

EPRI Utility Requirement Document

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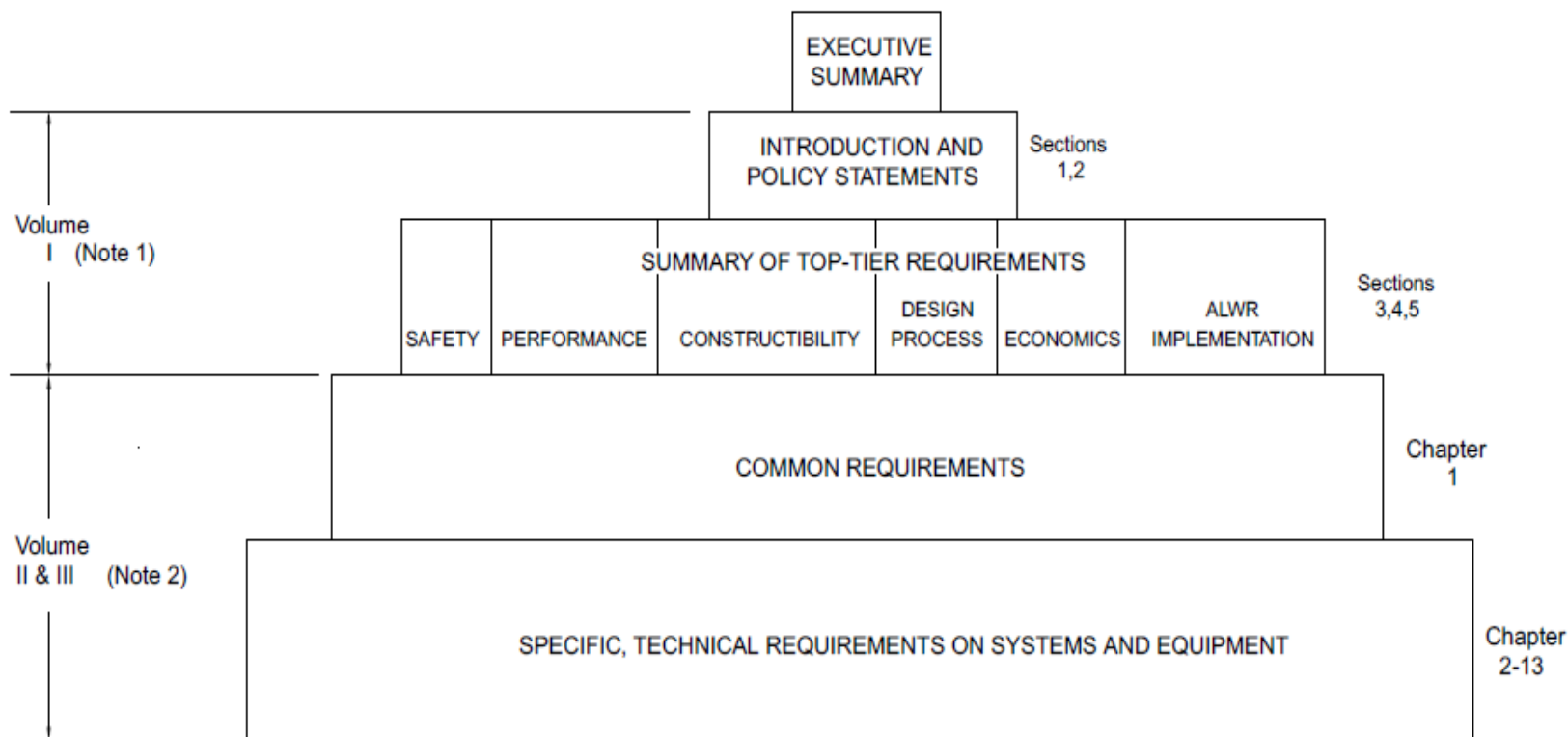
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- Background and Objectives
 - Purpose of the URD is to present a clear, comprehensive set of design requirements for the next generation of nuclear plants
 - The requirements are grounded in proven technology of 50 years of commercial U.S. and international light water reactor (LWR) experience
 - The utility design requirements build on the current LWR experience base, connecting problems which existed in operating plants and incorporating features which assure a simple, robust, and more forgiving design.
- EPRI's Utility Requirement Document (URD) established framework for advanced light water reactors (ALWR) that provides:
 - A stabilized requirement basis for new technologies
 - A standardized set of requirements for use in design certification
 - A standardized set of requirements for future owner bid packagesThis framework can provide the basis for successful design, licensing and deployment of advanced light water reactors.

- **1983** – Feedback from a survey of nuclear utility executives: nuclear power plants must be **safer and simpler, competitive, standardized, and pre-licensed by the U.S. NRC**
- **1985** – The EPRI ALWR Program is launched. Initial focus of the ALWR program was on the development of a utility requirement document to facilitate standardization.
- **1990** – **The first completed version of URD** was published
- After revised several times to reflect continuing feed back from the design certification projects and interactions with the NRC. **The NRC approved the evolutionary and passive plant URDs in 1992 and 1994, respectively.**
- As the detailed development of the three advanced designs (ABWR, System 80+, AP-600) has progressed, conformance assessments have been made to assure that the designs comply with the URD specifications. **Revision 8** of the URD was published **in 1999**. This version incorporated the results of **the final design certification and first-of-a-kind engineering**, which is publically available in EPRI Website.

Structure of EPRI URD



Note 1: Policy Statements and Summary of Top-Tier Requirements for all ALWRs

Note 2: Technical Requirements (Volume II - Evolutionary ALWR, Volume III - Passive ALWR)

(Source : EPRI URD Rev.8, 1999)

- **General utility design requirements**
 - Plant type and size: PWR or BWR, to a range of size up to 1350 MWe
 - Safety system concept
 - Plant design life: 60 years
 - Plant siting envelope: acceptable for most available site in U.S.; 0.3g SSE
- **Safety and investment protection**
 - Accident resistance
 - Core damage prevention
 - Core damage frequency : CDF is less than 10^{-5} per reactor year
 - Mitigation
 - . Severe accident risk : Whole body dose less than 25 rem at the site boundary for severe accident with cumulative frequency greater than 10^{-6} per year
 - . Containment design
 - . Containment margin: maintain integrity & low leakage during severe accident
 - . Licensing source term
 - . Hydrogen control
 - . Emergency planning

- **Performance**

- Design availability: 87%
- Refueling interval : 24 month capability
- Unplanned automatic scrams: less than 1/year
- Maneuvering: daily load follow
- Load rejection
- Operability and maintainability
- Man-Machine interface

- **Design Process and constructibility**

- Total time from owner commitment to construct to commercial operation
- Construction time from first concrete to commercial operation
- Design status at time of initiation of construction
- Design plan for construction
- Design process

- **Economics**

- Cost goal
- Resulting qualified cost goals

- The U.S. NRC was directly involved in the process by reviewing the Utility Requirements Document, that is applicable to the design of an Advanced Light Water Reactor (ALWR) power plant. **In 1994 finally the NRC published a Safety Evaluation Report (SER)** detailing their review of the requirements for each type of ALWR.
- The NRC has prepared Volume 1, 2 and 3 of its safety evaluation report to document the results of its review of Volume I, II and III of the URD.
 - **Volume 1** provides a discussion of the overall purpose and scope, the background, the review approach, and a summary of policy and technical issues raised.
 - **Volume 2 and 3** give the results of the staff's review of the 13 chapters of the URD for evolutionary plant designs and passive plant designs, respectively.
 - The format of Volume 2 and 3 follows that of Volume II and III of the URD as closely as possible.

- **NRC Review Criteria and Policy Issues**
 - : In reviewing URD, the staff is using **NUREG-0800** (Standard Review Plan), and reflects the requirements of **10 CFR Part 52**, and the commission's policy statements on **severe accident** (50 FR 32138) and **safety goal** (51 FR 28044). **The commission papers** were issued to address the policy issues.
 - "Evolutionary Light Water Reactor Certification Issues and their Relationship to Current Regulatory Requirements (SECY-90-016)"
 - "Chapter 11 of the EPRI's Requirements Document and Additional Evolutionary Light Water Certification Issues (SECY-91-078)"
 - "Issues Pertaining to Evolutionary and Passive Light Water Reactors and Their Relationship to Current Regulatory Requirements" (Feb. 27, 1992)
 - "Design Certification and Licensing Policy Issues Pertaining to passive and Evolutionary Advanced Light Water Reactor Designs" (July 6, 1992)
- Subject to the resolution of the identified **outstanding issues** and **vendor- and utility-specific items** discussed in the SER (Volume 2 and 3), the staff concludes that **the requirements established in the URD do not conflict with current regulatory guidelines and are acceptable.**

- **Revision 10 (15-Dec-2008):**
Significant changes and additions in the areas of ALARA /radiation Protection, Seismic and structure criteria, plant cooling water systems and human factors engineering /instrument and control.
- **Revision 12 (16-Dec-2014):**
This includes **a substantial numbers of revisions** that reflect the results of technical reviews addressing a number of technical areas, including material selection, inspectability, **Fukushima lessons learnt**, digital I&C, cyber security, probabilistic risk assessment, buried piping & tanks, cathodic protection, cables, equipment reliability, maintenance, refueling, electrical systems, cooling water & site support systems, steam generators, and water chemistry.
- **Revision 13 (05-Dec-2014):**
The introduction summarizes a project by EPRI for **small modular light water reactors (smLWR)** into the URD Rev.12. the introduction covers the scope and content of the URD, the process used to revise the URD to include smLWR requirements, how to use the URD, and documentation of discussion on topics.

- **Value of URD Process for Today and Tomorrow's Designs**
 - Incorporate/reflect the thousands of reactor-years of industry experiences
 - Realize significant improvements in safety
 - Stabilize regulatory basis: regulatory optimization, margin to regulation, resolution of state and local regulatory issues
 - Promote standardization
 - Reduce capital and O&M costs
 - Restore investor confidence
- **Utility Requirements Document contributes an international movement to Standardization & Harmonization of nuclear designs. The EPRI-URD strongly reflects the procedures, rules, regulations, codes and standards being used in the United States and utilities in other countries, and also influences the development of other regional Requirements Documents in the European Union, Republic of Korea, China.**