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Decision No. _____

BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

In the matter of the application)
of SOUTHERN CALIFORNIA EDISON)
COMPANY for a certificate that)
the present and future public)
convenience and necessity require)
or will require construction and)
operation by applicant of a single)
circuit 500 kV transmission line)
between Palo Verde Nuclear Gen-)
erating Station in Arizona and)
Devers Substation in California.)

Application No. 57251
(Filed April 21, 1977;
amended April 21, 1978)

SUPPLEMENTAL ORDER ON SEISMIC DESIGN CRITERIA

Background

An interim order in this proceeding, D.90552 dated July 17, 1979, granted a certificate of public convenience and necessity to Southern California Edison Company (SCE) authorizing the construction and operation of approximately 235 miles of 500 kV transmission line (between the Palo Verde Nuclear Generating Station in Arizona and SCE's Devers Substation in California) and ancillary facilities.

The California Energy Resources Conservation and Development Commission took the position in this proceeding that SCE's proposed addition to its Devers substation should be constructed to withstand the ground-shaking from a maximum probable earthquake (MPE) magnitude of 7 on the Richter Scale (RS) along either the Banning Fault or the Mission Creek Fault.

SCE contends that its design of the addition to its Devers substation is to a seismic loading which is consistent

with the seismic hazard and is an acceptable risk for a facility of the type and importance of Devers. D.90552 required SCE to furnish the Commission with supplemental information for our evaluation of whether to adopt SCE's assessment or to require SCE to procure and install more earthquake-resistant equipment.

Summary of Decision

Based upon our review of SCE's supplemental filing, we will not require SCE to procure and install more earthquake-resistant equipment for Devers than is commercially available.

Summary of SCE's Supplemental Filing

(a) SCE estimates that the MPE for the Devers area would have a magnitude of 7.0 RS. The corresponding maximum credible earthquake (MCE) range is between 6.5 and 8 RS. SCE's geologist estimates an MCE of 7.5 RS.

(b) SCE and electric equipment manufacturers have worked to improve the seismic withstand of new substation equipment to 0.5 g, which is the upper limit of commercially available state-of-the-art designs. The electrical bus and taps to the electrical equipment will be suspension types which mechanically isolate pieces of equipment. The line and bus deadend structures, tap supports, and other stationary structures will be mechanically designed specifically for Devers.

SCE states that (1) full-scale testing of equipment is needed to prove the reliability of equipment to meet seismic loads; (2) small components can be easily and economically tested for high seismic forces, but that large electric equipment such as transformers, circuit breakers, and capacitor banks require massive test platforms and shakers of a sufficient size and strength to transmit equivalent earthquake forces to the test specimen over the normal frequency range; (3) since such test frames are lacking, manufacturers are uncertain in predicting exact seismic withstand limits; and (4) extrapolations of prior tests indicate that many of the large heavy electrical components with low centers of gravity could probably withstand forces greater than 0.5 g.

(c) After reviewing information on earthquake damage to the Sylmar switching station in 1971, SCE reassessed its seismic criteria. SCE now incorporates a dynamic analysis in designing its substations and equipment to improve the seismic withstand of its facilities. SCE believes that an earthquake greater in magnitude than the 6.4 RS earthquake which incapacitated the Sylmar switching station would be needed to incapacitate the proposed addition to Devers substation.

An interpolation of the earthquake frequency chart supplied by SCE indicates that a 6.4 RS earthquake might occur at about thirty-five-year intervals. The MPE would occur at 100-year intervals, and an extrapolation of the earthquake frequency chart indicates that a 7.5 RS MCE would occur at intervals greater than 200 years.

(d) SCE states that (1) types of substation equipment most susceptible to damage are porcelain bushings and post insulators, due to their rigid and brittle characteristics; (2) large pieces of equipment such as circuit breakers, transformers, and reactors, which are normally built with low centers of gravity, may withstand heavy ground shaking without outward appearances of damage; however, some internal parts and mechanisms could be damaged from strong earth motion and require factory repair, which could take up to several months; (3) it can replace damaged equipment from available spare units at other substations and from spare stock; and (4) in the event of an outage, it could install spare parts and reactivate a substation within a time period ranging from a few hours to six or eight weeks.

SCE believes that should earthquake damage prevent it from serving its local customer load from Devers substation, the existing 115 kV transmission system connecting Devers substation to San Bernardino could be utilized to supply local loads, on an emergency basis, within a matter of hours.

SCE states that the cost of earthquake repairs would vary with the equipment damaged and with the extent of damage. The repair costs could range from a small fraction of the original cost to a complete unit replacement. Some critical components are 230 kV power circuit breakers, which cost \$100,000 each and 500 kV transformers, which cost \$1,000,000 each.

(e) SCE states that an outage on the Devers-Palo Verde 500 kV transmission line would not significantly impact its reserve margins because of the availability of alternative transmission paths which can be used in an emergency to transmit its 585 MW share of the output of the Palo Verde generating units. The 585 MW of capacity equates to 23 percent of SCE's estimated 1982 peak reserve margin of 18.5 percent.

(f) SCE states that due to the possibility of critical component failures from many causes, replacements are maintained for emergency use either in spare stock or at other operating locations. SCE has four 500 kV stations and forty 220 kV stations in its system.

(g) SCE states that its major equipment suppliers have indicated that (1) the design of electrical apparatus with a seismic withstand capability greater than 0.5 g would require new development; (2) such development has not taken place because there is no market for such equipment; (3) it would take three to four years to develop new equipment and, if successful, two or more years would be needed for manufacturing the equipment and 12 to 18 months would be needed to install the new equipment; and (4) an estimated total time of seven to eight years would be required to meet higher seismic loading criteria for 500 kV and 220 kV equipment.

(h) SCE's suppliers indicate that (1) the cost of development could amount to \$1,000,000 for each type of equipment and for each manufacturer; (2) in addition, if the development was successful, full-scale testing would be required to demonstrate product performance; (c) there would be extra production costs incurred for building a new model or series of an existing equipment type.

SCE believes that manufacturers would recover the development costs of the new equipment on the first units sold because of their limited marketability. SCE roughly estimates that these added costs would double the initial costs of existing standard commercially available equipment.

(i) SCE believes that installing equipment using its proposed design criteria would be an acceptable risk and that going beyond those criteria would place an unnecessary burden on its ratepayers because (1) SCE's substation and transmission components at Devers, designed for a 0.5 g dynamic withstand, would have greater capability to resist seismic forces than most residential, commercial, and industrial facilities designed to meet a statistically applied seismic force of 0.2 g; (2) the use of commercially available components having a 0.5 g capability would permit SCE to replace any damaged equipment in the shortest time using emergency spare equipment from other areas of its system; (3) its system is designed to maintain service under many unpredictable conditions, including earthquakes; and that (4) delaying the Devers-Palo Verde project for up to eight years to perfect new equipment, at a cost of several million dollars, would create more operating problems and greater system reliability risks pending completion of the project.

Discussion

The Environmental Impact Branch staff reviewed SCE's supplemental filing. A staff memorandum states that (a) the information submitted by SCE is responsive and accurate; (b) it adopts SCE's contention that the design of electrical apparatus at Devers substation in excess of 0.5 g could cause delay, additional costs, and could place an unnecessary burden on SCE's ratepayers.

Earthquakes of lesser intensity than the MPE or the MCE, from 4 to 6 RS, could generate forces in excess of 0.5 g if the epicenter of such quakes was relatively close to Devers (see Final EIR, page 5-57). At the request of Administrative Law Judge Jerry Levander, SCE sent a supplemental letter dated January 18, 1980, which states that (a) it has operated Devers substation since 1967; (b) the Devers substation has never been taken out of service due to seismic forces; and (c) the overall design criteria for seismic withstand of the existing Devers facilities are less than the 0.5 g criteria to be incorporated in the design of its addition to the Devers substation.

We concur with SCE and the staff and will not require SCE to develop and install equipment not commercially available for meeting higher seismic loadings.

Findings of Fact

1. Manufacturers are not marketing equipment for electrical substations designed to withstand seismic forces greater than 0.5 g.
2. Development design, manufacturing, testing, and installation of equipment designed to meet the seismic forces generated by the MPE or the MCE at Devers substation could delay the completion of the Devers-Palo Verde project by up to eight years and would add several million dollars to the cost of completing the project.

3. SCE could utilize spare stock or spare units at other locations in its system to replace Devers substation equipment damaged by seismic forces.

4. The duration of an outage at Devers substation due to an earthquake could range from a few hours to six to eight weeks.

5. Local communities served from Devers substation could be supplied from the San Bernardino area on an emergency basis within a matter of hours after seismic damage had knocked out the Devers substation.

6. SCE has sufficient reserve margins to continue normal operations in the event of an outage of Devers due to seismic forces pending repair or replacement of damaged equipment.

Conclusions of Law

1. It would be unreasonable to delay the completion of the Devers-Palo Verde project pending development of new equipment designed to meet seismic loads greater than that which is currently available.

2. SCE's request that it be permitted to design the Devers substation addition to meet a 0.5 g seismic load, using commercially available equipment, should be authorized.

3. Since this order resolves the seismic issue in SCE's Devers-Palo Verde project, authorized in D.90552, the effective date of this order should be the date hereof to expedite the completion of the project.

IT IS ORDERED that Southern California Edison Company is authorized to design its Devers substation addition to meet a 0.5 g seismic load, using commercially available equipment.

The effective date of this order is the date hereof.

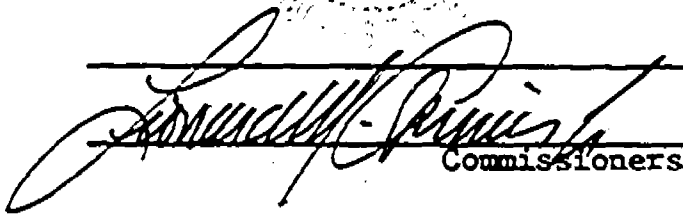
Dated MAR 18 1980, at San Francisco, California.



President







Commissioners

Commissioner Claire T. Dedrick, being necessarily absent, did not participate in the disposition of this proceeding.