



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555

DCS/DF02

11

FEB 2 1990

Mr. Carlton E. Thorne, Director  
Office of Nuclear Export Control  
Bureau of Oceans and International  
Environmental and Scientific Affairs  
U.S. Department of State  
Washington, DC 20520

Dear Mr. Thorne:

Enclosed is an export license application from the Department of Energy (DOE), dated January 22, 1990, for the export of experimental centrifugal contactors and supporting systems to the United Kingdom Atomic Energy Authority at Harwell, Didcot, England. These items are being provided by DOE under the scope of the USDOE/UKAEA Liquid Metal Fast Breeder Reactor Agreement of September 20, 1976, as extended by letter Agreement, and as implemented by the Agreement in Solvent Extraction Centrifugal Contactors of July 5, 1988.

Before taking action on this request, we would appreciate your views, in accordance with established procedures, and from the overall perspective of the Executive Branch, as to whether the proposed export meets the applicable criteria in the Atomic Energy Act of 1954 as amended by the Nuclear Nonproliferation Act of 1978.

Sincerely,

*For Hans B. Schechter*

Marvin R. Peterson, Assistant Director  
for International Security, Exports,  
and Material Safety  
International Programs  
Office of Governmental and Public Affairs

Enclosure:  
Appl dtd 1/22/90  
(XCOM1034 - United Kingdom)

cc w/Enclosure:  
T. Hart, DOE  
R. DeLaBarre, DOE  
N. Martin, DOE  
M. Rosenthal, ACDA  
G. Brubaker, DOD  
G. Kuzmycz, DOC

9002090025 900202  
PDR XPORT  
XCOM-1034 PDC

NRC FORM 7  
(1-89)  
10 CFR 110

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB  
3150-0027  
EXPIRES 12-31-90

APPLICATION FOR LICENSE TO EXPORT NUCLEAR MATERIAL AND EQUIPMENT (See Instructions on Reverse)

1. APPLICANT'S USE		a. DATE OF APPLICATION		D. APPLICANT'S REFERENCE UKAEA-1		2. NRC USE		a. DOCKET NO. 11000254		D. LICENSE NO. RIS	
3. APPLICANT'S NAME AND ADDRESS a. NAME U. S. Department of Energy b. STREET ADDRESS Office of Nuclear Energy (NE-471, GTN) c. CITY Washington STATE DC ZIP CODE 20545						4. SUPPLIER'S NAME AND ADDRESS (Complete if applicant is not supplier of material) RIS DOE Contractor DE-AC05-84OR2140 a. NAME Martin Marietta Energy Systems, Inc. b. STREET ADDRESS Oak Ridge National Laboratory, P.O.Box 2008 c. CITY Oak Ridge STATE TN ZIP CODE 37831					
5. FIRST SHIPMENT SCHEDULED 1989		6. FINAL SHIPMENT SCHEDULED 1992		7. APPLICANT'S CONTRACTUAL DELIVERY DATE N/A		8. PROPOSED LICENSE EXPIRATION DATE 12/31/92		9. U.S. DEPARTMENT OF ENERGY CONTRACT NO. (If Known) DOE/UKAEA Agreements per attachments			
10. ULTIMATE CONSIGNEE a. NAME Dounreay Nuclear Power Develop. Establishment b. STREET ADDRESS UKAEA, Thurso, Caithness KW14 7TZ c. CITY - STATE - COUNTRY Scotland, United Kingdom						11. ULTIMATE END USE (Include plant or facility name) Contactors will be used in a testing and analytical program in a specially built cell adjacent to the PFR separations line added for the purpose of carrying out the tests. 11a. EST. DATE OF FIRST USE					
12. INTERMEDIATE CONSIGNEE a. NAME Same as 10. b. STREET ADDRESS c. CITY - STATE - COUNTRY						13. INTERMEDIATE END USE Contactors will be used in a plutonium-active rig to test mass transfer performance prior to hot testing as described in Item 11. 13a. EST. DATE OF FIRST USE					
14. INTERMEDIATE CONSIGNEE a. NAME Atomic Energy Research Establishment b. STREET ADDRESS Harwell, Didcot, OXON OX11 0RA c. CITY - STATE - COUNTRY England, United Kingdom						15. INTERMEDIATE END USE Contactors will be run cold with depleted uranium to test hydraulic performance prior to testing with active solutions at Dounreay. 15a. EST. DATE OF FIRST USE					
16. NRC USE		17. DESCRIPTION (Include chemical and physical form of nuclear material; give dollar value of nuclear equipment and components)				18. MAX. ELEMENT WEIGHT		19. MAX. WT. %	20. MAX. ISOTOPE WEIGHT	21. UNIT	
		The equipment consists of experimental centrifugal contactors, detailed drawings for interfacing and maintenance, software control algorithms, and spare and replacement parts needed to test the units in non-radioactive and radioactive environments.				N/A		N/A	N/A	N/A	
22. COUNTRY OF ORIGIN - SOURCE MATERIAL N/A				23. COUNTRY OF ORIGIN - SNM WHERE ENRICHED OR PRODUCED N/A				24. COUNTRIES WHICH ATTACH SAFEGUARDS (If Known) N/A			
25. ADDITIONAL INFORMATION (Use separate sheet if necessary) See other Enclosures to the transmittal letter. 900702 0006 22/91											
26. The applicant certifies that this application is prepared in conformity with Title 10, Code of Federal Regulations, and that all information in this application is correct to the best of his/her knowledge.											
27. AUTHORIZED OFFICIAL						a. SIGNATURE E. Bailey			b. TITLE Dir. Div. of Fuel & Resources		



United States Government

Department of Energy

# memorandum

DATE: DEC 4 1989  
REPLY TO: NE-471, GTN  
ATTN OF:  
SUBJECT: US/UK Technology Exchange  
TO: Zan Hollander, DP-323.1

Under the subject exchange program, DOE has supplied on loan to the UKAEA four 4-stage banks of centrifugal contactors for testing in an experimental and analytical program in the UK. The contactors are advanced machines currently under development by DOE at ORNL and were not designed for reprocessing; we do not have enough test information to do that. The contactors will be tested in the UK as part of a joint test program under test conditions not available in the U.S. because of funding and other (e.g., facility availability) reasons. The ORNL system used to date only provides capability for tests with depleted uranium. In the UK, three test phases are planned: tests with uranium in the Solvent Extraction Pilot Plant at Harwell, tests with a 'cold' (alpha activity only) mixed uranium-plutonium solution in Building 2670 (Marshall Laboratory) at the Dounreay Nuclear Power Development Establishment, and 'hot' (alpha activity plus beta-gamma activity from fission products) tests with prototypic uranium-plutonium solutions in a specially built test cell adjacent to the PFR separation line in Building D1206 at Dounreay, added for the purpose of carrying out the hot tests.

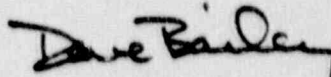
The objective of the test program is to obtain performance data and operating experience, not otherwise available to DOE, to help determine the feasibility of designing contactors for use in a future FBR reprocessing plant and to develop dynamic and mechanical design information that would be needed for future versions/upgrades. In the nature of a developmental item, scientific and not commercial in character, several cycles of testing, design upgrades, followed by further testing are expected. The contactors in question are clearly not designed or intended for a reprocessing plant, are still under long-term development and not suitable for use in a reprocessing plant. They will be used in test loops/configurations and for the technology development and exchange purposes indicated.

As you can appreciate, it is no simple matter to arrange or simulate prototypic hot test conditions. For this program, the hot tests planned will be in a newly constructed Centrifugal Contactor Facility (cell) at the PFR separations line (see attached). Because of duplicate mixer-settler capabilities in two High Active Cells in the PFR process line, the centrifugal contactors are able to be 'piped-in' in parallel with no impact on PFR-process operations. Feed solution and solvent will be taken from the normal plant first cycle process lines into the cell for the test runs. Should the centrifugal contactors malfunction, the feed and solvent streams can be valved back to the normal mixer-settler banks. The agreement provides for return of the contactors after the test program is completed in the 1993-94 time frame. As you know, recent changes in plans for the UK

breeder program call for shutdown of the PFR in 1994, and other facilities phased out thereafter.

This testing program is carried out under the US/UK LMFBR agreement, the DOE-UKAEA Reprocessing Technology Exchange Agreement, and the Specific Memorandum of Agreement in the Area of Solvent Extraction Centrifugal Contactors (July 5, 1988).

If you need additional clarification or information, please let me know. Please note that three of the attached sheets (Figures 9, 10, 11) are marked "Commercial in Confidence" by the UKAEA and should be treated accordingly.

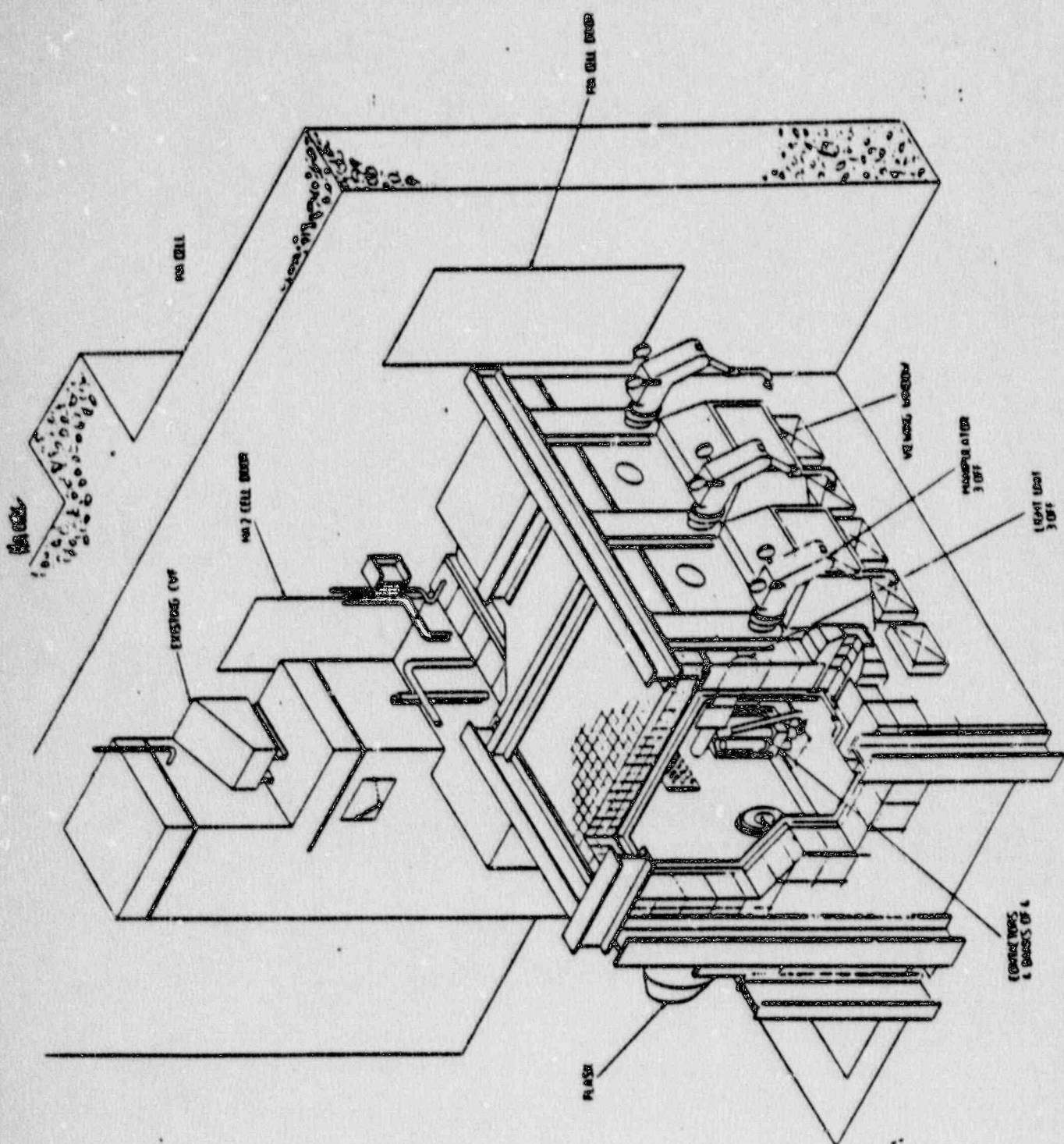


David E. Bailey, Director  
Division of Fuels and Reprocessing  
Office of Facilities, Fuel Cycle,  
and Test Programs  
Office of Nuclear Energy

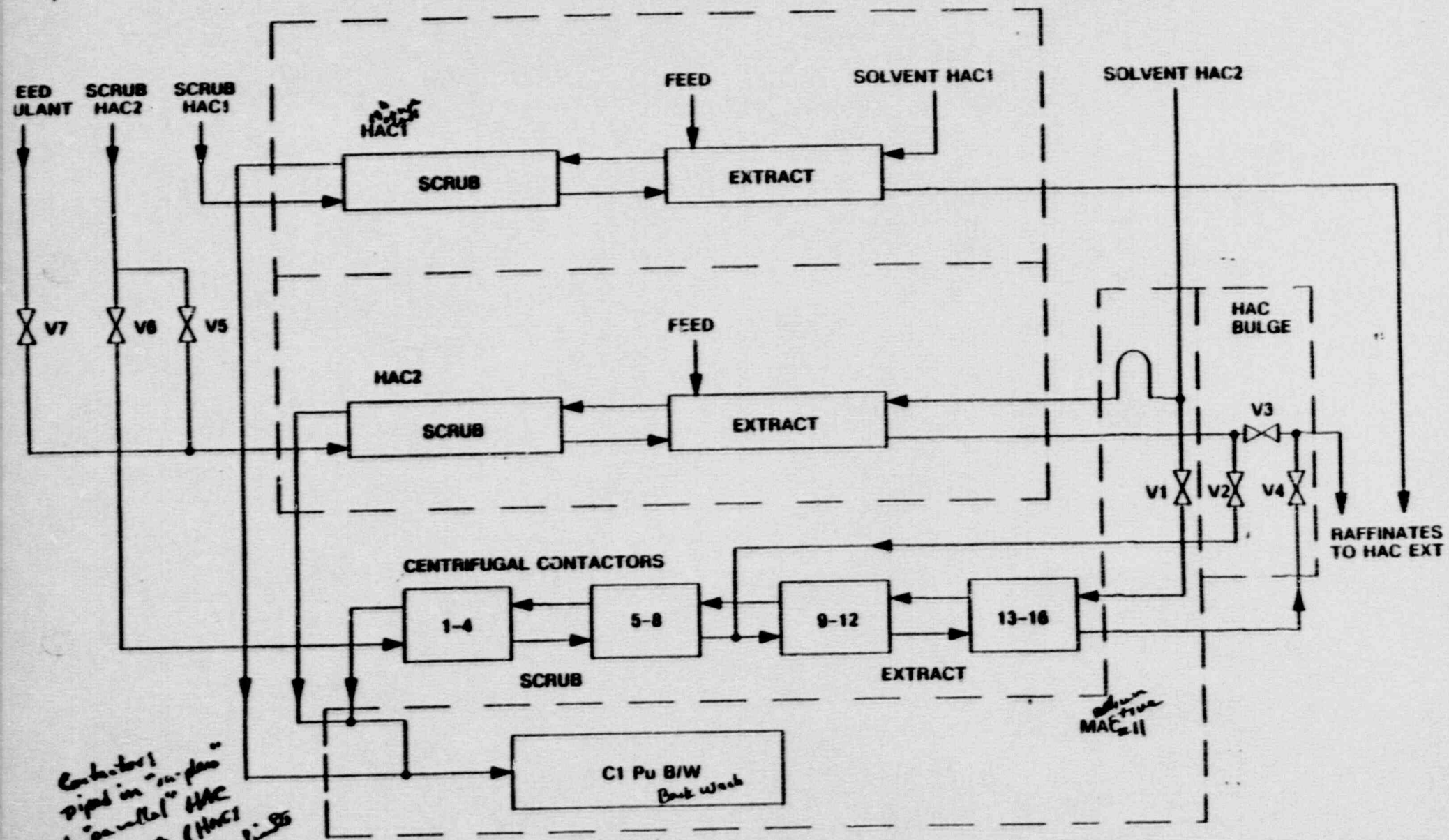
Attachment

cc: w/attachment  
J. M. Rooney, DP-323  
K. E. Horton, NE-14  
R. A. Hunter, NE-47





CENTRIFUGAL CONTACTOR FACILITY D1206



*Centrifugal  
piped in "in-plant"  
of "parallel" HAC  
capacity (HAC1  
and HAC2 redundancy  
& sized capacity).*

**CENTRIFUGAL CONTACTORS  
INSTALLATION IN CYCLE 1  
SIMPLIFIED LINE DIAGRAM**

**FIGURE 1**















Department of Energy

Washington, DC 20585

DEC 28 1987

Dr. G. A. Welch  
Commercial Director  
United Kingdom Atomic Energy  
Authority  
Rinsley, Warrington  
Cheshire WA3 6AT  
United Kingdom

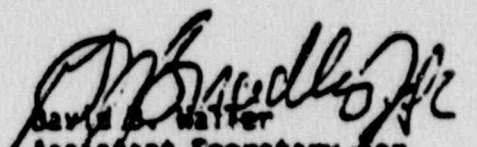
Dear Dr. Welch:

On behalf of the Department of Energy, I want to thank you for your letter of November 25, 1987, in which you proposed the extension of the Agreement between the United States Department of Energy and the United Kingdom Atomic Energy Authority in the field of Liquid Metal-Cooled Fast Breeder Reactors until December 31, 1988.

The Department agrees with the Atomic Energy Authority that the efforts which our organizations have expended over the past twelve years have been of mutual benefit and, therefore, can only continue to enhance our program.

It is therefore with pleasure that I accept, on behalf of the Department of Energy, your proposal to extend the Agreement in the field of Liquid Metal-Cooled Fast Breeder Reactors until December 31, 1988, or until such time as an agreement is signed between the Department and the Joint European R&D Organizations, whichever is earlier.

Sincerely,

  
David E. Waller  
Assistant Secretary for  
International Affairs and  
Energy Emergencies







RISLEY

UK ATOMIC ENERGY AUTHORITY

Corporate Headquarters Outstation Unit  
United Kingdom Atomic Energy Authority  
Risley  
Warrington  
Cheshire WA3 6AT

25 November 1987

Telex 629301 Fax (0925) 32804  
Telephone Warrington (0925) 31244

Mr D B Waller  
Assistant Secretary for  
International Affairs & Energy Emergencies  
OSDOE  
Washington DC 20545  
USA

Dear Mr Waller

The Agreement between the United States Department of Energy (formerly the Energy Research and Development Administration) and the United Kingdom Atomic Energy Authority in the field of Liquid Metal-Cooled Fast Breeder Reactors, which entered into force on September 20, 1976, is due to expire on December 31, 1987.

We in the UKAEA believe that this Agreement has been of considerable mutual benefit to our two organisations.

I am, therefore, pleased to propose on behalf of the United Kingdom Atomic Energy Authority that this letter and your favourable reply on behalf of the United States Department of Energy shall have the effect of extending the Agreement between our organisations in the field of Liquid Metal-Cooled Fast Breeder Reactors until December 31, 1988, or until such time as an agreement is signed between the United States Department of Energy and the joint European R&D Organisations, whichever is the earlier.

Yours sincerely

G A Welch



**RISLEY**

**UK ATOMIC ENERGY AUTHORITY**

14 December 1988

Mr David B Waller  
Assistant Secretary of Energy for  
International Affairs and Energy Emergencies  
US Department of Energy  
Washington DC 20545  
USA

Corporate Headquarters Outstation Unit  
United Kingdom Atomic Energy Authority  
Risley  
Warrington  
Cheshire WA3 6AT

Telex: 629301 Fax: (0925) 32804  
Telephone: Warrington (0925) 31244

Dear Mr Waller

Thank you for your letter, addressed to my predecessor, Dr Welch, and dated 1 November 1988, in which you propose that the Agreement on cooperation in the field of LMFBRs between the US Department of Energy (USDOE) and the United Kingdom Atomic Energy Authority (UKAEA), dated 20 September 1976, should be extended by a further two years, until 31 December 1990.

The United Kingdom Atomic Energy Authority highly values the technical discussions which its specialists have been able to have with colleagues in the USA, and the collaborative work we have been able to carry out, under the terms of this Agreement, and also wishes to keep the Agreement in force until such time as it is superseded by the proposed US/European cooperation agreement. After discussion with our associates in the Commissariat à l'Energie Atomique and in the Bundesministerium für Forschung und Technologie, we therefore agree with your proposal of a two year extension of our Agreement - subject to the proviso that, if the US/European agreement is signed before 31 December 1990, our Agreement shall be terminated as from the date on which the new agreement enters into force.

On behalf of the United Kingdom Atomic Energy Authority, I therefore agree to your proposal of an extension of the USDOE/UKAEA Agreement until 31 December 1990, or until such time as an agreement between the European grouping of fast reactor R&D organisations and US Department of Energy (and, if appropriate, other R&D organisations in the USA) enters into force, whichever is the earlier.

Yours sincerely

J I Bramman  
Head of International Collaboration Branch  
Central Services

cc Dr B L Eyre  
Mr M A W Baker  
Mr A M Broomfield  
Mr J R Bretherton  
File ICB USA/220





Department of Energy  
Washington, DC 20585

NOV 1 1988

Dr. G. A. Welch  
Commercial Director  
United Kingdom Atomic Energy Authority  
Rinsley, Warrington  
Cheshire WA3 6AT  
United Kingdom

Dear Dr. Welch:

The U.S. Department of Energy (DOE) and the United Kingdom Atomic Energy Authority (UKAEA) have had an agreement for cooperation in the field of liquid metal fast breeder reactors since September 20, 1976. It is our belief that significant cooperation has resulted from this arrangement.

As you know, after the formation of the European fast reactor "Club of Five" arrangement in 1984, we agreed to pursue the idea of a U.S.-European two party agreement among the United States, the United Kingdom (UK), the Federal Republic of Germany (FRG), France, Italy and Belgium. Initial drafts of a two party, multinational agreement were exchanged, and it is our understanding that the Bundesministerium für Forschung und Technologie (BMFT) of the FRG now has the assignment of developing a new draft.

Recent events in Europe have, from our perspective, raised new issues concerning this two party agreement which undoubtedly will take time to resolve. Therefore, we recommend postponing further dialogue on this matter and instead agree again to extend our bilateral agreement. We are making a similar proposal to the BMFT and the French Commissariat à l'Energie Atomique.

If the above is acceptable to you, I am pleased to propose on behalf of the Department of Energy that this letter, and your favorable reply, shall have the effect of extending the LMFBR agreement for another two years until December 31, 1990.

We look forward to continuing our arrangements with the UKAEA in the liquid metal reactor program.

Sincerely,

A handwritten signature in dark ink, appearing to read "David B. Waller", is written over the typed name.

David B. Waller  
Assistant Secretary of Energy  
for International Affairs and  
Energy Emergencies



**SPECIFIC MEMORANDUM OF AGREEMENT**

**between**

**THE UNITED STATES DEPARTMENT OF ENERGY**

**and**

**THE UNITED KINGDOM ATOMIC ENERGY AUTHORITY**

**in the area of**

**SOLVENT EXTRACTION CENTRIFUGAL CONTACTORS**

**JULY 5, 1988**

*9002020w? 24A*

SPECIFIC MEMORANDUM OF AGREEMENT  
between  
THE UNITED STATES DEPARTMENT OF ENERGY  
and  
THE UNITED KINGDOM ATOMIC ENERGY AUTHORITY  
in the area of  
SOLVENT EXTRACTION CENTRIFUGAL CONTACTORS

This Agreement to be called the "CENTRIFUGAL CONTACTOR SMA" is made between the UNITED STATES DEPARTMENT OF ENERGY (hereinafter referred to as "DOE") and the UNITED KINGDOM ATOMIC ENERGY AUTHORITY (hereinafter referred to as "UKAEA") (hereinafter jointly called the "Parties").

WHEREAS

the Energy Research and Development Administration (ERDA) and UKAEA under the Liquid Metal-Cooled Fast Breeder Reactors Agreement of 20 September 1976, as extended by letter agreements (hereinafter referred to as "the LMFBR Agreement") agreed to establish a reasonably balanced exchange of LMFBR technology;

pursuant to the Department of Energy Organization Act, ERDA was abolished and all functions transferred to and vested in DOE;

both DOE and UKAEA have an interest in providing close cooperation among design research and development personnel and safety assessment personnel;

ARTICLE 1 - OBJECTIVE

- 1.1 The objective of cooperation under this Specific Memorandum of Agreement (SMA) is to establish and to carry out a joint experimental and analytical program (hereinafter referred to as the "Program") to investigate the performance of Centrifugal Contactors for the extraction of fissile material and to exchange information derived from the Program.
- 1.2 This cooperation shall be a joint project under and as envisaged in the LMFBR Agreement.

ARTICLE 2 - PROGRAM

- 2.1 A joint Program designed to meet the objectives of this SMA has been agreed between the Parties and is given in the Appendix. It is recognized at the outset that this Program may be subject to changes as the work progresses. Any changes to the Program shall require the prior agreement in writing of the Parties.
- 2.2 In summary, the Program envisages:
- (a) Visits and attachment, as required, of ORNL staff to DNE and of UKAEA staff to ORNL for the purpose of discussions on, and participation in, the Program.



- (b) Arrange and provide for the attachment and visits of ORNL staff to DNE where appropriate in accordance with paragraph 3.3 of this SMA and Article 9 of the LMFBR Agreement.
- (c) Provide suitable office facilities for the UKAEA attached staff to enable them to fulfill the agreed function of participation in the Program.
- (d) Supply on loan ORNL Centrifugal Contactors for the purpose of the agreed Program. The details of the loan shall be the subject of separate written arrangements between Martin Marietta Energy Systems, and the UKAEA.
- (e) Provide to UKAEA, reports, general arrangements or layout drawings for placement of equipment components, and sufficient details of the above equipment necessary for the implementation of the Program.
- (f) Arrange and provide for transport of the above equipment to an agreed point of entry into the UK.
- (g) Responsibility for expenses, safekeeping and insurance during the transport of the equipment from the original location in the country of the sending Party to the place of entry in the country of the receiving Party shall rest with the sending

- (a) Discuss and agree with DOE on an experimental plan to carry out the Program.
- (b) Arrange and provide for visits and attachment of UKAEA staff to ONRL where appropriate in accordance with paragraph 3.3 of this SMA and Article 9 of the LMFBR Agreement.
- (c) Provide suitable office facilities for the ONRL attached staff to enable them to fulfill the agreed function of participation in the Program.
- (d) Install the ORNL Centrifugal Contactor equipment in the DNE test facilities or the PFR Fuel Reprocessing Plant.
- (e) Be responsible for the preparation of any documents necessary for securing approval at DNE for utilizing the equipment provided by DOE, in the DNE facilities.
- (f) Implement the agreed program of trials in the DNE facilities.
- (g) Be responsible for the recording of agreed data from the tests in 3.2(f) and make them available to DOE.
- (h) Arrange and provide for the return of the above equipment to DOE, unless agreed otherwise by DOE.

SPECIFIC MEMORANDUM OF AGREEMENT  
between  
THE UNITED STATES DEPARTMENT OF ENERGY  
and  
THE UNITED KINGDOM ATOMIC ENERGY AUTHORITY  
in the area of  
SOLVENT EXTRACTION CENTRIFUGAL CONTACTORS

This Agreement to be called the "CENTRIFUGAL CONTACTOR SMA" is made between the UNITED STATES DEPARTMENT OF ENERGY (hereinafter referred to as "DOE") and the UNITED KINGDOM ATOMIC ENERGY AUTHORITY (hereinafter referred to as "UKAEA") (hereinafter jointly called the "Parties").

WHEREAS

the Energy Research and Development Administration (ERDA) and UKAEA under the Liquid Metal-Cooled Fast Breeder Reactors Agreement of 20 September 1976, as extended by letter agreements (hereinafter referred to as "the LMFBR Agreement") agreed to establish a reasonably balanced exchange of LMFBR technology;

pursuant to the Department of Energy Organization Act, ERDA was abolished and all functions transferred to and vested in DOE;

both DOE and UKAEA have an interest in providing close cooperation among design research and development personnel and safety assessment personnel;



both DOE and UKAEA have been cooperating for a number of years in the development of techniques for the solvent extraction of fissile material in fuel reprocessing plants, in particular by the use of Centrifugal Contactors, with a view of eventual testing on a reprocessing plant, and the cooperation has now reached a stage at which further advance would be facilitated by a Specific Memorandum of Agreement on the topic;

the DOE's Oak Ridge National Laboratory (ORNL) has considerable expertise in the development of Centrifugal Contactors for incorporation into future reprocessing plants;

the UKAEA has a plant for reprocessing LMFBR fuel from its Prototype Fast Reactor (PFR) and supporting test facilities at Dounreay Nuclear Power Development Establishment (DNE) in Scotland, and in addition the UKAEA has a requirement to develop alternative extraction process equipment for fissile materials in reprocessing plants; and

the Parties believe that a joint project for collaboration in the development and application of Centrifugal Contactors for fissile material extraction, coupled with the experience obtained during plant operations, would be of significant benefit to the Parties.

IT IS AGREED AS FOLLOWS:

ARTICLE 1 - OBJECTIVE

- 1.1 The objective of cooperation under this Specific Memorandum of Agreement (SMA) is to establish and to carry out a joint experimental and analytical program (hereinafter referred to as the "Program") to investigate the performance of Centrifugal Contactors for the extraction of fissile material and to exchange information derived from the Program.
- 1.2 This cooperation shall be a joint project under and as envisaged in the LMFBR Agreement.

ARTICLE 2 - PROGRAM

- 2.1 A joint Program designed to meet the objectives of this SMA has been agreed between the Parties and is given in the Appendix. It is recognized at the outset that this Program may be subject to changes as the work progresses. Any changes to the Program shall require the prior agreement in writing of the Parties.
- 2.2 In summary, the Program envisages:
- (a) Visits and attachment, as required, of ORNL staff to DNE and of UKAEA staff to ORNL for the purpose of discussions on, and participation in, the Program.

- (b) The supply, on loan, by DOE of several banks of Centrifugal Contactors for the purpose of the Program.
- (c) Transport of the above equipment from DOE to DNE and, unless agreed otherwise, the return of the above equipment from DNE to DOE.
- (d) Implementation of the Program for the application of this equipment in DNE test rigs and later in the PiR Fuel Reprocessing Plant.
- (e) Recording and exchange between the Parties of agreed data analysis and results arising from the Program in each of the Party's facilities.
- (f) Preparation and exchange between the Parties of agreed reports during the Program and preparation of a joint report at the end of the Program.

ARTICLE 3 - PROVISION OF COMPONENTS AND SERVICES

3.1 To meet the requirements of the Program defined in the Appendix DOE shall, at its own expense:

- (a) Discuss and agree with UKAEA on an experimental plan to carry out the Program.



- (b) Arrange and provide for the attachment and visits of ORNL staff to DNE where appropriate in accordance with paragraph 3.3 of this SMA and Article 9 of the LMFBR Agreement.
- (c) Provide suitable office facilities for the UKAEA attached staff to enable them to fulfill the agreed function of participation in the Program.
- (d) Supply on loan ORNL Centrifugal Contactors for the purpose of the agreed Program. The details of the loan shall be the subject of separate written arrangements between Martin Marietta Energy Systems, and the UKAEA.
- (e) Provide to UKAEA, reports, general arrangements or layout drawings for placement of equipment components, and sufficient details of the above equipment necessary for the implementation of the Program.
- (f) Arrange and provide for transport of the above equipment to an agreed point of entry into the UK.
- (g) Responsibility for expenses, safekeeping and insurance during the transport of the equipment from the original location in the country of the sending Party to the place of entry in the country of the receiving Party shall rest with the sending

Party. If returned the sending Party it shall be responsible for expenses, safekeeping, and insurance during the transport of the equipment from the original point of entry in the country of the receiving Party to the final destination in the country of the sending Party.

(h) Responsibility for expenses, safekeeping, and insurance during the transport of the equipment from the place of entry in the country of the receiving Party to the final destination in the country of the receiving Party shall rest with the receiving Party. If returned, the receiving Party shall be responsible for expenses, safekeeping, and insurance during the transport of the equipment from the final destination in the country of the receiving Party to the original point of entry in the country of the receiving Party.

(i) The host establishment shall provide the necessary premises and shelter for the equipment, etc., and shall provide for electric power, water, gas, etc., in accordance with technical requirements which shall be mutually agreed upon.

3.2 To meet the requirements of the Program defined in the Appendix the UKAEA shall at its own expense:

- (a) Discuss and agree with DOE on an experimental plan to carry out the Program.
- (b) Arrange and provide for visits and attachment of UKAEA staff to ONRL where appropriate in accordance with paragraph 3.3 of this SMA and Article 9 of the LMFBR Agreement.
- (c) Provide suitable office facilities for the ONRL attached staff to enable them to fulfill the agreed function of participation in the Program.
- (d) Install the ORNL Centrifugal Contactor equipment in the DNE test facilities or the PFR Fuel Reprocessing Plant.
- (e) Be responsible for the preparation of any documents necessary for securing approval at DNE for utilizing the equipment provided by DOE, in the DNE facilities.
- (f) Implement the agreed program of trials in the DNE facilities.
- (g) Be responsible for the recording of agreed data from the tests in 3.2(f) and make them available to DOE.
- (h) Arrange and provide for the return of the above equipment to DOE, unless agreed otherwise by DOE.



3.3 Each Party shall at its own expense have the right to observe measurement performance at the other Party's facilities. This right may be exercised by short term visits or by the attachment of staff subject to prior agreement on each occasion. The Party proposing an attachment shall notify the receiving Party of the names of the persons proposed for attachment and shall provide such information and complete such other written arrangements in respect to any of the said persons as may be required by the Parties. The receiving Party may either approve or reject any persons so proposed and may at any time during the continuance of this Agreement without stating any reason revoke any approval previously given.

3.4 The Parties each propose to analyze the results arising from the Program according to their own requirements at their own expense. However, each Party shall inform the other Party of its intentions in this respect so as to provide for the possibility of cooperation on appropriate aspects of the analysis if desired between the Parties.

3.5 Termination costs if any shall be borne by each Party for the portion of the Program that Party is obligated to perform.

3.6 Except where otherwise provided, all costs incurred from the performance of the Program shall be borne by the Party that incurs them.

3.7 Each Party shall be responsible for obtaining any documentation, customs clearance or other procedures necessary to permit the import or export of the Centrifugal Contactor equipment into or out of its own country.

ARTICLE 4 - GENERAL PROVISIONS

4.1 Articles 7, 8 (para 1.b, 2 and 3 only), 9 and 11 of the LMFBR Agreement are hereby incorporated by reference. With the exception of the following modification, Article 6 of the LMFBR Agreement is hereby incorporated by reference in its entirety:

"6.2.A(ii) The term "proprietary information" means information developed prior to or outside this Agreement which contains trade secrets or commercial or financial information which is privileged or confidential, and may only include such 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 transmitting Party to other entities (including the receiving Party) except on the basis that it be held in confidence; and

- d) is not otherwise available to the receiving Party from another source without restriction on its further dissemination.<sup>a</sup>

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The Parties agree that information arising from joint activities conducted under this Agreement shall be designated proprietary if the Parties mutually agree that it discloses or can reveal proprietary information that has been developed outside the scope of the Agreement.

bb.  
DEB

- 
- 4.2 The LMFBR Agreement is hereby attached to the SMA as a reference document.
- 4.3 Implementation of this SMA is subject to the availability of appropriated funds.

ARTICLE 5 - USE AND DISCLOSURE OF INFORMATION

- 5.1 The Parties shall provide to each other sufficient information of the Centrifugal Contactor equipment and the DNE facilities to enable each Party to fulfill its commitments under this SMA including the requirements of Article 3.2(e) above.
- 5.2 The Parties shall produce an agreed schedule for testing and analysis and each Party shall promptly disclose to the other Party all information arising from the testing and analysis of results obtained under the Program.
- 5.3 The Parties recognize that in certain cases, information contained in the results of activities conducted during the Program may



disclose proprietary information as defined in Article 6 of the LMFBF Agreement. Such information shall be identified as soon as possible after it arises by the Party asserting that its proprietary information may be disclosed and the other Party advised of its identification. Results which disclose proprietary information shall be controlled as provided in Article 6 of the LMFBF Agreement. Either Party may provide to the other a non-exclusive list of those types of information arising under the Program which may disclose proprietary information as defined in Article 6 of the LMFBF Agreement and which are to be treated as prescribed therein.

5.4 Each Party shall make available to the other Party information from other programs of work agreed to be specific to the Program and may agree to exchange computer programs to implement or support the Program.

5.5 The Parties may publish jointly or either Party may publish individually a series of reports after mutual agreement in writing of the tests and analysis of the results.

#### ARTICLE 6 - MANAGEMENT OF THE PROGRAM

6.1 Pursuant to the terms of Article 4 of the LMFBF Agreement the DOE/UKAEA Joint Coordinating Committee shall be responsible for

review, evaluation, assessment and approval of the Program to be implemented under this SMA.

- 6.2 One person shall be nominated by each Party for the purpose of day-to-day management of the Program in the country of that Party.
- 6.3 Each Party shall nominate one or more representatives who, at periodic meetings, shall together review the progress of the Program and consider and, where appropriate, make decisions and put such decisions in writing consistent with paragraph 2.1, on any necessary or desirable modifications to the Program taking into account information arising from the Program and elsewhere, and shall report such decisions to the persons nominated for day-to-day management of the Program for implementation.
- 6.4 Each Party shall nominate one representative to be responsible for coordinating the arrangements for all transport of material or equipment required by the Program.

#### ARTICLE 7 - FACILITIES AND EQUIPMENT

- 7.1. In the event that equipment, other than that agreed in support of the Centrifugal Contractors is to be provided by one Party to the other Party for the purposes of implementing the Program, the loan or transfer of ownership of such equipment shall be the subject of separate written agreements as may be required by the Parties.

7.2 Each Party shall at all times be responsible for the operation of its own facilities and for any consequences arising from such operation. The Parties shall discuss any modifications to the Program which may be necessary for safety or operational reasons but each Party shall retain the right to suspend operation of its facilities at any time for operational or safety reasons.

ARTICLE 8 - PATENTS

8.1 In accordance with paragraph 1.c of Article 8 of the LMFBR Agreement, DOE shall acquire all right, title and interest in and to any inventions or discoveries made or conceived in the course of or under this SMA, which are improvements to the equipment provided by DOE pursuant to paragraph 3.1(d), in its own country and in third countries, subject to a non-exclusive, irrevocable, royalty-free license in all such countries to UKAEA, its Government, and its nationals designated by it. UKAEA shall acquire all right, title and interest in and to such improvements in its own country, subject to a non-exclusive, irrevocable, royalty-free license to DOE, its Government and its nationals designated by it.

8.2 In accordance with paragraph 1.c of Article 8 of the LMFBR Agreement, UKAEA shall acquire all right, title and interest in and



to any inventions or discoveries made or conceived in the course of or under this SMA, which relate to the installation provided by UKAEA pursuant to paragraph 3.2(d), in its own country and in third countries, subject to a non-exclusive, irrevocable, royalty-free license in all such countries to DOE, its Government, and its nationals designated by it. DOE shall acquire all right, title and interest in and to such improvements in its own country, subject to a non-exclusive, irrevocable, royalty-free license to UKAEA, its Government and its nationals designated by it.

8.3 With regard to other inventions or discoveries made or conceived in the course of or under this SMA, the provisions of paragraph 1.b of Article 8 of the LMFBR Agreement shall apply.

8.4 With regard to all inventions or discoveries made or conceived in the course of or under this SMA, the provisions of paragraph 3 of Article 8 of the LMFBR Agreement shall apply.

#### ARTICLE 9 - LIABILITY

9.1 Equipment loaned by one Party to the other Party under this SMA shall be suitable for its prescribed duty to the best knowledge and belief of the Lending Party. However, the Lending Party shall not be responsible for mal-operation or accident that may occur whilst the equipment is being used at the other Party's Facility.

9.2 Compensation for damages incurred during the implementation of this SMA shall be in accordance with the applicable laws of the countries of the Parties.

#### ARTICLE 10 - DELAYS

If, during the course of this SMA, any event occurs which significantly delays the Program, the Parties shall discuss the action to be taken to achieve an equitable solution.

#### ARTICLE 11 - DURATION AND TERMINATION

11.1 This SMA shall enter into force upon the latter date of signature and, except as provided in Article 11.2 and 11.3, shall continue for a five-year (5) period.

11.2 This SMA may be amended or extended at any time by mutual agreement of the Parties in writing.

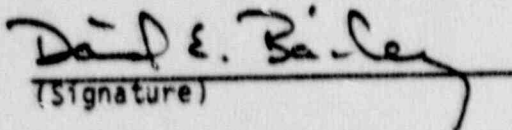
11.3 This SMA may be terminated at any time at the discretion of either Party upon one year's advance notification in writing by the Party seeking to terminate the SMA. Such termination shall be without prejudice to the rights which may have accrued under this SMA to either Party up to the date of such termination.

11.4 In the event of termination of this SMA, Articles 6, 7, and 8 (para 1.b, 2 and 3 only) of the LMFBR Agreement incorporated by reference into this SMA and Articles 5 and 8 of this SMA shall survive its termination.

11.5 In the event of termination by either Party pursuant to Article 11.3 after completion of the Centrifugal Contactor trials at DNE, all information and results available up to the time of such termination shall be exchanged by the Parties under the terms of the SMA.

Done in duplicate at

FOR THE UNITED STATES  
DEPARTMENT OF ENERGY

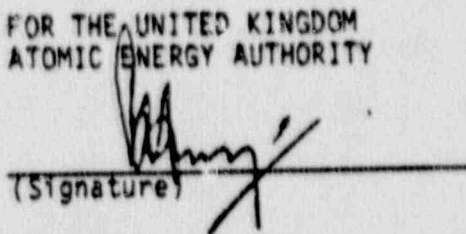
  
(Signature)

David E. Bailey  
(Printed Name)

Director, Division of Fuels  
and Reprocessing  
(Title)

February 25, 1988  
(Date)

FOR THE UNITED KINGDOM  
ATOMIC ENERGY AUTHORITY

  
(Signature)

H B Hickey  
(Printed Name)

Manager, Process Technology  
Branch  
(Title)

5 July 1988  
(Date)



APPENDIX 1

DESCRIPTION OF CENTRIFUGAL CONTACTOR PROGRAM

The program of work under this SMA shall comprise:

1

A. DOE CONTRIBUTION

1. DOE shall provide three tested four-stage 5.5 cm Centrifugal Contactors (plus one single-stage unit manufactured in clear plastic for familiarization studies) complete with drives and control gear.
2. DOE shall provide detailed drawings of all manufactured components to provide for appropriate hook-up and maintenance of the equipment.
3. DOE shall provide installation recommendations and mounting requirements.
4. DOE personnel shall provide on-site assistance as necessary during the commissioning of the unit.
5. DOE shall provide the necessary existing software control algorithms.

B. DOE BENEFITS

1. DOE would obtain confirmation of contactor operation for U feeds at different TBP concentrations.

DEB by.

2. DOE would obtain information on contactor operation for feeds containing U and Pu, in the absence of fission products, under extract, backwash and U/Pu separation modes including mixed nitric/sulphuric streams.
3. DOE would obtain information on contractor operation for feeds containing U and Pu in the presence of some fission products, under extract conditions.
4. DOE would obtain information on the operation, behavior and application of a spectrophotometer control system if one is used.
5. DOE would obtain reliability data for the hardware under field tests in a plutonium active but non-gamma radiation environment.
6. DOE would obtain reliability data for the hardware under field tests in a gamma radiation environment.

11

A. UKAEA CONTRIBUTION

1. Make available a laboratory test rig for confirmatory U trials of the DOE centrifugal contactor at 20% TBP with a UKAEA-associated spectrophotometer control system.
2. Make available the D2670 Pulsed Column Glovebox for mounting and subsequent trials of the DOE centrifugal contactor on uranium-

plutonium plant streams with a UKAEA-associated spectrophotometer control system.

3. Make available a location in D1206 for mounting and subsequent trials of the DOE centrifugal contactor on uranium-plutonium-fission product plant streams with a UKAEA-associated spectrophotometer control system.
4. Make existing UKAEA spectrophotometer equipment available for use with the DOE equipment as far as is practicable.
5. Provide full analytical services to quantify contact operation.
6. Provide measurement of any physical property data required to characterize operational behavior of the contactor.
7. Make existing UKAEA data interpretation procedures available for the above requirements.
8. Develop measurements and interpretation procedures in conjunction with DOE which optimize the UKAEA control system for use with UKAEA flowsheets.
9. Make available and evaluate alternative sensors where spectrophotometric devices cannot be used.



B. UKAEA BENEFITS

1. Information of the operating characteristics of a bank of centrifugal contactors for LMFBR fuel reprocessing under a variety of conditions.
2. Information on the feasibility of in-line control of centrifugal contactors under a variety of operating conditions.
3. Information on the startup, shutdown, washout and accountability of a bank of centrifugal contactors.
4. Information on the installation and mechanical reliability of in-cell centrifugal contactors.
5. Providing design information for fitting similar equipment to similar plants or for fitting to new plants.
6. Operating information on the reliability of the spectrophotometer detector head.



Department of Energy  
Washington, DC 20545

NOV 8 1989

Mr. H. B. Hickey, Manager  
Process Technology Branch  
United Kingdom Atomic Energy Authority  
Risley, Warrington, Cheshire WA3 6AT  
United Kingdom

Dear Mr. Hickey:

In the Specific Memorandum of Agreement between the United States Department of Energy and the United Kingdom Atomic Energy Authority in the area of Solvent Extraction Centrifugal Contactors that was entered into force on July 5, 1986, it is recognized (Article 2, paragraph 2.1) that the Program, as given in Appendix 1 to the Agreement, may be subject to changes as the work progresses. It is also stated (paragraph 2.1) that "Any changes to the Program shall require the prior agreement in writing of the Parties." The Program description (Appendix 1, I.A.1.) provides that the United States Department of Energy shall supply three tested four-stage 5.5 cm Centrifugal Contactors to the United Kingdom Atomic Energy Authority.

At the meetings in Risley, United Kingdom, on 19 October 1989, the principal fuel cycle coordinators, R. H. Allardice for the United Kingdom and D. E. Bailey for the United States, agreed that there are mutual program benefits in having all centrifugal contactor housings in an uncontaminated state before introducing them into the Centrifugal Contactor Facility, Building No. D1206, at the Dounreay Nuclear Power Development Establishment. It was further agreed that the most effective way to accomplish this would be for the United States Department of Energy to supply on loan to the United Kingdom Atomic Energy Authority three additional housings for the four stage 5.5 cm Centrifugal Contactors per Article 2, paragraph 2.2 (b) and Article 3, paragraph 3.1 (d).

I am, therefore, pleased to propose that this letter and your favorable reply shall have the effect of amending the Program in the Agreement as given in Appendix 1 to read:

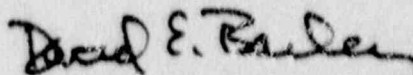
"1

A. DOE CONTRIBUTION

1. DOE shall provide three tested four-stage 5.5 cm Centrifugal Contactors (plus one single-stage unit manufactured in clear plastic for familiarization studies) complete with drives and control gear. In addition, DOE shall provide three spare housings for the contactors."

All other elements of the Program remain in effect as do all provisions of the Agreement.

Sincerely,



David E. Bailey, Director  
Division of Fuels and Reprocessing  
Office of Facilities, Fuel Cycle,  
and Test Programs  
Office of Nuclear Energy





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16 November 1989

Mr D E Bailey, Director  
Division of Fuels and Reprocessing  
Office of Facilities, Fuel Cycle  
and Test Programmes  
Office of Nuclear Energy  
US Department of Energy

Dear Mr Bailey

Thank you for your letter of 8th November 1989 proposing an amendment to the Specific Memorandum of Agreement between the United States Department of Energy and the United Kingdom Atomic Energy Authority in the area of solvent extraction centrifugal contactors that was entered into force on 8th July 1988.

By this letter I confirm that we agree to the proposal in your letter to amend the programme as given in Appendix 1 of the Agreement and we agree that all other elements of the programme remain in effect as do all provisions of the Agreement.

Yours sincerely

H B Hickey  
Manager, Process Technology Branch  
Technology Assessments Division