SOC 1 REPORT

FOR THE

SETTLEMENT OPERATIONS

A TYPE 2 INDEPENDENT SERVICE AUDITOR'S REPORT ON A DESCRIPTION OF A SERVICE ORGANIZATION'S SYSTEM AND THE SUITABILITY OF THE DESIGN AND OPERATING EFFECTIVENESS OF CONTROLS

FOR THE PERIOD OCTOBER 1, 2014, TO SEPTEMBER 30, 2015

PREPARED IN ACCORDANCE WITH THE
AICPA SSAE NO. 16 STANDARD

Attestation and Compliance Services

This report is intended solely for use by the management of Electric Reliability Council of Texas, Inc., its user entities (i.e., customers) that utilized the services covered by this report during the specified time period, and the independent financial statement auditors of those user entities (each referred to herein as a “specified user”).

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SECTION I

INDEPENDENT SERVICE AUDITOR'S REPORT

INDEPENDENT SERVICE AUDITOR'S REPORT

To Electric Reliability Council of Texas, Inc.:

We have examined Electric Reliability Council of Texas, Inc.'s ("ERCOT" or the "service organization") description of its settlement operations system for performing billing, settlement, and financial transfer services at the Austin, Texas, Bastrop, Texas, and Taylor, Texas, facilities throughout the period October 1, 2014, to September 30, 2015, (the "description") and the suitability of the design and operating effectiveness of controls to achieve the related control objectives stated in the description. The description indicates that certain control objectives specified in the description can be achieved only if complementary user entity controls contemplated in the design of ERCOT's controls are suitably designed and operating effectively, along with related controls at the service organization. We have not evaluated the suitability of the design or operating effectiveness of such complementary user entity controls.

In Section 2, ERCOT has provided an assertion about the fairness of the presentation of the description and suitability of the design and operating effectiveness of the controls to achieve the related control objectives stated in the description. ERCOT is responsible for preparing the description and for the assertion, including the completeness, accuracy, and method of presentation of the description and the assertion, providing the services covered by the description, specifying the control objectives and stating them in the description, identifying the risks that threaten the achievement of the control objectives, selecting the criteria, and designing, implementing, and documenting controls to achieve the related control objectives stated in the description.

Our responsibility is to express an opinion on the fairness of the presentation of the description and on the suitability of the design and operating effectiveness of the controls to achieve the related control objectives stated in the description, based on our examination. We conducted our examination in accordance with attestation standards established by the American Institute of Certified Public Accountants. Those standards require that we plan and perform our examination to obtain reasonable assurance about whether, in all material respects, the description is fairly presented and the controls were suitably designed and operating effectively to achieve the related control objectives stated in the description throughout the period October 1, 2014, to September 30, 2015.

An examination of a description of a service organization's system and the suitability of the design and operating effectiveness of the service organization's controls to achieve the related control objectives stated in the description involves performing procedures to obtain evidence about the fairness of the presentation of the description and the suitability of the design and operating effectiveness of those controls to achieve the related control objectives stated in the description. Our procedures included assessing the risks that the description is not fairly presented and that the controls were not suitably designed or operating effectively to achieve the related control objectives stated in the description. Our procedures also included testing the operating effectiveness of those controls that we consider necessary to provide reasonable assurance that the related control objectives stated in the description were achieved. An examination engagement of this type also includes evaluating the overall presentation of the description and the suitability of the control objectives stated therein, and the suitability of the criteria specified by the service organization and described in Section 2. We believe that the evidence we obtained is sufficient and appropriate to provide a reasonable basis for our opinion.

Because of their nature, controls at a service organization may not prevent, or detect and correct, all errors or omissions in performing billing, settlement, and financial transfer services. Also, the projection to the future of any evaluation of the fairness of the presentation of the description, or conclusions about the suitability of the design or operating effectiveness of the controls to achieve the related control objectives is subject to the risk that controls at a service organization may become inadequate or fail.

In our opinion, in all material respects, based on the criteria described in ERCOT's assertion in Section 2,

a. the description fairly presents the settlement operations system that was designed and implemented throughout the period October 1, 2014, to September 30, 2015;

b. the controls related to the control objectives stated in the description were suitably designed to provide reasonable assurance that the control objectives would be achieved if the controls operated effectively

throughout the period October 1, 2014, to September 30, 2015, and user entities applied the complementary user entity controls contemplated in the design of ERCOT's controls throughout the period October 1, 2014, to September 30, 2015; and

c. the controls tested, which together with the complementary user entity controls referred to in the scope paragraph of this report, if operating effectively, were those necessary to provide reasonable assurance that the control objectives stated in the description were achieved, operated effectively throughout the period October 1, 2014, to September 30, 2015.

The specific controls tested and the nature, timing, and results of those tests are listed in Section 4 (the "Testing Matrices").

In Section 5, ERCOT has provided additional information that is not a part of ERCOT's description. Such information has not been subjected to the procedures applied in our examination of the description and of the suitability of design and operating effectiveness of controls to achieve the related control objectives stated in the description, and accordingly, we express no opinion on it.

This report, including the description of the tests of controls and results thereof in the Testing Matrices, is intended solely for the information and use of ERCOT, user entities of ERCOT's settlement operations system during some or all of the period October 1, 2014, to September 30, 2015, and the independent auditors of such user entities, who have a sufficient understanding to consider it, along with other information including information about controls implemented by user entities themselves, when assessing the risks of material misstatements of user entities' financial statements. This report is not intended to be and should not be used by anyone other than these specified parties.

BrightLine CPAs & Associates, Inc.

Tampa, Florida
October 31, 2015

SECTION 2

MANAGEMENT'S ASSERTION

MANAGEMENT'S ASSERTION

We have prepared the description of Electric Reliability Council of Texas, Inc.'s settlement operations system (the "description") for user entities of the system during some or all of the period October 1, 2014, to September 30, 2015, and their user auditors who have a sufficient understanding to consider it, along with other information, including information about controls implemented by user entities of the system themselves, when assessing the risks of material misstatements of user entities' financial statements.

We confirm, to the best of our knowledge and belief, that

a. the description fairly presents the settlement operations system made available to user entities of the system during some or all of the period October 1, 2014, to September 30, 2015, for performing billing, settlement, and financial transfer services. The criteria we used in making our assertion were that the description

    i. presents how the system made available to user entities of the system was designed and implemented to process relevant transactions, including, as applicable:

        (1) the types of services provided including, as appropriate, the classes of transactions processed;

        (2) the procedures, within both automated and manual systems, by which services are provided, including, as appropriate, procedures by which transactions are initiated, authorized, recorded, processed, corrected as necessary, and transferred to reports and other information presented to user entities of the system;

        (3) the related accounting records, supporting information, and specific accounts that are used to initiate, authorize, record, process, and report transactions; this includes the correction of incorrect information and how information is transferred to the reports and other information prepared for user entities of the system;

        (4) how the system captures and addresses significant events and conditions, other than transactions;

        (5) the process used to prepare reports or other information provided for entities of the system;

        (6) specified control objectives and controls designed to achieve those objectives, including as applicable, complementary user entity controls contemplated in the design of our controls; and

        (7) other aspects of our control environment, risk assessment process, information and communication systems (including the related business processes), control activities, and monitoring controls that are relevant to processing and reporting transactions of user entities of the system.

    ii. does not omit or distort information relevant to the scope of the settlement operations system, while acknowledging that the description is presented to meet the common needs of a broad range of user entities of the system and their user auditors, and may not, therefore, include every aspect of the settlement operations system that each individual user entity of the system and its user auditor may consider important in its own particular environment; and

    iii. includes relevant details of changes to the settlement operations system during the period October 1, 2014, to September 30, 2015.

b. the controls related to the control objectives stated in the description were suitably designed and operated effectively throughout the period October 1, 2014, to September 30, 2015, to achieve those control objectives. The criteria we used in making this assertion were that

    i. the risks that threaten the achievement of the control objectives stated in the description have been identified by management;

ii. the controls identified in the description would, if operating as described, provide reasonable assurance that those risks would not prevent the control objectives stated in the description from being achieved; and

iii. the controls were consistently applied as designed, and manual controls were applied by individuals who have the appropriate competence and authority.

SECTION 3

DESCRIPTION OF THE SYSTEM

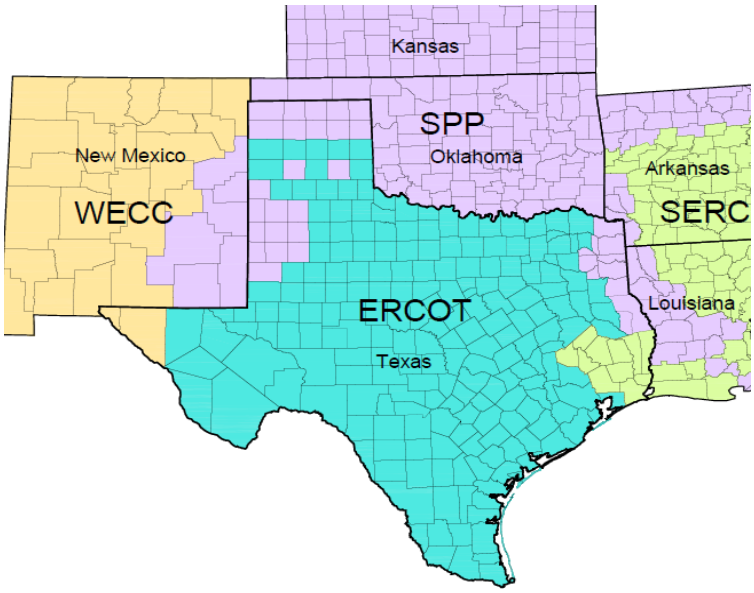
Overview of Operations

Company Background

Although Texans receive their electrical power from many different energy service companies, the reliability and security of the transmission of electricity in most of the state is administered by a single, independent, not-for-profit organization, the Electric Reliability Council of Texas (ERCOT). ERCOT manages the flow of electricity on the high-voltage power grid and administers the competitive wholesale electric market.

Officially founded in 1970, but having roots extending back to World War II, ERCOT has maintained the reliability of electric power in Texas for several decades. Its role expanded in response to the Texas Legislature-mandated restructuring of the electric utility industry. Under the legislation enacted in 1999 (Senate Bill 7), ERCOT was given the responsibility to develop market structure, infrastructure, and business processes to facilitate retail competition.

Description of Services Provided



Today, ERCOT administers the restructured Texas electricity market while maintaining the overall reliability of the electric grid. As one of the largest control areas in the United States, the organization serves about 24 million customers and controls the dispatch of more than 74,000 megawatts (MW) of generation and more than 43,000 miles of transmission lines in the state of Texas. ERCOT serves approximately 90% of the State's electric load. The company's primary responsibility is to facilitate reliable power grid operations in the ERCOT region by working with the area's electric utility industry organizations. To accomplish this, ERCOT receives electric energy schedules for all generation in the region, manages the procurement of ancillary services (AS), coordinates the real time dispatch of generation, and manages the reliability of the transmission grid. These functions are integral to maintaining open access to the transmission grid in the control area. To maintain the reliability of the ERCOT controlled transmission system, ERCOT determines, based on energy demand, the amount and type of services required to maintain system reliability. These requirements can be self-provided by the Qualified Scheduling Entities (QSEs) from their own generating plants, load and interchange, or can be purchased from other QSEs at a price determined principally by competitive bids through the administered auction processes. Through wholesale settlement, ERCOT ensures that electricity production and delivery are accurately accounted for among the entities. With the launch of a nodal market on December 1, 2010, ERCOT implemented locational marginal pricing at more than 8,000 nodes – including more than 550 settlement price points – and a day-ahead energy and AS co-optimized market. ERCOT also manages the retail switching process and registration for the areas of the State open to competitive choice – approximately 75% of the ERCOT load.

The primary regulatory authority for ERCOT is the Public Utility Commission of Texas (PUC). ERCOT's members include retail consumers, investor and municipally owned utilities (MOUs), rural electric co-ops, river authorities, independent generators, power marketers, and retail electric providers (REPs).

Boundaries of the System

The scope of this engagement includes the billing, settlement and financial transfer services supported by the Austin, Bastrop, and Taylor, Texas, facilities, and control activities that directly impact those services. The control objectives and related control activities included within the scope of this examination are described below and in Section 4 of this report.

Subservice Organizations

No subservice organizations were included in the scope of this assessment.

Significant Changes During the Review Period

No significant changes to the settlement operations system occurred during the review period.

CONTROL ENVIRONMENT

The control environment at ERCOT is the foundation for the other areas of internal control. It sets the tone of the organization and influences the control consciousness of its personnel. The components of the control environment factors include: integrity and ethical values; management's commitment to competence; the oversight and direction provided by the PUC, ERCOT's board of directors and management, and the Technical Advisory Committee (TAC); management's philosophy and operating style; ERCOT's organizational structure; the assignment of authority and responsibility; and ERCOT's human resources (HR) policies and practices.

Integrity and Ethical Values

ERCOT management, led by the Chief Executive Officer (CEO), is committed to maintaining the highest level of ethics and integrity. Management fosters this culture through its dedication to promoting cooperation, coordination, communication, and alignment of interests within and among the Board of Directors, employees, market participants, and other stakeholders. The executive management group communicates regularly with the staff on the importance of internal controls and compliance. These matters are emphasized as key aspects of ERCOT's organizational culture.

As a matter of policy, employees and members of the Board of Directors are required to certify their compliance with ERCOT's ethics policy and the ERCOT code of conduct on an annual basis. The employee ethics policy requires employees to refrain from disclosing proprietary and market-sensitive information to unauthorized individuals outside the ERCOT environment. The employee ethics policy also stipulates that employees must maintain total objectivity when performing job functions and may not have a direct financial interest in any market participant doing business in ERCOT markets or an ERCOT vendor. These policies, among others, are included in the ERCOT employee corporate standards manual. In addition, ERCOT management attests to the effectiveness of controls under their supervision in the internal Attestation of Adequacy & Effectiveness of Internal Controls. Additionally, the confidential third party reporting service, EthicsPoint, is in place to provide employees and other individuals with the capability to anonymously report issues and concerns. The issues reported through the system are investigated and resolved by HR, Legal and the Internal Audit departments. Issues reported through EthicsPoint are summarized and reported at each meeting of the Finance and Audit committee of the Board of Directors.

Commitment to Competence

ERCOT is dedicated to recruiting and retaining a highly qualified workforce. Annual performance assessments are conducted for employees by their immediate supervisors. Additionally, ERCOT sponsors internal and external continuing education programs for its employees to supplement their on-the-job training.

Public Utility Commission of Texas

Since ERCOT is located entirely within Texas, ERCOT is primarily regulated by the PUC and the Texas Legislature, rather than federal authorities, with the exception of federal jurisdiction associated specifically with federal reliability matters. The Texas Legislature monitors the effectiveness of electric utility restructuring legislation, including the fairness of rates, the reliability of service, and the effect of stranded costs, market power, and regulation on the normal forces of competition. The PUC is responsible for approving rules and establishing policies to carry out the mandates established by the Texas Legislature governing the electric utility industry. The PUC's rules define the operating requirements for utilities, power generation companies, and retail providers in Texas. The PUC chairman serves as an ex officio non-voting member on the Board of Directors and participates with the ERCOT Board of Directors in discussions of market design issues.

ERCOT Board of Directors

The membership of the Board of Directors is established by Texas statute. The 16-member Board of Directors comprises 15 voting directors and one non-voting director as follows:

- The chair of the PUC as an *ex officio* non-voting director
- The Public Counsel of the Office of Public Utility Counsel (OPUC) as an *ex officio* voting director representing residential consumers and small commercial consumers
- The ERCOT CEO as an *ex officio* voting director
- Six voting directors elected by their respective member segments as follows
    - One independent generator and one segment alternate
    - One investor owned utility and one segment alternate
    - One independent power marketer and one segment alternate
    - One independent REP and one segment alternate
    - One municipally owned utility and one segment alternate
    - One cooperative and one segment alternate
- One voting director representing industrial consumers
- One voting director representing large commercial consumers
- Five directors unaffiliated with any member segment

The Board of Directors meets regularly to oversee business operations. The Board of Directors has a standing Finance and Audit Committee that meets regularly to perform the functions that are further identified in the committee's charter, as follows:

- Oversee ERCOT's budget process and adherence to budget, and provide recommendations to the Board of Directors for ERCOT's financing, investment and financial guidelines and ERCOT's fees, including its system administration fee subject to PUC approval
- Review and make recommendations to the Board of Directors regarding the credit standards, procedures, governance, ERCOT Protocols and other market rules that impact credit risk
- Provide reasonable assurance that ERCOT's financial statements and internal control activities related to settlement processes and related business and information system processes are timely, properly, and effectively audited by qualified independent accountants
- Assist the Board of Directors in fulfilling its oversight responsibility with respect to ERCOT's maintenance of an effective internal audit function
- Establish and maintain procedures for the receipt (including anonymous submission), retention and treatment of complaints regarding accounting, internal controls and auditing

The Board of Directors also has two other standing committees – the Nominating Committee and the HR and Governance Committee.

Technical Advisory Committee

The TAC, which reports to the Board of Directors, is responsible for developing policies, procedures, and guidelines for power grid coordination, wholesale and retail operations, and reliability. The TAC includes 30 members representing seven market segments:

- Cooperative (four members)
- Independent generator (four members)
- Independent power marketer (four members)
- Independent REPs (four members)
- Investor owned utilities (four members)
- Municipal (four members)
- Consumer segment (six members)

The TAC has five standing subcommittees, which are:

- Protocol Revision Subcommittee
- Reliability and Operations Subcommittee
- Retail Market Subcommittee
- Wholesale Market Subcommittee
- Commercial Operations Subcommittee
- Each subcommittee has various working groups and task forces that contribute expertise and advisory information to the TAC

Organizational Structure and Assignment of Authority and Responsibility

ERCOT's executive management team positions include a President and CEO, Chief of Staff, Vice President HR, Vice President Governance Risk & Compliance and Chief Compliance Officer (CCO), Vice President and CFO, Chief Operating Officer, VP Commercial Operations, VP Grid Planning and Operations, Senior Vice President Governance Risk & Compliance and General Counsel (GC), Senior Vice President and Chief Information Officer (CIO), and Vice President External Affairs & Corporate Communications.

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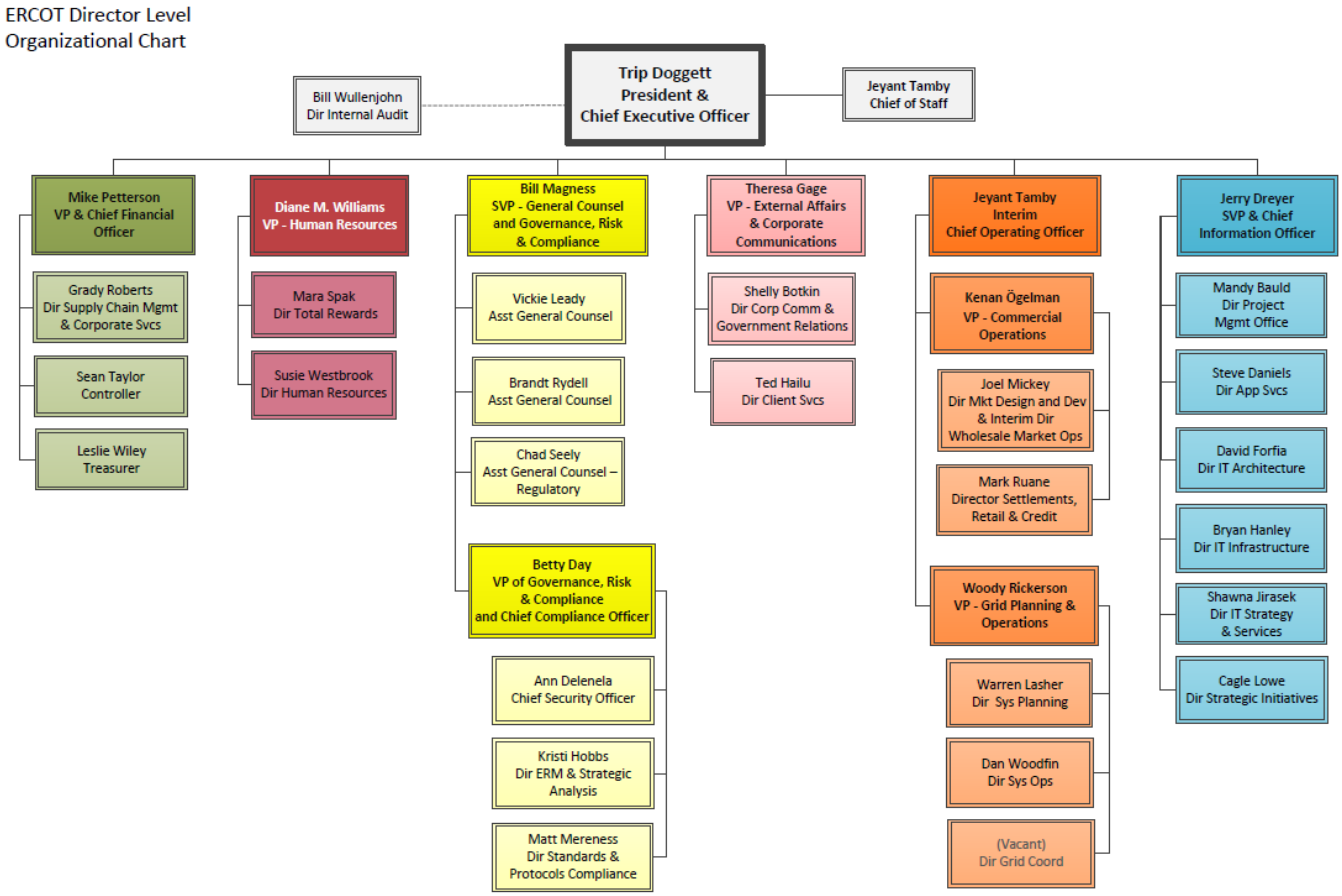
The following is ERCOT's senior management team organizational chart as of September 30, 2015:



The Information Technology (IT) division at ERCOT is organized into six functional areas – Project Management Office, IT Infrastructure, Application Services and Operations, IT Architecture, Strategic Initiatives and IT Strategy and Services – as described below.

- Project Management Office (PMO) includes three major areas of responsibility – project management, release and control management, and quality assurance and testing. The PMO has the overall accountability for delivery of business and technical projects beneficial to the organization and in support of Grid, Wholesale, Retail, and Market Data Transparency as well as IT Governance and Corporate Applications. Project delivery includes project management, management of major and minor software releases, and quality assurance and testing oversight.
- IT Infrastructure is responsible for the operations of the local area and wide area networks (LAN/WAN), telecommunications, database administration, server and storage operations. In addition, this area has overall responsibility for day-to-day management of the primary and secondary data centers.
- IT Architecture develops IT standards, guidelines, and framework as well as a cohesive technology strategy, enterprise architecture, and capacity plan. This area ensures the applications and infrastructure satisfactorily interlace within ERCOT's operating environment.
- Application Services and Operations is responsible for the development, enhancement, and maintenance as well as the day-to-day functioning and monitoring of the applications in use at ERCOT. This includes oversight of systems that support the business areas: Grid, Wholesale, Retail, Market Data Transparency, and IT Governance and Corporate Applications. Support responsibilities include user administration, disaster recovery planning, and the continuous monitoring of IT services. This area also manages service level agreements (SLAs) with business personnel and ERCOT Market Participants.IT Architecture develops IT standards, guidelines, and framework as well as a cohesive technology strategy, enterprise architecture, and capacity plan. This area ensures the applications and infrastructure satisfactorily interlace within ERCOT's operating environment.

- IT Strategy & Services performs IT asset management, vendor hardware and software support renewals, invoice administration, financial support and procurement processes for managers and directors within the IT division. This area also has enterprise operational responsibilities that include the service desk and access management areas, operating on a continuous basis. In addition, responsibilities include IT compliance, IT business relationship management, business analysis, user experience, and leadership of a rotational entry-level development program, BITS Program (Building IT Staff). Strategic Initiatives is responsible for the delivery of high-value, complex enterprise or information technology initiatives such as compliance readiness, major system upgrades, and transformational projects.
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Accountability

Accountability is an ERCOT Core Value. Senior management and executive leadership meet on a regular basis to discuss aspects of the ERCOT's business and operations. Management has established an organizational structure that facilitates the communication of important business information pertaining to market settlement-related matters. Scheduled meetings are periodically conducted for and between management and staff personnel. These include both intra- and inter-departmental meetings at various organizational levels including regular meetings of the ERCOT executive team.

To provide reasonable assurance that personnel have the relevant skills for the performance of their various job responsibilities, ERCOT has established formal hiring and promotion guidelines. Hiring policies include guidelines pertaining to experience, education, background, and employment history. Additionally, performance assessments are conducted on an annual basis to help ensure employees are meeting or exceeding management's expectations and corrective actions are taken, as applicable.

Risk Assessment

Risk Identification

Risk assessment is a continuous process undertaken by management and executive teams. The executive team assesses risk in prioritizing activities and making decisions for the organization. To this end, ERCOT has adopted an enterprise risk management framework to improve information sharing and informed decision making. In doing so, ERCOT is better positioned to identify potential issues early and reduce surprises that could impact the organization's operations, finances or reputation. To reinforce a culture of risk awareness in all levels of the organization, ERCOT utilizes a multiple approach process by working from the top down (executive team and risk partners) and from the bottom up (line management). The risk assessment process provides an opportunity to review the probability and potential impact associated with key risk to ERCOT's mission of serving the public by ensuring a reliable grid, efficient electricity markets, open access, and retail choice. ERCOT assesses risk in the following categories in support of its mission: ERCOT operations, critical infrastructure and security, regulatory/legal/compliance, HR, and external affairs. Issues related to risk management are reviewed with the executive team and the Finance and Audit committee of the Board of Directors on a regular basis.

In addition, an internal audit function is in place to help management assess risk throughout the organization. ERCOT's internal audit function employs a risk-based methodology to assess the level of potential exposure that processes or functions present to the organization.

Risk Factors

Currently, the methodology considers the following factors in assessing potential risk exposure.

- Inherent Risk – the inherent risk of the process or function before the effect of mitigating controls, as estimated by ERCOT management. Indicators of relatively high inherent risk may include, but are not limited to:
    - Financial Impact – financial statement impact, exposure to litigation, fines or penalties, contract liability, department budgets, asset losses, security risks, or risks to key financial systems
    - Complexity Impact – complexity of process or IT systems, security risks evaluated, personnel skill set and turnover, and changes in business conditions
    - Market Impact – risk of adverse impact to stakeholders in the marketplace
    - Regulatory/Reputation Impact – regulatory impact and reliability of the transmission service. Impact on ERCOT's reputation and credibility (including fraud and security risk)
- Reliance on Mitigating Controls – the extent to which auditable controls are relied upon to mitigate the estimated inherent risk to an acceptable level
- Manual Processes – the degree to which the process or function relies on manual activities or systems (e.g. spreadsheets)
- Management or Board Requests – requests from senior management or the Board of Directors
- Time since last audit and results of recent audits or consulting activities
- Types of Fraud
- Fraud incentives and pressures for employees
- Fraud opportunities
- Employee attitudes and rationalizations for fraud

Risk Analysis

Annual plans are developed from the risk and control assessment to audit areas that present the highest risk to the organization, have had areas for improvement noted in recent audits, or have been identified by executive management as those in which ERCOT places a heavy reliance on controls operating effectively in order to mitigate material inherent risks. Management input is key in developing the audit plan and executive management's suggestions for areas to audit and the linkage of the audits to the prioritized listing of current and emerging risks facing the organization is integral to the annual audit planning effort. The annual audit plans include audits that are required by ERCOT Protocols, the PUC, and ERCOT Corporate Policies. The annual audit plans also consider direction from the Finance and Audit Committee regarding the minimum frequency interval for performing certain audits. The audit universe is updated and the proposed annual audit plans are developed in coordination with senior management and specifically the Enterprise Risk Management function. The proposed audit plans are then provided to the Finance and Audit committee of the Board of Directors for review, comment, and final approval.

Integration with Control Objectives

Along with assessing risks, management has identified and put into effect actions needed to address those risks. In order to address risks, control objectives have been defined for each significant risk area. Control activities are then defined to serve as mechanisms for managing the achievement of those objectives and help ensure that the actions associated with those risks are carried out properly and efficiently.

CONTROL OBJECTIVES AND RELATED CONTROL ACTIVITIES

Integration with Risk Assessment

Along with assessing risks, management has identified and put into effect actions needed to address those risks. In order to address risks, control activities have been placed into operation to help ensure that the actions are carried out properly and efficiently. Control activities serve as mechanisms for managing the achievement of those objectives.

Control activities are a part of the process by which ERCOT strives to achieve its business objectives. ERCOT has applied a risk management approach to the organization in order to select and develop control activities. After relevant risks have been identified and evaluated, controls are established, implemented, monitored, reviewed and improved when necessary to meet the overall objectives of the organization.

ERCOT's control objectives and related control activities are included below and also in Section 4 (the "Testing Matrices") of this report.

The description of the service auditor's tests of operating effectiveness and the results of those tests are also presented in the Testing Matrices, adjacent to the service organization's description of control activities. The description of the tests of operating effectiveness and the results of those tests are the responsibility of the service auditor and should be considered information provided by the service auditor.

ERCOT Protocols

The ERCOT Protocols set forth the procedures and processes used by ERCOT and market participants for the orderly functioning of the ERCOT system and market. As the requirements of the market and the PUC change, the Protocols and ERCOT systems and processes are updated. Any market participant may request a change to the Protocols by submitting a nodal protocol revision request (NPRR). Market participants may also submit comments on any pending NPRR, pursuant to the requirements in Section 21 of the Protocols. NPRRs are evaluated through a stakeholder process, including the Protocol Revision Subcommittee and the TAC. To become effective, NPRRs must be approved by the ERCOT Board of Directors. NPRRs may be reviewed by or appealed to the PUC.

Overview of ERCOT Functions

For this document the term "Resources" refers to Generation and Load Resources distinguished with the ERCOT Transmission Grid level.

ERCOT's responsibilities can be categorized into five primary functions: registration; market operations; power operations; load profiling, meter data acquisition and aggregation; and settlement, billing and financial transfer.

- **Registration:** ERCOT is the centralized registration agent for market participants, their load and generation resources, and Electric Service Identifiers (ESI IDs) within ERCOT's service territory. Registration enables market participants secure access to submit authorized and confidential market information and asset data to ERCOT, validated in accordance with Protocols, and used in system applications for retail and wholesale market operations, as well as reliability operations.

- **Market operations:** Market operating activities include supporting the markets that determine resource and obligation scheduling, AS management, and congestion management hedging through a combination of semi-annual and monthly CRR auctions, a day ahead energy and AS market, and a Real Time Market (RTM) for energy dispatch in the ERCOT control area. The Day Ahead Market (DAM) is executed every day for the next operating day to secure the AS required by power operations, and conducts a voluntary energy market to procure and price energy and hedging contracts (i.e., CRRs) for every hour. In the operating day, the ERCOT market systems calculate and re-dispatch the online generation in ERCOT every five minutes in an economic dispatch that is secured within the constraints of the power system.
- **Power operations:** Power operating activities involve system security, planning, and market support. In the DAM, Power Operations assesses the amount of AS required to maintain reliable electricity production for the actual power demand and procures the required AS to be on standby to maintain electric reliability when there are differences between forecasted and actual electricity usage. Also in the DAM, Power Operations posts a load forecast. After the DAM has run and QSEs have updated their resource current operating plans, ERCOT determines through a day-ahead reliability unit commitment (DRUC) study which additional resources need to be procured to meet the load forecast for the next day. This study is also run every hour of the day (i.e., an hourly reliability unit commitment, or HRUC) to ensure there is adequate capacity and that constraints are managed throughout the day and the adjustment period. These technical responsibilities include real time operations, operations analysis, system planning, and data collection and analysis. In performing its responsibilities, ERCOT monitors and analyzes the electricity transmission components within the ERCOT region every two to four seconds for status, load, and output to maintain the reliable transmission of electricity with regulation services.
- **Load profiling, data acquisition, and aggregation:** This function includes the process of receiving, retrieving, and estimating energy production and consumption data from all points within ERCOT, grouping the data by responsible market participant, applying appropriate load profiles, loss factors, and unaccounted for energy (UFE) allocation mechanisms, and finally producing the necessary billing determinants to settle the market for each 15-minute interval. ERCOT assists the market in UFE analysis.
- **Settlement, billing and financial transfer:** This function, ERCOT's responsibility for settlement, billing and financial transfer, ensures that electricity production and delivery are accurately accounted for among the market participants. ERCOT calculates payments and charges to QSEs and CRR account holders (CRRAHs) using the results of the DAM, RTM, and CRR market activities. ERCOT processes for settlement, billing, and financial transfer also support ERCOT's requirement to maintain revenue neutrality.

1. Registration and Qualification

Each QSE is responsible for providing to ERCOT accurate registration information and subsequently for submitting any necessary changes to that information for as long as the QSE participates in the market. Any entity desiring to participate in the ERCOT market as a QSE must first be qualified by ERCOT as a QSE.

a. *QSE Registration and Qualification:* To qualify as a QSE, a QSE applicant must submit a properly completed QSE application for qualification, including any applicable fee and designation of authorized representatives. These authorized representatives are each responsible for administrative communications with the QSE and must have authority to commit and bind the QSE and the entities it represents. A standard application form is posted and is available for download from the ERCOT website. A duly authorized officer or agent of the QSE applicant must attest to the completeness and accuracy of the QSE application submitted. After receiving a QSE application, ERCOT's Legal Department sends the QSE applicant a written confirmation that ERCOT has received the QSE application along with the Standard Form Market Participant Agreement. If a QSE application does not include the required application fee, ERCOT may return it without reviewing it. If ERCOT's Legal Department concludes that a QSE application is not complete, ERCOT notifies the QSE, explains the deficiencies, and stipulates the additional information necessary to make the QSE application complete. Upon reasonable notice to the QSE applicant, ERCOT may conduct a site visit to verify information provided by the QSE. If the QSE intends to represent Resources, a WAN agreement must be signed and returned to ERCOT or the QSE must complete an agency agreement with a currently qualified WAN provider and ERCOT.

If ERCOT rejects a QSE's application, ERCOT's Legal Department sends the QSE applicant a letter explaining the grounds upon which ERCOT has rejected the QSE application. Grounds for rejecting a QSE application include: (1) required information not provided to ERCOT in the allotted time, (2) non-compliance with technical requirements, and/or (3) non-compliance with other specific eligibility requirements as set forth in the Protocols.

Before commencement of any scheduling activities with ERCOT, each QSE must fully complete the counter-party (CP) credit application. The credit application includes proof of credit, which may include a credit security amount.

As part of the qualification process, QSEs are required to demonstrate to ERCOT's reasonable satisfaction that the entity is capable of performing and complying with the requirements of all ERCOT Protocols, guidelines, and the functions of a QSE. The QSE must also implement and test various communication and interface requirements.

QSE qualification testing includes the following tests, each of which involves a qualification process by which ERCOT assesses the readiness of the QSE to enter the ERCOT market based upon established criteria:

- Communications Point to Point testing
- Multi-Protocol Label Switching (MPLS)/WAN connectivity (required of entities representing Resources)
- Market Operations/Market Manager User Interface Transaction Testing (as applicable)
- Market Operations XML Transaction Testing g (required of entities representing Resources)
- Inter-Control Center Communications Protocol (ICCP) Technical Qualification (required of entities representing Resources)
- Resource Specific ICCP Qualification
- Ancillary Service Qualification (as applicable)

Once all QSE qualification testing is complete, and financial assurances have been established, the production digital certificate request notice with the QSE's qualification documentation included is submitted to the designated ERCOT Client Services staff for approval and authorization. The designated staff validates the request with the information in the registration system and Market Participant Identity Management System (MPIM) and authorizes issuance of a production digital certificate to the QSE's user security administrator (USA) designated in the registration system via MPIM. This production digital certificate grants access to the QSE's USA to create user digital certificates for accessing relevant ERCOT system interfaces.

Through this process, QSEs acknowledge that: (1) ERCOT provides a public key infrastructure for authenticity, integrity, and non-repudiation of messages and transactions; (2) the QSE's designated USA will take necessary security measures for the storage and management of the QSE's digital certificates so as to minimize the risk of unauthorized access to the QSE's digital certificates; and (3) the QSE will be accountable for all actions in relation to the use of its digital certificates.

b. *CRRAH Registration and Qualification:* Each CRRAH entity is responsible for providing to ERCOT accurate registration information and subsequently for submitting any necessary changes to that information during the set-up process for as long as the CRRAH participates in the market. Any entity desiring to participate in the ERCOT market as a CRRAH must first be qualified by ERCOT as a CRRAH.

After receiving a CRRAH application, ERCOT's Legal Department sends the CRRAH applicant a written confirmation that ERCOT has received the CRRAH application along with the Standard Form Market Participant Agreement. If ERCOT's Legal Department concludes that a CRRAH application is not complete, ERCOT notifies the CRRAH, explains the deficiencies, and stipulates the additional information necessary to make the CRRAH application complete.

If ERCOT rejects a CRRAH's application, ERCOT's Legal Department sends the CRRAH applicant a letter explaining the grounds upon which ERCOT has rejected the CRRAH application. Grounds for rejecting a CRRAH application include: (1) required information not provided to ERCOT in the allotted time, (2) non-compliance with technical requirements, (3) non-compliance with other specific eligibility requirements as set forth in the Protocols and/or (4) application exceeds the maximum number of CRRAH accounts allowed per protocol.

Before commencement of any CRRAH activities with ERCOT, each CRRAH must fully complete the CP credit application. The CP credit application includes proof of credit, which may include a credit security amount.

As part of the qualification process, a CRRAH is required to demonstrate to ERCOT's reasonable satisfaction that the entity is capable of performing and complying with the requirements of all ERCOT Protocols, guidelines as a CRRAH, including basic functionality of CRR auction application. Once CRRAH qualification testing is complete, and financial assurances have been established, the production digital certificate request notice, with the CRRAH's qualification documentation included, is submitted to designated Client Services staff for approval and authorization. The designated staff validates the request with the information in the registration system and MPIM and authorizes issuance of a production digital certificate to the CRRAH's USA designated in the registration system via MPIM. This production digital certificate grants access to the CRRAH's USA to create user digital certificates for accessing relevant ERCOT system interfaces.

Through this process, CRRAHs acknowledge that: (1) ERCOT provides a public key infrastructure for authenticity, integrity, and non-repudiation of messages and transactions, (2) the CRRAH's designated USA will take necessary security measures for the storage and management of the CRRAH's digital certificates to minimize the risk of unauthorized access to the CRRAH's digital certificates, and (3) the CRRAH will be accountable for all actions in relation to the use of its digital certificates.

2. Network Operations Modelling (NOM)

ERCOT's Network Operations Modelling (NOM) is the foundation for nodal market activities. The operations model is a computer-based representation of the electric power grid and marketplace that ERCOT manages, including:

- Topology or Connectivity
- Parameters (Characteristics, Ratings, Limits)
- Telemetry Points or Mapping

Nodal market activities such as DAM and RTM operations, system planning, and CRR auctions and allocations are dependent on the operations model. Only one model is in production at any given time.

ERCOT's responsibilities include tracking NOM change requests (NOMCR) and planning model change requests (PMCR), notifying the market of NOMCR/PMCR status, testing NOMCRs and coordinating corrections, managing resubmitted NOMCRs/PMCRs, and posting NOMs on the market information system (MIS).

The NOM group manages the maintenance of the operations model and any associated changes/updates. Changes to the operations model are submitted by the owners of the inter-connected equipment into the Network Model Management System (NMMS) according to a timeline for data submissions. Model changes are due at least 90 days in advance. ERCOT must post the model to the market 45 days in advance. Changes to the model are tested according to published schedules. NOMCRs that are submitted by ERCOT as a result of a Special Action Modeling Request (SAMR) submission follow the same published schedules.

ERCOT validates and tests NOMCRs and then creates the models specific to the future time period in which they will be used. Each model is redacted to remove market sensitive data, publicly posted, and subjected to a multi-part validation by ERCOT subject matter experts (SMEs) prior to being placed into a production environment. ERCOT and TDSPs retain access to the complete model.

3. Congestion Revenue Rights (CRR)

CRRs are financial instruments that result in a charge or a payment to the owner when the ERCOT transmission grid is congested. CRRs may be used as either a financial hedge or a financial investment. When used as a hedge, a CRR locks in the price of congestion at the purchase price of the CRR. When purchased as an investment, it may be used as a financial tool to speculate whether the congestion rent will be greater than the purchase price.

The main purposes of the ERCOT CRR market are to:

- Support a liquid energy market by providing tradable financial instruments for the hedging of transmission congestion charges
- Allow market participants to eliminate or greatly reduce the cost uncertainties resulting from transmission congestion charges
- Encourage competitive energy trading, where the costs of congestion might otherwise be an impediment

CRR may be acquired through CRR auctions, Pre-assigned CRR (PCRR) allocations and bilateral market trading. ERCOT allocates PCRR annually and trues-up allocations monthly for PCRR not fully allocated during the annual process. ERCOT holds two bi-annual long term auction sequences and 12 monthly auctions. Controls have been put in place to provide reasonable assurance that auctions and allocations are processed accurately.

Credit Limit Monitoring

ERCOT's credit department is responsible for maintaining CP Available Credit Limits (ACL) and sending credit limits to both the CRR system and the DAM system on a daily basis. Through the CMM system, ERCOT's credit department sends 90% of the ACL to the CRR system. Once the CRR system confirms how much credit is held for the CRR auction, the CMM system sends the residual credit limit (90% of the ACL minus CP market credit limit held for the CRR auction) to the DAM system daily.

Additionally, counter-parties must enter a credit limit into the CRR system no later than the close of the CRR bid submission window (i.e., the lock date). Counter-parties may also establish sub-limits that restrict the total value of CRR awarded to individual CRRAHs represented by a CP in that particular CRR auction. For each CP, the CRR system holds the lesser of 90% of its ACL (from ERCOT's credit department) and the CP entered credit limit for the auction. The CRR system notifies the CMM system of the amount held.

If a CP does not enter a credit limit in the CRR system by the lock date, ERCOT assigns a zero credit limit to the CRR auction. With a zero credit limit, CRRAHs under the CP are not able to purchase products or sell negatively priced obligations in the auction. ERCOT then assigns the remaining ACL to the DAM for that entity.

a. *PCRR Nominations:* ERCOT allocates PCRR in long-term allocations (i.e., annually) and in short-term allocations (i.e., monthly) to non-opt-in entities (NOIEs) that meet the established criteria as stated in the ERCOT Protocols. ERCOT's objective in allocating PCRR is to achieve simultaneous feasibility by curtailing nominated CRR as little as possible in proportion to their contributions to congestion.

   On an annual basis, ERCOT reviews PCRR eligibility to confirm that each NOIE is still eligible for the same entitlement as previously used in the last annual allocation process. It also allows the NOIE to indicate any discrepancies in eligibility and work with ERCOT's Legal Department to resolve them. In the event discrepancies are found, the CRR market operator updates the PCRR contracts and entitlements master list, along with any other documentation that may apply.

   NOIEs are expected to nominate PCRRs to the load of that NOIE in reasonable proportion to the load served by the NOIE in each load zone. Load zone distribution is calculated using the aggregated monthly load data from the corresponding prior 12 months.

   ERCOT validates NOIE compliance with the Protocols regarding PCRR nominations prior to awarding PCRRs in the annual PCRR allocation. The validation is conducted after the nomination window has closed and before the PCRR allocation is run. If non-compliance is found, ERCOT works with the NOIE on remediation by contacting the NOIE to explain the violation and provide instructions for how to become

compliant. Two attempts are made to work with the NOIE to remediate the issue. If the NOIE is still not in compliance after the second attempt, the NOIE's nominations are removed.

Monthly PCRR true-up allocations are only run if PCRR nominations were not fully allocated during the annual allocation process. ERCOT evaluates the need for a PCRR true-up allocation by comparing the MW amount requested by the NOIE in the annual PCRR allocation to the MW amount allocated.

b. *CRR Auctions:* At the start of an auction, the market operator creates an auction log, which is used to document the completion of various steps in the auction process. Issues that arise during the auction are recorded on the auction log.

A network model is created for each monthly and long term CRR auction/allocation. A CRR network model is comprised of a series of files created using NMMS. Files include outages, dynamic ratings, sources/sinks, non-thermal constraints, contingencies, Electrically Similar Settlements Points and flowgates (if applicable). The resultant files are transferred to the CRR test environment, where they are loaded and tested for accuracy. The test involves creating a test allocation or auction, and verifying the results. The verification is completed by the original market operator and a backup operator. After it is determined that the network model works correctly, it is loaded into the production environment and used for an auction or allocation.

Network model files are uploaded into the CRR system and attached to a data case. The data case is then attached to an auction. For new data cases, baseline power flows for the network model are established. Running an initial power flow verifies that the system has a working model and that the data case is valid.

After an auction has been optimized (i.e., run), the results are verified. This may be done by checking the convergence log, binding constraints, branch flows, CRR bids and offers and by comparing the awarded CRR clearing prices to the source/sink shadow prices.

The valuation of the awarded CRR during the auction is based on the bids submitted into the CRR auction along with the reservation prices of the offers submitted. The set of bids and offers that maximize the value of the CRR awarded is determined by the set of simultaneously feasible CRR with the highest total auction value, such that the network and credit constraints are not violated. This ensures that ERCOT awards the set of CRRs and allocates them among auction participants in such a way that the value-based transmission utilization is maximized.

After validating the winning bids, the results are published and settlements occur. Winning bidders pay or receive payments for CRR acquired in the auction based on the market clearing prices in the CRR auction. CRR sellers pay or receive payments for the CRR they surrender in the CRR auction based on the market clearing prices in the CRR auction.

c. *CRR Ownership (Bilateral Market Trading):* Ownership of a CRR is acquired through ERCOT allocations and auctions. Existing CRRs may also be traded bilaterally between CRRAHs. Ownership of a CRR is disposed of when the period for which the CRR is valid expires, the CRR is sold in an auction, or the CRR is traded in a bilateral market.

Bilateral trades may be conducted privately outside of the system or on the bilateral trade display of the market user interface application. In order to transfer ownership of a CRR in the ERCOT system, a bilateral trade must be initiated using the market user interface application. ERCOT credit performs a credit check to ensure the market participants have an ACL to support the transaction. Once the trade is approved by the ERCOT credit department, the results are automatically sent from the CMM system to the CRR system, and the transfer of ownership is complete. Bilateral trades conducted privately between CRRAHs that are not reported using the CRR market user interface application will not be captured in ERCOT's systems.

For auctions and allocations, the CRR system automatically assigns ownership of CRR when payment is received and entered in the Settlements and billing system application. No CRR market operator interaction is required for anything but posting CRR ownership to MIS by the fifth business day of each month.

4. Scheduling and Bidding

For the DAM, QSEs submit three-part supply offers, AS offers, DAM energy-only offers, DAM energy bids, point-to-point (PTP) obligation bids, self-schedules, self-arranged AS, current operating plans, energy trades, capacity trades, and AS trades from 14 days prior to the operating day to 1000 (based on the 24-hour clock convention or "military time") on the day prior to the operating day. The DAM is a daily, co-optimized market in the day-ahead for AS capacity, CRR, and forward financial energy transactions. DAM is the first market process in the timeline to consume QSE transactions. However, certain of these transactions (e.g., current operating plans and three-part supply offers) are also used for later market processes, such as the DRUC and HRUC processes executed by ERCOT.

This section includes descriptions of the market clearing processes that are related to scheduling and bidding, but which are validated in the settlements data input and validation process (summarized in the section below). It is the responsibility of QSEs to submit accurate and complete information to ERCOT on a timely basis. ERCOT has designed and implemented applications to accept information necessary for each market and charge/credit type and is required to validate that the data submitted is complete.

a. *DAM Bidding and Market Clearing:* Offers submitted to ERCOT by a QSE represent an offer to supply a market service for a price. Bids submitted to ERCOT by a QSE represent a bid to purchase a market service for a price. AS offers are submitted from 14 days prior to the operating day to 1000 of the day-ahead of the operating day and include the following services: regulation service (up and down), responsive reserve service, and non-spinning reserve service (NSRS). Other submissions such as three-part supply offers, DAM energy-only offers, DAM energy bids, and PTP obligation bids are also submitted from 14 days prior to the operating day to 1000 of the day ahead. By 1000, QSEs submit offers and bids to ERCOT via the API or the MMS Market Manager to be used during the DAM clearing process. The ERCOT messaging system notifies a QSE that enters offers and/or bids when their offers and/or bids are accepted or rejected. Offers and/or bids that have been received by ERCOT and successfully validated are stored in a database for use in market calculations. QSEs can review their offers and/or bids submitted via the API or the MMS Market Manager to confirm their offer/bid has been successfully received by ERCOT.

   QSEs have the ability to delete, modify, or resubmit their offers and bids until 1000 of the day ahead. If a QSE identifies an offer or bid that is inconsistent with their expectation for what should appear, the market participant can adjust the offer/bid, or contact the ERCOT helpdesk or their wholesale account manager to seek resolution. Prior to the execution of the DAM at 1000, beginning at 0700 of the day ahead, ERCOT systems perform additional validations of offers, bids, trades, schedules and current operating plans for the next operating day. These validations include, but are not limited to, verification that credit is available to cover all offers and bids, verification that resource ownership is accurate, and verification that the QSE is still allowed to participate in the DAM. If a submission does not pass this validation, ERCOT sends a notice of rejection to the appropriate QSE that is responsible for correcting any rejected submissions.

   By 1330 of the day ahead, the day ahead operator clears the market. The MMS clears the market by maximizing bid-based revenues minus offer-based costs subject to security and other constraints as well as the ERCOT-calculated AS requirements. At approximately 1330, ERCOT procures energy, regulation up, responsive reserve, non-spinning reserve, regulation down, and CRR/PTP obligations simultaneously using a multi-hour mixed integer-programming algorithm. Cleared DAM results include a market clearing price for capacity (MCPC) for each AS, DAM Settlement Point Prices (SPP), DAM Locational Marginal Prices (LMP), and awarded quantity from bids/offers. QSEs selected to provide or receive services for each hour are notified electronically and ERCOT posts the hourly DAM SPPs, DAM LMPs, and MCPC for each DAM on the ERCOT public website.

   After the DAM clears, QSEs receive notification of the MCPC and the quantity of AS capacity procured by ERCOT for that QSE, as well as quantity and associated prices of other bids and offers procured by ERCOT for that QSE. The QSEs are responsible for making adjustments to their current operating plans as needed. QSEs must resubmit these current operating plans by 1430 to include the AS awarded to the QSE to serve ERCOT.

ERCOT posts the aggregated AS offer curve on the MIS and the ERCOT public website for each operating day for the DAM. Market participants have access to review the following data elements: operating hour, the AS MW capacity offered into the market, and the price offered into the market. The DAM SPPs and DAM LMPs are also posted for the market participants to review. As part of the DAM process, CRR oversold quantities are determined and the information is sent to settlements and billing.

b. *Daily and Hourly Reliability Unit Commitment Market Clearing:* ERCOT executes DRUC at 1430 each day to evaluate the need to procure additional resource to cover the load forecast of the next operating day. HRUC is executed hourly to ensure adequate capacity and congestion is properly managed during the day. If DRUC has not been run in the day ahead, the study period for HRUC will only cover the remaining hours of the current operating day. If DRUC has been run in the day ahead, the study period for HRUC will include the remaining hours of the current operating day as well as all 24 hours of the next operating day.

   By running DRUC or HRUC, ERCOT recommends commitment or decommitment of generation resources to match forecasted load subject to the transmission constraints and resource performance characteristics. Clearing the DRUC or HRUC market may result in the commitment of generation resources to resolve capacity inadequacy as well as potential transmission constraints. In some cases, DRUC and HRUC may recommend decommitment of the generation resources. The recommended decommitment is subjected to review and approval by ERCOT operators. QSEs are notified of any generation resource commitments or decommitments via the API and MMS Market Manager. The QSEs are responsible for making adjustments to their current operating plans based on any commitments or decommitments. For each DRUC and HRUC market, ERCOT posts the active and binding transmission constraints and committed or decommitted resources on the MIS.

c. *Supplemental Ancillary Services Market (SASM) Clearing:* The SASM can be opened for three reasons: ERCOT increase of the AS plan, replacement of undeliverable AS due to transmission constraints, and replacement of AS due to failure of a market participant to provide. In addition, ERCOT allows QSEs to request to modify their Ancillary Service positions through a reconfiguration SASM. The reconfiguration SASM is executed at 0900 daily. This SASM provides QSEs an optional mechanism to change their Ancillary Service Supply Responsibility from hour ending 1300 through hour ending 2400 of the current Operating Day. When a SASM market is opened by ERCOT due to an increase in the AS plan, QSEs are allowed to submit additional self-arranged AS to cover any AS obligations that they received. QSEs can submit AS offers from 14 days prior to the operating day to the moment that the SASM market is opened. QSEs are given 30 minutes notice prior to opening a SASM market. Thirty (30) minutes after a SASM market is opened due to an increase in the AS plan, or immediately after a SASM market is opened for other reasons, the SASM market is closed and the operator clears the market. AS procured by SASM are selected in a manner that minimizes the overall offer-based cost of the AS. QSEs are notified of their AS awards and the SASM MCPC via the API, the MMS Market Manager, and the MIS. QSEs are responsible for updating their current operating plans to reflect any AS awards received in the SASM market.

d. *Security-Constrained Economic Dispatch (SCED) Market Clearing:* ERCOT receives QSEs' three-part supply offers, incremental/decremental energy offers, and output schedules by the end of each adjustment period for an operating hour. QSEs may voluntarily submit three-part supply offers, incremental/decremental energy offers, and output schedules to ERCOT for use in the operating period. ERCOT sends out resource base points that are needed to simultaneously manage energy balance and congestion every five minutes, or more often, as determined by the operator. The system uses a two-step methodology that applies mitigation prospectively to resolve real time constraints while also evaluating energy offer curves and output schedules to produce a least cost dispatch of online generation resources to match the total current generation requirement determined by EMS, subject to transmission constraints. Once the SCED market is cleared, the system electronically sends base points to each resource represented by a QSE. QSEs are notified of the real time LMPs via the API and MIS.

5. Locational Marginal Prices (LMP) Price Validation

For the nodal market, ERCOT has developed a set of tools and formed a team of analysts to evaluate the market prices and resulting dispatch instructions from markets executed in nodal, specifically the RTM, the SASM, and

the DAM. The Price Validation Tool (PVT) is software that provides evaluation tools for market solutions and flags any potential errors in the market solution. The PVT does not recreate the market solution, but statistically analyzes the results based on the inputs and outputs from MMS to identify potential errors in results. Although the PVT identifies possible pricing issues, it does not alter or repost prices and dispatch.

The PVT is managed and supported by the price validation team. For the different markets described below, there are different processes for how the PVT is used by other groups to evaluate market solutions (as an initial analysis), and how the PVT is used by the price validation team to evaluate and consider the need for price changes to market solutions.

For each of the following market sequences there is a description of the activities by which the market operator evaluates the validity of prices from the market solutions, followed by how the price validation team evaluates the market solution, and the timeline and responsible parties for changing prices and communicating those changes to the market.

a. *Real Time Price Validation and Corrections:* The RTM is executed at least every five minutes and is executed from the operation control room. The RTM runs on an automatic timer and publishes/instructs resources to dispatch energy to meet the required system load every five minutes. PVT execution is automatically triggered by the completion of each SCED run.

   In the operations control room, the shift engineer may use the PVT error and warning messages to help identify any possible pricing or dispatch issues at real time. If potential issues are discovered, the shift engineer investigates the market solution to identify potential data or system issues and passes those on to the price validation team. If needed, the shift engineer can take immediate action in some cases, such as deactivating the constraint or aborting SCED. The shift engineer may log what was found and what action was taken with the price validation team providing analysis.

   The price validation team reviews the SCED PVT outputs, evaluates the RTM solution, and identifies any price issues. The price validation team also creates corresponding internal reports and escalates any price issues, thus triggering price correction. If price correction is identified to be needed, it must be performed by1600 of the second business day after operating day. Price correction will be performed if needed.

   An important overarching principal is that, per Protocols Section 6.3, “All Real-Time LMPs, Real-Time SPP, Real-Time prices for energy metered, Real-Time On-Line Reliability Deployment Price Adders, Real-Time On-Line Reliability Deployment Prices, Real-Time Reserve Prices for On-Line Reserves, Real-Time Reserve Prices for Off-Line Reserves, Real-Time On-Line Reserve Price Adders, Real-Time Off-Line Reserve Price Adders and SASM MCPCs are final at 1600 of the second Business Day after the Operating Day” The ERCOT Board may review and change the Real-Time prices if ERCOT gave timely notice to Market Participants no later than 30 days after the Operating Day and the ERCOT Board finds that such prices are significantly affected by an error. In review of the Real-Time prices, the ERCOT Board may rely on the same reasons identified in Protocols Section 6.3 (4) to find that the prices are significantly affected by an error.

b. *DAM Price Validation and Corrections:* The DAM is executed every day by a dedicated team of operators. After each execution, the operator evaluates the solution for energy and AS awards and prices. Part of the evaluation may involve using the PVT software to identify any possible pricing or dispatch issues. If potential issues are discovered, then the operator has the option of correcting any data issues and re-executing the DAM to seek a correct solution. The operator may use the PVT during the DAM evaluation processes to help identify potential data or system issues and pass those on to the price validation team. The price validation team then takes action in a joint effort with the day-ahead team. The price validation team also runs and reviews the DAM PVT independently on a regular basis during business hours.

   The price validation team reviews the DAM PVT outputs, evaluates the DAM solution and identifies any price issues. The price validation team also creates corresponding internal reports and escalates any price issues, which triggers price correction. If price correction is identified to be needed, it must be performed by 1000 of the second business day after the operating day, the price validation team has evaluated the DAM solution and identified any pricing issues.

An important overarching principal is that, per Protocols Section 4.5.3(5), "all DAM LMPs, MCPCs, and SPPs are final at 1000 of the second business day after the operating day. The ERCOT Board may review and change DAM LMPs, MCPCs, or SPP if ERCOT gave timely notice to Market Participants no later than 30 days after the Operating Day and the ERCOT Board finds that such prices are significantly affected by an error. In review of DAM LMPs, MCPCs, or SPP, the ERCOT Board may rely on the same reasons identified in Protocols Section 4.5.3 (4) to find that the prices are significantly affected by an error."

c. *SASM Price Validation and Corrections:* After each SASM execution, the operator uses the PVT to identify potential data or system issues and pass those on to the price validation team. The price validation team, in a joint effort with the SASM operator, then takes necessary actions. The price validation team also runs and reviews the SASM PVT on a regular basis during business hours.

   The price validation team reviews the SASM PVT outputs, evaluates the SASM solution and identifies any price issues. The price validation team also creates corresponding reports and escalates any price issues, which triggers price correction. If price correction is identified to be needed, it must be performed by 1600 of the second business day after operating day.

An important overarching principal is that, per Protocols Section 6.3 (6), "All Real-Time LMPs, Real-Time SPP, Real-Time prices for energy metered, Real-Time On-Line Reliability Deployment Price Adders, Real-Time On-Line Reliability Deployment Prices, Real-Time Reserve Prices for On-Line Reserves, Real-Time Reserve Prices for Off-Line Reserves, Real-Time On-Line Reserve Price Adders, Real-Time Off-Line Reserve Price Adders and SASM MCPCs are final at 1600 of the second Business Day after the Operating Day". The ERCOT Board may review and change the Real-Time prices if ERCOT gave timely notice to Market Participants no later than 30 days after the Operating Day and the ERCOT Board finds that such prices are significantly affected by an error. In review of the Real-Time prices, the ERCOT Board may rely on the same reasons identified in Protocols Section 6.3 (4) to find that the prices are significantly affected by an error.

6. Retail Electronic Data Interchange (EDI) Transaction Processing

Retail EDI transactions for LSE relationship maintenance (Move In, Move Out, and Switches) are submitted by TDSPs and LSEs and are processed within the ERCOT ESI ID Registration System to establish and update ESI ID relationship records. The additions and changes to ESI ID relationship records within the ERCOT ESI ID Registration System are processed into the ERCOT Data Aggregation System.

ERCOT performs data integrity checks within the ERCOT ESI ID Registration System so that the ESI ID relationship records do not reflect data inconsistencies within the service history, therefore allowing the updated records to process correctly into the ERCOT Data Aggregation system. Discrepancies found are manually corrected.

During the automated synchronization of ESI ID relationship records between systems, all ESI ID relationship records added or updated the previous day in the ERCOT ESI ID Registration System are processed into the ERCOT Data Aggregation System. The automated processing of records between the two systems occurs by validating the data through a series of business rules set to allow accurate data into the ERCOT Data Aggregation System.

After the ESI ID relationship records are updated within the ERCOT Data Aggregation System, an exception log is generated for any issues encountered during the automated update process. ERCOT staff manually updates the systems as necessary to maintain synchronization between systems. Once the exceptions are worked, a comparison of the most current status of the ESI IDs is performed between the ERCOT ESI ID Registration System and the ERCOT Data Aggregation System. Any status discrepancies that are identified for the processing day are researched and resolved within the relevant system(s).

In an effort to keep the ESI ID relationship records per the ERCOT ESI ID Registration System and the ERCOT Data Aggregation System synchronized, ERCOT performs a comparison of all of the ESI ID relationships records updated within the last four days for the history of the ESI ID. This process identifies relationship discrepancies between the two systems for the entire history of the ESI ID. The logged discrepancies are worked to completion and manually corrected in the relevant system(s). On a monthly basis, the ESI ID relationships existing in both

the ESI ID Registration System and the ERCOT Data Aggregation System that were updated within the month prior are compared and discrepancies that are identified between the two systems are logged and manually corrected in the relevant system(s).

The entire list of ESI IDs existing in both the ESI ID Registration System and the ERCOT Data Aggregation System are compared and identified discrepancies between the two systems are logged and manually corrected in the relevant system(s). As the ESI IDs and corresponding ESI ID relationship records are updated in the ERCOT Data Aggregation System, data extracts are provided to the Market Participant (TDSPs and LSEs) data owners for their comparison and research purposes as necessary.

7. Meter Data Acquisition and Validation (Non-EPS)

ERCOT requires actual metered or estimated data from loads, generators and DC Ties to measure the flow of electricity within the ERCOT Control Area and to calculate charges and payments in the settlements process. Meter data is collected either through submission of consumption data by the TDSPs via EDI or through the process of collecting usage data from ERCOT read EPS meters.

TDSP Submission of Data

During the process of establishing ESI IDs, the TDSP designates an assigned meter reading entity (MRE) that is responsible for reporting the flow of electricity for each of the TDSPs meter assets to ERCOT. TDSPs report the electrical flow for their assets in two ways. For standard IDR and/or NIDR, ESI IDs consumption data is sent to ERCOT via EDI 867 transactions. Upon receipt of 867 data, a 997 acknowledgement transaction is sent to the TDSP recognizing that ERCOT has received the data sent by that TDSP. Validations are performed to verify that the required fields for the 867 transactions are valid. If an error is present, ERCOT sends an 824 Usage Reject Response to the TDSP. The TDSP must then resend the corrected information back to ERCOT. Once the transaction passes all TX SET/ANSI compliance validation tests, the data is converted into a system readable format and is uploaded into the data aggregation system. Any identified "Compliance without TX SET" validation errors for the previous day's EDI 867 transactions are researched. The market participant is then notified when necessary. ERCOT will either manually reprocess the data or the market participant will resend the data. For ESI IDs equipped with an advanced meter, LSE files are sent to ERCOT via North American Energy Standards Board (NAESB) and ERCOT responds with a NAESB acknowledgement. The additional business validations occur after the data has been sent to the data aggregation system.

ERCOT reports successful and failed IDR and/or NIDR validations to the MRE in the 867_03 Activity Reports and in the Interval Data LSE Activity reports for advanced metered system (AMS) data. These reports detail each transaction that attempted to load into the data aggregation system and identify the success or failure of each. Detailed reasons for failures are provided to facilitate MRE correction. The errors must be resolved before the data can be loaded into the system and used in the data aggregation process. In addition to these validations, ERCOT prepares various reports such as the Missing Consumption Report and IDR Requirement Report for market participants' use and to support PUC market monitoring activities. These reports are posted on the portal and market participants can access and review these reports as desired.

8. Meter Data Acquisition and Validation (EPS)

Meter Data Acquisition from EPS Entities

The data acquisition process surrounding EPS entities is controlled through the MV-90 system. This process consists of collecting primary and backup data from EPS meters; running communications, time, and validation tests; and editing, formatting and transferring data into the data aggregation system. For EPS metering facilities to be set up in MV-90, TDSPs are required to provide metering design documentation for initial validation and approval by the Settlement Metering department's meter engineering group. Upon approval of this documentation, the group enters the site into a tracking system and monitors the progression until all affected systems have been updated. Changes to metering designs and specifications submitted to ERCOT are reviewed and approved for compliance with ERCOT requirements.

ERCOT assigns all primary and backup EPS meters a unique identifier. Once unique identifiers have been established, the MV-90 system collects the primary and backup meter data depending on how the TDSP has

chosen to set-up its metering facilities. Backup data is collected from an entirely separate metering device that has its own unique identifier. Some TDSPs have chosen not to use the primary and backup scheme and instead utilize a single metering device to transmit load data. (This is only allowed for the radial NOIE loads.)

During the collection of meter data, the MV-90 system maintains a communications log file that tracks all communications with field devices regardless of the completion status of the communication task. The information provided in this log file assists ERCOT in identifying the source of any trouble events associated with an EPS facility or field-related matter. A trouble event could occur and be logged in the following instances:

- A connection with the meter could not be established after multiple attempts
- After establishing a connection, the meter ID and the meter configuration do not check successfully
- After establishing a connection, the meter clock is not synchronized to within +/- 1% of the settlement interval when compared with the National Institute of Standards and Technology atomic clock
- Other meter-specific errors are identified

Should a transmission abnormally terminate, the MV-90 system discards the data and attempts to reconnect. The MV-90 system also performs cyclic redundancy checks as the data is being transmitted. In the event the MV-90 system detects data corruption, MV-90 will terminate the connection and attempt to reconnect and upload the necessary data. Once the data is successfully uploaded into the MV-90 system, the following tests are performed to validate that only revenue-quality data is passed to the data aggregation systems for use in the settlement process:

- Time tolerance validations to detect time differences that are outside system thresholds
- Check of meter status codes to detect possible metering exceptions related to interval, channel and/or event data, such as missing data
- Assessment of the number of intervals present in a given interrogation to identify that the number of expected intervals equals the number of actual intervals collected
- Validation and comparison of energy accumulated from the interval data to the energy calculated from the meter's start and stop readings
- Assessment of the total number of power outage intervals to ascertain if they exceed system tolerance limits
- Check for the existence of overlapping data (data for the same time period) in two separate data files
- Assessment of the total number of intervals with zero data values and report the number if exceeding a certain threshold
- Assessment of whether any single interval of data exceeds an upper or lower threshold
- Performance of interval level validation between the primary and backup meter data, where available

A validation summary report identifies all data sets that do not pass or that produce warnings based on the aforementioned validation tests. If the data received is inadequate or did not pass the communication, time, and/or validation tests, the data must be estimated, edited, or uploaded into the MV-90 system from a backup meter. In instances when ERCOT does not capture backup meter data or cannot identify the cause of the data failure, the TDSP is asked to further investigate the deficiency. If necessary, ERCOT then receives authorization from the TDSP to estimate and/or edit the meter data. All data edits are captured in the MV-90 edit logs. Once the data is manually re-entered into the MV-90 system, the data validation tests are automatically run again. Data that passes all validation tests is passed to the data aggregation system for processing.

During the process of transferring data to the data aggregation system, the validation of start time, stop time, and number of intervals occurs along with gap and overlap checking. For each operating day, an EPS completeness report is created, reviewed and archived for future reference. Along with this completion report, meter data acquisition operators review the missing RIDs table, the error table, and the EPS meter data table, as needed, in the data aggregation system.

A monthly data comparison is performed between MV-90 primary EPS meter data and the data in the data aggregation system, for the prior month operating days. Any resulting discrepancies from the data comparison are reviewed and resolved by the Settlement Metering department's meter data acquisition group prior to final settlements being run on the operating days included in the comparison.

9. Meter Data Aggregation, Loss Application and Unaccounted for Energy (UFE)

The meter data aggregation process groups the data by responsible party, applies load profiles, loss factors, and UFE allocation mechanisms, and finally produces the necessary billing determinants to settle the market for each 15-minute interval. There are four distinct data aggregation processes performed by ERCOT systems: competitive load aggregation, NOIE aggregation, generation aggregation, and direct current (DC) tie aggregation.

a. *Competitive Load Aggregation:* Competitive retailers (CR) are defined as MOUs or electric cooperatives that offer customer choice and sell electric energy at retail in the restructured electric power market in Texas or a REP. TDSPs submit meter data via EDI 867 transactions and/or AMS LSE files. The meter data is provided to ERCOT either by interval (if the ESI ID has an IDR or in a single value spanning a time period). Based on the type of meter data, two slightly different data aggregation processes are utilized. If ERCOT receives meter data by interval, the data is aggregated into groupings and applicable distribution loss, transmission loss, and UFE are applied. In the event that meter data has not been received from the TDSPs, ERCOT estimates the meter data based upon weather sensitivity classification. If the meter point is non-weather sensitive (NWS), the most recent data for the same day of the week will be used. If the meter point is weather sensitive (WS), the process utilizes a proxy day routine that selects and ranks three days that had similar weather patterns. If data exists for any of the three proxy days, the data for the highest ranked proxy day is used. If there is no data for the three WS proxy days, the most recent data for the same day of the week will be used. For non-interval metered ESI IDs, data aggregation must apply load profiles, as described below, to estimate or allocate energy usage to individual intervals.

b. *NOIE Aggregation:* NOIEs are defined as electric cooperatives or MOUs that do not offer customer choice with regard to electric utility service providers. For each NOIE, the metered energy inflows and outflows are netted on a settlement interval basis to calculate the net meter point flow. TDSPs submitting NOIE meter data are required to adjust the data for losses to the transmission point of interconnection. For EPS meters, if required and not performed in the meter, the data aggregation system adjusts meter points for losses to represent the energy flow at the transmission point of interconnection. Generation data identified as being "behind" the NOIE metering points is netted to calculate an internal generation value that is added to the net meter point flow. Generation "behind" NOIE metering points includes all generation resources, including distributed generation, which is registered in the NOIE area. Load for NOIE areas that contain transmission lines behind their metering interconnect points must be reduced by the calculated "actual" MWh of transmission losses as this load will eventually be increased by the ERCOT-wide Transmission Loss Factor (TLF). Data for generator load, identified as belonging to a NOIE but not "behind" the NOIE's metering point, are netted to calculate an external load value that is added to the "actual" transmission loss adjusted NOIE load. In the event that meter data has not been received from the TDSPs, ERCOT estimates the meter data based upon weather sensitivity classification. If the meter point is non-weather sensitive (NWS), the most recent data for the same day of the week will be used. If the meter point is weather sensitive (WS), the process utilizes a proxy day routine that selects and ranks three days that had similar weather patterns. If data exists for any of the three proxy days, the data for the highest ranked proxy day is used. If there is no data for the three WS proxy days, the most recent data for the same day of the week will be used. Once interval data is available, the NOIE total load value is aggregated and stored by the unique combination of QSE, LSE, TDSP, Profile ID, Distribution Loss Factor (DLF), load zone, UFE settlement zone and method.

c. *Generation Aggregation:* A generation entity is an owner or controller of a generation resource used for generating electricity that is connected to the ERCOT System. Generation metering not located at the actual point of transmission interconnect is adjusted for losses by the TDSP or by ERCOT excluding TDSP read meters. The preferred method for adjusting for losses involves programming of the EPS meter by the TDSP. If loss adjustment is not done in the EPS meter, it is performed by ERCOT's data aggregation system as necessary to account for transformer and/or line losses. For generation metering, IDR meters are used to calculate generator output or load usage. In the intervals where the generation output exceeds the load, the difference is assigned as generation. For net load conditions, the difference

is populated to the corresponding ESI ID and settled as load. For Generation Sites that have WSL associated to them, the WSL is identified separately for settlements. For generation sites that are behind NOIE metering points, ESI IDs are not established for the net load conditions since the load is accounted for within the NOIE metering points.

Entities representing generator units must select a QSE to provide ERCOT with a real-time signal of the MW of generation per generator unit. The signal is updated every scan cycle and represents each generator unit in positive MW. ERCOT integrates the real time signal into 15-minute interval MWh data and calculates a generation splitting ratio for each generator. The generation splitting ratio is then applied to the actual metered MWh values retrieved from the EPS meters to allocate the required amount to each generating unit. For any interval when ERCOT has not received a real-time signal for any one of the generating units, the last valid percentage ratio is used. A jointly owned generation resource unit may split the generation output into two or more virtual generating units.

d. *DC Tie Aggregation:* DC ties include the import (reflected as generation) and export (reflected as load) of energy across non-synchronous transmission interconnections between ERCOT and non-ERCOT electric power systems. The components and processes associated with aggregating DC tie data include collecting schedules and processing the generation and load data components. ERCOT is responsible for polling all meters at DC tie interconnection points. DC tie operators can modify real-time energy flow. If the DC tie operator makes a real-time modification, ERCOT technical operations must communicate modified schedules to the data aggregation team for use in the data aggregation process.

e. *Load Profiles:* Load profiles are used to convert NIDR data into interval data. TDSPs are responsible for initially assigning and maintaining the load profile ID for each ESI ID. The load profile ID segment assignments are validated annually. ERCOT is responsible for validating segment assignments as defined in the Profile Decision Tree, which is contained in Appendix D of the Load Profiling Guide. After performing the validations, ERCOT identifies ESI IDs for which the ERCOT-calculated load profile ID segments are different than those currently assigned. A list of ESI IDs with such differences is sent to the corresponding TDSP for its action. ERCOT monitors the listed ESI IDs to provide reasonable assurance that changes are made, and works with each TDSP to resolve discrepancies.

In converting non-interval data into interval data, the aggregation system categorizes each ESI ID into groups based on common characteristics (such as load profile ID, QSE, load zone, meter read start/stop times, etc.) and totals the kWh for each aggregated group. The aggregation system then scales the aggregated group load profile to reflect the total energy for the aggregated group. ERCOT creates and publishes on the portal the load profiles for each profile type. Based on time of use (TOU) versus non-TOU metering, profiled non-interval data is calculated by dividing the aggregated group kWh for a specific time period (usually a month, meter read start date through meter read stop date for that aggregation “bucket”) by the profile class’ total profiled kWh for the same time period and then multiplying this factor by the average class load profile for the given operating day. For TOU metering, TOU rate periods are figured into the aforementioned calculations.

The application of profiles results in multiple sets of operating day interval data grouped by characteristics. The final activity in this process sums these multiple data sets to create unique aggregated unadjusted load data sets for use in final aggregation processes.

f. *Aggregation Validation and Analysis:* As data aggregation occurs for each distinct process, ERCOT has established mechanisms for manually recalculating and systematically validating load, generation, and UFE values. Manual recalculation mechanisms include the use of data models that ERCOT created for NOIEs and generation entities to use to adjust actual meter data for applicable loss factors and UFE to arrive at interval data. ERCOT compares this interval data to the outputs generated by the data aggregation system and investigates any discrepancies. Systematic validations of the data aggregation process include the use of validation scripts or rate schedules, which are programmed into the data aggregation system and run on a nightly basis. Along with the use of these data models, ERCOT also performs trend analysis through the use of graphs that show comparisons of total ERCOT load to total generation and outlines the percentage of total load allocated to each class. In addition, ERCOT publishes load estimation counts and volumes reports, which display the total number and percentage of actual reads and ERCOT-estimated reads for IDRs and NIDRs for initial, final, and true-up settlement runs. Private reports are generated for each LSE and QSE as well as a public ERCOT-wide summary

report that displays the information for each TDSP. Data aggregation provides extracts of data aggregation load segments and aggregation factors to market participants to allow external verification of results.

g. *Transmission and Distribution Losses:* After the meter data has been aggregated by common characteristics, transmission and distribution loss estimates are applied to achieve a total load calculation for a given interval. Distribution loss is the difference between the energy delivered to the distribution system and the energy consumed by loads connected to the distribution system. Therefore, the application of DLFs adjusts aggregated load data for energy loss occurring at the distribution voltage level by adjusting all loads to a transmission interconnection point. Additionally, this process sorts load data, applies DLFs, and saves the data with unique billing determinants for settlement.

   Each distribution service provider (DSP) calculates and provides ERCOT with the annual DLFs to apply to distribution voltage level loads in its area of certification. The ERCOT Settlement Metering department meter engineering group reviews and approves the DLF methodology and supporting calculations submitted by each DSP prior to the loss factors being used for settlement. In addition, the TDSP assigns a DLF code to each ESI ID. ERCOT posts the DLF methodology, including any equations and constants, for each DSP on ERCOT's portal. ERCOT publishes on the MIS portal DLFs for each settlement interval of the operating day. The aggregated unadjusted metered load is increased by the distribution losses calculated utilizing the DLF associated with each ESI ID, resulting in distribution loss adjusted load.

   Transmission loss is the difference between energy input into the ERCOT transmission grid and the energy taken out of the ERCOT transmission grid. The ERCOT system planning group reviews the TLF methodology and supporting methodologies prior to the loss factor's use in settlement. TLFs are the fraction of ERCOT load that is considered to be the ERCOT transmission grid losses in the settlement interval. TLFs 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. Seasonal on-peak and off-peak TLFs are derived from annually updated ERCOT on-peak and off-peak load flow base case analysis. Base cases reflect the most current data on the transmission system and generation resource dispatch. The ERCOT transmission grid topology and related generation resource dispatch in the base cases are the critical factors in calculating transmission losses.

   ERCOT forecasts and publishes (via the Forecasted TLF Report) TLFs for each settlement interval of the operating day. After each operating day, ERCOT calculates deemed actual TLFs for each settlement interval of the operating day and publishes (via the Actual TLF Report) the TLFs that are used in the settlement calculations. The distribution loss adjusted load is increased by the transmission losses calculated using the TLFs, resulting in total loss adjusted load.

h. *Unaccounted For Energy:* UFE is the difference between total metered load, adjusted for losses, and total ERCOT system net generation. The data aggregation system calculates ERCOT-wide UFE as the difference between the total generation supplied to a specific physical region (ERCOT-wide) and the total load, adjusted for losses in that same physical region (ERCOT-wide) during each settlement interval. Total loss adjusted meter load (AML) is categorized into five UFE categories to calculate the load per UFE category. Once categorized, the UFE load is multiplied by the UFE category-weighting factor to arrive at the net load by UFE category. Next, UFE by UFE zone is calculated and then allocated to each load category based on load ratio share (LRS). Finally, UFE within each load category is allocated to the specific loads within each category. UFE may be positive or negative in any settlement interval and is allocated to specific load categories. The aggregation process increases or decreases the MWh value of each interval of the load data by the settlement interval UFE and then saves the data with billing determinants identifying the data set as AML.

   The data aggregation group has established mechanisms for validating the UFE values. ERCOT confirms that ERCOT-wide AML equals total generation and performs trend analysis using ERCOT created UFE validation reports and graphs. After ERCOT applies UFE, the validation report recalculates total load across all metered entities before the application of UFE, UFE across all metered entities, and total load across all metered entities after UFE has been applied. At this point, ERCOT verifies that the AML equals total generation and data aggregation analysts investigate any discrepancies.

i. *Final Aggregation:* ERCOT aggregates the AML data sets to provide the necessary data for settlement and for the calculation of LRS data. ERCOT aggregates the multiple data sets defined in the previous sections by QSE and load zone to produce the billing determinants for use in settlement calculations. To calculate LRS data, ERCOT translates the settlement interval data per QSE into hourly data and divides the QSE MWh load value by the ERCOT total MWh load for the same hours. Finally, ERCOT publishes all necessary data aggregation factors to the portal to provide entities with the ability to perform data aggregation recalculations.

Settlements and Billing Overview

ERCOT settles RTM activity, DAM activity, and CRR auction activity. Each type of settlement has a unique set of statements and/or invoices and settles according to a different timeline. Settlement statements and invoices can apply to a registered CRRAH, a registered QSE, or both.

The table below provides summary details regarding the various statements and invoices.

Type	Invoice or Statement	Recipient	Frequency	Post Timing	Payment Timing
CRR	CRR auction invoice	CRRAHs	Monthly	1st business day after completion of a CRR auction (monthly and annual CRR auctions are invoiced separately)	3rd bank business day after invoice posts *(or next day that is both business day and bank business day)*
	CRR auction revenue distribution invoice	QSEs (with Load)	Monthly	1st business day after RTM initial statement posts for the last day of the relevant month and 1st business day after RTM final statement posts for the last day of the relevant month	5th bank business day after invoice posts *(or next day that is both business day and bank business day)*
	CRR balancing account invoice	CRRAH (due a shortfall refund) QSEs (with load)	Monthly	1st business day after RTM initial statement posts for the last day of the relevant month	1st bank business day after the due date of the STL invoice that includes the RTM initial settlement statement for the last day of the month *(or next day that is both business day and bank business day)* For resettlements: 5th bank business day after invoice posts *(or next day that is both business day and bank business day)*
DAM	DAM statement	QSEs CRRAHs	Daily	2nd business day after the operating day	n/a

Type	Invoice or Statement	Recipient	Frequency	Post Timing	Payment Timing
	DAM resettlement statement	QSEs CRRAHs	Ad hoc	Ad hoc *(on business day)* *Market notice required	n/a
RTM	RTM initial settlement statement	QSEs CRRAHs	Daily	Operating day + 5 (or next business day)	n/a
	RTM final settlement statement	QSEs CRRAHs	Daily	Operating day + 55 *(or next business day)*	n/a
	RTM true-up settlement statement	QSEs CRRAHs	Daily	Operating day + 180 *(or next business day)*	n/a
	RTM resettlement settlement statement	QSEs CRRAHs	Ad hoc	Ad hoc *(on business day)* *Market notice required	n/a
MISC	Miscellaneous invoice	QSEs CRRAHs	Ad hoc	Ad hoc (on business day) *Market notice required	Specified in the market notice
STL	Settlement Invoice	QSEs CRRAHs	Daily	Every Business Day – Rolls up all statements posted that day	2nd Bank Business Day after invoice posts *(or next day that is both business day and bank business day)*
	Default uplift invoice	QSEs CRRAHs	Ad hoc	Ad hoc *(on business day)* *Market notice required	5th bank business day after the invoice posts *(or next day that is both business day and bank business day)*

There are 20 charge types calculated for DAM settlement (as applicable) and 52 charge types calculated for RTM settlements (as applicable). Each relevant charge type is paid and/or charged to a QSE or CRRAH as part of the market financial settlement processes. The charge types are identified in ERCOT Protocols and are calculated whenever the identified conditions occur. For DAM settlements, the charge types generally relate to energy, AS, and CRR ownership. For RTM settlements, the charge types generally relate to energy, AS, reliability services, CRR ownership, and ERCOT's administrative fee.

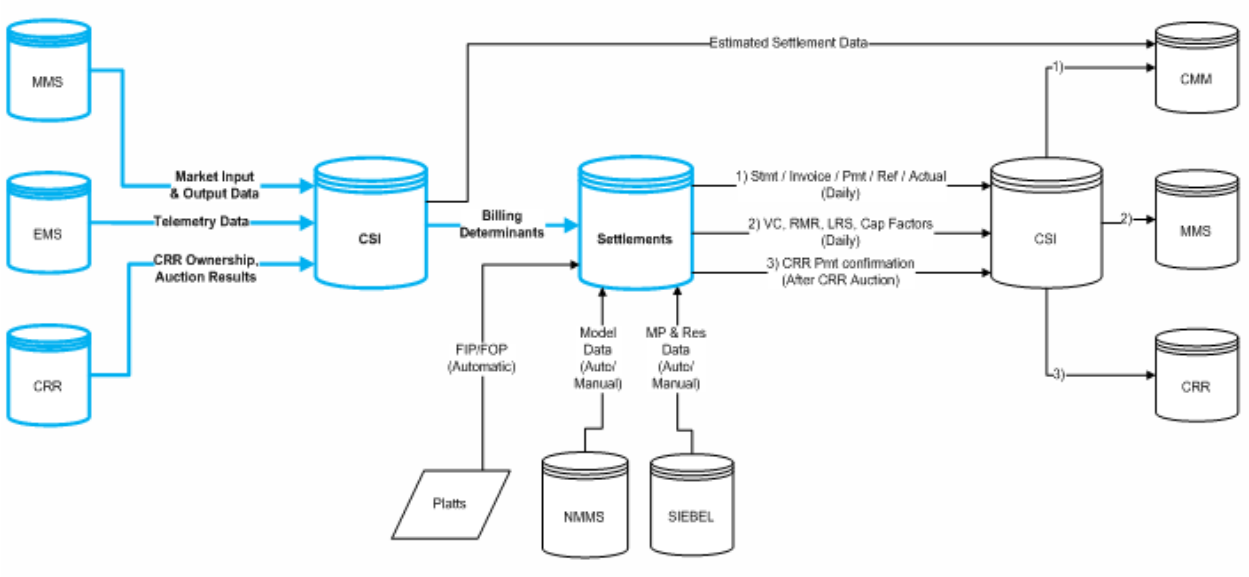
In addition to the charge types that are settled as part of the DAM or RTM settlements, ERCOT distributes CRR auction revenue and excess congestion rent collected from the DAM to CRRAHs and/or QSEs representing load. While these calculations are not referred to as "charge types", the calculations require similar validation processes and due diligence to ensure accuracy. ERCOT Protocols identify the calculations and the conditions that drive the calculations.

10. Settlement Data Input and Validation

a. *Commercial Systems Integration (CSI) Data Inputs:* The CSI system integrates data transactions from the market and operations systems into the settlements and billing system to create approximately 189 different billing determinants for use in settlement calculations. The relevant data is pulled from the MMS,

the EMS, and the CRR systems, transformed into the required bill determinant format, and imported into the settlements and billing system. CSI events transfer data at various times throughout the day, dependent upon availability of the data from the upstream systems and the timing by which the data is needed for settlement activity. The settlements group receives the following data from upstream systems:

- CRR System Inputs:
    - CRR auction results
    - CRR ownership
- MMS Inputs:
    - Prices (DAM and RTM SPPs, DAM shadow prices, RTM price for metered energy at the bus)
    - Current operating plan information
    - Energy offers (three-part offers and energy-only offers) and bids
    - Awarded energy offers and bids
    - AS obligations and self-arrangements
    - AS capacity awards
    - DAM CRR offers
    - PTP obligation awards
    - CRR deration and related information
    - QSE to QSE energy and capacity trades
    - Self-schedules
    - DC-tie schedules
    - RUC commitments and decommitments (automated or verbal dispatch instructions (VDI))
    - Resource parameters
- EMS Inputs:
    - SCED and emergency base point information
    - Telemetered resource status information
    - Telemetered generation
    - Regulation instructions
    - Forced outage information
    - Output schedules
    - Information regarding various system conditions
    - ERCOT load forecasts and actuals



The CSI events are evaluated to ensure completeness and accuracy of data transfers by reviewing system warnings/errors and resolving issues accordingly. Every integration event requires verification for completeness and accuracy. Events that run overnight are evaluated in the morning, prioritizing events that transfer data required for DAM settlement. Events that run during the day are included in the next day's validations. Analysts maintain logs to ensure that the events are verified prior to providing indication that the data is ready for use in settlement. When the data is verified, an analyst will send out an e-mail confirming completion of operating day specific day ahead and real time data.

b. *Other Data Inputs:* Most of the input data that is used in the settlement calculations is imported into the settlements and billing system automatically through the CSI interface (see above). There are additional input data elements required for settlement that are not transferred via CSI but are instead loaded in an automated fashion. Those elements include:

- Platt's fuel oil index price high and low values, and the FIP
- Market participant and relationship information (monitored by the data integrity and administration team)

Other data that is used in the settlement calculations is output from the data aggregation process or is imported into the settlements and billing system manually by the settlements group. Data that is imported into the settlements and billing system manually by settlements analysts may include the following:

- Information from VDIs
- Reliability must run (RMR) contract data and actual cost
- Black Start Service (BSS) contract data
- Emergency interruptible load service (EILS) settlement data
- Emergency energy settlement data
- Data changes due to disputes
- Corrections to market clearing prices
- Miscellaneous debits and credits
- Base data setup (bill determinants, calculation factors, load resources, specific generation resource characteristics, scheduling tables, etc.)

c. *The Approach Used to Change or Create Input Data:* The manually imported data comes from a variety of sources (e.g., after-the-fact price correction data comes from an e-mail notice from the market operations support group; VDIs come from queries of the MMS; RMR contract data and actual cost data comes from final contract negotiations and QSE cost submissions; BSS contract data comes from final contract negotiations; miscellaneous debit and credit data comes from alternative dispute resolutions, disputes, and Public Utility Counsel (PUC) orders; and dispute data comes from QSE or CRRAH submitted disputes). The process described below is in place for the imports of data into the settlements and billing system by the settlements group.

Two Person Teams

Two analysts make up a team to provide assurance that the data is created and imported completely and accurately. The first analyst performs the required analysis, derives the new/changed data to be imported, and updates the data input files and the operating day log (see below). The second analyst independently performs analysis and reviews the derived data changes. Once both analysts agree that the data changes are correct, the second analyst creates the appropriate import file (XML, IMP or CSV format) and imports the data into the settlements and billing system. The second analyst verifies that the import was successful and saves an electronic copy of the load report or import log generated by the settlements and billing system. The second analyst also verifies the update to the input data file and updates the operating day log to reflect that verification and import has occurred.

Market Input Data Files

At the completion of the data transfer for data required for DAM settlement and RTM settlement, an analyst creates CSV files to reflect an independent representation of the data for the operating day as it appeared in CSI for the transfer into the settlements and billing system The file is maintained by the settlements group for each operating day for each settlement run (DAM and RTM). As imports are made into the settlements and billing system, the new data entries are also added to the CSV file, with original data entries being retained and marked as changed. This CSV file is used in the validation of the payments and charges calculated by the settlements and billing system. Modification of this file follows a strict process.

Operating Day Log

Each operating day has an Excel log where entries are made by the analysts reflecting any issues pertaining to that operating day and all instances where data has been manually created/imported into the settlements and billing system. It is a record of the data that has been imported and data that needs to be imported prior to settlement. Log entries briefly describe the imported data and note the actions of the two analysts. Before the operating day is settled, the operating day log is reviewed by an analyst to provide reasonable assurance that the outstanding issues have been resolved.

11. Day Ahead Market (DAM) Settlement Statements

The DAM settlement process includes generation and approval of DAM settlement statements. The statements are required to post on the second business day after the operating day. The statements are created for each operating day for which a DAM was approved, but only for those QSEs or CRRAHs with DAM activity. Each statement reflects summary and interval level payments and charges. Negative amounts on the statement represent payments to statement recipients, while positive amounts represent charges to statement recipients.

The Protocols do not include a scheduled resettlement for the DAM. However, the Protocols specify conditions under which a DAM resettlement is necessary. DAM resettlements can occur for three reasons: (1) direction from the ERCOT Board of Directors due to DAM pricing errors, (2) ERCOT data or system error (other than prices) resulting in an impact greater than 2% of the total payments due to ERCOT for the DAM, or (3) resolution of QSE or CRRAH disputes of DAM settlements.

The settlements and billing system executes DAM settlement according to the schedule specified within the system. Analysts are responsible for setting the schedule within the system and completing any pre-batch processes (e.g., manual data entry and verification) prior to the scheduled settlement run. The pre-batch activities also require verification of the CSI events that provide the data required for DAM settlement.

Typically, all data is available for DAM settlement one day after the operating day. Therefore DAM settlement for an operating day is executed on the day following the operating day. Upon completion of the DAM settlement job, the analysts begin validation of the results. The group has until midnight of the following day (or the next business day) to complete the validations and to approve the DAM statements. Upon approval, the statements are published electronically to the MIS. This occurs on ERCOT business days. Please refer to *Validation of Calculations, Statements, and Invoices* below for details regarding the validation processes.

12. Real Time Market (RTM) Settlement Statements

The RTM settlement process includes generation and approval of RTM statements. The three scheduled iterations of RTM settlement for each operating day are initial, final, and true-up.

The RTM initial statement is the first iteration of RTM settlement and is required to post on the 5th day after the operating day (or the next business day).

The RTM final statement reflects any differences calculated in settlement amounts compared to the previous settlement for a given operating day (initial or resettlement) and is required to post on the 55th day after the operating day (or the next business day).

The RTM true-up statement reflects any differences calculated in settlement amounts compared to the previous settlement for a given operating day (final or resettlement) and is required to post 180 days after the operating day (or the next business day). However, true-up settlement is contingent upon ERCOT receipt and validation of IDR data in accordance with ERCOT Protocols Section 9.5.6 (monitored by the data aggregation group).

If required, a RTM resettlement statement is generated for an operating day. ERCOT Nodal Protocols direct the circumstances that require a DAM resettlement or an RTM resettlement. Resettlements are typically the result of disputes or correction of data errors. Resettlement statements are also generated when the total of all errors in data, other than prices, results in an impact greater than 2% of the total payments due to ERCOT for the RTM for the operating day. Any resettlement occurring after a true-up statement has been issued must meet the same IDR data threshold criteria as required for true-up settlement.

The settlements and billing system executes RTM settlement according to the schedule specified within the system. Analysts are responsible for setting the schedule within the system and completing any pre-batch processes (e.g., manual data entry and verification) prior to the scheduled settlement run. The pre-batch activities also require verification of the CSI events that provide the data required for DAM settlement.

Typically, all market and operational data is available for RTM settlement by the end of the day following operating day. However, RTM settlement requires various data elements associated with load and metered generation (outputs from the data aggregation jobs), which is not available until after the 4th day after the operating day. Therefore, the RTM settlement calculations are executed on the 4th day following the operating day.

Upon completion of the RTM settlement jobs, the analysts begin validation of the results. The group has until midnight of the 5th day after the operating day (or the next business day) to complete the validation of the calculations and approve the RTM statements. Upon approval, the statements are published electronically to the MIS. This occurs on ERCOT business days. Please refer to *Validation of Calculations, Statements, and Invoices* above for details regarding the validation processes.

13. Invoices

Settlement Invoices are generated and posted daily and include statement totals from the DAM and RTM settlement statements *posted* on the same day. All invoices are validated to ensure that they include the appropriate settlement data. Please refer to *Validation of Calculations, Statements, and Invoices* above for details regarding the validation processes.

In addition to Settlement invoices, ERCOT is responsible for three varieties of CRR-related invoices: CRR auction invoices, CRR auction revenue distribution invoices, and CRR balancing account invoices.

a. *CRR Auction Invoices:* ERCOT is required to post the CRR auction invoices on the first business day following the completion and posting of the CRR auction results. CRR auctions are conducted throughout the year, and at least monthly. CSI transfers the CRR auction results to the settlements and billing system, including the quantity, price, and amount for each allocation or award. settlements and billing system simply renders the auction results on an invoice for presentation to the CRRAH. Analysts are responsible for verifying complete receipt of the data, as well as complete invoicing of the data. Please refer to *Validation of Calculations, Statements, and Invoices* below for details regarding the validation processes.

b. *CRR Auction Revenue Distribution (CARD) Invoices:* On a monthly basis, ERCOT is required to calculate the disbursement of CRR auction revenue to QSEs representing load. Per the Protocols, the distribution of CRR auction revenue for a given month is allocated on a LRS (based on initial settlement) for each QSE for that same month and is required to post on the first business day following the RTM initial settlement posting of the last day of the given month. Additionally, there is a second iteration of the distribution that redistributes the CRR auction revenue for that month, according to LRS values that are based on final settlement. ERCOT is required to post the second iteration of the CARD invoice on the first business day following the RTM final settlement posting of the last day of the given month. The Settlements and billing system calculates the amount due to each QSE. The CARD calculations are independently validated to ensure accuracy. Similarly, the invoices are validated to ensure accuracy and completeness. Please refer to *Validation of Calculations, Statements, and Invoices* below for details regarding the validation processes.

c. *CRR Balancing Account (CRRBA) Invoices:* On a monthly basis, ERCOT is required to distribute excess congestion rent collected in the balancing account to CRRAHs and/or QSEs representing load. ERCOT is required to post the invoices on the first business day following the RTM initial settlement posting of the last day of the given month. If there are funds in the balancing account, refunds are paid to any CRRAH that received shortfall charges through DAM and RTM settlement. Any remaining funds are added to the CRR Balancing Account Fund and the excess are paid out to QSEs with load according to a LRS based on initial settlement. The settlements and billing system calculates the amount due to each CRRAH or QSE. The CRRBA calculations are independently validated to ensure accuracy. Similarly, the invoices are validated to ensure accuracy and completeness. Please refer to *Validation of Calculations, Statements, and Invoices* below for details regarding the validation processes.

14. Other Invoices

In addition to CRR settlement, ERCOT is responsible for a variety of other ad hoc or monthly invoices. Such invoices include default uplift invoices and miscellaneous invoices.

a. *Default Uplift Invoices:* In the event that a QSE or CRRAH does not pay a STL invoice in full (i.e., a short pay), the short amount is uplifted to QSEs and/or CRRAHs according based upon a “maximum MWh activity ratio share” no earlier than 180 days after the short-pay event. For each uplift, Treasury, Credit, and Settlements staffs coordinate action items prior to the uplift. A two-person team within the Settlements staff calculates and verifies the allocation of the uplift to each CP and the subsequent allocation to the QSEs or CRRAHs. Using the net balance of the short pay provided by Treasury, the settlements analysts manually determine the amount to be uplifted to QSEs and CRRAHs, as well as the amount to be paid to each entity that was originally short paid, and import the data into the settlements and billing system. This activity follows the validation processes and controls defined for all manual data entries. The system generates the default uplift invoices according to the data entered by the analyst. The invoices are validated to ensure accuracy and completeness. Please refer to *Validation of Calculations, Statements, and Invoices* below for details regarding the validation processes.

b. *Miscellaneous Invoices:* The miscellaneous invoice provides the means for a system-generated settlement invoice for *ad hoc* reasons such as ADRs or litigation. In the event that ERCOT needs to utilize the miscellaneous invoice, analysts work with the appropriate departments (e.g., Treasury and Legal) to determine the amount to be charged or paid to each entity. The analyst imports the data into

the settlements and billing system, following the validation processes and controls defined for all manual data entries. The system generates the invoices according to the data entered by the analyst. The invoices are validated to ensure accuracy and completeness. Please refer to *Validation of Calculations, Statements, and Invoices* below for details regarding the validation processes.

Validation of Calculations, Statements and Invoices (applicable to Objectives 11 to 14)

The primary function of the settlements group is to provide accurate and timely settlement statements and invoices. In order to accomplish this goal, the group executes a number of validation processes that enable analysts to identify errors in the settlement system results. Errors could be the result of an unidentified defect, an inaccurate manual data import, or uncontrollable technical circumstances, such as network or database issues.

The settlements group independently validates settlement system calculations using data independent from the settlement system. Excel and/or SAS validation tools are used to shadow every settlement system calculation, using the independent input data file. The shadow settlement comparison is performed at the most granular level possible. For instance, a charge type that is assessed by the QSE, generation resource, settlement point, and interval is validated at the interval level for every instance with the appropriate activity. Similarly, the billing calculation that calculates the difference between the daily sum of the initial settlement and the daily sum of the final settlement for a QSE-based charge type is validated by QSE for the operating day. The settlement system calculation process is simulated, according to the business requirements for the system, and analysts utilize validation tools to recalculate and compare to the Settlements and billing system results.

If the independent calculations do not match the calculations made by the system, the analyst investigates the issue. Data or system corrections are made, and either the settlement is backed out and re-executed (preferred option) or payment/charge adjustments are made on the next scheduled settlement (time-constrained option). If a correction is required on a subsequent settlement, an entry is made in the operating day log.

Upon successful validation, the settlement analyst is required to provide sign-off on an intra-departmental e-mail. This signoff indicates that either the validation tool calculated the same amounts as the settlements and billing system (within rounding limits) or a determination has been made of no change to calculated amounts for resettlements. An analyst performs a review to provide reasonable assurance that each applicable charge type on the sign-off logs has been initialed and that the validation tools have been saved to the electronic operating day folder. Upon determination that the settlement validation process is complete, an e-mail is sent to the billing team to provide notification of successful and complete settlement validation.

In parallel with the settlement team's verification of settlement calculations, the billing team validates the accuracy of the billing calculations and the completeness of the statement generation. In order to do this, comparisons are made between the settlement system-calculated settlement charge type data and the settlement system-calculated statement summary data, as well as between the Settlements and billing system-calculated summary data and the statement XML. This comparison ensures that the charge type's data is traced through to the appropriate statement. Additionally, a sampling of statements in XML format are converted and viewed as HTML to ensure that there are no presentation issues. If any discrepancies are identified, the results are backed out and re-executed.

Once the settlements team has verified accurate and complete generation of the statements and has received the notification that the settlement validation is complete, an analyst can begin the process to approve and post the statements. The analyst approves the statements in the settlements and billing system and sends an e-mail to the wholesale commercial operations support group requesting execution of the statement approval job. Upon successful completion of the job, statements are published to the MIS electronically for viewing by the statement recipients. An independent analyst performs procedures to ensure that the settlement statements were successfully posted to the MIS on time. In the event that any statements are late, the analyst works with the wholesale commercial operations support group to get the statements posted, and with wholesale client services to draft a market notice and extend the dispute deadline.

The settlements team is responsible for validating the Settlement Invoices on a daily basis. The invoices are prepared on a net basis for each invoice cycle. For each cycle, an invoice recipient is either a net payee or net payer. Each invoice recipient pays any net debit and is entitled to receive any net credit shown in the invoice on the payment date, whether or not there is any settlement and billing dispute regarding the amount of the debit or

credit. For Settlement invoices, the team cannot request that invoices be posted until DAM and RTM statements are deemed accurate and complete.

The process to validate the settlement invoices is very similar to that which validates the settlement statements. Comparisons are made between the settlement system-calculated statement summary data for each relevant settlement statement and the settlement system-generated billing summary data, as well as between the settlement system-generated billing summary data and the invoice XML. This comparison ensures that the settlement statement data for each of the relevant operating days is traced through to the appropriate invoice. Additionally, a sampling of invoices in XML format are converted and viewed as HTML to ensure that there are no presentation issues. If any discrepancies are identified, the results are backed out and re-executed.

15. Financial Transfer

For the invoice types mentioned above, both the Treasury and the Settlements staffs have responsibilities in the financial transfer process to ensure that invoice payments (money in to ERCOT) and invoice payouts (money out to invoice recipients) are accurate and timely. Please refer to the table under *Settlements and Billing Overview* for details regarding the different payment and payout timing for each invoice type.

The financial transfer process for an invoice cycle is a two-day, two-step process where:

- Payments due from market participants to ERCOT are due on day 1
- Payments due from ERCOT to market participants are due on day 2

On a daily basis, Treasury staff monitors a banking application to identify payments received by ERCOT and enters payments in the financial transfer application. Periodically throughout the day, Treasury staff that did not enter the payments will balance the posted payments with the bank's cash statement, import the payments to the settlements and billing system, and notify Settlements staff that payments have been imported. At that time, Settlements staff executes validation processes to ensure the payment file is complete and reasonable.

For invoices due that day but not yet received by ERCOT by 1200, Treasury staff sends a courtesy e-mail to market participants' authorized representatives and credit contacts and communicates internally with Wholesale Client Services staff, Settlements, and Credit staff. Wholesale Client Services and/or Credit staff follow(s) up as needed with market participants to seek payments due.

All payments must be accounted for before the payout process begins on day two. If all payments have been received, Treasury staff notifies Settlements and Credit staff by e-mail. If all payments are not received, Treasury staff notifies Settlements staff of any outstanding invoices not received on the due date and time. If a short payment is to be processed, a market notice for the short payment will be sent. Any overpayments of amounts due to ERCOT are investigated and resolved by the responsible Credit or Client Services and Treasury staff.

Once notified by Treasury staff, Settlements staff confirm that all invoice payments are in the settlements and billing system and processed (or confirm Treasury's short payment amount, as appropriate), and initiates invoice payouts.

When payments due have been accounted for, Settlements staff approves the payment amounts in the settlements and billing system, then sends an e-mail to the Wholesale Commercial Operations support group to execute the job that calculates invoice payout data. Upon successful completion of the job, Settlements staff executes validation processes to confirm payout data is accurate. When payouts are confirmed, Settlements staff approves the payouts in the settlements and billing system, which effectively imports payout data into the financial transfer application. Settlements staff notifies Treasury staff by e-mail that payouts can be processed.

Treasury staff uploads (or enters) payout data from the financial transfer application into the banking application and validates the completeness and accuracy of the payout data in the banking application. Treasury staff that did not enter the wire verifies the completeness and accuracy of the payouts, then approves and releases the wire in the banking application. The banking application is configured to require separate user accounts for entering and approving a wire before an outgoing wire is released.

16. Computer Operations

The IT operations environment operates on an enterprise model, which allows for the management and monitoring of ERCOT systems under the same structure and governing processes while maintaining the business applications as independent functional areas. The primary processes managed under the enterprise model include continuous system monitoring (24 hours per day, seven days per week) daily batch processing, data backup, incident reporting, and problem management.

The IT function supports all business applications. System monitoring and management is performed on a continuous basis through an enterprise management tool that allows for proper tracking of alerts and alarms within the operational environment. This process enables ERCOT to manage its production environment in a more proactive manner and permits remedial action to mitigate risks to that environment.

The batch process provides a means of consistent and routine execution of daily business processes. Batch processing is managed and monitored on a continuous basis to facilitate complete processing of the daily business data.

The data backup process enables ERCOT to secure mission critical data to reasonably assure the continued viability of the Texas electric market. Data backup processes allow for geographic separation of critical data, data replication, alternate media stores, and offsite storage. The backup process also establishes a means for data retention to meet the demands of the market and governing entities.

Incident reporting and problem management is a process that provides reasonable assurance that system issues and anomalies are documented, tracked, investigated, and remedied through established standards. It provides for escalation of high priority issues that can threaten normal processing and serves as an investigative tool for past issues as a knowledge base to mitigate future risks.

17. Management of Configuration and Program Area Changes

ERCOT's operations depend on the interaction of many systems – environments, platforms, and applications. It is important that necessary changes be made in a manner that provides reasonable assurance of the continued availability and viability of these systems. Configuration and program area change management refers to the policies and procedures that govern the many departments involved in making changes to ERCOT's systems and by which changes to hardware and software are controlled. These policies and procedures describe the systematic processes through which changes to systems are requested, developed, tested, implemented, verified, and approved, as well as the records retained to document the processes.

Changes can be categorized by type – software-related or non-software-related – and by urgency – emergency or routine. Under ERCOT's policies, the procedures that are followed to implement changes depend on the type of change and the urgency of getting the change into the production environment.

a. *Software-related Changes:* ERCOT classifies and manages its software changes in two categories depending on the urgency of the change:

   - Routine Change – A non-emergency change that has time to be scheduled, reviewed, tested, and approved before implementation
   - Emergency Change – A change performed to recover from an outage or performance degradation that is impeding the successful delivery of IT services or mitigates immediate risk to the successful delivery of IT service

   Proposed routine changes to the environment are controlled through a documented Release Management Operating Procedure that includes testing and validation of their proper function and integration with existing applications, where applicable.

   Many of ERCOT's systems must be available on a continuous basis. IT operations departments are responsible for maintaining highly reliable and available IT services. At times, circumstances arise that create the immediate need to correct system outages or performance degradations, or to mitigate critical risks to the computer systems. When this occurs, the remediation or system change must be

implemented in a time frame that precludes certain authorizations and test procedures from being performed that are customary for routine changes.

For emergency changes, certain aspects of the release management process may be abbreviated because of time considerations, including but not limited to migration to the test environment and testing. Additionally, documented approval may occur after the change has been implemented.

Throughout the emergency change process, there is a clear delineation of duties and roles. The development staff has the responsibility for creating changes to applications in the development environment only. Groups independent of development are responsible for taking those changes and implementing them into the production environments. The development teams can only gain write access to production environments through the direct supervision by an operations team member under documented circumstances.

b. *Non-Software-related Changes:* Non-software-related changes include changes to hardware, network components, systems configurations, databases, or facilities. ERCOT classifies and manages its non-software changes (hereinafter referred to as "hardware changes") in emergency and routine categories (utilizing criteria similar to that used for software-related changes) depending on the urgency of the change.

Routine hardware changes utilize the IT Change and Configuration Management Operating Procedure (a component of the overall configuration and program area change management process). The IT Change Management system tracks and records who requested the change, why the change was requested, and who approved the change. All changes must be approved by a member of the IT staff and the business or system owner prior to implementation.

Emergency hardware changes follow the same procedures with the exception that the approvals by the IT team and the business or system owner may occur after the change has been implemented.

18. Application and Overall Security

a. *Information Security Function:* ERCOT has implemented an information security function that is responsible for information security policies, governance, compliance testing, user awareness, and monitoring. The Critical Infrastructure Security Department (CISD) follows its strategic plan to secure ERCOT's logical assets and information infrastructure and to provide reasonable assurance that the information security organization is capable of meeting the challenges posed by present and future information security threats. The chief security officer (CSO) reports the status and posture of ERCOT security to executive management and the Board of Directors on a regular basis.

b. *Security Policies, Procedures, and Standards:* CISD has established information security policies, standards, and guidelines for the management of security functions. The procedures and implementation of established policies, standards, and guidelines are the responsibility of the support organization managing the system or function. CISD has also implemented a security awareness program. Corporate security policies, standards, and guidelines are communicated to ERCOT employees and contractors via the company's corporate newsletter. CISD provides regular security awareness materials to employees and contractors in order to inform them of their responsibilities for security, as well as to provide information regarding specific security issues or concerns. All ERCOT employees and contractors with physical or logical access are required to complete security training.

c. *Operating System and Database Configuration:* ERCOT has established system security configuration specifications to secure systems from vulnerabilities and threats. The specifications are developed by CISD and implemented by IT. To maintain security, CISD performs reviews of the various in-scope production systems on an annual basis to ensure continued compliance with security specifications.

d. *User Administration Procedure:* ERCOT has defined user administration procedures for provisioning user access. To gain access to ERCOT systems, the manager of an employee will grant access to the user by assignment of a role based on need. If the access is not managed using a role, the Manager or employee will submit an access request. Upon approval from the asset owner, access is granted.

ERCOT has defined termination administration procedures for access revocation. Compliance monitoring is performed on the termination process to provide reasonable assurance that Primary access is removed in a timely manner. Instances of non-compliance are escalated immediately to management for resolution.

e. *Annual Certification of User Access:* User access rights are reviewed annually to validate access to ERCOT Market Systems. Through this annual certification, individual accounts are reviewed and approved by asset owners, and documentation of the review is maintained.

f. *Internal and Perimeter Network Protection:* ERCOT has established firewalls to protect its network from unauthorized access. The firewalls are configured to protect ERCOT from external threats. Firewalls are also implemented to protect internal systems ensuring that access is allowed only as authorized. Documentation has been established that enumerates the configuration rules in place. Firewall changes that may affect production systems are tracked and approved through the change management process.

g. *Security Monitoring:* ERCOT has established a security monitoring and analysis process. CISD monitors system activity and responds to unusual or suspicious events. Monitoring activities are documented through operations activity logs.

h. *Physical Security:* Entrances to ERCOT facilities are monitored and access is limited through the use of an Physical Access Control System. The main entrances to the facilities are manned by security officers. Employees and contractors must obtain an access badge before accessing any ERCOT building. An online request is completed by the employee or the employee's manager or contractor's sponsor, and approved by the employee's manager or contractor's sponsor. Access requests to controlled areas are reviewed and approved by the managers of the controlled areas. Access badges must be displayed in a visible manner at all times. Visitors are provided with an identification badge to wear while on the premises. Visitors must be escorted by an authorized ERCOT employee or contractor at all times when inside ERCOT controlled areas.

   Access to restricted areas such as data centers and control rooms is limited to authorized personnel by badge and biometric access. Cameras continuously monitor these areas. Badge and biometric access reports are generated and reviewed by ERCOT management on a quarterly basis. Badge and biometric access is deactivated upon notification that an individual no longer requires physical access to ERCOT facilities.

i. *Environmental Control:* ERCOT has implemented measures to protect systems against environmental concerns and to monitor this protection. Rooms housing computer equipment are protected by fire suppression systems that are certified on a periodic basis. Additionally, fire extinguishers are placed inside and outside rooms housing computer equipment and certified on an annual basis. Smoke and water sensors are located in both the floor and ceiling of rooms housing computer equipment. Computer rooms are temperature-controlled.

   ERCOT has implemented uninterruptible power supply (UPS) systems to protect systems against power failures and fluctuations. The UPS systems are physically secured and maintained, and are tested on a periodic basis to maintain proper working condition. Supplemental power systems are in place to protect against power interruptions of a duration sufficient to exhaust the UPS systems.

Information and Communication Systems

Management has established an organizational structure that facilitates the communication of important business information pertaining to market settlement related matters. Scheduled meetings are periodically conducted for and between management and staff personnel. These include both intra- and inter-departmental meetings at various organizational levels including regular meetings of the ERCOT executive team. In addition to formal meetings, informal communication channels exist to share information that might affect market settlement related operations. ERCOT management currently communicates with employees through many media including e-mail,

printed documents, "all hands" events, and presentations by management. An intranet is also used to provide information, feedback and survey mechanisms for management and peers.

MONITORING

Monitoring Activities

ERCOT's management and supervisory personnel monitor the quality of internal controls as a normal part of their daily activities. Monitoring is tailored to the organization, department, function or business through the use of manual and automated activities that validate results, measure performance, and alert for anomalies.

Ongoing and Separate Evaluations of the Control Environment

Examples of ERCOT's ongoing monitoring activities include the following:

- Supervision and oversight of the personnel involved in settlement, billing, and accounting services
- Use of automated reports, tools and mechanisms to detect error conditions and initiate system generated alert and error messages
- Monitoring of external events such as changes in legislation and IT security vulnerabilities, including penetration testing
- Submission of annual certifications to the CEO by each vice president as to the adequacy of internal controls
- Use of a repository to document controls on an ongoing basis, identifying gaps in internal controls and/or whether existing controls are operating effectively. These controls are self-assessed periodically throughout the year

The operations in ERCOT's settlements and billing business and the supporting IT systems are subject to review by ERCOT's Internal Audit department. The Internal Audit department has direct and unrestricted access to the Finance and Audit Committee of the Board of Directors, while administratively reporting to the CEO. These audits are reported to management along with any Board stakeholders, as well as ERCOT's external auditor. The findings of these efforts are tracked to ensure follow-up actions are taken and risks to processes are mitigated. The Director of Internal Audit reports on the adequacy of internal controls in the annual report to the CEO and the executive team.

Reporting Deficiencies

Deficiencies in management's internal control system surface from many sources, including ERCOT's ongoing monitoring procedures, separate evaluations of the internal control system, and external parties. Management has developed protocols to help ensure findings of internal control deficiencies are reported not only to the individual responsible for the function or activity involved and who is in a position to take corrective action, but also to at least one level of management above the directly responsible person. This process enables the responsible individual to provide needed support or oversight for taking corrective action and to communicate with others in the organization whose activities may be affected. Management evaluates the specific facts and circumstances related to deficiencies in internal control procedures. Management's decision to address deficiencies is based on whether the incident was isolated or requires a change in ERCOT's procedures or personnel.

COMPLEMENTARY CONTROLS AT USER ENTITIES

ERCOT's settlements operations system is designed with the assumption that certain controls will be implemented by user entities, QSEs, CRR auction participants, CRRAHs, and market participants. Such controls are called complementary user entity controls. It is not feasible for all of the control objectives related to ERCOT's settlements operations system to be solely achieved by ERCOT's control activities. Accordingly, user entities, in conjunction with the settlements operations system, should establish their own internal controls or procedures to complement those of ERCOT and ensure compliance with required Protocols.

The following complementary user entity controls should be implemented by user entities to provide additional assurance that the specified control objectives described within this report are met:

Network Operations Modeling

1. Market participants are responsible for determining that NOMCRs meet the ERCOT Modeling Guidelines and Validation Rules prior to submission in order to facilitate successful processing of the request. Market participants should monitor the status of NOMCRs submitted to determine if they are accepted by ERCOT.
2. Market participants are responsible for the completeness and accuracy of their NOMCR submissions.
3. During the market testing period, market participants are responsible for testing updated models on their systems and communicating any issues to ERCOT.

Congestion Revenue Rights

4. Market participants eligible for PCRR are responsible for establishing a process to determine that PCRR are requested on an annual basis.
5. Recipients of PCRR allocations are responsible for determining if allocations are accurate based on nominated amounts.
6. CRR auction participants are responsible for reviewing their own available credit prior to each CRR auction and making limitations on the available credit if desired.
7. CRR auction participants are responsible for ensuring that only authorized users at their organization have access to participate in the CRR auction on their behalf.
8. CRR auction participants are responsible for reviewing the CRR auction results that are posted online after the CRR auction closes to verify the accuracy of their bid amounts and the amounts awarded given bid amounts.
9. CRR auction participants are responsible for reviewing the auction invoices for accuracy.
10. CRRAHs are responsible for reviewing ownership of CRR following payment of invoices or bilateral trades for accuracy.

Scheduling and Bidding

11. QSEs are responsible for submitting accurate and complete offers, schedules, trades, bids, and the current operating plan to ERCOT on a timely basis for the DAM and RTM.
12. QSEs are responsible for identifying all information that needs to be reported and for supplying such information completely, including the RMR and Black Start contracts.
13. QSEs must indicate on their schedules the amount of AS that will be purchased from the ERCOT AS market.
14. QSEs are responsible for accessing the portal or API to confirm that market data, including AS and energy bids, have been processed by ERCOT and are responsible for submitting corrections in the event of errors.
15. Sending and receiving QSEs are responsible for reviewing and following up on error notifications for schedules and bids submitted.

Settlement Input and Validation

16. Market participants are responsible for submitting complete and accurate cost data to ERCOT should they choose to participate in the verifiable cost structure.
17. Market participants are responsible for reviewing all charge and credit calculations supplied by ERCOT to provide reasonable assurance of the propriety of values and to immediately report any discrepancies to ERCOT personnel.
18. Market participants are responsible for ensuring that the invoice and corresponding data forwarded to the QSE by ERCOT contain complete and accurate data through comparisons to original input data and through recalculation using the data supplied by ERCOT.

Financial Transfer

19. QSEs are responsible for assigning appropriate personnel with the authority to initiate wire transfers for payment on their behalf.

Logical Security

20. User entities are responsible for ensuring the confidentiality of any user accounts and passwords assigned to them for use with ERCOT's systems.
21. User entities are responsible for immediately notifying ERCOT of any actual or suspected information security breaches, including compromised user accounts.
22. User entities are responsible for signing the ERCOT Private WAN Agreement that defines the communications method utilized to connect to ERCOT's systems (e.g., direct connections, over public networks, etc.).

SECTION 4

TESTING MATRICES

TESTS OF OPERATING EFFECTIVENESS AND RESULTS OF TESTS

Scope of Testing

This report on the controls relates to the settlement operations system provided by ERCOT. The scope of the testing was restricted to the settlement operations system considered to be relevant to the internal control over financial reporting of respective user entities. BrightLine conducted the examination testing over the period October 1, 2014, through September 30, 2015.

Tests of Operating Effectiveness

The tests applied to test the operating effectiveness of controls are listed alongside each of the respective control activities within the Testing Matrices. Such tests were considered necessary to evaluate whether the controls were sufficient to provide reasonable, but not absolute, assurance that the specified control objectives were achieved during the review period. In selecting the tests of controls, BrightLine considered various factors including, but not limited to, the following:

- The nature of the control and the frequency with which it operates;
- The control risk mitigated by the control;
- The effectiveness of entity-level controls, especially controls that monitor other controls;
- The degree to which the control relies on the effectiveness of other controls;
- Whether the control is manually performed or automated;

The types of tests performed with respect to the operational effectiveness of the control activities detailed in this section are briefly described below:

Test Approach	Description
Inquiry	Inquired of relevant personnel with the requisite knowledge and experience regarding the performance and application of the related control activity. This included in-person interviews, telephone calls, e-mails, web-based conferences, or a combination of the preceding.
Observation	Observed the relevant processes or procedures during fieldwork. This included, but was not limited to, witnessing the performance of controls or evidence of control performance with relevant personnel, systems, or locations relevant to the performance of control policies and procedures.
Inspection	Inspected the relevant audit records. This included, but was not limited to, documents, system configurations and settings, or the existence of sampling attributes, such as signatures, approvals, or logged events. In some cases, inspection testing involved tracing events forward to consequent system documentation or processes (e.g. resolution, detailed documentation, alarms, etc.) or vouching backwards for prerequisite events (e.g. approvals, authorizations, etc.).

Sampling

Consistent with American Institute of Certified Public Accountants (AICPA) authoritative literature, BrightLine utilizes professional judgment to consider the tolerable deviation rate, the expected deviation rate, the audit risk, the characteristics of the population, and other factors, in order to determine the number of items to be selected in a sample for a particular test. BrightLine, in accordance with AICPA authoritative literature, selected samples in such a way that the samples were expected to be representative of the population. This included judgmental selection methods, where applicable, to ensure representative samples were obtained.

System-generated population listings were obtained whenever possible to ensure completeness prior to selecting samples. In some instances, full populations were tested in cases including but not limited to, the uniqueness of the event or low overall population size.

Test Results

The results of each test applied are listed alongside each respective test applied within the Testing Matrices. Test results not deemed as control deviations are noted by the phrase "No exceptions noted." in the test result column of the Testing Matrices. Any phrase other than the aforementioned, constitutes a test result that is the result of non-occurrence, a change in the application of the control activity, or a deficiency in the operating effectiveness of the control activity. Testing deviations identified within the Testing Matrices are not necessarily weaknesses in the total system of controls at user entities, as this determination can only be made after consideration of controls in place at user entities, and other factors. Control considerations that should be implemented by user organizations in order to complement the control activities and achieve the stated control objective are presented in the "Complementary Controls at User Entities" within Section 3.

QSE Qualification and Credit Monitoring

Control Objective Specified by the Service Organization: Control activities provide reasonable assurance that only qualified Market Participants can participate in the ERCOT market.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
	QSE and CRRAH applications are reviewed for completeness when received by ERCOT and approved application information is entered into the registration system.		
1.1.1	When a QSE or CRRAH application is received, legal department personnel review the application for completeness of the following information: • Designation of authorized representative, USA via signature of an authorized representative or officer • Registration fee and confirmation of data universal numbering system (DUNS) • Registration with the Texas Secretary of State • 24x7 primary contact • Credit application with authorized signatures Completed applications are communicated to Registration, Settlements-Billing, Credit, and CRR as applicable.	Inquired of the legal relations specialist regarding the documentation requirements for QSE and CRRAH applicants to determine that application documentation was reviewed for completeness and that the QSE or CRRAH applicant was notified when the application was received or if additional information was required.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
		Inspected the application documentation for a sample of QSE and CRRAH applications received during the review period to determine that, for each application sampled, the documentation included the following: • Designation of authorized representative, USA via signature of an authorized representative or officer • Registration fee and confirmation of DUNS • Registration with the Texas Secretary of State • 24x7 primary contact • Credit application with authorized signatures	No exceptions noted.
1.1.2	A review by a second ERCOT client service analyst is performed to determine that QSE or CRRAH application data is entered completely and accurately into the registration system. Signatures on the QSE application form are maintained to document the initial and second reviews performed by each analyst.	Inspected the QA log for a sample of QSE and CRRAH applications received during the review period to determine that the QSE/CRRAH application data entered into the registration system was reviewed by a second ERCOT client service analyst for each application sampled.	No exceptions noted.
	QSE/CRRAH financial assurances are monitored against established credit limits.		
1.2.1	For applicants, the credit department reviews the information provided on the credit application, financial statements, and credit ratings to assess the applicant's financial condition. The credit manager approves assigned credit limits as specified by the ERCOT protocol before qualification is granted. The credit department notifies ERCOT client services once a CP has satisfied the ERCOT creditworthiness standards.	Inspected the credit worthiness analysis performed for a sample of QSE and CRRAH applications received during the review period to determine that for each application sampled, the credit manager approved credit limits based on the review of the credit application, financial statements, and credit ratings, and that the credit department notified ERCOT client services once ERCOT financial creditworthiness standards were satisfied by each sampled applicant.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
1.2.2	On a daily basis, credit staff compile and review the QSE's/CRRAH's financial liability in the ERCOT market to determine whether the QSE's/CRRAH's liability has exceeded its secured or unsecured credit limit and whether additional financial assurances are appropriate. Additional assurances are requested and collected when the QSE's/CRRAH's evaluation assurance level exceeds the financial secured or unsecured credit limit.	Inquired of the credit manager regarding the periodic monitoring of QSE's/CRRAH's financial liability to determine that credit staff evaluated the QSE's/CRRAH's financial liability and requested additional collateral whenever the QSE's/CRRAH's liability exceeded its secured or unsecured credit limit.	No exceptions noted.
		Inspected the financial liability review for a sample of dates during the review period to determine that credit staff evaluated the QSE's/CRRAH's financial liability for each date sampled and requested additional collateral whenever the QSE's/CRRAH's liability exceeded its secured or unsecured credit limit.	No exceptions noted.
1.2.3	The credit department receives payment information from the treasury department and evaluates whether there are any late or outstanding payments. Additional financial assurances are requested and collected in cases of repeated late payments.	Inquired of the credit manager regarding the monitoring of late payments to determine that the credit department received payment information from the treasury department and evaluated whether there were any late or outstanding payments. Additionally, determined that additional financial assurances were requested and collected in cases of repeated late payments.	No exceptions noted.
		Inspected the finance payment validation, the late invoice listing and the late payment notification for a sample of late payments recorded during the review period to determine that the credit department reviewed each late or outstanding payment sampled and additional financial assurances were requested and collected in cases of repeated late payments.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
1.2.4	Financial assurances are applied to outstanding invoices, if necessary, to remedy a short payment resulting from a default.	Inquired of the credit manager regarding outstanding payments and defaults to determine that financial assurances were applied to outstanding invoices, if necessary, to remedy a short payment resulting from a QSE default.	No exceptions noted.
		Inspected the finance payment validation, the late invoice listing and the late payment notification for a sample of late payments recorded during the review period to determine that financial assurances were applied to outstanding invoices, if necessary, to remedy a short payment resulting from a QSE default.	No exceptions noted.
1.2.5	On a daily basis, credit staff sends 90% of each CP's ACL to the CRR auction system and the DAM system. CPs must operate within ACL constraints in each CRR auction and in the DAM.	Inquired of the credit manager regarding the transmission of the credit limits to the CRR auction and DAM systems to determine that credit staff sent 90% of each CP's ACL to the CRR auction system and the DAM system on a daily basis.	No exceptions noted.
		Inspected the ACL transmission log for a sample of dates during the review period to determine that credit staff sent 90% of each CP's ACL to the CRR auction system and the DAM system for each date sampled.	No exceptions noted.
	QSE/LSE and QSE/Resource relationships are validated before being recorded in the registration system.		
1.3.1	ERCOT client services records LSE/Resource and QSE relationships in the registration system after confirming that the relationship is acknowledged by both parties. This communication comes in through a QSE Acknowledgement form by itself or accompanied either by a registration application or notice of change of information form (NCI).	Inspected the application forms for a sample of LSE/Resource and QSE relationships recorded in the registration system during the review period to determine that QSE approval was documented for each new LSE/Resource and QSE relationship sampled.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
1.3.2	ERCOT obtains a signed acknowledgement form as approval to make changes to relationships between a QSE and a LSE or Resource in the ERCOT Registration System.	Inspected the NCI forms for a sample of changes to LSE/Resource and QSE relationships completed during the review period to determine that a signed acknowledgment form was obtained for each LSE/Resource and QSE relationship change sampled.	No exceptions noted.
	Only authorized QSEs have access to ERCOT's systems and the related interfaces.		
1.4.1	ERCOT client services manager approves the issuance of a production digital certificate to enable the QSE/CRRAH access to participate in the ERCOT market based on completion of the following qualification requirements: • Credit worthiness confirmation from credit manager • Qualification letter • Signed Market Participant Agreement • Qualification checklist • IT interface and market testing	Inspected the supporting documentation for a sample of production digital certificates issued during the review period to determine that, for each digital certificate issued, the following documentation was completed: • Credit worthiness confirmation from credit manager • Qualification letter • Signed Market Participant Agreement • Qualification checklist • IT interface and Market testing	No exceptions noted.
1.4.2	Changes to authorized USAs are made only upon receipt of a NCI form signed by the authorized representative of the QSE/CRRAH. After changes are made and reviewed by a second ERCOT client services staff, the USA Digital Certificate Request is completed and submitted by a MPIM Analyst to an ERCOT Client Services Account Manager for notification that the certificate has been issued. The certificate is issued by a MPIM Analyst on USA changes only.	Inquired of the client services manager regarding changes to USAs and issuance of digital certificates to determine that a production digital certificate was issued to the QSE USA identified in the registration system via the MPIM.	No exceptions noted.
		Inspected the NCI for a sample of changes to authorized USAs completed during the review period to determine that the NCI form was signed by the authorized representative of the QSE/CRRAH for each change sampled.	No exceptions noted.

NETWORK MODEL

Control Objective Specified by the Service Organization: Control activities provide reasonable assurance that changes to the Network Operations Model (NOM) are authorized and processed completely and accurately.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
	Changes to the NOM are processed based on market requests.		
2.1.1	USA requests for new Network Model Management System (NMMS) users are reviewed and approved by the NMMS administrator prior to being granted access to submit NOMCRs to the Network Operations Modeling group.	Inquired of the network model coordinator regarding NMMS user access to determine that USA requests for new NMMS users were reviewed and approved by the NMMS administrator prior to being granted access to submit NOMCRs to the Network Operations Modeling group.	No exceptions noted.
		Inspected the approval documentation and system access for a sample of NMMS users granted access to submit NOMCRs to the Network Operations Modeling group during the review period to determine that the access request was reviewed and approved by the NMS administrator for each user account sampled.	No exceptions noted.
2.1.2	On a semi-annual basis, the Network Operations Modeling group sends out e-mails to market participants to review and validate users with the ability to submit NOMCRs. The Network Operations Modeling group keeps track of Market Participant responses and revokes users' ability to submit NOMCRs if no response is received.	Inquired of the network model coordinator regarding the review of NMS users to determine that the Network Operations Modeling group sent e-mails to Market Participants on a semi-annual basis to review and validate users with the ability to submit NOMCRs. Additionally, determined that the Network Operations Modeling group tracked Market Participant responses and revoked users' ability to submit NOMCRs if a response was not received.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
		Inspected the NOMCRs user account review and e-mail tracking to determine that the Network Operations Modeling group sent e-mails to Market Participants during the review period to validate users with the ability to submit NOMCRs, and tracked Market Participant responses and revoked users' ability to submit NOMCRs if a response was not received.	No exceptions noted.
2.1.3	The NMMS performs the automated level 1 validation (check on the required information and data format) on NOMCRs.	Inspected the results of a test NOMCR created by the Network Operations Modeling group to determine that the NMMS performed the automated level 1 validation for each NOMCR.	No exceptions noted.
2.1.4	The Network Operations Modeling group performs a level 2 validation (inspection for completeness of data) and a level 3 SAMR validation (assignment to a Model Tester) on all submitted SAMRS for Ratings Methodologies, Mitigation Action Plans, Contingency Files, Remedial Action Plans, Special Protection Schemes, Remedial Action Plans Conditional, and any other (ICCP and RARF) by an authorized data submitter according to the validation desk procedures.	Inspected a sample of SAMR changes implemented during the review period to determine that the Network Operations Modeling group performed level 2 and level 3 validations for each SAMR change sampled.	No exceptions noted.
	Changes to the NOM are validated prior to implementation in production.		
2.2.1	The nodal model coordinator and the nodal model tester perform the following for NOMCRs prior to release for testing: • Level 2 validation • Level 3 NOMCR validation (topology and power flow readiness)	Inspected the testing records for a sample of NOMCRs implemented during the review period to determine that the nodal market coordinator and the nodal market tester performed level 2 and level 3 validations for each NOMCR sampled.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
2.2.2	The nodal market tester performs a level 4 validation (power flow test and contingency analysis) for NOMCRs under test, when compiled with other NOMCRs that have the same energization date.	Inspected the testing records for a sample of NOMCRs with the same energization date implemented during the review period to determine that the nodal market tester performed level 4 validation for each NOMCR sampled.	No exceptions noted.
2.2.3	Initial model validation for 45-day model posting includes a level 5 validation (test unexplainable pricing changes in the MMS) by the Market Operations support group and/or model testers.	Inspected the testing records for a sample of NOMCRs with the same energization date implemented during the review period to determine that the Market Operations support group and/or model testers performed level 5 validation for each NOMCR sampled.	No exceptions noted.
2.2.4	Prior to release into production, the energy and market management system (EMMS) database load coordinator determines that testing has been completed by the modeling group and ERCOT business. The database load coordinator also confirms and communicates testing approval to the Control Room and DAM Control Room.	Inspected the e-mail communication of the NOMCR testing results for a sample of NOMCRs implemented during the review period to determine that the EMMS group database load coordinator communicated that testing was completed by the modeling group and ERCOT business prior to implementation for each NOMCR sampled.	No exceptions noted.

CONGESTION REVENUE RIGHTS AUCTION

Control Objective Specified by the Service Organization: Control activities provide reasonable assurance that CRR allocation and auction data (for use in settlements) are calculated accurately and completely.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
	All PCRR are allocated based on allocation eligibility forms and physical constraints of transmission elements.		
3.1.1	The CRR system is updated at least annually with current NOIE Contract and Entitlement information based on reviews of RARFs and approval from the legal department.	Inspected the results of the most recent CRR system update/review performed to determine that the CRR system was updated with current NOIE Contract and Entitlement information based on reviews of RARFs and approval from the legal department.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
3.1.2	NOIE PCRR nominations are validated by the CRR group and reviewed by a second CRR member. The initial validation and review are in the auction log.	Inspected the most recent annual auction log to determine that NOIE PCRR nominations were validated by two members of the CRR group as documented in the auction log during the review period.	No exceptions noted.
3.1.3	The CRR Market Operator (MO) runs monthly true-up procedures to allocate any residual PCRR nominations that were not fully allocated during the annual allocation process and the results of the true-up are reviewed by a second CRR member. The true-up and review are documented in the auction log.	Inspected the allocation log for a sample of months during the review period to determine that CRR MO ran monthly true-up procedures to allocate any PCRR nominations that were not fully allocated during the annual allocation process and the true-up was reviewed and documented in the auction log by a second CRR member for each month sampled.	No exceptions noted.
	CRRAH credit limits are monitored.		
3.2.1	Daily, the credit limits for CRRAHs in the CRR system are automatically updated from the CMM system.	Inspected the CRR Calendar and the updates to the collateral system for a sample of auctions held during the review period to determine that the credit limits for CRRAHs in the CRR system were automatically updated from the CMM system on a daily basis between the auction notice date and the auction lock date for each auction sampled.	No exceptions noted.
3.2.2	The CRR system prevents CRRAHs from being awarded more than their credit limit allows as of the specified credit lock date.	Inspected the CRR awards for a sample of auctions held during the review period to determine that the CRR system prevented CRRAHs from being awarded more than their credit limit allowed as of the specified credit lock date for each auction sampled.	No exceptions noted.
	CRR are awarded accurately and completely based on the results of the CRR auction.		
3.3.1	The CRR MO determines that the system is configured correctly for the auction and configurations are reviewed by a second CRR member. The initial configuration and review are documented within the auction log.	Inspected the auction log for a sample of auctions held during the review period to determine that two CRR team members verified the auction configurations and documented evidence of the configuration and review for each auction sampled.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
3.3.2	The CRR MO runs the semi-annual/monthly auction for CRR and validates the results. A second CRR member reviews the validation. The initial and secondary reviews are documented within the auction log.	Inspected the auction log for a sample auctions held during the review period to determine that the CRR MO ran the annual/monthly auction for CRR and a second CRR team member reviewed the validation as documented within the auction log for each auction sampled.	No exceptions noted.
	CRR ownership is transferred.		
3.4.1	The CRR system automatically assigns ownership of CRR when payment is received and entered in Lodestar.	Inspected the PTP Bids and CRR file to determine that the CRR system automatically assigned ownership of CRR when payment was received and entered in Lodestar.	No exceptions noted.

SCHEDULING AND BIDDING

Control Objective Specified by the Service Organization: Control activities provide reasonable assurance that Offers, Schedules, Trades, Bids, and the Current Operating Plan (COP) submitted by QSEs are received by ERCOT completely and accurately.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
	Offers, schedules, trades, bids, and COPs submitted by QSEs are acknowledged and validated by ERCOT.		
4.1.1	Energy offer curves, bids, trades, output schedules or the current operating plan submitted through the API are evaluated for syntax and structural validity. The results of this evaluation are presented to the QSE, who is responsible for correcting any rejected submissions.	Inquired of the manager of the DAM regarding bidding through the API to determine that energy offer curves, bids, trades, output schedules or the current operating plan submitted through the API were evaluated for syntax and structural validity and that the results were evaluated by the QSE.	No exceptions noted.
		Inspected the results of test transactions submitted through the API during the review period to determine that energy offer curves, bids, trades, output schedules and the current operating plan were evaluated for syntax and structural validity.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
4.1.2	Energy offer curves, bids, trades, output schedules or the current operating plan submitted through Market Manager are evaluated for syntax and structural validity. The results of this evaluation are presented to the QSE, who is responsible for correcting any rejected submissions.	Inquired of the manager of the DAM regarding bidding through Market Manager to determine that energy offer curves, bids, trades, output schedules or the current operating plan submitted through the Market Manager were evaluated for syntax and structural validity and that the results were evaluated by the QSE.	No exceptions noted.
		Inspected the results of test transactions submitted through the Market Manager during the review period to determine that energy offer curves, bids, trades, output schedules and the current operating plan were evaluated for syntax and structural validity.	No exceptions noted.
4.1.3	Prior to the execution of the DAM, ERCOT systems perform additional validations (credit evaluation, ownership verification and user certification) of the offers, schedules, trades, bids, and the current operating plan for the next operating day. If a submission does not pass this validation, ERCOT sends a notice of rejection to the appropriate QSE who is responsible for correcting any rejected submissions.	Inquired of the manager of the DAM regarding bidding to determine that the ERCOT systems performed additional validations (credit evaluation, ownership verification and user certification) of the offers, schedules, trades, bids, and the current operating plan prior to the execution of the DAM and that a notice of rejection was sent to the QSE for any rejected submissions.	No exceptions noted.
		Inspected the results of test transactions processed during the review period to determine that the ERCOT systems performed additional validations prior to the execution of the DAM and that a notice of rejection was sent to the QSE for any rejected submissions.	No exceptions noted.

LMP Price Validation

Control Objective Specified by the Service Organization: Control activities provide reasonable assurance that LMP pricing calculations are accurate.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
	Validate reasonableness of the LMPs, MCPCs, and SPPs from the DAM.		
5.1.1	After the DAM is executed, DAM Control Room personnel utilize the DAM PVT to analyze if the prices and dispatch values calculated by the MMS are reasonable prior to posting results to the market.	Inquired of the manager of market analysis regarding DAM price validation to determine that after the DAM was executed, DAM Control Room personnel utilized the DAM PVT to analyze if the prices and dispatch values calculated by the market were reasonable prior to posting results to the market.	No exceptions noted.
		Inspected the DAM price validation report for a sample of dates during the review period to determine that DAM Control Room personnel utilized the DAM PVT to analyze if the prices and dispatch values calculated by the market were reasonable prior to posting results to the market for each sampled date.	No exceptions noted.
5.1.2	By 10:00 AM of the second business day following each operating day, the price validation team completes an initial analysis on DAM pricing for the operating day prior to communicating finalization of day ahead LMPs, MCPCs, and SPPs. An internal PVT report will be generated and documented for reference purposes. By close of business on the second business day following each operating day, a report or a delay notice will be released if there is major price issue or price correction.	Inspected the DAM price validation report and e-mail communication for a sample of dates during the review period to determine that the price validation team completed an initial analysis on DAM pricing for the operating day prior to communicating finalization of day ahead LMPs, MCPCs, and SPPs for each date sampled.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
	Validate reasonableness of the RTM LMPs, MCPCs, and SPPs.		
5.2.1	After the execution of the RTM, market analysis personnel utilize the results from the automated SCED PVT to verify values calculated by the Security Constrained Economic Dispatch Real-Time Market (SCED RTM).	Inquired of the manager of market analysis regarding SCED price validation to determine that during the execution of the RTM, the price validation team utilized the results from the automated SCED PVT to analyze LMPs and verify values calculated by the SCED RTM.	No exceptions noted.
		Inspected the SCED PVT reports for a sample of dates during the review period to determine that during the execution of the RTM, the price validation team utilized the results from the automated SCED PVT to analyze LMPs and dispatch values calculated by the market for each date sampled.	No exceptions noted.
5.2.2	By 16:00 of the second business day after the operating day, the price validation team completes an initial analysis on RTM pricing for the operating day prior to communicating finalization of real time LMPs and SPPs. An internal PVT report will be generated and documented for reference purpose. By close of business on the second business day following each operating day, a report or a delay notice will be released if there is major price issue or price correction.	Inspected the SCED PVT for a sample of dates during the review period to determine that the price validation team completed an initial analysis on RTM pricing for the operating day prior to communicating finalization of real time LMPs and SPPs for each date sampled.	No exceptions noted.
	Validate reasonableness of the SASM point prices.		
5.3.1	After the SASM market is executed, the SASM market operator utilizes the SASM PVT to dispatch values calculated by the MMS system and ensure they are reasonable prior to posting results to the market.	Inquired of the manager of market analysis regarding SASM price validation to determine that the SASM market operator utilized the SASM PVT to analyze if SASM MCPCs and dispatch values calculated by the market were reasonable prior to posting results to the market.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
		Inspected SASM price validation report for a sample of dates during the review period to determine that the SASM market operator utilized the SASM PVT to analyze if SASM MCPCs and dispatch values calculated by the market were reasonable prior to posting results to the market for each date sampled.	No exceptions noted.
5.3.2	By 16:00 of the second business day after the operating day, the price validation team completes an initial analysis on SASM pricing for the operating day prior to communicating finalization of MCPCs. An internal PVT report will be generated and documented for reference purposes. By close of business on the second business day following each operating day, a report or a delay notice will be released if there is major price issue or price correction.	Inspected the SASM PVT report for a sample of dates during the review period to determine that the price validation team completed an initial analysis on SASM pricing for the operating day prior to communicating finalization of MCPCs for each date sampled.	No exceptions noted.

RETAIL (EDI) TRANSACTION PROCESSING

Control Objective Specified by the Service Organization: Control activities provide reasonable assurance that changes to QSE relationships for ESI IDs used in the data aggregation process are based on change notices communicated to LSEs and consistent with ERCOT retail systems.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
	ERCOT performs data validity and integrity checks to determine that LSE to ESI ID relationship data is synchronized across ERCOT internal systems based on market-communicated relationships and is consistent and accurate for the aggregation and settlement processes.		
6.1.1	The Siebel system is configured to prohibit the entry of data errors including, but not limited to, the following: • More than one active energy service on the same ESI ID • Active EDI status changed to deactivated when there is an active service instance	Inquired of the retail data analyst senior regarding the Siebel system queries to determine that the Siebel system was configured to prohibit entry of the following data errors: • More than one active energy service on the same ESI ID • Active ESI ID status changed to deactivated when there was an active service instance	No exceptions noted.
		Inspected the Siebel system configurations to determine that the Siebel system was configured to prohibit entry of the following data errors: • More than one active energy service on the same ESI ID • Active ESI ID status changed to deactivated when there was an active service instance	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
6.1.2	On a daily basis, ERCOT systems automatically create a notification message that includes any issues encountered during automated updating of the Data Aggregation System from the ESI ID Registration System. This notification message is sent to responsible parties via e-mail and corrective action is taken on at least a weekly basis.	Inquired of the data analyst regarding data aggregation system notification messages to determine that the following occurred on a daily or weekly basis, as applicable: • The ERCOT system was configured to automatically create a notification message that included issues encountered during automated updating of the data aggregation system from the ESI ID registration system • The notification message was sent to responsible parties via e-mail on a weekly basis • Corrective action was taken according to ERCOT internal procedures on a weekly basis	No exceptions noted.
		Inspected the Siebel to Lodestar status comparison procedures document to determine that procedures were documented to guide personnel in the handling of issues encountered during the automated updating of the data aggregation system from the ESI ID registration system.	No exceptions noted.
		Inspected the error notification messages and evidence of corrective action, as applicable, for a sample of dates during the review period to determine that the ERCOT system generated a notification message, which included issues detected during the automated updating of the data aggregation system from the ESI ID registration system, for each date sampled.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
		Inspected the error notification messages and evidence of corrective action, as applicable, for a sample of dates during the review period to determine that a notification message was sent to data aggregation and Data Integrity and Administration personnel via e-mail for each date sampled.	No exceptions noted.
		Inspected the error notification messages and evidence of corrective action, as applicable, for a sample of dates during the review period to determine that corrective action was taken for errors identified for each date sampled.	No exceptions noted.
6.1.3	At least weekly, ERCOT performs an ESI ID status comparison between the ESI ID Registration System and the Data Aggregation System. Any discrepancies are resolved manually.	Inquired of the data analyst regarding the status comparison to determine that at least weekly, ERCOT performed an ESI ID status comparison between the ESI ID registration system and the data aggregation system. Additionally, determined that identified discrepancies were resolved manually.	No exceptions noted.
		Inspected the ESI ID status comparison for a sample of dates during the review period to determine that a status comparison was performed for each date sampled and that identified discrepancies were resolved.	No exceptions noted.
6.1.4	At least weekly, ERCOT performs a comparison of all of the ESI ID relationships existing in both the ESI ID Registration System and the ERCOT Data Aggregation System. This comparison involves records updated within the last three to five days for the history of the ESI ID.	Inquired of the data analyst regarding the ESI ID relationship comparison to determine that at least weekly, ERCOT performed a comparison of all of the ESI ID relationships existing in both the ESI ID registration system and the ERCOT data aggregation system, and the comparison involved records updated within the last three to five days for the history of the ESI ID.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
		Inspected the ESI ID relationship comparison for a sample of dates during the review period to determine that an ESI ID relationship comparison was performed for each week sampled.	No exceptions noted.
6.1.5	At least weekly, ESI ID accounts existing in the ESI ID Registration System and the ERCOT Data Aggregation System are compared. Discrepancies are identified and manually corrected in the respective system(s).	Inquired of the data analyst regarding ESI ID existence comparisons to determine that at least weekly, ESI ID accounts existing in the ESI ID registration system and the ERCOT data aggregation system were compared for existence. Additionally, determined that discrepancies were identified and manually corrected in the respective system(s).	No exceptions noted.
		Inspected the ESI ID existence comparison for a sample of dates during the review period to determine that an ESI ID existence comparison was performed for each date sampled.	No exceptions noted.

METER DATA ACQUISITION AND VALIDATION NON-EPS

Control Objective Specified by the Service Organization: Control activities provide reasonable assurance that non-EPS meter data collected and used in the settlement process is complete.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
	Meter data provided by TDSPs through EDI 867 transactions are acknowledged, validated, and tracked prior to use in the aggregation process.		
7.1.1	All EDI 867_03 transactions are subjected to data validations for ANSI and TX SET compliance. If the EDI 867_03 transaction fails TX SET validation, ERCOT sends an automated EDI 824 to the TDSP detailing the reason for the rejection.	Inquired of the retail data analyst senior regarding data validations and rejection resolution to determine that EDI 867_03 transactions were subjected to data validations for ANSI and TX SET compliance, and if the EDI 867_03 transaction failed TX SET validation, ERCOT sent an automated EDI 824 to the TDSP detailing the reason for the rejection.	No exceptions noted.
		Inspected the query and logged results for a sample of dates during the review period to determine that EDI 824 notifications were sent for each failed ESI 867_03 transaction identified on each date sampled.	No exceptions noted.
7.1.2	867_03 transactions that passed ANSI validation but did not attempt to validate against TX SET rules are reviewed and resolved at least weekly.	Inquired of the analyst regarding the TX SET failure review to determine that EDI transaction TX SET rejections were investigated and resolved by EDI support personnel.	No exceptions noted.
		Inspected the compliance without TX SET listing e-mails and resolution documentation for a sample of dates during the review period to determine that TX SET failures were reviewed for each date sampled.	No exceptions noted.
7.1.3	Prior to importing EDI 867_03 transaction data into the Data Aggregation system, ERCOT systems perform business validations of the data.	Inquired of the analyst regarding business validations to determine that ERCOT systems performed business validations on EDI 867_03 data prior to import.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
		Inspected a sample of EDI 867_03 activity reports generated during the review period to determine that ERCOT systems performed business validations of the EDI 867_03 transaction data.	No exceptions noted.
7.1.4	Prior to importing AMS transaction data into the Data Aggregation system, ERCOT systems perform business validations of the data.	Inquired of the analyst regarding business validations to determine that automated business validations were performed prior to the import of AMS data into the data aggregation system.	No exceptions noted.
		Inspected the AMS activity reports for a sample of dates and MREs generated during the review period to determine that automated business validations were performed prior to data import.	No exceptions noted.
7.1.5	Automated processes are utilized to check the completeness of IDR data for conformity with the protocols prior to execution of daily true-ups or resettlement of true-ups (as needed).	Inquired of the analyst regarding the IDR data completeness and conformity check to determine that automated processes were utilized to check the completeness of IDR data for conformity with the protocols prior to the execution of true-ups or resettlement of true-ups.	No exceptions noted.
		Inspected the IDR protocol compliance verification report for a sample of dates during the review period to determine that automated processes checked the completeness of IDR data for conformity with the protocols for each date sampled.	No exceptions noted.
7.1.6	An EDI 867_03 transaction activity report of successful and failed EDI 867_03 transactions is sent to the MREs via MIS. Analysts review the activity report generation and communication process at least weekly.	Inquired of the analyst regarding the EDI 867_03 transaction activity report to determine that an EDI 867_03 transaction activity report was sent to MREs via the MIS and that analysts performed a review of the activity report generation and communication process on a weekly basis.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
		Inspected the EDI 867_03 transaction activity reports for a sample of dates during the review period to determine that an EDI 867_03 transaction activity report was generated for each date sampled.	No exceptions noted.
7.1.7	An AMS transaction activity report of successful and failed AMS transactions is sent to the MREs via MIS. Analysts review the activity report generation and communication process at least weekly.	Inquired of the analyst regarding the AMS transaction activity report to determine that an AMS transaction activity report was sent to MREs via web portal and analysts performed a review of the activity report generation and communication process on a weekly basis.	No exceptions noted.
		Inspected the AMS transaction activity reports for a sample of dates and MREs during the review period to determine that an AMS transaction activity report was generated for each date sampled.	No exceptions noted.

METER DATA ACQUISITION AND VALIDATION EPS

Control Objective Specified by the Service Organization: Control activities provide reasonable assurance that ERCOT polled settlement (EPS) meter data collected and used in the settlement process is complete.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
	ERCOT validates meter data collected through the ERCOT meter polling system prior to use in the aggregation process.		
8.1.1	For new EPS metering facilities, TDSPs must provide ERCOT with metering design documentation prior to set up in the ERCOT meter polling system, MV-90. ERCOT staff review for compliance with existing requirements prior to granting approval for implementation. The approved site is entered into a tracking system and monitored until it is set up in the data aggregation system for settlement.	Inquired of the meter engineering supervisor regarding EPS meter design approval to determine that ERCOT reviewed and approved new metering design documentation received from TDSP and entered the site into a tracking system.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
		Inspected the meter design approval documentation for a sample of meter additions that occurred during the review period to determine that meter designs were approved by the meter engineering supervisor and entered into the ticketing system for the meter additions sampled.	No exceptions noted.
8.1.2	Changes to metering designs and specifications submitted by TDSPs are reviewed and approved by ERCOT staff to verify compliance with ERCOT's requirements.	Inspected the change approval documentation for a sample of meter changes that occurred during the review period to determine that metering design and specification changes were reviewed and approved by ERCOT personnel for each meter change sampled.	No exceptions noted.
8.1.3	The MV-90 system is configured to perform communication tests to verify the following: • The connection is made to the correct device • The connection is maintained for the entire session • The meter settings are within predefined threshold	Inquired of the meter data and acquisition supervisor regarding MV-90 system configurations to determine that MV-90 was configured to perform communication tests to verify the following: • The connection was made to the correct device • The connection was maintained for the entire session • The meter settings were within set thresholds	No exceptions noted.
		Inspected the MV-90 communication log generated for a sample dates during the review period to determine that MV-90 performed communication tests to verify the following for each date sampled: • The connection was made to the correct device • The connection was maintained for the entire session • The meter settings were within set thresholds	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
8.1.4	The MV-90 system is configured to discard data in the event of an abnormal communication termination and re-establish a connection to attempt to upload meter data.	Inspected the MV-90 abnormal communication termination process to determine that MV-90 discarded data in the event of an abnormal communication termination and re-established a connection to attempt to upload meter data.	No exceptions noted.
8.1.5	The MV-90 system is configured to maintain a log of communications with field devices including data acquisition errors. Errors that require escalation are documented via 6 hour, 12 hour and 5 business day notices, and are resolved by data acquisitions personnel.	Inquired of the meter data and acquisition supervisor regarding MV-90 system error resolution to determine that errors that required escalation were documented via 6 hour, 12 hour and 5 business day notices, and were resolved by data acquisitions personnel.	No exceptions noted.
		Inspected the MV-90 communication log for a sample of dates and example error notices generated during the review period to determine that MV-90 maintained a log of communications with field devices including data acquisition errors.	No exceptions noted.
8.1.6	The MV-90 system is configured to perform validity checks and record failures on a validation summary report. Meter data acquisitions personnel resolve identified failures.	Inquired of the meter data and acquisition supervisor regarding MV-90 validity checks to determine that MV-90 was configured to perform validity checks and record processing failures on a validation summary report. Additionally, determined that meter data acquisitions personnel resolved identified failures.	No exceptions noted.
		Inspected the validity check report generated for a sample of dates and an example failed and subsequent successful validity check performed during the review period to determine that MV-90 was configured to perform validity checks and record processing failures on a validation summary report.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
8.1.7	EPS meter data is estimated and edited or copied from the backup meter when data from the EPS meter does not pass validation tests. Meter data acquisitions personnel communicate with TDSP metering personnel regarding any estimated or editing of meter data.	Inquired of the meter data and acquisition supervisor regarding EPS validation to determine that EPS meter data was estimated and edited or copied from the backup meter when data from the EPS meter did not pass validation tests and that meter data acquisitions personnel communicated with TDSP metering personnel regarding estimated or edited meter data.	No exceptions noted.
		Inspected an example EPS data validation and communication with TDSP for metering data corrections processed during the review period to determine that EPS meter data was estimated and edited or copied from the backup meter when data from the EPS meter did not pass validation tests and that meter data acquisitions personnel communicated with TDSP metering personnel regarding estimated or edited meter data.	No exceptions noted.
8.1.8	The MV-90 data edit logs record data edits performed on metered data. The data edit logs are reviewed by MV-90 personnel prior to the data being used in the settlement process.	Inspected the log review for a sample of dates during the review period to determine that MV-90 data edit logs recorded edits performed on metered data. Additionally, determined that the edit logs were reviewed by meter data acquisitions personnel for each date sampled.	No exceptions noted.
	EPS meter data imported into the data aggregation system are validated prior to use in the aggregation process.		
8.2.1	The data aggregation system is configured to perform validation checks on imported data. Errors generated by the data aggregation system are documented on the EPS report and are resolved by meter data acquisition personnel.	Inquired of the meter data and acquisition supervisor regarding the EPS completeness report to determine that the data aggregation system was configured to perform validation checks on imported data. Additionally, determined that errors were documented on the EPS completeness report and reviewed by meter data acquisition personnel on a daily basis.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
		Inspected the EPS completeness reports for a sample of dates during the review period to determine that EPS reports were generated and reviewed for each date sampled.	No exceptions noted.
8.2.2	A monthly automated data comparison is performed between MV-90 primary meter data and the meter data in the data aggregation system. Identified discrepancies are resolved by data acquisition personnel.	Inspected the MV-90 to Lodestar primary meter data comparison for a sample of months during the review period to determine that MV-90 to Lodestar primary meter data comparisons were performed for each month sampled.	No exceptions noted.

METER DATA AGGREGATION UNACCOUNTED ENERGY

Control Objective Specified by the Service Organization: Control activities provide reasonable assurance that ERCOT aggregates load data, applies losses, and applies unaccounted for energy completely and accurately for use in the settlement process.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
	Data Aggregation personnel test the completeness of the load data used and the accuracy in the calculations performed for the aggregation process.		
9.1.1	Analysts perform manual verifications of data for NOIEs. NOIE manual recalculations are compared to the data aggregation system output and identified discrepancies are researched and resolved.	Inquired of the data aggregation analyst regarding manual NOIE recalculations to determine that NOIE manual recalculations were compared to the data aggregation system models and identified discrepancies were investigated and resolved.	No exceptions noted.
		Inspected the verification documentation for a sample of NOIEs changed during the review period to determine that NOIE manual recalculations were compared to the data aggregation system models and identified differences were investigated and resolved for each NOIE change sampled.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
9.1.2	Analysts perform manual verifications of data for generation entities. Generation entity manual recalculations are compared to the data aggregation system output and identified discrepancies are researched and resolved.	Inspected the verification documentation for a sample of generation entities changed during the review period to determine that generation entity manual recalculations were compared to the data aggregation system models and identified discrepancies were investigated and resolved for each generation entity change sampled.	No exceptions noted.
9.1.3	During the settlement of an operating day in the settlements and billing system, automated data validations are run in the data aggregation system as a component of the data aggregation, loss application, and UFE application batch processes. The validation process generates fatal and non-fatal errors. If EPS meter data is incomplete, a fatal error occurs and the process aborts. Fatal and non-fatal errors are resolved by data aggregation analysts.	Inquired of the data aggregation analyst regarding automated data validations to determine that during the settlement of an operating day in the settlements and billing system, automated data validations were run in the data aggregation system during the data aggregation, loss application, and UFE application batch processes. Additionally, determined that the validation process generated errors, which were documented in the error log and resolved by the data aggregation analysts.	No exceptions noted.
		Inspected the error log and resolution documentation for a sample of errors generated during the review period to determine that data validations were performed and identified errors were documented in the error log and resolved by the data aggregation analysts for each error sampled.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
9.1.4	After settlement of an operating day has occurred in the settlements and billing system, a SAS program verifies data aggregation system data for each operating day. Any errors noted are investigated and resolved. Validations performed during this process are: • Generation bill determinants are recalculated and verified from net unit generation (GSITETOT) • Net metering real time energy total (NMRTETOT) bill determinants are recalculated and verified from metered data (Resource IDs) • Load bill determinants are verified and recalculated from the net load unadjusted for distribution and transmission losses and for unaccounted for energy (LSEGUNADJ) A data aggregation analyst notifies the settlements and billing personnel if validations are unsuccessful.	Inquired of the data aggregation analyst regarding the SAS program verification process to determine that the following validations were performed during the SAS program verification process: • Generation bill determinants were recalculated and verified from GSITETOT • NMRTETOT bill determinants were recalculated and verified from Resource IDs • Load bill determinants were verified and recalculated from LSEGUNADJ Additionally, determined that the data aggregation analyst notified the settlements and billing personnel if validations were unsuccessful.	No exceptions noted.
		Inspected the SAS program configurations and the verification report generated for a sample of dates during the review period to determine that the following validations were performed during the SAS program verification process for each date sampled: • Generation bill determinants were recalculated and verified from GSITETOT • NMRTETOT bill determinants were recalculated and verified from Resource IDs • Load bill determinants were verified and recalculated from LSEGUNADJ	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
9.1.5	After settlement of an operating day has occurred in the settlements and billing system, a SAS program (NON-CORE Verifications) verifies data aggregation system data by running a number of checks and validations. Any errors noted are investigated and resolved.	Inquired of the data aggregation analyst regarding the non-core verifications to determine that after settlement of an operating day had occurred, a SAS program (NON-CORE Verifications) verified data aggregation system data by running a number of checks and validations and that any errors noted were investigated and resolved.	No exceptions noted.
		Inspected the SAS NON-CORE validation reports for a sample of operating dates during the review period to determine that a SAS program (NON-CORE Verifications) verified data aggregation system data by running a number of checks and validations and that any errors noted were investigated and resolved for each date sampled.	No exceptions noted.
9.1.6	The data aggregation analysts review the following data accuracy graphical analyses for each operating day, which are automatically generated from data aggregation system data after the settlement of an operating day in the settlements and billing system: • Total generation, total load, and UFE • UFE percentage • Generation comparison between systems operations and the data aggregation system • Load group contribution to total load • TLFs – for initial settlements only • Comparison of UFE percentage by settlement run – for resettlements only Identified discrepancies are investigated and resolved.	Inquired of the data aggregation analyst regarding data accuracy graphical analyses to determine that the following data accuracy graphical analyses were generated for each operating day from data aggregation system data after the settlement of an operating day in the settlements and billing system: • Total generation, total load, and UFE • UFE percentage • Generation comparison between systems operations and the data aggregation system • Load group contribution to total load • TLFs – for initial settlements only • Comparison of UFE percentage by settlement run – for resettlements only Additionally, determined that identified discrepancies were investigated and resolved.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
		Inspected the data accuracy graphical analysis charts and e-mails for a sample of operating dates during the review period to determine that data accuracy graphical analyses were generated for each date sampled.	No exceptions noted.
	ERCOT verifies load profile type assignments and load profile calculations for accuracy.		
9.2.1	The load profiling analyst performs annual validations of load profile type assignments according to the profile decision tree. Upon completion of the load profile type determinations, load profiling analysts provide to each TDSP a list of all ESI IDs for which a determination was made that the profile type should be different than what is currently assigned. Load profiling analysts track all changes to ESI ID profile types identified through the annual validation process for evidence changes have been submitted by the TDSPs.	Inquired of the senior load profiling analyst regarding annual load profile type assignment validations to determine that a load profile analyst performed annual load profile type assignment validations. Additionally, determined that load profiling analysts provided TDSPs with a listing of ESI IDs that required profile changes and tracked changes to the ESI IDs.	No exceptions noted.
		Inspected the most recent load profile type assignment validation report for an example TDSP to determine a validation was performed during the review period. Additionally, determined that changes were tracked in the profile type assignment validation report.	No exceptions noted.
9.2.2	Load profiling analysts manually verify, utilizing Excel spreadsheets and SAS programs, that actual weather data are automatically downloaded for each trade day.	Inquired of the senior load profiling analyst regarding weather data downloads to determine that the load profiling analyst utilized Excel spreadsheets and the SAS program to verify that actual weather data was automatically downloaded on a daily basis.	No exceptions noted.
		Inspected the SAS program and Excel spreadsheets for a sample of dates during the review period to determine Excel spreadsheets and the SAS program were utilized to verify that actual weather data was automatically downloaded for each date sampled.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
9.2.3	Load profiling analysts use SAS programs and Excel spreadsheets to determine that the load profiles are correctly calculated based on actual weather data for each trade day.	Inquired of the senior load profiling analyst regarding weather data downloads to determine that the load profiling analyst utilized Excel spreadsheets and the SAS program to verify load profiles were correctly calculated based on actual weather data on a daily basis.	No exceptions noted.
		Inspected the SAS program and Excel spreadsheets for a sample of dates during the review period to determine that Excel spreadsheets and the SAS program were utilized to verify load profiles were correctly calculated based on actual weather data for each date sampled.	No exceptions noted.

SETTLEMENT DATA INPUT AND VALIDATION

Control Objective Specified by the Service Organization: Control activities provide reasonable assurance that data used in the settlement process is imported into the settlements and billing system completely and accurately.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
	Controls provide reasonable assurance that data used in the settlement process is automatically imported into the settlement and billing system completely and accurately.		
10.1.1	Market activity recorded in the MMS and automatically transmitted to the settlements and billing system through CSI is validated for completeness and accuracy through the use of CSI transmission status reports. A settlements and billing analyst reviews CSI transmission status reports and manually resolves items requiring action noted within the report.	Inquired of the settlements analyst regarding the MMS market activity transmission validation to determine that the following occurred on a daily basis: • Market activity recorded in the MMS through the CSI was validated for completeness and accuracy by a settlements and billing analyst via CSI transmission status reports • A settlements and billing analyst manually resolved action items documented in the CSI transmission status reports, as applicable	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
		Inspected the MMS CSI transmission status report and validation log for a sample of dates during the review period to determine that a settlements and billing analyst validated the transmission of the MMS market activity to CSI via the CSI transmission status reports for each date sampled.	No exceptions noted.
		Inspected the action item e-mail alert for a sample of dates during the review period to determine that MMS market activity action items were resolved for each date sampled, as applicable.	No exceptions noted.
10.1.2	Operational activity recorded in EMS and automatically transmitted to the settlements and billing system through CSI is validated for completeness and accuracy through the use of CSI transmission status reports. A settlements and billing analyst reviews CSI transmission status reports and manually resolves items requiring action noted within the report.	Inquired of the settlements analyst regarding the EMS operational activity transmission validation to determine that the following occurred on a daily basis: • Operational activity recorded in the EMS through the CSI was validated for completeness and accuracy by a settlements and billing analyst via CSI transmission status reports • A settlements and billing analyst manually resolved action items documented in the CSI transmission status reports, as applicable	No exceptions noted.
		Inspected the EMS CSI transmission status report and validation log for a sample of dates during the review period to determine that a settlements and billing analyst validated the transmission of EMS operational activity to CSI via the CSI transmission status reports for each date sampled.	No exceptions noted.
		Inspected the action item e-mail alert for a sample of dates during the review period to determine that EMS operational activity action items were resolved for each date sampled, as applicable.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
10.1.3	CRR ownership information recorded in the CRR system and automatically transmitted to the settlements and billing system through CSI is validated for completeness and accuracy through the use of CSI Reports. A settlements and billing analyst reviews CSI transmission status reports and manually resolves items requiring action noted within the report.	Inquired of the settlements analyst regarding the CRR ownership information transmission validation to determine that the following occurred on a daily basis: • Ownership information recorded in the CRR system through the CSI was validated for completeness and accuracy by a settlements and billing analyst via CSI transmission status reports • A settlements and billing analyst manually resolved action items documented in the CSI transmission status reports, as applicable	No exceptions noted.
		Inspected the CRR CSI transmission status report and validation log for a sample of dates during the review period to determine that a settlements and billing analyst validated the transmission of CRR ownership information to CSI via the CSI transmission status reports for each date sampled.	No exceptions noted.
		Inspected the action items for a sample of CSI transmission status reports generated during the review period to determine that CRR ownership information transmission action items were resolved for each report sampled, as applicable.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
10.1.4	Monthly and annual CRR auction results recorded in the CRR system and automatically transmitted to the settlements and billing system through CSI are validated for completeness and accuracy through the use of CSI transmission status reports. A settlements and billing analyst reviews CSI transmission status reports and manually resolves items requiring action noted within the report.	Inquired of the settlements analyst regarding CCR auction results transmission validation to determine that the following occurred on a monthly/annual basis: • Monthly CCR auction results recorded in the CRR system through CSI were validated by a settlements and billing analyst for completeness and accuracy via CSI transmission status reports • A settlements and billing analyst manually resolved action items documented in the CSI transmission status reports, as applicable • CCR auction results recorded in the CCR system through CSI were validated by a settlements and billing analyst for completeness and accuracy via CSI transmission status reports on an annual basis	No exceptions noted.
		Inspected the CRR auction result transmission status report and the corresponding review e-mail for a sample of monthly auctions completed during the review period to determine that CRR auction result transmission status reports were reviewed and action items were resolved for each month sampled.	No exceptions noted.
		Inspected the CRR auction result transmission status report and the corresponding review e-mail for the most recent annual CRR auction to determine that CRR auction result transmission status reports were reviewed and action items were resolved during the review period.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
10.1.5	FIP and inputs for FOP data that are automatically transmitted directly into the settlements and billing system are validated for completeness and accuracy. A settlements and billing analyst reviews transmission status reports and manually resolves items requiring action noted within the report.	Inquired of the settlements analyst regarding FIP and FOP validation to determine that FIP and FOP data transmitted to the settlements and billing system were validated for completeness and accuracy on a daily basis.	No exceptions noted.
		Inspected the validation spreadsheets for a sample of dates during the review period to determine that FIP and FOP data transmitted to the settlements and billing system were validated for each date sampled.	No exceptions noted.
	Controls provide reasonable assurance that data used in the settlement process is manually imported into the settlement and billing system completely and accurately.		
10.2.1	Approved submitted information provided by Market Participants is imported into the settlements and billing system to be verified by two analysts prior to import.	Inquired of the settlements analyst regarding the approved verifiable cost import verification to determine that approved verifiable cost information provided by market participants was independently verified by two analysts prior to import into the settlements and billing system.	No exceptions noted.
		Inspected the batch report, import file reconciliation and batch log for a sample of months during the review period to determine that the verifiable cost import files were independently verified for each file sampled.	No exceptions noted.
10.2.2	Upon completion of the import of submitted information into the settlements and billing system, an analyst reviews the import report for transmission errors and resolves any issues noted.	Inquired of the settlements analyst regarding the verifiable cost import report review to determine that an analyst reviewed the import report upon completion of the import of submitted data into the settlements and billing system on a monthly basis. Additionally, determined that the analyst resolved any issues noted on the verifiable cost import report.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
		Inspected the import reports for a sample of months during the review period to determine that the import reports were reviewed and issues, if any, were resolved for each month sampled.	No exceptions noted.
10.2.3	Once a month, the settlements and billing group recalculates verifiable cost data due to changes in fuel price and emission credits due to changes in monthly cost indices. Procedures are in place to determine that these changes are implemented and processed completely and accurately in the settlements and billing system.	Inspected the verifiable cost procedures to determine that procedures were in place to guide personnel through the verifiable cost data recalculation and implementation into the settlements and billing system.	No exceptions noted.
		Inspected the verifiable cost reconciliation spreadsheet for a sample of months during the review period to determine that recalculations were performed and changes were verified for each month sampled.	No exceptions noted.
10.2.4	ERCOT system operators submit VDIs through a standard electronic form that captures deployment information necessary to settle the charge and payment for the deployment. On a daily basis, a settlements and billing analyst retrieves applicable VDI data for the operating day to be processed as a manual input to the settlements and billing system.	Inquired of the settlements analyst regarding VDI processing to determine that ERCOT system operators submitted VDIs through an electronic form that captured deployment information necessary to settle the charge and payment for the deployment. Additionally, determined that a settlements and billing analyst retrieved applicable VDI data to be processed as a manual input to the settlements and billing system.	No exceptions noted.
		Inspected the VDI spreadsheet and VDI XML file for a sample of dates during the review period to determine that VDI data was retrieved and processed to the settlements and billing system for each date sampled.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
10.2.5	For data manually created and imported into the settlements and billing system, excluding verifiable costs (e.g. disputes, VDI, RMR files, Black Start contracts, no DAM indicator), two analysts from the settlements and billing group independently verify the completeness and accuracy of the data by shadowing the data prior to import creation. The verification is documented on the trade day log.	Inquired of the settlements analyst regarding manually created data imports to determine that the manually created data imports were independently verified for completeness and accuracy by two analysts from the settlements and billing group by shadowing the data prior to import creation on a daily basis. Additionally, determined that the verifications were documented on the trade day log.	No exceptions noted.
		Inspected the independent verification spreadsheets for a sample of dates during the review period to determine that manually created data imports were independently verified for each date sampled.	No exceptions noted.
		Inspected the trade day log for a sample of dates during the review period to determine that the verification of manually created data imports was documented on the trade day log for each date sampled.	No exceptions noted.
10.2.6	Before the operating day is settled, an analyst reviews the operating (trade) day log and verifies that no outstanding unresolved issues are noted on the trade day log.	Inspected the trade day log for a sample of dates during the review period to determine that an analyst verified that no outstanding unresolved issues were noted on the trade day log for each date sampled.	No exceptions noted.

DAY AHEAD MARKET SETTLEMENT STATEMENTS AND INVOICES

Control Objective Specified by the Service Organization: Control activities provide reasonable assurance that amounts and charges are calculated completely and accurately by the settlements and billing system for use in settlement statements and invoices for the DAM including relevant CRR settlements.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
	Completeness and accuracy of DAM settlement statement data, calculations, results, and publication to statement recipients is managed by ERCOT staff and systems.		
11.1.1	The settlements and billing system automatically calculates all payments and charges for the DAM based on formulas dictated by the ERCOT protocols. After settlement of an operating day has occurred in the settlements and billing system, analysts independently calculate the payments and charges for the DAM and resolve any discrepancies noted.	Inquired of the settlements supervisor regarding the DAM payments and charges validation process to determine that the following occurred on a daily basis: • The settlements and billing system automatically calculated payments and charges for the DAM based on formulas dictated by ERCOT protocols • After the operating day settled, an analyst independently calculated payments and changes for the DAM and resolved any discrepancies	No exceptions noted.
		Inspected the validation spreadsheet for a sample of dates during the review period to determine that analysts compared system-generated payment and charge amounts to independently calculated amounts for each date sampled.	No exceptions noted.
11.1.2	After confirming the independent shadow settlement calculations match the automated calculations by the settlements and billing system for the DAM, an analyst saves the validation results to the operating day folder and sends an e-mail to the group, as notification that the validations have been completed.	Inquired of the settlements supervisor regarding the DAM settlement calculation verification process to determine that after confirming the DAM independent calculations matched the DAM system-generated calculations, an analyst saved the validation results to the operating day folder and notified the group via e-mail that the validations were completed.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
		Inspected the DAM validation spreadsheets and DAM validation e-mails for a sample of dates during the review period to determine that an analyst saved the validation results to the operating day folder and notified the group via e-mail that the validations were completed for each date sampled.	No exceptions noted.
11.1.3	Amounts to be reflected on the DAM settlement statements are verified by two analysts who compare the independent sum of transactions to the system calculated sum of statement amounts on the settlement statements. Identified issues are resolved.	Inquired of the settlements operations manager regarding the DAM settlement statement verification process to determine that DAM settlement statement amounts were independently verified on a daily basis by two analysts that compared the sum of the transactions to the system calculated sum of statement amounts on the settlement statements. Additionally, determined that the analysts resolved issues noted during the verification process.	No exceptions noted.
		Inspected the DAM billing verification spreadsheets for a sample of dates during the review period to determine that DAM settlement statement amounts were independently verified by two analysts and issues were resolved for each date sampled.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
11.1.4	Prior to approval of the DAM settlement statements, an analyst determines that the sign-off sheet indicates that verification checks have been completed and that the appropriate validation tools are saved to the operating day folder. Upon completion of the review, the analyst sets the DAM statement schedule to "approval ready" in the Lodestar database and communicates the expected number of statements to the commercial operations group in the execution request to run the "approve DAM statements" job.	Inquired of the settlements operations manager regarding the DAM settlement statement verification process to determine that prior to approval of the DAM settlement statements, an analyst completed the following tasks on a daily basis. • Reviewed the sign-off sheet to verify that the appropriate validations were complete and the validation tools were saved to the operating day folder • Configured the DAM statement schedule to "approval ready" in the Lodestar database • Communicated the expected number of statements to the commercial operations group via e-mail and requested execution of the "approve DAM statements" job	No exceptions noted.
		Inspected the DAM verification documentation for a sample of dates during the review period to determine that an analyst completed the following tasks for each date sampled: • Reviewed the sign-off sheet to verify that the appropriate validations were complete and the validation tools were saved to the operating day folder • Configured the DAM statement schedule to "approval ready" in the Lodestar database • Communicated the expected number of statements to the commercial operations group via e-mail and requested execution of the "approve DAM statements" job	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
11.1.5	An analyst verifies that the DAM settlement statements are published to the MIS site for access by statement recipients in accordance with the published settlement schedule.	Inspected the DAM approval e-mail, DAM statement schedule and a listing of statements posted for a sample of dates during the review period to determine that an analyst completed the following tasks for each date sampled. • Verified that the correct number of statements was published to the MIS site • Verified that the statements were published on the scheduled publish date	No exceptions noted.
	Completeness and accuracy of settlement invoice data, calculations, results, and publication for invoice recipients is managed by ERCOT staff and systems.		
11.2.1	Prior to approval of settlement invoices, an analyst determines that the sign-off sheet indicates that the verification checks have been completed and that the appropriate validation tools are saved to the operating day folder. Upon completion of the review, the analyst sets the settlement invoice schedule to "approval ready" in the Lodestar database and communicates the expected number of settlement invoices to the commercial operations group in the execution request to run the "approve settlement invoices" job.	Inquired of the settlements operations manager regarding the settlement verification process to determine that an analyst completed the following tasks on a daily basis for DAM and RTM invoices: • Reviewed the sign-off sheet to verify that the verification checks were completed and the appropriate validation tools were saved to the operating day folder • Configured the DAM and RTM invoice schedule to "approval ready" in the Lodestar database • Communicated the expected number of invoices to the commercial operations group via e-mail and requested execution of the "approve invoices" job	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
		Inspected the approval e-mail and invoice schedule for a sample of dates during the review period to determine that an analyst completed the following tasks for each date sampled: • Reviewed the sign-off sheet to verify that the verification checks were completed and the appropriate validation tools were saved to the operating day folder • Configured the invoice schedule to “approval ready” in the Lodestar database • Communicated the expected number of invoices to the commercial operations group via e-mail and requested execution of the “approve invoices” job	No exceptions noted.
11.2.2	An analyst verifies that the expected number of settlement invoices is published to the MIS site for access by invoice recipients in accordance with the published invoice schedule.	Inspected the approval box e-mail, the invoice schedules, and a listing of published invoices for a sample of dates during the review period to determine that an analyst completed the following tasks for each date sampled: • Verified that the correct number of invoices were published to the MIS site • Verified that the invoices were published on the scheduled publish date	No exceptions noted.

Real Time Market Settlement Statements and Invoices

Control Objective Specified by the Service Organization: Control activities provide reasonable assurance that amounts and charges are calculated completely and accurately by the Settlement and Billing system for use in settlement statements and invoices for the Real Time Market (RTM) including relevant CRR settlements.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
	Completeness and accuracy of RTM settlement statement data, calculations, results, and publication to statement recipients is managed by ERCOT staff and systems.		
12.1.1	The Settlements and Billing system automatically calculates all payments and charges for the RTM based on the formulas dictated by the ERCOT protocols. After settlement of an operating day has occurred in the settlements and billing system, analysts independently calculate the payments and charges for the RTM and resolve any discrepancies noted.	Inquired of the settlements supervisor regarding the RTM payments and charges validation process to determine that the following occurred on a daily basis: • The settlements and billing system automatically calculated payments and charges for the RTM based on formulas dictated by ERCOT protocols • After the operating day settled, an analyst independently calculated payments and charges for the RTM and resolved any discrepancies	No exceptions noted.
		Inspected the RTM validation spreadsheet for a sample of dates during the review period to determine that analysts compared system generated payment and charge amounts to independently calculated amounts for each date sampled.	No exceptions noted.
12.1.2	After confirming the independent shadow settlement calculations match the automated calculations by the settlements and billing system for the RTM, the analyst saves the validation results to the operating day folder and sends an e-mail to the billing group, as notification that the validations have been completed.	Inquired of the settlements supervisor regarding the RTM settlement calculation verification process to determine that after confirming the RTM independent calculations matched the RTM system generated calculations, an analyst saved the validation results to the operating day folder and notified the billing group via e-mail that the validations were completed.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
		Inspected the RTM validation spreadsheets and RTM validation e-mails for a sample of dates during the review period to determine that an analyst saved the validation results to the operating day folder and notified the billing group via e-mail that the validations were completed for each date sampled.	No exceptions noted.
12.1.3	Amounts to be reflected on the statements are further verified independently by two analysts by comparing the sum of all transactions to the sum of all statement amounts on the RTM settlement statements. Any issues noted are resolved.	Inquired of the settlements operations manager regarding the RTM settlement review to determine that two analysts independently verified RTM statement amounts by comparing the sum of transactions to the sum of all statement amounts on the RTM settlement statements. Additionally, determined that any issues noted in the verification were resolved.	No exceptions noted.
		Inspected the RTM validation spreadsheets and RTM validation e-mails for a sample of dates during the review period to determine that an analyst notified the billing group via e-mail that the validations were completed for each date sampled.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
12.1.4	Prior to approval of the RTM settlement statements, an analyst determines that the sign-off sheet indicates that all verification checks have been completed and that the appropriate validation tools are saved to the operating day folder. Upon completion of the review, the analyst sets the RTM Statement Schedule to "approval ready" in the Lodestar database and communicates the expected number of settlement statements to the commercial operations group in the execution request sent to run the "approve RTM statements" job.	Inquired of the settlements operations manager regarding the RTM settlement statement verification process to determine that prior to approval of the RTM settlement statements, an analyst completed the following tasks on a daily basis. • Reviewed the sign-off sheet to verify that the appropriate validations were complete and the validation tools were saved to the operating day folder • Configured the RTM statement schedule to "approval ready" in the Lodestar database • Communicated the expected number of statements to the commercial operations group via e-mail and requested execution of the "approve RTM statements" job	No exceptions noted.
		Inspected the RTM verification documentation for a sample of dates during the review period to determine that an analyst completed the following tasks for each date sampled: • Reviewed the sign-off sheet to verify that the appropriate validations were complete and the validation tools were saved to the operating day folder • Configured the RTM statement schedule to "approval ready" in the Lodestar database • Communicated the expected number of statements to the commercial operations group via e-mail and requested execution of the "approve RTM statements" job	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
12.1.5	An analyst verifies that the RTM settlement statements are published to the MIS site for access by statement recipients in accordance with the published settlement schedule.	Inspected the RTM statement approval e-mail and a listing of statements posted for a sample of dates during the review period to determine that the following occurred for each date sampled: • The correct number of statements was published to the MIS site • The statements were published on the scheduled publish date	No exceptions noted.

CONGESTION REVENUE RIGHTS INVOICES

Control Objective Specified by the Service Organization: Control activities provide reasonable assurance that non-settlement amounts and charges are calculated completely and accurately for CRRs (CRR Auctions, CARD Invoices and CRR Balancing).

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
	Controls provide reasonable assurance that non-settlement amounts and charges are calculated completely and accurately for CRR auctions.		
13.1.1	Prior to the generation of CRR auction invoices by the settlements and billing system, an analyst verifies the availability of CRR auction invoice data. Upon completion, an analyst sends an execution request to the commercial operations group to run the "generate CRR auction invoices" job.	Inquired of the settlements operations manager regarding the CRR auction invoice data availability verification to determine that the following occurred on a monthly basis: • An analyst verified that the CRR auction invoice data was available prior to the generation of CRR auction invoices • After verifying the availability of the CRR auction invoice data, an analyst notified the commercial operations group via e-mail to run the "generate CRR auction invoices" job	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
		Inspected the CRR auction invoice validation spreadsheet and CRR auction validation e-mail for a sample of months during the review period to determine that the following occurred for each month sampled: • An analyst verified that the CRR auction invoice data was available prior to the generation of CRR auction invoices • The commercial operations group was notified via e-mail to run the "generate CRR auction invoices" job after the CRR auction invoice data availability validation was complete	No exceptions noted.
13.1.2	Prior to approval of CRR auction invoices, two analysts compare system calculated invoice amounts against independent calculations. Upon completion, an analyst sets the CRR auction invoice schedule to "approval ready" in the Lodestar database and communicates the expected number of CRR auction invoices to the commercial operations group in the execution request to run the "approve CRR auction invoices" job.	Inquired of the settlements operations manager regarding the CRR auction invoice reconciliation process to determine that the following occurred on a monthly basis: • Two analysts validated system calculated invoice data to independently calculated invoice data • An analyst configured the CRR auction invoice schedule to "approval ready" in the Lodestar database • An analyst communicated the expected number of invoices to the commercial operations group via e-mail and requested execution of the "approve CRR auction invoices" job	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
		Inspected the CRR auction invoice validation spreadsheet, the CRR auction invoice schedule, and CRR auction invoice approval box e-mail for a sample of months during the review period to determine that the following occurred for each month sampled: • Two analysts validated system calculated invoice data to independently calculated invoice data • An analyst configured the CRR auction invoice schedule to "approval ready" in the Lodestar database • An analyst communicated the expected number of invoices to the commercial operations group via e-mail and requested execution of the "approve CRR auction invoices" job	No exceptions noted.
13.1.3	An analyst verifies that the CRR auction invoices are published to the MIS site for access by invoice recipients in accordance with the published invoice schedule.	Inspected the CRR auction invoice approval e-mail, the CRR auction invoice schedule, and a listing of published invoices for a sample of months during the review period to determine that an analyst verified that the correct number of invoices was published to the MIS site on the scheduled publish date for each month sampled.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
	Controls provide reasonable assurance that non-settlement amounts and charges are calculated completely and accurately for CARD invoices.		
13.2.1	Prior to the monthly generation of CARD invoices by the settlements and billing system, an analyst validates the revenue distribution allocation amount by comparing system calculated amounts to independent calculations and resolving any issues noted.	Inquired of the settlements operations manager regarding the CARD invoice revenue distribution allocation amount validation process to determine that prior to the monthly generation of CARD invoices by the settlements and billing system, an analyst validated the revenue distribution allocation amount by comparing system calculated amounts to independently calculated amounts. Additionally, determined that an analyst resolved issues identified during the validation.	No exceptions noted.
		Inspected the CRR auction invoice schedule, and the CARD invoice approval e-mail for a sample of months during the review period to determine that a settlements analyst validated the revenue distribution allocation amount by comparing system calculated amounts to independently calculated amounts.	No exceptions noted.
13.2.2	Prior to the monthly generation of CARD invoices by the settlements and billing system, an analyst verifies the availability of CARD data. Upon completion, an analyst sends an execution request to the commercial operations group to run the “generate CARD invoices” job.	Inquired of the settlements operations manager regarding the CARD data verification process to determine that prior to the monthly generation of the CARD invoices by the settlements and billing system, an analyst verified the availability of CARD data. Additionally, determined that upon completion of the CARD data availability verification, an analyst notified the commercial operations group via e-mail to run the “generate CARD invoices” job.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
		Inspected the CARD invoice verification spreadsheet and the CARD invoice approval e-mail for a sample of months during the review period to determine that the following occurred for each month sampled: • An analyst verified the availability of CARD invoice data in the Lodestar system • An analyst sent an execution request to the commercial operations group via e-mail to run the "generate CARD invoices" job	No exceptions noted.
13.2.3	Prior to approval of CARD invoices, two analysts compare system calculated invoice amounts against independent calculations. Upon completion, an analyst sets the CARD invoice schedule to "approval ready" in the Lodestar database and communicates the expected number of CARD invoices to the commercial operations group in the execution request to run the "approve CARD invoices" job.	Inquired of the settlements operations manager regarding the invoice amount comparison process to determine that the following occurred prior to the monthly approval of CARD invoices: • Two analysts compared Lodestar database calculated invoice amounts to independently calculated invoice amounts • An analyst configured the CARD invoice schedule in the Lodestar database to "approval ready" • An analyst communicated the expected number of invoices to be published to the commercial operations group via e-mail and requested the execution of the "approve CARD invoices" job	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
		Inspected the CARD invoice verification spreadsheet, the CARD invoice schedule, and the CARD invoice approval e-mail for a sample of months during the review period to determine that the following occurred for each month sampled: • Two analysts compared Lodestar database calculated invoice amounts to independently calculated invoice amounts • An analyst configured the CARD invoice schedule in the Lodestar database to "approval ready" • An analyst communicated the expected number of invoices to be published to the commercial operations group via e-mail and requested the execution of the "approve CARD invoices" job	No exceptions noted.
13.2.4	An analyst verifies that the CARD invoices are published to the MIS site for access by invoice recipients in accordance with the published invoice schedule.	Inspected the CARD invoice schedule and a listing of published invoices for a sample of months during the review period to determine that an analyst verified the invoices were published to the MIS site in accordance with the published invoice schedule for each month sampled.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
	Controls provide reasonable assurance that non-settlement amounts and charges are calculated completely and accurately for CRR balancing account invoices.		
13.3.1	Prior to the approval of CRR balancing account invoices by the settlements and billing system, an analyst validates short fall and load allocation amounts by comparing system calculated amounts to independent calculations and resolving any issues noted.	Inquired of the settlements operations manager regarding the short fall and load allocation amount validation process to determine that prior to the approval of CRR balancing account invoices, an analyst validated the short fall and load allocation amounts by comparing system calculated amounts to independently calculated amounts. Additionally, determined that the analyst resolved issues identified during the validation process.	No exceptions noted.
		Inspected the CRR balancing account spreadsheet and CRR balancing account invoice approval box e-mail for a sample of months during the review period to determine that an analyst validated system calculated short fall and load allocation amounts against independently calculated fall and load allocation amounts for each month sampled.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
13.3.2	Prior to approval of CRR balancing account invoices, two analysts compare system calculated invoice amounts against independent calculations. Upon completion, an analyst sets the CRR balancing account invoice schedule to "approval ready" in the Lodestar database and communicates the expected number of CRR balancing account invoices to the commercial operations group in the execution request to run the "approve CRR balancing account invoices" job.	Inquired of the settlements operations manager regarding the CRR balancing account invoice verification process to determine that the following occurred on a monthly basis: • Two analysts compared system calculated invoice amounts to independently calculated invoice amounts • Upon completion of the invoice validation, an analyst configured the Lodestar CRR balancing account invoice schedule to "approval ready" • An analyst communicated the expected number of invoices to be published in the execution request to run the "approve CRR balancing account invoices" job	No exceptions noted.
		Inspected the CRR balancing account invoice spreadsheet, the CRR balancing account invoice approval e-mail, and the CRR balancing account invoice schedule for a sample of months during the review period to determine that the following occurred for each month sampled: • Two analysts compared system calculated invoice amounts to independently calculated invoice amounts • Upon completion of the invoice validation, an analyst configured the Lodestar CRR balancing account invoice schedule to "approval ready" • An analyst communicated the expected number of invoices to be published in the execution request to run the "approve CRR balancing account invoices" job	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
13.3.3	An analyst verifies that the CRR balancing account invoices are published to the MIS site for access by invoice recipients on time in accordance with the published invoice schedule.	Inspected the CRR balancing account invoice approval e-mail, the CRR balancing account invoice schedule and a listing of published invoices for a sample of months during the review period to determine that an analyst verified the invoices were published to the MIS site in accordance with the published invoice schedule for each month sampled.	No exceptions noted.

OTHER INVOICES

Control Objective Specified by the Service Organization: Control activities provide reasonable assurance that non-settlement amounts and charges are calculated completely and accurately for use in the non-settlement invoices (e.g., RTM Uplift and Misc.).

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
	Controls provide reasonable assurance that amounts and charges are calculated completely and accurately by the Settlement and Billing system for use in invoices for Default Uplift Charges.		
14.1.1	Prior to the generation of default uplift invoices by the settlements and billing system, an analyst performs pre-invoice validation procedures which are reviewed independently by a second analyst. Upon completion, an analyst sends an execution request to the commercial operations group to run the "generate default uplift invoice" job.	Inquired of the settlements operations manager regarding default uplift invoice generation to determine that the following occurred on a monthly basis: • An analyst performed pre-invoice validation procedures which were independently reviewed by a second analyst • An analyst sent an execution request to the commercial operations group to run the "generate default uplift invoice" job	No exceptions noted.
		No uplift invoices were generated during the review period; therefore, no testing of operating effectiveness was performed.	

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
14.1.2	Prior to approval of default uplift invoices, two analysts compare system calculated invoice amounts against independent calculations. Upon completion, an analyst sets the default uplift invoice schedule to "approval ready" in the Lodestar database and communicates the expected number of default uplift invoices to the commercial operations group in the request sent to run the "approve default uplift invoice" job.	Inquired of the settlements operations manager regarding default uplift invoice approval to determine that the analysts completed the following tasks on a monthly basis when default uplift fees were generated: • Compared system calculated invoice amounts against independent calculations • Configured the default uplift invoice scheduled to "approval ready" in the Lodestar database • Communicated the expected number of invoices to the commercial operations group via e-mail and requested execution of the "approve default uplift invoice" job	No exceptions noted.
		No uplift invoices were generated during the review period; therefore, no testing of operating effectiveness was performed.	
14.1.3	An analyst verifies that the default uplift invoices are published to the MIS site for access by invoice recipients in accordance with the published invoice schedule.	Inquired of the settlements operations manager regarding default uplift invoice verification to determine that an analyst verified that the default uplift invoices were published to the MIS site for access by invoice recipients in accordance with the published invoice schedule.	No exceptions noted.
		No uplift invoices were generated during the review period; therefore, no testing of operating effectiveness was performed.	

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
	Controls provide reasonable assurance that amounts and charges are calculated completely and accurately by the Settlement and Billing system for use in invoices for Miscellaneous Charges.		
14.2.1	Prior to generation of a miscellaneous invoice, an analyst performs pre-invoice validation procedures which are reviewed independently by a second analyst. Upon completion, an analyst sends an execution request to the commercial operations group to run the "generate miscellaneous invoice" job.	Inspected the miscellaneous invoice validation spreadsheet and execution request e-mail for a sample of months during the review period to determine that the following occurred for each month sampled: • An analyst performed pre-invoice validation procedures which were independently reviewed by a second analyst • An analyst sent an execution request to the commercial operations group to run the "generate miscellaneous invoice" job	No exceptions noted.
14.2.2	Prior to approval of miscellaneous invoices, two independent analysts compare the miscellaneous payment/charge data to be invoiced for each recipient to independent calculations. Upon completion of the review, the analyst approves the miscellaneous invoices in the Lodestar database and communicates the expected number of miscellaneous invoices to the commercial operations group in the request sent to run the "approve miscellaneous invoice" job.	Inspected the miscellaneous fee validation spreadsheet and execution request e-mail for a sample of months during the review period to determine that the analysts completed the following tasks for each month sampled: • Compared system calculated invoice amounts against independent calculations • Configured the miscellaneous fee invoice schedule to "approval ready" in the Lodestar database • Communicated the expected number of invoices to the commercial operations group via e-mail and requested execution of the "approve miscellaneous invoice" job	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
14.2.3	An analyst verifies that the miscellaneous invoices are published to the MIS site for access by invoice recipients in accordance with the published invoice schedule.	Inspected the miscellaneous fee approval e-mail and the listing of miscellaneous invoices posted to the MIS site for a sample of months during the review period to determine that an analyst verified that the miscellaneous fee invoices were published to the MIS site for access by invoice recipients in accordance with the published invoice schedule for each month sampled.	No exceptions noted.

FINANCIAL TRANSFER

Control Objective Specified by the Service Organization: Control activities provide reasonable assurance that payments received from Counter Parties and payments to Counter Parties are processed accurately and completely.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
	All financial transfer activities for invoice payments by counter parties to ERCOT are properly processed and tracked.		
15.1.1	Invoice payments are entered and processed in the financial transfer graphical user interface (GUI) by the finance staff based on the day received. A finance staff member enters the payment received in the financial transfer GUI and another finance staff member approves the payments to be imported to Lodestar. An e-mail is sent to settlements and billing.	Inspected the e-mail communication between the treasury and billing departments for a sample of dates during the review period to determine that a finance staff member entered the payment received in the financial transfer GUI and another finance staff member approved the payments to be imported to Lodestar for each date sampled. Additionally, determined that an e-mail was sent to settlements and billing for each date sampled.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
15.1.2	Once sign-off on payments has been verified in the settlements and billing system, the analyst confirms that payment data in the settlements and billing system is accurate by marking the financial transfer approval record as approved.	Inquired of the settlements operations manager regarding approval of payments to determine that once sign-off on payments was verified in the settlements and billing system, an analyst created the financial transfer approval record in Lodestar and confirmed that payment data in the settlements and billing system was accurate by marking the financial transfer approval record as 'approved'.	No exceptions noted.
		Inspected the financial transfer approval record for a sample of payments processed during the review period to determine that an analyst created the financial transfer approval record in Lodestar and confirmed that payment data in the settlements and billing system was accurate for each payment sampled.	No exceptions noted.
	All financial transfer activities for invoice payments to counter parties from ERCOT are properly processed and tracked.		
15.2.1	Analysts compare system calculated payout amounts to independent calculations. Upon completion of the review, an analyst will update the financial transfer approval record in Lodestar to sign-off that payouts for a given invoice cycle are ready to be paid to counter parties. An e-mail is sent to the finance department as confirmation.	Inquired of the settlements operations manager regarding payment calculations to determine that an analyst compared system calculated payout amounts to independent calculations, updated the financial transfer approval record in Lodestar, and communicated results to the finance department.	No exceptions noted.
		Inspected the calculation validation files and approval e-mails for a sample of dates during the review period to determine that an analyst compared system calculated payout amounts to independent calculations, updated the financial transfer approval record in Lodestar, and communicated results to the finance department for each date sampled.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
15.2.2	Finance uploads the bank import file into the JP Morgan ACCESS banking application to process wire transfers to counter parties. Separate finance staff review, approve and release payments through the same banking application.	Inspected the JP Morgan ACCESS application for an example wire transfer to counter parties processed during the review period to determine that finance staff reviewed, approved, and released each wire transfer sampled.	No exceptions noted.
		Inspected the JP Morgan ACCESS banking application user listing to determine that active accounts were assigned to personnel authorized to access the banking application.	No exceptions noted.

COMPUTER OPERATIONS

Control Objective Specified by the Service Organization: Control activities provide reasonable assurance that the process of managing computer operations provides a reliable processing environment and adequate support to business information systems.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
	Operations procedures have been established, implemented and documented.		
16.1.1	Computer operations procedures exist for the following: • System backup, storage and recovery • System and network performance monitoring • Batch processing	Inspected the computer operations policies and procedures to determine that documented computer operations procedures addressed the following: • System backup, storage and recovery • System and network performance monitoring • Batch processing	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
	Systems are actively monitored by qualified personnel to provide uninterrupted availability of production systems.		
16.2.1	Console operations performs real-time monitoring of production systems. Monitoring includes the following: • Monitoring of critical systems status 24 hours a day, 7 days a week • Monitoring of critical processing jobs and systems backups 24 hours a day, 7 days a week	Inquired of the lead console operator regarding console operations monitoring to determine that console operations performed real-time monitoring of the production systems which included the following: • Monitoring of critical systems status 24x7 • Monitoring of critical processing jobs and systems backups 24x7	No exceptions noted.
		Inspected the enterprise monitoring application configurations to determine that console operations performed real-time monitoring of the following: • Critical systems status • Critical processing jobs • System backups	No exceptions noted.
16.2.2	A staffed Help Desk is available 24 hours a day, 7 days a week, to allow reporting of systems and applications issues from both internal and external ERCOT customers.	Inquired of the lead console operator regarding help desk availability to determine that a staffed help desk was available 24x7 to allow reporting of systems and applications issues from both internal and external ERCOT customers.	No exceptions noted.
		Inspected the help desk schedule for a sample of weeks during the review period to determine that a staffed help desk was available 24x7for each week sampled.	No exceptions noted.
16.2.3	SMEs are available by means of a 24 hours a day, 7 days a week, call-out rotation to support critical systems and applications.	Inquired of the lead console operator regarding SME availability to determine that SMEs were available 24x7 using a call-out rotation schedule to support critical systems and applications.	No exceptions noted.
		Inspected the on-call calendar listing for a sample of weeks during the review period to determine that SMEs were available 24x7 for each week sampled.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
	IT infrastructure, including vendor-supported functions, is actively monitored to support the availability of production systems.		
16.3.1	An incident ticket is automatically generated as the result of an established threshold being exceeded in an available system/network monitoring tool to notify the Helpdesk and IT support of any critical event for in scope infrastructure.	Inquired of the IT support services manager regarding incident resolution to determine that an incident ticket was automatically generated upon an alert triggered in the available system/network monitoring tool, and that helpdesk personnel received notification of the incident ticket generation and documented resolution within the ticketing system.	No exceptions noted.
		Inspected the incident ticket and e-mail notification for a sample of alerts from the availability monitoring system triggered during the review period to determine that an incident ticket was automatically generated upon an alert triggered in the available system/network monitoring too, and helpdesk personnel received notification of the incident ticket generation and documented resolution within the ticketing system.	No exceptions noted.
16.3.2	SLAs are in place with key vendors to support ERCOT's availability requirements.	Inquired of the IT support services manager regarding key vendor SLAs to determine that SLAs were in place with vendors to support ERCOT's availability requirements.	No exceptions noted.
		Inspected SLA documentation for a sample of vendors to determine that SLAs were in place to support ERCOT's availability requirements for each vendor sampled.	No exceptions noted.
	Scheduled, automated processes are monitored to support the availability of production and archived data.		
16.4.1	System backups are scheduled to occur automatically on a daily basis to retain all production server data.	Inquired of the senior storage administrator regarding system backups to determine that the automated backup system was configured to perform daily backups of production systems and data.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
		Inspected the automated backup system configurations and job reports for an example incremental and full backup taken during the review period to determine that the automated backup system performed backups of production systems for each date sampled.	No exceptions noted.
16.4.2	Backup tapes are rotated off-site according to a predefined rotation schedule on a weekly basis.	Inquired of the senior storage administrator regarding backup tape rotation to determine that production backup tapes were rotated off-site according to a predefined rotation schedule on a weekly basis.	No exceptions noted.
		Inspected the tape transfer logs for a sample of weeks during the review period to determine that production backup tapes were rotated off-site for each week sampled.	No exceptions noted.
16.4.3	Batch coordinators generate performance reports for each day to review batch performance degradation.	Inquired of the IT support services manager regarding batch performance reports to determine that batch coordinators generated performance reports to review batch performance degradation each business day.	No exceptions noted.
		Inspected the operations report for a sample of dates during the review period to determine that batch coordinators generated performance reports for each date sampled.	No exceptions noted.

MANAGEMENT OF CONFIGURATIONS AND PROGRAM AREA CHANGES

Control Objective Specified by the Service Organization: Control activities provide reasonable assurance that the process of managing changes to the IT production environment minimizes the likelihood of disruption, unauthorized alterations, and errors.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
	A methodology for program changes and configuration changes is documented and implemented for all changes to applications and their supporting IT production environments.		
17.1.1	Policies and procedures have been established for changes to systems, applications, LAN/WAN configurations, and telecommunications and network infrastructure and have been incorporated into the company's official policy set, which includes policies and procedures for emergency changes. Changes to the policy are communicated to users.	Inspected the change management policies and procedures to determine that policies and procedures were documented to address changes to the following: • Systems • Applications • LAN/WAN configurations • Telecommunications and network infrastructure Additionally, determined that the policies and procedures were incorporated into the company's official policy set; which included policies and procedures for emergency changes.	No exceptions noted.
		Inspected an example E-wire notification communicated during the review period to determine that employees and contract workers were notified of the existence and the locations of the corporate security policies, standards, procedures, and guidelines, and that the affected staff were notified when such policies, procedures, and standards changed.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
17.1.2	Requests for changes to hardware and software (routine and emergency) are submitted to the change coordinator using a change request form that includes a Justification and Benefit.	Inspected the change request forms for a sample of routine and emergency changes implemented during the review period to determine that the sampled requests for routine and emergency changes to hardware and software were submitted to the change coordinator via a change request form, which included a Justification and Benefit.	No exceptions noted.
17.1.3	Changes which qualify as emergency changes are clearly defined within ERCOT change control policy and procedures.	Inspected the change management policies and procedures to determine that emergency changes were defined within the change control policies and procedures.	No exceptions noted.
	Program changes are approved by managers of impacted areas and by the Change Advisory Board (CAB).		
17.2.1	Prior to implementation of routine changes, approval managers of all impacted areas approve proposed changes.	Inspected the change request forms for a sample of routine changes implemented during the review period to determine that managers of impacted areas approved each change sampled.	No exceptions noted.
17.2.2	Subsequent to implementation of emergency changes, approval managers of all impacted areas approve changes.	Inspected the change request forms for a sample of emergency changes implemented during the review period to determine that managers of impacted areas approved each emergency change sampled.	No exceptions noted.
17.2.3	Prior to the migration of code into production, the change coordinator verifies that all required information has been entered into the change request form.	Inspected the change request forms for a sample of changes implemented during the review period to determine that prior to the migration of code into production, the change coordinator verified that required information was documented via the change request form for each change sampled.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
	A methodology includes clearly defined deliverables that provide support for testing changes before acceptance into the production environments.		
17.3.1	Testing of software-related changes is documented according to established procedures, which includes testing in established test areas. Testing is performed by individuals independent of the development process.	Inquired of the of the manager of change and configuration management regarding software testing to determine that testing of software-related changes was documented according to established procedures, which included testing in established test areas. Additionally, determined that testing was performed by individuals independent of the development process.	No exceptions noted.
		Inspected the change request forms for a sample of changes implemented during the review period to determine that testing of software-related changes was documented using the change ticket and that testing was performed by individuals independent of the development process for each change sampled.	No exceptions noted.
17.3.2	Change and configuration management verifies that required testing is performed prior to migration of changes into production.	Inspected the change request forms for a sample of changes implemented during the review period to determine that the change and configuration coordinator verified that required testing was performed prior to implementation for each change sampled.	No exceptions noted.
17.3.3	Prior to a routine change being implemented into the production environment, the change and configuration management group, along with the IT operations team and CISD, discuss the impact of pending changes on other systems within the ERCOT IT environment at the weekly CAB meeting.	Inquired of the manager of change and configuration management regarding change impact analysis to determine that the change and configuration management group, along with the IT operations team and CISD, considered the impact of pending routine changes on other systems within the ERCOT IT environment during the weekly CAB meeting.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
		Inspected the change request forms for a sample of changes implemented during the review period and the corresponding weekly CAB meeting agendas to determine that the impact of each routine change sampled was considered during a weekly CAB meeting.	No exceptions noted.
17.3.4	After the production migration is completed, business teams perform verification of applicable changes in the production environment. For technical changes, IT operations assists in the verification.	Inquired of the manager of change and configuration management regarding post-implementation reviews to determine that business teams performed verification of applicable changes in the production environment after implementation and IT operations assisted in the verification of technical changes.	No exceptions noted.
		Inspected the change request forms for a sample of changes implemented during the review period to determine that each change sampled was verified in the production environment, as applicable.	No exceptions noted.
	The migration of changes from development through to the production environments is properly segregated. Roles and responsibilities of change management personnel are approved and documented. Version control software is utilized to back up and record changes to critical system source code.		
17.4.1	Version control software supports each specific critical application environment.	Inspected the version control software access listing to determine that version control software was utilized to support each in-scope application.	No exceptions noted.
17.4.2	Development, testing and production environments are logically segregated at the network level.	Observed the network diagram to determine that development testing, and production environments were logically segregated at the network level.	No exceptions noted.
		Observed development, testing, and production environment access practices to determine that the environments were logically segregated.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
17.4.3	The ability to make changes to production environments is restricted to operations personnel. When necessary, development personnel may be granted temporary access as approved by application or system owners.	Inquired of the manager of change and configuration management regarding production environment access to determine that the ability to implement changes was restricted to operations personnel, and that, when authorized, development personnel were granted temporary access as required and approved by application or system owners.	No exceptions noted.
		Inspected the access listings for a sample of production servers and reviewed the listings for development personnel to determine that the development personnel sampled did not have access to the production servers sampled.	No exceptions noted.
17.4.4	A formal system development life cycle (SDLC) methodology is in place for system development initiatives.	Inspected the SDLC standards and operating procedures to determine that an SDLC methodology was documented for system development initiatives.	No exceptions noted.

APPLICATION ACCESS

Control Objective Specified by the Service Organization: Control activities provide reasonable assurance that the process of maintaining application security minimizes the risk of the unauthorized use, disclosure or modification, damage or loss of information.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
	Logical access is granted, changed and removed only upon the completion of formal access authorization and maintenance procedures.		
18.1.1	New access authorizations are requested, approved and completed according to established procedures.	Inspected the access management standards to determine that procedures were in place to establish the authorization, request, and approval of application access.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
		Inspected the facilities request forms for a sample of employees and contractors hired during the review period to determine that new access authorizations were requested, approved, and completed according to established processes for each new hire sampled.	No exceptions noted.
		Inspected the logical access request forms for a sample of employees and contractors hired during the review period to determine that new access authorizations were requested, approved, and completed according to established processes for each new hire sampled.	No exceptions noted.
18.1.2	Upon receipt of notification of employee or contract worker termination, ERCOT access custodians revoke or remove access.	Inquired of the manager of change and configuration management regarding access revocation to determine that ERCOT access custodians revoked or removed access upon receipt of notification of employee or contract worker termination	No exceptions noted.
		Inspected the termination notifications and access privileges for a sample of employees and contract workers terminated during the review period to determine that physical access to the facilities and system access was revoked for each terminated employee and contract worker sampled.	No exceptions noted.
18.1.3	Employee access coordinators verify that domain and RSA access has been revoked upon termination.	Inspected the access review completed for a sample of employees and contract workers terminated during the review period to determine that employee access review procedures were in place to verify that domain and RSA access was revoked for each terminated employee and contract worker sampled.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
18.1.4	Employee access coordinators verify that access changes related to employee transfers or promotions are completed by managers in accordance with the job change reporting received from HR.	Inquired of the manager of change and configuration management regarding employee transfers and promotions to determine that employee access coordinators verified that access changes related to employee transfers or promotions were completed by managers in accordance with the job change reporting provided by HR.	No exceptions noted.
		Inspected the e-mail notification and access change verification for a sample of employee promotions and transfers completed during the review period to determine that the access changes were requested / authorized by managers for each employee promotion and transfer sampled.	No exceptions noted.
18.1.5	User access re-certification is completed on an annual basis.	Inspected the most recent user access certification to determine that the user access certification was completed during the review period.	No exceptions noted.
18.1.6	Access roles re-certification is completed on an annual basis.	Inspected the most recent user access certification to determine that access role re-certification was completed during the review period.	No exceptions noted.

Overall Security

Control Objective Specified by the Service Organization: Control activities provide reasonable assurance that the process of maintaining database, operating system, network and facilities security minimizes the risk of the unauthorized use, disclosure or modification, damage or loss of information or assets.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
	Comprehensive information security policies, procedures and platform specific standards have been developed, documented and communicated to users and system administrators.		
19.1.1	Formal information security policies, standards, procedures, and guidelines have been established and incorporated into the company's official policy set.	Inspected the information security policies and procedures to determine that formal information security policies, standards, procedures, and guidelines were established and incorporated into the company's official policy set.	No exceptions noted.
19.1.2	Employees and contract workers are notified of the existence and the locations of the corporate security policies, standards, procedures, and guidelines upon hire. The affected staff is notified when such policies, procedures, and standards change.	Inquired of the senior security analyst regarding the corporate security policy to determine that employees and contract workers were notified of the existence and the locations of the corporate security policies, standards, procedures, and guidelines upon hire, and that the affected staff was notified when such policies, procedures, and standards changed.	No exceptions noted.
		Inspected the training web portal security policy acknowledgement for a sample of employees and contract workers hired during the review period to determine that policy acknowledgment forms were digitally signed for each employee and contract worker sampled.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
		Inspected an example E-wire notification communicated during the review period to determine that employees and contract workers were notified of the existence and the locations of the corporate security policies, standards, procedures, and guidelines and that the affected staff was notified when such policies, procedures, and standards changed.	No exceptions noted.
19.1.3	A user awareness program is in place to provide information for the user community regarding information security policies and issues.	Inquired of the senior security analyst regarding user awareness programs to determine that a user awareness program was in place to provide continuing education for the user community regarding information security policies and issues.	No exceptions noted.
		Inspected an example security notice e-mail communicated during the review period to determine that a user awareness program was in place to provide continuing education for the user community regarding information security policies and issues.	No exceptions noted.
19.1.4	System configuration requirements have been established for operating systems and databases which include security hardening, and documented exceptions.	Inspected the system configurations and requirements for in-scope operating systems (Windows, UNIX, AIX and Linux) and database platforms (SQL and Oracle) to determine that system configuration requirements, which included security hardening and documented exceptions, were established for each operating system and database platform sampled.	No exceptions noted.
19.1.5	Firewall standards have been established which enumerate the configuration rules implemented.	Inspected the firewall standards document to determine that firewall standards were established and enumerated the configuration rules implemented.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
19.1.6	Critical Infrastructure Security has established a procedure for the monitoring of ERCOT networks for cyber events.	Inspected the security monitoring procedures to determine that procedures were established to guide personnel regarding monitoring networks for cyber events.	No exceptions noted.
	Security monitoring programs are run and reports are generated, reviewed and investigated by the Critical Information Security Department.		
19.2.1	Security Operations collects system security events, monitors the use of powerful utilities, analyzes events and responds to unusual activity. Event logs for firewalls, operating systems and database activity are generated, and monitored for failed logins that have surpassed a defined acceptable threshold.	Inspected the security operations monitoring policies and procedures to determine that security operations collected system security events, monitored the use of powerful utilities, and analyzed events and responded to unusual activity.	No exceptions noted.
		Inspected the open security events portal and closed events reports generated for a sample of weeks during the review period to determine that security operations collected system security events, monitored the use of powerful utilities against policy, analyzed events and responded to unusual activity.	No exceptions noted.
19.2.2	Critical Infrastructure Security completes scans of pre-production servers prior to implementation to determine compliance with security requirements.	Inquired of the senior security analyst regarding pre-production server scans to determine that critical infrastructure security completed scans of pre-production servers prior to implementation to verify compliance with security requirements.	No exceptions noted.
		Inspected the results of the pre-production scans completed for a sample of servers implemented during the review period to determine that critical infrastructure security completed pre-production scans for each server sampled.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
19.2.3	Critical Infrastructure Security completes an annual scan of in-scope production servers and databases to evaluate compliance with security requirements.	Inquired of the senior security analyst regarding quarterly reviews of production servers and databases to determine that Critical Infrastructure Security completed an annual scan of in-scope production servers and databases to evaluate compliance with security requirements.	No exceptions noted.
		Inspected the results of the most recent production server and database scan to determine that Critical Infrastructure Security completed a scan of in-scope production servers and databases during the review period.	No exceptions noted.
		Inspected the scan results for a sample of in-scope production servers to determine that scans were performed for each server sampled during the review period.	No exceptions noted.
19.2.4	Microsoft Windows Systems are monitored for the existence of malicious software such as viruses and occurrences are deleted or quarantined.	Inquired of the senior security analyst regarding antivirus software to determine that Microsoft Windows systems were monitored for the existence of malicious software, such as viruses, and identified occurrences were deleted or quarantined.	No exceptions noted.
		Inspected the antivirus software system configurations to determine that antivirus software was configured for Microsoft Windows systems.	No exceptions noted.
19.2.5	Firewall changes that would affect production systems are tracked and approved through the change management process.	Observed the ticketing system utilized to track firewall changes to determine that firewall changes that affected production systems were tracked via an automated ticketing system.	No exceptions noted.
		Inspected a sample of firewall change tickets implemented during the review period to determine that each firewall change sampled was tracked and approved through the change management process.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
	Physical security access control measures restrict general access to ERCOT facilities.		
19.3.1	ERCOT management authorizes access to ERCOT facilities. Access to the buildings is limited through use of an access badge system.	Observed the entrances to the corporate office facilities to determine that a badge access system controlled access to and throughout the buildings.	No exceptions noted.
		Inspected the access request form for a sample of employees hired during the review period to determine that ERCOT management authorized access to the corporate facilities for each employee sampled.	No exceptions noted.
19.3.2	Security officers validate the identity of all visitors prior to admitting them onto ERCOT property.	Observed the visitor entrance process to determine that security officers validated the identity of all visitors prior to permitting access onto ERCOT property.	No exceptions noted.
19.3.3	Policy dictates that all access badges are displayed on the person.	Inspected the physical security policies and procedures to determine that the physical security policies and procedures stated that persons were required to display their access badges while on-site.	No exceptions noted.
19.3.4	Employees have their access permissions deactivated upon notification of termination from HR. Contract workers have their access permissions deactivated upon notification of termination from the responsible manager or the Legal Department.	Inquired of the senior security analyst regarding access deactivation to determine that badge access privileges were revoked as a component of the employee termination process or upon notification from the responsible manager or legal department for contract workers.	No exceptions noted.
		Inspected the access privileges for a sample of employees and contract workers terminated during the review period to determine that badge access privileges were revoked for each terminated employee and contract worker sampled.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
	Physical security access control measures restrict access to ERCOT restricted areas to individuals who have been authorized.		
19.4.1	System operations management authorizes access to the grid operations control room. Access to ERCOT grid operations control room is controlled by a biometric access system.	Observed the entrance to the grid operations control room to determine that access to the grid operations control room was controlled via a biometric access system.	No exceptions noted.
		Inspected the access request form for a sample of employees granted control room access during the review period to determine that systems operations management authorized access to the grid operations control room for each employee sampled.	No exceptions noted.
19.4.2	The data center manager authorizes access to data centers. Access to ERCOT data centers is controlled by a biometric reader.	Observed the entrance to the data centers to determine that access to the data centers was controlled via a biometric access system.	No exceptions noted.
		Inspected the access request form for a sample of employees granted data center access during the review period to determine that the data center manager authorized access to the data centers for each employee sampled.	No exceptions noted.
19.4.3	Invalid access attempts are viewed immediately. The LENEL system sends an alarm to the active Security Post. The alarm is investigated by the officers according to the procedures and process established by the Physical Security Department.	Inquired of the physical security manager regarding access monitoring to determine the following regarding invalid access attempts: • Invalid access attempts were reviewed immediately • The LENEL system was configured to send an alarm to the active security post • The alarm was investigated by the officers according to the procedures and process established by the Physical Security Department	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
		Inspected the reviews of unauthorized access for a sample of access alerts generated during the review period to determine that the active Security Post investigated and documented resolution of alarm for each alert sampled.	No exceptions noted.
19.4.4	The entrances to the Physical Security Perimeter are monitored by a Security Officer via video camera.	Observed the entrances to a sample of ERCOT restricted areas to determine that the entrances to the Physical Security Perimeter were monitored by a Security Officer via video camera.	No exceptions noted.
	Information resources are not protected against environmental hazards and related damage.		
19.5.1	Smoke and water sensors are installed and active in ERCOT's critical facilities.	Observed the data centers to determine that smoke and water sensors were located throughout the data centers.	No exceptions noted.
19.5.2	The computer rooms are temperature-controlled.	Observed the data center facilities to determine that the computer rooms were temperature controlled.	No exceptions noted.
19.5.3	Fire suppressant systems are present in the rooms housing computer equipment and are certified on an annual basis.	Observed the data centers to determine that a dry pipe fire suppression system was present in the rooms housing computer equipment.	No exceptions noted.
		Inspected the most recent fire inspection report to determine that the dry pipe fire suppression system was certified during the review period.	No exceptions noted.
19.5.4	The UPS system is physically secured.	Observed the UPS systems to determine that the UPS systems were located in a physically secured area.	No exceptions noted.
19.5.5	Fire extinguishers are strategically placed inside and outside the rooms housing computer equipment and are certified on an annual basis.	Observed the corporate facilities to determine that fire extinguishers were strategically placed inside and outside rooms housing computer equipment.	No exceptions noted.

#	Control Activity Specified by the Service Organization	Test Applied by the Service Auditor	Test Results
		Observed the fire extinguisher inspection tag for a sample of fire extinguishers located throughout the corporate facilities to determine that each fire extinguisher sampled was certified during the review period.	No exceptions noted.
19.5.6	The UPS systems are inspected on an annual basis to help ensure the devices function properly.	Inspected the most recent UPS system inspection report to determine that the UPS systems were inspected during the review period.	No exceptions noted.
19.5.7	The data centers are equipped with multiple dedicated power generators configured to provide electricity in the event of a power outage.	Inquired of the data center manager regarding the generators to determine that the data centers were equipped with multiple dedicated power generators configured to provide electricity in the event of a power outage.	No exceptions noted.
		Observed the generators to determine that the data centers were equipped with multiple generators.	No exceptions noted.

SECTION 5

OTHER INFORMATION PROVIDED BY MANAGEMENT

GLOSSARY OF RELEVANT TERMS

Adjusted Metered Load (AML)	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.
Ancillary Services (AS)	Those services, described in Section 6 of the ERCOT Protocols, 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.
Black Start Service (BSS)	An Ancillary Service provided by a Resource able to start without support of the ERCOT Transmission Grid.
Business Day	Monday through Friday, excluding observed holidays listed below: (1) New Year's Day (2) Memorial Day (3) Independence Day (4) Labor Day (5) Thanksgiving Thursday and Friday (6) Two days at Christmas, as designated by the ERCOT CEO
Commercially Significant Constraint (CSC)	A constraint in the ERCOT transmission grid that is found, through the process described in Section 7 of the ERCOT Protocols, to result in congestion which limits the free flow of energy within the ERCOT market to a commercially significant degree.
Competitive Retailer (CR)	MOU or an electric cooperative that offers customer choice and sells electric energy at retail in the restructured electric power market in Texas; or a REP as defined in 25.5 of the PUC 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.
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.

Day Ahead	The twenty-four (24) hour period prior to the beginning of the operating day.
Direct Current Tie (DC Tie)	Any non-synchronous transmission interconnections between ERCOT and non-ERCOT electric power systems.
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 Factors (DLF)	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 (DSP)	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 under 60 kilovolts (Kv) that provides electric service to customers or wholesale customers.
Electric Cooperative	(a) A corporation organized under Chapter 161, Texas Utilities Code, or a predecessor statute to Chapter 161 and operating under that chapter; (b) 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 (c) 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 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.
ERCOT Polled Settlement (EPS) Meter	Any meter polled by ERCOT as defined in Section 10 of the ERCOT Protocols for use in the financial settlement of the market.
ERCOT Region	The geographic area under the jurisdiction of the PUC that is served by TDSPs that are not synchronously interconnected with electric utilities outside the state of Texas.
ERCOT Transmission Grid	All of those transmission facilities which are within the ERCOT region.
Interval Data Recorder (IDR)	Metering device that is capable of recording energy in each settlement interval in accordance with ERCOT Protocols Section 9, Settlement and Billing, and Section 10, Metering.

Invoice Recipient	Market participants that receive an invoice from ERCOT.
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 Ratio Share (LRS)	A QSE's ratio of AML to total ERCOT AML related to the appropriate interval.
Load Serving Entity (LSE)	An entity that provides electric service to customers and wholesale customers. LSEs include REPs, CRs, and NOIEs that serve load.
Market Clearing Price for Capacity (MCPC)	The hourly price for Ancillary Service capacity awarded in the DAM or a SASM.
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, other than ERCOT, that engages in any activity that is in whole, or in part, the subject of the Protocols, regardless of whether that Entity has signed an Agreement with ERCOT. Examples of such an Entity include, but are not limited to, the following: LSE, QSE, TDSP, CRRAH, Resource Entity, Independent Market Information System Registered Entity and Renewable Energy Credit Account Holder.
Messaging System	The ERCOT-to-QSE communications system used to send real time notices and dispatch instructions to the QSEs.
Municipally Owned Utilities (MOUs)	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.
Non-Opt In Entity (NOIE)	An electric cooperative or MOU that does not offer customer choice.
Non-spinning Reserve Service (NSRS)	A service that is comprised of 30-minute non-spinning reserve service (30MNSRS) and BES-capable non-spinning reserve service (BESCNSRS).
Operating Day	The actual day, including hours ending 0100 to 2400, during which energy is flowing.
Operating Hour	The current clock hour.
Operating Period	A two-hour period comprised of the operating hour and the hour preceding the operating hour.

Portal	A web resource open to market participants, which allows for the submission of bids and schedules and the review of market participant data.
Protocols	The market rules for the ERCOT deregulated electricity market.
Qualified Scheduling Entity (QSE)	A market participant that is qualified by ERCOT, in accordance with Section 16 of the ERCOT Protocols, to submit balanced schedules and AS bids, and settle payments with ERCOT.
Resource Asset Registration Form (RARF)	A group of forms used for collecting all information necessary to register and model a Resource.
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.
Resource	Facilities capable of providing electrical energy or load capable of reducing, or increasing the need for electrical energy or providing AS to the ERCOT system, as described in Section 6 of the ERCOT Protocols. This includes generation resources, Controllable Load Resource, and emergency interruptible load service resources.
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 (REP)	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.
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 Invoice (STL)	A notice for payment or credit due rendered by ERCOT based on data contained in initial, final, true-up or any resettlement statements.
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 of the ERCOT Protocols.
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.

Technical Advisory Subcommittee (TAC)	A subcommittee in the ERCOT governance structure reporting to the Board of Directors as defined by the ERCOT bylaws.
Transmission and/or Distribution Service Provider (TDSP)	Entity that owns or operates, for compensation in the State of Texas, equipment or facilities to transmit and/or distribute electricity, and whose rates for transmission service, distribution service, or both, are set by a governmental authority or an entity that has been selected to own and operate transmission facilities by the PUC and has a PUC approved code of conduct in accordance with P.U.C. SUBST. R. 25.272, Code of Conduct for Electric Utilities and Their Affiliates.
Transmission Loss Factor (TLF)	The fraction of ERCOT load (forecast or actual) that is considered to constitute the ERCOT transmission grid losses in the settlement interval. TLFs 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.
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.