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The Path to Net Zero

A Decarbonization Roadmap for California

Key Takeaways

Clean & Reliable Electricity

1 This study is the first publicly available analysis to model California decarbonization through 2045 using the NERC[(1)] industry standard for evaluating electric system reliability, yielding new insights about the generation capacity, grid investments and technologies required to decarbonize reliably

2 A reliable, clean and diverse electric portfolio is critical to help enable economywide electrification. The pace of utility-scale solar and wind development is expected to significantly increase.

3 Significant electrification of transportation and buildings will need to occur, doubling SDGE's electricity consumption and increasing net peak demand to 1.8 times by 2045

Clean Fuels

4 A diverse approach is essential to reliable, affordable and equitable decarbonization. Clean electricity and clean fuels both play critical roles in every sector of the economy.

5 Clean fuels, especially hydrogen, will play a critical role in decarbonizing the electric sector, medium-duty and heavy-duty vehicles and portions of the industrial sector that cannot feasibly be electrified

Affordability

6 Customers that electrify according to our Roadmap are projected to have similar ongoing energy costs in 2045.[(2)] Successful decarbonization should ensure disproportionate costs are avoided and that everyone is able to adopt decarbonization technologies and benefit from the clean transition.

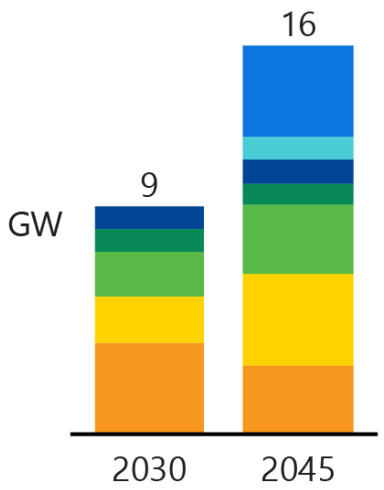
1) North American Electric Reliability Corporation
2) Does not account for impacts of inflation

ELECTRIC SUPPLY PORTFOLIO

Incorporating robust reliability modeling reveals a greater need for clean dispatchable generation

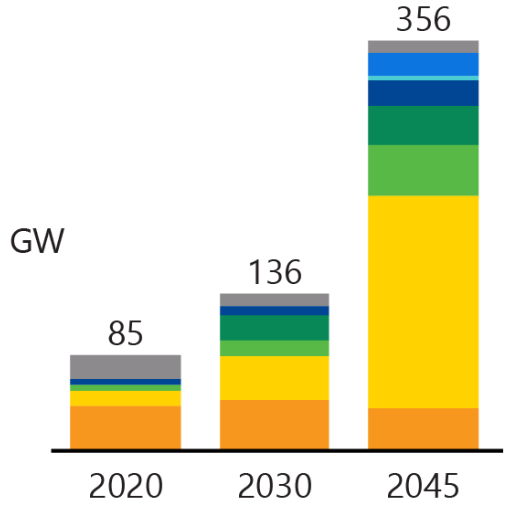
SDG&E'S SERVICE AREA

Generation Capacity

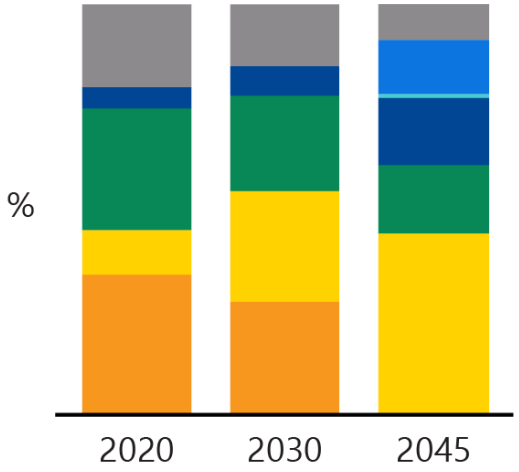


CALIFORNIA

Generation Capacity



Annual Electricity Breakdown



Natural Gas | Solar | Storage[1] | Imports | Wind | CCS[2] | Hydrogen | Other[3]

- The Path to Net Zero is the first in California to use the NERC industry standard for reliability through 2045
- A decarbonized and reliable electric sector is achieved through a combination of renewables, energy storage, and 100% clean hydrogen generation
  - While our modeling selected hydrogen-based generation to provide electric reliability, we support a technology inclusive approach
- Statewide, average annual growth ~8 GW of solar, and ~2 GW of battery storage, beginning in 2023

1) *Includes both short- and long-duration battery energy storage and pumped hydro storage*
2) *Natural gas generation with CCS. Includes new builds and retrofits*
3) *Other includes oil, coal, geothermal, biomass, hydro, and nuclear*

LESSONS LEARNED

Successful electric system planning requires the following:

1 Prioritizing Electric System Reliability

- Reliability modeling is critical for long-term state planning of the electric sector
- Reliable electricity is necessary for decarbonizing transportation and building sectors

2 Using Reliability Modeling to Inform Resource Diversity Needs

- Random sample modeling (e.g., LOLE) ensures the planned electric system appropriately meets planning targets and maintains reliability as compared to static reliability modeling (e.g., PRM)
- Model results should not be validated by the same model inputs
- Variations in reliability modeling results will demonstrate if additional resource diversity or locational diversity is necessary

3 Ensuring Reliability in Each Target Year

- Reliability modeling should be done for each year with targets (e.g., 2035, 2040, 2045)
- Results in a future year may be reliable, while interim years could prove more challenging