

# Designated Entity Design Standards Task Force Final Report

January 11, 2018



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## Executive summary

With the introduction of competition to the RTEP process via FERC Order 1000, PJM and its stakeholders determined that a set of common minimum requirements for all entities proposing a transmission project via the competitive planning process was required. The Designated Entity Design Standards Task Force (DEDSTF) was chartered to develop these minimum requirements. Comprised of PJM stakeholders representing multiple sectors, and all PJM Transmission Owners, the DEDSTF elected to develop these standards within sub-groups, containing industry veterans and subject matter experts. The task force branched out into three sub groups which, in parallel, reviewed existing accepted industry requirements, existing PJM Transmission Substation Subcommittee guidelines and Manuals, and composed sets of minimum required standards, for Transmission Lines, Substation equipment and Protection and Controls. These minimum required standards must be adhered to by all entities proposing a competitive solution in the PJM Competitive Planning Process that requires the signing of a Designated Entity Agreement. This set of standards was accepted by the PJM members via a Planning Committee endorsement, and is posted to PJM.com.

## Purpose of this report

This report will review and describe the work done by the Task Force of the Planning Committee: Designated Entity Design Standards Task Force (DEDSTF). The group met fifty six times from October 2015 through October 2017. The final version of the DEDSTF Minimum Required Standards was endorsed by the PJM Planning Committee at the November 9<sup>th</sup> 2017 meeting. This report serves as final documentation from the task force, to its parent committee that the deliverables outlined in the Issue Charge and Problem Statement has been completed.

## Issue review

FERC issued a Final Rule on Order No. 1000 in July 2011 and PJM has subsequently submitted a number of compliance filings to establish the process by which the revised planning and cost allocation requirements of the Order are being implemented. PJM has now implemented the process over the course of the last 2 years and, together with the stakeholders, have gained significant experience in managing the competitive planning process contemplated by the Order. Over that time, it has become apparent to PJM and the stakeholders that a number of issues have arisen in carrying out the process that suggest the need for process improvement to make the process more effective and efficient for both PJM and the stakeholder, while maintaining compliance with the Order. PJM, under the auspices of the Planning Committee, is conducting a number of stakeholder feedback sessions, both at the Planning Committee and at other venues, to gather feedback from the stakeholders as to their suggestions for process improvements. This Problem Statement is focused on a specific issue that was identified by stakeholders, Engineering Design standards to be used for greenfield projects that are competitively solicited. For Greenfield projects that are designated as a result of the competitive process, the Designated Entity may follow design standards that differ from those of the zonal transmission owner. Questions were raised at PC/TEAC and Lessons Learned regarding the potential for introducing a weak point in the system or reducing the reliability by less robust solutions. Feedback provided by stakeholders consisted of the following items:

- Ensure new project does not reduce the performance
- Consideration of physical geography and environment
- Consideration of other local requirements or codes
- Well integrated protection
- Robustness of physical construction
- Emergency Restoration
- Future considerations

Based on feedback, PJM recommends the development of minimum design standards, which would take into consideration geography, and physical and other local needs (noise level, undergrounding requirements, etc.) of the

project. The design standards would apply to projects that are competitively solicited and address the following areas.

- Transmission Lines
- Substations
- System Protection and Control Design and Coordination

## DEDSTF Organizational Structure

The DEDSTF was facilitated by a group from PJM including a Chairman, Secretary and a team of Subject Matter Experts. The facilitation team identified co-leads, two individuals from PJM member companies with industry experience in their respective fields, for each of the 3 sub-groups, and additional experts as required for specific segments requiring detailed knowledge. These co-leads had the responsibility of developing requirements, coordinating comments/revisions while representing all stakeholders involved in the development of the DEDSTF minimum requirements. The final details of what was and was not included in these documents resided wholly with the stakeholders. PJM provided guidance and recommendations but did not develop these minimum requirements.

## Education provided

The DEDSTF continually provided education to its members on a series of detailed design and procedural topics. The descriptions below are a high level explanation of the topics that were presented to the members of the DEDSTF.

PJM Subject matter experts led several educational sessions around the FERC orders, documentation and requirements of the competitive planning process. This included detailed explanations of the following:

- FERC Order #1000 and subsequent PJM filings
- PJM Designated Entity Agreement
- PJM Interconnection Coordination Agreement
- PJMs implementation of the Competitive Planning Process
- Existing Transmission and Substation Subcommittee practices and guidelines
- Minimum Design Standards currently in place at SPP and MISO
- Relay Subcommittee practices and responsibilities

Additionally, PJM and its stakeholders led several educational sessions focused on specific detailed aspects of design criteria including:

- Protection and Controls industry design standards and practices
- Substation equipment industry design standards and practices
- Transmission Lines industry design standards and practices
- Underground Lines design standards and practices
- HVDC Technologies
- Individual Stakeholders recommendations of specific requirements from existing documentation

## Final set of Minimum Required Standards

The DEDSTF developed a set of minimum required standards for each of the 3 major sections identified in the problem statement (Protection and Controls, Substation Equipment and Transmission Lines).

At the June 2017 Planning Committee, the following sections were endorsed by PJM Stakeholders:

- Overhead Transmission Lines
- Substation Equipment
- System Protection and Control Design Coordination

The task force continued to finalize the requirements of the Underground Transmission lines sections, which was ultimately endorsed by the Planning Committee at their November 2017 meeting.

It is important to note that the DEDSTF received education on HVDC technologies and determined that it was not appropriate to establish minimum standards for HVDC at this time, and that the need for this would be revisited at a future date.

It is also important to note that per the Problem Statement/Issue Charge, the discussion of ratings methodology was outside of the scope of this task force, and therefore is not included in the final set of minimum requirements.

The official set of DEDSTF Minimum Required Standards can be found at the following link:

<http://pjm.com/-/media/committees-groups/task-forces/dedstf/postings/20170626-designated-entity-design-standards-task-force-document.ashx?la=en>

and are posted to the Design, Engineering & Construction Page, within the planning section of [www.pjm.com](http://www.pjm.com).

## Conclusion

The final product of the DEDSTF was presented to the Planning Committee with the full support of the DEDSTF membership, therefore no alternatives were presented, and the group has completed all requirements and deliverables included in the Problem Statement/Issue Charge.

PJM and the DEDSTF members feel strongly that even though the deliverables have been completed, there will be a need for a periodic review of these minimum required standards, and therefore is recommending revisions to the charter of the DEDSTF that include a biennial review. In order to incorporate this ongoing review the task force will need to transform into a subcommittee, as reflected in the proposed charter revisions.

## Appendix

### *Planning Committee materials:*

November 9, 2017: Seeking PC endorsement of Underground Lines Section of DEDSTF Minimum Required Standards

[DEDSTF Underground Lines Presentation](#)

[DEDSTF Underground Lines Redline](#)

[DEDSTF Underground Lines Clean](#)

October 12, 2017: PC first read of Underground Lines Section of DEDSTF Minimum Required Standards

[DEDSTF Underground Lines Presentation](#)

[DEDSTF Underground Lines Redline](#)

[DEDSTF Underground Lines Clean](#)

June 8, 2017: Seeking PC endorsement of Overhead Lines, Protection and Substation Sections of DEDSTF Minimum Required Standards

[DEDSTF Overhead Lines, Substation and Protection Presentation](#)

[DEDSTF Overhead Lines, Protection and Substation Combined Sections](#)

May 4, 2017: PC first read of Overhead Lines, Protection and Substation Sections of DEDSTF Minimum Required Standards

[DEDSTF Overhead Lines, Substation and Protection Presentation](#)

[DEDSTF Overhead Lines Section](#)

[DEDSTF Protection Section](#)

[DEDSTF Substation Section](#)



April 13, 2017: PC pre-first read of Overhead Lines, Protection and Substation Sections of DEDSTF  
Minimum Required Standards

[DEDSTF Update to Planning Committee](#)

[Substation Group Draft Requirements](#)

[Lines Group Draft Requirements](#)

[Protection Group Draft Requirements](#)

March 9, 2017: DEDSTF Update to PC

[DEDSTF Update to Planning Committee](#)

[Substation Group Draft Requirements](#)

[Lines Group Draft Requirements](#)

[Protection Group Draft Requirements](#)

December 15, 2016: DEDSTF Update to PC

[DEDSTF Update to Planning Committee](#)

September 15, 2016: DEDSTF Update to PC

[DEDSTF Update to Planning Committee](#)

June 9, 2016: DEDSTF Update to PC

[DEDSTF Update to Planning Committee](#)

January 7, 2016: DEDSTF Charter Endorsement

[DEDSTF Charter Endorsement](#)

December 3, 2015: DEDSTF Charter First Read

[DEDSTF Charter First Read](#)

July 9, 2015: PC Endorsement of Problem Statement

[DEDS Problem Statement Presentation](#)

[DEDS Problem Statement First Read](#)

June 11, 2015: PC first read of Problem Statement

[DEDS Problem Statement Presentation](#)

[DEDS Problem Statement First Read](#)

### *DEDSTF Meeting materials*

October 19, 2017: Finalize revisions to underground standards, HVDC on hold discussion

[Agenda](#)

[Underground Standards](#)

[Minimum Requirements Document](#)

[Minimum Requirements Document – Post Meeting Version](#)

September 21, 2017: Revise underground standards, HVDC discussion

[Agenda](#)

[Underground Standards – Post Meeting Version](#)

[Underground Standards & AEP Comments – Post Meeting Version](#)

[Underground Standards Final Revision– Post Meeting Version](#)

September 7, 2017: HVDC Presentation

[Agenda](#)

[DEDSTF - HVDC Presentation](#)

[HVDC Development Process](#)

[Underground Standards – Post Meeting Version](#)

August 17, 2017: Review underground standards updates and review HVDC meeting outline

[Agenda](#)

[HVDC Presentation Outline](#)

[Underground Standards – 2017/07/20 Post Meeting Markup](#)

[Underground Standards – 2017/08/17 Meeting Revisions](#)

[Underground Standards – Post Meeting](#)

[Underground Standards – Nextera Comments](#)

July 20, 2017: Discuss and review of underground standards updates

[Agenda](#)

[Underground Standards](#)

[Underground Standards – Post Meeting](#)

[HVDC Outline](#)

June 15, 2017: Discuss and review of underground standards updates

[Agenda](#)

[Underground Standards](#)

May 22, 2017: Discuss and review of DEDSTF Protection Document

[DEDSTF Protection Document – Relay Subcommittee Review](#)

May 18, 2017: Discuss and review of underground standards, HVDC outline, substation subgroup, and DEDSTF format documents

[Agenda](#)

[Substation Subgroup – BGE Comments](#)

[Substation Subgroup – ComEd Comments](#)

[Substation Subgroup – Ameren Comments](#)

[DEDSTF Document Format](#)

[Substation Subgroup](#)

[Underground Standards](#)

[HVDC Outline – Post Meeting](#)

May 15, 2017: Discuss and review of substation subgroup document

[Substation Subgroup – ComEd Comments](#)

[Substation Subgroup – 2017/05/01 Version](#)

[Substation Subgroup – Ameren Comments](#)

[Substation Subgroup – BGE Comments](#)

May 9, 2017: Discuss and review of DEDSTF protection document

[DEDSTF Protection – BGE Comments](#)

[DEDSTF Protection – ComEd Comments](#)

[DEDSTF Protection – DUKE Comments](#)

[DEDSTF Protection – MD Comments](#)

May 1, 2017: Discuss and review of substation subgroup document

[Substation Subgroup – ComEd Comments](#)

[Substation Subgroup](#)

[Substation Subgroup – BGE Comments](#)

April 26, 2017: Discuss and review of substation subgroup and lines subgroup documents

[Agenda](#)

[Substation Subgroup](#)

[Lines Subgroup with Unresolved Issues](#)

[Substation Subgroup – FE Comments](#)

[Lines Subgroup – Underground Submarine Cable Rating](#)

[Lines Subgroup – Underground Standards Markup](#)

[Substation Subgroup – Bus Configuration](#)

[Substation Subgroup – DEDSTF Design Criteria](#)

[Substation Subgroup – BGE Comments](#)

[Lines Subgroup – Post Meeting Resolutions](#)

April 10, 2017: Discuss and review of TSS guidelines and DEDSTF substation documents

[Underground Submarine Transmission Cable](#)

[Interim TSS Guidelines – Spares](#)

[Interim TSS Guidelines – O&M](#)

[Interim TSS Guidelines – Underground Section Markups](#)

[DEDSTF Substation – DLC Comments](#)

[DEDSTF Substation – Dominion Comments](#)

[DEDSTF Substation](#)

April 3, 2017: Discuss and review of substation document

[Substation Civil/Structural – DLC Comments](#)

[Substation Civil/Structural – BGE Comments](#)

[Substation Civil/Structural – NEER Comments](#)

March 30, 2017: Discuss and review of DEDSTF protection document

[DEDSTF Protection – PJM Comments](#)

[DEDSTF Protection – DLC Comments](#)

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[DEDSTF Protection Draft Version 1 – Post Meeting](#)

March 28, 2017: Discuss and review of line document

[Lines Document – DLC Comments](#)

[Lines Document – LS Power Comments](#)

[DEDSTF Lines Subgroup – LSP, DLC, & FE Proposal](#)

March 27, 2017: Discuss and review of substation document

[Substation Document – Dominion Comments](#)

March 16, 2017: Discuss and review of line, protection, and substation documents

[Agenda](#)

[Lines Subgroup – PJM TSS Underground Cable Guidelines](#)

[Lines Subgroup – Underground Submarine Cable](#)

[Protection Subgroup – DEDSTF Protection](#)

[Protection Subgroup – Manual 7 Appendix F Revision 2](#)

[Substation Subgroup – DEDSTF Layout](#)

February 16, 2017: Discuss and review of line, protection, and substation documents

[Agenda](#)

[DEDSTF Battery Poll](#)

[DEDSTF Format](#)

[Lines Subgroup – DEDSTF Draft Edits](#)

[Protections Subgroup – DEDSTF Revision 1](#)

[Substation Subgroup – DEDSTF Layout](#)

[DEDSTF Protection Wording Comparison](#)

[DEDSTF Draft Edits](#)

February 8, 2017: Discuss and review of coordination and substation documents

[AC Station Service – ME Comments](#)

[Coordination Trade Off](#)

[Substation Subgroup – DEDSTF Layout](#)

February 7, 2017: Discuss and review of substation documents

[Substation Subgroup – DEDSTF Layout](#)

January 24, 2017: Discuss and review of line, PJM manual, protection, and substation documents

[Agenda](#)

[Lines Subgroup – DEDSTF Draft](#)

[Lines Subgroup – DEDSTF Draft Post Meeting](#)

[PJM Relay Committee – Manual 7 Appendix F Revision 2](#)

[Protection Subgroup – DEDSTF Design Revision 1](#)

[Substation Subgroup – DEDSTF Layout](#)

January 19, 2017: Discuss and review of line documents

[Lines Subgroup – DEDSTF Draft Meeting Edits](#)

January 11, 2017: Discuss and review of line documents

[Lines Subgroup – DEDSTF Draft](#)

January 5, 2017: Discuss and review of substation documents

[Substation Subgroup – DEDSTF Layout \(Control Cubicle\)](#)

December 12, 2016: Discuss and review of lines, substation, and protection documents

[Agenda](#)

[Lines Subgroup – DEDSTF TEC Requirements](#)

[Lines Subgroup – DEDSTF TEC Structural Loading](#)

[Lines Subgroup – Clearance & Galloping Post Meeting](#)

[Lines Subgroup Update](#)

[Substation Subgroup Update](#)

[Protection Subgroup – DEDSTF Design](#)

[Substation subgroup – DEDSTF Layout](#)

November 30, 2016: Discuss and review of lines documents

[Lines Subgroup Requirements Update](#)

[Lines Subgroup – Structural Loading Post Meeting](#)

November 29, 2016: Discuss and review of protection document

[Protection Subgroup Design](#)

November 15, 2016: Discuss and review of protection, substation, and lines documents

[Agenda](#)

[Protection Subgroup – DEDSTF Protection](#)

[Substation Subgroup – DEDSTF Layout](#)

[Lines Subgroup – Lines Clearance Draft](#)

[Lines Subgroup – Structural Loading Post Meeting](#)

[Lines Subgroup – PJM DEDSTF Educational Material](#)

[Lines Subgroup – DEDSTF 235 Presentation](#)

October 25, 2016: Discuss and review of substation, lines, and protection documents

[Agenda](#)

[Substation Subgroup – DEDSTF Layout](#)



[Substation Subgroup – DEDSTF Substation Design](#)

[Substation Subgroup – SPP Draft Design Standards](#)

[Line Subgroup – Lines Clearance Draft](#)

[Lines Subgroup – Structural Loading](#)

[Lines Subgroup – MDS Loading Criteria](#)

[Protection Subgroup – Document Update](#)

[Protection Subgroup – ComEd Interconnection Example](#)

[Protection Subgroup – AEP Requirements](#)

[Protection Subgroup – Minimum Design Requirements for FERC 1000](#)

October 5, 2016: Discuss and review of lines documents

[Lines Subgroup – DEDSTF Structural Loading Requirements](#)

[Lines Subgroup – TSSS MDS Loading Criteria Comparison](#)

[Lines Subgroup – SPP Transmission MDS Excerpt Draft](#)

[Lines Subgroup – Line Clearances Draft](#)

September 12, 2016: Discuss and review substation documents

[Agenda](#)

[Substation Subgroup – DEDSTF Layout](#)

[Substation Subgroup – DEDSTF Substation Design Topics](#)

[Substation Subgroup – SPP Draft Minimum Design Standards](#)

August 31, 2016: Discuss and review protection document

[Agenda](#)

[Protection Subgroup – JAB Comments](#)

[Example Substations](#)

August 17, 2016: Discuss and review of line, protection, and substation documents

[Agenda](#)

[Line Subgroup – DEDSTF Line Clearance Draft](#)

[Line Subgroup – DEDSTF Structural Loading Requirements](#)

[Protection Subgroup – DEDSTF Protection Document JAB Comments](#)

[Protection Subgroup – Example Substations](#)

[Protection Subgroup Update](#)

[Substation Subgroup – PJM TSS Sed Sec III](#)

[Substation Subgroup Update](#)

[Lines Subgroup Update](#)

August 10, 2016: Discuss and review of protection document

[Protection Subgroup – DEDSTF Protection Document](#)

August 8, 2016: Discuss and review of line document

[Line Subgroup – DEDSTF TEC Requirements](#)

July 19, 2016: Discuss and review of substation, line, and protection documents

[Agenda](#)

[Substation Subgroup – Proposed Section II Changes](#)

[Substation Subgroup – NERC-CIP-006-6 Standard](#)

[Lines Subgroup – SPP Draft](#)

[Lines Subgroup – OH Standards](#)

[Protection Subgroup – Topic Outline](#)

[Lines Subgroup – Conductors](#)

[Lines Subgroup – DEDSTF Galloping Design Standard](#)

[Substation Subgroup – PJM TSS Std Sec III](#)

## [Response to Lines Subgroup Questions](#)

July 11, 2016: Discuss and review of line document

[Lines Subgroup – Electrical Parameters](#)

[Lines Subgroup – Live Line Consideration](#)

[Lines Subgroup – Live Line Talking Points](#)

June 15, 2016: Discuss and review of protection, substation, and line documents

[Agenda](#)

[Education Materials](#)

[Lines Subgroup – OH Design Standards](#)

[Lines Subgroup – Spreadsheet Item List](#)

[Protection Subgroup – Topic Outline](#)

[SPP Draft – Minimum Standards for Competitive Upgrades](#)

[Substation Subgroup – Introduction](#)

[Substation Subgroup – Substation Design Topics](#)

[Synchrophasors – PMU Placement Strategy](#)

[Synchrophasors – PMU Placement Strategy & Generator PMUs](#)

[June 9<sup>th</sup> PC Meeting Update](#)

May 16, 2016: Discuss and review of protection, substation, and line documents

[Agenda](#)

[Protection Subgroup – Topic Outline](#)

[Protection Subgroup Update](#)

[Substation Subgroup – Design Topics](#)

[Substation Subgroup Update](#)

[Lines subgroup Update](#)

[Lines Subgroup – Status](#)

[Lines Subgroup – Scope & Guiding Principles](#)

[Lines Subgroup – OH Standards Worksheet](#)

April 14, 2016: Discuss and review of substation, line, and protection documents

[Agenda](#)

[Substation Subgroup – Design Topics](#)

[Lines Subgroup – Scope & Guiding Principles](#)

[Protection Subgroup – Manual 7 Revision 2 Draft](#)

[Lines Subgroup – Standards Worksheet](#)

March 22, 2016: Review of DEDSTF material

[Agenda](#)

[DEDSTF – Draft Minutes](#)

[DEDSTF – Charter](#)

[DEDSTF – Poll & Comments](#)

[Documentation Links](#)

[Problem Statement Examples & Requirements Document](#)

[DEDSTF – Educational Materials](#)

February 23, 2016: Review of DEDSTF poll

[Agenda](#)

[DEDSTF – Draft Minutes](#)

[Poll Questions](#)

[Poll Results & Next Steps](#)

January 21, 2016: Discuss and review of protection, substation, and line documents

[Agenda](#)

[Minutes](#)

[DEDSTF – Draft Minutes](#)

[Charter](#)

[Work Plan](#)

[DEDSTF – Organization Options](#)

December 16, 2015: DEDSTF discussions

[Agenda](#)

[Minutes](#)

[DEDSTF – Draft minutes](#)

[Charter](#)

[Interest Identification](#)

[Educational Materials](#)

[Relay Subcommittee PJM Manual](#)

[Options Matrix Design Components](#)

[Work Plan](#)

November 12, 2015: Review DEDSTF plan and other materials

[Agenda](#)

[DEDSTF – Draft Minutes](#)

[Charter for December Endorsement](#)

[Work Plan](#)

[Educational Materials](#)

[ITC Presentation](#)

[Interest Identification](#)

[Interest Identification – Post Meeting](#)

October 12, 2015: DEDSTF introductions and discussion

[Agenda](#)

[Problem Statement & Issue Charge](#)

[Draft Charter](#)

[Work Plan](#)

[Consensus Resolution Process](#)

[Educational Materials](#)