

## WESTINGHOUSE AP1000® GENERIC DESIGN ASSESSMENT

### GDA ISSUE

### FIRE PROBABILISTIC SAFETY ANALYSIS (PSA)

### GI-AP1000-PSA-02 REVISION 0

Technical Area		PROBABILISTIC SAFETY ASSESSMENT	
Related Technical Areas		Internal Hazards	
GDA Issue Reference	GI-AP1000-PSA-02	GDA Issue Action Reference	GI-AP1000-PSA-02.A1
<b>GDA Issue</b>	From the GDA assessment of the AP1000 PSA it cannot be concluded that the current prediction of internal fire risk is representative for the AP1000. This leaves ONR with a lack of understanding of the potential gap between the current estimated AP1000 risk associated with internal fires, and the AP1000 fire risk based on an up-to-date, realistic and complete evaluation. Since the current prediction of the fire Core Damage Frequency (CDF) is 5E-08/yr (approx 25% of the overall CDF) the uncertainty in the fire risk translates directly into uncertainty in the overall plant risk. Therefore a modern standards Fire PSA should be developed for the AP1000 to close this gap.		
<b>GDA Issue Action</b>	Westinghouse should provide the final approved procedure (Guidebook) established to guide the development of Fire PSA for the AP1000 PSA. With agreement from the Regulator this action may be completed by alternative means.		

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<b>GDA Issue Reference</b>	<b>GI-AP1000-PSA-02</b>	<b>GDA Issue Action Reference</b>	<b>GI-AP1000-PSA-02.A2</b>
<b>GDA Issue Action</b>	<p>Westinghouse should provide detailed information on the Database/s established / selected to be used to support the Fire PSA. The database/s should be populated with up-to-date design information.</p> <p>Example of information expected to be found in the database/s selected or developed to support the Fire PSA include:</p> <ul style="list-style-type: none"> <li>• List of fire PSA components and failure modes.</li> <li>• Circuit analysis, cable selection and routing process (with identification of uncertainties).</li> <li>• Physical characteristics of the fire compartments and their inventories, barriers and penetrations, ignition sources, transient combustibles, etc.</li> <li>• Equipment &amp; power supplies location. Data on relevant fire events in other NPPs.</li> </ul> <p>A database of assumptions should also be developed. This should provide clarity on:</p> <ul style="list-style-type: none"> <li>• General assumptions of the fire PSA analysis.</li> <li>• The type of assumptions (related to design, operation, fire impact, etc).</li> <li>• Specific information on those assumptions that are not yet substantiated in specific design documentation.</li> <li>• Pointers to the area of the Fire PSA where the specific assumptions are used.</li> </ul> <p>It is expected that the assumptions database (updated as appropriate) should feature in most of the deliverables for relevant GDA Issue Actions.</p> <p>With agreement from the Regulator this action may be completed by alternative means.</p>		

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<b>GDA Issue Reference</b>	<b>GI-AP1000-PSA-02</b>	<b>GDA Issue Action Reference</b>	<b>GI-AP1000-PSA-02.A3</b>
<b>GDA Issue Action</b>	<p>Westinghouse should provide information (including a programme of work) of the modifications to the internal events PSA model required to support the development of the Fire PSA.</p> <p>This should address the following:</p> <ul style="list-style-type: none"> <li>• Updates to the internal events PSA model and data to comply with Westinghouse's PSA Guidebooks which are required to support the development of the Fire PSA.</li> <li>• Updates to the internal events PSA model and data to address relevant findings from ONR's review of the AP1000 PSA during GDA, which are required to support the development of the Fire PSA. This should include completion of the list of Initiating Events and associated models as required.</li> <li>• Specific changes to the internal events PSA required by the Fire PSA itself.</li> </ul> <p>With agreement from the Regulator this action may be completed by alternative means.</p>		

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<b>GDA Issue Reference</b>	<b>GI-AP1000-PSA-02</b>	<b>GDA Issue Action Reference</b>	<b>GI-AP1000-PSA-02.A4</b>
<b>GDA Issue Action</b>	Westinghouse should provide detailed documentation of any qualitative screening of fire compartments including the screening criteria used and assumptions made. With agreement from the Regulator this action may be completed by alternative means.		

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<b>GDA Issue Reference</b>	<b>GI-AP1000-PSA-02</b>	<b>GDA Issue Action Reference</b>	<b>GI-AP1000-PSA-02.A5</b>
<b>GDA Issue Action</b>	<p>Westinghouse should undertake and document thoroughly an evaluation of Hot Shorts that could impact the risk associated to internal fires.</p> <p>ONR would expect Westinghouse to convene an expert panel to address single and multiple spurious actuation issues which may impact one or more safety functions (Note this would also be a requirement to support a modern deterministic safe shutdown analysis; albeit extended to address additional systems considered within the fire PSA).</p> <p>With agreement from the Regulator this action may be completed by alternative means.</p>		

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<b>GDA Issue Reference</b>	<b>GI-AP1000-PSA-02</b>	<b>GDA Issue Action Reference</b>	<b>GI-AP1000-PSA-02.A6</b>
<b>GDA Issue Action</b>	Westinghouse should provide detailed documentation on the Evaluation of Fire frequencies. With agreement from the Regulator this action may be completed by alternative means.		

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<b>GDA Issue Reference</b>	<b>GI-AP1000-PSA-02</b>	<b>GDA Issue Action Reference</b>	<b>GI-AP1000-PSA-02.A7</b>
<b>GDA Issue Action</b>	Westinghouse should provide detailed documentation of any quantitative screening of fire compartments including the screening criteria used. With agreement from the Regulator this action may be completed by alternative means.		

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GDA Issue Reference	GI-AP1000-PSA-02	GDA Issue Action Reference	GI-AP1000-PSA-02.A8
GDA Issue Action	Westinghouse should provide fire progression event trees (or equivalent) for all compartments screened in accompanied by detailed documentation of fire impact in each compartment and details of all the fire scenarios identified. <ul style="list-style-type: none"> <li>• Details of any fire modelling undertaken to support this task should also be included.</li> <li>• The identification of the most onerous Initiating Event for each fire scenario should be clearly documented.</li> </ul> With agreement from the Regulator this action may be completed by alternative means.		



# Office for Nuclear Regulation

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<b>GDA Issue Reference</b>	<b>GI-AP1000-PSA-02</b>	<b>GDA Issue Action Reference</b>	<b>GI-AP1000-PSA-02.A9</b>
<b>GDA Issue Action</b>	Westinghouse should provide documented evaluation of the reliability of the fire protection measures claimed (eg, PSA models for fire protection systems claimed and human reliability analyses as appropriate). With agreement from the Regulator this action may be completed by alternative means.		

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<b>GDA Issue Reference</b>	<b>GI-AP1000-PSA-02</b>	<b>GDA Issue Action Reference</b>	<b>GI-AP1000-PSA-02.A10</b>
<b>GDA Issue Action</b>	Westinghouse should provide documented evaluation of the inter-compartment fire propagation. Fire progression event trees for all relevant multi-compartment fires and details of any fire modelling undertaken to support this task should also be included as per Action 08. With agreement from the Regulator this action may be completed by alternative means.		

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<b>GDA Issue Reference</b>	<b>GI-AP1000-PSA-02</b>	<b>GDA Issue Action Reference</b>	<b>GI-AP1000-PSA-02.A11</b>
<b>GDA Issue Action</b>	Westinghouse should provide documented re-evaluation of the Human Reliability Analysis for all the fire scenarios identified. The effects of the fire, both direct (e.g. the need to evacuate the control room) and indirect (e.g. confusing information resulting from spurious indications, impact of smoke), on operator actions have to be considered. With agreement from the Regulator this action may be completed by alternative means.		

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<b>GDA Issue Reference</b>	<b>GI-AP1000-PSA-02</b>	<b>GDA Issue Action Reference</b>	<b>GI-AP1000-PSA-02.A12</b>
<b>GDA Issue Action</b>	Westinghouse should provide a documented Fire PSA model in CAFTA together with the results of the CDF quantification and evaluation of the results. With agreement from the Regulator this action may be completed by alternative means.		

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<b>GDA Issue Reference</b>	<b>GI-AP1000-PSA-02</b>	<b>GDA Issue Action Reference</b>	<b>GI-AP1000-PSA-02.A13</b>
<b>GDA Issue Action</b>	Westinghouse should provide an estimation of the Large Release Frequency associated with internal fires. With agreement from the Regulator this action may be completed by alternative means.		

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<b>GDA Issue Reference</b>	<b>GI-AP1000-PSA-02</b>	<b>GDA Issue Action Reference</b>	<b>GI-AP1000-PSA-02.A14</b>
<b>GDA Issue Action</b>	Westinghouse should provide the complete fire PSA documentation and ALARP assessment. With agreement from the Regulator this action may be completed by alternative means.		

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<b>GDA Issue Reference</b>	<b>GI-AP1000-PSA-02</b>	<b>GDA Issue Action Reference</b>	<b>GI-AP1000-PSA-02.A15</b>
<b>GDA Issue Action</b>	Westinghouse should develop and provide a Living PSA procedure to allow the Fire PSA to be updated as further design information becomes available and when the Internal Events PSA evolves in a way that may impact the Fire PSA. With agreement from the Regulator this action may be completed by alternative means.		