Revision to ISO Transmission Planning Standards

Market and Infrastructure Policy
Straw Proposal

DRAFT

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Straw Proposal

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1 Introduction

The ISO is proposing to modify the ISO Planning Standards to clarify and codify existing policy applications in the standards as well as updates due to changes within the NERC Transmission Planning (TPL) standards. The three areas that the ISO is planning on making the specific changes to Planning Standards are as follows:

- Non-consequential load shedding for Category C contingencies
- Extreme Event mitigation for San Francisco Peninsula area
- Changes to NERC Transmission Planning Standards (TPL)

This discussion paper is the first step in initiating the stakeholder process to make the proposed changes to the ISO Transmission Planning Standards. The ISO intends to take the revised planning standards to the ISO Board of Governors for approval in September 2014. The schedule for the stakeholder process and revisions to the planning standards is provided below.

2 Overview

The ISO is required through its tariff to adhere to planning standards established by the North American Electric Reliability Corporation (NERC), as well as regional standards, criteria and business practices established by the Western Electricity Coordinating Council (WECC). In addition, ISO's FERC-approved tariff provides for the approval of Planning Standards by the ISO's Board of Governors, which provides the necessary vehicle for needs specific to the ISO controlled grid to be properly addressed in ensuring acceptable system reliability. the ISO has identified such specific requirements necessary for reliable system operation that are referred to and documented as the ISO Planning Standards.

All of these planning standards are critical to providing reliable service to customers. They also form the foundation or basis for all planning activities. Transmission projects are developed and advanced as necessary to ensure compliance with these standards, and when transmission projects are advanced for other reasons, such as meeting economic or policy considerations, those projects must also remain compliant with approved planning standards.

As such, the planning standards set the direction for planning activities, and the basis for many of the transmission projects approved by the ISO.

The ISO has identified three areas in which further clarity in the Planning Standards would be beneficial, or which need to be updated to avoid inconsistencies with NERC mandatory standards. The three areas that have been identified are:

- Non-consequential load shedding for Category C contingencies (needed to codify and provide further clarity of existing and historical planning practices regarding these multiple contingency events)

- Extreme Event mitigation for San Francisco Peninsula area (needed to address the growing concerns for this particularly unique area)
- Changes necessary to maintain consistency with NERC Transmission Planning Standards (TPL)

2.1 Schedule

The ISO plans to complete this stakeholder process by August 2014 so that the Grid Planning Standards can be taken to the ISO Board for approval at the September Board meeting. As such, the ISO offers the following updated schedule for this stakeholder process:

Date	Action
March 26	Post issue paper/straw proposal
April 11	Stakeholder meeting (in person)
April 25	Stakeholder comments due by 5:00 p.m.
May 14	Post revised straw proposal
May 21	Stakeholder web conference
June 4	Stakeholder comments due by 5:00 p.m.
July 2	Post Draft Final Proposal
July 16	Stakeholder web conference
July 30	Stakeholder comments due by 5:00 p.m.
September 18-19	ISO Board meeting

3 Non-consequential load dropping: Category C Contingencies

Category C contingencies are more precisely defined in the NERC TPL standards, but can be summarized as the more probable multiple contingency events; less probable than the single contingency Category B events, but more probable than the Category D "extreme" events defined in the NERC TPL standards. The ISO is intending to provide further clarity in the ISO Planning Standards regarding when load shedding through Special Protection Systems is considered an acceptable means to address planning needs for Category C contingencies. The Planning Standards currently provide guidelines regarding system implications of SPS operation and SPS design considerations that need to be taken into account, but do not currently address the current and historical practices regarding considerations of non-consequential load shedding for Category C contingencies.

The ISO's current practice in local area planning, which is consistent with historical practices prior to and since the creation of the ISO, is to not rely upon high density urban load shedding as a long term planning solution for Category C contingencies. This practice has not previously been codified in the ISO Planning Standards, however. Also, further clarification of the considerations in the viability of load shedding as a short term measure, or in lower density areas is also being considered.

3.1 NERC Standard TPL 003

NERC Standard TPL 003 Requirement R1 states the following:

"The Planning Authority and Transmission Planner shall each demonstrate through a valid assessment that its portion of the interconnected transmission systems is planned such that the network can be operated to supply projected customer demands and projected Firm (non-recallable reserved) Transmission Services, at all demand Levels over the range of forecast system demands, under the contingency conditions as defined in Category C of Table I."[1]

In Table I of TPL003 the following footnote is applied to all Category C contingencies listed.

"Depending on system design and expected system impacts, the controlled interruption of electric supply to customers (load shedding), the planned removal from service of certain generators, and/or the curtailment of contracted Firm (non-recallable reserved) electric power transfers may be necessary to maintain the overall reliability of the interconnected transmission systems."

The key points from these two TPL 003 excerpts, in the context of this study, are the following:

1. The ISO must demonstrate that it can operate the transmission system to supply peak load during a Category C outage.

2. The ISO must review the system design and expected system impacts when considering load shedding as a mitigation measure for a Category C outage.

[1] http://www.nerc.com/_layouts/PrintStandard.aspx?standardnumber=TPL-003-0b&title=System Performance Following Loss of Two or More Bulk Electric System Elements (Category C)&jurisdiction=United States

3.2 Local Area Long-Term Planning

A local area is characterized by relatively small geographical size, with limited transmission import capability and most often with scarce resources that usually can be procured at somewhat higher prices than system resources. These areas are planned to meet the minimum performance established in mandatory standards or other historically established requirements, but tend to have little additional flexibility beyond the planned-for requirements taking into account both local generation and transmission capacity. The need for system reinforcement in a number of local areas is expected to climb due to projected resource retirements, with Categoy C contingencies playing a material role in driving the need for reinforcement. Relying on load shedding on a broad basis to meet these emerging needs would run counter to historical and current practices, resulting in general deterioration of service levels. One of the fundamental ISO Tariff requirements is to maintain service reliability at pre-ISO levels, and this further drives the need to codify the circumstances in which load shedding is not an acceptable long term solution.

The ISO system has approximately 14 special protection schemes that drop load for category C contingencies on the 100 kV system and above. Two of these SPS will be removed once transmission upgrades that are under development are in-place. The remaining SPS are not relied upon in order to serve load in high population density areas from the high voltage transmission system. In addition, the ISO ensures that new special protection systems adopted in the long-term transmission plan for local areas do not rely on load shedding in high population density areas for outages on the 100 kV and above transmission system. This current practice, which has considerable historical support, is based on not planning to shed large blocks of high density urban load for category C contingencies as a long term solution.

The ISO has explored the practices of other ISOs and RTOs regarding load shedding for category C contingencies and found that four of the nine ISO-RTO have identified various degrees of differences in planning criteria between their overall footprints and some of the large urban centerswithin those footprints. The differences relate mainly to locational capacity requirements, assumptions on the availability of generation resources (due to environmental restrictions), respecting more stringent contingencies than for the rest of the system, or lower ability to adjust the system following contingencies. The purpose of these criteria for large urban centres is in part to not rely on interruption of firm customer demand in lieu of planned transmission or generation to meet TPL 003 and for other credible contingency events. Out of the remaining five ISO-RTO that we talked to four of them do not rely on, or limit the amount of, interruption of firm customer Demand in lieu of planned transmission or generation to meet TPL 003 throughout their footprint. The fifth remaining ISO-RTO, defers to the Transmission Owners discretion regarding the use of load shedding to address a Category C violation as long as the NERC TPL standards are not violated.

The need for more stringent planning criteria for large urban centres seems to be in part driven by the population density and potential (economic and safety) impact that loss of electricity supply would have on such highly populated areas such as New York City, and in part by objective and legacy constraints

the various systems have, such as Dallas/Fort Worth area where environmental restrictions are likely to lead at times the loss of fossil generation.

The ISO's approach of avoiding urban load shedding in high density areas is therefore consistent directly or indirectly with the general approaches of the other ISOs and RTOs.

3.2.1 *Population density*

In general the electric utility industry avoids dropping load in high population density areas due to, among other reasons, high impacts to the community from hospitals and elevators to traffic lights and potential crime.

California Example: The San Diego area is a high density population area.

The diagram below shows the population densities for every county in California. San Diego County is one of nine counties in the ISO footprint which show significant population densities. The next diagram showing the population by census tract in San Diego County shows that practically all of the population is concentrated in the coastal area of San Diego County. The San Diego area has approximately 5,100 MW of load. Approximately 5,000 MW of that load is in high population density areas (areas with more than 1,000 people per square mile).

Figure 1: Population Density

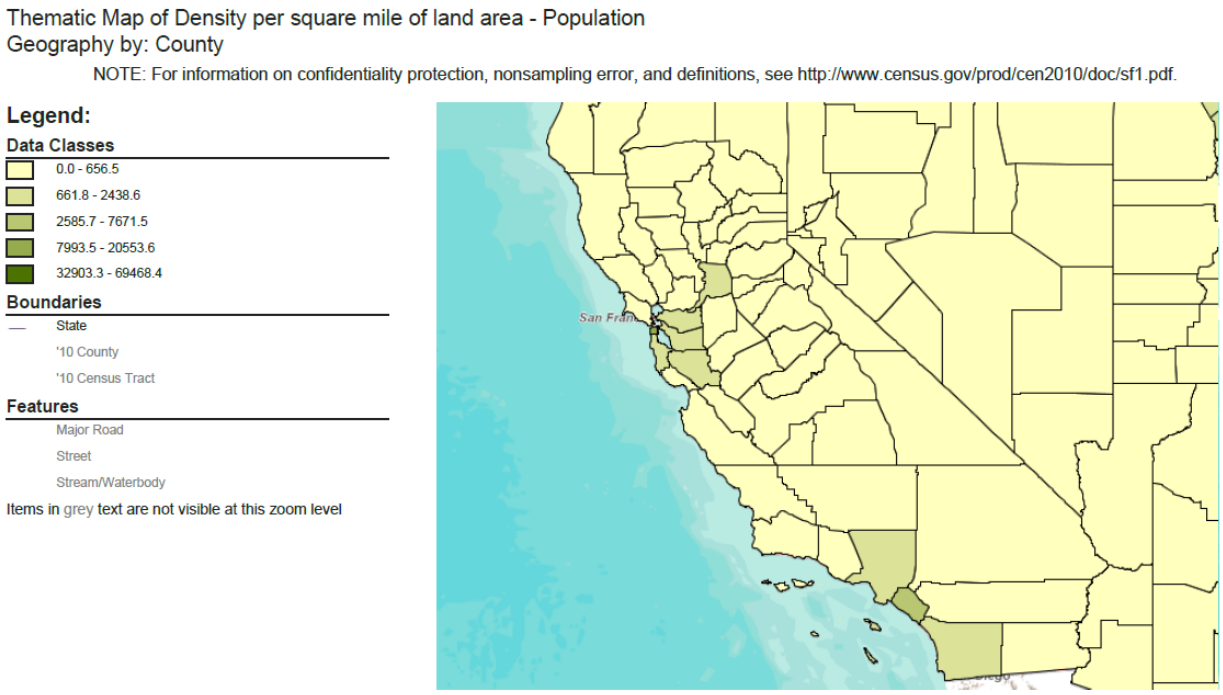
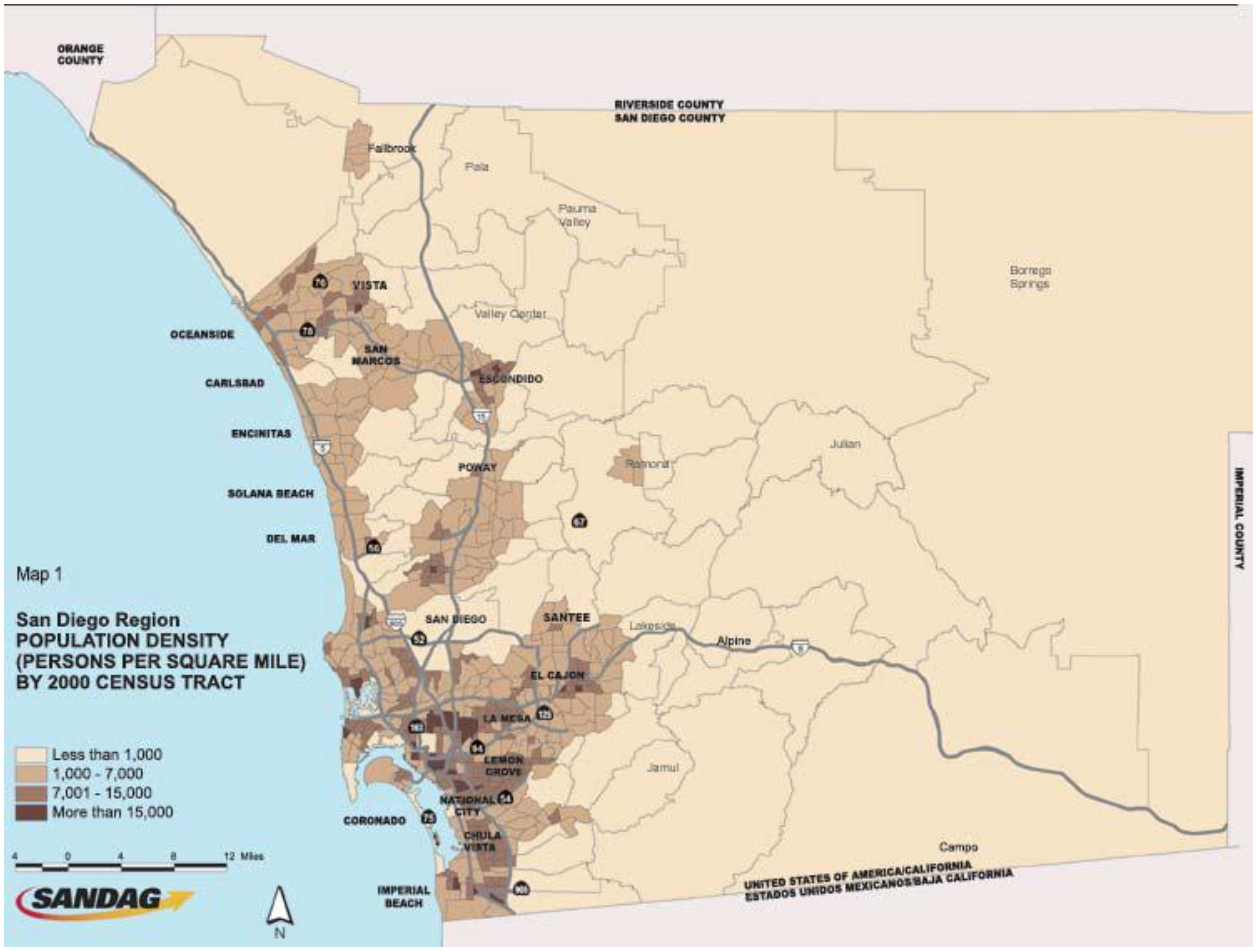


Figure 2: San Diego Region Population Density



High density urban load is generally considered to refer to an area with population over 1,000 people per square mile .

3.2.2 *Risk of outage*

In considering if load shedding is a viable mitigation in either the short term, or the long term for local areas that would not call upon high density urban load, case-by-case assessments need to be considered. Assessments should take in consideration risk assessment of the outage(s) that would activate the SPS including common right of way, common structures, history of fires, history of lightning, common substations, restoration time, coordination among parties required to operate pertinent part of the transmission system, number of resources in the area, outage history for resources in the area, retirement impacts, and outage data for the local area due to unrelated events.

Use of Benefit to Cost Ratio calculation

Benefit to Cost Ratio analysis can provide meaningful input into transmission reinforcement decisions, particularly in the case of radial systems and the need to loop or otherwise provide back-up service to

radially-served loads. The ISO Planning Standards includes a chapter addressing "Planning for New Transmission versus Involuntary Load Interruption Standard" to address these circumstances, and BCR analysis is discussed in that context.

However, these BCR type calculations do not necessarily give correct values or magnitude of impacts for large and complex networked transmission systems. This is because several factor including duration of interruption, number of interruptions per year, and the time of occurrence of interruption are generally beyond existing modeling capabilities to properly quantify within looped transmission systems considering multiple possible contingency combinations and availability of multiple local resources.

The ISO considers that BCR type calculations may be provided as additional information when planning for non-consequential load loss in these type of events however this data may not be the main driver or sole justifier for decisions to move forwards with either SPS or transmission upgrades.

3.3 System Wide Long-Term Planning

System planning is characterized by much broader geographical size, with greater transmission import capability and most often with plentiful resources that usually can be procured at somewhat lower prices than local area resources. Due to this fact more resources are available and are easier to find, procure and dispatch. Reliance on non-consequential load drop for double contingencies is mostly used to increase the transfer capability of major transmission paths across California and the West to the benefit of all and with rather rare occurrences of real outages. The operators have a greater availability of resources at their disposal and take active steps to reduce reliance on these load dropping schemes any time there active fires in the areas of concern or other known actions or phenomenon that could hinder the flow of electricity across these transmission paths.

For the reasons described above, the ISO is not proposing to eliminate existing system wide SPS schemes that include some non-consequential load dropping for common corridor double contingency events. However, prudent system design should include separating the distance between transmission circuits 300 kV and above more than 250 ft centerline to centerline, so that they are not categorized as a category C simultaneous contingency.

3.4 Short-Term Planning

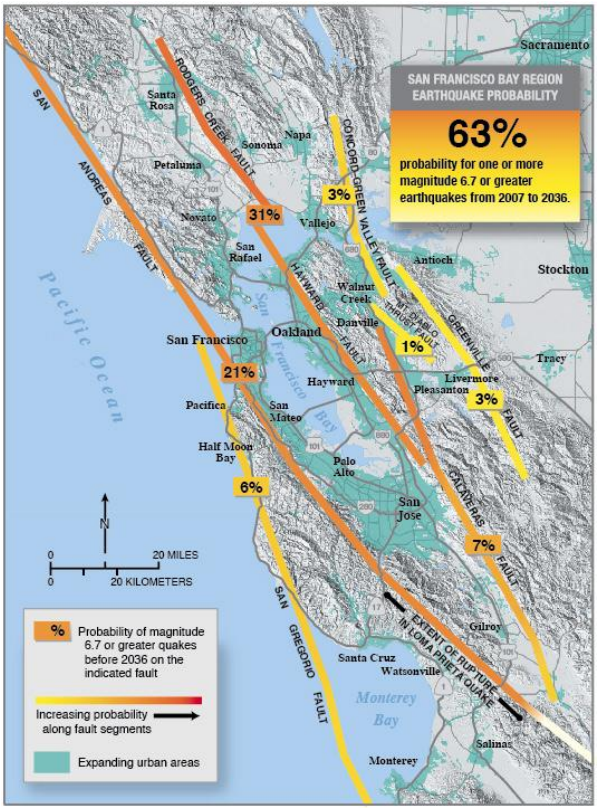
In the near team any SPS, may be used to bridge the gap between real-time operations and the time when system reinforcements could potentially be built and/or otherwise made available. The ISO intends to add this clarification to the ISO Planning Standards.

4 San Francisco-Peninsula Extreme Event Reliability Standard

The ISO assessment conducted as a part of its 2013-2014 transmission planning process has determined that there are unique circumstances affecting the San Francisco area that form a credible basis for considering mitigations of risk of outages and of restoration times that are beyond the reliability standards applied to the rest of the ISO footprint. The Peninsula area does have unique characteristics in the western interconnection due to the urban load center, geographic and system configuration, and potential risks with challenging restoration times for these types of events. Within the United States, a similar area for comparison would be the New York City area which has established specific requirements for operation of the system in the area as a part of the New York State Reliability Council Reliability Rules.[2]

The probability of earthquakes occurring in the Greater Bay Area has been forecasted as illustrated in Figure 3 from the USGS website[3]. The figure illustrates the probability of earthquakes of magnitudes 6.7 or greater occurring in the Bay area in the next 30 years. With this, the issue is not so much related to if a seismic event is to occur in the area, but where exactly and to what extent the impact of such event will be.

Figure 3 – Bay Area Earth Quake Probabilities



[2] http://www.nysrc.org/pdf/Reliability%20Rules%20Manuals/RR%20Manual%20V32%20Final%201-11-13%20.pdf
[3] http://earthquake.usgs.gov/regional/nca/ucerf/

At one time, the ISO Planning Standards did provide the San Francisco-Bay Area a special standard that had to do with resource unavailability at peak conditions and treatment of system normal conditions with certain resources out of service. This standard was eliminated after all old and less reliable resources in the San Francisco-Peninsula retired and transmission facilities were brought into service. These facilities include the Jefferson-Martin 230 kV cable and the TransBay Cable HVDC, that primarily dealt with addressing Category C type contingencies in the area with the retiring of generation in the peninsula area.

The ISO is required as a part of the NERC Reliability Standard TPL-004 to study the effects of Extreme Events (Category D) on the system, however the standard does not require that the Extreme Events to be mitigated for. However due to the nature of this highly urban load center, geographic and system configuration, potential risks of outages including seismic and collocating facilities and challenging restoration times it has become apparent that the San Francisco-Peninsula is uniquely situated and requiring consideration of mitigation.

The ISO is therefore proposing to add to the Planning Standards specific recognition of the unique characteristics of supply to the San Francisco Peninsula and acknowledgment that planning for extreme events – including the approval of transmission solutions to improve the reliability of supply - is an appropriate action for the ISO Board to consider and approve.

5 Changes to NERC Transmission Planning Standards

The current ISO Planning Standard is based upon the current NERC reliability standards TPL-001, TPL-002, TPL-003 and TPL-004. NERC has been developing over a the last number of years an update to the transmission planning standards, which among other changes consolidates the four existing TPL standards into one standard. The NERC standard TPL-001-4 has been approved by FERC. TPL-001-4 will replace the transmission planning standards TPL-001, TPL-002, TPL-003 and TPL-004. The effective date for TPL-001-004 is spread over two years, with the effective dates of the requirements in the standard to be:

- Requirements R1 and R7 – January 1, 2015
- Requirements R2 through R6 – January 1, 2016

With the sequenced in-service date of the standard, the ISO will be conducting the studies for the 2014-2015 Transmission Planning Process applying the NERC Reliability Standards TPL-001, TPL-002, TPL-003 and TPL-004. The ISO will ensure compliance to Requirements R1 and R7 as a part of the assessment. The ISO will be applying the NERC Reliability Standard TPL-001-04 for the 2015-2016 Transmission Planning Process.

The new standard, TPL-001-4, is similar in principle and application as the current TPL-001 through 004 with some elevation of the requirements in the standard. In addition, the new standard provides a complete recategorization of systemcontingencies, and replacing the current Category A, B, C and D contingency definitions. Within TPL-001-4 the contingencies will be categorized as P0 through P7 as set

out in Table 1 of the new standard. The following reflects in general how the current categories correlate to the new contingency categorization.

- Category A will become contingency P0
- Category B and C will become contingencies P1 through P7
- Category D will be considered Extreme Events

The ISO is proposing to change the ISO Planning Standards (effective April 1, 2015) to reflect the requirements of TPL-001-4 for use in the 2015-2016 Transmission Planning Process.

6 Next Steps

The ISO will host a stakeholder meeting on April 11, 2014 to discuss the contents of this straw proposal. Stakeholder comments on this straw proposal will be due April 25, 2014. The ISO anticipates seeking ISO Board approval at the September 2014 Board Meeting.