

*Bellefonte 3&4*

*Lee Nuclear 1&2*

*Summer 2&3*

*Vogtle 3&4*

*Harris 2&3*

*Levy 1&2*



**Bellefonte Nuclear Plant**

## **AP1000 R-COL Application Acceptance Review Issues**

### **Discussion of Schedule for Resolution of Hydrology Issue**

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# Hydrology: Introduction

- **NRC Staff expressed concern over TVA's Simulated Open Channel Hydraulics (SOCH) code**
  - Model description and documentation not cited
  - Question regarding review of materials used to meet 10CFR50 Appendix B QA requirements
- **Potential options cited by Staff:**
  - Update Bellefonte analyses using USACE HEC-RAS model
  - Use bounding calculations to determine design-basis flood
  - Provide model description and documentation to enable NRC Staff review, and possible parallel Staff development of independent numerical model
- **Discussion needed to:**
  - Describe TVA hydrology experience
  - Provide information on supporting documentation
  - Clarify various issues in NRC acceptance letter
  - Propose actions to reach closure on issue and facilitate NRC review

## Background: TVA Hydrology Experience

- TVA created by Congress via TVA Act of 1933, with charter/mission to provide, in part, navigation and flood control to protect inhabitants of Tennessee River Valley
- Modeling of Tennessee River Basin covers over 1250 total miles of river, with total drainage area of over 40,000 mi<sup>2</sup>, and containing 30 dams analyzed for outflows/failure effects
- TVA developed in-house hydrology and hydraulics expertise
  - Originally conducted analysis by hand
  - Later migrated methods to computer aided computations

## Background (continued)

- TVA has long term expertise in flood analyses and modeling of watercourses within Tennessee Valley
- Analytical models and methods, originally developed by TVA's hydrologists and water resource engineers, continue to be used within both nuclear and non-nuclear program areas
- Underlying methods and computer code development (Garrison, Granju, Price - 1969) similar to basic underlying methods used by USACE as building block for HEC-RAS software

## Regulatory History

- TVA model received *“extensive review”* by NRC during licensing of three other nuclear plants in 1970’s (NUREG 0011- Sequoyah SER, Browns Ferry SER, and NUREG-0847-Watts Bar SER)
- TVA model endorsed by the NRC in NUREG 0800 Section 2.4.4 - *“detailed failure models [of dams]...by Tennessee Valley Authority are used...”*
  - Recent revision of NUREG 0800 unclear as to basis for change in citation of TVA model
- TVA model is currently endorsed in guidance *“Processing Applications for Early Site Permitting”* (RS-002, Section 2.4.4, May 2004) using similar words
- Use of SOCH approved in 2007 SER for Sequoyah

## Supporting Documentation

- **Supporting documentation for TVA code does exist and is available for NRC review**
- **History of Analysis Method and SOCH Code**
  - Hand computations originally used to predict flood levels converted to Simulated Open Channel Hydraulics (SOCH) FORTRAN Code in 1960s because no other standardized models available
  - Analysis method published in 1969 in peer-reviewed ASCE Journal

# Supporting Documentation

- **SOCH Method/Code (continued)**
  - Analysis inputs updated in 1996 to reflect Dam Safety Program enhancements to dam structures
    - Program enhancements included altering potential failure modes
    - FORTRAN Code not altered
  - Analyses, codes, and supporting documentation collected into single TVA Nuclear Calculation, in compliance with TVA's Appendix B QA requirements and implementing procedures
  - Calculation now resides under TVA Nuclear QA configuration control
    - Supports design and licensing basis of three operating nuclear sites

## Clarification of Acceptance Letter

- ***NRC Issue: model description and documentation not cited***
  - Clarification: documented calculation available for review
- ***NRC Issue: question regarding review of materials used to meet 10CFR50 Appendix B QA requirements***
  - Clarification:
    - Use of SOCH model remains consistent with existing fleet licensing basis
    - Calculation is in compliance with TVA's Appendix B QA program requirements and implementing procedures
- ***NRC statement that update to HEC-RAS model is in progress***
  - Clarification: TVA regrets any confusion but has not indicated intent to adopt/apply HEC-RAS model to TVA system reservoirs



## TVA Points of Consideration

- **Existing model documentation is adequate for existing fleet and use in fulfilling TVA responsibility for flood control in Tennessee Valley**
  - NRC Staff encouraged to review existing documentation
  - A familiarization workshop on the SOCH model can be made available to assist NRC Staff in recreating ability to review model, as needed, consistent with previous and current NRC guidance
- **Consideration of use of HEC-RAS model**
  - Conversion of SOCH model to HEC-RAS not viable because of undue burden of significant cost and time required to model large and complex Tennessee River drainage basin without significant benefit
  - No regulatory basis for imposition of change
  - No indication existing model is inadequate
  - HEC-RAS would be unique for Bellefonte; Bellefonte would be outlier in TVA nuclear fleet and non-nuclear programmatic areas

## TVA Points of Consideration (continued)

- **NRC development of an independent model is not warranted**
  - No technical basis to abandon analysis previously approved by NRC
  - SOCH model previously provided reasonable and accepted results; no changes to code or computational methods have occurred that would suggest previous results are now less reasonable
  - TVA has confidence in development and use of analyses and methods and utilizes them in other non-nuclear programmatic areas

## Proposed Approach

- **Maintain use of SOCH model in Bellefonte COL application consistent with other TVA implementation**
- **NRC Staff review SOCH documentation in support of reasonable assurance conclusions**
  - Documentation in accordance with TVA QA program available for review
  - Leverage review experience from 2007 Sequoyah Review
  - Familiarization workshop to facilitate NRC review
- **Approach should**
  - Preclude need for extended schedule for the hydrology review
  - Enable focusing of Staff and applicant resources on risk-significant areas
  - Support reasonable assurance determination regarding use of TVA's Hydraulic Model in predicting maximum flood levels at Bellefonte site

## Proposed Schedule

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|----|---|----------|
| 1. | TVA make available calculation, supporting documents, and model description white paper to NRC for review | 04/04/08 |
| 2. | TVA conduct a familiarization workshop on SOCH code   | 05/16/08 |