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The Connecticut Energy Marketers Association's (CEMA) motor fuels members own, operate and distribute gasoline to approximately 1,000 convenience stores in the state. Our members own property in virtually every municipality, pay local and state taxes, employ thousands of people, and play a vital role in Connecticut's economy.

While electric vehicles (EV's) may be an attractive way to lower emissions, it appears that more consideration needs to be given to several factors that will have an impact on jobs, the economy, property values, electric reliability, emissions and family owned businesses. But, it is essential that TCI does not pick winners and losers by allowing regulated utilities to unfairly use their monopolistic status to overpower private businesses that depend on free market forces to support economically viable alternatives to electricity. Allowing massive (and in some cases foreign owned) utilities to do this would be unfair, it would destroy competition, and drive local family owned companies out of business taking with them thousands of jobs.

Allowing monopolies with a guaranteed rate of return to control EV charging would not only discourage private companies from investing in future alternative fuels, but it would also have a detrimental effect on their ability to maintain the current infrastructure that motorists depend on.

Over the past decade, federal policies such as the Renewable Fuel Standard (RFS), the Biodiesel Blenders Tax Credit, and others, have created incentives for fuel retailers to invest in infrastructure necessary to bring cleaner burning fuels to the market. Our members support policies that encourage a vibrant and competitive market that will deliver the most efficient prices to the public, but if electric utilities are allowed to exercise TCI and government granted power in the motor fueling space, private businesses will not be able to compete.

TCI needs to examine a regulatory landscape which encourages fuel retailers to invest in alternative fuels before generations of investment in thousands of locations throughout the state are irreparably harmed. We have one chance to get this right, or a major segment of the economy will be decimated.

While utilities need to play a role as EV's enter the market, they should be focused on grid enhancements, distribution upgrades (ie. line extensions), cyber security and other issues to ensure that the "lights stay on" as demand for electricity grows - these are fundamental to the reason that they have been granted monopoly status. TCI should seek and support pathways that leverage the current fueling

network that has been privately developed to bring alternative fuels to consumers - not tip the scale in favor of electricity.

TCI also needs to be cognizant of the impact that the “electrify everything” policy that the state is pursuing will have on grid reliability, the cost electricity, and emissions.

Attached is a spreadsheet that looks at the need to add electricity supply if EV’s replace gasoline and diesel fuel for transportation purposes and the replacement of heating oil and natural gas for heating. In Connecticut, Governor Lamont’s Executive Order number three seeks to achieve zero emissions in the electric sector by 2040, coupled with the need for additional electricity capacity to meet the demand that EV’s and electric heat pumps will add to the grid is going to place immense pressure on the need for renewable energy generation.

To do that we need to look at what it would take for wind and solar to meet this goal. It is a fact that solar and wind electric power farms are much more land intensive than oil, gas, or nuclear power plants. For example: “Wind farms require up to 360 times as much land area to produce the same amount of electricity as a nuclear energy facility, a Nuclear Energy Institute analysis has found. Solar photovoltaic (PV) facilities require up to 75 times the land area.” <https://www.nei.org/news/2015/land-needs-for-wind-solar-dwarf-nuclear-plants>. It’s simply the nature of the science and engineering behind wind and solar plants that they are land intensive.

Given TCI goals and that the state of Connecticut wants to move entirely to renewable power plants, specifically wind and solar, for electricity generation, it’s reasonable to ask how much land such plants would consume.

## SOLAR

Let’s look at solar first. Connecticut has a large solar farm currently in Somers, CT. [https://en.wikipedia.org/wiki/Somers\\_Solar\\_Center](https://en.wikipedia.org/wiki/Somers_Solar_Center) It has a capacity of 5 MW of electricity, and covers 50 acres of land. According to ISO-New England, Connecticut power plants have a nameplate capacity of 8,700 MW [https://iso-ne.com › grid\\_mkts › key\\_facts › final\\_ct\\_profile\\_2013\\_14](https://iso-ne.com › grid_mkts › key_facts › final_ct_profile_2013_14)

Doing the math, Connecticut would require some 1,740 solar farms the size of the one in Somers to replace all existing electric power capacity in the state, and doing another calculation, this would require some 87,000 of land use. This land area is equivalent to the total sum of all the land taken up by the cities of Hartford (11,490 acres), Bridgeport (12,400 acres), New Haven (12,870 acres), Waterbury (18,530 acres), New Britain (8,576 acres), New London (6,886 acres) and Meriden (15,440 acres).

## WIND

Wind power plants come in two forms, onshore and offshore.

### - Onshore

For our onshore example, we look at the Sheperds Flat wind farm in Oregon, the world's fifth largest onshore wind farm. <https://www.power-technology.com/projects/shepherds-flat-wind-farm-oregon/>

This wind farm has a capacity of 845 MW and covers some 80 square kilometers. We calculate that 10.3 such wind farms would be needed to replace CT's 8,700 nameplate capacity, and these would span some 823.7 square kilometers. As Connecticut consists of 14,360 km in area, more than twice the area of the solar plant described above.

### - Offshore

Since solar and onshore wind power plants take up so much land space, perhaps an offshore wind plant in Long Island Sound would be preferable. After all, there are no homes or businesses to disrupt out in the Sound.

The world's largest offshore wind power plant is the Walney Extension wind farm off the coast of England. <https://www.power-technology.com/features/largest-offshore-windfarm-world/> Unfortunately, as we shall see, the news isn't good. The British wind farm has a capacity of 659 MW and is spread over 145 sq. kilometers in the North Sea. To replace CT's 8,700 nameplate capacity, we'd need some 13.2 Walney-sized windfarms which would cover an expanse of 1,914 sq km of Long Island Sound. But the Sound only covers 3,056 sq km. In other words, this huge wind farm would choke off Long Island Sound, covering 62.6% of its entire surface area. This would mean a wind farm covering every square meter of Long Island Sound from the New York border to Rhode Island, and penetrating from a few miles into the sound at its narrowest point, to over 100 miles at its widest point.

Connecticut and TCI should be cautious before committing to entirely replacing Connecticut's current power capacity with wind and solar power plants to accommodate EV's. There are physical constraints to making such wholesale conversion possible. In the meantime, Connecticut can transition to a net-carbon zero energy source in the heating sector, elevating the need to put any additional burden on the existing electric power grid, through the use of biodiesel. Why further burden the grid by adding electric heat pumps, when electrons can be saved with liquid fuels that can deliver on emissions reductions that help the state comply with the greenhouse gas reductions required under the Global Warming Solutions Act? Since biodiesel and renewable diesel can be used as a transportation fuel (along with other low carbon fuels), the state can significantly reduce demand on the grid and significantly lowering emissions by utilizing the potential of local businesses to sell low/net zero liquid fuel to the public.

We know that Connecticut is concerned about increasing what are already the highest electricity rates in America, and as business owners we are troubled about the impact that potentially billions of dollars in ratepayer investment that will be needed to upgrade the grid to accommodate TCI goals, subsidizing new clean electric generation sources to accommodate those goals, the subsidization of EV infrastructure, and EV incentives will have on rates. We believe that TCI should put as much effort into finding low carbon/zero carbon liquid fuels, that utilize existing infrastructure that has been privately developed, as they are into electrification of the transportation sector.

Before Connecticut has even adopted any of the costly suggestions that have been made by EV industry advocates, Eversource customers will pay 15.8% more for electricity in 2020 and United Illuminating (UI) customers will realize 26.4% increase (which equates to average customer using 750 kilowatt hours a month paying \$9.65 and \$16.55 more per month with Eversource and UI respectively)! Connecticut needs to factor costs in and “right size” their electrification plans before fixed income and low-income families are disproportionately affected by the proliferation of EV’s and the infrastructure that comes with TCI’s plans. TCI needs to address the question of who benefits from all the costs that go into creating an EV future for Connecticut and the region, and needs to avoid the mistakes that have advantaged the wealthy over low and middle income families.

Of the 57,066 households that received the federal EV tax credit in 2016, 78% had at least a six-figure income and 7% reported more than \$1 million in income, while less than 1% of all EV credits went to households earning less than \$50,000 in 2014, meaning that about half of Americans receive virtually no benefit from the credit. EV manufactures data shows that EV’s are overwhelmingly benefit the wealthy. Tesla’s customers have an average household income of \$293,200 while even the buyers of the more modestly-priced electric Ford Focus have an average income of \$199,000. On top of the EV tax credit, electric cars owners don’t pay gas taxes to help support the roads they use, shifting more of the burden onto other drivers, contributing to a funding deficit that support our roads and bridges. PURA should not create incentives to purchase EV that will only benefit citizens who would be able to afford them without it.

TCI also, has to ask the question are we trading one type of pollution for another? Much of the literature noted that EV’s emit less CO<sub>2</sub> than traditional internal combustion powered engines (ICE). However, the makeup of the electric grid plays a role in the release of other gaseous pollutants and particulates. According to Weeberb J.Requia’s “How Clean Are Electric Vehicles? Evidence-based Review of the Effects of Electric Mobility on Air Pollutants, Greenhouse Gas Emissions and Human Health”, in China, even with an electric grid largely powered by coal, EV’s decrease CO<sub>2</sub> emissions by 20% compared to ICE’s. However, in the same study, emissions of PM<sub>10</sub>, PM<sub>2.5</sub>, NO<sub>x</sub>, and SO<sub>2</sub> emissions increased 360%, 250%, 120% and 370%, respectively.

The environmental impact of EV batteries cannot be ignored and needs to be a part of PURA plan. Li-ion battery production primarily occurs in China and South Korea, whose electricity mix is generally carbon-

intensive. Han Hao's "GHG Emissions from the Production of Lithium-Ion Batteries for Electric Vehicles in China." (April 4, 2017) showed that the GHG emissions were nearly 30% higher than those for comparable ICE's. EV battery materials impact the environment in different ways. Batteries that use large amounts of aluminum LiMnO<sub>2</sub> and LiFePO<sub>4</sub>, for instance, have a greater impact on ozone depletion. At the end of the day, TCI needs to factor in the environmental impact of EV batteries and their disposal. A lifecycle analysis of EV and the infrastructure needed to support them needs to be done comparing them to low emissions liquid fuels before ratepayers are burdened with more costs and environmental issues.

Finally, the current electric grid is not clean and adding EV's (and electric heat pumps) to it will only exacerbate the need for natural gas to ensure that we have enough power to support current demand and the additional demand that EV's will create. According to Gale Ridge, PhD, a scientist and researcher, *"In a one month period, we found about 700 [natural gas] leaks in Hartford. Over a one year period covering the same area, PURA reported 139 leaks. Even recognizing that some of the leaks we found are known to PURA, that's about a 5 fold difference. We believe that CNG may be missing a large percentage of its leaks."* Current overreliance on natural gas is clearly causing greater methane and CO<sub>2</sub> emissions and a massive expansion of EV's in Connecticut will only drive more emissions for a grid that depends on natural gas to power the state. PURA should not move forward with any plan to electrify the transportation sector until they can verify that the electricity that is being use to power EV is truly emissions free.

We urge TCI to address all of these issues before a final plan is proposed to Connecticut.

Respectfully,

Christian A. Herb

President