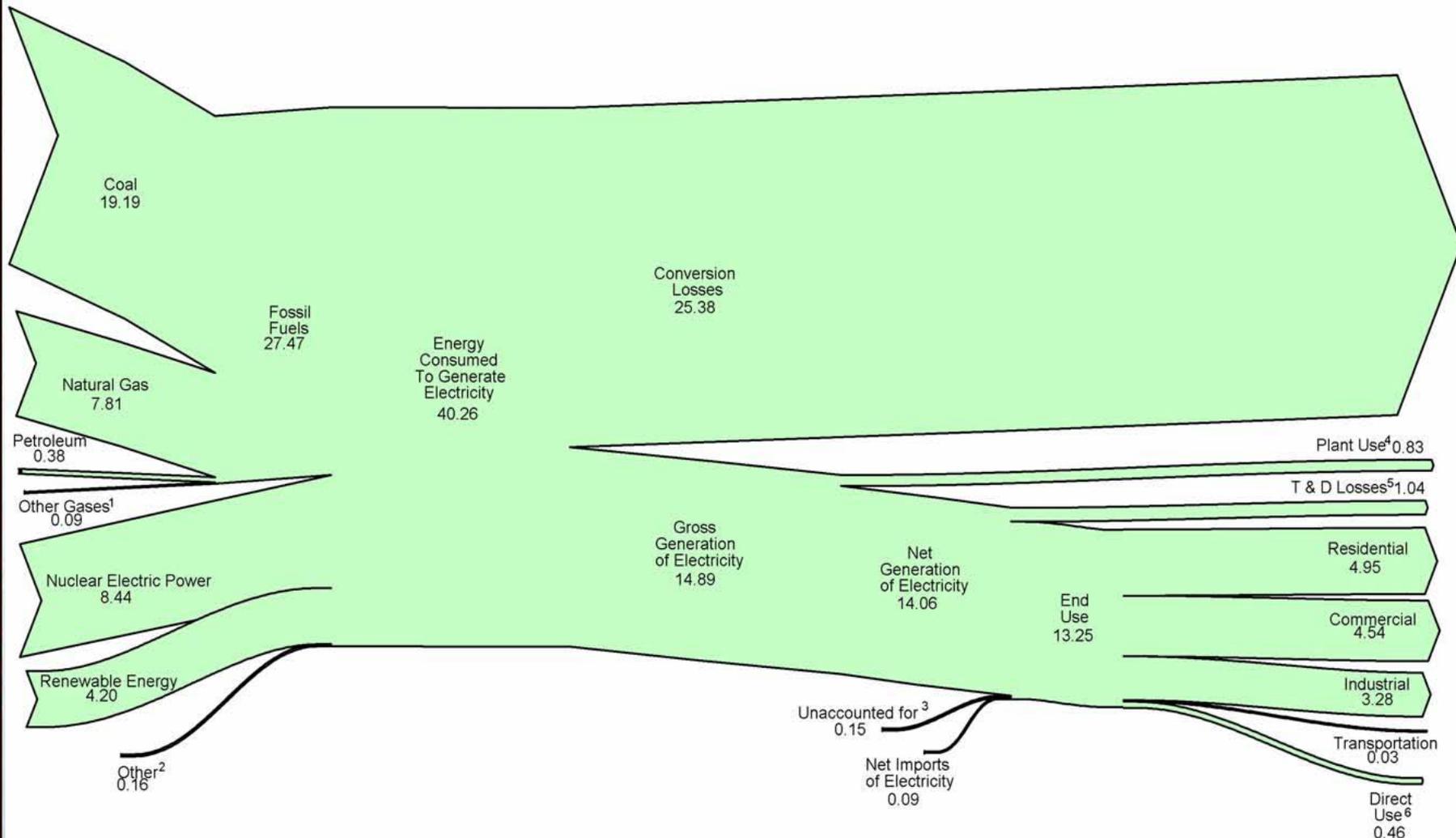




Combined Heat and Power Energy and Environmental Benefits

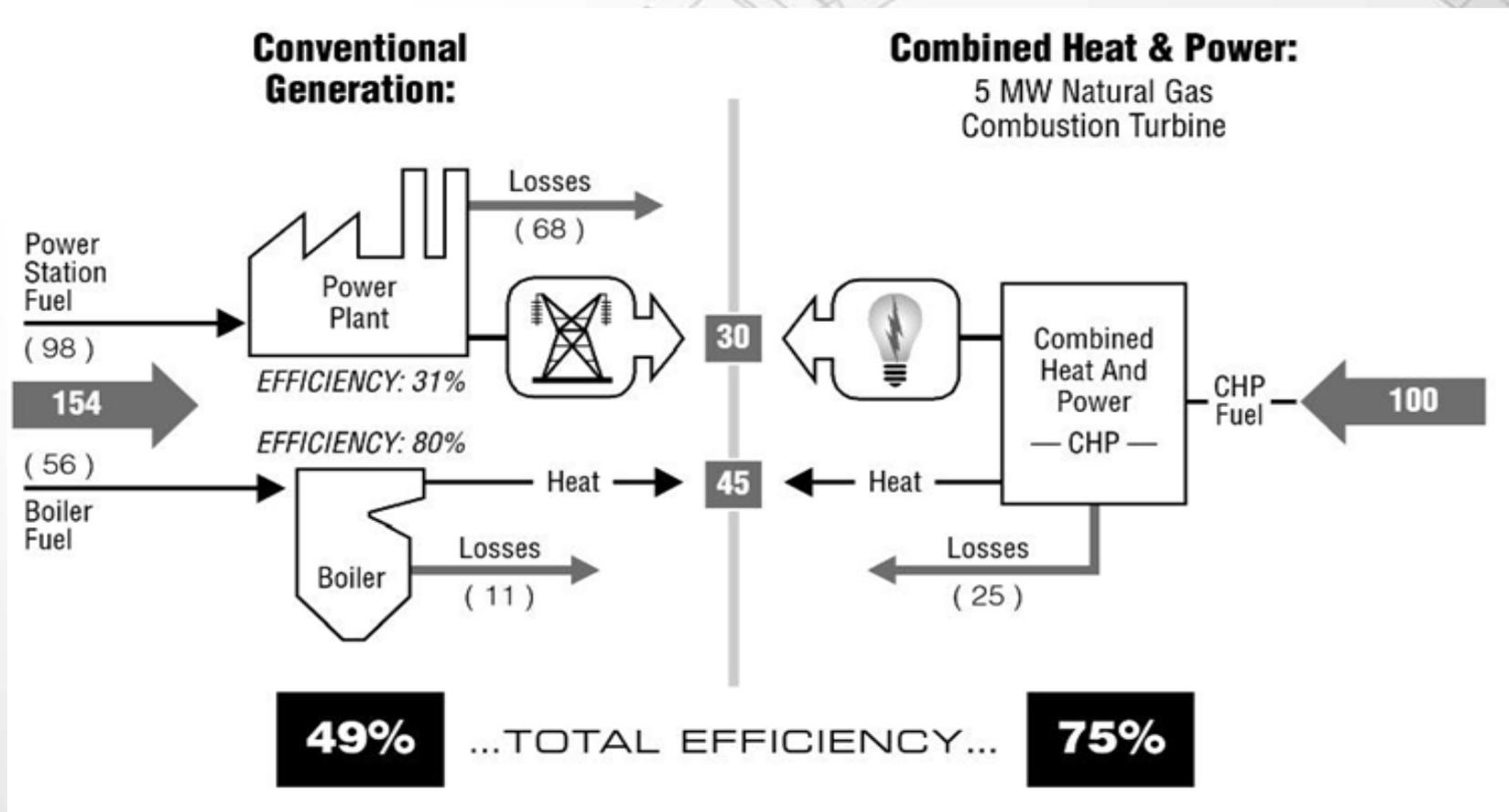
Neeharika Naik-Dhungel
US EPA Combined Heat and Power Partnership
Northeast Midwest Institute CHP Briefing
December 13, 2011

Fuel to Generate Electrical Power in the United States: Close to Two-Thirds Lost as Heat



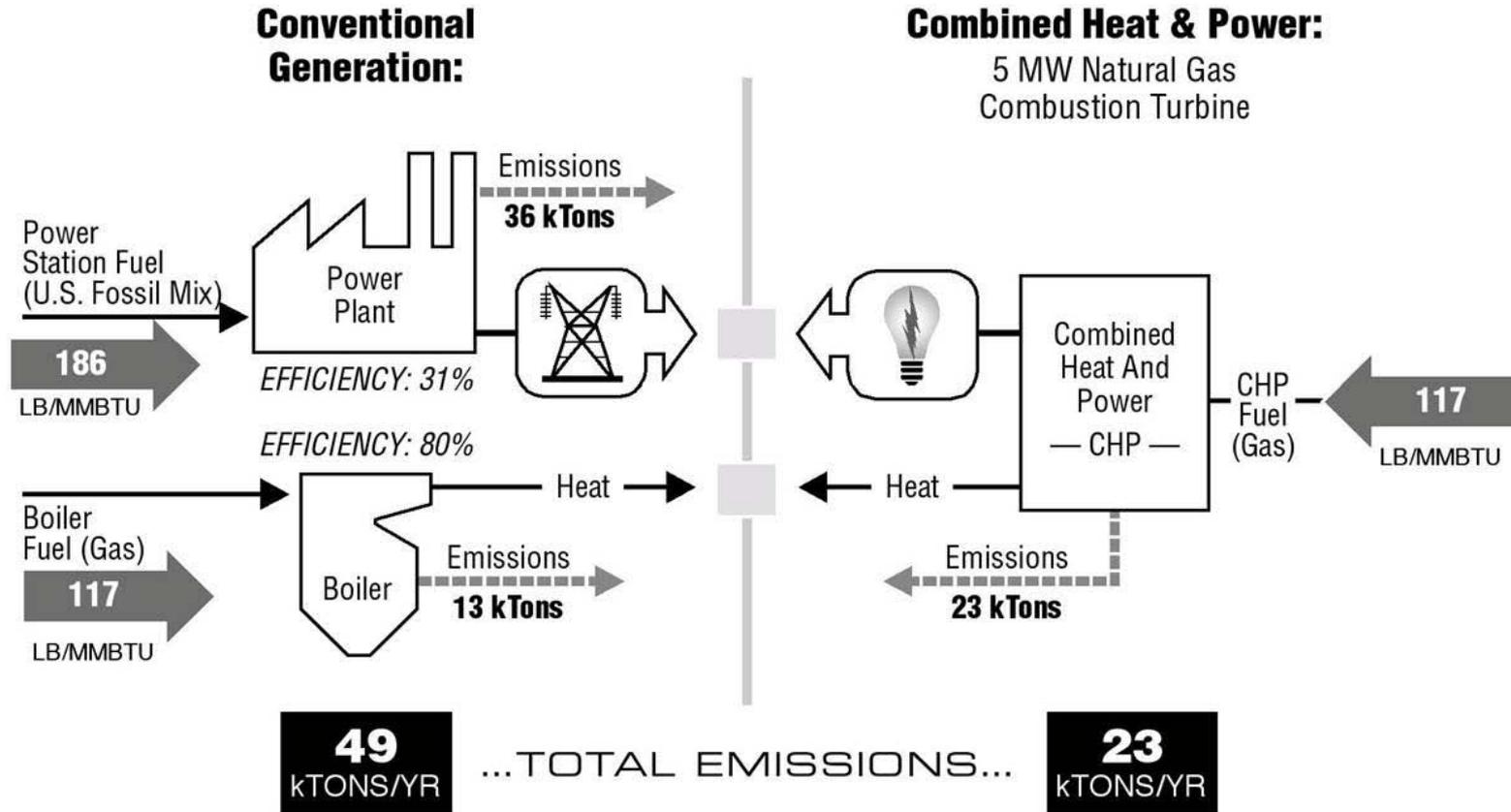
Source: US EIA, Annual Energy Review 2010, October 2011.

CHP Recaptures Much of the Heat, Increasing Overall Efficiency of Energy Services



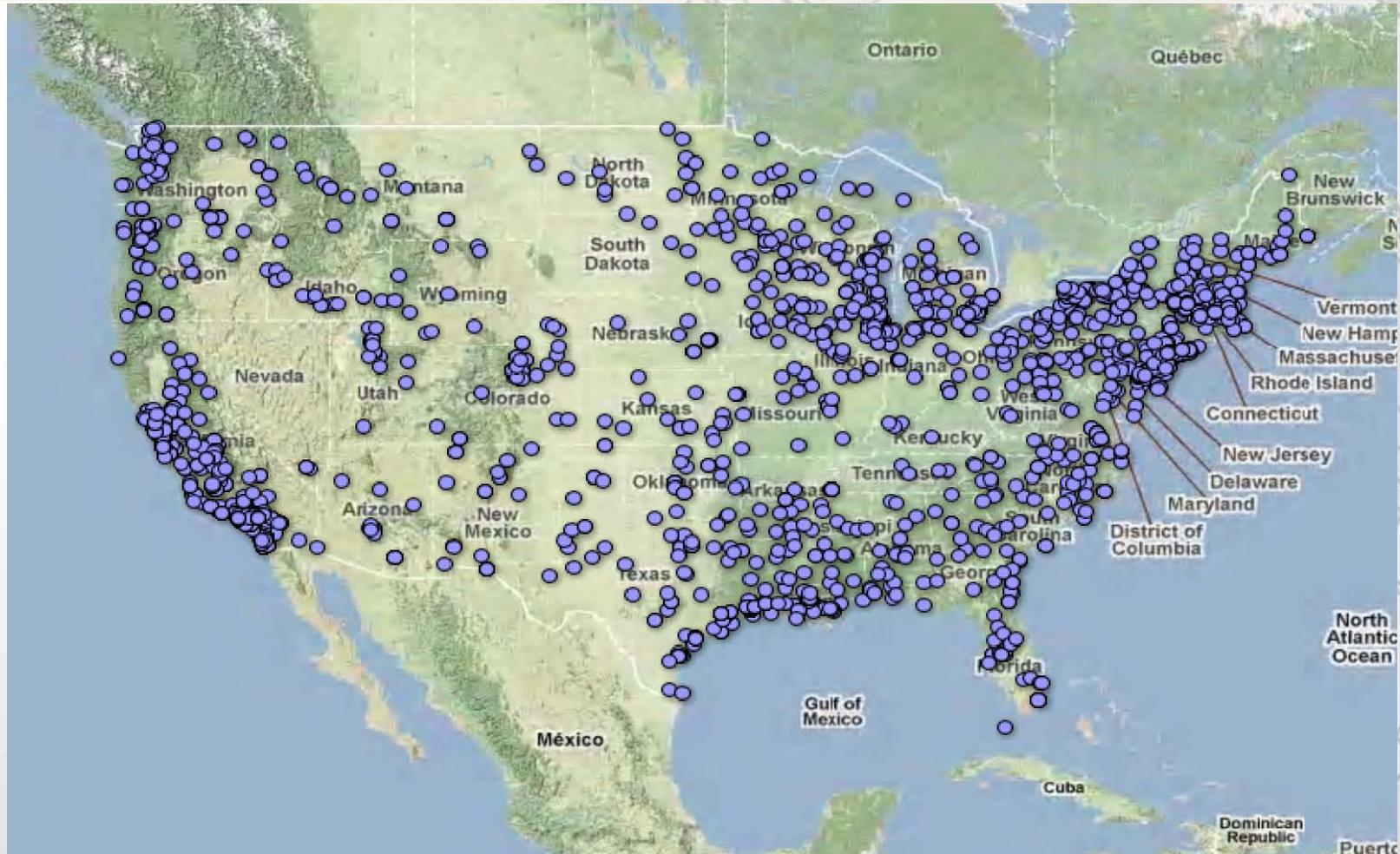
Source: ICF

Increased Efficiency Results in Reduced Carbon Emissions



Source: ICF

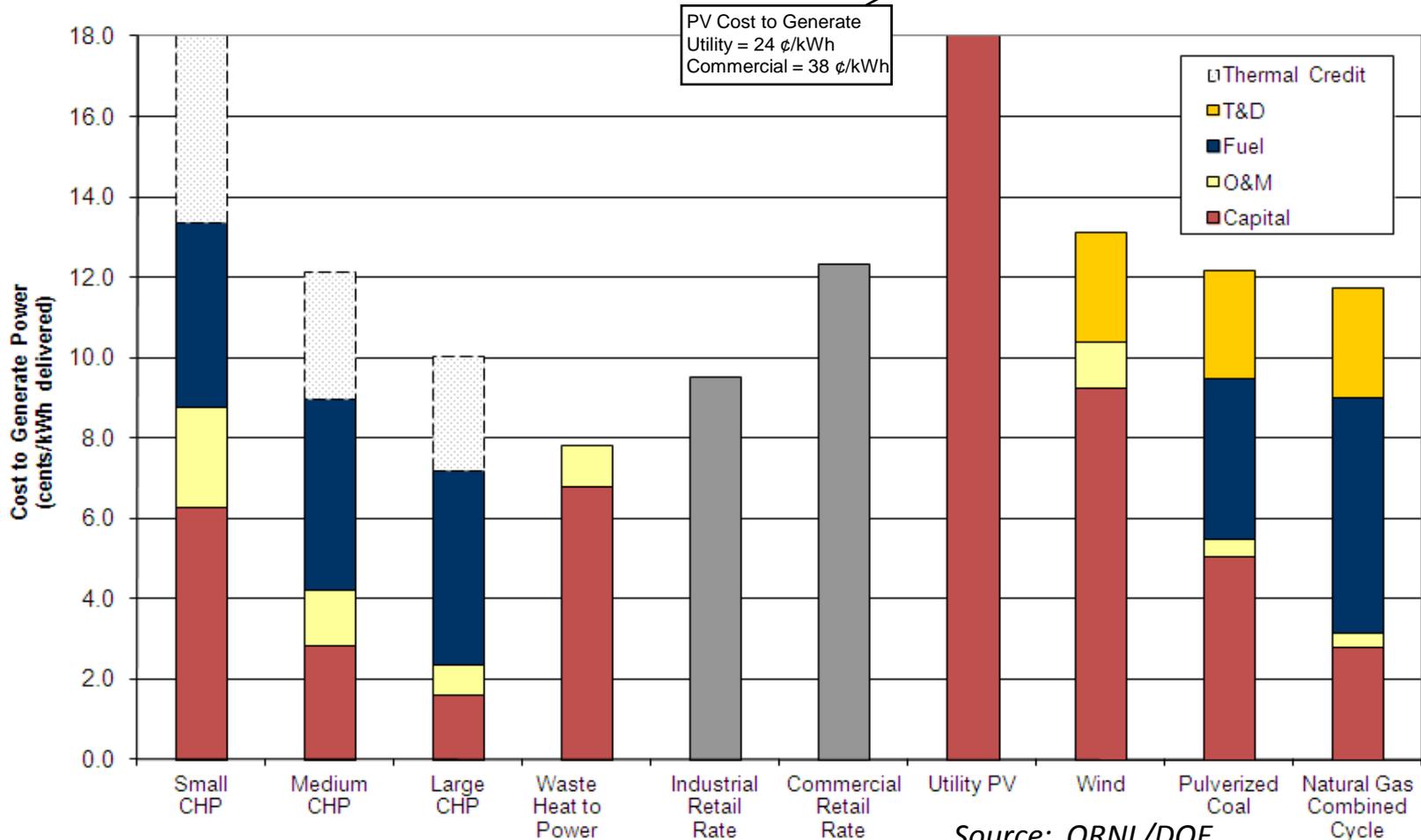
CHP Is a Resource Located at the Point of Demand



Source: ICF CHP Installation Database, 2011.

CHP is a Cost-Effective Source of New Power

Cost of Delivered Electricity - New Jersey



Source: ORNL/DOE

CHP thermal credit reflects the cost of boiler fuel avoided by capturing and using the waste heat from CHP

CHP Value Proposition

Category	10 MW CHP	10 MW Wind	10 MW Natural Gas Combined Cycle
Annual Capacity Factor	85%	34%	70%
Annual Electricity	74,446 MWh	29,784 MWh	61,320 MWh
Annual Useful Heat	103,417 MWh	None	None
Footprint Required	6,000 sq ft	76,000 sq ft	N/A
Capital Cost	\$20 million	\$24.4 million	\$9.8 million
Cost of Power	7.6 ¢/kWh	7.5 ¢/kWh	6.1 ¢/kWh
Annual Energy Savings	316,218 MMBtu	306,871 MMBtu	163,724 MMBtu
Annual CO ₂ Savings	42,506 Tons	27,546 Tons	28,233 Tons
Annual NO _x Savings	87.8 Tons	36.4 Tons	61.9 Tons

Source: ICF International, prepared for the EPA CHP Partnership

Incentives to System Adoption

- Developing **standard interconnection rules**.
- Implementing reasonable utility rates such as **standby rates, backup rates, and exit fees**.
- Developing incentive programs for CHP in **clean energy funds**.
- Include CHP/waste heat recovery in **renewable portfolio standards** and energy efficiency portfolio standards.
- Establishing **output-based emission regulations** and incorporating other efficiency measures into state implementation plans.

CHP's Energy and Environmental Benefits

- CHP is more efficient than separate generation of electricity and heat.
- Higher efficiency translates to lower operating cost, but requires capital investment.
- Higher efficiency reduces air emissions, including greenhouse gases.
- CHP can provide increased reliability and power quality to the user.
- On-site electric generation reduces grid congestion and avoids distribution costs

CHP Partnership Contact Information

CHPP Website : www.epa.gov/chp

Neeharika Naik-Dhungel:

Naik-Dhungel.Neeharika@epa.gov

Gary McNeil: McNeil.Gary@epa.gov

CHPP Help Line: [703/373-3108](tel:7033733108)