December 23, 2014

Dr. Myung-Ki Kim
Korea Hydro and Nuclear Power Co. Ltd.
Central Research Institute
70-1312-GIL Yuseong-Daero, Yuseong-Gu
Daejeon, 305-343, Korea

SUBJECT: KOREA HYDRO AND NUCLEAR POWER COMPANY'S RESPONSE TO THE U.S. NUCLEAR REGULATORY COMMISSION INSPECTION REPORT NO. 99901453/2014-201, NOTICE OF VIOLATIONS

Dear Dr. Kim:

Thank you for your December 10, 2014, letter in response to the Notice of Violation that was discussed in the subject U.S. Nuclear Regulatory Commission (NRC) inspection report (IR).

We have reviewed your letter and found that it is generally responsive to the referenced NOVs. However, certain aspects of your response needs to be addressed in further detail. The requests for additional information are described in detail in the enclosure. You are required to respond to this letter within 30 days of the date of this letter and should follow the instructions specified at the end of this letter when preparing your response.

In accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) 2.390 "Public Inspections, Exemptions, Requests for Withholding," of the NRC's "Rules of Practice, "a copy of this letter, its enclosure(s), and your response will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's Agencywide Documents Access and Management System, accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html. To the extent possible, your response should not include any personal privacy, proprietary, or Safeguards Information so that it can be made available to the Public without redaction. If personal privacy or proprietary information is necessary to provide an acceptable response, then please provide a bracketed copy of your response that identifies the information that should be protected and a redacted copy of your response that deletes such information. If you request that such material be withheld from public disclosure, you must specifically identify the portions of your response that you seek to have withheld and provide in detail the bases for your claim (e.g., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.390(b) to support a request for withholding confidential commercial or financial information). If Safeguards Information is necessary to provide an acceptable

response, please provide the level of protection described in 10 CFR 73.21 “Protection of Safeguards Information: Performance Requirements.”

Please contact Ms. Aixa Belen at 301-415-6263 or via electronic mail at aixa.belen@nrc.gov, if you have any questions or need assistance regarding this matter.

Sincerely,

/RA/

Kerri A. Kavanagh, Chief
Quality Assurance Vendor Inspection Branch
Division of Construction Inspection
and Operational Programs
Office of New Reactors

Project No.: 0782

Enclosure:
Request for Additional Information

response, please provide the level of protection described in 10 CFR 73.21 “Protection of Safeguards Information: Performance Requirements.”

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ADAMS ACCESSION No.: ML14353A136 NRO-002

OFC	NRO/DCIP/MVIB	NRO/DCIP/CQAB
NAME	ABelen (KKavanagh for)	KKavanagh
DATE	12/23/2014	12/23/2014

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REQUEST FOR ADDITIONAL INFORMATION

Violation 99901453/2014-201-01

Violation No. 99901453/2014-201-01(a) was cited in the NOV because KHNP did not verify that the test loop assembly met the design requirements for the size of the flow channel around the fuel assembly. The flow channel gap measurements taken by KHNP during the tests exceeded the design specifications stated in K00-A1-001-SO1-M00.

Your response to Violation No. 99901453/2014-201-01(a) stated: "The impact of flow channel gap on the validity of testing that has already been conducted will be described in APR1400-K-N-NR-14001, "In-vessel Downstream Effect Tests for the APR1400." The NRC requests that KHNP provide the evaluation for the impact of flow channel gap on the validity of testing in response to the NOV, under the inspection report number and project number, when that portion of the evaluation has been completed. The information should be descriptive enough for the NRC staff to determine if KHNP considered the extent of condition, and for the NRC staff to determine the adequacy of the corrective actions that KHNP has initiated.

Violation No. 99901453/2014-201-01(b) was cited in the NOV because KHNP did not verify that the lower plenum of the test loop assembly met the design requirements of a cone shape to prevent settling as required by KHNP APR1400-KA-I(RA)-P. The lower plenum of the test loop assembly did have a slight inclination angle. However, the inclination angle was inadequate resulting in significant debris settling.

Your response to NOV 99901453/2014-201-01(b) stated: "The impact of debris settling on the validity of testing that has already been conducted will be described in APR1400-K-N-NR-14001, "In-vessel Downstream Effect Tests for the APR1400." The NRC requests that KHNP provide the evaluation for the impact of debris settling on the validity of testing in response to the NOV, under the inspection report number and project number, when that portion of the evaluation has been completed. The information should be descriptive enough for the NRC staff to determine if KHNP considered the extent of condition, and for the NRC staff to determine the adequacy of the corrective actions that KHNP has initiated.

Violation 99901453/2014-201-02

Violation No. 99901453/2014-201-02(a) was cited in the NOV because KHNP failed to use an approved procedure to perform testing. KHNP used a preliminary revision of the test procedure during a test and the later approved revision 4 included test parameters that differed from the preliminary revision used at the beginning of the test.

Your response to Violation No. 99901453/2014-201-02(a) stated: "KHNP finished the tests using an approved procedure in the inspection period. Following the extent of condition review, KHNP performed a training session for related employees to emphasize the importance of using only approved procedures." The NRC requests that KHNP provide the evaluation of the impact on the test validity of using test parameters from the preliminary version of the procedure, which were different then the approved version of the test procedure. The information should be

descriptive enough for the NRC staff to determine if KHNP considered the extent of condition, and for the NRC staff to determine the adequacy of the corrective actions that KHNP has initiated.

Violation No. 99901453/2014-201-02(c) was cited in the NOV because KHNP failed to assure that a prerequisite for Quality Control (QC) hold points acceptance criteria was achievable for cold leg break tests. The cold leg break test's QC hold point acceptance criteria required verification that the differential pressure (dP) change after 30 minutes of the debris addition was less than or equal (≤) 2%. However, the uncertainty for the dP change in the cold leg break tests exceeded the 2% dP change stated as the acceptance criteria.

Your response to Violation No. 99901453/2014-201-02(c) stated: "KHNP revised DC-DG-11-02, "Test Procedure for the APR1400 In-vessel Downstream Effects," and described the following hold point definition for clear understanding.

> **Note**: 1) A steady state pressure drop is defined as less than 2% or 0.064 kPa change in pressure drop across the full test fuel assembly over the last 30 minute time interval."

The NRC determined that this response does not address this example of the NOV. The NRC requests that KHNP provide an evaluation of how the 2% dP change required by the acceptance criteria for cold leg break tests is achieved if the uncertainty of the dP change readings is greater than the 2% dP change. The information should be descriptive enough for the NRC staff to determine if KHNP considered the extent of condition, and for the NRC staff to determine the adequacy of the corrective actions that KHNP has initiated.

<u>Violation 99901453/2014-201-03</u>

Violation No. 99901453/2014-201-03 was cited in the NOV because KHNP failed to assure that adequate test instrumentation was available and used during the tests. Specifically, KHNP used an electromagnetic flow meter outside its calibration range to measure and control flow during eight cold leg break tests. The flow rate used for the cold leg break tests were between 9.2 lpm (liters/minute) and 16.6 lpm, which was below the flow meter calibrated range of 34.17 lpm to 251.67 lpm.

Your response to Violation No. 99901453/2014-201-03 stated: "KHNP conducted additional calibration of flow meter and confirmed that it met the required accuracy at measurement range (7.53 lpm to 250 lpm), which was provided by the GF630 manufacturer Toshiba (Document No. EJL-140)." The NRC inspection team noted that the flow meter supplier's documentation stated that the flow measurements were not accurate in the low range used for the cold leg break tests. The NRC requests that KHNP provide more detail information as to how it was determined that the flow meter would provide accurate and repeatable information, when being used in a range the flow meter supplier's documentation indicated that it would not be accurate. The information should be descriptive enough for the NRC staff to determine if KHNP considered the extent of condition, and for the NRC staff to determine the adequacy of the corrective actions that KHNP has initiated.

Violation 99901453/2014-201-04

Violation No. 99901453/2014-201-04(b) was cited in the NOV because KHNP entered into their corrective action program the other five conditions adverse to quality identified during the NRC audit in November 2013 and completed their corrective actions. However, two of these five conditions adverse to quality were not adequately corrected.

Your response to Violation No. 99901453/2014-201-04(b) stated, in part, that, "The impact of bubbles impinging on the bottom nozzle of the fuel assembly will be described in APR1400-K-N-NR-14001, "In-vessel Downstream Effect Tests for the APR1400." The NRC requests that KHNP provide the evaluation for the impact of bubbles impinging on the bottom nozzle on the validity of testing in response to the NOV, under the inspection report number and project number, when that portion of the evaluation has been completed. The information should be descriptive enough for the NRC staff to determine if KHNP considered the extent of condition, and for the NRC staff to determine the adequacy of the corrective actions that KHNP has initiated.

Violation No. 99901453/2014-201-04(c) was cited in the NOV because during this inspection, KHNP failed to identify, evaluate and document test abnormalities during the testing as conditions adverse to quality.

Your response to Violation No. 99901453/2014-201-04(c) stated, "KHNP revised DC-DG-11-02, "Test Procedure for the APR1400 In-vessel Downstream Effects," and added a note as follows:

> **Note:** Test anomalies should be recorded."

During the inspection the NRC staff noted that KHNP did not define test anomalies in their procedures and did not have a separate procedure or process for test anomalies. Provide further detail as to how KHNP will be able to adequately implement this note. The information should be descriptive enough for the NRC staff to determine if KHNP considered the extent of condition, and for the NRC staff to determine the adequacy of the corrective actions that KHNP has initiated.