

## Executive Summary

# California's Clean Energy Future Imagine the Possibilities

California has led the nation in setting environmental policy to address climate change. In 2006 California passed the landmark legislation, known as AB 32, requiring California to increase its use of solar and wind power and significantly reduce greenhouse gas (GHG) emissions. California accomplished its AB 32 goals four years ahead of schedule. This has been due, in part, to investments in wind and solar technologies, aggressive energy efficiency goals, and the movement away from coal to natural gas.

In 2018, California set an even bolder goal: to achieve carbon neutrality by 2045. Making this vision a reality will require business leaders, non-governmental organizations, and policy makers to work together to re-imagine how California's energy infrastructure can operate as one, integrated system that maximizes emissions reductions and minimizes waste.

Many see California as a test case to determine whether it's possible to drastically cut GHG emissions while still enjoying robust economic growth. It's a venture on which California is staking its leadership, and other states are watching closely to inform future policy decisions.

There is no clear path today to reach California's carbon neutral vision. Its investment in solar and wind technologies have made them price-competitive and are proof points of renewable energy innovation. Similar policies and investments have led to advances and adoptability in battery technology. But solar, wind, and batteries alone will not get California where it wants to go.

A more inclusive approach will be needed – one that is technology neutral, welcomes all ideas, considers all forms of energy, encourages and allows for current and future innovation, and factors in the cost and affordability of energy.

California has the world's fifth-largest economy and is the nation's most populous state. Its people must be able to afford to live in the state and businesses must be able to stay. Achieving the state's environmental goals cannot come at the price of deepening the state's affordability crisis or continuing to widen income disparity.





In short, California will need to ask and successfully answer three fundamental questions if it wishes to develop a sustainable energy future:

### **How will we store solar and wind energy to use when the sun isn't shining, and the wind isn't blowing?**

The solution to California's renewable future is not as simple as generating more solar and wind power and adding them to the grid. Wind and solar are intermittent forms of energy—they do not provide a reliable, continuous power supply; the power they generate is not always available when people need it most. California today produces excess wind and solar power that cannot be used. This energy waste is expected to grow – by 2025, California is expected to waste the amount of electricity that could power LA County for more than a month.

### **How do we keep energy affordable while achieving our greenhouse gas reduction goals?**

The total expense of reaching the 2045 target, as well as the full implications to California's consumers, is unknown. What is certain is that the decisions California makes today will have far-reaching consequences across many facets of Californians' daily lives. Success will depend on remaining open to all technologies and resources that can help create a realistic and affordable path to carbon neutrality.

### **How do we inspire consumer adoption?**

To date, California's Clean Vehicle Rebate Project has distributed nearly \$525 million in rebates for electric vehicles.<sup>1</sup> Despite policy efforts and investments, emissions from cars and trucks, already California's biggest source of GHGs, have increased over the last several years. As of May 2017, only 300,000 ZEVs and plug-in hybrids (PHEVs) have been sold in California.<sup>2</sup> One learning from the slow adoption of ZEVs in the

transportation sector is that the more California's GHG reduction targets rely on consumer behavior change, the more the targets are at risk. Preserving choice, providing affordable options and minimizing disruption to people's daily lives are all important strategies to inspire consumer adoption.

Any solution California adopts must also be scalable. Our state emits less than one percent of global GHG emissions. To have any meaningful impact on global GHG emissions, California's energy solutions must demonstrate results that can be adopted by other states and countries. This includes examining the entire energy value chain, so we don't inadvertently transfer our emissions to other regions.

To achieve all of these objectives will require California to (1) use the suite of energy options currently available, including wind, solar, batteries, and traditional natural gas; (2) expand implementation of existing and nascent technologies, such as renewable natural gas, Power-to-Gas, and Carbon Capture and Utilization; and (3) foster policies that allow for the development of innovative technologies and new ideas. California cannot assume that all the energy solutions to achieve carbon neutrality are known and in existence today.

Such an inclusive energy strategy will help harmonize California's energy policy with the tenets of sustainability: reducing our waste, utilizing current infrastructure and capturing carbon.

1. California Air Resources Board (ARB), Public Workshop on the Fiscal Year 2018-19 Funding Plan for Clean Transportation Incentives, June 15, 2018.

2. California Energy Commission (CEC), "Zero-Emission Vehicle and Infrastructure: Tracking Progress," July 5, 2017.

# What does that mean in the context of an energy solution?

## Reducing Our Waste

We can reduce fugitive emissions by harnessing our waste streams. Eighty percent of methane emissions come from daily activity – our food sources and waste. California can use that waste to generate energy, through the increased development and use of renewable natural gas (RNG). Most policy makers recognize at some level the need to continue to use natural gas as part of our fuel mix. Adding RNG helps to reduce its climate impacts.

Replacing less than 20 percent of California's natural gas throughput with RNG achieves the same emissions reductions as overhauling 100 percent of California's buildings to all-electric. This solution does not require millions of Californians to change out their appliances or spend money to replace existing infrastructure and is two to three times less expensive than electrifying California's buildings sector.

In addition, RNG can be used to fuel vehicles, improving air quality and reducing emissions in the transportation sector – the state's largest emissions source. Each new natural gas truck that replaces a traditional diesel truck is the equivalent of taking 57 passenger cars off the road. That number increases when the vehicle is fueled with RNG.

## Capturing Carbon

California can also recycle its waste streams to mitigate climate change. In addition to using our organic waste streams to create RNG, California can use Carbon Capture and Utilization technology, to capture carbon dioxide (CO<sub>2</sub>) from industrial and manufacturing processes rather than releasing it into the air. The captured CO<sub>2</sub> can then be recycled and used as raw material (e.g., carbon fiber), or, as discussed above, can be combined with hydrogen to form renewable gas to help fuel homes, businesses and vehicles.

While these additional technologies are important building blocks, we cannot assume we now have all the answers or have developed all the solutions. That means that any policies that are developed need to allow for continued innovation.

## Utilizing Current Infrastructure

Right now, excess wind and solar is either curtailed or California pays other states to take it. That will only increase as California increases the amount of wind and solar energy used. While batteries can help reduce the intermittency problem of wind and solar, they cannot do it alone. California can harness this excess wind and solar by leveraging the existing natural gas infrastructure to store electricity. Using Power-to-Gas (P2G) technology, California can capture the excess wind and solar energy to be used when it is needed most. P2G does this by converting excess wind and solar power into hydrogen, which can be used alone, or mixed with traditional natural gas, or combined with excess carbon dioxide (CO<sub>2</sub>) to be stored in the current natural gas pipeline infrastructure.



# Working together, we can create measurable progress toward a carbon-neutral energy system

Creating a clean, decarbonized and sustainable energy future requires an inclusive technology strategy if California is going to meet its climate goals and maintain system resiliency. Implementing a balanced energy approach allows California to minimize disruption, manage cost and preserve consumer choice.

## Our Vision

To become the cleanest natural gas utility in North America

## Our Commitments

**2022**

5% RNG throughput in our system

**2030**

20% RNG throughput in our system