



Recycled Energy from Flared Gas

Site Description

At a Hess Corporation well pad in North Dakota's Bakken shale play, natural gas produced during oil extraction was typically sent to flares for elimination because there was no accessible pipeline infrastructure or the pipelines could not accept additional gas. A recycled energy system diverted the waste gas from the flare and instead used it to generate low emission electricity for on-site use.



Facts at a Glance

- **Project:** Demonstration of oil field flare reduction by creating a beneficial use for flared gas
- **Collaborators:** Houston Advanced Research Center (HARC), Hess Corporation, ElectraTherm, the Environmentally Friendly Drilling Program (EFD), Gulf Coast Green Energy, Texas A&M Institute for Renewable Natural Resources
- **Location:** Bakken Shale Play in Keen, North Dakota
- **Waste Heat Source:** Wasted gas from production operations diverted from flare
- **Capacity:** 65 kW
- **Electric Output:** 103,486 kWe over 1,937 hours, enough to power over 40 U.S. households on an annual basis
- **Commercial Operation:** July 2015 to November 2015
- **Financial Benefit:** At \$30/bbl. oil, the system would have a simple payback of less than twelve months as a result of the avoidance of mandated oil production curtailment due to flare restrictions
- **Other Applications:** Anywhere there are flares, including oil and gas production, processing, and refining facilities; petrochemical plants; wastewater treatment plants; landfills



Key Benefits

- Significant emission reductions compared to emissions from the flare: 89% lower for CO₂, 48% lower for NO_x, and 93% lower for VOCs
- Reduced risk of state mandated well shut down for flare cap exceedances
- Power generated on site reduced need for purchased power
- Boiler was less costly than gas fired generators since it could accept fuel or raw gas and did not require gas treating equipment
- No permitting requirements for the Power+ Generator, boiler or associated equipment
- Low maintenance since system could be started, stopped and monitored remotely; did not require an on-site operator; could be installed in two days or less and is easily moved and redeployed to new well pads as waste gas volumes fluctuate at various well pads over time



Project Details

Gulf Coast Green Energy installed the ElectraTherm Power+ Generator 4400-FL Organic Rankine Cycle (ORC) together with a low emission Clever Brooks 150 HP 30 PPM NO_x hot water boiler on a producing Hess Corporation well pad which was flaring gas due to lack of pipeline infrastructure. Gas was diverted from the flare to the industrial boiler. Hot water (170°–252°F) from the boiler was piped to the heat exchanger in the

Power+ Generator, where the organic working fluid was passed through an expander to drive the generator, and then condensed and reused. The result was 103,486 kWe generated per 1,937 hours.

This pilot project demonstrated that generating low emission power for on-site operations is an attractive option as companies pursue emissions reduction plans that won't curtail production.

Reasons for Installing Recycled Energy

The driver for this demonstration project was emissions reductions. A number of pressures are forcing oil companies and others to look at alternatives to flaring:

- Colorado regulations that require installation of equipment to capture or control 95% of emissions from oil and gas wells
- The U.S. Environmental Protection Agency (EPA) new source performance standards and national emissions standards for hazardous air pollutants in the oil and natural gas sector
- North Dakota flaring caps and requirements that produced natural gas be collected for subsequent distribution, used in an electrical generator, or implemented in another beneficial use that reduces flaring

Had this not been a demonstration project, it may have been eligible to contribute to North Dakota's voluntary Renewable and Recycled Energy Objective which calls for 10% of all retail electricity sold in the state to be obtained from renewable energy and recycled energy. The state defines recycled energy as systems that generate electricity from currently unused waste heat resulting from combustion or other processes and that do not use an additional combustion process. A recycled energy system does not include waste heat captured from any system designed primarily to generate electricity unless the generation system consumes wellhead gas that would otherwise be flared, vented, or wasted.



About Recycled Energy in Colorado

Recycled energy systems use waste heat from industrial processes to generate electricity with no additional fuel, combustion or emissions. Recycled energy does not include energy produced by any system that uses waste heat from a process whose primary purpose is the generation of electricity. Power generated from recycled energy systems in Colorado can be used to help utilities meet their renewable energy standard obligations.



COLORADO
Energy Office

For more information:

Susan Brodie | Heat is Power Association | susandbrodie@gmail.com | 630-292-1304

Lindsey Stegall | Colorado Energy Office | lindsey.stegall@state.co.us | 303-866-2594

Gavin Dillingham | U.S. DOE Southwest CHP TAP | gdillingham@harcresearch.org | 281-216-7147