

**Southwest Power Pool
MODEL DEVELOPMENT WORKING GROUP
November 8, 2011
Conference Call
10:00 A.M. – 11:30 A.M.**

• M I N U T E S •

Agenda Item 1 - Administrative

The meeting was called to order at 10:05 a.m. The following Model Development Working Group (MDWG) members were in attendance:

Scott Rainbolt, Chair – American Electric Power (AEP)
Joe Fultz, Vice Chair – Grand River Dam Authority (GRDA)
Jason Shook – GDS Associates (GDS)
Dustin Betz – Nebraska Public Power District (NPPD)
Nathan McNeil – Midwest Energy (MIDW)
Reené Miranda – Southwestern Public Service (SPS)
Scott Schichtl – Arkansas Electric Cooperative (AECC)
Brian Wilson – Kansas City Power & Light (KCPL)
John Boshears – City Utilities of Springfield (CUS)
Mike Clifton – Oklahoma Gas & Electric (OGE)

SPP Staff in attendance included Anthony Cook (Secretary), Kelsey Allen, Mitch Jackson, and Jeff Rooker (RE).

The following guests were also in attendance:

David Macey – City of Independence, Missouri (INDN)
Deepthi Kasinadhuni – Grand River Dam Authority (GRDA)
Liam Stringham – Sunflower Electric Power Corporation (SEPC)
Ryan Yokley – Sunflower Electric Power Corporation (SEPC)
Derek Brown – Westar Energy (WR)

Meeting Agenda

The agenda was reviewed by the group. Scott Schichtl motioned to approve the agenda, Jason Shook seconded the motion. The motion passed unopposed (**Attachment 1 - MDWG Meeting Agenda 20111108.doc**).

Meeting Minutes

The August 2th meeting minutes were open for review. Scott Schichtl motioned to approve the previous meeting minutes as written; Jason Shook seconded the motion. The motion passed unopposed (**Attachment 2 - MDWG Minutes 20110802.doc**).

Agenda Item 2 – MITF White Paper

Kelsey Allen reviewed the Uniform Generation Modeling section of the MITF approved White Paper. He stated that Generator P_{MAX} should be modeled as a gross value with auxiliary load modeled explicitly for machines greater than 20 MVA or plants with an aggregate capacity greater than 20 MVA. Otherwise, auxiliary load should be netted with generator gross capability. Reené Miranda asked what value is currently used for P_{MAX}. Kelsey responded that P_{MAX} should be modeled as machine output capability based on test reports, not a nameplate value. Nathan McNeil asked that the third bullet of the solution under section 1.A. of the white paper be reworded for clarity and the inclusion of seasonal capability language. Nathan asked about the size of the machine and the aggregate capacity of greater than 20 MVA, stating an example of a group of municipal machines totaling 21 MVA for which he expressed concern of being required to model auxiliary load. Kelsey added that generation on a distribution system would fall under this 20 MVA requirement. Jason Shook asked about the options in Appendix C to which Kelsey stated that these were suggestions made by the MITF. Reené also asked about the language of the Tariff and if there is still an issue. Kelsey will review previous meeting minutes and make sure the issue was resolved. Nathan questioned the limit on the aggregate capacity being too low. Kelsey added that the Western Interconnection, WECC, uses 10 MVA for individual machines and 20 MVA for plants.

The group decided to table this decision until the December meeting.

(Attachment 3 - Model Improvement White Paper_draft 20110913_MITF Approved.doc)

Action Item – Kelsey Allen to review previous meeting minutes for resolution of any language discrepancies in the SPP Tariff.

Action Item – Staff to provide background information on reasons for choosing presented values for Uniform Generation Modeling.

Agenda Item 3 – Proposed 2012 Series Schedule Update:

The group reviewed the proposed 2012 Series Schedule updates while Kelsey Allen stated the reasoning behind proposal. These changes included improvements to Build 1 and the removal of Build 2 so that effort is focused on only one model build. These changes were based on discussion by the MITF on how to improve the models. Also, passes for building the Short Circuit models were weaved in with the Powerflow model build so that powerflow and short circuit models are built concurrently.

Scott Rainbolt was concerned about getting the NTC project idevs converted to MOD projects in time for the model build. Kelsey Allen informed the group that the idevs would be added to the model building process and that the projects could be added to MOD at a later date. Dustin Betz asked if the members could review the NTC idevs, to which Kelsey suggested trying to post the idevs for review during the December DBU.

Reené Miranda had concerns about removing Build 2 because SPS LSE companies are expecting a second build to make further improvements. Derek Brown also had concerns because of Westar internal study processes.

Reené suggested beginning in May instead of August for future model builds. Dustin added that the MMWG models are not ready until late fall and therefore does not help all companies to start early. Kelsey added that the two milestones of the build are the MMWG model release and the start of other SPP internal processes and studies in the beginning of the year.

The group decided to table this decision until the December meeting.
(Attachment 4 - MDWG Modeling Schedule 2012_transition_REV2.pdf)

Agenda Item 4 – Load Forecast Request:

Anthony Cook discussed the request for a load forecast for 2033. Scott Rainbolt asked how SPP wanted the members to submit the data. Kelsey Allen stated that Staff could upload a 2023 profile to MOD and name it 2033 for the members to add their profile to. Nathan McNeil questioned how allocation is determined for the off-peak model. Staff said this is a question needing to be answered by SPP Economic Planning and/or the ESWG.

Action Item – Staff to send out formal request for 2033 load forecast.

Agenda Item 5 – Face-to-Face Meetings:

Anthony Cook asked the group if they wanted to continue having face-to-face meetings in February and August in conjunction with the TWG. Staff stated that the February meeting seemed not as effective since it was at the end of the model build and a short time span after the December meeting. The August meetings have been effective, but could be earlier so that necessary agenda items could be presented before the model build begins. The group discussed holding a face-to-face meeting in conjunction with the TWG in May and to keep the current meeting in December, before the DBU, for 2012. Nathan McNeil motioned to accept the proposed face-to-face meeting schedule; Reené Miranda seconded the motion. The motion passed unopposed.

Agenda Item 6 – Other:

- A. Anthony Cook informed the group that the MMWG did decide to increase the model seasons by one year for the 2012 Series. This will coincide with the 2012 Series MDWG models.
- B. Reené Miranda had questions/comments involving the Dynamic Model process.

- i. Can Staff setup a folder on TrueShare for Dynamic submissions so that the Members don't have to wait until the formal request is sent out by Staff to submit data?
- ii. Data coordination for new generation needs to be improved between SPP and TOs. SPP receives data from the party requesting generation interconnection studies, but the TOs don't have the data to add it accurately to the powerflow models. As far as stability data, SPP does not provide the TOs with data.
- iii. SPP should be requesting non-proprietary models that represent an equivalence of the entire wind farm and mimic the characteristics of the farm at the POI.

Anthony will forward the comments of Reené to the correct Staff member.

Agenda Item 7 - Closing Administrative Duties:

Next Meetings:

Model Update Meeting: Little Rock, December 6-8

Upcoming Meetings Topics:

1. The purpose of the Exp. Bus Names & Translation Table
2. Generator Data Table Updates
3. MODWeb Procedure Manual
4. MDWG Model Development Procedure Manual
5. CBA Dispatching Discussion
6. MDWG involvement reviewing ITP Models
7. MDWG Schedule Transition
8. Uniform Generation Modeling
9. MITF Whitepaper
10. ATP Discussion Update
11. Confirmation of MMWG Participation
12. MOD Training

Summary of New Action Items

1. **Staff to review previous meeting minutes for resolution of any language discrepancies in the SPP Tariff.**
2. **Staff to provide background information on reasons for choosing presented values for Uniform Generation Modeling.**
3. **Staff to send out formal request for 2033 load forecast.**

(Attachment 5 - SPP MDWG Action Items 20111108.xls)

Adjourn Meeting

Scott Schichtl motioned to adjourn the meeting, Reené Miranda seconded the motion. With no further business to discuss, the MDWG adjourned at 11:30 a.m.



Respectfully submitted,
Anthony Cook
SPP Staff Secretary

**Southwest Power Pool
MODEL DEVELOPMENT WORKING GROUP
November 8, 2011
Conference Call
10:00 A.M. – 11:30 A.M.**

• D R A F T A G E N D A •

1. AdministrativeScott Rainbolt
 - a. Call to order
 - b. Proxies
 - c. Approve agenda
 - d. Approve minutes of previous meetings
 - i. August 2, 2011
2. MITF White Paper (Action Item) Kelsey Allen
3. Proposed 2012 Series Schedule Update(Action Item) All
4. Load Forecast Request Anthony Cook
 - a. ITP 20
5. Face-to-Face Meetings..... Anthony Cook
 - a. Locations
 - b. Dates
6. Other All
7. Closing Administrative Duties.....Scott Rainbolt
 - a. Next meeting place and date
 - b. Next meeting topics
 - c. Review of Action Items
 - d. Adjourn meeting

**Southwest Power Pool
MODEL DEVELOPMENT WORKING GROUP
August 2, 2011
Embassy Suites – Downtown/Old Market
Omaha, Nebraska
8:00 A.M. – 5:00 P.M.**

• M I N U T E S •

Agenda Item 1 - Administrative

The meeting was called to order at 8:08 a.m. The following Model Development Working Group (MDWG) members were in attendance:

Scott Rainbolt, Chair – American Electric Power (AEP)
Joe Fultz, Vice Chair – Grand River Dam Authority (GRDA)
Jason Shook – GDS Associates (GDS)
Dustin Betz – Nebraska Public Power District (NPPD)
Nathan McNeil – Midwest Energy (MIDW)
Mo Awad – Westar Energy (WR)
Nate Morris – Empire District Electric (EDE)
Reené Miranda – Southwestern Public Service (SPS)
Scott Schichtl – Arkansas Electric Cooperative (AECC)
Brian Wilson – Kansas City Power & Light (KCPL)
John Boshears – City Utilities of Springfield (CUS)
Mike Clifton – Oklahoma Gas & Electric (OGE)

SPP Staff in attendance included Anthony Cook (Secretary), Kelsey Allen, Doug Bowman, Scott Jordan, Mitch Jackson, and Levi Lyons.

The following guests were also in attendance:

Julie Denton – City of Independence, Missouri (INDN)
Lloyd Kolb – Golden Spread Electric Cooperative, Inc. (GSEC)
John Shipman – Omaha Public Power District (OPPD)
Alan Burbach – Lincoln Electric System (LES)
Mike Hamlin – ITC Great Plains
Robby Michiels – Cleco Power (CLECO)
Matt Bordelon – Cleco Power (CLECO)
Deepthi Kasinadhuni – Grand River Dam Authority (GRDA)
Liam Stringham – Sunflower Electric Power Corporation (SEPC)

Meeting Agenda

The agenda was reviewed by the group. Scott Schichtl motioned to approve the agenda, Nate Morris seconded the motion. The motion passed unopposed (**Attachment 1 - MDWG Meeting Agenda 20110802.doc**).

Meeting Minutes

The January 18th meeting minutes were open for review. Mo Awad motioned to approve the previous meeting minutes as written; Scott Schichtl seconded the motion. The motion passed unopposed (**Attachment 2 - MDWG Minutes 20110118.doc**).

Agenda Item 2 – Review of Past Action Items

Kelsey Allen reviewed the recently completed and in progress action items. Anthony Cook is working on completing a draft of the Compliance and Participation Template to complete item #2. Staff needs to discuss in further details item # 56 with Entergy.

Agenda Item 3 – 2011 Short Circuit Models Discussion:

Anthony Cook has recently taken over the development of the Short Circuit model set. In reviewing the work that has been done, he found that the 2011 MDWG Build 2 Final model set had been posted as the initial Short Circuit model set. He has been working to get the current feedback given by modeling contacts from review of the set posted as the initial Short Circuit models incorporated into current development. He has found that there is still zero sequence data missing and went on to specifically mention work to be done on regional tie line to SERC. An updated set with recent submissions will be posted for review within the next few days.

Agenda Item 4 – 2012 MDWG Model Set:

The MDWG began reviewing the proposed model selection for the 2012 Series MDWG powerflow, dynamics, and short circuit sets. Anthony Cook brought the groups attention to the note at the bottom of the document which states that the MMWG has yet to finalize their model set but upon polling the members, it was expected that the model selection would simply translate all seasons by one year, just as the proposed MDWG sets have.

Reené Miranda expressed concern about the NERC proposed redefining of Year One and the impacts of that redefinition on our current selection. After intermittent discussion on this topic, it was noted that the MDWG would need to revisit impacts once the new language in TPL-001 of Project 2006-02 is approved.

Nate Morris asked the group to re-assess the need for all 19 seasons of the proposed set. Reené Miranda and Mo Awad defended the need for the current year seasons mentioning their operational planning groups utilize those seasons. Kelsey Allen mentioned that the horizon year winter peak model was developed for the more northern companies that have winter peaking systems. After more discussion it was decided that all 19 seasons were needed.

Lloyd Kolb with Golden Spread asked why SPP and the MDWG don't develop models that cover each year to better support the ITP process. Kelsey Allen explained that SPP feels the timing analysis done to support the gaps in seasons is accurate enough that the integrity of the study is not sacrificed and performing studies on a reduced set provides efficiency in the process.

Dustin Betz motioned to approve the 2012 MDWG Model Set for powerflow, dynamics, and short circuit as proposed. Jason Shook expressed concern regarding the possibility of the MMWG not approving their model set as expected. The motion was amended to include “pending finalization of the MMWG model set.” Mo Awad seconded the motion. The motion passed unopposed.

Agenda Item 5 – 2012 Series Schedule:

The group reviewed the proposed 2012 Series Schedule. Kelsey Allen stated that staff is currently going through testing of MOD v7.1.0.6 and PSS/E v32.1 on the MOD testing server and expects to have testing complete and the updates running on production in time to start the 2012 series model build. Julie Denton asked if staff had any plans to coordinate with operations on data submission. Kelsey said that operations has been very proactive about reviewing and collecting model data from submissions made to planning but right now there is not a good feedback loop. He also mentioned that modeling staff has been looking to integrate with the new project tracking database to be able to capture updates from that system. The major issue right now is these three systems are completely different data sets and it will take some time to map data and develop procedures for all groups to follow before we can implement more automation and cohesiveness.

The group asked staff to add Short Circuit model build and MOD lockdowns to the schedule. Staff took those additions as an action item.

Action Item – Staff to add the Short Circuit model build and MOD lockdowns to the 2012 Series Schedule.

Staff asked the group if they wanted to consider letting the members vote on calling the models final instead of just finishing per the number of passes in the schedule. Nate Morris advised against this as we may never finish the model build. It was suggested that staff have the MDWG vote to approve the final models, staff agreed. It was also suggested that the MDWG have a mechanism for members to submit post-processing idevs to TrueShare once the models are finalized. Staff was amenable to this but said that they would not be responsible for applying idevs and posting new models. It was mentioned that for compliance purposes, we need a group to call the models final.

John Boshears asked about the solution issues experienced with the 2011 series cases. Staff attributed much of the issues to the many 3-winding transformers that were added during development of that set for short circuit purposes, coupled with the solution methodology of PSS/E v30.3. Dustin Betz mentioned that much of the reason the models were solving in nearly 20 iterations was due to interaction of phase shifting transformers in New England. He said in the past SPP has locked many of these out of courtesy to the members. Staff took note of this for future builds.

Scott Jordan proposed adding a data-bank update for dynamics models in June, much like the December modeling meeting for powerflow. He stressed the need to mitigate major updates needed after the models are deemed final. The group settled on a conference call to discuss issues prior to finalizing the dynamics models.

Action Item – Staff to make the suggested updates to the 2012 series schedule and send it out to the group for an e-mail vote.

Agenda Item 6 – MOD Modeling Matrix:

The MOD Type/Status Matrix was brought before the group for review. Kelsey Allen explained the proposed changes. Attention was brought to the ATP status of projects coming out of the ITP process and that the inclusion of those projects in TS and GI models was still under stakeholder discussion. It was asked why the ATP projects were intended to not be included in MDWG models. Kelsey Allen explained that he had been asked that question internally but didn't have an answer. The group decided to update the matrix to leave the modeling of ATP projects in all model sets as still under discussion. The group agreed to revisit ATP project for the MOD Matrix at a later meeting.

Action Item – Staff to add ATP discussion to the December meeting agenda.

Nathan McNeil motioned to approve the MOD Matrix as updated. Reené Miranda questioned the Type/Status of Requested/Alternative. Kelsey Allen explained that the Type/Status was used as a repository for projects that will not be used in any model, but will not be deleted from the database for the possibility of future use. Brian Wilson seconded the motion. The motion passed unopposed.

Agenda Item 7 – MOD 7.1 Updates:

Kelsey Allen briefed the group on the improvements made in the upcoming version of MOD currently undergoing testing on SPP's testing environment server. This included the ability to batch import projects and profiles, the improvement of error logs, and application preferences. He explained that the application preferences, which included the option to bypass approval steps and the option to e-mail groups instead of the submitting user during the review stages, could only be configured for the whole system and not individual companies. This would need to be a change voted on by the MDWG. He also briefly covered some new features of PSS/E rev32 that could potentially impact the previous need for certain data requirements of the Model Development Procedure Manual.

Action Item – Staff to post the powerpoint presentation on MOD 7.1.0.6 features to SPP File Sharing (TrueShare).

Agenda Item 8 – MDWG Procedure Manuals:

Kelsey Allen reviewed the updates staff has been making to the MODWeb and Model Development procedure manuals. He asked the group to focus more on the major changes and the goals staff is trying to accomplish with the updates rather than the multitude of minor changes. The Model Development manual is being updated and many of the old requirements revisited. Kelsey mentioned that SPP staff is currently working on a data reporting procedure for all of Engineering Planning that will cover data requirements of NERC Standards, SPP Tariff, and SPP Criteria and hope to weave a lot of that information into the manual. The group briefly discussed some of the

requirements of the current manual that were implemented due to old methods and software limitations. Staff agreed that all of these should be re-visited and their need re-assessed. The MODWeb manual is being re-written and re-arranged for better clarity and updated for the new software versions. Staff stressed that there is still work to be done but that the group should be ready to begin review of the changes. The group discussed how best to tackle review and approval and suggested staff provide completed updates by section for review in order to begin the process early and not overwhelm the members.

Agenda Item 9 – MITF Updates:

The MITF recently met to discuss the TWG action item to revisit their recommendations for Uniform Generation Modeling in order to discuss the need to model generator gross or net P_{MAX} for better accuracy of stability studies. Kelsey Allen informed the MDWG of the discussion on the MITF call and asked for input from the MDWG. Scott Rainbolt stated AEP's response that auxiliary load should only be modeled with machines that are being studied. Nathan McNeil and Dustin Betz both suggested that if it is decided that gross P_{MAX} and auxiliary load should be modeled, that a MW cutoff is implemented so that small municipal units do not fall under the requirement.

Agenda Item 10 – Congestion Hedging Modeling Impacts on MDWG:

Kelsey Allen explained the Congestion Hedging group would be needing data inputs supplied by the MDWG. Transmission Congestion Rights (TCR) models would be developed by starting with an EMS model and building it out 1 year using MOD projects. Kelsey stressed the importance of accurate in-service dates for those projects expected to be energized within a year and that inaccuracy could have financial impacts. The group was very uneasy with this, arguing that project construction timelines slide all the time and it is very tough to get accurate in-service dates a year out. After some discussion, the group asked that Mak Nagle, Manager of Congestion Hedging, be brought on the call for more clarification. Mak was brought on the call after a break for lunch and explained the process in more detail. Congestion hedging gives market participants the ability to hedge against market congestion. OASIS customers with firm service for a given month will be given Annual Revenue Rights (ARR). Each ARR holder will decide whether they want TCR's for the amount of their ARR, more TCR's, or to sell the TCR's. The process will require 7 models annually: June, July, August, September, Fall, Winter, and Spring. The MDWG is needed to help bridge the gap between EMS and planning to build those 7 models. Annual auctions will be held in April of each year. Mak went on to stress the importance of accurate data and the financial impacts of inaccuracy. The group asked if there would be fines imposed on the transmission owners. Mak stressed that there are no fines, but that inaccurate modeling of outage data or transmission can cause revenue inadequacy and have financial impacts. In order to mitigate these uncertainties, the available system capacity will be de-rated during the annual auctions for rights sold on periods closer and closer to 1 year. The group asked staff to provide more information and documentation of the congestion hedging process.

Action Item – Staff to provide modeling contacts with documentation on the congestion hedging process.

Agenda Item 11 – NERC Model Validation Task Force (MVTF) Discussion:

Scott Jordan has been representing SPP on the NERC Model Validation Task Force and informed the group of their current activities and findings. NERC studied the frequency response of each interconnection, most likely in response to the Florida blackout. The Eastern Interconnect showed a response 3-4 times better than the actual system event. The MVTF is looking at revisiting dynamic data of generators across the interconnection with each generator owner reviewing and providing updates via test reports. The MVTF also looked at improving load modeling, adding a better distribution of different types of load and possibly adding 2-winding transformers. Scott went on to say that the effort staff is currently undertaking to map planning data to EMS data will help us better re-create system events.

Agenda Item 12 – Other:

TPL-004

The group asked staff if studies were being done in accordance with TPL-004 item D14 of Table 1, Impact of severe power swings or oscillation from Disturbances in another Regional Reliability Organization. Staff was unsure and the group was unclear about the specifics of this requirement. After discussion, staff was asked to determine clarification of a 'severe' event and 'another RRO.'

Action Item – Staff to determine clarification of TPL-004 item D14 of Table 1.

Scott Jordan also mentioned that he is currently looking at other tools to perform different kinds of stability studies.

Agenda Item 13 - Closing Administrative Duties:

Next Meetings:

Conference Call: As needed prior to model update meeting

Model Update Meeting: Little Rock, December 6-8 (unless otherwise noted in approved MDWG schedule).

Upcoming Meetings Topics:

1. MODWeb Procedure Manual
2. MDWG Model Development Procedure Manual
3. Model Updates
4. ATP Discussion Update

Summary of New Action Items

1. ***Staff to add the Short Circuit model build and MOD lockdowns to the 2012 Series Schedule***
2. ***Staff to make the suggested updates to the 2012 series schedule and send it out to the group for an e-mail vote***
3. ***Staff to add ATP discussion to the December meeting agenda***

4. **Staff to post the powerpoint presentation on MOD 7.1.0.6 features to SPP File Sharing (TrueShare)**
5. **Staff to provide modeling contacts with documentation on the congestion hedging process**
6. **Staff to determine clarification of TPL-004 item D14 of Table 1**
(Attachment 3 - SPP MDWG Action Items 20110802.xls)

Adjourn Meeting

Mo Awad motioned to adjourn the meeting, Scott Schichtl seconded the motion.
With no further business to discuss, the MDWG adjourned at 3:11 p.m.

Respectfully submitted,
Kelsey Allen
SPP Staff



SPP Model Improvement White Paper

Prepared by: Model Improvement Task Force

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Version History

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Approved by Model Development Working Group:
Approved by Transmission Working Group:
Section I.A. Updated by the MITF:

October 4, 2010
October 18, 2010
September, 2011

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History and Background

The Model Improvement Task Force (MITF) was formed by the Transmission Working Group (TWG) to address increasing concern regarding the modeling process and the models produced by SPP. The MITF began work in February of 2010, comprised of members from the TWG and the Model Development Working Group (MDWG).

Purpose and Objective

The MITF was instructed to identify areas for process improvement within modeling. This group aimed efforts at adjusting and expanding the current set of practices associated with the MDWG in order to allow that group to develop a common base data set that will expand stakeholder input and instill efficiency and accuracy into each of the model sets it supports.

This document addresses issues put forth by SPP staff and members of the MITF.

1. Modeling Data Requirements

The following topics are addressed to highlight, adjust and expand the current MDWG data requirements in order to increase granularity and consistency of the modeling data being used for the different SPP model sets.

A. *Uniform Generation Modeling*

Issue: No uniform requirements exist to model generation.

- ✓ Seasonal maximum and minimum capabilities and forecasted capabilities are often not accounted for.
- ✓ Some members model station service or auxiliary load and others do not.
- ✓ Municipal Generation listed in EIA reports is often netted with load.

Solution:

- ✓ Any distributive or otherwise generation registered with the SPP market shall be represented appropriately in the base model set such that generation is not netted with customer load.
- ✓ Capability of units as listed in data reporting vehicles, such as EIA reports or SPP NITS applications, should be reflected in the base model set.
- ✓ Generator P_{MAX} should be modeled as a gross value with auxiliary load modeled explicitly for machines greater than 20 MVA or plants with an aggregate capacity greater than 20 MVA. Otherwise, auxiliary load should be netted with generator gross capability.
 - Location of generator auxiliary load should be modeled accurately or approximated by one of the modeling methods described in Appendix C.
 - Option 2 of Appendix C is the generic preferred method for combined cycle plants.
 - Option 3 of Appendix C is the generic preferred method for other fuel types.

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- o Complex power load requirements should be modeled as maximum, regardless of seasonal generator output. This provides for a more conservative analysis and allows for special application in the event generator capability needs to be netted with auxiliary load.
- o For generator auxiliary load not modeled on the generator bus, reports shall be provided detailing the bus number and ID for auxiliary load associated with each generator or plant in order for auxiliary load to be netted with generator capability in special applications.

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- ✓ Ownership assignments shall be modeled with each machine.

Benefit: More effort spent to accurately model generator data will help to improve efficiency and accuracy of study processes and results.

B. Uniform Load Modeling

Issue: The modeling world can vary from the real world in some respects. Often, methods used by members to model special loads (location or owner issues) skew the area interchange numbers. Some of the examples are:

- ✓ Pseudo-Tie Modeling
- ✓ Varying methods of assigning one's Load in another Area

Solution:

- ✓ Zero-impedance tie lines shall not be used to connect a load bus.
 - o Load shall be represented as it physically exists on the transmission system as accurately as the base model set will allow.
- ✓ Load shall be modeled on the metering bus (as allowed by the base model set) and shall be identified by the assignment of ownership, load area, or both.
 - o See Appendix A: Methods 1 and 2 will be used to model load for those members who have a modeling area and serve load which physically exists in another modeling area.

Benefit: This improvement will enhance model granularity and allow SPP Staff to accurately validate the area interchange when constructing the models.

C. Stability Load Modeling

Issue: More representative load modeling needs to be utilized for dynamic studies. 100% constant current data, which may be worst case, is unrealistic.

Solution: Each data reporting member may provide more detailed dynamic load data for each dynamic model supported by the MDWG. If this data is not provided, staff should assume data based on recognized national standards.

Benefit: This will provide consistency and help prevent unrealistic dynamic studies.

D. Explicit Modeling of Reactive Control Devices

Issue: Net var modeling is sometimes used in power flow cases instead of showing the discrete capacitor or reactor banks that are available for switching.

Solution:

- ✓ All capacitor banks shall be modeled as switched shunts as specified in Section 5.10 of the MDWG Power Flow Manual.
- ✓ Reactive devices shall be modeled to show individual blocks and steps available for switching.

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- ✓ The MDWG should provide modeling assistance to SPP members and the Multi-Regional Modeling Working Group on voltage bandwidth for switched shunts.

Benefit: This improvement will provide additional guidance of what can be done in contingencies to remedy voltage problems.

E. Identification of Generation Types

Issue: Proper identification of generation types, especially with respect to wind, does not currently exist in the base model set. Some study processes currently mix in non-firm generation that should not be dispatched.

Solution:

- ✓ The MDWG should discuss the implementation of uniform generator identification as done with load.
- ✓ Develop a set of generator IDs for the purpose of identifying different generation types such as:
 - Long-term firm
 - EIS market (non-firm)
 - Wind QF
 - Customer owned (behind the meter)

Benefit: Better rules for identifying generation “buckets” will aid those using models developed by SPP and the MDWG in discerning what generation is dispatchable.

2. Detailed Reporting and Data Synching

The following topics are addressed to expand the current practices of the MDWG and SPP staff in order to reconcile data sources within SPP and help bridge the gaps between models developed by the MDWG and those developed by SPP staff for the current STEP processes.

A. Joint-Owned Unit Coordination and Reports

Issue: The information staff receives for the dispatching of jointly owned units is simply a generation output value as modeled which makes it very difficult to determine which owners are using what amount of power.

Solution: Data reporting members shall provide reports detailing Inter-area and intra-area transactions that represent the modeling of the dispatched power from each jointly owned unit or plant.

Benefit: This improvement will remove any guesswork done by staff and improve efficiency in verifying usage rights.

B. Delivery Point Changes and Load Owner Reports

Issue: Additions, modifications, and abandonment of delivery points are not clearly documented.

- ✓ Each year staff has to correct intra-area transfers between Host TO and Load Serving Entities (Load Owners, Municipals, Coops, etc.).
- ✓ With the new tariff addition of Attachment AQ, “new” loads cannot be added to the model without first being studied.
- ✓ With the new tariff addition of Attachment AR the transfer of an existing load is studied.

Solution: In conjunction with implementation of the new SPP modeling assignments, which will create more granularity in defining load ownership, load reports should be provided on a per LSE basis. These reports would include, as necessary:

- ✓ Load values
- ✓ Generation required to serve load
- ✓ Transactions and any resulting changes to area interchange
- ✓ Losses incurred in serving load

SPP must work with each data reporting member to ensure that all LSE reports are provided.

Benefit: These detailed reports will help facilitate and instill accuracy into SPP processes.

- ✓ Transmission Service Studies
- ✓ Studies pursuant to Attachment AR
- ✓ Studies pursuant to Attachment AQ

C. MDWG Transaction Improvement

Issue: Currently, connectivity to both MDWG Models and OASIS Data is limited. This leads to a significant amount of time spent to validate, correct and expand the transactions in the MDWG Transaction Workbook by hand in order to create the STEP base scenario models. Non-firm transactions or exploratory and proposed transactions above reserved amounts are currently included in the MDWG models. In order to build the STEP base scenario models these transactions are removed; staff also adds transmission service that is not included in the MDWG models:

- ✓ DNR and PTP DC tie adjustments
- ✓ Inter-area DNR at reserved amount
- ✓ Intra-area DNR not in TO or TDU dispatch order
- ✓ Intermittent wind generation at reserved amount
- ✓ PTP (inter-regional, intra-regional, intra-area, designated resource) at reserved amount.

Netting and combining transactions practices:

- ✓ Transactions are netted from A to B with B to A transactions making it difficult to correlate with OASIS reservation amounts
- ✓ Transactions summed together making it difficult to correlate with OASIS reservation amounts

Solution: Staff would like to work with members to bridge the gap in the development of models suitable for NERC Compliance versus studies governed by SPP Tariff requirements in relation to transaction schedules and OASIS reservations.

- ✓ The MDWG transaction workbook should be expanded to include data from SPP OASIS.
- ✓ Transactions should be more comprehensive with all inter-area and intra-area reservations accounted for thereby allowing the members to make their own forecasts about usage of these capacity and roll-over rights.
- ✓ Eliminate the practice of netting and summing transactions.
 - Transactions should only be summed if they are from the same resource/source and load owner/sink.

Benefit: The amount of hours spent by engineers to develop transactions correlation can be reduced and thereby reducing STEP base model development time, making the process more efficient.

3. Modeling Methods

The following topics are addressed to highlight and better define modeling methods that will help create more uniformity across the SPP footprint.

A. *Forecasting of Rollover Rights*

Issue: Currently, the MDWG manual encourages planners to model roll-over rights for transmission service. However, this assumption can result in the identification of reliability issues where none would have been identified otherwise.

Solution:

- ✓ In developing transaction schedules, each data reporting member should continue to project the use of long-term firm transmission roll-over rights in the base model set.
- ✓ SPP will continue to address boundary conditions associated with modeling any unused roll-over rights in the scenario models, as required by Section III.1.d. of Attachment O to the SPP Tariff.

Benefit: This improvement will lead to more accurate and realistic modeling.

B. *Modeling New Generation and Transmission Projects*

Issue: No common practice currently exists for including new generation and transmission projects in the MDWG model set. Transmission Owners are allowed to add any new transmission and generation projects to meet load requirements and NERC reliability standards.

Solution:

- ✓ STEP Base Models (Used by SPP as the base for ITP Reliability, Transmission Service, and Generation Interconnection studies):
 - New Generation
 - New generation will only be modeled if it has a signed Interconnection Agreement and not on suspension.
 - New generation modeled will only be dispatched if it has an executed transmission service agreement.
 - Exceptions to the above requirements will be based on the TWG approved “Rules and Exceptions for Generation Deficiencies”.
 - This rule set will aid in reducing the reliance on heavily weighted transmission solutions until the SPP ITP can give more guidance on resource planning.
 - New Transmission will only be modeled if:
 - There is an existing Notification to Construct issued by SPP which has been accepted by the Transmission Owner.
 - It has been budgeted and approved by the Transmission Owner with firm commitment to build.
- ✓ MDWG Base Models (Used by SPP for NERC Compliance studies)
 - In addition to generation and transmission meeting the STEP base model requirements, projects may be modeled as necessary to meet load requirements and/or NERC reliability standards.
- ✓ The MDWG manual should be updated to reflect the following for generation deficiencies:
 - Inclusion of proposed generation to meet load requirements within the LSE

- Inclusion of existing generation and proposed transactions based on the method described in Appendix B.

Benefit: This set of rules will provide guidance in modeling new projects in order to create more consistent modeling practices across the SPP footprint.

C. Review, Expansion, and Implications of MOD Project Types

Issue: The current MOD project type/status matrix contains errors and is incomplete.

Solution: The MDWG should review and adjust the current MOD project matrix to account for issues addressed in this white paper and Tariff changes made to implement the ITP.

Benefit: This will aid members and staff alike in classifying projects correctly to feed into study processes and project tracking.

D. Modeling Projects in MOD before the RTO Need Date

Issue: It has been noted that often a member will submit a project in MOD with an effective date before the RTO Determined Need Date which can result in masking inherent reliability issues or allowing SPP to oversell the transmission system.

Solution: Any transmission project that has been issued an NTC by SPP shall not be modeled earlier than the later of the RTO Determined Need Date or the Transmission Owner Projected In-Service Date unless energized.

Benefit: This improvement would eliminate inherent ATC provided by projects modeled with no commitment to build. It would also allow the ITP reliability and transmission service analyses to accurately complete the following:

- ✓ Determine the need for Reliability Projects.
- ✓ Reassess the need for Reliability Projects without a NTC or with a NTC under review.
- ✓ Rescind the need for Reliability Projects with a NTC.
- ✓ Minimize the number of reliability analysis studies needed to determine whether a modeled TO Planned Project has reliability need.
- ✓ Protect SPP and its members against selling transmission service on ATC that may not exist due the delay of a transmission project.

4. Data Errors and Coordination

The following topics are addressed to expand the current practices of the MDWG and SPP staff in order to better address modeling errors and increase effectiveness of coordination efforts with neighboring regions and members.

A. Improve Identification of Major Model Changes and Errors

Issue: Tools in our model building processes should be implemented both external and internal to SPP modeling that flag major data changes and errors.

Solution:

- ✓ The Docucheck program now being used by SPP will aid in correcting model errors.
 - This python script developed for the MMWG produces reports of errors and warnings for review by each transmission owner.
 - SPP and the MDWG should work to adjust and expand the data errors flagged in these reports.

- ✓ MOD Anomalies and MOD Detailed Case Build posted with each model set.
- ✓ SPP will develop tools and processes to compare the models to other data sources available to SPP, which will aid in data verification.
- ✓ SPP should provide a summary of changes between each final build of any one model series year.

Benefit: More effort in implementing secondary checks to validate major changes to the models will result in increased reliability of study results, avoiding project proposals and other issues that stem from simple modeling errors.

B. Improve Regional Data Coordination and Checks

Issue: Due to the selection of seasons for a model series and the differing cycles of model building, SPP models inherently contain missing ties lines and outdated topology and transactional data for neighboring systems. The SPP MDWG attaches the “best match” MMWG model as the external case and this can create confusion if not coordinated between the regions.

Solution:

- ✓ SPP shall coordinate with external regions to ensure understanding of seams throughout the model series.
- ✓ The MDWG should consider all internal and external processes it supports when selecting the seasons for an annual a model series.
 - A one-to-one match for external regions is not always available and may require data modification.
 - SPP shall swap data with 1st tier companies consistent with the obligations of seams agreements.
- ✓ All members within SPP and all regions shall use the MMWG Master Tie File for all updates to NERC regional ties.

Benefit: SPP and first tier data will be more accurate and produce more realistic representation of powerflow across seams.

C. Coordination Between G.I. and Modeling

Issue: New generation (especially wind) with signed interconnection agreements interconnecting to the SPP footprint is often not coordinated directly into the MDWG Models by SPP Staff or SPP members.

- ✓ In the case of wind generation, accurate reactive capabilities are often not modeled if the generation is modeled at all.
- ✓ Proprietary stability models are being provided to the SPP for the purpose of the GI process and cannot be added to the MDWG models due to confidentiality reasons.
- ✓ Lack of good generic wind models in PSS/E Rev 30 is also an issue. Often wind generation plants are modeled with generic CIMTR1 or CIMTR3 models in lieu of more detailed generic wind models which are available in Rev 32.

Solution:

- ✓ Once a generator meets requirements to be included in the base model set, SPP Staff shall verify the data used in the SPP Generation Interconnection study and ensure that accurate data is submitted to MOD by Staff or the responsible SPP data reporting member.
- ✓ SPP shall step up enforcement of current data requirements of members and customers.
- ✓ SPP shall require that non-SPP member GI customers supply non-proprietary modeling data that can be added to the MDWG models.*

- If this data cannot be supplied in order to meet NERC MOD standards and SPP Tariff requirements then the GI request should be rejected.

**Staff Note: No SPP Tariff requirements currently exist that allow SPP reject GI requests based on failure to meet this criteria.*

Benefit: This will ensure all planned or operational generators with a signed interconnection agreement are included in the MDWG models, thereby improve accuracy of SPP models and provide for much better inputs into SPP study processes.

D. Model Sharing Instructions

Issue: SPP transmission owning members are not allowed access to certain models sets because of sensitive data. This lack of access puts a burden on transmission owners when developing solutions for responding to study-related data requests.

Solution: The SPP non-disclosure agreement (NDA) shall be sufficient to allow full access and use of the various models developed in support of administration of the tariff to be used by signatories to validate study results.

Benefit: FERC jurisdictional or Public Power Entity SPP transmission owning members who have completed the necessary requirements will have model access to better replicate SPP study results and provide more accurate solutions for system violations.

E. Auxiliary Files Coordination and Organization

Issue: Currently, staff members that are involved in the STEP model building process are responsible for requesting updates to the auxiliary files used for analysis and reporting (monitor, subsystem, contingency, invalid contingency and common name). These requests can potentially come from a number of different SPP employees from different engineering groups.

Solution: In keeping with the effort to create a common data set for all study tracks, the MDWG shall take over coordination and organization of auxiliary files used for study analysis.

- ✓ A single contingency file should be used for a full planning horizon.
- ✓ The MDWG needs to develop a process to identify and track contingencies that change due to topology changes through a model series.

Benefit: Stakeholders will have more control over the schedule of updating and maintaining these files producing more accurate results in all study processes.

F. Integrity of Forecasted Load Data

Issue: SPP staff has noted that discrepancies exist between load forecasts as they appear in the models produced by the MDWG and load forecasts submitted via other processes. No uniformity exists across the SPP footprint for developing load forecasts; each LSE or reporting BA has their own process.

Solution: The MITF believes that these concerns expressed by SPP staff are a non-issue.

- ✓ There is no one-for-one match of the different sources used to report load.
- ✓ EIA-411 is a separate data vehicle and should not be used for model verification.
 - Load and losses are not separated in the reports as they are in the powerflow models.
 - EIA-411 doesn't have the granularity of load forecasts as represented in the models.
- ✓ Some companies have multiple forecasts per year that are fed into different processes at different times.

- ✓ SPP should assess the need and consider the elimination of October updates to NITS Applications as required by the Tariff. These are redundant data updates that can be found in the powerflow models developed by the MDWG.
- ✓ MITF does not recommend pursuing a common load forecasting tool.
 - Each company has developed a process that has been vetted by their own staff and necessary State Commissions.

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5. Uniform Generation Dispatch

The following topics address the gap in process related to generation dispatch and resulting interchange between the current MDWG practices and those employed by SPP staff to develop the different STEP model sets.

A. Generation Dispatch Coordination and Expansion

Issue: Generation dispatch is currently being requested by multiple groups within SPP Engineering for different model sets. For the MDWG and STEP models, these requests for generation profiles and generation dispatch orders are generally provided by the same member staff. Once the MDWG models are developed, SPP Planning and Transmission Service staff uses an automated process to redispatch generation when performing reliability analysis and studying new requests for transmission service.

Solution: In addition to the generation profiles developed for the MDWG models used for compliance, MDWG modeling contacts will aid SPP staff in developing generation dispatch orders during the annual model update.

- ✓ The dispatch orders used for these purposes need to include both intra-area and inter-area generation.
- ✓ Dispatch orders would be per LSE where remote generation would be dispatched according to the transaction workbook net scheduled interchange (NSI) requirements.
- ✓ Since the majority of joint owned resources and purchases are base load generation per LSE, joint ownership and purchases would be included in the host TO dispatch order with the Pmax being equal to the sum of the allocated amounts if the host TO has a Joint Ownership or purchase of the same resource.
 - Exceptions to this would initially be manually dispatched when building models due to interchange and usage accounting requirements.
- ✓ The automated process incorporates:
 - Must-run unit commitments
 - Unit Outages
 - Transmission operating directives
- ✓ Non-dispatchable generation (wind, hydro, ect...) profiles will not be changed by the automated dispatch and would still need to be developed by members.

Benefit: In developing both sets concurrently, the base models for all study tracks will have a more consistent generation dispatch. Once the automated process becomes more refined, consideration should be given to implementing it to develop the MDWG models. This would eliminate SPP staff's work to adjust MDWG models for ITP Reliability, Transmission Service, and Generation Interconnection studies as well as reduce the burden on the members to create separate MDWG dispatches by hand.

B. LSEs That Cannot Meet Their Load

Issue: Clear guidelines are not available to account for the issue of how to solve cases where a LSE doesn't have enough designated network resources to serve their load in a far-term case. Currently, members add fictitious generation or transactions to address this deficit. To build the STEP base models, these generators are removed; when there is a shortfall between Interchange, generation and load, the process described in Appendix B is used.

Solution: The shortfall process described in the document referenced above is implemented through the automated dispatch process described in the Generation Dispatch Coordination and Expansion issue and would be fine-tuned to prepare for future implementation at the MDWG level. The MDWG should include this detailed process as an option to modeling proposed generation in the MDWG model set used for compliance.

Benefit: Any LSE that is not able to meet their load in a far term case will have specific guidelines to solving their case in a manner that is uniform across the SPP footprint. Additionally, this will improve the documentation of SPP Processes.

C. Determining Generation and NSI Profiles

Issue: Generation and Net Scheduled Interchange (NSI) data rely heavily on our transmission owners to develop snapshots. Additional profiles are needed for other model sets which would require much more work from the transmission owners to develop these following the current MDWG process.

Solution: SPP processes are available to aid in the development of the generation and NSI profiles for the Transmission owners to review. Profiles are already being developed by staff for other STEP model sets, yet these processes need to be expanded.

Benefit: Applying these processes at the MDWG level will save both staff and members time in creating and verifying generation and NSI profiles.

Appendix A

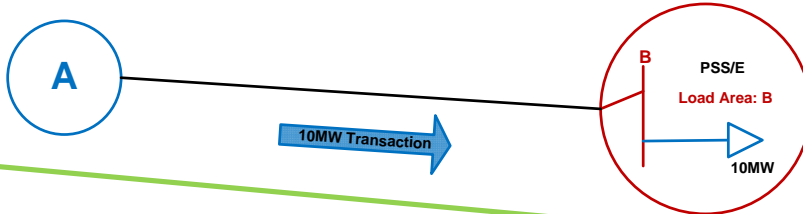
External Load Modeling Methods

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Representation of a 10MW Power Transfer from Area A to Area B

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#3



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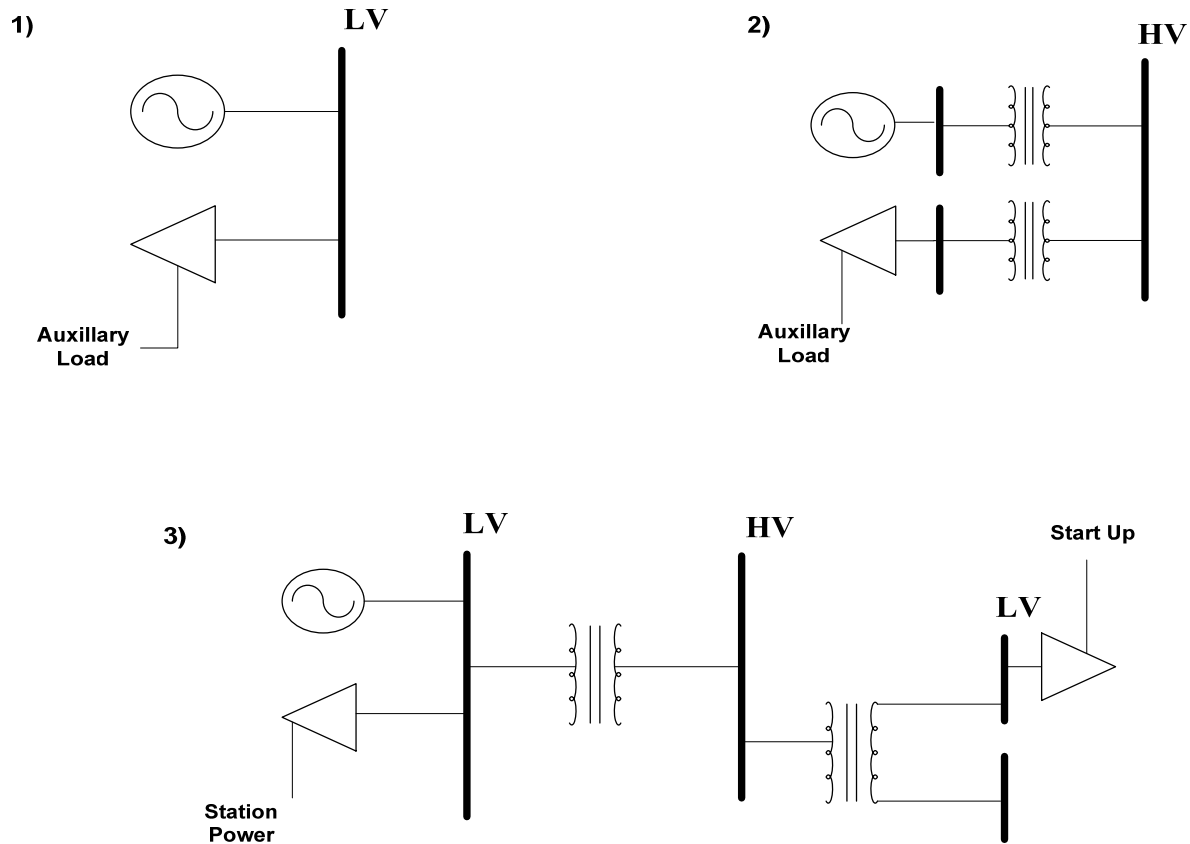
LSEs That Cannot Meet Their Load

1. MDWG Compliance Models - The dispatch orders will include a NERC Standard Compliance flag to allow for new generation and existing generation capacity changes that do not meet the requirements for inclusion in the STEP and ATSS to be dispatched in merit order. If there is a shortfall between generation and load then the detailed shortfall process for the STEP and ATSS will be utilized.
2. ITP Near-Term Reliability Assessment and ATSS Models - When there is a shortfall between the amount of designated network resources and designated network load for a LSE or transmission customer, the following sequential steps are outlined below.
 - i. Step One: Exhaust the customer's designated network resources until the network resources are sufficient to meet network load.
 - a. Dispatch generation by using dispatch orders provided by the transmission planning personnel of the SPP data reporting members and by representatives of the transmission service customers.
 - b. Add generation from behind the meter generating units. This generation consists of dispatchable behind the meter generation that may not already included in the SPP Model Development Working Group Base Cases.
 - c. Non-dispatchable wind generation or other generation with operating restrictions or forecasted projections shall not be used.
 - ii. Step Two: If the customer's designated load cannot be served after Step One, then exhaust the customer's other operational generation that is not designated.
 - a. Dispatch generation by using dispatch orders provided by the transmission planning personnel of the SPP data reporting members and by representatives of the transmission service customers.
 - b. Add generation from behind the meter generating units. This generation consists of behind the meter generation that may not already included in the SPP Model Development Working Group Base Cases.
 - c. Non-dispatchable wind generation or other generation with operating restrictions or forecasted projections shall not be used.

- iii. Step Three: If the customer's designated load cannot be served after Step One and Step Two, Exhaust the Host Transmission Owner's existing generation. These intra-area transfers will be documented in the LSE reports.
 - a. Dispatch generation by using dispatch orders provided by the transmission planning personnel of the SPP data reporting members and by representatives of the transmission service customers.
 - b. Non-dispatchable wind generation or other generation with operating restrictions or forecasted projections shall not be used.
 - iv. Step Four: If the customer's network load cannot be served after the above steps, exhaust Independent Power Producer's ("IPP") existing generation in the Host Transmission Owner's modeling area.
 - a. Exhaust IPP generation on a pro rata, as available basis accounting for firm transmission commitments. In other words, Use power from each IPP to meet the customer's designated load. The amount of power from each IPP will be determined using the total amounts available based on the IPP's historical generating levels minus the amount of power to model existing transmission service from the IPP.
 - b. Non-dispatchable wind generation or other generation with operating restrictions or forecasted projections shall not be used.
 - v. Step Five: Finally, if a customer's network load cannot be served after applying the above steps, exhaust existing primary modeling area generation with includes IPP's existing generation and existing primary modeling area generation.
 - a. Similar to Step Four, exhaust this generation on a pro rata, as available basis for firm transmission commitments. The amount of power from each IPP and from each primary modeling area generation will be determined using the total amounts available based on the maximum generating levels minus the amount of power to model existing transmission service from the IPP and primary modeling area generation.
 - b. Non-dispatchable wind generation or other generation with operating restrictions or forecasted projections shall not be used.
3. ITP 10 Year and 20 Year - The studies will use ESWG approved resource plans and futures for the SPP region.

Appendix C

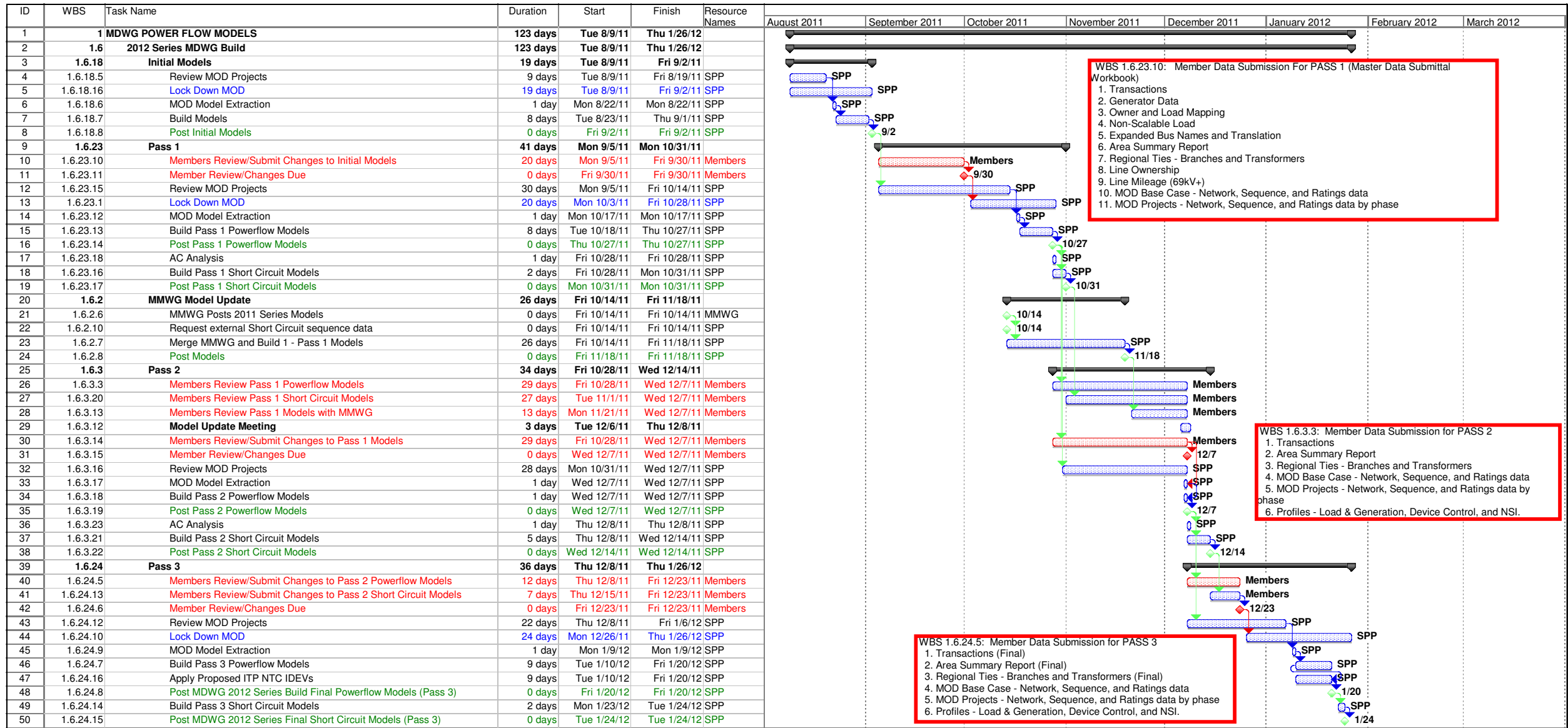
Generator Auxiliary Load Modeling



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Project: MDWG Modeling Schedule 20
Date: Wed 11/2/11

Task Milestone Rolled Up Task Rolled Up Progress External Tasks Group By Summary

Progress Summary Rolled Up Milestone Split Project Summary Deadline

	Action Item	Responsible Parties	Date Originated	Progress	Notes
2	SPP Staff will add the NERC TPL (Transmission Planning) and MOD (Modeling, Data, and Analysis) Standards that are applicable to each required item in the SPP Compliance Template Form	Anthony Cook	8/7/2009	In Progress	Staff still needs to update the template with Dynamics.
14	Staff will update the Web Based Power Flow Model Development Procedure Manual after MOD version 7 has been released and installed on the production server	SPP Staff	11/17/2009	In Progress	
42	Review the new MOD standards approved by FERC and how they will apply to the MDWG and SPP planning modeling	SPP Staff	3/1/2010	In Progress	
50	Reformat the MDWG procedure manual and add hyperlinks for referenced documents	Anthony Cook	8/6/2010	In Progress	
56	Discuss with Entergy about SPP members modeling load with zero impedance lines	SPP Staff	8/6/2010	In Progress	Anthony Cook to follow up
57	Determine the standards for stability load data	Scott Jordan	8/6/2010	In Progress	
67	Staff to add ATP discussion to the December meeting agenda	SPP Staff	8/2/2011	In Progress	
69	Staff to provide modeling contacts with documentation on the congestion hedging process	SPP Staff	8/2/2011	In Progress	
70	Staff to determine clarification of TPL-004 item D14 of Table 1	SPP Staff	8/2/2011	In Progress	
71	Staff to review previous meeting minutes for resolution of any language discrepancies in the SPP Tariff about Uniform Generation Modeling	Kelsey Allen	11/8/2011	In Progress	
72	Staff to provide background information on reasons for choosing 20 MVA for machines and aggregate plant capacity for Uniform Generation Modeling	Staff	11/8/2011	In Progress	
73	Staff to send out formal request for 2033 load forecast	Staff	11/8/2011	In Progress	