

Operational Readiness of SMRs

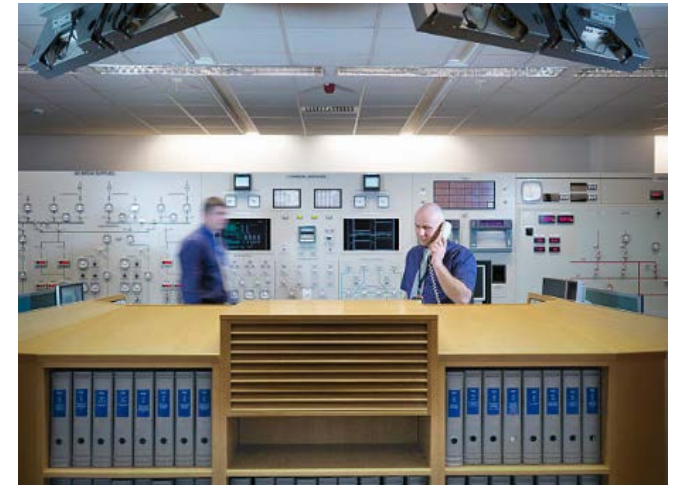
NPES Activities

Ed Bradley

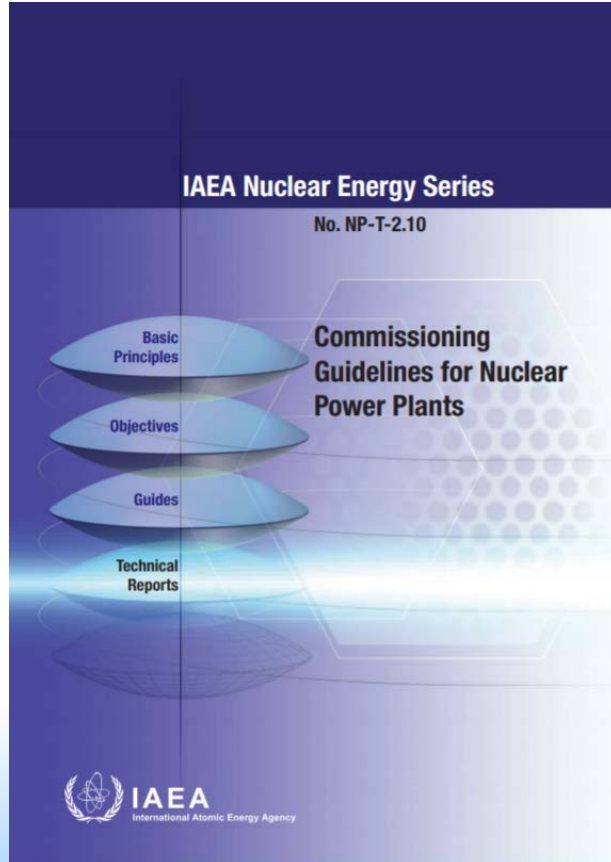
Team Leader, NPP Operation & Engineering Support

Background

- NPES
 - Engineering & Ops support
 - Operating Plants
 - New projects in operating countries
 - Management & HR Development
 - Management systems, leadership & stakeholder involvement
 - HRD

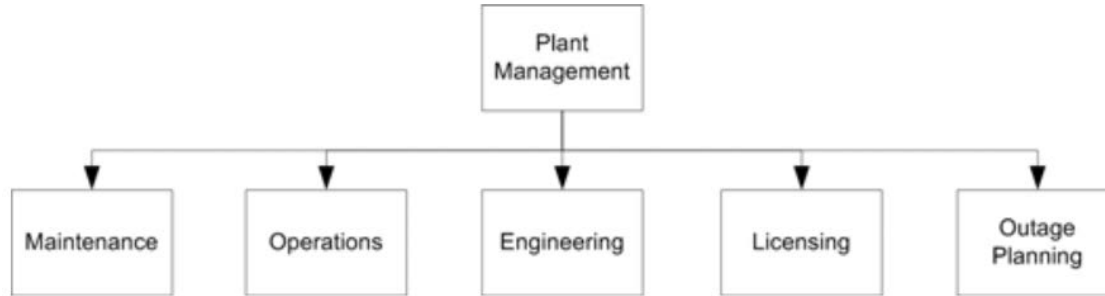


NPES & Commissioning

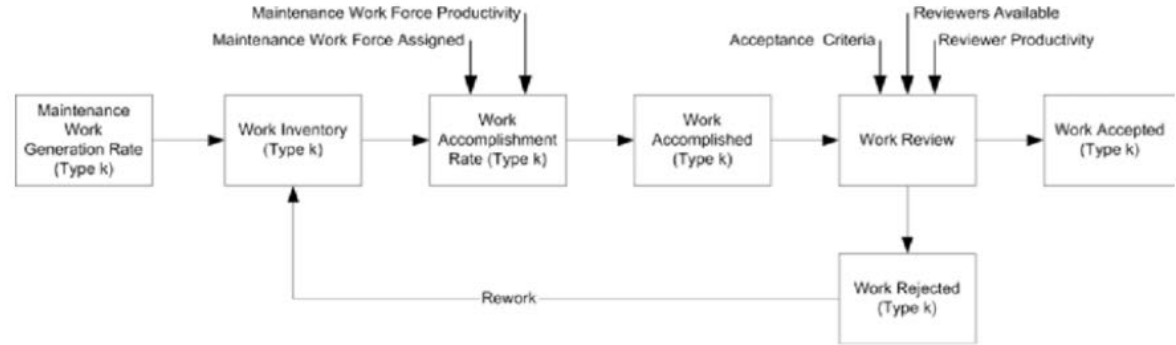


- [40] ALL-RUSSIAN RESEARCH INSTITUTE FOR NPP OPERATION, Integrated Measures to Ensure the **Operational Readiness** of New Power Units of Nuclear Power Plants: General Requirements, RD EE 1.1.2.28.760-2015 (with Amendments 1 2016, 2 2017), Rosenergoatom, Moscow (2017) (in Russian).
- Establishes general requirements for the **development plan, content and implementation conditions** for comprehensive measures for ensuring the operational readiness of new NPPs

Organizational Models, O&M Plans...



Typical Nuclear Power Plant Organizational Structure

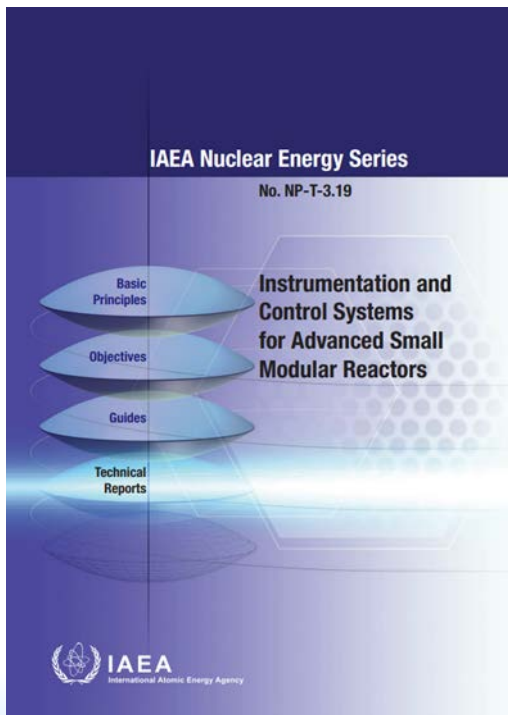


Maintenance Work Flow

P. Hallbert, Bruce & Joe, Jeffrey & J. Keefe, Molly & J. Persensky, Julius. (2007). Modeling and simulation approaches to developing human performance measures in nuclear industry. 373 - 377.

10.1109/HFPP.2007.4413236.

Recent, relevant NPES support



2.6. Operational characteristics specific to advanced SMRs	18
2.6.1. Autonomous operation with remote intervention capabilities	18
2.6.2. Integrated operation of multiple units	19
2.6.3. Multiple end product or reconfigurable energy conversion systems	20
2.7. Maintainability characteristics specific to advanced SMRs	20
2.7.1. Extended operation cycles	21
2.7.2. Cost effective maintenance and asset management	21

- “Autonomous, remote operation”
- “...skeleton maintenance staff.”
- “...absence of personnel reduces hazards from a fitness for duty perspective...”

[6] CLAYTON, D.A., WOOD, R.T., “The role of instrumentation and control technology in enabling deployment of small modular reactors”, Nuclear Plant Instrumentation, Control and Human–Machine Interface Technologies (Proc. 7th American Nuclear Society Int. Topical Mtg, Las Vegas, 2010), ANS, LaGrange Park, IL (2010) CD-ROM.

...and Operational Readiness for SMRs?

- Operations Plan
 - Organizational model / staffing
 - Surveillance & testing
 - Switching & tagging
 - Training
- Maintenance Plan
 - Organizational model / staffing
 - Maintenance process / workflow
 - Turnover from / to Operations
 - Training
- Engineering Plan
 - Organizational model / staffing
 - Engineering processes (modification, technical assessment)
 - Training
- Licensing Plan
 - Organizational model / staffing
 - Regulatory interface
- Outage Management Plan
 - Organizational model / staffing
 - Outage management process

Thank you!

