New England Electric Markets
Education Materials

January 2011

Education Presentations

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2. How are Prices Determined?

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- New England Key Facts
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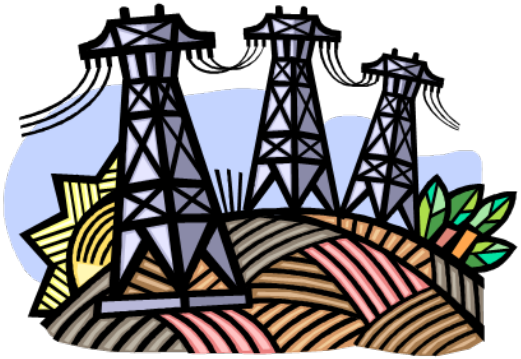
How Do New England Electric Markets Work?

The Basics – Producing & Delivering Electricity

There are three components to providing electricity to customers – generation, transmission & distribution.



Generation

- Production of electricity from power plants
- In restructured markets, this function is a competitive, non-monopoly service

Transmission

- Bulk transfer of electricity from power plants
- FERC regulated, merchant or monopoly function

Distribution

- Delivery of electricity from transmission to homes & businesses
- PUC regulated, monopoly function

Capacity v. Energy

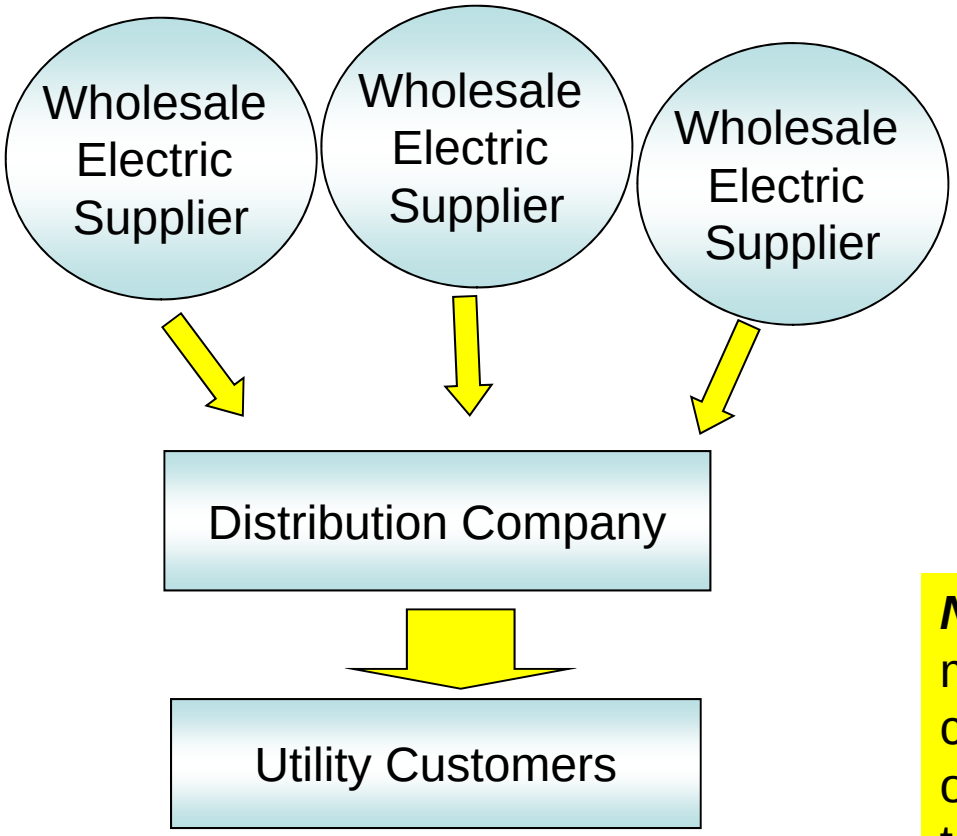
Generation includes two main products – capacity and energy.

CAPACITY	ENERGY
• The actual power plants or "steel in the ground" • Capacity = maximum available output from a plant at any point in time • Measured in megawatts (MW) • Capacity exists whether a power plant is turned on or off	• The actual output of a power plant • Energy = how many MWs are being produced at any given time • Measured in megawatt-hours (MWh) • Only exists when power plants are turned "on"

Capacity represents "steel in the ground" or the number of MW from available power plants.

Wholesale Competition

Under wholesale competition, electric suppliers compete to serve the distribution companies.

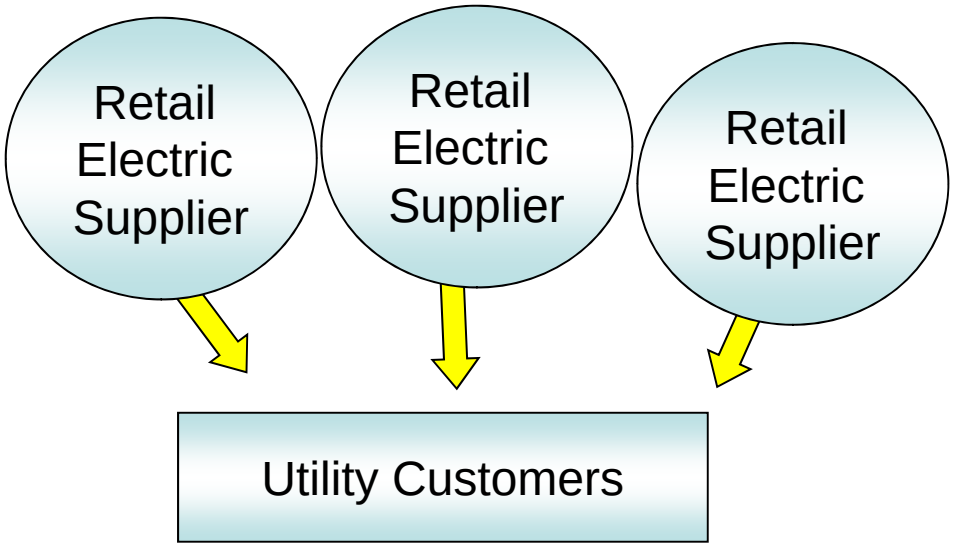


- Wholesale suppliers compete to assume electricity supply responsibilities to the distribution company
- The distribution company flows the electricity to its customers

National Grid Example: Every six months, Grid issues a RFP for its customers' generation or standard offer. A host of suppliers give their cost to serve & Grid picks the lowest cost bid to provide the generation component of this rate.

Retail Competition

Under retail competition, electric suppliers directly compete to serve utility customers.



- Retail suppliers compete to provide electric service directly to the distribution company's customers
- For customers choosing retail electric supply, the distribution company flows the winning competitive supplier's electricity directly to the customer.
- Often the retail supply is at lower cost than the distribution company's standard offer or Default Service.

UNH Example. *Conectiv, Constellation NewEnergy, Dominion, Hess, Sempra, GDF SUEZ Energy & other retail suppliers contract directly with UNH to serve its electric needs for a fixed period of time.*

Monopoly Utility Ownership Model

Prior to electric restructuring, most of the region's plants were owned & operated by monopoly utility companies.

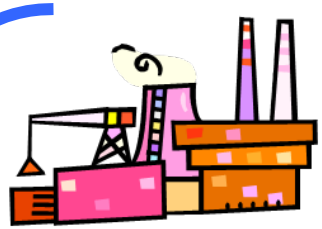
Utility-owned power plant

- Utilities participated in integrated resource planning processes
- If a need for new capacity was identified, the utilities would build the new power plant
  - A utility's rate of return (i.e., profit guaranteed by regulated rates) on the asset created an incentive to build
- Captive ratepayers financed the investment
  - If there were cost over-runs, ratepayers picked up the tab (e.g., Seabrook Station)
- Utilities were subject to after-the-fact prudence review by utility commissions

The legacy of monopoly utility-owned power plants left the New England region with approximately $20 Billion in stranded costs.

Monopoly Utility Model: Utility Revenues

The monopoly utility earned guaranteed revenues, regardless of generation costs & asset performance.

$** **Payments from Ratepayers ($) **=** **$** **All Expenses (fuels, labor, taxes & actual cost of power supplied by other generators)** **+**  **"Rate Base" or the Capital Cost of Generation Assets (utility-owned, including new generation additions)** **X** **%** **PUC Set Rate of Return (e.g., 10%)**

- More capital intensive power plants translate to more money for the utility
- Utility expenses & capital cost of generation are not limited by the market price of power
- If fuel costs from a new generating plant increase, causing price of power to spike above market price, the ratepayers still pay
- Utilities collect costs regardless of asset performance

The greater the capital cost of a monopoly utility's generation assets, the greater the revenues collected from ratepayers.

Competitive Ownership Model

Electric restructuring resulted in a significant move from monopoly utility-owned generation to competitively-owned generation.

Merchant-owned power plant

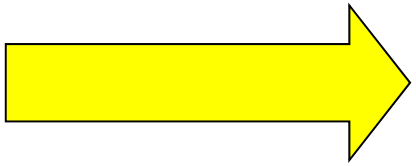
- The Public Utility Regulatory Policies Act of 1978 (PURPA) provided initial impetus for merchant generation with utility power purchase agreements
- Competitive merchant plants are owned by companies that are subject to competitive market forces
- Costs to purchase & operate the plants are financed by company shareholders, not captive ratepayers
- Cost over-runs & new investments are absorbed by owners, not ratepayers (e.g., AES Londonderry plant)
- Risk shifted from captive ratepayers to merchant generator shareholders

89% of the region's power plants are competitive non-utility plants.

Why Move to the Competitive Model?

Lower consumer risks, desire for more reliability and lowest costs was the incentive to move from utility ownership to the competitive model of ownership.

Utility-owned power plant



Competitive power plant

Three Main Reasons

- Risk of generation plant cost over-runs shifted from captive ratepayers to merchant generator shareholders
- Provide more efficient & reliable power system
- Competitive forces drive lowest prices

Role of Competitive Procurement

STANDARD OFFER

- Most New England states utilize competitive procurement processes to procure standard offer service
- Forms of competitive procurement for all requirement service include competitive RFPs and auctions
- A key factor in choosing a winning bid is cost

NEW GENERATION

- Some New England states have utilized competitive procurement processes for meeting certain needs for new generation
- Open, fair and transparent RFP processes make competitive procurement work
- A key factor in choosing a winning project is cost

The use of competitive procurement processes also drive toward lowest costs of electric supply.

Has the Competitive Model Worked?

Reduced Ratepayer Risks

- $6 Billion in new generation investment – 10,000 MW of new clean generation
- Increases of capacity at existing power plants with risks borne by merchant generators

Greater Reliability & Efficiency

- Average plant availability increased from 78 to 88% -- enough to power additional 1.96 million homes
- Reduced maintenance outage time frames (i.e., nuclear plants from 120-day average to 30-day average)

Less Environmental Emissions

- Decrease in CO_2 emissions by 7%
- Decrease in NO_X emissions by 44%
- Decrease in SO_2 emissions by 65%

Lowest Possible Costs

- Decrease in fuel-adjusted prices of approximately 7% from 2000 to 2006
- ISO-NE states that the cost of electricity dropped 50% from $10.6B in 2008 to $5.3B in 2009

On every key metric, the competitive market has worked and continues to work for New England.

Go Back to the Monopoly Model?

ARGUMENT #1

Regulated Companies Can Build New Plants at a Lower Cost

- ***Response:*** Those with specific experience & expertise have the best skills & economies of scale to build new generation. Merchant generators have these skills.
- ***Response:*** If utilities want to build, they should compete on a level playing field & not with ratepayer money.

ARGUMENT #2

Regulated and Merchant Plants Can Co-Exist

- ***Response:*** If regulated companies are allowed to build again, private companies will likely not be willing to invest.
- ***Response:*** Need for private companies to recover full costs from market & regulated companies to recover full costs from ratepayers cannot co-exist. Market signals are compromised.

Policy arguments for returning to the monopoly model are not persuasive or correct.

How are Prices Determined?

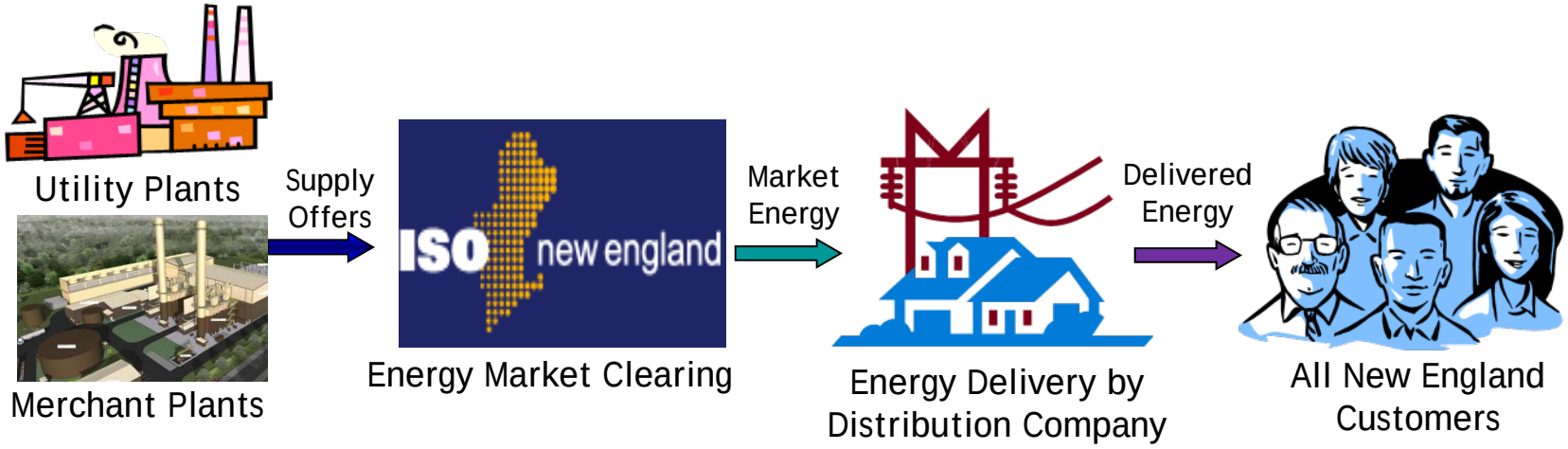
ISO-NE's Role

The ISO-NE acts as a type of "stock exchange" for facilitating electricity sales to customers throughout the region.

- Independent, not-for-profit corporation
- Headquarters in Holyoke, MA
- Main functions include:
  - Daily operation of New England's bulk power generation & transmission system
  - Oversight & administration of New England wholesale electric market
  - Management of comprehensive, regional planning processes across all six New England states

Relationship Between Power Plants & ISO-NE

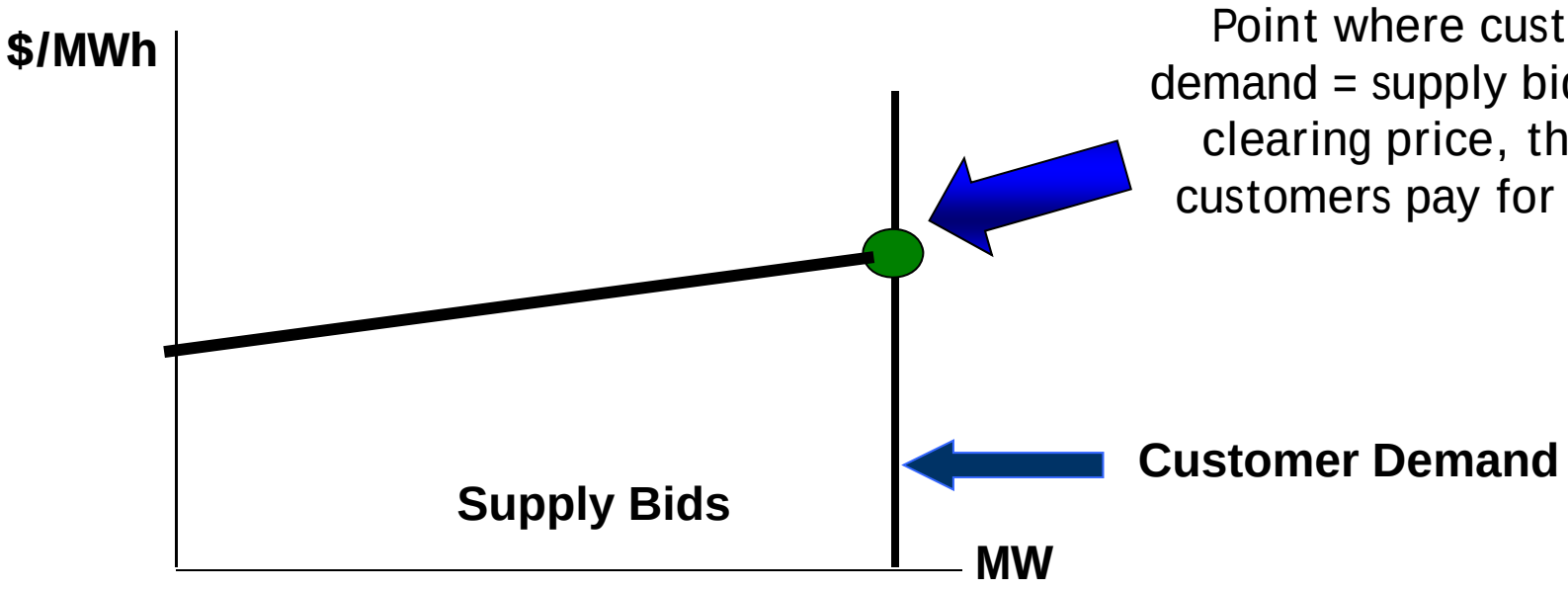
All regional power plants submit Supply Offers to the ISO; the ISO then dispatches units on a lowest cost basis across the region.



- All New England power plants submit “supply offers” or prices for their electricity to ISO-NE
- ISO-NE matches the MW of supply offers to MW needed by customers
- ISO-NE puts all bids together and dispatches (or turns on) plants based on lowest cost bids
- Lowest cost energy is delivered to the Distribution companies for redelivery to customer

Central dispatch provides the ratepayer the benefit of lowest cost power.

Determining Lowest Cost Bids



- The ISO "stacks" the electricity bids it receives from lowest (left) to highest (right)
- The ISO compares this "supply" against the "demand" for electricity from the region's customers
- At the point where the supply equals the demand, the ISO determines the price
- This clearing price is paid to all resources that the ISO chooses to dispatch subject to certain adjustments

The price of the commodity determines the regional price of electricity.

Basic Components of an Electric Bill

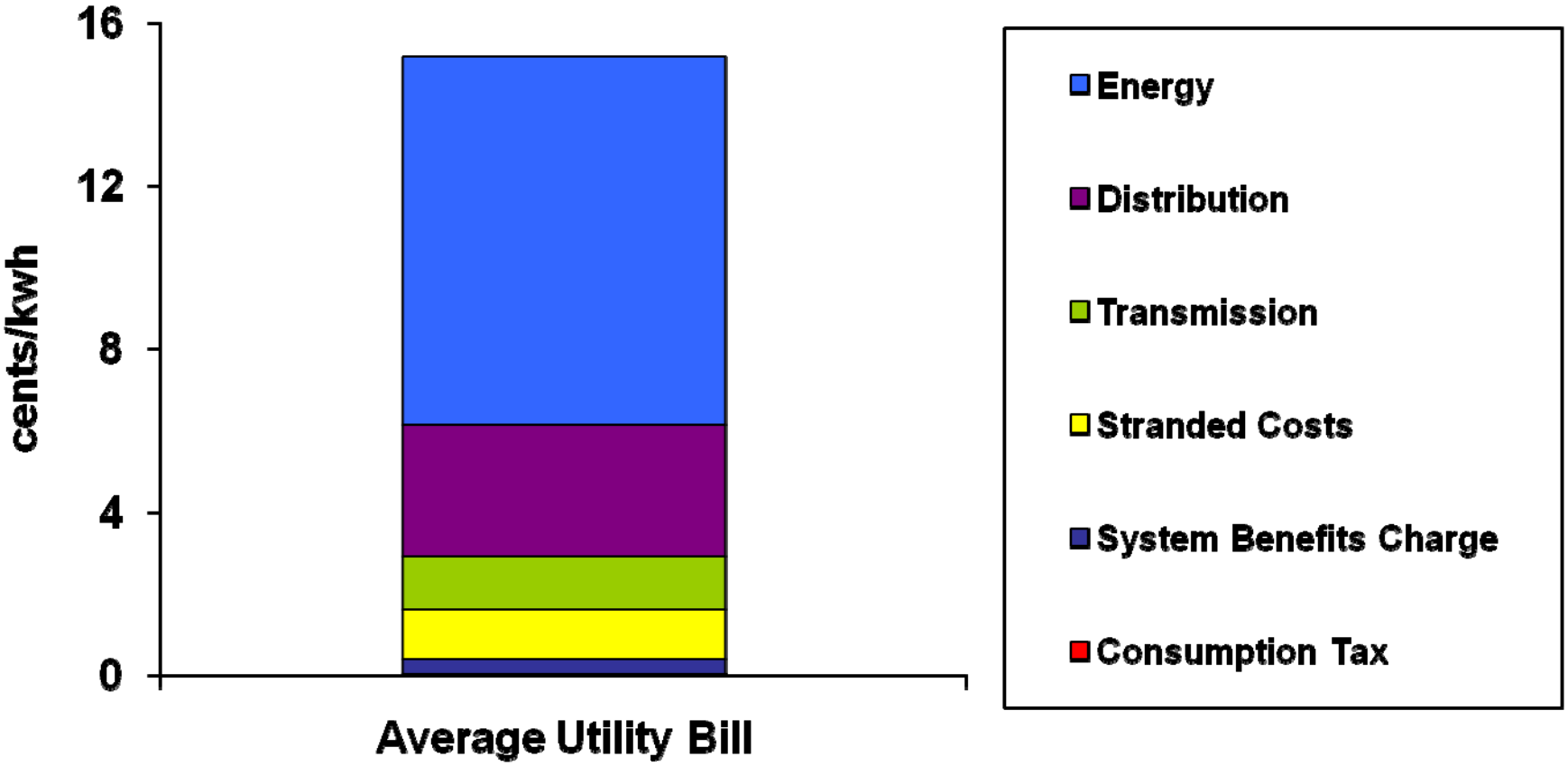
An electric bill for a residential customer has many typical components.

- **Competitive Energy Charge or Standard Offer charge** – cost of electricity commodity
- **Distribution** – cost to deliver from transmission system to end-use customer
- **Transmission** – cost to deliver from plant to distribution network
- **Stranded costs** – funds utility's past costs, investments & liabilities *that are not recoverable in a competitive marketplace*
- **System Benefits Charge** – state charge to fund energy efficiency & low-income electric assistance
- **Consumption tax** –state-mandated tax on energy consumption which is collected by electric utilities

Charges such as stranded costs, systems benefits charges & consumption taxes are all state policy choices.

Breakdown of Average Electric Bill

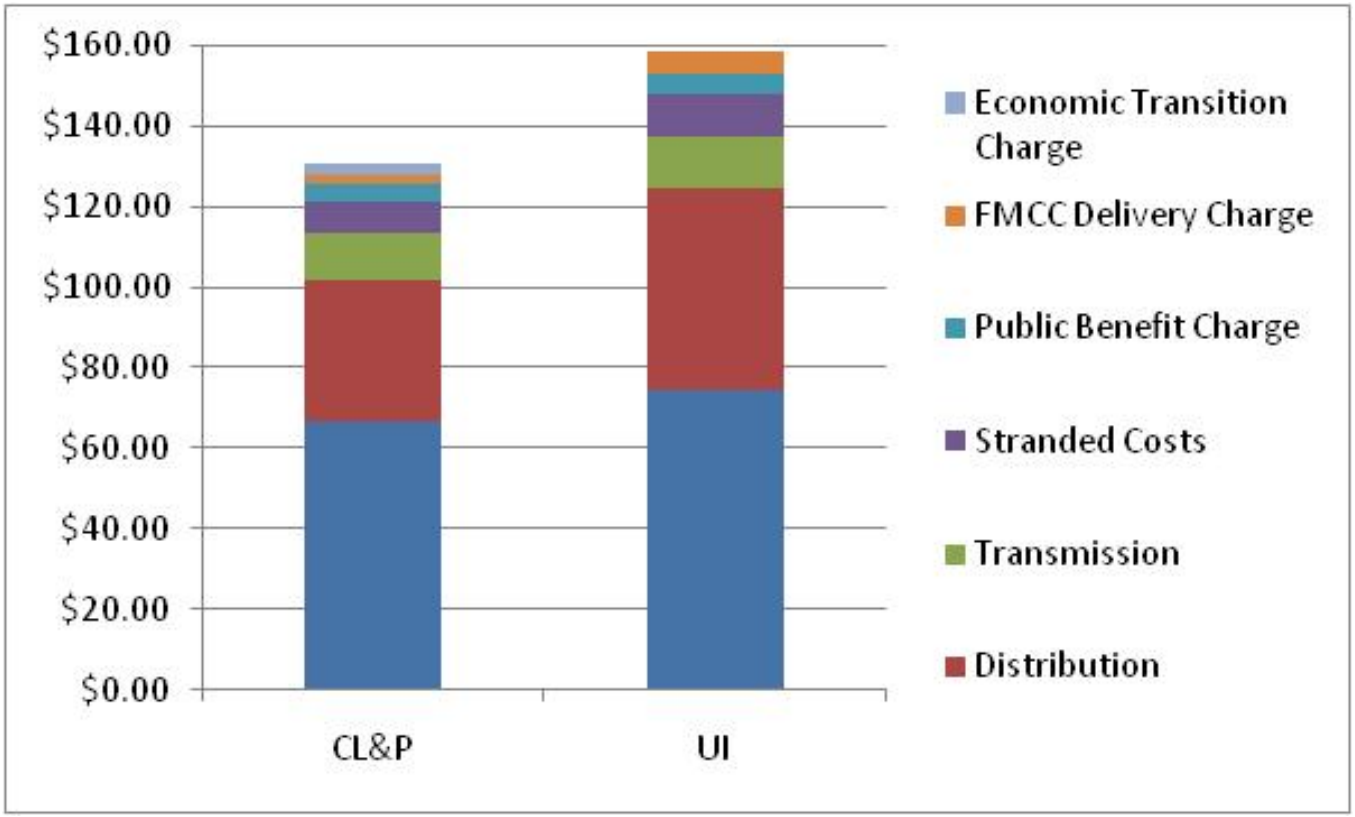
An average electric bill for a residential customer has many components.



There is often a $/month customer charge

Comparison of Utility Bills – Connecticut

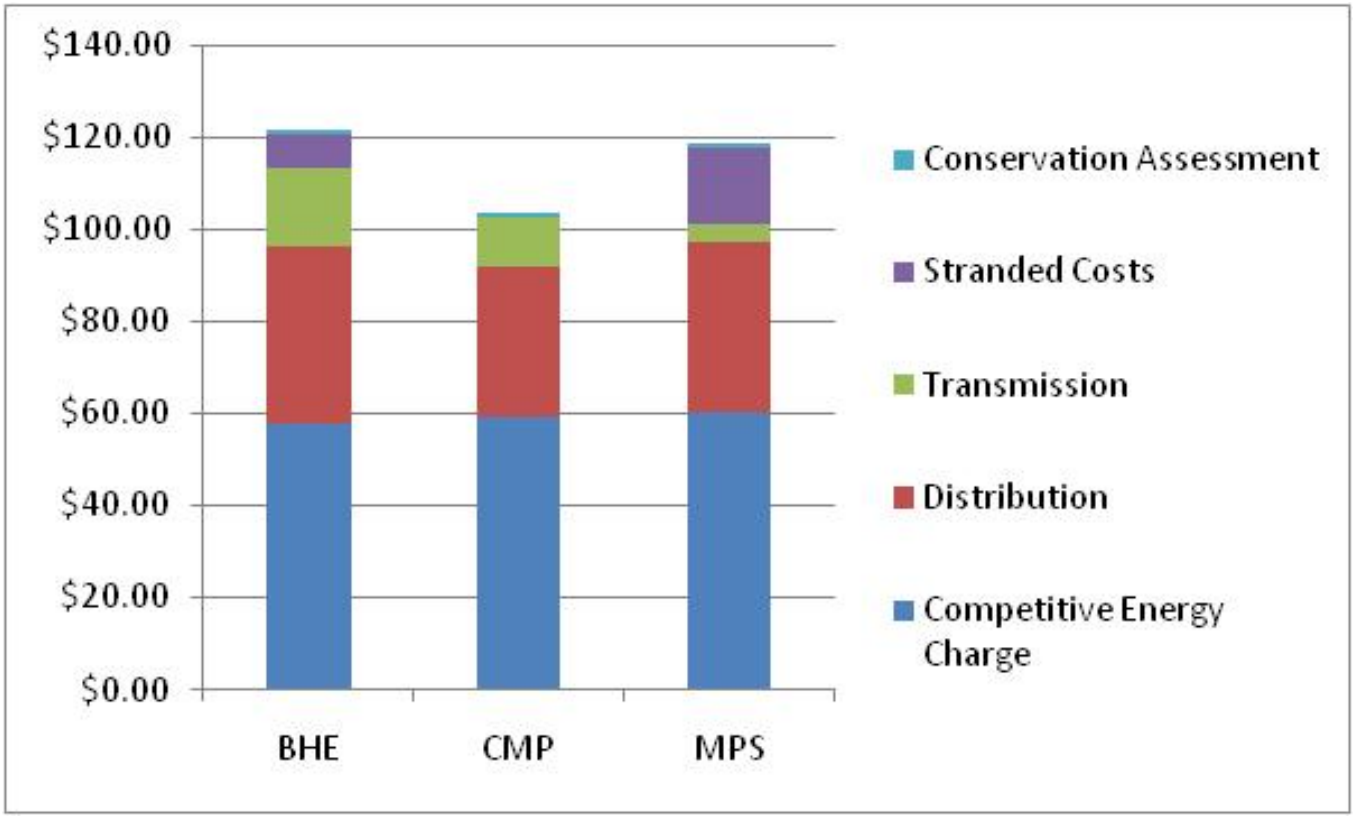
Based on a residential customer using 700 kwh per month.



Rates as of January 2011.

Comparison of Utility Bills – Maine

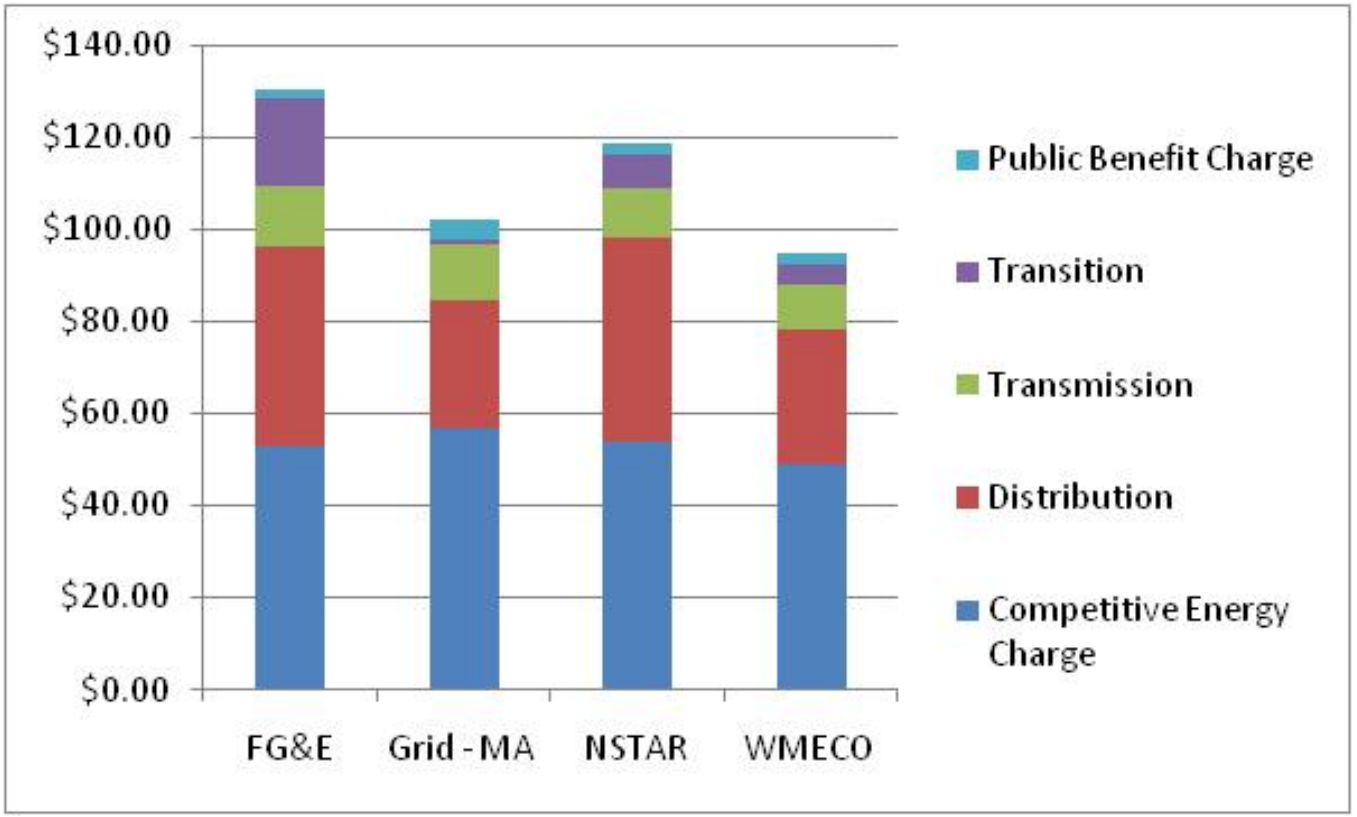
Based on a residential customer using 700 kwh per month.



Rates as of March 2011.

Comparison of Utility Bills – Massachusetts

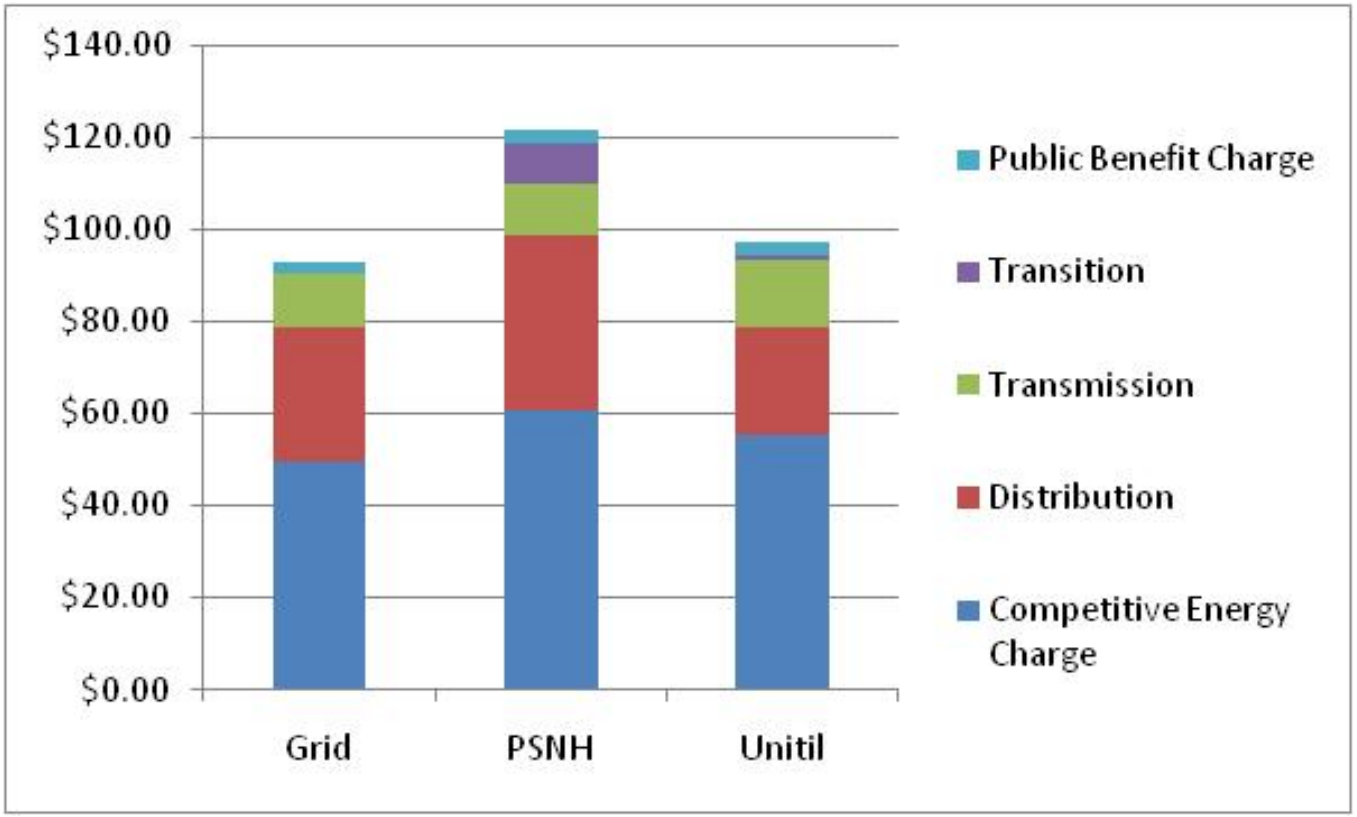
Based on a residential customer using 700 kwh per month.



Rates as of January 2011.

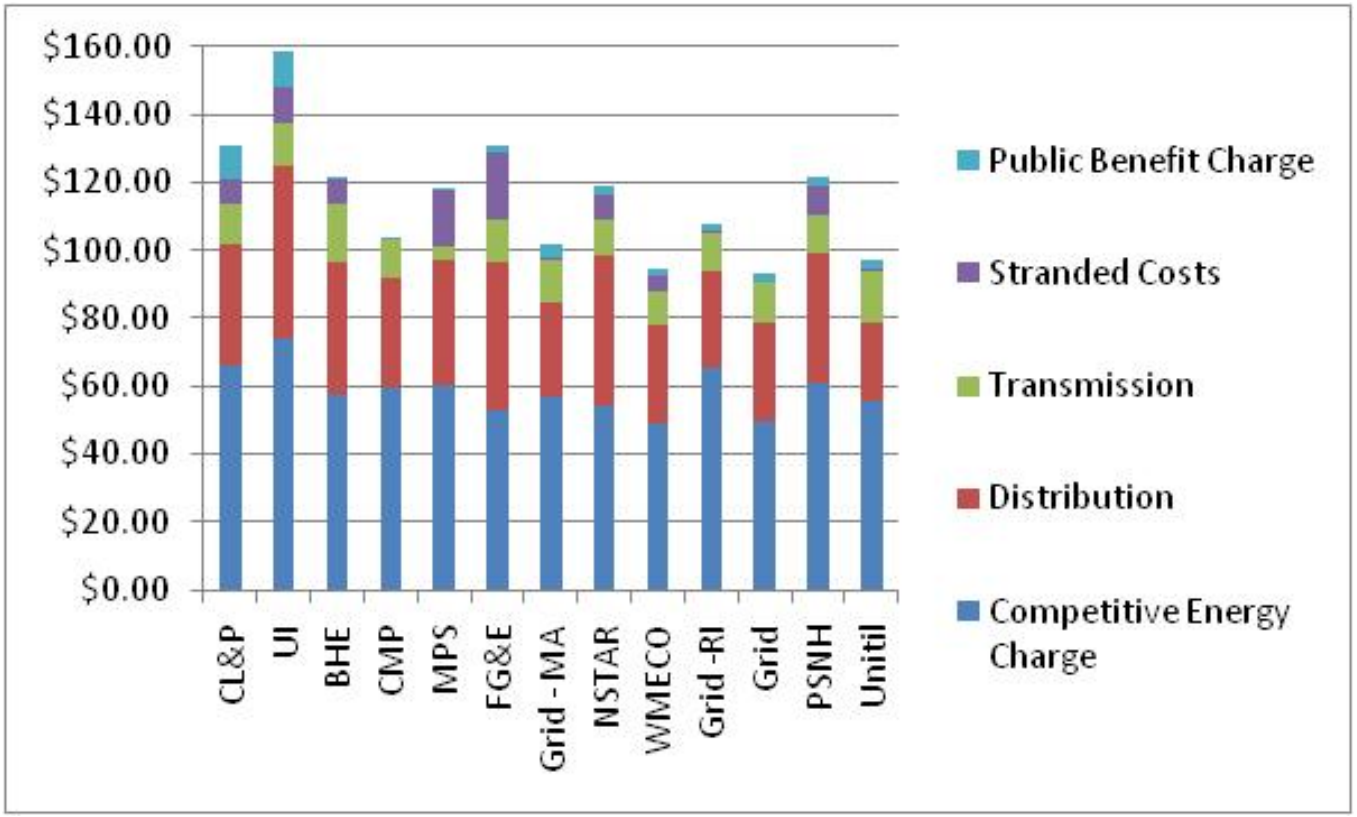
Comparison of Utility Bills – New Hampshire

Based on a residential customer using 700 kwh per month.



Rates as of January 2011.

Comparison of Utility Bills Across New England



All rates as of January 2011 except for Maine which are as of March 2011.

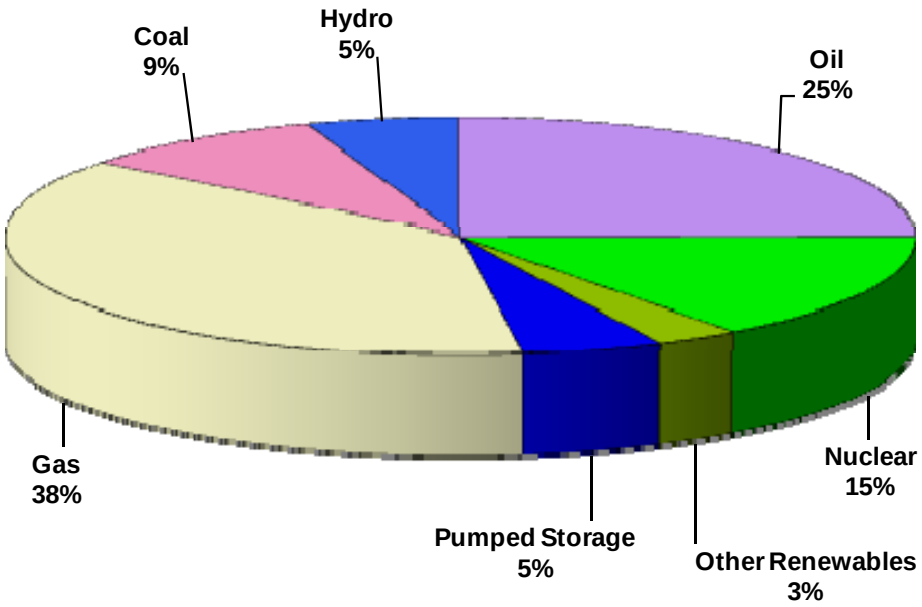
The Facts

New England Region: Key Numbers

- More than **350** power plants
- **8,000** miles of high-voltage transmission lines
  - **$4** Billion in transmission investment since 2002; another $5 Billion planned over next 10 years
- **13** interconnections to electric systems in New York & Canada
- **31,400** MW of total supply capacity, plus 2,300 MW of demand resources
  - All time peak of **28,130** MW used on August 2, 2006
- **300** market participants who generate, buy, sell, transport & use electricity
- **94** new generation projects – totaling **11,700** MW – are currently being tracked by the ISO-NE
- **$12** Billion annual total electric market value (2008)

What Fuels New England's Power Plants?

Natural gas & oil comprise more than 60% of the New England resource mix, with nuclear, coal & other renewables completing the portfolio.

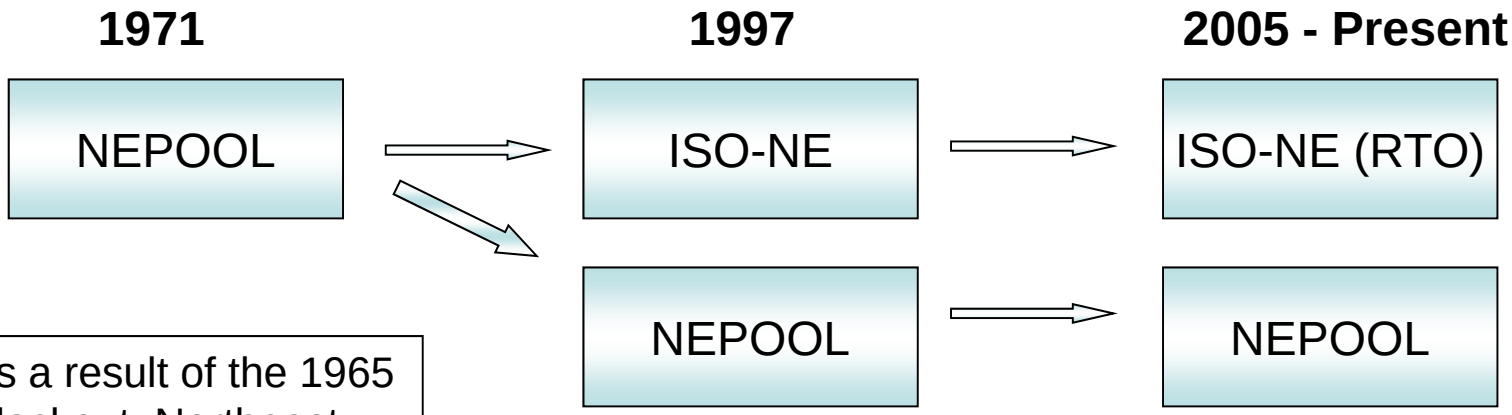


New England Resource Mix

Source: ISO-NE website

Who are NEPOOL & the ISO-NE?

The genesis of NEPOOL is the Great Northeast Blackout of 1965



- As a result of the 1965 Blackout, Northeast power companies formed three “power pools”
- The New England Power Pool (“NEPOOL”) was founded in 1971 by private & municipal utilities

- The Federal Energy Regulatory Committee (FERC) formed Independent System Operators (ISO’s) in the mid-1990s
- ISO-NE formed in 1997
- NEPOOL remained a stakeholder group

- The ISO-NE was designated as the Regional Transmission Organization (RTO) in 2005 by FERC
- NEPOOL, with generators, suppliers, end-users, demand response providers renewable providers, is advisory in nature

Connecticut: Key Numbers

- CT represents **25.0%** of the overall New England regional electricity demand.
- Total capacity of generation in CT is 7,900 MW, with natural gas and oil as primary fuels
- CT peak demand is projected to grow annually at **0.9%** over next **10** years
- 3,500 MW of proposed new resources in ISO interconnection queue
- CT represents **one of eight** electric pricing zones in New England
  - CT zone prices typically are slightly above region's Hub price

Maine: Key Numbers

- ME represents **9.0%** of the overall New England regional electricity demand.
- Total capacity of generation in ME is 3,300 MW, with natural gas and oil as primary fuels
- ME peak demand is projected to grow annually at **1.3%** over next **10** years
- 2,400 MW of proposed new resources in ISO interconnection queue
- ME represents **one of eight** electric pricing zones in New England
  - ME zone prices typically are slightly below region's Hub price

Massachusetts: Key Numbers

- MA represents **46.0%** of the overall New England regional electricity demand.
- Total capacity of generation in MA is 13,300 MW, with natural gas and oil as primary fuels
- MA peak demand is projected to grow annually at **1.3%** over next **10** years
- 2,600 MW of proposed new resources in ISO interconnection queue
- MA includes **three of eight** electric pricing zones in New England
  - Southern MA, Northern MA & West Central MA

New Hampshire: Key Numbers

- NH represents **9.0%** of the overall New England regional electricity demand.
- NH peak demand is projected to grow annually at **1.6%** over next **10** years
- 500 MW of proposed wind and biomass resources in ISO interconnection queue for Coos County
- NH represents **one of eight** electric pricing zones in New England
  - NH zone prices typically fall below region's Hub price

Rhode Island: Key Numbers

- RI represents **7.0%** of the overall New England regional electricity demand.
- Total capacity of generation in RI is 1,800 MW, with natural gas as the primary fuel
- RI peak demand is projected to grow annually at **1.3%** over next **10** years
- 1,000 MW of proposed new resources in ISO interconnection queue
- RI represents **one of eight** electric pricing zones in New England
  - RI zone prices typically are at the region's Hub price

Vermont: Key Numbers

- VT represents **5.0%** of the overall New England regional electricity demand.
- Total capacity of generation in VT is 1,200 MW, with approximately half from nuclear
- VT peak demand is projected to grow annually at **1.0%** over next **10** years
- 300 MW of proposed new resources in ISO interconnection queue
- VT represents **one of eight** electric pricing zones in New England
  - VT zone prices typically are at the region's Hub price

Key Electric Industry Terms

- ***Default Service***: electricity available through a distribution company for customers who have not switched to a retail electric provider
- ***Generation***: producing electricity from power plants
- ***Merchant Generators:*** companies that own power plants & use market-based revenues, not regulated rates, to pay for the plants; bear the risk/reward of investment
- ***Restructuring***: replacing monopoly system of electric utilities with competing wholesale & retail suppliers, & allowing customers the right to chose their electric supplier
- ***Retail Electric Provider***: an entity that offers to sell electricity directly to a retail customer
- ***Stranded Costs***: investments in generation made by utilities that would not be recoverable in a competitive marketplace
- ***Transmission & Distribution***: system of delivery lines used to deliver electricity from a power plant to a customer's home or business
- ***Transmission & Distribution Company***: an electric company that uses its transmission & distribution lines to deliver electricity to customers
- ***Wholesale Electric Provider***: an entity that offers to sell electricity to distribution & municipal utilities, using either merchant generation or generation contracts
- ***Demand Resource:*** source of capacity whereby customer reduces demand for electricity from the bulk power system, such as by using energy-efficient equipment, shutting off equipment, and using electricity generated on site
- ***Energy Efficiency:*** involves promoting all behaviors, working methods and production techniques that consume less energy for the same rate of production

New England Forward Capacity Markets

What is the Forward Capacity Market?

The forward capacity market was implemented in two phases – a transition stage and the permanent Forward Capacity Market.

Transition Stage

- Started December 1, 2006 with schedule of capacity payments to all supply resources in New England
  - Ended on May 31, 2010
- If resources were not available during high demand periods, payments were reduced
- Objectives
  - Defer retirements of existing generation
  - Attract imports of generation
  - Promote investment in energy efficiency, demand resources & renewable energy

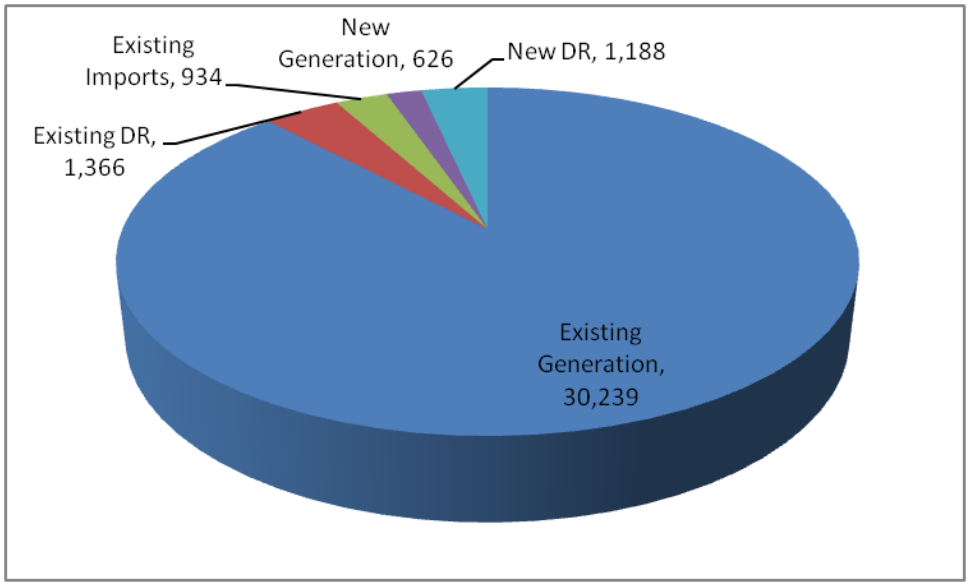
Forward Capacity Market

- Began June 1, 2010
  - First auction held in February 2008 for Power Year 2010 (June 2010-May 2011)
- Annually, ISO holds an auction to buy capacity for the year beginning three years into the future
  - ISO buys amount of capacity equal to meet projected demand
- Supply resources are subject to performance penalties
- Objective is to send signals when new capacity is needed with enough lead time for development & construction

FCM is a "capacity" market designed to send market signals for building new supply resources in New England.

Results of Forward Capacity Auction #1

ISO procured 34,252 MW of capacity to meet needs for June 2010-May 2011.

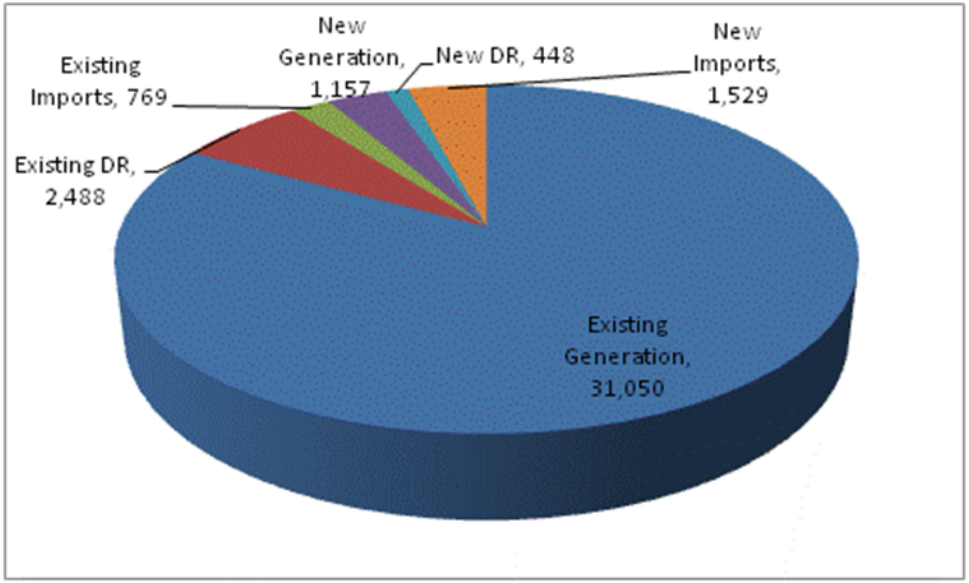


- Held in February 2008
- The auction began with 40,454 MW of resources
- The ISO bought 2,047 MW or 6%, capacity in excess of the minimum required amount
- Excess capacity clearing at the floor price pushed the capacity price down from $4.50 to $4.26 kw-Month

The auction started with available capacity 18% above what was necessary and cleared with an excess of 6%.

Results of Forward Capacity Auction #2

ISO procured 37,442 MW of capacity to meet needs for June 2011-May 2012.

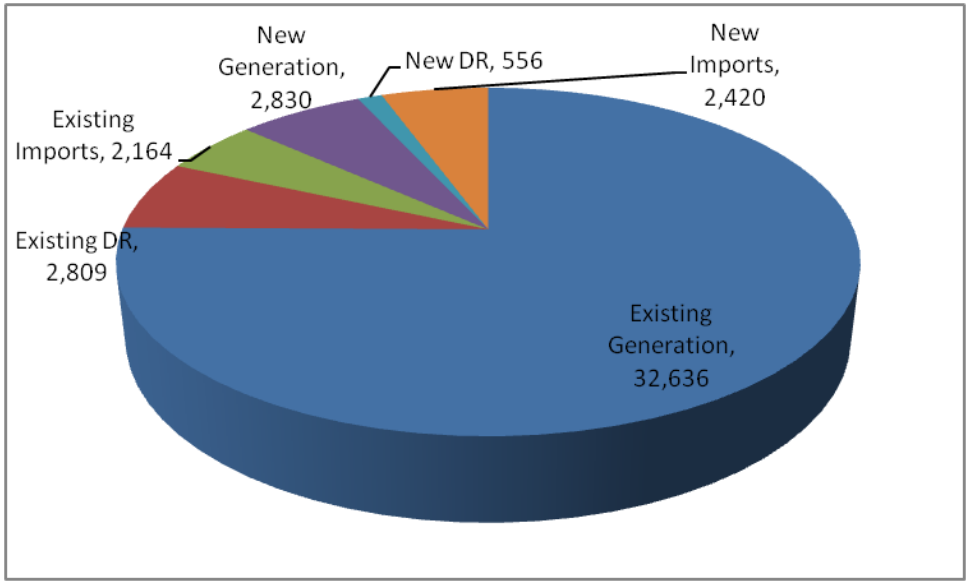


- Held in December 2008
- The auction began with 42,777 MW of resources
- The ISO bought 4,775 MW or 13% capacity in excess of the minimum required amount
- Excess capacity clearing at the floor price pushed the capacity price down from $3.60 to $3.12 kw-Month

The auction started with available capacity 14% above what was necessary and cleared with an excess of 13%.

Results of Forward Capacity Auction #3

ISO procured 36,995 MW of capacity to meet needs for June 2012-May 2013.

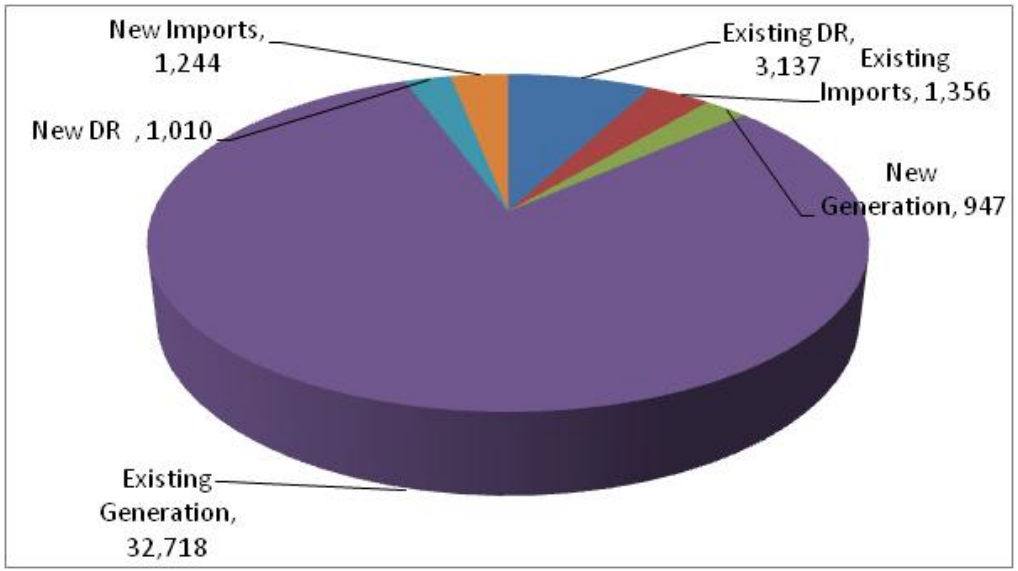


- Held in October 2009
- The auction began with 40,995 MW of resources
- The ISO bought 5,030 MW or 16% capacity in excess of the minimum required amount
- Excess capacity clearing at the floor price pushed the capacity price down from $2.95 to $2.53 kw-Month.

The auction started with available capacity 28% above what was necessary and cleared with an excess of 16%.

Results of Forward Capacity Auction #4

ISO procured 37,501 MW of capacity to meet needs for June 2012-May 2013.



- Held in August 2010
- The auction began with 40,412 MW of resources
- The ISO bought 5,374 MW or 16% capacity in excess of the minimum required amount
- Excess capacity clearing at the floor price pushed the capacity price down from $2.95 to $2.52 kw-Month

The auction started with available capacity 26% above what was necessary and cleared with an excess of 16%.