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SECY-90-364

For: The Commissioners (Information)
From: James M. Taylor
Executive Director for Operations
Subject: STATUS OF US-USSR NUCLEAR SAFETY COOPERATION

Purpose: The purpose of this memorandum is to provide the Commission with the documents created during the Meetings of the Joint Coordinating Committee for Civilian Nuclear Reactor Safety (JCCCNRS) which took place in Moscow, USSR, October 8-12, 1990.

Discussion: The JCCCNRS held its Third Annual Meeting in Moscow, USSR, on October 8 and 9, 1990. An extensive record of meeting was finalized and signed at this meeting. The record outlines the action plans for each working group and summarizes major additional discussion points. A copy of this record is attached to this Memorandum.

Additionally, an arrangement for mutual research cooperation in the area of Severe Accidents, Working Group 6, was signed at the JCCCNRS meeting. A copy of that arrangement is attached.

An additional Memorandum discussing highlights of note and possible policy questions raised during the JCCCNRS meetings is being prepared and will be forwarded as soon as possible.

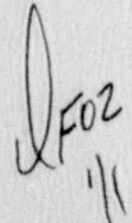

James M. Taylor
Executive Director for Operations

- Attachments:
1. Record of the Third Meeting of the U.S.-USSR JCCCNRS (October 8-9, 1990, Moscow, USSR)
 2. Implementing Arrangement on Severe Accident Research (October 11, 1990, Moscow, USSR)

NOTE: TO BE MADE PUBLICLY AVAILABLE IN 10 WORKING DAYS FROM THE DATE OF THIS PAPER

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RECORD OF THE THIRD MEETING OF THE U.S.-USSR
JOINT COORDINATING COMMITTEE FOR
CIVILIAN NUCLEAR REACTOR SAFETY
(October 8-9, 1990, Moscow, USSR)

The third meeting of the U.S.-USSR Joint Coordinating Committee for Civilian Nuclear Reactor Safety (JCCNRS), established in accordance with the Memorandum of Cooperation in the Field of Civilian Nuclear Reactor Safety between the United States of America (U.S.) and the Union of Soviet Socialist Republics (USSR), and supported by the Scientific and Technical Cooperation in the Field of Peaceful Uses of Atomic Energy signed June 1, 1990 by the Heads of State, was held in Moscow, USSR on October 8-9, 1990.

The U.S. delegation was headed by James M. Taylor, Executive Director for Operations of the Nuclear Regulatory Commission. The USSR delegation was headed by Nikolai N. Ponomarev-Stepnoy, First Deputy Director of the I.V. Kurchatov Institute of Atomic Energy. A list of the members of both delegations and advisors is appended hereto (Appendices I and II).

Dr. Ponomarev-Stepnoy welcomed the U.S. delegation and outlined the agenda. The purpose of the meeting, he said, was to reach agreement on the future direction of the cooperative program. Mr. Taylor responded that the U.S. shares these goals and looks forward to establishing mutual areas of cooperation for the next year.

The following represents the program for work by Working Groups.

WORKING GROUP 1
SAFETY APPROACHES AND REGULATORY PRACTICES

In accordance with the October 1989 Protocol* (P-2 item 1), Working Group 1 held a meeting in the USSR, April 1990 (M-5), in which the following topics were covered:

- results of the 1989 on-site inspector exchange program.
- the coordinating role of the NRC in safety research and development activities.
- inspector evaluation of overall plant safety on day-to-day basis.
- procedures for changes to inspection programs, design and modification activities, safety regulations and requirements as a result of the accumulation of operating experience and research results.
- NRC oversight of design activities from pre-licensing to license renewal/life extension.
- function and specific activities of the Scientific Technical Safety Center which is affiliated with the USSR State Committee for the Supervision of Industry and Nuclear Power Safety (GPAN USSR) and the U.S. NRC role in safety research and development.
- exchange of information about the organization and nuclear regulatory activities of Gospromatomnadzor (GPAN USSR).

Recommendations for Future Activities

Both sides agreed to proposed topics for the next Working Group 1 meeting and areas of emphasis for the next inspector exchange. The next Working Group meeting is tentatively proposed for March 1991. The U.S. side has just completed their second inspector exchange, and inspectors from the Soviet side are currently scheduled to spend the month of November 1990 in the U.S.

* Henceforth, the English version of the document reporting on these annual meetings will be referred to as the "Record." The documents reporting on the first two meetings will continue to be referred to as "Protocols."

Both sides agreed that the theme of "Safety Approaches and Regulatory Practices" is included in almost all working group activities. Therefore, GPAN USSR representatives are invited to participate more broadly in other JCCCNRS working group programs.

Both sides agree that the following topics should be included during the winter 1990 Soviet inspector exchange (in the U.S.) and upcoming working group meeting:

Inspector Exchange:

1. Allocation of inspection resources to reflect the differing safety performance of NPPs.
2. Programs for development of emergency preparedness drills with emphasis on the participation of local governments and public affairs groups. Both sides agree that observation during an emergency preparedness drill as part of the next inspector exchange would be beneficial.
3. How and when changes are made to the inspection program to incorporate lessons learned or information gathered from analysis of operational events.
4. Early in the inspector exchange, involved inspectors will be briefed on the host country's system for nuclear power production, focusing on the current roles of Soviet ministries or U.S. Government agencies and industry organizations in design, as well as construction, operations and regulation (including the relationships and responsibilities of GPAN USSR and the NRC relative to the other government ministries/agencies). Information will be exchanged about the philosophy and practices of supervision/regulation of the nuclear industry in the U.S./USSR.

Topics for Working Group Meeting in March 1991, which will discuss the regulatory framework of the following:

1. Inspection of licensee training programs and activities of operator licensing examiners. (10 CFR 55)
2. The role of the headquarters organization and regional offices in assessing the efficiency and effectiveness of the reactor inspection program.
3. Regulatory framework for reviewing the adequacy of reactor core thermal and physics characteristics of newly

installed cores, including comparison of associated U.S. and USSR regulatory documents.

4. Accident management for beyond design basis accidents.

5. U.S. and USSR practices regarding the supervision or regulation of design processes and methods for assuring that U.S. and USSR design standards are met.

6. Discussion of the results of the second inspector exchange.

In addition, both sides will consider appropriate tours of nuclear facilities for members of the working group.

Additional Future Items

1. Soviet Inspector Exchange during November 1990.
2. The Soviets invited the NRC to observe an emergency preparedness drill scheduled for December 1990 in the USSR.
3. The next Working Group 1 meeting should occur in March 1991, to coincide with a U.S. emergency preparedness drill which includes USNRC involvement.

WORKING GROUP 2 ANALYSIS OF THE SAFETY OF NUCLEAR POWER PLANTS IN THE USSR AND THE U.S.

In accordance with the October 1989 Protocol (P-2 item 2.1), Working Group 2 held two meetings--December 1989 (M-4) and May 1990 (M-6)--in which the following topics were covered:

- mutual understanding of the U.S. and USSR regulations and guides.
- participation by regulatory authorities as well as design organizations from both countries in the discussions.
- emergency guidance for operators/design features.
- station blackout (SBO).

- agreement of source data for loss-of-coolant and loss-of-feedwater accident analysis.
- Anticipated Transients Without Scram (ATWS) analysis.
- USSR reactor coolant pump (RCP) seal design.
- Steam Generator Tube Rupture (SGTR).

The JCCCNRS notes that the following topics are being discussed in the October 1990 meeting:

1. Risk during shutdown operations with emphasis on reduced inventory (mid-loop) operation.
2. In-depth containment studies.
3. Results of LOCA and ATWS analyses will be presented by both sides.
4. A Soviet discussion of the results of ongoing reactor coolant pump seal tests and details of the reactor coolant pump seal design.
5. A Soviet discussion of safety systems being considered for new plants. These include passive heat removal systems and a rapid boron injection system.

In addition to the above topics, it was agreed that Working Group 2 members would tour the Kalinin station as part of the fall meeting.

Recommendations for Future Activities

The recommendations from the WG-2 meeting, held simultaneously with the JCCCNRS in October 1990, will be forwarded to the two Co-Chairmen who will mutually approve future activities of this group.

The October 1989 Protocol holds the following areas as potential topics for discussion in 1991:

- seismic design
- containment studies
- new VVER designs of large and medium power level
- fuel cycle problems

- guides and standards application at the design stage

WORKING GROUP 3
RADIATION EMBRITTLEMENT OF THE HOUSING AND SUPPORT
STRUCTURES AND ANNEALING OF THE HOUSINGS

In accordance with the October 1989 Protocol (P-2, item 3.1.1.), Working Group 3 held a meeting in the USSR, June 25 to June 29, 1990 (M-7), in which the following topics were covered:

- annealing of the reactor vessel.
- research on reactor vessel materials from reactors taken out of operation.
- radiation embrittlement of materials of the vessel in model type VVER-1000.
- radiation embrittlement of reactor vessel materials and application to operating reactors.
- mechanisms of radiation damage of vessel materials.
- thermodynamics of thermal shock, elastic-plastic fracture mechanics and values of failure probability of the vessel.

Recommendations for Future Activities

The activities on this topic were very effective and the JCCCNRS considers it necessary that the Working Group undertake further efforts to distribute its experience to form a common basis for reactor vessel annealing understanding and implementation. The following will be the subjects and topics of discussion at the next Working Group 3 meeting in the U.S. in spring 1991:

1. Test specimens, including Charpy-V, tensile and 0.5 TCT, will be provided of U.S. pressure vessel steels and of USSR VVER-440 and -1000 steels for irradiation in the other's test and power reactors. Testing will be done in the country of irradiation and results will be compared. Test specimens will be exchanged at the next meeting which is currently planned for the spring of 1991.

2. Data summaries and data bases will be exchanged on reactor vessel surveillance data, cladding data, and on fracture toughness data.

3. The USSR will provide small samples of vessel material irradiated in the Novovoronezh and Armenian VVER-440s for microscopic study by Odette at UCSB and by MEA for micro-mechanical properties. This effort could be aided by having a Soviet specialist work with the U.S. contractor in the U.S. for a period of 1-3 months.

4. The USSR will provide detailed measurements of stress, strain, and temperature for a VVER-1000 reactor vessel, as well as detailed dimensions and appropriate mechanical properties; the USNRC will perform a stress analysis of the VVER-1000 vessel and validate the calculation by the measurements.

5. The U.S. has provided the USSR side with the H.B. Robinson (real case) data. The USSR will study this data and have the opportunity to resolve any further questions relating to methodology additionally by mail. After the Soviet side does its calculations and analysis of the effects of operational factors on the probability of leaks and ruptures, it will present ideas on the optimization of modes for hydrotests.

6. Data and existing reports will be exchanged on experimental studies of vessel integrity, especially for a range of loading conditions. Based on evaluation of the data by both sides, future cooperation or exchange in this area may be proposed.

7. The U.S. and the USSR will exchange available data on inhomogeneity of plate and forging material, especially as this is caused by manufacturing processes.

8. Blind test evaluations will be performed of thermal mixing models. The U.S. will provide the Purdue, CREARE 1/2-scale model and HDR benchmarks for USSR analysis, and the USSR will provide their full-scale VVER thermal mixing test for U.S. analysis. Results will be exchanged at the next annual meeting.

9. A team of U.S. experts will participate and witness the conduct of annealing on the Novovoronezh-3 Soviet VVER-440 reactor vessel. The U.S. side wishes to have temperature and any stress measurements made previously on a similar VVER-440 reactor vessel (preferably on Novovoronezh-3 during its first annealing, if such data exist) during annealing for validation of U.S. codes for predicting vessel behavior during annealing. The U.S. side

would also like to participate in pre-planning activities relating to the annealing of Novovoronezh-3, especially as they relate to the design and installation of instrumentation for data gathering during the annealing process.

10. The extent of cooperation and exchange with Prometey Institute in the following areas will be discussed at the spring 1991 meeting:

- pressurized thermal shock
- wide plate crack arrest tests
- alternative elastic plastic fracture mechanics methods
- comparison of shift in Charpy-5 and K-Ic curves
- evaluation of large-scale experiments

11. Specialists of the USSR and the U.S. have special interest in a program of the influence of neutron flux density (flux effect) on radiation embrittlement of vessel material. In this connection the USSR and the U.S. will extend the exchange of data and discussions of the data in the course of availability of new results of research.

WORKING GROUP 4 FIRE SAFETY

In accordance with the October 1989 Protocol (P-2 item 4.b), Working Group 4 held a meeting, including a plant walkdown of the Zaporozhye NPP, in the USSR on June 25-29, 1990 (M-7). The following topics were included in the discussions:

- general nuclear power plant fire protection philosophy.
- fire protection engineering methodologies and the application of fire suppression.
- detection and passive fire control measures associated with assuring reactor shutdown.
- general fire protection features associated with specific plant areas.
- fire brigade organization, training, and suppression capabilities.

Recommendations for Future Activities

Because of the progress made and areas that emerged from the last working group meeting, the JCCCNRS would like to see Working Group 4 continue. Accordingly, the next meeting for this group is tentatively scheduled for March 1991 in the U.S.

1. Both sides agreed to complete arrangements for a USSR fire protection delegation to visit during March 1991. The USSR delegation will tour a U.S. facility. During this tour the passive and active plant fire protection features typically incorporated into the design of U.S. facilities will be identified.

2. Both sides will discuss institutional aspects of Nuclear Plant Fire Protection.

3. Both sides will provide elaboration of methodology of fire protection control at the stages of a nuclear power plant design, construction, and operation.

4. Both sides will perform an analysis of their counterparts nuclear fire protection norms and standards with a view to improve the fire protection requirements.

5. The U.S. side will demonstrate fire modeling techniques at one of the U.S. national laboratories. During the March 1991 visit, the U.S. fire researchers will discuss the past studies for assessing vulnerability of equipment to fire and any current research work.

6. The U.S. will explain the technical specification testing program for plant fire protection features and identify how system reliability is assured through the implementation of the program.

7. The U.S. will consider a possibility of providing the Soviet side with representative samples of typical sprinkler heads.

8. The U.S. will provide copies of the standards for the design and testing of gaseous suppression systems. The U.S. will consider presenting information on current research related to Halon substitutes. The Soviet side will provide the U.S. with results of research on Halon substitutes.

9. Consideration will be given by both sides to establish a fire inspector exchange program to give them an opportunity to get more detailed information about the U.S. and USSR fire

protection practices. (The aforementioned program will involve no currency exchange and provide for full-board accommodations.)

10. Discuss the advisability and feasibility of isolating electrical circuits between the main and backup control rooms.

Additional Future Items

1. The U.S. will arrange for a Soviet walkdown of a U.S. plant in 1991 to coincide with the projected March 1991 visit.

2. Principles of new generation nuclear power plant fire protection standards will be discussed in March.

3. The future of this working group and activities will be decided after the March visit.

WORKING GROUP 5 MODERNIZATION/BACKFITTING

In accordance with the October 1989 Protocol (P-2 item 5.1), a joint seminar on the subject was held in December 1989 (M-4) in the USSR in order to discuss the following:

- comparative identification of the design bases and required improvements.
- the criteria used to determine the need for modernization/backfitting.
- methods used to improve equipment reliability.

A meeting of Working Group 5 was scheduled to be held in June 1990 in the U.S., but it was postponed until spring 1991.

Recommendations for Future Activities

Working Group 5 believes the next meeting (spring 1991) will be of mutual benefit, in order to review and discuss the following:

- a) A recent generic backfit including the associated analyses and justification, and the process used in terms of the identification of the safety problem, and the assessment, approval, and implementation of the backfit.

b) A recent plant-specific backfit, including the associated analyses and justification, and the process used in terms of the identification of the safety problem, and the assessment, approval and implementation of the backfit.

c) Other aspects of a backfit program which are of high mutual interest.

Additional Future Items

Following the spring 1991 meeting in the U.S., it is anticipated that the work of this group will have been accomplished. The JCCCNRS will review the Memorandum from that meeting and determine at that time which other Working Groups will follow the issues of backfitting in the future. It is recognized that WG-1 will have a special regulatory interest in future backfitting activities. Also, Working Groups 2 and 9 will be interested in aspects of this work. Lastly, if a new Working Group 12 is established, backfitting is a natural theme within the scope of plant aging and plant life extension.

WORKING GROUP 6 SEVERE ACCIDENTS

In accordance with the October 1989 Protocol (P-2 item 6.1.), Working Group 6 held a meeting in the USSR, June 25 to July 6, 1990 (M-7), in which the following topics were covered:

- severe accident research.
- cooperation in thermal-hydraulic research.
- hydrogen combustion/detonation.
- corium-concrete and corium-water interactions.
- accident management.
- probabilistic risk assessment.

At the conclusion of this meeting, the U.S. and USSR signed a bilateral agreement to cooperate in thermal-hydraulic safety research. In particular, the USSR joined the U.S. International Code Assessment Program (ICAP). In return for receiving the major U.S. thermal-hydraulic safety analysis codes, the USSR will

b) A recent plant-specific backfit, including the associated analyses and justification, and the process used in terms of the identification of the safety problem, and the assessment, approval and implementation of the backfit.

c) Other aspects of a backfit program which are of high mutual interest.

Additional Future Items

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provide the U.S. with assessments of these codes against a variety of experimental data.

In addition, an important topic of discussion was the proposal for the USSR to join the NRC's Cooperative Severe Accident Research Program. At this meeting of the JCCCNRS, the bilateral arrangement between NRC and IAE was signed by Mr. Taylor and Dr. Ponomarev-Stepnoy.

Recommendations for Future Activities

The USSR will send a delegation to the U.S. in October 1990. During the visit, the delegation and/or subgroups of it will:

1. Attend the NRC's Water Reactor Safety Research Information Meeting.
2. Attend and participate in the Semiannual ICAP meeting.
3. Attend and participate in the Semiannual Cooperative Severe Accident Research Program (SARP).
4. Visit TMI-2.
5. Visit the scaled B&W reactor heat transfer loop at the University of Maryland.
6. Visit the NRC's severe accident test facilities at Sandia National Laboratories.
7. Visit Professor Theofanous' heat transfer laboratory at the University of California at Santa Barbara.

In the framework of this visit the Working Group 6 meeting will be held and both sides will discuss the following:

1. Administrative aspects of carrying out the ICAP and cooperative SARP agreements.
2. Cooperative efforts in hydrogen research.
3. Topics of discussion at the next WG-6 meeting to be held in Moscow in mid-1991.

Probabilistic Risk Analysis:

1. Both sides will provide the other with their latest studies on the application of Probabilistic Risk

Assessment (PRA) methodology to nuclear power plants and the lessons and insights learned from them.

2. If the Soviets perform a level two PRA or other severe accident containment performance analysis, the U.S. will perform a review of it and provide comments.

WORKING GROUP 7 HEALTH EFFECTS AND ENVIRONMENTAL PROTECTION CONSIDERATIONS

The following P-2 projects were developed by both sides and exchanged in January-February 1990. Preliminary meetings on selection was in March, and a U.S. delegation of combined Working Group 7.1 and 7.2 visited the Soviet Union from May 26 through June 9, 1990. During the most recent meetings, both sides reached agreement on the first phases of the cooperative scientific program to be conducted by the U.S. and USSR.

Both sides recognize the JCCCNRS Protocol of August 31, 1988 mentioned future Working Group 7 topics for 7.3-Radiation Biology Research, 7.4-Ecological Effects, and 7.5-Criteria for Radiation Protection and for Nuclear Facility Siting. In light of the fact that significant and meaningful areas of cooperation have been identified and are being covered by Working Groups 7.1 and 7.2, both sides agree to hold these additional topics in abeyance pending the positive conclusion of some of the proposals for 7.1 and 7.2.

Below are the projects that both sides agreed to carry out over the next 12-18 month period.

7.1 Environmental Effects on the Chernobyl Accident

- 7.1.A. Research on Atmospheric Dispersion Modeling
- 7.1.B. Wind-Driven Resuspension of Toxic Aerosols
- 7.1.C. External Exposure and Dose from Deposited Radionuclides
- 7.1.D. Transfer of Radionuclides Through Terrestrial Food Chains and the Resulting Dose to Man
- 7.1.E. Long-Term Dose for the Contamination of Aquatic Food Chains

7.1.F. Modeling the Behavior of Radionuclides in a Soil-Aquatic System Including Rivers and Reservoirs

7.1.G. Intercalibration of Methods for Measuring Radioactive Containments in the Environment

Recommendations for Future Activities of 7.1

7.1.A. Research on Atmospheric Dispersion Modeling:

A USSR delegation of four persons will visit Lawrence Livermore National Laboratory (LLNL) for two weeks during the last half of November 1990 to discuss:

- Continental scale atmospheric dispersion model development and evaluation.
- Local/mesoscale atmospheric dispersion model development and evaluation.
- Methodology for combining radioactivity measurements with model predictions for source-term estimation.

The U.S. delegation will visit the Institute of Experimental Meteorology in Obninsk some time later in early 1991.

7.1.B. Wind-Driven Resuspension of Toxic Aerosols:

Two U.S. scientists attended the radioecological meeting at Zeleny Mys during September 1990 to discuss:

- empirical data and theories relating to the process of the resuspension of aerosols and preliminary planning for the conduct of laboratory and field studies, including the choice of experimental sites and methodology of future joint investigations. A Soviet delegation will visit Lawrence Livermore National Laboratory (LLNL) in January 1991, and a U.S. team will visit the USSR during April or May 1991 for a collaborative research effort at the Chernobyl site.

7.1.C. External Exposure and Dose from Deposited Radionuclides:

U.S. specialists visited Zeleny Mys (Chernobyl) and Kiev in September 1990 and discussed the following:

- Methodological approaches for calculating and forecasting the external radiation doses for population and biota.
- Computation and experimental methods for assessing the shielding factors for different groups of urban and rural population.
- Model verification and validation, using dosimetric data bases.
- Comparison of instruments and methods of ground dosimetric measurements.
- The Soviet specialists will visit the U.S. in the spring of 1991.

7.1.D. Transfer of Radionuclides Through Terrestrial Food Chains and the Resulting Dose to Man

This project's initial planning took place during the visit of U.S. scientists to the radioecological meeting in Zeleny Mys, Kiev, September 1990, which encompassed the following:

- Review of the Soviet experimental work that has already been done on this subject.
- Review of models used to predict transfer.
- Review parameters needed to refine prediction.
- Initial field work.
- Plans for experiments to be conducted in spring 1991 should be finalized by December 1990.

7.1.E. Long-term Dose for the Contamination of Aquatic Food Chains

U.S. scientists attended the September 1990 meeting at Zeleny Mys to become familiar with the experimental base and methodology of evaluating radioecological parameters.

During the meeting, the planning of an experimental program for spring 1991 at the Chernobyl site was made and means for using Chernobyl data for validation studies of U.S. and USSR models were discussed.

USSR scientists will visit the U.S. early in 1991 to become familiar with methods of studying aquatic food-chain transport and with U.S. predictive models.

7.1.F. Modeling the Behavior of Radionuclides in a Soil-Aquatic System Including Rivers and Reservoirs

In September 1990 the leader of this project from the U.S. side visited Kiev, Chernobyl, Zeleny Mys, and Obninsk where he became familiar in detail with the methods of mathematical modeling, laboratory and field experiments for addressing the problems concerning the elimination of the consequences of the Chernobyl accident.

Preliminary plans were developed for experiments to be conducted during the spring of 1991 in the Kiev Reservoir, in the 30-km zone and in the territory of Brjansk, Belorussia on runoff and transfer of radionuclides.

The Soviet delegation will visit the U.S.A. in January 1991 for:

- Mutual agreement of methods of studies of physical-chemical forms of radionuclides.
- Mutual analyses of mathematical models using the data of both sides.
- Planning the experiments to be conducted in spring 1991.

7.1.G. Intercalibration of Methods for Measuring Radioactive Containments in the Environment

The current activities in this area are to be postponed for the present. Both sides will continue to work on mutual logistic and financing problems and report on their progress in the future.

7.2 Health Effects of the Chernobyl Accident

The discussions between the U.S. and USSR to agree on possible cooperative research projects for Working Group 7.2 focused on the following general areas.

- Biological and Physical Dosimetry.
- Acute Radiation Syndrome and Non-stochastic Health Effects.
- Thyroid Effects.
- Leukemia Protocol Design.
- Countermeasures to Reduce Internal Radiation Exposure from Radioactive Cesium.
- Role of Dose Rate in Stochastic Radiation Effects Estimation.
- Population Registries and Database Management.

Recommendations for Future Activities of 7.2

A.1. Biological Dosimetry:

The work began with a visit of two Soviet scientists in December 1989 to the Biomedical Sciences Division, LLNL. Methodology experiences were exchanged and plans were developed to conduct parallel analyses of blood samples from Chernobyl accident victims being monitored in Leningrad and Kiev. These collaborations are now underway, and similar efforts will be discussed for patients under the auspices of the Institute of Biophysics, Moscow, and the Institute of Medical Radiology, Obninsk, during a U.S. team visit in mid-October 1990 addressing the subject 7.2.B.

A.2. Physical Dosimetry:

We have had some delays in the planned schedule. Dr. Goldman and Dr. Likterov from Kiev had meetings in September and Dr. Eckerman will discuss problems in this area in October 1990 during a visit to address task 7.2.B.

B. Acute Radiation Syndrome and Non-stochastic Health Effects:

A visit by U.S. specialists is scheduled for October 16-20, 1990 in Moscow. The plan is to review database management, statistical analysis, data extraction and record microfilming on the agreed group of records and joint report publication.

C. Thyroid Effects:

A U.S.-USSR workshop is planned for December 3-10 to follow the WHO conference on Radiation and the Thyroid in Chernigov. An important objective of the workshop will be discussions on the applicability of the most modern procedures to detect thyroid dysfunction, define exposure and dose, and to suggest improved methods for standardization and quality assurance.

In April 1990 two Soviet specialists visited the U.S. to help plan for the December meetings. Dr. Ilyin specifically asked for U.S. information developed as a result of radiation releases near Hanford, Washington, in the 1950's to be delivered at the time of the thyroid conference.

D. Leukemia Protocol Design:

The objective is to design a long-term leukemia epidemiology protocol, involving selected population cohorts, which includes the dose reconstruction, particularly of bone marrow, necessary to create a dose-effect relationship with minimum uncertainty. Included will be consideration of all dose sources, including bone-seeking radionuclides such as strontium-90. A planning meeting is being held in Kiev this week following a visit to Minsk to explore opportunities for collaboration. A workshop will be organized in Bethesda in the spring or summer of 1991 to develop the study protocol.

E. Countermeasures to Reduce Internal Radiation Exposure From Radioactive Cesium:

This work is still in a planning stage. Dr. Catlin is trying to organize a meeting in the USSR in December, 1990, to begin this work.

F. Role of Dose Rate in Stochastic Somatic Radiation Effects Estimation:

A workshop will be held in mid 1991 in the U.S. Empirical data from the East Ural accident and the contamination of the Techa River will be examined together with relevant experimental animal data and available information on mechanisms of carcinogenesis from cellular and molecular studies. The workshop will assess the feasibility of development of dose-rate dependent models for risk of stochastic, somatic effects from low-level radiation.

G. Population Registries and Database Management:

This work has been postponed - not because it is unimportant - but in order to benefit from the exchanges from tasks 7.2.C. and 7.2.D. It should result in some long-term specialist exchanges for future work.

WORKING GROUP 8
EXCHANGE OF OPERATIONAL EXPERIENCE

In accordance with the October 1989 Protocol (P-2, item 8.1.1), Working Group 8 held a meeting, April 23, 1990 (M-5), in the USSR and discussed the following issues of mutual interest:

- indicators of nuclear power plant safety with emphasis on measures to monitor maintenance.
- implications of human factors on nuclear power plant safety.
- in-depth discussion of methods for identifying accident precursors.
- assessment of the effectiveness of feedback and dissemination of operational experience.
- selected safety significant events or event classes.

Recommendations for Future Activities

The following topics will be reviewed and discussed at the next Working Group 8 meeting to be held in the fall of 1990 in the U.S.:

1. Performance indicators should be further discussed in the next meeting. Specific subjects would include further development and benefits resulting from the use of the indicators. The U.S. should coordinate a discussion of plant maintenance management systems and possibly a presentation by a U.S. utility.

2. JCCCNRS believes that future work is warranted to examine the human factors of recent operational events and share results from that work. Actual examples of operator performance during abnormal operational events should be further discussed.

3. Before the meeting, additional information on the Accident Sequence Precursor (ASP) code should be provided to the USSR delegation.

4. U.S. and USSR: Discussion of recent operational experience, including root cause analysis, lessons learned and feedback of operating experience.

Additional Future Items

1. Future meetings of the working group should include reports on new feedback projects, new case studies, and the analysis of recent safety significant events, specific topics being:

- (a) U.S.: Studies addressing common-cause failure potential.
- (b) U.S.: Programs and studies associated with conditions and events occurring during plant shutdowns.
- (c) U.S. and USSR: Interplant feedback of operating experience to stimulate improved plant performance.

2. Future meetings will be held in the spring-summer 1991 in the USSR and fall-winter 1991 in the U.S.

3. Agendas for the 1991 meetings will be finalized during the meeting in the U.S. in November, 1990.

WORKING GROUP 9
DIAGNOSTICS, ANALYSIS EQUIPMENT AND SYSTEMS
FOR SUPPORTING OPERATIONS

In accordance with the October 1989 Protocol, Working Group 9 held two meetings-- the first one in December 1989 (M-4) and the most recent in June 1990 (M-6).

At the December meeting (M-4), in accordance with (P-2 item 9.1), the following topics were covered:

- diagnostic system of the nuclear power plant equipment lifetime under cyclic loadings.
- monitoring and diagnostic system of the nuclear power plant.
- expert systems to monitor, simulate and ensure safe operation of the plant.
- development of generic systems of fast diagnostics of NPPs.
- development and implementation experience of the generic system of fast diagnostics for the first power unit of Ignalina NPP.
- fast diagnostic system of the reactor core and main equipment of VVER during operation.
- reliability projections of unique NPP equipment under cyclic loads during the operation.
- systems approach to training.
- operator training and licensing process.
- simulator history.
- operator information support systems.
- procedural support for operators.
- simulator types and use in the U.S.

- Electric Power Research Institute (EPRI) development . . expert systems.
- simulator certification.

At the June meeting (M-6), the following 9.2 topics were covered:

- organization of operational control of NPPs in the USSR.
- system for training and maintaining professional qualifications and increasing the qualifications of NPP personnel in the USSR.
- organization of administrative-technical control of NPPs in the USSR.
- diagnostics at reactor installations of NPPs in the USSR.
- system of acoustic diagnostics at NPPs including PWR power plants.
- problems of developing general systems of operative diagnostics of NPPs.
- management and organization of NPPs.
- U.S. experience in and observation of Safety Parameter Display Systems (SPD).
- major technical components of symptom-based Emergency Operating Procedures (EOP).
- observation of General Electric EOP training scenarios and of actual simulator training of NRC personnel.
- procedure violations in U.S. NPPs: Chernokyl follow-up.
- TMI lessons learned regarding EOP.
- EOP Tracking System (EOPTS).
- Reactor Emergency Action Level Monitor (REALM) system.

Recommendations for Future Activities

The working group will meet next in the Soviet Union in spring of 1991. The agenda will include the following activities:

1. Discuss and demonstrate specific diagnostic systems being designed, developed, tested, and installed in the U.S. and USSR NPPs.
2. Discuss diagnostic systems, man-machine interfaces, signal validation techniques, operator aids, plant database design and management, and automated control systems. Demonstrations of these systems should be made whenever possible.
3. Discuss the details of staffing and labor policies (including shift schedules, shift rotation, and overtime compensation) for U.S. and USSR NPP personnel.
4. Discuss the training of U.S. and USSR NPP personnel and begin discussions of the training and certification programs for USNRC inspectors and USSR State inspectors.
5. Determine the feasibility of joint development and application of an operational diagnostic system and possible implementation of a U.S. developed expert system in a Soviet NPP.
6. Visits to the Novovoronezh or Smolensk national training centers.
7. A briefing at a subsequent meeting on the qualification and training programs for state reactor inspectors.
8. Discuss the use of robotic aids for inspection and maintenance.
9. Explore the possibility of a joint development of an operational diagnostic with development and testing at a U.S. simulator and possible installation at a U.S. NPP.
10. The possible transfer of discussions of staffing and training to Working Group 11 will be examined further.
11. It is recognized that the U.S. training programs are to a large extent based upon regulatory requirements. These include licensing of plant operators and certification of training programs. As a result, these aspects remain with Working Group

1. The emphasis of Working Group 9 is directed to the man-machine interface. Because of the relationship between Working Groups 1 and 9 a joint session should be scheduled.

**WORKING GROUP 10
EROSION/CORROSION DESTRUCTION OF
PIPING AND COMPONENTS**

In accordance with the October 1989 Protocol (P-2 item 10.1.1.), Working Group 10 held a meeting in June 1990 (M-7) in Moscow in which the following topics were covered:

- water chemistry regimes for power water reactors (PWR) and boiling water reactors (BWR) in nuclear power plants.
- corrosion product release and transport.
- non-destructive examination techniques for monitoring degradation of components due to erosion and corrosion.
- study of alternative or new materials to resist the effects of erosion and corrosion.

Recommendations for Future Activities

1. Following a visit to U.S. plants and laboratories by a Soviet delegation currently scheduled for late October 1990, future work of Working Group 10 will be conducted within the framework of Working Groups 3 and 9 and a new Working Group 12 on aging and life extension. Following the October meeting, it is anticipated that the work of this group will have been accomplished. Upon completion of its activity, Working Group 10 will develop a report on its activities and its conclusions and findings. The NRC will consider the publication of the Working Group report after its receipt.

The following specific topics will be conducted:

- a) Exchange information that identifies structural material used in the primary loop for BWR and PWR and their performance in appropriate operating environments.

- b) Exchange information and explore potential cooperative efforts in diagnostic and monitoring techniques for water chemistry and materials performance.
- c) USSR to provide their erosion/corrosion predictive computer code. The U.S. to make comparisons with U.S. codes using field experience data and provide results to the USSR. Future exchanges and cooperative efforts will be based on the results of this comparison.
- d) Evaluate the Prometey proposal dealing with materials and components performance and reliability. Results of this evaluation may be relevant to other JCCCNRS Working Groups.
- e) Continue careful measurements of corrosion products and buildup. (This will provide an understanding of the role of oxides and corrosion products, e.g., nuclides, and their transport throughout the primary and secondary loops and their interrelationships to ALARA and corrosion performance.)
- f) Investigate corrosion processes kinetics under accident conditions.
- g) Explore and develop joint corrosion-erosion testing of materials with the use of the USSR facilities in order to develop means for pipe line corrosion prevention, methods for lifetime and reliability diagnostics of corrosion resistance parameters.
- h) Exchange specific case studies of NPP equipment materials failure.
- i) Exchange information on methods for accelerated corrosion material structure tests, also under radiation conditions.

2. The USSR and the commercial U.S. nuclear industry are encouraged to extend and to continue dialogues on potential areas of cooperation and mutual benefit. Examples of the potential areas of interest include a USSR in-line monitoring device for detection of erosion-corrosion (BWRs) and the USSR corrosion product transport studies (in-plant) for PWRs to optimize the water chemistry control in the secondary loop. (It is important that the copper ion concentration measurements be made at the same time that the iron transport measurements are performed.)

3. Computer programs developed in the USSR, U.S., and Europe to predict pipe wall thinning due to erosion-corrosion will be compared using actual plant experience data. Strengths from each program could be used to improve all three computer programs.

Additional Future Items

1. A USSR delegation of members of Working Group 10 will visit the U.S. during October of 1990. The trip will include visits at Brookhaven National Laboratory, Westinghouse Electric Corporation, the Surry Nuclear Power Plant (PWR), the Electric Power Research Institute NDE Center, the General Electric Company, Argonne National Laboratory, the Dresden Nuclear Power Plant (BWR), and the NRC. Topics of discussion would include prevention of erosion/corrosion, water chemistry control, NDE equipment and techniques, and material development.

WORKING GROUP 11 INITIATIVE ON OPERATIONAL SAFETY OF CIVILIAN NUCLEAR POWER PLANTS

Working Group 11 was established as a result of an initiative taken by Secretary of Energy Watkins on the operational safety of civilian nuclear power plants. As a result of a meeting in Moscow in March 1990, the initiative took the form of three sub-groups concerned with 1) operating instructions for NPPs, 2) training of NPP personnel, and 3) management and operational control of NPPs.

Working Group 11 held a meeting at the Soviet Novovoronezh NPP in May 1990 in which the following topics were covered:

NPP Operating Procedures:

- structure of the operational documentation of Units 3 and 4 of Novovoronezh NRB.

NPP Personnel Training:

- training programs for the control room operators.

Management and Control of NPP Operation:

- structure of the operational organization.

- conduct and control of operational activities for the FF.
- control room log keeping.
- control of equipment and systems status.
- investigations of abnormal events.

The Expert Group on training met at the U.S. Diablo Canyon Nuclear Power Plant in September 1990. The meeting served to familiarize the Soviet members with U.S. utility training programs and approaches.

Future Activities

Meetings of the Expert Groups on procedure and management are scheduled for late October/November at the U.S. Seabrook and Vermont Yankee plants respectively. (A followup meeting of the Training Group may also be held in the Soviet Union in early November.) A meeting of the Executive Steering Committee is planned for late November, and additional meetings of the three expert groups are expected in March 1991.

ADDITIONAL ITEMS OF DISCUSSION

1. Anatoli Mazalov from GPAN suggested that his organization as the regulatory body in the USSR is interested in pursuing future cooperation with the NRC in the areas of regulation and requirements of:
 - a) Low level waste
 - b) Ionizing source equipment and radioactive materials
 - c) Procedures to regulate older plants and life extension

These points were recently discussed in Vienna, Austria between GPAN Chairman Vadim Malyshev and NRC Chairman Kenneth Carr, during the time of the recent IAEA General Conference.

2. Professor Amaev, Working Group 3 Soviet Leader, asked that the Co-Chairmen of the JCCNRS pay particular attention to

plant aging questions and plant life extension as they apply to the possible establishment of a new Working Group 12. The Co-Chairmen can direct the work either as a new group or as specific tasks for existing groups.

Dr. Speis suggested that aging of vessel questions remain in Working Group 3 but other aging questions be in other groups. This met with agreement.

3. Relevant materials on a new U.S. cancer study of cancer effects in the areas around/surrounding nuclear power plants was mentioned by Mr. Taylor and Dr. Schulman. The results showed that there were no significant increases in cancer mortalities as a result of the plant operating in the neighborhood. The study and other materials will be provided by the U.S. side as soon as possible.

4. REPORT ON HOST COUNTRY PAYMENT POLICY

Dr. E. Shomaker and Dr. V. Sukhoruchkin presented an overview of the current status of Host Country Payments Policy within the JCCCNRS. The balance currently has a small Soviet credit, but this should be roughly even by March, 1991. Both sides discussed the current problems with the program, especially the hard currency restrictions at formal hotels in Moscow. The Soviet side is attempting to negotiate long-term agreements with hotels and guest houses that are exempt from these restrictions. Some success has been achieved, but the future is not certain. At any rate, our balance will be achieved soon and future actions will be on a case-by-case basis.

It is important to note that a particularly open and candid discussion on host country problems took place during both the Working Group 7 discussion on October 8 and the general discussion on October 9. Dr. Ilyin of the Institute of Biophysics discussed the problems of hard currency payment requirements within Moscow and stated that his organization was doing the best it could under the circumstances. Lastly, Dr. Ilyin asked that the Committee consider 7.1 and 7.2 as separate groups for host country purposes and that the Working Group 7 leaders develop yearly goals on the number of man-days for each group.

At the conclusion of this discussion, the Co-Chairmen determined that the principle of host country payment is still a valid goal and they directed the program managers to carry out all reasonable and flexible measures to assure

reasonable accommodations and balance on both sides. Further, the program managers were directed to try and determine man-day numbers for each working group using host country payments.

5. DISCUSSION OF LABORATORY VISITS

In addition there was a discussion of the possibility of long-term assignments of specialists from each country. The normal practice for such assignments in the U.S. is sending side pays, but it was determined that both leaders would review and decide on such assignments on a case-by-case basis and that the policy of host country long-term exchanges is possible.

6. NUCLEAR POWER PLANT AGING AND LIFE EXTENSION

A new Working Group 12 will be considered by both sides to be added to the cooperative program in 1991. The first set of discussions would consider plant aging. These would concentrate on scientific and engineering topics. After these discussions are completed, discussions would consider plant life extension. These would concentrate on the regulatory and licensing aspects of the process.


In addition, the first tasks for this new working group will include the identification of areas of mutual interest, the development of recommendations as to which tasks will be performed by this new group and which tasks will be performed within the work of existing working groups. In order to facilitate this process the U.S. side provided the Soviets with a draft of areas of interest for this group. The Soviets will review this draft and exchange views with the U.S. by the spring of 1991. Mr. Taylor noted that a GPAN official would be an appropriate sub-working group leader for the regulatory and licensing aspects of plant life extension.


FUTURE JCCCNRS MEETINGS

Both sides agreed to hold the next meeting of the JCCCNRS in the U.S. in autumn 1991.

Appendices:

- I. U.S. Representatives
- II. USSR Representatives


James M. Taylor
Executive Director for
Operations
U.S. Nuclear Regulatory
Commission
U.S. Co-Chairman of JCCCNRS


Nikolay N. Ponomarev-Stepnoy
First Deputy Director
I.V. Kurchatov Institute of
Atomic Energy
USSR Co-Chairman of JCCCNRS

APPENDIX I

Joint Coordinating Committee for Civilian Nuclear Reactor Safety (JCCCNRS)

October 1990
Moscow, USSR

U.S. Representatives

JCCCNRS Co-Chairman

James Taylor, Executive Director for Operations, U.S. Nuclear
Regulatory Commission (NRC)

Committee Members

Frank Miraglia, Deputy Director, Office of Nuclear Reactor
Regulation, NRC

Themis Speis, Deputy Director for Generic Issues Resolution,
Office of Nuclear Regulatory Research, NRC

Edward Jordan, Director, Office of Analysis and Evaluation of
Operational Data, NRC

Frank Goldner, Technical Adviser to the Director, International
Nuclear Program Division, Office of Nuclear Energy, Department of
Energy (DOE)

Murray Schulman, Executive Assistant to the Director for Health
and Environmental Research, Office of Energy Research, DOE

JCCCNRS Advisors

Edward Shomaker, Senior Program Manager (U.S.-Soviet
Cooperation), International Programs, GPA, NRC

Gordon Fowler, Program Manager (U.S.-Soviet Cooperation),
International Programs, GPA, NRC

Working Group Representative

John Kudrick - WG-2

Interpreters

John Glad
Joseph Lewin

APPENDIX II

Joint Coordinating Committee for Civilian Nuclear Reactor Safety (JCCCNRS)

October 1990
Moscow, USSR

U.S.S.R. Representatives

USSR Ministry for Nuclear Energy and Industry

Viktor A. Sidorenko, First Deputy Minister

Alexander T. Gutsalov, Assistant to First Deputy Minister

JCCCNRS Co-Chairman

Nikolay N. Ponomarev-Stepnoy, First Deputy Director,
I.V. Kurchatov Atomic Energy Institute

Committee Members

Armen A. Abagian, Director, Nuclear Power Plant Research
Institute

Vladimir G. Asmolv, Head of Division, I.V. Kurchatov Atomic
Energy Institute

Anatolyi T. Mazalov, Head of Main Scientific Department, Nuclear
Safety Supervisory Committee

Nikolay I. Ermakov, Head of Main Scientific Department, State
Committee for Utilization of Atomic Energy (GKAE)

JCCCNRS Advisors

Leonid A. Ilyin, Director, Biophysics Institute

Yuri M. Nikitin, Head of Department, Power Energotechnology
Institute

Vladimir K. Sukhoruchkin, Head of Laboratory, I.V. Kurchatov
Atomic Energy Institute

Valentin G. Fedorov, First Deputy General Designer, Hydropress
Design Bureau

Leonid A. Bolshov, First Deputy Director of the USSR Academy of
Sciences Nuclear Safety Institute

Working Group Leaders or Their Representatives

Anatolyi T. Mazalov - WG-1
Gleb L. Lunin - WG-2
Amir D. Amaev - WG-3
Anatolyi K. Mikeev - WG-4
Oleg Ya. Shakh - WG-6
Yuryi E. Kazakov - WG-7.1
Vladimir M. Vitkov - WG-8
Viktor M. Dmitriev - WG-9
Ivan A. Stepanov - WG-10

Interpreters

Alexander N. Gavrishin, Researcher, I.V. Kurchatov Atomic Energy
Institute

Olga A. Proshina, Engineer, I.V. Kurchatov Atomic Energy
Institute

IMPLEMENTING ARRANGEMENT
ON SEVERE ACCIDENT RESEARCH
BETWEEN
THE UNITED STATES NUCLEAR REGULATORY COMMISSION (USNRC)
AND
THE I.V. KURCHATOV INSTITUTE FOR ATOMIC ENERGY (IAE)

Considering that the United States Nuclear Regulatory Commission (USNRC) and I.V. Kurchatov Institute for Atomic Energy (IAE), hereafter referred to as IAE,

1. Have been cooperating in Working Group 6, Severe Accidents, of the Joint Coordinating Committee for Civilian Nuclear Reactor Safety (JCCCNRS) (held pursuant to the authority set forth in the Memorandum of Cooperation in the Field of Civilian Nuclear Reactor Safety of April 26, 1988, and the Peaceful Uses of Atomic Energy Agreement of June 1, 1990; hereinafter Peaceful Uses Agreement)
2. Have a mutual interest in cooperation in the field of severe accident research, with the objective of improving the safety of reactors on an international basis;
3. Have, as a mutual objective, reciprocity in the exchange of technical information in the field of reactor safety research;

USNRC and IAE, acting on behalf of the Soviet side of the JCCCNRS and at the request of the USSR Ministry of Nuclear Power and Industry, have adopted the following terms and conditions as an implementing arrangement:

ARTICLE I - PROGRAM COOPERATION

The USNRC and the IAE, in accordance with the provisions of this Arrangement and subject to applicable laws and regulations in force in their respective Countries, will join together for cooperative research in Severe Accident programs sponsored by the USNRC as well as those sponsored by the IAE.

ARTICLE II - FORMS OF COOPERATION

Cooperation between the parties may take the following forms:

- A. The exchange of information in the form of technical reports, experimental data, correspondence, newsletters, visits, joint meetings, and such other means as the parties agree.
- B. The temporary assignment of personnel of one party or of its contractors to laboratories or facilities owned by the other party or in which it sponsors research; each assignment to be considered on a case-by-case basis and to be the subject of a separate attachment-of-staff arrangement between the parties.
- C. The execution of joint programs and projects, including those involving a division of activities between the parties; each joint program and project will be considered on a case-by-case basis and will be the subject of a separate arrangement between the parties.

- D. The use by one party of facilities that are owned by the other party or in which research is being sponsored by the other party; such use of facilities will be the subject of separate arrangements between the parties and may be subject to commercial terms and conditions.
- E. If either party wishes to visit, assign personnel, or use the facilities owned or operated by entities other than the parties to this Arrangement, the parties recognize that the approval of such entities will in general be required with respect to the terms upon which such visit, assignment, or use will be made.
- F. Any other form agreed between the parties.

ARTICLE III - SCOPE OF COOPERATION

A. USNRC Scope of Responsibility

The USNRC will provide the following specified goods and services related to nuclear reactor Severe Accident research:

1. Severe Accident Codes

The USNRC will transmit to the IAE all relevant domestically available severe accident analysis codes and associated documentation developed by the USNRC. These codes will include

but are not necessarily limited to the latest versions of:

MELCOR
RELAP/SCDAP
VICTORIA
CONTAIN
HECHTR
CORCON

The USNRC will also accommodate reasonable requests from IAE regarding the installation and use of these codes.

2. Experimental and analytical Research Results

The USNRC will provide the IAE with copies of pertinent technical program documents and experimental data as documented in quick-look reports, technical memoranda, laboratory reports, etc., that are developed or obtained under the NRC's severe accident research program as soon as they have received appropriate management review.

The scope of the research program to be conducted by the USNRC is described in Appendix A.1 to the arrangement.

3. Meetings, Visits, and Exchange of Personnel

3.1 The USNRC will

- a) Permit Soviet personnel sponsored by IAE to attend, as appropriate, technical program review meetings and technical progress meetings except for those meetings primarily concerned with administrative and fiscal matters between the NRC and its contractors.
- b) Facilitate visits of IAE-sponsored personnel to laboratories at which NRC sponsored work relevant to this cooperation is being carried out.
- c) Permit the assignment of IAE-sponsored personnel to participate and work in the USNRC severe accident program and to have ready access to relevant documentation, codes and results.

B. IAE Scope of Responsibility

The IAE will provide the following specified goods and services related to nuclear reactor severe accident research:

1. Severe Accident Codes

The IAE will transmit to the USNRC all relevant severe accident analysis codes and associated documentation developed by IAE.

These codes will include:

RASPLAV - description of the processes of corium-concrete interaction

PROBL - hydrogen distribution and behavior (including combustion) in plant premises under severe accidents

MAIWA-2 - non-stationary temperature field in fuel elements under a pulse change of reactor power

TWOL, TWOE, 3ET - calculations of gas dynamic flows with chemical reactions in two- and three-dimensional geometries.

The IAE will also accommodate reasonable requests from the USNRC or its contractors regarding the installation and use of these codes.

2. Experimental and Analytical Results

The IAE will provide the USNRC with copies of pertinent technical programs documents and experimental data as documented in quick look reports, technical memoranda, laboratory reports, etc., as soon as they have received appropriate management review. The scope of the program to be conducted by the IAE is described in Appendix A.2 to this request.

3. Meetings, Visits and Exchange of Personnel

The IAE will

- a) Permit USNRC personnel or contractors sponsored by USNRC to attend, as appropriate, technical program review meetings and technical progress meetings concerning IAE-sponsored severe accident research.
- b) Facilitate visits of USNRC personnel or contractors sponsored by USNRC to laboratories at which IAE sponsored work relevant to this cooperation is being carried out.
- c) Permit the assignment of USNRC personnel or its contractors sponsored by USNRC to participate and work in the IAE severe accident program and to have ready access to relevant documentation, codes and results.

ARTICLE IV - ADMINISTRATION OF THE ARRANGEMENT

- A. The USNRC and the IAE will each designate one representative to coordinate and determine the detailed implementation of this Arrangement. This designated representative will be referred to as an Administrator of the Arrangement. The Administrators may, at their discretion, delegate this responsibility to the appropriate individuals with respect to a given issue.
- B. This Arrangement states restrictions concerning dissemination of proprietary or other confidential or privileged information. Other information that may be restricted includes matters related to organization, budget, personnel, or management.
- C. The USNRC and the IAE will endeavour to select technical personnel for assignment to the arrangement who can contribute positively to the activities. USNRC and IAE technical personnel assigned to the arrangement for extended periods will be considered visiting scientists (nonsalaried) within the arrangement and will be expected to participate in the conduct of the analysis and experiments of the arrangement as directed.
- D. Each party to this Arrangement will have access to all reports written by its partner's technical personnel assigned to the respective activities that derive from participation in this Arrangement.

- E. Except for dissemination to IAE [which has the responsibility as principal contact to share the data with its partners who are active members ~~in Working Group 6~~ of the JCCCNRS] in accordance with this Arrangement, USNRC-supplied codes and analytical techniques and any improvements, modifications or updates to such codes or techniques will not be disseminated to other parties outside the USSR without the consent of the USNRC.
- F. Except for dissemination to USNRC and its principal contractors in accordance with this Arrangement, IAE-supplied codes and analytical techniques and any improvements, modifications or updates to such codes, techniques will not be disseminated to other parties outside the U.S. without consent of the IAE.
- G. Article III and Appendix A outline the technical program to be performed under this arrangement.
- H. Travel costs, living expenses, and salaries will be borne by the parties who incurred them unless specified otherwise.

ARTICLE V - PATENTS AND EXCHANGE AND USE OF INFORMATION

The provisions of the Intellectual Property Rights (IPR) Annex to the Peaceful Uses Agreement will be applied to the protection of intellectual property developed from cooperation under this arrangement.

ARTICLE VI - FINAL PROVISIONS

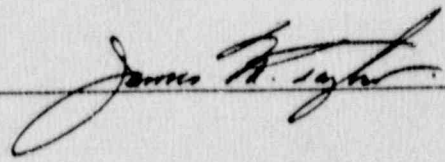
- A. This Arrangement will be effective from the date of acceptance by the USNRC and the IAE and will be employed for three years thereafter.
- B. Either Party may withdraw from the present Arrangement in accordance with Article 9.2 of the Peaceful Uses Agreement, i.e., after providing the other Party written notice at least 180 days prior to its intended date of withdrawal.
- C. All costs arising from implementation of this Arrangement will be borne by the Party that incurs them except when specifically agreed to otherwise by both Parties.
- D. The Parties to this Arrangement reserve the right to modify or extend the activities described in Article III and Appendix A within the intended scope of this Arrangement upon written concurrence of its Administrators.
- E. If the portion of the research program of either Party that is pertinent to this Arrangement is substantially reduced or eliminated, the technical scope described in Article III may be adjusted to substitute research of equivalent programmatic interest upon mutual arrangement of the Parties.

- F. The USNRC and the IAE recognize the benefits of international cooperation and, if necessary, will endeavor to obtain a mutually agreeable continuation of this Arrangement before its expiration.

- G. The responsibility for the proper use of codes, data and any related information exchanged pursuant to this Arrangement are the individual responsibility of each party. Neither side guarantees the direct applicability of their data and codes to the equipment and reactor types of the other party.

- H. Any dispute between the parties concerning the interpretation or application of this Arrangement will be settled by mutual arrangement of the parties.

FOR THE UNITED STATES NUCLEAR REGULATORY COMMISSION


BY: 

TITLE: _____

DATE: _____

PLACE: _____

FOR THE I. V. KURCHATOV INSTITUTE FOR ATOMIC ENERGY

BY:  11.1090

TITLE: _____

DATE: _____

PLACE: _____

APPENDIX A

A.1 Under the term of this Arrangement between the USNRC and the IAE, the USNRC will:

Provide the IAE from time to time with detailed information relevant to this Arrangement. This information may be conveyed by transfer of published reports and other documentation and/or by discussions, as appropriate. The technical areas covered in this Arrangement are described in more detail below. The technical program will be reviewed annually or as often as mutually agreed. The technical areas covered here include:

(a) Severe Accidents and Source Term Research Programs which include the following elements:

Analysis Support for German CORA program (INEL)

SCDAP-Assessment and Maintenance (INEL)

TMI Core Examination - NRC sponsored work (ANL and INEL)

Lower head Failure Analysis (INEL)

High-Temperature Fission Product Release Experiments (ORNL)

Post-Accident Fission Product Chemistry (ORNL)

Validation Studies on Fission Product/Aerosol Transport (ORNL)

Fission Product Deposition of Aerosols (SNL)
High-Temperature Fission Product Deposition
(SNL)
Victoria - Assessment and Maintenance (SNL)
Core-Melt Phenomena and Modeling (SNL)

In the above tasks, emphasis will be placed upon resolution of remaining important phenomenological uncertainties arising both from generic and specific aspects of specific severe accident applications and related plant-specific analyses.

- (b) An extended ACRR Test Program which includes separate effects experiments related to core melt phenomena.
- (c) An extended NRU Test Program which includes a final full length fuel assembly test, and evaluation of previous full length tests.
- (d) High burnup fuel studies including evaluation of actinide relationships (analyses and in-reactor and ex-reactor experiments) - to be developed with the aid of other participants in this program.
- (e) Containment Loads Research Program which includes experiments and analyses in the area of core-concrete

interactions including large-scale melt programs and small separate effects tests.

- (f) Direct containment heating experiments in the Surtsey facility at Sandia.
- (g) Hydrogen behavior program consisting of large scale experimental data from the flame and hot-tube facilities, and the associated data, analyses, and code development.

A.2 The IAE will:

Provide the USNRC from time to time with detailed information relevant to this Arrangement. This information may be conveyed by transfer of published reports and other documentation and/or by discussions, as appropriate. The technical areas covered in this Arrangement are described in more detail below. The technical program will be reviewed annually or as often as mutually agreed. The technical areas covered here include:

- (a) Hydrogen combustion studies that include:

Hydrogen-air-mixtures,
Hydrogen-air-steam mixtures,

Detonable mixtures,

Hydrogen-air mixtures with water spray additions.

- (b) Hydrogen spontaneous detonation formation, including:

Experimental study and numerical modeling of detonation formation in non-uniform mixtures (self-initiation of detonation, SWACER-mechanism),

Self-initiation conditions in presence of temperature and concentration gradients,

Deflagration to detonation transition (DDT).

- (c) Studies of fission product release from the fuel in in-reactor and ex-reactor experiments using irradiated fuel or its simulators.

Volatile fission product behavior (iodine, caesium) and their forms in the containment under severe accidents.

- (d) Small scale (up to 1 kg) and medium scale (10-20 kg) experimental studies of core-concrete interactions and resulting releases of aerosols and gases.

Small and medium scale experimental studies of core-water interactions.

(e) Material testing studies:

Thermal physical, physical and chemical properties of molten oxides and metals, their multi-component systems, mechanical properties of structural materials under severe accidents.

(f) Analysis of fission product mitigation (or concentration) by natural occurrences in the Chernobyl vicinity that are caused by other than normal radioactive decay and air or water motion (i.e., chemical reactions, physical transport by carrier aerosols, etc.).

(g) Experimental and theoretical studies of interactions between molten core and reactor lower head under reactor vessel external cooling with water and other means.