




Impacts of Earthquakes on Electrical Grid Resilience

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Abstract—One of the most complex and devastating disaster scenarios that the U.S. Pacific Northwest region and the state of Oregon faces is a large magnitude Cascadia Subduction Zone earthquake event. The region's electrical grid lacks in resilience against the destruction of a megathrust earthquake, a powerful tsunami, hundreds of aftershocks and increased volcanic activity, all of which are highly probable components of this hazard. This research seeks to catalyze further understanding and improvement of resilience. By systematizing power system related experiences of historical earthquakes, and collecting practical and innovative ideas from other regions on how to enhance network design, construction, and operation, important steps are being taken toward a more resilient, earthquake-resistant grid. This paper presents relevant findings in an effort to be an overview and a useful guideline for those who are also working towards greater electrical grid resilience.

Index Terms—Disaster Preparedness, Earthquakes, Resilience, Power System Planning, Network Operation.

This paper presents some of the key findings of the OTC funded research. It aims to systematize power system related experiences of historical catastrophic earthquakes in order to gain knowledge that can help the PNW to best prepare for a future CSZ event. The key contribution is a comprehensive collection of proven practices and innovative ideas from other regions and nations of the world, on how to improve power system design, construction and operation, which can help to transform Oregon's and the PNW's electrical grid into a more resilient, earthquake and tsunami resistant power system.

The remainder of this paper is organized as follows. Section II. gives a comprehensive review on the topic's background: information about the CSZ and its future, current resilience in Oregon and efforts to increase it, and a brief introduction of historical earthquakes that can serve as exemplar cases to provide valuable input. Sections III., IV., and V. present findings related to the generation, transmission