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## By the Numbers - Saving California from an Energy Apocalypse

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A few days before the Labor Day weekend, the California Air Resources Board voted to ban the sale of gasoline-powered automobiles by the year 2035, prospectively closing the door on what has long been the most well-known gasoline “car culture” anywhere in the United States. Later that same week, the California electricity grid operator, known as the California Independent System Operator, issued a warning of impending electric grid overuse and asked all Californians who own or operate electric vehicles voluntarily to either not charge them from August 31 through September 6 – essentially, over the Labor Day weekend – or at least not to charge them between 4:00 pm and 9:00 pm. The juxtaposition of these two events so close in time could not be more illustrative of California’s failed planning when it comes to transitioning to a non-fossil fueled energy environment.

To begin, the above-described voluntary restrictions on charging electric vehicles might work for those who use their electric vehicles on a discretionary basis, but as the State rushes to electrify virtually everything else, and as large cities like San Francisco and Berkeley ban the use of natural gas in future building construction future stresses on the electric grid can, and will, have more profound and dramatic consequences that cannot be so easily ameliorated by simply asking for volunteers not to use or charge their electric vehicles (or use electricity for any other customary and often necessary purposes) .

Meanwhile, at week’s end, California passed a budget that put new restrictions on oil and gas drilling, allocated billions for clean energy programs, moved the State toward more electrification, and mandated California to obtain 90% of its energy from renewable sources by 2030.

Given the importance of reliable and cost-effective energy to virtually every aspect of our everyday lives, it might be worthwhile to try to examine what California would actually need in order to move entirely to its goal of being an electricity-powered state. This way, we can “follow the science” and examine if there is a realistic and achievable path toward full electrification for California at all, and if so determine what it would in fact entail, instead of offering platitudes and optimistic projections that may not be consistent with reality.

Below is a Sankey diagram of California’s current energy inputs and outputs. The data comes from 2019, the most recent year available. It shows the following:

- California only produces about 596 Trillion British Thermal Units (TBTU) of electricity. The Golden State also imports another 258. Thus California’s total electric usage was 854 TBTU in all areas.
- Transportation consumes 3069 TBTU in order to produce 644 TBTU of “useful” energy. Most of this loss is from the inefficiency of internal combustion engine’s (ICE’s) losing heat inside the engine and other mechanical losses.

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- Only 2.6 TBTU of the 3069 TBTU going to transportation is coming from electrical energy. This would include all trains, trolleys, cars, and other means of transportation. The United States Department of Energy estimates an efficiency of electricity to drive power of 60% (ICE's are closer to 21%).
- Assuming the entire petroleum route for vehicles is electric, with no change in overall traffic, we can estimate that California needs the same 644 TBTU of useful energy. With the 60% efficiency, that means California needs  $644/0.60 = 1073$  TBTU of electricity ONLY FOR TRANSPORTATION.
  - That's an increase of  $1073 - 2.6 = 1070.4$  TBTU in electrical consumption.
  - That's on top of the 854 TBTU already consumed, so  $(1070.4 + 854)/854 = 2.25x$  current electrical consumption.
  - Making the assumption that California must produce this much electricity to meet its total needs, we're talking about an increase of  $(1070.4 + 596)/596 = 2.79x$  of current electrical production.
- So, assuming California's existing electrical grid can even handle the additional power (which, as seen in recent days, is very unlikely), California needs to radically increase its electrical output to over twice what it currently produces in order to generate enough electrical power to meet its future needs, especially when transitioning to a non-gasoline powered motor vehicle environment.

Obviously, it's unlikely these assumptions and current levels of energy use and transportation will remain static through 2035, so planners would need to assume they would need more power than is provided for in these numbers to satisfy electrical demand in the year 2035. As a baseline, however, California's ISO (i.e., the independent and federally regulated entity that coordinates regional transmission on the electrical grid) would have to be able to improve the electrical grid so that it could, at least, handle this much energy and do so efficiently and safely. This likely would take billions of dollars of new investment.

Were all or even most of this doable, two overriding questions then would remain about why and how it could be done:

First, will California's environmentalists even allow the State's electrical infrastructure and generating capacity to be improved at all? It seems odd to ask this question, given that the entire reason for the move to electricity is to save our ecology and environment, but that's looking at things on a macro level as opposed to a micro level. Each planned upgrade to California's electrical grid likely will face local environmental opposition, as almost all new infrastructure does. Is California's political class willing to face down the environmental opposition for a greater potential environmental good? To this point, there is little evidence that it will. In fact, something like this recently happened when, in 2021, Maine environmentalists and other groups opposed to Massachusetts's plan to install a long-distance power line in remote regions of Maine to supply environmentally friendly hydropower from Quebec Province to Massachusetts voted in favor of a State referendum to thwart Massachusetts' plans. Maine's highest court has since ruled the referendum to be unconstitutional, but the point remains that even the environmental community cannot be expected to support electrical infrastructure improvements whose goal is to facilitate transition away from fossil fuels to much cleaner forms of electrical power generation.

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Second, and perhaps most important, how will California generate that extraordinary increase in electricity? The 2023 State budget just passed requires 90% energy generation from renewable sources by 2030, but also rolls back the closure of the nuclear plants at Diablo Canyon, which were scheduled to be mothballed by the year 2025, but only to 2030, the target date for the 90% change to renewables.

Therefore, what will be the source of this indisputably necessary increase in electrical energy production? The State is demanding that it not be coal or natural gas. Instead, the answer, both by choice and now by California State mandate, is renewables like solar and wind. California does, of course, possess some of the most favorable conditions to produce both forms of renewable energy. Still, the suggestion that this massive increase in electrical generation will come only from renewable sources in the next eight years appears to be quite a stretch, and it's hard to see how this can answer the issue of reliability. What we are talking about is a political, social, and economic change in our most populated state on a scale and within a time frame that has never been attempted before. It is rational to be skeptical about California's chances for pulling it off.

However, let us sincerely hope that California succeeds. We all agree that moving toward cleaner sources of energy as quickly as possible is not only good policy but also is a matter of necessity, especially considering the increasingly apparent ravages of climate change. However, doing so mainly by governmental fiat with seemingly little thought preceding it and with no real plan for how it will get done is rarely a recipe for success. In other words, wishing – or in this case, decreeing – does not make it so. Maybe an alternative would be to run the numbers, follow the science to find out what we actually need to do and how might we actually be able to get there, and then seek to round up the political will to do so. This will require much sacrifice and compromise across the political and economic spectrum, and there is no shortcut for doing this. Better to start now.

#### **ATTORNEYS MENTIONED**

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