ACTION SHEET I

Pursuant to PROJECT ANNEX 1

FOR COOPERATION IN THE FIELD OF MOLYBDENUM-99 PRODUCTION FROM LOW-ENRICHED URANIUM

between

THE NATIONAL ATOMIC ENERGY COMMISSION OF THE ARGENTINE REPUBLIC (CNEA)

and

THE UNIVERSITY OF CHICAGO, AS OPERATOR OF ARGONNE NATIONAL LABORATORY

Article 1. Background

The Department of Energy of the United States of America (DOE) and the National Atomic Energy Commission of the Argentine Republic (CNEA) have entered into an Implementing Arrangement for Technical Exchange and Cooperation in the Area of Peaceful Uses of Nuclear Energy on October 16, 1997 (hereinafter referred to as the Implementing Arrangement), and Project Annex I thereto for Cooperation in the Field of Molybdenum-99 Production from Low-Enriched Uranium.

Noting that they will mutually benefit from joint research in the area of molybdenum-99 (^{99}Mo) production from low-enriched uranium (LEU), CNEA and ANL undertake the following Joint Research Agreement ("Agreement"), subject to the terms of the Implementing Arrangement and in furtherance of the Project Annex.

Article 2. Task Descriptions

The Joint Research will consist of research and development and related activities as described in Appendix A and may subsequently cover other areas as agreed in writing from time to time by the Parties. It is expected that results of the Joint Research will be complementary. The implementation of the Joint Research will include the exchange of information and personnel, the undertaking of collaborative research activities where these are identified, and the holding of meetings.

Article 3. CNEA Scope of Responsibilities

3.1 CNEA will provide the necessary personnel, materials, equipment and services in order to carry out its tasks in the Joint Research. The scope of work and the schedule shall be subject to the availability of funds within CNEA.

3.2 CNEA shall accept ANL-assigned individuals to participate in the Joint Research implemented at CNEA. The information derived through the activities of these technical experts will be disseminated between CNEA and ANL for their own respective use. The assignment and the work scope of these experts shall be mutually agreed to by ANL and CNEA prior to the assignment.

3.3 CNEA shall provide ANL access to CNEA research data as necessary to achieve the objectives of the Joint Research. This access shall be available as long as this Agreement is in effect.

3.4 CNEA shall fund the total costs of travel and salary arising from CNEA assignees to ANL.

Article 4. ANL Scope of Responsibilities

4.1 ANL will provide the necessary personnel, materials, equipment and services in order to carry out its tasks in the Joint Research. The scope of work and the schedule shall be subject to the availability of funds within ANL.

4.2 ANL shall accept CNEA-assigned individuals to participate in the Joint Research implemented at ANL. The information derived through the activities of these technical experts will be disseminated between CNEA and ANL for their own respective use. The assignment and the work scope of these experts shall be mutually agreed to by CNEA and ANL prior to the assignment.

4.3 ANL shall provide CNEA access to ANL research data as necessary to achieve the objectives of the Joint Research. This access shall be available as long as this Agreement is in effect.

4.4 ANL shall fund the total costs of travel and salary arising from ANL assignees to CNEA.

Article 5. Representations and Warranties

5.1 CNEA represents and warrants to ANL that as at the date hereof:

(a) CNEA has all requisite power to implement this Agreement, to bind itself in the manner contemplated by this Agreement and to execute and deliver and perform this Agreement, and to become bound thereby; and

(b) This Agreement has been validly executed and delivered on behalf of CNEA and constitutes the valid binding and enforcement obligation of CNEA.

5.2 ANL represents and warrants to CNEA that as at the date hereof:

(a) ANL has the power to execute, deliver, and perform this Agreement and to become bound thereby, pursuant to its Prime Contact No. W-31-109-ENG-38, as amended, with the U.S. Department of Energy.

(b) This Agreement has been validly executed and delivered on behalf of ANL and constitutes the valid binding and enforcement obligation of ANL.

Article 6. Disclaimer

THE GOVERNMENT OF THE ARGENTINE REPUBLIC, THE U.S. GOVERNMENT, CNEA AND ANL MAKE NO EXPRESS OR IMPLIED WARRANTY AS TO THE CONDITIONS OF THE RESEARCH OR ANY INTELLECTUAL PROPERTY OR GENERATED INFORMATION OR PRODUCT MADE OR DEVELOPED UNDER THIS AGREEMENT, OR THE OWNERSHIP, MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE OF THE RESEARCH OR RESULTING PRODUCT. NEITHER THE GOVERNMENT OF THE ARGENTINE REPUBLIC, THE U.S. GOVERNMENT, CNEA OR ANL SHALL BE LIABLE FOR SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGES ATTRIBUTED TO SUCH RESEARCH OR RESULTING PRODUCT, INTELLECTUAL PROPERTY, OR GENERATED INFORMATION OR PRODUCT MADE OR DEVELOPED UNDER THIS AGREEMENT.

Article 7. Intellectual Property

7.1 The intellectual property terms of the Implementing Arrangement (Article 9) and Project Annex I (Article 4), shall apply to work performed under this Agreement.

7.2 As set forth in paragraph 3.2(ii)(a) of Article 9 of the Implementing Arrangement and Article 4 of Project Annex I, each Party shall be entitled to obtain all rights and interests in its own country to intellectual property arising under this Agreement.

7.3 Copyrights.

(a) CNEA may assert copyright in any information produced by CNEA in the performance of this Agreement. ANL may assert copyright in any information produced by ANL in the performance of this Agreement. ANL and CNEA agree that the U. S. Government and the Government of the Argentine Republic shall each have for themselves and others acting on their behalf for information produced in the performance of this Agreement, a royalty-free, nonexclusive, nontransferable, irrevocable worldwide copyright license to reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly, by or on behalf of each Government, all copyrightable works produced in the performance of this Agreement, subject to the restrictions this Agreement places on publication of Business-Confidential Information.

(b) CNEA and ANL agree to place copyright and other notices, as appropriate for the protection of copyright, in human readable form onto all physical media, and in digitally encoded form in the header of machine readable information recorded on such media such that the notice will appear in human readable form when the digital data are off-loaded or the data are accessed for display or printout.

7.4 Inventions

(a) For purposes of this Agreement, "Invention" means any invention made in the course of work under this Agreement which is or may be patentable or otherwise protectable under the laws of the Argentine Republic, the United States of America, or any third country.

(b) CNEA and ANL agree to promptly disclose directly to each other each and every Invention made in the course of this Agreement.

(c) CNEA shall have the right to obtain all rights and interest in the Inventions of CNEA in all countries, except the United States.

(d) ANL shall have the right to obtain all rights and interest in the Inventions of ANL in all countries, except the Argentine Republic, subject to the rights of the U. S. Government therein under Contract W-3 l-1 09-ENG-38.

(e) Inventions made jointly by CNEA and ANL shall be jointly owned by CNEA and ANL. Within thirty (30) days after the Parties identify a joint invention, the Parties agree to assert their best efforts in cooperation with each other to determine whether patent application(s) should be filed in countries outside of the Argentine Republic and the United States, and the Parties' rights and obligations with respect to such patent application(s). If within one hundred twenty (120) days after identification of a joint invention, the Parties have not reached agreement in this regard, then such negotiations shall be presumed terminated unless extended by agreement of the Parties.

7.5 This Agreement does not convey any right or license under any patents of either Party except as expressly provided herein, regardless of whether such patents are dominant or subordinate to a patent obtained on an Invention made in the course of this Agreement.

7.6 Business Confidential Information

(a) In any written communication with the other Party, each Party shall identify Business Confidential Information meeting the definition set forth in paragraph 4 of Article 9 of the Implementing Arrangement, and shall attach such information in an appendix to the communication, each page of which shall be clearly marked "Business Confidential Information."

(b) If Business Confidential Information is orally disclosed to a Party, then it shall be identified as such at the time of oral disclosure and confirmed in a written summary thereof within ten (10) days as being Business Confidential Information.

(c) The Parties agree to use Business Confidential Information solely for purposes of work under this Agreement and to use reasonable care to avoid disclosure of Business Confidential Information to a third party. Notwithstanding the foregoing, a Party may use Business Confidential Information as necessary as part of a patent application describing an Invention made under this Agreement.

(d) Business Confidential Information shall be protected pursuant to paragraph (c) above unless and until such Business Confidential Information shall become publicly known without the fault of the recipient, shall come into recipient's possession without breach by the recipient of any of the obligations set forth herein, or shall be independently developed by recipient's employees who did not have access to Business Confidential Information.

(e) The Parties agree that the written consent of the disclosing Party shall be required before the receiving Party may convey to a third party experimental data and know-how generated under this Agreement which is not of the nature ordinarily included in a patent application and which is in written or other tangible form marked Business Confidential Information.

Article 8. Liability

In performing this Agreement, each Party shall be responsible for its own negligence.

Article 9. Reexport of ANL Research Data

, Research data furnished by ANL under this Agreement may be subject to the United States export/reexport control laws and regulations. The Parties agree to comply with such laws and regulations and acknowledge that these export control obligations survive the termination of this Agreement.

Article 10. Force Majeure

CNEA and ANL shall not be responsible for failure to perform any of the obligations imposed by this Agreement provided such failure is beyond the reasonable control of either Party.

Article 11. Term of Agreement

11.1 This Agreement shall enter into force upon signature by both Parties and shall remain in force for a period of four years.

11.2 This Agreement may be extended by mutual written agreement of the Parties.

11.3 This Agreement may be terminated by either Party upon six (6) months advance notice in writing by the Party seeking to terminate the Agreement.

Article 12. Amendments

Any amendments and supplements to this Agreement are subject to mutual written agreement of the Parties.

Article 13. Notices

Any notice given pursuant to this Agreement shall be given in writing and if sent by post shall be addressed as follows:

(a) in the case of CNEA to:

National Atomic Energy Commission
Attn: Lic. Alberto Manzini
Ezeiza Atomic Center
1842 Agencia Minipost
Buenos Aires, Argentina
Telephone: +54-1 1-4-379-8185
Facsimile: +54-1 l-4-379-8570

(b) in the case of ANL to:

Argonne National Laboratory
Attn.: Dr. James L. Snelgrove
9700 S. Cass Avenue
Argonne, IL 60439
Telephone: +1 -630-252-6369
Facsimile: +1-630-252-5161

Article 14. Assignment

It is understood and agreed that this Agreement is entered into by ANL under Prime Contract No. W-3 1-109-ENG-38, as amended, with the U.S. Department of Energy. Administration of this Agreement may be transferred from ANL to the U.S. Department of Energy or its designee with notice of such transfer to CNEA and ANL shall have no further responsibilities hereunder.

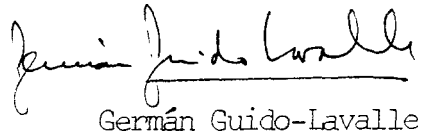
Article 15. Noninterference

It is the responsibility of ANL to perform the work under this Agreement in accordance with the Appendix A hereof. Work under this Agreement may be preempted by U.S. Department of Energy work related to the prime mission of ANL when it is essential to the public interest as determined by the U.S. Department of Energy. Accordingly, under this circumstance, neither the U.S. Government, the U.S. Department of Energy, ANL, CNEA nor person acting on their behalf will be responsible for failure to perform the services or furnish the materials or information hereunder on schedule.

IN WITNESS WHEREOF, the Parties hereto have executed this Agreement

SIGNED for and on behalf of the

THE NATIONAL ATOMIC ENERGY COMMISSION
OF THE ARGENTINE REPUBLIC

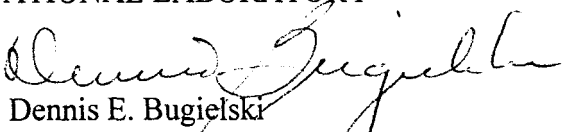
By: 

Title: Germán Guido-Lavalle
Manager of International Cooperation and Technology Transfer

Date: February 8, 1999

SIGNED for and on behalf of the

THE UNIVERSITY OF CHICAGO, OPERATOR OF
ARGONNE NATIONAL LABORATORY

By: 

Dennis E. Bugielski

Title: Manager, ANL Procurement

Date: January 28, 1999

APPENDIX A – JOINT RESEARCH

COOPERATION IN THE FIELD OF MOLYBDENUM-99 PRODUCTION FROM LOW-ENRICHED URANIUM METAL FOIL TARGETS

The National Atomic Energy Commission of the Argentine Republic (CNEA) and Argonne National Laboratory (ANL) will perform a Joint Research in the area of MO-99 production from Low-Enriched Uranium metal foil targets.

The Joint Research will consist in the development and implementation of the following activities:

- Design and demonstration of an LEU metal foil target for use in the RA-3 reactor.
- Design, development, and demonstration of an LEU metal foil dissolver.
- Development and demonstration of modifications to the existing CNEA process for MO-99 recovery and purification using LEU metal foil targets.

The previous tasks pursue the following objectives:

- Show technical viability of LEU metal foil targets for MO-99 production.
- Produce safe, reliable, and economic LEU metal foil targets.
- Show technical viability of chemical processing of LEU metal foil targets to produce Mo-99.
- Demonstrate that conversion to LEU will provide MO-99 with acceptable yield and purity.
- Provide a basis for a comparison of the economics of producing of MO-99 from HEU and from LEU.

A full description of tasks, duration, primary responsibilities, and assumed effort of each party is presented in the following list and schedule.

CNEA/ANL COOPERATION ON MO-99 PRODUCTION FROM LEU METAL FOIL TARGETS

	Task	Primary Responsibility	Duration		Assumed Effort (SM[a])	
			Start	End	ANL	CNEA
1	CNEA/ANL approval of plan/schedule		11198	01199		
2	**Develop and demonstrate LEU U-foil taraet**					
3	**Prepare for test target irradiation**					
4	Determine target loading and geometry	Joint	02/99	03/99	0,5	1
5	Design test target & irradiation fixture	Joint	04/99	07/99	1	1
6	Perform safety analysis for target irradiation	CNEA	08/99	08/99	1	1
7	Prepare safety documentation	CNEA	09/99	09/99	0,5	1
8	Prepare irradiation fixture	CNEA	10199	10/99	0,5	1
9	Obtain approval for irradiation	CNEA	11/99	12/99	-	0,5
10	**Fabricate test targets**					
11	Develop target fabrication techniques	ANL	02/99	10/99	4	0,5
12	ANL fabricate and ship first test targets	ANL	11/99	01/00	1,5	0,5
13	Refine target fabrication techniques	Joint/ANL	05/00	07/00	3	1
14	ANL fabricate and ship second test targets	ANL	08/00	09/00	1,5	0,5
15	Transfer fabrication technology	Joint	05/00	12/00	2	8
16	CNEA fabricate third test target	CNEA	03/01	04101	1	4
17	**Irradiate and examine test targets**					
18	Irradiate and examine first test target	CNEA	03/00	04/00	1	2
19	Irradiate and examine second test target	CNEA	11/00	12/00	1	2
20	Irradiate and examine third test target	CNEA	05101	06101	1	2
21	**Prepare for industrial target irradiation**					
22	Design production target and irradiation fixture	Joint	01/01	02/01	1	2
23	Develop industrial fabrication of targets	Joint	03/01	08/01	1	6
24	Fabricate demonstration/production targets	CNEA	09/01	10/01	1	4
25	Irradiate and examine demonstration/production targets	CNEA	11/01	12/01	1	2
26	Assess economics of target production	Joint	11/01	01/02	1	3
27	**Develop LEU-foil target dissolver process**					
28	Evaluate feasibility of acid dissolution/base precipitation	ANL	02/99	05/99	4	1
29	Evaluate use of O_2 under pressure to dissolve U in base	ANL	03/99	05/99	2	0,5
30	Choose dissolution process (H_2O_2, O_2, acid/base)	Joint	06/99	06/99	0,5	0,5
31	**Design LEU foil dissolver**					
32	Optimize dissolution process & evaluate dissolver design options	Joint/ANL	07/99	04/00	16	10
33	Decide on materials of construction	Joint/ANL	05/00	06/00	2	1
34	Develop means to handle greater gas evolution, especially O_2	Joint/CNEA	04/00	06/00	2	4
35	Address all safety considerations	Joint/CNEA	07/99	06/00	2	3
36	Address hot-cell ergonomics	Joint/CNEA	07/99	06/00	2	3
37	Address reliability and ease of maintenance	Joint/CNEA	07/99	06/00	2	3
38	Prepare blueprints for dissolver	ANL	07/00	08/00	3	0
39	Conduct formal design review	Joint	08/00	08/00	1	2
40	Prepare CNEA hot cells for LEU dissolution	CNEA	02/00	01/01	-	12

[a] Staff-Month: Equivalent to 1/12 of a full-time technical staff person's annual effort

CNEA/ANL COOPERATION ON Mo-99 PRODUCTION FROM LEU METAL FOIL TARGETS

	Task	Primary Responsibility	Duration		Assumed Effort (SM)[a]	
			Start	End	ANL	CNEA
41	**Build, test and modify dissolver system**					
42	Fabricate prototype LEU-foil dissolver system	ANL	09/00	10/00	3	-
43	Cold-test prototype LEU-foil dissolver system	ANL	11/00	12/00	3	0,5
44	Modify LEU-foil dissolver system as needed	Joint/ANL	01/01	02/01	2	0,5
45	Prepare documentation for hot-testing and processing	CNEA	12/00	12/00	0,5	1
46	Obtain approval for hot-testing and processing	CNEA	01/01	03/01	-	0,5
47	Install prototype dissolver in hot cell	CNEA	04/01	04/01	-	0,5
48	Hot-test prototype LEU-foil dissolver	CNEA	05/01	05/01	0,5	5
49	Prepare final upgrade to dissolver system	Joint/ANL	06/01	07/01	1	0,5
50	Fabricate production LEU-foil dissolver for full-scale process demonstration	ANL	08/01	09/01	1	-
51	Install production dissolver in hot cell	CNEA	10/01	10/01	-	0,5
52	Demonstrate LEU-foil dissolution (with task 25)	CNEA	11/01	12/01	1	5
53	**Develop Mo-recovery and purification process for LEU**					
54	**Measure effects of Zn on primary Mo-recovery step**					
55	Cold experiments	ANL	04/99	07/99	2,5	0,5
56	Tracer experiments	Joint	08/99	10/99	2,5	3
57	Hot-cell experiments (using third test target with task 48)	CNEA	05/01	05/01	0,5	5
58	**Measure effects of peroxide on primary Mo-recovery step**					
59	Cold experiments	ANL	07/99	10/99	1,5	0,5
60	Tracer experiments	Joint	11/99	01/00	2	3
61	Hot-cell experiments (using third test target with task 48)	CNEA	05/01	05/01	0,5	5
62	**Measure actinide behavior in primary Mo-recovery step**					
63	Tracer experiments	ANL	02/00	07/00	3,5	0,5
64	Hot-cell experiments (using third test target with task 48)	CNEA	05/01	05/01	0,5	5
65	**Verify no effect of LEU on further purification steps**					
66	Cold experiments	ANL	08/00	10/00	2,5	0,5
67	Tracer experiments	Joint	11/00	01/01	3	3
68	Hot-cell experiments (using third test target with task 48)	CNEA	05/01	05/01	0,5	5
69	Develop modifications to process as required	Joint	06/01	10/01	4	4
70	**Demonstrate entire process**					
71	With fully irradiated LEU foils (with task 48)	CNEA	05/01	05/01	1	3
72	With demonstration/production targets (with tasks 25 + 52)	CNEA	11/01	12/01	1,5	5
73	**Assess effects of LEU/modifications on waste volume/treatment/disposal**	CNEA	06/01	10/01	4	4
74	**Assess economics of LEU process and waste handling**	CNEA	11/01	01/02	1	3
75	**Assess economics of conversion to LEU**	Joint/CNEA	12/01	01/02	1	1

[a] Staff-Month: Equivalent to 1/12 of a full-time technical staff person's annual effort