SOLUTIONS RELATED TO LICENSING OF NUCLEAR TECHNOLOGY – CODES / NORMS / STANDARDS

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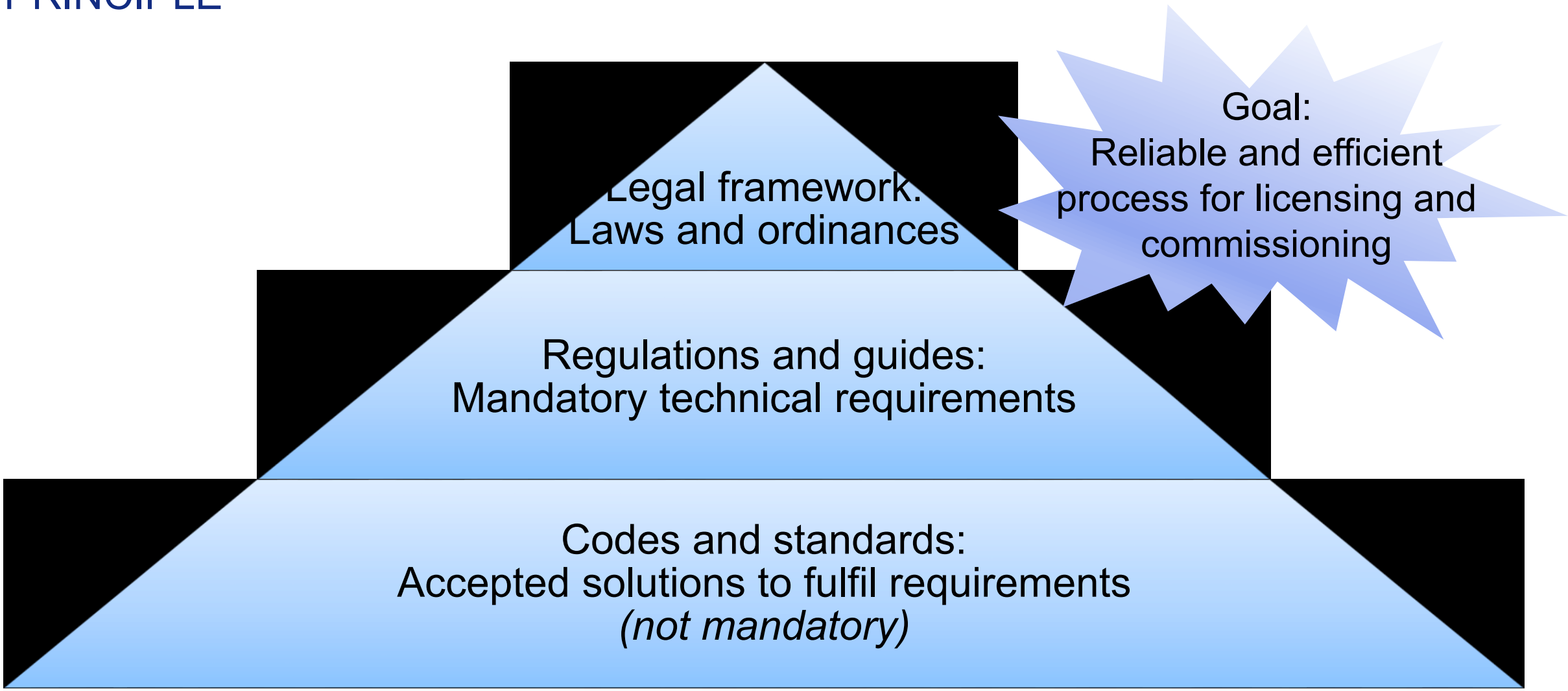
TÜV NORD NUCLEAR – INTERNATIONAL EXPERT ORGANIZATION

- TÜV NORD EnSys: Technical Support Organisation (TSO) for German authorities for more than 50 years
- Broad spectrum of competencies covering all aspects of nuclear safety for the complete life cycle of NPPs
- Network of international entities in the nuclear field
- Involvement in current international nuclear power plant projects , e.g.:
  - Qualification of suppliers and equipment for NPP Angra-3, Brazil
  - Qualification of I&C equipment for NPP Olkiluoto-3, Finland
  - Support of FANR, the regulator of UAE, in the safety assessment of the Barakah NPP, since 2012
  - EU projects supporting regulators of emerging nuclear countries: Jordan, Iran
- Personal introduction Thomas Riekert:
  - Nuclear safety expert with 30 years experience
  - Head of nuclear safety in TÜV NORD EnSys
  - Long-standing member of German Reactor Safety Commission (RSK) and Nuclear Safety Standards Committee (KTA)
- TÜV NORD is well established in Poland: **TÜV NORD Polska**

CODES AND STANDARDS AS PART OF THE LICENSING PROCESS PRINCIPLE



CODES AND STANDARDS AS PART OF THE LICENSING PROCESS ILLUSTRATION FOR PRESSURE BOUNDARY MATERIAL, GERMANY

Regulations and guides: Safety Requirements for Nuclear Power Plants

Requirement 3.4 (3):
For the reactor coolant pressure boundary…
use of high quality materials, in particular with regard to toughness and corrosion

Codes and standards: KTA 3201.1 Components of the reactor coolant pressure boundary for LWR, Part 1: Materials and product forms (157 pages)

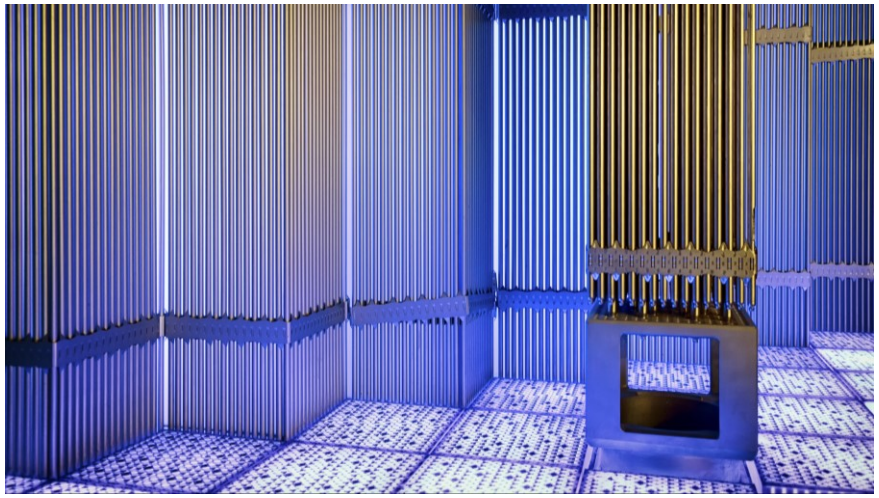
- Specification of requirements on the materials and the testing of materials, general and for specific applications like shells, pipes, tube sheets …
- Specification of requirements on manufacturers
- List of accepted materials (e.g. 20 Mn Mo Ni 5 5) with the material specific requirements, e.g. mechanical-technological properties
- Accepted manufacturers (with cross reference)
- For further materials and manufacturers: Conformity with requirements has to be demonstrated and would be reviewed in the licensing process

INTERNATIONAL SYSTEMS OF CODES AND STANDARDS OVERVIEW

- Well developed systems of codes and standards in various countries, e.g.
  - ASME (American Society of Mechanical Engineers), USA – Basis of other standards
  - RCC-M (Règles de Conception et de Construction des Matèriels Mècaniques der Ilôts Nuclèaires REP), France
  - KTA (Kerntechnischer Ausschuss), Germany
  - GOST (Gosudarstvennyy Standart**)**, Russia
- These systems of codes and standards form a systematic approach:
  - Materials
  - Design
  - Analysis with calculations and safety margins
  - Manufacturing
  - ➢ No “cherry picking”, but application as a system
- Collection of research results, knowledge and experience, mostly not available without fee (exception: KTA-standards, see http://www.kta-gs.de/welcome_engl.htm)

INTERNATIONAL SYSTEMS OF CODES AND STANDARDS EXPERIENCE WITH APPLICATION

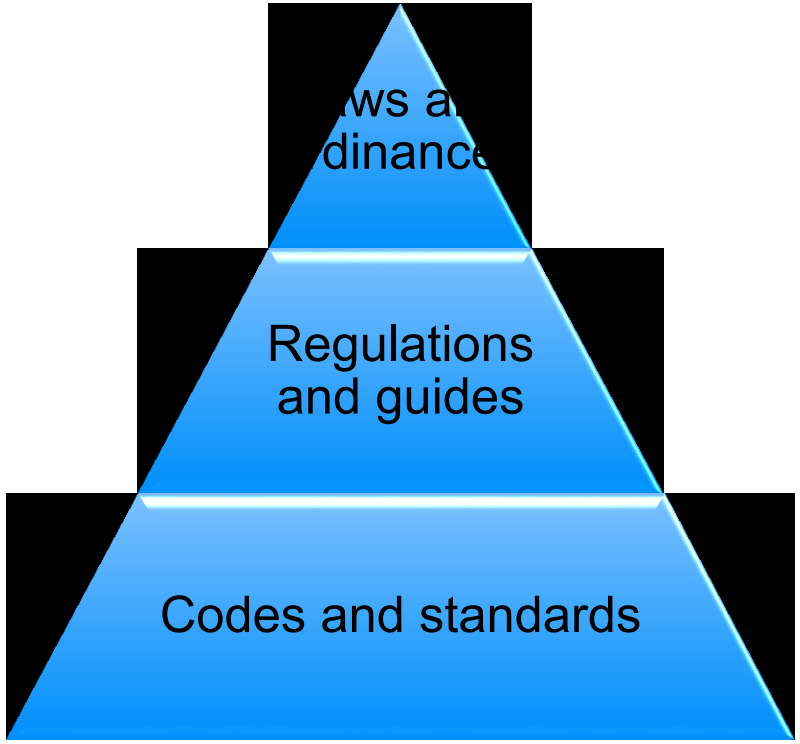
- Example: Lifting equipment for a spent fuel facility in Europe
- Requirement by main contractor: Lifting equipment according to Germans standard KTA 3902 on lifting equipment for nuclear power plants (which is used in several countries)
- Supplier of crane: Company with no experience on KTA 3902
- Result:
  - Assessment by TÜV NORD as inspection agency found many deviations
  - Substantial delays
- Lesson to be learned:
  Prepare on application of required safety standard before contracting



OPTIONS FOR NEWCOMER COUNTRIES

- First two levels of pyramid:
  Task of government and regulator
- Codes and standards – options
  a) Development of own domestic codes and standards
  b) Adoption of an existing system, e.g. ASME, by regulator
  c) Selection of codes and standards by vendor, acceptance by utility and regulator

(Approach c) is applied in many countries, e.g. UK, Czech Republic)



OPTIONS FOR NEWCOMER COUNTRIES ADVANTAGES AND DISADVANTAGES

Option	Advantages	Disadvantages
a) Development of domestic C&S	• Domestic control over the requirements • Development of knowledge in country	• High effort (time, money) • Acceptance by international vendors/ suppliers questionable
b) Adoption of existing C&S by regulator	• Low effort • Application of established system • International experience available	• No control over further development • Acceptance by vendors/suppliers from other countries questionable • Need for training
c) Selection of C&S by vendor	• Low effort • Application of established system • Flexibility • International experience available	• No control over further development • Need for training • Need for adaption by domestic suppliers

Preferred option – with condition:
Fulfillment of regulations and guides to be demonstrated by utility (applicant)

CONCLUSION: HOW TO PROCEED

- Foster decision on codes & standards by regulator (if not already made)
- Follow development: Which vendors are possible? Which system of codes & standards will be applied?
- Prepare for the application: Develop processes and structures for training, certification, …
- Qualification of manufacturers: Certification according to ISO 19443 (Quality management systems – Nuclear) as a basis
- When decision on NPP with vendor is made:
  Build the basis for application of codes and standards
  - Specific qualification / certification?
  - Technical requirements on the design of the products?
  - Requirements on testing and documentation?
  - Involvement of inspection agency?
- TÜV NORD will be ready to support your member companies in this process

KNOWLEDGE AND DIALOGUE, PROGRESS AND SUSTAINABILITY. TAKEN TOGETHER, THIS IS OUR EXPERTISE FOR YOUR SUCCESS.

With our knowledge, we stand for safety, independence and quality – everywhere and at all times. We look to the future and dedicate ourselves to making our clients even more successful in the connected world.

We protect lives, goods and natural resources. We achieve this by offering services in testing, inspection, certification, engineering and training.

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