# Merchant Power: "The New Kid on the Block"

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## INTRODUCTION & DEFINITIONS

The term "merchant power producer" is a relatively new concept, which has evolved from the *Independent Power Producer, IPP,* classification to specifically describe a particular type or 'class' of an electric power generation facility.

A more formal definition of a *merchant power plant* would be "a power plant built or purchased with private equity that does not have firm customers (i.e. captive ratepayers similar to a utility) which will attempt to sell most or all of its product in the open market." The pure merchant plant would initially have no customers while a "hybrid merchant" would have some but not all of its capacity initially contracted to a customer(s). This can easily be contrasted to an *Independent Power Producer, IPP,* defined as " a power plant with all or the majority of its output dedicated to contract customer(s)." For discussion we will clarify a *cogeneration facility* (Federal Energy Regulatory Commission, FERC, qualified facility or 'QF') as "a power plant primarily constructed to meet a given site's thermal and electric needs which meets the required FERC efficiency standards for a 'QF', and generally not exporting much if any power for external sale."

In summary, we'll say a utility has captive ratepayers, an IPP has contract customers, a cogenerator has its own site as the 'customer', and a merchant plant attempts to sell into the open market establishing customers as it produces its product.

In reality a merchant plant can be of almost any configuration. It can span technology (from gas turbines to geothermal, from fluidized bed to nuclear or wind power, etc.), utilizing any fuel (natural gas to coke, coal to solar, etc.). Merchants can be of any form (from newly constructed to existing, repowered facilities, from repurchased old utility plants to existing industrial cogeneration units, etc.).

## SCOPE

In order for the merchant plant to compete in the open market it must be able to compete with existing utility plants, IPPs, EWGs (exempt wholesale generators), and other merchant facilities. Since true cogenerators don't typically sell much or any power in open markets, they can usually be eliminated from a merchant's major competitors. To effectively compete without major market risks, a merchant producer must be able to put power on the grid at an effective busbar cost (the net of all associated costs including equity, fuel, O&M, etc.) which is below the regional "hurdle rates." The regional hurdle rate will vary from region to region and from hour to hour, but it will generally be that rate which can minimally compete with the hourly market pricing and allow the plant's capacity to be purchased in the open market.

Although a merchant plant could be any technology and utilize any fuel source, for purposes of this article we will discuss the merchant plant within the context of a newly constructed or vastly retrofitted structure. The project will attempt to be in the lowest quarter of anticipated, regional heat rates in order to minimize market risk. In addition, equity and O&M costs must be minimized, while fuel supply, emissions, and costs are optimized. With natural gas being the "primary fuel of choice" for the majority of new capacity, the two most common new construction equipment configurations for this application are:

1. The *combined cycle* gas turbine based plant which will have heat rates in the 7,000 Btu/kWh range but will attempt to minimize equity costs by utilizing economy of scale applications (building larger MW output plants with larger, less expensive components, contracting for larger quantity, less expensive fuels, and spreading O&M over large production output) thereby reducing final busbar cost.

   This configuration may also attempt to "re-power" existing utility type generation facilities which can take advantage of the existing, developed site (usually with all infrastructure in place and existing substation and transmission connection access) all of which will result in lower capital and O&M costs and lower busbar prices.

2. The *'merchant host'* facility which can be thought of as an "optimized power plant design utilizing the best traits of both cogeneration and combined cycle utility type generation plants." The plant will have a site thermal host (selling thermal energy, typically steam, to the host at a discounted value, while utilizing much of the host's existing site infrastructure to reduce capital and O&M costs, and possibly selling a portion of the electrical output to the host site).

   This configuration allows for net heat rate efficiencies (fuel chargeable to power after credit for thermal energy recovery value) in the 5,500 to 6,500 Btu/kWh range, while also allowing the plant to optimize electrical output (through let-down and condensing turbine applications) while simultaneously taking advantage of "economies of scale." Finally, this configuration allows the electrical output to be increased at times of high market pricing by either increasing condensing steam flows and/or reducing thermal and/or electrical sales to the host facility (economic dispatching) thereby allowing the host facility to participate in the profits from the higher price grid sales.

Because configuration #2, the *merchant host*, allows for the lower net heat rates while also capturing value from economies of scale, existing site infrastructure, and economic dispatch, the remainder of the discussion will focus on this type merchant plant (although much of the discussion will also apply to any form of merchant plant).

## BACKGROUND

Impending deregulation along with proactive, future market speculation has, in a sense, created the merchant concept. At some point in the future when full market deregulation exists, all power generation plants will technically be merchant in that there will be no regulated monopoly generation and all plants will compete for market share. The bottom line is to "optimize the plant" by maximizing the gross power output to supply megawatts to a given (sometimes speculative) market structure while minimizing all project costs including equity, O&M, and fuel costs. Speculation can become a combination of timing the deregulation environment, projecting load growth/supply characteristics in a given geographic region, anticipating market grid ($/kWh) value, and attempting to utilize the most efficient technologies with the best fuel choice(s). Emissions and environmental impact minimization, especially with 'dirty' fuels, will also be a key project factor.

Uncertainty over deregulation and stranded costs issues during the past decade has caused electric utility companies to all but stop construction of central station power stations and delay any new generation plans. With their reserve generation margins (typically in the 15% ranges) significantly reduced and with specific geographic regions in immediate need of capacity (those approaching 10% or less), utilities and IPPs are quickly attempting to fill the gaps. Simultaneously, load growth in many areas is rampant reaching record levels in 1998.

Industrial facilities are increasingly concerned about the availability, reliability, and costs of their power supplies and are turning to on-site generation (cogeneration) as a viable alternative. Those industrial sites with large thermal requirements are being targeted by forward thinking, aggressive merchant developers seeking to capture their inherent value.

A recent check on the U.S. manufacturers of large gas turbine-generator, GTG, equipment indicates that most of their larger MW units (greater than 100 MW each) have been reserved while still on the production line extending out 2 to 3 years. Since the June 1998 electric market price spike, these manufacturers have seen the demand for their equipment increase drastically causing prices for the prime equipment to increase minimally 10 to 15% after reaching all time lows earlier in 1998. Availability of many specific GTGs is zero for the next few years unless you were one of the lucky players who reserved your unit on the production line. A few developers currently are positioned to take advantage of any opportunities requiring such equipment simply because they are the only sources of obtaining the equipment in the near future. These developers are actively seeking sites to best utilize their soon to be delivered GTG units.

All in all, the power generation market is poised to "launch" into a new dimension where efficiency, low cost, and environmental impact reduction will displace central station, monopoly utility mentality. Existing central station utility generation currently averages above a 10,000 heat rate (10,000 Btu/kWh) from older, complex cycle equipment with 'bulky' control & operation schemes. It won't take much project optimization for the new GTG cogeneration plants with their simple configurations, digital control systems, and well under 6,500 heat rates to compete.

A theory recently developed suggests that future base loaded plants will be those with the lowest marginal costs (incremental fuel cost and O&M) probably those in the lower quarter of heat rates. As these new plants qualify for more and more base load they will force the utility grade plants to "cycle" during the day and/or season which will in turn cause their average heat rates and O&M to increase thus causing them to be even less competitive for the next round of competition. Basically, these older, inefficient plants will eventually be forced out of the base load market and into peaking duty. Because of the sheer magnitude of the amount of load at stake it will be impossible to quickly displace the existing capacity supplied by these older plants. This whole process will necessarily take many years, which will allow a continued source of income for most of these older plants.

## MERCHANT MENTALITY

A summarized outline of what "merchant mentality" may look like is as follows:

1. Locate a 'capacity attractive' region where:
   - prevailing political climate is conducive
   - potential local 'customers' (future deregulated customer access) exists
   - current local utility player is capacity short or a 'weak player'

2. Locate a 'host site' within target region which:
   - has reasonable access to transmission system
   - has a good thermal sink requirement and willing to purchase heat/steam
   - already possesses plant site infrastructure (land, utilities, O&M systems, boilers, water treatment, etc.) in place
   - has site permits and environmental (offset) credits already established

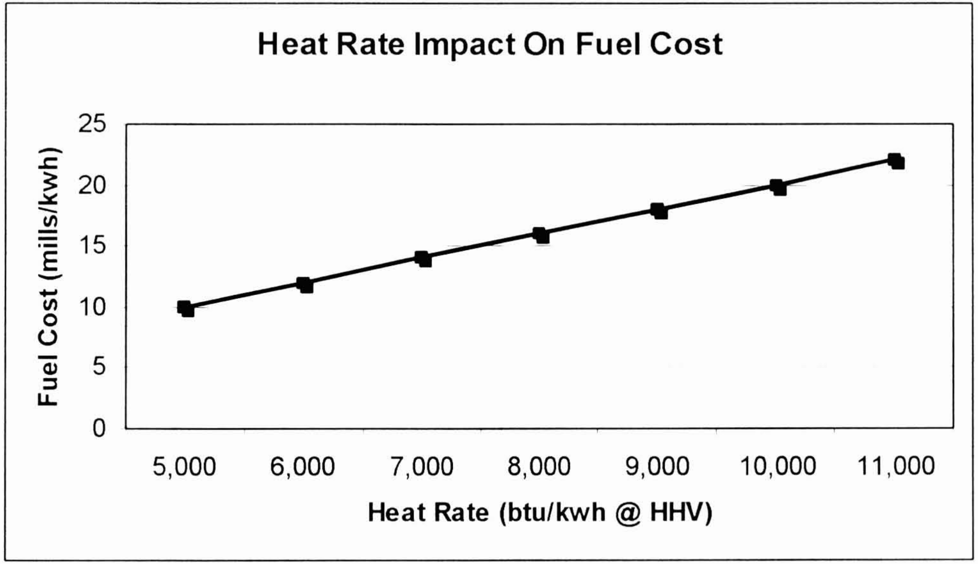


Figure 1. Example impact of the plant net heat rate (Btu/kWh) on the fuel cost component for a typical fuel (natural gas) valued at $2.00 per MMBtu HHV.

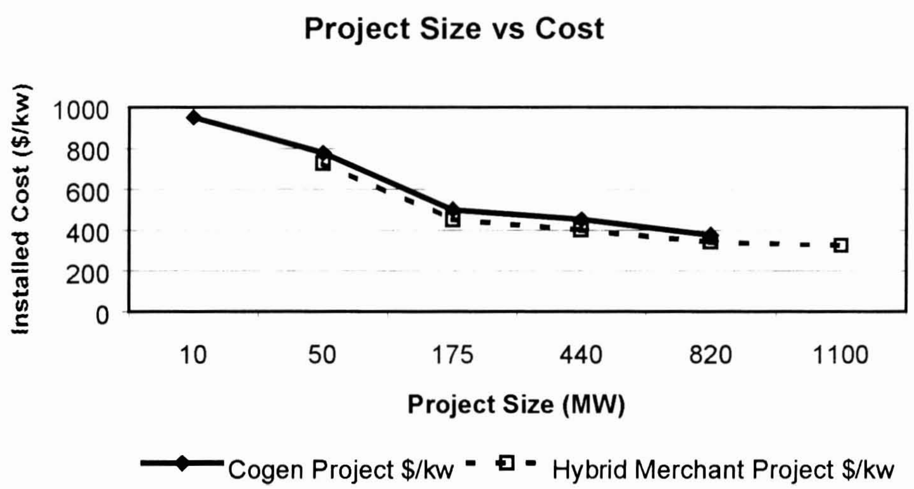


**Figure 2. Hypothetical example of the "economy of scale" theory which clearly indicates that larger plants are typically less costly to construct on a unit ($/kW) basis, and that the unit costs will generally level off after a given size for a specific project.**

- will be a long-term 'partner and customer' (a well established entity)

3. Develop a 'optimized generation plant' which:
   - maximizes economies of scale/minimizes equity factor ($/kW)
   - optimizes net heat rate around thermal host for equipment configuration
   - minimizes installed costs and ongoing O&M
   - optimizes use of existing equipment and infrastructure
   - maximizes kW dispatch during peak price periods through increased condensing capacity, curtailment of site host load, etc.
   - utilizes competitive pricing for all major equipment and services
   - maximizes flexibility and future adaptability/expansion/salvage
   - minimizes project risk (technical, political, fuel, financial, environmental, etc.)
   - minimizes environmental impact issues

4. Configure project cash flow to account for:
   - long-term thermal sales and electric power sales option to host partner
   - initial (pre-deregulated market) wholesale sales for excess power generation
   - longer term (post deregulated market) excess sales to easy access industrials and municipals, and ultimately aggregated loads and local retail (pre-qualify all perspective customers)
   - be prepared for delays in deregulation and ultimate retail access
   - utilize risk assessment tools/models to identify, quantify, access and mitigate project risk (market, fuel, technology, political, etc.)

It is unlikely that a new merchant plant will be able to meet anticipated market pricing if it does not follow the above guidelines. This necessitates that lowest cost, highest efficient technology be utilized around a clean, reliable and inexpensive fuel source. While a merchant plant could be a simple or combined cycle plant with no thermal/site host, this profile may not be best suited to compete in all markets and may offer considerably higher risks than the "optimized' configuration discussed in this article.

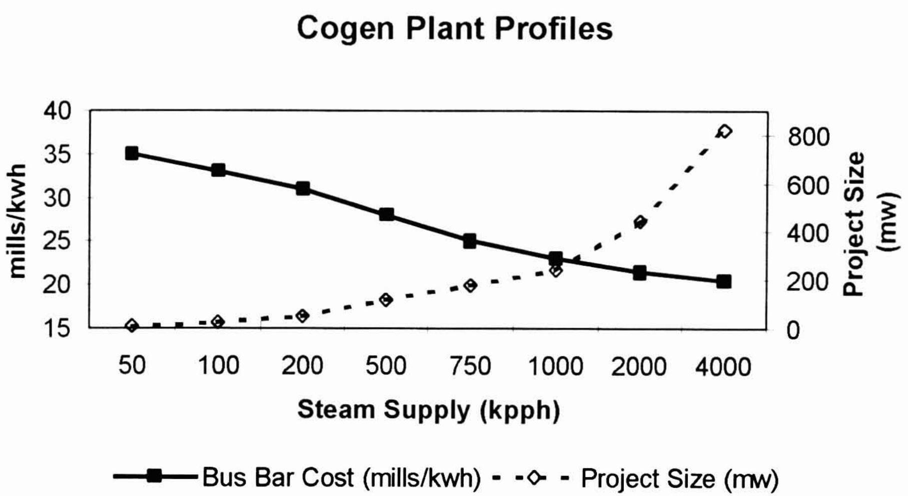


Figure 3. Theoretical plant profile for a given industrial cogeneration configuration which displays relationship of a project sized for host site thermal supply vs. the final busbar costs. Note that economies of scale also prevail with a leveling of busbar costs for projects above 250 MW.

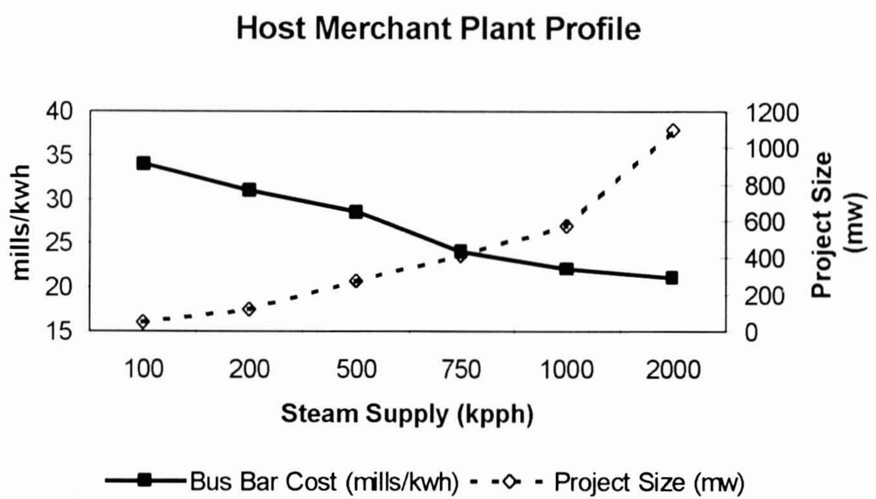


Figure 4. Theoretical plant profile for a given host merchant configuration which displays relationship of a project optimized around both host site thermal supply & maximum power production vs. the final busbar costs. Note that economies of scale also prevail with a leveling of busbar costs for projects above 450 MW.

## THE 'BOTTOM LINE'

The first thing to keep in mind that it is highly unlikely that any two power generation projects will be the same. Even projects utilizing the same equipment configuration and the same developer, owners, and EPC supplier will likely differ in their final busbar costs. Individual site and project conditions will necessitate that every project be evaluated independently. Just because a "very similar" project was successful at one site is no guarantee that an identical project at a different site will also be successful.

A variety of factors contribute to any specific project and a slight variation in any one of these factors can significantly affect a project's success, good or bad. Sometimes just the timing (exactly when a project is built, major equipment is ordered, and debt is secured) is enough to completely change the characteristics of two basically identical projects. For instance, vendors may offer an equipment "fire sale" during one project order and not the other. Site permitting and regulatory/legal hassles may cause a 6-month extension of project development or construction at one project, increasing interim finance costs and delaying project cash flows. Available debt structure can quickly change due to market conditions affecting the entire profitability margin of a given project.

Sometimes there are "extenuating circumstances" particular to a given site which can enhance or detract from a project's value. One site with old inefficient boilers may require investment in new boiler plant, which can be credited against a projects capital value. Another site may be experiencing excessive power outages affecting their product profitability which will be corrected by the power generation project which in turn takes a significant credit for these increased product sales revenues.

Suffice it to say that to attempt to provide generic data on these type projects is only an attempt to put things in perspective and perhaps establish some order of magnitude, not to suggest that these complexities can be converted to simple graphs and charts.

With this is mind, Figures 3 & 4 provide data for theoretical plant installations detailing the industrial cogeneration configuration and the host merchant configuration, respectively. The projects evaluated could be typical and employ specific financial evaluation criteria such as 70/30 debt equity with an effective 10% project discount rate, 20-year project life, 15-year depreciation, $2/MMBtu fuel, and under 2-year actual construction.

The actual values displayed are not as important as the general concepts displayed. The most significant is that there is a definite value to both the lower heat rate concept and the economy of scale concept. There will be an optimum size, which can be calculated for any given set of project considerations. While even larger sizes (above the optimum) may continue to incrementally provide for a lower busbar cost, the small incremental cost reductions are typically offset by significantly higher capital requirements and associated risk of enormous amounts of exported power which must compete in the given market. From a portfolio risk perspective and given a specific equity pool, it would generally be better to construct 3 merchant plants each averaging 500 MW in separate regions, then to construct a single 1,800 MW plant at any one of the sites.

The primary unknown once all markets are truly deregulated is exactly what will be the hourly prevailing market price these merchant plants must compete against and the associated annual average market-clearing price. Since this is a real time target only "best guess" models and speculation will prevail, especially in the short term until markets stabilize and future prices become more predictable. Using the busbar costs displayed in Figures 3 & 4 it can be seen that the "floor" for the given projects approaches about 20 mills (optimized projects will probably be slightly higher). Because the busbar figures include no transmission or local utility fees, actual customers would likely pay a premium above the busbar values shown. If we assume a 25 mill/kWh annualized average "break-even" cost, then for the project to be able to sell all power it must assume their ultimate customers will be willing to pay at least that value. If prevailing market clearing prices average below the 25 mill value, the project may not make the required return for its investors.

As hourly dynamics are established in the market an interesting situation develops for our merchant host project. If the merchant can export/sell significant amounts of power when market pricing is high, or if it can establish base contracts to specific customers above the average clearinghouse values, then it will reap significant profits for these sales. These plants may actually have low incremental busbar costs (fuel and incremental O&M with no capital or fixed O&M costs) well under 15 mills/kWh, so they can effectively compete in the off-peak markets much more competitively than if we assume the average 25 mill/kWh break-even scenario. Expanding on this concept could allow these merchants to increase their project's return even though the market pricing is basically neutral to their average busbar costs!

**Example**

Let's assume our merchant plant with the 25 mills/kWh average break-even price can balance his customer portfolio to take advantage of some higher profit from contract customers (i.e. aggregated commercial, municipals, smaller industrial sites in the area) in the 30 to 40 mills/kWh ranges. If he can then maximize exported open market sales when prevailing clearinghouse prices are elevated (say above 30 mills/kWh) by one of the strategies already discussed, while only exporting efficient power during low market prices (say below 23 mills/kWh), then he should be in a position to base load his core plant year round and maximize annualized returns. If the host customer agrees to shifting his thermal supply to allow the merchant to increase power export (condensing turbines) during peak market prices and/or agrees to curtail on-site power consumption to further increase export sales, then both the merchant and the host can increase their overall profits from market electricity sales. The combination strategy described here should allow our merchant plant to actually profit even when short-term market prices are below 15 mills/kWh.

If many large merchants in a given area were to successfully deploy the tactics in the above example, they would undoubtedly affect the market supply balance and clearinghouse pricing in their region. One obvious effect could be that some current base loaded utility plants are pushed out of the base load markets which would have a dramatic impact on the total regional market supply/pricing dynamics. The resulting possibilities are complex and better addressed in a separate paper devoted to that subject.

## THE HOST SITE'S PERSPECTIVE

Opportunities for merchant generation can provide an industrial host site with an array of values including:

- discounted thermal and electricity prices
- redundant supplies of thermal and electricity supplies (increased reliability)

- reduced risk from deregulated market factors
- options to participate in the electric power market for added profits either through ownership in the merchant project or through economic dispatch of their site
- capacity (through curtailable electric load or product/process)
- profitable utilization of their products, services, or waste products in the project
- reduced site environmental impacts

Risks also exist for the site host as involvement with a merchant plant will usually require a long-term (10 to 20 years) commitment to purchase thermal and/or electric power from the project. This will contain degrees of uncertainty as the deregulation process unfolds and the market adjusts to prevailing conditions (general project/contract risk). For instance, a host may find that they have future access to cheap electric power through a wholesaler or aggregator without the need for the merchant plant commitment (market risk). Also, the merchant plant will likely be restricted to a given fuel source(s) which does not have the flexibility of the variety of fuel and energy sources the open market would have access to (fuel source/supply risk). New technologies are emerging which could offer more attractive alternatives to the merchant project (technology risk). In addition, there are the obvious contractual, financial, and liability risks associated with any project of this magnitude and nature. They also share in any risks their merchant project partner(s) have by the very nature that it is their site/business that is being used by all parties as the host.

Because there are definite opportunities and risks, the prospective host must practice caution and due diligence in his assessment of merchant projects. The host should keep his options as flexible as possible so as to be able to "check and adjust" as the market, technology, and new opportunities emerge, or should problems not find resolve.

A strong recommendation here is that the host industrial utilize the services of their own independent engineer either in a value engineering capacity and/or as a typical owner's engineer. Although all involved parties will likely be evaluating the project's technical and financial worthiness (including the developer, EPC provider, debt source, insurance entity, major equipment supplier, etc.) their perspectives are all focused on their particular interest and risk associated with the project. The minimal costs for independent engineer is almost negligible in the overall costs and risks of such a large project. Many times this "extra set of eyes" can provide suggestions and cautions, even when minimal in nature, which will more than cover the costs of these extra services. Including independent risk assessment and mitigation along with these engineering services is also definitely worth considering.

## THE UTILITY'S PERSPECTIVE

Depending on the individual utility involved, their current strategy for the generation business, their reserve capacity situation, and a host of other factors, any given utility's reaction to a merchant plant development in their service territory may span from "we welcome with open arms" (pro-merchant) to " we will fight to the last" (anti-merchant)! Options for so called "fighting" are becoming more scarce as deregulation gets closer and closer to a federally mandated reality.

Anti-merchant utilities and their regulators have primarily addressed the issue by dealing with the structure and timing of their respective deregulation plan and by focusing on the existing customers which likely includes the prospective project's host. Basically, utilities have engaged in longer term contracts (some including 'no cogen' type language); implemented cost to serve, transition to deregulation, and a host of other "exit fees/costs"; have utilized regulatory rules to hinder permits and restrict 3rd party sales; implemented regulation for 'stranded cost recovery'; and a bevy of other discouraging tactics.

On the other side of the arena, pro-merchant utilities have solicited merchant activity through RFPs and supply bidding, promoted regulation to foster 3rd party/independent generation development, and many are actually participating in perspective projects from either their regulated operations or through their unregulated affiliates. A recent article identified five well-known utilities (unregulated affiliates) as bidders for an existing generation plant sale inside a sixth's service area. Comments suggest the units might be more valuable to the out-of-state operations, because they could be used as merchant plants in the wholesale market (assuming they are purchased at attractive prices), and, after deregulation, could be used to provide retail service in the state.

As always, some utilities are "on-the fence" as to merchant activity. Still others are actively engaged in pro-merchant activity outside their regulated service territories (usually through unregulated affiliates) while taking a definite anti-merchant position within their home service territories.

## THE MARKET'S PERSPECTIVE

This could really be seen as a perspective from the Fed's viewpoint on "free enterprise and the electric power business." The primary intent here is to establish a free market which in turn will foster competition which should result in benefits to the consumer at large (more choices, more value, better quality, etc.). In addition, more efficient use of our natural resources with less environmental problems should prevail.

From the viewpoint of heat rate and emissions, the merchant plant configuration should easily accomplish higher efficiency with reduced environmental impacts. The 'trick' is to also do it at a reduced bottom line, busbar costs, which is certainly a possibility under proper project conditions. Even the combined cycle IPP power plant with its 7,000 heat rate should be able to qualify for the above benefits (especially for incremental or replacement capacity). The main difference with the merchant host plant configuration will be in its ability to extract value from the host while providing additional benefits to the host site.

Downside technical risks here have mainly to do with continued reliability of the nation's electric system once the market opens to all the various players. Of particular concern is how all this activity will impact the constrained transmission systems as well as the market's ability to maintain excess capacity for emergency situations. This reliability is essential for the country's economy as well as national security. Consumer risks could arise if there are limited players in a given market that would constrain competition and could theoretically increase (instead of decrease) electric rates. Worst case scenarios could depict higher electricity prices combined with less reliable supply.

## CONCLUSIONS

With deregulation just around the corner, existing generation reserve capacity margins dropping below 10% in some areas, and with over 50,000 MW of merchant capacity currently under construction in this country, it is clear that the merchant power plant concept is no minor fad, nor one to soon fade into oblivion. Since all power plants will theoretically be merchant plants once the market is fully deregulated (i.e. none will have captive ratepayers as do today's regulated utilities) it makes sense that the key drivers that allow for a competitive merchant plant should prevail in the open market.

Bottom-line price (busbar costs) will be the name of the game as all power plants struggle to compete in what many see as a commodity market. With off-peak market prices averaging well under 20 mills/ kWh, it will require careful insight, planning, management, and risk mitigation to be among the "winners." New plants will typically be required to be extremely fuel efficient, generally operating in the lower quarter of incremental regional net heat rates, if they hope to effectively compete for base loaded operation. On the "up side" a plant should be positioned to put the maximum capacity on the grid during peak use/ price periods, which can easily exceed 50 mill/kWh. The "trick" will be to balance all project factors in order to allow the merchant facility to operate base loaded while maintaining incremental profitability at all anticipated market prices.

The developer (owner/operator/equity partner) will be the entity which stands to profit (or lose) most in this game. [*Note that the developer is defined here as an active player in the project and may consist of multiple entities/partners, as opposed to a developing "agent " who simply puts together or manages the project for separate owners or equity partners but has no active equity position himself.*] He will typically bear most of the impact of all associated project risks either directly or through contractual agreement. However, consistent with the "risk-reward" rule, the developer will also be the one to reap the maximum financial benefits from a successful project.

Market speculation, political uncertainty, and a few "surprises" should be anticipated in any merchant project and accounted for during the project assessment phase. Prudent developers with strong balance sheets and diversified portfolios will be able to "roll with the punches" in this market. Companies which own or have direct access to fuel supplies and who have a history of operating industrial facilities in the highly competitive global markets (i.e., chemical and petro-chemical entities) should be well positioned to compete in this market. In addition, a developer who has fuel hedging and power marketing capabilities should be able to mitigate much of the risk associated with such projects.

All in all the merchant game will be best played by the "big guys" with experience who can adequately identify and take steps to mitigate and/or absorb the multitude of risks associated with these projects. The upside potential for these qualified developers is extremely high as the entire electric supply of this country transitions from regulated utility generation to new technologies and configurations over the next two decades.

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ABOUT THE AUTHOR

**Louis J. Braquet, P.E.**, is an independent energy consultant, whose work entails knowledge of the energy industry's customer/utility/regulatory environments. His background includes project experience with industrial and commercial power generation, electric technology application, and business development opportunities. He has been involved in over 60 large power systems projects, some exceeding 200 MW and $150 million construction value.

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