 2012	March 15, 2012	0.5	14.0%	0.07	613	Nov-2013	$316.00	0.00%	N	15
Soltas Energy Corporation	35 Martin Solar	Cumberland, RI	DG - Solar PV	August 30, 2012	March 15, 2012	0.5	14.0%	0.07	613	Oct-2013	$316.00	0.00%	N	15
Soltas Energy Corporation	87 Woodville Alton	Hopkinton, RI	DG - Solar PV	August 30, 2012	March 15, 2012	0.5	14.0%	0.07	613	**Terminated**	$316.00	0.00%	N	15
All American Foods, Inc.	All American Foods Solar	North Kingston, RI	DG - Solar PV	April 24, 2013	March 15, 2012	0.331	14.0%	0.05	406	Jan-2014	$284.00	0.00%	N	15
NextSun Energy North Smithfield, LLC	Brickle Group Solar Project	North Smithfield, RI	DG - Solar PV	April 24, 2013	March 15, 2012	1.084	14.0%	0.15	1,329	Jan-2014	$184.90	0.00%	N	15
Conanicut Marine Services, Inc.	CMS Solar	Jamestown, RI	DG - Solar PV	April 24, 2013	March 15, 2012	0.128	14.0%	0.02	157	Jan-2014	$288.00	0.00%	N	15
Golden Ale Realty, LLC	Gannon & Scott Solar	Cranston, RI	DG - Solar PV	April 24, 2013	March 15, 2012	0.406	14.0%	0.06	498	Jan-2014	$284.00	0.00%	N	15
Newport Vineyards and Winery, LLC	Newport Vineyards Solar	Middletown, RI	DG - Solar PV	April 24, 2013	March 15, 2012	0.053	14.0%	0.01	65	Jan-2014	$299.50	0.00%	N	15
Clean Energy Development, LLC	T.E.A.M. Inc. Solar	Woonsocket, RI	DG - Solar PV	April 24, 2013	March 15, 2012	0.182	14.0%	0.03	223	Jan-2014	$288.00	0.00%	N	15
WED Coventry One, LLC	WED Coventry One	Coventry, RI	DG - Wind	August 2, 2013	March 15, 2012	1.5	24.0%	0.36	3,154	Jan-2014	$148.00	0.00%	N	15

*Certified to Rhode Island PUC

PRE-FILED DIRECT TESTIMONY

OF

PAUL H. FLEMMING

September 25, 2013

TABLE OF CONTENTS

I. Introduction and Qualifications

Q. Please state your name and business address.

A. My name is Paul H. Flemming and my business address is 401 Edgewater Place, Suite 640, Wakefield, MA, 01880

Q. Can you describe ESAI Power and the type of work it is involved in?

A. ESAI Power, LLC ("ESAI Power") develops monthly and quarterly research reports that cover all aspects of the wholesale electric markets including developments in market rules, other regulatory and policy developments, and such fundamental issues as changes in generation, fuel prices, and transmission topology that impact pool operations. Approximately 60 clients receive our syndicated research reports including trading organizations, investment banks, utilities, merchant generators, and organizations such as the Federal Energy Regulatory Commission ("FERC") and the New York Independent System Operator ("NYISO"). ESAI Power also engages in a variety of consulting assignments including power plant valuations, renewable energy outlooks, and white papers for PJM Interconnection LLC ("PJM") and NYISO. ESAI has worked on a number of renewable energy projects in the Northeast and our New England energy, capacity and Renewable Energy Certificates ("REC") forecasts were most recently selected to support the 2013 Massachusetts Renewable Energy RFP issued by the Massachusetts utilities.

Q. Please state your position with ESAI.

A. I am Director and Principal of ESAI Power. In this capacity I am responsible for overseeing all aspects of the ESAI's business, which includes ongoing analysis of the wholesale electricity markets in New England, New York and PJM. I have been with ESAI Power since 1999.

Q. Will you describe your educational background?

A. I have a Bachelor of Science degree in Chemical Engineering from Northeastern University in Boston, MA.

Q. What is your professional background?

A. I have over 30 years of experience in the energy markets. I have been responsible for the Northeast Power Market analytics at ESAI Power since 2003. Prior to that, I was responsible for risk management consulting and oil market analysis for the Asian regions (1999 to 2003). Before joining ESAI, I worked for Koch Industries (Koch Supply & Trading) as Manager of Refined Oil Product Trading in Singapore (1995-1999). Prior to that, I worked for Chevron/Texaco (Caltex Petroleum) as Manager of Global Trading for Refined Products, also in Singapore (1992-1995). I am knowledgeable in energy markets (electricity, natural gas, renewable energy, and oil) and have served as an advisor and consultant in each of these areas in the Northeast markets. I am also familiar with ISO market structures and operations. I have extensive experience in the development of

Independent Market Expert reports in support of financing and acquisition of assets in the power sector. I worked on a number of renewable energy projects in the Northeast markets including the development and ongoing maintenance of ESAI's renewable energy outlook for New England.

Q. Have you previously testified before the Rhode Island Public Utilities Commission ("Commission")?

A. No.

Q. Have you testified before any other state or federal regulatory agencies?

A. Yes. I have testified before the Maine Public Service Commission relative to power offtake dispute as a consultant on behalf of Maine Public Service in Docket No. 2004-538. I have also testified in a FERC technical conference on transmission congestion issues. More recently I have submitted testimony to FERC regarding buyer-side capacity mitigation in the New York capacity market under Docket No. EL-11-50.

II. Purpose of Testimony

Q. What is the purpose of your testimony?

The purpose of my testimony is to provide an overview of the assignment that was given to ESAI Power relative to the adequacy of renewable energy supply available to meet the 2015 requirements of Rhode Island's Renewable Energy Standard ("RES"), as well as to summarize the methodology and conclusions stated in my report titled "Assessment of Rhode Island's Resource Adequacy for Renewable Energy" dated September 25, 2013.

Q. What was the scope of the assignment that ESAI Power undertook?

A. ESAI Power was selected by The Narragansett Electric Company d/b/a National Grid ("Narragansett Electric") to develop an assessment of renewable energy supplies available to meet the 2015 requirements of RES, which requires that 10.0 percent of electric energy supply be met by renewable resources (8.0 percent must be met by new renewable energy resources while 2 percent may be met by either new or existing renewable energy resources).

III. Methodology of Assessment

Q. Please describe the methodology utilized in your assessment.

A. ESAI Power developed a supply and demand balance of Tier I renewable energy for the entire New England region. This is important because each state in the region competes for the same resources to meet its own renewable energy standards. As such, to gain an understanding of the renewable energy supplies available for Rhode Island, it is important to develop a New England supply and demand balance. ESAI Power maintains a detailed database of operational renewable assets as well as renewable projects that are under development. Total regional supply is developed from the actual performance of operational assets, projections for projects under construction of development and imports from outside the region. Not all projects under development will move to completion, therefore ESAI handicaps each project and assigns a "probability of completion" to each project. This probability is used to de-rate each project and develop an aggregate outcome that should approximate the output of actual new build for the next several years. ESAI projects Tier I REC demand for each state based on ISO-NE load forecasts and each state's renewable energy standard. From this data, the supply and demand outlook is developed for each year.

IV. <u>Conclusions of Assessment</u>

Q. Please summarize the conclusions of the assessment that you conducted.

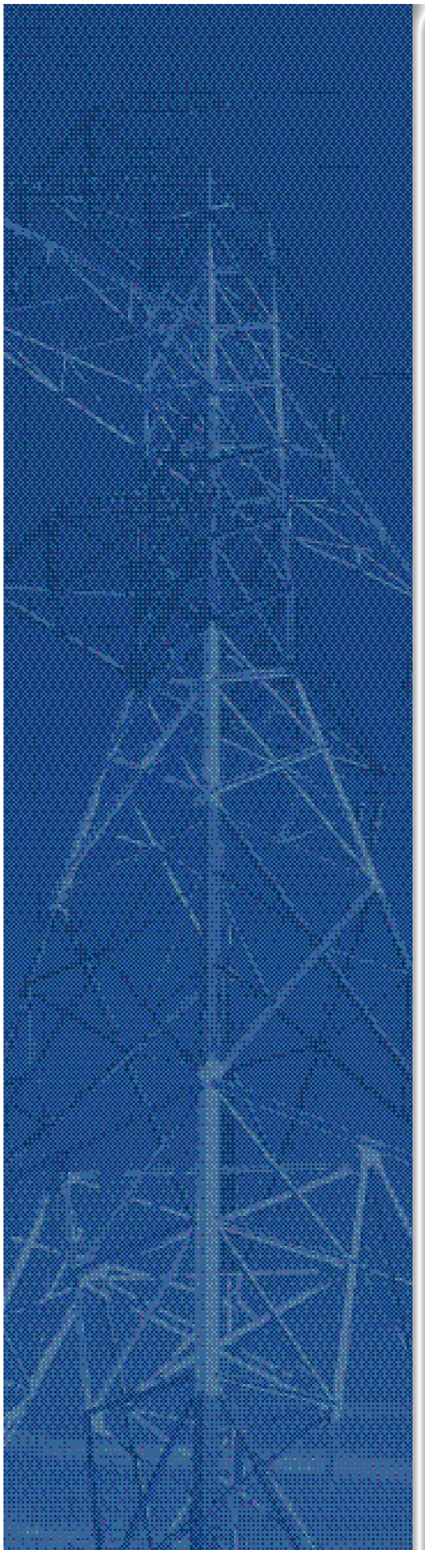
A. After assessing the New England Tier I supply and demand balances for 2015, using conservative base case assumptions, ESAI projects a potential regional supply deficit of 12 percent for Tier I resources. However, it is difficult to develop an assessment of which state within the New England region will have shortfalls or meet its RES goals. Moreover, the long term contracting efforts by Narragansett Electric could result in a surplus of available renewable energy resources to meet the RES requirements for load served by Narragansett Electric. Thus, although the New England region may be short of required renewable resources in 2015, the portion of Rhode Island load served by Narragansett Electric may be adequately covered with a surplus of renewable energy resources that may be applied to meet RES obligations in later years. Additionally, in order to quantify the sensitivities of determining adequacy of renewable energy resources, ESAI also included a high-supply scenario, which resulted in a projected match of supply and demand in the year 2015. It should also be noted that the base-case assessment reflects relatively conservative judgments with regards to the addition of new renewable resources to meet expect demand in 2015. However, as shown in the high-supply scenario described in the attached report, if projects become commercially operational sooner than projected and if load growth decelerates, then it would be feasible that Tier I regional supply could match regional demand in 2015.

Q. Are you providing the details of your assessment along with the overview that you have provided in this testimony?

A. Yes. A complete report entitled, "Assessment of Rhode Island's Resource Adequacy for Renewable Energy," is included as Attachment 1 to my pre-filed direct testimony.

Q. Does that conclude your direct testimony?

A. Yes



ESAI POWER, LLC

Assessment of Rhode Island's Resource Adequacy for Renewable Energy

A Study Prepared

For

National Grid

September 25, 2013

ESAI Power LLC
401 Edgewater Place, Suite 640, Wakefield, MA 01880
T: 781.245.2036 | F: 781.245.8706 | www.esai.com

DISCLAIMER

By accepting and using this report, you agree to the following terms:

This report was prepared by ESAI Power ("ESAI") for National Grid("Client") pursuant to a written agreement. This report may be used only by the persons, and for the purposes, specified in such agreement and any other use or dissemination of this report is prohibited.

The opinions expressed in this report are based in part upon information and assumptions provided to ESAI by Client and others. This report is not a substitute for any party's own due diligence in evaluating any potential transaction or project, whether or not such transaction or project was the underlying purpose of this report. ESAI does not opine upon the merits or future outcome of any transaction or project.

This Report is effective as of the date hereof and ESAI disclaims any obligation to update it.

ESAI POWER LLC

ESAI Power LLC (ESAI) is an energy research and development firm, currently working with a large number of: power marketers; financial institutions; generators; utilities; regulators; developers; and end-users. A key differentiator of ESAI, particularly in the Northeast, is an understanding of the connections between capacity, energy, transmission, market design and policy, and how their interplay drives market pricing structures. ESAI publishes reports on an ongoing basis for its clients that are focused on market dynamics and price forecasts by region and zone, as well as gas forecasts for the Northeast US (New England, New York and PJM). These reports contain varying degrees of market analysis, policy updates, and insights on changes in market design that provide focus on key issues of interest to a wide range of market participants. All of these publications combine to form ESAI's Northeast Power Service, which is provided to our clients through annual retainer agreements. Ongoing analysis is required to produce these reports, which form the basis for ESAI's understanding of the three Northeast markets and their unique design features.

Our economic assumptions, forecasts, revenue projections and market insights have been used to support the development of numerous new generation and transmission projects, now under operation. ESAI currently provides the same "market sensitive" analyses to other asset buyers and project developers, providing a good indication of the real-time and practical application of our analytics.

In addition ESAI performs specific project work for clients. From 2010-12 the developers of the Bayonne Energy Center and the Hess Newark Generation Project hired ESAI to develop and author the Independent Market Consultant Reports and follow-up studies for their respective projects. The New York ISO engaged ESAI in 2008 to author a white paper on the potential and actual drivers of transmission expansion activities in New York State and the surrounding control areas. In 2005 PJM engaged us to assess the benefits of their expanded market footprint as new utilities joined the pool. The PJM report summarized that a savings of $500+ million would be felt across the expanded and integrated RTO on an annual basis, due to increased efficiencies in dispatch. ESAI has performed project specific analysis for wind and other renewable projects in New England, New York and PJM.

ESAI diligently maintains a database of generation projects under development, including renewable power projects. ESAI has maintained a renewable energy supply and demand outlook for New England since 2008. ESAI's outlooks for energy, capacity and RECs have been selected on numerous occasions as the basis for RFP evaluations by Massachusetts and Rhode Island utilities.

Table of Contents

Figures

Tables

1. EXECUTIVE SUMMARY

1.1. Background

ESAI has been commissioned to provide an assessment of Rhode Island's resource adequacy for renewable energy in the 2015 compliance year. Rhode Island's Renewable Energy Standard (RES) stipulates that in 2015, 10.0 percent of Rhode Island's electric supply from obligated entities[1] must be met by renewable resources. Of this, 2.0 percent can be supplied by "Existing" legacy resources while the balance of 8.0 percent must be met by "New" resources (with commercial operation dates after December 31, 1997).

This assessment covers the resource adequacy for the Rhode Island category of "New" resources, also referred to regionally as "Tier I". This assessment does not address the adequacy of the Rhode Island category of "Existing" legacy resources, which have ample supply and a static level of requirement.

The majority of Tier I renewable energy resources in New England qualify for each of the five New England states' Tier I programs for meeting their Renewable Portfolio Standards ("RPS"). The term "RPS" is used interchangeably with "RES". (Vermont does not have a mandatory RPS.) Renewable energy production is represented by a Renewable Energy Certificate ("REC"), which is defined as a generation attribute that represents one megawatt-hour of energy produced. RECs are tracked within the New England Power Pool ("NEPOOL") Generator Information System ("GIS"). RECs can be transferred among accounts within GIS; generators produce them and sell them to obligated entities which then use them to demonstrate compliance with RES requirements. Because these RECs are deliverable across the pool with no constraints from the transmission system, RECs generated in one state are fully deliverable to any other state in NEPOOL and are thus produced as a pool of supply. Each of the New England states therefore competes for RECs from this same pool of supply. Rhode Island must draw from this greater pool of REC resources, after consideration of its internal supply characteristics. An assessment of Rhode Island's resource adequacy for renewable energy accounts for all available supply from New England renewable energy producers and qualifying imports as well as the competing demand for renewable energy from the renewable energy programs in Massachusetts, Connecticut, New Hampshire and Maine.

This assessment incorporates each currently operating renewable resource as well as renewable energy projects under active development that can start production before the end of 2015. This analysis also includes scenarios that will "bracket" the supply and demand balance on the low and high side of the base case outlook.

In addition to the 2015 analysis, ESAI provides an outlook for the New England supply and demand balance for the period 2016 to 2020. ESAI also reviewed long term contracting in Rhode Island of

[1]Obligated entities are persons or entities that sell electrical energy to end-use customers in Rhode Island, including, but not limited to: non-regulated power producers and electric utility distribution companies, supplying standard offer service, last resort service, or any successor service to end-use customers; including The Narragansett Electric Company, but not to include Block Island Power Company or Pascoag Utility District.

The Narragansett Electric Company d/b/a National Grid ("Narragansett Electric"), including distributed generation, and the corresponding outlook for Narragansett Electric, which is Rhode Island's largest load serving entity.

Massachusetts, Maine and Rhode Island have Alternative Compliance Payments (ACPs) that are at similar levels and escalate with inflation annually (estimated to be $68.57/MWh in 2015). The Connecticut ACP is lower at $55.00/MWh and may result in lower purchasing power from Connecticut obligated entities and a more competitive purchasing position for the remaining New England states, including Rhode Island. In 2012, New Hampshire passed legislation to reduce its ACP to $55.00/MWh in 2013. New Hampshire also includes an inflation adjustment for ACP and Connecticut is the only state without an ACP escalator. (We note that the Connecticut ACP of $55/MWh was competitive with the other states in 2006, but as the CT ACP has no escalation factor, it has not kept pace with the ACP escalation of other states.)

1.2. Summary of Findings

ESAI's assessment of the New England supply and demand balances for Tier I renewable energy, making certain base case assumption, indicates that demand may exceed available supply by 1,320 GWh in 2015. This represents a 12 percent shortfall against the 10,920 GWh of total Tier I demand in New England.

Although the New England REC supply and demand balance may indicate a deficit in 2015, it is possible that Rhode Island obligated entities could purchase sufficient RECs to meet demand through a combination of long term contract purchases and moderately aggressive purchasing strategies for 2015 compliant RECs. As detailed later in Section 6 this report, Narragansett Electric has already completed arrangements for long term contracts that could fully supply its 2015 requirements with some surplus that can be carried over as banked allowances for use in later years.

It is difficult to predict whether all New England states will have shortfalls in 2015, or whether individual states will be able to cover their complete requirements. Given that Connecticut and New Hampshire entities would be unwilling to pay above the $55.00/MWh ACP for Tier I RECs, it is likely that the shortfall will be proportionally higher in Connecticut and New Hampshire and lower in the remaining states, including Rhode Island. Thus the proportional shortfall for Rhode Island could be significantly mitigated and much lower than the projected regional deficiency.

To help quantify the sensitivities of adequacy, ESAI developed two additional scenarios – low supply and high supply. The low supply scenario reduces imports and generation, while increasing demand through higher load growth assumptions. The high supply scenario increases imports, generation, and wind capacity factors, while decreasing demand through lower load growth assumptions. The low supply case resulted in a projected deficit of 1,875 GWh, a 42 percent increase above the base case deficit. The high supply case resulted in a surplus of approximately 110 GWh, essentially eliminating the base case deficit (see Figure 1and Table 1).

It should be noted that assessment of the base case is based on relatively conservative judgments with regards to the addition of new renewable resources to meet expect demand in 2015, and the level of imports to the region. In particular, projects with which recent long term contracts have been signed but which are not yet approved or built are discounted in terms of their contribution to the projected supply, as are DG resources in the region, which are supported by various state level programs.
As described further in this report in the high supply scenario, if projects become commercially operational sooner than projected and if load growth decelerates, if all contracted projects are built, and if REC imports increase beyond levels projected in this report, then it would be feasible that regional supply could match regional demand in 2015.

Figure 1: New England Tier I Renewable Supply/Demand Balance Scenarios

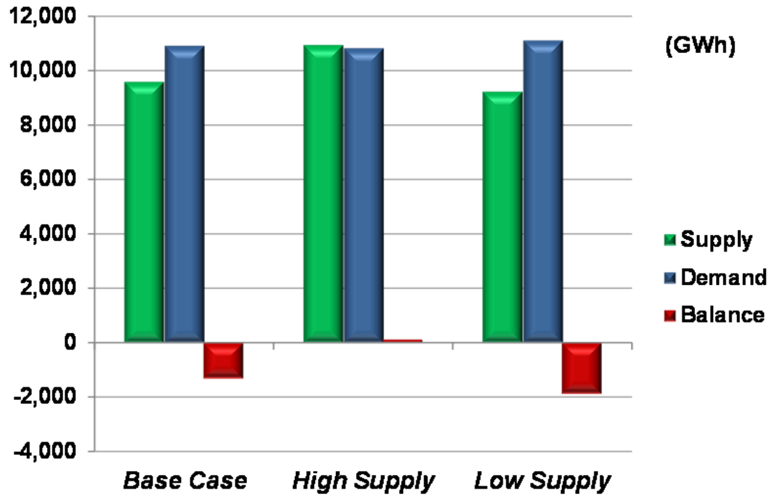


Table 1: Tier I Renewable Energy Supply/Demand Details By Scenario

(GWh)	Base Case	High Supply	Low Supply
Existing Production	5,966	6,136	5,831
Imports	1,504	1,754	1,404
Queue	2,010	2,020	1,991
Future Generation	120	1,040	10
Supply	9,600	10,950	9,236
Demand	10,920	10,837	11,113
Balance	-1,320	113	-1,877

1.2.1. Other Considerations

There are a number of factors that can influence the expected outcome for the New England Tier I REC supply and demand balance. These include the following:

1) **Load Growth** – underlying load growth is affected by economic factors as well as the effectiveness of energy efficiency initiatives. Higher load growth will increase the demand for RECs. ESAI base case load assumption is consistent with ISO-NE load growth projections and ESAI also considers high and low load growth scenarios in this analysis.
2) **Load Variability** – energy demand can vary greatly from year to year depending on weather conditions. A year in which both a warm winter and a cool summer occur will have a much lower total energy demand and thus a correspondingly low REC

demand. Conversely, a year that sees a cold winter and a hot summer will have high energy demand and correspondingly higher REC demand. ESAI did not consider weather variability in this analysis.

3) **Wind Capacity Factors** – due to advances in turbine technologies, wind farm capacity factors are expected to increase for new plants that come on-line. Most projections for New England on-shore wind farms place capacity factors at or near 30 percent. However, actual capacity factors for operational wind farms in New England are averaging just below 25 percent when assessing total actual aggregate output against total nameplate capacity. The lower actual figure accounts for all operations and includes curtailments, unplanned outages and maintenance. ESAI uses a 25 percent capacity factor for currently operational wind farms and uses a higher capacity factor of 27.5% for projects in the queue and future projects. ESAI includes an increase in the capacity factor of 2.5% for existing and future resources in the high supply case.

4) **New Development**– ESAI has assigned a probability of completion to each project in its New England queue. Many of the projects that are slated for completion in 2014 or 2015 have not started construction and are still in development. Each project contributes to future supply consistent with its expected commercial start date as well as its probability of completion. For this reason, many projects are assigned a very low probability of completion and each such project has a correspondingly low contribution to total supply. For example, a 50 MW wind farm in the queue in early stages of development might be assigned a 10 percent probability of completion. Its expected annual output would be 109 GWh, however, in the ESAI outlook it would contribute only 10 percent or 10.9 GWh to modeled results. The aggregate 'handicapped' output of all projects in the queue provides a very reasonable estimate of the likely outcome of projects brought to completion. This method of projecting future projection from the queue is consistent with the fact that only 10 to 20 percent of projects that enter the queue ever reach completion.
The successful outcome of the current Massachusetts RFP to comply with Section 83A of the Green Communities Act for new renewable resources increases the number of the projects in the queue that could move forward to completion. ESAI assumes in its base case outlook that RFP efforts will support additional REC production of 32 GWh in 2015 and an incremental 750 GWh by 2017 (beyond an expected 1,010 GWh of projects under construction that will provide RECs in 2014). In the high supply case, ESAI assumes an additional 920 GWh of production in 2015 supported by higher levels of state RFP purchases.

5) **State Legislated Changes to RPS Standards** – Connecticut recently passed legislation that could allow the use of large-scale hydro to meet a limited amount (1.0 percent) of CT Class I REC requirements in 2016 and could allow higher percentages (up to 5.0 percent) through annual increases until 2020. The use of large scale hydro would result in an effective decrease in demand for Tier I RECs in New England. While this does not impact the current 2015 outlook, it does highlight the possibility that state mandates can shift and alter the supply and demand outlook as defined by the current mandates.

6) **Imports**–New England imports of Tier I RECs have declined from a peak of 1,670 GWh in 2010 to 1,380 GWh in 2012. The decline is due to lower imports from New York and the Maritimes which result from lower transfers of energy sourced from biomass resources. As variability of imports has an impact on total supply, ESAI has included import scenarios in its 2015 outlook.
7) **Banking–**The banking of RECs for future use is allowed in most New England states. Due to the significant REC deficits projected to start in 2013, ESAI does not make any provisions for banking with respect to 2015 balances. It is assumed that given the deficit situation most compliance entities will be short and banking by any individual entity would not be significant enough to alter the overall supply and demand balance in 2015.

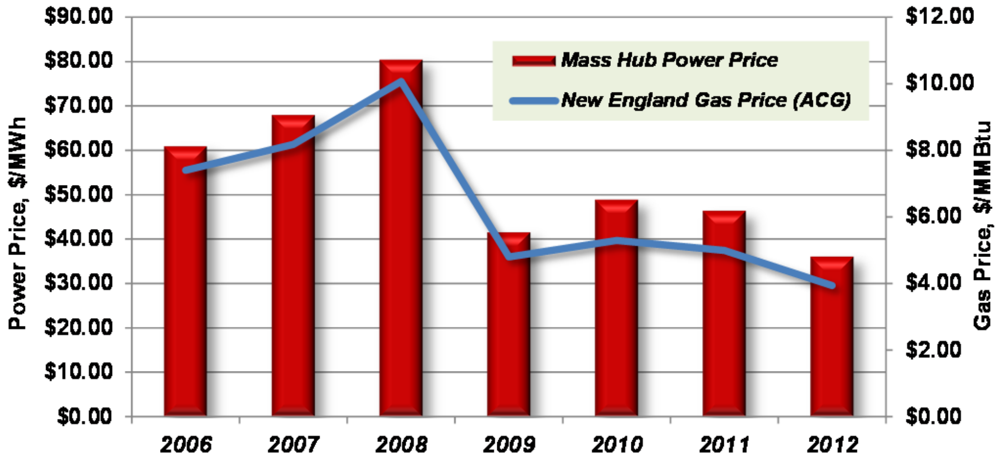
1.3. Recent Trends Impacting Renewable Supply & Demand

From 2010 to 2020, demand for New England Tier I RECs is projected to more than triple from 5,400 GWh/yr to 17,300 GWh/yr. Over the same time period Rhode Island’s demand for “New” RECs will grow from 206 GWh/yr to 1,090 GWh/yr. In 2015, New England Tier I REC demand is projected to reach 10,920 GWh and Rhode Island’s requirement for Tier I will be 642 GWh or approximately six percent of total New England Tier I demand.

REC demand growth has been legislated by each state and is therefore mandated to occur in accordance with each state’s directives. Supply of RECs is impacted by many factors that can impact the development of new resources. The following is a brief summary of major trends that have had dampening impacts on the development of new renewable resources:

- **Natural Gas Prices -** The prolific development of shale-based natural gas has been largely responsible for the significant drop in New England natural gas prices (Algonquin City Gates) from above $10.00/MMBtu in 2008 to below $4.00/MMBtu in 2012. From 2006 to 2008, Mass Hub 7x24 power prices averaged near $70.00/MWh but averaged only $43.00/MWh from 2009 to 2012. As New England power prices are largely dictated by natural gas as the marginal fuel, power prices have closely followed the natural gas pricing trend (see Figure 2). The significant decrease in power prices means that renewable energy projects will receive much lower prices for their energy and must make up for this loss of revenue through higher REC prices. The drop in gas and power prices has rendered many development projects uneconomic and has been a factor in projects dropping out of the development queues.

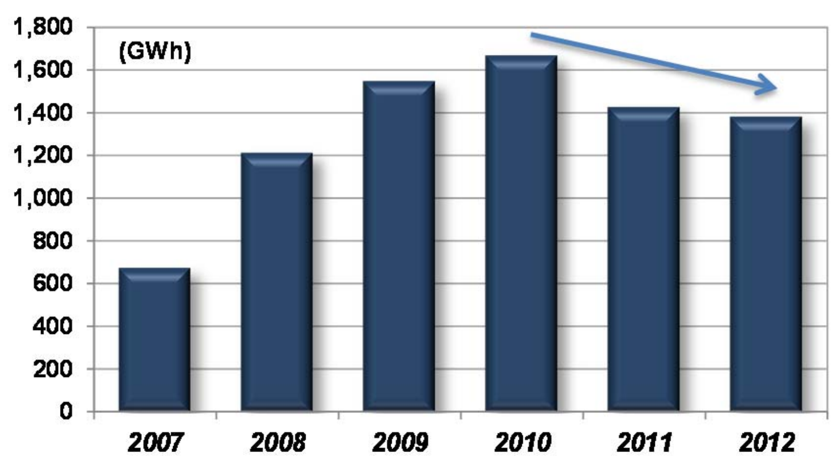
Figure 2: New England Natural Gas & Power Prices



- **Biomass restrictions** – Massachusetts has placed additional restrictions on biomass plants that require much higher standards of emissions, efficiency and sustainability of biomass supply. As Massachusetts has the largest demand for renewable energy, the state's upgraded standards have discouraged new supply from biomass resources.

- **Imports**– Renewable imports come primarily from New York, Quebec and the Canadian Maritimes provinces. As shown in Figure 3, total Tier I REC imports have decreased from 1,670 GWh in 2010 to 1,380 GWh in 2012. The reduction in imports is largely due to lower biomass imports from New York and New Brunswick.

Figure 3: New England Renewable Energy Imports



- **Production Tax Credit Uncertainty**–The 2.2 cent per kWh federal production tax credit was effectively allowed to expire on December 31, 2012. On January 1, 2013 Congress extended the production tax credits for an additional year as part of the 'fiscal cliff' agreement. The extension also includes a modification that allows the credits to apply to projects that start construction by December 31, 2013. The continued uncertainty of the outlook for production tax credits has been a hindrance to developers of renewable energy projects that rely on the credits to make their projects economic.

These factors plus the ongoing siting issues faced by renewable developers highlight the challenges faced by renewable energy developers in New England. Offsetting these difficulties is the interest of New England states in providing long term contracts to support new renewable project development. In particular, Massachusetts and Rhode Island have mandates for their states' utilities to procure significant levels of renewable energy to promote the development and construction of new facilities. New Hampshire has also made significant commitments under long term contracting including a purchase commitment to the 75 MW Laidlaw biomass facility.

2. METHODOLOGY

ESAI has developed a detailed outlook of the supply and demand balance for Tier I RECs in New England. ESAI's assessment of supply factors and demand outlooks determine the deficit or surplus REC balance for each year. This analysis specifically focuses on the supply and demand balance for the 2015 compliance year.

The ESAI supply outlook is based on the current New England generation portfolio, subsequent renewable generation additions as defined by the generation queue monitored by ESAI (including the ISO-NE interconnection queue and other additions), and ESAI's assumptions about new build going forward past the queue. Supply for 2015 is largely defined by operational generation and assumptions about the development of projects in the queue.

Demand is defined by the individual state RPS mandates which specify the annual percentages of energy that must be supplied by renewable energy. Retail load, including losses, subject to RPS is determined as a function of the total energy demand in each state as well as the outlook for load growth. In this report, any reference to retail load means that losses are included. The exception is New Hampshire, where retail load is subject to RPS requirements. In some states, certain municipal entities are exempt from RES; Rhode Island exempt entities are the Block Island Power Company and Pascoag Utility District. New England load growth is state-specific and the latest New England CELT report is used to determine each state's load profile by year.

The following sections provide more detail on the development of the supply and demand balances and the resulting outlook for Tier I RECs in 2015.

2.1. Demand

The REC demand is based on state renewable requirements for qualified load. Certain load serving entities are exempt from the state-mandated renewable requirements such as municipals and certain cooperatives. ISO-NE load growth rates as specified in the most recent CELT report are applied to the known qualified load in each state to estimate future load. Most states have annual increases to their renewable energy requirements expressed as a percent of load (see Table 2).

The table below shows Rhode Island's "New" requirement in its RES, which is added to the "Existing" requirement, to total 3.0 percent of energy consumption in 2007. For the Existing requirement, 2.0 percent of Rhode Island's demand can be met by legacy (pre-1998) resources, including hydro with less than 30 MW of capacity, of which there is ample supply. The requirement for New RECs increased from 1% in 2007 by 0.5 percent per year to 4.5 percent in 2010. Additional 1.0 percent annual increases for New RECs are expected until 2014 when the New REC requirement will reach 6.5 percent. Beyond 2014, annual increases jump to 1.5 percent for New RECs until the RES reaches 14.0 percent in 2019.

Table 2: RPS Tier I Portfolio Standards by State

	RI	MA	CT	ME	NH
2007	1.0%	3.0%	3.5%	—	—
2008	1.5%	3.5%	5.0%	1.0%	—
2009	2.0%	4.0%	6.0%	2.0%	0.5%
2010	2.5%	5.0%	7.0%	3.0%	1.0%
2011	3.5%	6.0%	8.0%	4.0%	2.0%
2012	4.5%	7.0%	9.0%	5.0%	3.0%
2013	5.5%	8.0%	10.0%	6.0%	4.0%
2014	6.5%	9.0%	11.0%	7.0%	5.0%
2015	8.0%	10.0%	12.5%	8.0%	6.0%
2016	9.5%	11.0%	14.0%	9.0%	6.9%
2017	11.0%	12.0%	15.5%	10.0%	7.8%
2018	12.5%	13.0%	17.0%	10.0%	8.7%
2019	14.0%	14.0%	19.5%	10.0%	9.6%
2020	14.0%	15.0%	20.0%	10.0%	10.5%

Note: RI Class I requirements above do not include 2% legacy allowance.

Likewise, Massachusetts Class I REC requirements have risen from 1.0 percent of energy consumption in 2003 to 7.0 percent in 2012. Further 1.0 percent annual increases in Class I obligations are scheduled in Massachusetts until the requirement reaches 15.0 percent in 2020 (additional 1.0 percent increases will occur unless cancelled by the Massachusetts legislature). These escalating percent requirements for Massachusetts and the other four participating New England states are applied to ESAI's estimates of each state's future load to determine the annual MWh of renewable energy required in each state.

2.2. Supply

To determine future supply resources, ESAI includes the use of the publicly available ISO-NE generation interconnection queue when evaluating new supply additions as far out as 2016. All renewable generation in the queue has been included in the supply outlook. The resources included in the forecast are assigned completion dates provided by ISO-NE or by ESAI based on its evaluations of each individual project. ESAI maintains a database of all new project development (including those that are not in the ISO-NE queue) and monitors the progress of every project.

Our outlook for supply breaks out renewable energy production into three categories:

1) **Operational Resources -** ESAI has developed a detailed listing of the current renewable energy supply portfolio for New England based upon the ISO-NE listings of currently qualified renewable resources as well as additional resource information obtained from the participating states' compliance reports and NEPOOL GIS data. *Imports are included as a*

subset of the currently operational resource data. ESAI uses actual operating data for currently operational resources as well as imports to project future production from the operational resource portfolio.

2) **Generator Queue -** Renewable generation under development is monitored and ranked for probability of completion. The potential output of generation under development is adjusted based on its handicapped probability of completion and is then added towards production in the applicable year of its expected commercial start. Annual production for the first year of operations is prorated according to the number of months of expected operations.
3) **Future Generation -** ESAI includes assumptions about future renewable generation on a 'wind-equivalent' basis for supply beyond the visibility of the queue. For the2015 resource adequacy analysis, the impact of 'future' generation is limited to only 50 MW of new generation included in the base case, as most projects are well developed or under construction, and most capacity that would impact 2015 is already in the generation queue. The low and high supply scenarios vary this 50 MW base case assumption by shifting to zero and 350 MW, respectively. In 2016 and 2017, there is limited visibility in the queue and so estimates of future additions are somewhat low. Over the longer term, from 2018 and beyond, ESAI assumes that 350 MW/year of new wind equivalent renewable capacity will be built which accounts for the positive influences on development of continued state RFP support, new transmission capacity that would facilitate the development of wind capacity in Maine (such as National Grid's Northeast Energy Link), and the potential for legislative changes in RPS..

ESAI's outlook provides for operations under 'normal' conditions. Wind farms are expected to operate at their nominal capacity ratings, therefore such factors as a 'windy' or 'less windy' year are not taken into account. ISO-New England's load projections are used to project Tier I REC demand; however, REC demand can increase with hot summers and cold winters and likewise can decrease under milder demand conditions.

The detailed New England supply outlook is aggregated from the three categories of generators above.

3. ANALYSIS OF 2015 SUPPLY &DEMAND BALANCES

3.1. Demand Outlook

3.1.1. Rhode Island

Rhode Island's qualifications for "New" renewable energy are generally consistent with the Tier I requirements of the other New England states. Other states have requirements for additional classes of renewable energy to promote additional policy objectives such as preserving legacy hydro (MA Class II) or facilitating the more efficient use of waste heat. As Rhode Island does not compete for additional classes of renewable energy, no consideration was given to the supply and demand outlooks for other classes of New England renewable energy required in other states. Thus the supply and demand for only Tier I was analyzed in this report; the supply and demand outlook for "Existing" renewable energy was not included.

Table 3: Rhode Island REC Demand By Year

Compliance Year	Total Target Percentage	Percentage from New Renewable Energy Resources	Percentage from *either* New *or* Existing Renewable Energy Resources
2007	3.0%	1.0%	2.0%
2008	3.5%	1.5%	2.0%
2009	4.0%	2.0%	2.0%
2010	4.5%	2.5%	2.0%
2011	5.5%	3.5%	2.0%
2012	6.5%	4.5%	2.0%
2013	7.5%	5.5%	2.0%
2014	8.5%	6.5%	2.0%
2015	10.0%	8.0%	2.0%
2016	11.5%	9.5%	2.0%
2017	13.0%	11.0%	2.0%
2018	14.5%	12.5%	2.0%
2019	16.0%	14.0%	2.0%
2020	16.0%	14.0%	2.0%

Table 2 summarizes Rhode Island's Renewable Energy Standard starting in 2007 through 2020. The total target percentage increases from 3.0 percent to 16.0 percent over this time period. Existing resources may meet 2.0 percent of the total target percentage for each year, thus reducing the requirements from New resources to 14.0 percent by 2020. Existing resources are defined as resources entering commercial operations before December 31, 1997.

In 2015, Rhode Island's eligible retail load is expected to be 8,023 GWh[2]. The total renewable energy requirement for 2015 from New resources will be 8.0 percent or 642 GWh. The additional 2.0

[2] From the ISO New England (ISO-NE) Control Area net energy for load (NEL) and peak loads from the Forecast Report of Capacity, Energy, Loads and Transmission (CELT) 2013 – 2022, May 1, 2013.

percent from Existing resources will add 160 GWh for a total of 802 GWh of the Rhode Island retail energy demand met by renewable resources.

3.1.2. New England

From 2007 to 2015, demand for New England Tier I RECs is projected to increase from 2,870 GWh to 10,920 GWh, driven by annual increases in RPS requirements as applied to projected load. In 2015, Rhode Island's RES requirement is projected to be 640 GWh or just over 6 percent of total New England demand.

Figure 4 shows the growth in REC demand by state over the period from 2007 to 2015. Table 4 provides a breakdown of REC demand for 2015 by retail load, RPS requirement and total REC demand.

Figure 4: New England Tier I REC Demand by State

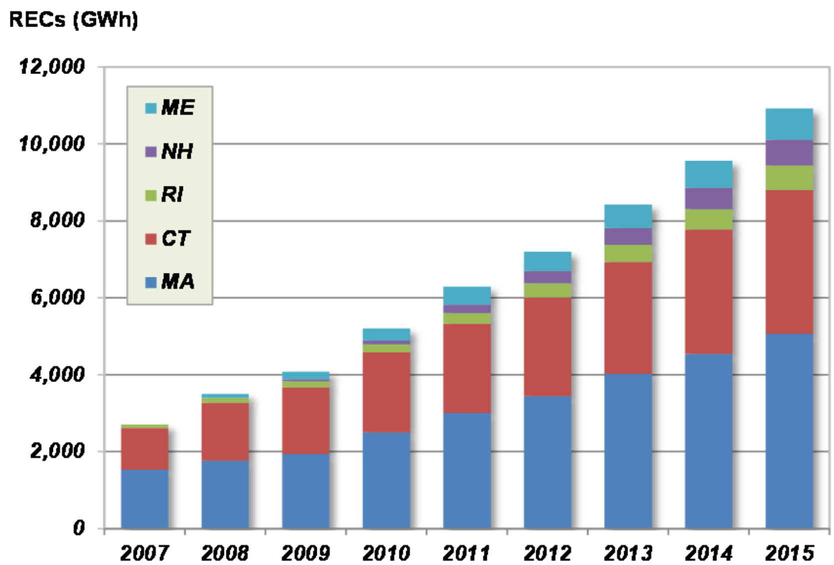


Table 4: 2015 New England Tier I REC Demand by State

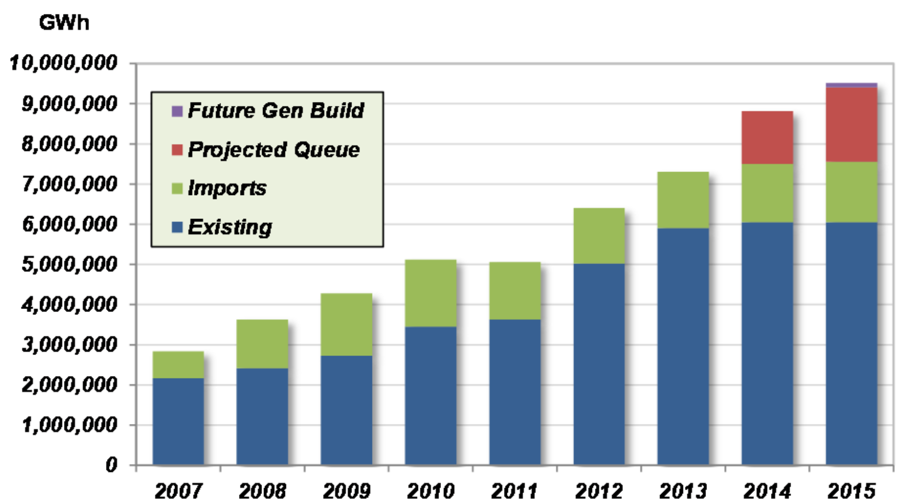
	Eligible Load (GWh)	% RPS	REC Demand (GWh)
RI	8,024	8.0%	642
MA	50,634	10.0%	5,063
CT	29,866	12.5%	3,733
ME	10,143	8.0%	811
NH	11,173	6.0%	670
	109,840	9.9%	10,920

3.2. Supply Outlook

New England renewable supplies have shown consistent growth since 2007. Figure 5 highlights the annual increases in Tier I renewable supplies and provides a breakdown of the resource sources: operational, imports, projected production from the development queue, and future generation build not yet in the queue. The development queue impacts production in 2014 and 2015. Each development project is tracked by ESAI and assigned a probability of completion. This probability of completion changes over time as projects make progress through siting and permitting, financing, and construction. Additional weight is given to projects that have cleared in an ISO-NE Forward Capacity Auction (FCA) and to projects that are known to have received long term contracts.

ESAI included another category called 'future' generation build when developing supply outlooks for New England. Because the development queue has a limited visibility of 2 to 3 years, ESAI accounts for new generation that will ultimately enter the queue at later dates. The queue is fairly active from 2013 to 2015, but ESAI conservatively included a small amount, 50 MW, of new nameplate wind-equivalent capacity that would enter the market in 2015 in addition to the capacity in the development queue.

Figure 5: New England Tier I REC Supply Outlook By Source Type



3.2.1. Operational Supply

New England's anticipated 2013 production from operational supply sources is provided in Table 5. Current production is dominated by biomass and wind at approximately 2,000 GWh each, but landfill gas also provides significant renewable energy production at just over 1,000 GWh.

As indicated in Table 6, Maine dominates as the state with the highest amount of renewable energy production, with biomass at 1,230 GWh and wind at 980 GWh (most of Maine's biomass is used internally to meet its more relaxed Maine biomass standard). Rhode Island produces significant renewable energy production from landfill gas with 2015 expectations at 275 GWh.

Massachusetts, New Hampshire and Vermont are each expected to generate between 200 and 400 GWh of wind energy in 2013, with the bulk of Massachusetts wind coming from the western part of the state.

Wind resources are assigned capacity factors consistent with actual operations history, otherwise operational wind resources are assigned a 25 percent capacity factor consistent with the pool-average history of 24.7 percent. ESAI utilized EIA-923 data to assess actual capacity factors for New England wind farms using data as available for each facility for 2007 and 2008. The data is presented in the Appendix section (Table 11). Resources in the queue (under development or construction) and future resources are assigned a 27.5 percent capacity factor to reflect improving technology.

Table 5: New England 2013 Operational Supply Production by Resource Type

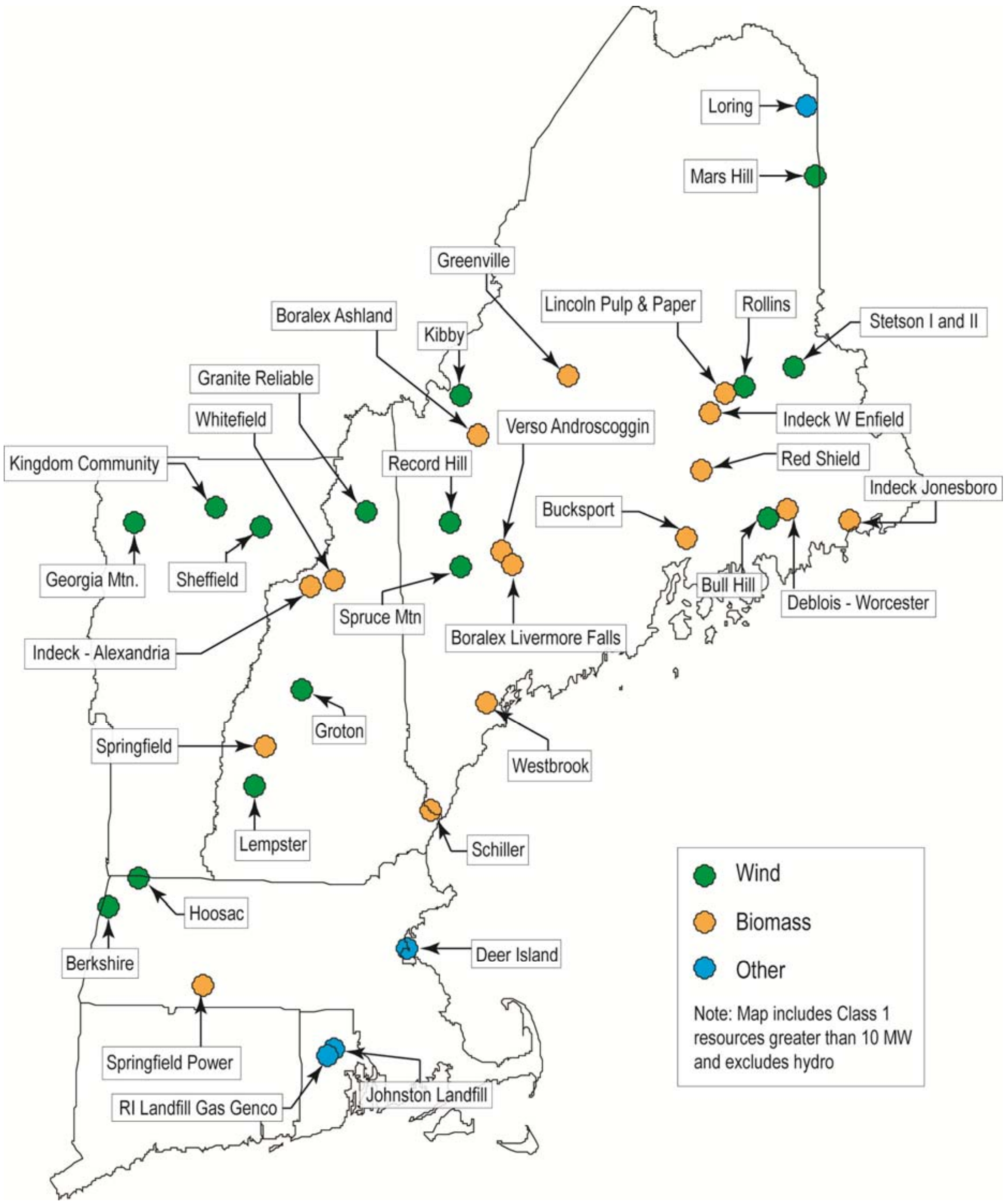
Resource Type	*Existing Production (GWh)*	*% of Total*
Anaerobic Digester	92	1.6%
Biomass	1,866	32.2%
Fuel Cell	41	0.7%
Hydro	326	5.6%
Landfill Gas	1,171	20.2%
Solar	465	8.0%
Wind	1,835	31.7%
Grand Total	5,796	100.0%

Table 6: Operational Supply Production by State and Type (GWh)

	Anaerobic Digester	*Biomass*	*Fuel Cell*	*Hydro*	*Landfill Gas*	*Solar*	*Wind*	*State Total*
CT	0	2	39	29	58	61	0	189
MA	82	106	2	40	302	386	215	1,133
ME	0	1,139	0	85	47	1	980	2,252
NH	0	619	0	80	149	1	375	1,224
RI	0	0	0	7	275	4	18	304
VT	10	0	0	85	340	12	247	695
Total	92	1,866	41	326	1,171	465	1,835	5,796

Note: Table 5 and Table 6 include operational resources as of August 2013 and projects under construction that are expected to be complete by end-2013.

Figure 6: Operational New England Renewable Resources (>10 MW)



3.2.2. Imports

New England supplies are augmented by imports from neighboring regions: New York, Quebec, and the Maritimes provinces. In 2007, imports represented 40 percent of total supply but as New England-based production grows, imports represent a declining percentage of the total. Imports peaked at 1,670 GWh in 2010 and declined to 1,383 GWh in 2012 (see Figure 7). The data presented in Table 7 indicates that the decline in imports was largely due to lower imports of biomass from New York and New Brunswick and is most likely due to poor production economics in the lower gas price environment (see Figure 8).

ESAI assumes that imports will gradually recover to 1,500 GWh by 2015 from 1,383 GWh in 2012. It is possible that imports could move higher in 2015, and this scenario is covered in the high supply outlook (increasing imports to 1,750 GWh). A downside case would lower imports by 100 GWh in 2015 to 1,400 GWh, reflected in the low supply case.

Figure 7: New England Imports

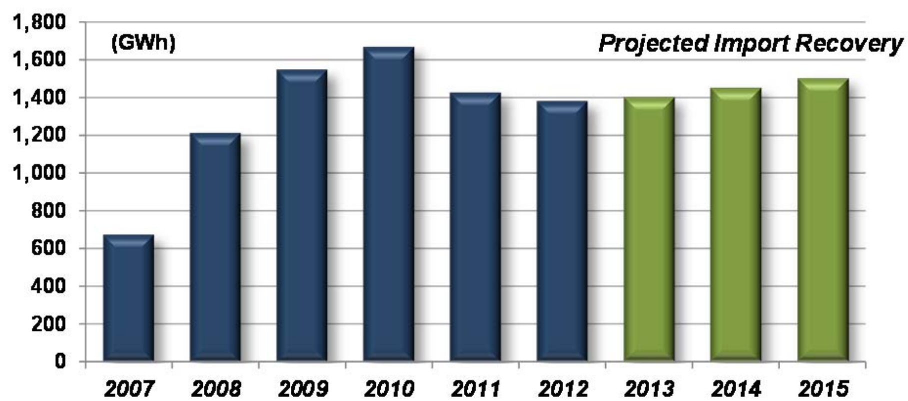
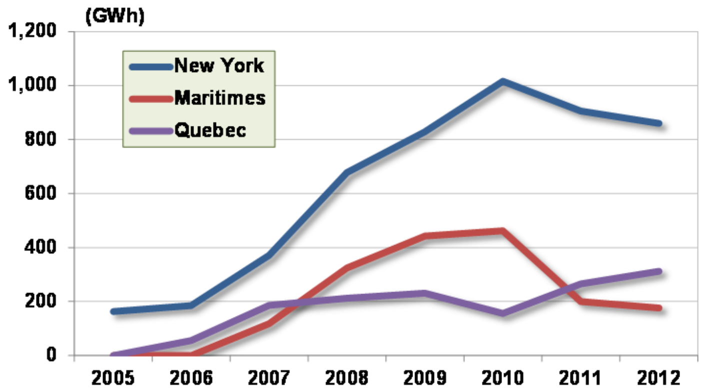


Table 7: Imports By Resource Type (MWh)

	2009	2010	2011	2012
Wind	737,767	803,800	779,978	802,001
Biomass	224,448	209,796	34,500	0
Landfill Gas	587,092	656,440	613,891	579,879
Digester gas	0	0	0	895
Total	**1,549,307**	**1,670,036**	**1,428,369**	**1,382,775**

Figure 8: Imports By Region



3.2.3. Queue Projections

In addition to operational facilities, ESAI utilizes projections for new facilities based on the ISO-NE generator queue for applicable renewable energy facilities. ESAI also monitors other projects that may not be in the ISO-NE queue. As noted earlier, ESAI maintains a database of development projects and tracks the progress of each project. ESAI handicaps each project with a probability of completion based on its progress through the siting, permitting and financing process.

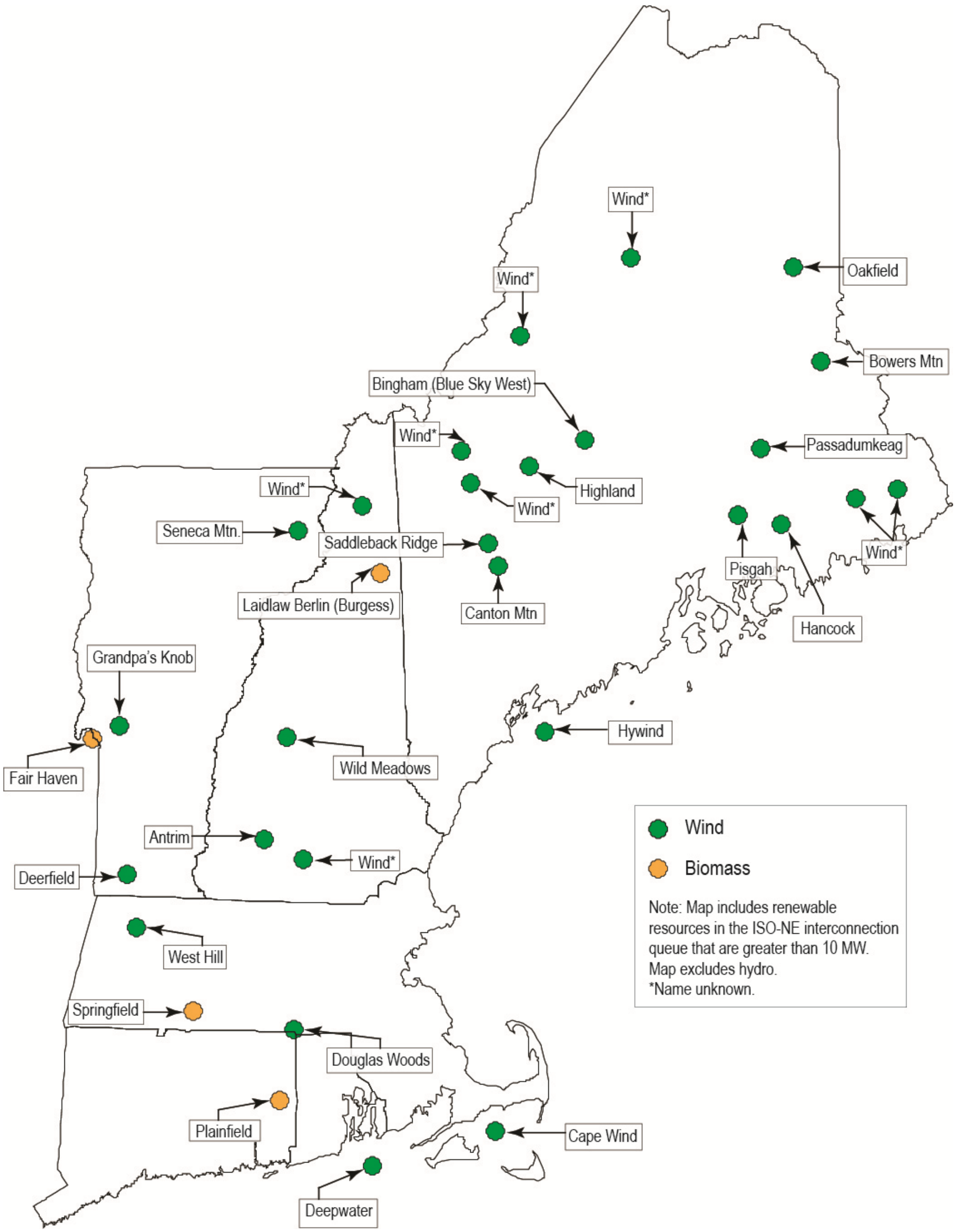
Table 12 in the Appendix provides an overview of the projects included in the queue that will contribute to 2015 Tier I production. Table 8 summarizes the contributions of queue projects by resource type and shows a total contribution to 2015 renewable energy production of 2,010 GWh.

Table 8: ESAI 2015 Projection of Production from Queue Projects

(GWh)	2015 Queue Production
Solar	486
Hydro	45
Landfill Gas	23
Biomass	838
Wind	618
Total	2,010

The 30 MW Deepwater Block Island wind project is included in the queue and in ESAI's assessment of future projection. However, as the estimated completion date is late December 2015, it has not been included in the supply balance for 2015.

Figure 9: New England Renewable Project Queue



3.2.4. Future Generation

As the generation queue extends through 2015 and into 2016, there is only a small chance that new generation currently not in the queue would be developed and operating by 2015. ESAI allows for 50 MW of wind-equivalent generation to begin production in 2015. This allows for capacity that may not desire qualification in the capacity market and thus might enter the interconnection queue later than other resources seeking capacity payments. Due to the low capacity factors imputed to wind farms in the capacity market, some developers place less priority on obtaining capacity revenues. In addition, there are projects that are under development that might fast-track into the interconnection queue as a result of winning a state-sponsored RFP or, advance a 2016 on-line expectation to 2015.

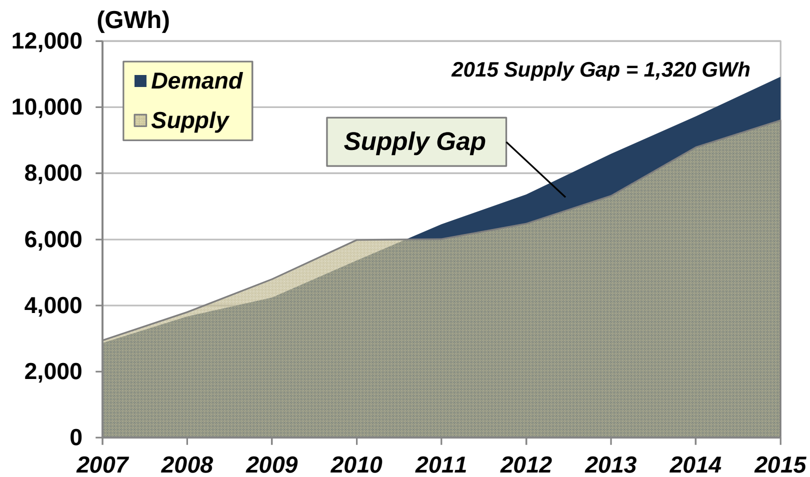
In the scenarios discussed in the next section, ESAI assumes that no additional generation is added beyond the queue in the low supply case. In the high supply case, an additional 300 MW (total 350 MW) of new wind-equivalent capacity is assumed to commence operations by 2015.

4. 2015 SUPPLY AND DEMAND BALANCE

4.1. 2015 Base Case Outlook

In 2015, demand for Tier I RECs is projected to be 10,920 GWh based on individual state RPS standards and expected load growth. Total supply from operational resources, imports, generation under development and future generation is expected to total 9,600 GWh and be short of the total states' requirement for RECs in 2015. The 2015 Tier I REC deficit will be approximately 1,320 GWh.

Figure 10: 2015 New England REC Supply/Demand Balance



4.2. Scenarios

As there are a number of factors that can influence the 2015 Tier I REC supply and demand balance, ESAI developed two scenarios that would bracket potential outcomes within high and low supply scenarios.

The factors that have been selected for variance in the two scenarios are outlined below and summarized in Table 9:

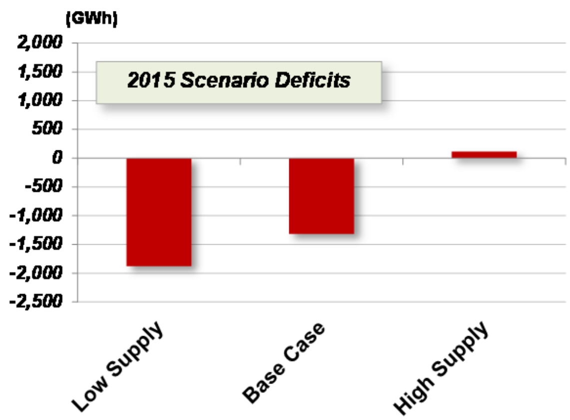
- Load Growth – Low load growth translates into lower demand and an annual load growth of only 0.25 percent is used for the high supply case. A more robust 1.5 percent load growth is used in the low supply case (increased demand for RECs).
- Wind Farm Capacity Factor – The low supply case lowers the base case wind farm capacity factor of 25 percent by 2.5% for both existing and new generation (existing drops from 25% to 23% and new generation (queue) drops from 27.5% to 25.0%). The high supply case increases all capacity factors by 2.5% (to 27.5% for existing and to 30% for new supply).

- Imports – The low supply scenario assumes that imports will be 100 GWh lower than the 2015 base case assumption of 1,500 GWh. The high supply case assumes an import increase of 250 GWh to 1,750 GWh.
- Future Additions – The base case assumes that only 50 MW of equivalent nameplate wind capacity above the queue expectations will contribute to 2015 production. The low supply case assumes that this 50 MW does not materialize. In the high supply case, the total new generation increases by 300 MW of equivalent nameplate wind capacity.

4.2.1. Scenario Outcomes

Figure 11 shows the base case supply deficit and the corresponding low supply and high supply scenarios. As summarized below in Table 9, under the low supply scenario the deficit increases from 1,320 GWh to 1,877 GWh. Under the low supply scenario, the deficit increases by over 40 percent.

Figure 11: 2015 New England REC Scenarios



Under the high supply scenario, the deficit is reduced and a slight surplus of113 GWh emerges, eliminating the base case deficit. The change in new wind capacity factors from 27.5 to 30 percent and lower load growth resulted in relatively small changes (adding 333 GWh of net supply) but the increase in new wind equivalent additions to 350 MW contributed over 900 GWh to potential supply.

Table 9: Scenario Definitions and Supply/Demand Impacts

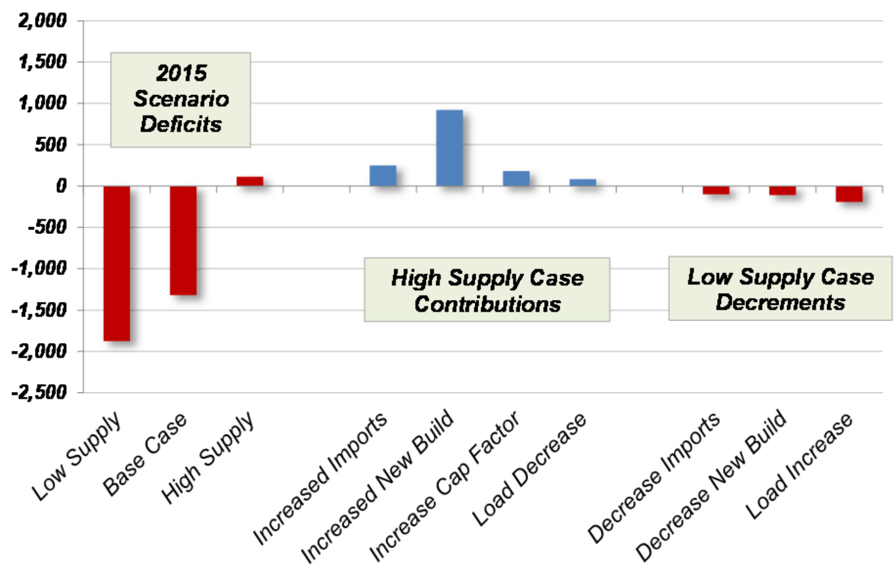
Scenario	Load Growth	Delta From Base Case	Capacity Factor	Delta From Base Case	New Additions [2]	Delta From Base Case	Imports	Delta From Base Case	2015 Demand	2015 Supply	Supply & Demand Deficit
Low Supply Case	*1.50%*	193	*-2.5%*	-154	*-50 MW*	-110	*-100 GWh*	-100	11,113	9,236	-1,877
Base Case	*CELT* [1]	-	*Base*	-	*Base*	-	*Base*	-	10,920	9,600	-1,320
High Supply Case	*0.25%*	-83	*+2.5%*	180	*350 MW*	920	*+250 GWh*	250	10,837	10,950	113

1 - CELT Load Forecast averages 0.5 percent after energy efficiency is accounted for. Varies by state.
2 - New Additions - total MW based on nameplate onshore wind and applicable capacity factor.

Figure 12 shows the individual contributions to the supply deficits for the low and high supply scenarios for each varied element. As noted above, the high supply case factors tend to decrease the deficit while the low supply case factors increase the deficit.

Please note that although Cape Wind was not included as a variance factor in the scenarios, a delay in the on-line date for the first phase of Cape Wind would have further detrimental impacts not included in these scenarios. ESAI assumes that Cape Wind will produce approximately 375 GWh of energy in 2015 which is about 25 percent of its full expected annual production of 1,500 GWh. Conversely, an advance in the timing of Cape Wind operations would reduce the deficit accordingly.

Figure 12: Individual Impacts of Scenario Components



4.3. 2015 New England Resource Adequacy Conclusions

The base case expectation for the Tier I New England supply and demand balance indicates a renewable energy deficit of 1,320 GWh. The high supply scenario indicates that the deficit would be eliminated and a surplus of 110 GWh would emerge, while the low supply scenario indicates that the deficit would increase to 1,875 GWh. The supply projection is therefore bracketed between a 110 GWh surplus (essentially balanced) and a deficit of 1,875 GWh. Although the most likely outcome is a supply deficit for 2015, it is possible that the region could achieve a balanced position for 2015 under the right conditions.

The projected deficits could be further offset by decreases in weather related energy consumption under a combination of very warm winter weather and much cooler-than-normal summer temperatures. Additionally, there could be weather-related increases in wind farm or small hydro capacity factors that would increase supply. Weather related demand (higher loads in winter or summer) could also result in higher REC demand and increase deficits beyond the weather-normalized assumptions in this analysis.

5. 2015-2020 SUPPLY & DEMAND OUTLOOK

ESAI has developed a longer term outlook for New England REC supply and demand balances that extends through 2020. The methodology is the same as outlined in previous sections of this report; electricity loads are taken from the ISO-NE CELT load report, REC demand is based on state by state renewable standards and production of qualifying renewable energy is estimated from a combination of operational production, the development queue and future additions (projects not yet in the queue). In view of the greater uncertainty associated with longer term projections, this outlook was developed for a base case only, however, the possible effect of the large hydro provisions in the Connecticut RPS was specifically examined.

In 2016 and 2017, there is some visibility in the queue (including recent award announcements for Massachusetts and Connecticut RFPs) and so estimates of 'future' additions are somewhat low. The queue visibility stops beyond 2017, and therefore new additions are solely based on ESAI's estimate of future additions. In 2018 and beyond, ESAI assumes that 350 MW of nameplate onshore wind capacity will be built in each year. ESAI believes that this estimate is optimistic, but achievable with the continued support of state-sponsored RFPs for renewable energy. It is also assumed that renewable enabling transmission will be built to provide grid access to wind farms in favorable locations such as northern Maine.

Figure 13 shows the renewable energy supply for New England in accordance with the categories described above. The operational supply plus imports supply is constant while the development queue provides supply increases through 2017. Future generation increases are moderate until 2018 when 760 GWh are added annually in anticipation of new renewable project additions.

Figure 14 provides an overview of renewable energy demand by state through 2020. Massachusetts renewable requirements increase annually until 2020 when the requirement reaches 15.0 percent (additional annual increases of 1.0 percent will occur unless specifically rescinded by the Massachusetts legislature). Connecticut and New Hampshire also have annual increases through 2020 reaching 20.0 percent and 10.5 percent respectively. Rhode Island reaches its upper limit for requirements at 14.0 percent in 2019, while Maine halts incremental additions to requirements in 2017 at 10.0 percent.

Figure 13: Renewable Energy Supply Outlook for 2015-2020

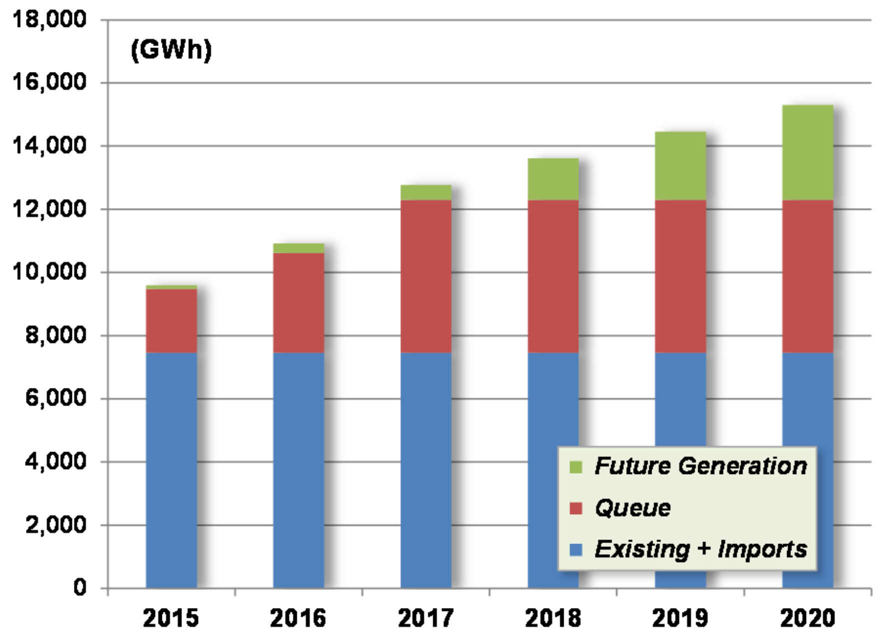
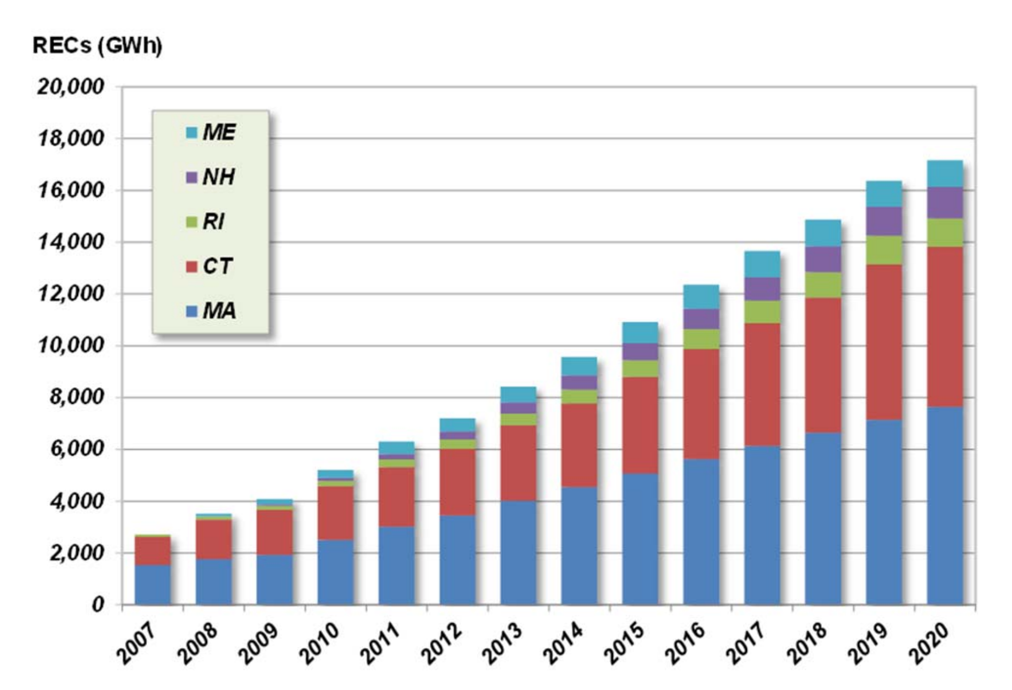


Figure 14: Renewable Energy Demand By State; 2015-2020



5.1. 2015-2020 Base Case Outlook

As noted in Section 4.1, 2015 demand for Tier I RECs is projected to be 10,920 GWh. By 2020, total REC demand for New England is expected to reach 17,315 GWh. Total supply from operational resources, imports, generation under development and future generation is expected to total 9,600 GWh in 2015 and increase to 15,310 GWh in 2020. From 2015 to 2020, the supply gap is expected to widen from 1,320 GWh to 2,005 GWh. The widening supply gap can be seen in Figure 15 and the associated data is provided in Table 10.

Figure 15: New England Supply & Demand Balances; Base Case, 2015-2020

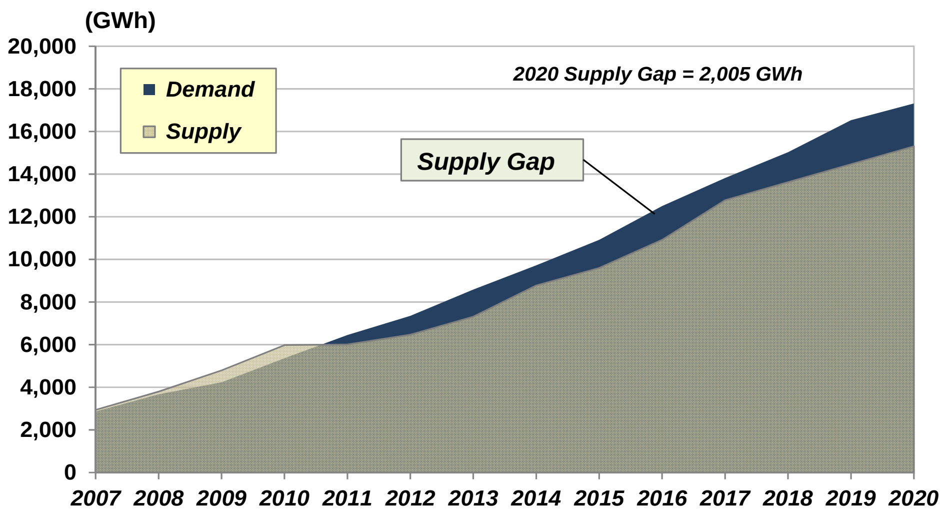


Table 10: New England Supply & Demand Balances; Base Case, 2015-2020

(GWh)	REC Compliance Requirement	Qualified REC Supply	Surplus/(Deficit)
2007	2,868	2,944	76
2008	3,671	3,800	130
2009	4,241	4,795	555
2010	5,365	5,983	617
2011	6,457	6,009	(448)
2012	7,360	6,473	(887)
2013	8,586	7,316	(1,270)
2014	9,725	8,784	(941)
2015	10,920	9,600	(1,320)
2016	12,508	10,923	(1,585)
2017	13,824	12,781	(1,043)
2018	15,030	13,624	(1,406)
2019	16,536	14,467	(2,069)
2020	17,316	15,310	(2,005)

5.2. 2015-2020 Outlook With Connecticut Large Hydro

On June 5, 2013, Connecticut Governor Dannel P. Malloy signed into law new legislation that expands the resource qualifications of CT Class I resources and allows large hydropower to be utilized against CT Class I requirements if certain requirements are met. The large hydro provisions will not impact 2015 REC balances as they would only be implemented in 2016 at the earliest. Large hydro can be used in 2016 and later years if the following triggers are met:

1) An obligated entity pays ACP – This provision presumes that if ACP is paid then supply is short.
2) The CT Department of Energy and Environmental Protection ("DEEP") Commissioner must verify supply shortage–This provision ensures that the supply shortage is real and that there are no negligent actions by those entities that pay ACP.
3) The CT DEEP Commissioner must confirm - that in subsequent years in-state renewable energy is short.
4) Failure to fill gap with an RFP – In light of potential shortages, the DEEP Commissioner must authorize RFPs for long term contracts (up to 10 years) to fill the gap. The Commissioner must verify that the RFP responses are insufficient.

If all of the above triggers are met, then the Commissioner may authorize the qualification of large hydro for 1.0 percent of the renewable requirement in 2016 (14.0 percent is reduced to 13.0 percent). In subsequent years, the large hydro qualification will increase by 1.0 percent per year until the increase reaches 5.0 percent such that in 2020 the requirement could be reduced from 20.0 percent to 15.0 percent. Although it is likely that the first three triggers may be realized, in light of the successful RFPs in Rhode Island and Massachusetts, it appears that successful RFPs for long term renewable energy in Connecticut would avoid the fourth trigger and allow the current renewable targets to remain in place.

In our analysis of the potential impacts of the Connecticut RPS changes, we assume that if the triggers are met, then the Connecticut demand for Tier I RECs is effectively reduced by the appropriate percentages in each year. Figure 16 shows the decline in demand for each year starting in 2016 and growing into 2020 if the full 5.0 percent reduction was allowed. By 2020, the demand reductions would be significant and would reduce the projected deficits as outlined below. In 2016, if the triggers are met, the use of large hydro to meet CT Class I REC requirements would effectively reduce demand by 1.0 percent or 300 GWh. By 2020, if the full 5.0 percent reduction were to be implemented, the use of large hydro would displace over 1,500 GWh of CT Class I REC demand.

Figure 17 below illustrates the shift in the New England supply and demand balance in the scenario in which Connecticut fully utilizes the large hydro qualification. Although the supply outlook remains constant, the use of large hydro effectively reduces Tier I REC demand and significantly narrows the supply gap. The 2020 supply deficit would drop from the Base Case expectation of 2,005 GWh to 460 GWh. We note however, that the recent award of 250 MW of wind and 20 MW of solar resources in the Connecticut RFP reduces the probability that these large hydro provisions will be triggered.

Figure 16: New England Demand for Tier I RECs With & Without CT Reductions

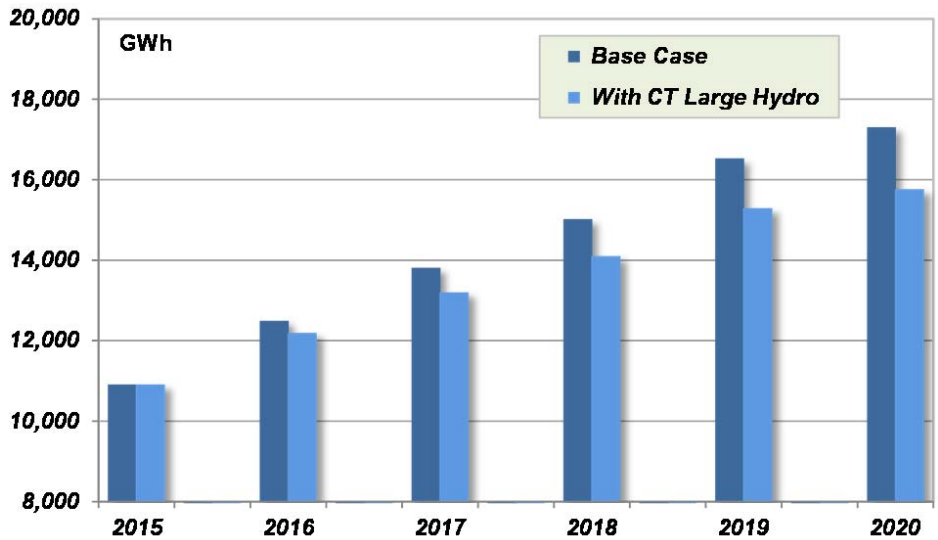
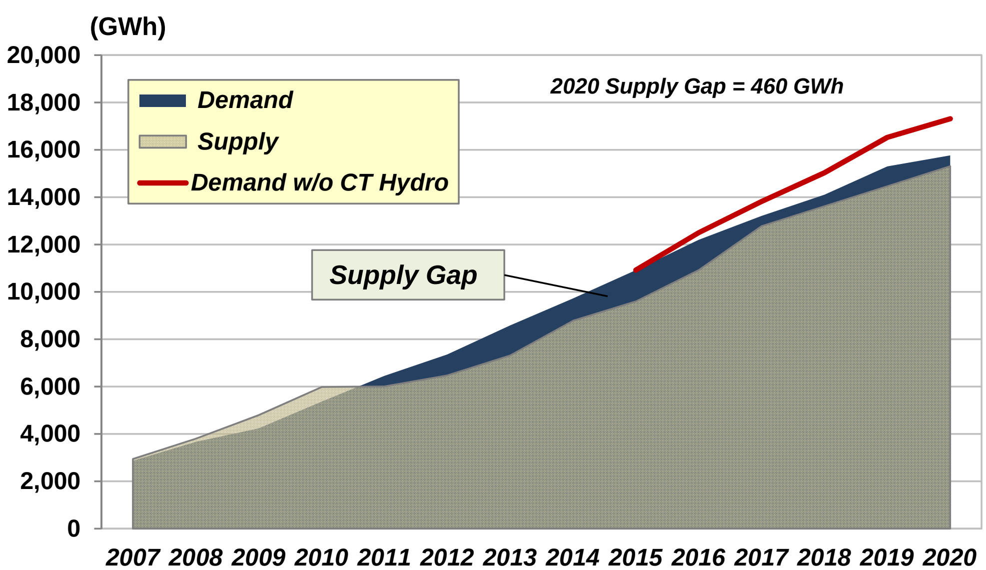


Figure 17: New England Supply & Demand Balances; CT Hydro Case, 2015-2020



6. NARRAGANSETT ELECTRIC REC SUPPLY

Narragansett Electric has developed a long term strategy to utilize RECs procured under the Long Term Contracting Standard for Renewable Energy, and the Distributed Generation Standard Contracts Act to meet its projected REC requirements. Recent RFPs for long term contracts for renewable energy and distributed generation (also renewable) have resulted in procurement of contracted RECs from 2013 to 2029. These contracts are in addition to the 20 year Deepwater Wind contract which runs from 2015 to 2034. Due to this procurement of long term REC supplies, Narragansett Electric could slightly exceed its requirements in 2015, and significantly exceed its requirements in 2016, when the full output of Deepwater Wind would be anticipated. The surplus RECs purchased in 2015 and 2016 can be banked and applied towards meeting increased requirements from 2017 to 2019. An additional RFP and/or additional distributed generation contract enrollments will be held to complete the full requirements of the Long Term Contracting Standard, which requires a total of 788.4 GWh, which is equivalent to 90 MW at 100 percent capacity factor.

7. APPENDIX

Table 11: New England Wind Production & Capacity Factors (EIA-923)

Plant Name	Year	Summer Capacity, MW	Net Generation, MWh	Gen at 100%, MWh	Capacity Factor
Stetson	2010	78.25	151,528	685,470	22.1%
Stetson	2011	82.5	214,093	722,700	29.6%
Stetson	2012	82.5	149,593	722,700	20.7%
Kibby	2009	66	25,982	578,160	4.5%
Kibby	2010	77	152,524	674,520	22.6%
Kibby	2011	132	278,436	1,156,320	24.1%
Kibby	2012	132	263,419	1,156,320	22.8%
Mars Hill	2007	42	99,071	367,920	26.9%
Mars Hill	2008	42	131,621	367,920	35.8%
Mars Hill	2009	42	121,141	367,920	32.9%
Mars Hill	2010	42	120,743	367,920	32.8%
Mars Hill	2011	42	127,554	367,920	34.7%
Mars Hill	2012	42	133,105	367,920	36.2%
Fox Island Wind LLC	2010	4.5	11,795	39,420	29.9%
Fox Island Wind LLC	2011	4.5	11,099	39,420	28.2%
Beaver Ridge Wind	2010	4.5	14,050	39,420	35.6%
Record Hill, ME	2012	50.6	109,917	443,256	24.8%
Rollins, ME	2012	60	126,677	525,600	24.1%
Hull Wind II	2008	1.8	3,674	15,768	23.3%
Hull Wind II	2009	1.8	5,537	15,768	35.1%
Hull Wind II	2010	1.8	6,083	15,768	38.6%
Hull Wind II	2011	1.8	4,106	15,768	26.0%
Deer Island	2009	1.2	209	10,512	2.0%
Deer Island	2010	1.2	2,231	10,512	21.2%
Deer Island	2011	1.225	1,912	10,731	17.8%
Richard F Wheeler	2010	3.28	6,001	28,733	20.9%
Richard F Wheeler	2011	3.28	5,071	28,733	17.6%
Falmouth (Notus)	2010	1.375	2,117	12,045	17.6%
Falmouth (Notus)	2011	1.65	4,807	14,454	33.3%
Lempster Wind, NH	2009	22	62,478	192,720	32.4%
Lempster Wind, NH	2010	24	75,688	210,240	36.0%
Lempster Wind, NH	2011	24	66,092	210,240	31.4%
Searsburg Wind, VT	2008	6	10,235	52,560	19.5%
Searsburg Wind, VT	2009	6	11,589	52,560	22.0%
Searsburg Wind, VT	2010	6	13,892	52,560	26.4%
Searsburg Wind, VT	2011	6	10,829	52,560	20.6%
Searsburg Wind, VT	2012	6	12,172	52,560	23.2%
Sheffield Wind, VT	2011	40	22,356	350,400	6.4%
Sheffield Wind, VT	2012	40	80,869	350,400	23.1%
			2,650,296	10,746,418	24.7%

Table 12: ESAI Queue Projects (Under Development); 2013-2017

	Facilty Name	Probability of Completion	State	Source	Capacity	Start Date	1st Full Year Operation	Capacity Factor	2017 Forecast Generation
2013	Laidlaw Berlin Biomass Energy Plant	100%	NH	Biomass	75.0	12/31/2013	2014	85.0%	558.5
2013	Solar (unspecified)	5%	MA	Solar	6.0	12/31/2013	2014	14.5%	0.4
2013	Skelton Station Modernization Phase 1 and 2	100%	ME	Hydro	2.4	12/31/2013	2014	45.0%	9.5
2013	Black Bear Hydro	100%	ME	Hydro	4.0	12/31/2013	2014	90.2%	31.3
2013	MA Solar Carve-Out	85%	MA	Solar	435.4	12/31/2013	2014	14.5%	470.1
2013	2013 PV (RI)	100%	RI	Solar	7.5	12/31/2013	2014	13.0%	8.5
2014	Wind (unspecified)	5%	ME	WND	19.8	12/31/2014	2015	27.5%	2.4
2014	Plainfield Renewable Energy Project	100%	CT	Biomass	37.5	1/1/2014	2014	85.0%	279.2
2014	Wind (unspecified)	5%	NH	WND	8.6	6/30/2014	2015	27.5%	1.0
2014	Solar (unspecified)	5%	MA	Solar	4.9	11/1/2014	2015	14.5%	0.3
2014	Canton Mountain Winds	5%	ME	WND	24.0	11/1/2014	2015	27.5%	2.9
2014	Saddleback Ridge Wind Project	15%	ME	WND	32.0	8/15/2014	2015	27.5%	11.6
2014	Wind (unspecified)	5%	ME	WND	1.2	11/15/2014	2015	27.5%	0.1
2014	Douglas Woods Wind Farm	5%	MA	WND	30.0	10/1/2014	2015	27.5%	3.6
2014	Wind (unspecified)	5%	NH	WND	16.1	10/31/2014	2015	27.5%	1.9
2014	Wind (unspecified)	5%	ME	WND	48.0	10/31/2014	2015	27.5%	5.8
2014	Wind (unspecified)	5%	ME	WND	3.6	11/1/2014	2015	27.5%	0.4
2014	Wind (unspecified)	5%	NH	WND	34.0	11/1/2014	2015	27.5%	4.1
2014	Deerfield Wind	50%	VT	WND	30.0	12/31/2014	2015	27.5%	36.1
2014	Pisgah Mountain (Clifton)	20%	ME	WND	9.0	12/31/2014	2015	27.5%	4.3
2014	Passadumkeag Wind Project	5%	ME	WND	39.8	12/31/2014	2015	27.5%	4.8
2014	Pisgah Mountain Increase	20%	ME	WND	0.1	12/31/2014	2015	27.5%	0.0
2014	Hydro Uprate U4	75%	ME	Hydro	1.6	12/31/2014	2015	45.0%	4.7
2014	Orbit Energy HSAD Biogas	100%	RI	Biogas	3.2	4/30/2014	2015	83.0%	23.3
2014	Peskotmuhkati Wind Farm	75%	ME	WND	20.0	12/31/2014	2015	27.5%	36.1
2014	Forbes Street Solar	100%	RI	Solar	3.7	1/1/2014	2014	13.6%	4.4
2014	2014 PV (RI)	100%	RI	Solar	2.2	12/31/2014	2015	14.5%	2.8
2014	WED Coventry One	100%	RI	WND	1.5	1/1/2014	2014	23.8%	3.1
2015	Oakfield II Wind - Keene Road	75%	ME	WND	147.6	12/31/2015	2016	27.5%	266.7
2015	Bowers Mountain	75%	ME	WND	48.0	1/31/2015	2015	38.2%	120.5
2015	Hancock Wind	50%	ME	WND	51.0	12/31/2015	2016	27.5%	61.4
2015	West Hill Wind	5%	MA	WND	12.5	12/1/2015	2016	27.5%	1.5
2015	Wind (unspecified)	5%	MA	WND	4.8	7/1/2015	2016	27.5%	0.6
2015	Wind (unspecified)	5%	NH	WND	58.2	10/31/2015	2016	27.5%	7.0
2015	Seneca Mountain Wind Project	5%	VT	WND	60.0	12/1/2015	2016	27.5%	7.2
2015	Highland Wind	5%	ME	WND	100.0	12/31/2015	2016	27.5%	12.0
2015	Deepwater, Block Island	75%	RI	WND	30.0	12/31/2015	2016	40.0%	78.8
2015	Cape Wind Turbine Generators	100%	MA	WND	468.0	10/1/2015	2016	37.0%	1516.9
2015	Passamaquoddy Wind	75%	ME	WND	38.2	12/31/2015	2016	27.5%	69.0
2016	Grandpa's Knob Wind	5%	VT	WND	20.0	12/31/2016	2017	27.5%	2.4
2016	Fair Haven Biomass	5%	VT	Biomass	33.0	3/30/2016	2017	85.0%	12.3
2016	Springfield Biomass	1%	MA	Biomass	36.7	7/15/2016	2017	85.0%	2.7
2016	Hywind Maine Pilot Offshore Wind	5%	ME	WND	11.9	9/13/2016	2017	27.5%	1.4
2016	Number 9 Wind Project - CT RFP	75%	ME	WND	250.0	12/30/2016	2017	27.5%	451.7
2016	Wind (unspecified)	5%	ME	WND	33.0	11/1/2016	2017	27.5%	4.0
2016	Wind (unspecified)	5%	ME	WND	101.8	11/1/2016	2017	27.5%	12.3
2016	Wind (unspecified)	5%	ME	WND	90.0	12/31/2016	2017	27.5%	10.8
2016	unspecified	5%	ME	WND	99.0	10/31/2016	2017	27.5%	11.9
2017	Bingham Wind (Blue Sky West)	75%	ME	WND	186.0	1/1/2017	2017	27.5%	336.1
2017	Wild Meadows Wind Project	75%	NH	WND	75.9	1/31/2017	2017	27.5%	137.1
2017	Fusion Solar Center	75%	CT	Solar	20.0	12/31/2016	2017	14.5%	19.1
2017	Fletcher Mountain Wind	75%	ME	WND	97.1	1/1/2017	2017	27.5%	175.4