



Oregon

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To: Energy Facility Siting Council

From: Todd Cornett, ODOE Assistant Director for Siting/Council Secretary and
Michael Freels, ODOE Senior Policy Analyst

Date: April 5, 2024

Subject: Agenda Item H (Action Item):
Jurisdictional Evaluation for Hydrogen Electrolyzers for the April 19, 2024 EFSC Meeting

BACKGROUND

Oregon's transition to a clean energy future is likely to include the use of hydrogen as a decarbonization strategy. While there are numerous ways to produce hydrogen, one of those ways is through an electrolyzer, which uses electricity to split water into hydrogen and oxygen with no harmful greenhouse gas emissions or byproducts.

QUESTION

Do hydrogen electrolyzers constitute an "Energy Facility" as included in ORS 469.300(11)(a)(F) below, and are therefore within the jurisdiction of the Energy Facility Siting Council (EFSC)?

A synthetic fuel plant which converts a natural resource including, but not limited to, coal or oil to a gas, liquid or solid product intended to be used as a fuel and capable of being burned to produce the equivalent of two billion Btu of heat a day.

STAFF RECOMMENDATION

While hydrogen electrolyzers may be a component of a synthetic fuel plant, energy generation, pipeline, or storage facility that may fall within the jurisdiction of the EFSC, based on the information below, the Department recommends Council vote that hydrogen electrolyzers by themselves **do not** constitute a synthetic fuel plant as that term is included in ORS 469.300(11)(a)(F), and therefore do not fall within the jurisdiction of the EFSC.

WHAT ARE SYNTHETIC FUEL PLANTS?

Synthetic fuels are fuels with the same properties as fossil fuels but are produced artificially and can be used as fossil fuel replacements to power transportation, generate heat, or other applications. Fossil fuels are made of chains of the elements hydrogen and carbon. Synthetic fuel production consists of mixing hydrogen and carbon monoxide into a hydrocarbon fuel. This is an established industrial process that has commonly been completed using coal and natural gas as feedstocks. A low carbon version of synthetic fuel production would incorporate a

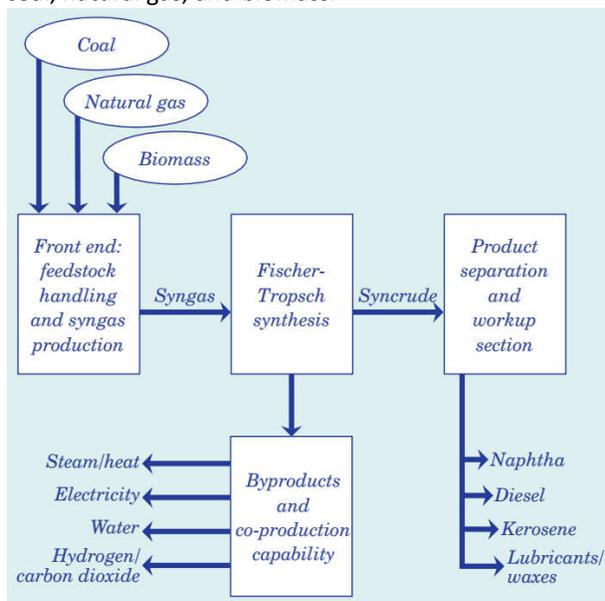
combination of renewable electricity, biomass, or another renewable resource to provide the hydrogen and carbon needed to create the fuel.¹

The United States Energy Information Administration (EIA) defines synthetic fuels as fuels created from coal, natural gas, or biomass feedstocks through chemical conversion. The general categories of synthetic fuel production are included below:

- Coal-to-Liquids. The transformation of coal into liquid fuels.
- Gas-to-Liquids. The chemical conversion of natural gas into a variety of petroleum fuels
- Biomass-to-Liquids. Encompasses the production of fuels from waste wood and other non-food plant sources. This is different than conventional biodiesel production, which uses primarily food-related crops as its feedstock.

Industrial facilities gasify the feedstocks to produce synthetic gas (carbon monoxide and hydrogen) as an initial step. Synthetic fuel plants commonly employ the Fischer-Tropsch process which converts synthetic gas into hydrocarbon fuels that can be used as drop-in low-carbon fuels to substitute a petroleum product. The manufacturing process for synthetic fuels is typically separate from and bypasses the traditional oil refining system, creating fuels that can go directly to final markets and compete with traditional fossil fuels. A simplified flow diagram of the synthetic fuels process is shown in the figure below.²

System elements for production of synthetic fuels from coal, natural gas, and biomass.

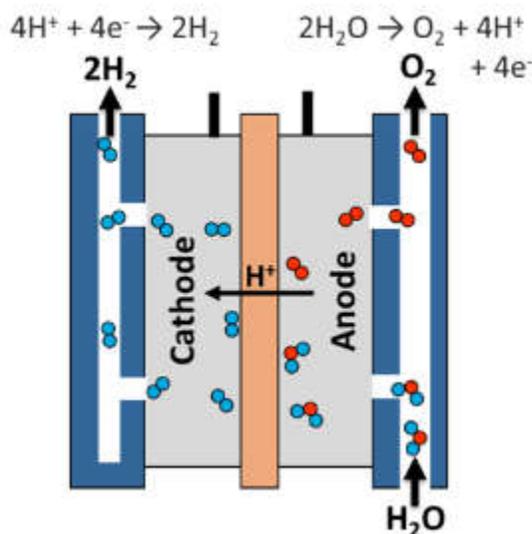


¹ Murer, C. (n.d.). *Synthetic fuels explained* | Synhelion. Retrieved March 22, 2024, from <https://synhelion.com/news/synthetic-fuels-explained>

² Department of Energy, E. I. A. (n.d.). *Annual Energy Outlook 2006: Issues in Focus*. <https://www.eia.gov/outlooks/archive/aeo06/pdf/issues.pdf>

WHAT ARE HYDROGEN ELECTROLYZERS?

Electrolysis is the process of using electricity to split water into hydrogen and oxygen. This reaction takes place in a unit called an electrolyzer. An electrolyzer is composed of an anode and a cathode separated by an electrolyte. An electrolyte is the chemical from which ions are made. The ions created in the electrolyzer effectively pull water molecules apart, which can be converted, with help from electricity, into hydrogen and oxygen.³ The collected hydrogen can be used as a fuel or for energy storage. The collected oxygen gas can be used for industrial applications or vented into the air. This is not a combustion process and GHG emissions do not come directly from the electrolyzer or the chemical reaction.⁴



Around one quart of water is needed to produce one kilogram of hydrogen which contains about the same energy as one gallon of gasoline.⁵ Given concerns in many of Oregon’s communities over the supply of fresh water, electrolyzers can use recycled water from wastewater treatment plants or desalinated seawater.⁶

APPLICABLE OREGON REVISED STATUTES

ORS 469.300(11)(a) defines an “Energy Facility” which establishes the jurisdictional thresholds for EFSC and includes:

(F) A synthetic fuel plant which converts a natural resource including, but not limited to, coal or oil to a gas, liquid or solid product intended to be used as a fuel and capable of being burned to produce the equivalent of two billion Btu of heat a day.

³ Oregon Department of Energy. (2022). *RENEWABLE HYDROGEN IN OREGON: Opportunities and Challenges*, 6 <https://www.oregon.gov/energy/Data-and-Reports/Documents/2022-ODOE-Renewable-Hydrogen-Report.pdf>

⁴ Kleijne, K. de, Coninck, H. de, Zelm, R. van, J. Huijbregts, M. A., & V. Hanssen, S. (2022). The many greenhouse gas footprints of green hydrogen. *Sustainable Energy & Fuels*, 6(19), 4383–4387. <https://doi.org/10.1039/D2SE00444E>

⁵ U.S. Department of Energy, Alternative Fuels Data Center, Hydrogen Basics, Accessed April 3, 2024. <https://afdc.energy.gov/fuels/hydrogen-basics#:~:text=The%20energy%20in%202.2%20pounds,driving%20range%20of%20conventional%20vehicles.>

⁶ Oregon Department of Energy. (2022). *RENEWABLE HYDROGEN IN OREGON: Opportunities and Challenges*, 6 <https://www.oregon.gov/energy/Data-and-Reports/Documents/2022-ODOE-Renewable-Hydrogen-Report.pdf>

STATUTORY EVALUATION AND INTERPRETATION

An analysis was conducted to assess whether hydrogen electrolyzers should be considered an energy facility subject to EFSC jurisdiction under ORS 469.300(11)(a)(F). Evaluating and interpreting statute typically starts with the text of the statute at issue and its context. If that is not adequate to lead to a defensible interpretation, the next step is to look at any legislative history to help determine the thinking of the legislature at the time the statute was created.

In analyzing the text of ORS 469.300(11)(a)(F), a facility that produces hydrogen via electrolysis would meet the definition of an “energy facility” if it:

- a. is a synthetic fuel plant**
- b. converts a natural resource including but not limited to coal or oil**
- c. to a gas, liquid or solid product**
- d. intended to be used as a fuel**
- e. and capable of being burned to produce the equivalent of two billion Btu of heat a day**

These are each evaluated individually below.

a. is a synthetic fuel plant

Text and Context of statute

The legislature first included “synthetic fuel plant” in the definition of “energy facility” in 1981, under HB 2260 (which was then found in ORS 469.300(10)(f)). However, neither “synthetic fuel plant” nor “synthetic fuel” are defined in ORS 469.300.

The dictionary definition at the time does not appear to cover facilities producing hydrogen from water and electricity.

When, as here, a term is not defined in a statute, Oregon courts may consider a dictionary definition of the term that is contemporaneous with the enactment of the statute to assess legislative intent.⁷ Looking to the definition understood at the time of enactment assists in discerning the enacting legislature’s intent. Below is the 1984 Webster’s II New Riverside University Dictionary definition of “synfuel”:

“A liquid, gaseous or solid hydrocarbon fuel derived from naturally occurring fossil fuels as coal, shale or tar sand.”

Therefore, the 1984 Webster’s II dictionary definition of “synfuel” would not cover hydrogen produced by electrolysis because the hydrogen is derived from water, not from a fossil fuel.

Per the Oxford English Dictionary online, the word “synfuel” first appeared in the dictionary in 1976 and since then Oxford has defined it without making any changes, as:

“Any fuel made from coal, oil shale, or the like as a substitute for a petroleum product.”

⁷ LaDu v. Oregon Clinic, P.C., 165 Or App 687, 690–691, 998 P2d 733 (2000) (relying on dictionary contemporaneous with enactment of statute)

While the Oxford dictionary does not define synfuel as being derived from “fossil fuels” by defining synfuel as a fuel made from coal, oil shale “or the like” it suggests synfuel is made from a naturally occurring fossil fuel.

Therefore, the dictionary definitions of synthetic fuel and synfuel at or around the time the legislature passed HB2260 support a conclusion that the legislature would not have intended for present day facilities that produce hydrogen via electrolysis to be subject to EFSC jurisdiction as a “synthetic fuel plant.”

Legislative history of HB 2260

Testimony regarding HB 2260 also suggests that when the legislature used the term “synthetic fuel plant” in the definition of an energy facility, it likely had fossil-fuel based plants in mind.

The Oregon Department of Energy Director, Lynn Frank, provided testimony in support of HB 2260, stating that synthetic fuel and liquified natural gas (“LNG”) facilities “will have socio-economic, land-use and environmental concerns similar to those of large electrical generating plants which must obtain a site certificate.”⁸ In his written testimony, as well as his oral testimony, when addressing synthetic fuel plants, Mr. Frank referenced coal gasification plants.⁹

The Oregon Environmental Council (OEC) also provided oral and written testimony in support of HB 2260. In oral testimony before the House Environment & Energy Committee on May 28, 1981, Mr. William Cook of the OEC testified there was a loophole in the Siting Act because it did not cover LNG or synthetic fuel plants, in particular coal gasification plants. He testified that synthetic fuel processes release pollutants, “including coal dust and sulfur dioxide” and that most synthetic fuel plants create slag or sludge as a byproduct that has to be disposed of carefully to make sure they don’t leach toxic chemicals into groundwater.¹⁰

A Staff Measure Analysis for HB 2260 states:

“HB 2260 as amended both adds to and deletes facilities from the list of facilities for which an energy facility siting certificate is required.

- deletes geothermal pipelines used to distribute heat within a geothermal heating district*
- adds synthetic fuel plants*

⁸ Written testimony of Lynn Frank, Oregon Office of Energy, to the House Committee on Environment and Energy HB 2260, Exhibit E, 5/28/81

⁹ Oral testimony of Lynn Frank, Oregon Office of Energy, to the House Committee on Environment and Energy HB 2260, audio tape OL 1981 c. 629, 5/28/82 Tape 168, beginning at approximately 59:20.

¹⁰ Oral testimony of William Cook of the Oregon Environmental Council, to the House Committee on Environment and Energy HB 2260, audio tape OL 1981 c. 629, 5/28/82 Tape 168, beginning at approximately 27:00.

- adds industrial and commercial facilities with an electricity consumption capacity of more than 150,000 kilowatts (150 megawatts)

Current law does not cover the siting of synthetic fuels plants. The impacts of synthetic fuel production are quite similar to and possibly greater than those of other energy facilities covered by current law. Synfuels production is water-consumptive, releases pollutants into the air, and creates by-products which must be disposed of carefully. Requiring a site certificate would allow for full public review of the socio-economic, land use and environmental effects of siting such a plant.”¹¹

Based on the House Staff Measure Summary and the aforementioned testimony, the legislature appears to have placed synthetic fuel plants under EFSC jurisdiction to ensure state and public review of such facilities, largely due to their environmental impacts and specifically due to concerns about their water consumption, release of pollutants into the air and creation of waste by-products.

While facilities that produce hydrogen from water via electrolysis would be water-consumptive, unlike plants that are converting coal, oil or even biomass to a fuel, they would not release pollutants into the air or create by-products such as slag or sludge that must “be disposed of carefully.” While present day facilities that produce hydrogen from water via electrolysis might have socioeconomic and land use impacts, they should not pose the environmental concerns identified when the legislature placed “synthetic fuel plants” under EFSC jurisdiction in 1981.

b. converts a natural resource including but not limited to coal or oil

Text of statute: Water is a “natural resource” being converted to hydrogen in the electrolysis process. However, this alone does not make a hydrogen electrolyzer a synthetic fuel plant. The other relevant portions of the statute, including the threshold requirement of being a “synthetic fuel plant” would also have to be met.

c. to a gas, liquid or solid product

Text of statute: This portion of ORS 469.300(11)(a)(F) is clear and hydrogen is a gas. However, producing a gas alone would not result in a hydrogen electrolyzer being a synthetic fuel plant. The other relevant portions of the statute would also have to be met.

d. intended to be used as a fuel

Text of statute: According to EIA, there are numerous uses of hydrogen, only some of which are as a fuel.¹² This portion of ORS 469.300(11)(a)(F) is therefore clear and would only require a clarification that the output from the electrolyzer would be used as a fuel.

¹¹Staff Measure Analysis HB 2260 to the House Environment and Energy Committee, 5/28-29/81, prepared by Lori Parker, Administrator.

¹² <https://www.eia.gov/energyexplained/hydrogen/use-of-hydrogen.php>

However, producing fuel alone would not result in a hydrogen electrolyzer being a synthetic fuel plant. The other relevant portions of the statute would also have to be met.

e. and capable of being burned to produce the equivalent of two billion Btu of heat a day

Text of statute: This portion of ORS 469.300(11)(a)(F) is clear and would only require a calculation based on the proposed facility. However, producing the equivalent of two billion Btu's of heat a day alone would not result in a hydrogen electrolyzer being a synthetic fuel plant. The other relevant portions of the statute would also have to be met.

CONCLUSION

It is not clear based just on the text and context of the statutes whether the legislature would have intended for the term “synthetic fuel plant” in the ORS 469.300(11)(a)(F) definition of “energy facility” to cover facilities that produce hydrogen from water via electrolysis. Neither the terms “synthetic fuel,” or “synthetic fuel plant” are defined in statute. However, when this statute was first passed in 1981, testimony before the legislature and a House staff measure summary identified the socio-economic, land use and environmental impacts of “synthetic fuel plants” as being reasons to place them under EFSC jurisdiction. The types of environmental concerns cited, such as emissions and creation of waste, should not arise with present-day hydrogen production from electrolysis. As discussed in the first section of this report, hydrogen electrolyzers use a different chemical process, water as a feedstock, and produce no harmful GHG emissions or byproducts. Further, dictionary definitions of the term “synfuel” from the approximate time the legislature first used the term in the EFSC statutes suggests the legislature likely considered “synthetic fuel plants” to be facilities that convert carbon containing natural resources to fuels. Therefore, the Department recommends EFSC interpret ORS 469.300(11)(a)(F) as not granting EFSC jurisdiction over hydrogen electrolyzers.