

At an energy policy conference that I attended on campus recently, one of the speakers asked how many people in the audience were familiar with the Duck Chart. As someone who tries to stay on top of things in the energy world, I was surprised by how many people raised a hand to express familiarity with this thing I had never heard of. Fortunately, with the benefit of the Internet, I was staring at a duck-evoking image within a few minutes.

✘ It's a bit of a Rorschach test. To see a duck, you have to imagine that one set of squiggly lines is actually an eye-less, beak-less duck face, and that another set of lines represents a tail - more of a Labrador Retriever tail than the fluffy duckish variety, but I digress.

The [image](#) is offered by the California Independent System Operator (the group that manages most of the electric grid in the state). From the ISO's perspective, I guess you could call this the Duck of Doom.

What I think the author is trying to say is that within the next seven years, the grid will be awash with renewable power - during some hours of the day, there even might be too much. The bad news for a grid operator is that a lot of that will come from the sun, which is only scheduled to appear - well - from sun-up to sun-down. When the sun shows its face, there will be a quick run-up of power, and the opposite will happen at the end of the day. Since the grid needs to remain balanced all day long, it looks like there will be a need to shut down a lot of other electric generators really quickly in the morning and bring them back up really quickly in the evening. The ISO wants a great quantity of gas-fired power to serve that function.

The only problem is, over time, we will have to stop using natural gas. Otherwise, there is no hope of reaching the more ambitious greenhouse gas reduction goals that people talk about. The ISO knows that there are other ways to balance things out, and the same presentation that displays the duck lists some of them:

Demand response involves finding ways to get people to use less power at those moments when the grid needs the most help. Energy storage technologies offer the hope of using intermittent renewables to charge up batteries, or otherwise to store the potential of generating clean power when the sun doesn't shine. "Dispatchable" wind and solar may involve matching up particular storage technologies with specific wind and solar farms.

There are other options, as well, such as matching up day-shining solar with night-gusting wind; using hydroelectric power to fill in the gaps to the extent that the technology allows; developing a significant amount of truly dispatchable renewable capacity - in California, that would mostly be geothermal.

No one is pretending that there won't be significant challenges. This involves nothing less than requiring utilities to rethink the way they provide service, undertaking comprehensive (truly integrated) system planning, and enhancing the extent to which the system operator owns the goal of eliminating carbon (fossil-fueled power) from the grid. There is a need for cultural changes - such as treating peak load reduction from demand response programs as a resource (like natural gas-fired power) rather than as a sign of failure to provide enough power. There is a need, more than anything else, for a long-term vision: an intention not only to be ready for the duck when it arrives, but also to achieve a decarbonized grid in the years that follow.