

Nebraska's Nuclear Legacy and My Electric Car

Contributed by Bill Moore
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It is America's smallest nuclear power station. Until recently, most people had never heard of the 476 MW pressurized water reactor nestled into a bend on the turgid Missouri 20 miles north of downtown Omaha, Nebraska. Apart from the power plant, the tiny hamlet's only other claim to fame is that briefly in the 1820s it was an U.S. Army outpost on the fringe of the vast new territory Lewis and Clark had explored a decade earlier for the Jefferson Administration.

A reconstruction of the original stockade, along with period re-enactors attract tourists in the summer; that is until this year when the narrow channel turned into a swollen lake flooding the wide river bottom, and in the process laying siege to Omaha Public Power District's nuclear power plant.

Commissioned in 1973, the Ft. Calhoun facility isn't Nebraska's only nuclear facility. Fifty-five miles south southeast, also on the banks of the Missouri, is the Cooper Power Station, a 770 MW boiling water reactor built by GE, owned by the Nebraska Public Power District, and operated by Entergy, which operates nine other nuclear power plants across the U.S. While Ft Calhoun's reactor has been shut down since April for scheduled refueling -- fortunately, it turns out -- the Cooper plant is, for the time being, still operational, although it too is threatened by flood waters.

These aren't the state's first ventures into the fabled atomic age. Twenty-five miles southwest of the capital in Lincoln is the coal-fired Sheldon Station operated by NPPD. Buried beneath it are some of the radioactive remains of the short-lived Hallam nuclear power plant, an early sodium graphite-moderated facility that operated for only two years between 1962 and 1964. One of ten experimental plants built by the Atomic Energy Commission at the time, corrosion problems quickly developed. Engineering and economic analysis concluded it would be too expensive to repair, so the \$29 million experiment was decommissioned in 1969. The NRC estimates the materials buried in a waterproof concrete vault and covered with dirt will finally be safe to exhume for landfill reburial around 2066.

Most of the electric power used by the 1.8 million of us that call Nebraska our home, is generated by thermoelectric power stations burning Wyoming coal freighted in on 110 car trains that cross the state by the dozens every day. Stand near the Union Pacific mainline that passes through Omaha and you'll see mile-long coal trains coming through every 20 minutes or so. Depending on scheduled plant outages for refueling, like the one going on at Ft. Calhoun just now, anywhere from 60-70% of our electrical power comes from fossil fuels with nuclear, natural gas, and some hydro providing the bulk of the rest. Nebraska lags far behind other midwestern states in construction and acquisition of renewable power from wind. Solar PV is virtually non-existent despite having as many annual hours of sunshine as San Diego and more than Gainesville, Florida.

Nebraska's heavily fossil fuel-dependent power grid poses a dilemma for electric vehicle advocates like myself. While we can truthfully assert that compared to a conventional car running on gasoline, an electric car powered by coal still results in fewer CO2 emissions, it really comes as little consolation. Burning a gallon of gasoline to drive 25 miles produces around 22 lbs of carbon dioxide, not to mention other particulates and pollutants. Consuming 8.3 kWh of electricity to drive the same distance will generate around 8 pounds of CO2, 65% of it from coal, the rest from less carbon-intensive sources, including power from Ft. Calhoun and Cooper, which produce no CO2 during power-generation, though it is created from upstream processes such as the mining of uranium and its enrichment into radioactive fuel rods. Burning coal, itself, also releases radioactive elements, as well, along with mercury and sulfur dioxide.

Assuming one of the goals of switching to electric vehicles (EVs) is to reduce the production of global warming gases like carbon dioxide, nuclear power would seem a good choice. Not only could you generate virtually CO2-free electric power to recharge an EV's battery pack, making more cost-effective and energy-efficient use of overnight base load power, but any of that energy you don't use immediately could be routed into producing hydrogen gas on which you could run fuel cell electric vehicles. That was the premise of a GM-sponsored media trip that flew a dozen or so journalists, including yours truly, to Idaho Falls, Idaho back in 2006 for a guided tour of the Energy Department's Idaho National Laboratory (INL) nuclear power research facilities. In presentations by lab scientists and outside engineers, including a representative of Entergy, the case was made that nuclear power is safe and that recycling of spent fuel rods, like the estimated 870 metric tons said to be stored in cooling pools and caskets at Ft. Calhoun, could provide many future generations with clean electric power and hydrogen gas, all with few greenhouse gas emissions, while consuming the

bulk of the waste now stored in similar cooling pools, shielded caskets and oil drums around the nation.

Would that it was all that simple.

Outside of the INL research facility, which is located in a desolate sage brush valley 45 miles west of Idaho Falls proper, stand two leviathan-sized exhibits; a pair of experimental nuclear-powered jet engines, each mounted on twin flat bed train cars welded side-by-side. These are vestiges of a 1950's era quest to create atomic-powered bombers that could loiter aloft for days and weeks along the old Soviet border without having to land and refuel, ever ready to bring nuclear Armageddon to our communist foes. Assuming you could even get one of these monster machines into the air, what would happen if it crashed, especially on American soil, scattering radioactivity debris and fuel across farms and cities? That unanswerable question, more than anything else, doomed the program. We were told that the locomotive that used to pull the engines out to their desert test facility had to be buried because it became too radioactive to operate safely.

That, in my view, is the core of the problem with nuclear power. You can decommission a coal plant, recycle its old steel and bio-remediate its physical footprint, eventually turning a brownfield into a green one in only a matter of few months or years. As witnessed by the entombed Hallam plant, a nuclear power plant takes generations to rehab. Much of its physical structure is simply too dangerous to reuse for decades, if ever. Essentially one generation is getting the benefit of a facility that will become an economic and environmental liability to many generations to follow; and that is, in my view, unethical, as well as selfish and uncaring.

Granted, comparatively speaking, the footprint of a Cooper or Ft. Calhoun is relatively tiny compared to the power it can produce. The entire Cooper facility occupies just over one kilometer square. Purely in terms of energy density, it pales the output of the handful of wind turbines that might occupy a similarly sized patch of ground, and it isn't dependent on the capriciousness of nature. But those turbines don't represent anywhere near the same level of risk. An ice storm, a bolt of lightning, a tornado might take out some or all of a wind farm, but there would be little long-lasting environmental impact. The same can't be said for a nuclear plant, especially one where flood waters literally flow at this very moment within inches of breaching its hastily erected defenses.

Until a few weeks ago, all this discussion for me was largely academic. Our two n-plants have been relatively well-managed, though each has had its share of problems; including the most recent two incidents where fire in a switch room cut off power to the pumps that run cooling water through the spent fuel rod storage pool. Then a few days ago, the water-filled bladder that served as a temporary berm around the reactor building collapsed after being punctured by heavy equipment working inside its perimeter, letting a couple feet of flood water inside the generator room. While OPPD and NRC officials have been reassuring the public that there is no danger -- and several of these people are acquaintances of mine -- I personally remain uneasy, as do, I believe, a lot of other people in our community. Fukushima is still too fresh on our minds and there's still far too much flood water yet upstream, behind 50 year-old dams, that has yet to flow past both Ft. Calhoun and Cooper, as well as three coal-fired plants also along our stretch of the Mighty Mo.

So, how do I feel now about nuclear power as it relates to EVs? As I have replied to not a few people who've asked me that question in the past, just about the time I start to get comfortable with the notion that maybe nuclear power is the way forward, events like Fukushima happen. [Back in the early 70's, I lived across the river from Harrisburg, Pennsylvania and used to water ski next to Three Mile Island when it was still under construction].

Now the problem is, quite literally, in my backyard. I am fairly confident that OPPD is doing the best they can to manage the situation, but their record isn't spotless, as we are starting to learn. The NRC warned them last year that Ft. Calhoun wasn't secure enough against a catastrophic flood and ordered them to seal up the plant better so that flood waters couldn't get into the facility. The plant reportedly completed most of the recommended actions just in the nick of time.

The very day that a violent thunderstorm knocked out electric power last week to a large portion of our community of

Papillion, just south of Omaha and 24 miles from Ft. Calhoun, I was up on my roof measuring to see how many solar panels I could mount in order not so much to cut my electric power bill -- our electric rates are already some of the lowest in the country -- but to make sure that my electric car -- a Plug In Conversions Corporation-converted 2009 Prius -- would be charged by sunlight, or at least the power it consumes at night is offset during the day by PV-generated electricity. The 1.8kW system that I envision would easily offset the 4kWh it takes for my wife's daily commute, feasibly producing a surplus on long sunny, summer days. But it wouldn't completely supplant what we buy from the grid.

My climbing around on my roof and estimating our daily power consumption revealed to me that we use a lot of energy, not just for the car, but for the CFL and LED lights we burn, my computers, our flat screen television, our Energy Star appliances, and our heat pump; far more than the PV system can generate. We either find more ways to reduce our personal energy consumption or we find a way to produce the power we do use more cleanly. I just don't see nuclear power, at least as it's currently engineered and operated, as a safe, sustainable way forward for this or future generations.

In the meantime, this radioactive equivalent of the Sword of Damocles will hang over our heads all summer, which is how long the Army Corps of Engineers say it will take to release the waters building behind the six dams they manage on the upper reaches of the Missouri. I am hopeful that the flood waters that precipitated this crisis will pass as uneventfully as possible, though those with farms, homes and businesses in the flood plain won't be so fortunate. What I hope we learn from this is that, at the very least, building nuclear power plants along flood-prone rivers isn't a very bright idea. The increasingly obvious and ongoing climate change behind the flooding is likely to reinforce that realization in the coming years. Beyond that, I am committed, as personal finances permit, to begin shifting my own energy consumption away from dependence on both fossil fuels and nuclear power. The 6.1 kWh battery pack in our plug-in Prius will have a role to play in that at some point, I am sure, as will the currently empty south-facing triangle on the roof above my head. I can only hope that others will find the will and the means to do the same.

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Note: Bill Moore's publication has in the past covered Jan Lundberg's anti-car views and Lundberg's thoughts on petrocollapse.