



# DEDSTF Educational Materials

December 16<sup>th</sup>, 2015  
Version 3



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

December 16, 2015  
Design Entity Standards TF  
Suzanne Glatz

- 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

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

# 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

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

- 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 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>

The screenshot shows the PJM website navigation bar with links for 'about pjm', 'training', 'committees & groups', 'planning', 'markets & operations', and 'documents'. The 'planning' link is highlighted. Below the navigation bar is a sidebar menu with categories like 'Generation Interconnection', 'Merchant Transmission', 'Long-Term Firm TSR Customers', 'Generation Deactivation', 'ARR Analyses', 'RTEP Upgrades & Status', 'RTEP Development', 'Resource Adequacy Planning', 'Planning Criteria', 'Design, Engineering & Construction', 'Transmission Owner Guidelines', 'Transmission Owner Engineering & Construction Standards', and 'Interregional Planning'. The main content area shows the breadcrumb path 'Home > Planning > Design, Engineering & Construction > Transmission Owner Guidelines' and the title 'Transmission Owner Guidelines'. The text explains that these guidelines are published by the Transmission and Substation Subcommittee (TSS) and are subject to PJM's review. A table lists the guidelines with their dates and PDF links. The table has two columns: 'Date' and 'Guidelines'. The 'Date' column is on the right, and the 'Guidelines' column is on the left. The table contains five rows of data. The first row is 'I. Introduction - Technical Requirements & Design Philosophy (PDF)' with a date of '6.2.2002'. The second row is 'II. Transmission System Design Criteria (PDF)' with a date of '11.2001'. The third row is 'III. Substation Bus Configuration & Substation Design Requirements (PDF)' with a date of '6.2.2002'. The fourth row is 'IV. Spare Equipment Philosophy (PDF)' with a date of '2.1999'. The fifth row is 'V. Design, Application, Maintenance & Operation Technical Requirements' with two sub-rows: 'a. Overhead Transmission Lines (PDF)' with a date of '1.2002' and 'b. Power Cables (PDF)' with a date of '3.2002'. On the right side of the page, there is a 'RELATED INFORMATION' section with links to 'Manuals', 'Compliance', 'Transmission Expansion Advisory Committee', 'Regional Planning Process Task Force', 'Eastern Interconnection Planning Collaborative', and 'Regional Transmission Expansion Plan Documents'. Below that is a 'CONTACT INFORMATION' section with a 'Member ? Community' button, a 'Website Feedback' button, and contact details: '(866) 400-8980', '(610) 666-8980', and 'Member Relations'.

Home > Planning > Design, Engineering & Construction > Transmission Owner Guidelines

## Transmission Owner Guidelines

Transmission owner technical guidelines and recommendations are listed below and are published by the Transmission and Substation Subcommittee (TSS.)

The documents included here are still subject to PJM's review and may thus potentially change before being formally published pursuant to section 1.2c of the [Open Access Transmission Tariff \(PDF\)](#).

These documents were originally developed for PJM by the TSS member companies when PJM's footprint matched the North American Reliability Corporation (NERC) MAAC region (contributing companies included AE, BGC, DPL, JCPL, MetEd, PECO, PENELEC, PEPCO, PPL and PSEG.) Many of these companies often reference these documents for their technical requirements and standards as defined in the PJM tariff. PJM now extends into multiple NERC regions. New members typically reference their own documents and therefore these documents no longer represent all of PJM. However, all PJM members are welcome to reference these documents.

Guidelines	Date
I. Introduction - Technical Requirements & Design Philosophy <a href="#">(PDF)</a>	6.2.2002
II. Transmission System Design Criteria <a href="#">(PDF)</a>	11.2001
III. Substation Bus Configuration & Substation Design Requirements <a href="#">(PDF)</a>	6.2.2002
IV. Spare Equipment Philosophy <a href="#">(PDF)</a>	2.1999
V. Design, Application, Maintenance & Operation Technical Requirements	
a. Overhead Transmission Lines <a href="#">(PDF)</a>	1.2002
b. Power Cables <a href="#">(PDF)</a>	3.2002

**RELATED INFORMATION**

- Manuals
- Compliance
- Transmission Expansion Advisory Committee
- Regional Planning Process Task Force
- Eastern Interconnection Planning Collaborative
- Regional Transmission Expansion Plan Documents

**CONTACT INFORMATION**

**Member ? Community**

Website Feedback

(866) 400-8980  
(610) 666-8980  
Member Relations

# 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 not detailed design documents

# 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

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**Dave Parrish**

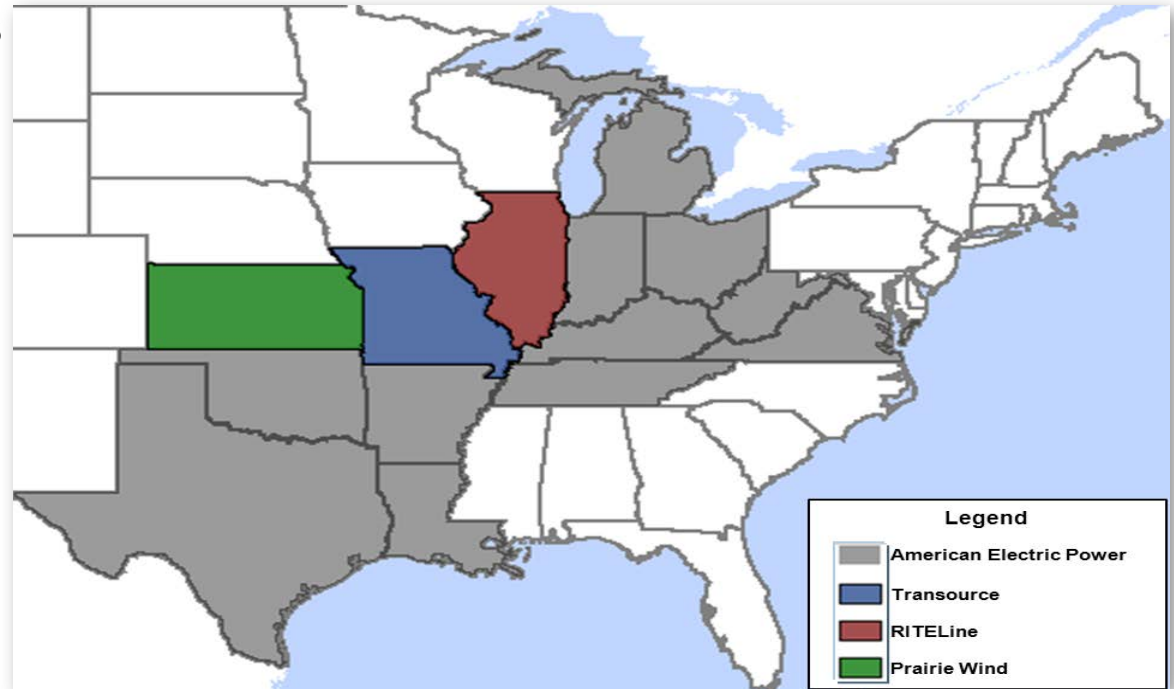
**Transmission Line Standards Manager**

**American Electric Power**

**December 16, 2015**

# AEP System

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



# SPP Minimum Design Standards

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- **“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...”***

# SPP Minimum Design Standards

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- ***“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**

# SPP Minimum Design Standards

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

# SPP Minimum Design Standards

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- **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

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- **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

# SPP Minimum Design Standards

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- **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**



# SPP Minimum Design Standards

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- **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**

# MISO Minimum Project Requirements

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- **“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...”***

# MISO Minimum Project Requirements

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- **“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.”***

# MISO Minimum Project Requirements

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

# MISO Minimum Project Requirements

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- **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

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- **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

# MISO Minimum Project Requirements

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- **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**

# PJM TSS Technical Requirements

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- **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...”*



# PJM TSS Technical Requirements

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- **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**

# Recommendations

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- **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**

# Recommendations

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- **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

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- **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**

# Recommendations

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- **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

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

# Appendix



# DEDSTF Educational Materials

October 12<sup>th</sup>, 2015  
Version 1



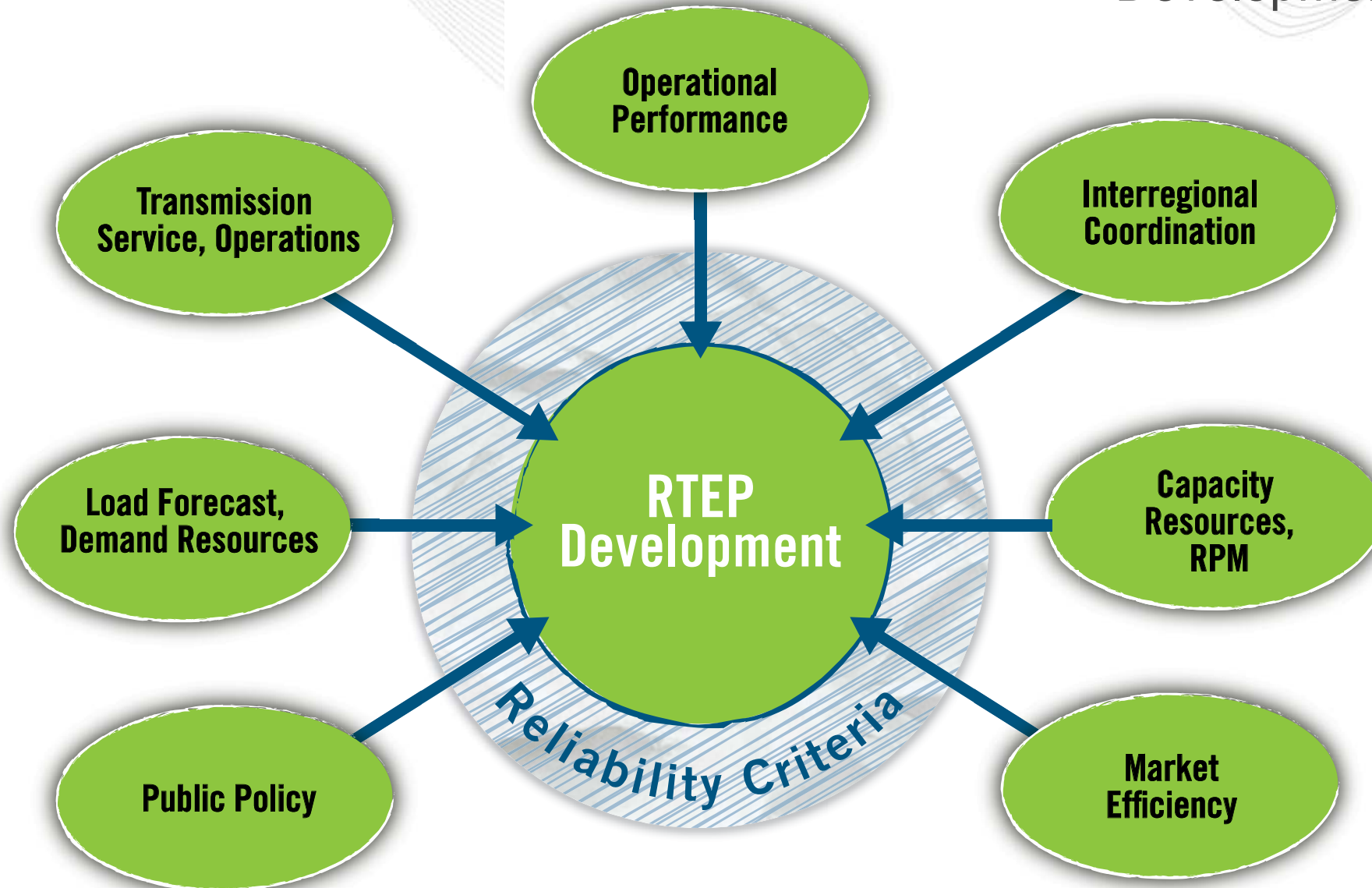


# PJM Planning – Proposal Window Process

Jason Shoemaker  
Infrastructure Coordination

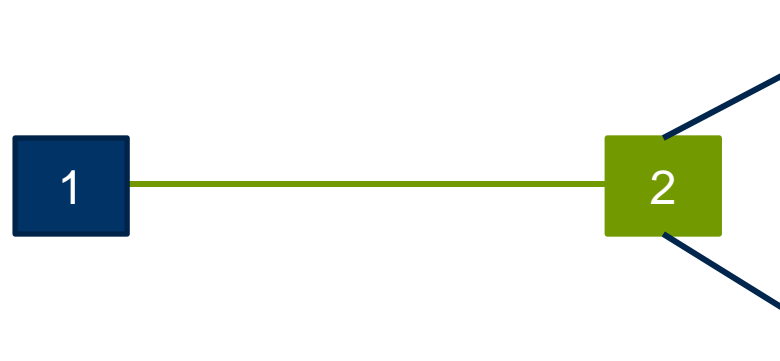
- Order No. 1000 addresses the following topics:
  - Non-incumbent transmission developer reforms
  - Local, regional and interregional transmission planning processes
  - Consideration of transmission needs driven by public policy requirements
  - Transmission cost allocation policies

# Regional Transmission Expansion Plan Development Drivers

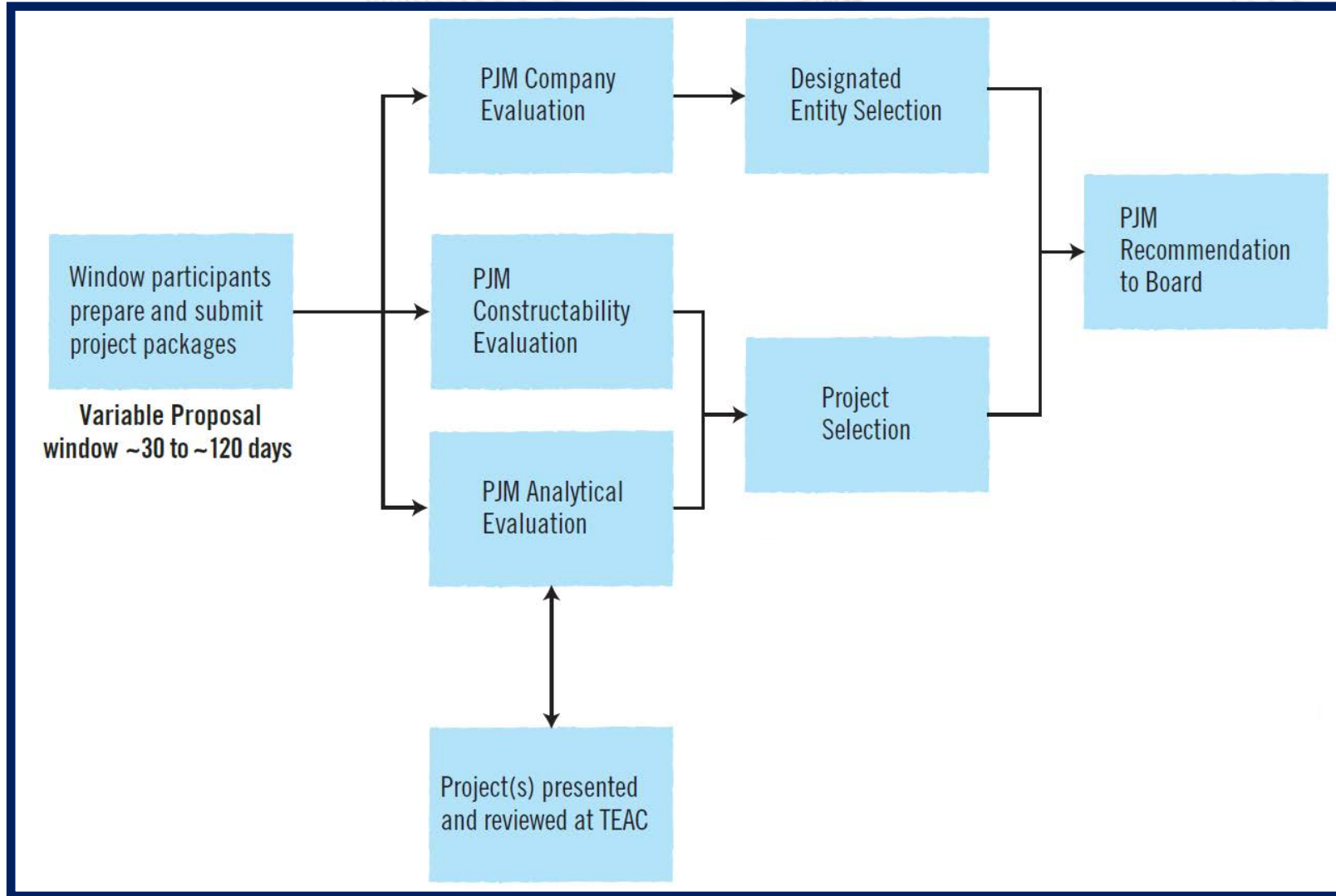


- Proposal window data securely provided to participating entities
- Project proposal window duration based on project classes:
  - *Long-lead projects*: reliability or market efficiency driven upgrades needed in year six or beyond
    - 120 day window
  - *Short-term projects*: reliability driven upgrades 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

- 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



# Project Proposal Evaluation and Selection





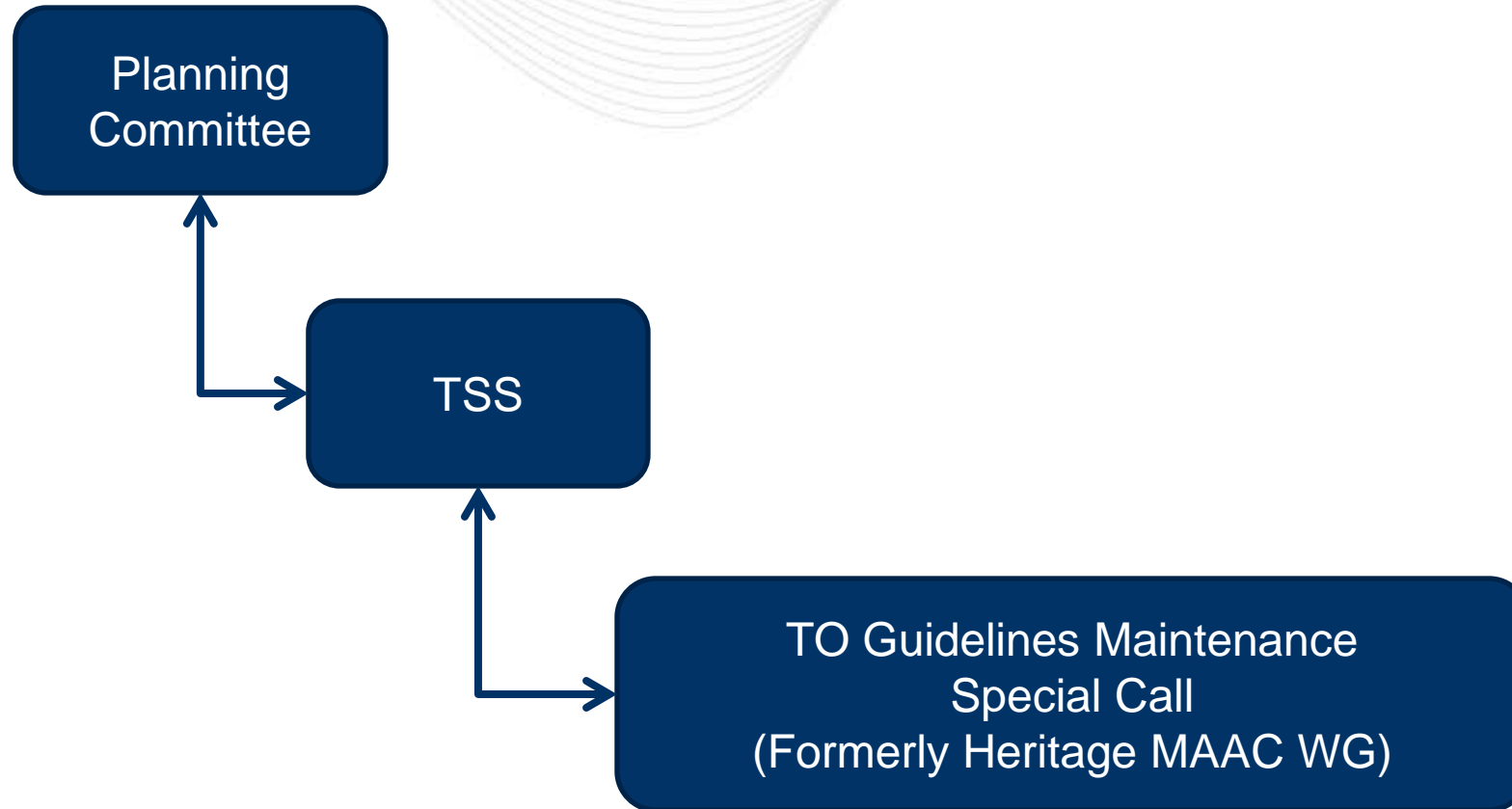
# Transmission and Substation Subcommittee

Jeffery Falciani  
TSS Secretary



- 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>





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



# DEDSTF Educational Materials

November 12<sup>th</sup>, 2015  
Version 2

## 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](#)



# Relay Sub Committee Presentation to the DEDSTF

Stan Sliwa  
Former Chairman of the  
Relay Sub Committee  
November 12<sup>th</sup>, 2015

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



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- Meeting Center
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- Demand Response Subcommittee
- Dispatcher Training Subcommittee
- Governing Document Enhancement & Clarification Subcommittee
- Intermittent Resources Subcommittee

Home ▶ Committees & Groups ▶ Subcommittees ▶ Relay Subcommittee



## Relay Subcommittee

Relay Subcommittee (RS) ensures that all PJM bulk power electrical equipment is adequately protected. The RS focuses on all matters related to the application, design, performance, testing and operation of relay systems and associated equipment on the interconnected bulk power system of PJM member companies. This committee reports to the [Planning Committee \(PC\)](#).

**Chair:** Dennis Field  
**Secretary:** Mark Kuras, PJM

Postings	Date
<a href="#">Protective Relaying Philosophy and Design Guidelines</a>	9.3.2013
<a href="#">Coordination of Protection on Shared Facilities</a>	6.26.2013
<a href="#">Charter</a>	12.10.2012

### RELATED INFORMATION

- [Facilitator Feedback Form](#)
- [Roster Update Form](#)
- [Stakeholder Process Quick Guides & Templates](#)
- [RS Roster](#)
- [Manual 34: PJM Stakeholder Process](#)
- [Committee Structure Diagram](#)

### CONTACT INFORMATION





# 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:  
DMS Document Number:

Dennis Field-ComEd  
xxxxxxx





# PJM Protection Standards Manual

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



*Working to Perfect the Flow of Energy*

PJM Manual 07:  
**PJM Protection Standards**

Revision: 1  
Effective Date: 02/27/2014

Prepared by  
System Planning Division  
Transmission Planning Department

© PJM 2014





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Questions?

# CONNECTING

*Energy Infrastructure*

Development of Minimum Design Standards:  
Review of MISO and SPP

Nathan Benedict  
Regulatory Analyst

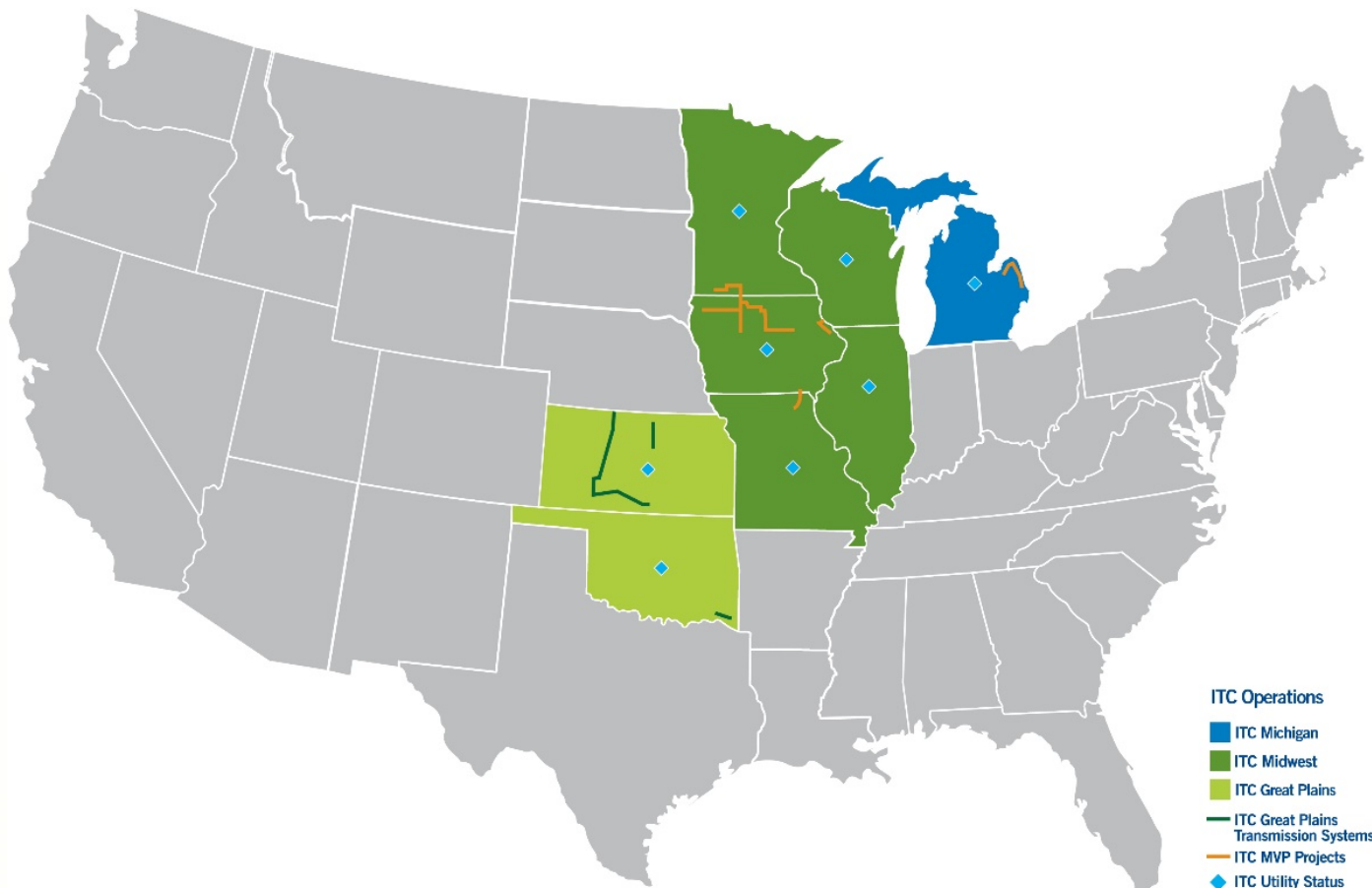


*November 12, 2015*



# 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)<sup>1</sup>
- 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)<sup>2</sup> 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)<sup>3</sup>; 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<sup>4</sup>
- 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](http://www.spp.org/documents/26087/minimum_design_standard_rev_1.pdf)
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# CONNECTING

*Energy Infrastructure*

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- 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