ENERGY STAR® Emerging Technology Efforts

Peter Banwell, EPA
ENERGY STAR Labeled Products
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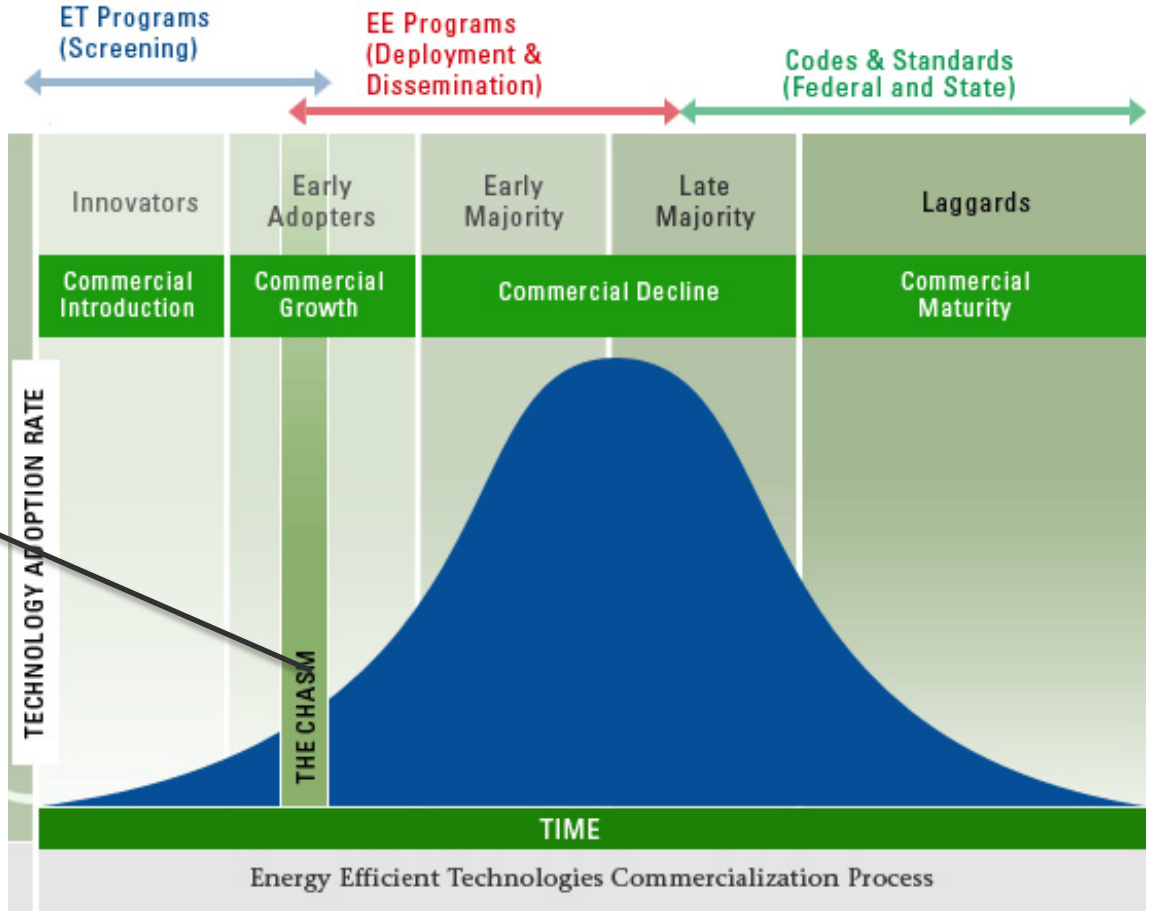
The Opportunity

- EPA recognized the need to deploy clean technologies faster to address climate change

Challenges in Market Introduction: The Chasm



Why Micro-CHP

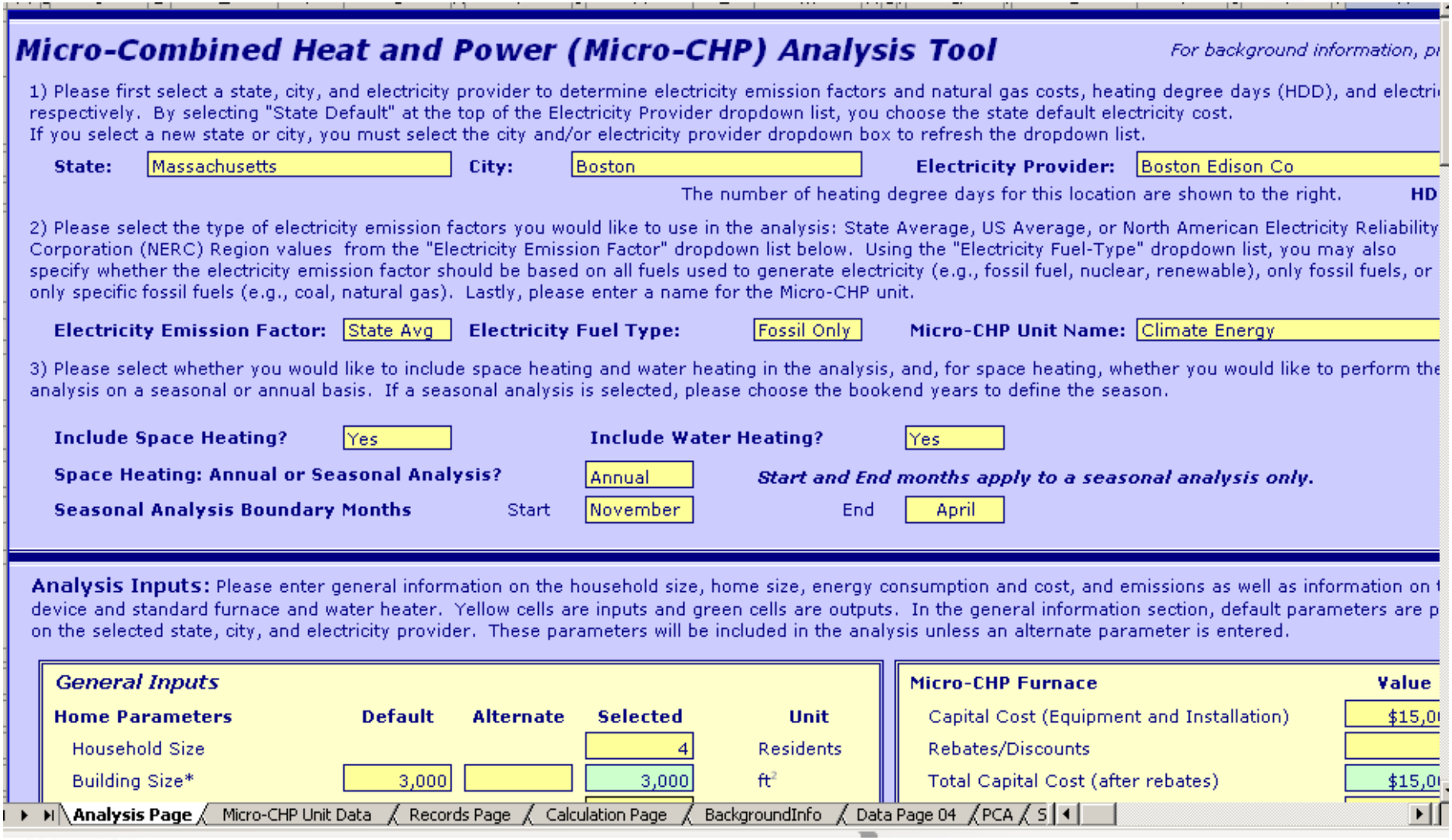
- EPA has experience with technology through EPA CHP Partnership program
- Significant CO_2 and energy savings
  - Particularly in cold climates (NE U.S.)
  - Estimate CO_2 emissions of 20–30%
- Net metering opportunities
- Significant barriers to market entry
  - Significant capital and installation costs
  - Maintenance (lack of trained professionals)
  - Lack of industry standards and awareness

EPA

Micro-CHP Efforts to Date

- Since launching effort in 2007, EPA has:
  - Developed a Micro-CHP tool to evaluate Micro-CHP technologies
  - Met with Micro-CHP manufacturers, test laboratories, and state implementers/ utilities
  - Attended industry conferences
  - Visited demonstration sites (U of MD)
  - Convened initial stakeholder working group to discuss market barriers

Micro-CHP Model



Micro-Combined Heat and Power (Micro-CHP) Analysis Tool

For background information, pl

1) Please first select a state, city, and electricity provider to determine electricity emission factors and natural gas costs, heating degree days (HDD), and electri
respectively. By selecting "State Default" at the top of the Electricity Provider dropdown list, you choose the state default electricity cost.
If you select a new state or city, you must select the city and/or electricity provider dropdown box to refresh the dropdown list.

State: Massachusetts **City:** Boston **Electricity Provider:** Boston Edison Co

The number of heating degree days for this location are shown to the right. **HD**

2) Please select the type of electricity emission factors you would like to use in the analysis: State Average, US Average, or North American Electricity Reliability Corporation (NERC) Region values from the "Electricity Emission Factor" dropdown list below. Using the "Electricity Fuel-Type" dropdown list, you may also specify whether the electricity emission factor should be based on all fuels used to generate electricity (e.g., fossil fuel, nuclear, renewable), only fossil fuels, or only specific fossil fuels (e.g., coal, natural gas). Lastly, please enter a name for the Micro-CHP unit.

Electricity Emission Factor: State Avg **Electricity Fuel Type:** Fossil Only **Micro-CHP Unit Name:** Climate Energy

3) Please select whether you would like to include space heating and water heating in the analysis, and, for space heating, whether you would like to perform the analysis on a seasonal or annual basis. If a seasonal analysis is selected, please choose the bookend years to define the season.

Include Space Heating? Yes **Include Water Heating?** Yes

Space Heating: Annual or Seasonal Analysis? Annual ***Start and End months apply to a seasonal analysis only.***

Seasonal Analysis Boundary Months Start November End April

Analysis Inputs: Please enter general information on the household size, home size, energy consumption and cost, and emissions as well as information on t
device and standard furnace and water heater. Yellow cells are inputs and green cells are outputs. In the general information section, default parameters are p
on the selected state, city, and electricity provider. These parameters will be included in the analysis unless an alternate parameter is entered.

General Inputs

Home Parameters	Default	Alternate	Selected	Unit
Household Size			4	Residents
Building Size*	3,000		3,000	ft²

Micro-CHP Furnace	Value
Capital Cost (Equipment and Installation)	$15,0
Rebates/Discounts	
Total Capital Cost (after rebates)	$15,0

Analysis Page | Micro-CHP Unit Data | Records Page | Calculation Page | BackgroundInfo | Data Page 04 | PCA | S

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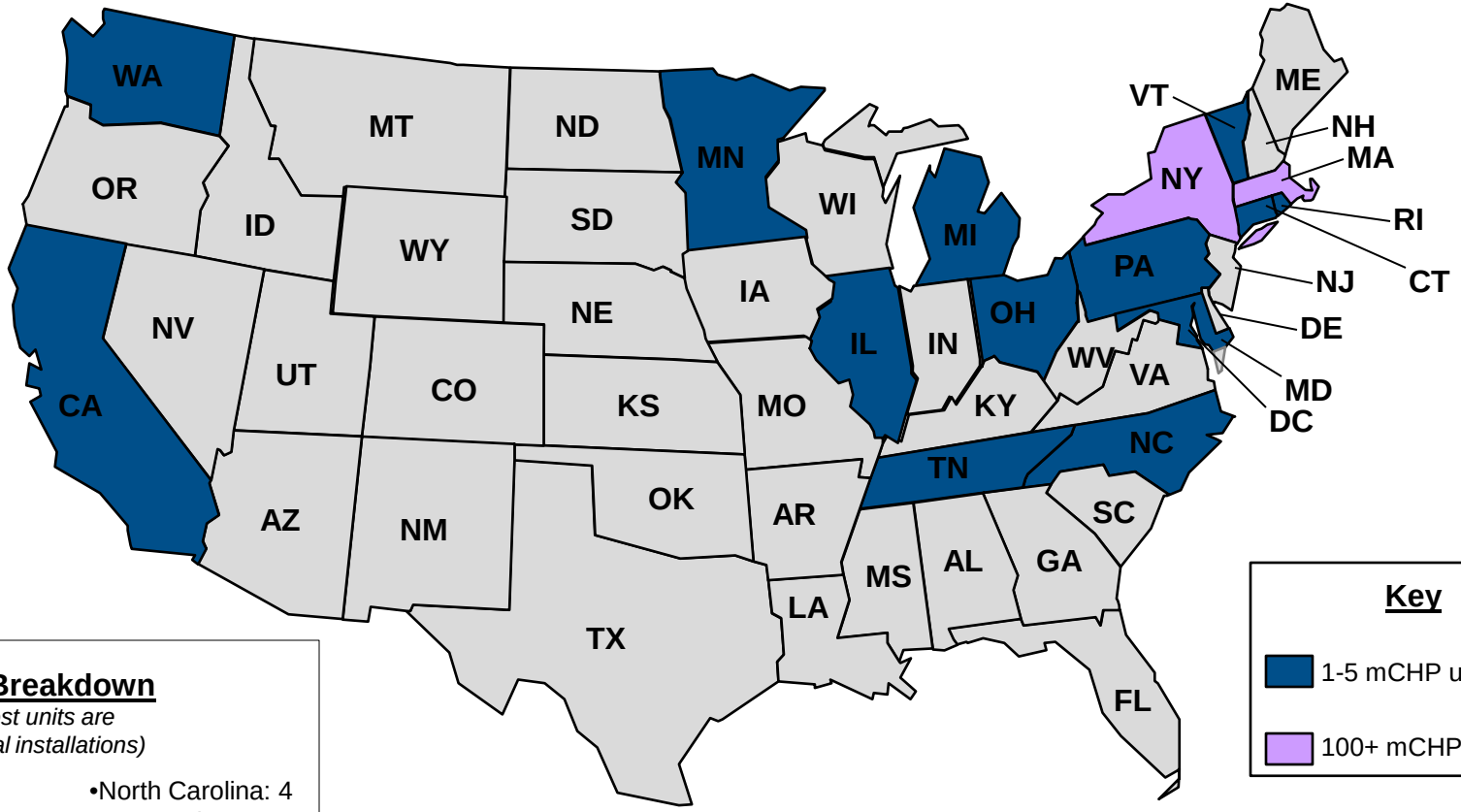
EPA's Focus

- Interest in residential, small commercial applications (≤5 kW)
- Technologies most suitable to residential applications
  - IC engine, stirling engine, fuel cell systems
  - Space heating and/or water heating applications

ECR International Micro-CHP



Key

- 1-5 mCHP units
- 100+ mCHP units

State Breakdown

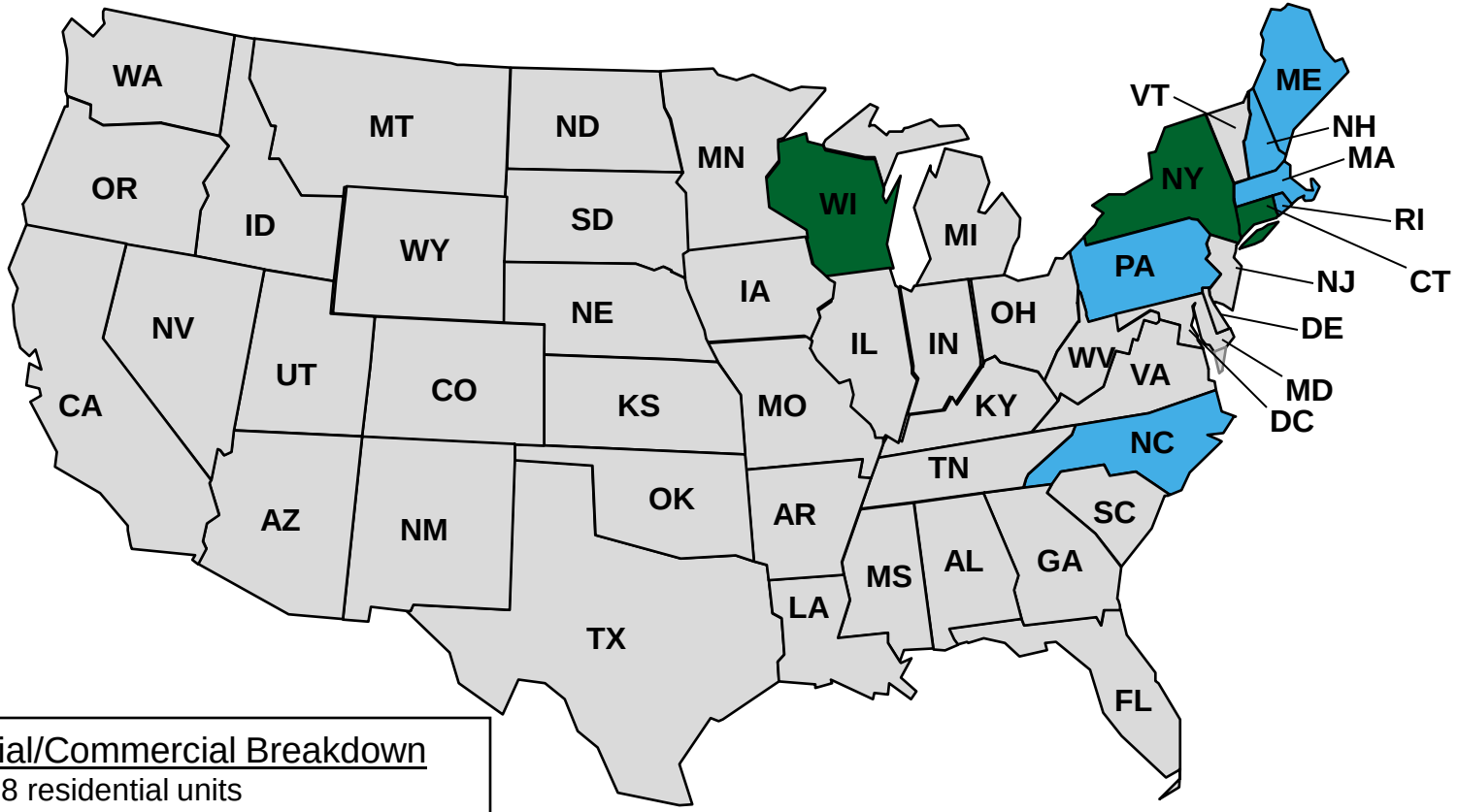
(note: most units are residential installations)

- California: 1
- Connecticut: 2
- Illinois: 1
- Maryland: 2
- Massachusetts: 151
- Michigan: 1
- Minnesota: 1
- North Carolina: 4
- New York: 101
- Ohio: 1
- Pennsylvania: 3
- Rhode Island: 5
- Tennessee: 1
- Vermont: 1
- Washington: 1

Other

- Ontario, Canada: 5

Marathon Micro-CHP



Residential/Commercial Breakdown

- Connecticut: 8 residential units
- Maine: 1 commercial unit
- Massachusetts: 1 residential unit
- New Hampshire: 1 commercial unit
- New York: 6 commercial units
- North Carolina: 1 demonstration project
- Pennsylvania: 1 commercial unit
- Rhode Island: 1 commercial unit
- Wisconsin: 1 commercial unit, 1 institutional unit, 3 residential units

Key

- 1-4 mCHP units
- 5-8 mCHP units

ENERGY STAR Award

Emerging Technology Awards Program

- Recognizes innovative products with potential to significantly reduce greenhouse gas emissions
- Advances promising technologies that may not yet meet ENERGY STAR Guiding Principles or may be relatively more complex to properly install and operate.
- Raises the profile of products, helping to build demand so cost is reduced and availability broadened
- Annual award given to products that meet rigorous performance criteria in 1–2 select categories per year

Micro-CHP: 1st Category

Goals of Awards Program

- Increase awareness via website and tools to educate consumers, utilities
- Provide a forum of industry leaders to identify market barriers and opportunities to remove these barriers
- Educate the builder/contractor community of the benefits of incorporating Micro-CHP in home design

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Micro-CHP: 1st Category

How Emerging Technology Award addresses barriers specific to MCHP

Barrier	Goal	How Award Program can Help:
Significant equipment & installation costs	Reduce costs	•Help manufacturers achieve greater economies of scale by providing tools and 3rd party recognition that will help them increase sales in target markets •Provides neutral forum for stakeholders to discuss strategies for increasing base of qualified installers, increasing competition among them and lowering installation costs
Lack of industry standards	Expedite standards development	•Highlights the need for standards development in this area •Encourages prioritization of MCHP standard development
Lack of awareness	Increase awareness	Increases awareness via EPA outreach activities, website and tools to educate consumers, utilities, builders and other stakeholders
Lack of trained professionals	Increase base of qualified professionals	Helps product providers engage and educate prospective installation and maintenance contractors

Micro CHP Requirements

Performance Characteristic	Requirements	Required Documentation
Product Performance		
NOx Emissions (Output based, includes thermal credit*)	<0.3 lb/MWh (136 gm/MWh)	Certified third party emissions measurements in accordance with established EPA testing protocols or equivalent
Overall CHP efficiency ("system efficiency")**	70% HHV	Laboratory results based on ASERTTI Laboratory Testing Protocol or equivalent
Noise	≤ 60 dB(A) at 1m	Verified measurements at 1m
Minimum warranty available (years)	Two years parts and labor on all systems	Copy of warranty agreement
Minimum runtime field testing	Verified, monitored at least 5 units for 1 year (one heating season)	Field report signed by senior management. At minimum, test report should include: test location(s); primary fuel type, measured or calculated system efficiency, thermal output, net power output, fuel input, total run hours, and availability factor***
Certification	UL 2200 (Stationary Generators); UL 1741 (Inverters, Converters, Controllers and Interconnection Equipment) or equivalents	Copy of certification case files

Requirements cont.

Additional Company Requirements		
Product Commercialization Plan	Required	Company must submit and EPA must approve a Product Commercialization Plan that includes: market size, commercialization partners, targeted applications, targeted regions, and staffing plan to support plan implementation.
Warranty, Service and Maintenance Plan	Required	Company must submit and EPA must approve a Warranty, Service and Maintenance Plan that demonstrates that sales will occur in areas that are supported by qualified installers and maintenance technicians, and/or that service plans and warranties are offered.

*Emissions rate (lb/MWh) = Mass Emissions Rate (lb/hr) / (Elecric Output (MW) + Thermal Output Recovered for Heating and/or Hot Water (MW))

** Overall CHP Efficiency = (Net CHP Electric Output + CHP Thermal Output Used)/CHP Fuel Input; all calculated in Higher Heating Value (HHV)

*** Availabiliy Factor (AF) = measures on a percent basis the unit's "could run" capability. Impacted by scheduled outage hours (SOH - system is down due to scheduled maintenenace) and Forced Outage Hours (FOH - hours when the system would be operating but is down due to mechancial/other malfunctions). AF = (Total Annual Run Hours/(Total Annual Run Hours + Forced Outage Hours)); Assumes SOH conducted during non-operating season

Timeline

- Awards program announced August 12
- Micro-CHP applications due November 1
- Award winners announced January 1, 2011
  - Send to emergingtech@energystar.gov
- Website info
  - http://www.energystar.gov/emergingtech

EPA Contacts

- Peter Banwell: Banwell.Peter@epa.gov
- Kristen Taddonio: Taddonio.Kristen@epa.gov