Hybrid Finance

A solution to high electricity prices in restructured states.

By Mark C. Beyer

New baseload generation is needed in many areas of the United States to restrain electricity price increases and to assure reliability as economic growth creates increasing demand for electric power. The financing of new plants will be particularly challenging in restructured states where generation facilities are no longer included in rate base and therefore not financed through the traditional rate-of-return paradigm associated with vertical integration.

The adoption of a market hybrid approach in which new baseload plants would be partially owned and financed by the regulated distribution company with the other portion owned and financed by the unregulated generation company would combine the advantages of lower-cost capital and regulatory oversight associated with traditional rate-of-return regulation with the cost control and efficiency associated with competitive markets. In addition, the use of rate-reduction bonds borrowed from industry restructuring would further minimize the cost to ratepayers.

Economic growth will require new baseload capacity in addition to conservation and the increased use of renewables. The environmental concerns engendered by global warming dictate that new baseload generation will be very expensive, *i.e.*, either nuclear or clean coal power. The addition of baseload capacity to the generation mix will have a salutary impact on market prices and the construction of new baseload plants will enhance regional economic growth.

The market hybrid approach is a solution to the problem of high electricity prices. Preliminary indications are that consumers would benefit from lower priced electricity, the environment would benefit from cleaner energy production and the economy would benefit from increased employment, output and growth.

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Electric Utility Restructuring

Electric rates in states that restructured their electric utility industry continue to be among the highest in the nation, creating a burden not only on residential customers but also negatively impacting economic growth. The goal of restructuring was to increase competition in both wholesale and retail markets to reduce electric rates and expand consumer choice.

Prior to restructuring, electricity was generated, transmitted and distributed to end-use customers by regulated monopolies that built, owned and operated most power plants and delivered electricity to end-users. This business model was referred to as vertical integration. A fair return on utility investment, although not guaranteed, was reasonably assured through the regulatory process. The funding of baseload generation was accomplished under rate-of-return regulation. Regulation of these monopolies was based on cost of service and was meant to produce prices that would exist in a properly functioning market.

Approximately one-half of U.S. states have adopted some level of deregulation or restructuring of the energy utility sector to enhance competition and eliminate inefficiencies in the supply market. The basic framework of restructuring includes the following:

- Retail prices were cut on the order of 10 percent; phased-in over five years to enhance the appeal of deregulation to the public;
- Utility generation was required either to be divested or transferred to an unregulated subsidiary;
- The cost of energy and capacity was eliminated from the retail rate such that retail suppliers could compete directly in supplying electricity to the consumer;
- At the end of the phase-in period, electricity was bought or sold in the wholesale market either through an auction process or through bilateral contracts;
- Transmission and distribution continued to be regulated under traditional rate-of-return regulation; and
- The issuance of rate-reduction bonds was authorized to cover stranded costs.

Restructuring allowed producers to keep the profits from efficiency gains, resulting in a dramatic increase in capacity factors at existing coal and nuclear plants. The efficiency gains were especially pronounced at nuclear power plants. »

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Significant new sources of supply, primarily combined-cycle gas (*i.e.*, both energy efficient and environmentally acceptable) were brought on-line, as price signals from the wholesale market encouraged new investment. Absent from the market, however, was significant construction of new baseload electric generation in restructured states.

The issuance of rate-reduction bonds was authorized to cover stranded costs and deferred balances. Without this mechanism, the rate reductions associated with restructuring would have been more difficult to achieve.

High Wholesale Prices

The increase in wholesale electricity prices has been dramatic, with rate increases exceeding 50 percent or more in some markets. These price increases have occurred in both restructured and traditional markets, but are more noticeable in restructured markets. The primary reason that vertically integrated states have lower electricity prices is the prevalence of coal units, especially older units without advanced pollution controls.

In the initial years of restructuring, the marginal cost-based pricing of competitive markets led to a decrease in electricity prices compared with the average costs, which would be charged under rate-of-return regulation. Recently, as a result of demand growth, inefficient natural gas-fueled combustion turbine units are on the margin more of the time, causing electricity prices to surge. In addition, the price of natural gas also has increased substantially, which has compounded the problem. In effect, less-efficient units burning increasingly expensive natural gas are setting the price of electricity more of the time.[1] Some of the factors that contributed to the increase in electricity prices include: rising prices for key production inputs, such as coal, oil and natural gas, because of scarcity, production constraints, weather, OPEC, *etc.*; high real rates of economic growth and the rise of the information economy have led to increased demand, *i.e.*, a data center can use as much electricity as a steel mill; and increased demand has led to the use of less efficient generation units because new baseload capacity hasn't been built. Additionally, utilities have responded to state and federal incentives to install new generating technologies, such as wind and photovoltaics, at a higher cost than traditional baseload generation.

Rate-reduction bonds could be included in the market hybrid approach to maximize ratepayer benefits.

Electricity prices increased in most markets despite the implementation of various strategies to ameliorate the price increases, such as real-time pricing, first for large customers and eventually for other customers;[2] demand-side management and energy efficiency programs; and additional market monitoring to assure wholesale market competition.

Significantly lacking from restructured markets has been the construction of new baseload generation capacity.

Regulated vs. Competitive Market Pricing

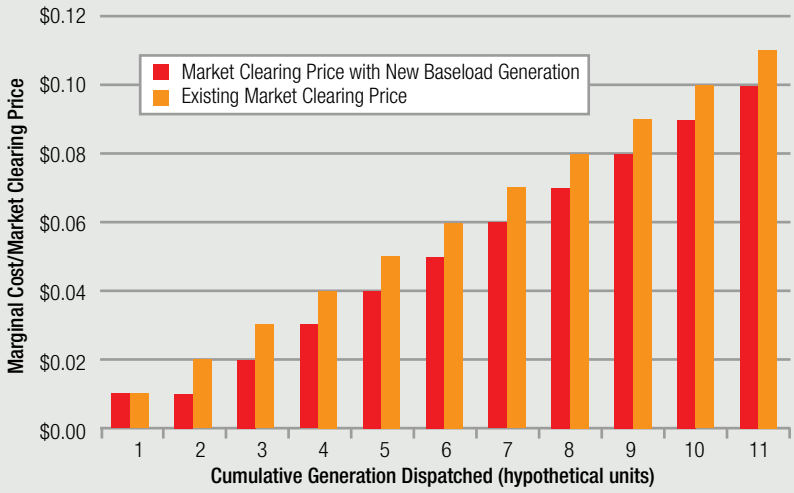
The same economic dispatch of generating units applies under both cost-of-service and market-based pricing. Utilities run generators with the lowest marginal costs first and start more expensive units as power demand increases, so as to maximize economy of service. When demand for electricity is low, the grid is supplied by hydro, nuclear and coal baseload power plants, which have low marginal costs. When demand for electricity is high, in addition to baseload units, the grid is supplied by combustion turbine plants, which have high marginal costs due to the price of natural gas and the high heat rates associated with these less efficient units.

Prices under the rate-of-return model are set to cover the utility's cost of service including fuel, appropriate operating expenses, depreciation and taxes, plus a fair return on invested capital. The price or average cost of electricity normally is expressed per unit of output, which is obtained by dividing the cost of service by output. When restructuring first was proposed, average costs of generation exceeded marginal costs, which was a strong argument in favor of deregulation; customers didn't want to pay for excess capacity and utility inefficiency. Cost-of-service regulation imposed the majority of cost overruns directly on captive retail customers. Most existing baseload generation was financed under rate-of-return regulation.

Under a market-based pricing model, prices are based on the marginal cost of electricity produced by the last generating unit dispatched. When demand is low, prices also are low because they are based on the marginal cost of coal and nuclear units. When demand is high, prices are correspondingly high because they are based on the marginal cost of combustion turbines, which burn expensive natural gas. Unlike rate-of-return pricing, which provides for a fair return on invested capital, return on investment under market-based pricing depends on the market producing prices that exceed the marginal costs of some generating units. Prices haven't risen high enough to incentivize the construction of new baseload generation, possibly because prices in these markets often are priced-capped during periods of the highest demand.

Owners of existing baseload generation are realizing significant profits from the present state of the market because prices reflect the marginal cost of the producer with the highest cost whose output is necessary to meet demand. If

Fig. 1 Impact of New Baseload Generation on Market Clearing Price



Source: Author's analysis

new baseload generation was to be constructed, the price of electricity would fall and the profits being realized by the owners of existing baseload generation would be reduced.

Supply Growth Reduces Prices

New baseload generation will be needed despite the increased use of energy efficiency, conservation and renewables. The construction of new baseload capacity is especially important given the decline in reserve margins. If reserve margins shrink more than expected, system reliability would be affected, with a deleterious impact on the economy.

The new baseload technology likely will be either nuclear power or clean coal; the latter might be the appropriate technology in areas with accessible coal resources and the geology to accommodate carbon sequestration. There has been increased consideration of nuclear power because of global warming and the need for clean baseload generation. If taxes or other constraints on carbon are imposed, the economics of nuclear power would be increased. The low marginal cost of new generation assures that it will displace other fossil generation, which is frequently coal fired, leading to less pollution and fewer greenhouse gases.

Additional efficient baseload generation with its low marginal cost of operation will reduce the market price of electricity because it will displace the equivalent amount of generation with higher marginal costs, which sets the market clearing price at any given level of demand. The actual price impact depends on the marginal cost of the generation resource being displaced, but the clearing price is always lower—except when demand is so low that only baseload units are being dispatched—than it would have been without the addition of the low cost baseload generation (*see Figure 1*).

Adding new baseload capacity to the generation mix would lead to lower electricity prices because less expensive generation would be on the margin. The new baseload capacity would displace more expensive coal and natural gas-fired capacity and electricity prices would fall.

Market Hybrid Financing

Financing new baseload generation in restructured markets presents significant challenges to regulators, plant owners and the financial markets. Baseload generation projects are capital intensive, subject to lengthy construction horizons, and entail material operating, regulatory and financial risks. Because of the magnitude of baseload generation projects, the cost of capital is an extremely important consideration in determining construction feasibility.

Under the market hybrid approach, new baseload plants would be partially owned and financed by both the regulated distribution company and the unregulated or merchant generation company.

The portion owned by the regulated distribution company would be subject to cost-of-service regulation. Commission involvement on a continuous basis would minimize risks and promote regulatory support on issues important to the project. Regulated assets are attractive to pension and infrastructure funds because of their stable cash flows. Large electricity users such as steel mills, oil refiners and real-estate proprietors might be interested in partial ownership of regulated assets in order to assure a long-term source of cost-based, emissions-free baseload power. Such investment might be in response to state or federal mandates to reduce carbon emissions. In areas where substantial baseload generation is being built, there would be less need for the market hybrid approach.

The unregulated generation company would have the lead in constructing and operating the plant and market forces would determine its profits or losses. Other entities such as equipment suppliers and investors seeking more than a regulated return could be partial owners. Deregulation has shown that generation efficiency improved under competition as evidenced by lower heat rates at fossil plants and higher capacity factors at nuclear plants. These efficiency gains help achieve environmental goals especially with respect to carbon emissions (*see "Best of Both Worlds"*).

The output of a baseload plant financed under the market hybrid approach would be sold into the market and receive market prices. The revenue allocable to the regulated distribution company and the unregulated generation company would be accounted

according to each company's operating structure. For a regulated distribution company, revenue would be compared with cost of service. If the revenue exceeded the cost of service, such excess would be returned to ratepayers or could be used to finance additional energy efficiency or renewable investments. If there were a shortfall in revenue relative to the cost of service, rates would be increased to make up the difference.

And for an unregulated generation company, the revenue would belong to the company—*i.e.*, it would produce profits or losses depending on the company's success in building, operating and selling plant output. Experience has shown that the profit motive would assure efficient and effective operation of the plant.

Use of Rate-Reduction Bonds

Rate-reduction bonds could be included in the market hybrid approach to maximize ratepayer benefits. These bonds would be structured to achieve AAA credit ratings on the debt, thereby minimizing interest costs. Bonds of this type could be utilized in various ways as part of the market hybrid approach.

These bonds could replace the distribution company's weighted average cost of capital, which is based on a mix of debt at an embedded rate of interest, common equity at an allowed return and preferred stock at an embedded dividend rate. The substitution of 100-percent tax-deductible debt for the distribution company's weighted average cost of capital would give rise to substantial customer savings. An alternate approach would be for the rate-reduction bonds to be used in place of the distribution company's debt in the capital structure used to finance the baseload investment. The investment would be financed at the weighted average cost of capital with rate reduction bonds replacing the traditional utility debt. Some combination of these approaches might be used depending on circumstances, but full substitution of the utility's revenue requirement with rate reduction bonds isn't recommended.

The rating agencies normally don't view rate-reduction bonds as company debt, thereby preserving the debt capacity of the utility, which could be utilized to finance further investment in energy conservation and renewables. Rate-reduction bonds could be incorporated into the market hybrid approach to further reduce the cost of capital—a critical factor in financing baseload generation.

Best of Both Worlds

A market hybrid approach provides the advantages of both rate-of-return regulation and competitive markets.

Rate-of-Return Regulation	Competitive Markets
Strong Regulatory Oversight	Consumer Choice
Lower Cost of Capital	Lower Construction Costs
Cost-Based Prices	Operational Efficiency

Environmental Benefits

The market hybrid approach will allow the cost-effective construction of new, highly efficient baseload generation. This construction would be accomplished through the provision of low-cost capital and regulatory oversight associated with rate-of-return regulation and the cost control and efficiency associated with competitive markets. Rate-of-return regulation assures that only environmentally sound baseload projects, nuclear or clean coal, would be included in the cost of service.

> The multiplier impact on the regional economy from the construction of a new baseload power plant is likely to be substantial.

New baseload generation is characterized by lower heat rates and higher capacity factors than existing generation. Coal-fired power plants built years ago with outdated, inefficient technologies burn inordinate amounts of coal for each unit of electricity produced. Because older, less efficient coal-fired generation frequently operates on the margin, the new efficient generation would reduce significantly both smog (*e.g.*, ozone) and soot (*e.g.*, particulate matter) pollution while producing fewer or no greenhouse gases. If taxes are levied or other restrictions on carbon are imposed, the economics of new efficient generation, particularly nuclear power, would be enhanced. The relatively inefficient generation would operate less of the time, while highly inefficient plants likely would be forced to shut down because of the lack of profitability—an advantage associated with competitive markets that is incorporated into the market hybrid approach. In either case, production of greenhouse gases and other pollutants would be reduced significantly.

Furthermore, it should be noted that nuclear power or any other highly efficient baseload technology wouldn't displace energy efficiency, wind or photovoltaic sources of power because these latter technologies have zero or extremely low marginal costs of operation. Similarly, the market hybrid approach could be structured to produce revenues to finance additional conservation and renewables yielding further environmental benefits.

Economic Growth Benefits

Infrastructure development is an essential component in encouraging economic growth, creating new jobs and boosting the region's economy. In many »

states, economic growth is required to enhance revenues without increasing taxes to provide resources for various needed social goods such as schools, health care, transportation infrastructure and pension obligations.

Construction of a new baseload generating unit would have a material impact on economic growth due to its multi-billion dollar cost, labor intensity—particularly skilled union labor—and the associated multiplier impact on related industries, most notably construction materials. There also would be substantial permanent employment associated with the continuing operation of the plant. Unlike tax increases that produce a reduction in demand, offset by increased state spending, construction financed by private-sector debt and equity has a more powerful economic impact and doesn't affect the debt capacity of the state. Increased economic growth leads to increased tax revenue without an increase in tax rates, providing the enhanced revenue required for social good.

At the consumer level, lower residential electricity prices free up resources for the purchase of other goods and services, thereby enhancing individuals' standard of living. The residential cost of electricity is regressive because low-income households spend a larger proportion of their income on the consumption of energy. All consumers benefit from lower electricity prices, but low-income consumers realize a proportionately greater benefit similar in effect to a tax cut targeted to people with low incomes. An ancillary benefit is ameliorating the cost of universal service and other energy assistance programs.

Not only does infrastructure enhance the efficiency of production, it also provides economic incentives to the private sector and influences firms' investment decisions. As a key input in many production processes, lower electric prices increase profitability, thereby providing incentives for business investment and growth. The construction of new baseload generation sends a clear signal to businesses that there will be a reliable supply of electricity available in the future, which is important in retaining and attracting commercial and industrial enterprises, particularly in the technology sector. The multiplier impact on the regional economy from the construction of a new baseload power plant is likely to be substantial. Lower electricity prices enhance consumers' standards of living and spur consumption. Increased consumer spending and lower input costs encourage business investment and job growth.

The market hybrid approach combines the advantages of the lower-cost capital and strong regulatory oversight of rate-of-return regulation with the cost control and efficiency of competitive markets. Under a market hybrid approach, consumers and businesses would benefit from lower-priced electricity. The environment would benefit from cleaner energy production, and the economy would benefit from increased employment, output and growth.

Endnotes:

1. Natural gas prices have fallen recently as a result of demand curtailment caused by the recession, as well as the use of a new extraction technique known as hydraulic fracturing, which has increased supply. Demand is likely to rebound and hydraulic fracturing may be slowed because of environmental concerns. As in the past, natural gas prices are likely to fluctuate greatly over the 30 or more year life of a baseload plant. For this analysis, it's important to note that natural gas prices are unlikely to fall enough such that the marginal cost of electricity from a gas plant would be lower than the marginal cost of electricity from a new baseload power plant.
2. Beyer, Mark C., "Pricing Electricity Using Technology," *Public Utilities Fortnightly*, Volume 127, Number 1, Jan. 1, 1991.

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