Energy Efficiency Forecast 2015-2020

Energy Efficiency Forecast Working Group
Friday, February 24, 2012
9:00 a.m. – 4:00 p.m.
ISO-NE, Holyoke, MA
Connecticut Room

David Ehrlich, ISO New England
Eric Wilkinson, ISO New England
Eric Winkler, ISO New England

AGENDA

9:00 a.m. – 9:15 a.m.	**Introduction to Workgroup & Welcome** *ISO New England*
9:15 a.m. – 9:45 a.m.	**EE Forecast Background and Data Collection Process** *ISO New England*
9:45 a.m. – 10:45 a.m.	**EE Program Data Summary** *Dave Ehrlich, ISO New England*
10:45 a.m. – 12:15 p.m.	**Direction of EE Programs and Costs - Program Administrators** *Update from each PA focusing on recent data submission including insights on future of program mix, percent of budget spent and production costs*
12:15 p.m. – 1:00 p.m.	**Lunch**
1:00 p.m. – 1:30 p.m.	**EE Projected Budget Summary**
1:30 p.m. – 2:30 p.m.	**Direction on EE Funding and Sources - State Agencies** *Updates on amount of funding and sources for EE programs*
2:30 p.m. – 3:45 p.m.	**EE Forecast Scenarios and Discussion** *Dave Ehrlich, ISO New England* *Discussion of EE forecast model, current assumptions and data inputs*
3:45 p.m. – 4:00 p.m.	**Next Steps in Forecast Development Q&A** *Discussion of EE forecast model process*
4:00 p.m.	**Adjourn**

Energy Efficiency Forecast Work Group

- Objective
  - Provide input on EE forecast assumptions, data inputs, model validation, and feedback on the model results
  - The responsibility to produce both the load forecast and the EE forecast rests with the ISO
- Organization
  - Chaired by a representative of ISO New England, and not a formal NEPOOL committee or subcommittee
  - The EEFWG will serve in an advisory role to the ISO and will not be a voting body.
  - Meeting agendas and materials will be posted on the ISO website and advance notice will be provided to all interested parties
- Participation:
  - This stakeholder group is open to all interested parties
  - PA and state agency representatives with strong knowledge of EE programs and funding will be particularly valuable
- EEFWG scope of work will be posted to ISO Website

(http://www.iso-ne.com/committees/comm_wkgrps/othr/enrgy_effncy_frcst/index.html)

EE Forecast

- Forecast long range Energy Efficiency savings for New England by state
- Establish inputs to model

  MW = $ * %Spent * MWh/$ * Realization Rate * MW/MWh

  - $: an estimate of the dollars to be spent on EE (Including Budget Uncertainty)
  - %Spent: percentage of dollars that can be spent on EE programs in that time period – developed from historical data
  - MWh/$: MWh savings per dollar spent – developed from historical data
  - Realization Rate: comparison of observed/measured savings to estimated savings – developed from historical data
  - MW/MWh: peak to energy ratio (inverse of load factor) developed from historical data and possibly load forecast

Out of Scope for the EE Forecast

- Evaluation of EE program or measure level energy or demand impacts
- Comparisons of programs across sectors, program administrators (PAs) or states
- Cost benefit analysis
- Wholesale energy or capacity market implementation or design
- Discussion of Forward Capacity Market (FCM) bidding, performance, or future participation
- Transmission or interconnection analysis

Potential Use of EE Forecast

- EE forecast would be used in studies looking beyond the FCM timeframe
  - Long-term transmission planning studies
  - Economic planning studies
  - Other planning studies
- EE forecast would not impact:
  - FCM auctions
  - ICR/Local Sourcing Requirement/Maximum Capacity Limit
  - FCM related reliability studies (qualification, de-list, non-price retirement)
  - Any System Operations analysis across the four-year FCM window

Energy Efficiency Forecast Background

Background

- New England states are making large investments in EE through many programs
- ISO staff has been working with regional stakeholders to explore the impact of state-sponsored EE
  - Created the Regional Energy Efficiency Initiative in 2009
    - Met with states & utilities to understand the magnitude of EE programs
    - Results were summarized in the 2010 Regional System Plan (RSP10)

Background, *cont.*

- In August 2010, NESCOE submitted comments on RSP10 indicating that:
  - There are MW of EE outside of the FCM not addressed by ISO and ISO should adopt an EE forecast based on the average of EE in the FCM
- In April 2011, ISO presented results of the FCM EE analysis to the Planning Advisory Committee (PAC)
  - ISO met with all EE PAs to gather additional information
  - Analysis shows that nearly all state-sponsored EE is captured in the FCM
- There is consensus among states that ISO should forecast EE savings beyond the FCM results across the ten-year planning horizon
- Many other stakeholders support this position

ISO's Current Practice

EE Incorporated

- Load Forecast
  - Past actual EE not modeled as a resource in FCM is reflected in historical data and subsequent load forecasts
  - Impact of future federal appliance efficiency standards is reflected
- Installed Capacity Requirement (ICR)
  - EE resources with obligations in the FCM are treated as resources that contribute toward meeting New England's ICR

Longer-term Incremental EE Not Incorporated

- Beyond the FCM timeframe, levels of EE are held constant; therefore, incremental EE growth is not captured in ten-year-out transmission planning studies

EE Forecast Research

- Among other ISO/RTO's, only NYISO currently forecasts EE
  - Their methodology is based on forecasted "production costs" (MWh savings per dollar spent) and budgets of EE programs
  - Discussions with NYISO confirmed:
    - The need for states/PAs to provide reliable data to the ISO
    - An approach that uses EE budgets and estimated costs to predict future EE-related savings is a good basis for EE forecast
- NESCOE
  - NESCOE proposed an alternative approach based on a rolling average of EE in the FCM
  - NESCOE would like flexibility in the timing of data requests for supporting information

EE Forecast Process

- EE forecast completed during normal forecasting cycle and would be included in the annual RSP
- EE forecast would be published to accompany the traditional 10-year load forecast, typically in early spring of each year
- Create a task force/working group to provide ongoing input on EE forecast assumptions and methodology
  - Populated with state representatives and utility PAs, chaired by ISO staff
- Implement Data Collection from PAs
- Hold Workgroup meeting(s) to review data and preliminary model results
- Finalize forecast for the annual RSP

Energy Efficiency Program Data Collection Summary

Program Data Summary

- 14 PA Reports
- 3 years of data
- 492 EE Programs Reported
- 132 Unique Program Names
- 108 Programs with Energy and/or Demand Savings
- 22 Unique Customer Classes (All, C&I, Low Income, Residential)
- 73 Unique Program Types (reduced to 12)
- 50 Unique Measure/End Uses (reduced to 14)

Program Data Summary – Count of Programs with Energy and or Demand Savings

State	2008	2009	2010	2011	Total
CT	-	17	17	17	**51**
MA	47	53	57	-	**157**
ME	-	5	6	5	**16**
NH	26	26	33	-	**85**
RI	10	10	9	-	**29**
VT	10	10	10	-	**30**
Grand Total	**93**	**121**	**132**	**22**	**368**

Program Data Summary – Program and Measure Categories

Program Type
Admin/Planning
Behavior
Demand Response
Education
Existing Buildings
Existing Buildings Large
Existing Buildings Small
Lighting/Appliances
Loans
New Construction
New Construction Small
New Construction/Major Renovation

Measure/End Use
Education
Envelope
Heating
Appliances
Lighting
Lighting/Appliances
Lighting/Appliances/Envelope
Lighting/Mechanical
Lighting/Mechanical/Process
Mechanical/Process
Mechanical
Process
Other

Overlapping Measures

Program Data Summary

- Limited data for committed savings or project implementation information
- Need greater consistency in allocation of all budget costs
  - Unallocated performance incentive, budget weighted allocation
  - Unallocated non-performance incentive, energy weighted allocation
- A narrowing of customer classes and program types and enhanced details on end-use/measures and may need to occur in order to infer production costs to specific programs
- Need to revisit data collection tool to reflect enhancements

Energy Efficiency Program Data Summary

Key Parameters for EE Forecast Model

MW = $ * %Spent * MWh/$ * Realization Rate * MW/MWh

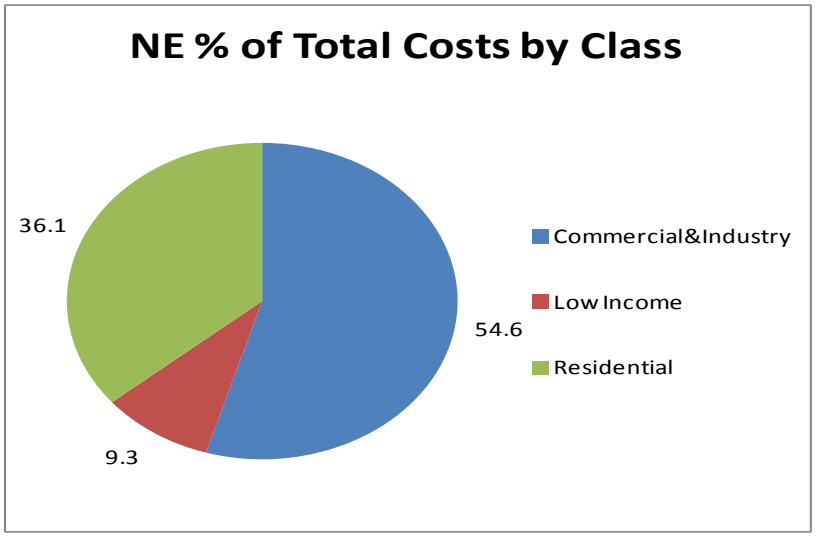
- **$:** an estimate of the dollars to be spent on EE (Including Budget Uncertainty)
- **%Spent:** percentage of dollars that can be spent on EE programs in that time period – developed from historical data
- **MWh/$:** MWh savings per dollar spent – developed from historical data
- **Realization Rate:** comparison of observed/measured savings to estimated savings – developed from historical data
- **MW/MWh:** peak to energy ratio (inverse of load factor) developed from historical data and possibly load forecast

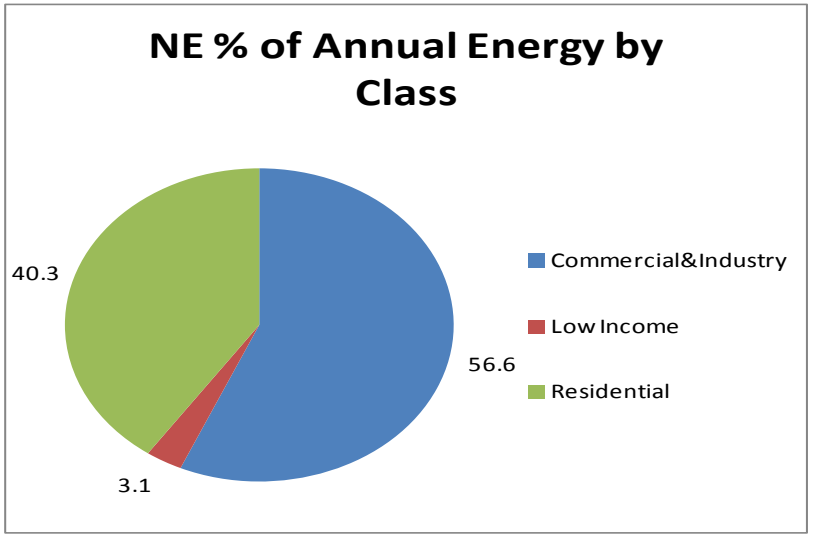
Summary

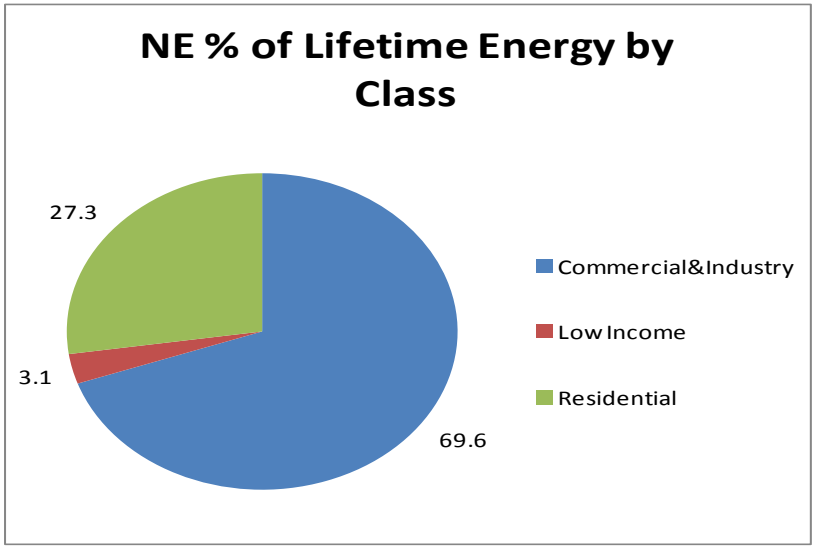
	Total Costs $1000s	Achieved Annual ergy (MWh)	Dollars per MWh	Achieved Summer Peak (MW)	Dollars per MW	% Energy Achieved	% Budget Spent	Achieved Lifetime Energy	Lifetime Dollars per MWh	Peak to Energy Ratio MW/GWh
New England										
2008	193491	663634	292	104	1864396	103	103	7401611	26	0.15638
2009	351008	933470	376	153	2294948	83	107	10685610	33	0.16385
2010	499665	1370739	365	196	2548389	110	105	14625840	34	0.14304
2011	142243	534638	266	61	2316632	130	132	4611472	31	0.11485
Connecticut										
2009	73411	222500	330	34	2150181	60	83	2464777	30	0.15345
2010	144938	405043	358	50	2907253	113	124	3533541	41	0.12308
2011	119426	381974	313	43	2769431	93	111	3163706	38	0.11290
Maine (Maine Efficiency Trust)										
2009	13806	55176	250	6	2127537	0	0	519953	27	0.11760
2010	16846	74180	227	8	2198392	0	0	709392	24	0.10330
2011	22817	152663	149	18	1248348	0	0	1447766	16	0.11973
Massachusetts										
2008	126376	388254	325	59	2149443	98	106	4452237	28	0.15143
2009	192362	424652	453	70	2751448	81	114	5075859	38	0.16464
2010	253086	619638	408	92	2756933	100	92	7336580	34	0.14815
New Hampshire										
2008	18177	64173	283	13	1358547	127	94	770818	24	0.20850
2009	17988	59691	301	13	1413028	139	99	750029	24	0.21326
2010	21763	73710	295	17	1309063	121	100	894648	24	0.22555
Rhode Island (NECO NGRID)										
2008	16248	60053	271	10	1589028	110	112	717714	23	0.17027
2009	26211	81543	321	15	1702327	103	113	899331	29	0.18882
2010	27581	81275	339	13	2163860	116	110	929242	30	0.15683
Vermont										
2008	32689	151154	216	21	1528816	106	96	1460841	22	0.14146
2009	27230	89907	303	14	1907265	92	94	975655	28	0.15880
2010	35451	116894	303	17	2039380	88	104	1222437	29	0.14871

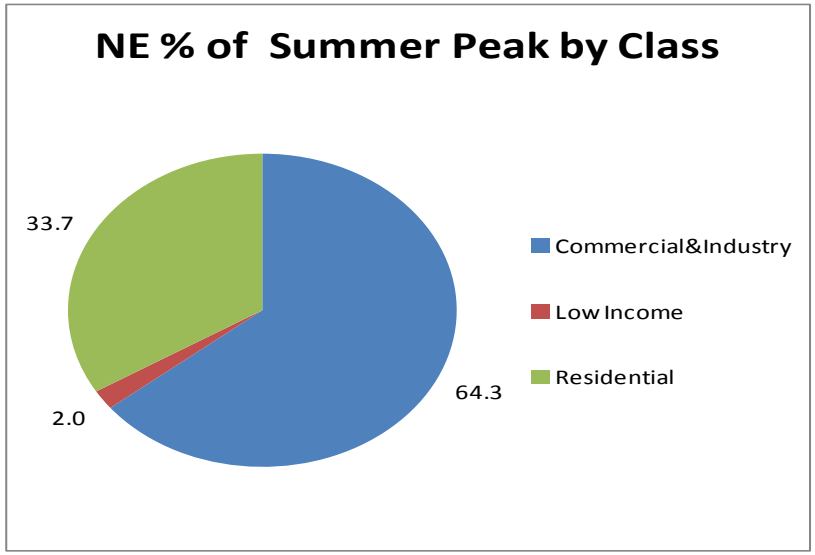
* PA data for missing years (2008 or 2011) are excluded in state level data

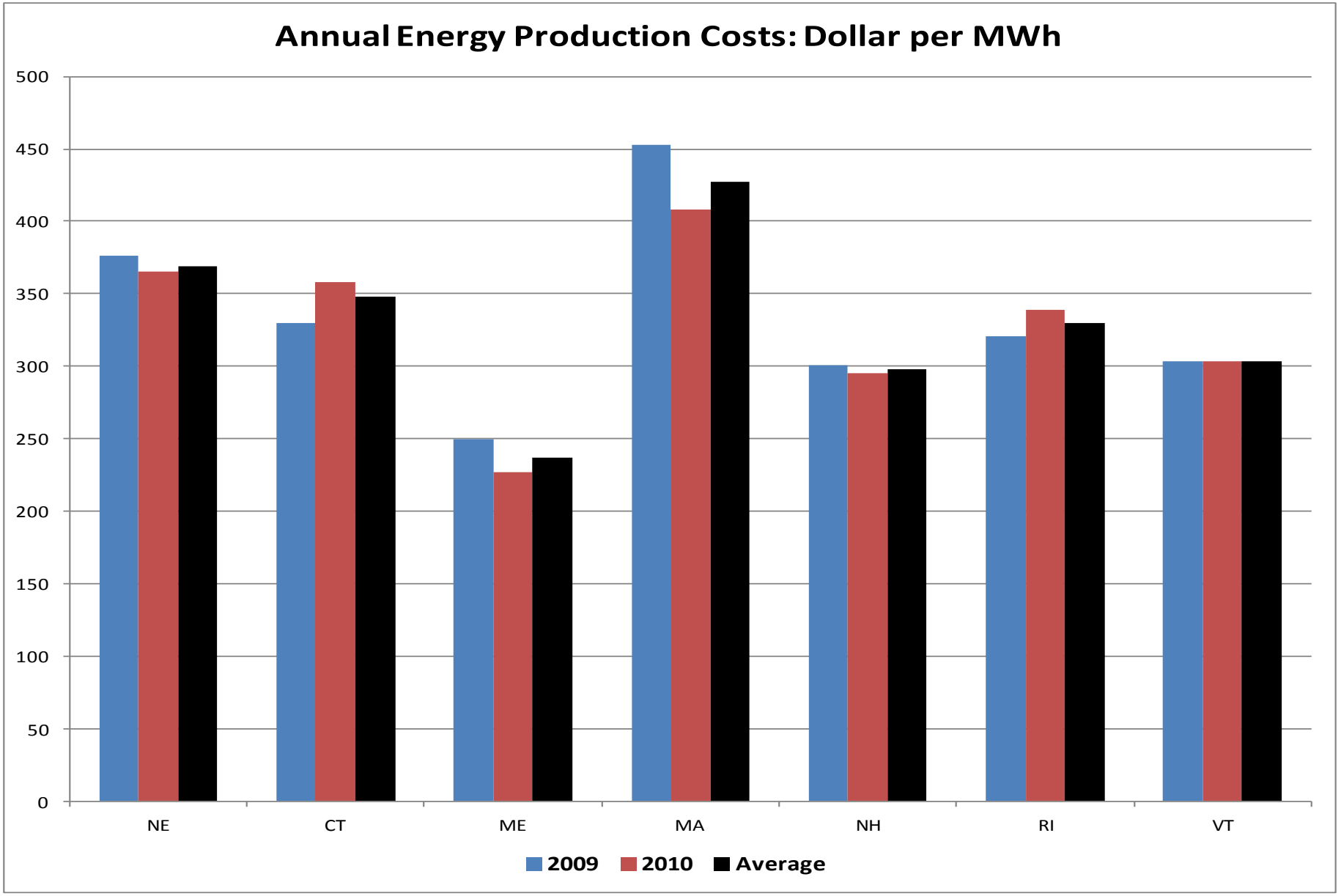
Summarization by Class

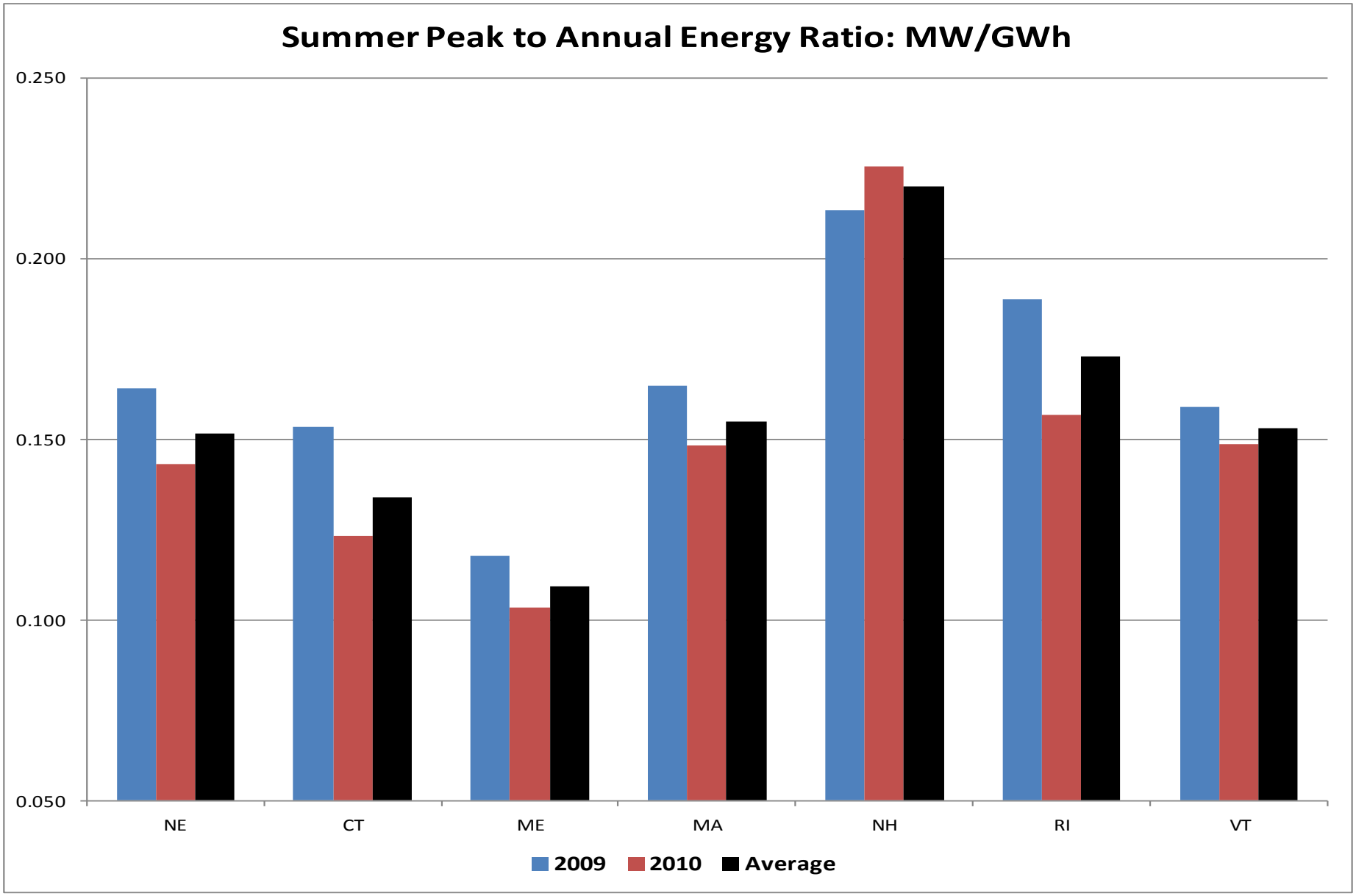


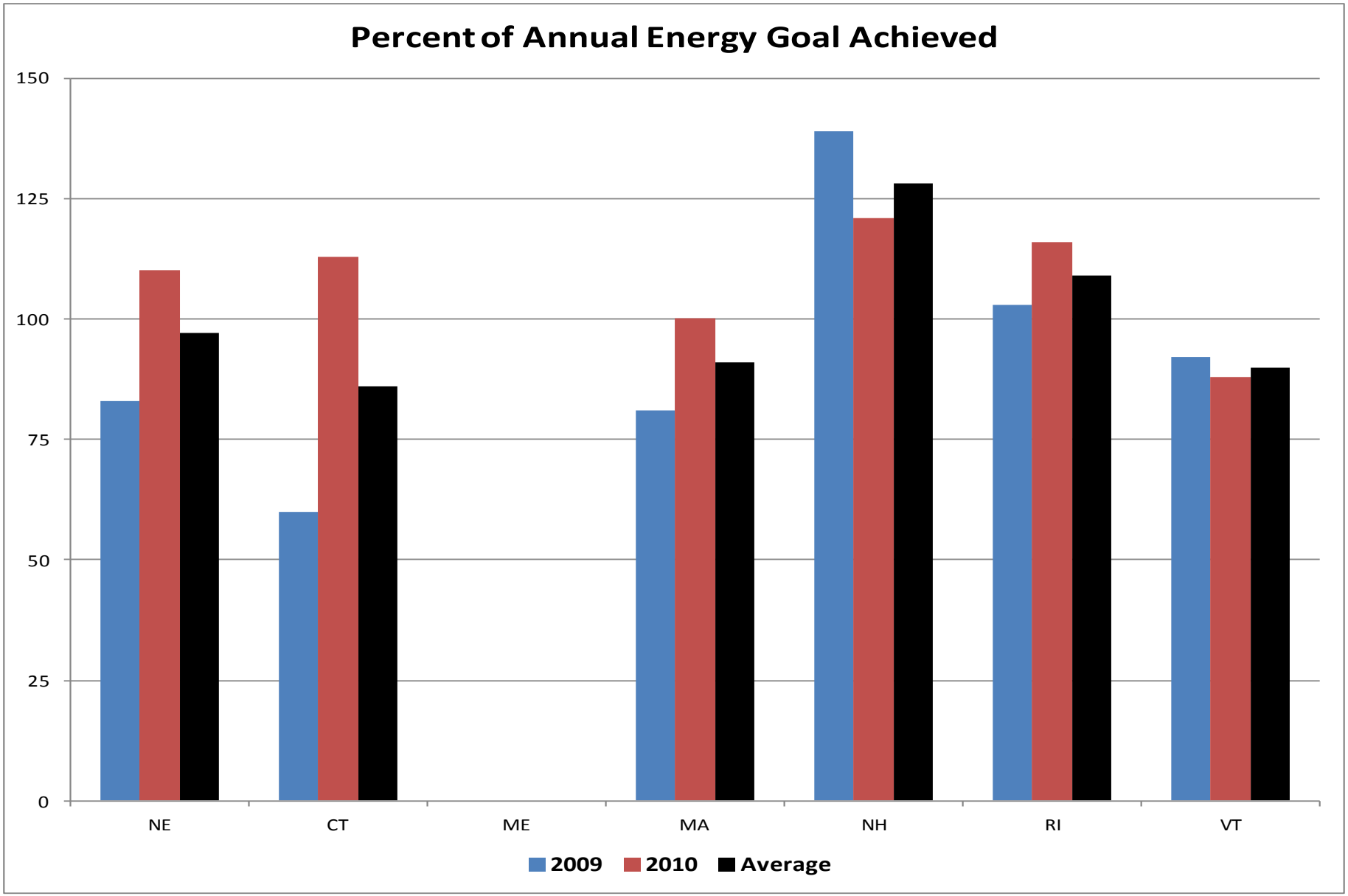


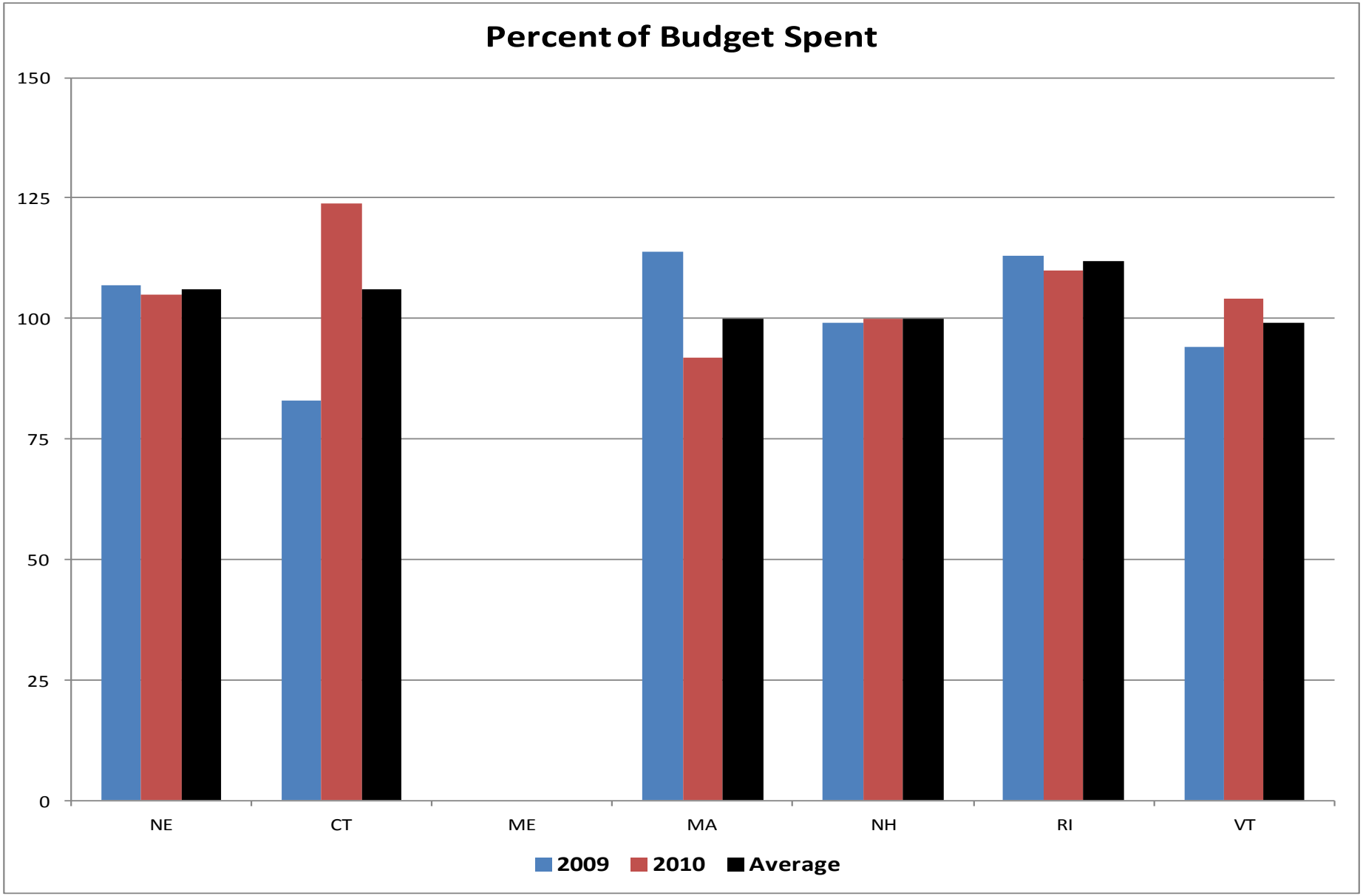


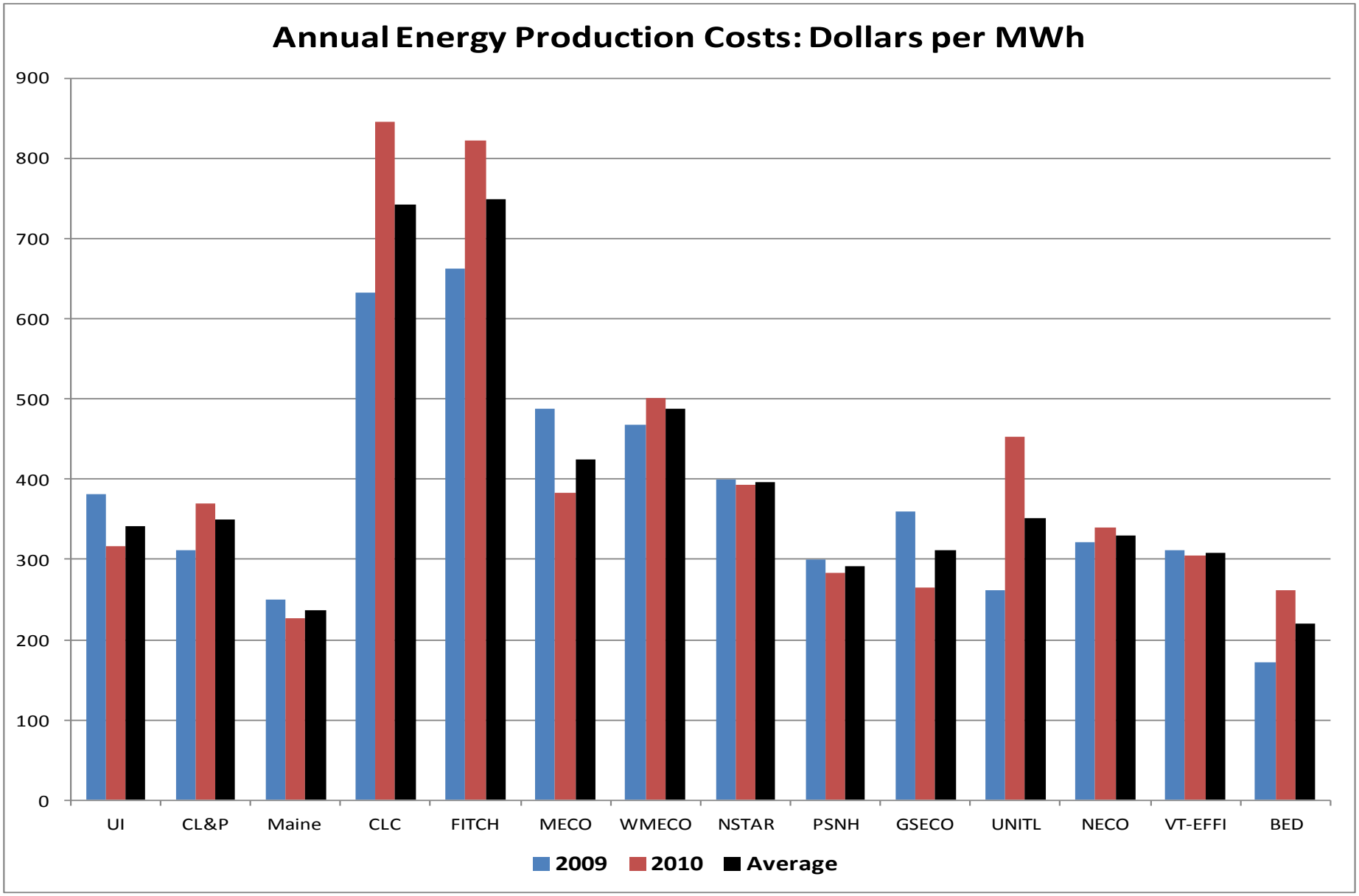


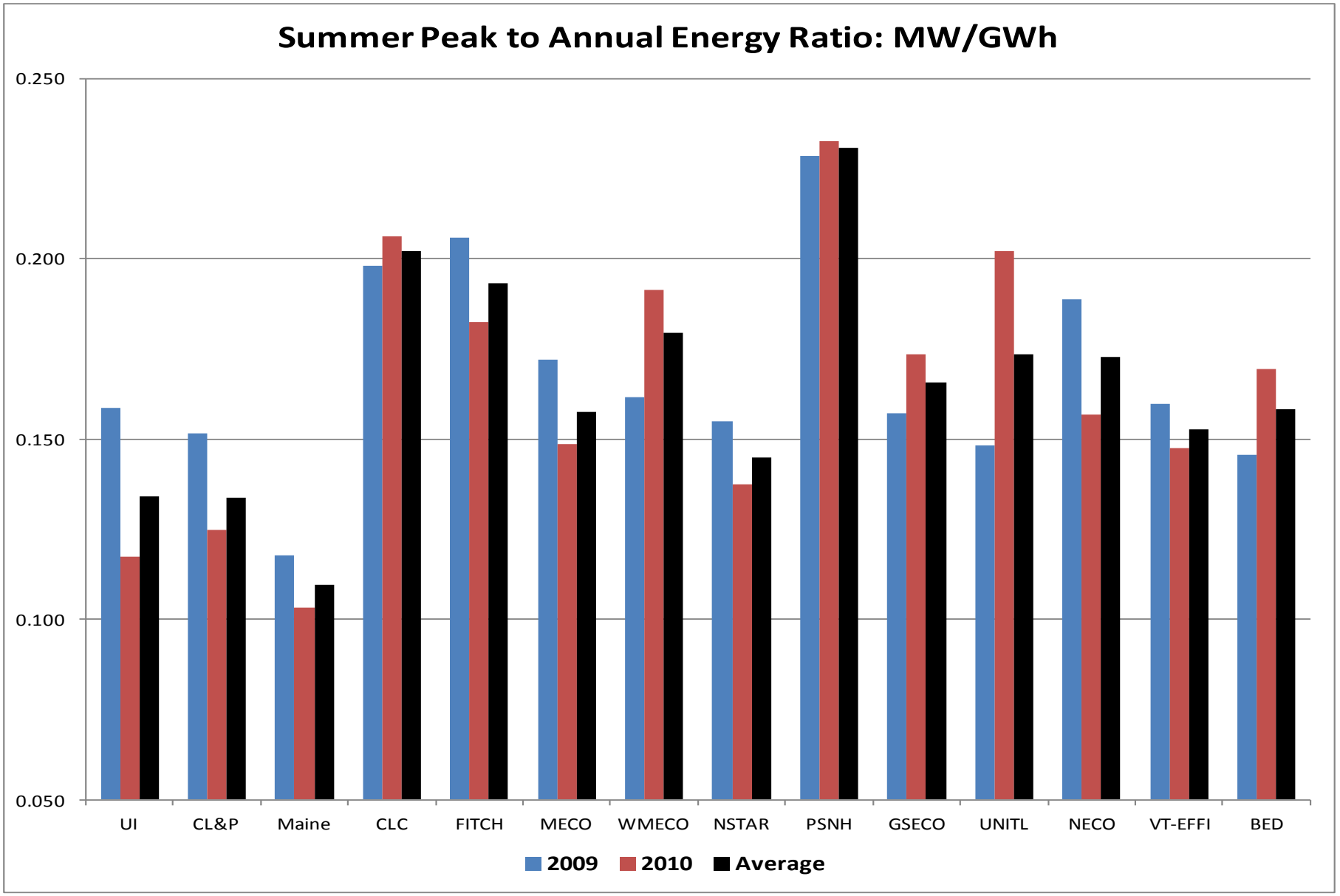








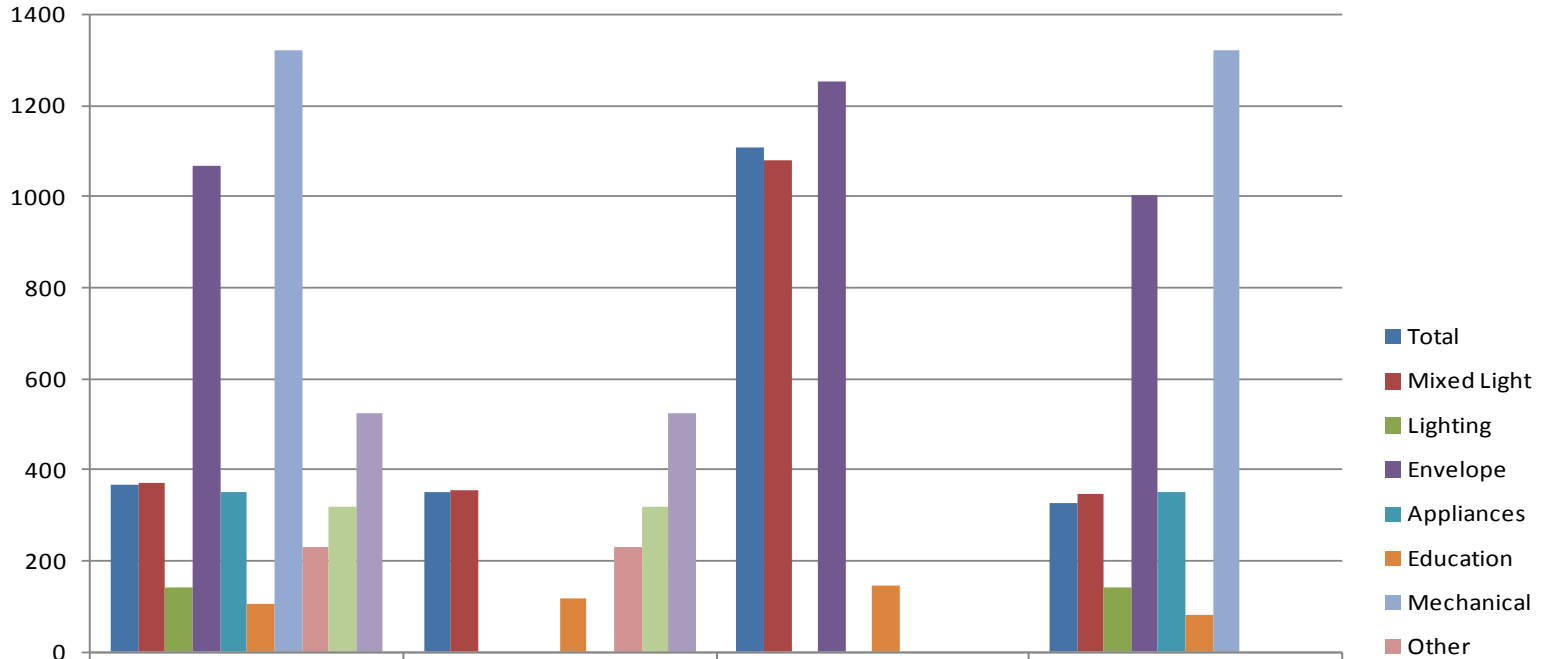




Program/End Use Measures Summary

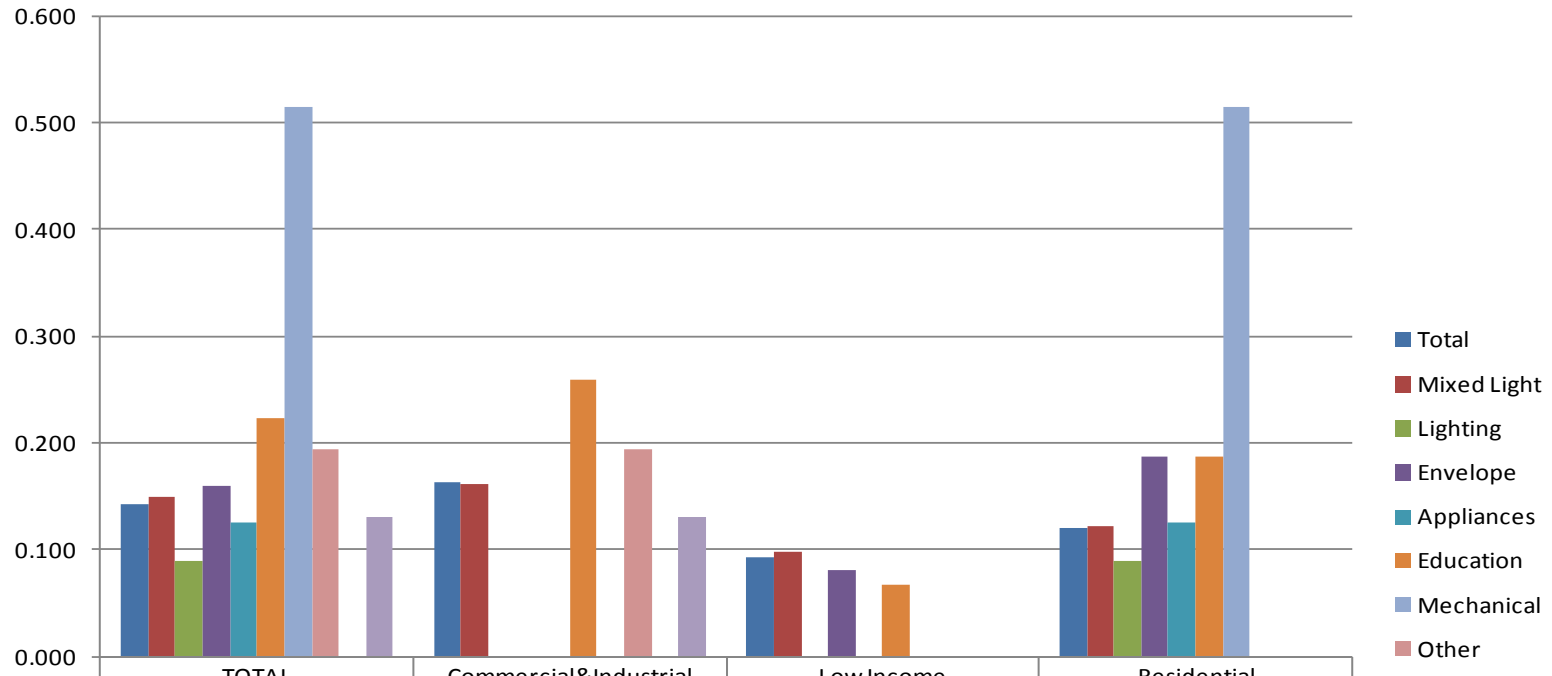
- Commercial Industrial programs are significant portion of energy and demand savings
- Lighting measures are majority of energy and demand savings
- Peak to energy ratio appears to be measure dependent
- Cost varies across measures
- Averages reflect mix of class and measures
- Additional detail on program level measures may be helpful to improve forecasting analysis

2010 New England Energy Production Costs: Dollars per MWh By Class and Measure



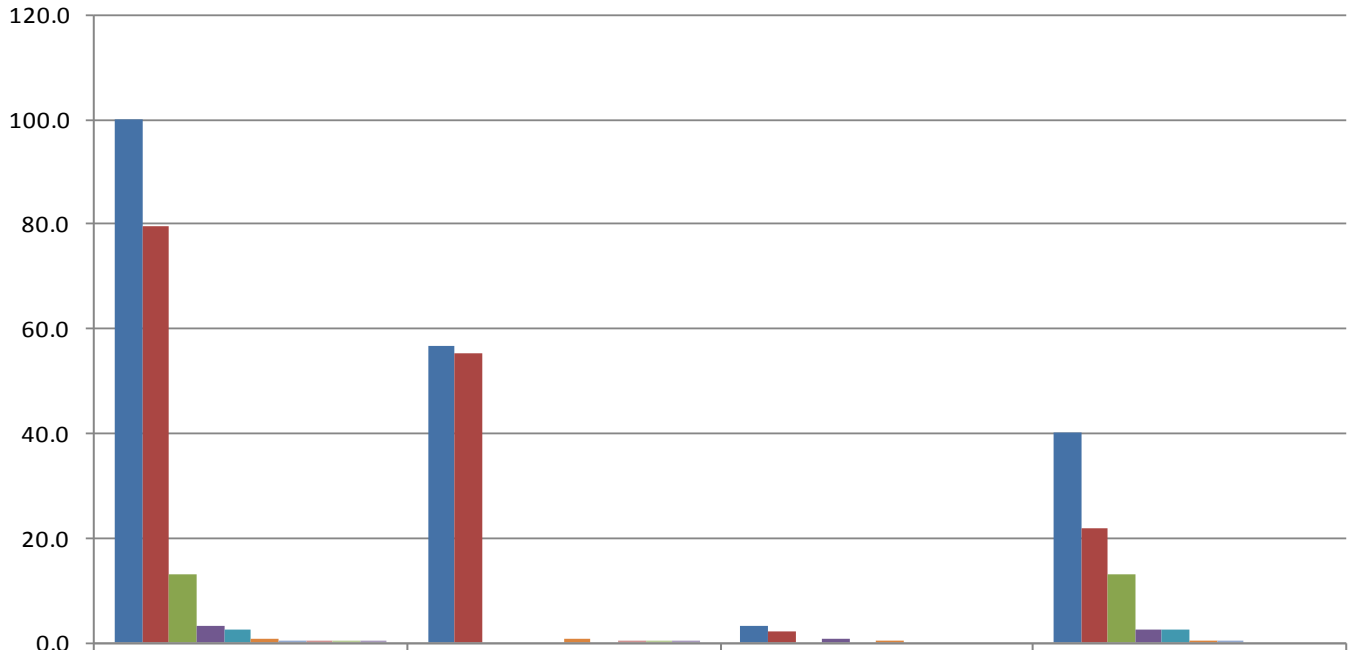
	TOTAL	Commercial&Industrial	Low Income	Residential
Total	365	352	1106	326
Mixed Light	372	354	1078	346
Lighting	142	0	0	142
Envelope	1068	0	1254	1005
Appliances	350	0	0	350
Education	106	116	146	79
Mechanical	1320	0	0	1320
Other	231	231	0	0
Process	320	320	0	0
Mech/Proc	525	525	0	0

2010 New England Summer Peak to Energy Ratio: MW/GWh By Class and Measure



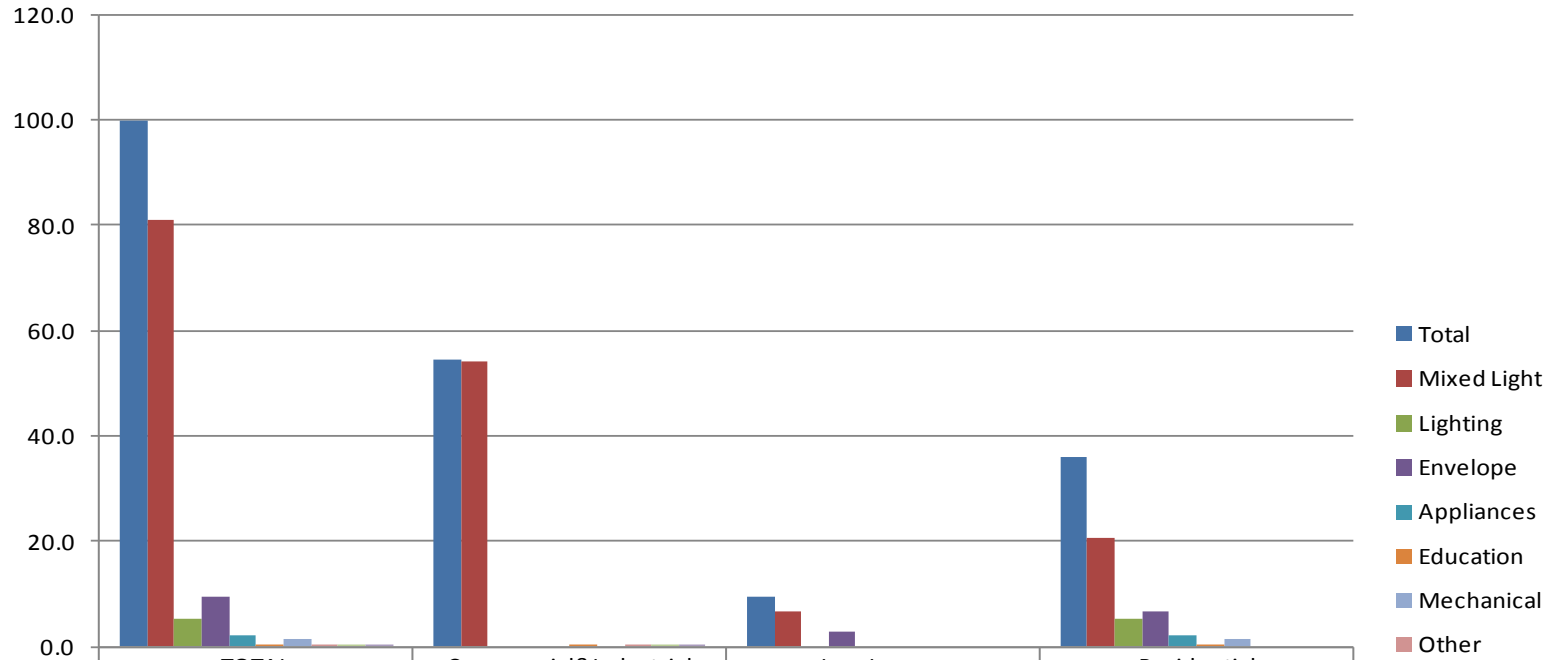
	TOTAL	Commercial&Industrial	Low Income	Residential
Total	0.14304	0.16242	0.09264	0.11962
Mixed Light	0.14903	0.16177	0.09772	0.12181
Lighting	0.0897	0	0	0.0897
Envelope	0.15983	0	0.08098	0.18683
Appliances	0.12471	0	0	0.12471
Education	0.22258	0.25855	0.06636	0.18638
Mechanical	0.51574	0	0	0.51574
Other	0.19426	0.19426	0	0
Process	0	0	0	0
Mech/Proc	0.12988	0.12988	0	0

2010 New England Percent of Annual Energy By Class and Measure



	TOTAL	Commercial&Industrial	Low Income	Residential
Total	100.0	56.6	3.1	40.3
Mixed Light	79.5	55.5	2.2	21.8
Lighting	13.0	0.0	0.0	13.0
Envelope	3.2	0.0	0.8	2.4
Appliances	2.4	0.0	0.0	2.4
Education	0.9	0.6	0.1	0.3
Mechanical	0.4	0.0	0.0	0.4
Other	0.3	0.3	0.0	0.0
Process	0.2	0.2	0.0	0.0
Mech/Proc	0.1	0.1	0.0	0.0

2010 New England Percent of Total Costs By Class and Measure



	TOTAL	Commercial&Industrial	Low Income	Residential
Total	100.0	54.6	9.3	36.1
Mixed Light	81.2	54.0	6.5	20.7
Lighting	5.1	0.0	0.0	5.1
Envelope	9.4	0.0	2.8	6.6
Appliances	2.3	0.0	0.0	2.3
Education	0.3	0.2	0.0	0.1
Mechanical	1.4	0.0	0.0	1.4
Other	0.2	0.2	0.0	0.0
Process	0.1	0.1	0.0	0.0
Mech/Proc	0.1	0.1	0.0	0.0

Energy Efficiency Budget Summary

Basis for Budget Analysis

- Methodology: Forecasting the budgeted dollars for EE
- Budget estimates derived from revenue sources
  - System Benefit Charge (SBC)
  - Regional Greenhouse Gas Initiative (RGGI)
  - FCM payments
- Policy based on estimates of “all cost-effective EE”
  - Costs of programs net of SBC + RGGI + FCM
  - Charged back to electricity customers

Budget Analysis – Load Forecast

ENERGY : 2010 Actual 2011-2020 RSP11 Forecast (GWh)							
	Total	ME	NH	VT	CT	RI	MA
2010	130,773	11,696	11,735	6,063	32,296	8,464	60,519
2011	135,455	12,105	12,085	6,505	33,795	8,615	62,350
2012	137,955	12,320	12,375	6,615	34,395	8,780	63,470
2013	139,230	12,385	12,535	6,685	34,720	8,885	64,020
2014	140,830	12,480	12,730	6,755	35,140	9,000	64,725
2015	142,215	12,565	12,910	6,800	35,480	9,105	65,355
2016	143,585	12,655	13,090	6,835	35,790	9,215	66,000
2017	144,980	12,750	13,275	6,875	36,090	9,315	66,675
2018	146,390	12,850	13,455	6,915	36,385	9,415	67,370
2019	147,760	12,950	13,635	6,960	36,665	9,495	68,055
2020	149,145	13,055	13,815	7,000	36,950	9,575	68,750

Budget Analysis – Load Forecast Minus EE

ENERGY - Passive Demand Resources (GWh)							
	Total	ME	NH	VT	CT	RI	MA
2010	130,773	11,696	11,735	6,063	32,296	8,464	60,519
2011	131,237	11,942	11,828	6,162	32,309	8,351	60,646
2012	132,500	12,016	12,036	6,174	32,521	8,446	61,306
2013	132,603	11,839	12,137	6,123	32,657	8,482	61,365
2014	133,677	11,817	12,316	6,138	32,962	8,569	61,875
2015	135,062	11,902	12,496	6,183	33,302	8,674	62,505
2016	136,411	11,991	12,675	6,216	33,605	8,783	63,141
2017	137,827	12,087	12,861	6,258	33,912	8,884	63,825
2018	139,237	12,187	13,041	6,298	34,207	8,984	64,520
2019	140,607	12,287	13,221	6,343	34,487	9,064	65,205
2020	141,971	12,391	13,400	6,381	34,765	9,143	65,891

Budget Analysis – Load Forecast Minus Municipals

ENERGY - Passive Demand Resources - MA Municipals (GWh)							
	Total	ME	NH	VT	CT	RI	MA
2010	122,300	11,696	11,735	6,063	32,296	8,464	52,047
2011	122,746	11,942	11,828	6,162	32,309	8,351	52,155
2012	123,917	12,016	12,036	6,174	32,521	8,446	52,723
2013	124,012	11,839	12,137	6,123	32,657	8,482	52,774
2014	125,014	11,817	12,316	6,138	32,962	8,569	53,212
2015	126,311	11,902	12,496	6,183	33,302	8,674	53,754
2016	127,571	11,991	12,675	6,216	33,605	8,783	54,301
2017	128,891	12,087	12,861	6,258	33,912	8,884	54,889
2018	130,204	12,187	13,041	6,298	34,207	8,984	55,487
2019	131,478	12,287	13,221	6,343	34,487	9,064	56,076
2020	132,746	12,391	13,400	6,381	34,765	9,143	56,666

Budget Analysis – Load Forecast Minus System Loses

Sales: Energy-Losses (GWh)							
	Total	ME	NH	VT	CT	RI	MA
2010	115,377	11,034	11,070	5,719	30,468	7,984	49,101
2011	115,798	11,266	11,158	5,813	30,480	7,878	49,203
2012	116,903	11,336	11,355	5,825	30,680	7,968	49,739
2013	116,992	11,169	11,450	5,777	30,808	8,002	49,786
2014	117,938	11,148	11,619	5,790	31,096	8,084	50,200
2015	119,161	11,229	11,789	5,833	31,417	8,183	50,711
2016	120,350	11,312	11,957	5,864	31,703	8,286	51,228
2017	121,595	11,403	12,133	5,904	31,992	8,381	51,782
2018	122,834	11,498	12,303	5,941	32,271	8,476	52,346
2019	124,036	11,592	12,473	5,984	32,535	8,551	52,902
2020	125,232	11,689	12,641	6,020	32,797	8,625	53,459

Budget Analysis – Forecasted SBC Funds

System Benefit Charge (mils/kwh)							
		1.50	1.80	4.00	3.00	2.00	2.50
System Benefit Charge Dollars (Thousands)							
	Total	ME	NH	VT	CT	RI	MA
2010	289,481	16,552	19,927	22,877	91,405	15,969	122,751
2011	290,440	16,899	20,085	23,251	91,441	15,756	123,008
2012	293,066	17,004	20,439	23,299	92,040	15,936	124,347
2013	293,364	16,754	20,611	23,106	92,424	16,003	124,466
2014	295,755	16,723	20,914	23,162	93,288	16,168	125,500
2015	298,789	16,843	21,220	23,332	94,250	16,366	126,778
2016	301,698	16,968	21,523	23,457	95,109	16,572	128,069
2017	304,753	17,105	21,839	23,615	95,977	16,763	129,455
2018	307,785	17,246	22,145	23,766	96,812	16,951	130,865
2019	310,735	17,388	22,451	23,935	97,604	17,102	132,254
2020	313,658	17,534	22,754	24,080	98,392	17,251	133,647

Budget Analysis – Forecasted Policy Funds

Policy Dollars (thousands)							
	Total	ME	NH	VT	CT	RI	MA
2010	200,000	0	0	0	0	0	200,000
2011	200,000	0	0	0	0	0	200,000
2012	200,000	0	0	0	0	0	200,000
2013	200,000	0	0	0	0	0	200,000
2014	200,000	0	0	0	0	0	200,000
2015	200,000	0	0	0	0	0	200,000
2016	200,000	0	0	0	0	0	200,000
2017	200,000	0	0	0	0	0	200,000
2018	200,000	0	0	0	0	0	200,000
2019	200,000	0	0	0	0	0	200,000
2020	200,000	0	0	0	0	0	200,000

Budget Analysis – Forecasted RGGI and FCM

RGGI Dollar Payments: Average of 12 Auctions - Four Auctions a Year (thousands)

	Total	ME	NH	VT	CT	RI	MA
Average Auction	23,522	2,268	3,028	553	4,411	1,246	12,016
Annual	94,088	9,072	12,112	2,212	17,644	4,984	48,064

FCM Passive Demand Resources (MW)

	Total	ME	NH	VT	CT	RI	MA
2010	560	20	35	45	176	38	246
2011	774	28	46	56	297	47	300
2012	960	59	61	73	316	61	390
2013	1,148	100	67	92	357	70	462
2014	1,398	139	72	104	385	83	615

FCM PDR Dollar Payments (thousands)

	Total	ME	NH	VT	CT	RI	MA	Clearing Price
2010	30,252	1,069	1,891	2,434	9,480	2,074	13,304	4.50
2011	33,425	1,214	2,002	2,413	12,815	2,035	12,946	3.60
2012	33,975	2,092	2,156	2,588	11,195	2,149	13,795	2.95
2013	40,650	3,544	2,362	3,257	12,630	2,494	16,362	2.95
2014	53,851	5,354	2,773	4,006	14,830	3,197	23,690	3.21

Budget Analysis – Forecasted Total Funds

Total Dollars Adjusted for SBC & FCM (thousands)							
2010 PA	499,665	16,846	21,763	35,451	144,938	27,581	253,086
	Total	ME	NH	VT	CT	RI	MA
2010 ExP$	413,816	26,691	33,929	27,522	118,530	23,026	184,118
2010	613,816	26,691	33,929	27,522	118,530	23,026	384,118
2011	617,949	27,183	34,199	27,875	121,901	22,775	384,016
2012	621,124	28,165	34,707	28,098	120,881	23,069	386,204
2013	628,098	29,368	35,085	28,574	122,700	23,481	388,891
2014	643,690	31,147	35,799	29,378	125,764	24,349	397,252
2015	652,293	31,586	36,480	29,669	127,714	24,796	402,049
2016	660,797	32,030	37,161	29,917	129,567	25,252	406,870
2017	669,472	32,488	37,859	30,197	131,436	25,695	411,798
2018	678,150	32,952	38,549	30,471	133,279	26,139	416,762
2019	686,772	33,417	39,242	30,764	135,085	26,546	421,718
2020	695,393	33,888	39,937	31,033	136,894	26,952	426,690

Budget Analysis – Forecasted Feedback on Funds Due to EE

Lost SBC Dollars (thousands) Proof of Concept							
	Total	ME	NH	VT	CT	RI	MA
2015	3,900	110	153	278	896	116	2,347
2016	7,818	221	307	558	1,797	232	4,701
2017	11,754	333	463	839	2,705	350	7,064
2018	15,708	445	620	1,122	3,618	468	9,435
2019	19,680	557	778	1,406	4,538	587	11,814
2020	23,670	670	938	1,691	5,463	707	14,202
Additional FCM Dollars (thousands) Proof of Concept							
	Total	ME	NH	VT	CT	RI	MA
2015	9,469	429	528	400	1,883	364	5,865
2016	18,981	859	1,060	801	3,779	732	11,750
2017	28,538	1,291	1,597	1,205	5,688	1,102	17,654
2018	38,139	1,726	2,139	1,610	7,610	1,475	23,580
2019	47,783	2,162	2,685	2,018	9,543	1,850	29,526
2020	57,471	2,600	3,235	2,428	11,488	2,227	35,492

EE Forecast Scenarios and Discussion

EE Forecast Scenario Parameter Assumptions

Proof of concept

- Assumed 100% realization rate and spend rate
- Fixed production cost $450
- Peak to energy ratio based on historical load factors

Updated with historical PA data

- Production cost
- Peak to energy ratio

ISO-NE Planning Scenarios

- Production costs assumed to increase 2.5% and 5%
- Budget uncertainty assumed to decrease 5% and 10%

Proof of Concept Forecast

Summer Peak to Energy Ratio (MW/GWh): Proof of Concept							
		ME	NH	VT	CT	RI	MA
		0.151	0.161	0.149	0.164	0.164	0.162
Production Cost ($/MWh): Proof of Concept							
		ME	NH	VT	CT	RI	MA
		450	450	450	450	450	450
Energy EE (GWh): Proof of Concept							
	Total	ME	NH	VT	CT	RI	MA
2015	1537	74	86	70	301	58	947
2016	1557	75	88	70	305	59	958
2017	1577	77	89	71	310	61	970
2018	1597	78	91	72	314	62	982
2019	1618	79	92	72	318	63	993
2020	1638	80	94	73	322	63	1005
Summer Peak EE (MW): proof of Concept							
	Total	ME	NH	VT	CT	RI	MA
2015	248	11	14	10	49	10	154
2016	251	11	14	11	50	10	155
2017	254	12	14	11	51	10	157
2018	258	12	15	11	51	10	159
2019	261	12	15	11	52	10	161
2020	264	12	15	11	53	10	163

PA Data Forecast

Summer Peak to Energy Ratio (MW/GWh): PA Historical Data							
		ME	NH	VT	CT	RI	MA
		0.109	0.220	0.153	0.134	0.173	0.155
Production Cost ($/MWh): PA Historical Data							
		ME	NH	VT	CT	RI	MA
		237	298	303	348	330	427
Energy EE (GWh): PA Historical Data							
	Total	ME	NH	VT	CT	RI	MA
2015	1843	142	131	104	389	80	998
2016	1870	144	136	105	394	82	1010
2017	1897	146	140	106	399	84	1022
2018	1923	148	144	108	404	86	1034
2019	1950	151	148	109	409	87	1046
2020	1977	153	153	110	414	89	1058
Summer Peak EE (MW): PA Historical Data							
	Total	ME	NH	VT	CT	RI	MA
2015	281	15	29	16	52	14	155
2016	285	16	30	16	53	14	156
2017	289	16	31	16	53	14	158
2018	294	16	32	16	54	15	160
2019	298	16	33	17	55	15	162
2020	302	17	34	17	55	15	164

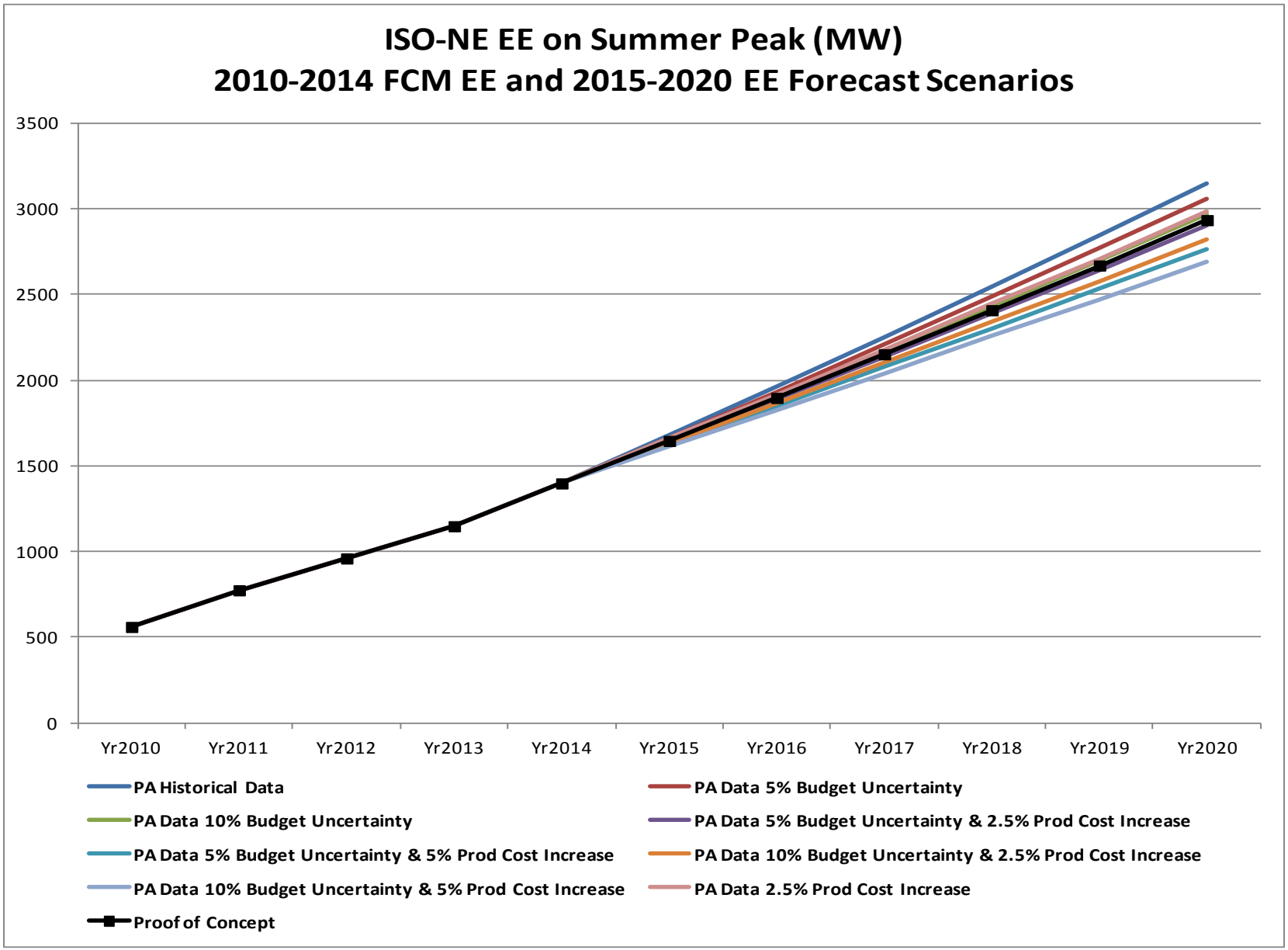
ISO-NE Planning Scenario Forecast

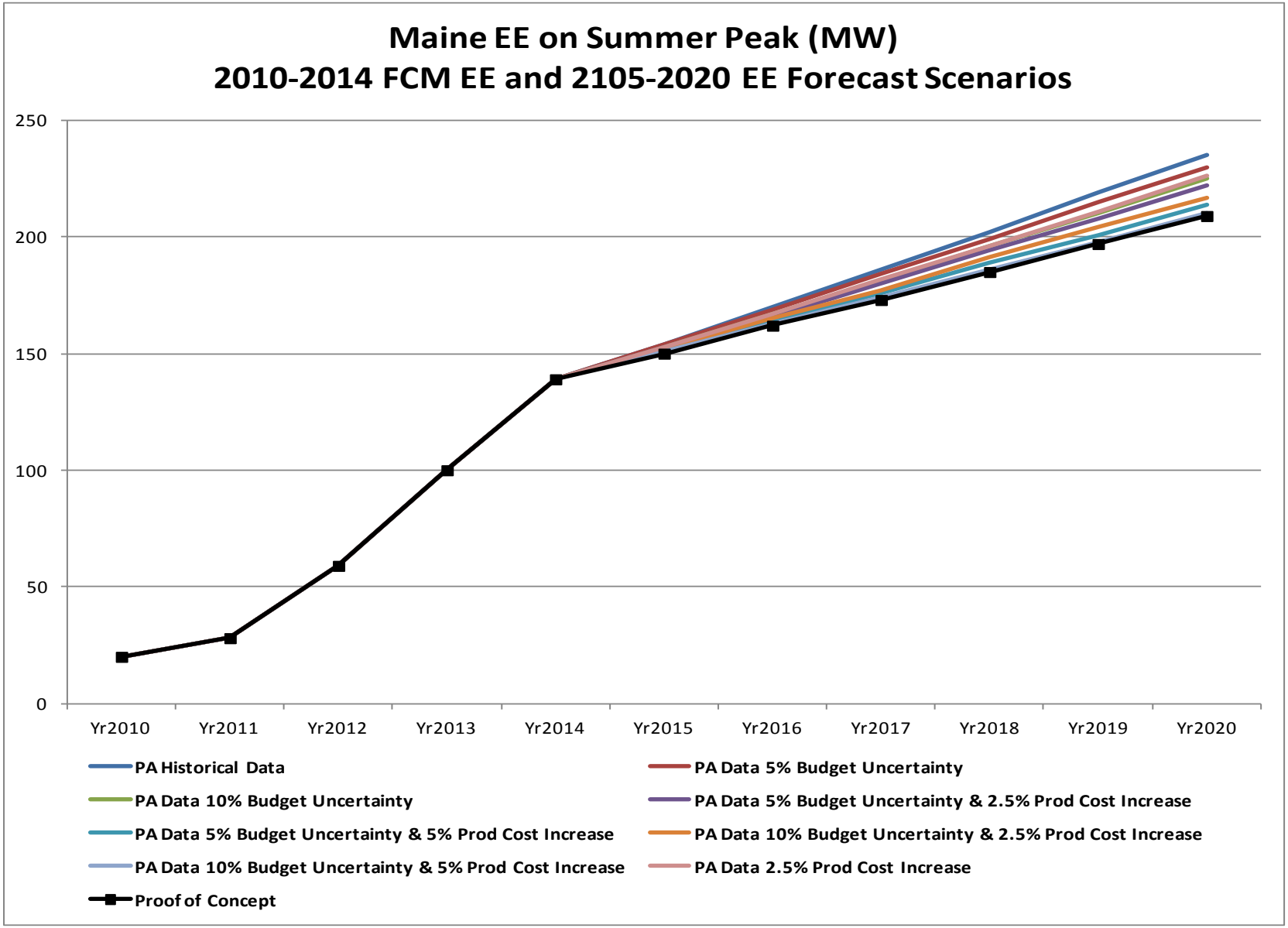
PA Production Costs with 2.5% Increases 2013-2016							
	ME	NH	VT	CT	RI	MA	
2010	237	298	303	348	330	427	
2011	237	298	303	348	330	427	
2012	237	298	303	348	330	427	
2013	243	305	311	357	338	438	
2014	249	313	318	366	347	449	
2015	255	321	326	375	355	460	
2016	262	329	334	384	364	471	
Energy EE (GWh): PA Historical Data & 2.5% Prod Cost Increase 2013-2016							
	Total	ME	NH	VT	CT	RI	MA
2015	1711	131	122	97	361	74	926
2016	1691	130	122	95	356	74	913
2017	1714	132	126	96	361	76	924
2018	1737	134	130	97	365	77	934
2019	1760	136	133	98	370	79	944
2020	1782	138	137	99	374	80	954
Summer Peak EE (MW): PA Historical Data & 2.5% Prod Cost Increase 2013-2016							
	Total	ME	NH	VT	CT	RI	MA
2015	261	14	27	15	48	13	144
2016	258	14	27	15	48	13	142
2017	261	14	28	15	48	13	143
2018	265	15	28	15	49	13	145
2019	269	15	29	15	50	14	146
2020	272	15	30	15	50	14	148

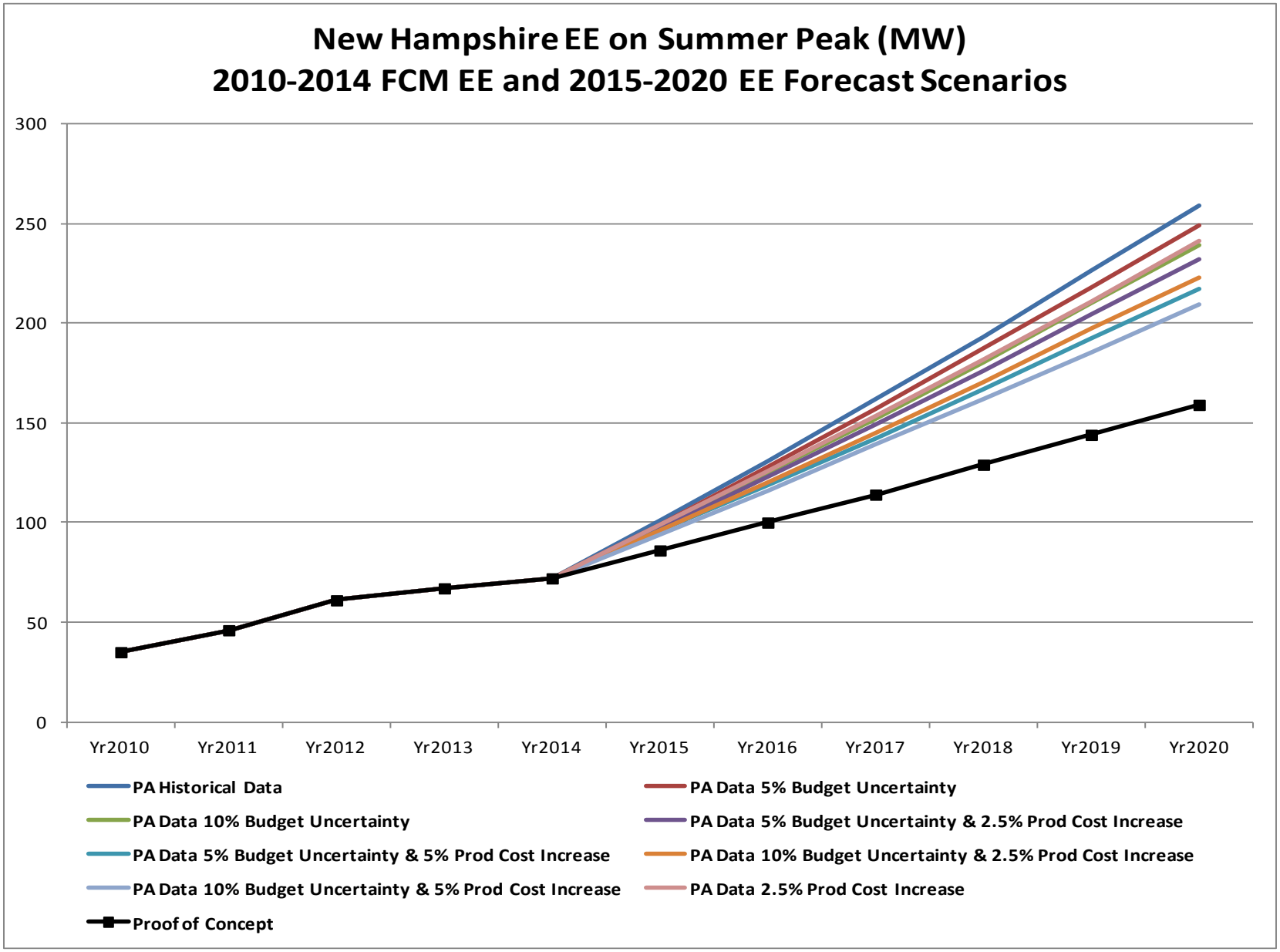
Summary of EE Forecast Scenarios

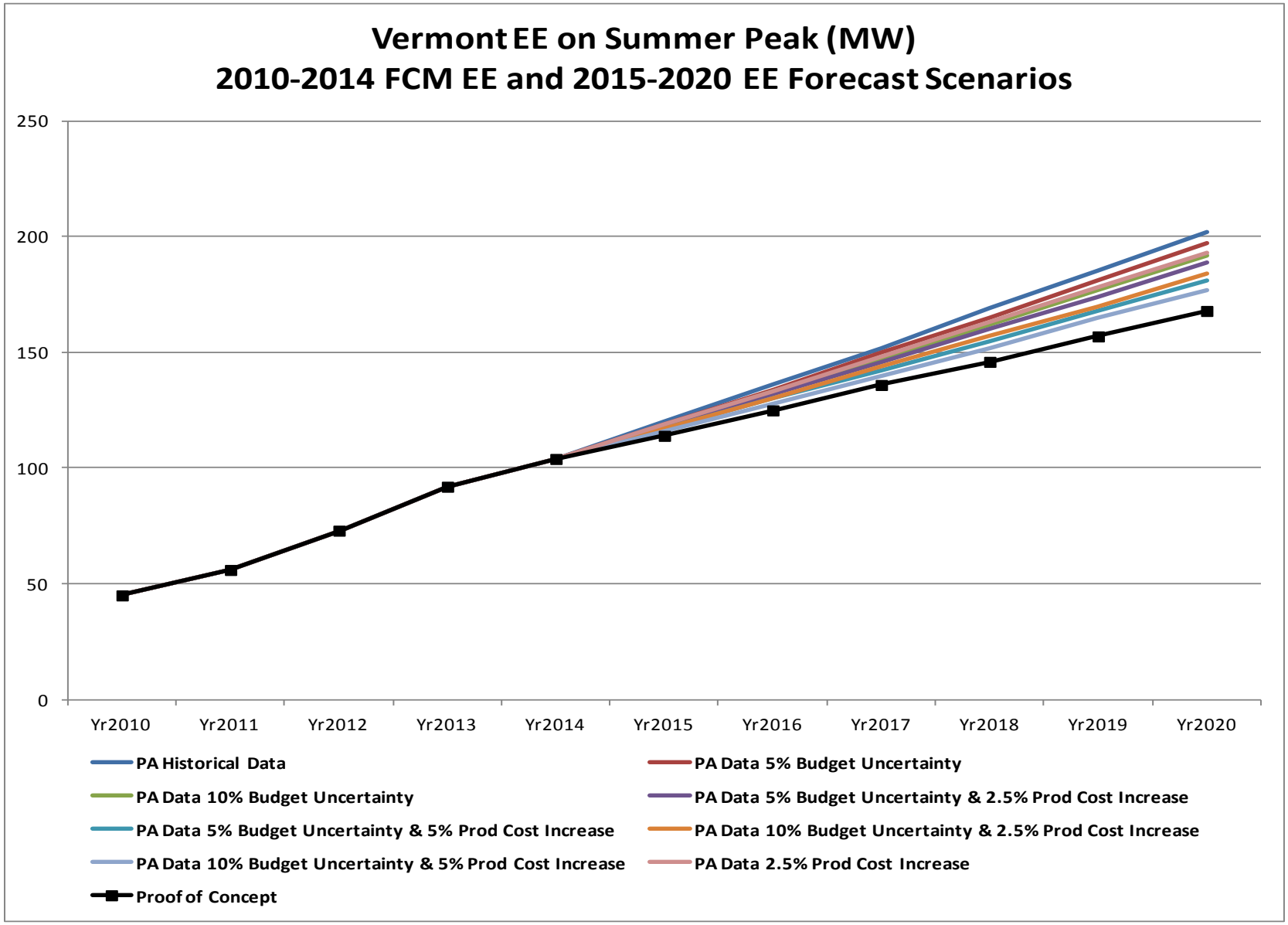
Energy EE: Average of 2015-2020 (GWh)							
	ISO-NE	ME	NH	VT	CT	RI	MA
PA Historical Data	1910	147	142	107	401	85	1028
PA Data 5% Budget Uncertainty	1812	140	134	102	381	80	975
PA Data 2.5% Prod Cost Increase	1732	134	128	97	364	77	932
PA Data 10% Budget Uncertainty	1713	132	127	96	360	76	922
PA Data 5% Budget Uncertainty & 2.5% Prod Cost Increase	1643	127	121	92	346	73	885
Proof of Concept	1587	77	90	71	312	61	976
PA Data 10% Budget Uncertainty & 2.5% Prod Cost Increase	1555	120	115	87	327	69	837
PA Data 5% Budget Uncertainty & 5% Prod Cost Increase	1495	115	110	84	315	66	805
PA Data 10% Budget Uncertainty & 5% Prod Cost Increase	1414	109	104	79	298	62	762

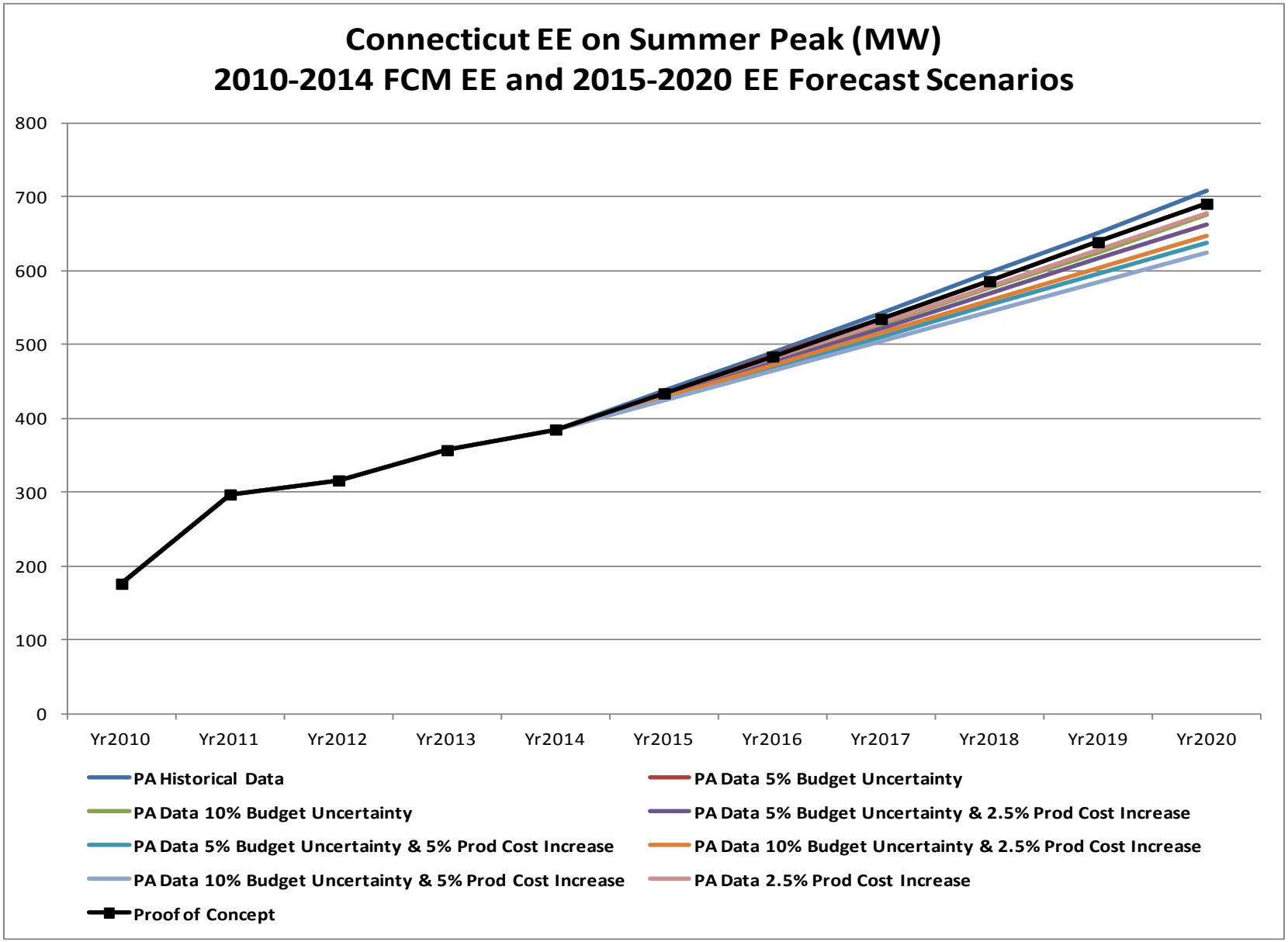
Summer Peak EE: Average of 2015-2020 (MW)							
	ISO-NE	ME	NH	VT	CT	RI	MA
PA Historical Data	291	16	31	16	54	15	159
PA Data 5% Budget Uncertainty	276	15	30	16	51	14	151
PA Data 2.5% Prod Cost Increase	264	15	28	15	49	13	145
PA Data 10% Budget Uncertainty	261	14	28	15	48	13	143
Proof of Concept	256	12	15	11	51	10	158
PA Data 5% Budget Uncertainty & 2.5% Prod Cost Increase	251	14	27	14	46	13	137
PA Data 10% Budget Uncertainty & 2.5% Prod Cost Increase	237	13	25	13	44	12	130
PA Data 5% Budget Uncertainty & 5% Prod Cost Increase	228	13	24	13	42	11	125
PA Data 10% Budget Uncertainty & 5% Prod Cost Increase	216	12	23	12	40	11	118

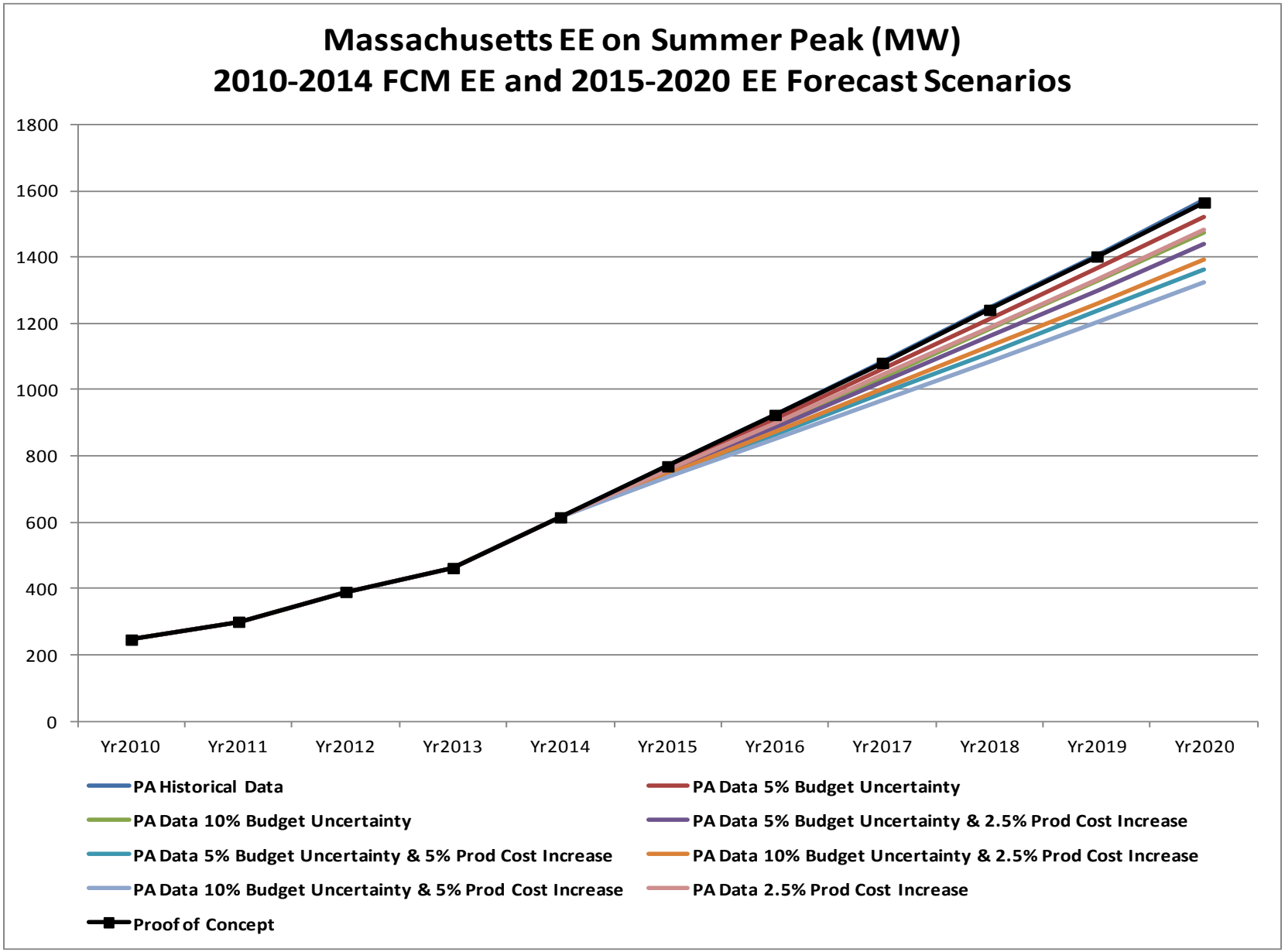


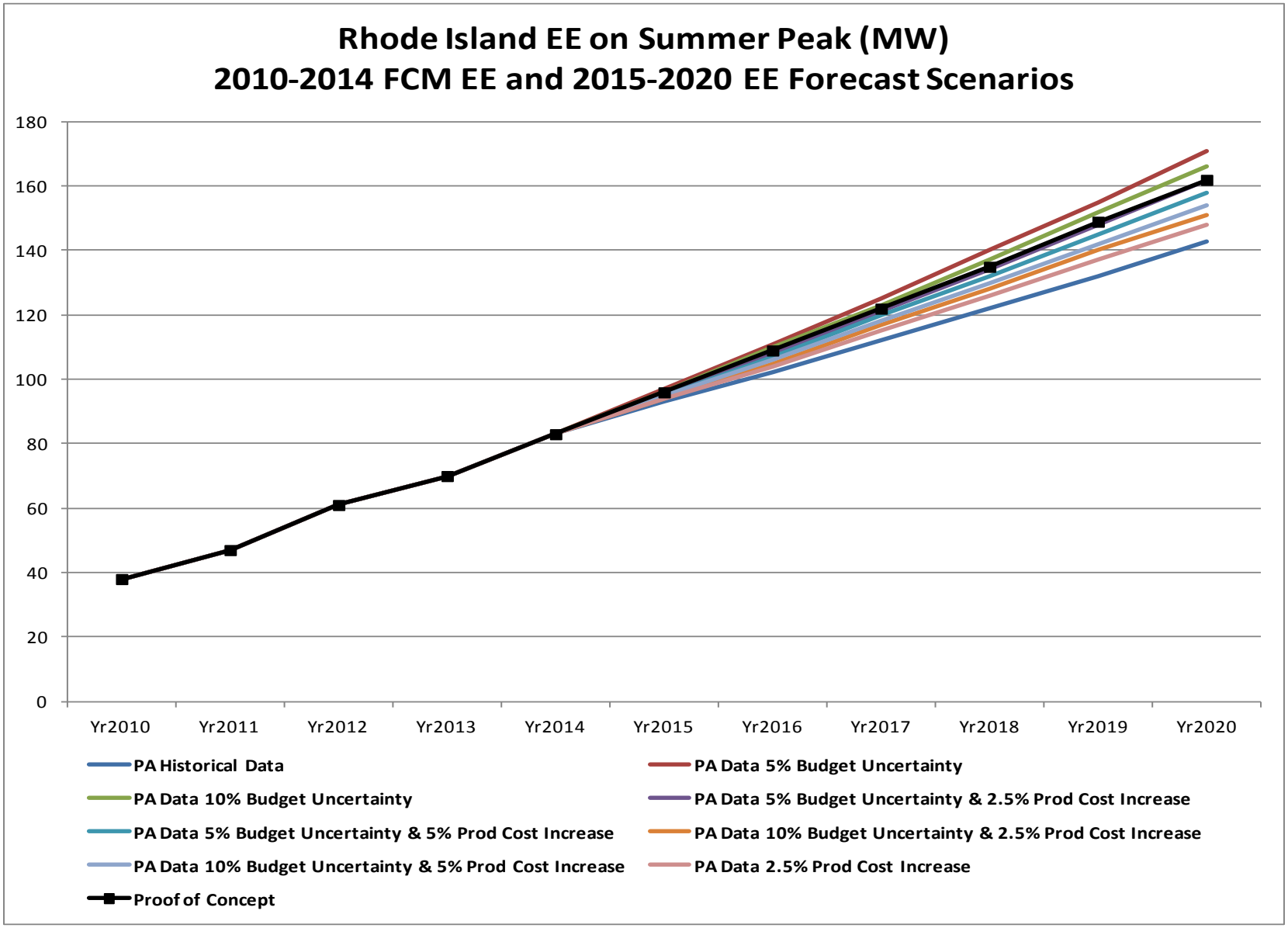












Energy Efficiency Forecast Model Implementation Next Steps

Model Implementation Next Steps

- Resolve any outstanding data issues
- Model Considerations
  - Shift in portfolio offerings
  - Escalator for production costs
  - Budget expansion or contraction
  - Realization and spending rates
- Draft revised forecast and post for review and comment by EEFWG
- Review and discuss comments with EEFWG
- Finalize EE Forecast

EE Forecast Process

Looking Ahead

- March 15 – PAC update
- Mid-March – Send out revised forecast to EEFWG for comments
- End of March – Review comments with EEFWG
- Mid-April – Present final EE forecast to EEFWG
- April 18 – PAC presentation