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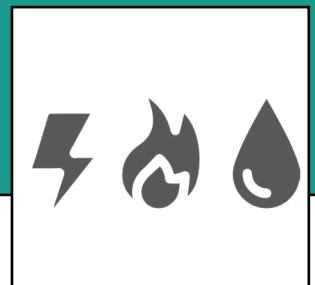
SCHOOL OF ENERGY RESOURCES
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WHITE PAPER SERIES

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White Paper Title:

An analysis of the conditions under which a microreactor could be considered a qualifying facility under PURPA.



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NUCLEAR ENERGY RESEARCH CENTER WHITE PAPERS

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SYNOPSIS

The Public Utility Regulatory Policies Act of 1978 (“PURPA”) was passed in response to the energy crisis of the 1970s and was intended to encourage electricity conservation and domestic energy production to reduce reliance on foreign energy sources. Public Utility Regulatory Policies Act of 1978, Pub. L. No. 95-617, 92 Stat. 3117 (1978); *The Public Utility Regulatory Policies Act of 1978*, AMERICAN PUBLIC POWER. To further this energy independence goal, PURPA required the Federal Energy Regulatory Commission (“FERC”) to establish rules encouraging “cogeneration” and “small power production” by requiring “electric utilities” to sell and purchase electricity to and from “qualifying cogeneration facilities and qualifying small power production facilities” (“Qualifying Facilities”). See 16 U.S.C. § 824a-3. PURPA benefits and incentivizes electricity generation by power producers of Qualifying Facilities by requiring electric utilities to purchase electric power from Qualifying Facilities at the “avoided cost” rate that it would cost the utility if it were to generate the electricity itself or purchase it from another source. See 18 C.F.R. §§ 292.304(a) and 292.101(b) (6).

To benefit from PURPA, nuclear microreactors must be Qualifying Facilities. Nuclear fuel use does not meet the fuel use criteria to qualify as a “small power production” facility under PURPA. See 18 C.F.R. § 292.204(b). Accordingly, for a nuclear microreactor to qualify under PURPA, it would need to be operated as a “cogeneration facility” producing not only electricity but also producing heat or “useful thermal energy” for use with other systems and applications. See *generally* 18 C.F.R. § 292.202(c) and 292.205(d).

DISCUSSION - PURPA APPLICATION TO NUCLEAR MICROREACTORS

A. PURPA Legislative Background and Overview

The Public Utility Regulatory Policies Act of 1978 (“PURPA”) was passed in response to the energy crisis of the 1970s and was intended to encourage electricity conservation and domestic energy production. Public Utility Regulatory Policies Act of 1978, Pub. L. No. 95-617, 92 Stat. 3117 (1978); *The Public Utility Regulatory Policies Act of 1978*, AMERICAN PUBLIC POWER. To further this energy independence goal and to reduce reliance on foreign energy, PURPA required the Federal Energy Regulatory Commission (“FERC”) to establish rules encouraging “cogeneration” and “small power production” by requiring “electric utilities” to sell and purchase electricity to and from “qualifying cogeneration facilities and qualifying small power production facilities” (“Qualifying Facilities”). See 16 U.S.C. § 824a-3. An “electric utility” is defined by 16 U.S.C. § 2602(4) as “any person, State agency, or Federal agency which sells electric energy.”

PURPA requires the purchase of electricity from Qualifying Facilities at an avoided cost rate. FERC rules cannot “provide for a rate which exceeds the incremental cost to the electric utility of alternative electric energy” which is defined as “the cost to the electric utility of the electric energy which, but for the purchase from such cogenerator or small power producer, such utility would generate or purchase from another source.” See 16 U.S.C. §§ 824a-3(b) and 824a-3(d). The applicable state agency implements FERC’s rules for electric utilities over which the state agency has ratemaking authority, while other utilities must implement such rules themselves. See 16 U.S.C. § 824a-3(f).¹

PURPA was significantly amended in 2005 modifying the criteria for Qualifying Facility status and providing exceptions to the requirements for utilities to purchase electricity from Qualifying Facilities. See Energy Policy Act of 2005, Pub. L. 109-58, 119 Stat. 594 (2005); *The Energy Policy Act of 2005: PURPA Reform, the Amendments and Their Implications*, at Page 32 *The Energy Law Journal*, Hornstein and Stormer (2006). Perhaps most notably and after August 8, 2005, “no electric utility shall be required to enter into a new contract or obligation to purchase electric energy from a” Qualifying Facility if FERC finds that the Qualifying facility has nondiscriminatory access to: (i) day ahead, real time and long-term wholesale markets for the sale of electric energy; or (ii) transmission and interconnection services provided by a FERC approved regional transmission entity affording access to competitive wholesale markets “to buyers other than the utility to which the qualifying facility is interconnected.” See 16 U.S.C. § 824a-3(m); see also 18 C.F.R. § 292.309 and 292.310.

¹ See also FERC Order No. 872 (as amended) providing state regulatory bodies more flexibility in establishing avoided cost rates for Qualifying Facilities. <https://www.ferc.gov/media/order-no-872>

B. FERC's PURPA Regulations with Respect to Qualifying Facilities

Pursuant to § 824a-3(a), FERC has promulgated rules in furtherance of PURPA. See 18 C.F.R. §§ 290-294 (2022). Notably and subject to certain exceptions, electric utilities are generally: (i) obligated to purchase “any energy and capacity which is made available from a qualifying facility;” (ii) to “sell to any qualifying facility...energy and capacity requested by the qualifying facility;” and (iii) to “make such interconnection with any qualifying facility as may be necessary to accomplish purchase or sales...” See 18 C.F.R.

§ 292.303. Exceptions include: (i) nondiscriminatory access to wholesale markets as further set forth in 18 C.F.R. § 292.309; and (ii) temporary exceptions based on “operational circumstances” as further set forth in 18 C.F.R. § 292.304(f).

18 C.F.R. § 292.304(a) sets forth general parameters for the rates at which electric utilities must purchase power from Qualifying Facilities. Such rates must be reasonable to customers of electric utilities and in the public interest, must not discriminate against Qualifying Facilities, and must not require an electric utility to pay more than its “avoided costs” for purchases required under PURPA. See *id.* “Avoided costs” are defined as “the incremental costs to an electric utility of electric energy or capacity or both which, but for the purchase from [a Qualifying Facility], such utility would generate itself or purchase from another source.” 18 C.F.R. § 292.101(b)(6). 18 C.F.R. § 292.304(e) sets forth factors for determining purchase rates in accordance with avoided costs.

18 C.F.R. § 292.305(a) sets forth the rates at which an electric utility must sell energy or capacity to a Qualifying Facility. Such rates must be just, reasonable, and in the public interest, and the electric utility must not discriminate against Qualifying Facilities in comparison to rates paid by other customers of the electric utility. See 18 C.F.R. § 292.305(a)(1).

Finally, FERC also requires an electric utility to provide additional services upon the request of a Qualifying Facility. *Id.* § 292.305(b). These services include “(i) Supplementary power; (ii) Back-up power; (iii) Maintenance power; and (iv) Interruptible power.” 18 C.F.R. § 292.305(b)(1). A state regulatory authority, however, is authorized to waive requirements for regulated utilities to provide these additional services if, after notice and a public hearing, the state authority finds that the requirements will either impair the electric utility’s ability to provide adequate service to its customers or that the requirements will place an undue burden on the electric utility. See *id.* § 292.305(b)(2). FERC may waive these requirements in the same manner for nonregulated utilities. See *id.*

C. Microreactors as Qualifying Facilities Under PURPA

The opportunity to access electricity markets and obtain back power may benefit operators of nuclear microreactors if the energy system is designed as a Qualifying Facility under PURPA. Accordingly, it is necessary to evaluate under what circumstances a microreactor might be considered a Qualifying Facility.

i) Small Power Production Facilities

“Small power production facilities” are one of two types of Qualifying Facilities recognized by FERC under PURPA. To qualify, a small power production facility must meet the three general requirements set forth under 18 C.F.R. § 292.204(a). The first factor limits “the power production capacity of a facility for which qualification is sought, together with the power production capacity of any other small power production qualifying facilities that use the same energy resource” which are owned by the same party and located at the same site to a maximum of 80 megawatts. *Id.* Because most microreactors typically range up to 20 megawatts, a single nuclear microreactor is likely to meet this size requirement. See “What are Microreactors” <https://inl.gov/trending-topic/microreactors/>.

The second general requirement for a Qualifying Facility is that the “primary energy source of the facility must be biomass, waste, renewable resources, geothermal resources, or any combination thereof, and 75 percent or more of the total energy input must be from these sources.” See 18 C.F.R. § 292.204(b). “Biomass” and “waste” are defined under 18 C.F.R. § 292.202(a)-(b) and do not include nuclear fuels within their definitions. While “geothermal energy” is not given a definition under FERC regulations, nuclear fuels

are typically not associated with geothermal energy. See *Geothermal Power Plants*, UNIVERSITY OF CALGARY ENERGY EDUCATION, September 27, 2021), https://energyeducation.ca/encyclopedia/Geothermal_power_plants (describing geothermal energy as “the Earth’s internal thermal energy”). “Renewable resources” are similarly not defined by an applicable regulation, but are described on FERC’s website as including “hydro, wind, or solar,” and thus do not appear to include nuclear fuels. See *PURPA Qualifying Facilities*, FEDERAL ENERGY REGULATORY COMMISSION (June 11, 2021), <https://www.ferc.gov/qf>. Accordingly microreactors are unlikely to meet the definition of a “small power production facility” under PURPA because of the fuel-use criteria. Therefore, a microreactor will likely need to meet the “cogeneration facility” definition to be considered a Qualifying Facility under PURPA.

ii) Cogeneration Facilities

“Cogeneration facilities” are the second class of facilities that are eligible for Qualifying Facility status under PURPA. See 18 C.F.R. § 292.203(b). Notably, there is no generation size limitation for qualifying cogeneration facilities. FERC regulations define a “cogeneration facility” as “equipment used to produce electric energy and forms of useful thermal energy (such as heat or steam), used for industrial, commercial, heating, or cooling purposes, through the sequential use of energy.” See 18 C.F.R. § 292.202(c). As stated by FERC on its website “[a] cogeneration facility is a generating facility that sequentially produces electricity and another form of useful thermal energy (such as heat or steam) in a way that is more efficient than the separate production of both forms of energy.” See <https://www.ferc.gov/qf>.

Such qualifying cogeneration facilities may include “topping-cycle facilities” or “bottoming-cycle facilities” so long as they meet the criteria set forth in 18 C.F.R. § 292.205. These terms are defined as follows:

Topping-cycle cogeneration facility means a cogeneration facility in which the energy input to the facility is first used to produce useful power output, and at least some of the reject heat from the power production process is then used to provide useful thermal energy;

Bottoming-cycle cogeneration facility means a cogeneration facility in which the energy input to the system is first applied to a useful thermal energy application or process, and at least some of the reject heat emerging from the application or process is then used for power production.

18 C.F.R. § 292.202(e)-(d). For purposes of these definitions, “useful power output” of a cogeneration facility is defined as “the electric or mechanical energy made available for use, exclusive of any such energy used in the power production process” while “useful thermal energy output” of a topping-cycle cogeneration facility means the thermal energy that is made available to an industrial or commercial process, used in a heating or space cooling application, or “[t]hat is used by a fuel cell system with an integrated steam hydrocarbon reformation process for production of fuel for electricity generation.” *Id.* §§ 292.202(g) and 292.202(h). Qualifying topping-cycle facilities also have an operating standard that requires the facility’s useful thermal output to be at least 5% of the total energy output for the facility’s first year of operation and each subsequent calendar year. See *id.* § 292.205(a)(1). This requirement generally applies to all topping-cycle facilities but can be waived by FERC “upon a showing that the facility will produce significant energy savings.” See *id.* § 292.205(a)(1), (c).

In addition to the criteria set forth above, and for all facilities constructed after August 8, 2005, the thermal output of the cogeneration facility must be “used in a productive and beneficial manner” ensuring that the “electrical, thermal, and chemical output of the cogeneration facility is used fundamentally for industrial, commercial, or institutional purposes and is not intended fundamentally for sale to an electric utility.” *Id.* §§ 292.205(d)(1) and 292.205(d)(2). Importantly “a new cogeneration facility of 5 MW or smaller will be presumed to satisfy” these requirements. *Id.* §§ 292.205(d)(4). For facilities larger than 5 MW: (i) productive and beneficial use is presumed by FERC “where a thermal host existed prior to the development of a new cogeneration facility whose thermal output [will supplant the thermal source previously in use by the thermal host...”; and (ii) fundamental use is presumed by FERC if at least 50 percent of the aggregate electrical, thermal, chemical and mechanical output of the cogeneration facility “is used for industrial, commercial or institutional purposes...” *Id.* §§ 292.205(d)(3) and 292.205(d)(5).

Whether a microreactor qualifies as a cogeneration facility will be based on the technical design of the microreactor and the use of its various energy outputs. According to the International Atomic Energy Agency, in addition to the generation of electricity “nuclear power plants can be used to produce a vast range of products such as cooling, heating, process heat, desalination and hydrogen” which such “cogeneration option may be different depending on the technology, reactor type, fuel type and temperature level.” See *Industrial Application and Nuclear Cogeneration*, IAEA <https://www.iaea.org/topics/non-electric-applications>. Therefore (1) microreactors under 5 MW that are used for both electric and thermal energy generation will qualify as “cogeneration facilities” under PURPA so long as the useful thermal output is at least 5% of the total energy output for topping-cycle facilities; and (2) microreactors greater than 5 MW that are used for both electric and thermal energy generation will qualify as “cogeneration facilities” under PURPA if the thermal output is “used in a productive and beneficial manner” with at least 50% of the aggregate energy output being used for “industrial, commercial or institutional purposes.”

D. Certification of Qualifying Facilities under PURPA

Both small power production facilities and cogeneration facilities must follow FERC’s procedural requirements to be certified as Qualifying Facilities. See 18 C.F.R. § 292.203(a)(3), (b)(2). To be certified as a Qualifying Facility, a facility must either self-certify or be certified by FERC. See *id.* § 292.207(a)-(b).

To self-certify, a facility’s owner, operator, or representative must complete and file FERC Form No. 556. *Id.* § 292.207(a)(1). Any applicant that self-certifies must serve a copy of its self-certification “on each electric utility with which it expects to interconnect, transmit or sell electric energy to, or purchase supplementary, standby, back-up or maintenance power from, and the State regulatory authority of each state where the facility and each affected electric utility is located.” *Id.* § 292.207(e)(1).

As an alternative to self-certification, a facility’s owner, operator, or representative may apply to have FERC certify its status as a Qualifying Facility. See *id.* § 292.207(b). The application must include a completed FERC Form No. 556. See § 292.207(b)(2). Within ninety days of such an application, FERC must grant the application, deny the application, inform the applicant the application information is not satisfactory, or toll the time for issuing an order. *Id.* § 292.207(b)(3)(i). If FERC fails to act in such a manner, the application is deemed to have been granted. See *id.*

CONCLUSION

Recognition as a Qualifying Facility under PURPA provides distinct advantages to potential operators of nuclear microreactors, including requirements that electric utilities purchase such generated power at favorable rates and provide access to backup power from the grid at fair prices. To be considered a Qualifying Facility under PURPA, a microreactor likely would have to be operated as a “cogeneration facility.” Under FERC regulations: (1) microreactors under 5 MW that are used for both electric and thermal energy generation will qualify as “cogeneration facilities” under PURPA so long as the useful thermal output is at least 5% of the total energy output for topping-cycle facilities; and (2) microreactors greater than 5 MW that are used for both electric and thermal energy generation will qualify as “cogeneration facilities” under PURPA if the thermal output is “used in a productive and beneficial manner” with at least 50% of the aggregate energy output being used for “industrial, commercial or institutional purposes.” Accordingly, potential operators of microreactors may be wise to design and locate microreactors in areas suitable for potential cogeneration use.