Combined Heat and Power: The State of Distributed Generation Opportunities in the Texas Market

Gavin Dillingham, PhD
DistribuGen Conference & Trade Show for Cogeneration/CHP 2015
CHP is an important energy resource that provides:

**Benefits for U.S. Industry**

- Reduces energy costs for the user
- Reduces risk of electric grid disruptions
- Provides stability in the face of uncertain electricity prices
- Reduces water consumption

**Benefits of CHP**

- **Power Plant**
  - 32% efficiency
  - Produces 94 units of electricity

- **Boiler/Furnace**
  - 80% efficiency
  - Produces 56 units of heat

- **Combined Efficiency**
  - ~45%

- **CHP**
  - 75% efficiency
  - Produces 30 units of electricity
  - Produces 45 units of heat

30% to 55% less greenhouse gas emissions
CHP Market
Where Are We Today?

- **82 GW** of installed CHP at 3,842 industrial and commercial facilities (2011)
- 87% of capacity in industrial applications
- 71% of capacity is natural gas fired
- Avoids more than **1.8 quadrillion Btus** of fuel consumption annually
- Avoids **241 million metric tons of CO₂** compared to separate production

Source: CHP Installation Database
Installed vs. Technical Potential

The graph compares the installed capacity (blue) against the technical potential (green) for various industries and categories. The y-axis represents capacity in MW (megawatts), and the x-axis lists different industries and categories such as Food Processing, Wood Products, Paper, Chemicals, Refining, Primary Metals, Transportation Equipment, Commercial Buildings, Multifamily Buildings, Hotels, Hospitals, College/Universities, Govt. Buildings, and Prisons. The bars show the difference in capacity between what is currently installed and what could be technically possible.
CHP Drivers and Opportunities
**Restraints and Opportunities**

**Total Cogeneration Market: Key Market Drivers and Restraints, North America, 2011-2016**

- **Drivers**
  - Regulatory policies promote CHP installations.
  - End-user demand for higher efficiency encourages investment in CHP.
  - Environmental concerns drive the CHP market.
  - An increase in the price of electricity accelerates the growth of the CHP market.

- **Restraints**
  - The current regulatory structure restrains CHP market growth.
  - The local process for permits slows the growth of the CHP market.
  - Economic slowdown and fear of a second recession are likely to reduce investment in CHP.
  - Lack of public awareness hinders market growth.

---

**Source:** Frost & Sullivan analysis.
Energy-Water Nexus

Figure ES.1. Hybrid Sankey diagram of 2011 U.S. interconnected water and energy flows.
Source: See Appendix A for data sources and calculations
Water Consumption and Scarcity

Texas Power Plants Consumes 430 million gallons per day

Enough water for 3 million Texans per year
Reservoir Levels Improving, but Still Low
CHP and Water Consumption

- Ruling on March 30th by 13th District Court no special treatment for communities or power plants
- $2 billion dollar water fund
  - SWIFT and SWIRFT
  - Water Conservation
- CHP Reduces Water Waste

Source: Bullock, 2011
Emissions Reduce with CHP

Source: Bullock, 2011
Federal Level Activity
GHG Permitting in Texas

EPA has authority to regulate GHG and issue GHG permits for new or modified projects requiring PSD Air Permits.
Incentive Programs

Incentives:

- PUC Administered Energy Efficiency Incentive Program
  - Utility Programs – systems up to 10 MW
- RPS – biomass systems
- 10% Federal Investment Tax Credit for first 15 MW, systems smaller than 50 MW

Figure 1. For the purpose of comparison, ACEEE estimated an average annual savings target by calculating each state’s EERS savings over the years specified in the EERS policy. Source: ACEEE 2013 State Energy Efficiency Scorecard, p. 33.
Legislation:

• Permit by Rule – HB 3268

• Critical Infrastructure – HB 1831, HB 4409, HB 1864

• Power Export – HB 2049

• PACE – SB 385
Outlook for CHP

• CHP appears to be poised for new growth
  – Benefits recognized by policy makers – many states promoting CHP
  – Favorable outlook for natural gas supply in North America enhances economics
  – Opportunities created by environmental pressures on the power sector and industrial/institutional users

• Market Uncertainties
  – Easing of environmental drivers?
  – Restrictions on hydraulic fracturing?
  – Utility attitudes changing?
HARC (härk), n.
an independent research hub helping people thrive and nature flourish.