



CSLF Projects Background

Developed, Developing Nations Come Together to Curtail CO₂ In Carbon Sequestration Leadership Forum Technology Projects

The 17 projects formally recognized by the international Carbon Sequestration Leadership Forum bring together developed and developing nations in a collaborative quest to curtail manmade emissions of the greenhouse gas CO₂. All are aimed at gathering the knowledge and experience required to initiate widespread carbon capture and to conduct safe, secure geologic storage on the order of thousands of years.

On the list are pioneering activities to identify potential storage capacity in China and India, the most populous and fastest-growing developing nations.

Projects in Europe and North America are dedicated to matters such as cutting the costs of CO₂ capture technology and developing new methods of combustion; identifying storage capacity and widening the understanding of geologic reservoirs; predicting the behavior of stored carbon in various kinds of reservoirs; and developing technologies for successful, reliable and long-term monitoring, measurement and verification of stored carbon.

Most projects serve several purposes, and a number capitalize on the concept of using CO₂ storage to augment energy production as with enhanced oil recovery and methane recovery from unmineable coal seams.

Projects Recognized by the CSLF:

1. Alberta Enhanced Coal-Bed Methane Recovery Project

Nominators: Canada (lead), United States, and United Kingdom

This pilot-scale project is aimed at demonstrating, from both economic and environmental criteria, the overall feasibility of coal bed methane (CBM) production and simultaneous CO₂ storage in deep unmineable coal seams. Specific objectives of the project are to determine baseline production of CBM from coals; determine the effect of CO₂ injection and storage on CBM production; assess economics; and monitor and trace the path of CO₂ movement by geochemical and geophysical methods.

Recognized by the CSLF at its Melbourne meeting, September 2004

2. CANMET Energy Technology Centre (CETC) R&D Oxyfuel Combustion for CO₂

Nominators: Canada (lead) and United States

This is a pilot-scale project that will demonstrate oxyfuel combustion technology with CO₂ capture. The goal of the project is to develop energy-efficient integrated multi-pollutant control, waste management and CO₂ capture technologies for combustion-based applications and to provide information for the scale-up, design and operation of large scale industrial and utility plants based on the oxy-fuel concept.

Recognized by the CSLF at its Melbourne meeting, September 2004

3. CASTOR

Nominators: European Commission (lead), France, and Norway

This is a multifaceted project that has activities in three main areas: strategy for CO₂ reduction, post-combustion capture, and CO₂ storage performance and risk assessment studies. The goal of the project is to reduce the cost of post-combustion CO₂ capture and to develop and validate, in public/private partnerships, all the innovative technologies needed to capture and store CO₂ in a reliable and safe way.

Recognized by the CSLF at its Melbourne meeting, September 2004

4. China Coalbed Methane Technology / CO₂ Sequestration Project

Nominators: Canada (lead), United States, and China

This is a pilot-scale project that aims to successfully demonstrate that coal seams in this part of China are permeable and stable enough to absorb CO₂ and enhance methane production, leading to a clean energy source for China. The project will evaluate reservoir properties of selected coal seams of the Qinshui Basin of eastern China and carry out field testing at relatively low CO₂ injection rates.

Recognized by the CSLF at its Berlin meeting, September 2005

5. CO₂ Capture Project

Nominators: United Kingdom (lead), Italy, Norway, and United States

This is a pilot-scale project that will continue the development of new technologies to reduce the cost of CO₂ separation, capture, and geologic storage from combustion sources such as turbines, heaters and boilers. The goal of the project is to reduce cost of CO₂ capture from large fixed combustion sources by 60–80% while addressing critical issues such as storage site/project certification, well integrity, and monitoring.

Recognized by the CSLF at its Melbourne meeting, September 2004

6. CO₂ GeoNet

Nominators: European Commission (lead) and United Kingdom

This multifaceted project is focused on geologic storage options for CO₂ as a greenhouse gas mitigation option, and on assembling an authoritative body for Europe on geologic sequestration. Major objectives include formation of a partnership consisting, at first, of 13 key European research centers and other expert collaborators in the area of geological storage of CO₂, identification of knowledge gaps in the long-term geologic storage of CO₂, and formulation of new research projects and tools to eliminate these gaps. This project will result in re-alignment of European national research programs and prevention of duplication of research effort. It will also contribute to the knowledge base for CO₂ storage site selection, injection operations, monitoring, verification, safety, environmental protection, and training standards.

Recognized by the CSLF at its Berlin meeting, September 2005

7. CO₂ Separation from Pressurized Gas Stream

Nominators: Japan (lead) and United States

This is a small-scale project that will evaluate processes and economics for CO₂ separation from pressurized gas streams. The project will evaluate primary promising new gas separation membranes, initially at atmospheric pressure. A subsequent stage of the project will improve the performance of the membranes for CO₂ removal from the fuel gas product of coal gasification and other gas streams under high pressure.

Recognized by the CSLF at its Melbourne meeting, September 2004

8. CO₂ Sink

Nominators: European Commission (lead) and Germany

This is a pilot-scale project that will test and evaluate CO₂ capture and storage at an existing natural gas storage facility and in a deeper land-based saline formation. A key part of the project will be monitoring the migration characteristics of the stored CO₂. The goal of the project is to advance understanding of the science and practical processes involved in underground storage of CO₂ and to provide real case experience for use in development of future regulatory frameworks for geologic storage of CO₂.

Recognized by the CSLF at its Melbourne meeting, September 2004

9. CO₂STORE

Nominators: Norway (lead) and European Commission

This project is a follow-on to the Sleipner project and involves monitoring of CO₂ migration (involving a seismic survey) in an saline formation beneath the North Sea and additional studies to gain further knowledge of geochemistry and dissolution processes. There will also be several preliminary feasibility studies for additional geologic settings of future candidate project sites. The goal of the project is to develop sound scientific-based methodologies for the assessment, planning, and long-term monitoring of underground CO₂ storage, both onshore and offshore.

Recognized by the CSLF at its Melbourne meeting, September 2004

10. ENCAP

Nominators: European Commission (lead), France, and Germany

This is a multifaceted project consists of six sub-projects: Process and Power Systems, Pre-Combustion Decarbonization Technologies, O₂/CO₂ Combustion (Oxy-fuel) Boiler Technologies, Chemical Looping Combustion, High-Temperature Oxygen Generation for Power Cycles, and Novel Pre-Combustion Capture Concepts. The goals of the project are to develop promising pre-combustion CO₂ capture technologies (including O₂/CO₂ combustion technologies) and propose the most competitive demonstration plant technology, design, process scheme, and component choices.

Recognized by the CSLF at its Berlin meeting, September 2005

11. Feasibility Study of Geological Sequestration of CO₂ in Basalt Formations (Deccan Trap) in India

Nominators: India (lead) and United States

The feasibility of CO₂ storage in India's basalt formations will be established using mainly noninvasive technologies like 2D/3D and MT studies, physical and chemical characterization of formations, kinetic studies, wire logging for temperature and pressure profiles, and detailed modeling. Subsequent detailed schemes will be developed for CO₂ injection and monitoring in these basalt formations.

Recognized by the CSLF at its Berlin meeting, September 2005

12. Frio Project

Nominators: United States (lead) and Australia

This is a pilot-scale project that will demonstrate CO₂ sequestration in an on-shore underground saline formation. The project involves injecting relatively small quantities of CO₂ into the formation and monitoring its movement for several years thereafter. The

goals of the project are to verify conceptual models of CO₂ sequestration in such geologic structures, demonstrate that no adverse health, safety or environmental effects will occur from this kind of sequestration, demonstrate field-test monitoring methods, and develop experience necessary for larger scale CO₂ injection experiments.

Recognized by the CSLF at its Melbourne meeting, September 2004

13. Geologic CO₂ Storage Assurance at In Salah, Algeria

Nominators: United Kingdom (lead) and Norway

This multifaceted project will develop the tools, technologies, techniques and management systems required to cost-effectively demonstrate, safe, secure, and verifiable CO₂ storage in conjunction with commercial natural gas production. The goals of the project are to develop a detailed dataset on the performance of CO₂ storage; provide a field-scale example on the verification and regulation of geologic storage systems; test technology options for the early detection of low-level seepage of CO₂ out of primary containment; evaluate monitoring options and develop guidelines for an appropriate and cost-effective, long-term monitoring methodology; and quantify the interaction of CO₂ re-injection and hydrocarbon production for long-term storage in oil and gas fields.

Recognized by the CSLF at its Berlin meeting, September 2005

14. IEA GHG Weyburn-Midale CO₂ Monitoring and Storage Project

Nominators: Canada and United States (leads) and Japan

This is a commercial-scale project that will utilize CO₂ for enhanced oil recovery at a Canadian oil field. The goal of the project is to determine the performance and undertake a thorough risk assessment of CO₂ storage in conjunction with its use in enhanced oil recovery. The work program will encompass four major technical themes of the project: geological integrity; wellbore injection and integrity; storage monitoring methods; and risk assessment and storage mechanisms. Results from these technical themes, when integrated with policy research, will result in a Best Practices Manual for future CO₂ Enhanced Oil Recovery projects.

Recognized by the CSLF at its Melbourne meeting, September 2004

15. ITC CO₂ Capture with Chemical Solvents

Nominators: Canada (lead) and United States

This is a pilot-scale project that will demonstrate CO₂ capture using chemical solvents. Supporting activities include bench and lab-scale units that will be used to optimize the entire process using improved solvents and contactors, develop fundamental knowledge of solvent stability, and minimize energy usage requirements. The goal of the project is to develop improved cost-effective technologies for separation and capture of CO₂ from flue gas.

Recognized by the CSLF at its Melbourne meeting, September 2004

16. Regional Carbon Sequestration Partnerships

Nominators: United States (lead) and Canada

This multifaceted project will identify and test the most promising opportunities to implement sequestration technologies in the United States and Canada. There are seven different regional partnerships, each with their own specific program plans, which will conduct field validation tests of specific sequestration technologies and infrastructure concepts; refine and implement (via field tests) appropriate measurement, monitoring and

verification (MMV) protocols for sequestration projects; characterize the regions to determine the technical and economic storage capacities; implement and continue to research the regulatory compliance requirements for each type of sequestration technology; and identify commercially available sequestration technologies ready for large scale deployment.

Recognized by the CSLF at its Berlin meeting, September 2005

17. Regional Opportunities for CO₂ Capture and Storage in China

Nominators: United States (lead) and China

This project will characterize the technical and economic potential of CO₂ capture and storage technologies in China. The goal of the project is to compile key characteristics of large anthropogenic CO₂ sources (including power generation, iron and steel plants, cement kilns, petroleum and chemical refineries, etc.) as well as candidate geologic storage formations that exist across China, and to develop estimates of geologic CO₂ storage capacities in China.

Recognized by the CSLF at its Berlin meeting, September 2005

Note: "Lead Nominator" in this usage indicates the CSLF Member which proposed the project.