

SUBSIDIARY AGREEMENT BETWEEN THE UNITED STATES DEPARTMENT OF ENERGY (DOE) AND
THE NETHERLANDS ENERGY RESEARCH FOUNDATION (ECN) IN CLOSED-CYCLE MAGNETOHYDRO-
DYNAMICS (CCMHD)

Annex to an Agreement between the United States Department of Energy (DOE) and
The Netherlands Energy Research Foundation (ECN) in the Field of Magnetohydro-
dynamic Power Generation (The Umbrella Agreement).

The United States Department of Energy (DOE) and The Netherlands Energy Research
Foundation (ECN), hereinafter called the Parties, have agreed to establish a
cooperative program in Closed-Cycle Magnetohydrodynamics (CCMHD).

ARTICLE I: Purpose

The objective of cooperation under this Subsidiary Agreement is, on the basis
of mutual benefit, to jointly advance the understanding of the CCMHD process.

ARTICLE II: Joint Program

2.1 The Joint Program outlined below, has been agreed to between the Parties to
meet the objectives of this Subsidiary Agreement. It is recognized that the
Joint Program may be subject to change as the work progresses. Any changes
shall require prior written agreement between Parties.

2.2 The Joint Program envisages:

- a. Supply and fabrication by DOE of
 - (i) an advanced CCMHD channel
 - (ii) a preheat loop for an advanced CCMHD channel
 - (iii) other interface components as the Parties may mutually agree.
- b. Transport of the equipment in paragraph 2.2.a. by DOE to an agreed port of entry in The Netherlands and subsequent transport by The Netherlands side to the Technische Hogeschool Eindhoven (THE).
- c. Joint tests and analyses of the DOE CCMHD channel in the THE CCMHD facility.
- d. Exchange of all relevant data and results of both DOE and THE CCMHD channels in the THE CCMHD facility.
- e. Preparation and exchange between the Parties of agreed reports during the Joint Program and preparation of a Joint Report.
- f. Return of DOE equipment and components to the United States of America at the discretion of DOE upon completion of mutually agreed experiments; however, the preheat loop shall be loaned to the THE for additional experiments of common interest through 1982 or for a mutually agreed extended period in accordance with a loan contract to be entered into by the Parties.

- g. Exchange of available reports on request in the areas of cooperation listed in Article 2 of the Umbrella Agreement.

ARTICLE III: Provision of Components and Services

3.1 To perform the Joint Program in Article II of this Subsidiary Agreement, the DOE shall, at its expense:

- a. Provide an advanced CCMHD channel, channel preheat loop and other interface components to allow hot-walled CCMHD channel testing using an argon/cesium working fluid with a stagnation temperature of 2000 K (3140°F) and a stagnation pressure of up to 10 atmospheres. These components shall be suitable for operation in the THE blowdown test facility for installation and testing during the period January 1-September 30, 1981 at a nominal power of 5.0 MWt.
- b. Provide oral and written technical commentaries on planned and actual test operation and procedures for testing of the DOE CCMHD channel.
- c. Provide as mutually agreed the on-site services of a DOE technical expert during initial check-out operation of the ceramic regenerative heat exchanger.
- d. Provide DOE personnel to participate in installation, integration, check out and Joint Program operation of all DOE-supplied CCMHD components, and for the conduct of joint tests of these components, as well as for additional experiments in the THE facility preceding or subsequent to the joint tests as mutually agreed upon.

- e. Provide analysis of joint test data using existing CCMHD codes owned by the U. S. Government.

3.2 To perform the Joint Program in Article II of this Subsidiary Agreement, the ECN, acting through its prime contractor, the THE, shall:

- a. Provide DOE access to the existing and planned heat source, cesium seed subsystem, magnet, subsonic diffuser, instrumentation, electrical load, diagnostics, control and mechanical support interfaces, etc., at the THE blowdown test facility for the purpose of joint test activity during the period January 1 - September 30, 1981.
- b. Assume the operating and integrating costs associated with the testing of the DOE CCMHD channel and interface components in the THE blowdown test facility and data reduction from the joint tests. THE shall install and test the DOE CCMHD channel and interface components during the period January 1 - September 30, 1981.
- c. Provide on request appropriate available information required by DOE to design the DOE CCMHD channel and components.
- d. Allow DOE personnel to be present at key testing of the THE CCMHD channels and at other times, and provide results of these tests in order to give DOE familiarity with CCMHD channel performance, test operation, and data acquisition techniques which may affect the design of the DOE CCMHD channel. THE shall notify DOE at least 45 days in advance of the scheduled dates for key test runs.

e. Provide analyses of joint test data using existing THE CCMHD codes.

3.3 The Parties propose to undertake analysis of the results arising from the joint tests according to their own requirements and using their own data and CCMHD codes and 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. Each Party shall make available to the other Party the results of these analyses. It is an objective of the Parties to cooperate in attempts to establish the reasons for any differences between results of the analyses.

ARTICLE IV: Facility and Equipment

4.1 The Parties shall discuss any modifications to the Joint Program which may be necessary for safety or operational reasons, but each Party shall retain the right to suspend operation of its equipment at any time for operational or safety reasons.

4.2 DOE reserves the right to recall at its discretion the DOE CCMHD channel, preheat loop and other interface components upon completion of mutually agreed experiments. DOE shall extend for additional experiments of common interest the use of its preheat loop and appropriate preheat loop interface components in the THE blowdown test facility.

4.3 Upon the completion of the Joint Program and through 1982 or for a period of time agreed to by mutual consent of the Parties the DOE preheat loop and its interface components shall be subject to the execution of a loan contract.

ARTICLE V: Use and Disclosure of Information

The following provisions shall apply to information obtained during the Joint Program:

- 5.1 Information developed prior to and outside the scope of the Joint Program shall be treated as prescribed in Article 6 of the Umbrella Agreement.
- 5.2 The Parties shall freely exchange all analytical and experimental data arising from the Joint Program.
- 5.3 Except as otherwise agreed, the Parties shall publish, by mutual agreement, results of the Joint Program as joint publications.

ARTICLE VI: Patents

DOE shall acquire all right, title and interest in and to any invention or discovery made or conceived in the course of or under activities pursuant to paragraph 2.2.a. of Article II of this Subsidiary Agreement. Any invention or discovery made or conceived in the course of or under exchanges of personnel of the Parties shall be governed by paragraph 1.A. of Article 9 of the Umbrella Agreement. Any invention or discovery made or conceived in the course of or under other activities pursuant to Article II of this Subsidiary Agreement shall be governed by paragraph 1.B. of Article 9 of the Umbrella Agreement.

ARTICLE VII: Program Management

Management of the Joint Program under this Subsidiary Agreement shall be carried out by both Parties through designated Program Managers who shall act on behalf of each Party in matters concerning the Joint Program.

ARTICLE VIII: Incorporation by Reference

Articles 7, 8, 9, 10, 11, 12, 13, 14 and 15 of the Umbrella Agreement are hereby incorporated by reference.

ARTICLE IX: Delays

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

ARTICLE X: Duration and Termination

10.1 This Subsidiary Agreement shall enter into force upon signature, to be preceded by execution of the Umbrella Agreement, and shall continue for 5 (five) years, and may be amended or extended by an amendment of this Subsidiary Agreement by mutual written consent. This Subsidiary Agreement shall be subject to semiannual review by the Parties and may be amended by mutual written consent.

10.2 This Subsidiary Agreement may be terminated at any time at the discretion of either Party upon 6 (six) months advance notification in writing by the Party seeking such termination. Such termination shall be without prejudice to the rights which may have accrued under this Subsidiary Agreement to either Party up to the date of such termination.

10.3 The implementation of this Subsidiary Agreement shall be subject to administrative procedures set out by the appropriate authorities of both Parties, as well as to the continued availability of annual appropriations from the Congress of the United States and funding approval by the official organizations of The Netherlands.

Done in duplicate at Eindhoven this 11th day of October 1979.

Anthony P. Ricciardi
For the Department of Energy of

For the Department of Energy of
the United States of America (DOE)

V. P. Vilins

For The Netherlands
Energy Research Foundation (ECN)