

A Demand-Side Approach to Price-Responsive Demand

Robert B. Burke
Principal Analyst, Market Development
ISO New England Inc.

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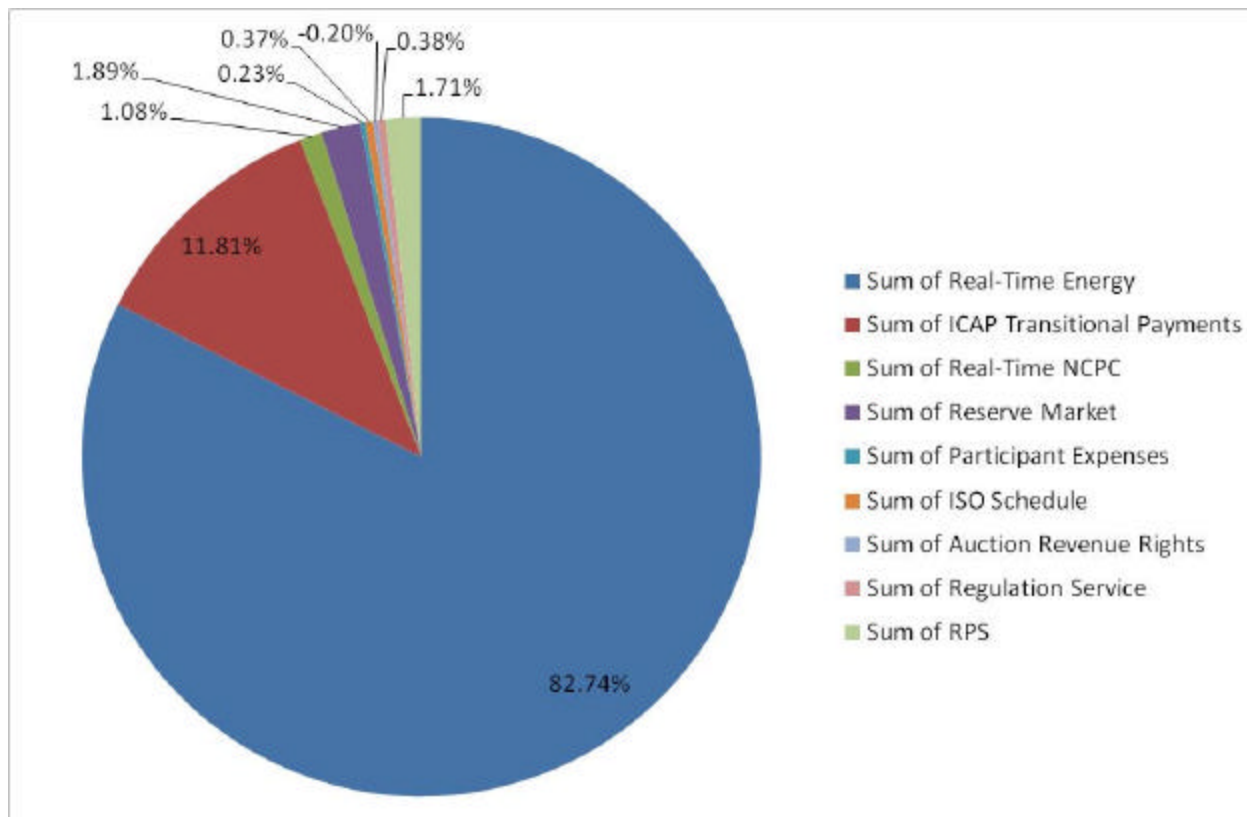
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- The content of this presentation contains information summarizing the ISO's analysis and current thinking on a so-called "Demand-Side Approach" to achieving price-responsive demand in New England.

Demand-Side Approach to Price-Responsive Demand

- Eligible Market Participants may purchase directly from the wholesale market a power product measured in MWh and priced on an hourly basis.
- The energy consumption of price-response assets would be charged a real-time hourly price (\$/MWh).
 - ISO's current thinking is to include the cost of **energy and capacity** in the \$/MWh price.
 - All other wholesale costs would be charged to purchasers pursuant to the ISO's current tariff provisions.
 - These costs are known several days after the Operating Day (i.e., at least 3-4 days after the Operating Day).
 - Even when added together, these costs are a small portion of total wholesale costs (about 5% of total wholesale costs).
 - NCPC, Ancillary Markets, Other (ISO and NEPOOL expenses)

Energy and Capacity are the Most Significant Part of Wholesale Power Costs*

- Energy and Capacity make up about 95% of total cost of wholesale power for a typical large C&I customer in New England.
 - About 12% of the cost of wholesale power is associated with Capacity.
 - About 1.3¢ out of 10.8¢ per kWh in 2008.



*A matrix describing the major components of a wholesale load customer's bill is located at: http://www.iso-ne.com/stlmnts/cost_comp/index.html

Demand-Side Approach

Capacity Pricing Alternatives

- Energy is already priced on a real-time basis.
- Capacity costs are currently allocated on a monthly basis.
- Can capacity be priced on real-time basis (in \$/MWh) along with energy?
 - Developing real-time capacity prices requires:
 - Estimating the **Capacity Revenue Requirement** for the Capacity Commitment Period.
 - Determining the **Capacity Rate in \$/MWh**.
 - Establishing the time periods that the Capacity Rate would be **effective**
 - which MWh of consumption would the rate be charged to.
 - Addressing the following issues:
 - Cash flow,
 - Under/over collection of the revenue requirement, and
 - Allocation of the under/over collection.

Demand-Side Approach

Capacity Pricing Alternatives

- Two capacity pricing alternatives have been considered by the ISO:
 - A method based on expected Loss of Load Probabilities (“LOLPs”), and
 - A dynamic critical peak pricing (“CPP”) method where the ISO calls a critical peak hour based on system conditions at the time.
- Hybrid approaches are being examined.

LOLP Approach:

Calculating the Capacity Revenue Requirement

Capacity Clearing Price 2012 (per kW-month)	= \$2.95
Capacity Clearing Price 2012 (per MW-year)	= \$35,406
Installed Capacity Requirement* (“ICR”) (MW)	= 32,879 *

The expected Capacity Revenue Requirement is equal to:

$$\text{Capacity Clearing Price 2012 (per MW-year)} \times \text{ICR} = \$1,164,111,644^{**}$$

* Installed Capacity Requirement includes Hydro Quebec Installed Capacity Credits (“HQICCs”)

** Results may vary slightly due to rounding

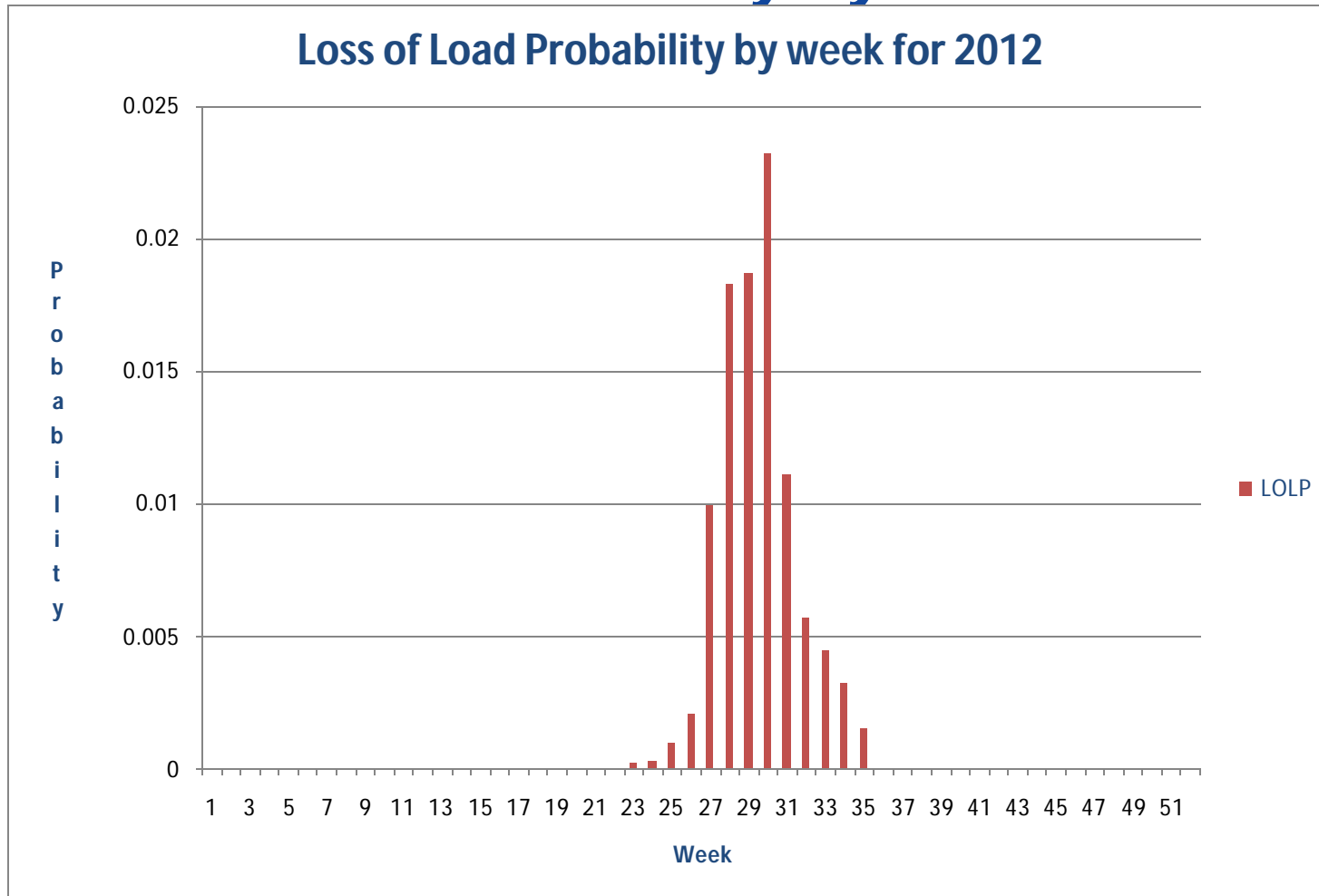
LOLP Approach

Determination of Capacity Rates

1. Installed Capacity Requirement (“ICR”) is computed so that Loss of Load Probabilities (“LOLP”) for the year equals 0.1 (i.e., the one day in ten years criterion).
2. Distribution of LOLPs across the year is then weighted in percentage terms – for example, a week with a LOLP of 0.018 would be given a weight of 18% (i.e., $0.018/0.1$). Sum = 100%
3. Total Capacity Revenue Requirement is allocated across the year using these weights – i.e., weeks with highest LOLPs get a larger share of the total Capacity Revenue Requirement.
Weekly Capacity Cost = Weekly LOLP weight x Capacity Revenue Requirement.
4. Hourly Capacity Rate (\$/MWh) = Weekly Capacity Cost divided by the total projected load (MWh) during the hours with the highest LOLPs.

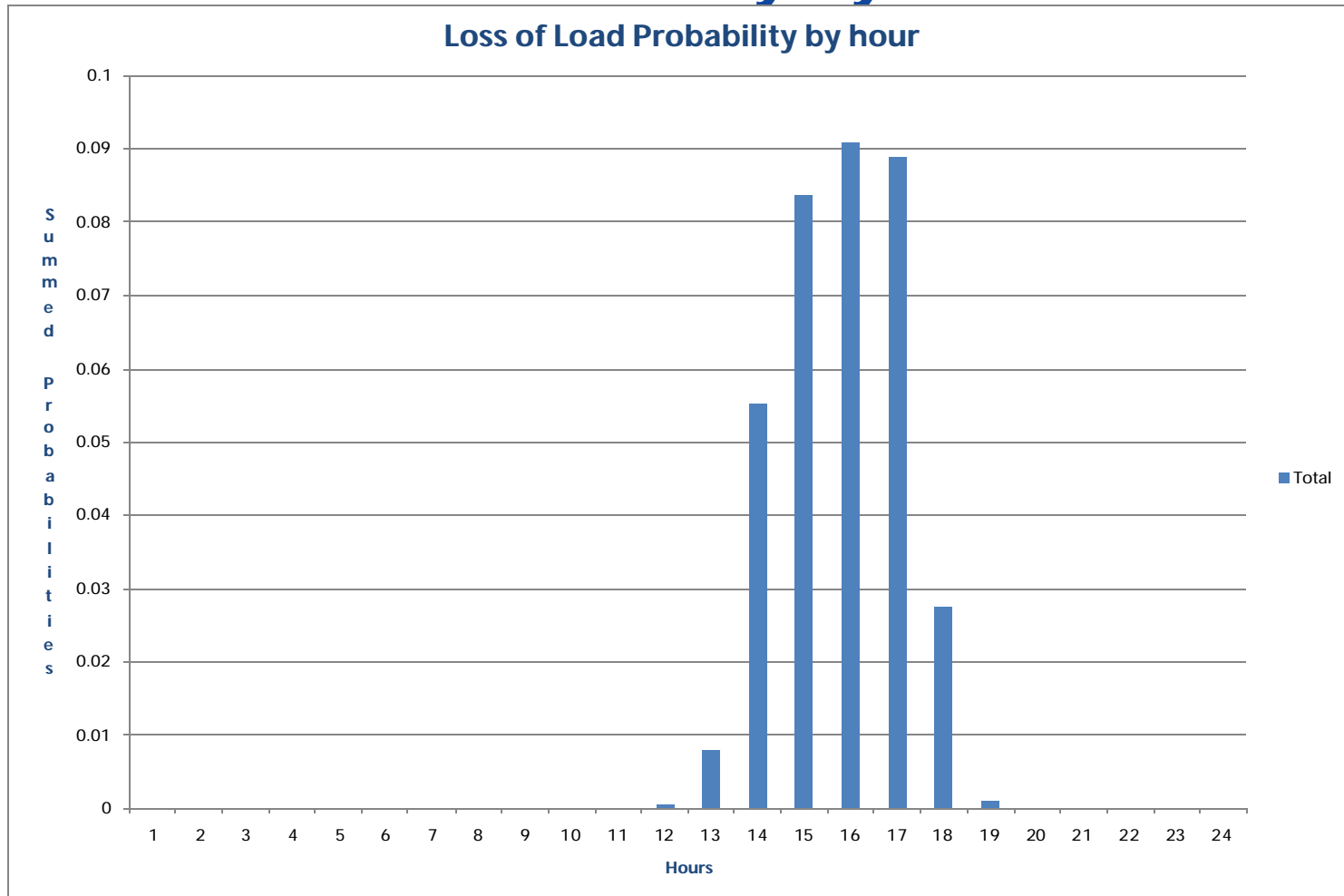
LOLP Approach:

Loss of Load Probability by Week



LOLP Approach:

Loss of Load Probability by Hour



LOLP Approach: Sample Rates

8 critical hrs vs. 6 critical hrs

Chronological Week*	LOLP	Allocation of Capacity Costs to Weeks	Critical Hours 12 - 19		Critical Hours 13 - 18	
			Load in Capacity Hours	Capacity Rate (\$/MWh)	Load in Capacity Hours	Capacity Rate (\$/MWh)
23	0.2333%	\$ 2,715,646	711,033	\$ 3.82	535,909	\$ 5.07
24	0.3025%	\$ 3,522,015	757,523	\$ 4.65	572,039	\$ 6.16
25	0.9475%	\$ 11,029,565	747,386	\$ 14.76	564,763	\$ 19.53
26	2.0768%	\$ 24,176,461	842,718	\$ 28.69	637,431	\$ 37.93
27	9.9701%	\$ 116,062,572	608,100	\$ 190.86	459,457	\$ 252.61
28	18.3413%	\$ 213,512,732	841,082	\$ 253.85	636,684	\$ 335.35
29	18.7485%	\$ 218,253,497	906,833	\$ 240.68	686,448	\$ 317.95
30	23.2760%	\$ 270,958,303	856,042	\$ 316.52	647,721	\$ 418.33
31	11.1563%	\$ 129,871,273	910,597	\$ 142.62	689,480	\$ 188.36
32	5.7119%	\$ 66,493,271	822,856	\$ 80.81	622,937	\$ 106.74
33	4.4896%	\$ 52,263,653	798,036	\$ 65.49	603,352	\$ 86.62
34	3.2238%	\$ 37,528,532	768,391	\$ 48.84	581,264	\$ 64.56
35	1.5220%	\$ 17,717,209	769,656	\$ 23.02	581,363	\$ 30.48
36	0.0005%	\$ 5,289	595,600	\$ 0.01	449,719	\$ 0.01
37	0.0001%	\$ 1,627	699,092	\$ 0.00	526,262	\$ 0.00
38	0.0000%	\$ 1	685,413	\$ 0.00	516,376	\$ 0.00
39	0.0000%	\$ 0	684,979	\$ 0.00	513,836	\$ 0.00

Dynamic Critical Peak Pricing Approach: *Determining the Critical Peak Capacity Rate*

The expected Capacity Revenue Requirement is equal to:

Capacity Clearing Price 2012 (per MW-year) X ICR = \$1,164,111,644*

Projected Demand Resource Critical Peak Hours = 42**

Projected Load Over All Critical Peak Hours (MWh) = 973,333***

Critical Peak Capacity Rate = \$1,196 / MWh

* Same as in LOLP Approach.

** Based on 2012/2013 DR Op Cap Analysis (Intermediate Case).

*** Projected load over all Critical Peak Hours was estimated based on the 2012/2013 DR Op Cap Analysis.

Critical Peak Pricing (CPP) Approach :

- The DR OP Cap Analysis* quantifies the number of Demand Resource Critical Peak Hours and days within each month.
- Demand Resource Critical Peak Hours were **assumed** to occur during the hours with the highest loads in the month.
 - This assumption was made to establish the CPP rate.
 - High load hours were highly consistent with the number of Demand Resource Critical Peak Hours and days predicted in each month.
 - For instance, in September 2012, the DR OP Cap Analysis projected five Demand Resource Critical Peak Hours on two days; load projections for the same month showed that the five highest hourly loads fell on two days.
- Actual Demand Resource Critical Peak Hours in a Capacity Commitment Period will be based on anticipated (day-ahead) or actual (real-time) system conditions.

* DR OP Cap Analysis - Demand Resource Operable Capacity Analysis

Demand Resource Critical Peak Hours

- The Critical Peak Capacity Rate would be effective during Demand Resource Critical Peak Hours.
- Includes Demand Resource Forecast Peak Hours and Real-Time Demand Resource Dispatch Hours.
 - **Demand Resource Forecast Peak Hours** are those hours in which, absent the dispatch of active Demand Resources, Dispatch Zone, Load Zone, or system-wide implementation of the action of OP-4 where the ISO would have begun to allow the depletion of Thirty-Minute Operating Reserve is forecasted in the ISO's most recent next-day forecast.
 - **Real-Time Demand Resource Dispatch Hours** are those hours in which OP-4 is implemented and the ISO has begun to allow the depletion of Thirty-Minute Operating Reserve on a Dispatch Zone, Load Zone, or system-wide basis.

Advantages and Disadvantages

- System operations: CPP(+), LOLP(-)
 - Under a dynamic CPP, the capacity rate is “called” in response to actual system conditions at the time.
 - Rates under LOLP are charged in specific time periods regardless of actual system conditions at the time.
- Cost incurrence: CPP(-), LOLP(+)
 - LOLP reflects how capacity costs under FCM are incurred.
- Customer response and acceptance: CPP(+--), LOLP(--+)
 - Customer response (in terms of load reduction) will be stronger with a stronger price signal – a CPP advantage. But may cause “sticker shock”.
 - Advanced warning under LOLP enables customer planning.
- Recovery of the Capacity Revenue Requirement: CPP(-), LOLP(-)
 - Cash flow
 - Under/over collections
 - CPP may result in greater revenue variances.

Questions and Discussion



Contact Information

Robert B. Burke

ISO New England Inc.

Office: 413-535-4356

Cell: 860-833-5370

Email: rburke@iso-ne.com