Southwest Power Pool

TRANSMISSION WORKING GROUP MEETING

March 16, 2016

SPP Corporate Campus – Little Rock, AR

• Summary of Action Items •

1. Approved RR 156
2. Approved RR 141
3. Approved a motion to *not approve* RR 140
4. Approved the WIS NTCs to be accelerated

Southwest Power Pool

TRANSMISSION WORKING GROUP MEETING

March 16, 2016

SPP Corporate Campus – Little Rock, AR

• M I N U T E S •

Agenda Item 1 – Administrative Items

Call to Order
TWG Chair Travis Hyde called the meeting to order at 8:30 am. The following members were in attendance (Attachment 1a – Attendance) or represented by proxy:

Travis Hyde (Chair), Oklahoma Gas & Electric
Scott Benson, Lincoln Electric System
John Boshears, City Utilities of Springfield
Richard Dahl, Missouri River Energy Services
John Fulton, Southwestern Public Service Company
Joe Fultz, Grand River Dam Authority
Jeremy Harris, Westar Energy, Inc., proxy for Nathan McNeil, Westar Energy, Inc.
Jody Holland, South Central MCN, proxy for Noman Williams, South Central MCN
Dan Lenihan, Omaha Public Power District
Randy Lindstrom, Nebraska Public Power District
Jim McAvoy, Oklahoma Municipal Power Authority
Matt McGee, American Electric Power
Nate Morris, Empire District Electric
Michael Mueller, AECC
Gayle Nansel, Western Area Power Administration
Chris Pink, Tri-State Generation and Transmission Association, Inc.
Rey Rodriguez, Western Farmers' Electric Cooperative, proxy for Kalun Kelley, Western Farmers' Electric Cooperative
Jason Shook, GDS Associates representing ETEC
Matthew Stoltz, Basin Electric Power Cooperative
Michael Wegner, ITC Great Plains, proxy for Alan Myers, ITC Great Plains
Harold Wyble, Kansas City Power & Light

Kirk informed Travis quorum had been achieved.

Proxies
Travis informed the group 4 proxies (Attachment 1b – Proxies) had been provided. Jeremy Harris received Nathan McNeil's proxy, Jody Holland received Noman Williams' proxy, Rey Rodriguez received Kalun Kelley's proxy, and Michael Wegner received Alan Myer's proxy

Agenda Item 2 – Revision Requests

RR 156
Tony Green, SPP staff, reviewed Revision Request 156 (Attachment 2a – RR 156) which outlines changes to Business Practice 7650 and requested TWG approve of the revision request. The TWG asked for clarification on the definition of a station. Staff informed members that a hard tap is not considered a station in the business practice although it is represented as a bus in the powerflow models. Marguerite Wagner informed the TWG of discussion on this Revision Request at other working groups. She noted that that ITC Great Plains is in favor of the language changes, but is opposing the

implementation of this revision immediately and requests the changes be implemented in the next ITP cycle.

> **Motion: Jody Holland made a motion to approve the RR 156. Jason Shook seconded the motion. The motion passed with one vote in opposition from Michael Wegner, ITC Great Plains.**

After the meeting Michael Wegner provided the following reason for his vote:

> *As stated during the meeting, ITC's "no" vote comes from the position that ITC does not believe it is fair to change the process in the middle of an ITP cycle. We agree with the changes, we disagree with the timing of the implementation. Because this appears to be headed in the direction of implementation during the current ITP cycle and possibly even for the upcoming 2017 ITP10 DPP window, we are opposed.*

RR 141

Neil Robertson, SPP staff, reviewed Revision Request 141 (Attachment 2b – RR141) with the TWG. Neil informed the group that the ORWG accepted the TWG changes approved previously by the TWG and made additional changes. Neil focused on the additional changes made by the ORWG and asked the TWG to approve the revision in its current state.

> **Motion: Jason Shook made a motion to approve RR 141, which was seconded by Nate Morris. The motion passed unanimously.**

RR 140

Derek Hawkins, brought RR 140 (Attachment 2c – RR140) back to the TWG for approval. The TWG did not feel like the 30 minute rating should be a part of the SPP Planning Criteria especially since the rating was not going to be used in a planning model or study. Members preferred the rating language be placed in the SPP Operating Criteria. Members also mentioned SPP Planning Criteria 7 needed to be reviewed and asked Kirk to schedule specific time for the TWG to review SPP Planning Criteria Section 7.

> **Action Item: Staff to set up specific time for TWG to review Section 7 of the SPP Planning Criteria.**

> **Motion: Jason Shook made a motion that the TWG does not approve RR 140 because they believe language for a short-term emergency rating belongs in the SPP Operating Criteria instead of the Planning Criteria. Jody Holland seconded the motion. The motion passed with two abstentions, one from Randy Lindstrom and one from Gayle Nansel.**

Agenda Item 3 – TPL in the ITP

Jason Davis and Jason Terhune, SPP staff, discussed additional proposals (Attachment 3 – TPL in the 2017 ITP10) for evaluating the additional TPL-001-4 contingencies in the 2017 ITP10. The proposals included the respective schedule impacts, and added the possibility of re-doing the Constraint Assessment incorporate constraints from the TPL contingencies. The group's main discussion point was on the ability of staff to issue NTCs for projects needed to meet TPL compliance. Jason Davis informed the group that staff was still researching whether NTCs could be issued for projects needed for TPL compliance out of an ITP study. Staff asked for additional feedback and reminded the members that the TWG needed to provide a recommendation to the MOPC for the April meeting. The only opportunity left would be the next Net Conference on March 29th.

Agenda Item 4 – Wind Integration Study NTC Acceleration

Jason Tanner, SPP staff, presented to the TWG on the acceleration of NTCs (Attachment 4 – Wind Integration Study NTC Acceleration) from the Wind Integration Study. The TWG did not have any concerns with the methodology of the benefit calculations, but some members did express concern that they did not receive any time to review the scope document.

> **Motion: Jody Holland made a motion to accept the staff recommendation. Scott Benson seconded the motion. The motion passed with 1 vote against from Dan Lenihan and two abstentions from Jason Shook and Nate Morris.**

After the meeting Dan Lenihan provided the following reason for his 'No' vote:

- *The TWG was never offered any chance to review a study scope for the WIS so I find it very difficult to comment on a study recommendation where TWG stakeholder involvement was not sought at the beginning but at the end*
- *There was no indication if firm transmission service has been requested or approved for the wind generators that were causing the need to accelerate the NTC projects*
- *The TWG presentation didn't provide sufficient detail to fully understand the how the benefits were calculated and which zones were receiving the benefits*

After the meeting Jason Shook provided the following reason for his abstention:

> *The base case models used in the study included historical transmission outages and this is not done in other SPP planning studies. The study recommendation means that there is a group of power plants that will receive a benefit from accelerated transmission projects. The study recommendation raises a question of fairness because the acceleration costs will be paid in part by SPP members whose generators were not given an opportunity to be studied in a comparable manner.*

After the meeting Nate Morris provided the following reason for his abstention:

> *EDE abstained due to the lack of information available before the matter was brought before the TWG. EDE did not feel that enough time was allowed for adequate vetting nor enough discussion had on the matter during the scope development and would prefer the process had been more transparent regarding the study scoping process. To consider supporting the effort, EDE would require more information regarding the foundation and assumptions driving the proposed acceleration. EDE has seen fluctuation in other special case studies in which NTC's were accelerated.*

Agenda Item 5 – RCAR II Constraint Assessment

Josh Ross, SPP staff, gave an update to the TWG on the RCAR II Constraint Assessment. He informed the TWG that staff was working to complete it and would be posting for review and approval within the next few weeks.

Additionally Kirk informed the members that the cutoff for feedback on the 2016 ITPNT scope was by close of business since the deadline for cost estimates had passed.

Respectfully Submitted,

Kirk Hall
Secretary

Name	Email
Kelsey Allen	kallen@spp.org
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Southwest Power Pool, Inc.

TRANSMISSION WORKING GROUP MEETING

March 16, 2016

Net Conference – Little Rock, AR

• A G E N D A •

8:30 am – 11:30 pm

1. Administrative Items .....Travis Hyde (5 min.)
    a. Call to Order
    b. Proxies

2. Revision Requests..... All (1 hr.)
    a. RR 156 – Tony Green (Action Item)
    b. RR 141 – Neil Robertson (Action Item)
    c. RR 140 – Derek Hawkins (Action Item)

3. TPL Analysis in the ITP ..... Staff (1 hr.)

4. Wind Integration Study NTC Acceleration.....Jason Tanner (15 min.)

5. RCAR II Constraint Assessment .....Josh Ross (10 min.)

6. NERC Activities Update ..... Kirk Hall (5 min.)

Kirk Hall

From: Kelley, Kalun <k_kelley@wfec.com>
Sent: Tuesday, March 15, 2016 11:25 PM
To: Audrey White
Cc: Kirk Hall; Rodriguez, Reynaldo
Subject: Re: TWG 3/16/16 Agenda & Background Materials posted

Audrey,

WFEC's board meeting is tomorrow morning. I will need to give my proxy to Rey Rodriguez tomorrow.

Thank you,

Kalun

On Mar 9, 2016, at 9:02 PM, Audrey White <awhite@spp.org> wrote:

> TWG 3/16/16 Agenda & Background Materials have been posted to the SPP website for your review at the link shown below:
>
> TWG Meeting Materials
>
> TWG 3/16/16 Online Registration
>
> *Audrey White*
> *Administrative Assistant*
> *501-688-2531*
> *awhite@spp.org*
> *<image001.png>*
> www.spp.org
>
> ---
> You are currently subscribed to the list titled twg as: k_kelley@wfec.com
> To unsubscribe send a blank email to questions@spp.org with Unsubscribe in the Subject line and include your name, email address, phone number and the exploder list(s) you wish to be removed from in the Body of the email.
>
>

Kirk Hall

From: Myers, Alan K. <amyers@Itctransco.com>
Sent: Monday, March 07, 2016 9:55 AM
To: Kirk Hall
Cc: Wegner, Michael
Subject: FW: Transmission Working Group Net Conference 3/16/16 Updated Times

Kirk,

Michael Wegner will have my proxy for this meeting.

Thanks,
Alan

From: bounce-51172-118444@spplist.spp.org [mailto:bounce-51172-118444@spplist.spp.org] **On Behalf Of** Audrey White
Sent: Friday, March 04, 2016 3:23 PM
To: Transmission Working Group
Subject: Transmission Working Group Net Conference 3/16/16 Updated Times

Transmission Working Group Net Conference 3/16/16 updated times. Please change your personal calendars to the new start time.

TIME: March 16, 2016 **8:30AM - 11:30AM**

TWG 3/16/16 Online Registration

Audrey White
Administrative Assistant
501-688-2531
awhite@spp.org

www.spp.org

Kirk Hall

From: Nathan B McNeil <Nathan.McNeil@westarenergy.com>
Sent: Friday, March 11, 2016 7:09 AM
To: Kirk Hall; Hyde, Travis
Cc: Harris, Jerem
Subject: TWG 3/16/16 Proxy

Kirk and Travis,

I will be unavailable for the TWG net conference on 3/16, and Jeremy Harris will have my proxy.

Please let me know if you have any questions.

Thanks,
Nathan

Nathan McNeil, PE
Westar Energy
Manager, System Planning
Nathan.McNeil@WestarEnergy.com
O (785) 575-1698 **C** (785) 342-2979

Kirk Hall

From: Noman Williams <Nwilliams@gridliance.com>
Sent: Monday, March 14, 2016 1:05 PM
To: Kirk Hall
Cc: Jody Holland
Subject: TWG Meeting - March 16th

Kirk, I will be engaged in another meeting during the TWG call on Wed March 16th and will provide my proxy to Jody Holland for any voting items

Thanks

Noman Williams
Senior Vice President Engineering & Operations, COO
South Central MCN, LLC
Midcontinent MCN, LLC
Phone: 816-492-2014
Cell: 785-259-5110
Nwilliams@gridliance.com

GRIDLIANCE

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Revision Request Recommendation Report

RR #: 156	Date: 2/12/2016
RR Title: Modification to Business Practice 7650 DPP clarification	
SUBMITTER INFORMATION	
Submitter Name: Tony Green	**Company:** SPP
Email: tgreen@spp.org	**Phone:** 501-688-1789
EXECUTIVE SUMMARY AND RECOMMENDATION FOR MOPC AND BOD ACTION	
OBJECTIVE OF REVISION	

Objectives of Revision Request:
This will clarify the steps taken in determining which Detailed Project Proposals (DPP) may be equivalent to transmission projects selected within a portfolio eligible for the Transmission Owner Selection Process.

The changes to the DPP Selection Criteria will further enhance SPP's ability to efficiently and accurately execute the DPP Process within the required timelines of the Integrate Transmission Planning (ITP) studies.

SPP STAFF ASSESSMENT

IMPACT

Will the revision result in system changes ☒ **No** ☐ **Yes**

Summarize changes:

Will the revision result in process changes? ☒ **No** ☐ **Yes**

Summarize changes:

Is an Impact Assessment required? ☒ **No** ☐ **Yes**

If no, explain:

Estimated Cost: $	**Estimated Duration:** months
Primary Working Group Score/Priority:	

SPP DOCUMENTS IMPACTED

☐ **Market Protocols**	**Protocol Section(s):**	**Protocol Version:**
☐ **Operating Criteria**	**Criteria Section(s):**	**Criteria Date:**
☐ **Planning Criteria**	**Criteria Section(s):**	**Criteria Date:**
☐ **Tariff**	**Tariff Section(s):**	
☒ **Business Practice**	**Business Practice Number:** 7650	

WORKING GROUP REVIEWS AND RECOMMENDATIONS List Primary and any Secondary/Impacted WG Recommendations as appropriate	
Primary Working Group: **BPWG**	**Date: 2/18/2016** **Action Taken: Approved** **Abstained:** **Opposed: ITC Great Plains**
Reasons for Opposition: ITC opposed the Motion to approve the RR, stating that while they supported the changes being made, they could not support the changing of the process once it had already begun, in effect, "changing the process mid-stream."	
Secondary Working Group: **CTPTF**	**Date: 2/12/2016** **Action Taken: Approved** **Abstained: None** **Opposed: One**
Reasons for Opposition: ITC opposed the Motion to approve the RR, stating that while they supported the changes being made, they could not support the changing of the process once it had already begun, in effect, "changing the process mid-stream."	
Secondary Working Group:	**Date:** **Action Taken:** **Abstained:** **Opposed:**
Reasons for Opposition:	
Secondary Working Group:	**Date:** **Action Taken:** **Abstained:** **Opposed:**
Reasons for Opposition:	
MOPC	**Date:** **Action Taken:** **Abstained:** **Opposed:**
Reasons for Opposition:	

BOD/Member Committee	**Date:** **Action Taken:** **Abstained:** **Opposed:**
Reasons for Opposition:	
COMMENTS	
Comment Author:	
Date Comments Submitted:	
Description of Comments:	
Status:	
PROPOSED REVISION(S) TO SPP DOCUMENTS	
Market Protocols	

Tariff (OATT)

SPP Operating Criteria

SPP Planning Criteria

SPP Business Practices

7650 Order 1000: Detailed Project Proposal

Business Practice:

The purpose of this Business Practice is to describe the process for submission and treatment of a Detailed Project Proposal ("DPP") during the Integrated Transmission Planning ("ITP") study process as outlined in Attachment O of the SPP Tariff. After the applicable ITP study scope has been approved, and the needs assessment has been performed, SPP staff shall notify stakeholders of the identified transmission needs and

provide a transmission planning response window of thirty (30) days during which any stakeholder may submit a DPP. The information supplied by the stakeholder in the DPP must be sufficient to allow SPP staff to evaluate the project described by the DPP pursuant to Section III.8.b of Attachment O of the Tariff.
If the project described in a DPP is selected and approved for construction as a Competitive Upgrade, the submitting stakeholder may be eligible to receive incentive points pursuant to the eligibility requirements described in Section III.2.f.iv of Attachment Y of the Tariff.

Notification of Open Window for DPP Submittal

SPP will provide notification via the SPP website and email exploder when transmission needs have been posted for a specific ITP study and post the 30-day response window when a stakeholder may submit a DPP. Requirements for the submission of a DPP are contained in Section III.8.b of Attachment O of the Tariff.

DPP Submittal

To propose a DPP, stakeholder(s), hereinafter referred to as "Submitter," shall submit the necessary information to SPP via the Request Management System (RMS). The necessary information must be submitted within the prescribed 30-day transmission planning response window in order to qualify as a DPP. The information required for a DPP submittal is included in the DPP Submittal Form that is found in Exhibit A. The DPP Submittal Form must be used when submitting the DPP to SPP staff.

DPP Receipt and Response

Upon receipt of the DPP submittal, SPP will verify that the DPP was received within the 30-day DPP transmission planning response window, based on the time and date stamp in the RMS of such submittal, and verify that the submittal is complete. If a DPP submittal is received outside of the 30-day transmission planning response window, SPP staff will notify the Submitter via email that its submittal does not qualify for incentive points.

Notification to Submitter of an Incomplete DPP

If SPP staff determines a DPP Submittal Form is incomplete, SPP staff will notify the Submitter via email. The notification will be sent to the Submitter no later than 10 business days after the close of the transmission planning response window.
The Submitter is permitted to remedy the deficiencies by the latest date of the following (cure period):

- The end of the transmission planning response window; or
- 10 business days after SPP issues the notification using the date stamp of the issued email.

If the missing information is not received within the required timeframe, or if the DPP is still incomplete at the end of the cure period, the proposed project will not qualify as a DPP and will not be eligible to receive incentive points if the project is ultimately approved for construction during that ITP. SPP will notify the Submitter that DPP submittal is disqualified from consideration for incentive points.

Notification to Submitter of Accepted or Disqualified DPP

SPP will notify the Submitter via email of the acceptance or the disqualification of its DPP. A stakeholder that submits a DPP Submittal Form that is equivalent to a DPP or a Transmission Provider identified project in a previous ITP assessment during the current three-year ITP planning cycle shall not be eligible for incentive points unless the stakeholder is the original Submitter. SPP retains the right to use the suggested project in its planning process even if the submitter of the project does not qualify for incentive points.

Cost Estimates for DPP Projects

It is not a requirement that a DPP include a transmission cost estimate. Cost estimates will be developed throughout the study process. The development of the cost estimate will be the responsibility of SPP. The cost estimate included at the time of project approval by the SPP Board of Directors will be at a +/-30% level of confidence.

DPP Selection

SPP staff will use the following criteria to determine when a project submitted via a DPP is ~~the~~ equivalent to~~same as~~ a transmission project in the recommended portfolio:

- The project submitted via a DPP must solve at least the same needs as the selected transmission project;
- ~~•~~
- ~~•~~The project submitted via a DPP must have the same ~~T~~transmission line voltage as the selected transmission project ~~(same)~~;
- The project submitted via a DPP must have the same or similar[99] ~~•T~~termination points including transformers as the selected transmission project~~(same or similar)[99]~~;
- ~~•~~The project submitted via a DPP must have an
- ~~•E~~equipment rating in MVA within +50% of lines and transformers as the selected transmission project ~~in MVA (within +50%)~~;
- ~~•~~The project submitted via a DPP must have an impedance within
- ~~•Impedance (within~~ +/-25% of the selected transmission project~~)~~; and
- The project submitted via a DPP ~~•Viability: D~~does not create additional reliability issues not already addressed ~~and solves the same needs as the selected transmission project~~.

Selection Notification

After the SPP Board of Directors approves an ITP portfolio of projects, SPP staff will notify each of the Submitters in writing whether or not it~~'~~s DPP was approved for construction by the SPP Board of Directors where the Transmission Owner will be selected utilizing the Transmission Owner Selection Process as described in Attachment Y of the Tariff. Concurrent with written notification to each of the Submitters, SPP Staff will post on the SPP website the names of the approved ITP Portfolio of projects that has associated DPPs pursuant to the Transmission Owner Selection Process as described in Attachment Y of the Tariff.

99 Similar termination points determined if they are located no more than 1 ~~bus Physical~~ station (sub-station, switching station, or other station as identified in the SPP Model) away ~~and~~ or within 15 linear miles from the~~a~~ Board approved project.

SPP Southwest Power Pool

Revision Request Recommendation Report

RR #: 141	**Date: 2/4/2016**
RR Title: SOL Methodology Revisions	

SUBMITTER INFORMATION

Submitter Name: Jason Smith	**Company:** SWPP
Email: jsmith@spp.org	**Phone:** 501-614-3293

EXECUTIVE SUMMARY AND RECOMMENDATION FOR MOPC AND BOD ACTION

OBJECTIVE OF REVISION

Objectives of Revision Request:

As part of a filed mitigation plan with SERC, SPP RC has agreed to add clarifying language to its RC SOL Methodology that clearly provides flexibility to use updated ratings for facilities, elements, and ultimately flowgates that reflect the current ambient conditions or more relevant system conditions. There has been concern in the past that allowing real-time use of a rating value that is higher than the rating used for various long term or operational planning studies is a violation of FAC-011 and the SOL Methodology. The concern is that this results in using an SOL which exceeds the Facility Rating.

A second change is proposed within this RR that includes required language from FAC-011 that requires SOLs to provide acceptable performance after loss of certain HVDC facilities. In the past, prior to IS integration, there were none of these facilities within the RC footprint. This language should be added to the SOL methodology so that SPP can remain compliant with FAC-011.

Other miscellaneous changes are proposed to provide consistency with TOP/IRO standards and more recent NERC terminology. Namely the use of the phrase "exceedance" vs "violation" when referring to study results related to SOL and IROLs.

SPP STAFF ASSESSMENT

IMPACT

Will the revision result in system changes ☒ **No** ☐ **Yes**

Will the revision result in process changes? ☒ **No** ☐ **Yes**

If yes to either, please provide a summary of the changes:

Is an Impact Assessment required? ☒ **No** ☐ **Yes**

If system/process changes exist, but an Impact Assessment is not performed, please explain why it is not needed:

Estimated Cost: $	**Estimated Duration:** months
Primary Working Group Score:	

SPP DOCUMENTS IMPACTED

☐ **Market Protocols**	**Protocol Section(s):**	**Protocol Version:**
☐ **Operating Criteria**	**Criteria Section(s):**	**Criteria Date:**
☒ **Planning Criteria**	**Criteria Section(s):** 7.3	**Criteria Date:** 1/1/2016
☐ **Tariff**	**Tariff Section(s):**	
☐ **Business Practice**	**Business Practice Number:**	

WORKING GROUP REVIEWS AND RECOMMENDATIONS List Primary and any Secondary/Impacted WG Recommendations as appropriate	
Primary Working Group: **ORWG**	**Date: 1/6/2016** **Action Taken: Approved** **Abstained: David Pham (EDE), John Stephens (CU)** **Opposed: None**
Secondary Working Group: **TWG**	**Date: 1/20/2016** **Action Taken: Approved as Modified by TWG** **Abstained: None** **Opposed: None**
Primary Working Group: **ORWG**	**Date: 2/4/2016** **Action Taken: Approved TWG Modifications and Additional ORWG Modifications** **Abstained: None** **Opposed: None**
Secondary Working Group: **TWG**	**Date: 2/23-24/2016** **Action Taken:** **Abstained:** **Opposed:**
Reasons for Opposition:	
Secondary Working Group: **RCWG**	**Date: 3/17/2016** **Action Taken:** **Abstained:** **Opposed:**
Reasons for Opposition:	
MOPC	**Date:** **Action Taken:** **Abstained:** **Opposed:**
Reasons for Opposition:	
BOD/Member Committee	**Date: 4/12/2016** **Action Taken:** **Abstained:** **Opposed:**

Reasons for Opposition:	
COMMENT	**Date: 4/26/2016** **Action Taken:** **Abstained:** **Opposed:**
Comment Author: Douglas Web (KCPL)	
Date Comments Submitted: 01/05/2016	
Description of Comments: KCPL recommends that RR141 be withdrawn for the following reasons stated in the comment form; Revisions are in Opposition to NERC Compliance Initiatives, Revisions Add Indefinite Language to Already Ambiguous Language, Proposed Changes Create Unnecessary Work with NERC Revised and New Definitions Likely on the Horizon, RC Requirement to Establish System Performance Methodology is likely Ending, Facility Ratings Need to Align with Transmission Planning Analysis.	
Status: The ORWG reviewed these comments and incorporated some of the suggested language changes in the version of RR141 that was approved by the ORWG. The ORWG did not agree with the actions this comment recommended taking on RR141.	
COMMENT	
Comment Author: SPP TWG	
Date Comments Submitted: 1/20/2016	
Description of Comments: The TWG made updates and corrections to the proposed modifications. There was desire by the group to specify that any adjusted ratings must be coordinated amongst the applicable entities.	
Status: The ORWG incorporated TWG's recommended changes into RR141 on 2/4/2016.	
COMMENT	
Comment Author: SPP ORWG	
Date Comments Submitted: 2/4/2016	
Description of Comments: The version of RR141 language in this comment form contains changes recommended by TWG and accepted by ORWG along with some additional changes made by ORWG on 2/4/2016.	
Status: ORWG approved version of RR141 on 2/4/2016.	
PROPOSED REVISION(S) TO SPP DOCUMENTS	

SPP Criteria

7.3 System Operating Limits (SOLs)

The 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 of the Bulk Electric System (BES) within acceptable reliability criteria. System Operating Limits are based upon certain operating criteria. These include, but are not limited to: Facility Ratings (Applicable pre- and post-Contingency equipment or facility ratings), Transient Stability Ratings (Applicable pre- and post-Contingency Stability Limits), Voltage Stability Ratings (Applicable pre- and post-Contingency Voltage Stability), and System Voltage Limits (Applicable pre- and post-Contingency Voltage Limits). SPP monitors and controls the BES using Flowgates and the NERC TLR process.

SPP also monitors numerous other BES facilities within its footprint and creates temporary flowgates when operating conditions reveal any additional limiting system configurations. Since SPP is utilizing these flowgates to ensure the system is operating within acceptable reliability criteria, these flowgate limits serve as the SPP System Operating Limits.

7.3.1 Methodology for Determination of Operating Horizon SOLs

(1) This methodology is applicable for developing SOLs used in the operating horizon.

(2) Based on results of system studies (as described below), SOLs are determined per the definition.

(3) SOLs shall not exceed Facility Ratings. SOLs equal applicable Facility Ratings unless additional studies have established a lower limit based on other operational issues such as transient, dynamic and voltage stability, etc. The Facility Ratings used in the Operating Horizon or Real-Time Horizon may be higher or lower than the Facility Ratings used in the Planning Horizon. ~~and shall be based upon the forecast system conditions applicable to the horizon of the study used to establish the SOL.~~ All Facility Ratings shall be calculated in accordance with the appropriate Transmission Owner's Facility Rating methodology. Ratings that have been adjusted must be coordinated so that the impacted operating entities are aware of the ~~times~~duration that the adjusted rating may be used.

(4) Anticipated system topology, generation dispatch, and load levels ~~are~~ shall be utilized ~~daily via SPP member submission on OPS1 and NERC SDX for non-members~~.

(5) Pre-contingency and first contingency studies will be conducted to investigate thermal and voltage exceedances~~violations~~ for current and next day.

(6) Voltage and angular stability issues are investigated ~~off-line~~ as deemed necessary by operator and engineer experience and engineering judgment.

(7) As deemed necessary by study results, an operating guide to aid operators in mitigating potential SOL ~~violations~~ exceedances may be produced. These guides may be temporary or permanent, depending whether the violation is due to a short-term outage, seasonal loading issues, etc. At a minimum, this operating guide will include:

(a) Statement of type(s) of ~~violations~~ limit exceedances revealed by study (voltage/thermal/stability)

Commented [KH1]: TWG Addition

Commented [jrs2]: This language – or similar – is needed to satisfy a required mitigation for SPP RC. The methodology needs clarifying language that allows a higher rating than that submitted for the planning/ems base model build to be used in real-time, ex. Night/colder weather/higher wind in real-time.

Commented [NR3]: ORWG 2/4/2016

Commented [KH4]: TWG Addition

Commented [jrs5]: This is a methodology for TOPs to use when developing SOLs. Not a description of how data is used by SPP RC.

Commented [KH6]: TWG Correction

(b) Applicable dates

(c) Available/recommended mitigation methods, including generation redispatch (maximum MW and/or minimum Mvar generation), transmission reconfiguration, reclosing reconfiguration, load shedding, and/or Transmission Loading Relief (TLR).

(8) Identified SOLs are screened to compile a list of potential IROLs per the following criteria**:**

(a) Potential IROLs will be investigated when a contingency analysis highlights a thermal overload in excess of 120% of the SOL of the monitored facility.

(b) Potential IROLs will also be investigated when a contingency analysis highlights an under-voltage condition characterized by bus voltages of less than 90% across three or more BES facilities.

The potential IROL condition will be reviewed further by evaluating the system response to the loss of the ~~SOL violated~~ facility with the SOL expected to be exceeded. The original potential IROL ~~contingency~~ condition will be assumed to be a confirmed IROL condition if the evaluation reveals that the ensuing loss of the facility with the SOL ~~violated facility contingency~~exceedance results in another BES facility being overloaded to greater than 120% of its SOL or three or more additional BES facilities with bus voltages in the area experiencing projected post-contingency voltages less than 90%, unless there are studies or system knowledge that the SOL is not an IROL.

(9) The IROL T_V is 30 minutes unless studies dictate a shorter time.

(10) Special Protection Schemes (SPS's) or Remedial Action Schemes (RAS's) are allowed to prevent prolonged undervoltage and to preserve system voltage and machine stability. ~~The Transmission Owner shall provide the RC with the location and description of each SPS, and shall notify the RC when the schemes are enabled/disabled.~~

Commented [jrs7]: This language is duplicative of other requirements in Criteria 7, Appendix 7, and other NERC Standards.

7.3.1.1 SOL Provisions

(1) In the pre-contingency state, the BES shall demonstrate transient, dynamic, and voltage stability; all Facilities shall be within their Facility Ratings and within their thermal, voltage, and stability limits. In determining SOLs, the BES condition used shall reflect future system conditions with all facilities operated in their normal operating condition.

(2) Following single contingencies as defined in (a) ~~and~~, (b), and (c) below, the system shall demonstrate transient, dynamic, and voltage stability; all Facilities shall be operating within their Facility Ratings and within their thermal, voltage, and stability limits; and Cascading Outages or uncontrolled separation shall not occur.

(a) Single-line-to-ground or three-phase fault (whichever is more severe), with normal clearing, on any faulted generator, line, transformer, or shunt device.

(b) Loss of any generator, line, transformer, or shunt device without a Fault.

~~(b)~~(c) Single pole block, with Normal Clearing, in a monopolar or bipolar high voltage direct current system.

Commented [jrs8]: With integration of IS HVDC lines, this provision needs to be added to Criteria.

(3) In determining the system's response to a single Contingency starting with all facilities operated in their normal operating condition, the following shall be acceptable:

(a) Planned or controlled interruption of electric supply to radial customers or some local network customers connected to or supplied by the Faulted Facility or by the affected area. System reconfiguration should be implemented to minimize the interruption of electric supply to the extent possible.

(b) System reconfiguration through manual or automatic control or protection actions.

(4) To prepare for the next Contingency, system adjustments may be made, including changes to generation, uses of the transmission system, and the transmission system topology.

(5) Starting with all facilities operated in their normal operating condition and following any of the multiple contingencies identified in Reliability standard TPL-003 the system shall demonstrate transient, dynamic and voltage stability; all facilities shall be operating within their facility ratings and within their thermal, voltage and stability limits; and cascading or uncontrolled separation shall not occur.

(6) In determining the system's response to any of the multiple contingencies identified in Reliability standard TPL-003, in addition to the actions identified in (a) and (b) above, the following shall be acceptable:

(a) Planned or controlled interruption of electric supply to customers (load shedding) the planned removal from service of certain generators, and/or curtailment of contracted firm electric power transfers. System reconfiguration should be implemented to minimize the interruption of electric supply to the extent possible.

7.3.1.2 System Modeling and Contingency Definition

(1) All offline models ~~are based on the ERAG MMWG~~shall be based on a coordinated model of the Eastern Interconnect and any necessary facilities in other Interconnections~~power system~~. The model shall include~~s~~ all ~~TOs~~ Transmission Operator (TOP)~~P~~ Areas within the SPP RC footprint as well as facilities in adjacent TOP Areas that have been determined to have impact on the SPP RC footprint.

Commented [KH9]: TWG Correction

(2) The model shall include~~s~~ all non-radial facilities within the BES. Loads served over radial lines ~~are typically~~may be modeled as aggregate at the delivery bus. ~~Many systems are modeled in greater detail down to subtransmission level voltages (<69kV). This is typically true only when the subtransmission system is networked (non-radial). In a few cases distribution level voltages (26kV/13kV) are also modeled.~~ Distribution capacitors can be modeled as aggregate at a load bus.

(3) The online model used by the SPP EMS application is constructed from data in the offline model (PSS/E).

(4) At a minimum the contingency list used in the operating horizon ~~should~~ shall include all non-radial BES transmission lines and transformers ~~> 100kV~~ and all generators rated 300MW and above. Additional

contingencies will be included as provided by ~~BA's and/or TOs within the RC footprint~~other applicable registered entities.

~~**7.3.1.3 Methodology Distribution**~~

~~SPP shall issue this methodology and any changes to the methodology, prior to the changes taking effect, to all the following:~~

~~(1) Adjacent RCs and each RC that has indicated it has a reliability related need for the methodology~~

~~(2) Each PA and Transmission Planner that models any portion of the RC footprint~~

~~(3) Each TOP within the RC footprint.~~

Commented [jrs10]: FAC-011-3 already requires this, there is no need to include this requirement as a duplicate. FAC-011-3 just requires this be done, not the methodology include the requirement that this be done.

~~**7.3.1.4 Comments on Methodology**~~

~~(4) If a recipient of the SOL methodology provides documented technical comments on the methodology, the RC will provide a documented response to that recipient within 45 calendar days of receipt of those comments. The response will indicate whether a change will be made to the SOL methodology and, if no change will be made to the SOL methodology, the reason why.~~

Commented [jrs11]: FERC retired this requirement in January 2014. Also, the FAC-011-3 standard required this, not that the methodology include this process. This is a needless duplication of a requirement.

SPP Business Practices

SPP Southwest Power Pool

Revision Request Comment Form

RR #: 140	Date: 3/3/2016
RR Title: 30 Minute Standardization of Ratings	
SUBMITTER INFORMATION	
Name: Derek Hawkins	**Company: SPP**
Email: dhawkins@spp.org	**Phone:** 501-688-1662

COMMENTS

This comment form addresses the action suggested by the TWG to abandon the retirement of language in Section 7.2 of the SPP Planning Criteria that the TWG developed as the baseline for Transmission Owners' Facility Rating Methodology. The ORWG does not view this language retirement as essential for reliable operations; however, the consensus is that the section should be reviewed for applicability with current NERC Standards. This review should also determine if SPP Planning Criteria is the appropriate location for this type of guideline.

The following redline changes are intended to provide consistency among facility ratings. The inclusion of a Short Term Emergency Rating for use in the operating horizon provides a standard rating format by which the RC and TOP can reliably return actual loading below normal limits. This form includes a slight update to that rating definition as discussed during the TWG and ORWG meetings. That change has a comment below.

Finally, there is no requirement specified in this revision request that requires any use of the Short Term Emergency Rating in SPP transmission planning processes. Communication of the applicable ratings will be accomplished through SPP's Ratings Submission Tool that has a tentative production date of July 1, 2016. Any required effective date for the Short Term Emergency Rating will not be sooner than the SPP Ratings Submission Tool's ability to accommodate the new rating.

PROPOSED REVISION

Provide proposed modifications (redlined) to the revision request for which you are providing comments. Use language from the revision request and redline with your additional edits.

SPP Operating Criteria

SPP Operating Criteria Appendix OP-1: Reliability Coordinator Data Specification and Collection

Transmission Data				
Definition:	Transmission Facility: All facilities 100kV and above, or other lower voltage facilities as specifically requested by the Reliability Coordinator. For Transformers, the low side voltage measurement shall be 100kV and above.			
Data Type	Description/Requirements	Required Exchange Mechanism	Applicability	Required Effective Date
Facility Status	Current status of the switching devices (breakers, switches, disconnects) at each end of a transmission facility. Facilities include generators, transformers, lines, and reactive devices. Possible values are Open and Closed for two-state devices and Open, Closed, and Between for three-state devices. Status is only required on those facilities requested by the Reliability Coordinator in (insert document name here).	ICCP Block 2 For devices without telemetered status, voice notification to the RC is acceptable.	Transmission Operator and/or Balancing Authority	February 1, 2012

Facility Loading MW	Instantaneous Real Power flow in MW on the transmission facility. Unit of measurement is in MW.	ICCP Block 1	Transmission Operator and/or Balancing Authority	February 1, 2012
Facility Loading Mvar	Instantaneous Reactive Power flow in Mvar on the transmission facility. Unit of measurement is in Mvar.	ICCP Block 1	Transmission Operator and/or Balancing Authority	February 1, 2012
MVA Capability Normal (Normal Rating)	Normal ~~(long term)~~ rating for transmission facilities~~. Capability must reflect the most limiting element of the facility~~ pursuant to SPP Planning Criteria 7.2~~Criteria 12.2~~. Unit of measurement is in MVA.	For Dynamic limits: ICCP Block 1	Transmission Operator and/or Balancing Authority	February 1, 2012
		For Static Limits: Network model exchange or written notification to "ENGModelChanges@spp.org"	Transmission ~~Operator~~ Owner and/or ~~Balancing Authority~~Generator Owner	
MVA Capability Emergency (Emergency Rating)	Emergency ~~(short term)~~ rating for transmission facilities~~. Capability must reflect the most limiting element of the facility~~ pursuant to SPP Planning Criteria 7.2~~Criteria 12.2~~. Unit of measurement is in MVA.	For Dynamic limits: ICCP Block 1	Transmission ~~Operator~~ Owner and/or ~~Balancing Authority~~Genera	February 1, 2012
		For Static Limits: Network model exchange or written notification to "ENGModelChanges@spp.org"	Transmission Owner and/or Generator Owner~~Operator and/or Balancing~~	
MVA Capability ~~30 Minute Short-term Emergency Rating~~Short-Term Emergency Rating	~~30 Minute Short-term emergency rating~~Short-Term Emergency Rating for transmission facilities~~. Capability must reflect the most limiting element of the facility~~ pursuant to SPP Planning Criteria 7.2. Unit of measurement is in MVA.	For Dynamic limits: ICCP Block 1	Transmission Owner and/or Generator Owner~~Operator~~	April 1, 2017~~June 1, 2016~~
		For Static Limits: Network model exchange or written notification to "ENGModelChanges@spp.org"	Transmission ~~Owner and/or~~ Generator Owner~~Operator and/or Balancing~~	
Transformer Tap Setting	Predefined, fixed positions on one or both sides of a transformer. Each Tap postion represents a specific voltage value. (i.e. changing a Tap Position changes the voltage.) There is no standard numbering scheme for the tap position. Documentation defining the possible values and their meaning must be provided to SPP.	Telemetered/Derived tap positions: ICCP Block 1	Transmission Operator and/or Balancing Authority	February 1, 2012
		Non-telemetered/no-load tap information: Network Model Exchange or written notification to "ENGModelChanges@spp.org"	Transmission Operator and/or Balancing Authority	

Commented [dwh1]: Proposed effective date.

Commented [dwh2]: The network model exchange mechanism shall include submission via the SPP Ratings Submission Tool following its production implementation date.

7.2 Rating of Transmission Circuits

Each SPP member shall rate transmission circuits operated at 69 kV and above in accordance with ~~this criteria~~the Transmission Owner's Facility Rating Methodology. ~~A transmission circuit shall consist of all elements load carrying between circuit breakers or the comparable switching devices. Transformers with both primary and secondary windings energized at 69 kV or above are subject to this criteria. All circuit ratings shall be computed with the system operated in its normal state (all lines and buses in service, all breakers with normal status, all loads served from their normal source).~~ The circuit ratings will be specified in "MVA" ~~and are taken as the minimum ratings of all of the elements in series~~. ~~The minimum circuit rating shall be determined as described in this criteria and members shall maintain transmission right of way to operate at this rating. However, SPP members may use circuit ratings higher than these minimums.~~ Each Transmission Owner shall provide SPP with~~element of a circuit shall have~~ a ~~normal~~Normal ~~and an~~, ~~emergency~~Emergency, and ~~short term emergency rating~~Short-Term Emergency Rating for each circuit. ~~For certain equipment, (switches, wave traps, current transformers and circuit breakers), t~~These ~~two~~ three ratings ~~are identical and~~ are defined as follows:

(1) NORMAL RATING: Normal circuit ratings specify the level of power flow that facilities can carry continuously without loss of life to the facility involved.

(2) EMERGENCY RATING: Emergency circuit ratings specify the level of power flow that a facility can carry for the time sufficient for adjustment of transfer schedules, generation dispatch, or line switching in an orderly manner that a system, facility, or element can support, or withstand for a finite period. The rating assumes acceptable loss of equipment life or other physical or safety limitations for the equipment involved.~~with acceptable loss of life to the facility involved.~~ This rating shall ~~be coordinated between Reliability Coordinator and Transmission Operator in order to address current operating conditions.~~have a time associated with it which identifies the finite period of the Emergency Rating.

~~(2)~~(3) ~~SHORT-TERM EMERGENCY RATING~~SHORT-TERM EMERGENCY RATING: ~~30-minute circuit ratings exist to make system operators aware of the speed in which overloads must be relieved.~~The level of power flow that a facility can carry for a time period ~~no shorter than~~of at least 30-minutes. The TO shall specify the duration associated with ~~short term emergency rating~~Short-Term Emergency Ratings. The rating assumes acceptable loss of equipment life or other physical or safety limitations for the equipment involved. ~~The 30-minute rating is intended to be used in pre-contingent operation conditions and allow sufficient time for system operators to return actual loading below normal or short-term ratings.~~

Commented [dwh3]: Language revision suggested by the TWG.

The ~~30-minute~~Ss~~s~~hort-T~~t~~erm E~~e~~mergency R~~r~~ating is intended to be used only in pre-contingent operating conditions and provides a ~~consistent~~minimum ~~Emergency r~~Rating period that provides sufficient time for system operators to ~~return actual loading below normal~~keep actual loading within applicable ratings. Emergency circuit ratings can be higher than the ~~short-term emergency rating~~Short-Term Emergency Rating as permitted through an approved operating guide on file with the SPP Reliability Coordinator.

At a minimum, each member shall ~~compute~~ provide SPP with summer and winter seasonal ratings for each circuit element. The summer season is defined by the months June, July, August and September. The winter season is defined by the months December, January, February and March. The seasonal rating shall be ~~based upon an ambient temperature (either maximum or average)~~ developed using the ~~methodology described in Appendix PL-2.A~~Transmission Owner's Facility Rating Methodology. A member may elect to ~~compute~~ provide a third set of seasonal ratings for the remaining months of the year (April, May, October and November). If that election is not made, summer ratings shall be used for these remaining months.

7.2.1 Power Transformer

Power transformer ratings are discussed in ANSI/IEEE C5791, IEEE Guide for Loading Mineral-Oil-Immersed Power Transformers. Every transformer has a distinct temperature rise capability used in setting its nameplate rating (either 55°C or 65°C). These temperature rise amounts reflect the average winding temperature rise over ambient that a transformer may operate on a continuous basis and still provide normal life expectancy.

7.2.1.1 Normal Rating

The normal circuit rating for power transformers shall be its highest nameplate rating. The nameplate rating shall include the effects of forced cooling equipment if it is available. For multi-rated transformer (OA/FA, OA/FA/FA, OA/FOA/FOA, OA/FA/FOA) with all or part of forced cooling inoperative, nameplate rating used is based upon the maximum cooling available for operation. Normal life expectancy will occur with a transformer operated at continuous nameplate rating.

7.2.1.2 Emergency Rating

When operated for one or more load cycles above nameplate rating, the transformer insulation deteriorates at a faster rate than normal. The emergency circuit rating for power transformers shall be a minimum of 100% of its highest nameplate rating. Member systems may use a higher emergency rating if they are willing to experience more transformer loss-of-life.

7.2.1.3 Loss of Life

In ANSI/IEEE C57.91, a 65°C rise transformer can operate at 120% for an 8 hour peak load cycle and will experience a 0.25% loss of life. If a 65°C rise transformer experiences 4 incidents where it operates at or below 120% for an 8 hour peak load cycle, it will still be within the target of 1%

loss of life per year. In ANSI/IEEE C57.91, a 55°C rise transformer can operate at 123% for an 8 hour peak load cycle and will experience a 0.25% loss of life. Likewise, if a 55°C rise transformer experiences 4 incidents where it operates at or below 123% for an 8 hour peak load cycle, it will still be within the target of 1% loss of life per year.

7.2.1.4 Ambient Temperature

Average ambient temperature is an important factor in determining the load capability of a transformer since the temperature rise for any load must be added to the ambient to determine operating temperature. Transformers designed according to ANSI standards use a 30°C average ambient temperature (average temperature for 24 consecutive hours) when setting nameplate rating. Transformer overloads can be increased at lower average ambient temperatures and still experience the same loss of life. This allows seasonal ratings with higher normal and emergency ratings. However, this circuit rating criteria does not call for seasonal transformer ratings. In ANSI/IEEE C57.91, transformers can be loaded above 110% and experience no loss of life when the average ambient temperature is below 78°F. By not having seasonal ratings, the four occurrences that contribute to loss of life are limited to days when the average ambient temperature exceeds 78°F. The Power Transformer Rating Factors include:

(1) Nameplate rating, normal loss of life for 55°C and 65°C rise transformers with cooling equipment operating.

(2) Average ambient temperature, 30°C.

(3) Equivalent load before peak load, 90% of nameplate rating.

(4) Hours of peak load, 8 hour load cycle.

(5) Acceptable annual loss of life, 1%.

7.2.2 Overhead Conductor

Overhead conductor ratings are discussed in IEEE Standard 738, IEEE Standard for Calculating the Current-Temperature Relationship of Bare Overhead Conductors. Ampacity values are to be determined using the fundamental heat balance equation outlined in the House and Tuttle method. Because of the amount and complexity of the equations, this method lends itself to computer application. The recommended computer programs to be used for this calculation either include the BASIC program listed in Annex B of IEEE Standard 738 or an equivalent program, such as the DYNMAP program which is part of the EPRI TLWorkstation ™ software package. While tables and graphs may be convenient to use, they fail to take into account the geographic location of the line and often lack either the desired ambient temperature and/or the desired conductor temperature. The use of tables and graphs is not acceptable.

7.2.2.1 Conductor Properties

Some computer programs used to compute ampacity values have a conductor property library whereby a user simply specifies the conductor code name and the program will search the conductor property file and select the proper input properties. Those using the BASIC program from Annex B of IEEE Standard 738 or another computer program that does not have a conductor property library will obtain conductor properties from an appropriate data source (Aluminum Electrical Conductor Handbook, EPRI Transmission Line Reference Book 345 kV and Above, Westinghouse Transmission and Distribution Book, etc.).

7.2.2.2 Line Geographic Location

These factors specify the location of the line, its predominant direction and its predominant inclination. These numbers can either be line specific or they can represent a general line within the control area. One ambient temperature shall be agreed upon for tie lines traversing several geographic areas and interconnections among different control areas.

7.2.2.3 Radiation Properties

The two radiative properties of conductor material are solar absorptivity and infrared emissivity.

Solar Absorptivity The fraction of incident solar radiant energy that is absorbed by the conductor surface. This value shall be between 0 and 1. Recommended values are given in the following tables:

COPPER CONDUCTORS	
Oxidation Level	**Absorptivity**
None	0.23
Light	0.5
Normal	0.7
Heavy	1.0

ALUMINUM CONDUCTORS	
Service Years	**Absorptivity**
0<5	0.43
□ 5	1.00

Source: Glenn A. Davidson, Thomas E. Donoho, George Hakun III, P. W. Hofmann, T. E Bethke, Pierre R. H. Landrieu and Robert T. McElhaney, "Thermal Ratings for

Bare Overhead Conductors", IEEE Trans., PAS Vol. 88, No.3, pp. 200-05, March 1969.

Infrared Emissivity The ratio of infrared radiant energy emitted by the conductor surface to the infrared radiant energy emitted by a blackbody at the same temperature. This value shall be between 0 and 1. Recommended values are given in tables below:

COPPER CONDUCTORS	
Oxidation Level	**Emissivity**
None	0.03
Light	0.3
Normal	0.5
Heavy	0.8

ALUMINUM CONDUCTORS	
Service Years	**Emissivity**
0	0.23
5-10	0.82
10-20	0.88
□ 20	0.90

Source: W. S. Rigdon, H. E. House, R. J. Grosh and W. B. Cottingham, "Emissivity of Weathered Conductors After Service in Rural and Industrial Environments," AIEE Trans., Vol. 82, pp. 891-896, Feb. 1963.

7.2.2.4 Weather Conditions

Ambient temperature represents the maximum seasonal temperature the line may experience for summer and winter conditions. Appendix PL-2.A contains a methodology to compute maximum ambient temperature. Wind speed is assumed at 2 ft/sec (1.4 mph) or higher. Wind direction is assumed perpendicular to the conductor.

7.2.2.5 Maximum Conductor Temperature

The selection of a maximum conductor temperature affects both the operation and design of transmission lines. Existing transmission lines were designed to meet some operating standard that was in effect at the time the line was built. That standard specified the maximum conductor temperature which maintained acceptable ground clearance while allowing for acceptable loss of strength. Over time, the required amount of ground clearance and the maximum conductor temperature needed to maintain acceptable ground clearance have changed. The changes are reflected in the revisions that have been made to the National Electric Safety Code (NESC) over the years. Although this Criteria specifies a maximum conductor temperature that could be met by

current line design practices, consideration must be given to existing lines that were built according to an earlier standard. This Circuit Rating Criteria specifies a maximum conductor temperature (for both normal and emergency operating conditions) that shall be used for seasonal circuit ratings. For those existing lines that were designed to meet an earlier standard, it is the responsibility of the line owner to establish a rating that is consistent with the NESC design standards being practiced at the time the line was built. This Criteria specifies the use of maximum conductor temperatures that either maintain acceptable ground clearance requirements from earlier NESC's or meet the temperature requirements in SPP Planning Criteria section 7.2.2.6, whichever is lower.

7.2.2.6 Determination of Maximum Conductor Temperature

The maximum conductor temperature for normal ratings may be limited by conductor clearance concerns. Normal ratings are at a level where loss of strength is not a concern. The maximum conductor temperature for emergency ratings have both conductor clearance and loss of strength concerns. By setting a maximum conductor temperature and the length of time a conductor may operate at this temperature, the maximum allowable loss of strength over the life of the conductor is prescribed. Unless conductor clearance concerns dictate otherwise, at least the following maximum conductor temperatures shall be used. This allows for the efficient utilization of the transmission system while accepting minimal risk of loss of conductor strength during emergency operating conditions. These conductor temperatures are a result of the examination of SPP members practices.

	Maximum Conductor Temperature	
	Normal Rating	**Emergency Rating**
ACSR	85°C	100°C
ACAR	85°C	100°C
Copper	85°C	100°C
Copperweld	85°C	100°C

AAC	85°C	100°C
AAAC	85°C	100°C
SSAC	200°C	200°C

Note: Annealing of copper and aluminum begins near 100°C.

7.2.2.7 Hours of Operation at Emergency Rating

The effect of conductor heating due to operating at the maximum temperature during emergency conditions is cumulative. If a conductor is heated under emergency loading for 4 hours 8 times during the year, the total effect is nearly the same as heating the conductor continuously at the temperature for 32 hours. Using a useful conductor life of 30 years, the conductor will have been heated to the maximum temperature for 1000 hours. For an all aluminum conductor (AAC), this results in a 7% reduction from initial strength. Since the steel core of an ACSR conductor is essentially unaffected by the temperature range considered for emergency loadings, for an ACSR conductor, this results in a 3% reduction from initial strength. Both of these amounts are acceptable loss of strength. The daily load cycle for operating at the emergency rating shall not exceed 4 hours. This load cycle duration for conductors operating at the emergency rating is more restrictive than power transformers because power transformers have a delay in the time required to reach a stable temperature following any change in load (caused by a thermal lag in oil rise) and because seasonal ratings shall allow transmission lines to achieve a maximum conductor temperature throughout the year, not just days when the ambient exceeds 78°F.

7.2.3 Underground Cables

Ampacities are calculated by solving the thermal equivalent of Ohm's Law. Conceptually, the solution is simple, however the careful selection of the values of the components of the circuit is necessary to ensure an accurate ampacity calculation. The recognized standard for almost all steady-state ampacity calculations, in the United States, is taken from a publication, "The Calculation of the Temperature Rise and Load Capability of Cable Systems," by J.H. Neher and M.H. McGrath, 1957, hereafter referred to as the Neher-McGrath method. The procedure is relatively simple to follow and has been verified through testing. In recent years, some of the parameters have been updated, but the method is still the basis of all ampacity calculations.

7.2.3.1 Cable Ampacity

Cable ampacity is dependent upon the allowable conductor temperature for the particular insulation being used. Conductor temperature is influenced by the following factors:

(6) Peak current and load-cycle shape;

(7) Conductor size, material and construction;

(8) Dielectric loss in the insulation;

(9) Current-dependent losses in conductor, shields, sheath and pipe;

(10) Thermal resistances of insulation, sheaths and coverings, filling medium, pipe or duct and covering, and earth;

(11) Thermal capacitances of these components of the thermal circuit;

(12) Mutual-heating effects of other cables and other heat sources; and

(13) Ambient earth temperatures.

Both steady-state and emergency ampacities depend upon these factors, although emergency ratings have a greater dependency upon the thermal capacitances of each of the thermal circuit components.

7.2.3.2 Conductor Temperature

The maximum allowable conductor temperature is 85°C for high-pressure fluid-filled (HPFF), pipe-type cables and 90°C for crosslinked, extruded-dielectric cables.

The table below summarizes allowable conductor temperatures for different insulation materials. Two values are given for each cable insulation. The higher temperature may be used if the thermal environment of the cable is well-known along the entire route, or if controlled backfill is used, or if fluid circulation is present in an HPFF circuit. The maximum conductor temperatures allowed under steady-state conditions are limited by the thermal aging characteristics of the insulation structure of the cable. For emergency-overload operating conditions, maximum conductor temperatures are also limited by the thermal aging characteristics. The temperature is also limited by the melting temperature range of the insulation structure of the cable, its deformation characteristic with temperatures, restraints imposed by the metallic shield, deformation characteristic of the jacket, and the decrease in ac and impulse strengths with increases in temperature.

Insulation Material	Maximum Temperature	
	Normal	Emergency

Impregnated paper (AEIC CS2-90 for HPFF and HPGF (AEIC CS4-79 for SCLF)	85°C (75°C)	105°C for 100 hr 100°C for 300 hr
Laminated paper-polypropylene (AEIC CS2-90)	85°C (75°C)	105°C for 100 hr 100°C for 300 hr
Crosslinked polyethylene (AEIC CS7-87)	90°C (80°C)	105°C cumulative for 1500 hr
Ethylene-propylene rubber (AEIC CS6-87)	90°C (80°C)	105°C* cumulative for 1500 hr
Electronegative gas/spacer	Consult manufacturer for specific designs	

* Emergency operation at conductor temperatures up to 130°C may be used if mutually agreed between purchaser and manufacturer and verified by qualification and prequalification tests.

7.2.3.3 Ambient Temperature

The ambient temperature is measured at the specified burial depth for buried cables and the ambient air temperature is used for cables installed above ground. IEC Standard 287-1982 (2-5) recommends that in the absence of national or local temperature data the following should be used:

Climate	Ambient Air Temperature °C	Ambient Ground Temperature °C
Tropical	55	40
Sub-tropical	40	30
Temperature	25	20

The electrical resistance is composed of conductor dc resistance, ac increments due to skin and proximity effects, losses due to induced currents in the cable shield and sheath and induced magnetic losses in the steel pipe. Heat generated in the cable system will flow to ambient earth and then to the earth surface. This heat passes through the thermal resistances of the cable insulation, cable jacket, duct or pipe space, pipe covering and soil. Adjacent heat sources, such as other cables or steam mains, will provide impedance to the heat flow and thus reduce cable ampacity. Further information concerning the components of the ampacity calculations are summarized in Appendix PL-2.B and fully detailed in the EPRI Underground Transmission Systems Reference Book. An example calculation, from the EPRI book, is also provided in Appendix PL-2.B.

7.2.4 Switches

Appendix PL-2.C contains a discussion on developing ratings for switches. In general, switches have seasonal ratings that are a function of the maximum ambient temperature. A switch part class designation is used to differentiate loadability curves that give factors which can be multiplied by the rated continuous current of the switch to determine temperature adjusted normal and 4 hour emergency ratings. The summer normal and emergency switch ratings can be computed by selecting the appropriate loadability factor curve for the switch part class, reading the loadability factors that are appropriate for the summer maximum ambient temperature (40°C or the summer maximum ambient temperature determined in Appendix PL-2.A), and multiplying the continuous current ratings by the loadability factor. The switch winter normal and emergency ratings can be computed by multiplying the continuous current rating by the normal and emergency loadability factors that are appropriate for the winter maximum ambient temperature (0°C or the winter maximum ambient temperature determined in Appendix PL-2.A). Appendix PL-2.C contains loadability factor curves (both normal and emergency) for various switch part classes. The ANSI/IEEE standard referenced in Appendix PL-2.C allows for emergency ratings to be greater than normal ratings. This Criteria does not require the emergency rating to be greater than the normal rating.

7.2.5 Wave Traps

Appendix PL-2.D contains a discussion on developing ratings for wave traps. The two types of wave traps are the older air-core type and the newer epoxy-encapsulated type. In general, both types have a continuous current rating based on a 40°C maximum ambient temperature. Both types have a loadability factor that can be used to determine seasonal ratings that are a function of the maximum ambient temperature. However, the older air-core type has another loadability factor that can be used to determine a four-hour emergency rating that is also a function of the maximum ambient temperature. The newer epoxy encapsulated type does not have an emergency rating.

7.2.6 Current Transformers

Appendix PL-2.E contains a discussion on developing ratings for current transformers. The two types of current transformers are the separately-mounted type and the bushing type. In general, both types have a continuous current rating based on a 30°C average ambient temperature.

7.2.6.1 Separately Mounted Current Tranformers

The separately-mounted type has an ambient-adjusted continuous thermal current rating factor that can be multiplied by the rated primary current of the current transformer to determine seasonal ratings. Separately-mounted current transformers do not have emergency ratings.

7.2.6.2 Bushing Current Transformers

Bushing current transformers are subject to and influenced by the environment of the power apparatus in which they are mounted. Bushing current transformers can be located within circuit breakers and power transformers. Since bushing current transformers are subject to the environment within the power apparatus, they do not have ambient adjusted continuous thermal current rating factors. Rather, if the primary current rating of the ratio being used is less than the continuous current rating of the breaker or the power transformer, this restricts the breaker or power transformer to operate below its rated current which reduces the current transformer temperature. This allows the current transformer to be operated at a continuous thermal rating factor greater than 1.0. Having a bushing current transformer whose primary current rating of the ratio being used is less than the continuous current rating of the breaker or the power transformer is an unusual case. However, the formula to develop the rating factor for this case is located in Appendix PL-2.E. Although bushing current transformers have some short-term emergency overload capability, it must be coordinated with the overall application limitation of the other equipment affected by the current transformer loading. Consequently, this criteria does not recognize an emergency rating for bushing current transformers.

7.2.7 Circuit Breakers

Appendix PL-2.F contains a discussion on developing ratings for circuit breakers. This discussion centers on the use of specific circuit breaker design information to set seasonal and emergency ratings. This design information is not readily available to the owners of such equipment. To use the rating methodology discussed in Appendix PL-2.F would require contacting the manufacturer for detailed design information for each circuit breaker being rated. Rather than doing that, this circuit rating criteria specifies that the nameplate rating shall be used for seasonal normal and emergency ratings. The nameplate rating is based on a maximum ambient temperature of 40°C. If a circuit breaker is found to be a limiting element in a circuit and is experiencing loadings that limit operations, a member system may pursue the methodology outlined in Appendix PL-2.F to determine the circuit breakers seasonal normal and emergency rating.

7.2.8 Ratings of Series and Reactive Elements

The series transmission elements rating will be in amps, ohms, and MVA. The series transmission elements current (amps) rating will be taken as the minimum rating of all internal components (e.g., breakers) that are in series with the interconnected transmission circuit. Shunt reactive elements (e.g., capacitors, reactors) MVA ratings will be based on the nominal transmission interconnecting voltage.

The documentation of the methodology(ies) used to determine the rating of series and reactive elements shall be provided to SPP and/or NERC on request within five business days.

7.2.9 Ratings of Energy Storage Devices

The available real power rating, reactive power rating, control points, and availability of each electrical energy storage device will be provided to SPP upon request. The documentation of the methodology(ies) used to rate electrical energy storage devices shall be provided to SPP and/or NERC on request within five business days.

7.2.10 Circuit Rating Issues

7.2.10.1 Dynamic (Real Time) Ratings

The calculation of static thermal ratings specified in SPP Planning Criteria section 7.2.2.6 uses worst case thermal and operational factors and therefore apply under all conditions. Often times, these worst case thermal and operational factors do not all occur at the same time. Consequently, a static rating may understate the thermal capacity of the circuit. For operation purposes, some members have elected to monitor the factors that affect circuit ratings and use this information to set dynamic ratings. A member can develop and use a rating that exceeds the static thermal rating for operating purposes. The ratings developed by using this criteria are not intended to restrict daily operations but set a minimum rating that can be increased when factors for determining the equipment rating have changed. However, if transmission line ratings are changed dynamically, the required clearances shall still be met.

7.2.10.2 Non-Thermal Limitations

There may be instances when the flow on a transmission circuit is limited by factors other than the thermal capacity of its elements. The limit may be caused by other factors such as dynamics, phase angle difference, relay settings or voltage limited.

7.2.10.3 Tie Lines

When a tie line exists between two member systems, use of this criteria shall result in a uniform circuit rating that is determined on a consistent basis between the two systems. For tie lines between a SPP member and a non-member, the member shall follow this criteria to rate the circuit

elements owned by them and shall coordinate the rating of the tie line with the non-member system such that it utilizes the lowest rating between the two systems.

7.2.10.4 Rating Inconsistencies

A member may have a contractual interest in a joint ownership transmission line whereby the capacity of the line is allocated among the owners. The allocated capacity may be based upon the thermal capacity of the line or other considerations. Members shall use good faith effort to amend their transmission line agreements to reflect the effects of new circuit ratings. There may exist other transmission agreements or regulatory mandates that use the thermal capacity of transmission circuits in allocation of cost and determination of network usage formulas (for example, the MW-mile in ERCOT). These agreements and mandates may specify a methodology and/or factors for computing thermal capacity used in the formulas. Since these amounts are only used in assignment of cost or usage responsibility and not in actual operations of the transmission system, there is no conflict with using a different set of ratings for this specific purpose.

7.2.10.5 Damaged Equipment

There may be instances when a derating of a transmission line element is required due to damaged equipment. The limit may be caused by such factors as broken strands, damaged connectors, failed cooling fans, or other damage reducing the thermal capability.

7.2.11 Reporting Requirements

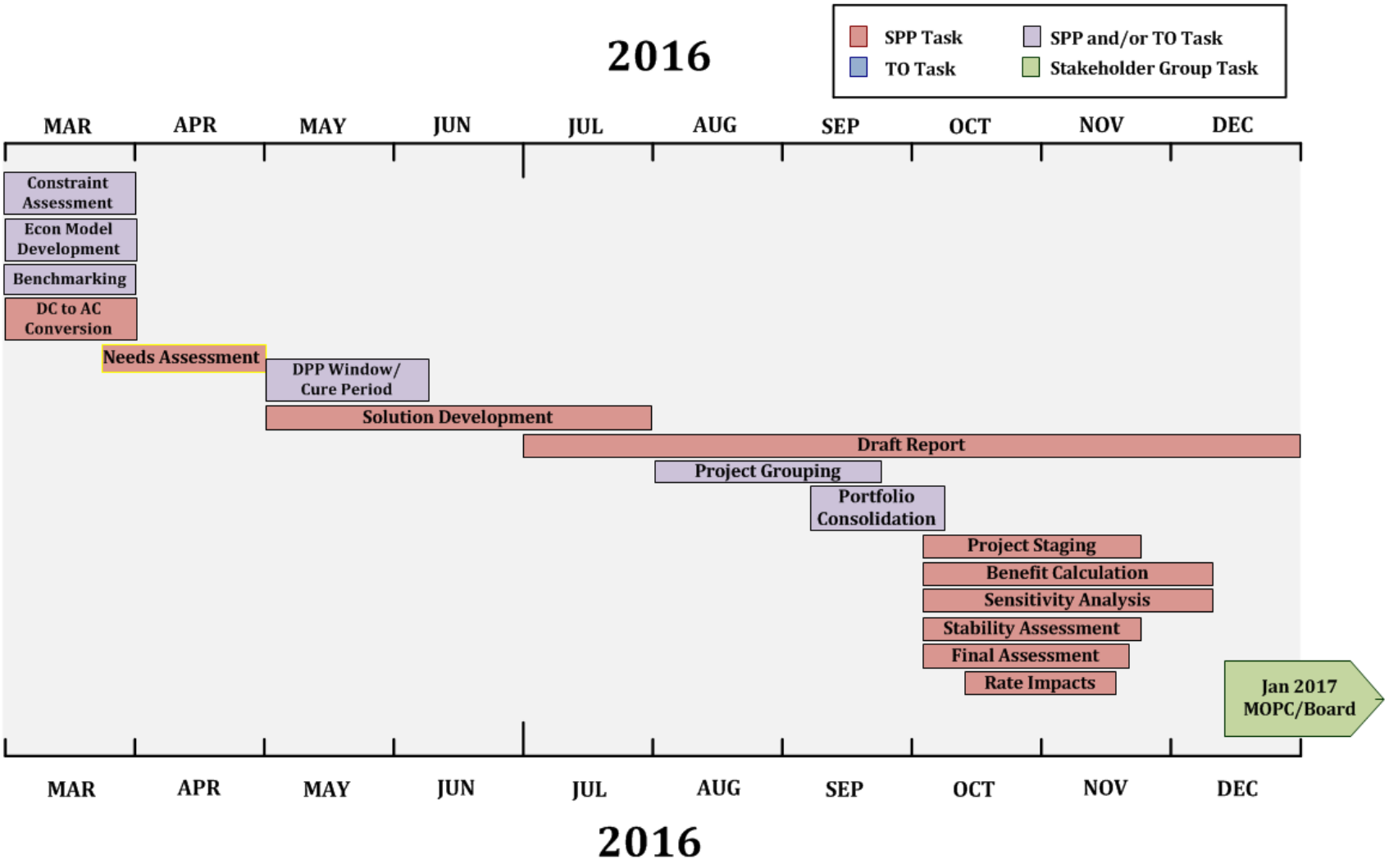
Each member will administer this Criteria and will make available upon request the application of this Criteria for those facilities that impact another member (i.e. force them to curtail schedules due to line loadings, denies them access to transmission service or requires them to build new transmission facilities or pay opportunity costs to receive transmission service).

TPL in the 2017 ITP10

TWG

March 16th, 2016

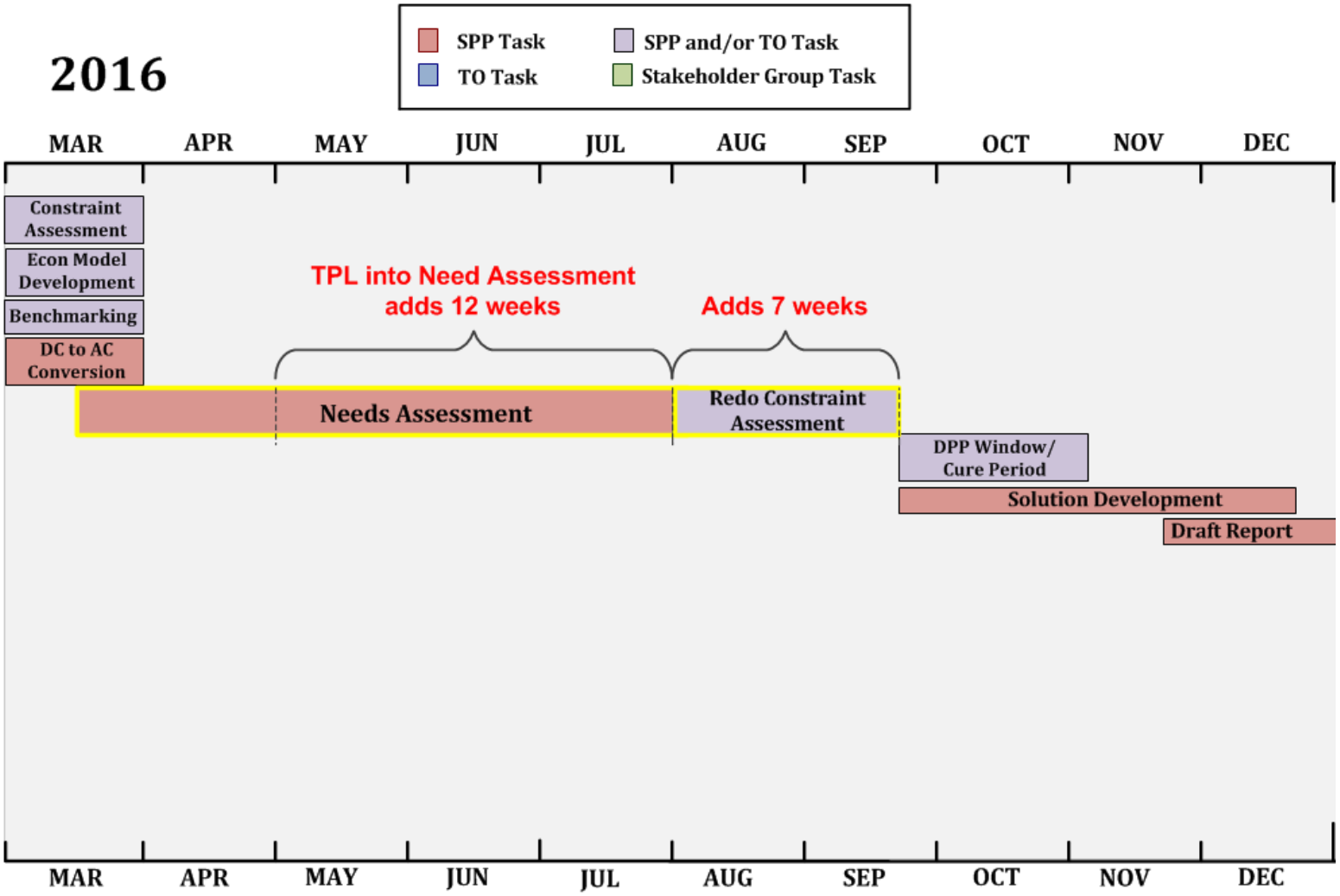
Current 2017 ITP10 Timeline



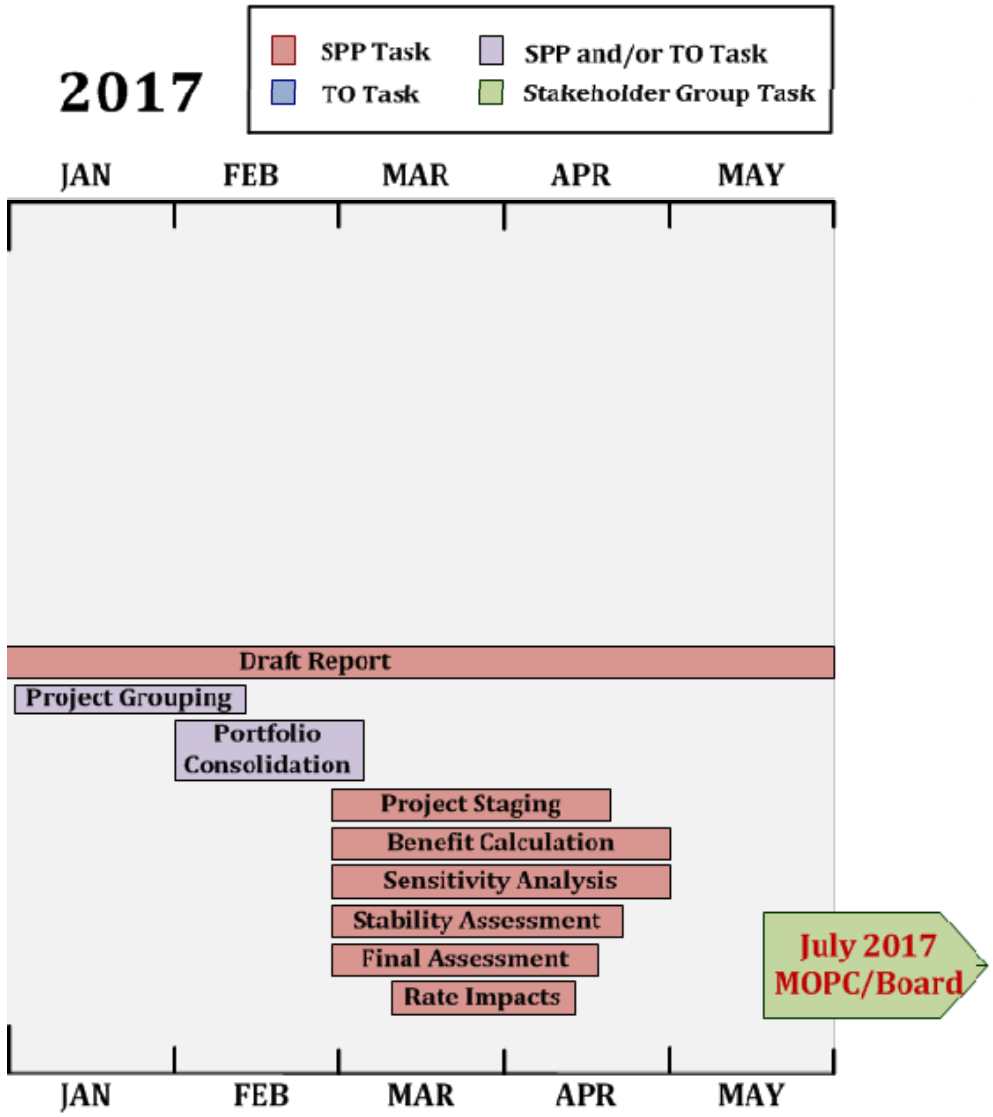
TPL Impact utilizing Proposal for February TWG meeting for 2017 ITP10

- Feedback loop using OPM module of POM software for system adjustments
- Members feedback system adjustment
- Needs assessment shows remaining violations after system adjustment that would require solutions

TPL Impact utilizing Proposal for February TWG meeting for 2017 ITP10



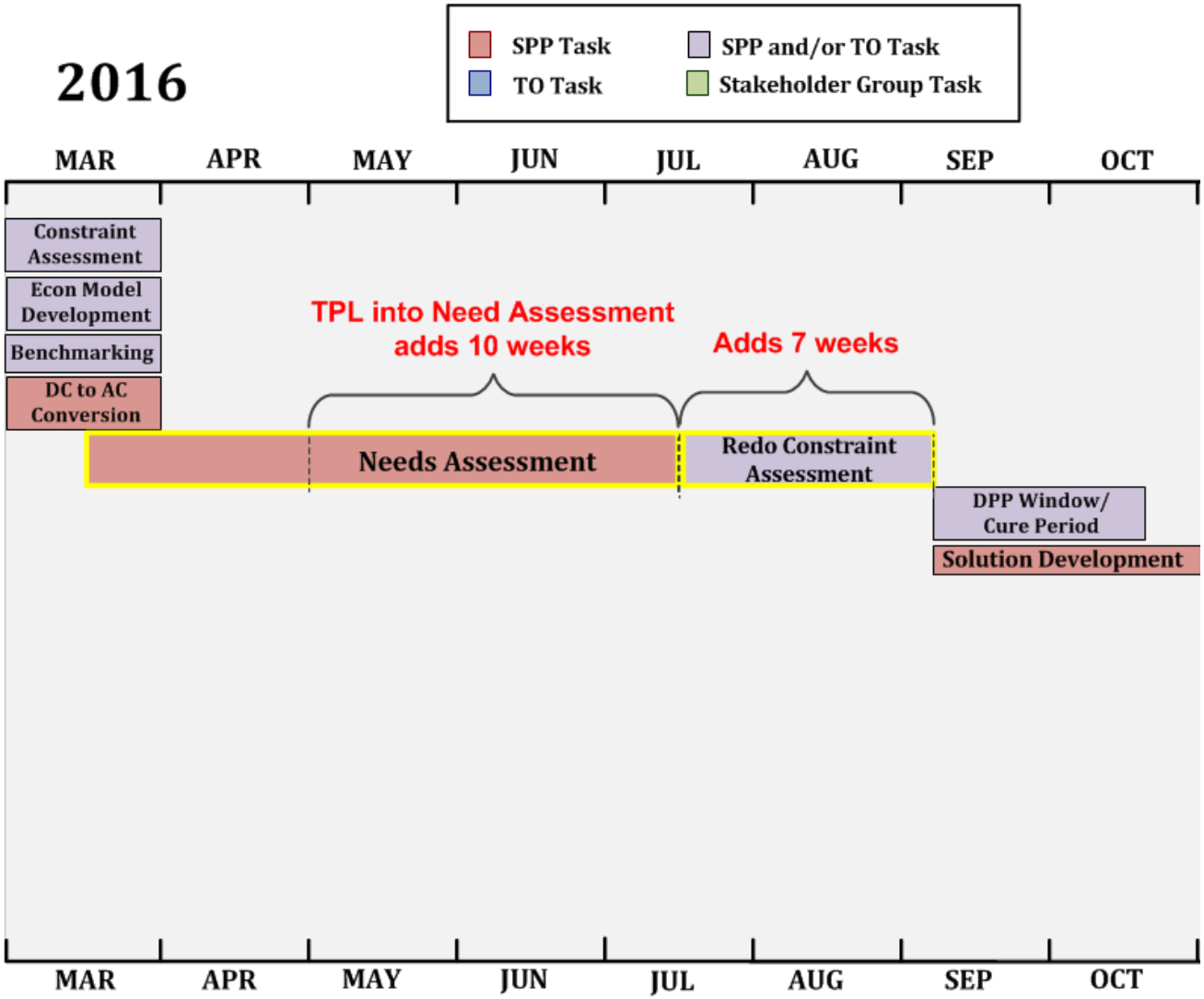
TPL Impact utilizing Proposal for February TWG meeting for 2017 ITP10



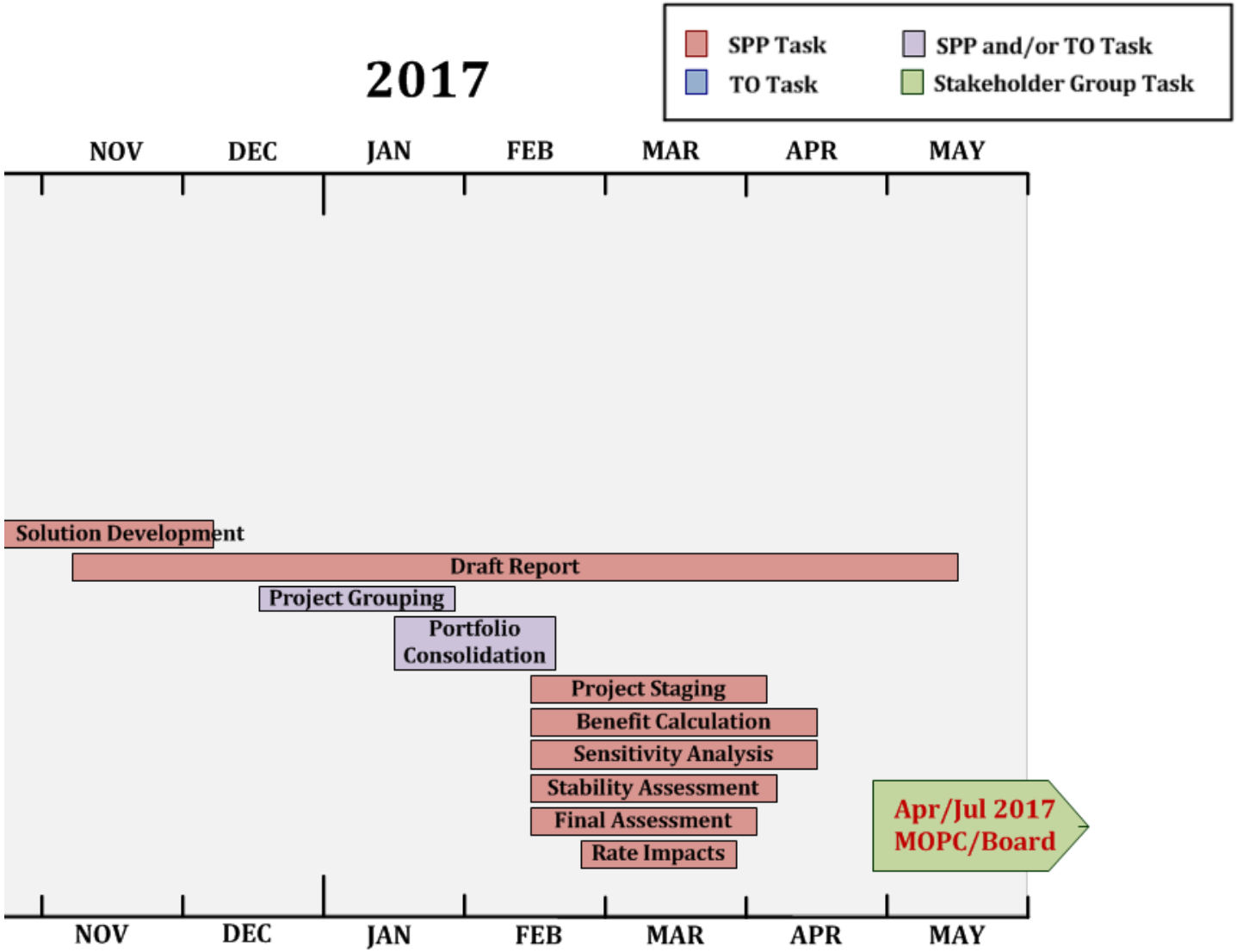
TPL Impact utilizing GSF to reduce the number of P3 events

- Only G-1, N-1 where a GSF is >5% on monitored elements
- Feedback loop using OPM module of POM software for system adjustments
- Members feedback system adjustment for all identified G-1, N-1 issues
- Needs assessment shows remaining violations after system adjustment that would require solutions

TPL Impact utilizing GSF to reduce the number of P3 events



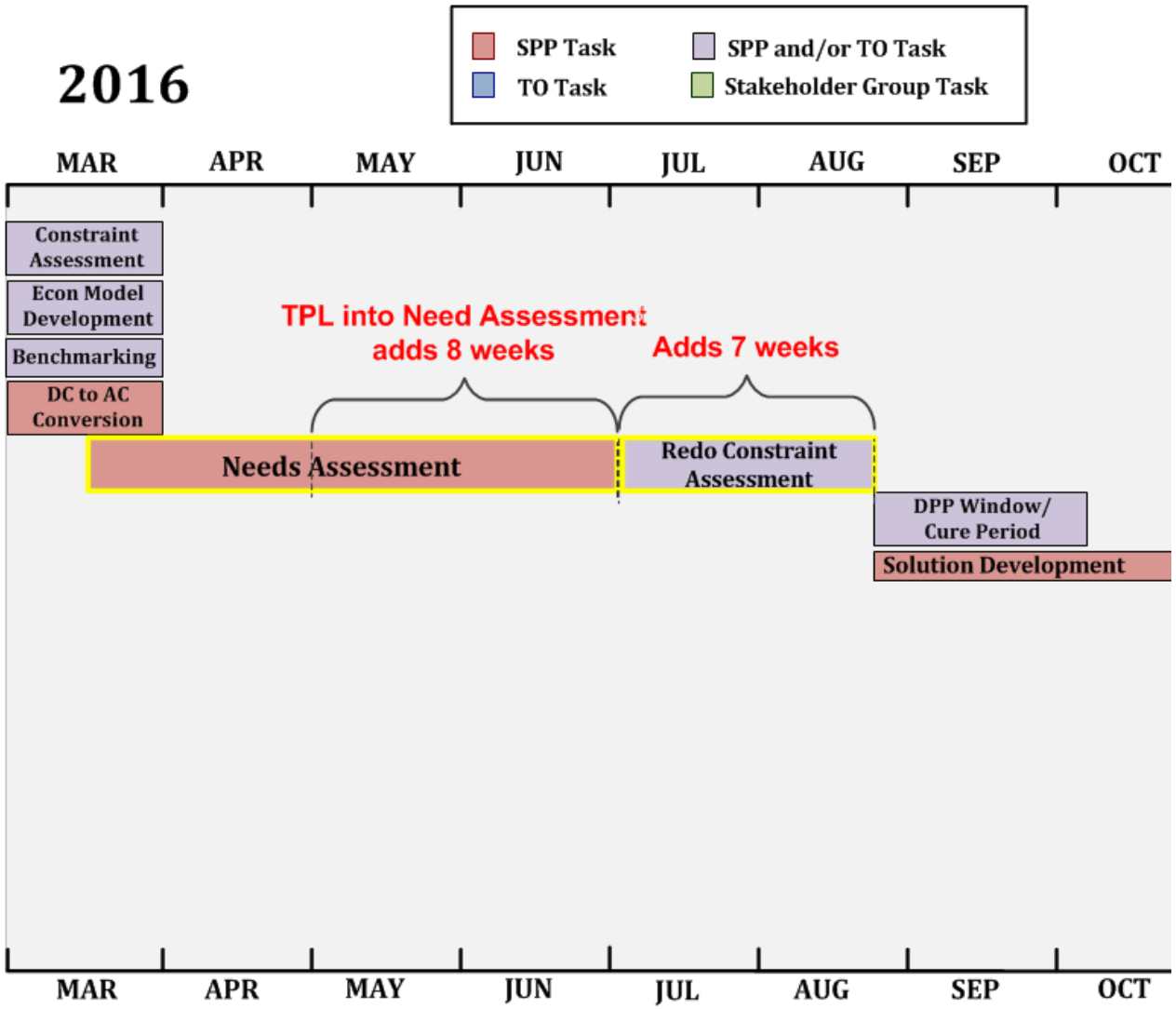
TPL Impact utilizing GSF to reduce the number of P3 events



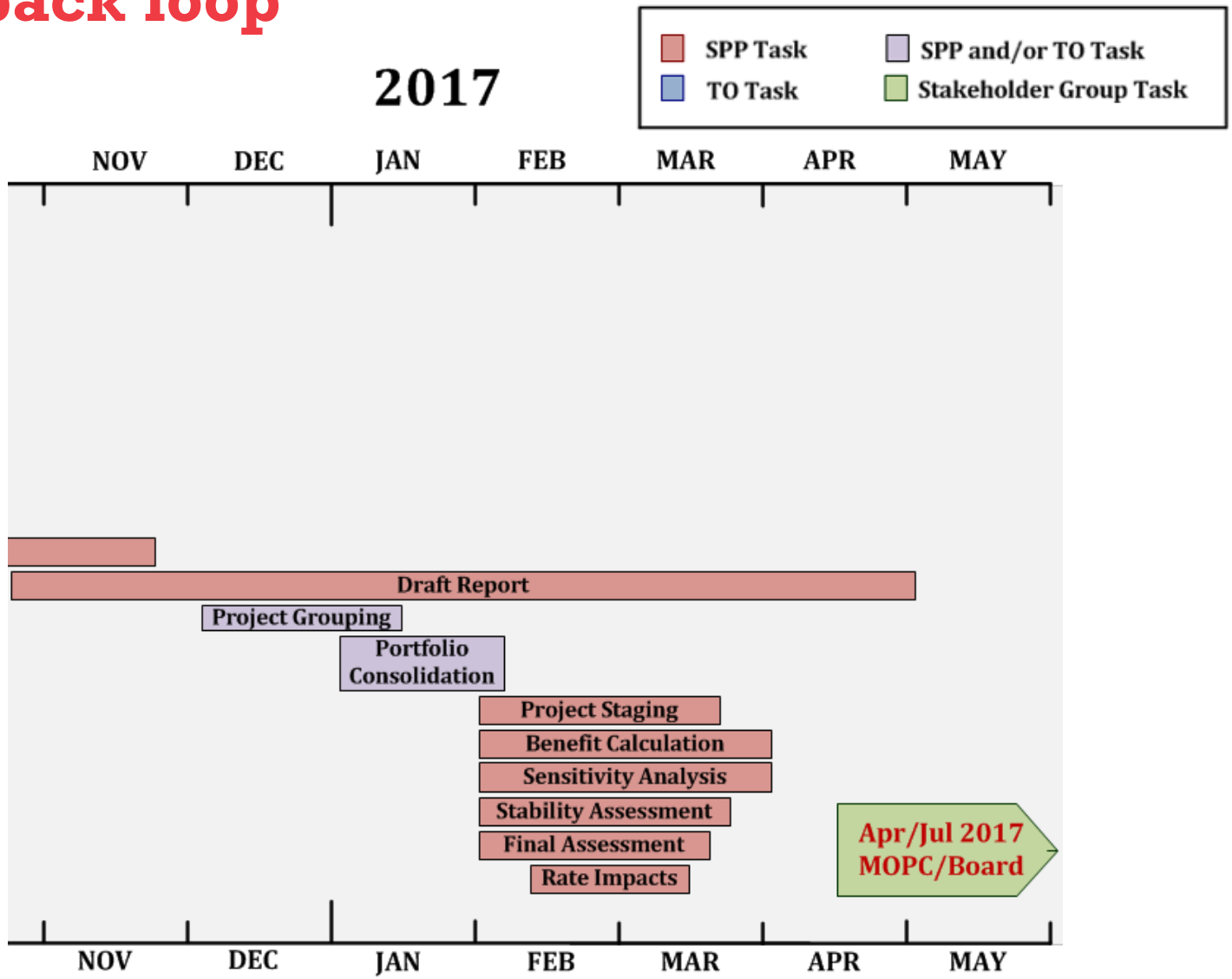
TPL Impact utilizing GSF to reduce the number of P3 events and OPM to reduce Feedback loop

- Only G-1, N-1 where a GSF is >5% on monitored elements
- Feedback loop using OPM module of POM software for system adjustments
- Members feedback system adjustment on non-mitigated G-1, N-1
- Needs assessment shows remaining violations after system adjustment that would require solutions

TPL Impact utilizing GSF to reduce the number of P3 events and OPM to reduce Feedback loop



TPL Impact utilizing GSF to reduce the number of P3 events and OPM to reduce Feedback loop



Potential Downstream Impacts

- Additional processing time:
  - Needs
  - Reliability Metric calculation
  - Solution development
  - Study Cost Estimates
  - Portfolio Consolidation
  - Reliability Assessment

SPP Wind Integration Study Recommended Projects for Acceleration

Jason Tanner

March 16, 2016

WIS Recommended Projects for Acceleration

PID	State(s)	Upgrade Name	Project Type	New Date provided by TOP		Project Owner Indicated In-Service Date
30364	OK	Tatonga - Woodward District EHV 345 kV Ckt 2	Regional Reliability	7/1/2018	new date set by TO	3/1/2021
30364	OK	Mathewson - Tatonga 345 kV Ckt 2	Regional Reliability	7/1/2018	new date set by TO	3/1/2021
30364	OK	Cimarron - Mathewson 345 kV Ckt 2	Regional Reliability	7/1/2016	new date set by TO	6/1/2017
30364	OK	Mathewson 345 kV	Regional Reliability	7/1/2016	new date set by TO	6/1/2017
30367	KS	Elm Creek - Summit 345 kV Ckt 1 (ITCGP)	Regional Reliability	12/31/2016	new date set by TO	3/1/2018
30367	KS	Elm Creek 345/230 kV Transformer	Regional Reliability	12/31/2016	new date set by TO	12/31/2016
30367	KS	Elm Creek 345 kV Terminal Upgrades	Regional Reliability	12/31/2016	new date set by TO	12/31/2016
30367	KS	Elm Creek 230 kV Terminal Upgrades	Regional Reliability	12/31/2016	new date set by TO	12/31/2016
30367	KS	Elm Creek - Summit 345 kV Ckt 1 (WR)	Regional Reliability	12/31/2016	new date set by TO	12/31/2016
30509	TX	Canyon East Sub - Canyon West Sub 115 kV Ckt 1 Rebuild	Regional Reliability	7/1/2016	new date set by TO	5/31/2016
30817	TX	Canyon West - Dawn 115 kV Ckt 1 Rebuild	Regional Reliability	not feasible to accelerate	Right of way coordination needed	4/1/2018
30817	TX	Dawn - Panda 115 kV Ckt 1 Rebuild	Regional Reliability	not feasible to accelerate	Right of way coordination needed	4/1/2018
30817	TX	Deaf Smith - Panda 115 kV Ckt 1 Rebuild	Regional Reliability	not feasible to accelerate	Right of way coordination needed	4/1/2018
30842	TX	Pantex North - Pantex South 115 kV Ckt 1 Reconductor	Regional Reliability	needs NTC		4/1/2019
30842	TX	Highland Park - Pantex South 115 kV Ckt 1 Reconductor	Regional Reliability	needs NTC		4/1/2019
30842	TX	Martin - Pantex North 115 kV Ckt 1 Reconductor	Regional Reliability	needs NTC		4/1/2019
30843	OK	Cimarron - Draper 345 kV Terminal Upgrades	Regional Reliability	6/1/2017		4/1/2019
30844	TX	Amoco - Sundown 230 kV Terminal Upgrades	Economic	10/1/2018		4/1/2019
30916	KS	Buckner - Spearville 345 kV Ckt 1 Terminal Upgrades	Regional Reliability	3/1/2017	not feasible to accelerate	12/31/2016

Methodology

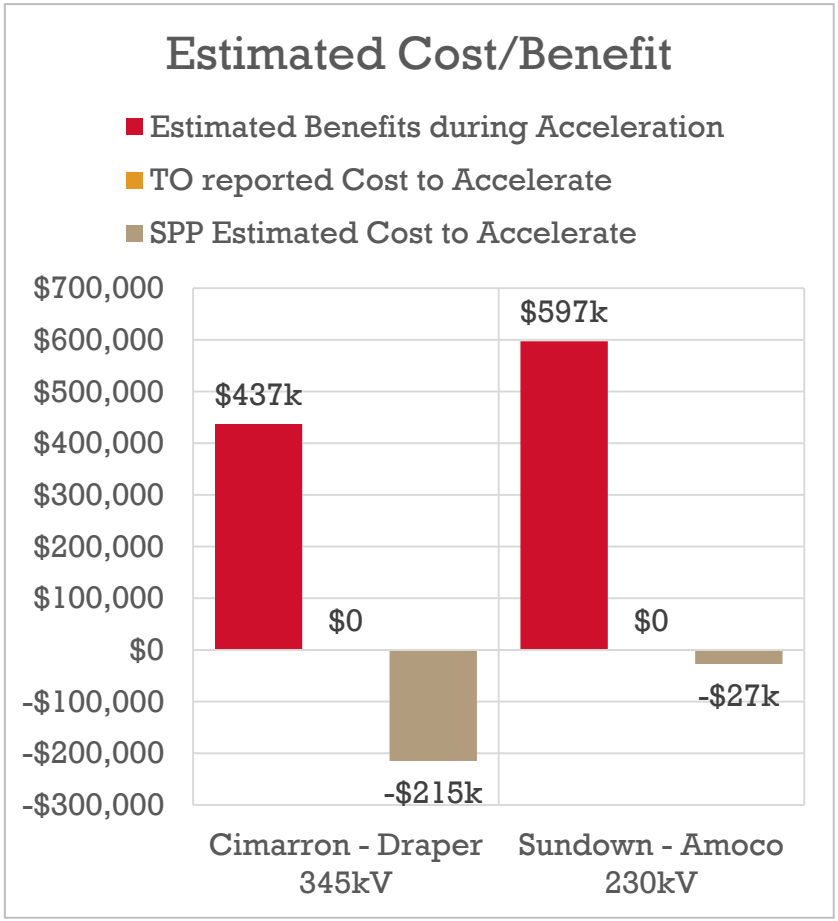
- Same as before
  - Used WIS scenarios, benefit calculated based on production cost difference between scenarios with and without selected project(s)
  - It was not feasible to re-build models based on individual project acceleration dates or rebuild 8760 models
  - Major change to models was the assessment of benefits with updated topology, specifically adding approved upgrades (including those others identified in WIS. Modeled to be in-service by 7/1/2018 and impacted binding constraints in the analysis (ex. Chisholm – Gracemont 345kV ISD 3/1/18)
- Calculate average benefit for each project based on WIS 30-60% scenarios and extrapolate to annual benefits based on expectation of congestion occurrence throughout the year (estimated ~22.6% of hours in the year)
- Multiply annual benefit values times acceleration window to get total expected benefits of acceleration
- Compare total benefits to cost of acceleration

Benefits

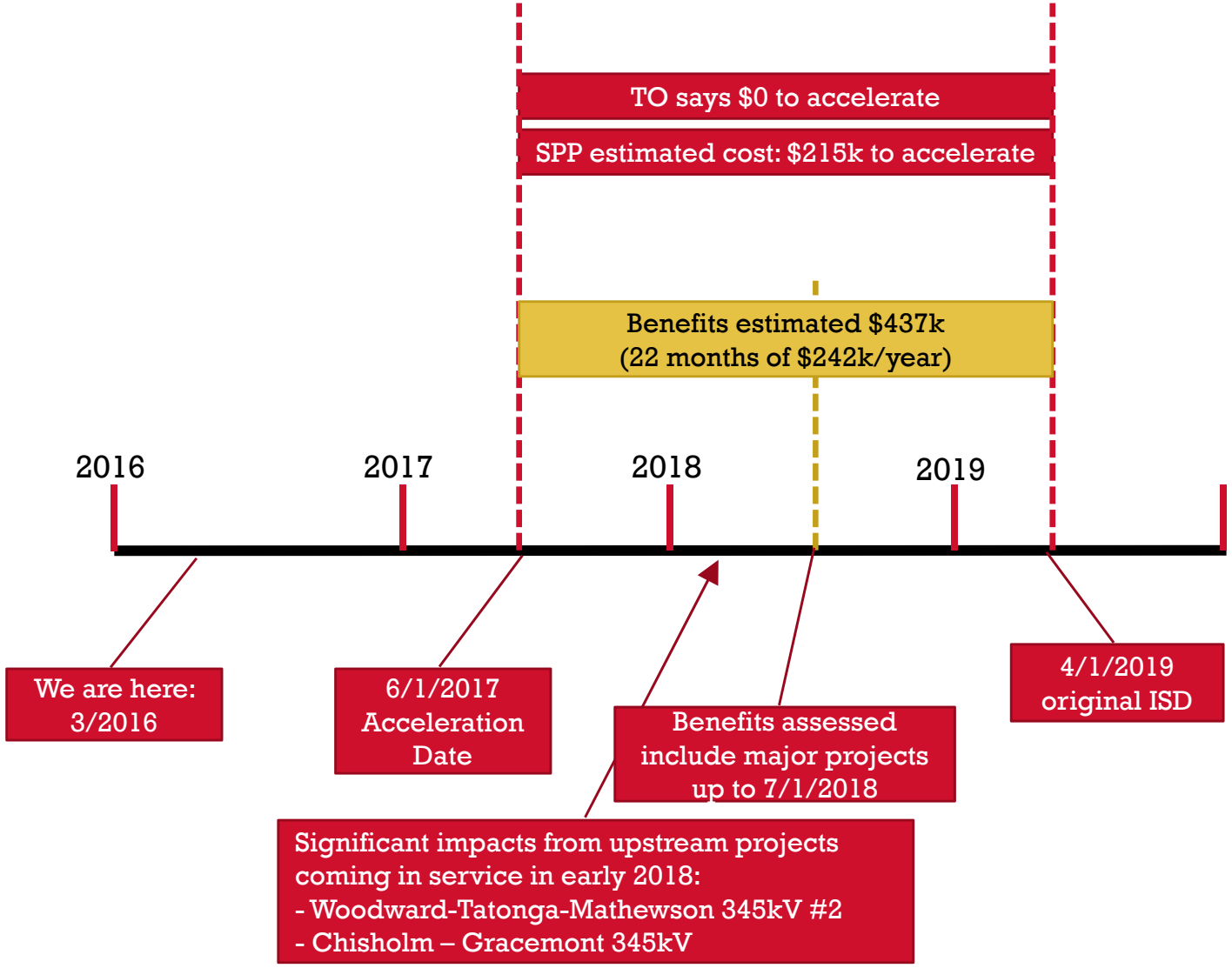
- Cimarron – Draper 345kV
  - Average benefit for scenario (~$120/hour)
  - Annual benefit = $238k/year (~$120/hour * 8760 hours/year * 0.226)
  - Benefit over acceleration window = **$437k** (~$238k/year * 1.833 years)
- Sundown – Amoco 230kV
  - Average benefit for scenario (~$603/hour)
  - Annual benefit = $1,194k/year (~$603/hour * 8760 hours/year * 0.226)
  - Benefit over acceleration window = **$597k** (~$1,194k/year * 0.5 years)
- Additional scenario was run with both projects
  - Average benefit for scenario (~$650/hour)
  - Annual benefit = $1,287k/year (~$650/hour * 8760 hours/year * 0.226)

Cost/Benefit

- TO reported $0 additional cost to project to accelerate
- SPP internally calculated cost of acceleration based on Net Plant Carrying Charge (NPCC), construction inflation, depreciation, etc. over life of equipment
  - $215k cost for 2 years of acceleration for Cimarron – Draper 345kV
  - $27k cost for 1 year of acceleration for Sundown – Amoco 230kV
- **<u>Benefits outweigh cost over acceleration window</u>**

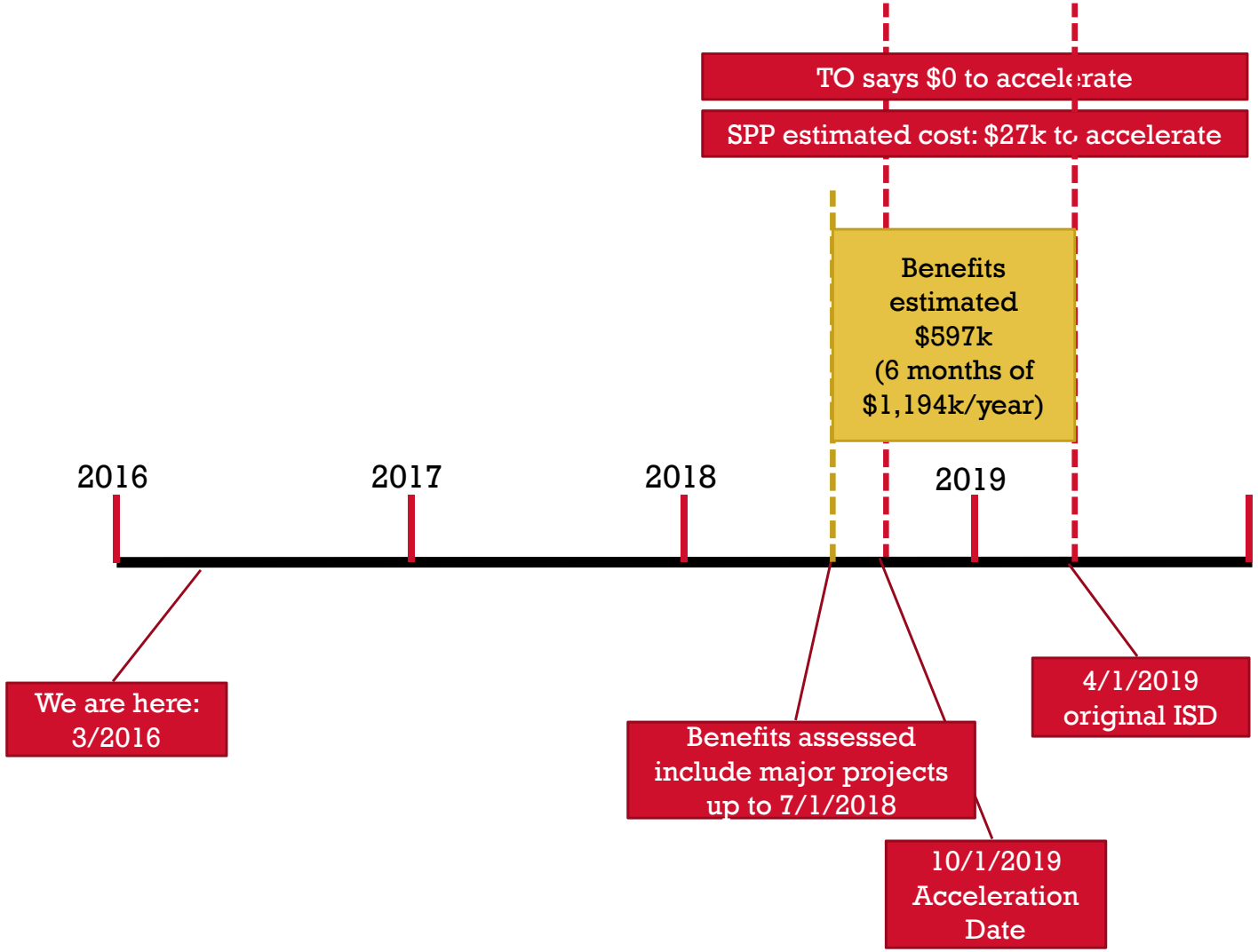


Cimarron – Draper 345kV



*We already have existing temporary flowgate TEMP63_21164 built (Cimarron – Draper 345kV ftlo Minco – Gracemont 345kV) that was built and saw congestion in summer 2015

Sundown – Amoco 230kV



*We already have existing permanent flowgate #5548 (SUNAMOTOLYOA) since 2014 (was temporary flowgate before), which saw >300 hours of congestion in RTBM in 2015

Recommendation

- SPP Staff Recommends Stakeholder Approval to endorse the Wind Integration Study recommendation #5 to begin accelerating the approved ITP projects with issued NTCs, specifically:

PID	State(s)	Upgrade Name
30843	OK	Cimarron - Draper 345 kV Terminal Upgrades
30844	TX	Amoco - Sundown 230 kV Terminal Upgrades