CALIFORNIA'S ISO AND POWER EXCHANGE: THE BUILDING BLOCKS OF A COMPETITIVE MARKET

by
VIKRAM BUDHRAJA
SENIOR VICE PRESIDENT
SOUTHERN CALIFORNIA EDISON

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On January 1, 1998, just 149 days from today, electricity generation and power sales will become competitive businesses in California, and millions of customers throughout the state will have the opportunity to choose their electricity providers for the first time.

The introduction of competition and customer choice into an industry that has historically been tightly regulated represents a profound, and even revolutionary change. Today, I want to talk about how we are implementing this change – in effect, about how we are managing a revolution.

I know this may sound contradictory. "Manage" and "revolution" are words we don't normally associate with each other. But managing revolutionary change is what we are presently about in California, with the goal of making a smooth transition to a new marketplace where competition is fair, customer choice is real, and the reliability of the electricity transmission and distribution systems is uncompromised.

Our vehicles for this transition are the Independent System Operator (ISO) and the Power Exchange (PX). On January 1, the ISO will assume responsibility for managing the transmission grid, and the PX will inaugurate a competitive spot market for electricity. Together, these two new institutions will serve as the basis for a competitive marketplace which will continue to provide Californians with highly reliable electricity service. And over the next four years, our industry will undergo a complete transformation from a regulated, cost-plus business, where customers could not choose their suppliers, to a market-based business, where generation and retailing will be cost-competitive, and customers can choose among electricity providers.

I'll talk in greater detail about the ISO and the PX in a moment. But first, I should mention some critical policy issues which were discussed at length both at the California Public Utilities Commission and at the State Legislature – issues which had to be resolved in order to accomplish this transformation.

Policy Issues for a Competitive Market

(Figure #1)

In summary, there is substantial consensus on the public policy framework for a competitive market:

1) All Customers, both large and small, must benefit from restructuring;

2) Utilities must have an opportunity to recover the costs of their past investments and the ongoing costs for renewable, environmental, and other public benefit programs;

3) The reliability of the electricity system must be maintained, and even improved if possible;

4) A smooth transition to a competitive market must occur;

5) Open and non-discriminatory access to transmission services must be provided to all market participants;

6) The market should be designed to promote efficiency;

7) Market power must not be allowed to be exercised;

8) The market should be transparent with visible prices and accessible to all consumers; and

9) Customers should be able to exercise choice of obtaining service through utilities or energy service providers.

The ISO and the PX will enable us to establish a competitive electricity market that upholds these policy principles.

California's Competitive Electric Market: Scope and Scale

(Figure #2)

We are restructuring a huge industry here in California, affecting 50,000 jobs. To give you a sense of the magnitude of this undertaking, I'd like to cite a few numbers:

1) The peak electricity load for the state is 50,000 Megawatts.

2) The amount of energy transmitted to customers is about 200 billion kWh per year.

3) At current rates, customers pay about $20 billion for this power.

4) There are about 1,000 generators in the state.

5) There are 6 control areas in the state currently. At least three will be consolidated into one ISO control area, and others may follow.

6) The development budget for the ISO and PX is $250 million.

7) It is anticipated that the ISO will have 260 employees, and the PX will have 90, and they have to be hired and in place by next January 1.

Competitive Market Structure

(Figure #3)

Today, electricity is supplied to customers by vertically integrated electric utility companies that are responsible for all of their customer's needed generation, transmission, and distribution. Electric utilities are regulated almost entirely by their respective state Public Utilities Commissions, or in the case of municipally-owned systems, by their City Councils.

In the future, the distinct components of the electricity business will be separated, so that competition will be possible in those sectors that can be competitive. The generation sector of the industry will be competitive, and largely unregulated. The transmission sector of the industry, consisting of the interconnected high-voltage grid carrying power over long distances, will be

regulated by the federal government. The distribution sector of the industry, consisting of lower-voltage lines distributing power locally to retail customers, will be regulated by the state PUCs. A new business sector, retailing, will come to exist and will be competitive.

For competition to take place in generation and retailing, there must be open and non-discriminatory access to the transmission system, and there should be an open power market available for all participants. California has chosen to satisfy these requirements through the ISO and the PX. Both of these entities will be non-profit agencies, independent of market participants, and regulated by the federal government.

California's Competitive Electricity Market

(Figure #4)

Here is how the ISO and the PX and the rest of the marketplace fit together: The ISO is responsible for the control of the dispatch of generation and transmission, and assuring reliable system operation. Distribution utilities will take delivery of power from the transmission grid and distribute it locally to all customers in their franchise service territory, regardless of which retailing company serves the customer.

Generation companies will have a choice of bidding into the power exchange, or selling their output in an unregulated "contracts market" directly to retail marketers or customers. The ISO will not discriminate between the power exchange and the contracts market in scheduling the delivery of power through the transmission system.

Now I want to address how this market will work, in greater detail.

Attributes of California's New Competitive Electricity Market

(Figure #5)

First: The market's commercial and operating functions will be separated.

> The electricity market can be separated into operating functions and commercial functions, each of which are addressed most effectively by the ISO and PX respectively.
>
> The integration of electricity generation, transmission, and distribution is of paramount importance to assure reliable operation of the electrical grid. It requires close control, coordination, and integration among generators, transmission, and customer loads, and is best ensured by an independent entity such as the ISO.

The commercial functions of the market, such as procuring generation supplies or retail services, are best performed by participants in a competitive market.

Second: As I mentioned a moment ago, governance of the ISO and Power Exchange will be independent of utilities and other market participants.

The ISO performs functions that are essential for the reliable operation of the transmission grid, and is similar to the air traffic control functions in the airline industry, while the Power Exchange provides a competitive spot market, or electricity stock exchange. These entities must be truly independent of the utilities and other market participants. California has established a governance structure for these two entities with diverse representation from 26 Governing Board members designed to assure that it can act independently.

Third: Market solutions will take precedence over central planning solutions

For the benefits of competition to accrue most effectively to customers, we must move from central planning solutions to market solutions. California's market structure facilitates this, by allowing for a competitive

retailing sector and a competitive generation market where generators may either participate in the Power Exchange or deliver power directly to customers through a contracts market. There will be market solutions and or competitive markets for day-ahead supplies, hour-ahead supplies, ancillary services, congestion management, and other commercial aspects of the power market.

Fourth: We will transition from a "contract path" transmission model to a "grid network" model.

The transmission system consists of many lines connected to each other. When power flows from one point to another, it does so according to the laws of physics over multiple paths. However, the practice of the electricity industry has always been to base "rights" on the basis of an assumption that power flows over one "contract path" corresponding to ownership of particular transmission lines. This has created problems of coordination between the many users of transmission lines. The establishment of an ISO will end this fiction by replacing the "contract path" model with a "grid network" model of transmission usage which will correspond to the physical laws of power flow. During congestion, access to the grid will be allocated based on market economics as opposed to preferential physical rights.

Fifth: Access to transmission will be open and non-discriminatory.

For competition to work in the generation sector of the industry, generators and customers must have the ability to procure transmission services on an open and non-discriminatory basis. California's ISO will provide this to all generators and customers.

Sixth: Market power must be mitigated, vertically, horizontally, and locally.

Competition only benefits customers if no supplier is able to exercise market power. California's restructured industry effectively addresses market power. Vertical market power is eliminated through the establishment of an ISO. Horizontal market power, where it exists, is eliminated through divestiture of power plants. Finally, in some instances local market power may exist, and that will be eliminated by the requirement that entities that possesses local market power operate under regulatory-approved contracts at cost-based rates.

Seventh, and finally, prices must be visible and transparent.

California's Power Exchange will provide visible hourly prices for all market participants to evaluate and consider in their decision making. Additionally, the price determination process is transparent in the sense that it follows clearly defined rules and procedures.

California's Independent System Operator

(Figure #6)

California's Independent System Operator will be located in Folsom, with a backup facility in Alhambra. The ISO will:

1) Be a new company independent from the existing utilities

2) Control the dispatch of generation and transmission

3) Provide open and comparable access to a common carrier transmission grid

4) Procure and manage ancillary services, those services that are necessary to balance load with generation at all instants.

5) Assure reliable system operation

6) Administer a settlement system whereby services that market participants use or produce will be determined so that billing and or payments may take place.

7) Obligate utilities to connect customers and generators to the grid, and build needed transmission .

ISO Transmission Pricing

(Figure #7)

An important element of restructuring is the pricing of transmission, and the ability to move electricity over large distances on high-voltage transmission lines. There will be three components to transmission pricing: 1) an access charge; 2) a usage charge; and 3) a loss charge.

The access charge is designed to recover the fixed costs and the operations and maintenance costs of the transmission system. These are in effect sunk costs and not dependent on usage or market competition. It will be specific to each utility service area, and will be paid by customers, or buyers, of electricity.

The usage charge is designed to cover the costs of using any congested transmission line. When the demand to use a transmission line exceeds the capacity of the line, the line is said to be congested. The ISO will determine a price which will bring the demand to use the transmission line back down to its capacity. This price will be charged to generators, and the revenues received will be used to reduce the access charge so that excess total revenues are not collected. In other words, there is no "and" pricing. Transmission owners recover cost-based rates, not cost-based rates plus congestion charges. This pricing mechanism provides the necessary locational price signal to guide consumption, production, and investment decisions.

Some electricity is lost in transmission, due to resistance. The loss charge will cover the amount of electricity that is lost on the transmission system. The loss charge will be assigned to generators, and will be specific to each generator, and thus will also provide locational price signals.

ISO Role in Reliability Management

(Figure #8)

The establishment of an ISO will enhance system reliability. It will do so by focusing responsibility for reliability management in one entity. The ISO will

operate a unified transmission grid in a coordinated fashion, and will comply with all WSCC, NERC, and local reliability criteria. The unification of control areas into one will simplify communication and coordination, particularly important when there are emergencies that must be dealt with rapidly.

California Power Exchange Role and Responsibilities

(Figure #9)

The other new entity that we are creating in California is the Power Exchange. The PX will provide a competitive spot market for electricity open to all buyers and sellers. Prices will vary by hour, and will be known a day ahead so that producers and consumers can make rational decisions. Producers will submit offers to produce by hour to the PX, and consumers will submit offers to purchase. The Power Exchange will determine a market clearing price for each hour and submit the resulting schedule to the ISO.

The Power Exchange is voluntary to all market participants except for the three investor owned utilities. For a four-year transition period, we are required to bid all of our generation into the Power Exchange and to purchase all of our customer load from the Power Exchange. Other market participants are free to either use the power exchange for their load or generation, or to directly schedule transactions through a contracts market.

California Power Exchange Objectives

(Figure #10)

The Power Exchange is designed to achieve several objectives:

1) Efficiency

The bidding procedures should be designed to promote market efficiency with prices that will reflect the benefits of the hourly competitive electricity auction.

2) Bidding transparency

The rules by which bidding takes place and prices are determined should be clear and simple so that Power Exchange participants may be confident of a fair, transparent, and efficient market outcome.

3) Price visibility

Prices should be published so that all market participants can make rational decisions about participating in the Power Exchange

4) Implementability

The Power Exchange must be implemented by January 1, 1998. To assure this, needless complexity of limited value will be not be included for the start-up of the Power Exchange. Enhancements will be staged and added over time. The focus is on a workable solution, not a perfect solution.

5) Market acceptability

To be viable for long-term success, the Power Exchange must operate efficiently and enjoy the support of California market participants.

Activity Rules

(Figure #11)

Bidders in the Power Exchange will be required to follow "activity rules" which are designed to prevent gaming, ensure reliable price discovery, and achieve a feasible generation dispatch. The rules ensure convergence to an efficient solution by requiring that bidders improve their bids on successive iterations of the auction. For example, bidders must bid their maximum capacity in the first

round. They must lower their bid to improve the market clearing price in successive rounds, otherwise their bid is frozen. Bidders may withdraw all, but only all, of their capacity from an hour prior to the close of an auction. The auction will close when either no bids are revised, the market clearing price does not change, or time runs out.

Market Structure Issue Resolutions

(Figure #12)

The restructuring of California's electricity industry reflects many decisions that have been made over the past couple of years. These decisions are the result of extensive collaboration, discussion, and agreement among stakeholders and they reflect broad agreement on all elements of the basic market structure. The California State legislature, as well as the California Public Utilities Commission, have both endorsed a common vision of this electricity market. In the California process, many complex and controversial market structure issues have been resolved:

1) The role of the ISO is to administer the market;

2) The transmission access charge will be utility specific for at least 2 years;

3) The ISO is responsible for reliability management;

4) Transmission congestion management will be market driven with an ISO backstop;

5) The Power Exchange will utilize single-part energy bids hour-by-hour and will establish activity rules to prevent gaming;

6) There will be broad and independent representation on the ISO and PX Governing Boards;

7) All existing contracts will be honored with the goal of transitioning to the new market structure;

8) The market will be allowed to develop financial hedges for transmission congestion;

9) Some ISO and PX systems will be implemented according to a phased schedule; and

10) All customers will be able to choose their energy providers on January 1, 1998.

We are hopeful that the Federal Energy Regulatory Commission will approve the California proposal to enable the timely start-up of the new market on January 1, 1998.

Conclusion

Together, California's Independent System Operator and Power Exchange provide a good foundation for a robust and competitive electricity market. They promise to provide: competitive rates for customers, enhanced reliability, recovery of transition costs, open and non-discriminatory access for all players, competitive efficiency, reduced regulation, and resolution of market power issues.

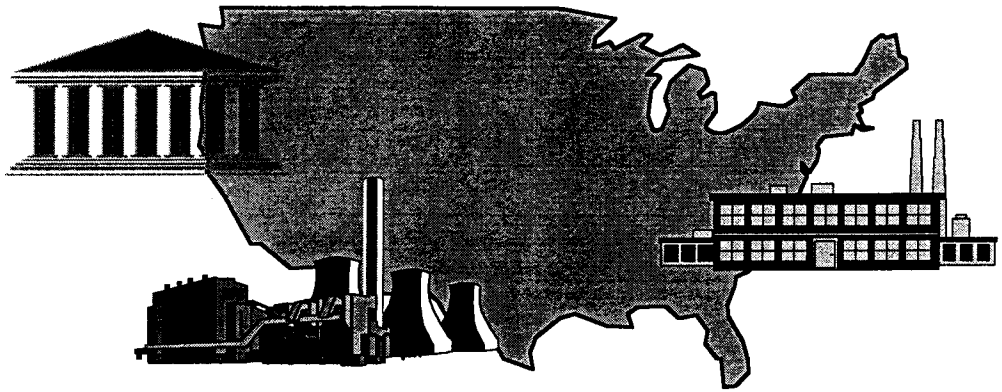
Inevitably, as the ISO and Power Exchange begin operation and we gain experience with them, the need for improvements will become clear, and adjustments will be made. Much of what we are implementing is unique, with no comparable existing models elsewhere in the world, particularly for the management of commercial transactions. Trying to force everything to happen

all at once risks failure. Expecting too much too soon can only lead to disappointment.

Will the system deliver on its promise? The power system is a very complex machine created over the last 100 years. Transforming it requires patience on the part of all stakeholders, including customers, policy-makers, regulators, power producers, and utilities. The biggest challenge is to manage expectations and allow for a smooth transition and not expect instant gratification.

We have come a very long way in a very short time. The degree and speed of change could not have been foreseen in 1992 with the passage of EPACT, or in 1994 with the release of the CPUC's blue book. The promise of a competitive electricity market is exciting, and it is within our grasp.

California's ISO and Power Exchange: The Building Blocks of a Competitive Market



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by

Vikram Budhraja
Senior Vice President
Southern California Edison

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Policy Issues for a Competitive Market

- Customer Benefits
- Transition Costs
- Reliability
- Smooth Transition
- Open Access
- Market Efficiency
- Market Power
- Transparency -- Visible Prices
- Customer Choices

California's Competitive Electric Market: Scope and Scale

- 50,000 MW peak load
- 200 billion kWh transmitted per year
- $20 billion electricity market -- $5 billion energy
- 1000 generators
- Consolidation of control areas
- $250 million development budget
- 260 ISO employees and 90 Power Exchange employees

Competitive Market Structure

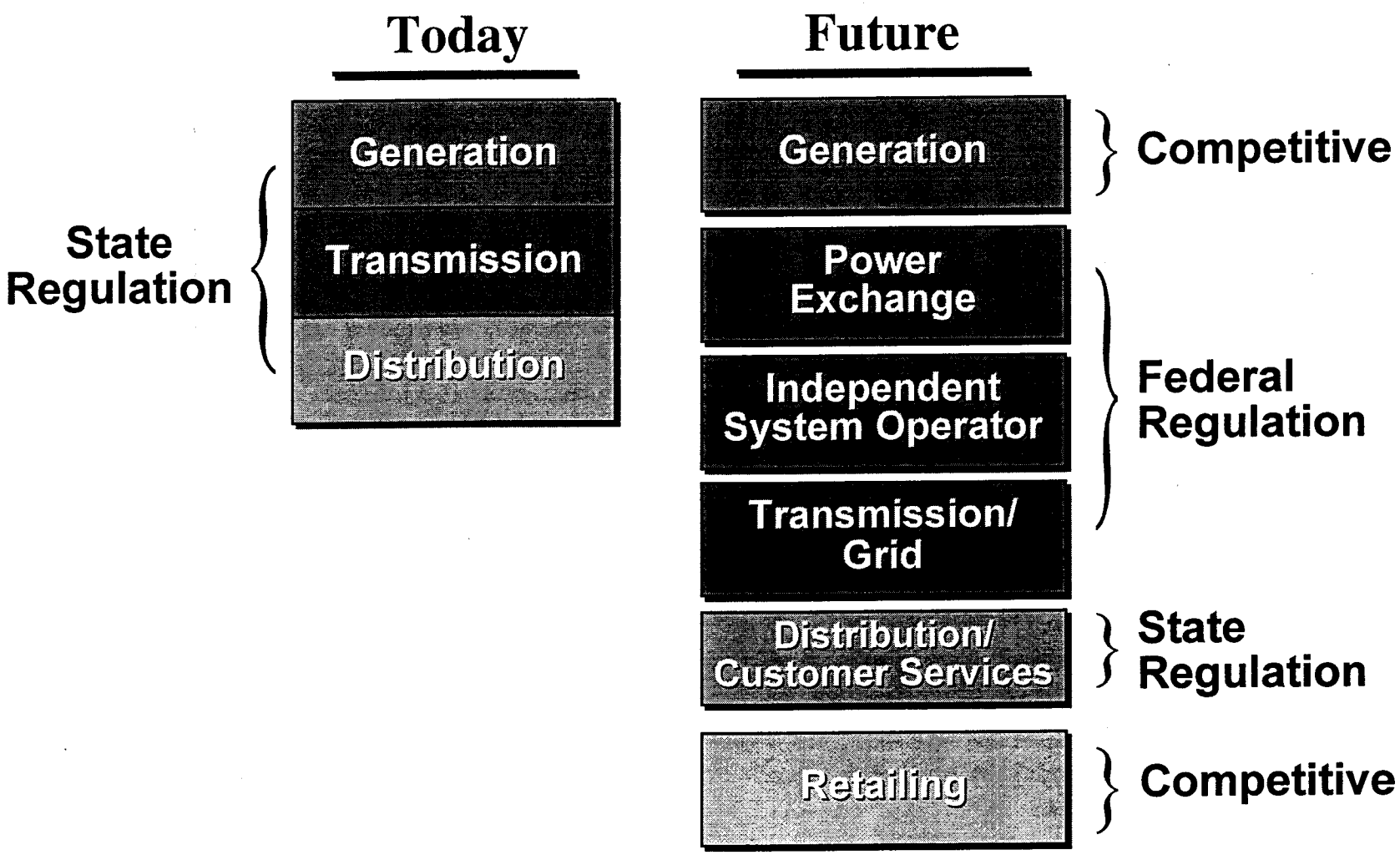

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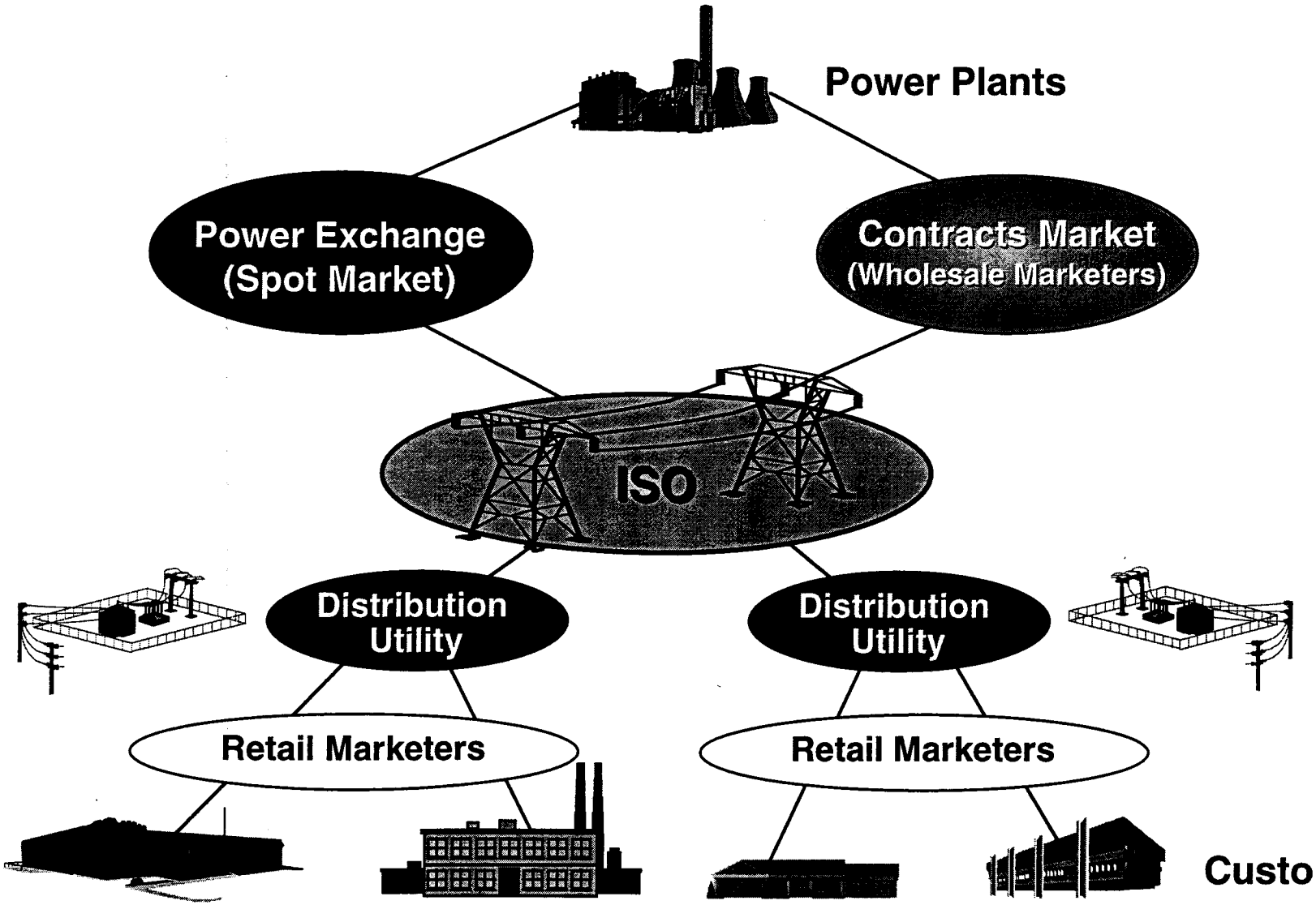
Figure 4

California's Competitive Electricity Market



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Attributes of California's New Competitive Electricity Market

- Separation of commercial and reliability functions
- Governance of ISO and Power Exchange independent of utilities
- Reliance on market solutions, not central planning
- Transition from "contract path" transmission model to "grid network" model
- Open and non-discriminatory access to transmission
- Focused responsibility for reliability management
- Market power mitigation
  - Vertical, horizontal, and local
- Price visibility and transparency

California's Independent System Operator (ISO)

- New California Company - independent from existing utilities
- Controls dispatch of generation and transmission
- Provides open & comparable access to common carrier transmission grid
- Procures and manages ancillary services
- Assures reliable operations
- Administers settlement system
- Obligates utilities to connect customers and generators to the grid
- Utilities retain transmission ownership, operation and maintenance responsibility -- transfer dispatch control to ISO
- ISO establishes reliability and maintenance standards

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ISO Transmission Pricing

Access Charge

- Fixed cost recovery
- O&M recovery
- Service area specific
- Paid by customers

Usage Charge

- For use of congested paths
- Marginal price signal
- Paid by generators
- Credit against access charge

Losses

- Generator specific loss factors
- Paid by generators

ISO Role In Reliability Management

- **Establish focused responsibility for reliability management**
  - Grid operations
  - Compliance with WSCC, NERC, local criteria
  - Maintenance coordination
- **Unify control areas**
  - Security Coordinator for California
- **Simplify communications and coordination**
  - Direct system emergency operation and restoration
- **Implement mandatory reliability protocols and impose sanctions**
  - Establish standards
  - Compliance monitoring
- **Separate commercial and reliability functions**

California Power Exchange
Role and Responsibilities

- Provides a competitive electricity spot market with published hourly prices, day-ahead
- Allows power producers to compete using non-discriminatory and transparent rules for bidding into the Exchange
- Facilitates both supply bids and demand bids for power
- Ranks bids and submits least cost schedule to the ISO
- A visible market clearing price allows customers to make efficient purchasing decisions and adjust their consumption
- Performs scheduling coordinator functions for PX participants

California Power Exchange Objectives

- **Efficiency**
  - Market competition
  - No centralized optimization
- **Bidding Transparency**
  - Price/Quantity
  - Discrete hourly bids
- **Price Visibility**
  - Hourly uniform market clearing price
- **Implementability**
  - Minimize custom design
- **Market Acceptability**

Activity Rules

Need for Rules

- Prevent gaming
- Ensure reliable price discovery
- Achieve feasible generation dispatch

Activity Rules

- Opening -- Must bid maximum capacity in first round
- Revision -- Must lower bid to improve Market Clearing Price (MCP)
- Exclusion -- Bid is "frozen" if left above MCP
- Withdraw -- May withdraw all capacity from any hour prior to final iteration
- Closing -- Auction ends when:
  - No bids revised
  - No change in MCP
  - Time runs out

*Market Structure Issue Resolutions**

- ISO Role -- Market Administrator
- Utility-Specific Transmission Access Charges for Initial 2 Years
- ISO Responsible for Reliability Management
- Congestion Management through Market Solutions with ISO Backstop
- Transmission Expansion -- ISO Decisions with Utility Obligation to Build
- Single Price Energy Bidding with Anti-Gaming Rules in the Power Exchange
- ISO and Power Exchange Governance -- Broad Representation and Independent
- Existing Contracts Honored -- Conform to ISO Protocols, Scheduling Priority for up to 5 Years
- Firm Transmission Rights and Pricing -- Rely on Congestion Management and Unregulated Market to Develop Financial Hedges
- Phase Implementation of Some ISO and Power Exchange Systems (e.g., Ancillary Services)
- Direct Access Eligibility -- All Customers Eligible on 1-1-98

* *All issue resolutions are subject to FERC acceptance or revision in their Phase II decision*