

Health and Environmental Impacts from Nacero's Proposed PA Gas-to-Liquids Refinery



Rendering of Nacero's planned Pennsylvania refinery. Image Credit: Nacero

Background

In October 2021, the company Nacero and local elected officials announced plans to build a massive gas-to-liquids refinery that would turn fracked shale gas into synthetic gasoline. The refinery is proposed to be built in Newport Township, Luzerne County, just southwest of Wilkes-Barre. Nacero has made statements claiming that its new refinery would produce environmentally friendly gasoline. However, if this refinery is similar to Nacero's proposed Texas project, the Luzerne County facility would be the third highest emitter of greenhouse gases in Pennsylvania and among the top emitters of other harmful pollutants. While Nacero has proposed four gas-to-liquids refineries in the United States, none have advanced to construction.

Synthesis Process

The company plans to market two gasoline products, which it will call "Nacero Blue" and "Nacero Green." Nacero Blue is made from fracked gas whereas Nacero Green is described as being made from gases from agricultural sites, landfills, and waste treatment facilities. The products are likely to be identical, since Nacero plans to pool its gas feedstocks together.

According to the Energy Information Administration (EIA), gas-to-liquids (GTL) is a process that converts natural gas to liquid fuels, including gasoline, jet fuel, and diesel. The processes that Nacero claims are cutting edge are not new. The methanol to gasoline (MTG) process Nacero proposes to use was developed by Exxonmobil in 1975 as an alternative to the similar but older Fischer-Tropsch synthesis process developed nearly a century ago.¹

The MTG process converts natural gas into syngas, which is a mixture of hydrogen, carbon dioxide, and carbon monoxide. According to the EIA, syngas is scrubbed to remove impurities such as sulfur, water, and carbon dioxide.² This is then taken and reacted with hydrogen with carbon monoxide to form different liquid hydrocarbons. The final step is to further process the liquid hydrocarbons into fuel like gasoline.

In Nacero's case, methanol is the liquid hydrocarbon that would be converted into gasoline. Methanol is a highly flammable liquid alcohol used industrially in fuels, solvents, and pesticides.³



ORYX GTL plant, located in Qatar. Image Credit: Orxy (CC BY-SA 3.0)

The capacity for methanol generation has been growing worldwide, with several plants in the US, mostly in the gulf coast region, and a large fraction of worldwide capacity in China where it is used as a gasoline additive or alternative, or for gasoline production.^{4, 5} Some of the methanol from these plants is converted on-site into gasoline using the Exxonmobil MTG process or other similar chemical processes.

Though methanol has been produced in the US for over 25 years, recently natural gas to methanol and methanol to gasoline has become more financially viable.⁶ Natural gas producers see MTG as a way to take advantage of low natural gas to now-increasing oil prices.⁶ While these facilities are, so far, not very common, they are expanding and planned capacity is increasing every year.

Environmental Impact

The process that the refinery would use to make the synthetic gasoline is a very energy-intensive process that creates significant amounts of air pollution. If this facility is similar to the one Nacero proposed in Texas, it would be a major source of harmful air pollution and greenhouse gases (GHGs) that accelerate climate change. The proposed facility in Texas has an annual emission allowance of more than 5.7 million tons per year of GHGs.⁷

The proposed Texas plant also has the potential to emit 600 tons per year of volatile organic compounds, and 95 tons per year of hazardous air pollutants - many of which are very harmful to public health.



Rendering of Nacero's planned Texas refinery in Penwell, Tx. Image Credit: Nacero

Despite Nacero's claim, the refinery is unlikely to be able to produce carbon neutral gasoline. Nacero has not provided a full lifecycle analysis of the facility's environmental impact to justify this claim. In addition to emissions from the refinery, the gas infrastructure needed to produce gas for the plant and burning gasoline from the plant in vehicles will produce even more air pollution.

Emissions Estimates for Nacero's Texas Plant

- Nitrogen oxides: 543.32 tons/yr
- Greenhouse gases: 5.7 million tons/yr
- Volatile organic compounds: 602.21 tons/yr
- Particulate matter 2.5: 240.27 tons/yr
- Total Hazardous air pollutants: 95.69 ton/yr

Health Effects from Potential Emissions

Nitrogen oxides (NO_x) exposure can cause respiratory inflammation and exacerbates heart and lung issues such as asthma, emphysema, and chronic obstructive pulmonary disease (COPD).

Greenhouse gases (GHG) are a major driver of climate change.

Volatile organic compounds (VOCs) can cause cancer; some are suspected or known carcinogens. Elevated exposure can include eye and respiratory tract irritation, headaches, nausea, dizziness, visual disorders, and memory impairment.

Particulate matter 2.5 (PM_{2.5}) can get deep into lungs and cause serious health problems. PM_{2.5} can cause premature death in people with heart or lung disease, and aggravate asthma.

Hazardous air pollutants (HAPs) are pollutants that are known to cause cancer and other serious health impacts.

Economic Viability Issues and Jobs

In July 2020, PA Gov. Tom Wolf signed into law House Bill (HB) 732, which would allow petrochemical plants, including the Nacero project, to receive a maximum of \$6.7 million in tax breaks each year for up to 25 years.⁸

A study published by David Ramberg in 2017 states that "with carbon constraints, large-scale deployment of GTL is not economical."⁹ The study concludes that it will become less viable with the expanded use of electric vehicles and biofuels when there are more robust carbon emission restrictions in place due to climate change.

Nacero and project supporters claim that the refinery will create thousands of jobs. The vast majority of these jobs would be temporary construction jobs and the company's website says that only 300 permanent jobs would be created. Nacero has not committed to hiring local workers to fill these positions.

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