

## STATEMENT OF CONSIDERATIONS

REQUEST BY AIR PRODUCTS & CHEMICALS, INC. FOR AN ADVANCE  
WAIVER OF DOMESTIC AND FOREIGN INVENTION RIGHTS UNDER DOE  
COOPERATIVE AGREEMENT NO. DE-FC26-98FT40343; W(A)-99-017,  
CH-1018

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The Petitioner, Air Products, & Chemicals, Inc. (APCI), was awarded this cooperative agreement for the performance of work entitled, "Development of an ITM Oxygen Technology for Integration in IGCC and Other Advanced Power Generator Systems". Under the cooperative agreement, APCI is to develop Ionic Transport Membrane (ITM Oxygen) technology for stand-alone plants for producing oxygen in tonnage quantities, and for integration of ITM Oxygen plants with Integrated Gasification Combined Cycle (IGCC) and other power generation systems. The Department of Energy's Integrated Gasification Combined Cycle program is responsible for fostering the commercialization of gasification-based processes for the conversion of carbon-based feedstocks to some combination of electricity, steam, fuels, chemicals, and hydrogen. It is envisioned that the program will lead to gasification-based processes that will be more attractive economically, have higher thermal efficiencies, and demonstrate superior environmental performance compared to competing technologies. As brought out in response to question 2 of the waiver petition, APCI explains that work under the cooperative agreement will develop the ITM Oxygen Technology by resolving relevant technical and economic issues for further scaleup to one 1 and one 5 ton per day (TPD) demonstration units in future work. The work scope will involve materials development to establish design specifications for commercially acceptable oxygen flux and mechanical integrity at industrially relevant operating conditions, engineering development for technology integration with commercially available gas turbines, understanding mass transfer and hydrodynamic phenomena and case studies for the use of ITM Oxygen Technology in IGCC power production plants. A 0.1 TPD laboratory-scale ITM Technology Demonstration Unit will be designed, built and used for performance testing and process concept validation, and an economic scaleable fabrication route will be developed.

The total estimated cost of the cooperative agreement is about \$24,750,468, over three (3) budget periods. The current approved budget is \$14,564,502, with the DOE share being \$7,282,251. APCI is cost thus sharing \$7,282,251 or 50%. It is anticipated that the length of this cooperative effort will be from October 1, 1998 until September 30, 2001.

In its response to questions 5 and 6 of the attached waiver petition, APCI indicates that it is technically competent in the field of ITM Technology. APCI has made significant advances in ITM Oxygen Technology covering materials compositions, membrane fabrication techniques, membrane structures, commercially scaleable ceramic processing techniques, and novel process cycles and applications, all of which are evidenced by thirty-two (32) U.S. Patents. A list of these patents is attached to APCI's response to the waiver petition. APCI's research has lead to the reaching of several key milestones in ITM technology since 1989. These milestones are listed in APCI's response to the waiver petition. Additionally, APCI is a world leader in the production and supply of industrial gases, including oxygen, nitrogen, argon, helium, hydrogen, carbon monoxide, and syngas. It has designed, built, and operated or sold thousands of industrial gas plants and gas processing facilities. APCI possess core competencies in

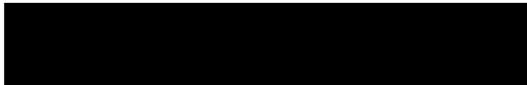
essential engineering disciplines that support all of petitioner's technologies and evidence its technical competence in the ITM technology that is the subject matter of this cooperative agreement.

In addition, APCI has assembled a team consisting of several firms—Eltron Research, Inc.; Ceramatec, Inc.; McDermott International, Inc.; Northern Research and Engineering Corporation; Texaco, Inc.; The Pennsylvania State University; and Professor Wayne Worrell of the University of Pennsylvania; and together these entities will be performing the scope of work under this contract. Although this waiver is directed only to inventions made by the petitioner, APCI, a summary of these firms' technical qualifications and expertise have been listed in response to question 5. APCI indicates the team has been assembled to establish and build upon APCI's core competencies in ionic ceramic materials science, ceramic fabrication, and process engineering.

From its response to questions 9 and 10, APCI indicates that grant of the waiver will more efficiently promote the development and commercialization of inventions made under the cooperative agreement. APCI also indicates there will be a positive effect on competition and market concentration by grant of the waiver. Specifically, APCI defines the market as technology to develop non-cryogenic methods of air separation. APCI's technology represents one of several approaches to developing processes for producing atmospheric gases, including Pressure Swing and Vacuum Swing Adsorption. APCI asserts that the technology, when commercialized, will be made widely available on the world market.

The subject cooperative agreement will be modified to add the Patent Rights--Waiver clause in conformance with 10 CFR 784.12. This waiver clause will also include a paragraph entitled U.S. Competitiveness, in which APCI agrees to substantial U. S. manufacture of subject inventions (attached hereto). Additionally, APCI agrees not to transfer subject inventions to any other entity unless that other entity agrees to these same requirements. The petitioner has further agreed to modification of the data clause of the subject cooperative agreement (48 C.F.R. 952.227-14) by adding paragraph (k), Alternative VI, concerning contractor licensing of data.

Considering the foregoing, it is believed that granting the waiver will provide the Petitioner with the necessary incentive to invest resources in the commercialization of the results of the agreement in a fashion which will make the agreement's benefits available to the public in the shortest practicable time. In addition, it would appear that grant of the above requested waiver would not result in an adverse effect on competition nor result in excessive market concentration. Therefore, in view of the objectives and considerations set forth in 10 CFR 784, all of which have been considered, it is recommended that the requested waiver, as set forth above, be granted.

  
Mark P. Dvorscak  
Assistant Chief Counsel  
Office of Intellectual Property Law

Date Feb 9 2000

Based on the foregoing Statement of Considerations and the representations in the attached waiver petition, it is determined that the United States and the general public will best be served by a waiver of rights and consent to assignment of the scope described above, and therefore the waiver is granted. This waiver shall not apply to any modification or extension of this agreement, where through such modification or extension, the purpose, scope, or cost of the agreement is substantially altered.

CONCURRENCE:

  
George Lynch FE-22  
Program Manager, Gasification Systems  
Coal and Power Systems

Date 03/13/2000

APPROVAL:

  
Paul A. Gottlieb  
Assistant General Counsel  
for Technology Transfer and  
Intellectual Property

Date 3-15-00

(t) U. S. COMPETITIVENESS The Contractor agrees that any products embodying any waived invention or produced through the use of any waived invention will be manufactured substantially in the United States unless the Contractor can show to the satisfaction of the DOE that it is not commercially feasible to do so. In the event the DOE agrees to foreign manufacture, there will be a requirement that the Government's support of the technology be recognized in some appropriate manner, e.g., recoument of the Government's investment, etc. The Contractor agrees that it will not license, assign or otherwise transfer any waived invention to any entity unless that entity agrees to these same requirements. Should the Contractor or other such entity receiving rights in the invention undergo a change in ownership amounting to a controlling interest, then the waiver, assignment, license, or other transfer of rights in the waived invention is suspended until approved in writing by the DOE.