

## Overview on Site Characteristics for the APR1400 NRC Design Certification

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### 1. Introduction

In March 2015, The U.S. Nuclear Regulatory Commission (NRC) started Phase 1 review of the design certification application (DCA) of the APR1400 as shown Fig. 1. The NRC review schedule is listed in Table I.

KHNP provided sufficient information, such as Design Control Document (DCD) [1], to meet the NRC's safety standards. The APR1400 DCD provides information to support the NRC's approval and certification of the standard APR1400 design, under the Title 10 Code of Federal Regulations (CFR) Part 52.

As part of the DCD, site characteristics include geographical, meteorological, hydrological, seismological, and geological characteristics. The combined license (COL) applicant is to demonstrate that the APR1400 design meets the requirements if the characteristics of site fall outside the assumed site parameters.

In this paper, overall information of site characteristics for the APR1400 is described.

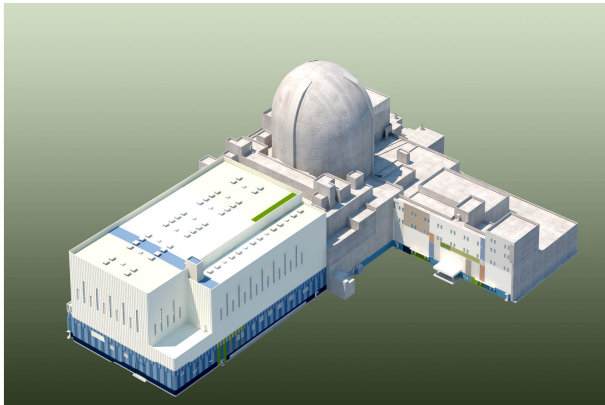


Fig. 1 Geometry of APR1400

Table I: NRC Review Schedule

Task	Description	End date
Phase 1	Preliminary SER and RAI	Feb. 2016
Phase 2	SER with Open Items	Nov. 2016
Phase 3	ACRS Review of SER with Open Items	Jun. 2017
Phase 4	Advanced SER with No Open Items	Dec. 2017
Phase 5	ACRS Review of Advanced SER with No Open Items	Jun. 2018
Phase 6	Final SER with No Open Items	Sep. 2018

### 2. Description of Site Characteristics

#### 2.1 Site Parameters

The APR1400 is designed on the basis of a set of assumed site-related parameters. The parameters were selected to include a range of potential nuclear power plant sites in the United States. The summarized assumed parameters are shown in Table II.

Detailed site-related characteristics will be provided in the final safety analysis report for any applications referencing the APR1400 design. The site parameters, in Table II, are needed to review and compare with the detailed site-related characteristics. If the characteristics of the proposed site fall outside the parameters specified in Table II, COL applicant is required to demonstrate that the APR1400 design meets the requirements.

#### 2.2 Geography and Demography

The site-specific information on the site location and a description of the site, exclusion authority and control, and population distribution will be provided by the COL applicant under Regulatory Guide (RG) 1.206 [2].

Table II: Summarized Site Parameters

Parameter Description	Value
Max. elevation	Ground water 0.6 m below plant grade
	Flood 0.3 m below plant grade
Precipitation -maximum rate(1 mi <sup>2</sup> )	492.7 mm over 1 hour 157.5 mm in 5 minutes
HVAC Outdoor Design Temp.	5% exceedance value Max. 35°C dry / 25°C wet Min. -20.6°C
Extreme Wind	50-year 3-second wind gust speed 64.8 m/s
Hurricane Parameters	Max. 3-second wind gust speed 116 m/s
Tornado Parameter	Max. horizontal/translational/Rotational 102.8 / 20.6 / 82.2 m/s
Accident Release $\gamma/Q$ Value	at exclusion area boundary 0-2 hr: $1.00 \times 10^{-3}$ s/m <sup>3</sup> at low-population zone 0-8 hr: $2.20 \times 10^{-4}$ s/m <sup>3</sup> 8-24 hr: $1.60 \times 10^{-4}$ s/m <sup>3</sup> 24-96 hr: $1.00 \times 10^{-4}$ s/m <sup>3</sup> 96-720 hr: $8.00 \times 10^{-4}$ s/m <sup>3</sup>
Safe Shutdown Earthquake(SSE)	peak ground acceleration 0.3g

### *2.3. Nearby Industrial, Transportation, and Military Facilities*

The site-specific information on nearby industrial, transportation, and military facilities are required for the COL applicant in NRC RG 1.206.

The COL applicant is to identify a design basis event (DBE) caused by nearby facilities as described above and determine their design parameters.

### *2.4 Meteorology*

Meteorological site-specific information including regional climatology, local meteorology, the onsite meteorological measurement program, estimated short-term atmospheric dispersion for accident release, and long-term atmospheric dispersion estimates for routine release is needed to provide by the COL applicant, as addressed in NRC RG 1.206. Therefore, the COL applicant will perform the radiological consequence analysis and demonstrate that the related dose limits specified in 10 CFR 50.34 [3] and 10 CFR Part 50 Appendix I [4] are not exceeded, if the site-specific  $\chi/Q$  values exceed the bounding values used.

### *2.5. Hydrologic Engineering*

The site grade level is established at least 0.30 m (1 ft) above the maximum flood level as described Table II. The probable maximum precipitation (PMP) defined as maximum precipitation rate (1-hour, 1-mi<sup>2</sup>) is 492.7 mm (19.4 in.) for a flooding hazard analysis.

The COL applicant will provide the site-specific hydrologic information on PMP, probable maximum flood (PMF) of streams and rivers, potential dam failures, probable maximum surge and seiche flooding, probable maximum tsunami hazards, ice effects, cooling water canals and reservoirs, channel diversions, flood protection requirements, low water considerations, groundwater, potential accidental release of liquid effluents in ground and surface water, Technical Specifications, and emergency operation requirements in accordance with NRC RG 1.206, NRC RG 1.59 [5], and NRC JLD-ISG-2012-06 [6].

### *2.6 Geology, Seismology, and Geotechnical Engineering*

The COL applicant is to provide site-specific information on geology, seismology, and geotechnical engineering as required in NRC RG 1.206. The site-specific information includes the geological, seismological, geophysical, and geotechnical investigation and evaluations procedures to estimate the site-specific ground motion response spectra (GMRS), as well as the geotechnical engineering aspects of the site and slope stability.

## **3. Conclusions**

The APR1400 is undergoing a Phase 2 review for the standard design certification by the NRC. Phase 1: Preliminary SER and RAI has been completed successfully in January 2016. It was achieved one month earlier than NRC's review schedule. And Advisory committee on Reactor Safeguards (ACRS) subcommittee meeting on the site characteristics of the APR1400 was held in September 2016. The APR1400 standard design certification will be completed in May 2019.

## **REFERENCES**

- [1] APR1400 Design Control Document, Revision 0, December 2014.
- [2] Regulatory Guide 1.206, "Combined License Applications for Nuclear Power Plants (LWR Edition)," U.S. Nuclear Regulatory Commission, June 2007.
- [3] 10 CFR 50.34, "Contents of Applications, Technical Information," U.S. Nuclear Regulatory Commission.
- [4] 10 CFR Part 50, Appendix I, "Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion 'As Low as is Reasonably Achievable' for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents," U.S. Nuclear Regulatory Commission
- [5] Regulatory Guide 1.59, "Design Basis Floods for Nuclear Power Plants," U.S. Nuclear Regulatory Commission, August 1977.
- [6] NRC JLD-ISG-2012-06, "Guidance for Performing a Tsunami, Surge, or Seiche Hazard Assessment," U.S. Nuclear Regulatory Commission, 2012.