



**IAEA**

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# **INDC International Nuclear Data Committee**

Summary Report of Consultants' Meeting

## **IAEA International Database on Irradiated Nuclear Graphite Properties**

**9<sup>th</sup> Meeting of the Technical Steering Committee**

IAEA Headquarters, Vienna, Austria  
26–27 March 2007

Prepared by

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June 2007

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June 2007

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**IAEA International Database on Irradiated Nuclear  
Graphite Properties**

**9<sup>th</sup> Meeting of the Technical Steering Committee**

Prepared by

D. Humbert and A.J. Wickham

**Abstract**

The "9th Meeting of the Technical Steering Committee for the International Database on Irradiated Nuclear Graphite Properties" was held on 26–27 March 2007 at the IAEA Headquarters, Vienna, Austria. All discussions, recommendations and actions of this Consultants' Meeting are recorded in this report. The purposes of the meeting were to review the matters and actions identified in the previous meeting, undertake a review of the current status of the database and make recommendations for actions for the next year. This report contains the current status of the identified actions as well as a summary of the recommendations on enhancements to the database.

June 2007



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# **Minutes of 9<sup>th</sup> Meeting of the Technical Steering Committee for the International Database on Irradiated Nuclear Graphite Properties**

**26–27 March 2007, IAEA Headquarters, Vienna, Austria**

## Present

Mr. A.J. Wickham, United Kingdom (*Chairman*)  
Mr. D. Humbert, IAEA (*Scientific Secretary*)

## *Other Members:*

Mr. T.D. Burchell (United States)  
Mr. S.-H. Chi (Republic of Korea)  
Mr. G. Haag, FZJ (Germany)  
Mr. T. Shibata (Japan)  
Mr. A. Smaizys (Lithuania)  
Mr. J.A. Vreeling (The Netherlands (*part time*))  
Mr. R.E.H. Clark (IAEA)  
Mr. A.L. Nichols (IAEA (*part-time*))

## *Observer:*

Mr. P. Homerin, Graftech International Inc (France)  
Mr. F. Gerstgrasser, SGL Carbon Ltd (Germany)  
Mr. E.S. Kim, KAERI (Korea (*to represent The Republic of Korea at future meetings*))  
Mr. M. Mitchell, PBMR Co. (Pty) Ltd (South Africa)

## *Apologies for Absence:*

Mr. T. Konishi, Toyo Tanso Co. Ltd (Japan)

## **Welcome and Opening Remarks**

The meeting was welcomed to the IAEA by Mr. Nichols on behalf of the Nuclear Data Section and the IAEA and by Mr. Clark as officer principally responsible for the Database project within the IAEA. Mr. Nichols observed that it was very clear that nuclear power was on the ascendant, and that the Database project was also proceeding well. He spoke about forthcoming staff changes in the Nuclear Data Section which would see a complete change in personnel involved with the project in approximately two years. Mr. Clark observed that there would also be changes in the Agency's accounting system in the next two years and care should be taken that the project finances are retained under the new system.

The Chairman then welcomed delegates and observers, inviting the latter to take a full role in the meeting. He commented that the Database would double in size with the issue of the next CD-ROM, a milestone which met with considerable approval from the meeting. He then reviewed recent events related to graphite reactors, concentrating on initiatives related to decommissioning which included a recent conference at The University of Manchester held with the cooperation of the IAEA Waste-Management Division, the continued involvement of the US Electric Power

Research Institute in the subject, and a major proposal to the EU Seventh Framework programme under the self-explanatory acronym 'CARBOWASTE' which involved nineteen participants from Europe and beyond and aimed to include both the interests of current reactor decommissioning and the design needs for decommissioning in future reactor designs. Finally he thanked IAEA representatives, together with Mr. K. Sheikh, for the efficient arrangements for the meeting.

## **Minutes and Actions**

The Chairman moved the adoption of the Agenda for the meeting and this was carried *nem con* with the addition of an item on INGS-9 (2008) and the standing item on Database Security, which had been overlooked.

The Minutes of the previous Committee Meeting (March 2007, IAEA Vienna), published as INDC-(NDS)-498, were accepted without amendment.

All Actions from the previous meeting had been completed.

The principal matter arising from the Minutes related to the emerging need to continue the programme beyond the remaining two years of the current 'four-year plan', in order to implement additional work on matrix materials and composites, and to deal with any additional data which might emerge (Mr. Haag observed that some additional data had indeed been located at Forschungszentrum Jülich, whilst Mr. Wickham expected additional UK data in due time as well as information from international irradiation experiments, and the possibility of some involvement with decommissioning issues). The IAEA representatives strongly advised against an extension, but rather that a new proposal for specific 'Phase 2' activities should be prepared, possibly at the next Committee Meeting, to present to the Agency. This would allow the current project to be seen to close out on schedule. This was agreed.

Mr. Burchell commented that his proposal last year to ensure that all data arising from Gen IV should ultimately enter the IAEA Graphite Database had not been straightforward. There was a view within Gen IV membership that data should be protected for the lifetime of the Gen IV project since they could otherwise lose their 'trading value'. He still considered that the data would be made available in the end, and therefore that we should include such an activity in the later stages of our proposed 'Phase 2'.

## **Review of National Database Users' Meetings and Interests**

Mr. Wickham advised that no formal meeting of UK Database users had taken place during the previous year, largely because these users were very satisfied at the progress being made with the implementation of QA procedures and the maintenance of the project timescale. No other Member State representative had held any formal meeting. However, Mr. Burchell reported feedback from US users (US NRC and Idaho National Laboratory), the comments reflecting a desire for more data which would in all probability be met by the next and succeeding CD-ROMs. He also commented upon the value of the creep data which was now being inputted.

## Review of Progress on Project Plan

### Module 2

Mr. Haag presented a review of the work carried out by himself and students during the year. 280 working hours had been spent on upgrading the Version-1 UK data (funded directly by UK HSE) and a further 300 working hours had been spent on new data input. The effort required for the former had been a surprise both to himself and to Mr. Wickham, when they realised that Version-1 data had been entered into the system 'blind' with the result that important items of information needed for useful interpretation were missing. This unsatisfactory situation had resulted in a need to consult the original reports again, a task which was now partly completed, and had also required significant effort from Mr. Wickham.

The following items will therefore be added for 'Excel Version 2' which will be produced as soon as the QA requirements are completed (see below):

Residual data from the very large US report BNWL 1672

Upgraded data from Version 2.1 (complete)

Updated files from Version 1.3 (mainly UK and partially completed) together with new UK data H-451 data from USA (ORNL/NRC compilation)

HTK7 and HFIR data

Hanford ETR irradiation data

One third of the Petten (Dragon) data scheduled originally in Module 4 (*brought forward partly because of serious concern about fading documents*)

The net amount of data to be added, although differing slightly from the plan, exceeds that originally expected, and Mr. Haag and his team were congratulated for their achievement.

Mr. Wickham reported that he had asked UK HSE (Nuclear Safety Directorate) if they would be willing to continue funding the upgrading of the remaining Version-1 UK data at the same level as in the previous financial year, and was awaiting a formal response. The next working year should then see this work completed together with additional UK data and the insertion of the re-formatted Japanese data (which was handed by Mr. Shibata to Mr. Haag with compatibility problems resolved during the meeting), the remaining Petten data, GA and ORR data from the US and (if possible) data from the 'Carbon' journal. The latter could well be found to duplicate items already present, and has been considered a rather low priority.

The timeline diagram also calls for the insertion of data from INET during the next twelve months, these having previously been promised by Chinese observers.

**Action 1:** Mr. Wickham to contact INET to ascertain the status of this offer, relating to irradiation of HTR-10 materials in a Russian research reactor.

Finally, a small anomaly relating to the timescale of the issue of the final CD-ROM in the current Phase-1 plan will be corrected.

## **Application of QA Procedures (*from INDC(NDS)-0500*)**

Mr. Haag then reviewed the application of the QA procedures as described in Section 2 of INDC(NDS)-0500. He considered that they had lengthened the time taken to input data, although the committee felt that he had always applied similar procedures informally in the past. All agreed that the exercise had been successful after Mr. Haag gave examples of errors and inconsistencies found in the input material.

It became apparent that the description in INDC(NDS)-0500 contained some duplication of checks between the data input stage and the subsequent document review stage. Mr. Mitchell offered the view that the document could be better written to separate the procedure of verification from that of validation. This was generally agreed. Further issues emerged with the usage of the 'tick sheet' for qualification of source reports (see below) and as a result a second issue of INDC(NDS)-0500 will be prepared.

**Action 2:** Mr. Wickham to initiate a revised version of INDC(NDS)-0500 for comment by the committee and for subsequent issue by the IAEA Nuclear Data Section.

Application of the document qualification procedure ('Categorisation of Data') in Section 3 of INDC(NDS)-0500 proved problematical. The principal issue was that the committee were not familiar with the source documents for the data in the next issue of the CD-ROM and could therefore not offer an informed view upon them. Instead, agreement was reached that this stage of the QA procedure should be applied one year in arrears, after the committee members had had time to study the scanned-in documents.

The meeting therefore decided to examine instead the documents applicable to the April 2006 CD-ROM issue. However, not being prepared for this requirement caused some difficulties. In the course of this exercise, some minor changes were also found to be required in the 'tick sheet'. There was a lengthy debate about whether signed copies of old reports were acceptable as the highest grade of QA, but the view that there could not possibly be an auditable trail associated with such documents prevailed after strong arguments voiced by Messrs. Mitchell, Shibata and Wickham. There were some quite wide divisions amongst committee members on this issue. However, it was eventually agreed that QA could only be applied according to the precise standards identified in INDC(NDS)-0500. Owing to the intervention of a pre-arranged conference call for members of the Gen IV forum, a full evaluation of reports from the 2006 CD-ROM could not be completed during the meeting, and agreement was reached that Mr. Wickham would offer members proposed categorisation for the remaining reports, and these would be agreed by e-mail.

**Action 3:** Mr. Wickham to complete the proposed categorisation of the UK data volumes from the 2006 CD-ROM for endorsement by the committee, ahead of the issue of the 2007 CD-ROM.

The committee agreed that the application of QA standards in these exercises had provided valuable lessons, and that the approach added a considerable weight to the value of the Database for future users.

**Action 4:** Mr. Wickham to work with Mr. Haag to effect the issue of the 2007 CD-ROM by the end of May 2007, including the scanned-in 'tick sheets' assessed by the committee and the Working Arrangement (as before). A password for protected files on the 2007 issue CD-ROM was agreed during the meeting, for the avoidance of doubt amongst committee members and

sponsors. Members and sponsors will be notified again by e-mail when the CDs are ready for issue by IAEA.

### **“Version 3 Project” and Related Issues**

Mr. Wickham invited Mr. Gerstgrasser to comment upon the importance of establishing a fully functional relational searchable database. Mr. Gerstgrasser and Mr. Srinavasan of US NRC had been strong supporters of this activity, with Mr. Gerstgrasser in 2004 suggesting informally that such a possibility might be fundable through SGL Carbon. Subsequently, the committee had agreed that this should be a very low priority. Mr. Gerstgrasser said that he was considerably encouraged by the progress that was now evident in the Database project, and that the principal users were entirely happy to use the Excel version. He would not therefore try to force a move to a more complex software package, although the option remained open if time and funding were available.

Mr. Wickham raised concerns about changes in Microsoft Office 2007 which might affect accessibility of the Database in the future. He had recently discovered that Word 2007 files could not be accessed by users of any earlier version, and was concerned that similar problems might afflict Excel. A poll of members established that users of all Excel versions between 1997 and 2007 were present. Since utilisation of Excel 97 for the Database could not be guaranteed indefinitely, members need to be aware of the possible consequences of system upgrades in their organisations.

### **Decommissioning Database**

Mr. Wickham had already outlined the large increase in activity with respect to the decommissioning of graphite-moderated plant, and the consequent increase in interest for some sort of decommissioning database, possibly as part of Phase 2. A lively discussion established that such an activity should definitely be separate from the present Database, and based primarily upon isotopic assays although mechanical properties were also relevant to dismantling methodologies. Mr. Wickham reported that there were large differences between calculations and measurements in the French UNGG decommissioning characterisation exercise, and he felt that reliance on the experimental data might be more productive than expending a large effort on trying to refine calculations which could not account for dispersion of isotopes around the circuits by operational events. However, Mr. Mitchell commented that the PBMR reflector-change safety case would have to rely upon calculations since there would be *no* characterisation, and therefore a Database would not be useful in this instance. Mr. Homerin drew attention to the activities of the CARBOWASTE project in this regard. Mr. Haag commented about the resources needed to effect such a decommissioning Database. Mr. Burchell indicated a growing interest from the USDoE (Next Generation Nuclear Plant project) in such an activity. Mr. Smaizys again stressed the importance of such an activity for Lithuania in dealing with the Ignalina plant.

The discussion should be reported to the IAEA Waste-Management Section (Mr. Zoran Drace) with a view to establishing what role the Agency might wish to take in such an activity.

**Action 5:** Mr. Wickham to discuss options with Mr. Drace of IAEA for possible involvement with a Decommissioning Database under Phase 2.

## **ASTM Standards for Nuclear Graphite**

Mr. Burchell reported on the activities of his sub-committee on nuclear graphites, developing standards and test methodologies for small-sample pieces of irradiated nuclear graphite. His committee was more concerned with the methods used to generate data (and its validity) than with the data itself.

## **TWGGCR**

Mr. Wickham had attended the recent IAEA TWGGCR meeting (January 2007) both to represent the Database project and, for the first time, as the official UK representative. The report of the Database activity (previously circulated for comment to Committee members) had been well received, and the TWGGCR gave due weighting to the proposal for a CRP on Irradiation Creep in Graphite which had been proposed by Mr. Burchell and was the subject of an IAEA Technical Consultancy at the end of 2006.

## **INGSM<sup>1</sup> Meetings**

These meetings were started by this Committee although the conferences are not themselves IAEA activities, and they have proven to be extremely successful. The committee has reserved to itself the decision on where such meetings will be hosted and also on their format.

Mr. Burchell presented a report on the very successful INGS-7 meeting held at Oak Ridge National Laboratory in the USA in September 2006. He recommended that a dedicated external publication should be a feature of all meetings in the future, along with an appropriate registration fee to cover its cost and other costs associated with the meetings. Some members were unhappy with one or both of these proposals, feeling that the informality of presentations encouraged wider discussion of individual issues. The recommendations were therefore noted but not endorsed.

Mr. Mitchell then announced plans for the 2007 INGS-8 meeting, to take place in September at the Bakubung Lodge near Sun City, South Africa. This meeting will be sponsored by PBMR Co. (Pty) Ltd, but a registration fee will be necessary to cover additional costs and, again, a publication is envisaged for those who wish to publish their work externally. Personal letters of invitation should shortly reach all former participants in these meetings direct from PBMR Co. See also <http://ingsm-8.pbmr.co.za>

There followed a short discussion about INGS-9 (2008). Two firm offers were available: NRG wished to host the meeting at the Petten Laboratories in The Netherlands, and the Dalton Nuclear Institute, part of The University of Manchester, UK, similarly proposed the use of their University Conference Centre in the city. Mr. Wickham expressed a personal ambition to have the meeting at the Chateau de Caradache (CEA), France at some point in the future: the possibility had been discussed with CEA representatives during INGS-6, although no firm offer existed. Mr. Homerin also indicated that AREVA in France might be interested, and he agreed to contact them.

The meeting agreed that each proposer should within eight weeks forward a short presentation covering basic issues of cost, conference venue, hotels, availability of nuclear facilities for visits,

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<sup>1</sup> International Nuclear Graphite Specialists' Meetings

etc. to Mr. Wickham for examination by the committee ahead of INGSM-8, in order that an appropriate announcement may be made there by the successful host organisation of the following year's conference.

**Action 6:** Mr. Homerin to invite AREVA to propose a venue and support for INGSM-9, if they wish to do so, by the end of May 2007.

**Action 7:** All Committee Members to give timely consideration to the proposals for INGSM-9 and to report their views to Mr. Wickham by a date to be agreed when the proposals are distributed to members electronically.

## **Database Website**

The content of the website was reviewed by Mr. Humbert and some items required updating. An html page on publications will be added and will include a link to the 'Working Arrangement'. All references to the 'User Guide' should be deleted since this is no longer relevant for the Excel versions of the Database.

## **Database Security**

There were no issues of concern.

## **Dates of Next Meeting**

The 2008 Technical Committee Meeting will be held at IAEA on Wednesday and Thursday, 26<sup>th</sup> and 27<sup>th</sup> March 2008, and will include the QA qualification of source reports for the 2007 CD-ROM issue along with the definition of 'Phase 2' of the project, in addition to reviewing the progress in Phase 1.

## **Closed Session**

After observers took their leave, there was a short discussion on Database finances. With current commitments from sponsors, provided that all payments were received, and if the additional funding from the UK was agreed, then all programmed work could be completed, although funding remains extremely tight and there is no obvious provision for Phase 2<sup>2</sup>.

Mr. Wickham was re-elected as Chairman of the Technical Steering Committee for the next three-year period.

The updated timeline diagram with all agreed targets for inputs and milestones is shown in the **Appendix**.

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<sup>2</sup> Subsequent to the meeting, an additional sponsor has contacted Mr. Wickham and expressed interest in joining the project. This possibility is being pursued through the IAEA.

## **Actions from the 9<sup>th</sup> Meeting**

1. Mr. Wickham to contact INET to ascertain the status of this offer, relating to irradiation of HTR-10 materials in a Russian research reactor.
2. Mr. Wickham to initiate a revised version of INDC(NDS)-0500 for comment by the committee and for subsequent issue by the IAEA Nuclear Data Section.
3. Mr. Wickham to complete the proposed categorisation of the UK data volumes from the 2006 CD-ROM for endorsement by the committee, ahead of the issue of the 2007 CD-ROM.
4. Mr. Wickham to work with Mr. Haag to effect the issue of the 2007 CD-ROM by the end of May 2007, including the scanned-in 'tick sheets' assessed by the committee and the Working Arrangement. A password for protected files on the 2007 issue CD-ROM was agreed during the meeting for the avoidance of doubt amongst committee members and sponsors. E-mail notification will again be initiated when the CDs are ready for issue by IAEA.
5. Mr. Wickham to discuss with Mr. Drace of IAEA the options for involvement with a Decommissioning Database under Phase 2.
6. Mr. Homerin to invite AREVA to propose a venue and support for INGSIM-9, if they wish to do so, by the end of May 2007.
7. All Committee Members to give timely consideration to the proposals for INGSIM-9 and to report their views to Mr. Wickham by a date to be agreed when the proposals are distributed to members electronically.

## Appendix A

### IAEA Consultants' Meeting: 9<sup>th</sup> Meeting of the Technical Steering Committee for the International Database on Irradiated Nuclear Graphite Properties

26–27 March 2007, Building-A, Floor-27 and Room-74 (A27-74), IAEA Headquarters, Vienna, Austria

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## Appendix B

### IAEA Consultants' Meeting: 9<sup>th</sup> Meeting of the Technical Steering Committee for the International Database on Irradiated Nuclear Graphite Properties

26–27 March 2007, Building-A, Floor-27 and Room-74 (A27-74), IAEA Headquarters, Vienna, Austria

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#### MEETING AGENDA

Monday March 26<sup>th</sup> 2007

0900h          Welcome (*IAEA, Chairman*)

                 Welcome to Sponsors' Representatives

                 Adoption of the Agenda

                 Chairman's Remarks

                 Apologies for Absence

                 Minutes of the Previous Meeting (*March 2006*): INDC(NDS)-498

                 Matters Arising (*which are not covered elsewhere in the Agenda*)

                 Review of National Database Users Meetings (*or Report on National Activities by National Liaison Officers if no national meeting has taken place*)

*Coffee Break*

                 Review of Project Plan As Amended at March 2006 Meeting

                                 Funding Requirements (Outline of Position without declaration of specific financial data)

                                 Presentation on Progress of Data Input during the past year [Module 2] (*Mr. Haag*)

                                 Report on Application of QA Process to Data Input (*Mr. Haag*): (INDC(NDS)-500)

1230h *Lunch Break*

1330h          Review of Project Plan As Amended at March 2006 Meeting (*continued*)

                                 Application of Agreed QA Procedures to the Evaluation of the Newly-Input Reports (All): (INDC(NDS)-500)

*Coffee Break*

Application of Agreed QA Procedures (*continues*)

Progress on Module 3 (*planned completion date January 2008*)

Review of Data Security (*standing item*)

1700h *End of First Day*

Tuesday March 27<sup>th</sup> 2006

0900h Review of Remaining Modules and Consideration of Amendments (if any)

The Possibility of Undertaking Parts of the Project within Member States

Issue of Incompatible Character Sets (*Action on Mr. Shibata*)

Issue of Next CD-ROM (Excel file format) (*planned completion date March 2007*)

Agree content

Extent of available hyper-linking of source reports

Mechanism for production of CD-ROMs

*Coffee break*

Version 3 Project (Relational Search Functionality Development): Proposals for Development (*this is currently regarded as a peripheral issue by the Committee, but observers may like to contribute*)

Decommissioning Database: Report on (i) EPRI “Graphite Decommissioning Initiative” (ii) EdF CIDDEN Proposals; and their possible impact/interaction upon the IAEA Graphite Database

Report on the Manchester University Conference held with the cooperation of the IAEA Consultancy (“Solutions for Irradiated Graphite Waste – A Contribution to the Accelerated Decommissioning of Graphite-Moderated Nuclear Reactors”) held 21<sup>st</sup> – 23<sup>rd</sup> March 2007

1230h Lunch Break

1330h ASTM Graphite Standards Progress and Its Implications for the IAEA Graphite Database Project (Mr. Burchell)

Impact upon IAEA Graphite Database of International Collaboration on Nuclear Graphite Research (*e.g.* Recent UK Regulatory Initiative, Materials and Components Project Management Board of Generation IV International Forum, etc.) (*contributions from all Members invited*)

Report to the IAEA TWGGCR (January 2007, Mr. Wickham)

INGSM-7 Report (Mr. Burchell)

INGSM-8 (South Africa, September 2007: PBMR Representative)

*Coffee Break*

Other Future Activities not presently in the Project Plan (*if any*)

Review of Database Website (*D. Humbert*)

Any Other Business (*prior notification to the Chairman would be appreciated*)

Dates for Next Committee Meeting

*(Close of Open Meeting, Observers take their leave)*

Closed Session (Members Only)

Review of Financial Position

Any Other Administrative Matters

Election of Technical Steering Committee Chairman for period 2007 - 2010

*Meeting Close 1630h*



## Appendix C

### Updated Timeline for Completion of IAEA Graphite Database Project Phase 1 (2007-2009)

Date	Phase 1 Module 3 Data Input	Phase 1 Module 4 Data Input	Phase 1 Module 5 Data Input	Phase 2 Proposal for Data Input	Document QA Procedure for Data Input (INDC(NDS)-0500)	
April 2007	COMPLETE	Conclude input of Petten data from Dragon Project  Mitsubishi L2R files segregated  Doctoral thesis and Toyo Tanso data  Further UK upgrade and new data				
May 2007						
June 2007	Issue CD – (Excel)					
July 2007						
Aug 2007						
Sept 2007						
Oct 2007						Revise QA Document as Issue 2
Nov 2007						
Dec 2007						
Jan 2008						Issue 2 of QA document published
Feb 2008						
March 2008			TO BE COMPLETED	OC Series from ORR (USA)  Data from further GA reports as identified at March 2006 meeting  INET results (if available)  Additional data from Carbon journal papers	Consider options as below for new proposal:	
April 2008						
May 2008					Data on matrix materials	
June 2008		Issue CD – (Excel)			Data on composites	
July 2008					Any other identified irradiation data	
Aug 2008					Decommissioning data	
Sept 2008						
Oct 2008						
Nov 2008						
Dec 2008			TO BE COMPLETED			
Jan 2009						
Feb 2009						

March 2009					
April 2009					
May 2009					
June 2009			Issue CD – (Excel)		
July 2009				Potential commencement of Phase 2	

	Colour indicates Steering Committee Meeting scheduled
	Colour indicates interim position to be achieved by date
	Colour indicates milestone to be achieved by date

All timelines and milestones subject to annual review by the Technical Steering Committee.

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