July 1, 2016

James H. Riley
Sr. Technical Advisor
Nuclear Energy Institute
1201 F Street, NW, Suite 1100
Washington, DC 20004

SUBJECT: ACCEPTANCE REVIEW OF PWROG-15060, "PUMP SUCTION GAS ACCUMULATION OPERABILITY CRITERIA GUIDANCE" (TAC NO. MF7789)

Dear Mr. Riley:

By letters dated May 5 and 9, 2016 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML16147A079 and ML16147A123, respectively), the Nuclear Energy Institute (NEI) submitted nonproprietary and proprietary versions of PWROG-15060, "Pump Suction Gas Accumulation Operability Criteria Guidance" (ADAMS Accession Nos. ML16147A080 and ML16147A124). The U.S. Nuclear Regulatory Commission (NRC) staff has performed an acceptance review of the PWROG-15060. We have found that the material presented is sufficient to begin our review.

In addition, upon review of the information provided, the NRC staff has determined that additional information is needed to complete the review. The request for additional information (RAI) questions are enclosed.

In a June 29, 2016, email exchange between you representing NEI and me, we agreed that the NRC staff will receive your response to the enclosed RAI questions by September 30, 2016.

The NRC staff expects to issue a second round of RAIs by September 10, 2016, and issue its draft safety evaluation (SE) by February 15, 2018. This schedule takes into consideration the NRC's current review priorities and available technical resources and may be subject to change. If modifications to these dates are deemed necessary, we will provide appropriate updates to this information.

The NRC staff estimates that the review will require approximately 280 hours, including project management and contractor support. This estimate of hours includes the hours already expended on completing this acceptance review.

Section 170.21 of Title 10 of the *Code of Federal Regulations* requires that Topical Reports (TRs) are subject to fees based on the full cost of the review unless NEI requests and is granted a waiver. A fee is currently under review by the Chief Financial Officer.

As with all TRs, the SE will be reviewed by the NRC's Office of the General Counsel (OGC) to determine whether it falls within the scope of the Congressional Review Act (CRA). During the course of this review, OGC considers whether any acceptance for use of a TR by the NRC staff amounts to a rule as defined in the CRA. If this initial review concludes that the SE and

associated TR, may be a rule, the NRC staff will forward the package to the Office of Management and Budget (OMB) for further review and consideration. Any review by OMB would impact the schedule for the final issuance of the SE.

If you have questions regarding this matter, please contact Joseph J. Holonich at 301-415-7297 or via e-mail at Joseph.Holonich@nrc.gov.

Sincerely,

/RA/

Kevin Hsueh, Chief
Licensing Processes Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Project No. 689

Enclosure:
As stated

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NAME	JHolonich	DHarrison	EOesterle	KHsueh
DATE	06/14/2016	06/30/2016	06/30/2016	07/01/2016

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U.S. Nuclear Regulatory Commission Staff
Request for Additional Information Questions for
PWROG-15060, "Pump Suction Gas Accumulation Operability Criteria Guidance"

RAI 1. We understand that some of the Froude numbers attained in the Purdue tests differ from the expected numbers. Please explain. What values of Froude numbers should be used when analyzing the Purdue data?

RAI 2. Please provide tables of transport times that were determined by the process discussed in Section 8.2.2 of WCAP-17271-P, Volume 1.

RAI 3. Please provide calculations of a representative selection of the volumetric flux ratio, β, provided in the graphs contained in WCAP-17271-P, Volume 3 using the transport times identified in RAI 2 and the following PWROG-15060-NP equation:

$$\beta = \frac{Q_g}{Q_{mix}} = 448.8 \frac{V_i\left(\frac{P_{t,i}}{P_M}\right)}{Q_{mix}\,\Delta t} \qquad (4\text{-}5)$$

or, if a different process was used to calculate β, describe that process and provide the requested calculation using the different process. See also RAI 4.

RAI 4. Froude number is defined by:

$$N_{FR} = \frac{u_\ell}{\sqrt{D\ g_c}}$$

where: D = pipe inside diameter
u_ℓ = liquid velocity based on total pipe flow area
g_c = gravitational constant

In assessing flow characteristics discussed in WCAP-17271-P, is it correct to obtain the liquid velocity from the published N_{FR}? If not, how is liquid velocity obtained? Equations 8-7 and 8-8 can be combined to obtain the mixture flow rate, Q_{mix}, as a function of N_{FR}. Is it correct to obtain Q_{mix} from that equation and to use the resulting Q_{mix} to obtain β from Equation 4-5?

RAI 5. β exiting the vertical downcomer where the jet entrainment phenomena no longer occur appears to be based on Purdue test results where the downcomer length is sufficient to ensure homogeneous bubbly flow enters a horizontal elbow at the lower end of the downcomer. This β, corrected for the change in pressure due to the downcomer, is used as input to the downcomer exit elbow correlation. PWROG-15060-P Equation 4-6, the elbow correlation, provides the value of β that exits the elbow, where Δt is provided by Equation 4-1. Please provide justification for using Equation 4-6 for the following conditions:

(1) The upstream downcomer length is less than required to accommodate the ideal gas length that is calculated by PWROG-15060-P Equation 4-2.

(2) The upstream downcomer length is less than required to ensure that homogeneous bubbly flow occurs at the downcomer exit.

(3) The downcomer is located downstream of another downcomer and the connecting pipe is a short horizontal pipe where a kinematic shock does not occur.

(4) The downcomer is located downstream of another downcomer and the connecting pipe is a long horizontal pipe where a kinematic shock has occurred.

(5) The downcomer is located downstream of another downcomer and the connecting pipe provides homogeneous bubbly flow at the entrance of the downstream downcomer.

RAI 6. Please address how the data in PWROG-15060-P Figures 9-1 through 9-3 are related to the System Test points in Figure 9-4.

RAI 7. Please provide the information necessary to independently reconstruct the points (including the x and y coordinates and the corresponding values) in PWROG-15060-P Figure 9-4. For example, what are the test conditions that resulted in the x coordinate values?

RAI 8. Please provide a calculation using the WCAP-17271 correlations to obtain the WCAP-17271points in PWROG-15060-P Figure 9-4.