DEDSTF Educational Materials

December 16th, 2015

Version 3

PJM©2015

Designated Entity Agreement (DEA) and Interconnection Coordination Agreement (ICA)

December 16, 2015

Design Entity Standards TF

Suzanne Glatz

PJM©2015

Designated Entity Agreement (DEA)

- In accordance with FERC-approved Order No. 1000 process, PJM designates an entity to develop and construct a specified project to expand, replace and/or reinforce the Transmission System operated by Transmission Provider;
- Agreement by and between PJM and the selected Designated Entity
- Designated Entity may be an incumbent TO, an incumbent TO building outside its zone or a non-incumbent developer who is not a signatory to the CTOA

PJM©2015

Designated Entity Agreement (DEA)

Declares defined contract terms, duties, accountabilities and obligations of each party

Documents:

- Project Scope
- Planning Criteria
- Security
- Project Required In Service Date
- Project Milestones
- Non-standard Terms

PJM©2015

Interconnection Coordination Agreement (ICA)

- In accordance with FERC-approved Order No. 1000 process, PJM notifies Designated Entity and Transmission Owner(s) of project and associated interconnection points
- Designated Entity has accepted the designation and the obligations to build the project
- Transmission Owner has accepted the designation from PJM to construct modifications to its transmission facilities in order to effectuate interconnection with the project
- If the DE and the TO are both signatories to the CTOA, then an ICA is not required
- ICA does not replace the need for an interconnection agreement between the DE and TO

PJM©2015

Interconnection Coordination Agreement (ICA)

ICA provides:

- Coordination of Designated Entity and Transmission Owner with each other to facilitate the interconnection of the Project to the Transmission Owner's transmission facilities
- Ensures coordination of outages
- Defines scope of work for DE and TO
- Defines terms, duties, accountabilities and obligations of each party
- Ensures activities are undertaken in a reliable, safe, and timely manner to enable the Project to meet its Required Project In-Service Date

PJM©2015

Agreement Development and Filings

- Agreements were developed through the stakeholder process in the RPPTF and agreements were filed and accepted at FERC in 2014
- Designated Entity Agreement - Attachment KK of the PJM Open Access Transmission Tariff (ER13-198, 3rd compliance filing)
- Interconnection Coordination Agreement - Attachment LL of the PJM Open Access Transmission Tariff (ER14-2426)

PJM©2015

PJM©2015

PJM TSS Document Scope

December 16, 2015

What is included?

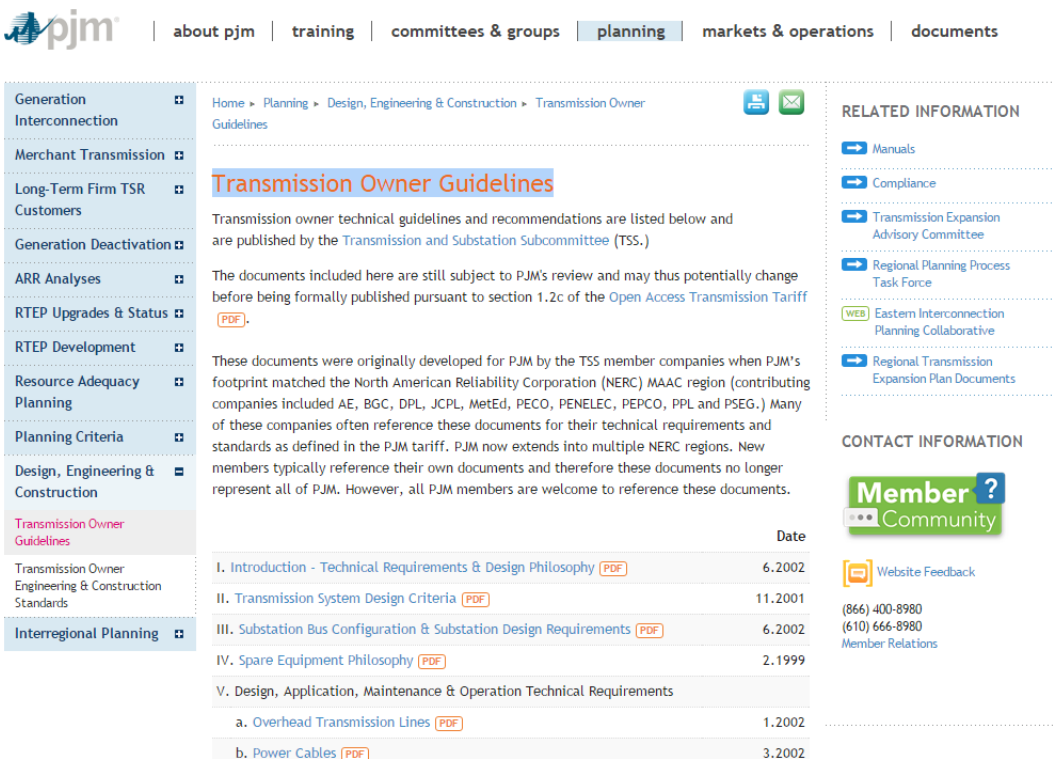
- Scope of Existing TSS Guidelines
  - Voluntary Guidelines
    - Available to all Transmission Owners
    - Generally utilized by original TSS members (legacy MAAC companies)
  - Issues Covered
    - Equipment Rating Guidelines
    - Design Guidelines
  - Developed over many years beginning in the 1960's

How have they been developed?

- Developed over many years based on business drivers
  - The need for ratings drove the initial work
  - Scope was expanded to include design to address potential non-utility generation additions within PJM
  - NERC Rating Compliance drove updates to the rating guides
  - Roundtable lessons are included as needed in the development of any guideline
  - Industry experts have been used as needed
  - TSS has utilized the task force structure using SMEs to develop complex documents as needed

Transmission Owner Guidelines Posted on PJM website

- http://www.pjm.com/planning/design-engineering/maac-to-guidelines.aspx



Development History

- Ratings
  - Ratings guides for various types of substation and transmission line equipment dating back many years. Listed below is an example for overhead transmission conductor
    - 1967 – Short –Time Thermal Ratings for ACSR
    - 1973 – Determination of Bare Overhead Conductor Ratings
    - 1980 – Ambient Adjusted Thermal Ratings for Bare Overhead Conductors
    - 2000 – Bare Overhead Transmission Conductor Ratings
    - 2010 – Bare Overhead Transmission Conductor Ratings (Revised)
- Design guides
  - Design guides were created in 1999 to address growing Non-Utility Generators connecting to the PJM system. In these instances the Non-Utility Generator would build the transmission line or substation and then transfer ownership to the local Transmission Owner. These guides covered overall design, as well as specific pieces of equipment. Some have been updated a little more recently with the newest being published in 2004

Development Philosophy

- Standardization within each TO to enhance restoration and repair capability
- Utilize knowledge and lessons learned to maintain or improve system reliability
- Enhance and support regulatory compliance
- Acknowledge TO ownership boundaries
- Match existing / installed TO standards where possible
- Incorporation of failure impacts / mitigation
- Define and clarify maintenance responsibilities
- Conceptual guidelines, these documents are <u>not detailed design documents</u>

Lessons Learned

- Standards development takes time.
  - Some documents have taken 1-2 years to develop
  - TSS development history dates back to the 1960's
- Document development has been primarily driven by Transmission Owner needs. In a limited number of instances has PJM driven the need.
- Slight changes in standardization requirements may have major effects to each Transmission Owner.
  - Employee training, procedures, equipment, etc. may need to be adjusted .

Questions?

Minimum Design Standards

Comparing Processes & Product

SPP - MISO

Dave Parrish

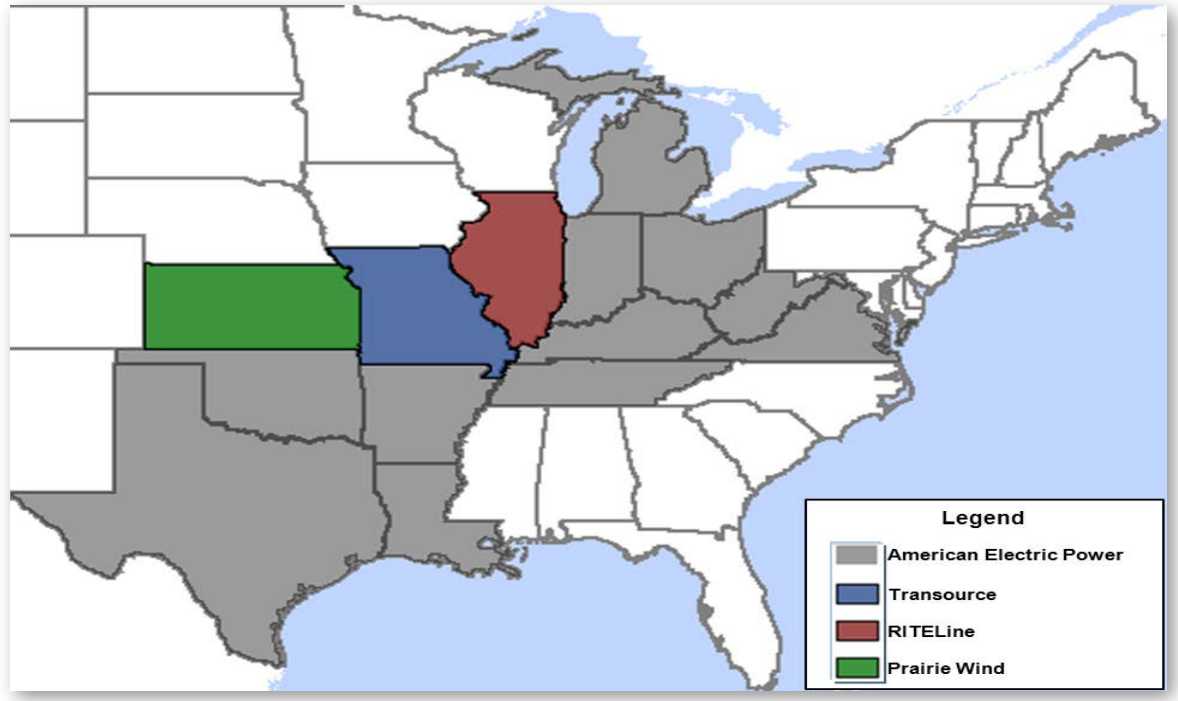
Transmission Line Standards Manager

American Electric Power

December 16, 2015

AEP System

- **5.4 million customers in 11 states**
- **~200,000 mi^2 service territory**
- **40,000+ circuit miles of transmission lines in 13 states**
  - **Facilities in three RTO regions**
- **32,000 MW of generation**



AEP AMERICAN® ELECTRIC POWER

SPP Minimum Design Standards

- **“Minimum Transmission Design Standards for Competitive Upgrades” (MTDS)**
  - ***“The MTDS facilitate the design of transmission facilities in a manner that is compliant with NERC…Good Utility Practice…and are consistent with current industry standards…NESC, IEEE…”***

AEP AMERICAN® ELECTRIC POWER

SPP Minimum Design Standards

- ***"The MTDS represent the minimum design standards by which a Competitive Upgrade must be designed unless the RFP specifies different values…"***

- **Underlying Purpose – Promote reliability by providing enforceable minimum standards for design**

AEP AMERICAN® ELECTRIC POWER

SPP Minimum Design Standards

- **Task Force Representation**
  - **~10 incumbent TOs**
    - **Chair and Vice Chair - TOs**
  - **Developers participated in key discussions, but had no voting privileges**
  - **(2) SPP Staff**

AEP AMERICAN® ELECTRIC POWER

SPP Minimum Design Standards

- **Task Force Meetings**
  - **Most by phone**
  - **Held every 2 to 4 weeks, more frequently as needed**
  - **(1) F2F held midway through the development cycle**
  - **~ 7 months to complete**

SPP Minimum Design Standards

- **Task Force Process**
  - **Developed in parallel with SPP's RFP process**
    - **SPP Staff provided TF direction**
    - **No formal charter**
    - **Significant time devoted by Staff to update MTDSTF with RFP progress**
  - **Document basis**
    - **SPP's Study Estimate Guide**
      - **Originated from Stakeholder input**

AEP AMERICAN® ELECTRIC POWER

SPP Minimum Design Standards

- **Task Force Process**
  - **Meetings facilitated by the Chair (TO representative)**
  - **TO representatives were largely responsible for technical content**
  - **SPP Staff ensured SPP procedures and guidance followed, provided an interface to Staff, updated the document, kept the minutes, and offered some technical input**

AEP AMERICAN ELECTRIC POWER

SPP Minimum Design Standards

- **Summary**
  - **Minimum, enforceable design requirements for Line, Station, and P&C**
    - **Promotes reliability**
  - **Consensus document**
    - **Compromise between existing TO standards and incorporates industry best practices**
    - **Not based on lowest common denominator**
  - **Contains both prescriptive and “mandatory suggestive” language**
  - **Complements RFP process**

AEP AMERICAN ELECTRIC POWER

MISO Minimum Project Requirements

- **"Minimum Project Requirements for Competitive Transmission Projects" (MPR)**
  - ***"The purpose of the…MPR…is to ensure the Competitive Transmission Facilities are adequate, prudent, and robust from an operational and planning standpoint. …this MPR describes MISO's process for developing minimum load ratings, minimum short-circuit interrupting ratings, substation bus, and high-level minimum protection system requirements…"***

AEP AMERICAN® ELECTRIC POWER

MISO Minimum Project Requirements

- **"Minimum Project Requirements for Competitive Transmission Projects" (MPR)**
  - ***"It is important to emphasize that the…MPR is not an engineering specification, engineering design document or engineering calculation document for a specific facility."***
  - ***"Development of final engineering specifications, designs… for specific facilities is the sole responsibility of the Selected Developer."***

AEP AMERICAN ELECTRIC POWER

MISO Minimum Project Requirements

- **Task Force Representation**
  - **~ 15 incumbent TOs**
  - **(2) Transmission Developers**
  - **MISO Staff**

AEP AMERICAN ELECTRIC POWER

MISO Minimum Project Requirements

- **Task Force Meetings**
  - **F2F and by phone**
  - **Held as needed**
  - **~ 9 months to complete**
    - **Currently pending Planning Advisory Committee approval in December 2015 or January 2016**

MISO Minimum Project Requirements

- **Task Force Process**
  - **MISO Staff**
    - **Provided TF direction**
    - **Facilitated Meetings**
    - **Proposed original document and subsequent revisions based on input from TF representatives and the Planning Subcommittee**
    - **Owned the document**
  - **TF provided comments**
  - **No voting process**

AEP AMERICAN® ELECTRIC POWER

MISO Minimum Project Requirements

- **Summary**
  - **Planning and operation-based, enforceable project requirements**
    - **Limited traditional design requirements**
    - **Ensures system robustness from an operational and planning perspective**
  - **Compromise between existing TO standards**
    - **Not based on lowest common denominator**
  - **Contains prescriptive language**

AEP AMERICAN® ELECTRIC POWER

PJM TSS Technical Requirements

- **PJM TSS Technical Requirements**
  - ***"They are intended to provide common PJM transmission provider criteria concerning design philosophy, design requirements and operating practices for…Transmission Facility… requirements…"***

AEP AMERICAN ELECTRIC POWER

PJM TSS Technical Requirements

- **Originated from original PJM members**
- **Similar to SPP MTDS in philosophy, but in general, more detailed**
- **Contains both prescriptive and “mandatory suggestive” language**
- **Currently not mandatory**

AEP AMERICAN® ELECTRIC POWER

Recommendations

- **Create mandatory and enforceable minimum design (not planning-type) standards for competitive projects**
- **Provide clear direction**
  - **Design vs. planning criteria**
  - **Complement RFP Process**
- **Allow for innovation**
- **Ensure a thorough understanding of the competitive project process**

AEP AMERICAN® ELECTRIC POWER

Recommendations

- **Maintain manageable sized teams**
  - **Sub-divide by discipline (line, station, P&C)**
  - **Further sub-divide by topic (equipment capabilities, station bus layouts)**
  - **Ensure opportunities for cross-discipline and cross-topic input**

Recommendations

- **Establish meeting protocol, schedule, roles & responsibilities**
  - **Promote a collaborative atmosphere**
  - **Promote transparency**
  - **Establish ground rules for meetings, conflict resolution**
  - **Establish expectations for participation**
  - **Establish predictable schedules**
  - **F2F kick-off with smaller teams, with additional periodic F2F as required**

AEP AMERICAN® ELECTRIC POWER

Recommendations

- **Start with a Straw Man Proposal**
  - **Originating from the TOs**
  - **Avoid lowest common denominator**
  - **Avoid local preferences**
  - **Consider local geographic requirements**
    - **Special wind, ice zones**

Recommendations

- **PJM TSS Technical Requirements**
  - **AEP agrees that in general, these documents are an acceptable starting point.**

Appendix

PJM©2015

DEDSTF Educational Materials

October 12th, 2015

Version 1

PJM©2015

PJM Planning – Proposal Window Process

Jason Shoemaker
Infrastructure Coordination

PJM©2015

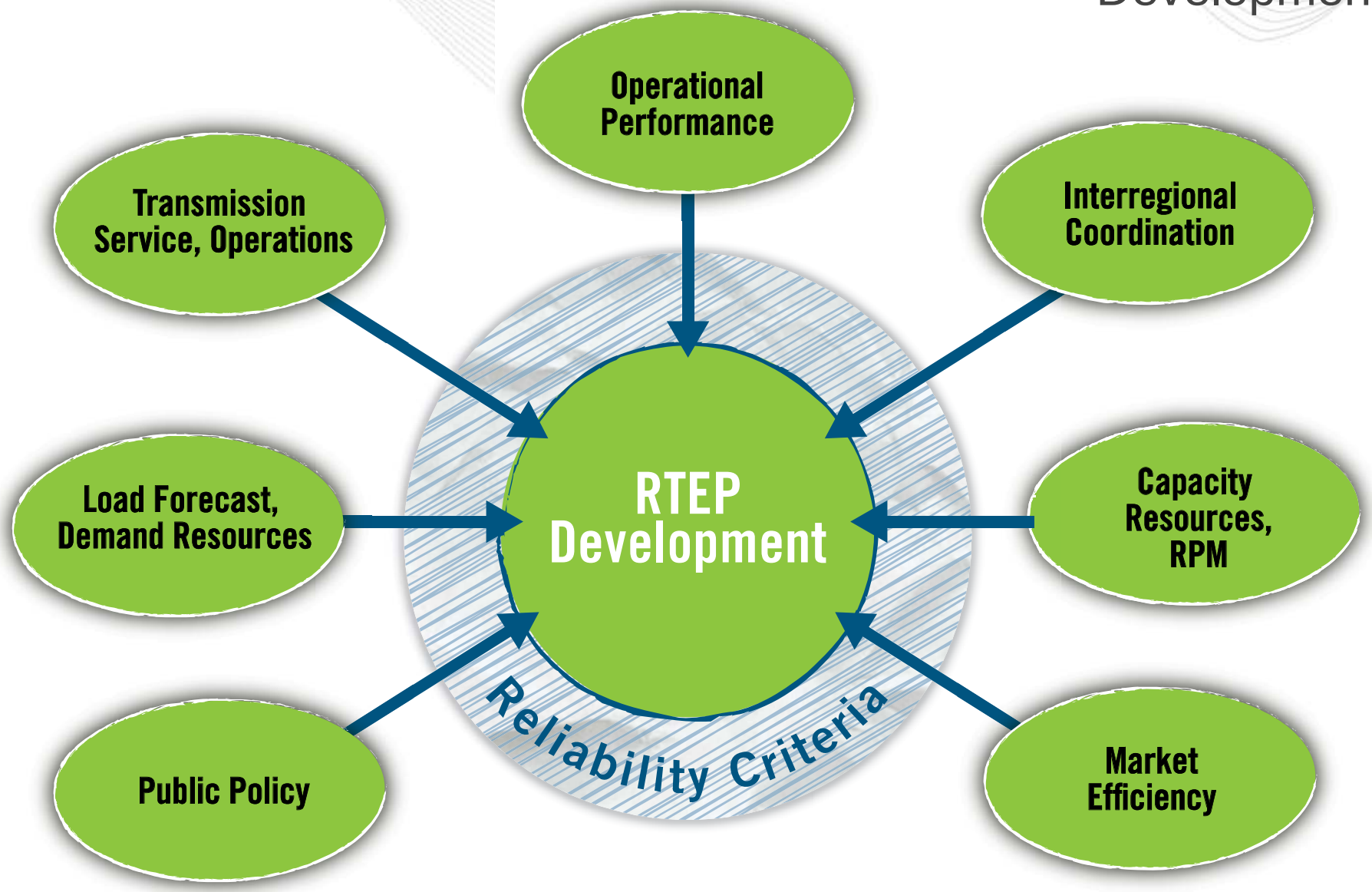
Order No. 1000 Overview

- Order No. 1000 addresses the following topics:
  - Non-incumbent transmission developer reforms
  - Local, regional and interregional transmission planning processes
  - Consideration of transmission needs driven by public policy requirements
  - Transmission cost allocation policies

PJM©2015

Regional Transmission Expansion Plan

Development Drivers



Proposal Windows

- Proposal window data securely provided to participating entities

- Project proposal window duration based on project classes:
  - *Long-lead projects*: reliability or market efficiency driven upgrades needed in year six or beyond
    - 120 day window
  - *Short-term projects:* reliability driven upgrades needed in year four or five
    - 30 day window
  - *Immediate-need projects:* reliability driven upgrades needed in three years or less;
    - window if possible, likely less than 30 days

PJM©2015

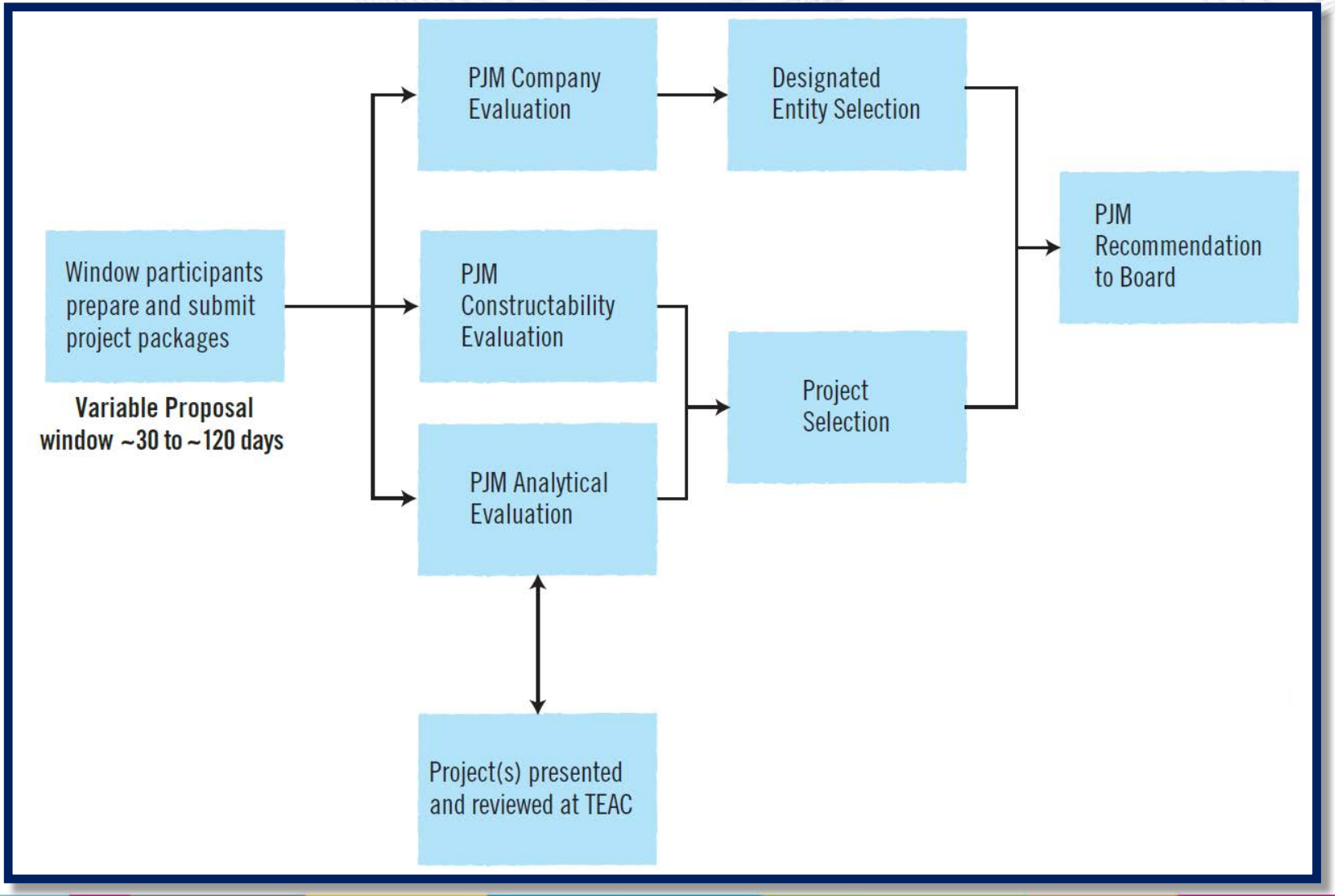
Proposing Entities and Project Designations

- Pre-qualification for proposing entities seeking to be designated
  - Ability to develop, construct, operate and maintain a generic project within the PJM footprint

- Non-incumbent may be designated the greenfield portions of a project

PJM©2015

Project Proposal Evaluation and Selection



PJM©2015

Transmission and Substation Subcommittee

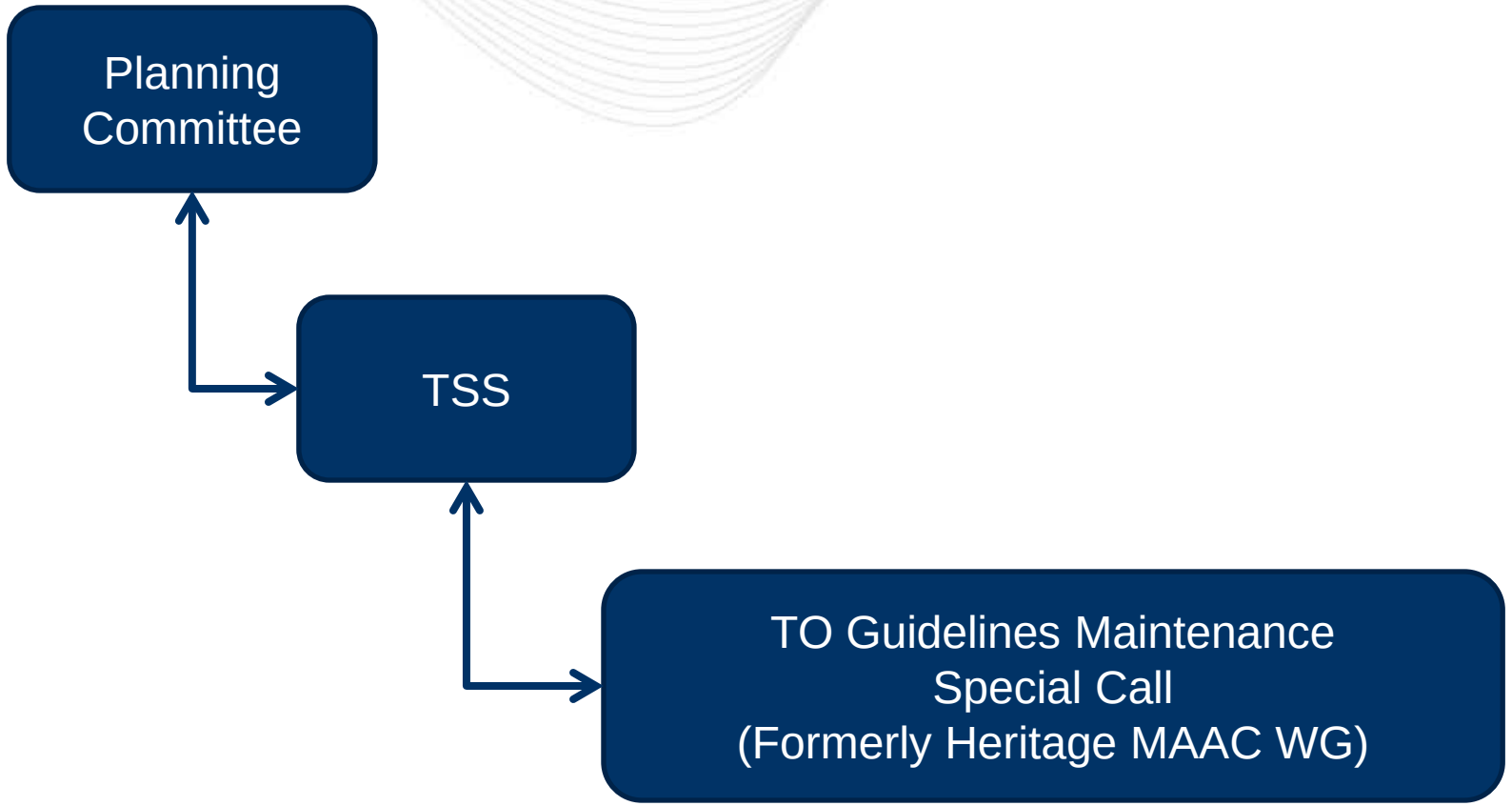
Jeffery Falciani
TSS Secretary

PJM©2015

- Mission (From the Charter)
  - The Transmission and Substation Subcommittee (TSS) serves as a technical advisory committee regarding the design, installation and maintenance of all PJM Interconnection bulk power facilities (facilities under PJM control), and reports to the PJM Planning Committee (PC).
- Charter
  - http://www.pjm.com/~/media/committees-groups/subcommittees/tss/tss-charter.ashx

PJM©2015

TSS Committee Hierarchy



PJM©2015

TSS Body of Documentation

- Technical Guidelines and Recommendations
  - Standards?
- Ratings Guides and Methodologies
- PJM.com URL
  - http://www.pjm.com/planning/design-engineering/maac-to-guidelines.aspx

PJM©2015

DEDSTF Educational Materials

November 12th, 2015

Version 2

PJM©2015

Links to draft standards developed by other regional entities:

- Southwest Power Pool: SPP - Minimum Transmission Design Standards for Competitive Upgrades
- Midwest ISO: MISO - Minimum Project Requirements for Competitive Transmission Projects
- Transmission and Substation Subcommittee (TSS) Transmission Owner Guidelines: TSS - Transmission Owner Guidelines

PJM©2015

Relay Sub Committee Presentation to the DEDSTF

Stan Sliwa

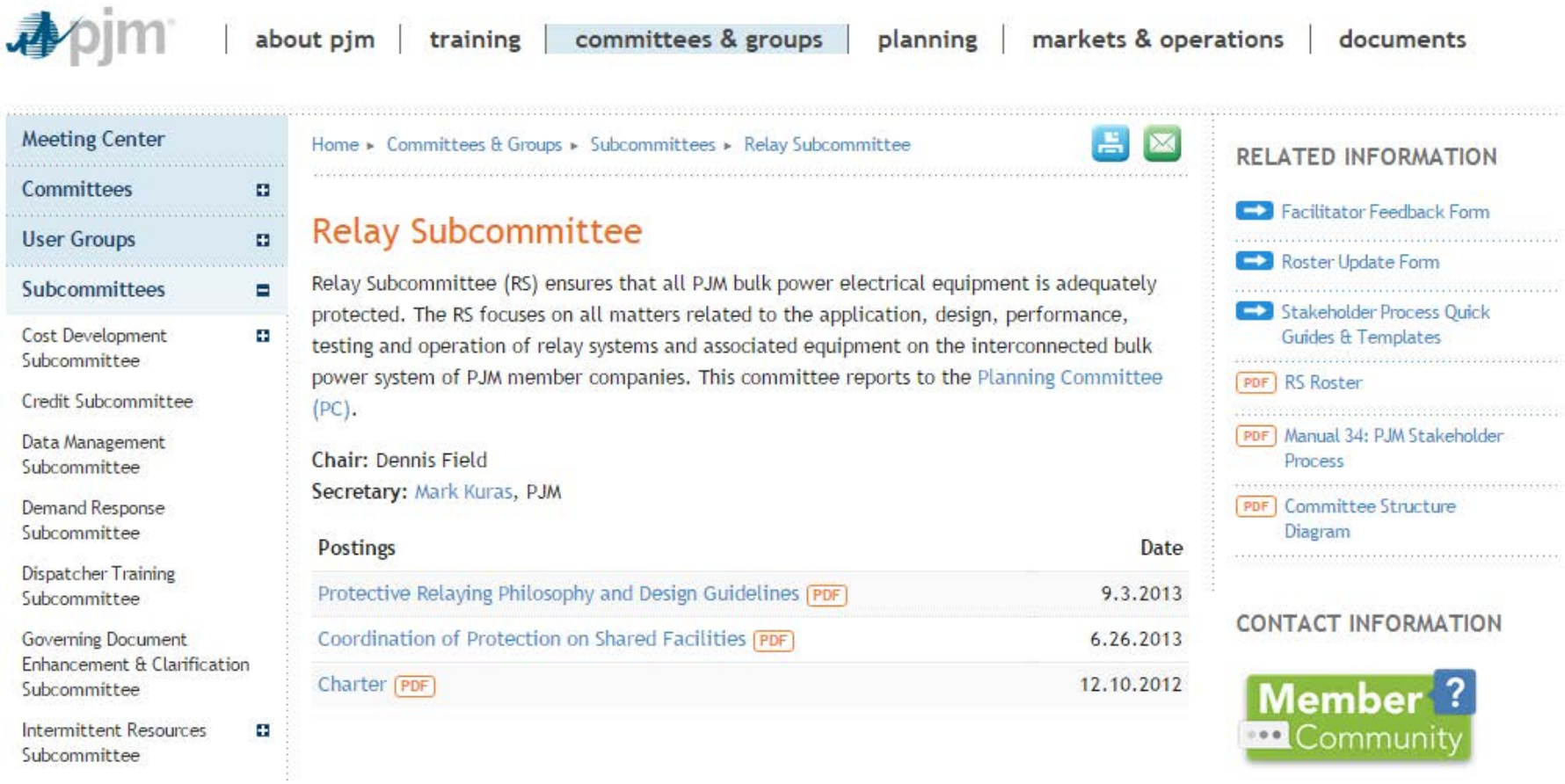
Former Chairman of the Relay Sub Committee

November 12th, 2015

PJM©2015

Relay Subcommittee Webpage

http://www.pjm.com/committees-and-groups/subcommittees/rs.aspx



PJM©2015

Recent Relay Subcommittee Agenda

AGENDA
PJM Interconnection
Relay Subcommittee Meeting #480
PJM Conference and Training Center
Audubon, PA
September 17, 2015
9:15 a.m.

1. **MINUTES**
   - Review minutes from Meeting #479.
2. **REVIEW ACTION ITEMS AND UPDATE STATUS**
3. **REVIEW INTERCONNECTION LINE PROJECTS AND UPDATE STATUS**
4. **FERC, NERC, RFC/SERC & PJM ACTIVITIES**
5. **MFT'S AND MISOPERATIONS**
6. **ROUNDTABLE**

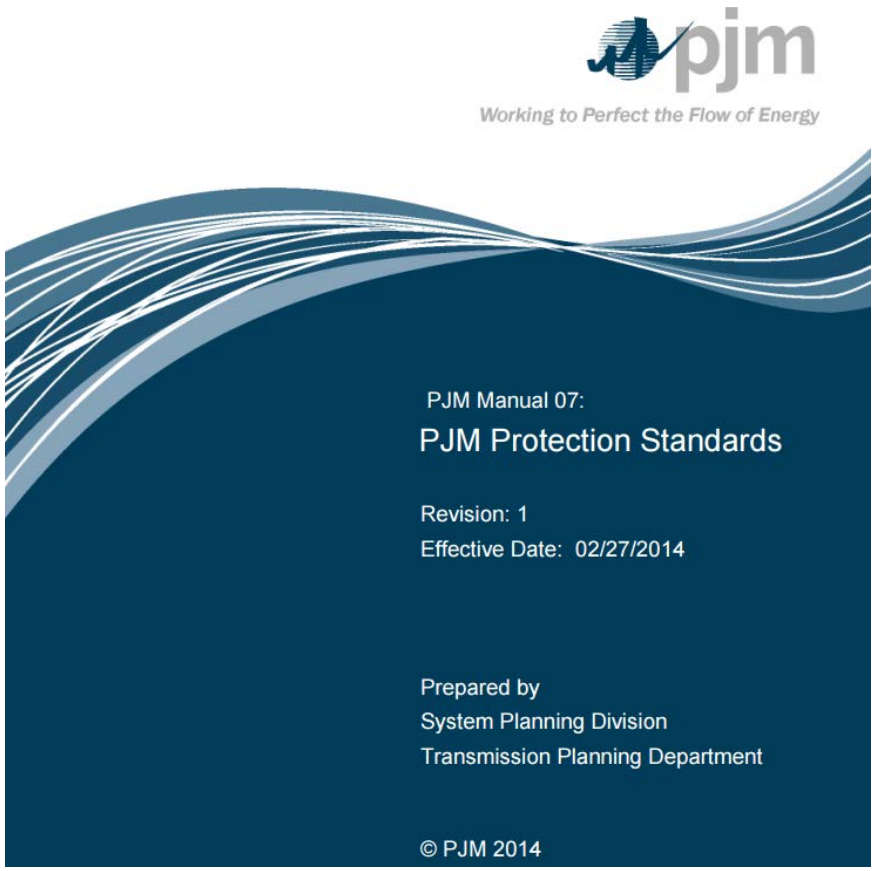
Next meeting: November 19, 2015

Author: Dennis Field-ComEd
DMS Document Number: xxxxxxxx

PJM©2015

PJM Protection Standards Manual

http://www.pjm.com/~/media/documents/manuals/m07.ashx



PJM Manual 07 Table of Contents

Table of Contents

PJM©2015

Questions?

PJM©2015

Development of Minimum Design Standards: Review of MISO and SPP

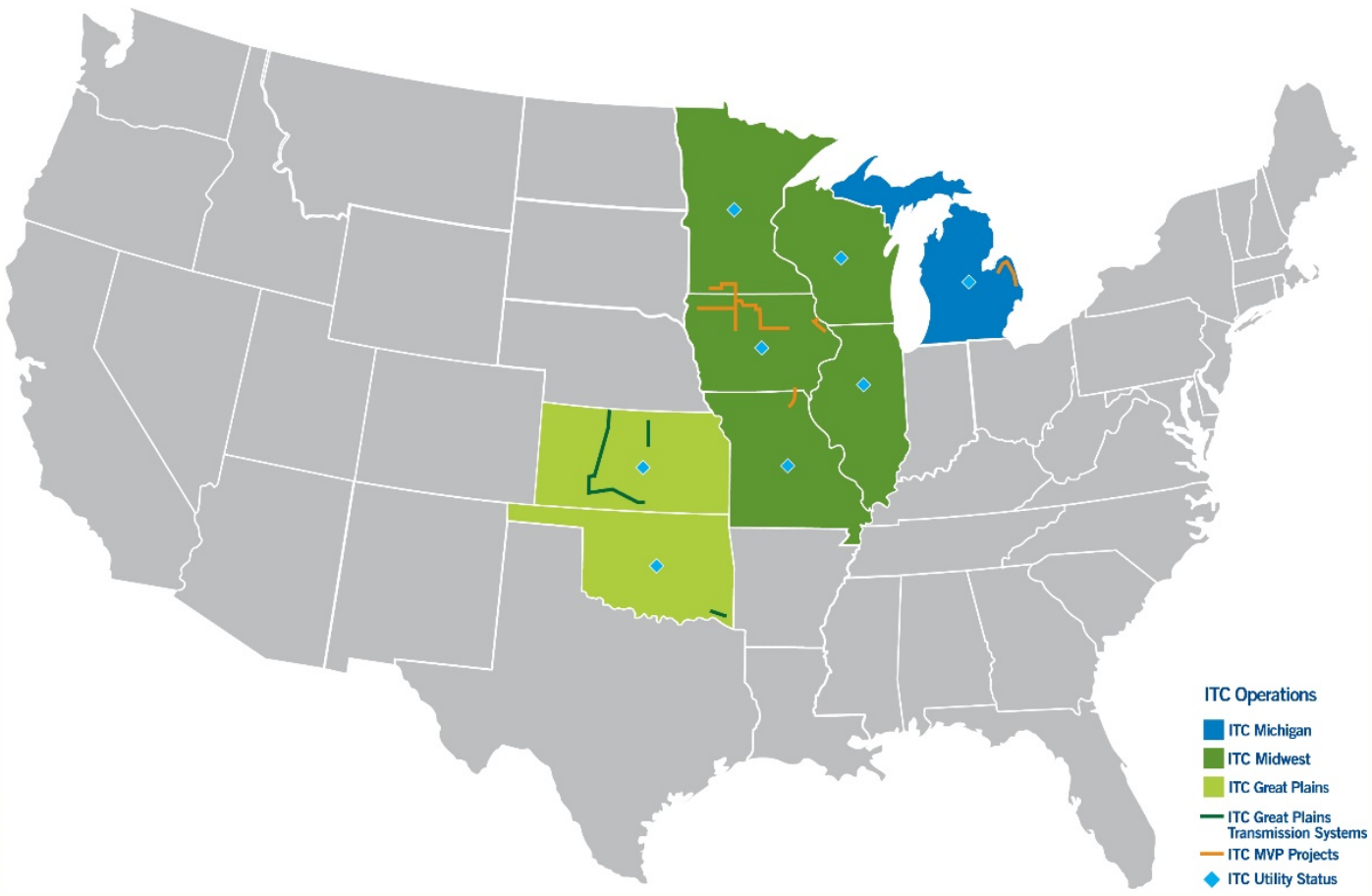
Nathan Benedict
Regulatory Analyst

ITC

November 12, 2015

ITC TODAY

$5.5B **Invested In Infrastructure Since 2003**



- 4 Subsidiaries in 7 states
- 15,600 Circuit miles
- 90,000 Square mile service territory
- 600 Employees making a difference
- Members of 3 RTOs
- Flexible business model that drive value

SPP Standards for Competitive Projects

Background

- Minimum Design Standards for Competitive Upgrades (2015)[1]
- Created by the Minimum Design Standards Task Force (MDSTF)
- Study Estimate Design Guide (2011) is a precursor; the guide is intended to promote consistency in study estimates for projects at 100 kV and above
- The MDSTF used the Design Guide as a foundation: reviewed item by item, removing subjective items (routing, for example) that are part of SPP's evaluation criteria for competitive projects
- The geographic diversity of the SPP region requires special consideration (ice loading, for example)

SPP Standards for Competitive Projects

Development

- Meetings convened primarily over the phone; in-person meetings toward the end of the process
- One participant per company acted as a liaison and participated in meetings. Representation by line and station SMEs was about 50/50
- Protection, relaying, and communications were incorporated using material from a separate, pre-existing group
- Reliability was the focus: the group did not consider how minimum standards may impact the ultimate selection of bids
- Process took about 6-9 months; resulting standards apply to all competitive projects

MISO Standards for Competitive Projects

Background

- BPM-029: Minimum Project Requirements for Competitive Transmission Projects (2015)[2] is currently in draft form. Final draft to be presented to the Planning Advisory Committee for December approval
- Created by the Minimum Design Requirements Task Team (MDRTT)[3]; task team consists of volunteers from the Planning Subcommittee (PSC)
- Transmission Owners have published planning criteria to which they adhere for projects outside of the Order 1000 process[4]
- Minimum requirements developed to allow TOs to follow their existing planning criteria as closely as possible when building competitive projects

MISO Standards for Competitive Projects

Development

- MISO focused initially on ratings and impedance, and task team members consisted of typical stakeholder participants (not design engineers). The focus shifted during the process and feedback from design engineers became more critical
- The task team met periodically by phone, with MISO requesting feedback on specific topics prior to releasing draft standards
- MISO created the draft standards based on feedback received and returned them to the Planning Subcommittee for further comment and approval

MISO Standards for Competitive Projects

Development

- Concerns over designs with “lowest common denominator” elements resulted in minimum standards with elements that are higher than some existing TOs’ standards
- Process took about 12 months; applies to all competitive projects

Lessons Learned

Process

- Start with a strawman
- Use incumbent utilities' standards as a guide
- Incumbents' standards guide the need for location-specific standards
- Existing standards provide insight into what works in the field
- Avoid pressure to closely align standards to an incumbent's existing standards
- Stay focused on reliability

Lessons Learned

Process

- A “least common denominator” approach is instructive but also requires a holistic review
- MISO’s draft standards are more planning-driven; SPP’s standards are more design-driven. The path for the DEDSTF should be clear up front for the task team to be most effective
- Keep in mind that business practices are subordinate to tariff requirements

Lessons Learned

Organization

- Divide work group discussions among areas of specialization (lines; substations; protection, controls, and communication) in the interest of efficiency—the experts are in the room
- Periodic in-person meetings throughout the process promote full participation
- Provide standards in a single document arranged by functional area

References

1. http://www.spp.org/documents/26087/minimum_design_standard_rev_1.pdf
2. https://www.misoenergy.org/Library/Repository/Tariff/BPM%20Drafts/DRAFT%20BPM-029%20Minimum%20Project%20Requirements%20for%20Competitive%20Transmission%20Projects_Clean.pdf
3. https://www.misoenergy.org/STAKEHOLDERCENTER/COMMITTEESWORKGROUPSTASKFORCES/MDRTT/Pages/home.aspx
4. https://www.misoenergy.org/Library/Pages/ManagedFileSet.aspx?SetId=433

Nathan Benedict
nbenedict@itctransco.com
(248) 946-3070

Revision History

- Version 1 – 10/7/2015 – Posted for meeting 1 (10/12/2015)
- Version 2 – 11/9/2015 – Posted for meeting 2 (11/12/2015)
- Version 3 – 12/11/2015 – Posted for meeting 3 (12/16/2015) Rev:12/17/2015

PJM©2015