Southern California Edison

El Niño Hazard Assessment Methodology

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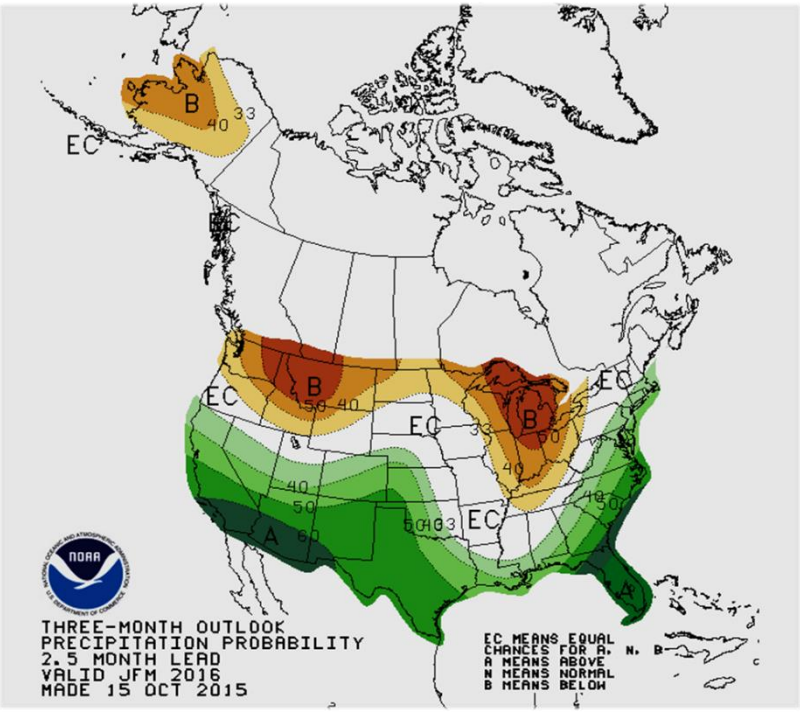
PURPOSE

According to the NOAA Climate Prediction Center, The 2015-16 El Niño climate conditions are forecasted to produce more frequent and severe rainfall than normal throughout southern California.



In preparation for these events, Southern California Edison (SCE) initiated an El Niño Preparedness Project to supplement the ongoing storm preparation work that SCE conducts on a normal basis.

This project included evaluating the hazards associated with the forecasted El Niño, identifying vulnerabilities to SCE personnel and the operation of the SCE system, and implementing activities to mitigate those vulnerabilities to ensure emergency response personnel are prepared to safely respond to the forecasted events.

This paper will discuss how the Hazard Assessment and Vulnerability Assessment were completed. Specifically, how the hazards were identified, how the hazards were mapped, how infrastructure was identified, how vulnerabilities were identified, and at a high-level, how mitigation, preparedness, and response activities were developed.

HAZARD ASSESSMENT METHODOLOGY

The Hazard Assessment was completed in three steps

1. Identify the Hazards
2. Map the Hazards
3. Analyze where Hazards intersect SCE Infrastructure

Step 1: Identify the Hazards

SCE identified four hazard types associated with the forecasted increase in storm events

Hazard Type	Data Source	Areas Evaluated
Landslide	*California Geological Survey Landslide Susceptibility Map*	Landslide Susceptibility of > 8 (Scale of 1-10)
Debris Flow	*Recent Fire Perimeters (2010-15) from USFS, CalFire, and SCE Fire Mgmt*	All
Flooding	*FEMA 100-yr Floodplain*	All
High Winds	*SCE Wind Map (wind pressure ratings based on 34-years of historical weather observations from NOAA)*	Wind pressures > 12#

Step 2: Map the Hazards

SCE obtained each of the hazard data above and uploaded it into SCE's GIS mapping database. SCE then took each hazard type, applied a weighted risk ranking, and overlaid them on top of one another to create a high resolution "heat map", which served to identified the areas in the SCE service territory that had the highest risk due to multiple hazards existing in that location. This heat map helped to inform SCE personnel of the highest hazard areas in the territory.

Step 3: Analyze where Hazards intersect SCE Infrastructure

SCE then conducted an analysis to identify where SCE infrastructure existed in the hazard areas. SCE analyzed for each set of infrastructure, what type of hazard intersected that infrastructure location. This provided SCE with a comprehensive list of hazards associated with the following infrastructure types

Transmission Lines
Substations
Distribution Circuits
Telecommunication Lines
Dams & Water Conveyance Systems
Gas and Solar Generation Sites
New Construction Projects

VULNERABILITY ASSESSMENT METHODOLOGY

The Vulnerability Assessment was completed by taking the results of the Hazard Assessment and refining it by soliciting review and input from subject matter experts to develop a list of vulnerabilities by using their knowledge of operations. This review allowed SCE to not only identify vulnerabilities associated with the safety and reliability of infrastructure, but also safety and preparedness requirements for SCE personnel.

It is important to note that not all infrastructure identified in the hazard assessment was identified as a vulnerability. For example, if a substation is constructed in a 100-year floodplain, while it shows up on the hazard assessment, it may not show up as a vulnerability because these hazards were mitigated during design and operation and are captured in other activities such as Storm Water Pollutant Prevention Plan (SWPPP).

The final list of vulnerabilities are used to create mitigation activities that are implemented by each operational unit responsible for the operation and maintenance of the critical infrastructure. These mitigation activities are meant to ensure that SCE continues to operate safely and reliably during adverse and hazardous conditions.

Determining Transmission System Vulnerabilities

SCE took the results of the hazard assessment and provided it to Grid Control Center personnel and Transmission personnel to analyze vulnerabilities to the SCE Bulk Electric System.

SCE personnel identified four systems that were at the highest risk due to having multiple hazards present and the absence of any automatic mitigation in the form of remedial action schemes (RAS).

- **Saugus System**
- **Viejo System**
- **Padua System**
- **Goleta System**

Upon further analysis by Grid Control Center personnel, it was determined that Viejo, Saugus, and Padua transmission systems are capable of having all of their load served during winter peak loads. These systems all have at least three adjacent subtransmission systems where all of the load can be transferred to with the exception of Viejo system (which is capable of having all of its load transferred to Santiago system).

The Goleta transmission system is unique in that its located geographically at one end of our system and with only one adjacent system (with limited tie-line carrying capability) where load can be transferred to, thus resulting in the inability to serve all of its load. Therefore, SCE will develop area-specific mitigations as a result of the unique operational characteristics of the Goleta system and the hazards posed during the 2015-16 El Niño season.

Determining Substation Vulnerabilities

To develop a list of substation vulnerabilities, SCE surveyed substation personnel on known risks and impacts based on historical and subject matter expertise. This compiled list was then expanded to include 115kV and higher voltage substations that had two or more hazards. In addition all AA and A bank substations were included due to their importance to this system. From this feedback, a list of substations were compiled and mitigation actions assigned to each AOR that were above and beyond normal storm preparation.

Determining Distribution Vulnerabilities

For Distribution circuits, the hazards assessment was shared with key personnel from Distribution and Grid Operations with a request to identify circuits by area that SCE intends to patrol prior to the storm season, and immediately following a significant weather/storm event.

Determining Dam and Water Conveyance Vulnerabilities

SCE took the results of the Hazard Assessment for both dams and water conveyance and shared them with managers and experts in Northern Hydro, Eastern Hydro, and Dam and Public Safety. From these meetings, mitigation actions were assigned to each AOR that were above and beyond normal storm preparation.

Determining Gas/Solar Vulnerabilities

SCE took the results of the Hazard Assessment for Mountainview Generating Station and SCE's peakers, as well as solar generation, and shared them with the facility managers and leaders from Power Production. From these meetings, mitigation were actions assigned to each AOR that were above and beyond normal storm preparation.

Determining New Construction Project Vulnerabilities

SCE took the results of the Hazard Assessment for new construction projects and shared them with construction project managers. The Hazard Assessment for new construction projects is intended to supplement existing mitigation plans and activities, such as the Storm Water Pollutant Prevention Plan (SWPPP). This information was shared to ensure that project managers are aware of the risks and can adjust their activities as necessary.