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ATTN: Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Serial No. 13-390A
LIC/JG/R0
Docket No.: 50-305
License No.: DPR-43

DOMINION ENERGY KEWAUNEE, INC.
KEWAUNEE POWER STATION
SUPPLEMENT 1 AND RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION REGARDING REQUEST FOR EXEMPTIONS FROM PORTIONS OF 10 CFR 50.47 AND 10 CFR 50, APPENDIX E

By application dated July 31, 2013 (Reference 1), Dominion Energy Kewaunee, Inc. (DEK) requested exemptions from portions of 10 CFR 50.47(b), 10 CFR 50.47(c)(2), and 10 CFR 50, Appendix E, Section IV, for Kewaunee Power Station (KPS). The requested exemptions would allow DEK to reduce emergency planning requirements and subsequently revise the KPS Emergency Plan consistent with the permanently defueled condition of the station.

Subsequently, the Nuclear Regulatory Commission (NRC) transmitted a request for additional information (RAI) regarding the proposed exemptions (Reference 2). The RAI questions and associated DEK response are provided in Attachment 1 to this letter.

In response to the staff's comments, DEK is revising the originally proposed exemption request. Attachment 2 to this letter provides a supplement to the proposed exemption request describing the revisions. The analyses and conclusions provided in Reference 1 are not changed by the proposed revisions. The conclusions of the no significant hazards consideration and the environmental considerations contained in Reference 1 are not affected by, and remain applicable to, this revised request.

The July 31, 2014 requested approval date for the submittal remains unchanged.

Please contact Mr. Jack Gadzala at 920-388-8604 if you have any questions or require additional information.

Very truly yours,

Mark D. Sartain
Vice President – Nuclear Engineering and Development

A045
NRR

Attachments:

1. Response to NRC Request for Additional Information
2. Supplement 1 to DEK Request for Exemptions

Enclosure:

1. Supporting Calculation

References:

1. Letter from A. J. Jordan (DEK) to NRC Document Control Desk, "Request for Exemptions from Portions of 10 CFR 50.47 and 10 CFR 50, Appendix E," dated July 31, 2013.
2. Email from Dr. Karl D. Feintuch (NRC) to Margaret Earle, Jack Gadzala, Craig Sly, et al (DEK), "MF2567 Kewaunee Emergency Plan Requests for Exemption MF2567-RAII-ORLT-Norris-001 to -014 8 October 2013," dated October 8, 2013.

Commitments made by this letter: None

cc: Regional Administrator, Region III
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ATTACHMENT 1

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION:

REQUEST FOR EXEMPTIONS FROM PORTIONS OF 10 CFR 50.47(b), 10 CFR 50.47(c)(2), AND 10 CFR 50, APPENDIX E, SECTION IV

KEWAUNEE POWER STATION
DOMINION ENERGY KEWAUNEE, INC.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION: REQUEST FOR EXEMPTIONS FROM PORTIONS OF 10 CFR 50.47(b), 10 CFR 50.47(c)(2), AND 10 CFR 50, APPENDIX E, SECTION IV

By application dated July 31, 2013 (Reference 1), Dominion Energy Kewaunee, Inc. (DEK) requested exemptions from portions of 10 CFR 50.47(b), 10 CFR 50.47(c)(2), and 10 CFR 50, Appendix E, Section IV, for Kewaunee Power Station (KPS). The requested exemptions would allow DEK to reduce emergency planning requirements and subsequently revise the KPS Emergency Plan consistent with the permanently defueled condition of the station.

Subsequently, the Nuclear Regulatory Commission (NRC) transmitted a request for additional information (RAI) regarding the proposed exemptions (Reference 2). The RAI questions and associated DEK responses are provided below.

In the NRC RAI questions, the specific portion of the requirement within the regulation from which exemption is being requested is depicted in emphasized (**bold/underlined**) font. The table numbers refer to the tables contained in Reference 1. In the tables below, the column titled "Kewaunee Request Wording" indicates DEK's originally requested exemption as contained in Reference 1. The right column (titled "Past Precedence Wording") indicates exemptions (i.e., exempted wording) as previously granted by NRC for the associated regulation.

NRC Question MF2567-RAII-ORLOB-Norris-001

Table 1

	Kewaunee Request Wording	Past Precedence Wording
50.47(b)(1)	**...State and local organizations within the Emergency Planning Zones....**	...State and local organizations **within the Emergency Planning Zones....**

Although formal offsite emergency plans have typically been exempted for decommissioning sites, State and local organizations continue to be relied upon for firefighting, law enforcement, ambulance and medical services. Please explain why this requirement would not be applicable.

Response:

The intent of the originally requested exemption was to continue to rely on State and local organizations for firefighting, law enforcement, ambulance and medical services as needed for events at the site, but without an expected need for these organizations for offsite events. However, the past precedence wording also meets this intent. Therefore, DEK is revising the originally requested exemption from portions of 10 CFR

50.47(b)(1) in Reference 1, to read as shown in Attachment 2 of this submittal. The revised request is consistent with the past precedence wording shown above.

Memoranda of Understanding (MOU) establish agreements for assistance of the local organizations for firefighting, law enforcement, ambulance and medical services. The MOU continue to be required per 10 CFR 50.47(b)(3) even after approval of the proposed exemption to a portion of that regulation. Applicable details are contained in the Permanently Defueled Emergency Plan.

NRC Question MF2567-RAII-ORLOB-Norris-002

Table 1

	Kewaunee Request Wording	Past Precedence Wording
50.47(b)(7)	**Information is made available to the public on a periodic basis on how they will be notified and what their initial actions should be in an emergency (e.g., listening to a local broadcast station and remaining indoors), the principal points of contact with the news media for dissemination of information during an emergency (including the physical location or locations) are established in advance, and procedures for coordinated dissemination of information to the public are established.**	**Information is made available to the public on a periodic basis on how they will be notified and what their initial actions should be in an emergency (e.g., listening to a local broadcast station and remaining indoors),** [T]he principal points of contact with the news media for dissemination of information during an emergency **(including the physical location or locations)** are established in advance, and procedures for coordinated dissemination of information to the public are established.

The regulations in 10 CFR 72.32(a)(16) states, "Arrangements made for providing information to the public." Although Kewaunee has a general licensed ISFSI, the staff informed the previous exemption granted with the regulations in Part 72 for a specific licensed ISFSI. Please describe how information would be disseminated to the public should an event occur at the KPS site.

Response:

Dominion Resources, Inc. (Dominion), the parent company for DEK, maintains a corporate communications organization, which includes a media relations group. News media contacts for the KPS location continue to be maintained. Should an event occur at the KPS site, information would be disseminated to the public and briefings with pertinent media organizations would be conducted per Dominion corporate communication protocols. 10 CFR 50.72(b)(2)(xi) requires that the NRC be notified, via the Emergency Notification System, within 4 hours of certain events for which a news release is planned. The process for complying with this requirement is procedurally implemented.

Since there are no longer any pre-planned actions that the public needs to take as a result of an anticipated emergency at KPS, it is no longer necessary to pre-plan dissemination of emergency information to the public.

The intent of the originally requested exemption was to discontinue specific emergency response organizational requirements for major interactions with news media. However, the past precedence wording also meets this intent. Therefore, DEK is revising the originally requested exemption from portions of 10 CFR 50.47(b)(7) in Reference 1, to read as shown in Attachment 2 of this submittal. The revised request is consistent with the past precedence wording shown above.

Applicable details regarding how information would be disseminated to the public should an event occur at the KPS site are contained in the Permanently Defueled Emergency Plan.

NRC Question MF2567-RAII-ORLOB-Norris-003

Table 1

	Kewaunee Request Wording	Past Precedence Wording
50.47(b)(9)	**Adequate methods, systems, and equipment for assessing and monitoring actual or potential offsite consequences of a radiological emergency condition are in use.**	Adequate methods, systems, and equipment for assessing and monitoring actual or potential **offsite** consequences of a radiological emergency condition are in use.

The regulations in 10 CFR 72.32(a)(4) states, "*Detection of accidents.* Identification of the means of detecting an accident condition." Previous exemptions were granted for only the "offsite" assessment and monitoring. Please provide specific justification for exempting this requirement.

Response:

The intent of the originally requested exemption was to discontinue only those requirements associated with "offsite" assessment and monitoring. However, the past precedence wording also meets this intent. Therefore, DEK is revising the originally requested exemption from portions of 10 CFR 50.47(b)(9) in Reference 1, as shown in Attachment 2 of this submittal. The revised request is consistent with the past precedence wording shown above.

Applicable details regarding methods, systems, and equipment for assessing and monitoring actual or potential onsite consequences of a radiological emergency condition at the KPS site are contained in the Permanently Defueled Emergency Plan.

NRC Question MF2567-RAII-ORLOB-Norris-004

Table 1

	Kewaunee Request Wording	Past Precedence Wording
50.47(b)(14)	Periodic **exercises are (will be) conducted to evaluate major portions of emergency response capabilities, periodic** drills are (will be) conducted to develop and maintain key skills, and deficiencies identified as a result of **exercises or** drills are (will be) corrected.	Periodic exercises are (will be) conducted to evaluate major portions of emergency response capabilities, periodic drills are (will be) conducted to develop and maintain key skills, and deficiencies identified as a result of exercises or drills are (will be) corrected.

10 CFR 72.32(a)(12) states:

Exercises. (i) Provisions for conducting semiannual communications checks with offsite response organizations and biennial onsite exercises to test response to simulated emergencies. Radiological/Health Physics, Medical, and Fire drills shall be conducted annually. Semiannual communications checks with offsite response organizations must include the check and update of all necessary telephone numbers. The licensee shall invite offsite response organizations to participate in the biennial exercise.

(ii) Participation of offsite response organizations in biennial exercises, although recommended, is not required. Exercises must use scenarios not known to most exercise participants. The licensee shall critique each exercise using individuals not having direct implementation responsibility for conducting the exercise. Critiques of exercises must evaluate the appropriateness of the plan, emergency procedures, facilities, equipment, training of personnel, and overall effectiveness of the response. Deficiencies found by the critiques must be corrected.

Previous exemptions did not grant an exemption as requested by DEK. Additionally, the regulations in 10 CFR 30, 10 CFR 40 and 10 CFR 70 related to emergency plans require licensees to conduct a biennial exercise within the scope of 10 CFR 72.32(a)(12). Please provide specific justification for exempting this requirement.

Response:

DEK is retracting the originally requested exemption from 10 CFR 50.47(b)(14) in Reference 1, as shown in Attachment 2 of this submittal.

Although NUREG-0654 states that "an exercise shall include mobilization of State and local personnel and resources adequate to verify the capability to respond to an accident scenario requiring response," such an exercise scenario scope is not necessary for a permanently defueled facility. Performance of reduced scope exercises

is sufficient to maintain and assess the capability of the emergency response organization to properly perform activities.

KPS plans to conduct biennial exercises to test the adequacy of timing and content of implementing procedures and methods; to test emergency equipment and communication networks; and to ensure that emergency personnel are familiar with their duties. KPS plans to invite offsite response organizations to participate in the exercises.

For alternating years, a drill would be conducted for the purpose of testing, developing, and maintaining the proficiency of on-site emergency responders.

Exercise and drill scenarios would include, at a minimum, the following:

- The basic objective(s) of the drill.
- The date(s), time period, place(s), and participating organizations.
- A time schedule of real and simulated initiating events.
- A narrative summary describing conduct of the drill, including simulated casualties, off-site fire assistance, rescue of personnel, and use of protective clothing.

Critiques would evaluate the performance of the organization.

Applicable details regarding specific requirements for exercises and drills at KPS are contained in the Permanently Defueled Emergency Plan.

NRC Question MF2567-RAII-ORLOB-Norris-005

Table 2

	Kewaunee Request Wording	Past Precedence Wording
10CFR50 Appendix E IV.B.1	... **and outside** the site boundary to protect health and safety. The emergency action levels shall be based on in-plant conditions and instrumentation in addition to onsite **and offsite** monitoring. **By June 20, 2012, for nuclear power reactor licensees, these action levels must include hostile action that may adversely affect the nuclear power plant.** The initial emergency action levels shall be discussed and agreed on by the applicant or licensee and state and local governmental authorities, and approved by the NRC. **Thereafter, emergency action levels shall be reviewed with the State and local governmental authorities on an annual basis.**	..... **and outside** the site boundary to protect health and safety. The emergency action levels shall be based on in-plant conditions and instrumentation in addition to onsite **and offsite** monitoring. **By June 20, 2012, for nuclear power reactor licensees, these action levels must include hostile action that may adversely affect the nuclear power plant.** The initial emergency action levels shall be discussed and agreed on by the applicant or licensee and state and local governmental authorities, and approved by the NRC. **Thereafter, [E]**mergency action levels shall be reviewed with the State and local governmental authorities on an annual basis.

Maintaining the requirement for the offsite response organizations (OROs) to review the EALs on an annual basis will ensure the proper awareness by OROs of applicable emergency classifications and will also ensure that communications with the proper authorities are maintained. Please provide specific justification for exempting this requirement.

Response:

The intent of the originally requested exemption to review emergency action levels (EALs) with State and local governmental authorities was based on the proposed elimination of the requirement for offsite emergency response plans. However, based on the reviewer's comments, this portion of the exemption request is being retracted. Therefore, DEK is revising the originally requested exemption from portions of 10 CFR 50, Appendix E, IV.B.1 in Reference 1, as shown in Attachment 2 of this submittal. The revised request is consistent with the past precedence wording shown above.

Based on the significantly reduced scope of EALs for the permanently defueled facility, the scope of the annual review of EALs with State and local governmental authorities (to ensure proper awareness of applicable emergency classifications) is expected to be commensurately reduced (e.g., informational mailings, etc.).

Applicable details regarding review of EALs with State and local governmental authorities are contained in the Permanently Defueled Emergency Plan.

NRC Question MF2567-RAII-ORLOB-Norris-006

Table 2

	Kewaunee Request Wording	Past Precedence Wording
10CFR50 Appendix E IV.F.1	**In addition, a radiological orientation training program shall be made available to local services personnel; e.g., local emergency services/Civil Defense, local law enforcement personnel, local news media persons.**	

Previous exemption requests did not include an exemption for this requirement. Firefighting, local law enforcement and ambulance/medical facilities are still expected to play a role in some onsite emergencies; therefore they should have some basic knowledge about radiation. 10 CRF 50.47(b)(15) requires that radiological emergency response training is provided to those who may be called on to assist in an emergency. 10 CFR 72.32(a)(8) requires a commitment to and a brief description of the means to promptly notify offsite response organizations and request offsite assistance, *including medical assistance for the treatment of contaminated injured onsite workers* when

appropriate. 10 CFR 72.32(a)(10) requires training including any special instructions or orientation tours the licensee would offer to fire, police medical and other emergency personnel. Additionally, 10 CFR 72.32(a)(16) requires arrangements made for providing information to the public. Please provide justification for exempting this requirement.

Response:

Based on the reviewer's comments, this portion of the exemption request is being retracted. Therefore, DEK is revising the originally requested exemption from 10 CFR 50, Appendix E, IV.F.1 in Reference 1, as shown in Attachment 2 of this submittal. The revised request proposes only to delete a reference to two of the examples listed in the regulation of local services personnel (Civil Defense and local news media persons).

The intent of the originally requested exemption was premised on local services personnel, such as local law enforcement personnel and local news media persons, no longer needing radiological orientation training since they will not be called upon to respond to a radiological event. However, their response to certain onsite emergencies was expected to be maintained.

10 CFR 50.47(b)(15) requires that radiological emergency response training be provided to those who may be called on to assist in an emergency. This requirement would encompass training offered to offsite response organizations (firefighting, law enforcement, ambulance and medical services).

A discussion of how information would be disseminated to the public is discussed in the response to Question 2 above. Since there are no longer any expected actions that must be taken by the public during an emergency, it is no longer necessary to pre-plan the dissemination of this information to the public or to provide radiological orientation training to local news media persons.

The phrase "Civil Defense" is no longer a commonly used term and is no longer applicable as an example in the regulation.

Applicable details regarding the extent of the radiological orientation training program available to local services personnel are contained in the Permanently Defueled Emergency Plan.

NRC Question MF2567-RAII-ORLOB-Norris-007

Table 2

	Kewaunee Request Wording	Past Precedence Wording
10CFR50 Appendix E IV.F.2	The plan shall describe provisions for the conduct of emergency preparedness **exercises** as follows: **Exercises** shall test the adequacy of timing and content of implementing procedures and methods, test emergency equipment and communications networks, **test the public alert and notification system,** and ensure that emergency organization personnel are familiar with their duties.	The plan shall describe provisions for the conduct of emergency preparedness exercises as follows: Exercises shall test the adequacy of timing and content of implementing procedures and methods, test emergency equipment and communications networks, **test the public alert and notification system,** and ensure that emergency organization personnel are familiar with their duties.

See RAI 4, above.

Previous exemptions did not grant an exemption as requested. Additionally, the regulations in 10 CFR 30, 10 CFR 40, 10 CFR 70, and 10 CFR 72 related to emergency plans require licensees to conduct a biennial exercise. Please provide specific justification for exempting this requirement.

Response:

The intent of the originally requested exemption was to continue testing the adequacy of timing and content of implementing procedures and methods, emergency equipment, and communications networks, except to perform these tests during the conduct of drills. However, the past precedence wording also meets this intent. Therefore, DEK is revising the originally requested exemption from portions of 10 CFR 50, Appendix E, IV.F.2 in Reference 1, as shown in Attachment 2 of this submittal. The revised request is consistent with the past precedence wording shown above.

Although NUREG-0654 states that "an exercise shall include mobilization of State and local personnel and resources adequate to verify the capability to respond to an accident scenario requiring response," such an exercise scenario scope is not necessary for a permanently defueled facility. Performance of reduced scope exercises is sufficient to maintain and assess the capability of the emergency response organization to properly perform activities.

Applicable details regarding the extent of drills (training activities) and exercises (evaluated activities) are contained in the Permanently Defueled Emergency Plan.

NRC Question MF2567-RAII-ORLOB-Norris-008

Table 2

	Kewaunee Request Wording	Past Precedence Wording
10CFR50 Appendix E IV.F.2.b	Each licensee at each site shall conduct **a subsequent exercise of its onsite emergency plan every 2 years. Nuclear power reactor licensees shall submit exercise scenarios under § 50.4 at least 60 days before use in an exercise required by this paragraph 2.b. The exercise may be included in the full participation biennial exercise required by paragraph 2.c. of this section. In addition, the licensee shall take actions necessary to ensure that adequate emergency response capabilities are maintained during the interval between biennial exercises by conducting drills, including** at least one drill involving a combination of some of the principal functional areas of the licensee's onsite emergency response capabilities. The principal functional areas of emergency response include activities such as management and coordination of emergency response, accident assessment, event classification, notification of offsite authorities, assessment of the onsite **and offsite** impact of radiological releases, **protective action recommendation development, protective action decision making,** plant system repair and mitigative action implementation. During these drills, activation of all of the licensee's emergency response **facilities (Technical Support Center (TSC), Operations Support Center (OSC), and the Emergency Operations Facility (EOF))** would not be necessary, licensees would have the opportunity to consider accident management strategies, supervised instruction would be permitted, operating staff in all participating facilities would have the opportunity to resolve problems (success paths) rather than have controllers intervene, and the drills may focus on the onsite **exercise** training objectives.	Each licensee at each site shall conduct a subsequent exercise of its onsite emergency plan every 2 years. **Nuclear power reactor licensees shall submit exercise scenarios under § 50.4 at least 60 days before use in an exercise required by this paragraph 2.b. The exercise may be included in the full participation biennial exercise required by paragraph 2.c. of this Section.** In addition, the licensee shall take actions necessary to ensure that adequate emergency response capabilities are maintained during the interval between biennial exercises by conducting drills, including at least one drill involving a combination of some of the principal functional areas of the licensee's onsite emergency response capabilities. The principal functional areas of emergency response include activities such as management and coordination of emergency response, accident assessment, event classification, notification of offsite authorities, assessment of the onsite **and offsite** impact of radiological releases, **protective action recommendation development, protective action decision making,** plant system repair and mitigative action implementation. During these drills, activation of all of the licensee's emergency response facilities **(Technical Support Center (TSC), Operations Support Center (OSC), and the Emergency Operations Facility (EOF))** would not be necessary, licensees would have the opportunity to consider accident management strategies, supervised instruction would be permitted, operating staff in all participating facilities would have the opportunity to resolve problems (success paths) rather than have controllers intervene, and the drills may focus on the onsite exercise training objectives.

See RAI 4, above.

Previous exemptions did not grant an exemption as requested. Additionally, the regulations in 10 CFR 30, 10 CFR 40, 10 CFR 70, and 10 CFR 72 related to emergency plans require licensees to conduct a biennial exercise. Please provide specific justification for exempting this requirement.

Response:

As discussed in the response to Question 7 above, the intent of the originally requested exemption was to continue testing the adequacy of the emergency response organization, except to perform these tests during the conduct of drills. However, the past precedence wording also meets this intent. Therefore, DEK is revising the originally requested exemption from portions of 10 CFR 50, Appendix E, IV.F.2.b in Reference 1, as shown in Attachment 2 of this submittal. The revised request is consistent with the past precedence wording shown above.

Although NUREG-0654 states that "an exercise shall include mobilization of State and local personnel and resources adequate to verify the capability to respond to an accident scenario requiring response," such an exercise scenario scope is not necessary for a permanently defueled facility. Performance of reduced scope exercises is sufficient to maintain and assess the capability of the emergency response organization to properly perform activities.

Applicable details regarding the extent of drills (training activities) and exercises (evaluated activities) are contained in the Permanently Defueled Emergency Plan.

NRC Question MF2567-RAII-ORLOB-Norris-009

Table 2

	Kewaunee Request Wording	Past Precedence Wording
10CFR50 Appendix E IV.F.2.e	**Licensees shall enable any State or local government located within the plume exposure pathway EPZ to participate in the licensee's drills when requested by such State or local government.**	Licensees shall enable any State or local government **located within the plume exposure pathway EPZ** to participate in the licensee's drills when requested by such State or local government.

Previous exemption requests did not include an exemption for this requirement. 10 CFR 72.32(a)(10) requires training, including any special instructions or orientation tours the licensee would offer to fire, police medical and other emergency personnel. Additionally, 10 CFR 72.32(a)(12)(i) requires the licensee to invite offsite response organizations to participate in the biennial exercise. Additionally, CFR 72.32(a)(12) (ii) states in part, that participation of offsite response organizations in biennial exercises,

although recommended, is not required. Please provide justification for exempting this requirement.

Response:

Similar to the discussion contained in the response to Question 1 above, the intent of the originally requested exemption was to continue to rely on State and local organizations for firefighting, law enforcement, ambulance and medical services as needed for events at the site, but without an expected need for these organizations for offsite events. However, the past precedence wording also meets this intent. Therefore, DEK is revising the originally requested exemption from portions of 10 CFR 50, Appendix E, IV.F.2.e in Reference 1, as shown in Attachment 2 of this submittal. The revised request is consistent with the past precedence wording shown above.

Applicable details regarding offsite agency personnel participation in the licensee's drills are contained in the Permanently Defueled Emergency Plan.

NRC Question MF2567-RAII-ORLOB-Norris-010

Table 2

	Kewaunee Request Wording	Past Precedence Wording
10CFR50 Appendix E IV.F.2.f	**Remedial exercises will be required if the emergency plan is not satisfactorily tested during the biennial exercise, such that NRC, in consultation with FEMA, cannot (1) find reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency or (2) determine that the Emergency Response Organization (ERO) has maintained key skills specific to emergency response. The extent of State and local participation in remedial exercises must be sufficient to show that appropriate corrective measures have been taken regarding the elements of the plan not properly tested in the previous exercises.**	Remedial exercises will be required if the emergency plan is not satisfactorily tested during the biennial exercise, such that NRC, **in consultation with FEMA,** cannot (1) find reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency or (2) determine that the Emergency Response Organization (ERO) has maintained key skills specific to emergency response. **The extent of State and local participation in remedial exercises must be sufficient to show that appropriate corrective measures have been taken regarding the elements of the plan not properly tested in the previous exercises.**

Previous exemptions did not grant an exemption as requested. Biennial exercises are required and are subject to NRC inspection. 10 CFR 50.47(b)(14) states that periodic exercises are (will be) conducted to evaluate major portions of emergency response capabilities, periodic drills are (will be) conducted to develop and maintain key skills, and deficiencies identified as a result of exercises or drills are (will be) corrected. A remedial exercise ensures that, in the event that an exercise did not provide reasonable

assurance to the NRC that the license can and will take adequate protective measures in the event of a radiological emergency, the deficiencies are corrected. Please provide justification for exempting this requirement.

Response:

As discussed in the response to Questions 7 and 8 above, the intent of the originally requested exemption was to continue testing the adequacy of the emergency response organization, except to perform these tests during the conduct of drills. However, the past precedence wording also meets this intent. Therefore, DEK is revising the originally requested exemption from portions of 10 CFR 50, Appendix E, IV.F.2.f in Reference 1, as shown in Attachment 2 of this submittal. The revised request is consistent with the past precedence wording shown above.

Although NUREG-0654 states that "an exercise shall include mobilization of State and local personnel and resources adequate to verify the capability to respond to an accident scenario requiring response," such an exercise scenario scope is not necessary for a permanently defueled facility. Performance of reduced scope exercises is sufficient to maintain and assess the capability of the emergency response organization to properly perform activities.

Applicable details regarding the extent of drills (training activities) and exercises (evaluated activities) are contained in the Permanently Defueled Emergency Plan.

NRC Question MF2567-RAII-ORLOB-Norris-011

Table 2

	Kewaunee Request Wording	Past Precedence Wording
10CFR50 Appendix E IV.F.2.i	Licensees shall use drill **and exercise** scenarios that provide reasonable assurance that anticipatory responses will not result from preconditioning of participants. **Such scenarios for nuclear power reactor licensees must include a wide spectrum of radiological releases and events, including hostile action. Exercise and** drill scenarios as appropriate must emphasize coordination among onsite **and offsite** response organizations.	Licensees shall use drill and exercise scenarios that provide reasonable assurance that anticipatory responses will not result from preconditioning of participants. **Such scenarios for nuclear power reactor licensees must include a wide spectrum of radiological releases and events, including hostile action.** Exercise and drill scenarios as appropriate must emphasize coordination among onsite and offsite response organizations.

Previous exemptions did not grant an exemption as requested. Biennial exercises are required and are subject to NRC inspection. 10 CFR 50.47(b)(14) that periodic exercises are (will be) conducted to evaluate major portions of emergency response capabilities, periodic drills are (will be) conducted to develop and maintain key skills,

and deficiencies identified as a result of exercises or drills are (will be) corrected. 10 CFR 72.32(a)(10) requires training including any special instructions or orientation tours the licensee would offer to fire, police medical and other emergency personnel. Additionally, 10 CFR 72.32(a)(12)(i) requires the licensee to invite offsite response organizations to participate in the biennial exercise. Additionally, CFR 72.32(a)(12) (ii) states in part, that participation of offsite response organizations in biennial exercises, although recommended, is not required. Please provide justification for exempting this requirement.

Response:

As discussed in the response to Questions 7, 8, and 10 above, the intent of the originally requested exemption was to continue testing the adequacy of the emergency response organization, except to perform these tests during the conduct of drills. However, the past precedence wording also meets this intent. Therefore, DEK is revising the exemption originally requested from portions of 10 CFR 50, Appendix E, IV.F.2.i in Reference 1, as shown in Attachment 2 of this submittal. The revised request is consistent with the past precedence wording shown above.

Although NUREG-0654 states that "an exercise shall include mobilization of State and local personnel and resources adequate to verify the capability to respond to an accident scenario requiring response," such an exercise scenario scope is not necessary for a permanently defueled facility. Performance of reduced scope exercises is sufficient to maintain and assess the capability of the emergency response organization to properly perform activities.

Applicable details regarding the extent of drills (training activities) and exercises (evaluated activities) are contained in the Permanently Defueled Emergency Plan.

NRC Question MF2567-RAII-ORLOB-Norris-012

The Executive Summary in NUREG-1738 states, in part, "the staff's analyses and conclusions apply to decommissioning facilities with SFPs that meet the design and operational characteristics assumed in the risk analysis. These characteristics are identified in the study as industry decommissioning commitments (IDCs) and staff decommissioning assumptions (SDAs). Provisions for confirmation of these characteristics would need to be an integral part of rulemaking." The IDCs and SDAs are listed in tables 4.1-1 and 4.1-2, respectively, of NUREG-1738. Please explain if/how KPS meets each of these IDCs and SDAs.

Response:

Results of a comparison of the KPS spent fuel pool against the IDCs and SDAs listed in tables 4.1-1 and 4.1-2, respectively, of NUREG-1738, are shown below.

TABLE 1

Industry Decommissioning Commitments (IDCs) Comparison

IDC No.	IDC Description	KPS/DEK Alignment to IDC Description
1.	Cask drop analyses will be performed or single failure-proof cranes will be in use for handling of heavy loads (i.e., phase II of NUREG-0612 will be implemented).	KPS design aligns with this description. DEK controls the handling of heavy loads within the protected area by an administrative procedure designed to meet the guidance provided in NUREG-0612. Additionally, the auxiliary building crane, which is employed for the lifting and handling of heavy loads in the vicinity of the spent fuel storage pool, is of a single failure proof design. The NRC Safety Evaluation Report (SER) for KPS License Amendment 200 documents the single failure proof design of the auxiliary building crane (SER dated November 20, 2008 (ML082971079)).
2.	Procedures and training of personnel will be in place to ensure that onsite and offsite resources can be brought to bear during an event.	DEK practices align with this description. Consistent with KPS Emergency Plan requirements, DEK has procedures in place to ensure that onsite and offsite resources are available and personnel are trained on the access and use thereof during an event. The Permanently Defueled Emergency Plan (PDEP) being submitted for NRC approval addresses these requirements. KPS also maintains Letters of Agreement (LOA) or Memoranda of Understanding (MOU) with offsite agencies to ensure additional resources are available if needed. The discussion in KPS/DEK Alignment to IDC Description #4 contains additional details.
3.	Procedures will be in place to establish communication between onsite and offsite organizations during severe weather and seismic events.	DEK practices align with this description. Should severe weather or seismic events occur that result in an Emergency Plan entry, procedures are in place that direct personnel to establish the necessary communications and make the appropriate notifications. For example, the Emergency Director (Shift Manager) would direct notification of the ERO, applicable State and Counties officials, and the NRC. As decommissioning progresses, DEK anticipates maintaining procedures in place to require the appropriate communication between onsite and offsite organizations.
4.	An offsite resource plan will be developed which will include access to portable pumps and emergency power to supplement onsite resources. The plan would principally identify organizations or suppliers where offsite resources could be obtained in a timely manner.	DEK practices align with this description. Consistent with directions provided in the Emergency Plan, DEK maintains an Emergency Telephone Directory (ETD). The ETD provides the information necessary to access necessary offsite resources in a timely manner. Appropriate station personnel are trained to use the ETD to obtain offsite resources when needed to support onsite resources. ETD subsection ETD 02 lists contacts for government agencies, emergency equipment contacts (e.g., for fuel, electrical power, makeup water, firefighting equipment). It also identifies private agencies that would be capable of providing resources if requested (such as INPO, NEI, Bartlett Nuclear, and Point Beach Nuclear Plant). ETD subsection ETD 03 has a section specifically for emergency contacts. It lists items such as a portable diesel driven pump, diesel fuel, construction

IDC No.	IDC Description	KPS/DEK Alignment to IDC Description
		and lifting equipment, firefighting equipment, electrical power equipment, compressed gas and air and it identifies the Pooled Equipment Inventory Co., to which DEK subscribes. As decommissioning progresses, DEK intends to maintain an ETD and necessary subscriptions in place to facilitate the timely acquisition of outside resources if they are needed during Emergency Plan implementation activities.
5.	SFP instrumentation will include readouts and alarms in the control room (or where personnel are stationed) for SFP temperature, water level, and area radiation levels.	The KPS design aligns with the intent of this description. Spent fuel pool (SFP) instrumentation provides alarms in the control room for: Elevated SFP Area Radiation Level (alert and high level setpoints), SFP Level Hi (two channels), SFP Level Lo (two channels), and SFP Temperature Hi (two channels). Also, the SFP area radiation level reads out in the control room. Additionally, the SFP instrumentation provides local readouts of SFP level and temperature. A local alarm to notify personnel of high area radiation levels is also in place. Additionally, DEK intends to improve SFP level monitoring instrumentation. After the planned modifications, KPS will have an additional level monitoring capability (radar). This added feature will provide two channels of pool level readout locally (in the SFP heat exchanger room from which mitigating action would be taken) and low level alarms in the control room.
6.	SFP seals that could cause leakage leading to fuel uncovery in the event of seal failure shall be self limiting to leakage or otherwise engineered so that drainage cannot occur.	The KPS design aligns with this description. The design of the SFP gates is self limiting to prevent draining to a point where the fuel would be uncovered. The relative elevation between the bottom of the SFP gate openings and the top of spent fuel assemblies while stored within the spent fuel storage racks ensures that the inadvertent drainage or leakage via spent fuel gate opening cannot uncover the fuel – i.e., the bottom of the gate opening is above the top of stored spent fuel assemblies.
7.	Procedures or administrative controls to reduce the likelihood of rapid draindown events will include (1) prohibitions on the use of pumps that lack adequate siphon protection or (2) controls for pump suction and discharge points. The functionality of anti-siphon devices will be periodically verified.	DEK practices align with this description. DEK employs a formal procedure to allow for pumping down specified volumes within the SFP. Although the method used does not have the capability to drain down the SFP rapidly, the procedure includes the key elements called out in IDC 7. Similarly, the KPS ISFSI equipment design is such that there are no ISFSI-related SFP operations that have the potential to cause a rapid drain down event. The DEK procedure governing "procedure use and adherence" requires procedure users to conform to process requirements established to control specific activities. Moreover, work activities, whether performed under a specific procedure designed to control that activity, or under the general process controls of the work control process, are subject to the DEK integrated risk management procedure, wherein appropriate measures are employed to assess and manage the risk associated with such activities (e.g., address the affects upon SFP cooling availability).
8.	An onsite restoration plan will be in place to provide repair of the SFP cooling systems or to provide access for makeup water to the SFP. The plan will	DEK practices align with this description. DEK maintains in place contingency work orders to support the repair and replacement of key SFP cooling components. Similarly, the necessary work orders are maintained in place to support the alignment of a Residual Heat Removal system heat exchanger to allow for its use to cool the SFP should it be needed. Additionally, there are procedures in place that provide for the use of a

IDC No.	IDC Description	KPS/DEK Alignment to IDC Description
	provide for remote alignment of the makeup source to the SFP without requiring entry to the refuel floor.	backup means (beyond the NRC Safety Guide 13 capabilities required by the KPS design basis for fuel pool makeup) of SFP water makeup which can be executed without requiring entry to the refuel floor.
9.	Procedures will be in place to control SFP operations that have the potential to rapidly decrease SFP inventory. These administrative controls may require additional operations or management review, management physical presence for designated operations or administrative limitations such as restrictions on heavy load movements.	DEK practices align with this description. The KPS SFP design precludes an operationally induced rapid decrease in SFP inventory. DEK employs a formal procedure to allow for pumping down specified volumes within the SFP. Similarly, the KPS ISFSI equipment design is such that there are no ISFSI-related SFP operations that have the potential to cause a rapid drain down event. The DEK process governing "procedure use and adherence" requires procedure users to conform to process requirements established to control specific activities. Moreover, work activities, whether performed under a specific procedure designed to control that activity, or under the general process controls of the work control process, are subject to the DEK integrated risk management procedure wherein appropriate measures are employed to assess and manage the risk associated with such activities. For example, the integrated risk management procedure requires DEK management to consider requiring direct supervisory oversight or engineered mitigation methods. Also, the DEK "Decommissioning Safety Assessment Checklist" provides guidance relative to heavy loads at the station. Finally, implementing procedures related to the use of cranes at KPS provide the needed restrictions upon the handling of heavy loads, with specific requirements related to the handling of such loads in the vicinity of the SFP.
10.	Routine testing of the alternative fuel pool makeup system components will be performed and administrative controls for equipment out of service will be implemented to provide added assurance that the components would be Available, if needed.	DEK practices align with this description. The KPS design basis credits the station's seismically designed service water (SW) system for meeting the NRC Safety Guide 13 requirements for SFP makeup. The SW system has redundant pumping capability and redundant power supplies adequate to support the SFP makeup function. The station SW system is continuously operating, allowing for continuous monitoring for proper operation, and provides pressurized water from Lake Michigan to the inlet of a single manual isolation valve that can be repositioned locally to supply makeup water to the SFP. For defense-in-depth, the station also has available, with supporting procedures for its use, an engine driven emergency makeup pump capable of delivering Lake Michigan water to the SFP. By procedure, both the design basis and defense-in-depth capabilities are routinely tested to ensure their ongoing availability. The process for testing the design basis makeup water supply isolation valve includes an explicit step requiring that a test failure be addressed via the corrective action program. This complies with the corrective action program's general requirement that plant System, Structure, or Component (SSC) failures be entered into the program.

TABLE 2

Staff Decommissioning Assumptions (SDAs) Comparison

SDA No.	SDA Description	KPS/DEK Alignment to SDA Description
1.	Licensee's SFP cooling design will be at least as capable as that assumed in the risk assessment, including instrumentation. Licensees will have at least one motor-driven and one diesel-driven fire pump capable of delivering inventory to the SFP.	KPS design aligns with the intent of this description. The KPS SFP Cooling System design is based, in part, on NRC Safety Guide 13. Safety Guide 13 requires a seismic category 1 system for providing makeup water to the SFP. This design basis requirement for SFP cooling is provided by the SW system, which is a Nuclear Safety Design Class I* system (i.e., it is designed to withstand design basis earthquake seismically induced load) protected by a Nuclear Safety Design Class I structure. The SW system has redundant pumping capability and is provided with redundant power supplies adequate to provide SFP makeup at the required capacity. The SW pumps are normally powered from offsite power, but can be supplied with backup power from the emergency diesel generators (EDGs), which are also Class 1 components housed in a Class 1 structure. The station design also includes two motor driven fire pumps, each with the ability to be powered from either off site power or from either of two EDGs. The fire pumps have the capability to deliver water to the SFP for makeup. Finally, the station also maintains available, with supporting procedures for its use, a diesel engine powered emergency makeup pump capable of supplying water from Lake Michigan to the SFP.
2.	Walk-downs of SFP systems will be performed at least once per shift by the operators. Procedures will be developed for and employed by the operators to provide guidance on the capability and availability of onsite and offsite inventory makeup sources and time available to initiate these sources for various loss of cooling or inventory events.	DEK practices align with the intent of this description. Station procedures require a member of the staff to tour the SFP area each shift. Proper system operation is verified once per shift by verifying and recording normal SFP level and temperature. Additional verifications are performed daily by direct observation of the proper operation and status of SFP pumps. The normal and alternate SFP makeup water sources (including related tank levels) are also verified daily to ensure that they remain available. Station procedures require continual verification that the SW system (design basis makeup source) is in operation; thereby ensuring that SFP emergency makeup is available. Moreover, the KPS guidance in place for "Recovery Plan for Catastrophic Event" includes instructions for the following specific actions/events: • SFP makeup • Alternate method to ventilate the SFP area • SFP leakage control • Additional resources Finally, KPS procedure "Validation of Time Sensitive Operator Actions," provides the guidance necessary to ensure that operators have sufficient

SDA No.	SDA Description	KPS/DEK Alignment to SDA Description
		time available to initiate makeup water sources for various loss of cooling or inventory events.
3.	Control room instrumentation that monitors SFP temperature and water level will directly measure the parameters involved. Level instrumentation will provide alarms at levels associated with calling in offsite resources and with declaring a general emergency.	KPS design aligns with the intent of this description. Item 7 in KPS Updated Safety Analysis Report (USAR), Table 9.5-2, "Design Conformance with Safety Guide 13, states that "Level measuring instrumentation and radiation monitoring equipment are provided which alarm both locally and in the Control Room." Additionally, DEK has initiated actions to enhance SFP level monitoring instrumentation. These enhancements are intended to provide an additional level monitoring capability (radar). The planned level instrumentation includes two channels that provide local pool level indication (in the SFP heat exchanger room, from which mitigating action would be taken). Each level channel also provides input to a low level alarm in the Control Room. DEK processes in place to respond to an abnormally low level in the SFP direct the plant staff to take appropriate actions to provide SFP makeup, first through normal means, then by utilizing available onsite resources, including both design basis and defense-in-depth capabilities. Ultimately, if the use of onsite means fails to restore SFP inventory to an acceptable level, processes would direct the plant staff to access offsite resources. To facilitate accessing offsite resources, DEK maintains an Emergency Telephone Directory (ETD). The ETD provides the information necessary to access necessary offsite resources in a timely manner. Appropriate station personnel are trained to use the ETD to obtain offsite resources when needed to support onsite resources. ETD subsection ETD 02 lists contacts for government agencies, emergency equipment contacts (e.g., for fuel, electrical power, makeup water, firefighting equipment). It also identifies private agencies that would be capable of bringing resources when needed such as INPO, NEI, Bartlett Nuclear, and Point Beach Nuclear Plant. ETD subsection ETD 03 has a section specifically for emergency contacts. It lists items such as a portable diesel driven pump, diesel fuel, construction and lifting equipment, firefighting equipment, electrical power equipment, compressed gas and air, and it identifies the Pooled Equipment Inventory Co., to which DEK subscribes. Regarding the declaration of a general emergency, KPS will be employing Shutdown EALs using an approved NRC EAL Scheme. Consistent with that scheme, there are no conditions that have the capacity to reach any threshold requiring the declaration of a general emergency.
4.	Licensee determines that there are no drain paths in the SFP that could lower the pool level (by draining, suction, or pumping) more than 15 feet below the normal pool operating level and that licensee must initiate recovery using offsite sources.	KPS design aligns with this description. Nominal SFP water level is approximately 27 feet above the stored fuel. As stated in KPS USAR, Section 9.3.2.3, "The SFP pump suction lines are located well above the fuel assemblies and a system failure cannot result in loss of pool water. The return lines enter the pool above the top of the fuel assemblies and the lines contain check valves at the point of entry into the pool shielding concrete. Thus, line failure outside of the SFP cannot cause a loss of pool water due to siphon action." The SSCs relied upon to preserve the SFP inventory are seismically designed SSCs that preclude any significant loss in fuel pool inventory, via the SFP cooling water suction lines, under design basis conditions. Additionally, the SFP cooling water return lines

SDA No.	SDA Description	KPS/DEK Alignment to SDA Description
		(also seismically qualified) terminate approximately 15 feet above the stored fuel. This limits any reduction in SFP level via the return lines to approximately 12 feet.
5.	Load Drop consequence analyses will be performed for facilities with non single failure-proof systems. The analyses and any mitigative actions necessary to preclude catastrophic damage to the SFP that would lead to a rapid pool draining would be sufficient to demonstrate that there is high confidence in the facilities ability to withstand a heavy load drop.	KPS design aligns with this description. The auxiliary building crane, which is employed for the lifting and handling of heavy loads in the vicinity of the spent fuel storage pool, is of a single failure proof design. The NRC Safety Evaluation Report (SER) for KPS License Amendment 200 documents the single failure proof design of the auxiliary building crane (SER dated November 20, 2008 (ML082971079)). Additionally, DEK controls the handling of heavy loads within the protected area by an administrative procedure designed to meet the guidance provided in NUREG-0612. Control of heavy loads is governed by the Technical Requirements Manual (TRM), specifically, TRM 8.9.1, "Spent Fuel Pool – Control of Heavy Loads," which is subject to the requirements of 10 CFR 50.59.
6.	Each decommissioning plant will successfully complete the seismic checklist provided in Appendix 2B to this study. If the checklist cannot be successfully completed, the decommissioning plant will perform a plant specific seismic risk assessment of the SFP and demonstrate that SFP seismically induced structural failure and rapid loss of inventory is less than the generic bounding estimates provided in this study (<1 $x10^{-5}$ per year including non-seismic events).	Item 10 of the seismic checklist provides an alternative wherein the licensee delays request for a licensing "waiver" (i.e. License Amendment Request) for Emergency Planning until the plant specific zirconium fire is no longer a credible concern. DEK has performed an analysis (Calculation 2013-11284, "Maximum Cladding and Fuel Temperature Analysis for Uncovered Spent Fuel Pool"), which concludes that, about 17 months after reactor shutdown, decay heat cannot raise the spent fuel cladding temperature sufficiently to cause clad failure (565°C) if all water is drained from the SFP. Therefore, as of October 2014, when the requested changes will be implemented, the plant specific zirconium fire will no longer be a credible concern. Additionally, KPS is located in a geologically stable region whose seismic hazard risk is very low as documented in recent seismic hazard estimates (based on U.S. Geological Survey (USGS) of 2008). Geologic investigations throughout the Lake Michigan basin have not found any indication of fault movement in the recent geologic past. As shown in Figure 2 of Generic Issue 199 (GI-199, August 2010), the peak horizontal acceleration (%g) for 2-percent probability of exceedance in 50 years, for the geographic region where KPS is located, is in the second lowest region of the conterminous United States (between 0.02 and 0.03 g). Based on existing knowledge of the SFP structural capabilities, the SFP seismically induced structural failure and rapid loss of SFP inventory is very unlikely. Finally, KPS has procedures in place to ensure successful implementation of mitigation measures to supply alternate cooling water using portable equipment. As a result, no radiological releases with offsite consequence is expected or should occur following a severe earthquake because KPS has been permanently shutdown since May 2013, and mitigation measures for cooling water are in place.

SDA No.	SDA Description	KPS/DEK Alignment to SDA Description
7.	Licensees will maintain a program to provide surveillance and monitoring of Boraflex in high-density spent fuel racks until such time as spent fuel is no longer stored in these high-density racks.	DEK procedures align with this description. KPS does not utilize Boraflex in any of its spent fuel storage racks. Rather, the KPS design employs boron carbide (B_4C) in the spent fuel storage racks in the north and south pools and Boral neutron absorber material in the north canal spent fuel storage racks.

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Page 43 of 55 references a site-specific adiabatic heat up to address a partial drain down of the SFP (identified as Reference 12), assuming no air-cooling it states that the time necessary for the hottest fuel assembly to reach the critical temperature of 565°C is six hours after the fuel rods have become uncovered. Some previous exemptions were granted based [on] time to reach the cladding auto-ignition temperature of 900°C. Based on 17 months of decay time, at what time after the fuel is uncovered, assuming an adiabatic heatup, would the hottest fuel assembly reach 900°C? Please provide a copy of this analysis and the existing analysis for the Partial Loss of Cooling Water Inventory with No Air Cooling.

Response:

Calculation 2013-07050, "Maximum Cladding Temperature Analysis for an Uncovered Spent Fuel Pool with No Air Cooling," shows that after approximately 17 months of decay time, the hottest fuel assembly in the spent fuel pool would reach 900°C in 10 hours after the fuel is uncovered, assuming no air cooling (adiabatic heatup) (documented in Section 7, "Results" and Figure 7-1, "Heat-Up Time vs. Decay Time"). Seventeen months of decay time will occur on October 21, 2014.

A copy of this site-specific adiabatic heat up analysis to address a partial drain down of the SFP, assuming no air-cooling, is provided in Enclosure 1 to this submittal (Calculation 2013-07050, Maximum Cladding Temperature Analysis for an Uncovered Spent Fuel Pool with No Air Cooling). This site-specific quantitative heat up analysis includes both the time to reach 565°C and the time to reach 900°C (the previous analysis for the heat up to 565°C, identified as Reference 12 in the exemption request, was a qualitative analysis whose results have been subsumed into the current analysis).

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Page 43 of 55 references spent fuel pool inventory makeup strategies. Please provide additional information related to:

a. What is the availability of trained personnel to perform the required actions?
b. How is the referenced equipment maintained and tested?
c. Are there procedures developed to perform this task and how are they controlled?
d. Will these procedures and equipment be referenced in the emergency plan since the basis for this exemption, in part, is the existence of these mitigative strategies, until such time that the spent fuel has decayed to a point where they are no longer needed or the spent fuel is placed in a dry ISFSI?

Response:

a. Availability of trained personnel to perform the required actions

   The on-shift Plant Operators and Fire Brigade members are appropriately trained on the various actions needed to provide makeup to the spent fuel pool (SFP) based on a systematic approach to training. Because KPS is no longer operating, maintaining SFP cooling and inventory would be the highest priority activity; therefore, the personnel needed to perform these actions are available at all times.

b. Referenced equipment maintained and tested

   Existing plant systems used for SFP makeup are maintained and tested using plant procedures in accordance with the KPS preventive maintenance program. This includes testing the capability to align emergency makeup via the service water system. The diesel-driven portable pump is maintained and tested using plant procedures in accordance with the KPS preventative maintenance program. In addition, flow testing of external makeup capacity is performed periodically to validate that the specified actions can be completed in a timely manner.

c. Procedures developed to perform this task and how they are controlled

   Operating procedures (NOP-SFP-001, "Spent Fuel Pool Cooling and Cleanup System" and AOP-SFP-001, "Abnormal Spent Fuel Pool Cooling and Cleanup System Operation") provide direction for supplying makeup water to the spent fuel pool using existing plant systems in the event of a loss of level. If these procedurally directed strategies do not result in restoration of level, then response plans (which are in place to address large area fires) would be implemented which direct personnel to provide external makeup water via a portable diesel-driven pump. Administrative controls (GNP-03.01.01, "Directive, Implementing Document, and Procedure Administrative Controls") are in place to ensure that procedures are

maintained and implemented, and that any changes to them are appropriately reviewed and approved (including any applicable requirements of 10 CFR 50.59).

d. Referencing these procedures and equipment in the emergency plan

These procedures and equipment are not specifically referenced in the existing KPS Emergency Plan and are not included in the planned Permanently Defueled Emergency Plan (to be submitted for NRC approval). These procedures are required by TS 5.4.1.a, which directs establishing, implementing, and maintaining applicable procedures recommended in RG 1.33, Revision 2, Appendix A. Therefore, it is not necessary for them to be specifically referenced in the Emergency Plan. Equipment requirements are specified in the pertinent procedures.

References

1. Letter from A. J. Jordan (DEK) to NRC Document Control Desk, "Request for Exemptions from Portions of 10 CFR 50.47 and 10 CFR 50, Appendix E," dated July 31, 2013.
2. Email from Dr. Karl D. Feintuch (NRC) to Margaret Earle, Jack Gadzala, Craig Sly, et al (DEK), "MF2567 Kewaunee Emergency Plan Requests for Exemption MF2567-RAII-ORLT-Norris-001 to -014 8 October 2013," dated October 8, 2013.

ATTACHMENT 2

SUPPLEMENT 1 TO DEK REQUEST FOR EXEMPTIONS:

REQUEST FOR EXEMPTIONS FROM PORTIONS OF 10 CFR 50.47(b), 10 CFR 50.47(c)(2), AND 10 CFR 50, APPENDIX E, SECTION IV

KEWAUNEE POWER STATION
DOMINION ENERGY KEWAUNEE, INC.

Supplement 1:
Request for Exemptions from Portions of 10 CFR 50.47(b), 10 CFR 50.47(c)(2), and 10 CFR 50, Appendix E, Section IV

I. DESCRIPTION

By application dated July 31, 2013 (Reference 1), Dominion Energy Kewaunee, Inc. (DEK) requested exemptions, pursuant to 10 CFR 50.12 "Specific exemptions," from portions of 10 CFR 50.47(b), 10 CFR 50.47(c)(2), and 10 CFR 50, Appendix E, Section IV, for Kewaunee Power Station (KPS). The requested exemptions would allow DEK to reduce emergency planning requirements and subsequently revise the KPS Emergency Plan consistent with the permanently defueled condition of the station.

In response to the staff's comments, DEK is revising the originally proposed exemption request. Attachment 2 to this letter provides a supplement to the proposed exemption request. The analyses provided in Reference 1 remain applicable and bounding to this revised request. The conclusions of the no significant hazards consideration and the environmental considerations contained in Reference 1 are not affected by, and remain applicable to, this revised request.

A. Revised Exemptions Requested from 10 CFR 50.47

Table 1 (Revised) below lists the pertinent portions of 10 CFR 50.47(b) and 10 CFR 50.47(c)(2) in the left column. The specific portion of the requirement within the regulation from which exemption is being requested is emphasized (bold/underlined). The basis for the exemption from the specific portion of each requirement is provided in the corresponding row of the column on the right.

The table below shows only the regulations for which a revision to the originally requested exemption (Reference 1) is being proposed. The rows shown in Table 1 (Revised), below, replace the corresponding rows listed in Table 1 of Reference 1 in their entirety. The requested exemptions from all other regulations shown in Table 1 of Reference 1 remains in effect.

TABLE 1 (Revised)

Exemptions Requested from 10 CFR 50.47

Regulation (portion being exempted shown emphasized)	**Basis for Requested Exemption**
10 CFR 50.47(b)(1) - Primary responsibilities for emergency response by the nuclear facility licensee and by State and local organizations **within the Emergency Planning Zones** have been assigned, the emergency responsibilities of the various supporting organizations have been specifically established, and each principal response organization has staff to respond and to augment its initial response on a continuous basis.	Revised radiological analyses have been developed that show that, 90 days after shutdown, the radiological consequences of design basis accidents will not exceed the limits of the EPA Protective Action Guides at the EAB. In addition, analyses have been developed for beyond design basis events related to the spent fuel pool which show that, within 17 months after shutdown, the analyzed event is either not credible, is capable of being mitigated, or the event's radiological consequences will not exceed the limits of the EPA Protective Action Guides at the EAB. Therefore, there will no longer be a need for Emergency Planning Zones. State and local government agency response will be in accordance with each agency's plans and procedures, and commensurate with the hazard posed by the emergency.
10 CFR 50.47(b)(7) - **Information is made available to the public on a periodic basis on how they will be notified and what their initial actions should be in an emergency (e.g., listening to a local broadcast station and remaining indoors),** the principal points of contact with the news media for dissemination of information during an emergency **(including the physical location or locations)** are established in advance, and procedures for coordinated dissemination of information to the public are established.	Revised radiological analyses have been developed that show that, 90 days after shutdown, the radiological consequences of design basis accidents will not exceed the limits of the EPA Protective Action Guides at the EAB. In addition, analyses have been developed for beyond design basis events related to the spent fuel pool which show that, within 17 months after shutdown, the analyzed event is either not credible, is capable of being mitigated, or the event's radiological consequences will not exceed the limits of the EPA Protective Action Guides at the EAB. There will be no need for the public to take any protective actions in the event of an emergency at KPS. Therefore, there will no longer be any need for information to be made available to the public about how they will be notified and what their initial protective actions should be.

Regulation (portion being exempted shown emphasized)	**Basis for Requested Exemption**
10 CFR 50.47(b)(9) - Adequate methods, systems, and equipment for assessing and monitoring actual or potential **offsite** consequences of a radiological emergency condition are in use.	Revised radiological analyses have been developed that show that, 90 days after shutdown, the radiological consequences of design basis accidents will not exceed the limits of the EPA Protective Action Guides at the EAB. In addition, analyses have been developed for beyond design basis events related to the spent fuel pool which show that, within 17 months after shutdown, the analyzed event is either not credible, is capable of being mitigated, or the event's radiological consequences will not exceed the limits of the EPA Protective Action Guides at the EAB. Therefore, assessing and monitoring of offsite consequences of radiological emergency conditions will no longer be required. Since a need for monitoring and assessing will no longer exist, DEK no longer intends to maintain the capability to deploy field teams for assessing and monitoring offsite radiological conditions.
10 CFR 50.47(b)(14) - Periodic exercises are (will be) conducted to evaluate major portions of emergency response capabilities, periodic drills are (will be) conducted to develop and maintain key skills, and deficiencies identified as a result of exercises or drills are (will be) corrected.	No exemption from 10 CFR 50.47(b)(14) is being proposed.

B. Exemptions Requested from 10 CFR 50, Appendix E

Table 2 (Revised) below lists the pertinent portions of 10 CFR 50, Appendix E, Section IV, in the left column. The specific portion of the requirement within the regulation from which exemption is being requested is emphasized (bold/underlined). The basis for the exemption from the specific portion of each requirement is provided in the corresponding row of the column on the right.

The table below shows only the regulations for which a revision to the originally requested exemption (Reference 1) is being proposed. The rows shown in Table 2 (Revised), below, replace the corresponding rows listed in Table 2 of Reference 1 in their entirety. The requested exemptions from all other regulations shown in Table 2 of Reference 1 remains in effect.

TABLE 2 (Revised)

Exemptions Requested from 10 CFR 50, Appendix E

Regulation (10 CFR 50, Appendix E) (portion being exempted shown emphasized)	**Basis for Requested Exemption**
§ IV.B.1 - The means to be used for determining the magnitude of, and for continually assessing the impact of, the release of radioactive materials shall be described, including emergency action levels that are to be used as criteria for determining the need for notification and participation of local and State agencies, the Commission, and other Federal agencies, and the emergency action levels that are to be used for determining when and what type of protective measures should be considered within **and outside** the site boundary to protect health and safety. The emergency action levels shall be based on in-plant conditions and instrumentation in addition to onsite **and offsite** monitoring. **By June 20, 2012, for nuclear power reactor licensees, these action levels must include hostile action that may adversely affect the nuclear power plant**. The initial emergency action levels shall be discussed and agreed on by the applicant or licensee and state and local governmental authorities, and approved by the NRC. **Thereafter,** emergency action levels shall be reviewed with the State and local governmental authorities on an annual basis.	Revised radiological analyses have been developed that show that, 90 days after shutdown, the radiological consequences of design basis accidents will not exceed the limits of the EPA Protective Action Guides at the EAB. In addition, analyses have been developed for beyond design basis events related to the spent fuel pool which show that, within 17 months after shutdown, the analyzed event is either not credible, is capable of being mitigated, or the event's radiological consequences will not exceed the limits of the EPA Protective Action Guides at the EAB. Therefore, offsite emergency response plans for local government authorities will no longer be necessary. Since offsite emergency plans will no longer be necessary, and based on the significantly reduced scope of EALs for the permanently defueled facility, the scope of the annual review of EALs with State and local governmental authorities is expected to be commensurately reduced (e.g., informational mailings, etc.). Justification from the requirements in Appendix E related to a "hostile action" is provided in the Basis for the requested exemption from § IV.1 above.
§ IV.F.1 - In addition, a radiological orientation training program shall be made available to local services personnel; e.g., local emergency services**/Civil Defense**, local law enforcement personnel**, local news media persons**.	Revised radiological analyses have been developed that show that, 90 days after shutdown, the radiological consequences of design basis accidents will not exceed the limits of the EPA Protective Action Guides at the EAB. In addition, analyses have been developed for beyond design basis events related to the spent fuel pool which show that, within 17 months after shutdown, the analyzed event is either not credible, is capable of being mitigated, or the event's radiological consequences will not exceed the limits of the EPA Protective Action Guides at the EAB. Therefore, offsite emergency response plans will no longer be necessary. Local news media persons no longer need radiological orientation training since they will not be called upon to respond to a radiological event. The term "Civil Defense" is no longer commonly used; therefore, reference to this term in the examples provided in the regulation is not needed.

Regulation (10 CFR 50, Appendix E) (portion being exempted shown emphasized)	**Basis for Requested Exemption**
§ IV.F.2 - The plan shall describe provisions for the conduct of emergency preparedness exercises as follows: Exercises shall test the adequacy of timing and content of implementing procedures and methods, test emergency equipment and communications networks, **test the public alert and notification system,** and ensure that emergency organization personnel are familiar with their duties.	Revised radiological analyses have been developed that show that, 90 days after shutdown, the radiological consequences of design basis accidents will not exceed the limits of the EPA Protective Action Guides at the EAB. In addition, analyses have been developed for beyond design basis events related to the spent fuel pool which show that, within 17 months after shutdown, the analyzed event is either not credible, is capable of being mitigated, or the event's radiological consequences will not exceed the limits of the EPA Protective Action Guides at the EAB. There will be no need for the public to take any protective actions in the event of an emergency at KPS. Therefore, participation by offsite entities will no longer be necessary, public alert and notification system will no longer be required. Although NUREG-0654 states that "an exercise shall include mobilization of State and local personnel and resources adequate to verify the capability to respond to an accident scenario requiring response," such an exercise scenario scope is not necessary for a permanently defueled facility. Performance of reduced scope exercises is sufficient to maintain and assess the capability of the emergency response organization to properly perform activities.

Regulation (10 CFR 50, Appendix E) (portion being exempted shown emphasized)	**Basis for Requested Exemption**
§ IV.F.2.b - Each licensee at each site shall conduct a subsequent exercise of its onsite emergency plan every 2 years. **Nuclear power reactor licensees shall submit exercise scenarios under § 50.4 at least 60 days before use in an exercise required by this paragraph 2.b. The exercise may be included in the full participation biennial exercise required by paragraph 2.c. of this section.** In addition, the licensee shall take actions necessary to ensure that adequate emergency response capabilities are maintained during the interval between biennial exercises by conducting drills, including at least one drill involving a combination of some of the principal functional areas of the licensee's onsite emergency response capabilities. The principal functional areas of emergency response include activities such as management and coordination of emergency response, accident assessment, event classification, notification of offsite authorities, assessment of the onsite **and offsite** impact of radiological releases, **protective action recommendation development, protective action decision making,** plant system repair and mitigative action implementation. During these drills, activation of all of the licensee's emergency response facilities **(Technical Support Center (TSC), Operations Support Center (OSC), and the Emergency Operations Facility (EOF))** would not be necessary, licensees would have the opportunity to consider accident management strategies, supervised instruction would be permitted, operating staff in all participating facilities would have the opportunity to resolve problems (success paths) rather than have controllers intervene, and the drills may focus on the onsite exercise training objectives.	Revised radiological analyses have been developed that show that, 90 days after shutdown, the radiological consequences of design basis accidents will not exceed the limits of the EPA Protective Action Guides at the EAB. In addition, analyses have been developed for beyond design basis events related to the spent fuel pool which show that, within 17 months after shutdown, the analyzed event is either not credible, is capable of being mitigated, or the event's radiological consequences will not exceed the limits of the EPA Protective Action Guides at the EAB. There will be no need for the public to take any protective actions in the event of an emergency at KPS. Therefore, participation by offsite entities will no longer be necessary and associated exercises will no longer need to be conducted. Although NUREG-0654 states that "an exercise shall include mobilization of State and local personnel and resources adequate to verify the capability to respond to an accident scenario requiring response," such an exercise scenario scope is not necessary for a permanently defueled facility. Performance of reduced scope exercises is sufficient to maintain and assess the capability of the emergency response organization to properly perform activities. Offsite emergency response plans will no longer be necessary and there will be no required response by offsite agencies to the EOF. An EOF will no longer be maintained. An onsite facility (whether the control room or a facility similar to the technical support center) would continue to be maintained, from which effective control can be exercised during an emergency.

Regulation (10 CFR 50, Appendix E) (portion being exempted shown emphasized)	**Basis for Requested Exemption**
§ IV.F.2.e - Licensees shall enable any State or local government **located within the plume exposure pathway** EPZ to participate in the licensee's drills when requested by such State or local government.	Revised radiological analyses have been developed that show that, 90 days after shutdown, the radiological consequences of design basis accidents will not exceed the limits of the EPA Protective Action Guides at the EAB. In addition, analyses have been developed for beyond design basis events related to the spent fuel pool which show that, within 17 months after shutdown, the analyzed event is either not credible, is capable of being mitigated, or the event's radiological consequences will not exceed the limits of the EPA Protective Action Guides at the EAB. Therefore, the plume exposure pathway emergency planning zone, and offsite plans and drills will no longer be necessary. In the context of this paragraph of the regulation, "any State" means Wisconsin and "local government" means the organizations that provide emergency support services (i.e. ambulance, fire, police) to KPS upon request.
§ IV.F.2.f - Remedial exercises will be required if the emergency plan is not satisfactorily tested during the biennial exercise, such that NRC**, in consultation with FEMA,** cannot (1) find reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency or (2) determine that the Emergency Response Organization (ERO) has maintained key skills specific to emergency response. **The extent of State and local participation in remedial exercises must be sufficient to show that appropriate corrective measures have been taken regarding the elements of the plan not properly tested in the previous exercises.**	Revised radiological analyses have been developed that show that, 90 days after shutdown, the radiological consequences of design basis accidents will not exceed the limits of the EPA Protective Action Guides at the EAB. In addition, analyses have been developed for beyond design basis events related to the spent fuel pool which show that, within 17 months after shutdown, the analyzed event is either not credible, is capable of being mitigated, or the event's radiological consequences will not exceed the limits of the EPA Protective Action Guides at the EAB. Therefore, offsite emergency response plans will no longer be necessary and the scope of exercises can be commensurately reduced.

Regulation (10 CFR 50, Appendix E) (portion being exempted shown emphasized)	**Basis for Requested Exemption**
§ IV.F.2.i - Licensees shall use drill and exercise scenarios that provide reasonable assurance that anticipatory responses will not result from preconditioning of participants. **Such scenarios for nuclear power reactor licensees must include a wide spectrum of radiological releases and events, including hostile action.** Exercise and drill scenarios as appropriate must emphasize coordination among onsite and offsite response organizations.	Revised radiological analyses have been developed that show that, 90 days after shutdown, the radiological consequences of design basis accidents will not exceed the limits of the EPA Protective Action Guides at the EAB. In addition, analyses have been developed for beyond design basis events related to the spent fuel pool which show that, within 17 months after shutdown, the analyzed event is either not credible, is capable of being mitigated, or the event's radiological consequences will not exceed the limits of the EPA Protective Action Guides at the EAB. Requirements for offsite planning will no longer be necessary. Therefore, the scope of exercises can be commensurately reduced. Following docketing of its "Certification of Permanent Removal of Fuel from the Reactor Vessel," dated May 14, 2013, KPS is a permanently shutdown facility with spent fuel stored in the spent fuel pool and ISFSI. In the EP Final Rule (76 FR 72596, Nov. 23, 2011), the Commission defined "hostile action" as, in part, an act directed toward a nuclear power plant or its personnel. The NRC excluded non-power reactors (NPR) from the definition of "hostile action" at that time because an NPR is not a nuclear power plant and a regulatory basis had not been developed to support the inclusion of NPR in that definition. Likewise, spent fuel pools and ISFSIs are not a nuclear power plant. The following similarities between the KPS facility and NPRs show that the KPS facility should be treated similarly to NPRs. Similar to NPRs, KPS poses lower radiological risks to the public from accidents than do power reactors because: (1) KPS is a permanently shutdown facility (with fuel stored in the spent fuel pool and ISFSI) and no longer generates fission products; 2) Fuel stored in the KPS SFP has lower decay heat, resulting in lower risk of fission product release in the event of a non-credible boil off or draindown event; and 3) no credible accident at KPS will result in radiological releases requiring offsite protective actions. NPRs have lower decay heat associated with a lower risk of core melt and fission product release in a loss-of-coolant accident. Likewise, KPS has a low likelihood of a credible accident resulting in radiological releases requiring offsite protective actions.

The portions of 10 CFR 50.47 and 10 CFR 50, Appendix E that are not identified in Tables 1 and 2 of Reference 1, as modified in the two tables above (i.e., those portions for which exemption is not being requested), will remain applicable to KPS.

II. BACKGROUND

The background information contained in Reference 1 remains applicable to this supplement. As discussed in Reference 1, an analysis of the potential radiological impact of a design basis accident at KPS in a permanently defueled condition indicates that any potential radiological releases beyond the site boundary would be below the EPA PAG exposure levels, as detailed in the EPA's "Protective Action Guide and Planning Guidance for Radiological Incidents," Draft for Interim Use and Public Comment dated March 2013 (PAG Manual).

As stated in Reference 1, the KPS USAR contains the following description regarding spent fuel pool indication available to operators for responding to a postulated loss of heat removal capability for the spent fuel pool.

> Both temperature and level indicators in the pool would alert operators to a loss of cooling. Local and remote alarms are provided. This allows the operator to take corrective measures in a timely manner to restore cooling capability to the spent fuel pool cooling loop.

A recent review of this USAR description revealed that the sentence regarding local and remote alarms is ambiguous and could imply that local and remote alarms are provided both for pool temperature and for pool level. Although installation of a new spent fuel pool level indication system will include both a local and remote alarm, only a remote alarm is provided for spent fuel pool temperature. These indications and alarms are considered adequate to allow timely operator response to an abnormal spent fuel pool condition.

III. JUSTIFICATION FOR EXEMPTIONS AND SPECIAL CIRCUMSTANCES

10 CFR 50.12 states that the Commission may, upon application by any interested person or upon its own initiative, grant exemptions from the requirements of the regulations of Part 50 which are authorized by law, will not present an undue risk to the public health and safety, and are consistent with the defense and security. 10 CFR 50.12 also states that the Commission will not consider granting an exemption unless special circumstances are present. The justification for exemptions and special circumstances contained in Reference 1 are not affected by, and remain applicable to, this supplement. Therefore, this exemption request satisfies the provisions of Section 50.12.

IV. ENVIRONMENTAL CONSIDERATION

The conclusions of the environmental considerations contained in Reference 1 are not affected by, and remain applicable to, this supplement.

V. CONCLUSION

The conclusions contained in Reference 1 are not affected by, and remain applicable to, this supplement. Therefore, the requested exemptions, as supplemented herein, are authorized by law, will not present an undue risk to the public health and safety, and are consistent with the common defense and security, and special circumstances are present as set forth in 10 CFR 50.12(a)(2).

REFERENCES

1. Letter from A. J. Jordan (DEK) to NRC Document Control Desk, "Request for Exemptions from Portions of 10 CFR 50.47 and 10 CFR 50, Appendix E," dated July 31, 2013
2. Email from Dr. Karl D. Feintuch (NRC) to Margaret Earle, Jack Gadzala, Craig Sly, et al (DEK), "MF2567 Kewaunee Emergency Plan Requests for Exemption MF2567-RAII-ORLT-Norris-001 to -014 8 October 2013," dated October 8, 2013.

ENCLOSURE 1

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION: REQUEST FOR EXEMPTIONS FROM PORTIONS OF 10 CFR 50.47(b), 10 CFR 50.47(c)(2), AND 10 CFR 50, APPENDIX E, SECTION IV

SUPPORTING CALCULATION

1. CALCULATION 2013-07050, MAXIMUM CLADDING TEMPERATURE ANALYSIS FOR AN UNCOVERED SPENT FUEL POOL WITH NO AIR COOLING

Dominion

Calculation Cover Sheet

CM-AA-CLC-301 ATTACHMENT 2 Page 1 of 1

Note: This form is only applicable to **Revision 6** of this procedure.
Complete the fields with text or an **X** as required.

Calculation Number:	Revision:	Addendum:	Sub type:	Decommissioning Record?
2013-07050	2	N/A	000	☒Yes ☐No

Vendor (If not Dominion): Sargent & Lundy	Calculation Preparation Risk: ☒Low ☐Medium ☐High HU-RISK-20130082
Vendor Proprietary: ☐Yes ☒No	Pre-Job Brief Completed: ☐Yes ☐No ☒NA
Calculation Quality Class: ☐Safety Related ☒NSQ ☐Non-Safety Related	
Subject (Calculation Title): Maximum Cladding Temperature Analysis for an Uncovered Spent Fuel Pool with no Air Cooling	
Addendum Title: N/A	
Station(s) and Unit(s): NA ☐1 ☐2 ☐3 SU ☐1 ☐2 KW ☒ MP ☐1 ☐2 ☐3 ☐CO (Note: If both SU and NA then only check CO)	Affected System(s), Structure(s), or Component(s): 21-SFP – Spent Fuel Cooling

Purpose (Executive Summary):

This vendor calculation was performed by Sargent & Lundy to their Quality Program. It evaluates the length of time it takes for uncovered spent fuel assemblies to reach the temperature where the zircaloy might ignite for the unlikely postulated event of a loss of spent fuel pool inventory. The analysis assumes no air cooling of the fuel assemblies.

Originator (Qual. Required): Printed Name (1) (3)	Signature: (1) (3)	Date: (1) (3)
N/A	N/A	N/A

Reviewer (Qual. Required): Printed Name (1)	Type of Review: (2)	Signature:	Date:
M. S. Lico	Owner		8/28/13
Approver: Printed Name W. J. Eakin		Signature:	Date: 8/28/13

Note: Physical or electronic signatures are acceptable.

Note: At the discretion of the originator, a facsimile of this cover sheet that does not contain the "CM-AA-CLC-301"or "Attachment 1" headers may be used. Facsimiles must contain all of the elements of the cover sheet in the current revision of CM-AA-CLC-301. (1) Add lines for additional originators or reviewers as necessary. (2) Note if reviews are "Independent," "Peer", "Subject Matter Expert", "Supervisor", or "Owner's". (3) Enter N/A for Owner's Review of Vendor Calculation.

Dominion

Calculation Review Checklist

Calculation # 2013-07050 Rev. 2 Add. N/A

NOTE: If "Yes" is not answered, an explanation may be provided below. Reference may be made to explanations contained in the calculation or addendum.

Questions:	Yes	N/A
1. Have the sources of design inputs been correctly selected and referenced in the calculation?	[X]	[ ]
2. Are the sources of design inputs up-to-date and retrievable/attached to the calculation?	[X]	[ ]
3. Where appropriate, have the other disciplines reviewed or provided the design inputs for which they are responsible?	[X]	[ ]
4. Have design inputs been confirmed by analysis, test, measurement, field walkdown, or other pertinent means as appropriate for the configuration analyzed?	[ ]	[X]
5. Have the bases for assumptions been adequately and clearly presented and are they bounded by the Station Design Basis?	[X]	[ ]
6. Were appropriate calculation/analytic methods used and are outputs reasonable when compared to inputs?	[X]	[ ]
7. Are computations technically accurate?	[X]	[ ]
8. Has the calculation made appropriate allowances for instrument errors and calibration equipment errors?	[X]	[ ]
9. Have those computer codes used in the analysis been referenced in the calculation?	[X]	[ ]
10. Have all exceptions to station design basis criteria and regulatory requirements been identified and justified in accordance with NQA-1-1994?	[ ]	[X]
11. Has the design authority/original preparer for this calculation been informed of its revision or addendum, if required?	[ ]	[X]

Comments provided to S & L resolved in the final draft of the calculation to Dominion's satisfaction.

Item # 4 – Input data is from the literature or provided in ETE-NAF-2013-0077, Rev. 0 (documented in S & L calc).

#10 – Calculation provides information and is not used for design basis criteria.

11 – The original preparer of Rev. 2 is the same as Rev. 0 and 1.

Signature: N/A Date: N/A
(Preparer)

Signature: M. S. Lico Date: 8/28/13
(Reviewer)

Note: Physical or electronic signatures are acceptable.

Sargent & Lundy LLC

DESIGN CONTROL SUMMARY

CLIENT:	Dominion	UNIT: 1	PAGE NO.: 1
PROJECT NAME:	Kewaunee Power Station	S&L NUCLEAR QA PROGRAM	
PROJECT NO.:	11862-198	APPLICABLE ☒ YES ☐ NO	
CALC. NO.:	2013-07050	SAFETY RELATED ☐ YES ☒ NO	
TITLE:	Maximum Cladding Temperature Analysis for an Uncovered Spent Fuel Pool with no Air Cooling		
EQUIPMENT NO.:			

IDENTIFICATION OF PAGES ADDED/REVISED/SUPERSEDED/VOIDED & REVIEW METHOD

Initial Issue. The main body is pages 1 through 10. The final page is Attachment C, page C2.

INPUTS/ ASSUMPTIONS
☒ VERIFIED
☐ UNVERIFIED

REVIEW METHOD:	Detailed Review		REV.:	0
STATUS:	☒ APPROVED ☐ SUPERSEDED BY CALCULATION NO. ☐ VOID		DATE FOR REV.:	7-22-13
PREPARER:	Matthew M. Ross	Signature on file	DATE:	7-22-13
REVIEWER:	Joseph J. Pawasarat	Signature on file	DATE:	7-22-13
APPROVER:	Robert J. Peterson	Signature on file	DATE:	7-22-13

IDENTIFICATION OF PAGES ADDED/REVISED/SUPERSEDED/VOIDED & REVIEW METHOD

Revision 1 corrects a typo in Figure 7-1 and incorporates minor editorial changes. Pages 1 through 10 are revised and the changes are tracked with revision bars. None of the attachments are revised. The main body is pages 1 through 10. The final page is Attachment C, page C2.

INPUTS/ ASSUMPTIONS
☒ VERIFIED
☐ UNVERIFIED

REVIEW METHOD:	Detailed Review		REV.:	1
STATUS:	☒ APPROVED ☐ SUPERSEDED BY CALCULATION NO. ☐ VOID		DATE FOR REV.:	7-23-13
PREPARER:	Matthew M. Ross	Signature on file	DATE:	7-23-13
REVIEWER:	Joseph J. Pawasarat	Signature on file	DATE:	7-23-13
APPROVER:	Robert J. Peterson	Signature on file	DATE:	7-23-13

IDENTIFICATION OF PAGES ADDED/REVISED/SUPERSEDED/VOIDED & REVIEW METHOD

Revision 2 calculates the date when it will take 2, 4, 6, or 10 hours for the spent fuel to heat up from 32 °C to 900 °C. Changes to the main body are tracked with revision bars. Changes to Attachment B are tracked with revision bars. There are no changes to Attachments A and C. The main body is pages 1 through 10. The final page of the calculation is Attachment C, page C2.

INPUTS/ ASSUMPTIONS
☒ VERIFIED
☐ UNVERIFIED

REVIEW METHOD:	Detailed Review		REV.:	2
STATUS:	☒ APPROVED ☐ SUPERSEDED BY CALCULATION NO. ☐ VOID		DATE FOR REV.:	8-28-13
PREPARER:	Matthew M. Ross	Matt M Ross	DATE:	8/28/2013
REVIEWER:	Joseph J. Pawasarat		DATE:	8-28-13
APPROVER:	Robert J. Peterson	Robert J. Peterson	DATE:	8-28-13

1. Purpose and Scope

1.1. Purpose

The purpose of this calculation is to conservatively evaluate the length of time (number of hours) it takes for uncovered spent fuel assemblies to reach the temperature where the zirconium cladding would fail. This analysis conservatively assumes that there is no air cooling of the assemblies: the flow paths that would provide natural circulation cooling are assumed to be blocked.

1.2. Scope

The length of time for the fuel to heat up (the heat-up time) is determined as a function of the day that the analysis is performed (the decay time). The heat load from Westinghouse 422V+ fuel is used in this analysis (Reference 2.5 and Assumption 5.1).

The zirconium cladding must remain below the temperature where it will fail. Per NUREG/CR-6451 (Ref. 2.1, see Design Input 4.1), 565 °C (1049 °F) is the lowest temperature where incipient cladding failure might occur. NUREG-1738 (Ref. 2.7, pg. 3-7) states that runaway oxidation of zirconium occurs at 900 °C. For this analysis, the NUREG/CR-6451 temperature (565 °C, 1049 °F) and the NUREG-1738 temperature (900 °C, 1652 °F) are the temperatures of interest for the zirconium cladding.

There are no specific acceptance criteria for this analysis, however, SECY-99-168 (Ref. 2.4) suggests that "10 hours (is) sufficient time to take mitigative action" and that for PWRs, 2.5 years is expected to be the decay time needed to reach a 10 hour heat-up time from 30 °C to 900 °C. NUREG-1738 shows that a 10 hour heat up time to 900 °C for a PWR would occur at less than 2 years (Ref. 2.7, Fig. 2-2).

2. References

2.1. NUREG/CR-6451, "A Safety and Regulatory Assessment of Generic BWR and PWR Permanently Shutdown Nuclear Power Plants," August 1997.

2.2. Incropera, Frank P., and David P. DeWitt, Introduction to Heat Transfer, Fourth Edition, John Wiley & Sons.

2.3. Kewaunee USAR, Chapter 3: Reactor, Revision 24.02 – Updated Online 04/15/13.

2.4. SECY-99-168, "Improving Decommissioning Regulations for Nuclear Power Plants," June 30, 1999.

2.5. Document No. ETE-NAF-2013-0077, "Information for Kewaunee Spent Fuel Pool Postulated Loss of Inventory Calculation," Rev. 0, July 10, 2013.

2.6. Email from Michael Lico (Dominion) to Matthew Ross (S&L), "KPS sfp temp today," July 22nd, 2013. Included as Attachment C.

2.7. NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants," February 2001.

3. Definitions

3.1. Decay Time
The decay time is the time since the reactor was shut down (May 7th, 2013).

3.2. Heat-up Time
The heat-up time is the amount of time between when the fuel becomes uncovered and when the zirconium cladding reaches the failure temperatures of interest, 565 °C (1049 °F) and 900 °C (1652 °F).

4. Input Data

4.1. Maximum Zirconium Temperature

Several studies are presented in NUREG/CR-6451 (Ref. 2.1) discussing the maximum allowable temperature of zirconium cladding that will ensure that failure of the zirconium cladding will not occur. Per NUREG/CR-6451 (Ref. 2.1, see Design Input 4.1), 565 °C (1049 °F) is the lowest temperature where incipient cladding failure might occur. NUREG-1738 uses 900 °C (1652 °F) as the temperature where "runaway oxidation" is expected to occur (Ref. 2.7, pg. 3-7). These two temperatures are the failure temperatures of interest for this calculation

4.2. Zirconium Properties

The specific heat of zirconium at 600 K (620 °F) is 322 J/kg-K and the density of zirconium is 6570 kg/m^3 (Ref. 2.2, pg. 822). A temperature of 620 °F is in the temperature range (less than the midpoint for both ranges) of this analysis. From Reference 2.2, the specific heat slightly increases with an increase in temperature. At higher temperatures, the zirconium would heat up more slowly. This temperature is representative of the full temperature range for this analysis.

4.3. Uranium Properties

The specific heat of uranium at 600 K (620 °F) is 146 J/kg-K and the density of uranium is 19070 kg/m^3 (Ref. 2.2, pg. 822). A temperature of 620 °F is in the temperature range (less than the midpoint for both ranges) of this analysis. From Reference 2.2, the specific heat slightly increases with an increase in temperature. At higher temperatures, the uranium would heat up more slowly. This temperature is representative of the full temperature range for this analysis.

4.4. Geometry for Westinghouse 422V+ Assemblies

The table below shows the geometry inputs for the fuel assemblies used in this analysis.

Table 4-1: Fuel Assembly Inputs (from USAR Table 3.2-8, Ref. 2.3)

Uranium Pellet Diameter	0.3659 inches
Inner Diameter of Cladding	0.3734 inches
Outer Diameter of Cladding	0.422 inches
Rod Configuration and Total Rods	14 x 14, 196 total spaces
Number of Guide Tubes, Instrument Tubes	16 guide, 1 instrument
Total Number of Heated Rods	179 rods
Inner Diameter of Guide Tubes (Above Dashpot)	0.492 inches
Outer Diameter of Guide Tubes (Above Dashpot)	0.526 inches

Table 4-1 Continued

Heated Height of Rods	143.25 inches
Cladding and Guide Tube Material	ZIRLO Zirconium
Theoretical Uranium Density Percentage	96.56%

4.5. Heat Load

Reference 2.5 determines the maximum heat load from a single assembly. The assembly with the highest heat load will have the shortest heat-up time. The table showing the maximum fuel assembly heat generation rate for several years is located in Attachment A. The heat generation rates were calculated using the computer program HEATUP. Per Reference 2.5, the results in HEATUP are conservative compared to ORIGEN models.

5. Assumptions

5.1. All of the fuel assemblies are assumed to be Westinghouse 422V+ fuel. This is appropriate because the most recent design consisted of a full core of 422V+ assemblies (Ref. 2.3, pg. 3.2-22). The most recently offloaded assemblies are limiting in terms of heat generation.

5.2. The properties of pure zirconium are used for the specific heat and density of the zirconium alloy cladding. Based on an examination of alloys of some metals (e.g. aluminum, nickel, or steel) in Table A.1 of Reference 2.2, the density and specific heat are not significantly impacted by alloying.

5.3. Details of the thermal mass of the instrument tube are unavailable. For simplicity, the instrument tube is assumed to be identical to the guide tubes. This is appropriate because there are 16 guide tubes and one instrument tube, and the guide tubes are hollow while the instrument tube may have other thermal mass of the instruments.

5.4. The starting temperature for the heat-up analysis is assumed to be uniform and 90 °F (32 °C). A temperature of 90 °F is selected as representative of the current pool conditions (see Attachment C). The water temperature in the pool will continue to decrease over time due to a reduction in the heat load. It is appropriate to use a realistic value for the initial temperature due to the inherently conservative methodology (i.e. no heat transfer to the environment). In addition, this temperature is consistent with the sample analysis performed in SECY-99-168, where the starting temperature was 30 °C (86 °F).

5.5. The heat-up time is assumed to start when the spent fuel pool has been completely drained. This is conservative. It is likely that site personnel will start to respond to an incident when draindown starts.

6. Methodology

This analysis determines the heat-up time of the fuel assembly using the thermal capacity of materials (Based on Section 2.3 of Ref. 2.2).

$$\dot{q} = \rho \times V \times c_p \times \frac{\Delta T}{t} \qquad \text{Equation 6-1}$$

Where:

$\dot{q}$ is the heat generation rate in BTU/hr
ρ is the density of the material in lb/ft^3
V is the volume of the material in ft^3
c_p is the specific heat in BTU/lb-°F
ΔT is the temperature increase in °F
t is the heat-up time in hr

For this analysis, there are two materials being heated: the uranium fuel pellets and the ZIRLO zirconium alloy cladding. The zirconium is in the cladding and the instrument tubes, which are also being heated. The zirconium and the uranium are modeled as heating up at the same rate, so the $\Delta T/t$ will be the same for both materials.

$$\dot{q} = \frac{\Delta T}{t} \times \left(\rho_u \times V_u \times c_{p,u} + \rho_z \times V_z \times c_{p,z}\right) \qquad \text{Equation 6-2}$$

Where:

X_u signifies the property is for uranium
X_z signifies the property is for zirconium

This calculation seeks the heat-up time, so Equation 6-2 is solved for t.

$$t = \frac{\Delta T}{\dot{q}} \times \left(\rho_u \times V_u \times c_{p,u} + \rho_z \times V_z \times c_{p,z}\right) \qquad \text{Equation 6-3}$$

The volume of uranium is given below.

$$V_u = \left(\pi \times \frac{D_p^{\,2}}{4}\right) N_{hr} \times L \qquad \text{Equation 6-4}$$

Where:

D_p is the diameter of the uranium pellet
N_{hr} is the number of heated rods
L is the heated length of the rods

The volumes of zirconium in the heated rods and in the guide tubes are given below. The length of the cladding and guide tubes that are heated is conservatively modeled as being the same as the heated length of uranium. The guide tubes and cladding are longer than the length of the uranium pellets.

$$V_{z,c} = \left(\pi \times \frac{D_{c,o}^{\ 2} - D_{c,i}^{\ 2}}{4} \right) N_{hr} \times L \qquad \text{Equation 6-5}$$

$$V_{z,g} = \left(\pi \times \frac{D_{g,o}^{\ 2} - D_{g,i}^{\ 2}}{4} \right) N_{gt} \times L \qquad \text{Equation 6-6}$$

$$V_z = V_{z,g} + V_{z,c} \qquad \text{Equation 6-7}$$

Where:

$V_{z,c}$ is the volume of zirconium in the cladding of heated tubes
$V_{z,g}$ is the volume of zirconium in the guide tubes
$D_{c,o}$ is the outer diameter of the cladding
$D_{c,i}$ is the inner diameter of the cladding
$D_{g,o}$ is the outer diameter of the guide tubes
$D_{g,i}$ is the inner diameter of the guide tubes
N_{gt} is the number of guide tubes

The temperature increase (ΔT) for this analysis is taken to be from the initial temperature of the pool, 90 °F (Assumption 5.4), to the zirconium cladding failure temperatures of interest, 1049 °F and 1652 °F (Input 4.1).

The heat-up time is calculated as a function of the decay time.

To avoid rounding, the Hottest Assembly column is recalculated in Attachment A based on the equations presented in Reference 2.5. Per Reference 2.5, the hottest assembly is calculated as:

$$Hottest\ \ Assembly = \left(\frac{Heat\ \ Load\ \ from\ \ Cycle\ \ 32\ \ Discharge\ \ Assemblies}{121} \right) \times 1.449$$

7. Results

The results are shown in Table 7-1 below (from Attachment B).

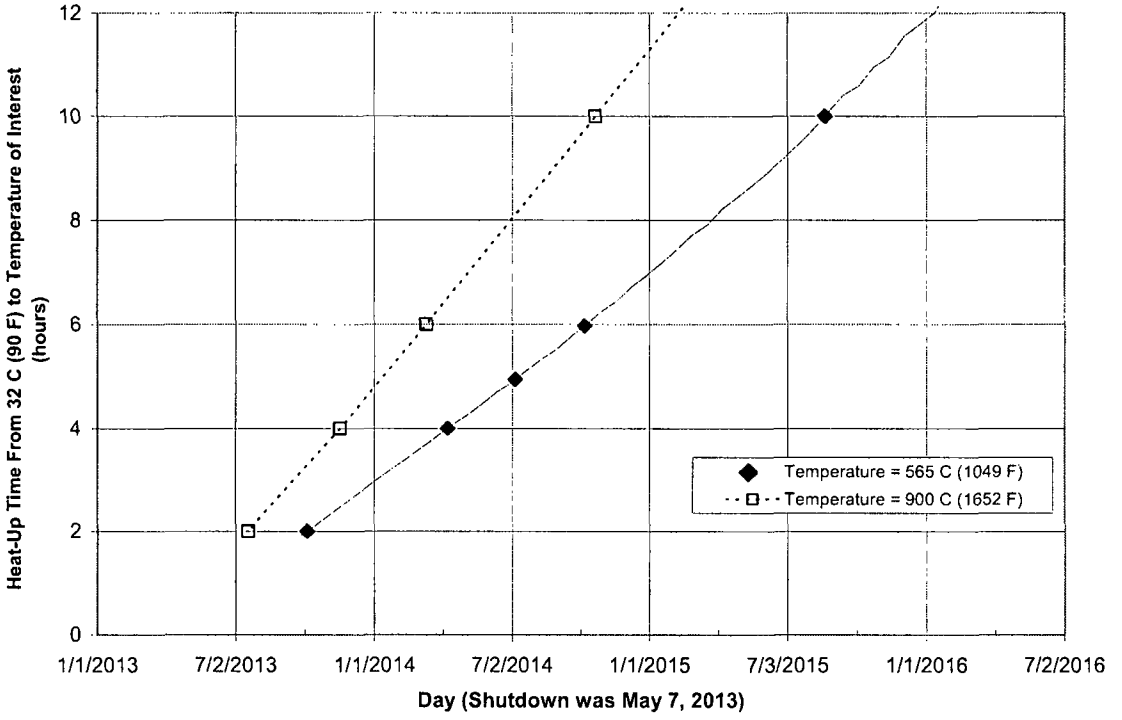
Table 7-1: Results

Date	End Temperature (°C, °F)	Decay Time (months)	Heat-Up Time (hours)
October 4th, 2013	565, 1049	~ 5	2.0
April 8th, 2014	565, 1049	~ 11	4.0
July 7th, 2014	565, 1049	14	4.9
October 7th, 2014	565, 1049	17	6.0
August 21st, 2015	565, 1049	~ 28	10.0
July 18th, 2013	900, 1652	~2	2.0
November 16th, 2013	900, 1652	~6	4.0
March 11th, 2014	900, 1652	~10	6.0
October 21st, 2014	900, 1652	~17	10.0

The 10 hour heat-up time to a temperature of 565 °C (1049 °F) occurs at a decay time of under 2.5 years, which is the expected decay time to a temperature of 900 °C (1652 °F) stated in SECY-99-168 (Ref. 2.4). The 10 hour heat-up time to a temperature of 900 °C (1652 °F) occurs at a decay time of roughly 1.5 years, which is less than the expected decay time calculated in NUREG-1738 (Ref. 2.7, pg. 2-3).

A plot showing the heat-up time to the temperatures of interest as a function of decay time is Figure 7-1.

Figure 7-1: Heat-Up Time vs. Decay Time



8. Conclusions and Recommendations

The Kewaunee results are more favorable than the analyses performed for SECY-99-168 (Ref. 2.4) and NUREG-1738 (Ref. 2.7). There are no acceptance criteria for this analysis. There are no specific recommendations for this analysis.

The primary input to this analysis is the heat generation rate, which is conservative. The heat generation rates were calculated using the computer program HEATUP. Per Reference 2.5, the results in HEATUP are conservative compared to ORIGEN models.

Attachment A: Heat Generation Rate vs. Decay Time (from Ref. 2.5)

Date	Time	Heat Load from Cycle 32 Discharge Assemblies Only (MBTU/hr)	Hottest Fuel Assembly Estimate (MBTU/hr)		Date (Reprinted)	Days since May 8, 2013	Recalculated Hottest Assembly (MBTU/hr)
5/8/2013	0:00	32.25	0.386		5/8/2013	0	0.3862
5/8/2013	8:00	28.23	0.338		5/8/2013	0.33	0.3381
5/8/2013	16:00	26.62	0.319		5/8/2013	0.67	0.3188
5/9/2013	0:00	25.39	0.304		5/9/2013	1	0.3041
5/9/2013	8:00	24.36	0.292		5/9/2013	1.33	0.2917
5/9/2013	16:00	23.45	0.281		5/9/2013	1.67	0.2808
5/10/2013	0:00	22.62	0.271		5/10/2013	2	0.2709
5/10/2013	8:00	21.86	0.262		5/10/2013	2.33	0.2618
5/10/2013	16:00	21.15	0.253		5/10/2013	2.67	0.2533
5/11/2013	0:00	20.5	0.246		5/11/2013	3	0.2455
5/11/2013	8:00	19.9	0.238		5/11/2013	3.33	0.2383
5/11/2013	16:00	19.33	0.232		5/11/2013	3.67	0.2315
5/12/2013	0:00	18.81	0.225		5/12/2013	4	0.2253
5/13/2013	0:00	17.44	0.209		5/13/2013	5	0.2088
5/14/2013	0:00	16.3	0.195		5/14/2013	6	0.1952
5/15/2013	0:00	15.34	0.184		5/15/2013	7	0.1837
5/16/2013	0:00	14.52	0.174		5/16/2013	8	0.1739
5/17/2013	0:00	13.81	0.165		5/17/2013	9	0.1654
5/18/2013	0:00	13.19	0.158		5/18/2013	10	0.1580
5/19/2013	0:00	12.65	0.151		5/19/2013	11	0.1515
5/20/2013	0:00	12.16	0.146		5/20/2013	12	0.1456
5/21/2013	0:00	11.73	0.140		5/21/2013	13	0.1405
5/22/2013	0:00	11.34	0.136		5/22/2013	14	0.1358
5/23/2013	0:00	10.99	0.132		5/23/2013	15	0.1316
5/24/2013	0:00	10.67	0.128		5/24/2013	16	0.1278
5/25/2013	0:00	10.38	0.124		5/25/2013	17	0.1243
5/26/2013	0:00	10.11	0.121		5/26/2013	18	0.1211
5/27/2013	0:00	9.87	0.118		5/27/2013	19	0.1182
5/28/2013	0:00	9.64	0.115		5/28/2013	20	0.1154
5/29/2013	0:00	9.43	0.113		5/29/2013	21	0.1129
5/30/2013	0:00	9.24	0.111		5/30/2013	22	0.1107
5/31/2013	0:00	9.06	0.108		5/31/2013	23	0.1085
6/1/2013	0:00	8.88	0.106		6/1/2013	24	0.1063
6/3/2013	0:00	8.57	0.103		6/3/2013	26	0.1026
6/5/2013	0:00	8.29	0.099		6/5/2013	28	0.0993
6/7/2013	0:00	8.04	0.096		6/7/2013	30	0.0963
6/9/2013	0:00	7.8	0.093		6/9/2013	32	0.0934
6/11/2013	0:00	7.59	0.091		6/11/2013	34	0.0909
6/13/2013	0:00	7.38	0.088		6/13/2013	36	0.0884
6/15/2013	0:00	7.19	0.086		6/15/2013	38	0.0861
6/17/2013	0:00	7.01	0.084		6/17/2013	40	0.0839
6/19/2013	0:00	6.84	0.082		6/19/2013	42	0.0819
6/21/2013	0:00	6.68	0.080		6/21/2013	44	0.0800
6/25/2013	0:00	6.38	0.076		6/25/2013	48	0.0764
6/29/2013	0:00	6.11	0.073		6/29/2013	52	0.0732
7/3/2013	0:00	5.86	0.070		7/3/2013	56	0.0702

Attachment A: Heat Generation Rate vs. Decay Time (from Ref. 2.5)

Date	Time	Heat Load from Cycle 32 Discharge Assemblies Only (MBTU/hr)	Hottest Fuel Assembly Estimate (MBTU/hr)		Date (Reprinted)	Days since May 8, 2013	Recalculated Hottest Assembly (MBTU/hr)
7/7/2013	0:00	5.64	0.068		7/7/2013	60	0.0675
7/11/2013	0:00	5.43	0.065		7/11/2013	64	0.0650
7/15/2013	0:00	5.24	0.063		7/15/2013	68	0.0628
7/19/2013	0:00	5.07	0.061		7/19/2013	72	0.0607
7/23/2013	0:00	4.91	0.059		7/23/2013	76	0.0588
7/27/2013	0:00	4.76	0.057		7/27/2013	80	0.0570
8/6/2013	0:00	4.42	0.053		8/6/2013	90	0.0529
8/16/2013	0:00	4.13	0.049		8/16/2013	100	0.0495
8/26/2013	0:00	3.88	0.046		8/26/2013	110	0.0465
9/5/2013	0:00	3.66	0.044		9/5/2013	120	0.0438
9/15/2013	0:00	3.46	0.041		9/15/2013	130	0.0414
9/25/2013	0:00	3.27	0.039		9/25/2013	140	0.0392
10/5/2013	0:00	3.11	0.037		10/5/2013	150	0.0372
10/15/2013	0:00	2.96	0.035		10/15/2013	160	0.0354
10/25/2013	0:00	2.82	0.034		10/25/2013	170	0.0338
11/4/2013	0:00	2.69	0.032		11/4/2013	180	0.0322
11/24/2013	0:00	2.46	0.030		11/24/2013	200	0.0295
12/14/2013	0:00	2.27	0.027		12/14/2013	220	0.0272
1/3/2014	0:00	2.1	0.025		1/3/2014	240	0.0251
1/23/2014	0:00	1.96	0.023		1/23/2014	260	0.0235
2/12/2014	0:00	1.84	0.022		2/12/2014	280	0.0220
3/4/2014	0:00	1.73	0.021		3/4/2014	300	0.0207
3/24/2014	0:00	1.63	0.020		3/24/2014	320	0.0195
4/13/2014	0:00	1.54	0.018		4/13/2014	340	0.0184
5/3/2014	0:00	1.47	0.018		5/3/2014	360	0.0176
5/23/2014	0:00	1.4	0.017		5/23/2014	380	0.0168
6/12/2014	0:00	1.33	0.016		6/12/2014	400	0.0159
7/2/2014	0:00	1.28	0.015		7/2/2014	420	0.0153
7/22/2014	0:00	1.22	0.015		7/22/2014	440	0.0146
8/11/2014	0:00	1.17	0.014		8/11/2014	460	0.0140
8/31/2014	0:00	1.13	0.013		8/31/2014	480	0.0135
9/20/2014	0:00	1.08	0.013		9/20/2014	500	0.0129
10/10/2014	0:00	1.04	0.012		10/10/2014	520	0.0125
10/30/2014	0:00	1	0.012		10/30/2014	540	0.0120
11/19/2014	0:00	0.97	0.012		11/19/2014	560	0.0116
12/9/2014	0:00	0.93	0.011		12/9/2014	580	0.0111
12/29/2014	0:00	0.9	0.011		12/29/2014	600	0.0108
1/18/2015	0:00	0.87	0.010		1/18/2015	620	0.0104
2/7/2015	0:00	0.84	0.010		2/7/2015	640	0.0101
2/27/2015	0:00	0.81	0.010		2/27/2015	660	0.0097
3/19/2015	0:00	0.79	0.009		3/19/2015	680	0.0095
4/8/2015	0:00	0.76	0.009		4/8/2015	700	0.0091
4/28/2015	0:00	0.74	0.009		4/28/2015	720	0.0089
5/18/2015	0:00	0.72	0.009		5/18/2015	740	0.0086
6/7/2015	0:00	0.7	0.008		6/7/2015	760	0.0084
6/27/2015	0:00	0.68	0.008		6/27/2015	780	0.0081

Attachment A: Heat Generation Rate vs. Decay Time (from Ref. 2.5)

Date	Time	Heat Load from Cycle 32 Discharge Assemblies Only (MBTU/hr)	Hottest Fuel Assembly Estimate (MBTU/hr)		Date (Reprinted)	Days since May 8, 2013	Recalculated Hottest Assembly (MBTU/hr)
7/17/2015	0:00	0.66	0.008		7/17/2015	800	0.0079
8/6/2015	0:00	0.64	0.008		8/6/2015	820	0.0077
8/26/2015	0:00	0.62	0.007		8/26/2015	840	0.0074
9/15/2015	0:00	0.6	0.007		9/15/2015	860	0.0072
10/5/2015	0:00	0.59	0.007		10/5/2015	880	0.0071
10/25/2015	0:00	0.57	0.007		10/25/2015	900	0.0068
11/14/2015	0:00	0.56	0.007		11/14/2015	920	0.0067
12/4/2015	0:00	0.54	0.007		12/4/2015	940	0.0065
12/24/2015	0:00	0.53	0.006		12/24/2015	960	0.0063
1/13/2016	0:00	0.52	0.006		1/13/2016	980	0.0062
2/2/2016	0:00	0.5	0.006		2/2/2016	1000	0.0060
2/22/2016	0:00	0.49	0.006		2/22/2016	1020	0.0059
3/13/2016	0:00	0.48	0.006		3/13/2016	1040	0.0057
4/2/2016	0:00	0.47	0.006		4/2/2016	1060	0.0056
4/22/2016	0:00	0.46	0.005		4/22/2016	1080	0.0055

Attachment A: Heat Generation Rate vs. Decay Time (from Ref. 2.5)

Date	Time	Heat Load from Cycle 32 Discharge Assemblies Only (MBTU/hr)	Hottest Fuel Assembly Estimate (MBTU/hr)		Date (Reprinted)	Days since May 8, 2013	Recalculated Hottest Assembly (MBTU/hr)
41402	0	32.25	0.386		=A3+B3	=0	=(C3/121)*1.449
41402	0.33333333	28.23	0.338		=A4+B4	=F4-F$3	=(C4/121)*1.449
41402	0.66666666	26.62	0.319		=A5+B5	=F5-F$3	=(C5/121)*1.449
41403	0	25.39	0.304		=A6+B6	=F6-F$3	=(C6/121)*1.449
41403	0.33333333	24.36	0.292		=A7+B7	=F7-F$3	=(C7/121)*1.449
41403	0.66666666	23.45	0.281		=A8+B8	=F8-F$3	=(C8/121)*1.449
41404	0	22.62	0.271		=A9+B9	=F9-F$3	=(C9/121)*1.449
41404	0.33333333	21.86	0.262		=A10+B10	=F10-F$3	=(C10/121)*1.449
41404	0.66666666	21.15	0.253		=A11+B11	=F11-F$3	=(C11/121)*1.449
41405	0	20.5	0.246		=A12+B12	=F12-F$3	=(C12/121)*1.449
41405	0.33333333	19.9	0.238		=A13+B13	=F13-F$3	=(C13/121)*1.449
41405	0.66666666	19.33	0.232		=A14+B14	=F14-F$3	=(C14/121)*1.449
41406	0	18.81	0.225		=A15+B15	=F15-F$3	=(C15/121)*1.449
41407	0	17.44	0.209		=A16+B16	=F16-F$3	=(C16/121)*1.449
41408	0	16.3	0.195		=A17+B17	=F17-F$3	=(C17/121)*1.449
41409	0	15.34	0.184		=A18+B18	=F18-F$3	=(C18/121)*1.449
41410	0	14.52	0.174		=A19+B19	=F19-F$3	=(C19/121)*1.449
41411	0	13.81	0.165		=A20+B20	=F20-F$3	=(C20/121)*1.449
41412	0	13.19	0.158		=A21+B21	=F21-F$3	=(C21/121)*1.449
41413	0	12.65	0.151		=A22+B22	=F22-F$3	=(C22/121)*1.449
41414	0	12.16	0.146		=A23+B23	=F23-F$3	=(C23/121)*1.449
41415	0	11.73	0.14		=A24+B24	=F24-F$3	=(C24/121)*1.449
41416	0	11.34	0.136		=A25+B25	=F25-F$3	=(C25/121)*1.449
41417	0	10.99	0.132		=A26+B26	=F26-F$3	=(C26/121)*1.449
41418	0	10.67	0.128		=A27+B27	=F27-F$3	=(C27/121)*1.449
41419	0	10.38	0.124		=A28+B28	=F28-F$3	=(C28/121)*1.449
41420	0	10.11	0.121		=A29+B29	=F29-F$3	=(C29/121)*1.449
41421	0	9.87	0.118		=A30+B30	=F30-F$3	=(C30/121)*1.449
41422	0	9.64	0.115		=A31+B31	=F31-F$3	=(C31/121)*1.449
41423	0	9.43	0.113		=A32+B32	=F32-F$3	=(C32/121)*1.449
41424	0	9.24	0.111		=A33+B33	=F33-F$3	=(C33/121)*1.449
41425	0	9.06	0.108		=A34+B34	=F34-F$3	=(C34/121)*1.449
41426	0	8.88	0.106		=A35+B35	=F35-F$3	=(C35/121)*1.449
41428	0	8.57	0.103		=A36+B36	=F36-F$3	=(C36/121)*1.449
41430	0	8.29	0.099		=A37+B37	=F37-F$3	=(C37/121)*1.449
41432	0	8.04	0.096		=A38+B38	=F38-F$3	=(C38/121)*1.449
41434	0	7.8	0.093		=A39+B39	=F39-F$3	=(C39/121)*1.449
41436	0	7.59	0.091		=A40+B40	=F40-F$3	=(C40/121)*1.449
41438	0	7.38	0.088		=A41+B41	=F41-F$3	=(C41/121)*1.449
41440	0	7.19	0.086		=A42+B42	=F42-F$3	=(C42/121)*1.449
41442	0	7.01	0.084		=A43+B43	=F43-F$3	=(C43/121)*1.449
41444	0	6.84	0.082		=A44+B44	=F44-F$3	=(C44/121)*1.449
41446	0	6.68	0.08		=A45+B45	=F45-F$3	=(C45/121)*1.449
41450	0	6.38	0.076		=A46+B46	=F46-F$3	=(C46/121)*1.449
41454	0	6.11	0.073		=A47+B47	=F47-F$3	=(C47/121)*1.449
41458	0	5.86	0.07		=A48+B48	=F48-F$3	=(C48/121)*1.449
41462	0	5.64	0.068		=A49+B49	=F49-F$3	=(C49/121)*1.449
41466	0	5.43	0.065		=A50+B50	=F50-F$3	=(C50/121)*1.449

Attachment A: Heat Generation Rate vs. Decay Time (from Ref. 2.5)

Date	Time	Heat Load from Cycle 32 Discharge Assemblies Only (MBTU/hr)	Hottest Fuel Assembly Estimate (MBTU/hr)		Date (Reprinted)	Days since May 8, 2013	Recalculated Hottest Assembly (MBTU/hr)
41470	0	5.24	0.063		=A51+B51	=F51-F$3	=(C51/121)*1.449
41474	0	5.07	0.061		=A52+B52	=F52-F$3	=(C52/121)*1.449
41478	0	4.91	0.059		=A53+B53	=F53-F$3	=(C53/121)*1.449
41482	0	4.76	0.057		=A54+B54	=F54-F$3	=(C54/121)*1.449
41492	0	4.42	0.053		=A55+B55	=F55-F$3	=(C55/121)*1.449
41502	0	4.13	0.049		=A56+B56	=F56-F$3	=(C56/121)*1.449
41512	0	3.88	0.046		=A57+B57	=F57-F$3	=(C57/121)*1.449
41522	0	3.66	0.044		=A58+B58	=F58-F$3	=(C58/121)*1.449
41532	0	3.46	0.041		=A59+B59	=F59-F$3	=(C59/121)*1.449
41542	0	3.27	0.039		=A60+B60	=F60-F$3	=(C60/121)*1.449
41552	0	3.11	0.037		=A61+B61	=F61-F$3	=(C61/121)*1.449
41562	0	2.96	0.035		=A62+B62	=F62-F$3	=(C62/121)*1.449
41572	0	2.82	0.034		=A63+B63	=F63-F$3	=(C63/121)*1.449
41582	0	2.69	0.032		=A64+B64	=F64-F$3	=(C64/121)*1.449
41602	0	2.46	0.03		=A65+B65	=F65-F$3	=(C65/121)*1.449
41622	0	2.27	0.027		=A66+B66	=F66-F$3	=(C66/121)*1.449
41642	0	2.1	0.025		=A67+B67	=F67-F$3	=(C67/121)*1.449
41662	0	1.96	0.023		=A68+B68	=F68-F$3	=(C68/121)*1.449
41682	0	1.84	0.022		=A69+B69	=F69-F$3	=(C69/121)*1.449
41702	0	1.73	0.021		=A70+B70	=F70-F$3	=(C70/121)*1.449
41722	0	1.63	0.02		=A71+B71	=F71-F$3	=(C71/121)*1.449
41742	0	1.54	0.018		=A72+B72	=F72-F$3	=(C72/121)*1.449
41762	0	1.47	0.018		=A73+B73	=F73-F$3	=(C73/121)*1.449
41782	0	1.4	0.017		=A74+B74	=F74-F$3	=(C74/121)*1.449
41802	0	1.33	0.016		=A75+B75	=F75-F$3	=(C75/121)*1.449
41822	0	1.28	0.015		=A76+B76	=F76-F$3	=(C76/121)*1.449
41842	0	1.22	0.015		=A77+B77	=F77-F$3	=(C77/121)*1.449
41862	0	1.17	0.014		=A78+B78	=F78-F$3	=(C78/121)*1.449
41882	0	1.13	0.013		=A79+B79	=F79-F$3	=(C79/121)*1.449
41902	0	1.08	0.013		=A80+B80	=F80-F$3	=(C80/121)*1.449
41922	0	1.04	0.012		=A81+B81	=F81-F$3	=(C81/121)*1.449
41942	0	1	0.012		=A82+B82	=F82-F$3	=(C82/121)*1.449
41962	0	0.97	0.012		=A83+B83	=F83-F$3	=(C83/121)*1.449
41982	0	0.93	0.011		=A84+B84	=F84-F$3	=(C84/121)*1.449
42002	0	0.9	0.011		=A85+B85	=F85-F$3	=(C85/121)*1.449
42022	0	0.87	0.01		=A86+B86	=F86-F$3	=(C86/121)*1.449
42042	0	0.84	0.01		=A87+B87	=F87-F$3	=(C87/121)*1.449
42062	0	0.81	0.01		=A88+B88	=F88-F$3	=(C88/121)*1.449
42082	0	0.79	0.009		=A89+B89	=F89-F$3	=(C89/121)*1.449
42102	0	0.76	0.009		=A90+B90	=F90-F$3	=(C90/121)*1.449
42122	0	0.74	0.009		=A91+B91	=F91-F$3	=(C91/121)*1.449
42142	0	0.72	0.009		=A92+B92	=F92-F$3	=(C92/121)*1.449
42162	0	0.7	0.008		=A93+B93	=F93-F$3	=(C93/121)*1.449
42182	0	0.68	0.008		=A94+B94	=F94-F$3	=(C94/121)*1.449
42202	0	0.66	0.008		=A95+B95	=F95-F$3	=(C95/121)*1.449
42222	0	0.64	0.008		=A96+B96	=F96-F$3	=(C96/121)*1.449
42242	0	0.62	0.007		=A97+B97	=F97-F$3	=(C97/121)*1.449
42262	0	0.6	0.007		=A98+B98	=F98-F$3	=(C98/121)*1.449

Attachment A: Heat Generation Rate vs. Decay Time (from Ref. 2.5)

Date	Time	Heat Load from Cycle 32 Discharge Assemblies Only (MBTU/hr)	Hottest Fuel Assembly Estimate (MBTU/hr)		Date (Reprinted)	Days since May 8, 2013	Recalculated Hottest Assembly (MBTU/hr)
42282	0	0.59	0.007		=A99+B99	=F99-F$3	=(C99/121)*1.449
42302	0	0.57	0.007		=A100+B100	=F100-F$3	=(C100/121)*1.449
42322	0	0.56	0.007		=A101+B101	=F101-F$3	=(C101/121)*1.449
42342	0	0.54	0.007		=A102+B102	=F102-F$3	=(C102/121)*1.449
42362	0	0.53	0.006		=A103+B103	=F103-F$3	=(C103/121)*1.449
42382	0	0.52	0.006		=A104+B104	=F104-F$3	=(C104/121)*1.449
42402	0	0.5	0.006		=A105+B105	=F105-F$3	=(C105/121)*1.449
42422	0	0.49	0.006		=A106+B106	=F106-F$3	=(C106/121)*1.449
42442	0	0.48	0.006		=A107+B107	=F107-F$3	=(C107/121)*1.449
42462	0	0.47	0.006		=A108+B108	=F108-F$3	=(C108/121)*1.449
42482	0	0.46	0.005		=A109+B109	=F109-F$3	=(C109/121)*1.449

Attachment B: Analysis

Specific Heat of Uranium	146	J/kg-K	Input 4.3
Specific Heat of Uranium	0.035	BTU/lb-F	Conversion
Specific Heat of Zirconium	322	J/kg-K	Input 4.2
Specific Heat of Zirconium	0.077	BTU/lb-F	Conversion
Diameter of Fuel Uranium	0.3659	inches	Input 4.4
Inner Diameter of Zirconium	0.3734	inches	Input 4.4
Outer Diameter of Zirconium	0.422	inches	Input 4.4
Heated Rods per Assem	179	Rods	Input 4.4
Unheated Rods (Guide or Instrument Tubes)	17	Tubes	Input 4.4
ID of Guide Tubes	0.492	inches	Input 4.4
OD of Guide Tubes	0.526	inches	Input 4.4
Density of Uranium	19,070	kg/m^3	Input 4.3
Theoretical Density	96.56%		Input 4.4
Density of Uranium	1149.5	lb/ft^3	Conversion
Density of Zirconium	6570	kg/m^3	Input 4.2
Density of Zirconium	410.2	lb/ft^3	Conversion
Heated Length of Uranium	11.9375	feet	Input 4.4
Initial Temperature	90	F	Assumption 5.4
Final Temperature	1049	F	Input 4.1
Total temperature Increase	959	F	Initial Minus Final
Volume of Uranium	1.560	ft^3	Equation 6-4
Volume of Zirconium in a Heated Rod	0.451	ft^3	Equation 6-5
Volume of Zirconium in a Guide Tube	0.038	ft^3	Equation 6-6
Total Volume of Zirconium	0.489	ft^3	Equation 6-7
Assem Heat Generation at 14 Months	0.01515	MBTU/hr	Interpolated from Att. A
Time to Failure	4.94	hrs	Equation 6-3
Assem Heat Generation at 17 Months	0.01253	MBTU/hr	Interpolated from Att. A
Time to Failure	5.97	hrs	Equation 6-3
Heat Generation that Gives 2 Hour Heat-Up	0.03739	MBTU/hr	Iterated
Time to Failure	2.00	hrs	Equation 6-3
Date of Associated Heat Generation	10/4/2013		Interpolated from Att. A
Heat Generation that Gives 4 Hour Heat-Up	0.01869	MBTU/hr	Iterated
Time to Failure	4.00	hrs	Equation 6-3
Date of Associated Heat Generation	4/8/2014		Interpolated from Att. A
Heat Generation that Gives 10 Hour Heat-Up	0.00748	MBTU/hr	Iterated
Time to Failure	10.00	hrs	Equation 6-3
Date of Associated Heat Generation	8/21/2015		Interpolated from Att. A
NUREG-1783 Maximum Temperature (900 C)	1652	F	Input 4.1
Temperature Increase	1562	F	Initial Minus Final
Heat Generation that Gives 10 Hour Heat-Up	0.01218	MBTU/hr	Iterated
Time to Failure	10.00	hrs	Equation 6-3
Date of Associated Heat Generation	10/21/2014		Interpolated from Att. A
Heat Generation that Gives 6 Hour Heat-Up	0.02030	MBTU/hr	Iterated
Time to Failure	6.00	hrs	Equation 6-3
Date of Associated Heat Generation	3/11/2014		Interpolated from Att. A
Heat Generation that Gives 4 Hour Heat-Up	0.03045	MBTU/hr	Iterated
Time to Failure	4.00	hrs	Equation 6-3
Date of Associated Heat Generation	11/16/2013		Interpolated from Att. A
Heat Generation that Gives 2 Hour Heat-Up	0.06089	MBTU/hr	Iterated
Time to Failure	2.00	hrs	Equation 6-3
Date of Associated Heat Generation	7/18/2013		Interpolated from Att. A

	A	B	C	D	E	F
1	**Attachment B: Analysis**					
2						
3	Specific Heat of Uranium	146	J/kg-K	Input 4.3		
4	Specific Heat of Uranium	=B3*0.0009478/2.20462/(9/5)	BTU/lb-F	Conversion		
5	Specific Heat of Zirconium	322	J/kg-K	Input 4.2		
6	Specific Heat of Zirconium	=B5*0.0009478/2.20462/(9/5)	BTU/lb-F	Conversion		
7	Diameter of Fuel Uranium	0.3659	inches	Input 4.4		
8	Inner Diameter of Zirconium	0.3734	inches	Input 4.4		
9	Outer Diameter of Zirconium	0.422	inches	Input 4.4		
10	Heated Rods per Assem	179	Rods	Input 4.4		
11	Unheated Rods (Guide or Instrument Tubes)	17	Tubes	Input 4.4		
12	ID of Guide Tubes	0.492	inches	Input 4.4		
13	OD of Guide Tubes	0.526	inches	Input 4.4		
14	Density of Uranium	19070	kg/m^3	Input 4.3		
15	Theoretical Density	0.9656		Input 4.4		
16	Density of Uranium	=B14*2.20462/3.28084^3*B15	lb/ft^3	Conversion		
17	Density of Zirconium	6570	kg/m^3	Input 4.2		
18	Density of Zirconium	=B17*2.20462/3.28084^3	lb/ft^3	Conversion		
19	Heated Length of Uranium	=143.25/12	feet	Input 4.4		
20	Initial Temperature	90	F	Assumption 5.4		
21	Final Temperature	1049	F	Input 4.1		
22	Total temperature Increase	=B21-B20	F	Initial Minus Final		
23						
24	Volume of Uranium	=PI()*B7^2/4*B19/144*B10	ft^3	Equation 6-4		
25	Volume of Zirconium in a Heated Rod	=PI()*(B9^2-B8^2)/4*B19/144*B10	ft^3	Equation 6-5		
26	Volume of Zirconium in a Guide Tube	=PI()*(B13^2-B12^2)/4*B19/144*B11	ft^3	Equation 6-6		
27	Total Volume of Zirconium	=B25+B26	ft^3	Equation 6-7		
28						
29	Assem Heat Generation at 14 Months	='Attachment A'!H76-(5/20)*('Attachment A'!H76-'Attachment A'!H77)	MBTU/hr	Interpolated from Att. A		
30	Time to Failure	=$B$22/(B29*10^6)*($B$16*$B$24*$B$4+$B$18*$B$27*$B$6)	hrs	Equation 6-3		
31						
32	Assem Heat Generation at 17 Months	='Attachment A'!H80-(17/20)*('Attachment A'!H80-'Attachment A'!H81)	MBTU/hr	Interpolated from Att. A		
33	Time to Failure	=$B$22/(B32*10^6)*($B$16*$B$24*$B$4+$B$18*$B$27*$B$6)	hrs	Equation 6-3		
34						
35	Heat Generation that Gives 2 Hour Heat-Up	0.0373850764604915	MBTU/hr	Iterated		
36	Time to Failure	=$B$22/(B35*10^6)*($B$16*$B$24*$B$4+$B$18*$B$27*$B$6)	hrs	Equation 6-3		
37	Date of Associated Heat Generation	='Attachment A'!F60+('Attachment A'!H60-B35)/('Attachment A'!H60-'Attachment A'!H61)*10		Interpolated from Att. A		
38						
39	Heat Generation that Gives 4 Hour Heat-Up	0.0186925354210505	MBTU/hr	Iterated		
40	Time to Failure	=$B$22/(B39*10^6)*($B$16*$B$24*$B$4+$B$18*$B$27*$B$6)	hrs	Equation 6-3		
41	Date of Associated Heat Generation	='Attachment A'!F71+('Attachment A'!H71-B39)/('Attachment A'!H71-'Attachment A'!H72)*20		Interpolated from Att. A		
42						
43	Heat Generation that Gives 10 Hour Heat-Up	0.00747701366999636	MBTU/hr	Iterated		
44	Time to Failure	=$B$22/(B43*10^6)*($B$16*$B$24*$B$4+$B$18*$B$27*$B$6)	hrs	Equation 6-3		
45	Date of Associated Heat Generation	='Attachment A'!F96+('Attachment A'!H96-B43)/('Attachment A'!H96-'Attachment A'!H97)*20		Interpolated from Att. A		
46						
47	NUREG-1783 Maximum Temperature (900 C)	1652	F	Input 4.1		
48	Temperature Increase	=B47-B20	F	Initial Minus Final		
49	Heat Generation that Gives 10 Hour Heat-Up	0.0121784105537324	MBTU/hr	Iterated		
50	Time to Failure	=$B$48/(B49*10^6)*($B$16*$B$24*$B$4+$B$18*$B$27*$B$6)	hrs	Equation 6-3		
51	Date of Associated Heat Generation	='Attachment A'!F81+('Attachment A'!H81-B49)/('Attachment A'!H81-'Attachment A'!H82)*20		Interpolated from Att. A		
52						
53	Heat Generation that Gives 6 Hour Heat-Up	0.0202973514135572	MBTU/hr	Iterated		
54	Time to Failure	=$B$48/(B53*10^6)*($B$16*$B$24*$B$4+$B$18*$B$27*$B$6)	hrs	Equation 6-3		
55	Date of Associated Heat Generation	='Attachment A'!F70+('Attachment A'!H70-B53)/('Attachment A'!H70-'Attachment A'!H71)*20		Interpolated from Att. A		
56						
57	Heat Generation that Gives 4 Hour Heat-Up	0.0304460281462153	MBTU/hr	Iterated		
58	Time to Failure	=$B$48/(B57*10^6)*($B$16*$B$24*$B$4+$B$18*$B$27*$B$6)	hrs	Equation 6-3		
59	Date of Associated Heat Generation	='Attachment A'!F64+('Attachment A'!H64-B57)/('Attachment A'!H64-'Attachment A'!H65)*20		Interpolated from Att. A		
60						
61	Heat Generation that Gives 2 Hour Heat-Up	0.0608920616935551	MBTU/hr	Iterated		
62	Time to Failure	=$B$48/(B61*10^6)*($B$16*$B$24*$B$4+$B$18*$B$27*$B$6)	hrs	Equation 6-3		
63	Date of Associated Heat Generation	='Attachment A'!F51+('Attachment A'!H51-B61)/('Attachment A'!H51-'Attachment A'!H52)*4		Interpolated from Att. A		

FW: sfp temp today
Michael S Lico (Generation - 6)
07/22/2013 11:28 AM
To:
'MATTHEW.M.ROSS@Sargentlundy.com'
Show Details

Max,

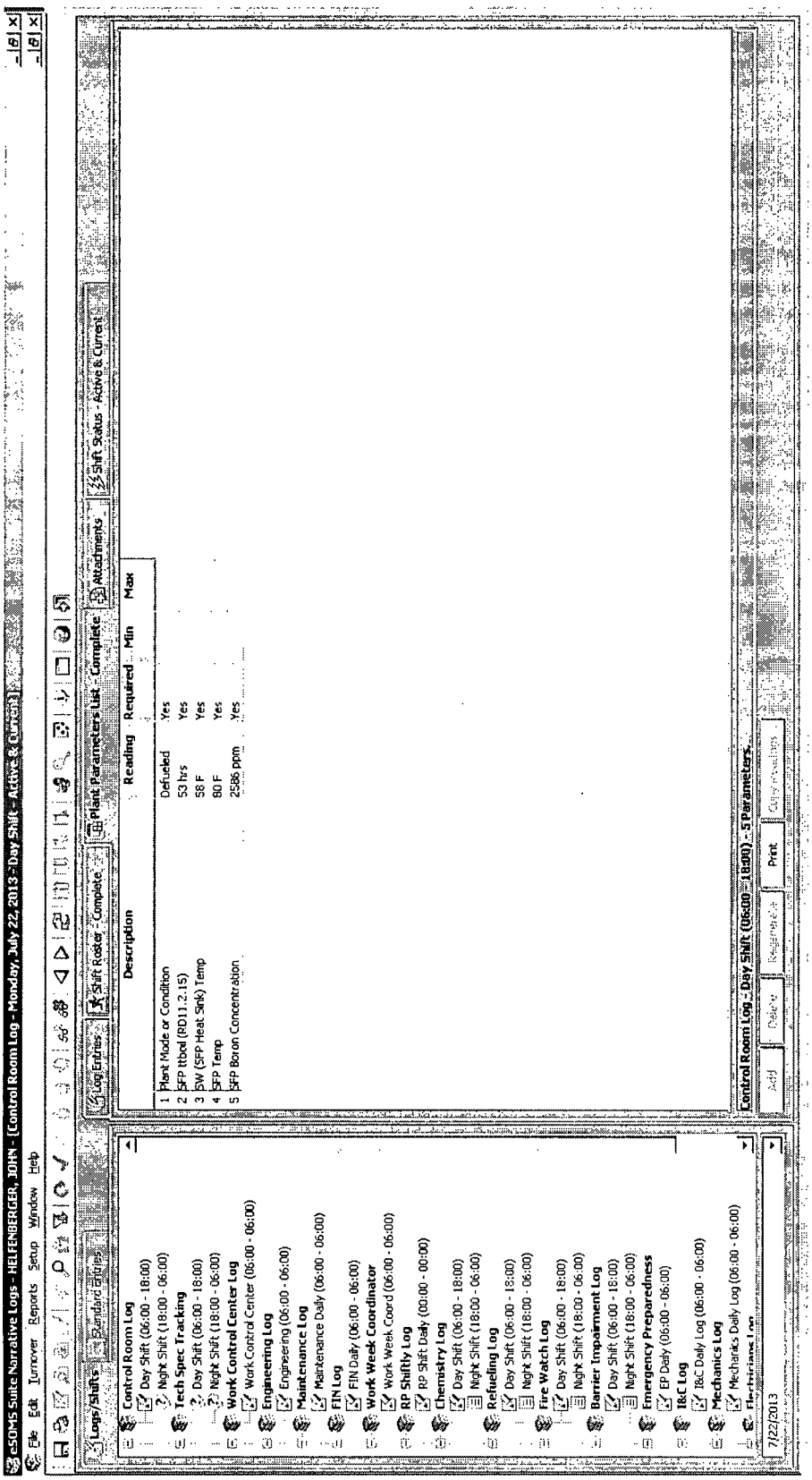
The attached printout from the KPS Plant Parameters List shows the present SFP temperature to be 80^0F. Clearly, the temperature will only continue to drop as the SFP heat load decreases. Thanks.

Mike Lico

From: John F Helfenberger (Generation - 4)
Sent: Monday, July 22, 2013 9:18 AM
To: Michael S Lico (Generation - 6)
Subject: sfp temp today

FYI.

John F. Helfenberger,
Lead Reactor Engineer,
Kewaunee Power Station
bus. 920.388.8294
Dominion Tie-line - 8.691.8294
pag. 920.704.4471


eSOMS Suite Narrative Logs - HELFENBERGER, JOHN - [Control Room Log - Monday, July 22, 2013 - Day Shift - Active & Current]
File Edit Turnover Reports Setup Window Help
Logs/Shifts
Standard Groups
Control Room Log
Day Shift (06:00 - 18:00)
Night Shift (18:00 - 06:00)
Tech Spec Tracking
Day Shift (06:00 - 18:00)
Night Shift (18:00 - 06:00)
Work Control Center Log
Work Control Center (06:00 - 06:00)
Engineering Log
Engineering (06:00 - 06:00)
Maintenance Log
Maintenance Daily (06:00 - 06:00)
FIN Log
FIN Daily (06:00 - 06:00)
Work Week Coordinator
Work Week Coord (06:00 - 06:00)
RP Shiftly Log
RP Shift Daily (00:00 - 00:00)
Chemistry Log
Day Shift (06:00 - 18:00)
Night Shift (18:00 - 06:00)
Refueling Log
Day Shift (06:00 - 18:00)
Night Shift (18:00 - 06:00)
Fire Watch Log
Day Shift (06:00 - 18:00)
Night Shift (18:00 - 06:00)
Barrier Impairment Log
Day Shift (06:00 - 18:00)
Night Shift (18:00 - 06:00)
Emergency Preparedness
EP Daily (06:00 - 06:00)
I&C Log
I&C Daily Log (06:00 - 06:00)
Mechanics Log
Mechanics Daily Log (06:00 - 06:00)
Electricians Log
7/22/2013
Log Entries
Shift Roster - Complete
Plant Parameters List - Complete
Attachments
Shift Status - Active & Current
Description
Reading
Required
Min
Max
1 Plant Mode or Condition
Defueled
Yes
2 SFP ttbol (RD11.2.15)
53 hrs
Yes
3 SW (SFP Heat Sink) Temp
58 F
Yes
4 SFP Temp
80 F
Yes
5 SFP Boron Concentration
2586 ppm
Yes
Control Room Log - Day Shift (06:00 - 18:00) - 5 Parameters
Add
Delete
Print