

142 FERC ¶ 61,241  
UNITED STATES OF AMERICA  
FEDERAL ENERGY REGULATORY COMMISSION

Before Commissioners: Jon Wellinghoff, Chairman;  
Philip D. Moeller, John R. Norris,  
Cheryl A. LaFleur, and Tony Clark.

Entergy Services, Inc.

Docket No. IN13-9-000

ORDER APPROVING STIPULATION AND CONSENT AGREEMENT

(Issued March 28, 2013)

1. The Commission approves the attached Stipulation and Consent Agreement (Agreement) between the Office of Enforcement (Enforcement) and Entergy Services, Inc. (Entergy). This order is in the public interest because it resolves on fair and reasonable terms an investigation of Entergy, conducted by Enforcement in coordination with the Commission's Office of Electric Reliability (OER), into possible violations of Reliability Standards associated with Entergy's operation of a portion of the Bulk Power System (BPS). Entergy agrees to pay a civil penalty of \$975,000 to the United States Treasury, and to commit to mitigation and compliance measures necessary to mitigate the violations described in this Agreement. Entergy will also make semi-annual compliance reports to Enforcement for a period of up to two years.

**I. Background**

2. Entergy and its six affiliated operating companies are public utilities that provide generation, transmission, and distribution services to customers in Louisiana, Texas, Mississippi, and Arkansas. Entergy operates high-voltage transmission lines with voltages as high as 500 kV, and operates a significant amount of generation in the Eastern Interconnection. It is subject to the Commission's regulations under section 215 of the Federal Power Act (FPA).<sup>1</sup> Entergy's parent company, Entergy Corporation, is registered with NERC as a Balancing Authority, Distribution Provider, Generator Owner, Generator Operator, Interchange Authority, Load Serving Entity, Planning Authority, Purchasing-Selling Entity, Resource Planner, Transmission Owner, Transmission Operator, Transmission Planner, and Transmission Service Provider.

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<sup>1</sup> 16 U.S.C. § 824o (2006).

3. On March 16, 2007, in Order No. 693, the Commission approved all but one of the Reliability Standards at issue in this matter.<sup>2</sup> These standards became mandatory and enforceable within the contiguous United States on June 18, 2007. On January 18, 2008, the Commission approved the Critical Infrastructure Protection (CIP-) Reliability Standards, one of which is at issue in this matter.<sup>3</sup> The CIP standards became mandatory and enforceable as to Entergy on July 1, 2008.

4. Enforcement's investigation arose following an audit of Entergy conducted by Enforcement in coordination with OER. The audit, initiated in October 2009, examined Entergy's practices related to bulk electric system planning and operations, and compliance with terms and conditions in its Open Access Transmission Tariff.<sup>4</sup> In August 2010, audit staff referred five areas of potential violations of the Reliability Standards for further examination and inquiry: (1) protection system maintenance; (2) facility ratings; (3) system modeling; (4) operator qualification; and (5) communications systems.

## II. Investigation

6. Enforcement initiated a non-public investigation pursuant to Part 1b of the Commission's regulations<sup>5</sup> into whether Entergy has complied with the following applicable Reliability Standards. The Resource and Demand Balancing (BAL-) Reliability Standards are designed to balance resources with demand in order to maintain interconnection frequency within certain prescribed limits.<sup>6</sup> The CIP Reliability Standards are intended to safeguard critical cyber assets.<sup>7</sup> The Communications (COM-) group of Reliability Standards requires transmission operators and balancing authorities

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<sup>2</sup> *Mandatory Reliability Standards for the Bulk-Power System*, Order No. 693, FERC Stats. & Regs. ¶ 31,242, *order on reh'g*, Order No. 693-A, 120 FERC ¶ 61,053 (2007).

<sup>3</sup> *Mandatory Reliability Standards for Critical Infrastructure Protection*, Order No. 706, 122 FERC ¶ 61,040, *denying reh'g and granting clarification*, Order No. 706-A, 123 FERC ¶ 61,174 (2008), *order on clarification*, Order No. 706-B, 126 FERC ¶ 61,229 (2009), *order denying clarification*, Order No. 706-C, 127 FERC ¶ 61,273 (2009).

<sup>4</sup> See Docket No. PA10-1-000.

<sup>5</sup> 18 C.F.R. Part 1b (2012).

<sup>6</sup> Order No. 693, FERC Stats. & Regs. ¶ 31,242 at P 305.

<sup>7</sup> Order No. 706, 122 FERC ¶ 61,040 at P 1.

to have facilities for the internal and external exchange of interconnection and operating information adequate for maintaining reliability.<sup>8</sup> The Emergency Preparedness and Operations (EOP-) group of Reliability Standards includes requirements that address preparation for emergencies, necessary actions during emergencies, and system restoration and reporting following disturbances.<sup>9</sup> The Facilities Design, Connections and Maintenance (FAC-) Reliability Standards address topics including facility interconnection requirements and facility ratings.<sup>10</sup> The Personnel Performance, Training and Qualifications (PER-) Reliability Standards address the need to adequately train and certify personnel who can affect reliable operation of the BPS.<sup>11</sup> The Transmission Operations (TOP-) group of Reliability Standards covers the responsibilities and decision-making authority for reliable operations and aims to ensure that the transmission system is operated within operating limits.<sup>12</sup> Finally, the Transmission Planning (TPL-) group of Reliability Standards is intended to ensure the transmission system is “is planned and designed to meet an appropriate and specific set of reliability criteria.”<sup>13</sup>

7. Enforcement concluded that Entergy violated 27 Requirements of 15 Reliability Standards, as described in the following paragraphs. Enforcement found these violations to be serious deficiencies undermining reliable operation of Entergy’s portion of the BPS.

8. Enforcement concluded that Entergy violated Requirements R1, R6, R10, and R11 of TOP-002-2b; Requirements R1, R2 and R4 of TOP-004-2; Requirement R1.3.12 of TPL-002-0b; Requirement R1.3.12 of TPL-003-0a; and Requirement R1.3.9 of TPL-004-0. Prior to October 2010, Entergy did not consider certain protection system maintenance activities in its operations studies. Entergy gave its regional managers and field technicians discretion to disable protection system components for maintenance and testing while leaving the protected BPS facilities in service (i.e., engaged in energized maintenance and testing), without first conducting operational or planning studies to evaluate the performance of the system should a fault occur while the protection system was disabled. Enforcement determined that Entergy thereby operated in an unknown

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<sup>8</sup> Order No. 693, FERC Stats. & Regs. ¶ 31,242 at P 472.

<sup>9</sup> *Id.* P 541.

<sup>10</sup> *Id.* P 677.

<sup>11</sup> *Id.* P 1324.

<sup>12</sup> *Id.* P 1567.

<sup>13</sup> *Id.* P 1683.

state, and without validating System Operating Limits (SOLs),<sup>14</sup> system response, and appropriate operator response to unplanned contingencies for the current system conditions. Also, Enforcement determined that to the extent Entergy did not include certain planned protection system outage and maintenance activities, performed as energized maintenance, as part of the base case system conditions in its planning studies, Entergy's long-term planning assessments were invalid.

9. Enforcement concluded that Entergy is in violation of Requirement R1 of FAC-008-1 and Requirement R1 of FAC-009-1 because it lacks a documented methodology for developing facility ratings for its transmission lines built before 1994. Since June 2007 and continuing to the present, Entergy has relied on ratings for transmission lines built before 1994 ("vintage" lines) that Entergy maintains were calculated when these vintage lines were first put into service by the independent operating companies that Entergy later consolidated. Enforcement determined that the vintage ratings are not based on a documented, known, or validated methodology, and Entergy used them without any knowledge of how these ratings were determined or whether they remain technically valid and reflective of current conditions.

10. Enforcement concluded that Entergy violated Requirements R1, R2, R3.1 through R3.4, and R4 of PER-002-0 because Entergy inadequately trains system operators at its regional Transmission Operations Centers (TOCs) despite those operators sharing primary responsibility for the real-time operation of the BPS. Entergy gives dispatchers at its five TOCs the authority and discretion to make and implement certain reliability decisions and authority over various transmission system operations. Entergy relies on "on-the-job" training at each TOC to ensure the efficacy of dispatchers in performing these functions. Enforcement determined that this informal training is inadequate because Entergy lacks a defined set of training program objectives establishing the knowledge and competencies necessary to ensure that system operators operate the system reliably; does not provide initial and continuing training; does not provide dedicated training time; lacks competent training instructors; and does not provide at least five days per year of training using realistic simulations of system emergencies.

11. Enforcement further determined that although Entergy's TOC dispatchers have primary responsibility for the real-time operation of the interconnected BPS and are

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<sup>14</sup> In its Glossary of Terms Used in Reliability Standards, the North American Electric Reliability Corporation defines SOL as "[t]he value (such as MW, MVar, Amperes, Frequency or Volts) that satisfies the most limiting of the prescribed operating criteria for a specified system configuration to ensure operation within acceptable reliability criteria."

directly responsible for complying with the Reliability Standards, they are not NERC-certified. Thus, Enforcement concluded that Entergy also violated Requirement R1 of PER-003-0.

12. Enforcement concluded that Entergy violated Requirement R19 of TOP-002-2b because Entergy has not maintained accurate models in its operations and operations planning tools. For example, in February 2009, Entergy failed to model three new transmission lines that had already been put into service for at least five days. Also, in September 2010, Entergy's operations planning models failed to properly account for auxiliary loads at all of its nuclear generation sites.

13. Enforcement determined that Entergy's inaccurate operations and operations planning models prevented Entergy from accurately determining SOLs, operating within accurate SOLs, and determining the cause of SOL violations. Therefore, Enforcement concluded that Entergy also violated Requirement R1 of TOP-004-2, Requirement R4 of TOP-008-1, and Requirement R11 of TOP-002-2b.

14. Enforcement concluded that Entergy violated Requirements R1 and R1.4 of COM-001-1.1 because Entergy's communications network did not provide adequate and reliable telecommunications, and the routing of data among its telecommunications facilities was not adequately redundant and diverse. Data from a significant number of Remote Terminal Units (RTUs) had to pass through a single point on Entergy's communications system in order to get to all of Entergy's control centers. The failure of this single point resulted in the loss of system visibility, monitoring, and control capabilities for a large portion of Entergy's system and the inability to perform real-time contingency analysis for Entergy's overall footprint.

15. Enforcement concluded that Entergy violated Requirement R2 of COM-001-1.1 and Requirement R15 of BAL-005-0.1b because it failed to routinely manage, test, or monitor vital communications facilities by failing to monitor and test backup power supplies (batteries) at such facilities.

16. Enforcement concluded that Entergy violated Requirements R1, R1.2, R2, and R6 of TOP-006-2 and Requirement R2 of TOP-004-2 during several outages in 2008 and 2009. Entergy could not know the status of transmission and generation resources, nor convey the status of its generation and transmission resources to its Reliability Coordinator; could not monitor transmission line status, real and reactive power flows, voltage, load-tap changer settings, and status of rotating and static reactive reserves; could not monitor operating conditions; and, without these monitoring capabilities, could not operate to avoid instability, uncontrolled separation, or cascading outages as a result of the most severe single contingency.

17. Enforcement further determined that Entergy is in violation of Requirements R1.1 and R1.8 of EOP-008-0 because Entergy's plan to continue reliability operations in the event it loses its control center functionality is not viable. Entergy's plan relies on a

backup control center that relies on data from the primary control facility to function. Also, Entergy's interim control center, used as a temporary measure for oversight of the system while it switches operations to its backup control center, likewise relies on data from the primary facility to function.

18. Finally, Enforcement concluded that Entergy violated Requirement R1 of CIP-007-1 because it failed to adequately protect critical infrastructure by neglecting to test a firmware upgrade before applying the upgrade in production mode.

### **III. Stipulation and Consent Agreement**

19. Enforcement and Entergy resolved this matter by means of the attached Agreement. Entergy stipulates to the facts recited in the Agreement and agrees to pay a \$975,000 civil penalty to the United States Treasury. Entergy neither admits nor denies that its actions constituted violations of the Reliability Standards.

20. Entergy also agrees to additional mitigation measures, as specified in the Agreement, and to submit to compliance monitoring.

21. In consideration of the appropriate sanction, staff considered that Entergy has made significant efforts to date to address reliability concerns identified in the investigation and also by Entergy on its own initiative. These measures include, among others, new protection system maintenance procedures; development of a facility ratings methodology for vintage lines; enhanced training for TOC operators; and improvements to the communications network. Entergy has also committed to future mitigation measures, including but not limited to using Light Detection and Ranging (LiDAR) technology to map the 13,669 miles of transmission lines Entergy operates at 100 kV or above to improve facility ratings calculations; hiring of dedicated training personnel; procedures and tools to ensure the accuracy of its models; and greater redundancy and diversity for communications network power supplies and also for certain data sources.

### **IV. Determination of the Appropriate Sanctions**

22. The civil penalty amount is consistent with the Penalty Guidelines.<sup>15</sup> Enforcement considered that, given the size and complexity of Entergy's system, its violations posed a high risk that it would be unable to prevent, contain, or control a disturbance that could lead to substantial harm. Entergy also has a history of past violations of the Reliability

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<sup>15</sup> *Enforcement of Statutes, Orders, Rules and Regulations*, 132 FERC ¶ 61,216 (2010).

Standards, including violations of the BAL- and FAC- Reliability Standards.<sup>16</sup> The civil penalty amount reflects credit for Entergy's full cooperation during the course of the investigation as well as a credit for avoiding a trial-type hearing.

23. The Commission concludes that the penalties and other sanctions set forth in the Agreement are a fair and equitable resolution of this matter and are in the public interest. The Commission also concludes that the reliability enhancement measures set forth in the Agreement will enhance the reliability of the BPS and are therefore also fair and in the public interest.

The Commission orders:

The attached Stipulation and Consent Agreement is hereby approved without modification.

By the Commission.

( S E A L )

Kimberly D. Bose,  
Secretary.

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<sup>16</sup> See, e.g., Notice of Penalty, Docket No. NP10-22-000, December 30, 2009; Notice of Penalty, Docket No. NP10-78-000, March 31, 2010.

UNITED STATES OF AMERICA  
FEDERAL ENERGY REGULATORY COMMISSION

Entergy Services, Inc.

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Docket No. IN13-9-000

STIPULATION AND CONSENT AGREEMENT

**I. INTRODUCTION**

1. Staff of the Office of Enforcement (Enforcement) of the Federal Energy Regulatory Commission (Commission) and Entergy Services, Inc. (Entergy) enter into this Stipulation and Consent Agreement (Agreement) to resolve an investigation conducted under Part 1b of the Commission's regulations, 18 C.F.R. Part 1b (2011). Enforcement determined that Entergy violated 27 Requirements of 15 Reliability Standards. Enforcement and Entergy agree that Entergy will pay a civil penalty of \$975,000 to the United States Treasury and also commit to mitigation and compliance measures going forward, subject to compliance monitoring, as detailed in the following paragraphs of this Agreement.

**II. FINDINGS AND VIOLATIONS**

2. Enforcement and Entergy hereby stipulate and agree to the following facts, but Entergy neither admits nor denies the alleged violations.

**A. Background**

3. Entergy and its six affiliated operating companies are public utilities that provide generation, transmission, and distribution services to customers in Louisiana, Texas, Mississippi, and Arkansas. Entergy operates high-voltage transmission lines with voltages as high as 500 kV and operates a significant amount of generation in the Eastern Interconnection, and is subject to the Commission's regulations under Section 215 of the Federal Power Act. Entergy's parent company, Entergy Corporation, is registered with NERC as a Balancing Authority, Distribution Provider, Generator Owner, Generator Operator, Interchange Authority, Load Serving Entity, Planning Authority, Purchasing-Selling Entity, Resource Planner, Transmission Owner, Transmission Operator, Transmission Planner, and Transmission Service Provider.

4. In October 2009, Enforcement's Division of Audits and the Office of Electric Reliability's Division of Compliance commenced an audit to examine Entergy's practices related to bulk electric system planning and operations, and compliance with terms and conditions in its Open Access Transmission Tariff. On

August 16, 2010, the audit team referred five areas of concern to Enforcement's Division of Investigations for further examination and inquiry.

5. At the conclusion of its investigation, Enforcement concluded that Entergy violated 27 Requirements of 15 Reliability Standards. Enforcement finds these violations to be serious deficiencies undermining reliable operation of Entergy's portion of the Bulk Power System (BPS). Enforcement recognizes, however, that during the audit and investigation, Entergy voluntarily made improvements in its operations and addressed many of the findings arising from the audit and investigation. The conduct, violations, and any mitigation steps Entergy has completed to date are described below.

## **B. Findings of Fact and Violation**

### **1. Protection System Maintenance Planning**

6. *Findings of Fact.* From June 2007 through October 2010, Entergy did not have policies that would prohibit disabling protection system components for maintenance and testing while leaving the protected BPS facilities in service ("energized maintenance"). In the absence of such policies, Entergy performed energized maintenance on multiple occasions without first conducting operational or long-term studies to evaluate the performance of the system should a fault occur while the protection system was disabled. During these periods of unstudied energized maintenance, Entergy on multiple occasions relied on slower-clearing remote backup systems to respond to potential contingencies.

7. In addition, Entergy allowed managers across its regional units discretion to decide whether to conduct energized maintenance. Entergy also allowed its field technicians discretion to disable protection system components without notification to, or approval from, Entergy's transmission operations personnel. However, based on staff guidance during the audit, Entergy undertook certain corrective actions, as described in Section III.1.

8. *Findings of Violation.* Enforcement determined that while Entergy's protection system maintenance procedure as of October 2010 is comprehensive and satisfactory, Entergy's prior protection system maintenance practices were inadequate because they did not require operational studies to determine how protection system maintenance activities and associated equipment outages would affect its system in the operating horizon. Enforcement further determined that, without operational studies accounting for protection system outages for maintenance, Entergy operated in an unknown state, and without validating System Operating Limits (SOLs), system response, and appropriate operator response to unplanned contingencies for the current system conditions. Enforcement also determined that Entergy allowed managers across its regional

units to decide whether to conduct energized maintenance, despite their lack of knowledge and tools to study the reliability consequences.

9. Enforcement finds that Entergy violated the following Transmission Operations (TOP) Reliability Standards requiring operational planning at its local transmission level and analysis of the full set of relevant contingencies or conditions internal to its transmission system: Requirements R1, R6, R10, and R11 of TOP-002-2b; and Requirements R1, R2 and R4 of TOP-004-2. Also, in the long-term planning horizon, to the extent that Entergy did not include certain planned protection system outage and maintenance activities, performed as energized maintenance, as part of the base case system conditions in its transmission planning assessments, Entergy's long-term planning assessments were invalid and violated Requirement R1.3.12 of TPL-002-0b, Requirement R1.3.12 of TPL-003-0a, and Requirement R1.3.9 of TPL-004-0.

## **2. Methodology for Vintage Facility Ratings**

10. *Findings of Fact.* Since June 2007 and continuing to the present, Entergy has relied on ratings for transmission lines built before 1994 ("vintage" lines) that Entergy maintains were calculated when these vintage lines were first put into service by the independent operating companies that Entergy later consolidated (legacy operating companies).

11. *Findings of Violation.* Enforcement determined that Entergy lacked a documented methodology for determining facility ratings for its vintage lines. Enforcement determined that the vintage ratings are not based on a documented, known, or validated methodology, and Entergy used them without any knowledge of how these ratings were determined or that they remain technically valid and reflective of current conditions. Enforcement determined that Entergy's lack of a documented facility ratings methodology and failure to establish facility ratings using a documented methodology violates Requirement R1 of FAC-008-1 and Requirement R1 of FAC-009-1.

## **3. Training, Supervision, and Certification of Operating Personnel**

12. *Findings of Fact.* Entergy gives dispatchers at its five regional Transmission Operations Centers (TOCs) the authority and discretion to make and implement certain reliability decisions and authority over various transmission system operations. This authority includes switching transmission equipment to facilitate fault isolation and load restoration prior to contacting Entergy's certified operators at its System Operations Center (SOC) under certain conditions. Entergy relies on "on-the-job" training at each TOC to ensure the efficacy of dispatchers in performing these functions.

13. *Findings of Violation.* Enforcement determined that Entergy does not provide formal training to its TOC dispatchers and provides some informal training, but does not have an adequate method of evaluating training effectiveness. As a result, Enforcement finds that Entergy violated PER-002-0 R2 because Entergy's TOC dispatchers are given "primary responsibility . . . for the real-time operation of the interconnected Bulk Electric System," and are in "[p]ositions directly responsible for complying with NERC Standards" (see PER-002-0 R2.1 and R2.2), yet Entergy does not have a training program for its TOC dispatchers.

14. Enforcement finds that Entergy failed to adequately train its TOC dispatchers because it failed to provide training that meets the criteria specified in PER-002-0, thereby violating R1, R3.1 through R3.4, and R4 of that Standard. Specifically with regard to R3 and R4, Entergy (R3.1) lacks a defined set of training program objectives establishing the knowledge and competencies necessary to ensure that system operators operate the system reliably; (R3.2) does not provide initial and continuing training; (R3.3) does not provide dedicated training time; (R3.4) lacks competent training instructors; and (R4) does not provide at least five days per year of training using realistic simulations of system emergencies.

15. Enforcement finds that Entergy violated PER-003-0 R1 because, although they have "primary responsibility . . . for the real-time operation of the interconnected Bulk Electric System," and are in "[p]ositions directly responsible for complying with NERC Standards" its TOC dispatchers are not NERC-certified.

#### **4. Inaccurate Models in Operations and Planning Tools**

16. *Findings of Fact.* Enforcement reviewed three modeling systems used by Entergy. Each modeling system is maintained by a different group. The Operations Model is the Energy Management System (EMS) model which is used in real time applications by the SOC. This model is maintained by Entergy's EMS Applications and SCADA Database groups. The Operations planning model includes the models used for short term planning and outage coordination. These are maintained by Entergy's Transmission Operations Planning (TOP) group. The Long-term planning model includes the models used for long-term planning. These are maintained by Entergy's long-term planning group.

17. *Findings of Violation.* Enforcement determined that Entergy has not maintained accurate models in its operations and operations planning tools. For example, in February 2009, Entergy failed to model three new transmission lines that had already been put into service for at least five days. In September 2010, Entergy's operations planning models failed to properly account for auxiliary

loads at all of its nuclear generation sites. Enforcement determined that inaccurate models used in Entergy's operations planning studies limited its ability to plan for and operate within SOLs.

18. Enforcement finds that Entergy violated TOP-002-2b R19, which requires Entergy as a Transmission Operator to maintain accurate computer models utilized for analyzing and planning system operations. Entergy's inaccurate operations and operations planning models prevented Entergy from accurately determining SOLs, operating within accurate SOLs, and determining the cause of SOL violations. Enforcement thus finds Entergy also violated TOP-004-2 R1, TOP-008-1 R4, and TOP-002-2b R11.

## **5. Design and Maintenance of Communications Systems**

19. *Findings of Fact.* On February 21, 2008, a relay misoperation following a lightning strike on a substation caused a loss of power to Entergy's Jackson Electric Building, which houses a major equipment node on Entergy's communications network. Power to critical communications equipment was interrupted for at least ninety minutes because of problems with Entergy's backup power supply at the building. Specifically, Entergy's backup power immediately failed because the batteries at the building were aging and had not been replaced in 2007 as originally scheduled, although they had subsequently been scheduled for replacement later in 2008. Also, because the data from a significant number of Remote Terminal Units (RTUs) had to pass through the Jackson Electric Building in order to get to Entergy's other control centers, the failure of this single point on Entergy's communications system resulted in the loss of system visibility and monitoring capabilities for a large portion of Entergy's system in Mississippi and a portion of Entergy's system in Louisiana.

20. On April 23, 2009, Entergy's primary and backup Energy Management System (EMS) servers at its primary SOC failed when a network switch reset due to an error in the switch's firmware. The failure prevented all external systems from communicating with Entergy's EMS servers at its SOC for approximately three hours. As a consequence, Entergy's SOC lost its data communication capabilities with Entergy's five TOCs, Entergy's Interchange Transactions Scheduler, Entergy's Reliability Coordinator (SPP ICT), and neighboring Transmission Operators and Balancing Authorities. System operators lost visibility to the EMS system from their consoles. Entergy maintains they were able to access the EMS system through one other terminal.

21. On August 21, 2009, in an attempt to correct the firmware error that caused the EMS outage on April 23, 2009, Entergy upgraded the firmware on the applicable switch without first testing the firmware. The upgrade disrupted Entergy's servers at its SOC, causing SOC and ICTE operators to lose

communication with EMS servers for several hours. Entergy's backup control center plan did not provide a feasible solution during this event because the interim backup site relied on the same EMS servers as the primary SOC site.

22. During 2010, Entergy failed to test the security of Critical Cyber Assets (CCAs) within an Electronic Security Perimeter (ESP) before an IP configuration change; it was missing cyber security testing results for significant changes to CCAs within ESPs; and it was unable to perform security control testing for a significant change to the configuration of a CCA within an ESP.

23. *Findings of Violation.* Enforcement finds that during several communications outages, Entergy could not perform various functions required of it as a Balancing Authority and Transmission Operator. With respect to the 2008 event, Enforcement finds that Entergy's communications system was not adequate and reliable because of the loss of visibility to and control of the system based on a lack of redundancy and diversity in the communications network, violating COM-001-1.1 R1 and R1.4. Entergy routed a significant number of RTUs only through Jackson in order to get to its control centers. As a result, in addition to the loss of functionality at the Jackson transmission and distribution control centers, all of Entergy's other control centers—including the main, interim, and backup centers—lost the ability to monitor and control portions of Entergy's power system and perform real-time contingency analysis for Entergy's overall footprint. By routing a significant amount of data through a single hub, Entergy became particularly vulnerable in the event it lost the Jackson Electric Building. In addition, Entergy failed to routinely manage, test, or monitor vital communications facilities by failing to monitor and test its batteries, including those at the Jackson Electric Building, violating COM-001-1.1 R2. Furthermore, Entergy did not provide adequate and reliable backup power supplies or regularly test backup power supplies, violating BAL-005-0.1b R15. If Entergy had properly tested, maintained, and timely replaced its batteries, the backup power supply at its Jackson Electric Building would have prevented any interruption of power to vital communications equipment.

24. Enforcement finds that during and as a result of the February 2008 and April 2009 events, Entergy lost critical monitoring capabilities that violated several TOP Standards. Enforcement finds that for the April 2009 event, while system operators were without visibility to the EMS system, there is no evidence that they received information from any other sources. Enforcement finds that Entergy could not know the status of transmission and generation resources as required by TOP-006-2 R1; Entergy did not convey the status of its generation and transmission resources to its Reliability Coordinator during the outage as required by TOP-006-2 R1.2; could not monitor transmission line status, real and reactive power flows, voltage, load-tap changer settings, and status of rotating and static

reactive reserves as required by TOP-006-2 R2; could not monitor operating conditions as required by TOP-006-2 R6; and, without these monitoring capabilities, could not operate to avoid instability, uncontrolled separation, or cascading outages as a result of the most severe single contingency as required by TOP-004-2 R2.

25. These outages further revealed that Entergy's plan to continue reliability operations in the event its SOC becomes inoperable is not viable, because the plan relied on a backup control center that relies on data from the primary control center to function, violating EOP-008-0 R1.1. Entergy's EOP-008-0 plan also violates R1.8 because the interim control center, its interim measure for oversight of the system while it switches operations to its backup control center, likewise relies on data from the primary center to function.

26. Enforcement further finds that the August 21, 2009, outage reveals Entergy violated CIP-007-1 R1 by failing to test the firmware upgrade prior to applying the upgrade in production mode. In addition, Entergy further violated CIP-007-1 R1 because during the 2010 testing failures, it could not assess whether significant configuration changes to CCAs would adversely affect its cyber security controls and compromise those CCAs or render them inoperable.

### **III. MITIGATION TO DATE**

27. Entergy has made significant efforts to address certain reliability-related concerns that were identified by Entergy outside of this investigation or identified by staff during the course of this investigation and the preceding audit. Through these efforts, Entergy has already completely or partially mitigated some of the findings of violation in this matter.

#### **1. Protection System Maintenance Planning**

28. In October 2010, Entergy implemented a procedure to manage energized maintenance of protection systems and coordinate managerial approval for such maintenance. Entergy now routinely studies what, if any, effect removal of a protection system component would have on system reliability and includes energized protection system maintenance tracking and approval in its transmission outage tracking system. Under its new procedure, Entergy conducts steady-state and stability analyses, based on expected next-day conditions, to determine how each planned energized maintenance activity will affect reliability. Also, Entergy now notifies operations personnel of planned protection system maintenance before conducting the maintenance, so that SOC or TOC operators can postpone the maintenance if system conditions change such that a new study is warranted.

## **2. Methodology for Vintage Facility Ratings**

29. Entergy agreed to create a facility ratings methodology that documents the underlying operating assumptions used to calculate vintage ratings, and to use this methodology to establish accurate facility ratings for its transmission lines. To ensure that its vintage transmission line ratings accurately reflect field variables, such as location, height, and topography changes, Entergy is verifying conductor-to-conductor and conductor to object clearances, including ground, vegetation, or other structures. To this end, Entergy contracted with a mapping and imaging firm that uses airborne Light Detection and Ranging (LiDAR) technology to measure the elevation of lines relative to the ground and other objects. Entergy continues to obtain LiDAR data from its contractor, and, by December 31, 2013, Entergy plans to have completed LiDAR surveys on all 13,669 miles of its transmission lines that are operated at 100 kV and above. Entergy uses, and will continue to use, updated clearance values provided by LiDAR data to verify or update as necessary all transmission line ratings.

## **3. Training, Supervision, and Certification of Operating Personnel**

30. While Entergy will continue to vest TOC dispatchers with shared primary responsibility over critical transmission operations, Entergy has amended a written procedure to clarify the limits of “judgment calls” made during emergency unplanned switching activities, and to clarify when TOC dispatchers need approval of an SOC Operator.

31. Entergy has developed and begun implementing a mandatory formal training and certification program to ensure that TOC dispatchers are adequately skilled and have specific technical knowledge necessary to ensure reliability.

## **4. Design and Maintenance of Communications Systems**

32. Entergy has begun to strengthen the communications network infrastructure vital to reliably operating its portion of the BPS and its control center arrangements, including additional diverse routing of data, upgrading backup power equipment, improving the resilience of its control centers during future outages of communications systems, and improving its disaster recovery processes.

33. Entergy has implemented procedures to remedy the cyber security vulnerabilities of its communications system. Specifically, Entergy has created a procedure used by technicians to plan and implement upgrades or configuration changes to critical cyber assets. This procedure includes a checklist to guide technicians through the sequence of required actions and record each step;

requirements for work approval, scheduling, and tracking based on assessment of expected impacts by supervisors and Entergy's internal tool for conducting such assessments; and plans to test upgrades or configuration changes and rollback any that are unsuccessful.

#### **IV. REMEDIES AND SANCTIONS**

34. Entergy stipulates to the facts regarding its conduct as described in Section II of this Agreement. Entergy neither admits nor denies Enforcement's findings that the conduct violated the Reliability Standards specified in this Agreement. To resolve the findings contained in this Agreement, Entergy agrees to the remedies set forth in the following paragraphs.

##### **A. Civil Penalty**

35. Entergy agrees to pay a civil penalty of \$975,000 to the United States Treasury.

##### **B. Additional Mitigation**

36. Entergy commits to the following actions as necessary to complete mitigation of the violations described in this Agreement. Entergy commits to completion of the mitigation items identified in this Section no later than one year after the Effective Date of this Agreement, unless otherwise stated in this Section. Entergy will report on the status of these mitigation items and submit evidence to staff's satisfaction of status and progress in its compliance monitoring reports to be submitted to staff pursuant to section IV.C of this Agreement.

37. Entergy will complete LiDAR mapping by December 31, 2013 of all 13,669 miles of its transmission lines operated at 100 kV and above and will promptly thereafter complete its engineering analysis of the LiDAR data. Based on the LiDAR data, Entergy will adjust any facility ratings, as necessary, to account for reduced clearances.

38. Entergy will complete revision of its facility ratings methodology to ensure it includes documentation of underlying operating assumptions used to calculate vintage ratings.

39. Entergy will continue to develop and implement its mandatory formal training and certification program for TOC dispatchers, and provide to staff copies of training modules designed to cover the following skills or topics: (a) monitoring and control of transmission system parameters, including voltage and line flows; (b) switching of transmission equipment; (c) operation of transmission equipment; and (d) curtailment implementation and load shedding. Entergy has

provided staff a timeline for analyzing TOC dispatcher tasks by December 2012, recruiting and hiring dedicated training personnel by June 2013, developing training materials specific to TOC transmission operations by January 2013, dedicating training shifts for each dispatcher beginning in January 2013, training at least eight existing TOC dispatchers per year beginning in February 2013, and training new TOC dispatchers beginning in October 2013. Entergy will demonstrate compliance with these items in its subsequent compliance monitoring report(s). Entergy will provide evidence demonstrating that it completed training by the end of 2012 of all then-employed dispatchers on emergency and unplanned switching procedures, and that it trains subsequently-employed dispatchers reasonably promptly after hire.

40. Entergy provided staff a detailed monthly schedule of its training and certification initiative. Entergy will require each of its TOC dispatchers to obtain Transmission Operator Certification from NERC. Entergy commits to, within three years from the effective date of this Agreement, scheduling one certified dispatcher on duty at all times in each TOC. All Entergy TOC dispatchers will be NERC-certified by June 2017. Entergy's second compliance monitoring report shall provide evidence of the plan and resource commitments to ensure it meets the goals of one certified dispatcher on duty at all times in each TOC within three years from the effective date of this Agreement and NERC-certification of all TOC dispatchers by June 2017.

41. Entergy will develop and provide staff in its first compliance monitoring report formal procedures specifying the following: (a) the steps and tools necessary for building and updating the internal and external portions of Entergy's models;<sup>1</sup> (b) tools and formal test steps to validate and benchmark Entergy's models and updates before they are released into production; (c) tools and formal test steps for mapping and cross-referencing Entergy's operations, operations planning, and long-term planning models to ensure consistency before these models are released to production; and (d) tools for release and coordinated implementation of validated models in production systems.<sup>2</sup> Entergy's second compliance monitoring report will provide evidence to staff that it has implemented and follows the formal procedures outlined. Entergy will establish a process to improve communicating model topology and parameter information required to support its EMS and operations planning models and provide evidence

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<sup>1</sup> The models would include specifically the EMS node-switch, and Short Term and Long Term bus-branch planning models.

<sup>2</sup> The procedures required in subsections (a) through (d) of this paragraph shall specify the assumptions, prerequisites, and acceptance criteria in Entergy's tools used to determine the accuracy of its models.

to staff that it has implemented and is following the improved process.

42. Entergy will continue strengthening its communications network by upgrading its infrastructure. Specifically, Entergy will implement the following: (a) eliminate the existence of single-bus failures of backup power equipment at vital telecommunications facilities by introducing redundancy into the backup power equipment;<sup>3</sup> (b) establish monitoring capabilities of backup power equipment at vital telecommunications facilities, so that Entergy can regularly check the status of such equipment; (c) determine which batteries need replacement at its vital telecommunications facilities and provide evidence of a plan and resource and financial commitments to replace any such batteries, as necessary; (d) determine which relays, if any, have not been timely calibrated in accordance with its protection system maintenance program and provide evidence of a plan and resource and financial commitments to calibrate any such relays, as necessary; (e) reconfigure the routing of RTU data from telecom hubs into Entergy's EMO/SPO control centers to route the data to at least two locations, thus creating diversity and redundancy of telemetering data into EMO/SPO. Entergy also agrees to address improving the diversity and redundancy in routing RTU data to the SOC. In particular, Entergy will provide redundancy and diversity for the telemetered RTU data, routed through individual TOCs to the SOC and required by the SOC to maintain visibility of the BPS. Also, to the extent practicable consistent with the costs and benefits of mitigation, Entergy will review its data concentration practice for such RTU telemetry and implement appropriate changes to mitigate the risks that result from the lack of redundancy and diversity. Entergy will provide evidence in its second compliance monitoring report of resource and financial commitments and a timetable for addressing this issue of routing RTU data into its SOC.

43. Entergy will provide in its first compliance monitoring report: (a) a documented strategy and a procedure on operators' use of state estimator and contingency analysis functions at Entergy's SOC during normal operations as well as during the outages of RTUs or communications systems; (b) documentation that Entergy has trained its operators on the procedure described in part (a) of this paragraph; (c) an update to its procedure on which transmission status and flow data its SOC operators should capture from the field to adequately monitor the system and to report to Entergy's Reliability Coordinator during communications outages; (d) documentation that Entergy has trained its SOC operators on the procedure described in part (c) of this paragraph; (e) a viable loss of control center functionality plan (i.e., EOP-008 plan) to reflect changes made to the

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<sup>3</sup> Enforcement and Entergy have agreed to a list of vital telecommunications facilities, which list is maintained confidentially by Enforcement and Entergy.

configuration of its control centers and communications network; and (f) evidence that Entergy tested the viable loss of control center functionality plan and the test procedures used. Entergy's second compliance monitoring report will provide evidence to staff that it has implemented and follows the formal procedures outlined in this paragraph.

### **C. Compliance Monitoring**

44. Entergy shall make semi-annual reports to Enforcement for one year following the Effective Date of this Agreement. The first semi-annual report shall be submitted no later than ten days after the end of the second calendar quarter after the quarter in which the Effective Date of this Agreement falls. The subsequent reports shall be due in six month increments thereafter. Each report shall detail the following: (1) actions taken as of the date of the report to satisfy the terms of this agreement, including all mitigation items; (2) actions taken to improve reliability compliance, including investments in new measures and training activities during the reporting period; and (3) any additional violations of Reliability Standards that have occurred and whether and how Entergy has addressed those new violations. The reports must include an affidavit executed by an officer of Entergy that the compliance reports are true and accurate and also include corroborative documentation or other satisfactory evidence demonstrating or otherwise supporting the content of these reports. Enforcement may require a second year of biannual reporting if the internal review by Entergy or other circumstances indicate the need for further monitoring.

### **V. TERMS**

45. The "Effective Date" of this Agreement shall be the date on which the Commission issues an order approving this Agreement without material modification. When effective, this Agreement shall resolve the matters specifically addressed herein, and that arose on or before the Effective Date, as to Entergy, any affiliated entity, and any successor in interest to Entergy.

46. Commission approval of this Agreement without material modification shall release Entergy and forever bar the Commission from holding Entergy, any affiliated entity, and any successor in interest to Entergy liable for any and all administrative or civil claims arising out of the conduct addressed and stipulated to in this Agreement that occurred on or before the Agreement's Effective Date.

47. Failure to make timely civil penalty payments or to comply with the mitigation and monitoring agreed to herein, or any other provision of this Agreement, shall be deemed a violation of a final order of the Commission issued pursuant to the Federal Power Act (FPA), 16 U.S.C. §792, *et seq.*, and may subject

Entergy to additional action under the enforcement provisions of the FPA.

48. If Entergy does not make the civil penalty payment described above at the times agreed by the parties, interest payable to the United States Treasury will begin to accrue pursuant to the Commission's regulations at 18 C.F.R. § 35.19(a)(2)(iii) from the date that payment is due, in addition to the penalty specified above.

49. The Agreement binds Entergy and its agents, successors, and assignees, including any entity that acquires, by way of merger or asset purchase, all or a portion of Entergy's assets. If such an entity acquiring Entergy's transmission system by way of merger or asset purchase determines that alternative mitigation plan(s) can be equally or more effective in achieving the reliability objectives set forth herein, it may propose such alternative(s) to Enforcement and shall document and support any such plan(s), whereupon Enforcement shall not unreasonably withhold its consent to any such alternative mitigation plan(s). The Agreement does not create any additional or independent obligations on Entergy, or any affiliated entity, its agents, officers, directors, or employees, other than the obligations identified in this Agreement.

50. The signatories to this Agreement agree that they enter into the Agreement voluntarily and that, other than the recitations set forth herein, no tender, offer or promise of any kind by any member, employee, officer, director, agent or representative of Enforcement or Entergy has been made to induce the signatories or any other party to enter into the Agreement.

51. Unless the Commission issues an order approving the Agreement in its entirety and without material modification, the Agreement shall be null and void and of no effect whatsoever, and neither Enforcement nor Entergy shall be bound by any provision or term of the Agreement, unless otherwise agreed to in writing by Enforcement and Entergy.

52. In connection with the payment of the civil penalty provided for herein, Entergy agrees that the Commission's order approving the Agreement without material modification shall be a final and unappealable order assessing a civil penalty under sections 215 of the FPA, 16 U.S.C. § 825o-1(b), as amended. Entergy waives findings of fact and conclusions of law, rehearing of any Commission order approving the Agreement without material modification, and judicial review by any court of any Commission order approving the Agreement without material modification.

53. Each of the undersigned warrants that he or she is an authorized representative of the entity designated, is authorized to bind such entity and

accepts the Agreement on the entity's behalf.

54. The undersigned representatives of Entergy affirm that they have read the Agreement, that all of the matters set forth in the Agreement are true and correct to the best of their knowledge, information and belief, and that they understand that the Agreement is entered into by Enforcement in express reliance on those representations.

55. The Agreement may be signed in counterparts.

56. This Agreement is executed in duplicate, each of which so executed shall be deemed to be an original.

Agreed to and accepted:

Norman C. Bay

Norman C. Bay

Director, Office of Enforcement

Federal Energy Regulatory Commission

Date: 3/12/13

Marcus V. Brown

Marcus V. Brown

Senior Vice President and General Counsel

Entergy Services, Inc.

Date: 3/4/13