

MEMORANDUM OF UNDERSTANDING

between

**The Ministry of Petroleum and Natural Gas
of the Republic of India**

and

**the Department of Energy
of the United States of America**

for Cooperation in Gas Hydrates

The Ministry of Petroleum and Natural Gas of the Republic of India (MOP&NG), through its Directorate General of Hydrocarbons (DGH), and the Department of Energy of the United States of America (DOE) (hereinafter jointly referred to as the "Participants"), conclude this Memorandum of Understanding (Memorandum) to exchange information and analyses, conduct joint studies and projects, exchange scientific and technical personnel, and facilitate the establishment of a Gas Hydrate Technology Center in India in order to increase understanding of the geologic occurrence of, and the potential for methane production from, natural gas hydrates in both India and the United States.

On May 31, 2005, U.S. Secretary of Energy Dr. Samuel W. Bodman and Deputy Chairman of the Planning Commission of India (now NITI Aayog) Dr. Montek Singh Ahluwalia launched a new Energy Dialogue. Several working groups, including the U.S.-India Energy Dialogue Oil and Gas Working Group, have been formed to support the new Energy Dialogue. The initial Memorandum of Understanding dated April 4, 2008 for gas hydrates under the Oil and Gas Working Group expired on April 4, 2013. This Memorandum further supports the Oil and Gas Working Group.

The National Gas Hydrate Programme (NGHP) has been launched by the MOP&NG for exploratory research on the natural gas hydrates in India. NGHP is represented by DGH under the MOP&NG. The participating organizations in NGHP are Oil and Natural Gas Corporation Ltd, GAIL India Ltd, Oil India Ltd, Indian Oil Corporation Limited, and research institutions such as National Institute of

Oceanography, National Institute of Ocean Technology, and National Geophysical Research Institute. DGH on behalf of NGHP is interested in the study, drilling and sampling of gas hydrates in order to meet India's long term goal of developing this natural energy resource in a cost-effective and efficient manner.

DOE conducts gas hydrate research and development in coordination with other United States Government agencies, including the Departments of the Interior, Commerce, and Defense, and the National Science Foundation. DOE works with industry and academia to develop methane production from hydrates while seeking to protect the environment and understand the role of hydrates in safe conventional petroleum operations and global climate change.

The Participants have reached the following understanding:

1. AIMS AND OBJECTIVES:

This proposed cooperation between DGH and DOE aims to enhance and accelerate the understanding of the geologic occurrence, distribution, and production of natural gas hydrates along the continental margin of India and in the United States of America.

2. PLANNED AREAS OF COOPERATION:

The Participants intend to exchange scientific and technical information and scientific personnel; conduct workshops, seminars and other meetings; and plan cooperative research with respect to the following broad areas:

- I. Exploration of natural gas hydrates
- II. Quantification of natural gas hydrates in marine sediments
- III. Laboratory analysis and characterization of natural gas hydrates
- IV. Resource assessment
- V. Modeling for producibility of natural gas from hydrated reservoirs
- VI. Development of pilot production test plan for marine hydrates
- VII. Field testing of producibility from hydrate reservoirs
- VIII. Data access and archiving
- IX. Facilitation of establishment of a Gas Hydrate Technology Center in India
- X. Facilitation of the transfer of technology for hydrate exploration and development
- XI. Consideration of active participation of NGHP and DOE scientists in each other's field testing, data collection of gas hydrate production, and/or field trials
- XII. DOE consideration of providing a role for Indian scientists in the research and development projects of DOE and its R&D partners.

3. PARTICIPATING ORGANIZATIONS:

DGH may nominate the NGHP organizations for participation in cooperative research with DOE on gas hydrates. DOE may propose or invite organizations in the United States to participate in cooperative research with DGH on gas hydrates. Collaborative research is to be undertaken under appropriate written agreements therefor.

4. EXCHANGE OF INFORMATION:

A. The Participants may exchange publicly available scientific and technical information, documents and results of research and development. Such information should be limited to that which the Participants have the right to disclose, either in their possession or available to them. If the Participants desire to exchange any business-confidential information, they should conclude an appropriate written agreement therefor.

Information to be exchanged under this Memorandum includes, but is not limited to, available technology, knowledge sharing, seismic data, well logs, core analysis, and other laboratory analysis.

B. The Participants intend to try to identify all of the publications relating to gas hydrates at the start of their cooperation under this Memorandum, but additional publications may be subsequently identified. All publications and announcements concerning cooperation conducted under this Memorandum should be made in a spirit of collaboration among the DGH and DOE project participants. All publications and data releases should be identified and coordinated through the DGH and DOE project managers identified in Paragraph 10 of this Memorandum, or as modified or directed by the project managers identified in Paragraph 10. Proprietary data, such as seismic profiles or derived maps, may be published, subject to prior approval of the owner of the said data.

5. DISCLAIMER:

Neither Participant makes any representation or warranty respecting the results arising from the projects under this Memorandum.

6. MODIFICATIONS:

This Memorandum may be modified at any time in writing by the Participants.

7. COMMENCEMENT AND DURATION:

Implementation of this Memorandum may commence upon signature by both Participants and (subject to Paragraph 8) continue for five years. This Memorandum may be modified or extended for additional periods by mutual consent in writing.

8. DISCONTINUATION:

The Participants may discontinue their cooperation under this Memorandum at any time by mutual consent in writing. Alternatively, a Participant that wishes to discontinue its cooperation under this Memorandum should endeavor to provide ninety (90) days advance written notice to the other Participant.

9. FINANCIAL ARRANGEMENTS:

Each Participant is to be responsible for its costs of participating in the cooperative activities under this Memorandum.

10. MANAGEMENT:

The coordinators for the activities under this Memorandum are:

DGH	DOE
Director General Directorate General of Hydrocarbons OIDB Bhawan, Plot No. 2, Sector 73, NOIDA – 201301 Uttar Pradesh, India Ph : +91-120-247 2000 Fax: +91-120-247 2049/ 247 2160	Deputy Assistant Secretary Office of Oil and Natural Gas U.S. Department of Energy FE-30, Room 3G-043 1000 Independence Ave., S.W. Washington, DC 20585, Ph : +001.202.586.5600 Fax : +001.202.586.6221

Each coordinator may appoint technical coordinators to manage specific cooperative activities under this Memorandum. To assess the mutually accrued benefits under this Memorandum and to take corrective measures, if required, the coordinators may meet at such times and places as they may determine.

11. GENERAL CONSIDERATIONS:

A. This Memorandum does not create any legally binding obligations between the Participants.

B. Each Participant should conduct the activities contemplated under this Memorandum in accordance with the applicable laws and regulations to which it is subject, and subject to the availability of personnel, appropriated funds, and other resources.

Signed in duplicate.

For the Ministry of Petroleum and
Natural Gas of the Republic of
India:



Date: 6/6/2016

Place:

Washington D.C.

For the Department of Energy
of the United States of America:



Date: 6/6/2016

Place: WASHINGTON D.C.