

Annex to the Agreement between the Power Reactor and  
Nuclear Fuel Development Corporation of Japan (PNC) and the United  
States Department of Energy (DOE) on Cooperation in the Area of  
Radioactive Waste Management

PNC-DOE Collaborative Program  
on Development of Fundamental Thermochemical and Adsorption Data

## 1. INTRODUCTION AND TERMS OF REFERENCE

Pursuant to Article III.2 of the Agreement between the Power Reactor and Nuclear Fuel Development Corporation of Japan (PNC) and the United States Department of Energy (DOE) on Cooperation in the Area of Radioactive Waste Management of November 20 1986 (hereinafter referred to as the "PNC-DOE Agreement"), PNC and DOE agree to establish this Annex to define the detailed provisions of a collaborative program on Development of Fundamental Thermochemical and Adsorption Data (hereinafter referred to as the "Collaborative Program"), in accordance with the provisions of the PNC-DOE Agreement as follows:

## 2. OBJECTIVES

The primary objectives of this Collaborative Program include: 1) the development of thermodynamic data for aqueous species and solid phases important to the geologic disposal of nuclear waste, 2) the development of mechanistic adsorption data and constants essential for providing scientifically defensible models of adsorption processes, 3) the development of kinetic data needed to evaluate the importance of increased crystallinity of the solid phases on predicted aqueous solubilities, and 4) experimental validation of the thermodynamic data and adsorption models using waste glasses and actual soils/geologic materials. These efforts can provide the capability to perform quantitative and scientifically defensible performance assessment analyses.

## 3. PROJECT

3.1 The Collaborative Program will: develop thermodynamic data at various temperatures for the carbonate complexes of tetravalent actinides (e.g., Th(IV), U(IV), and Np(IV)); develop kinetic data for relating the degree of crystallinity to solubility for oxides and hydrous oxides of tetravalent actinides (e.g., Th(IV), U(IV), and Np(IV)); and develop mechanistic adsorption data at various temperatures for the adsorption of Am(III) and Np(V) by simple to complex adsorbents (pure minerals such as iron and aluminum oxides and complex adsorbents such as clays and natural sediments) in simple to complex aqueous media so as to reliably predict adsorption-controlled aqueous concentrations in any given geologic media and groundwater.

3.2 DOE shall conduct the research described in paragraph 3.1 at the Pacific Northwest Laboratory (PNL), Richland, Washington.

3.3 Annual reports from the Collaborative Program shall be prepared by PNL, Richland, Washington.

3.4 Technology and information developed under this Annex will be transferred to PNC and DOE. The transfer shall be facilitated through such means as reports, workshops, and personnel visits. In general, the mechanism

of technology and information transfer will be in accordance with Articles VI, VII, and VIII of the PNC-DOE Agreement.

#### 4. MANAGEMENT

4.1 PNC and DOE agree that the general management and conduct of the Collaborative Program shall be carried out by Technical Coordinators.

4.2 PNC will name a technical coordinator to represent PNC and DOE will name a technical coordinator from PNL for DOE. PNC and DOE shall designate alternates who shall serve if the Technical Coordinators are unable to do so and each shall inform the other in writing of all such designations.

4.3 The Technical Coordinators shall meet semiannually or more frequently, if required, on dates and locations mutually agreed upon. All decisions under the functions of the Technical Coordinators shall be by unanimity of the Technical Coordinators.

4.4 The functions of the Technical Coordinators shall include:

- (a) planning the Collaborative Program and development of annual work plans,
- (b) arranging for annual and periodic technical reports, to be issued in English,
- (c) facilitating all technical communications,
- (d) arranging for the implementation of personnel visits,
- (e) reviewing the technical progress in experiments and analyses,
- (f) reviewing plans for publication, and
- (g) discussion of other matters as mutually agreed.

In addition to these functions, the Technical Coordinators shall be responsible for assessing periodically the Collaborative Program's relevance to both DOE and PNC waste management programs and shall report these assessments as needed. The above functions of the Technical Coordinators will be under the general oversight of the PNC and DOE Principal Coordinators of the PNC-DOE Agreement.

#### 5. FINANCE

PNC shall provide funding to DOE for the work outlined in the Joint Work Statement. The amount of funding and the work for each year shall be agreed upon in writing by the Parties. PNC's funding to DOE for Japanese fiscal year 1993 and after shall be subject to the approval of the budget by the Japanese Government.

#### 6. INFORMATION AND PATENTS

The parties shall support the dissemination of information provided or exchanged under this Collaborative Program in accordance with Articles VI, VII, and VIII of the PNC-DOE Agreement.

#### 7. LOAN OF EQUIPMENT

Any changes, loan or supply of equipment, instruments, materials, or spare parts under the Collaborative Program shall be conducted in accordance with Article XI of the PNC-DOE Agreement.

## 8. PERSONNEL ASSIGNMENT

Active visits of various durations between PNC and DOE personnel are anticipated in order to carry out the Collaborative Program. All visits will be approved by the Technical Coordinators.

## 9. REFERENCE

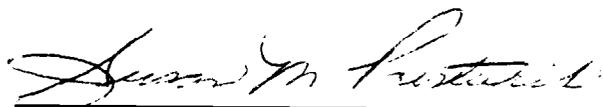
The reference for this Annex and the Joint Work Statement is the Agreement between the Power Reactor and Nuclear Fuel Development Corporation of Japan and the United States Department of Energy on Cooperation in the Area of Radioactive Waste Management.

## 10. DURATION AND TERMINATION

The Collaborative Program shall enter into force upon signature of this Annex by PNC and DOE and shall remain in force for a period of four (4) years. This annex may be renewed or amended by written agreement between PNC and DOE. The Collaborative Program may be terminated at the discretion of either PNC or DOE upon six months advanced notice in writing by the side seeking termination. Such termination shall be without prejudice to the rights that may have accrued under the Collaborative Program to either Party up to the date of such termination. Specific activities initiated hereunder but not completed at the termination of this Annex may be continued until their completion under the terms of this Annex.

DONE this 28th day of July 1993, in duplicate in English.

for THE UNITED STATES  
DEPARTMENT OF ENERGY



Susan M. Prestwich

for THE POWER REACTOR AND  
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T. Yamaguchi  
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