Using a carbon price to cost-effectively meet clean generation goals in New England

August 11, 2016

Wholesale Market Designs to Address State Public Policy Initiatives

An regional wholesale market solution that incorporates the price of carbon into the energy market is sufficient to meet state carbon policy goals and attract new and retain existing zero emission resources.

- A price on carbon is technology-neutral, and provides value to different technologies based consistently and solely on their carbon emission characteristics, including recognizing the carbon mitigation value of low, but not zero, emission technologies such as highly efficient gas generation.
- A price on carbon automatically incents carbon mitigation from all potential sources, including low-cost source such as coal/oil to gas redispatch and demand-side efficiency, which will allow states to meet carbon goals in the most cost-effective manner
- A price on carbon fully internalizes the costs and benefits of state carbon mitigation goals into a transparent wholesale energy price signal

Depending on the level of the price on carbon, it may not be sufficient in the short term to support all needed investments in clean energy resources. As a result, some existing clean energy incentives may need to persist while an adequate price on carbon phases in, albeit at lower levels. Even with a phase-in, a price on carbon in the energy market will achieve the states' emission reduction goals at lower total cost to consumers.

An energy solution based on a carbon price is relatively simple

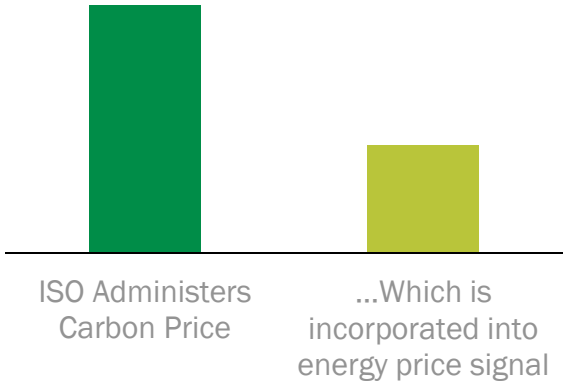
- ISO and states work together to translate state carbon reduction goals into a schedule of year-by-year carbon emission goals for the ISO-NE footprint
- ISO determines carbon price necessary to meet carbon emission goals
  - Year 1 carbon price set at U.S. Interagency Working Group social cost of carbon (~$42/short ton in 2017)
  - Following year 1, ISO compares actual realized emissions to year 1 goals. If goals are met, carbon price for year 2 left unchanged. If goals are not met, carbon price is increased by an agreed-upon fixed increment (e.g. $5/ton)
  - This iterative process continues indefinitely
  - While carbon price will increase through time, feedback loops will dampen impact
    - Pass-through rate of carbon prices to wholesale energy prices will fall as low/zero carbon resources are increasingly on the margin, reducing consumer impact and mitigating "windfall profits" concern
    - Existing capacity and reserve markets will provide price signals necessary to maintain reliability and ensure a sufficient amount of fast-ramping and load-following resources
- ISO incorporates carbon price into energy market dispatch via an ISO-administered resource-specific, energy bid adder for carbon emitting resources
  - Carbon bid adder = carbon price ($/ton) x emission rate for resource (tons/MWh)
  - Emitting resources pay the bid adder to the ISO, and the ISO remits the proceeds to LSEs, using an agreed-upon allocation approach that could accommodate differences in state goals
  - States may direct LSEs to use proceeds to offset customer costs or for other purposes (i.e., LIHEAP)

A carbon price drives multiple types of carbon reductions in a fully market-based fashion

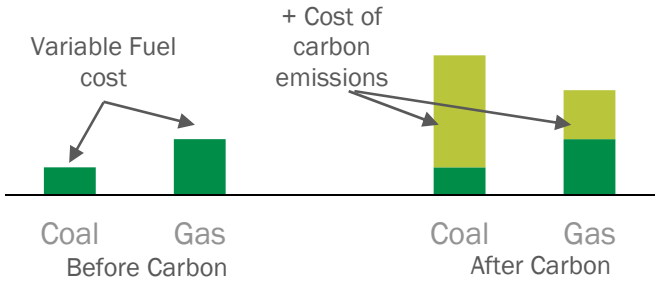
Illustrative

...Which drives multiple carbon-reducing processes, via the same market-based price signal

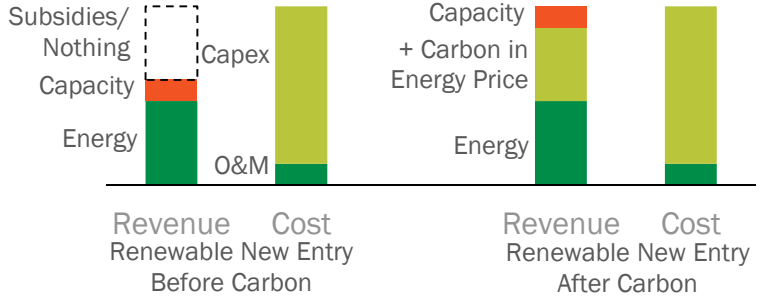
ISO Administers Carbon Price...



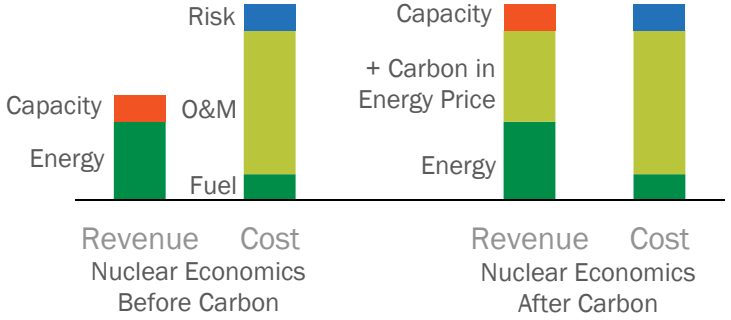
...Redispatch



...Renewable Entry



...Nuclear Retention



Plus Energy Efficiency and other Demand-Side

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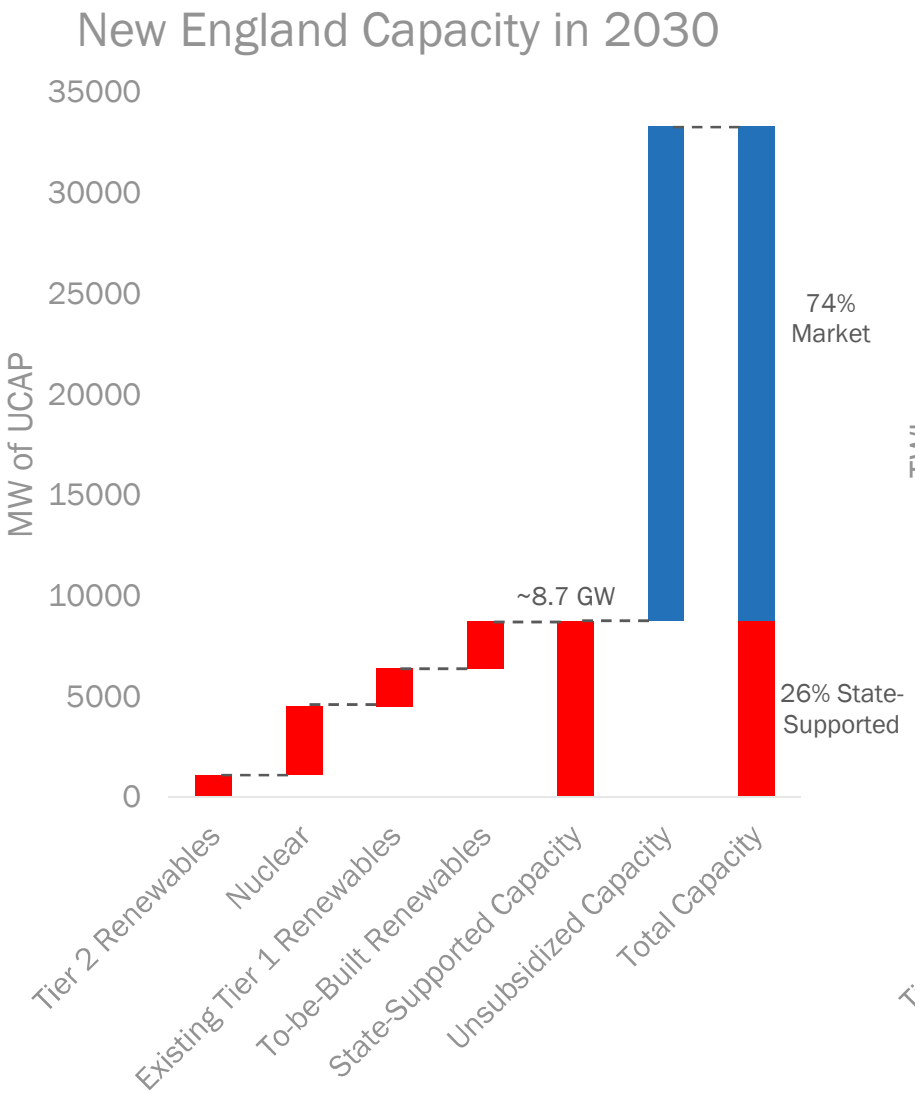
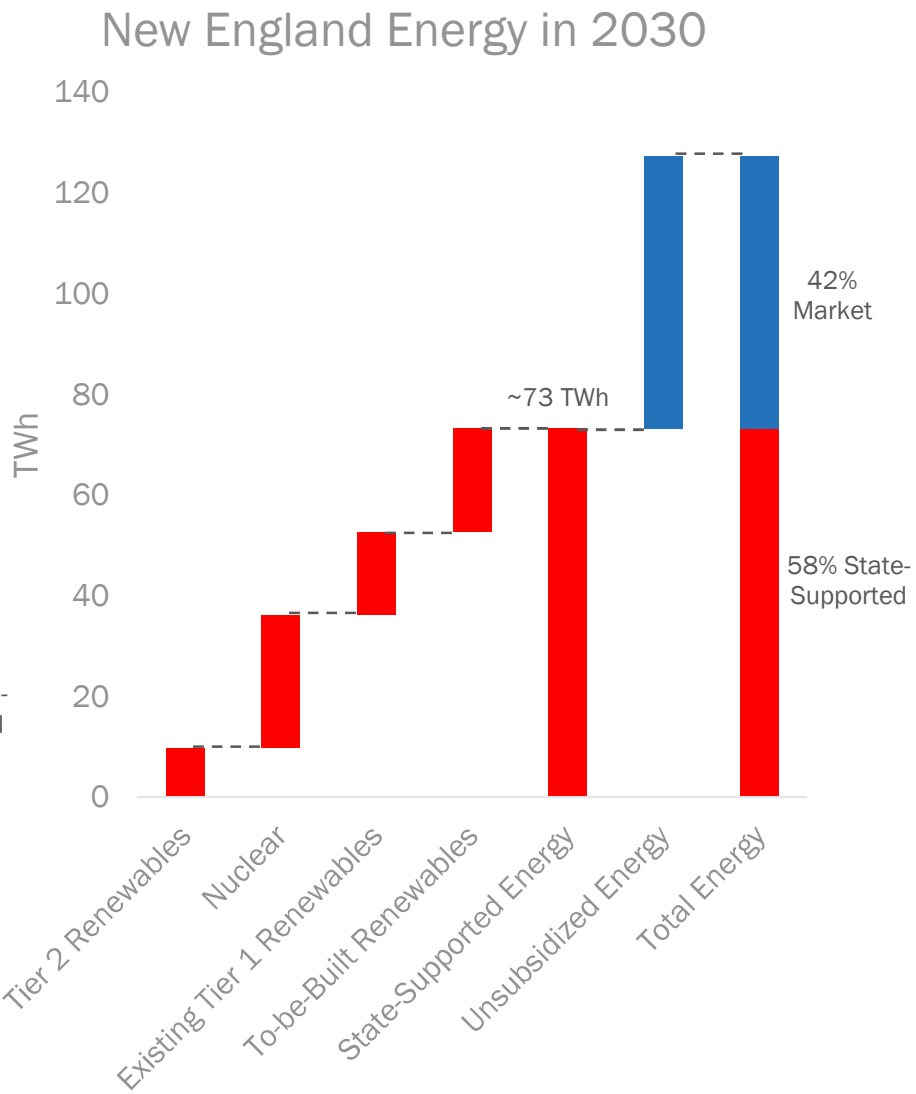
Under the current status quo about 25% of New England Capacity and 60% of Energy will require state support by 2030





Note: To-be-built renewables includes 9.45 TWh of incremental clean generation specified in MA H. 4568

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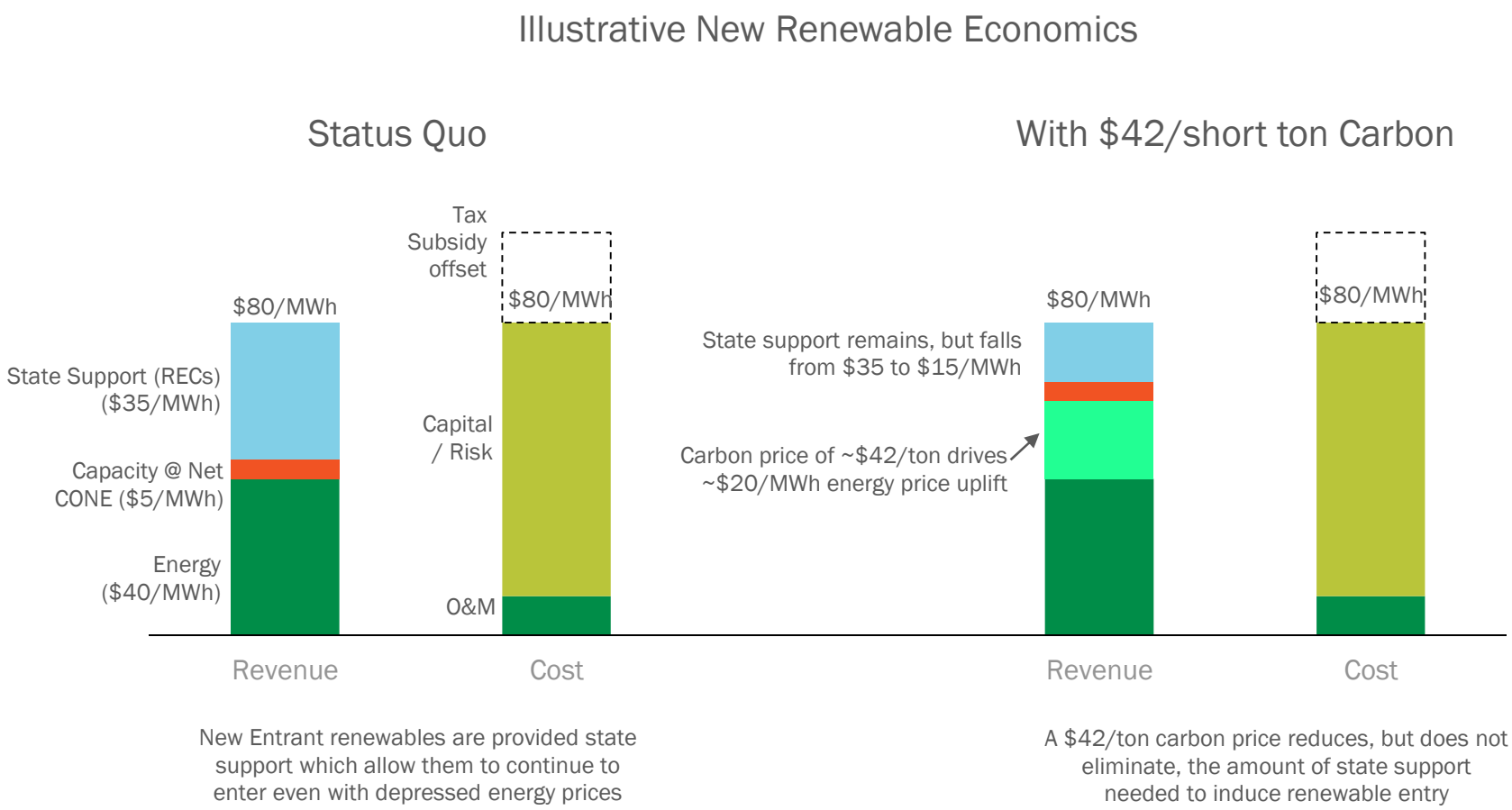
A $42/ton carbon price is likely sufficient to transition nuclear to market support, while reducing cost of renewable state support



New Entrant renewables are provided state support which allow them to continue to enter even with depressed energy prices

A $42/ton carbon price reduces, but does not eliminate, the amount of state support needed to induce renewable entry

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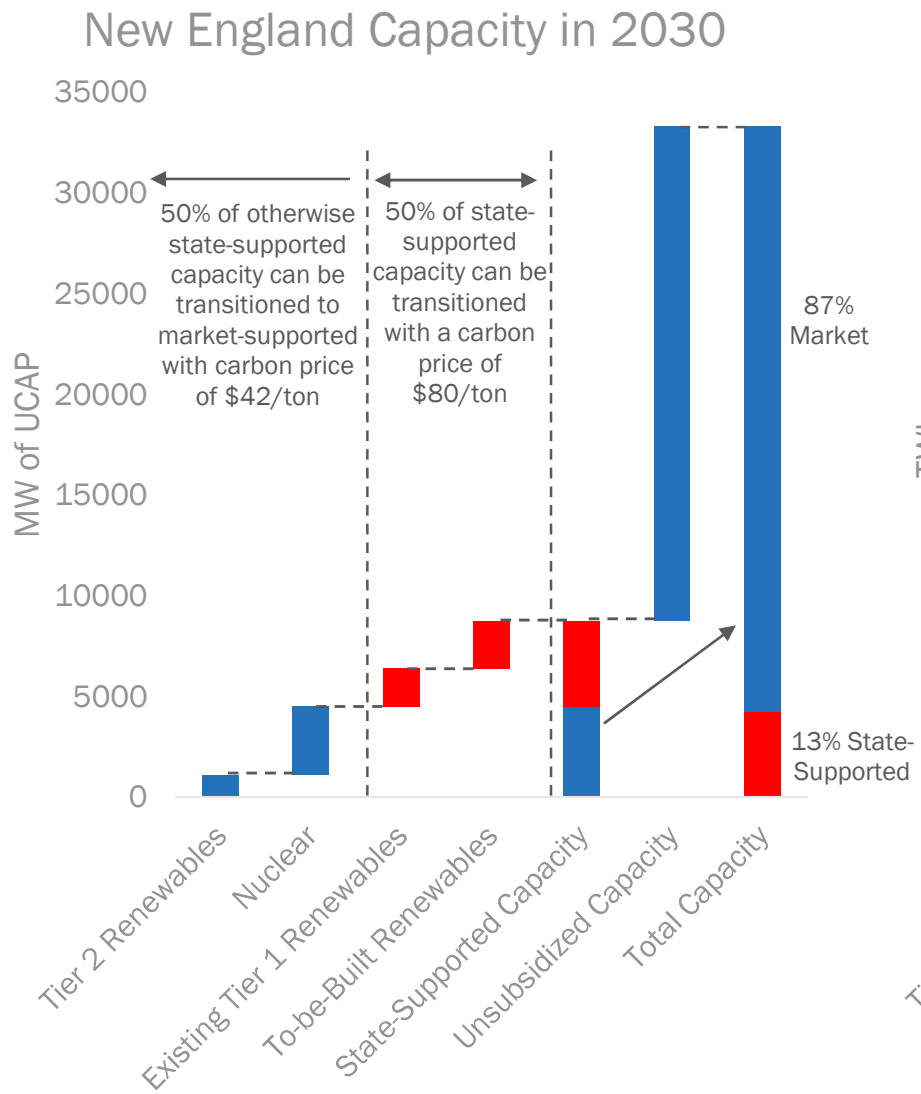
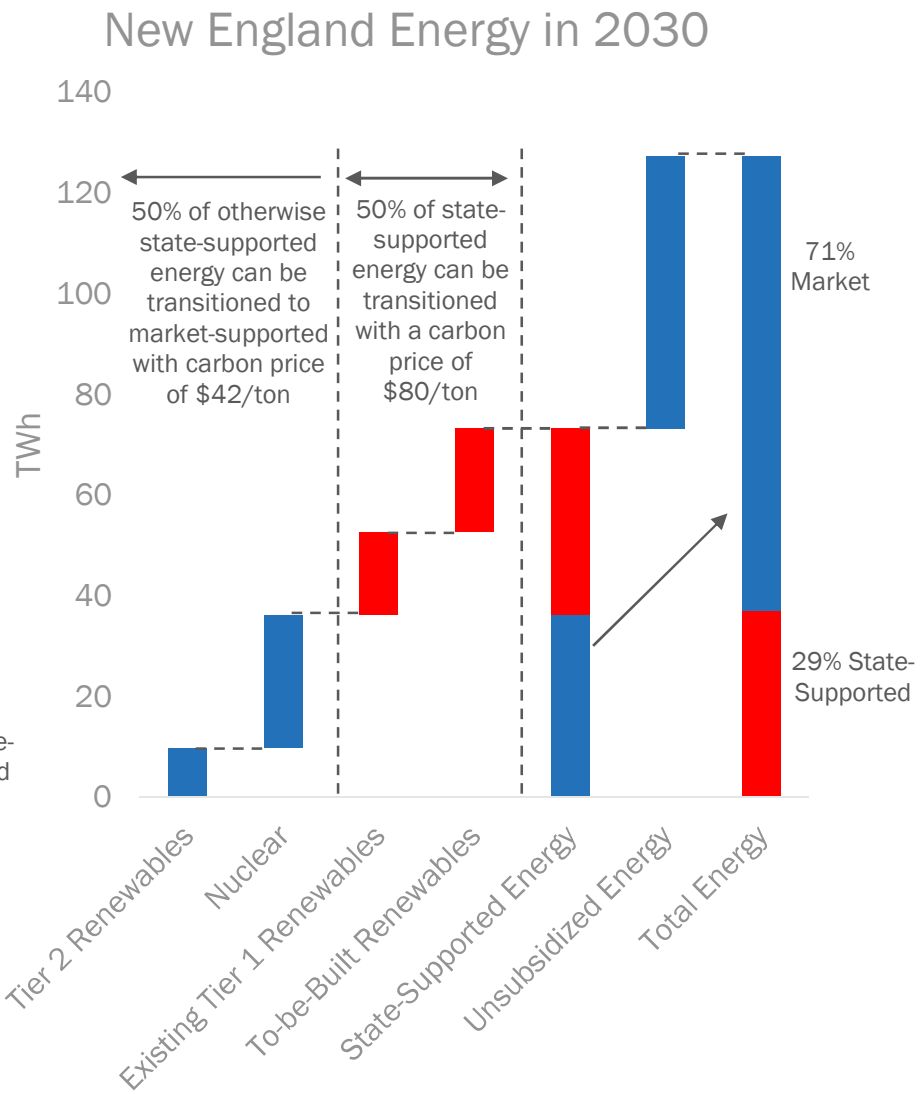
More broadly, a $42/ton carbon price would transition about half of state-supported energy and capacity to market





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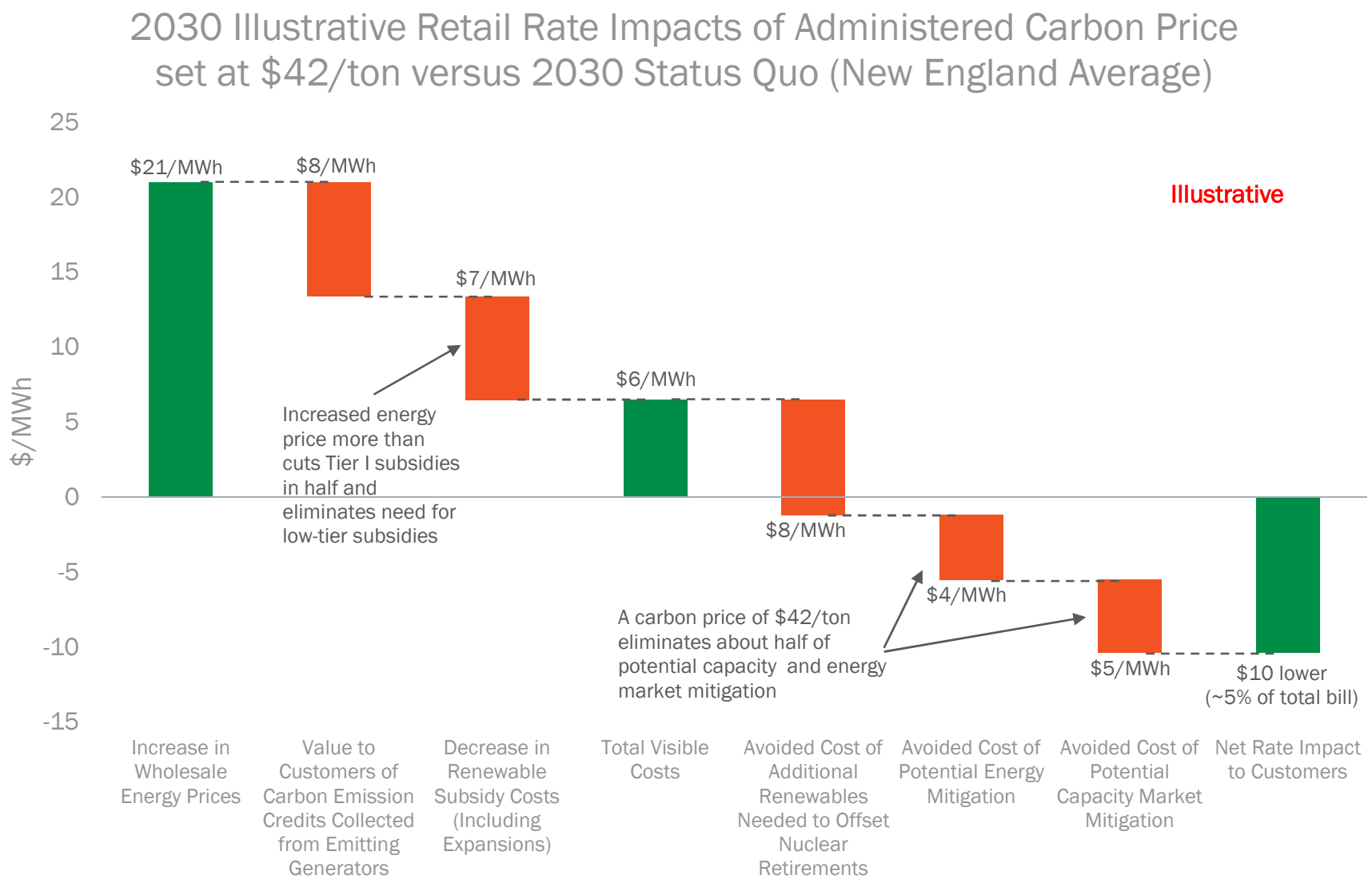
With the overall result that a carbon pricing solution is actually much cheaper for customers over the long run



Assumptions: 0.47 short ton per MWh marginal emission rate; 0.17 short ton per MWh average emission rate; baseline REC price of $35/REC; capacity market mitigation requires that additional non-subsidized capacity resources equal to UCAP value of subsidized resources be purchased.

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Proposal Meets State Goal Posts

State Goal Post	Carbon Adder
Flexibility to meet short and long-term goals and react to changing market conditions Achieve State RPS requirements	The carbon adder is reviewed annually Adder may be increased or decreased as necessary to meet state goals based on carbon reduction mandates and technologies available
Consider mechanisms to ensure consumers in any one state do not fund the public policy requirements mandated by another state's laws.	Revenues collected from the adder may be allocated to account for differences in state laws
Proposal should not imprudently increase costs to consumers over the costs that they would incur under the status quo/current market design.	Carbon adder in the energy market is a lower cost solution than the state's current bilateral contract approach.
Must not compel or assume state legislative action nor include out of market actions	Carbon adder will not require out of market or state legislative actions as it will be implemented through an ISO FERC filing.
Move risk to market participants	Proposal sends appropriate market signals incenting competitive market responses