



Combined Heat and Power for the Ethanol Industry

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Overview

- EPA CHP Partnership
- CHP basics
- CHP for ethanol industry
- Experience to date
- State opportunities to promote CHP
- EPA assistance available

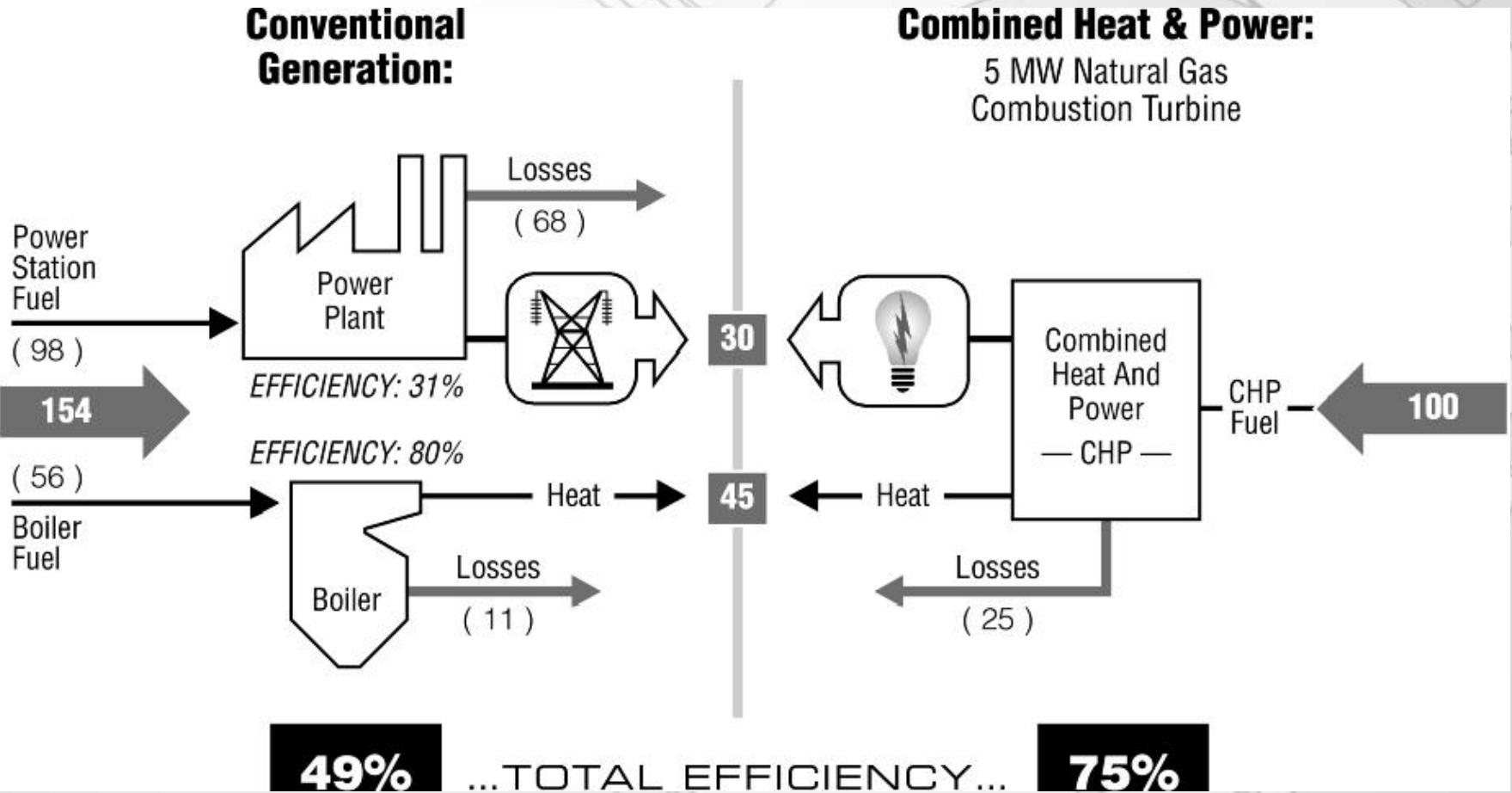
The EPA CHP Partnership

- Voluntary public-private partnership to foster clean, efficient, cost-effective CHP
 - CHP saves fuel and reduces GHG emissions
- Accomplishments
 - Working with 166 Partners to date
 - Assisted 110 operational CHP projects totaling over 2,200 MW
 - Reduced emissions by an estimated 1.5 million metric tons of carbon equivalent (MMTCE)

Combined Heat and Power

- Combined heat and power (CHP) is the simultaneous production and utilization of electrical and thermal energy from one fuel source
- CHP is a proven strategy for increasing the efficiency for electric and thermal generation
 - 80 GW of existing CHP in U.S.
 - Approximately 10% of total U.S. electric generation
- Overarching benefits
 - Can be 50% more efficient than separate heat and power
 - Can reduce fuel demand and use any fuel or technology
 - Can reduce emissions and replace older, high emitting assets

Efficiency Advantages of CHP



CHP for the Ethanol Industry

- Ethanol production has large electric and steam demands appropriate for CHP
 - Typical CHP system would be 2 to 6 MW
 - Plants run 24/7 all year long
- Energy is a significant production cost in ethanol industry
 - Energy costs second only to cost of corn in dry mill ethanol plants
 - Grid power cost increasing in many areas

Benefits/Drivers for Ethanol Plant Owners

- Reduce operational and capital expenses
 - Lower energy costs
 - Offset equipment retrofit or replacement
- Enhance competitive position
 - The most cost-effective plants have advantage
- Increase power reliability
 - Reduce likelihood and impact of power outages
- Reduce environmental impacts
 - Efficiency lowers greenhouse gas emissions
- Opportunity to partner with servicing utilities
- Hedge against unstable energy costs

Benefits to the State

- Improve competitiveness of businesses in your state
- Improve energy security
 - CHP less vulnerable to disruption
 - Reduced fuel demand
- Environmental performance
 - Increased efficiency reduces greenhouse gases and pollutants
- Improve power infrastructure
 - CHP/DG may support the grid and help delay or avoid transmissions and distribution upgrades

CHP Options for Ethanol Plants

- Boiler/steam turbine CHP
- Gas turbine CHP
- Integrated VOC destruction
- Technology and fuel flexibility to meet plant needs

CHP at U.S. Ethanol Plants

- About 77 plants in operation
- Over 40 plants in some stage of development
- 4 plants currently use CHP
 - U.S. Energy Partners, LLC, Russell, Kansas
15 MW gas turbine
 - Northeast Missouri Grain, LLC, Macon, Missouri –
10 MW gas turbine
 - Adkins Energy, LLC, Lena, Illinois –
5 MW gas turbine
 - Otter Creek Ethanol, LLC, Ashton, Iowa
7 MW gas turbine
- Significant opportunity exists

U.S. Energy Partners, LLC/ City of Russell

- 40 million gallons per year plant in Russell, Kansas
- Two gas turbines – 15 MW electric, 65,000 lbs/hr steam
- Joint project between plant and municipal utility
- 10 to 20% savings on process steam



Adkins Energy, LLC

- 42.5 million gallons per year plant in Lena, Illinois
- One gas turbine – 5 MW electric; 26,000 lbs/hr steam
- Supplies 99% of the plant's electric needs and 32% of the steam needs
- Simple payback of 3.3 years



Northeast Missouri Grain, LLC/ City of Macon

- 40 million gallons per year plant in Macon, Missouri
- One gas turbine – 10 MW electric; 51,000 lbs/hr steam
- Partnership between City of Macon and Northeast Missouri Grain
- Increased reliability – CHP system maintained plant operations during four power outages since April 2003



Challenges and Opportunities

- CHP not normally considered by plant designers
 - New developers may use CHP as a competitive advantage
- Lack of capital
 - Third party options/partner with utilities
 - State incentives
- Utility practices (interconnection, rate design)
 - State policies
- Concern about natural gas/power prices
 - Consider alternate fuels (co-firing, coal, biomass)
 - In certain areas, electric prices rising with gas

State Policies Can Help

- Establish rules to encourage fair treatment of CHP
 - Standard interconnection, rate design
- Adopt emissions limits on an output basis to encourage efficiency
 - Must include thermal output
- Develop CHP incentive programs
- CHP Partnership can assist
 - learn what other states are doing
 - focus on CHP opportunities in your state
- CHPP working closely with State Partners
 - IA, IL, MN, OH, WI, NE, NJ, NY, CT

How Does the CHP Partnership Help?

- Education and Outreach
 - Identify and communicate opportunities, benefits, barriers and solutions to energy users, developers, state agencies
- Direct project support
 - Provide needs assessment, feasibility analyses, barrier analysis, strategies, networking for end users
- Recognition and publicity
 - ENERGY STAR CHP Awards, press releases, dedication ceremonies

EPA CHPP Progress in Ethanol Market Development

- Education and outreach
 - Assessed technical and economic potential
 - Developed fact sheet and case studies
 - Partnered with developers, plant owners, States, Nebraska Ethanol Board, and Midwest CHP Applications center (MAC)
 - Presented to Governors' Ethanol Coalition, Fuel Ethanol Workshop, Iowa, Wisconsin, plant owners
- Project assistance
 - Evaluated CHP options for 4 ethanol plants
- Recognized and publicized award-winning plants
 - Russell Energy Center, Kansas

EPA CHPP Next Steps

- Work with designers and developers
- Expand direct project assistance to evaluate CHP at additional plants
- Explore policy opportunities with States
 - Output-based emissions limits
 - Interconnection and rate design
 - Incentive programs
- Recognize and publicize new projects

Conclusions

- CHP is a valuable option for the ethanol industry
- CHP benefits the consumer, the state, and the environment
- State agencies can institute policies and regulations that promote CHP
- The EPA CHPP is ready to help

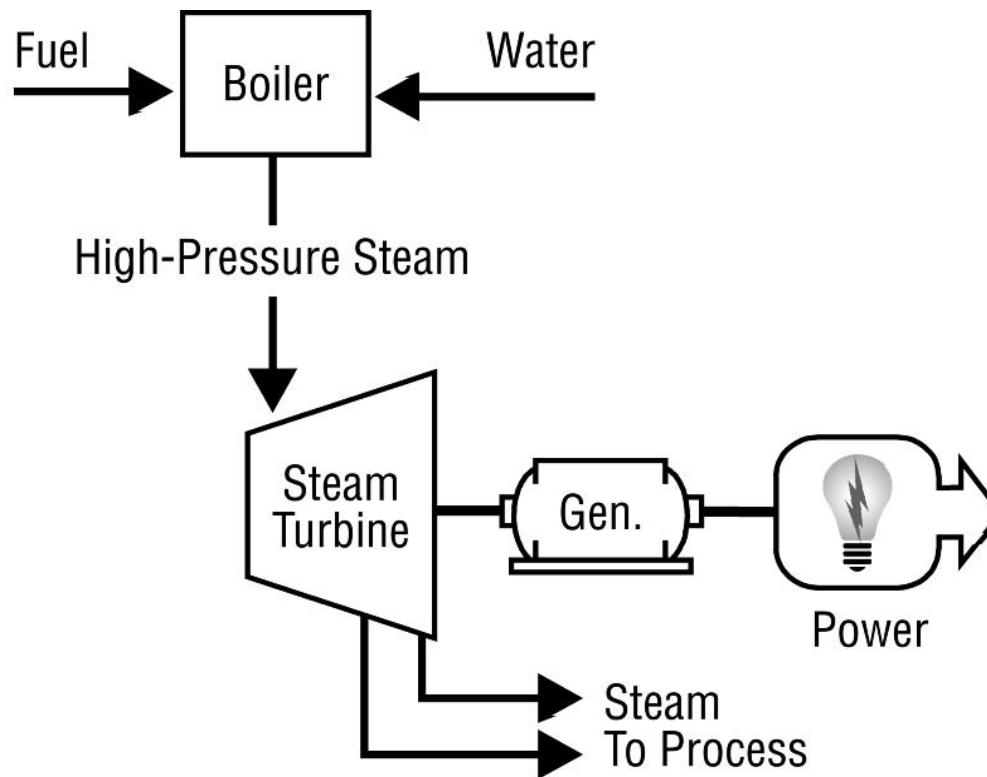
For More Information

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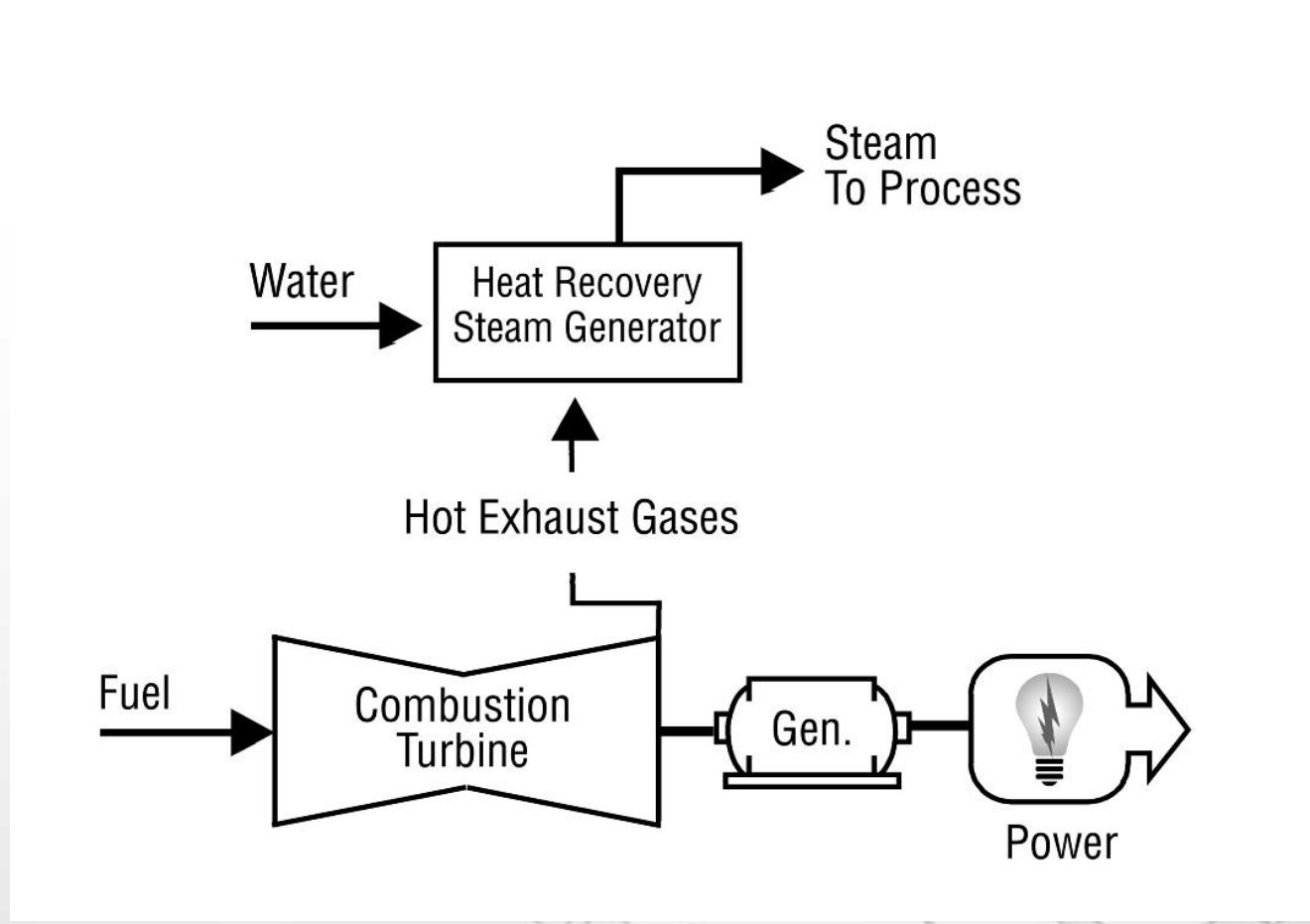


Appendix – Additional Information on CHP

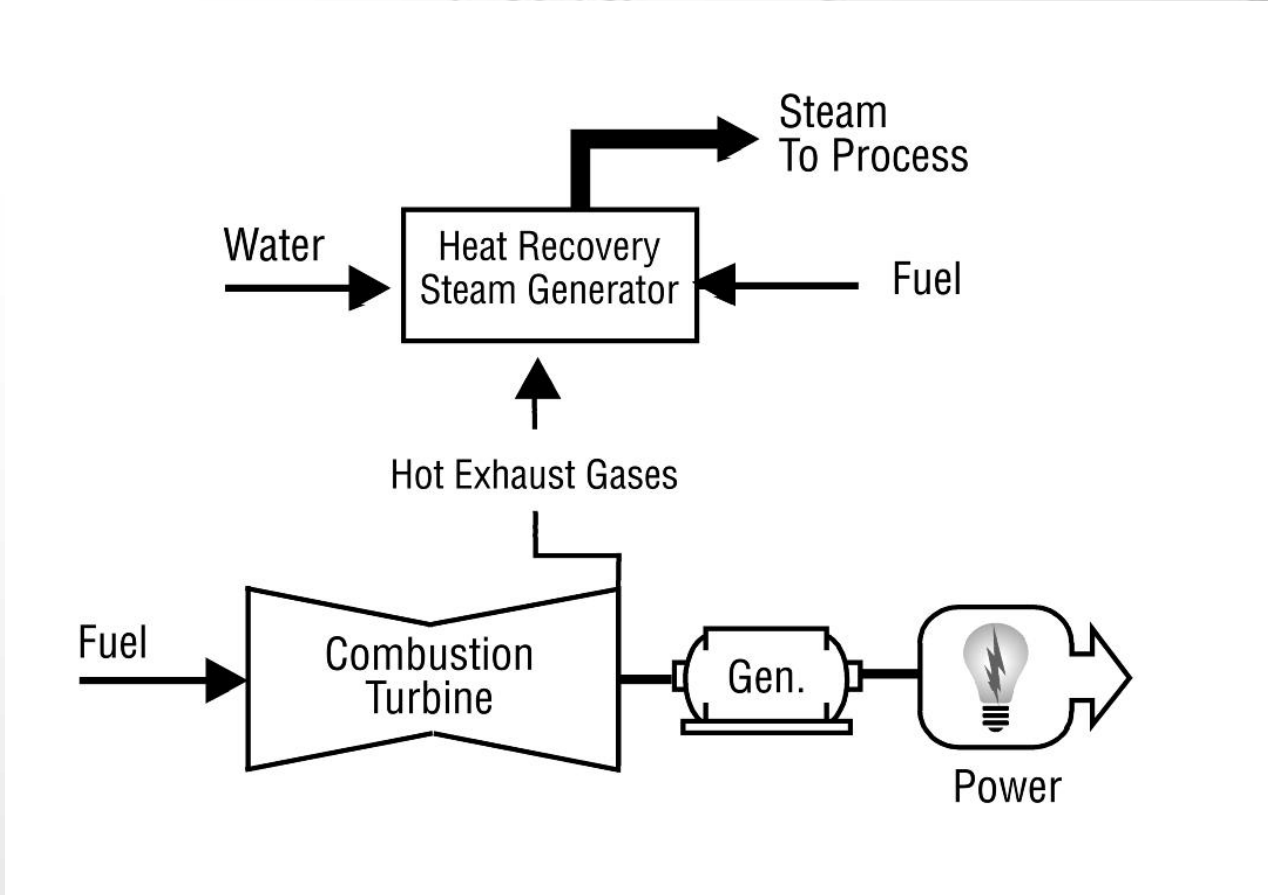
Boiler/Steam Turbine CHP



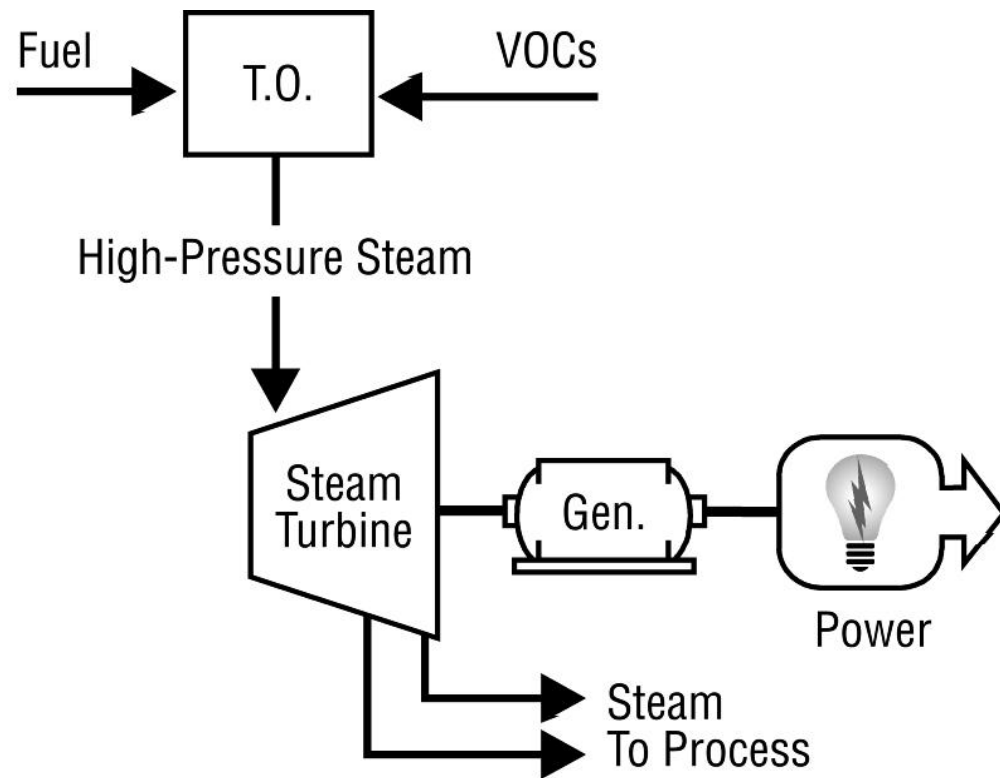
Gas Turbine CHP



Gas Turbine/Supplemental Firing CHP



Thermal Oxidizer/Steam Turbine CHP



Environmental Benefits of CHP- NOx Example

