The Emerging Need For Intermediate Peaking Power

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As deficiencies in the transmission system have become more strained, as load growth continues and density increases in almost all geographic regions in the U.S., the need for small scale peaking generation is becoming more pronounced.

As municipal and cooperative utility companies are subjected to extremely volatile costs to meet their peak demands because of limited supplies and transmission capacity, the need for locally owned peaking generation is becoming more obvious.

As smaller geographic areas experience brown-outs and black-outs due to insufficient generating capacity within their area, the need for local, intermediate peaking generation is becoming more apparent.

It is generally conceded that there is sufficient base load generation either in place or being developed in the form of new combined cycle systems. Also, the nation's existing transmission system is assumed to be sufficient to manage the base load capacity requirements in most areas of the U.S. Nevertheless, problems occurred frequently last spring and summer with both generation and transmission capacity to meet peak demand conditions — in a phenomenon often called "The Perfect Storm." Major outages were averted by a combination of emergency equipment deployment and conservation measures, but this does not seem to be a solution for future growth planning, when considering environmental aspects.

Peaking capacity using traditional generation technology is being developed to meet the system deficiencies at locations where large gas transmission lines intersect large natural gas lines. The rapid construction of new peaking capacity on the major transmission grids will rapidly saturate these lines and crowd out other providers of energy and capacity. In fact, there is increasing evidence that existing transmission systems are already saturated.

With the combination of transmission and generation shortfalls, deregulation under way, and a leveling economy, what does it mean for end users of energy, especially smaller market customers in the new electricity dynamic that is emerging? How does the volatility of pricing and reliability affect the usage and availability of power?

Intermediate Peaking

As shown in figures 1 and 2, energy usage may be divided into three parts:

Figure 1: Load duration curve, 1997

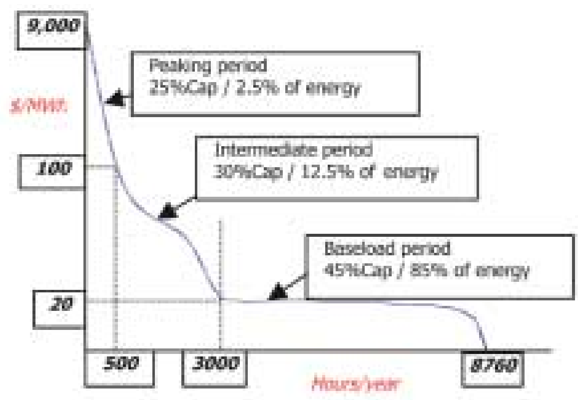
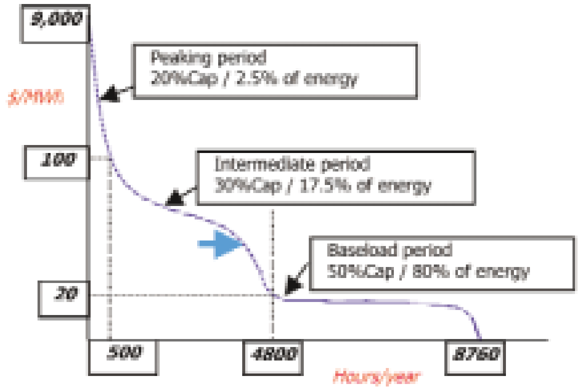


Figure 2:
Load duration curve, 2000.



peak period, baseload and intermediate. Peak is the period during the year when electric rates are at their highest (here designated as over $100/MWh). This occurs typically not more than 500 hours per year, and is indeed often defined as below 500 hours by regulators, to place emission limitations on emergency generation equipment. Baseload period, where electric rates are lowest, is typically assigned to the marginal costs of central utility plants generated with coal or hydro (here designated as $20/MWh), on a continuous basis. This energy is provided to the central transmission system 8,760 hours per year.

In between, there is what's known as "intermediate" or "intermediate peaking" periods, where the marginal cost of generation is higher than that of a central base plant, but occurs at a greater recurrence than 500 hours per year, the limitation for peaking plants.

Looking at the load duration curves in figures 1 and 2, the annual intermediate peaking period — between $20 and $100 per MWh — has increased by over 25% since 1997. Why is this? Is it a trend, or an isolated occurrence?

Factors Contributing To Intermediate Peaking

A variety of factors contribute to the increased intermediate peaking period. A combination of these factors has made a calculable difference in the needs of our generation system in just a short period of time.

Demand

There has been an increased demand for steady, high quality power for an increasing period of time, due in part to the common usage of computers in commercial, industrial and residential users. Other usage categories would include air conditioning for such computers, more highly automated production for manufacturers, etc.

Increased load density, e.g., the Internet boom and "co-location centers" has put a much larger capacity strain at the same location. A typical office space that would require about 10 watts per square foot has increased to the order of 100 watts in a square foot for an Internet hotel.

Deregulation

The current political environment encourages free-market influences for energy, which in turn results in volatility of pricing. This increased volatility raises the average cost, or at least the occurrence of intermediate cost, of power.

Power brokers are focusing on larger, more flexible markets to make their profits in trading, not the smaller, steadier loads. This hinders the smaller (and more common) loads' bargaining position for lower energy pricing from utilities.

Deregulation exposes the market inconsistencies between supply and demand (as we saw recently in California), to encourage short term supply investment.

Supply

Load growth exceeds current generation and transmission capabilities (less than 2% reserves in load pockets, not to mention the retirement schedule for existing generation. This is increasing the price and volatility of power supply.

To meet the growing demand, additional generation must be installed. Most of this generation is planned to be fueled by natural gas (over 80% of new power plants planned, according to the Department of Energy), mainly for environmental reasons. The installation of these new large gas-fired generation facilities is contributing to an expected increase in natural gas prices, and therefore a higher cost to generate – a cost structure in the intermediate peaking range. Pipeline capacity is also threatened for these large generation and base load sites, for constraints on pressure and capacity requirements.

Locations are increasingly limited for new major source sites of generation facilities, as capacity is increased. This pushes the power plant generation facilities to a more distributed network, where gas pressure and capacity is smaller.

Major deficiencies in transmission systems will take several peak seasons to re-fortify, in areas where it is possible to do so. The basic construction of the transmission system as an intra-state system that radiates out from large central station facilities rather than in inter-state grid that is capable of easy movement of electricity on a regional basis, is directing generation to a more distributed network system.

As transmission systems become more dedicated to base load generation, in order to maximize the significant investments required to fortify the central system, the increasing peaking and intermediate periods will need to be addressed by a more disbursed system.

Environmental factors limit some large scale and base load plants, and encourage diversification of energy sources.

These supply, demand and deregulation drivers are some of the reasons for the increase in the intermediate peaking period. As supply and demand play out their classic relationship in a free market, this price-influenced market will also encourage efficiency to meet the demand at the lowest possible variable cost.

Two Cases For Disbursed Generation

Given these parameters, and the directives of the National Energy Policy to balance environmental and energy policies more soundly, a case is made for a more disbursed generation system, including intermediate peaking capacity in areas where the transmission system is overburdened, where electricity prices are increasing, and where reliability is of issue. Municipalities and cooperative utilities are taking steps even today to install intermediate peaking generation capacity, to:

1. Ensure reliability to their customers;
2. Hedge the price risk in a volatile market; and
3. Sell excess power into the grid system, to support the transmission grid and create revenues which may be converted to lower prices for their ratebase.

City Light, Water and Cable, Paragould, AR and City Light, Gas and Water, Kennett, MI, are two such municipalities. This summer, each commissioned PeakingPlus™ systems as provided by Wärtsilä North America, Inc. In plant sizes of 18.4 and 12.6 MW respectively, CLWC and CLGW ensured their customers added reliability, a capped price of electricity, at rates that were already among the lowest in their regions. PeakingPlus was developed by Wärtsilä to address exactly this intermediate peaking need. Introduced in October 2000, PeakingPlus is a line of ready-made power plants that allow users to generate their own power when electricity demand is at its highest. In the first six months following its introduction, Wärtsilä won eight orders for PeakingPlus plants, representing 325 megawatts, more than doubling its installed capacity in the United States.