



Attachments:

1. Supplemental Responses to RAIs B2.1.31-3a, B2.1.31-4a, and B2.1.31-5a.

References:

1. Letter from D. A. Christian (DEK) to NRC, "Kewaunee Power Station Application for Renewed Operating License," dated August 12, 2008. [ADAMS Accession No. ML082341020]
2. Letter from J. Alan Price (DEK) to NRC, "Response to Request for Additional Information for the Review of the Kewaunee Power Station License Renewal Application," dated December 28, 2009. [ADAMS Accession No. ML100110061]

Commitments made in this letter:

1. License Renewal Commitment 44 will be added to LRA Table A6.0-1 consistent with the supplemental response to RAI B2.1.31-3a. The new commitment is proposed to support approval of the renewed operating license, and may change during the NRC review period.
2. License Renewal Commitment 45 will be added to LRA Table A6.0-1 consistent with the supplemental response to RAI B2.1.31-3a. The new commitment is proposed to support approval of the renewed operating license, and may change during the NRC review period.
3. License Renewal Commitment 46 will be added to LRA Table A6.0-1 consistent with the supplemental response to RAI B2.1.31-4a. The new commitment is proposed to support approval of the renewed operating license, and may change during the NRC review period.
4. License Renewal Commitment 34 in LRA Table A6.0-1 will be revised consistent with the supplemental response to RAI B2.1.31-5a. The revised commitment is proposed to support approval of the renewed operating license and may change during the NRC review period.

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**ATTACHMENT 1**

**SUPPLEMENTAL RESPONSES TO RAIs B2.1.31-3a, B2.1.31-4a, AND B2.1.31-5a**

**KEWAUNEE POWER STATION  
DOMINION ENERGY KEWAUNEE, INC.**

## **RAI B2.1.31-3a Supplemental Question**

### Groundwater Quality

*The below-grade concrete at KPS has been exposed to chloride content above the GALL Report limit of 500 ppm, which means it has encountered an aggressive groundwater environment as defined in GALL (any of the following: pH < 5.5, or chlorides > 500 ppm, or sulfates > 1500 ppm). The probable cause of this is stated to be the use of salt for deicing, which began sometime between 1992 and 2000. Although applicant states a new deicer will be used in the future, the staff needs assurance that the past exposure to an aggressive environment has not degraded the concrete. The staff is looking for some sort of test or inspection that will provide assurance that the concrete is not degraded. The staff would also like to know what actions will be taken in the future the chloride content in the groundwater does not drop below acceptable limits.*

## **DEK Supplemental Response to RAI B2.1.31-3a:**

### Test or Inspection

Based on the information provided in the response to RAI B2.1.31-3a in DEK letter 09-760 dated December 28, 2009 [ADAMS ML100110061], the marginally elevated groundwater chloride content is not expected to cause degradation of in-scope reinforced concrete structures. However, to address NRC staff concerns, core samples will be obtained and tested prior to the period of extended operation. The core samples will be taken from the inside surface of a concrete wall (below the groundwater table elevation) or from the foundation basemat in the vicinity of the groundwater wells for which average sampling results have exceeded the chloride concentration limit of 500 ppm. The concrete core samples will be tested to determine if the chloride content within the concrete could cause degradation due to corrosion of reinforcing steel.

The following commitment will be added to LRA Appendix A, USAR Supplement, Table A6.0-1:

Item	Commitment	Source	Schedule
44	Core samples will be obtained from the inside surface of a concrete wall (below the groundwater table elevation) or from the foundation basemat in the vicinity of the groundwater wells for which average sampling results have exceeded the chloride concentration limit of 500 ppm. The concrete core samples will be tested to determine if the chloride content within the concrete could cause degradation due to corrosion of reinforcing steel.	Letter 10-093 Supplemental Response to RAI B2.1.31-3a	Prior to the Period of Extended Operation

Future Actions if Groundwater Chloride Content Does Not Decrease to <500 ppm

If the chloride content in the groundwater does not decrease to below 500 ppm within the first ten years of the period of extended operation, then additional core samples will be obtained and tested. The concrete core samples will be tested to determine if the chloride content within the concrete could cause degradation due to corrosion of reinforcing steel.

The following commitment will be added to LRA Appendix A, USAR Supplement, Table A6.0-1:

Item	Commitment	Source	Schedule
45	In the event that the chloride content in the groundwater does not decrease to below 500 ppm within the first ten years of the period of extended operation, core samples will be obtained from the inside surface of a concrete wall (below the groundwater table elevation) or from the foundation basemat in the vicinity of a groundwater well for which average sampling results have exceeded the chloride concentration limit of 500 ppm. The concrete core samples will be tested to determine if the chloride content within the concrete could cause degradation due to corrosion of reinforcing steel.	Letter 10-093 Supplemental Response to RAI B2.1.31-3a	Prior to the end of the first ten years of extended operation

## **RAI B2.1.31-4a Supplemental Question**

### Reactor Refueling Cavity Leakage

- *The staff would like the applicant's plan (Commitment 33) to be submitted as part of the license renewal process, thus being a part of the current license renewal review. There are examples of such plans from recent license renewals of other facilities.*
- *The staff would like to see wording added (to an existing Commitment or as a new Commitment) that says a core will be taken in the refueling cavity if the spent fuel pool core indicates degradation.*

## **DEK Supplemental Response to RAI B2.1.31-4a:**

### First Bulleted Item

As described in response to RAI B2.1.31-4a in DEK letter 09-760 dated December 28, 2009 [ADAMS ML100110061], there are two indications of potential reactor refueling cavity liner leakage within the containment. These locations are identified as leakage indication sites #2 and #3 and are located below the elevation of the refueling cavity floor, but well above the elevation of the containment basement. As further described in the response to RAI B2.1.31-4a, the leakage indications at these sites consist of localized staining and streaking on the concrete surface near construction joints, with limited moisture or residue present. The leakage is minor with no quantifiable leakage rate. There is no water dripping or running at these locations. As such, there is insufficient moisture present to obtain a liquid sample for chemical analysis.

These leakage indications are not long standing issues at Kewaunee (one was identified in 2006 and the other in 2008). Leakage indications at these sites have been documented in the Corrective Action Program and the conditions have been evaluated by Engineering. Based on the localized and minor nature of the leakage indications, the effect on the integrity of the structure surrounding the refueling cavity was determined to be insignificant.

As stated in the response to RAI B2.1.31-4a, new License Renewal Commitment 33 has been initiated to develop a plan for identification and remediation of refueling cavity liner leakage.

An outline of the plan is provided below:

## Refueling Cavity Liner Leakage Remediation Plan Outline

The elements of the plan to identify and remediate reactor refueling cavity liner leakage are:

1. Continued Inspections of Leakage Indication Sites
  - a. The previously identified leakage indication sites associated with refueling cavity liner leakage will continue to be visually inspected during each refueling outage in accordance with the inspection criteria of the Structures Monitoring Program.
  - b. The results of the visual inspections will be documented and trended to identify changes in leakage rate and any signs of structural degradation.
  - c. Visual inspections will continue during the period of extended operation until liner leakage has been eliminated.
2. Multi-Discipline Team
  - a. A multi-discipline team will be formed, consisting of technical representatives and a management sponsor, to pursue identification of refueling cavity liner leakage and necessary corrective actions.
  - b. The teams objectives will include:
    - 1) Review Kewaunee history of refueling cavity liner leakage and associated corrective actions.
    - 2) Benchmark the industry related to cavity liner leakage issues through a review of operating experience and interface with industry peers.
    - 3) Review refueling cavity design and construction details to determine potential leak sites.
    - 4) Develop recommendations for inspection, testing, and repairs to remediate liner leakage. Potential actions include: (1) performance of surface and visual examinations of liner welds and penetration points, including vacuum box testing or other applicable techniques; and (2) determination of appropriate and effective repair and prevention methods such as weld repairs, sealant application, and operating and maintenance procedure enhancements.
3. Containment Internal Structure Inspections
  - a. Inspections will be performed during each refueling outage during the period of extended operation with the objective of identifying any additional refueling cavity liner leakage indication sites.
  - b. If additional leakage sites are identified, the condition will be documented in the Corrective Action Program and evaluated. The evaluation will consider the potential for the leakage to result in degradation of the



structural integrity of the concrete and the potential for moisture contact with the reactor containment vessel.

Second Bulleted Item

The following commitment will be added to LRA Appendix A, USAR Supplement, Table A6.0-1:

Item	Commitment	Source	Schedule
46	If the results of the core sample testing of the waste drumming room reinforced concrete ceiling leakage site (related to potential SFP liner leakage – Commitment 34) indicate degradation of the structural integrity of the concrete, at least one core bore sample will be taken near at least one of the refueling cavity liner leakage indication sites. The core sample location and depth will be sufficient to validate the strength of the concrete and the extent of any degradation. The core sample will be tested for compressive strength and will be subject to petrographic examination. Reinforcing steel in the core sample area will be exposed and inspected for material condition.	Letter 10-093 Supplemental Response to RAI B2.1.31- 4a	Prior to the Period of Extended Operation

## **RAI B2.1.31-5a Supplemental Question**

### Spent Fuel Pool Leakage

- *The staff would like the action plan (Commitment 35) to be submitted as part of the license renewal process, thus being part of the current license renewal review.*
- *The staff would like the core sample below the spent fuel pool (Commitment 34) to be taken as soon as practicable, allowing for planning and scheduling requirements of the activity. The applicant should explain why the decided upon schedule is appropriate.*

## **DEK Supplemental Response to RAI B2.1.31-5a:**

### First Bulleted Item

As described in response to RAI B2.1.31-5 in DEK letter 09-469 dated August 17, 2009 [ADAMS ML092320093], the indications of spent fuel pool liner leakage through concrete cracks in the overhead of the Auxiliary Building waste drumming room have been evaluated. The leakage indications consist of a white substance, determined to be boric acid residue, on the surface of the concrete at two locations below the spent fuel pool. The leakage is minor with no quantifiable leakage rate. There is no water dripping or running at these locations. As such, there is insufficient moisture present to obtain a liquid sample for chemical analysis.

These leakage indications are not long standing issues at Kewaunee (recently identified in 2007). Leakage indications at these sites have been documented in the Corrective Action Program and the conditions have been evaluated by Engineering. Based on the localized and minor nature of the leakage indication, and the lack of surface indications of reinforcement corrosion such as spalling, deformed surfaces, or widening of the cracks, the effect on the integrity of the structure surrounding the spent fuel pool was determined to be insignificant.

As stated in the response to RAI B2.1.31-5a, in DEK letter 09-760 dated December 28, 2009 [ADAMS ML100110061], new License Renewal Commitment 35 has been initiated to develop a plan for identification and remediation of spent fuel pool liner leakage. An outline of the plan is provided below:

### Spent Fuel Pool Liner Leakage Remediation Plan Outline

The design of the spent fuel pool liner and supporting structure includes provisions for the collection of minor leakage from weld seams through the installed leakage detection and collection system. The objective of spent fuel pool liner leakage remediation

activities is to identify and remediate leakage that is bypassing the leak collection system and resulting in leakage indications through the concrete structure.

The elements of the plan to identify and remediate spent fuel pool liner leakage are:

1. Continued Inspections of Leakage Indication Sites
  - a. Leakage indication sites within the waste drumming room will continue to be visually inspected monthly.
  - b. The results of the visual inspections will be documented and trended to identify changes in leakage rate and any signs of structural degradation.
  - c. Visual inspections will continue during the period of extended operation until spent fuel pool liner leakage that bypasses the leakage detection and collection system has been eliminated.
2. Multi-Discipline Team
  - a. A multi-discipline team will be formed, consisting of technical representatives and a management sponsor, to pursue identification of spent fuel pool liner leakage and necessary corrective actions.
  - b. The teams objectives will include:
    - 1) Review Kewaunee history of spent fuel pool liner leakage and associated corrective actions.
    - 2) Benchmark the industry related to spent fuel pool liner leakage issues through a review of operating experience and interface with industry peers.
    - 3) Review spent fuel pool design, construction, and modification details to determine potential leak sites.
    - 4) Develop recommendations for inspection, testing, and repairs to remediate liner leakage. Potential actions include: (1) performance of surface and visual examinations of accessible liner welds and penetration points, including vacuum box testing or other applicable techniques; and (2) determination of appropriate and effective repair and prevention methods such as weld repairs, sealant application, etc.
3. Leakage Detection and Collection System Maintenance
  - a. The spent fuel pool liner seam weld leakage detection and collection system drain lines will be inspected and repaired, if required, to ensure a clear drain flowpath to the extent practical. This will minimize the potential for re-direction of liner leakage through the concrete structure due to clogged drain lines.

- b. A routine maintenance activity will be created to continue leakage detection and collection system drain line inspections through the period of extended operation.
4. Spent Fuel Pool Structure Inspections
- a. Inspections of the portions of the Auxiliary Building structure adjacent to the spent fuel pool will be performed annually during the period of extended operation with the objective of identification of any additional liner leakage indication through the concrete.
  - b. Any additional leakage sites will be documented in the Corrective Action Program and evaluated for the potential to result in degradation of the structural integrity of the concrete.

Second Bulleted Item

In the original response to RAI B2.1.31-5a, License Renewal Commitment 34 was initiated to obtain and test a core sample from the Auxiliary Building waste drumming room reinforced concrete ceiling near the spent fuel pool liner leakage indications. Significant engineering assessment, planning, and preparation are necessary in order to obtain and test the core sample. Additionally, based on the low observed leakage rate, the localized nature of the leakage indication, and the highly alkaline conditions within the concrete (such that corrosion of reinforcement is minimized), it was concluded that spent fuel pool structural integrity is not significantly affected by the condition, therefore the safety significance of this condition is minimal. The basis for performing the testing is to provide additional confirmation of the structural integrity of the concrete during the period of extended operation.

License Renewal Commitment 34 indicated that these activities would be completed "prior to the period of extended operation." Although DEK has no current concerns regarding the current integrity of the spent fuel pool concrete, it has been decided that this commitment will be completed on a more aggressive schedule. Therefore, DEK is proposing to revise the completion date of License Renewal Commitment 34 from "prior to the period of extended operation" to "prior to the end of 2011." Given the low safety significance of the leakage condition, the pre-planning required to obtain the sample, and the time required for a comprehensive analysis of the sample, a schedule of "prior to the end of 2011" is reasonable and adequately supports the objective of the commitment.

The revised License Renewal Commitment 34 is provided below. This commitment will be added to LRA Appendix A, USAR Supplement, Table A6.0-1:

Item	Commitment	Source	Schedule
34	At least one core bore sample will be taken from the waste drumming room reinforced concrete ceiling below the spent fuel pool. The core sample location and depth will be sufficient to validate the strength of the concrete and the extent of any degradation. The core sample will be tested for compressive strength and will be subject to petrographic examination. Reinforcing steel in the core sample area will be exposed and inspected for material condition.	Letter 10-093; Supplemental Response to RAI B2.1.31-5a	Prior to the end of 2011