February 13, 1996 SECY-96-036

FOR: The Commissioners

FROM: James M. Taylor /s/
Executive Director for Operations

SUBJECT: STATUS OF NRC RESEARCH CONDUCTED BY THE RUSSIAN RESEARCH CENTER (I.V. KURCHATOV INSTITUTE) AND THE INSTITUTE OF NUCLEAR SAFETY OF THE RUSSIAN ACADEMY OF SCIENCES

PURPOSE:

To inform the Commission of the progress made on research sponsored by the NRC at the Russian Research Center (the I.V. Kurchatov Institute) and the Institute of Nuclear Safety of the Russian Academy of Sciences. Also, to inform the Commission of the staff's plan to continue these arrangements in 1996 provided that research results continue to be of value to the NRC and that measurable progress is being made. We will inform the Commission annually of these programs.

SUMMARY:

For the past several years the Russian Research Center and the Russian Academy of Sciences have performed research work for the NRC under bilateral agreements. This work is funded by the Office of Nuclear Regulatory Research and involves research in code development and assessment, hydrogen combustion experiments, evaluation of high burnup fuel test data, in-vessel debris coolability experiments, evaluation of reactor pressure vessel surveillance capsule data and development of concrete containment failure criteria. The results of this work have led to code improvements, expanded data bases and confirmatory research information. This work has also helped the Russians become familiar with USNRC analytical tools, safety issues and Western approaches to safety. It is intended to continue these programs in 1996. The proposed agreements for the 1996 work are attached to this paper.

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BACKGROUND:

In SECY-91-375, "Proposed Arrangement with the I.V. Kurchatov Institute for Atomic Energy of the U.S.S.R. on Severe Accident Experiments," SECY-92-015, "Addendum to SECY-91-375," SECY-93-350, and SECY-95-021, "Status of NRC ... Arrangements," the staff provided descriptions of the NRC research programs being conducted in Russia and recommended to the Commission that continued research cooperation between the NRC and the Russian Research Center and the Institute of Nuclear Safety of the Russian Academy of Sciences was in the best interest of the NRC. The Commission endorsed the staff recommendation.

Currently, the work being performed for the NRC by the Russian Research Center is described in Addendum 5 to Appendix A of the Implementing Arrangement on Severe Accident Research between the USNRC and the Russian Research Center (RRC). A copy of this Addendum was enclosed with SECY-95-021. The 1995 work covered by the Addendum consists of:

- Model development, calculations and experiments on hydrogen combustion
- Evaluation of high burnup fuel test data
- Investigation of mechanisms for in-vessel cooling of molten core debris
- Evaluation of reactor pressure vessel surveillance capsule data

The FY 1995 cost to NRC for this work was $600K.

The work being performed for the NRC by the Institute of Nuclear Safety is described in the Implementing Agreement on the Development and Application of Nuclear Safety Analysis Codes between the USNRC and the Institute of Nuclear Safety of the Russian Academy of Sciences (RAS). A copy of this implementing arrangement was also enclosed with SECY-95-021. The 1995 work covered by the implementing arrangement consists of:

- Model development and assessment for NRC severe accident codes
- Enhancement of the data base and assessment of NRC thermal-hydraulic codes
- Development of concrete containment failure criteria

The FY 1995 cost to NRC for this work was $600K.

DISCUSSION:

Discussed below is a summary of the work done in 1995 under Addendum 5 and the Implementing Agreement and our plans for continuing work in 1996. Attached to this paper are a proposed updated Implementing Agreement covering the 1996 work at the RRC and a proposed Addendum 1 to the existing agreement with the RAS covering their 1996 work. The proposed updated Implementing Agreement with the RRC replaces the existing Implementing Arrangement which expires in 1996.

WORK AT THE RRC

Work Completed in 1995

- Hydrogen Behavior -

During 1995 the RRC continued to conduct experiments on hydrogen combustion to provide data on the potential for hydrogen detonation by hot turbulent jet initiation and deflagration to detonation transition (DDT). Tests were performed in different size facilities to investigate the effects of scale on the experimental results.

Tests were conducted in the large scale (480 m^3 volume) RUT facility with a low elevation for the hydrogen injection location and higher elevation for the hydrogen igniter. These tests confirmed that for this configuration, which is typical of the relative igniter placement in U.S. nuclear plants, no DDT was observed and only slow deflagration was produced with a very small pressure rise.

In 1995 the RRC completed a report on the turbulent jet initiation experiments that had been completed during 1994 in the KOPER facility. These tests had been conducted in a confined volume (approximately 50 m^3) to study the effect of parameters such as jet size and hydrogen concentration on hydrogen combustion phenomena. The RRC conducted additional turbulent jet initiation experiments in 1995 in a redesigned KOPER facility (150 m^3 volume). The results of these tests were compared to previous tests under similar conditions to study scaling phenomena.

The findings from the above experiments are being used to develop a generalized methodology for predicting the possibility of detonations due to both turbulent jet initiation and DDT. The implications of these findings with respect to the potential for detonation occurrence during severe accidents in nuclear power plants continue to support our general view that detonations are unlikely during a severe accident.

- High Burnup Fuel -

In 1995 all 13 VVER-1000 high burnup fuel tests conducted in the IGR reactor were analyzed. Energy depositions, cladding condition and failure mechanism were determined. Post irradiation examination was also conducted on the test rods. The results were presented at an OECD/NEA specialist meeting in France in September 1995 and also at NRC's Water Reactor Safety Meeting in October 1995. Key results obtained so far include:

- fuel cladding rupture occurred by a different mechanism (ductile failure) than in some French, Japanese and U.S. tests (brittle failure).

- VVER cladding (Zr,Nb) oxidizes less than standard LWR cladding (Zr, Sn) and oxidation affects the failure mechanisms.

- cladding failures occur at about the same energy level in VVER fuel as in lightly oxidized LWR fuel.

- In-vessel Cooling Mechanisms -

During 1995 RRC initiated a project to investigate inherent heat transfer mechanisms that may have resulted in enhanced cooling of the reactor pressure vessel lower head during the TMI-2 accident. This was funded jointly by RRC and NRC. RRC prepared a design for experiments to measure the thermal resistance in a steam-filled gap between the solid ceramic crust and the vessel wall. In addition, RRC developed an

analytical model to predict the experimental results. Construction of the experimental test apparatus and completion of an initial feasibility test are to be completed in early 1996.

- Evaluation of Surveillance Capsule Data -

The work in 1995 consists of the following three tasks:

1. Evaluation of fast neutron fluence for the South Ukraine No. 1 NPP surveillance assemblies

2. Evaluation of fast neutron fluence for the Novovoronezh No. 5 NPP surveillance assemblies; and

3. Evaluation of fast neutron fluence for surveillance assemblies from other standard VVER-1000 reactors.

The first two evaluations have been completed and documented in letter reports to NRC dated June 30, 1995 and October 30, 1995 respectively. Work on the third evaluation is in progress. The fast neutron fluences (E>0.5 NeV) have been completed for surveillance capsules in the Kalinin and Balakovo reactors in Russian and for Rovno and Zaprozohia in Ukraine. In addition, material specimens from these assemblies have been evaluated and analyzed for the following:

- ductile-to-brittle transition temperature;

- surveillance impact test results and general trends of radiation embrittlement of VVER-1000 RPV materials;

- dependence of radiation embrittlement for welds, heat affected zone, and base metal;

- trend curves for the dependence of radiation embrittlement on fluence and chemical composition;

- radiation embrittlement for projected end of life conditions.

A report on the work in the third task is expected in early 1996.

<u>Work Planned for 1996</u>

Attachment I to this paper describes the work planned in 1996 at the RRC. This work is summarized below:

- Continuation of Hydrogen Behavior Research -

  In 1996 experimental work on hydrogen deflagration will continue. This will include additional experiments on hydrogen ignition at a temperature higher than ambient temperature and in the presence of steam at the large scale (480m^3) RUT facility. The purpose of this work is to investigate the effects of scale on the experimental results obtained at smaller scales on hydrogen deflagration. We are currently working with France and Germany on a cost sharing arrangement for this work in 1996, thus enabling the generation of test data at a lower cost to NRC. The cost shown in the Agreement is the U.S. contribution only.

- Continue Investigation of In-vessel Cooling Mechanisms -

  This work is a continuation of the work begun in 1995 to

investigate the potential for water in the reactor vessel to provide enhanced cooling of molten core debris beyond what is currently modeled. A test apparatus to measure gap conductance in the presence of high pressure water/steam was designed and built and in early 1996 a feasibility test is to be run to demonstrate the technique. Based upon the results of the feasibility test, future plans will be developed and the remainder of the 1996 work defined, including continuing the cost sharing arrangement with RRC.

- Evaluation of High Burnup Fuel Test Data -

  A report on the data analyzed in 1995 will be published. Additional analysis of the test transients will be performed and additional post-irradiation examinations will be conducted to investigate the failure mechanisms. The cost of this work is being shared 50-50 with CEA, France. Supplemental funding from RRC is also expected. The cost shown in the proposed Agreement is the U.S. contribution only.

- Dosimetry Benchmark.

  This work will utilize experimental results to benchmark calculations of neutron flux, energy and fluence on in-reactor surveillance specimens and to correlate these data to critical locations on the reactor pressure vessel. The study will perform engineering benchmark calculations for determining fluence estimates for VVER-440 reactor vessels, with standard cores and with reduced low leakage cores, based on mock-up experiments in the LR-O experimental reactor at Nuclear Research Institute, REZ.

WORK AT THE RUSSIAN ACADEMY OF SCIENCES (RAS)

Work Completed in 1995

- Model Development for NRC Severe Accident Codes -

The RAS has been providing model development and code assessment for NRC's severe accident codes SCDAP/RELAP5 and MELCOR. For MELCOR, RAS completed in 1994 an assessment of MELCOR's treatment of core-concrete interactions using a large number of experiments performed under NRC-supported ACE, MACE, SURC, and SWISS programs and under the BETA program conducted in Germany. This assessment will be documented in a two-volume report, NUREG/IA-0129. Volume one will focus on the thermal-hydraulic predictions, and volume two will address the fission product assessment. RAS prepared drafts of both of these volumes in 1995. NUREG/IA-0129 will be published following review and revision of the draft report.

In 1994 RAS completed a melt spreading model for MELCOR which has been peer reviewed. The peer review concluded that the model was too detailed to be incorporated into MELCOR. In 1995 RAS performed an analysis to identify the sensitivity of the model to various parameters. In order to enhance MELCOR with this new information, SNL will exercise the model outside of MELCOR. The results of the SNL analysis will be used to update the existing tabular information in MELCOR. This is considered to be the best compromise between the detailed RAS model and the effect of the model on code running time. RAS has also completed a fuel clad ballooning model in 1995 that has been sent for peer review. The results of the peer review will provide the basis on whether or not to implement this model in MELCOR.

For SCDAP/RELAP5, the RAS has been working on implementation and assessment of improved core degradation models. Specific activities accomplished in 1995 include completion of model design reports on: (1) effective thermal conductivity in porous debris bed, and (2) model development of UO_2 dissolution by molten zircaloy. In addition, implementation and testing of the following three improved models was initiated: (1) UO_2/Zr/steam interactions, (2) candling of fuel rod molten material, and (3) mechanical behavior of fuel rod cladding response, are ongoing at the RAS. The completion of this model implementation and testing effort in the RAS version of SCDAP/RELAP5 is scheduled for 1996.

- Development of Concrete Containment Failure Criteria

The purpose of this work is to develop containment failure criteria applicable to severe accident loads. A model of a reinforced concrete containment was developed and tested against experimental data from a containment test conducted at SNL. Agreement between the model and test results was good and the model was extended to prestressed concrete VVER-1000 type containments.

- Enhancement of the Data Base for NRC Thermal-Hydraulic Codes -

In late 1995 work began on RELAP5 code assessments and this work will continue through 1996. The objective is to assess the adequacy of the RELAP5 hydrodynamic heat and mass transfer models in low flow regimes and for horizontal tube bundles using Russian experimental data. In effect, this will expand the assessment data base for RELAP5 to include data and conditions that were not available in the U.S. and not considered in previous assessments. This assessment will provide additional confidence in demonstrating the adequacy of RELAP5 code to analyze conditions of interest in the AP600 Passive Residual Heat Removal system which employs a tube bundle that has horizontal sections. In addition to code assessment, new models for wall drag and wall heat transfer of two-phase bubble flow at low pressure and low mass fluxes will be developed. The new models will be assessed using existing experimental data and, if satisfactory, will be implemented by INEL in the official version of the RELAP5 code.

Work Planned for 1996

Attachment II to this paper describes the work planned in 1996 at the RAS. This work is summarized below:

- Model Development for NRC Severe Accident Codes.

  Work is planned to continue on SCDAP/RELAP model development and assessment. This will include improving existing models, development of new models and comparisons against experimental data. Also, for those models implemented in the code last year, integrated assessment against experimental data will be done to help ensure proper integral functioning of the code.

- Completion of Development of Concrete Containment Failure Criteria.

  This work is a continuation of a task started in 1995 directed toward the development of failure criteria for concrete containments which can be used in studies of severe accidents and risk. Existing experimental data for a VVER-1000 containment are to be used to assess the model, with the goal of developing

containment fragility data applicable to VVER-1000 containments. However, it is expected that this work will be of general use in assessing any concrete containment.

- Uncertainty Analysis Methods

  A comparison will be made of existing PRA uncertainty analysis methods employed by NRC versus a more detailed uncertainty method developed by RAS, which includes the uncertainty in analytical methods and success criteria. The results will be used to help determine what additional uncertainty methods development would be useful for use in risk-informed regulation.

Given the progress to date on the ongoing programs and the expectation that the 1996 work described above can be successfully carried out, we believe that it is in the best interest of NRC to continue our agreement with the RRC and the RAS. The proposed updated Agreement with RRC and the proposed Addendum 1 to the Agreement with the RAS are attached for information. I intend to forward these to the RRC and RAS for signature. The cost to NRC in FY 1996 of the research summarized above would be $500K for the RRC and $350K for the RAS. These costs do not include the cost of travel, which will be paid for by the RRC and RAS or by NRC through invitational travel. Funds for this research work are in the FY 1996 RES budget. I will continue to keep the Commission informed of progress on the NRC sponsored research at the RRC and the RAS.

James M. Taylor
Executive Director
for Operations

Attachments:
1. Agreement with RRC
2. Addendum 1 to Agreement with RAS

ATTACHMENT I

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

Considering that the United States Nuclear Regulatory Commission (USNRC) and Russian Research Center, formerly the I.V. Kurchatov Institute for Atomic Energy (RRC/IAE):

1. Have been cooperating in the area of civilian nuclear reactor safety as part of a five year Agreement Between the Government of the United States of America and the Government of the Russian Federation Concerning Operational Safety Enhancements, Risk Reduction Measures and Nuclear Safety Regulation for Civil Nuclear Facilities in the Russian Federation signed on December 16, 1993, hereinafter "Agreement";

2. Have been conducting joint cooperative nuclear safety activities through the Joint Coordinating Committee for Civilian Nuclear Reactor Safety (JCCCNRS) (pursuant to the Memorandum of Cooperation in the Field of Civilian Nuclear Reactor Safety of April 26, 1988, and the agreement between the United States of America and the Union of Soviet Socialist Republics on Scientific and Technical Cooperation in the Field of Peaceful Uses of Atomic Energy of June 1, 1990; hereinafter Peaceful Uses Agreement). The JCCCNRS has been acknowledged as the implementing committee for the above Agreement;

3. Have a mutual interest in cooperation in the field of nuclear safety research, with the objective of improving the safety of reactors on an international basis;

4. Have, as a mutual objective, reciprocity in the exchange of technical information in the field of reactor safety research;

The USNRC and the RRC/IAE have adopted the following terms and conditions as an implementing agreement.

ARTICLE I - PROGRAM COOPERATION

The USNRC and the Nuclear Safety Institute of the RRC/IAE, in accordance with the provisions of this Implementing Agreement and subject to applicable laws and regulations in force in the respective Countries, will join together in nuclear safety severe accident research programs related to RBMK, VVER-type and U.S. LWR reactors. This Implementing Agreement supersedes that signed on October 11, 1990, and addresses research in the areas of hydrogen combustion, core-debris coolability, high burnup fuel and materials behavior.

ARTICLE II - FORMS OF COOPERATION

Cooperation between the parties may take the following forms:

A. The exchange of information in the form of experimental results, technical reports, code validation 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; 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 may be considered on a case-by-case basis and may 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; such use of facilities may 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 Implementing Agreement, 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

The objective of this Implementing Agreement is to perform severe accident research related to the development of models, data and criteria to resolve safety issues associated with hydrogen combustion, core debris coolability, high burnup fuel, materials behavior and other areas, as appropriate.

A. USNRC Scope of Responsibility

Subject to Article VI, the USNRC will provide and coordinate the provision of the following specified goods and services related to severe accident research:

1. Codes and Other Support

a. When available, the USNRC will transmit to the RRC/IAE updated FRAPCON and FRAP-T codes for fuel performance analysis.

b. The USNRC will accommodate reasonable requests from RRC/IAE for information and assistance related to the conduct of experimental programs and the analysis of experimental data.

2. Meetings, Visits, and Exchange of Personnel

Subject to Article V.J of this Implementing Agreement, the USNRC will:

a. Permit Russian personnel sponsored by RRC/IAE to attend, as appropriate, technical program review meetings and technical progress meetings related to this Implementing Agreement.

b. Facilitate visits of RRC/IAE-sponsored personnel to laboratories at which NRC-sponsored work related to this Implementing Agreement is being conducted.

c. Permit the assignment of RRC/IAE-sponsored personnel to

participate in USNRC nuclear Safety programs related to this Implementing Agreement and to have ready access to relevant documentation associated with severe accident research.

3. The USNRC will direct and coordinate with the RRC/IAE the above activities to assure timely and effective completion of the above tasks.

4. During the course of this cooperation, the USNRC and RRC/IAE will develop specific tasks such as those listed above, involving severe accident research. These tasks, once developed, will be included as technical appendices to this agreement.

B. RRC/IAE Scope of Responsibility

The RRC/IAE, in coordination with the USNRC, will provide the following specified goods and services related to severe accident research.

1. Hydrogen Combustion

a. Conduct at least six hydrogen combustion experiments in the RUT facility to better define the conditions for transition to detonation. These experiments will be conducted at a temperature higher than ambient temperature with various concentrations of hydrogen, air and steam present. The exact test conditions will be specified by NRC after review of previously conducted test results and in consultation with the French and Germans who are co-sponsoring this experimental program. Cost for these experiments are to be shared among France-IPSN, Germany-FZK and USNRC, and the cost specified in this Agreement is for the USNRC portion only.

b. Continue model development and calculations on hydrogen combustion behavior and continue to provide data on deflagration to detonation transition (DDT) and spontaneous detonation scaling methodology. In addition, provide assistance to USNRC in the review of technical issues associated with hydrogen combustion on an as requested basis.

2. High Burnup Fuel

Work in 1996 is organized in four tasks:

- Prepare a summary paper on high-burnup data assessment for publication in a major technical journal.

- Using American, French, and other available codes, perform transient analysis of IGR tests.

- Perform additional post-irradiation examination to address questions on failure mechanism.

- Perform data assessment and computer analysis for IGR tests with fresh fuel to complement understanding from high-burnup tests.

The cost of this work is to be shared equally between France (CEA) and the USNRC. The cost specified in this Agreement is for the

USNRC portion only.

3. In-vessel Core Debris Coolability

Demonstrate (via a demonstrations test) the operability and feasibility of the test apparatus (designed and constructed in 1995) to produce useful experimental information on thermal conductance across a simulated small gap between a reactor vessel and core debris in the presence of high pressure water/steam. Develop a proposal for continued work based upon the results of the demonstration test.

4. Reactor Vessel Dosimetry Benchmark

Perform engineering benchmark calculations for determining fluence estimates for VVER-440 reactor vessels with standard cores and with reduced low leakage cores. The benchmarks should be based on mock-up experiments carried out by Czech and Russian specialists in the LR-O experimental reactor in the Nuclear Research Institute, REZ. The calculations should be sufficient to correlate the measured data at the location of the surveillance assemblies to critical locations on the reactor pressure vessel.

5. Quarterly Technical and Financial Progress Reports

The RRC/IAE will prepare a quarterly summary letter report on each of the above tasks. Each report should include: the title of the project, a Financial Identification Number (FIN) to be provided by the USNRC, the period of performance, and the reporting period. This report should contain two sections as indicated below.

5.1 Project Status Section

This section should include the following:

a. A listing of the efforts completed during the period and milestones reached or, if missed, an explanation why.

b. Any problems or delays encountered or anticipated and recommendations for resolution.

c. A summary of progress to date (this may be expressed in terms of percentage completion for the project).

d. Planned accomplishments for the next reporting period.

e. Preliminary or interim results, conclusions, trends, or other items of information that the RRC/IAE believes are of timely interest to the USNRC.

f. Problems or delays experienced by the RRC/IAE in the conduct of this effort and the proposed resolutions

5.2 Financial Status Section

Provide the total amount of funds expended (cost) during the reporting period for each task, identifying the major items of expense and the total cumulative expenditure for the year to date.

6. Audit and Record Requirements

The RRC/IAE shall maintain complete accounting records of all funds provided to it by the USNRC under this Implementing Agreement in accordance with accounting principles generally accepted in the Russian Federation. These accounting records shall be maintained for a period of no less than three years after the expiration of this Implementing Agreement. The USNRC, the U.S. Agency for International Development, or other authorized U.S. Government officials shall have full access to the accounting records for the purposes of financial audit during the period of this Implementing Agreement and, after its expiration, for a period of no less than three years.

7. Meetings, Visits and Exchange of Personnel

In accordance with Article V.J. of this Implementing Agreement, the RRC/IAE will:

a. permit USNRC personnel or contractors sponsored by USNRC to attend, as appropriate, technical program review meetings and technical progress meetings concerning RRC/IAE work related to this Implementing Agreement.

b. Facilitate visits of USNRC personnel or contractors sponsored by USNRC to laboratories at which RRC/IAE-sponsored work related to this Implementing Agreement is being conducted.

c. Permit the assignment of USNRC personnel or its contractors sponsored by USNRC to participate in the RRC/IAE nuclear safety program related to this Implementing Agreement and to have ready access to relevant nuclear reactor safety documentation, codes and results.

d. Attend NRC's annual Water Reactor Safety Meeting and Cooperative Severe Accident Research Meetings to present results of research work as requested. In general, this will involve annually two trips to the U.S.

ARTICLE IV - FINANCIAL CONSIDERATIONS

The ability of the parties to carry out their obligations is subject to the appropriation of funds by the appropriate governmental authority and to laws and regulations applicable to the parties. Subject to the availability of funds, the USNRC will provide the RRC/IAE the sum of $500,000 in Fiscal Year 1996. $250,000 will be designated for the hydrogen combustion work, $150,000 for the high burnup fuel work and $100,000 for the dosimetry and analytical support benchmark work. Additional funds may be provided for the debris coolability work described in III.B.3 above, subject to USNRC review and approval of the requested proposal.

The first payment of $250,000 will be made within 30 days after entry into force of this Implementing Agreement. RRC/IAE will complete a work plan acceptable to both parties within 60 days after entry into force of this Implementing Agreement. A second payment of $250,000 will be provided to the RRC/IAE in June 1996. Payment will be made upon receipt of RRC/IAE invoices, subject to U.S. government rules and regulations.

If other technical appendices are developed during the course of this cooperation, the resulting financial considerations will be included in these appendices.

ARTICLE V - ADMINISTRATION OF THE IMPLEMENTING AGREEMENT

A. The USNRC and the RRC/IAE will each designate one representative to coordinate and determine the detailed implementation of this Implementing Agreement. This designated representative will be referred to as an Administrator of the Implementing Agreement. The Administrators may, at their discretion, delegate this responsibility to the appropriate individuals with respect to a given issue.

B. This Implementing Agreement 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. Each party to this Implementing Agreement will have access to all reports written by its partner's technical personnel assigned to the respective activities that derive from participation in this Implementing Agreement.

D. Subject to Article V G. and H. 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 Russian Federation without the consent of the USNRC.

E. Except for dissemination to USNRC and its principal contractors in accordance with this Implementing Agreement, RRC/IAE-supplied codes and analytical techniques and any improvements, modifications or updates to such codes and techniques will not be disseminated to other parties outside the U.S. without the consent of the RRC/IAE.

F. The application or use of any codes exchanged or transferred between the parties under this Implementing Agreement shall be the responsibility of the receiving party, and the transmitting party does not warrant the suitability of such codes for any particular use or application.

G. The USNRC computer codes and other related analytical techniques that are provided to the RRC/IAE under this Implementing Agreement and any improvements, modifications or updates to such codes or techniques are for the purpose of this Implementing Agreement and shall not be used by RRC/IAE for commercial purposes; that is, for financial or other benefits not concerned with the study of reactor safety.

H. The USNRC codes and other related analytical techniques shall not be advertised directly or by implication to obtain contracts related to the construction, servicing, or refueling of nuclear facilities, nor shall advertising imply that the USNRC has endorsed any analysis or techniques.

I. The USNRC makes no warranties whatsoever for the ability or suitability of any USNRC code or other analytical technique to perform in any particular manner for any particular purpose, or to accomplish any particular task. Furthermore, the USNRC accepts no liability for damages of any type that may result from the use of the USNRC codes or other analytical techniques provided under this Implementing Agreement.

J. Travel costs, living expenses, and salaries will be borne by the parties who incurred them unless specified otherwise.

ARTICLE VI - EXCHANGE AND USE OF INFORMATION AND INTELLECTUAL PROPERTY

A. General

The Parties support the widest possible dissemination of information provided or exchanged under this Implementing Agreement, subject both to the need to protect proprietary or other confidential or privileged information as may be exchanged hereunder, and to the provisions of the Intellectual Property Addendum, which is an integral part of this Implementing Agreement.

B. Definitions (As used in this Implementing Agreement)

1. The term "information" means nuclear energy-related regulatory, safety, safeguards, waste management, scientific, or technical data, including information on results or methods of assessment, research, and any other knowledge intended to be provided or exchanged under this Implementing Agreement.

2. The term "proprietary information" means information made available under this Implementing Agreement which contains trade secrets or other privileged or confidential commercial information (such that the person having the information may derive an economic benefit from it or may have a competitive advantage over those who do not have it), and may only include information which:

   a. has been held in confidence by its owner;

   b. is of a type which is customarily held in confidence by its owner;

   c. has not been transmitted by the owner to other entities (including the receiving party) except on the basis that it be held in confidence;

   d. is not otherwise available to the receiving party from another source without restriction on its further dissemination; and

   e. is not already in the possession of the receiving party.

3. The term "other confidential or privileged information" means information, other than "proprietary information," which is protected from public disclosure under the laws and regulations of the country of the party providing the information and which has been transmitted and received in confidence.

C. Marking Procedures for Documentary Proprietary Information

A party receiving documentary proprietary information pursuant to this Implementing Agreement shall respect the privileged nature thereof, provided such proprietary information is clearly marked with the following (or substantially similar) restrictive legend:

> "This document contains proprietary information furnished in confidence under an Implementing Agreement dated _____ between the United States Nuclear Regulatory Commission and the Russian Research Center and shall not be disseminated outside these organizations, their consultants, contractors, and licensees, and concerned departments and agencies of the Government of the United States and the Government of the Russian Federation without the prior approval of (name of transmitting party). This notice shall be marked on any

reproduction hereof, in whole or in part. These limitations shall automatically terminate when this information is disclosed by the owner without restriction."

This restrictive legend shall be respected by the receiving party and proprietary information bearing this legend shall not be used for commercial purposes, made public, or disseminated in any manner unspecified by or contrary to the terms of this Implementing Agreement without the consent of the transmitting party.

D. Dissemination of Documentary Proprietary Information

1. In general, proprietary information received under this Implementing Agreement may be freely disseminated by the receiving Party without prior consent to persons within or employed by the receiving Party, and to concerned Government departments and Government agencies in the country of the receiving Party.

2. In addition, proprietary information may be disseminated without prior consent to contractors or consultants of the receiving Party located within the geographical limits of that Party's nation, for use only within the scope of work of their contracts with the receiving Party in work relating to the subject matter of this Implementing Agreement; provided that any such dissemination of proprietary information shall be on an as-needed, case-by-case basis, shall be pursuant to an agreement of confidentiality, and shall be marked with a restrictive legend substantially similar to that appearing in Article VI. C. above.

3. With the prior written consent of the party furnishing proprietary information under this Implementing Agreement, the receiving Party may disseminate such proprietary information more widely than otherwise permitted in subsections 1. and 2. The parties shall cooperate in developing procedures for requesting and obtaining approval for such wider dissemination, and each party will grant such approval to the extent permitted by its national policies, regulations, and laws.

E. Marking Procedures for Other Confidential or Privileged Information of a Documentary Nature

A party receiving under this Implementing Agreement other confidential or privileged information shall respect its confidential nature, provided such information is clearly marked so as to indicate its confidential or privileged nature and is accompanied by a statement indicating

1. that the information is protected from public disclosure by the Government of the transmitting party; and

2. that the information is transmitted under the condition that it be maintained in confidence.

F. Dissemination of Other Confidential or Privileged Information of a Documentary Nature

Other confidential or privileged information may be disseminated in the same manner as that set forth in paragraph D., Dissemination of Documentary Proprietary Information.

G. Non-Documentary Proprietary or Other Confidential or Privileged Information

Non-documentary proprietary or other confidential or privileged information provided in seminars and other meetings arranged under this Implementing Agreement, or information arising from the attachments of staff, use of facilities, or joint projects, shall be treated by the parties according to the principles specified for documentary information in this Implementing Agreement; provided, however, that the party communicating such proprietary or other confidential or privileged information has placed the recipient on notice as to the character of the information communicated.

H. Consultation

If, for any reason, one of the parties becomes aware that it will be, or may reasonably be expected to become, unable to meet the nondissemination provisions of this Implementing Agreement, it shall immediately inform the other party. The parties shall thereafter consult to define an appropriate course of action.

I. Other

Nothing contained in this Implementing Agreement shall preclude a party from using or disseminating information received without restriction by a party from sources outside of this Implementing Agreement.

ARTICLE VII - FINAL PROVISIONS

A. This Implementing Agreement shall be effective from the date of signature by the USNRC and the RRC/IAE and shall be effective for a period of five years. It may be extended for a further period of time by written agreement of the parties.

B. Either party may withdraw from the present Implementing Agreement 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 Implementing Agreement will be borne by the party that incurs them except when specifically agreed to otherwise by both parties.

D. The parties to this Implementing Agreement reserve the right to modify or extend the activities described in Article III within the intended scope of this Implementing Agreement upon written concurrence of its Administrators.

E. Any dispute between the parties concerning the interpretation or application of this Implementing Agreement will be settled by mutual agreement of the parties.

DONE at Rockville, Maryland on _____, 1996, and at Moscow, Russia on _____, 1996.

FOR THE UNITED STATES NUCLEAR REGULATORY COMMISSION:

BY: _____
James M. Taylor
TITLE: Executive Director for Operations

FOR THE RUSSIAN RESEARCH CENTER (RRC), FORMERLY THE I.V. KURCHATOV INSTITUTE OF ATOMIC ENERGY

BY:	_____	_____
	N. N. Ponomarev-Stepnoy	Vladimir Asmolov
TITLE:	Vice President (RRC)	Director, Nuclear Safety Institute/RRC
DATE:	_____	_____

INTELLECTUAL PROPERTY ADDENDUM

Pursuant to Article VI of this Implementing Agreement:

The parties shall ensure adequate and effective protection of intellectual property created or furnished under this Implementing Agreement and relevant implementing arrangements. The parties agree to notify one another in a timely fashion of any inventions or copyrighted works arising under this Implementing Agreement and to seek protection for such intellectual property in a timely fashion. Rights to such intellectual property shall be allocated as provided in this Addendum.

I. SCOPE

A. This Addendum is applicable to all cooperative activities undertaken pursuant to this Implementing Agreement, except as otherwise specifically agreed by the parties or their designees.

B. For purposes of this Implementing Agreement, "intellectual property" shall have the meaning found in Article 2 of the Convention Establishing the World Intellectual Property Organization, done at Stockholm, July 14, 1967; viz., "'intellectual property' shall include the rights relating to:

- literary, artistic and scientific works,
- performances of artists, phonograms, and broadcasts,
- inventions in all fields of human endeavor,
- scientific discoveries,
- industrial designs,
- trademarks, service marks, and commercial names and designations,
- protection against unfair competition,

and all other rights resulting from intellectual activity in the industrial, scientific, literary or artistic fields."

C. This Addendum addresses the allocation of rights, interests, and royalties between the parties. Each party shall ensure that the other party can obtain rights to intellectual property allocated in accordance with the Addendum by obtaining those rights from its own participants through contracts or other legal means, if necessary. This Addendum does not otherwise alter or prejudice the allocation between a party and its nationals, which shall be determined by that party's laws and practices.

D. Disputes concerning intellectual property arising under this Implementing Agreement should be resolved through discussions between the concerned participating institutions or, if necessary, the parties or their designees. Upon mutual agreement of the parties, a dispute shall be

submitted to an arbitral tribunal for binding arbitration in accordance with the applicable rules of international law. Unless the parties or their designees agree otherwise in writing, the arbitration rules of the United Nations Commission on International Trade Law (UNCITRAL) shall govern.

E. Termination or expiration of this Implementing Agreement shall not affect rights or obligations under this Addendum.

II. ALLOCATION OF RIGHTS

A. Each party shall be entitled to a non-exclusive, irrevocable, royalty-free license in all countries to translate, reproduce, and publicly distribute scientific and technical journal articles, reports, and books directly arising from cooperation under this Implementing Agreement. All publicly distributed copies of copyrighted work prepared under this provision shall indicate the names of the authors of the work unless an author explicitly declines to be named.

B. Rights to all forms of intellectual property, other than those rights described in Section II(A) above, shall be allocated as follows:

1. Visiting researchers, for example, scientists visiting primarily in furtherance of their education, shall receive intellectual property rights under the policies of the host institution. In addition, each visiting researcher named as an inventor shall be entitled to national treatment with regard to awards, bonuses, benefits, or any other rewards, in accordance with the policies of the host institution.

2. (a) For intellectual property created during joint research, for example, when the parties, participating institutions, or participating personnel have agreed in advance on the scope of work, each party shall be entitled to obtain all rights and interests in its own country. The party in whose country the invention was made shall have first option to acquire all rights and interests in third countries. If research is not designated as "joint research", rights to intellectual property arising from the research will be allocated in accordance with paragraph II.B.1. In addition, each person named as an inventor shall be entitled to national treatment with regard to awards, bonuses, benefits, or any other rewards, in accordance with the policies of the host institution.

(b) Notwithstanding paragraph II.B.2.(a), if a type of intellectual property is available under the laws of one party but not the other party, the party whose laws provide for this type of protection shall be entitled to all rights and interests worldwide. Persons named as inventors of the property shall nonetheless be entitled to royalties as provided in paragraph II.B.2.(a).