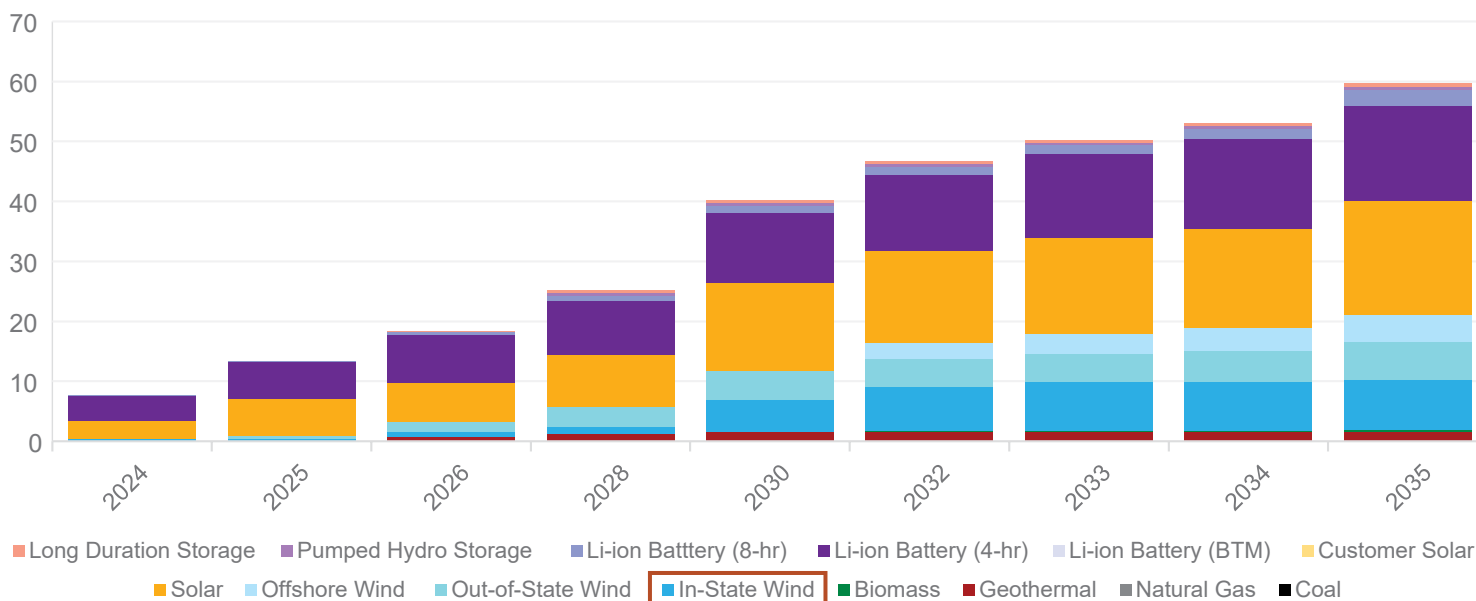




Onshore wind strengthens the electric grid by harnessing natural wind resources that often peak at night or during storm conditions, complementing solar generation patterns. By providing clean, renewable electricity during periods when solar output is low, wind reduces dependence on fossil fuels, enhances resource diversity, and improves overall grid reliability and resilience. One rotation of a large wind turbine can power one average home for a day.

California's installed onshore wind capacity continues to grow. As of 2023, the state had over 6 gigawatts (GW) of installed wind capacity, with expansion projected through 2045.

New Resource Buildout in the California Public Utility Commission's Resource Plan



Source: California Public Utilities Commission. (2024). Fact sheet: Decision Adopting 2023 Preferred System Plan (R.20-05-003).

Benefits of Wind



Grid Reliability and Flexibility

- Complements solar by producing electricity at night or during weather-driven events.
- Reduces grid stress and mitigates power curtailment.



Resilience and Environmental Impact

- Reduces dependence on fossil fuels and imported energy.
- Delivers clean power with no direct emissions or air pollutants.
- Helps the state and utilities meet renewable portfolio standards and climate targets.
- Supports energy resilience during fuel supply disruptions or emergencies.



Economic and Market Benefits

- Provides low-cost energy over the long term with no fuel costs.
- Attracts investment and diversifies local energy portfolios.
- Creates local jobs in manufacturing, construction, and operations – over 120,000 U.S. wind energy jobs.
- Supports rural communities through land lease payments and increased tax revenue.
- Wind power is a commercially mature technology with a long asset life and one of the lowest costs of electricity.

Wind Power by Location

- **Onshore Wind:** Most common form of wind power, typically found in rural, agricultural, or hilly areas.
- **Offshore Wind:** In oceans or large lakes; typically more consistent wind but higher installation costs.

Wind Turbine Types

- **Horizontal-Axis Wind Turbines (HAWT):** Propeller-like blades that rotate around a horizontal axis and face into the wind (most common design).
- **Vertical-Axis Wind Turbines (VAWT):** Cylindrical or “egg-beater” blades rotate around a vertical axis, that can face any direction (used in small-scale applications).



Additional Resources for Wind



[Wind Explained: US Energy Information Administration](#)

[Advantages and Challenges of Wind Energy: US Department of Energy](#)

[WINDEXchange: US Office of Energy Efficiency and Renewable Energy](#)

Wind Power Considerations

Environmental Impacts

- Large scale wind projects undergo California Environmental Quality Act (CEQA) review and, as applicable, federal National Environmental Protection Act (NEPA), the Migratory Bird Treaty Act (MBTA) and the Endangered Species Act (ESA) to identify and mitigate impacts to protected species and habitats.
- Wind turbines cause less than 0.01% of human-related bird deaths annually. Localized impacts to threatened birds, however, could be significant.
- Mitigation options for birds, bats, and avian species include various layout, monitoring, operational, and technology options.

Sound and Health Impacts

- At typical distances from residential properties, wind turbines can generate up to 50 dB of sound, equivalent to ambient noise in urban settings.
- Credible scientific studies have found no direct relationship between human health and wind turbines.

Land Use and Decommissioning

- Wind turbines typically occupy about 5% of the project land; the remaining land can be used for agriculture or other compatible purposes.
- Options for project decommissioning at end of life (e.g. 30+ years) include land restoration and recycling over 85% of wind turbine materials.

Additional Regulations

- CEQA and local zoning may regulate shadow flicker, or sunlight passing through rotating blades causing shadows (e.g. maximum of 30 hours/year).
- Wind project locations and height may require Federal Aviation Administration (FAA) coordination.

Onshore wind delivers electricity to customers through the transmission and distribution grid. Electricity generated by the turbines is stepped up in voltage and injected into the transmission system, which carries it long distances at high voltage. The electricity then flows into the distribution system, where it is stepped down and delivered through local power lines to homes and businesses.

