January 8, 2014

CCN 231960
NRC Project #0748

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

SUBJECT: Contract No. DE-AC07-051D14517 – Next Generation Nuclear Plant (NGNP) Submittal – (NRC Project #0748) – Voluntary Response to Nuclear Regulatory Commission Regulatory Issue Summary 2013-18

On November 15, 2013, the U.S. Nuclear Regulatory Commission (NRC) published Regulatory Issue Summary (RIS) 2013-18, "Licensing Submittal Information and Design Development Activities for Small Modular Reactor Designs" (Reference a). The RIS seeks voluntary information regarding the content and schedule information for construction permit (CP), early site permit (ESP), standard design certification (DC), standard design approval (DA), or manufacturing license (ML) for a nuclear power plant that references a small modular reactor (SMR) design under the provisions of 10 CFR 50 or 10 CFR 52. For purposes of this RIS, SMRs are defined using the International Atomic Energy Agency definition of small- and medium-sized reactors with an electrical output of less than 700 megawatts. This RIS is a follow-on and update to previous annual NRC RIS requests, which have sought similar information.

Enclosed is the "Next Generation Nuclear Plant Submittal (NRC Project #0748), Voluntary Response to Nuclear Regulatory Commission, RIS 2013-18." The information provided in the enclosure updates information provided in the NGNP response to RIS 2012-12 (Reference b). The purpose of this response is to make NRC staff aware of planned Department of Energy (DOE)/ Idaho National Laboratory (INL) NGNP team licensing activities that will establish key foundations of the licensing framework to support the future Combined License (COL) application for plant construction and operation.

The August 2008 NGNP Licensing Strategy Report to Congress (Reference c) provides the overview of the recommended licensing strategy for satisfying the Energy Policy Act of 2005. The Licensing Strategy was jointly developed by NRC and DOE, and provides a high-level strategy for the research and development, licensing, construction, and deployment of a high temperature gas-cooled reactor (HTGR) via the adaptation of existing light water reactor regulations. The Licensing Strategy also identified a series of high priority topics as specific areas of focus by both DOE and NRC that must be addressed to license the NGNP. These topics include the establishment of:

- An acceptable basis for event-specific mechanistic source term calculations, including the siting source term
- An approach for using frequency and consequence to select licensing-basis events
- Allowable dose consequences for the licensing-basis event categories
- Requirements and criteria for functional performance of the NGNP containment as a radiological barrier

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NGNP then developed a more detailed description of the actions to be taken to implement the Licensing Strategy, including a focus on the four topics summarized above. This description is contained in the NGNP Licensing Plan (Reference d), which was issued in June 2009, and has formed the basis for our interactions with NRC in the ensuing years.

As stated in the October 17, 2011, letter to Congress (Reference e), NGNP has continued to focus on high temperature reactor research and development activities, and interactions with NRC to develop a licensing framework. Those interactions resulted in initial NRC feedback on key licensing framework topics through the issuance of working group assessments in February 2012, with mutual agreement that DOE and NRC would continue to focus efforts in 2012 on the key licensing framework topics (Reference f). To improve overall focus on these topics, NGNP submitted a summary of specific items to be resolved in 2012 (Reference g) and has engaged the NRC staff on those items through an extensive series of public meetings and information exchanges. Those interactions have included the engagement of NRC's Advisory Committee on Reactor Safeguards (ACRS) through a series of public meetings in early 2013 that included the review of the NRC staff's draft assessment of the NGNP proposals (Reference h). We understand that the next step in this licensing framework development process is NRC's issuance of the staff's assessment of the topics summarized by NGNP in Reference g, as modified in response to the feedback provided by ACRS (Reference i).

It is also noted that the NGNP Industry Alliance Limited (Alliance) is submitting a separate response to this RIS that provides NRC with a summary of Alliance plans for design and licensing activities associated with the deployment of an HTGR. It is recognized the HTGR licensing framework development activities, currently being led by DOE and INL via the NGNP effort, will transition to the future license applicant. The details and timing of that transition will be the subject of future interactions with NRC. As noted above, NGNP is currently awaiting NRC feedback via the issuance of the staff's assessment of the proposals for addressing the highest priority licensing framework development topics.

If you have any questions or require additional information regarding the content of this submittal, please contact me at (208) 526-7735 or James Kinsey, Director of NGNP Regulatory Affairs, at (208) 569-6751.

Sincerely,

David A. Petti, Director
VHTR Technology Development Office

JK:DES

Enclosure

References:

a. NRC Regulatory Issue Summary 2013-18, Licensing Submittal Information and Design Development Activities for Small Modular Reactor Designs, dated November 15, 2013 (ML13263A227)
b. Next Generation Nuclear Plant Project Submittal - (NRC Project #0748) – Voluntary Response to Nuclear Regulatory Commission Regulatory Issue Summary 2012-12, dated February 6, 2013 (ML13038A225)
c. Next Generation Nuclear Plant Licensing Strategy, A Report to Congress, dated August 2008 (ML082290017)
d. Next Generation Nuclear Plant Licensing Plan, PLN-3202, dated June 26, 2009
e. Letter from DOE Secretary Chu to Congress, dated October 17, 2011
f. Letter from NRC to DOE, dated February 15, 2012 (ML120240682)
g. Next Generation Nuclear Plant Project Submittal, (NRC Project # 0748) - Confirmation of Requested NRC Staff Positions, dated July 6, 2012 (ML121910310)
h. Memo from NRC to ACRS, Next Generation Nuclear Plant - Preapplication Assessment of Key Licensing Issues, dated March 7, 2013 (ML13060A102)
i. NRC Staff Response to ACRS Regarding Staff Assessment of NGNP Key Licensing Issues, dated June 20, 2013 (ML13148A090)

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Enclosure to CCN 231960
Next Generation Nuclear Plant Submittal
(NRC Project #0748)

Voluntary Response to Nuclear Regulatory Commission, RIS 2013-18

List of Acronyms

ACRS	Advisory Committee on Reactor Safeguards
AGR	Advanced Gas Reactor
ANS	American Nuclear Society
ASME	American Society of Mechanical Engineers
COL	combined license
CP	construction permit
DA	design approval
DC	design certification
DCWG	design-centered working group
DOE	Department of Energy
ESP	early site permit
HTGR	high temperature gas-cooled reactor
HTTF	High Temperature Test Facility
INL	Idaho National Laboratory
LBE	licensing basis event
ML	manufacturing license
NEI	Nuclear Energy Institute
NGNP	Next Generation Nuclear Plant
NRC	Nuclear Regulatory Commission
NSTF	Natural Circulation Shutdown Test Facility
PIE	post-irradiation examination
PIRT	phenomena identification and ranking table
PRA	probabilistic risk assessment
QA	quality assurance
QAPD	quality assurance program description
R&D	research and development
RAI	request for additional information
RIS	regulatory issue summary
SSC	structure, system, and component
TDRM	technology development roadmaps
TRISO	tristructural-isotropic
TRL	technology readiness level

NGNP's Voluntary Response to NRC RIS 2013-18

Design and Licensing Submittal Information

1. When (month and year) are applications planned for design-related applications, and what NRC action will be requested (i.e., a CP, DC, DA, or ML, or a COL that does not reference a DC or DA)?

RESPONSE: The Energy Policy Act of 2005 formally authorized the Next Generation Nuclear Plant Project (NGNP). Sections 641 through 645 of the Energy Policy Act of 2005 established expectations for research, development, design, construction, and operation of a demonstration nuclear plant that would provide electricity and/or hydrogen.

The provisions of the Energy Policy Act of 2005 establish two distinct phases for NGNP. Phase 1 covers selecting and validating the appropriate technology, carrying out enabling research, development, and demonstration activities, determining whether it is appropriate to combine electricity generation and hydrogen production in a single demonstration nuclear reactor and plant, and carrying out initial design activities for a demonstration reactor and plant, including development of design and safety analytical methods and studies.

Phase 2 covers development of a final design for the demonstration nuclear reactor and plant, application for a Nuclear Regulatory Commission (NRC) license to construct and operate the demonstration nuclear facility, and construction and operation for the demonstration nuclear reactor and its associated electricity, process heat, and/or hydrogen production facilities.

The August 2008 "NGNP Licensing Strategy Report to Congress" provides the overview of the recommended licensing strategy for satisfying the Energy Policy Act of 2005 (Public Law 109-58, August 8, 2005). The Licensing Strategy was jointly developed by NRC and the Department of Energy (DOE) and provides a high-level strategy for the research and development, licensing, construction, and deployment of a high temperature gas-cooled reactor (HTGR) via the adaptation of existing light water reactor regulations.

Consistent with the plant deployment expectations provided in the Energy Policy Act of 2005, DOE's October 17, 2011 report to Congress stated that NGNP will continue to focus on high temperature reactor research and development activities, interactions with the NRC to develop a licensing framework, and establishment of a public-private partnership. DOE has continued to work with NRC to address key generic HTGR policy and technical issues, so that these critical portions of the licensing framework can be established. The status of this effort is summarized in the response to Item 16. In addition, it is noted that the DOE has issued a cost-shared award to the private sector for the update of existing economic analyses and the preparation of a commercialization strategy, including design and licensing schedules supporting the construction of a demonstration facility. These are the next steps in the overall process supporting the establishment of a public-private partnership, and are expected to be followed by a future solicitation to the private sector for design work and the development of the associated license application. DOE will assure that the NRC is regularly updated on the license application submittal plans and schedule developed under the current economic analyses and commercialization strategy contract and future plans and schedules developed under a partnership for design, licensing, and construction.

2. Will the applicants be organized into DCWGs? If known, what is the membership of the DCWG, and which party is the primary point-of-contact designated for each DCWG?

RESPONSE: Idaho National Laboratory (INL), working under contract with the DOE, is the lead nuclear energy research and development laboratory for DOE in support of HTGR deployment. In this role, INL has worked closely with potential HTGR suppliers in resolving priority HTGR licensing and policy issues. In spite of reduced funding levels, the INL is the primary point of contact for early development activities related to NRC licensing submittals that are applicable to HTGR designs. In addition, NGNP has engaged with other industry organizations and committees (e.g., American Nuclear Society [ANS], Nuclear Energy Institute [NEI], American Society of Mechanical Engineers [ASME], etc.) to develop resolutions for selected regulatory policy issues that are generic to advanced reactor technologies, and are applicable to HTGR licensing. These coordination activities are expected to become the responsibility of a future applicant. In the interim, as stated in response to Item 1, NGNP has continued to work with NRC to develop a licensing framework for HTGRs.

These activities are supportive of a design-centered working group (DCWG) concept and are intended to promote the "one issue, one review, one position," strategy advanced by NRC Regulatory Issue Summary (RIS) 2006-06, "New Reactor Standardization Needed to Support the Design-Centered Licensing Review Approach".

3. Have protocols been developed to provide coordinated responses for requests for additional information with generic applicability to a design center?

RESPONSE: See response to Item 2.

4. Which applicant that cites the design will be designated as the reference COL applicant, or, alternatively, how will various applications (e.g., CP, DC, or COL applications) be coordinated to achieve the desired design-centered licensing review approach?

RESPONSE: The plant design for NGNP is being conducted in phases as stated in the response to Item 1. No COL applicant has been identified at this time.

5. When (month and year) will CP, COL, or ESP applications be submitted for review? In addition, what are the design, site location, and number of units at each site?

RESPONSE: As summarized in the response to Item 1, DOE will update NRC on the license application submittal plans, site location, unit configuration, and schedule upon finalization of the public-private partnership with the selected design and license application organization(s).

6. Are vendors or consultants assisting in the preparation of the application(s)? If so, please describe their roles and responsibilities for the design and licensing activities.

RESPONSE: NGNP consists of the research, development, and licensing associated with the demonstration plant, including a nuclear reactor that is based on research and development (R&D) activities supported through the Office of Advanced Reactor Technologies within DOE's Office of Nuclear Energy. Three (3) primary reactor suppliers that provide HTGR technology have previously been involved with the development of NGNP pre-licensing white papers and the related responses to NRC requests for additional information (RAIs). These suppliers are AREVA, General Atomics, and Westinghouse. In addition, NGNP has engaged with various national laboratories, universities, and

international advanced reactor communities in R&D activities that support the Generation IV reactor concepts. See response to Item 1.

Design, Testing, and Application Preparation

7. What is the current status of the development of the plant design (i.e., conceptual, preliminary, or finalizing)? Has the applicant established a schedule for completing the design? If so, please describe the schedule.

RESPONSE: A portion of the necessary conceptual design work was completed in December 2010. See the response to Item 1 for a discussion of next steps.

8. What is the applicant's current status (i.e., planning, in progress, or complete) for the qualification of fuel and other major systems and components? Has the applicant established a schedule for completing the qualification testing? If so, please describe the schedule.

RESPONSE: While DOE does not expect to be a future applicant, qualification of major systems and components is an integral activity that has been in progress since the early stages of NGNP. Various research, development, and qualification activities are underway in support of HTGR design, licensing, and plant operation. These activities focus on many of the qualification issues addressed in the "HTGR NRC Research Plan" (March, 2010), which describes NRC activities related to the development of confirmatory tools to be used during the HTGR license application review process.

As an example, the fuel qualification program for NGNP has been ongoing for a number of years, and details of the schedule and plan are discussed in INL's Advanced Gas Reactor (AGR) Fuel Development and Qualification Program Plan, which was provided to NRC staff in December 2010. This program plan, "A Technical Program Plan for the Very High Temperature Reactor Technology Office/Advanced Gas Reactor Fuel Development and Qualification Program," PLN-3636, Revision 2, was updated December 18, 2012, and the updated plan was provided to NRC for information on January 21, 2013 (also see the response to Item 11). The objective of the AGR Fuel Development and Qualification Program is to qualify tristructural-isotropic coated particle fuel (TRISO) for use in HTGRs. Both pebble bed and prismatic block reactors employ TRISO fuel particles, which consist of a microsphere (i.e., kernel) of nuclear material encapsulated by multiple layers of pyrocarbon and a silicon carbide layer.

There are five elements in the AGR Fuel Development and Qualification Program: fuel manufacture, fuel irradiation, post-irradiation examination (PIE) and safety testing, fuel performance modeling, and fission product transport and source term. The "NGNP Fuel Qualification White Paper" (INL/EXT-10-18610) covering the proposed fuel qualification process was submitted for NRC review on July 21, 2010. In addition, the "HTGR Mechanistic Source Terms White Paper" (INL/EXT-10-17997) was submitted for NRC review on July 21, 2010. NGNP provided responses to two rounds of NRC RAIs following submittal of the white papers. An NRC working group assessment report regarding these white papers was issued on February 15, 2012. The assessment report identified several items for follow up, and these items were discussed in a series of public meetings with NRC staff throughout 2012 (see response to Item 16). As a result of these discussions, NGNP provided several additional documents to NRC staff.

DOE and the NGNP team are currently awaiting NRC's issuance of its updated assessment report output with the results of its review of these key HTGR topics, as noted in the response to Item 16 below.

9. What is the applicant's status (i.e., planning, in progress, or complete) in developing computer codes and models to perform design and licensing analyses? Has the applicant defined principal design criteria, licensing-basis events, and other fundamental design and licensing relationships? Has the applicant established a schedule for completing the design and licensing analyses? If so, please describe the schedule.

RESPONSE: While DOE does not expect to be a future applicant, NGNP has engaged in the design, construction, and operation of thermal fluidic testing facilities to validate system and computational fluid dynamics software being developed for HTGR safety analysis and design. (See the response to Item 10 for additional details.) The "Next Generation Nuclear Plant Licensing Basis Event Selection White Paper" (INL/EXT-10-19521) covering the topic of licensing basis event (LBE) selection was submitted for NRC review on September 16, 2010. A preliminary NRC working group assessment report for this white paper identified a variety of technical and policy issues needing further description or clarification. Public meetings were conducted by NRC in 2012 on the white paper and issues associated with the white paper as indicated in the response to Item 16. The key issues were discussed by NGNP in a presentation to the ACRS Future Plant Designs Subcommittee on January 17, 2013. Additional presentations by both NGNP and NRC staff were provided to ACRS in April and May 2013. See response to Item 16 below.

NGNP understands that NRC staff is currently finalizing staff positions regarding the outcome of its review of the LBE white paper. It is expected that open issues identified, if any, will be addressed by the COL applicant to support the establishment of a licensing framework, which would significantly reduce existing design and licensing uncertainty.

DOE has also commenced work on clarifying the applicability of the General Design Criteria contained in Appendix A to 10 CFR Part 50 to the licensing of advanced reactor designs. This work includes the establishment of proposed principal design criteria for the HTGR design type as part of a recently established joint initiative with NRC. This joint DOE-NRC initiative is focused on the development of a licensing framework for advanced reactors and was established to improve the effectiveness and efficiency of future licensing. The principal design criteria being developed by DOE for HTGRs are based on the fundamental design and licensing relationships established through recent NGNP interactions with the NRC staff. Those interactions have been focused on identifying and resolving policy, regulatory, and key technical issues, and are described in more detail in Item 16 below.

10. What is the applicant's status in designing, constructing, and using thermal-fluidic testing facilities and in using such tests to validate computer models? Has the applicant established a schedule for the construction of testing facilities? If so, please describe the schedule. Has the applicant established a schedule for completing the thermal-fluidic testing? If so, please describe the schedule.

RESPONSE: While DOE does not expect to be a future applicant, NGNP is engaged in the design, construction, and operation of thermal fluidic testing facilities. As noted in the response to Item 9, the main objective of this work is the validation of system and computational fluid dynamics software used for HTGR safety analysis and design. These facilities and experiments cover a range of separate effects and integral phenomena that have been identified in the NGNP Phenomena Identification and Ranking Table (PIRT) as having a significant impact on one or more safety or performance parameters and possessing a high degree of uncertainty. The PIRT process provides an expert panel assessment of safety-relevant phenomena and identifies R&D needs. The detailed PIRT exercises have been documented in NUREG/CR-6844 (July 2004) and NUREG/CR-6944 (March 2008). These data are further analyzed and reduced to an actionable level in the "Next Generation Nuclear Plant Gap Analysis Report" (ORNL/TM-2007/228, July 2008).

The two major integral test facilities are: 1) the High Temperature Test Facility (HTTF) nearing completion at Oregon State University, and 2) the Natural Circulation Shutdown Test Facility (NSTF) which was recently refurbished at Argonne National Laboratory. The HTTF will be used to study the fluid flow behavior and heat transfer under steady state and severe loss of forced cooling conditions. The NSTF will be used to simulate and study vessel cooling and excore heat transfer phenomena. Data from these facilities will be used to validate computer models. The NSTF facility has been completed, including the performance of initial "shakedown" testing, and its test program is planned to commence in early 2014. The HTTF is expected to be available to commence its test program in mid-2014.

11. What is the applicant's status in defining system and component suppliers (including fuel), manufacturing processes, and other major factors that could influence design decisions? Has the applicant established a schedule for identifying suppliers and key contractors? If so, please describe the schedule.

RESPONSE: While DOE does not expect to be a future applicant, NGNP has implemented the Technology Readiness Level (TRL) process, which is a tool used by National Aeronautics and Space Administration and Department of Defense projects as part of the overall project risk management program. The reactor design suppliers have identified those structures, systems, and components (SSCs) that have development needs with the potential to impact NGNP. Plans and preliminary schedules to progress through the TRL maturity levels for those SSCs have been developed and documented as technology development roadmaps (TDRMs) and associated test plans. The TDRMs and test plans, along with various technology development studies performed by the suppliers, such as for heat transport system and power conversion system alternatives, provide a preliminary overview of the current international status of large equipment suppliers. These include suppliers of items such as circulators, steam generators, and forgings to support the NGNP. This process may be utilized by a future COL applicant for making down-selections and selecting components, suppliers, and key contractors. Additionally, NGNP performed a comprehensive infrastructure readiness assessment to review the current infrastructure capabilities of the nuclear industry, with focus on component suppliers and key contractors, to support the deployment of a demonstration plant HTGR module. This assessment was completed in February 2011 and summarized in the report "NGNP Infrastructure Readiness Assessment: Consolidation Report" (INL/EXT-11-20973). The infrastructure assessment reinforces the TDRM indications that the current primary technical challenges to the deployment of an HTGR appear to be qualification of fuel and graphite and delivery of high temperature heat exchangers. The qualification of the fuel is being addressed via INL's AGR Fuel Development and Qualification Program. The qualification of graphite is being addressed via INL's Graphite Program. Challenges associated with other major system and components, such as for large forgings and circulators, should be manageable if procurement activities are initiated early during the detailed design phase.

NGNP is continuing to support the development and codifying of high temperature materials and manufacturing processes, such as diffusion bonding for compact heat exchangers. This work is being performed in conjunction with, and within, the overall goals of ASME as identified in their draft "*Roadmap for the Development of ASME Code Rules for High Temperature Gas Reactors*". In support of this activity, NGNP submitted a white paper for NRC review entitled "*NGNP High Temperature Materials*" (INL/EXT-09-17187) on June 25, 2010. The scope of this paper is to review the existing policies, regulations, and guidance associated with acceptance of materials for nuclear reactor applications and to assess the bases for their implementation in the system components of the HTGR. The design of the HTGR is in the initial conceptual design phase, so final component specification and material selection has yet to be performed. Still, typical component performance requirements and candidate materials for specific applications are evaluated in the white paper to identify potential qualification and acceptance gaps.

In a letter dated May 9, 2012, NRC issued "NGNP – Assessment of White Paper on High Temperature Materials." This letter forwards a report assessing the contents of the white paper submitted by the NGNP Project and responses to RAIs submitted by NRC after preliminary review. NRC stated that the staff will not provide a final conclusion regarding the design and qualification of any NGNP components, materials, or their use in the plant design, until an NGNP combined license or design certification application is received and reviewed.

Reactor fuel manufacturing and supply/acquisition issues are addressed by various elements of the "Advanced Gas Reactor Fuel Development and Qualification Program Plan" provided to NRC in December 2010. This program plan was updated on December 18, 2012, and the updated plan was provided to NRC for information on January 21, 2013 (see response to Item 8).

Final decisions on systems and component suppliers will be made by the COL applicant when identified.

12. What is the applicant's status in the development and implementation of a quality assurance program?

RESPONSE: While DOE does not expect to be a future applicant, the "NGNP Quality Assurance Program Description" (QAPD) establishes the quality assurance (QA) policy for the NGNP and assigns major functional responsibilities for NGNP activities. It describes the methods and establishes QA and administrative control requirements that meet 10 CFR 50, Appendix B, and "*Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants*." The QAPD is being applied to NGNP activities beginning with technology development and continuing through the design, licensing, operation, construction, pre-operation, operation, and decommissioning phases. It includes all planned and systematic activities necessary to provide adequate confidence that safety-related SSCs will perform satisfactorily in service. It may also be applied to certain equipment and activities that are not safety related, support safe plant operations, or where DOE and/or NRC requirements or guidance results in the establishment of additional program requirements.

These QA requirements are based on Regulatory Guide 1.28, Rev. 4, June 2010, "*Quality Assurance Requirements (Design and Construction)*," and on Regulatory Guide 1.33, Rev. 2, February 1978, "*Quality Assurance Program Requirements (Operation)*." Regulatory Guide 1.28, Revision 4 states that Part I and Part II requirements of NQA-1-2008, 1a-2009, "*Quality Assurance Requirements for Nuclear Facility Applications*," provide an adequate basis for complying with the requirements of 10 CFR Part 50, Appendix B, subject to the additions and modifications identified therein. The QAPD is based on the requirements and guidance of ASME's NQA-1-2008, 1a-2009, Parts I and II, with specific reference to selected sections of Parts III and IV as identified in the document.

In September 2012, NRC issued, "Staff Assessment of NGNP Quality Assurance Program Description" for NGNP. This letter forwards a report assessing the contents of the NGNP QAPD, Revision 3 and the NGNP responses to previous NRC RAIs. Based on its review of the portions of the QAPD applicable to the current scope of the NGNP project (i.e., non-applicant activities), the staff found that the quality assurance program described in the QAPD, as revised by the referenced supplemental letter, meets the criteria of Appendix B to 10 CFR 50; therefore, it is acceptable for use during the technology development and high-level design phase of the NGNP. The NRC assessment report also states that the staff's expectation is that either 1) a supplemental QAPD would be submitted by INL should the scope of the NGNP project be expanded to include design and/or construction activities that would warrant INL becoming an applicant in accordance with the guidelines of 10 CFR Part 52; or 2) any future applicant or licensee planning to design and/or construct a NGNP-type reactor based on INL's current research and development efforts would submit an independent QAPD covering the appropriate scope of activities in accordance with the applicable quality assurance regulations and guidance in place at that time.

13. What is the applicant's status in the development of probabilistic risk assessment (PRA) models needed to support applications (e.g., needed for Chapter 19 of safety analysis reports or needed to support risk-informed licensing approaches)? Does the applicant plan to use the PRA for any risk-informed applications (i.e., risk-informed technical specifications, risk-informed inservice inspection, risk-informed categorization and treatment, risk-informed inservice testing, etc.). What are the applicant's plans for using the PRA models in the development of the design? At what level will the PRA be prepared, and when will it be submitted in the application process?

RESPONSE: While DOE does not expect to be a future applicant, information on the use of probabilistic risk assessment (PRA) in support of NGNP design and licensing efforts was provided to the NRC in the white paper, "NGNP Probabilistic Risk Assessment White Paper" (INL/EXT-11-21270), submitted in September 2011 and was discussed in NRC public meetings as presented in the response to Item 16. The PRA will be introduced at an early stage in the design, and it will be upgraded as the design matures and design details are defined. This will provide an opportunity to optimize the design relative to safety and licensing by using the PRA to define the required capability and reliability of SSCs to prevent and to mitigate accidents. The NGNP COL application will include an HTGR design-specific PRA.

As noted in the response to Item 16 below, DOE and the NGNP team are currently awaiting the NRC's issuance of its updated assessment report output addressing key HTGR licensing framework topics, including the staff's initial feedback regarding the proposed path for development and use of the PRA in design and licensing activities. It is expected that open issues, if any, identified in the assessment report will be addressed by the COL applicant to support the establishment of a licensing framework.

14. What is the applicant's status in the development, construction, and use of a control room simulator?

RESPONSE: While DOE does not expect to be a future applicant, NGNP design is not sufficiently mature to support simulator design and construction. Therefore, there is currently no schedule for developing a control room simulator.

15. What are the applicant's current staffing levels (e.g., full-time equivalent staff) for the design and testing of the reactor design? Does the applicant have plans to increase staffing? If so, please describe future staffing plans.

RESPONSE: See the response to Items 1 and 6 for current overall NGNP status. Future staffing levels will be better defined when the license applicant is identified.

16. What are the applicant's plans on the submittal of white papers or technical and topical reports related to the features of its design or the resolution of policy or technical issues? Has the applicant established a schedule for submitting such reports? If so, please describe the schedule.

RESPONSE: To provide additional detail regarding plans for implementing the NGNP licensing strategy described in Item 1, INL issued the "NGNP Licensing Plan" (PLN-3202) in June 2009. The plan identifies those high priority generic licensing topics that were deemed necessary for early interaction with the NRC staff to identify and resolve policy, regulatory, and key technical issues related to NGNP that are critical to the establishment of the licensing framework. The plan also describes a process to be used for addressing those topics with NRC, via a series of licensing white paper submittals, NRC public meetings, and NRC disposition of the identified issues. NGNP completed a series of white papers and submitted them to NRC for review as summarized below.

White Paper	Submittal Date	NRC Public Meeting
Next Generation Nuclear Plant Defense-in-Depth Approach INL/EXT-09-17139	December 9, 2009	March 8, 2010
High Temperature Materials White Paper INL/EXT-09-17187	June 25, 2010	September 1, 2010
NGNP Fuel Qualification White Paper INL/EXT-10-18610 Revision 1	July 21, 2010	September 2, 2010 October 19, 2011 April 17, 2012 July 24, 2012
HTGR Mechanistic Source Terms White Paper INL/EXT-10-17997	July 21, 2010	September 2, 2010 October 19, 2011 April 17, 2012 July 24, 2012 September 20, 2012 November 14, 2012
Licensing Structure for Multi- Module Facilities INL/EXT-10-18178	August 10, 2010	None
Next Generation Nuclear Plant Licensing Basis Event Selection White Paper INL/EXT-10-19521	September 16, 2010	November 2, 2010 April 16, 2012 May 16, 2012 July 10, 2012 August 22, 2012 September 19, 2012 November 14, 2012
Next Generation Nuclear Plant Structures, Systems, and Components Safety Classification White Paper INL/EXT-10-19509	September 21, 2010	November 2, 2010 July 10, 2012 September 6, 2012
Determining the Appropriate Emergency Planning Zone Size and Emergency Planning Attributes for an HTGR INL/MIS-10-19799	October 28, 2010	January 26, 2011
NGNP Nuclear-Industrial Facility and Design Certification Boundaries INL/EXT-11-21605	July 22, 2011	None
Next Generation Nuclear Plant Probabilistic Risk Assessment White Paper INL/EXT-11-21270	September 20, 2011	April 12, 2012 July 10, 2012 September 19, 2012
Modular HTGR Safety Basis and Approach INL/EXT-11-22708 (submitted for information only)	September 6, 2011	None

There are no additional white papers currently under development by INL. Additional technical and topical reports would be identified by the future applicant.

Other public meetings were conducted by NRC on key topics for which specific white papers had not been submitted but are closely related to white paper topics. These include the topics of siting source terms and functional containment.

Additionally, in September 2011, NGNP provided to NRC the results of a comprehensive regulatory gap analysis for HTGRs that evaluated potentially applicable existing regulatory requirements and guidance against the design characteristics specific to a generic modular HTGR.

NRC issued assessments reports on five of the white papers listed above on February 15, 2012, that identified a variety of issues requiring further description or clarification. NGNP engaged in a series of public meetings with NRC staff throughout 2012 to address these issues as noted above. In addition, in a letter to the NRC dated July 6, 2012, NGNP requested that NRC develop staff positions on the key licensing topics of fuel qualification, functional containment performance, source terms, and emergency planning to support the establishment of a modular HTGR licensing framework, which would significantly reduce existing design and licensing uncertainty within the industry. A presentation to the ACRS Future Plant Designs Subcommittee was conducted by NGNP on these matters on January 17, 2013. In March 2013, NRC staff developed draft positions in response to NGNP's July 6 letter and provided that material to ACRS for review. That material was then discussed in ACRS subcommittee and full committee meetings in April and May 2013, and NRC staff responses to ACRS feedback were provided in June 2013 (Reference i).. DOE and the NGNP team are currently awaiting the NRC's issuance of its updated assessment report output addressing these key HTGR licensing framework topics. It is expected that open issues, if any, identified in the staff positions will be addressed by the COL applicant to support the establishment of a licensing framework.

The knowledge and resolution of identified issues will aid in future design and licensing activities. Topical reports, which will form a portion of the COL application, are expected to be submitted to the NRC once a license applicant is identified.

17. Will ESP applicants seek approval of either "proposed major features of the emergency plans" in accordance with 10 CFR 52.17(b)(2)(i) or "proposed complete and integrated emergency plans," in accordance with 10 CFR 52.17(b)(2)(ii)?

RESPONSE: DOE does not currently anticipate the submittal of an Early Site Permit (ESP) application associated with the demonstration plant site, although the ESP application option may be reconsidered by the COL applicant. The plan, schedule, and scope for the ESP application would be communicated to NRC staff at that time. Also, see the response to Item 5.

18. Describe possible interest in the use of the provisions in Subpart F, "Manufacturing Licenses," of 10 CFR Part 52, instead of, or in combination with, other licensing approaches (e.g., DC or DA).

RESPONSE: Because a reactor vendor and license applicant have not been designated at this time, specifics regarding the possible use of the Manufacturing License provisions in Subpart F are not currently available.

19. Describe the desired scope of a possible ML and what design or licensing process would address the remainder of the proposed nuclear power plant. For example, would the ML address an essentially complete plant or would it be limited to the primary coolant system that basically comprises the integral reactor vessel and internals?

RESPONSE: See response to Item 18.

20. Describe the expected combination of manufacturing, fabrication, and site construction that results in a completed operational nuclear power plant. For example, what systems, structures, and components are being fabricated and delivered? Which of these are being assembled onsite? Which of these are being constructed onsite?

RESPONSE: The evaluation of a fabrication and construction model suitable for completing an operational nuclear power plant would be undertaken as part of the Phase 2 design activities.