Westinghouse UK
AP1000® GENERIC DESIGN ASSESSMENT
Resolution Plan for GI-AP1000-CE-01
Justification of Novel Forms of Structure for the Steel/Concrete Composite Wall and Floors Known as CA Modules

MAIN ASSESSMENT AREA	RELATED ASSESSMENT AREA(S)	RESOLUTION PLAN REVISION	GDA ISSUE REVISION
Civil Engineering	-	2	0

GDA ISSUE:	Definition and justification of the novel design used for the steel/concrete composite system proposed for the CA modules within the nuclear island.
ACTION: GI-AP1000-CE-01.A1	**CONSOLIDATED SET OF DESIGN DOCUMENTS** The current set of documents submitted by Westinghouse range from high level documents to TQ responses. The UK Regulator requires a consolidated set of documentation to adequately describe the structure that is the basis of Westinghouse's submission under the GDA process. This is to ensure any changes made after an iDAC/DAC is issued are easily identifiable. This action requires Westinghouse to provide a consolidated set of formal documents that explicitly define the design submission. This should include, but not necessarily be limited to the following: • A single overarching document that summarises the structure submitted and the design methodology used for the UK GDA submission. This should draw together all the various submissions on the design methodology for the CA modules that have been submitted under GDA Step 4, and should include the UK Regulator additional requirements. • A document map and a list of the complete set of formal documents that define the structural layout, materials, form, the design methodology and the substantiation /calculations for the CA modules. • Adequate responses to any questions arising from assessment by ONR of documents submitted at the end of GDA Step 4 but not reviewed in detail at that time. • Sufficient drawings/mark ups to describe the structural layout and form of the CA Modules submitted under GDA.

	With agreement from the Regulator this action may be completed by alternative means.
ACTION: GI-AP1000-CE-01.A2	**ADDITIONAL ACCEPTANCE CRITERIA FOR OUT OF PLANE SHEAR CAPACITY** For the current demand versus capacity utilisations for the majority of locations, the design method used is acceptable but is not universally applicable for higher utilisations. Therefore, additional limitations/acceptance criteria must be included in the GDA design methodology to limit the level of utilisation. This action requires Westinghouse to provide additional acceptance criteria for the proposed design methodology to ACI 349-01 for out of plane shear, which shall include, but not be limited to, the following: • A reduction in the design value for Vc for the concrete contribution to shear strength, below the allowable value in ACI 349-01. Justification should be provided for the chosen limit of Vc. • Confirm the limit on Vc, above which shear reinforcement will be added (as stated in APP-GW-SUP-001) and provide design substantiation for the reinforcement provided. The key design methodology document must therefore clearly state that this margin should not be encroached upon by future design development or changes. With agreement from the Regulator this action may be completed by alternative means.
ACTION: GI-AP1000-CE-01.A3	**ADDITIONAL ACCEPTANCE CRITERIA FOR IN-PLANE SHEAR CAPACITY WHEN CONSIDERED WITH OTHER LOADS** The current demand versus capacity utilisations, the design method used is acceptable but, it is not universally applicable to combinations of high in-plane shear, moment and axial load. Therefore, additional limitations/acceptance criteria must be included in the GDA design methodology. This action requires Westinghouse to provide additional justification for the proposed design methodology for in-plane shear when combined with other loads, as follows: 1) Provide further calculations for in-plane shear to alternative codes: • JEAG 4618

	• draft AISC N690 App N9 • any others deemed applicable by Westinghouse, including first principles. in order to justify that the plates still have sufficient margin above the demand levels when these codes are used for design. These calculations should consider all the coincident loads present for each critical loadcase, such as those described in other actions of this GI. These calculations should also include the symmetric sharing of in plane shear stress used by these codes. 2) Following the above, provide the limitations on combined loadings (e.g. moment and axial load) for which the Westinghouse methodology of asymmetric sharing of in-plane shear stress is applicable. With agreement from the Regulator this action may be completed by alternative means.
ACTION: GI-AP1000-CE-01.A4	**ADDITIONAL SUBSTANTIATION OF SHEAR CONNECTION** Provide the following substantiation with respect to the shear connectors: • Justify that the strength reduction factor of 0.75 for shear studs taken from ACI 349-01 B.4.4 is appropriate and provide sensitivity of this. • Justify the 125kips capacity for the channel acting as a shear lug, calculated to B.4.5.2 of ACI 349-01. Also justify the length of the channel (8inches) used in calculating the bearing onto the concrete. • Justification for omission of any tension force in the shear studs (resulting from restraining the plate) is required, and, if a tension force is required, the effect on the stud shear capacity needs to be considered. • Provide calculations for the development length to justify the shear for the full range of wall thicknesses and incorporating the outcomes of the above. If the development length is smaller than the lesser of three times the wall thickness or 9 feet, a first-principles approach that considers shear flow and locally applied forces in the horizontal and vertical direction may be acceptable. With agreement from the Regulator this action may be

	completed by alternative means.
ACTION: GI-AP1000-CE-01.A5	**JUSTIFICATION OF CONNECTIONS FOR CA MODULES** Westinghouse is required to submit the final concept details for a sample of generic connections for the CA Modules. This should include detail drawings and calculations. The calculations should clearly state the failure mechanisms of the connections considered and the effects on the ductile behaviour of the whole structure. With agreement from the Regulator this action may be completed by alternative means.
ACTION: GI-AP1000-CE-01.A6	**JUSTIFICATION OF THE ABILITY OF SC TO WITHSTAND THERMAL LOADCASE** Westinghouse is required to justify how the thermal analysis models transient thermal effects, such as environmentally induced transients and how these are combined with other mechanical loads in the design load cases. Westinghouse is also required to provide further justification that vapour pressure within the CA modules resulting from high thermal loading will not affect the structure's ability to perform its safety function (refer to action 07). With agreement from the Regulator this action may be completed by alternative means.
ACTION: GI-AP1000-CE-01.A7	**JUSTIFCATION OF THE ABILITY OF SC TO WITHSTAND FIRE** Westinghouse is required to provide evidence on the effect of fire on the CA Modules generally, not only where they are claimed as fire barriers. The effect of fire on the CA Modules needs to be quantified, such that the risk to structures supporting Category 1 nuclear safety plant can be assessed, Specifically: • Loss of the faceplate – the level of fire that will achieve this and the resulting effect on the load carrying capacity of the remaining structure need to be quantified. • Build up of vapour pressure inside the wall due to fire. Westinghouse considers this a local effect but ONR believes this is not the case for a full room

	burn. • Overall response of the whole structure to the temperatures in the fire, i.e. combination of induced thermal moment with other loads and deflections. The response to GI-**AP1000**-IH.1.01 will be key in answering the above. However, IH.1.01 specifically refers to walls and floor claimed as fire barriers. This action is concerned with the structural stability of all the CA Modules following a potential fire. Therefore, a quantification of the fire magnitude that the structure can withstand without structural collapse shall be provided. With agreement from the Regulator this action may be completed by alternative means.
ACTION: GI-AP1000-CE-01.A8	**LONG TERM RELIABILITY** Westinghouse is required to provide further substantiation on the long term reliability as follows: • Provide details of similar structures in use on nuclear power stations, including construction provisions, design methodologies adopted and operational performance. • Assess the effects on the calculation of HCLPF for the in-containment CA Modules, based on the completion of actions 02 to 04 of this GDA Issue. • Provide any other relevant reliability calculations, e.g. similar to Eurocodes. With agreement from the Regulator this action may be completed by alternative means.
RELEVANT REFERENCE DOCUMENTATION RELATED TO GDA ISSUE	
Technical Queries	TQ-**AP1000**-0069 design methodology for civil modules TQ-**AP1000**-0143 design references TQ-**AP1000**-0319 supporting documents TQ-**AP1000**-0447 civil module testing programme TQ-**AP1000**-0613 Japanese standard JEAG 4618 TQ-**AP1000**-0614 CA modules concreting at Sanmen TQ-**AP1000**-0615 design methodology for CA modules TQ-**AP1000**-0644 design methodology for CA modules TQ-**AP1000**-0645 CA floor modules TQ-**AP1000**-0663 CA modules –connection to basemat TQ-**AP1000**-0664 resistance of connectors TQ-**AP1000**-0665 concrete placement loads TQ-**AP1000**-0739 wall to floor connections TQ-**AP1000**-0740 shear interface flow TQ-**AP1000**-0742 wall to wall connections

	TQ-**AP1000**-0913 CA modules used as fire barriers TQ-**AP1000**-1009 queries on CA module submission (s/s by TQ-1098) TQ-**AP1000**-1016 queries on CA module submission TQ-**AP1000**-1077 shear interface flow TQ-**AP1000**-1078 connection between duplex and mild steel. TQ-**AP1000**-1079 thermal stress analysis TQ-**AP1000**-1098 expanded list queries on CA modules TQ-**AP1000**-1136 testing details TQ-**AP1000**-1173 thermal loadcases TQ-**AP1000**-1194 design code for composite floors TQ-**AP1000**-1202 material grades TQ-**AP1000**-1203 floors – composite design
Regulatory Observations	RO-**AP1000**-041 RO-**AP1000**-079 RI-**AP1000**-02
Other Documentation	UKP-GW-GLR-018 Rev. 0 APP-GW-SUP-001 Rev. 2 DCP_JNE_000496 DCP_JNE_000525

Scope of work:

Action 1
Westinghouse will provide a consolidated set of formal documents that explicitly define the design submission. This will include items such as the following:

1) A single overarching document that summarises the structure submitted and the design methodology used for the UK GDA submission.
2) The submittal will draw together all the various submissions on the design methodology for the CA modules that have been submitted under GDA Step 4, and will highlight any UK Regulator requirements.
3) The submittal will include a document map and list the set of formal documents that define the structural layout, materials, form, the design methodology and the substantiation for the CA modules.

Action 2
Westinghouse will provide additional acceptance criteria for the proposed design methodology to ACI 349-01 for out of plane shear. The acceptance criteria will include a reduction in the limit of Vc value for the concrete contribution to shear strength. Justification will be provided for using the chosen limit of Vc. The submittal will confirm the limit on Vc above which shear reinforcement will be added (as stated in APP-GW-SUP-001). Substantiation for the type of reinforcement will be provided as described in Action4.

Action 3
Westinghouse will provide additional justification for the proposed design methodology for in-plane shear when combined with other loads. As part of the justification, Westinghouse will provide further calculations for in-plane shear to alternative codes

such as JEAG 4618 and the draft AISC N690 App N9. The calculations will consider coincident loads present for critical load cases. These calculations will include the symmetric sharing of in plane shear stress used by these codes, and the deliverable will define the limitations for which the Westinghouse methodology of asymmetric sharing of in-plane shear stress is applicable.

Action 4
Westinghouse will provide further substantiation with respect to the shear connectors. The substantiation will include the following:

1) Justification that the strength reduction factor of 0.75 for shear studs taken from ACI 349-01 B.4.4 is appropriate.
2) Justification of the 125kips capacity for the channel acting as a shear lug, (calculated to B.4.5.2 of ACI 349-01) and justification of the length of the channel (8inches) used in calculating the bearing onto the concrete.
3) Justification for omission of any tension force in the shear studs (resulting from restraining the plate), and, if a tension force is required, the effect on the stud shear capacity will be considered.
4) Calculations the development length to justify the shear for the full range of wall thicknesses incorporating the outcomes of 1) and 2) above. If the development length is smaller than the lesser of three times the wall thickness or 9 feet, a first-principles approach that considers shear flow and locally applied forces in the horizontal and vertical direction may be considered.

Action 5
Westinghouse will submit the final concept details for a sample of generic connections for the CA Modules. This will include detailed drawings and calculations. The calculations will state the failure mechanisms of the connections considered and the effects on the ductile behaviour of the whole structure.

Action 6

1) Westinghouse will justify how the thermal analysis models transient thermal effects, such as environmentally induced transients.
2) Westinghouse will provide further justification that vapour pressure within the CA modules is not a concern.

Action 7
Westinghouse will provide evidence on the effect of fire on the CA modules.

Action 8
Westinghouse will provide further substantiation on the long term reliability as follows:

1) Assess the effects on the calculation of HCLPF for the in-containment CA Modules, based on the completion of actions 02 to 04 of this GI.
2) Provide relevant reliability calculations similar to Eurocodes.

Description of work:

Action 1
During the resolution of RI-**AP1000**-02, Westinghouse has provided a large volume of

documentation related to the design of the **AP1000**® structural modules. The documentation includes design criteria and design methodology documents, drawings, calculations, test reports and responses to regulatory questions. To resolve this action, Westinghouse intends to provide a consolidated set of documentation that presents the information provided and agreed during GDA and the information required to address the actions in this GDA Issue. A single high level document will be created which summarises the design and identifies the documentation that defines the design methodology and provides key supporting references that support the implementation of this methodology. This report will draw together the responses contained within various Westinghouse reports and key responses. In support of this action Westinghouse will update as necessary, the structural module design methodology, the drawings provided with DCP_JNE_00484, and the supporting design basis calculations. A final CA module test report will be provided in response to this action. The test report will further validate the module design methodology and demonstrate that out-of-plane and in-plane shear strength are conservatively calculated.

Action 2

In response to Action Item 3.1 from the November 30 – December 2, 2011 civil engineering technical meeting, Westinghouse supplied an evaluation of the mechanical load combinations design demand compared to $\phi (f'_c)^{1/2}$, which is half the design demand allowed in ACI 349-01. Generally, the module walls satisfied this lower limit for the mechanical load cases. Results were supplied for both the Containment Internal Structures (CIS) and CA20. This is documented in DCP_JNE_000496. To respond to this action, Westinghouse would specifically define design criteria by which additional shear reinforcement would be required to be added to CA wall modules. The criteria would be based on the out of plane shear demand on the module walls for the defined load cases. The final design criteria will be informed by the evaluation performed to compare the module walls design demand against $\phi (f'_c)^{1/2}$, comparisons to alternative codes, and results from the Westinghouse test program. This will demonstrate that out-of-plane shear is conservatively calculated for the **AP1000** structural modules. The defined design criteria will provide confidence that adequate margin exists in the structures if they are subjected to out of plane shear loading. The criteria will be documented in either the standard plant structural module design methodology or a UK specific supplement.

Action 3

Westinghouse will perform a review of the methodology used to combine in-plane shear with moment and axial load. This review will include consideration of information gained from test results, detailed FEA, draft/alternative codes, and principles of engineering mechanics. The review will be supported by a sample of calculations for the CA modules based on JEAG 4618 and the draft AISC N690 App N9. The results of the review will provide the basis for any required modification to the current methodology, including combined loading and any required limitations on asymmetric sharing of in-plane shear stress. Required calculations and design details will be provided, and if necessary the design methodology will be updated based upon the conclusions drawn from the review.

Action 4

APP-1100-SUC-003 documents the general design of the shear studs which attach the face plate of the structural modules to their concrete cores. The primary purpose of the

shear reinforcement is to provide the composite action of the structure; therefore, the design basis comes from ANSI/AISC N690. There are four items which need to be addressed as part of the action. These are defined in the Scope of Work section above. Westinghouse intends to update the current calculation to document the responses to these items and provide sufficient justification.

Action 5

As agreed upon with the regulator, Westinghouse will provide design calculations for the following sample of connection types: module wall to basemat, module wall to module wall, module wall to module floor outside containment, and the connection of equipment supports (specifically the steam generator support) to module walls. For the module wall to basemat and module wall to module wall connections, design basis calculations and detailed level 3 finite element calculations will be provided.

For the module wall to basemat connection, the level 3 calculation will examine the design of the CA20 base connection. An overview of the objectives of this calculation was provided in DCP_JNE_000535 (UN REG WEC 000498). Preliminary results were also presented during a technical meeting on February 18, 2011. The design basis calculation (APP-CA20-S3C-002 Rev. 4) for this connection was provided on January 17, 2011. The document has since been updated. The updated calculation will be provided as part of the resolution of this action.

An overview of the objectives of the level 3 calculation for the module wall to module wall connection was also provided in DCP_JNE_000535 (UN REG WEC 000498), and preliminary results were presented during the technical meeting on February 18, 2011. The generic module wall to module wall design basis calculation (APP-CA00-CAC-002 Rev. 0) was provided in response to TQ 319. An updated version of this calculation will be provided as part of the resolution of this action.

The design basis calculation for the module wall to module floor connections for floors outside containment was provided on January 14, 2011. As indicated in DCP_JNE_000496 (UN REG WEC 000469), this calculation is being revised to reflect that the dowel rebar will be anchored to the far face of the module wall. An updated version of this calculation will be provided as part of the resolution of this action.

The design basis calculation for the equipment supports to module wall connections was provided on January 14, 2011. As indicated in DCP_JNE_000496 (UN REG WEC 000469), this calculation is being updated to include the revised stud spacing and plate strength. An updated version of this calculation will be provided as part of the resolution of this action.

Action 6

In response to TQ 1079, Westinghouse provided updated thermal analysis for the containment internal structures (CIS). The response included new non-linear thermal analysis for the CIS. The TQ response also provided advanced copies of the in progress corresponding static thermal analysis. To address this issue the final static thermal analysis and a Revision 0 of the nonlinear analysis will be provided.

Westinghouse will perform an additional review of the issues related to vapour pressure build-up within the CA modules walls. This will include further research and/or detailed

analyses. Based upon the review, Westinghouse will perform required additional calculation and required design detailing to address vapour pressure build-up.

Action 7
Westinghouse has provided a demonstration that the CA module floors can serve as a three hour fire barrier. This was documented in DCP_JNE_000496 in response to Action Item 21.2 from the November 30-December 2 2010 civil engineering technical meeting. In response to this action, Westinghouse intends to provide a similar hand calculation for a typical CA module wall. Additionally, Westinghouse intends to perform a new finite element analysis to demonstrate that the wall modules credited as fire barriers are capable of withstanding the worse case credible fire loading. The analysis will demonstrate how the structural capacity of the module walls is affected by a potential fire. This response will not involve fire testing. Westinghouse believes the thorough analysis will demonstrate the robustness of the structures to serve as a fire barrier.

Action 8
In response to RO 79 Action 8 as part of UKP-GW-GLR-018, Westinghouse supplied information to provide evidence of the long term reliability of the CA modules. This included references to other nuclear structures throughout the world that use SC type modules. This specific information was provided to highlight that similar structures have been employed as nuclear structures. To further demonstrate the long term reliability of the CA modules, Westinghouse is proposing to perform a structural reliability evaluation of the CA modules in accordance with the Eurocodes. To execute this task Westinghouse would first generate an assessment methodology specific for the **AP1000** SC structures in accordance with the Eurocodes. Using this methodology, an assessment of a typical CA wall module and an assessment of a typical CA floor module would be completed.

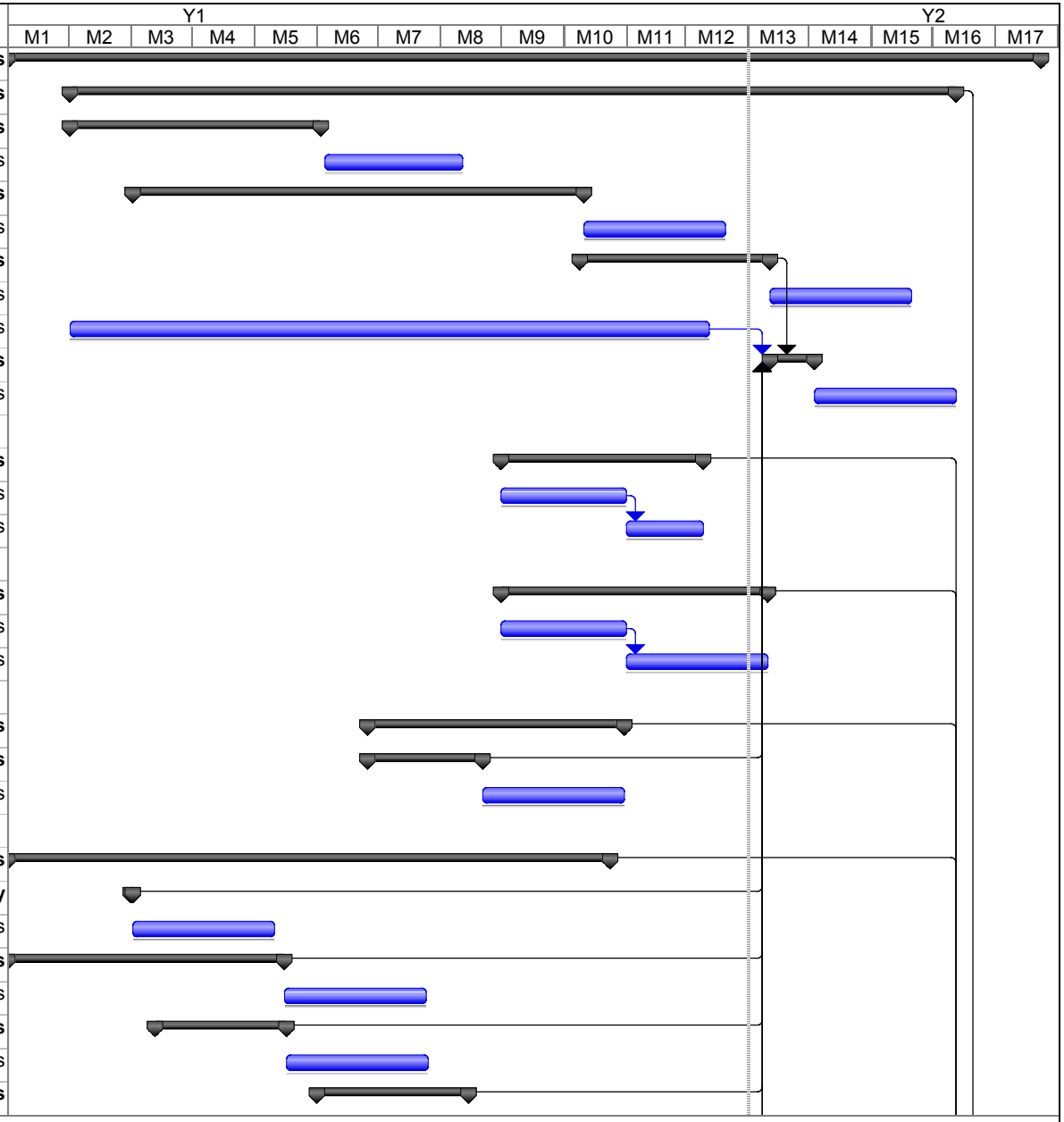
Based on the results to Action 02 and 04, Westinghouse will review the HCLPF calculations for the in-containment CA modules and update if necessary.

Schedule/ programme milestones:

Because all Resolution Plan start dates are subject to future contract placements, dates are presently unidentified; therefore schedule dates have been anonymised for consistency. Actual dates will be inserted when contracts are placed.

Note: ONR review time indicated on the schedule is a generic assumption. Actual review time may be shorter or longer.

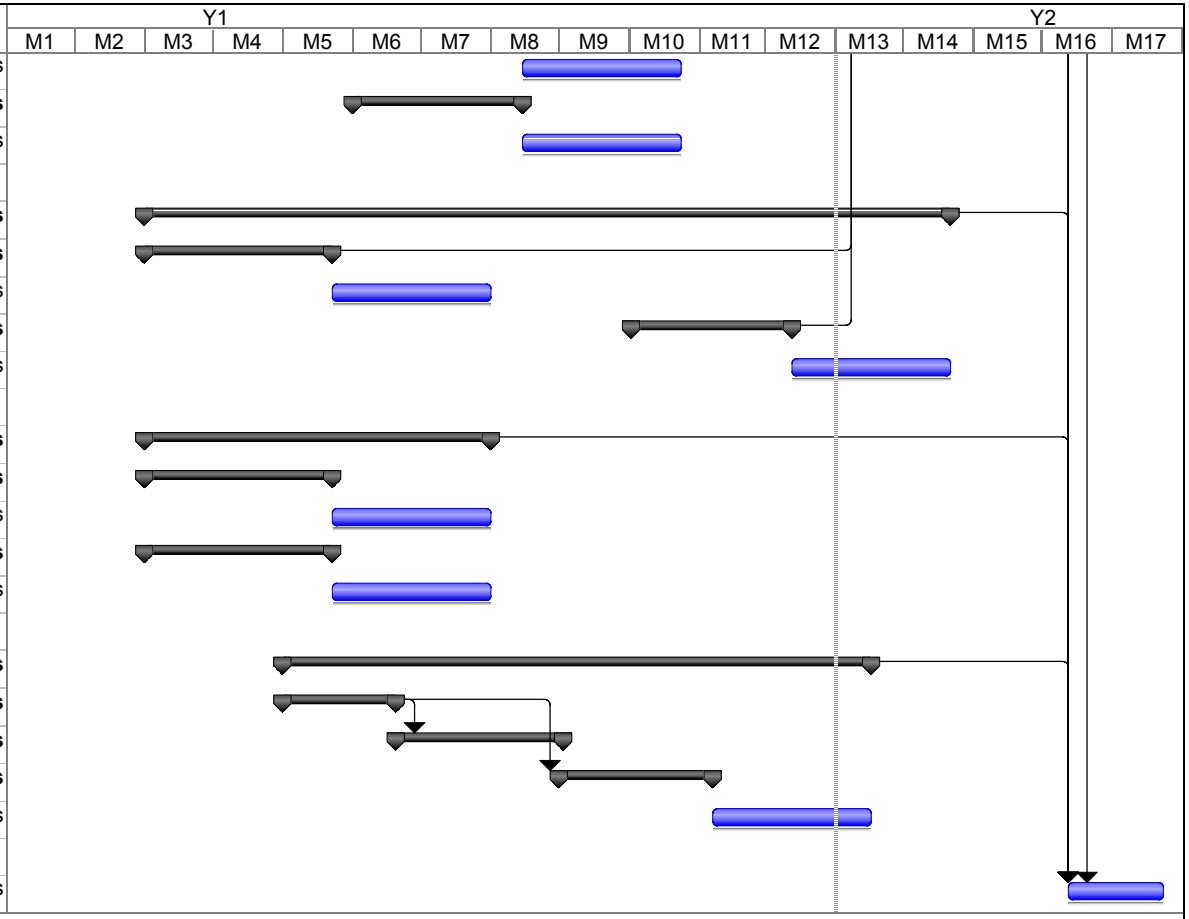
ID	Task Name	Duration
1	**GI-AP1000-CE.01 Resolution Plan**	**365 days**
2	**Action 1: Consolidated Documentation**	**314 days**
3	**Update Drawings as Required**	**90 days**
6	WEC Support of ONR review	50 days
7	**Module Test Program**	**159 days**
11	WEC support of ONR review	50 days
12	**Module Design Methodology**	**68 days**
15	WEC support of ONR review	50 days
16	Update Supporting Design Basis Calcs as requ	226 days
17	**Complete Design Roadmap**	**16 days**
20	WEC support of ONR review	50 days
21		
22	**Action 2: OOP Shear Acceptance Criteria**	**72 days**
23	Define Acceptance criteria	44 days
24	WEC support of ONR review	28 days
25		
26	**Action 3: In Plane Shear w/ Combined Loads**	**94 days**
27	Review & update methodology as required	44 days
28	WEC support of ONR review	50 days
29		
30	**Action 4: Shear Connections**	**91 days**
31	**APP-1100-SUC-003**	**41 days**
34	WEC support of ONR review	50 days
35		
36	**Action 5: Connections**	**212 days**
37	**CA20 Base Connection**	**1 day**
39	WEC support of ONR review	50 days
40	**Base Connection Level 3 Model**	**97 days**
43	WEC support of ONR review	50 days
44	**Wall to Wall Connection**	**47 days**
47	WEC support of ONR review	50 days
48	**Wall to Wall Connection Level 3 Model**	**53 days**



Project: GI-AP1000-CE.01 Rev. B.mpp
Date: Fri 17/06/11

Task
Split
Progress
Milestone
Summary
Project Summary
External Tasks
External Milestone
Deadline

ID	Task Name	Duration
51	WEC support of ONR review	50 days
52	**Connection of Equipment Support to Modul**	**53 days**
55	WEC support of ONR Review	50 days
56		
57	**Action 6: Thermal Loading**	**254 days**
58	**Linear & Nonlinear Thermal Calculations**	**59 days**
61	WEC support of ONR review	50 days
62	**Vapour Pressure Submittal**	**51 days**
65	WEC support of ONR review	50 days
66		
67	**Action 7: Fire Barrier**	**109 days**
68	**Hand Calculation**	**59 days**
71	WEC support of ONR review	50 days
72	**Finite Element Analysis**	**59 days**
75	WEC support of ONR review	50 days
76		
77	**Action 8: Long Term Reliability**	**186 days**
78	**Methodology Document**	**36 days**
81	**Standard Floor Calculation**	**54 days**
84	**Standard Wall Calculation**	**48 days**
87	WEC support of ONR review	50 days
88		
89	Update Safety Submission	30 days



Project: GI-AP1000-CE.01 Rev. B.mpp
Date: Fri 17/06/11

Task
Split
Progress
Milestone
Summary
Project Summary
External Tasks
External Milestone
Deadline

Methodology:

Action 1
A single high level document will be created which summarises the design of the CA modules and identifies the documentation that defines the design methodology and provides key supporting references.

Action 2
Specific criteria will be defined for which additional shear reinforcement will be required to be added to the CA wall modules. The criteria will be based on the out of plane shear demand on the module walls for the defined load cases.

Action 3
A sample of in plane shear calculations for the CA modules based on JEAG 4618 and the draft AISC App N9 will be completed. The calculations in combination with other information described above for Action 3 will provide a basis to support the design methodology for assessing in-plane shear when combined with other loads.

Action 4
The identified hand calculation will be updated to address the four times identified in the scope of work. The design basis for the shear studs is ANSI/AISC N690.

Action 5
General methodology for the design basis calculations has been provided in the calculations previously submitted. The objectives and approach for the level 3 finite element calculations was presented during the technical meeting on February 18, 2011 and is described in the response to Action Item 12.1 from the November 30 – December 2, 2010 civil engineering technical meeting. Please refer to DCP_JNE_000525.

Action 6
The methodology for the updated thermal analysis is documented in the submitted calculations. Please refer to APP-1100-S3C-017 and APP-1100-S2C-005. Regarding vapour pressure, Westinghouse will further include further industry research of the issue and if necessary perform supporting analysis to demonstrate that vapour pressure build up is not an issue for the CA modules.

Action 7
Both hand calculations and FEA will be provided to demonstrate that the CA modules can serve as a fire barrier and maintain their structural integrity when subjected to fire loading within the design basis.

Action 8
The general structural reliability assessment will be based on the approach provided in the Eurocodes. A specific methodology for applying this approach to the **AP1000** structural modules will be developed as part of this action. Any HCLPF calculations that need revised will be updated based on the methodology employed for the HCLPF calculations already submitted.

Justification of adequacy:

Action 1
The plan presented in the Description of Work for Action 1 aligns with the scope outlined in the GDA Issue as defined by ONR. The consolidated set of documentation that will be provided will draw together the responses provided to adequately describe the structure that is the basis for the Westinghouse GDA submission.

Action 2
The plan presented in the Description of Work for Action 2 aligns with the scope outlined in the GDA Issue as defined by ONR. The information to be provided will demonstrate that the CA modules have adequate out-of-plane shear capacity.

Action 3
The plan presented in the Description of Work for Action 3 aligns with the scope outlined in the GDA Issue as defined by ONR. The information to be provided will demonstrate that the CA modules have adequate in-plane shear capacity and that the methodology for assessing in-plane shear with combined loads is appropriate for the demand on the structure.

Action 4
The plan presented in the Description of Work for Action 4 aligns with the scope outlined in the GDA Issue as defined by ONR. The revision to the identified calculation will address the four items noted in the scope of work. The revision to the calculation will further reinforce that the shear studs support their function of providing the composite action for the structure.

Action 5
The plan presented in the Description of Work for Action 5 aligns with the scope outlined in the GDA Issue as defined by ONR. The proposed sample of connection design types for detailed review is based on agreement with ONR, and the calculations described in the scope of work will demonstrate that the connection designs provide adequate strength and ductility.

Action 6
Much of the key information required to demonstrate the structures ability to perform their safety function when subjected to thermal loading has already been provided, and initial feedback has been positive. This provides confidence that the approach presented is adequate. The primary work associated with this item will be to support questions that may arise based on the regulatory review of these submittals and finalise the analysis provided.

Regarding vapour pressure, the plan presented in the Description of Work for Action 6 aligns with the scope outlined in the GDA Issue as defined by ONR. Successful execution of this plan will address each of the items outlined in the GDA Issue for this action.

Action 7
The plan presented in the Description of Work for Action 7 aligns with the scope outlined in the GDA Issue as defined by ONR. The approach described to demonstrate the wall

modules ability to serve as a fire barrier is similar to what has already been done for the CA module floors. Feedback from ONR on these calculations has been positive, which provides confidence that the approach presented is adequate.

Action 8

Based on the information provided to date and the design margins exhibited in the analysis and testing, Westinghouse believes this action can be addressed by providing a Eurocode type structural reliability evaluation for a typical wall module and a typical floor module.

Impact assessment:

The Safety Submission Documents (Pre-Construction Safety Report (primarily chapter 16), Environment Report and its supporting documents, Design Reference Point, Plant Life Cycle Safety Report, Master Submission List and Roadmap) will be updated as appropriate.