

New England Electricity Rates Analysis

Prepared for NESCOE

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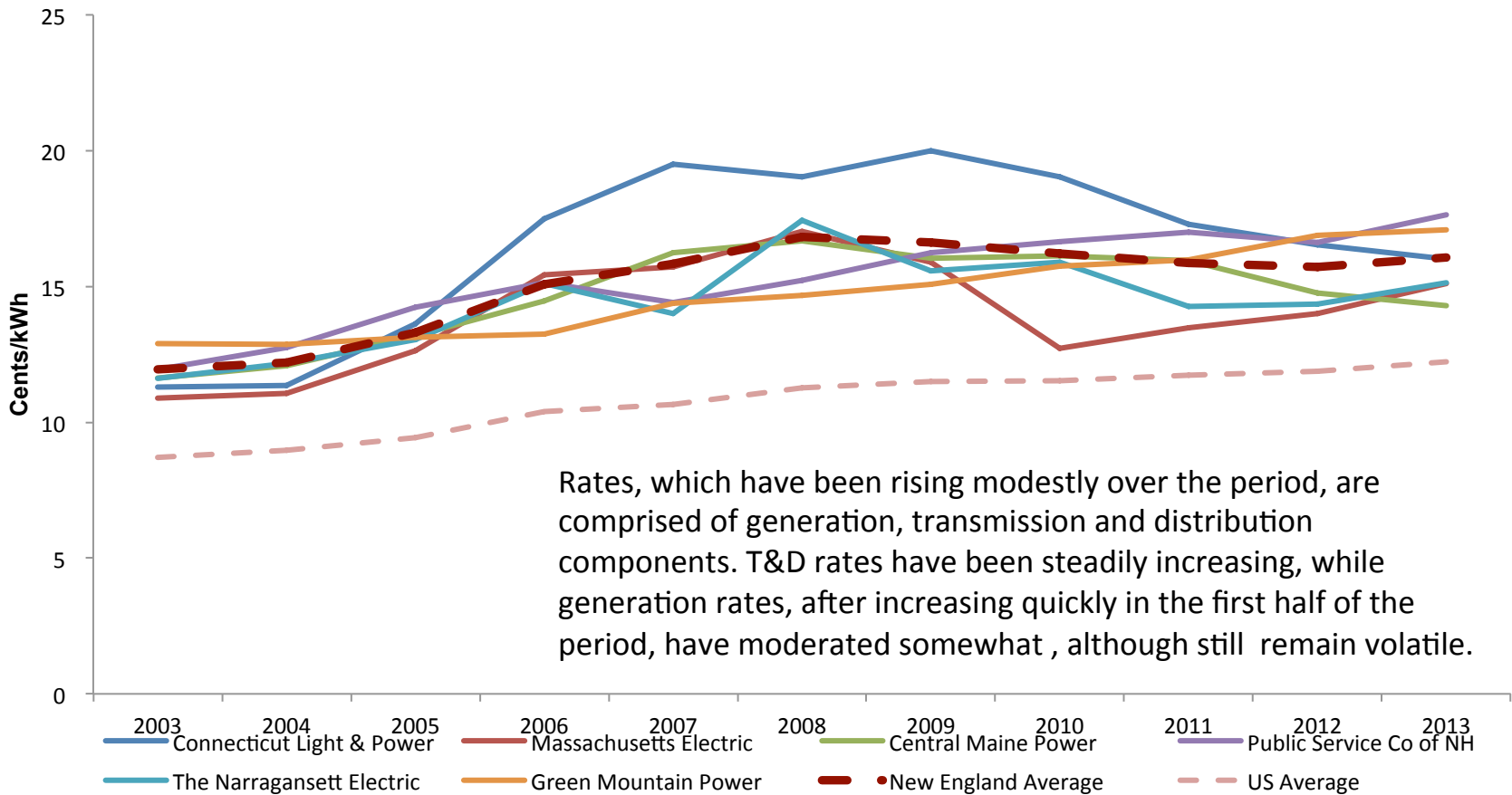
Preliminary insights

- Residential electricity customers in New England states have paid higher rates than those of the national average over the last decade.
 - The most significant factor that drives differences in rates paid by residential customers across the US is the underlying fuel mix of the power supply that customers purchase.
 - New England as a region derives relatively less of its power from cheaper sources of generation – especially coal, nuclear, and large federal hydro projects -- than many other regions in the US.
- Over the last decade, the level and volatility in the price of natural gas that fuels a significant portion of power generation explains much of the movement of power prices in New England year over year, but it is a complicated relationship.
 - The share of natural gas fired generation is increasing at a time when natural gas prices have generally fallen to their lowest annual average in years, yet natural gas has also spiked to extremely high but short-lived prices during recent periods of supply constraint.
 - Residential customers are generally not directly exposed to real-time wholesale spot electric prices, which closely track natural gas prices delivered to electric generation plants, but over time they will see those spikes incorporated into seasonal or average generation rates.

Preliminary insights, continued

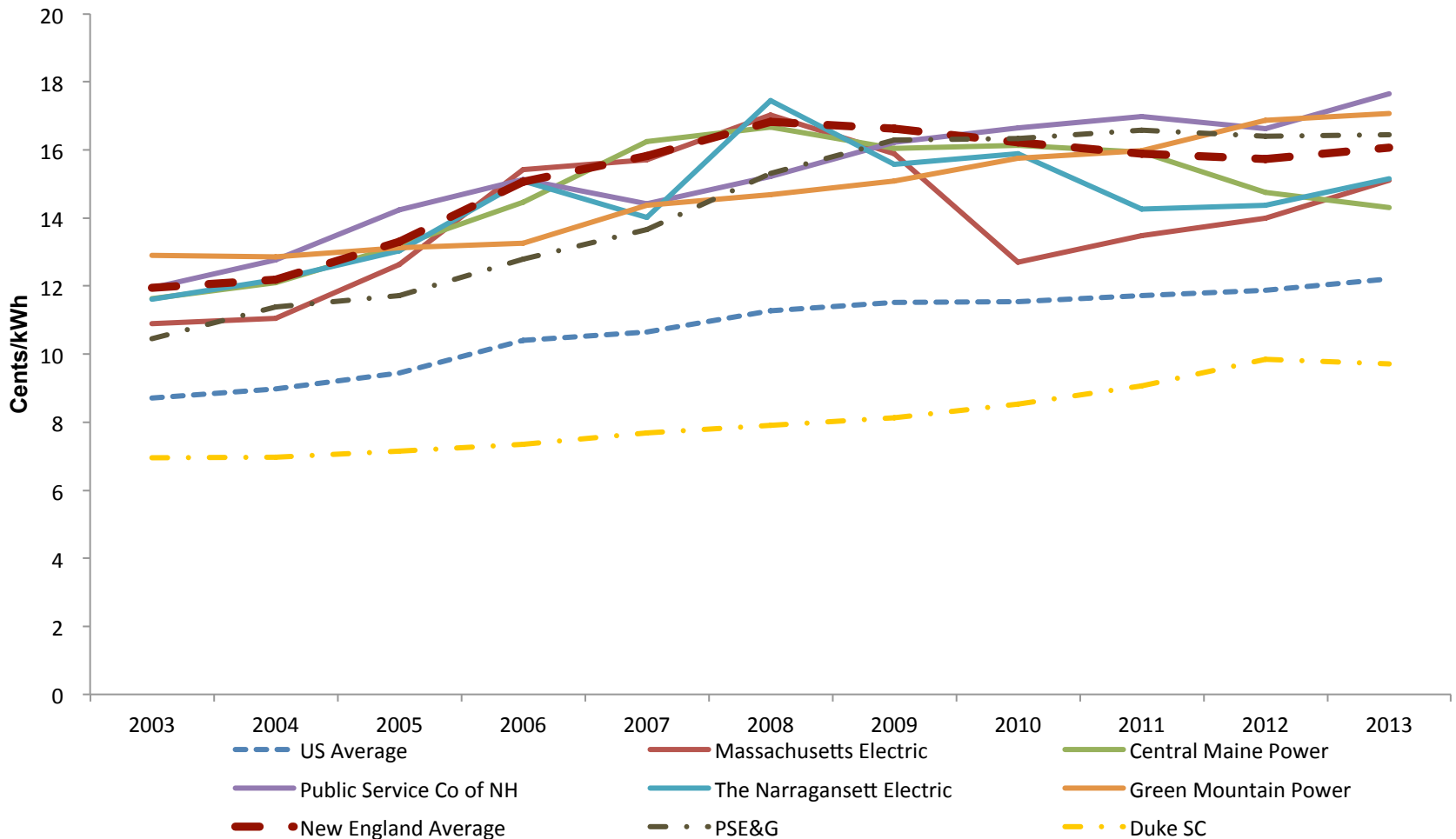
- Other factors also drive trends in residential electricity bills, including:
 - The amount of electricity consumed on average by residential customers, which varies across states and utilities, and is correlated to factors such as the size and income level of the average household, and the level of electric heat and air-conditioning penetration
 - Specific regulatory and corporate policies that may impact the cost of utility distribution operations that are passed on to customers, such as relative levels of utility spending on specific programs related to smart meters or tree trimming to improve reliability,
 - Regulatory rate design choices that spread the utility's allowed revenue requirement across different classes of customers or provide for time-differentiated rates,
 - Statewide policies, such as those establishing rules or targets for long-term contracts, renewable portfolio standards, and energy efficiency programs.
- The non-generation portion of rates, i.e., distribution and transmission, has been slowly but steadily increasing over time, driving up total bills to residential customers.
- Purchased power contracts are still a relatively small portion of the total generation mix in New England; their impact on rates is difficult to assess because of the lack of publicly available data.

Historical average residential rates of selected New England utilities (2003-2013)



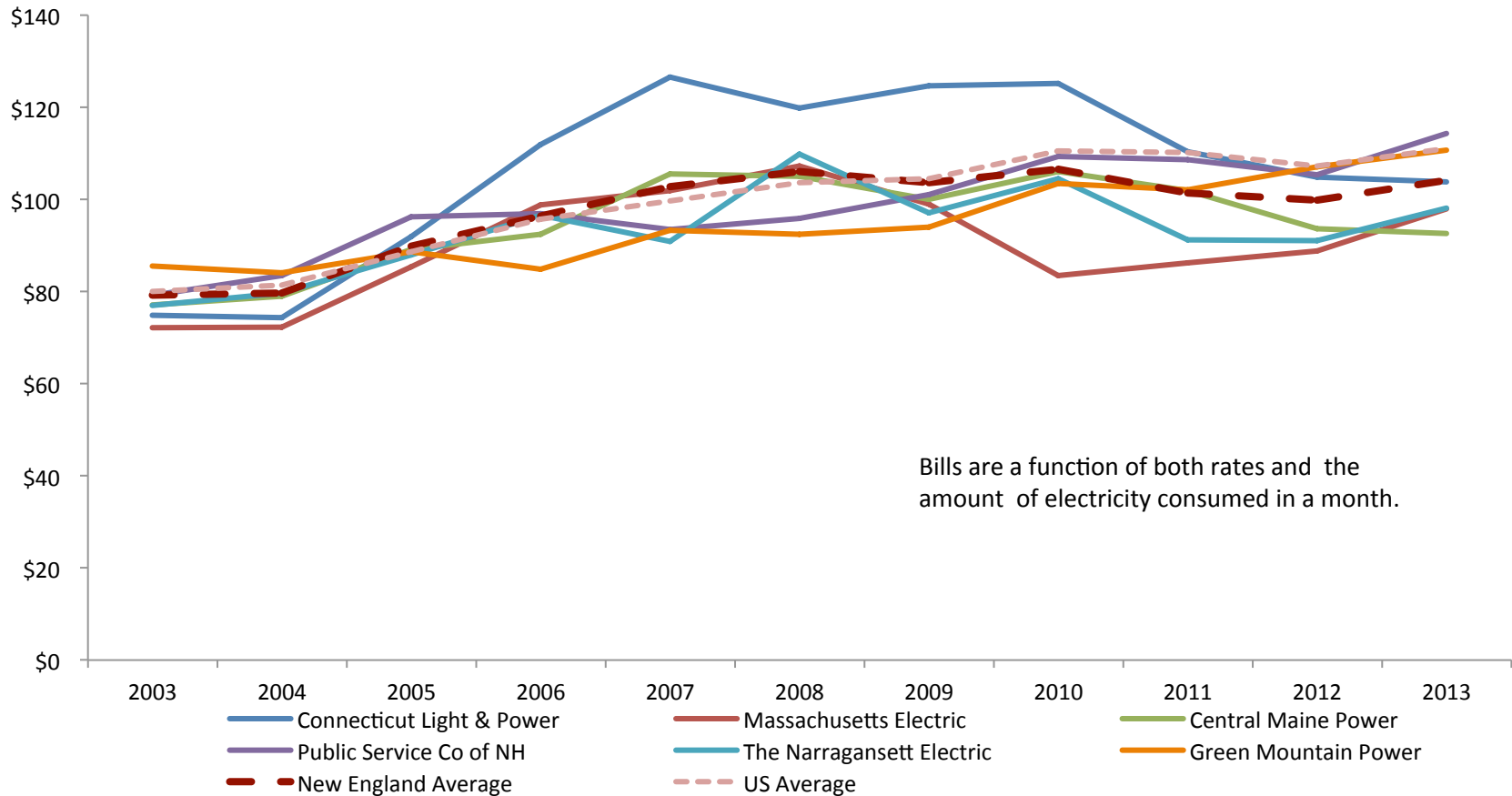
Source: EIA

Historical average residential rates of New England and of two comparable east coast utilities (2003-2013)



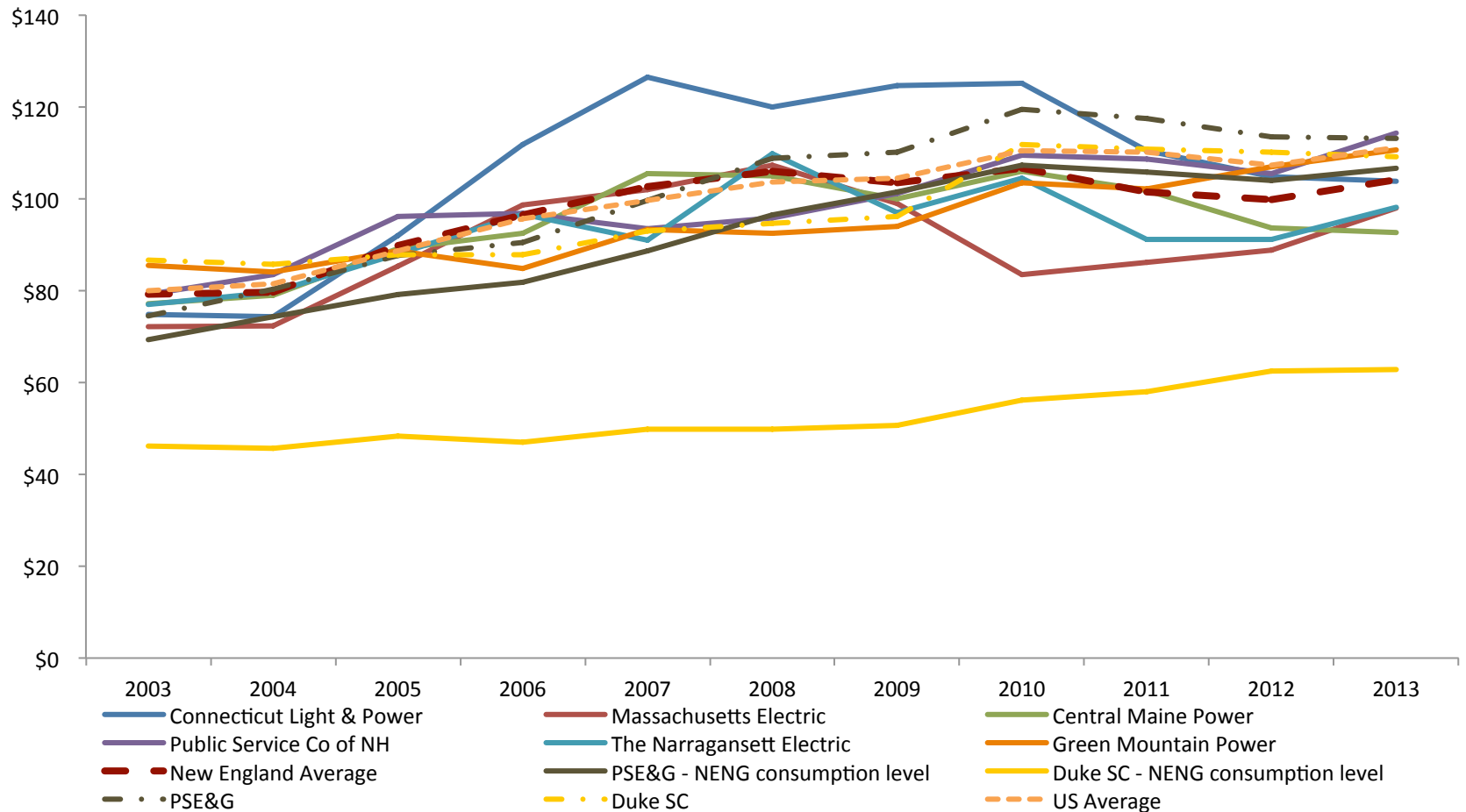
Source: EIA

Calculated monthly bills paid by typical New England residential customers, based on regional average consumption



Note: the monthly consumptions are assumed to be same across utilities and equal to the average New England consumption of 648 kWh/month. This chart thus represents average monthly bills based on the region's consumption average, and an annualized rate, which may not reflect actual seasonality in consumption or rates experienced by customers of these utilities. Source: EIA

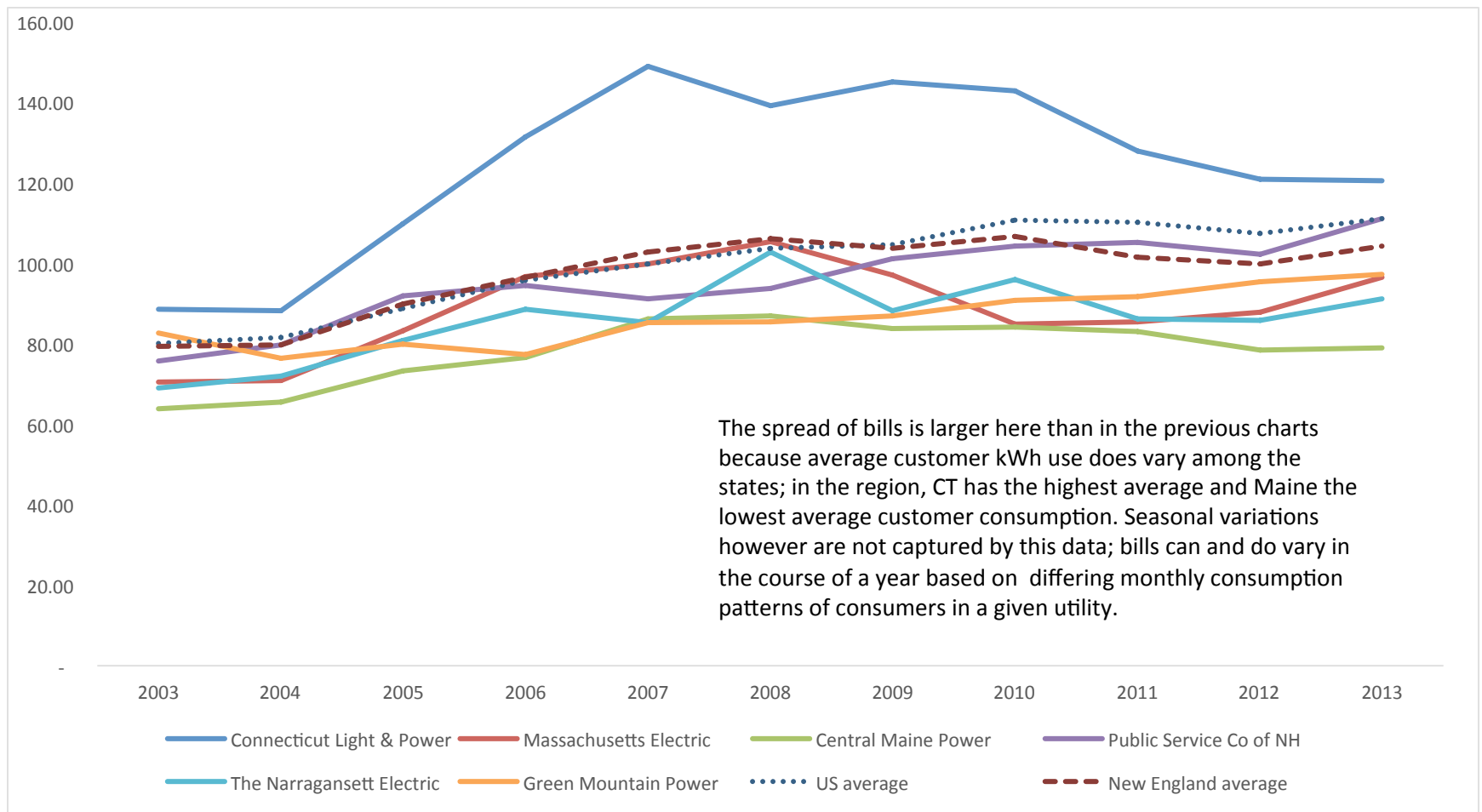
Calculated bills paid by typical residential customers across utilities based on an average New England consumption level



Note: the monthly consumptions are assumed to be same across the listed utilities represented by solid lines, i.e., based on the average New England level. For the data represented by the dotted lines, i.e., PSE&G, Duke SC and the US average, the calculation is based on the respective average state level or national average consumption. Also note that average sales among states actually varies considerably across the US; one significant factor is the level of air conditioning load and total cooling degree days; national average electricity consumption is higher than the New England average. Source: EIA

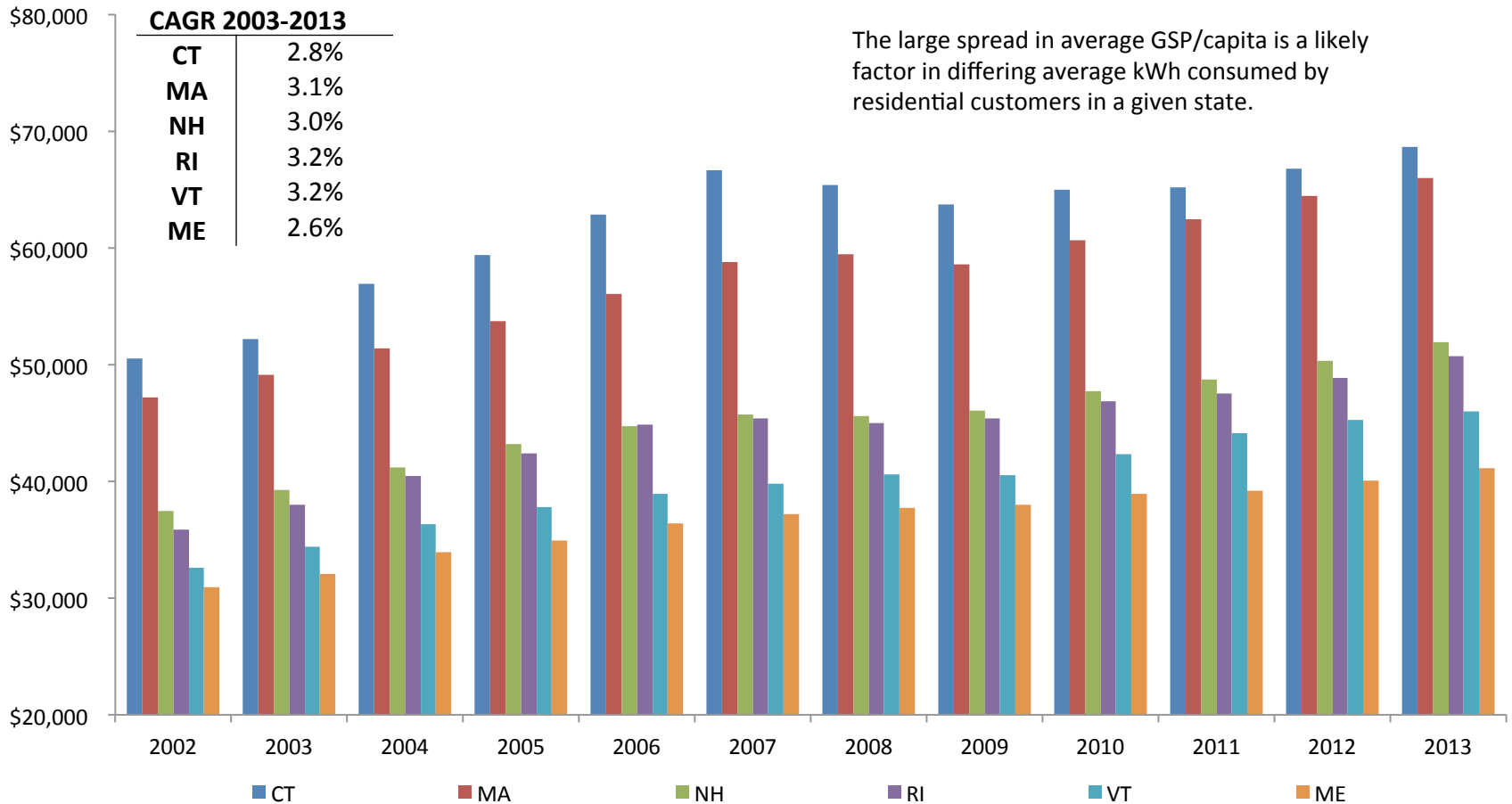
Calculated bills paid by typical residential customer across New England

(based on each state's specific average annualized use)



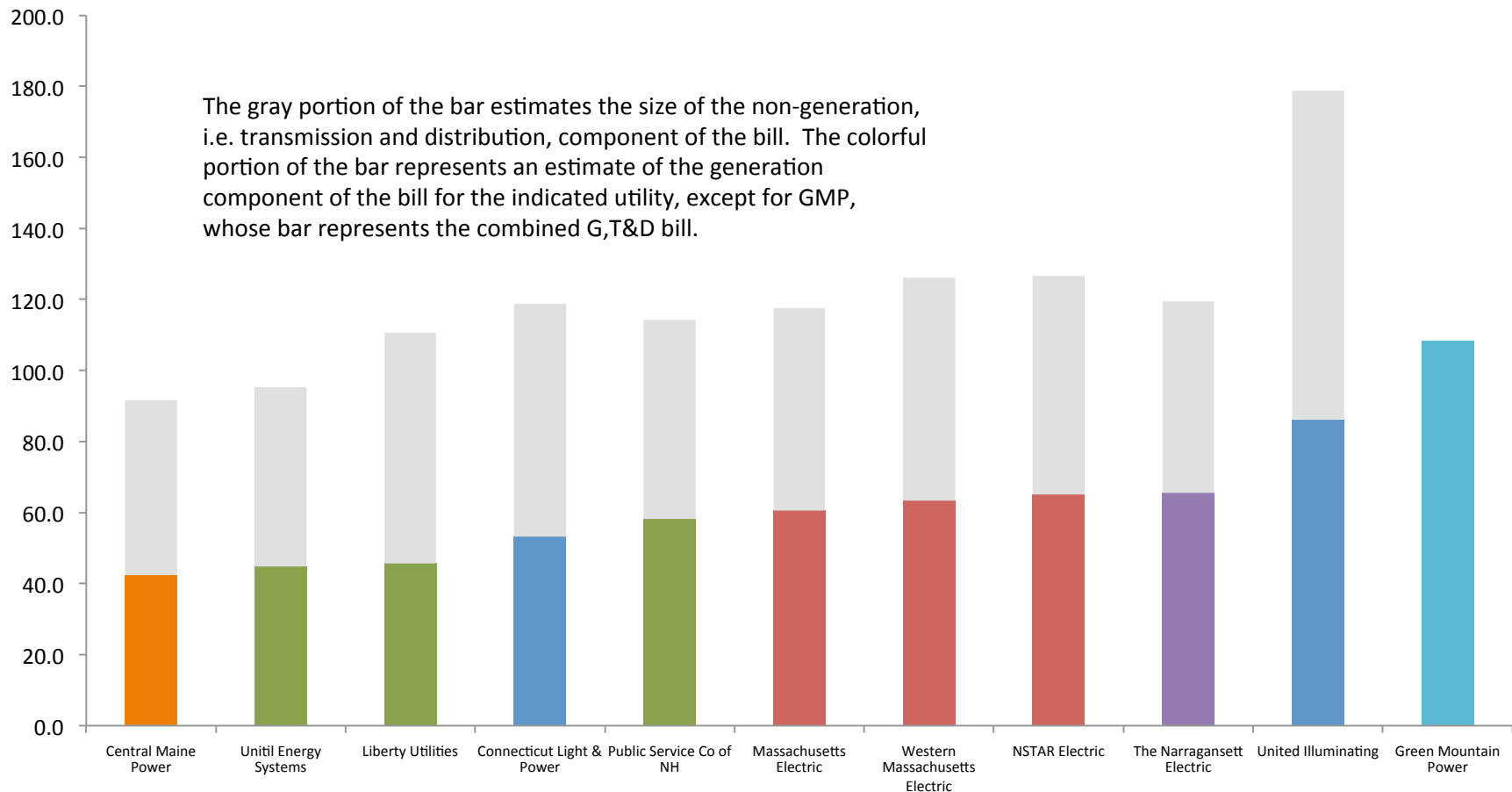
Note: the monthly consumption level is calculated for each state based on sales and revenue data. The calculation is average estimated annual rate (\$/kWh) * average consumption in each state (kWh/month). Source: EIA

Gross state product per capita growth for New England states has recovered since the last recession



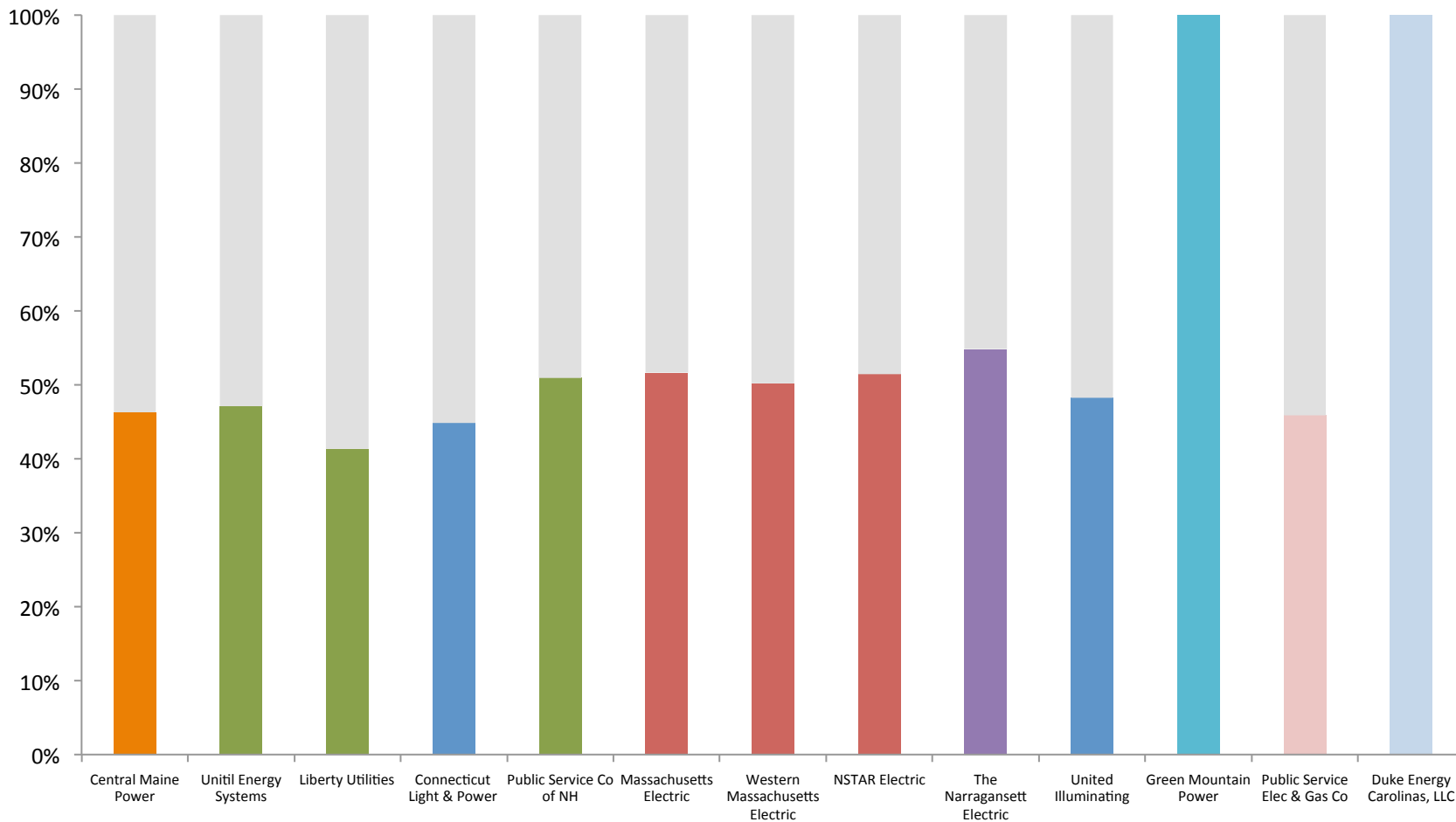
Source: Bureau of Economic Analysis (BEA); data is nominal

The relative size of the current typical monthly residential bill varies somewhat across the New England utilities



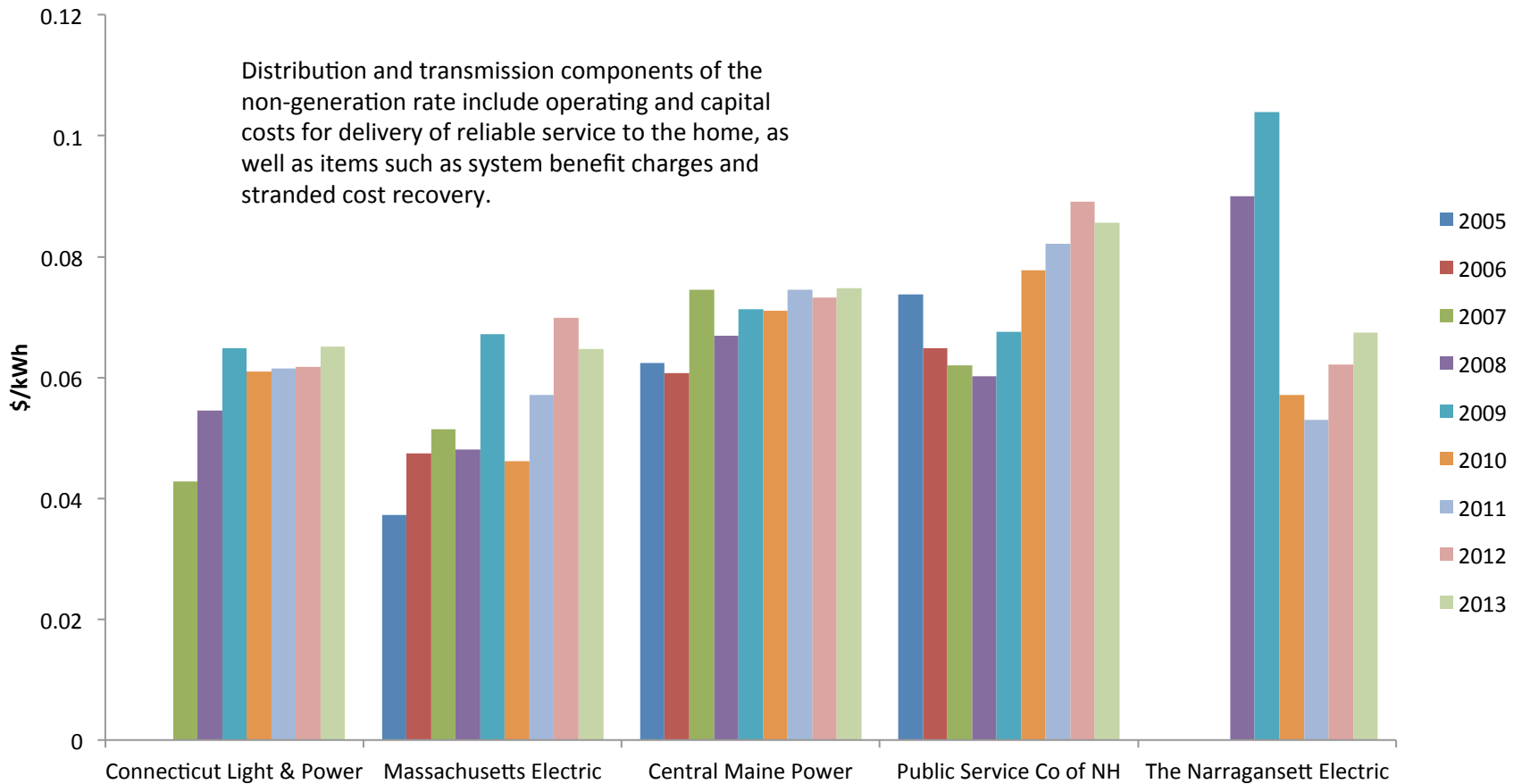
Note: 1) Monthly bill by average customer = current each utility rate in 2015 * 2013 New England average monthly consumption per customer
 2) The value of Green Mountain Power represents an undifferentiated residential rate because of the unavailability of easily accessible public data of the component parts. Source: EIA, state PUCs & utility websites

The generation and non-generation components of the current average residential power bill are roughly equal in size



Note: 1) Monthly bill by average customer = current each utility rate in 2015 * 2013 New England average monthly consumption per customer
 2) The value of Green Mountain Power and Duke Energy Carolinas represent an undifferentiated residential rate because of the unavailability of easily accessible public data.
 Source: EIA, state PUCs & utility websites

The non-power supply portion of residential rates has been generally trending upward over time

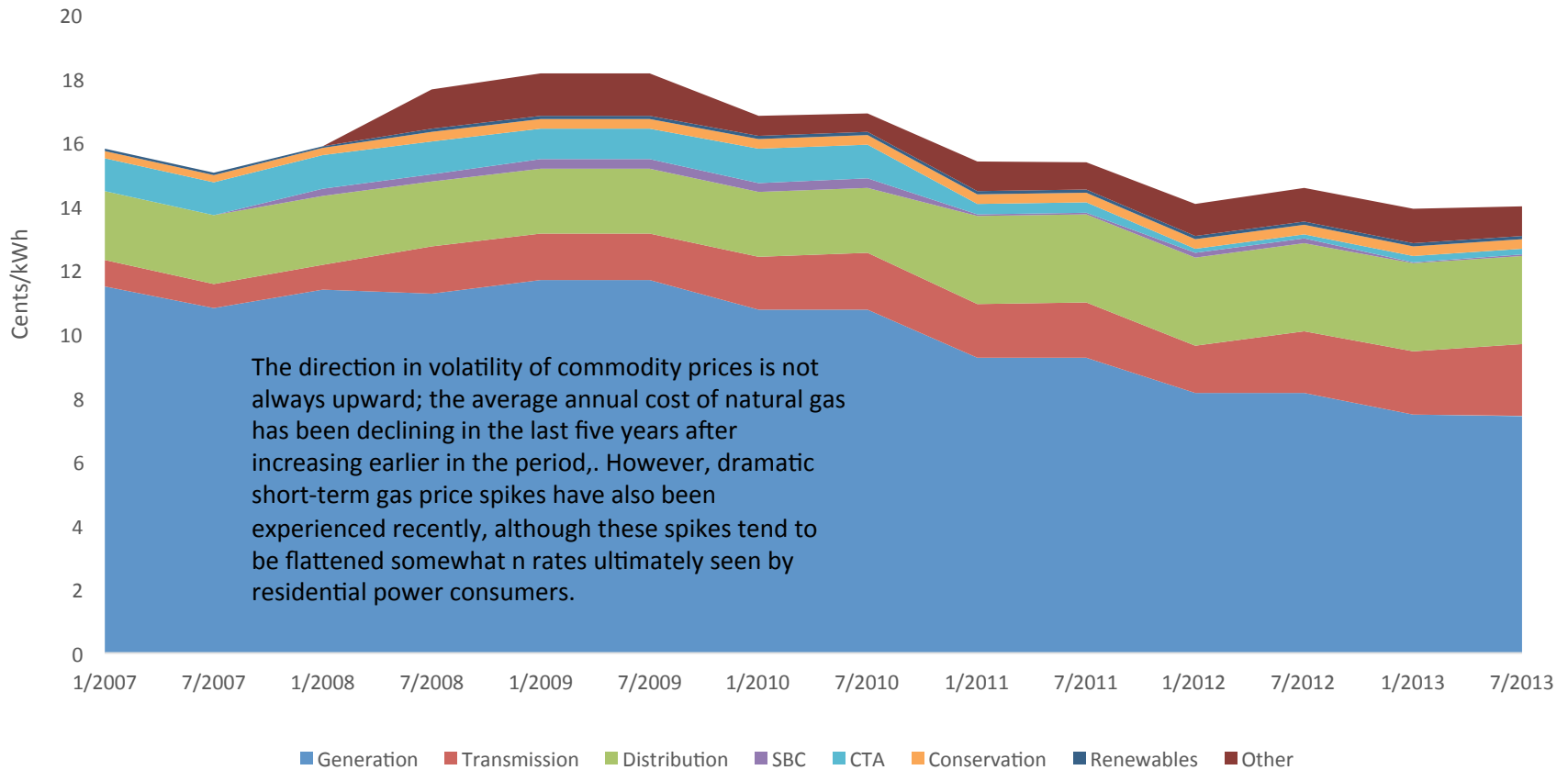


Note: For Massachusetts Electric, Central Main Power and Public Service Co of NH, EIA bundled residential rate is assumed to be roughly equivalent to the residential tariff., but is not a precise indicator of the non-generation portion of rates.

Source: EIA, state PUCs

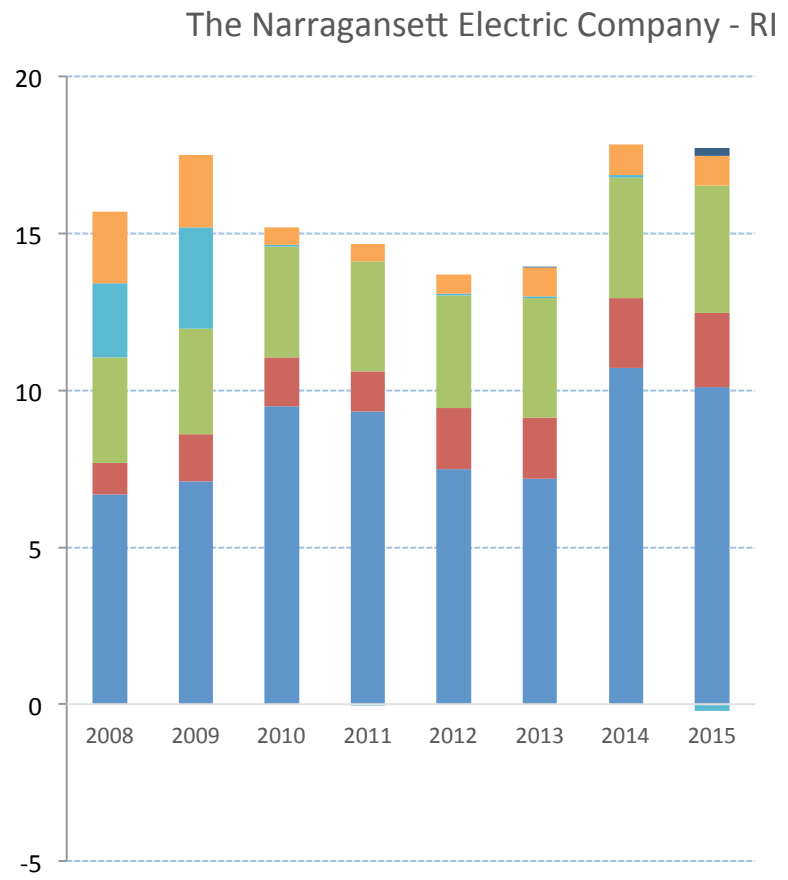
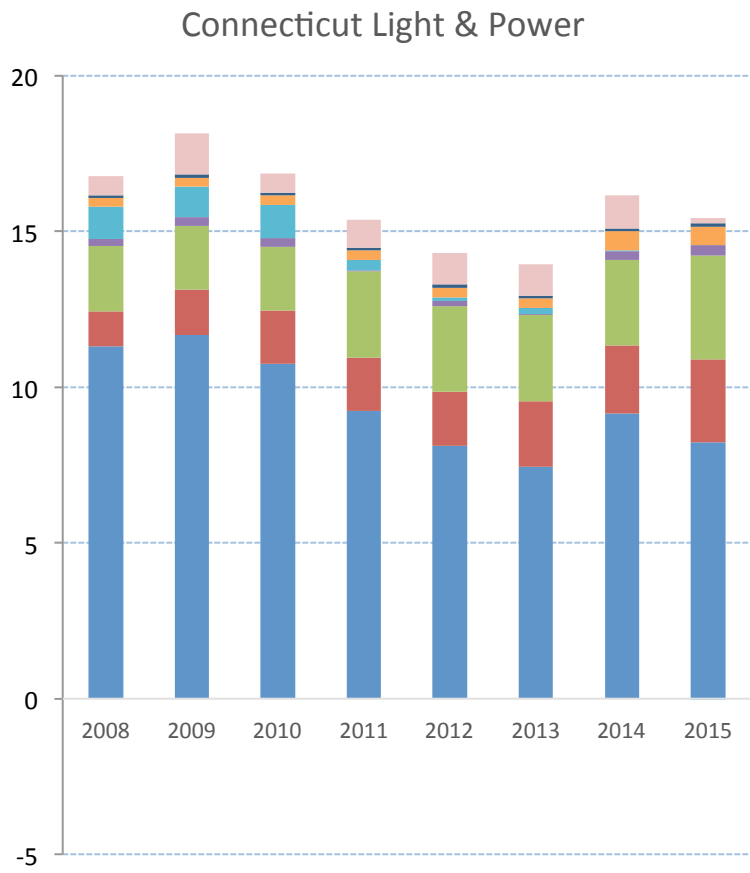
The generation component of rates exhibits more movement over time than other portions of the electric price

Historical residential rates for Connecticut Light & Power



Notes: 1) SBC refers to System Benefits Charge, 2) CTA refers to Competitive Transition Assessment, in other states this component is often called stranded cost recovery, 3) "Other" includes Conservation Adjustment Mechanism and Federally Mandated Congestion Cost
 Source: The Connecticut Public Utilities Regulatory Authority (CT PURA)

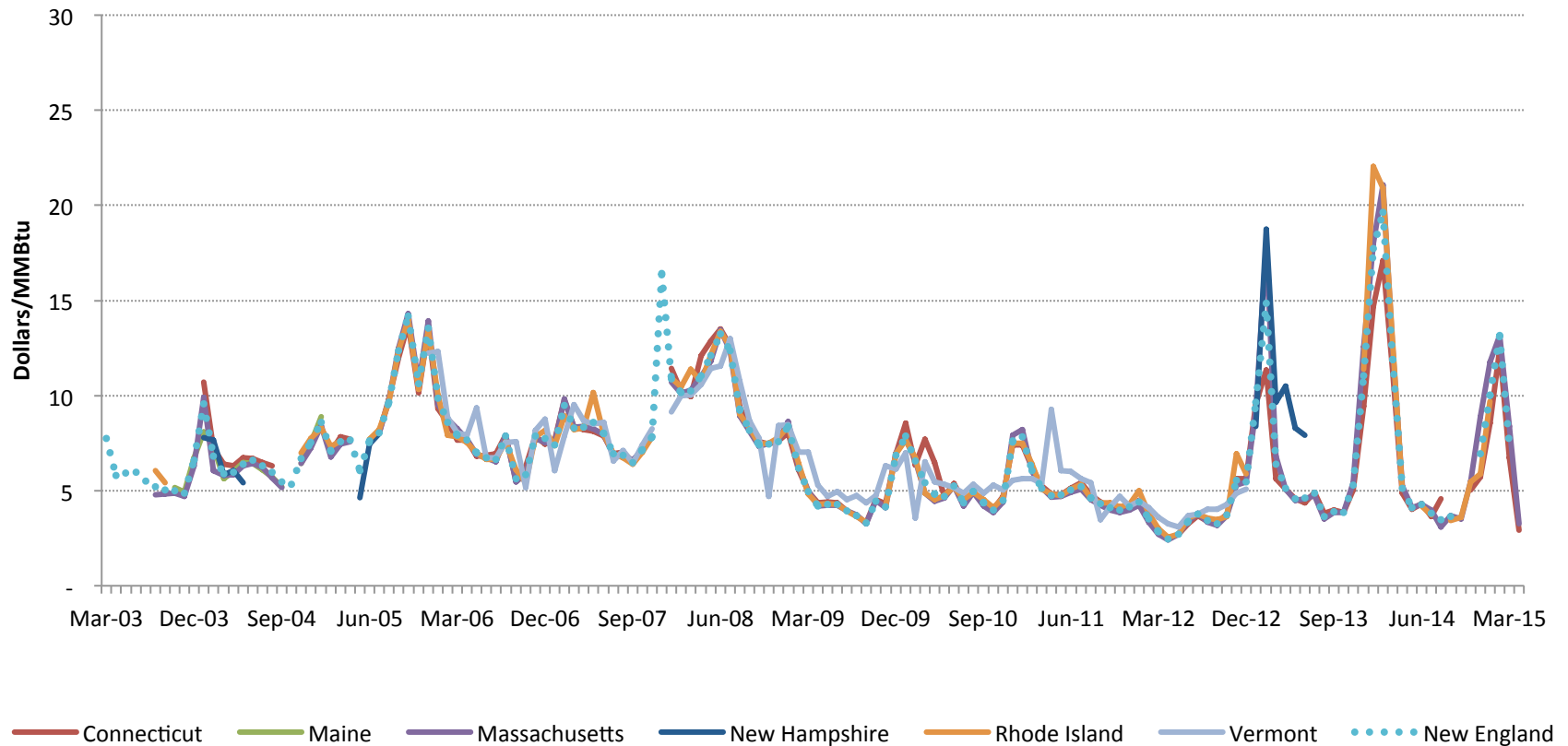
Overall price volatility for residential customers is most closely linked to the volatility in the generation portion of rates



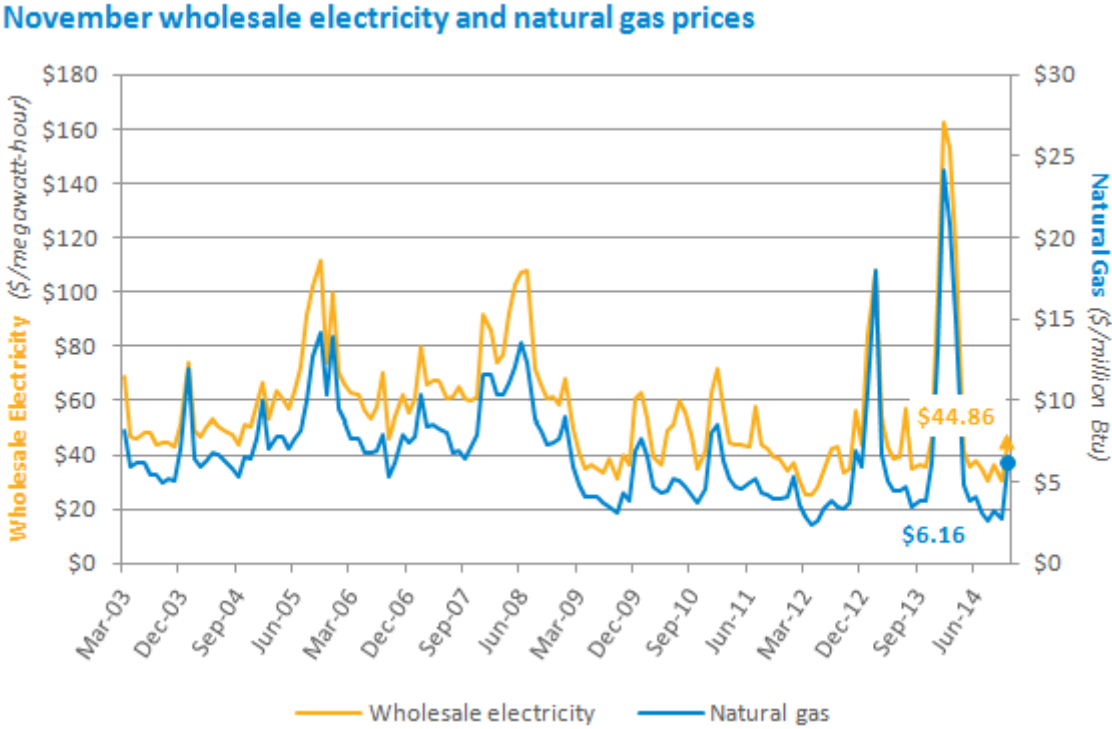
■ Generation ■ Transmission ■ Distribution ■ SBC ■ CTA ■ Conservation ■ Renewables ■ Other

Source: state PUCs

The price of natural gas delivered to electricity plants in the region has been especially volatile in the past two years after experiencing several years of significant declines in price



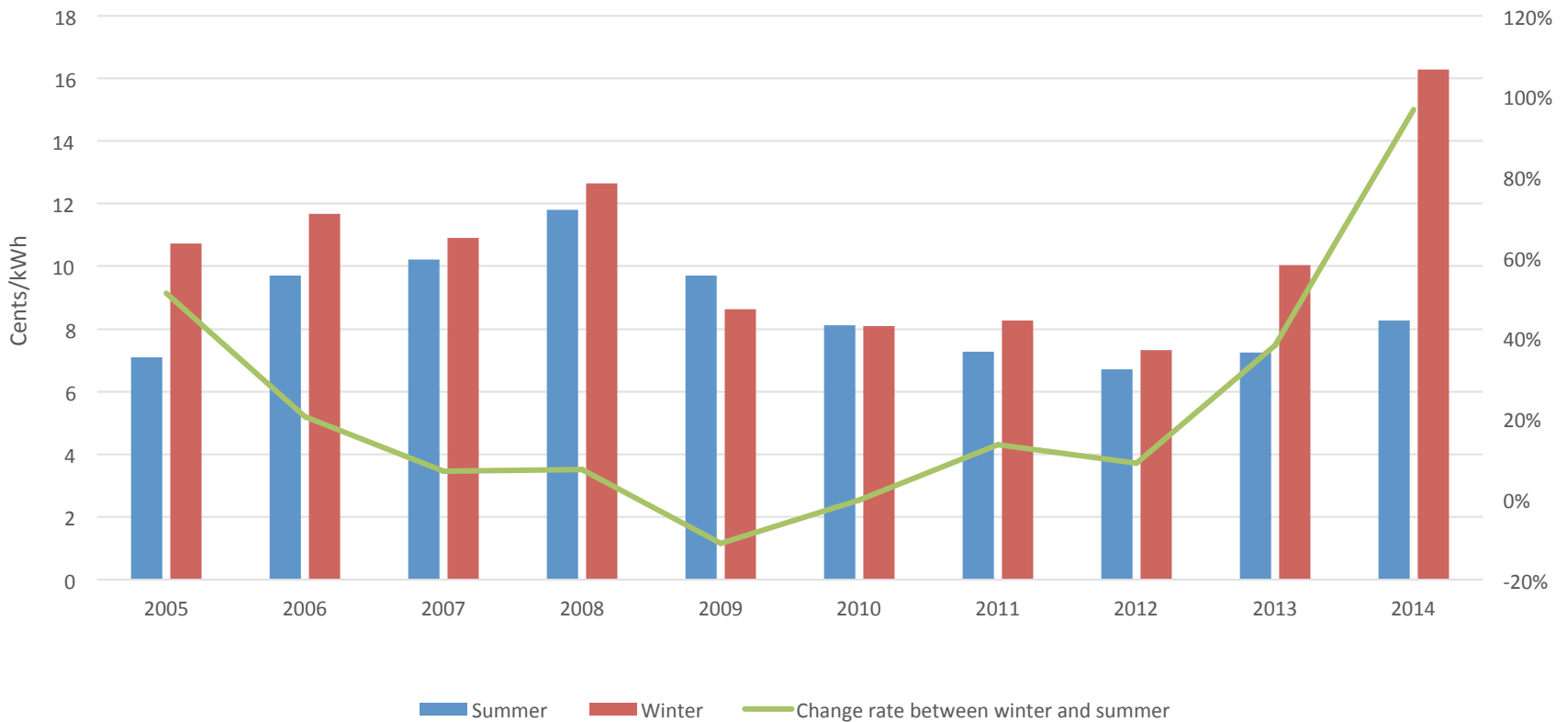
There is a close relationship between wholesale spot supply price of electricity and natural gas prices in New England



Note: residential power customers are generally not exposed directly to electric wholesale spot prices. Source: ISO-NE, December 2014

The generation component of rates can exhibit a significant seasonal difference that captures short-term volatility, depending on the specific rate design in place for a given utility

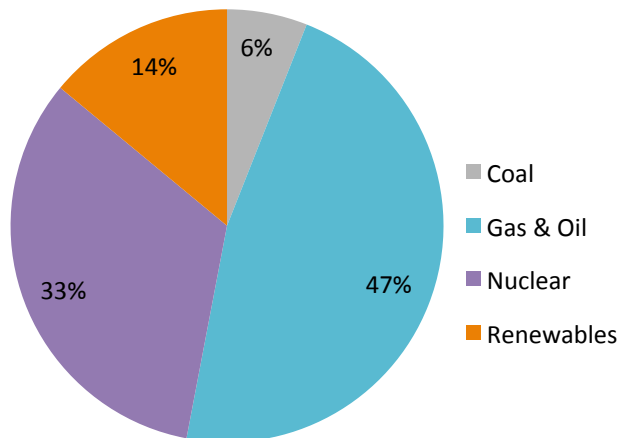
Average residential generation component of rates for Massachusetts Electric Co



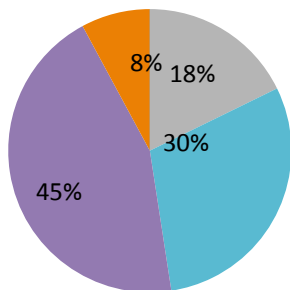
Source: The Department of Public Utilities, Massachusetts (MA DPU)

Fuel diversity of power supply for New England, New Jersey, and South Carolina exhibit significant differences, especially in the proportion of coal, gas & oil in the generation mix

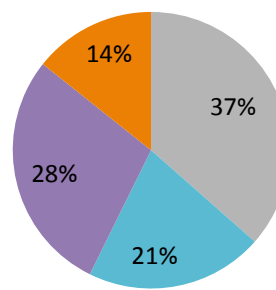
Nationally, the lowest cost US states have the highest proportion of coal in their fuel mix



New England average



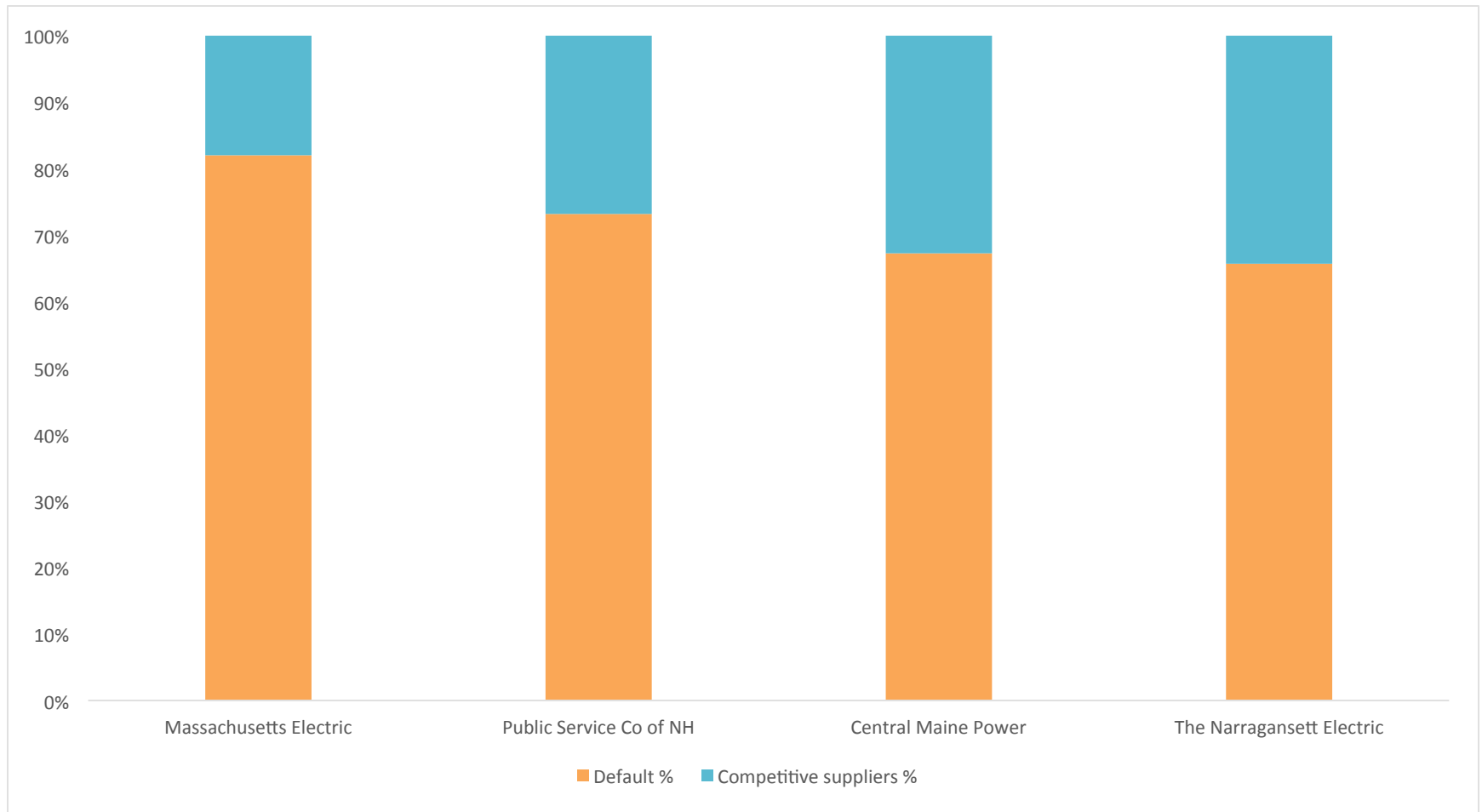
NJ-Public Service Electric & Gas



SC-Duke Energy Carolinas

Note: For New England, hydro resources represent approximately 10% of the mix, and is grouped in the renewables section of the pie chart.
Source: ISO-NE, utility 10k, state PUCs

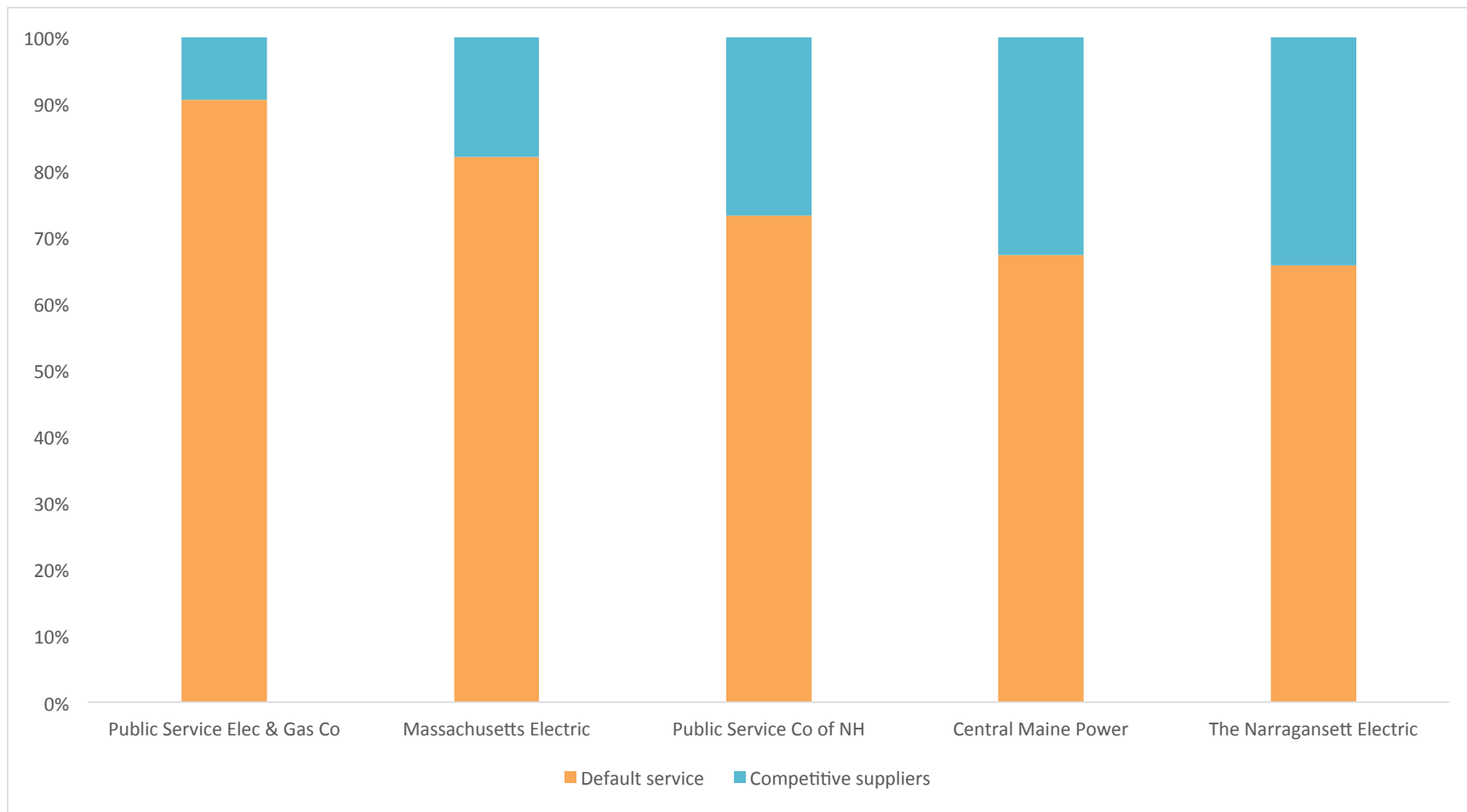
Some residential consumers have elected to be served by competitive suppliers, which may have different fuel diversity profiles than the default service providers



Note: 1) Presented are latest available data: CT(2014), MA(2014), ME(2013), NH(2010), RI(2014), VT(2014), NJ(2014), SC(2014)

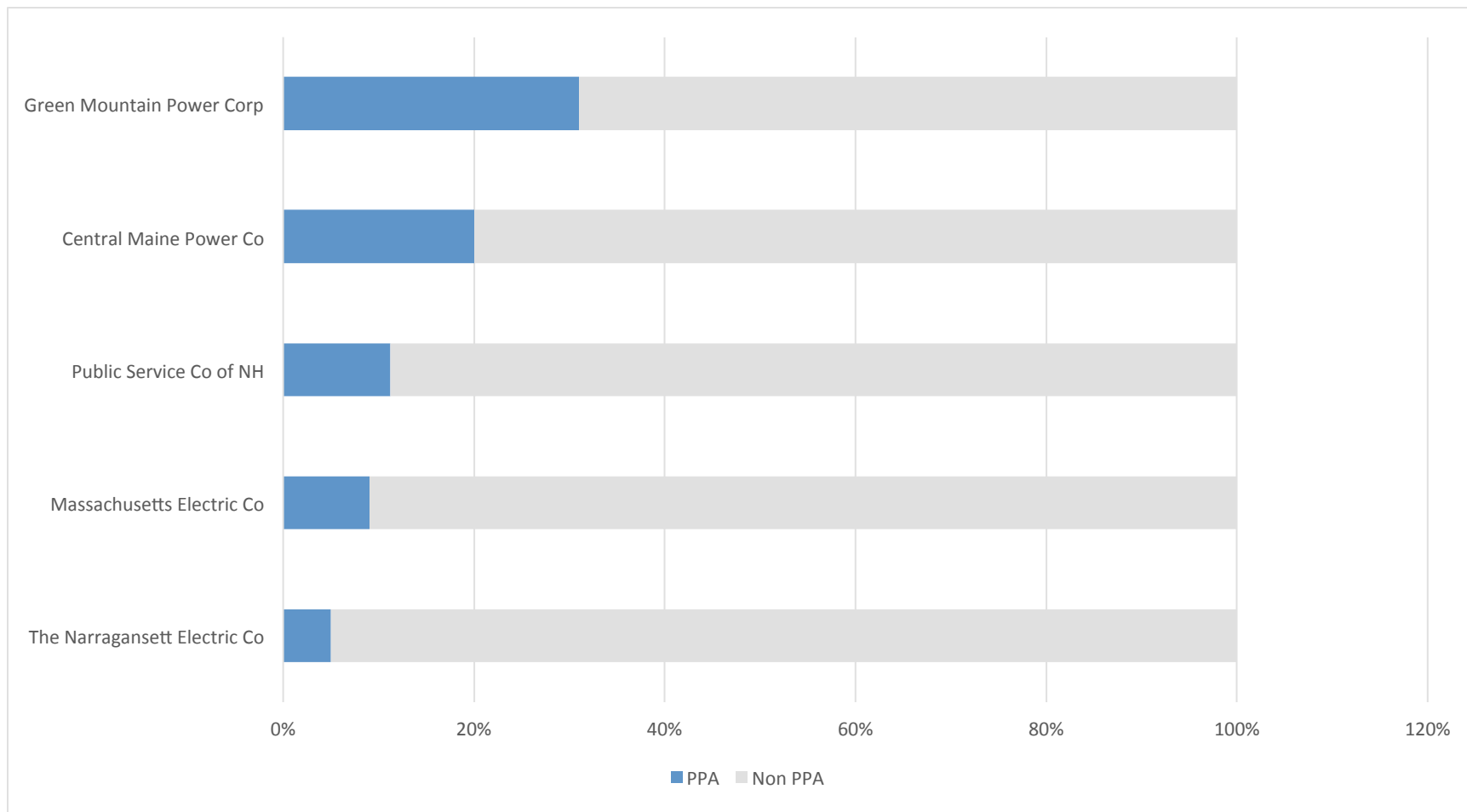
2) The state level data are shown in MA and RI charts. Source: EIA, utility 10K, LCIRP(PSNH), state PUCs; note that more research is necessary to determine if competitive providers have a significantly different fuel mix, such as a higher than average natural gas fired generation or renewables.

Portion of total load served by default service providers versus competitive suppliers, continued



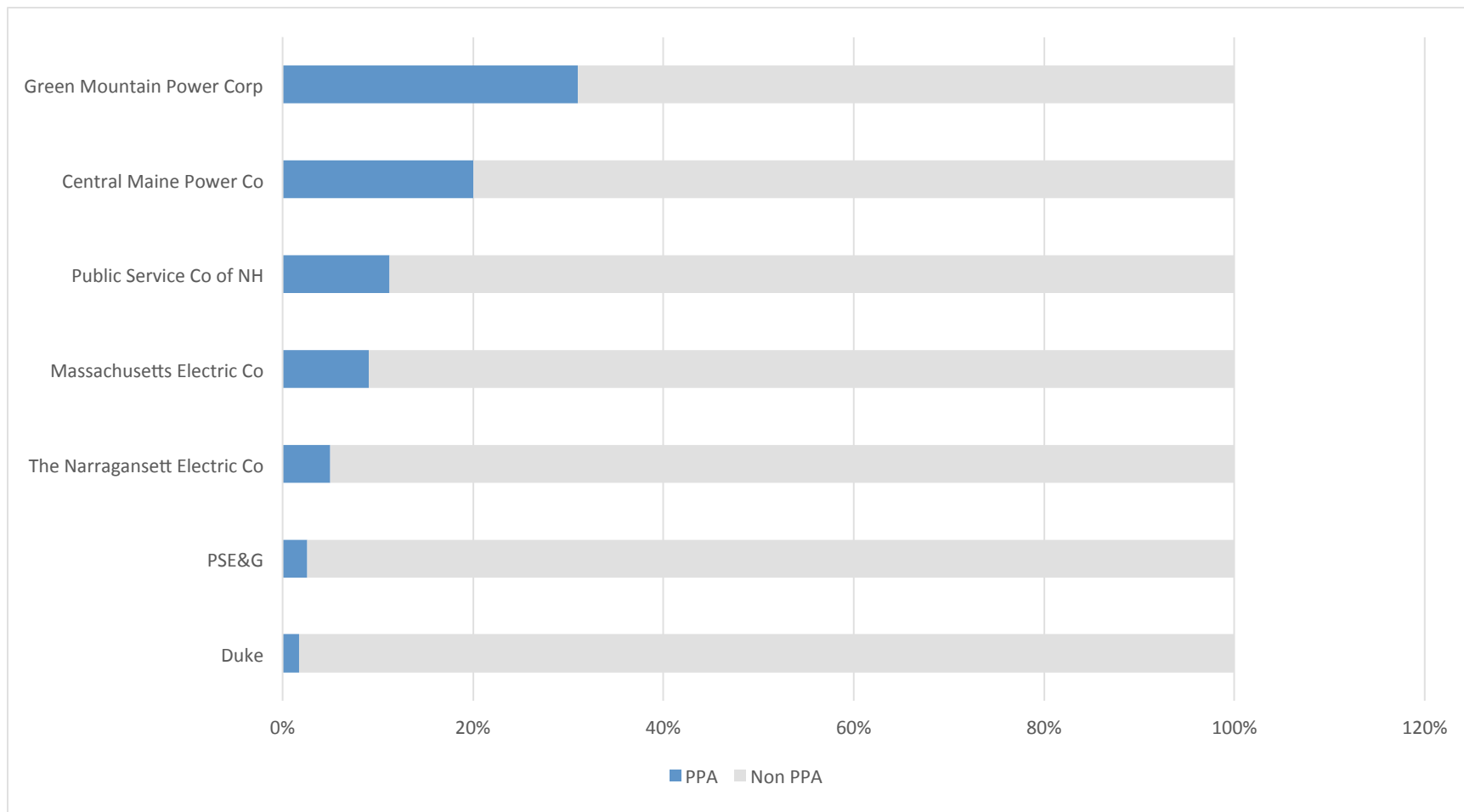
Note: 1) Presented are latest available data: CT(2014), MA(2014), ME(2013), NH(2010), RI(2014), VT(2014), NJ(2014), SC(2014)
2) The state level data are shown in MA and RI charts
Source: EIA, utility AR & 10K, LCIRP(PSNH), state PUCs

Estimated share of renewable PPAs as a portion of the total generation mix varies significantly in the region, but remains a relatively small portion of the generation component to date



Note: Proportion of PPAs is not precise, as a comprehensive data source was not available. Source: EIA, utility AR & 10K, LCIRP(PSNH), state PUCs

Estimated share of renewable PPAs as a portion of the total generation mix, continued



Notes on the analysis

- Six representative investor-owned utilities, one from each state that includes a major urban center, were included in this analysis:
 - Central Maine Power Co (CMP, owned by Iberdrola)
 - Green Mountain Power Corp (GMP) in Vermont
 - Public Service Co of NH (PSNH)
 - Massachusetts Electric Co (now National Grid)
 - Connecticut Light & Power Co (CL&P, now Eversource)
 - The Narragansett Electric Co (now National Grid) in Rhode Island
- Two east coast utilities, PSEG in New Jersey and Duke in South Carolina, are included in the analysis as useful comparisons.
 - While PSEG's customers pay similar rates as those in New England, Duke's customers pay significantly less, in large degree because its power supply mix includes a substantial portion of lower-cost coal-fired generation.
- There is significant variation among the six states in regard to estimated rates, and average bills, that customers paid in the period reviewed. Although the relative position has changed over time, in general Connecticut has been the highest cost state over most of the past decade while other states have traded places for the lowest cost; currently Maine occupies that rank.
- Actual historical residential tariff data for each utility proved difficult to locate in this preliminary analysis, so the 10-year look back at rates and bills is estimated from publicly available indirect data re sales and revenues, and thus should not be considered definitive.