



## Projects Background

### **Carbon Sequestration Leadership Forum's Demonstration Partnerships Unite Developed and Developing Nations in Quest of CO<sub>2</sub> Reductions**

In the two years since organizing, the Carbon Sequestration Leadership Forum has marshaled 18 research, development and demonstration projects selected to advance the technologies of low-cost carbon dioxide capture and safe, long-term storage.

CSLF Ministers endorsed a comprehensive set of 10 research, development and demonstration projects last year. Eight additional projects have been nominated for the Forum's Policy Group and are further action. More will be selected as proposed by member nations in the future. The Forum's current charter runs through 2013.

Of the 18 projects, seven deal chiefly with carbon dioxide capture and 11 primarily with storage.

One of the endorsed projects is the pilot-scale CASTOR Project that could lead to capture and storage of as much as 30 percent of Europe's large industrial emissions with emphasis on electric generation.

Five of the nominated projects mark the first involvement of developing nations, the largest source of future CO<sub>2</sub> emissions, in cooperative activities aimed at reducing greenhouse gases. China and India, both member nations, will host two projects each and Algeria, a non-member, one.

#### **Endorsed projects:**

- 1) **CANMET Energy Technology Center Oxyfuel Combustion for CO<sub>2</sub> Capture** – Pilot-scale capture project seeking combustion-based removal at 95 percent purity and information to support scale-up for large industrial applications and electric generation; nominators: Canada, U.S.
- 2) **CASTOR** – Multi-purpose, pilot-scale: Post-combustion capture from flue gas; evaluation of geologic storage sites in the Mediterranean Sea, the North Sea (2 sites) and Austria, including environmental and risk assessments; nominators: European Commission, France, Norway.
- 3) **CO<sub>2</sub> Capture Project – Phase Two** – Multi-purpose, pilot-scale: Breakthrough cost-reducing capture technologies for multiple combustion applications, storage risk assessment, monitoring and best practices; nominators: U.K., Norway, Italy, U.S.
- 4) **CO<sub>2</sub> Separation from Pressurized Gas Streams** – Small-scale capture project; testing and evaluation of membranes at atmospheric pressure to support follow-up development of high-pressure removal from coal gasification or other gas fuel streams; nominators: Japan, U.S.
- 5) **ITC (International Test Center) CO<sub>2</sub> Capture with Chemical Solvents** – Pilot-scale capture project; improved solvent removal, more efficient solvent regeneration, using

slip-stream flue gas from power generation with low-rank coal: nominators: Canada, U.S.

- 6) **ARC (Alberta Research Center) Enhanced Coalbed Methane Recovery** – Pilot-scale storage project; demonstration of the economic and environmental feasibility of simultaneous storage in and methane recovery from deep, unmineable coal seams: nominators: Canada, U.S., U.K.
- 7) **CO<sub>2</sub>SINK** – Pilot-scale storage project; evaluate capture and storage in an existing natural-gas storage facility near Berlin and in a deeper underlying formation representative of large parts of Europe to provide real-case experience to use in developing future regulatory frameworks; nominators: European Commission, Germany.
- 8) **CO<sub>2</sub>STORE** – Large-scale storage project; a follow-on the Sleipner Project now successfully storing 1 million metric tons a year in deep saline reservoir beneath the floor of the North Sea; monitoring CO<sub>2</sub> in storage for improved understanding of behavior and preliminary assessment of storage possibilities in four countries; nominators: Norway, European Commission.
- 9) **Frio Project** – Pilot-scale storage project in an on-shore, deep saline reservoir in Texas to develop the experience necessary for large-scale injection research, to verify models and to demonstrate the absence of harmful effects on health, safety and the environment: nominators: U.S., Australia.
- 10) **Weyburn II CO<sub>2</sub> Storage Project** – Commercial scale project involving use of 95 million cubic feet a day in enhanced oil recovery; to measure and monitor performance and assess risks, follow-up to an earlier demonstration that found CO<sub>2</sub> can be safely stored in oil-bearing geologic formations; the project involves pipeline (320 km, 200 mi) transportation of CO<sub>2</sub> from coal gasification in the U.S. to an oil field in Canada; nominators: U.S., Canada, Japan.

### **Nominated projects:**

- 11) **China: Regional Opportunities for CO<sub>2</sub> Capture and Storage** – A collaborative project applying proven methodology to assess potential for mitigating present and future emissions; to compile key characteristics of large-scale industrial emissions, potential storage sites, and infrastructure needs and costs: nominators: China, U.S.
- 12) **China: Development of Coalbed Methane Technology/Carbon Dioxide Sequestration Project** – Pilot project; multi-well test of technologies and processes developed in the Alberta Enhanced Coalbed Methane Project with potential application in the country's more than 50 potential deep, coalbed storage sites; nominators: Canada, Norway, U.S.
- 13) **India: Capture, Injection and Geologic Sequestration in Basalt Formations** – Pilot-scale project that pioneers a new type of potential reservoir; injection, monitoring and modeling of CO<sub>2</sub> in basalt-capped sedimentary formations of extensive potential on the Indian sub-continent; nominators: India, U.S.
- 14) **India: Anoxic Microbial Sequestration** – Pilot-scale, the first biotechnology project; use of microbial enzymes to transform flue-gas CO<sub>2</sub> into methane, methanol and other

useful carbon products while retaining 20 percent in building up cell mass for on-going production: nominators: pending.

- 15) **Geologic CO<sub>2</sub> Storage Assurance at In Salah, Algeria** – Industrial-scale project, the world's first storage in a natural-gas reservoir; re-injection of CO<sub>2</sub> removed in preparing gas for European markets in a sandstone formation at a depth of 1,800 meters (6,000 feet) at rate of 1 million metric tons a year to further assess feasibility and effect on production of storage in oil and gas fields, a joint venture of the commercial enterprises Sonatech, BP and Statoil: nominators, Norway, U.K.
- 16) **ENCAP CO<sub>2</sub> (Enhanced Capture of CO<sub>2</sub>)** – Extensive research project of a largely European consortium of more than 20 members which is focused on large-scale electric generation: it will conduct sub-projects to develop and validate storage-capable capture technologies that include pre-combustion de-carbonization, oxyfuel combustion; chemical looping combustion and high temperature oxygen combustion' nominators: European Commission, Germany, France.
- 17) **CO<sub>2</sub>GeoNet (Network of Excellence)** – Consortium of 13 European research institutes in seven nations dedicated to helping facilitate the rapid application of large-scale underground storage in Europe; nominators: European Commission, U.K.
- 18) **Regional Carbon Sequestration Partnerships** – A joint effort of 40 states of the United States, four Canadian provinces, three Indian nations and almost 250 other entities in the public and private sectors; planned activities include field tests of 25 potential sequestration sites involving five different geologic reservoir types, refinement of monitoring and verification technology and protocols, and determination by region of technical and economic storage capacity; nominators: U.S. Canada.

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