## MEMORANDUM OF UNDERSTANDING

### between

# The National Renewable Energy Laboratory, managed and operated by the Alliance for Sustainable Energy, LLC for the United States Department of Energy

### and

Fraunhofer-Gesellschaft zur Förderung der Angewandten Forschung e.V., as legal entity for its Fraunhofer Institute for Solar Energy Systems

# For Coordination on Hydrogen and Fuel Cell Technologies

## INTRODUCTION

The National Renewable Energy Laboratory (NREL) is a national laboratory managed and operated by the Alliance for Sustainable Energy, LLC for the United States Department of Energy (DOE) under DOE Contract No. DE-AC36-08GO28308. Integral to its mission for DOE, NREL conducts research and development in renewable energy and energy efficiency technologies and practices, advances related science and engineering, and transfers knowledge and innovation to address the United States' energy and environmental goals. NREL is supported by funding from the DOE Office of Energy Efficiency and Renewable Energy (EERE). Within NREL's Fuel Cell and Hydrogen Technologies program, researchers support the development of renewable hydrogen production and fueling systems to generate fuel for fuel cell electric vehicles (FCEVs). Long-term research and development is an essential element for cost reduction, improved reliability, and improved performance of technologies currently supported by the Fuel Cell Technologies Office at DOE. NREL's longterm research and development (R&D) activities include research on advanced electrolysis, hydrogen fueling infrastructure, and analysis of grid-scale hydrogen system performance. Collaborative activities among the world's foremost players in the field of hydrogen and fuel cell technologies from Germany and the United States are expected to lead to a significant acceleration of progress in these fields.

NREL is a Federally Funded Research and Development Center (FFRDC) managed and operated by the Alliance for Sustainable Energy, LLC for DOE. NREL's participation in planned collaborative activities under this MOU is in accordance with the terms of the DOE contract and the DOE FFRDC sponsoring agreement.

NREL's mission is to enhance energy efficiency and the production of renewable energy to bring clean, reliable and affordable energy technologies to the marketplace. NREL has active programs in solar energy, wind energy, ocean energy, biomass, geothermal energy, utility integration, transportation systems, energy efficiency, and energy analysis and applications. A major stronghold of NREL's Fuel Cell & Hydrogen Technologies program lies in renewable hydrogen production. NREL intends to meet the United States' rapidly growing and changing needs for clean energy, blending their considerable expertise and passion for the mission with state-of-the-art equipment housed in leading facilities.

The Fraunhofer Institute for Solar Energy Systems (Fraunhofer ISE) is a part of the Fraunhofer-Gesellschaft, the leading organization for applied research in Europe with more than 20,000 employees in 80 research units, with headquarters in Munich, Germany. With a total staff of more than 1,100, including students, Fraunhofer ISE is the largest solar energy

research institute in Europe. Fraunhofer ISE is member of and plays a leading role within the Fraunhofer Energy Alliance, which brings together the expertise in energy research of several Fraunhofer institutes. Furthermore, it is closely connected with the Fraunhofer Center for Sustainable Energy Systems (CSE) of Fraunhofer's subsidiary, Fraunhofer USA Inc., located in Cambridge, Massachusetts. Fraunhofer ISE conducts research on the technology needed to supply energy efficiently and on an environmentally sound basis in industrialized, threshold and developing countries. To this purpose, the Institute develops systems, components, materials and processes in the areas of the thermal use of solar energy, solar building, solar cells, electrical power supplies, chemical energy conversion, energy storage and the rational use of energy. The Institute's work in hydrogen and fuel cell technology ranges from fundamental scientific research for the production, storage and conversion of hydrogen. The Institute's objectives are to develop hydrogen energy storage in an energy system based on renewables as well as hydrogen production for fuel cell vehicles. The Institute plans, advises and provides know-how and technical facilities as services. More than 90% of the operating funds of Fraunhofer ISE of about 60 million Euros are based on competitive contracts provided by industry, governmental bodies and the European Commission, of which 40% come from industrial contracts alone.

Fraunhofer ISE is part of the non-profit Fraunhofer-Gesellschaft which is partly funded by the German Government devoted to applied research. Fraunhofer ISE is located in Freiburg, Germany and operates laboratories in Gelsenkirchen, Halle (CSP, together with Fraunhofer IWM) and Freiberg (THM, together with Fraunhofer IISB).

Fraunhofer ISE's objective is to conduct research and technology development which are able to supply energy efficiently and in an environmentally sound basis for everybody – worldwide. The work at the Institute ranges from the investigation of scientific and technological fundamentals for solar energy applications, through the development of production technology and prototypes, to the construction of demonstration systems. The Institute plans, advises and provides know-how and technical facilities and services. The Fraunhofer ISE is integrated into a network of national and international co-operation.

NREL and Fraunhofer ISE are referred to individually as a "Participant" and jointly as the "Participants."

This Memorandum of Understanding (MOU) between NREL and Fraunhofer ISE memorializes the intent of the Participants to engage in collaborative activities to maximize the benefit of their respective interests.

### Section 1: Collaborative Activities

The objectives of the collaborative activities contemplated under this MOU are to accelerate progress toward shared research and development goals and ensure the more sustainable use of hydrogen and fuel cell technologies. These objectives make use of complementary research and capabilities of the Participants in the following areas:

- Electrolysis: cell, stack, system and characterization;
- Hydrogen infrastructure;
- Analysis and modeling for grid-scale implementation of hydrogen systems;
- Hydrogen system field validation and performance data collection and evaluation; and
- Accelerated stack and system evaluation, testing and deployment.

### Section 2: Funding

a. The scope of planned collaborative activities under this MOU should be mutually determined in light of time, resources and/or funds available to each Participant for the types of collaborative activities undertaken and by such other financial assistance as may

be obtained by each Participant from external sources.

b. Unless the Participants otherwise determine in a separate written agreement, each Participant is to be responsible for the costs it incurs in participating in the collaborative activities contemplated by this MOU, including all administrative costs, overhead expenses, labor costs, insurance costs, travel expenses and similar costs.

# Section 3: Researcher Exchanges

- a. Each Participant is to be responsible for its own personnel in relation to researcher exchanges to carry out collaborative activities under this MOU.
- b. Each Participant's personnel is to abide by the regulations, policies, and procedures of the host Participant in carrying out exchange activities under this MOU, including protection of business proprietary information, protection of intellectual property, conditions of coordination and decorum, health, safety and security requirements, and all other terms under which personnel are authorized to participate in researcher exchanges at the host Participant's facility. Such activities may require entry into separate written agreements.
- c. Each Participant is to be solely responsible for its own personnel in relation to matters such as visa and travel formalities, appropriate insurance (medical insurance and medical evacuation and repatriation insurance), travel expenses, and suitable living accommodation and expenses.
- d. To the extent possible, the host Participant should assist in facilitating travel arrangements of the other Participant's personnel in relation to researcher exchanges in accordance with its applicable procedures governing foreign national access to the host Participant's facility.

# Section 4: Dissemination of Information

Each Participant intends to participate in the collaborative activities in a manner that facilitates exchanges of publicly available, non-proprietary information. Subject to applicable laws and regulations of its country, each Participant may disseminate non-proprietary information, data, and reports of the collaborative activities carried out under this MOU.

# Section 5: Use of Information

Any information transmitted by one Participant to another Participant under this MOU should be accurate to the best knowledge and belief of the transmitting Participant. No Participant makes any warranty, express or implied, nor assumes any responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, nor represents that its use would not infringe upon privately owned rights.

## **Section 6: Intellectual Property**

The Participants do not anticipate the transfer of rights in intellectual property or the sharing of confidential information under this MOU. If it appears that a particular activity may lead to the creation of intellectual property or the disclosure or exchange of confidential information, the Participants should enter into an appropriate written agreement therefor.

### Section 7: Future Collaborations

Any specific future research and development collaboration or the transfer or commitment of funds is to be implemented through an appropriate written contract between the Participants. Any such contract should include a work plan, staffing requirements, cost estimates, funding sources, the adequate and effective protection and allocation of intellectual property rights, and other arrangements or conditions; and must be authorized under NREL's Management and Operating Contract.

## Section 8: Review of Collaborative Activities

The Participants intend to review the collaborative activities undertaken under this MOU as a means to ascertain their effectiveness, document achievements and lessons learned, recognize technical personnel, and identify and plan areas for potential future collaboration involving the conduct of collaborative research and development. This review should take the form of periodic meetings of representatives of each Participant to discuss ongoing collaborative activities and to identify and plan potential future collaboration involving the conduct of collaborative research and development activities.

## Section 9: Contacts

One or more designated representatives from each Participant should oversee, manage and facilitate implementation of this MOU in cooperation with each other on behalf of their respective institutions. All notices, communications and coordination should involve, at a minimum, the following individuals, their successors and/or designees as follows:

a) For NREL:

Keith Wipke Álliance for Sustainable Energy, LLC 15013 Denver West Pkwy Golden CO 80401 Tel: 011 - 303-275-4451 Email: keith.wipke@nrel.gov

#### b) For Fraunhofer ISE:

Christopher Hebling Fraunhofer-Institut für Solare Energiesysteme ISE Heidenhofstr. 2, 79110 Freiburg, Germany Phone: +49 (0) 761 45 88-5195 Email: Christopher.hebling@ise.fraunhofer.de

### Section 10: Commencement, Modification, and Discontinuation

- a. Collaborative activities under this MOU may commence upon signature and may continue for an initial period of five (5) years unless discontinued in accordance with paragraph c. of this Section.
- b. The Participants may modify or extend this MOU at any time by mutual consent in writing.

c. The Participants may discontinue this MOU at any time by mutual consent in writing. Alternatively, a Participant that desires to discontinue its participation in this MOU should endeavor to provide the other Participant at least 90 days advance written notice.

# Section 11: General Considerations

- a. This MOU does not create any legally binding obligations between the Participants.
- b. Each Participant should conduct the collaborative activities contemplated by this MOU in accordance with applicable laws and regulations to which it is subject and international agreements to which its Government is party.

[Signatures on following page.]

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# Signatures

Signed in duplicate.

For The National Renewable Energy Laboratory

William T. Farris

Associate Director, Innovation, Partnering & Outreach

2016 10 Ŧ Date

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For Fraunhofer-Gesellschaft zur Förderung der Angewandten Forschung e.V., as legal entity for its Fraunhofer Institute for Solar Energy Systems

In

Eicke Weber

Director, Fraunhofer ISE Chair, Fraunhofer Energy Alliance

10/26/2016 Frik

Date

Place

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