



April 2015 Distributed Generation Survey Results

Distributed Generation Forecast Working Group

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APRIL 2015 PV SURVEY RESULTS

Determining Total PV Installed Through April 2015

- ISO requested distribution owners to provide the total nameplate PV (in MW_{ac}) that is already installed and operational within their respective service territories as of April 30, 2015
- The following Distribution Owners responded:
 - **CT:** CL&P, CMEEC, UI
 - **ME:** CMP, Emera Maine,
 - **MA:** Braintree, Chicopee, National Grid, NSTAR, Reading, Shrewsbury, Unitil, WMECo
 - **NH:** Liberty, NHEC, PSNH, Unitil
 - **RI:** National Grid
 - **VT:** Burlington, GMP, Stowe, VEC, VPPSA, WEC
- Based on respondent submittals, installed and operational PV resource totals by distribution owner and state are listed on the next slides



April 2015 Year-To-Date PV Installed Capacity

State-by-State

The table below reflects statewide aggregated PV data provided to ISO by regional Distribution Owners. The values represent installed nameplate as of 4/30/15.

State	Installed Capacity (MW _{ac})
Connecticut	133.83
Maine	12.60
Massachusetts	739.48*
New Hampshire	13.93
Rhode Island	19.08
Vermont	90.76*
New England Total	1,009.67

Notes:

*Includes values based on MA SREC data associated with 43 MA munis and VT SPEED data for 3 VT munis that did not provide individual responses

April 2015 Year-to-Date Installed PV by Distribution Owner

State & Utility	Installed Capacity (MW _{ac})
Connecticut	133.83
Connecticut Light & Power	112.60
Connecticut Municipal Electric Energy Co-op	0.45
United Illuminating	20.78
Maine	12.60
Central Maine Power	11.00
Emera	1.60
Massachusetts	739.48
Braintree Electric Light Dept	1.75
Chicopee Electric Light	7.82
National Grid	345.96
NSTAR	268.08
Shrewsbury Electric & Cable Operations	2.59
Unitil	8.13
Reading Municipal Lighting Plant	1.10
Western Massachusetts Electric Company	51.88
Other Municipals (Per MA SREC data)	52.17



April 2015 Year-to-Date Installed PV by Distribution Owner

State & Utility	Installed Capacity (MW _{ac})
New Hampshire	13.93
Liberty	0.52
New Hampshire Electric Co-op	2.93
Public Service of New Hampshire	9.00
Unitil	1.47
Rhode Island	19.08
National Grid	19.08
Vermont	90.76
Burlington Electric Department	1.80
Green Mountain Power	75.54
Vermont Electric Co-op	9.57
Vermont Public Power Supply Authority	2.19
Stowe Electric Department	0.27
Washington Electric Co-op	1.42
Other Municipals (per VT SPEED data)	0.1
New England Total	1,009.67

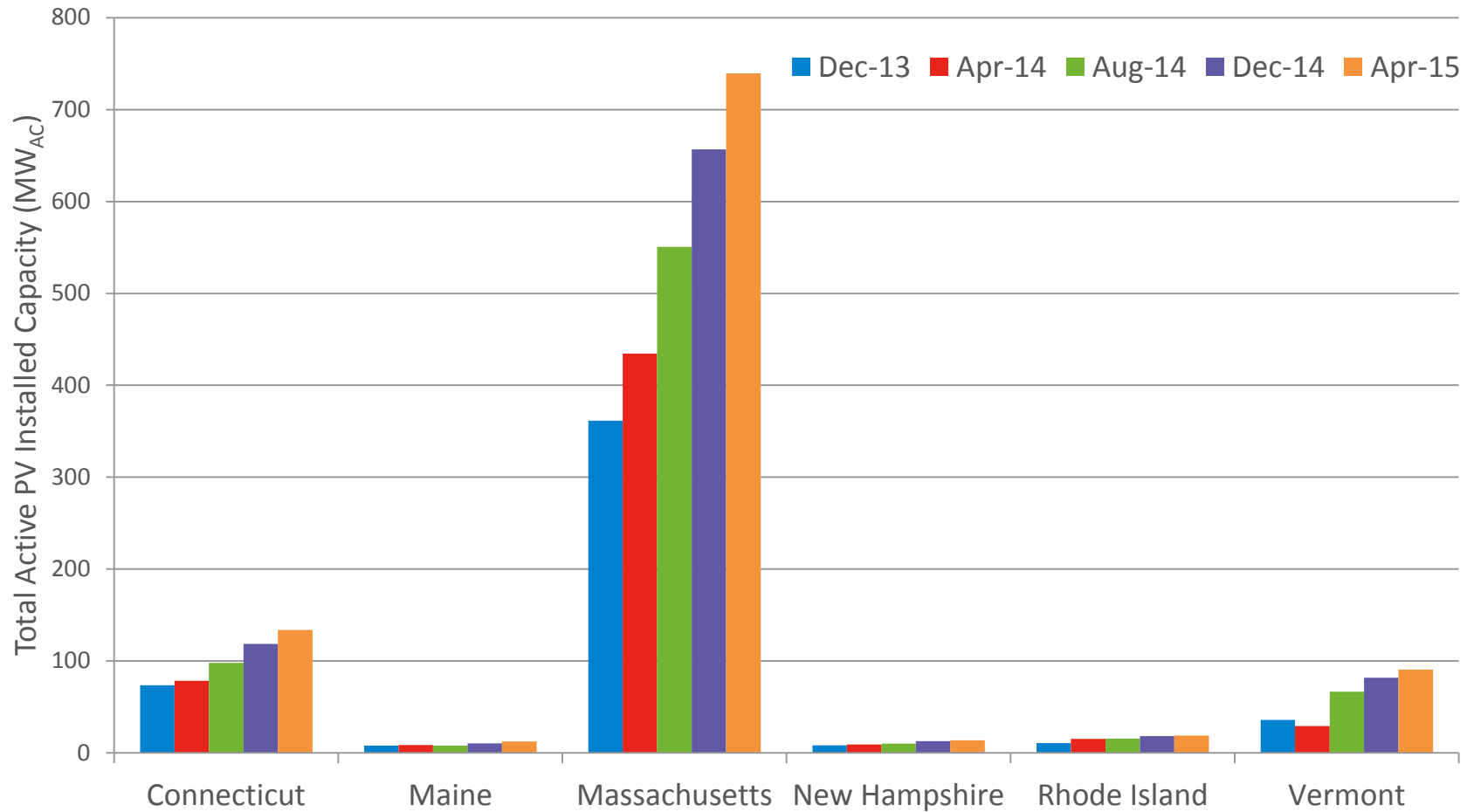
Total Active PV Installed Capacity Survey Results

Reflects statewide aggregated PV data provided to ISO by regional Distribution Owners. Values represent installed megawatt AC (MW_{ac}) nameplate

	December 2013	April 2014	August 2014	December 2014	April 2015
Connecticut	73.75	78.416	98.02	118.80	133.83
Maine	8.12	8.512	8.16	10.38	12.60
Massachusetts	361.55	434.39	550.54	666.83	748.61
New Hampshire	8.22	9.35	10.17	12.71	13.60
Rhode Island	10.9	15.29	15.52	18.21	19.08
Vermont	36.13	29.40	66.55	81.85	90.79
New England Total	498.67	575.37	748.95	908.80	1,009.67

Total Active PV Installed Capacity Survey

Results 2013-2015 YTD (MW_{ac})



APRIL 2015 NON-PV DISTRIBUTED GENERATION (DG) SURVEY RESULTS

Determining Total Non-PV DG Installed

- ISO requested Distribution Owners provide the total nameplate (in kW) of Non-PV distributed generation interconnected and operational within their respective service territories
- The following distribution owners responded:
 - **CT:** CL&P, CMEEC, UI
 - **ME:** CMP, Emera,
 - **MA:** Chicopee, National Grid, NSTAR, Reading, Unitil, WMECo
 - **NH:** Liberty, NHEC, PSNH, Unitil
 - **RI:** National Grid
 - **VT:** Burlington, GMP, Stowe, VEC, VPPSA, WEC
- Based on respondent submittals, reported interconnected and operational non-PV DG resource totals by distribution owner and state are listed on the next slides



Introduction: Non-PV DG

- High growth rates for energy efficiency (EE) and PV in the region resulted in the ISO developing discrete forecasts for these resources
 - State policies clearly define the amount (MW) of PV and EE growth and provide specific funding mechanisms to achieve that growth
- Previous DGFVG discussion focusing on growth of non-PV DG resources did not conclusively identify similar rapid growth rates
 - Today's discussion is meant to quantify the growth trends of these resources using more comprehensive data that are now available
- In compiling the non-PV DG data, ISO focused on units with nameplate capacity less than 5 MW in accordance with the DG definition used by the DGFVG
 - Reported data included many units with nameplate capacity in excess of 5 MW, with some as large as 60 MW, which should not be considered DG
 - Units larger than 5 MW represent $\sim 2/3$ of the total reported capacity (see appendix for details)

NON-PV DG (≤ 5 MW) SURVEY RESULTS

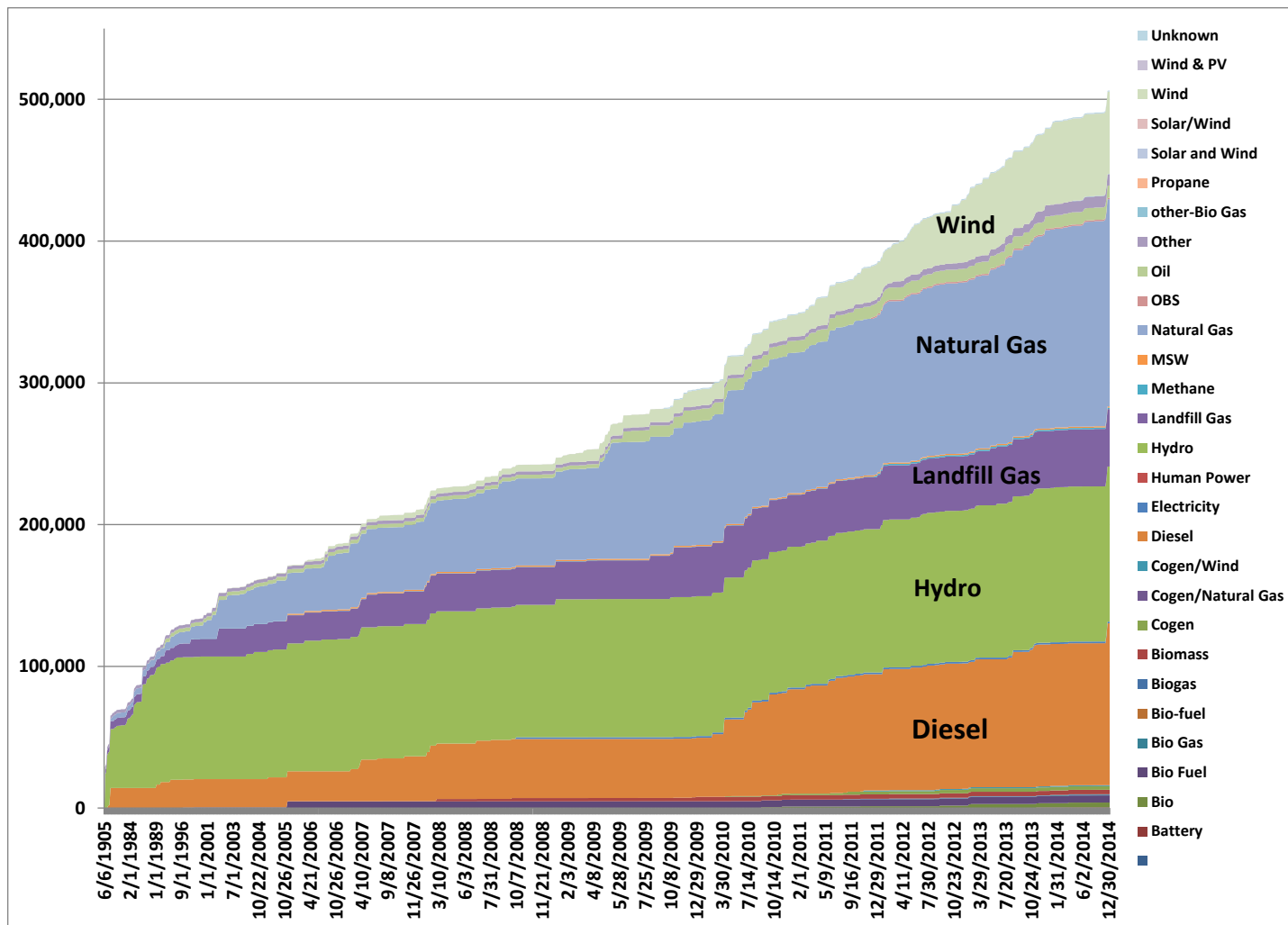
End-of-2014 Non-PV DG Installed Capacity

State-by-State

The table below reflects statewide aggregated non-PV DG data provided to ISO by regional distribution owners. The values represent installed nameplate capacity as of 12/31/14.

State	Installed Capacity (MW)
Connecticut	171
Maine	19
Massachusetts	184
New Hampshire	95
Rhode Island	21
Vermont	12
New England Total	502

Reported Non-PV DG Interconnection Date by Fuel Type (kW)



5-Year Growth of Reported Non-PV DG by Fuel Type (kW)

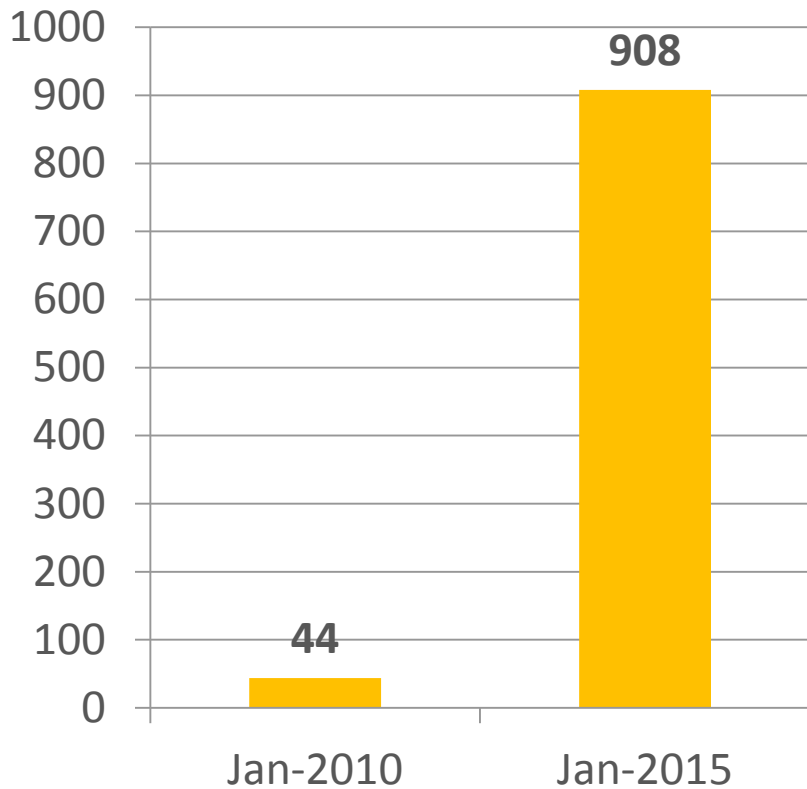
Note: Fuel types contributing <0.1% of total 5-year growth were eliminated

Fuel Type	Installed Capacity (kW)		5-yr Growth (kW)	% of Total 5yr Growth
	1/1/2010	1/2/2015		
Battery	0	415	415	0.2%
Bio	19	3,404	3,385	1.6%
Bio Fuel	4,810	5,042	232	0.1%
Bio Gas	0	495	495	0.2%
Biogas	0	300	300	0.1%
Cogen	0	2,499	2,499	1.2%
Cogen/Wind	0	666	666	0.3%
Diesel	41,682	114,182	72,500	34.4%
Hydro	98,670	109,437	10,767	5.1%
Landfill Gas	35,065	40,533	5,468	2.6%
Methane	235	1,026	791	0.4%
Natural Gas	87,068	146,181	59,113	28.1%
OBS	0	980	980	0.5%
Oil	8,450	8,663	213	0.1%
Other	2,411	7,871	5,461	2.6%
other-Bio Gas	0	300	300	0.1%
Wind	11,323	57,954	46,631	22.1%
Grand Total	289,732	499,948	210,216	99.8%

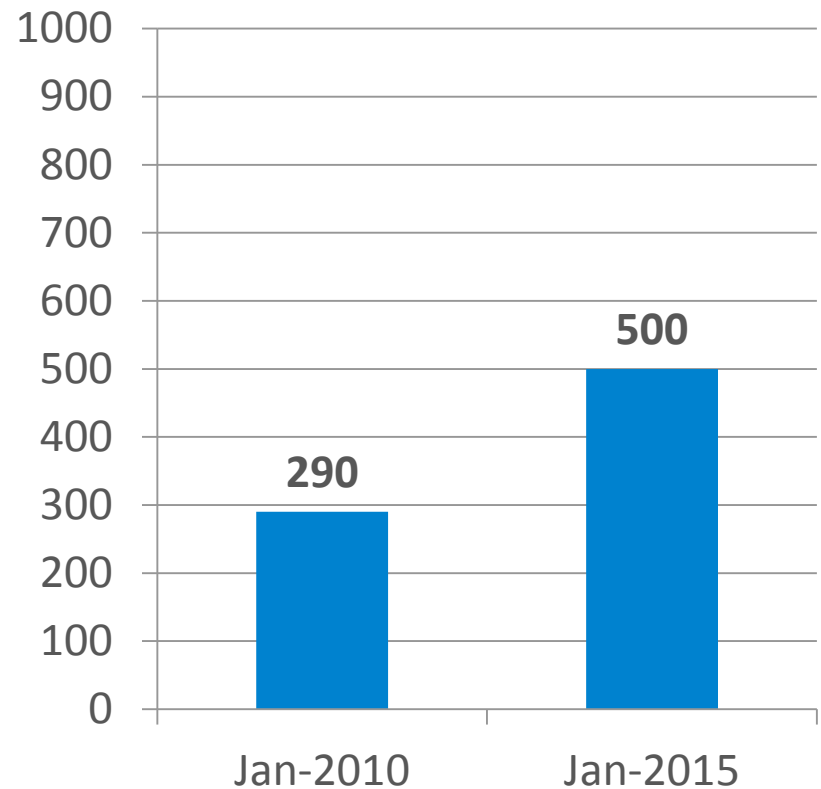
Three fuel types comprise 85% of 5-year growth of Non-PV DG resources

Non-PV DG Growth Not Nearly as Fast as PV

Solar PV Distributed Generation (MW)

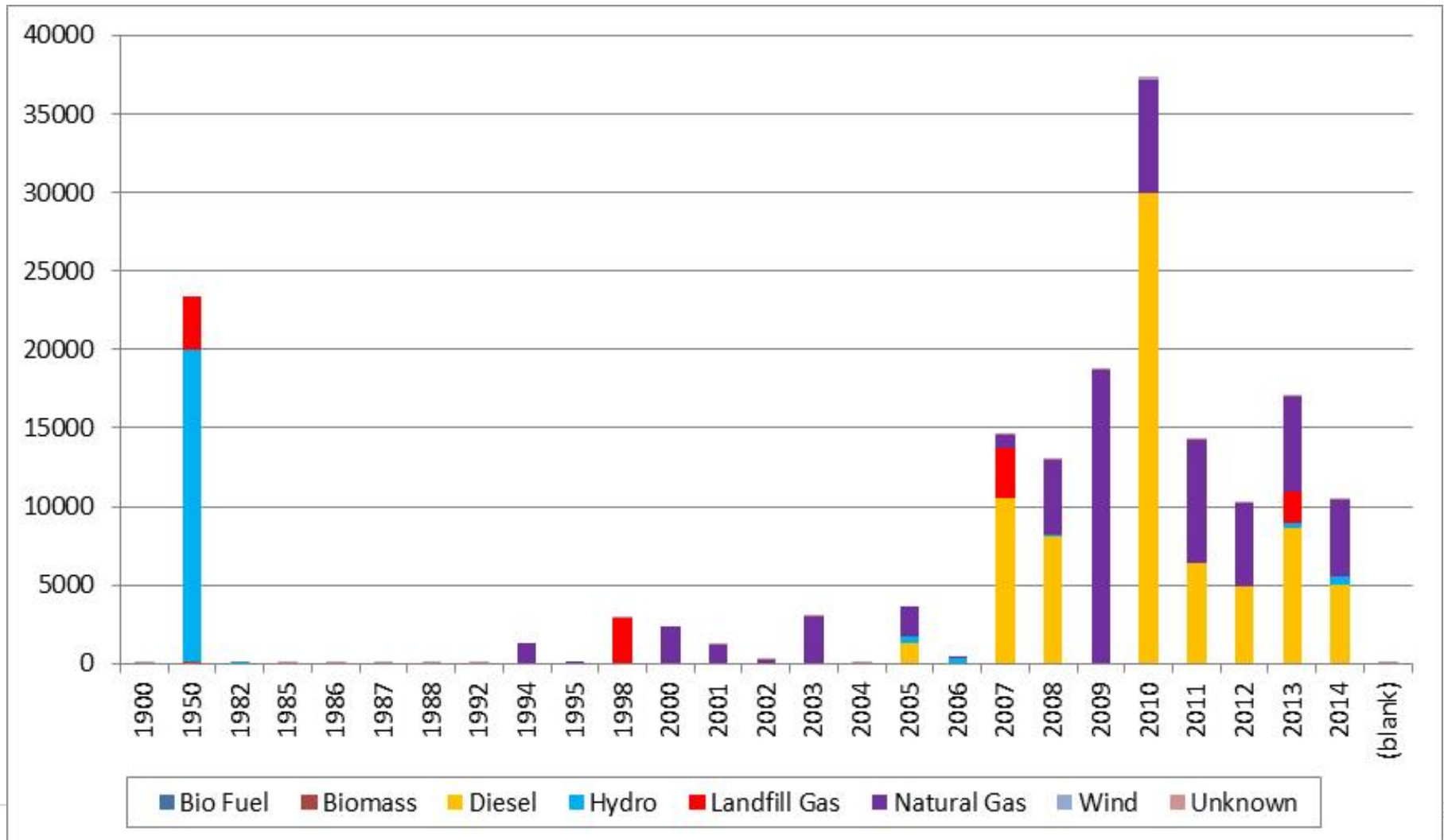


Non-PV Distributed Generation (MW)



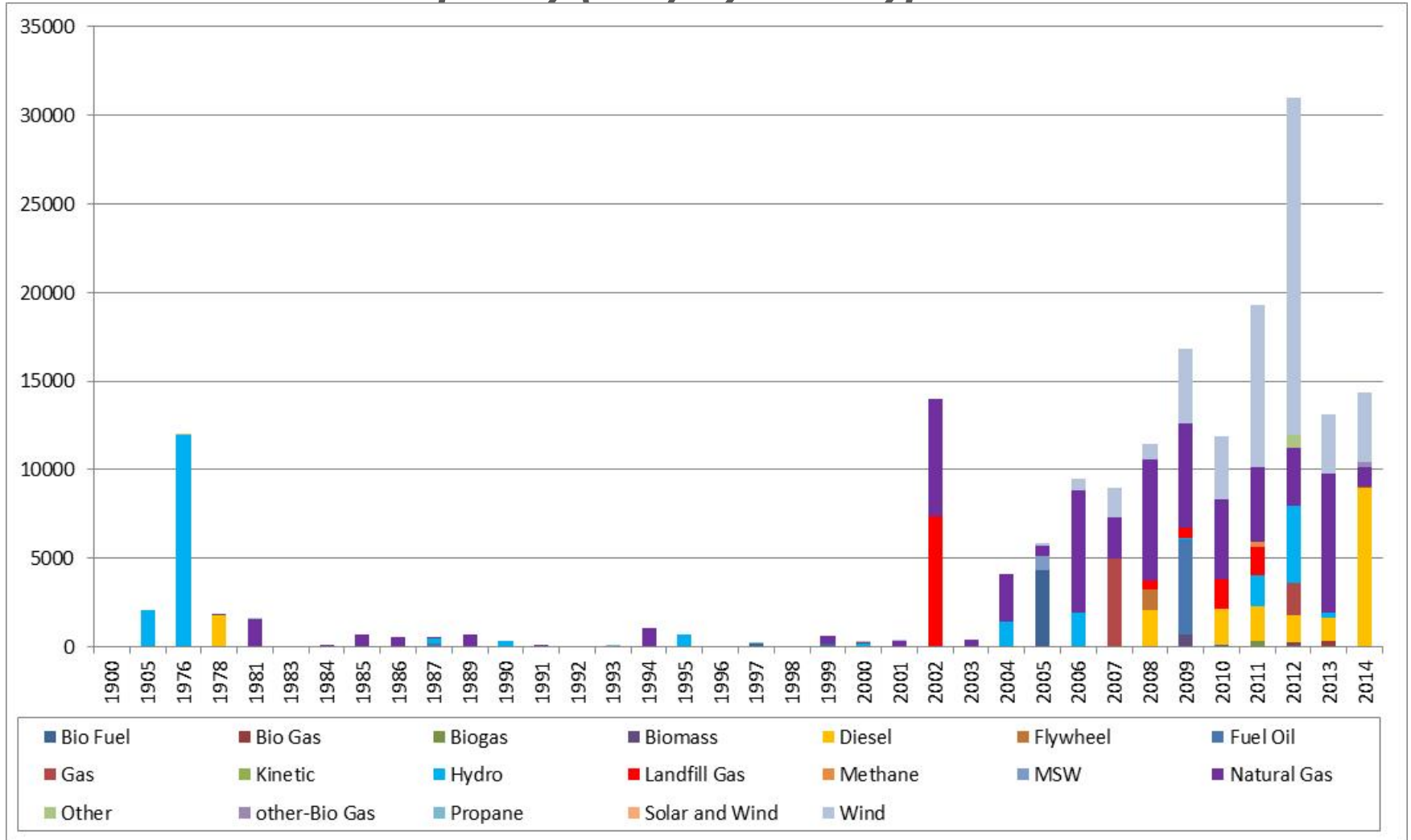
Connecticut Non-PV DG

Annual Installed Capacity (kW) by Fuel Type



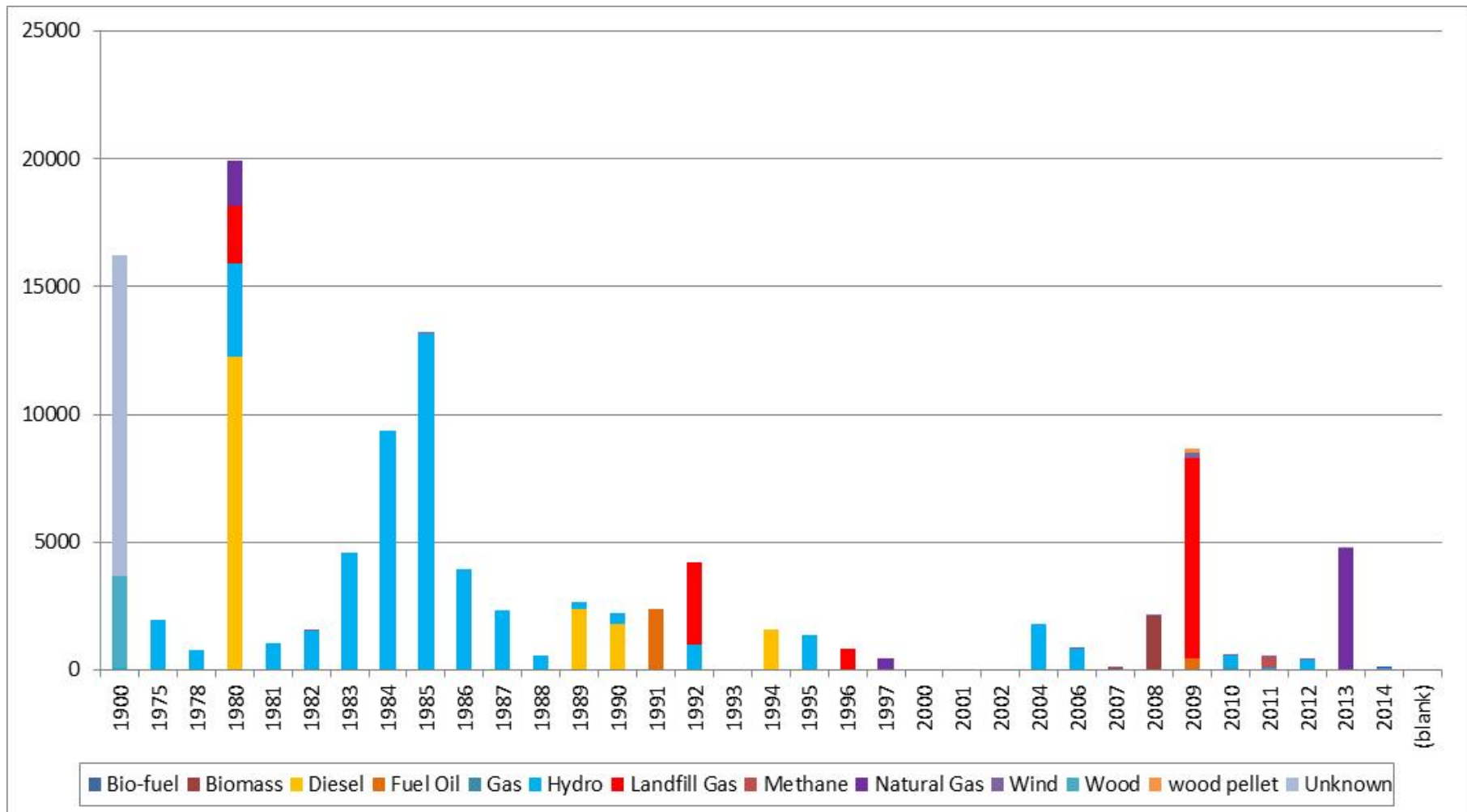
Massachusetts Non-PV DG

Annual Installed Capacity (kW) by Fuel Type



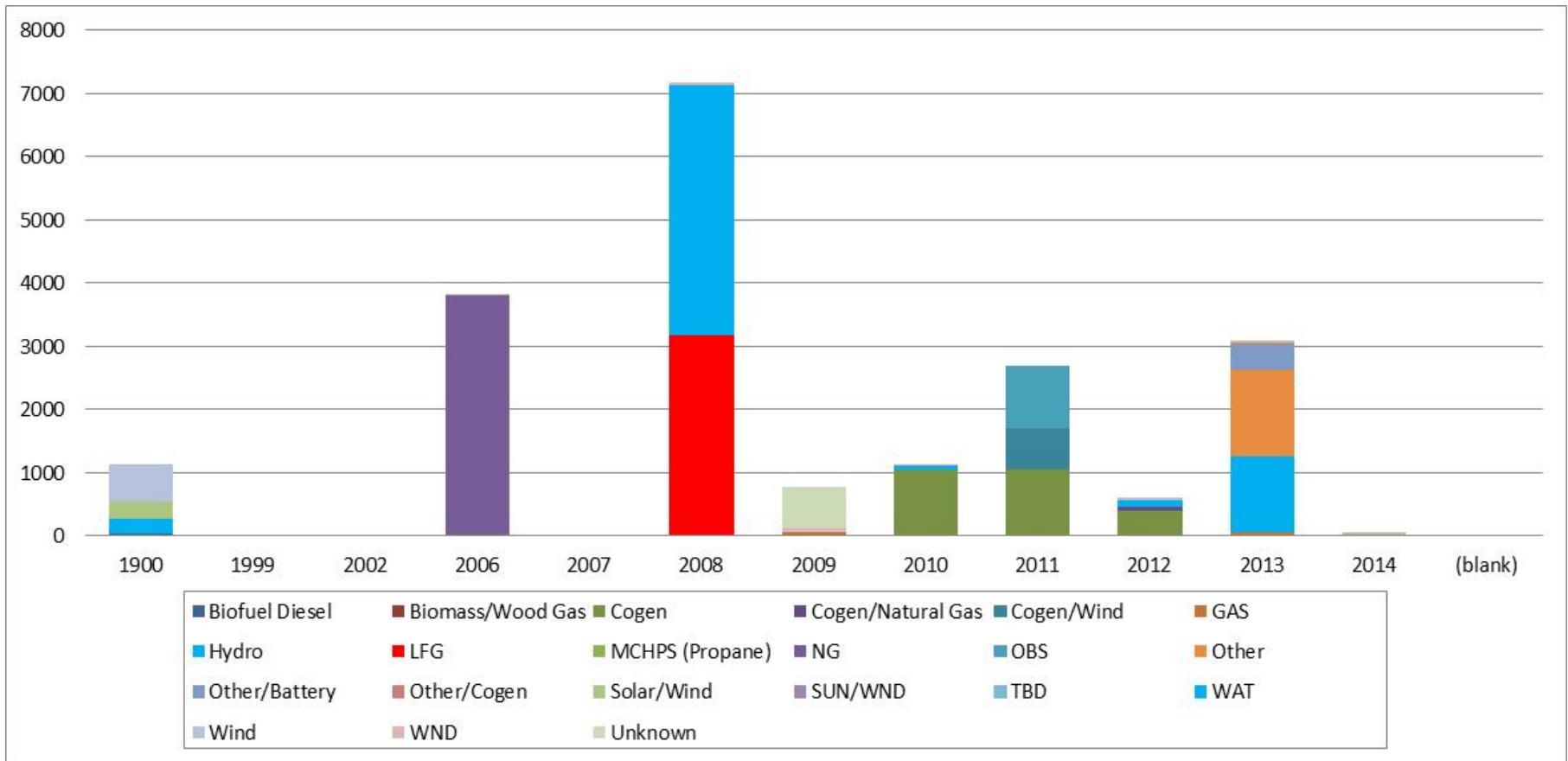
New Hampshire Non-PV DG

Annual Installed Capacity (kW) by Fuel Type



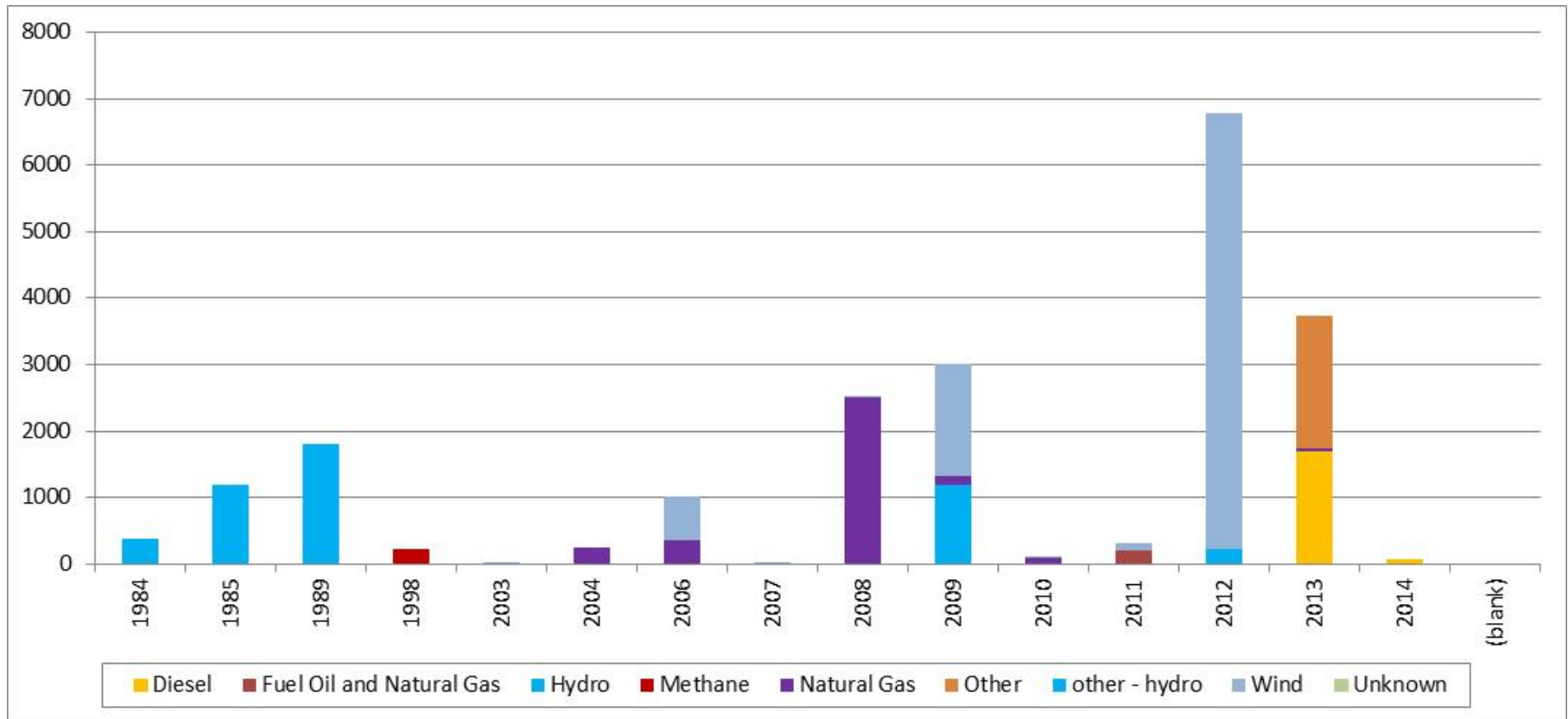
Maine Non-PV DG

Annual Installed Capacity (kW) by Fuel Type



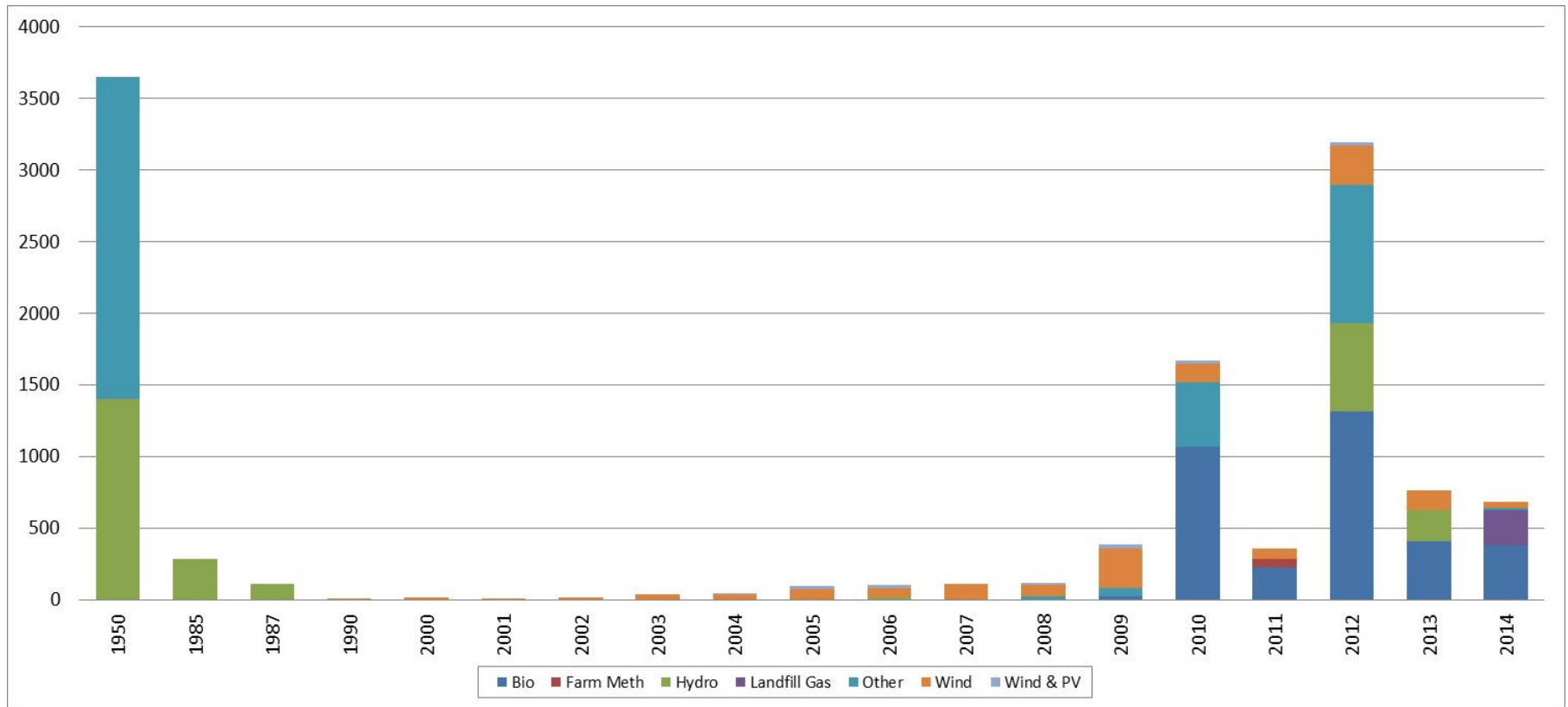
Rhode Island Non-PV DG

Annual Installed Capacity (kW) by Fuel Type



Vermont Non-PV DG

Annual Installed Capacity (kW) by Fuel Type



Summary of Findings Concerning Non-PV DG

- Recent growth of non-PV DG has been much more modest than that of PV/EE and encompasses an array of fuel/technology types
 - Approximately 210 MW of growth in last 5 years
 - Growth rate has been relatively consistent over the last 5 years
 - Many of these resources participate in wholesale markets
 - Incremental growth of behind-the-meter resources will continue to be picked up in load forecasts, as it becomes embedded in the load
 - Many state policies supporting growth of non-PV DG have several eligible technologies
- Therefore, for 2016, the DG forecast will continue to focus on PV resources
 - The ISO will continue to monitor growth of non-PV resources

Ongoing Data Collection Issues

- The overall results and trends are credible
 - Distribution utilities have provided invaluable assistance in addressing data queries and clarifying record gaps
- For PV data collection, continuing challenges include:
 - Errors in DC/AC nameplate reporting
 - Quality assurance errors in survey responses
 - Missing data for municipal and other public utility entities
- For non-PV data collection, issues are more involved:
 - Conflicting fuel and technology type definitions for projects
 - Incomplete project data (technology type, fuel type, size, in-service date, project status)
 - Quality assurance errors in survey responses
 - Missing data for municipal and other public utility entities
- ISO will continue working with the Distribution Owners to improve the data collection process

Questions



APPENDIX

Total Reported Capacity

Total Reported Installed Capacity Survey Results Includes Units > 5 MW

Values represent reported installed megawatt (MW) nameplate, interconnected and operational

	December 2013	December 2014	April 2015
Connecticut	478	615	618
Maine	19	20	37
Massachusetts	496	515	514
New Hampshire	268	300	300
Rhode Island	21	34	32
Vermont	11	12	16
New England Total	1,293	1,496	1,517

April 2015 Total Non-PV Reported Capacity by Distribution Owner *(includes units > 5 MW)*

State & Utility	Installed Capacity (MW)
Connecticut	618
Connecticut Light & Power	471
Connecticut Municipal Electric Energy Co-op	50
United Illuminating	98
Maine	37
Central Maine Power	8
Emera	29
Massachusetts	514
Chicopee Electric Light Department	18
National Grid	100
NSTAR	162
Shrewsbury Electric & Cable Operations	--
Unitil	23
Reading Municipal Lighting Plant	4
Western Massachusetts Electric Company	207
Other Municipals (Per MA SREC data)	---

April 2015 Total Non-PV Reported Capacity by Distribution Owner *(includes units > 5 MW)*(cont.)

State & Utility	Installed Capacity (MW)
New Hampshire	300
Liberty	0
New Hampshire Electric Co-op	0
Public Service of New Hampshire	267
Unitil	33
Rhode Island	32
National Grid	32
Vermont	16
Burlington Electric Department	0
Green Mountain Power	12
Vermont Electric Co-op	3
Vermont Public Power Supply Authority	0
Stowe Electric Department	0
Washington Electric Co-op	0
Other Municipals	1
New England Total	1,517

April 2015 Total Non-PV Reported Capacity (includes units >5MW) State-by-State

The table below reflects statewide aggregated Non-PV DG data provided to ISO by regional Distribution Owners. The values are installed nameplate as of 4/31/15.

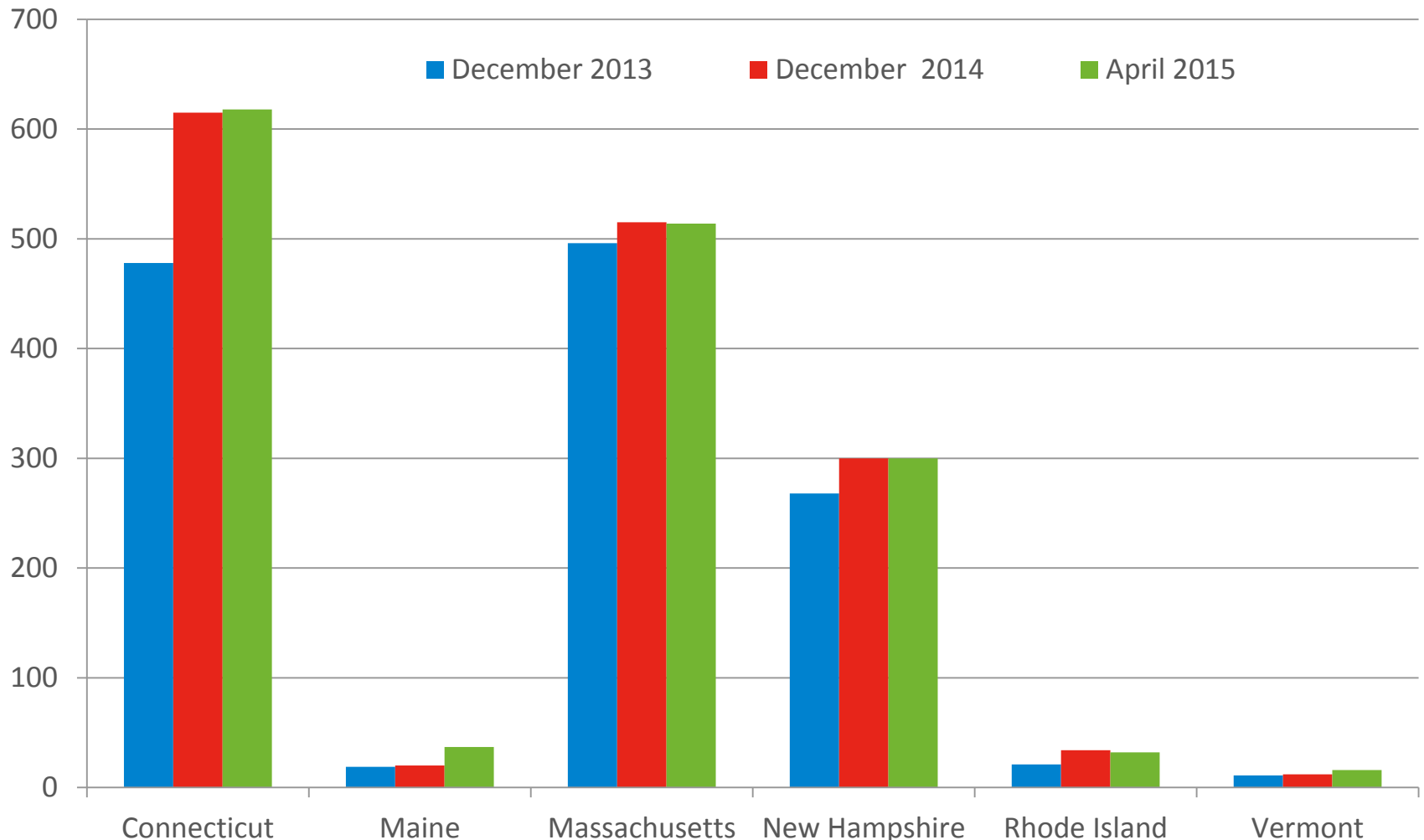
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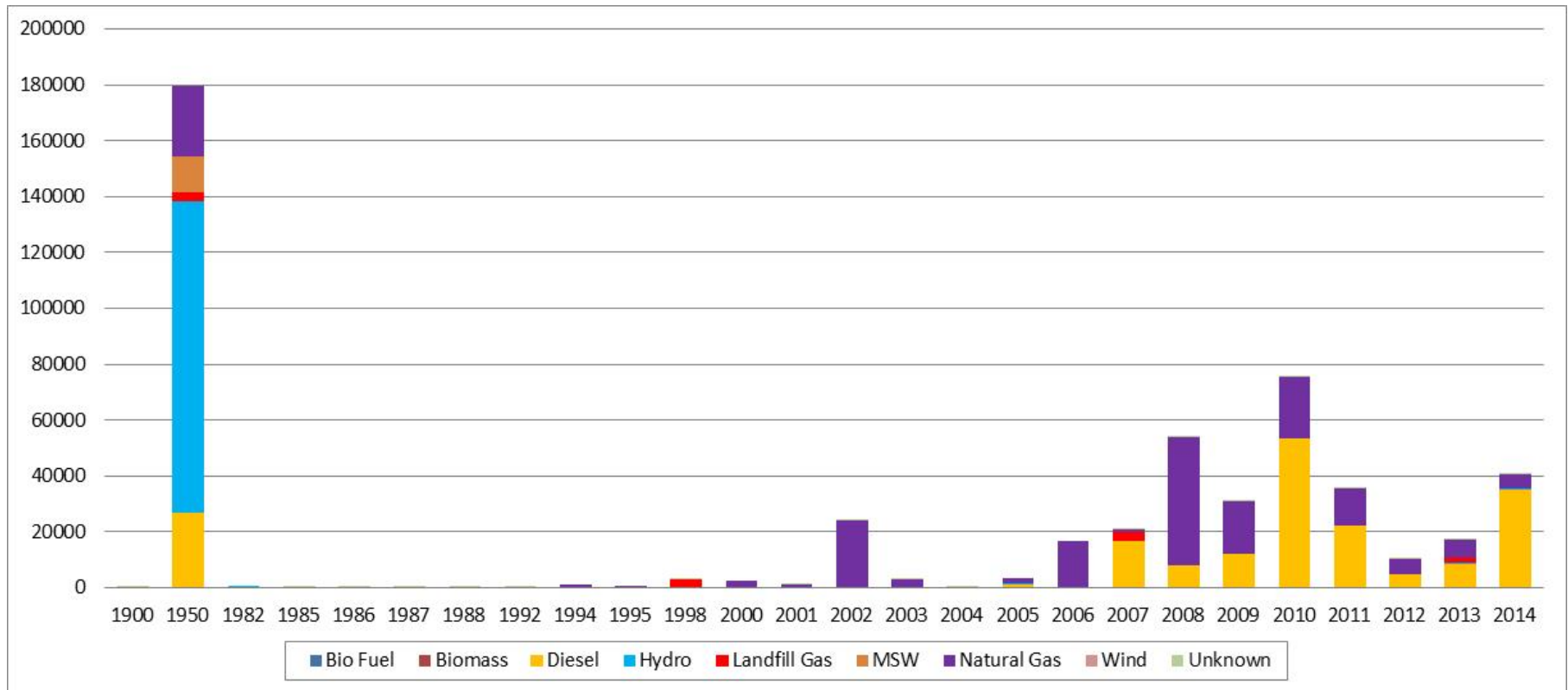
Non-PV DG data not available from municipal distribution utilities in several States



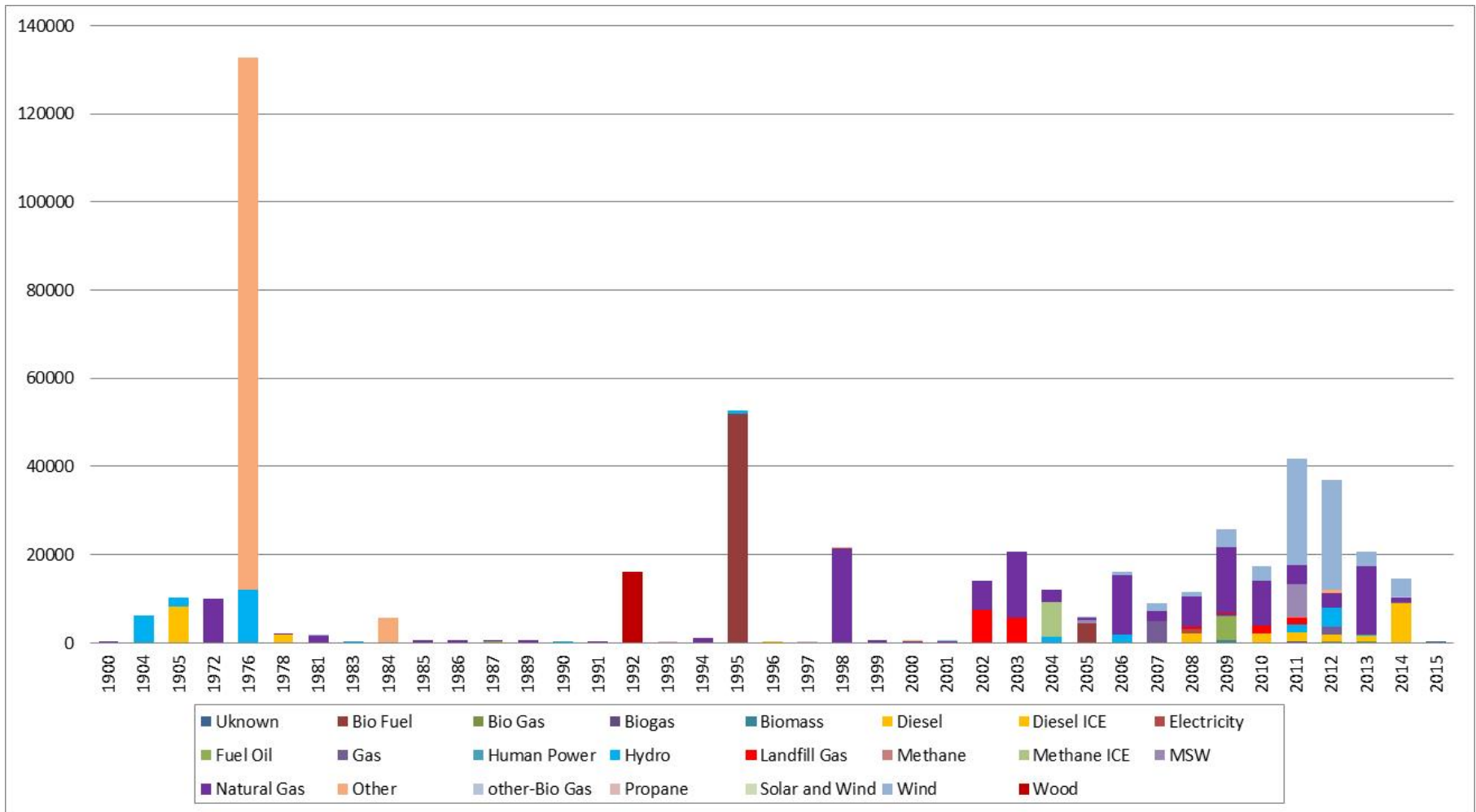
Total Non-PV Reported Capacity 2013-2015 YTD (MW) (includes units > 5 MW)



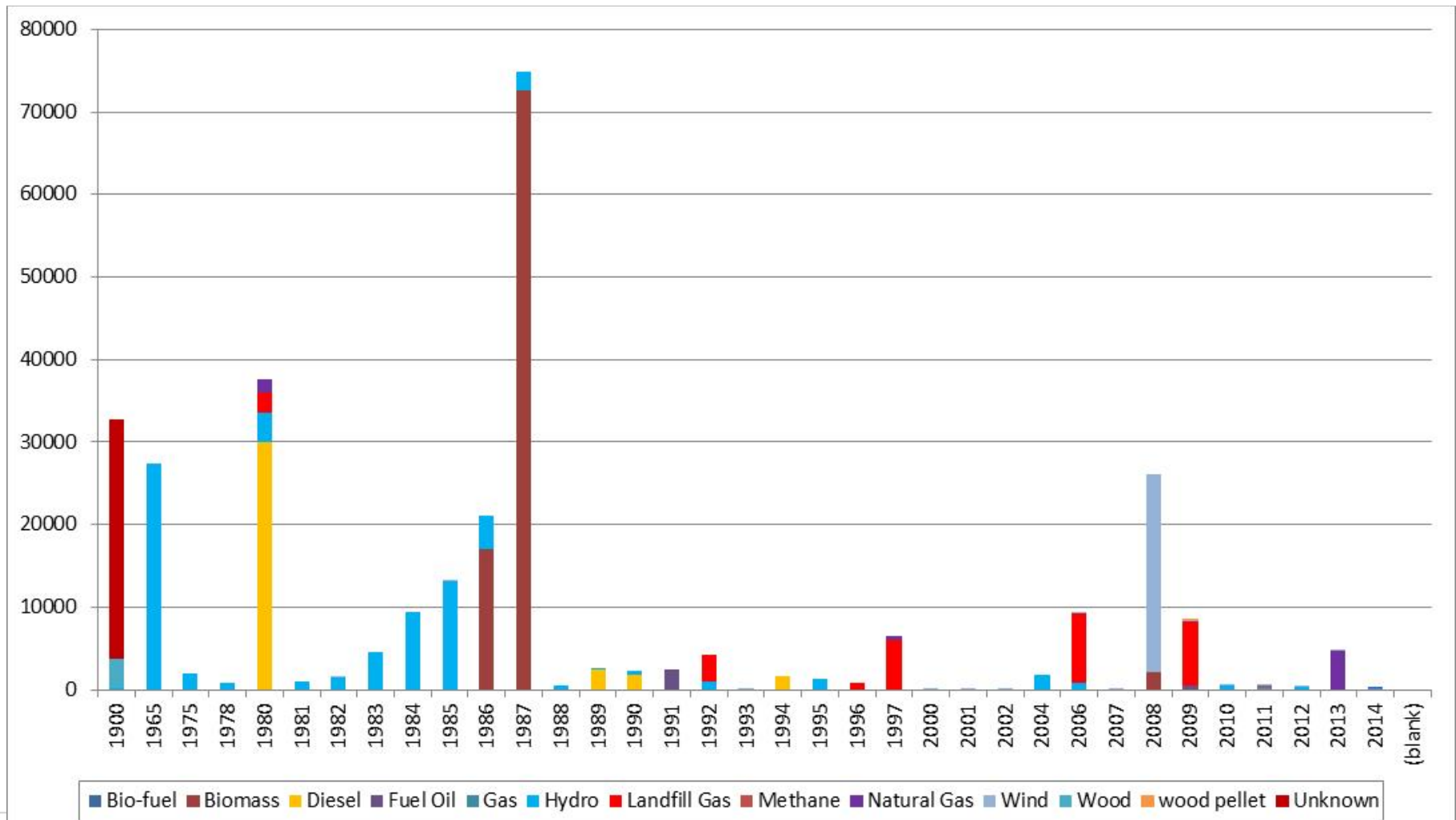
Connecticut Non-PV Annual Installed Capacity (kW) by Fuel Type (Includes units > 5 MW)



Massachusetts Non-PV Annual Installed Capacity (kW) by Fuel Type (Includes units > 5 MW)



New Hampshire Non-PV Annual Installed Capacity (kW) by Fuel Type (Includes units > 5 MW)



Rhode Island Non-PV Annual Installed Capacity (kW) by Fuel Type (Includes units > 5 MW)

