

Waste Heat to Power a.k.a. Recycled Energy Opportunities in Western Colorado

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Clean Innovative Energy Sources to Power Our Region**



Waste Heat to Power (WHP) / Recycled Energy Overview

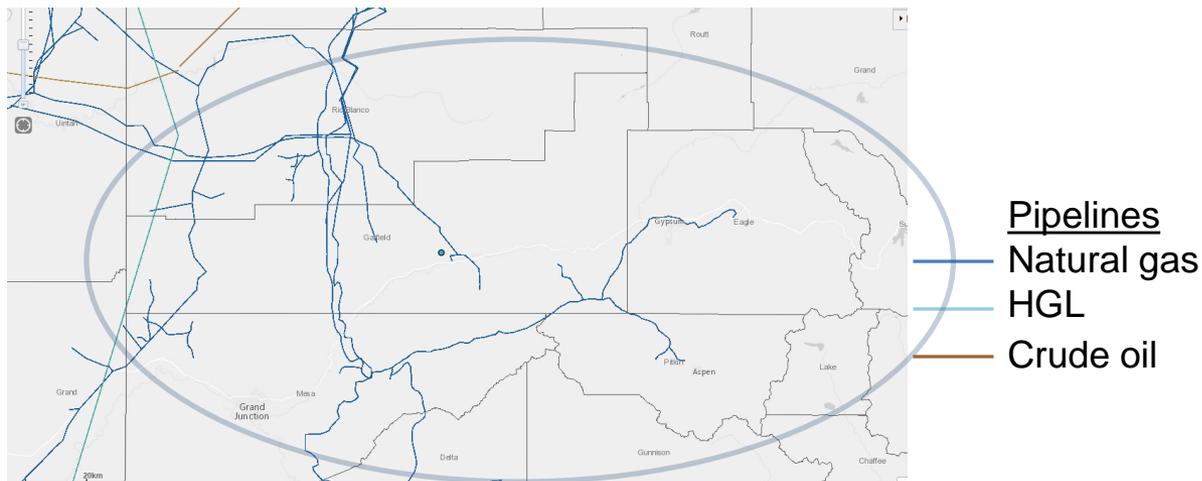
- WHAT: The process of using recovered waste heat from an industrial process to generate electricity with no additional fuel, combustion or emissions
- WHERE
 - Oil and gas production and transportation, including pipeline compressor stations and flares.
 - Industrial operations with high temperature processes such as refineries, glass furnaces, steel mills, cement kilns
 - Other processes that exhaust heat greater than ~250°F
- WHY
 - Generate electricity on-site where the power is needed
 - No combustion = no emissions
 - Using waste heat eliminates costs associated with fuel and purchased electricity
 - Sell back excess power to grid
 - Improve electric service reliability on-site
 - Reduce carbon footprint
 - Produce renewable energy credits (RECs)

**Known as Waste Heat to Power on federal level and in many states,
WHP is called Recycled Energy in Colorado**

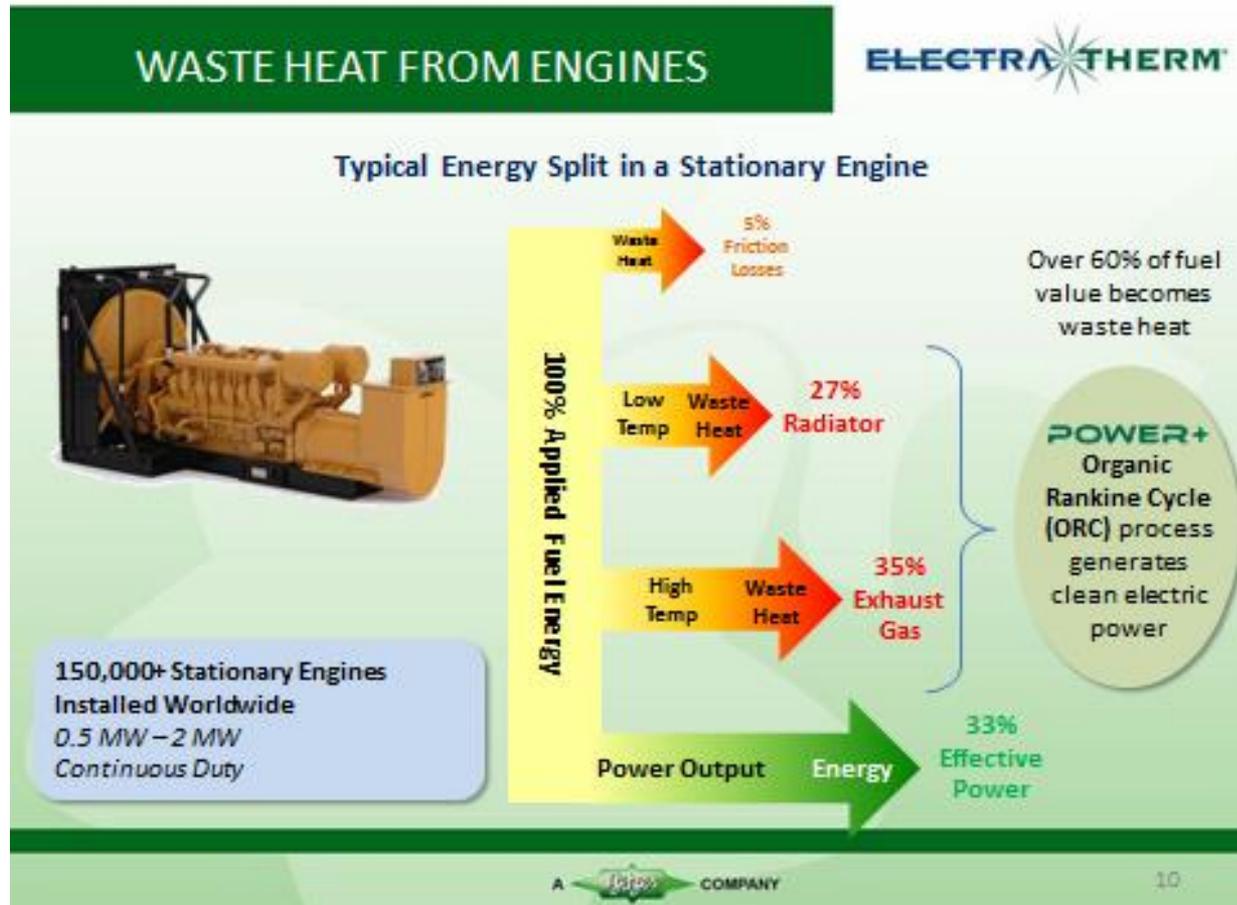


Recycled Energy System on Compressor Station

- Trailblazer Pipeline Compressor Station in Peetz
- Generates 27,600 MWh renewable energy per year for Highline Electric Association members
- Saves est. >\$10 million over 20 years, >\$600,000 annually
- Saves est. 27,600 tons CO₂, 38 tons NO_x, 137 tons SO₂ annually
- *Where are the opportunities in Garfield, Pitkin, Eagle Counties?*



Engine Compressor Example



Recycled Energy Systems on Flares

- Problems
 - Oil and gas wells need power but are often remote from electric transmission
 - Flares are required to destroy gases that cannot otherwise be used or put in the pipeline
 - Flaring destroys the energy potential of the gases
 - Flaring may be limited by states
- Solution
 - WHP systems can transform traditional flares into power generators
- Benefits
 - Reduce emissions and may ease permitting burden
 - Quick payback from electricity savings or offsetting existing pneumatic or genset remote power
 - Avoid flare emissions permitting and fines
 - Quieter, more attractive, fewer emissions than flares
 - Use on any flares – oil and gas production, WWTP, refineries



Flare Example



PGC™ Customer Case Study: Eagle Ford Producer, BlackBrush Oil & Gas

Eagle Ford operations with BlackBrush

- BlackBrush needed ~2 kW of power per site to install electrical equipment, replace pneumatics
- Landowner was complaining regularly about flaring eyesore and noise
- BlackBrush's remote sites require reliable, maintenance-free operation
- Emissions need to be reduced and destruction efficiency must be Quad-O
- Did not want to permit an additional emitter (a genset) on site
 - PGC™ solving all of these issues while delivering rapid payback



Recycled Energy in State Policy

- Recycled energy is a renewable resource in Colorado and can generate renewable energy credits (RECs)
- The Renewable Energy Standard (RES) defines recycled energy as “energy produced by a generation unit with a nameplate capacity of not more than fifteen MW that **converts the otherwise lost energy from the heat from exhaust stacks or pipes to electricity** and that **does not combust additional fossil fuel**. Recycled energy **does not include energy produced by any system that uses energy, lost or otherwise, from a process whose primary purpose is the generation of electricity**, including, without limitation, any process involving engine-driven generation or pumped hydroelectricity generation.”

Some WHP application qualify as renewable in Colorado, others do not, but all use a waste resource to generate electricity without emissions



Resources

Find out if your site is a good candidate for a recycled energy project

- www.HeatisPower.org
 - National association for WHP industry; advances WHP in the U.S. through education, outreach and advocacy
 - Refer to website for information on WHP policies, data, reports, technology and project development
- Colorado Energy Office (CEO)
 - Published “Colorado Recycled Energy Market Overview” in February 2016
- U.S. DOE Southwest CHP Technical Assistance Partnership (TAP)
 - Helps promote and stimulate investment in WHP and CHP across region
 - Provides technical assistance, education and outreach
 - Working with CEO to provide 4 feasibility studies for recycled energy project in 2017
- Southwest Energy Efficiency Project (SWEEP)
 - Public interest organization promoting greater energy efficiency in the Southwest
 - Works with CEO and TAP to advance WHP in Colorado
- “Reducing Energy Costs with Waste Heat to Power,” a WHP webinar co-hosted by TAP and SWEEP March 14, 10am MST



Questions?

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The Heat is Power Association

The industry-led advocacy organization focused on advancing waste heat to power (WHP). Through collaboration with federal, state and regional stakeholders, we are working to gain inclusion of WHP in federal and state legislation, regulations, and programs as an energy efficient and renewable power resource that generates electricity with no additional fuel, combustion or emissions.

