

Contact Expert Group (CEG) on ISTC ADS projects
Summary Records of the Fifth (or Second EU CEG) Meeting

Forschungszentrum, Karlsruhe

February 1, 2002

Meeting was organised by EC, ISTC and FZK. FZK was a host of the Meeting, organizing also two very interesting technical tours and social program. All participants appreciated a very good organization and hospitality of FZK.

I. Welcome and approval of the agenda

W. Gudowski, Chairman of the CEG, welcomed the participants and invited them to introduce themselves. M. Hugon was kindly ask to be the Secretary. M. Hugon reminded that he had been nominated Secretary for one year only, but accepted to be Secretary for this meeting only.

List of the participants, the CEG members and guests of this meeting is given in Attachment 1.

The agenda was approved (see Attachment 1).

II. Review of the CEG activities in 2001

1. Minutes of the fourth CEG meeting in Stockholm in January 2001 (see Attachment 2)

W. Gudowski presented first a CEG Annual Report for 2001 (see Attachment 3) and then reported and reviewed the action plan decided during the fourth CEG meeting in Stockholm in January 2001. Most of the tasks and actions have been successfully completed and do not require any further activities.

The actions were:

1. M. Hugon is responsible for preparation of the minutes of this meeting – **completed.**
2. W. Gudowski contacts co-ordinator of n-TOF-ND-ADS project informing him about # 1749 - **closed by the CEG on ADTT.**
3. W. Gudowski and J. Blomgren inform co-ordinator of HINDAS project on # 1971 – **done.**
4. W. Gudowski initiates talks with US-partners on 50-50 financing of # 1971 – **project financed by USA.**
5. W. Gudowski will ask the Japanese to have access to the results of the project #1828, **which is funded by Japan – to be done again.** He will also send the

- proposal for information to the co-ordinator of the FP5 n-TOF-ND-ADS project.
6. W. Gudowski takes action on # **1755**: suggests Mr. Finck, be the driving force of this project and will send proposal to the co-ordinator of the FP5 MUSE project for consultation – **closed by the ISTC Governing Board.**
 7. W. Gudowski will send proposal # **1886** to the co-ordinator of the FP5 SPIRE project and to Mr. G. Bauer (PSI) for consultation - **closed by the ISTC Governing Board.**
 8. W. Gudowski will send the proposal #**2048** to the co-ordinator of the FP5 TECLA project for consultation – **done.**
 9. C. Broeders will assess the whole proposal # **2048** and its cost, which seems to be very high – **completed, proposal accepted for funding by the Governing Board.**
 10. C. Broeders (FZK) will be the monitor for project # **1372** – **project not yet signed by ISTC.** He has made the link with Mr. F. Kaeppler (FZK), who participates to the n-TOF-ND-ADS – **done.**
 11. W. Gudowski will discuss matching funds for # **1372** with USA and Japan. Once accepted, this project should be coupled to the FP5 n-TOF-ND-ADS project – **project financed by EU only.**
 12. M. Hugon together with Mr. J.-F. Dozol (CEA) will monitor # **2068** – STCU # **Rus-09 (j)** – **project STCU # Rus-09 (j) started on 1 January 2002, but project # 2068 not yet signed by ISTC.**
 13. W. Gudowski will discuss matching funds from Japan and USA for # **2002**. Looks after coupling with the FP5 HINDAS project - **project financed by EU only, started on 1 January 2002.**

2. Project # 1606: Molten salt technology for radwaste and Pu treatment

The kick-off meeting of this project was held in the closed city of Snezhinsk in the province of Chelyabinsk on May 31 - June 1, 2001. The record of decisions is given in Attachment 3.1

M. Hugon mentioned that Western collaborators should maintain funding on long-term R&D projects, such as the molten salt loop, when it is installed in one of the hot cells in Snezhinsk. In the past, experiments for fusion studies have been built in closed cities with ISTC funds, but have been subsequently abandoned because of change of interest of the financing parties (in this case, European countries).

This project should be linked through the CEG with the ISTC project # 1486 (Cascade sub-critical molten salt reactor for RW transmutation), which is funded by the USA and Japan. The link could be achieved directly by the Kurchatov Institute, which is participating in both projects. **No link has been established yet!**

Project # 1606 is coupled to the FP5 concerted action MOST (molten salt reactor) in the area of “Safety and efficiency of future systems”. V. Ignatiev (KI) was invited at the second meeting of the MOST project in Cadarache on 21-22 January 2002.

3. Project # 559: Pilot flow lead-bismuth target of MW power for ADS

The ISTC Molten Metal Target Advisory Group met on November 12 from 8 p.m. to 10 p.m. during the AccApp/ADTTA'01 conference in Reno (Nevada). This EU-Russian-US advisory group was set up 3 years ago in the framework of ISTC project # 559 (funded by USA (500 000\$), EC (250 000\$) and Sweden (250 000\$)). Its objective is to monitor the progress of the fabrication and test of a liquid lead-bismuth target in Obninsk and its subsequent transfer to the LANSCE facility in Los Alamos to study its coupling with the linac.

The participants were made aware that the cost for the installation of the target in the LANSCE facility was 20 million \$ and that LANL had no such funding available. An alternative solution proposed by the USA was to install the target in the University of Nevada in Las Vegas (UNLV) as an installation to train students on lead corrosion and thermodynamics without irradiation. UNLV is willing to invest 2 million \$ per year during 4 years for this.

A task force was set up with H. Ait Abderrahim (SCK.CEN) and J. Knebel (FZK) to propose a joint EU-US programme for the target. Meanwhile, H. Ait Abderrahim has expressed a strong interest to install the target in SCK.CEN Mol.

III. Presentation on ISTC projects

1. Proposal #2048: Improvement of Corrosion Resistance of Constructional Steels in Liquid Pb and Pb-Bi Alloys by Means of Their Surface Modification with the Help of Pulsed Electron Beams and Protective Coatings

The original proposal, which was first unofficially submitted at the last CEG meeting, was assessed by C. Broeders. A new proposal has been prepared with a reduced cost (640 000 \$) and has been sent to the second Governing Board meeting of 2001. It has been accepted for funding and the work plan sent to ISTC.

A. Rusanov (IPPE Obninsk) reported on the objectives of the project, which are to study the corrosion of pre-coated steels in liquid lead alloys at 550-650 °C. V. Engelko (NIIEA St Petersburg) explained how to put a 20 µm aluminium coating on the steel surface with an intense pulsed electron beam.

The foreign collaborators of this project are G. Müller (FZK), CIEMAT and CEA.

Action on G. Müller: ISTC project # 2048 should be coupled to the FP5 TECLA project and be associated with the TESTRA cluster on technological support for transmutation.

A participant asked whether the stability of the protective coating to radiation was improved by the electron beam treatment.

G. Heusener questioned whether irradiation of certain lead isotopes was creating dangerous isotopes. If it is true, then a process is needed to separate those lead isotopes.

Action on V. Engelko: Find out if it is possible to get the data on generation of dangerous isotopes from Pb-Bi cooled reactors used in submarines.

2. ISTC related nuclear data projects in Russia

S. Yavshits (KI) made a summary of the ISTC funded projects on nuclear data for transmutation. A table including 50 proposals submitted to ISTC for funding in this area was distributed by L. Tocheny (ISTC). The large number of ISTC proposals related to different aspects of nuclear data are completed, on-going, or proposed (for spallation reactions in target, for transmutation reactions in reactors and subcritical blankets, driven by accelerator or fusion driver) - within thermal, fast and very fast neutron spectrum at the range 1 eV - 3 GeV. Initialisation of the projects is often quite chaotic, not always based on a principle of "supply-and-demand". There is virtually no coordination between proposals, proposals are in competition for approval and there are no working mechanisms to enforce a natural coordination. Therefore the CEG recommends to create a short-term ISTC project with the following objections:

1. Review and summary of the all ISTC-funded nuclear data projects. If scientifically motivated other projects not funded by ISTC (like so called back-ground results, library activities – as for example photonuclear data coordinated by IAEA) could be also included.
2. Review of the implementation of the final results of data projects – like contribution to nuclear data libraries, availability from nuclear data libraries, new nuclear data files etc.
3. In collaboration with nuclear data community – updating “The High priority request list for nuclear data at low and intermediate energies” with formulation of recommendations for further focus of ISTC projects.

Experts from relevant Russian institutes should be participating in this project in order to guarantee its broad scope (to CEG knowledge most active institutes are IPPE, ITEP, JINR, Arzamas, Khlopin RI, Kurchatov, MIFI, NIKIET + some more)

Moreover, CEG strongly recommends publishing the set of selected nuclear data related papers under the ISTC label with results of completed projects in a special issue of e.g. "Nuclear Instruments and Methods".

Actions on L. Tocheny:

- What is the situation with TENDL ? This data base was promised in project ISTC # 1145
- In order to be useful, the data obtained in the ISTC projects funded by the EU should be delivered to the JEFF Committee for evaluation. This will allow finding out the gaps and possible overlaps with FP5 projects. Similarly, the data coming from the projects funded by Japan (JAERI - JENDL), KOREA (KAERI) and USA should be sent to the relevant data libraries.
- There should be co-ordination between the Russian institutes providing nuclear data. CJD Obninsk is the nuclear fission data centre in Russia, but KRI St Petersburg proposes to make a web page for nuclear data.
- The results obtained in the ISTC projects on nuclear data should be published in the journal “Nuclear Instruments and Methods”.

3. Proposal # 2267: Creation of Sub-critical Assembly Driven by Proton Accelerator (SAD)

The SAD project at JINR in Dubna is indirectly linked to the FP5 MUSE project through the University of Mining and Metallurgy (UMM) of Krakow (Poland). UMM is an assistant contractor to KTH, a principal contractor of the MUSE project.

The SAD project is at present funded by CEA, CIEMAT, FZK and KTH. Its aim was to prepare proposal # **2267**: Creation of Sub-critical Assembly Driven by Proton Accelerator (SAD). The purpose of this proposal is the development and construction of an experimental installation (SAD) using the existing 660 MeV synchro-phasotron proton accelerator in JINR and a sub-critical MOX fuel blanket. The present conceptual design of the experimental sub-critical assembly in Dubna (SAD) is based on a core with a nominal thermal power of 15-20 kW. This corresponds to a multiplication coefficient $k_{eff}=0.95$ and an accelerator beam power of 0.5 kW.

The proposal is co-ordinated by JINR Dubna and has NIKIET Moscow, Mayak Ozersk, GSPI Moscow and VNIIM Moscow as partners. The total cost of this 3-year project is 1 750 000 \$, of which 1 200 000 \$ are requested to ISTC. The rest of the funding will be provided by JINR and its member states.

A joint seminar was organised with FZK/IRS, where V. Shvetsov presented the on going SAD-related experiments in Dubna and the SAD project proposal # **2267**. This seminar provided background information for evaluation of project # **2267**.

The SAD experiment is different from the MUSE experiment by the size of the installations, the neutron producing target and the power level of the sub-critical core. SAD is a compact experiment with a one-meter diameter and 60 cm high core and a real lead target producing neutrons, whereas MUSE has a very large core without target (the neutron energy is 14 MeV). In addition, the power level of the sub-critical core is 15-20 kWth in SAD and a few 100 Wth in MUSE. Therefore the SAD experiment appears to be complementary to MUSE.

SAD project may become the first experimental facility proving feasibility of coupling a real spallation source with a subcritical core. Data obtained on specific MOX fuel, Pb targets and coolants will serve as a gold mine of data for validation of the codes and improving simulation tools for transmutation systems. Moreover, this experiment will deliver very valuable shielding data for intermediate and high energy neutrons.

IV. Evaluation of new ISTC proposals

The results of the evaluation are given in the group ranking table indicating the funding priority (see Attachment 4).

2199: Neutron cross-sections in the resonance energy range and nuclear level densities for fission products, Th, ²³³U

There are no support letters for the proposal. Three potential collaborators are mentioned (two Korean collaborators (Pohang and Kyungpook universities) and one European (TU Delft). IPPE Project Manager and CEG Chairman should consult this project with collaborators.

CEG decision is postponed.

Action on W. Gudowski:

Consult # 2199 with Korea, contact TU Delft.

2213: Measurements of proton- and neutron-induced fission cross sections of separated tungsten isotopes and natural tungsten in 50-200 MeV energy region

This proposal is supported for funding by the CEG with high-medium priority (2nd in the group ranking). Once accepted, it could be linked the FP5 HINDAS project.

2224: New generation eco-friendly high-power ion linear accelerators

This proposal is not supported for funding by the CEG. It will be sent by S. Monti to C. Pagani and A. Müller for advice.

Action on S. Monti:

Send proposal #2224 to C. Pagani and A. Müller for advice.

2253: Investigation of the delayed neutron characteristics from the fission of compound nuclei ^{233}Th , ^{234}U , ^{235}U , ^{244}Am , ^{238}Np , ^{246}Cm , ^{233}Pa , ^{234}Pa , ^{240}Np , Np at the excitation energies from 5 to 20 MeV

This proposal is supported for funding by the CEG with medium priority (3rd in the group ranking). At present, no experimental work is performed on delayed neutrons both in FP5 and ISTC.

2257: Proton accelerator based intense source of radioactive ions for nuclear physics experiments

This proposal is not supported for funding by the CEG. It should be sent to accelerator specialists for evaluation.

2267: Creation of Sub-critical Assembly Driven by Proton Accelerator (SAD)

This proposal is supported for funding by the CEG with the highest priority (1st in the group ranking).

2299: Experimental and theoretical research of the basic parameters of interaction of intense relativistic nuclear beams with matter

This proposal is not supported for funding by the CEG. It should be sent to accelerator specialists for evaluation.

2405: Experimental researches of nuclear physics characteristics of materials essential for the processes of weapon plutonium utilisation and radioactive wastes transmutation

This proposal is not supported for funding by the CEG. As the previous project # 1145 of the same team was completed at the end of July 2001, the final report should be first sent to the CEG prior to evaluation. This project was financed by the USA and had Japan with JAERI as foreign collaborator.

V. Re-evaluation of ISTC proposals evaluated during the Fourth CEG meeting

The results of the re-evaluation are given in the revised group ranking table established during the Fourth CEG meeting in Stockholm (see Attachment 3).

1749: Measurements of the cross sections of fast and resonance neutrons induced fission of minor actinides for their transmutation with accelerator-driven systems

This proposal is closed by the CEG on ISTC ADS projects.

1755: Experimental study of fast and fast-thermal accelerator driven systems on the basis of BFS-1 – microtron complex

This proposal was already closed by the ISTC Governing Board.

1828: Measurements of the Prompt Neutron Spectra of Minor Actinides. Fast Neutron Induced Fission of ^{241}Am and ^{243}Am , Thermal Neutron Induced Fission of ^{243}Cm

This proposal is funded by Japan.

Action on W. Gudowski:

The Chairman will ask again the Japanese to have access to the results of this interesting project. They are of interest for the FP5 n-TOF-ND-ADS project.

1886: Investigations of the irradiation and thermomechanical endurance of the beam window of ADS neutron generating target

This proposal was already closed by the ISTC Governing Board.

1971: Neutron Induced Fission Cross-Sections of ^{240}Pu , ^{243}Am and W in the Energy Range 1 – 200 MeV

This proposal is funded by USA.

Action on W. Gudowski:

The Chairman will ask the Americans to send the data of this project, which are of interest for the FP5 HINDAS project.

VI. Short report on project # 559: Pilot flow lead-bismuth target of MW power for ADS

This point was added to the agenda shortly before the meeting to discuss the possibility of installing the target in SCK.CEN in Mol, as proposed by H. Ait Abderrahim (see Section II.3). P. Kupschus reported that for the MYRRHA project, which is only funded by SCK.CEN, there are two options to use the target loop for licensing purposes: (i) as a demonstration experiment or (ii) run corrosion experiments under conditions relevant to MYRRHA. The first possibility is excluded, because the loop is too small.

A. Rusanov (IPPE Obninsk) felt that it would be very difficult to use the target for other purposes than for irradiation.

L. Tocheny and the CEG encouraged SCK.CEN to discuss with IPPE Obninsk and DOE. Before making a proposal to install the target in Mol, SCK.CEN will ask IPPE whether it is possible or not to export the target to Mol rather than to Las Vegas. If

yes, a cost estimate will be made in about six weeks. If the price is acceptable, a proposal will be made.

Action on Kupschus:

Prepare an option for #559 target experiments at Mol. This is a conditional action depending on negotiations with IPPE and US.

VII. Links between ISTC and EU FP5 funded projects

The possible links between EU FP5 projects on advanced options for partitioning and transmutation and ISTC projects/proposals are identified as indicated in Figure 1 (see caption very carefully).

VIII. FINAL RECOMMENDATION on highest priority projects (see Excel recommendation table for more detail information – Attachment 4)

The highest priority:

2267: Creation of Sub-critical Assembly Driven by Proton Accelerator (SAD)

The SAD experiment has a special importance for the European partners being very complementary to the MUSE experiment and offering important enhancements by using a real spallation target driven by 660 MeV accelerator. The size of the installations, the neutron producing target and the power level of its sub-critical core make this installation very suitable and convenient for many interesting experiments. SAD project may become the first experimental facility proving feasibility of coupling a real spallation source with a subcritical core. Data obtained on specific MOX fuel, Pb targets and coolants will serve as a gold mine of data for validation of the codes and improving simulation tools for transmutation systems. Moreover, this experiment will deliver very valuable shielding data for intermediate and high energy neutrons.

Moreover, a focus on Pb reflector/coolant makes this experiment very important for the European projects TECLA, MEGAPIE and XADS.

FZK, KTH, CEA and CIEMAT have already put significant efforts to design this experiment and to fund some preliminary experiments related to SAD.

Next highest priority (suggested the highest priority for the fall 2002 GB meeting):

2213: Measurements of proton- and neutron-induced fission cross sections of separated tungsten isotopes and natural tungsten in 50-200 MeV energy region

Khlopin's group has a long time experience of a very successful collaboration with Uppsala University, running interesting nuclear data projects on Uppsala accelerator. Moreover, projects run by this group are well integrated into the European projects and in reality Khlopin group acts already now as a subcontractor (funded by ISTC through #1309) to HINDAS project. This group has a unique competence (missing in

European groups) in measurements techniques for fission induced by very high energy neutrons.

Third priority (suggested the highest priority for the fall 2002 GB meeting)::

2253: Investigation of the delayed neutron characteristics from the fission of compound nuclei ^{233}Th , ^{234}U , ^{235}U , ^{244}Am , ^{238}Np , ^{246}Cm , ^{233}Pa , ^{234}Pa , ^{240}Np , ^{241}Np at the excitation energies from 5 to 20 MeV

At present, no experimental work is performed on delayed neutrons neither in FP5 nor in ISTC, however this data are very important for designing transmutation systems. We support this project and we shall integrate it into BASTRA cluster.

IX. Diverse issues

W. Gudowski proposed to change the name of the CEG to **CEG on ISTC Transmutation projects**. A revised versions a the White paper is attached in Attachment 5.

CEG will extend collaboration with IAEA, particularly in projects of common ineterest (like B70, SAD etc. and other transmutation projects)

G. Heusener wished well to the CEG members because it was his last CEG meeting before his retirement next May. Dr. Heusener stressed also that it would be very important to reinvigorate a close collaboration with USA , Japan and Korea. CEG will keep our US, Japanese and Korean colleagues informed about our actions.

Next meeting of CEG will take place – as usual - in January, 2003. Place will be suggested by the chairman in October-November 2002.

CEG acknowledges and appreciates very much EU/ISTC travel support for our Russian guests for this meeting.

X. Summary of ACTION PLAN

V. Engelko

Action on V. Engelko:

Find out if it is possible to get the data on generation of dangerous isotopes from Pb-Bi cooled reactors used in submarines.

W. Gudowski

The Chairman will ask again the Japanese to have access to the results of the project #1828. They are of interest for the FP5 n-TOF-ND-ADS project.

The Chairman will ask the Americans to send the data of this project, which are of interest for the FP5 HINDAS project.

Consult # 2199 with Korea, contact TU Delft.

P.Kupschus

Prepare an option for #559 target experiments at Mol,

S. Monti

Contact accelerator experts – Pagani and Mueller to get review on the proposal #2224

G. Müller

ISTC project # **2048** should be coupled to the FP5 TECLA project and be associated with the TESTRA cluster on technological support for transmutation.

L. Tocheny:

- What is the situation of TENDL ? This data base was promised in project ISTC # 1145
- In order to be useful, the data obtained in the ISTC projects funded by the EU should be delivered to the JEFF Committee for evaluation. This will allow finding out the gaps and possible overlaps with FP5 projects. Similarly, the data coming from the projects funded by Japan should be sent to JENDL.
- There should be co-ordination between the Russian institutes providing nuclear data. CJD Obninsk is the nuclear fission data centre in Russia, but KRI St Petersburg proposes to make a web page for nuclear data.
- The results obtained in the ISTC projects on nuclear data should be published in the journal “Nuclear Instruments and Methods”.

Waclaw Gudowski

Michel Hugon

Attachment 1

Agenda for CEG meeting
Karlsruhe, January 31 – February 1, 2002

Thursday, January 31, 2002, Technical visits

12:00 – 14:00 Optional : Lunch

14:00 – 14:30 Welcome, organisational issues, approving agenda

14:30 – 16:00 Visit to the Minor Actinide Laboratory at ITU, host - J. Magill

16:00 – 18:00 Visit to KALLA laboratory, FZK – host G. Heusener

19:00 - Dinner

Friday, February 1, 2002

8:30 – 9:00 CEG annual activity report – W. Gudowski

9:00 – 9:30 Informal EC evaluation of CEG work D. Gambier/J. Karjala

9:30 – 10:00 Informal ISTC Office suggestions and advices on co-operation with CEG, discussion on broadening of CEG interest scope to Transmutation and Advanced Nuclear Systems –L. Tocheny + discussion

10:00 – 10:15 Coffee break

Presentation of our Russian guests:

10:15 – 11:15 – PB/Bi technology in Russia, status report on Pb/Bi related projects and projects proposals. Status and prospects. Including discussion on status and working plan of #2048 (Improvement of Corrosion Resistance of Constructional Steels in Liquid Pb and Pb-Bi Alloys by Means of Their Surface Modification with the Help of Pulsed Electron Beams and Protective Coatings) – V. Engelko, A. Rusanov

11:15 – 11:30 Discussion lead by J. Knebel, KALLA

11:30 – 12:15 Short review of the ISTC related nuclear data projects in Russia. Making most of the sense from ISTC data projects - S. Yavshits, Khlopin Institute (background presentation for (re-)evaluation of #1749, 1971 and 1828)

12:15 – 12:45 Discussion on technical issues of SAD, collaboration with European projects, time-scale and approval.

12:45 – 14:00 Lunch

14:00 – 15:00 Joint seminar with IRS - “Presentation of SAD project proposal #2267 (Subcritical Assembly in Dubna). On going SAD-related experiments in Dubna, V. Shvetsov (background presentation for evaluation of the project #2267)

15:15 – 15:30 Discussion on technical issues of SAD, collaboration with European projects, time-scale and approval

15:30 – 17:00 Review and prioritising of the current ISTC projects (full copies of the projects together with our evaluation sheet will be e-mail distributed one week before the meeting)

#1749 “Measurements of the cross sections of fast and resonance neutrons induced fission of minor actinides for their transmutation with accelerator-driven systems”

#1971 “Neutron Induced Fission Cross-Sections of Pu240, Am243 and W in the Energy Range 1 – 200 MeV”

2253 "Investigation of the delayed neutron characteristics from the fission of compound nuclei ^{233}Th , ^{234}U , ^{235}U , ^{244}Am , ^{238}Np , ^{246}Cm , ^{233}Pa , ^{234}Pa , ^{240}Np , Np , at the excitation energies from 5 to 20 MeV" and

#2224 "New generation eco-friendly high-power ion linear accelerators".

Short revisit to the projects:

#1755, Experimental study of fast and fast-thermal accelerator driven systems on the basis of BFS-1 – microtron complex

#1828, “Measurements of the Prompt Neutron Spectra of Minor Actinides. Fast Neutron Induced Fission of ^{241}Am and ^{243}Am , Thermal Neutron Induced Fission of ^{243}Cm .”

#1886 “Investigations of the irradiation and thermomechanical endurance of the beam window of ADS neutron generating target”

17:00 – 17:30 Workplan for 2002/2003

17:30 Adjourn

Participants and invited guests:

M Hugon, EC – Brussels

J. Karjala, EC – Brussels

C. Broeders, FZK – Karlsruhe, co-host of the meeting

G. Heusener – Karlsruhe, host of the meeting

G. Müller, FZK – Karlsruhe

S. Monti, ENEA - Rome

P. Kupschus, SCK-Mol

A. Stanculescu, IAEA

L. Tocheny, ISTC - Moscow

W. Gudowski, KTH, chairman of CEG

ISTC guests:

V. Engelko – NIIIEFA, St. Petersburg

A. Rusanov – IPPE, Obninsk

S. Yavshits – Khlopin, Petersburg

V. Shvetsov – JINR, Dubna

Attachment 2.

Contact Expert Group (CEG) on ISTC ADS projects
Summary Records of the Fourth (and First EU CEG) Meeting, January 25-26, 2001

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Contact Expert Group (CEG) on ISTC ADS projects
Summary Records of the Fourth (and First EU CEG) Meeting, January 25-26, 2001

Contact Expert Group (CEG) on ISTC ADS projects

Summary Records of the Fourth (and First EU CEG) Meeting

Royal Institute of Technology, Stockholm

January 25-26, 2001

I. Welcome and approval of the agenda

Mr. W. Gudowski, Chairman of the CEG, welcomed the participants and invited them to introduce themselves. The participants were the CEG members and a few guests (see [Attachment 2.1](#)).

The agenda was approved (see [Attachment 2.2](#)).

II. Review of the CEG activities in 2000

Mr. W. Gudowski reported on the following issues:

1. Minutes of the third CEG meeting in Seoul in January 2000

Mr. W. Gudowski reported and reviewed the action plan decided during the meeting in Seoul. Most of the tasks and actions have been successfully completed and do not require any further activities.

Particularly, actions of :

- | | |
|---------------|--|
| W. Park | gives feedback on Korean priority list and eventual participation in the projects discussed during meeting – completed. |
| W. Gudowski | sends a “working-plan” paper for Obninsk feasibility of Pb/Bi – waits until completion of #559. |
| W. Gudowski | distributes Armenian CRC proposal – completed , US has dropped its interest for this project. |
| M. Salvatores | organizes meetings: with project managers of 1755 (in connection to MUSE meeting), meeting between Ansaldo people and Obninsk Pb/Bi feasibility – contacts have been established, many activities in progress in Pb and Pb/Bi technology. |
| E. Gonzales | will be asked to help to finalize Dubna proposal - completed |

M. Carelli is asked to present this conclusions to our Americans colleagues and to discuss and prompt eventual action to nominate US Chairman of sub-CEG – **completed** (by WG) during meeting of #559 Advisory Committee meeting.

W. Gudowski will present these conclusions during the #559 meeting at DOE in Washington - **completed**

2. Local CEGs

In Seoul, it was decided to split the CEG into local CEGs (EU, Japan, Korea, USA), because the Funding Parties respond primarily to local interests. It was therefore difficult to have matching funds from different Funding Parties for the same ISTC proposal.

Since 1998, there have been important changes in the ADS community. In particular, the level of funding of the ATW project in the USA and of the Partitioning & Transmutation research activities in the EU have increased.

European CEG has created official ties with the ADS Technical Working Group (TWG) and will in the future coordinate its actions with TWG.

In 1996-97, the USA had a strong interest in the R&D activities related to ADS in Russia with some less active profile in the last 2 years, when this interest has decreased. A very active participation of our American colleagues in preparation of the CEG meeting, together with strong verbal commitments from LANL indicate, however, that this interest is growing again and an active participation of US groups in ISTC may be now expected.

The Japanese CEG requires an official recognition from the ISTC Board of Governors to be operational.

There is apparently a good interaction between the EU and Korean CEGs.

III. Evaluation of ISTC projects for the Board of Governors meeting in March 2001

1. Expectation from CEG evaluation

Mr. J. Karjala, representative of the ISTC team in Brussels, gave a short presentation on ISTC. The EU is providing ISTC with about 20 million € every year to finance R&D projects. The evaluation of proposals is made either by a minimum of 2 external evaluators or by a CEG (Contact Expert Group).

Mr. J. Karjala then explained the expected evaluation process from the CEG. After reading each proposal, the CEG members should give their

comments on the ISTC evaluation forms. They will then have a consensus discussion on each ISTC proposal to determine whether it is worth funding or not. The final stage of the evaluation is the preparation of the group ranking table indicating the funding priority

The role of foreign collaborators is given in and that of monitors is given in. The CEG felt that the role and duties of monitors had to be clarified with respect to those of foreign collaborators. Monitoring ISTC projects seems to be a very demanding task and it will be very difficult to find EU experts, more especially because they are not receiving any financial support from ISTC.

In the “partnership programme”, the ISTC provides the structure (funding, services, ...) to approved potential projects. The funding for this programme is coming from the foreign collaborators (e.g. FZK), but not from the funding parties (e.g. EC).

As the ISTC Board of Governors will meet in future twice a year in Moscow, the proposals will be approved for funding in a “continuous process”.

2. Evaluation of ISTC proposals

The results of the evaluation are given in the group ranking table indicating the funding priority.

1749: Fission cross sections for minor actinides

This proposal is not supported for funding by the CEG, because it is too expensive. It will be sent by the Chairman to the coordinator of the FP5 n-TOF-ND-ADS project for consultation.

1971: Fission cross sections at intermediate energies

This proposal is supported for funding by the CEG with high priority (3rd in the group ranking). The EU should fund 45 828 € i.e. 50% of the request. As this proposal is also supported by LANL, the other 50% should be sought in the USA. Tungsten should be replaced by something else. Once accepted, this project should be coupled to the FP5 HINDAS project.

1755: ADS-BFS experiments

This proposal is not supported for funding by the CEG, because its scope is still very vague and requires more accuracy. The CEG suggests that ANL, namely Mr. Finck, be the driving force of this project. A pre-project should be first funded with a small amount of money by the Americans. This proposal will be sent by the Chairman to the coordinator of the FP5 MUSE project for consultation.

1828: Measurements of prompt neutron spectra in minor actinide fission

This proposal is not supported for funding by the CEG, because it has already received funding from Japan at the last ISTC Governing Board. However, the Chairman will ask the Japanese to have access to the results of this interesting project. He will also send the proposal for information to the coordinator of the FP5 n-TOF-ND-ADS project.

1886: ADS beam window endurance

This proposal is not supported for funding by the CEG, because ISTC project # 559 should be completed before. Although the topic is very interesting, the funding of this proposal is deemed too high. The proposal is very theoretical, does not provide any state of the art for data, models and tools and does not propose any new tools for modeling. However, if this proposal is submitted again, it should take into consideration the materials foreseen in the FP5 MEGAPIE proposal. The Chairman will send the ISTC proposal to the coordinator of the FP5 SPIRE project and to Mr. G. Bauer (PSI) for consultation.

2048: Improvement of corrosion resistance of constructional steels

This proposal has not yet been sent officially to the ISTC team in Brussels. It was only received unofficially by the Chairman. The CEG members have not properly evaluated it. Mr. C. Broeders will assess the whole project and its cost, which is extremely high. The proposal should be sent to the second Governing Board meeting of 2001. The Chairman will send this proposal to the coordinator of the FP5 TECLA project for consultation.

1372: Transmutation effectiveness of nuclear waste

This proposal is supported for funding by the CEG with high priority (1st in the group ranking). Task 5 on comparative analysis of transmutation efficiency in fast neutron reactors and ADS should be dropped. The data obtained in this project should be accessible for benchmarking. Matching funds should be sought from USA and Japan. Once accepted, this project should be coupled to the FP5 n-TOF-ND-ADS project. The monitor for ISTC project # 1372 will be Mr. C. Broeders (FZK). He should make the link with Mr. F. Kaeppler (FZK), who participates to the n-TOF-ND-ADS project.

2068 – STCU # Rus-09 (j): Calixarenes for HLW partitioning

This proposal has not yet been sent officially to the ISTC team in Brussels. It was only received unofficially by Mr. M. Hugon. This proposal, which is dealing with aqueous partitioning, has been evaluated by European experts in this field. They strongly supported this very interesting proposal, which is complementary to the FP5 CALIXPART project. They gave recommendations for improvement of the work plan to avoid overlaps with the CALIXPART project. The monitor of this joint Russian-Ukrainian project will be Mr. J.-F. Dozol (CEA), who is coordinator of the CALIXPART project. The CEG supported for funding this proposal with high priority (4th in the group ranking) and recommended the ISTC Governing Board to approve it for funding in the “continuous process”, so that it can start as soon as possible to be in phase with CALIXPART. No matching funds are requested from the other Funding Parties.

2002: Yields of residual nuclei

This proposal is supported for funding by the CEG with high priority (2nd in the group ranking). Once accepted, it should be coupled with the FP5 HINDAS project. The foreign collaborators are Mr R. Michel (Un. of Hannover) and Ms. S. Leray (CEA). Thin target data are very important for the FP5 MEGAPIE proposal. Matching funds from Japan and USA should be sought for this proposal, because it is supported also by these both countries.

Review of US-CEG:

#1749: Fission cross sections for minor actinides

This is an ambitious proposal, and would provide very useful data on Am and Cm isotopes for ADS research programs. The experimentalists have access to separated isotopes for these nuclei, and would measure the fission cross sections in both the fast range (5-30 MeV), and the resonance range (1eV - 30 keV). The proposal will also provide useful data to develop nuclear theory models of level densities and fission, and will impact the development of improved nuclear data evaluations. Whilst this is an extensive project, the request to ISTC for \$680 000 does appear to be rather high.

#1755: ADS-BFS experiments

Rev. G. Vantuyle

It resembles an experiment series we are preparing to run at Los Alamos with some important variations. They propose to use an electron accelerator as a driver, which could produce a modest number of neutrons (less efficient than proton accelerators). A modest number of neutrons could be sufficient, however. They also propose to do the experiment with several blanket arrays. The cost seems about right- \$400K in

comparison to ours (about 10% as much). They probably have greater flexibility regarding fuel components, including plutonium. I think a combination of the tests we plan (using LANSCE) and the ones they propose would provide an excellent data base. Therefore, I think you can safely state that we are interested in the proposed tests.

#1828: Measurements of prompt neutron spectra in minor actinide fission

Rev. Mark Chadwick

This proposal aims to provide new measurements of the fission neutron spectra for ^{241}Am and ^{243}Cm . These data are very important for ADS systems, and currently the existing nuclear database is very poor. The data will positively impact our ability to predict k_{eff} in an ADS transmuter. The high-quality researchers at the Khlopin institute have a rare capability to make high-purity separated radioactive isotopes, and undertake fission measurements with quasimonoenergetic fast neutron beams.

I think the proposal is very important, and the funds requested (222K) are appropriate for this task. Furthermore, their collaborations with quality foreign collaborators at Cadarache (Dr. Jacqmin), Karlsruhe and Belgium, strengthens this proposal. The proposal also will interpret the measurement in terms of fission decay models using Hauser-Feshbach theory. Their results will be of interest to scientists at LANL.

#1886: ADS beam window endurance

Reviewer: Stuart Maloy

It is an ambitious proposal stating that it plans to :

1. Calculate nuclear reaction rates in the window material.
2. Calculate rates of the basic processes inducing radiation damage in the window material.
3. Model the gas accumulation and migration in the window by performing helium ion implantation on the ILU-100 accelerator.
4. Calculate the temperature distribution and mechanical stresses arising in the window
5. Analysis of the degradation of window material properties and prediction of the window lifetime as a function of target power.

This proposal plans to obtain irradiation data from two and possibly three sources. These are the ILU-100 accelerator which can implant He and induce displacement damage using an ion accelerator; previously irradiated specimens of EP-823, EP-450 and Steel-1 and Steel-2 in the fast reactor BR-10 to 26 dpa and possibly irradiation of specimens at the LANSCE accelerator during testing of the demonstration target developed in Project 559. The irradiation data from ILU-100 will be interesting although it will not include the hydrogen effect on materials and the temperature must be accurately measured during this analysis. The analysis of the specimens irradiated in BR-10 will also be interesting although once again, the temperature of the irradiation is crucial as well as the test temperature. Also, it will be important to accurately know the range of neutron energies that are present in BR-10. The most important data would be from the LANSCE accelerator although it may be 2-3 years

when or if this target is irradiated. I do not have much to comment on the calculations.

1971: Fission cross sections at intermediate energies

Reviewer M. Chadwick:

The measurements proposed are of great value to the international accelerator-driven-system (ADS) efforts, including the US effort, and their collaboration involves high-quality Japanese ADS researchers (Hasegawa, Fukahori). The Russian scientists are first-rate.

The proposal is likely to succeed. This group has already successfully measured certain fission cross sections for ADS, up to 200 MeV, under a previous ISTC proposal (609). I have seen their results for this previous work, and the data they obtain appear to be of high-quality. We intend to use these data in our Los Alamos ADS nuclear data work once they are available. The proposed new measurements, on ^{240}Pu , ^{243}Am , and W, will significantly improve the experimental database, and provide useful information to guide actinide and subactinide fission model development. The requested cost of \$91 655 is very modest, and would be money well spent.

#2002: Yields of residual nuclei

Reviewer: N. Li and G. Vantuyle

1. LANL did natural Pb and W, thick target experiment in the mid-1990s and the results were published. They are taken at 800 MeV but has incorporated all contributions from slowed down protons/spallation neutrons etc.
2. There was a subsequent experiment on thin Pb and W targets at 800 MeV, but the results were not published.
3. The intermediate to high energy cumulative yield measurement, resp. at small energy increment and on mono-isotopic thin targets of Pb and Bi, should provide very valuable information for spallation target design, operation and D&D. It was noted in the ADS target studies that the lack of high energy yield data contributed to significant uncertainties and discrepancies. Such data is also scientifically valuable.
4. LANSCE has lost significant capability/expertise to do this kind of experiment. It will take some re-learning and substantial resources to do what the ITEP has proposed to do. If the ISTC # 839 has positive experience, then this experiment is just an extension to that with nearly identical capabilities and there should be no feasibility issue (it is a standard nuclear physics experiment with intense analysis load).
5. On a more speculative note, how the authors plan to differentiate decay or secondary spallation products and dependence on irradiation time is not clear.

From a programmatic point of view, this proposal is certainly worth supporting, in view that this kind of needed nuclear data, even if it's done in Russia, will have the credibility and validity that can be accepted in the West. Not to mention it's something

could be very expensive for us to do. **It also avoids the export/import, proprietary technical know-how and other issues as we encounter in the LBE target project.**

IV. Status of ongoing ISTC projects

1. **# 839-B:** Experimental and Theoretical Study of the Yields of Residual Product Nuclei Produced in Thin Targets Irradiated by 100-2600 MeV Protons

Mr. Y. Titarenko reported on ISTC project # 839-B and presented its draft final report. He informed the CEG that the Japanese proposed to publish it as a JAERI report. This proposal was refused by the CEG, because it had no visibility for the EU and Norway, which were funding project # 839-B (155 000 \$) together with Japan (105 000 \$). It was then discussed on how best to publish this report. As no solution was found, it was decided that Mr. Y. Titarenko would publish it as an ITEP report. Mr. J. Karjala is going to inquire on the ISTC policy concerning the publication of final reports. (*Action on Mr. J. Karjala*)

ISTC proposal # 2002 is a follow-up study of ISTC project # 839-B.

2. **# 1145:** Nuclear-Physics Investigations Aimed at the Solution of Weapon Plutonium Conversion and Long-Lived Radioactive Wastes Transmutation Problems

Mr. Y. Titarenko presented this project, which is dealing with the measurement of effective fission cross sections of actinide isotopes placed in the centre of a 183 mm salt sphere inside the BIGR reactor in Sarov. This project is financed by the USA and has Japan with JAERI as foreign collaborator. It will be completed at the end of July 2001. The CEG should have access to the data.

A follow-up proposal is being prepared for submission to the ISTC for funding. The same level of funding will be requested as for ISTC project # 1145 (about 600 000 \$). The same type of measurements will be performed, but using a lead sphere.

3. **# B70:** Experimental Research of Transmutation of Fission Products and Minor Actinides in a Subcritical System Driven by a Neutron Generator.

Ms. A. Kiyavitskaya from Minsk reported on ISTC project # B70, which deals with the experimental investigation of transmutation of fission products and minor actinides in the sub-critical assembly YALINA, which is coupled to a neutron generator. This 3-year project is progressing well and will be completed at the end of August 2001. The EU has funded 295 000 \$, i.e. half of the request for this project. The remaining half could be allocated by the ISTC Governing Board to the project depending on its progress. Nevertheless, the CEG recommended Ms. A. Kiyavitskaya to resubmit a new proposal to ISTC.

There is a good flow of information from Minsk to the EU foreign collaborators from Germany, Spain, Sweden and the EC. This project is linked to the FP5 MUSE project dealing with sub-critical experiments in MASURCA.

A consultancy meeting was organized by IAEA in Minsk in July 2000, which recommended to maintain and strengthen the link between IAEA's present and future CRPs on ADS and the YALINA experimental programme on the physics of sub-critical systems and the measurement of transmutation rates.

4. **# 1606**: Molten salt technology for radwaste and Pu treatment

Mr. M. Delpéch (CEA) summarized this project, which is funded by the EU and has just been signed by ISTC. The salt composition will be discussed with the Russian partners at the kick-off meeting, which should take place during the spring of 2001 in Chelyabinsk. This project should be linked through the CEG with the ISTC project # 1486 (Cascade sub-critical molten salt reactor for RW transmutation), which is funded by the USA and Japan. The link could be achieved directly by the Kurchatov Institute, which is participating in both projects.

Project # 1606 will be coupled to the MOST (molten salt reactor) proposal for a concerted action in the area of "Safety and efficiency of future systems", if it is accepted for funding in FP5.

5. **# 1418**: Lead cooled reactor with inherent safety

Mr. W. Gudowski indicated that this project was co-financed by the EU and Korea. It should be completed in March 2001. The project manager, Mr. A. Filin (NIKIET), will produce a monograph on "Inherently safe fast neutron lead-cooled reactor" completion of the project as foreseen in the work plan.

For information, METALLICA, a proposal for a concerted action in the area of "Safety and efficiency of future systems" has been submitted for funding in FP5 to evaluate the inherent safety of lead cooled reactors.

6. **# 1653**: Linacs for ADTT

Mr. W. Gudowski reported that this project is financed by Korea. Mr. B. Murin, who was in charge of writing a monograph on high power proton linear accelerator, just died. Someone from the Moscow Radiotechnical Institute should replace him to finish the monograph.

7. **# 559**: Pilot flow lead-bismuth target of MW power for ADS

A summary of the problems, both political and technical, of project # 559 is given in [Attachment 7](#), which includes the minutes of the 1st liquid metal target advisory committee (LMTAC) in Washington in March 2000, of the 2nd LMTAC in Los Alamos in October 2000 and of meetings in Moscow and Obninsk in November 2000 related to the transfer of the target from Obninsk to Los Alamos.

Mr. G. Gherardi presented the MEGAPIE (MEGAWatt Pilot Experiment) initiative, which should demonstrate the feasibility of a liquid lead-bismuth target at power levels relevant to ADS. The experiment will use the SINQ target position and the cyclotron at PSI. A proposal for a shared-cost action has been submitted for financing by the EU under FP5.

V. New ISTC proposal

The SAD project at JINR in Dubna is at present a partnership programme, which is funded by CEA, CIEMAT, FZK and KTH, as indicated by Messrs. C. Broeders and W. Gudowski

SAD stands for Sub-critical Assembly in Dubna. SAD is aimed to be a 20 kWth sub-critical system based on MOX fuel and driven by the existing 660 MeV and 3.2 μ A JINR synchro-phasotron proton beam. The SAD proposal may lead to a first real ADS: a slightly subcritical reactor system, driven by a 600 MeV proton beam.

The present project should produce a conceptual design and cost estimate of SAD. This will be the basis of a proposal for a 3 year project to be submitted to ISTC for funding (~ 600 000 €) at the beginning of 2001. This proposal will include the final designs and licensing and the deliveries of fuel and targets. A next proposal will deal with the actual construction of the facility.

After a meeting with JINR, Gozatomnadzor indicated that it would authorize the installation of SAD in Dubna.

The SAD project is indirectly linked to the FP5 MUSE project through the University of Mining and Metallurgy (UMM) of Krakow (Poland). UMM is an assistant contractor to KTH, a principal contractor of the MUSE project.

VI. Links between ISTC and EU FP5 funded projects

Mr. M. Hugon gave a presentation on the partitioning and transmutation research activities under the EURATOM FP5. Then the possible links between EU FP5 projects and ISTC projects/proposals have been identified as indicated in Figure 1 (see caption very carefully).

In order to inform the EU community about R&D activities on nuclear data in the CIS countries funded by the EU through ISTC, the EC proposed to invite the partners of on-going ISTC projects in this field to the meeting of the FP5 cluster on basic studies on transmutation (BASTRA), which will be organized towards the end of 2001 – beginning of 2002 in the EU. Representatives of the OECD/NEA nuclear data bank and of the IAEA nuclear data section may also be invited. This was accepted by the CEG.

Note that Mr. Y. Titarenko proposed to organize a workshop on nuclear data with ISTC and FP5 project in Moscow in June 2001. However, the CEG thought that June was too early and that it would be too expensive to invite the EU participants in

Russia, whereas it was easier for ISTC to fund the travel expenses of the Russian participants in the EU.

Possible links between FP5 Projects on Advanced Options for Partitioning and Transmutation and ISTC projects/proposals - January 2001

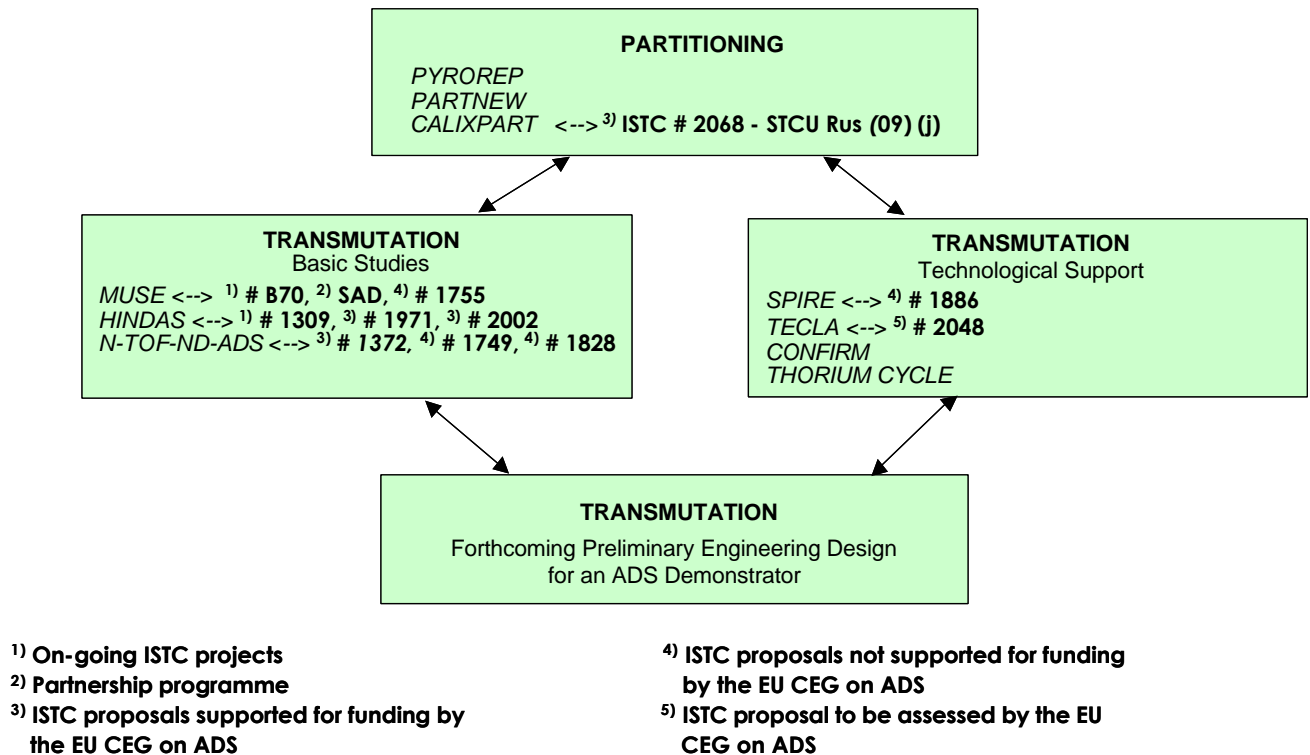


Figure 1

VII. Future of the CEG

Mr. W. Gudowski has been re-elected Chairman of the CEG on ISTC ADS projects for one year. Mr. M. Hugon has been elected Secretary of the CEG for the same period of time.

The Chairman proposed to enlarge the CEG to two other members, one of which being knowledgeable in nuclear data. Proposals are expected.

The CEG will meet once a year as before. The next meeting will be held in January 2002, possibly in the USA.

Action plan:

1. M. Hugon is responsible for preparation of the minutes of this meeting
2. W. Gudowski contacts co-ordinator of n-TOF-ND-ADS project informing him about # 1749

3. W. Gudowski and J. Blomgren inform co-ordinator of HINDAS project on # 1971.
4. W. Gudowski initiates talks with US-partners on 50-50 financing of #1971
5. W. Gudowski will ask the Japanese to have access to the results the project #1828. He will also send the proposal for information to the coordinator of the FP5 n-TOF-ND-ADS project.
6. W. Gudowski takes action on # 1755: suggests Mr. Finck, be the driving force of this project and will send proposal to the coordinator of the FP5 MUSE project for consultation.
7. W. Gudowski will send proposal # 1886 to the coordinator of the FP5 SPIRE project and to Mr. G. Bauer (PSI) for consultation.
8. W. Gudowski will send the proposal #2048 to the coordinator of the FP5 TECLA project for consultation.
9. C. Broeders will assess the whole proposal # 2048 and its cost, which seems to be very high.
10. C. Broeders (FZK) will be the monitor for project # 1372. He should make the link with Mr. F. Kaeppler (FZK), who participates to the n-TOF-ND-ADS.
11. W. Gudowski will discuss matching funds for # 1372 with USA and Japan. Once accepted, this project should be coupled to the FP5 n-TOF-ND-ADS project.
12. M. Hugon together with Mr. J.-F. Dozol (CEA) will monitor # 2068 – STCU # Rus-09 (j):
13. W. Gudowski will discuss matching funds from Japan and USA for # 2002. Looks after coupling with the FP5 HINDAS project.

Waclaw Gudowski

Michel Hugon

Attachment 2.1.

List of participants:

C. Broeders, FZK – Karlsruhe
M. Delpech, CEA - Cadarache
G. Gherardi, ENEA - Bologna
W. Gudowski, RIT - Stockholm
M. Hugon, EU-Commission, Brussels
J. Karjala, EU-Commission, Brussels

Invited guests:

A. Kiyavistkaya, Minsk-Sosny Institute, Belarus
V. Batayev, ITEP - Moscow
A. Stanculescu, IAEA -
Y. Titatenko, ITEP – Moscow

P-E Ahlström, SKB – Stockholm, Swedish ADS Expert Group (only 26-01-01)
J. Blomgren, UU
H. Conde, UU, Swedish ADS Expert Group
K. Jansson, SKI – Stockholm, Swedish ADS Expert Group (only 25-01-01)
C. Mileikowsky, Swedish ADS Expert Group

Attachment 2.2.

Agenda for CEG meeting.
Stockholm, Royal Institute of Technology
Lindstedtsvägen 24,
January 25 – 26, 2001

Thursday, January 25, 2001

9:00 9:30 – Welcome, organisational issues, approving agenda
9:30 W. Gudowski, Review of CEG activities year 2000 plus some conclusions and short discussion (45 min.)

Review and evaluation of ISTC projects to for the coming Board Meeting

10:15 – 10:30 What is expected from CEG evaluation. Improvements of evaluation sheet. J. Karjala

10:30 – 10:45 **#1749** e-mail evaluation summary, final evaluation (W. Gudowski + J. Karjala)

10:45 – 11:05 **#1755** and **# 1828, #1886** e-mail evaluation summary, final evaluation (W. Gudowski + J. Karjala)

11:05 – 11:15 Coffee break

11:15- 11:30 **#1971, #2048, #1372** (reevaluation) e-mail evaluation summary, final evaluation (W. Gudowski + J. Karjala)

11:30 – 11:45 **# 2068** – Joint ISTC-STCU proposal, e-mail evaluation summary, final evaluation (M. Hugon + J. Karjala)

11:45 – 12:45 **#2002** e-mail evaluation summary, final evaluation. Presentation of Y. Titarenko, summary and progress of the **#839, #1145** (Y. Titarenko)

12:45 – 13:00 Information on the Molten Salt proposal **#1606** and its European context (W. Gudowski, M. Delpech, M. Hugon)

13:00 – 14:30 Lunch at “Världhuset”, RIT

14:30 – 15:30 Presentation of ISTC projects in Minsk-Sosny, including summary of the project **#B70**, some data projects and plans for future projects – A. Kiyavitskaya

Status of the spallation target project #559, monographic projects

15:30 – 16:15 Status of the spallation target projects #559. Technical problems, exportation issues in the context of US ATW-related activities. Report from off-beam tests in Obninsk, November 2000 (W. Gudowski). European context of the #559, info on MEGAPIE (G. Gherardi)

16:15 – 16:45 ADS-related monographic projects (W. Gudowski)

16:45 – 17:00 Coffee break

New ISTC projects

17:00 -17:45 Subcritical Assembly in Dubna – SAD project proposal and its integration with MUSE-project (C. Broeders)

17:45 – 18:30 Discussion

18:30 Adjourn

19:00 Dinner

Friday, January 26, 2001

9:00 – 10:00 All-over review of the nuclear data-related projects in Russia, mechanisms for collaboration and dissemination of results (W. Gudowski, Y. Titarenko)

European and funding party context

10:00 – 10:45 Review of European ADS-related activities in the 5th framework programme, potential for closer collaboration with ISTC projects (M. Hugon)

10:45 – 11:15 ADS Technical Working Group - short review of its activities, possible synergy with the work of CEG.

11:15 – 11:35 IAEA – perspective on collaboration with ISTC-projects (A. Stanculescu)

11:35 – 11:50 Coffee break

11:50 – 12:15 Collaboration and co-ordination between CEG and ISTC-office and EU-Commission – how to make CEG – work more effective. The problem of formalisation of CEG. (J. Karjala, W. Gudowski + all)

12:15 – 12:45 Exploration of further experimental potential of Russian partners.
Emphasis on material and irradiation experiments. (all, with a special contribution of our invited guests)

12:45 – 13:00 Discussion on collaboration between EU and ISTC projects. Strategy for future involvmenet in ISTC-projects (all)

13:00 - 14:30 Lunch

14:30 – 15:00 Election of a new Chairman and secretary

15:00 – 15:30 Final conclusions of the meeting

15:30 Adjourn

ATTACHMENT 3

Annual report of the ISTC Contact Expert on Accelerator Driven Transmutation projects for year 2001.

During our last meeting in Stockholm – see [Minutes in Attachment 2](#) – following decisions and action plans were taken.

I. CEG decided to put the following priority recommend on the ISTC

Project Number	Shorttitle	Funding priority by CEG
1372	Transmutation Effectiveness of Nuclear Waste	1
2002	Yields of Residual Nuclei	2
1971	Fission Cross-Sections at Intermediate Energies	3
2068	Calixarenes for HLW partitioning	4
1749	Fission cross sections for minor actinides	high/5
1755	ADS-BFS experiments	low
1828	Measurements of Prompt Neutron Spectra in Minor Actinide Fission	low
1886	ADS beam window endurance	low
2048	Improvement of corrosion resistance	wait

projects

- 1) **Project #1372** has been approved. C. Broeders and W. Gudowski are actively collaborating with this project; working plan has been approved few weeks ago and a kick-off meeting with foreign collaborators is planned to take place in the near future. W. Gudowski visited Obninsk and Dubna in April/May 2001 and helped with a final adjustment of the working plan. This project is incorporated into BASTRA cluster.

- 2) **Project #2002** has been approved. The working plan is also approved and project started recently. This project is well incorporated into the nuclear data-community having good interactions with BASTRA-cluster and other foreign collaborators (KTH, Saclay, Univ. of Hannover)
 - 3) **Project #1971** has been approved, now is under preparation to be launched. Jan Blomgren from UU keeps track on it. Well integrated into the international data-community. JAERI is a major collaborator.
 - 4) **Project #2068** and Ukrainian Rus-09 have been approved. M. Hugon keeps track on them, a clear synergy with the European partitioning activities.
 - 5) **Project #1749** is back on our agenda this year.
 - 6) **Project #2048** has been approved. Status report will be given during our meeting in Karlsruhe. FZK is a leading collaborator.
 - 7) A prolongation of the **project B70** has been also approved in line with CEG recommendations from Stockholm. This project is well integrated with the European nuclear data community and serves also as a benchmark experiment for an IAEA task.
- II. 1 MW spallation target project - #559 has been successfully finished. W. Gudowski participated in the final off-beam tests in Obninsk in April 2001. The future faith of this target is still under discussion. The problems related to the export of this target out of Russia were successfully resolved in a rather smooth collaboration between ISTC Moscow Office, LANL and CEG. The ISTC partnership project with Los Alamos National Laboratory has ensured funds for the target export. This topic will be discussed on the CEG meeting in Karlsruhe.
- III. A kick-off meeting of the #1606 (Molten Salt) took place in May in Sneznisk/Chelyabinsk. A final workplan has agreed after many interactions with CEG-members and other European collaborators. Project is being under integration with the MOST European project. M. Hugon, G. Heusener, M. Delpech and W. Gudowski. Minutes from this meetings are attached as [Attachment 3.1](#).
- IV. SAD-project has been finally delivered to the ISTC Office after many interactions with the European collaborators, i.e. FZK, KTH, CIEMAT and CEA. The ISTC number for this project #2267. In December 2001 an ad-hoc SAD meeting has been organised in order to discuss and adjust activities related to the SAD-project. W. Gudowski participated in this meeting. See Minutes from the meeting – [Attachment 3.2](#).

Short conclusions

CEG's work in 2001 was very effective and successful. Most of the objectives set during the meeting in Stockholm have been achieved.

Today there are no real incentives and driving forces for an effective collaboration with USA, Japan and Korea and there are no clear benefits. Until situation changes we should concentrate our efforts in the European frame of ISTC activities.

Attachment 3.1

Conclusions from the #1606 kick-off meeting in Snezhnisk, May 30-31, 2001.

Russian Federal Nuclear Center - Institute of Technical Physics (**VNIITF**)

Foreign Participants:

Name	Institute	e-mail
Dr. Marc Delpech	CEA-Cadarache	mdelpech@cea.fr
Prof. Waclaw Gudowski	KTH, Stockholm	wacek@neutron.kth.se
Dr. Gerhard Heusener	FZK, Karlsruhe	gerhard.heusener@psf.fzk.de
Dr. Michel Hugon	European Comm.	Michel.Hugon@cec.eu.int
Dr. Guy Lamorlette	COGEMA	BCHAUVEL@cogema.fr
Prof. Jan-Olov Liljenzin	Chalmers, Göteborg	jol@nc.chalmers.se
Dr. Ulrich Rohde	FZ Rossendorf	U.Rohde@fz-rossendorf.de

Project management and other participants:

Dr. K. Grebenkin Head of Department, Project Manager, VNIITF,
greb@nine.ch70.chel

Dr. V. Ignatiev RRC-KI, Moscow, Project Scientific Leader,
ignatiev@quest.net.kiae.su

Prof. B. Vodolaga, Deputy Director for International Relations. VNIITF

Dr. V. Khokhryakov, Deputy Head of Experimental Division, VNIITF

Mr. Yu. Zouev, Head of Department. VNIITF

Mr. V. Subbotin, Head of Laboratory, Deputy Project Manager, VNIITF

Dr. A. Panov, Head of Group, VNIITF

Prof. V. Mashirev VNIHT, Moscow

Prof. VI. Chochlov IVE, Ekaterineburg

Dr. V. Afonichkin IVE, Ekaterineburg

CEA – Commissariat a l'Energie Atomique

KTH – Kungliga Tekniska Högskolan, Stockholm

FZK – Forschungszentrum Karlsruhe

COGEMA – French Industrial Group

FZ Rossendorf - Forschungszentrum Rossendorf

VNIITF – All-Russian Research Institute of Technical Physics

RRC-KI, Russian Research Centre – Kurchatov Institute

VNIHT – All-Russian Research Institute of Chemical technology

IVE – Institute of High Temperature Electro-Chemistry

1 – Objectives of the project :

Molten salt concepts have the flexibility to utilize different fissile fuel in continuous operation with no special modification of the core as it was demonstrated during MSRE operation at ORNL for Li,Be,Zr/F solvent fueled by $^{233,235}\text{U}$ and Pu. The mission of this Project is clearly transmutation of actinides (Pu and MA). Solvent systems containing BeF_2 as major constituent and fueled only by Pu and MA as trifluorides, without UF_4 or ThF_4 have more limitations with respect to some parameters, e.g. lower solubility of heavy nuclides (HN). Because of that the data obtained during the project can be useful for the molten salt concepts with uranium (UF_4) or thorium (ThF_4) based fuels. If during the project, reactor physics calculations show that cores with U free fuel has positive temperature feedback effect, there is still a need of data and experiments. Some preliminary calculations have shown that temperature feedback effects are linked to the salt compositions and usually are negative.

It is decided that

- CEA will send the isotopic composition of HN and FP for a U free fuel, together with the assumption made to Russian side (mid June) (M. Delpech),
- The Project will send the density variation of candidate salts with temperature to KTH (V. Ignatiev),
- KTH will perform detailed calculations on the temperature effect (W. Gudowski).

2 – Salt choice :

The second quarter of the project will focus on the choice of salt composition . The Project proposes to keep FLiBe as a base and to modify it step by step in order to :

- Reduce amount of Be in the solvent by swelling the system structure with addition of third component,
- Increase the HN solubility.

This proposal must be assessed by partners and collaborators.

It is decided that the Project (V. Ignatiev) will send to western collaborators (M. Delpech)

- a set of criteria for the choice of salt composition
- the first proposal for the salt composition by June 15th.

The salt composition will be subject of iteration between Russian partners and western collaborators (V. Ignatiev and M. Delpech), in order to have a reference of salt composition for end of July.

3– Budget problem:

Following a request of Russian side on the budget reduction due to the conversion rate between Dollar and Euro, the collaborators ask the project to reconsider the need for two loops. In case that only one loop is to be built there is a need to define material.

It is underlined by western side that it is important for the project to perform experiments with actinides.

In the contract signed on the base of 500 k\$, it was planned to build two loops: one with SS material and one with Ni-based alloy material. Each loop has a height of about 2 m, a diameter between 5 cm and 20 cm and a temperature gradient between 100 and 150 C.

The purpose of the loop experiments is to measure:

Corrosion phenomena including mass transfer with thermal gradients

The measurement of REDOX potential in the system and the impact on corrosion when adding, step by step, with different rates of fission products (Ln's, Te) and Pu, An.

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| <ul style="list-style-type: none">- In order to take into account the decrease of the budget (* -20 %), it is decided to :Construct one loop (Hastelloy N or Nickel) Conduct experiment at Snezhnisk using a non-active salt, containing BeF₂,Measure the standard potential of Ln- If the results are promising, to ask for a prolongation of the project for the active test in a hot cell and to perform experiments in with Pu and MA fluorides |
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In connection with budget problems, the Russian side pronounced the intention to reduce the program of reactor physics calculations. The western collaborators asked to specify in detail this program (V. Ignatiev). FZ Rossendorf is ready to support the calculational work by hosting a reactor physics expert from RRC-KI for a few months. The working program for this stay will be agreed between V. Ignatiev and U. Rohde.

Next meeting will take place with the 5th European Framework Program MOST project kick-off meeting in France, end of **September** 2001.

Attachment 3.2

Minutes from meeting on SAD (ADS with Pu MOX core at Dubna proton Phasotron) current status and future plans

Place: Warsaw, Poland

Date: 18-19/12/2001

Participants:

Sergey Chigrinov – Scientific and Technical Center "Sosny", Belarus
Waclaw Gudowski – Royal Institute of Technology, Stockholm Sweden
Jerzy Janczyszyn – University of Mining and Metallurgy, Cracow, Poland
Wladyslaw Pohorecki – University of Mining and Metallurgy, Cracow, Poland
Alexander Polanski – Joint Institute for Nuclear Research, Dubna, Russia
Stefan Taczanowski – University of Mining and Metallurgy, Cracow, Poland
Valery Shvetsov – Joint Institute for Nuclear Research, Dubna, Russia

Introduction

The purpose of this was to discuss the current status of the SAD project, to work out the principles of the future scientific program for SAD installation, elaborate proposal on creation the scientific board of the SAD collaboration, inquire into a question of cooperation between different ADS and transmutation project, planned at JINR.

Status of the ISTC proposal

Manager of the ISTC project #2267, which now is under consideration, V. Shvetsov reported about the SAD installation conceptual design. Three projects (general civil engineering, subcritical assembly and proton beam line) were elaborated in 2000 – 2001 with financial support of the FZK and RIT. These projects contain financial estimations for the main parts of the installation and construction works, which gave the basis for financial part of the ISTC proposal. It was mentioned that the rest part of the SAD conceptual design financing in accordance with the "PROJECT PROPOSAL:

CONCEPTUAL DESIGN OF SAD FACILITY AND PREPARATORY EXPERIMENTS" should be paid by CEA Cadarache and CIEMAT as soon as possible. **It will permit to start the work on SAD design and fuel manufacturing immediately after positive decision of the ISTC Governing Board.** Otherwise we'll have delay until real ISTC financing will start.

ISTC proposal #2267 now is under examination of the ISTC **Scientific Advisory Committee** and will be considered at the next meeting of the ISTC **Governing Board** at the beginning of April 2002.

Scientific program for the SAD facility and its influence on SAD design parameters
Future scientific program for SAD facility as its formulated in ISTC proposal looks like the following:

1. Studying the operation modes of subcritical assembly in combination with the proton accelerator, development of techniques of measurement and control of parameters of the facility
2. Studying the problems of target and subcritical assembly integration, including influence of the target size and position on main SAD characteristics;
3. Measurement of absolute value of a power gain of installation (for the decision of this task systems with a low level of power are most appropriate);
4. Measurement of shielding efficiency (especially in a direction of a primary proton beam);
5. Analysis of the neutron producing targets after long irradiation by protons, analysis of special samples (MA, LLFP), irradiated in ADS experimental channels (including the radiochemical analysis)
6. Measurements of transmutation rates for MA and LLFP in different neutron spectra;
7. Computer codes validating;

During the meeting several speakers mentioned urgent necessity for determination of the detailed experimental techniques, which will be introduced at SAD facility, because it'll influence strongly on the SAD design.

The same is valid for requirements on SAD construction materials certification and fuel elements certification. It was stressed that during project implementation, especially during manufacturing and building the detailed certification of the all materials is very necessary. Particularly, calculations made by Stefan Taczanowski show that kinetic of the SAD core depends drastically on B content in shielding concrete.

The most urgent task is requirements for fuel components certification. It's necessary to fix the accuracies for fuel isotope contents. IA "Mayak" is planning to start preparation for PuO₂ production in third quarter of 2002. Standard level of the certification is 10⁻² mass percents.

The activity on measuring the k_{eff} with different methods, headed by Sergey Chigrinov, could be introduced into the SAD scientific program and details of k_{eff} measuring techniques will be accounted for during SAD design stage.

Proposal on using in SAD replaceable targets (Pb, PbBi, W) and reflectors (Pb, Be, C) that will bring us the possibility to change neutron spectra demands negotiations with design institutes. It seems that the main problem will arise from licensing of such an installation

Experimental program with heavy targets and its interference with SAD project

Within SAD project several irradiations of the heavy Pb targets and associated foils have being done by Cracow and Dubna experimental teams. Neutron/hadron spectral, angular and spatial distributions were measured. Different isotopes production cross

sections were extracted from Cracow group experiments. It became clear that proton beam current and position monitoring systems at Phasotron could not provide accuracy, which is enough for obtaining world-class results. So, experimental program on heavy targets studies will be supported by SAD project in the field of Phasotron control and monitoring systems modernization.

To provide precise experiments on spallation products yield the SAD team needs high quality HpGe spectrometer working at Dubna with proper software and corresponding manpower.

Conclusions

I. Proposal on membership in SAD scientific board:

Waclaw Gudowski – chairman;
Cornelis Broeders
Enrique Miguel Gonzales-Romero
Roland Soule
A?t Abderrahim Hamid
Stefan Taczanowski
Sergey Chigrinov
Pavel Bem
Alexei Sissakian
Alexander Polanski
Igor Puzynin
Nikolai Russakovich
Walter Furman
Valery Shvetsov

II. Proposal on meeting at Minsk

It was suggested to organize next meeting on SAD project at Minsk at the end of May 2002 with participation of experimentalists and designers from Minsk, Dubna, Moscow, Cadarache to discuss the details of SAD parameters.

III. Program on Phasotron modernization and new experimental site equipping

Dubna and Cracow representatives were entrusted with a task to prepare project/s on Phasotron monitoring systems modernization and new experimental site on beam #9 equipping. Projects should be presented at Minsk meeting.

ATTACHMENT 4 EVALUATION SHEET

Project Number	Shorttitle	Funding priority by CEG	Total cost k\$	EU funds CEG's proposal k\$	Other funds k\$	Project duration	CEG evaluators	Evaluation and recommendations	Comments	CEG/EU Collaborators	CEG/EU Monitors	Connection s/links with EU Framework Programme
2267	SAD-project - Creation of Subcritical Assembly Driven by Proton Accelerator in Dubna	high/1	1700	1200	500 delivered by JINR and its member states	36	CEG	Strongly recommended, a lot of European interest!!		C. Broeders (FZK), W. Gudowski (KTH), E. Gonzales (CIEMAT), R. Soule (CEA), P. Kupschus (SCK.CEN)	S. Monti (ENEA), V. Bhatnagar (?), A. Stanculescu (IAEA)	MUSE/TECLA/MEGAPIE
2213	Fission Cross Sections of Tungsten Isotopes	high/2	200	200		30	CEG	This group has a unique competence (missing in European groups) in measurements techniques for fission induced by very high energy neutrons.		J. Blomgren,Uppsala, Broeders, M. Hugon	V. Bhatnagar, S. Monti	Hindas
2253	Investigation of the delayed neutron characteristics	high/3	360	360		24	CEG	At present, no experimental work is performed on delayed neutrons neither in FP5 nor in ISTC. This data are very important for designing transmutation systems. We support this project and we shall integrate it into BASTRA cluster.		Fion-Saclay, d'Angelo - ENEA, Cas	C. Broeders, V. Bhatnagar	BASTRA
2199	Neutron cross-sections and level densities for fission-products, Th, 233U	low at the moment	225			24	CEG	To consult with Korea (2 collaborators)		Delft, H. Postma + Koreans		
2224	ECO-FRIENDLY HIGH-POWER LINACS	to be reviewed by accelerator experts	298			36		to be reviewed by accelerator experts - Pagani, Mueller		Lagniel-Saclay, H. Klein-Frankfurt + USA-Gillespie		
2257	Proton accelerator based intense source of radioactive ions for nuclear physics experiments.	to be reviewed by accelerator experts	650			24		to be reviewed by accelerator experts		Fortuna - INFN, Huber - Isolde/Mainz		
2299	Experimental and theoretical research of the basic parameters....	Beyond the competence of CEG	340			36		Beyond the competence of CEG		Dapnia/CEA - F. Lehar		MUSE
2405	Experimental researches of nuclear-physics characteristics of materials essential for the processes of weapon plutonium	low at the moment!	595	0		24	CEG	First final report of #1145 must be presented. Not supported for time-being		Uppsala, Gudowski, Broeders, Fioni		

February 19, 2002

ISTC-Contact Expert Group on Nuclear Transmutation related research

A rapid development of the Transmutation and Partitioning research, particularly Accelerator-Driven Systems (ADS) in last few years opens continuously new research fields and creates new scientific and technological challenges. If development of this technology continues successfully it can offer interesting solutions for a radioactive waste treatment and, possibly, for weapon plutonium incineration. The scale of these challenges requires an effective international collaboration and co-operation, which is now taking its form. Moreover, the objectives of ISTC program in Russia and former Soviet Republics are highly compatible and coherent with development of Accelerator-Driven Transmutation Technologies. These technologies open one of the best prospects for former weapon experts to convert their expertise to useful nuclear technology helping to ease the burden of cold war nuclear weapon race.

ISTC Contact Expert Group (CEG) on Nuclear Transmutation related research provides the venue for experts from the funding parties to shape up the policy and to formulate a common approach for soliciting, prioritising and directing the efforts of ISTC-funded projects. CEG provides the framework and opportunity for building a lasting co-operation between laboratories and research groups from ISTC funding countries and the laboratories of recipient countries (Russia and CIS-countries).

CEG, based on expertise of its members and their involvement in reviewing ISTC projects, has identified five major areas where projects are soliciting. These areas are:

- a) Accelerator technology
- b) Basic nuclear and material data and neutronics of ADS and reactor based transmutation systems
- c) Targets and materials including basic material data.
- d) Fuels related to ADS and reactor based transmutation systems
- e) Chemical separation

CEG considers these five areas equally important and foresees that available funding will be divided roughly equally among these areas.

CEG is expecting that all the projects submitted to ISTC in these 5 areas will be forwarded to the CEG chairman for consideration. CEG will review the projects and will recommend the priority for approval and level of funding. The priorities of projects will be set to: **high, medium, low or not recommended.**

CEG meets annually in January. Between the meetings the CEG is working using electronic mail, faxes and telephone calls. Extra meetings will take place if necessary and will be organized by the chairman or secretary after consultations with CEG members. Minutes of every CEG meeting will be sent to the ISTC Board.

Waclaw Gudowski
Chairman

Michel Hugon
Secretary