

F inancing Back Pressure Steam Turbine Cogeneration Systems

Lynn B. Di Tullio, *President*
Trigen Ewing Power

Editor's Note: Steam turbines and engines have been used by many companies to cogenerate power for decades. In the right circumstances, steam turbines can enable a company to generate electricity for 1.5 - 2.0 cents* per kWh using the same steam they are now using for process. Now a variety of ways to finance these systems open new opportunities for many industries and institutions.

*at \$4-\$6/lb. steam

Steam turbine cogeneration is "the newest old technology." It was once the main source of our electricity in this country, but over the years companies have become more and more dependent on large centralized utilities to supply their electricity. However, as electricity costs rise plants are striving to find new ways to streamline their operations, and lower their costs: they are rediscovering cogeneration.

Deregulation has also pushed energy costs onto the corporate radar screen. Under deregulation, it seems clear that as utilities sell off their electricity production assets and become "T&D" (transmission and distribution) companies, they intend to ensure that their backs are covered. Here in Massachusetts, where we've experienced "deregulation" since March 1998, we find that the lion's share of energy charges in our new, more complicated bills, resides T&D.

Across the country, the transition to deregulation has been uneven, and in most states there are still elements of a regulated market. Meanwhile, the lure of a truly free market (and, of course, lower prices) has had many electric customers adopting a "wait and see" attitude.

We all would like lower electricity charges. But unless your com-

pany is located in an area of extremely high rates, most analysts now agree that your rates will NOT come down. How can a company lock in lower costs now, and still take advantage of a deregulated market, when and if it becomes truly deregulated? Many plants already have all the ingredients for an exciting steam turbine generator application.

If you can make power via cogeneration cheaper than you are presently purchasing it why wait? What the Europeans call "CHP"—combined heat and power—is more efficient and less expensive almost across the board. Making power as a function of thermal load is a tried and true way to "lock in" cheaper power—and you'll never have to pay T&D charges on any of it.

Steam turbine cogeneration can give companies a financial edge, but many of them find it difficult in the new economy to invest capital dollars in something that isn't directly involved in their core business. Now, a variety of financing techniques are available that will allow new users to take advantage of cogeneration without tying up strategic resources.

NEW FINANCING OPTIONS MAKE COGENERATION MORE ACCESSIBLE

Leasing is "bigger than stocks, bigger than bonds, and bigger than the commercial mortgage," according to *Fortune* magazine. The operating lease is one of the most practical and cost-effective methods of acquiring equipment. It provides the use of the equipment at a fixed rental payment and permits a company to be more flexible in its management of assets and liabilities. Profitability (electric savings, in this case) comes from the *use* of the equipment, not always from its ownership.

The advantages of leasing are numerous. For example, there could be tax advantages in leasing vs. buying. Companies should consult their tax advisor. Cash can remain available for investment in areas of "core" production, and bank lines of credit are preserved. Leased equipment can generate energy savings with minimal up-front cash outlay. Rental payments remain constant so a company can acquire cogeneration equipment now, with tomorrow's dollars.

Leasing programs can be tailored to fit a company's budget requirements. At the end of the lease term, one has the option of

purchasing, re-leasing, or returning the equipment to the lessor.

"Deferred Payment" is another financial option now available. In this program, we essentially become the bank. Instead of requiring full payment upon shipment of the equipment, we now offer two deferred payment plans:

Plan 1 requires 65% prior to shipment under the following terms: 10% down upon order, 25% upon release of drawing package; 30% upon shipment; the residual 35% to be spread over six months in equal payments, including principal and interest.

Plan 2 requires 65% prior to shipment under the following terms: 65% down upon order, with the residual 35% spread over six months in equal payments, interest free.

Shared Savings is a loan used to enhance energy-saving improvements to a facility. The loan is repaid with savings generated from reduced energy expenses and no up-front investment is needed. Shared Savings allows a company to make improvements without affecting working capital or credit lines. When the Shared Savings agreement ends, monthly payments end, and the customer receives all the savings created by the improvements. Other benefits include: improved cash flow; reduced maintenance costs; increased property value; environmental benefits; capital dollars preserved for other projects; increased comfort, production and morale.

Through our parent company, Trigen Energy Corporation, we can also in some cases own and operate the cogeneration system, or the entire plant, and sell steam by the pound and power by the kilowatt hour. This concept has been prevalent in Europe for many years. In France alone, more than 140 "chauffagiste" companies serve over 3 million apartments.

These various financing plans create a win-win situation for everyone. Companies win by reaping the savings in cogeneration right away. Our environment benefits, because for every kilowatt of electricity made through cogeneration at about 85% efficiency, there is one kilowatt less generated at a conventional power plant operating at 35% efficiency.

COGENERATION EVALUATION

Readers can arrange a free cogeneration evaluation by filling out the form on the following page. Engineers at Trigen Ewing Power will analyze your specific steam conditions to determine how much power you could generate.

Power production with a back-pressure steam turbine is a function of two main factors: Steam Flow and Pressure Drop. These two parameters determine how much power can be made and how much a system will cost. Each has to be large enough to make enough power to yield a reasonable payback.

Forward your request form to Trigen Ewing Power, FAX 413-863-3157, email: ewing@trigen.com. Phone: 413-863-3500.

Steam turbine cogeneration systems can, in many instances, convert a boiler room into a profit center by generating electricity with the steam already used for process. System life is 20 years, or more—and payback periods of as low as two or three years are not uncommon. Financing options reviewed in this article can open the way for users to take advantage of this time-tested cogeneration technology.

ABOUT THE AUTHOR

Lynn B. Di Tullio is president of Trigen Ewing Power, the leading systems integrator of small steam turbine driven power systems and a subsidiary of Trigen Energy Corporation. (Trigen Energy is the combined heat and power expert, with 41 plants in 27 locations throughout the United States). Ms. Di Tullio is a licensed Professional Engineer with a BSME from the University of Massachusetts. She has written several articles on cogeneration, its advantages, and about designing systems for optimum economic performance.

Trigen Ewing Power; 161 Industrial Boulevard; Turners Falls, MA 01376; 413-863-3500, fax 3157; ewing@trigen.com

A SUCCESSFUL COGENERATION PROJECT
MUST HAVE THE FOLLOWING AS A MINIMUM:

1. A steam load of at least 3,000 pounds steam per hour (90 boiler horsepower), average, for at least 5,000 hours per year.
2. A pressure drop of at least 80 psi between boiler operating pressure and the pressure required by process or heating equipment. For processes requiring high pressure steam (75 psig or greater) the pressure of the steam entering the turbine must be at least two times the process pressure.

If your potential application does not meet the above conditions, process steam pressure can sometimes be reduced without affecting the end product. Also, if a boiler is operating at a pressure substantially below its pressure vessel rating, it may be worthwhile to look at raising the operating pressure.

If your application meets the above conditions, fill out the following information, fax this form to us, and we'll get right to work evaluating your application. If you have waste fuel, waste steam, or waste heat, please call our application engineers directly. If you have any questions or comments, please call!

Existing or new boiler(s):

Design pressure: _____ psig* Operating pressure: _____ psig
 Capacity: _____ pph** Steam temp., if not saturated: _____ °F

What is steam used for? _____

At what pressure is steam used? _____ pph at _____ psig _____ hours per year
 _____ pph at _____ psig _____ hours per year
 _____ pph at _____ psig _____ hours per year

Plant voltage: _____ V, and frequency: _____ Hz.

Average cost per kWhr: _____ from utility

*Use metric units if you prefer, but be sure to specify Absolute or Gauge pressures!

**1 Boiler horsepower (BHP) = 34.5 pounds per hour of steam (PPH)