HTR-TN
High Temperature Reactor Technology Network

HTR 2002

Final Programme

Sunday, April 21, evening

19:30 **Arrival of Participants at ´Fort Kijkduin' in Den Helder and Registration**

20:00 **Opening Reception at 'Fort Kijkduin'**

22:00 **Return of Participants to Hotels**

Monday, April 22

09:00 **Welcome Address**
Kari Törrönen, Director Institute for Energy, European Commission, Joint Research Centre

09:15 **Opening Address**
Hans Forstrom, DG Research, European Commission

09:30 **Session 1: HTR Projects and Programmes**
Chairperson: Mr A. Kadak, Massachusetts Institute of Technology, USA

09:35 **USA Programme Status**
R.M. Versluis, US Department of Energy, USA

09:55 **Japanese Position and Status**
S. Shiozawa, Department of Advanced Nuclear Technology, JAERI, Japan

10:15 ***Coffee break***

10:30 **Chinese Point and Status**
Y. Xu, INET, Tsinghua University, China

10:50 **The PBMR Project**
NN, Eskom, South Africa

11:10 **The GTHMR Project**
A. Kiryushin, N. G. Kodochigov, OKB Mechanical Engineering , Russia

11:30 **European Position in HTR-TN**
D. Hittner, FRAMATOME-ANP, France

11:50 **Discussion of all contributions in Session 1**

12:15 ***Lunch Break***

13:30 **Session 2: Fuel and Fuel Cycle**
Chairperson: S. Shiozawa, Department of Advanced Nuclear Technology, JAERI, Japan

13:35 **Key Differences in the Fabrication of U.S. and German TRISO-coated Particle Fuel, and their Implications on Fuel Performance**
D. A. Petti, J. Bongiorno, J. T. Maki and G. K. MillerIdaho National Engineering & Environmental Laboratory, Idaho National Engineering and Environmental Laboratory, USA

13:55 **High Temperature Reactor Fuel Technology Programme in Europe**
A. Languille, C. Perrais, M. Perez*, P. Obry, CEA Cadarache, Grenoble*, R. Conrad, CEC/JRC/IE Petten, P. Guillermier, FRAMATOME-ANP/Lyon, H. Nabielek, H. Werner, FZJ/Jülich, D. Haas, J. Somers, H. Toscano, JRC/ITU Karlsruhe, K. Bakker, NRG/Petten, T. Abram, BNFL

14:15 **Microspheres of UO2, THO2 and PUO2 for the High Termperature Reactor**
E. Brandau, Brace GmbH, Germany

14:35 **Development of an Integrated Performance Model for TRISO-Coated Gas Reactor Particle Fuel**
G. K. Miller, D. A. Petti and J. T. Maki, Idaho National Engineering and Environmental Laboratory, USA

14:55 Chairperson: N.N., Institute of Nuclear Energy Technology, Tsinghua University, China

15:00 **Prospective Studies of HTR Fuel Cycles Involving Plutonium**
B. Bonin and D. Grenache, Cogema, F. Carré, F. Damian and J. Y. Doriath, CEA Direction de l'Energie Nucléaire, France

15:20 **Examination of the Potential for Diversion or Clandestine Dual Use of a Pebble-Bed Reactor to produce Plutonium**
A. Ougouag, W. K. Terry and H. D. Gougar, Idaho National Engineering and Environmental Laboratory, USA

15:40 **Deep Burn Transmutation of Nuclear Waste**
C. Rodriguez, A. Baxter and D. McEachern, General Atomics, Francesco Venneri, Los Alamos National Laboratory and General Atomics and D. Williams, Oak Ridge National Laboratory, USA

16:00 **Discussion of all contributions in Session 2**

16:15 **Poster Session with refreshments served**

17:45 **Evening Programme**

17:45 **Transfer of Participants from Petten Centre to ´Fort Kijkduin' in Den Helder**

18:45 **Tour of 'Fort Kijkduin' and the Aquarium**

20:00 **Aperitif at 'Fort Kijkduin'**

20:30 **Gala Dinner at 'Fort Kijkduin'**

22:30 (approx) **Transfer of Participants from ´Fort Kijkduin' to hotels**

Tuesday, April 23

09:00 **Session 3: Physics and Neutronics**
Chairperson: W. van Lensa, Research Centre Jülich, Germany

09:05 **Analysis of the European Results on the HTTR's Core Physics Benchmarks**
X. Raepsaet, F. Damian, CEN Saclay, France, U. A. Ohlig, H. J. Brockmann, Research Centre Jülich, Germany, J. B. M. De Haas, NRG/Petten and E. M. Wallerboss, Interfaculty Reactor Institute, Delft, The Netherlands

09:25 **Investigation of Criticality Parameters of High-Temperature Reactors at the Kurchatov Institute's ASTRA Critical Facility**
N. E. Kukharkin, E. S. Glushkov, G. V. Kompaniets, V. A. Lobyntsev, D. N. Polyakov, O. N. Smirnov, Institute of Nuclear Reactors, RRC Kurchatov Institute, Russia

09:45 **Design of Spherical and "Hollow" Burnable Particles for UO_2 Fuels in High Temperature Reactors**
J. L. Kloosterman, H. van Dam and T. H. J. J. van der Hagen, Interfaculty Reactor Institute, Technical University, Delft, The Netherlands

10:05 **Matrix Formulation of Pebble Circulation in the PEBBED Code**
H. D. Gougar, W. K. Terry and A. M. Ougouag, Idaho National Engineering and Environmental Laboratory, USA

10:25 ***Coffee Break***

10:40 Chairperson: G. P. Greyvenstein, Department of Mechanical Engineering, Potchefstroom University, South Africa

10:45 **Physics Studies for a Particle-Bed Gas Cooled Fast Reactor Core Design**
T. A. Taiwo, M. Fatone, G. Palmiotti and R. N. Hill, Reactor Analysis and Engineering Division, Argonne National Laboratory, USA

11:05 **Models for Neutronics Calculations for HTR Pebble Bed Modular Reactors**
W. Bernnat and W. Feltes, University of Stuttgart, Germany

11:25 **An Evaluation of the Control Rod Modelling Approach used in VSOP by Comparing its Results to the Experiments Performed in the ASTRA Critical Facility**
F. Reitsma, D. Naidoo and Z. Karriem, Radiation and Reactor Theory, NECSA, Pretoria, South Africa

11:45 **Creation of the Equilibrium Core PBMR ORIGEN-S Cross Section Library**
C. C. Stoker, F. Reitsma and Z. Karriem, Radiation and Reactor Theory, NECSA, South Africa

12:05 **HTR core physics analysis at NRG**
J. C. Kuiper, J. B. M. de Haas and J. Oppe, Fuels, Actinides & Isotopes Department, NRG, The Netherlands

12:25 **Neutronic Features of the GT-MHR Reactor**
N. Kodochigov, Yu. Sukharev, E. Marova, OKB Mechanical Engineering, N. Ponomarev-Stepnoy, E. Glushkov and P. Fomichenko, RRC Kurchatov Institute, Russia

12:45 **Discussion of all contributions in Session 3**

13:00 ***Lunch Break***

14:30 **Session 4: Thermohydraulic Calculation**
Chairperson: G. H. Lohnert, IKE University of Stuttgart, Germany

14:50 **Three-dimensional Numerical Simulation of Flow and Heat Transport in a High-Temperature Reactor**
S. Becker and E. Laurien, Institute for Nuclear Technology & Energy Systems, Germany (IKE), University of Stuttgart, Germany

15:10 **Decay heat removal by passive means in case of a block type HTR reactor core - CFD Analysis**
A. Woaye-Hune and S. Ehster, FRAMATOME-ANP, France

15:30 **Thermal Hydraulic Simulations on High Temperature Reactors**
N. Tauveron, M. Elmo, O. Cioni, T. Chataing, CEA/Grenoble, France

15:50 **Steady-state and Accident Analyses of PBMR with the Computer Code SPECTRA**
M. M. Stempniewicz, NRG/Arnhem, The Netherlands

16:10 ***Coffee Break***

16:30 **Design of a Physical Model of the PBMR with the Aid of Flownet**
G. P. Greyvenstein and P. G. Rousseau, Department of Mechanical Engineering, Potchefstroom University, South Africa

16:50 **Flow Distribution of Pebble Bed High Temperature Gas Cooled Reactors Using Large Eddy Simulation**
Y. A. Hassan and G. Gokhan Yesilut, Department of Nuclear Engineering, Texas A&M University, USA

17:10 **Discussion of all contributions in Session 4**

18:00 **Transfer of Participants to Hotels**

Wednesday, April 24

09:00 **Session 5: Engineering, Design and Applications**
Chairperson: A. van Heek, NRG, The Netherlands

09:05 **GTHTR300 System Design Features and Performance**
X. Yan, K. Kunitomi, T. Nakata and S. Shiozawa, Japan Atomic Energy Research Institute, Japan

09:25 **Design of a Power Conversion System for an Indirect Cycle, Helium Cooled Pebble Bed Reactor System**
C. Wang, R. G. Ballinger and P. W. Stahle, Department of Nuclear Engineering, Massachusetts Institute of Technology, USA

09:45 **Thermodynamic assessment of plant efficiencies for HTR power conversion systems**
W. Fröhling, H.–M. Unger, Research Centre Jülich, Germany and Y. Dong, Institute of Nuclear Energy Technology, Tsinghua University, China

10:05 **Load Analysis and Safety Evaluation of HTR-10's Hot-Gas Duct Vessel**
H. Shu-Yan, Z. Zheng-Ming, Y. Su-Yuan, Division of Reactor Structure & Mechanics, Institute of Nuclear Energy Technology, NET, Tsinghua University, China

10:25 ***Coffee Break***

10:40 Chairperson: N. Ponomarev-Stepnoy, RRC Kurchatov Institute, Moscow, Russia

11:00 **ACACIA-Indirect: A Small Scale Nuclear Plant for New Markets**
D. F. Da Cruz, J. B. M. de Haas and A. I. van Heek, NRG/Petten, The Netherlands

11:20 **The Concept Design of the Power Conversion Unit for HTR-10 with Direct Gas Cycle**
S. Yu, Z. Zhang, Z. Wu, Y. Xu and Y. Sun, Institute of Nuclear Energy Technology, Tsinghua University, China

11:40 **Burn-up Dependent Core Neutronic Analysis for PBMR**
Y. Cecen, U. Colak and O. K. Kadiroglu, Department of Nuclear Engineering, Hacettepe University, Turkey

12:00 **Economic Study of Seawater Desalination for 300MW(E) High Temperature Gas-Cooled Reactor (HTR) by Reverses Osmosis (RO)**
L. Tian, J. Guo and Y. Sun, Institute of Nuclear Energy Technology, Tsinghua University, China

12:20 **Discussion of all contributions in Session 5**

12:35 ***Lunch Break***

13:45 ## Session 6: Materials and Components
Chairperson: A. J. Wickham, United Kingdom

13:50 **Operating Experience with the Dragon High Temperature Reactor Experiment**
R. A. Simon, DRAGON Operation Branch/EC (retired), Belgium and P. D. Capp, DRAGON Operations Branch/UKAEA (retired), United Kingdom

14:10 **The relation between irradiation induced dimensional change and the coefficient of thermal expansion: A new look**
G. Hall, B. J. Marsden, A. Fok and J. Smart, Nuclear Graphite Technology Group, University of Manchester. United Kingdom

14:30 **Comparison of Cycle Efficiency, Turbine Efficiency and Recuperator Heat Transfer Surface Area between Direct Cycles of Carbon Dioxide and Helium**
Y. Kato, T. Nitawaki and Y. Muto, Research Laboratory for Nuclear Reactors, Tokyo Institute of Technology, Japan

14:50 ## Session 7: Safety and Licensing
Chairperson: M. Methnani, IAEA, Austria

14:55 **Studies on Air Ingress for Pebble Bed Reactors**
R. L. Moore, C. H. Oh, B. J. Merrill and D. A. Petti, Idaho National Engineering and Environmental Laboratory, USA

15:15 **Nuclear Emergency Planning and Preparedness for the HTR-10**
J. Qu and Z. Wu, Institute of Nuclear Energy Technology, Tsinghua University, China

15:35 **HTR Confinement/Containment Question**
G. Brinkmann, Framatome ANP GmbH, Germany and S. Esther, FRAMATOME-ANP, France

15:55 **Lessons learned during the Safety Assessment of the THTR for further Developments and Assessments of HTR**
R. Sartori, Department of Machine Technology, Stress Analysis, Nuclear Technology and K. Hofman, Subdivision Energy and Environment, RWTÜV Anlagetechnik GmbH, Germany

16:15 **Discussion of all contributions in Session 5**

16:30 **Conclusions by the General Conference Chairman**
J. Guidez, JRC Petten, The Netherlands

16:45 ***Coffee Break and Transfer of Participants to Hotels/ Railway Station***

Posters

1 **Thermal Characteristics Research of Circular High Temperature Gas-Cooled Reactors under Loss-Cooling and Depressurisation Crisis**
T. Qin and Z. Gao, Institute of Nuclear Energy Technology, Tsinghua University, China

2 **A Combined Experimental and Finite Element Analysis of MANETII Steel Fracture Proporties**
K. Ahmed and M. Ghonim, Atomic Energy Authority, Egypt

3 **HTR-E Project. High temperature Components and Systems**
E. Breuil, FRAMATOME-ANP, France and R. Exner, Borsig Energy GmbH, Germany

4 **The measurement of burn-up level in HTR-10**
L. Zhengpei, l. Wenfeng, H. Song and L. Fu, Institute of Nuclear Energy Technology, Tsinghua University, China

5 **Overview of LEI investigations on heat transfer and flow structure in gas-cooled packed beds of spheres and channels**
J. Vilemas, E. Uspurus, S. Rimkevicius, A. kaliatka, P. Pabarcius, Lithuanian Energy Institute, Lithuania

6 **A High Temperature Reactor for ship propulsion**
P. Lobet, R.Seigel, Ecole de application militaries de l'energie atomique, France and A. C. Thompson, R. M. Beadnell and P. A. Beeley, HMS Sultan, Nuclear Department, United Kingdom

7 **Materials for the High Temperature Reactor**
D. Buckthorpe, NNC, United Kingdom, R. Couturier, CEA/Grenoble, France, B. van der Schaaf,, NRG/Petten, The Netherlands, B. Riou, FRAMATOME-ANP, France, H. Rantala, JRC/Petten, The Netherlands, K. Kuehn, Research Centre Jülich, Germany, A. Buenventura, Empresarios Agrupados Internacional SA, Spain and B-C. Friedrich, Framatome ANP GmbH, Germany

8 **The numerical determination of the variation in the porosity of Pebble-bed core**
C. du Toit, School for Mechanical and Materials Engineering, Potchefstroom University, South Africa

9 **Analysis of Operational Transients in a Fluidized Bed Nuclear Reactor**
A. Agung, D. Lathouwers, T. H. J. J. van der Hagen, H. van Dam, Interfaculty Research Institute, Delft University of Technology, The Netherlands and C. C. Pain, C. R. E. Oliviera, A. J. H. Goddard, Department of Earth Science and Engineering, Imperial Colleage of Science, Technology and Medicine, United Kingdom

10 **Conceptual design of a passive, inherently safe emergency shutdown rod for High Temperature Reactor applications**
A. M. Ougouag, W. K. Terry and R. R. Schultz, Idaho National Engineering and Environmental Laboratory, USA

11 **An inherent safe HTGR power plant: An innovative design concept**
A. Hodzic, Environment & Energy Engineering EEE, Germany

12 **An In-Depth Study on Oscillation Peculiarities by Step-Input of Reactivity and Frequency of Helium Fan's Transducer of 10 MW High Temperature Gas-Cooled Reactor and its Control Strategy**

X. Huang, Institute of Nuclear Energy Technology, Tsinghua University, China

13 **Thermal Insulation for Hot Gas Ducts**

P. Bröckerhoff, Forschungszentrum Jülich, Germany

14 **Stress and Seismic Calculation of HTR-10 SG Accident Discharge System**

J. Dong, J. Fu and S. Yu, Institute of Nuclear Energy Technology, Tsinghua University, China

15 **Modelling of the HTTR in Flownet**

P. Rousseau and G. P. Greyvenstein, School of Mechanical & Ematerials Engineering, Faculty of Engineering, Potchefstroom University, South Africa

16 **EC-Funded Project (HTR-L) for the Definition of a European Safety Approach for HTR's**

S. Ehster, FRAMATOME-ANP, France, M. T. Dominguez, Empresarios Agrupados Internacional SA, I. Coe, NNC Ltd, United Kingdom, G. Brinkmann, Framatome ANP GmbH, Germany, W. von Lensa, Research Vcentre Jülich, Germany, W. van der Mheen, Nuclear Research and Consultancy Group, The Netherlands, C. Allessandroni, Ansaldo Nucleare, Italy and J. Pirson, Tractebel Energy Engineering, Belgium

17 **Graphite Materials Testing in the ATR for Lifetime Management of Magnox Reactors**

S.B. Grover, Idaho National Engineering and Environmental Laboratory, USA and M. P. Metcalfe, British Nuclear Fuels plc, Research and Technology, Berkeley Centre, United Kingdom

18 **Energy Storage and Release Calculations for HTR-10 Reflector**

U. Colak, H. Dikmen and U. E. Sikik, Nuclear Energy Department, Hacettepe University, Turkey

19 **CEA methods improvement in HTTR modelling**

F. Damian and X. Raepsaet, CEA, France

20 **The Behaviour of Fission Products in the HTGR Fuel Irradiated in the IVV-2M Reactor**

K. N. Koscheyev, Sverdlovsk Branch of R&D Institute of Power Engineering Zarechny and A. S. Chernikov, RPA "Lutch", Russia

21 **Conceptual Design of a Simultaneous Hydrogen and Heavy Water Production System for High Temperature Reactors**

H. Chung, D. H. Ahn, M. Lee, S. Paek and J. H. Chang, Korea Atomic Energy Research Institute, Korea

22 **Thermodynamic Analysis of PBMR Plant**

S. Sen and O. K. Kadiroglu, Nuclear Energy Department, Hacettepe University, Turkey