2018 RPS REVIEW:

PUBLIC STAKEHOLDER KICK-OFF MEETING

PUBLIC UTILITIES COMMISSION
APRIL 16, 2018

AGENDA

- Welcome and Introductions
- CESA: State RPS Efforts: Current Status and Trends
- New Hampshire's RPS: Overview and Status
- 2018 RPS Review: Process & Timeline
- Next Steps

STATE RPS EFFORTS: CURRENT STATUS & TRENDS

WARREN LEON
CLEAN ENERGY STATES ALLIANCE
APRIL 16, 2018

NEW HAMPSHIRE'S RPS: OVERVIEW AND STATUS

KAREN CRAMTON
NEW HAMPSHIRE PUBLIC UTILITIES COMMISSION
SUSTAINABLE ENERGY DIVISION
APRIL 16, 2018

NEW HAMPSHIRE'S RENEWABLE PORTFOLIO STANDARD (RPS)

- Renewable energy policy was established in 2007 (RSA 362-F)

- The purpose of this renewable energy policy is to:
  - Provide **fuel diversity**
  - Utilize renewable fuels **sourced locally**
  - **Retain energy and investment dollars within the state** to benefit New Hampshire's economy
  - **Lower the need to use fossil fuels** for power generation and thermal purposes
  - Provide the potential to **lower and stabilize future energy and transmission costs**
  - Reduce emissions thereby providing **environmental and health benefits** by **i**mproving air quality and public health

- Established portfolio requirements for new (Class I & II) and existing (Class III & IV) sources
- Goal 25.2% energy by 2025

2018 RPS REVIEW – REQUIREMENTS (RSA 362-F: 5)

I. **Adequacy or potential adequacy of sources to class requirements;**

II. **The class requirements of all sources in light of existing and expected market conditions;**

III. **Potential for addition of a thermal energy component;**

IV. **Increasing the class requirements relative to classes I and II beyond 2025;**

V. **Possible introduction of any new classes such as an energy efficiency class or the consolidation of existing ones;**

VI. **Timeframe and manner in which new renewable class I and II sources might transition to existing renewable sources and how new and existing sources requirements might be adjusted;**

2018 RPS REVIEW – REQUIREMENTS (RSA 362-F: 5)

VII. Evaluation of the benefits and risks of using multi-year purchase agreements for REC (with purchased power), in consideration of the restructuring policy principles of RSA 374-F:3;

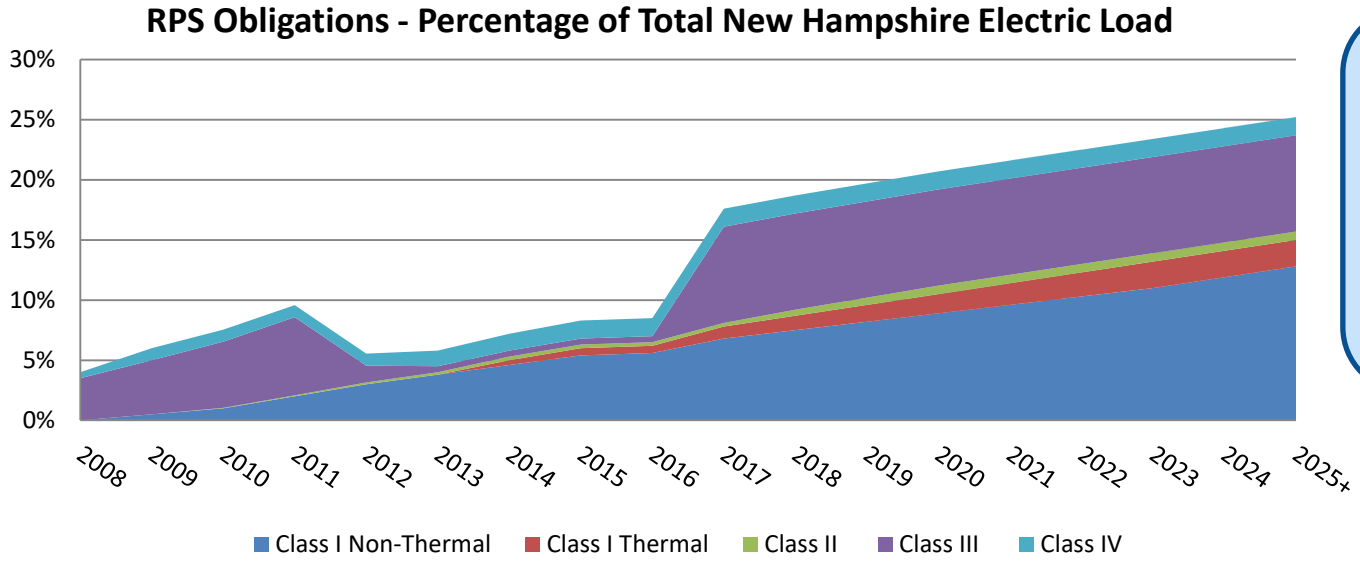
VIII. Alternative methods for renewable portfolio standard compliance, such as competitive procurement through a centralized entity; and

IX. Distribution of the renewable energy fund.

Report Due: November 1, 2018

Submitted to: General Court

RPS REQUIREMENTS



Electric Supplier RPS Obligations

Obligations calculated as a percentage of annual retail load (sales)

Basic Class Definitions

- Class I
  - New Renewable
  - New Useful Thermal
  - Production of Biodiesel
- Class II – New Solar
- Class III
  - Existing Biomass
  - Existing Methane
- Class IV - Existing Hydro

Renewable Portfolio Standard Obligations							
Calendar Year	Total RPS Requirement	Class I Non-Thermal	Class I Thermal	Total Class I	Class II	Class III	Class IV
2008	**4.00%**	0.00%	0.00%	0.00%	0.00%	3.50%	0.50%
2009	**6.00%**	0.50%	0.00%	0.50%	0.00%	4.50%	1.00%
2010	**7.54%**	1.00%	0.00%	1.00%	0.04%	5.50%	1.00%
2011	**9.58%**	2.00%	0.00%	2.00%	0.08%	6.50%	1.00%
2012	**5.55%**	3.00%	0.00%	3.00%	0.15%	1.40%	1.00%
2013	**5.80%**	3.80%	0.00%	3.80%	0.20%	0.50%	1.30%
2014	**7.20%**	4.60%	0.40%	5.00%	0.30%	0.50%	1.40%
2015	**8.30%**	5.40%	0.60%	6.00%	0.30%	0.50%	1.50%
2016	**8.50%**	5.60%	0.60%	6.20%	0.30%	0.50%	1.50%
2017	**17.60%**	6.80%	1.00%	7.80%	0.30%	8.00%	1.50%
2018	**18.70%**	7.50%	1.20%	8.70%	0.50%	8.00%	1.50%
2019	**19.70%**	8.20%	1.40%	9.60%	0.60%	8.00%	1.50%
2020	**20.70%**	8.90%	1.60%	10.50%	0.70%	8.00%	1.50%
2021	**21.60%**	9.60%	1.80%	11.40%	0.70%	8.00%	1.50%
2022	**22.50%**	10.30%	2.00%	12.30%	0.70%	8.00%	1.50%
2023	**23.40%**	11.00%	2.20%	13.20%	0.70%	8.00%	1.50%
2024	**24.30%**	11.90%	2.20%	14.10%	0.70%	8.00%	1.50%
2025 and thereafter	**25.20%**	12.80%	2.20%	15.00%	0.70%	8.00%	1.50%

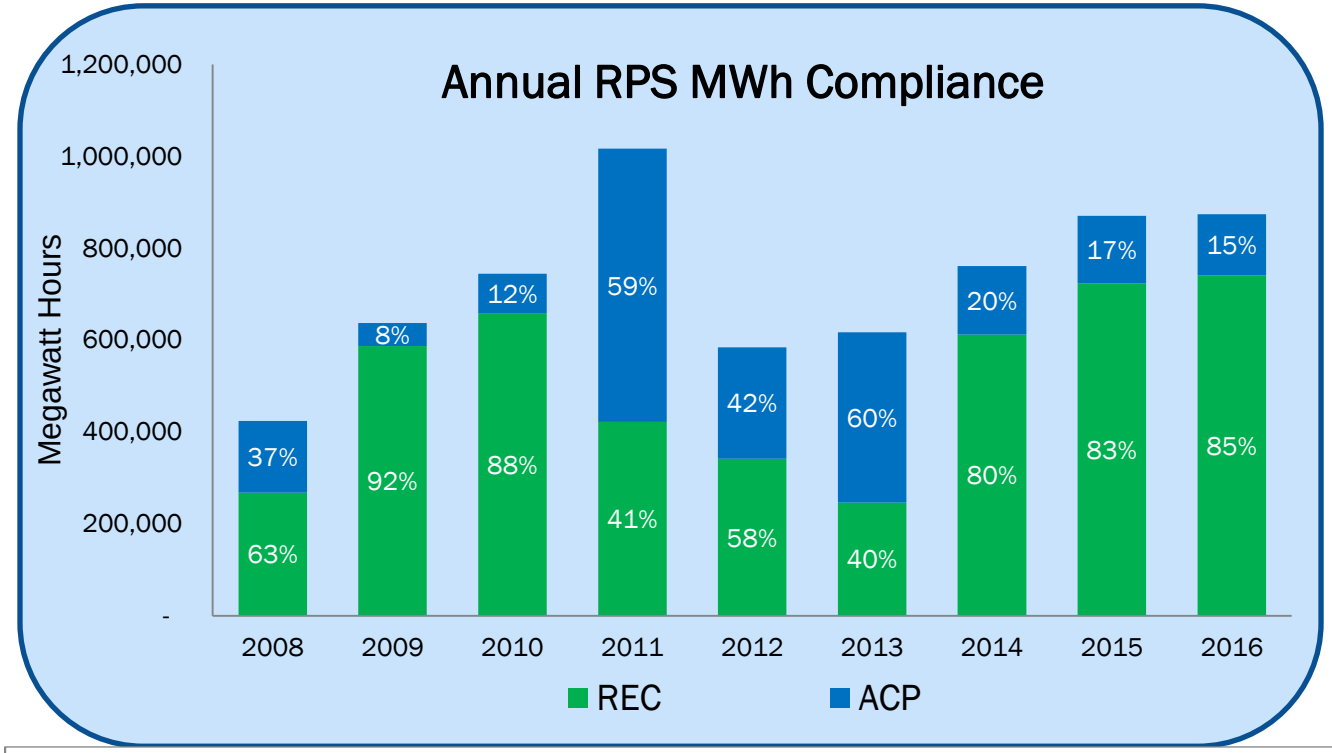
ALTERNATIVE COMPLIANCE (ACP) RATES

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Class I	$ 58.58	$ 60.92	$60.93	$ 62.13	$ 64.02	$ 55.00	$ 55.37	$ 55.75	$ 55.72	$ 56.02	$ 56.54
Class I Thermal						$ 25.00	$ 25.17	$ 25.34	$ 25.33	$ 25.46	$ 25.69
Class II	$ 153.85	$ 159.98	$ 160.01	$ 163.16	$ 168.13	$ 55.00	$ 55.37	$ 55.75	$ 55.72	$ 56.02	$ 56.54
Class III	$ 28.72	$ 29.86	$ 29.87	$ 30.46	$ 31.39	$ 31.50	$ 31.93	$ 45.00	$ 45.00	$ 45.00	$ 55.00
Class IV	$ 28.72	$ 29.86	$ 29.87	$ 30.46	$ 31.39	$ 26.50	$ 26.86	$ 27.23	$ 27.20	$ 27.49	$ 28.00

1 Megawatt-hour (MWh) of generation = 1 Renewable Energy Certificate (REC)

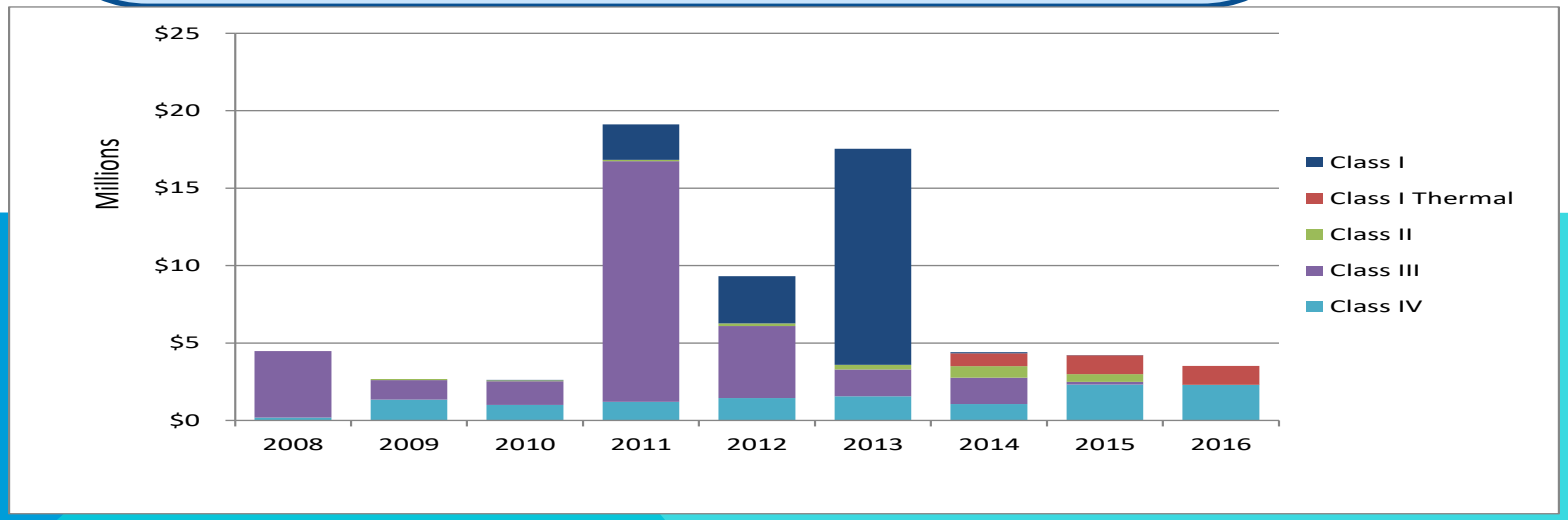
1 Alternative Compliance Payment (ACP) is equivalent to 1 REC

RPS COMPLIANCE



RPS Compliance

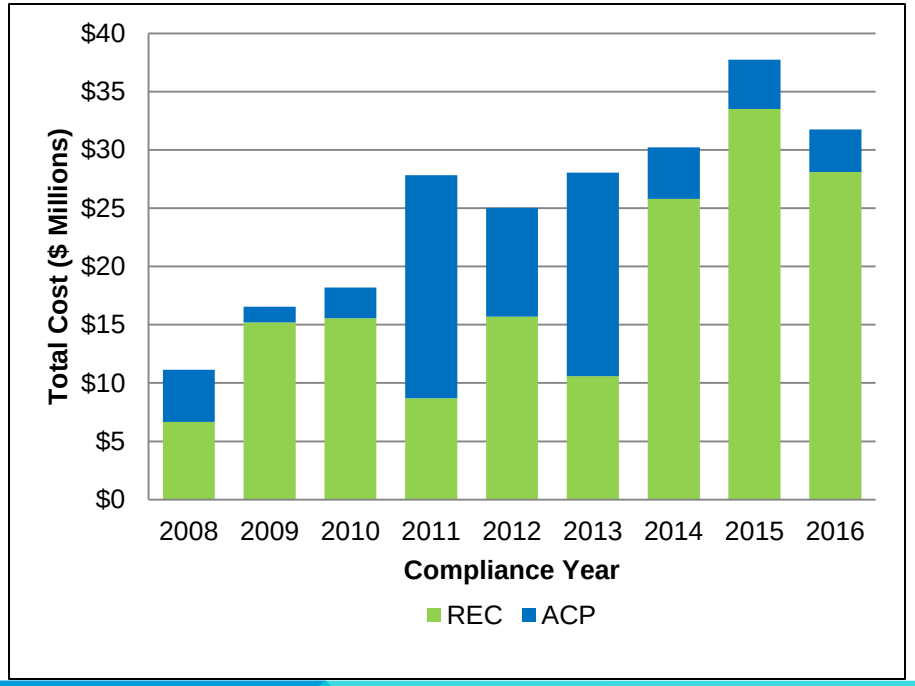
Obligations are satisfied by electricity providers purchasing Renewable Energy Certificates (REC) or making Alternative Compliance Payments (ACP)



Annual ACPs by Class

RPS COMPLIANCE COSTS & AVERAGE RATE IMPACT

RPS Compliance Costs



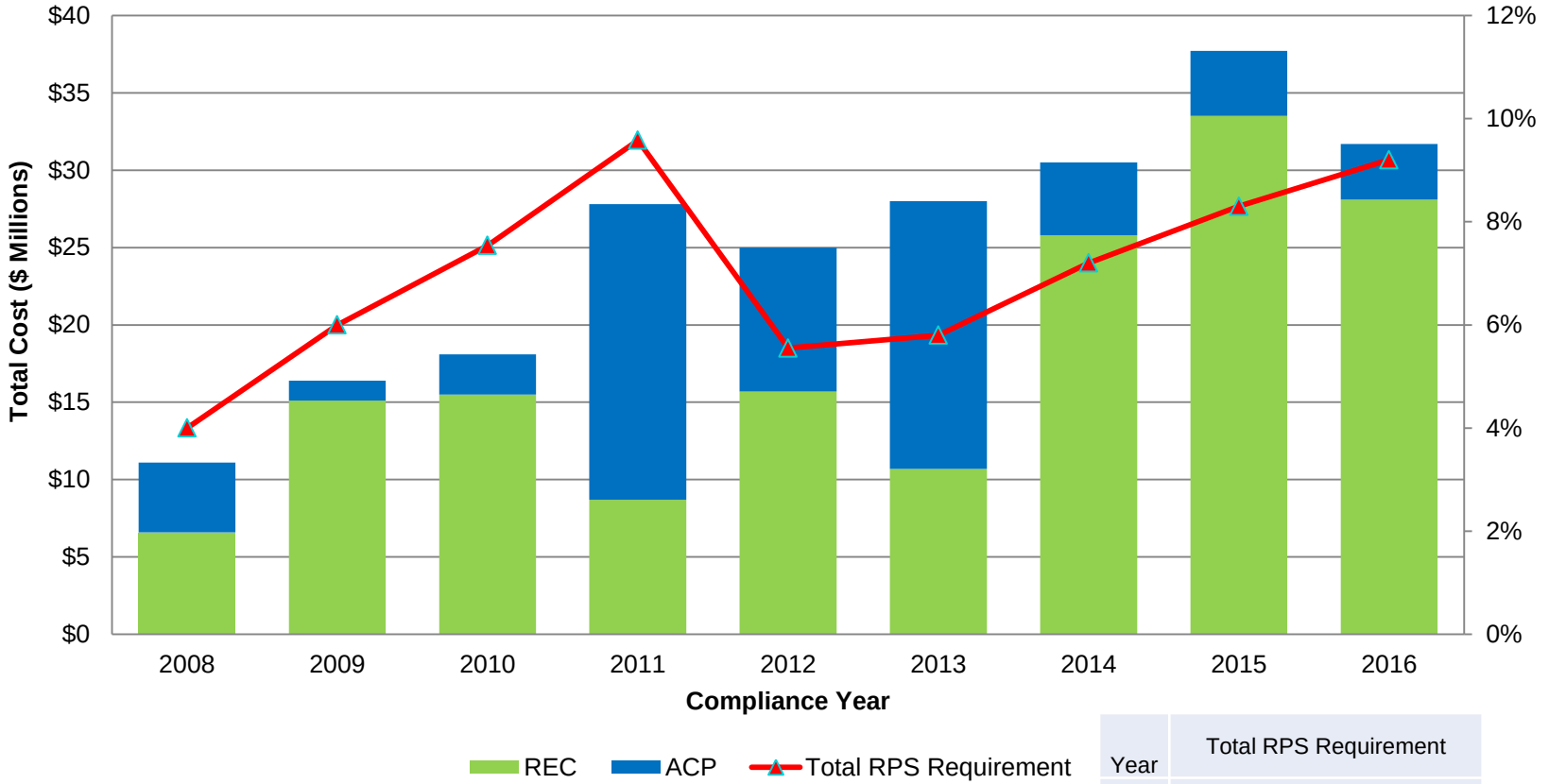
Total RPS Cost = Total REC Costs + Total ACP Costs

RPS Costs and Average Rate Impact (Costs in $ Millions)

Compliance Year	Total RPS Compliance Cost ($ Millions)	Average per kWh Rate Impact
2008	$11.1	$0.0011
2009	$16.4	$0.0016
2010	$18.1	$0.0017
2011	$27.8	$0.0026
2012	$25.0	$0.0023
2013	$28.1	$0.0026
2014	$30.5	$0.0028
2015	$37.7	$0.0035
2016	$31.7	$0.0030

Average Rate Impact from 2008 to 2016
$0.0023 per kWh

RPS COMPLIANCE COSTS



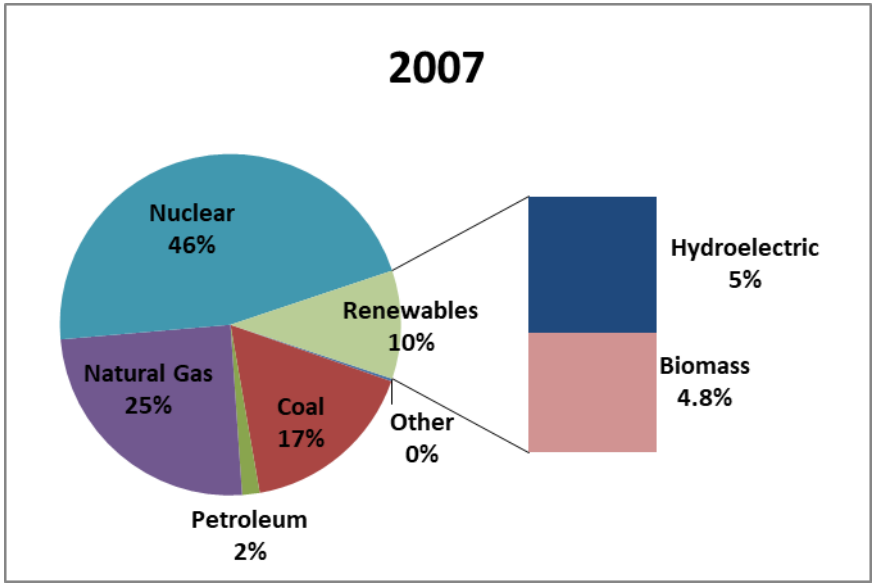
Year	Total RPS Requirement
2008	4.00%
2009	6.00%
2010	7.54%
2011	9.58%
2012	5.55%
2013	5.80%
2014	7.20%
2015	8.30%
2016	9.20%
2017	17.6%

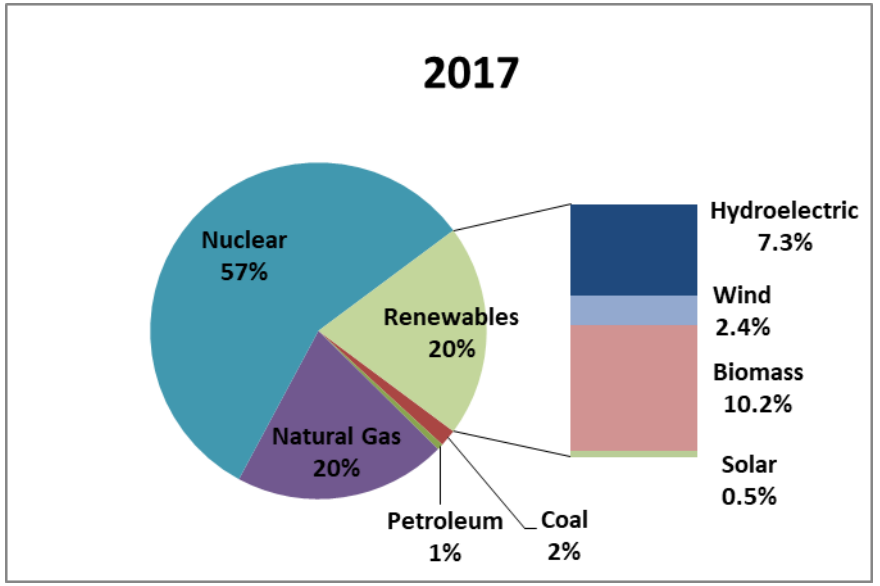
Factors Impacting Annual RPS Compliance Costs:

- Compliance Requirement
- ACP Price (set in statute, adjusted annually by CPI or 50% CPI
- REC Certified Capacity and Supply of RECs
- NH RPS Policy Changes (e.g. SB129)
- Regional RPS Policy Changes
- Regional ACP Prices
- Regional RPS Class Definitions

ELECTRICITY GENERATION IN NEW HAMPSHIRE

Electricity Generation from Facilities Located in New Hampshire





Source: U.S. Energy Information Administration, YTD Electric Power, 2007 & 2017

RENEWABLE ENERGY FUND (REF) PROGRAMS & OPPORTUNITIES FOR RATEPAYERS

Renewable Energy Fund (REF) Supported Programs

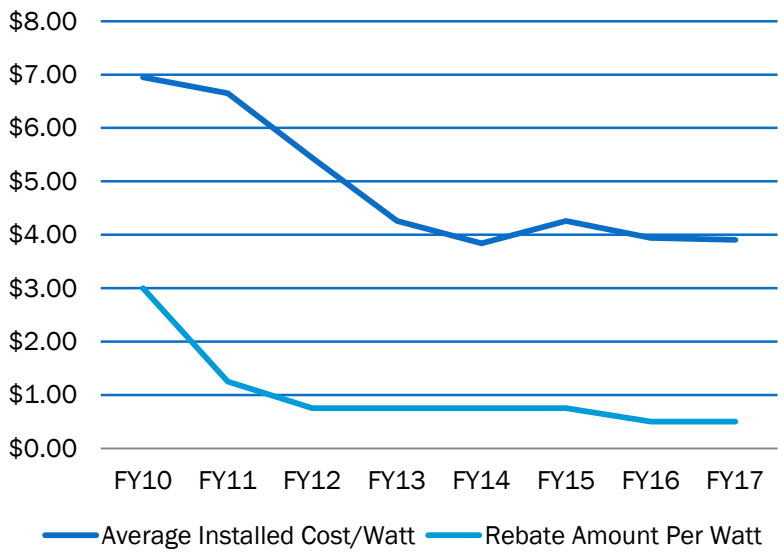
- Residential PV/Wind Rebate Program
- Residential Solar Hot Water Rebate Program
- Residential Wood Pellet Heating System Rebate Program
- Low and Moderate Income Solar PV Program (beginning Fiscal Year 2018)
- Commercial & Industrial PV/SHW Rebate Program
- Commercial & Industrial Wood Pellet Heating System Rebate Program
- Competitive Grant Program - Request for Proposals

ACP Revenue to REF

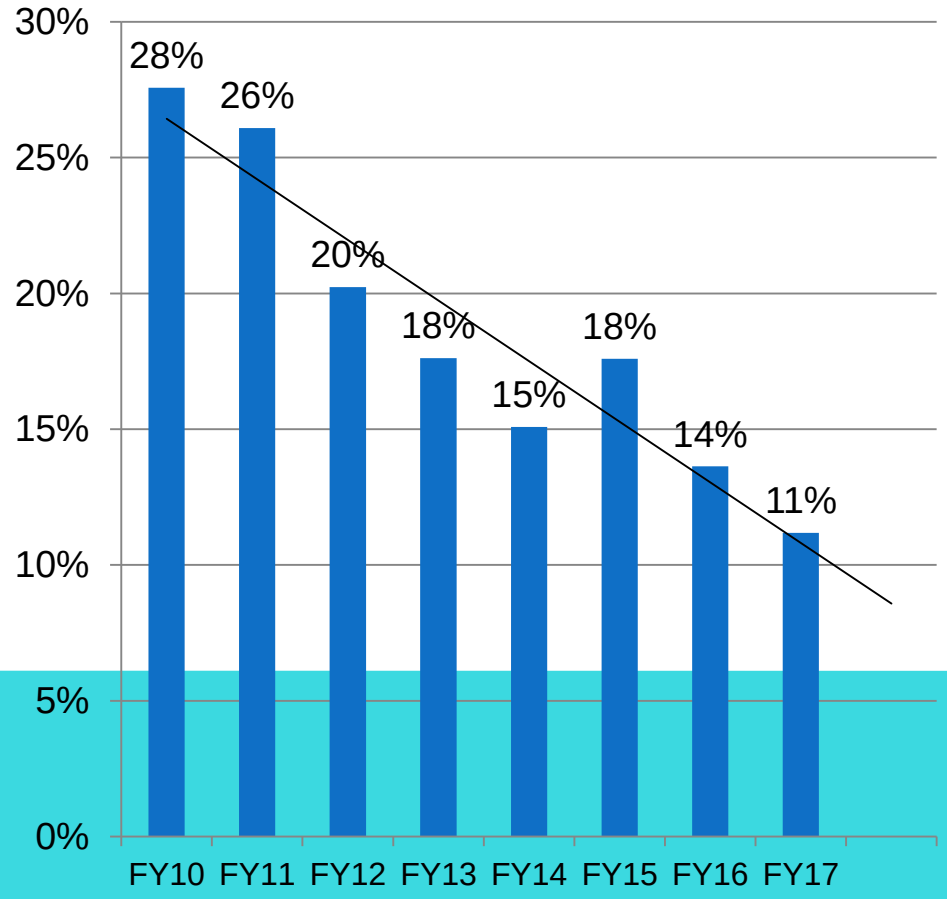
Calendar Year	Total ACP Revenue
2008	$ 4,483,917
2009	$ 1,348,294
2010	$ 2,625,499
2011	$ 19,121,853
2012	$ 9,323,198
2013	$ 17,458,196
2014	$ 4,406,804
2015	$ 4,224,339
2016	$ 3,633,342

RESIDENTIAL SOLAR AND WIND REBATE PROGRAM

Comparison of Installed System Cost and Rebate Amount *(per Watt)*



Average Rebate as Percentage of Average Total Installed System Cost



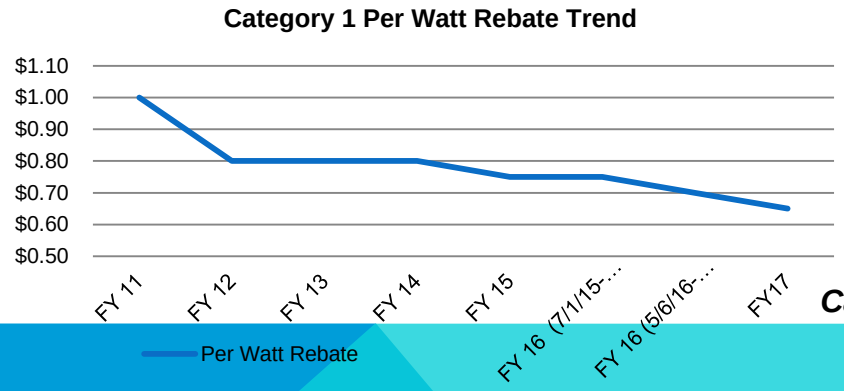
Program Results

- Interconnected Residential PV ~24 MW
- Estimated Annual Generation ~31 MWh

COMMERCIAL & INDUSTRIAL SOLAR REBATE PROGRAM

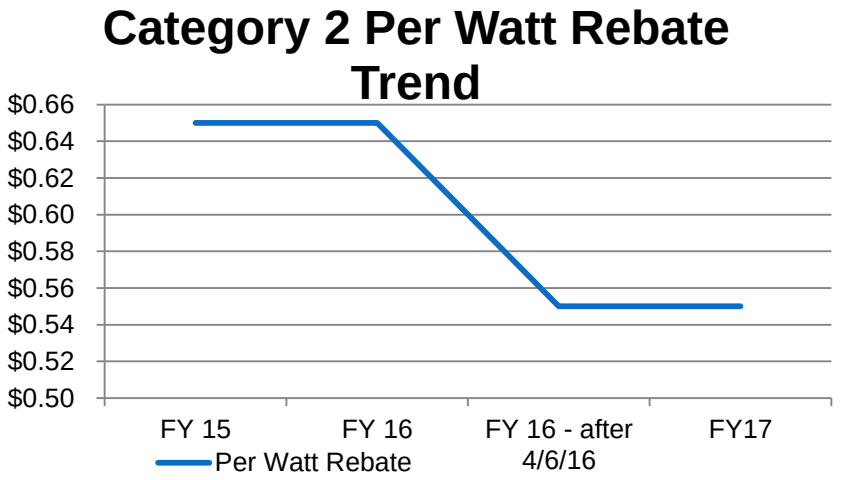
Category 1: Systems <= 100 kW

Fiscal Year	Per Watt Rebate
FY 11	$ 1.00
FY 12	$ 0.80
FY 13	$ 0.80
FY 14	$ 0.80
FY 15	$ 0.75
FY 16 (7/1/15-5/5/16)	$ 0.75
FY 16 (5/6/16-6/30/16)	$ 0.70
FY17	$ 0.65
FY18 (3/8/18)	$ 0.40



Category 2: Systems > 100 kW and <= 500 kW

Fiscal Year	Per Watt Rebate
FY 15	$ 0.65
FY 16	$ 0.65
FY 16 – after 4/6/16	$ 0.55
FY17	$ 0.55
FY18 (3/8/18)	$ 0.40



Category 1 & 2 - All rebates capped at maximum 25% of total cost.

Program Results

- Interconnected C&I PV ~11.3 MW (328 systems)
- Estimated Annual Generation ~15.2 MWh

General Trends

- System cost per watt has declined since program inception
- Rebate Amount per watt has declined

RENEWABLE ENERGY FUND (REF) REBATE PROGRAM RESULTS CUMULATIVE THROUGH JUNE 30, 2017

REF Rebate Program	Number of Rebates Awarded	Funds Disbursed	Aggregate Applicant Investment (*rounded to nearest thousand*)
Residential Electrical Renewable Energy (PV and Wind)	3,783	$12,665,650	$103,908,000
Residential Solar Water Heating	489	$1,004,900	$3,280,000
Residential Wood Pellet Boiler/Furnace*	328	$1,912,903	$4,182,000
C&I Solar Technologies (Electric and Thermal)	380	$7,537,282	$39,717,000
C&I Wood Pellet Boiler/Furnace	48	$1,382,880	$4,644,000
TOTALS	**5,028**	**$24,536,015**	**$155,731,000**

Rebate Program Leveraging Ratio > 6:1

*Includes ARRA funded projects

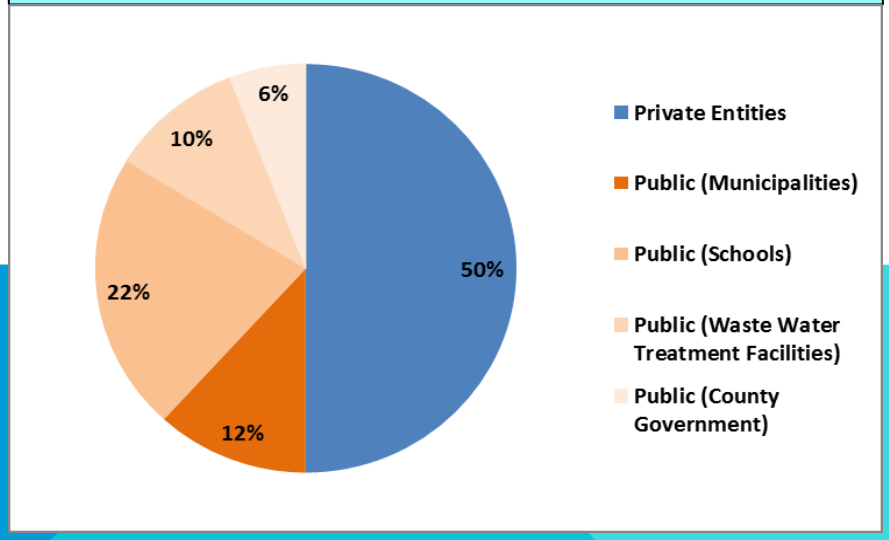
COMMERCIAL & INDUSTRIAL COMPETITIVE GRANT PROGRAM AWARDS (2011-2016)

REF Grant Program	Number of Grants Awarded	Total Grant Amount	Total Value of Projects
2011	4	$650,890	$1,280,923
2012	6	$654,750	$4,035,424
2013	9	$3,637,890	$28,888,905
2014	5	$2,107,199	7,683,400
2015	4	$1,025,000	$2,927,000
2016	6	$1,272,425	$6,106,790
Totals	**34**	**$9,348,154**	**$50,922,442**

Grant Program Leveraging Ratio > 5:1

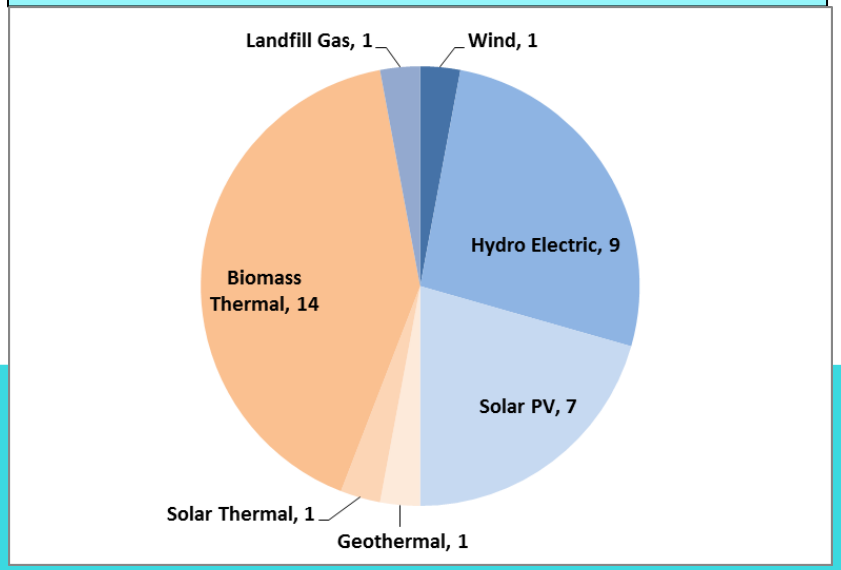
Grant Award Recipients

Private Entities in blue
Public Entities in oranges

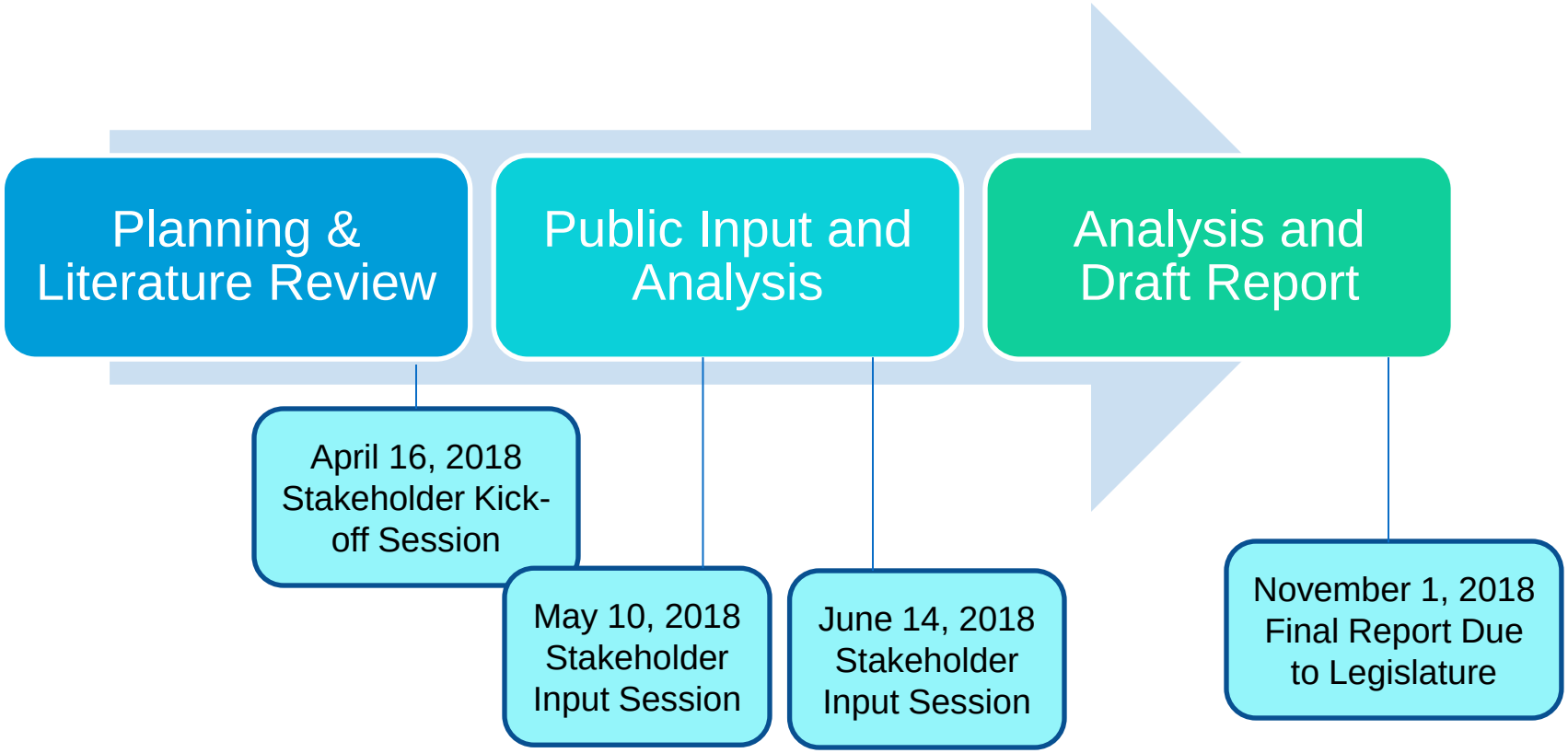


Grgrants by Technology

Electricity Generation in blues
Thermal Generation in oranges



2018 RPS REVIEW: PROCESS AND TIMELINE



NEW HAMPSHIRE SPECIFIC RPS REVIEW MAY 10TH STAKEHOLDER SESSION

RPS Targets and Classes (RSA 362-F:5 I-VI)

- **Adequacy of current/ potential sources to meet class requirements (I)**
- **Class requirements of all sources in light of existing and expected market conditions (II)**
- **Potential for addition of a thermal energy component to the electric RPS (III)**
- **Increasing the class requirements relative to class I and II beyond 2025 (IV)**
- **Increasing the class requirements relative energy efficiency class or the consolidation of existing ones (V)**
- **Timeframe and manner I which new renewable class I and II sources might transition to and be treated as existing renewable source, and if appropriate how corresponding portfolio standards of new and existing sources might be adjusted (VI)**

NEW HAMPSHIRE SPECIFIC RPS REVIEW JUNE 14TH STAKEHOLDER SESSION

RPS Targets and Classes (RSA 362-F:5 VII-IX)

- **Evaluation of the benefits and risks of using multi-year purchase agreements for REC (with purchased power), in consideration of the restructuring policy principles of RSA 374-F:3 (VII)**
- **Alternative methods for renewable portfolio standard compliance, such as competitive procurement through a centralized entity (VIII)**
- **Distribution of the renewable energy fund (IX)**

NEW HAMPSHIRE SPECIFIC RPS REVIEW MISCELLANEOUS TOPICS – JUNE OR ADDITIONAL MEETING?

- **SB51 – RPS Study Committee:**
  - Final Report of the RPS Study Committee (SB 51, Chapter 81:1, Laws of 2017), page 5.
  - Cost/benefit analysis of the New Hampshire RPS to address the SB 51 Study Committee final report.
- **RPS Retrospective Comments:**
  - The use of the RPS:
    - To enhance Grid Modernization
    - To encourage Peak Load Reduction
  - Determine the potential of storage technologies to assist in the RPS policy goals, grid modernization objectives and peak load reductions targets

    Harmonization of New England-area RPS policies

CONTACTS & STAKEHOLDER INPUT

Website:

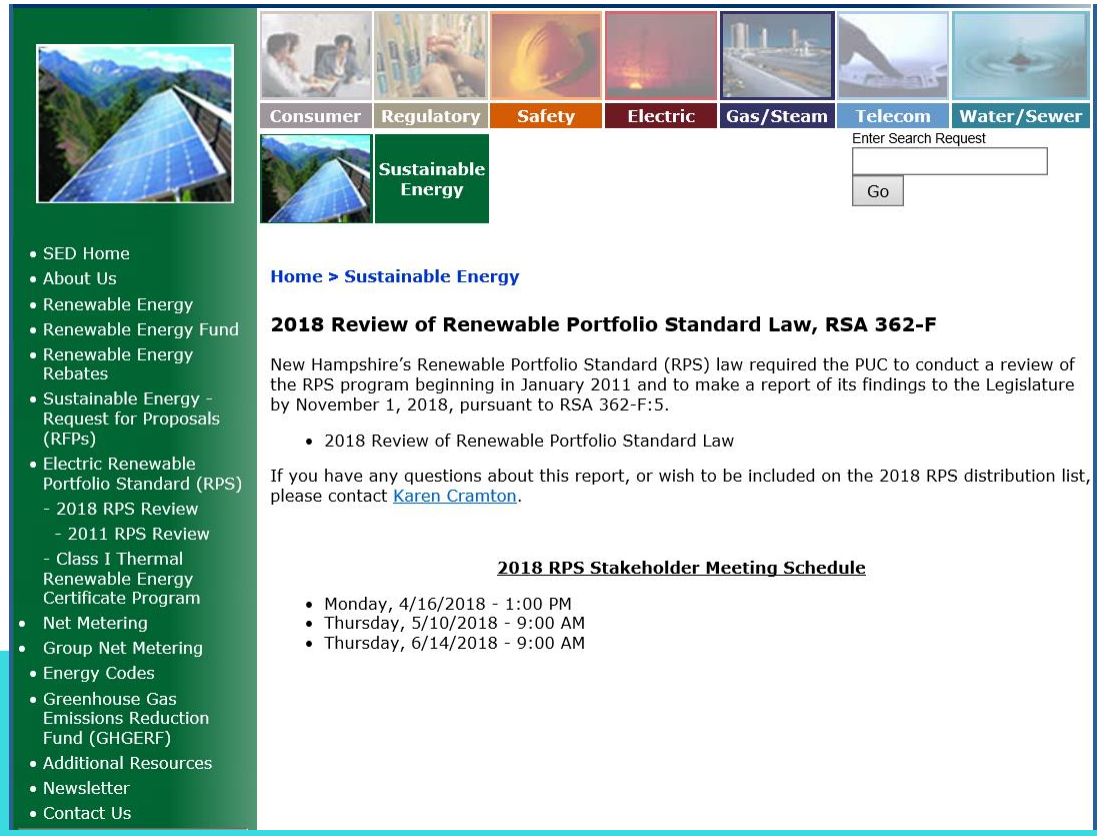
http://puc.nh.gov/Sustainable%20Energy/Review%20RPS%20Law.html

Email:

rpsreview@puc.nh.gov

Insert “RPS Review Stakeholder Distribution List” in subject

Questions:
karen.cramton@puc.nh.gov



NEXT MEETING:
MAY 10, 2018
AT 9 A.M.

THANK YOU!