

Could hydrogen-electric cars be crucial to meeting California's climate goals?

By Dustin Gardiner

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SACRAMENTO — As California pushes to end the sale of gas-powered cars by 2035, a rivalry over which types of green vehicles will replace the internal combustion engine is playing out.

The dominant player is clearly battery-powered electric cars like Teslas and Chevy Bolts. That's for obvious reasons: California already has about 450,000 plug-in electric cars on the road and more than 67,300 charging ports.

But some legislators and energy experts say the state must not forget to invest in another technology in its infancy, hydrogen fuel-cell cars, which could help serve drivers who cannot easily charge at home.

Hydrogen-powered cars are also electric cars with no emissions. The key difference is the source of power: Hydrogen cars generate their own electricity internally by combining hydrogen, the most plentiful resource in the universe, with oxygen.

Yet hydrogen cars are a tiny fraction of the market today, with fewer than 10,000 cars on the road and 44 fuel stations in California.

Hydrogen advocates said the momentum behind battery-electric cars doesn't tell the full story. Hydrogen cars can refuel within minutes, like a gas-powered car, and have an average range of more than 300 miles — two key advantages.

Battery-electric cars take much longer to recharge; about 30 minutes to get 80% of battery capacity with a fast charger. Many battery models also have a range of well under 300 miles, though the gap is narrowing.

"We are definitely kind of the underdog in this story," said Teresa Cooke, director of the California Hydrogen Coalition, an industry advocacy group. "It's all the same benefits as the battery electrics" but without the battery "range anxiety."

While many environmentalists say both technologies can be part of California's plan, the rivalry has been fierce at times as the industries vie for public attention and subsidies.

Tesla CEO Elon Musk has repeatedly attacked the hydrogen industry. During the summer, he [tweeted](#) that "fuel cells = fool sells," and called the technology "staggeringly dumb" and less energy-efficient than battery cars.

California is officially neutral on the technologies, though battery-electric cars have received far more in total state subsidies.

Gov. Gavin Newsom signed an [executive order](#) in September, setting the [2035 deadline to end the sale of new gas-powered cars](#), a move the governor took as wildfires raged across the state, fueled in part by climate change.

Newsom's order doesn't specify whether hydrogen or batteries should be used, only that the cars must have zero emissions.

Some state legislators say they worry the state isn't so neutral in practice. In a letter to Newsom's administration this month, nine Democrats said the state could become "overly-reliant and overly-invested" in battery cars.

"We have observed that hydrogen fuel cell electric mobility solutions have been largely deprioritized compared to battery-based vehicles," the legislators [wrote](#).

Assemblyman Bill Quirk, D-Hayward, was one of those who signed the letter. He said that while battery-electric models are important, they aren't a practical solution for many people who live in apartments and don't have a garage with a power outlet.

Quirk speaks from personal experience. He lives in a retirement community and bought a hydrogen-powered car because he said the parking garage doesn't have power outlets.

“Lots of people don’t have garages,” Quirk said. “The bottom line is that we have to be flexible and look at more than one solution. And that’s certainly the way that the executive order is written, but it’s not necessarily the way that it’s been interpreted.”

The vast majority of battery-electric car owners primarily charge them at home. State agencies, utilities and others have invested heavily to build more charging stations in apartments and public spaces.

Hydrogen advocates say the cost of building enough infrastructure for everyone to charge vehicles at home is impractical. For others, owning a hydrogen car is a matter of convenience when it comes to refueling time and longer road trips.

Tadashi Ogitsu, a scientist who lives in Dublin and owns a Honda Clarity fuel-cell car, said he chose the model so he can still make weekend trips to Yosemite without stopping for 30 minutes or longer to charge.

With hydrogen cars, “the process is almost the same as fueling with gasoline, basically,” Ogitsu said. “I don’t want to spend hours at a super charging station.”

But hydrogen vehicles face a major disadvantage: The typical sticker price is about \$58,000, before various incentives and rebates. That’s roughly \$20,000 more than the best-selling battery models, such as the Tesla Model 3 or Chevy Bolt.

Fuel is also significantly more expensive, at about \$16 per kilogram of hydrogen. That [equates](#) to about \$6 per gallon of gasoline to travel a similar distance.

Cooke said the prices will come down because as the market grows, it becomes cheaper to mass produce hydrogen vehicles and fuel. The state has heavily subsidized both sectors, and offers a standard [\\$4,500 rebate](#) for hydrogen-car buyers.

Hydrogen cars also aren’t a new concept. In the early 2000s, then-Gov. [Arnold Schwarzenegger](#) and President George W. Bush vowed that hydrogen would rapidly transform the auto industry. Those efforts went nowhere.

Experts say perhaps the most compelling area for hydrogen vehicles could be heavy-duty trucks and other commercial vehicles.

For automakers, it has been a long struggle to adapt battery technology to large trucks, due to the limited range and lengthy charging time. More large battery-powered vehicles are being developed, but results are uncertain.

Hydrogen, meanwhile, is already being used to power city buses and automakers are rolling out big rigs that run on fuel cells. Newsom’s order requires that all medium and heavy-duty trucks traveling long distances in California be zero-emissions by 2045, where feasible.

There are also far fewer hydrogen stations today, with 44 statewide and at least 53 more planned or funded. A draft [report](#) from the California Air Resources Board says the charging network could be self-sufficient in about a decade with between \$100 million and \$400 million in state subsidies.

Dan Sperling, a member of the board and founding director at the Institute of Transportation Studies at UC Davis, said the state ultimately must not view competition between battery and hydrogen cars as a zero-sum game.

“My perspective is we should be supporting both of those options strongly, and I think we are,” he said.

Sperling added, “One way of putting it is, do we want to put all our eggs in one basket? Every option is going to have its strengths and its weaknesses.”

California moves toward all-electric home appliances as part of decarbonization effort

By John Cox

Bakersfield Californian, Friday, Nov 27, 2020

Natural gas-fueled appliances such as water heaters and ranges may eventually become the sign of an older home as policymakers push forward with California's ambitious plan to decarbonize the state.

The latest sign of this shift is the pressure facing the California Energy Commission to require developers of new apartments and single-family homes to install only electric home-heating systems, water heaters, ovens, dryers and stoves.

As noted in a recent report from the California Air Resources Board, there are two reasons for banning natural gas-powered appliances: It would cut the state's greenhouse gas emissions by as much as 10 percent while also reducing indoor air pollution blamed for respiratory problems.

But some question the urgency of the campaign, noting natural gas is generally a less expensive way to power appliances, and that using the fuel in homes can be more reliable than switching to exclusive use of electricity, especially at a time of heightened risk of power shutoffs because of wildfires.

The push to electrify home appliances is also a symbolic threat to Kern County's embattled oil industry, which in 2017 produced 70 percent of the state's domestically sourced natural gas.

Local politicians have spoken up against phasing out natural gas, saying that such efforts would raise costs on businesses and consumers. They have instead supported diversification of the state's energy industry as a way of promoting affordability and flexibility in case cyber threats suddenly cut off the flow of electricity.

ACTION AHEAD

The energy commission is preparing to draft a report that environmentalists hope will propose barring natural gas appliances in new residences across the state. A final decision on whether to include that measure in the state's master building code is expected next summer.

Earlier this month the air board made its feelings clear by adopting a resolution that it supports a move by the energy commission to ban gas appliances in new homes. The resolution also called for working with regional air districts to reduce emissions of nitrous oxide and other pollutants by electrifying home appliances.

A report by the air board's staff found gas appliances pollution indoor settings with not only nitrous oxides but also carbon monoxide and particulate matter, increasing people's risks of asthma, allergies and respiratory and heart disease.

By the Sierra Club's count, more than three dozen cities or counties in California have adopted ordinances phasing out gas-powered appliances but not necessarily doing away with them altogether.

POTENT GAS

Kathryn Phillips, director of Sierra Club California, said natural gas is a focus for the organization because it is a greenhouse gas many times more potent than carbon dioxide.

"If we still have every new building and every new home hooking up to gas we'll still be producing an awful lot of ... climate pollution," Phillips said. She added that as technology improves, electrification is becoming most cost-efficient.

But there are substantial doubts that electric-powered appliances are less expensive to operate than those powered by natural gas, and that's one reason the building industry has been slow to embrace full electrification.

Dave Dmohowski, executive officer of the Homebuilders Association of Kern County, said he's not convinced complete home electrification is a money-saver, given that natural gas is cheap and efficient and, at this point, gas-power appliances tend to be simpler and more durable than electric ones. He also points out that a large share of California's and the nation's power plants run on natural gas.

Plus, research by the state's building industry suggests consumers prefer gas appliances, especially for cooking, Dmohowski said.

'DONE DEAL'?

As much as he favors a balanced approach that doesn't rule out any single form of energy, he's also realistic about where policymakers are headed in California.

"Given California's orientation toward clean energy and climate change," he said, "I think it's probably a done deal."

A recent [study](#) out of UCLA supports his skepticism. It concluded appliance electrification programs gaining popularity in California might increase consumer costs while having little impact on the state's greenhouse gas emissions.

Part of the reason gas may hold an edge in cost-efficiency, researchers determined, is its relatively low price in the age of hydraulic fracturing, which has opened access to large underground methane deposits. Meanwhile, the study noted, the quick ramping up of utility-scale renewable energy projects has raised the cost of electricity in the state.

"Careful, integrated planning and sequencing of future electrification policies and programs will be necessary to avoid unintended consequences," authors of the UCLA report wrote.

UTILITY VIEW

The Southern California Gas Co. said it supports the state's climate goals and noted methane, which is natural gas, already provides some of the power behind electric vehicles.

The company emphasized natural gas increases reliability and resiliency in the state's energy portfolio. It said it is working to decarbonize fuels by investing in renewable natural gas, which can include methane harvested and purified at Central Valley dairies.

An organization that has focused on practical aspects of electrifying residential appliances is National Community Renaissance, a large, Rancho Cucamonga-based nonprofit that develops, operates and maintains affordable housing. Its director of sustainable design, architect Tim Kohut, said water heaters present the toughest part of the challenge, particularly for multi-family residential projects.

Until three years ago, he said, the organization used bulky, expensive solar thermal systems to preheat water for apartment dwellers, as state guidelines require for new multi-family housing projects using natural gas for its water heaters.

COST PARITY

Then the nonprofit turned to decentralized, electric heat pumps and found they offer cost parity with natural gas water heaters — and they offer savings by eliminating the need for solar preheating.

There's an additional, if minor benefit from not having to build natural gas infrastructure in every building, Kohut added in an email. Even more money is saved through the installation of rooftop photovoltaic panels.

Now each of the nonprofit's projects currently in design stages is all-electric.

"We made this move because we understand the cost of PV (photovoltaic solar panels), we understand operational economics, and we're interested in lowering our operational costs as much as possible without impacting first cost," he wrote.

[Visalia Times-Delta, Friday, November 27, 2020](#)

Commentary: After this year's wildfires, California must spend to manage forest health

Our forests can again function as they did historically and be more resilient to wildfires, if the state makes these major shifts.

By Robert Dugan and Jeff Harris

The uncontrolled wildfires that raged across California this year devastated lives, homes, forests and entire watersheds. We set a dubious record for most acres burned in a single year: 4.1 million and counting.

It takes a long time to recover from such intense fires. In 2014, the King Fire burned 97,000 acres of vital American River watershed in Northern California, and we're still managing the consequences.

As representatives of urban and rural communities in this watershed, we appreciate that our lives are interconnected by the effects of wildfire. We understand how uncontrolled fire in our headwater forests can trigger cascading negative impacts on our water supplies, environment, recreational resources and economy — from the Sierra foothills to Sacramento's urban core into the Delta and beyond. We also know that the way we have historically managed our forests must change.

Today, millions of acres of forest, too crowded with trees and brush, are primed for catastrophic fire with little or no resilience to accommodate our changing climate. For this, we can blame last-century practices of extinguishing every forest fire as rapidly as possible.

Lightning-caused fires and burning practices of indigenous people, which mitigated the risk of mega-fire, were stopped in the early 1900s. This allowed underbrush and small trees to crowd the park-like spaces between big trees that once defined our forests.

Forests can again function as they did historically and be more resilient to climate change, if Californians make several major shifts:

Local agencies must take the lead on forest restoration efforts. State and federal agencies can provide vital money and technical support. But the pressure to act must arise from residents, elected officials and conservation organizations in fire-threatened watersheds.

Also, each of us needs to accept that small-scale, controlled fires are a natural condition in California. After all, historical accounts tell us that smoky skies in the late summer were common long before the state was settled.

We must support more funding for forest thinning and prescribed fire. Case in point: The King Fire turned sections of the American River watershed into a virtual moonscape.

Later, tons of ash, logs and soil eroded into hydropower and water supply facilities owned by Placer County Water Agency, threatening storage capacity and water quality for not just our Sacramento region but the Valley and Southern California as well.

Ever since, the Placer County Water Agency, Placer County, The Nature Conservancy, U.S. Forest Service and other partners have progressed on a 20,000-acre forest restoration project at French Meadows Reservoir, a vital water storage facility on the American River's Middle Fork.

The project's goal is to use small, prescribed fires to eliminate overcrowded trees and brush that could stoke an inferno. Getting there has required six years of planning and hard work to mechanically remove undergrowth — using saws and tractors — so that a prescribed burn could occur safely.

Ultimately, we estimate the total project will cost \$18 million. That's a bargain when considering that federal officials spent \$117 million fighting the King Fire in 2014 and the countless tons of carbon that was released into the atmosphere.

Much more is needed statewide to address the tinderboxes like French Meadows that exist throughout California — up to \$10 billion according to forest health experts. Gov. Gavin Newsom and the Legislature were unsuccessful in their attempts earlier this year to boost funding for forest health projects. It's imperative that funding succeed in the year ahead.

That may require broad public support for a bond measure — your support — for the many public benefits these projects could yield. For example, restoring the natural, open condition of our forests is more accommodating for recreation and native species. Remaining trees can grow bigger, making them more resistant to fires.

And avoiding catastrophic fires prevents pollution caused by massive carbon release, post-fire storm runoff and sediment flows that shrink capacity in downstream reservoirs and impact cold water management to protect fisheries.

The fires of 2020 showed all of us how daily life is affected by uncontrolled wildfire. Our long summer of record heat, deadly wildfires and smoky skies may have left many Californians feeling hopeless about the state we cherish. But the future is actually very bright, if we turn our focus to the forests.