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STAFF REPORT

Assembly Bill 100 Seismic Safety and Earthquake Preparedness Activities Report

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ABSTRACT

The *Assembly Bill 100 Seismic Safety and Earthquake Preparedness Activities Report* addresses a requirement in Assembly Bill 100 (Ting, Chapter 20, Statutes of 2020) and prepared at the request of the Seismic Safety Commission. This report identifies key activities and responsibilities conducted by the California Energy Commission related to earthquake preparedness and seismic safety and identifies the value these programs and services provide to the public, state, local and tribal governments, and businesses of California.

Keywords: AB 100, Seismic Safety Commission, earthquake preparedness, seismic safety

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Introduction

The Alfred E. Alquist Seismic Safety Commission (SSC) was established in 1975 to advise the Governor, Legislature, state, local agencies, and the public about strategies to reduce earthquake risk. In 2020 the SSC became a department within the Office of Emergency Services (Cal OES) (Government Code §8589.71, et seq.). In coordination with the California Office of Emergency Services, the SSC offers a broad perspective of the overall seismic risk to the state, sets consistent policies and goals and makes independent findings and recommendations. The SSC investigates earthquake-related issues and evaluates and recommends to the Governor and Legislature policies and programs needed to reduce earthquake risk.

Assembly Bill (AB) 100 (Ting, Chapter 20, Statutes of 2020) established an annual reporting requirement of the SSC. The Legislature finds that numerous agencies at various levels of government have substantial responsibilities in the fields of earthquake preparedness and seismic safety. To provide a consistent policy framework to track and monitor those activities and to identify key activities and responsibilities related to seismic safety, the SSC is requiring that the California Energy Commission (CEC) participate in the annual reporting requirement.

In accordance with AB 100 the SSC requested the provide this report highlighting the seismic programs and services provided by the CEC.

This report identifies key activities and responsibilities conducted by the CEC related to earthquake preparedness and seismic safety and includes:

- A description of the programs that include earthquake preparedness and seismic safety aspects.
- A description of the value of these programs to the public, state, local, and tribal governments, and businesses.
- Long-term goals, budgets, and web links for these programs.

Purpose and Objective

The Warren-Alquist Act established the CEC in 1974 to respond to the energy crisis of the early 1970s and the state's unsustainable growing demand for energy resources. The California Legislature continues to amend the act to address pressing energy needs and issues. The CEC's Chief Counsel's Office publishes an updated version of the act every year.

Today the CEC is leading the state to a 100 percent clean energy future for all. As the state's primary energy policy and planning agency, the CEC plays a critical role in creating the energy system of the future, one that is clean, affordable, reliable, equitable, safe, and ensures the fifth largest economy in the world continues to thrive.

Earthquake Preparedness and Seismic Safety

The CEC focuses on earthquake preparedness and seismic safety by:

- Investing in energy innovation and providing grants through the Energy Research and Development Division (ERDD).
- Preparing in-depth environmental analyses for licensing of thermal power plants and ensuring conditions of certification (COC) are met during construction, operation, and decommissioning through the CEC's Siting, Transmission, and Environmental Protection (STEP) Division.
- Reviewing seismic-related reports and data through the Diablo Canyon Nuclear Power Plant (DCPP) Independent Peer Review Panel (IPRP).
- Providing subject matter experts in petroleum, natural gas, and energy generation and transmission to the Governor's Office of Emergency Services (Cal OES) for emergency planning and preparedness along with catastrophic earthquake planning.

Programs

Energy Research and Development Division

Since 1975, the CEC has advanced innovation through its energy research and development programs. The CEC research has generated billions of dollars in energy cost savings for California ratepayers, helped create new businesses and thousands of jobs, and attracted almost \$2 billion in private and federal investments.

The CEC supports the modernization of California's energy system by investing in science and technology that aligns with the state's policy goals. These investments support advancements in energy efficiency, renewable energy, storage technologies, energy-related environmental protection, transmission and distribution, and transportation technology. The CEC partners with businesses, utilities, energy companies, public advocacy groups, and world-class scientists at California universities and national laboratories to help achieve technology breakthroughs and bring them to market.

Funded Projects with Seismic Components

Projects with seismic components funded through the Gas R&D Program cover topics including carbon sequestration and the potential for induced seismicity, pipeline right-of-way monitoring which could be used to detect damage in the event of a landslide or earthquake, and the development of open-source software to assess seismic risks. These projects are summarized below.

Investigations of Potential Induced Seismicity Related to Geologic Carbon Dioxide Sequestration in California

The Lawrence Berkeley National Laboratory received a \$575,423 award to address public concerns about the unknown but potential risk of induced seismicity as a result of sequestering carbon dioxide (CO₂) in geologic formations. Carbon sequestration is the practice

of capturing and compressing CO₂ gas and injecting it into natural underground geologic strata at significant depths.¹ The project developed a procedure to analyze available data on rock layers and geophysical logs from wells to construct a geological model of a potential carbon storage system. The model is used to estimate the seismic hazard and risk from simulated CO₂ injections. The project was completed in June 2016 and assessed the state of knowledge at the time surrounding the issue of induced seismicity, informing policy makers on how potential risks from geological carbon sequestration can be assessed during the planning and permitting stages.²

Pipeline Right-of-Way Monitoring and Notification System

The Institute of Gas Technology received a \$1,049,978 award to develop a pipeline right-of-way (ROW) monitoring and notification system that prevents damage and improves gas pipeline safety in California. This project designed, tested, and demonstrated a system that automatically monitors the ROW of the pipeline and notifies gas utility operators of encroachment threats. While this project was designed to notify gas utility operators of encroachment threats like non-utility company excavation equipment, it could also be used to detect when landslides or seismic events cause damage to a pipeline.³

Seismic Risk Assessment and Management of Natural Gas Storage and Pipeline Infrastructure in California

The Regents of the University of California, Los Angeles received a \$3,485,255 award to improve current seismic risk assessment of natural gas storage and pipeline infrastructure by:

- Addressing earthquake hazards (i.e., ground shaking and displacement from surface faulting, landslides, and liquefaction).
- Developing an open-source performance-based risk management tool that is flexible, yet quantitative.
- Testing the methodology in collaboration with the partnering pipeline and storage facility operators.

The project team used state of the art seismic hazards assessments and Bayesian network to quantify the seismic risk of natural gas storage and pipeline infrastructure in California.

1 California Energy Commission. 2023. "Energize Innovation, Investigations of Potential Induced Seismicity Related to Geologic Carbon Dioxide Sequestration in California," <https://www.energizeinnovation.fund/projects/investigations-potential-induced-seismicity-related-geologic-carbon-dioxide-sequestration>.

2 California Energy Commission. 2017. "Investigation Of Potential Induced Seismicity Related To Geologic Carbon Dioxide Sequestration In California," Publication Number: CEC-500-2017-028, <https://www.energy.ca.gov/publications/2017/investigation-potential-induced-seismicity-related-geologic-co2><https://www.energy.ca.gov/publications/2017/investigation-potential-induced-seismicity-related-geologic-co2>.

3 California Energy Commission. 2023. *Energize Innovation, Pipeline Right of Way Monitoring and Notification System*. <https://www.energizeinnovation.fund/projects/pipeline-right-way-monitoring-and-notification-system>. <https://www.energy.ca.gov/sites/default/files/2021-05/CEC-500-2020-024.pdf>.

This project developed an open-source seismic risk assessment software tool that integrates real-time seismic activity data to perform predictions and failure analysis.⁴ The project tested the tool and method in collaboration with gas pipeline and storage operators. The project is expected to be completed in December 2023, with subsequent work anticipated to begin in fall 2023 through the System Approach for Monitoring and Risk Assessment for Natural Force Damage to Gas Pipelines project.

Performance-Based Earthquake Engineering Assessment Tool for Gas Storage and Transmission Systems

The Regents of the University of California, Berkeley, received a \$4,940,158 award to develop an open-source seismic risk assessment software package to provide regulators and utilities with a tool to analyze seismic risk to gas infrastructure. The tool uses recent advances in seismic hazard analysis to perform quantitative, more accurate, and more reliable assessments of gas infrastructure risks caused by ground motion, fault rupture, liquefaction, and landslide ground deformation. The tool helps gas system regulators and operators better understand and address statewide seismic risks, prioritize mitigation, plan gas infrastructure investments and retrofits, and focus on post-earthquake repair.⁵

System Approach for Monitoring and Risk Assessment for Natural Force Damage to Gas Pipelines

The Regents of the University of California, Los Angeles, has been announced as a proposed awardee for a \$2,992,909 grant under GFO-22-503⁶ to develop an integrated platform using remote and embedded sensing technologies and models to monitor, predict, and reduce the risk of natural hazard impacts to gas pipelines. The integrated platform will be developed as a user-friendly, free, and open-source software package for gas pipeline operators to assist in integrity management decision-making. The proposed award is pending approval at a CEC business meeting.

Siting, Transmission, and Environmental Protection Division (STEP)

STEP plays a key role in ensuring a safe and reliable electric system by reviewing the design of a proposed power plant and analyzing the potential for adverse environmental impacts including a process for public input and outreach to California Native American tribes. This permitting process ensures that proposed thermal power plants are reviewed in a transparent, public proceeding and are designed, constructed, and operated in a manner that protects public health and safety, promotes the general welfare, and preserves environmental quality.

4 California Energy Commission. 2021. "[Energize Innovation, Seismic Risk Assessment and Management of Natural Gas Storage and Pipeline Infrastructure in California](https://www.energizeinnovation.fund/projects/seismic-risk-assessment-and-management-natural-gas-storage-and-pipeline-infrastructure-ca)." <https://www.energizeinnovation.fund/projects/seismic-risk-assessment-and-management-natural-gas-storage-and-pipeline-infrastructure-ca>.

5 California Energy Commission. 2021. "[Energize Innovation, Performance Based Earthquake Engineering Assessment Tool for Gas Storage and Transmission Systems](https://www.energizeinnovation.fund/projects/performance-based-earthquake-engineering-assessment-tool-gas-storage-and-transmission)." <https://www.energizeinnovation.fund/projects/performance-based-earthquake-engineering-assessment-tool-gas-storage-and-transmission>.

6 California Energy Commission. 2022. "[Gas Pipeline Safety and Integrity Research to Support Decarbonization](https://www.energy.ca.gov/solicitations/2022-11/gfo-22-503-gas-pipeline-safety-and-integrity-research-support-decarbonization)." <https://www.energy.ca.gov/solicitations/2022-11/gfo-22-503-gas-pipeline-safety-and-integrity-research-support-decarbonization>.

The process is the functional equivalent of a California Environmental Quality Act review and includes coordination with local, state, and federal agencies to ensure that these agencies' permit requirements are incorporated.

STEP also maintains an inspection and enforcement program to ensure that permitted thermal power plants are constructed, operated, and decommissioned in accordance with their permits and laws. This includes annual reporting requirements, on-site audits and investigations of formal and informal complaints. If necessary, STEP may work with project owners to bring thermal power plants into compliance or take enforcement action against violators.

Plant Licensing

The CEC licenses thermal power plants 50 megawatts and greater and the infrastructure serving them such as electric transmission lines, fuel supply lines, and water pipelines. Licensure is available to developers either through an Application for Certification (AFC) program or the new streamlined Assembly Bill 205 (AB 205) Opt-In Certification.⁷

The AFC is the standard licensing process used for most proposed power plant projects that would fall under CEC jurisdiction. The Opt-In Certification is available for eligible non-fossil-fueled power plants and related facilities using emergency rulemaking authority provided by AB 205. During the technical evaluation of these applications, staff analyzes the project design and assesses possible environmental impacts for several technical subjects.

Assessment of earthquake preparedness and seismic safety of the project design is analyzed by staff during the geology and soils assessment. This assessment includes a review of geotechnical information provided by the applicant along with the applicable seismic hazard and response analyses required by the current California Building Code (CBC).

Construction Inspection, Observation, and Plan Review

The CEC license approval authorizes a power plant project owner to proceed with detailed design and construction. The CEC selects a qualified third-party firm to act on behalf of the CEC as its delegate chief building official (DCBO) to perform plan reviews and construction inspections in accordance with the California Building Standards Code (CBSC) and the CEC's final commission decision for the facility. The CBSC includes specific references to the CBC, California Electric Code, California Plumbing Code, California Mechanical Code, and California Fire Code. Other laws, ordinances, regulations, and standards may also apply to the design and construction.

The authority given to the DCBO is a delegated authority of the CEC and as such the CEC retains the final decision authority on all matters relating to the design, construction, and licensing of the power plant. The role of the DCBO is the enforcement of the CBSC requirements. In this role, the DCBO reviews and approves the construction documents necessary for CBSC compliance and performs observations and inspections of construction components to verify the as-constructed facilities are consistent with the approved construction documents.

⁷ California Energy Commission. 2023. "Power Plant Licensing." <https://www.energy.ca.gov/programs-and-topics/topics/power-plants/power-plant-licensing>.

The DCBO reviews seismic safety-related design documents including structural design methods related to seismic and wind loading, site class, importance category, occupancy category, and design criteria. The DCBO also reviews the supporting structural design calculations for design loading, load combinations, and computer modeling input and output reports.

Compliance Site Inspections

CEC inspection program conducts compliance inspections of jurisdictional power plants to ensure they comply with their Certification of Conditions (COC) and the applicable laws, ordinances, regulations, and standards. The primary purpose of the inspection program is to ensure the safety and reliability of the jurisdictional power plants.

Each compliance inspection consists of a team of two inspectors. Inspections focus on reviewing procedures and documentation related to worker safety, security, hazardous materials and waste, fire protection, and other technical areas related to environmental protection that are submitted by the power plant. The inspection team then conducts an on-site inspection of the power plant and its auxiliary systems. Though not the primary focus, the team performs the following to ensure the readiness of the plant for an earthquake:

- Inspecting cabling and anchoring of bulk chemical tanks
- Inspecting foundation and equipment anchoring
- Documenting any signs of structural corrosion
- Reviewing emergency action plans and interviewing control room operators regarding actions taken during an emergency, which cover earthquake preparedness
- Ensuring that new structures constructed are reviewed and inspected by a DCBO who ensures that these structures are built to the correct code.

Diablo Canyon Nuclear Power Plant Independent Peer Review Panel

In 2006, the California Legislature enacted Assembly Bill 1632 (AB 1632, Blakeslee, Chapter 722), which directed CEC to assess the potential vulnerability of the state's nuclear plants to major disruptions, including earthquakes. CEC's resulting AB 1632 report⁸ recommended that the utilities perform enhanced seismic studies with two- and three-dimensional seismic surveys in the areas onshore and offshore from DCPN located near the city of Avila Beach in San Luis Obispo County and the San Onofre Nuclear Generating Station (SONGS), located south of San Clemente in San Diego County. In Decision (D) 10-08-003, the California Public Utilities Commission (CPUC) approved funding for DCPN seismic studies and established the

⁸ California Energy Commission staff. 2018. [AB 1632 Assessment of California's Operating Nuclear Plants, Final Report, October 2008](https://www.energy.ca.gov/proceedings/dockets/california-energy-commission-dockets). Publication Number: CEC-100-2008-007-CMF. Docket 08-IEP-01F, TN 48783, <https://www.energy.ca.gov/proceedings/dockets/california-energy-commission-dockets>.

Independent Peer Review Panel (IPRP)⁹ to review them. The IPRP is tasked with providing expertise to the CPUC while assuring the public that the studies are being performed appropriately.

The IPRP is composed of technical experts from the CEC, the Governor's Office of Emergency Services (Cal OES), California Geological Survey, California Coastal Commission, California Seismic Safety Commission, and the County of San Luis Obispo. Pacific Gas & Electric (PG&E) submits its seismic studies to the IPRP for review. Following the submission of these studies, the IPRP convenes for public meetings to review and discuss the results and ultimately submits reports.

The IPRP is involved in reviewing documents prepared by the Diablo Canyon Independent Safety Committee and PG&E regarding the ongoing DCPD license extension, which could extend DCPD beyond the current expiration dates, to up to five additional years.

Catastrophic Earthquake Planning

The CEC provides subject matter experts in petroleum, natural gas, and energy generation and transmission to the Cal OES for emergency planning and preparedness and catastrophic planning programs. CEC staff has assisted in preparing the Bay Area Earthquake Plan, 2016¹⁰, and the Southern California Catastrophic Earthquake Plan, 2022¹¹.

The Bay Area Earthquake Plan was developed by the United States Department of Homeland Security Federal Emergency Management Agency Region IX and Cal OES to describe the joint State and Federal response to a catastrophic earthquake in the Bay Area. Counties covered by this plan include Alameda, Contra Costa, Marin, Mendocino, Monterey, Napa, Sacramento, San Benito, San Francisco, San Joaquin, San Mateo, Santa Clara, Santa Cruz, Solano, Sonoma, and Yolo.

The Southern California Catastrophic Earthquake Plan provides a coordinated state/federal response to a catastrophic earthquake in Southern California. Counties covered by this plan include Imperial, Inyo, Kern, Los Angeles, Orange, Riverside, San Bernardino, San Diego, San Luis Obispo, Santa Barbara, Tulare, and Ventura.¹²

9 California Public Utilities Commission. 2021. "[Diablo Canyon Independent Peer Review Panel](https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-costs/diablo-canyon-independent-peer-review-panel)." <https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-costs/diablo-canyon-independent-peer-review-panel>.

10 California Governor's Office of Emergency Services, U.S. Department of Homeland Security, Federal Emergency Management Agency Region IX. [Bay Area Earthquake Plan](https://emergencymanagement.sccgov.org/sites/g/files/exjcpb261/files/For%20Partners/bay-area-earthquake-plan_0.pdf). https://emergencymanagement.sccgov.org/sites/g/files/exjcpb261/files/For%20Partners/bay-area-earthquake-plan_0.pdf.

11 California Governor's Office of Emergency Services, U.S. Department of Homeland Security, Federal Emergency Management Agency Region IX. "[Southern California Catastrophic Earthquake Plan, 2022](https://www.caloes.ca.gov/office-of-the-director/operations/planning-preparedness-prevention/planning-preparedness/catastrophic-planning/)." <https://www.caloes.ca.gov/office-of-the-director/operations/planning-preparedness-prevention/planning-preparedness/catastrophic-planning/>.

12 California Governor's Office of Emergency Planning. "[Catastrophic Planning](https://www.caloes.ca.gov/office-of-the-director/operations/planning-preparedness-prevention/planning-preparedness/catastrophic-planning/)." 2023. <https://www.caloes.ca.gov/office-of-the-director/operations/planning-preparedness-prevention/planning-preparedness/catastrophic-planning/>.

Value to Public Safety

The CEC programs discussed in this report are intended to:

- Increase safety and value to the public, state, local, and tribal governments, businesses, and other organizations by investing in energy innovation, resiliency, and reliability by providing grants.
- Ensure a safe and reliable power supply while protecting life and property through the evaluation and analyses of geologic and seismic hazards during thermal power plant licensing.
- Verify that licensed facilities under CEC jurisdiction comply with the respective COC and applicable laws, ordinances, regulations, and standards through compliance inspections.
- Ensure safe and reliable nuclear power by reviewing seismic-related reports and data through the DCCP Independent Peer Review Panel (IPRP).
- Ensure Cal OES's emergency planning and preparedness and catastrophic planning programs have access to trained and experienced subject matter experts in petroleum, natural gas, and energy generation and transmission.

Long-Term Seismic Safety Goals and Objectives

The long-term seismic safety goals and objectives of CEC include:

- Continued investment in energy innovation, resiliency, and reliability through funding projects which include and build upon seismic safety of power plants and infrastructure across all existing and developing energy sectors.
- Verifying existing and future licensed power plants meet the seismic safety requirements required by the applicable laws, ordinances, regulations, and standards.
- Continued involvement in advancing the seismic safety of California's last nuclear power plant as part of the DCCP IPRP.
- Continued involvement with Cal OES's emergency planning and preparedness and catastrophic planning programs by providing access to trained and experienced subject matter experts in petroleum, natural gas, and energy generation and transmission.

Program Budget Sources

Natural gas-fired generation has become the dominant source of electricity in California, as it fuels about 43 percent of electricity consumption followed by the state's renewable resources. Natural gas is used for everything from generating electricity to cooking and space heating to an alternative transportation fuel. The Natural Gas Program is funded by a ratepayer surcharge on the natural gas consumed in California.

The Warren-Alquist Act of 1974 requires the CEC to collect AFC and compliance monitoring fees and reimbursements, and fees for processing amendments to CEC decisions. The processing of AFCs and opt-in certifications is funded by a mixture of the Energy Resource Programs Account (ERPA) and the Energy Facility License and Compliance Fund (EFLCF). The ERPA is a fee collected from all electricity consumers in California and the EFLCF revenue is collected from AFC applicants.¹³

The compliance inspection fees are provided by the EFLCF mentioned above.¹⁶

The CPUC reimburses CEC for costs incurred related to CEC staff's involvement in the IPRP.

Organizational Links

Energy Research and Development Division: <https://www.energy.ca.gov/about/divisions-and-offices/energy-research-and-development-division>

Power Plant Licensing: <https://www.energy.ca.gov/programs-and-topics/topics/power-plants/power-plant-licensing>

Power Plant Compliance Monitoring and Oversight: <https://www.energy.ca.gov/programs-and-topics/topics/power-plants/power-plant-construction-compliance-monitoring-and>

Diablo Canyon Independent Peer Review Panel: <https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-costs/diablo-canyon-independent-peer-review-panel>

California Governor's Office of Emergency Planning, Catastrophic Planning.
<https://www.caloes.ca.gov/office-of-the-director/operations/planning-preparedness-prevention/planning-preparedness/catastrophic-planning/>

13 California Energy Commission. 2023. "Licensing and Compliance Fees for Facilities."
<https://www.energy.ca.gov/programs-and-topics/topics/power-plants/licensing-and-compliance-fees-facilities>.