

POLICY ISSUE INFORMATION

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SECY-11-0079

FOR: The Commissioners

FROM: R. W. Borchardt
Executive Director for Operations

SUBJECT: LICENSE STRUCTURE FOR MULTI-MODULE FACILITIES RELATED
TO SMALL MODULAR NUCLEAR POWER REACTORS

PURPOSE:

The purpose of this paper is to inform the Commission of the staff's assessment for the license structure for multi-module facilities composed of small nuclear reactor modules or units. This paper does not address any new commitments or resource implications.

SUMMARY:

As discussed in SECY-10-0034, "Potential Policy, Licensing, and Key Technical Issues for Small Modular Nuclear Reactor Designs," dated March 28, 2010, several nuclear reactor designers have notified the U.S. Nuclear Regulatory Commission (NRC) that they may submit design certification, combined license (COL), or construction permit and operating license applications related to small modular reactors (SMRs) within the next few years. One of the issues discussed in the paper is the license structure for multi-module facilities composed of small nuclear modules or units. The NRC staff assessed the following alternatives for the structure of the licenses that will be issued for multi-module facilities: (1) single facility license, (2) master facility license and individual reactor module licenses, and (3) individual reactor module licenses. The staff believes that continuing the practice of issuing a license for each reactor module (Alternative 3) is the best approach. The staff plans to engage a broader range

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of stakeholders to discuss the alternatives and, absent compelling arguments for other alternatives, will further develop the specific aspects of Alternative 3 and will submit a specific proposal to the Commission for its consideration and approval.

BACKGROUND:

As discussed in SECY-10-0034, "Potential Policy, Licensing, and Key Technical Issues for Small Modular Nuclear Reactor Designs," dated March 28, 2010, several nuclear reactor designers have notified the NRC that they may submit design certification, COL, or construction permit (CP) and operating license (OL) applications related to SMRs within the next few years.¹ Several technical and policy issues associated with the multi-module designs will be applicable to a number of advanced reactor designs, including integral pressurized-water reactors, high-temperature gas-cooled reactors such as the commercial versions of the Next Generation Nuclear Plant (NGNP) reactor designs, and sodium-cooled fast reactors. In addition, the staff has received comments from various stakeholders (e.g., the NGNP program, the Nuclear Energy Institute (NEI), and the nuclear industry) discussing their positions on the most appropriate license structure for multi-module power reactor facilities.

As stated in the Commission's final policy statement on the regulation of advanced reactors, the NRC staff encourages the early resolution or identification of a clear path to the resolution of licensing issues related to advanced reactor designs so that designers can incorporate appropriate changes during the development of their designs and before the submittal of a design or license review application. The staff communicated these licensing issues to the Commission in previous papers, such as SECY-10-0034 and SECY-01-0207, "Legal and Financial Issues Related to Exelon's Pebble Bed Modular Reactor (PBMR)," dated November 20, 2001.

DISCUSSION:

The NRC staff has met with NEI, the U.S. Department of Energy, individual SMR designers, representatives of the nuclear industry, and the public to discuss issues related to the structure of the license or licenses for a multi-module facility and the processes related to the addition of modules over time. Under existing regulations and practices, the available choices for the licensing structure for a multi-module facility are (1) a single facility license or (2) a license for each module. In SECY-01-0207, the NRC staff concluded that either approach is allowed by the Atomic Energy Act of 1954, as amended (AEA or the Act), and by the Commission's regulations for applications made under Title 10 of the *Code of Federal Regulations* (10 CFR) Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants." Similar alternatives exist for licensing individual reactor modules or for issuing a license for a multi-module facility under the licensing provisions of 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities." The NRC staff assessed the alternatives discussed below.

Alternative 1: Single Facility License

Issuing a single license for a facility consisting of one or more modular reactor units has several possible advantages. A single facility license for a facility consisting of one or more modular

¹ SMRs are generally defined as reactor units with an electrical output of less than 300 Megawatts-electric (MWe) that are produced using modular fabrication and construction techniques.

reactor units could promote administrative efficiencies and standardization among modules, and it may be easier to address structures, systems, and components (SSCs) that are shared between or common to multiple modules. As described in SECY-09-0101, "Licensing of a Babcock and Wilcox Medical Isotope Production System," dated July 9, 2009, and the related staff requirements memorandum dated October 9, 2009, there is no legal impediment under Section 161.h of the AEA to issuing one OL for an entire facility consisting of numerous isotope production reactors and one or more production facilities under 10 CFR Part 50.

SECY-01-0207, states that Congress did not specifically address the prospect of combining individual COLs issued per reactor module into a single COL for multiple reactor modules. Nevertheless, there appears to be nothing in the legislative history of the AEA that explicitly precludes the possibility that the Commission may, under the authority of Section 161.h of the AEA, combine into a single license the individual 10 CFR Part 52 COLs for reactor modules of a substantially similar design collocated at a single site. In SECY-09-0101, the staff concluded that because this approach would present a change from the previous licensing practice under 10 CFR Part 50, this type of license should be granted on an individual, site-specific basis by Commission order. In addition, previous interactions with Pebble Bed Modular Reactor (Pty.), Ltd., included discussions of a single license for multi-module facilities, as described in SECY-01-0207. The staff stated in SECY-01-0207 that although there is no legal impediment under Section 161.h of the AEA to combine into a single license the individual 10 CFR Part 52 COLs for reactor modules at a single site, the NRC should consider rulemaking under this approach to clarify the nature of reactor modules and the process for making findings under 10 CFR 52.103(g).

A potential disadvantage of the single facility license approach is the establishment of a license term based on the first operating module, which could possibly reduce the lifetimes for subsequent modules. Additionally, individual power reactor modules licensed under 10 CFR Part 52 will involve verification of inspections, tests, analyses, and acceptance criteria (ITAAC); individual modules will involve unique operating cycles; and module-specific operating problems will likely occur. The staff explained in SECY-09-0101, that the issuance of a single license for an entire facility consisting of multiple reactors would present challenges in terms of practical implementation and day-to-day interactions involving licensing or technical issues related to different portions of the facility. The license application would have to address these challenges and restrictions and may require that individual reactors be identical, with common technical specifications and licensing conditions. The staff believes that the issuance of a single facility license for a multi-module facility would likely require the creation of an additional regulatory mechanism to address individual power reactor modules. Developing such a module-specific licensing and regulatory structure would likely resemble a module-specific license but would involve the development of new regulatory mechanisms (e.g., a sublicense for each module).

The staff also evaluated the implications of single facility licenses in terms of licensing proceedings and the transition from construction to operation. If the applicant requests a single facility license under 10 CFR Part 52, the COL application would likely be handled as an individual licensing proceeding and undergo a single license review and a single hearing. The regulation at 10 CFR 52.103(g) states the following about the transition to the operations phase for each reactor module:

If the combined license is for a modular design, each reactor module may require a separate finding as construction proceeds.

The transition from a CP to an OL under 10 CFR Part 50 is more problematic. As explained in SECY-09-0101, a combined CP and OL is not authorized under 10 CFR Part 50. If the applicant requests a single facility license under 10 CFR Part 50, Section 189 of the AEA requires the NRC to hold a hearing at the CP stage and to offer a hearing at the OL stage of the process in order to license that facility under Section 103 of the AEA. Notice for the mandatory CP hearing is governed by 10 CFR 2.104, "Notice of Hearing." However, under 10 CFR 2.105(c), if the applicant files an application that is complete enough to permit all evaluations necessary for issuance of the CP and OL, the notice of proposed issuance of the CP may provide that upon completion of construction and inspection, the OL will be issued without further prior notice. If the application is complete and no hearing is requested and ordered for the OL, the OL could then be issued without a hearing.² In 10 CFR 50.57, "Issuance of Operating License," the NRC states that an OL may be issued upon finding, "(1) Construction of the facility has been substantially completed, in conformity with the construction permit and the application as amended, the provisions of the Act, and the rules and regulations of the Commission."

If all modules are ready for operation at the same time, the transition from a CP to an OL could work for a multi-module facility that is issued a single OL under 10 CFR Part 50. However, the staggered addition and operation of reactor modules would not be feasible for a single operating facility license under 10 CFR Part 50 because the construction would not be substantially complete if reactor modules were yet to be installed.

In regard to decommissioning, the single facility license could reflect a decommissioning funding scheme to address the various modules that could be in operation or in decommissioning during specific periods of time. The NRC's current regulations allow licensees to change their decommissioning funding schemes. The staff believes that, under this licensing alternative, a license condition or similar provision might be necessary to define and restrict a licensee's decommissioning funding scheme to ensure appropriate decommissioning plans for each module and for the shared facilities.

Alternative 2: Master Facility License and Individual Reactor Module Licenses

The staff assessed a possible hybrid of the single facility license and individual module license that would take the form of a master facility license and individual reactor module licenses. Although not previously used for reactor licensing, the agency has applied this approach to NRC licenses for the use of byproduct materials. The master materials license (MML) program consolidates different types of single-entity licenses, from across the country and across multiple NRC regional office jurisdictions, under one single master license for the respective Federal organization. The NRC has used this provision for branches of the U.S. armed services and the U.S. Department of Veterans Affairs. Some nonmaster materials licenses likewise authorize the use of byproduct materials in multiple devices or facilities.

For reactor licensees, the staff envisions that a master facility license could address common SSCs and requirements established for the overall site or facility. The master facility license would be similar in some respects to a materials license that authorizes the use of licensed

² It would also be possible for the Commission to issue an order authorizing a combined CP and OL proceeding. This would likely be a very complex order. The infrastructure for such an approach has not been developed.

material in multiple devices or facilities (i.e., a “multi-site license”); the NRC has issued this type of license to certain licensees under 10 CFR Part 30, “Rules of General Applicability to Domestic Licensing of Byproduct Material,” and 10 CFR Part 40, “Domestic Licensing of Source Material.” This approach could include performance-based criteria and aging management provisions for common SSCs and would define requirements and limitations affecting all modules. The master facility license would be valid for the entire life of the plant, and because it would not include an authorization to operate a nuclear reactor, it would not necessarily be limited to the 40-year term as defined by Section 103(c) of the AEA. The NRC would issue individual licenses for each reactor module to be operated at the facility, and each of these reactor licenses would reference the master facility license for site or facility requirements.

This approach would address, at least in part, the concerns with single facility licenses and issues such as the possible need to create sublicenses and the different license terms for individual modules and shared structures. The master facility license approach would seem feasible for either 10 CFR Part 50 or 10 CFR Part 52 licensing processes. The major obstacle to the master facility license approach is that the NRC would need to develop processes and possibly new regulations to define how the master facility license would fit within the existing technical and legal requirements.

In regard to decommissioning, the master facility license could reflect a decommissioning funding scheme to address the various modules that would be in operation or in decommissioning during specific periods of time. The staff believes that a decommissioning funding scheme that would apply to all modules in a master facility license would limit a licensee’s flexibility to change its decommissioning funding scheme as permitted under the NRC’s current regulations. Therefore, under this licensing alternative, a license condition or similar provision might be necessary to define and restrict a licensee’s decommissioning funding scheme to ensure appropriate decommissioning plans for each module and for the shared facilities, or the licensee could have separate decommissioning plans for each module and the shared facilities.

Alternative 3: Individual Reactor Module Licenses

Another alternative is to issue a license for each reactor module. NEI provided a position paper entitled, “License Structure for Multi-Module Small Modular Reactor Facilities,” dated December 20, 2010 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML103550059), that endorsed the NGNP white paper entitled, “License Structure for Multi-Module Facilities,” dated August 10, 2010 (ADAMS Accession No. ML102240273). The papers stated the following positions:

- “A single application for a Part 52 COL can include multiple, essentially identical reactor modules, regardless of the size of the reactors.”
- “The single application with multiple, essentially identical reactor modules...can undergo a single NRC review, SER and NRC hearing.”
- “The license duration for each module within a single license authorization is a period not to exceed 40 years from the date the Commission finds that the acceptance criteria in the license are met, in accordance with §52.103(g), for that module.”

Consistent with NRC regulations and existing practice, a COL application related to multiple modules at a single facility can undergo a single license review, safety evaluation report (SER), and hearing if a single license application is made for modules of essentially the same design. The precedent for this process comes from recent large light-water reactor COL applications that have been filed under 10 CFR Part 52 for two units (e.g., Vogtle Electric Generating Plant), and many CPs and OLs issued under 10 CFR Part 50. However, the NEI approach for SMRs might differ from the NRC's historical practice in that, under this alternative, the NRC could be authorizing operation of some modules many years after the licensing review, the NRC hearing, and the overall NRC licensing decision.³

NRC regulations related to ITAAC (10 CFR 52.103(g)) adequately address the transition from construction to operation under 10 CFR Part 52 by allowing separate findings for each module. The individual license for each module would also support the transition from construction to operation under 10 CFR Part 50 by allowing the issuance of separate OLs at different times for each module (which has been the historical practice for CPs issued for multiunit sites).

Addressing common structures and components when a license is issued to each module is somewhat more difficult. The staff has identified two possible approaches described below for handling common SSCs when a license is issued for each reactor module.

Alternative 3a

In its position paper, NEI described an approach to address common SSCs primarily in the license for the first module. This approach is relatively simple, but it raises the same issues related to the license term for common SSCs and to limits on the license term for common SSCs of subsequent modules as Alternative 1 does. NEI's recommended approach may not introduce significant issues for the control of common SSCs and license renewal for the facility until a facility approached the end of the license term for the first module. Therefore, although the connection of common SSCs to the first module would not necessarily provide the optimum approach for multi-module facilities, it would support initial licensing, and the staff and industry could pursue alternate approaches to address the license renewal of common SSCs in subsequent years after the NRC has issued the license. For the decommissioning process and funding, a license condition or other provision would need to be developed to address the

³ It should be noted that the NRC considered using a similar approach for nuclear power plant license renewal, whereby the NRC would make a renewal decision many years before the actual expiration date of the operating license but issue the renewed operating license upon expiration of the previous operating license (i.e., a "tack-on" license). The NRC staff declined to recommend this approach because of issues with administrative finality, uncertainty in the application of the Backfit Rule, and other related issues associated with a long dormant period between the administrative decision and the actual licensing action (i.e., issuance of the license). For these reasons, the staff recommended issuing the renewed license as a "supersession license." Under this approach, the NRC would issue a renewed license superseding the original license, with the term of the renewed license being the sum of the remaining years left on the (now-superseded) operating license plus the number of years of "extended operation" (the period beyond the expiration) that the renewal applicant justified under the renewal application (up to 20 years). The agency adopted the supersession license approach as part of the final rulemaking for 10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants." See "Nuclear Power Plant License Renewal: Final Rule," 56 FR 64943, 64964; December 13, 1991.

various modules that would be in operation or in the decommissioning process during a specific period of time, or the licensee could have separate decommissioning plans for each module and the shared facilities. Either option would be feasible for the decommissioning process; however, this approach raises the challenge of how the common SSCs would be handled because they would be attached to the license of the first module.

Alternative 3b

An alternate approach would be to define license conditions for common SSCs in a license appendix to ensure that they remain functional and that they meet the necessary requirements for each module. This approach is similar to the master facility license concept discussed under Alternative 2. Such an approach could address common SSCs using performance-based criteria, and it could incorporate aging management provisions similar to those established for the license renewal process. These license conditions could be captured in an appendix that would be incorporated by reference into the license for each reactor module. This approach would not need the development activities related to a master facility license because incorporation by reference is a well-established practice within NRC licenses. For the decommissioning process and funding, a license condition or other provision would need to be developed to address the various modules that would be in operation or in the decommissioning process during a specific period of time, or the licensee could have separate decommissioning plans for each module and the shared facilities.

Staff Evaluation of Licensing Alternatives

The staff assessed the various alternatives and believes that the issuance of a license for each reactor module, as described under Alternative 3, is the best approach for the licensing of multi-module power reactor facilities. In making this determination, the staff considered the backfitting and issue finality implications of Alternative 3. The staff concluded that Alternative 3 raises no special backfitting policy issues not already presented in other regulatory contexts (e.g., design certification and license renewal) and the NRC has sufficient regulatory tools to ensure that necessary backfits are addressed at multi-module power reactor facilities. The staff plans to engage a broader range of stakeholders to discuss the alternatives and, absent compelling arguments for other alternatives, will further develop the specific aspects of Alternative 3 and will submit a specific proposal to the Commission for its consideration and approval.

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