Information on the TECDOC: Considerations on the Application of the IAEA Safety Requirements for Design of NPPs.

Javier Yllera
SAS/NSNI
Presentation Outline

• Objectives and scope of the TECDOC
• Development and review process. Current Status
• Highlights on some of the TECDOC contents.
Objective

• The main purpose of this TECDOC is to provide insights and approaches in support of the application of the new requirements introduced in SSR-2/1 and subsequently revised in SSR-2/1 (Rev. 1). The TECDOC also identifies some terms that need to be explained to ensure consistency with the requirements.

• The IAEA Secretariat expects that the effort devoted to the preparation of this TECDOC will also facilitate the preparation or revision of harmonized supporting Safety Guides for design and safety assessment of NPPs that are related to SSR-2/1 (Rev. 1).
The TECDOC provides a technical discussion on the following selected topics:

- Plant States considered in the design (for reactor and SFP),
- Design Extension Conditions without and with fuel damage.
- Design basis of structures, system and components
- DiD strategy for new plants.
- Independence of the levels of DiD and prevention of common cause failures.
- Concept of “practical elimination”
- Design margins and cliff-edge effects
- Design for external hazards (hazards exceeding the input from site evaluation)
- Use of mobile sources of electric power and coolant
- Reliability of the heat transfer to the ultimate heat sink
Development Process (1)

- Work started after publication of SSR 2/1, in parallel with its revision
- DPP approved and 1st Consultancy Meeting in 2013
- 1st Presentation to INSAG. Some members offered to participate in the development
- 2nd CM in March 2014 after NUSSC WG on Safety Requirements
- 3rd CM in July 2014.
- Draft circulated for internal comments.
- Draft TECDOC announced during the IAEA GC at the INSAG Forum and presented also at the Senior Regulators Meeting by DIR-NSNI, inviting for comments.
- NUSSC Members were informed in October by the Secretariat
- Draft presented to INSAG in October 2014
Upon request of Japan at the CSS meeting in November 2014, the draft was posted at CSS website for comments (until end of 2014).

In November 2014 comments were received from Canada, Japan, and discussed with their NUSSC representatives before the NUSSC Meeting in November.

IAEA reported to NUSSC in November 2014. NUSCC requested comments to be provided until the end of 2014.

In December 2014, IAEA released produced an interim revision (7c) addressing the comments from USA, Canada and Japan.

Only Korea provided comments until end of 2014. France, Canada, Germany and USA at the beginning of 2015. Late comments by India and ENISSL. USA provided comments on the text (rev.7c), drafting substantial new text. Comments delivered by through email, Permanent Mission, NUSSC and CSS web page posting.

IAEA held internal meetings to discuss the comments (January/February). Rev. 8a released at the beginning of April.

April: Meeting for discussion of the comments/resolutions in Rev. 8a. Most comments solved. Request to ask the opinion of NUSSC on some questions.

End of May 2015: Revision 9 and questions posted at the NUSSC web page.
The TECDOC was presented at the 39\textsuperscript{th} NUSSC meeting. A special working group meeting of NUSSC members was held to discuss a set questions that some country representatives wanted to be debated by interested NUSSC members.

Views of different members regarding the TECDOC were presented and discussed. The participants agreed on the publication of the TECDOC taking into account the agreements reached at the working group (reflected in the minutes of the Chairman) and that the IAEA will report on the TECDOC at the next NUSSC meeting.

The IAEA has finalised the TECDOC in accordance with the agreements reached at NUSSC.

The TECDOC is in the publication process.
## Design Basis of SSCs

<table>
<thead>
<tr>
<th>Operational states</th>
<th>Accident conditions</th>
<th>Design Extension Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO</td>
<td>AOO</td>
<td>DBAs</td>
</tr>
</tbody>
</table>

- **Loads and conditions generated by External & Internal Hazards** (for each plant state)
- **Criteria for functionality, capability, margins, layout and reliability** (for each plant state)

<table>
<thead>
<tr>
<th>Design basis of equipment for Operational states</th>
<th>Design Basis of Safety Systems including SSCs necessary to control DBAs and some AOOs</th>
<th>Design Basis of safety features for DECs including SSCs necessary to control DECs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Features to prevent core melt</td>
<td>Features to mitigate core melt (Containment systems)</td>
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</table>
### Defence in Depth ↔ Plant States

<table>
<thead>
<tr>
<th>Level of defence Approach 1</th>
<th>Objective</th>
<th>Essential design means</th>
<th>Essential operational means</th>
<th>Level of defence Approach 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
<td>Prevention of abnormal operation and failures</td>
<td>Conservative design and high quality in construction of normal operation systems, including monitoring and control systems</td>
<td>Operational rules and normal operating procedures</td>
<td>Level 1</td>
</tr>
<tr>
<td>Level 2</td>
<td>Control of abnormal operation and detection of failures</td>
<td>Limitation and protection systems and other surveillance features</td>
<td>Abnormal operating procedures/emergency operating procedures</td>
<td>Level 2</td>
</tr>
<tr>
<td>3a</td>
<td>Control of design basis accidents (postulated single initiating events)</td>
<td>Engineered safety features (safety systems)</td>
<td>Emergency operating procedures</td>
<td>Level 3</td>
</tr>
<tr>
<td>Level 3</td>
<td>Control of design extension conditions to prevent core melt</td>
<td>Safety features for design extension conditions without core melt</td>
<td>Emergency operating procedures</td>
<td>4a</td>
</tr>
<tr>
<td>3b</td>
<td>Control of design extension conditions to mitigate the consequences of severe accidents</td>
<td>Safety features for design extension conditions with core melt. Technical Support Centre</td>
<td>Complementary emergency operating procedures/ severe accident management guidelines</td>
<td>Level 4 4b</td>
</tr>
<tr>
<td>Level 4</td>
<td>Control of design extension conditions</td>
<td>Safety features for design extension conditions with core melt. Technical Support Centre</td>
<td>Complementary emergency operating procedures/ severe accident management guidelines</td>
<td>Level 4 4b</td>
</tr>
<tr>
<td>Level 5</td>
<td>Mitigation of radiological consequences of significant releases of radioactive materials</td>
<td>On-site and off-site emergency response facilities</td>
<td>On-site and off-site emergency plans</td>
<td>Level 5</td>
</tr>
</tbody>
</table>
• **Approach 1**, i.e. the association of DECs without core melt to level 3, has the advantage that each level has clear objectives regarding the progression of the accident and the protection of the barriers, i.e. level 3 to prevent damage to the reactor core and level 4 to mitigate severe accidents for preventing off site contamination.

• **Approach 2**, i.e. the grouping of DECs without core melt and with core melt in level 4, facilitates however the differentiation between the set of rules for design and safety assessment to be applied for DECs from those for DBA.
Thank you
for your attention!