

Licensing New Nuclear Power Plants in Different Regulatory Environments

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New Plant Licensing Regulatory Charter

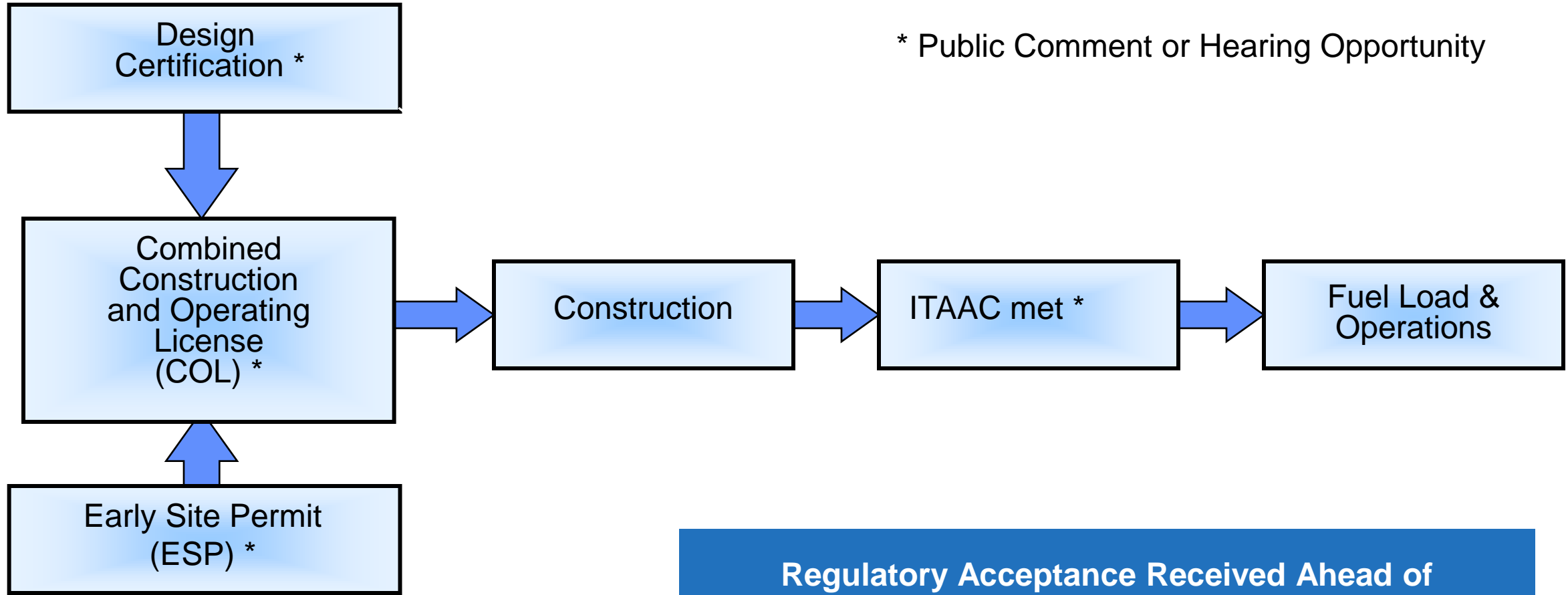
- Nuclear regulators are tasked with ensuring appropriate levels of safety for plant construction and operation
 - International Atomic Energy Agency defines basic guidance
- Approaches vary widely, but regulators pursuing this goal can be generally categorized within one of two groups:
 - **Prescriptive**
 - U.S. Nuclear Regulatory Commission (NRC)
 - Chinese National Nuclear Safety Administration (NNSA)
 - Indian Atomic Energy Regulatory Board (AERB)
 - **Non-Prescriptive (Performance- or Goal-Oriented)**
 - UK Office for Nuclear Regulation (ONR)
 - Canadian Nuclear Safety Commission (CNSC)

Multiple unique means to achieve a common goal

Prescriptive vs. Performance-Based Regulations

	Prescriptive Regulatory Structure	Performance-Based Regulations
<i>Approach</i>	<p>Detailed requirements are defined and must be met prior to approval</p> <ul style="list-style-type: none"> • Provides clear indication of minimum set of requirements • Less flexible, especially when considering new/unique designs • Example – 10 CFR Parts 50 and 52 	<p>Focus on key principles that applicant must demonstrate</p> <ul style="list-style-type: none"> • Flexibility to conform without meeting prescriptive limits • Uncertainty regarding when a design principle is “met” • Example – UK Safety Assessment Principles
<i>Result</i>	<ul style="list-style-type: none"> • Typically results in legally binding acceptance of plant design 	<ul style="list-style-type: none"> • Results in documentation of positive outcome • Open to further review / evaluation throughout project

United States 10 CFR 52 Process



Regulatory Acceptance Received Ahead of Construction to Reduce Regulatory Risk

AP1000[®] Plant Licensing Pedigree

United States / U.S. NRC

- Design Certification under 10CFR52 (2006 & 2011)
- Multiple approvals of utility COL applications (2012-2016)

China / NNSA

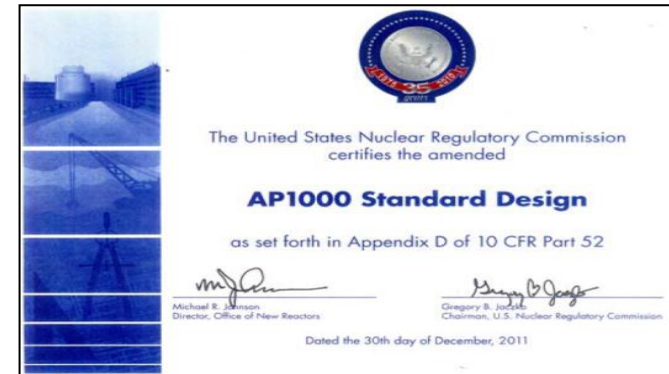
- PSAR Review / Construction Permits (2009)
- FSAR Review / Fuel Load Permit (2018)

United Kingdom / ONR

- Generic Design Assessment concluded with issuance of Design Acceptance Certificate (2017)

Canada / CNSC

- Pre-project Design Review Phase 2 concluded no fundamental barriers to licensing AP1000 plant design in Canada (2013)



Licensing pedigree of the AP1000 plant design
unmatched by any other technology

Regulatory Alignment

- **Westinghouse sees great value in attempts to align international regulatory bodies**
 - Nuclear Energy Agency's Multinational Design Evaluation Programme (MDEP)
 - WNA's Cooperation in Reactor Design Evaluation and Licensing (CORDEL)
- **AP1000 units in China and United States demonstrate advantages of standardization**
 - MDEP has successfully supported collaboration between U.S. NRC and China NNSA
 - Project efficiencies recognized through regulator collaboration, e.g. crediting China first plant only tests for Vogtle



Vogtle Site, Georgia, U.S.
Image courtesy of Southern Nuclear

AP1000[®] Plant Update

The Westinghouse AP1000[®] plant, a Generation III+ two-loop pressurized water reactor (PWR), is considered the most advanced commercially available plant, offering an industry-leading design featuring passive safety systems.

Westinghouse provides the development, licensing, detailed engineering, project management, component manufacturing and startup support for new nuclear power plants.



Westinghouse currently has two AP1000[®] units progressing through construction at the Alvin W. Vogtle Electric Generating Plant near Waynesboro, Georgia, U.S.

Vogtle Site, Georgia, U.S.
Image courtesy of Southern Nuclear



AP1000[®] Plant Update

Completed Westinghouse AP1000[®] Reactors

In early 2019, Westinghouse completed four AP1000 nuclear power plants at the Sanmen and Haiyang, China sites.

Each site has two AP1000 units, all of which safely and successfully achieved commercial operation.



Sanmen Site. Image courtesy of Sanmen Nuclear Power Company Limited (SMNPC).



Haiyang Site. Image courtesy of Shandong Nuclear Power Company Limited (SDNPC).



Sanmen Site. Image courtesy of Sanmen Nuclear Power Company Limited (SMNPC).



Haiyang Site. Image courtesy of Shandong Nuclear Power Company Limited (SDNPC).

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