RPS Collaborative Webinar

Renewable Thermal in RPSs: Examples from New Hampshire, Oregon, and Vermont

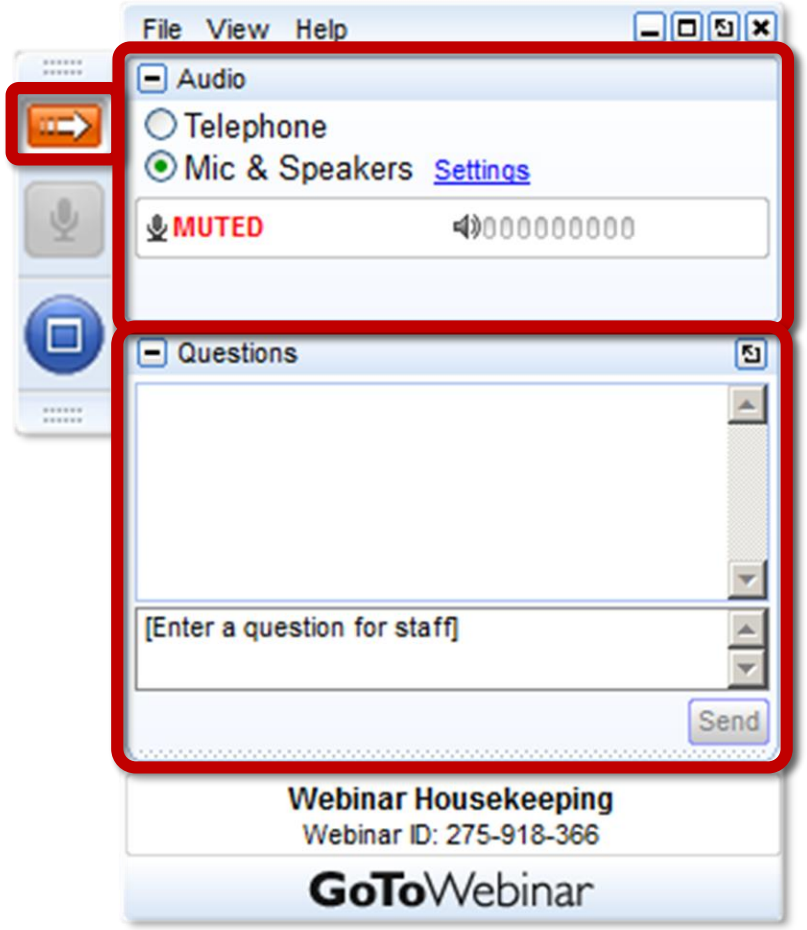
November 29, 2018

CleanEnergy States Alliance

Webinar Agenda – *Renewable Thermal in RPSs*

- Housekeeping
- Introduction to CESA and the RPS Collaborative
- Overview of renewable thermal in RPSs & CESA's new reports
- State examples:
  - **New Hampshire** (Karen Cramton & Deandra Perruccio, NH PUC)
  - **Oregon** (Rebecca Smith, ODOE)
  - **Vermont** (Andy Perchlik, VT PSD)
- Q&A

Housekeeping



Join audio:

- Choose Mic & Speakers to use VoIP
- Choose Telephone and dial using the information provided

Use the orange arrow to open and close your control panel

Submit questions and comments via the Questions panel

This webinar is being recorded. We will email you a webinar recording within 48 hours. CESA's webinars are archived at www.cesa.org/webinars

ALASKA ENERGY AUTHORITY

STATE OF CALIFORNIA ENERGY COMMISSION

DEPARTMENT OF ENERGY & ENVIRONMENT

EnergyTrust of Oregon

IOWA economic development

MASSACHUSETTS CLEAN ENERGY CENTER

IPA ILLINOIS POWER AGENCY

NEW MEXICO emnrd Energy, Minerals and Natural Resources Department

OEI Wisconsin Office of Energy Innovation

NEW YORK STATE OF OPPORTUNITY. NYSERDA

BPU New Jersey's cleanenergy njcleanenergy.com program™

CONNECTICUT GREEN BANK SM

New Hampshire PUBLIC UTILITIES COMMISSION

Maryland Energy Administration

STATE OF WASHINGTON Department of Commerce Innovation is in our nature.

MIEnergy Michigan Agency for Energy Michigan Energy Office

VERMONT CLEAN ENERGY DEVELOPMENT FUND PUBLIC SERVICE DEPARTMENT

Xcel Energy® Renewable Development Fund

Rhode Island Commerce CORPORATION

COMMERCE DEPARTMENT

MassDEP

SMUD™ Powering forward. Together.

PRAIRIE ISLAND INDIAN COMMUNITY

DOER Massachusetts Department of Energy Resources

STATE OF RHODE ISLAND OFFICE OF ENERGY RESOURCES

OREGON DEPARTMENT OF ENERGY

CONNECTICUT ENERGY ENVIRONMENT

NREL NATIONAL RENEWABLE ENERGY LABORATORY

Illinois Department of Commerce & Economic Opportunity

Education Protection Advocacy OPC DC Office of the People's Counsel District of Columbia Advocating, Protecting and Educating DC Consumers

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

Smart Electric Power Alliance

ACEP Alaska Center for Energy and Power

www.cesa.org

RPS Collaborative

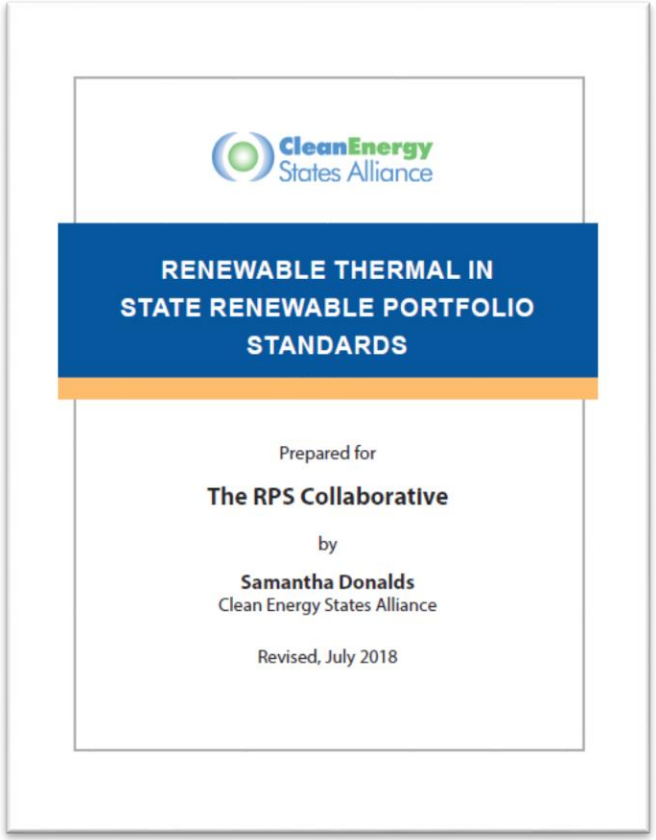
- With funding from the Energy Foundation and the U.S. Department of Energy, CESA facilitates the **Collaborative**.
- Includes **state RPS administrators**, **federal agency representatives**, and other stakeholders.
- Advances dialogue and learning about RPS programs by **examining the challenges and potential solutions** for successful implementation of state RPS programs, including **identification of best practices**.
- To sign up for the Collaborative listserv to get the **monthly newsletter** and announcements of **upcoming events**, see: www.cesa.org/projects/renewable-portfolio-standards

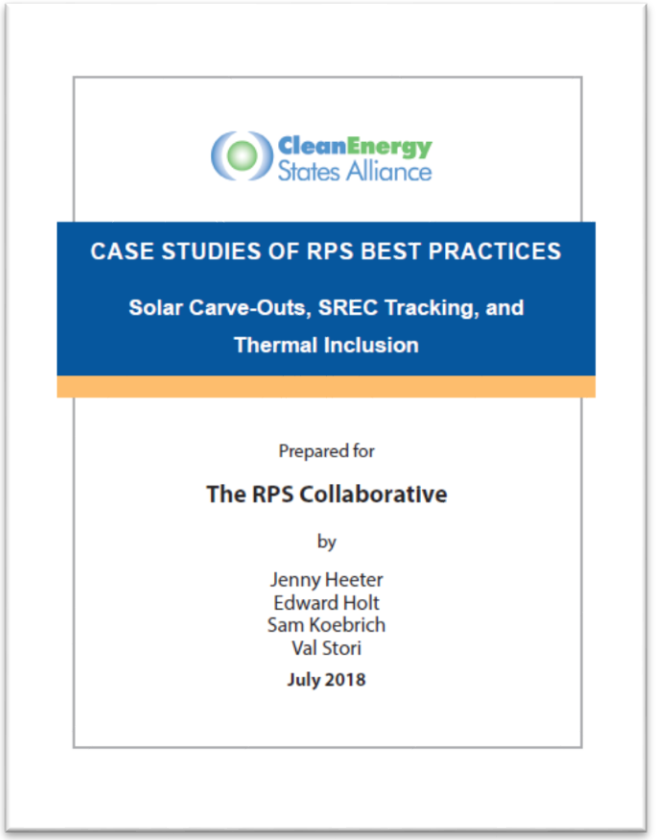
ENERGY FOUNDATION
building a new energy future

U.S. DEPARTMENT OF ENERGY

CleanEnergy States Alliance

RPS Collaborative Reports on Renewable Thermal





Renewable Thermal in State Renewable Portfolio Standards (July 2018)
www.cesa.org/resource-library/resource/renewable-thermal-in-state-renewable-portfolio-standards

Case Studies of RPS Best Practices: Solar Carve-Outs, SREC Tracking, and Thermal Inclusion (July 2018)
www.cesa.org/resource-library/resource/case-studies-of-rps-best-practices-solar-carve-outs-srec-tracking-and-thermal-inclusion

Find more reports and resources on the RPS Collaborative website: www.cesa.org/projects/renewable-portfolio-standards

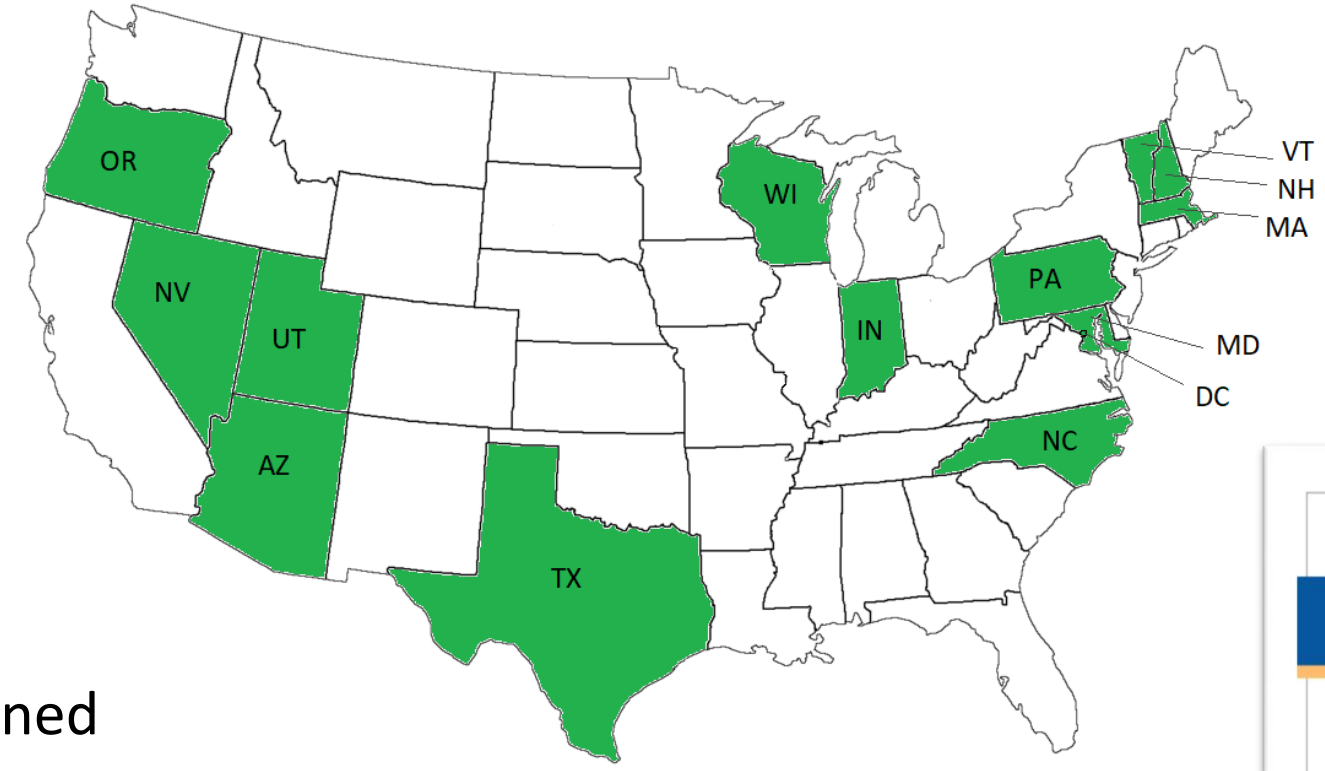
For more on renewable heating and cooling technologies, visit www.cesa.org/projects/renewable-heating-and-cooling

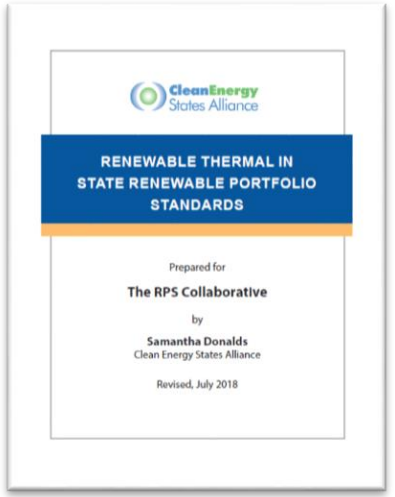
Renewable Thermal in State Renewable Portfolio Standards

Fourteen state RPS programs include renewable thermal.

These programs vary widely in terms of:

1) which renewable thermal technologies are eligible
2) how energy output is measured and monitored
1) how REC values are determined
2) how the technologies are classified in the RPS



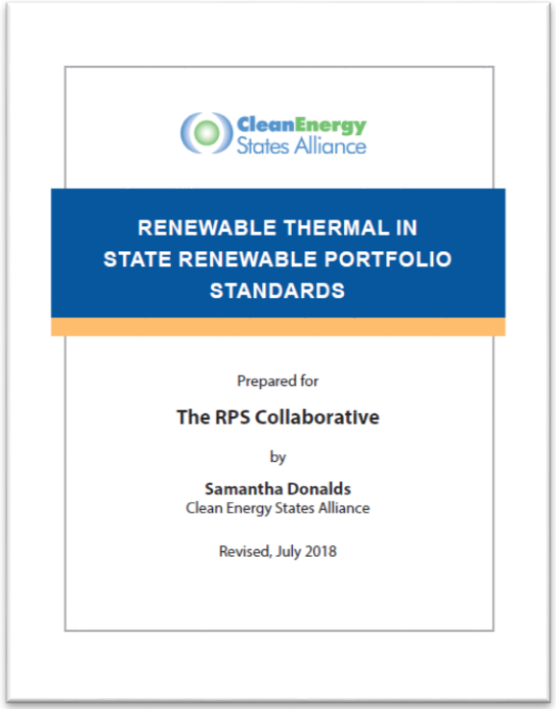


CleanEnergy States Alliance

Why Include Renewable Thermal in an RPS?

- Adding clean energy technologies to an RPS is a powerful way to promote their development and market growth
- Using certain renewable energy sources, like biomass, to produce heat is more efficient than using them to produce electricity
- Promotes economic development and job creation
- Renewable thermal heating and cooling achieve a main policy goal of an RPS: helping people transition away from fossil fuels to cleaner, renewable, and local technologies.

The challenge: RPS programs have historically focused on ELECTRICITY generation.



Economic Impacts of NH's Thermal RPS in 2017

- Displaced an estimated 1,500,851 gallons of #2 heating oil
- Generated 43,094 T-RECs
- T-RECs generated $991,162 in gross revenue for the 21 system owners who reduced their heating costs by an estimated $1,300,00 with wood biomass fuels
- Analysis demonstrated an estimated $8,385,000 in beneficial impacts on the regional economy

Webinar Speakers

- **Val Stori**, Clean Energy States Alliance
- **Samantha Donalds**, Clean Energy States Alliance
- **Deandra Perruccio**, New Hampshire Public Utilities Commission
- **Karen Cramton**, New Hampshire Public Utilities Commission
- **Rebecca Smith**, Oregon Department of Energy
- **Andy Perchlik**, Vermont Public Service Department

Renewable Thermal in RPS

New Hampshire

Karen Cramton & Deandra Perruccio
New Hampshire Public Utilities Commission
Sustainable Energy Division

November 29, 2018

New Hampshire's RPS Legislation: Addition of Thermal Requirement

Senate Bill 218 (2012)
became effective June 19, 2012

- Class I carve out for useful thermal energy delivered to an end-use customer in New Hampshire

- Required Commission to adopt procedures (i.e., Puc 2500 rules) for:
  - metering;
  - verification; and
  - reporting of useful thermal energy output (RSA 362-F:13 VI-a)

Useful Thermal Energy means:

renewable energy derived from Class I sources that can be metered and is delivered in NH to an end user in the form of direct heat, steam, hot water, or other thermal form that is used for heating, cooling, humidity control, process use or other valid thermal end use requirements and for which fuel or electricity would otherwise be consumed. RSA 362-F:2, XV-a.

Eligible Technologies (i.e., Class I Sources):

- Geothermal
- Solar Thermal
- Methane Gas
- Eligible Biomass Technologies

To be REC eligible, systems must have begun operation after January 1, 2013.

Emissions Requirements for Thermal REC Eligibility:

Particulate Matter (based on generation unit size; MMBtu/hr)		
<3 MMBtu/hr	3-30 MMBtu/hr	>30 MMBtu/hr
Best Management Practices	0.1 lb/MMBtu	0.02 lb/MMBtu

NOx (based on generation unit size; MMBtu/hr)	
< 100 MMBtu/hr	≥ 100 MMBtu/hr
Best Management Practices	0.075 lb/MMBtu

Note: Additional emission requirements for electric REC eligibility

Metering Thermal Energy (Large)

Large Thermal Generator > 1 MMBtu/hr of heat input

Boundary for thermal measurement: before thermal delivery to distribution

Measuring thermal energy:

- **Air or Liquid Systems:** metered flow and temperature;
  - meter accuracy of BS EN1434-1 (2015 edition)
  - ± 5.0% or better; compliance confirmed by professional engineer licensed in New Hampshire
  - use of a certified alternative method

- **Steam Systems:** based on flow and specific enthalpy (temperature and pressure)
  - meter accuracy ± 3.0% or better; compliance confirmed by professional engineer licensed in New Hampshire;
  - meter accuracy ± 5.0% or better; compliance confirmed by professional engineer licensed in New Hampshire;
  - or use of a certified alternative method

Metering Thermal Energy (Small)

Small Thermal Generator <= 1 MMBtu/hr of heat input

Parametric monitoring for small sources allowed:

Solar Thermal: runtime of circulator pump and SRCC rating taking into account shading/orientation losses

Geothermal: operating hours of pump and Heating Capacity and Coefficient of Performance (AHRI certified figures)

Thermal Biomass: auger feed volume, runtime and fuel input verified through purchase records

Verifying and Reporting Thermal Energy

- Professional Engineer must attest to the thermal energy metering/measurement methodology
- Independent monitor must complete initial inspection
- Independent monitor must verify and report thermal production to NEPOOL GIS
- Quarterly emissions testing verification from New Hampshire Department of Environmental Services for facilities over 30 MMBtu/hr (8.8 MW)

Production Calculation

1. Measure thermal output (see Puc2506.04)
2. Apply Discounts:

   a) Meter Accuracy Discount:

   Discount for meter accuracy if meter does not meet accuracy requirements: manufacturer guaranteed accuracy of metering

   b) Losses Discount (large systems only):

   Discount for operating energy or parasitic load and thermal energy storage losses:

   2.0% - 3.6% depending on technology

3. Report thermal production (i.e., generation) from above calculation methodology to NEPOOL GIS in MWh(3,412 MMBtu = 1 MWh)

RPS Requirements

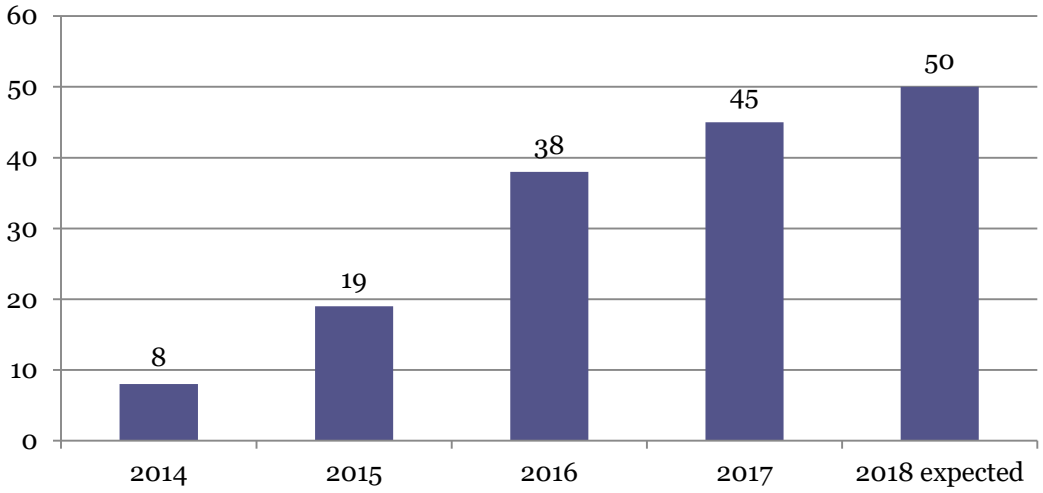
RPS Obligations (% of retail electric sales)

Calendar Year	Total RPS Requirement	Class I Non-Thermal	Class I Thermal	Total Class I	Class II	Class III	Class IV
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%**

REC Prices

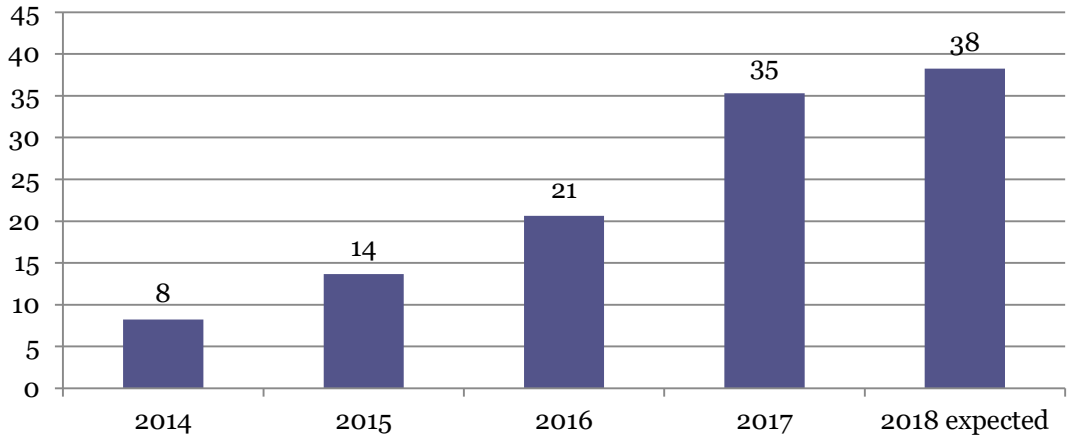
- ACP Rate for 2018: $25.69
  - Adjusted annually by ½ CPI
- REC price is set through market principals: supply and demand

Thermal Facilities – REC Certified Facilities and Capacity



New Hampshire Certified Thermal Facilities

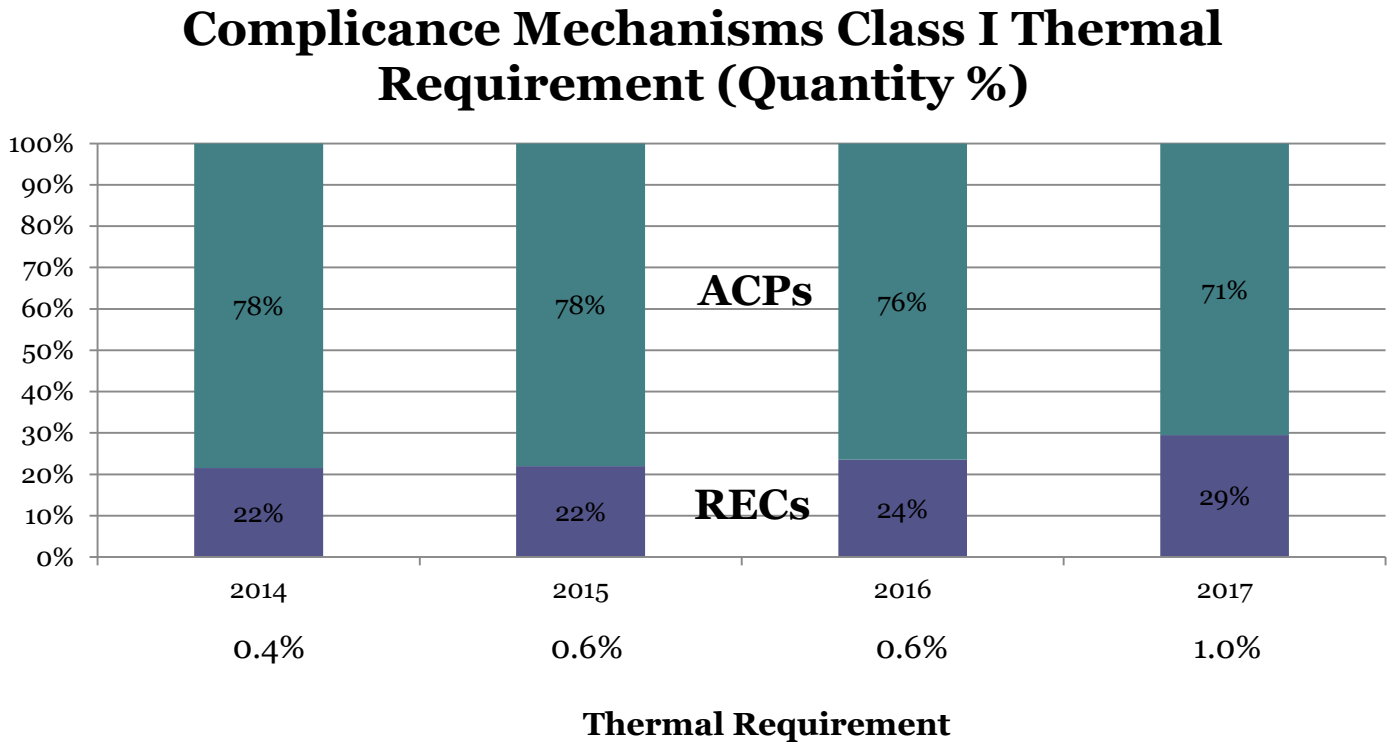
(**Quantity**)



New Hampshire Certified Thermal Facilities

(**Capacity** in MW equivalent)

Thermal REC Compliance



Due to capacity increase of 21 MW in 2016 to 35 MW in 2017, 2018 thermal compliance through REC retirement is expected to increase.

Renewable Energy Fund Programs

- Pellet Rebate Programs
  - Residential and Commercial and Industrial
- Competitive Commercial and Industrial Grant Program

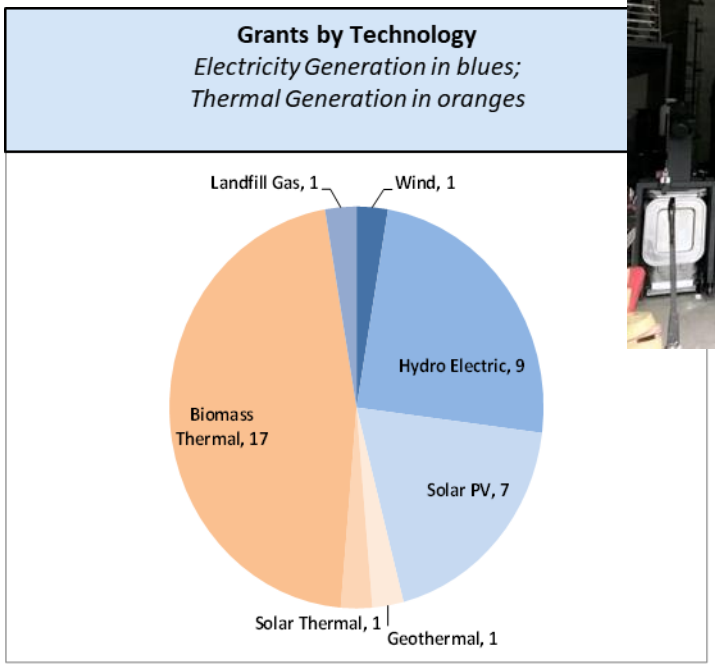
Rebate Programs

Cumulative Program Results

REF Rebate Program	Number of Applications Received	Number of Rebates Awarded	Rebate Funds Reserved or In-Process	Rebate funds disbursed	Aggregate Applicant Investment *(rounded to nearest thousand)*
Residential Wood Pellet Boiler/Furnace	383	380	$ 44,805	$ 2,166,249	$ 4,179,000
C&I Wood Pellet Boiler/Furnace	78	59	$ 125,004	$ 1,681,078	$ 6,161,000

Competitive Commercial and Industrial Grant Program

The project at John Stark High School began construction of the silo necessary to store precision dried chip fuel for the new biomass boiler



UNH Biomass Boilers & Precision Dried Chips Storage

Benefits of Thermal Component in RPS

- Local Resources & Economic
  - Spurred growth of the biomass heating industry
  - Displaces heating oil
  - Keeps energy dollars in the State
  - Provides an additional revenue stream for participants
- Environmental Aspects
  - Helps support forest health
  - Increased efficiency from newer, renewable technologies
  - More stringent emissions standards required for biomass facilities

Recent and Upcoming Changes

- Puc 2500 Rule revisions adopted in 2018:
  - Changed small/large thermal system threshold
  - Non-thermal RPS related changes for independent monitors, biodiesel and suspensions
- Methane Gas now an eligible thermal source (SB 577 (2018)) – requires Puc 2500 rule changes
- Rebate programs may be reviewed in early 2019

Website and Contact

http://www.puc.nh.gov/Sustainable%20Energy/Class%20I%20Thermal%20Renewable%20Energy.html

Deandra Perruccio
deandra.perruccio@puc.nh.gov
603-271-6176

Oregon Department of **ENERGY**

Thermal Energy in the Oregon RPS

Rebecca Smith
November 29, 2018

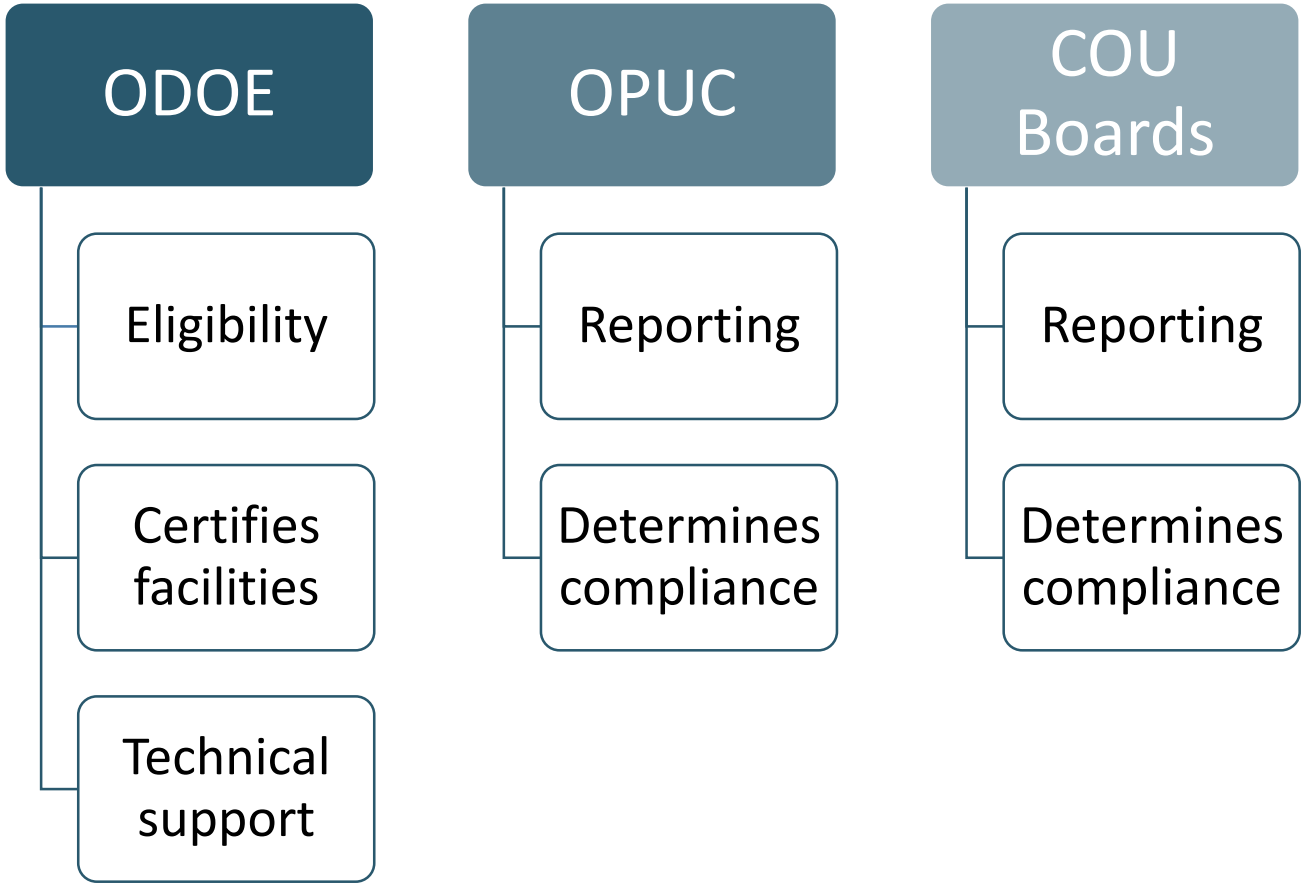


OREGON DEPARTMENT OF ENERGY

Table of Contents

OREGON DEPARTMENT OF ENERGY

OREGON RPS ADMINISTRATION



OREGON DEPARTMENT OF ENERGY

- Increased RPS targets for largest utilities to 50% by 2040
- Eliminated coal by wire
- Added community solar
- Added thermal RECs

SB 1547

(2016)

OREGON DEPARTMENT OF ENERGY

SB 1547 – WHAT IT SAYS FOR T-RECs

"If a facility that. . .

- generates electricity using biomass
- also generates thermal energy for a secondary purpose,
- as part of the system established under ORS 469A.130,
- …renewable energy certificates must be issued for generation of the thermal energy."

1 MWh = 3,412,000 BTUs

OREGON DEPARTMENT OF ENERGY

SB 1547 – WHAT IT *DIDN'T* SAY FOR T-RECs

- Do REC rules apply to T-RECs?
- What kinds of biomass are eligible?
- How is 'secondary purpose' defined?
- How much primary electricity must be generated?
- Methodology for measurement, reporting, and verification of thermal energy generation?

OREGON DEPARTMENT OF ENERGY

ODOE'S T-RECs RULEMAING – THE ISSUES

Secondary purpose vs. station service

- On-site fuel processing? What about biodigesters?

Require fuel displacement?

- Electricity only? Electricity or fuel?

Are T-RECs RECs?

- Do all REC rules apply to T-RECs?

Metering requirements?

- Constant versus estimation

OREGON DEPARTMENT OF ENERGY

T-RECs IN THE OREGON RPS – HOW IT WORKS

Eligibility

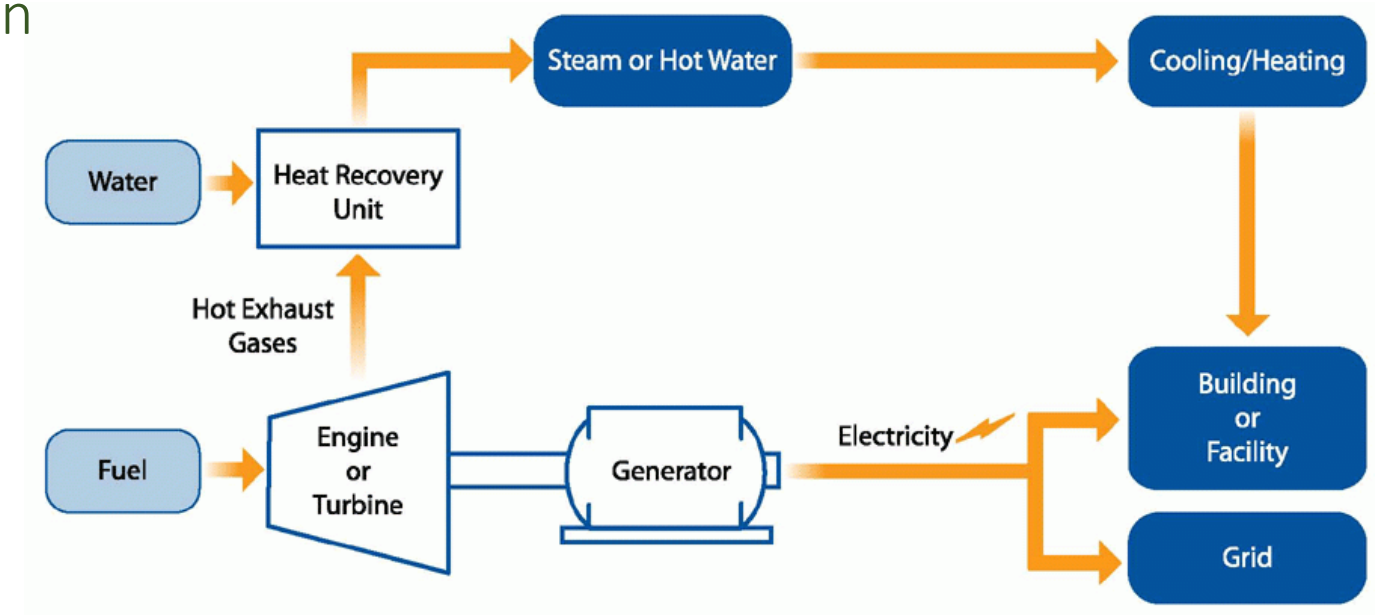
- RPS-eligible biomass feedstocks (multi-fuel facilities can qualify)
- RPS-eligible facilities – facility age, located within WECC boundary
- Qualifying thermal energy – “direct heat, steam, hot water, or other useful thermal form”
- Qualifying thermal energy must displace fuel or electricity use
- Station service – boiler feedwater preheating, steam deaerator heating, on-site fuel processing, etc.

OREGON DEPARTMENT OF ENERGY

T-RECs IN THE OREGON RPS – HOW IT WORKS

Certification

- Must submit detailed Thermal Energy Management Plan:
  - Thermal energy generating equipment
  - Secondary purposes
  - Data measurement, collection, storage
  - Measurement system calibration
  - Calculation methodology



OREGON DEPARTMENT OF ENERGY

T-RECs IN THE OREGON RPS – HOW IT WORKS

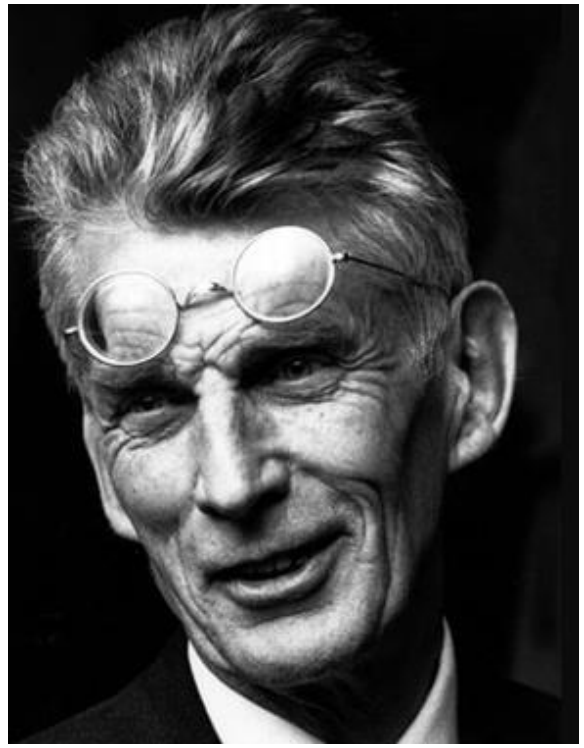
Metering, Monitoring, Verification

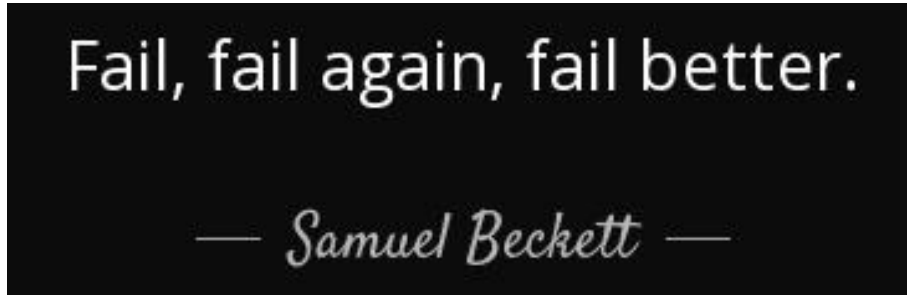
- All facilities must meter thermal energy going to secondary purpose(s)
- Small vs. large facility threshold based on capacity for Btus/hour
  - Small facilities may use as constants parameters that represent de minimis values and do not vary more than +/- 2 percent under full range of expected operating conditions
- Must take data readings at least once per hour
- Small facilities may self-report data to WREGIS; large facilities must use a “non-balancing Thermal QRE”

OREGON DEPARTMENT OF ENERGY

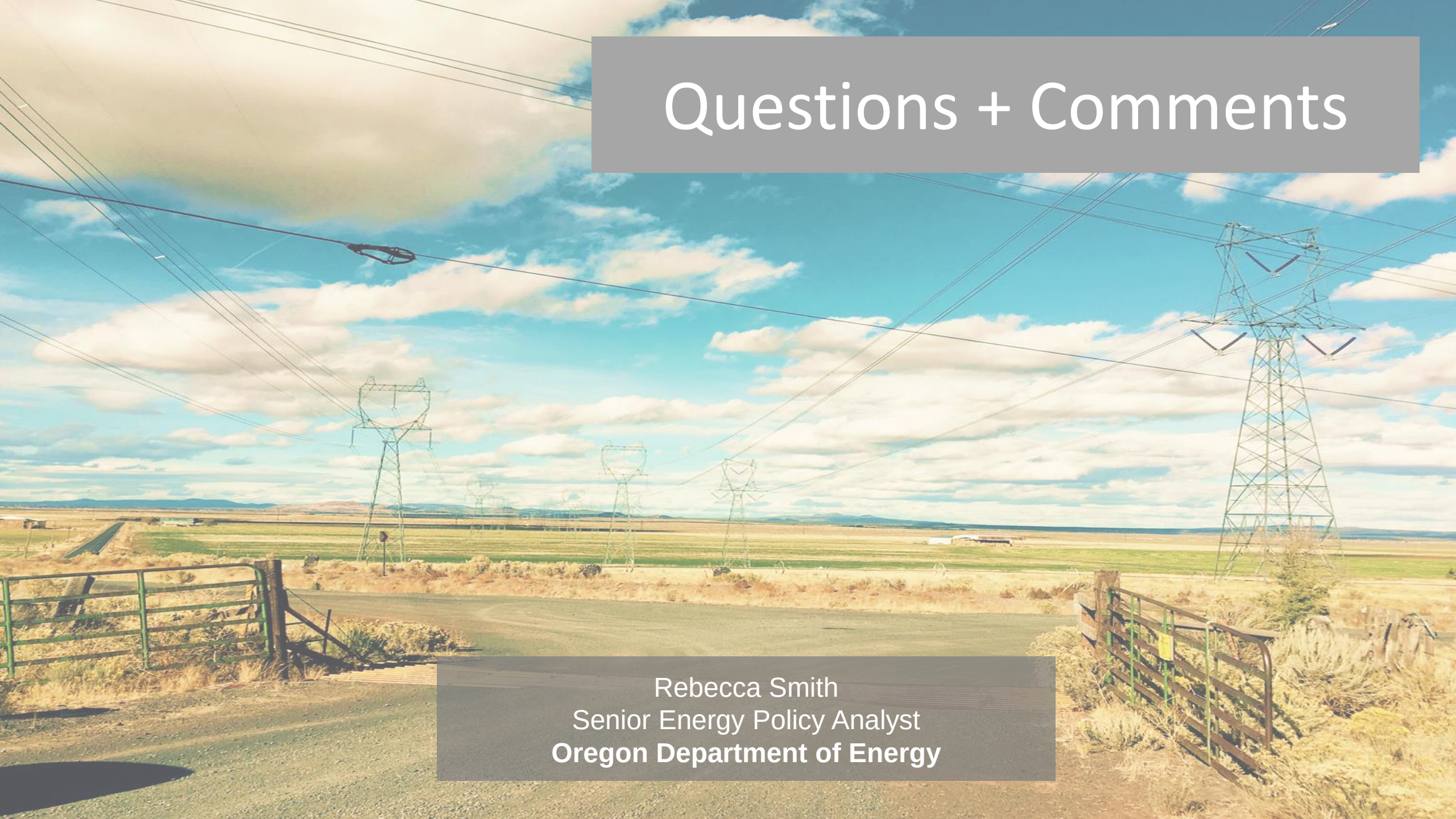
LESSONS LEARNED

- Outreach to states with established or emerging thermal programs was crucial
- When in doubt, look to European standards
- Rely as much as reasonable on best practices and established standards…
- …but when there are no applicable best practices, GET CREATIVE
- Constantly improve your program/rules/processes





OREGON DEPARTMENT OF ENERGY



Questions + Comments

Rebecca Smith
Senior Energy Policy Analyst
Oregon Department of Energy

Thermal Renewable Energy in Vermont's Renewable Energy Standard

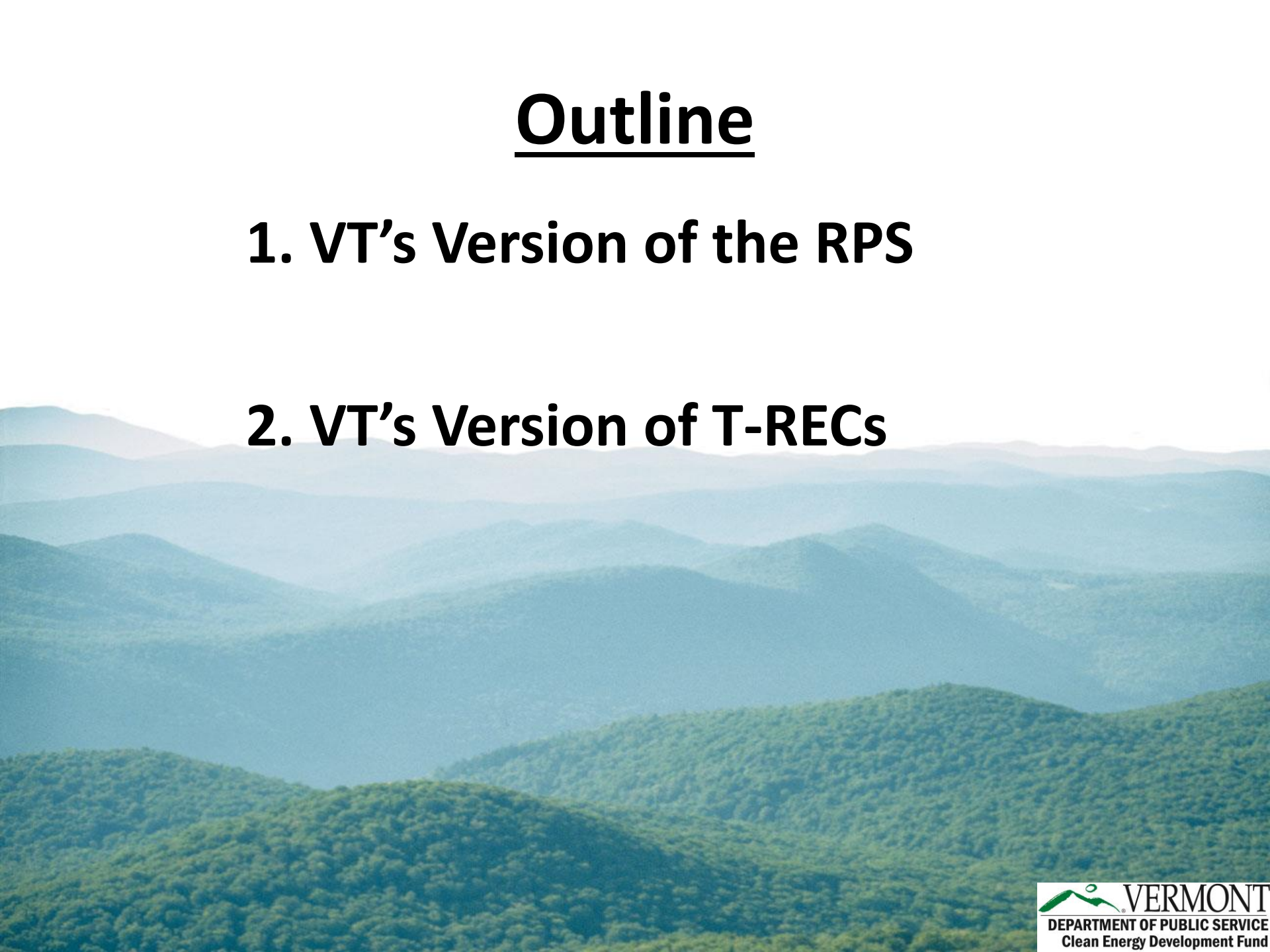
Andrew Perchlik
Public Service Department
Clean Energy Development Fund
November 29, 2018

VERMONT
DEPARTMENT OF PUBLIC SERVICE
Clean Energy Development Fund

Outline

1. VT's Version of the RPS

2. VT's Version of T-RECs



VERMONT
DEPARTMENT OF PUBLIC SERVICE
Clean Energy Development Fund

Standard not Portfolio
Tiers not Classes

Tier I. Total renewable energy (55% in 2017 increasing 4%/yr. to 75% by 2032)

- Capture low-value RECs not claimed elsewhere in New England
- Includes generation of any vintage and large hydro (*not waste to energy*)

VT RES

Tier II. Distributed generation (1% of sales increasing to 10%, carve-out of Tier I.)

- Drive new "Vermont-scale" distributed generation on our grid. Must be <5 MW, on the VT distribution grid, & new (2015)

- Depending on generation mix, corresponds to about 25-30 MW/yr. of new generation smaller than 5 MW per year

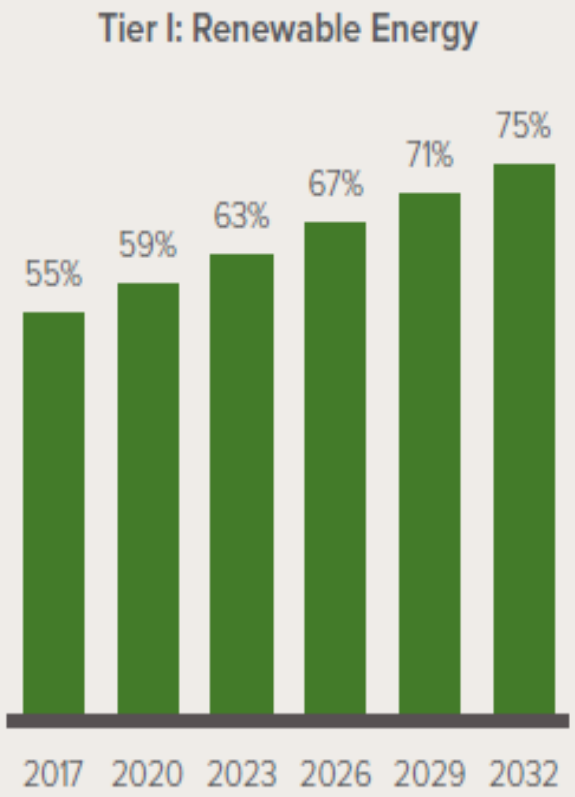
VERMONT
DEPARTMENT OF PUBLIC SERVICE
Clean Energy Development Fund

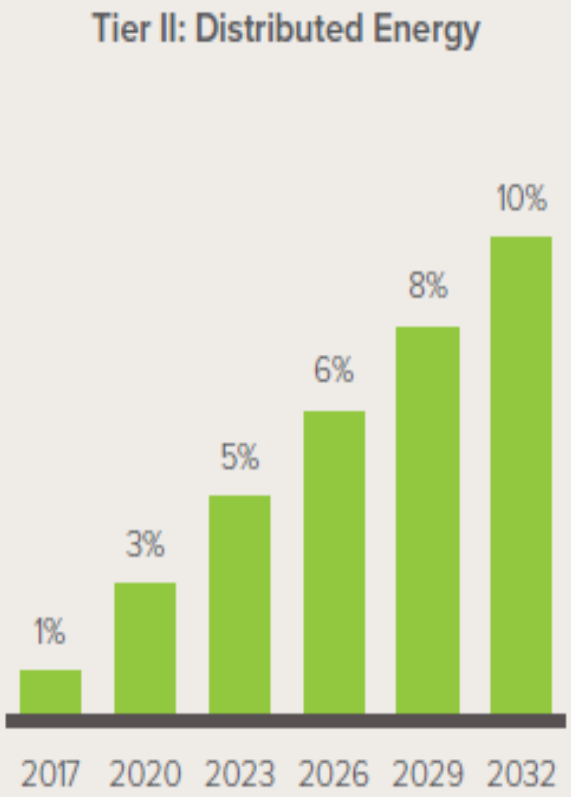
VT RES

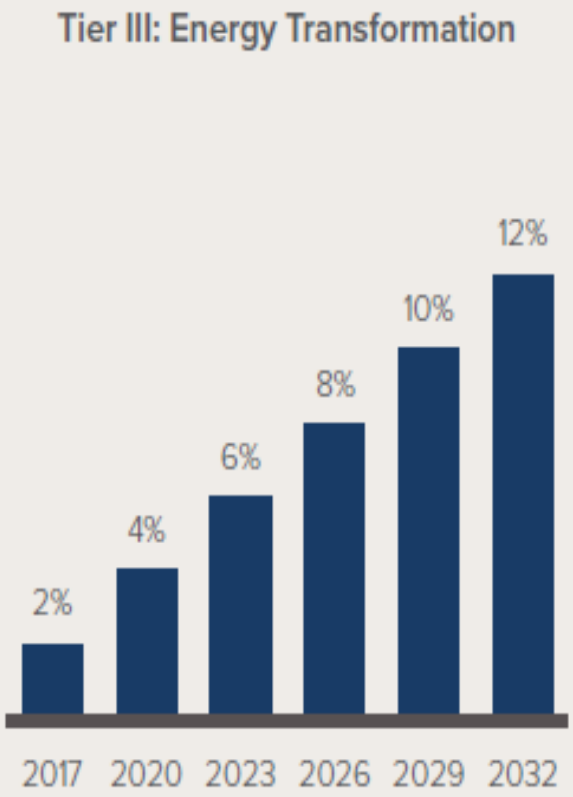
Tier III. Energy transformation (2% to 12%, not a carve-out)

- Approved measures that displace customer's fossil fuel use. Eligible measures include thermal and transportation technologies (pellet boilers, weatherization, electric vehicles)
- Measured on fossil-fuel-reduction basis converted to MWh
- Encourage utilities to expand business models, build partnerships
- Excess Tier II RECs can be used for Tier III obligation

RES Graphs


Tier I: Renewable Energy
55%
59%
63%
67%
71%
75%
2017
2020
2023
2026
2029
2032


Tier II: Distributed Energy
1%
3%
5%
6%
8%
10%
2017
2020
2023
2026
2029
2032


Tier III: Energy Transformation
2%
4%
6%
8%
10%
12%
2017
2020
2023
2026
2029
2032

RES Program Components

- Alternative Compliance Payments
  - $60/MWh for Tiers II and III, increasing 1.3% annually.
  - Money goes to Clean Energy Development Fund
- Conversion of thermal energy (and all Tier III activities) to MWh for REC compliance is agreed to by a Technical Advisory Group (TAG).

RES Program Components

Two types of Tier III program measures:

Prescriptive programs already have their savings established by the TAG. This approach is for measures whose savings levels are reasonably well understood and can be quantified.

Custom measures take into account site specific characterizations that vary from site to site. These tend to be large projects.

RES Program Components

- Tier III Programs generate thermal savings in MMBtu
- Additional electrical use is then subtracted from this MWh number (this is modified by the percentage of renewable generation in a DU territory, 100% renewable = no reduction)

Contact Information

Andrew Perchlik

Clean Energy Development Fund Manager

Vermont Department of Public Service

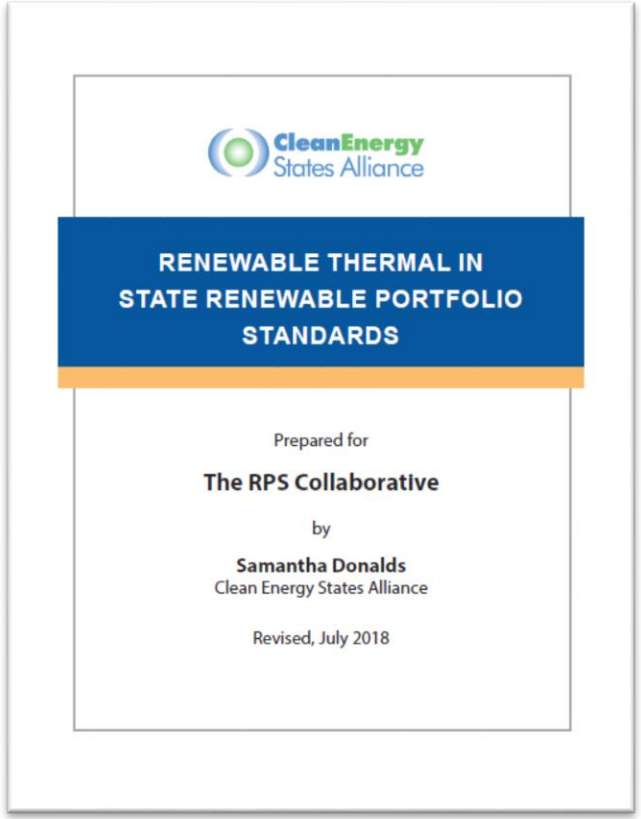
andrew.perchlik@vermont.org **#802-828-4017**

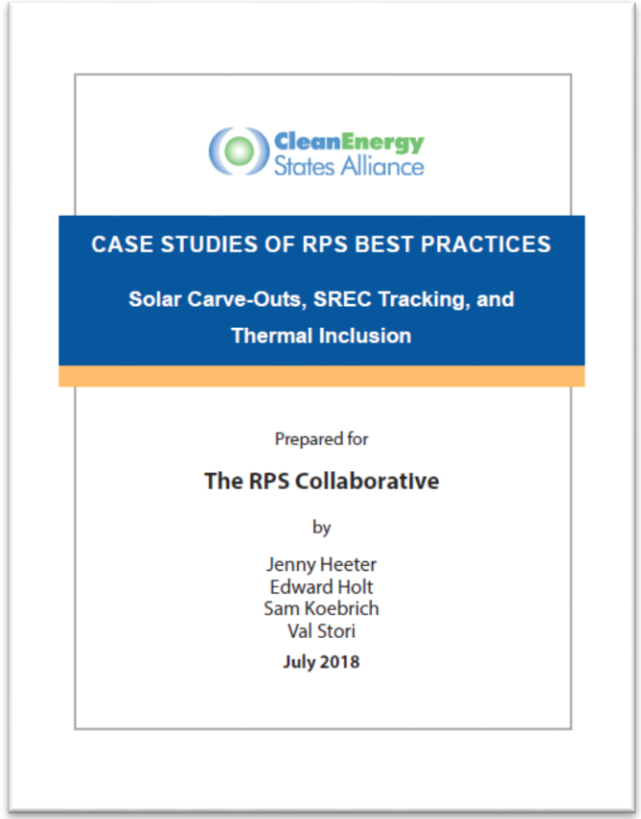
VERMONT
DEPARTMENT OF PUBLIC SERVICE
Clean Energy Development Fund

Thank you for attending our webinar

Val Stori
Project Director, CESA
val@cleanegroup.org

Find more reports and resources on the RPS Collaborative website: www.cesa.org/projects/renewable-portfolio-standards





CleanEnergy States Alliance

Upcoming Webinars

Americans' Changing Views of Renewable Energy Policies
Tuesday, December 4, 1-2pm ET

The Real Estate Industry and Selling Homes with Solar
Tuesday, December 11, 1-2pm ET

Read more and register at: www.cesa.org/webinars