Comments on the Article "Cogeneration Blueprint for State Facilities"

Two cogeneration professionals, both with many years of experience, have reviewed the preceding article—"The 1981 California Cogeneration Blueprint."

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I found it amazing that the majority of the issues discussed in an article written 20 years ago are still valid today.

In the preamble of the article it was stated that then Governor of California E.G. Brown challenged utilities and industries to develop 6,000 MW of electricity in California during the 1980s, through cogeneration. I can add that in a 1982 letter the then Chairman of CEC (California Energy Commission) C.R. Imbrecht echoed the Governor's concept, stating that **"… it is estimated that as much as 4,000 megawatts of electricity can be produced by cogeneration by the year 2002."**

Sure, some cogeneration plants were built in California. But with the passage of time, significant changes were made to the original estimates, due to reasons I'll discuss later. The referenced article dealt with state (of California) facilities. Based on a study prepared for the Governor's Cogeneration Task Force the authors estimated that of the potential 700 MW identified for development at state facilities, 490 MW of cogeneration were considered cost effective and could be developed in the immediate future.

Now we regret that the challenges were not met, and the recommendations were not implemented.

Four criteria are used in the article for evaluating cogeneration projects: results of feasibility studies, status of conservation programs,

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availability of fair thermal loads, and status of cogeneration technologies.

These are still valid today, although cogeneration and emission control technologies have advanced and proliferated.

The authors included a map showing the potential sites and cogeneration plant sizes at state facilities in California. I am familiar with several of them in the Southern California area. Since 1981-82 some of them expanded, and now justify larger size cogeneration plants. The loads of some other sites were picked up by "merchant" plants.

For example, a recent feasibility study recommends a 12 MW cogeneration plant instead of 6 MW plant for CSU Long Beach, and 12 MW (although with a different technology) instead of 3.5 MW for CSU Fullerton. The loads of the California Institute for Men (correctional facility) in Chino were picked up by a larger 29 MW cogeneration plant built in Chino. However, in its entirety the list of sites is still applicable today.

What changed during the 20 years that have elapsed since the "Blueprint" was prepared? On one hand, **two major advancements occurred that help to enhance cogeneration economics.**

First, advances in gas turbine technologies provide more options, and help find better cogeneration equipment matches for the available loads.

Second, the proliferation of thermal energy storage (TES) systems that shave peak loads for both chilled water and hot water supply can provide stable thermal "base loads" on an annual basis, thus again improving cogeneration economics.

For example, of the above mentioned Long Beach and Fullerton State universities, the first had installed a large TES for chilled water, and the latter has TES for both chilled and hot water. Credit must be given to utilities that promoted TES programs.

ON THE OTHER HAND...

Two other major factors HINDERED the development and implementation of cogeneration in California. These were: reluctance, or better stated, resistance of electric utilities to cogeneration (being seen as a rival) and ever-changing stiff emission control requirements imposed by local Air Quality Management districts. Sometimes, open op-

position by electric utilities obstructed the development and installation of cogeneration plants in California.

There were no clear utility requirements for interconnection to the grid. Utilities required that they would conduct interconnection studies, frequently very costly and lengthy. In several cases the electric utilities just killed (bought out) the cogeneration projects, offering the potential hosts lower electric rates in exchange for not building a cogeneration plant.

The stiff environmental requirements in California, although pursuing a noble task, in several cases overburdened the cogeneration projects financially, substantially increasing their cost, and made permitting a very lengthy and costly process, thus making the cogeneration projects less attractive for developers and investors.

It is worthwhile to say that gas utilities did promote cogeneration by offering lower gas rates due to higher potential volumes of gas that they could sell should the cogeneration plant be built. I am not mentioning here the recent drastic changes that occurred with gas deregulation and the start of electric deregulation that brought great uncertainty in power prices and lack of stability in natural gas supply and prices. I am sure the readers are familiar with this situation. No more long-term contracts, more risks for developers.

THE INVESTMENT ANALYSIS SECTION

In the "Investment Analysis Section" of the referenced article the authors provided a range of unit costs for cogeneration, $/kW. On one hand during the 20 years that followed, inflation took its toll. On the other hand, technology advances and larger numbers of equipment sold by the manufacturers kept the cost under control, therefore, the numbers given in the article are still applicable today.

One factor should be noticed, though. The referenced costs do not include the cost of site retrofits or modifications often required to accommodate the cogeneration plant, such as piping and auxiliary equipment relocation, expansions and additions, substation expansion, etc.

THE FINANCING STATE COGENERATION SECTION

The methods to reduce costs and time recommended in the article are still applicable, although estimated savings may now have a wider

spread. In the " Financing State Cogeneration Section" the authors correctly observed that "utilities (electric, MF) have shown little interest in developing the projects themselves" (at that time.)

In Option IV—Third Party Cogeneration—the authors listed, though, the utilities as a source of development. One reservation must be made about this. As the passage of time has shown, such utilities will be out of state (there are plenty of recent examples.)

POSSIBLE CONSTRAINTS TO COGENERATION

In the "Possible Constraints to Cogeneration Section," the authors listed two factors: air pollution permitting, and the Fuel Use Act, which prohibited use of natural gas for large plants. The last was repealed, therefore, it is not a constraint any more. Permitting is still a problem, although in this area some later developments such as emission trading (one example is the RECLAIM program offered by the South Coast Air Quality Management District) add flexibility in permitting and monitoring the emissions.

EFFECTS OF THE BLUEPRINT

In the concluding section, "Effects of the Blueprint," the authors recap savings, environmental impacts, and benefits to the state. In the energy savings part the authors stated that "…cogeneration systems… have an overall thermal efficiency of up to 80% and more." While this is true for efficient industrial plants with stable, round-the-clock, whole-year loads, cogeneration plants for state facilities that require mostly heating and air conditioning only, may exhibit lesser average annual efficiencies.

In no way, though, will this reduce the benefits of cogeneration, because the alternate, non-cogeneration methods would have lower average efficiency also.

BENEFITS TO STATE POWER PRODUCTION CAPACITY

In the "Benefits to State Power Production Capacity Section," the authors stated that cogeneration plants could be brought on-line in

shorter periods of time than conventional power plants. While this is true, the authors' reference to one to four years for cogeneration plants versus eight to ten years for conventional plants is obsolete.

Their time frames for conventional plants were based on solid-fuel-fired utility plants, while current gas-fired combusting turbine and combined cycle merchant plants can be built in a fraction of that time. Of course, the same is true for cogeneration plants.

Another cogeneration benefit mentioned in the article, "on-site generation eliminates transmission and distribution energy losses (5%-10%)" is of course still true.

In general, the "Blueprint" gives us a good retroactive view on issues related to cogeneration for state facilities, and cogeneration as a whole. I am sure we can all learn and enrich our experience from this article.

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Editor's Note: Dr. Fridman is an expert in cogeneration and power plants, industrial energy supply, and District Heating and Central Cooling Systems. He has over 30 years of experience in energy source development around the world.

Dr. Fridman's article "Cogeneration Efficiency and Economics" will appear in the winter issue of *Cogeneration and Competitive Power Journal*.