

U.S. Department of Energy Clean Energy Application Centers

*Promoting CHP, District Energy,
& Waste Heat Recovery*



U.S. DEPARTMENT OF ENERGY

Clean Energy Application Centers

Origin of the Regional Application Centers (2001)

NATIONAL CHP ROADMAP DOUBLING COMBINED HEAT AND POWER CAPACITY IN THE UNITED STATES BY 2010



MARCH 2001

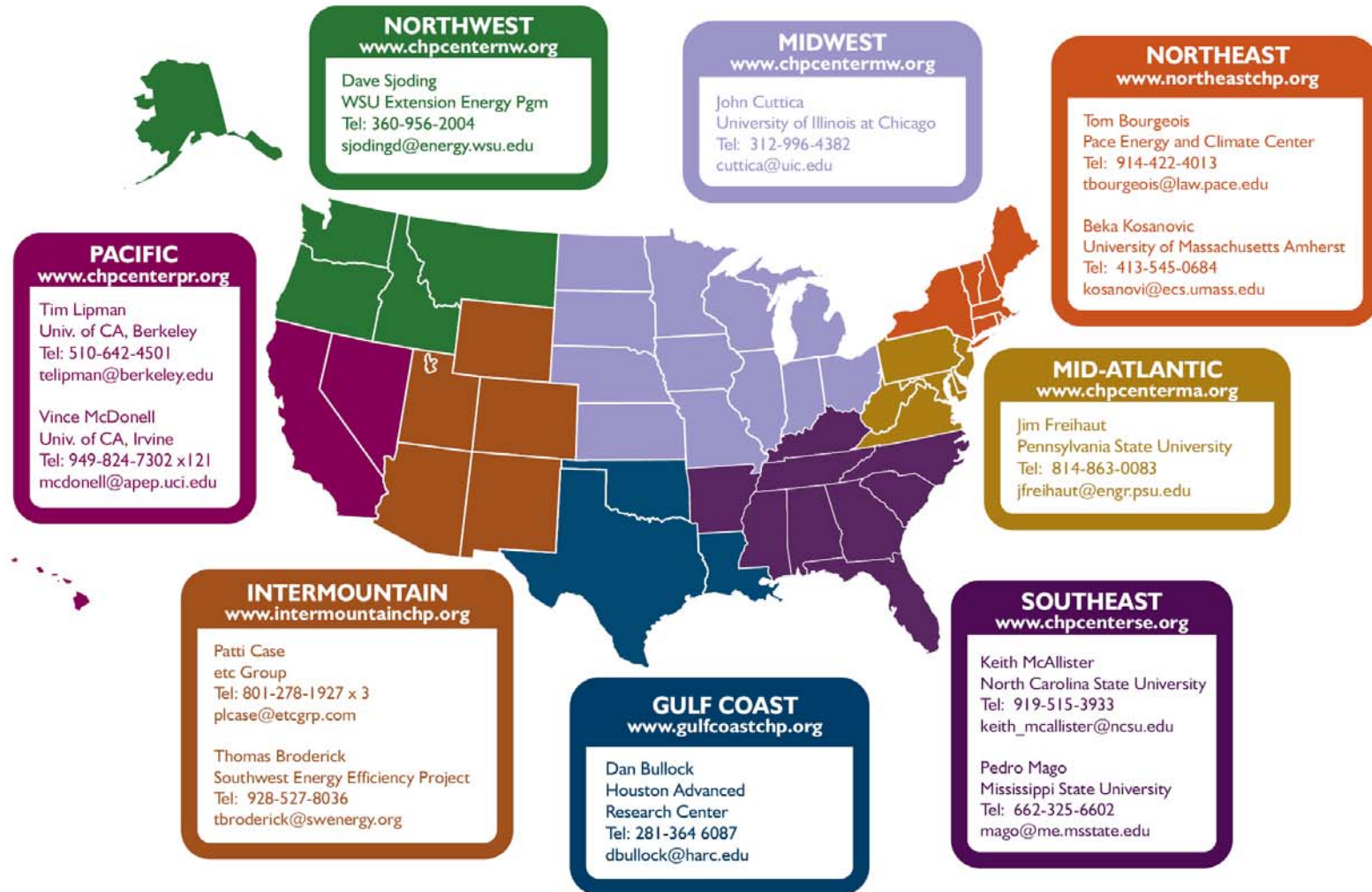


IN COOPERATION WITH
U.S. DEPARTMENT OF ENERGY
U.S. ENVIRONMENTAL PROTECTION AGENCY

- Over 50 organizations contributed to National CHP Roadmap:
 - Technology issues
 - Deployment issues
- Determined need for a stronger regional focus
 - ➔ DOE EERE's approach: CHP Regional Application Centers (RACs)
 - Pilot center in the Midwest



Eight Application Centers Now Serve all 50 States (2003)



For more information: www1.eere.energy.gov/industry/distributedenergy/racs.html

Expansion in Scope: 2009



- Names changed to “Clean Energy Application Centers”
- Added Waste Heat Recovery and District Energy



Clean Energy Technologies

CHP



The sequential production of electric and thermal power from a single dedicated fuel source

Waste Heat Recovery



Captures heat otherwise wasted in an industrial process and utilizes it to produce electric power. These systems may or may not produce additional thermal energy

District Energy



Central heating & cooling plants that incorporate electricity generation along with thermal distribution piping networks for multiple buildings (campus / downtown area)

Mission

- Each center is charged with:

*Helping facilitate the adoption of efficient and well-designed
CHP, waste heat recovery, and district energy*

- Each center determines the best way to do that for their region

- Always a combination of:

- Education and Outreach
- Technical Assistance
- Informing Policy



What We Actually Do

- Inform prospective end users on the benefits, business models, & resources available for their specific application
 - Workshops, trainings, webinars, guides, websites, advice
- Help potential projects “take the next step”
 - Free project feasibility screenings
 - Help on permitting issues, tariffs/rate assessments, equipment questions, convincing upper management, 3rd party review of proposals...
- Promote CHP as an effective clean energy **policy** solution:
 - Educate state policymakers and regulators, remove barriers



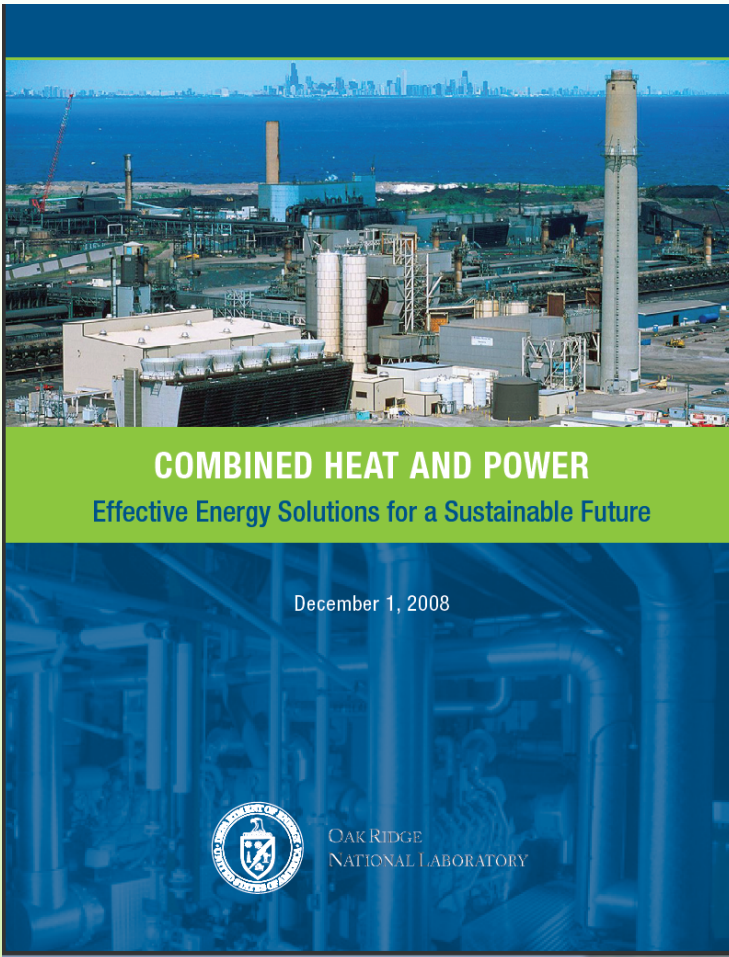
On-The-Ground Results and Accomplishments

- Supported over 350 projects representing over 1.5 GWs CHP
 - 7.7 million tons of CO₂ avoided
- Over 120 target market workshops (9000 attendees)



- Hospitals and Healthcare
- Waste Heat to Power
- Manufacturing
- Food Processing
- Forest Products
- Livestock
- Wastewater Treatment
- Energy Assurance
- Multi-family housing
- Federal Facilities
- Municipalities
- Premium Power
- Gas Utility Clients

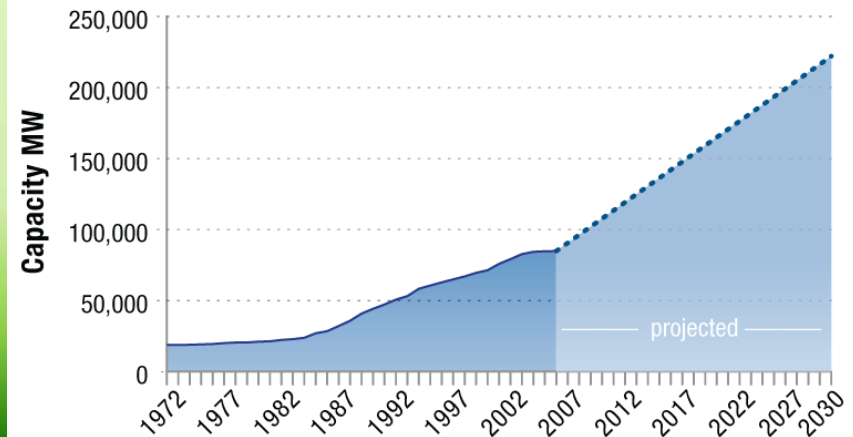




http://www1.eere.energy.gov/industry/distributedenergy/pdfs/chp_report_12-08.pdf

- CHP already provides almost 10% of our nation's energy
- **Our New Target:** 20% of U.S. electrical capacity by 2030

Historical CHP Capacity and Growth Needed to Achieve 20% of Generation



Information Examples

- Basic info
- Market-specific applications
- Policies & regulations
- Installations and contacts
- Project profiles
- Technical reports/studies
- Evaluation tools
- News & events
- Presentations

Trailblazer Pipeline
4-MW Waste Heat Recovery System

Trailblazer Pipeline
The 430-mile Trailblazer natural gas pipeline winds through parts of Wyoming, Colorado, and Nebraska. The pipeline is

Quick Facts

- LOCATION: Near, Colorado
- MARKET SECTOR: Pipelines
- FUEL: None (uses heat only)
- PLANT TYPE: None
- MAX CAPACITY: 4.5 MW
- AVERAGE CAPACITY FACTOR: ~70%
- ENERGY OUTPUT: 27,000 Mwh per year
- IN OPERATION SINCE: March 2008
- EQUIPMENT: Ormat organic Rankine cycle
- USE OF ELECTRICAL ENERGY: Renewable energy for Highline Electric Association members
- ESTIMATED YEARLY SAVINGS: Over \$10 million
- JOINT PROJECT BY: Highline Electric Association, Tri-State Generation & Transmission, Kinder Morgan, and Ormat
- ENVIRONMENTAL BENEFITS: 27,000 tons of CO₂, 84,000 kg of NO_x, and 124,200 kg of SO₂

Kennecott Utah Copper Smelter
32-MW Waste Heat Recovery System

Quick Facts

- LOCATION: Salt Lake County, Utah
- MARKET SECTOR: Primary metals
- SMELTER SIZE: 300,000 tons of copper anodes produced annually
- EQUIPMENT: Waste heat boilers, heat recovery system, steam turbine generator
- ELECTRIC CAPACITY: 32 MW (nameplate, 25-28 MW average)
- PERCENT OF FACILITY LOAD: ~50%
- WASTE HEAT SOURCE: Smelter exhaust, acid plant
- IN OPERATION SINCE: 1995
- ENVIRONMENTAL BENEFITS: Pollution-free electricity from waste heat, improved energy efficiency

Reasons for Waste Heat Recovery

The smelter was re-designed and modernized in 1995 to be among the lowest-emission smelters in the world, and a pollution-free, waste-heat-to-power generation system was a key component of the modernization. The Kennecott Utah Copper smelter has the highest level of energy recovery of any smelter in the world.

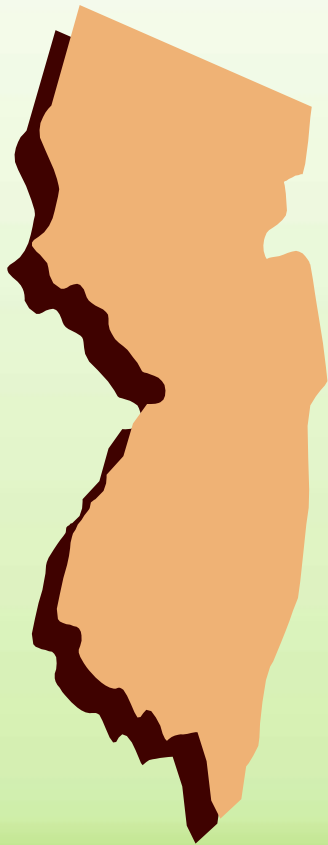
Since the copper production process is energy intensive and energy is a key component of Kennecott's costs, the company strives for continual improvement in how it manages, generates, and uses energy. Based on forecasts of rising energy costs, the company determined that it would be a wise long-term investment to generate power from thermal energy that would otherwise be wasted. The company's on-site engineers continue to improve the system design to optimize the energy output and reliability.

Over 100 Project Profiles



Sample Policy Success:

- New Jersey



WIN

- NJ now allows CHP plants that provide thermal energy to adjacent properties to also provide electric power to those properties
 - Even across streets
 - **Mid-Atlantic RAC** educated legislators and regulators on the concept, the benefits, and the proper language



Sample Policy Success:

- Texas



- TX requires a CHP feasibility analysis for all new construction and major renovations to **critical government buildings**
 - Any gov't building expected to continue service during prolonged electric outages
 - **Gulf Coast RAC** provided technical education and analysis leading to the introduction of the bill



Sample Policy Success:

- Arizona



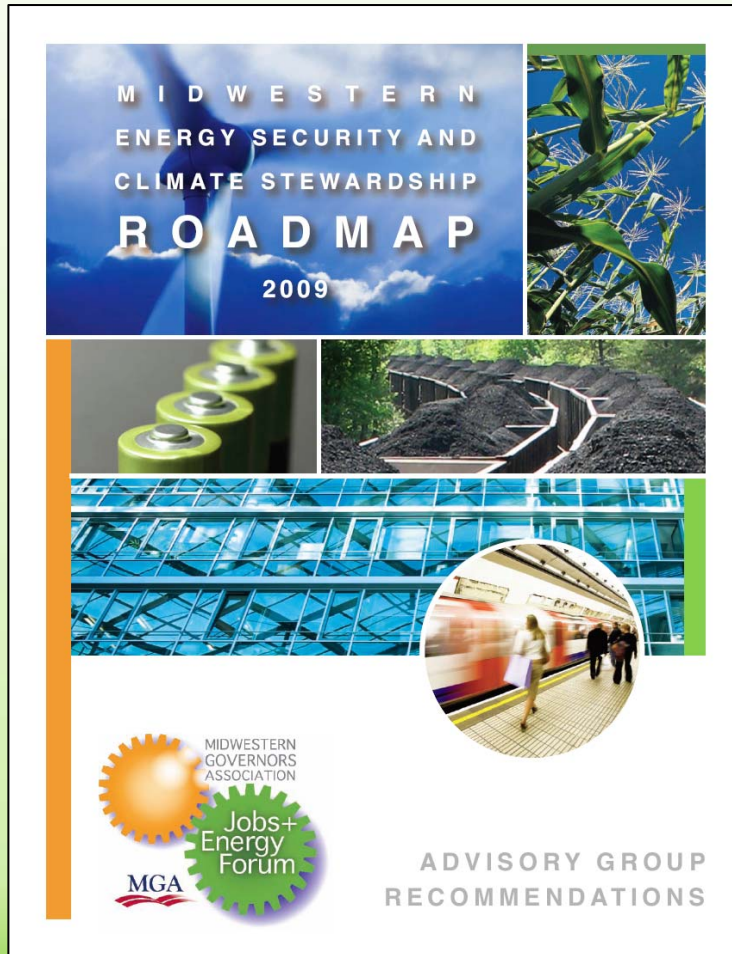
WIN

- CHP is eligible in Arizona's new electric efficiency resource standard (22% by 2020)
- ...And in the gas efficiency standard (6% by 2020)
 - **Intermountain RAC** educated commissioners/ staff about its inclusion
 - Now working on getting a pilot program



Sample Policy Success:

- Midwest Governors Association



- Midwestern Energy Security & Climate Stewardship Roadmap
 - Calls for doubling the CHP capacity in the Midwest by 2030 (21.2 GW)
 - Outlines policy needs to reach those targets
 - **Midwest RAC** provided all the CHP educational, analytical, and policy inputs



Technical Assistance for Potential Projects

1.
PRE-SCREEN /
SITE QUALIFICATION

2.
LEVEL 1
SCREENING ANALYSIS

3.
LEVEL 2
CONCEPTUAL & FINANCIAL

4.
LEVEL 3
INVESTMENT GRADE ANALYSIS

5.
PROCUREMENT, OPERATION,
& MAINTENANCE

- We provide free Pre-Screening, Level 1 Analyses, and Level 2 Analyses
- We advise businesses on all other steps



Sample Technical Assistance:

- Texas

○ BP Oil (World Wide Energy) Trading Center

- New construction
- 4.3 MW (low NOx) turbine
- 1,300 ton absorption Chiller
- 75% total efficiency

○ Gulf Coast RAC participation:

- Introduced & promoted the to the design team and end user (*extensive education and information exchanges*)
- Organized tours of Del Medical Center for BP management to witness CHP installation & operation
- Provided BP Oil technical assistance in overseeing the feasibility study done by ARUP (*engineering firm*)



Sample Technical Assistance:

- Washington State

○ Grays Harbor Paper Mill

- 18.5 MW boiler/steam turbine system
- Biomass fueled (wood waste)
- Thermal energy utilized in the plant process

○ Paper Mill gets revenue:

- Onsite power displaces utility power
- Excess power sold to the utility
- Green tags sold to the utility

○ Northwest RAC participation:

- Assisted in developing a lease purchase agreement (*Local utility owns equipment (leases to paper mill)*)



Thank you

Questions? Contact:

Christine Brinker

U.S. DOE Intermountain Clean Energy Application Center

Southwest Energy Efficiency Project

720-939-8333 / cbrinker@swenergy.org

www.intermountaincleanenergy.org



U.S. DEPARTMENT OF ENERGY

Clean Energy Application Centers