

CHP in State Clean Energy Portfolio Standards

Minnesota CHP Stakeholder Meeting #2:
Overview and Comparison of State CHP Policies and
Programs, Standby Rates and Net Metering

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U.S. DEPARTMENT OF ENERGY

CHP Technical Assistance Partnerships

MIDWEST

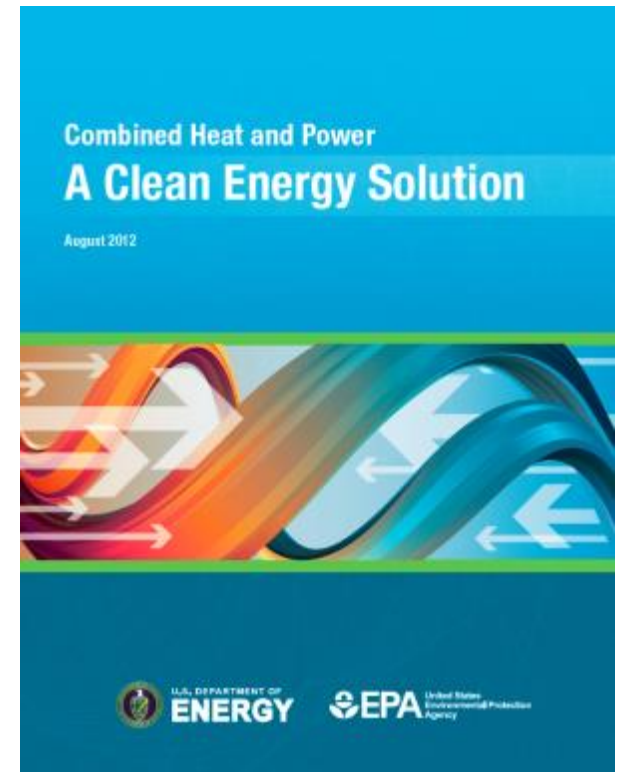
Presentation

- CHP Drivers
- CHP in Clean Energy Portfolio Standards
- Example Approaches: Massachusetts and Illinois

Emerging Drivers for CHP

- Benefits of CHP recognized by policymakers
- Favorable outlook for natural gas supply and price in North America
- Opportunities created by environmental drivers
- Energy resiliency and critical infrastructure

DOE / EPA CHP Report (8/2012)



Report:
http://www1.eere.energy.gov/manufacturing/distributedenergy/pdfs/chp_clean_energy_solution.pdf

President Obama Executive Order


August 30th, 2012

- To accelerate investments in industrial energy efficiency, including CHP.
- Establishes a national goal of 40 GW of new, cost effective CHP installations by 2020.
- Achieving this goal would:
 - Increase total CHP capacity in the U.S. by 50%
 - Save energy users additional \$10 billion a year
 - Result in \$40 - \$80 billion in new capital investment in manufacturing and other U.S. facilities

The Guide provides state policy makers with actionable information regarding:

- Design of standby rates
- Interconnection standards for CHP with no electricity export
- Excess power sales
- Clean energy portfolio standards
- Emerging market opportunities: CHP in critical infrastructure and utility participation in CHP markets

In development: State coordination on the Guide & how to refine policy implementation to achieve greater CHP.



Guide to the Successful Implementation of State Combined Heat and Power Policies

Industrial Energy Efficiency and Combined Heat and Power Working Group

Driving Ratepayer-Funded Efficiency through Regulatory Policies Working Group

March 2013

The State and Local Energy Efficiency Action Network is a state and local effort facilitated by the federal government that helps states, utilities, and other local stakeholders take energy efficiency to scale and achieve all cost-effective energy efficiency by 2020.

Learn more at www.seeaction.energy.gov

CHP in Clean Energy Portfolio Standards

○ Renewable Portfolio Standard (RPS)

- Traditionally focused on wind, solar, biomass projects
- Often market based – qualifying projects may receive tradable credits (RECs)
- CHP utilizing biogas/biomass usually qualify (sometimes WHP)
- Example of RPS that include CHP: **Connecticut**

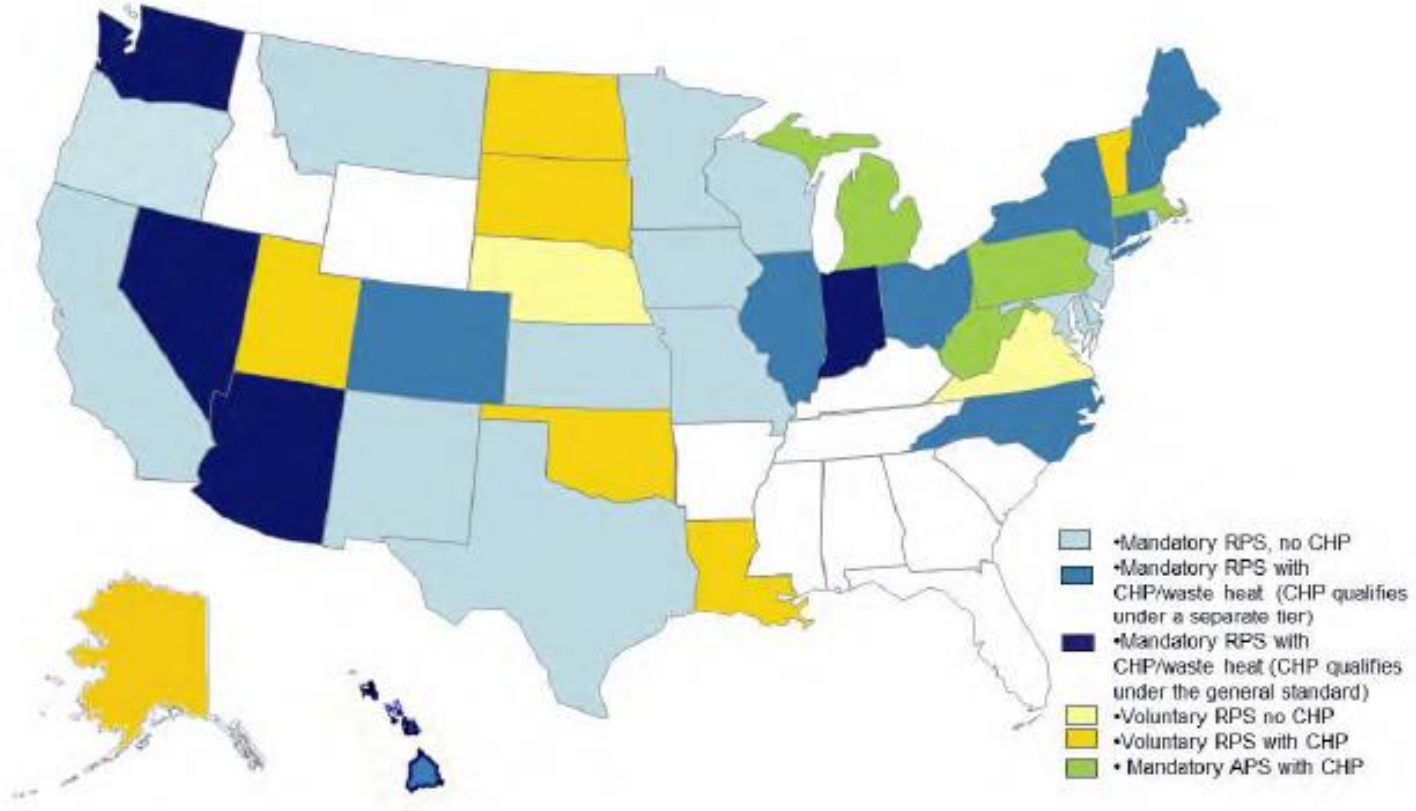
○ Energy Efficiency Resource Standards (EERS)

- Utilities to meet mandated or voluntary annual targets (reduce energy use)
- Some states include CHP and other efficient DG technologies
- Examples of CHP in EERS: **Massachusetts, Ohio, Illinois, Maryland**
- Sometimes CHP is restricted due to fuel switching issue

CHP in Clean Energy Portfolio Standards (cont.)

- Alternative Energy Portfolio Standard (AEPS)
 - Annual targets for percentage of supplier's capacity from alternative or advanced energy sources
 - Example Technologies: CHP, Coal with Carbon Capture and Storage (CCS), coal co-fired w/biomass, or MSW
 - Examples of APS with CHP: **Massachusetts, Pennsylvania**

States with CHP in Clean Energy Standards



Source: Map based on ICF International research. December 2012.

- February, 2013 – 42 states plus District of Columbia have some form of CEPS
- 24 of the states include a form of CHP and/or WHP as an eligible resource
- States vary on levels of implementation (specific tiers w/wo targets)

3 Considerations for Successful Approaches of CHP in Clean Energy Portfolio Standards

1. Qualifying Resources Definition – How CHP is Defined

- Example 1: **Massachusetts APS** allows CHP systems using renewable fuels and natural gas
- Example 2: **Connecticut RPS Class III** is a third tier to the RPS resource requirements that is fulfilled with CHP, demand response, and electricity savings from conservation and load management programs

2. Min. Eff. Requirements and/or Performance-Based Metrics

- Minimum Efficiency Examples: **Connecticut** credits all electricity generated from systems >50%; **Washington State** CHP systems must have thermal output of at least 33%
- Performance Metric Example: **Massachusetts APS** credits are allocated on basis of one credit per MWh of net source fuel savings (no min. eff.)

3 Considerations for Successful Approaches of CHP in Clean Energy Portfolio Standards (cont.)

3. Separate, Distinct Targets for CHP and Other Technologies

- Percentage Requirement Examples: **Connecticut's Class III** and **Pennsylvania's Tier II** set a separate tier for CHP and other EE technologies and require a specified percentage of the target to be met by each tier
- Separate Program Examples: **Massachusetts's APS** and **Michigan's Energy Optimization Savings Standard** establish a separate portfolio standard program (distinct from the RPS) that is devoted to CHP and/or other EE technologies

Examples of CHP Eligibility in State Portfolios

State	RPS w/ CHP	APS w/ CHP	EERS w/ CHP... CHP Explicitly Included	EERS w/ CHP... EERS Unspecified Technology
AZ	Yes, only includes renewably fueled CHP	---	Yes	---
CO	Yes, separate DG tier	---	---	Yes
CT	CHP is in a separate tier – a Class III resource	---	Yes, as part of the RPS (Class III)	---
DE	Only renewably fueled CHP	---	Yes	---
HI	Yes	---	Yes, full implementation begins in 2015	---
IL	---	---	Yes, in Public Sector Pilot Program & Private Sector Custom Program	---
LA*	Yes, only WHP (pilot)	---	---	---
MA	CHP not explicitly mentioned, renewably fueled CHP only	Yes, stand-alone EE program, separate from the state's RPS	Yes, targets as part of the Green Communities Act	---
ME	Yes	---	---	Yes, unspecified technologies qualify (potentially CHP)
MI	---	Yes, renewable standard with EERS component	Yes, part of APS	---
NV	Yes	---	Yes, part of RPS	---
NC	Yes	---	Yes, part of RPS	---
OH	Yes, only WHP	Yes	Yes	---

* Voluntary Goal

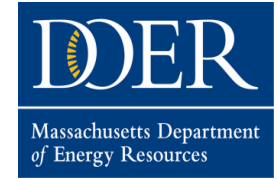


Source: SEE Action

Overview of MA Policies for CHP

MASS SAVE – Utility Energy Efficiency Program

Alternative Energy Portfolio Standard (APS)



MASS SAVE – Utility Energy Efficiency Program (Grant Support)

- All cost-effective EE is mandated by Green Communities Act of 2008 funded through a System Benefit Charge on electric ratepayers, as well as contributions of RGGI auction funds, with lost revenues captured through de-coupling.
- CHP is included as Energy Efficiency measure, if it can pass a B/C test
- Provides rebates of up to \$750/kW, and 50% cost of feasibility studies.

Alternative Energy Portfolio Standard – APS (Performance Based Support)

- Operates in conjunction with state's Renewable Energy Portfolio Standard (RPS) programs
- Creates obligation of all retail electricity suppliers to acquire Alternative Energy Certificates (AECs) Minimum Standard – 3% in 2013 to 5% in 2020.
- Alternative Compliance Payment rate is \$21.43 in 2013.
- APS supports non-RE technologies, nearly all is CHP.
- For CHP, AECs are provided for efficiency gains due to electric and thermal production.

MASS SAVE Energy Efficiency Program for CHP Incentive Structure

- Green Communities Act of 2008 recognizes CHP as an Energy Efficiency Measure eligible for incentives by utilities.
- Rebate Incentive Structure
 - Small systems (<150 kW): \$750/kW
 - Larger systems (\geq 150 kW): up to \$750/kW
 - Rebate limited to no more than 50% of installed cost.
- Benefit/Cost Ratio (BCR) Test considers operational and electric grid value of CHP project. Analysis is on a case-by-case basis, typically with hourly simulation.
- Only high efficiency CHP units likely to demonstrate threshold $BCR > 1$.

MASS SAVE Energy Efficiency Program for CHP

Recent Outcomes

- For projects awarded, Benefit/Cost ratios have ranged between 1 and 2.
- For 2011:
 - CHP has represented 30% of Commercial/Industrial EE Target Savings
 - \$/kWh savings have been the lowest of all MASS SAVE measures.

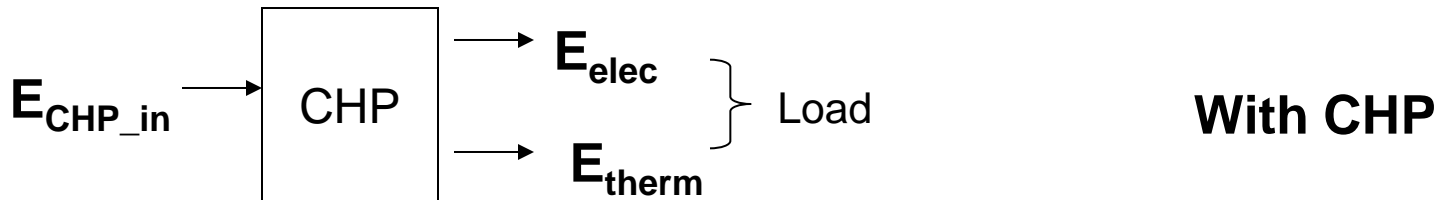
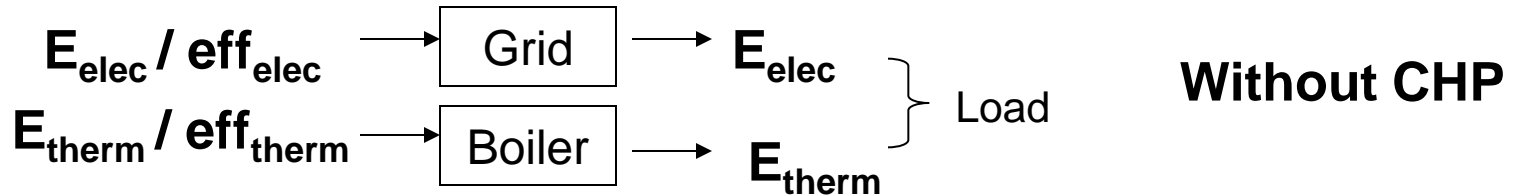
Link to Guide for the MASS SAVE CHP Incentive Program

<http://www.masssave.com/business/building-or-equipment-upgrades/find-incentives/~media/Files/Business/Applications%20and%20Rebate%20Forms/CHP%20Incentive%20Guidebook%20-%20dated%2011-18-10.ashx>

Alternative Energy Portfolio Standard

- Established under Green Communities Act 2008. Provides for RPS-type program for alternative (non-renewable) technologies. Program administered under DOER APS Regulation 225 CMR 16.00.
- Creates obligation of all retail electricity suppliers to acquire Alternative Energy Certificates (AECs) equal to a set percentage of load served. Program compliance obligation began in 2009; Minimum Standard increases to 5% by 2020; ACP Rate is \$21.43/MWh increasing with CPI.
- Eligible technologies include flywheels, CHP, gasification with carbon capture/sequestration, paper-derived fuels. Nearly 100% of AECs generated are from CHP units.

Alternative Energy Portfolio Standard AECs for CHP Account for Primary Fuel Savings



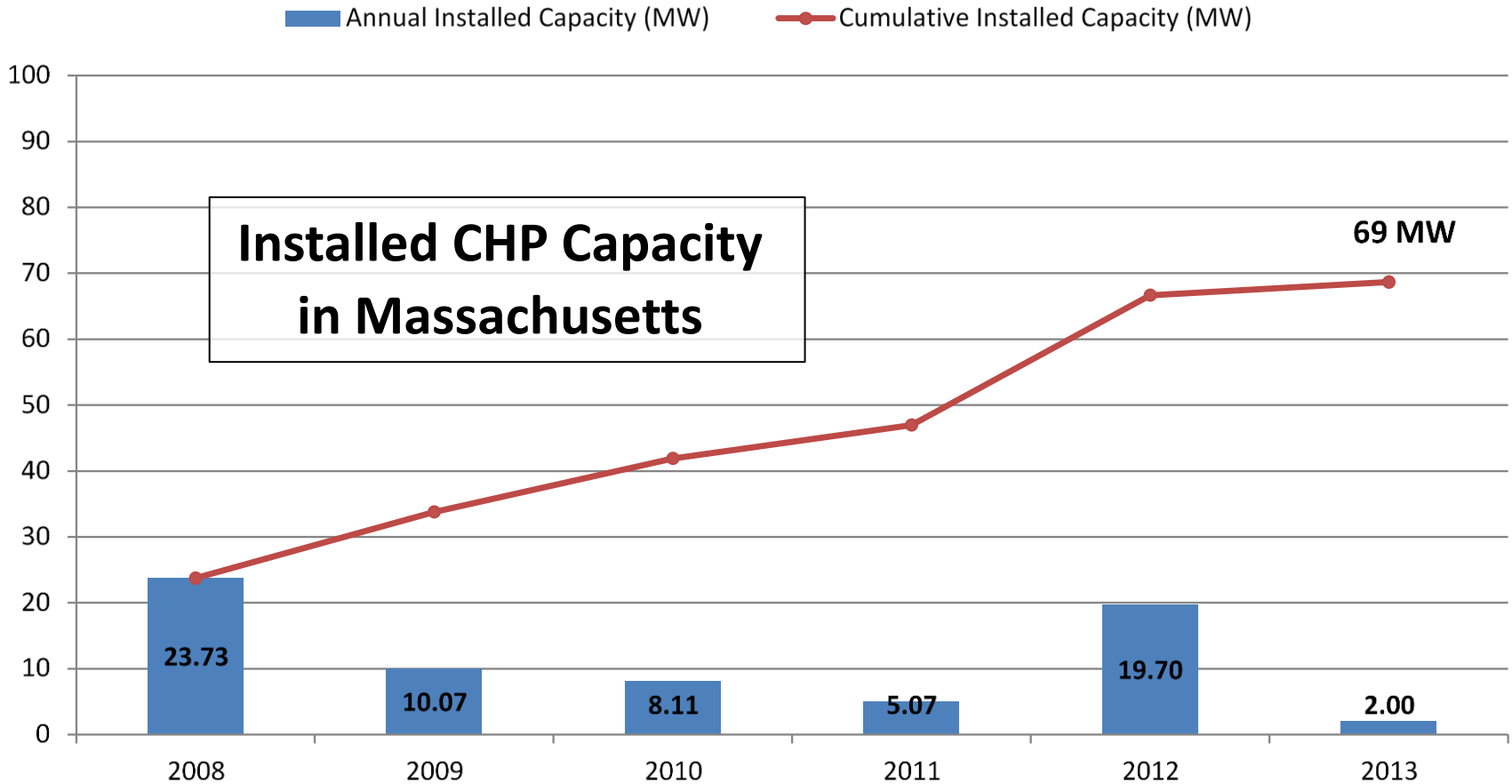
Alternative Energy Credits (AECs) calculated as **primary energy savings** by subtracting the primary fuel inputs (with average overall electric and thermal efficiencies of 0.33 and 0.80, respectively, and all energy units expressed in MWh).

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

Guidelines for APS Eligible CHP Systems

- Metering, subject to independent verifier, is required to demonstrate useful thermal and power output. Metering requirements relaxed for small systems.
- Program supports incremental CHP
 - Provides incentive for existing electric-only power plants to add useful thermal load, or for thermal-only plants to add electric generation.
- CHP Projects must serve thermal load in MA
- CHP Units may also qualify for utility MASS SAVE Funding
- APS Guideline for CHP at: www.mass.gov/eea/docs/doer/rps-aps/aps-chp-guidelines-jun14-2011.pdf

Slow, Steady Growth in CHP



Illinois CHP Pilot Program

Energy Efficiency Portfolio Standard



- 2013 legislation amended the Public Utility Act to include measures that reduce total Btu's of electricity & natural gas eligible for energy efficiency savings
- 2013 amendment opened the door for the inclusion of CHP and geothermal heat pumps
- In 2013, DCEO in partnership with the ERC proposed a Public Sector CHP Pilot Program to the Illinois Commerce Commission (ICC)
- In 2014, ICC approved DCEO Public Sector CHP Program and directed the Stakeholder Advisory Group (SAG) to incorporate standardized methodology in the Illinois TRM



Incentive Structure

Type	Incentive Value ¹	Issue Date
Design Incentive	\$75/kW capacity ²	Completion of the design phase
Construction Incentive	\$175/kW capacity ³	Successful commissioning of the system
Production Incentive (Conventional CHP)	\$0.08/kWh ($\eta \geq 70\%$ HHV) OR \$0.06/kWh ($60\% \leq \eta < 70\%$ HHV) of “useful electric energy” produced	After 12 months of operation based on meeting the measured operating requirements of the system
Production Incentive (WHP)	\$0.08/kWh of “useful electric energy produced” – assumes no additional fossil fuel utilized	After 12 months of operation

1. Total Incentive (Design + Construction + Production) capped at \$2M or 50% of project cost, whichever is less
2. Design incentive is capped at \$195,000 or 50% of design cost , whichever is less
3. Construction total capped at 50% of construction cost or [\$650,000 – design incentive], whichever is less

Energy Savings Measurements

- The customer is interested in the incentive levels
(kWhs produced at required annual efficiency levels)
- The program is interested in the energy savings
(kWhs and therms realized by the system)
- The same measured data required to calculate the performance (energy efficiency) is needed to calculate the energy savings.

Goal is to promote long hours of operation at highest levels of efficiency to achieve maximum energy savings.

Energy Savings Calculations

○ Fuel Savings =

Fuel that would have been Utilized to Generate the Useful Electricity Output of the CHP system if that electricity was provided from the **Local Electric Grid**

+

Fuel that would have been utilized by a **Boiler On-Site** to provide the useful thermal energy output of the CHP system)

–

Total Fuel Consumed by the **CHP system**

$$S_{\text{fuel CHP}} = (F_{\text{grid}} + F_{\text{thermal CHP}}) - F_{\text{total CHP}}$$

Unique Program Aspect: 75% savings attributed to electric and 25% savings attributed to natural gas

Cost Effectiveness

$$TRC = \frac{NPV \sum Benefits}{NPV \sum Costs}$$

Benefits

- Energy-related costs avoided by the utility
- Capacity-related costs avoided by the utility, including generation, transmission, and distribution
- Additional resources savings (i.e. gas & water if utility is electric)
- Monetized environmental and non-energy benefits
- Applicable Tax credits

Costs

- Program overhead costs
- Program installation costs
- Incremental measure costs (whether paid by customer or utility)
- Maintenance costs
- Cost of extra fuel used by the CHP system for its operation

Project Eligibility & Other Info

- Projects must be public sector, physically located in Illinois, and received delivery service from participating utility
- Topping Cycle systems: minimum 60% efficiency (HHV) with at least 20% of total useful energy output in form of useful thermal energy.
- Bottoming Cycle systems no efficiency requirement if no additional fuel required to operate
- Existing CHP systems are eligible if CHP system has not operated in last 3 years and would require a 2+ year payback to repair/upgrade and bring back online
- Existing prime mover systems not presently outfitted with heat recovery (again payback to upgrade > 2 years)
- RFA Announced June 2014... Applications Due Nov. 2014... Projects Online by May 2016

More Information: <http://www.erc.uic.edu/energy-efficiency/illinois-energy-now-programs/dceo-chp-pilot-program/>

US DOE CHP Technical Assistance Partnerships (TAPs)

- **U.S. DOE CHP Technical Assistance Partnerships (TAPs)** originally established in 2001 by U.S. DOE and ORNL to support DOE CHP Challenge (formally known as RACs and CEACs)
- Today the **7 TAPs** promote the use of **CHP, District Energy, and Waste Heat to Power** Technologies
- Strategy: provide a technology outreach program to end users, policy, utility, and industry stakeholders focused on:
 - **Market analysis & evaluation**
 - **Education & outreach**
 - **Technical assistance**
- Midwest Website: www.midwestCHPTAP.org



Questions

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