ISO-NE Distributed Generation Working Group

UPDATE TO VSPC 12/11/13

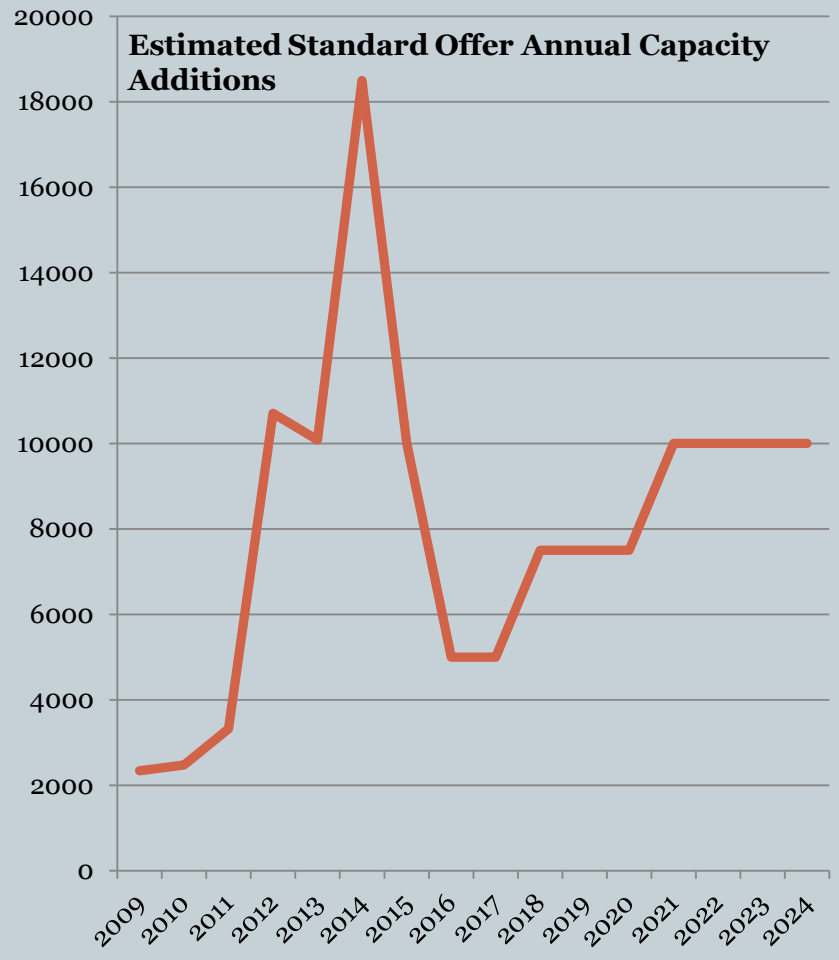
Background

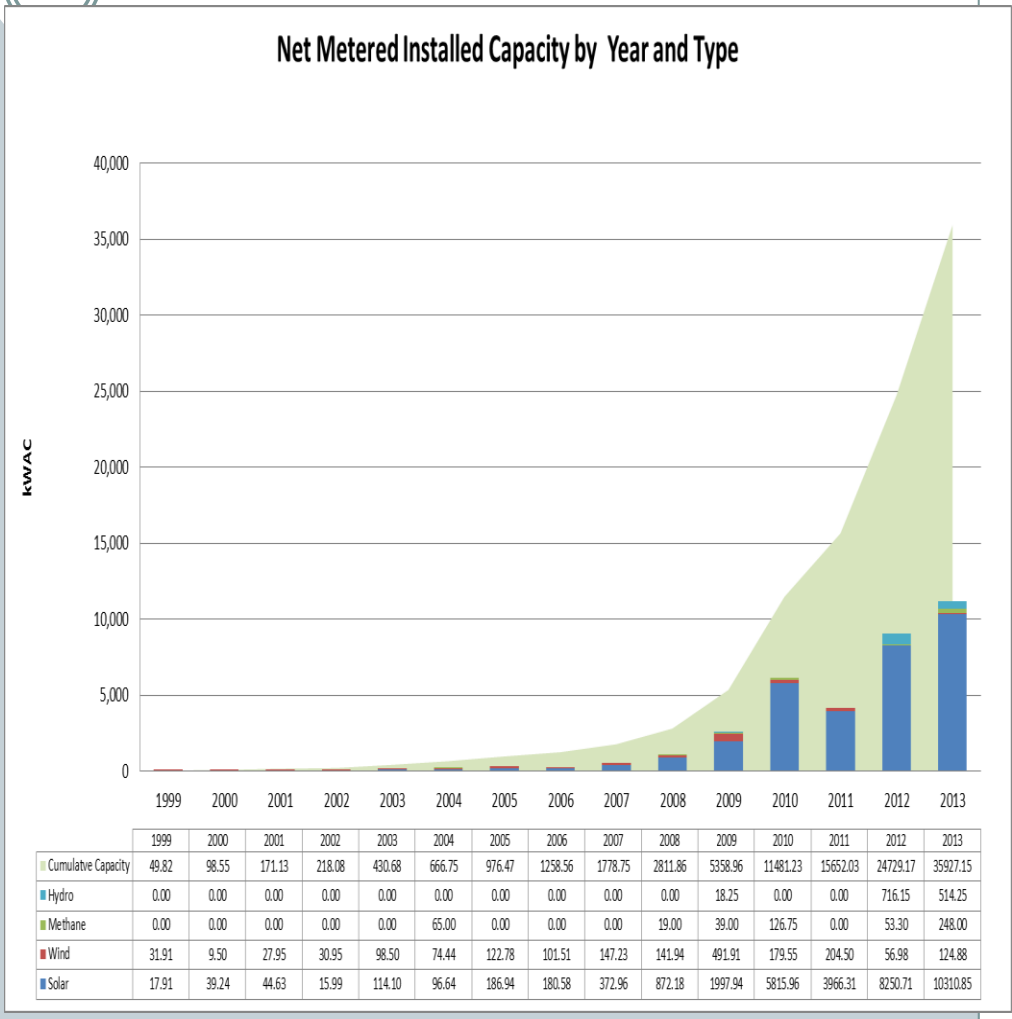
- Stakeholders have encouraged ISO-NE to include the impacts of Distributed Generation (DG) in RSP
- Goal – Interim forecast to be included in RSP 2014
- General Agreement to begin with Solar PV
  - Significant public policy push
  - Improving Economics
  - Potential for reliability impacts of high penetrations
- September kick off meeting; Dec 16 next meeting

ISO Current DG Forecast Practice

- DG with obligations in FCM included in load and forecast
- Existing non-FCM DG registered in Wholesale Energy Markets are counted
- Load reductions from remainder of existing DG are embedded in historic loads used to develop ISO's 10 year load forecast used in ICR calculation
  - Existing DG that ISO doesn't know about

Vermont Presentation at DGFWG Illustrates Importance of including forecast of PV now





	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Cumulative Capacity	49.82	98.55	171.13	218.08	430.68	666.75	976.47	1258.56	1778.75	2811.86	5358.96	11481.23	15652.03	24729.17	35927.15
Hydro	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.25	0.00	0.00	716.15	514.25
Methane	0.00	0.00	0.00	0.00	0.00	65.00	0.00	0.00	0.00	19.00	39.00	126.75	0.00	53.30	248.00
Wind	31.91	9.50	27.95	30.95	98.50	74.44	122.78	101.51	147.23	141.94	491.91	179.55	204.50	56.98	124.88
Solar	17.91	39.24	44.63	15.99	114.10	96.64	186.94	180.58	372.96	872.18	1997.94	5815.96	3966.31	8250.71	10310.85

Implications of a Long-Term DG Forecast

- May affect system studies of resource adequacy, transmission planning, and economic studies
- Work with DG Forecast Working Group will enable stakeholders to share information
  - Better understanding of DG Impacts on peak
  - Address DG integration challenges

Challenges to Forecast DG

- Long-term funding for some state DG programs unclear; unlike EE rely more on mix of public/private investment
- Market and technology uncertainties affect potential and realizable amounts of DG development
- Avoiding double counting of DG resources
- Timing of development
- Location
- Potential reliability impacts – voltage issues and reverse power flows
- Development of Resource Capacity Credit

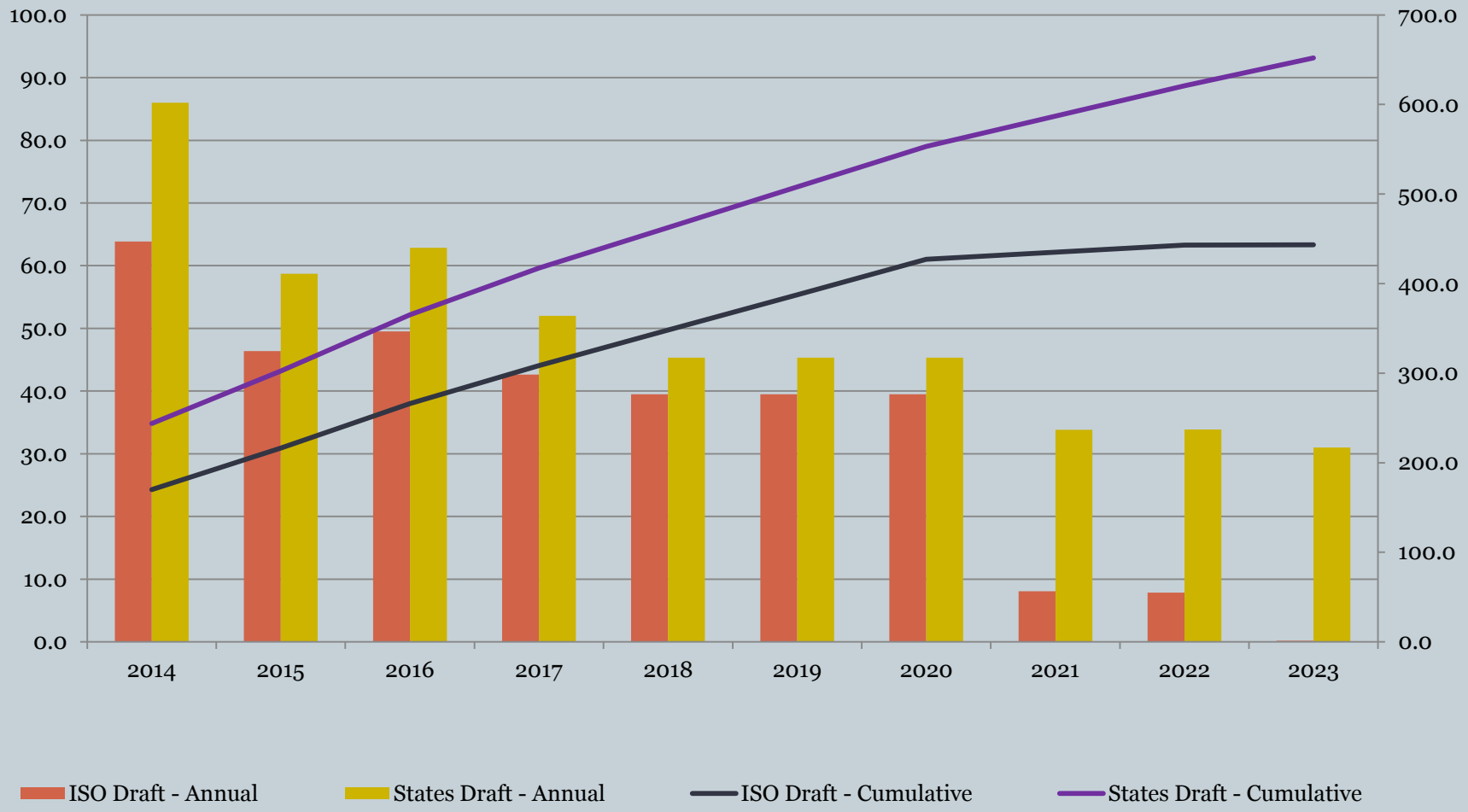
Original ISO-NE Draft PV Forecast

- ISO-NE provided draft forecast to States for review and comment in November. Assumptions included
  - State programs (e.g. standard offer, net metering) resulted in targeted EE. Zero commissioned projects after end of state programs
  - 35% Coincidence Factor for large (>100kW) projects
  - 25% for small (<100kW)
    - Based on Seasonal Claimed Capability
  - Applied 25% uncertainty factor across the board

States feedback in advance of DG Working Group

- Zero PV after state programs end is unreasonable
  - Program history suggests re-up of targets
  - Economics suggests greater penetration
  - Utility efforts outside of state programs
- Coincidence factor may not be justified
  - Seeking more justification for utilization of SSCC
- Uncertainty discount is reasonable, however should begin small in early years and ramp up further into future
  - Greater discount for after program assumptions may be reasonable

Preliminary DRAFT (Original) ISO and State PV Forecasts



Dec 11 - Preliminary PV Forecast

States	Annual Total MW (MW, AC nameplate rating)											Totals
	Through 2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	
CT	54.3	51.3	41.3	61.3	41.3	41.3	41.3	41.3	41.3	41.3	41.3	**497.0**
MA	322.2	199.2	146.1	146.1	146.1	132.8	132.8	132.8	132.8	132.8	132.8	**1,756.4**
ME	2.0	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	**10.0**
NH	5.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0	1.0	1.0	**22.0**
RI	10.1	8.4	8.4	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	**80.4**
VT	54.0	20.3	13.5	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	**141.8**
Annual Policy-Based MWs	**447.5**	**281.9**	**212.0**	**223.6**	**196.9**	**183.6**	**145.4**	**145.4**	**11.6**	**10.6**	**0.8**	**1,859.0**
Annual Post-Policy MWs	**0.0**	**0.0**	**0.0**	**0.0**	**6.7**	**6.7**	**45.0**	**45.0**	**177.8**	**178.8**	**188.6**	**648.6**
Annual Nondiscounted Total (MW)	**447.5**	**281.9**	**212.0**	**223.6**	**203.6**	**190.3**	**190.4**	**190.4**	**189.4**	**189.4**	**189.4**	**2,507.6**
Cumulative Nondiscounted Total (MW)	**447.5**	**729.3**	**941.3**	**1,164.9**	**1,368.5**	**1,558.8**	**1,749.2**	**1,939.5**	**2,128.9**	**2,318.2**	**2,507.6**	**2,507.6**

Discounted MWs

Total Discounted Annual	**447.5**	**253.7**	**180.2**	**178.9**	**149.3**	**139.4**	**120.3**	**120.3**	**53.1**	**52.6**	**47.8**	**1,742.9**
Total Discounted Cumulative	**447.5**	**701.1**	**881.4**	**1,060.2**	**1,209.6**	**1,348.9**	**1,469.2**	**1,589.5**	**1,642.6**	**1,695.2**	**1,742.9**	**1,742.9**

Final Summer SCC (MW) Based on 35% [Assume Winter SCC equal to zero]

Annual: Total Discounted SSCC (MW)	**156.6**	**88.8**	**63.1**	**62.6**	**52.3**	**48.8**	**42.1**	**42.1**	**18.6**	**18.4**	**16.7**	**610.0**
Cumulative: Total Discounted SSCC (MW)	**156.6**	**245.4**	**308.5**	**371.1**	**423.3**	**472.1**	**514.2**	**556.3**	**574.9**	**593.3**	**610.0**	**610.0**

Notes:

(1) Yellow highlighted cells indicate that values contain post-policy MWs

(2) "Through 2013" values must be reconciled with distribution queue data

Other Issues

- PV Impacts on System Operation
  - No noticeable negative effects to date
  - Increased Ramping in winter?
  - What will be incremental impact of increased penetrations on reserve/regulation requirements?
- ISO has Potential System Reliability Concerns
  - Interconnection standards – no 'ride through' capability – potential for significant amounts of DG to be lost if there is grid disturbance
  - At what penetration do these impacts begin

DG Forecast Working Group to date

- September 30 kick off meeting
  - ISO identified issues above
  - States shared data on existing DG
- December 16th second meeting
  - ISO expected to share publicly draft PV forecast