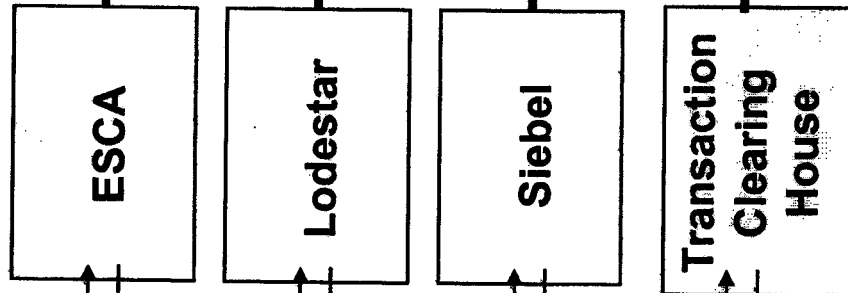
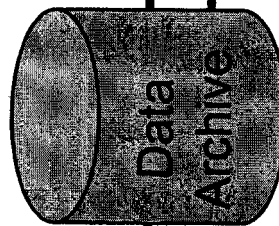


Data Archive Overview

Market



ERCOT



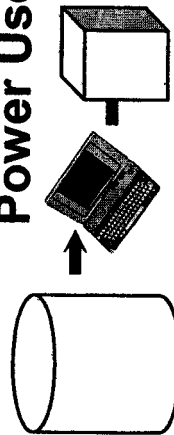
Dynamic Extract



Market Participants

- Stand alone System
- Answers defined business questions

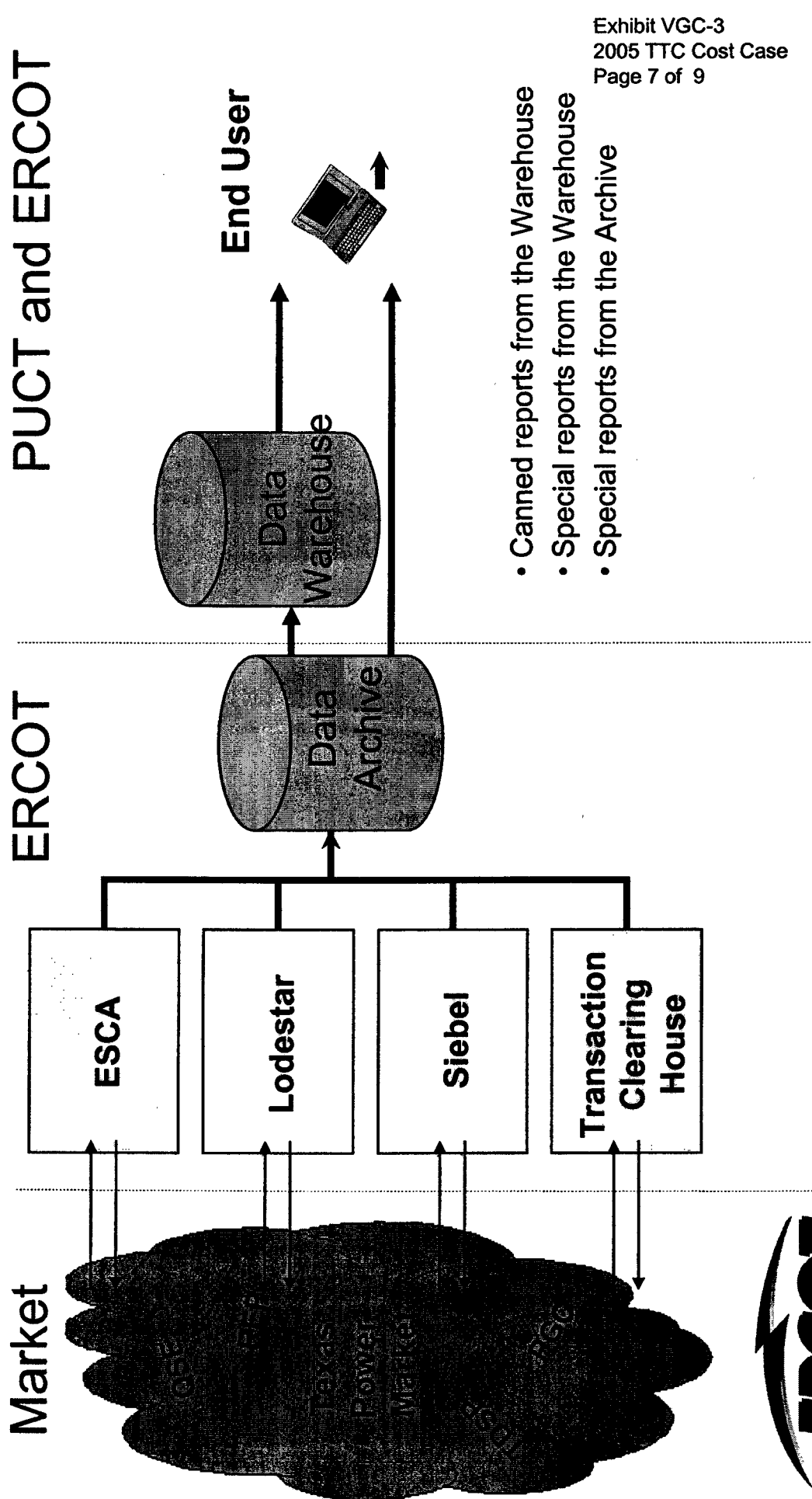
Scheduled Extract



Power User

- Automated Downloads
- Needs a large system to receive data
- Shadow Settlement System
- Flexible historical analysis

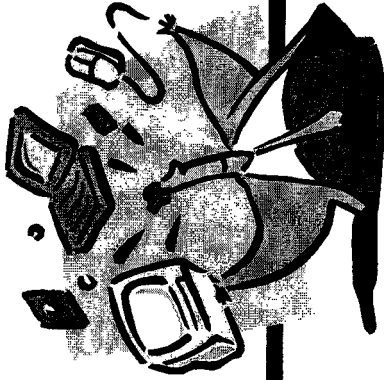
Data Warehouse Overview



- Canned reports from the Warehouse
- Special reports from the Warehouse
- Special reports from the Archive



Interesting System Facts (1)



- ERCOT's systems were built at the Accenture Solutionworks facility in St. Petersburg, Florida, the ESCA facility in Bellevue, Washington and at the ERCOT facilities in Taylor, Texas. All systems were ultimately integrated at ERCOT's Taylor and Austin facilities.
- During the peak of development, nearly 300 developers, engineers and analysts were working on the new ERCOT systems.
- In parallel with ERCOT's system development, each market participant was also developing a new system to support the new Texas Market.



Interesting System Facts (2)



- ERCOT's systems are currently utilizing more than half a gigabit per second of communications bandwidth. That's the same capacity as nearly 9000 56k modems (that might be found on a home computer.)
- ERCOT's system consists of over 160 servers. Servers range from desk top capacity servers to high performance high capacity servers. At the high end, ERCOT has HP V2600s with 32 processors capable of 70 Giga-floating point operations per second. This is equivalent to the computing power of 10 Cray 4 computers.
- ERCOT's systems store more than 10 terabytes of data. A single terabyte is equivalent to 696,000 volumes of encyclopedias.



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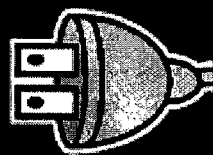
The New Role of the ERCOT ISO

The New Rules of the Texas Power Game
June 21-23 2000

Bill Bojorquez
Director of Settlement and Customer Service



Contents



- ❖ Background
- ❖ Single Control Area Operation of the ERCOT Interconnect
- ❖ Congestion Management
- ❖ Transmission System Operation and Planning
- ❖ Wholesale Energy Accounting
- ❖ Retail Customer Registration
- ❖ Customer “Slamming” Prevention

Contents

Background



ERCOT Market Timeline

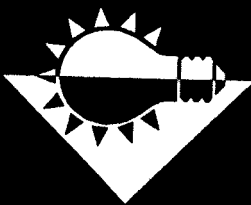
Market Rule Working Groups Underway	Mock Market 4/1/01 to 5/25/01	Market Pilot 6/1/01 to 12/31/01	Competitive Metering Possible
--	--	---------------------------------------	-------------------------------------

3/99 Senate Bill 7 Enacted	5/00 System Design and Data Conversion Efforts Begin	4/01 Single Control Area Begins	6/01 Full Retail Market Open	1/02 1/04
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↑
Now

ERCOT Market Timeline Details

- Senate Bill 7 (SB7) approved on March 17, 1999 to open the Texas electric market for competition.
- ERCOT Market Participants will take part in a Mock Market from April 1 to May 25, 2001 to test their systems and to simulate market activities.
- Single Control area operations begin on June 1, 2001.
- A “competition pilot” with 5% retail access begins on June 1, 2001 to December 31, 2001. IOUs will participate in the competition pilot.
- On January 1, 2002, full retail access will begin.
- In 2004, competitive metering is allowed by SB7.



ISO Functions

- ❖ Administers power and market operation systems
 - Transmission system oversight
 - Forecasting
 - Scheduling
 - Ancillary services market
- ❖ Provides commercial operations
 - Market participant and retail customer registration
 - Centralized profile creation
 - Centralized data aggregation
 - Settlement, billing and financial transfer
- ❖ Tracks TCR auction
- ❖ Administers renewable energy credit (REC) program

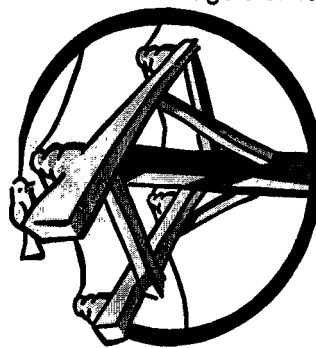


ERCOT Market Participant Overview

- ❖ Qualified Scheduling Entity (QSE) – is a market participant that is certified (based upon credit worthiness, 24 hour operation etc.) by the ISO to submit schedules and ancillary services bids; and is financially responsible for settlement with the ISO.
- ❖ Retail Electric Provider (REP) - sells electric service to retail customers in Texas. An Affiliated REP is affiliated with or the successor in interest of an electric utility certificated to serve an area when customer choice is introduced.
- ❖ Provider of Last Resort (POLR) - offers a standard retail service package at a fixed, non-discountable rate approved by the PUCT to any requesting customer or to a customer dropped by a REP.

ERCOT Market Participant Overview

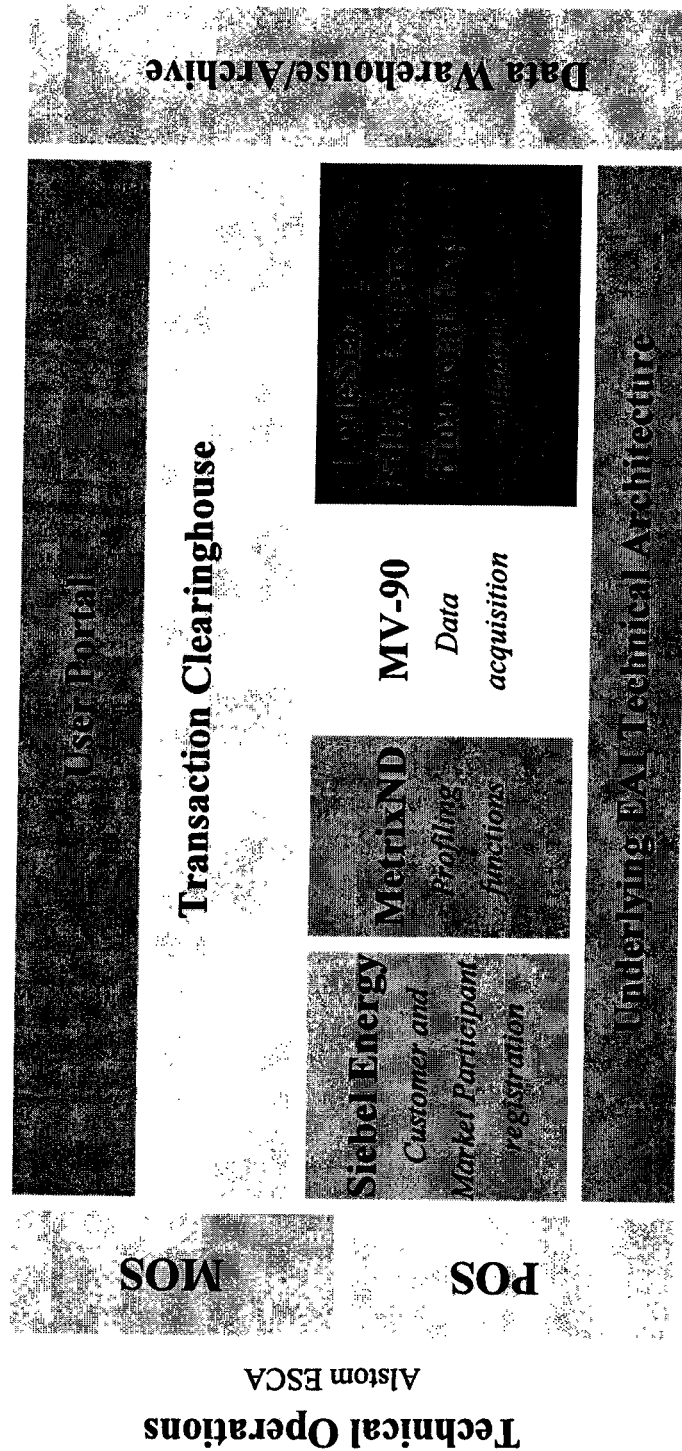
- ❖ Opt-Out Entity - is a Municipal or Cooperative Utility organization that opts not to participate in the competitive market and will not be required to have their customers registered (only wholesale generators will be registered).
- ❖ Power Generating Companies (PGC)
- ❖ Transmission & Distribution Utilities



ERCOT ISO

ERCOT Applications

Background



Contents

Single Control Area Operation of the ERCOT Interconnect



ERCOT ISO

Single Control Area Operation

- Settlement is simplified with a single control area rather than multiple control areas
- Market participants are put on an equal basis

Single
Control
Area



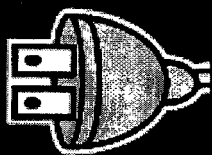
Bilateral Energy Market

- QSEs submit 15 minute balanced schedules to ISO
- QSEs self provide a percentage of ancillary services for ISO to operate.
- ISO runs a market for remaining percentage of ancillary services
- ISO performs load balance using 15 minute ahead increments and decrements from QSE
- ISO performs regulation using regulation increments and decrements from QSE
- ISO is single point of frequency control



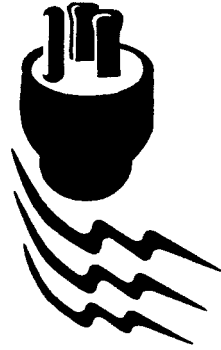
Contents

Congestion Management



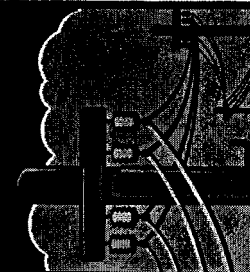
Congestion Management

- ISO determines Commercially Significant Constraints (CSCs)
- ISO checks day ahead schedules from QSEs for congestion
- ISO gives market a chance to clear congestion through rescheduling



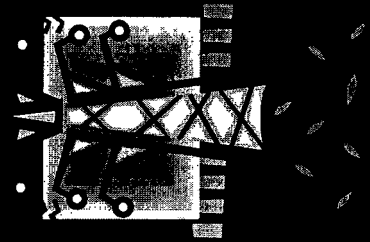
Congestion Management

- In real time, ISO manages constrained interface using zonal increments and decrements supplied by the market or purchased by the ISO
- Congestion costs allocated to all loads on a pro rata basis
- If congestion management costs exceed \$20 million in any 12 month period, costs will be allocated to responsible parties and a TCR process will be adopted



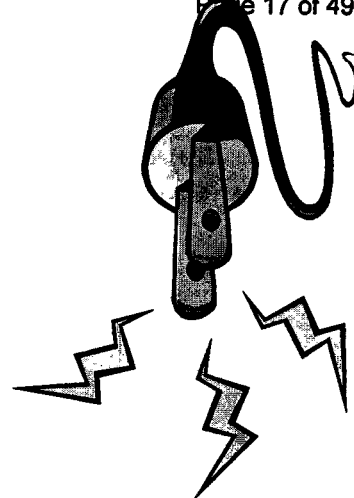
Congestion Management

- Commercially Significant Constraint (CSC)
 - 4 zones
 - Shift factors within CSC zones
 - Proportional congestion charges for flows on CSC
 - Marginal clearing price within each CSC zone
- Operational Congestion (OC)
 - dynamic set of zones
- Capacity Inadequacy



Congestion Management Approach

- Simultaneous analysis for resolution of congestion types
- Market-based system operation
 - QSE-driven schedules and bids
 - Facilitation by the ERCOT ISO
- Consistency in megawatts and prices
 - Marginal pricing
 - Promotion of competition



Congestion Cost

Congestion Management

- CSC
 - Postage stamp method until 2004 or until \$20 million threshold is met at which point full zonal method will be established within 6 months for CSC
 - Zonal method after 2004
- Operation Congestion
 - ERCOT-wide
- Capacity Inadequacy
 - On those with insufficient capacity



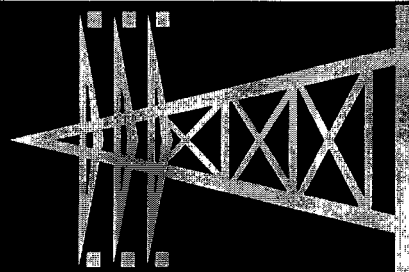
Contents

Transmission System and Operation Planning



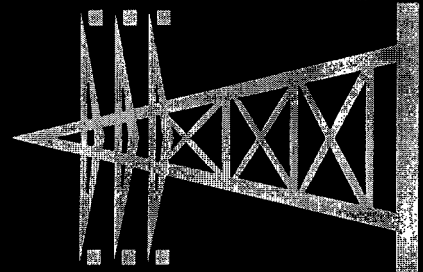
Transmission System Operation

- Transmission providers will operate transmission control centers
- ISO will receive data from the transmission providers to monitor the transmission system
- ISO will calculate all ATC used for scheduling purposes



Transmission System Operation

- ISO will receive all energy schedules
- ISO will monitor and specify voltage profiles
- ISO will approve all transmission planned outages
- Transmission providers will perform all transmission switching and maintenance



Transmission Planning

- ISO will supervise all transmission planning in the ERCOT grid
- ISO will recommend new transmission projects needed to accommodate new generation and relieve major constrained interfaces
- ISO designates providers of new transmission
- Several 345 kV projects are underway in ERCOT





ERCOT ISO

Contents

Wholesale Energy Accounting



The ERCOT Market

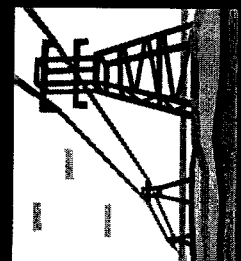
ERCOT ISO

Before and After

	Before	After
Forecasting/ Scheduling	Schedule within own control area Schedule peak load for next day with ERCOT	Schedule within single control area Ancillary Service Market
Metering	Read and interrogate meters internally	Sends consumption reads to ERCOT ISO polls generation meters
Settlement	Reconcile bilateral contracts	Settle against ISO and allocate charges Reconcile bilateral contracts
Retail Registration	T&D Utilities maintain customer accounts	REPs maintain customer accounts Premises switched through the ISO

Power and Market Operations

- ERCOT will operate a market to procure a minimum of 30% ancillary services
- All energy transactions will be conducted bilaterally.
- QSEs will submit balanced schedules with load and generation resources.



Ancillary Service Products

Capacity

- Regulation Reserves
- Responsive Reserves
- Non-Spinning Reserve
- Replacement Reserve
- Reliability Must Run (RMR)
- Out of Merit Order
- Black Start

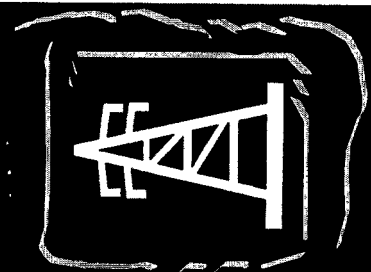
Energy

- Balancing Energy

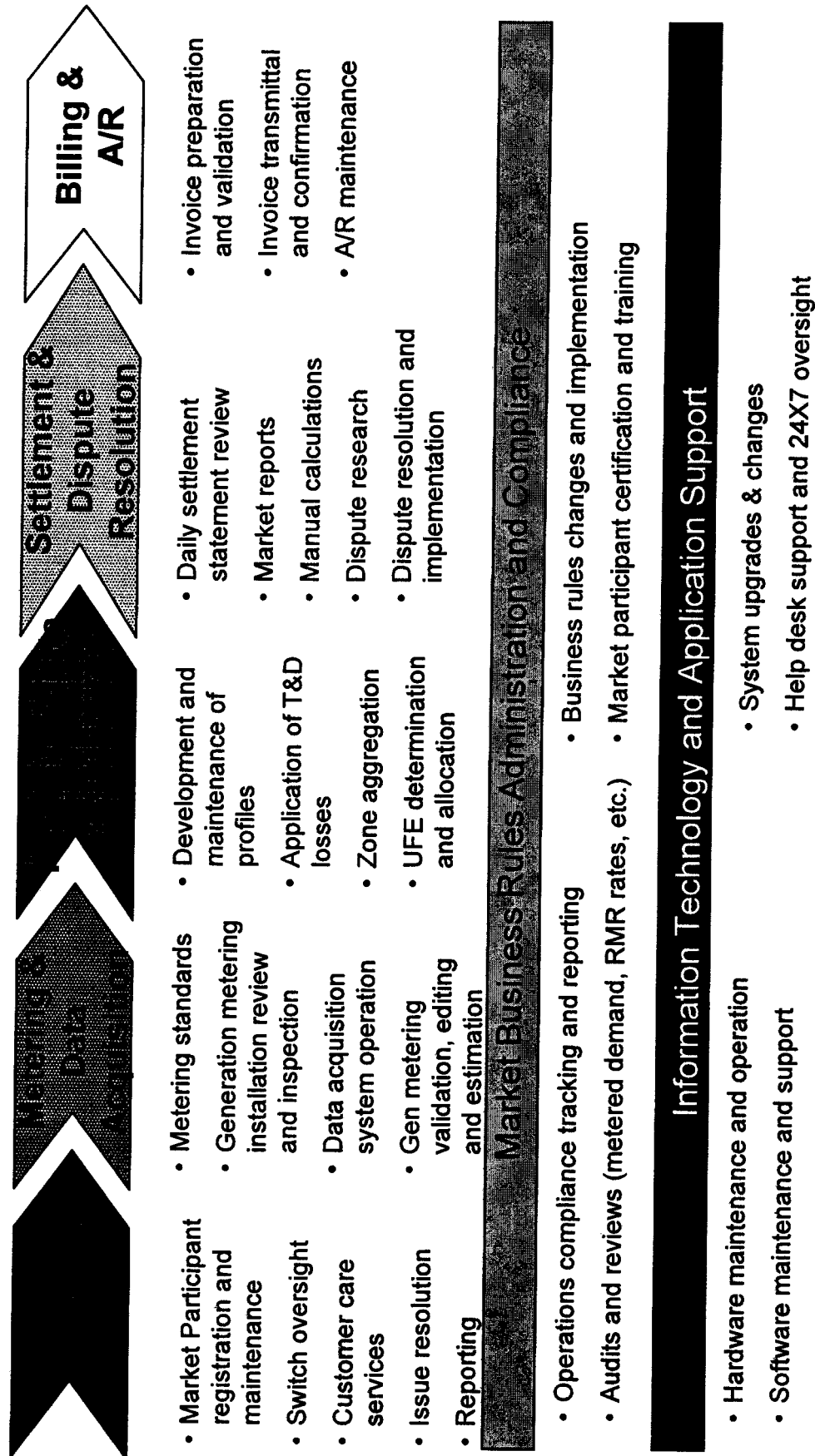


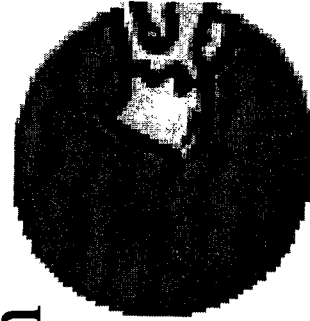
Ancillary Service Markets

Product	Contract	Day Ahead	Adjust-ment	Real Time
Balancing Energy				✓
Regulation Reserve		✓	✓	
Responsive Reserve		✓	✓	
Non-Spinning Reserve		✓	✓	
Replacement Reserve		✓	✓	
Reliability Must Run	✓			
Out of Order Merit				✓
Black Start	✓			



ISO Settlement and Customer Service Functions





ERCOT ISO

Market Participant Registration

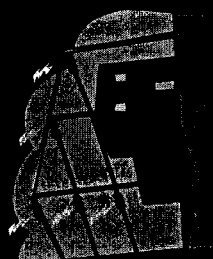
- Track and maintain authorized users of the ISO and any relationships required for financial settlement administered by the ISO
- Store and make available to appropriate parties information for scheduling and other ISO activities

The
ERCOT
Market

Market Participant Data

ERCOT will track:

- QSE certification information
- Status and authorization of all participants (e.g. REPs and QSEs)
- QSE asset relationships
- Credit limit information
- Market participant contact and account information
- Relationships and update history

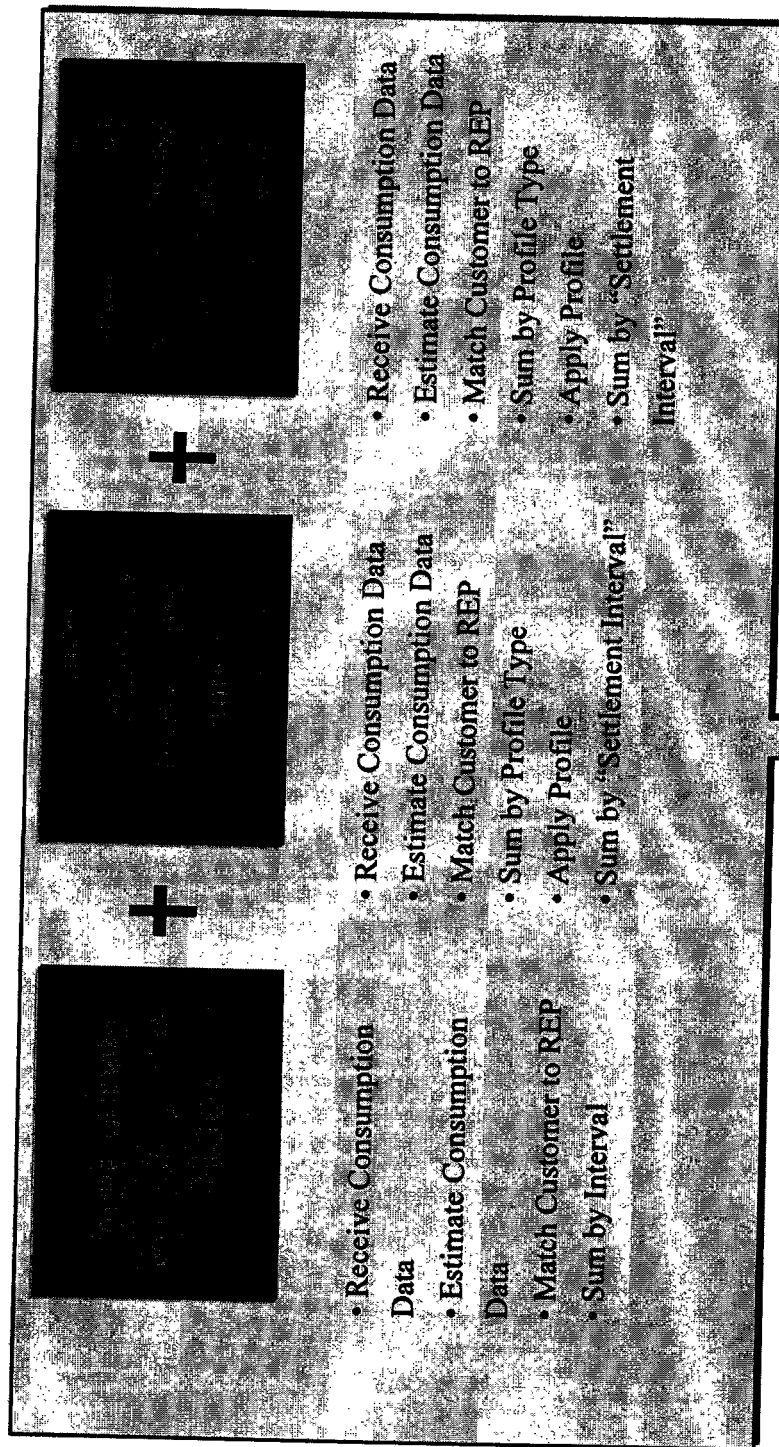


Load Profiling

- Store centrally and make available all ERCOT profiles
- Create daily profiles for previous day and three future days

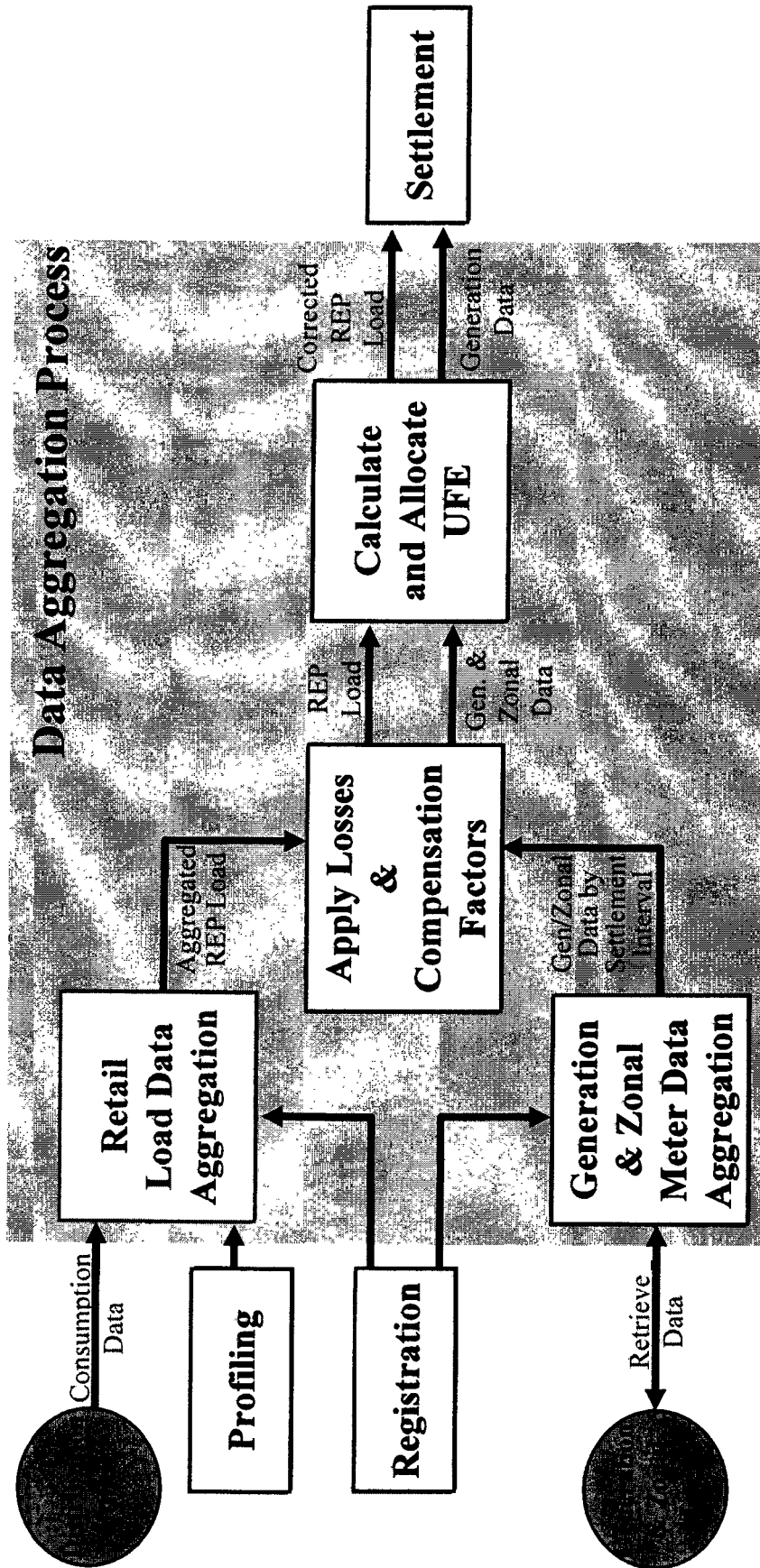
The
ERCOT
Market

ERCOT Data Aggregation



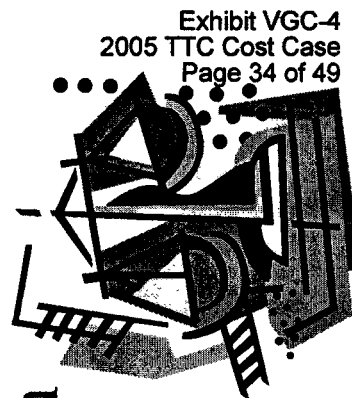
"Settlement Interval" Load Data by REP

ERCOT Data Aggregation

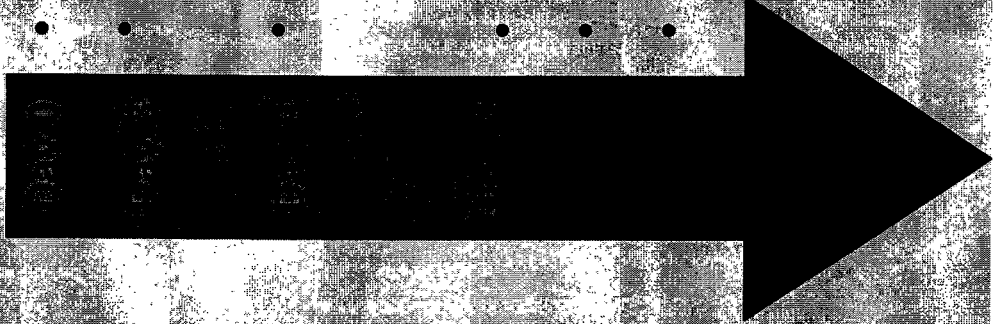


Settlement and Billing

- Settle with each QSE on an hourly basis for capacity services and 15-minute intervals for balancing energy and congestion fees
- Publish billing determinants, settlement statements and invoices
- Collect all payments and charges via electronic funds transfer
- Provide dispute research and resolution
- Manage revenue neutrality



Settlement Timeline

- 
- Energy consumed.
 - Initial Settlement information provided.
 - Initial Settlement for day 0 to 6 are invoiced with payment due in 30 days.
 - Payments made.
 - Final Settlement for day 0 calculated.
 - Final Settlement is accumulated and the difference from the initial settlement is invoiced.

Settlement Dispute Process

- Invoice recipient reviews, validates and confirms settlement or invoice statements
- Invoice recipient will register any disputes with the ISO by electronic means within 10 business days from the date of issue of the statement or invoice.
- The ISO will determine if the dispute is valid by verifying that the dispute was submitted within the specified time and contains the minimum required information.
- The ISO will resolve dispute issue and process the change on the next available Final or True-Up Settlement process.
- Statement or invoice recipients may not dispute a settlement or invoice statement due to an operational decision or market rule.

Contents

Retail Customer Registration



Retail Customer Registration

- Track and maintain the choice relationships between RHP and their customers' premises (ESI IDs) statewide.
- Track and maintain new ESI IDs and status (e.g. move-ins)
- Facilitate measures to monitor unauthorized switches or slamming
- Provide customer care services

Centralized Retail Registration

Distributed

Hybrid



ERCOT

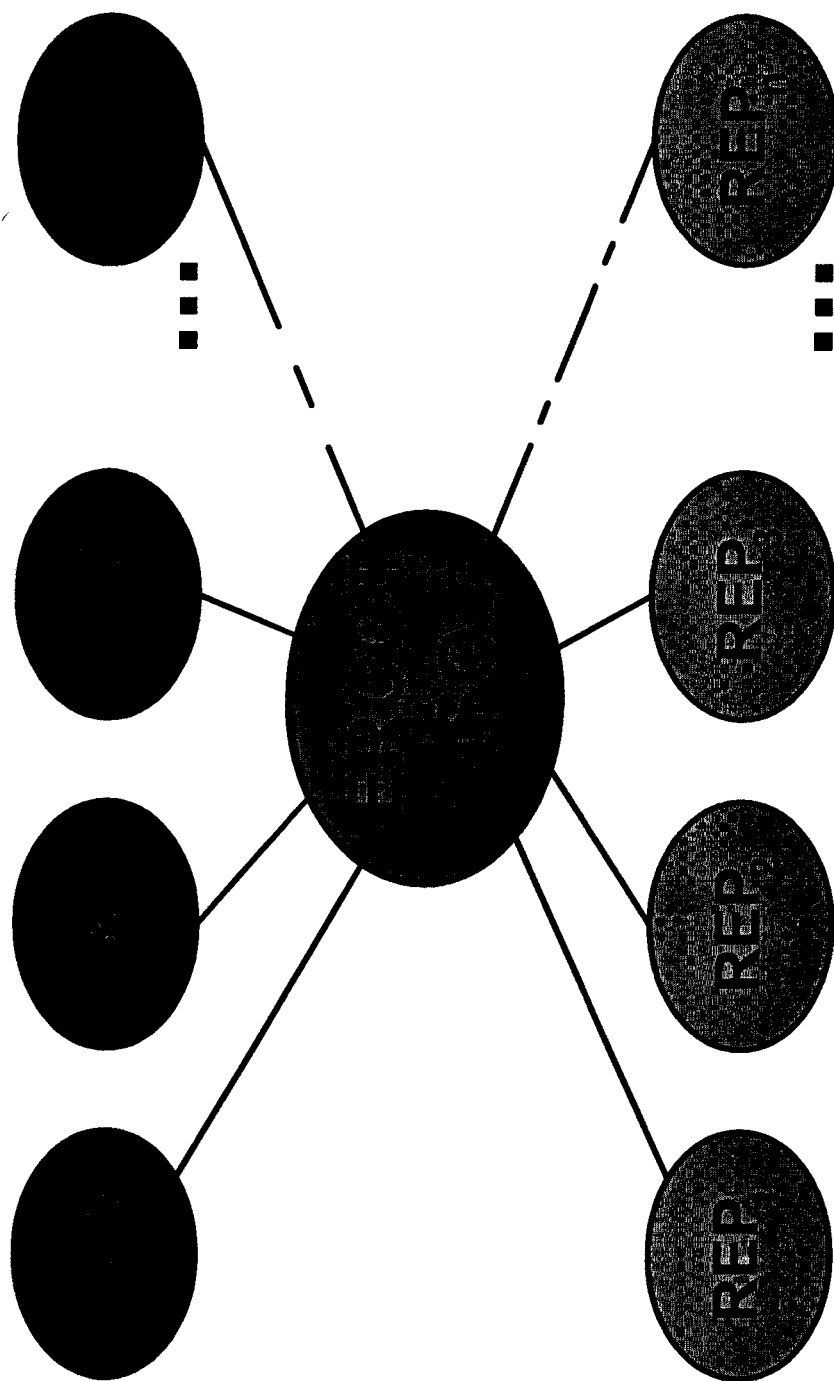
- Each Utility has its own registration system.
- REPs interface with multiple systems and protocols

- Limited data is stored in a central database to facilitate processing customer switch requests.
- Detailed information is stored by each Utility.

- All customer and utility information is stored in central database.
- All updates are centralized.
- Customer service information is stored with each REP.

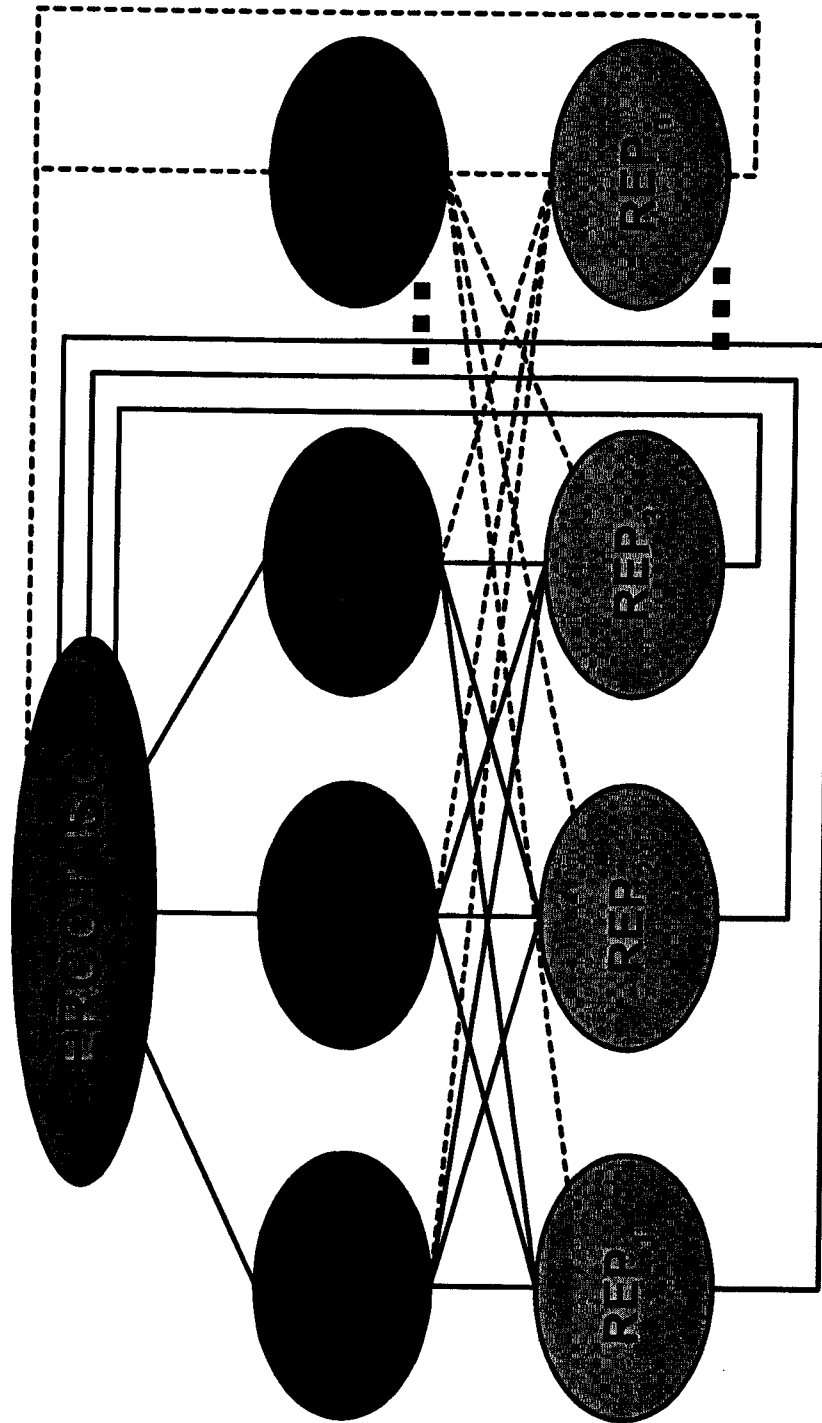
ERCOT ISO

Centralized Registration



Retail
Registration

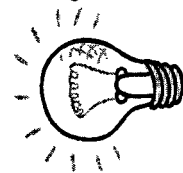
Distributed Registration



Centralized Registration

The ERCOT working group decided that the limited central system would best:

- Meet SB7 requirements and enable competition while controlling the costs of the system
- Accommodate registration statewide, in both ERCOT and non-ERCOT areas
- Ensure smooth customer switches with efficiency and accuracy
- Accommodate rules for access to data for all participants



Centralized Registration Data

The data to be stored centrally includes:

- Data that has to be exchanged accurately between competitive market participants to facilitate market operations
- Data that is necessary to facilitate fair competition between incumbent market participants and new market entrants
- Data that does not impinge upon customers' privacy, including name and billing address

Examples of Retail Customer Registration Data Elements

Support a Customer Switch
 ESI ID T&D Utility
 5-digit zip code REP history
 Provider Of Last Resort

Support Settlement
 ESI ID Voltage
 Loss Factor Code Profile type
 Substation bus UFE zone
 Usage Factor

Provide ESI ID lookup and verification
 ESI ID Service address
 Meter read code

Customer Switch Model

Retail
Registration

