AUGUST 27, 2013 | WARWICK, RI

Outlook for Renewable Resources in New England

Rhode Island Technical Session

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Objectives

- Describe Renewable Portfolio Standards (RPS) and how they can be met
- Update and project out to 2022, RPS targets for New England states
- Summarize proposed renewable projects in the ISO New England Generation Interconnection Queue and alternative means for meeting RPS
- Discuss trends in distributed generation (DG) resources and the upcoming efforts of the DG Forecast Working Group

REVIEW OF STATE RPS POLICIES IN NEW ENGLAND

Overview of Renewable Portfolio Standards

- RPS are state-legislated targets to obtain a specific percentage of energy to be supplied from renewable resources
  - Generally applicable to electric utilities and competitive retail electric suppliers
- Entities can make Alternative Compliance Payments (ACP) for any RPS deficiency
  - ACP generally used to fund new renewable energy projects
  - ACP serve as price caps on Renewable Energy Certificates (RECs)
- RPS are typically structured into “existing” and “new” resource categories, and in some states, special technology categories also exist
  - The “new” classes of RPS grow as an increasing percentage of the competitive retail supplier load
- Some states also have related goals for energy efficiency which could reduce the need for supply-side resources

RPS Classes in New England

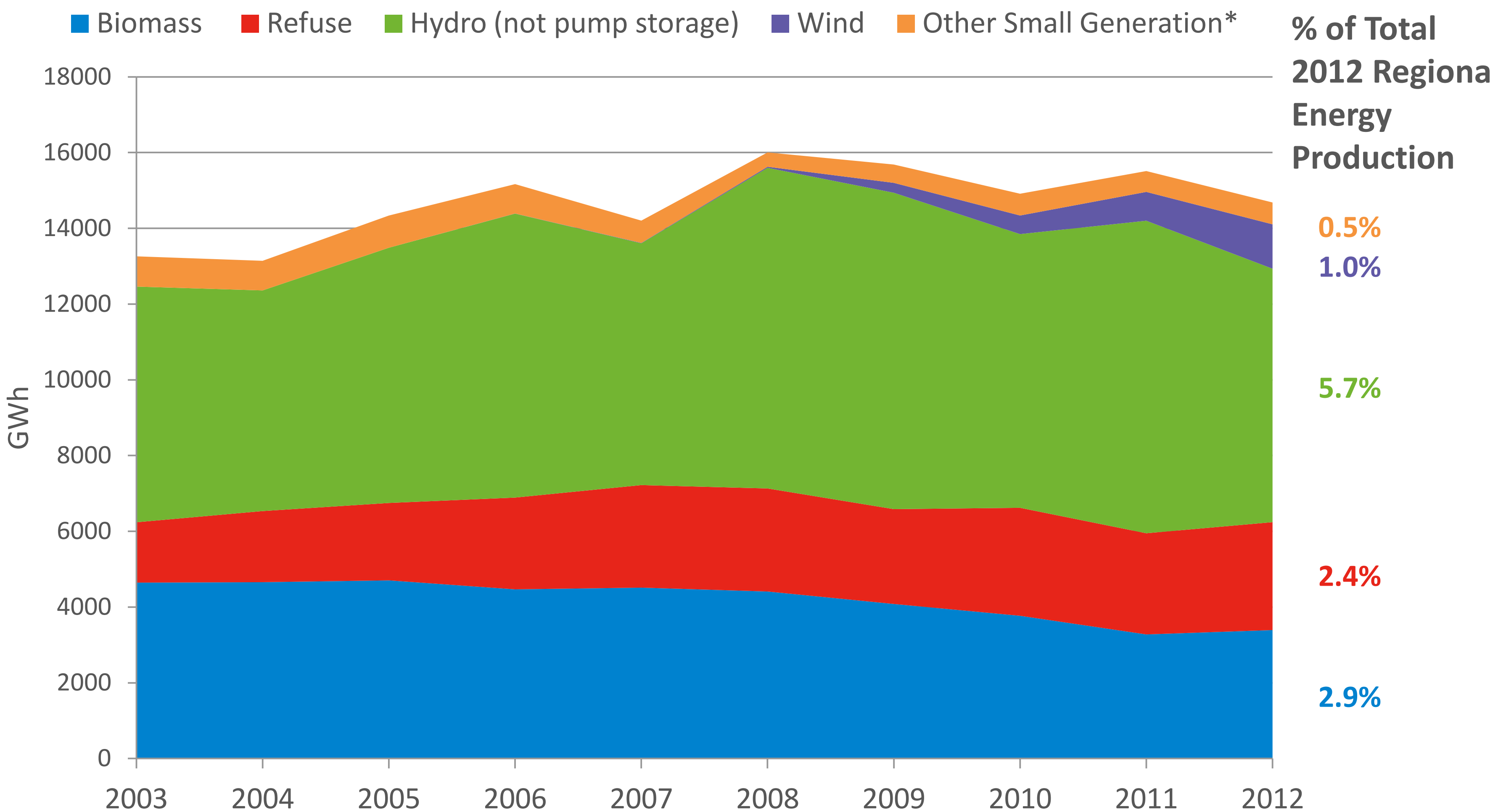
State	RPS Classes	RPS Target by 2022
Connecticut	I New	20%
	II Existing	3%
	III CHP/EE (Existing)	4%
Maine	"Existing"	30%
	New capacity	10% by 2017
Massachusetts	New (incl. Solar Carve-out)	16%
	Existing I and II	3.6% (I) 3.5% (II)
New Hampshire	I New (incl. "useful thermal energy")	12.3% by 2022
	II Solar	0.3% by 2015
	III Existing Biomass	8% by 2015
	IV Existing small hydro	1.5% by 2015
Rhode Island	Existing	2%
	New	14% by 2019
Vermont	Has no formal RPS	Goal of 20% by 2017
	SPEED Program	All energy growth above 2005

Technologies to Meet State RPS

Common Technologies	State	Special Technologies or Restrictions
Solar thermal, photovoltaic, ocean thermal, wave, tidal, wind, biomass (MA: subject to eligibility requirements), hydro, landfill gas, fuel cells	Maine	Municipal Solid Waste (MSW) with recycling, cogeneration, and geothermal, "useful thermal energy"
	Massachusetts	Fuel cells only with renewable fuels, MSW
	Connecticut	Hydro < 5 MW, sustainable biomass, MSW, fuel cells, energy efficiency and combined heat and power (CHP), large-scale hydro (only if shortfall in Class I resources, capped at 5% in 2020)
	Rhode Island	Fuel cells only with renewable fuels, geothermal
	Vermont*	Agricultural wastes, no ocean thermal, wave or tidal power
	New Hampshire	Geothermal, no fuel cells

* Vermont does not have a formal RPS

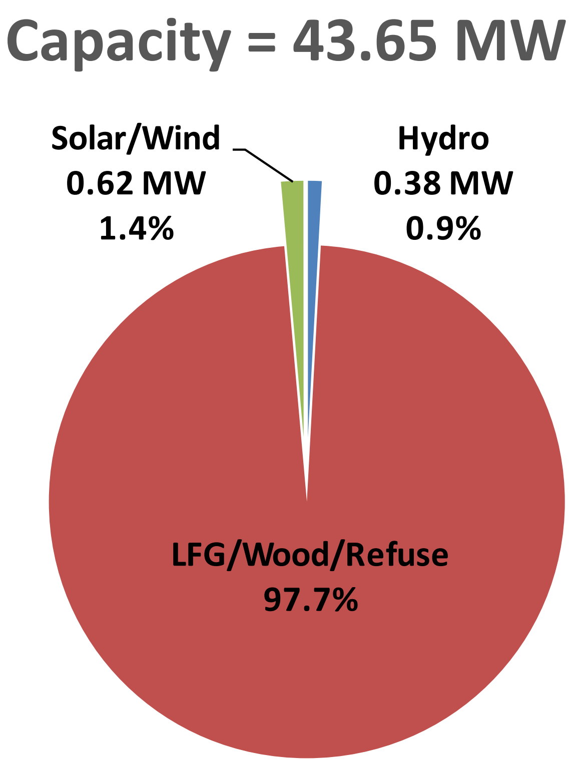
Regional Renewable Energy Production

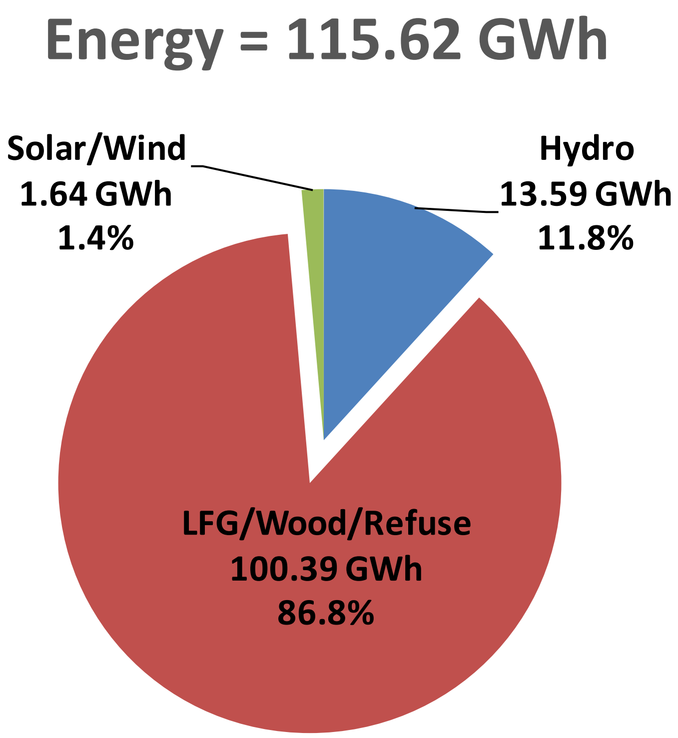


* Other small generation includes: LFG, methane, solar, and steam.

Source: http://www.iso-ne.com/markets/hstdata/rpts/net_eng_peak_load_sorc/energy_peak_source.xls

Rhode Island's Renewable Energy Supply to the ISO Grid in 2012





DETERMINING NEW ENGLAND'S RPS OUTLOOK, 2013-2022

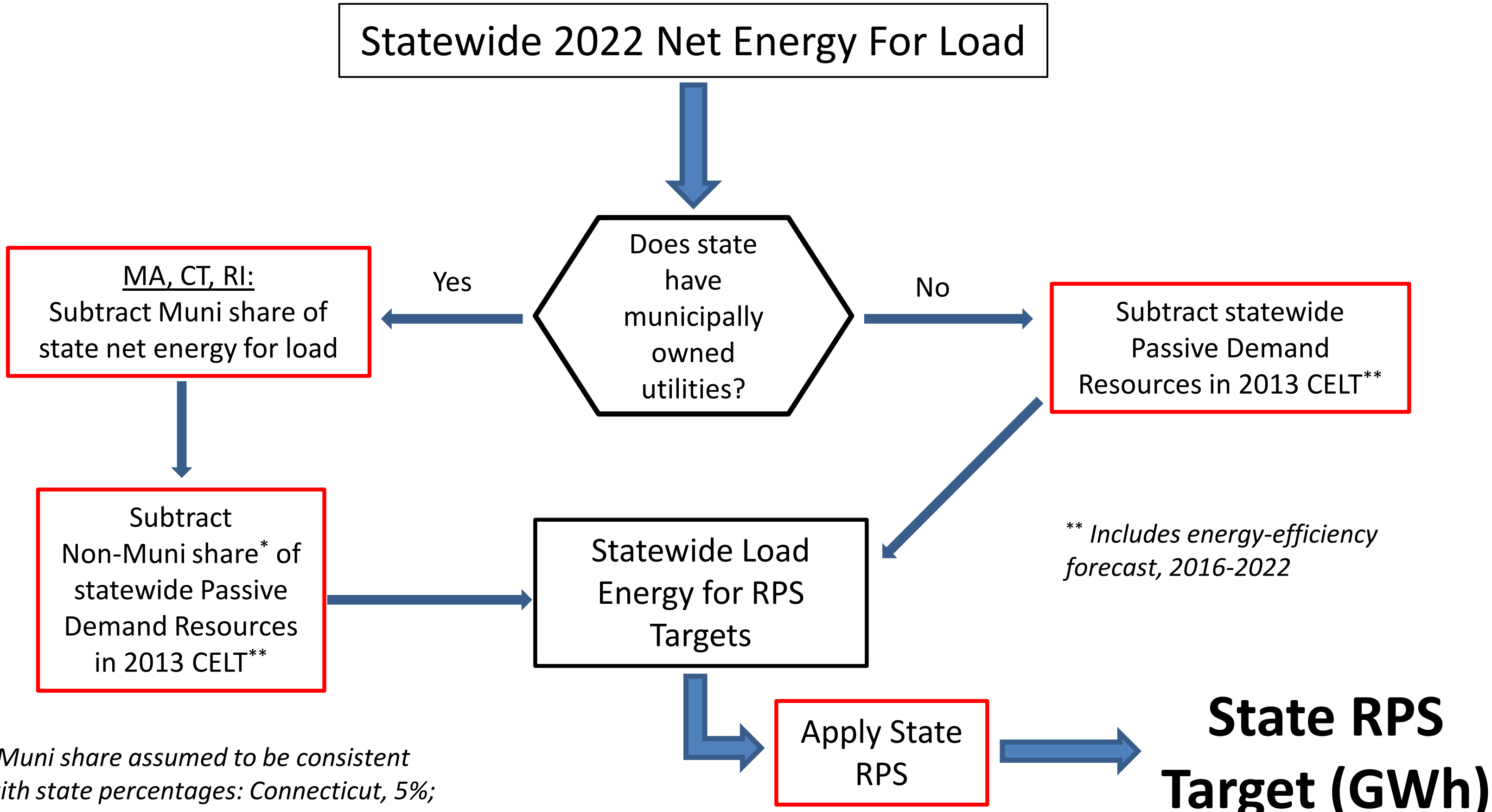
ISO Uses a Number of Sources to Estimate State Targets

- Future RPS energy goals for each state depend on:
  1. RPS targets in %
  2. Amount of state load energy served by electric utilities and competitive retail electric suppliers, rather than municipally-owned utilities, which are exempt from RPS
  3. Amount of load energy reductions due to energy efficiency
- 2013 Capacity Energy Load Transmission (CELT) data
  - Reflects ISO's Energy Efficiency (EE) forecast through 2022 and the amount of load energy reductions achieved by EE in each state
  - Reflects Passive Demand Resources (DR) in ISO's Forward Capacity Market (FCM) through FCA#7
  - ISO's 2013 CELT Forecast Data File: http://www.iso-ne.com/trans/celt/fsct_detail/2013/isone_fcst_data_2013.xls

How the ISO Estimates State Targets

1. Review states' annual energy growth to 2022 from 2013 CELT forecast
2. Factor in municipal load that is exempt from RPS
3. Subtract passive DR for all states
4. Apply annual RPS percentage targets by class to energy forecast of competitive suppliers
5. Group RPS requirements into the RPS class categories
   – Existing renewables: CT II/III, MA II, ME II, RI
   – New renewables: CT I/II, MA I, RI, NH I/II/III /IV, ME I
   – Other renewable requirements: VT SPEED goal

Method for Calculating State RPS Targets

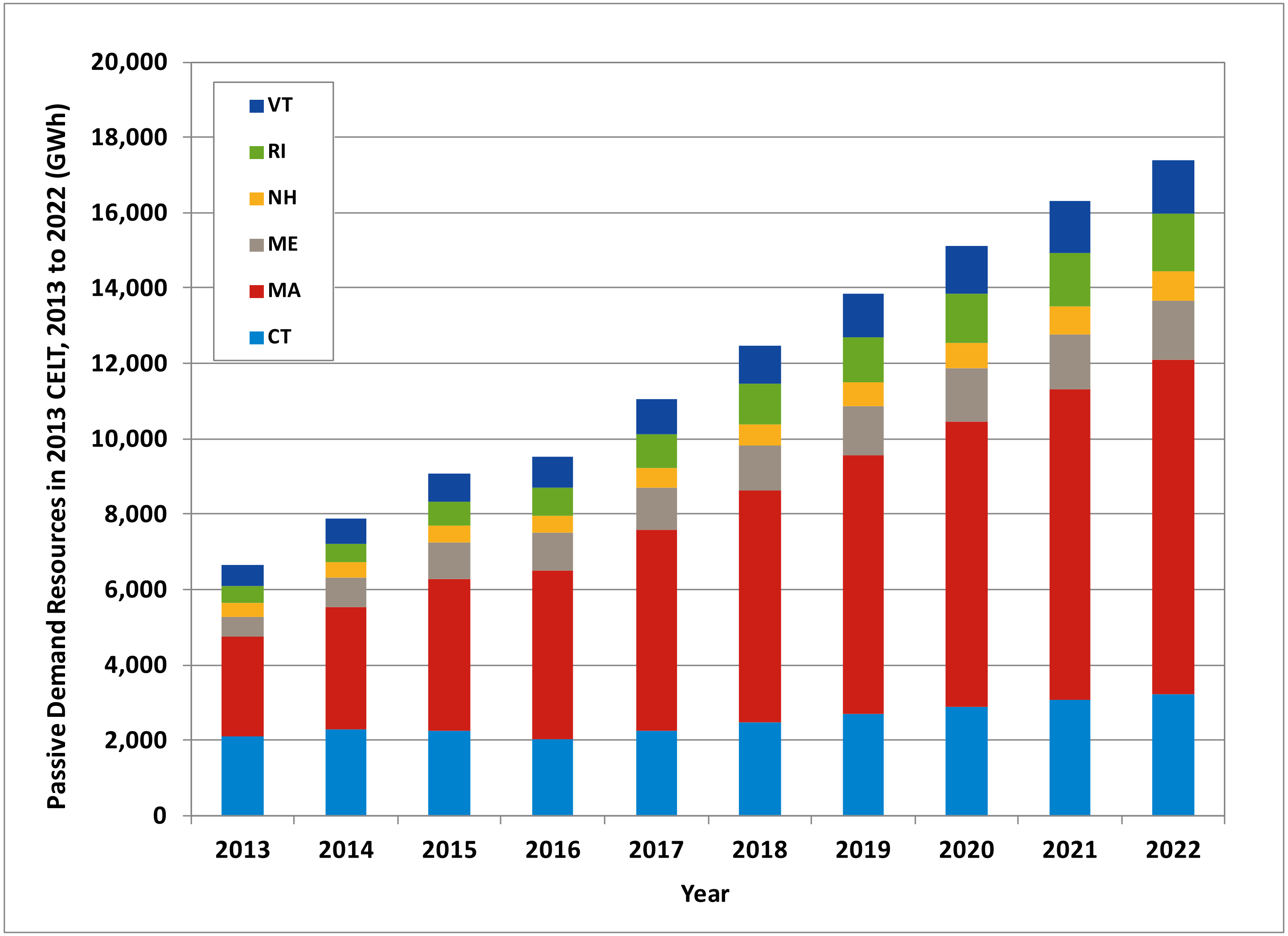


** *Includes energy-efficiency forecast, 2016-2022*

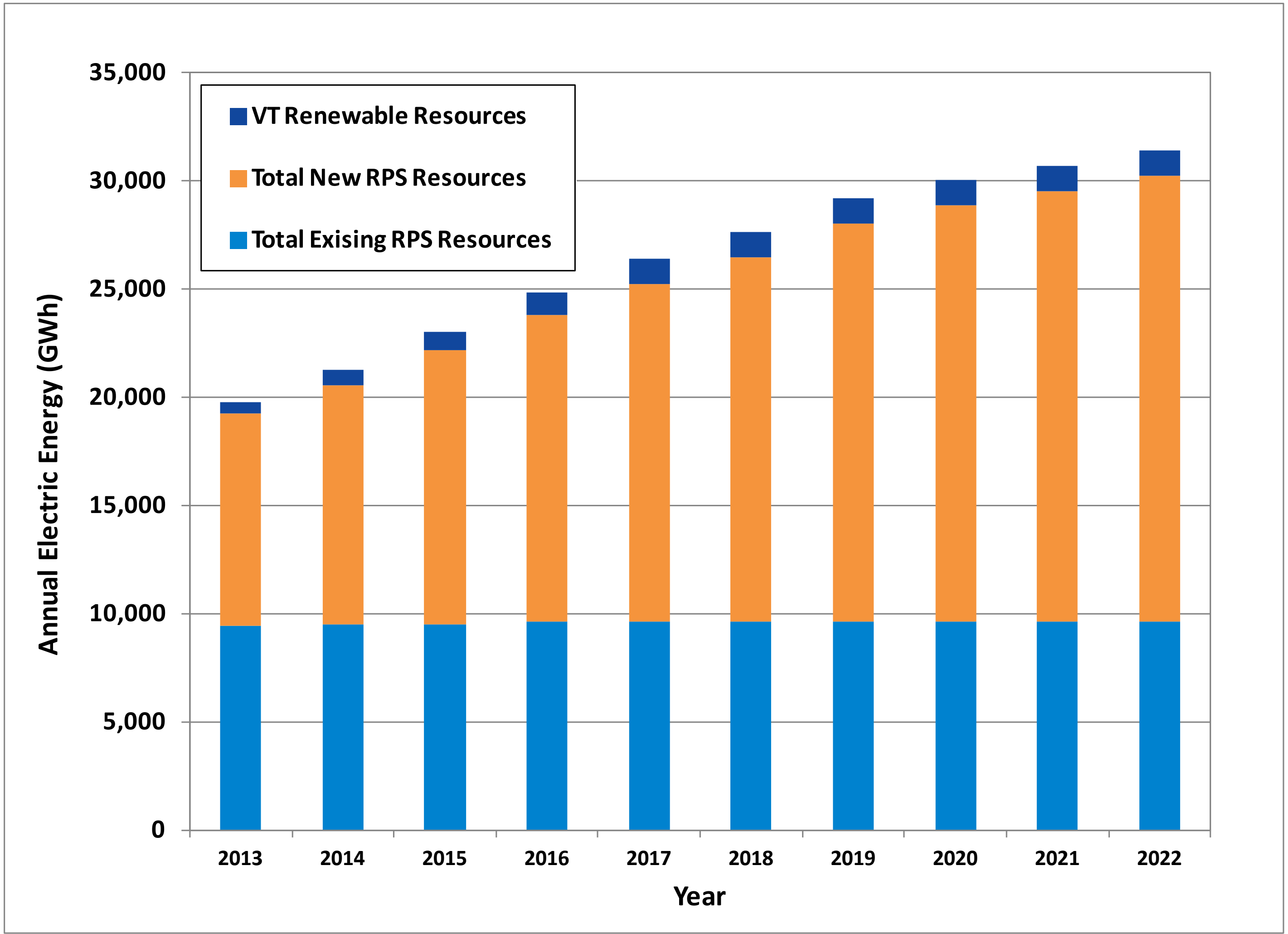
* *Muni share assumed to be consistent with state percentages: Connecticut, 5%; Massachusetts, 14%; and Rhode Island, 0.6%.*

Regional RPS targets = Σ(State RPS Targets)

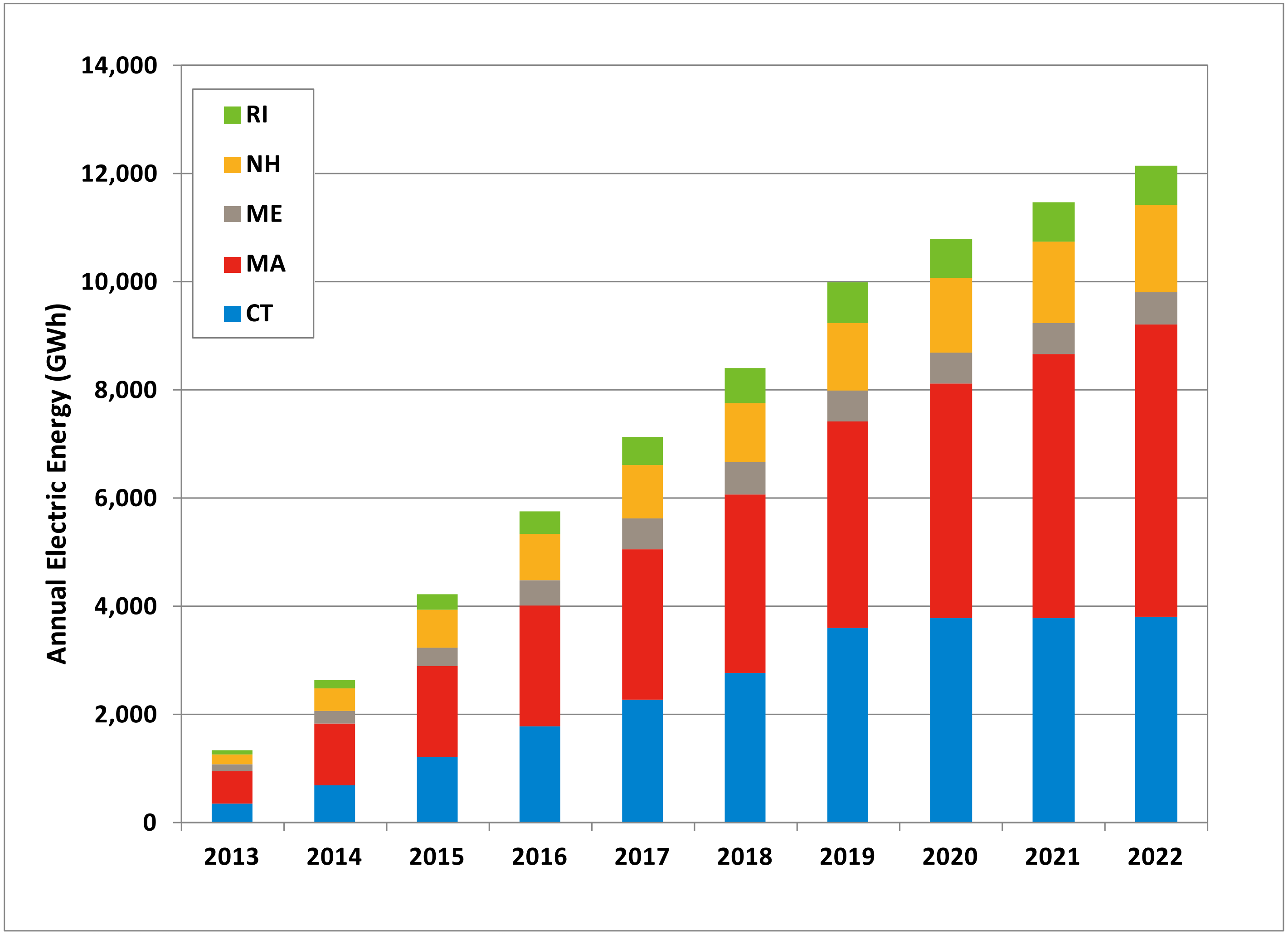
Passive Demand Resources in 2013 CELT



ISO's Projection of Cumulative RPS and Related Renewable Goals in New England: 2013-2022

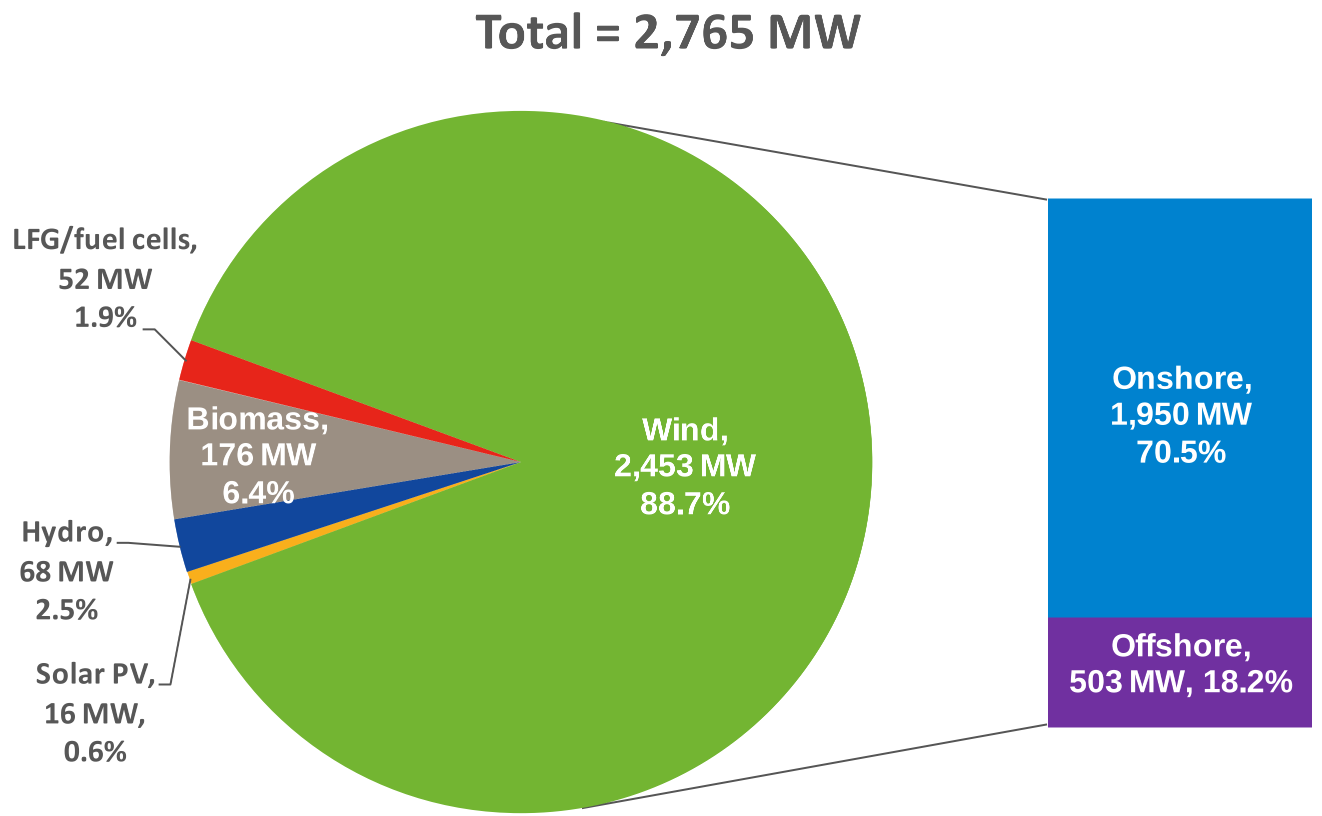


ISO's Projection of Increase in New RPS Above 2012



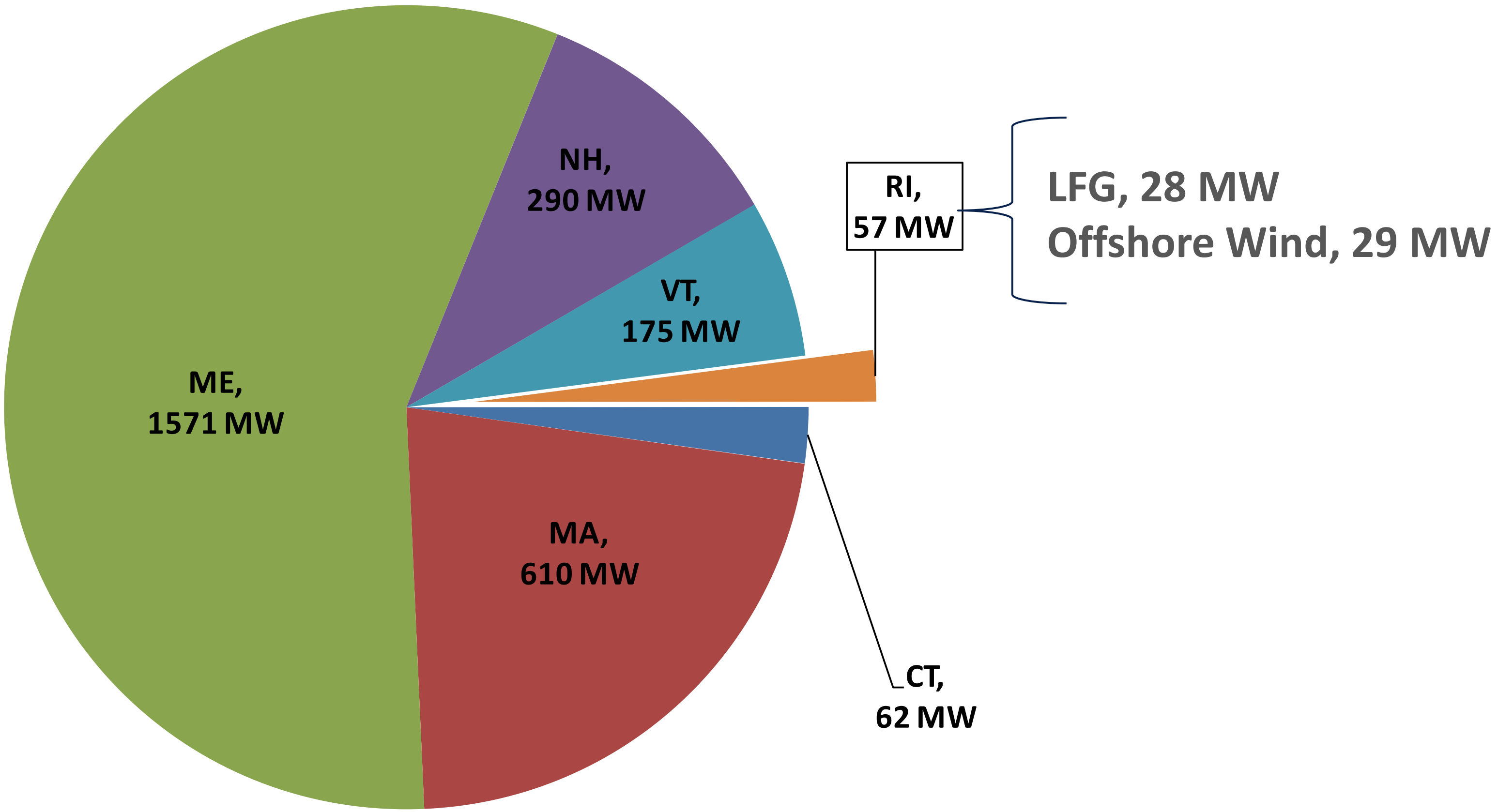
RENEWABLE RESOURCES IN ISO'S INTERCONNECTION QUEUE

Renewable Resources in the ISO Queue



As of April 1, 2013. Totals include non-FERC-jurisdictional projects, including those that are located in northern Maine, which are outside the area administered by ISO-NE.

Renewable Resources in the ISO Queue by State



Renewable Projects in the ISO Queue

Nameplate Capacity and Estimated Energy

Note: Estimated energy values assume that projects are fully operating, without transmission constraints

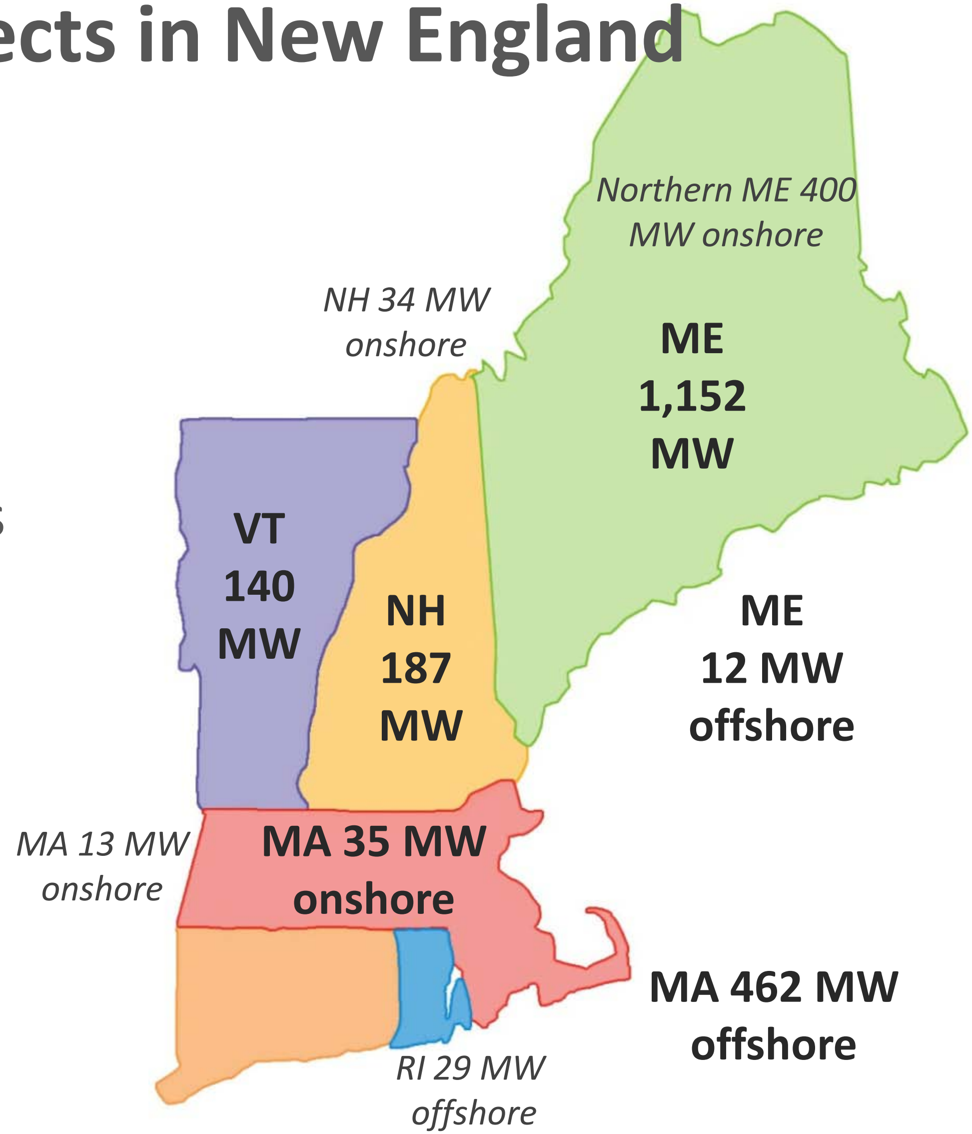
Type	Total Nameplate Capacity (MW)[a]	Capacity Factor (%)[b]	Maximum Annual Energy (GWh)
Hydro	68	25%	149
Landfill gas	28	90%	221
Biomass	176	90%	1,388
Wind - onshore	1,950	32%	5,466
Wind - offshore	503	41%	1,807
Fuel cells	24	95%	200
Solar PV	16	13%	18
Total	**2,765**	**38%**	**9,248**

(a) A facility's total nameplate capacity is its megawatt value listed in the ISO queue

(b) Capacity factors are based on the ISO's 2007 Scenario Analysis and ISO's 2010 NEWIS study. See http://www.iso-ne.com/committees/comm_wkgrps/othr/sas/mtrls/elec_report/scenario_analysis_final.pdf and http://www.iso-ne.com/committees/comm_wkgrps/prtcpnts_comm/pac/reports/2010/newis_report.pdf

Proposed Wind Projects in New England

- More than 2,400 MW of proposed wind projects
  - Includes non-FERC jurisdictional projects
- Majority of wind proposals are in northern New England
- Offshore projects proposed in Massachusetts, Maine, and Rhode Island



Based on April 1, 2013 Interconnection Queue

Note: FERC-jurisdictional wind project totals are bold-faced; non-FERC-jurisdictional totals are non-boldfaced.

Growth of Wind Power in New England

- Number of wind renewable energy credits (RECs), particularly those generated within ISO territory, have increased since 2010

	2010	2011	2012
Total MWh of wind RECs registered	1,321,146	1,572,454	2,013,794
% of total MWh that was generated within ISO service territory	39%	50%	61%

- 710 MW of commercial wind power within ISO service territory (as of April 2013)
  - 186 MW went commercial in 2012

Other Renewable Resource Considerations

- Large-scale hydro
  - 479.5 GWh of hydropower energy imported into the ISO service territory in 2012 (NEPOOL GIS data)
  - CT's new policy will allow large-scale hydro to meet Class I RPS if there's a shortfall of other renewables (beginning in 2016)
  - NESCOE analyzing economic and environmental costs and benefits of incremental levels of imported Canadian hydroelectricity
- Solar
  - Significant amounts of distributed generation, particularly solar photovoltaic (PV) resources, are being developed in the region
  - Can play a significant role in meeting state RPS goals
    - Assuming a 13% capacity factor, 2,000 MW of PV would equal 2,278 GWh of energy per year – almost 19% of region's incremental growth in "new" Class I RPS goals

Observations

- Achievement of aggressive state EE goals may further reduce RPS target energy by 2022
- Any shortage of renewable energy could be met by:
  – Proposing additional projects
  – Buying RECs from renewable projects in neighboring regions
  – Behind-the-meter DG projects that are not in the ISO's Queue
  – Load Serving Entities paying ACPs that contribute to state funds that support renewable resource development

UPDATE ON SOLAR PHOTOVOLTAIC (PV) RESOURCES & OTHER DISTRIBUTED GENERATION

Region Experiencing Growth of PV and Other DG

- Regionally: More than 2,000 MW of DG anticipated by 2021
  - PV will be the dominant DG technology
    - 250 MW installed by end of 2012; approximately 125 MW in 2012 alone
- Massachusetts: Reached its 250 MW PV goal three years early
  - May 2013: Announced expanded goal of 1,600 MW of PV by 2020
- Connecticut: Public Act 11-80 is stimulating growth in DG
  - Could result in more than 300 MW of DG by 2022, mostly PV
- Vermont: State goal of 127.5 MW of DG by 2022
  - Approximately 26 MW of PV installed in VT by end of 2012
- Rhode Island: DG Standard Contracts→40 MW of DG by 2014
  - Program awarded contracts to 14.67 MW of PV through the end of 2012
- New Hampshire: Class II Renewable Portfolio Standards (RPS) will require about 25 MW of PV by 2015

PV and Other DG in Long-Term System Planning

- Existing DG resources are currently considered in long-term planning in the following ways:
  – Capacity Supply Obligations (CSOs) associated with DG projects that clear in the Forward Capacity Market (FCM) can satisfy the Installed Capacity Requirement (ICR)
  – Energy production and/or load reductions from existing non-FCM DG is:
    - Registered as a generating load asset (i.e., Settlement Only Generator, or SOG) that is explicitly counted as generation in determining Net Energy for Load
    - Embedded in the historic loads used to develop ISO’s 10-year load forecast used in the ICR calculation on the load side
- At historical amounts of DG, this approach was sufficient. However, given the anticipated growth of DG, additional steps may be necessary

DG Forecast Working Group

- First DGFWG meeting will be held on September 30, 2013
- Will require an open collaborative effort between ISO and:
  - State policymakers
  - DG/PV program administrators
  - Distribution companies
  - Other interested parties
- Will require coordination of multiple simultaneous efforts
  - Need to address all of the identified key challenges to the integration of large amounts of DG resources
  - Data/information sharing
    - Obtain data and other information needed, including (but not limited to) amounts, locations, and time-series power production of DG resources
    - Need information concerning state and federal policy outlook to support DG resource projections
    - Data to support operational PV forecast
  - Conduct analysis of data to support forecast

Challenges to Developing a DG Forecast

- Developing a forecast methodology
- Avoiding the double-counting of DG resources
  - Need to consider the ways in which existing DG is already treated in long-term planning
    - i.e., in FCA, as SOGs or historical loads used for CELT
  - May need to reconstitute a portion of load that is served by DG resources
- Projecting the future growth of resources that have uncertain economics and product reliability
- How to determine resource capacity credit?
  - Will vary by resource type
- What geographic distribution should be applied to future DG resource projections?
  - DG resources will likely be unevenly distributed across region, and also across individual states
- Developing realistic timing of projected DG development

Questions