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FROM FOSSIL FUELS TO GREEN ENERGY

A look at the ongoing power shifts in electric generation.

We recently sat down with Pacific Asset Management Analyst Abre Kaizar to get his insights into the recent changes in the electric power sector, including the energy needs and infrastructure for electric vehicles, the promise of nuclear power, and obstacles to generating 100% green energy.

Let's start with a basic question: How are we generating our electric power today?

On a national basis, we generate about 60% of our energy from traditional fossil fuels such as coal, petroleum, and natural gas. The other 40% comes from green energy sources, including nuclear, wind, solar, hydro, or even geothermal.

Is the shift to green energy moving slowly or rapidly?

The shift is accelerating. Here's some stats to consider. In 1970, we generated about 82% of our energy from traditional fossil fuels. Flash forward to the year 2000, fossil fuels generation dropped to 71%. Now, if you look at the latest data up until 2022, that generation number has dropped to 60%. So, over 30 years from 1970 to 2000, we dropped 10%. But over the next 20 years, we dropped by another 10%.

Will we ever be completely green in creating electric power?

That's a good question. Is there a future where we can become completely green? I think that's eventually possible, but there are a lot of strides that need to be taken to make sure that green energy's reliable. When you think about the major green sources of energy, the sun needs to be out for solar to work, and, for wind, you need there to be a steady breeze to push the turbines to generate electricity. So, when there are cloudy days or not much wind, those energy sources are not as reliable. What we need to do is build up more battery storage to store excess energy for those days when solar or wind power isn't being generated.

Another example to consider is this: The goal of most utilities is to be a net-zero by 2050 for greenhouse gas emissions. The keyword here is "net." Utilities will still use some form of carbon-based fuels but will try to do some carbon capture and may plant some trees to make sure that on a net-net basis, they are zero. So even by 2050, I'd expect there will still be some carbon usage.

Let's talk about batteries and electric vehicles. Can the current power markets keep up with the demand right now?

For the most part, yes. If you were to exclude any natural disasters that happened domestically, the grid has held up well, but there are some growing concerns. Here's an example. There is a regional transmission organization called PJM. Think of this basically as an exchange between the ultimate user's electricity and the supplier's electricity. They conduct capacity auctions. This is basically how the exchange makes sure that there's an adequate

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power supply to meet the expected generation needs, and they usually have a little bit of a reserve for a buffer. PJM's capacity-auction results recently came out, and they got two gigawatts less of generation this time around. This is the third straight time. There's been declining amount of generation that's available. While that's okay right now, it's definitely a going concern moving forward.

In a future, where there is not enough generation, they will have to source energy somewhere, whether that's a different region or even maybe energy from overseas. That's definitely a possibility too. So, it's a concern. They have to meet it somehow. This is something that the utilities are concerned about, and the regulators that are governing the electric power grid are concerned about.

For us out here in California with the rolling brownouts during the summer, it seems like we're a long way off from having more energy for an avalanche of new EVs on the road. Is that correct?

That's a fair conclusion. One interesting stat to point out is, last summer California saw a record 10-day heat wave, which saw demand reach a peak of 52,000 megawatts. That's 4% higher than the previous record set in 2006. That time around, California fortunately had enough reserve supplies, but if that had been depleted, the independent system operators of this—basically California's version of a regional transmission organization (RTO)—they would've ordered utilities to begin rolling power outages to make sure there was not a national rolling blackout.

If you were to completely go 100% EVs right now, California definitely could not handle that, but there have been some steps to handle the increased load. For instance, utilities have been exploring having EVs that are plugged in during the middle of the day discharged back to the grid, and utilities would compensate the owners of the EVs a nominal amount. This will create a kind of virtual power plant that basically can help the grid in times of extreme stress. So, we're taking some steps to get there but we're still a long way away from being to handle 100% EVs here.

Infrastructure-wise, will we need to build more in terms of charging stations, grids, substations, and those sorts of thing?

Absolutely. It's hard to get specific data on EVs, but if you were to look at new sales versus the actual number of vehicles on the road, I would ballpark it as currently about sub 2% EV penetration domestically. So, doubling that wouldn't be too meaningful in terms of the actual generation required.

But on the infrastructure side, there's a significant amount of work that needs to be done. The great thing about us here in California is the infrastructure's great. There are so many power-charging stations often like less than a mile from each other. But if you look across the country, there's a definite lack of power and lack of EV-charging stations. JD Power recently did a survey where they showed that one in five charging attempts fail, with 72% of failures due to some malfunctioning of that EV charging unit. This needs to be addressed. So, yes, we will need a fair amount of additional EV chargers to make sure that the whole nation is ready for 100% EV adoption.

What's more challenging, producing the energy or building the infrastructure to get the electricity to the vehicles?

This may seem like a copout, but I think they're equally as challenging. If you look at from the energy-producing side, we will need to build out

much more storage, and we need to make solar and wind more efficient in how they capture energy. But equally as important is the infrastructure side. It's very weak across the country. There is work being done to increase the number of charges available, but it's definitely slim pickings. A significant overhaul will be needed both on the energy generation/innovation side as well as making sure that the proper infrastructure is available so that we can drive an EV across the country.

Let's talk about the grid itself and hotter summers, colder winters. How much pressure are we seeing on the grid right now?

We have seen more record heat waves and cold winters. Utilities are recognizing this and trying to harden the grid. They're trying to direct their investment to make sure that the grid is sustainable in extreme weather events. For instance, they're making sure the actual transmission lines are coated to withstand this extreme weather through a process called weatherization. And the Federal Energy Regulatory Commission (FERC) recently approved two extreme cold weather reliability standards across the country.

There's more. Utilities are even using smart devices to alert operators of issues. And when there are issues, they can sectionalize portions of the transmission system to block those sections and keep the overall grid safe. And in some cases, we're seeing delays in retirement of actual generation stations to make sure that we can provide the appropriate amount of power during those extreme weather events. I would say we're probably in the second or third inning in the grand scheme of things. But it is something that the regulators are aware of and are trying to address.

In terms of increasing the grid's capacity, is that the companies themselves or is that a Washington issue, a Build Back Better-type issue?

It's a bit of both. On the Washington side, there was a White House initiative called the EV Charging Action Plan that essentially sketched how federal agencies will coordinate with private companies to coordinate the development of a national network of 500,000 electric-vehicle chargers. You also have the Inflation Reduction Act, which increased capacity on at least the green energy side of things, so solar and wind, through the extension of what are called production tax credits, to make those energy sources more economically viable.

On the utility side, they're essentially building out more of green energy themselves to make sure that there's adequate capacity. So, it goes hand in hand. Utilities as well as the legislators, are focused on making the grid is secure.

Several decades ago nuclear power had the reputation of being dangerous enough to outweigh the benefits. How's that changed?

I believe nuclear is definitely not as risky as it was before. There have been a lot of safeguards put in to limit the risk now. There won't be another Chernobyl or Fukushima happen in today's world. There are stress tests for various scenarios, including earthquake, flooding, a plane crash, or human error.

And if you look at Europe, for example, about 25% of all energy is from nuclear versus the U.S. where it's about 18%. So given the amount of risk mitigation that's gone into nuclear generation, sentiment—at least on a corporate and federal level—has changed. And I believe it is a reliable energy resource.

Do you see it eventually being a major energy source for us?

The short answer is no. Yes, nuclear is great, and here's one stat to consider. When we look at generation and how effective it is, we look at something called the capacity factor. This is basically defined as actual energy output over time versus over the theoretical maximum energy output. If you look at traditional fossil fuels, the best one has a capacity factor of 50-ish percent. Nuclear has a capacity factor of 93%, so it is definitely highly reliable, and it's a great energy resource.

But on the negative side, there are significant costs to start up a nuclear plant. There's a company out there that's trying to build out two nuclear plants in Georgia, and they're the only two nuclear plants being developed in the country. And those are seven years behind schedule and almost $20 billion over budget. The original contractor has now gone bankrupt. Other utilities have seen this, and they are very reticent on trying to build out just because, from a corporate perspective, you're putting in tons of money into this bleeding asset that takes a lot of capital. You could even suffer rating agency downgrades. So that's something to consider as well. That's why it's probably not going to happen here.

There's been some work done for more project-based nuclear, something called small modular reactors or SMRs. As the name suggests, they're smaller in scale and more easily deployable, but they're likely going to be used in isolated situations—like at a military base or hospital system where they can provide energy for a large area but it's still relatively localized. Also, given the overall goal on the federal side to curb greenhouse gas emissions, there's been movement to at least preserve the existing nuclear fleet.

In 25 years, as a percentage, where do you think we'll get our power from?

Maybe we can get to 55-45, with 55% being green energy. Everyone in the power space and the utility space have continued to direct their investment towards more green energy resources and are trying to move away from coal. I believe the transition will certainly happen and for it to be meaningful—like greater than 60 or 70% green energy—I think that might take 50 years.

How are companies tapping the credit markets to achieve some of these goals in their power shift?

You are seeing companies, mainly utilities, raising debt to fund their capital investments. Utilities have massive, massive CapEx programs, some in the range of $50 to $100 billion over five-year span. This is all being essentially directed towards making sure that their proportion of the grid is reliable and towards green-energy investment.

Utilities in general are looking to invest in green resources and hardening the grid from natural disasters to make sure that there's reliability and their emission-reduction target are achieved.

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