Creating A Cleaner Energy Future For the Commonwealth

DOER
Massachusetts Department of Energy Resources

Acts 2014, Ch. 251

Renewable Thermal Technologies in the Alternative Portfolio Standard

Stakeholder Meeting

November 17, 2014

Boston, MA

Agenda

- Context
- Regulatory process
- Key issues
  - Metering guidelines
  - Credit calculation and minting
  - Biomass/gas/fuels requirements

Technologies – per the Statute

- Add any facility that generates useful thermal energy using:
  - Sunlight, biomass, biogas, liquid biofuel or naturally occurring temperature differences in ground, air or water
- Strike carbon capture and storage, gasification, paper derived fuel
- Additionally exclude construction & demolition debris

Specifications in the Statute

1 credit (MWh) shall be earned for every 3,412,000 Btu of **net** useful thermal energy produced and **verified** through an on-site utility grade meter **or other means satisfactory to the department**.

- Non-emitting on-site renewable thermal technologies can get a credit for **less** than 3,412,000 Btu, *or in essence, a credit multiplier*.

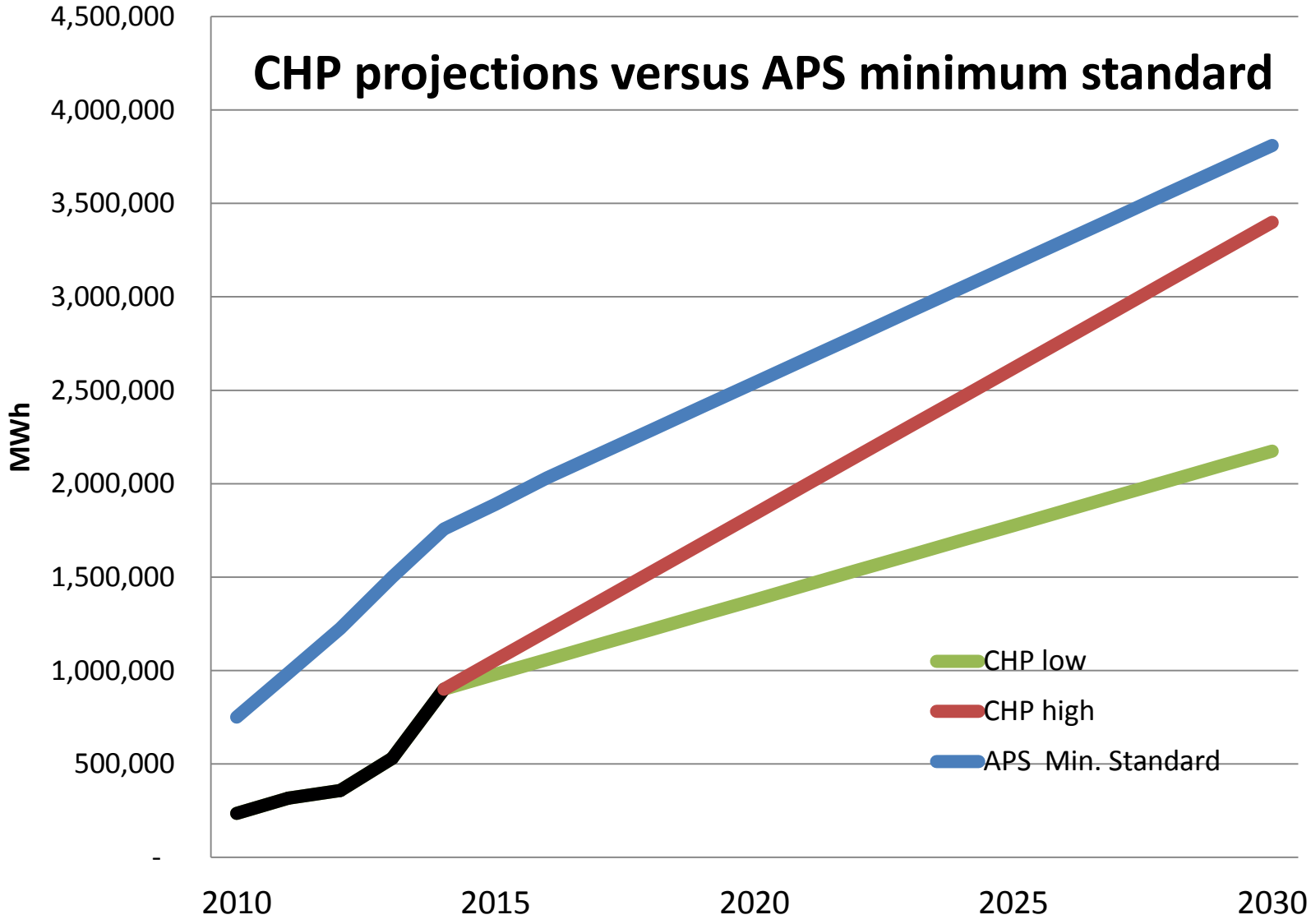
DOER has to establish for biomass, biogas and liquid biofuel technologies (with MassDEP):

- **Air emission performance standards** for PM2.5 and CO;
- A requirement of **50% reduction in life-cycle GHG emissions**;
- Requirements for **thermal storage** or other means to minimize deterioration of efficiency or emissions due to boiler cycling, if feasible;
- Fuel conversion **efficiency performance standards**;
- Requirements that fuel shall be provided by means of **sustainable forestry practices** (with DCR).

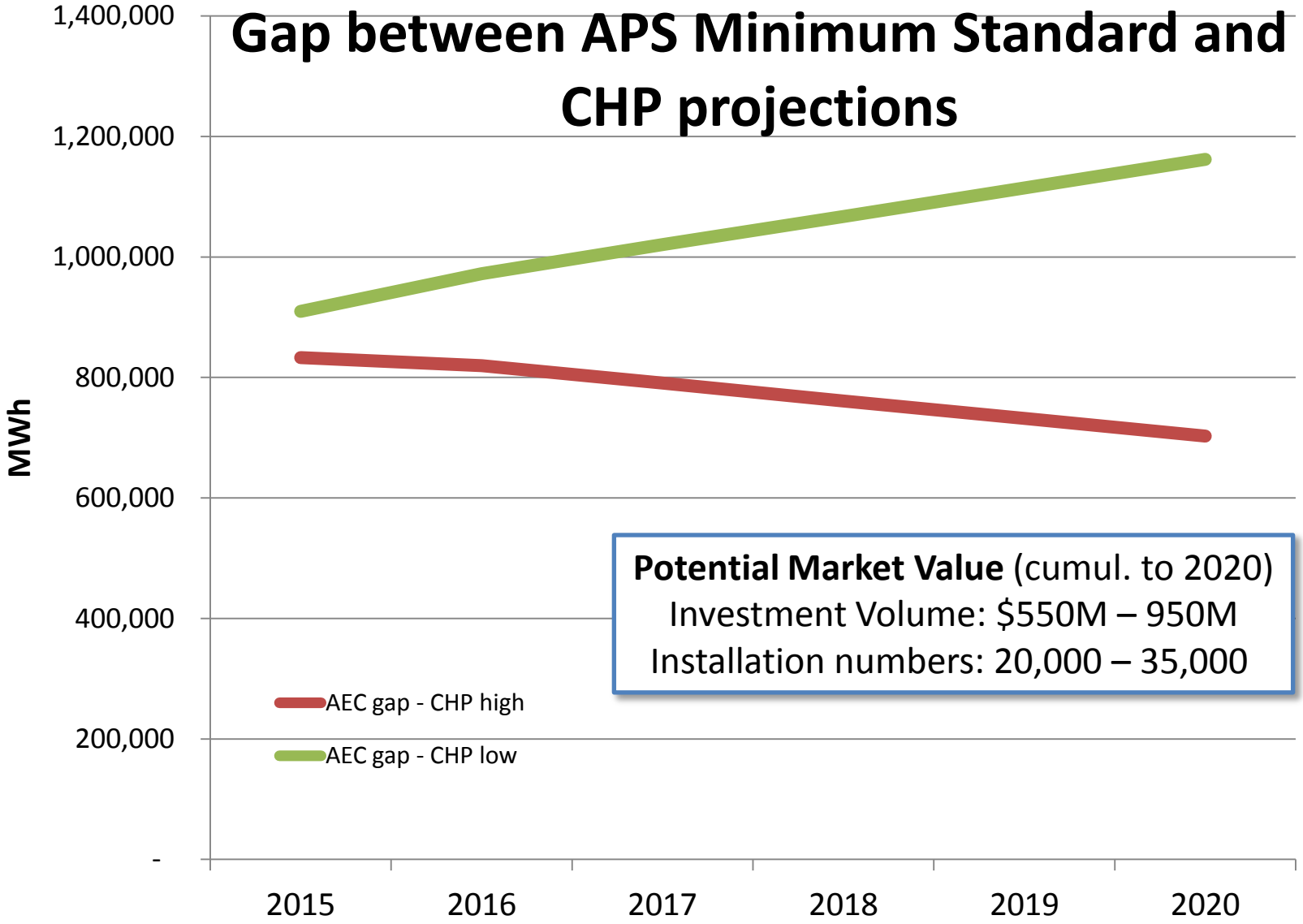
Enters into force 1/1/2015

Prior Analysis

- Massachusetts Renewable Heating and Cooling, Opportunities and Impacts Study, Meister Consultants Group for DOER/MassCEC, 2012
- Heating and Cooling in the Massachusetts Alternative Portfolio Standard, Report to the Legislature, EEA/DOER with assistance from Meister Consultants Group and MassCEC, 2012
- Commonwealth Accelerated Renewable Thermal Strategy, Navigant/Meister for DOER, 2014


CHP projections versus APS minimum standard
MWh
4,500,000
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
-
2010
2015
2020
2025
2030
CHP low
CHP high
APS Min. Standard

Gap between APS Minimum Standard and CHP projections



Potential Market Value (cumul. to 2020)
Investment Volume: $550M – 950M
Installation numbers: 20,000 – 35,000

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DOER Regulatory Process

- Stakeholder/industry engagement
  - Meeting preceding formal regulatory process
  - Formal public hearing and comment period
  - Subgroups on metering and biomass
- Regulatory proceeding
  - Draft regulations before end 2014
  - Final regulations by summer 2015?
- Use guidelines according to RPS/APS custom

Questions?

Eligible Technologies

- Active solar heating
  - Space heating, domestic & process hot water
- Heat pumps
  - Air source, ground source, water source
- Automatically fed biomass boilers and furnaces
  - Wood pellets, chips
- Blended or pure biogas (methane) and biofuels (liquids)
- Other?

Net Energy Generation

$$E_{net} = E_{thermal,\ out} - E_{non\text{-}renewable,\ in}$$

- Energy calculated as primary energy
  - Taking into account average heat rate and transmission/distribution losses for electricity (ISO-NE)
- 1 Alternative Energy Credit = 1 MWh = 3.412 MMBtu
  - Solar multiplier: 1 AEC = 3.412 MMBtu / X
  - Basis for X = bring simple payback in line with other renewable thermal technologies

Example Residential Installation

Building characteristics		
Heat Load	MMBtu/y	100
Cool Load	MMBtu/y	40
Domestic Hot Water Load	MMBtu/y	15

Illustrative example – actual calculation will depend on final regulations

		BIO	ccASHP	GSHP	Solar Combi	Solar DHW
Efficiency/COP		0.85	3	4	1	1
Load served	%	100%	80%	100%	40%	60%
Thermal energy	MMBtu/y	115	112	140	46	9
Net useful thermal energy	MMBtu/y	115	20	54	46	9

Electric Conversion Rate used for net energy calculation = 41%

Questions?

Metering Approach

- Large systems: continuous accurate **metering** and automatic reporting
- Small systems: **calculate** projected output
  - Cut-off large/small = 400 kBtu/h (total system capacity)
    - Meant to cover residential, small multi-family and small commercial
    - Based on assessment of cost of metering compared to AEC revenue
  - Verification of ongoing operation through spot checks and run-time monitoring

Large System Metering

- **Air/Ground Source Heat Pumps**: quantify the consumption of the site grid electricity and the supply of renewable heat energy terms by combining
  - Directly metered values (ΔT, runtime)
  - Nominally rated system performance
    - Original equipment manufacturer (OEM) certified

Large System Metering

- **Hydronic Solar Thermal**: quantify useful thermal generation by combining
  - Metering of flow, ΔT (storage tank/collector)
  - SRCC rating of collector
- **Biomass pellet/chip**: quantify useful thermal generation based on
  - OEM Rated efficiency of boiler
  - Parasitic power meter (if >25kW)
  - Btu meter in water/steam loop and/or volume and energy content of fuel use

Questions?

Upfront Minting of AECs

- Upfront minting will be default for non-metered (small) systems
  - In lieu of lifetime AECs, systems will receive a one-time strip of AECs, equivalent to 10 years projected output
    - AECs will be year of APS qualification vintage
    - Upfront minting allowed as far as APS minimum standard can accommodate
  - DOER contracts with Third Party (Agent)
    - Default AEC aggregator
    - System verification
  - DOER is considering market options to enable purchase of pre-minted AECs to provide up-front project capital

Output Projections for Pre-Minted AECs

- Based on thermal load served in building and rated capacity and performance of system
- Biomass
  - OEM rating and average fuel energy content
- Solar thermal
  - SRCC calculation, taking into account shading and orientation
- Air/Ground Source Heat Pump
  - OEM rating (AHRI) and site specific parameters

Example Residential Installation

Building characteristics		
Heat Load	MMBtu/y	100
Cool Load	MMBtu/y	40
Domestic Hot Water Load	MMBtu/y	15

Illustrative example, without multiplier for non-emitting – actual calculation will depend on final regulations

		BIO	ccASHP	GSHP	Solar Combi	Solar DHW
Efficiency/COP		0.85	3	4	1	1
Load served	%	100%	80%	100%	40%	60%
AEC/year		34	6	16	13	3
Pre-minted AEC value	$	$5,056	$886	$2,370	$2,022	$396

Calculation assumes 10 years pre-minted AECs are sold at $15/AEC

Questions?

Biomass Sustainability

- Need to demonstrate sustainable forest management
  - Sustainability certification of fuel feedstock
    - MA pellets: Commonwealth Quality Program (DAR/DCR)
    - Import from outside MA: ENPlus, Sustainable Forestry Initiative, Forest Stewardship Council, Tree Farm, Canadian Standards Association…
  - Option to use qualified list of fuel suppliers
- Combine with fuel quality (NESCAUM)

Biomass Sustainability

- Verification
  - Qualified biomass systems required to keep record of invoices to demonstrate eligible fuel is used
    - Spot audits by DOER or Agent
  - DOER tracks and reports on average aggregate share of residues/thinnings from large wood chip users and pellet producers

Biomass GHG balance

- Need to demonstrate 50% lifecycle GHG savings compared to default traditional heating source
  - DOER calculation, no individual reporting
    - Based on representative reported mix of residues and thinnings
    - Include in sustainability criteria
  - Residue share in pellet feedstock should be at least 40% to 65% depending on the fossil fuel offset by the pellets

    (Indicative results based on the MA RPS Class I GHG Calculation Guideline)

Biomass/gas/fuels performance

DOER to establish with MassDEP: best in class commercially feasible technologies

- **Air emission performance standards** for $PM_{2.5}$ and CO
  - Max. 0.1 lb PM/MMBtu heat output for small systems
- Requirements for **thermal storage** or other means to minimize deterioration of efficiency or emissions due to boiler cycling, if feasible
  - No storage needed if boiler can operate with minimum emissions / efficiency loss at 20% of capacity
  - Review based on results of MassCEC metering
- Fuel conversion **efficiency performance standards**
  - Min. 80% efficiency

Biogas

- Allow for blending of biogas with natural gas in distribution system
  - Similar to RPS Class I
    - Deliverability into MA
  - AEC calculation taking into account transmission and distribution losses and receiving entities' conversion efficiency
- Upstream qualification?
  - Biogas supplier qualifies and gets credits
  - Tracking through supply contracts

Biofuels

- Biofuel blended with heating oil or used unblended for heating
- Biofuels need to be “advanced” biofuels
  - 50% lifetime GHG savings
  - Currently only organic waste derived biodiesel
    - Other feedstocks considered case-by-case
- Upstream qualification?
  - Biofuels vendor (retail seller? producer?) qualifies and gets credits
  - Tracking using RINs

Questions?

Technical Subgroups

- DOER is establishing dedicated subgroups for more in-depth technical discussions
  - Metering subgroup
    - First meeting 11/21, 2PM, DOER
  - Biomass subgroup
    - First meeting 11/24, 2PM, MTC, Westborough, MA
  - Biofuels subgroup
    - (to be convened)
- Stakeholders welcome to step forward
  - Subgroup size needs to allow for active technical discussion

Stakeholder Comments

- Stakeholders invited to provide written feedback on this presentation
  - Comments, suggestions, information resources
  - E-mail before 11/26/2014 to bram.claeys@state.ma.us

Thank you!