GreenBiz

Should we electrify everything?

By **Matt Tomich**
President, Energy Vision

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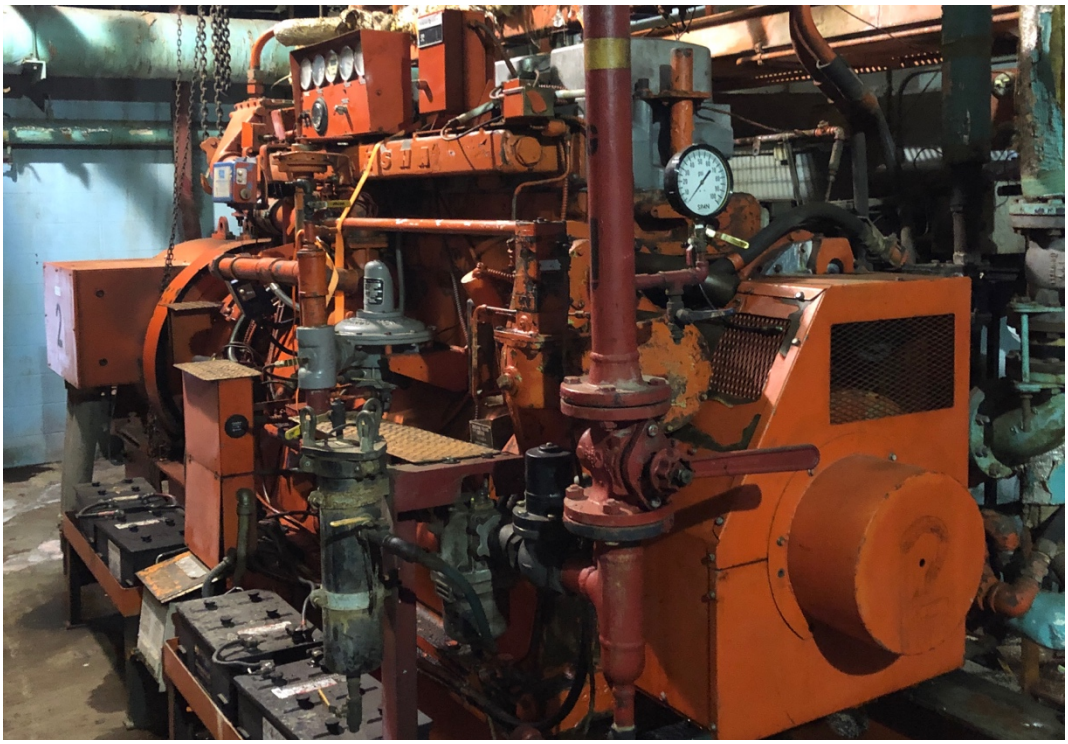

Even in the midst of the pandemic, with wildfires and storms raging, it is imperative to get on with fighting climate change. This crisis is also an opportunity to chart a green recovery, transition to a post - fossil fuel economy, and ramp up renewables rapidly.

Some renewables advocates insist we should "electrify everything" and exclude all biofuel options, because electric motors are more efficient than combustion engines, even when they run on low-carbon or zero-carbon fuels. But electrification is not a panacea, and doesn't always represent the swiftest or surest path to decarbonization.

Take the transportation sector, which emits 28 percent of U.S. greenhouse gases. Electric batteries work well for passenger cars and other light duty vehicles (about three-quarters of vehicles on the road).

Electrifying them eliminates tailpipe emissions, which can go a long way to decarbonization under the right circumstances.

But in terms of their overall impact on the climate, environment and public health, EVs are only as clean as the energy sources charging their batteries and the materials in the batteries.

If charged with solar, wind or other renewables sources, they are great. But if their power comes from fossil fuel plants, the smokestack emissions from those plants are part of EVs' overall "lifecycle" emissions, which could be as bad or worse than gasoline or diesel-powered vehicles.

"With climate change accelerating, we need a whole suite of decarbonization options now, including electrification, RNG, hydrogen and other emerging solutions, applying each where it makes the most sense."

We're still decades away from ending our dependence on fossil fuel-fired power plants. In 2017, 62 percent of all U.S. power came from fossil fuels (30 percent from coal, 32 percent from fossil natural gas). California got 56 percent of its power from natural gas. Ohio got 57 percent from coal and 24 percent from natural gas. New York State got 37 percent from natural gas. Pennsylvania got 22 percent from coal and 34 percent from natural gas. So for the foreseeable future, electric vehicles in these places will produce GHG emissions associated with the power they draw from the grid.

They have other problems, too. EV batteries lose 40 percent of their range in cold weather, and work poorly for heavy-duty transport, such as trains, buses and heavy trucks. Batteries lack the energy density those vehicles need, so they have serious reliability and range problems, struggling on hills and in heat or cold.

The $1.2 million e-buses Albuquerque, New Mexico, bought didn't deliver the promised range needed to complete their routes, so the city pulled the plug and returned them. The Minnesota Valley Transportation Authority experimented with an e-bus in the Twin Cities area and found its performance suffered badly whenever the temperature dipped below 20 degrees Fahrenheit.

Despite all this, 16 states plus D.C. pledged to make all their medium and heavy-duty trucks and buses "zero-emissions," meaning either electric or hydrogen fuel cell-powered vehicles, by 2050. Fuel cells haven't worked well in heavy vehicles yet, either. Witness the recent troubles of Nikola, whose CEO resigned amid accusations he fraudulently exaggerated his trucks' functionality, passing off a semi rolling downhill as running on fuel cell power.

In order for electric or fuel cell-powered trucks and buses to become good options for municipal fleets, the grids charging them will have to become fossil-free, serious performance issues will need to be resolved and prices will have to come down. All that will take time.

Meanwhile, as we continue to build greener electric grids and more EV passenger vehicles, we also should look for alternative technologies that can contribute to decarbonizing transport now, especially heavy vehicles.

One technology that does work well is renewable natural gas (RNG), aka biomethane, an ultra-low-carbon fuel made from organic waste. More than 50,000 trucks and buses already run on RNG today. The lifecycle GHG footprint for RNG vehicle emissions actually can be below zero, making it superior to electrics from a climate standpoint.

RNG is made by capturing the methane biogases emitted by rotting food and other organic wastes, turning what we typically throw into landfills into a valuable energy source. As a greenhouse gas, methane is 86 times more potent than CO2 over a 20-year period. Instead of releasing methane biogases into the air, RNG production captures them and refines them into fuel.

When food wastes and manures are the feedstocks, making RNG captures more greenhouse gases than vehicles emit when burning it, so it is called "net carbon-negative" over its lifecycle, a fact verified by the California Air Resources Board. Carbon-negative strategies such as RNG are essential to meeting the global emissions reduction goals.

In urban and rural areas alike, U.S. organic waste streams are massive and could produce enough RNG to displace more than a quarter of on-road diesel demand. Every truck and bus fleet converted to RNG would meet and exceed the IPCC's 2050 emissions goals — not 30 years from now, but immediately.

In other sectors, biofuels such as RNG offer advantages we shouldn't ignore. In the U.S. the building sector consumes the most natural gas (54 percent) and emits 12 percent of GHG (globally buildings emit 40 percent).

A strong case can be made for electrifying buildings, especially new construction and buildings that can be powered by solar or other renewables. But electric conversion may not be the best option for the 48 percent of homes now using fossil gas, because switching them to RNG has no up-front costs and many benefits.

Yet some environmental advocates accuse utilities that offer RNG to their residential and commercial customers of greenwashing, simply because it's not electrification. Earth Justice and the Sierra Club recently issued a report to that effect. But in their zeal to "electrify everything," they have strayed into misleading and counterfactual territory.

The Newton Creek municipal solid waste digester in Brooklyn, New York. Image courtesy of Energy Vision.

The report claims using RNG would perpetuate air pollution and negative health impacts from natural gas combustion indoors. But compared to fossil gas, RNG actually improves indoor and outdoor air quality, as it is nearly pure methane and burns much cleaner than fossil gas. RNG has near-zero emissions of ethane, propane, butane, pentane or other trace hydrocarbons in fossil gas.

The report calls RNG production "intentionally produced methane," noting that methane is a powerful greenhouse gas. But RNG production actually reduces methane pollution, because it captures and converts methane biogases that otherwise would escape into the atmosphere as organic wastes decompose. It's largely because of these avoided methane emissions that RNG can be net carbon-negative over its lifecycle.

Critics have a point when they object to methane leakage from gas pipelines and biogas storage facilities. These need improvement, although biogas leakage is still small compared to the fossil gas industry. But the more carbon-negative RNG natural gas pipelines carry, the more the climate impacts of natural gas infrastructure will be reduced. RNG will never fully displace fossil gas, but considering the giant challenge we face, it's an arrow we need in the decarbonization quiver.

Electrification will keep getting better for the climate as renewable power generation ramps up, but that will take many years. With climate change accelerating, we need a whole suite of decarbonization options now, including electrification, RNG, hydrogen and other emerging solutions, applying each where it makes the most sense.

Today, RNG is ready to decarbonize trucks, buses, gas-equipped buildings, and to some extent, natural gas infrastructure itself. It's not greenwashing; for those applications, it's a genuine solution.