



Combined Heat and Power in the U.S. Ethanol Industry

"Ethanol and the Environment"

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Overview

- What is CHP?
- CHP as Pollution Prevention
 - Efficiency and environmental benefits
- Why CHP makes sense for ethanol production
 - Cost savings
 - Sample applications
- Regulatory mechanisms affecting CHP
 - Barriers and incentives to efficiency gains

Combined Heat and Power

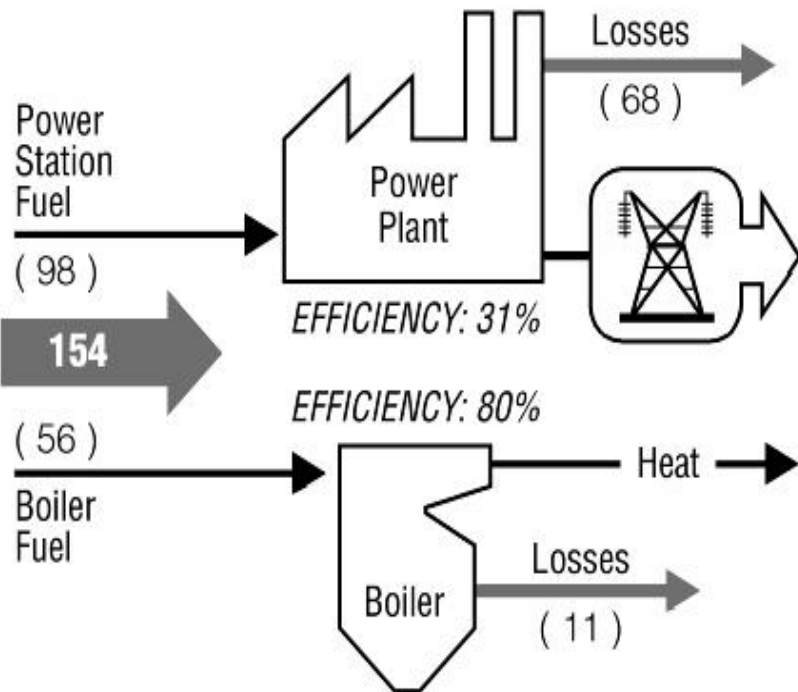
- CHP – or cogeneration - is the generation of heat and power from the same fuel source.
 - Electricity primarily used on-site, but may be sold back to grid. Grid can serve as back-up or swing provider.
 - Thermal energy used for heating/cooling or process applications.
 - CHP uses all technologies and all fuels.

Advantages of CHP

- CHP is more efficient than separate generation of electricity and heat.
- Higher efficiency translates to lower operating cost, but requires capital investment.
- On-site electric generation reduces grid congestion and avoids distribution costs.
- Higher efficiency reduces emissions of all pollutants.
- Increased reliability and power quality can also add significant value.

Efficiency Advantages of CHP

Conventional Generation:



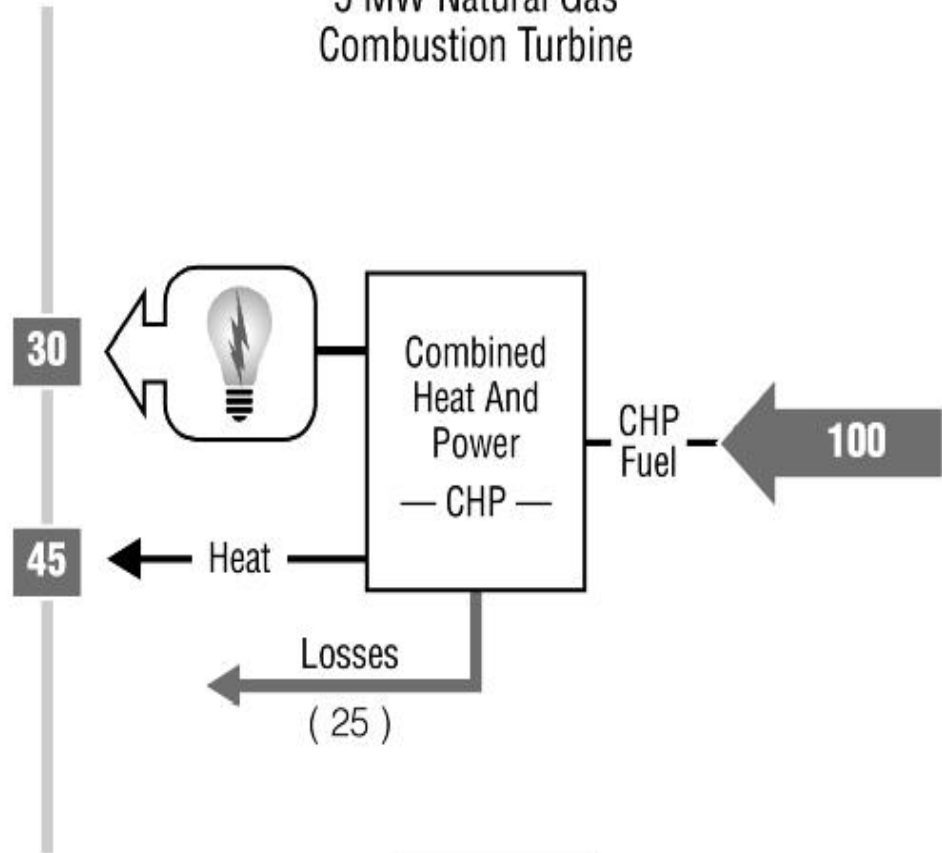
49%

...TOTAL EFFICIENCY...

75%

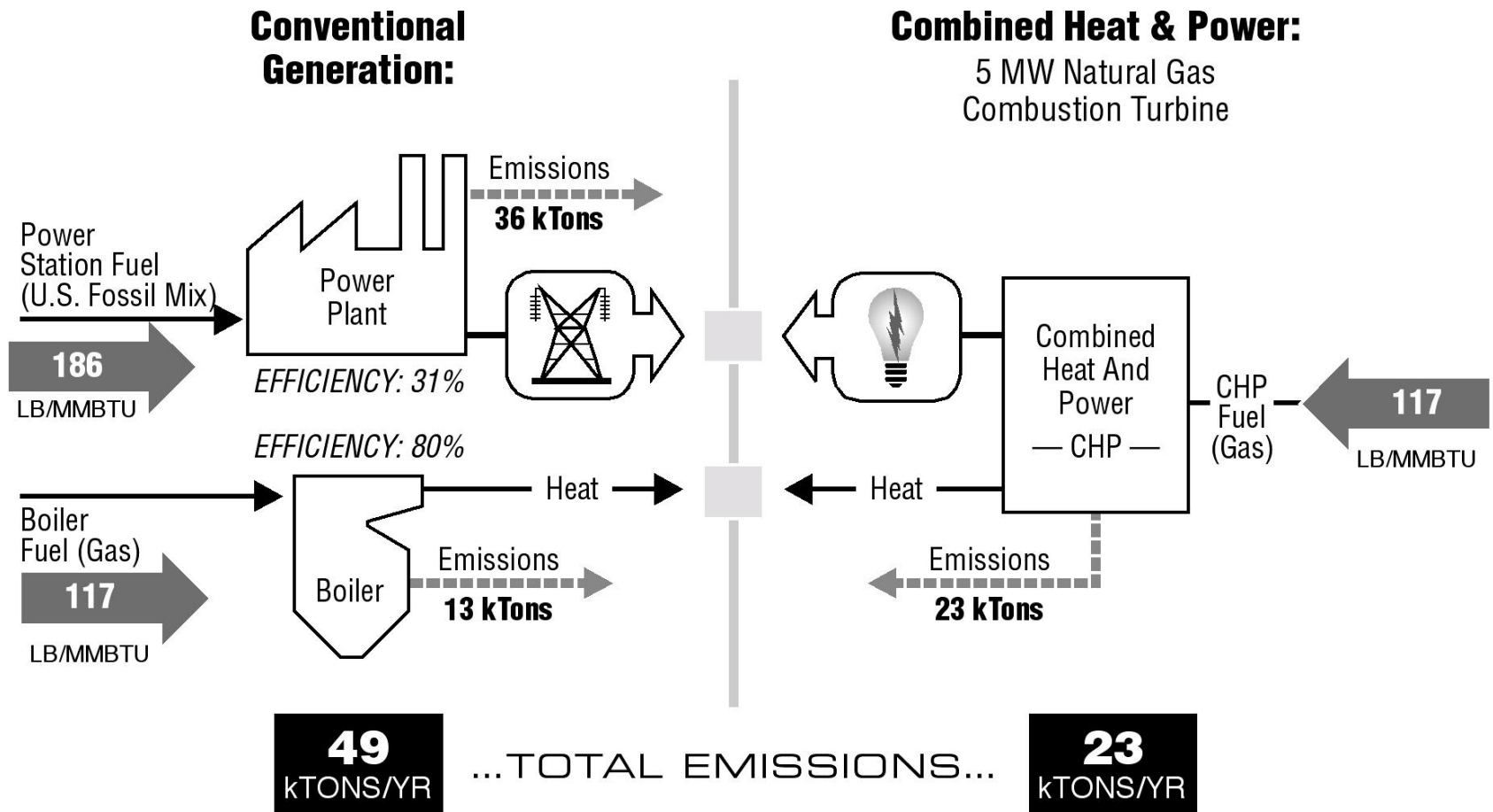
Combined Heat & Power:

5 MW Natural Gas
Combustion Turbine

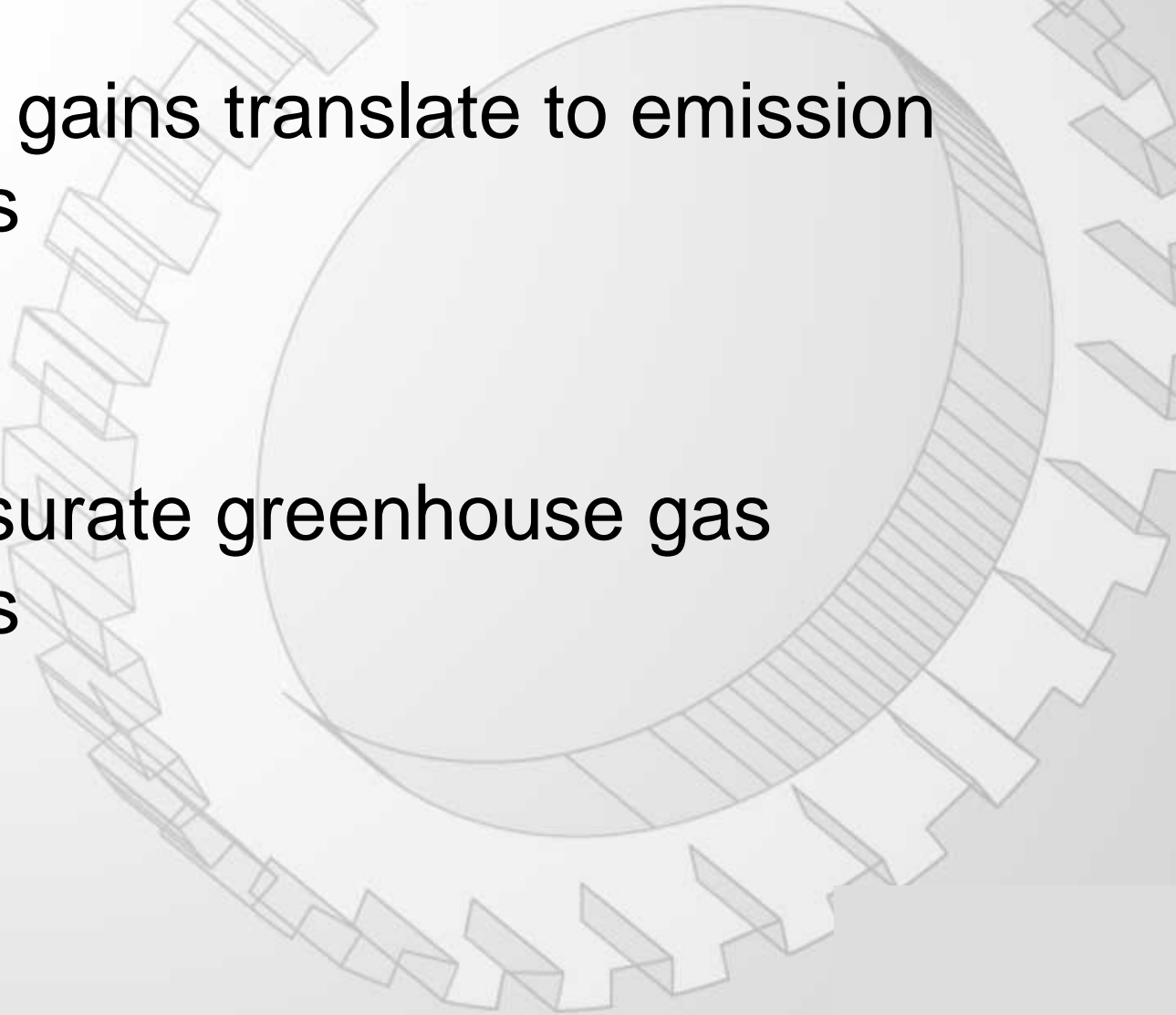


49% ...TOTAL EFFICIENCY... **75%**

Environmental Benefits of CHP- CO2



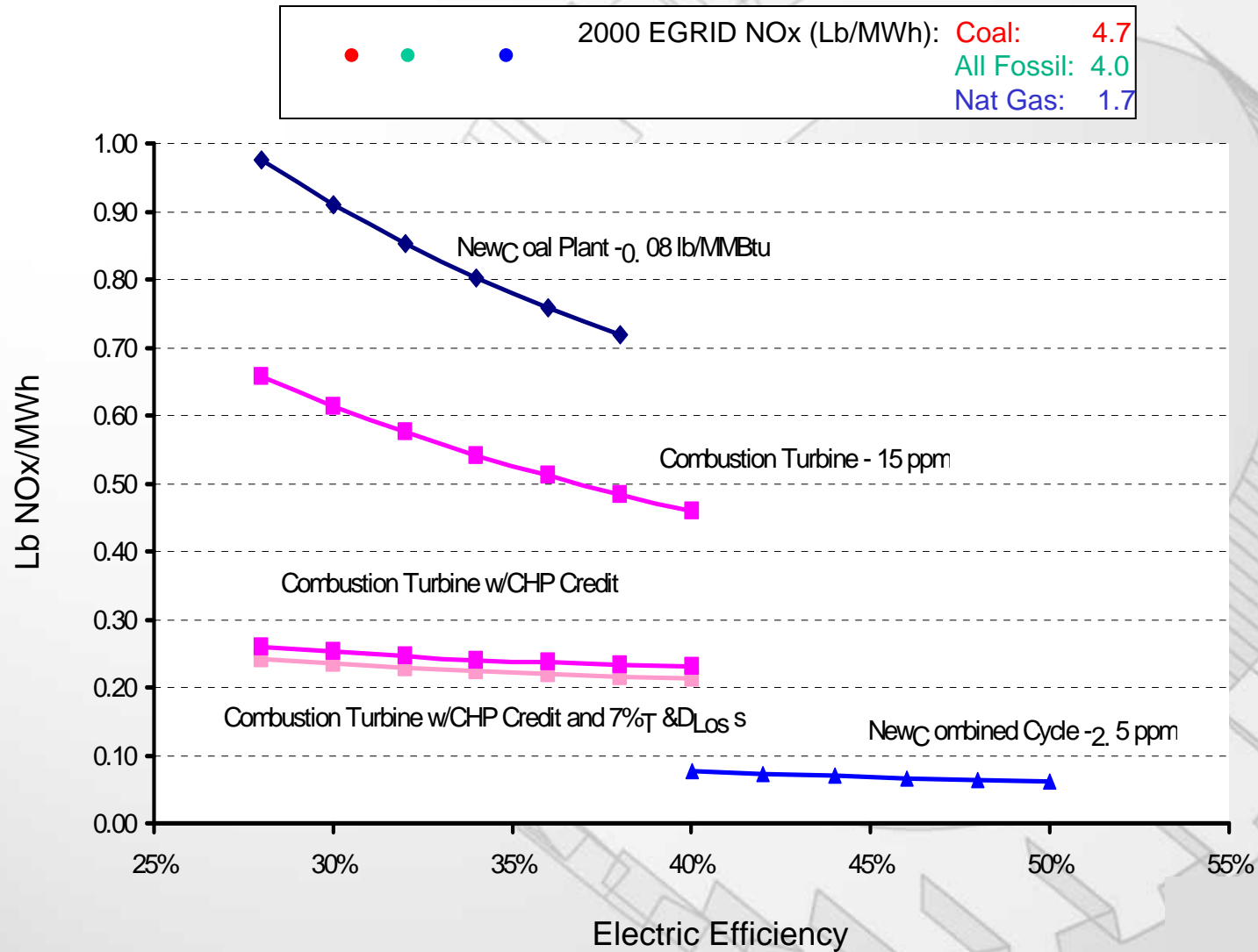
Criteria and GHG Reductions

- Efficiency gains translate to emission reductions
 - SO₂
 - NO_x
 - Commensurate greenhouse gas reductions
- 

Regulatory Mechanisms

- Multiple avenues to affect CHP
- Permitting
 - Small generator regulations
 - Emission Limits
- Emission Credits
 - Cap and trade
 - Emission reduction credits
 - Set asides

Efficiency Effect on Emission Rate



Why CHP Is a Good Fit for Dry Mill Ethanol Plants?

- Energy is the second largest cost of production for dry mill ethanol plants
- Electric and steam demands are large and coincident
 - Typical power demand is 2 to 6 MW
 - Typical steam use is 40 - 150,000 lb/hr
- Electric and steam profiles are relatively flat
- Operating hours are continuous – 24/7
- Energy costs are rising

What Can CHP Offer the Ethanol Plant?

- Increase energy efficiency of ethanol production
- Can yield energy cost savings from 10 to 25 %
- Reliable electricity and steam generated on-site
- Provides a hedge against unstable energy costs
- Improves competitiveness
- Reduces greenhouse gas emissions and other environmental impacts

CHP at U.S. Ethanol Plants

- CHP is currently operating at five plants
 - 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
 - East Kansas Agra Energy, LLC, Garnett, Kansas – Thermal Oxidizer/HRSG with 2 MW steam turbines
- CHP is under consideration for a number of new and expanding plants
 - Biomass CHP systems -
 - Coal boiler/steam turbine systems incorporating VOC destruction

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



Challenges to Implementing CHP in the Ethanol Industry

- Time (& Money)
 - Will CHP add complexity?
 - Will CHP add additional regulatory requirements?
 - Will CHP be treated differently?
 - Will environmental benefit be recognized?

What the EPA CHP Partnership Is Doing

- Evaluating environmental, economic, and energy benefits of CHP at ethanol plants
- Collaborating with plants, developers, and other key players
 - Awareness growing among users
 - Focusing on engineer/developers
 - Educating key sectors on competitive benefits of CHP
- Building bridges with various levels of governance and trade organizations

What is the Partnership?

- Voluntary program that seeks to reduce the environmental impact of power generation by promoting the use of CHP - actively providing education/ outreach and direct project assistance to promote CHP in ethanol facilities since 2003.
- Provides services and tools for Partners to assist with CHP project development, regulatory barriers, market transformation.
- Work with government and environmental community to evaluate environmental benefits of CHP
- Visit us! www.epa.gov/chp
- Or call me at 202.343.9794

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