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|  | EUROPEAN COMMISSION  DIRECTORATE-GENERAL ‘RESEARCH’ | INTERNATIONAL  SCIENCE AND  TECHNOLOGY  CENTER |  |

## NON PROLIFERATION THROUGH SCIENCE AND CO-OPERATION

**CONTACT EXPERT GROUP on**

**SEVERE ACCIDENT MANAGEMENT**

**(CEG-SAM)**

**MINUTES OF THE 6th MEETING**

**Congress centre of Dimitrovgrad**

**Ulyanovsk region, Russia**

**September 14-17, 2004**

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| Dissemination level: RE  PU: public  RE: restricted to EC and a group specified by the CEG-SAM members  CO: confidential, only for EC and CEG-SAM members |

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Final minutes, February 28, 2005 CEG-SAM / M-06

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| Subject: Sixth Meeting of the ISTC  “Contact Expert Group on Severe Accident Management” (CEG-SAM)  Place: Congress centre of Dimitrovgrad, Ulyanovsk region, Russia  Date: September 14-17, 2004  Participants: 35 participants of 21 organizations from 6 countries:  Mr. B.Adroguer IRSN, Cadarache  Mr. H.J.Allelein GRS, Cologne  Mr. E.Altstadt FZR, Rossendorf  Mr. D.Bottomley DG-JRC / ITU, Karlsruhe  Mr. G.Cognet CEA/DEN/DSNI, Saclay  Mr. P.Hofmann Consultant, Karlsruhe (secretary)  Mr. M.Hugon DG-RTD / J4, Brussels (next chairman)  Mr. Ch.Journeau CEA/NT, Cadarache  Mr. J.Stuckert FZK, Karlsruhe  Mr. L.Summerer ESA, DG-X, Noordwik  Mr. W.Tromm FZK, Karlsruhe  Mr. A.Zurita DG-TREN / B3, Brussels (chairman)  Mr. Yu.Aniskevich RIT / NITI, Sosnovy Bor  Mr. S.Bechta RIT / NITI, Sosnovy Bor  Mr. V.Bezlepkin SPAEP, St. Petersburg  Mr. M.Budaev RRC KI, NSI, Moscow  Mr. A.Goryachev RIAR, FRD, Dimitrovgrad  Mr. A.Grachev RIAR, Dimitrovgrad  Mr. A.Kisselev IBRAE, DNS, Moscow  Mr. V.Konstaninov LUCH, SIA, Podolsk  Mr. V.Kumayev IPPE, Obninsk  Mr. I.Kungurzev RIAR, Dimitrovgrad  Mrs. I.Kuzmin RIAR, Dimitrovgrad  Mr. V.Lebedev RIAR, Dimitrovgrad  Mr. Yu.Leontiev SPAEP, St. Petersburg  Mrs. E.Lipilina VNIITF, Snezhinsk  Mr. A.Lukianov IPPE, Obninsk  Mr. V.Mineev IVTAN-RAS, Moscow  Mr. N.Parshin LUCH, SIA, Podolsk  Mr. V.Smirnov RIAR, FRD, Dimitrovgrad  Mr. V.Strizhov IBRAE, Moscow  Mr. L.Tocheny ISTC, Moscow (co-chairman)  Mr. Yu.Vassiliev NNC, Kurchatov, R. Kazakhstan  Mr. M.Veshchunov IBRAE, Moscow  Mr. V.Zhdanov NNC, Kurchatov, R. Kazakhstan  Mr. Yu.Zvonarev RRC KI, NSI, Moscow  Distribution list: Mr. A.Mitsos DG-RTD  Mr. H.Richardson DG-RTD  Mr. L.Bellemin DG-RTD / N  Mrs. B.Rhode DG-RTD / N.3  Mr. L. Samaniego Moffre DG-RTD / N.3  Mr. P.Fernández Ruiz DG-RTD / J  Mr. M.Poireau DG-RTD / J.1  Mr. H.Forsström DG-RTD / J.4  Mr. R.Schenkel DG-JRC  Intranet of Unit J.4  Mr. N. Jousten ISTC, Moscow  Mr. L.Tocheny ISTC, Moscow  EU CEG-SAM members  Contact person: Mr. M. Hugon Tel.: +32-2-29.65719 – CDMA 1/52 |

Agenda of the meeting see annex 1, list of participants see annex 2.

The 6th CEG-SAM Meeting in Dimitrovgrad has been conducted in connection with the one day Steering Committee Meetings on the ISTC projects #833.2 (METCOR-2) and #1950.2 (CORPHAD-2) on September 14 where progress reports on the project status have been presented and were discussed in detail. The future activities were updated. Also a very first information meeting on the status of the ISTC project #1648.2 (VVER-QUENCH) was held.

The CEG-SAM group members had the unique opportunity to visit the hot cell facilities at RIAR, in which a part of the experiments of the ISTC project # 1648.2 on quenching will be conducted, and of the MIR research reactor, on September 15, 2004. In the MIR research reactor different types of in-pile tests with VVER fuel rods and fuel elements have been conducted under various boundary conditions.

**Restricted session**

**Topic #1:** Welcome and opening remarks

The meeting was divided into open and restricted sessions. The restricted sessions are to discuss internal matters and the status of current ISTC projects. The open sessions are mainly for the presentations of new or revised ISTC project proposals by Russian scientists.

A.Zurita opened the first part of the restricted session and welcomed the EU participants of the 6th meeting of the International Science and Technology Centre (ISTC) – Contact Expert Group on Severe Accident Management (CEG-SAM). He expressed his thanks to RIAR (Research Institute for Atomic Reactors) to host the meeting in the Congress Centre of Dimitrovgrad.

**Topic #2:** Adoption of the agenda

The sequence of presentations in the extended session was slightly changed. One presentation was exchanged for another. With these changes, the attached agenda (see annex 1) was accepted.

**Topic #3:** Approval of the minutes of the 5th CEG-CM meeting in Paris, February, 2004

On the basis of the draft minutes the secretary considered the various comments received by the group members in the revised minutes, dated April 26, 2003, which were approved without changes at the meeting in Dimitrovgrad.

**Topic #4:** Specific action list

Remarks to the action list of the last meeting in Paris:

Action 4/9: Distribution of requested documents on various ISTC proposals in advance to the meetings. > *executed*

Action 5/1:The status of collaborators in the on-going projects #833.2, #1950.2, #1648.2, and planned projects #2916 and #2936 should be checked and possibly updated (ISTC secretariat / L.Tocheny).

**In future, the collaborators should send the letter of support by airmail to ISTC with scanned copies by e-mail or by fax to L.Tocheny and to the CEG-SAM chairman and secretary.**

*>L.Tocheny requested to add new collaborators to a project in form of an addendum in a joint action and not each collaborator separately.*

Action 5/2: The list of ISTC CEG-SAM related projects should be updated and completed (L.Tocheny, A.Zurita). >*A.Zurita presented an updated list of projects and collaborators (see topic #27). The official list in the ISTC database has to be updated concerning the collaborators as well.*

Action 5/3: All member organisations are requested to look for further expertise in the group to cope with future wider SAM aspects (all members).

The status (membership) of EU experts on specific SAM subjects in CEG-SAM meetings has to be clarified (A.Zurita). > *executed*

Action 5/4: The collaborators of the project #1648.2 should try to solve the financial difficulties together with the ISTC secretariat (L.Tocheny) that resulted from the large changes in the exchange rate between the Euro and US dollar. W.Tromm will coordinate the necessary activities. > *executed*

Action 5/5: A small working group will formulate the specific interest of the CEG-SAM group in the topic on fission gas release presented by A.Lukianov. Some recommendations on the experimental measurements, which should be considered in a revised ISTC project proposal, will be made. The revised ISTC proposal should then be presented and discussed at the next CEG-SAM meeting. The group will consist of B.Adroguer, D.Bottomley, G.Cognet, and S.Marguet. B.Adroguer and M.Kissane will prepare the first draft, which will then be circulated before it will be send to A.Lukianov. > *B.Adroguer sent the recommendations of the group to A.Lukianov and expects a revised proposal by him.*

Action 5/6: Another working group, composed of H.-J.Allelein, B.Adroguer, D.Bottomley, G.Cognet, M.Fischer and W.Tromm, will prepare a memo in which recommendations on the scope of the ISTC project proposal by Yu.Leontiev on ex-vessel ST analysis (EVAN) should be indicated. D.Bottomley, the co-ordinator of the group, will prepare a first draft. > *D.Bottomley sent the proposal to Yu.Leontiev. After some feedback with him a final proposal (distributed at the meeting) was sent to him about one week before the meeting, too late to obtain any response. The project proposal contains a long list of research topics, including experiments. Concerning the experiments not enough information is available, therefore additional details are needed. A.Zurita mentioned that maybe a development grant could be possible for the detailed preparation of the project.*

Action 5/7: A.Miassoedov / J.Stuckert should check the technical capabilities of the project proposal #1134 on fuel assembly tests under severe accident conditions by LUCH. > *A description of the PARAMETER facility was obtained. Experiments with fuel elements under severe accident conditions (top and bottom flooding) are possible. A CEG-SAM position on experiments in the PARAMETER facility was elaborated (see topic #20).*

*The Scientific Industrial Association “LUCH” offered to organize the 8th CEG-SAM meeting in Podolsk, Moscow region.*

Action 5/8: NIKIET should be informed that the CEG-SAM group is not interested in the presented proposal on core catcher design (L.Tocheny). > *L.Tocheny informed NIKIET.*

Action 5/9: The DINCOR 3D tools could be used to calculate corium spreading in the Chernobyl accident. It should be therefore checked if DINCOR could be linked with the Chernobyl step 2 project CHESS. D.Bottomley will prepare a proposal and P.Hofmann will send it to A.Lukianov for comments. > *The proposal was send to A.Lukianov and the group members’ end of June. It could be implemented in phase 2 of the CHESS project*.

Action 5/10: Prof Khabensky should be informed on the decisions of the US collaborators on the projects #833.2 and #1648.2 (A.Zurita, L.Tocheny). *> L.Tocheny informed V.Khabensky. US collaborators should be deleted from the official ISTC data list.*

Action 5/11: A specific web side of the CEG-SAM group within the official ISTC web side should be established to deposit all relevant documents (presentations, minutes, etc…) of the meetings (A.Miassoedov). The access to the information on the web side should be provided by a password. > *The specific CEG-SAM web side has been established, which can be opened by a password. P.Hofmann prepared a proposal on possible documents that should be stored under the specific web side. The listed documents should be supplemented by the work plans (without financial and personnel details). In addition, a general short description of the CEG-SAM objectives and tasks should be given within the official ISTC web page. A.Miassoedov kindly offered to store the documents under the CEG-SAM website until the next meeting.*

Action 5/12: J.Stuckert should inform V.Smirnov on the decision of the group to have the next CEG-SAM meeting in Dimitrovgrad. The date of the meeting: September 13-17, 2004. In connection with the CEG-SAM meeting, project meetings on CORPHAD-2, METCOR-2 and QUENCH will take place. > *executed*

Action 5/13: G.Cognet (CEA) will send to CEG members a copy of the specific CEA-IBRAE project recently launched on “Development of a data base for thermo-physical properties of corium”. > *No copy was send up to now;* *G.Cognet will do it in the near future*.

**Topic #5**: Report by the secretariat

A.Zurita briefly presented the updated list of CEG-SAM related projects” and of their collaborators as well as their links with current Euratom co-sponsored projects (EC-SARNET) and international research programmes (OECD-MASCA).

Various parties finance the ISTC projects. Two projects (#2936-IBRAE and #2916-CHESS) are financially supported by non-European collaborators, respectively, Canada and South Korea. The Canadian collaborator (organisation) of the project #1648.2 (VVER-QUENCH) has not yet been announced. As a result of the new collaborators the CEG-SAM will be an international group in future. The interaction with SARNET and the participation of non-European collaborators in the CEG-SAM has to be examined.

The group members expressed again their concern that most of the requested documents from ISTC regarding selected project proposals were not made available to them in sufficient time. A better organisation in this matter is absolutely necessary to establish a fruitful exchange of information and successful co-operation between ISTC and the CEG-SAM.

**Topic #6**: Space nuclear power sources. - Interest and options for a dedicated CEG

L. Summerer from the European Space Agency (ESA) made a short presentation on a planned contact expert group (CEG) on nuclear power sources for use in space. After a brief presentation of the history and basic parameters of typical space nuclear power sources, the motivation for the creation of such a CEG were outlined. There exist only two options for sustainable power supply in space: nuclear and solar power. Due to severe limitations of solar power Russia and the US developed since the 1960s nuclear power sources for space. The development and use of space nuclear power sources (space nuclear fission reactors, radioisotope sources) was done within the Soviet military space complex since the early 1960s. The Soviet Union has concentrated their efforts on the development of small nuclear fission reactors (5-6 kWe) for low Earth orbiting defence satellites. In addition, radioisotope power sources were developed for the Soviet Moon and Mars programmes. Given the fact that western Europe was engaged in the development of space nuclear power sources only to a small extent (CEA carried out rather thorough studies in the eighteens, one of which was named ERATO) but studies by ESA have shown not only the necessity for a wide range of space missions but also the principal industrial and institutional interest, the Contact Expert Group could focus Russian research efforts towards topics of particular interest for the European Union and ESA and prepare for more concrete cooperation. Two ISTC projects are known dealing with nuclear power stations design and nuclear thermal propulsion (ISTC #335 and #1172).

**Topic #7:** Acceptance of the extended ISTC CEG-SAM guidelines

The topic was shifted to topic #27.

**Topic #7**: Preliminary discussion/checking of individual ISTC proposals/projects

Comments on the revised ISTC proposal on “Ex-vessel source term analysis” (EVAN), Topic #17: The project proposal contains a long list of research topics, including experiments. However, concerning the experiments the information is limited to iodine chemistry and fission product release from molten pools. Additional information is needed on these experimental possibilities to evaluate their interest. Only a small number of selected well-defined tests on fission product release and source term should be performed. The results should provide the basis for further modelling activities to improve the Russian code system.

It was discussed that the Russian code system should be used for a calculation exercise on the basis of the PHEBUS FP1 test results.

Comments on the revised ISTC proposal on “Determination of parameters of fission product release from VVER irradiated fuel under beyond design basis accident conditions”, Topic #19: The group expressed large interest in this project. Concerning fission product (fp) release data still large uncertainties exist. Therefore, new experiments on specific items as the impact of cladding/fuel interactions or of liquefied fuel on fp release under different environmental conditions (inert, air, dry and wet conditions) with high burn up fuel are requested. But, the experiments should be started with a series of experiments those results are known to benchmark and compare the obtained test results.

Comments on the proposals Topic #18 and #20 through #24: No detailed discussion was possible due to lack of time and especially since the project proposals #21 to #24 had only short abstracts distributed to the group members just a few days before the meeting. The project proposal #1134 (Topic #20) “Fuel assembly tests under severe accident conditions in the PARAMETER facility” (LUCH) is an old one with changed title and activities. L.Tocheny suggested to keep the old number of the project since it has been already accepted without funding by the ISTC Governing Board.

# Extended session

**Topic #9**: Welcome of the Russian colleagues; discussion of the shortened minutes of the 5th CEG-SAM meeting in Paris, adoption of the agenda

A.Zurita opened the extended session of the meeting and welcomed the Russian participants. On behalf of the group, he expressed his thanks to Prof. V.Smirnov (Head of the RIAR hot cell laboratories) to host the meeting and to the head of the “Bureau for International Cooperation” Mrs. K.Vinogradova for the connected preparatory work.

A change in the sequence of presentations was discussed and accepted. The shortened minutes were supplemented by a comment of Yu.Leontiev and were then accepted without any additional changes.

23 Russian scientists attended the meeting. 12 of them gave presentations on the status of ongoing ISTC projects, project proposals or ideas, which could be considered as candidates for future project proposals, or other type of research works related to the technical scope of the CEG-SAM group.

**Topic #10:** Introductory presentation by RIAR

Prof. V.Smirnov expressed his welcome to the participants of the CEG-SAM meeting. No technical presentation was given.

**Topic #11:** Status of the ISTC CEG-SAM. Present and future

A.Zurita summarised the development and activities performed by the CEG-SAM since its launching in April 2002 within the frame of the ISTC agreement. He stressed that after 5 meetings the expert group has reached a reasonable maturity in evaluating ISTC proposals and projects presented by Russian scientists. Effectively, a total of five proposals were approved by the ISTC Governing Board based on the positive opinions given by the CEG-SAM to the EU financing party. Four of the projects have already started; the fifth one is presently under preparation. For the Russian scientists, the fact that a CEG is seriously assessing their proposals also represents a motivating factor to prepare adequate proposals in different SAM domains.

Concerning the perspectives A.Zurita pointed out that a strategic step should be done in order to assure the consolidation of the CEG-SAM. In view of the launched Network of Excellence EC-SARNET in April 2004 such a strategic step should be the integration of the CEG-SAM activities with that of EC-SARNET. Both activities on SAM are co-sponsored by the EC. This integration will bring mutual benefits and it would further assure a critical mass of expertise for ISTC proposals addressing specific issues in the SAM area. Furthermore, a closer research co-operation with Russian organisations in the SAM area would be formalised. The possibilities of success in this co-operation would be higher if an equivalent Russian programme on SAM is launched by ISTC.

Possible improvements of the CEG functioning could be: 1) enlargement of the number in EU organisations and Countries, 2) more systematic approaches should be implemented, e.g. the ISTC proposals should be timely and completely prepared in order to assure proper assessment quality, 3) the roles of “project monitor” and “project collaborator” should be fully implemented by CEG-SAM members, and 4) further international projection.

The impact assessments of current ISTC projects should be carried out by this CEG, in particular at the end of the projects.

To further improve the interaction of the group with ISTC a list of research topics that are of interest for the CEG-SAM group should be prepared, connected with priorities, and it should be updated continuously. That means, the group calls for specific project proposals, which may improve the co-operation between ISTC and the CEG-SAM member organisations.

**Topic #12:** Status on the ISTC project #833.2 (METCOR-2)

S.Bechta (RIT-NITI) reported on the outcome of the 5th METCOR (phase 2) project meeting on “Investigation of corium melt interaction with NPP reactor vessel steel” with collaborators that took place on September 14, 2004, in connection with the CEG-SAM meeting in Dimitrovgrad. In order to prove viability of a severe accident management concept for VVER reactors based on molten core retention within the reactor pressure vessel it is necessary to know the physico-chemical processes taking place during the interaction of molten corium with the internal surface of the vessel cooled from the outside.

S.Bechta described briefly the amended experimental matrix of the project. At the project meeting results of the Pr-MC 8 experiment were presented and discussed and they were compared with the results of earlier experiments Pr-MC 6 and Pr-MC 7. These experiments were conducted with different suboxidized corium melts up to 2600°C in an argon atmosphere. The steel specimen surface in contact with the molten corium was varied between 1150 and 1400°C. The results show that the maximum steel ablation depth is determined by the chemical composition of the corium melt and the interface temperature solid steel/molten corium (heat flux from corium melt). Interface temperatures below about 1100°C (position of the isotherm) should avoid corium/vessel interaction and provide a reliable vessel performance. This is considerably lower than the melting temperature of steel, which is currently used in the calculations of in-vessel retention. The minimum corrosion intensity was observed with fully oxidised corium (C-100, ZrO2 completely oxidised) with increasing intensity with deviations of the melt composition, especially on the substoichiometric side (ie. with free metallic Zr). The interactions between steel and unoxidised corium components result in an eutctic Fe-U-Zr(O) alloy that subsequently liquefies.

A proposal for additional experiments with FeO additions to the corium and with a Fe-U-Zr-Cr-Ni melt was presented. A prolongation or extension of the project was recommended by the collaborators that would further elaborate the corium interaction with reactor pressure vessel steel of Western type reactors (if justified) and mainly the mechanical properties of the steel specimen after the interaction experiments. The work plan until the 6th project meeting was approved by the collaborators. At the next meeting a decision has to be taken on the continuation of METCOR and on the topics to be studied.

**Topic #13:** Status on the ISTC project #1950.2 (CORPHAD-2)

S.Bechta (RIT-NITI) presented the topics and summarized the essential results of the 4th CORPHAD (phase 2) project meeting on “Phase diagrams for multicomponent systems containing corium and products of its interaction with NPP materials” with collaborators, which took place on September 14, 2004, in connection with the METCOR-2 and CEG-SAM project meetings. The CORPHAD-2 project focuses on experimental studies of phase diagrams of corium/NPP material mixtures to obtain information on liquidus and solidus temperatures, on temperature-concentration regions of miscibility gaps and on solubility limits. The reactor application of the results will be used for thermodynamic database optimisation, thermodynamic code validation and corium behaviour modelling.

The CORPHAD-2 test matrix was discussed and modified. The system UO2-ZrO2-SiO2(CaO) was deleted from the test matrix in favour of more detailed studies of the U-Zr-O system at high temperatures. If the system UO2-SiO2 will be examined as initially planned will be decided later. Progress in the field of phase diagram investigations was achieved for the systems ZrO2-FeO, UO2-FeO, Fe2O3-SiO2, U-Zr-O, Fe-Zr-O and UO2-ZrO2-FeOy. Final results of liquidus temperature measurements and determination of the eutectic points and temperatures in the quasi binary systems UO2-FeO and ZrO2-FeO were presented.

Beside the RIT-NITI presentations, M.Sheindlin (JRC/ITU) presented first results of melting point determinations (solidus and liquidus temperatures) in the U-Zr-O system by a polychromatic pyrometer method, which are partially different compared with literature data. D.Bottomley (JRC/ITU) reported on the melting behaviour of irradiated MOx fuel rod segments. Metallic Zr decreases the liquidus temperature of the MOx/Zr mixtures and apparently also the melt viscosity. The prediction of the high-temperature behaviour of irradiated fuel is complicated due to the fragmentation of the fuel and fission gas release (both depend on the burnup of the fuel), which result in heterogeneous structures. The data are important to determine the temperature and chemical composition at which reactor structures may collapse or degrade, and indicates the likely deviations from the conventional phase diagrams.

The scope of the work in the CORPHAD-2 project until the next meeting was discussed and updated. The studies of the systems UO2-ZrO2-FeO und UO2+x-ZrO2-FeOy will be completed. The studies of the system Zr-Fe-O will be continued. Two cold crucible melt tests in the TIGEL facility (RRC KI) with U-Zr-O mixtures will be conducted. First studies are planned in the U-Fe-O system.

**Topic #14:** Work plan and status on the ISTC project # 2916 “Analysis of fuel-containing mass (FCM) behaviour during the active phase of the Chernobyl accident / Chernobyl lessons” (CHESS)

L.Tocheny (ISTC) explained that after the Chernobyl accident a very large amount of chemical data on fuel containing material (FCM) measurements was obtained, which are of interest to the CEG-SAM. The data should be summarised and implemented in a severe accident database. Prof. A.Borovoi was requested to prepare a work plan that should be submitted to ISTC. L.Tocheny will send it to the collaborators of the project for comments (Action 6/1). Prof. A.Borovoi suggested to held eventually a kick-off meeting on this project at the Kurchatov Institute (February or March 2005 in Moscow).

V.Strizhov (IBRAE) presented briefly the different modified tasks (altogether five) of the already approved project. The revisions were made on the basis of CEG-SAM recommendations. The objectives of the project are to analyse the physical and chemical state as well as the spatial location of fuel-containing materials, to analyse the accident scenario and to determine directions of future research on this problem. Understanding of processes, which occurred during the active phase of the accident, is of great importance from the viewpoint of generic nuclear industry safety-related issues.

The five tasks are: Task 1) the collection, verification and analysis of initial data on nuclear fuel behaviour for different stages of the accident progression including the assessment of the graphite impact on the accident progression. Task 2) development of the database for the modelling of FCM behaviour in the 4th Unit of the Chernobyl NPP, e.g. elaboration of the variety of possible scenarios during corium spread and its interaction with structural materials. Task 3) additional measurements of chemical compositions of once molten material from the compartments below the reactor. Task 4) application of existing computational models for the evaluation of the FCM state. Task 5) development of the final report that identifies the knowledge lacking in phenomena and data necessary for code use and validation. In addition a proposal will be developed for a step 2 of the project on the basis of performed analyses and evaluations. As already mentioned above by L.Tocheny the detailed work plan of the project still has to be provided and approved.

**Topic #15:** Work plan and status on the project # 1648.2 “Examination of VVER fuel behaviour under severe accident conditions, Quench state”

A.Goryachev from RIAR Dimitrovgrad described the different stages and tasks of the project, including the test procedures. Stage A comprises the study of spent fuel rod segments under reflood conditions. The about 150 mm long fuel rod segments will be pre-oxidised and then heated up to different temperatures (max. 1700°C) from which they will be inserted in a water container at a well-defined velocity. The argon carrier gas flow, the generated hydrogen and steam, and the released volatile fission products will be measured. Pre- and post-test examinations of the specimens will be performed. Stage B covers the conduct of one integral quench experiment with fuel element simulators that consist of 18 electrically heated and 13 unheated fuel rods. The heated length of the fuel rods is about 1m. The results will provide a database for VVER fuel elements under quench conditions in comparison with the available database for Western type PWRs, which use different cladding material (Zircaloy-4 instead of Zr-Nb alloy). Stage C contains the development of a quench model, which can be used in code systems to predict the VVER core behaviour during reflood conditions.

The current status is as follows: the design for the single rod test facility is completed; it will be manufactured and then installed in a hot cell at RIAR. The preparatory work on the irradiated fuel rod segments is in progress. Parts for the bundle quench experiment are ready and will be sent to Karlsruhe (FZK) as soon as possible where the bundle quench test will be conducted in the QUENCH facility. The initial export difficulties of some of the Russian bundle materials (cladding tubes, rods, shroud) to Germany should be clarified.

**Topic #16:** Work plan and status on the ISTC project # 2936 “Modelling of reactor core behaviour under severe accident conditions. Melt formation, relocation and evolution of molten pool”

M.Veshchunov (IBRAE) presented the objectives, work plan and status of the project #2936. On the base of detailed analysis of available experimental data to update, to improve and to verify models on reactor core molten materials behaviour at consecutive stages of a severe accident (melt formation, onset of melt relocation, molten pool formation) and to prepare them for benchmarking of simplified models and for implementation in existing SA system codes. The work plan is divided in 8 tasks starting with modelling of melt formation and relocation up to a thermo hydraulic model for the molten corium pool behaviour in the reactor pressure vessel with accounting for the crust formation. The different tasks and the technical approach and methodology as well as the expected results and their applications were described in detail and an outline for the technical schedule and deliverables was given. The ISTC project will be connected with other EU (SARNET, PHEBUS, LACOMERA) and international OECD projects (RASPLAV, MASCA) as well as with QUENCH program. Especially the expected results from the project LACOMERA, and in particular the LIVE-tests will be very valuable for the modelling improvements.

**Topic #17:** Revised ISTC proposal on “Ex-vessel source term analysis” (EVAN)

The proposal on the project EVAN on “Development of models and computational tools for justification of reactor safety in NPPs under severe accident conditions”. was made by a consortium of five Russian research institutes with different expertises (SPEAP, NITI, IHPCDB, VNIPIET, KRI) lead by SPAEP and was for the first time presented by Yu.Leontiev (SPAEP) at the last CEG-SAM meeting in Paris. At this meeting Yu.Leontiev presented a revised version of the project based on recommendation given by a working group of CEG (see topic #4 action 5/6). The objectives of the proposal are severe accident source term assessments in the containment and in the environment along with radiological consequences for plants/sites of interest. The five main project tasks, which are divided into several subtasks, are: Task 1) Choice of the reference accident scenario analysis and input data for late phase source term assessment as fission product (fp) inventory in the fuel. Task 2) Local aerosol behaviour analysis. Task 3) Molten pool fp release analysis. Task 4) Iodine species and aerosol behaviour analysis. And Task 5) Assessment of the environmental source term and its consequences, radiological impact and mitigation measures. Since the latest recommendations of the working group were send to Yu. Leontiev only one week before the meeting he was not able to consider them in the revised project presentation.

After the presentation of the project a long discussion took place concerning the different tasks. The main comments are summarised in the following.

To task 1): It will not be possible to define one reference accident sequence that covers all physico-chemical phenomena for Eastern and Western type of reactors. Instead, the great number of available plant calculations should be evaluated to define boundary conditions for each key parameter to be investigated in the subsequent tasks as composition of the melt pool, chemical species to be released from the melt pool and temperature range of the sump and atmosphere in iodine tests. Performance of a code benchmark using Russian codes on ISP-46 exercise (Phebus FPT1) could be helpful.

To task 2): The obtained results from the OECD International Standard Problems ISP-37, ISP-44 and ISP-46 show that the aerosol transport and deposition in the containment is sufficiently well understood and simulated in most code systems. However, resuspension of aerosols, for example as a result of hydrogen combustion has been neither experimentally nor analytically examined, while aerosol transport in bends & vertical pipes is poorly understood. Aerosol separate-effects and revaporisation tests in pipes are still being planned.

To task 3): Fisssion product release experiments from a molten corium pool are of general great interest. However, for this type of experiments it is mandatory to specify on a jointly agreed basis the chemical composition of the pool, the temperature regime to be examined, the fission products and aerosols that should be considered and the environmental conditions. Due to experimental difficulties, past Russian experiments could not produce useful results for modelling. Improvements have to be proposed before making new experiments using the same test rig.

To task 4): A large scope of experiments seems possible but there is no information on real experimental conditions and measurements. The CEG expressed a specific interest in systematic investigations on the influence of “impurities” in the sump and in the environment on the iodine chemistry and release. There is also interest on iodine release at high temperature (high pressure) and dose rates. On the analytical side a sound pH simulation model is needed.

To task 5): The assessments and analysis should be done at the very end of the project by interested organisations for selected types of NPPs.

The conclusion of the discussion was to concentrate on focused experiments based on the latest recommendations of the working group. A close exchange between the Russian partners of the project and the collaborators should be maintained in particular to clarify the experiments on fission product release from molten pools and on iodine chemistry in the containment. L.Tocheny mentioned the possibility to fund travelling expenses of Russian experts in order to held a topical meeting with Western experts.

**Topic #18:** Revised project proposal on “3-D calculation codes for two-fluid flow” (DINCOR)

V.Kumayev (SSC-RF-IPPE) presented a revised proposal on “Development of the multicomponent medium model and code DINCOR for numerical simulation of corium spreading”. This topic was already discussed in the last two CEG-SAM meetings. The project is devoted to develop mathematical models and codes for the numerical simulation of thermal hydraulic problems in a multicomponent medium with solid-liquid phase change processes (melting, solidification), chemical interactions and hydrodynamics of liquid and gaseous components. The basic set of equations of the mathematical model of the multicomponent medium was presented. Some examples of two-dimensional DINCOR code applications were presented as well. The experience with the application of the two-dimensional version of the code has shown that joint calculations of hydrodynamics, heat transfer, stratification and chemical interaction have significantly improved the description of complex physico-chemical processes. The model of multicomponent medium can be used as base for the development of the three-dimensional version of the code DINCOR. The three-dimensional version of the code may be used to determine the quantity and chemical composition of the core melt, the destruction of reactor pressure vessel and in-vessel core structures as well as the interaction of the melt with the melt localization systems (core catcher), the formation of hydrogen, fission products and aerosols during the severe accident.

The opinion of the CEG has been that the 3-D modelling of in-vessel phenomena is of interest, but not so much for ex-vessel phenomena such as corium spreading. The code could be used, for example, for calculations of the ECOSTAR experiments. It would be of advantage if the code were able to describe chemical interactions of the melt with concrete. More detailed information is needed to come to a final conclusion how to proceed with the project proposal. The application of these codes to the corium melt modelling for the CHESS project was discussed later in the restricted session.

The CEG also asked if connections exist between the DINCOR code and those that are foreseen to be developed in the frame of the project #2936 (see topic #18). This question was unfortunately not answered.

**Topic #19:** Revised ISTC project proposal on “Determination of parameters of fission product release from VVER irradiated fuel under beyond design basis accident conditions”

A.Lukianov from SSC-RF-IPPE presented the revised project proposal; the first version was already presented at the last CEG-SAM meeting in Paris. The project covers two tasks: 1) experiments on the release of the volatile fission products (fp) Cs, Ru, and Kr from VVER oxide fuel of different burnup and aerosol source term measurements, and 2) developments of models to determine the release of fp from the fuel as well as its chemical form and transport in the propagation test tubes. The fp release and aerosol experiments were conducted up to temperatures of 2100°C in inert gas and in a steam environment. Experiments in air will also be possible. The maximum temperatures that can be reached in the test rig will be 2500°C. In future also the influence of structural materials as Zr and stainless steel on fp release and aerosol formation will be examined. The pre- and post-test calculations will be performed with the MELCOR code system.

The impact of fuel/cladding interactions on fission product release is of great importance, especially with high burnup fuel rod segments. The group maintained its interest even if the burn-up is limited at the present time to 23 MWd/kgU.

During the discussion, it appeared that recommendations sent by a group of experts (action 5/5) following the presentation carried out in the previous 5th CEG-SAM meeting in Paris (February 2004) were never received by IPPE. Only recommendations expressed during that meeting could be partly taken into account. Further discussion of the project and of the test matrix are required to finalise this project. This matter was re-discussed in the restricted session.

**Topic #20:** Revised ISTC project proposal # 1134 on “Fuel assembly tests under severe accident conditions” (PARAMETER facility)

N.Parshin from LUCH presented detailed information on the PARAMETER test facility. The PARAMETER facility is an electrically heated out-of-pile facility erected at LUTCH in Podolsk, Moscow region, and is based on the experience gained within the WTZ agreement using CORA-WWER experiments and fuel element simulator tests in the QUENCH facility at FZK, Karlsruhe. It is possible to conduct in the facility large-scale bundle experiment with UO2-containing electrically heated fuel rod simulators. (number of rods: 19 or 37, total length of the rods: up to 3,5m, heated length: 0.5 to 1.2m). The major tasks considered are the investigation of the fuel bundle degradation phenomena under severe accident conditions, depending on bundle characteristics and various selected experimental conditions and the hydrogen generated during quenching (top and bottom flooding). The investigations will be performed as part of co-operative research programs with participation of the following institutions: RRC “Kurchatov Institute”, EDO “Hydropress”, Bochvar Research Institute for Non-organic Materials and Nuclear Safety Institute (IBRAE) of the Russian Academy of Sciences.

After the presentation the discussion by the group resulted in the following statements. The fuel rod bundles are designed for WWER geometries and materials, however, the differences to Western LWRs are likely to be minor with respect to flooding behaviour, if the system parameters are scaled adequately. Based on the available database on reflooding of partially degraded fuel rod bundles, the facility seems to be capable of closing some of the remaining gaps of knowledge in the reflood phenomena. The main parameters that can be varied are the inlet mass flow during reflood and the injection position: upper plenum (top) / downcomer (bottom).

Up to now no experiments are available for low mass flow rates, e.g. below 0.5 g/s·per fuel rod. Also a wide gap is seen between the high flow QUENCH and LOFT LP-FP2 tests. Moreover, top flooding of fuel rod bundles and debris beds is not treated in severe accident codes and no data exists in this area up to now. For these reasons, the conduct of two experiments will be of great interest to the CEG-SAM in the PARAMETER facility: 1) a low rate top-flooding about 1g/s per fuel rod, and 2) a mixed flooding at high flow rates (about 8 g/s per fuel rod). However the first experiment should follow the conditions of the test QUENCH-06 as closely as possible in order to try to replicate this bottom-flooding test but with a WWER bundle materials. This could possibly linked up with the proposed test QUENCH-12 for summer 2005 for the ISTC project #1648.2, when a WWER bundle will be bottom quenched and could provide a direct comparison between the two facilities. This initial calibration phase is important for interpretation of the subsequent top-flooding tests. For comparison reasons, both experiments should also have same pre-oxidation history and peak rod temperature at time of flooding initiation. Peak bundle temperature at time of flooding initiation should be at least 2270 K. The data evaluation would clearly benefit by comparison with the experimental data and modelling results from the QUENCH-06 and QUENCH-12 tests. This data could be made available to LUTCH in order to derive the maximum value from this data.

The CEG-SAM would be interested to receive detailed test description and work program for the above-mentioned type of bundle tests.

**Topic #21:** Experimental studies of limitation technique of corium components interaction with carbon

V.Zhdanov from NNC Republic Kazakhstan presented the project proposal on small-scale experiments with crucibles of various types of materials and composition (coating) to be used for molten corium experiments at very high temperatures up to 2800°C. The objective of the work has been to find crucibles and coatings that minimise the chemical interactions between the molten corium and the crucible materials. Graphite is mainly applied at NNC as a result of its high thermo-stability and optimal specific electric resistance from the point of view of induction heating. However, depending on the chemical composition of the corium and applied temperature chemical interactions will occur with the graphite. Therefore, several variants of protection of graphite against undesirable interactions has been studied and described, for example, the coating of the graphite crucibles with refractory materials or refractory carbides (NbC, TaC) as well as the use of internal inserts (thin protecting inner Ta or W crucibles) from refractory metals in graphite crucibles.

The results obtained show that the efficiency of the inner graphite crucible surface protection depends on the quality of the inserts as barrier. Ta and W have shown limited protection as a result of interactions with carbon and/or plastic deformation of the inserts. The effect of self-limitation of the interaction with carbon due to the formation of a thin film of zirconium carbide (ZrC) on the interface between the corium melt containing metallic Zr and graphite crucible was observed. Thus a thin ZrC coating alone, or a ZrC or Zr coating in combination with a tungsten insert was successfully applied, independent of the chemical composition of the molten corium (PWR, BWR), to avoid chemical interactions with elements that are not part of corium.

It was mentioned by the CEG that similar studies were performed in France and Germany, and these problems also arose in the OECD-RASPLAV programme.

**Topic #22:** Accident investigations at RFNC VNIITF (Chelyabinsk-70)

Mrs. E.Lipilina from VNIITF presented the project proposal of RIA tests in the uranium-graphite pulse reactor (IGR) at the Semipalatinsk test site in the Republic Kazakhstan. A similar presentation was already given by N.Gorin at the 4th CEG-SAM meeting in St.Petersburg, September 2003.

In 1990s a series of experiments was carried out in the IGR reactor to study the behaviour of fuel rod segments of different types of reactors during reactivity initiating accidents (RIA). In the experiments, fuel rod segments of the reactor BN-800 with a length of about 140 mm were used. The fuel was enriched uranium dioxide 235U of 2%, 6% and 10%. The fuel rod segments were tested in a dry ampoule without coolant; in an outer ampoule filled with sodium. In the experiments the centreline fuel temperature, the temperatures of the cladding and of the coolant as well as the internal gas pressure in the fuel rod segments were measured

Altogether five tests were carried out. Two tests using VVER reactor fuel with equal gap widths between the fuel pellets and the cladding tube. In one test the fuel has been brought up to melting. In other transient experiments, fuel rod segments of the design reactor BREST (2 and 10% enriched uranium mononitride) in lead coolant of about 450°C were tested. In the experiment with 10% enriched UN fuel melting occurred and fuel particles were spread to different locations of the ampoule where they solidiefied in the lead.

Mrs. E.Lipilina suggested a project to conduct the following tasks: description of the experiments including post-test investigation; development of a mathematical model, conduct of test calculations.

Mrs. E.Lipilina additionally proposed the ISTC project #2771 “Development and Study of Properties of Enhanced Density Composite Materials for Construction Activities at Nuclear Power Facilities”. VNIITF and PGASA (Penza) jointly carry out works on the development of new building materials (concrete). The main objective of the project is improvement of a composition and more accurate specification of properties of concrete with densities up to 7 g/cm3 obtained due to addition of lead waste to the composition. It is proposed to use this concrete for construction of nuclear power facilities at NPP, for radioactive wastes storing, for localization of radioactive contamination in the case of radiation accidents, biological shielding at intense radiation facilities, and consolidation of potentially hazardous wastes. The investigations will be focussed on basic factors, which determine the radiation-protective and structural properties of developed composite materials.

**Topic #23:** Development of methods for elimination of consequences of severe nuclear accidents (Arzamas-16); Sacrificial material for modern and future catchers of nuclear reactors (ISTC #1974)

V.Mineev (IHED-IVTAN) presented the modified project proposal. The same subject (ISTC #1974) was already presented at the 3rd CEG-CM meeting in Moscow, February 2003. The proposal is divided in several tasks. 1) Selection of a sacrificial material. 2) Experimental studies with silica/ferric oxide and ferric oxide/alumina sacrificial materials. 3) Experimental studies with zirconia/titania sacrificial material. 4) Application of sacrificial materials as ex- and in-vessel core catcher material. The objective of the proposed project is to develop and test advanced materials for brickwork elements for ex-vessel core catchers in VVER (PWR) type of reactors. The core catchers will be used to guarantee the localisation of the core melt and its cooling and retention without serious damage to the containment and environment. In the proposed project titanium ceramics, rare-earth oxides and zirconia were selected as advanced materials. Their chemical and thermal effects, and their physico-chemical properties will be investigated in several tests under core melt conditions. The experiments can be conducted with amounts up to 1t of UO2 or corium; however, no tests have been done with these large quantities and only steel was melted up to now.

Other topics such as steam explosion or molten corium-concrete interaction (including sacrificial material) can also be investigated using experimental facilities enabling molten corium generation. The CEG expressed potential interest for MCCI tests with large quantities of corium. More information on the project proposal is needed. A small working group should define the interest of the CEG-SAM (action 6/2).

**Topic #24:** NNC experimental facilities, short description

Yu.Vassiliev from the National Nuclear Centre (NNC) of the Republic of Kazakhstan presented different types of small- and large-scale experimental facilities that can be used for high temperature experiments to liquefy corium and conduct experiments with molten corium up to 60kg UO2 and temperatures up to 3000°C. Examinations on the corium interactions with reactor pressure vessel steel (LHI), concrete (MCCI) or coolant (FCI) has been studied. The decay heat in the fuel is simulated by various electro-technical devices and methods. A few of the tests were described in detail.

The impressive facilities will be of interest (especially for FZK) since “real” corium mixtures can be used for comparison with corium simulate materials used in some of the EU tests such as LIVE.

**Topic #25:** Work plan and status of the ISTC project proposal ASAC “Adaptation of Severe Accident ICARE/CATHARE and ASTEC Codes to VVER”

Yu.Zvonarev (NSI RRC KI) presented the work plan and status of this project proposal. The objectives of the work are: 1) the adaptation of the coupled severe accident code system ICARE/CATHARE and the new severe accident code ASTEC to VVER type of reactors. 2) The support of the EC-SARNET (Severe Accident Research Network) project devoted to severe accident researches in the frame of the 6th EC Framework Programme. The main phases of the work will be: i) the investigation of the applicability and requirements of the ICARE/CATHARE and ASTEC codes for analysis of the VVER reactor behaviour under SA conditions. ii) The necessary modification of the ICARE/CATHARE and ASTEC codes (taking into account VVER material properties and safety systems) to meet the requirements and to perform some benchmark calculations with other best-estimated and integral codes as SCADAP/RELAP5 or MELCOR codes or the Russian RATEG/SVECHA/GEFEST SA code. iii) Verification calculations with the ICARE/CATHARE and ASTEC codes based on a VVER validation matrix. iv) conduct of a plant calculation based on the VVER reactor case matrix as well as benchmark calculations.

It was recommended not only to use the French ICARE/CATHARE code but also the German ATHLET-CD code system for the planned activities. What will be important and desirable in the frame of the project is a close feedback of Russian code users to the code developers in order to improve continuously the capability of Western code systems to calculate VVER severe accident sequences. This target is of particular interest for IRSN and GRS.

This project will require a close cooperation with SARNET providing a complementary contribution on the planned adaptation of ASTEC or VVER calculations.

**Restricted session** (continued)

**Topic #26:** Detailed discussion and preparation of the CEG-SAM reports

After the presentation of the various ISTC project proposals by the Russian scientists, the restricted session of the meeting continued with detailed discussion on the presented activities to elaborate advices and priorities of the proposals.

Discussion on the revised project proposal on ”Ex-vessel source term analysis (EVAN)” (topic #17). The latest recommendations by the working group were not considered (see action 5/6). Already after the presentation by Yu.Leontiev an extended discussion took place regarding the various tasks of the project. H.-J.Allelein summarised once more his comments and additional ones from IRSN to the project and distributed a short memo; the main statements are described under topic #17. In principle the CEG agrees to the statements and discussed additional recommendations: task 3 on fission product release is too general and therefore a clearer concept is needed, task 4 on iodine chemistry, the influence of control rod material on the iodine chemistry and release should be considered, and task 5 is only of preliminary nature at this stage and should be defined on the basis of the previous tasks' results. All tasks should be executed step by step. A.Zurita and L.Tocheny suggested having a meeting of the working group members, who prepared recommendations on the project proposal, with Yu.Leontiev and some people from experiments involved in EVAN. ISTC will be able to fund such a trip, however, it has to be agreed by Minatom and by the ISTC Governing Board. Therefore, a quick decision on such a meeting by the group is necessary and a support letter to be send to Minatom via L.Tocheny is requested. To increase the efficiency of the information exchange Yu.Leontiev should include the latest written and oral recommendations of the CEG. In parallel, Yu.Leontiev should prepare a detailed proposal (work plan) on the various tasks taking into account the CEG recommendations that should be sent to the working group members before any meeting (action 6/3).

Concerning the project proposal “3-D calculation codes for two-fluid flow (DINCOR)” (topic #18, action 5/9) the opinion of the CEG-SAM has been that 3-D calculations are not necessary for many calculations, especially regarding ex-vessel phenomena. But, for in-vessel phenomena the DINCOR code may be valuable and possible applications should be evaluated. D.Bottomley pointed out this presentation was in reply to his memo to Lukianov about applicability to the CHESS project. He believes the code is applicable to the specific 3-D modelling FCM melt flow problems in CHESS and stated that he would send a memo to Dr. Lukianov to request that IPPE take contact with RRC KI or IBRAE near the end of phase 1 so that their proposal for 3-D modelling can be incorporated in CHESS phase 2 of the project (action 6/4).

In the revised ISTC project proposal on “Determination of parameters of fission product release from VVER irradiated fuel under beyond design basis accident conditions” (topic #19, action 5/5), presented by A.Lukianov, the recommendations of the working group were not considered since he, for whatever reason, did not, receive them. **Hence, one should always request a confirmation of important messages by the addressee in future**.

The strong interest of the group for this project was confirmed. The recommendations of the working group were given to him at the meeting and he was asked to respond on them, taking into account if experiments with high burn-up fuel will be possible (action 6/5).

At the revised ISTC project proposal # 1134 on “Fuel assembly tests under severe accident conditions (PARAMETER facility)” (topic #20, action 5/7) FZK Karlsruhe expressed strong interest. FZK is ready to take the lead to define, in co-operation with the CEG-SAM, further recommendations and a work plan. A cluster with the current FZK QUENCH programme and the ISTC project # 1648.2 should be considered. However L.Tocheny mentioned that, first of all, a reactivation of the officially accepted project without funding is needed before such a link can be formed. Reactivation means finalization of the work plan of the project. Therefore, a letter of support to ISTC is urgently needed to obtain funding (action 6/6). The project proposal #1134 itself was already agreed by the ISTC Governing Board long time ago.

The presentation “Experimental studies of limitation technique of corium components interaction with carbon” (topic #21) was discussed with limited interest since some experimental studies were conducted in the frame of the OECD-RASPLAV project & CEA has an agreement on this topic with the Kurchatov Institute in Moscow. Nevertheless their expertise in high temperature materials is recognised by the CEG members, as well as the excellence of their facilities. Within a bilateral Kazakh-French agreement G.Cognet & Ch.Journeau will visit the test facilities in the Republic Kazakhstan and they will make a short report to CEG-SAM (action 6/7). Of great interest would be in-vessel retention experiments with corium (see 'NNC experimental. facilities' below).

The CEG-SAM members expressed no interest in the “Accident investigations at RFNC VNIITF (Chelyabinsk-70)” (topic #22).

Concerning the project “Developing of methods for elimination of consequences of severe nuclear accidents (Arzamas-16); Sacrificial material for modern and future catcher of nuclear reactors, ISTC #1974” (topic #23, action 5/8, action 6/2) the group showed no interest in the core catcher development activities and limited interest in the other topics. At the moment no final decision will be possible. Further information on some of the topics is needed, which should be discussed at the next CEG-SAM meeting.

Some of the topics covered in the presentation “NNC experimental facilities, short description” (topic #24) are of great interest for the CEG-SAM, especially the in-vessel retention experiments with corium and MCCI tests with large corium masses. However more information on the tests are needed for further decisions. A working group (including FZK, CEA; IRSN, GRS) should formulate a letter of interest on the lower head and MCCI experiments and send it to L.Tocheny (action 6/8). Ch.Journeau asked for all questions on the facilities to be sent to him so as to be able to get the maximum operational details from the visit.

The project proposal ASAC “Adaptation of Severe Accident ICARE/CATHARE and ASTEC Codes to VVER” (topic #25) has been considered as a valuable contribution to describe severe accidents in VVER NPPs by different European code systems. A subgroup (GRS, IRSN, CEA), lead by H.-J.Allelein, will prepare a letter of support and elaborate – together with the Kurchatov Institute- a detailed work plan for the project (action 6/9). The work plan should be presented and discussed at the next CEG-SAM meeting.

**Topic #27**: Discussion of the chairman report

A.Zurita summarised briefly once more the work performed by the CEG-SAM since it was launched in April 2002 and since he acted as chairman of the group (see also topic #11). He distributed a document in which he described the status, the achievements, and the perspectives of the group. Attached to this report are the updated guidelines of the CEG-SAM, a list of the members of the group, a description of the “Role of foreign collaborators”, the six positive opinions given by the group, and a list of ISTC CEG-SAM related projects. He stressed the need of the group to be enlarged by selected experts (scientists who are involved in the EC-SARNET programme would be qualified) to cover the additional research areas since the expansion of the topics from “Corium Management” to “Severe Accident Management” considered by the group. In this connection he suggested to organise a joint EC/ISTC meeting in combination with the 2nd EC-SARNET meeting in Cologne early 2004. The current CEG-SAM members mentioned that they are all also members of SARNET and recognize the need to have a strong interaction between SARNET and the CEG. It was pointed out it would not be easy to find a common time to meet as the members are involved in different aspects of the SARNET Network.

It was also discussed to enlarge the CEG-SAM by experts of Eastern countries that have joined the EC and in which VVER reactors are operated. Finally A.Zurita mentioned an additional procedure to come into a closer co-operation with ISTC by defining a list of topics connected with priorities that are of interest for the CEG-SAM.

**Topic #28:** Election of a new chairman

A.Zurita expressed his thanks to the CEG-SAM for the fruitful co-operation. According to the guidelines a chairman has to be elected after a three-years period. Due to the reorganisation of the EC A.Zurita will be now responsible for a different research area within the EC and will therefore not be a candidate for an additional chairmanship. He proposed M.Hugon as new chairman of the group who was welcomed and accepted unanimously by the CEG-SAM members. M.Hugon thanked in advance for the confidence by the group and promised to continue the successful work of the group and to foster the future co-operation with ISTC.

**Topic #29:** Other issues

-The question was raised if any change of the work plan of a running ISTC project has not only to be agreed by the foreign collaborators of that project but also by the other CEG-SAM group members? According to the guidelines of the collaborators the group only has to be informed as the Steering Committee (collaborators & operators) are responsible for the work plan. Only in the case of major changes in the work plan does the CEG have to be asked.

-Up to now only one project proposal on RBMK safety-related research work was submitted to CEG-SAM (CHESS). The reasons for the scarce offer of proposals are not known. L.Tocheny will contact Russian organisations involved in safety-related research on RBMK reactors to obtain some feedback (action 6/10).

**Topic #30:** Next meeting

The next CEG-SAM meeting will take place in Cologne, Germany, on February 28 – March 1, 2005, in connection with the 2nd EC-SARNET meeting. It will be kindly organised by H.-J.Allelein (GRS).

**A.Zurita** (past chairman), **M.Hugon** (future chairman) **P.Hofmann** (secretary)

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**Annexes:**

1. Revised final agenda of the 6th CEG-SAM meeting
2. List of participants
3. List of ISTC CEG-SAM related projects (updated August 2004)
4. Specific action list (see below)

Annex #4:

**Specific Action List**

6th CEG-SAM meeting, Dimitrovgrad, September 2004

6/1 – Topic #14: L.Tocheny will ask A.Borovoi to prepare a work plan on the project CHESS, which is then to be sent to the collaborators of the project for comments. Prof. A.Borovoi will eventually held a seminar on this project at the Kurchatov Institute.

6/2 – Topic #23: A small working group composed of CEA, FZK and IRSN should collect more information and define the interest of the CEG-SAM on this project proposal.

6/3 - Topic #26: D.Bottomley to maintain contact with Dr. Leontiev at SPAEP. The revised EVAN proposal ´from Dr. Leontiev can be circulated to the working group (incl. H-J Allelein) and further comments by the working group incorporated. At a later stage -if necessary a working visit by Dr. Leontiev and some experts from experiments to the working group partners can be made to finalise the work packages making up the proposal in preparation for presentation at a CEG meeting. (see Topic #17).

6/4 - Topic #26: D.Bottomley to send memo to A. Lukianov requesting him to take contact with Kurchatov Institute & IBRAE in preparation for CHESS Phase 2 project so that IPPE can include the 3-D DINCOR modelling of the FCM melt flows in Phase 2 (see Topic #18).

6/5 - Topic #26: B.Adroguer to collect revised '“Determination of parameters of fission product release from VVER irradiated fuel under beyond design basis accident conditions” proposal from Dr. Lukianov incorporating the working groups' remarks. This can be circulated to the working group for final comment before presentation at a CEG meeting. (see Topic #19).

6/6 – Topic #26: A letter of support should be prepared by the working group on the project proposal #1134 (PARAMETER facility) and should be send to L.Tocheny (see also Topic #20).

6/7 – Topic #26: C.Journeau will prepare a short report after his visit of the test facilities in the Republic of Kazakhstan (see also Topic #24).

6/8 – Topic #26: A working group should formulate a letter of interest on the lower head and MCCI experiments and send it to L.Tocheny and collect major questions for Ch.Journeau to pose during the visit to the facilities in Kazakhstan (see also Topic #24).

6/9 – Topic #26: A working group, lead by H.-J.Allelein, will prepare a letter of support and elaborate –together with the Kurchatov Institute- a detailed work plan for the project proposal ASAC(see also Topic #25).

6/10 – Topic #29: L.Tocheny will contact Russian organisations involved in safety-related research on RBMK to stimulate them for ISTC project proposals.

6/11 – Topic #30: The next CEG-SAM meeting should take place in connection with the 2nd EC-SARNET meeting in Cologne. It will be kindly organised by H.-J.Allelein (GRS). He will inform the CEG-SAM members on the possible dates of the next meeting as soon as the date of the SARNET meeting will be fixed. >executed, see topic #30