

Date of Hearing: April 23, 2025

ASSEMBLY COMMITTEE ON UTILITIES AND ENERGY

Cottie Petrie-Norris, Chair

AB 1182 (Irwin) – As Introduced February 21, 2025

SUBJECT: State Energy Resources Conservation and Development Commission: report: electrical grid infrastructure manufacturing

SUMMARY: Requires the California Energy Commission (CEC) to prepare and submit a report to the Governor and Legislature, by July 1, 2026, on the status of electrical transmission and distribution grid infrastructure manufacturing in California.

EXISTING LAW:

- 1) Requires the CEC, on a biennial basis, to adopt an integrated energy policy report (IEPR) containing an overview of major trends and issues facing the state. Requires the report to include an assessment and forecast of system reliability and the need for resource additions, efficiency, and conservation that considers all aspects of energy industries and markets that are essential for the state economy, general welfare, public health and safety, energy diversity, and protection of the environment. (Public Resources Code § 25302)
- 2) Requires the CEC to adopt a strategic plan for the state's electric transmission grid, which recommends actions required to implement investments needed to ensure reliability, relieve congestion, and meet future growth in load and generation. (Public Resources Code § 25324)
- 3) Authorizes the CEC to designate electric transmission corridor zones (TCZs) in order to identify and reserve land that is suitable for high-voltage transmission lines. Specifies the CEC may designate a TCZ on its own motion or in response to an application from a person seeking a TCZ designation based on its future plans to construct a high-voltage electric transmission line. Makes the CEC the lead agency, for purposes of CEQA, for the designation of any TCZ. (Public Resources Code § 25330-25341)
- 4) Establishes the policy that 100% of the state's retail electricity be supplied with a mix of Renewables Portfolio Standard (RPS)-eligible and zero-carbon resources by December 31, 2045 and 100% of electricity procured to serve all state agencies by December 31, 2035, for a total of 100% clean energy. Sets interim targets of 90% by December 31, 2035, and 95% by December 31, 2040. (Public Utilities Code § 454.53)

FISCAL EFFECT: Unknown. This bill is keyed fiscal and will be referred to the Committee on Appropriations for its review.

CUSTOMER COST IMPACTS: Unknown, likely negligible.

BACKGROUND:

No Transition without Transmission – California has ambitious clean energy goals: SB 100 (De León, Chapter 312, Statutes of 2018), also known as the “100% Clean Energy Act of 2018,”

established a landmark policy that renewable and zero-carbon resources supply 100% of retail sales and electricity procured to serve all state agencies by 2045 (the 100% Clean Energy Policy).¹ This policy was updated under SB 1020 (Laird, Chapter 361, Statutes of 2022), and among other requirements, established interim targets to meet the sector-wide 100% goal. The SB 100 report notes that in order to meet state clean energy and climate goals, California will need to roughly triple its current electricity capacity.² Specifically, the report projects that the state will need to add approximately 6 gigawatts (GW) of new renewable capacity annually, nearly double the historical average.³ A study conducted by the Clean Air Task Force and the Environmental Defense Fund concluded that, at a minimum, transmission capacity must double by 2045 to accommodate new renewables and ensure grid reliability.

20 Year Transmission Outlook – Released in 2022, the 20-Year Transmission Outlook is a long-term planning study initiated by the California Independent System Operator (CAISO) outside its normal transmission planning cycle, in coordination with the CEC and the California Public Utilities Commission (CPUC). The study evaluates the longer-term grid needed to reliably and cost-effectively achieve the state’s 100% Clean Energy Policy. To achieve this effort, the study provides a conceptual roadmap for how the transmission grid should evolve over the next two decades. It incorporates projected resource development and electricity demand, guided by input from state agencies on load forecasting and resource planning. The initial plan projects that approximately \$30.5 billion in transmission development will be needed to meet California’s 2045 clean energy goals.⁴ However, the 2024 updated study, which builds on the 2022 analysis, estimates California will require between \$45.8 billion to \$63.2 billion in new transmission infrastructure by 2045.⁵ The CAISO notes that the projected “transmission needs will range from high-voltage lines that traverse significant distances to access out-of-state resources, as well as major generation pockets, including offshore wind and geothermal resources located in California.”⁶

CAISO’s 2023-2024 Transmission Planning Process (TPP) – The CAISO’s TPP released in May 2023,⁷ calls for 85 GW of new resources in the next decade.⁸ The plan is centered on California’s greenhouse gas reduction goals and anticipated load growth including the potential for increased electrification needs.⁹ The TPP includes:

¹ Public Utilities Code § 454.53

² Pg. 10, CEC, CPUC, & CARB; “Achieving 100% Clean Electricity in California,” 2021 SB 100 Joint Agency Report Summary: An Initial Assessment, March 2021

³ CARB, “California releases report charting path to 100 percent clean electricity.” <https://ww2.arb.ca.gov/news/california-releases-report-charting-path-100-percent-clean-electricity>

⁴ Pg.3, CASO; “20-Year Transmission Outlook”; May 2022

⁵ Pg.2, CASO; “20-Year Transmission Outlook”; May 2024

⁶ Pg.1, CASO; “20-Year Transmission Outlook”; May 2024

⁷ CAISO; “2023-2024 Transmission Plan”, May 23,2024; <https://www.caiso.com/documents/iso-board-approved-2023-2024-transmission-plan.pdf>

⁸ The CPUC-provided portfolio calls for 85 GW of installed capacity, beyond its baseline of existing resources and resources already contracted for and under development

⁹ The CEC adopted the 2021 IEPR Energy Demand Forecast, 2021-2035 on January 26, 2022

[<https://www.energy.ca.gov/datareports/reports/integrated-energy-policy-report/2021-integrated-energy-policy-report/2021-1>] The CEC subsequently adopted 2021 IEPR Additional Transportation Electrification Scenario that on July 1, 2022, the CEC and CPUC requested the ISO utilize in the 2022-2023 Transmission Plan. (<http://www.caiso.com/InitiativeDocuments/2022-2023TransmissionPlanningProcessPortfolioTransmittalLetter.pdf>)

- 26 transmission projects with a total cost of \$6.1 billion, ranging in individual cost from \$4.6 billion to \$1.5 billion.
- Pursuant to CAISO's Federal Energy Regulatory Commission (FERC) tariff, only two of these projects were eligible for competitive solicitation.
- The reliability and policy projects included 26 that can meet the increase in electrification needs.
- This plan does not recommend any projects based solely on economic considerations.

Global Supply Chain Challenges – California's power transmission infrastructure is currently grappling with significant supply chain challenges that hinder the state's clean energy transition. The global supply chain disruptions, including the COVID-19 Pandemic and political instability, have led to increased costs and delays in acquiring raw materials like steel and aluminum as well as essential components such as transformers and conductors, impeding the timely expansion and modernization of the grid.¹⁰ According to a 2024 report by the National Infrastructure Advisory Council (NIAC), the U.S. domestic supply chain currently meets only about 20% of the nation's transformer demand. The U.S. power system comprises over 80,000 transformer types, many of which are outdated, susceptible to failures, and lack standardization—making replacements more complex and costly. These shortages, coupled with extended lead times for manufacturing and delivery, hinder timely infrastructure upgrades and expansions, further exacerbating supply chain challenges.¹¹ In California, the three investor-owned utilities—Pacific Gas and Electric (PG&E), Southern California Edison (SCE), and San Diego Gas & Electric (SDG&E)—are similarly experiencing significant delays in transmission and distribution projects due to a nationwide shortage of electrical transformers. For instance, PG&E has reported that transformer delivery times have extended from a few weeks to up to three years, hence delaying transmission project timelines and increasing system upgrade costs.

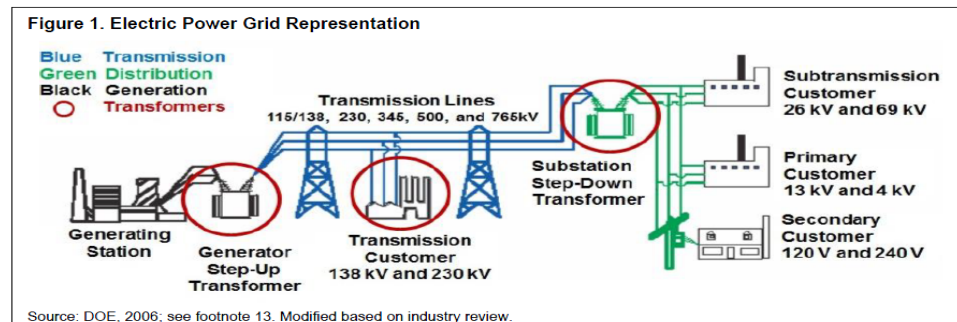
COMMENTS:

- 1) *Author's Statement.* According to the author, “As California moves towards an electrified future, it will require significant infrastructure buildout and grid upgrades to support load from data centers, EV chargers, hydrogen facilities, and heat pumps. The CAISO estimates between \$40 and \$60 billion in new transmission capacity is necessary by 2045. In order to meet its ambitious climate and electrification goals, California must consider what infrastructure needs this transition will require. Post-COVID supply chain issues, highly-specified designs, and routine system upgrades all contribute to an existing infrastructure shortage. AB 1182 directs the California Energy Commission to examine the possibility of manufacturing energy infrastructure, such as transformers, in California in a report to the Legislature.”
- 2) *This Bill.* For background, transformers are essential to the transmission system, as they regulate voltage levels throughout the grid—stepping up voltage at the point of generation, for efficient long-distance transmission, and stepping it down for safe

¹⁰ International Energy Agency, <https://www.iea.org/news/rising-component-prices-and-supply-chain-pressures-are-hindering-the-development-of-transmission-grid-infrastructure>; Accessed April 10, 2025

¹¹ Trabish H. (2025), Transformer Supply Bottleneck Threatens Power System Stability as Load Grows

distribution to end users (see Figure 1).¹² Power transformers are also needed at every point where there is a change in voltage in power transmission, to step the voltage either up or down for distribution to a level that can be used by customers.¹³



A recent National Renewable Energy Laboratory (NREL) study forecasts that the number of distribution transformers required in the U.S. by 2050 will be 160% to 280% higher than 2021 levels.¹⁴ Much of the expected growth could come from data center demand, transportation electrification, and increases in step-up transformers needed for wind and solar generation. This is especially true in the case of large power transformers, which are highly specialized. According to a Department of Commerce study, the average large power transformer in service is 38 years old, which is near or beyond its intended design life.¹⁵

During the COVID-19 pandemic, the transformer manufacturing industry was among those that experienced severe supply chain disruptions. The impact of those disruptions have only become more pronounced in subsequent years. Large power transformers are typically custom-built with costs varying by manufacturer and size. A large power transformer can cost millions of dollars and weigh between 200,000 and 800,000 pounds.¹⁶ Additionally, their production involves long lead times, driven by a complex procurement and manufacturing process that involves manufacturer prequalification, a competitive bidding process, sourcing of specialized raw materials, and the need for specialized transport due to their substantial size and weight. Given these challenges, this legislation aims to evaluate California's capacity to develop in-state domestic manufacturing of transformers as a strategy to mitigate supply chain constraints.

3) *Related Legislation.*

AB 825 (Petrie-Norris, 2025) would create the Public Transmission Financing Fund within the State Treasury for the purpose of financing eligible transmission projects, as defined, that are necessary to meet the state's clean energy goals to reduce or offset

¹² Pg. 5; Department of Energy; "Infrastructure Security and Energy Restoration Office of Electricity Delivery and Energy Reliability U.S. Department of Energy." April 2014 Update

¹⁴ NREL; "How Many Transformers Will US Distribution Grid Need by 2050?"; <https://www.nrel.gov/news/program/2024/how-many-transformers-will-the-us-distribution-grid-need-by-2050.html>

¹⁵ P.g 8, National Infrastructure Advisory Council' "Addressing the Critical Shortage of Power Transformers to Ensure Reliability of the U.S. Grid"; June 2024

¹⁶ Pg. vi; Department of Energy; "Infrastructure Security and Energy Restoration Office of Electricity Delivery and Energy Reliability U.S. Department of Energy." April 2014 Update

ratepayer costs associated with the public benefits of transmission projects. Status: Assembly Utilities & Energy Committee

AB 745 (Irwin, 2025) would, consistent with the commission's authority to review and approve new transmission line projects undertaken pursuant to the Independent System Operator planning process, require the commission to review and approve or deny transmission line projects, including the extension, expansion, upgrade, or other modification of existing transmission lines, initiated by an electrical corporation based on the appropriateness and cost-effectiveness of the projects. Status: Assembly Utilities & Energy Committee

AB 941 (Zbur, 2025) requires the CPUC to expedite the environmental review process for an electrical infrastructure project designated as a "priority project" as defined. Status: Assembly Natural & Resources Committee

SB 330 (Padilla, 2025) would authorize the Governor to establish one or more pilot projects to develop, finance, or operate electrical transmission infrastructure that meet specified criteria, including, among other things, that the transmission line is identified by the CAISO in its transmission planning process as necessary to support clean energy generation to meet the state's clean energy goals. Status: Senate Utilities & Energy Committee

SB 787 (McNerney, 2025) would direct the California Energy Commission's Senior Counselor to convene working groups focused on strategic clean energy sectors, including home and grid-scale batteries, offshore wind, and building decarbonization. These groups will identify challenges to expanding in-state manufacturing and strengthening California's clean energy supply chains. Status: Senate Utilities & Energy Committee

SB 86 (McNerney, 2025) would extend and expand tax incentives for green energy manufacturers operating in California. It also includes nuclear fusion manufacturing in the incentive program, aiming to create clean manufacturing energy jobs within the state. Status: Senate Appropriations Committee

4) *Prior Legislation.*

AB 52 (Grayson, 2024) would have allowed a credit under both the Personal Income Tax Law and the Corporation Tax Law, equal to the amount of sales tax reimbursement or use tax paid on purchases that were partially exempt under the existing sales and use tax (SUT) exemption, for manufacturing and research and development (MR&D). Status: Vetoed by the Governor

AB 1951 (Grayson, 2022) would have expanded, for a five-year period, the existing partial SUT exemption for MR&D by making it a full exemption. Status: Vetoed by the Governor

SB 100 (De León) establishes the 100 Percent Clean Energy Act of 2018, which increases the Renewables Portfolio Standard (RPS) requirement from 50% by 2030 to 60% and creates the policy of planning to meet all of the state's retail electricity supply

with a mix of RPS-eligible and zero-carbon resources by December 31, 2045, for a total of 100% clean energy. Requires the CPUC, in consultation with the CEC, CARB, and all California balancing authorities, to issue a joint report to the Legislature by January 1, 2021, reviewing and evaluating the 100% clean energy policy. Status: Chapter 312, Statutes of 2018

REGISTERED SUPPORT / OPPOSITION:**Support**

None on file.

Opposition

None on file.

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