The cost of deregulation

US electricity deregulation does not necessarily make prices more competitive, as is shown in this study of New England power prices by Logical Information Machines

Hourly data for the New England power pool and its successor, the New England independent system operator (ISO) are available for the past 10 years for the analysis of temperature, pricing and load for the region. Software vendor Logical Information Machines (Lim) used the data to perform a comparison between pricing under the power pool and the ISO.

New England comprises the six northeastern US states of Maine, Vermont, New Hampshire, Connecticut, Rhode Island and Massachusetts.

Formed in 1971, the New England power pool is a voluntary association of entities that are engaged in the electricity business in New England. The pool's members, referred to as participants, include investor-owned utility systems, municipal and consumer-owned systems, joint marketing agencies, power marketers, load aggregators, generation owners and end-users. None of the pool's members has an ownership interest in the association

The power pool has established a single regional network, which, historically, has co-ordinated, monitored and directed the operations of virtually all the major generation and transmission bulk power supply facilities in New England. As a regulated entity, the pool's pricing was determined on a system lambda basis – the incremental cost of adding another megawatt of generation – before the New England ISO was set up in 1999. Generation bid into the pool was priced at cost, so that as demand went up, increasingly costly – that is, less efficient – generating assets kicked in, and the pool price of power rose accordingly.

ISO New England Inc was set up as a not-for-profit, private company on July 1, 1997, following its approval by the Federal Energy Regulatory Commission (Ferc). The organisation immediately assumed responsibility for managing the New England region's bulk power generation and transmission systems and administering its open-access transmission tariff.

Located in Holyoke, Massachusetts, ISO New England was formed by transferring staff and equipment from the New England power pool. ISO New England has also administered the wholesale electricity market for the region since May 1, 1999. Under the initial ISO scheme, which ran from 1999 until March 2003, market participants traded electricity on an internet-based markets system. A system-wide, day-ahead hourly price was generated by the ISO, which determined the clearing price of electricity in the New England Market.

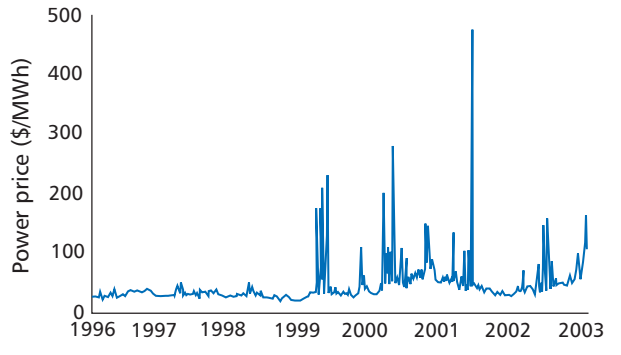
In March 2003, the New England ISO further enhanced the market price mechanism by moving to a standard market design (SMD) system. This move was a step towards meeting the Ferc's goal of standardising the market price system throughout the US. Under SMD, pricing – known as locational marginal pricing (LMP) – is determined for every zone and generating asset within the ISO. The ISO now administers a real-time hour-ahead market, as well as running a day-ahead market. Under the SMD, hourly day-ahead and real-time LMP is generated every day for the eight zones and 904 individual generating assets in New England.

Price comparisons

Using the historical data available from the pool and the New England ISO, Lim analysed the impact on pricing of the introduction of the New England ISO initial design in 1999. The study looked at how both the original pool and the initial ISO systems handle pricing during periods of extreme temperature and high demand for electricity.

The first test was to identify when temperatures went above 90º Fahrenheit at the same time as the hourly load was above 19,000 megawatts (MW). This represents a typical summer heat wave.

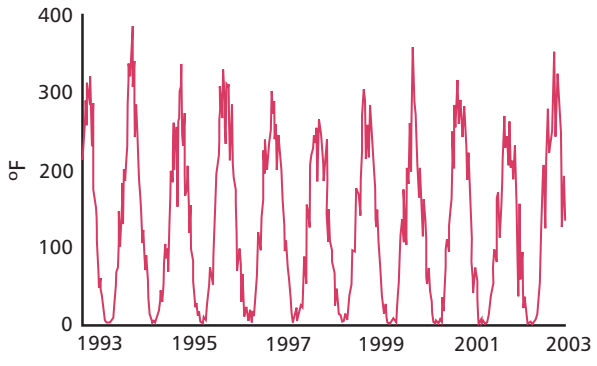
Figure 1: **New England daily high power prices**



Source: Platts

The figure shows New England daily electricity prices since 1996 for peak hours. The volatility of prices after the introduction of independent system operator pricing in 1999 is clearly visible.

Figure 2: **New England heating degree-days**



Source: National Climate Data Center

Heating degree-days (HDDs) for New England since 1993 have been fairly consistent. HDDs are calculated when the temperature cools below a 'comfortable' 65ºF and are a sum of how many degrees below 65 the low fell each day during the heating season.

Table 1: New England power pool pricing

Date	Time	Hourly price ($/MWh)	Temp (ºF)	Load (MW)
Jul 7, 1993	12pm	32.5	92.1	19,098
Jul 8, 1993	12pm	39.5	91.1	19,335
Jul 9, 1993	1pm	25.3	90.7	19,321
Aug 26, 1993	2pm	40.0	90.2	19,117
Aug 27, 1993	1pm	29.3	90.9	19,203
Jul 13, 1994	2pm	34.0	90.9	19,029
Jul 21, 1994	12pm	30.7	90.7	20,323
Jun 19, 1995	1pm	33.4	90.9	19,515
Jul 14, 1995	11am	33.2	90.8	19,772
Aug 1, 1995	12pm	41.5	90.8	19,834
Jul 17, 1997	1pm	45.2	90.3	20,485
Average		**35.0**	**90.9**	**19,548**
Maximum		**45.2**	**92.1**	**20,485**
Minimum		**25.3**	**90.2**	**19,029**
Standard deviation		**5.913**	**0.4906**	**499**

Source: New England ISO

New England power pool pricing before the independent system operator was set up, when temperatures were above 90ºF and the load exceeded 19,000MW. The highest hourly price was $45/MWh and the average hourly price was $35/MWh.

The data was split into two periods: before the ISO (from 1993 to 1999); and after the new ISO was introduced but before SMD came in (1999 to 2002). For the first period (1993 to 1999), pricing in the test circumstances – that is, in 11 instances – averaged around $35 a megawatt hour (MWh) under the old New England power pool (see table 1).

For the second period – after the ISO took over the operation of the New England grid, when prices were determined by a bidding process between participants – the same test conditions were sought: temperatures above 90ºF and load exceeding 19,000 MW. This time, the number of occurrences increased from 11 to 23 – probably because of increasing demand in this period of economic growth – but the average hourly price jumped dramatically to $216/MWh. The highest price was $1,000/MWh, the ISO system's maximum allowed price (see table 2).

The cost of power when the system was stretched rose from an average of $35/MWh before deregulation to an average of $216/MWh after deregulation. This represents a difference of $181 an hour or an increased cost (at a load of 19,000 MW) of $3.4 million an hour.

Lim performed a similar test in winter conditions – again where the load exceeded 19,000 MW – but this time when the hourly low temperature dipped below 20ºF. Before the ISO was set up, prices per megawatt hour again averaged about $35/MWh in these circumstances. In the years after the ISO and before SMD, the average price per megawatt hour in the same circumstances rose to $68. Although the winter test proved that the ISO was better able to contain prices during a freeze, prices had still nearly doubled in the space of three years after the ISO was introduced.

And, looking beyond the detailed hourly data provided by the New England power pool and the ISO, data from market reporting services confirm the disparity between daily prices before 1999 and after the advent of the ISO. Figure 1 shows daily peak high prices since 1996 – the first year they were available – and indicates relatively consistent price levels before 1999 and much greater volatility after 1999.

Impact of temperature on demand

Another good measure of the market situation is to look at the impact of temperature on demand in New England. One measure of likely demand is the heating degree-day (HDD) statistics published by US government weather service the National Climate Data Center. Figure 2 shows HDDs for New England since 1993. The calculation adds together the number of degrees the average temperature falls below 65ºF every day each year.

As expected, the results show up as yearly peaks every winter in New England, because of the cold winter weather there. What the chart does not show is any particular increase in cold weather after 1999, suggesting that colder weather cannot explain the higher electricity prices seen in the region.

It is too early yet to tell whether the new SMD system will result in more efficient pricing of electricity in New England. But Lim's analysis of the data provides a cautionary note to the advocates of deregulating electricity pricing. A market-based pricing system does not always benefit consumers.

Although much has been said and written about the public problems of the California power crisis in 2000/2001, allegations of market fixing and price gouging have not surfaced in the same way for the New England market. Hence, perhaps the price increases in New England reflect more specifically the failure of the price discovery mechanism than the behaviour of the individuals engaged in trading. EPRM

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Table 2: New England ISO pricing

Date	Time	Hourly price ($/MWh)	Temp (ºF)	Load (MW)
Jun 7, 1999	1pm	679.25	90.7	20,511
Jul 5, 1999	12pm	150.49	91.1	19,683
Jul 16, 1999	4pm	442.87	91.3	21,443
Jul 17, 1999	1pm	33.43	91.7	20,017
Jul 18, 1999	1pm	35.47	91.0	19,585
Aug 1, 1999	3pm	52.84	91.2	19,130
Jul 24, 2001	1pm	1,000.00	90.2	23,370
Jul 25, 2001	2pm	1,000.00	91.0	23,952
Aug 2, 2001	3pm	40.01	90.1	22,097
Aug 7, 2001	1pm	67.29	90.2	24,122
Aug 9, 2001	11am	91.88	90.7	24,249
Jul 2, 2002	2pm	62.49	90.2	23,712
Jul 3, 2002	11am	71.42	90.2	24,227
Jul 3, 2002	1pm	195.17	92.4	24,719
Jul 4, 2002	1pm	48.18	92.1	21,360
Jul 23, 2002	1pm	348.40	90.3	24,563
Jul 29, 2002	5pm	57.28	90.4	23,431
Jul 30, 2002	3pm	77.16	90.6	24,206
Aug 13, 2002	1pm	120.75	90.9	24,700
Aug 14, 2002	12pm	221.65	90.3	24,760
Aug 16, 2002	3pm	69.92	90.9	24,315
Aug 17, 2002	3pm	58.36	90.9	21,388
Aug 18, 2002	2pm	51.87	91.9	21,060
Average		**216.36**	**90.9**	**22,635**
Maximum		**1,000.00**	**92.4**	**24,760**
Minimum		**33.43**	**90.1**	**19,130**
Standard deviation		**292.17**	**0.65**	**1,938**

Source: New England ISO

New England independent system operator (ISO) pricing after the ISO started, when temperatures were above 90ºF and the load exceeded 19,000MW. The highest hourly price was $1,000/MWh (the system maximum) and the average hourly price was $216.36/MWh – $181 more than under the regulated New England power pool.