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November 23, 2020

Mr. John Segala  
Chief, Advanced Reactor Policy, Division of Advanced Reactors and Non-power Production and Utilization  
Facilities, Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

**Subject:** NEI Input on NRC Annual Fee Assessment for Non-Light Water Reactors

**Project Number: 689**

Dear Mr. Segala:

The purpose of this letter is to provide the U.S. Nuclear Regulatory Commission (NRC) with Nuclear Energy Institute's (NEI)<sup>1</sup> input on NRC annual fee assessment for non-light water reactors (non-LWRs), including micro-reactors. The NRC is currently reviewing a license application for a non-LWR, with other applications expected to follow; however, the NRC's annual fee rule in 10 CFR Part 171 is focused on LWRs. Therefore, 10 CFR Part 171 must be amended to address annual fees for non-LWR technologies. The attached paper proposes an approach to fairly and equitably incorporate future non-light water reactors, including micro-reactors, in the assessment of 10 CFR Part 171 annual fees. Specifically, we recommend that the NRC: 1) make the variable fee structure technology-inclusive (i.e., address both LWR and non-LWR technologies) and 2) create more equitable fees for micro-reactors that, based on their unique design and operational characteristics, avoid disproportionate impacts relative to larger power reactors and bundled small modular reactor (SMR) units.

Like light-water SMRs, non-LWRs are being designed with more inherent safety features, and are expected to have lower regulatory oversight costs. Many non-LWR designs are also SMRs, and thus logically should be charged the same fees as their light-water counterparts. Similarly, non-LWR sites may also host multiple reactors and thus utilize the bundled unit mechanism. As such, the current variable SMR fee structure should be amended to be technology-inclusive, covering all power reactors, including non-LWRs.

Micro-reactors are very small reactors with thermal power ratings less than 100 MWt. Under the NRC's current Part 171 variable annual fee structure for SMRs, even the minimum fee, which is assessed to

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<sup>1</sup> The Nuclear Energy Institute (NEI) is the organization responsible for establishing unified industry policy on matters affecting the nuclear energy industry, including the regulatory aspects of generic operational and technical issues. NEI's members include all entities licensed to operate commercial nuclear power plants in the United States, nuclear plant designers, major architect/engineering firms, fuel cycle facilities, nuclear materials licensees, and other organizations and entities involved in the nuclear energy industry.

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reactors with licensed thermal power ratings of 250 MWt and below, would disproportionately impact micro-reactors. Furthermore, due to their relative simplicity, smaller radionuclide inventory, and reliance on inherent and passive safety features, micro-reactors are expected to incur significantly lower regulatory oversight costs. The paper provides three options for establishing more appropriate fees for micro-reactors.

As was the case with the 2016 rulemaking, our recommendations align with the imperative that any such modification to the existing annual fee structure achieve the following goals:

- Ensure protection of public health and safety by reimbursing the NRC adequately for the costs of regulatory oversight;
- Use a fee structure that shares regulatory oversight costs equitably among large and smaller-scale generation facilities, as well as among light water and non-light water technologies; and
- Ensure that the existing fleet of operating power reactors does not bear the regulatory development costs associated with deploying advanced reactor technologies.

NEI looks forward to discussing these recommendations with the NRC, along with any further considerations that the NRC staff identifies, as NRC plans for annual fee assessment for non-LWRs. If there are any questions on this matter, please contact me.

Sincerely,

A handwritten signature in black ink that reads "Katherine R. Austgen". The signature is written in a cursive, slightly slanted style.

Katherine R. Austgen

Attachment

c: Amy Cabbage, NRR/DANU/UARP  
Jo Jacobs, OCFO/DOB/LFPT  
NRC Document Control Desk



# NRC ANNUAL FEE ASSESSMENT FOR NON-LIGHT WATER REACTORS

Prepared by the Nuclear Energy Institute  
November 2020

## Acknowledgements

This document was developed by the Nuclear Energy Institute. NEI acknowledges and appreciates the contributions of NEI members and other organizations in providing input, reviewing and commenting on the document including

- Leanne Galanek, NEI intern
- Marty O’Neill, NEI
- Marc Nichol, NEI
- The NEI Advanced Reactor Regulatory Task Force

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## 1 INTRODUCTION

The U.S. Nuclear Regulatory Commission's (NRC's) current power reactor annual fees in 10 Code of Federal Regulations (CFR) Part 171 are focused on light-water reactor (LWR) technology, and do not consider the non-LWR technologies that are currently under development. NEI has developed this position paper to inform the NRC's efforts to revise Part 171 to encompass these new technologies. As was the case with the 2016 rulemaking, it is imperative that any such modification to the existing annual fee structure achieve the following goals:

- Ensure protection of public health and safety by reimbursing the NRC adequately for the costs of regulatory oversight;
- Use a fee structure that shares regulatory oversight costs equitably among large and smaller-scale generation facilities, as well as among light water and non-light water technologies; and
- Ensure that the existing fleet of operating power reactors does not bear the regulatory development costs associated with deploying advanced reactor technologies.

These goals inform our recommendation that the NRC amend its Part 171 annual fee regulations to incorporate non-light water technologies for reactors licensed after NRC's Fiscal Year (FY) 2020.

The Nuclear Energy Innovation and Modernization Act (NEIMA) of 2019 requires the NRC to collect 100 percent of its annual budget authority (less certain excluded items), to the maximum extent practicable, beginning in FY 2021. Additionally, in accordance with Section 102(b)(3)(B)(i) of NEIMA, the operating power reactors fee class annual fee, to the maximum extent practicable, shall not exceed the operating power reactor annual fee amount established in the FY 2015 final fee rule, adjusted for inflation. In accordance with NEIMA and other statutory authorities discussed below, the NRC establishes applicable fees in 10 CFR Parts 170 and 171.

Part 171 fees are annual fees that encompass all allocations that are not collected under Part 170, and are assessed only to NRC licensees. (Part 170 fees cover the hourly work done by the NRC, as billed quarterly to licensees and other parties requesting specific services from the NRC staff.) The total sum of Part 171 fees is divided among NRC-identified fee classes and assessed separately within each fee class. For the power reactor fee class, each licensed and operating nuclear power reactor is required to pay an annual fee based on its thermal power rating. The NRC's current annual fee regulations make no mention of advanced reactors, non-LWRs, or micro-reactors.

However, within the power reactor fee class, the NRC's definition of small modular reactor (SMR) expressly applies only to light-water reactors. Further, the use of the SMR definition in implementing a variable annual fee structure does not account for micro-reactors. Thus, the NRC's current Part 171 annual fee regulations do not clearly provide an equitable variable fee structure for non-LWRs. As a result, developers and designers of such reactor technologies do not have an accurate idea of expected annual fee costs. In the absence of clarification, one might believe that they would fall under the general power reactor annual fee class with no consideration of the disproportionate impact of those fees. This regulatory gap creates uncertainty for new reactor technology developers and prospective license applicants who are currently making investment decisions relative to non-LWR designs. This lack of certainty could delay or even deter the deployment of advanced reactor technologies, including micro-

reactors. This is contrary to one of the policies underlying the NRC's adoption of the variable annual fee structure rule for SMRs in 2016.<sup>1</sup>

Through the analysis performed to develop this paper, we believe that the 2016 variable annual fee structure can be extended to include non-LWRs to be optimally effective and comprehensive in scope. Like light-water SMRs, non-LWRs are being designed with more inherent safety features, and are expected to have lower regulatory oversight costs. Many non-LWR designs are also SMRs, and thus logically should be charged the same fees as their light-water counterparts. Similarly, non-LWR sites may also host multiple reactors and thus utilize the bundled unit mechanism. As such, the current variable SMR fee structure should be amended to be technology-inclusive, covering all power reactors, including non-LWRs. Accordingly, NEI's Advanced Reactor Regulatory Task Force recommends that the NRC incorporate non-LWRs into the current power reactor variable SMR fee structure, for reactors licensed after NRC's FY 2020.

New reactor technologies under development also include micro-reactors, which are very small reactors with thermal power ratings less than 100 MWt. Under the NRC's current Part 171 variable annual fee structure for SMRs, even the minimum fee, which is assessed to reactors with licensed thermal power ratings of 250 MWt and below, would disproportionately impact micro-reactors. Due to their relative simplicity, smaller radionuclide inventory, and reliance on inherent and passive safety features, micro-reactors are expected to incur significantly lower regulatory oversight costs. Additionally, due to their smaller power output, micro-reactors expect lower annual generating costs. Although micro-reactor licensees could seek annual fee exemptions, such an approach would not be efficient or sustainable. Accordingly, the NRC's fee rule should reflect these important considerations by establishing annual fees for micro-reactors that avoid disproportionate impacts, as compared to large and small modular power reactors.

There is directly relevant NRC precedent for such an approach. Specifically, in 2016, the NRC amended Part 171 to include a new variable annual fee structure for SMRs, after determining that "the current annual fee structure may not be fair and equitable for assessing fees to SMRs based on the unique size and characteristics of SMRs."<sup>2</sup> Before this change, each licensed, operating power reactor was required to pay the same annual fee, regardless of its thermal power rating. The 2016 rulemaking allowed SMRs to be charged equitable fees relative to the current fleet of large LWRs. This rulemaking also introduced the "bundled unit" concept, which allows multiple SMRs on the same site to be bundled together for purposes of calculating a cumulative thermal power rating. Further, the NRC treats each bundled unit as a single fee unit based on the sum of the component SMR thermal power ratings, instead of assessing a separate fee for each individual SMR on a given site. The NRC concluded that "the variable annual fee structure allows SMRs to pay an annual fee that is *commensurate with the economic benefit received from its license and that appropriately accounts for the design characteristics and current expectations regarding regulatory costs.*"<sup>3</sup>

We believe our recommendations to address non-LWRs in Part 171 annual fees for power reactors minimizes the changes to the current annual fee structure. The changes proposed would be to 1) make the variable fee structure technology-inclusive (i.e., address both LWR and non-LWR technologies) and

<sup>1</sup> See 81 Fed. Reg. at 32,625 ("[A]s discussed in SECY-15-0044, the staff's recommended alternative for establishing an SMR variable annual fee rule supports the agency's goals of transparency and providing regulatory certainty to potential SMR applicants.").

<sup>2</sup> 81 Fed. Reg. 32,617, 32,619, *Variable Annual Fee Structure for Small Modular Reactors* (May 24, 2016).

<sup>3</sup> 81 Fed. Reg. at 32,620 (emphasis added).



2) create more equitable fees for micro-reactors that, based on their unique design and operational characteristics, avoid disproportionate impacts relative to larger power reactors and bundled SMR units. NEI's specific proposal for amending the NRC annual fee structure is discussed in Section 3 below.

## 2 BACKGROUND ON NRC ANNUAL FEES AND NON-LIGHT WATER REACTORS

### A. NRC Statutory Authorities to Assess Fees

The U.S. Nuclear Regulatory Commission's (NRC's) authority to charge service and annual fees is derived from two laws: the Independent Offices Appropriations Act of 1952 (IOAA) and the Omnibus Budget Reconciliation Act of 1990, as amended (OBRA-90). IOAA provides broad authority to federal agencies, including the NRC, to assess user fees or charges to identifiable beneficiaries through regulation. OBRA-90 requires that the NRC recover approximately 90 percent of its annual budget authority through fees assessed to licensees, excluding amounts appropriated for any one of certain specified purposes. The NRC must first use its authority under IOAA to collect service fees for specific services provided. However, because those fees do not equal 90 percent of NRC's budget authority, NRC also assesses annual fees. OBRA-90 provides that "[t]o the maximum extent practicable, the charges shall have a reasonable relationship to the cost of providing regulatory services and may be based on the allocation of the Commission's resources among licensees or classes of licensees."

Subsequently, the Nuclear Energy Innovation and Modernization Act of 2019 (NEIMA), which took effect on October 1, 2020, updated the requirement for NRC to collect 100% of its annual appropriated budget (less non-recoverable items) through annual fees.

NEIMA specifies how annual fees should be assessed to licensed and operating reactors. Section 2(2) of NEIMA states that the Act seeks to provide "a revised fee recovery to ensure the availability of resources to meet industry needs without burdening existing licensees unfairly for inaccurate workload projections or premature existing reactor closures." This language indicates that the NRC is expected to recover all of its annual allocations via annual fees, while accurately estimating the upcoming year's workload for each fee class. As discussed below, the NRC provides its workload estimates (i.e., resource needs) in the yearly Congressional Budget Justification submitted to Congress. After the Congressional allocations are made, the NRC details how it allocates the budgeted resources for each class of licensees and calculates the fees in that fiscal year's work papers. As reflected therein, those fees are calculated by business lines, product lines, and products based on the budget authority enacted for the current fiscal year.

NEIMA further specifies the protocol the NRC must follow when considering how to divide the annual fees amongst fee classes and within those individual fee classes. Specifically, Section 102(b)(3)(C) of NEIMA provides as follows

*(C) AMOUNT PER LICENSEE.—*

*(i) IN GENERAL.—The Commission shall establish by rule a schedule of annual charges fairly and equitably allocating the aggregate amount of charges described in subparagraph (A) among licensees and certificate holders.*

*(ii) REQUIREMENT.—The schedule of annual charges under clause (i)—*

*(I) to the maximum extent practicable, shall be reasonably related to the cost of providing regulatory services; and*

*(II) may be based on the allocation of the resources of the Commission among licensees or certificate holders or classes of licensees or certificate holders.*

This section thus incorporates the OBRA-90 standard that fees be set “fairly and equitably” and be reasonably related to the cost of regulatory oversight for the fee class.

## **B. NRC Annual Budgeting Process**

The NRC is allocated a budget each year by Congress, to be used to regulate the civilian use of nuclear technology. As a part of the allocation process, the NRC submits a Congressional Budget Justification. In that report, the NRC provides estimates of the costs of providing its regulatory services for the coming fiscal year and bases for those estimates (i.e. how the budget will be used). Once Congress approves the NRC’s allocations, the NRC then undertakes an internal budgeting process whereby it assigns budgets to each of the internal NRC fee classes, with specific line items for each class. These budgets are later converted to annual fees that are assessed to each of the NRC-determined fee classes. (This process is shown in the FY 2020 Final Fee Rule Work Papers.)<sup>4</sup>

NRC allocations fluctuate each fiscal year due to the expected amount of work required of the NRC in a given year. If certain major projects are ending (e.g., design certifications, license application reviews, etc.) or reactors come offline, then work decreases and there are fewer allocations. Conversely, the onset of new projects may increase agency workloads and related fee allocations. These yearly allocation fluctuations are partially what create year-to-year differences in annual fees for licensees.

Importantly, there are fee-exempt line items of the NRC’s budget that are not recovered via annual fees. These fee-exempt allocations are generally non-recoverable and include the Nuclear Waste Fund, homeland security, and advanced reactor regulatory support until 2031. Section 102(b)(B)(iii) of NEIMA describes these non-recovered advanced reactor<sup>5</sup> allocations as “costs for activities related to the development of regulatory infrastructure for advanced reactor technologies.” Additionally, NEIMA Section 103(a)(6) sets aside money for advanced reactor regulatory work. This part of the public law budgets \$14.42 million each year from 2020 to 2024 to support the future licensing of advanced reactors, including hiring experts, training NRC staff, increasing use of risk-informed, performance-based licensing evaluation techniques, and establishing an alternative technology-inclusive regulatory framework.

Beyond NEIMA, the 2020 Congressional Budget Justification also allocates a projected \$15.5 million for “Advanced Reactor Regulatory Readiness.”<sup>6</sup> This funding is intended to support continued development of a regulatory infrastructure for advanced nuclear reactor technologies as part of the NRC’s Nuclear Reactor Safety Program, which is implemented through the Operating Reactors and New Reactors Business Lines. The FY 2020 Final Fee Rule Work Papers indicate that this \$15.5 million allocation for “advanced reactor infrastructure” is excluded from fee recovery.

This non-recoverable, budgeted money for advanced reactor regulatory work is likely intended to ensure that annual fees for the current operating reactors remain fair and equitable by ensuring that they do not pay for the development and deployment of the advanced reactor fleet. This money should

<sup>4</sup> ML20142A363, *FY2020 Final Fee Rule Work Papers* (May 20, 2020).

<sup>5</sup> See Section 3 *Definitions*, Subsection 1 *Advanced Reactor* of the Nuclear Energy Innovation and Modernization Act, Public Law 115-439.

<sup>6</sup> NUREG-1100, Vol. 35, *Congressional Budget Justification Fiscal Year 2020* (March 31, 2019).

be utilized to help establish the various fee structures discussed herein, such that the NRC is ready to license and oversee the coming fleet of advanced reactors.

Having discussed both Congress's and the NRC's funding allocations for advanced reactor licensing and regulatory work, we identify the specific reductions in regulatory oversight costs that are expected for micro-reactors in Section 3 below.

### C. NRC Annual Fee Regulatory Structure

The NRC sets its service fees and annual fees through the federal rulemaking process every year. The NRC recovers its annual allocations through the assessment of two types of fees. The first type of fee, set out in 10 Code of Federal Regulations (CFR) Part 170, serves to recover the NRC's costs of providing specific services to discrete applicants and licensees. To assess these fees, the NRC determines a yearly hourly rate that is billed to clients quarterly. This hourly rate is determined by adding the budgeted resources for mission-direct salaries and benefits, mission-indirect program support, and agency support; then dividing these budgeted resources by the mission-direct full-time equivalent converted to hours. Part 170 fees cover the costs of inspections (e.g., resident inspectors and specific site inspections (including performance reviews and assessments, evaluations, incident investigations), licensing (e.g., review of applications for new licenses, license amendment requests and renewals, pre-application interactions, NRC project managers assigned to facilities), special projects and Part 55 review fees (e.g., operator training).

The other type of fee, set out in 10 CFR Part 171, is an annual fee paid by all licensees, and serves to recoup generic regulatory expenses (e.g., oversight and research) and other costs not recovered through fees for specific services. (NEI's recommendations herein relate solely to Part 171 annual fees.) The NRC first promulgated its Part 171 regulations in 1986.<sup>7</sup> Notably, in a 1991 fee schedule rulemaking, the NRC stated that "[t]he annual charge should be assessed under the principle that licensees who require the greatest expenditures of the agency's resources should pay the greatest annual charges."<sup>8</sup> It also noted that "[a]fter examining and analyzing the historical data available, the Commission has determined that the bulk of its licensee-related activities have and will continue to be directly related to the regulation of *large power reactors*."<sup>9</sup> Thus, at the time, the existing commercial nuclear power facilities were large light-water reactors (LWRs)—no commercial small modular reactor (SMR) or advanced reactor technologies of the type discussed herein were subject to NRC licensing reviews.

When annual fees would cause undue economic burden to a specific licensee, Section 171.11(c) authorizes licensees to seek exemptions from NRC annual fees. As set forth in Section 171.11(d), the NRC may grant such exemptions based upon its consideration of each of the following factors: (1) reactor age; (2) number of customers in rate base; (3) net increase in kWh cost for each customer directly related to the annual fee assessed under Part 171; and (4) any other relevant matter which the licensee believes justifies the reduction of the annual fee. The NRC, however, grants such exemptions only sparingly based on case-specific circumstances.<sup>10</sup>

<sup>7</sup> See *Annual Fee for Power Reactor Operating Licenses and Conforming Amendment; Final Rule*, 51 Fed. Reg. 33,224 (Sept. 18, 1986) (noting the "Congressional directive that all fees be reasonably related to the cost of providing services" to licensees).

<sup>8</sup> 56 Fed. Reg. 14,870, 14,871, *Revision of Fee Schedules* (Apr. 12, 1991). See also 136 Cong. Rec. H 10107 (Oct. 16, 1990).

<sup>9</sup> 51 Fed. Reg. at 24,078, 24,084, *Annual Fee for Power Reactor Operating Licenses or Applications and Major Materials Licenses and Conforming Amendment; Proposed Rule* (July 1, 1986) (emphasis added).

<sup>10</sup> See 51 Fed. Reg. at 33,228 ("The Commission may grant such relief, if it is persuaded by the licensee that factors such as age and size of the plant and size and impact on its customer rate base substantially reduce the NRC's regulatory costs for that plant and the benefits bestowed on that licensee below that of the other power reactors. Nevertheless, the agency's intent is to grant exemptions sparingly.").

By way of example, the NRC granted partial exemptions from the Part 171 annual fee requirements to Big Rock Point, La Crosse, and Yankee Rowe in the late-1980s and early-1990s. As the Staff explained in SECY-87-66:<sup>11</sup>

*For these plants, the staff notes that the annual fee, on top of other fees already required by Part 170, provides a significant increase in power production costs. Because of the smaller generating capacity, the impact on individual customers is greater than for the same fee applied to large plants, and the ability to absorb such costs by the utility is similarly limited. The staff concludes that these three plants meet the criteria of Section 171.11; that imposition of the full annual fee would be a disproportionate burden for these plants; and, therefore, that a reduction should be granted for Big Rock Point, La Crosse and for Yankee.*

As discussed below, while the industry does not advocate the use of the exemption process to address issues that affect an entire class of licensees, the considerations reflected in 10 CFR 171.11(d) and prior NRC exemption approvals are relevant to the fee-related challenges faced by micro-reactors and our recommendations for addressing those challenges.

#### **D. The NRC's Variable Annual Fee Structure for Small Modular Reactors**

The technological and regulatory landscapes have changed in recent years, as reflected in the NRC's current annual fee regulations, which now include light-water SMRs. The NRC's current annual fee requirements are found in 10 CFR 171.15, which identifies those reactor (Part 50 and Part 52) and independent spent fuel storage (Part 72) licensees required to pay Part 171 annual fees. Section 171.15(a) states:

*(a) Each person holding an operating license for a power, test, or research reactor; each person holding a combined license under part 52 of this chapter after the Commission has made the finding under § 52.103(g); each person holding a part 50 or part 52 power reactor license that is in decommissioning or possession only status, except those that have no spent fuel onsite; and each person holding a part 72 license who does not hold a part 50 or part 52 license shall pay the annual fee for each license held at any time during the Federal fiscal year in which the fee is due. This paragraph does not apply to test and research reactors exempted under § 171.11(a).*

Section 171.15(e)(1) codifies the NRC variable annual fee structure for SMRs<sup>12</sup>:

*(e)(1) Each person holding an operating license for an SMR issued under 10 CFR part 50 or a combined license issued under 10 CFR part 52 after the Commission has made the finding under 10 CFR 52.103(g), shall pay the annual fee for all licenses held for an SMR site. The annual fee will be determined using the cumulative licensed thermal power rating of all SMR units and the bundled unit concept, during the fiscal year in which the fee is due. For a given site, the use of the bundled unit concept is independent of the number of SMR plants, the number of SMR licenses issued, or the sequencing of the SMR licenses that have been issued.*

<sup>11</sup> SECY-87-66 at 2, ML022830195, *Partial Exemptions from 10 CFR Part 171, Annual Fee for Power Reactor Operating Licenses* (Mar. 11, 1987).

<sup>12</sup> 81 Fed. Reg. 32,617, *Variable Annual Fee Structure for Small Modular Reactors* (May 24, 2016).

In the final rulemaking that established the variable SMR fee structure (see 10 CFR 171.15(e)(1) above), the NRC did not include non-LWRs, evidently due to the lack of non-LWR designs ready for near-term licensing during the rule's development. In fact, Part 171's definition of "small modular reactor" refers only to "light-water" SMRs:

*Small modular reactor (SMR) for the purposes of calculating fees, means the class of light-water power reactors having a licensed thermal power rating less than or equal to 1,000 MWt per module. This rating is based on the thermal power equivalent of a light-water SMR with an electrical power generating capacity of 300 MWe or less per module.*

The NRC noted that it "may consider the inclusion of non-light water SMRs in a future rulemaking once the agency has increased understanding of these factors [i.e., physical configuration, operational characteristics, and applicability to the NRC's existing regulatory framework] with respect to non-light water designs."<sup>13</sup>

Nevertheless, the variable annual fee structure for SMRs created by the NRC's 2016 rulemaking is both relevant and instructive here. In that rulemaking, the NRC established a minimum fee, variable fee, and maximum fee. Small reactors or bundled units with thermal power ratings of 250 MWt and below are assessed an annual fee equal to the minimum fee. The minimum fee is determined by calculating the average of the research and test reactor (RTR) fee class and the spent fuel storage/decommissioning fee class fees for a given fiscal year. From the FY2020 final fee rule, the minimum fee calculated for SMRs would be the average of \$81,300 (RTR fee) and \$188,000 (spent fuel storage/decommissioning), which is equal to \$134,650.

For SMRs or bundled units with thermal power ratings between 250 MWt and 2,000 MWt, a variable fee is assessed. The variable fee is determined by finding a per MWt charge in the range between the minimum fee and the maximum fee, then adding this to the base minimum fee. For example, in FY2020, the variable rate would be \$2,564 per MWt. Thus, a 750 MWt reactor would be assessed a fee of \$1,416,650.

$$SMR \text{ Annual Fee} = \text{Minimum Fee} + (\text{SMR MWt} - 250 \text{ MWt}) * \text{Variable Rate} (\$/\text{MWt})$$

$$\$1,416,650 = \$134,650 + (750 - 250) * \$2,564$$

$$\$1,416,650 = \$134,650 + \$1,282,000$$

For large bundled units, with thermal power ratings between 2,000 MWt and 4,500 MWt, a maximum fee is assessed. This maximum fee is equal to the fee assessed to the current fleet of large LWRs for a given fiscal year. For FY 2020, this fee was \$4,621,000.

Bundled units cannot exceed 4,500 MWt. If a site has multiple SMRs whose cumulative thermal power rating is greater than 4,500 MWt, then the site is split into multiple bundled units. After the first bundled unit reaches the maximum thermal limit of 4,500 MWt and is assessed the maximum fee, each

<sup>13</sup> 81 Fed. Reg. at 32,625.

successive bundled unit is assessed a new fee with a similar variable structure. Notably, the variable rate for the second and each successive bundled unit is different than that for the first unit due to the lack of a minimum fee for each additional bundled unit.

The variable SMR fee rule encompasses both the base annual fee and additional spent fuel storage/decommissioning fee paid by licensees in the power reactor fee class. As with the current fleet, power reactor annual fees traditionally are the sum of the annual fee from the power reactor fee class and the annual fee from the spent fuel/decommissioning fee class. The variable SMR fee rule allows SMRs to pay just one fee that covers the cost of regulatory services for operation, decommissioning, and spent fuel storage.

### 3 RECOMMENDED REGULATORY FRAMEWORK FOR NON-LWR/MICRO-REACTOR ANNUAL FEES

On June 15, 2020, the NRC accepted the first non-LWR combined license application from Oklo Power LLC for docketing and detailed technical review.<sup>14</sup> As of late-October 2020, the NRC was engaged in preapplication activities with six other non-LWR designers. These developments, along with recent legislative actions like NEIMA, reflect concrete commercial and congressional interest in advanced reactor technologies. However, lack of an NRC rule to establish annual fees for non-LWRs creates uncertainty to near term business decisions needed for the deployment of those technologies.

To provide the needed clarity, NEI recommends that the NRC establish via rulemaking a fee structure that is technology-inclusive and readily adaptable to future advanced reactor designs. Like the 2016 variable annual fee structure for SMRs, the new annual fee structure for non-LWRs should adequately reimburse the NRC for oversight costs, facilitate (not hinder) the development and deployment of advanced reactors, and ensure that the current LWR fleet does not bear the costs associated with developing an advanced reactor regulatory infrastructure. As outlined below, our proposal includes two parts: (1) include non-LWRs in the SMR definition under the current power reactor fee structure and (2) create more equitable fees for micro-reactors that, based on their unique design and operational characteristics, avoid disproportionate impacts relative to larger power reactors and bundled SMR units.

#### A. Including Non-LWR Technologies Under Current Fee Rule

As noted above, the current variable SMR annual fee structure is limited to LWRs. However, given that SMRs are described by their size and will use modularization to expedite the construction process, there is no apparent reason to limit the SMR fee structure to light-water technologies. As such, non-LWRs in the same thermal power range as the current fee rule (250 MWt and above) should be included under that rule. Like the light-water SMRs discussed in the 2016 rulemaking, non-light water SMRs “are expected to be considerably smaller in size and may utilize designs that could reduce the NRC’s regulatory costs per reactor.”<sup>15</sup> Non-light water SMRs, like their light-water counterparts, will have smaller and simpler designs than the large LWRs, fewer structures, systems, and components (SSCs), smaller radionuclide inventories, and reduced staffing needs.

#### Alternatives

<sup>14</sup> ML20169A270, *Press Release-20-033: NRC Accepts License Application for Oklo Advanced Reactor* (June 15, 2020).

<sup>15</sup> 81 Fed. at 32,618

NEI considered other options for assessing annual fees to non-LWRs. One option is creating a separate fee class for non-LWRs, in which annual fees are determined by risk. This approach would consider indicators of overall risk for each plant, such as Core Damage Frequency (CDF), to create a tiered fee system. This resembles an option considered during the 2016 variable SMR annual fee rulemaking process, and is based on the premise that nuclear plants with reduced risk of core damage represent a lesser risk and a commensurate reduction in generic costs associated with NRC oversight. However, in our view, this approach would introduce an unnecessary new level of complexity in the annual fee structure. Additionally, it introduces the question of PRA uncertainty that may precipitate significant analysis efforts, NRC review, and costs related to reducing such uncertainties. This approach also does not recognize that the entire commercial fleet currently meets the NRC's safety goal for CDF, and that the past 40 years of fleet operation have demonstrated nuclear plant safety. Classifying new, non-LWRs by risk may also wrongly cast a negative light on the current fleet in the public's view, despite the fleet's continued, proven safety. We therefore do not recommend that the NRC pursue this option.

## **B. Suggestions for Rulemaking on Micro-Reactor Annual Fees**

While NEI believes that the current fee rule can be extended to cover non-LWR technologies for SMRs up to large reactors, we do not believe that the current structure of this fee rule equitably covers micro-reactors. Micro-reactors are in a thermal power range that is at least 30-40 times smaller than the current fleet of large reactors, and at least 2.5 times smaller than the current minimum thermal power rating for the variable SMR annual fee structure. As such, even the current *minimum* fee would cause undue disproportionate economic burden for a micro-reactor's ability to provide resilient, carbon-free power.

### **Considerations Specific to Micro-Reactors**

As their name denotes, micro-reactors are very small nuclear reactors that, as defined herein, have a thermal power rating of 100 MWt or less. Notably, the largest of these micro-reactors are 2.5 times smaller than the lower bound (i.e., bundled unit thermal power rating of 250 MWt) of the current annual fee rule that is tailored to SMRs. Micro-reactors are expected to have different end uses than SMRs. For example, they may be used more often as standalone (as opposed to large grid-connected) units to provide clean, reliable, and resilient electricity and/or district heating. Indeed, the major market targets for micro-reactors are off-grid or micro-grid systems in remote and island communities, mining operations, and defense installations.<sup>16</sup> SMRs, in contrast, are more likely to be used in tandem at a single site, as bundled units, to provide larger-scale flexibility for a variety of end uses in a variety of markets.

NEI believes that the current annual fee structure would substantially impair micro-reactors' ability to provide affordable electricity to customers. Micro-reactor designers have cited specific expected net increases in kWh cost for end users due to unreasonably high annual fees. Within the current power reactor fee class, each reactor's annual costs for regulatory services in recent years has averaged approximately 1.7% of their total annual generating costs. Based on the FY 2020 final fee rule, this fee class pays approximately 70% of their annual regulatory costs in Part 171 annual fees.<sup>17</sup> Due to their much smaller power output, micro-reactors are expected to have a proportionate reduction in annual

<sup>16</sup> NEI Report, *Cost Competitiveness of Micro-Reactors for Remote Markets* (April 15, 2019).

<sup>17</sup> 85 Fed. Reg. 37,250, *Revision of Fee Schedules; Fee Recovery for Fiscal Year 2020* (June 19, 2020).

generating costs. However, the current minimum annual fee would have a disproportionate impact on micro-reactors' annual generating costs as compared to the current LWR fleet.

Although micro-reactor licensees could seek annual fee exemptions, such an approach would not be efficient or sustainable. The need to prepare and review frequent exemption requests would unduly burden licensees and the NRC staff, respectively. Moreover, fee exemptions are intended "only for unanticipated or rare situations."<sup>18</sup> The NRC noted similar concerns when it amended Part 171 in 2016 to establish a variable annual fee structure for light-water SMRs:

*Small modular reactor licensees could apply for annual fee exemptions under 10 CFR 171.11(c). The fee exemption criteria consider the age of the reactor, number of customers in the licensee's rate base, how much the annual fee would add to the per kilowatt-hour (kWh) cost of electricity, and other relevant issues. But, as described in SECY-15-0044, there are no guarantees that an exemption request would be approved, decreasing regulatory certainty. The OBRA-90 statute also requires the NRC to establish, by rule, a schedule of charges fairly and equitably allocating annual fees among its licensees. Therefore, if the NRC anticipates up-front that its annual fee schedule will not be fair and equitable as applied to a particular class of licensees, then amending the fee schedule, rather than planning to rely on the exemption process, is the far better course for complying with OBRA-90.*

In short, the need to seek and obtain yearly fee exemptions is not a viable option since it would create unacceptable regulatory and commercial uncertainties for reactor owners and developers.

### **Micro-Reactors are Expected to Have Significantly Lower Regulatory Costs of Service**

Micro-reactors are smaller and simpler than the current fleet of large reactors as well as light-water SMRs and other non-LWRs, with substantially fewer SSCs. This simplicity in design and smaller radionuclide inventory, combined with the expected reliance on inherent and passive safety features to mitigate risk and accidents, are the primary reasons for expected reductions in cost of regulatory oversight. These reductions can be seen most directly as reductions in costs for Part 170 fees, as detailed in the 2019 NEI White Paper *Micro-Reactor Regulatory Issues*.<sup>19</sup> As described in that paper, such reductions in Part 170 regulatory costs are expected for inspections, resident inspectors and NRC project managers assigned to plants, senior reactor operators and reactor operators, control rooms and licensing costs; among other areas.

Regarding the remaining regulatory costs covered under Part 171 annual fees, applying the current minimum fee to micro-reactors would cause a disproportionate impact; i.e., that fee would constitute a much larger percentage of annual operating costs for micro-reactors in comparison to current operating reactors, light-water SMRs and other non-LWRs. These are the primary reasons why the current fee rule cannot fairly and equitably apply to micro-reactors. The minimum fee that would be fair and equitable for micro-reactors must be lower than the current minimum fee, such that simply extending the current fee rule is not a viable option.

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<sup>18</sup> 81 Fed. Reg. at 32,618.

<sup>19</sup> NEI White Paper, *Micro-Reactor Regulatory Issues* (November 13, 2019).



Assessing lower annual fees for micro-reactors is justified not just to avoid disproportionate impacts, but also because the general regulatory work required by the NRC to safely regulate micro-reactors is likely to be much less than that for the current operating fleet of large reactors as well as light-water SMRs and other non-LWRs. Due to the significant reduction in radionuclide inventory at the plant site and the subsequent reduction in severity of worst-case accident scenarios, micro-reactors are expected to pose an extremely low risk to public health and safety. Indeed, some accidents currently recognized and mitigated by large reactors will not be applicable to micro-reactors.

Additionally, micro-reactors are expected to seek alternative approaches to various physical and environmental requirements. For example, in terms of emergency preparedness, because micro-reactors will have much smaller radionuclide inventories, the emergency planning zone (EPZ) can be much smaller. No offsite radiological emergency planning may be required due to the extremely small dose at the EPZ boundaries.

With regard to physical security, micro-reactors will again likely seek alternative regulatory approaches. With such a small reactor, there is an expected reduction in on-site armed responders. The fuel used for micro-reactors also is expected to be difficult to handle or disperse in the case of a postulated radiological or sabotage event. Advanced fuels are not readily separable and, from a safety standpoint, are self-protecting during operations. The fuels for a micro-reactor are also expected to be difficult to access quickly in reactor designs; thus, it could be possible to mitigate a potential physical security breach via off-site response. Furthermore, aircraft impacts are expected to be extremely unlikely due to the unattractiveness and smaller footprint of such small targets. All of these considerations, and more alternative and simplified oversight programs, should result in lower NRC regulatory costs for micro-reactors.

More specifically, in looking at the FY 2020 fee rule work papers, one can see specific line items for which we expect reductions in regulatory oversight costs for micro-reactors. These include: Operator Licensing, Security, Emergency Preparedness, Nuclear Safety Professional Development Program (NSPDP) Training, License Renewal, Fukushima Near-Term Task Force (NTTF)/Japan Lessons Learned, Inspection, Risk Analysis, Systems Analysis Research, Vendor Inspection, Construction Inspection, and Mission Training. These reductions can be justified based on one or more of the following features of micro-reactors: simplicity, reduced staff, alternative approaches/lack of accident types, modularization, reduced radionuclide inventory, reliance on automatic control/inherent and passive safety, and newness of technology/lack of license renewals.

As such, a lower annual fee can be justified for micro-reactors in order to avoid disproportionate impacts to this class of reactors and due to the expected reduction in regulatory oversight costs relative to the current fleet of large reactors as well as light-water SMRs and other non-LWRs.

### **NRC's Current Fee Structure Would Disproportionately Impact Micro-Reactors**

To understand the disproportionate impact of the current fee rule on micro-reactors, NEI evaluated the current fee rule's impacts on expected SMR annual generating costs. The table below summarizes this evaluation. To estimate the annual plant generating cost for each SMR, a generating cost of \$30/MWh and a capacity factor of 95% were assumed (this generating cost excludes overnight capital costs).<sup>20</sup> The annual plant generating cost is the product of the generating cost (\$30/MWh) and the number of MWh

<sup>20</sup> SMR Start, *The Economics of Small Modular Reactors* (September 14, 2017).

the plant generates annually. Part of this calculation includes converting MWt to MWe by dividing by 3, which is based on the efficiency of converting thermal power to electricity. Additionally, the annual fees come from the FY 2020 annual fee rule.

$$\text{Annual Generating Cost} = \text{Generating cost (\$/MWh)} * \text{Annual Generated MWh}$$

$$\text{Annual Generated MWh} = \text{Capacity Factor} * \text{Number of Hours in Year} * \text{MWe}$$

$$\text{MWe} = \text{MWt}/3$$

**Table 1: Fee Rule Impacts Given Estimated SMR Generating Costs**

<b>Thermal Power Rating (MWt)</b>	250	2,000	4,500
<b>Annual Fee</b>	\$134,650	\$4,621,000	\$4,621,000
<b>Annual Plant Generating Cost</b>	\$20,805,000	\$166,440,000	\$374,490,000
<b>Annual Fee as Percent of Annual Plant Generating Cost</b>	<b>0.65%</b>	<b>2.78%</b>	<b>1.23%</b>

From this table, it is apparent that the cost for regulatory services should not be a burden relative to the annual generating cost for SMR licensees. However, when doing a similar calculation for micro-reactors under the current fee rule, the disproportionate impact becomes apparent. This is shown in the table below. Note that the generation cost for micro-reactors is expected to be higher than that for SMRs, about \$40/MWh.<sup>21</sup>

**Table 2: Fee Rule Impacts Given Estimated Micro-Reactor Generating Costs**

<b>Thermal Power Rating (MWt)</b>	5	10	25	50	75	100
<b>Annual Fee</b>	\$134,650	\$134,650	\$134,650	\$134,650	\$134,650	\$134,650
<b>Annual Plant Generating Cost</b>	\$554,800	\$1.1096M	\$2.774M	\$5.548M	\$8.322M	\$11.096M
<b>Annual Fee as Percent of Annual Plant Generating Cost</b>	<b>24.27%</b>	<b>12.14%</b>	<b>4.85%</b>	<b>2.43%</b>	<b>1.62%</b>	<b>1.21%</b>

<sup>21</sup> NEI Report, *Cost Competitiveness of Micro-Reactors for Remote Markets* (April 15, 2019).

For the current fleet of power reactors, the NRC annual fee represents approximately 1.7% of the annual plant generating costs. Thus, there is a case for ensuring that the fees for micro-reactors, and other advanced reactors, should not exceed 1.7% of estimated annual generating costs.

An annual fee that is 1.7% of the expected annual generating cost of the plant or the minimum fee, whichever is less, would be fair and equitable, as this is the approximate percentage of annual generating costs that Part 171 fees constitute for the current fleet. Thus, for micro-reactors (thermal power ratings 100 MWt and below), the annual fee structure would be a variable fee structure, where each plant would pay \$1,886 /MWt. This micro-reactor variable fee is derived by taking the estimated annual generating costs for a 100 MWt reactor and determining what 1.7% of this cost is. One then divides that proportionate annual fee by the thermal power rating (100 MWt) to determine the per MWt micro-reactor variable annual fee rate. While the related NRC costs of regulating micro-reactors could exceed these fees in these early days, the costs during this time period are also expected to be paid for by off-fee-based funding, according to the provisions in NEIMA. Therefore, it is appropriate to establish the fair and equitable fee of \$1,886 /MWt for micro-reactors, which would be \$47,150 for a micro-reactor plant with a bundled output of 25 MWt, since it is expected to reasonably relate to the associated NRC costs in the longer term.

**Table 3: Fee Structure to Avoid Disproportionate Impacts**

<b>Thermal Power Rating (MWt)</b>	5	10	25	50	75	100
<b>Annual Fee</b>	\$9,430	\$18,860	\$47,150	\$94,300	\$134,650	\$134,650
<b>Annual Plant Generating Cost</b>	\$554,800	\$1.1096M	\$2.774M	\$5.548M	\$8.322M	\$11.096M
<b>Annual Fee as Percent of Annual Plant Generating Cost</b>	<b>1.7%</b>	<b>1.7%</b>	<b>1.7%</b>	<b>1.7%</b>	<b>1.62%</b>	<b>1.21%</b>

It is important to note that the micro-reactor fees should not be based on individual reactors or licensees. It is appropriate to estimate the micro-reactor fee (e.g., 1.7%) based on generic industry reported costs, such as the NEI report of micro-reactor costs.<sup>22</sup> It is also not necessary to revise the generating cost estimate every year.

NEI recognizes that assessing an annual fee to a power reactor (even one as small as a micro-reactor) that is potentially lower than the annual fee for an RTR may be counterintuitive. RTRs also require little general oversight beyond that covered in specific services paid for under Part 170. In FY 2020, RTRs paid approximately 90 percent of their regulatory fees in Part 170 fees. As discussed above, due to their simplicity and very small radionuclide inventories, micro-reactors are expected to incur much lower general regulatory oversight costs than other power reactors. The lower fees for micro-reactors are further justified by the need to avoid disproportionate impacts, since these commercial power reactors will need to be able to provide power at reasonable costs to customers, and higher NRC fees would

<sup>22</sup> NEI Report, *Cost Competitiveness of Micro-Reactors for Remote Markets* (April 15, 2019).

make this impossible. In contrast, RTRs are owned and operated by university and research organizations that are usually government-funded and thus do not need to recover regulatory costs through revenues, or even make revenues for that matter. Conversely, micro-reactors will need to offset regulatory costs through revenues without placing undue burdens on customers. While NEI recognizes that the NRC is a regulatory, non-promotional agency, annual fees should not be unduly burdensome for any licensees or their end-consumers.

### **Three Options to Address the Disproportionate Impact on Micro-Reactors**

#### **Option 1 – Modify the Variable Fee Structure**

A putative solution to address the micro-reactor fee disproportionate impact is to amend the current variable fee structure. This could be achieved by modifying one or more of the current equation parameters – minimum fee, minimum power level, and variable fee rate. One approach is to extend the minimum fee down to the range of micro-reactor thermal power ratings using the current variable fee rate. The challenges here are two-fold: ensuring the new minimum fee does not go negative and ensuring that disproportionate impacts below 10 MWt are eliminated. As noted in Section 2.D above, the variable fee rate in the FY 2020 annual fee rule is about \$2,564 per MWt. To extend the minimum thermal power rating down from 250 MWt to 100 MWt, one would subtract the variable fee difference between 250 MWt and 100 MWt from the minimum fee. This is done by multiplying the variable fee (in dollars per MWt) by the thermal power rating difference of 150 MWt. This calculation yields \$384,600, which is greater than the minimum fee \$134,650 and results in a negative fee. Thus, this approach is not feasible.

Alternatively, the current fee structure could be amended to extend down to micro-reactor thermal power ratings by setting a new minimum fee at 100 MWt and resetting the variable fee rate between the new minimum and current maximum fee. There are two major problems with this approach. First, such an approach would fail to address disproportionate impacts, since a 10 MWt reactor would pay the same fee as a 100 MWt reactor. Second, this method would change the expected fee for any reactor in the variable fee region of the current rule (thermal power rating 250 MWt to 2,000 MWt) since it changes the variable fee rate. Impacts on SMRs currently in planning stages that have estimated their annual fees based on the current fee rule would therefore need to be considered.

#### **Option 2 - Fee Cap for Micro-Reactors**

A fee cap approach can be used with the current variable fee approach. In this manner, the fee cap is a secondary criterion established for reactors below a certain power level. Based on the earlier discussion, the disproportionate impact occurs at approximately 75 MWt. Thus, for reactors with a licensed thermal power rating of 75 MWt or below, a fee cap would apply. An appropriate fee cap for micro-reactors under 75 MWt (using the 1.7% of expected annual generation costs definition of disproportionate impacts) would be \$1,886/MWt. The fee cap reaches the minimum fee at 75 MWt. Thus, all micro-reactors with licensed thermal power ratings 75 MWt to 250 MWt would pay the current minimum fee.

In this approach, the SMR variable fee rule would include a requirement such as, “Plants with a total output of 75 MWt or less, shall not be assessed an annual fee greater than \$1,886/MWt in order to avoid the disproportionate impacts of NRC fees on reactors with very small power levels.” This approach has the advantages of maintaining the expected fee for any reactor in the variable fee region of the

current rule (thermal power rating 250 MWt to 2,000 MWt) and addressing the potential for disproportionate impact on micro-reactors at the lower licensed thermal power levels in Table 3 above.

### **Option 3 – Separate Fee Structure for Micro-Reactors**

Alternatively, establishing a separate fee structure for micro-reactors ensures that these reactors are assessed fees that are truly commensurate with their associated regulatory oversight costs, without the constraint of force-fitting them into the current variable SMR fee structure. This approach is particularly attractive in the case that regulatory costs for micro-reactors are less than 1.7% of their annual plant generating costs.

There are concerns that establishing a separate fee structure for micro-reactors may cause difficulties and unfairly high fees for the “first-adopters,” or the first licensed micro-reactors. However, this is likely to be mitigated, initially, by the money already budgeted to create regulatory infrastructure for advanced reactors, through NEIMA and the FY 2020 Congressional Budget Justification. Indeed, we believe it is appropriate for the work to develop advanced reactor regulatory infrastructure to be performed off-fee base. As part of that regulatory infrastructure development, it is reasonable to consider the establishment of a new fee structure as well as the collection of information on the actual cost of regulatory service during initial operation of the first licensed micro-reactors. This collected information can be used to amend this proposed micro-reactor fee structure in the future, as necessary.

As previously stated in Section 2.D, the current SMR variable fee structure encompasses both the base annual fee and the spent fuel/decommissioning fee. If the NRC were to pursue an option for a separate micro-reactor fee structure, NEI believes this structure should also stand in place of a base fee and spent fuel/decommissioning fee, to remain fair and equitable to micro-reactors.

## **4 NEED FOR PROMPT RULEMAKING**

NEI urges the NRC to move forward with a rulemaking under 10 CFR Part 171, proposing an amendment to the current fee rule to be technology-inclusive as well as addressing the disproportionate impact of the fee structure for micro-reactors. These approaches serve several important objectives: (1) they most effectively satisfy the need to ensure protection of public health and safety by reimbursing the NRC adequately for the cost of regulatory oversight; (2) they utilize a fee structure that shares regulatory oversight costs equitably among large and smaller-scale generation facilities of various technologies; and (3) they ensure that the current operating fleet does not bear the regulatory development costs associated with deploying new technologies.

Finally, NEI reiterates that activities aimed at licensing and deploying the next generation of nuclear power reactors in the U.S. are well underway, as evidenced by the NRC’s pending technical review of one docketed micro-reactor combined license application and its engagement with industry in pre-application activities for six other non-LWR designs/technologies. Therefore, we highly recommend that the NRC proceed with rulemaking expeditiously.