BY PETER BALDWIN

What's driving the electric drive

TRADING IN NO_X EMISSION CREDITS IN THE U.S. AFFECTS THE ECONOMICS OF ELECTRIC DRIVES VS. GAS TURBINES IN PIPELINE COMPRESSION

I have been intrigued by the concept of electric-driven natural gas pipeline compressors. The whole notion of using electric drives seems counter-intuitive, and I wanted to better understand the factors that are driving these decisions. I also wanted to see how much of this discussion is garden variety "sales fluff."

I am no expert on this, but here is what I found.

First and foremost, this is an economic play, heavily influenced and, in some cases, restricted by environmental and regulatory issues. Locational factors shift the economic trade-off, the most significant of which are whether or not the facility is in an Environment Protection Agency (EPA) Non-Attainment Zone, and what the primary fuel source is for the competing electric supply.

The map identifies the recently released EPA 8-hour classifications. These areas are subject to emission caps to "prevent serious deterioration." Allowances have been established for the existing facilities and a New Source Review (NSR) process is required for permitting new installations and applicable to sites that have the potential to emit more than 100 to 250 tons of NO_X per year, depending upon the source. This is also subject to more stringent state and local requirements at their discretion through their own State Implementation Programs (SIP).

If a facility exceeds its allowance, Emissions Reduction Credits (ERC) can be purchased through available emissions trading exchanges. The settling price for these credits are normally cited as $4,000 per ton/year.

For reference, a 15,000 hp gas turbine at 25 ppmv will emit 50 tons/year of NO_X. At $4,000 per ton/year, ECR coverage would be valued at $200,000 per year for as long as the unit is operated.

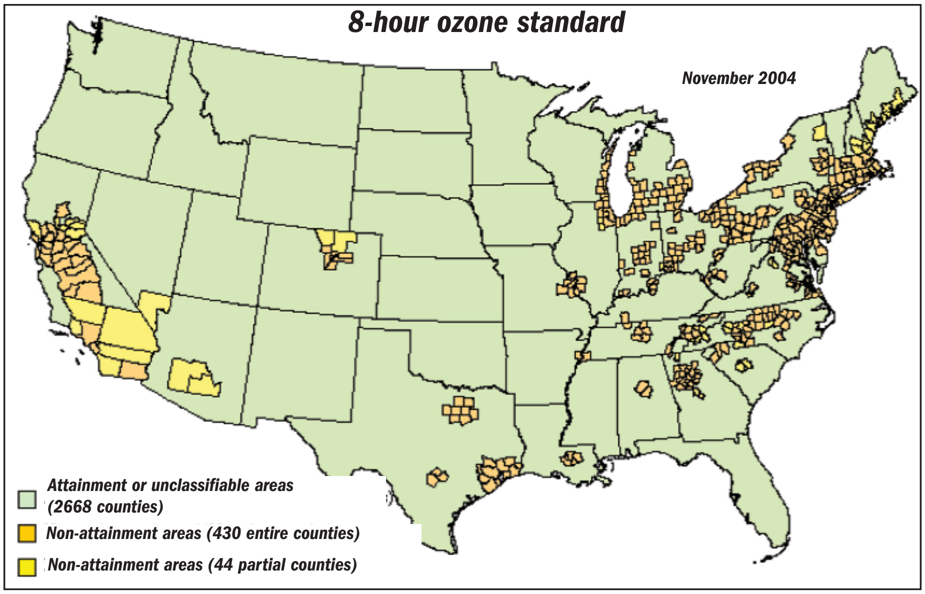
These credits can also work in favor of new equipment if permitting of an engine is allowable. Most of the pipeline compressor fleet is 30-50 years old with an estimated emissions profile of 20 times that of a modern gas turbine. These same credits can be generated through the replacement of existing units with equipment that has a cleaner environmental signature.

Naturally, these credits can be generated by deploying either a modern gas turbine or electric-drive compressors. Electric-drive pipeline compressors are generally not subject to these restrictions and offer a more predictable permitting process, if not necessarily lower life cycle cost.

Of course, life cycle cost includes the normal capital, operating and maintenance factors, and location is important here as well. If high voltage capacity is available at or reasonably near the compressor station, electric drives will definitely be less expensive. They are also available as variable speed devices and in a greater variety of sizes, opening the potential for improved system optimization. These drives are not yet available in the sizes commonly thought of as pipeline machines, but this too appears to be changing, as larger power-level frame developments are underway for this and military applications.

Maintenance costs do favor electric machines and add to the evaluation, but the fuel source for the competing electric supply is the key determinant in any spark-spread analysis. If coal or nuclear is the local fuel, it is quite possible that buying low cost electricity for these drives may very well be able to offset the direct energy conversion benefits of engine drive.

It is impossible to generalize about the specifics of these arrangements, but with valuable ERC credits available and the opportunity to create base load electric demand; all manner of horse-trading is both possible and probable.



Current enviroment regulations in the U.S. impose caps on emissions, leading to trading in NO_X emission credits

What makes this all feasible is the emergence of high-power drive systems that have and will continue to impact turbomachinery design and practice. What makes this interesting is that it sits at the crossroads between the need to add Liquified Natural Gas capacity and the need to respond to growing environmental concerns. TI

Peter Baldwin is an industry consultant (www.base-e.net) and former executive of Ingersoll-Rand Company's Northern Research and Engineering Corp. (NREC) subsidiary. Reach him at pete_baldwin@base-e.net.