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California scopes $30bn grid plan in face of 'unprecedented' green power demand

Buildings of downtown Los Angeles partially obscured by smog Photo: Mario Tama/Getty Images

State grid operator Caiso says 'critical need for more proactive long-term' thinking on transmission as forecast 120GW-plus of renewables are brought online by 2040

By **Richard Kessler**

California's transition to clean electric power will require $30.5bn investment in high-voltage bulk transmission infrastructure by 2040 to tie together a potential 121GW of new battery storage and renewable energy production, according to a planning document issued by the state's grid operator.

"There is a critical need for more proactive, long-term transmission planning and coordination," said Elliot Mainzer, CEO of California ISO (Caiso), a non-profit that manages the state's bulk power system, transmission lines, and electricity market.

"This type of forward-looking planning and coordination is essential to meeting the state's energy policy goals in a reliable and cost-effective fashion and strengthening interconnections with our partners across the West," he added.

Caiso collaborated with the California Energy Commission and **California Public Utilities Commission** (CPUC) on the draft paper released earlier this month. A final version will be available in March.

The authors of ***20 Year Transmission Outlook*** noted that "California is facing an unprecedented need for new renewable resources over the next 10 to 20 years."

This acceleration will "stress all aspects of the resource planning, procurement, engineering, supply chain and construction. It will also accelerate the need for new transmission approvals, permitting and construction," they added.

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The document considers the longer-term grid requisites and options for meeting the state's greenhouse gas (GHG) reduction and renewable energy objectives "reliably and cost-effectively."

Senate Bill 100 (100 Percent Clean Energy Act of 2018) requires renewable energy and zero-carbon resources supply 60% of all retail electricity sold and state agency electricity needs by 2030 and 100% by 2045. California has the second largest US state electricity market after Texas.

Also spurring demand for clean energy are consumers and other stakeholders, continuing electrification of transportation and other carbon-emitting industries, and higher than anticipated impacts of peak loads shifting to later-day hours when solar resources are unavailable, according to the report.

It also highlights the critical need to have alternative resources to maintain system reliability with planned retirements of baseload natural gas and nuclear power.

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The document uses a 'starting point' scenario that assumes how much new operational clean resource capacity would be necessary to attain the 2045 target, taking into account 2040 forecast peak demand of 82.3GW compared with a 2021 peak of 43.9GW, minus what behind-the-meter resources could contribute. It also considered a 15GW loss in natural gas-fired generation.

The resulting scenario called for California to add 53.2GW of utility solar versus about 14GW in 2020; 37GW of battery storage and 12GW of wind from other states as distant as Wyoming, with 9.9GW requiring new transmission lines and 2.1GW exported on existing ones.

Other 2040 resource assumptions include 10GW of floating offshore wind from projects along California's central and northern coasts, 4GW of long-duration energy storage, 2.3GW of geothermal and 2.2GW of in-state onshore wind.

The document notes that connecting these new resources will involve "significant" heavy-duty transmission development. This places a premium on long-term planning among state agencies "given the lead times needed for these facilities primarily due to right-of-way acquisition and environmental permitting requirements."

Upgrades totaling $10.7bn will be necessary within the existing CAISO footprint and consist of 230kV and 500kV lines, high-voltage direct current lines and substations.

Integrating offshore wind projects in central and northern California will require $8.1bn investment for new 500kV AC and HVDC lines, while out-of-state solar and wind integration will consist of 500kV and HVDC lines a forecast $11.6bn investment, according to the document.

"California is working very diligently to ensure resource adequacy during this transition to a carbon-free system," said Mainzer. In 2021, California brought 79 clean-energy projects onto the grid, the most it has ever added in a single year.

"This improved transmission planning and coordination with regulatory agencies and other partners will help ensure that California can sustain and even exceed that pace and meet the challenge of achieving a reliable clean-energy grid," he added.