

Assessing new nuclear reactor designs

Generic Design Assessment Periodic Report
November 2016 – January 2017

1 INTRODUCTION

1. This report provides information on the work that the Office for Nuclear Regulation, Environment Agency and Natural Resources Wales, have been carrying out on our Generic Design Assessments (GDA) of Hitachi-GE's UK Advanced Boiling Water Reactor (UK ABWR) and Westinghouse's **AP1000®** reactor for the period November 2016 – January 2017. We also report on the start of the GDA of the UK HPR1000, which commenced following a request from Government in January 2017. As we suggested in our previous progress report; this edition is focused on project performance metrics and provides a condensed summary of project progress.
2. ONR will realign its regulation of new nuclear build from April 2017, to be technology facing rather than lifecycle based (GDA, licensing, construction), and we will provide more information on this in future updates of our work. In light of this realignment we will also review how best to present public information on our new build regulatory work. This will likely mean changes to the joint regulators' 'GDA Progress Report' that we have provided to date so as to give a better overview of the regulators' work on new nuclear build.
3. In addition to this report, there is detailed information about our GDA work on our joint regulators' website (<http://www.onr.org.uk/new-reactors/index.htm>) including the Regulatory Observations (RO) we have raised, the requesting party's resolution plan, and ONR assessment reports relating to Regulatory Issue (RI) closure. The Environment Agency's assessment reports, and documents related to GDA consultations and decisions are published on GOV.UK <https://www.gov.uk/government/collections/assessing-new-nuclear-power-station-designs>
4. If you have any comments on this report, please send them to us at new.reactor.build@onr.gsi.gov.uk
5. To find out more about GDA, ask a question or make a comment about reactor designs visit <http://www.onr.org.uk/new-reactors/>
6. To receive the latest news and information on GDA, subscribe to our e-bulletin by visiting www.onr.org.uk/newreactors/ebulletin.htm



2 UK ABWR PROGRESS UPDATE

7. During this period, ONR has continued the step 4 detailed assessments and moved towards ensuring technical convergence and beginning to finalise assessment requirements as the project moves into its final year. Hitachi-GE has now submitted over 90% of its GDA deliverables and those remaining relate largely to the Pre-Construction Safety Report (PCSR). This is a further indication that the project is completing the assessment phase. The regulators expect to conclude detailed technical work in the summer and move into drafting the step 4 reports that will underpin a decision on whether to grant a Design Acceptance Confirmation (DAC) and Statement of Design Acceptability (SoDA) in December 2017. As with other GDA projects, we will publish all step 4 assessment reports and a summary report at the end of the project which continues to be targeted for December 2017.
8. The Environment Agency and Natural Resources Wales began a 12 week public consultation on 12 December 2016. The consultation asked for views on the environment agencies' preliminary conclusions following detailed assessment of the UK ABWR design, and on the environmental aspects of the design. Our consultation included a number of stakeholder meetings in England and Wales. Information about the consultation, which ended on 3 March is available on GOV.UK <https://www.gov.uk/government/consultations/gda-of-hitachi-ge-nuclear-energy-ltds-uk-advanced-boiling-water-reactor>
9. In total, we received 36 responses to the consultation: 13 via the consultation e-tool, 16 via email and seven in writing at the face to face stakeholder events. These will be collated and published at the end of March. Our responses will be included in our decision document, targeted for the end of this year.
10. There have been no new, significant technical issues emerging in this period. We have concluded work on the fuel export design as reported in our last progress update and progressed assessment relating to the one outstanding RI in Probabilistic Safety Analysis (PSA). Furthermore we expect a significant number of ROs to be closed in the coming period. For these reasons we have moved the delivery confidence for the project from amber/green to green; reflecting regulatory confidence in the likely success of the project concluding in December 2017. In addition, at this stage we do not anticipate new significant technical matters to be identified by our assessments, although we cannot preclude it, and we consider that overall the project is stable.
11. In terms of the fuel export design, ONR sought independent technical advice on the extant design and optioneering and as low as reasonably practicable (ALARP) analysis provided by Hitachi-GE. Our final conclusion is that Hitachi-GE has made a robust case for the current design and its optioneering work is commendable. There are some residual matters around managing the risk of foreclosing future design options, which we will take forward with Hitachi-GE. For PSA, progress has been made and we have been able to close some aspects of the RI actions and supporting ROs.
12. Within the period:



- There have been 36 meetings between regulators and Hitachi-GE.
- Hitachi-GE has issued 650 submissions for regulatory assessment.
- The regulators have issued 137 new Regulatory Queries (RQ) and responded to 52.
- The regulators have issued six new ROs issued and closed eight.
- There have been no new RIs opened or closed.
- ONR let one new technical support contract to the Health and Safety Laboratory for Control & Instrumentation (C&I) support and extended four existing contracts.

2.1 Topic Progress Updates

2.1.1 Engineering

13. Hitachi-GE has continued to meet its re-baselined programme for civil engineering, which included an eight month delay on the previous programme for some aspects. ONR is working hard to absorb this delay. In general the Hitachi-GE submissions are well presented and of a good standard. There are issues of completeness with some but overall the position is good. In November 2016 ONR closed RO-ABWR-0068 relating to seismic methodology.
14. Hitachi-GE continues to meet its programme for external hazards and the quality of the submissions is adequate overall. RO-ABWR-0067 on the subject of the treatment of beyond design basis hazards remains open, and work on this is continuing. Hitachi-GE continues to progress the justification for a generic site envelope value for lightning, and on the consideration of cliff-edge effects for civil engineering structures.
15. In this period, ONR raised two new ROs for internal hazards, RO-ABWR-0078 on 'exceptions to segregation' and RO-ABWR-0079 relating to turbine disintegration. Overall, the quality of Hitachi-GE submissions has improved following ONR's feedback and targeted RQs.
16. Substantiation of A1 barriers against internal hazards is proving challenging, given the high level assumptions made in modelling of pipe whip (which is not informed by pipework layout) and other internal hazards.
17. For mechanical engineering Hitachi-GE has submitted the majority of submissions in accordance with its submission schedule. Three ROs have been closed in this period and we expect to close a further three by the end of February. ONR is working with Hitachi-GE to expedite closure of RO-ABWR-0075 on heating, ventilation and air conditioning (HVAC), and we expect to be able to close this RO in April 2017 subject to an adequate submission in March 2017.
18. The position in structural integrity is stable with no emerging issues. ONR is currently assessing a large volume of documentation.
19. Assessment of Revision C of the UK ABWR Conceptual Security Arrangements (CSA) continues. Hitachi-GE has been responsive to all queries raised and has sought to consolidate comments and feedback into Revision D of the CSA. The focus of assessment activity has been to ensure adequate analysis has been carried out and



documented to support the identification of those areas to be protected from identified threats. Further work has focussed on claims to mitigate cyber threats.

20. Hitachi-GE is making good progress in delivering the documentation for supporting an ALARP justification for fire safety design. For conventional safety, discussions continue on the use of open-topped construction of the reactor building and no technical concerns have been identified so far.

2.1.2 Safety Analysis

21. Hitachi-GE continues to make good progress in developing the C&I safety case and improving the clarity and linkage of the claims, arguments and evidence. The remaining four open RO's are awaiting the submission of documents from Hitachi-GE. ONR has identified differences in justification approaches between the C&I and the internal hazards technical area, and this has resulted in the submission on electromagnetic interference requiring revision.
22. In electrical engineering ONR is in the process of reviewing system study submissions, and has requested further evidence to support the close out submission for RO-ABWR-0063 on Grid Code compliance. This is being prepared by Hitachi-GE with a planned submission to ONR due at the end of February 2017. ONR has also raised RO-ABWR-0074 requiring Hitachi-GE to demonstrate that electrical switchgear can be accommodated in the space available following requirements to increase ratings identified by system studies.
23. The focus for ONR's fault studies team has been on understanding the key assumptions and operational strategies that inform the design, for example, controls on planned maintenance and single failure assumptions. There has also been further productive dialogue on management of steam generation from the spent fuel pool, safety relief valve diversity and FLSS design. Furthermore, independent confirmatory analysis of accident transients has provided some useful insights, for example on modelling factors affecting boron dilution.
24. In fuel and core, ONR has continued to work with Hitachi-GE on the design of the fuel route and demonstrations of fault tolerance. Hitachi-GE has provided an acceptable resolution plan for a RO requiring changes in protection for the fuel in the event of control-rod movement faults. In addition, Hitachi-GE has demonstrated that:
 - Core power shape remains stable during proposed load-follow operations.
 - Fuel channel can be re-flooded effectively, despite clad ballooning in postulated low-frequency fault sequences.
25. ONR's primary focus in human factors has been to ensure that a clear understanding is reached on Hitachi-GE's human machine interface validation and verification programme. Some significant Hitachi-GE submissions have been delayed in the period, which has hindered assessments on human based safety claims and human reliability assessment. Progress on RO-ABWR-0069 has been good.



26. During this period ONR's PSA team have completed most of the review of the UK ABWR PSA 2016 submissions. The most significant issues identified during this period are the adequacy of the demonstration that the risks are ALARP and the specificity of the containment performance analysis. Hitachi-GE has provided sufficient information to close some of the ROs 40, 41, 42, 46, 48 and 53 actions. A PSA workshop focusing on internal fire and internal flooding PSA was held in November 2016. One of the key conclusions of this workshop is that there may be significant conservatism in the internal fire and flooding PSAs. Hitachi-GE has committed to undertake further refinement work in GDA.
27. ONR's PSA assessment of Hitachi-GE response to RI-ABWR-0002 has been completed. The assessment concluded that Hitachi-GE has provided sufficient information to meet the intent of RI-ABWR-0002 and have addressed the issues which led to it being raised.
28. In the area of severe accident analysis ONR has been assessing Hitachi-GE's submissions on hydrogen management during severe accidents. ONR's work on independent confirmatory analysis for severe accidents continues and it is expected that conclusions will be available in the next reporting period.
29. In the area of radiological consequences ONR has focused on caesium release to the spent fuel pond during a boiling fault. This, together with a safety claim on reactor building retention may impact on the arguments for filtering of potential releases. In addition ONR has questioned the approach to the cut-off of consideration for Target 9.

2.1.3 Science

30. Our priorities in management for safety and quality assurance (MSQA) include demonstration by Hitachi-GE that improvements to the safety case process will result in a better quality safety case; and that technology transfer arrangements will provide suitable outputs to move the safety case into the operational regime. There is an emerging concern on document quality as ONR has received a number of submissions with an unacceptable level of quality errors for this stage in the GDA process.
31. For reactor chemistry there has been an improvement in the quality of submissions over the period. RO-ABWR-0034 related to the bottom drain line is progressing; however ONR still has concerns with the current justification for the materials changes to the bottom drain line, which we will progress via RO-ABWR-0035.
32. Hitachi-GE has delivered all the substantive documents for radiological protection on plan. Our priorities for this area include Hitachi-GE's approach to evacuation times and how Hitachi-GE develops designs for contamination control and radiological zoning.
33. ONR continues to discuss Hitachi-GE's approach to the demonstration of ALARP in radioactive waste to achieve closure of RO-ABWR-0036. Further evidence is required to demonstrate that the GDA design will be capable of reducing risks ALARP and securing adequate control of nuclear matter. Similarly for spent fuel interim storage, ONR is seeking additional evidence to demonstrate that the UK ABWR infrastructure for management of spent fuel will be capable of reducing risks ALARP. We are also

progressing our assessment of Hitachi-GEs work on addressing decommissioning in the design.

34. For chemical engineering the submissions to close out RO-ABWR-0054 have been delivered on plan and we expect this RO to be closed following an ONR inspection of the implementation of Hitachi-GE processes in this area.

2.1.4 Progress Metrics

	Civil Engineering			External Hazards			Internal Hazards			Mechanical Engineering			Structural integrity			Conventional Safety			Fire Safety			PSA			Reactor Chemistry					
Category 1 - Programme	Y	Y	N	Y	N	N	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	N	Y	Y	Y			
Category 2 - Submissions	N	D	J	N	D	J	N	D	J	N	D	J	N	D	J	N	D	J	N	D	J	N	D	J	N	D	J	N	D	J
Category 3 - interactions																														
Category 4 - Existing Issues																														
Category 5 - Emerging Issues																														

	Radiation Protection			Human Factors			MSQA			Rad Waste			Decommissioning			Spent Fuel Interim Store			Severe Accident			Fault Studies			C&I					
Category 1 - Programme	Y	Y	N	Y	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y	Y	Y	Y			
Category 2 - Submissions	N	D	J	N	D	J	N	D	J	N	D	J	N	D	J	N	D	J	N	D	J	N	D	J	N	D	J	N	D	J
Category 3 - interactions																														
Category 4 - Existing Issues																														
Category 5 - Emerging Issues																														

	Electrical Engineering			Fuel & Core Design			Security			Environmental			Chemical Engineering			Rad Cons		
Category 1 - Programme	Y	Y	N	Y	N	N	Y	N	N	N	N	N	N	N	N	N	N	N
Category 2 - Submissions	N	D	J	N	D	J	N	D	J	N	D	J	N	D	J	N	D	J
Category 3 - interactions																		
Category 4 - Existing Issues																		
Category 5 - Emerging Issues																		



3 AP1000 PROGRESS UPDATE

35. There has been a significant increase in pace, progress and delivery in this period. As an example, Westinghouse provided 163 formal submissions; the majority of which have been further iterations of earlier documents. This represents approximately 20% of its total submissions for the GDA closure phase. We have reported the compression of the programme for this project in earlier reports, and although Westinghouse has been able to meet its schedule, the back-end loading of work has placed considerable pressure on ONR resources. The ONR team has maintained pace and undertaken an extensive amount of assessment in this short period of time to enable Westinghouse to complete the GDA in March 2017. To support this accelerated pace the level of communication and interaction between the Westinghouse and regulatory teams has also increased at all levels within the project.
36. ONR and Westinghouse have also provided enhanced management attention on critical path topic areas, and implemented weekly management progress updates across the teams, all with a view of enabling Westinghouse to complete the GDA successfully on time.
37. This increase in pace and delivery has dramatically improved the Westinghouse position and increased the likelihood of the project completing on time at the end of March 2017. As we signalled in our last update, ONR undertook a project wide health check/deep dive in January 2017. We have improved our delivery confidence from amber/red to amber/green as a key outcome from that review. The sheer volume of work undertaken by ONR in this period has contributed to this change in position.
38. Although it is clear from the topic summaries that in the majority of areas, assessment is complete and the assessment reports are progressing; in the area of structural integrity there is still technical work outstanding. This therefore remains a project risk although we are confident of a way forward. There have been other technical hurdles within the period, but for the majority of areas ONR has been able to work expeditiously with Westinghouse to resolve them.
39. Within the period:
- There have been 98 meetings between regulators and Westinghouse.
 - Westinghouse has issued 163 formal submissions for regulatory assessment.
 - The regulators have issued 54 new RQs and responded to 86.
 - ONR let one new technical support contract for PSA support to Jacobsen Analytics.
 - ONR has closed 21 GDA issues in principle

3.1 Topic Updates

3.1.1 Engineering

40. ONR has completed its assessment in civil engineering and has drafted assessment reports for all four GDA issues. Assessment findings and minor shortfalls have been identified.
41. For internal hazards Westinghouse met its programme of submissions, including some new explosion analysis work in January 2017. ONR has completed its assessment work and drafted its assessment report with assessment findings and a minor shortfall identified.
42. The ONR assessment of submissions and the production of the assessment report in mechanical engineering have significantly progressed in the period. Westinghouse has been proactive in responding to closing queries and there are no outstanding issues.
43. For structural integrity this has been a very busy period of delivery of submissions from Westinghouse and ONR assessment. We were able to close GDA Issues SI-02 and SI-03 and GDA Issues SI-01 and SI-04 can close shortly. Some late information received under SI-01 will be assessed under SI-06.
44. SI-05 and SI-06 has also progressed, however, some technical challenges remain to be addressed at this very late stage. For the engineering evaluation aspects of SI-05, Westinghouse submitted updated design calculations for the Reactor Pressure Vessel, Pressuriser, Steam Generator and Passive Heat Removal Heat Exchanger. Our assessment of these concluded that Westinghouse has addressed the majority of the technical comments, but there are some residual matters to be addressed prior to closure.
45. On the MSQA side of GDA Issue SI-05, ONR assessed the output of the Westinghouse corrective action and lessons learnt process, which included causal analyses. It then supplemented this with an internal inspection covering the implementation of its verification and validation arrangements across all GDA technical disciplines, and we are currently assessing this. Overall, the technical and programme risks for the closure of GDA Issue SI-05 have reduced over the period.
46. ONR has kept the US Nuclear Regulatory Commission (US NRC) and the Chinese Nuclear Regulator informed through the Multinational Design Evaluation Programme regulatory working group.
47. For GDA Issue SI-06, Westinghouse has undertaken consequence assessments and introduced a design change proposal to improve the impact resistance of the Steam Generator vertical support. These are significant developments aimed at avoiding the need to invoke highest reliability claims. Westinghouse recently provided submissions covering other structural integrity classification matters for GDA Issue SI-06 and these are currently being assessed.

3.1.2 Science

48. Westinghouse has delivered the final submission for all of the three GDA issues for reactor chemistry. ONR is finalising its assessments and producing the associated reports. Westinghouse has delivered sufficient evidence to enable us to close out all issues. There will be a number of assessment findings resulting from ONR's review.
49. The final assessment of the Westinghouse submission for radiological protection is complete.

3.1.3 Safety Analysis

50. During this period Westinghouse delivered the final GDA submissions of the C&I safety case documents and RQ responses broadly in line with their re-baselined programme, and ONR has been assessing them. ONR also undertook an inspection of evidential documents containing proprietary information for the **AP1000**[®] protection and safety monitoring system at the ABB Stonehouse facility near Gloucester.
51. In electrical engineering Westinghouse submitted updated documents to address issues on the use of smart devices. ONR has now completed its assessment in this area.
52. Westinghouse has also provided its final submissions for fault studies, which has culminated in a consolidated PCSR at the end of January 2017. There is a high degree of confidence that these final submissions will facilitate timely closure of all fault studies GDA issues.
53. In the period ONR has established that the core barrel is sufficiently stiff to resist the forces experienced in a loss-of-coolant accident without unacceptable impact loads on the fuel. It has also been demonstrated that Westinghouse has taken reasonable measures to mitigate the effect of a postulated failure in the BEACON core monitoring system.
54. In human factors, Westinghouse submitted its main submissions for HF-01 closure in December. Additional evidence has been drawn from Westinghouse's integrated system validation trials. This GDA issue has been closed in principle in this period.
55. ONR's PSA team has been assessing responses to the outstanding RQs and writing assessment reports this period. ONR had a meeting with the US NRC to discuss technical matters of mutual interest on the **AP1000**[®] plant PSA assessment.

3.1.4 Cross-cutting

56. The Westinghouse submissions for GDA Issue CC-03 relating to Fukushima are comprehensive and high quality. There are no outstanding technical issues and are completing the report.
57. Sufficient submissions of evidence and adequate modifications to the PCSR have been made to enable assessment to close out GDA Issue CC-01 in March 2017.

58. Westinghouse's updates to the PCSR were delivered on time on programme and assessment is indicating that the document will be adequate to enable the GDA issue to be closed, and provide a baseline from which any future licensee will be able to develop a detailed design related PCSR.
59. The Environment Agency has assessed the Environment Report (Revision 6) and await an update of this report, which should address a number of minor technical errors.

3.1.5 Progress Metrics

	C&I			Fault Studies			Internal Hazards			Structural integrity			Civil Engineering			Fuel & Core Design			Mechanical Engineering			Reactor Chemistry		
Category 1 - Programme	Red	Yellow	Yellow	Green	Green	Green	Yellow	Yellow	Green	Red	Red	Yellow	Yellow	Yellow	Green	Green	Green	Green	Yellow	Yellow	Green	Green	Green	Green
Category 2 - Submissions	Yellow	Yellow	Green	Green	Green	Green	Yellow	Yellow	Green	Green	Green	Green	Yellow	Yellow	Grey	Yellow	Grey	Green	Green	Green	Green	Green	Grey	Green
Category 3 - interactions	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Category 4 - GDA Issue 1	Yellow	Green	Blue	Blue	Blue	Blue	Yellow	Yellow	Green	Green	Green	Green	Yellow	Yellow	Green	Blue	Blue	Blue	Green	Blue	Blue	Green	Blue	Blue
Category 4 - GDA Issue 2	Yellow	Green	Blue	Green	Blue	Blue	Yellow	Yellow	Green	Green	Green	Green	Yellow	Yellow	Green	Green	Blue	Blue	Green	Blue	Blue	Green	Blue	Blue
Category 4 - GDA Issue 3	Yellow	Yellow	Green	Blue	Blue	Blue	Yellow	Yellow	Green	Yellow	Yellow	Green	Green	Green	Blue	Green	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
Category 4 - GDA Issue 4	Yellow	Green	Blue	Blue	Blue	Blue	Yellow	Yellow	Green	Red	Red	Yellow	Green	Green	Blue									
Category 4 - GDA Issue 5	Yellow	Green	Blue	Blue	Blue	Blue	Yellow	Yellow	Green	Red	Red	Yellow												
Category 4 - GDA Issue 6	Red	Yellow	Green	Blue	Blue	Blue	Yellow	Yellow	Green	Yellow	Yellow	Green												
Category 4 - GDA Issue 7	Yellow	Yellow	Green	Green	Green	Green																		
Category 4 - GDA Issue 8	Red	Yellow	Yellow	Green	Green	Green																		
Category 4 - GDA Issue 9	Yellow	Yellow	Yellow																					
Category 4 - GDA Issue 10	Green	Green	Blue																					
Category 5 - Emerging Issues	N	N	N	N	N	N	Y	Y	N	Y	Y	Y	Y	Y	N	Y	N	N	Y	N	N	N	N	N
	N	D	J	N	D	J	N	D	J	N	D	J	N	D	J	N	D	J	N	D	J	N	D	J

	PSA			Electrical Engineering			Radiological Protection			Human Factors			Cross Cutting 1			Cross Cutting 2			Cross Cutting 3					
Category 1 - Programme	Yellow	Yellow	Yellow	Yellow	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Category 2 - Submissions	Green	Green	Grey	Green	Green	Green	Green	Green	Grey	Green	Green	Green	Green	Green	Grey	Green	Green	Green	Green	Green	Green	Green	Green	Grey
Category 3 - interactions	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Category 4 - GDA Issue 1	Green	Green	Green	Yellow	Green	Blue	Green	Green	Blue	Green	Green	Blue	Green	Green	Green	Green	Green	Green	Blue	Blue	Blue	Blue	Blue	Blue
Category 4 - GDA Issue 2	Green	Green	Green																					
Category 4 - GDA Issue 3																								
Category 4 - GDA Issue 4																								
Category 4 - GDA Issue 5																								
Category 4 - GDA Issue 6																								
Category 4 - GDA Issue 7																								
Category 4 - GDA Issue 8																								
Category 4 - GDA Issue 9																								
Category 4 - GDA Issue 10																								
Category 5 - Emerging Issues	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y	Y	Y	Y
	N	D	J	N	D	J	N	D	J	N	D	J	N	D	J	N	D	J	N	D	J	N	D	J

4 HPR1000 GDA PROGRESS UPDATE

60. The regulators received a request from Government to commence a GDA of the UK HPR1000 reactor technology on 10 January 2017. This followed work by the regulators and General Nuclear System (GNS), the requesting party acting for China General Nuclear (CGN) and EDF, on the pre-requisites for GDA. The regulators confirmed to the Department for Business, Energy and Industry (BEIS) that GNS were in a good position to commence the GDA and there is confidence that they have the capability and capacity to complete the process in a reasonable timeframe. The UK HPR1000 GDA formally started on 19 January 2017.
61. UK HPR1000 reactors will be deployed at the Bradwell B site in Essex (expected in 2021) it is proposed that
62. In this period the regulators and the requesting party have signed the GDA charging agreements allowing regulators to recover their costs for the work. Furthermore the regulators have mobilised a team and begun preparatory work for a technical workshop in China in March 2017.