

No. 16650

**UNITED STATES OF AMERICA
and
AUSTRIA**

Agreement on research participation and technical exchange between the United States Nuclear Regulatory Commission (USNRC) and the Österreichische Studiengesellschaft für Atomenergie (SGAE) in the USNRC PBF Research Program covering a four-year period (with appendix and administrative understandings dated 11 February 1977 and 3 March 1977). Signed on 25 February and on 3 March 1977

Authentic text: English.

Registered by the United States of America on 27 April 1978.

**ÉTATS-UNIS D'AMÉRIQUE
et
AUTRICHE**

Accord entre la Commission de réglementation nucléaire des États-Unis (USNRC) et le Bureau autrichien d'étude de l'énergie atomique (SGAE) relatif au programme quadriennal de recherche de la PBF de l'USNRC (avec appendice et arrangements administratifs datés du 11 février 1977 et du 3 mars 1977). Signé les 25 février et 3 mars 1977

Texte authentique : anglais.

Enregistré par les États-Unis d'Amérique le 27 avril 1978.

AGREEMENT¹ ON RESEARCH PARTICIPATION AND TECHNICAL EXCHANGE BETWEEN THE UNITED STATES NUCLEAR REGULATORY COMMISSION (USNRC) AND THE ÖSTERREICHISCHE STUDIENGESELLSCHAFT FÜR ATOMENERGIE (SGAE) IN THE USNRC PBF RESEARCH PROGRAM COVERING A FOUR-YEAR PERIOD

The Contracting Parties

Considering that the United States Nuclear Regulatory Commission (USNRC) and the Österreichische Studiengesellschaft für Atomenergie (SGAE)

- (a) have a mutual interest in cooperation in the field of reactor safety research, and
- (b) have as a mutual objective improving and thus ensuring the safety of reactors on an international basis, and
- (c) have as a mutual objective the achievement of full reciprocity in the exchange of technical information in the field of reactor safety research, and
- (d) recognize that their respective countries are member nations of the International Energy Agency which encourages cooperative programs on reactor safety research, and
- (e) have expressed their intention to participate cooperatively in the USNRC-funded Power Burst Facility (PBF) research program at the Idaho National Engineering Laboratory, which is owned by the United States Government and operated under contractual arrangement between the EG&G, Inc., and the U.S. Energy Research and Development Administration (USERDA),

Have agreed as follows:

Article I. PROGRAM COOPERATION

The USNRC and the SGAE, in accordance with the provisions of this Agreement and subject to applicable laws and regulations in force in their respective countries, will join together for cooperative research in the USNRC PBF program as described in Appendix A.

Article II. SCOPE OF AGREEMENT

A. Scope of Responsibility — USNRC

1. The USNRC agrees to provide the necessary personnel, materials, equipment, and services for the performance of the PBF research program described in Appendix A, or as amended, subject to the availability of funds.
2. The USNRC agrees to permit the SGAE to assign one mutually agreed upon technical expert to the PBF program for participation in the conduct and analysis of program experiments.
3. In addition, the USNRC agrees to permit the SGAE to assign one technical expert as a consultant to the PBF Program Review Group, which will periodically review the status of the present program and of future program plans.

¹ Came into force on 3 March 1977 by signature, in accordance with article VI (A).

4. The USNRC agrees to grant the SGAE and its assignees access to all experimental data and results of analyses generated by the PBF program during the period of this Agreement.

5. The USNRC agrees to provide the SGAE access to operational computer codes and data developed to analyze experimental data generated by the PBF program. Access to proprietary codes and data will not be provided except by written authorization of the owner.

B. Scope of Responsibility — SGAE

1. The SGAE, as a contribution for the technical benefits received by participation in the USNRC PBF research program and receipt of information under this Agreement, agrees to pay into a specified U.S. Government account the amount of sixty-one thousand dollars annually for the period of this Agreement, the initial payment to be made within a month after execution of the Agreement, with subsequent payments on each of the remaining anniversary dates of the execution of the Agreement.

2. It is further understood that in the event appropriate SGAE-sponsored reactor safety research programs become available for exchange with the USNRC program included in this Agreement, the Parties may, upon mutual agreement, arrange for substitution of technical benefits in kind for all or part of the financial contribution by SGAE.

3. The SGAE agrees to grant the USNRC and its assignees access to all results obtained from SGAE's analyses of PBF experimental data during the period of this Agreement.

4. The SGAE agrees to provide the USNRC access to operational codes and data developed to analyze experimental data generated under the PBF program. Access to proprietary codes and data will not be provided except by written authorization of the owner.

5. The SGAE agrees to bear the total costs of transportation, living expenses and any other costs arising from its participation under this Agreement, and the transport and related costs for apparatus and other equipment furnished by the SGAE.

Article III. PATENTS

A. With respect to any invention or discovery made or conceived during the period of, or in the course of or under, this Agreement for SGAE participation in the USNRC PBF research program, the USNRC on behalf of the United States Government, as recipient party, and the SGAE, as assigning party, hereby agree that:

1. if made or conceived by personnel of one party (the assigning party) or its contractors while assigned to the other party (recipient party) or its contractors:
 - (a) the recipient party shall acquire all right, title, and interest in and to any such invention, discovery, patent application or patent in its own country and in third countries, subject to a non-exclusive, irrevocable, royalty-free license to the assigning party, with the right to grant sublicenses, under any such invention, discovery, patent application or patent for use in the production or utilization of special nuclear material or atomic energy; and
 - (b) the assigning party shall acquire all right, title, and interest in and to any such invention, discovery, patent application, or patent in its own country, subject to a non-exclusive, irrevocable, royalty-free license to the recipient party, with the right to grant sublicenses, under any such invention, discovery, patent application or patent, for use in the production or utilization of special nuclear material or atomic energy;
2. if made or conceived other than by personnel in paragraph 1 above and while in attendance at meetings or when employing information which has been communicated

under this exchange agreement by one party or its contractors to the other party or its contractors, the party making the invention shall acquire all right, title, and interest in and to any such invention, discovery, patent application or patent in all countries, subject to the grant to the other party of a royalty-free, non-exclusive, irrevocable license, with the right to grant sublicenses, in and to any such invention, discovery, patent application, or patent in all countries, for use in the production or utilization of special nuclear material or atomic energy.

B. Neither party shall discriminate against citizens of the country of the other party with respect to granting any license or sublicense under any invention pursuant to subparagraphs A(1) and A(2) above.

C. Each party will assume the responsibility to pay awards or compensation required to be paid to its nationals according to the laws of its country.

Article IV. EXCHANGE OF SCIENTIFIC INFORMATION AND USE OF RESULTS OF PROGRAM

A. Both parties agree that, pending the grant by the transmitting party of approval to publish, information developed or transmitted under this Agreement will be freely available to governmental authorities and organizations cooperating with the parties. Such information, except as noted below in paragraphs B and C, may, as required by the administrative procedure in its own country, also be made available to the public by either party through customary channels and in accordance with the normal procedures of the parties.

B. It is recognized by both parties that in the process of exchanging information, or in the process of other cooperation, the parties may provide to each other "industrial property of a proprietary nature." Such property, including trade secrets, inventions, patent information, and know-how, made available hereunder and which bears a restrictive designation shall be respected by the receiving party and shall not be used for commercial purposes or made public without the consent of the transmitting party. Such property is defined as:

- (a) of a type customarily held in confidence by commercial firms;
- (b) not generally known or publicly available from other sources;
- (c) not having been made available previously by the transmitting party or others without an agreement concerning its confidentiality; and
- (d) not already in the possession of the receiving party or its contractors.

C. Recognizing that "industrial property of a proprietary nature," as defined above, may be necessary for the conduct of a specific cooperative project or may be included in an exchange of information, such property shall be used only in the furtherance of nuclear safety programs in the receiving country. Its dissemination will, unless otherwise mutually agreed, be limited as follows:

- (a) to persons within or employed by the receiving party, and to other concerned government agencies of the receiving party, and
- (b) to prime or subcontractors of the receiving party for use only within the country of the receiving party and within the framework of its contract(s) with the respective party engaged in work relating to the subject matter of the information so disseminated, and
- (c) on an as-needed, case-by-case basis, to organizations licensed by the receiving party to construct or operate nuclear production or utilization facilities, provided that such information is used only within the terms of the license and in work relating to the subject matter of the information so disseminated, and

(d) to contractors of licensed organizations in subparagraph (c) receiving such information, for use only in work within the scope of the license,

provided that the information disseminated to any person under subparagraphs (b), (c) and (d) above shall be pursuant to an agreement of confidentiality.

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

Article V. DISPUTES

Any dispute between the USNRC and the SGAE concerning the application or interpretation of this Agreement that is not settled through consultation shall be submitted to the jurisdiction of the United States Federal courts. This Agreement shall be construed in accordance with the internal federal law applicable in the appropriate United States Courts, to agreements to which the Government of the United States is a party.

Article VI. FINAL PROVISIONS

A. This Agreement shall enter into force upon signature of the parties and shall remain in force for a period of 4 years.

B. Either party may withdraw from the present Agreement after providing the other party written notice 6 months prior to its intended date of withdrawal.

C. The SGAE may at its option participate in a continuation of the USNRC PBF program beyond the 4-year period of this Agreement under mutually acceptable terms and conditions.

D. If the USNRC PBF technical program is substantially increased by mutual agreement, the USNRC and SGAE agree to consider equitable adjustments in the SGAE contribution.

E. If the PBF research program is substantially reduced or eliminated, equitable work determined by the USNRC and SGAE to be of equivalent programmatic interest will be substituted as may be mutually agreed.

For the United States Nuclear Regulatory
Commission:

By: LEE V. GOSSICK
Title: Executive Director for Operations
Date: February 25, 1977

For the Österreichische Studiengesellschaft für Atomenergie:

By: H. GRÜMM
Title: Scientific Managing Director
Date: March 3, 1977

By: W. BADERLE
Title: Administrative Managing Director
Date: March 3, 1977

APPENDIX A

THE POWER BURST FACILITY (PBF) IDAHO FALLS, USA

The Facility:

The Power Burst Facility is a water cooled and moderated reactor contained in an open top steel vessel. The PBF is operated for the Energy Research and Development Administration (ERDA) and the Nuclear Regulatory Commission (NRC) by the EG&G Idaho, Inc. (EG&G).

The present reactor core is designed for both steady state operation (to 40 MW) and pulsed mode operation (to 1500 MWsec). A new reactor core interchangeable with the original core should be available sometime after late 1977. The new core is designed for steady state operation for testing large assemblies (clusters) of low enrichment irradiated or unirradiated fuel elements at high power densities.

Table 1 describes the general facility characteristics and compares the test capabilities of the first and second PBF cores.

The PBF currently operates on a two shift basis, but 3 or 4 shift operation during the next few years is probable. At present, reactor tests are scheduled at 7 day to 30 day intervals, with 7 to 16 tests scheduled per 8-month operating year. Four months are allowed each year for reactor certification and maintenance.

The Test Train:

Fuel elements and fuel element assemblies to be tested, one to 25 fuel rods in the first core and one to 64 rods in the second core, are fitted into a test train, together with necessary test instrumentation. The assembled test train is then fitted into a heavy walled vertical pressurizable cylindrical metal tube (the IPT) mounted concentric to the vertical axis of the reactor core and the containing vessel.

The in-pile tube head has six openings, permitting the active use of up to 100 pairs of instrumentation test leads. Typical test instrumentation includes inlet and/or exit flow meters (up to 5 per test), absolute and differential pressure transducers for monitoring fluid and fuel element plenum pressures, surface and internal thermocouples for monitoring fuel, clad, plenum and coolant temperatures, ultrasonic thermometers, linear variable differential transformer (deflection indicators) radiation flux monitor wires and foils and self-powered neutron detectors. Suitable instrumentation, signal conditioning equipment and data accumulation and reduction equipment and services are available.

The Program:

The program for the four-year period, June 1975-June 1979 encompasses tests in each of the following areas: (a) Power-cooling mismatch (PCM), 9 reactor tests (FY76, early FY77), (b) Irradiation effects, 14 reactor tests (FY76, FY77), (c) Loss of Coolant Accident (LOCA), 11 to 18 reactor tests (late FY77, 78, 79), (d) Inlet Flow Blockage, 5 reactor tests (late FY77, 78), (e) Reactivity Initiated Accident (RIA), 7 to 18 reactor tests (FY77-79), (f) Gap Conductance and PCM Parameters, 17 to 23 reactor tests (FY76-79).

This program is subject to continuous review and selective modification as test results are evaluated and further behavior demonstration and model verification needs are identified. The overall PBF test program is based on balanced support of the following Fuel Behavior Branch, RES:RSR, NRC objectives:

1. In-reactor study of fuel properties
2. In-reactor study of fuel rod and fuel rod assembly properties
3. In-reactor study of fuel rod and fuel rod assembly behavior under accident conditions
4. Support of fuel element behavior model development
5. Support of fuel element behavior model evaluation

The several PBF test series are described in the Small Cluster Program Requirements Section of the WRSR Fuel Behavior Program Description prepared by the Systems Safety Research Division, EG&G Idaho, Inc. The test series descriptions may be summarized as follows:

- (a) Power-Cooling Mismatch Tests: These tests will study CHF and post-CHF fuel behavior of single rods (4 at a time) and 9 rod clusters under a variety of power and cooling conditions. Coolant flow, stored energy, and test termination temperatures will be measured.
- (b) Irradiation Effects Tests: These tests will study the effects of irradiation and burnup of the thermal-mechanical properties of cladding materials and single fuel rods and the behavior of

- fuel rods at high power ratings. Post CHF cladding deformation will be one of the dependent test variables measured.
- (c) **Loss of Coolant Tests:** These tests will study fuel rod behavior, e.g., clad deformation and oxidation of multiple rod assemblies, under PWR loss of coolant conditions. Results will be correlated with ex-reactor tests. Parameters to be varied include irradiation history and cold internal pressures. Test loop modifications will provide heatup and blowdown capability late in the 4-year test period.
- (d) **Inlet Flow Blockage Tests:** These tests will study fuel rod behavior, e.g., clad temperature profiles of multiple rod assemblies under inlet flow blockage conditions. Blockages of 80% and greater will be investigated. Test loop modifications will be required for these tests.
- (e) **Reactivity Initiated Accident Tests:** These tests will study irradiated and unirradiated fuel rod behavior under rod drop and rod ejection conditions. Independent rod tests, cluster tests and model development/evaluation tests will be performed. The effects of irradiation, cluster size, coolant flow, and initial power level will be studied.
- (f) **Gap Conductance and PCM Parameter Tests:** These tests will study gap conductance and fuel rod behavior of irradiated and unirradiated rods. Parameters to be varied include irradiation history, gap size, fill gas and pressure and pellet densities. Power oscillation (transfer function technique) and integral k-dt methods will be compared.

Table 1. PBF TEST CAPABILITIES

	Core 1*	Core 2*
Test Space Size		
Diameter.....	15.5 cm	21.6 cm target 15.5 cm minimum
Active length	91 cm	91 cm (nominal)
Test Coolant Flow Rate	0-3000 l/min.	0-3000 l/min
Coolant Pressure	0.3-15.6 MPa (154 atm, std)	0.3-15.6 MPa (154 atm, std)
Coolant Temperature	Ambient—343°C (650°)	Ambient—343°C (650°F)
Test Power Density (max)	a) 18 kw/ft in a 16 rod array of highly enriched 17 × 17 type PWR fuel rods b) 18 kw/ft in a 25 rod array of highly enriched BWR-6 type fuel rods	a) 21 kw/ft in a 36 rod array irradiated (to 40,000 MWD/M) 17 × 17 type PWR fuel rods maximum initial enrichment 3.1 w/o ²³⁵ U. b) 21 kw/ft in a 25 rod array irradiated (to 40,000 MWD/M) BWR-6 type fuel rods with maximum initial enrichment 2.0 w/o ²³⁵ U.
Test Power Rate of Change		
Steady State.....	100%/min power increase 15%/sec power decrease	100%/min power increase 15%/sec power decrease
Pulse Mode	Periods as short as 1.3 msec—natural burst (to 1500 mw sec sloped burst)	

ADMINISTRATIVE UNDERSTANDINGS BETWEEN THE USNRC AND THE SGAE

An Agreement between the SGAE and the USNRC on SGAE participation in the USNRC-funded PBF reactor safety research program has been negotiated. This bilateral Agreement will be within the framework of an IEA multilateral cooperative agreement for the PBF program upon negotiation of the IEA multilateral agreement.

The coordinators of each party of the bilateral Agreement have arrived at the following administrative understandings of the details of the SGAE participation in the PBF program:

1. Under special circumstances the SGAE may wish to send one or more technical experts for a short period of time to review or investigate particular technical problems related to the experiments or analysis of results of the PBF program. Short term visits by SGAE-sponsored experts may be arranged by mutual agreement with USNRC on a case-by-case basis. The USNRC will, to the best of its ability and within the constraints of available manpower and minimum interference with the program, make available to the visiting experts various data and documents (excluding proprietary information) relevant to the technical problems in question.

2. The Agreement indicates the type of program information, documents, data, computer codes, etc. that are to be made available by each party to the other. Information which may be withheld includes that dealing with organizational, budgetary, personnel or management-related matters.

3. The SGAE will endeavor to select as technical expert for assignment to the PBF program an individual who can contribute positively to the program. Such an expert, assigned for an extended period, will be considered a visiting scientist (nonsalaried) within the program and be expected to participate in the conduct of the program experimentation and analysis as directed. The SGAE expert will be assigned to a mutually agreed upon position within the organizational structure of the PBF project.

4. Both parties will have access to all reports written by the assigned SGAE expert deriving from his participation in the PBF project.

5. Administrative details concerning such questions as security, indemnity and liability related to the assignment of an SGAE expert to the PBF project will be covered in a Personnel Assignment Agreement signed between the USNRC PBF Program Contractor and the SGAE or SGAE contractor organization of the assigned individual.

For the United States
Nuclear Regulatory Commission:

By: SAUL LEVINE
Title: Director of Nuclear Regulatory
Research
Date: February 11, 1977

Österreichische Studiengesellschaft
für Atomenergie:

By: WALTER BINNER
Title: Deputy Managing Director
Date: March 3, 1977