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While you've been out chasing energy efficiency within your own operations, you probably haven't been keeping up with the state of the power gen industry and how its growing problems are bound to impact your company. Get ready for a big shock.

The power industry is at a crossroads, faced with environmental requirements from the federal government, unprecedented power demands from the consumer, an aging fleet of power plants and the all important antiquated transmission system.

The way in which the power industry responds to this "crisis" will impact every person in the United States. The profitability of industry will be dependent on how industrial sector management responds to the inevitable rising energy cost necessary to support massive power plant and transmission construction.

It's interesting that a majority of attention regarding the energy crisis is focused on oil and gas when electricity is what impacts almost every part of our lives. Could it be that people treat electrical service as a right, and that electricity is only noticed by its absence? This is a far cry from the early days of power generation, when electric lighting was only for the well-to-do. To paraphrase Tom Bodett's Motel Six mantra, "We'll keep the light on for you," it may not be very easy for any of us to keep our lights on in the not too distant future.

Electricity demand is expected to increase by approximately 30% by the year 2030. At the same time our reserve is declining, due to economic expansion, growth of electrical technology, population growth and our aging power plants. Over 60% of the power plants in North America are at least 40 years old. The last base-loaded coal-fired power plant was commissioned in the 1970s. Nothing lasts forever—especially power plants. Eventually a plant is too costly to maintain and requires replacement or major rebuild. Alas, that is the situation with a majority of the power gen plants in North America. Add to the equation our antiquated power grid, and you

have an even more complex issue. How did we get into such a mess? To answer that question, we need to go back into history.

Historical perspective

Since the beginning of modern electric power generation in the 1880s, the power industry has seen relatively steady growth:

- Rapid growth spurts occurred in the 1890s, as people began to install lighting in their homes.
- From 1901 to 1932, growth escalated as a result of more efficient steam-powered turbines replacing the old reciprocating steam engines and new inventions using electricity.
- From 1933 to 1950, the Federal Government began regulating private utilities and central air conditioning was developed.
- During WW II, in order to feed America's war machine, demand for electricity increased by 27%, perhaps the largest growth rate in history.
- From 1950 to 1970, growth continued at a steady 8.5% per year. During this period, commercial nuclear power was introduced.
- The 1970s to mid 1980s saw increasing unit costs and slower growth. This slowdown was a result of general inflation, fossil fuel prices, environmental concerns and problems in the nuclear power industry.
- In 1984, electricity posted its largest single-year increase since 1976 (4.5%).

The late 1980s saw increased generation by non-utilities. In fact, by 1991 a significant shift had occurred. Non-utilities now owned about 6% of the electric power generating capacity and produced about 9% of the total electricity generated in the U.S.

Major issues in the power industry surfaced in the 1990s due to structure changes that impacted reliability of the electric power supply and bulk power trading. The Clean Air Act of 1990 also took effect during this time, raising even more issues within the industry.

In 2000, for the first time in the history of the power industry, retail customers were given a choice of electricity suppliers. To date, 24 states and the District of Columbia have passed laws or regulatory orders to implement retail competition. The introduction of wholesale and retail competition to the electric power industry has produced and will continue to produce significant changes in the industry.

Transmission concerns

The power industry evolved based on demand within a local utilities service territory—this included the transmission lines. Over the years, a utility and/or investors would build a power plant, then add transmission lines to service customers. Therefore, the transmission lines are owned and maintained by the utility.

Transmission between service territories typically has been built to accommodate utilities that co-owned plants and to share reserve power between utilities and regions. To that end, today's transmission system can be defined as a group of networks covering the service territories of the major utilities separated by weak connectors limiting interconnectivity.

Transmission constraints are a major concern. The antiquated grid prevents utilities from routing electricity long distances, thereby feeding areas that require additional power. In the early days of the power industry, the typical power plant would push power approximately 50 to 75 miles. Fast forward to our deregulated industry today; it is not unusual to transmit power 1000 miles. This longdistance transmission comes at a price—line losses that are absorbed by the utility generating the power.

Over the past eight to 10 years, transmission construction has declined. (I suspect this is due to deregulation and the increase in investor-owned utilities otherwise known as "merchant" plants.) Whatever the reason, this lack of investment has impacted our life styles by way of blackouts.

It is well known that we have issues with our transmission system and that they must be addressed as we add further generation. Unfortunately, no one seems to have an answer. How do we get every generator to contribute dollars to upgrade the North American power grid? (Investment in transmission, however, will increase over the next 15 or so years, primarily due to new plant construction.)

Generation concerns

Figure 1 shows how power generation in North America is broken down. Given the abundance of coal in the United States, it is only natural that coal is the largest source of our power (48.9%).

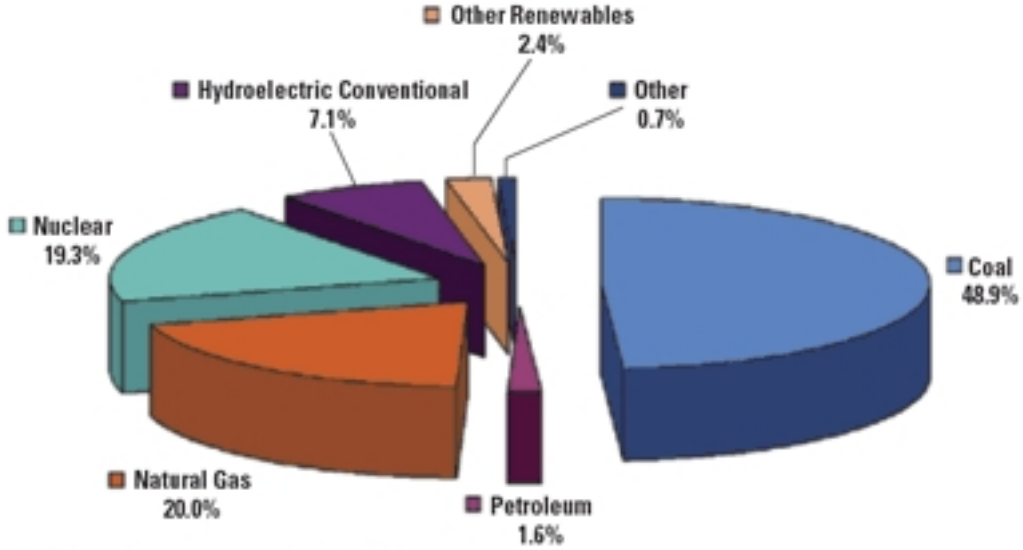

Fig. 1. Breakdown of power generation in North America

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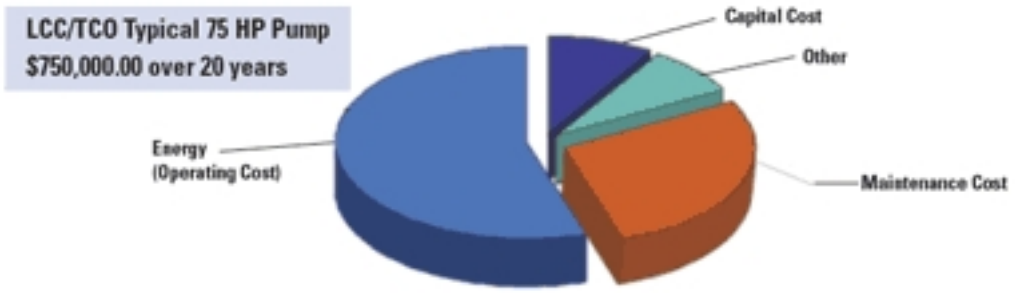

Fig. 2. Think in terms of life-cycle cost (LCC) and total cost of ownership (TCO), rather than first cost when specifying and purchasing equipment.

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Editor's Note – Working To Ensure Our Future

The DOE/ITP mission is intended to provide a mechanism to help corporations assign greater value to the