



### Energy Efficiency as a Resource presented by Paul Peterson

NAESCO Midwest Regional Meeting How an Evolving Utility Industry May Change the Current Market for Energy Efficiency June 6, 2013

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## **Synapse Energy Economics**

- Consulting firm in Cambridge Massachusetts with a staff of 30 people
- Issues
  - Electric industry restructuring & utility rate cases
  - Wholesale markets, ISOs, and RTOs
  - Resource development and retirements
  - Environmental impacts of power industry
- Clients
  - State Consumer Advocates and Utility Commissions
  - Public Interest and Environmental groups
  - EPA and DOE
  - RTO stakeholders

## **Energy Efficiency Resource Attributes**

- Non-dispatchable, passive resource
- Predictable operation
- Measurable savings:
  - Direct measurement (meter)
  - Profiled measurement from studies
  - Custom measurement
- Savings vary by time of day and season
- Reduces energy consumption
- Reduces peak loads
- Reduces environmental impacts

## New England Case Study

## 1. Energy Efficiency as a Capacity Resource

## 2. Energy Efficiency Forecast for System Planning

## Energy Efficiency in New England Forward Capacity Market

- Qualification package submitted nine months prior to auction; M&V part of qualification
- ISO designates a maximum capacity supply amount (MW) for each qualification package
- EE resources that are offered and clear must submit financial assurance shortly after auction (three years in advance of delivery)
- Annual M&V must substantiate installed measures; variety of methods
- Long-term M&V must confirm savings

## **Passive Demand Resources**



### Energy Efficiency resources by state



## Impact on State EE Budgets

State	2010 Annual Budget (\$m)	Approx. FCM Revenue (\$m) 2010 – 2011	% extra from FCM
Vermont	\$ 34.0	\$ 2.9	9%
New Hampshire	\$ 26.3	\$ 1.6	6%
Maine	\$ 14.0	\$ 1.3	9%
Massachusetts	\$ 301.9	\$ 13.7	5%
Rhode Island	\$ 32.1	\$ 2.2	7%
Connecticut	\$ 126.9	\$ 9.7	8%

#### Notes:

1. Annual Budget from ACEEE 2011 Scorecard, Table 4.

2. Estimated FCM revenues for June 2010 – May 2011. Does not account for over/under delivery nor proration.

# Energy consumption 1980-2009 (weather normalized)



## Key Parameters for ISO-NE 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

## Key Disputed Assumptions for ISO-NE EE Forecast

- Production costs will increase annually by 5%
  - Low-cost measures will all be achieved
  - Program efficiencies are not recognized
- Inflation assumption (2.5%) is applied to program cost, but not to program budgets
- Some program budgets are discounted
- Only M&V qualified measures are counted
  - Penalties for non-performance create conservative assumptions
  - M&V for some measures is impractical

## **ISO-NE Forecast of EE resources (2012)**

GWh Savings									
Sum of States	ME	NH	VT	СТ	RI	MA			
1619	99	65	110	244	163	948			
1518	82	62	102	230	153	889			
1423	77	59	95	216	143	833			
1333	71	56	88	204	134	780			
1247	65	53	82	191	125	731			
1167	60	50	77	180	117	684			
1092	55	48	71	169	109	640			
9399	499	393	625	1434	944	5505			
1343	71	56	89	205	135	786			
MW Savings									
Sum of States	ME	NH	VT	СТ	RI	MA			
249	10	11	20	33	28	147			
233	9	10	19	31	26	138			
218	8	10	18	29	25	129			
205	8	9	16	27	23	121			
192	7	9	15	26	22	113			
179	7	8	14	24	20	106			
168	7	8	13	23	19	99			
1444	55	65	115	193	163	853			
206	8	9	16	28	23	122			
	Sum of States 1619 1518 1423 1333 1247 1167 1092 9399 1343 Sum of States 249 233 218 205 192 179 168 1444 206	Sum of States ME   1619 99   1518 82   1423 77   1333 71   1247 65   1167 60   1092 55   9399 499   1343 71   Sum of States ME   249 10   233 9   218 8   205 8   192 7   179 7   168 7   1444 55   206 8	Sum of States   ME   NH     1619   99   65     1518   82   62     1423   77   59     1333   71   56     1247   65   53     1167   60   50     1092   55   48     9399   499   393     1343   71   56     205   48   9     9399   499   393     1343   71   56     MW Sat     MW Sat     Sum of States   ME   NH     249   10   11     233   9   10     218   8   10     205   8   9     192   7   9     179   7   8     168   7   8     168   7   8     1444   55   65     206   8   9	Sum of States   ME   NH   VT     1619   99   65   110     1518   82   62   102     1423   77   59   95     1333   71   56   88     1247   65   53   82     1167   60   50   77     1092   55   48   71     9399   499   393   625     1343   71   56   89     MW Savings     MW Savings     Sum of States   ME   NH   VT     249   10   11   20   233   9   10   19     218   8   10   18   205   8   9   16     192   7   9   15   179   7   8   14     168   7   8   13   1444   55   65   115     206   8   9 </td <td>Sum of States   ME   NH   VT   CT     1619   99   65   110   244     1518   82   62   102   230     1423   77   59   95   216     1333   71   56   88   204     1247   65   53   82   191     1167   60   50   77   180     1092   55   48   71   169     9399   499   393   625   1434     1343   71   56   89   205     MW Savings     MW Savings     Sum of States   ME   NH   VT   CT     249   10   11   20   33     233   9   10   19   31     218   8   10   18   29     205   8   9   16   27     192   7   9</td> <td>Sum of States   ME   NH   VT   CT   RI     1619   99   65   110   244   163     1518   82   62   102   230   153     1423   77   59   95   216   143     1333   71   56   88   204   134     1247   65   53   82   191   125     1167   60   50   77   180   117     1092   55   48   71   169   109     9399   499   393   625   1434   944     1343   71   56   89   205   135     MW Savings     MW Savings     MW Savings     ME   NH   VT   CT   RI     249   10   11   20   33   28     233   9   10   19   31   26</td>	Sum of States   ME   NH   VT   CT     1619   99   65   110   244     1518   82   62   102   230     1423   77   59   95   216     1333   71   56   88   204     1247   65   53   82   191     1167   60   50   77   180     1092   55   48   71   169     9399   499   393   625   1434     1343   71   56   89   205     MW Savings     MW Savings     Sum of States   ME   NH   VT   CT     249   10   11   20   33     233   9   10   19   31     218   8   10   18   29     205   8   9   16   27     192   7   9	Sum of States   ME   NH   VT   CT   RI     1619   99   65   110   244   163     1518   82   62   102   230   153     1423   77   59   95   216   143     1333   71   56   88   204   134     1247   65   53   82   191   125     1167   60   50   77   180   117     1092   55   48   71   169   109     9399   499   393   625   1434   944     1343   71   56   89   205   135     MW Savings     MW Savings     MW Savings     ME   NH   VT   CT   RI     249   10   11   20   33   28     233   9   10   19   31   26			

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## **ISO-NE Forecast of EE resources (2013)**

GWh Savings							1
	Sum of States	ME	NH	VT	CT	RI	MA
2016	1,621	108	68	120	246	161	919
2017	1,529	102	65	119	232	150	861
2018	1,435	97	61	113	218	140	806
2019	1,349	91	58	109	204	131	754
2020	1,268	86	55	107	192	122	706
2021	1,187	81	52	100	180	114	660
2022	1,114	76	49	97	169	106	618
Total	9,503	641	408	765	1,441	924	5,324
Average	1,358	92	58	109	206	132	761
MW Savings							
	Sum of States	ME	NH	VT	СТ	RI	MA
2016	231	12	11	18	31	26	133
2017	218	12	11	18	29	24	124
2018	204	11	10	17	27	23	116
2019	192	10	10	16	26	21	109
2020	180	10	9	16	24	20	102
2021	169	9	9	15	23	18	95
2022	159	9	8	14	21	17	89
Total	1,353	73	68	114	181	149	768
Average	193	10	10	16	26	21	110

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#### ISO-NE RSP12 Annual Energy (GWh) Weather Normal History 1991-2011 and Forecast 2012-2021



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#### ISO-NE RSP12 50/50 Summer Peaks (MW) Weather Normal History 1991-2011 and Forecast 2012-2021

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#### ISO-NE RSP12 50/50 Winter Peaks (MW) Weather Normal History 1991-2011 and Forecast 2012-2021



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## **New England Peak Load Forecast**





## **PJM Peak Load Forecast**



## **MISO Peak Load Forecast**



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