中國科學院
CHINESE ACADEMY OF SCIENCES

MEMORANDUM OF UNDERSTANDING

among

UNITED STATES DEPARTMENT OF ENERGY
NATIONAL ENERGY TECHNOLOGY LABORATORY

and

BATTELLE MEMORIAL INSTITUTE, PACIFIC NORTHWEST DIVISION
AS OPERATOR OF PACIFIC NORTHWEST NATIONAL LABORATORY

and

CHINESE ACADEMY OF SCIENCES
RESEARCH CENTER FOR ENERGY AND POWER

The United States Department of Energy's (USDOE's) National Energy Technology Laboratory, and Battelle Memorial Institute, Pacific Northwest Division, as operator of the Pacific Northwest National Laboratory under its USDOE Contract No. DE-AC05-76RL0 1830, and the Chinese Academy of Sciences' Research Center for Energy and Power (CEP), collectively herein the "Participants",

SHARING an interest in collaborating to advance the technical, environmental, and cost performance of fossil energy technologies,

HAVE REACHED THE FOLLOWING UNDERSTANDING:

I. OBJECTIVE

1. The Participants intend to work together to develop the mechanisms and processes that will promote and sustain collaborative efforts for research and development (R&D) on base and enabling technologies, and assessments of technology options and economics.

2. Fossil energy-related institutes within the Chinese Academy of Sciences that are expected to participate in the cooperative activities under this Memorandum of Understanding (MOU) include: the Institute of Coal Chemistry, the Dalian Institute of Chemical Physics, the Institute of Process Engineering, the Institute of Engineering Thermophysics, the Institute of Chemistry, and the Institute of Rock and Soil Mechanics.

II. AREAS OF COOPERATION

Topics of the Participants' proposed collaboration may include, but are not limited to, the following:

1. Advanced, low-emission, fuel-flexible gasification and combustion systems, including key components and processes, such as:
   a) advanced gasifier reactor designs
   b) efficient and cost-effective oxygen (O_2) supply, hydrogen (H_2) separation, and carbon dioxide (CO_2) separation
   c) high-temperature gas cleanup for particulate and gas-phase contaminants
   d) advanced materials, such as ultra-high-temperature intermetallics and refractory materials, O_2 carriers, and CO_2 absorbers
   e) syngas conversion to power, clean fuels, and chemicals;

2. Environmental control technologies for gaseous, water, and solids effluents from these systems, especially carbon capture and storage.

Other areas of collaboration may be added by the Participants' mutual consent in writing.

III. FORMS OF COOPERATION

Cooperation may include, but is not limited to:

1. Exchange of information, publications, reports, technical data, samples, and materials;

2. Exchange of scientists, engineers, and other specialists for participation in training, project definition activities, research, energy analyses, and technology transfer. Each Participant is to abide by the health, safety, and environmental requirements of the host Participant when on an exchange assignment at the host Participant's facility;

3. Planning of joint research projects in the Areas of Cooperation cited in Section II, such R&D to be undertaken pursuant to an appropriate written agreement therefor.

IV. MECHANISMS OF COOPERATION

1. Lead Coordinators

Each Participant should designate one or more Lead Coordinators, to serve as its principal representative(s) for all activities conducted under this MOU, including identifying areas of cooperation, providing rapid response concerning its organization's interest in specific areas of cooperation, coordinating cooperation among the Participants, and identifying available resources (including funding) for collaborative activities under this MOU.

2. Joint Steering Committee

A Joint Steering Committee should be formed among the Participants, to be co-chaired by the Lead Coordinators and composed of designated representatives in the mutually determined areas of cooperation. The Joint Steering Committee should meet regularly to review the cooperation under this MOU, discuss and identify new collaborative areas, and define funding requirements.

3. Technical Groups

Technical Groups may be established by the Joint Steering Committee to implement the cooperative projects determined by the Joint Steering Committee. The Technical Groups should consist of experts in the mutually determined areas of collaboration. Working under the Joint Steering Committee, the Technical Groups should meet regularly to review ongoing activities, consider new opportunities for collaboration, plan future activities, and report on the progress of each cooperative project under this MOU to the Joint Steering Committee.

V. GENERAL PROVISIONS

1. This MOU does not create any legally binding obligations between or among the Participants.

2. The conduct of cooperative activities contemplated by this MOU is subject to the availability of funding, personnel, and other resources.

3. Each Participant should conduct the cooperation under this MOU in accordance with applicable laws and regulations to which it is subject, and international agreements to which its Government is party.

4. Each Participant is responsible for the costs it incurs in participating in cooperative activities under this MOU

VI. COMMENCEMENT, MODIFICATION AND DISCONTINUATION

1. Cooperative activities under this MOU may commence upon signature by the Participants and continue for a 5-year period unless discontinued in accordance with paragraph 2 of this Section VI.

2. The Participants may discontinue this MOU at any time in writing. A Participant that wishes to discontinue its participation in this MOU should endeavor to provide at least ninety (90) days written notice to the other Participants. The withdrawal of (a) CEP or (b) both United States Participants constitutes discontinuation of this MOU.

3. This MOU may be modified in writing by mutual consent of the Participants, and may be extended for additional periods.

Signed at Beijing, in triplicate, on the 11th day of May, 2009, in the English and Chinese languages.

Carl O. Bauer, Director National Energy Technology Laboratory United States Department of Energy	Xiao Yunhan, Director Research Center for Energy and Power Chinese Academy of Sciences	Michael Kluse, Director Pacific Northwest National Laboratory