NRR-DRMAPEm Resource

From: Sebrosky, Joseph
Sent: Thursday, August 15, 2019 11:58 AM
To: Lee.Grzeck@duke-energy.com; winston.stewart@duke-energy.com
Cc: Uribe, Juan; Quinlan, Kevin; See, Kenneth; Barnhurst, Daniel
Subject: RE: Clarification questions associated with staff assessment of Robinson flooding integrated assessment dated December 19, 2018

Mr. Grzeck, and Mr. Stewart,

By letter dated December 19, 2018 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML18353A435), Duke Energy Progress LLC (the licensee) provided the flooding integrated assessment (IA) for H.B. Robinson Steam Electric Plant, Unit 2 (Robinson). The Robinson flooding IA was provided in response to Enclosure 2 of the March 12, 2012, 10 CFR 50.54(f) letter (ADAMS Accession No. ML12053A340). By letter dated July 18, 2017 (ADAMS Accession No. ML 17192A452), the NRC issued a generic audit plan and entered into the audit process described in Office Instruction LIC 111, "Regulatory Audits," dated December 29, 2008 (ADAMS Accession No. ML082900195) to assist in the timely and efficient closure of activities associated with the staff's review of flooding responses provided in response to the March 12, 2012, 50.54(f) letter. To support the staff's audit of the December 19, 2018, Robinson IA the staff has developed the clarification questions found below based on a phone call held with members of your staff on August 8, 2019. After you have time to review the clarification questions, please let me know if you would like to make arrangements for an audit phone call to discuss these questions.

Sincerely,

Joe Sebrosky
Senior Project Manager
Beyond-Design-Basis Management Branch
Office of Nuclear Reactor Regulation
301-415-1132

Precipitation Frequency Analysis

Request for Supplemental Information Met #6: Storm Typing – Effects of Non-TSR Exclusion

Background: The precipitation frequency (PF) analysis documented in Calc. No. RNP-18-001 applies a storm typing approach in which only tropical storm remnant (TSR) events are included for analysis. This approach is based on the licensee identifying the TSR storm type "as the controlling storm type for the 72-hour duration."

As outlined in the staff's white paper provided to the licensee and entitled: "Potential Concerns of the Storm Typing Approach in Estimating Extreme Rainfall Estimates," staff has the following observations and concerns:

a) The "true" PF estimate for the Robinson watershed is influenced by both TSR and non-TSR precipitation events, which differs from the TSR-only approach used in Calc. No. RNP-18-001. The mathematical formulae presented in the white paper demonstrate how the introduction of TSR-only storm typing will result in lower PF estimates (i.e., less conservative values) for a

given annual exceedance probability compared with a mixed-population approach of including both TSR and non-TSR storm events.

b) There are large differences between the MetStat PF estimates versus the NOAA Atlas 14 PF estimates, which are likely explained by NOAA Atlas 14's use of all storm event types, compared to MetStat's use of only TSR events. The storm typing approach used in Calc. No. RNP-18-001 may be a primary factor resulting in lower precipitation frequency depths than NOAA Atlas 14, which does not include storm typing. The use of lower precipitation frequency depths results in lower streamflow and flood levels in the Robinson Integrated Assessment.

Request: To help resolve these concerns, additional written documentation and analysis is needed to ensure the exclusion of non-TSR events does not lead to the underestimation of PF. As a part of the response:

1) For a relevant study region, provide separate TSR and non-TSR precipitation frequency estimates (for AEP = 10^{-2}, 10^{-3}, and 10^{-4}), along with their probabilistic distributions and fitted parameters to support evaluation.

2) Demonstrate (for AEP = 10^{-2}, 10^{-3}, and 10^{-4}) the following two equations can lead to similar estimates of *x*. The definition and formulation are provided in the white paper "Potential Concerns of the Storm Typing Approach in Estimating Extreme Rainfall Estimates".

$$P[\mathbf{X}_{\boldsymbol{TSR}} > x] + P[\mathbf{X}_{\boldsymbol{non-TSR}} > x] - P[\mathbf{X}_{\boldsymbol{TSR}} > x] * P[\mathbf{X}_{\boldsymbol{non-TSR}} > x] = AEP \quad (3)$$

$$P[\mathbf{X}_{\boldsymbol{TSR}} > x] = AEP \quad (5)$$

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From: Sebrosky, Joseph

Created By: Joseph.Sebrosky@nrc.gov

Recipients:
"Uribe, Juan" <Juan.Uribe@nrc.gov>
Tracking Status: None
"Quinlan, Kevin" <Kevin.Quinlan@nrc.gov>
Tracking Status: None
"See, Kenneth" <Kenneth.See@nrc.gov>
Tracking Status: None
"Barnhurst, Daniel" <Daniel.Barnhurst@nrc.gov>
Tracking Status: None
"Lee.Grzeck@duke-energy.com" <Lee.Grzeck@duke-energy.com>
Tracking Status: None
"winston.stewart@duke-energy.com" <winston.stewart@duke-energy.com>
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Priority: Standard
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$$P[X_{TSR} > x] + P[X_{non-TSR} > x] - P[X_{TSR} > x] * P[X_{non-TSR} > x] = AEP$$