



The Market Guide

“An introductory guide to how the Electric Reliability Council of Texas (ERCOT) facilitates the competitive power market”

This version is based on operations of the ERCOT market on January 1, 2005. This guide is subject to changes as on-going updates to the market protocols are made.

The ERCOT Protocols hold precedence over this guide.

Version 2005.1

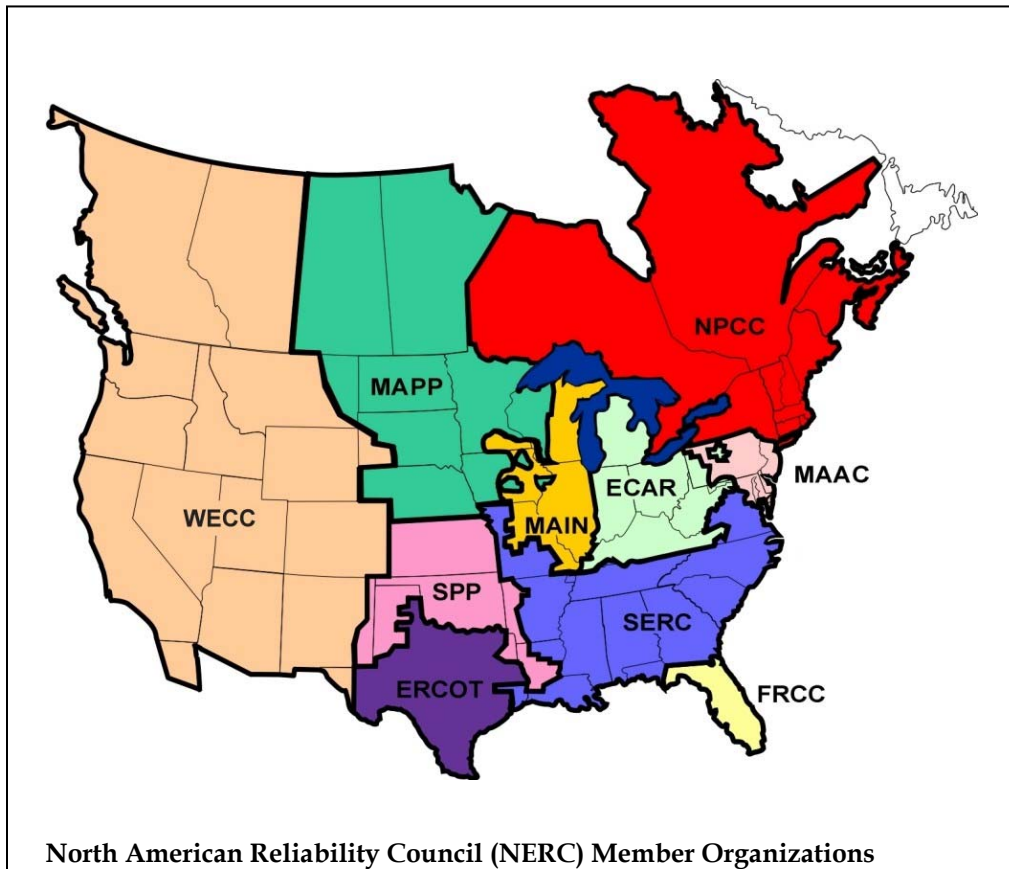
<i>Date</i>	<i>Revision</i>
1/22/01	V1.2 is a major revision that updates the Guide to current specifications and ERCOT Protocols. Updated sections on market operations, data aggregation, settlements.
11/25/02	V2003.1 updated V1.2 to reflect current operations and changes in protocols to be in effect as of 1/1/2003.
7/26/04	Updated competitive metering language – Beginning in 2004 , competitive metering is limited to meter ownership

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1. Introduction

The Electric Reliability Council of Texas (ERCOT) is one of 10 regional reliability councils in the North American Electric Reliability Council (NERC), as shown on the map below.



The ERCOT Independent System Operator (ISO) is the independent, not-for-profit organization responsible for the reliable transmission of electricity across Texas' interconnected 37,000-mile power grid. The ERCOT ISO has the responsibilities of ensuring reliable power grid operations in the ERCOT region jointly with the electrical energy industry organizations that operate within that region, ensuring open access to transmission ERCOT wide and distribution systems in areas permitting competition, ensuring the timely conveyance of market information to market participants, and ensuring accurate accounting of power produced and delivered.

To support these roles the ERCOT ISO focuses on the development, implementation, and ongoing management of reliable market and operating systems, transmission planning, retail mechanics supporting retail choice, accountable and reliable wholesale settlement and billing systems, and financial risk strategies.



ERCOT members serve about 85% of the electrical load in Texas, and have an overall generating capacity of approximately 75,000 Megawatts (MW). Because ERCOT is located entirely within Texas, the Public Utility Commission of Texas (PUCT) is the principal regulatory authority.

As of January 2005, ERCOT membership consists of 17 Industrial Consumers, 3 Retail/Commercial Consumers, 41 Electric Cooperatives, 16 Independent Generators, 19 Independent Power Marketers, 36 Independent Retail Electric Providers, 8 Investor Owned Utilities, and 19 Municipal Owned Utilities.

1A. - Events leading up to Retail Choice

Since 1970, ERCOT's primary role has been to ensure the coordination of electricity transmission reliability and electric power transfers among members. Several times since its origin, ERCOT's duties have expanded to accommodate the changing needs of Texas' electricity industry.

Today ERCOT (ISO) is realizing its largest role yet. In addition to transmission reliability and open wholesale access, ERCOT is also charged with overseeing the transactions related to the restructuring of the electric industry - including the development and effective operation of the majority of Texas' competitive retail market. ERCOT is the central controller of the majority of the energy market's activities, including power scheduling, power operations, and retail market data transactions between retailers and wire companies.

A major step toward a fully competitive market in the ERCOT region was taken in 1995, when the Texas State Legislature amended the Public Utility Regulatory Act to deregulate the wholesale generation market. ERCOT expanded its responsibilities to enable this change and facilitate the efficient use of the electric transmission system by all market participants. ERCOT restructured its organization and initiated operations as a not-for-profit Independent System Operator (ISO) on September 11, 1996.

The Texas State Legislature passed Senate Bill 7 (SB7) in 1999, which initiated a series of events that changed how the electrical energy industry operates in the state. The forces of supply and demand are allowed to engage for a more efficient and innovative industry, benefiting all classes of electric service consumers.

This legislation required the creation of a competitive retail electricity market to give customers the ability to choose their retail electric providers starting on January 1, 2002¹. Customers who were served

¹ A Customer Choice Pilot occurred from June 1, 2001 through December 31, 2001 where 5% of eligible customers were given the ability to choose their



by investor owned utilities were automatically eligible to participate in the new market. Customers of Municipally Owned Utilities and Cooperatives were given the opportunity to also participate in retail competition if their governing bodies chose to do so².

The objective of SB7 was to make the price of energy more visible, provide more choice for customers, and create an environment that is conducive to innovation and new business opportunities. Some of the major impacts to the Texas electric industry and its organizations as a result of SB7 include:

- 1) **Functional Unbundling:** All formally, fully-regulated investor-owned utilities (IOU) were required to unbundle their generation, transmission and/or distribution, and retail functions. For each IOU this was to create a separate Power Generation Company (PGC), a Transmission and/or Distribution Service Provider (TDSP), and a Retail Electric Provider³ (REP) by January 1, 2002. Customers of these IOU's who did not choose a new retail provider by January 1, 2002 were automatically enrolled with their existing utility's affiliated REP.
- 2) **Continuing Wires Regulation:** Transmission and/or Distribution Service Provider s (TDSPs) continue to be regulated. As of 2004, some commercial and industrial customers in areas open to retail competition are eligible for competitive meter ownership.
- 3) **Limitation of Ownership of Installed Capacity:** After January 1, 2002 a PGC cannot own more that 20% of the installed capacity in the ERCOT region, or any other power region in Texas.
- 4) **Creation of a Price to Beat:** An affiliated REP of an IOU is required to offer residential and small commercial customers⁴ in its affiliated TDSP's service area a "price to beat."⁵ The "price to beat" is six percent lower than the rate charged by its affiliated electric utility on January 1, 1999 (excluding fuel). The affiliated REP (AREP) cannot adjust this price until either 36 months after retail competition started, or 40% of the customers in its affiliated TDSP's area have switched to another retailer. The AREP can petition the PUCT for fuel cost adjustment. Several IOUs have successfully petitioned the PUCT for approval to end the "price to beat" for a specific retail class of customers.

retail electric provider starting. Municipally Owned Utilities and Cooperatives chose not to opt-in to retail competition during this pilot.

² A municipality or cooperative utility decision to opt into the competitive retail market cannot be reversed.

³ A REP is a type of Competitive Retailer that is certified by the PUCT.

⁴ Residential and small commercial customers are defined to be those with less than 1000 kW demand in SB7

⁵ The "price to beat" is under the jurisdiction of the PUCT.



- 5) **Provision for Municipally Owned Utilities or Cooperatives:** Municipally owned utilities and electric cooperatives have the right not to opt into retail competition and retain their existing service territories. Also, they are not required to functionally unbundle their organizations if they choose to opt in and participate as a Competitive Retailer (CR). They are allowed to continue bundled operations regardless of their choice to open their service areas to retail competition.

Some of the major changes for ERCOT that occurred included the consolidation of the former 10 control areas⁶ in the ERCOT region into a single control area. On July 31, 2001, the ERCOT system began operation as a single control area.

Also on July 31, 2001 ERCOT began operations of centralized power scheduling for wholesale electricity market transactions. In this role ERCOT began procuring the necessary ancillary services⁷ to fulfill its reliability role. From this point on ERCOT began accounting and settling the total exchange of wholesale electricity transactions on a 15-minute basis. This entails performing commercial functions centrally to facilitate efficient market operations, such as meter data acquisition and aggregation, load profiling and statewide registration of retail premises in areas competition is open and wholesale delivery points for areas not open to competition.

1B. – Market Design

The ERCOT wholesale market is designed around bilateral transactions across its high voltage transmission grid with the management of power flow based on a “Zonal” model. The “zonal” approach partitions the transmission grid and associated interconnected load and generation points into areas or zones. For 2005 there are five zones. The process of establishing these zones is described further in this guide.

The retail market is defined by areas served by transmission and distribution utilities. These areas are either open to retail competition or are “opted out”. The areas in competition require that end-user load be represented by independent identification that is accessible to competitive retailers who vie for providing the power across the local distribution utilities’ systems. The local distribution utility is the keeper of this independent identification or electric service identification (ESI_ID). The ESI ID represents the location, ownership, type of electric service for a premise whether a residential dwelling, commercial or industrial business, or governmental institution or facilities. The local distribution utility must keep the ESI ID information current and available to competitive retailers. The ESI ID and the standard of data transaction across all distribution

⁶ The 10 control areas were operated by regulated utilities.

⁷ Ancillary services are introduced in the next section.



utilities in competitive areas are the basis to which the competitive retail market functions – more on this later in this guide.

In those areas where retail competition is not enacted remain as fully integrated utilities. These entities such as electric cooperatives and municipals can open their areas to competition upon the action of their governing boards.

In areas of Texas not within the ERCOT control area will also be moving towards opening for retail competition in the future pending readiness review at the PUCT. This includes areas of the Texas panhandle, East Texas, and El Paso. ERCOT is currently the sole retail competition transaction clearing house for the entire state.

The competitive wholesale and retail market in Texas continues to evolve as market participants and the state regulator implement market changes. This is most dramatic for the wholesale market. In 2003 the PUCT Order 26376 initiated effort for the redesign of how the wholesale market will manage transmission congestion and how the market will provide “day-ahead” market services. The Texas Nodal Team of market stakeholders was established in August of 2003 to begin the design. The redesign is focused on the application of Local Marginal Pricing in a “nodal” model. The implementation of this order could be realized as early as the end of 2006.

1C. – An Overview to This Guide

This guide provides an overview of how the Electric Reliability Council of Texas (ERCOT) performs its role in the competitive wholesale and retail electricity market. It is not intended to be a detailed comprehensive market document⁸. The guide aims to be a starting point to gain an understanding of how the Texas competitive electric market operates, including the roles and responsibilities of ERCOT and the various participants. It is assumed that readers have a basic understanding of electrical energy industry operations. The remaining sections of this guide contain.

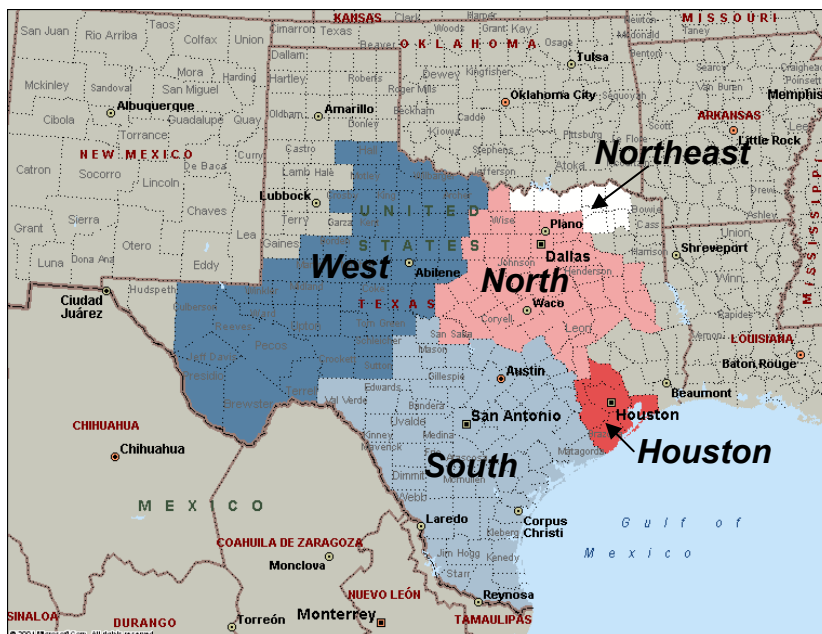
- 2) **Important Concepts:** An introduction to ERCOT Operational responsibilities essential to understanding ERCOT’s role in the competitive retail market.
- 3) **Competitive Market Overview:** An overview of how the competitive retail market operates, including the major roles and responsibilities of key market participants.
- 4) **ERCOT Core Processes:** A description of the core business processes that ERCOT uses to facilitate the competitive retail market.

⁸ Refer to the ERCOT Protocols and www.ERCOT.com for more complete information on the competitive retail market.

- 5) **Key Concepts in Detail:** A closer look at the ancillary services procurement and congestion management functions that ERCOT performs in the competitive retail market.
- 6) **Participant Qualification:** An overview of the key requirements for organizations planning to participate in the Texas power market.

2. Current Market Design

The ERCOT market model is “Zonal” based. The transmission grid and associated interconnected load and generation points are grouped into four areas or zones. The figure below depicts the five zone boundaries for 2005:



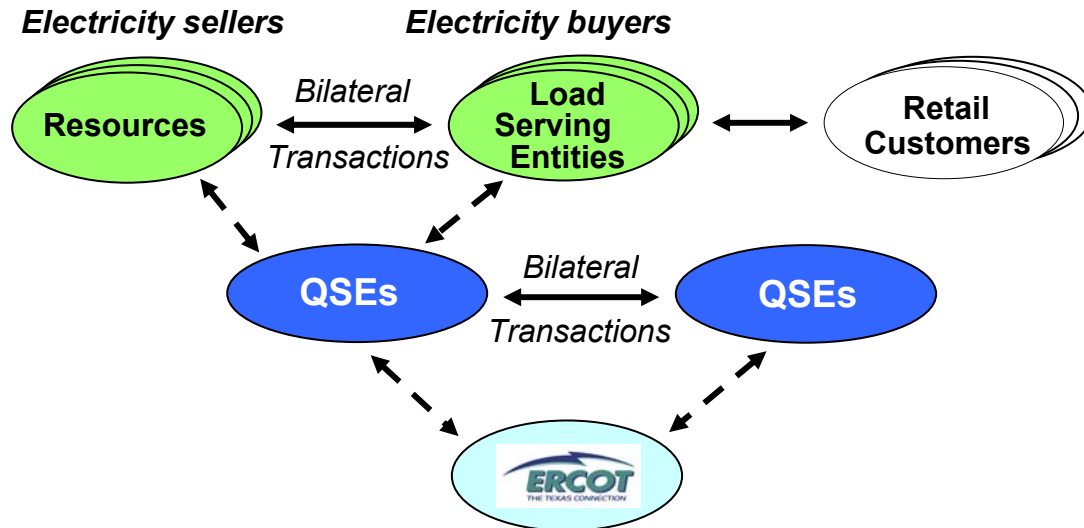
The zonal model is based primarily on the transfer capability of the 345 KV transmission system. Transmission flow studies are performed with the outcome used to group load and generation transmission points into groups of similar impact on flow across those major transmission paths that reach limits during established system contingencies (load, generation dispatch, outages). These major transmission paths form the means to establishing what is called Commercially Significant Constraints or CSCs (described further later in this guide.) These CSCs then become the basis for forming the zones.

A key feature of the ERCOT competitive retail electricity market is that it is based on “bilateral” transactions between buyers and sellers of energy, as shown in the picture below. Scheduling entities are

required to turn into ERCOT balanced energy schedules of load and energy required to serve the load. The balance schedules are a result of bilateral trades between load and resource entities. ERCOT only operates the electricity market needed to mitigate the energy imbalances that result due to the differences between the real time system requirements and the system loading anticipated in the balanced schedules. This is unlike some other markets, where power generating companies sell electricity into a “pool” and load serving entities purchase from the same “pool” in an exchange where the amount of demand and supply sets market prices for buyers and sellers.

The ERCOT market model does permit QSEs the ability to modify their resource and/or obligation schedules below or above expected quantities. This is called “Relaxed Balanced Schedules”. This provides QSEs the flexibility to alter resource and obligation schedules in response to market and/or system conditions, often outside of their control, letting the ERCOT balancing energy market make up the difference. The ERCOT balancing energy market is an ancillary service market – NOT a SPOT Market. It accounts for only 5-10% of the total ERCOT energy market.

ERCOT Bilateral Market



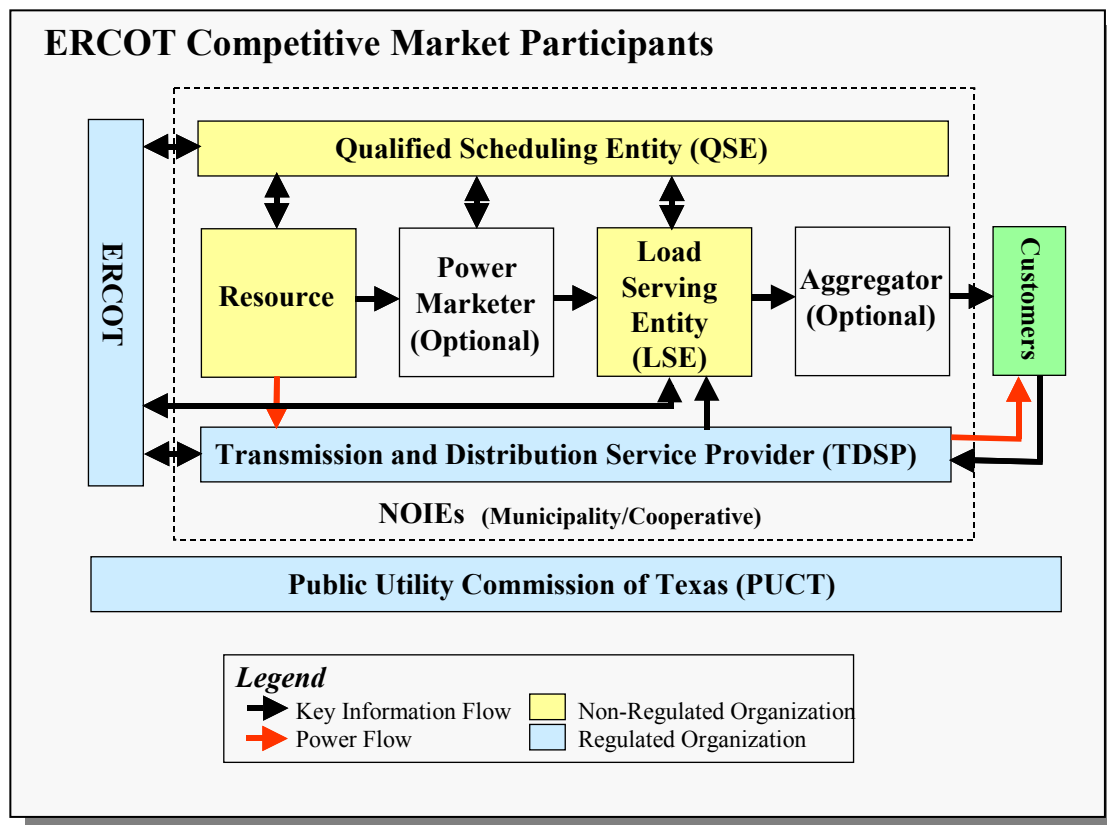
Load serving entities buying energy and Resources selling energy communicate operational information such as their bilaterally arranged balanced schedules of loads and resources to ERCOT through their Qualified Scheduling Entities. ERCOT ensures that the

power grid can accommodate the schedules that were generated by the bilateral market.

ERCOT is uniquely positioned to identify the ancillary services needed to resolve system conditions like capacity inadequacy and congestion, to maintain reliability, as shown in the previous section. ERCOT makes an assessment of the ancillary services needed to accommodate the bilateral schedules and the scheduling entities are asked to either provide their share of these services from their own resources and/or bilateral trades with another QSE or let ERCOT purchase these services from the market on their behalf. Market Participants may self-provide all or part of their share of ancillary services.

For the market to operate reliably and efficiently, the various market participants need to work closely together and operate according to standard market rules or Protocols. A description of the ERCOT Protocols can be found on the www.ERCOT.com website.

The next figure illustrates the main market participant relationships in the ERCOT region electricity market. A description of these market participants follows.



Qualified Scheduling Entities (QSEs) From a market operations perspective, QSEs provide the main information interface with



ERCOT. For example, market participant scheduling of energy or bidding for ancillary services must be done by a QSE.

ERCOT sends instructions to the QSEs, including regulation signals, balancing instructions, and accepted bid information. QSEs relay the instructions to the appropriate resources, as instructed by specific resource site or by resource portfolio.

The schedules that QSEs submit have to be “balanced” in terms of scheduled loads and their corresponding resources though obligations may be more or less than the QSE’s metered obligations (Relaxed Balanced Schedules). Within an established range schedules are allowed to vary from actual metered obligations to match the scheduled resource, the difference made up by the ERCOT balancing energy market.

The following figure shows an example of a bilateral energy schedule. The left side is the Resource schedule, the right the Obligation schedule. The MW quantities between the right side and left side balance, summing to 130 MW. Anything other than balanced is rejected.

BILATERAL AGREEMENTS										
CURRENT TOTALS: Resource MW = 130, Obligation MW = 130										
Market Date: 17-DEC-2003		Hour: 1700		Interval: 1700		Service Type: ENE		QSE: ABC		
Market Interval	Resource MW	Provider Type	Provider	CM Zone	Dynamic	Obligation MW	Recipient Type	Recipient	CM Zone	Dynamic
1700	123	QSE	ABC	NORTH2003	Yes	123	QSE	ABC	NORTH2003	Yes
1700	7	QSE	XYZ	NORTH2003	No	7	QSE	ABC	NORTH2003	No
					No					No

The financial settlement for balancing energy and ancillary services that were deployed by ERCOT takes place between QSEs and ERCOT. Settlement of balancing energy is based on the load and resource imbalances. The load imbalance is the difference between the scheduled load and actual load. Resource imbalance is the difference between the scheduled energy and actual energy. The actual load and energy amounts are derived from the load and resource meter readings. For example, when a QSE’s actual energy supplied from resources it represents is insufficient to match the scheduled energy in the balanced schedule provided to ERCOT, the QSE would be required to reimburse ERCOT for the balancing energy ERCOT procured, at the Market Clearing Price. On the other hand, if the QSE’s resource meters show to be greater than the scheduled

energy then the QSE is paid the difference at Market Clearing Price for energy (MCPE).

ERCOT procures and deploys balancing energy services from bids submitted by QSE's for each hour. If ERCOT accepts a balancing energy bid by a QSE, ERCOT pays the QSE as appropriate at the associated MCPE.

QSEs can also bid into other ancillary services markets from the resources in their portfolio. ERCOT reimburses the QSE at the associated MCPE if ERCOT selects the bid.

ERCOT helps market participants plan and manage their competitive market operations effectively by giving them timely information like forecasts of weather, load, losses, and ancillary services requirements.

For every Settlement Interval, which lasts 15 minutes, ERCOT accepts balanced schedules from QSEs that identify the source and destination of contracted power flows, as well as their amount and timing. ERCOT compares the sum of these schedules to its own load forecasts, to determine balancing energy and ancillary services requirements.

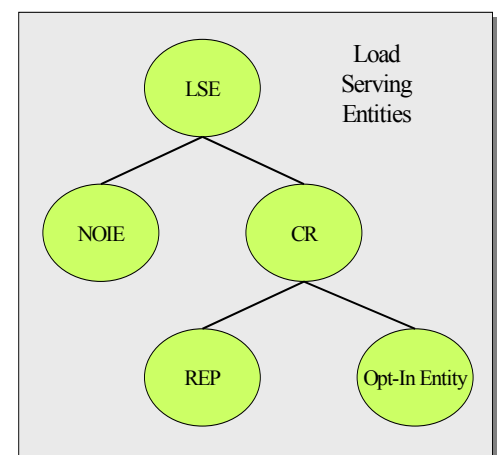
ERCOT works with QSEs to procure ancillary services through a series of markets, which ERCOT will operate, and deploys them as needed to ensure system reliability. If the submitted schedules ultimately result in congestion of the transmission system and ERCOT needs to re-dispatch system resources to resolve the congestion, market participants pay for the re-dispatching or congestion costs.⁹

In order to settle with QSEs , ERCOT aggregates load and resource data for every settlement interval. ERCOT then calculates the load imbalance as the difference between scheduled and the aggregated load data, to issue the appropriate credits and/or debits to QSEs. The same comparison is made between aggregated energy supplied from the resources provided by the QSE and the scheduled energy to allocate the appropriate debits and/or credits due to the resource imbalance.

ERCOT also works with TDSPs to manage the transmission system. TDSPs are also responsible for load and resource meters installation as well as submitting meter data for all loads and resource meters not directly polled by ERCOT.

ERCOT has a central premise registration system that facilitates the retail customer switching process by transmitting switch requests and

⁹ Zonal congestion cost was initially allocated using the "postage stamp" method. This changed to a direct assignment method in 2002 where cost is assigned to the entities causing the zonal congestions as per their schedules.



meter consumption data between Competitive Retailers (CRs) and TDSPs and keeping track of the association between premises and load serving entities in the ERCOT centralized statewide registration system.



Resource Entities negotiate privately with other market participants to sell their energy, and communicate the resulting schedules to ERCOT through their QSEs. These entities also own and/or operate generation or loads that provide ancillary services ERCOT needs to manage system reliability.

Load Serving Entities (LSEs) represent either Competitive Retailers (CRs), which are the only organizations authorized to sell electricity to retail customers who have customer choice, or Non Opt-in entities (NOIE) which are represented by wholesale delivery points. CRs may be Retail Electric Providers (REPs) or Opt-in Municipally Owned Utilities or Cooperatives. LSEs forecast their customer load and negotiate privately with other market participants, like resources or power marketers, to buy energy. LSEs communicate the resulting schedules to ERCOT through a QSE.

CRs interact directly with ERCOT when submitting switching requests, where customers choose a new CR. ERCOT processes the switching requests by working with TDSPs to obtain the initial and final meter reads, confirming switches with customers, and confirming the switch with the relevant CRs once the switch is approved. ERCOT also sends switch confirmation notices to consumers to help control “slamming” or unauthorized switching.

Transmission and/or Distribution Service Providers (TDSPs) provide the electricity transmission infrastructure, and work with ERCOT to jointly manage the reliability of the transmission system. TDSPs are also charged with management of metering functions including meter reading activities. As of 2004, some commercial and industrial customers in areas open to retail competition are eligible for competitive meter ownership.

ERCOT needs TDSPs to provide meter reading and consumption information, in order to correctly settle the balancing energy and ancillary service markets. For example, consumption information for each LSE is needed to determine whether the actual load matches the schedules submitted by a QSE, on behalf of its LSE. If it did not match, the difference is settled with QSEs at the balancing energy Market Clearing Price.

The majority of meters measure accumulated consumption between meter-read dates, and are typically read once per month. An estimate of the energy consumption for each 15-minute period is needed to properly perform “initial” settlement. To manage this, ERCOT



utilizes standard load profiles (or shapes) to estimate how monthly consumption breaks down into 15-minute intervals for the different customer segments in the region. Consumers of 1,000 kW or greater are metered with interval data recorders that provide 15-min data. This data takes the place of profiled data once received by the TDSP.

Non Opt-In Entities (NOIEs) Municipalities and Cooperatives may remain functionally bundled organizations, and do not need to submit switching requests to ERCOT because their customers do not have a choice of electric retailer until such time the NOIE decides to open their area to competition.

However, these utilities participate in all the wholesale competitive market transactions, including acquiring energy through private bilateral transactions, and submitting balanced schedules for energy to ERCOT.

Other Participants may also operate in the ERCOT market. Power Marketers, who buy and sell blocks of energy, schedule that power with ERCOT through a QSE. Aggregators that acquire groups of retail customers may also operate in this market.

The PUCT oversees the entire market, including customer participation matters, and monitor market activity to deal with market abuses and gaming.

It is important to recognize that not all processes needed to operate the competitive market are facilitated by ERCOT. For example, ERCOT does not provide a facility to bring buyers and sellers of energy together.

ERCOT does not facilitate interactions between TDSPs and other market participants to support processes such as distribution outage management or TDSP retail meter services

ERCOT will continue to evolve as it modifies and refines its active role in the operation of the competitive retail market. The rest of the Market Guide is focused on how the ERCOT power market processes work, as well as the requirements for organizations wishing to participate through one or more of the roles described above.

3. Important Concepts

As operator of the single control area, ERCOT is responsible for insuring the reliable supply of electricity to all customers within its region. The key questions ERCOT resolves every minute of every day, to ensure reliability, include:



- Is the right amount of generation available to support the amount of load on the power system? Is available capacity adequate?
- Is there enough transmission capacity to deliver the power being generated to the points in the network where the load is situated?
- How much capacity and energy will be procured to support real-time balancing of energy supply and demand in the region and to relieve transmission constraints?
- What instructions need to be provided to participants to support reliable system operations?

ERCOT relies on the availability of generation capacity to provide balancing energy to maintain the electric system within allowable reliability limits. Capacity and energy procurement, needed by ERCOT to perform reliability role, are competitively garnered from power generation companies (PGCs). Generation units that can be on standby and available to be called upon to provide energy or loads that are available to be interrupted to relieve the need for additional energy may provide these services upon meeting ERCOT qualification requirements. These services needed from generation or load resources by ERCOT to ensure reliability are called “ancillary services,” and are discussed in more detail in section 5A. However, at this point we can simplify them by thinking of the two types of ancillary services:

- ‘Capacity’- is generation reserve available to be used if needed to provide balancing energy or loads available to be interrupted reducing the need for additional capacity.
- ‘Balancing Energy’- is capacity deployed in energy to ensure that supply and demand are in balance or loads interrupted to avoid the need for additional energy.

3A. Ancillary Services- Capacity

ERCOT continuously monitors the amounts of reserve capacity available across the system to insure against unforeseen events, ranging from differences between scheduled and actual demand to the sudden loss of a generating unit or transmission facility. ERCOT applies a methodology to establish the capacity requirement to be supported by the market.

Regulation Reserve: ERCOT calculates a system total Regulation Reserve capacity for the next operation day by using average and standard deviation of regulation deployments from the previous month and from the same month of the previous year. The calculation comes to a capacity value that provides adequate supply of regulation service 98.8% of the time. To facilitate the market for these services ERCOT divides these requirements into 4 "blocks" of constant requirements using a minimization process.

If experience indicates that this method results in repeated shortages of regulation reserve; ERCOT may increase these requirements after



issuing an Operating Condition Notice (OCN) explaining its actions. If this option is exercised ERCOT must provide a report to TAC and the Board of Directors explaining its actions and new methodology at their next meeting.

Responsive Reserve: RRS is set at 2,300 MW for all hours under normal conditions. ERCOT is allowed to increase this requirement under extreme system conditions. This value has been historically the value of the two largest generation units connected to the ERCOT grid. Unless indicated otherwise by studies or adverse operating experience, Loads acting as a resource (LaaRs) will be allowed to provide up to 50% of the ERCOT Responsive Requirement of 2300 MW.

Non-Spinning Reserve: NSRS is intended to cover the contingency of losing resources or under forecasting load. ERCOT will purchase NSRS when projected risk of insufficiency is higher than normal, or large amounts of spinning reserve are not projected to be available online based on resource plans.

Using this methodology ERCOT procures NSRS when hot weather, cold weather, or uncertain weather is expected, and when amounts of spinning reserve is less than 4,600 MW (including that used for responsive) are projected.

These reserves described above are the first ancillary services that ERCOT procures each day for the next “operating day”.

Replacement Reserve: The next type of ancillary services capacity that ERCOT may procure is dependent on the scheduled amounts of generation and load. ERCOT makes its additional capacity procurement decision based on the analysis of schedules to determine whether:

- The amount of scheduled load is consistent with ERCOT’s own load forecasts for the operating day.
- There will be congestion anywhere in the transmission system during the operating day, given the locations of generation and load.

If the analysis identifies a problem in either of these areas, ERCOT will procure Replacement Reserve to ensure sufficient capacity to deal with the projected capacity inadequacy or congestion.

3B. Ancillary Services- Balancing Energy

As ERCOT moves closer to the real-time interval in which the energy will actually be delivered, it continuously gets additional information that improves its ability to forecast system conditions. For instance, as the day-ahead energy schedules are finalized for a given 24-hour period, scheduling entities submit resource plans for generators that indicate the amounts of:



- Capacity- generation capacity that will be readily available.
- Energy- the capacity deployed and sent to the grid to meet the generators' contracted amounts of energy obligations.

After evaluating the effect on the power grid of forecasted loads, schedules, transmission system conditions and resource plans, ERCOT determines how much additional capacity needs to be reserved to assure ERCOT will have resources that can provide regulation and balancing energy in real-time to maintain reliability. ERCOT will procure the needed capacity services to assure itself the ability to serve the scheduled loads as well as relieve loading on transmission lines that appear to be constrained upon a study of the submitted schedules. ERCOT procures balancing energy approximately 13 minutes before the time of actual power flow, by which point the right amount can be predicted more accurately using short-term forecasting tools.

Replacement Reserve ancillary service providers submit balancing energy bids when they submit their Replacement Reserve capacity bids. Their balancing energy bids will go in the balancing energy bid stacks for the hours for which they were awarded to provide Replacement Reserve capacity service.

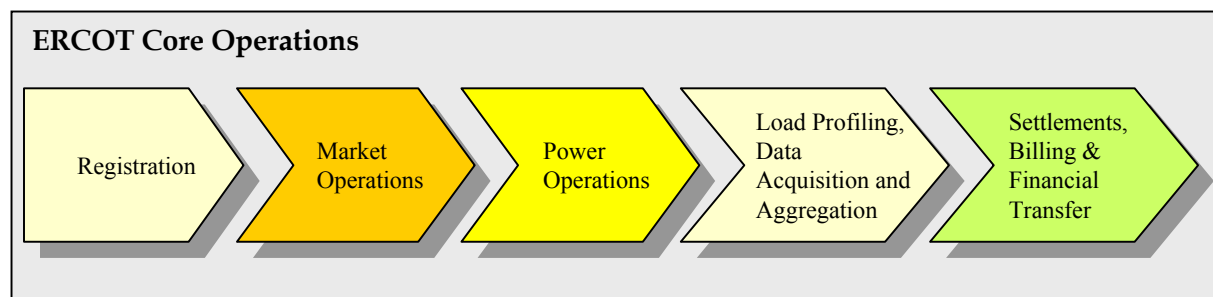
Ancillary service providers shall not bid the capacity that they have sold to ERCOT into the market for other capacity services.

ERCOT selects and deploys balancing energy in the amount necessary to keep the system in balance and minimize the net energy needed in real time from regulation service providers.

4. ERCOT Core Processes

ERCOT is continuously performing five major processes to support the wholesale and retail markets:

- Registration
- Market Operations
- Power Operations
- Load Profiling, Data Acquisition & Aggregation
- Settlements, Billing & Financial Transfer



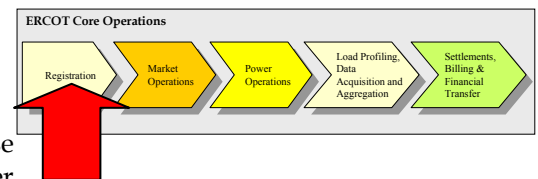
Each process is described next. In section 4B a market timeline is used to introduce the closely related operations and settlements processes.

4A. Registration Process

ERCOT is the registration agent for the entire state of Texas. It uses a centralized registration system to register retail premises and market participants alike.

ERCOT is responsible for the registration of:

- ◆ Market participant *organizations* and the people within those organizations who are authorized to access ERCOT computer systems. Each time an organization joins the ERCOT market, it will provide this information.
- ◆ Market participant *assets*, which are resources that participate in the supply of energy and ancillary services, including both generating units and loads acting as resources and how these assets will be metered.
- ◆ Metered and un-metered retail *premises* of customers who are in the competitive market. This information is sent to the ERCOT database by the TDSPs that serve those retail customers.
- ◆ Registration of load represented by *non-opt-in entities* (NOIEs). NOIEs register as Load Serving and Resource Entities as



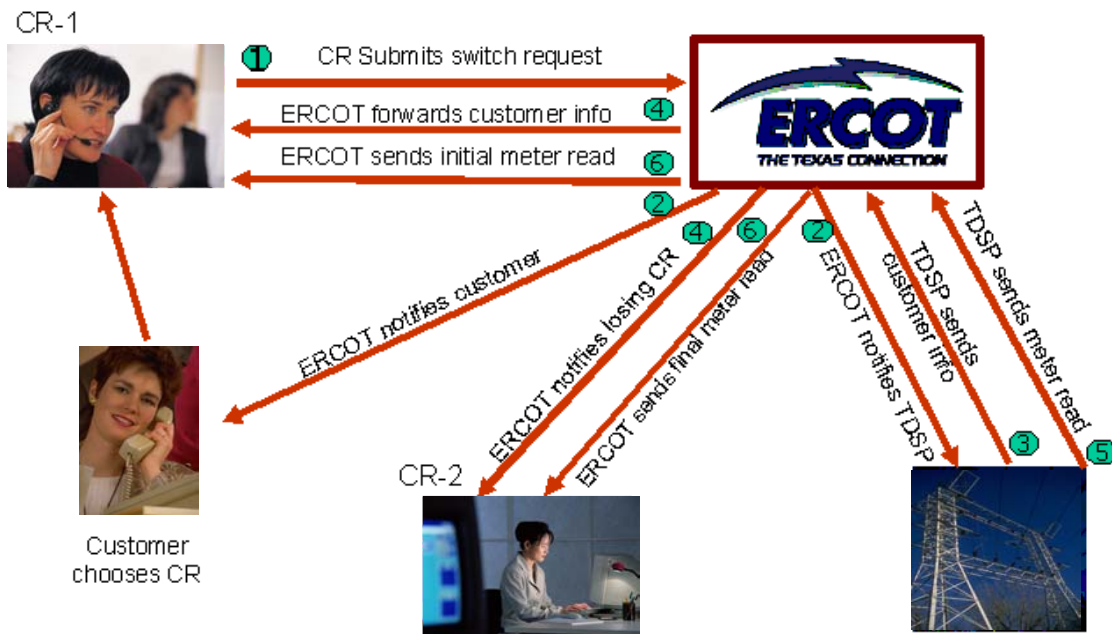
applicable. Their wholesale metering points are registered outside of the automated retail premise registration system. This is done to insure these points are not subject to switches between competitive retailers.



The ERCOT centralized registration database contains the minimal information that ERCOT needs to facilitate the process of a customer switching CRs. Additional information on retail premises such as customer names and telephone numbers is not stored by ERCOT.

The ability for customers to switch CRs is fundamental to supporting retail competition. The figure below shows how ERCOT processes a customer switch.

Sample transaction: Switch Request



When ERCOT receives a switch request from a customer's New CR, it verifies that the New CR is certified by the PUCT, registered with ERCOT, and authorized to serve the customer's premise area.

ERCOT notifies the customer and both CRs about the impending switch. ERCOT also notifies the TDSP so it can send detailed premise data, like historical usage, the rate class and meter type. This information is sent from the TDSP to ERCOT, which forwards it to the New CR. The New CR needs this data in order to prepare for the switch.

When the TDSP reads the customer's meter, it sends the reading data to ERCOT, which forwards it to both CRs and finalizes the switch.

The CRs need this meter reading information in order to determine when the customer stops being billed by the current CR and starts being billed by the new CR.

With millions of ESI-IDs in service in the Texas retail market there are understandably thousands of ESI-ID transactions for switching, moving in and out, etc. This presents the opportunity for a significant volume of data synchronization issues between competitive retailers, TDSPs, and ERCOT.

ERCOT and market participants implemented FasTrak - ERCOT Production Issue Resolution System, to work through data differences. The ERCOT FasTrak system is the primary tool and entry system used by CRs and TDSPs to communicate with ERCOT Registration Analyst regarding enrollment process issues.

Before a FasTrak issue is submitted the CR must validate the discrepancy with the use of ESI-ID status reports provided to market participants. These are the "Service Order Full Extract Report" and the "ERCOT Market Participant (MP) Transaction Report".

The goal of this process is to resolve data exchange issues in order to make service changes to retail electric customers' services quickly and efficiently.

4B. Market Timeline

Next the wholesale market timeline is described.

- (4C) - Market operations enable a competitive ancillary services market.
- (4D) - Power operations support the reliability of the grid.
- (4E) - Data Acquisition and Load Profiling establish the means to measure power flow results while
- (4F) - Settlements allocate the resulting costs among QSEs.

Market Operations

Day-Ahead Market occurs from 6:00AM to 6:00PM on the day prior to the operating day or actual power flow. QSEs submit balanced schedules and ancillary services bids based on operation forecasts. Ancillary services for Regulation, Responsive, Non-Spinning and Replacement Reserve capacity markets clear, and ERCOT publishes the results. ERCOT completes capacity sufficiency and transmission security studies and procures necessary resources as Out-of-Merit Replacement Capacity and/or Reliability-Must-Run services in preparation for foreseen congestion contingencies. This process is described later in more detail.

Adjustment Period happens in the time between the close of the Day-Ahead Market and the start of the Operating Period. QSEs may modify their schedules and outstanding bids during this



ERCOT Market Timeline

Market Operations

Day-Ahead Period

6:00am to 6:00pm prior to Operating Day.

Adjustment Period

Precedes Operating Period

Operating Period

Balancing Energy Clearing Occurs every 15 minutes

Power Operations

Commercial Operations

Initial Settlement

17 days after Operating Day

Final Settlement

59 days after Operating Day

True-up Settlement

180 days after Operating Day And/or specific Protocol Criteria is met



time. ERCOT may procure additional ancillary services as needed, based on its analysis of changed schedules, resource plans, load forecasts, and other system conditions.

Operating Period includes the Operating hour and the hour prior to Operating hour. During the Operating period, ERCOT performs look-ahead analysis of the physical system and identifies operational constraints. Prior to each 15-min period the ERCOT Energy Management System (EMS) sends Balancing Energy (BES) deployments to QSEs whose BES bids are struck to resolve market imbalances and/or transmission congestion between zones. For system reliability needs ERCOT deploys Regulation to correct frequency deviations; monitors the amount of Responsive Reserve available to respond to system interruptions; and deploys Non-Spinning Reserve when primary reserves are used up.

If necessary, ERCOT deploys unit-specific instructions as Out-of-Merit Energy to resolve local transmission constraints. These are constraints within a zone.

Power Operations

Power Operations run continuously, operating the grid according to market rules. The ERCOT power operations system monitors and analyzes all grid components every 2-4 seconds for status, loading and output. In conjunction with the transmission control centers of the TDSPs in the ERCOT region, ERCOT supports the safe and reliable operation of the power system.

At any point in time, several operations activities are taking place concurrently.

For example, just for market and power operations, the following is taking place at 1:33PM:

1. The Day-Ahead Market is active for the next Operating Day.
2. The Adjustment Period is active for the Hour ending (HE) 4:00PM Operating Hour and subsequent Operating Hours in the Operating Day (i.e. HE 5:00PM, HE 6:00PM, etc.)
3. The Hour-Ahead Period is active for the HE 3:00PM Operating Hour.
4. The Real Time Balancing Energy Market has just cleared and deployment instructions are being sent for the 1:45PM-2:00PM Settlement Interval.

5. Power is flowing for the 1:30-1:45 Settlement Interval, and the power operations system is conducting analysis of grid reliability every 2-4 seconds.



Settlements

Initial Settlement: 17 days after the operating day, ERCOT runs the first settlement for that day. For most load premises this settlement is based on estimated consumption using average daily usage from previous months or weather adjusted consumption profiles because most TDSP meter readings for loads, in competitive retail areas, are performed once a month. For loads reporting in by ERCOT Polled Settlement metering or by TDSP wholesale metering the interval load data is typically in before settlement occurs.

Final Settlement: 59 days after the operating day, ERCOT runs the final settlement program for the Settlement Intervals, and incorporates any revised results. This settlement will typically have a significant increase in the number of actual premise consumption data reported in by TDSPs.

True-Up Settlement: In six months or when ERCOT has received and validated at least ninety-nine percent (99%) of the total interval data recorded (IDR) data, when ERCOT has received and validated at least ninety percent (90%) of the IDR data from each Meter Reading Entity (MRE) ERCOT issues, and any other criteria directed by the ERCOT Board of Directors this statement to reconcile any late or final metering information, and resolve any outstanding disputes.

Resettlement: ERCOT may run a settlement as needed if disputes or data error result in an impact greater than two-percent (2%) of the ERCOT Operating Day market transaction dollars, excluding bilateral transactions, or if directed by the ERCOT Board of Directors.

Similarly, on any given day, the following settlement runs for multiple trade days are also running concurrently:

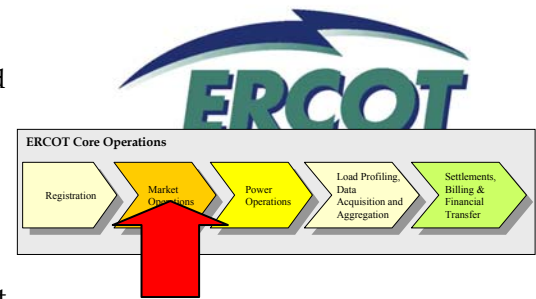
- Initial Settlement for 17 days ago
- Final Settlement for 59 days ago
- True-up Settlement for 6 months ago
- Possible Resettlement of a day 6 months or less

4C. Market Operations Process

In this process ERCOT assesses the amount of ancillary services required to support the reliable operation of the grid, and procures those services. The market operations process contains four major sets

of activities: Day-Ahead Market, Adjustment Period, Hour-Ahead Period, and the Real Time Balancing Energy Market Clearing.

Day-Ahead Period



By 06:00AM- ERCOT publishes operational information for the next day that includes:

- Forecast of hourly load by congestion zones.
- Transmission and distribution loads
- Forecast of hourly system ancillary service requirements.
- Allocation of ancillary service obligations for the QSEs, based on historical load share ratios.

By 11:00AM- QSEs use the information that ERCOT published to:

- Submit balanced schedules.
- Submit ancillary services schedules indicating what the QSE will self-arrange.

By 11:15AM- ERCOT matches the schedules of all QSEs to verify that inter-QSE trades match. ERCOT also evaluates its Commercially Significant Constraints (CSCs). Specifically ERCOT:

- Notifies QSEs of mismatched schedules. An example of a mismatched schedule could be when QSE A submits a schedule to deliver energy to QSE B, but QSE B does not submit a corresponding schedule showing the same amount of energy being delivered from QSEA.
- Computes total loads based on the aggregate QSE schedules and notifies QSEs of differences between ERCOT's load forecast and aggregated QSE load schedules.
- Evaluates and publishes CSC congestion analysis.
- Publishes hourly load based on QSE schedules and hourly ERCOT load forecasts.

By 1:00PM- QSEs submit adjusted schedules in response to the information that ERCOT published. ERCOT re-evaluates the adjusted schedules by:

- Checking for matching of adjusted schedules, and notifying QSEs of mismatched schedules. If mismatched schedules are not corrected by the QSEs by the end of the adjustment period for the specific operating period, ERCOT generates settlement determinants according to the mismatched quantities and settle with the QSEs at the pertinent market-clearing price.
- Evaluating CSC congestion based on the adjusted schedules. This analysis is done without the resource plan, so ERCOT makes assumptions about the allocation of QSE portfolio schedules to individual resources in order to test for congestion.



QSEs also submit bids for Regulation-Up and Down, Responsive Reserve, and Non-Spinning Reserve.

By 1:30 PM- ERCOT awards ancillary services bids for Regulation, Responsive and Non-Spinning Reserves. ERCOT:

- Computes aggregated amounts of QSE self-arranged services for Regulation-Up and Down, Responsive Reserve, and Non-Spinning Reserve.
 - Determines, for each type of ancillary service, the remaining amount that needs to be procured in the ancillary services markets.
 - Clears ancillary services markets based on the ancillary services bids. Different types of ancillary services are cleared in the sequential order of:
 - Regulation Down
 - Regulation Up
 - Responsive Reserve
 - Non-Spinning Reserve
- [A simultaneous method is expected to be online in 2005.]
- Publishes hourly ancillary services Market Clearing Prices.

The methodology described above is used by ERCOT to complete the day-ahead ancillary services plan by 1:30 PM. As the process moves closer to real-time, changes in both the system and resource plans may require procurement of additional ancillary services to maintain reliability.

Post-1:30 PM ancillary services markets

By 2:30 PM- QSEs submit resource plans, and unit-specific Replacement Reserve bids.

QSEs:

- Submit hourly unit-specific resource plans. Each QSE sends ERCOT the resource plan for each resource that the QSE represents.
- Update hourly portfolio of ancillary services commitments with awards.
- Submit unit-specific Replacement Reserve bids.

ERCOT:

- Validates QSE resource plans and ancillary services commitments against balanced energy schedules. ERCOT verifies that unit schedules can meet QSE energy and ancillary services obligations, and respect the physical and operating limits of all the units.
- Notifies QSE of any discrepancy in total MW values in resource plans and ancillary services commitments from Day-Ahead

balanced schedules. QSEs are allowed to correct these discrepancies.



ERCOT starts to perform security analysis using physical network models and resource plans, for all scheduling intervals in the next calendar day.

To determine the need for Replacement Reserve bids, ERCOT analyzes simultaneously, for each scheduling interval, the capacity inadequacy, CSC, and Operational Constraint problems.

By 6:00 PM: Day-Ahead market operation is complete. ERCOT:

- Completes procurement of Replacement Reserve for those intervals that have capacity inadequacy, CSC, or Operational Constraint problems.
- Publishes hourly Replacement Reserve Market Clearing Price by constraint zones.

Adjustment Period

The Adjustment Period starts after the close of the Day-Ahead Market and ends when the Operating Period begins. During the Adjustment Period, QSEs may adjust their energy and ancillary service schedules as well as update their resource plans. QSEs may also submit, remove or adjust their balancing energy and Replacement Reserve bids during the adjustment period.

ERCOT:

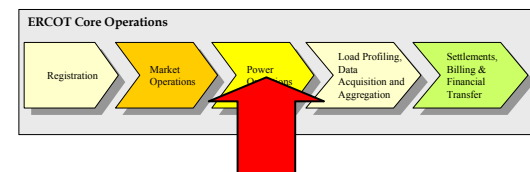
- Verifies that adjusted QSE schedules are balanced and matched.
- May perform physical analysis and purchase additional Replacement Reserve to resolve capacity inadequacy, CSC and Operational Constraint problems.
- May re-open the Ancillary Service market for Regulation-Up and Down, Responsive Reserve, or Non-Spinning Reserve for any future hours when ERCOT judges that additional reserves bids are needed to maintain system security for those hours.

During the Adjustment Period ERCOT relies on the same analytical tools it used for Day-Ahead market activities.

Operating Period

The Operating Period includes the Operating hour and the hour prior to Operating hour. By the end of the adjustment period, ERCOT would have received final bids for up and down balancing energy services. During the Operating Period, ERCOT:

- Performs forecast analysis of physical system security based on energy schedules, previously procured ancillary services, and balancing energy service bids.





- Creates the merit order bid stack for balancing energy for each zone, based on the bids provided.
- Procures balancing energy service to balance resources and loads, and resolve congestion and communicates awarded balancing energy service (BES) megawatt values to QSEs.¹⁰
- Provides real-time information to QSEs about the market-clearing price corresponding to the BES awards.

4D. Power Operations Process

The power operations process runs continuously as power flows, to ensure reliability of the grid. ERCOT:

- Operates the power grid in accordance with market rules.
- Monitors all network generators and bulk transmission line loading and voltage, as well as the current status of all network generators and bulk transmission facilities.
- Manages frequency and system stability through deployment of Regulation, balancing energy or deployment of other ancillary services.

An Energy Management System that is configured for the ERCOT region enables this power operations process.

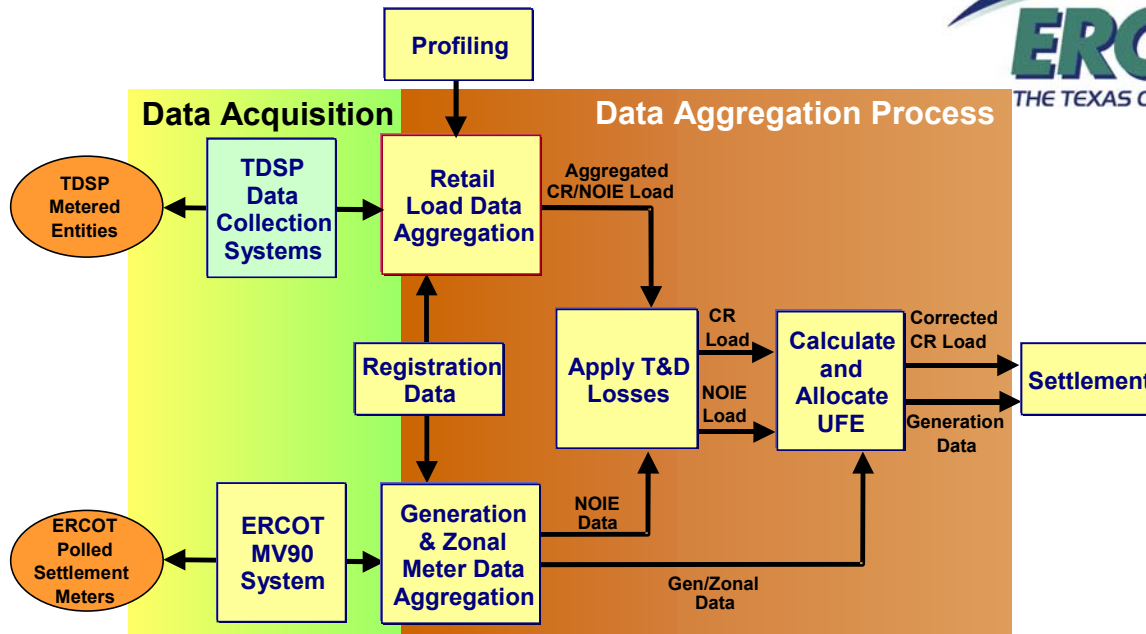
ERCOT performs an analysis of reliability every 2-4 seconds. The Energy Management System is essential for maintaining system reliability, and frequency at 60 Hertz. Deviations from this frequency are detected by the system, which then sends to QSE's deployments for small increases or decreases in generation.

QSE energy management systems are used to control their generation resources as directed by the QSE's resource schedule and by the ERCOT ISO.

The power operations process also includes a series of activities to ensure system reliability in the longer term. ERCOT analyzes the changing energy consumption patterns of the ERCOT region and provides load forecasts years into the future. Market participants and the Public Utility Commission of Texas (PUCT) use this data to evaluate the need for transmission and generation construction projects for additional capacity or relief of transmission constraints.

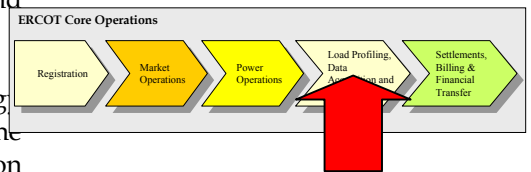
4E. Load Profiling, Data Acquisition, and Data Aggregation Process

¹⁰ ERCOT publishes the Market Clearing Price of Energy (MCPE) approximately 13 minutes prior to the Settlement Interval.



This section introduces load profiling, data acquisition and aggregation.

Data acquisition is the process of receiving and processing energy consumption and production data from TDSPs. It also supports the retrieving, validating, editing and estimating of energy production and consumption data from ERCOT polled settlement meter points. This process provides the necessary meter data for the ERCOT data aggregation process.



Data Aggregation is the process of:

- Receiving, retrieving and estimating energy production and consumption data from all points within ERCOT.
- Grouping the data by responsible entity.
- Applying load profiles, appropriate loss factors and allocation mechanisms (unaccounted for energy, UFE).
- Providing the necessary billing determinants to settle the market for each 15-minute interval on a daily basis.

The centralized aggregation of data by ERCOT has a number of benefits:

- Provides a central data repository that allows for ESI-level validation of data completeness.
- Standardizes methods for estimation, application of profiles and aggregation.
- Facilitates changes to market (e.g. zonal changes, profile methodology, utility unbundling, etc).
- Is consistent with centralized registration and load profiling.



Load Profiling

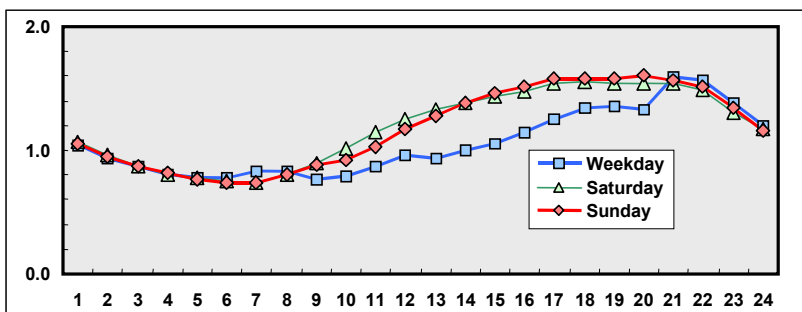
In order for ERCOT to determine the load obligations of each QSE during each 15-minute period of each settlement day, it is necessary to allocate energy consumption data collected from the TDSPs into 15-minute intervals. Interval Data recorders (IDRs), which collect consumption data in 15 minute intervals, are required to be installed at commercial and industrial loads exceeding 1000 kW of demand. Even though IDRs are installed at some utilities below the 1000 kW level, cumulative (non-IDR) meters continue to be used at most residential and small commercial loads due to the higher cost of IDRs. Some loads such as streetlights continue to be un-metered.

Meter data from cumulative meters and estimated consumption from un-metered loads is allocated into 15-minute intervals through the process of Load Profiling. This process uses load profile models or energy consumption patterns to allocate cumulative meter readings into estimated 15-minute consumption values. Load profiles are patterns of energy consumption at various hours of each day that are developed by studying groups of loads with similar consumption patterns

ERCOT develops and maintains load profile models for residential, small commercial and un-metered loads in the ERCOT region. Load research data from utilities was used to create load profile models and identify the profile zones and classes. These profile models are adjusted daily using actual weather and calendar data, for use in the aggregation processes. ERCOT gives market participants a description of the profile models so they can forecast their own loads.

Proper allocation of load obligations at different times during the day using Load Profiling is important to market participants because energy prices are more costly during periods of high demand. Load profiling has been used in many markets to enable the participation of residential and small commercial loads without incurring the higher cost of IDRs. The process of estimating interval consumption data from cumulative meter data through Load Profiling can introduce inaccuracies for premises whose energy consumption patterns may not be adequately represented by the profile models. Competitive Retailers participate in the establishment of load profiles and their assignments.

The load profile curve for a typical residential customer in the ERCOT region for a summer day can look like the next chart.



The horizontal axis indicates the time of day (using a 24-hour clock), in 15-minute settlement intervals. *For illustration purposes the time of day on the chart above is shown in hours only.* The vertical axis represents the kW demand level.

ERCOT uses “static load profile” models like the one above, which are developed for different customer groups, or segments, and weather zones throughout the ERCOT region. The models are called static because they are pre-determined and assigned to groups of loads with similar consumption patterns prior to the day of actual energy consumption. These profiles are based on statistical analysis of consumption information for different customer segments from across the ERCOT region.

A static load profile is adjusted using “actual” weather and calendar data prior to being used in load profiling. For example a holiday requires an adjustment to a profile because consumption patterns are significantly different. The application of a load profile calculation for converting data from a monthly cumulative meter reading to interval data is shown below.

EXAMPLE:

The monthly reading of a residential customer's cumulative meter shows that it consumed 1500 Kilowatt Hours (kWh) during a 30-day period.

From the residential profile type associated with this premise, we find that the energy represented by the load profile in the same 30-day segment is 1000 kWh.

First we will divide the 1500 kWh metered consumption from the premise by the 1000 kWh derived from the class load profile to determine a scaling factor.

$$1500 \text{ kWh} / 1000 \text{ kWh} = 1.5$$

This scaling factor tells us that this premise is estimated to use 1.5 times the energy represented by the class load profile. We can now use this scaling factor to determine the consumption associated with this premise for each settlement interval.

The estimated energy consumption for each interval is then calculated by multiplying the consumption per interval represented by the class load profile, by the calculated scaling factor

For example, if the energy represented by the class load profile for a particular interval, say from 5AM to 5:15AM on a weekday was 0.5 kWh, one can use the adjusted load profile to estimate the customer consumption for that interval to be:

$$(0.5 \text{ kWh average per interval}) \times (1.5 \text{ scaling factor}) = 0.75 \text{ kWh}$$

Data Aggregation

Data aggregation consists of a series of calculations to consolidate estimated and actual load and generation for each 15-minute settlement interval into a series of categories. There are a number of categories into which load and generation are aggregated, the most important being:

- ◆ Physical Interconnectivity to the ERCOT Grid – for aggregation purposes, load and generation are assigned to geographical zones. These zones are primarily used to facilitate the accurate allocation of the costs of congestion and UFE
- ◆ Market participant – load within each zone is aggregated by QSE and LSE, while generation is aggregated by QSE and Resource



Entity. These aggregations provide the data that is required for input to settlement calculations.

Before settlement calculations can be performed, the load has to be adjusted to account for distribution losses, transmission losses and UFE. These adjustments are described in the next two sections.

Losses

Transmission Loss Factors are forecasted by ERCOT, and posted to the market by 06:00AM of the Day-Ahead period. On the day following the Operating Day, ERCOT calculates Transmission Loss Factors for each settlement interval using actual system Load for that Settlement Interval and posts the results to the market and to the ERCOT settlement system.

Similarly, distribution companies (TDSP) furnish distribution loss factors to ERCOT to be applied to load in the TDSP's distribution areas.

For example, if the distribution loss factor is 5%, and the transmission loss factor is 3%, then a Load Serving Entity with total energy consumption in that distribution area of 1MWh will be allocated an aggregated load of 1.0852 MWh, which is derived as follows:

$$1\text{MWh} \times (1/(1-0.05))\text{dist. loss factor} \times (1/(1-0.03))\text{trans. loss factor}$$

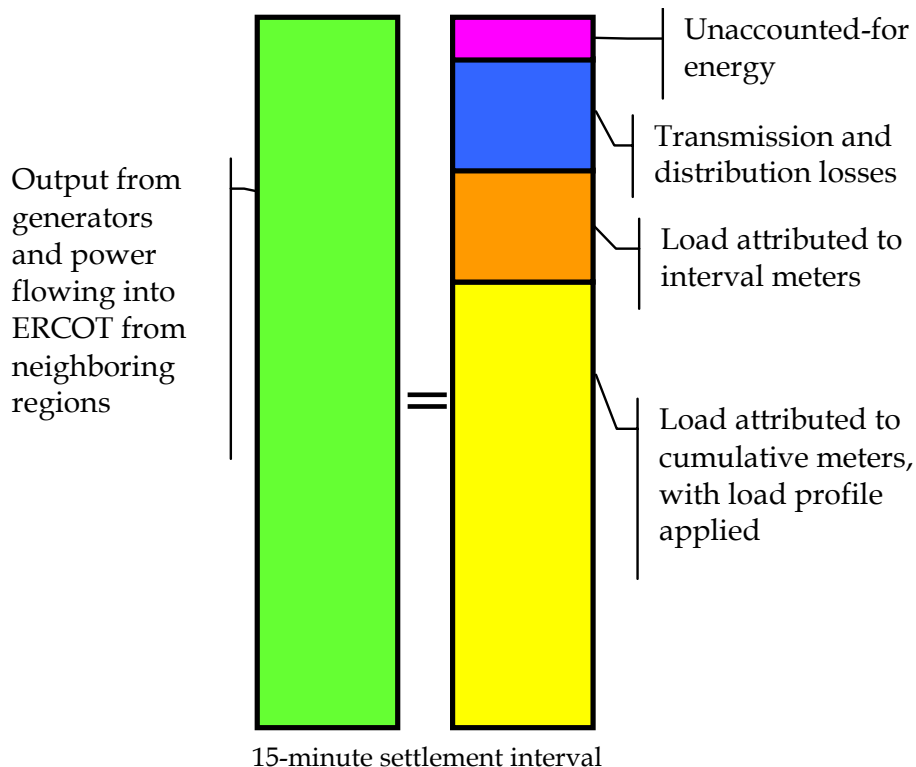
UFE

After allowing for losses, metered resource output in a given interval will not exactly equal metered load, for several reasons including the following:

- (a) Profiles are estimates, and are thus not 100% accurate.
- (b) Meters are not 100% accurate.
- (c) Energy diversion due to theft
- (d) Loss calculations are estimates, and are thus not 100% accurate.

The difference between metered resource output and the aggregated load, derived from the sum of profiled and interval usage, plus transmission and distribution losses is called unaccounted-for-energy or UFE.

As the next diagram shows for each Settlement Interval, metered resource output has to be allocated to an equal amount of load in order to compensate the resources for all the energy injected into the ERCOT grid. Because of the reasons stated above, there will likely always be a certain amount of UFE, which can be described as the difference between metered load and metered generation in a given settlement interval, even after allowing for losses. UFE may be positive or negative based on whether the aggregated load quantity in a given interval, after accounting for losses, is either short of or exceeds the amount of metered resource output in the same interval. ERCOT aims to keep UFE as small as possible by investigating the causes of UFE and recommending remediation measures.



The costs or credits due to UFE are allocated across all loads in ERCOT based on premise type. The ERCOT protocols specify a methodology by which UFE is allocated to Load Serving Entities. The methodology attempts to allocate UFE based on the degree to which the type of premises represented by the LSE may cause UFE. For example, Profiled loads are allocated more UFE than those metered

by Interval Data Recorders (IDRs) since errors in the application of profiles contribute more to UFE. A simplified UFE settlement allocation is shown in the following text box:

Assume that

- Total system output or generation is metered at 10,100 Megawatt Hours (MWh) for a particular interval.
- Total load, including losses, is determined to be 10,000MWh.

Hence UFE is 1% because

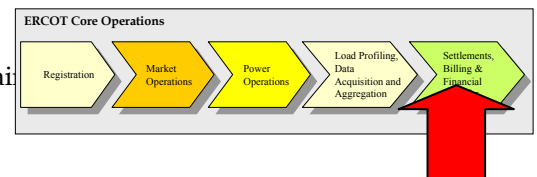
10,100 output - 10,000 consumed or lost = 100MWh, which is 1% of the electricity that was consumed.

In this basic allocation mechanism example, each CR load is thus adjusted upwards by 1% before settlement calculations are performed. The total interval load is therefore made to equal the total interval generation, and the imbalance settlement is revenue neutral for ERCOT.

4F. Settlements, Billing, and Financial Transfer Process

Settlement is the process by which ERCOT:

- Pays QSEs for the market services it purchased to maintain reliability.
- Allocates the cost of these market services out to QSEs.



ERCOT generates a separate settlement every 15-minutes for energy and every hour for capacity. The payments are typically based on the Market Clearing Price of Balancing Energy, or a derived price for each service times the amount of the service procured.

The cost allocation for most of the market services is done by summing all the payments made to providers of that service for the settlement interval. This total cost is then allocated to QSEs in proportion to the amount of the total load obligation they represent. ERCOT thus neither profits nor loses from market activities.

Since the entire meter data that ERCOT needs to perform settlements for a given day is not available until after that day, ERCOT performs a number of settlement runs as follows:

- The initial settlement is run 17 days after the operating day, using estimated meter data when the actual readings are not available.
- The final settlement is run 59 days after the operating day, by which time a significant increase in actual meter readings are available, IDR data in particular.



- A 'resettlement' can occur as needed if disputes or data error results in an impact greater than two-percent (2%) of the ERCOT Operating Day market transaction dollars, excluding bilateral transactions, and as directed by the ERCOT Board of Directors.
- A 'true-up' settlement is run 6 months after the operating day and/or when ERCOT has received and validated at least ninety-nine percent (99%) of the total IDR data and has received, validated at least ninety percent (90%) of the IDR data from each Meter Reading Entity (MRE), and any other criteria directed by the ERCOT Board of Directors. A True-Up Statement will reflect differences to financial records generated on the previous Statement for the given Operating Day.

ERCOT provides invoices to QSEs every seven days, covering settlement payments and charges, which are paid using electronic funds transfer. ERCOT requires payment in full of each Invoice, regardless of any outstanding disputes.

Finally, ERCOT assesses miscellaneous fees on the settlement statement for the service it provides. Examples of administrative fees include the ERCOT Administration Fee and Mismatched Schedule Fees.

Settlement Calculations

While the settlement formulas used in ERCOT are numerous and can be complicated, they can be simplified somewhat for the purposes of this overview.

There are two main types of settlement:

- Imbalance settlement
- Ancillary service settlement

Imbalance Settlement

The imbalance settlement is relatively simple. It applies to both loads and resources. This settlement represents the cost difference between the amount of energy scheduled, and the amount that is actually used or generated. The price applied is the prevailing Market Clearing Price for balancing energy.

If a generator was scheduled to produce 40MWh in a particular interval, and actually produced 35MWh:

The QSE scheduling that generator will be charged for the 5MWh difference, times the Market Clearing Price. The QSE pays that amount to ERCOT.

Similarly if a CR load was scheduled to use 10MWh in an interval and only used 8MWh:

The QSE scheduling that load would be paid the 2MWh difference, times the Market Clearing Price. ERCOT pays that amount to the QSE.

Since the bilateral schedules that ERCOT received were balanced in the first place, the sum of all imbalance charges will net to zero.

Ancillary Service Settlement

For ancillary services settlement, ERCOT treats the payment to providers of the service separately from the charge-back to all QSEs.

Payments to providers of ancillary services

For Regulation, Responsive Reserve, Non-Spinning Reserve and Replacement Reserve, the payment to a QSE providing a service in a given settlement interval is simply the amount of service awarded to the QSE times the Market Clearing Price for that service for the settlement interval.

For example, a QSE that is awarded 200MWh of Responsive Reserve for an interval that has a market-clearing price of \$10/MWh for energy would be paid \$2000 by ERCOT.

Note that the payment is made only for services awarded to the QSE by ERCOT. QSEs are not paid by ERCOT for ancillary services that they are self-providing.

For payment to providers for resolving zonal and local transmission congestion the payment is based on the degree the provider followed the instruction. For zonal instructions the payment is made through the imbalance settlement while for local congestion the payment is made through the specific service determinant (e.g., Out-of Merit Energy, Out-of Merit Capacity, Local Balancing Energy, etc.).

Allocation of the costs of ancillary services

The basic principle behind the allocation of the cost of ancillary services is as follows:



- (a) Total cost to ERCOT of each ancillary service in a given settlement interval is calculated by summing all the costs ERCOT has incurred for that service.
- (b) The price charged by ERCOT is the total costs in (a) above, divided by the quantity procured in the interval.
- (c) The obligation of each QSE for that service is forecasted and published at 6AM in the Day-Ahead period. The forecasted obligation is based on each QSE's Load Ratio Share (percentage share of the total system load) from 21 days prior. This obligation is reduced by any self-arranged ancillary services. A QSE can self-arrange 100% of its forecasted Day-Ahead obligations for Regulation Down, Regulation Up, Responsive Reserve and Non-Spinning Reserve (Group A, discussed later in section 5A) through bilateral transactions or from its own resource.
- (d) During Initial Settlement, the most recent load data available is used to re-calculate the obligation for each service, based on the QSE's Load Ratio Share from the Operating Day.
- (e) The re-calculated obligation for a QSE is netted for self-arranged quantities, and multiplied by the price derived in (b) to obtain the total cost allocation.

Examples of such services allocated as described above are:

1. Regulation Up
2. Regulation Down
3. Responsive Reserve
4. Non-Spinning Reserve

For example, imagine a situation where there are 1000MW of Responsive Reserve required across the whole ERCOT region for a given settlement interval. There are only three QSEs:

- QSE A has an obligation for 500MW, and is awarded 200
- QSE B has an obligation for 300MW, and is awarded 800
- QSE C has an obligation for 200MW, and is awarded 0

The Market Clearing Price is \$10/MW. Assume for simplicity that there is no self-provision. The net allocation from the perspective of each QSE would be as follows:

Obligation	Amount awarded	Clearing price	Payment provision	for Total allocation	Net Allocation
QSE A 500	200	\$10	-\$2,000	\$5,000	\$3,000
QSE B 300	800	\$10	-\$8,000	\$3,000	-\$5,000
QSE C 200	0	\$10	\$0	\$2,000	\$2,000
Total 1000	1000		-\$10,000	\$10,000	\$0



Positive amounts indicate payments from the QSE to ERCOT; negative amounts indicate payments from ERCOT to the QSE. Note that the net allocations sum to zero, which confirms that ERCOT is revenue neutral.

Allocating costs of congestion

The essence of the cost allocation for Replacement Reserve and balancing energy, procured and deployed for managing zonal congestion, is that the costs should be borne by the QSE responsible for the zonal congestion. The approach is:

- (a) Determine a shadow price for the constraint. This is defined as the cost of an operation to effect a one (1) MW change in a transmission constraint.
- (b) Determine a “shift factor” for the constraint. This is the impact on the flow of electricity through the constraint of a 1MW power injection by QSE resources in that congestion zone.
- (c) Calculate the impact of the QSE’s balanced schedules across the congestion zone experiencing the congestion.
- (d) Multiply QSE impact on congestion by the shadow price of capacity or energy, to determine the congestion cost or credit for a QSE.

In the case for local (inter-zonal) transmission congestion the cost of procuring and deploying resources to manage the constraint is allocated to QSEs representing load on a load ratio share of total ERCOT load for each interval affected.

Statements

ERCOT produces daily settlement statements reflecting a breakdown of market charges for hourly and 15-minute interval market services. The statements also reflect administrative and miscellaneous charges.

The Settlement Statement includes:

SUMMARY PAGE

- Type of market service.
- Billable quantity.
- Net amount payable to or receivable from the QSE for each of the services in that operating day after the amounts payable and the amounts receivable have been offset.
- Total charge or credit for the QSE after the amounts payable and the amounts receivable have been offset for all charge types combined.




DETAIL SECTION

- Total net amount payable to or receivable from the statement recipient for each settlement interval.
- Type of market service unit price.
- Summary of charges for each settlement interval over the operating day, including a grand total for the day.

ERCOT uses all available Initial, Final and Resettlement data to produce the True-Up Statement for each statement recipient for the given operating period.

The Summary Settlement Statement is an overview of the total financial position of all charge types and activity of a particular QSE for a given trade day. An example is shown on the next page:

		SETTLEMENT SUMMARY		
Participant Name: XYZ Energy Trading				
Trade Date: 01/01/02				
Statement ID: 01012002-6000000003-1				
Participant ID: 600000003				
Trade Day Information				
Total System Load: 853090.78		Energy Provided: 239,081.88		
Peak Load: 11583.38		Capacity Provided: 9,482.00		
QSE Load: 204000.00		Congestion Information:		
QSE Capacity: 26200.00		Outage Information:		
Ancillary Services				
Resource	Billable Quantity	Billable Load Amount	Billable Quantity	Billable Amount
NON SPIN RESERVE SERVICE PAYMENT TO QSE		NON SPIN RESERVE SERVICE CHARGE		
1 Initial	800.00	(\$6,603.00)	1 Initial	0
Net	800.00	(\$6,603.00)	Net	0
OOM NON SPINNING CAPACITY PAYMENT		REGULATION DOWN SERVICE CHARGE		
1 Initial	0.00	\$0.00	1 Initial	800
Net	0.00	\$0.00	Net	800
OOM REGULATION DOWN CAPACITY PAYMENT		REGULATION UP SERVICE CHARGE		
1 Initial	0.00	\$0.00	1 Initial	2,380.00
Net	0.00	\$0.00	Net	2,380.00
OOM REGULATION UP CAPACITY PAYMENT		RESPONSVE RESRVE SERVICE CHARGE		
1 Initial	0.00	\$0.00	1 Initial	6,360.00
Net	0.00	\$0.00	Net	6,360.00
Imbalance				
LOCAL BALANCING ENERGY DOWN TO PROVIDER		BALANCING ENRGY NEUTRALITY ADJUSTMENT		
1 Initial	75.00	(\$7,800.00)	1 Initial	204,000.00
Net	75.00	(\$7,800.00)	Net	204,000.00
RESOURCE IMBALANCE		LOAD IMBALANCE		
1 Initial	3500.00	\$73,200.00	1 Initial	23,800.00
Net	3500.00	\$73,200.00	Net	23,800.00
OOM ENERGY PAYMENT TO PROVIDER		LOCAL BALANCING ENERGY SERVICE CHARGE		
1 Initial	245.00	(\$6,400.00)	1 Initial	204,000.00
Net	245.00	(\$6,400.00)	Net	204,000.00
UNINSTRUCTED RESOURCE CHARGE		OOM ENERGY CHARGE		
1 Initial	800.00	\$24,000.00	1 Initial	204,000.00
Net	800.00	\$24,000.00	Net	204,000.00
Other				
ERCOT ADMINISTRATION FEE				
1 Initial	204000.00	\$56,300.00		
Net	204000.00	\$56,300.00		
Totals				
Status	Version	Invoice #	Amount	
Initial	1.00		\$731,597.00	
Net Amount Paid (Collected)			\$731,597.00	



5. Key Concepts in Detail

As previous sections have shown, ERCOT performs two very important functions in the competitive market. First, it maintains reliability by constantly monitoring and fine-tuning the system through the use of ancillary services. Second, and no less importantly, ERCOT manages congestion that can occur because there may be insufficient transmission capacity between clusters of customers and generators. This section explains these concepts in greater detail.

5A. Ancillary Services

Ancillary services can be categorized into 4 groups by the nature of the service required, whether the requirement is fixed or variable, and the method by which it is procured.

Group A

There is a predetermined system-wide requirement of Group-A ancillary services to ensure operational reliability. This predetermined system-wide requirement is calculated once a month based on statistical calculations using deployments of these services the previous month and the deployments of the target month of the previous year. For example, for ancillary service requirements for March 2004 the deployments of February 2004 and March 2003 are used.

ERCOT publishes a Day-Ahead requirement for each of these ancillary services and allocates the requirement among all QSEs in the market, based on their historical load share. This is how ERCOT determines each QSE's obligation to either self-provide or provide through the Day-Ahead A/S Market.

QSEs indicate in their balanced schedules the amounts of ancillary services that they intend to self-arrange through their own resources and/or through a bilateral trade. When ERCOT has validated and processed these schedules, the aggregate amount of self-provision is calculated. Hence the remainder, which ERCOT must procure, can be determined. ERCOT notifies the market of this shortfall in ancillary services.

ERCOT then receives bids from QSEs, qualified to provide ancillary services, for one to all four of the services. ERCOT's market operations system "stacks" these bids in merit order and establishes a Market Clearing Price at the bid price of the last bidder needed to purchase the required amount of each ancillary service. The markets for these four services are cleared in order:

1. Regulation Down
2. Regulation Up



3. Responsive Reserve
4. Non-Spinning Reserve

QSEs can submit bids in which the same capacity is offered into more than one of these markets. Capacity which is not selected in a higher order market is then assumed by ERCOT to be available in the next lower order market.

A simultaneous method of awarding ancillary services is expected to be implemented in 2005.

Group B

- Replacement Reserve
- Balancing Energy

Replacement Reserve and Balancing Energy are procured to resolve either, or both, of:

- Capacity inadequacy - Occurs when the sum of QSE-scheduled load is less than the load forecasted by ERCOT.
- Congestion - Occurs when power flows implied by QSE schedules violate transmission system limits.

ERCOT procures Replacement Reserve, if necessary, at the end of the Day-Ahead Period and in the Adjustment Period if required. It procures Balancing Energy from online resources, as needed, approximately 13 minutes prior to Real Time.

ERCOT procures Balancing Energy to minimize the amount of regulation that is required to maintain system balance.

For both Replacement Reserve and Balancing Energy, the essence of the Market Clearing Price calculation is the same:

- The ERCOT market operations system clears bids in order to minimize the total market cost of the Replacement Reserve and Balancing Energy that is required to resolve the capacity inadequacy and congestion problems.
- If Replacement Reserve or Balancing Energy is used to solve zonal congestion, the bids are separated into zones and a separate Market Clearing Price is calculated for each zone.

Group C

- Black Start
- Voltage Support
- Reliability-Must-Run

Black start units are generators that are capable of being started and synchronized without the support of the power grid. They are needed



in the event of widespread power black out. Procurement of Black Start service occurs on an annual basis. Bidders respond to a Black Start request for proposal posted by ERCOT. The bids are evaluated and awarded according to location on the transmission grid and price. The awarded entities then must complete a 12-month contract and complete black start testing prior to the start of the next calendar year. Black start readiness monitored on a daily basis and the payment to the providers is based on the availability of the contracted resources. Black start training is also integrated in the 12 months of period.

Voltage Support is provided by specific units to maintain transmission and distribution voltages on the power grid within acceptable limits. Currently, resource providers are dispatched to provide voltage support via an out-of-merit capacity deployment.

Reliability Must-Run Units are those generators that ERCOT retains to dispatch power for the purpose of voltage support or for stability or reliability, which would otherwise not be an active resource in the ERCOT market. These generators are called on to resolve local system reliability issues due to lack of primary market resources in their area. The RMR resource is contracted either through an action by ERCOT to petition a resource owner of the idle generator or the resource owner petitions ERCOT to consider an idled resource to provide RMR service. The RMR contract is for 12-months with a 90-day notice of termination at which point ERCOT re-assesses the need for the idled resource if required.

Group D

– Out-of Merit Order

ERCOT procures Out-of-Merit order capacity from resources that would otherwise not be selected to operate because of their place in, or absence from, the merit order of bids for ancillary services.

ERCOT deploys Out-of-Merit order energy from resources for resolving congestion, or an emergency when no Market Solution exists. In other words, there are insufficient unaffiliated resources in the area needed to resolve local congestion (within a congestion zone).

Out-Of-Merit Capacity payments are made to providers in predetermined or “generic” dollars per unit based on a proxy of generation technology or resource category. An Example of this is “Gas Steam Supercritical Boiler”, describing what type of generator and how it is being used. If the resource entity determines that the “generic” payment does not recover sufficiently their cost their QSE can submit “verifiable” cost information to ERCOT to replace the “generic” payment in a subsequent settlement. ERCOT analyzes and

approves/denies the “verifiable” cost submittal for completeness and audit ability of supporting data.

Out-of-Merit order Balancing Energy-up and Balancing Energy-down payments to providers also involve the use of “generic” constants.

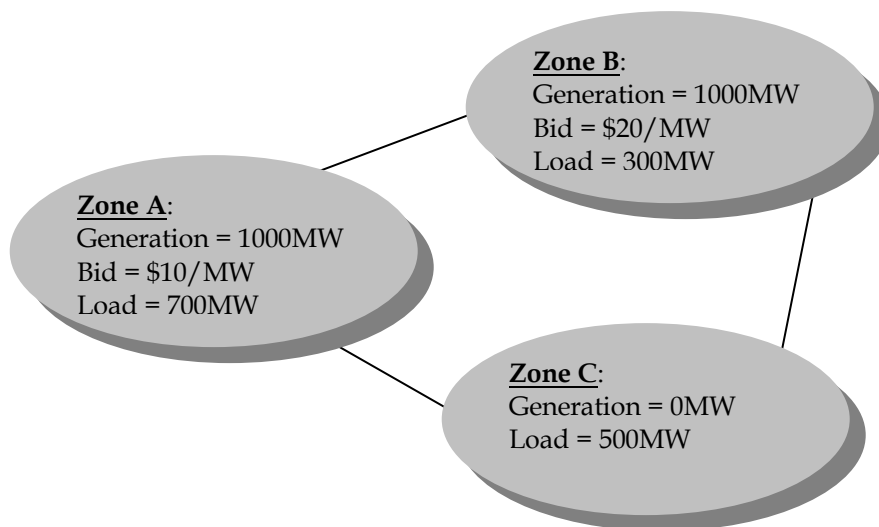
OOM energy up payment is the product of the MW per quarter hour instruction quantity times the difference between the applicable Resource Category Generic Fuel Cost factor for instructed generating unit and the associated interval’s market clearing price for energy.

OOM energy down payment is the inverse of the OOM energy up payment; quantity times the difference between the market clearing price for energy and the Resource Category Generic Fuel Cost factor for instructed generating unit.

5B. Congestion Management

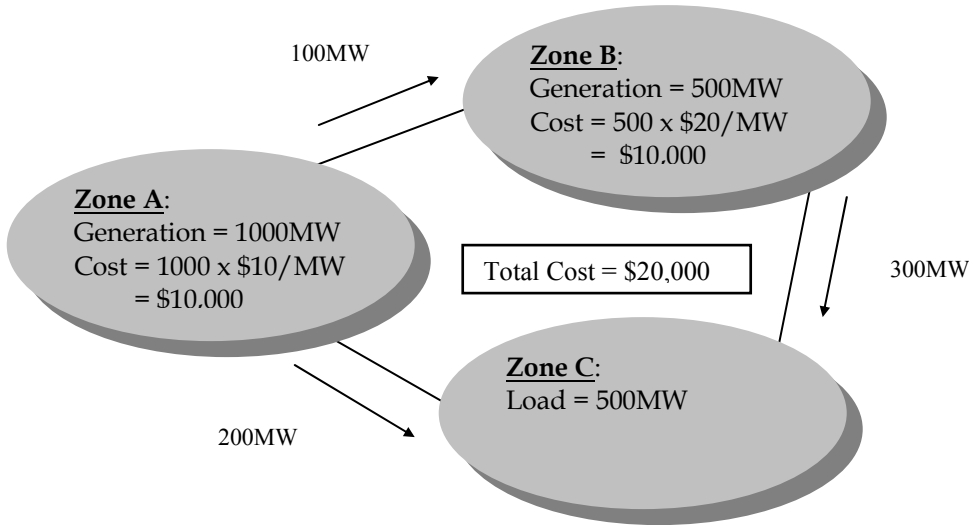
Congestion management begins when the balanced schedules submitted by QSEs are such that safe operating limits on the transmission system are projected to be exceeded in the operating hour. QSEs are notified of this possibility before it happens in case they wish to modify schedules to avoid congestion charges. This later translates into actual measures if this condition persists into real-time. In these circumstances, generators are re-dispatched to meet the forecasted or actual loads, while respecting transmission limits.

Consider the following example of a very simple grid with three zones, a load in each zone, and some generation capacity in two of the three zones:



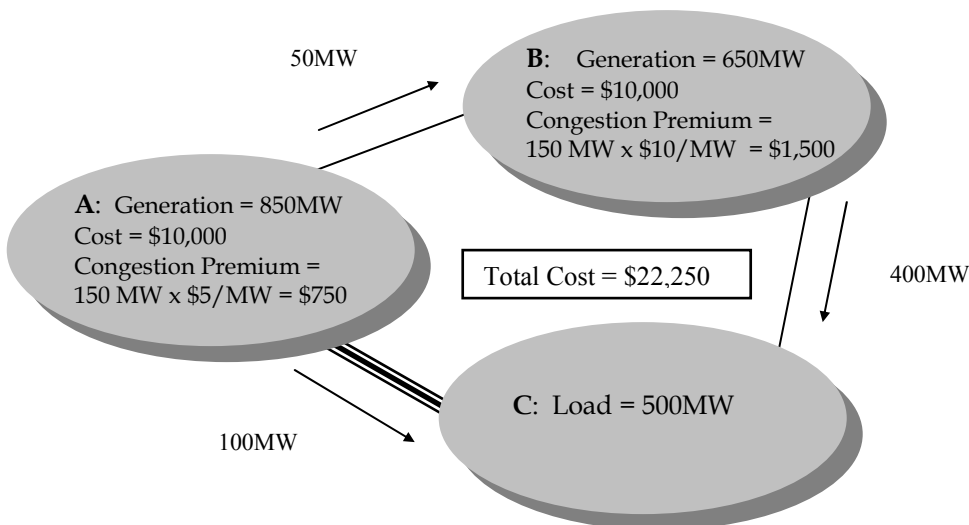
Assume that the characteristics of this grid are such that when power flows out from zone A, the flow along A->C is twice the flow along A->B.

With no constraints on the transmission wires connecting each of the zones, the least cost solution to satisfy the load requirement would be as follows:



Generator A, being the lowest cost, is used to the maximum, and the excess generation, 300MW, flows out from A. As prescribed on the previous page, the flow from A->C is twice that of A->B, hence 200MW flows from A->C and 100 MW from A->B. The total cost to the loads is \$20,000.

Now let's introduce a constraint. Say that the line connecting A->C is only capable of safely handling 100MW. Hence we currently have 100MW of congestion on this line. Now the generators have to be re-dispatched as follows:





Generation at A has to be reduced to respect the 100MW constraint between A and C, and higher cost generation at B is dispatched to make up for the shortfall. The total cost of the generation dispatched is now \$22,250, an increase of \$2,250 over the unconstrained solution.

In practice, what would happen if the above situation were projected to occur by ERCOT in analyzing the Day-Ahead schedules?

First, ERCOT would notify the QSEs and thus give them the opportunity to adjust their schedules to relieve the forecast congestion.

If the adjusted schedules, after analysis, still produce congestion and resource plans reported insufficient resources to be available to manage this congestion, then ERCOT's next recourse is to procure Replacement Reserve – in this case 150MW of such reserve would be procured in zone B. That way, ERCOT knows that there will be sufficient capacity available in zone B and balancing energy bids available to deal with the congestion that has been forecasted.

If the congestion does indeed continue to be predicted as we approach real-time, ERCOT will clear balancing energy bids to relieve the congestion – incremental energy of 150MWh in zone B, and detrimental energy of 150MWh in zone A.

The constraint example can be used to introduce the terms that describe congestion, as it is handled in the ERCOT service area:

The *Congestion Cost* is the incremental cost of the re-dispatch required to resolve the congestion. In the example this cost is \$2,250.

The *Shadow Price* of congestion is the marginal price of the constraint – it indicates the decrease in overall cost if the constraint limit were to increase by 1MW. In the example this is \$15/MW.

The *Shift Factor* describes the impact that a generator in a given zone has on the constraint. These shift factors are expressed as fractions (the ratio of MW impact across the constraint path between zones by the MW change in a specific generators output).

Using these terms, we can describe our situation as follows:

Shift factor (reflecting the impact of generation in zone A on the constraint A->C) = 0.66, since only 66% of the change in generation at A is reflected on the flow between A->C.

Congestion cost = shadow price x amount by which limit is violated =
 $\$15/\text{MW} \times 150\text{MW} = \$2,250$

Hence if the shift factors are known, the shadow prices and the overall congestion clearing prices can be calculated for a given power flow situation.



Congestion Zones

In an actual power flow situation, every combination of a generator and a constraint has its own shift factor, and that shift factor varies according to the power flow in the network.

To simplify congestion management ERCOT defines a reasonably stable Commercial Model, which is a simplified version of the detailed network model of the Grid.

To create the Commercial Model:

- ◆ The constraints that frequently impact the operation of the grid are identified on an annual basis – these are called Commercially Significant Constraints (CSC).
- ◆ Power flow analysis is performed under typical grid conditions to determine the shift factors for these constraints for each transmission bus.
- ◆ Transmission buses are grouped into Congestion Zones in which shift factors are similar relative to all constraints.
- ◆ Zonal Shift Factors are then calculated for these zones as a weighted average of all shift factors in the zone.

This process produces a more manageable number of constraints and shift factors which help market participants understand the way the network is likely to behave and therefore to plan accordingly.

During real-time operations, the actual network model is used to assess security and to manage Operational Constraints. However, the principles described in the previous section are applied in the same way to arrive at congestion costs and clearing prices for capacity and energy to relieve the congestion.

Settlement for Congestion

As discussed earlier in section 4F, the providers of Replacement Reserve are paid the prevailing capacity clearing price times the amount awarded; except for resources used to resolve Operational Constraints (OC), which will receive the "Out-of-Merit" Resource Category Generic Cost payment for the specific resource deployed. Balancing energy services providers are paid zonal prevailing energy clearing prices plus a premium paid or the Resource Category Generic Fuel Cost to the providers of balancing energy services dispatched to resolve OC. Imbalance energy is paid the difference between the scheduled and actual amount times the prevailing energy clearing price.



ERCOT's zonal congestion management assigns the cost directly to the QSEs' whose schedules impact the CSC's. To create a more direct cost allocation for zonal congestion, ERCOT applies two mechanisms at a later date:

- ◆ Zonal cost allocation.
- ◆ Transmission Congestion Rights.

Zonal Congestion Cost Allocation

The formulas used for zonal cost allocation are complex, but the essence of the zonal method is to calculate CSC congestion costs zone by zone for each QSE for a specific CSC as the product of:

$(\text{QSE's "schedules" impact on the CSC}) \times (\text{shadow price for the constraint})$

Hence QSEs with the greatest impact on the constraint, pay the most.

Transmission Congestion Rights (TCR)

Transmission congestion rights are financial instruments that enable QSEs to hedge against the risk of incurring CSC congestion charges. Each MW of transmission capacity on each CSC is equal to 1 TCR for that constraint.

These congestion rights are auctioned to the highest bidder, and are awarded in hourly increments for each month. One annual auction is held for 60% of the TCRs. The remaining 40% of the TCRs are auctioned on a monthly basis. This allows for more current transmission status to be included in determining the total number of TCRs for each CSC. The owner of a TCR can use it to offset the risk of congestion charges for a corresponding constraint, for the period in which the rights are valid.

6. Participant Qualification

This section provides a high level set of requirements for market participant qualification to participate in the ERCOT power market.

More detailed sources for qualification information are the www.ERCOT.com website.

6A. Participant Requirements

For specific requirements and dates each market participant should refer to Section 16 of the ERCOT Protocols and to the ERCOT website for registration materials. Registration requirements and qualification tests listed in this section pertain to interfaces between market participants and ERCOT; and do not include tests that may be

recommended by the Texas SET Test Planning Team to support testing of commercial transactions between TDSPs and CRs.

Please refer to the www.ERCOT.com website for the detailed and current versions of the Market Participant registration and/or qualification forms.



REGISTRATION and QUALIFICATION

Load Serving Entities (LSEs)

Competitive Retailer (CR): Retail Electric Providers (REPs)/Opt-In MOUs /Coops

- LSE Registration
 - Submit Application
 - Designate a QSE
 - Complete requirements of Texas SET and the Texas Test Plan Team (CR/REP)
- Complete PUCT certification (REPs only)
- Execute LSE Agreement
- Receive digital certificate for access to ERCOT Web Portal
- Market Participant training on ERCOT business systems (as needed).
- ERCOT Programmatic Interface functional testing completed (if applicable).

Non Opt-In Entities (NOIEs) (See the other applicable categories for additional requirements)

- LSE Registration.
 - Submit Application
 - Designate a QSE
- Complete NOIE wholesale point registration.
- Execute LSE Agreement.
- Receive digital certificate for access to ERCOT Web Portal.
- Market Participant training on ERCOT business systems (as needed).

Qualified Scheduling Entities (QSEs)

- QSE Registration.
 - Submit Application
 - Submit Service Filings
 - Declare intent to provide ancillary services
 - Complete credit application
 - Post financial security
- Execute the Standard Form QSE Agreement.
- Submit telecommunication requirements survey (WAN users).
- Complete ERCOT WAN Agreement
- Establish and test ERCOT private network access.



- Test real-time data exchange and ability to send/receive control signals (ICCP/RTU).
- ERCOT programmatic interface functional testing.
- Receive digital certificate for access to ERCOT Web Portal.
- Market Participant training on ERCOT business systems (as needed).
- Ancillary service tests.
- Receive notice of qualification.

Resources (Power Generating Companies (PGCs) and Loads Acting as Resources)

- Resource Registration
 - Submit Application
 - Designate a QSE
 - Complete asset registration form
- Execute Resource agreement.
- Register with PUCT.
- Complete control and data interfaces with QSE.
- Market Participant training on ERCOT business systems
- Receive digital certificate for access to ERCOT Web Portal.

Transmission and/or Distribution Service Provider (TDSP) that operates in the ERCOT region

- (If Applicable) Data Conversion of premise, historic, and ongoing retail usage data (ESI-ID) via EDI/XML.
- TDSP Registration
 - Submit Application
 - Register company and users
- Execute TDSP agreement
- Provide annual distribution loss factors or alternate methodology
- Provide annual transmission losses within NOIE ties (NOIEs only).
- Establish and test ERCOT private network access (if applicable)
- Test Transmission SCADA using ICCP or RTU(if applicable)
- ERCOT Programmatic Interface functional testing (if applicable).
- EDI/XML functional certification.
- Receive digital certificate for access to ERCOT Web Portal.
- ERCOT polled settlement metering installation (if applicable)
- Meet mandatory IDR meter installation requirements
- Market Participant training on ERCOT business systems (as required or needed).

TDSP that operates in the Texas competitive retail market, but outside the ERCOT region

- Data Conversion of premise, historic, and ongoing retail usage data (ESI-ID) via EDI/XML (Not required for NOIEs)



- TDSP Registration
 - Submit Application
 - Register company and users
- Execute TDSP agreement
- EDI/XML functional certification
- Receive digital certificate for access to ERCOT Web Portal.
- Market Participant training on ERCOT business systems (as required or needed).

6B. Interfaces

Market participants have specific requirements to interface effectively with ERCOT.

There are 5 main technical interfaces between market participants and ERCOT. In general, most QSEs and Transmission Service Providers interact with ERCOT over a private wide area network. Other market participants perform their market transactions over the internet.

1. Portal – the portal is a browser-based interface which allows both public and private information transfers between ERCOT and participants. However, only active market participants with digital certificates can access the Portal for either public market information or data specific to the market participant.
2. Transaction Clearinghouse – the transaction clearinghouse manages the EDI transactions between ERCOT and participants. The clearinghouse supports commercial transaction management for complex transactions like switches of retail customers between competitive retailers, which require multiple organizations to be involved in the right sequence to execute correctly. The encryption and digital certificate technology provided by ERCOT makes this information transfer secure. The Transaction Clearinghouse will also support the XML implementation of the EDI transactions.

ERCOT acts as the Certificate Authority and generates a digital certificate on behalf of each Market Participant. The Market Participant must be identified uniquely within the ERCOT system. The following information provides the details on validation performed by ERCOT after the decryption process:

The Interchange Sender ID (ISA06) is the only place that ERCOT is not validating DUNS numbers. The ISA06 is the only exception to providing the unique DUNS identification for those that have multiple entities under one DUNS number.

A Market Participant may use one of the either of the following:

- (a) Their entity or Corporate DUNS number, or

- (b) Their entity or Corporate DUNS number plus a suffix of one to four alphanumeric characters



Market Participants are instructed to populate the GS Application Sender's code (GS02) with the Market Participant's official DUNS number and the GS Application Receiver's Code (GS03) with ERCOT's DUNS number. ERCOT validates the GS Application Receiver's Code (GS02) against a trading partner table to ensure the DUNS number exists and that the Market Participant is authorized to send that transaction set. The DUNS number provided in the GS Application Sender Code must be unique.

ERCOT validates all DUNS numbers contained in the N1 Segments in the transactions, not just the DUNS number of the sending party. The sender and receiver DUNS number contained in the N104 (identified by Entity Identifier Code "41" and "40" in the N106) must match the GS Application Sender's/Receiver's code (GS02/GS03)

It is not necessary for the DUNS Number in the GS Sender's Code (GS02) to match the DUNS Number in the ISA06.

3. Application Programmatic Interface (API) – the API is a custom interface developed by ERCOT to support integration between participant systems and ERCOT's systems to reduce the need for manual interaction in this process. This is particularly important for QSE operations in areas like scheduling and bidding where manual interaction could be cumbersome.
4. Real Time Inter Control Center Communications (ICCP) Interface – this is a standard power industry interface supporting automated integration between QSE/TDSP control systems and ERCOT's power control system.
5. Real Time Remote Terminal Unit (RTU) Interface – this interface supports real-time signal transfer between ERCOT and TDSP/QSEs to support dispatch instructions and transmission system management.

A **CR** requires technical interfaces to exchange customer information with ERCOT. Interface requirements:

- Portal via Web Browser Internet Explorer over PGP (data encryption tool).
- EDI/XML via FTP Replacement with data
- EDI/XML via NAESB EDM
- Programmatic Interface via HTTPS (optional).
- Private Wide Area Network Access (optional)

At a minimum, a **QSE** needs secure access to the Web Portal to process settlement statements and invoices and download extracts. It



may also be used to access the market operation functions such as scheduling and bidding. The portal and the Programmatic Interface give access to specific QSE information, including selected bids, generation outage schedules, as well as market data. QSEs that represent resources also need ICCP/RTU for real-time signal communication with ERCOT. Interface requirements:

- Web browser Internet Explorer.
- Internet.
- Web Portal (digital certificate) for processing of settlement invoices and data extracts.
- Programmatic Interface for market operation functions.
- Private Wide Area Network Access (required for QSEs with dispatchable resources).
- ICCP/RTU (required for QSEs with dispatchable resources).

A **TDSP** needs to use ICCP/RTU to transmit and receive real-time signals if it operates a transmission network. Distribution Service Providers also require the Transaction Clearinghouse access to send ESI ID maintenance, consumption, and switch responses. Interface requirements:

- Web browser Internet Explorer.
- Internet.
- Private Network Access (Required for Transmission Service Providers).
- EDI/XML via FTP Replacement for commercial operations such as meter reads.
- EDI/XML via NASEB EDM for commercial operations such as meter reads
- Programmatic Interface (recommended).
- ICCP/RTU (Required for Transmission Service Providers).

A Basic **Non Opt-In Entity** (without transmission) interacts with ERCOT via the QSE. It may access its data extracts from the ERCOT data archive via the portal. Interface requirement:

- Web browser Internet Explorer.
- Internet.

A **Resource** interacts with ERCOT via a QSE. It needs portal access for general market information and data from the ERCOT data archive. Interface requirement:

- Web browser Internet Explorer.
- Internet.
- ICCP/RTU interface with QSE

The **PUCT** needs to interface with ERCOT to extract market data for oversight function. Interface requirement:

- Web browser Internet Explorer.
- Internet.



6C. Education

Market participant education is offered via classroom sessions. A Training site on the www.ERCOT.com website provides access to currently scheduled classes.

Education covers:

- ERCOT grid operations, market operations, metering and data aggregation, settlement, registration, and market monitoring functions.
- ERCOT portal, learning to perform key market participant activities.

ERCOT strives to provide education courses quarterly in the primary subject areas. Market participants are also encouraged to request education as needed.

ERCOT education includes:

- Registration and Web Portal Functions
- Settlements and Billing
- Metering, Data Acquisition, Data Aggregation, and Load Profiling
- Systems Operations
- Market Operations System Interface

Glossary [excerpt from Protocol Section 2]

A

Adjusted Metered Load

Retail Load usage data that has been adjusted for UFE and transmission and/or distribution losses.

Adjustment Period

The Adjustment Period for any given Operating Hour is the time period following the close of the Day-Ahead market and extending up to each Operating Period.

Affiliate

An Entity who directly or indirectly owns or holds at least five percent of the voting securities of another Entity; or

An Entity in a chain of successive ownership of at least five percent of the voting securities of another Entity; or

An Entity that has at least five percent of its voting securities owned or controlled, directly or indirectly, by another Entity; or

An Entity that has at least five percent of its voting securities owned or controlled, directly or indirectly, by an Entity who directly or indirectly owns or controls at least five percent of the voting securities of another Entity or an Entity in a chain of successive ownership of at least five percent of the voting securities of another Entity; or

A person who is an officer or director of another entity or of a corporation in a chain of successive ownership of at least five percent of the voting securities of an Entity; or

An Entity that actually exercises substantial influence or control over the policies and actions of another Entity; or

Any other Entity determined by the PUCT to be an Affiliate;

Aggregated Retail Load Data

Adjusted Metered Load that has been aggregated as defined in Section 11.4.1, Aggregate Retail Load Data.

Aggregated Unit

A single plant or facility containing two or more individual generation units that require tandem operation for optimal performance (e.g. a combined cycle plant) which ERCOT has agreed to treat as a single unit for settlement purposes only as set forth in Protocols Section 6.8.2.4, Aggregating Units.

Agreement

Standard form Agreement executed between ERCOT and Market Participants.



Ancillary Services

Those services, described in Section 6, necessary to support the transmission of energy from Resources to Loads while maintaining reliable operation of transmission provider's transmission systems in accordance with Good Utility Practice.

Ancillary Service Obligations

See Obligations

Ancillary Services Plan

ERCOT produced plan, as described in Section 6, Ancillary Services, that identifies the types and amount of Ancillary Services necessary for each hour of the next day, or next two (2) days, to operate the ERCOT Transmission Grid reliably in accordance with Operating Guides, and which includes the allocation of types and amounts of the Ancillary Services Obligations for each QSE.

Annual Transmission Planning Report

A report prepared at least annually by ERCOT, as required by the PUCT rules, regarding the status of the ERCOT System including identification of ERCOT System existing and potential Congestion, which includes identification of current and recommended construction of Transmission Facilities.

Automatic Voltage Regulator

A device used on Generation Resources to automatically maintain a voltage set point.

Availability Plan

An hourly representation of availability of RMR, Synchronous Condenser and/or Black Start Resources submitted to ERCOT by Entities with RMR, Synchronous Condenser and/or Black Start Resources by 0600 in the Day Ahead Period.

Average Daily Usage

The ratio of the total consumption divided by the number of days the consumption covered. (ADU = Monthly kWh/# of days).

B

Balanced Schedule

An Energy and Ancillary Service schedule submitted to ERCOT by a Qualified Scheduling Entity that consists of projected interval Obligations and projected interval Supply, and that includes Qualified Scheduling Entity Obligations for Transmission and Distribution Losses. A Balanced Schedule must have projected aggregate Supply equal to projected aggregate Obligations, by Settlement Interval.

Balancing Energy

Balancing Energy represents the change in zonal energy output or demand determined by ERCOT to be needed to ensure secure operation

of ERCOT Transmission Grid, and supplied by the ERCOT through deployment of bid Resources to meet Load variations not covered by Regulation Service.



Bid Stack

Bids received for Ancillary Services organized from lowest price to highest price bid for the same service and time interval.

Black Start Service

A contracted Ancillary Service acquired by ERCOT for the benefit of all Loads, provided by Resource capable of starting without support of the ERCOT Transmission Grid.

Black Start Resource

A single Resource capable of providing Black Start Service.

Business Day

Monday through Friday, excluding observed holidays listed below:

New Year's Day

Memorial Day

Independence Day

Labor Day

Thanksgiving Thursday and Friday

2 days at Christmas, as designated by the ERCOT CEO

Business Hours

8:00 A.M. to 5:00 P.M. Central Prevailing Time on Business Days.

C

Central Prevailing Time

Either Central Standard Time or Central daylight time as established by national time standards.

Check Meter

A redundant revenue quality meter, which produces equal or better accuracy than the primary revenue quality meter, connected at the same metering point, which must be certified in accordance with the ERCOT Protocols.

Closely Related Elements (CREs)

Those transmission facilities that have shift factor impacts similar to those associated with a particular Commercially Significant Constraint (CSC), and for which there exists a limited amount of Boundary Generation Resources between it and the particular CSC, so that the zonal deployment of Balancing Energy Service is effective in mitigating Zonal Congestion.

**Commercial Model**

Transmission model developed by ERCOT that arranges groups of Generation Resource and Load busses into Congestion Zones that have similar impacts on Commercially Significant Constraints.

Commercially Significant Constraint (CSC)

A constraint in the ERCOT Transmission Grid that is found, through the process described in Section 7, to result in Congestion which limits the free flow of energy within the ERCOT market to a commercially significant degree.

Commercially Significant Constraint (CSC) Limit

The maximum power flow across a CSC allowed to maintain reliable operation.

Competitive Retailer (CR)

Municipally Owned Utility or an Electric Cooperative that offers Customer Choice and sells electric energy at retail in the restructured electric power market in Texas; or a Retail Electric Provider (REP) as defined in 25.5 of the PUCT Substantive rules.

Congestion

The situation that exists when requests for power transfers across a Transmission Facility element or set of elements, when netted, exceed the transfer capability of such elements.

Congestion Zone

A grouping of busses that create a similar Shift Factor on CSCs.

Control Area

An electrical system, bound by interconnect (tie line) metering and telemetry, which continuously regulates, through automatic Resource control, its Resource(s) and interchange schedules to match its system Load, regulates frequency, and meets all applicable Control Area requirements.

Control Area Operator

An individual or set of individuals responsible for monitoring and control operation of the Control Area.

Current System Conditions

The Real-Time status of the ERCOT System, which may affect ERCOT's operational decisions.

Customer

An Entity that purchases electricity for its own consumption.

Customer Choice

The freedom of a retail Customer to purchase electric services, either individually or on an aggregated basis with other retail Customers, from the provider or providers of the Customer's choice and to choose among

various fuel types, energy efficiency programs, and renewable power suppliers.



Customer Premise

See Premise.

Customer Registration Database

The database maintained by the Registration Agent containing information identifying each Premise, including current and previous Competitive Retailers serving the Premise.

D

Data Aggregation

The process of netting, grouping and summing Load consumption data, applying appropriate profiles, Transmission Loss Factors, and Distribution Loss Factors and calculating and allocating UFE to determine each QSE and/or Load Serving Entities responsibility by Settlement Interval by Congestion Zone and by other prescribed aggregation determinants.

Data Aggregation System

The database and communication system that will collect meter data from TDSPs and directly polled meters in ERCOT. The system will perform aggregation functions to the Load data in order to satisfy certain objectives such as providing TDSPs with Load share data to use in billing Competitive Retailers, assigning QSE Load responsibility, and assisting Competitive Retailers and QSEs in their settlement responsibilities. The data will also be compiled along Congestion and weather zones.

Data Archive

An integrated normalized data structure of all the target source systems' transactions. The population of the data archive will be an extraction of data from the transaction systems without transforming the data. The Data Archive will be used to populate the Data Warehouse.

Data Warehouse

De-normalized data stored in a schema, physically optimized to handle high volumes of data and concurrent user access, and is generally lightly indexed.

Day Ahead

The twenty-four hour period prior to the beginning of the Operating Day.

**Delivery Plan**

A plan by ERCOT containing the hours and levels of operation that an RMR Unit, including Synchronous Condenser Unit, is instructed to operate.

Demand

Instantaneous or integrated power consumption

Direct Current Tie, DC Tie

Any non-synchronous transmission interconnections between ERCOT and non-ERCOT electric power systems.

Direct Load Control

Controlling select end-use equipment (e.g. A/C, water heaters) for purposes of reducing or increasing energy consumption during select periods.

Dispatch

The act of issuing Dispatch Instructions.

Dispatch Instruction(s)

Specific command(s) issued by ERCOT to QSEs or TDSPs during the course of operating the ERCOT System.

Distribution Losses

The difference between the energy delivered to the Distribution System and the energy consumed by Loads connected to the Distribution System.

Distribution Loss Factor

The ratio of the Distribution Service Provider's estimated Distribution Losses to the total amount of energy deemed consumed (IDR plus profiled consumption) on the Distribution Service Provider's system.

Distribution Service Provider

An Entity that owns and maintains a Distribution System for the delivery of energy from the ERCOT Transmission Grid to the Customer.

Distribution System

That portion of an electric delivery system operating at under 60 kilovolts (kV) that provides electric service to Customers or Wholesale Customers.

DUNS Number

A unique nine-digit common company identifier used in electronic commerce transactions.

E



Electric Cooperative

A corporation organized under Chapter 161, Texas Utilities Code, or a predecessor statute to Chapter 161 and operating under that chapter;

A corporation organized as an electric cooperative in a state other than Texas that has obtained a certificate of authority to conduct affairs in the State of Texas; or

A successor to an electronic cooperative created before June 1, 1999, in accordance with a conversion plan approved by a vote of the members of the electric cooperative, regardless of whether the successor later purchases, acquires, merges with, or consolidates with other electric cooperatives.

Electric Reliability Council of Texas, Inc. (ERCOT)

A Texas nonprofit corporation that has been certified by the PUCT as the Independent Organization, as defined in §39.151 of PURA, for the ERCOT Region.

Electric Service Identifier (ESI ID)

The basic identifier assigned to each Service Delivery Point used in the registration and settlement systems managed by ERCOT or another Independent Organization

Eligible Transmission Service Customer

A Transmission and/or Distribution Service Provider (for all uses of its Transmission System) or any electric utility, municipally owned utility, Electric Cooperative, Power Generation Company, Competitive Retailer, Retail Electric Provider, federal power marketing agency, exempt wholesale generator, qualifying facility, power marketer, or other person whom the Public Utility Commission of Texas has determined to be an Eligible Transmission Service Customer.

Emergency Electric Curtailment Plan

A plan which provides an orderly, predetermined procedure for maximizing use of available Resources and, only if necessary, curtailing demand during electric system emergencies while providing for the maximum possible continuity of service and maintaining the integrity of the ERCOT System.

Emergency Short Supply

The condition wherein ERCOT experiences an insufficient amount of bids in any Ancillary Services market, as described in Section 6.

Engineering Studies

Studies performed by ERCOT for the purpose of studying, evaluating, or planning of the ERCOT System.

**Entity**

Any natural person, partnership, municipal corporation, cooperative corporation, association, governmental subdivision, or public or private organization.

ERCOT Board

The Board of Directors of the Electric Reliability Council of Texas.

ERCOT CEO

ERCOT Chief Executive Officer

ERCOT Member

Any member of ERCOT that is a member in good standing in accordance with the ERCOT Bylaws.

ERCOT Metered Entity

Any one of the following entities that meets the requirements of Section 10.2.3, ERCOT Polled Settlement Meters:

Any Generation connected directly to the transmission system;

Any Generation equal to or over 10MW;

Any Generation participating in any ancillary service market;

Non-opt-in Cooperatives and Municipality points of delivery over 10MW; or

Direct-Current ties (or interchanges with other control areas outside of ERCOT).

Additionally ERCOT will directly poll any generator or non-opt-in utility metering point at the request of the entity if the entity meets all requirements and certifications associated with EPS metering.

ERCOT Polled Settlement (EPS) Meter

Any meter polled by ERCOT as defined in Section 10 for use in the financial settlement of the Market.

ERCOT Region

The geographic area under the jurisdiction of the PUCT that is served by TDSPs that are not synchronously interconnected with electric utilities outside the state of Texas.

ERCOT Service Fee Schedule

Schedule of fees charged by ERCOT for various services provided to designated Entities, in accordance with these Protocols and/or as approved by the ERCOT Board, and as posted on the MIS.

ERCOT System

The interconnected combination of generation, transmission, and distribution components in the ERCOT Region.

ERCOT System Load

The sum of all HVDC interconnections and Generation Resources metered at the point of its interconnection with the ERCOT System at any given point in time.



ERCOT Transmission Grid

All of those Transmission Facilities which are within the ERCOT Region.

F

Facilities

Equipment situated for the purpose of conducting service and/or business through use of the ERCOT System

Final Day-Ahead Schedule

Those schedules ERCOT deems valid following the close of the Day Ahead period.

Fuel Index Price

The FIP is the Midpoint price expressed in \$/MMBTU, published in Gas Daily, in the Daily Price Survey, under the heading "East-Houston-Katy, Houston Ship Channel" for the day of OOME deployment. The FIP for Saturdays, Sundays, holidays and other days for which there is no FIP published in Gas Daily, shall be the next published FIP after the day of OOME deployment. In the event that the FIP is not published for more than two (2) days, the previous day published FIP will be used for initial settlement and the next day published FIP will be used for true up of the final settlement statement.

Fuel Index

An electronically-published index that reflects the price of fuel as determined by a fuel industry organization using available market information.

G

Generation Entity

Owner or controller of a Generation Resource used for generating electricity and electrically connected to the ERCOT System.

Generation Resources

Facilities that produce energy and that are owned or operated by a Generation Entity.

Good Utility Practice

Any of the practices, methods, and acts engaged in or approved by a significant portion of the electric industry during the relevant time period, or any of the practices, methods, and acts that, in the exercise of reasonable judgment in light of the facts known at the time the decision was made, could have been expected to accomplish the desired result at a reasonable cost consistent with good business practices, reliability, safety, and expedition. Good utility practice is not intended to be limited

to the optimum practice, method, or act, to the exclusion of all others, but rather is intended to include acceptable practices, methods, and acts generally accepted in the region.



Governmental Authority

Any Federal, state, local or municipal body having jurisdiction over a Market Participant or ERCOT; provided, however, a Governmental Authority who is also a Market Participant shall not exercise its jurisdiction in any matter that involves the interests of that Market Participant where that matter also involves the interests or responsibilities of any other Market Participant or ERCOT, unless the matter is one in which the Market Participant has exclusive jurisdiction.

Gross Generation

The generated output power at the terminals of the generator.

H

High Operating Limit

The maximum net dependable capability of a Resource that may be delivered for a period of up to one hour.

High Sustainable Limit

The maximum net capability of a Resource that may be delivered for an indefinite period.

I

IDR Data Threshold

The percentage of IDR data by MRE that must be available before ERCOT will calculate a True-Up Settlement as set forth in Protocols Section 9.2.6, True-Up Statement.

IDR Requirement

The kW level at which the installation of interval data recorders are required for settlement purposes as set forth in Protocols Section 18.6.1, Interval Data Recorder Installation and Use in Settlement.

Inter-QSE Trade

Any Energy and Ancillary Services scheduled to or from other QSEs or ERCOT.

Interconnection Agreement

An agreement that sets forth requirements for physical connection between an Eligible Transmission Service Customer and Transmission and/or Distribution Service Providers.

Interval Data Recorder (IDR)

Metering Device that is capable of recording Load usage in each Settlement Interval in accordance with Section 9, Settlement and Section 10, Metering.

**Invoice****Settlement Invoice**

A notice for payment or credit due rendered by ERCOT based on data contained in Initial, Final, True-Up or any Resettlement Statements.

TCR Invoice

An invoice issued to a successful bidder based on a final round of a TCR auction.

Invoice Recipient

Market Participants that receive an Invoice from ERCOT.

J

K

L

Late Payment

Payments due to ERCOT by Invoice Recipients that are not received by the due date and time.

Load

The amount of electric power delivered at any specified point or points on a system.

Load Profile

A representation of the energy usage of a group of Customers, showing the demand variation on an hourly or sub-hourly basis.

Load Profile Type

A classification of a group of Customers having similar energy usage patterns and that are assigned the same Load Profile

Load Profiling

The set of processes used for the development and creation of Load Profiles. .

Load Profiling Methodology

The fundamental basis on which Load Profiles are created. The implementation of a Load Profiling Methodology may require statistical sampling, engineering methods, econometric modeling, or other approaches.

Load Ratio Share

A QSE's ratio of Adjusted Metered Load to total ERCOT Adjusted Metered Load related to the appropriate interval.

Load Serving Entity

An Entity that provides electric service to Customers and Wholesale Customers. Load Serving Entities include Retail Electric Providers, Competitive Retailers, and Non-Opt In Entities that serve Load.



Local Congestion

Any Congestion that cannot be resolved by deployment of Balancing Energy Service by Congestion Zone. Local Congestion will include those actions, and related costs, associated with mitigating overloads on CSCs or CREs beyond that which can be accomplished by the zonal deployment of BES.

Location Code

The code representing the physical location of a Premise.

Low Operating Limit

The minimum net capability of a Resource that may be delivered for a period of up to one hour.

Low Sustainable Limit

The minimum net capability of a Resource that may be delivered for an indefinite period.

M

Market Clearing Price for Capacity

The highest price associated with a Congestion Zone for a Settlement Interval for Ancillary Service capacity awarded in each Ancillary Services capacity procurement run by ERCOT. There will be a separate Market Clearing Price for Capacity for each Ancillary Services capacity market.

Market Clearing Price for Energy

The highest price associated with a Congestion Zone for a Settlement Interval for Balancing Energy deployed during the Settlement Interval.

Market Information System (MIS)

An electronic communications interface established and maintained by ERCOT that provides a communications link to Market Participants, including secure access by and communications to individual Market Participants regarding information linked to each individual Market Participant.

Market Participant

An Entity that engages in any activity that is in whole or in part the subject of these Protocols, regardless of whether such Entity has executed an Agreement with ERCOT.

Market Segment

The Segments defined in Article 2 of the ERCOT Bylaws. The segments are:



Independent REPs,
Independent Generators,
Independent Power Marketers,
Investor Owned Utilities,
Municipals,
Cooperatives, and
Consumers.

Market Solution

A Market Solution exists when at least three unaffiliated Resources, with capacity available, submit bids to ERCOT that can solve a circumstance of local Congestion and no one bidder is essential to solving the Congestion.

Mass Drop

The immediate cessation of service by a CR to all ESI IDs served by the CR.

Merit Order

The ranking of Resources as a direct function of the monetary bid from those resources.

Messaging System

The ERCOT-to-QSE communications system used to send Real-Time notices and Dispatch Instructions to the QSEs.

Meter Data Acquisition System

The system to obtain revenue quality meter data from ERCOT Polled Settlement meters and Settlement Quality Meter Data from the TDSP for settlement and to populate the Meter Data Aggregation System and ERCOT Data Archive.

Meter Reading Entity (MRE)

An Entity that is responsible for providing ERCOT with ESI ID level consumption data as defined in Texas SET and Protocols Section 19. This Entity must be a TDSP that is registered with ERCOT as prescribed in Protocols Section 10. In the case of an ERCOT Polled Settlement (EPS) Meter or ERCOT populated ESI ID data (such as generation site load), ERCOT will be identified as the MRE in ERCOT systems.

Metering Facilities

Revenue Quality Meters, instrument transformers, secondary circuitry, secondary devices, meter data servers, related communication Facilities and other related local equipment intended to supply ERCOT settlement quality data

Mismatched Schedule Processing Fee

The fee charged to a QSE that fails to correct a mismatched schedule in a timely manner.



Municipally Owned Utility

A utility owned, operated, and controlled by a municipality or by a nonprofit corporation, the directors of which are appointed by one or more municipalities.

N

Net Dependable Capability

Maximum sustainable capability of a Generation Resource as demonstrated by performance testing.

Net Generation

Gross generation minus station auxiliaries or other internal unit power requirements metered at or adjusted to the point of interconnection at the Common Switchyard.

New Renewable Facilities

Renewable energy generators placed in service on or after September 1, 1999. A New Facility includes the incremental capacity and associated energy from an existing Renewable Facility through repowering activities undertaken on or after September 1, 1999.

Non-Metered Load

Load that is not required to be metered by applicable distribution or transmission tariff.

Non-Opt In Entity (NOIE)

An Electric Cooperative or Municipally Owned Utility that does not offer Customer Choice.

Non-Spinning Reserve Service (NSRS)

A service that is provided through utilization of the portion of off-line generation capacity capable of being synchronized and ramped to a specified output level within thirty (30) minutes (or Load that is capable of being interrupted within thirty (30) minutes) and that is capable of running (or being interrupted) at a specified output level for at least one (1) hour. Non-Spinning Reserve Service (NSRS) may also be provided from unloaded on-line capacity that meets the above response requirements and that is not participating in any other activity, including ERCOT markets, self-generation and other energy transactions.

O

Obligation

Total Obligations scheduled by a QSE that are comprised of energy Obligations and Ancillary Services Obligations where:

Energy Obligations =

Load + losses + energy sales + energy exports; and



Ancillary Services Obligations =

ERCOT allocated Ancillary Services Obligations (which may be self-arranged) + Ancillary Services sales (to ERCOT or to other QSEs)

On-line

Resources that are synchronously interconnected to the ERCOT System.

Operating Day

The actual day, including hours ending 0100 to 2400, during which energy is flowing.

Operating Guides

Guidelines approved by the ERCOT Board describing the reliability standards for ERCOT.

Operating Hour

The current clock hour.

Operating Period

A two-hour period comprised of the Operating Hour and the hour preceding the Operating Hour.

Operating Plan

A plan developed by ERCOT to operate the ERCOT System in Real Time.

Operational Constraint

Anticipated or actual security violation or overload of a transmission element, based on actual network topology.

Operational Model

The transmission model based on actual network topology of the ERCOT System.

Out of Merit Order (OOM)

The selection of Resources for Ancillary Services that would otherwise not be selected to operate because of their place (or absence) in the bidding process for that service.

Outage

Removal of a Facility from service to perform maintenance, construction or repair on the Facility for a specified duration.

Forced Outage

A component failure or other condition that requires that the equipment be removed from service immediately or up to and including the next weekend.

Maintenance Outage

Removing Transmission Facility or Resource Facility equipment from service to perform work on specific Facility components that could be postponed past the very next weekend. Such work is required to prevent

a potential Forced Outage and that could not be postponed until the next Planned Outage.

Planned Outage

Any major or minor Transmission Facility or Resource Facility equipment maintenance that is planned and scheduled in advance as submitted to ERCOT.

Out of Merit Capacity

Capacity provided by a Resource selected by ERCOT outside the bidding process to resolve a reliability or security event when no Market Solution exists.

Out of Merit Energy

Energy provided by a Resource selected by ERCOT outside the bidding process to resolve a reliability or security event when no Market Solution exists.

P

Postage Stamp Allocation

The pro rata allocation of charges (or payments), which spreads to designated, Entities based on a pro rata share (of actual or estimated consumption).

Power Generation Company

An Entity registered by the PUCT that: (1) generates electricity that is intended to be sold at wholesale; (2) does not own a transmission or distribution Facility in this state other than an essential interconnecting Facility, a Facility not dedicated to public use, or a Facility otherwise excluded from the PURA definition of “electric utility”; and (3) does not have a certificated service area, although its affiliated electric utility or transmission and distribution utility may have a certificated service area.

Power Marketer

An Entity that:

Becomes an owner or controller of electric energy in this state for the purpose of buying and selling the electric energy at wholesale;

Does not own generation, transmission, or distribution Facilities in this state;

Does not have a certificated service area; and

Has been granted authority by the Federal Energy Regulatory Commission to sell electric energy at market-based rates or has registered as a power marketer.

Pre-assigned Congestion Rights (PCRs)

Congestion Rights allocated prior to the annual TCR auctions to MOUs and ECs which own or have a long-term (greater than five years)



contractual commitments, entered into prior to September 1, 1999, for annual capacity and energy from a specific remote Generation Resource.



Premise

A Service Delivery Point or combination of Service Delivery Points that are assigned a single Electric Service Identifier (ESI ID) for purposes of settlement and registration.

Price-to-Beat

The bundled rate a Retail Electric Provider that is affiliated with an Entity required to unbundle its electric services, and offer Customer Choice, must charge to residential and small commercial Customers upon initiation of Customer Choice, as further described in Section 39.202 of PURA and PUCT rules.

Primary Meter

The ERCOT approved, revenue-quality meter connected at an ERCOT approved interconnection point.

Prior Agreement

Any previous agreement between an Entity, its Affiliate(s) or its predecessor(s) in interest and ERCOT regarding performance under the ERCOT Protocols.

Proposal for Installation

A written proposal submitted by an Entity to ERCOT describing a proposal for the installation of additional Metering Facilities.

Proprietary Customer Information

Any information compiled by a Market Participant on a Customer in the normal course of Market Participant's business that makes possible the identification of any individual Customer by matching such information with the Customer's name, address, account number, type of classification service, historical electricity usage, expected patterns of use, types of Facilities used in providing service, individual contract terms and conditions, price, current charges, billing records, or any other information that a Customer has expressly requested not be disclosed. Information that is redacted or organized in such a way as to make it impossible to identify the Customer to whom the information relates does not constitute Proprietary Customer Information.

Protected Information

That information protected from disclosure as described in Section 1, Overview.

Protocol Implementation Plan

Plan developed by ERCOT that identifies any known differences between the ERCOT market operations system, power operations system, and settlement systems and these Protocols, and specifies a plan to conform such systems to these Protocols.

Provider of Last Resort (POLR)

The designated Competitive Retailer as defined in the PUCT Substantive Rules for default Customer service, and as further described in Section 15.1, Customer Switch of Competitive Retailer.



Q

QSE Operator

The person designated by the QSE to communicate with ERCOT on a 24-hour basis.

Qualified Scheduling Entity

A Market Participant that is qualified by ERCOT in accordance with Section 16, Registration and Qualification of Market Participants, to submit Balanced Schedules and Ancillary Services bids and settle payments with ERCOT.

Qualifying Facility

A qualifying cogenerator or qualifying small power producer according to regulatory qualification criteria as defined in PURA.

R

Remedial Action Plan

Predetermined operator actions to maintain ERCOT Transmission Grid reliability during a defined adverse operating condition.

Reactive Power

The product of voltage and the out-of-phase component of alternating current. Reactive Power, usually measured in megavolt-amperes reactive, is produced by capacitors, overexcited generators and other capacitive devices and is absorbed by reactors, underexcited generators and other inductive devices.

Reactive Reserve

That reactive capability required to meet sudden loss of generation, Load or transmission capacity and maintain voltage within desired limits.

Real Time

The current instant in time.

Registered Market Participant

Entity that is registered with ERCOT to participate in the competitive market administered by ERCOT within the ERCOT Region. Registered Market Participants include those using statewide systems administered by ERCOT and may be non-ERCOT participants.

Registration Processing Period

Minimum amount of time the ERCOT registration system requires to process transactions. This period begins when ERCOT receives a

registration transaction request and continues until the completion of the transaction.



Regulation Service

A service that is used to control the power output of Resources in response to a change in system frequency so as to maintain the target system frequency within predetermined limits.

Reliability Must Run (RMR) Service

The provision of generation capacity and/or energy resources from a Reliability Must Run Unit or a Synchronous Condenser Unit.

Reliability Must Run (RMR) Unit

A Generation Resource unit operated under the terms of an Agreement with ERCOT that would not otherwise be operated except that they are necessary to provide voltage support, stability or management of localized transmission constraints under first contingency criteria where Market Solutions do not exist.

Replacement Reserve Service

A service that is procured from Generation Resource units planned to be off-line and Load acting as a Resource that are available for interruption during the period of requirement.

Representative Interval Data Recorder

The technique for profiling premises participating in special pricing programs which consists of implementing a statistically representative Load research sample on the program population. The sample data is then used to develop the representative IDR (RIDR) for profiling these premises.

Resettlement Statement

See Settlement Statement

Resource

Facilities capable of providing electrical energy or Load capable of reducing, or increasing the need for electrical energy or providing Ancillary Services to the ERCOT System, as described in Section 6, Ancillary Services. This includes Generation Resources and Loads acting as Resources.

Resource Category Generic Fuel Cost (RCGFC)

A standard \$/MWh cost for fuel specific to one of eight resource categories (Nuclear, Hydro, Coal and Lignite, Combined Cycle, Simple Cycle, Gas Steam, Diesel and Non-Hydro Renewable).

Resource Category Generic Startup Cost

A fixed price for starting a unit that is selected out of merit order to provide balancing energy. The RCGSC is defined by the generation unit category (Base-load, Gas Intermediate, Gas Cyclic, Gas Peaking and Renewable).

Resource Category Generic Operational Cost

A standard \$/MWh price for running a unit selected out of merit order to provide balancing energy. The RCGOC is defined by the generation unit category (Base-load, Gas Intermediate, Gas Cyclic, Gas Peaking and Renewable).



Resource Entity

A Market Participant that owns or controls a Resource.

Resource ID

A unique identifier assigned to each Resource used in the registration and settlements systems managed by ERCOT.

Resource Minimum Down Time

The minimum time from shutdown of a Resource required until that Resource can be restarted and available to the ERCOT market.

Resource Plan

A plan provided by a QSE to ERCOT indicating the forecast state of Generation Resources or individual Loads each acting as a Resource, including information on availability, limits and forecast generation or Load of each Resource.

Responsive Reserve Service

Responsive Reserve consists of the daily operating reserves that are intended to help restore the frequency of the interconnected transmission system within the first few minutes of an event that causes a significant deviation from the standard frequency.

Retail Electric Provider

A person that sells electric energy to retail Customers in this state. As provided in PURA §31.002(17), a Retail Electric Provider may not own or operate generation assets. As provided in PURA §39.353(b), a Retail Electric Provider is not an Aggregator.

Revenue Quality Meter

For ERCOT Metered Entities, a meter that is in compliance with the Protocols and the Operating Guides. For TDSP Metered Entities, a meter that is in compliance with Local Regulatory Authority approved meter standards or the Protocols and the Operating Guides.

S

Schedule Control Error

The difference in the QSE's actual Resource output and its base power schedule plus instructed Ancillary Services.

Scheduling Process

The process through which schedules for energy and Ancillary Services are submitted by QSEs to ERCOT as further described in Section 4, Scheduling.



Season

Winter months are December, January, and February; Spring months are March, April, and May; Summer months are June, July, and August; Fall months are September, October, and November.

Self-Arranged Ancillary Service

Resources used for Ancillary Services designated by a QSE for use by ERCOT for meeting the ERCOT allocated portion of the Ancillary Services Obligations of a QSE. These Resources may not be included in the ERCOT Ancillary Services market.

Service Address

The street address associated with an ESI-ID as recorded in the Registration Database. This address shall conform to United States Postal Service Publication 28.

Service Delivery Point

The specific point on the TDSP's system where electricity flows from the TDSP to a Load.

Service Fee Schedule

A listing of ERCOT fees and charges to Market Participants, posted on the Market Information System.

Settlement Calendar

As defined in Section 9.1.2, Settlement Calendar.

Settlement Interval

The time period for which a Market Service is deployed and financially settled. For example, the currently defined settlement interval for the Balancing Energy Market Service is 15 minutes.

Settlement Meter

Generation and end-use consumption meters used for allocation of ERCOT charges and wholesale and retail settlements.

Settlement Quality Meter Data

Data that has been edited, validated, and is appropriate for ERCOT Settlement Agent to use for settlement and billing purposes.

Settlement Statement

A statement issued by ERCOT reflecting a breakdown of administrative, miscellaneous, and market charges for the applicable Market Services, as further described in Section 9.2, Settlement Statements.

Initial Statement

The first iteration of a Settlement Statement issued for a particular Operating Day, as further described in Section 9.2.3, Initial Statements



Final Statement

The statement issued at the end of the fifty-ninth (59th) calendar day following the Operating Day, as described in 9.2.4, Final Statements.

Resettlement Statement

The statement using corrected settlement data, in accordance with Section 9.2.5, Resettlement Statement.

True-Up Statement

The statement issued six (6) months following the Operating Day, as further described in Section 9.2.6, True-Up Statement.

Shadow Price

The cost of an operation to effect a one (1) MW change in a constraint.

Shift Factor

A measure of the flow of a unit injection of the power on the transmission element from a particular bus to a fixed reference bus.

Site Specific Shift Factor

The actual Shift Factor for a particular bus.

Zonal Shift Factor

The average Shift Factor for all busses in a particular zone.

Supply

Total supply scheduled by a QSE that is comprised of Energy Supply and Ancillary Services Supply where:

Energy Supply = Resources + energy purchases + energy imports; and

Ancillary Services Supply = Resources + Ancillary Services purchases (including purchases through ERCOT) + Ancillary Services imports

Synchronous Condenser Unit

A unit operated under the terms of an annual Agreement with ERCOT that is only capable of supplying Volt Amperes Reactive (VAR) that would not otherwise be operated except that it is necessary to provide voltage support under first contingency criteria where Market Solutions do not exist.

System Operator

An Entity supervising the collective Transmission Facilities of a power region that is charged with coordination of market transactions, system-wide transmission planning, and network reliability.

T



TCR Interface

The CSC for which Transmission Congestion Rights are auctioned and awarded.

TCR Invoice

See Invoice

TDSP Metered Entity

Any Entity that meets the requirements of Section 10.2.2, TDSP Metered Entities.

Technical Advisory Committee

A subcommittee in the ERCOT governance structure reporting to the Board of Directors as defined by the ERCOT bylaws.

Texas SET

Texas Standard Electronic Transaction procedures, set forth in Section 19, Texas SET, used to transmit information pertaining to the Customer Registration Database. Record and Data Element Definitions are provided in the data dictionary in Protocols Section 19.

Time of Use Metering

A programmable electronic device capable of measuring and recording electric energy in pre-specified time periods. For Load Profiling purposes Time of Use Metering does not include IDRs.

Time of Use Schedule

A schedule identifying the Time of Use period associated with each Settlement Interval. These schedules may include on-peak, off-peak, and shoulder periods.

Total Energy Obligation

The total energy Obligation for a Qualified Scheduling Entity during a Settlement Interval, including the energy from the Balanced Schedule and integrated energy of instructed Ancillary Services.

Total Transmission Capacity

The maximum power that may be transferred across a transmission corridor while maintaining reliability of the ERCOT System.

Transaction Clearinghouse

A batch, transactional interface intended to provide reliable exchange of high volume, standardized transactions between Market Participants and ERCOT using the Texas SET procedures in Section 19, Texas SET.

Transmission Access Service

Use of the TDSP's Transmission Facilities for which the TDSP is allowed to charge for the use through tariff rates approved by the PUCT.



Transmission Billing Determinants

Key parameters and formula components required by a TDSP in determining the billing charges for the use of its Transmission Facilities and/or distribution Facilities.

Transmission Congestion Right (TCR)

A financial hedge against the cost of 1 MW flowing across a particular Commercially Significant Constraint, in a single direction, for 1 hour.

Transmission Congestion Right Account Holder (TCR Account Holder)

A Registered Market Participant that is qualified to bid for and own TCRs in ERCOT's annual or monthly auctions, or that has acquired such rights in secondary markets for purposes of participating in ERCOT's financial settlements for Congestion Credits. [A TCR Account Holder is a Registered Market Participant whose record of ownership appears in ERCOT's databases of auction results or financial settlements for Zonal Congestion Credits].

Transmission and/or Distribution Service Provider (TDSP)

An Entity that owns or operates for compensation in this state equipment or Facilities to transmit and/or distribute electricity, and whose rates for Transmission Service, distribution service, or both is set by a Governmental Authority.

Transmission Facilities

The following Facilities are deemed to be Transmission Facilities:

Power lines, substation, and associated Facilities, operated at 60 kV or above, including radial lines operated at or above 60 kV.

Substation Facilities on the high side of the transformer, in a substation where power is transformed from a voltage higher than 60 kV to a voltage lower than 60 kV or is transformed from a voltage lower than 60 kV to a voltage higher than 60 kV.

The direct current interconnections with the Southwest Power Pool (SPP), Western System Coordinating Council (WSCC), Comision Federal de Electricidad, or other interconnections.

Transmission Loss Factors

The fraction of ERCOT Load (forecast or actual) that is considered to constitute the ERCOT Transmission Grid losses in the Settlement Interval. Transmission Loss Factors are computed by ERCOT and are based on a linear interpolation (extrapolation) of the calculated losses in the off-peak and on-peak seasonal ERCOT base cases.

Transmission Losses

Difference between energy input into the ERCOT Transmission Grid and the energy taken out of the ERCOT Transmission Grid.

Transmission Service

Commercial use of Transmission Facilities.

Transmission Service Provider

An Entity under the jurisdiction of the PUCT that owns or operates Transmission Facilities used for the transmission of electricity and provides transmission service in the ERCOT Transmission Grid.



U

Unaccounted for Energy (UFE)

The difference between total metered Load each Settlement Period, adjusted for applicable Distribution Losses and Transmission Losses, and total ERCOT System net generation.

Uninstructed Deviation

A condition occurring whenever the total metered resources of a QSE for a Settlement Interval are different from the total of the scheduled resources plus any Resource deployments instructed by ERCOT

Uninstructed Factor

A factor used to reduce the total payments made to a Resource for Uninstructed Deviations. The Uninstructed Factor could change by interval, in accordance with Section 6.8.1.14.2, Determining the Uninstructed Factor.

Uplift

The process of allocating costs to QSEs based on Loads and exports within the ERCOT Region.

V

Validation, Editing, Estimation of Meter Data

See Section 11, Metering

Voltage Profile

A predetermined distribution of desired nominal voltage set points across the ERCOT System.

Voltage Support Service

A service that is required to maintain transmission and distribution voltages on the ERCOT Transmission Grid within acceptable limits.

W

Weather Zone

A geographic region in which climatological characteristics are similar for all areas within such region.

Wholesale Customers

Non-Opt-in entities receiving service at wholesale points of delivery from an LSE other than themselves.

X
Y
Z



Zonal Congestion

Congestion on CSCs or CREs that can be resolved by zonal deployment of Balancing Energy Services and RPRS.

Zonal Congestion Credits

Payments equal to the directly assigned costs of BES and RPRS that were incurred in managing Zonal Congestion. Zonal Congestion Credits are paid to TCR Account Holders, appearing in ERCOT's database, as the owner of record for the hour of relevant Settlement Intervals.

Acronyms

AAA	American Arbitration Association
ADR	Alternative Dispute Resolution
ADU	Adjusted Daily Usage
AEIC	Association of Edison Illuminating Companies
AGC	Automatic Generation Control
AML	Adjusted Metered Load
AMR	Adjusted Metered Resource
AP	Adjustment Period
API	Automated Programmatic Interface
ARR	Adjusted REC Requirement
AS	Ancillary Service
ATC	Available Transmission Capability
AVR	Automatic Voltage Regulator
BLT	Block Load Transfer
BSS	Black Start Service
CAO	Control Area Operator
CCF	Capacity Conversion Factor
CFC	Constant Frequency Control
COP	Current Operating Plan
CPT	Central Prevailing Time
CR	Competitive Retailer
CRE	Closely Related Elements
CSA	Continuous Service Agreement
CSC	Commercially Significant Constraint
CSV	Comma Separated Values
CT	Current Transformer
DA	Day Ahead
DAS	Data Aggregation System
DC	Direct Current
DLC	Direct Load Control
DLF	Distribution Loss Factor
DOE	Department of Energy



DSA	Dynamic Security Analysis
DSG	Dynamically Scheduled Generation
DSL	Dynamically Scheduled Load
DSP	Distribution Service Provider
DUNS #	DUNS Number
EC	Electric Cooperative
EDI	Electronic Data Interchange
EECP	Emergency Electric Curtailment Plan
EMS	Energy Management System
EPS	ERCOT Polled Settlement Meter
EPRI	Electric Power Research Institute
ERCOT	Electric Reliability Council of Texas
ESC	Engineering Subcommittee
ESI ID	Electric Service Identifier
ETIN	Electronic Transmission Information Network
EWG	Exempt Wholesale Generators
FERC	Federal Energy Regulatory Commission
FPA	Federal Power Act
FPC	Federal Power Commission
FRR	Final REC Requirement
FTC	Federal Trade Commission
FTP	File Transfer Protocol
GR	Generation Resources
HO	Historical Output
HVDC	High Voltage Direct Current
IDR	Interval Data Recorder
IOU	Investor Owned Utilities
IPP	Independent Power Producers
KWH	Kilowatt Hour
LPA	Load Profiling Agent
LSE	Load Serving Entity
MAD	Mean Absolute Deviation
MAPE	Mean Absolute Percentage Error
MCP	Market Clearing Price
MCPC	Market Clearing Price for Capacity
MCPE	Market Clearing Price for Energy
MDAS	Meter Data Acquisition System
MIS	Market Information System
MOS	Market Operating System
MOU	Municipally Owned Utility
MP	Market Participant
MRE	Meter Reading Entity
MVA	Megavolt Ampere
MVAR	Megavolt Ampere Reactive
NBS	National Bureau of Standards
NERC	North American Electric Reliability Council
NOIE	Non Opt-In Entity
NSRS	Non-Spinning Reserve Service
NWSIDR	Non-Weather-Sensitive Interval Data Recorder
OC	Operational Congestion
OCN	Operating Condition Notice
OOM	Out of Merit Order



OOME	Out of Merit Energy
OOMC	Out of Merit Capacity
OTC	Operating Transmission Capacity
PCR	Pre-assigned Congestion Right
PM	Power Marketer
POLR	Provider of Last Resort
POS	Power Operating System
PRR	Preliminary REC Requirement
PTB	Price to Beat
PUCT	Public Utility Commission of Texas
PURA	Public Utility Regulatory Act, Title II, Texas Utility Code
PURPA	Public Utility Regulatory Policy Act
QSE	Qualified Scheduling Entity
RA	Registration Agent
RAP	Remedial Action Plan
RAPP	Registration Agent Processing Period
RCAG	Remote Control Area Generator
RCAL	Remote Control Area Load
REC	Renewable Energy Credit
REP	Retail Electric Provider
RGS	Regulation Service
RGSD	Regulation Service Down
RGSU	Regulation Service Up
RID	Resource ID
RIDR	Representative IDR
RMR	Reliability Must-Run
RPP	Registration Processing Period
RPRS	Replacement Reserve Service
RRO	Responsive Reserve Obligation
RRS	Responsive Reserve Service
RRWF	Rapid Response Wind Farm
RspT	Responsibility Transfer
RSS	Reliability and Security Subcommittee
RT	Real Time
SCADA	Supervisory Control And Data Acquisition
SCE	Schedule Control Error
SCF	System Congestion Fund
SDP	Service Delivery Point
SET	Standard Electronic Transaction
SGIA	Standard Generation Interconnection Agreement
SIS	Security Information System
SPP	Southwest Power Pool
SRR	Statewide REC Requirement
SRWF	Slow Response Wind Farm
TAC	Technical Advisory Committee
TCOS	Transmission Cost of Service
TCR	Transmission Congestion Right
T&D Losses	Transmission Losses & Distribution Losses
TDSP	Transmission and/or Distribution Service Provider

TGR	Tradeable Generation Right
TLF	Transmission Loss Factor
TMOS	Transmission Market Operations Subcommittee
TOU	Time Of Use
TOUS	Time Of Use Schedule
TSP	Transmission Service Provider
TTC	Total Transfer Capability
TUOS	Transmission Use of Service
TX SET	Texas Standard Electronic Transaction
UFE	Unaccounted For Energy
URL	Unit Reactive Limit
USTR	Uninitiated Service Termination Request
Va.m.M	Vector Absolute Megawatt-Mile
Va.m.O	Vector Absolute Megawatt Ohm
VEE	Validation, Editing and Estimation of meter data
VSA	Voltage Security Analysis
VSS	Voltage Support Service
VT	Voltage Transformer
WPGR	Wind Powered Generation Resource
WSCC	Western System Coordinating Council
WSIDR	Weather-Sensitive Interval Data Recorder
XML	Extensible Markup Language

