

15 February 2017

Opportunities in New England & New York

Rachel Jiang

Power & Environmental Markets Analyst

Bloomberg
NEW ENERGY FINANCE

Is there demand?

1. NEPOOL RPS and power market outlooks
2. New York RPS outlook

Is there an economic advantage?

3. Levelized cost of wind energy in Canada, US
4. Power prices
5. Power purchase agreements - pricing

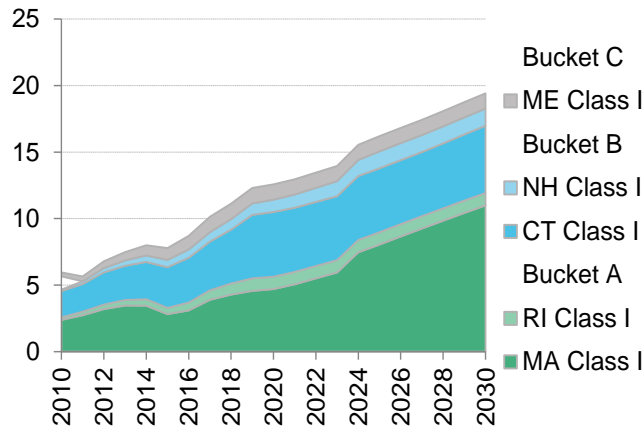


Is there demand?

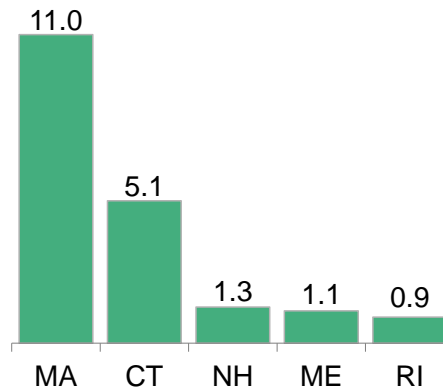
Bloomberg
NEW ENERGY FINANCE

NEPOOL: RPS demand, 2010-30 (TWh)

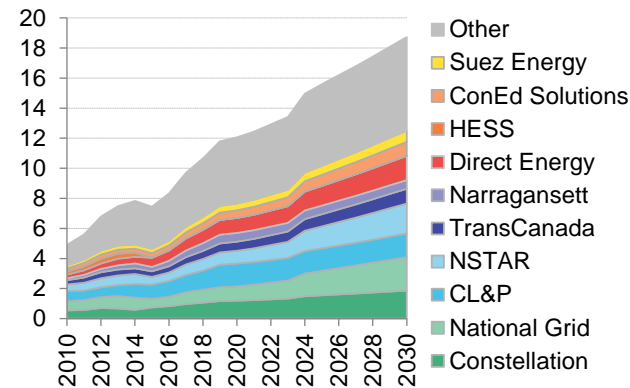
By RPS program



Class I REC demand in 2030

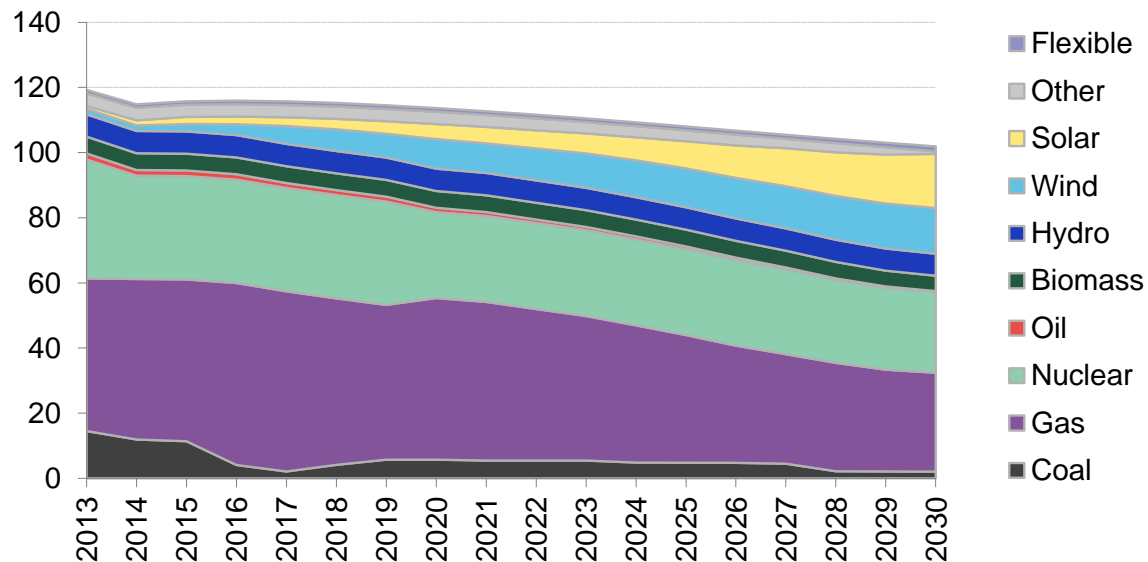


By REC buyer



Source: Bloomberg New Energy Finance, DSIRE

NEPOOL: Power sector forecast, 2013-30 (TWh)

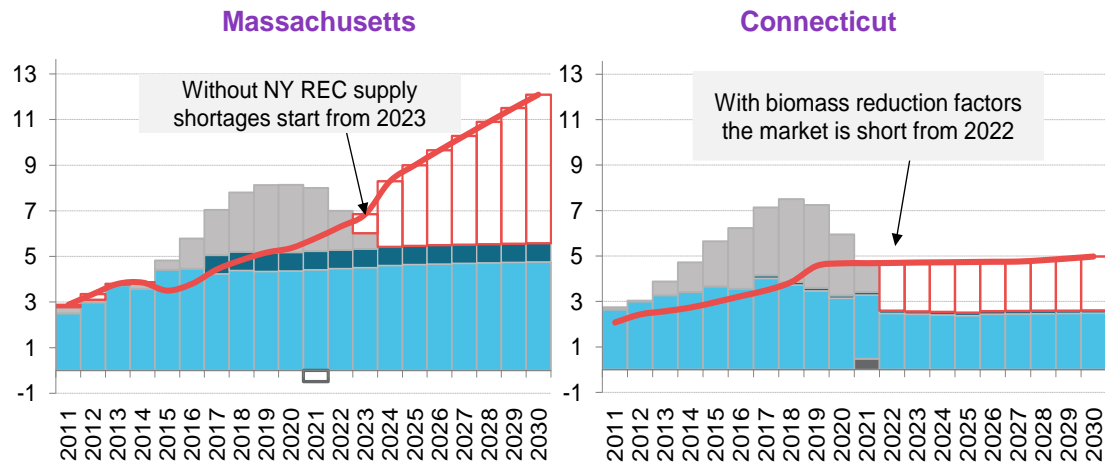


Role of emissions targets: Massachusetts has proposed boosting RPS to 80% by 2050 in order to help meet state emissions goals.

- Massachusetts emissions goal: 25% below 1990 by 2020, 80% by 2050
- Connecticut emissions goal: 80% below 2001 levels by 2050
- RGGI: Considering 2.5-3.5% cap decline rate, to 58Mst or 50Mst in 2030, respectively (6-19% fall in effective cap)

Source: Bloomberg New Energy Finance, EIA

NEPOOL: Class I REC supply-demand forecast (TWh)



Source: Bloomberg
New Energy Finance,
EIA 923. NEPOOL-GIS

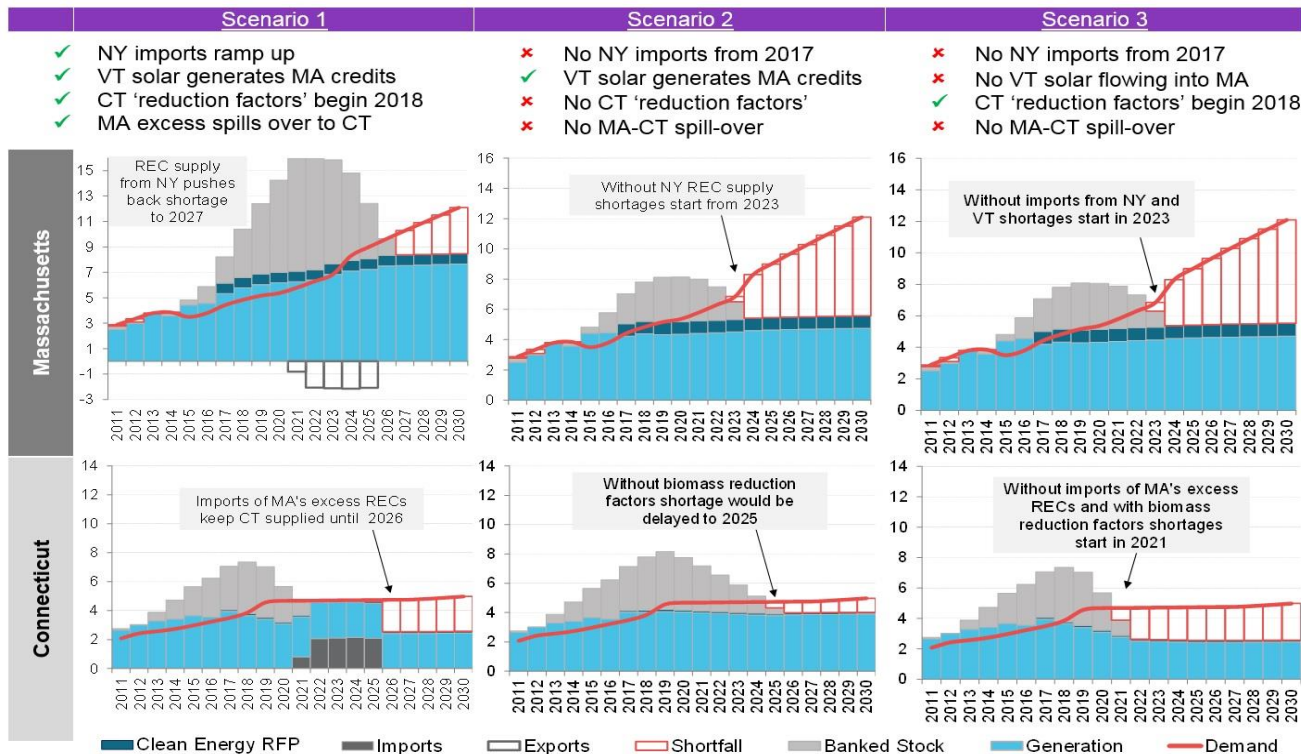
Accounting for the expected policy changes on the horizon and the current pipeline of projects, the first possible shortage could be realized in 2023 in MA and in 2022 in CT. These dates could be pushed back depending on how much supply New York is actually able to keep out of the export market.

Assumptions:

- ✗ No NY imports from 2017
- ✓ VT solar generates MA credits
- ✓ CT reduction factors start from 2018
- ✓ MA excess spills over to CT

*Includes estimated impact of New England Clean Energy RFP

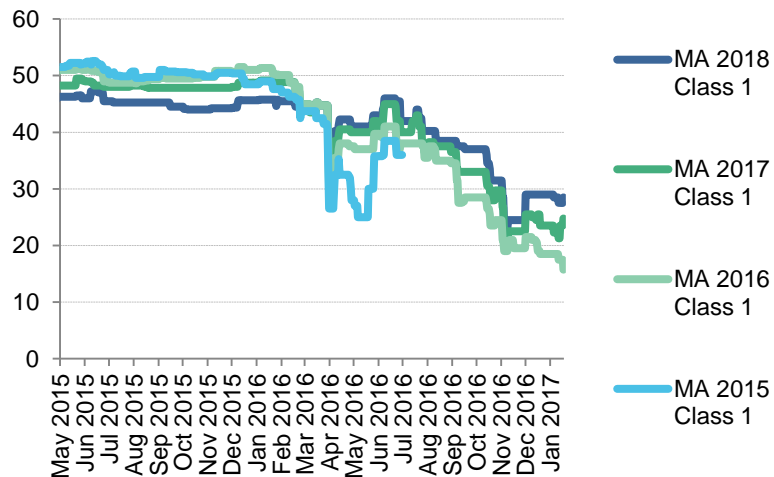
NEPOOL: Class I REC supply-demand sensitivities (TWh)



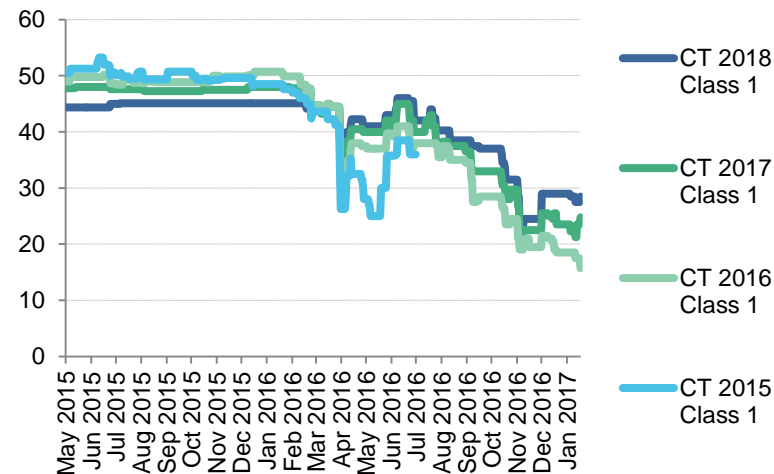
Source: Bloomberg New Energy Finance

NEPOOL: Current REC prices for major state programs (\$/MWh)

Massachusetts



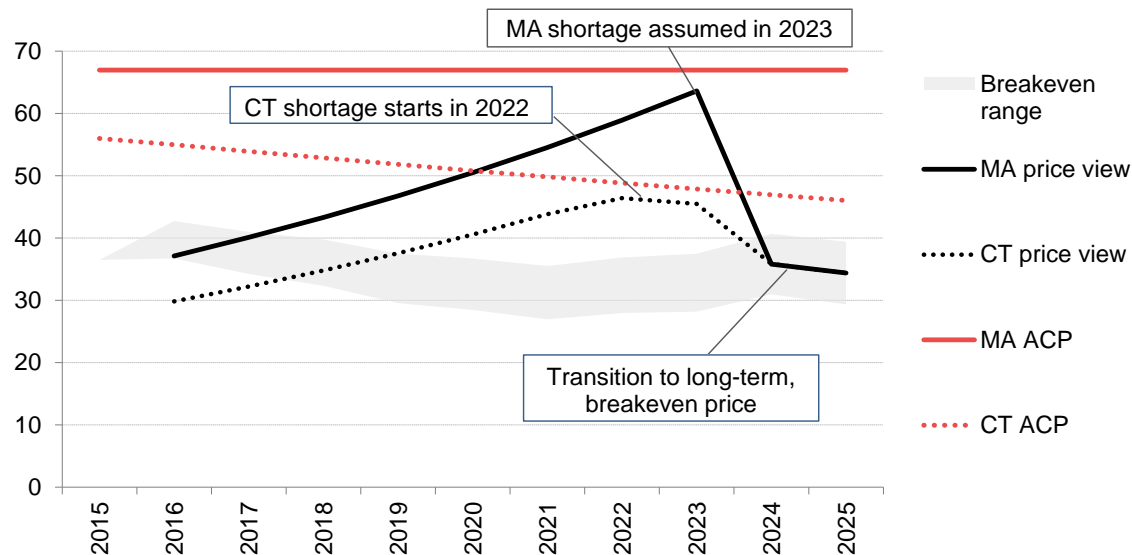
Connecticut



Source: Bloomberg New Energy Finance, Bloomberg Terminal, ICAP, Karbone. Note: Some data above is from ICAP; for that data, the disclaimer below applies.

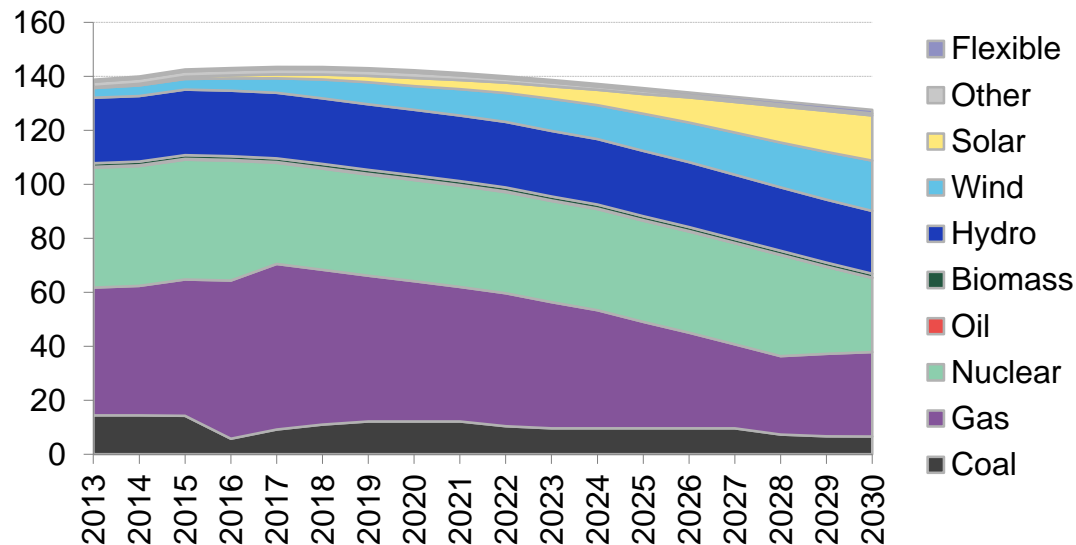
*Data in the charts above is the sole property of ICAP United, Inc. Unauthorised disclosure, copying or distribution of the Information is strictly prohibited and the recipient of the information shall not redistribute the Information in a form to a third party. The Information is not, and should not be construed as, an offer, bid or solicitation in relation to any financial instrument. ICAP cannot guarantee, and expressly disclaims any liability for, and makes no representations or warranties, whether express or implied, as to the Information's currency, accuracy, timeliness, completeness or fitness for any particular purpose.

NEPOOL: REC price projection, 2016-25 (\$/MWh, real 2015 USD)



Source: Bloomberg New Energy Finance Note: ACP stands for the Alternative Compliance Payment. Breakeven value corresponds to the median between two power price scenarios: one that assumes market-traded gas forward curves; and another that assumes BNEF's gas price forecast. We apply a \$20 fixed adder to the 'best-in-class' LCOEs listed in slide 12. CT ACP (constant at \$55 nominal) has been adjusted for inflation. LCOE analyses assume an 8% discount rate. MA and CT spot prices are provided by vintage year.

New York: Clean Energy Standard – 50% by 2030 (TWh)

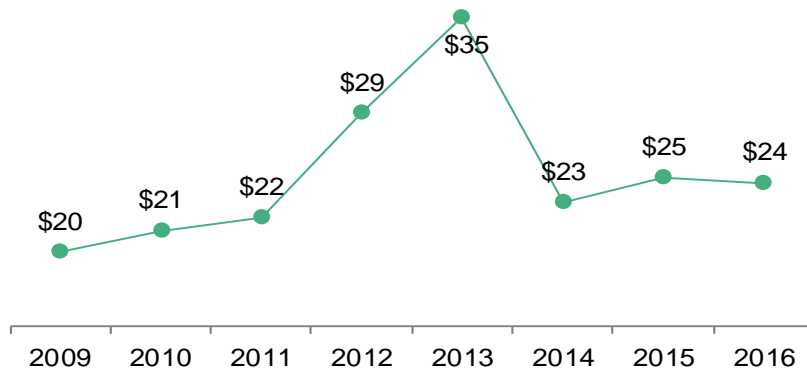


Incremental demand from RPS: 29TWh/yr by 2030 (NY PSC estimate)

- New York emission goal: 40% below 1990 levels by 2030
- Indian Point (2GW) retirement in 2020/2021 to add ~7.4Mst in emissions if replaced by gas generation (~19% of NY power sector emissions, ~13% of RGGI's 2020 effective cap)
- Champlain-Hudson Power Express (1GW) to bring zero-emission generation from Canada to replace nuclear retirement

*Modelling was completed before announcement of Indian Point retirement in 2020/2021

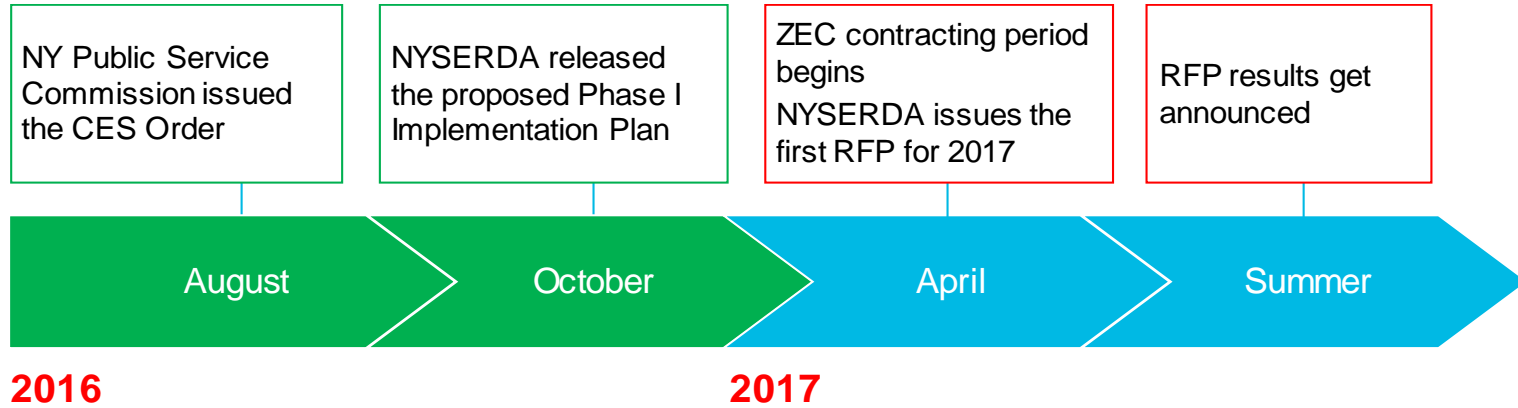
NY large-scale REC contract prices, 2009-16 (\$/MWh)



- 2017 NYSERDA Tier 1 REC Price: \$21.16/MWh
- 2017 Tier 1 RECs offered for sale by NYSERDA: 56,142
- Tier 1 eligibility: in operation on or after 1 Jan 2015
- Tier 1 obligation can be met by:
 1. Buying RECs via PPAs
 2. Paying Alternative Compliance Payment (ACP)
 3. Buying RECs from NYSERDA
- 2017 ACP Price: \$23.28/MWh (REC price + 10%)

Source: Bloomberg New Energy Finance, NYSERDA

New York: Clean Energy Standard – timeline



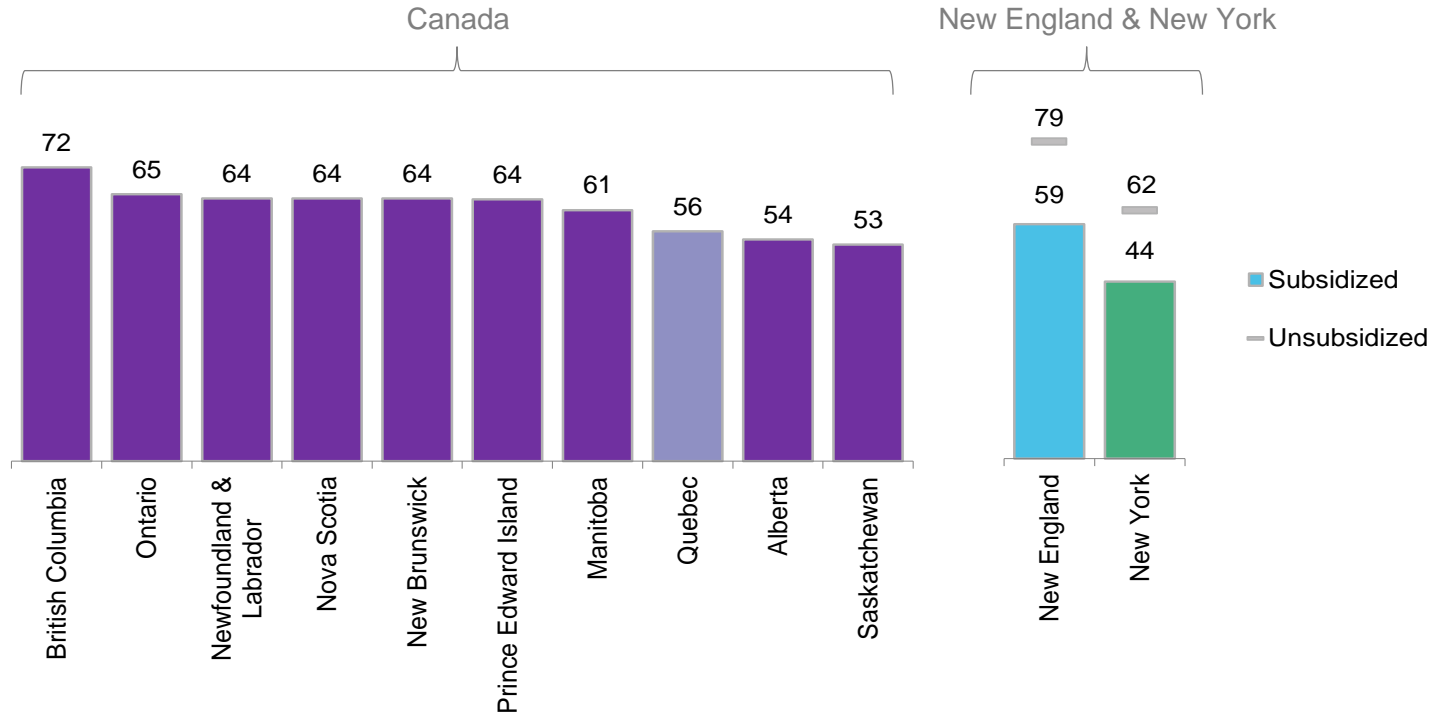
Source: Bloomberg New Energy Finance, NYSERDA



Is there an economic
advantage?

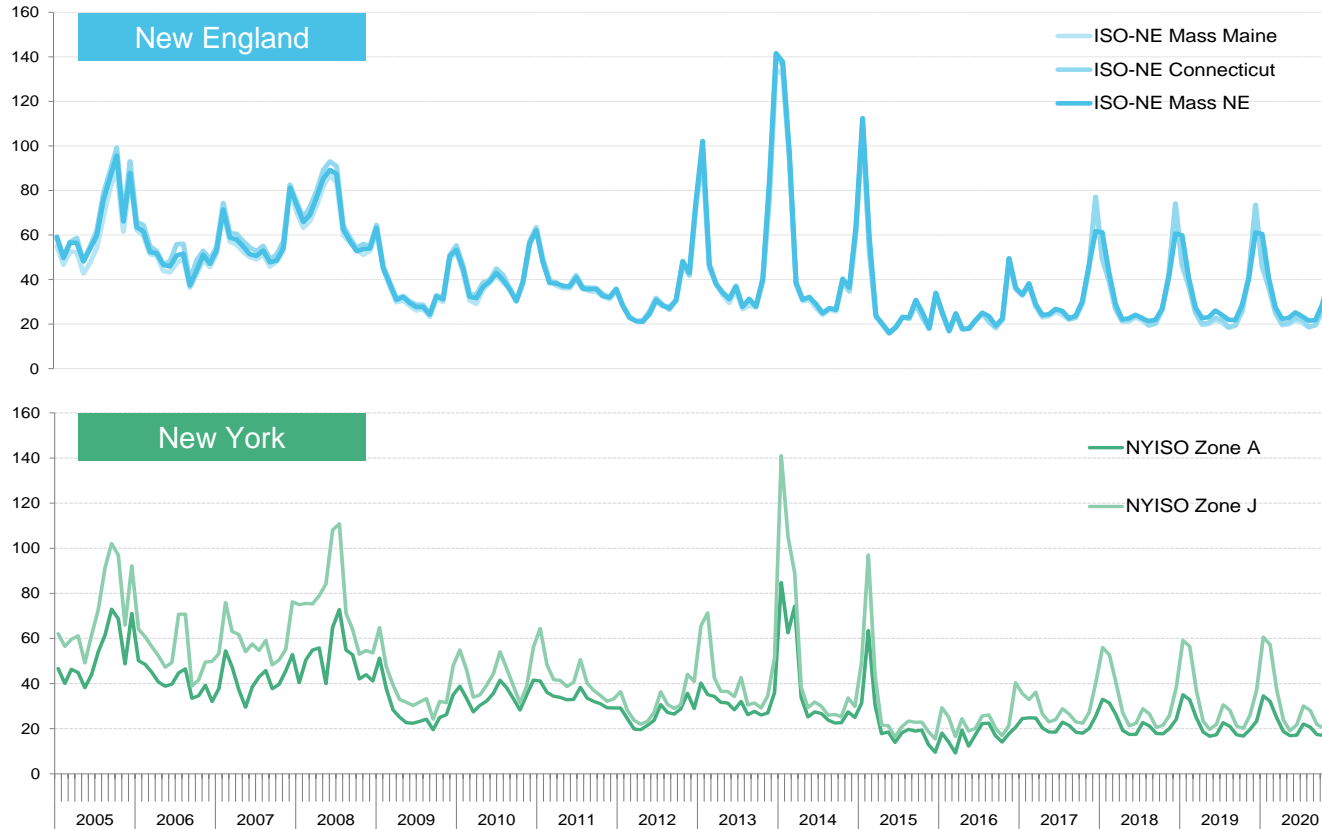
Bloomberg
NEW ENERGY FINANCE

Levelized cost of wind energy (\$/MWh, H2 2016)



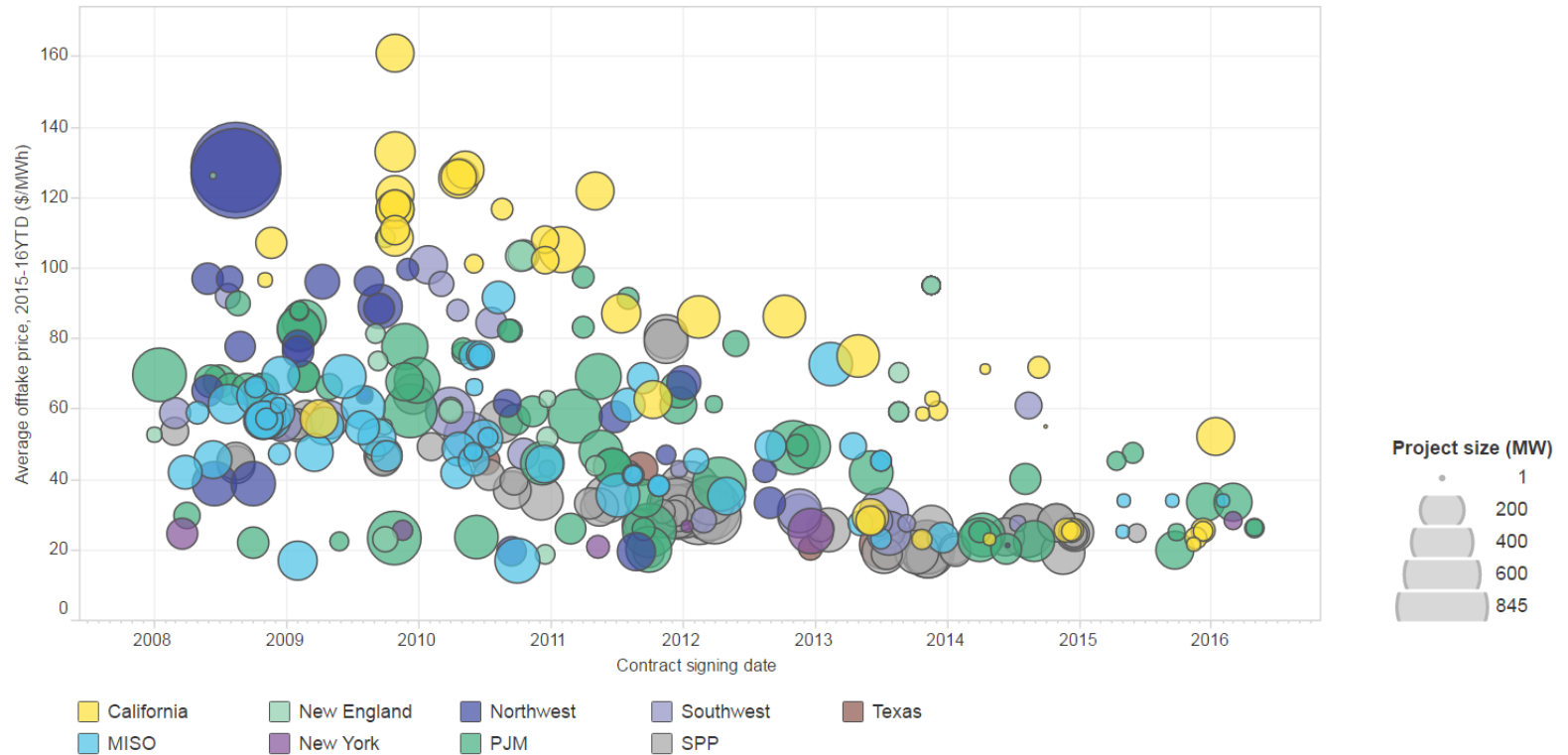
Source: Bloomberg New Energy Finance, EIA. Notes: LCOE is the per-MWh inflation-adjusted lifecycle cost of producing electricity from a technology assuming a certain hurdle rate (ie, after-tax, equity internal rate of return, or IRR). The target IRR used for this analysis is 10% across all technologies. All figures are derived from Bloomberg New Energy Finance analysis. Analysis is based on numbers derived from actual deals (for inputs pertaining to capital costs per MW) and from interviews with industry participants (for inputs such as debt/equity mix, cost of debt, operating costs, and typical project performance). Capital costs are based on evidence from actual deals, which may or may not have yielded a margin to the sellers of the equipment; the only 'margin' that is assumed for this analysis is 10% after-tax equity IRR for project sponsor. The diamonds correspond to the costs of actual projects from regions all over the world; the hollow circles correspond to 'global central scenarios' (these central scenarios are made up of a blend of inputs from competitive projects in mature markets). For nuclear, gas, and coal, the light blue squares correspond to US-specific scenarios. 'CHP' stands for combined heat and power; 'LFR' stands for linear Fresnel reflector. EIA is the source for capex ranges for nuclear and conventional plants.

Power price fair value curves (off-peak, \$/MWh)



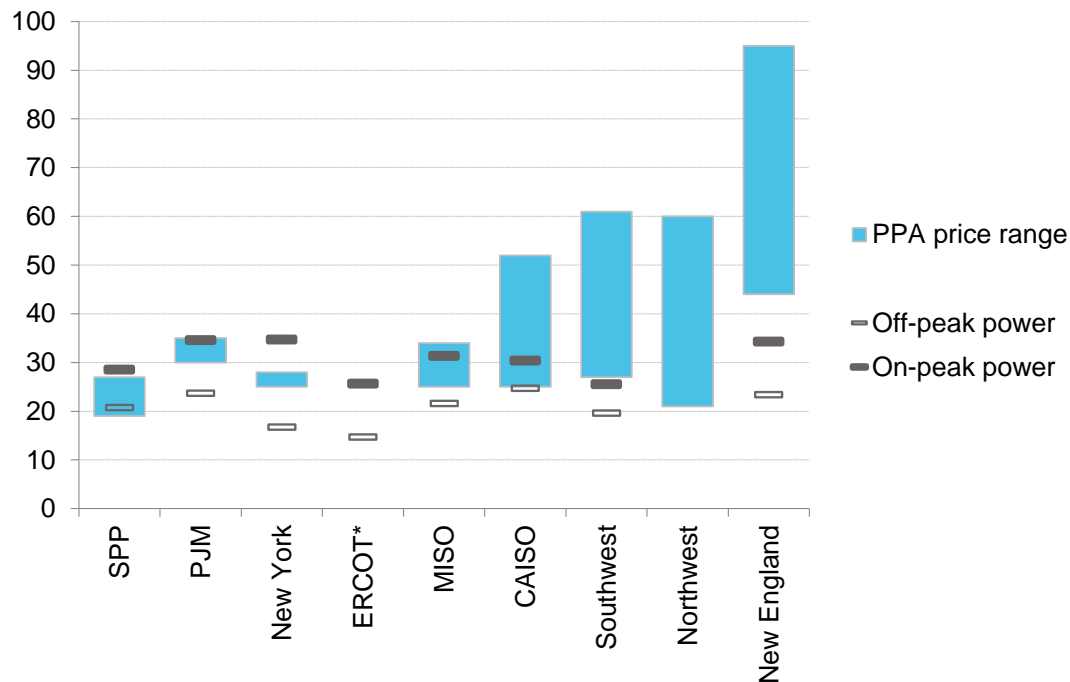
Source: Bloomberg Fair Value Curves

Power purchase agreement (PPA) price evolution (\$/MWh)



Source: Bloomberg New Energy Finance, FERC EQRs

Power purchase agreement (PPA) prices – recent cases (\$/MWh, observed in 2016)



Source: BNEF, SEC filings, interviews, analyst estimates Notes: *ERCOT PPA information is missing due to insufficient data. MISO is the Midwest region; PJM is the Mid-Atlantic region; SPP is the Southwest Power Pool, covering the central southern US; NEPOOL is the New England region; ERCOT is most of Texas. Wholesale power price is average of quarterly future power prices (based on Bloomberg Commodity Fair Value curve) maturing in calendar year 2016 for selected nodes within the region.

MARKETS

Renewable Energy
Energy Smart Technologies
Advanced Transport
Gas
Carbon and RECs

SERVICES

Americas Service
Asia Pacific Service
EMEA Service
Applied Research
Events and Workshops
Unique analysis, tools and data for decision-makers
driving change in the energy system

sales.bnef@bloomberg.net

Rachel Jiang

Bloomberg
NEW ENERGY FINANCE