An Efficient Electricity Market: Using a Pool to Support *Real* Competition

A pool-based market can reduce the costs of electricity by increasing competition in those parts of the electricity system where market forces can be effective and efficient — including direct access — while regulatory attention focuses on the remaining monopoly parts of the industry and on environmental and social goals that competitive markets cannot be expected to handle.

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San Diego Gas & Electric Co. supports the establishment of an efficient wholesale electricity market based on a nondiscriminatory, competitive power pool open to all qualified wholesale utility and nonutility entities. The objective of a pool-based wholesale market is to reduce the costs of electricity by increasing competition in those parts of the electricity system where market forces can be effective and efficient, while legislative and regulatory attention focuses on the remaining monopoly parts of the industry and on the environmental and social goals that competitive markets cannot be expected to handle.

Although SDG&E is confident that an efficient, competitive electricity market can be developed, doing so is inherently difficult in practice and even in theory. Indeed, a major justification for treating electricity supply as a monopoly has been the impossibility of coordinating the actions of com-

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The views expressed here represent the official position of San Diego Gas & Electric Co.

petitors by using prices to match supply to demand instantaneously at each of hundreds of locations, as required on an interconnected electricity grid. Recent advances in information technology make it practical now to use competitive markets much more extensively in managing an electricity system, but only by carefully integrating market processes into the still-essential central control and coordination functions.

A pool-based wholesale electricity market is complex, not because a pool makes it so, but because a pool recognizes and deals with the real complexities of an electricity system. Assuming that somehow an "invisible hand" will create an electricity market that can deal with or can ignore the technical complexities is an invitation to supply disruption, high costs, and inequitable shifting of costs. Those who really want competition to accomplish the objective of reducing costs to consumers, as opposed to creating opportunities for some players to exploit gaps and inefficiencies at the expense of others, will invest the time and effort necessary to develop the market arrangements required for efficient and effective competition.

Once an efficient wholesale pool has been established, consumers can obtain market access through retail utility prices that unbundle the pool price from the balance of utility costs. This will make it possible for consumers to make their own contract arrangements for longer-term price stability and portfolio diversity, with the utility's obligation to supply redefined as the obligation to provide access to the wholesale market. Retail access to the market and redefinition of utility obligations can proceed as quickly as the pooling institutions and technical facilities (e.g., metering) are put in place.

To advance understanding of wholesale markets and pooling, SDG&E has invited interested parties to join a working group to produce one or more specific wholesale market proposals for submission to state and federal regulators, and offers this outline of SDG&E's current thinking on the subject. The ideas presented here reflect theory and experience developed in electricity markets around the world, but are expected to be modified when tested by discussion and analysis of the specific issues facing California.[1]

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I. A Pool-Based Wholesale Electricity Market

A. Structure of the Industry

Effective competition in any market requires multiple buyers and sellers interacting through efficient contracting and physical trading arrangements. The basic commercial arrangements in a competitive market will be determined by informal, decentralized negotiations between individual buyers and sellers, culminating in bilateral, usually confidential commercial contracts. However, for many commodities, particularly those that are costly to move and to store, efficiency and competitiveness are greatly enhanced by the establishment of centralized transport, storage and/or trading facilities. Such facilities have many characteristics of natural monopolies and hence access to and pricing of these facilities should not be controlled by any of the potentially competitive traders in the market.

Electricity is the quintessential example of a commodity in which efficient transport and trading of the physical product in real time requires centralized facilities, both physical and institutional. It is generally recognized that certain physical facilities — the wires — form a natural monopoly that should be made available to all competitors in the market on comparable terms. But given the need for instantaneous control, coordination and trading of physical product on an electricity system, it is equally important that certain institutional arrangements — the

dispatch, pooling and economy energy trading processes — be available to all on comparable terms. This comparability of access to the grid and to the physical spot market is the essence of the pool-based wholesale market proposal.

The *market structure* that best accomplishes comparability of access and pricing is illustrated in **Figure 1** and described briefly below.

- **Competitive Generators (Gencos):** Generators, some affiliated with utilities and some not, who compete to sell electricity in the wholesale spot and contract markets.[2]
- **Regulated Distribution/Retailing Utilities (Discos):** Regulated utilities — municipals and investor-owned — operate the local distribution systems and purchase electricity in the competitive wholesale market for resale to final, franchise consumers.
- **A Regulated Monopoly Transmission System (Gridco):** The regional transmission grid should ideally be owned and maintained by a separate, regulated company unaffiliated with any gencos or discos. If this is not feasible, then other ownership or joint venture arrangements are possible. For example, Gridco could be a regional transmission group (RTG) comprising several gridcos affiliated with utilities that have joined the pool. Gridco provides the assets that physically interconnect gencos and discos but does not control the dispatch of generation on the grid, which is the responsibility of Poolco. Gridco, particularly if it is a unified entity uncontrolled by any gencos and discos, can play an important role in grid investment and planning decisions.
- **A Central Dispatch/Spot Market Operator (Poolco):** An independent entity dispatches the system based on energy buy/sell offers from individual gencos and discos, purchases short-run ancillary services (e.g., reactive power, spinning reserves) needed to maintain system performance, determines market clearing energy prices for each hour, and settles spot transactions with the pool.
- **Final, Franchise Consumers:** Each final consumer buys distribution services and electricity, on a bundled or unbundled basis, from its local disco.

The existence of an independent Poolco that deals with all gencos and discos on a nondiscriminatory basis should alleviate many of the concerns about ownership arrangements in the industry. Gridco could be a single entity to which all existing transmission assets are sold, or could, as illustrated in **Figure 2**, comprise several transmission entities (T1-T4 in Figure 2), some of whom may be affiliated with companies operating in other parts of the industry (Companies A and B in Figure 2), as long as all transmission owners surrender real-time operational control of their assets to Poolco; all transmission entities would be paid relatively fixed fees based on embedded costs with performance-related incentives. Some companies in the industry could be purely gencos, owning one or more generating plants in one or more distribution companies in various markets. But some companies could own both gencos and discos (Companies B and C), as long as the disco is restricted to pass through only pool prices to its franchise custom-

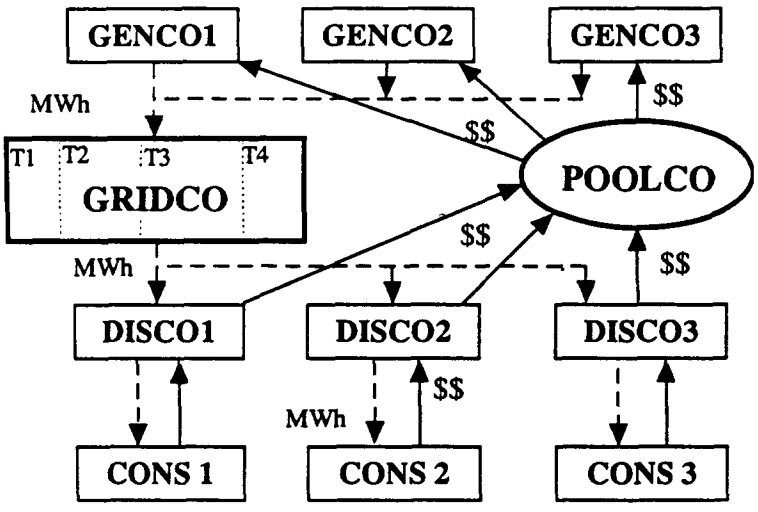
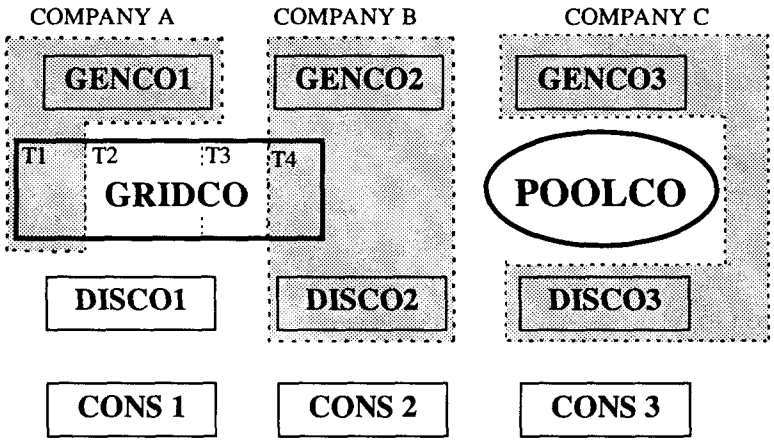


Figure 1: Structure of the Market

Figure 2: Possible Ownership Arrangements



ers or contracts with affiliated gencos only through competitive bidding subject to regulatory oversight. The essential condition is that some critical separations of control and accountability be maintained, including the following:

- **Independence of Poolco:** Poolco provides services for the benefit of gencos, discos and perhaps middlemen — collectively, "traders" — in the market, and in the process makes difficult decisions that directly and differentially affect these traders. Ownership and governance arrangements must make Poolco responsive to the needs of traders overall but operationally independent of any of them — a standard requirement for commodity and financial exchanges.
- **Arms-Length Dealings Between Discos and Gencos:** If discos are allowed to pass through to franchise customers the full costs of contract purchases, either they must purchase from unaffiliated gencos or their contracts (e.g., transition contracts for existing generation) must be approved by regulators.
- **Neutrality of Gridco:** Gridco must not be subject to the control of any genco or disco and must have no incentive or opportunity to discriminate among gencos and discos.

B. Dispatch and Pool Pricing

1. *No Grid Congestion.* Poolco operates an open spot market or pool in electricity, with all energy flowing onto or from the system being metered and priced at the pool price at each location in each hour.[3] In essence, developing the details of the dispatch and pricing process involves finding a set of hourly prices that clear the market.[4]

Beginning with the relatively simple case in which there are no transmission constraints, *the dispatch and spot pricing process* includes the following principal elements:

- **Genco Offers To Sell Energy:** Each genco, for each location or unit, submits to Poolco offers to sell various amounts of energy at various times at various prices. These offers may be complex to reflect the detailed cost structure and operating characteristics of generating plants or may be relatively simple price and quantity curves.
- **Disco Demand Projections or Bids:** Each disco provides Poolco with its expected demand profile, ideally in the form of contractually binding offers to buy defined amounts of energy at various prices.[5] Price-dependent demand bids can reflect specific load management arrangements between the disco and consumers or simply the disco's estimate of how its customers will respond to prices.
- **Intersystem Trading:** Neighboring systems, whether using their own Poolcos or more traditional dispatch and trading arrangements, make offers to sell into and bids to buy from the Poolco-run market, and vice versa, which are included in the demand or supply curves as appropriate. With efficient intersystem trading and no intersystem transmission constraints, spot prices between systems should differ only by the relatively small effect of marginal transmission losses.
- **A Dispatch/Market Clearing and Pool Pricing Procedure:** Poolco determines a "least-cost" dispatch of generation (and load management) to meet demand, based on genco offers and disco bids, setting the pool price for each hour (in the simplest case) at the energy price of the last gener-

ator operated to meet system demand at that time. As illustrated in **Figure 3** (where transmission losses have been ignored and, by assumption, there is no congestion between points X and Y in the pool), generator G3 is the marginal generator and sets the pool price at $26/MWh. These prices "clear the market" in the sense that at these prices each genco is selling and each disco is buying amounts of energy consistent with its offers or bids.

- **Poolco Purchase of Ancillary System Services:** Poolco negotiates on a nondiscriminatory basis with gencos (and, where appropriate, discos) for spot or short-term (e.g., one year) contract purchases of the non-energy system services, such as reactive power and spinning reserve, it needs to operate the integrated system reliably. The costs of these services are collected from system users through charges that, where possible, reflect cost causation, with any unallocated residual costs (e.g., Poolco overheads) collected through a general adder or "uplift" on all energy flowing on the system.
- **Settlement of Pool Transactions at Pool Prices:** A central settlement process pays the applicable pool price to all energy delivered to the system at each time and place and similarly collects the pool price (plus a markup or "uplift" to cover system services) for all energy taken from the system.[6]

2. ***With Grid Congestion.*** Dispatch and pricing become more difficult, and a centralized pool becomes even more essential, when the combination of limited transmission capacity and the pattern of load and generation create grid congestion. Now, every physical action by a genco or a disco can threaten the reliability of the system unless other gencos or discos adjust their actions in response. Demand must equal supply not only for the system as a whole, but at each of dozens or hundreds of different locations or submarkets, each with a different market-clearing price.[7]

The effect of grid congestion on pool prices at different locations can be illustrated with the example in **Figure 4**, which is the same as Figure 3 except that generator G2 at X has increased its available capacity to 20 MW and generator G4 at Y has decreased its capacity to 6 MW. With more generation at X and less at Y than before, it would be desirable to transmit more energy (14 MWh/hr) from X to Y, except that transmission from X to Y is limited to 10 MW. High-cost generator G5 at Y, with energy cost of $28/MWh, must be run to meet demand at Y, while G3 at X must be turned off and G2 at X, with energy cost of only $22/MWh, must run at less than its available capacity.

With the X to Y transmission constraint binding, the pool price — defined as the incremental cost of meeting additional demand — is now $22/MWh at X and $28/MWh at Y. Poolco, as a net buyer of low-cost energy at X and a net seller of high-cost energy at Y, earns congestion revenue of $60/hour — here equal to the price differential between X and Y of $6/MWh ($28/MWh - $22/MWh) multiplied by the X to Y flow (10 MW). This congestion revenue is rebated to those who, for reasons discussed below, hold the 10 MW of rights to compensa-

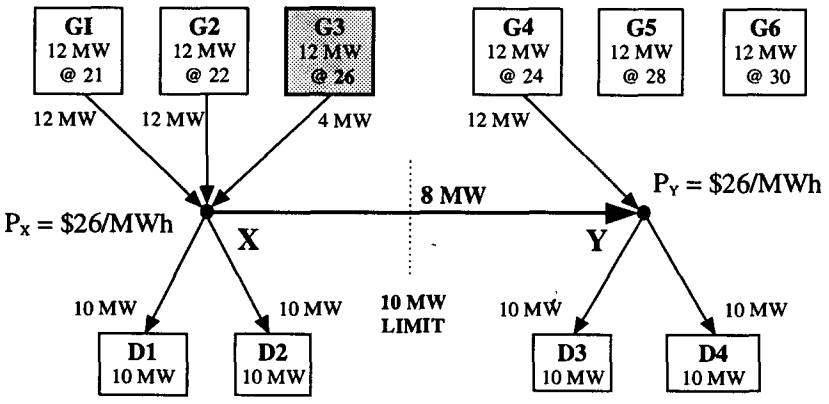
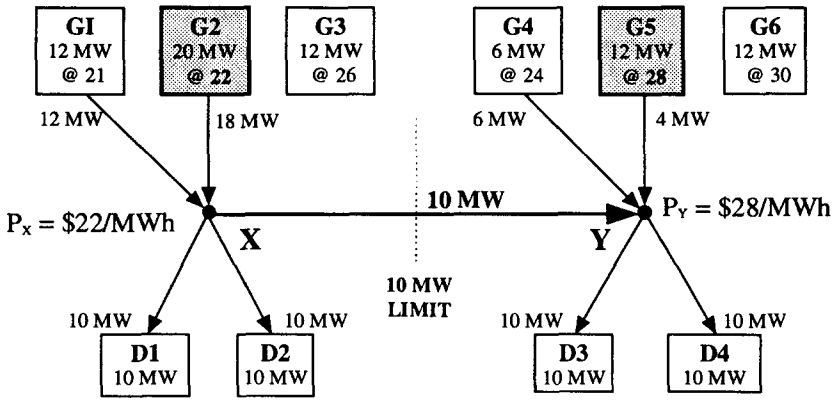


Figure 3: Pool Pricing: No Congestion. *In the hour illustrated, Poolco is a net buyer of 8 MWh of energy at point X and a net seller of 8 MWh (ignoring losses) at point Y. With no binding transmission constraint from X to Y, the pool price will be the same at both points (ignoring losses), so Poolco collects no congestion revenue. In Figure 4, the X to Y constraint is binding and Poolco would collect (and immediately rebate) congestion revenue.*

Figure 4: Pool Pricing: With Congestion



tion for X to Y congestion. Because congestion revenue is rebated by Poolco to those who hold compensation rights, Poolco bears little or no financial risk because of congestion and has no incentive to maintain grid constraints — or to relieve them. As discussed presently, the incentive to invest to relieve grid constraints is with those who want to take advantage of the X to Y price differential but do not have compensation rights.

The net congestion revenue that, in the first instance, accrues to Poolco is the result of a real scarcity of transmission capacity, similar to the scarcity of land that makes land rents in prime locations higher than the "cost" of the land. This revenue or rent is not a "monopoly profit" unless the entity receiving it is artificially creating the scarcity in the short run or maintaining it in the long run. It is important that variable pool prices reflect such scarcities, both to encourage efficient use of the limited transmission capacity in the short run and to stimulate grid enhancements when they are cost effective in the long run.

Transmission constraints that can create grid congestion do not fundamentally change Poolco's dispatch and pool pricing process, but do require much greater attention to locational factors in offers, dispatch and pricing.

The principal elements in Poolco's process are the following:

- **Genco Offers to Sell and Disco Bids to Buy Energy:** Energy offers, bids and forecasts are much as before, but now with location a critical component, i.e., each bid (or offer) is to deliver (take) energy at a specific location on the grid.
- **Intersystem Trading:** Transmission constraints and the corresponding spot price differentials are likely to be larger and more volatile between systems than within any single system. Intersystem trading rules must clearly define and allocate the rights to buy and sell energy at the various prices, presumably giving the benefits of intersystem trading to those who paid for intersystem transmission capacity, but in a way that allows competition to determine who actually uses the link to move physical power. This can be done through the use of the rights to locational compensation discussed below.
- **The Dispatch/Market Clearing and Pool Pricing Procedure:** When congestion is important, the least-cost dispatch of generation (and load management) is more complex, with no guarantee that the parties to a bilateral contract will be able to operate as they had expected. Locational pool price differentials can be large and volatile, as high-cost generation must be operated to meet local demand in some regions.
- **Congestion Revenues and Compensation Rights:** The net revenues collected by Poolco from locational price differences are used to compensate those grid users who hold rights to the grid. Initially, such rights will be allocated to those who have paid or are paying the fixed costs of the initial grid or of grid expansions, so that they will be protected from the economic effects of increasing grid congestion in the future. Over time, perhaps under the direction of regulators, these rights may be sold and freely traded in secondary markets, all without affecting system operations at any time.
- **Poolco Purchase of Ancillary System Services:** Poolco will buy the short-term system services it needs to operate the system reli-

ably. With grid congestion, these system-balancing services may include generation and load management at specific locations to deal with transmission constraints that are not properly reflected in pool prices. These constraint-related costs will be recovered through charges on specific gencos and discos or in specific regions to reflect cost causation as well as possible, with any unallocated residual recovered through a general uplift on pool energy prices.

• **Settlement of Pool Transactions at Locational Pool Prices:** All energy is purchased and sold by Poolco at the prices at the location of the physical transactions. Poolco's settlement system credits and debits individual pool accounts appropriately and automatically credits the accounts of those pool members holding locational compensation rights, in effect allowing the holder of such a right to buy or sell a specified amount of energy at the pool price somewhere else. For example, a generator at X with 100 MW of rights to locational compensation for the X-to-Y price differential will always be able to sell 100 MW at the price at Y or be compensated for being unable to do so, even if the grid becomes congested from X to Y.

C. Bilateral Contracts in a Pool-Based Wholesale Market

The pool is fundamentally a technical device to facilitate bilateral contracts negotiated and administered totally independent of Poolco. Because the pool provides and prices system services and incremental physical energy on an efficient, nondiscriminatory basis without even knowing about bilateral contracts, market participants can enter into any kind of bilateral commercial contracts they choose and can then meet their contract obligations flexibly and economically.

The principal commercial relationships in a competitive wholesale market will include the following:

• **Long-Term Contracts Defining Equity Risks of New Investments:** The construction or sale of a major generation asset is

often financed on the basis of long-term (e.g., twenty-year) contracts. A pool-based electricity market will accommodate such contracts, including any commercial terms two parties may negotiate, such as take-and-pay provisions or specific operating requirements.

• **Bilateral Trading Contracts:** Individual gencos, discos and perhaps power merchants will enter into bilateral contracts specifying the prices and other conditions under which the seller will sell and the buyer will buy defined amounts of electricity at defined times and places. Such contracts will be used to guarantee prices for periods of, say, one year, to accommodate annual budget and weather cycles, planned maintenance schedules, etc. Shorter-term (e.g., two-week) contracts will also be used to adjust contract positions to actual conditions as they develop. For example, a disco whose load evolves differently than expected earlier in the year, or a genco whose generating capacity is temporarily less than it contracted to provide, can always satisfy its needs and obligations by buying and selling physical energy in the pool — that is the great advantage of the pool — but may want short-term contracts to protect against pool price risk.

• **Spot Purchases/Sales of Uncontracted Quantities:** The pool allows last-minute adjustments by any genco or disco who needs more (less) physical energy than it can produce or has contracted for. The ability to buy and sell such quantities at a common, efficient spot price at the time and location of the physical transaction is essential to maintain efficient short-run operations of the system, to reduce the risks involved in longer-term contracting, and to facilitate contracting by providing a common reference price.

D. Special Bilateral Contracts: Contracts for Differences

A pool-based wholesale market allows great commercial flexibility in bilateral contracting and in-

dividual operations even though — or, more accurately, *because* — all physical electricity is sold to and purchased from the spot market or pool. As a mechanical matter, however, the contracts must take the form of "contracts for differences" (CFD) that specify payments between the parties based on pool prices.

The central features of a CFD are the following:

• **Defined Quantities and Prices:** A CFD defines the quantities of electrical energy (MWh) that are contracted for in each hour over the period of the contract; a reference locational pool price; a contract energy or "strike" price ($/MWh) for each hour that the buyer is to pay and the seller is to receive for the defined quantity of energy; and (perhaps) periodic fixed or capacity payments ($/MW-month) from buyer to seller. The contract quantities and prices can depend on anything the buyer and seller agree to, such as plant availability, fuel price indexes, the weather, the buyer's demand, etc.

• **Independent or Contract-Specified Operations:** The existence of a pool does nothing to limit the flexibility of any genco or disco to operate as it chooses individually or as it has contracted to do. Poolco's dispatch and pricing rules will provide the flexibility for any genco to operate whenever it wants to (subject to system-dependent technical limits) simply by bidding in an energy price of zero or declaring itself "must run." A genco choosing to operate in this way will be passing up the opportunity to meet its contract obligations more cheaply by buying from the pool when the pool price is less than the genco's incremental energy cost; but any genco who wants to operate in such a manner will be able to do so.

• **Periodic Payments Based on Pool Price Outcomes:** Once the pool price outcome is known, the parties to a CFD (i.e., their accountants or computer programs) determine who owes how much money to whom under the contract. These payments, which are made totally outside and perhaps without the knowledge of the pool, offset the effects of pool prices to the extent agreed by the contracting parties. For example, as illustrated in **Figure 5**, a simple contract might specify that a genco at X will guarantee a disco at Y that the disco will get 1 MWh each hour at Y for a net price of $25/MWh. Then, in an hour in which the pool price is $26/MWh at both X and Y (as in Figure 3, where there is no congestion from X to Y), the genco simply pays the disco the difference between the pool price of $26/MWh and the contract energy price of $25/MWh, or $1/MWh, on the 1 MWh contract quantity. The net effect of the pool and contract transactions is that the disco pays and the genco receives the contract price of $25/MWh for the contracted amount.[8]

• **Buying and Selling Uncontracted Quantities at the Pool Price:** The net effect of the pool and contract transactions is automatically to sell all contracting parties back-up energy at the local pool price whenever they need it and to purchase any excess they produce at the local pool price. It is this automatic trading of incremental energy at efficient prices, plus the automatic and nondiscriminatory purchase and sale of

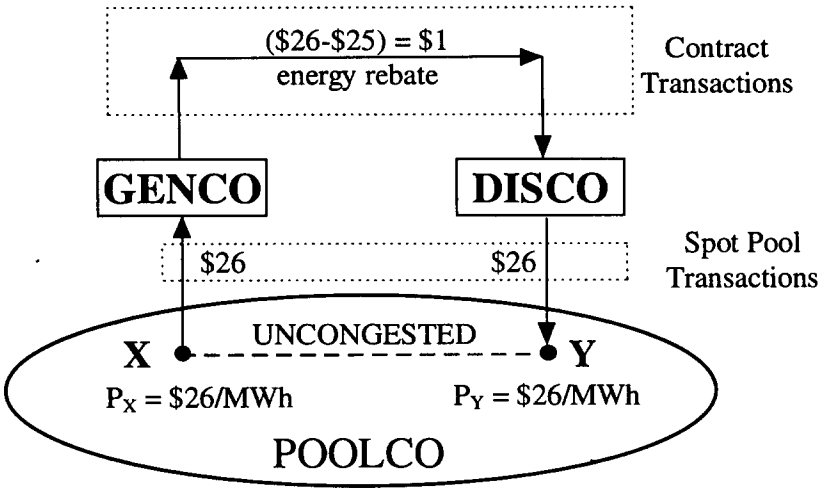


Figure 5: Contracts for Differences: No Congestion. *Terms of CFD: Disco contracts with Genco at X to buy 1 MWh every hour at Y at a net price of $25/MWh.*

ancillary system services, that facilitates contracting and competition among all competitors.

E. Grid Pricing and Planning

One of the principal advantages of a pool-based wholesale market is that it allows a clear separation between the pricing of the physical grid assets and the pricing of all the energy-related services that are an integral part of providing efficient transmission service. Pricing of grid assets becomes a relatively simple matter that can be handled with modest extensions of traditional embedded cost concepts. Losses, back-up, reactive power, opportunity costs, loop flow, etc. — all the energy-related effects that are bedeviling efforts to define and price "wheeling" service — are priced automatically by the spot pool prices at each location. Furthermore, grid planning and investment decisions can be subjected to market tests, not just centrally planned by utilities and reviewed by regulators.

The principal features of grid pricing and planning are the following:

- **Allocation of Initial Grid Costs and Compensation Rights:** Native customers of the grid-owning utility should be willing to continue paying the embedded costs of that grid in a competitive market, as long as they are assured that they will continue getting the economic benefits they expected when the grid was built, e.g., the right to buy low-cost energy from a distant generation market. Native customers can be assured of this benefit, but without any ability to limit competition for use of the grid, if the locational compensation is credited to them by the disco when the local pool price exceeds the pool price in the distant market. This solves several problems: the existing grid is paid for, at embedded costs; competition in the spot market and in the secondary market for rights to locational compensation assures that the grid is used by those who have the most valuable use for it at any time; and native users are protected from the effects of increased congestion —

"opportunity costs" in the current jargon — due to new uses of the grid.

- **Grid Expansion When Users Agree to Pay:** An investment to expand grid capacity is cost effective only when it costs less than the generation costs it saves. With locational pool pricing, the benefits of a grid expansion accrue to specific grid users, providing incentives for these users to form a coalition to pay for cost-effective expansions. Further, a secondary market for rights to locational compensation assures that existing grid capacity is used efficiently and that those who pay for new grid capacity get the benefits they pay for.

For example, a genco considering locating at point X at the end of a potentially congested radial line has several choices. It can locate at X and suffer the low pool prices or inability to run at all that will often arise at X because of congestion. It can offer to buy rights to compensation from another genco at X who might be better off selling its rights and closing down its high-cost plant. Or it can pay for a grid expansion, individually or in a coalition with other gencos at X or discos elsewhere who would benefit from the expanded transmission capability. The combination of locational prices and tradeable rights to compensation provides the right price signals to all involved.

- **Regulated Regional Grid Planning as a Backstop:** In a competitive market, those competitors who benefit from a specific grid expansion should pay for it in exchange for rights to compensation in the event of future congestion. Gridco will play an important role in analyzing grid expansion options and helping grid users identify cost-effective improvements for potential user coalitions. But if no coalition of grid users is able to agree to pay for a grid expansion that appears to be beneficial for the system as a whole, any interested party can propose a project and an allocation of its costs among those grid users who would benefit. Regulatory procedures, simi-

lar to those used now, will decide whether the project should go forward and how its costs should be allocated to those expected to benefit from the effect on locational pool prices, with the payers granted rights to compensation to assure that future congestion does not rob them of the benefits they are paying for.

F. Market Access Through Pricing

An open wholesale pool will produce some benefits by facilitating short-term trades that might otherwise be missed because of the poor information and high transaction costs of bilateral contract markets. But the real benefits of a more competitive wholesale market will come from increasing the role of market forces in long-term decisions about how much and what kind of generating capacity to build. And the key to accomplishing this is to allow final consumers, directly or through competitive middlemen, to choose to make their own arrangements with generators for long-term security of supply and price, taking the regulated disco out of the middle.

Once an open and public wholesale pool price exists, consumers can deal directly with competitive generators or middlemen without becoming participants in the wholesale market itself. All that is required is the following:

- **Pass-Through of Pool Prices to Final Consumers:** The existence of hourly wholesale prices will encourage and facilitate sophisticated pricing, such as real-time pricing where metering allows it, or time-of-use rates with frequent purchase power adjustment clauses that can approximate real-time pool pricing. Ultimately, all consumers, even though still franchise customers of the local disco, will be able to buy electricity at the pool price if they wish — provided that they pay the other, non-commodity utility costs approved by regulators.

- **Unbundling of Disco Prices:** The wholesale market will clearly define the commodity or electric-

ity-only component of utility prices. The balance of consumers' bills will cover the costs of transmission and distribution, administration and billing, DSM programs, low-income assistance programs, subsidies to renewables and electric vehicles, and during a transition period, any above-market costs of existing utility generation assets (the equivalent of the competition transition charge proposed by the California Commission). These separate items can be individually identified on consumers' bills to the extent desired by the disco or regulators.

- **Competitive Provision of Pool Price Hedges or Insurance:** Once consumers are paying local disco bills consisting of the wholesale pool price plus the other utility costs approved by regulators, anybody is free to offer them financial hedges or insurance against the pool price. For example, a generator can offer to pay the pool price component of a consumer's utility bill in exchange for the consumer paying contract prices based on the generator's fixed and variable cost structure. Or a broker or financial middleman can offer consumers CFDs providing fixed prices for a defined period, backing these commitments with matching CFDs with generators. Any commercial terms a consumer could get by operating directly in the wholesale market can be obtained through CFDs outside the market — provided that both consumers and generators see the same wholesale price for electricity so that they can write contracts for differences referencing that common price.

- **Redefinition of the Obligation To Supply Direct Access Consumers:** Once consumers have the option of buying at spot market prices or signing long-term contracts with competitive generators or price hedgers, utilities need not and should not be obligated to make long-term commitments on behalf of such consumers. The obligation to supply such consumers must be redefined as the obligation to provide the physical and commercial con-

nections between consumers and the wholesale spot market, not to plan and invest for consumers who will switch to the spot market or to cheaper suppliers if investments made on their behalf, however prudently, turn out badly. Consumers can decide for themselves whether and how to take on the risk of long-run obligations in exchange for the expectation of lower or less volatile prices in the long run. If individual consumers are unwilling to make long-term commitments, new generation will be built on the balance sheet of diversified corporations and investors who routinely take such risks in other markets.

• **Continuation of Obligation to Supply for Utility Consumers:** Discos may continue to have the obligation to contract on behalf of consumers who do not select the option of buying at spot prices or contracting with price hedgers. However, contract commitments should not extend beyond the period of the consumers' commitment, i.e., one year under the Commission's proposed one-year notification for switching to direct access, unless the contract costs of those commitments will continue in the non-commodity portion of direct access customers' bills.

G. Regulation and Governance

The creation of a competitive wholesale market, including largely self-governing institutions such as Poolco, will allow and require changes in regulatory processes and philosophy.

The principal features of the revised regulatory arrangements include the following:

• **FERC Oversight of a Largely Self-Regulating Poolco:** Poolco, as operator of a wholesale market similar to today's tight power pools, will be subject to FERC jurisdiction. Based on the precedents of similar cooperative industry arrangements, it is likely that FERC would allow Poolco to be largely self-regulating, subject to general oversight and the right of aggrieved parties to appeal to FERC.

• **Performance-Based Regulation of the Discos:** The discos will remain regulated much as they are today, but may be disaggregated into distinct functions or businesses — distribution wires, franchised retailing, utility energy service companies (ESCOs) offering DSM services, etc. Each of these functions can be subjected to focused PBRs that can provide significant profit (and loss) potential to the disco.

• **FERC Regulation of Gridco:** Gridco will own the transmission grid and will have responsibilities to maintain its performance to certain standards, but will have little control over its day-to-day operation. Gridco is a natural monopoly, so traditional cost-of-service regulation, presumably with performance incentives to encourage efficiency, would seem appropriate.

Buyers will compete hotly to make short- and long-term sales.

II. Conclusion

The proposal here for a wholesale electricity market based on pooling represents SDG&E's current views on the best way to create efficient and effective competition in electricity, without giving any parties artificial advantages due to their current position in the industry or to their market power or access to market informaiton. The essential transporta-

tion and real-time coordination/trading facilities are separated from any traders in the competitive parts of the market. Gencos who are able to generate low-cost electricity while complying with environmental and other requirements will be able to compete even if they have only a single plant. Traders who can assemble portfolios of generating plants or contracts that reduce market risks through diversification will be able to compete for sales to discos and, ultimately, final consumers, simply by offering financial hedges against the pool price, with no need to get embroiled in the technical mechanics of the wholesale market unless they choose to do so. Social and environmental subsidies can be maintained in the discos to the extent deemed appropriate by regulators and legislators.

It is hard to imagine market arrangements that can accomplish all this more effectively or more quickly; if there are such arrangements, SDG&E would like to learn about them and incorporate them into its proposal. But we do think it is important to develop a logically coherent and reasonably detailed view of how the competitive electricity market can and should operate before rushing ahead piecemeal. Calls to simplify or short-cut the process of increasing competition by simply throwing open the grid to some undefined form of "open access" or "retail wheeling" reflect either a misunderstanding of what is required to operate a competitive electricity system reliably or a self-interested desire to take advantage of the years of market inefficiencies and cost-shifting that will result from rushing ahead before getting it right.

To facilitate the process of developing and implementing a logically coherent and reasonably detailed proposal for submission to state and federal regulators, SDG&E has taken the lead in organizing a Competitive Power Market Working Group. This group, which is open to all stakeholders in the California electricty market, including out-of-state entities, will discuss and analyze the many issues involved in establishing a competitive electricity market, to assure that all legitimate commercial, environmental and other interests are understood, considered and, as far as appropriate, included in the proposals that SDG&E and other participants submit to regulatory authorities.

SDG&E is working to develop an efficient and competitive market, not only because it is right for California, but because it is in its business interest. Competition is coming to the electricity industry, one way or another — to the detriment of economic, environmental and social objectives if done poorly, but to the benefit of such objectives if done well. The incumbent electric utilities will not be regarded as the good guys in this process; indeed, in some quarters there is strong suspicion that the Poolco model must be a bad idea because some (although not all) utilities are supporting it. But if competition is introduced without creating logical and well-designed market processes such as those outlined here, the inefficiences and distortions will result in years of regulatory and political conflicts. In these conflicts, the utility Goliaths will be continually at odds with the competitive Davids. Whatever the merits of these disputes — even when the utility is trying to prevent unfair and inefficient cost shifting among the various classes of utility customers and shareholders — the utilities will not come out ahead, on average. The best utilities can hope for their customers and shareholders is to move the competition out of the regulatory and political arena into a truly fair and efficient market. That is what the Poolco proposal is all about. ■

Endnotes:

1. The wholesale market outlined here is essentially the same in concept as the market outlined by Southern California Edison Co. The differences are in the details of implementation, particularly in dealing with congestion on the grid. These differences and other details will be resolved

through further discussion, analysis and quantitative modeling in the working group proposed by SDG&E, and through other means.

2. The number of competing generators required for workable competition is a complex matter, given the different types of plants (i.e, baseload to peaking) and local markets created by transmission constraints. At any time, most generation capacity will be under contracts that limit the exercise of market power in the short run. Competition will be most important in the contract markets, where the threat of entry will keep prices near "long-run marginal cost" or the entry level. The key to maintaining effective competition is to make contracting and competitive entry relatively easy — which is what a pool does.

3. The requirement that all energy flowing on the system be priced at the pool price is simply for administrative convenience and commercial flexibility. Bilateral financial contracts negotiated and administered outside the pool will provide for monetary payments between contracting parties that offset the effect of pool prices for contracted quantities. The net effect of pool and contract transactions is that only uncontracted energy is actually traded at the pool price.

4. In principle, buyers and sellers interacting bilaterally in informal markets could find market-clearing prices every few minutes and exchange quantities at those prices. For standardized commodities for which market conditions can change quickly, however, it is far more efficient to establish a centralized market-clearing process, similar to most commodity and financial exchanges: a seller tells its broker to sell a specified quantity for the best price available but not for less than $X; the broker goes into the market where the interactions of many buy-sell offers determine market-clearing prices; the seller waits to learn if its offer was accepted and at what price. Such central market-clearing processes have proved invaluable for commodities requiring much less central control and instantaneous responses than is required for electricity. It would be remarkable if some such central process were not the best way to deal with electricity.

5. Discos who do not want to make their own demand projections or bids can delegate this function to Poolco, presumably by providing Poolco with a demand forecasting model. Any disco that takes more (less) than the amount it projects/bid for pricing purposes would have to buy (sell) the difference at a price reflecting the effects on the pool's marginal cost of its inaccurate projection.

6. Gencos are paid, and discos pay, the market-clearing pool price rather

than what they offer or bid, because that is the economically efficient outcome and is what would happen in a fully efficient bilateral market if such a market were feasible. In markets where supply and demand conditions change slowly enough, traders can use bilateral search and negotiation processes to determine the market-clearing price before making final offers; transactions then occur at offer prices, not as an alternative to market clearing price, but because the market mechanics allow and require each offerer to make its own best guess of the market clearing price. If transaction prices for the same commodity at the same time and place vary much, the market is by definition inefficient and potentially unfair, with those who have inside information or market power gaining at the expense of the less advantaged. When such inefficiency gets large enough, traders come together to create a more efficient market, such as a financial or commodity exchange, in which they each can do a better job of determining the market clearing price before committing to a transaction price. In the contract markets, where any two traders can insulate themselves from the effects of the spot market to the extent they want to be, there is more time for bilateral search and negoiations to determine the market clearing price before transactions are consummated, and hence no need for a centralized Poolco to be involved.

7. If there are no transmission constraints it is possible (barely) to imagine bilateral trading among buyers and sellers maintaining reasonably efficient system operations, because each bilateral transaction is at least physically feasible independent of the others. But when congestion can arise, two traders cannot make a bilateral deal and then act on it, because what they have contracted to do might not be physically feasible given what all others have contracted to do at the same time. All bilateral contracts must be considered simultaneously and virtually instantaneously, which requires a central market-clearing process that takes physical constraints into account.

8. If, as in Figure 4, congestion between X and Y depresses the price at X to $22/MWh and increases the price at Y to $28/MWh, the genco at X who promised the disco a price of $25/MWh at Y will be losing money two ways: The price the genco is paid (if it runs at all) at X will be low; and the compensation it must pay the disco will be high. To guard against this risk, the genco at X can purchase a right to locational compensation between X and Y. Then, whenever the price at Y is higher than at X, Poolco's settlement system will automatically compensate the genco for the price differential between X and Y.