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Standardization of Reactor Designs: The Way Forward

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International standardization of reactor designs

- International standardization means that each vendor's design can be built by a vendor, and ordered by a utility, in every country **without obligatory adaptation to specific national regulations**
- International standardization will
  - help deliver large-scale worldwide new build of nuclear power plants
  - bring benefits for safety

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Standardization as an enabler for new build

≈400 new reactors planned
But only ≈10 reactor types

Past:

- **Investment by state-owned utilities in regulated markets**
- **Investment by national players**
- **Custom-made reactors: almost every reactor was different**

Present:

- **Investment by private-owned utilities in highly competitive markets**
- **Emergence of multinational utilities choosing among a small number of international designs**
- **Standardization is required to facilitate new build !!!**

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Standardization as a benefit for safety

- Fleets of standardized designs offer a broad basis for construction and operation experience feedback
- Design improvements could be implemented across the fleet
- Risk of a design shortcoming affecting the whole fleet (large scale shutdown) is small due to high probability of early detection of design flaws

Standardized advanced plants will bring additional safety layers for design, construction, operation and decommissioning

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Existing regulatory/legal situation

- Each reactor project needs a licence issued in a specific procedure after full assessment by the competent regulatory body
- Licence is issued according to special national licensing procedures, which vary considerably
- Licence is based on national safety requirements, which vary considerably in details

► **This does not facilitate deployment of standardized designs across a range of countries**

► **A design approval in one country is irrelevant for others**

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Role of Regulators and Governments

- Standardization as such must be delivered by industry…
- …but industry needs to be enabled to do so by starting new approaches within national and international regulatory frameworks
- Three main targets to tackle the situation presented in the previous slide:
  - **design approvals with international impact**
  - **harmonization of safety requirements**
  - **alignment in licensing procedures**

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Multinational Design Approval Programme (MDEP)

- 10 regulators who are/will be undertaking review of new NPP designs: Canada, China, Finland, France, Japan, Russia, South Africa, South Korea, UK, US
- Fully operable since 2008
- Aims of MDEP:
  - enhance cooperation between regulators
  - establish reference regulatory practices
  - achieve convergence of codes, standards, and safety goals in the long-term
- However: no harmonization of safety requirements, no commonly valid design acceptance

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Potential regulatory hurdles on the way to standardization

- Sovereignty of each country's regulator has to be respected
- Regulators are bound by law to apply their national safety requirements and licensing procedures
- Regulators need to build up knowledge of the design

The CORDEL proposal: 3 steps towards standardization

World Nuclear Association (WNA) Cooperation in Reactor Design Evaluation and Licensing (CORDEL) Group

- Founded in January 2007
- Membership:Includes all major vendors and many utilities interested in new build

CORDEL proposes **3 subsequent steps** to achieve **international validity of design approvals** and thus to achieve **full international standardization of reactor designs**

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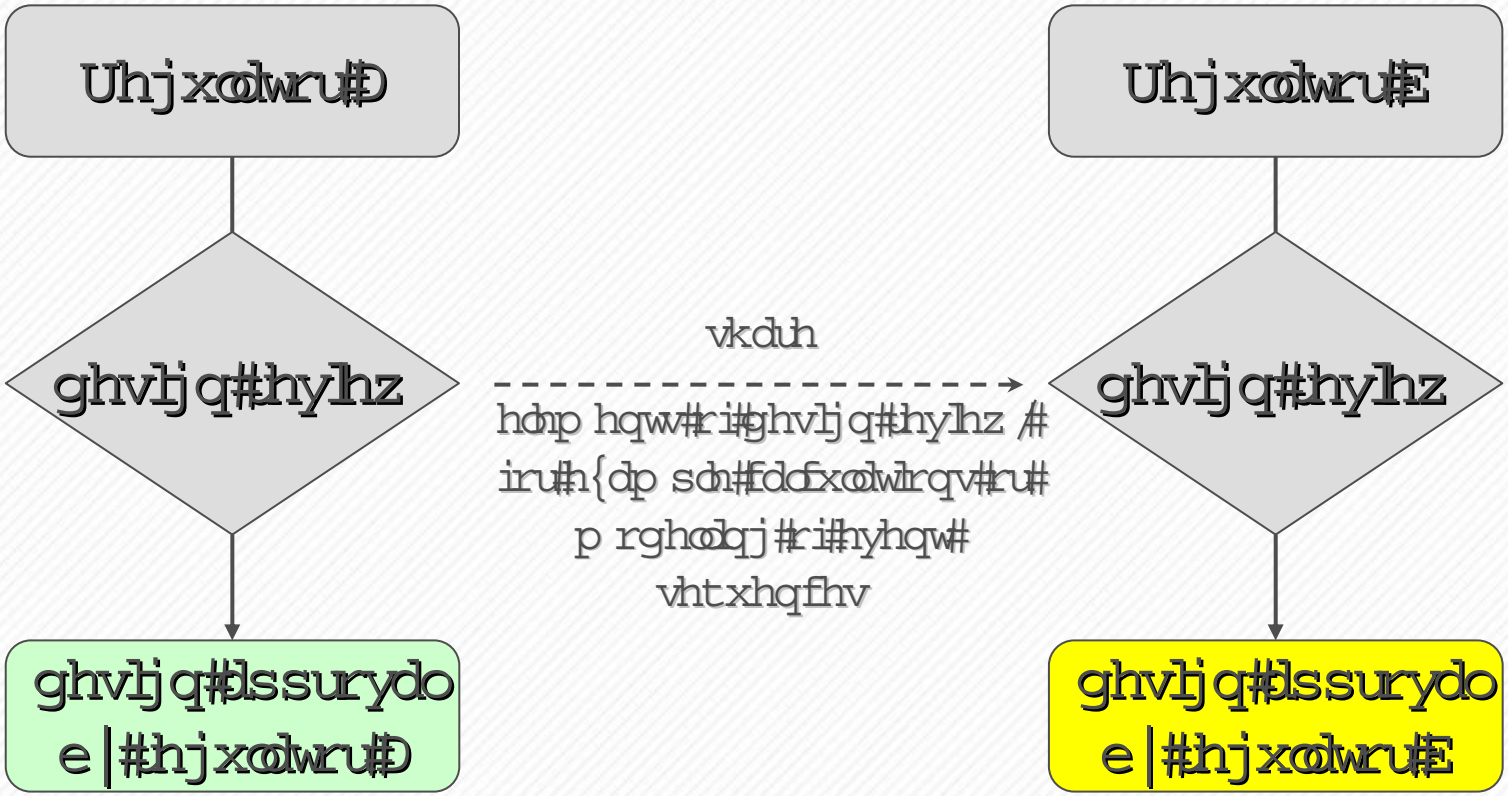
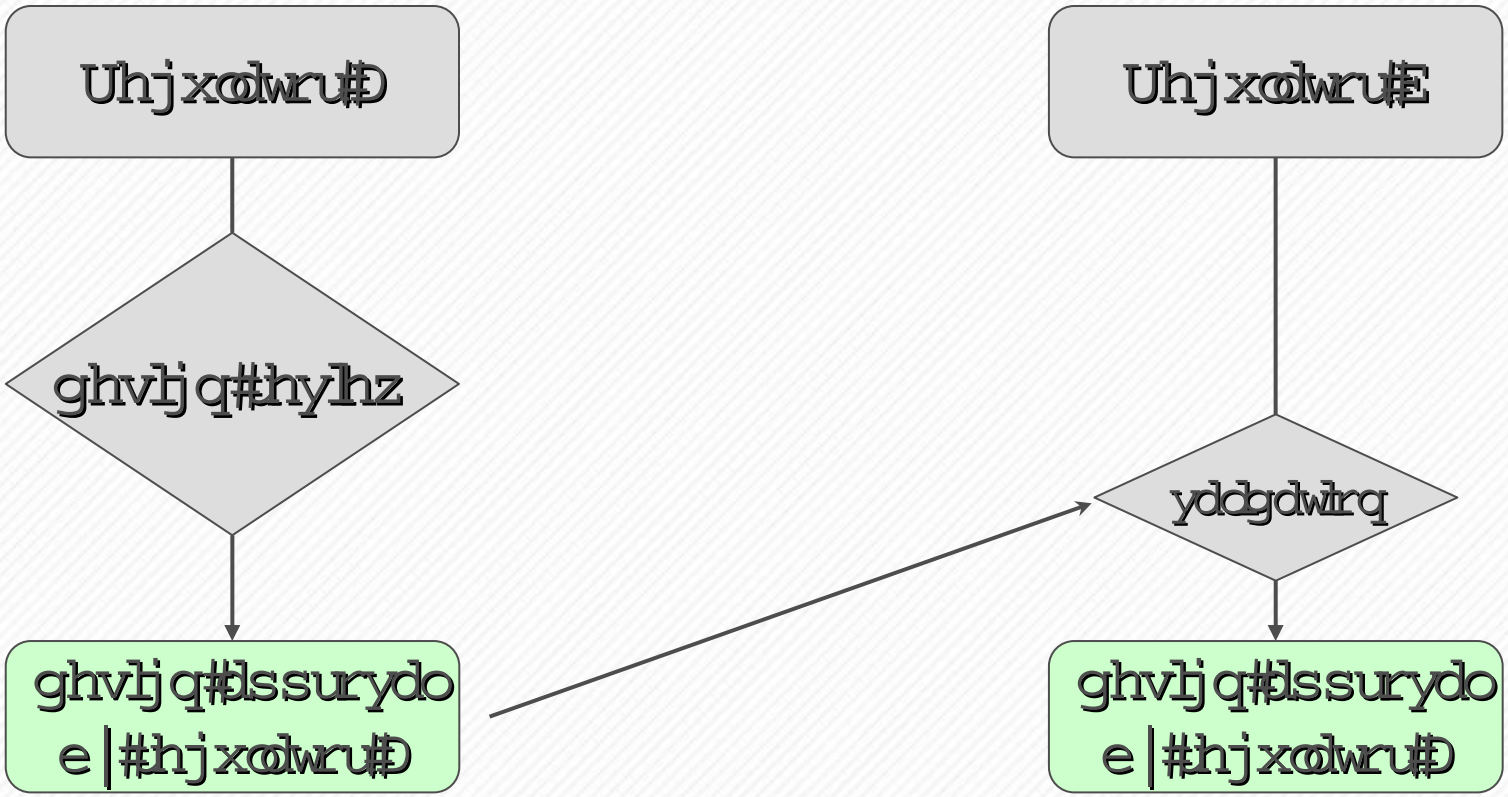
Step 1: Share design assessment



Step 2: Accept design approvals after validation



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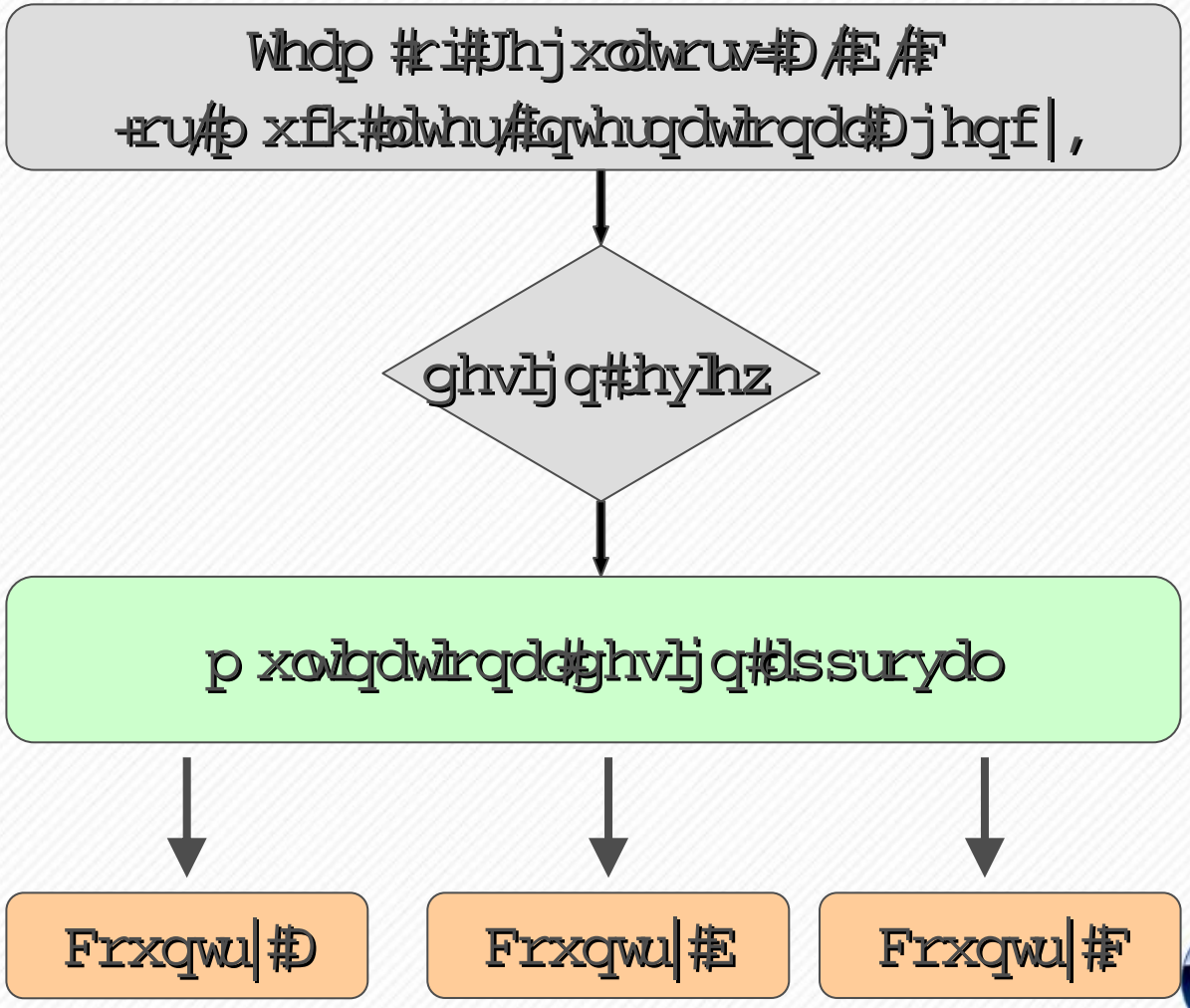
Step 3: Issue multinational design approval



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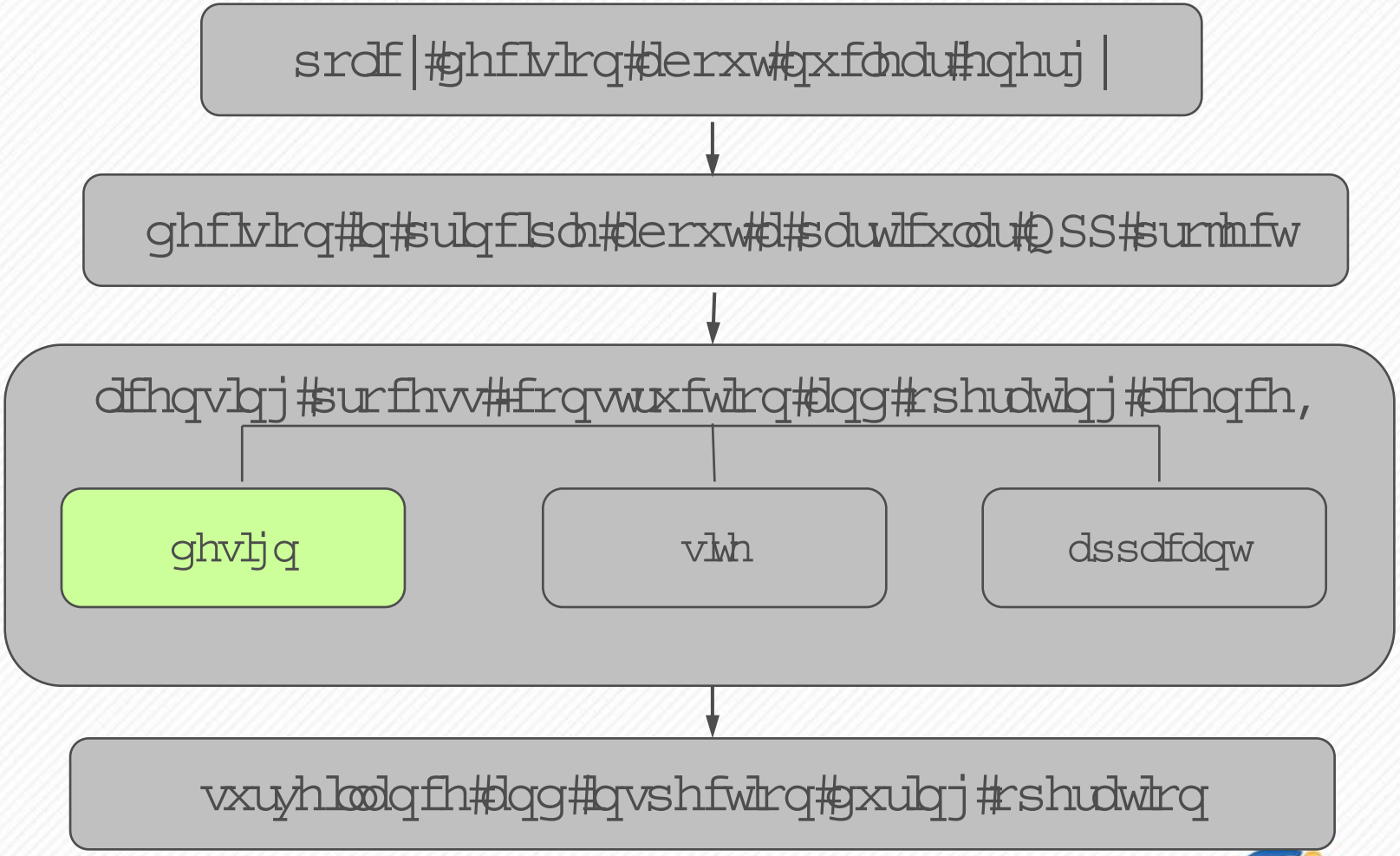
Design approval as part of the overall regulatory process



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Step 1: Mutual acceptance of design reviews and assessments

- For demonstration of safety, the regulators could make use of:
  - Assessment work done by their peers, e.g. by reusing calculations or modelling of event sequences
  - Assessments done by industry (EUR, US URD)
- This would reduce the strain on regulators' resources
- This would in no way infringe the right and the duty of regulators to take the final decision to issue a licence
- MDEP development towards shared assessment work is highly appreciated

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Step 2: Mutual acceptance of design approvals (1)

Mutual acceptance of design approvals — a facilitated takeover of a foreign design approval

- Not "automatic" but through a "**validation**". There are models for this, e. g. transport casks for waste.
- Focus for national regulator would be on "local" site-specific and operator-specific issues
- Changes in national legislation may be necessary to permit adaptation of foreign design approvals
- Regulator would have enough opportunity to familiarize himself with the design

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Step 2: Mutual acceptance of design approvals (2)

Example: Italy's new Act on Energy Companies, Act no. 99 of 23 July 2009, Art. 25, 2 i):

[Government is empowered to issue] a provision that licences relating to technical requirements and specifications for reactor designs which have been licenced in the past 10 years by the competent authorities in member states of OECD-NEA, or in states linked to Italy by bilateral agreements … in the nuclear sector, will be considered to be valid in Italy after approval by the Nuclear Safety Agency

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Step 3: Multinational Design Approval

- Multinational Design Approval – issued by a team of all concerned regulators or by an international organisation
- Multinational certification is owned by the vendor and is valid for entire design life
- Operator is “intelligent customer” (it wouldn’t make sense for 20 operators to each maintain full design authority for one design…..)
- Network of vendors, operators and regulators is required to address post-certification design changes and to maintain the Multinational Design Approval

Alignment of licensing processes

- Licensing processes and documents should be aligned so that the design acceptance of one country would fit into the licensing sequence of another country
- Best solution: separate generic design approval
  - US: design certification
  - UK: Generic Design Assessment (GDA)
  - France: “avis” of ASN on safety of a design
- Legal implications of design approval: period of validity, binding character, “ownership”, etc.

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Harmonization of national safety requirements

- Absolutely necessary for standardization
- Differences are ever more difficult to justify (why should requirements of one country be “safer” than others….)
- However, combination and “piling up” of the strictest requirements to be avoided
- IAEA Safety Standards as a model
- Good opportunity for newcomer countries to start right away with regulations based on international consensus

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CONCLUSIONS

WNA CORDEL Group proposes 3 steps to achieve international standardization of reactor designs:

1. Sharing design assessment
2. Accepting design approvals after validation
3. Issuing multinational design approvals

In parallel and to enable this, national **licensing procedures** and **safety requirements** have to be **harmonized**.

Standardized designs will

- help deliver nuclear new build on a large scale
- enhance nuclear safety.

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