EC Project 'Modernisation & Optimisation of European Nuclear Supply Chain'

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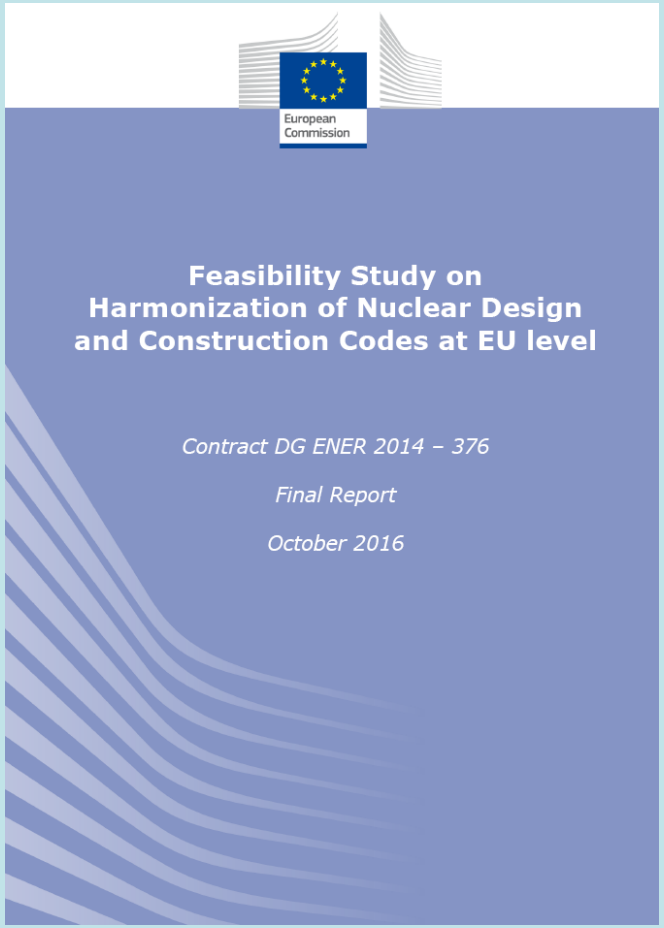
NEA Nuclear Supply Chain Management Workshop, November 5-6, 2018, Boulogne-Billancourt

European Commission

Origin of Project



- Study accompanied Phase 2 of CEN Workshop 64 [1)]
- Idea for project came largely from Vattenfall (= contributor to CEN WS64 P2 and feasibility study), as European utilities face increasing challenges on their supply chain.
- Annex 6 of study contains first outline of project with background information on why it is needed.

Project aims at modernising European nuclear supply chain according SAHARA Principle <u>without</u> compromising nuclear safety (could even improve safety of European NPPs).

[1)] project running from 06/2014 – 06/2018 with aim to provide recommendations on further evolution of AFCEN codes & required underlying research

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Background & Motivation (1)

Utilities are required to invest continuously in their plants to maintain & even increase nuclear safety level.

While doing so they face **increasing challenges on supply side:**

- **Challenge 1, Obsolescence issue**: OEM suppliers of SSC equipment currently installed in nuclear facilities do not exist anymore or have stopped producing specific SSC equipment according to original design (mandated by original equipment qualification).
- **Challenge 2, Difficulty to find new SSC equipment suppliers:** Potential new suppliers offer SSC equipment to nuclear vendors / utilities with an added risk-premium or chose not to sell to them at all.
- **Challenge 3, Existing suppliers lose interest to re-perform qualification processes**.

Background & Motivation (2)

Consequences:

- Heavy qualification processes are postponed and therefore timely replacement of SSC equipment due to obsolescence issues is avoided, although better similar state-of-the-art SSC equipment is in principle available (but not similar enough for a like-for-like replacement based on the old qualification).
- Large efforts for procurement of new SSC equipment according to old legacy requirements in order to avoid equipment qualification uncertainties and risks.
- **Thus** mending of currently installed SSC equipment is **preferred way** forward in many countries with considerable efforts (cost + personnel).

Background & Motivation (3)

- **Challenge 4, Formal strict quality assurance documentation requirements** (methods & procedures predating ISO 9001) on SSC equipment (in particular for safety class 3 SSC or lower), because:
  - "Spill-over effects" (more or less same level of quality assurance documentation for a SC3 SSC as for SC1 / SC2 SSC, because it is to be used in a nuclear facility);
  - Uncertainty about level of quality assurance documentation needed, resulting in a tendency of doing too much, e.g. more than is actually needed;
  - Conservatives in practice;
  - Industrial protectionism;
  - A prevailing attitude of nuclear exceptionalism;
  - …

Background & Motivation (4)

- **Challenge 5, General difficulty to receive approval for using modern state-of-the-art technology for SSC equipment in nuclear facilities,** because:
  - National nuclear regulation does not allow it;
  - Established nuclear design standard (normally used) does not cover the modern state-of-the-art technology;
  - Conservatives in practice;
  - …

Key to overcome supply challenges is to clarify (and possibly re-define) link between nuclear safety requirements (WENRA, IAEA, etc.) and industry practice to manufacture, select & procure SSC equipment for nuclear facilities.

Project Objective 1

Project aims to make it possible to generally use standard non-nuclear industry equipment (manufactured according to ISO, EN, …) in nuclear facilities (in particular, for SSC of SC3 and lower) without any additional nuclear specific regulations.

Non-Nuclear High Quality Industrial Standards (IS)

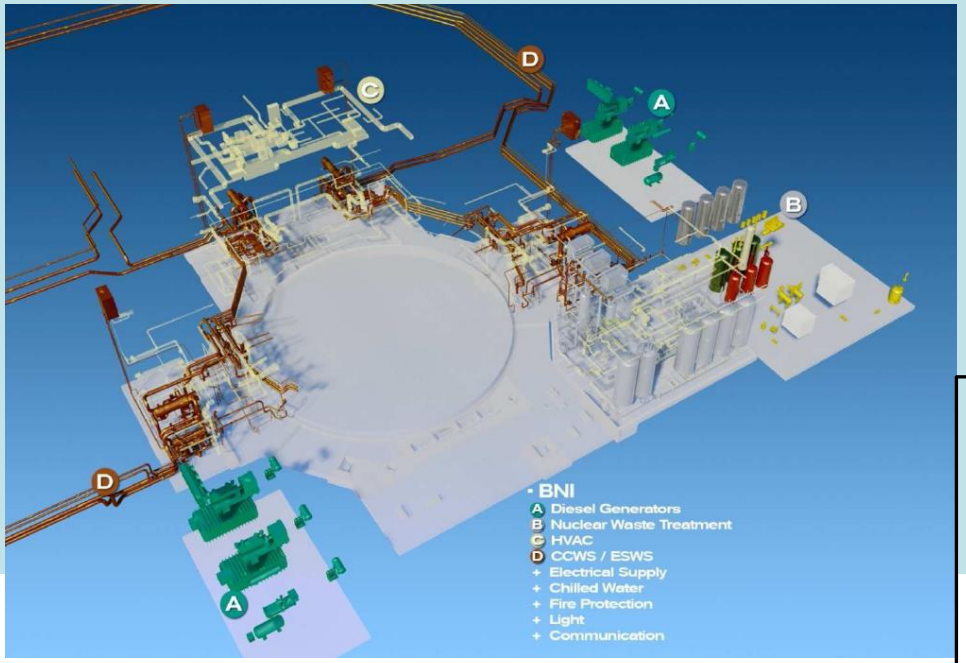
EUROPEAN STANDARDS

ISO International Organization for Standardization

DIN EN ISO

Lloyd's Register Marine

energy API AMERICAN PETROLEUM INSTITUTE



Support systems EPR

From "Areva presentation & EPR Reactor product", UK Supplier Day, March 16, 2009, Birmingham

Standard non-nuclear industry equipment with (if required by usability factors) additional tests to meet environmental & seismic requirements should be preferred practice and fully sufficient.

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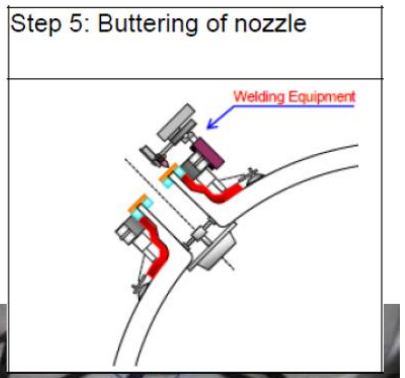
Project Objective 2

Alternative Nuclear Standards (ANS)

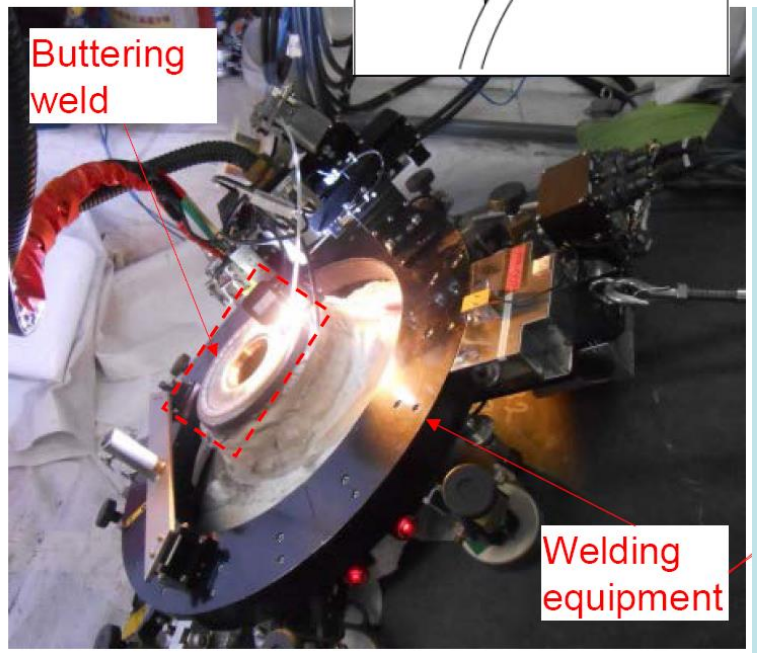
Allow use of ANS SSC equipment in nuclear facilities (current & new build), i.e. allow general use of SSC equipment manufactured according to nuclear design codes & standards different to ones normally used in country in scope.

Project Objective 2: An Example



Replacement of Pressuriser Safe-Ends at Ringhals Unit 3 (Westinghouse PWR)

Successfully performed to highest standard by MHI using machine welding!



- Initially MHI proposed manual welding, because it had been successfully performed 21 times in Japan.
- However, Ringhals requirements and current Swedish nuclear industry praxis prefers machine welding.
- If MHI had been able to qualify their Japanese standard manual welding praxis, work would have been accomplished for significantly lower cost (based on the Japanese experience, on an ANS).
- **Thus** resulting Ringhals 3 Safe-Ends solution became a high risk & cost First-of-a-Kind (FoaK) engineering design.

For more details: www.iaea.org/NuclearPower/Downloadable/Meetings/2017/2017-10-23-10-27-NPTDS/15_Miyoshi.pdf

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Project Benefits & Scope

Safety Improvements, because of

- Avoidance of high risk & cost FoaK designs;
- Allow suppliers use standards & manufacturing methods they are most familiar with. This guarantees highest SSC equipment quality & functionality;
- Reduced possibility of common cause failures due to possibility to deploy commonly used SSC equipment with good & long-term experience from other industries and to use different designs for redundant systems more easily if approval process is simple enough.
- Makes timely correct replacement/maintenance of SSC equipment easier possible and thus allows repair and re-use of replaced SSC at another place more easily.
- Reduced number of unexpected shut downs as SSC equipment can be more easily replaced in time.

Project Benefits & Scope (2)

In addition for utilities

- ❑ Increases pool of potential suppliers;
- ❑ Reduces efforts for quality assurance documentation for SSC equipment;
- ❑ Cost reductions.

Project scope: Gen II – IV Reactors

Project Partners

- **European utilities** (problem owners): Vattenfall, Uniper, Fortum, TVO, Fennovoima, EDF-Energy, Tractebel-ENGIE, EDF, Iberdrola, CEZ, Paks 2, Nuclearelectrica, Energoatom (answers pending from Kozloduy NPP, Horizon (UK); requests to be sent to Krsko NPP, EPZ)
- **National atomic / nuclear fora**: Swedish Atomic Forum, Finnish Nuclear Forum, SwissNuclear
- **Nuclear industry associations**: FORATOM, WNA, WANO;
- **ETSON**;
- **CEA** (to cover Gen IV);
- **EC-ENER** (project driver + WENRA/ENSREG contact);
- **EC-JRC** (project driver + project secretariat).

Throughout project interaction with **EPRI**.

Reaching project goals most probably requires changes in licensing practices of SSC equipment in European countries, so **interaction with regulators is needed & envisaged (how is under discussion)**.

Current status

- Kick-off meeting on June 13-14, 2018 in Brussels
- Agreed to issue report (1st project deliverable) summarising nuclear supply chain situation and assessing to what extent standard non-nuclear industry equipment and ANS for SSC equipment can be used in European countries.
  - EC-JRC currently drafting this report based on info from presentations at kick-off meeting and answers from questionnaire sent to utilities and nuclear fora involved in project.
  - Publication envisaged for 1st half of 2019.
- Afterwards agreement on next steps (e.g. technical studies, methodology and/or roadmap development)

Supply Chain Situation in Participating Countries – Quick Summary

Received answers from questionnaire confirms that

- Utilities of nearly all participating countries are affected by SSC equipment obsolescence, in particular for I&C.
- Finding new potential suppliers is difficult in European countries as they do not understand nuclear requirements or perceive them as too challenging and/or see nuclear market as too small.
- Mending of currently installed SSC equipment is preferred path forward.
- In some countries (e.g. Belgium) supply chain situation is becoming increasingly challenging, but practice / regulation provides more flexibility to respond to challenges.
- Only France (EDF) not affected: Sufficient number of suppliers to supply SSC equipment to desired quality (advantage of large fleet?).

Thanks

Any questions?

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