

October 25, 2011

Dr. Said Abdel-Khalik, Chairman
Advisory Committee on Reactor Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555

SUBJECT: RESPONSE TO ACRS RECOMMENDATIONS ON DRAFT FINAL
REGULATORY GUIDE 1.115

REFERENCE: Letter to Mr. R. W. Borchardt, Executive Director for Operations, from Said Abdel-Khalik, Advisory Committee on Reactor Safeguards (ACRS) Chairman, dated September 19, 2011, Subject: Draft Final Regulatory Guide 1.115, "Protection Against Turbine Missiles," ADAMS Accession No. ML11256A184.

Dear Dr. Abdel-Khalik:

The referenced letter from the Advisory Committee on Reactor Safeguards, (ACRS) contains recommendations pertaining to the issuance of draft final Regulatory Guide (RG) 1.115, Revision 2, "Protection Against Turbine Missiles." The ACRS reviewed this RG during the 586th meeting, September 8-10, 2011, during which time the U.S. Nuclear Regulatory Commission (NRC) staff presented its proposed changes to the RG and the associated technical justification. The ACRS Regulatory Policies and Practices Subcommittee also reviewed an earlier version of this draft RG during its meeting on October 4, 2010. This memorandum contains the NRC staff's responses to the ACRS recommendations.

ACRS RECOMMENDATIONS

Recommendation 1 - *Revision 2 of RG 1.115 should be issued after adequate justification is provided for excluding an evaluation of high-trajectory missiles under Regulatory Position 2.b.*

Regulatory Position 2.b in RG 1.115, Revision 2, states that the frequency of low-trajectory missiles should be limited to less than 1×10^{-5} event per year for an unfavorably oriented turbine. It also states that an evaluation of the frequency of high-trajectory missiles is not needed because "the turbine missile generation frequency for low-trajectory missiles is bounding." It is not evident why the frequency of turbine missiles that are ejected on high trajectories is necessarily bounded by the frequency of missiles that are ejected on low trajectories. The potential strike areas and damage footprints from high-trajectory missiles and low-trajectory missiles differ substantially. The guidance should better explain and justify why an evaluation of the frequency of high-trajectory missiles is not needed for unfavorably oriented turbines.

Staff Response - The following text was added to the discussion section of RG 1.115 under the section "Protection Provided by Control of Turbine Missile Generation Frequency," second paragraph, to justify the logic for regulatory Position 2.b.

For unfavorably oriented turbines, evaluation of high-trajectory missiles is not required because the probability of a high-trajectory missile exiting the casing at a trajectory that results in striking and damaging an essential SSC ($P_2 \times P_3$) is much smaller than the equivalent probability for low-trajectory missiles. This is because high-trajectory, high-velocity missiles must exit the turbine casing through a much smaller arc (approximately one-tenth of the arc possible for a direct, low-trajectory missile) in order to strike essential SSCs than missiles exiting in a direct, low-trajectory path. High-trajectory, high-velocity missiles that exit the turbine casing more than a few degrees from vertical would travel too far over essential SSCs to strike them.

This change will be made to the RG prior to issuance.

Recommendation 2 - *The staff should supplement its review of domestic nuclear operating experience by including operating experience at large U.S. conventional power plants and international nuclear facilities for the last ~20 years to confirm that the nominal frequency of 1×10^{-4} turbine missile ejection event per year from all causes is justified. This review should not delay the issuance of RG 1.115, Revision 2. A substantial update to RG 1.115 would be necessary if the expanded operating experience does not support the nominal turbine missile frequency...Protection against catastrophic turbine failures is a vital safety and investment consideration for every nuclear and conventional power plant. Therefore, the turbine operating experience from a broader spectrum of nuclear and conventional power plants should provide relevant data to support the assertion that the generic frequency of turbine missiles is less than 1×10^{-4} event per year. An expanded data sample may also capture operating experience from advanced turbine control systems, protection systems, and valve designs which may not be installed at currently operating U.S. nuclear plants but may be installed in new reactors. The staff should include data from the most recent 20 years of operating experience from international nuclear power plants and large U.S. conventional power plants to confirm that the nominal frequency of 1×10^{-4} turbine missile ejection event per year from all causes remains justified.*

Staff Response – The NRC staff agrees with the ACRS comment that there may be additional operating experience that could be applied to this RG. The NRC staff will review this experience and include any applicable information in the next revision of this RG.

S. Abdel-Khalik

- 3 -

CONCLUSION

Based on the referenced ACRS letter dated September 19, 2011, RG 1.115 will be issued with the change incorporated above. The NRC staff expects to publish the RG by the end of 2011.

We appreciate the recommendations and comments provided by the ACRS.

Sincerely,

R. W. Borchardt /*RA by Martin J. Virgilio for*/
Executive Director
for Operations

cc: Chairman Jaczko
Commissioner Svinicki
Commissioner Apostolakis
Commissioner Magwood
Commissioner Ostendorff
SECY

CONCLUSION

Based on the referenced ACRS letter dated September 19, 2011, RG 1.115 will be issued with the change incorporated above. The NRC staff expects to publish the RG by the end of 2011.

We appreciate the recommendations and comments provided by the ACRS.

Sincerely,

R. W. Borchardt /*RA by Martin J. Virgilio for*/
Executive Director
for Operations

cc: Chairman Jaczko
Commissioner Svinicki
Commissioner Apostolakis
Commissioner Magwood
Commissioner Ostendorff
SECY

DISTRIBUTION: G20110698 /EDATS: OEDO-2011-0645

Public	RidsResPmdaMail	RidsNrrMailCenter	RidsNroMailCenter
RidsEdoMailCenter	RidsAcrc_Mail Center	RidsOgcMailCenter	DE r/f

Pkg No.: ML112770235**Incoming: ML11256A184.**

OFFICE	RES/DE/RGDB	RES/DE/RGDB	SUNSI Review	RES/DE	Tech Editor	RES	NRR/DE
NAME	R. Jervey	T. Boyce	T. Boyce	M. Case	J. Zabel email	B. Sheron	P. Hiland via email
DATE	10/18/11	10/20/11	10/20/11	10/20/11	10/ 07/11	10/21/11	10/17/11
OFFICE	NRR/DSS	NRO/DE	EDO				
NAME	W. Ruland (S. Bahadur for)	T. Bergman (S. Montgomery for)	R. W. Borchardt/RA by MJVirgilio for/				
DATE	10/20/11	10/20/11	10/25/11				

OFFICIAL RECORD COPY