Raquel Webster
Senior Counsel

November 15, 2017

BY HAND DELIVERY AND ELECTRONIC MAIL

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

RE: Docket 4756 - The Narragansett Electric Company, d/b/a National Grid
2018 System Reliability Procurement Report
Appendix 1

Dear Ms. Massaro:

I have enclosed ten copies of National Grid's[1] 2017 New England Electric Peak (MW) Forecast for the long term, 2017 to 2031. This document is a summary of the Company's load growth rates, which are incorporated into distribution planning analysis to assess the reliability of its electrical infrastructure. The analysis determines wires or non-wires solutions to any forecasted issue.

The Company inadvertently omitted this document from Appendix 1 of the Company's 2018 System Reliability Procurement (SRP) Report. This document is referenced on page 15 of the 2018 SRP Report.

Thank you for your attention to this filing. If you have any questions, please contact me at 781-907-2121.

Sincerely,

Raquel Webster

Enclosure

cc: Docket 4756 Service List
Jon Hagopian, Esq.
Steve Scialabba, Division

[1] The Narragansett Electric Company d/b/a National Grid (National Grid or Company).

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Certificate of Service

I hereby certify that a copy of the cover letter and any materials accompanying this certificate was electronically transmitted to the individuals listed below.

The paper copies of this filing are being hand delivered to the Rhode Island Public Utilities Commission and to the Rhode Island Division of Public Utilities and Carriers.

Joanne M. Scanlon

November 15, 2017
Date

Docket No. 4755 - National Grid – Energy Efficiency Program Plan for 2018
Docket No. 4756 - National Grid – 2018 System Reliability Procurement Report (SRP)
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NEW ENGLAND

2017 Electric Peak (MW) Forecast

Long-Term: 2017 to 2031

[Massachusetts Electric Company]
[Nantucket Electric Company]
[Narragansett Electric Company]

November 2016

Rev. 0, 11/01//2016

Advanced Data & Analytics
Customer Organization

nationalgrid

REVISION HISTORY & GENERAL NOTES

Revision History

Version	Date	Changes
Rev. 0	11/01/2016	- ORIGINAL;

General Notes:

- Input data through **August 2016**; Projections from September 2016 forward;
- Economic data is from Moody's vintage **August 2016**.
- Energy Efficiency data is vintage **April 2016**
- Distributed Generation data is vintage **August 31, 2016**
- Peak MW and Energy GWH source is ISO-NE/National Grid meter-reconciled data (1/2003 to 6/2016); internal unreconciled **preliminary** data (7/2016 to 8/2016)
- Peak load data is metered zone load
- "Coincident" in this report refers to coincident with each jurisdiction's (MA or RI) peak and does not in any way refer to ISO-NE peak days & times.
- "Non-Coincident" refers to each "Zone's" peak day/time.
- References to "Zones" refers to ISO-NE designations
- The term "Weather-Normal" and "Extreme" 90/10 ("1 in 10") and 95/5 ("1 in 20") weather are based on 20 year average.

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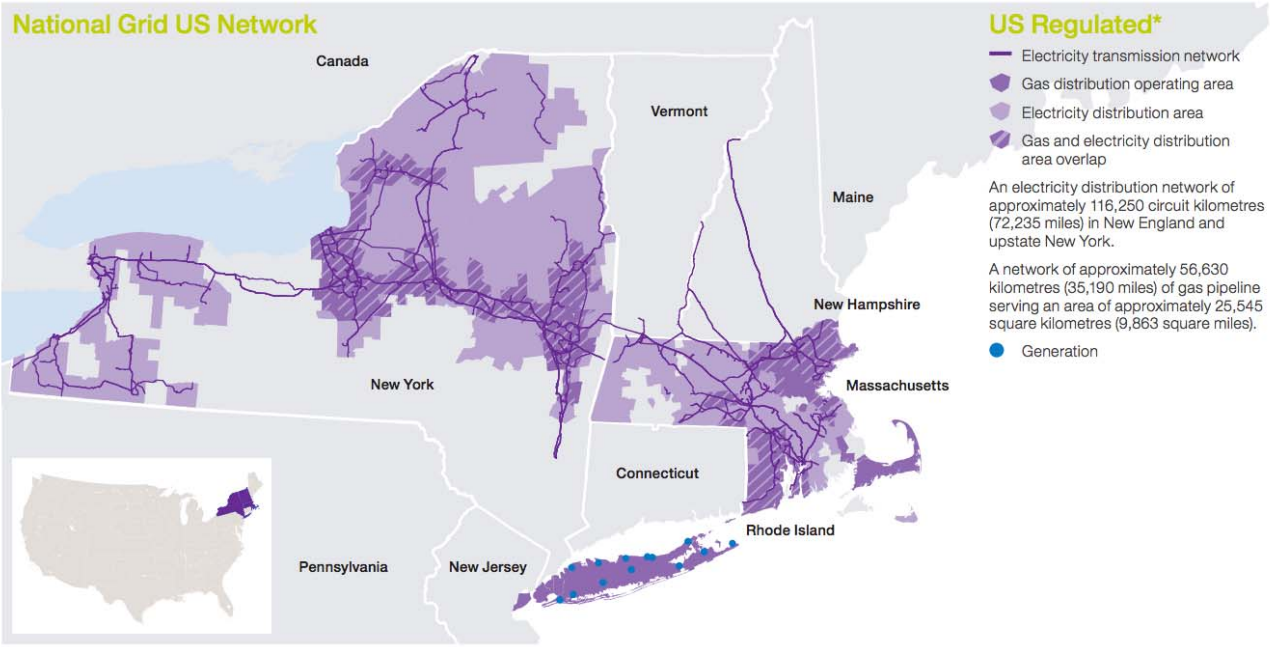
Summary

National Grid's US electric system is comprised of four companies serving 3.4 million customers in Massachusetts Rhode Island and Upstate New York. The four electric distribution companies are Massachusetts Electric Company and Nantucket Electric Company, serving 1.3 million customers in Massachusetts, Narragansett Electric Company, serving 0.5 million customers Rhode Island and Niagara Mohawk Power Company, serving 1.6 million customers in upstate New York. Figure 1 shows the Company's service territory in the U.S..

Figure 1



*Access to electricity and gas transmission and distribution assets on property owned by others is controlled through various agreements.

Source: National Grid

Forecasting peak electric load is important to the Company's capital planning process because it enables the Company to assess the reliability of its electrical infrastructure, enables timely procurement and installation of required facilities, and it provides system planning with information to prioritize and focus their efforts. In addition to these internal reliability and capital planning internal uses, the peak forecast is also used to support regulatory requirements with the state, federal, and other agencies.

Massachusetts

The Company's peak demand in Massachusetts in 2016 was 4,597[1], on Thursday, August 11th. The 2016 peak was 11% below the Massachusetts all-time high of 5,190 MW reached on Wednesday, August 2, 2006.

[1] Meter Data Service's system level PRELIMINARY peak and subject to change

This summer‘s peak was considered about midway between an average (normal) and higher load extreme weather scenario. This year’s peak is considered 125 MW above the peak the company would have experienced under normal weather conditions. Thus, on a weather adjusted “normal” basis this year’s peak was estimated to be 4,472 MW, an decrease of 2.5% vs. last year’s weather-adjusted ‘normal’ peak.

Table 1 below shows the historical and projected forecast for the Company.

Table 1

Massachusetts COINCIDENT Summer Peaks (Actuals and 50/50, 90/10, & 95/5 Weather-Adjusted Cases)

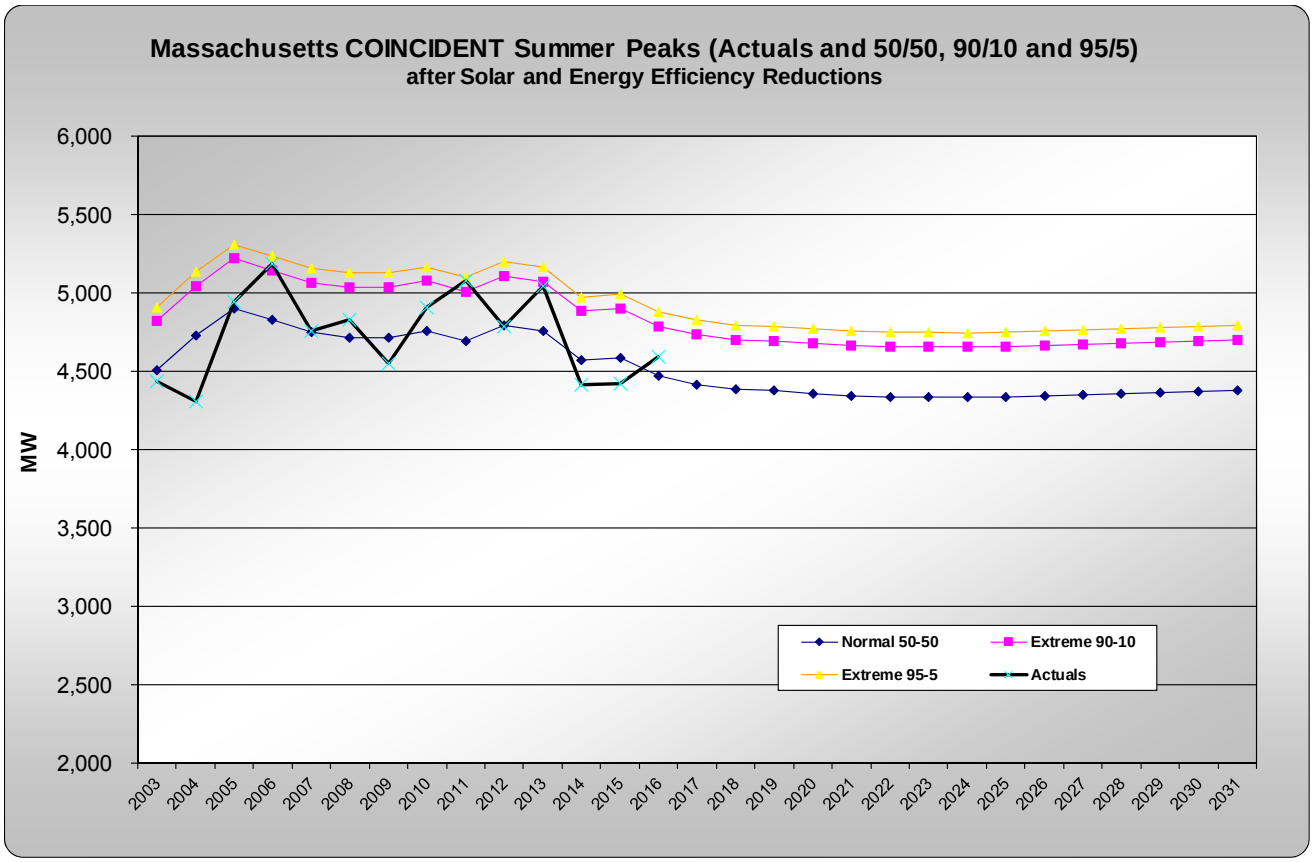
after Solar and Energy Efficiency Reductions

	Actuals		Normal 50-50		Extreme 90-10		Extreme 95-5	
YEAR	(MW)	(% Grwth)	(MW)	(% Grwth)	(MW)	(% Grwth)	(MW)	(% Grwth)
2003	4,440		4,507		4,822		4,911	
2004	4,311	-2.9%	4,729	4.9%	5,047	4.7%	5,137	4.6%
2005	4,946	14.7%	4,902	3.6%	5,221	3.4%	5,311	3.4%
2006	5,190	4.9%	4,828	-1.5%	5,148	-1.4%	5,238	-1.4%
2007	4,758	-8.3%	4,749	-1.6%	5,068	-1.5%	5,159	-1.5%
2008	4,831	1.5%	4,719	-0.6%	5,038	-0.6%	5,129	-0.6%
2009	4,552	-5.8%	4,718	0.0%	5,037	0.0%	5,128	0.0%
2010	4,911	7.9%	4,761	0.9%	5,079	0.8%	5,170	0.8%
2011	5,078	3.4%	4,692	-1.4%	5,011	-1.3%	5,101	-1.3%
2012	4,789	-5.7%	4,792	2.1%	5,111	2.0%	5,202	2.0%
2013	5,047	5.4%	4,757	-0.7%	5,076	-0.7%	5,167	-0.7%
2014	4,414	-12.5%	4,570	-3.9%	4,887	-3.7%	4,977	-3.7%
2015	4,426	0.3%	4,587	0.4%	4,903	0.3%	4,992	0.3%
2016	4,597	3.9%	4,472	-2.5%	4,790	-2.3%	4,880	-2.2%
2017			4,419	-1.2%	4,737	-1.1%	4,827	-1.1%
2018			4,386	-0.8%	4,705	-0.7%	4,795	-0.7%
2019			4,378	-0.2%	4,698	-0.2%	4,788	-0.1%
2020			4,361	-0.4%	4,681	-0.4%	4,772	-0.4%
2021			4,348	-0.3%	4,668	-0.3%	4,758	-0.3%
2022			4,341	-0.2%	4,661	-0.1%	4,752	-0.1%
2023			4,338	-0.1%	4,658	-0.1%	4,749	-0.1%
2024			4,337	0.0%	4,658	0.0%	4,748	0.0%
2025			4,340	0.1%	4,661	0.1%	4,752	0.1%
2026			4,345	0.1%	4,666	0.1%	4,757	0.1%
2027			4,351	0.1%	4,672	0.1%	4,763	0.1%
2028			4,357	0.2%	4,679	0.2%	4,771	0.2%
2029			4,365	0.2%	4,687	0.2%	4,779	0.2%
2030			4,372	0.2%	4,695	0.2%	4,787	0.2%
2031			4,381	0.2%	4,705	0.2%	4,796	0.2%
Compound Avg. 10 yr ('06 to '16)		-1.2%		-0.8%		-0.7%		-0.7%
Compound Avg. 5 yr ('11 to '16)		-2.0%		-1.0%		-0.9%		-0.9%
Compound Avg. 5 yr ('16 to '21)				-0.6%		-0.5%		-0.5%
Compound Avg. 10 yr ('16 to '26)				-0.3%		-0.3%		-0.3%
Compound Avg. 15 yr ('16 to '31)				-0.1%		-0.1%		-0.1%

The forecast indicates that the area will experience a slightly negative growth of -0.1% per year over the next fifteen years (after the impacts for energy efficiency and solar PV).

Figure 1 shows the Massachusetts forecast graphically.

Figure 1



Rhode Island

The Company's peak demand in Rhode Islands in 2016 was 1,803[2], on Friday, August 12th. The 2016 peak was 9% below the Rhode Island all-time high of 1,985 MW reached on Wednesday, August 2, 2006.

This summer's peak was considered slightly above an average (normal) weather scenario. This year's peak is considered 21 MW above the peak the company would have experienced under normal weather conditions. Thus, on a weather adjusted "normal" basis this year's peak was estimated to be 1,782 MW, an decrease of 3.1% vs. last year's weather-adjusted 'normal' peak.

[2] Meter Data Service's system level PRELIMINARY peak and subject to change

Table 2 below shows the historical and projected forecast for the Company.

Table 2

Rhode Island Summer Peaks (Actuals and 50/50, 90/10, & 95/5 Weather-Adjusted Cases)

after Solar and Energy Efficiency Reductions

	Actuals		Normal 50-50		Extreme 90-10		Extreme 95-5		WTHI
YEAR	(MW)	(% Grwth)	(MW)	(% Grwth)	(MW)	(% Grwth)	(MW)	(% Grwth)	ACTUAL
2003	1,670	#DIV/0!	1,783	#DIV/0!	1,932	#DIV/0!	1,974	#DIV/0!	80.1
2004	1,628	-2.5%	1,832	2.7%	1,980	2.5%	2,022	2.5%	78.5
2005	1,805	10.8%	1,760	-3.9%	1,908	-3.6%	1,950	-3.5%	83.1
2006	1,985	10.0%	1,789	1.6%	1,937	1.5%	1,979	1.5%	85.9
2007	1,777	-10.5%	1,849	3.4%	1,998	3.1%	2,039	3.1%	80.9
2008	1,824	2.6%	1,786	-3.4%	1,934	-3.2%	1,976	-3.1%	82.9
2009	1,713	-6.1%	1,816	1.7%	1,964	1.5%	2,006	1.5%	80.3
2010	1,872	9.3%	1,749	-3.7%	1,897	-3.4%	1,939	-3.3%	84.5
2011	1,974	5.5%	1,836	5.0%	1,985	4.6%	2,026	4.5%	84.8
2012	1,892	-4.2%	1,826	-0.6%	1,974	-0.5%	2,016	-0.5%	83.5
2013	1,965	3.9%	1,835	0.5%	1,983	0.5%	2,025	0.5%	84.7
2014	1,653	-15.9%	1,752	-4.5%	1,900	-4.2%	1,942	-4.1%	80.4
2015	1,738	5.1%	1,839	5.0%	1,987	4.6%	2,029	4.5%	80.4
2016	1,803	3.8%	1,782	-3.1%	1,930	-2.9%	1,972	-2.8%	82.6
2017			1,793	0.6%	1,944	0.7%	1,986	0.7%	
2018			1,783	-0.6%	1,934	-0.5%	1,977	-0.5%	
2019			1,780	-0.2%	1,931	-0.1%	1,974	-0.1%	
2020			1,780	0.0%	1,933	0.1%	1,976	0.1%	
2021			1,786	0.3%	1,939	0.3%	1,982	0.3%	
2022			1,794	0.5%	1,948	0.5%	1,991	0.5%	
2023			1,804	0.5%	1,958	0.5%	2,001	0.5%	
2024			1,812	0.5%	1,967	0.5%	2,011	0.5%	
2025			1,821	0.5%	1,977	0.5%	2,021	0.5%	
2026			1,830	0.5%	1,987	0.5%	2,031	0.5%	
2027			1,840	0.5%	1,998	0.5%	2,042	0.5%	
2028			1,850	0.6%	2,009	0.6%	2,053	0.6%	
2029			1,861	0.6%	2,020	0.6%	2,065	0.6%	
2030			1,872	0.6%	2,032	0.6%	2,077	0.6%	
2031			1,883	0.6%	2,044	0.6%	2,090	0.6%	

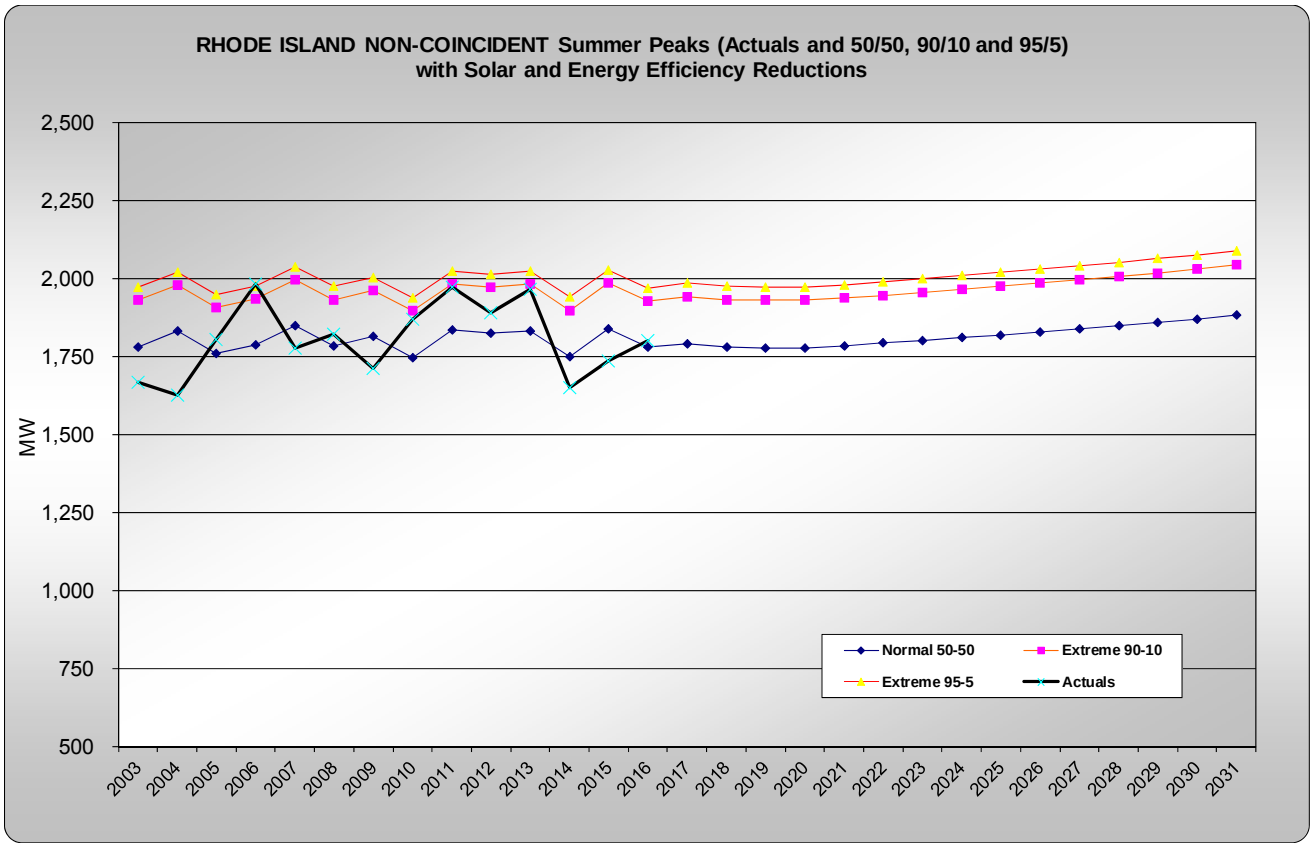
Compound Avg. 10 yr ('06 to '16)	-1.0%	0.0%	0.0%	0.0%
Compound Avg. 5 yr ('11 to '16)	-1.8%	-0.6%	-0.6%	-0.5%
Compound Avg. 5 yr ('16 to '21)		0.0%	0.1%	0.1%
Compound Avg. 10 yr ('16 to '26)		0.3%	0.3%	0.3%
Compound Avg. 15 yr ('16 to '31)		0.4%	0.4%	0.4%

WTHI	
NORMAL	82.2
EXTREME 90/10	85.0
EXTREME 95/5	85.8

The forecast indicates that the area will experience a growth of 0.4% per year over the next fifteen years (after the impacts for energy efficiency and solar PV).

Figure 2 shows the Rhode Island forecast graphically.

Figure 2



Forecast Methodology

The Company forecasts peak MW demands in Massachusetts, Rhode Island and Nantucket. In Massachusetts, it forecasts peaks for the three ISO-NE zones that make up National Grid's service territory in that state. It does this for both summer and winter seasonal peaks. Non-coincident demand is the demand that each region experiences, regardless of whether that demand is also the same day and time each Company's peak. Coincident demand is each zone's peak at the same day and time it's corresponding Company's peak [RI zone > NECO peak; NEMA, SEMA and WCMA > MECO peak). The four regions forecast are:

- The Northeast Massachusetts Region, comprised of the portions of the ISO-NE Load Zones NEMA served by the Company; includes, among others the North shore and Merrimack areas,

- The Southeast Massachusetts Region, comprised of the portions of the ISO-NE Load Zones SEMA served by the Company; includes, among others, the South shore, Attleboro, Uxbridge and Fall River areas,
- The West Central Massachusetts Region, comprised of the portions of the ISO-NE Load Zones WCMA served by the Company; includes, among others, the Worcester, central and western areas;
- The Rhode Island region, comprised of the portion of the ISO-NE Load Zone of the same name, includes the state of Rhode Island.

The overall approach to the peak forecast is to use energy growth, which is developed using econometric methods, adjusted by historical trends in load factor. This method allows the peak MW forecasts to grow along with energy growth rates for each zone, however also allows the peak to adjust and follow historical trends in the relationship between MW growth and GWh growth (i.e. load factor). County peak growth rates are introduced to differentiate varying economic conditions among the different counties in each zone. County growth rates are determined based on each county's historical energy trend to further differentiate between the various growth rates across the different areas. A detailed breakdown of the county forecasted growths are presented in Appendix B of this report. Planning Supply Areas (PSAs) are similarly provided as Appendix C.

Post-model reductions were made to the initial forecast models for energy efficiency (EE) and solar (DG) and increased for historical demand response (DR) impacts.

The results of this forecast are used as input into various system planning studies. The forecast is presented for all three weather scenarios. The transmission planning group uses the extreme-90/10 weather scenario for its planning purposes. For distribution planning, the degree of diversity is reduced and the variability of load is greater, so a 95/5 forecast is used.

Distributed Energy Resources (DERs)

In New York State there are a number of policies, programs and technologies that are impacting customer loads. These include, but are not limited to energy efficiency, distributed generation (specifically solar distributed generation),demand response and electric vehicles. These collectively are termed distributed energy resources because they impact the loads at the customer level, as opposed to traditional, centralized power supplies.

Energy Efficiency (EE)

National Grid has been running energy efficiency programs in its New England jurisdictions for a number of years and will continue to do so for the foreseeable future. In the short-term (one to three years), energy efficiency targets are based on approved company programs. Over the longer term, programs are expected to continue, but at a reduced level to account for saturation of measures and increased costs per unit of savings.

Figure 3 shows the expected loads and energy efficiency program reductions to deliveries by year for Massachusetts. As of 2016, it is estimated that these EE programs have reduced loads by 646 MW than if there were no programs run. By 2031, it is expected that this reduction will grow to 1,491 MW or 24.3% of what load would have been had these programs not been implemented. Over the fifteen year planning horizon these reductions lower annual growth from 1.1% to 0.1% per year.

Figure 3

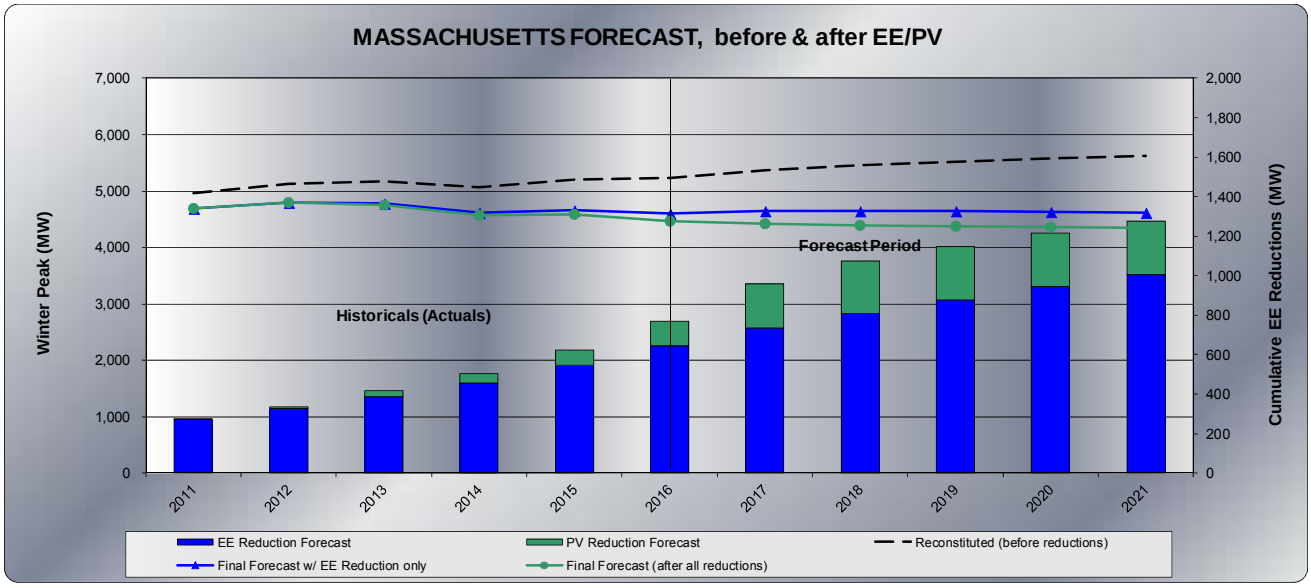
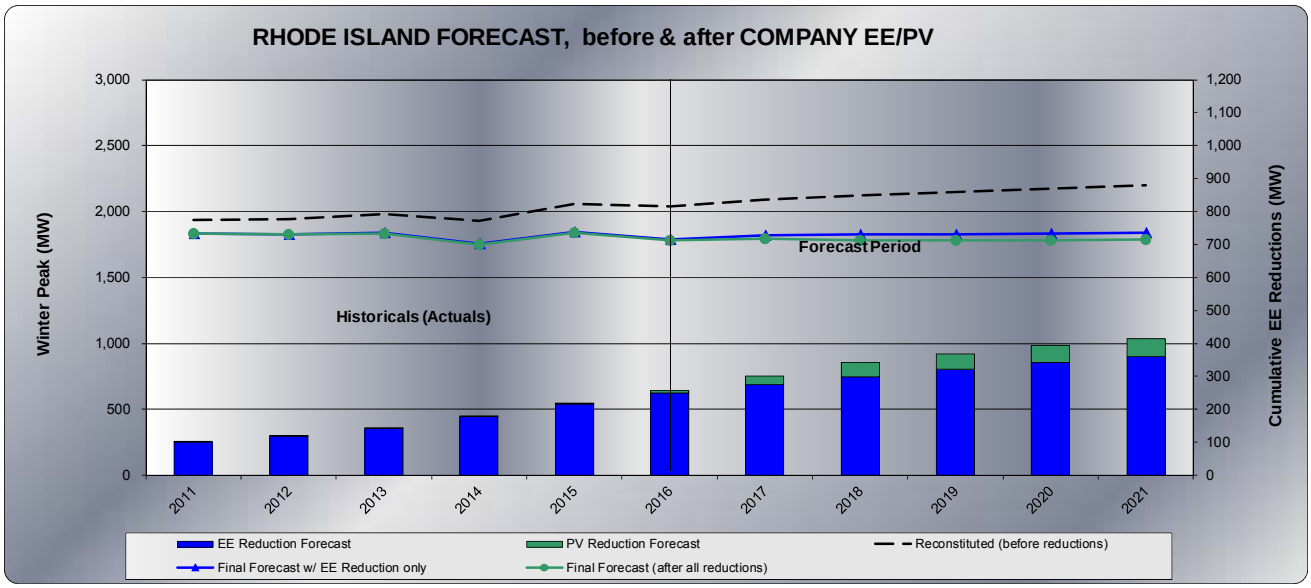


Figure 4 shows the expected loads and energy efficiency program reductions to deliveries by year for Rhode Island. As of 2016, it is estimated that these EE programs have reduced loads by 248 MW than if there were no programs run. By 2031, it is expected that this reduction will grow to 510 MW or 20.8% of what load would have been had these programs not been implemented. Over the fifteen year planning horizon these reductions lower annual growth from 1.2% to 0.5% per year.

Figure 4



Distributed Generation (Solar – PV)

There has been a rapid increase in the adoption of solar[3] throughout New England. In Massachusetts state policy is now targeting up to 1,600 MW in solar installations by the year 2020. While there are no specific company by company goals in this policy, the company's pro-rata share by load would be about 800 of nameplate MWs. In Rhode Island state policy is to reach 200 MW of DG by 2019. The peak reductions associated with these connections are expected to reduce company peaks and is captured in this forecast. In the short-term (one to three years) estimated increases in solar in the company's service territory are based on applications already in the 'queue' and the average time to be installed. Over the longer term, it is assumed that solar in the company's area will reach[4] its pro-rata share of the state-wide policy goal. This assumes a continuation, but at a somewhat lower level than the current and near-term annual growth rates. Post policy goals years it is expected that solar – PV reductions will continue to increase at incremental annual level reached at the policy target years[5].

Figure 3 above shows the expected loads and solar reductions to peaks by year for Massachusetts. As of 2016, it is estimated that this technology may have already reduced

[3] The Company limits this discussion to the impacts of solar distributed generation because it is the single largest contributor and the fastest growing of all distributed generation technologies at this time.
[4] Reach or exceed. In the case of Massachusetts current PV already installed plus those applications in the 'queue' are expected to cause the Company to surpass its pro-rata share of the statewide goal prior to 2020.
[5] In the case of MA, since it is expected that the Company will greatly surpass its pro-rata share of the statewide PV goal earlier than 2020, by 2020 new PV installations are greatly reduced and over the subsequent years are close to zero. Should the state policy goals be increased, then this will be revisited at that time.

system peak loads by 123 MW. By 2031 it is expected that these reductions may grow to 270 MW[6], or 4.4% of what load would have been had this technology not been installed. Over the fifteen year planning horizon these reductions lower annual growth from positive 0.1% to negative -0.1% per year.

Figure 4 above shows the expected loads and solar reductions to peaks by year for Rhode Island. As of 2016, it is estimated that this technology may have already reduced system peak loads by 9 MW. By 2031 it is expected that these reductions may grow to 60 MW, or 2.4% of what load would have been had this technology not been installed. Over the fifteen year planning horizon these reductions lower annual growth from positive 0.5% to 0.4% per year.

Explicit reductions to system peaks have been made for these energy efficiency and solar PV programs.

Demand Response

Demand Response (or "DR") are programs that actively target reductions to peak demand during hours of high expected demand and/or reliability problems. These are in contrast to the more passive energy efficiency savings discussed above that provide savings throughout the year. The DR programs enable utilities and operating areas, such as the New England Independent System Operator (ISO-NE) to take action in response to a system reliability concern or economic (pricing) signal. During these events customers can actively participate by either cutting their load or by turning on a generator to displace load from behind the customer's meter.

The ISO-NE has been implementing these type programs for a number of years now and for the purposes of this report are referred to as "wholesale DR". These programs have been activated several times over the last decade. The Company's policy has been to add-back reductions from these call-outs to its reported system peak numbers. This is because the Company is not in control of the call-out days nor times and thus there is no guarantee that these ISO –NE call-outs would be at the times of Company peaks. Therefore, the Company recognizes their existence, but must plan in the event that they are not called.

[6] These are Company system summer peak impacts; these are approximately 21% of connected PV MWs.

Table 3 shows the expected calculated reductions* for the historical call-outs on the peak days.

Table 3

DATE	HOUR	NEMA	SEMA	WCMA	RI
11-Aug-2016	16	4.9	5.4	16.7	10.4
11-Aug-2016	17	4.9	4.9	17.1	10.0
11-Aug-2016	18	4.5	3.7	15.9	8.8
11-Aug-2016	19	3.7	3.5	15.5	8.5
19-Jul-2013	14	4.6	6.0	13.5	9.8
19-Jul-2013	15	5.2	6.0	14.0	11.7
19-Jul-2013	16	4.4	5.1	13.5	8.8
19-Jul-2013	17	4.4	4.2	12.3	9.8
19-Jul-2013	18	4.2	3.2	12.3	7.8
19-Jul-2013	19	4.0	3.7	10.1	5.9
19-Jul-2013	20	3.8	3.7	8.4	5.9
22-Jul-2011	13	9.3	12.9	16.3	24.8
22-Jul-2011	14	13.3	18.3	23.2	35.2
22-Jul-2011	15	15.1	20.7	26.3	39.9
22-Jul-2011	16	14.8	20.4	25.8	39.2
22-Jul-2011	17	14.2	19.6	24.8	37.7
22-Jul-2011	18	13.1	18.0	22.8	34.7
02-Aug-2006	13	1.0	7.0	13.5	36.1
02-Aug-2006	14	1.0	7.0	13.5	36.1
02-Aug-2006	15	1.0	7.0	13.5	36.1
02-Aug-2006	16	1.0	7.0	13.5	36.1
02-Aug-2006	17	1.0	7.0	13.5	36.1
02-Aug-2006	18	1.0	7.0	13.5	36.1
01-Aug-2006	16	0.2	1.1	2.2	5.8
01-Aug-2006	17	0.2	1.1	2.2	5.8
01-Aug-2006	18	0.2	1.1	2.2	5.8
01-Aug-2006	19	0.2	1.1	2.2	5.8
01-Aug-2006	20	0.2	1.1	2.2	5.8

*It should be noted that the absolute MW do not always translate into one-to-one reductions to the peak depending on the timing of DR call-outs and pre-DR metered loads.

The Company is exploring the creation of DR programs at the 'retail', or customer level. In contrast to the wholesale level DR programs implemented by the ISO-NE, these programs would be activated by the Company. This will continue to be monitored and included as applicable.

Plug-in Electric Vehicles

Over the longer-term, the forecast results may be further adjusted for the penetration of plug-in electric vehicles (PEVs). Electric vehicles of interest are those that "plug-in" to the electric system and include "plug-in hybrid electric vehicles" (HEVs) and "plug-in 'battery-only' electric vehicles" (BEVs). These two types are those that could have potential impacts on the electric network.

National Grid has developed estimates for several scenarios covering a mix of different levels of future adoption of PEVs. These scenarios generally range low to higher levels of adoption. These scenarios include:

- Annual Energy Outlook (AEO): This scenario uses information from the Department of Energy's 2016 AEO[7] report to determine a scenario for PEVs in National Grid's share of Massachusetts and Rhode Island. The uses the AEO "Reference" case.
- Percent of New Registrations: This scenario uses the historical adoption rate of "non plug-in hybrid electric vehicles" (NPHEVs) as a proxy for how the plug-in electric vehicle adoption might behave. This scenario is determined as a function of new PEV registrations each year as a percent of all new vehicle registrations[8]. NPHEVs have been in the market for over ten years and have a record of adoption over that time frame. This scenario assumes that PEVs, which have not until recently begun to be widely adopted in the marketplace, may behave similarly to that of NPHEVs. This scenario is considered the Base Case.
- Zero Emissions Vehicles (ZEVs) target: This scenario assumes that PEV adoption meets the ZEV target of about 300,000[9] in Massachusetts and 45,000 in Rhode Island by the year 2025. National Grid is assumed to garner a share of that goal as a function of its current share of PEVs in its service territory as a percent PEVs in the entire state. Current levels of PEVs are ramped up between now and the year 2025 to achieve those shares.

In Massachusetts PEV adoption may result in increased system peaks of up to 1.3% by 2031 depending on scenario. PEV volumes grow close to 44,000 for the fifteen years of the planning horizon, or 2031, for the basecase. For Rhode Island, peaks may increase by 1.3% by 2031 in the highest case or only 0.2% in the basecase. Basecase electric vehicle volumes are targeted at about 11,600 by 2031 in the RI basecase

Figures 5 and 6 show the PEV volumes assumed in each scenario in National Grid's Massachusetts and Rhode Island service territories.

[7] 2016 Annual Energy Outlook (AEO) report, U.S. Energy Information Administration (EIA), Department of Energy (DOE).

[8] National Grid has a contract with R.L. POLK and Company (IHS Automotive), a Company which is a leader in compiling electric vehicle registration information. It also contracts with Moody's Analytics, a leader in compiling economic and demographic information including motor vehicle registrations and future projections.

[9] Based on share of population for Massachusetts or Rhode Island vs. total multistate ZEV targets of 3.3 million by 2025.

Figure 5

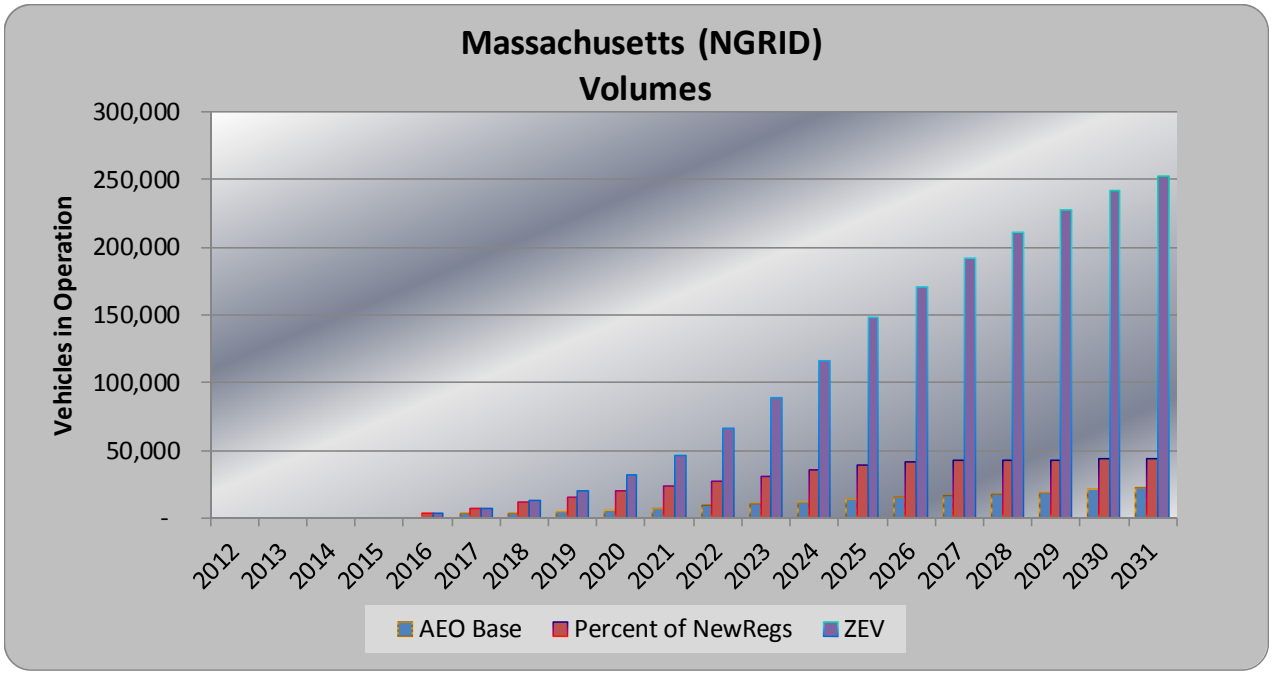


Figure 6

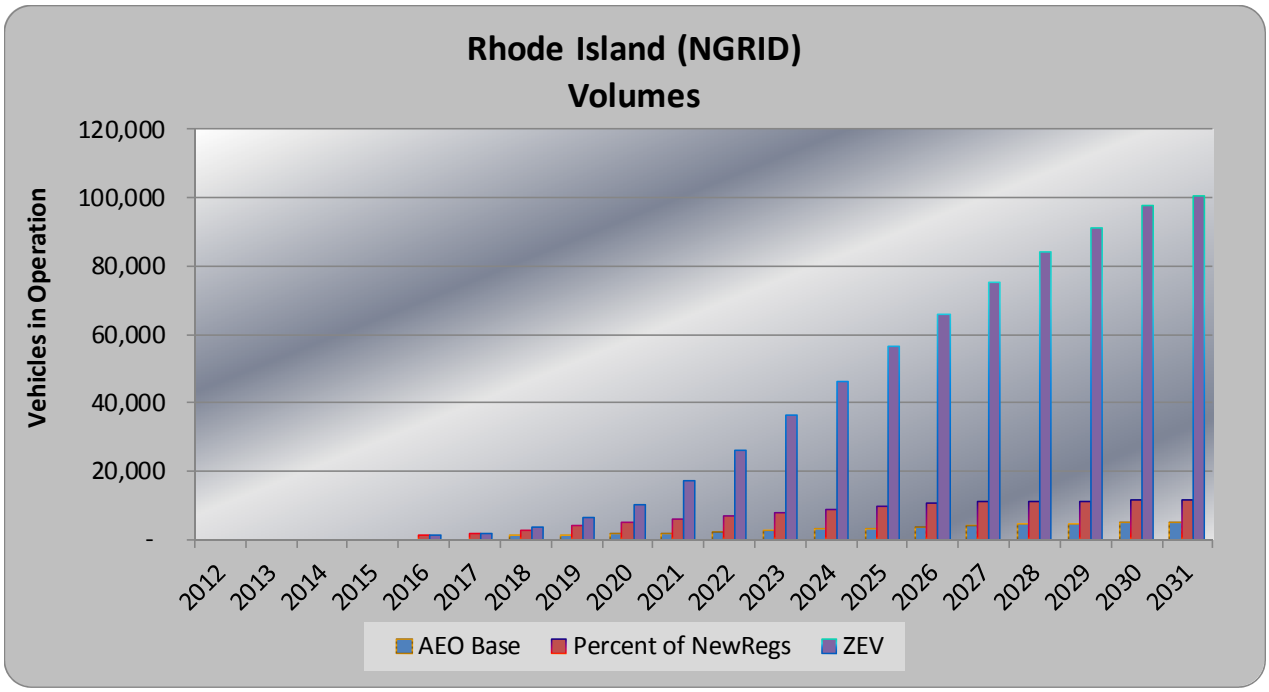


Figure 7 and 8 show system peak impact in MW % of load increase for each scenario.

Figure 7

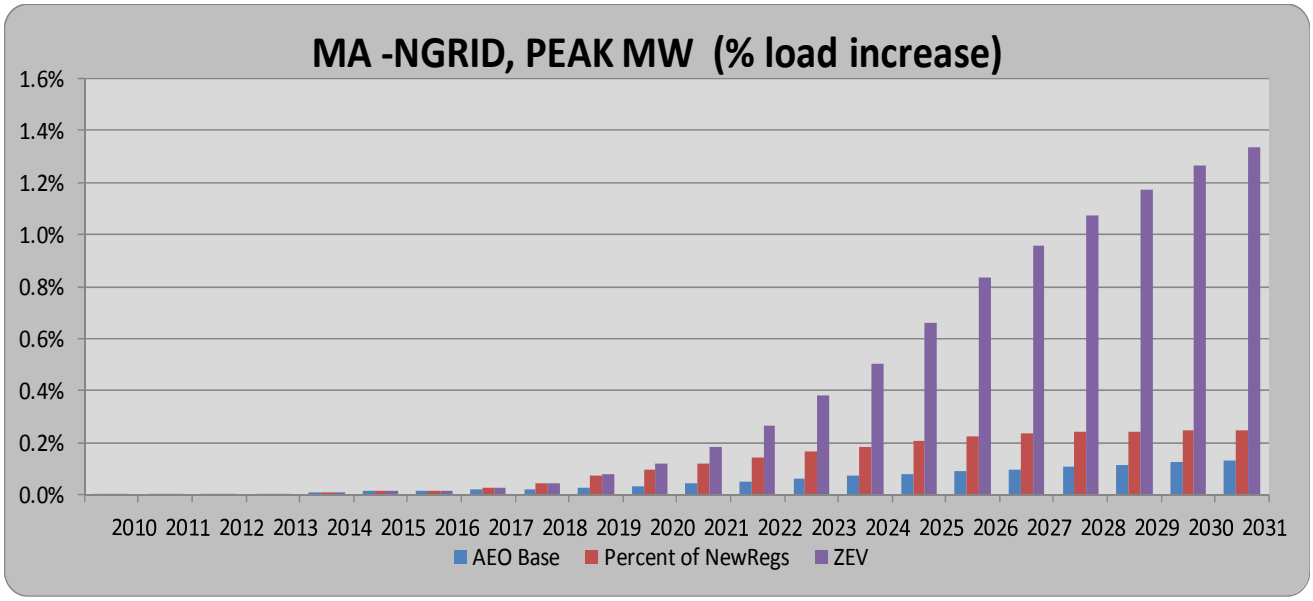
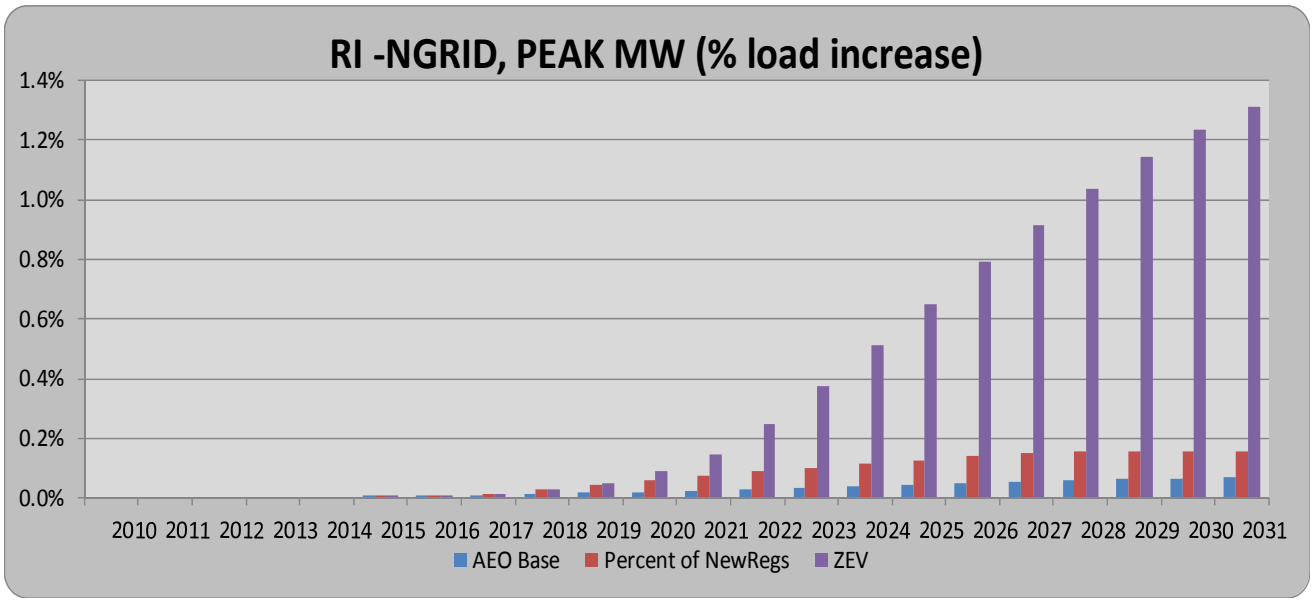


Figure 8



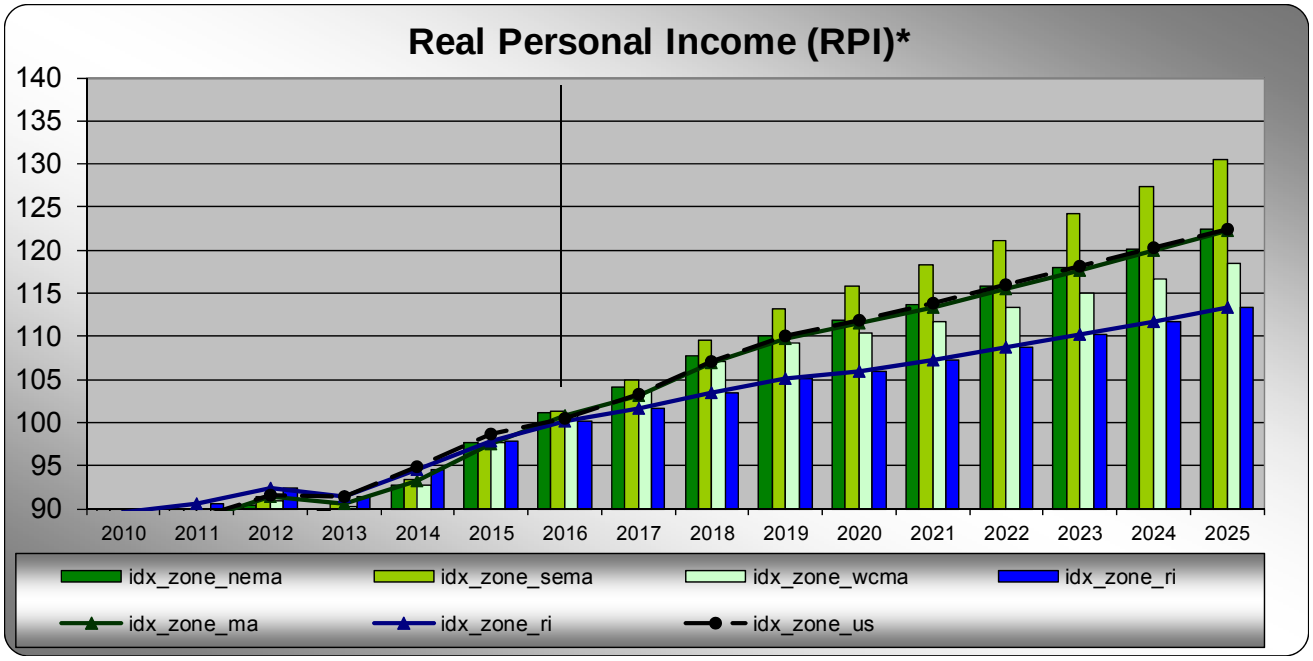
EV projections are provided for informational purposes only. No explicit increases have been made in the sales report. The company will continue to monitor the magnitude and timing of EV and incorporate projections in future forecasts as appropriate.

Regional Economic Drivers

The historical and forecast economic projections are obtained under subscription services from Moody's Investor Services. Moody's provides economic and demographic forecasts at the US, state and metro areas of detail. The Company aligned these sets with its service area to develop load forecasts. Key economic drivers are real personal income, output and employment.

Figure 9 shows a comparison of Real Personal Income (RPI), generally associated with residential sector growth, for the Massachusetts zones vs. the states and U.S. values. Massachusetts is expected to track with the U.S. growth while Rhode Island is expected to lag the U.S. the planning horizon. Within the state, SEMA is expected to outperform, NEMA to match and WCMA to lag the state growth.

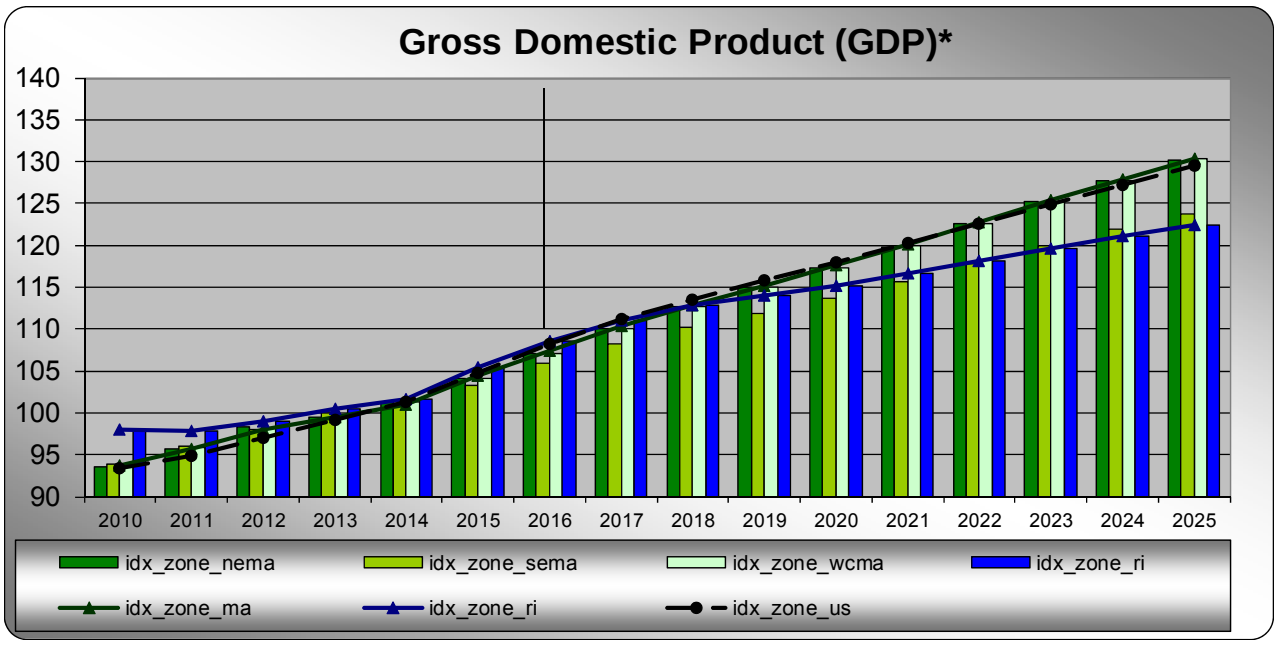
Figure 9



- **Index Jan. 2016 = 100**

Figure 10 shows a comparison of Gross Domestic Product (GDP), generally associated with overall growth, for the Massachusetts zones, the states and U.S. values. Over the planning horizon, Massachusetts and the SEMA & NEMA zones are expected to track the U.S. growth rates, while Rhode Island and the WCMA zone are expected to lag the country.

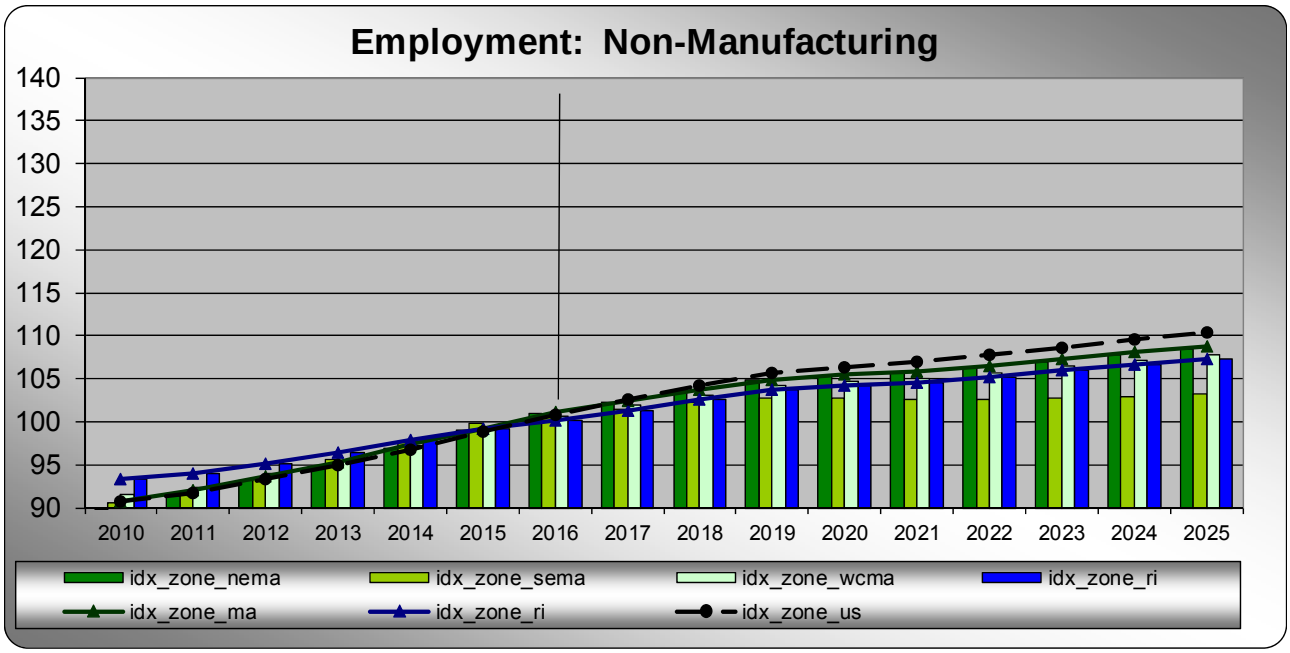
Figure 10



- **Index Jan. 2016 = 100**

Figure 11 shows a comparison of Non-Manufacturing Employment, generally associated with business growth. Over the planning horizon, both states as well as all zones, except SEMA are expected to generally track with the country. SEMA is expected to lag.

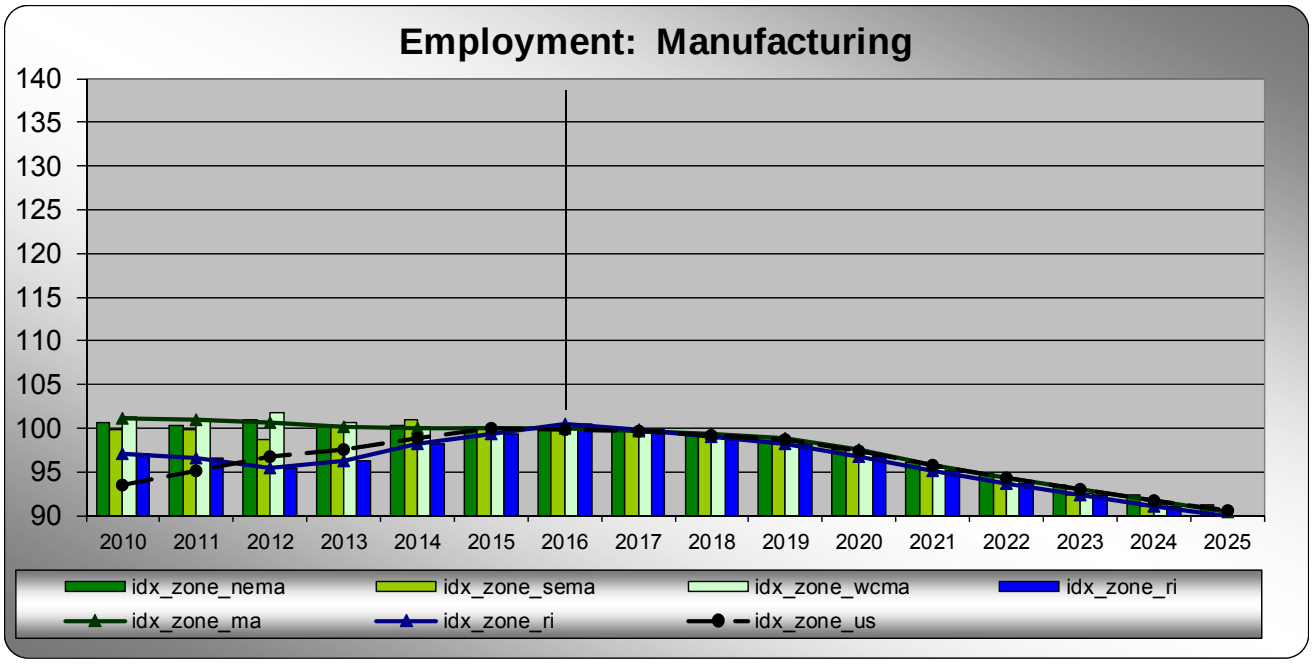
Figure 11



- **Index Jan. 2016 = 100**

Figure 12 shows a comparison of Manufacturing Employment, generally associated with industrial growth. Both states and all zones are expected to continue the long-term decline in manufacturing jobs as is the U.S..

Figure 12



- **Index Jan. 2016 = 100**

Weather Assumptions

Weather data is collected from the relevant weather stations located within the Company's New England service territory and used to weather-adjust peak demands. The relevant weather stations are Boston, Worcester, Providence, and Albany due to its proximity to western Massachusetts region. These most closely represent the Company's territory in the NEMA, SEMA, WCMA and Rhode Island zones of the ISO-NE.

The weather variables used in the model include heating degree days for the colder winter months and temperature – humidity indexes (THIs)[10] for the warmer summer months. These weather variables are correlated to the actual days that each peak occurs in each season over the historical period. Summer THI uses a weighted three day index (WTHI)[11] to capture the effects of prolonged heat waves that drive summer peaks.

[10] THI is calculated as (0.55 * dry bulb temperature) + (0.20 dew point) + 17.5. Maximum values for each of the 24 hours in a day are calculated and the maximum value is used in the WTHI formula.
[11] WTHI is weighted 70% day of peak, 20% one day prior and 10% two days prior

Weather adjusted peaks are derived for “normal (50/50)” average weather, “90/10 (1 in 10)” extreme weather and “95/5 (1 in 20)” extreme weather. Extreme weather scenarios are determined using a “probabilistic” approach that employs “Z-values” and standard deviations (i.e. the more variable the weather has been on peak days over the historical period, the higher the 90/10 and 95/5 levels will be versus the average).

- Normal “50/50” weather is the average weather on the past 20 seasonal peak days.
- Extreme “90/10” weather is such that it is expected that 90% of the time it should not be exceeded. It is similarly inferred that it should occur no more than one time in a ten year period.
- Extreme “95/5” weather is such that it is expected that 95% of the time it should not be exceeded. It is similarly inferred that it should occur no more than one time in a twenty year period.

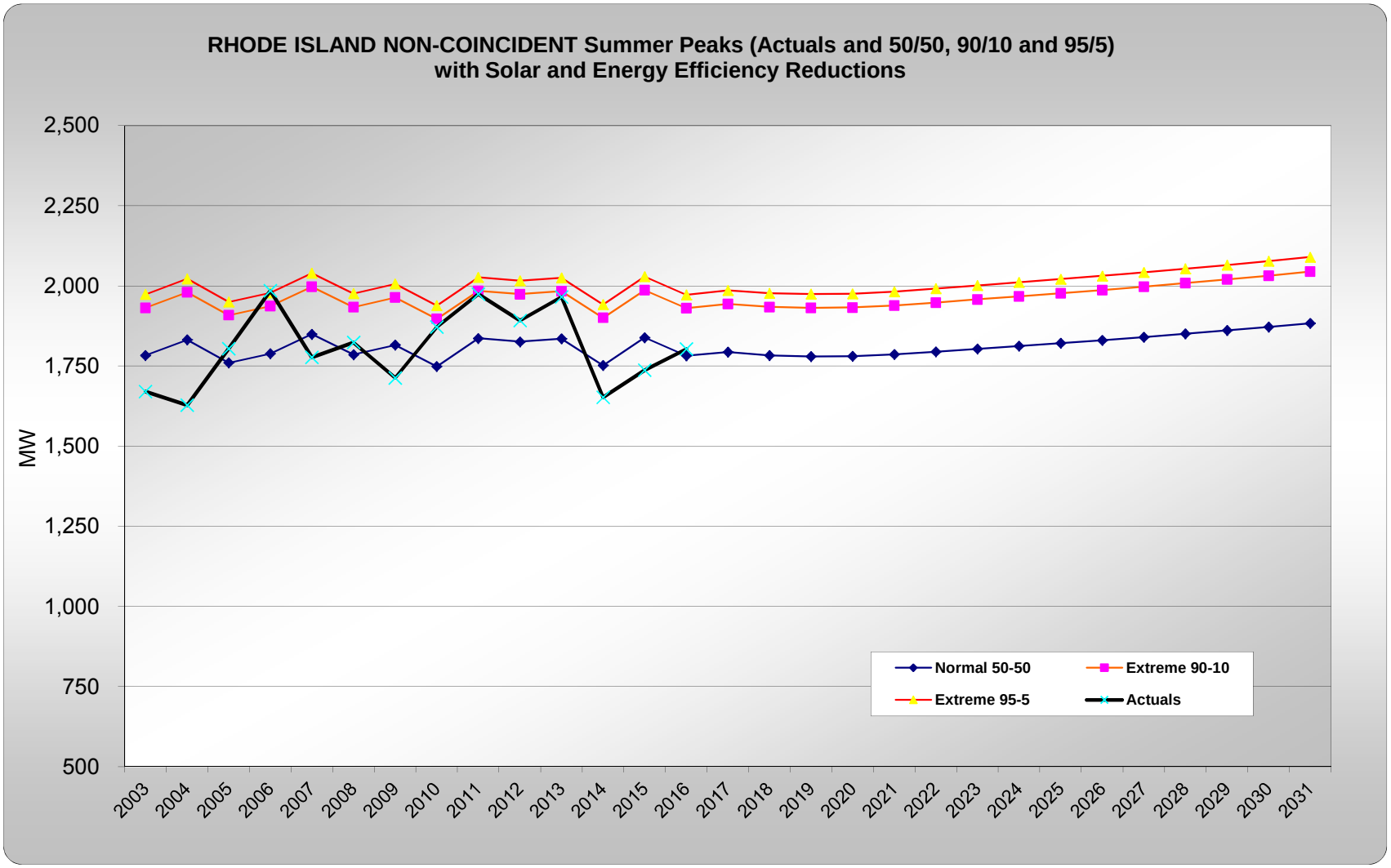
These “normals” and “extremes” are used to derive the weather-adjusted historical and forecasted values for each of the normal and extreme cases.

Details for each of the three Massachusetts zones, Rhode Island and Nantucket are presented in each of the zonal sections later in this report.

Massachusetts Grid Modernization (MA Grid Mod)

There are a number of initiatives proposed under the Massachusetts new MA Grid Mod proceeding that may impact customer loads, DERs and the network if approved. The company is aware of these and will monitor the progress of this proceeding and make appropriate changes to this deliveries forecast in the future as needed.

RHODE ISLAND PEAK FORECASTS


RHODE ISLAND NON-COINCIDENT Summer Peaks (Actuals and 50/50, 90/10 and 95/5)
with Solar and Energy Efficiency Reductions
MW
2,500
2,250
2,000
1,750
1,500
1,250
1,000
750
500
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
Normal 50-50
Extreme 90-10
Extreme 95-5
Actuals

Rhode Island Summer Peaks (Actuals and 50/50, 90/10, & 95/5 Weather-Adjusted Cases)

after Solar and Energy Efficiency Reductions

YEAR	Actuals (MW)	Actuals (% Grwth)	Normal 50-50 (MW)	Normal 50-50 (% Grwth)	Extreme 90-10 (MW)	Extreme 90-10 (% Grwth)	Extreme 95-5 (MW)	Extreme 95-5 (% Grwth)	WTHI ACTUAL
2003	1,670	#DIV/0!	1,783	#DIV/0!	1,932	#DIV/0!	1,974	#DIV/0!	80.1
2004	1,628	-2.5%	1,832	2.7%	1,980	2.5%	2,022	2.5%	78.5
2005	1,805	10.8%	1,760	-3.9%	1,908	-3.6%	1,950	-3.5%	83.1
2006	1,985	10.0%	1,789	1.6%	1,937	1.5%	1,979	1.5%	85.9
2007	1,777	-10.5%	1,849	3.4%	1,998	3.1%	2,039	3.1%	80.9
2008	1,824	2.6%	1,786	-3.4%	1,934	-3.2%	1,976	-3.1%	82.9
2009	1,713	-6.1%	1,816	1.7%	1,964	1.5%	2,006	1.5%	80.3
2010	1,872	9.3%	1,749	-3.7%	1,897	-3.4%	1,939	-3.3%	84.5
2011	1,974	5.5%	1,836	5.0%	1,985	4.6%	2,026	4.5%	84.8
2012	1,892	-4.2%	1,826	-0.6%	1,974	-0.5%	2,016	-0.5%	83.5
2013	1,965	3.9%	1,835	0.5%	1,983	0.5%	2,025	0.5%	84.7
2014	1,653	-15.9%	1,752	-4.5%	1,900	-4.2%	1,942	-4.1%	80.4
2015	1,738	5.1%	1,839	5.0%	1,987	4.6%	2,029	4.5%	80.4
2016	1,803	3.8%	1,782	-3.1%	1,930	-2.9%	1,972	-2.8%	82.6
2017			1,793	0.6%	1,944	0.7%	1,986	0.7%	
2018			1,783	-0.6%	1,934	-0.5%	1,977	-0.5%	
2019			1,780	-0.2%	1,931	-0.1%	1,974	-0.1%	
2020			1,780	0.0%	1,933	0.1%	1,976	0.1%	
2021			1,786	0.3%	1,939	0.3%	1,982	0.3%	
2022			1,794	0.5%	1,948	0.5%	1,991	0.5%	
2023			1,804	0.5%	1,958	0.5%	2,001	0.5%	
2024			1,812	0.5%	1,967	0.5%	2,011	0.5%	
2025			1,821	0.5%	1,977	0.5%	2,021	0.5%	
2026			1,830	0.5%	1,987	0.5%	2,031	0.5%	
2027			1,840	0.5%	1,998	0.5%	2,042	0.5%	
2028			1,850	0.6%	2,009	0.6%	2,053	0.6%	
2029			1,861	0.6%	2,020	0.6%	2,065	0.6%	
2030			1,872	0.6%	2,032	0.6%	2,077	0.6%	
2031			1,883	0.6%	2,044	0.6%	2,090	0.6%	

Compound Avg. 10 yr ('06 to '16)	-1.0%	0.0%	0.0%	0.0%
Compound Avg. 5 yr ('11 to '16)	-1.8%	-0.6%	-0.6%	-0.5%
Compound Avg. 5 yr ('16 to '21)		0.0%	0.1%	0.1%
Compound Avg. 10 yr ('16 to '26)		0.3%	0.3%	0.3%
Compound Avg. 15 yr ('16 to '31)		0.4%	0.4%	0.4%

WTHI	
NORMAL	82.2
EXTREME 90/10	85.0
EXTREME 95/5	85.8

21

Rhode Island Winter Peaks (Actuals and 50/50, 90/10, & 95/5 Weather-Adjusted Cases)

after Energy Efficiency Reductions

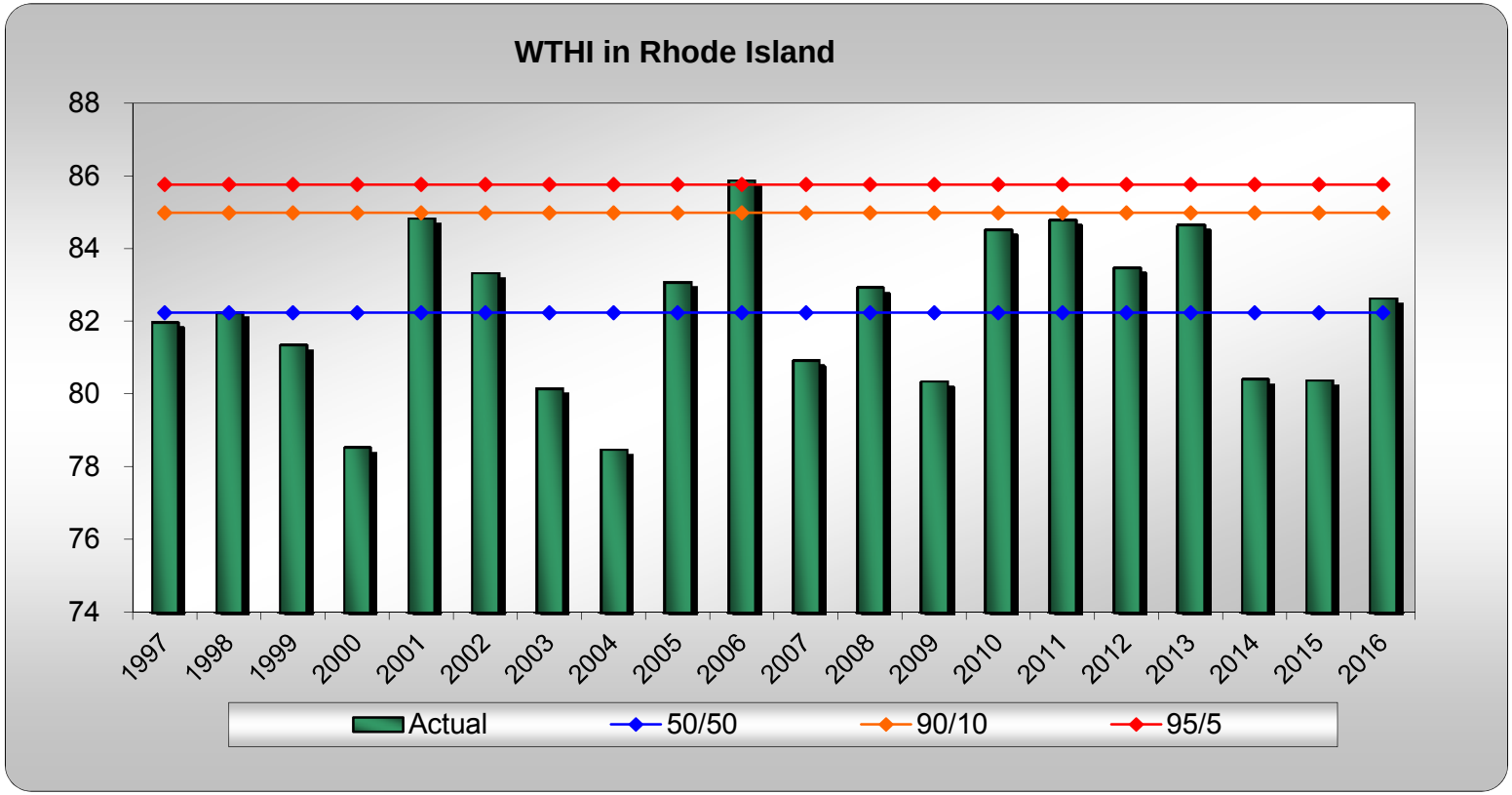
YEAR	Actuals (MW)	Actuals (% Grwth)	Normal 50-50 (MW)	Normal 50-50 (% Grwth)	Extreme 90-10 (MW)	Extreme 90-10 (% Grwth)	Extreme 95-5 (MW)	Extreme 95-5 (% Grwth)	HDD ACTUAL
2003	1,389		1,278		1,359		1,382		59.2
2004	1,394	0.4%	1,457	14.0%	1,538	13.2%	1,561	13.0%	40.0
2005	1,329	-4.6%	1,319	-9.4%	1,401	-8.9%	1,424	-8.8%	48.0
2006	1,329	0.0%	1,306	-1.0%	1,388	-0.9%	1,411	-0.9%	49.4
2007	1,352	1.7%	1,303	-0.2%	1,385	-0.2%	1,408	-0.2%	52.2
2008	1,305	-3.5%	1,327	1.8%	1,408	1.7%	1,431	1.7%	44.5
2009	1,294	-0.8%	1,354	2.1%	1,436	2.0%	1,459	1.9%	40.2
2010	1,315	1.6%	1,216	-10.2%	1,298	-9.6%	1,321	-9.5%	57.8
2011	1,243	-5.5%	1,258	3.4%	1,339	3.2%	1,362	3.2%	45.2
2012	1,320	6.2%	1,268	0.8%	1,350	0.8%	1,373	0.8%	52.5
2013	1,328	0.7%	1,321	4.2%	1,402	3.9%	1,425	3.8%	47.7
2014	1,275	-4.0%	1,208	-8.5%	1,290	-8.0%	1,313	-7.9%	54.2
2015	1,223	-4.1%	1,182	-2.1%	1,264	-2.0%	1,287	-2.0%	51.3
2016			1,184	0.2%	1,267	0.2%	1,290	0.2%	
2017			1,178	-0.5%	1,261	-0.5%	1,284	-0.4%	
2018			1,173	-0.4%	1,256	-0.4%	1,279	-0.4%	
2019			1,167	-0.5%	1,250	-0.5%	1,273	-0.5%	
2020			1,161	-0.5%	1,244	-0.5%	1,267	-0.5%	
2021			1,159	-0.1%	1,243	-0.1%	1,266	-0.1%	
2022			1,159	0.0%	1,243	0.0%	1,267	0.0%	
2023			1,161	0.1%	1,245	0.1%	1,268	0.1%	
2024			1,163	0.2%	1,247	0.2%	1,271	0.2%	
2025			1,167	0.3%	1,251	0.3%	1,275	0.3%	
2026			1,172	0.4%	1,257	0.4%	1,281	0.4%	
2027			1,177	0.4%	1,262	0.4%	1,286	0.4%	
2028			1,182	0.5%	1,268	0.5%	1,292	0.5%	
2029			1,188	0.5%	1,274	0.5%	1,299	0.5%	
2030			1,195	0.5%	1,281	0.5%	1,305	0.5%	

Compound Avg. 10 yr ('05 to '15)	-0.8%	-1.1%	-1.0%	-1.0%
Compound Avg. 5 yr ('10 to '15)	-1.5%	-0.6%	-0.5%	-0.5%
Compound Avg. 5 yr ('15 to '20)		-0.4%	-0.3%	-0.3%
Compound Avg. 10 yr ('15 to '25)		-0.1%	-0.1%	-0.1%
Compound Avg. 15 yr ('15 to '30)		0.1%	0.1%	0.1%

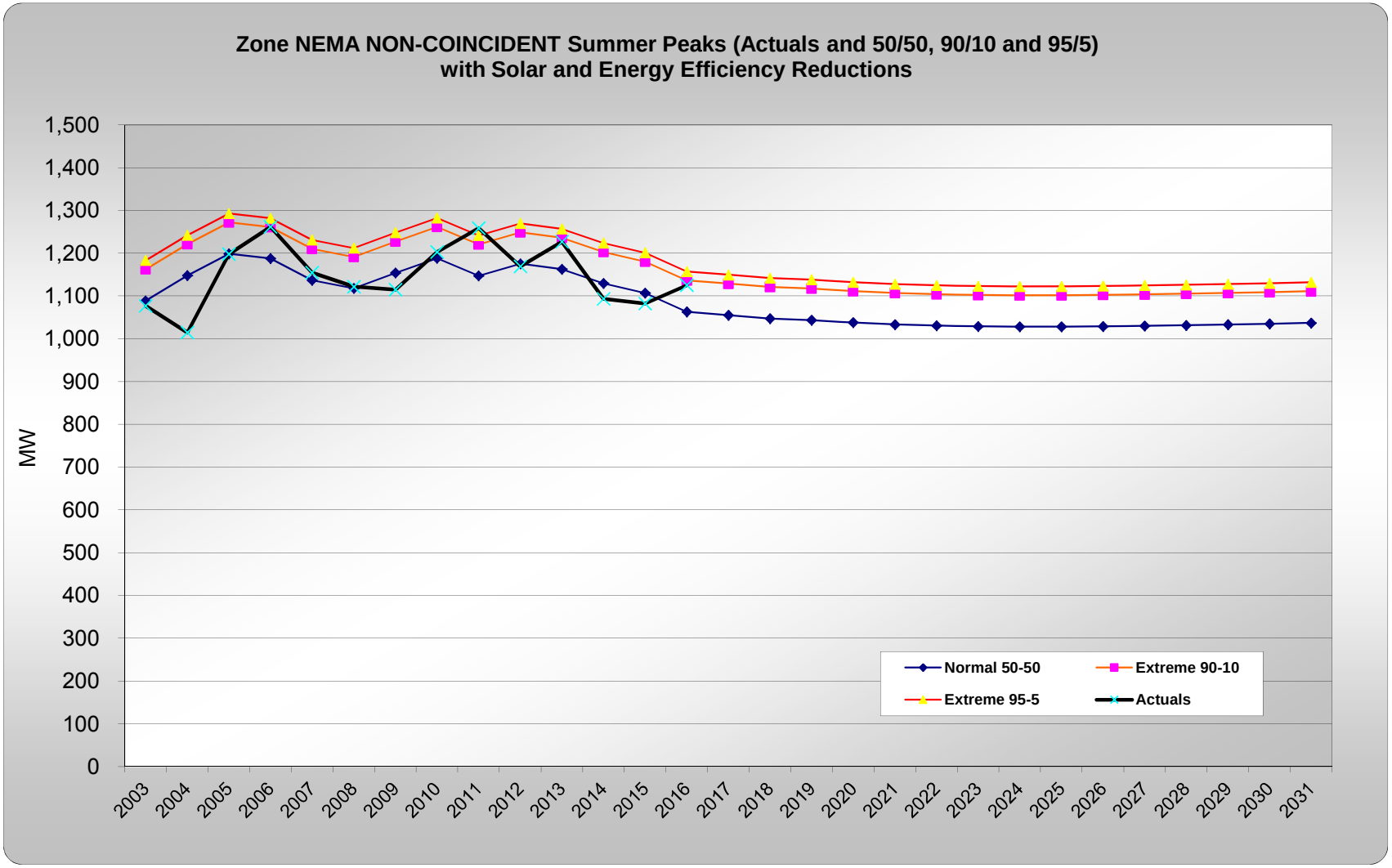
HDD

NORMAL	46.9
EXTREME 90/10	55.8
EXTREME 95/5	58.4

**** year is Dec. of year posted plus Jan. & Feb. of following year. (ex: year = 2014 is Dec.2014, Jan 2015, Feb 2015)***


WTHI in Rhode Island
88
86
84
82
80
78
76
74
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
Actual
50/50
90/10
95/5

NEMA (Northeast Massachusetts) DETAILS


Zone NEMA NON-COINCIDENT Summer Peaks (Actuals and 50/50, 90/10 and 95/5)
with Solar and Energy Efficiency Reductions
MW
1,500
1,400
1,300
1,200
1,100
1,000
900
800
700
600
500
400
300
200
100
0
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
Normal 50-50
Extreme 90-10
Extreme 95-5
Actuals

Zone NEMA Summer Peaks (Actuals and 50/50, 90/10, & 95/5 Weather-Adjusted Cases)

after Solar and Energy Efficiency Reductions

	YEAR	Actuals (MW)	Actuals (% Grwth)	Normal 50-50 (MW)	Normal 50-50 (% Grwth)	Extreme 90-10 (MW)	Extreme 90-10 (% Grwth)	Extreme 95-5 (MW)	Extreme 95-5 (% Grwth)	WTHI ACTUAL
	2003	1,077	#DIV/0!	1,089	#DIV/0!	1,162	#DIV/0!	1,183	#DIV/0!	78.0
	2004	1,015	-5.8%	1,148	5.4%	1,221	5.1%	1,242	5.0%	82.2
	2005	1,198	18.1%	1,198	4.4%	1,272	4.1%	1,293	4.1%	84.5
**	2006	1,262	5.3%	1,188	-0.9%	1,261	-0.8%	1,282	-0.8%	82.7
	2007	1,155	-8.5%	1,137	-4.3%	1,210	-4.0%	1,231	-4.0%	82.3
	2008	1,122	-2.8%	1,118	-1.7%	1,191	-1.6%	1,212	-1.5%	81.0
	2009	1,115	-0.6%	1,154	3.2%	1,227	3.0%	1,248	3.0%	82.6
	2010	1,203	7.9%	1,188	3.0%	1,262	2.8%	1,282	2.7%	85.7
	2011	1,259	4.6%	1,147	-3.5%	1,221	-3.3%	1,241	-3.2%	82.0
	2012	1,169	-7.1%	1,176	2.5%	1,249	2.3%	1,270	2.3%	84.2
**	2013	1,227	4.9%	1,163	-1.1%	1,236	-1.0%	1,257	-1.0%	81.1
	2014	1,094	-10.9%	1,130	-2.9%	1,203	-2.7%	1,224	-2.6%	81.4
	2015	1,082	-1.0%	1,107	-2.0%	1,181	-1.9%	1,201	-1.8%	84.1
**	2016	1,125	3.9%	1,063	-4.0%	1,136	-3.7%	1,157	-3.7%	0.0
	2017			1,055	-0.7%	1,129	-0.7%	1,150	-0.7%	
	2018			1,047	-0.7%	1,121	-0.7%	1,142	-0.7%	
	2019			1,044	-0.4%	1,117	-0.3%	1,138	-0.3%	
	2020			1,038	-0.5%	1,111	-0.5%	1,132	-0.5%	
	2021			1,033	-0.4%	1,107	-0.4%	1,128	-0.4%	
	2022			1,031	-0.3%	1,104	-0.3%	1,125	-0.2%	
	2023			1,029	-0.2%	1,102	-0.1%	1,123	-0.1%	
	2024			1,028	-0.1%	1,102	-0.1%	1,122	-0.1%	
	2025			1,028	0.0%	1,102	0.0%	1,123	0.0%	
	2026			1,029	0.1%	1,103	0.1%	1,123	0.1%	
	2027			1,030	0.1%	1,104	0.1%	1,125	0.1%	
	2028			1,032	0.1%	1,105	0.1%	1,126	0.1%	
	2029			1,033	0.2%	1,107	0.2%	1,128	0.2%	
	2030			1,035	0.2%	1,109	0.2%	1,130	0.2%	
	2031			1,037	0.2%	1,111	0.2%	1,132	0.2%	

Compound Avg. 10 yr ('06 to '16)	-1.1%	-1.1%	-1.0%	-1.0%
Compound Avg. 5 yr ('11 to '16)	-2.2%	-1.5%	-1.4%	-1.4%
Compound Avg. 5 yr ('16 to '21)		-0.6%	-0.5%	-0.5%
Compound Avg. 10 yr ('16 to '26)		-0.3%	-0.3%	-0.3%
Compound Avg. 15 yr ('16 to '31)		-0.2%	-0.2%	-0.1%

WTHI

NORMAL	82.2
EXTREME 90/10	84.5
EXTREME 95/5	85.1

***** There were Demand Response activations in these years on the day of this Zone's peak.***

Zone NEMA Winter Peaks (Actuals and 50/50, 90/10, & 95/5 Weather-Adjusted Cases)

after Energy Efficiency Reductions

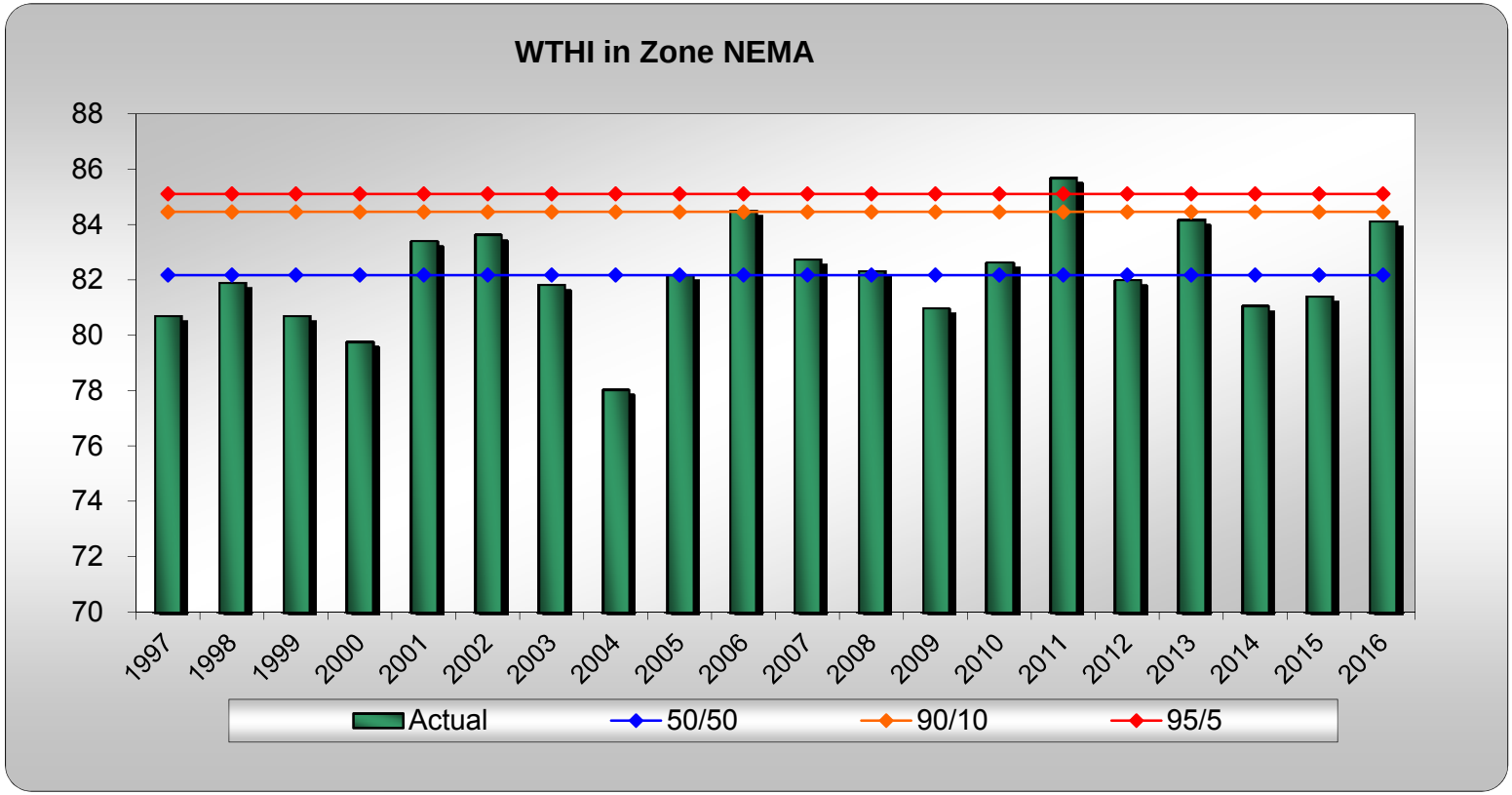
YEAR	Actuals (MW)	Actuals (% Grwth)	Normal 50-50 (MW)	Normal 50-50 (% Grwth)	Extreme 90-10 (MW)	Extreme 90-10 (% Grwth)	Extreme 95-5 (MW)	Extreme 95-5 (% Grwth)	HDD ACTUAL
2003	1,004		913		993		1,015		61.7
2004	987	-1.8%	1,000	9.5%	1,079	8.7%	1,102	8.5%	44.3
2005	913	-7.5%	928	-7.2%	1,007	-6.7%	1,029	-6.6%	48.3
2006	944	3.4%	938	1.2%	1,018	1.1%	1,040	1.1%	50.6
2007	956	1.3%	921	-1.8%	1,001	-1.7%	1,023	-1.6%	54.1
2008	908	-5.0%	936	1.5%	1,015	1.4%	1,037	1.4%	51.2
2009	918	1.1%	955	2.1%	1,034	1.9%	1,057	1.9%	42.7
2010	940	2.4%	884	-7.4%	963	-6.9%	986	-6.7%	58.5
2011	865	-8.0%	911	3.0%	990	2.8%	1,012	2.7%	43.5
2012	906	4.8%	872	-4.2%	951	-3.9%	974	-3.8%	54.1
2013	926	2.2%	868	-0.5%	947	-0.5%	969	-0.4%	48.3
2014	886	-4.4%	852	-1.8%	931	-1.7%	953	-1.6%	54.6
2015	840	-5.2%	751	-11.9%	830	-10.9%	852	-10.6%	44.8
2016			744	-0.8%	823	-0.8%	846	-0.7%	
2017			738	-0.9%	817	-0.8%	839	-0.8%	
2018			732	-0.8%	811	-0.7%	833	-0.7%	
2019			726	-0.8%	804	-0.8%	827	-0.8%	
2020			720	-0.8%	798	-0.8%	820	-0.8%	
2021			716	-0.6%	793	-0.6%	815	-0.6%	
2022			712	-0.5%	789	-0.5%	811	-0.4%	
2023			710	-0.4%	787	-0.4%	808	-0.4%	
2024			707	-0.3%	784	-0.3%	806	-0.3%	
2025			705	-0.3%	782	-0.3%	803	-0.3%	
2026			704	-0.2%	780	-0.2%	801	-0.2%	
2027			702	-0.2%	778	-0.2%	800	-0.2%	
2028			701	-0.2%	777	-0.2%	798	-0.2%	
2029			700	-0.1%	776	-0.1%	797	-0.1%	
2030			699	-0.1%	775	-0.1%	796	-0.1%	

Compound Avg. 10 yr ('05 to '15)	-0.8%	-2.1%	-1.9%	-1.9%
Compound Avg. 5 yr ('10 to '15)	-2.2%	-3.2%	-2.9%	-2.9%
Compound Avg. 5 yr ('15 to '20)		-0.8%	-0.8%	-0.8%
Compound Avg. 10 yr ('15 to '25)		-0.6%	-0.6%	-0.6%
Compound Avg. 15 yr ('15 to '30)		-0.5%	-0.5%	-0.5%

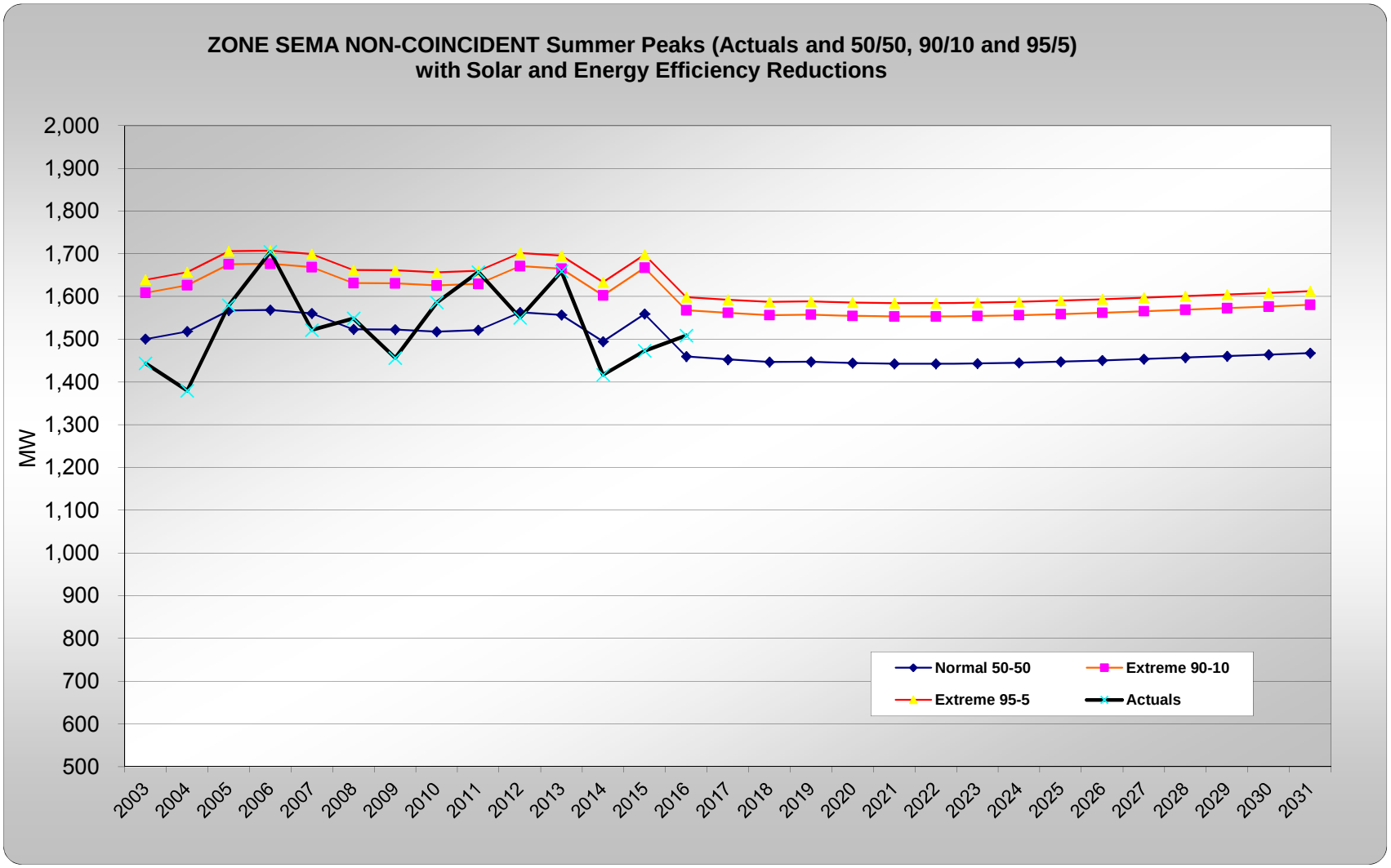
HDD

NORMAL	49.9
EXTREME 90/10	61.6
EXTREME 95/5	65.0

**** year is Dec. of year posted plus Jan. & Feb. of following year. (ex: year = 2014 is Dec.2014, Jan 2015, Feb 2015)***


WTHI in Zone NEMA
88
86
84
82
80
78
76
74
72
70
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
Actual
50/50
90/10
95/5

SEMA (Southeast Massachusetts) DETAILS


ZONE SEMA NON-COINCIDENT Summer Peaks (Actuals and 50/50, 90/10 and 95/5)
with Solar and Energy Efficiency Reductions
MW
2,000
1,900
1,800
1,700
1,600
1,500
1,400
1,300
1,200
1,100
1,000
900
800
700
600
500
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
Normal 50-50
Extreme 90-10
Extreme 95-5
Actuals

Zone SEMA Summer Peaks (Actuals and 50/50, 90/10, & 95/5 Weather-Adjusted Cases)

after Solar and Energy Efficiency Reductions

	YEAR	Actuals (MW)	Actuals (% Grwth)	Normal 50-50 (MW)	Normal 50-50 (% Grwth)	Extreme 90-10 (MW)	Extreme 90-10 (% Grwth)	Extreme 95-5 (MW)	Extreme 95-5 (% Grwth)	WTHI ACTUAL
	2003	1,444	#DIV/0!	1,501	#DIV/0!	1,609	#DIV/0!	1,639	#DIV/0!	78.9
	2004	1,380	-4.4%	1,519	1.2%	1,627	1.1%	1,657	1.1%	82.2
	2005	1,580	14.5%	1,567	3.2%	1,676	3.0%	1,706	2.9%	84.9
**	2006	1,705	7.9%	1,568	0.1%	1,676	0.1%	1,707	0.1%	81.1
	2007	1,522	-10.7%	1,561	-0.5%	1,669	-0.5%	1,699	-0.5%	82.5
	2008	1,549	1.8%	1,523	-2.4%	1,631	-2.2%	1,662	-2.2%	80.5
	2009	1,456	-6.0%	1,523	0.0%	1,631	0.0%	1,661	0.0%	83.4
	2010	1,586	8.9%	1,518	-0.3%	1,626	-0.3%	1,656	-0.3%	84.9
	2011	1,658	4.5%	1,522	0.3%	1,630	0.2%	1,660	0.2%	81.7
**	2012	1,551	-6.5%	1,563	2.7%	1,671	2.5%	1,702	2.5%	84.2
	2013	1,659	7.0%	1,557	-0.4%	1,665	-0.4%	1,696	-0.4%	80.2
	2014	1,417	-14.6%	1,495	-4.0%	1,603	-3.7%	1,634	-3.7%	80.0
	2015	1,473	4.0%	1,559	4.3%	1,667	4.0%	1,698	3.9%	83.0
**	2016	1,509	2.4%	1,460	-6.4%	1,568	-6.0%	1,599	-5.9%	0.0
	2017			1,453	-0.5%	1,562	-0.4%	1,593	-0.4%	
	2018			1,447	-0.4%	1,556	-0.3%	1,587	-0.3%	
	2019			1,447	0.0%	1,557	0.1%	1,589	0.1%	
	2020			1,445	-0.2%	1,555	-0.2%	1,586	-0.2%	
	2021			1,443	-0.1%	1,553	-0.1%	1,584	-0.1%	
	2022			1,443	0.0%	1,553	0.0%	1,585	0.0%	
	2023			1,444	0.1%	1,554	0.1%	1,586	0.1%	
	2024			1,445	0.1%	1,556	0.1%	1,588	0.1%	
	2025			1,448	0.2%	1,559	0.2%	1,590	0.2%	
	2026			1,451	0.2%	1,562	0.2%	1,594	0.2%	
	2027			1,454	0.2%	1,565	0.2%	1,597	0.2%	
	2028			1,457	0.2%	1,569	0.2%	1,601	0.2%	
	2029			1,461	0.2%	1,573	0.2%	1,605	0.2%	
	2030			1,464	0.2%	1,577	0.2%	1,608	0.2%	
	2031			1,468	0.3%	1,581	0.3%	1,613	0.3%	

Compound Avg. 10 yr ('06 to '16)	-1.2%	-0.7%	-0.7%	-0.7%
Compound Avg. 5 yr ('11 to '16)	-1.9%	-0.8%	-0.8%	-0.8%
Compound Avg. 5 yr ('16 to '21)		-0.2%	-0.2%	-0.2%
Compound Avg. 10 yr ('16 to '26)		-0.1%	0.0%	0.0%
Compound Avg. 15 yr ('16 to '31)		0.0%	0.1%	0.1%

WTHI

NORMAL	81.9
EXTREME 90/10	84.3
EXTREME 95/5	85.0

***** There were Demand Response activations in these years on the day of this Zone's peak.***

Zone SEMA Winter Peaks (Actuals and 50/50, 90/10, & 95/5 Weather-Adjusted Cases)

after Energy Efficiency Reductions

YEAR	Actuals (MW)	Actuals (% Grwth)	Normal 50-50 (MW)	Normal 50-50 (% Grwth)	Extreme 90-10 (MW)	Extreme 90-10 (% Grwth)	Extreme 95-5 (MW)	Extreme 95-5 (% Grwth)	HDD ACTUAL
2003	1,271		1,165		1,242		1,264		61.7
2004	1,249	-1.7%	1,278	9.7%	1,355	9.1%	1,377	8.9%	44.3
2005	1,206	-3.4%	1,204	-5.8%	1,281	-5.5%	1,303	-5.4%	48.3
2006	1,194	-1.0%	1,173	-2.5%	1,251	-2.4%	1,273	-2.3%	50.6
2007	1,181	-1.1%	1,134	-3.4%	1,211	-3.2%	1,233	-3.1%	54.1
2008	1,138	-3.7%	1,113	-1.8%	1,190	-1.7%	1,212	-1.7%	51.2
2009	1,143	0.4%	1,184	6.4%	1,261	6.0%	1,283	5.9%	42.7
2010	1,151	0.8%	1,070	-9.6%	1,147	-9.0%	1,169	-8.9%	58.5
2011	1,084	-5.8%	1,119	4.6%	1,196	4.3%	1,218	4.2%	43.5
2012	1,165	7.4%	1,117	-0.2%	1,195	-0.1%	1,217	-0.1%	54.1
2013	1,218	4.6%	1,216	8.8%	1,293	8.2%	1,315	8.1%	48.3
2014	1,132	-7.0%	1,081	-11.1%	1,159	-10.4%	1,180	-10.2%	54.6
2015	1,058	-6.6%	1,082	0.1%	1,160	0.1%	1,182	0.1%	44.8
2016			1,078	-0.4%	1,156	-0.3%	1,178	-0.3%	
2017			1,074	-0.4%	1,152	-0.4%	1,174	-0.4%	
2018			1,070	-0.4%	1,148	-0.3%	1,170	-0.3%	
2019			1,066	-0.4%	1,143	-0.4%	1,166	-0.4%	
2020			1,060	-0.5%	1,138	-0.5%	1,160	-0.5%	
2021			1,056	-0.4%	1,134	-0.4%	1,156	-0.4%	
2022			1,054	-0.2%	1,131	-0.2%	1,153	-0.2%	
2023			1,052	-0.2%	1,129	-0.2%	1,151	-0.2%	
2024			1,050	-0.2%	1,127	-0.2%	1,149	-0.2%	
2025			1,049	-0.1%	1,126	-0.1%	1,148	-0.1%	
2026			1,048	-0.1%	1,125	-0.1%	1,146	-0.1%	
2027			1,046	-0.1%	1,123	-0.1%	1,145	-0.1%	
2028			1,046	-0.1%	1,123	-0.1%	1,144	-0.1%	
2029			1,045	-0.1%	1,122	-0.1%	1,144	-0.1%	
2030			1,044	-0.1%	1,121	-0.1%	1,143	-0.1%	

Compound Avg. 10 yr ('05 to '15)	-1.3%	-1.1%	-1.0%	-1.0%
Compound Avg. 5 yr ('10 to '15)	-1.7%	0.2%	0.2%	0.2%
Compound Avg. 5 yr ('15 to '20)		-0.4%	-0.4%	-0.4%
Compound Avg. 10 yr ('15 to '25)		-0.3%	-0.3%	-0.3%
Compound Avg. 15 yr ('15 to '30)		-0.2%	-0.2%	-0.2%

HDD

NORMAL	48.0
EXTREME 90/10	58.0
EXTREME 95/5	60.8

**** year is Dec. of year posted plus Jan. & Feb. of following year. (ex: year = 2014 is Dec.2014, Jan 2015, Feb 2015)***

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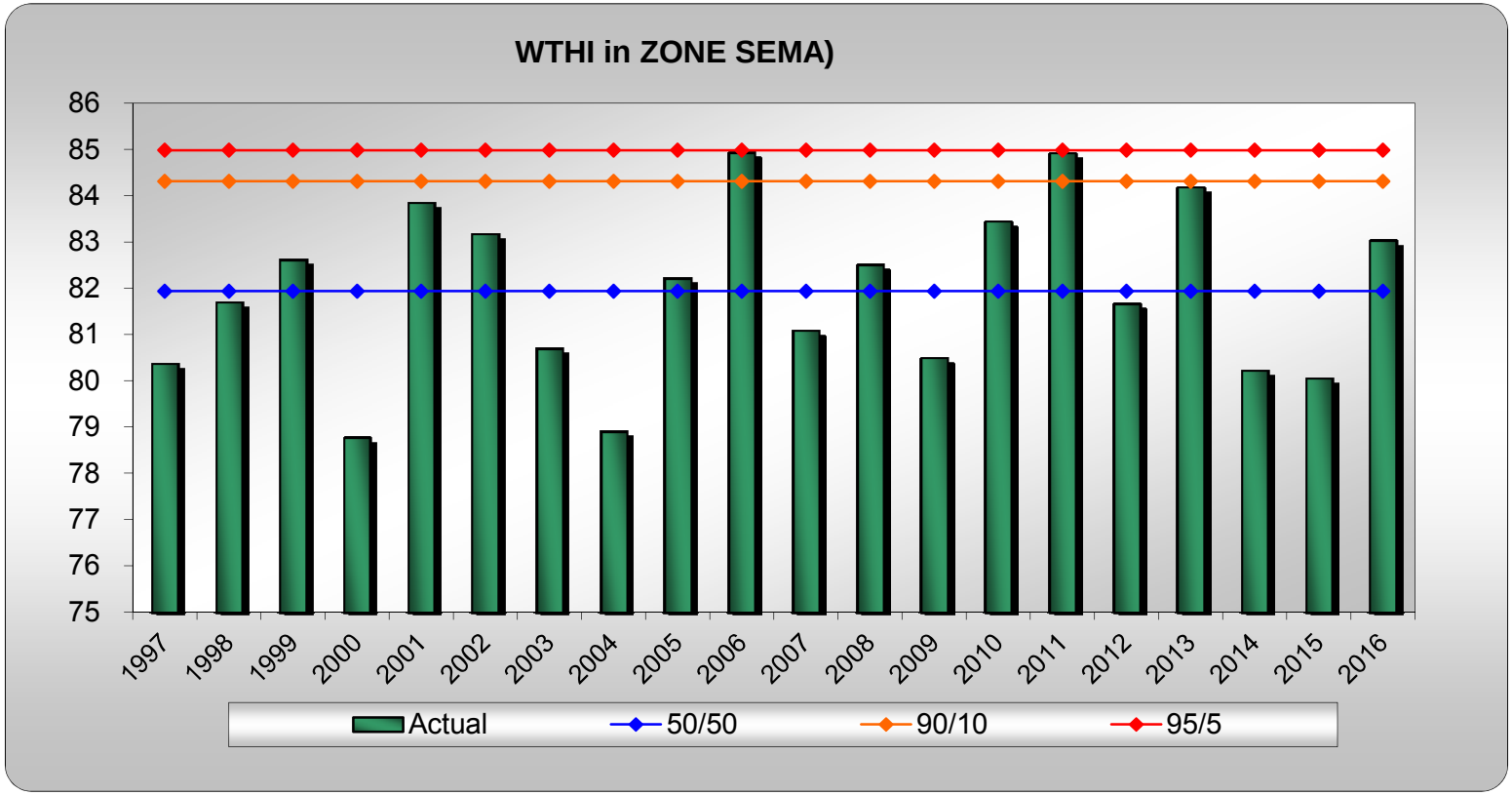
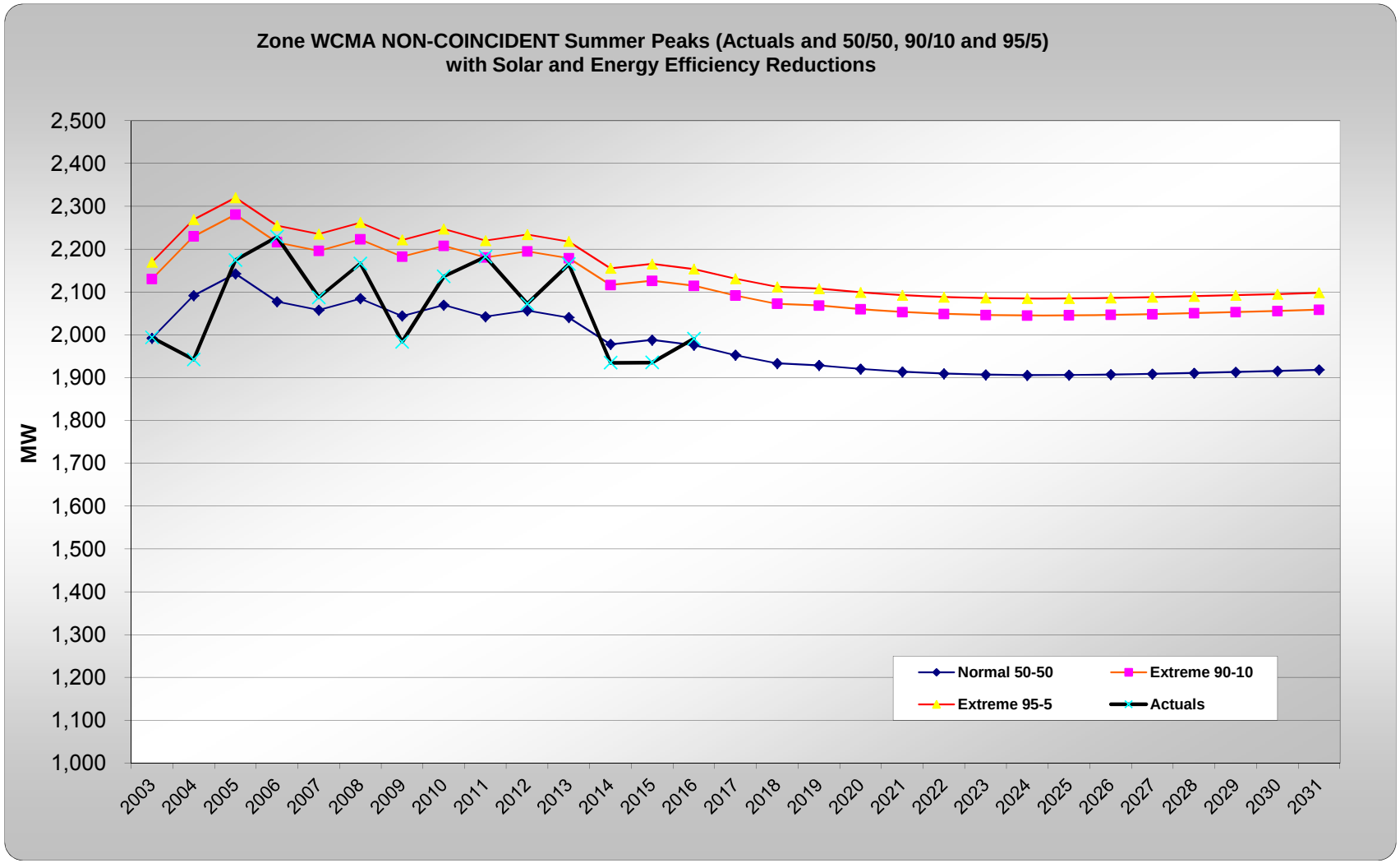

WTHI in ZONE SEMA)
86
85
84
83
82
81
80
79
78
77
76
75
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
Actual
50/50
90/10
95/5

WCMA (West-Central Massachusetts) DETAILS


Zone WCMA NON-COINCIDENT Summer Peaks (Actuals and 50/50, 90/10 and 95/5)
with Solar and Energy Efficiency Reductions
MW
2,500
2,400
2,300
2,200
2,100
2,000
1,900
1,800
1,700
1,600
1,500
1,400
1,300
1,200
1,100
1,000
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
Normal 50-50
Extreme 90-10
Extreme 95-5
Actuals

Zone WCMA Summer Peaks (Actuals and 50/50, 90/10, & 95/5 Weather-Adjusted Cases)

after Solar and Energy Efficiency Reductions

		Actuals		Normal 50-50		Extreme 90-10		Extreme 95-5		WTHI
	YEAR	(MW)	(% Grwth)	(MW)	(% Grwth)	(MW)	(% Grwth)	(MW)	(% Grwth)	ACTUAL
	2003	1,994	#DIV/0!	1,992	#DIV/0!	2,131	#DIV/0!	2,170	#DIV/0!	77.3
	2004	1,942	-2.6%	2,092	5.0%	2,230	4.7%	2,269	4.6%	80.3
	2005	2,175	12.0%	2,143	2.4%	2,281	2.3%	2,320	2.2%	82.2
	2006	2,229	2.5%	2,078	-3.0%	2,216	-2.8%	2,255	-2.8%	80.2
	2007	2,088	-6.3%	2,058	-1.0%	2,196	-0.9%	2,235	-0.9%	81.1
	2008	2,167	3.8%	2,085	1.3%	2,223	1.2%	2,262	1.2%	78.7
	2009	1,984	-8.4%	2,044	-1.9%	2,182	-1.8%	2,222	-1.8%	80.8
	2010	2,137	7.7%	2,070	1.2%	2,208	1.2%	2,247	1.1%	82.0
	2011	2,182	2.1%	2,043	-1.3%	2,181	-1.2%	2,220	-1.2%	80.0
	2012	2,073	-5.0%	2,057	0.7%	2,195	0.6%	2,234	0.6%	81.8
**	2013	2,165	4.5%	2,040	-0.8%	2,179	-0.7%	2,218	-0.7%	79.0
	2014	1,935	-10.6%	1,978	-3.1%	2,116	-2.9%	2,155	-2.8%	78.9
	2015	1,935	0.0%	1,988	0.5%	2,126	0.5%	2,165	0.5%	80.0
**	2016	1,991	2.9%	1,976	-0.6%	2,114	-0.6%	2,153	-0.5%	0.0
	2017			1,953	-1.2%	2,092	-1.1%	2,131	-1.0%	
	2018			1,933	-1.0%	2,072	-0.9%	2,112	-0.9%	
	2019			1,929	-0.2%	2,068	-0.2%	2,108	-0.2%	
	2020			1,920	-0.4%	2,060	-0.4%	2,099	-0.4%	
	2021			1,914	-0.4%	2,053	-0.3%	2,092	-0.3%	
	2022			1,909	-0.2%	2,049	-0.2%	2,088	-0.2%	
	2023			1,907	-0.1%	2,046	-0.1%	2,086	-0.1%	
	2024			1,906	-0.1%	2,045	-0.1%	2,085	-0.1%	
	2025			1,906	0.0%	2,045	0.0%	2,085	0.0%	
	2026			1,907	0.1%	2,047	0.1%	2,086	0.1%	
	2027			1,909	0.1%	2,048	0.1%	2,088	0.1%	
	2028			1,911	0.1%	2,050	0.1%	2,090	0.1%	
	2029			1,913	0.1%	2,053	0.1%	2,092	0.1%	
	2030			1,915	0.1%	2,055	0.1%	2,095	0.1%	
	2031			1,918	0.2%	2,058	0.2%	2,098	0.2%	

Compound Avg. 10 yr ('06 to '16)	-1.1%	-0.5%	-0.5%	-0.5%
Compound Avg. 5 yr ('11 to '16)	-1.8%	-0.7%	-0.6%	-0.6%
Compound Avg. 5 yr ('16 to '21)		-0.6%	-0.6%	-0.6%
Compound Avg. 10 yr ('16 to '26)		-0.4%	-0.3%	-0.3%
Compound Avg. 15 yr ('16 to '31)		-0.2%	-0.2%	-0.2%

WTHI

NORMAL	79.7
EXTREME 90/10	82.0
EXTREME 95/5	82.6

***** There were Demand Response activations in these years on the day of this Zone's peak.***

Zone WCMA Winter Peaks (Actuals and 50/50, 90/10, & 95/5 Weather-Adjusted Cases)

after Energy Efficiency Reductions

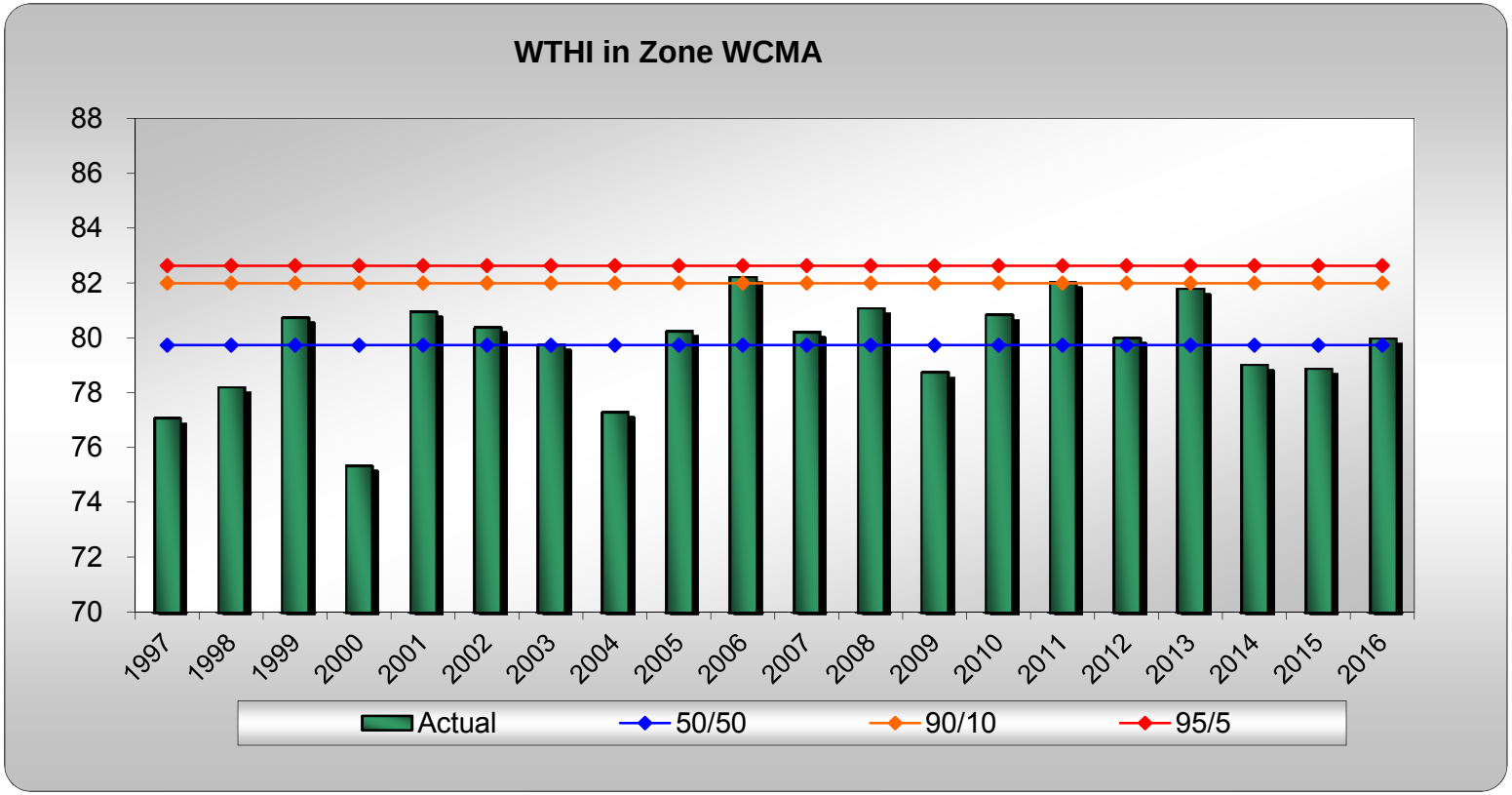
YEAR	Actuals (MW)	Actuals (% Grwth)	Normal 50-50 (MW)	Normal 50-50 (% Grwth)	Extreme 90-10 (MW)	Extreme 90-10 (% Grwth)	Extreme 95-5 (MW)	Extreme 95-5 (% Grwth)	HDD ACTUAL
2003	1,871		1,729		1,831		1,860		61.7
2004	1,821	-2.7%	1,850	7.0%	1,952	6.6%	1,981	6.5%	44.3
2005	1,765	-3.1%	1,767	-4.5%	1,869	-4.2%	1,899	-4.2%	48.3
2006	1,764	0.0%	1,728	-2.2%	1,831	-2.1%	1,860	-2.0%	50.6
2007	1,778	0.8%	1,708	-1.2%	1,810	-1.1%	1,839	-1.1%	54.1
2008	1,717	-3.4%	1,740	1.9%	1,843	1.8%	1,872	1.8%	51.2
2009	1,701	-0.9%	1,740	0.0%	1,843	0.0%	1,872	0.0%	42.7
2010	1,740	2.3%	1,627	-6.5%	1,729	-6.1%	1,759	-6.0%	58.5
2011	1,637	-5.9%	1,665	2.3%	1,767	2.2%	1,796	2.1%	43.5
2012	1,719	5.0%	1,656	-0.5%	1,759	-0.5%	1,788	-0.5%	54.1
2013	1,776	3.3%	1,760	6.3%	1,863	5.9%	1,892	5.8%	48.3
2014	1,677	-5.6%	1,644	-6.6%	1,746	-6.2%	1,776	-6.1%	54.6
2015	1,589	-5.2%	1,624	-1.2%	1,727	-1.1%	1,756	-1.1%	44.8
2016			1,620	-0.3%	1,734	0.4%	1,752	-0.2%	
2017			1,615	-0.3%	1,728	-0.4%	1,747	-0.3%	
2018			1,611	-0.3%	1,722	-0.3%	1,744	-0.2%	
2019			1,605	-0.3%	1,715	-0.4%	1,738	-0.3%	
2020			1,599	-0.4%	1,707	-0.5%	1,732	-0.4%	
2021			1,595	-0.2%	1,701	-0.3%	1,728	-0.2%	
2022			1,594	-0.1%	1,699	-0.2%	1,727	-0.1%	
2023			1,594	0.0%	1,697	-0.1%	1,727	0.0%	
2024			1,594	0.0%	1,697	0.0%	1,727	0.0%	
2025			1,594	0.0%	1,698	0.0%	1,727	0.0%	
2026			1,595	0.1%	1,699	0.1%	1,728	0.1%	
2027			1,596	0.1%	1,700	0.1%	1,729	0.1%	
2028			1,598	0.1%	1,702	0.1%	1,731	0.1%	
2029			1,600	0.1%	1,703	0.1%	1,733	0.1%	
2030			1,601	0.1%	1,705	0.1%	1,735	0.1%	

Compound Avg. 10 yr ('05 to '15)	-1.0%	-0.8%	-0.8%	-0.8%
Compound Avg. 5 yr ('10 to '15)	-1.8%	0.0%	0.0%	0.0%
Compound Avg. 5 yr ('15 to '20)		-0.3%	-0.2%	-0.3%
Compound Avg. 10 yr ('15 to '25)		-0.2%	-0.2%	-0.2%
Compound Avg. 15 yr ('15 to '30)		-0.1%	-0.1%	-0.1%

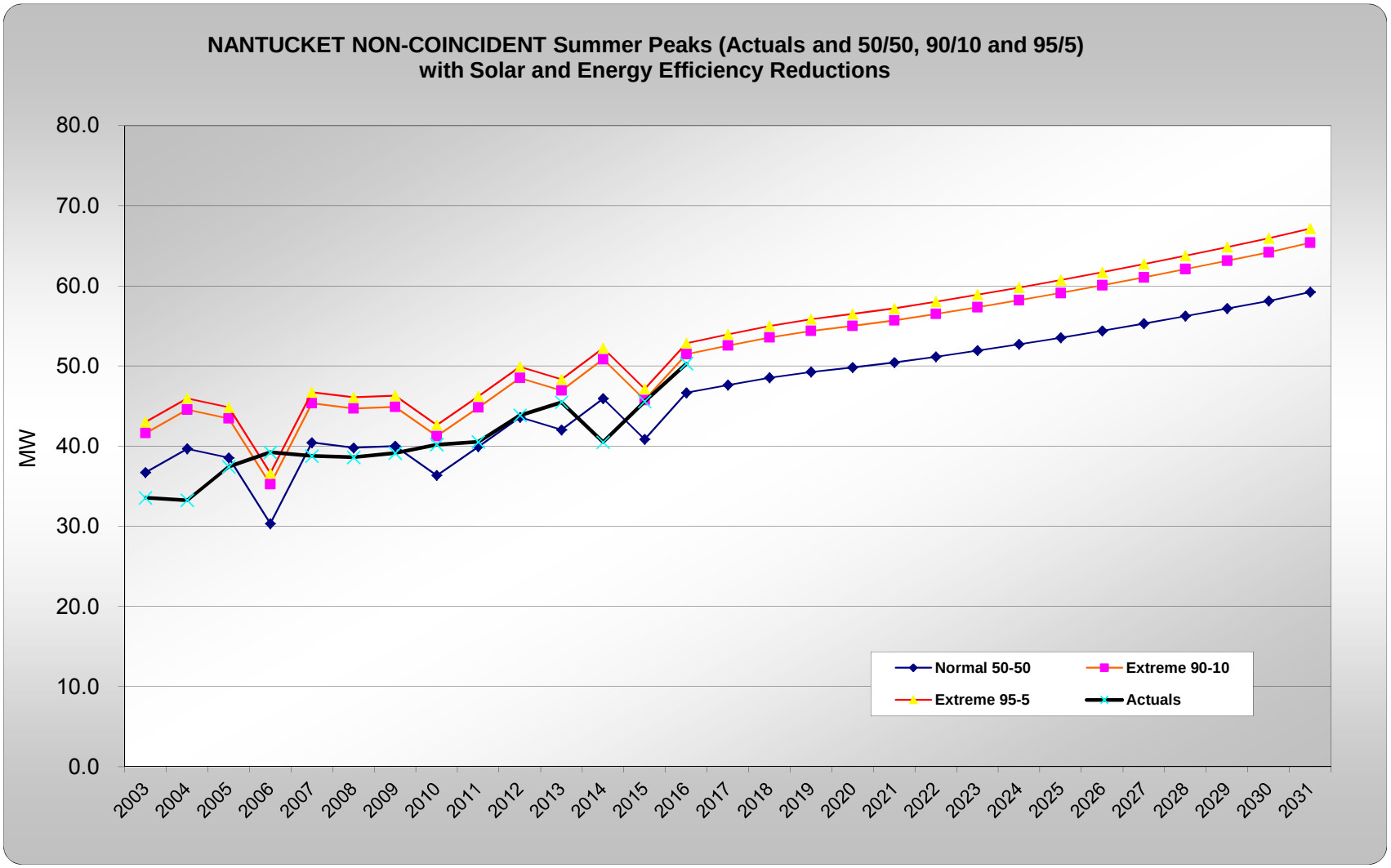
HDD

NORMAL	51.9
EXTREME 90/10	61.8
EXTREME 95/5	64.6

**** year is Dec. of year posted plus Jan. & Feb. of following year. (ex: year = 2014 is Dec.2014, Jan 2015, Feb 2015)***


WTHI in Zone WCMA
88
86
84
82
80
78
76
74
72
70
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
Actual
50/50
90/10
95/5

NANTUCKET DETAILS


NANTUCKET NON-COINCIDENT Summer Peaks (Actuals and 50/50, 90/10 and 95/5)
with Solar and Energy Efficiency Reductions
MW
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
Normal 50-50
Extreme 90-10
Extreme 95-5
Actuals

Zone NANTUCKET Summer Peaks (Actuals and 50/50, 90/10, & 95/5 Weather-Adjusted Cases)

after Solar and Energy Efficiency Reductions

YEAR	Actuals (MW)	Actuals (% Grwth)	Normal 50-50 (MW)	Normal 50-50 (% Grwth)	Extreme 90-10 (MW)	Extreme 90-10 (% Grwth)	Extreme 95-5 (MW)	Extreme 95-5 (% Grwth)	WTHI ACTUAL
2003	33.6	#DIV/0!	36.7	#DIV/0!	41.6	#DIV/0!	43.0	#DIV/0!	73.5
2004	33.3	-1.0%	39.7	8.0%	44.6	7.1%	46.0	6.8%	72.0
2005	37.5	12.6%	38.6	-2.8%	43.5	-2.5%	44.8	-2.4%	74.5
2006	39.2	4.8%	30.3	-21.3%	35.2	-18.9%	36.6	-18.3%	79.1
2007	38.8	-1.2%	40.4	33.3%	45.3	28.7%	46.7	27.6%	74.2
2008	38.6	-0.5%	39.8	-1.6%	44.7	-1.4%	46.1	-1.4%	74.4
2009	39.1	1.3%	40.0	0.5%	44.9	0.5%	46.3	0.5%	74.6
2010	40.2	2.7%	36.4	-9.1%	41.3	-8.1%	42.7	-7.9%	76.8
2011	40.5	0.8%	39.9	9.8%	44.8	8.7%	46.2	8.4%	75.3
2012	43.9	8.2%	43.6	9.2%	48.5	8.2%	49.9	8.0%	75.1
2013	45.5	3.7%	42.0	-3.6%	47.0	-3.2%	48.3	-3.1%	76.6
2014	40.5	-10.9%	45.9	9.3%	50.8	8.3%	52.2	8.1%	72.5
2015	45.6	12.5%	40.9	-11.1%	45.8	-10.0%	47.1	-9.7%	77.2
2016	50.3	10.4%	46.7	14.3%	51.5	12.5%	52.8	12.1%	76.7
2017			47.6	2.1%	52.6	2.1%	54.0	2.1%	
2018			48.5	1.9%	53.6	1.9%	55.0	2.0%	
2019			49.3	1.5%	54.4	1.5%	55.8	1.5%	
2020			49.8	1.1%	55.0	1.2%	56.5	1.2%	
2021			50.4	1.2%	55.7	1.3%	57.2	1.3%	
2022			51.2	1.4%	56.5	1.5%	58.0	1.5%	
2023			51.9	1.5%	57.4	1.5%	58.9	1.5%	
2024			52.7	1.5%	58.2	1.5%	59.8	1.5%	
2025			53.5	1.5%	59.1	1.5%	60.7	1.5%	
2026			54.4	1.6%	60.1	1.6%	61.7	1.6%	
2027			55.3	1.7%	61.1	1.7%	62.7	1.7%	
2028			56.2	1.7%	62.1	1.7%	63.8	1.7%	
2029			57.2	1.7%	63.2	1.7%	64.9	1.7%	
2030			58.1	1.7%	64.2	1.7%	65.9	1.7%	
2031			59.2	1.9%	65.4	1.9%	67.2	1.9%	

Compound Avg. 10 yr ('06 to '16)	2.5%	4.4%	3.9%	3.7%
Compound Avg. 5 yr ('11 to '16)	4.4%	3.2%	2.8%	2.7%
Compound Avg. 5 yr ('16 to '21)		1.6%	1.6%	1.6%
Compound Avg. 10 yr ('16 to '26)		1.5%	1.6%	1.6%
Compound Avg. 15 yr ('16 to '31)		1.6%	1.6%	1.6%

WTHI

NORMAL	75.0
EXTREME 90/10	77.2
EXTREME 95/5	77.9

NANTUCKET Winter Peaks (Actuals and 50/50, 90/10, & 95/5 Weather-Adjusted Cases)

after Energy Efficiency Reductions

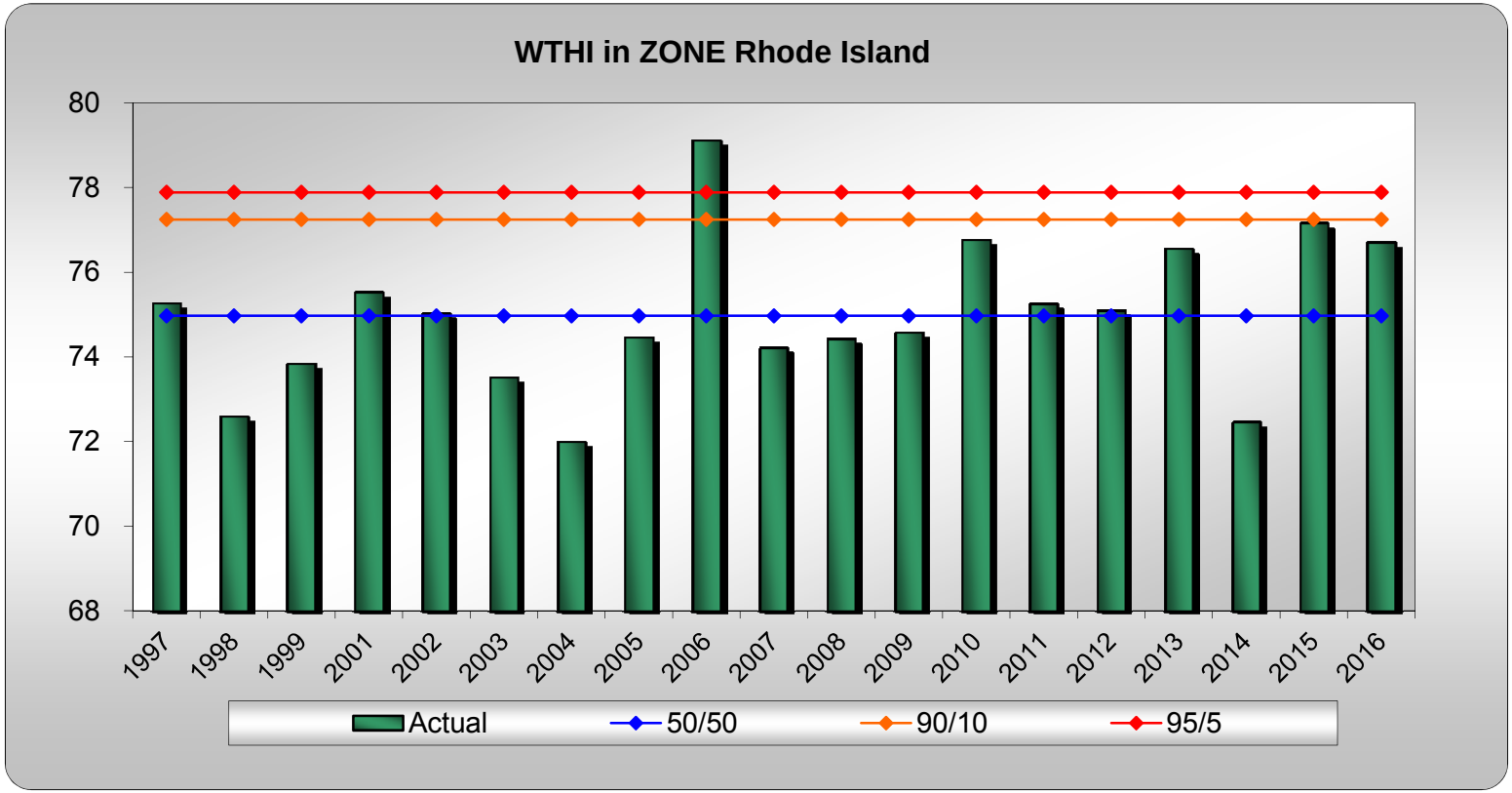
YEAR	Actuals (MW)	Actuals (% Grwth)	Normal 50-50 (MW)	Normal 50-50 (% Grwth)	Extreme 90-10 (MW)	Extreme 90-10 (% Grwth)	Extreme 95-5 (MW)	Extreme 95-5 (% Grwth)	HDD ACTUAL
2002	28.1		27.4		29.0		29.4		49.0
2003	32.1	14.4%	30.4	10.7%	31.9	10.2%	32.3	10.0%	58.0
2004	28.0	-12.8%	27.1	-10.7%	28.6	-10.2%	29.1	-10.1%	51.0
2005	26.6	-5.1%	26.9	-0.7%	28.5	-0.7%	28.9	-0.7%	41.0
2006	27.7	4.2%	26.4	-1.8%	28.0	-1.7%	28.4	-1.7%	54.0
2007	28.0	1.1%	29.6	11.9%	31.1	11.2%	31.5	11.0%	31.0
2008	25.4	-9.4%	24.7	-16.4%	26.2	-15.6%	26.7	-15.4%	49.0
2009	25.7	1.4%	26.0	5.4%	27.6	5.1%	28.0	5.0%	41.0
2010	24.9	-3.2%	25.0	-4.1%	26.5	-3.8%	27.0	-3.8%	43.0
2011	23.7	-4.6%	23.6	-5.6%	25.1	-5.3%	25.6	-5.2%	45.0
2012	27.2	14.5%	26.3	11.4%	27.8	10.7%	28.3	10.6%	51.0
2013	29.3	7.9%	29.1	10.6%	30.6	10.0%	31.1	9.8%	45.8
2014	29.7	1.1%	28.5	-1.8%	30.1	-1.7%	30.5	-1.7%	52.7
2015	30.1	1.6%	28.4	-0.6%	29.9	-0.6%	30.3	-0.6%	58.1
2016			28.1	-1.1%	29.6	-1.0%	30.0	-1.0%	
2017			28.6	1.9%	30.2	1.9%	30.6	1.9%	
2018			29.0	1.3%	30.6	1.3%	31.0	1.4%	
2019			29.2	0.9%	30.8	0.9%	31.3	0.9%	
2020			29.4	0.8%	31.1	0.8%	31.5	0.8%	
2021			29.8	1.2%	31.4	1.2%	31.9	1.2%	
2022			30.2	1.3%	31.9	1.3%	32.3	1.3%	
2023			30.6	1.4%	32.3	1.4%	32.8	1.4%	
2024			31.0	1.4%	32.8	1.4%	33.3	1.4%	
2025			31.5	1.5%	33.3	1.5%	33.8	1.5%	
2026			32.0	1.6%	33.8	1.6%	34.3	1.6%	
2027			32.5	1.6%	34.3	1.6%	34.8	1.6%	
2028			33.1	1.7%	34.9	1.7%	35.4	1.7%	
2029			33.6	1.7%	35.5	1.7%	36.0	1.7%	
2030			34.2	1.7%	36.1	1.7%	36.7	1.7%	

Compound Avg. 10 yr ('05 to '15)	1.3%	0.5%	0.5%	0.5%
Compound Avg. 5 yr ('10 to '15)	3.9%	2.6%	2.4%	2.4%
Compound Avg. 5 yr ('15 to '20)		0.8%	0.8%	0.8%
Compound Avg. 10 yr ('15 to '25)		1.1%	1.1%	1.1%
Compound Avg. 15 yr ('15 to '30)		1.3%	1.3%	1.3%

HDD

NORMAL	43.7
EXTREME 90/10	56.3
EXTREME 95/5	59.8

**** year is Dec. of year posted plus Jan. & Feb. of following year. (ex: year = 2014 is Dec.2014, Jan 2015, Feb 2015)***


WTHI in ZONE Rhode Island
80
78
76
74
72
70
68
1997
1998
1999
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
Actual
50/50
90/10
95/5

Appendix A

Distributed Energy Resources:

Energy Efficiency &
Solar - PV

Massachusetts — Total

SUMMER Peak (MW) and Energy Efficiency (EE)/PV Impacts

Calendar Year	SYSTEM PEAK (50/50) Reconstituted (before reductions)	SYSTEM PEAK (50/50) Final Forecast w/ EE Reduction only	SYSTEM PEAK (50/50) Final Forecast (after all reductions)	EE/DG REDUCTIONS EE Reduction Forecast	EE/DG REDUCTIONS PV Reduction Forecast	EE % of 'Reconstituted' Deliveries	PV % of 'Reconstituted' Deliveries
2003	4,520	4,507	**4,507**	13	0	0.3%	0.0%
2004	4,771	4,729	**4,729**	42	0	0.9%	0.0%
2005	4,971	4,902	**4,902**	70	0	1.4%	0.0%
2006	4,921	4,828	**4,828**	93	0	1.9%	0.0%
2007	4,869	4,749	**4,749**	120	0	2.5%	0.0%
2008	4,868	4,719	**4,719**	149	0	3.1%	0.0%
2009	4,901	4,718	**4,718**	183	0	3.7%	0.0%
2010	4,987	4,761	**4,761**	226	0	4.5%	0.0%
2011	4,965	4,692	**4,692**	273	0	5.5%	0.0%
2012	5,128	4,803	**4,792**	325	11	6.3%	0.2%
2013	5,174	4,786	**4,757**	387	30	7.5%	0.6%
2014	5,074	4,617	**4,570**	457	47	9.0%	0.9%
2015	5,210	4,665	**4,587**	545	78	10.5%	1.5%
2016	5,240	4,595	**4,472**	646	123	12.3%	2.3%
2017	5,376	4,643	**4,419**	733	224	13.6%	4.2%
2018	5,460	4,653	**4,386**	807	268	14.8%	4.9%
2019	5,525	4,648	**4,378**	877	270	15.9%	4.9%
2020	5,575	4,631	**4,361**	944	270	16.9%	4.9%
2021	5,626	4,618	**4,348**	1,008	270	17.9%	4.8%
2022	5,679	4,611	**4,341**	1,068	270	18.8%	4.8%
2023	5,733	4,608	**4,338**	1,125	270	19.6%	4.7%
2024	5,787	4,608	**4,337**	1,180	270	20.4%	4.7%
2025	5,842	4,611	**4,340**	1,231	270	21.1%	4.6%
2026	5,896	4,615	**4,345**	1,280	270	21.7%	4.6%
2027	5,948	4,621	**4,351**	1,327	270	22.3%	4.5%
2028	5,999	4,628	**4,357**	1,371	270	22.9%	4.5%
2029	6,048	4,635	**4,365**	1,413	270	23.4%	4.5%
2030	6,096	4,643	**4,372**	1,453	270	23.8%	4.4%
2031	6,143	4,651	**4,381**	1,491	270	24.3%	4.4%

'06 to '16: 10-year av	0.6%	-0.5%	**-0.8%**
'11 to '16: 5-year avg	1.1%	-0.4%	**-1.0%**
'16 to '21: 5-year avg	1.4%	0.1%	**-0.6%**
'16 to '26: 10-year av	1.2%	0.0%	**-0.3%**
'16 to '31: 15-year av	1.1%	0.1%	**-0.1%**

Rhode Island — Total

SUMMER Peak (MW) and Energy Efficiency (EE)/PV Impacts

Calendar Year	SYSTEM PEAK (50/50) Reconstituted (before reductions)	Final Forecast w/ EE Reduction only	Final Forecast (after all reductions)	EE/DG REDUCTIONS EE Reduction Forecast	PV Reduction Forecast	EE % of 'Reconstituted' Deliveries	PV % of 'Reconstituted' Deliveries
2003	1,788	1,783	**1,783**	5	0	0.3%	0.0%
2004	1,848	1,832	**1,832**	16	0	0.9%	0.0%
2005	1,787	1,760	**1,760**	27	0	1.5%	0.0%
2006	1,826	1,789	**1,789**	38	0	2.1%	0.0%
2007	1,898	1,849	**1,849**	49	0	2.6%	0.0%
2008	1,845	1,786	**1,786**	59	0	3.2%	0.0%
2009	1,889	1,816	**1,816**	73	0	3.9%	0.0%
2010	1,836	1,749	**1,749**	88	0	4.8%	0.0%
2011	1,937	1,836	**1,836**	101	0	5.2%	0.0%
2012	1,944	1,826	**1,826**	118	0	6.1%	0.0%
2013	1,980	1,837	**1,835**	142	2	7.2%	0.1%
2014	1,932	1,755	**1,752**	177	3	9.2%	0.2%
2015	2,058	1,843	**1,839**	215	5	10.5%	0.2%
2016	2,039	1,791	**1,782**	248	9	12.2%	0.4%
2017	2,093	1,817	**1,793**	276	24	13.2%	1.1%
2018	2,125	1,826	**1,783**	299	43	14.1%	2.0%
2019	2,149	1,828	**1,780**	320	49	14.9%	2.3%
2020	2,173	1,832	**1,780**	341	52	15.7%	2.4%
2021	2,200	1,839	**1,786**	361	53	16.4%	2.4%
2022	2,228	1,848	**1,794**	379	54	17.0%	2.4%
2023	2,255	1,858	**1,804**	397	55	17.6%	2.4%
2024	2,281	1,868	**1,812**	414	55	18.1%	2.4%
2025	2,307	1,877	**1,821**	430	56	18.6%	2.4%
2026	2,332	1,887	**1,830**	445	57	19.1%	2.4%
2027	2,357	1,897	**1,840**	459	57	19.5%	2.4%
2028	2,381	1,908	**1,850**	473	58	19.9%	2.4%
2029	2,405	1,919	**1,861**	486	58	20.2%	2.4%
2030	2,429	1,931	**1,872**	498	59	20.5%	2.4%
2031	2,453	1,943	**1,883**	510	60	20.8%	2.4%

'06 to '16: 10-year av	1.1%	0.0%	**0.0%**
'11 to '16: 5-year avg	1.0%	-0.5%	**-0.6%**
'16 to '21: 5-year avg	1.5%	0.5%	**0.0%**
'16 to '26: 10-year av	1.4%	0.5%	**0.3%**
'16 to '31: 15-year av	1.2%	0.5%	**0.4%**

Appendix B

COUNTY LEVEL GROWTH PROJECTIONS

Year One Weather-Adjustment and Multi-Year Annual Growth Percentages (Summer) after EE and PV reductions

			2016 Weather-Adjustments (2)			Annual Growth Rates (percents) (3)					5-yr avg	5-yr avg	5-yr avg
State	County	Zone (1)	for 50/50	for 90/10	for 95/5	2017	2018	2019	2020	2021	'17 to '21	'22 to '26	'27 to '31
MA	Essex	NEMA	94.5%	101.0%	102.8%	-0.6	-0.6	-0.3	-0.4	-0.3	-0.4	0.0	0.2
MA	Suffolk	NEMA	94.5%	101.0%	102.8%	-0.7	-0.7	-0.4	-0.6	-0.5	-0.6	-0.1	0.1
MA	Bristol	SEMA	96.7%	103.9%	105.9%	-0.5	-0.4	0.0	-0.2	-0.2	-0.3	0.1	0.2
MA	Norfolk	SEMA	96.7%	103.9%	105.9%	-0.7	-0.6	-0.2	-0.4	-0.3	-0.4	0.0	0.2
MA	Plymouth	SEMA	96.7%	103.9%	105.9%	-0.3	-0.3	0.2	-0.1	0.0	-0.1	0.2	0.3
MA	Berkshire	WCMA	99.2%	106.2%	108.2%	-0.9	-0.7	0.0	-0.3	-0.2	-0.4	0.0	0.2
MA	Franklin	WCMA	99.2%	106.2%	108.2%	-1.9	-1.7	-0.9	-1.0	-0.9	-1.3	-0.5	-0.1
MA	Hampden	WCMA	99.2%	106.2%	108.2%	-1.1	-1.0	-0.3	-0.5	-0.4	-0.6	-0.1	0.1
MA	Hampshire	WCMA	99.2%	106.2%	108.2%	-1.3	-1.1	-0.4	-0.6	-0.5	-0.8	-0.2	0.0
MA	Middlesex	NEMA/WCMA	97.8%	104.6%	106.6%	-0.9	-0.8	-0.2	-0.4	-0.4	-0.6	-0.1	0.1
MA	Worcester	SEMA/WCMA	98.9%	105.9%	107.9%	-1.0	-0.8	-0.2	-0.4	-0.3	-0.5	0.0	0.1
RI	Bristol	RI	98.8%	107.0%	109.4%	0.1	-1.1	-0.7	-0.4	-0.1	-0.4	0.2	0.4
RI	Kent	RI	98.8%	107.0%	109.4%	0.2	-1.0	-0.6	-0.3	0.0	-0.3	0.2	0.4
RI	Newport	RI	98.8%	107.0%	109.4%	0.3	-0.9	-0.5	-0.3	0.0	-0.3	0.3	0.4
RI	Providence	RI	98.8%	107.0%	109.4%	0.7	-0.5	-0.1	0.1	0.3	0.1	0.5	0.6
RI	Washington	RI	98.8%	107.0%	109.4%	1.7	0.4	0.6	0.8	1.0	0.9	1.0	0.9

(1) Zones refer to ISO-NE designations

(2) These first year weather-adjustment values can be applied to actual MW readings for current summer peaks to determine what the weather-adjusted value is for any of the three weather scenarios.

(3) These annual growth percents can be applied to the current summer peaks to determine what the growth for each area is.

Appendix C

PLANNING SUPPLY AREA (PSA) LEVEL PROJECTIONS

Year One Weather-Adjustment and Multi-Year Annual Growth Percentages (Summer) after EE and PV reductions

			2016 Weather-Adjustments (2)			Annual Growth Rates (percents) (3)					5-yr avg	5-yr avg	5-yr avg
State	PSA	Zone (1)	for 50/50	for 90/10	for 95/5	2017	2018	2019	2020	2021	'17 to '21	'22 to '26	'27 to '31
MA	Essex	NEMA	94.5%	101.0%	102.8%	-0.7	-0.7	-0.4	-0.6	-0.5	-0.6	-0.1	0.1
MA	Surburban	NEMA	94.5%	101.0%	102.8%	-0.9	-0.9	-0.6	-0.7	-0.6	-0.7	-0.2	0.1
MA	Merrimack	NEMA/WCMA	96.6%	103.3%	105.2%	-0.6	-0.6	-0.1	-0.3	-0.2	-0.4	0.0	0.2
MA	Attleboro	SEMA	96.7%	103.9%	105.9%	-0.3	-0.3	0.2	-0.1	0.0	-0.1	0.2	0.3
MA	Brockton	SEMA	96.7%	103.9%	105.9%	-0.5	-0.4	0.0	-0.2	-0.2	-0.2	0.1	0.2
MA	Fall River	SEMA	96.7%	103.9%	105.9%	-0.4	-0.4	0.0	-0.2	-0.2	-0.2	0.1	0.2
MA	Weymouth	SEMA	96.7%	103.9%	105.9%	-1.0	-0.9	-0.4	-0.6	-0.5	-0.7	-0.2	0.1
MA	Uxbridge	SEMA/WCMA	96.7%	103.9%	105.9%	0.0	0.0	0.4	0.1	0.1	0.1	0.3	0.3
MA	Adams	WCMA	99.2%	106.2%	108.2%	-0.8	-0.6	0.1	-0.2	-0.1	-0.3	0.1	0.2
MA	Athol	WCMA	99.2%	106.2%	108.2%	-1.5	-1.3	-0.5	-0.7	-0.6	-0.9	-0.3	0.0
MA	Gardner	WCMA	99.2%	106.2%	108.2%	-1.6	-1.4	-0.6	-0.8	-0.7	-1.0	-0.3	-0.1
MA	Leominster	WCMA	99.2%	106.2%	108.2%	-0.4	-0.3	0.4	0.1	0.1	0.0	0.3	0.3
MA	Marlboro	WCMA	99.2%	106.2%	108.2%	-1.7	-1.4	-0.7	-0.8	-0.7	-1.1	-0.3	0.0
MA	Northampton	WCMA	99.2%	106.2%	108.2%	-1.1	-0.9	-0.2	-0.4	-0.4	-0.6	-0.1	0.1
MA	Palmer	WCMA	99.2%	106.2%	108.2%	-1.2	-1.0	-0.3	-0.5	-0.4	-0.7	-0.1	0.1
MA	South Berkshire	WCMA	99.2%	106.2%	108.2%	-1.0	-0.9	-0.2	-0.4	-0.3	-0.6	0.0	0.1
MA	Webster	WCMA	99.2%	106.2%	108.2%	-0.3	-0.2	0.5	0.2	0.2	0.1	0.3	0.4
MA	Worcester	WCMA	99.2%	106.2%	108.2%	-1.8	-1.6	-0.8	-1.0	-0.9	-1.2	-0.5	-0.1
RI	Blackstone Valley	RI	98.8%	107.0%	109.4%	0.4	-0.7	-0.4	-0.1	0.1	-0.1	0.4	0.5
RI	Newport	RI	98.8%	107.0%	109.4%	0.1	-1.0	-0.6	-0.4	-0.1	-0.4	0.2	0.4
RI	Providence	RI	98.8%	107.0%	109.4%	0.7	-0.5	-0.2	0.0	0.3	0.0	0.4	0.5
RI	Western Narraganset	RI	98.8%	107.0%	109.4%	0.9	-0.3	0.1	0.2	0.5	0.3	0.6	0.7

(1) Zones refer to ISO-NE designations

(2) These first year weather-adjustment values can be applied to actual MW readings for current summer peaks to determine what the weather-adjusted value is for any of the three weather scenarios.

(3) These annual growth percents can be applied to the current summer peaks to determine what the growth for each area is.

Appendix D

Historical Peak Days and Hours

MASSACHUSETTS* Peak Days and Hours

Year	Date	Month	Hour	Day *
2003	8/22/2003	8	15	6
2004	8/30/2004	8	16	2
2005	7/27/2005	7	16	4
2006 **	8/2/2006	8	16	4
2007	6/27/2007	6	15	4
2008	6/10/2008	6	17	3
2009	8/18/2009	8	14	3
2010	7/6/2010	7	15	3
2011 **	7/22/2011	7	14	6
2012	7/17/2012	7	17	3
2013 **	7/19/2013	7	15	6
2014	7/2/2014	7	16	4
2015	7/20/2015	7	17	2
2016	8/12/2016	8	15	6

** includes MECO & Nantucket*

RHODE ISLAND Peak Days and Hours

year	Date	Month	Hour	Day *
2003	8/22/2003	8	15	6
2004	8/30/2004	8	15	2
2005	8/5/2005	8	15	6
2006 **	8/2/2006	8	15	4
2007	8/3/2007	8	15	6
2008	6/10/2008	6	15	3
2009	8/18/2009	8	15	3
2010	7/6/2010	7	15	3
2011 **	7/22/2011	7	16	6
2012	7/18/2012	7	15	4
2013 **	7/19/2013	7	15	6
2014	**9/2/2014**	9	16	3
2015	7/20/2015	7	15	2
2016	8/12/2016	8	16	6

NANTUCKET Peak Days and Hours

year	Date	Month	Hour	Day *
2003	8/8/2003	19	15	6
2004	8/20/2004	20	15	6
2005	8/5/2005	19	15	6
2006	8/3/2006	19	15	5
2007	8/3/2007	19	15	6
2008	8/2/2008	19	15	**7**
2009	8/21/2009	19	15	6
2010	8/6/2010	18	15	6
2011	7/22/2011	19	16	6
2012	8/4/2012	19	15	**7**
2013	7/19/2013	18	15	6
2014	7/3/2014	19	16	5
2015	7/29/2015	18	15	4
2016	8/14/2016	18	15	**1**

SUMMER Zones Non-Coincident Peak Days and Hours

	WCMA				NEMA				SEMA			
Year	Date	Month	Hour	Day	Date	Month	Hour	Day	Date	Month	Hour	Day
2003	6/27/2003	6	14	6	8/22/2003	8	16	6	8/22/2003	8	15	6
2004	8/30/2004	8	16	2	8/3/2004	8	17	3	8/30/2004	8	16	2
2005	7/27/2005	7	15	4	7/27/2005	7	17	4	7/27/2005	7	16	4
2006 **	8/2/2006	8	15	4	8/2/2006	8	17	4	8/2/2006	8	16	4
2007	6/27/2007	6	15	4	6/27/2007	6	16	4	8/3/2007	8	15	6
2008	6/10/2008	6	17	3	6/10/2008	6	18	3	6/10/2008	6	17	3
2009	8/18/2009	8	14	3	8/18/2009	8	14	3	8/18/2009	8	15	3
2010	7/7/2010	7	15	4	7/6/2010	7	15	3	7/6/2010	7	17	3
2011 **	7/22/2011	7	14	6	7/22/2011	7	15	6	7/22/2011	7	16	6
2012	7/17/2012	7	17	3	7/17/2012	7	18	3	7/17/2012	7	16	3
2013 **	7/19/2013	7	15	6	7/19/2013	7	17	6	7/19/2013	7	15	6
2014	7/2/2014	7	15	4	7/2/2014	7	16	4	**9/2/2014**	9	16	3
2015	**9/8/2015**	9	17	3	**9/9/2015**	9	17	4	7/20/2015	7	18	2
2016	8/12/2016	8	15	6	8/12/2016	8	16	6	8/12/2016	8	16	6

All Hours are "Hour-Ending"

DAY: Sunday = 1 to Saturday = 7*

*** Indicates that there was a ISO-NE Demand Response event called*