BALLOT PREVIEW PRESENTATION – P497
“STANDARD CRITERIA FOR ACCIDENT MONITORING INSTRUMENTATION FOR NUCLEAR POWER GENERATING STATIONS”

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NPEC 15-01
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NPEC Preview – P497

Presentation Contents

1. P497 PAR Summary
2. Working Group Membership
3. P497 Table of Contents
4. Summary of Changes
5. Schedule
6. Conclusion
NPEC Preview – P497

1. PAR Summary

PAR Details

Approved: March 6, 2013
Expires: December 31, 2017
Status: PAR for a revision to existing IEEE Standard 497-2010

Expected date of submission of draft to the IEEE-SA for initial sponsor ballot: 03/2015
Expected Projected completion date: 03/2016
Old Scope of Standard
The standard contains the functional and design criteria for accident monitoring instrumentation for nuclear power generating stations. This standard is intended for new plant designs and for operating nuclear power generating stations desiring to perform design modifications.

Scope of Proposed Standard
The standard contains the functional and design criteria for accident monitoring instrumentation for new plant designs and nuclear power generating stations desiring to perform design modifications.

Change to the Scope
Combined the two sentences into one.
1. PAR Summary (Continued)

Old Purpose of Standard
The purpose of this standard is to establish selection, design, performance, qualification and display criteria for accident monitoring instrumentation. It provides guidance on the use of portable instrumentation and examples of accident monitoring display configurations.

Purpose of Proposed Standard
The purpose of this standard is to establish selection, design, performance, qualification and display criteria for accident monitoring instrumentation for anticipated operational occurrences, design basis events and severe accidents.

Change to the Purpose
Expanded the purpose to specifically include all events to which the standard applies. Removed the statement about providing guidance and examples.
Need for the Project

A revision of IEEE Std 497-2010 is needed to incorporate lessons learned from industry events and to address other industry concerns. Some of the lessons learned and industry concerns are:

• Address lessons learned from industry events (Fukushima [earthquake & tsunami], Browns Ferry [tornado], Salem [loss of RPS due to CCF], North Anna [seismic event], etc.).

• Address accident monitoring instrumentation requirements based emergency procedure guidelines (including Severe Accident Management Guidelines) and monitoring of fission product barriers and plant conditions following a potential breach of these barriers.

• Continue advancing the standard to a technology neutral approach (including small modular reactors) and improve international usability.

• Incorporate user feedback.

• Provide guidance for instrumentation used during severe accident conditions.

• Revise the standard as a joint project with IEC, making the standard a joint-logo standard.
2. Working Group Membership

Formed January 2011 (continuation of working group that developed the Standard & Corrigendum)

Active Members – 16 (14 full & 2 corresponding members)
9 US Members – 7 International Members

Additional input provided IAEA, IEC and PWROG

Consultants (3)
- Greg Hostetter [Tetra Tech]
- Yumi Sato [JANUS]
- Rie Nakamura [JANUS]

Vendors (6)
- Jeri Chadwick [Westinghouse]
- Daryl Harmon [Westinghouse]
- Wolfgang Koenig [AREVA]
- Jason Karns [Westinghouse]
- Takeshi Ikeuchi [MHI]
- Glen Lang [Westinghouse – retired]

Regulators / Industry Agency (5)
- Steve Wyman [US NRC]
- Alex Duchac [IAEA]
- Gary Johnson [IAEA – retired]
- Barry Marcus [US NRC – retired]
- Michiaki Akiyama [JANSI]

Utilities (2)
- Alex Klemptner [DTE]
- Ifti Rana [Southern]
NPEC Preview – P497

3. Table of Contents

Table of Contents

1. Overview
2. References – **Added Clause 2.2 for IEC References**
3. Definitions
4. Selection Criteria – **Added Clause 4.6 for Type F Variables**
5. Performance Criteria
6. Design Criteria
7. Qualification Criteria – **Added Clause 7.6 for Type F Variables**
8. Display Criteria
9. Quality Assurance

Annexes

A. Accident Monitoring Instrument Channel Accuracy (informative)
B. Examples of Monitoring Channel Displays (informative)
C. Operational State Diagram (informative) – **New Annex**
D. Bibliography (informative) – **Previously Annex C**
Severe Accident Related Revisions

• Added definitions to support the expanded scope
  
  – Accident Management Personnel
    The personnel authorized to make command and control decisions during an accident
  
  – Design Extension Conditions [IAEA SSR 2/1]
    Postulated accident conditions that are not considered for design basis accidents, but that are considered in the design process of the facility in accordance with best estimate methodology, and for which releases of radioactive material are kept within acceptable limits.

NOTE – Design extension conditions include conditions in events without significant fuel degradation and conditions with core melting. Severe accidents are included in design extension conditions.
4. Summary of Changes

Severe Accident Related Revisions (cont.)

• Added Type F Variables for severe accident specific instrumentation
  – Selection Criteria - Clause 4.6

  Type F variables are those variables that provide primary information to accident management personnel to indicate fuel damage and the effects of fuel damage. The selection of these variables represents a minimum set of plant variables that provide the most direct indication of the parameters needed to execute the severe accident management guidelines (SAMGs) and / or variables needed to mitigate those accidents postulated in a plants severe accident analysis.

  Selection Criteria for the Variable Type:
  • Indicate fuel Damage
  • Monitor the direct effects (e.g. combustible gasses concentration, radiation, pressure, or temperature) of fuel damage

Potential Source Documents:
• Plant SAMGs
• Plant Severe Accident Analyses
Severe Accident Related Revisions (cont.)

• Added Type F Variables for severe accident specific instrumentation (cont.)

— Qualification Criteria — Clause 7.6 {PREVIEWED VERSION}

Instrument channels shall be type tested to the anticipated severe accident environmental and seismic conditions.

If during testing the anticipated seismic or environmental conditions are not reached, due to test equipment limits, and the tested equipment does not experience a failure, then a survivability analysis shall be performed for the anticipated severe accident environments and seismic conditions. Survivability analysis needs to be accompanied by additional testing such as separate effects testing.

The survivability analysis should determine the seismic and environmental constraints for the reliable use of the instrument data and these constraints shall be provided to the end user.
4. Summary of Changes

Severe Accident Related Revisions (cont.)

• Added Type F Variables for severe accident specific instrumentation (cont.)

— Qualification Criteria – Clause 7.6 {PROPOSED VERSION}

Instrument channels shall be type tested to the anticipated severe accident conditions. Type testing may be done sequentially.

If during testing the required test conditions are not reached, due to test equipment limits, and the tested equipment does not experience a failure, then a survivability analysis shall be performed for the untested anticipated severe accident conditions.

The survivability analysis shall determine the constraints for the reliable use of the instrument data and these constraints shall be provided to the end user.
4. Summary of Changes

Severe Accident Related Revisions (cont.)

- Added Annex C – Operational State Diagram
  - Matrix showing severe accident portion of design extension conditions based on procedure use
  - Clarifies application of the standard

<table>
<thead>
<tr>
<th>Plant State</th>
<th>Operational States</th>
<th>Accident Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Normal Operation</td>
<td>Design Basis</td>
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<tr>
<td></td>
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<td>Accidents</td>
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<tr>
<td></td>
<td>Anticipated</td>
<td>Design Extension</td>
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<tr>
<td></td>
<td>Operational</td>
<td>Conditions</td>
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<td></td>
<td>Occurrence (AOO)</td>
<td>DEC w/Out Fuel</td>
</tr>
<tr>
<td></td>
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<td>Damage</td>
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<tr>
<td></td>
<td></td>
<td>Severe Accidents</td>
</tr>
</tbody>
</table>

| Procedure Use | Nonal Operating Procedures | Abnormal Operating Procedures | Emergency Operating Procedures (EOP) | Severe Accident Management Guidelines (SAMG) |

NOTE: Term “DEC w/out Fuel Damage” used to avoid confusion with BDBEs
4. Summary of Changes (cont.)

IEC Related Revisions

- Added IEC References
  - Added IEC reference list (Clause 2.2)
  - Added IEC references in various clauses
- Incorporated IAEA Safety Glossary Definitions
- Addressed IEC comments on IEEE Std. 497-2010

Addition to Introduction:

The individual IEEE and IEC reference sets in whole are individually appropriate for use in the application of the standard, but inclusion of the IEC and IEEE references does not imply equivalency between the individual references of the two sets.

Revised Clause 2:

The following sets of referenced documents are indispensable for the application of this document (i.e., they must be understood and used, so each referenced document is cited in text and its relationship to this document is explained). This standard can be used with either the IEC or IEEE normative references but the references shall not be mixed. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies.
NPEC Preview – P497

4. Summary of Changes (cont.)

Other Revisions

• Clause 1 revised to reflect changes in PAR
• Revisions to reflect Work-In-Progress comments
• Other minor editorial improvements throughout the standard were also incorporated.
• The Introduction was revised in whole.
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5. Schedule

- 1 / 2015  NPEC Preview
- 3 / 2015  Initiate Balloting Process
- 6 / 2015  Balloting Complete
- 9 / 2015  Resolution of Comments
- 10 / 2015 Recirculation Ballot (if needed)
- 1 / 2016  IEEE-SA Approval
- 3 / 2016  Anticipated completion date
6. Conclusion

WG-6.1 has developed a draft revision to IEEE Std 497-2010 which conforms with the purpose and scope and satisfies the need stated in the approved PAR

WG-6.1 requests permission to ballot P497
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4. Summary of Changes

Severe Accident Related Revisions (cont.)

• Added Type F Variables for severe accident specific instrumentation

• Performance Criteria
  • Clause 5.1: Range
  • Clause 5.4: Required Operating Time

• Design Criteria
  • Clause 6.3: Independence and Physical Separation
  • Clause 6.4: Isolation
  • Clause 6.6: Power Supply
4. Summary of Changes

Severe Accident Related Revisions {cont.}

• Added Type F Variables for severe accident specific instrumentation

• Qualification Criteria
  • Clause 7.8: Operating Time

• Display Criteria
  • Clause 8.2: Trend or Rate Information
  • Clause 8.5: Display Location
  • Clause 8.7: Recording

• Quality Assurance