

Nuclear New Build

Managing Design Change during Licensing

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Conference

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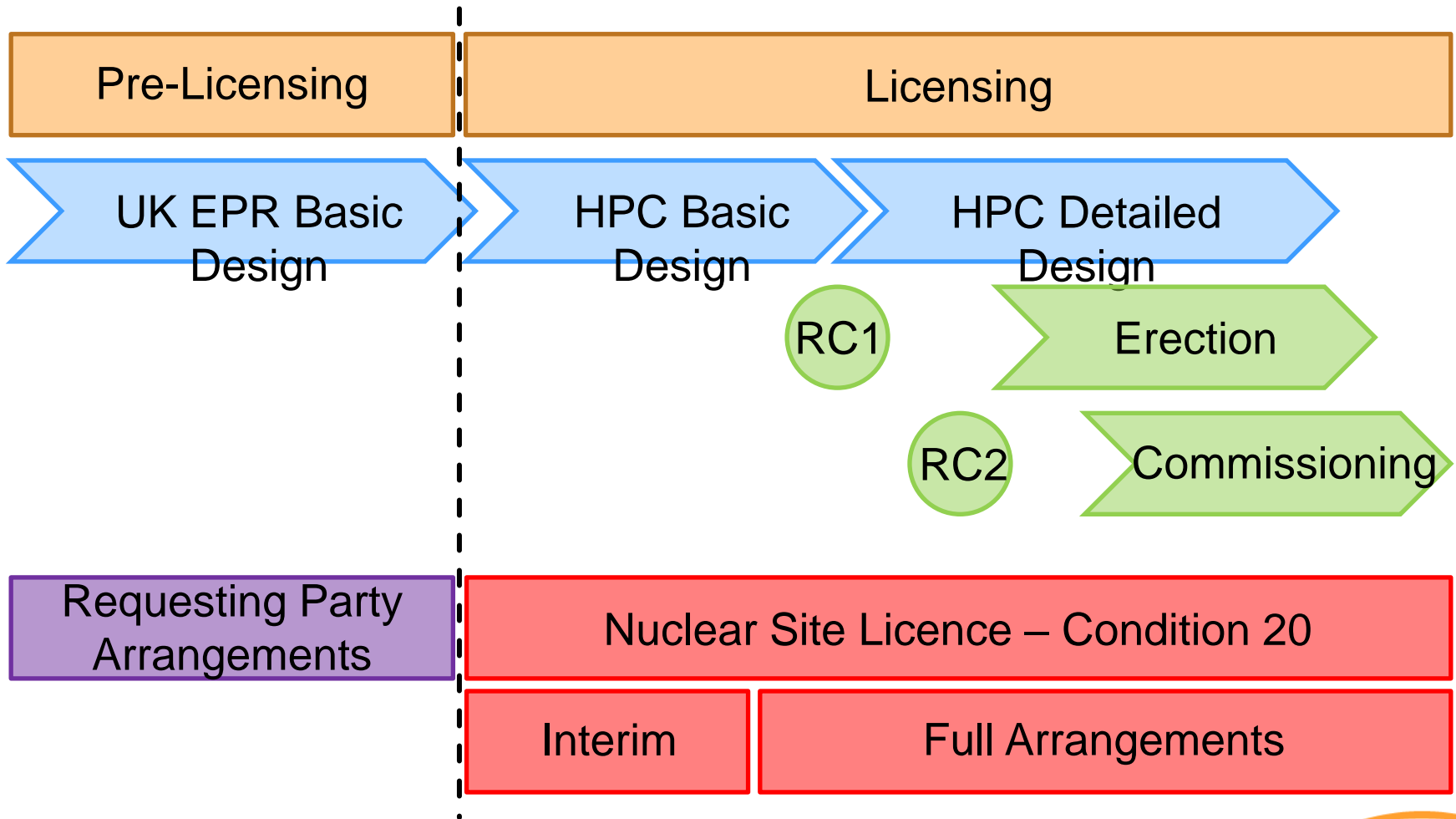
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The UK: Pre-Licensing and Licensing



GDA design change control

In the development of the UK EPR, design changes with respect to the reference design at Flamanville 3 were inevitable due to UK regulation, relevant good practice demonstrated at Sizewell B and industrial practices...

The main elements of the process were:

- Robust process, operated by EDF and AREVA, which was inspected by the regulators
- Sources of changes:
 - FA3 modifications with potential high impact on GDA submission
 - UK regulation
 - Fukushima response
 - Improvements where it was more efficient to implement at this stage and that could facilitate GDA assessment
- Graded Application:
 - Modifications related to nuclear safety, environment or security, which have (or potentially have) a **significant** impact on the GDA submission
 - Modifications related to nuclear safety, environment or security, but having a **minor** impact on the GDA submission
 - Modifications not related to nuclear safety, environment or security

GDA design change control

Further elements of configuration management were:

- Staged process
 - Change proposal
 - Impact analysis
 - Update of impacted documents
- Regular dialogue and correspondence with the regulator agreeing the inclusion of the change into the GDA scope
- All tracked in a Design Change Master List, circulated to all parties monthly
- Regular update and distribution of the “Reference Design Configuration” to the working teams
- Independent reviews of the most significant changes – a meeting similar to the UK Nuclear Safety Committee to provide advice on these changes
- Handover process for the transfer to the licensees of the design changes that remained open at the end of GDA

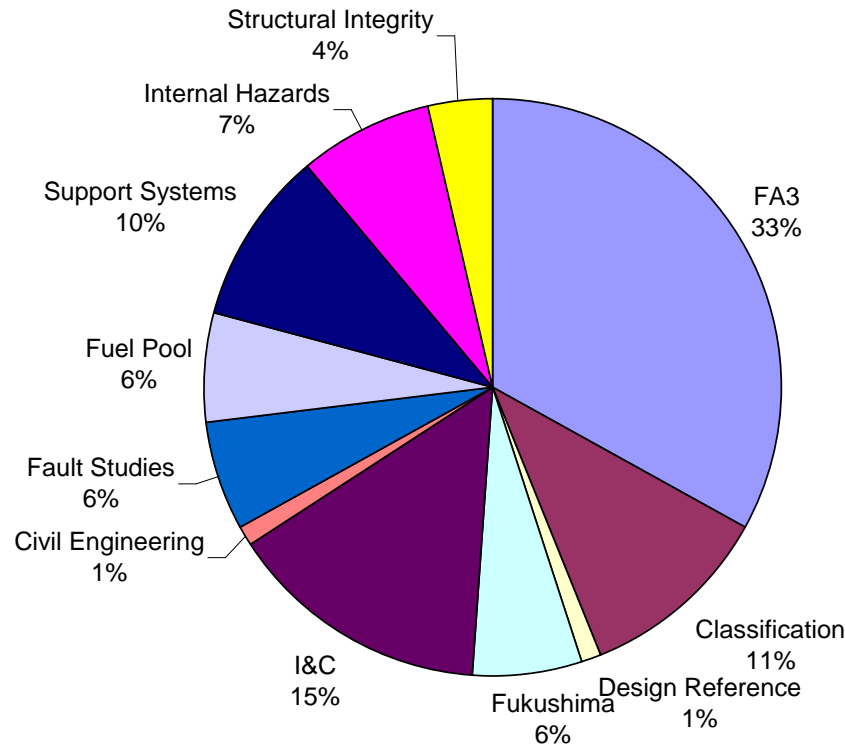
Main changes in GDA to the FA3 EPR design

The main changes were:

- Addition of a non-computerised safety system (third protection / control platform)
- Auto-standby Nuclear Island Heating, Ventilation and Air-Conditioning systems leading to an additional floor for two safeguards buildings
- Revised nuclear safety significant categorisation methodology resulting in some increases in classification
- Probabilistic safety approach complementary to deterministic one leading to diverse lines of protection against faults
- Introduction of diversity into the electrical systems
- Modification to primary circuit pipework to improve “inspectability”
- Other differences linked to UK context: Fire protection, lifting equipment, spent fuel storage...

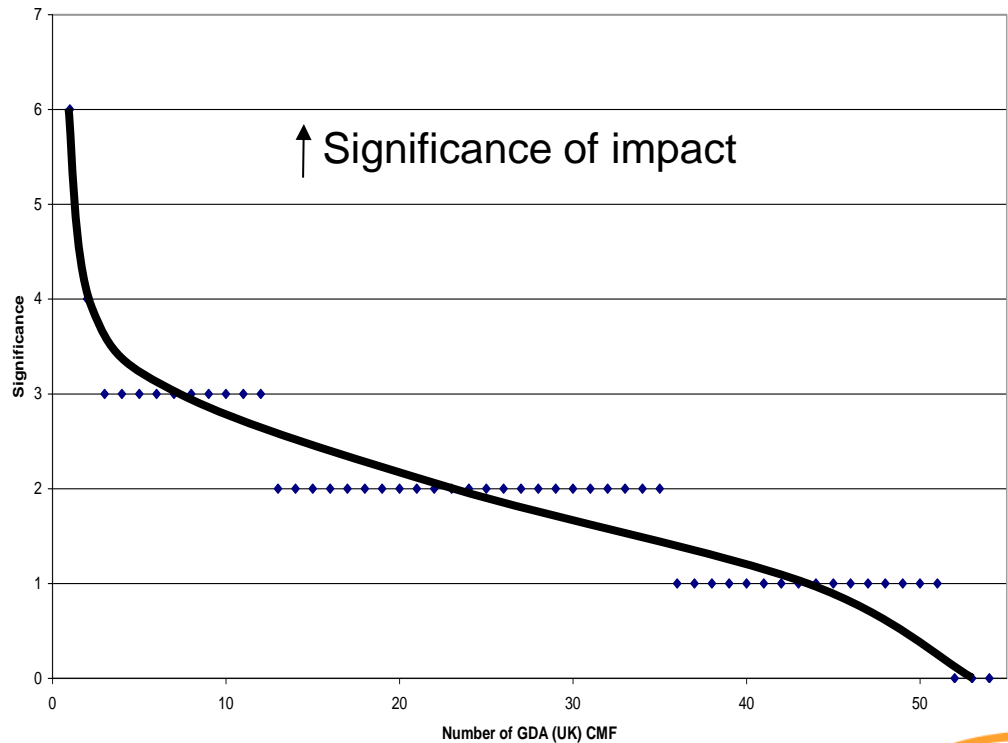
Outcome and impact from GDA

- At the end of GDA there were 82 design changes identified in the GDA Reference Design



Outcome and impact from GDA

- Overall significance of the individual design changes
 - Attempt to measure significance of individual changes by scoring the measurable impact on the following criteria
 - Building
 - Layout
 - System
 - I&C
 - Safety Case
 - Operations



Design change control under the Licence

In the UK, the Nuclear Site Licence sets out 36 conditions that the Licensee must comply with. Design Change Control is covered in two conditions, one for plant under construction (LC20) and one for existing plant (LC22)

LC20, Modification to design of plant under construction, states [in parts]:

- 1) The licensee shall ensure that no **modification to the design which may affect safety** is made to any plant during the period of construction except in accordance with **adequate arrangements** made and implemented by the licensee for that purpose
- 4) The aforesaid arrangements shall provide for the **classification of modifications according to their safety significance**. The arrangements shall where appropriate divide modifications into stages. Where the ONR so specifies the licensee shall not commence nor thereafter proceed from one stage to the next of the modification without the consent of the ONR.

The arrangements shall include a requirements for the **provision of adequate documentation to justify the safety of the proposed modification** and shall where appropriate provide for the submission of the documentation to the ONR

Interim Arrangements

- At the granting of the Licence, NNB put in place interim LC20 arrangements for the control of modifications as the project had not entered the period of construction
- The purpose was to provide client (intelligent customer) oversight of the pre-licensing design changes through surveillance
- Scope extended from GDA outcomes to first reference configuration
- These arrangements will remain in force until the full LC20 arrangements are implemented

The main elements of the process are:

- Responsible Designer to manage and approve design changes using its own process
- The Licensee to screen all modifications to identify those of safety or UK context significance (~10%)
- For the Licensee to perform a Technical Review of the proposed change (where significant) in order to assure its adequacy
- Confirmation of acceptance at the Modifications Committee to permit inclusion of the changes into the Reference Configuration

Full Arrangements

- With the first Reference Configuration in place, the project is about to move to the full LC20 arrangements
- This is mainly a development of the interim arrangements with the additional features:
 - Categorisation (Nuclear Safety & UK Context) by the originating organisation
 - Management and approval for implementation of the less safety significant changes by the originating organisation, with oversight of the Licensee
 - Independent Technical Assessment of higher significance modifications by the Safety Directorate (a group independent from production)
 - The decision to implement the higher significance changes managed by the Licensee Modifications Committee
 - Advice and Consideration sought from the independent Nuclear Safety Committee through provision of a Licensing Summary Statement for the most significant modifications



Points for Consideration – GDA

- Generally the changes were at the detailed level but a few were conceptual, sometimes a list of options, leaving the basic design work for the Licensing phase
- The ability to maintain consistency between the reference design used in GDA and that of the reference plant depends on the state of the reference plant
- Some of the significant changes were identified late in the process
- The process implemented within GDA was very complex and slow and was only appropriate for a small number of modifications (not applicable for construction phase with higher number of changes)

Points for Consideration – Licensing

- Design change control arrangements are usually comprehensive and well developed. In bringing together the arrangements of two organisations, it is important to take the time to fully understand the approach in all parties
- Introduction of UK elements:
 - The need to address ALARP (the basis of UK health and safety law)
 - Categorisation used to introduce a proportionate approach
 - Introduction of quantitative criteria as an aid to identifying “significance”
 - Management of UK Context through the addition of a specific appendix to the RD change form covering environmental, security and UK [non-nuclear] regulation
 - Awareness training for the whole organisation and specific role holders

Points for Consideration – Licensing

- To recognise the difference in approach during construction compared with operation
- Benefit acquired from regular interface with regulator during preparation of Full Arrangements
 - Early feedback from regulator
 - Alleviates the need for long assessment of arrangements prior to their implementation
- The full arrangements will require more effort to operate so the switch needs to be made at the right time

Conclusions

- Three design change processes will have been implemented during Pre-Licensing and Licensing
- It has been a significant challenge to implement design change processes where the designer operates in a different regulatory framework to the client
- Consequently the two processes that have been used to date have had significant development based on feedback identified during use
- The significant effort to establish the full arrangements has been enhanced by early engagement with the regulator

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