

STATEMENT OF CONSIDERATIONS

ADVANCE WAIVER OF THE GOVERNMENT'S U.S. AND FOREIGN
PATENT RIGHTS TO INVENTIONS MADE BY AIR PRODUCTS AND
CHEMICALS, INC IN THE PERFORMANCE OF COOPERATIVE
AGREEMENT NO. DE-FC08-99NV13578; DOE WAIVER NO.

W(A)-99-022; SAN-682

The Petitioner, Air Products and Chemicals Inc., has submitted a petition for an advance waiver of the Government's domestic and foreign rights to inventions made under the above cited cooperative agreement.

Background

Under the authority of Section 2026 of the Energy Policy Act of 1992, Public Law 102-486, and Title I, Section 103 of the Hydrogen Future Act of 1996, Public Law 104-271, the U.S. Department of Energy Nevada Operations Office (DOE-NV) solicited applications for the cost-shared development and validation of an integrated hydrogen reformer technology, 50 kw proton exchange membrane (PEM) fuel cell electrical generating system and vehicle refueling station. The vehicle refueling system will be multipurpose and capable of dispensing hydrogen, hydrogen enriched natural gas, and compressed natural gas. DOE anticipates that, through this cooperative agreement, commercial fuel cell power generation and vehicle refueling system designs will evolve, reformer design integration issues will be resolved, and operational experience will be gained.

The specific goals of this cooperative agreement are to : 1) demonstrate and resolve design issues associated with small scale, on-site, hydrogen production technologies that are capable of satisfying fuel cell requirements and the hydrogen needed for hydrogen and hydrogen enriched natural gas fuels in transportation systems applications; 2) design, construct, and operate a state-of-the-art mixed refueling station with sufficient capacity, storage, and pressurization capabilities to meet the needs of advanced transportation systems which ultimately will serve as a link in a national hydrogen corridor; 3) design, construct, and operate a reliable fuel cell power generating system for distributed power applications; and 4) demonstrate, test, and certify the integrated power generation and vehicle refueling designs.

PEM fuel cells were identified for this demonstration because of their performance potential for meeting technical, economic, safety, and environmental demands of the commercial sector. The development status of distributed hydrogen reformer technologies based on the use of natural gas and water as feedstocks are also considered sufficiently advanced that they can be considered as an on-site production source for use in fuel cells and hydrogen enriched natural gas for vehicle applications. It is recognized, however, that reformers of the size required for this application are not commonly available. Thus, demonstrations of these technologies are needed in an operating environment to resolve concerns associated with the size of these units, siting, regulatory matters, and operating procedures.

The Petitioner, Air Products and Chemicals Inc., was founded over 50 years ago to design and manufacture equipment for the production of oxygen. Since that time, Air Products has grown into an international corporation with FY-98 revenues of \$4.9 billion from major businesses in industrial gases and related equipment and chemicals. Headquartered near Allentown, Pennsylvania, the company has operations throughout the United States and in over 30 countries, and employs 17,000 people worldwide. The Petitioner currently has numerous technology development programs underway in hydrogen production systems and many others in the testing phase at major operating plants. Each year Air Products dedicates millions of dollars toward the further development of its technologies in an effort to maintain its position as the technological applications leader in the use of industrial gases. As evidenced by the list of ongoing major projects set forth on pages 8-9 of its petition, Air Products continues to expand and develop an already broad research and development program with specific efforts in hydrogen generation, adsorption, membranes and related gas application technologies.

The solicitation, DE-SC08-99N13578 issued by DOE-NV on 13 March 1999, required a minimum cost sharing commitment of fifty (50) percent. Applicants underwent a comprehensive technical evaluation using peer review in accordance with criteria published in the referenced solicitation. The technical evaluation criteria were weighted as significantly more important than the business evaluation criteria and cost. The proposal submitted by Petitioner and its Project Team, comprised of Plug Power LLC and City of Las Vegas, was determined to best achieve the objectives and goals described in the solicitation. The cooperative agreement award, which commenced on 1 October 1999 and is scheduled to be completed on 30 September 2004, has a total estimated project cost of \$10.88 million dollars. DOE has approved \$2.46 million and provided \$1.15 million dollars in funding for the initial budget period which will be matched by the Petitioner and its Project Team.

Analysis

Synthesis gas consisting of Hydrogen (H₂) and Carbon Monoxide (CO) is primarily produced through steam reforming of natural gas, i.e., injection of high pressure steam (H₂O) into natural gas (methane-CH₄). Air Products' large operational base of SMR (Steam Methane Reforming) plants allows the company to evaluate, scale up and field test new technology innovations in reforming technology prior to full commercial introduction. In addition to its long range development programs in sorption enhanced reforming and ionic-transport membrane syngas projects, the company is actively engaged in evaluation, developing and commercializing new reformer technologies for small-scale hydrogen production, such as that proposed for this project. Air Products engineered and installed several Hythane® (mixture of hydrogen and natural gas) refueling stations to support demonstration projects in both Colorado and Pennsylvania. Recently, through a competitive bidding process, this company won a contract with Ballard Power Systems to design and install a turnkey hydrogen refueling facility for the Chicago Transit

Authority. The Petitioner was also chosen to work with the Ford Motor Company to design and install high pressure gaseous and liquid hydrogen filling stations for their P-2000 fuel cell car prototypes.

The Petitioner has a substantial investment in its patent portfolio and has demonstrated a long-term commitment to the development and commercialization of hydrogen reformer technology. Air Products owns three pertinent patents, has four patent applications pending, and has licensed three patents related to this field. The present work will be greatly benefitted by effectively utilizing Petitioner's extensive knowledge of this technology in a collaborative effort with its Project Team members. Air Products is responsible for providing the entire non-DOE share of the project costs (\$5,442,957 representing 50% of the total project costs). As part of this cost share, Plug Power LLC which will be furnishing the PEM fuel cell technology and will provide \$1, 831,758 against their proposed project costs of \$3,663,517. The City of Las Vegas is in the process of acquiring six new 33-passenger transit buses at a cost of approximately \$1.5 million which will be operated on hydrogen enriched compressed natural gas and will utilize the proposed refueling facility.

Scope of Waiver

It is the purpose of this advance waiver to provide for a waiver of the Government's domestic and foreign patent rights under the authority of 42 USC 2182 and 5908, in accordance with DOE's patent waiver regulations at 10 CFR 784.4. In particular, the scope of this advance waiver is directed to those inventions conceived or first actually reduced to practice by the employees of Air Products in the course of its development and demonstration project under the aforementioned cooperative agreement. It is also an object of this advance waiver that the Petitioner, which initially executed the cooperative agreement containing the clause at 48 CFR 952.227-13, be able to retain the patent rights to their sole or joint (undivided) subject inventions in accordance with the terms and conditions set forth in 48 CFR 52.227-12 as amended by 10 CFR 784.12. This waiver is subject to DOE's retention of a royalty-free, non-transferable, irrevocable, nonexclusive license to practice any subject invention by or on behalf of the U.S. Government anywhere in the world, march-in rights and a U.S. preference provision comparable to those set forth in 35 U.S.C. 202 and 204. In addition, the attached U.S. Competitiveness provision will be included in the Patent Rights-Waiver clause per DOE policy. Lastly, Air Products has agreed to third party licensing of background data in accordance with 48 CFR 952.227-14 Alternate VI.

Conclusions and Recommendation

A class waiver of the scope described hereinabove would promote the commercial utilization of inventions arising from this demonstration project by facilitating transfer of invention rights from the Government to the interested private sector participant, thereby making benefits of the hydrogen reformer technology widely available to the public in the shortest practicable time. Air Products is strategically interested in the small on-site hydrogen generator business to serve traditional gas markets, as well as to offer new cost effective technology for the emerging energy market of hydrogen fuel stations and fuel cell power plants. The Petitioner has spent more than \$25 million

over the past seven years in support of this development effort. On page 14 of its attached petition, Air Products' states that "(c)ommercial implementation of this technology requires a large financial commitment and Petitioner and its partners require the greater bundle of rights afforded by the Patent Waiver in order to secure financing and commercial commitments from third parties in order to invest in the substantial manufacturing facilities which shall be required to manufacture equipment for use in this technology." Hence, grant of this advance waiver will serve to encourage participation in the DOE Program by providing assurance that statutory Government ownership of inventions will not inhibit private industry commercialization plans.

Grant of this class waiver should not result in adverse effects on competition or market concentration since the DOE Program is directed to a multiplicity of projects, each of which is generally directed toward advancing the state of alternate fuel technology, with the objective of maintaining a competitive position in overseas markets and a future domestic market. The Petitioner's technology represents only one of several approaches to developing processes for producing hydrogen, fuel stations, and fuel cell power plants. There are a number of entities which are actively developing small scale hydrogen generators based on a variety of technologies such as water electrolysis, reforming and partial oxidation of hydrocarbons. Also, there are dozens of companies developing fuel cell technologies for power generation applications. Thus, it is highly unlikely that the acquisition of the patent rights requested would place the Petitioner in a preferred or dominant position in this field. Although certain generated technical information may be protected from public disclosure for a period of up to five years under 42 USC 13541(d), Air Products has indicated that they intend to "non-exclusively license parties to practice (the) process technology developed under this project." Accordingly, this waiver is viewed as having a limited effect on competition. On balance, the allocation of invention rights fostered by this advance waiver should serve to enhance competition by encouraging the development of new or improved technologies which will expedite the attainment of the purposes of the Program. Thus, the statutory objectives of DOE's waiver policy are being met.

Accordingly, in view of the statutory purposes of DOE wavier policy, and the objectives of the Hydrogen Future Act, and in view of the factors to be considered under DOE's statutory patent waiver policy, all of which have been considered, it is recommended that this class waiver as set forth will best serve the interest of the United States and the general public. It is therefore recommended that the wavier be granted.



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(2) Attachments

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 DOE that it is not commercially feasible to do so. In the event 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., recoupment of the Government's investment, etc. The Contractor further agrees to make the above condition binding on any assignee or licensee or any entity otherwise acquiring rights to any waived invention including subsequent assignees or licensees. Should the Contractor or other such entity receiving rights in any waived invention undergo a change in ownership amounting to a controlling interest, then the waiver, assignment, license, or other transfer of rights in any waived invention is suspended until approved in writing by DOE.