

Reliable Power For A Renewable Future

: 2012-2016 STRATEGIC PLAN :



California ISO
Shaping a Renewed Future

From yesterday's electricity lines to tomorrow's energy network:

Achieving a greener, smarter, and more secure electric future for California

Electricity powers this state's economy, making possible the innovation that has opened new opportunities in California and around the world. The state's ability to sustain its global leadership in energy and technology depends on a transformation of the electric system to meet the needs of the 21st century.

Today's electric grid is fundamentally a one-way system linking generation plants with transmission towers, substations, distribution lines and electric meters. It relies on aging fossil-fuel plants and an operating infrastructure designed for the last century. Tomorrow's system will be a network of many interdependent components as we shift beyond predictable gas-fired units to more intermittent renewable energy sources, from centralized energy management to an orchestrated portfolio of distributed resources, from gasoline to electric-fueled vehicles, and from consumers as simply users of electricity to active participants in managing that use and even producing electricity itself.

Elements of this transition are underway. New renewable energy plants are coming online, additional transmission facilities are being built, and more sophisticated energy management technologies (including devices to better synchronize customer electricity demand with grid supply conditions, smart meters and energy storage solutions) are being tested and deployed. Vehicle charging capability is expanding. However, this is only the beginning. Electricity

producers, distributors, consumers, system operators and regulators all have critical roles to play. The tasks are challenging and the possibilities exciting. But success is imperative.

What this means for the ISO and its customers...

As the nonprofit, public benefit organization responsible for ensuring the *reliability* and *security* of the state's electric system, the California Independent System Operator Corporation (ISO) has a key role in achieving this transformation. *For example:*

- **Increased generation diversity:** Between now and 2020, wind and solar generation will *quadruple* within the ISO-managed grid.
- **Changing usage patterns:** At the same time that solar generation is expanding dramatically, nighttime electric vehicle charging also will increase significantly. The result will be *two-way*, 24-hour demands on a one-way distribution system designed primarily for use during waking hours.
- **Active role for consumers:** Today's electric consumers have limited ability to manage their energy consumption in response to rates or conditions on the grid. Smart technologies will provide simpler ways for consumers to lower their utility bills by actively managing their usage, which presents additional challenges to our ability to manage the system.

To prepare for this new operating reality, while maintaining reliable electric service for all we serve, the ISO is pursuing four fundamental strategies:

1

Facilitate California's transition to a smarter, cleaner, more reliable and secure energy future

2

Ensure continued reliability during grid transformation

3

Strengthen California's global leadership commitment to renewable, responsible and reliable electricity

4

Explore opportunities for regional collaboration and focused technological innovation

1 Strategy One:

Facilitate California's transition to a smarter, cleaner, more reliable and secure energy future

The Challenge:

California pioneered the development of renewable energy resources in the 1980s. Building on that tradition, the state now requires that by 2020, 33% of electricity come from renewable sources. As the organization responsible for energy reliability, the ISO is at the forefront of making this vision possible—while continuing to keep the lights on.

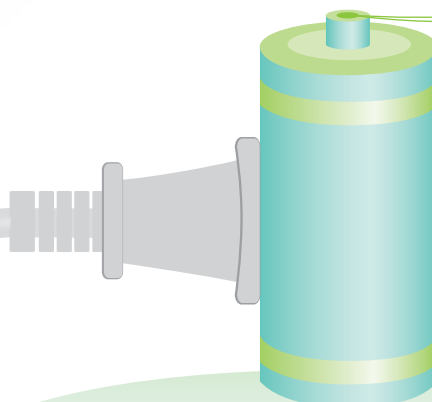
Renewable generation poses both unique opportunities and operational challenges. It reduces greenhouse gas emissions, improves generation diversity and creates jobs. But wind

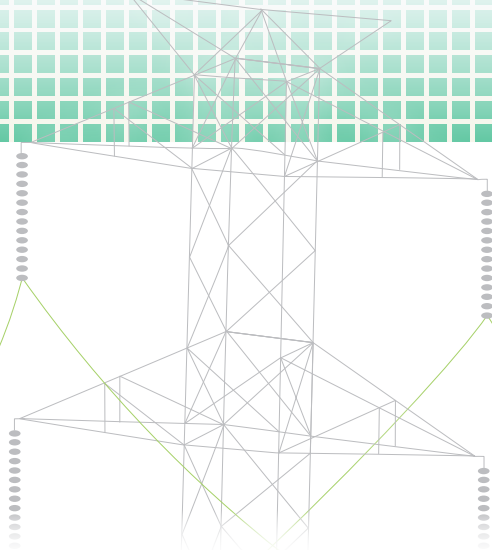
and solar resources depend on the weather and most renewable sources (including biomass and geothermal) tend to be located in places far from California's population centers—both complicating electricity predictability and requiring transmission connections.

These new resources should be developed in the most cost-effective and environmentally responsible way for California consumers. Renewable developers have already proposed over 57,000 MW of new generation for the ISO grid, but our system's current peak requirement is only about 50,000 MW. Integrating the right amount of new resources requires sophisticated engineering analyses and poses significant policy questions about who pays for what.

The Strategy:

The ISO will provide **independent analysis and perspective** on what the system needs when and where. This will help key decision makers as they consider how much renewable and related generation resources to buy, which transmission lines to approve and when, what mechanisms





will best encourage customer efficiency and how to accelerate deployment of new energy storage and communication technologies that complement the ISO's world-leading grid management and forecasting platform.

We will **facilitate timely development** of generator interconnection projects by appropriately managing the project queue and progress milestones in line with the state's grid operational needs and regulatory timetables. In addition, we will provide new market mechanisms to bring online new resources offering the kinds of operational flexibility we need (such as 1-minute response and more versatile ramping) to orchestrate the state's increasingly complicated electricity network. In order to facilitate timely integration of these resources, the ISO welcomes independent transmission developers in helping build it, consistent with federal policy.

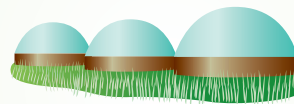
Finally, we will **offer our best thinking** on the costs associated with operating California's new system, and ideas about how those costs might be allocated among developers, connecting utilities and the customers ultimately served by these new resources.



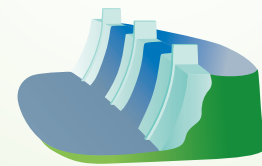
WIND



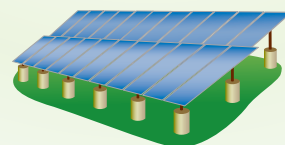
GEOTHERMAL



BIOMASS



SMALL HYDRO



SOLAR

Strategy Two:

Ensure continued reliability during grid transformation —from today's aging fleet of fossil power plants to a cleaner, more diverse and complex portfolio of resources

The Challenge:

Many fossil-fuel power plants within the ISO grid are at the end of their economic and physical lives. Thirteen of these plants (representing about 17,500 MW) and the state's nuclear facilities must retrofit, repower, or retire by 2020 and 2024, respectively to comply with state "once-through cooling" policy restricting the use of coastal waters for power plant cooling. However, some of these plants are in areas with transmission bottlenecks, resulting in the need for local generation to minimize the risk of power

outages for those customers. Some of these plants can be powered up quickly when weather or system conditions limit wind or solar power output.

As renewable sources come into the system, procurement of fossil-fuel generation will decline just when it is needed to offset the intermittency of variable resources. ISO studies show these "grid workhorses" will remain needed for reliability until other technologies such as storage or demand response mature. Another complication is that current market prices do not cover the cost of operating an existing fossil-fuel power plant, let alone the cost of developing a new facility. Furthermore, existing plants are not currently eligible to compete for long-term procurement contracts for new resources.



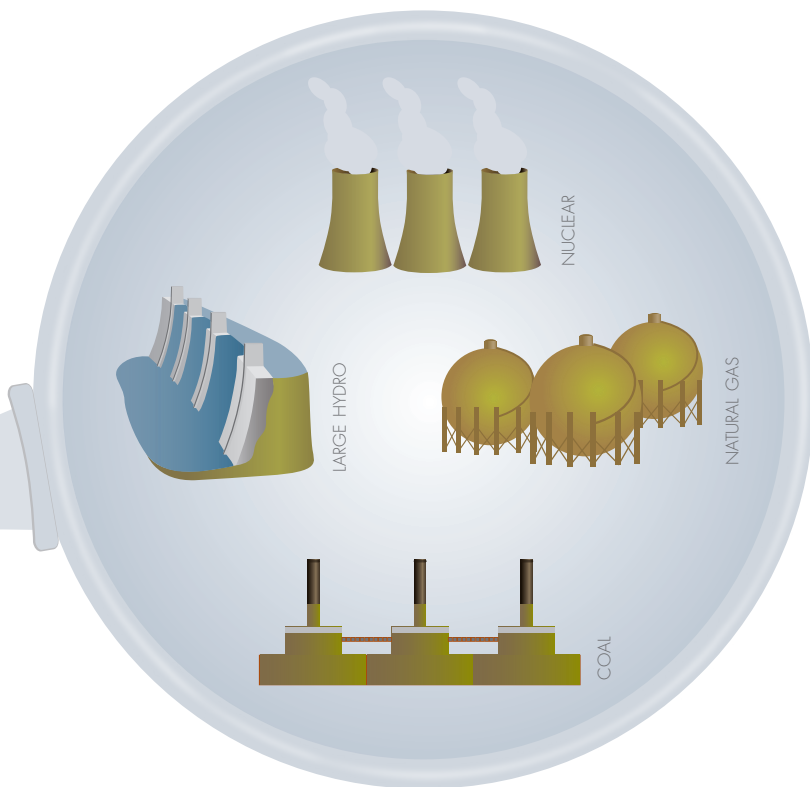
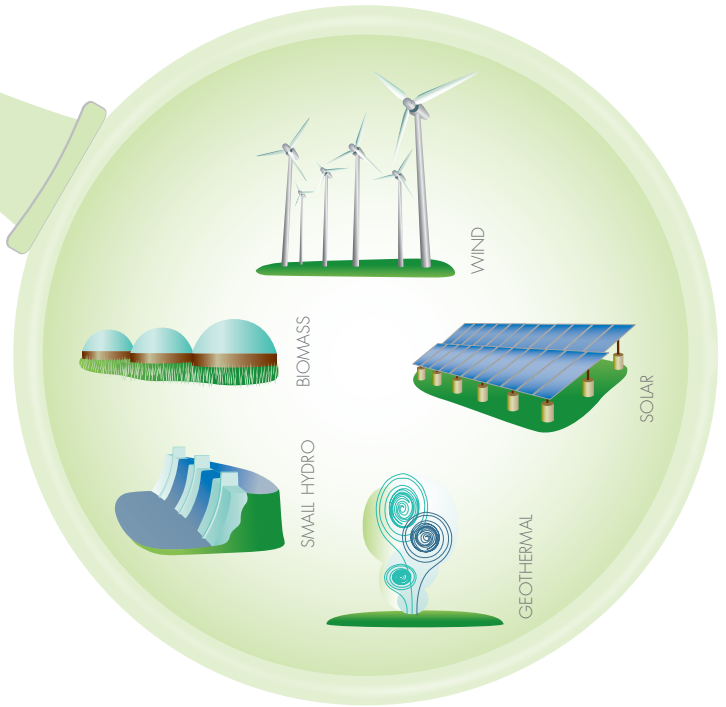
RELIABILITY
DURING
TRANSITION

The Strategy:

The ISO will work closely with other agencies to **develop a long-term procurement strategy** that ensures reliable operation throughout all areas of the grid.

This will require **coordinating** compliance with once-through cooling policy and local reliability requirements, developing appropriate financial support for continued availability of existing generation facilities necessary to complement new renewables, and encouraging innovation in new and more flexible storage, demand response and ramping capabilities across our portfolio.

Working closely with the California Public Utilities Commission, we will identify ways to optimize its Resource Adequacy Program, Long Term Procurement Program and the ISO **backstop procurement authority** to focus on maintaining an efficient fleet with proper capabilities. We will work with stakeholders to broaden the ISO's backstop abilities to ensure that more flexibility exists to react to system needs. Finally, we will make sure that system needs are fully studied, documented and available to policy makers and stakeholders.



Strategy Three:

Strengthen California's global leadership commitment to renewable, responsible and reliable electricity

The Challenge:

Energy policy is inherently complicated and contentious. It involves difficult trade-offs among competing and legitimate public policy and private interests. These range from customer concerns about cost and environmental quality, generator needs for business viability, public expectations of accountability and an overarching need for strengthening California's economic competitiveness. Simply put, electricity powers not just the lights, but the jobs upon which we all depend.

Regulatory authority over these considerations is shared by several state and federal entities with separate and sometimes overlapping responsibilities. For example, the ISO is federally regulated and must simultaneously answer to the Federal Energy Regulatory Commission and state policy makers that oversee, among other things, utility resource procurement, infrastructure permitting and ratemaking. In order to build the kind of electric network we need to fuel our state's future economic prosperity, we need continued coordination and clarity across the regulatory landscape of which the ISO is a part.

The Strategy:

As the entity ultimately responsible for keeping California's lights on, we have the duty to provide **independent perspective** on what it takes to reliably operate the grid while pursuing the state's multiple policy objectives. Building on the collaborative foundation laid by the multi-agency California's Clean Energy Future initiative, the ISO will explore **new opportunities for policy coordination** among policy makers.

We will provide greater transparency for agency and public input into our transmission planning process, including related environmental considerations, and work cooperatively on efforts to **streamline generation interconnections** on both the distribution and transmission systems.





We will offer an **integrated road map** to California's future electric network that can drive job growth and economic opportunity in a way consistent with California's environmental aspirations. Finally, we will do so with a primary focus on helping achieve the state's goals while **maintaining the electric reliability** on which we all depend.

Policy

Process

Partnership

Executive, Legislative,
Regulatory
[Federal and State]

Private
Entities

Publicly Owned Utilities
and
Investor-Owned Utilities

4 Strategy Four:

Explore opportunities for regional collaboration and focused technological innovation—to strengthen the reliability, sustainability, security and resiliency of our electricity network

The Opportunity:

California is synonymous with innovation—in culture, technology and policy. Our electric grid should be the cleanest, safest, most secure and efficient in the world. Fortunately, nature and physics combine to offer an unprecedented opportunity to make that happen for Californians and our neighbors in the West. These opportunities have been tapped in the past and offer great possibilities for the future. They include vast hydro resources in British Columbia and the northwest;

significant geothermal generation from California, Nevada, Utah and Colorado; low cost wind in Montana and Wyoming; and intense solar potential in the deserts of the southwest and Mexico.

There are significant imbalances among the location, mix and scale of potential renewable resources, the nature and magnitude of the customer demand they could serve, and the availability of integration services necessary to maintain reliability. The entire region shares the goal of accelerating renewable generation; the real challenge is determining the right mix between independent and collaborative strategies to do that.

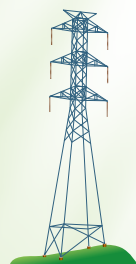
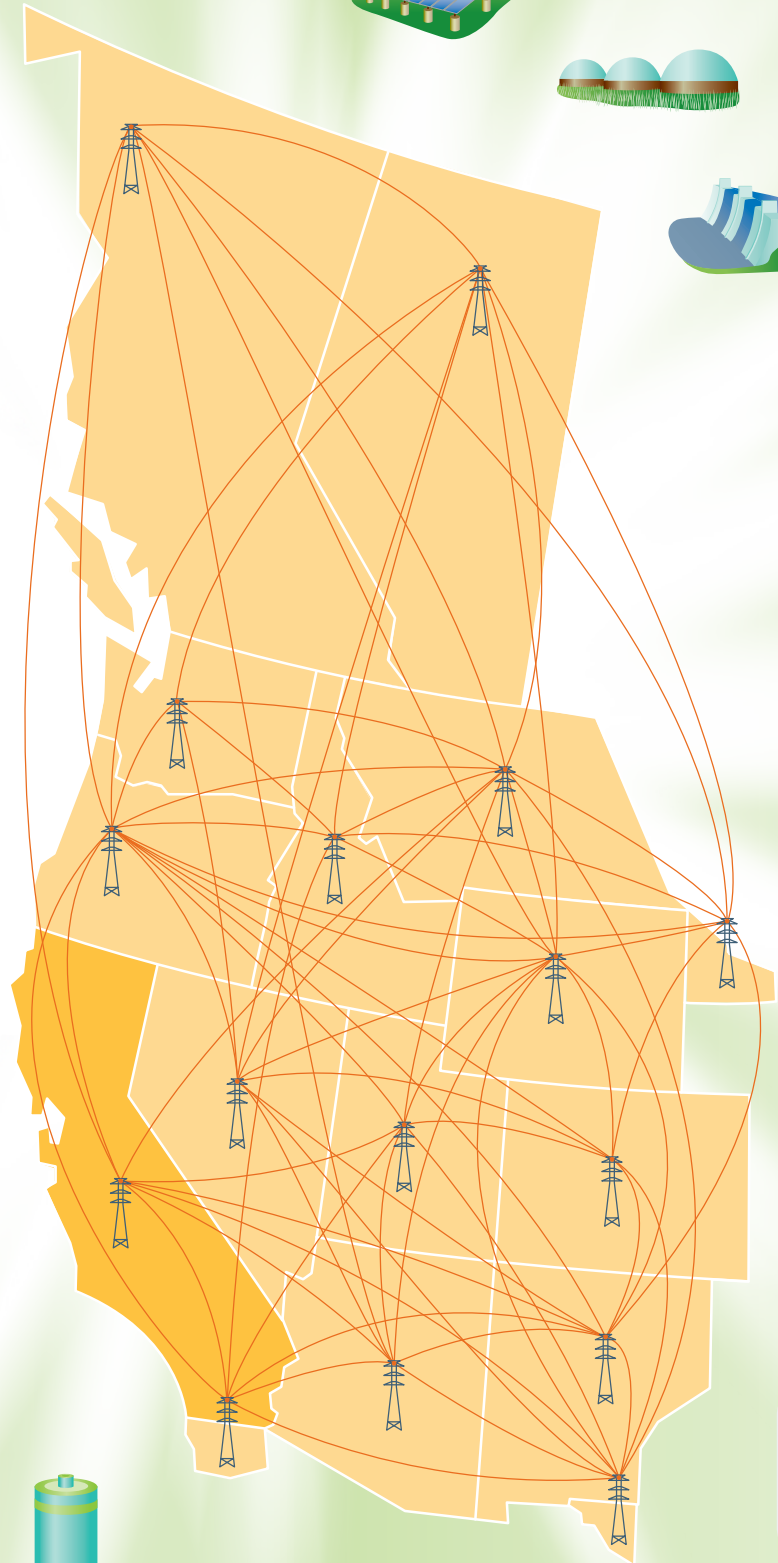
Furthermore, overarching concerns for national security and grid resiliency make new forms of regional collaboration essential to protect the public interest, economic stability and citizen safety. Working together, the western region represents an enormous market opportunity to accelerate and demonstrate potential new technologies—renewable generation, smart grid operation, demand response and electric transportation, among others. California can and should show the world how it can power the future economically and sustainably.



REGIONAL
COLLABORATION

The Strategy:

We will **encourage rapid deployment** of strategically advanced technologies such as synchrophasors that provide instant visibility and faster coordinated response to grid conditions, commercial-scale energy storage and electric vehicles. We will explore opportunities for deeper collaboration and partnership with other regional players to **improve the reliability, efficiency and security** of electric service across our respective geographical areas of responsibility.

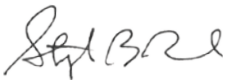


Together, these four strategies directly align with our priorities to keep the lights on and fulfill state policy objectives

Underpinning these four core strategies

is our continued commitment to strengthening the depth and versatility of our team of leading-edge experts—engineers, economists, grid operators, policy analysts and other staff. We will leverage technology to improve efficiency and upgrade the effectiveness of our daily business processes.


This strategic plan will anchor and focus our overall performance management framework in the years ahead, and define the capabilities we need to accomplish them. Our organization strives to be as reliable and versatile as the electricity we ensure for the customers we serve.




Steve Berberich, President & CEO



Nancy Saracino, VP, General Counsel
& Chief Administrative Officer



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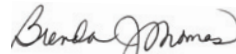
Petar Ristanovic, VP, Technology



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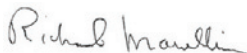
Keith Casey, VP, Market &
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Brenda Thomas, VP,
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Richard Maullin,
ISO Board of Governors



Angelina Galiteva,
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Ash Bhagwat,
ISO Board of Governors

Strategy	Reliability Electricity when you need it	Renewability A cleaner, greener and more agile grid	Rates Competitive prices that encourage efficiency	Resiliency A more secure, less vulnerable grid
1 Facilitate California's transition to a smarter, cleaner, more reliable and secure energy future	Ensure reliability while integrating more diverse and less predictable variable generation	Deploy clean, renewable generation and related infrastructure Create jobs	Provide independent analysis of costs for transition	Develop grid network management capabilities that match and leverage the new diverse resource portfolio
2 Ensure continued reliability during grid transformation	Provide appropriate financial and regulatory certainty to keep needed plants online	Test and deploy storage technology solutions Support wide-spread deployment of EV charging infrastructure	Analyze operating costs and cost responsibility related to generation and variability, and system reserve requirements	Improve operating flexibility across a more diverse portfolio of generation resources
3 Strengthen California's global leadership commitment to renewable, responsible and reliable electricity	<p>Develop a streamlined, shared multi-agency project management system to improve transparency and accountability for projects and policy makers alike</p> <p>Collaborate with state agencies to better synchronize key policy and management decisions</p> <p>Provide independent analysis and leadership to help California achieve its renewable energy objectives without compromising reliability and economic competitiveness</p>			
4 Explore opportunities for regional collaboration and focused technological innovation	Improve operational transparency across interdependent grids to improve joint reliability	Encourage acceleration of demand response technologies Evaluate options to optimize renewable resource development for overall regional benefit	Leverage the ISO's state-of-the-art grid management technology platform to achieve shared economies of scale with other interested parties	Enhance the ability to address outages, while strengthening overall grid security

We are committed to leveraging the ISO's world-class technology platform and dedicated team of professionals to achieve success of these strategies and continued reliability of the electricity California depends on.

California ISO's Electricity Road Map

California's electric system is

becoming an interconnected two-way network, vastly more intelligent and complex than today's electricity system. Customers will have greater opportunities to actively manage their energy use and even generate power themselves. The media and general public will be increasingly curious about what this new network offers and how it works. And policy makers and regulators will face new challenges in ensuring this new network is reliable, sustainable, efficient and secure—fully capable of driving California's future economic leadership.

We think it would be useful to give all interested parties a clearer picture of what California's electric system looks like today, and how the ISO's strategies will contribute to its transformation. The enclosed "California ISO's Electricity Road Map" shows how and where our state generates and distributes the electricity that keeps California's lights on. It also indicates how closely interconnected we are with other states in the region.

We hope it will help you better understand the grid we share today, and the direction we are headed to make sure we have the electricity we need to power our future.

[Click here](#) to see
the California ISO's
Electricity Road Map



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