

Market Trials Integrated Deployment Test Plan v3.01

~~October-December 293~~, 2013

Integrated Marketplace Market Trials

Revision History

| Date or Version Number | Author | Change Description | Comments |
|----------------------------|--|---|--------------------------------------|
| 0.1 | George Kelly | Initial Draft | For internal development |
| 0.2 | George Kelly | Incorporating MTRG/CBASC comments and feedback | For discussion on the 06-28-13 call. |
| 1.0 | George Kelly | Accept changes from MTRG/CBASC Review on 06/28/2013. Incorporate new feedback | |
| 2.0 | George Kelly | Removed planning calendar so separate posting. Added minor revisions/clarifications. | |
| 3.0 | George Kelly | Added clarification based on RMS tickets and stakeholder meeting feedback | |
| <u>3.1</u> | <u>Ashley Churilla</u> | <u>Updated and added additional links to the Calendar & Parallel Ops Communication Plan. Updated webMirroring ending date</u> | |

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1.0 Overview of Integrated Deployment Test and Market Trials

The purpose of this document is to provide Market Participants and existing Balancing Authorities (BAs) instructions and information to aid in the preparation for the execution of SPP's Integrated Deployment Tests. The Integrated Deployment Tests are a subset of the larger Market Trials effort that is intended to validate that SPP and Market Participant systems, processes, and staff are able to operate in alignment with Integrated Marketplace Protocols. Market Trials serves as the participant integration test stage utilizing five participant test sub-stages: 1) Connectivity Test, 2) Structured Test, 3) Unstructured Test, 4) Parallel Operations Test, and 5) Integrated Deployment Test. Market Trials is conducted in the Marketplace Production environment, in order to efficiently deploy the integrated systems solution for Go-Live.

During the Integrated Deployment Tests SPP will be focusing on all items required to obtain NERC/SERC certification as a BA. Compliance will analyze the data that makes up ACE to ensure that all of SPP's certification obligations are met. SPP will run the Integrated Marketplace with Registered Resources responding to deployment instructions from the SPP Integrated Marketplace EMS system. These tests will be the first time that the entire footprint will follow the SPP Integrated Marketplace deployment instructions. In this manner we can more fully test the end to end processes and systems prior to market Go-Live.

This Test Plan describes the SPP and Market Participant activities for Market Trials related to Market Systems including Day-Ahead Market, Reliability Unit Commitment (Day-Ahead and Intra-Day), Real-Time Balancing Market (RTBM) and Real-Time Generation (RTGEN) Dispatch. The objective of this sub-stage of Market Trials is to continue to test the ability of the market and SPP to submit and receive a full set of transactions in support of the Day-Ahead and Real-Time activities, for SPP to execute the Markets, for SPP to communicate the results to the market and to confirm the ability of the Market Participants to respond to dispatch instructions. Protocol timelines will be used for all Market Processes.

2.0 Expectations

The Integrated Deployment Tests are designed to demonstrate Real-Time Market Operations that result in SPP control of Registered Resources across the Market Footprint. Market Participants will provide the Real-time Resource Offers (consisting of Start-Up Offer, No-Load Offer, Energy Offer Curve, Regulation-Up Offer, Regulation-Down Offer, Spinning Reserve Offer and Supplemental Reserve Offer) that will shape the dispatchable range of Resources during testing. For more information on the handling of Offers see Section 5.0.

During the Integrated Deployment Tests, the Integrated Marketplace systems (RTBM, RSS, CRD, and RTGEN) will operate as a single BA comprised of the 16 existing BAs in parallel with the Energy Imbalance Services (EIS) Market for at least fifteen separate Integrated Deployment Test periods. The goal of each Integrated Deployment Test is to operate the Integrated Marketplace RTBM and RTGEN with no issues, prove that SPP and Market Participant systems/interfaces work as intended, and that SPP can perform the balancing function through successful regulation deployment.

During all Integrated Marketplace Parallel Operations tests, the EIS Market will continue to operate normally (in parallel). Locational Imbalance Prices (LIPs) will continue to be calculated normally based upon EIS Resource Offers. These LIPs will be used for all Energy Settlement during Integrated Marketplace Integrated Deployment Tests. During all Integrated Deployment Tests, Uninstructed Resource Deviation penalties will not apply in EIS Market Settlements.

2.1 Offering of Available Generation

In order to minimize the differences between RTBM Dispatch Instructions and EIS Market Dispatch, Market Participants will submit Resource Offers for use in RTBM as described in Section 5.0.

2.2 Market Participants with all Resources Offline

Market Participants that do not plan on having Resources online during the testing periods are not required to participate in testing. Market Participants will not be required to bring Resources online solely for testing purposes. However, Market Participants are encouraged to utilize this opportunity to exercise end-to-end Market processes.

3.0 Test Execution Parameters

There will be at least fifteen Integrated Deployment Tests of varying durations beginning with a two-hour test on November 20, 2013 and ending with a two-hour test on January 30, 2014 (See full calendar at [Parallel Operations Calendar- v7-0](#)).

SPP and Market Participants will coordinate the flexibility of adding more or subtracting planned Integrated Deployment Test through the use of the Parallel Operations Communications Plan (See Section 10.0). During these tests SPP will be operating as the BA for the entire SPP footprint and the individual BAs will not be held responsible for maintaining their own ACE. All of the EIS BAs have received waivers from SPP RE and MRO such that CPS1/CPS2 violations have been waived with the requirement of the BA's to maintain logs of start/stop times. These waivers cover the entire duration of the 2, 4 or 8 hour Integrated Deployment Test as well as a 15 minute lead-in ramp time and a 15 minute lead-out ramp time.

During all Integrated Marketplace Deployment Tests, Uninstructed Resource Deviation penalties will not apply in EIS Market Settlements. Under-Scheduling and Over-Scheduling Charges will continue to apply and will be charged as appropriate.

The timing of these tests will be designed so that SPP can test for operational control in various conditions throughout the day:

- Demonstrate AGC operation during extended heavy load pick up during morning period.
- Demonstrate AGC operation during an evening load pick up period.
- Demonstrate crossing midnight period and operational continuation between days.

These Integrated Deployment Tests are imperative to ensure a reliable start-up of the SPP Integrated Marketplace and will:

- Verify that SPP can transmit proper AGC signals to Resources and that the EIS BAs within the SPP footprint can receive the new information.
- Verify SPP can calculate a single ACE and respond to it appropriately.
- Verify that Resources respond to AGC signals received from SPP.
- Verify that Resources can respond to a Congestion Management Event (CME/TLR).
- Verify that AGC is correctly biased in response to a Reserve Sharing System event (RSS/CRD).
- Verify that SPP and Resources can respond to a Contingency Reserve Deployment (CRD) as follows:

RSS events will be entered into the normal EIS, such that the settlement schedules will be created as normal. There will be a dual entry into the SPP CRD, such that the response within the SPP BA would be similar to the sum of the individual 16 BAs. The SPP Marketplace Operator

will enter equivalent schedules and CRD events into the Marketplace production environment to ensure Net Schedule Interchange matches EIS production.

RSS is required whenever there is a loss of significant generation within the SPP footprint. The CRD application will perform two functions: (1) manage deployments of reserves, and (2) monitors the compliance of Resources during contingency events. If a significant loss of Resources occurs, a RSS event will be created by an operator. Once the event is issued an operator will acknowledge and deploy the event. RSS will calculate the total amount of reserves that will be deployed and CRD will split it between the RTGEN managed deployments and the CRD managed deployments. RTGEN manages deployments for Spinning and Online Supplemental reserves only. CRD manages deployments for recallable transactions, offline supplemental reserves, and BDR Spinning and Supplemental reserves. All RTGEN deployments made by RTGEN will be communicated to Resources via ICCP while CRD triggered deployments are communicated via XML.

4.0 Integrated Deployment Test Schedule

It is expected that there will be multiple Integrated Deployment Tests during Parallel Operations. These will include a total of at least 15 Integrated Deployment Tests, starting with 2 hour tests, proceeding with 4 hour tests and continuing with 8 hour tests.

The tentative schedule for the Integrated Deployment Tests are included in the Parallel Operations Calendar posted at [Parallel Operations Calendar-v7-0](#). [An overall listing of Integrated Deployment Test dates and associated meetings can be found in the Parallel Operations Communications Plan.](#)

SPP will work with the Market Participants if changes need to be made to this schedule as Parallel Operations proceeds.

5.0 Setup Assumptions During Integrated Deployment Test

The Current Operating Plan (COP) will be populated using the Resource Plans and Ancillary Service Plans submitted in the EIS Market by the Market Participants.

- Resources submitted by the Market Participants in the EIS Resource Plan will be shown as committed and on-line in the COP.
- Resources identified in the EIS Ancillary Service Plans as providing Regulation will be selected to provide Regulation in the COP. Market Participants shall submit a fixed amount for Regulation-Up and Regulation-Down with a zero Offer price, this is required so that the RTBM will allow clearing of Regulation-Up and Regulation-Down on the selected Resources identified in the COP.

Operating Reserve Requirements will be set at the same level as those in the EIS Market.

- Resources identified in the EIS Market Ancillary Service Plans as providing Regulation-Up will have their Regulation-Up MW value identified in the Plan fixed at that level (i.e. the Resource's Regulation-Up Dispatch Status will be set to "Fixed" at the specified MW).
- Resources identified in the EIS Market Ancillary Service Plans as providing Regulation-Down will have their Regulation-Down MW value identified in the Plan fixed at that level (i.e. the Resource's Regulation-Down Dispatch Status will be set to "Fixed" at the specified MW).
- Resources identified in the EIS Market Ancillary Service Plans as providing Spinning Reserve will have their Spinning Reserve MW value identified in the Plan fixed at that level (i.e. the Resource's Spinning Reserve Dispatch Status will be set to "Fixed" at the specified MW).

- Resources identified in the EIS Market Ancillary Service Plans as providing On-Line Supplemental Reserve shall submit a zero price Supplemental Reserve Offer as well as a zero price Spinning Reserve Offer. Resources providing Off-Line Supplemental Reserve shall submit a “Fixed” Offer at zero price.
- Resources not supplying Operating Reserves in EIS shall submit reasonable offers for Regulation-Up, Regulation-Down, Spinning Reserve and Supplemental Reserve based on the unit’s actual current capability.

Market Participants will submit Resource Offers for use in RTBM. In order to minimize the differences between RTBM Dispatch Instructions and EIS Market Dispatch Instructions:

- Resource Offers should be consistent with the operational parameters submitted in the EIS Market Resource Plans and the Energy Offer Curves submitted in for use in the EIS Market.
- Regulation Ramp Rate curves and Contingency Reserve Ramp Rate curves should be set equal to the Ramp Rate Curve submitted for use in the Up direction in the EIS Market.

SPP has a new OATI enhancement called webMirror that automatically converts EIS schedules into Integrated Marketplace schedules. This will be used to duplicate schedules until it is deactivated on ~~January-December 2016, 2014-2013~~. Following ~~January-December 20th-16th~~ Market Participants will be required to submit separate schedules into EIS and the Integrated Marketplace for the duration of Parallel Operations.

RTBM Dispatch Instructions and cleared Operating Reserve will be sent to the RTGEN system every 5 minutes.

- RTGEN will create Setpoint Instructions that will consist of the sum of the RTBM Dispatch Instruction, Regulation Deployment and CRD.
- RTBM Locational Marginal Prices (LMPs) and Market Clearing Prices (MCPs) will be generated for information purposes and will not be used for Settlement during each Integrated Marketplace Integrated Deployment Test.

Market Participants will be required to follow the RTGEN Setpoint Instructions.

- Although 5 minute NSI values will continue to be generated and sent to each BA from the EIS Market, these values should be ignored.
- No financially-binding Integrated Marketplace Settlement calculation will be performed.

6.0 SPP Activities

- Execute all Pre-Day Ahead Integrated Marketplace activities (e.g. Multi-day Reliability Assessment, Day-Ahead Market, DA-RUC, and ID-RUC)
- Execute and monitor Real-Time system components, including RTBM/AGC, State Estimator and all Real-Time security applications
- Execute all EMS 2.5 Production studies, RTNET, RTRFCALC, RTCA, Losses, etc.
- Execute RTBM every 5 minutes using Market Participant data from ICCP and Portal submissions
- Execute all rolling Forecasting applications, Wind, Parallel Loop Flow, Mid-Term, & Short-Term Load Forecasts
- Verify Market Participant submission activities
- Work with Market Participants to resolve issues
- Generate setpoints, LMPs, MCPs and Shadow Prices
- Execute AGC every 4 seconds

- Execute Integrated Deployment Tests to deploy generation from the new Integrated Marketplace systems
- Communicate Real-Time reports and outputs
- Update Counterparty credit limits with self-selected credit limits submitted by Market Participants
- Generate Awards, Day-Ahead LMPs/MCPs, and other reports
- Communicate Day-Ahead Market and RUC reports and outputs to the market
- Produce Settlement Statements and invoices . All EIS Settlement Statements and Invoices will be generated in the normal course of operations in accordance with the EIS Protocols. From the Integrated Marketplace perspective, SPP will generate ‘For information only’ Settlement Statements and invoices as if the Integrated Marketplace was in production, utilizing the market clearings and the meter data submitted by the Market Participants.

The following results are communicated to each Market Participant that relate only to that Market Participant:

- Cleared Resource Offers for Energy, Regulation-Up, Regulation-Down, Spinning Reserve and/or Supplemental Reserve, in MW;
- Cleared Demand Bids, in MW;
- Cleared Virtual Energy Offers, in MW;
- Cleared Virtual Energy Bids, in MW;
- Cleared Import Interchange Transaction Offers, in MW;
- Cleared Export Interchange Transaction Bids, in MW;
- Cleared Through Interchange Transactions, in MW.

The following Public results are communicated to all Market Participants:

- LMPs for each Settlement Location, the Marginal Energy Component (MEC) of LMP, the Marginal Congestion Component (MCC) of LMP for each Settlement Location and the Marginal Losses Component (MLC) of LMP for each Settlement Location;
- LMPs and each component (MCE, MLC, MCC) for each elemental Price node;
- MCPs for Regulation-Up, Regulation-Down, Spinning Reserve and Supplemental Reserve for each Reserve Zone.
- Binding constraints that were effective in the Day-Ahead Market

7.0 Market Participant Activities

Each Market Participant must offer sufficient Resources and Import Transactions to the Day-Ahead Market to cover their load and Firm exports plus Operating Reserve obligation to the extent the Resources are available (e.g. not on forced outage, planned outage or Reserve Shutdown). Only Resources submitted with a Commitment Status of “Market” or “Self” may be used to satisfy this requirement.

- A Market Participant’s load for purposes of this section shall be equal to that Market Participant’s expected daily peak Resident Load.
- A Market Participant’s daily Operating Reserve obligation shall be equal to the sum of that Market Participant’s maximum daily Regulation-Up, Regulation-Down and Contingency Reserve obligation as calculated by SPP.
- May submit Dispatchable or Up to Congestion Schedules to RTOSS for testing only, these are not to be submitted during the Integrated Deployment Tests.

- All EIS Production schedules that cross the SPP boundary will be pre-populated each day prior to the execution of the Day-Ahead Market
- Market Participants should not replicate any tag names that are in the EIS Market Production system when submitting additional test schedules to RTOSS. Test schedules are not to be submitted during the Integrated Deployment Tests.
- Submit Resource Offers as described in Section 5.0.

8.0 Integrated Deployment Test Details

8.1 EMS Functional Requirements

- SPP will continue to send 5 minute dispatch instructions from the EIS Market through ICCP and will also send 4 second setpoints from Integrated Marketplace through ICCP for Integrated Marketplace Registered Resources at the same time. The 5 minute EIS dispatch instructions and 4 second Integrated Marketplace setpoint instructions will be sent by SPP through different ICCP Object ID's. Refer to the ICCP Handbook and AGC User Guide for specification of ICCP Object IDs.
- For the purpose of participating in a 2 hour, 4 hour or 8 hour Integrated Deployment Test, EIS BAs, or the appropriate entity, should be able to quickly (within minutes) point their AGC System from reading the 5 minute EIS dispatch instructions to reading the 4 second Integrated Marketplace setpoint instructions as sent by SPP through ICCP.
- For the purpose of participating in the Integrated Deployment Tests, the EIS BAs, or the appropriate entity, should be able to disable all Resources from providing regulation by their AGC system based on their calculated ACE. The EIS BA's, or the appropriate entity's, Resources should follow the 4 second Integrated Marketplace setpoint instructions that already include regulation and any CRD for the SPP Market footprint as a whole.
- EIS BAs, or the appropriate entity, must send control status to SPP through ICCP for all Resources. These control statuses must be maintained in Real-Time throughout the duration of the Integrated Deployment Tests.
- EIS BA's, or the appropriate entity's, AGC System should be able to read the 4 second Integrated Marketplace setpoint instructions via ICCP and control the Resources close to those 4 second Integrated Marketplace setpoint instructions. The 4 second Integrated Marketplace setpoint instructions include energy (5 minute value), and any regulation (4 second value) for Resources submitted for regulation in Integrated Marketplace and any 4 second contingency reserves for Resources submitted in the Integrated Marketplace.
- EIS BA's AGC System should still be able to calculate ACE, CPS1, and CPS2 during the Integrated Deployment Tests, but not adjust any setpoints to control for the EIS BA's ACE. The EIS BA's ACE is a calculated value in the EIS BA's AGC, and should not be used by their AGC systems to control Resources during Integrated Deployment Testing.
- During the Integrated Deployment Tests SPP will continue to send out NSI values (NSI EIS, NSI RTOSS, NSI Sum) from the EIS Market System and the EIS BAs can continue to calculate ACE based on those NSI values as if they were operating in the EIS Market. The NSI values that SPP will be sending out during the Integrated Deployment Tests will be sent out on the same ICCP Object ID's. No changes are needed by the EIS BAs.
- For the purpose of ending a 2 hour, 4 hour or 8 hour Integrated Deployment Test, the EIS BAs, or the appropriate entity, should be able to quickly (within minutes) point their AGC System from reading the 4 second Integrated Marketplace setpoint instructions to reading the 5 minute EIS dispatch instructions as sent by SPP through ICCP. This will bring the EIS BAs back in EIS

Market Operation mode, and they will resume responsibility for ACE Control by deploying regulation with their AGC System.

8.2 Inadvertent Handling

- SPP already has a Regional Scheduling Waiver in place for financial settlement of losses from the EIS market. Since all of the SPP BAs settle their Inadvertent hourly with the EIS market, SPP has a NERC account that takes the entire SPP EIS footprint Eastern Interconnection Inadvertent and SPP owns it.
- During Integrated Deployment Tests, the EIS BAs will deploy their generation based upon SPP signals and the EIS market and settlements processes will be running in the background. Any inadvertent that SPP causes during the Integrated Deployment Tests will be treated as any other inadvertent would have been in the EIS Market. The BAs will settle any inadvertent financially each hour.
- One of the checks and balances SPP will be performing will be to monitor the SPP CBA Inadvertent calculation and check it against the aggregation/summation of the Inadvertent from each of the EIS BAs.

9.0 Documentation

The following documentation set comprises the scope of materials for Test Preparation efforts.

| Document Name | Document Location |
|---|---|
| Marketplace Markets Web Services <ul style="list-style-type: none"> - Markets API XSD Manifest - Markets API Data Exchange Guide - WSDLs - XSDs | Integrated Marketplace-Market Systems |
| Settlements DEGs and WSDLs <ul style="list-style-type: none"> - SPP Settlements External API Manifest - Bilateral Settlement Schedules – Data Exchange Document - Meter Data – Data Exchange Document - Settlement Reports – Data Exchange Document - WSDLs - XSDs | Integrated Marketplace-Settlements |
| Notification DEG and WSDL <ul style="list-style-type: none"> - SPP External Notification API Manifest - Notification – Data Exchange Document - WSDLs - XSDs | Integrated Marketplace-Settlements |
| TCR API Specifications <ul style="list-style-type: none"> - Nexant API Documentation Manifest - API Definitions for ARR Nomination - API Definitions for Download - SPP TCR API XML Reference - API Definitions for TCR Market - API Definitions for TCR Secondary Market - API Definitions for TCR Auction - WSDLs - XSDs | Integrated Marketplace-Transmission Congestion Rights |
| CWG Marketplace Public Data Inventory | Integrated Marketplace - Public Data |

| | |
|---|---|
| Integrated Marketplace Market User Interface Business Validations | Integrated Marketplace-Market Systems |
| Integrated Marketplace TCR Market User Interface Business Validations | Integrated Marketplace-Transmission Congestion Rights |
| Integrated Marketplace Meter Bilaterals User Interface Business Validations | Integrated Marketplace-Settlements |
| Integrated Marketplace Connectivity and Data Exchange Documentation | Integrated Marketplace - Connectivity and Data Exchange Testing |
| Comprehensive Modeling Approach Timeline for 2013-1 | Modeling Approach Timeline for 2013-1 |
| Integrated Marketplace Deployment Testing Settlements Approach | SPP Deployment Testing Approach 20120912 |
| Integrated Marketplace Parallel Operations Market Participant Guide | SPP IM Market Trials Parallel Operations Test Market Participants Guide v 1.4 |

10.0 Communication Plan

10.1 General Information and Inquiries

SPP has developed a separate Communications plan for Parallel Operations and it is posted in a list of documents on SPP.org at: [Parallel Operations Communications Plan](#)

11.0 Test Preparation

The following Integrated Deployment Test preparation actions are expected to have been completed by Market Participants prior to the start of test execution:

- Review of the latest version of the SPP Integrated Marketplace Protocols
- Review of list of currently modeled generation Resources and ICCP point IDs
- XML Listener URL provided to Customer Relations
- Resources have attended training
- Resource RTBM Offers entered and updated for all Resources in fleet to reflect test objectives and Resource capabilities
- Market Participants and SPP confirm accurate tie-line measurements
- Ensure that Dynamic Schedules are accurate and that SPP is receiving Real-Time actuals
- Ensure the Non-Conforming Load forecasts and actuals are updated and accurate and SPP is receiving Real-Time data

12.0 Acronyms

The following table describes the key acronyms specific to the Program:

| Acronym | Term |
|---------|----------------------------------|
| ACE | Area Control Error |
| AGC | Automatic Generation Control |
| BDR | Block Demand Resource |
| BA | Balancing Authority |
| CBA | Consolidated Balancing Authority |
| CC | Combined Cycle Resource |
| CMS | Credit Management System |
| CMT | Centralized Modeling Tool |
| COP | Current Operating Plan |

| | |
|----------|--|
| CRD | Contingency Reserve Deployment |
| CROW | Control Room Operating Window |
| DA-RUC | Day-Ahead RUC |
| DBDA-RUC | Day Before Day-Ahead RUC |
| DDR | Dispatchable Demand Resource |
| EAD | Enterprise Analytic Data Store |
| EIS | Energy Imbalance Service |
| EMS | Energy Management System |
| IDC | Interchange Distribution Calculator |
| ID-RUC | Intra-Day RUC |
| IPP | Independent Power Producer |
| JOU | Jointly Owned Unit |
| LIP | Locational Imbalance Price |
| LMP | Locational Marginal Price |
| LSA | Local System Administrator |
| MCE | Market Clearing Engine |
| MCP | Market Clearing Price |
| MMU | Market Monitoring Unit |
| MOI | Market Operator Interface |
| NSI | Net Scheduled Interchange |
| OD | Operating Day |
| OH | Operating Hour |
| OR | Operating Reserve |
| PFC | Parallel Flow Calculator |
| PSE | Purchasing and Selling Entity |
| RCIS | Reliability Coordinator Information System |
| RMS | Request Management System |
| RRS | Ramp Reservation System |
| RSS | Reserve Sharing System |
| RTBM | Real-Time Balancing Market |
| RUC | Reliability Unit Commitment |
| RZ | Reserve Zone |
| SE | State Estimator |
| SCED | Security Constrained Economic Dispatch |
| SCUC | Security Constrained Unit Commitment |
| TCR | Transmission Congestion Rights |
| UI | User Interface |
| VER | Variable Energy Resource |
| VRL | Violation Relaxation Limit |