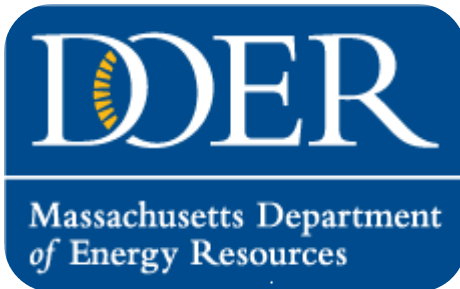


*Creating A Greener Energy Future For the Commonwealth*



**An Effective State Policy for  
Clean, Efficient Energy:  
*Massachusetts APS for  
Combined Heat & Power (CHP)***

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# Overview of MA Portfolio Standard Programs

## Renewable Energy Portfolio Standard (RPS)

## Alternative Energy Portfolio Standard (APS)

### Policy Purpose

- Creates obligation of all retail electricity suppliers to acquire Renewable Energy Certificates (RECs) equal to a set percentage (Minimum Standard) of load served. Purchase of RECs from qualified generators provides additional revenue.
- Strategy is to “green up” the ISO-NE grid. Generation from throughout New England and adjacent control areas are eligible (except for solar and CHP).

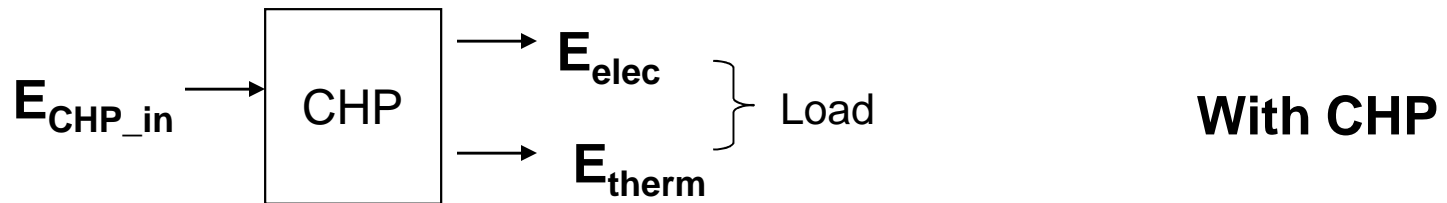
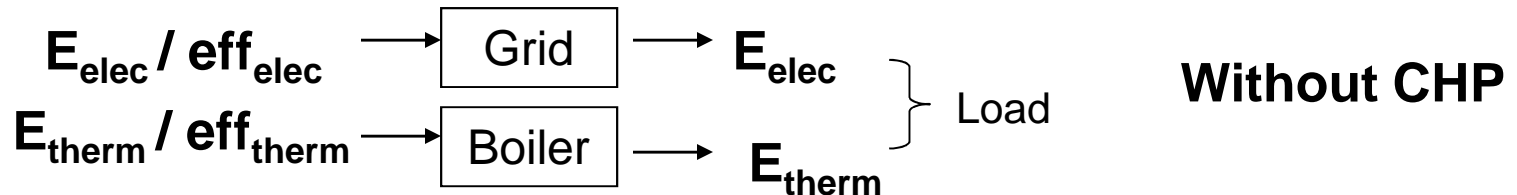
### RPS/APS Standards

- **Renewable Energy Portfolio Standard – RPS Class I**
  - New (post-1997) renewable energy generation – original program (began 2002)
  - RPS Solar Carve Out – begins in 2010 to grow solar PV sector to 400 MW
- **Renewable Energy Portfolio Standard – RPS Class II**
  - Supports MA share of existing (pre-1998) RE generation
  - Subclass supports existing Waste-to-Energy Plants in MA and dedicates at least 50% of revenues to recycling programs
- **Alternative Energy Portfolio Standard (APS)**
  - Supports non-RE technologies (flywheels, gasification, CHP)
  - CHP of key importance – provides credits for efficiency gains in electric and thermal production

# Alternative Energy Portfolio Standard

- Established under Green Communities Act 2008. Provides for RPS-type program for alternative (non-renewable) technologies.
- Program compliance obligation began in 2009.
- Eligible technologies include flywheels, CHP, gasification with carbon capture/sequestration, paper derived fuels.
- Key technology of interest is CHP. Provides credit for electric generation and useful thermal load.
- Qualified units produce Alternative Energy Credits (AECs).
- Alternative Compliance Payment (ACP) Rate is \$20/MWh (2010) and increases with CPI.

# AECs for CHP Account for Efficiency Gains



Alternative Energy Credits (AECs) calculated as energy savings of CHP compared with grid power and separate thermal unit, to meet the same load.

$$\text{AECs} = E_{\text{elec}}/0.33 + E_{\text{therm}}/0.80 - E_{\text{CHP\_in}}$$

all energy expressed in MWh

## Benefits Expected from CHP

- Savings due to increased efficiency, combined with avoided demand and time of use charges.
- Significant reductions in GHG emissions. A “good performing” natural gas fueled system operating in MA – achieves an annual net source reduction of about 19% due to:
  - Reduced fuel consumption
  - Use of natural gas and/or renewable fuels having CO<sub>2</sub> emission factors significantly less than the ISO-NE grid average emission factor for each grid supplied MWh to generate electricity.

# Benefits Expected from CHP

- Greater control over facility energy costs.
- Increased reliability
- Reduction to grid peak loads.

## MA Alternative Portfolio Standard – Minimum Standard and Cumulative CHP Demand

Year	APS Minimum Standard	Est. MW of Installed CHP
2009	1.00%	
2010	1.50%	64
2011	2.00%	92
2012	2.50%	121
2013	3.00%	148
2014	3.50%	177
2015	3.75%	205
2016	4.00%	215
2017	4.25%	226
2018	4.50%	237
2019	4.75%	249
2020	5.00%	261

Approximately 27 MW of new CHP installations required each year through 2014, and half this amount in years following.

Estimate based upon APS being met only by CHP

# Guidelines for APS Eligible CHP Systems

- System has to have started operation after Jan. 1, 2008.
  - Exceptions: The incremental production from older systems due to additional loads and/or increased efficiency.
    - EXAMPLE: 2009 Addition of a heat driven chiller to a 2005 CHP system to supply a new process cooling load.
- Metering of fuel, kWh and BTUs heat supplied to a useful load by revenue grade meters is required as the basis for determination of the AECs generated per quarter
  - Reduced meter requirements for systems < 200kW are in draft form and will be issued for public comment soon.

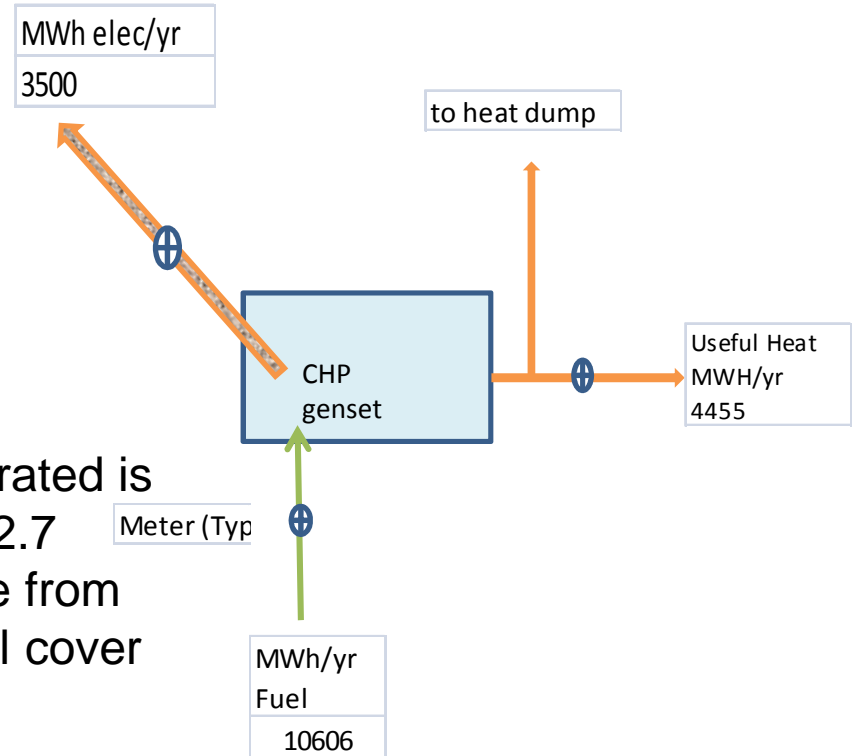
# Guidelines for APS Eligible CHP Systems

- Meter reading and computation of the AECS are by an independent verifier.
- Program supports incremental CHP
  - Provides incentive for existing electric-only power plants to add useful thermal load, or for thermal-only plants to add electrical generation.
- CHP Projects must serve thermal load in MA
- CHP Units may also qualify for Utility EE Funding
  - Per Green Communities Act, CHP projects passing a cost-effectiveness screen are eligible for support (up to \$750/kW) from the electric utility energy efficiency programs.

# APS Benefit – Example

Unit Electric Generating Capacity		Unit Useful Heat Generating Capacity		Electric Generation EFF	Fuel to CHP (mWh)		AECs/hr	\$/hr Maximum	Equivalent Full Load Run hrs/year	AECs/yr	Maximum Annual Value for AECs (\$/year)
kW	MWh/yr	MMBTU/yr	MWh/yr		MMBTU/yr	MWh/yr					
500	3500	15203	4455	0.33	36198	10606	0.80	\$ 15.91	7000	5568	\$ 111,363.64

Useful Heat as a % of Total Heat Output	CHP Overall Efficiency @Full Load	Value per AEC (from pull down list below)	Annual Value for AECs (\$/year)
42%	0.75	\$ 17.00	\$ 94,659.09



## Remarks:

Ratio of AECs to MWh electric generated is 1.6:1. So, for every kWh generated 2.7 cents is earned. As O&M cost range from 2 to 4 cents per kWh, this benefit will cover a substantial portion of these costs.

# Examples of Projected APS Benefit by Size and Application

- Based on the system inputs and \$17/AEC as used in the previous example

Size (kW)	APS \$/yr	Application	System Types
10	\$ 1,900.00	Residential, Small Commercial	IC Genset with heat recovery
250	\$ 47,330.00	Small Industrial, institutional, health care, commercial, mixed use and district energy.	IC Genset &/or Gas Turbine + HSRSG Boiler + Steam Turbine Absorption Chiller Option
500	\$ 94,659.09		
1,000	\$ 189,318.18		
5,000	\$ 946,590.91		
10,000	\$ 1,893,181.82	Mid-sized to large Industrial, institutional, health care, commercial, mixed use and district energy.	
15,000	\$ 2,839,772.73		

# APS CHP Projects Currently Generating AECs

- 19 MW in three campus district energy systems – UMass Amherst, Amherst and Smith Colleges (2009)
- 2 MW at Titleist Golf Ball Manufacturer (2009)
- Two 2 MW Dairy Processing Plants (2010)
- 5.65 MW at Harvard U. Blackstone Central Plant (2010)
- 1.2 MW at Genzyme – Allston Plant (2011)
- 250 kW CHP at Southeast Regional School (2011)
- 300 kW CHP at Worcester Housing (2011)
- 555 kW CHP at Boston Scientific (2011)

See the list of qualified projects at the DOER web page:

[mass.gov/energy/aps](http://mass.gov/energy/aps)

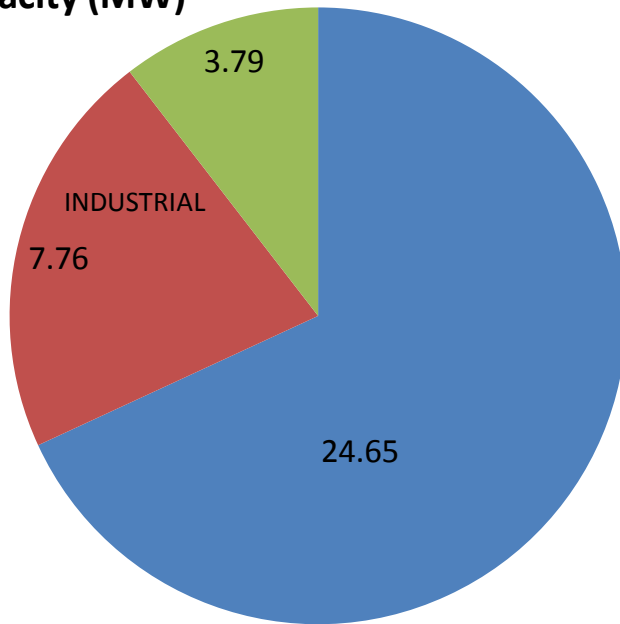
# APS CHP Projects Currently Generating AECs

- 75 kW - Nursing Home
- 75kW - Nursing Home
- 135 kW - Sports Club
- 75 kW - Sports Club
- 100 kW - Hotel
- 75 kW - Multi-Family

# CHP Qualifications by DOER (as of 1/10/2011)

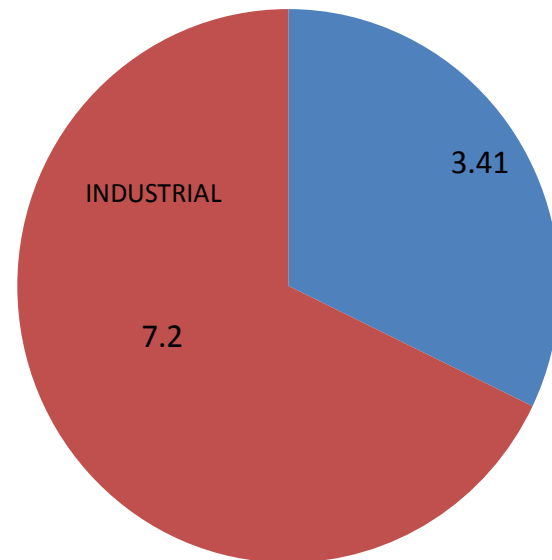
**Qualified**  
**36.2 MW**

Capacity (MW)



**Applications Currently Under Review**  
**10.6 MW**

Capacity (MW)



# Look Ahead

- What does the APS Program “pipeline” look like?
  - 75 to 200 kW: Encouraging increased interest and participation by developers and owners of systems in this size range. Expected that simplified metering requirements will assist.
  - 500 to 3000 kW: Expect steady but slow growth
  - $\geq 5000$  kW : One definite project and several others ranging from 10,000 to 13,000 kW which are contingent on economy.

# Look Ahead

- Scenarios that could produce a “step-function” increase in the number of AECs generated:
  - New or incremental use of by-product heat generated by utility scale power plants.
    - A steam based plant supplies warm condenser return water for heating commercial green houses
    - Supply of heat to a nearby host customer by changing operating mode and/or increasing the steam production capacity of the station.
  - Reduction or elimination of utility standby tariffs.

# Look Ahead

- Relaxation of existing limits on size of systems that can be interconnected to area and spot distribution networks.
- Program Related:
  - Expand Guidelines to:
    - address determination of biomass fuel usage including digester gas and wood chips.
    - Provide examples of correct application or the APS formula to frequently occurring cases under the incremental provisions.

# Other Topics

- Treatment of parasitic loads.
  - Examples: Fuel gas compressors , boiler feedwater pumps.
    - If total draw from plant auxiliary systems is > 25 kW at full load and the APS kWh meter is not located such that these loads are netted out, they must be computed and subtracted from the metered APS kWh.
      - » If any single parasitic load represents > 60% of the total parasitic load , that load must be provided with a dedicated kWh meter which must be read along with the main kWh meter.
      - » **AECs =  $(E_{elec} - E_{elecP}) / 0.33 + E_{therm} / 0.80 - E_{CHP\_in}$**

## Other Topics

- Treatment of supplemental firing:
  - Usually associated with gas turbine + HRSG systems. Allows augmented HRSG output when design steam load exceeds capacity of heat addition rate from the gas turbine hot exhaust stream.
  - A separate APS meter must be added to the supplemental burner fuel supply. The fuel supplied to the burner must be subtracted along with the turbine fuel in the formula.

- **Formula for Gas Turbine + HRSG with Parasitic Load >25kW at full load and supplemental firing**
- **AECs =  $(E_{elec} - E_{elecP}) / 0.33 + E_{therm} / 0.80 - (E_{gasturbine\ in} + E_{supplemental\ in})$**

## Resources at the MA DOER APS Website

[www.mass.gov/energy/aps](http://www.mass.gov/energy/aps)

Statement of Qualification Application

Standards for APS meters

Tools for estimating AECs generated for your project

## DOER CONTACT INFO

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