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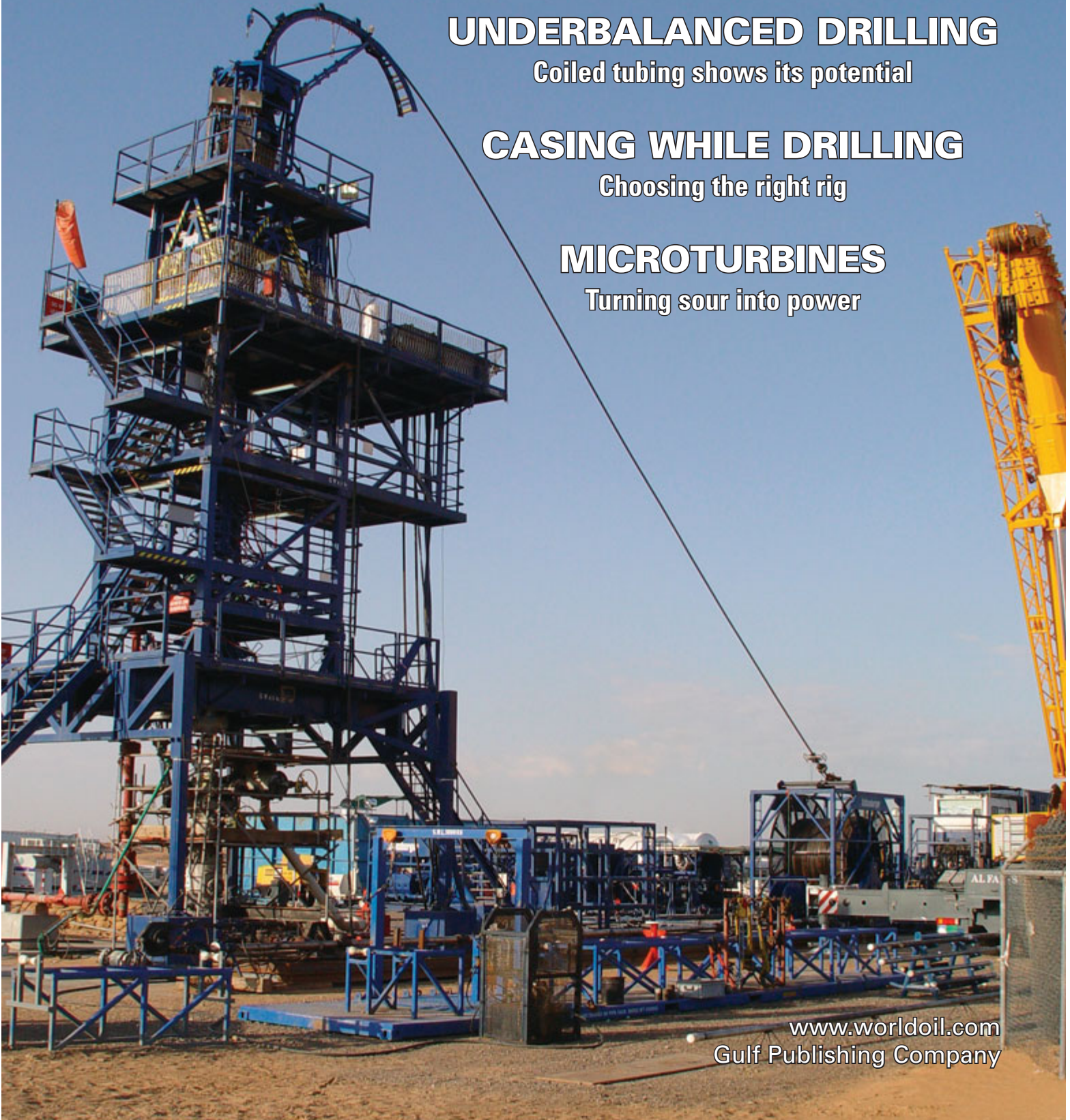
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# Microturbine application reduces sour gas flaring, provides partial power

**At an Amerada Hess-operated oil field in North Dakota, a pilot project is harnessing waste gas to efficiently generate electricity.**

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Many oil field sites produce energy that is unused, typically in the form of gas that becomes stranded, due either to pipeline logistics or quality issues (such as sulfur). At one such site operated by Amerada Hess in Newburg, North Dakota, sour gas (1%-1.5% H<sub>2</sub>S), is being converted to electricity, using a Capstone microturbine. This opportunity, which is under evaluation by the Energy and Environmental Research Center at the University of North Dakota, should yield a two-to-three-year payback on the investment in power generation equipment.

The 30-kW microturbine was chosen over reciprocating engines, due to sulfur tolerance, low emissions, low noise, remote capability and grid-ready interconnection. Microturbines, typically sized below 200 kW, compete economically with packaged piston generators and provide the advantages of high sulfur tolerance (7% H<sub>2</sub>S). There are no requirements for lubrication, as they operate on air bearings.

A comparable piston engine will tolerate 0.1% H<sub>2</sub>S (1,000 ppm) and require a 90-day oil change. Capstone microturbines are expected to perform continuously over five years prior to overhaul with no lubrication maintenance. Efficiency at 28% is comparable to piston



Capstone Microturbine operating in Newburg, North Dakota.

engines. However, emissions are lower. Table 1 provides a general comparison.

The challenge during the project was to integrate the microturbine package with the waste gas, and provide compression and cleaning economically. Microturbines typically require compression to 55 psig, but piston engines do not. Compression and gas cleaning solutions were engineered by EERC and are currently being evaluated as the project logs operational hours.

The project operating in North Dako-

ta is evaluating a single, 30-kW turbine offsetting power consumed on-site by water injection units. Opportunity exists to expand to anywhere from 100 kW to 300 kW. The current project has logged more than 3,000 hr with no significant maintenance issues (see photo). The project will log 8,000 hr prior to reporting results. Total emissions from flare operation are reduced, on average, 75%. The installed cost is approximately \$45,000, and electricity is offset at \$0.07/kWh.

Although waste heat was not a consideration for this project, other applications can make use of the 500°F (310,000 Btu/hr) turbine exhaust. Standard combined heat and power (CHP) packages are available. **WO**

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typically include unique applications in industry, focused on achieving economic return from applying new technology. Mr. Schmidt has authored numerous publications, and completed feasibility studies and technology development projects for commercial clients and the US Department of Energy. He is a registered mechanical engineer and holds a BS in mechanical engineering from West Virginia University. He may be reached at [dschmidt@undeerc.org](mailto:dschmidt@undeerc.org)

**TABLE 1. Comparison of emissions.**

Emission	Capstone microturbine, lbs/MWH	Typical natural gas spark-ignited generator, lbs/MWH
NOx	0.491	24.6
CO	1.33	3.6
<b>Total hydrocarbons</b>	<b>0.171</b>	<b>5.1</b>