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

**CONTACT EXPERT GROUP on SEVERE ACCIDENT MANAGEMENT (CEG-SAM)**

*To:* R. Burmanjer (EC, DG-RTD / D.3) *Advice no.:* A -12

*Project code:* ISTC # 3635 *Date:* 25th March 2007

*Signatures:* P.Hofmann (Secretary)

*Linked meeting:*  11th CEG-SAM meeting, Dresden, Germany, March 7-9, 2007.

*Attending members:* Altstadt, Willschütz (FZD); Azarian, Nie (AREVA); Bottomley (JRC/ITU); Cenerino, Clement (IRSN); Ducros, Journeau (CEA); Dutheillet (EdF); Güntay (PSI); Herranz (CIEMAT); Koch (RUB); Miassoedov, Stuckert, W. Tromm (FZK); Krause (AECL); Trambauer (GRS)

*Copies:*  CEG-SAM members; M. Hugon, J. Sanders (EC, DG-RTD / D.3), S. Webster (EC, DG-RTD / J.2), L.Tocheny (ISTC, Moscow)

\* Subject: - “Scale experimental investigation of the thermal and structural integrity of the VVER pressure vessel lower head in severe accidents”

\* EU Collaborators: - FZD, and eventually other organisations

\* Documents: - ISTC project proposal #3635; “VVER Vessel in Severe Accident” (Version March 2007), Leading Institution: MPEI, Moscow

\* Advice: - **EU funding recommended after the proposal has been revised**

\* Justification: - This project proposal will last for 3 years for a total cost of 567640 US $. The revised proposal, which will take into account the comments below, will be less expensive and the CEG-SAM will propose a funding adequate for this new proposal

The group supports the execution of this project aimed at providing additional information of in-vessel retention that are of direct relevance to the current operational VVERS. The project proposal is dedicated to experimental and numerical investigation of lower head failure within IVR scenarios. Scaled models of the VVER LH, which will be electrically heated and pressurized, are used for the experiments. The experiments are oriented to creep / viscoplastic failure of the vessel wall.

\* Recommendations: - The proposal is worth funding subject to a more precise elaboration of the work plan. In particular the following questions should be addressed:

* It is planned to use 4 vessels of VVER-LH shape with a maximum scale of 1:5. It should be mentioned, which specific VVER design is envisaged (440, 640, and 1000). Moreover, the minimum scale should not be less than 1:10 (FOREVER).
* Concerning the heater design: which heat flux along the polar angle will be realised (homogeneous or a peaked, location of hot focus)?
* Before and after the test, a wall thickness "map" of the vessel should be recorded.
* The scheme of measurement position should be more detailed; it is recommended to place some thermocouples inside the wall (at positions with moderate mechanical load).
* Material creep tests are proposed in the range of 750 to 1300 °C for failure times of 30 h and above. It is proposed to conducted tests such that in total, the old and new tests should cover a temperature range from 500 °C to 1300 °C and failure times from 1 to 50 hours. The accompanying tensile tests should be performed with sufficiently high strain rate to avoid relaxation due to creep in these tests.
* The creep tests should allow for evaluating the scatter of creep and plasticity properties; i.e. there should be at least three tests per temperature and stress level; some of the tests should repeat the same conditions (temperature and load) as they have been applied in the REVISA-programme for the French 16MND5, or in other programmes, to allow a direct comparison of European and VVER vessel steels.
* The creep test specimens are planned to be manufactured from the tested vessels. Care should be taken, that the mechanical properties are not falsified by the preceding LH experiments (creep damage, heat treatment).
* The aim of the project to get insights for further research on core catcher designs should be removed from the proposal. The general scope of the work should focus on generic research rather than on commercial applications!
* Comments: -This project will bring additional material properties data needed to expand ASTEC models to simulate VVER lower head creep behaviour. This will also bring important additional data to the METCOR-P project (#3592) where a comparison of European and Russian reactor steel interaction with corium will be carried out.

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| Dissemination level : RE: restricted to EC, CEG-SAM members, ISTC and CIS beneficiaries |