

California's new landmark energy law should be a matter of pride for the whole state. It calls for electricity providers to rely on renewable sources for at least 60% of their delivered power by 2030 and on zero greenhouse gas-emitted sources for the remaining 40% by 2045. People refer to this as the 100% clean energy bill, and it represents a bold new approach for reducing California's carbon footprint. The California Legislature deserves praise for its dedication to these important issues and for its leadership.

Let's be clear, however, about what this change is and what it isn't. The new law is not a 100% renewable energy mandate. The zero-emitting 40% could include large-scale hydroelectric, which is not called "renewable" for the purposes of California's mandate, and nuclear power. It could even include natural gas or coal-fired power if people can figure out an economical way to capture and sequester all of the related greenhouse gas emissions. Although the new law leaves it to regulators to define what "clean" means, arguably some of the eligible power sources are not particularly clean, as I will explain below. Nonetheless, at this point only Hawaii can boast of a similar broad effort to eliminate carbon-based powerplant fuels.

So, we're done! Since all power is going to be clean, we are all off the hook. It doesn't matter how much we use. It doesn't matter if we generate power on our rooftops, or if we provide community solar parks. We can plug in our cars, set up new districts with neon lights that rival Las Vegas, and get a second or third refrigerator to store beer in the garage — our friendly retail electricity provider will take care of everything.

Well, not so fast. It is still important for us all to do what we can to reduce demand for energy, across-the-board, and shift our usage to periods of lower demand. It is still valuable to distribute power generation throughout a utility service area (closer to customers), add solar photovoltaics to suitable rooftops, and rely on storage in batteries and other devices to make renewable energy available at night and when the wind doesn't blow.

Here are some of the reasons why:

- 1. In 2045, under the new law, there is still room for a lot of greenhouse gas emissions.**

For starters, consider the way that the mandate is phrased: by 2045, the entire electric supply must be comprised of "eligible renewable energy resources and zero-carbon resources" (the underlining is mine). This phrasing is not accidental. Many types of eligible renewables are carbon-emitting to some extent. Most biomass processes add more carbon to the atmosphere than they save. Utility-scale solar thermal power plants use natural gas to

preheat the towers that capture the solar energy. In addition, when such facilities store excess heat for later use, they frequently rely on molten salt fields that must be kept warm with natural gas burners when the sun doesn't shine. Facilities that store solar and wind output by using underground chambers filled with compressed air use natural gas to warm up the air as it is released to provide power to generating facilities. Geothermal power plants can release carbon dioxide into the atmosphere and still qualify as renewable. Systems that create electricity by burning methane derived from dairy waste do a nice job of using up a very potent greenhouse gas, but they still release carbon dioxide. You get the picture. And of course, there is also the potential to release carbon into the atmosphere when manufacturing any kind of energy equipment. If we use less power overall, we will release less carbon into the atmosphere - even if the power is generated by using eligible renewable fuels.

2. Generators can burn coal or natural gas to generate electricity and still call that electricity renewable.

That is because retailers can meet part of their renewable power obligations by buying unbundled renewable energy credits. These credits exist because some additional renewable electricity is being generated but isn't being delivered into the California market. While that power is entering an electricity grid somewhere and potentially displacing power from some other source that might or might not have burned fossil fuel, we just don't know for certain what carbon emissions it may be avoiding. But the retailer has choices as to what kind of power it uses to back up these credits, and it can choose to burn coal or natural gas.

3. More utility-scale renewables means more transmission lines to deliver the power.

Transmission lines represent additional greenhouse gas emissions - because of the materials manufactured to build them, the trucks and machines used to construct them, and the vegetation that is eliminated to create rights-of-way for the new lines. Transmission lines create other significant environmental challenges by invading sensitive habitat, impairing scenic views and, where there are access roads, increasing the odds that people may accidentally ignite wildfires. When these lines are placed underground (increasingly necessary as we expand our urban footprint), more electricity is needed to run pumps that circulate oil through the system to dissipate heat. The fewer new long lines we build, the better.

4. Climate damage can get worse based on emissions between now and 2045.

Meeting California's admirable 2045 is going to take a long time and rely on innovative new approaches to grid operation and technology. In the meantime, conventional generators will continue to spew greenhouse gases into the atmosphere. A new rooftop solar array installed today can begin reducing the need for carbon-based fuels now and continue to provide benefits for its entire expected lifetime. An energy efficiency improvement can continue to deliver these benefits for the lifetime of the appliance or the building within which it is used.

5. Distributed energy resources such as energy efficiency improvements as well as onsite generation and storage provide many benefits, even in California's new clean energy world.

If we use energy more efficiently, we can reduce the number of electricity facilities we need and the amount of greenhouse gas that we release into the atmosphere. If we increase our use of onsite solar generation and energy storage, we can reduce the need for large generating stations and long-distance lines used to deliver their power to customers; and reduce greenhouse gas emissions even more. Greater efficiency, as well as onsite generation and energy storage, can save customers money and make the electricity system more resilient in the face of possible grid interruptions. All of these strategies improve our ability to reduce greenhouse gas emissions now.

Carefully watch the news coverage of California's new electricity policy. Pay attention as people get a little enthusiastic and suggest that the grid of 2045 will be 100% clean. And while you are at it, contemplate what is meant by clean energy and whether that term comports with your usual expectation of what it means to be clean. The new law is reason to celebrate, but not a reason to let down our guard — or abandon our efforts to produce a more sustainable, lower carbon, and more resilient way to manage our energy use.