Successful participation in competitive electricity markets requires strategies that consider multiple time horizons. Developers and operators of power plants must address all time horizons, varying from years to minutes. Strategies must be developed for each of the time scales in the figure below. These include:

- Assessment of the physical and financial viability of a project and the position of that project in the queue of all projects requiring assessment
- Participation in capacity markets where they exist
- Participation in day-ahead markets where they exist
- Participation in the real-time or balancing market
- Real-time operation, performance, penalties, and costs

### Physical Planning

Assessment of the physical impact of a generation project on the existing system is the foundation of the years-out time band. Typically the analyses include:

- Feasibility study
- System reliability impact study
- Facilities study and cost allocation
- Interconnection agreement

Accomplished in sequence, each assessment is more detailed than its predecessor. Due to the level of detail required, the operator of the transmission to which the project will connect, an Independent System Operator (ISO), or a Regional Transmission Operator (RTO) conducts the assessment. The project assumes the cost of each assessment, and an "up-front" charge is typically levied. The demand for assessment services often exceeds the resources available, and a first-come first-served queue may be in effect for all transmission projects, whether or not related to generation expansion. Competition for a spot in the queue is becoming the norm. Successful strategies must also include the possibility of delays in the planning cycle, as well as competing projects.

Other aspects of preliminary planning, for example, the evidence of viability required by financiers or the environmental issues that must be addressed, are beyond the scope of this article.
Capacity Market
Where they exist, capacity markets provide payments to energy suppliers based on the concept of unforced capacity:

- generators with a low forced outage rate have an unforced capacity close to their nameplate rating
- generators with a high forced outage rate have an unforced capacity substantially lower than their nameplate rating.

The rationale for capacity payments is based on energy suppliers bidding short-run marginal costs in the energy market. Since longer-term investment costs are covered by capacity payments, they do not correlate with the electricity market. Typically, loads must acquire capacity to cover their peak plus a margin of 15% to 18%. There is competition among generators to sell capacity to loads and competition among loads to acquire capacity.

Intermittent generators present a special challenge. Even without a forced outage, intermittent generators are, at times, unable to reach nameplate output. Furthermore, the peak production rates from intermittent generators may not be coincident with peak load levels. Recognizing the apparent mismatch between the output of intermittent generation and electricity demand, an equivalent unforced capacity is typically determined from actual production, where the average power production measured during selected peak hours is taken as the unforced capacity. A successful strategy must recognize and address these factors.

Day-Ahead Market
The day-ahead market performs two functions:

- providing a financial obligation to buyers and sellers for the next day
- assuring that sufficient resources will be available to meet the next day’s load.

Day-ahead schedules provide a basis for real-time balancing. In the absence of a day-ahead market, special balancing rules are required to handle deviations from a presumed schedule. Generation sufficiency is driven by reliability concerns and must account for the lengthy start-up periods required by many generators. All energy markets, even those without an explicit day-ahead market, assess reliability. Competition among generators to supply load is a fairly straightforward concept. The competitive mix includes loads that may defer the acquisition of energy until real-time, forcing competition with one another to acquire energy. Virtual traders, who seek to arbitrage price deviations without ever actually supplying or consuming energy, add yet another dimension to the competitive mix. In addition to these factors, a successful strategy must address expected differences in price and price volatility between day-ahead and real-time settlements.

Real-Time Market
Electricity markets structured with both day-ahead and real-time settlements possess a natural mechanism for balancing energy. The system is dispatched to make the best use of generation and transmission resources. Energy deviations in these markets simply settle at real-time prices. Any real-time energy production that had not been previously sold day-ahead must be sold at real-time prices. Shortfalls must be purchased at real-time prices. Energy markets that lack a two settlement structure must devise special rules for handling imbalances. These rules vary from market to market, but often involve balancing at the real-time price plus or minus a penalty. Competition in real-time tends to be among generators seeking to supply power, and successful strategies must recognize the opportunities available by adjusting output in response to electricity prices.

Real-Time Performance
The reliable and efficient operation of the electrical system and the electricity markets depends on the ability of generators to follow a schedule. Deviations from expected output have a detrimental impact on energy clearing prices, and penalties may be imposed on generators that do not follow their schedule within a tolerance. In this scenario generators do not compete directly with one another. Rather, they minimize performance penalties by adhering to schedule and minimizing deviations. The successful strategy must address minimizing deviations from schedule or changing schedule in a timely manner.
Conclusion
The developers and operators of power plants in today’s market environment face competition in many areas. A realistic assessment of the complete competitive situation will enable sound business and operational decisions on multiple time scales. Successful strategies must address each time scale.