

MEETING REPORT

16th Meeting of the International Working Group on Gas Cooled Reactors Vienna International Center

27-29 June 2000

The co-chairmen of the meeting were Mr. Y. Xu from China and Mr. S. Shiozawa from Japan, and the Scientific Secretary was Mr. J. Kendall of the IAEA. The meeting was attended by the following IWGGCR Members and Observers:

Members

Mr. Y. Xu	China
Mr. P. Chapelot	France
Mr. W. von Lensa	Germany
Mr. B. Arbie	Indonesia
Mr. S. Shiozawa	Japan
Ms. A. I. van Heek	The Netherlands
Mr. E. Obryk	Poland
Mr. Y. Sukharev	Russian Federation
Mr. W. Roscoe	South Africa
Mr. H. Eisele	Switzerland
Ms. K. Hopkinson	United Kingdom
Ms. M. Feltus	United States

Organizations

Mr. J. Martin-Bermejo	European Commission
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Observers

Mr. S. Kato	Japan
Mr. Y. Tsuschie	Japan
Mr. A. Chudin	Russian Federation
Mr. A. Mysen	South Africa
Mr. V. Tshivhase	South Africa
Mr. G. Maret	United States of America

IAEA Participants (* - part time)

Mr. J. Kupitz*
Mr. J. Kendall, Scientific Secretary
Mr. J. Stephens*
Mr. P. Gowin*
Mr. M. Gasparini*
Mr. T. Konishi*
Mr. K. Fukuda*
Mr. M. Bell*
Mr. R. Fagerholm*

A copy of the final meeting agenda is provided as Attachment 1, and list of participants as Attachment 2. A brief overview of the meeting and the recommendations and requested actions of the IWG-GCR developed in the course of the meeting are provided below, followed by a summary of the meeting presentations and discussions.

OVERVIEW

The meeting was attended by 19 participants from 12 Member States and 1 international organisation. Presentations and discussions confirmed a substantial increase in Member State and international organisation activities in support of gas cooled reactor development since the last IWG-GCR meeting in September 1999.

Japan reported good recent progress in the power ascension testing of the HTR research reactor, with plans to achieve 20 MWt in July and full rated power in March 2001. The construction of the HTR-10 research reactor in China is progressing well, with initial criticality expected in October. Substantial progress was also reported on the PBMR project by South Africa, both on the technical and licensing front, as well as financial and organisational, as indicated by the recent announcement of BNFL in the United Kingdom as a partner in the consortium, and expectations of additional international partners to be announced soon. The representative from South Africa noted that the successes of the PBMR project would not have been possible without the information exchange and support provided by the IAEA, and particularly through the IWG-GCR. Other Member State presentations also reflected increasing interest and activities, including continued progress in the development of the GT-MHR design supported by the US, Russia, Japan and France, and increased support for HTR technology in the US DOE NERI project. Presentations on existing and planned activities in support of HTR development within the 5th Euratom RTD Framework Programme of the European Commission indicated a substantial expansion of HTR research and development across a broad range of key topics.

A half-day session on Issues and International Support Needs for Modular HTR Development & Deployment provided a basis for subsequent discussions on the planning for 2002/2003. Presentations on the subject were made on behalf of the HTR, HTR-10, PBMR and GT-MHR projects. A common theme was a need for internationally accepted nuclear safety norms and standards that are based on the unique characteristics and features of modular HTGR technology. Other needs included international review and standards with regard to proliferation resistance and long term storage and disposal of spent fuel, as well as specific support to the research reactor test planning and operation, and resolution of GT-MHR design issues. IAEA staff participants in the discussion included representatives from the Division of Nuclear Fuel Cycle and Waste Technology of the Nuclear Energy Department, the Division of Nuclear Installation Safety of the Nuclear Safety Department, and the Division of Concepts and Planning of the Safeguards Department.

IAEA Staff provided presentations on developments in the use of electronic communications, including implementation of the GCR Project web site and use of Internet collaboration software, on current activities within the frame of the IWG-GCR, and on other IAEA activities related to IWG-GCR interests. A need for additional support from members of the IWG to enhance performance and participation in ongoing and planned CRPs was noted. A presentation by Nuclear Safety regarding activities related to development of nuclear safety standards for HTGRs was of particular interest. Proposed revisions to the IWG-GCR terms of reference to reflect changes in Agency policy and practices were presented by IAEA staff and accepted by the IWG.

Plans for 2001 and draft plans for 2002/2003 within the frame of the IWG-GCR were presented and discussed. The IWG recommended the initiation of a new CRP on HTGR coated particle fuel technology development and recommended that a TCM be added to the planned activities for 2002. It was also recommended that the next IWG-GCR meeting be held in November 2001 in Cape Town, South Africa, with Indonesia as an alternative location.

IWGGCR Agreements and Recommendations

Agreements

1. The IWG concurs with the proposed revisions in the Terms of Reference for the Working Group, as provided by the IAEA.
2. The IWG recommends that the next meeting be held in Cape Town South Africa in November 2001, with BATAN in Indonesia as an alternative location.

3. The IWG acknowledges the value and importance of the GCR Project Web Site and recommends that it continue to be maintained and further developed.

Recommendations - IAEA Responsibility

4. The IAEA will provide the IWG with an update of the status of proposals for the pending CRP on Conservation and Application of HTGR Technology by the end of July.
5. The IWG requests that the Agency consider extending the term of the CRP on HTGR Performance for two years to provide additional time for analysis of HTTR and HTR-10 testing data.
6. The IWG recommends that a CRP be initiated on Coated Particle Fuel Development, including the addition of quality control and long term fuel storage and disposal to the scope presented by the IAEA, and the scope to be further developed with review by the IWG through email.
7. The IWG agrees that the working material report containing the final meeting summary report, agenda, participant list and presentations, will be provided on CD instead of hard copy.
8. The IWG recommends that a Technical Committee Meeting be added to the planning for 2002, with the activity description to be developed by IAEA with review by the IWG.

Recommendations - IWG Responsibility

9. IWG members from Member States participating in the CRP on HTGR Performance are requested to contact their Chief Scientific Investigators with regard to the importance of documenting the results in final form as the work is completed, with the assistance of internet collaboration software provided and supported by the IAEA.
10. IWG members are requested to review the status of their country's consideration of participation in the pending CRP on Conservation and Application of HTGR Technology
11. IWG members are requested to review the call for papers and list of invited countries for the TCM on Gas Turbine Power Conversion Systems for Modular HTGRs, and to provide suggested participants from their own or other countries listed, along with contact information, to the IAEA.
12. IWG members from Member States represented on the Standing Advisory Group on Nuclear Energy (SAGNE) are requested to contact their representative with regard to co-ordinating relevant interests between the IWG-GCR and SAGNE.
13. IWG members are requested to provide estimated expenditures on GCR development in their country during 2000 to the IAEA for compilation.

MEETING SUMMARY

The 16th meeting of the IWGGCR was held at the headquarters of the IAEA in Vienna. Mr. Y. Xu from China and Mr. S. Shiozawa from Japan served as co-chairman of the meeting. A list of meeting attendees and contact information is provided as Attachment 2.

Mr. Jürgen Kupitz, Head of the Nuclear Power Technology Development Section, opened the meeting. He noted that nine of the twelve Member States present in the initial IWG-GCR meeting twenty two years ago, were present for this sixteenth meeting, along with four additional Member States. He acknowledged recent statements by representatives of Eskom that the PBMR project would not have happened without the support of the IAEA, and noted that the international relationships established and the information received at Agency meetings were key factors. He further noted that the Working Group, consisting of leaders in gas cooled reactor technology from around the world, deserves the lion's share of credit for that achievement. He identified recently completed Co-ordinated Research Projects addressing the key nuclear safety functions

(controlling reactor power, cooling the fuel, and confining radioactive materials), as they relate to modular gas cooled reactor technology, as examples of results of the gas cooled reactor project which enhance the prospects for success. A full copy of the opening remarks is provided as Attachment 3. Following opening remarks, introduction of meeting participants, and approval of the draft agenda, the following major topics were addressed:

Descriptions and Summary Status of National Programmes in Gas Cooled Reactors –

Descriptions and status of programmes in the following countries were presented and discussed:

China	France	Germany
Indonesia	Japan	The Netherlands
Poland	Russian Federation	South Africa
Switzerland	United Kingdom	United States

The presentation material summarising the status of the GCR programs will be provided in the Working Material report for the meeting, to be distributed on CD.

European Commission Activities – Mr. Martin Bermejo presented and discussed EC research activities on high temperature gas-cooled reactors within the 5th Euratom RTD Framework Programme. Work is being initiated in the areas of fuel technology, physics and fuel cycle studies, and materials for HTRs, as well as co-ordination and synthesis of technologies. Planning is underway for additional work on HTR components and systems, which may be added to the programme. The EC programme includes a broad cross section of European industrial and research organisations, with a total of fifteen participants currently involved. Additional work on HTRs may be initiated by future calls within the 5th Framework. It was noted that there will be a conference on the status of HTR-related R&D in Europe in 2002 organised by the European Commission.

Mr. von Lensa discussed the initiation of the HTR-Technology Network (HTR-TN), within the co-ordination and synthesis of technologies project of the EC 5th Framework. The objective of the HTR-TN will be the pooling of most European HTR R&D activities. A workshop on coated particle fuel will be held in February 2001 (Paris), and IWG members were requested to nominate experts on fuel technology and fuel qualification. It was also requested that the IAEA invite the official representative of the HTR-TN (Mr. Guidez, JRC-Petten, The Netherlands) to future meetings as an observer.

GCR Project Web Site & Business Collaborator Demonstration – Mr. Kendall presented a demonstration of the GCR Project Web Site, which was developed jointly with IAEA/NESI as a prototype project, in response to a commitment from the last IWGGCR meeting. The objective of the site is the broad dissemination of information regarding the IAEA GCR Project, including full text of the resulting technical documents. The Business Collaborator software was also demonstrated to illustrate recent use of the internet for collaborative work among Member States participating in the activities of the GCR Project.

Issues and International Support Needs for Modular HTGR Development and Deployment – Members of the IWGGCR representing the two HTGR test reactors and the two modular HTGR design projects provided their views regarding the subject. Since the needs involved possible application of resources outside NPTDS, representatives from NEFW/NFC&MS (Mr. Fukuda), NEFW/WTS (Mr. Bell), NSNI/ESS (Mr. Gasparini), and SGCP/SSS (Mr. Fagerholm) participated. Their reactions to the information presented are summarized following the summary of the project presentations (it should be noted that in particular Mr. Bell and Mr. Fagerholm attended on very short notice, and that all of the observations should be considered as informal and preliminary)

- **HTTR Project –** Mr. Shiozawa identified the following areas:
 - International safety criteria or philosophy
 - Past experience with heat application systems
 - Commercial plant design information and related R&D needs
 - Evaluation of HTTR operational and test data

- Participation and evaluation of the HTTR safety demonstration tests
- Participation in the development study for HTTR heat application systems
- **HTR-10 Project**
 - Review of HTR-10 experimental programme
 - Provision of past operation or test experience
 - Advice on test technique, method and instrumentation
 - Evaluation of safety consideration
 - Assignment of experienced experts
- **PBMR Project**
 - Standard safety & licensing requirements
 - Non-proliferation standards for HTGR fuel
 - International HLW disposal acceptance
- **GT-MHR Project**
 - Drop of Turbomachine (external forces, rotor dynamics)
 - Reactor Neutronics (high burnup WGPu, temp. coefficient for WGPu with Er BP, CR worth in annular core)

Representatives of other parts of the Agency were invited to attend this discussion and provide their views, as summarized below:

Mr. Fukuda from the Nuclear Fuel Cycle and Materials Section of the Nuclear Energy Department noted their interest in supporting the development of HTGR fuel and intent to have activities in this area in the 2002/2003 plan

Mr. Bell from the Waste Technology Section of the Nuclear Energy Department noted a high priority within their program for achieving public acceptance of waste repositories. They don't presently have an activity with regard to coated particle fuel, but might be able to include something within the 2002-2003 plan.

Mr. Gasparini from the Engineering Safety Section of the Nuclear Safety Department noted their activity with regard to review of the PBMR project and plans for development of safety standards for modular HTGRs, which were discussed later in the meeting.

Mr. Fagerholm from the Systems Studies Section of the Department of Safeguards noted that an assessment of safeguards issues was included in the Agency review of the PBMR Project. He said the concept of "proliferation resistance" has not been defined within the Safeguards Department, but they can provide support with regard to current (*INFCIRC/153*) safeguards requirements for modular HTGR fuel. An "integrated" safeguards approach which takes into account the provisions of INFCIRC/540 is under development.

Review of Recommendations from the 15th IWGGCR – Mr. Kendall reviewed the recommendations as documented in the report for the 15th meeting. The status of the recommendations is documented in the IAEA presentation materials. The recommendations requiring IAEA actions have all been addressed to the degree possible within the constraints on Agency resources.

Review of Activities/Meetings Within the Frame of the IWGGCR – The following activities and meetings were summarised:

- Mr. Stephens reviewed the status of the work on development of an **International Database for Irradiated Nuclear Graphite Properties**. This activity had been planned as a CRP but is now proceeding as an extrabudgetary task with annual consultancy meetings.

- **TECDOCs** - Mr. Kendall reviewed the status of development of TECDOCs for completed activities within the GCR Project. Several important TECDOCs have been recently completed and additional completions are expected during 2000. Delays and difficulties with completion of TECDOCs from past activities were noted and the need for support from the IWG and Member State participants in meetings and co-ordinated research projects was discussed, with specific agreements included in the meeting list.
- **CRP on Design and Evaluation of Heat Utilization Systems for Modular HTGRs** – Mr. Kendall reviewed the status of the CRP, noting that the final meeting was held in Japan in October 1999. The TECDOC is under preparation and expected to be submitted for publication in 2000.
- **CRP on Evaluation of HTGR Performance** – Mr. Kendall reviewed the status of the CRP, noting that the second meeting was held in Beijing in October 1999. A detailed outline for the TECDOC reporting the results of the CRP was developed and the IAEA agreed to work on establishing an internet based means of communication and production of the TECDOC. This was done in March 2000 using the Business Collaborator software. It was noted that the participation by the CSIs in the use of the software has been very limited to date, and none of the work that has been completed, in some cases more than a year ago, has been documented. It was agreed that members of the IWG-GCR should contact their CSI and urge them to use the software and begin the production of the TECDOC sections for documentation of work that has been completed.
- **New CRP on Conservation and Application of HTGR Technology** – Mr. Kendall reviewed the status of the CRP, noting that the project had been given final approval by the IAEA and the requests for proposals had been issued in March 2000. As of the beginning of the IWG-GCR meeting, only two Member States had submitted proposals (a minimum of five are needed to start the CRP). It was agreed that members of the IWG-GCR should contact prospective CSIs and urge their submittal of proposals if they have not yet done so.
- **TCM on Gas Turbine Power Conversion Systems for Modular HTGRs** – Mr. Kendall discussed the subject meeting planned for 14-17 November 2000 in Palo Alto, California, USA. IWG-GCR members were requested to review the call for papers and suggest candidate meeting participants.

IAEA Activities Related to IWGGCR Interests – Information in the following areas was presented and discussed:

- **IEA/NEA/IAEA Study on Future Nuclear Energy Technologies** – Current status and results of the study were presented and discussed by Mr. Gowin. Members of the IWGGCR noted progress made so far and expressed interest in a continuation of the study to include a wider range of designs in the future.
- **SMR Project** – Relevant activities of the SMR Project since the last IWG-GCR meeting were discussed by Mr. Kendall. These included the AGM on Development of a Strategic Plan for an International Project on Innovative Nuclear Fuel Cycles and Power Plants, and an AGM on Contribution of Advanced Reactors for Sustainable Development. Recently completed TECDOCs on SMR staffing and on guidance for development of user requirements for developing countries.
- **Application of IAEA Nuclear Safety Standards to HTGR** – Mr. Gasparini of the Nuclear Safety Department presented information on the IAEA documentation structure for IAEA Safety Standards, and revisions to the documentation that are currently in progress. He also summarized the process planned for development of safety standards for modular HTGRs, including a workshop and consultancy scheduled for 3-7 July 2000.
- **NPTDS Organization and PPAS Review, 2002-2003 Planning** – Mr. Kendall discussed the changes in the NPTDS structure for 2001, the formation of the Standing Advisory Group on Nuclear Energy, the recently completed Program Performance Assessment System review of NPTDS (with support from Mr. Roscoe, who served on the review panel), the planning and

budgeting process for 2002-2003, and performance indicators to be used for evaluation of the conduct of the 2002-2003 plan.

- **Cogeneration and Heat Applications** – An overview of current activities of the Cogeneration and Heat Applications Project was presented by Mr. Konishi based on excerpts from a paper on the program prepared for the KTG2000 in Bonn in May 2000. In reviewing the information it was noted that the gas turbine HTR is particularly well suited for desalination applications in a cogeneration mode. It was recommended that members explore participation in the cogeneration and heat application activities to provide detailed information on the performance of GCRs. An Advisory Group Meeting planned for November 2000 in Vienna would be an appropriate forum.

Revision of IWGGCR Terms of Reference – Mr. Kendall discussed proposed changes to the IWG-GCR Terms of Reference. It was noted that the revisions approved by the IWG-GCR at the previous meeting had not been approved by Agency management due to subsequent changes in Agency policy regarding working groups. Thus the proposed changes included those previously approved by the IWG and additional changes reflecting changes in Agency policy. The proposed changes were approved by the IWG-GCR.

New Activities Within the Frame of the IWGGCR – Mr Kendall summarised plans for 2001 and preliminary planning for 2002/2003. The following areas were discussed:

- **CRP on Evaluation of HTGR Performance** – It was noted that the 3rd RCM, which had been in the 2000 plan, had been deferred to 2001 due to budget constraints. The working group expressed concern with deferral of this meeting at a time when both the HTR-10 and HTRR projects are highly active in their startup programmes. The working group agreed to accept this deferral on the condition that the RCM be held as early in 2001 as possible, and expressed its concerns in item 5 of the Recommendations and Requested Actions.
- **CRP on Conservation and Application of HTGR Technology** – If sufficient support is provided by Member States to proceed, the plan is to hold the first RCM during 2000. IWG members agreed to review the status of their country's consideration of participation in the pending CRP.
- **2001 Plan** – The plan for 2001 was briefly reviewed, noting the following activities:
 - Coordinated Research Projects
 - Evaluation of HTGR Performance (RCM in Japan, March 2001)
 - Conservation and Application of HTGR Technology
 - Organization of Coated Particle Fuel Development (?)
 - International Working Group Meeting
 - Other Activities
 - Support Nuclear Safety in norms/standards development
 - Graphite Database (lead by NAPC)
 - Improving and Updating GCR Web Site

The primary elements of the plan had been discussed at the previous meeting. It was noted that the plan has been under review by Member States for some time and is subject to final approval at the 2000 General Conference.

- **2002/2003 Plan** – The activities proposed for the 2002/2003 plan are noted in the table below:

Activity	2002	2003
CRP - Evaluation of HTGR Performance	RCM	TECDOC
CRP - Conservation & Application of HTGR Tech.	RCM	RCM
CRP - Coated Particle Fuel Technology Development	RCM	RCM
Modular HTGR Safety Norms & Standards (NS lead)		
HTGR Fuel Production, Handling and Disposition Norms & Standards (NEFW lead)		
Consultations with Member States (IWG-GCR)		TCM

The proposed CRP on Coated Particle Fuel Technology Development was discussed at length, based on the information in the position paper provided as Attachment 4. It was agreed that this CRP should be pursued, with the addition of quality control technologies, as well as long term storage and proliferation considerations to the scope.

In the overall review of the proposed activities, it was recommended that a TCM be added to the activities planned in 2002. The Agency was requested to propose a topic for the TCM.

The revised planning process of the Agency was briefly discussed and it was noted that outcomes and performance indicators are required for each project. The PPAS of the NPTDS had recommended that the performance indicators for a given project be developed by the IWG. The following outcomes were suggested for the GCR activities:

- Further reductions in design and technology uncertainties for Modular HTGRs
- Formation of an international team to pursue development and qualification of advanced coated particle fuels supporting broader application and enhanced cost effectiveness of modular HTGRs
- Comprehensive and current information on GCR technology available through GCR Project web site

The following performance indicators were also suggested:

- Construction of a demonstration modular HTGR power plant
- Continuing increase in global funding of activities supporting the development of gas cooled reactors
- Number of Member States participating in CRP on development of coated particle fuel
- Continuing increase in the amount of information downloaded from the GCR project web site

A number of IWG members questioned whether the Agency had any control over the construction of a plant. It was noted that the guidance regarding planning was that while an outcome and related performance indicator can be induced by an Agency output, it is not fully within the control of the Agency. Thus if an outcome occurs, the Agency can take at least some responsibility for it. If it does not occur the Agency has clearly not succeeded. It was further noted that the Agency planners were looking for high impact outcomes and performance indicators. After some discussion the IWG generally concurred with the suggested performance indicators, but recommended that the first be modified to beginning of construction.

- **Next IWGGCR Meeting** – Mr. Roscoe offered to host the next IWG-GCR meeting in Cape Town, South Africa, and Mr. Arbie offered that BATAN could serve as an alternative host for the meeting in Indonesia. It was further recommended that the meeting be held in November 2001. These suggested were approved by the IWG and planning will proceed on this basis.

AGENDA

International Atomic Energy Agency
**16th Meeting of the International Working Group
on Gas Cooled Reactors (IWGGCR)**

27-29 June 2000

Vienna International Center, Room C07-V

Tuesday, 27 June 2000

1. Opening Session

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|--|--------------|-------|
| • Welcome and Opening remarks | IAEA | 09:00 |
| • Introduction of IWGGCR Members and Observers | All | 09:15 |
| • Scientific Secretary's Remarks/Draft Agenda | Kendall | 09:30 |
| • Discussion and Finalisation of the Agenda | Chairman/All | 09:45 |

COFFEE BREAK

10:00-10:30

2. Descriptions and Summary Status of National Programmes in Gas Cooled Reactors

- | | | |
|-------------------|-----------|-------|
| • China | Xu | 10:30 |
| • France | Chapelot | |
| • Germany | Von Lensa | |
| • Indonesia | Arbie | |
| • Japan | Tsuchie | |
| • The Netherlands | Van Heek | |

LUNCH BREAK

- | | | |
|----------------------|-----------|--|
| • Poland | Obryk | |
| • Russian Federation | Sukharev | |
| • South Africa | Roscoe | |
| • Switzerland | Eisele | |
| • United Kingdom | Hopkinson | |
| • United States | Feltus | |

COFFEE BREAK**3. Description and Summary Status of International Programmes in Gas Cooled Reactors**

- | | | |
|-------------------------------------|----------------|--|
| • European Commission 5th Framework | Martin-Bermejo | |
|-------------------------------------|----------------|--|

4. Discussion of General Status and Future Directions of GCR Development 16:30**5. GCR Project Web Site & Business Collaborator Demonstration** 17:00

Adjourn 1st Day 17:30

DINNER 18:00

Agenda (continued)16th Meeting of International Working Group on Gas Cooled Reactors**Wednesday 28 June 2000****6. Issues and International Support Needs for Modular HTR Development & Deployment**

- | | | |
|---------------------|----------|-------------|
| ● HTTR Project | Shiozawa | 09:00 |
| ● HTR-10 Project | Xu | 09:20 |
| ● PBMR Project | Roscoe | 09:40 |
| COFFEE BREAK | | 10:10-10:30 |
| ● GT-MHR Project | Sukharev | 10:30 |
| Panel Discussion | | 11:00 |
| LUNCH BREAK | | 12:00-13:00 |

7. Review of Activities/Meetings Within the Frame of the IWGGCR

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|---|----------|-------|
| ● Irradiated Nuclear Graphite Properties Database | Stephens | 13:00 |
| ● Recommendations from the 15 th IWGGCR | Kendall | 13:10 |
| ● TECDOCs | “ | |
| ● CRP on Design and Evaluation of Heat Utilization Systems for the HTTR | “ | |
| ● CRP on Evaluation of HTGR Performance | “ | |
| ● New CRP on Conservation and Application of HTGR Technology | “ | |
| ● TCM on Gas Turbine Power Conversion Systems for Modular HTGRs | “ | |

8. IAEA Activities Related to IWGGCR Interests

- | | | |
|--|-----------|-------|
| ● IEA/NEA/IAEA Study | Gowin | 14:30 |
| ● SMR Project | Kendall | 14:40 |
| COFFEE BREAK | | 15:00 |
| ● Application of IAEA Nuclear Safety Standards to HTGR | Gasparini | 15:30 |
| ● New NPTDS Structure, SAGNE | Kupitz | 16:30 |
| ● NPTDS PPAS Review | “ | |
| ● Planning and Budgeting Process for 2002-2003 | “ | |
| ● Performance Indicators for GCR Activities | “ | |
| Discussion | | |

9. Revision of IWGGCR Terms of Reference

- | | | |
|-----------------------------|---------|-------|
| | Kendall | 17:30 |
| Adjourn 2 nd Day | | 18:00 |

Agenda (continued)16th Meeting of International Working Group on Gas Cooled Reactors**Thursday 29 June 2000**

Opening remarks	Chairman	09:00
8. IAEA Activities Related to IWGGCR Interests (cont'd)		
• Cogeneration and Heat Applications	Konishi	09:10
10. New Activities Within the Frame of IWGGCR		
• GCR Elements of SMR Project for 2001	Kendall	09:30
• GCR Elements of SMR Project for 2002/2003	Kendall/All	10:00
	COFFEE BREAK	11:00-11:30
• Next IWGGCR Meeting	Chairman/All	11:30
11. Review of Agreements and Recommendations		12:00
Adjourn		13:00

Attachment 2

Department of Nuclear Energy
Division of Nuclear Power

Issue No. 2
2000-06-20

NOTIFICATION OF AN AGENCY SPONSORED MEETING

<u>Title of meeting:</u>	Technical Committee Meeting to “Review National Gas Cooled Reactor Programmes” (International Working Group on Gas Cooled Reactors)	<u>Opening Meeting:</u>	9:30 a.m.
<u>Dates, inclusive:</u>	27 – 29 June 2000	<u>Scientific Secretary:</u>	J.M. Kendall A2574 ext. 22820
<u>Place:</u>	IAEA Headquarters, Vienna, Austria, Conference Room V, C07 , Ext. 21351	<u>Administrative Secretary:</u>	R. Bojdo A2573 xt. 22815
		<u>Conference Clerk:</u>	Dina Yarulina

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27 – 29 June

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Attachment 2

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NOTIF. IWG

Attachment 3

Opening Remarks

16th Meeting of the International Working Group on Gas Cooled Reactors
27 June 2000 (C07 / V - 09:00)

Mr. Jürgen Kupitz, Head, Nuclear Power Technology Development Section

On behalf of the IAEA I would like to welcome you to our headquarters here in Vienna. This is the sixteenth meeting of the International Working Group on Gas Cooled Reactors since its inception twenty-two years ago, in September 1978. Nine of the twelve Member States and international organizations attending the first meeting are here for this meeting, plus four additional Member States. I am also pleased to note that one of the individuals participating in that first meeting, Mr. Obryk from Poland, is with us here today.

Today we are beginning to see a reawakening of interest in nuclear power technology development around the world. Innovative reactors such as the HTGR may help to meet future energy needs, particularly for developing countries, while reducing the environmental impact. In response, the Agency is expanding its efforts to support the development of innovative nuclear power and fuel cycle technologies through co-operative activities among Member States.

Modular gas cooled reactor concepts under development for the past twenty years, and the recently formed international consortium to pursue the development and deployment of the PBMR, are leading examples of the type of innovative nuclear power technology which can effectively address future needs. The IAEA has been informed by representatives of Eskom that the PBMR project would not have happened without the support of the IAEA. The international relationships established and the information received at Agency meetings were key factors. This working group, consisting of leaders in gas cooled reactor technology from around the world, deserves the lion's share of credit for that achievement. Your sustained guidance and support over the past twenty-two years has allowed the Agency to maintain an effective activity in gas cooled reactor technology development during the recent difficult years. Recently completed Co-ordinated Research Projects addressing the key nuclear safety functions (controlling reactor power, cooling the fuel, and confining radioactive materials), as they relate to modular gas cooled reactor technology, are examples of results of the gas cooled reactor project which enhance the prospects for success. We are pleased to have played a role in the advancement of this technology and look forward to future successes with your continuing guidance and support.

We are very pleased with the attendance at this meeting, reflecting the growing level of activity and interest in this technology among our Member States. This meeting is very timely, as we are currently in the process of planning Agency activities for 2002 and 2003. We will give your thoughts and suggestions our highest consideration as we draft our next biennial plan.

You have a challenging agenda before you for the next three days, but I know that this working group will meet the challenge as it has for the past twenty-two years. IAEA staff will be available to support your efforts throughout the meeting. I hope that you find your experience rewarding, as well as productive. I also hope that you will be able to find some time to enjoy the city while you are here. I now turn the meeting over to your chairman, Mr. Shiozawa.

Attachment 4

For Discussion at IWG-GCR Meeting

Potential Co-ordinated Research Project on Coated Particle Fuel Technology Development

Background

Considerable experience has been accumulated over the past half century in the production and testing of coated particle fuels in support of High Temperature Gas Cooled Reactor technology development. Most of the experience has been with pyrocarbon and silicon carbide coatings on UO₂ and UC₂ kernels, but other materials have also been investigated on a smaller scale. The production of large quantities of high quality coated particle fuel, capable of retaining fission products over a wide range of operating and accident conditions, as well as for disposal of spent fuel, has been conclusively demonstrated for particles with combined pyrocarbon and silicon carbide coatings (referred to as a TRISO particle). The state of the art for PyC/SiC TRISO coated UO₂ particles is well advanced, and sufficient to support modular HTGR development and deployment projects in the near term. However, there are potential gains from advanced fuel design and production technology, which could enhance the economics and range of applicability of HTGRs. Examples include PyC/ZrC TRISO coatings, further investigation of other promising concepts such as a thin ZrC coating on the kernel prior to TRISO coating, applications of advanced technologies in process instrumentation and control, etc.

Objective

The overall objective would be to develop proven new materials and improved production processes for coated particle fuels. The initial tasks would be to:

- Develop an inventory of existing facilities within participating Member States capable of performing technology development in the areas listed below
- Identify additional new facility and capability needs, and practical interfaces among elements of process development and demonstration
- Establish a co-ordinated research project utilising existing and new facilities and equipment among participating Member States, with clearly identified roles, responsibilities and interfaces.

Scope

The scope would include all of the functions necessary to develop proven new materials and advanced coated particle fuels, requiring the integration of a number of technological capabilities, including:

- Fuel Kernel Production – Sol-gel and other processes used to economically produce small spherical particles of fuel material require detailed knowledge of materials, process chemistry and engineering
- Coating – Fluidised bed particle coating requires knowledge of potential coating materials, carrier gases, active gases, nozzle and coater geometries, optimum temperatures, flowrates, etc.
- Fuel Element Fabrication – Fabrication of coated particles and matrix materials into fuel sticks or spheres requires knowledge of injection moulding equipment and procedures
- Supporting Processes – Heat treatment, identification and rejection of defects, product sampling, inspection methods, and other supporting processes are necessary for attaining high product quality
- Irradiation Testing – Irradiation testing for both normal operation and accident condition simulation is necessary as an integral part of process development to improve product performance and to demonstrate attained product integrity
- Postirradiation Testing – Postirradiation testing (e.g., temperature transients) provides additional data for process improvement and product integrity demonstration
- Postirradiation Examination – Provides understanding of failure mechanisms and detailed information on the condition of the fuel particles after service, essential to the optimisation and validation of production processes