

Challenges in licensing and inspection of OL3

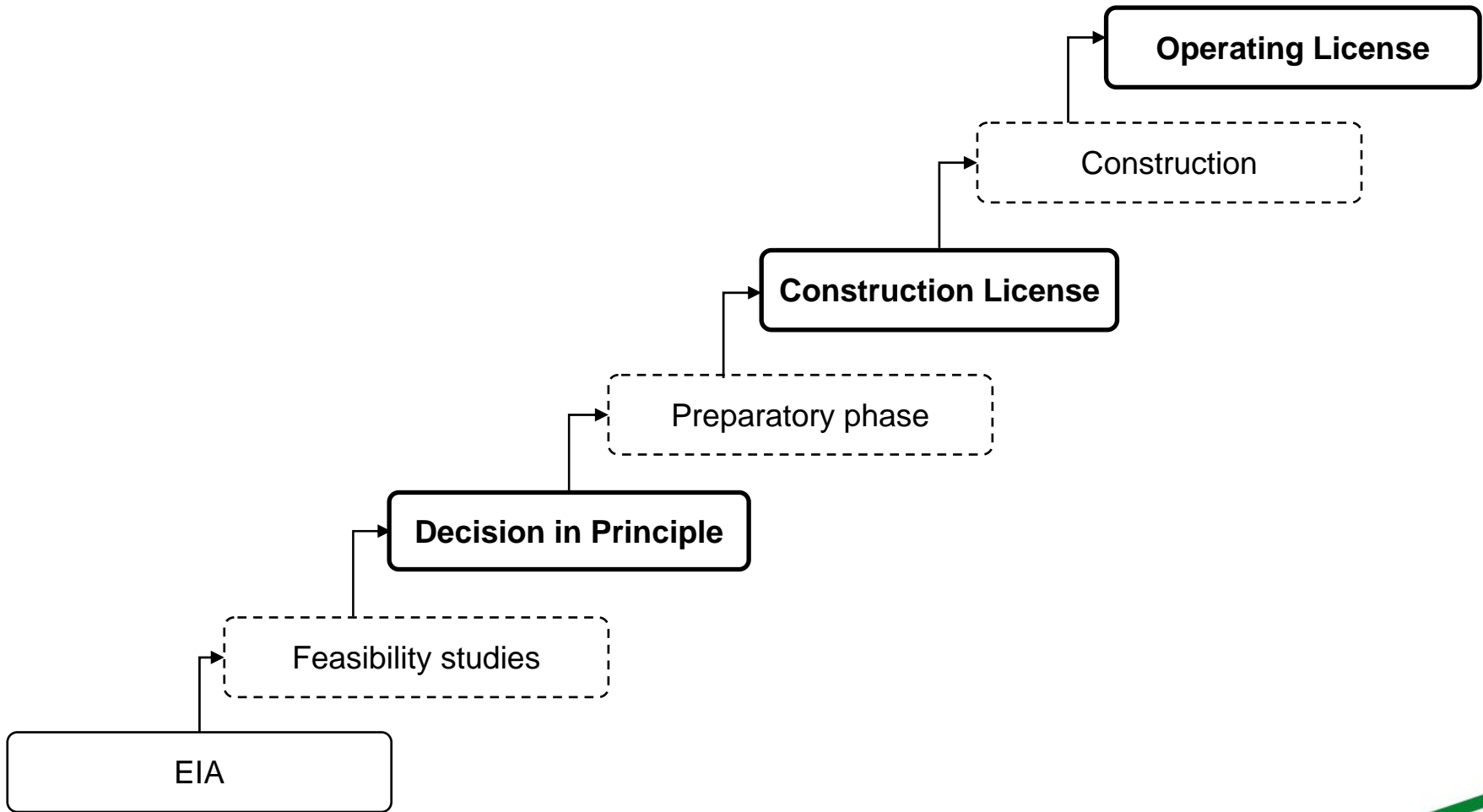
RIC 2007

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Outline

- Licensing process and stages
- Regulatory oversight during construction
- Experience
 - Project schedule, Project Management, Manufacturing, Regulatory issues, Quality Management, View forward, Safety and quality
- Conclusions

Licensing Stages



Stages and goals

Preparatory phase

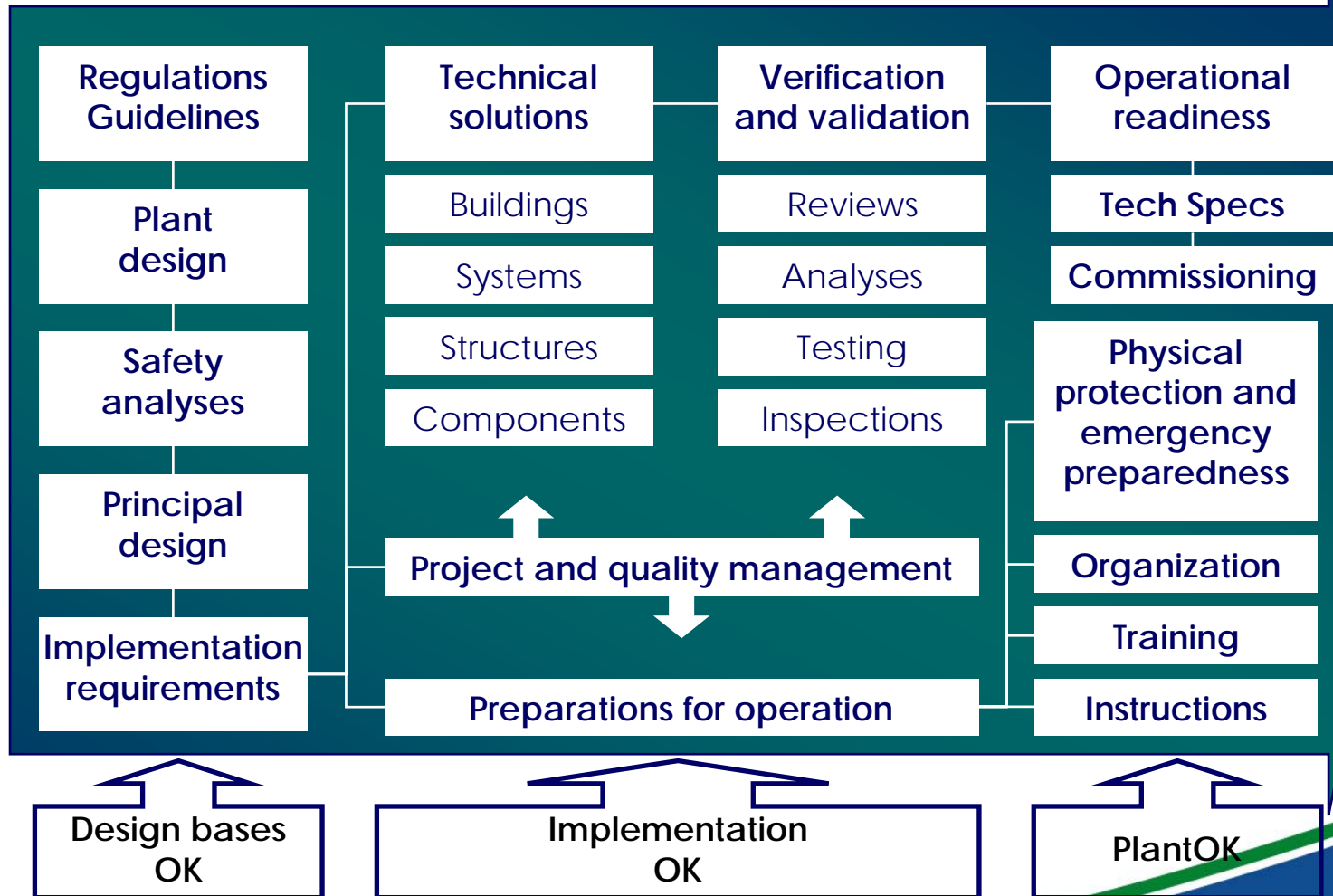
Construction permit reviews

Oversight during construction

Operating license reviews

Decision in principle

Plant and site selection by utility
Construction permit application



Regulatory Oversight during construction

- Design review and control of construction, manufacturing, installation and commissioning
 - focus based on safety classification
 - requirements defined in specific regulatory guides
 - Inspection Organisations used in lower safety classes
- Licensee performance - CIP
- Performance of the main vendors

OL3 project - General status

- Project is delayed by year and half
 - delays in the detailed design (civil works, system design)
 - problems in the manufacturing of main components
 - implementation of civil works at site
- Design ongoing - finished by 2007
- Nuclear Island civil works on the critical path
- Manufacturing of main components ongoing
- Commercial operation end of 2010 - early 2011

Experience - Ambitious project schedule

- Slow progress of design
 - Status of plant design in the beginning was on a conceptual level
 - Incorporation of new design features has taken longer than expected
 - Engineering resources needed for the detailed design were underestimated - new recruitment needed
- Consequences
 - Slow completion of design has been a bottleneck limiting the progress in construction and manufacturing
 - problems in subcontractors work - work planning and scheduling difficulties
 - Batch wise approval of design has complicated regulators work
 - “Design as you go” is a challenge for plant configuration management

Experience - Project management

- Lack of experience in managing a large construction project
 - understanding on skills required to manage a large construction project
 - management of entities at the construction site
 - management of subcontractors in the project
 - unclear requirements (quality control, regulatory inspections)
 - poor guidance and inadequate supervision
 - poor communication between consortium and its contractors
 - expectations for high safety culture
 - unfamiliarity with Finnish licensing and inspection process

Experience - Manufacturing capabilities

- Degradation of the global manufacturing infrastructure
 - manufacturers have disappeared - new manufacturers had to be trained
 - training and supervising of contractors has not always been well managed
 - experienced persons have retired - retraining of personnel and recruitment of new personnel
 - experienced manufacturers not interested in producing “nuclear quality” because of extra burden

Experience - Manufacturing problems

- Quality problems in manufacturing
 - difficulties with new design features (main cooling pipes forged from stainless steel with minimum number of welds, nozzle welds done with new technology, narrow gap bi-metallic welds in safe-ends)
 - difficulties in qualifying new manufacturing technologies - qualification process causing extra work and delays
 - carelessness - dropped forgings, failures in heat treatment
- Manufacturing of some of the large components did not succeed in the first instance
 - forged parts of the pressurizer shell
 - HP turbine shaft
 - RPV upper core barrel shell
 - main coolant pipelines (grain size of the metal was so large that ultrasonic in-service-inspections had not been possible)

Experience - Quality management

- ISO vs. IAEA quality requirements
 - safety related (IAEA) - non safety related (ISO)
 - QA systems complemented with project specific quality plans
- Quality assurance and quality control
 - experienced QA and QC personnel (nuclear specific experience)
 - use of existing QA systems instead of creating new for project
 - timely and effective handling of non conformances
 - systematic assessment of results
 - proactive working
 - Audits on subcontractors
 - not only quality management issues
 - technical issues and project specific issues

Experience - Regulatory oversight

- Integration of licensing into the project schedule
 - licensing process interpreted in the licensing schedule - needed for regulatory oversight and planning
 - timely regulatory hold points
- Turn key contract
 - role of the licensee and vendor - licensing/licensability
 - licensee's rights and responsibilities
 - use and control of subcontractors
- Regulatory success
 - resources, project management tools, up to date requirements
 - project experience and knowledge
 - intervention and enforcement tools
- Media, NGOs

Experience - Signs of progress

- Experienced persons in key positions
- Experienced constructor started works on the nuclear island
- Detailed design is progressing
- Fixed schedules between vendor and sub contractors

Experience - Safety

- Safety and quality has not been compromised because of
 - extensive (and time consuming) tests, inspections and analyses have been performed to prove that the required standards and criteria have been met
 - extensive repairs have been made to reach required quality
 - re-manufacturing and re-construction of some equipment and structures
- Causing additional work to all parties

Conclusions

- Project has been very educating to all parties and in many respect
- Experience and competence is everything
- Safety and quality has not been compromised
- Lessons have been learned - signs of better progress