

# **Preliminary Dispersion Modeling for the NuStart Plant at Bellefonte**

Doyle E. Pittman and Kenneth G. Wastrack  
Tennessee Valley Authority

# Introduction

---

- Construction at Bellefonte halted in 1988
- Two units placed in deferred status
- Site selected in 2005 by NuStart for new plant
- Old construction permit cancelled in 2006
- New plant: Passive-reactor design - Westinghouse AP1000

# Conceptual Layout at Bellefonte

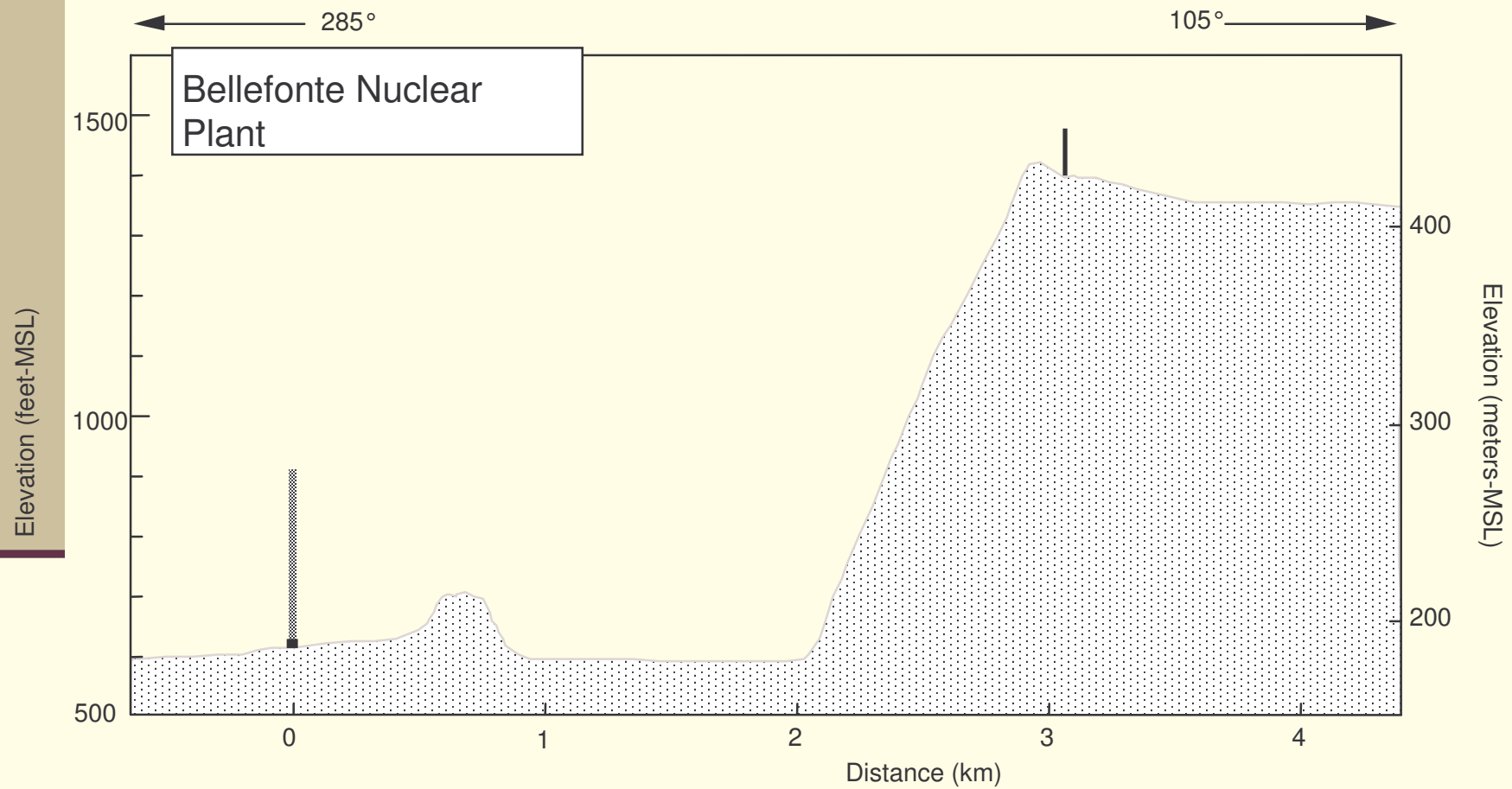


# Meteorological Data Collection

---

- Data collected onsite from 1972 to 1983
  - Temporary towers until 1978
  - Permanent 110 meter tower from 1975
- Wind flow study in 1993
- Tower removed
- Building left
- Training tower erected (55 meter)

# Terrain Cross Section



# Examination of Monitoring History

---

- Meteorological measurements at the local site reasonably represent conditions at surrounding locations and short-term measurements are representative of longer-term periods.
- The last complete year of data collected at the permanent meteorological monitoring facility is more than 20 years old so it will not be acceptable as “the most recent 1-year period”.

# Exam Continued

---

- Historical data were archived and are retrievable.
- Meteorological data collected in the valley do not adequately represent meteorological conditions in the Bellefonte vicinity (10-mile EPZ) for emergency preparedness applications.

# Data Collection Renewed

---

- Evaluated 55 meter tower – **acceptable**
- Evaluated data needed for COLA submittal
- Used guidance from ANS-3.11 (2005)
- Installation begun in January 2006
- Operation began in April 2006



# Bellefonte Meteorological Tower



# Site Acceptability Evaluation

---

- Westinghouse AP1000 Design Control Tier 1 Document identifies key site parameter specifications related to the design of safety-related aspects of structures, systems, and components for the AP1000.
- An actual site is deemed acceptable if its site characteristics fall within these plant site design parameters.

# Evaluation Continued

---

- Parameters include Atmospheric Dispersion Factors ( $\chi/Q$ ) for:
  - the site boundary,
  - for the low population zone, and
  - for Control Room and Heating Ventilation and Air Conditioning intakes for accident dose analysis.
- Concern with the proximity of a portion of the site boundary at Bellefonte to the desired plant location (only 343 meters).

# TVA Analysis of $\chi/Q$ Values

---

- Used onsite data from 1979-1982
- Design basis accidents were treated as ground-level releases
- Utilized 10 meter wind speed and direction and the 10 to 46 meter temperatures for stability class
- Used in-house model based on R. G 1.145
- Used geometric source data for the AP1000
- Compared results with NRC's PAVAN model

# Results

---

- Worst case site boundary  $\chi/Q$  would exceed the site parameter specification by about a factor of 2 to 3
- Worst case condition was the 0-2 hour  $\chi/Q$  that was exceeded 5% of the time.
- Question was raised whether the site parameter specification was the 50th percentile or the **5th percentile value.**

# Results Continued

---

- Move **plant** or move site boundary?
- Estimate what distance would be needed to meet the design specification for the existing site boundary - 700 meters
- Verify that site parameter  $\chi/Q$  is satisfied for relocated plant within the Bellefonte site. Site boundary distance of about 805 meters

# Bellefonte Arial View



# Conclusions

---

- Availability of representative onsite data was critical to this analysis.
- Important to ensure that key site design specifications are met before finalizing site selection and prior to completion of the combined operating license application.
- Need a thorough understanding of the basis for the key site parameters.