

LOL-HECO-IR-67

Ref: "Rather, these 'less probable' outages must be addressed in planning studies." (T-3, page 14, line 7) "To optimize the performance of the electrical system, some entities are beginning to consider the probabilistic methods to transmission system planning in order to examine the likelihood of certain possible events and combination of events based on real world historic outage performance. However, at the present time, a deterministic approach to planning continues to be the primary approach." (T-3, page 15, lines 12-17)

Question(s):

- a. How does a utility that uses deterministic planning handle calculate which types of outages have higher probabilities of occurring?
- b. How can the correct probability prioritization occur if the probability of different outage scenarios are unknown?
- c. Doesn't deterministic planning result in the overbuilding of redundancies, that is, in the gold-plating of the system?
- d. What is the minimum size system load for which you have any hands-on experience in probabilistic transmission planning?

HECO Response:

- a. Please see Mr. Pollock's testimony (HECO T-3) beginning on page 14 for a description of the scenarios recommended for study in the NERC planning criteria. For the deterministic approach, the system is studied by establishing a system model (a base case), and then various elements of the system are removed from the model and the resulting load flows with that component removed from the model are recalculated. In this way, deficiencies in the system can be identified. For example, the basic level of contingency analysis removes each single element of the system from the model sequentially (an N-1 or single contingency analysis) and the system is analyzed with that element removed. For multiple contingency outage scenarios (more than one element out of service), the scenarios are identified by the engineer and the performance of the system evaluated. As compared to the mainland

interconnected grid, which is large and complex, the Oahu 138kV system is a simpler and less complex system. From a planning study perspective, the lower level of complexity of the Oahu system means that is straightforward to identify all of the contingency scenarios to be studied. Since all reasonable outage scenarios are required to be studied to determine compliance with the planning criteria, there is no need to calculate the probability of a particular outage scenario.

b. See the response to subpart a. above.

c. No. Deterministic planning does not result in the “gold plating” of the system.

Redundancies in the system are necessary to enable the system to continue to operate and serve load when various system elements fail. The system planning process is conducted based on accepted planning criteria that is the result of the accumulated experience of the entire utility industry. Recommendations that result from the study must balance system performance against cost to determine which recommendations or alternatives achieve the objective of complying with the planning criteria. (Please refer to Mr. Pollock’s testimony (HECO T-3) beginning on page 4 for a system planning process overview.)

d. Based on historical outage data, Power Engineers recently calculated the probability of an outage occurring in any year for a particular 230kV transmission line serving a 180MW industrial facility.