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

**CONTACT EXPERT GROUP on**

**SEVERE ACCIDENT MANAGEMENT**

**(CEG-SAM)**

**MINUTES OF THE 5th MEETING**

**CEA Headquarter, Paris**

**February 11-13, 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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Revised minutes, April 26, 2004 CEG-SAM / M-05

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| Subject: Fifth Meeting of the ISTC  “Contact Expert Group on Severe Accident Management” (CEG-SAM)  Place: CEA Headquarter, 31-33 rue de la Federation, 75015 Paris, France  Date: February 11-13, 2004  Participants: 27 participants of 18 organisations from 5 countries:  Mr. B.Adroguer IRSN, Cadarache  Mr. H.J.Allelein GRS, Cologne  Mr. E.Altstadt FZR, Rossendorf  Mr. G.Azarian Framatome ANP, Paris  Mr. D.Bottomley JRC / ITU, Karlsruhe  Mr. G.Cognet CEA/DEN/DSNI, Saclay  Mr. Y.Dutheillet EDF, Clamart  Mr. M.Fischer Framatome ANP, Erlangen  Mr. P.Hofmann Consultant, Karlsruhe (secretary)  Mr. Ch.Journeau CEA/NT, Cadarache  Mr. M.Kissane IRSN/DPAM, Cadarache  Mr. S.Marguet EDF, Clamart  Mr. A.Miassoedov FZK, Karlsruhe  Mr. F.Oriolo University of Pisa  Mr. J.Stuckert FZK, Karlsruhe  Mr. W.Tromm FZK, Karlsruhe  Mr. H.Unger RUB, Bochum  Mr. A.Zurita DG-Research / J.4, Brussels (chairman)  Mr. Y.Aniskevich RIT / NITI, Sosnovy Bor  Mr. S.Bechta RIT / NITI, Sosnovy Bor  Mrs. E.Kalyago RIT / NITI, Sosnovy Bor  Mr. V.Khabensky RIT / NITI, Sosnovy Bor  Mr. Y.Leontiev SPAEP, St. Petersburg  Mr. A.Lukianov IPPE, Obninsk  Mrs. L.Mezentseva JSC / RAS, St. Petersburg  Mr. L.Tocheny ISTC, Moscow (co-chairman)  Mr. V.Strizhov IBRAE, Moscow  Distribution list: Mr. A.Mitsos DG-Research  Mr. H.Richardson DG-Research  Mr. L.Bellemin DG-Research / N5  Mr. D.Gambier DG-Research / N.3  Mr. P.Vincent DG-Research / N.3  Mr. P.Fernández Ruiz DG-Research / J  Mr. M.Poireau DG-Research / J.1  Mr. H.Forsström DG-Research / J.4  Mr. R.Schenkel JRC  Mr. P.Frigola JRC / 02  Intranet of Unit J.4  Mr. N. Yousten ISTC, Moscow  Mr. L.Tocheny ISTC, Moscow  EU CEG-SAM members  Contact person: Mr. A.Zurita Tel.: +32-2-29.58365 – MO75, 5/30 |

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

The 5th CEG-CM/SAM Meeting in Paris has been conducted in connection with the two-days Steering Committee Meetings on the ISTC projects #833.2 (METCOR-2) and #1950.2 (CORPHAD-2) where progress reports on the project status have been presented and were discussed in detail. The future activities were updated.

**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.

A.Zurita opened the first part of the restricted session and welcomed the EU participants of the 5th meeting of the International Science and Technology Centre (ISTC) – Contact Expert Group on Severe Accident Management (CEG-SAM; see topic #6). On behalf of the group, he expressed his thanks to CEA (G.Cognet) to host the meeting and for the connected preparatory work.

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

The sequence of presentations in the extended session was changed, primarily to discuss the Chernobyl corium related project somewhat earlier. Two additional presentations were included. With these changes, the attached agenda (see annex 1) was accepted.

**Topic #3:** Approval of the minutes of the 4th CEG-CM meeting in St.Petersburg, September, 2003

On the basis of the draft minutes of October 20, 2003, the secretary considered the various comments received in the revised minutes, dated November 21, 2003, which were approved without changes at the meeting in Paris. Some members asked to mark the changes/ supplements in the revised minutes to better recognise and discuss them.

**Topic #4:** Specific action list

Remarks to the action list of the last meeting in St.Petersburg:

Action 4/1: The status of collaborators in the three ongoing ISTC projects #833.2, #1950.2 and #1648.2 should be clarified. In all cases the financing body has the property rights and can decide on the participation of non-EU collaborators. An updated list of collaborators for all recommended project is still needed [replaced by Action 5/1].

Action 4/2: The adaptation of the CEG-CM guidelines for the extension of the technical scope of the group is discused in topic #6 [Action closed].

Action 4/3: The list of considered ISTC projects has been updated by the chairman (Action closed - see annex 3). In the past meetings the group requested to combine the two ISTC project proposals #1445 and #1448 into one, however, only one Russian organisation agreed to this procedure. For this reason no further decision on the proposals was made by the group.

The rather old project proposal #1134 on “Facility for modelling reactor accidents” (LUTCH) from 1997 was frozen for some time and has been now reactivated.

Action 4/4: The Forschungszentrum Rossendorf will act as “moderator” for the ISTC project proposals #1445 and #1448 [Action closed].

Action 4/5: Detailed information on the ISTC project proposal #0243 (Models and codes for accident phenomena in NNPs) could not be sent to the group members since the responsible Russian scientist from IPPE is not involved anymore in this subject [Action closed].

Action 4/6: The planned information exchange between IRSN and IPPE concerning the ISTC project proposal #0243 on “Spreading and interaction of molten material in severe accidents” did not take place [Obsolete action].

Action 4/7: The CEG group prepared some revised recommendation on the Chernobyl ISTC project proposal #2916 regarding its technical scope, which were then commended by IBRAE (see topic #7) and considered in the modified project proposal (see topic #10) [Action closed].

Action 4/8: L.Tocheny pointed out that the ISTC Governing Board had approved the idea of topical progammes for ISTC [Action closed].

Action 4/9: The requested documents on various ISTC project proposals were not distributed before the meeting in Paris [Action still open].

Action 4/10: Two types of minutes (with and without the discussions and conclusions of the restricted sessions) were prepared and distributed. No comments were received from the Russian scientists on the “shortened” minutes [Action closed].

Action 4/11: The chairman expressed once more his thanks to CEA (G.Cognet) for the excellent organisation of the CORPHAD-2, METCOR-2 and CEG-CM/SAM meetings in Paris. In future the CORPHAD-2 and METCOR-2 project meetings should take place only once per year in connection with the CEG-SAM meeting, preferentially in Russia [Action closed].

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

A.Zurita briefly presented the updated list of CEG related projects” (new update as Action 5/2 - annex 3).

The ISTC project proposal on “Modelling of reactor core behaviour under severe accident conditions” by IBRAE was officially registered (#2936) in November 2003 and a positive advice by the group was issued (CEG-CM/A-06) right after it and based on the conclusions of the 4th CEG-SAM meeting.

L.Tocheny reported that the proposal #2936 has been transferred to the ISTC Governing Board for a positive decision. The proposal on the Chernobyl accident was registered by ISTC (#2916).

The ISTC project proposal #1134 on “Facility for modelling reactor accidents“ by LUTCH (Institute for high temperature materials for nuclear and space application) has been re-activated and should be considered by the group.

The group members expressed their concern that most of the requested documents from ISTC regarding selected project proposals were not made available to them. 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-CM/SAM.

**Topic #6**: Discussion on the enlargement of the technical scope of the ISTC CEG-CM

A.Zurita proposed an updated version of the guidelines (draft version January 2004) that considered the planned enlargement of the technical scope of the group from “Corium Management” to “Severe Accident Management” as already discussed at the 4th CEG-CM meeting in St.Petersburg. An extensive discussion took place regarding chapter 2 (ISTC proposals/projects concerned) of the guidelines defining the various tasks and objectives of the group.

With respect to the enlargement of the technical scope of the group, and in particular to the limits of the technical scope, it was stressed among others that also general aspects of PSA studies should be considered and that ‘Design Basis Accidents (DBA)’ are excluded. A precise specification of the experimentally and analytically tasks is needed. All member organisations are requested to look for further expertise in order to cope with the approved extended technical work (Action 5/3).

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

It was the general opinion of the group that a strong link to the planned EU Network of Excellence, called SARNET, should be established. Most of the group members will participate in SARNET and therefore an exchange of information should be guaranteed. In particular, the list of priorities mentioned above should be the outcome from SARNET.

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

Comments on Chernobyl ISTC project #2916 (CHESS); topic #10: Based on the discussion at the last meeting in St.Petersburg the group elaborated in several steps so-called “revised recommendations” on the Chernobyl project “Development of analytical models for the processes that took place during the active phase of the Chernobyl accident”. The project proposal was submitted at the last meeting by RRC-KI and IBRAE and consisted of 8 tasks. The group suggested splitting this wide field of tasks into different areas, which should be treated step by step. V.Strizhov from IBRAE commented on the recommendations of the group on January 23, 2004, and agreed in general on the recommendations to split the project into 2 steps and focus the first step on the accumulation of data, their assessments, and on the development of data for specific models to be used in the calculations. In step 2 the findings of phase 1 will be used for modelling activities and inter-code comparisons. Regarding the role of graphite during the accident as heat source some information should be provided, although no specific data are available. Therefore, only assessments of the possible role of graphite can be made. The opinion of the group was that the planned project would provide a sufficient amount of data to model a RMBK reactor, to calculate the accident, and to investigate mitigating measures.

Comments on the ISTC project proposals #1445 and #1448: L.Tocheny mentioned that the two proposals have to be considered as “frozen” as long as no collaborator is available. The request of the group to merge the two proposals into one was not accepted by one of the Russian organisations. For this reason the group should maybe consider only one of the two proposals. FZR declared to act as “moderator”.

Comments on the ISTC project proposal #1134 “Facility for modelling reactor accidents” (LUTCH): The proposal was submitted to ISTC already in 1997 and has been now reactivated. The proposal deals with the development and fabrication of an experimental facility called PARAMETER and some additional analytical activities on the high-temperature material behaviour of VVER fuel elements.

Comments on the ISTC project #1648-2 (QUENCH): The budget for the project “VVER fuel behaviour under severe accident conditions; Quench stage” phase 2 has not yet been approved by ISTC. Since the exchange rate between the Euro and US dollar changed considerably the planned instrumentation of the VVER test bundle with high-temperature thermocouples, which are very expensive, has probably to be changed. The collaborators of the project expressed their willingness to find an acceptable solution for this problem together with the Russian colleagues (Action 5/4). L.Tocheny mentioned that eventually additional money can be provided by ISTC if the group expresses its strong interest in this project. A.Zurita explained that the interest of the group was already expressed by the advice A-05 in 2003 and therefore no further burocratic actions from the CEG group are necessary. It was also suggested to adjust the work-plan in order to suit with the available funding.

# Extended session

**Topic #8**: Welcome of the Russian colleagues; discussion of the agenda; approval of the shortened minutes

A.Zurita opened the extended session of the meeting and welcomed the Russian participants. A change in the sequence of presentations was discussed and accepted. The shortened minutes were accepted without any changes.

Nine Russian scientists attended the meeting. Five of them gave presentations on the status of ongoing ISTC projects, project proposals or ideas, which can 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 #9**: Further steps of Euratom FP-6 on severe accident research and interaction with the ISTC CEG-CM/SAM

A.Zurita described some elements of the nuclear activities within the Euratom 6th Framework Programme (FP) and gave some outlook on the 7th FP. The 6th FP aimed at intensifying and deepening the well established co-operation at European level striving towards greater integration by promoting research in key priority areas and international co-operation with partners from third countries. The objectives are focusing on areas where community actions can provide the greatest European added value and greater efficiency by channeling resources to bigger projects of longer duration as well as close partnership with the EU member states and different European organisations by networking European research to overcome fragmentation.

A “Network of excellence for a sustainable integration of European research on severe accident methodology and management” has been formed, called SARNET (Severe Accident Research and management NETwork), which will start its activity in April 2004. SARNET will provide an appropriate frame for achieving a sustainable integration of the European research capacities on severe accidents. Significant activities will be the elaboration of large scientific databases, the definition of priorities for research of common interest to the network, education, training and mobility. Very strong links are expected with on-going projects financed by the EC through other programmes as ISTC, TACIS or PHARE. The possible creation of a Russian ISTC topical programme on severe accidents would consolidate the interaction with EC-SARNET. A.Zurita described finally the 6th FP instruments, the exercise ‘Expression of Interest’, the next calls for the 6th FP and first thoughts to the planned 7th FP. He also pointed out the new I3 instrument (Integrated Infrastructure Initiative) and the presence of the nuclear reactor safety issue in the future programme.

**Topic #10**: Revised Chernobyl ISTC project proposal on “Development of analytical models for the processes that took place with nuclear fuel of Unit 4 of the Chernobyl NPP during the active phase of the accident” (RRC-KI, IBRAE)

V.Strizhov from IBRAE presented the revised ISTC project proposal that considered the changes and recommendations of the CEG-SAM group. The group suggested in its revised recommendations to change the title of the project into “Analysis of fuel containing mass (FCM) behaviour during the active phase of the Chernobyl accident/Chernobyl lessons” with the acronym CHESS. The official ISTC registration number of the project is: #2916.

The objective of the project is the analysis and interpretation of the FCM behaviour during an active phase of Chernobyl accident accounting for a wide spectrum of available data with the use of extended models. The major tasks are: 1) the accumulation, assessment and analysis of initial data for different stages of the accident progression including the assessment of the graphite impact on the accident progression, 2) development of the database for the modelling of FCM behaviour in the 4th Unit of the Chernobyl NPP, 3) additional measurements of chemical compositions of once molten material, and 4) use of existing models for the evaluation of the FCM state and identification of the lack of phenomena knowledge and lack of data necessary for code use and validation. The timing of events of the accident as initial melt formation, spreading and relocation into the different rooms of the complicated structure of the RMBK reactor was described in detail. Examples of 3D computations of molten corium spreading were shown. What seems to be difficult in the calculations is not the timing of melt relocations, but their final locations in the numerous RMBK compartments.

Since no measurements of the carbon content in the various materials were made its influence on the material properties hardly can be assessed. However, some aspects as graphite burning and the impact of graphite on the heat source can be analysed.

The obtained overall results of the project will be of interest for the prognosis of long-term corium behaviour in core catchers, which are being developed for some NPP concepts for EPR and VVER-1000. In a follow up project (step 2) analytical and modelling activities are envisaged as improvement of the input decks and models followed by a final intercode comparison

After the presentation an extensive discussion on the project proposal took place. Of great interest will be the estimation of the influence of graphite in the melt on corium spreading. The carbon concentration in the various relocated corium melts and its chemical state were not determined. Only if necessary, the data should be determined in a limited number of cases, keeping in mind, that this will be rather difficult and expensive. The obtained information may be of interest with respect to the long-time behaviour of corium and the confinement of the destroyed Unit 4 of the Chernobyl reactor.

Concerning the interaction between the the Russian scientists and the EU collaborators (who should send their letters of support to ISTC; see action 5/1) it was recommended to discuss and exchange models before code comparison calculations with different code systems will be performed.

**Topic #11**: New proposal on “Determination of parameters of fission product release fromVVER irradiated fuel under beyond design basis accident conditions”

A.Lukianov from IPPE presented the ISTC project proposal. The project covers 2 planned activities: 1) experiments on the release of fission products (FP) from VVER oxide fuel 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 propogation test tubes. The ratio of activities is 2/3 on experiments and 1/3 on analytical work. A new semi-empirical model of low-volatile FP release (Cs, Ru) by combination of intra- and inter-granular diffusion was developed. The coupling between the the thermohydraulic code KUPOL and the new aerosols dynamic model enable the prediction of FP (aerosol) propagation toward and into the containment considering condensation and coagulation phenomena. The FP release and aerosol experiments were conducted up to temperatures of 2100°C in inert gas and in a steam environment. On-line Kr measurements are carried out. There is no re-irradiation possibility of the sample before the test. Experiments in air will be possible, but have not yet been conducted. The maximum temperatures that can be reached in the test rig will be 2500°C. The burnup of the fuel varied between 6,3 and 27MWxday/kgU. In addition the influence of structure materials as Zr and stainless steel in the hot zone on FP release and aerosol formation can be determined. The tests have been conducted with 2 to 5cm long fuel rod segments that were examined by gamma-spectrometric measurements before and after the tests to determine the FP inventory. The used crucible material was ZrO2.

**Topic #12**: New proposal on “Development of models and calculation tools for justification of radiation safety under NPP severe accident conditions”

Yu.Leontiev from SPAEP presented the refined project proposal with the changed title “Ex-vessel source term analysis” (EVAN). The new features will be extra investigations of some ex-vessel phenomena with high impact on the source term and its consequences. 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 project tasks are: 1) choice of the reference accident scenario analysis and input data for late phase source term assessment as fission product inventory in the fuel, 2) molten pool FP release analysis, 3) local aerosol behaviour analysis, 4) iodine species behaviour analysis, and 5) assessment of the environmental source term and its consequences, radiological impact and mitigation measures. Choice of the severe accident phenomena groups to be addressed in the project was based mainly on the insights gained after FP4 project «Evaluation of the key uncertainties in predicting the source terms from severe accidents» (STU). Additionally, FP molten pool release task is closely related to the earlier FP4 and FP5 projects «Fission Product Release from Molten Pools» (MP) and «Late Phase Source Term Phenomena» (LPP). Altogether 5 Russian organisations with different expertises will be involved in the project. The expected CEG-SAM contribution will be the choice of the plant of interest and reference accident scenario, the discussion on the project goals and the connection with other ISTC and EC projects. The five tasks were decribed in detail.

The extent of the project is very wide and the planned activities should therefore be concentrated on selected specific tasks, which will be recommended by the CEG-SAM group in a memo. In general, the assessment of the environmental source term, its consequences and the analysis of mitigation measures should be of more generic nature and should not concentrate on specific plants/sites.

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

S.Bechta presented the topics and summarized the essential results of the 3rd CORPHAD (phase 2) project meeting with collaborators, which took place on February 9, 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. Progress in the field of phase diagram investigations was achieved for the quasi-binary systems ZrO2-FeO, UO2-FeO and SiO2-Fe2O3. First results of liquidus temperature measurements in the ternary system U-Zr-O were obtained. The reactor application of the results will be used for the optimisation of the thermodynamic database, thermodynamic code validation and corium behaviour modelling.

The programme and future activities in the CORPHAD-2 project will be discussed and if necessary updated at each meeting.

**Topic #14**: Status on the on-going project #833.2 (METCOR-2)

S.Bechta reported on the outcome of the 4th METCOR (phase 2) project meeting with collaborators that took place on February 10-11, 2004, in connection with the CEG-SAM meeting. At that meeting results of the Pr1-MC7 (pre-test) and MC7 tests (interaction of sub-oxidized C30 corium with vessel steel) and the post-test anylysis were presented. Two characteristic different stages (depths) of ablation of the steel specimen took place at corium melt temperatures below 1400°C. The steel ablation is not uniform and an accelerated ablation (2nd stage) was observed after 5h exposition time (incubation period). The observed eutectic phase at the interface forms at about 1090°C, which is lower than presently used in calculations.

**Topic #15**: ISTC project proposals #1445 and #1448

This topic was not presented and cancelled.

**Topic #16**: Development of a data base for thermo-physical properties of corium

This topic was additionally considered in the agenda. It was presented by V.Strizhov (IBRAE). The development of the database is a joint work of IBRAE and CEA. The objectives are to collect or assess generic plant specific data, materials properties and the documentation of material properties models for computer codes as well as the input data. The required material properties are of thermodynamic, thermophysical and mechanical nature. In a state-of-the-art review the available databases will be summarised. The existing properties data relevant for severe accident studies will be then jointly assessed and areas of lack of knowledge will be identfied and proposals for specific material property measurements will be made. The thermo-physical properties of pure components and relevant mixtures of components addressed by this project were described. This project was a joint CEA-IBRAE project in an ISTC framework, not funded by the EC.

**Topic #17**: ISTC project proposal on “Development of verified models and three dimensional calculation codes for numerical modeling of corium spreading and interaction in VVER type reactors under severe accident conditions”

A.Lukianov from IPPE presented this project proposal, which was initially not considered in the agenda and that was already presented at the last CEG-CM meeting in St.Peterburg by V.Kumayev. At that meeting the group requested some modifications. Special interest was expressed regarding the description of the in-vessel corium melt behaviour and progression in porous media.The two-dimensional DINCOR computer code is used for numerical simulation of two-dimensional dynamics of multi-component medium with phase changes (melting, solidification) and chemical interactions between components. The transition from 2D to 3D will provide the possibility to simulate overall non-symmetric flow of the medium and the investigation of local processes such as blockages in the core.

The tasks of a possible ISTC project could be the development of local mathematical models of liquefaction and solidification of materials under front melting and melting as a result of inner heat sources, of models for multi-component medium segregation and models for the dissolution and chemical interaction of reactor core materials in the multi-component medium representing corium. The code should then be applied to real plant simulations.

Lev Tocheny pointed out the possibility to organise an ISTC topical meeting on numerical modelling.

**Topic #18**: Discussion on other possible ISTC project proposals

L.Tocheny described briefly a few old and new ISTC project proposals:

> The ISTC project proposal #2219 on “Pecularities of steam explosion in the corium-water system” is approved without funding. V.Melikhov from EREC had not responded to the request of a more detailed proposal since his last appearance in Karlsruhe, October, 2002.

> The ISTC project proposal #2107 on “Thermophysical properties of UO2 and other materials”, funded by the US, is underway.

> The ISTC project proposal #1134 on “Facility for modelling reactor accidents” (LUTCH), submitted in 1997, has been reactivated. In the facility PARAMETER, 2m long UO2 containig fuel assemblies can be tested under high external pressure conditions at elevated temperatures. The updated proposal should be presented and discussed at the next meeting.

> The project proposal from NIKIET on “Development of an innovative concept on a core melt localisation facility” was presented in Moscow, February, 2003, and again briefly presented by L.Tocheny.

**Restricted session** (continued)

**Topic #19**: Detailed discussion and preparation nof the CEG-CM/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 advice and priorities of the proposals.

Discussion on the revised Chernobyl ISTC project proposal (topic #10) on “Analysis of fuel containing mass (FCM) behaviour during the active phase of the Chernobyl accident / Chernobyl lessons”, called CHESS. The group agreed that the proposal was very suitable and considered it worth funding. An advice should be prepared and sent to the EC and ISTC before the next ISTC Governing Board (GB) meeting in Moscow, March 1, 2004. In addition, letters of support from collaborators (CEA, FZK, GRS, IRSN, JRC-ITU) should be sent to ISTC as soon as possible. On the other side, V.Strizhov (IBRAE) will prepare a revised ISTC project proposal, based on the recommendations of the group, which will be send via L.Tocheny to the GB.

The group then discussed the new proposal (topic #11) on “Determination of parameters of fission product release from VVER irradiated fuel under beyond design basis accident conditions”, presented by A.Lukianov. The IPPE fission gas release tests and calculations were considered by the group as very useful, since very little data on VVER fuel are available. These data could be used for model development and validation. The primary interest of the group are the experimental results and to a smaller extent model developments and calculations. It was proposed that a small group will formulate the specific interest of the group in this topic and will give some recommendations on the experimental measurements, which should be considered in a revised ISTC project proposal prepared by IPPE. This proposal should then be presented and discussed at the next CEG-SAM meeting. The ad-hoc working group will consist of B.Adroguer, D.Bottemley, 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 (Action 5/5).

The extent of the new proposal on “Ex-vessel source term analysis (EVAN)”, topic #12, presented by Yu.Leontiev (SPAEP), was considered as too wide and the planned activities (5 tasks) should therefore be concentrated on selected certain items, which will be recommended by the CEG group in a memo. The ad-hoc working group will be composed of H.-J.Allelein, B.Adroguer, D.Bottomley, G.Cognet, M.Fischer, and W.Tromm. D.Bottomley is the co-ordinator of the group and will prepare a first draft of the memo in which recommendations on the scope of the project and the added value to the EC should be indicated (Action 5/6).

The ISTC project proposal #1134 “Facility for modelling reactor accidents” (LUTCH), topic #18 is also of interest for the group. The proposal deals with the development and construction of an experimental facility, called PARAMETER (CORA-type facility), and some additional analytical activities on the high-temperature material behaviour of VVER fuel elements. The experiments can be conducted with 2m long UO2 fuel rod simulators under high external pressure conditions, for this reason the facility will provide some new valuable experimental opportunities in this research area. A.Miassoedov will contact LUTCH to obtain (and distribute) more information on the facility before the next meeting, at which a detailed presentation of the PARAMETER facility by LUTCH should be given (Action 5/7).

L.Tocheny mentioned once more the NIKIET proposal on a special core catcher design. The project looks into the melt behaviour in a core catcher within a cooled vessel. The group did not show great interest in this subject, since in this research area no new or additional experiments are needed for the EU. The added value of knowledge to the EC would be only very small. NIKIET should be informed by L.Tocheny that the CEG-SAM group is not interested in the presented core catcher design (Action 5/8).

The CEA-IBRAE project recently launched on “Development of a data base for thermo-physical properties of corium”, presented by V.Strizhov, was of special interest to IRSN. G.Cognet (CEA) promised to send a copy of this project to IRSN. However, the other organisations of the group would also be interested in this document (Action 5/13). It was briefly discussed, if the project could be extended by additional funding from ISTC.

Discussion on the ISTC project proposal on “Development of verified models and three dimensional calculation codes for numerical modelling of corium spreading and interaction in VVER type reactors under severe accident conditions” (topic #17). A.Miassoedov expressed his interest in the DINCOR code system, which could be of interest for calculations of experiments conducted in the LIVE facility (FZK). The DINCOR 3D calculations for 2 fluid flow were recognised as being an advanced model in a very difficult area. The 3D tool 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 (Action 5/9).

In any case, the project proposal should not be rejected and, therefore, to be discussed in future once more. A small workshop in this research area could be of interest.

**Topic #20**: Other issues

A.Zurita informed the group on the status of various ISTC projects. The ISTC project #1648-2 has been approved. The projects #2916 (CHESS) and #2936 will be or were submitted to parties for GB decision in March 2004.

S.Bechta requested the group to have extended ISTC project meetings on on-going projects in connection with CEG-SAM meetings only once a year, preferentially in Russia. At the next CEG-SAM meeting the project leaders will inform the group on the achieved progress without having an official project meeting. The CEG-SAM group agreed to this reasonable proposal.

A.Zurita and L.Tocheny suggested the group members to prepare a list of topics of specific interest for the group, which should be submitted to ISTC. This procedure could probably be more efficient for the Russian scientists to prepare project proposals. For example, there exist no ISTC project proposal on in-vessel core melt retention, which would be of interest of the group. In addition, it will be benefitial if possible connections of ISTC project proposals with EU projects can be indicated.

L.Tocheny pointed out that letters of support for collaboration were not complete (see topic #5 of the 4th CEG-CM meeting). He recommended that all collaborators should check their status. The information caused some confusion on the distribution and receipt of the letters of support, because –based on the statements in the last minutes- the group members assured they have sent their letters of interest to ISTC. In future, the letters of support to act as collaborator should be send by air-mail and additionally by e-mail or fax to L.Tocheny and A.Zurita.

A letter of support has actually come from Prof. Theofanous (UCSB) for the METCOR phase 2 project. ANL had not applied for collaboration in phase 2 of the CORPHAD project up to now. Both organisations were collaborators of the first phases of those projects. Due to the fact that the group did not agree to have collaborators from outside the Financing Party both American organisations can not be considered to be collaborators. The chairmanship should inform Prof. Khabensky on the outcome of this discussion (Action 5/10).

In order to provide all presentations of the Russian scientists on ISTC project proposals and other documents to the members of the CEG-SAM group A.Miassoedov (FZK) will contact persons responsible for the web management at ISTC, to set-up a web site from which the documentations can be downloaded. The access to restricted documents should be protected by a password (Action 5/11).

It was proposed that CEG-SAM meetings in Russia could be joined up with other workshops/events on severe accidents so that more Russian organisations could participate. ISTC also has a transmutation and a HTR Contact Expert Group (CEG). Both are looked after by L.Tocheny.

A possible CEG-SAM workshop could also be organized together with other CEG groups or in connection with a EC-SARNET or a FISA meeting. A.Zurita favours however any workshop in connection with an ISTC meeting in Russia, in order to bring the EU information to the Russian organisations and get more significant impact in Russia.

The financial problem of the ISTC project #1648-2 (QUENCH), topic #7, was once more discussed. It was recommended that W.Tromm (FZK) should first try to solve the problem in connection with the other collaborators. Maybe ISTC can put additional money into the project; L.Tocheny will check this possibility and inform W.Tromm on the outcome.

**Topic #21**: Next meeting

The next CEG-SAM meeting will take place in Dimitrovgrad, in the week of September 13 to 17, 2004. It will be kindly organised by V.Smirnov. Project meetings on CORPHAD-2, METCOR-2 and QUENCH are planned in connection with the CEG-SAM meeting. In this regard, J.Stuckert should inform V.Smirnov (Action 5/12).

**A. Zurita** (Chairman) **P. Hofmann** (Secretary)

**Annexes:**

1. Revised final agenda of the meeting
2. List of participants
3. List of ISTC CEG-SAM related projects (updated 17.02.2004)
4. Specific action list (see below)

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Annex 4:

**Specific Action List**

5th CEG-SAM meeting, Paris, February 2004

4/9 – generic: Distribution of requested documents on various ISTC proposals in advance to the meetings.

5/1 - Topic #4: 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 A.Zurita.

5/2 – Topic #5: The list of ISTC CEG-SAM related projects should be updated and completed (L.Tocheny, A.Zurita).

5/3 – Topic#6: 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).

5/4 – Topic #7: The collaborators of the project #1648.2 should try to solve the financial difficulties together with the ISTC secretariat (L.Tocheny) that resulted due to strong changes in the exchange ratio between the Euro and US dollar. W.Tromm will coordinate the necessary activities.

5/5 – Topics #11,19: 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.

5/6 – Topics #12,19: 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 on the paper of Yu.Leontiev on ex-vessel ST analysis (EVAN) should be indicated. D.Bottomley, the co-ordinator of the group, will prepare a first draft.

5/7 – Topics #18,19: The technical capabilities of the project proposal #1134 on fuel assembly tests under severe accident conditions by LUTCH should be checked by A.Miassoedov / J.Stuckert.

5/8 - Topic #19: NIKIET should be informed that the CEG-SAM group is not interested in the presented proposal on core catcher design (L.Tocheny).

5/9 – Topics #17,19: 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.

5/10 – Topic #20: Prof Khabensky should be informed on the decisions of the US collaborators on the projects #833.2 and #1648.2 (A.Zurita, L.Tocheny).

5/11 – Topic #20: 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.

5/12 – Topic #21: 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.

5/13 – Topic #19: 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”