



## TABLE OF CONTENTS

## I. EXECUTIVE SUMMARY

## II. CARBON SEQUESTRATION MARKET DRIVERS

## 1. Sequestration Critical Step to Keep Coal a Viable Energy Resource

- Intensifying Carbon Concerns Accelerate Coal Plant Pushback
- Global Carbon Capture Power Project Development Picks Up

## 2. Carbon Policy Critical to Commercializing Sequestration

- 2009 Shaping up to Be a Critical Year
- Cap-and-Trade vs Carbon Tax
- Global Policy Looks Past Kyoto Protocol *Attention Turns to Copenhagen in 2009 CCS Hits Snag to Inclusion Under CDM at the End of 2008*
- The EU Emission Trading Scheme (ETS) to Opt in CCS *Phase III of ETS Lessens Policy Uncertainty*
- U.S. Carbon Policy to Address Carbon Sequestration *Treatment of CCS in Emerging US National Climate Bills US State Carbon Policy Initiatives*
- Carbon Policies in the Rest of the World *CCS a Key Priority of Australia's Domestic Carbon Trading Scheme Regional Initiatives Lead the Way in Canada as Federal Policy Sputters Alberta Underpins Carbon Policy with CCS Ambitions Japan Tip-Toes Onward with Voluntary Cap-and-Trade Scheme New Zealand Emission Trading Scheme Unravels at the End of 2008 Large Non-Annex 1 Nations Move Slowly Towards Carbon Goals*
- Voluntary Carbon Markets Bolster CCS Economics

## 3. Carbon Sequestration Support Policies and Project Incentives

- US CCS Strategy Matures to Demonstration Scale *US DOE Regional Carbon Sequestration Partnerships Key Funding Mechanism Federal Support for Clean Coal Drives CCS Demonstration Sequestration Tax Credits for Volume Based CO<sub>2</sub> Storage to Have Limited Appeal US State Initiatives Support Sequestration*
- European CCS Funding Focused on the Power Sector *EU Passes Substantial CCS Demonstration Funding at the End of 2008 National Support for CCS in Europe*
- Alberta Leads Canada Sequestration
- Australia Clean Coal Policy Advances Technology Demonstration
- CCS Support Policies in the Rest of the World

## III. PROJECT DEVELOPMENT HURDLES

1. Global Carbon Sequestration Activity, 1980-2008
2. Sequestration Applications: Technical Challenges and Risks

- Near-Term Opportunity: Depleted Oil and Gas Reservoirs Dominate *EOR Crucial for Initial Scaling of Sequestration Strategies Enhanced Gas Recovery (EGR) Gains Limited Attention*
- Saline Aquifers Hold Long-Term Potential, Face Upfront Risks
- Coal Bed Storage Has Big Upside, But Faces Technical Challenges
- Basalt Far From Commercial
- Exotic Storage Options Largely Impractical

## 3. Storage Capacity a Challenge for Select Markets

## 4. Regulation Hurdles Slow Sequestration Evolution

- Site Characterization and Monitoring
- Regional Analysis of Sequestration Policies *Fluid US Regulatory Situation Evolving on Multiple Levels EU Negotiates Vote on Draft Sequestration Directive Australia Federal Government Takes Lead Offshore, States Onshore Alberta Sets up Council for Draft Regulations*

## 5. Economics of Carbon Sequestration

- Breakdown of Sequestration Costs Along Value Chain *Race Heats up to Define Capture Costs for the Power Sector Upfront Costs Challenge Sequestration Site Developers Pipeline Costs Relatively Well Defined*
- EOR Developers Seek out 'Affordable' CO<sub>2</sub>

## IV. CARBON SEQUESTRATION MARKET ANALYSIS &amp; FORECASTS

## 1. Status of Global Carbon Sequestration Pipeline

- A Pivotal Time: Landmark Projects Starting Up in 2008 & 2009
- Financial Crisis Exacerbates Sequestration Challenges

## 2. Carbon Sequestration Project Review by Region

- USA Leads Global Sequestration Activity
- Western Canada Places Bet on Sequestration
- Carbon Sequestration Project Development in Europe *UK Taps CCS Demonstration as Energy Crunch Looms Norway Evaluates Opportunities to Benefit from Early Leadership Netherlands Eyes Potential for Emissions Hub Germans Weigh CCS Alongside Renewables and an Uncertain Nuclear Future National Energy Giants Team Up in Italy Poland Weighs CCS Cost Against Russian Natural Gas Dependence*

*Other EU Nations Evaluate Limited Potential*

- Carbon Sequestration Activity in Australia
  - Carbon Sequestration Activity in Asia *China Turns Industrial Weight Towards CCS Attracting Foreign Players Government Backed Japanese Industry Leads CCS Forward Domestically and Abroad Southeast Asia Awaits CDM Opportunities*
  - Carbon Sequestration Activity in the Rest of the World *Middle East Ponders Mega-Scale Sequestration*
- 3. Global Carbon Sequestration Market Forecast, 2009-2030**
- Global Sequestration Forecast Building Blocks *EOR as a Critical Intermediate Driver for Sequestration Government Funding Critical Foundation for Industry Development Aggressive Carbon Policies Needed to Provide Long-Term Stable Price Incentive Cost Competitiveness of CCS in a Carbon Constrained World*
  - Global Sequestration Forecast Scenarios, 2009-2030 *Base Case Driven by EOR until 2020 High Growth Forecast Shows Substantial Upside*
  - Forecast of Investment in Carbon Sequestration 2008-2030

## V. CARBON SEQUESTRATION DEVELOPER STRATEGIES

## 1. Sequestration Value Chain in Formative Stages

- Market Share of Companies Involved in Existing CO<sub>2</sub> Injection
- Carbon Sequestration Development Rankings
- Sequestration a Natural Fit for Oil & Gas Players

## 2. Oil &amp; Gas Industry Getting Ready to Lead

- Shell and BP Lead Supermajors in CCS Activity
- Regional Leaders Tap Sequestration for Geographic Expansion
- In North America, Independents Bid for Competitive Niche with CO<sub>2</sub>-EOR
- Midstream Energy Companies Explore CO<sub>2</sub> Marketing, Pipeline strategies
- Upstarts Seek to Catalyze Early Activity, Look to Get Out in Front
- Oil and Gas Services Companies Explore Potential

## 3. Europeans Tap Power-Gas Strategies for Sequestration

## 4. Coal Industry Strategies Tied to Sequestration

## 5. Early Stage MMV strategies

## VI. CARBON SEQUESTRATION COMPANY PROFILES

## 1. Global Oil and Gas Supermajors

- BP / Hydrogen Energy

- *Sequestration Activity and Strategy*
- Chevron  
*Sequestration Activity and Strategy*
- ConocoPhillips  
*Sequestration Activity and Strategy*
- ExxonMobil  
*Sequestration Activity and Strategy*
- Royal Dutch Shell  
*Sequestration Activity and Strategy*
- Total S.A.  
*Sequestration Activity and Strategy*
- 2. Regional and Independent Oil and Gas Producers**
- Anadarko  
*Sequestration Activity and Strategy*
- Centrica  
*Sequestration Activity and Strategy*
- Core Energy, LLC  
*Sequestration Activity and Strategy*
- Denbury Resources  
*CCS Strategy*
- Encana  
*CCS Strategy*
- GDF Suez  
*Sequestration Activity and Strategy*
- Japan Petroleum Exploration Co. (JAPEX)  
*Sequestration Activity and Strategy*
- Occidental Petroleum  
*Sequestration Activity and Strategy*
- OMV  
*Sequestration Activity and Strategy*
- Pengrowth Energy Trust  
*Sequestration Activity and Strategy*
- Penn West Energy Trust  
*Sequestration Activity and Strategy*
- Santos  
*Sequestration Activity and Strategy*
- Star Energy  
*Sequestration Activity and Strategy*
- StatoilHydro  
*Sequestration Activity and Strategy*
- Suncor  
*Sequestration Activity and Strategy*
- Strike Oil Limited  
*Sequestration Activity and Strategy*
- Tullow Oil  
*Sequestration Activity and Strategy*
- 3. CO<sub>2</sub> Aggregators, Marketers and Pipeline Developers**
- Blue Source  
*Sequestration Activity and Strategy*
- Dakota Gasification / Basin Electric Power  
*Sequestration Activity and Strategy*
- Enbridge  
*Sequestration Activity and Strategy*
- Enhance Energy  
*Sequestration Activity and Strategy*
- Kinder Morgan  
*Sequestration Activity and Strategy*
- M&M Energy  
*Sequestration Activity and Strategy*
- N.V. Nederlandse Gasunie  
*Sequestration Activity and Strategy*
- TransCanada  
*Sequestration Activity and Strategy*
- Trinity CO<sub>2</sub> LLC  
*Sequestration Activity and Strategy*

- 4. Carbon Sequestration Services Companies and Technology Promoters**
- HTC Pureenergy  
*Sequestration Activity and Strategy*
- Schlumberger  
*Sequestration Activity and Strategy*
- Technip  
*Sequestration Activity and Strategy*
- Geogreen  
*Sequestration Activity and Strategy*
- 5. Coal Companies Involved in Sequestration**
- Anglo American  
*Sequestration Activity and Strategy*
- Arch Coal  
*Sequestration Activity and Strategy*
- Peabody Energy  
*Sequestration Activity and Strategy*
- Rio Tinto  
*Sequestration Activity and Strategy*
- Solid Energy  
*Sequestration Activity and Strategy*
- Xstrata  
*Sequestration Activity and Strategy*

- 5. EOR Activity by Country and Largest Operating EOR Projects Using CO<sub>2</sub>
- 6. Saline Aquifer Storage Projects
- 7. Carbon Sequestration Projects in Coal Beds
- 8. Project Activity Targeting Storage in Basalt
- 9. Key Sedimentary Basins Considered for Sequestration Globally
- 10. Regulatory Hurdles Facing Carbon Sequestration
- 11. Global Matrix of Carbon Sequestration Regulation Development
- 12. US States Progressing Specific Sequestration Legislation
- 13. Status of Carbon Sequestration Regulations in Australia
- 14. Cost Breakdown of the Carbon Capture and Sequestration Value Chain
- 15. Activity Targeting Capture Cost Reduction
- 16. Investment Requirements for Key Elements of a Large Sequestration Project
- 17. Project Cost Breakdown for CO<sub>2</sub>-EOR

**IV. SEQUESTRATION MARKET ANALYSIS & FORECASTS**

- 1. Select Carbon Sequestration Projects by Scale and Sink Type
- 2. Sequestration Project Activity 2007-2009
- 3. Recently Cancelled Carbon Sequestration Projects
- 4. Carbon Sequestration Project Market Share by Region, 150 Million Tons / Year
- 5. Analysis of Carbon Sequestration Maturity by Region
- 6. US Carbon Capture and Sequestration Activity
- 7. Emerging Pockets of CCS Activity in Western Canada
- 8. Overview of European Carbon Sequestration Activity
- 9. CCS Project Activity in the UK
- 10. CCS Activity in Norway
- 11. Planned Carbon Capture and Sequestration Activity in Netherlands
- 12. Proposed CCS Activity in Germany
- 13. CCS Activity in Italy
- 14. CCS Activity in Australia
- 15. Key CCS Activity Across Northern Asia
- 16. Base Case Carbon Sequestration Forecast for EOR
- 17. Forecasted CCS Projects Leveraging Government Funding, 2009-2016
- 18. Coal Plant Demand Potential in Key Regions by 2030
- 19. EER's Base Case Sequestration Market Forecast by Region, 2009-2030
- 20. Carbon Sequestration Market Forecast, Base Case 2008-2030
- 21. Carbon Sequestration Market Forecast, High Growth 2008-2030
- 22. Forecast of Annual Capital Outlay for CCS, 2009-2030

**V. CARBON SEQUESTRATION DEVELOPER STRATEGIES**

- 1. Positioning Along the CO<sub>2</sub> Project Development Value Chain
- 2. Company Involvement in Existing CO<sub>2</sub> Storage Projects

**LIST OF EXHIBITS**

**I. EXECUTIVE SUMMARY**

**II. CARBON SEQUESTRATION MARKET DRIVERS**

- 1. CO<sub>2</sub> Sequestration Market Drivers
- 2. Coal Resource Availability, Use in Power Sector and Price Comparison
- 3. Policies Impacting Coal's Long Term Viability without CCS
- 4. Status of Carbon Capture Power Projects Under Development
- 5. State of Global Carbon Policy Momentum
- 6. Proposed CDM Projects and Methodologies with a Sequestration Component
- 7. ETS Evolving as a Critical Driver for CCS Roll-out in the EU
- 8. Carbon Reduction of Proposed Climate Change Bills in the U.S. Congress, 2008
- 9. Status of US State Carbon Policies and Regional Partnerships
- 10. Provincial Carbon Policy in Canada and Alberta
- 11. Overview of Global CCS Funding and Key Regions with Sequestration Regulations
- 12. Overview of Sequestration Related Federal Funding in the US
- 13. RCSP Combined Project Value and Planned Sequestration by Phase
- 14. Key US State Funding Initiatives Related to Carbon Sequestration
- 15. CCS Development in Europe
- 16. National Initiatives Supporting CCS in Europe
- 17. Canadian CCS Funding and Allocation Schedule
- 18. Funding Initiatives in Australia

**III. PROJECT DEVELOPMENT HURDLES**

- 1. Challenges Facing Developers of CCS Projects
- 2. Sequestration Scale-up Ahead
- 3. Summary of Sequestration Sinks
- 4. Previous and Existing CO<sub>2</sub> Injection Activity in Depleted Oil and Gas Reservoirs

3. Developer Rankings of Carbon Sequestration Projects Announced in the Pipeline
4. Crossover Between Sequestration and Traditional Oil & Gas Value Chains
5. Energy Companies and the Carbon Sequestration Development Continuum
6. Supermajors Strategic Alliance with CCS
7. CCS and International Growth Strategies
8. Company Market Share in Existing Projects Across the CO<sub>2</sub>-EOR Value Chain
9. Examples of Significant Ongoing CO<sub>2</sub> Pipeline Development Activity
10. New Entrants Positioning along the CO<sub>2</sub> EOR Value Chain
11. Vertically Integrated EU Power-Gas Utilities

5. Royal Dutch Shell Sequestration Activity
6. Total S.A. Sequestration Activity
7. Anadarko Sequestration Activity
8. Centrica Sequestration Activity
9. Core Energy Sequestration Activity
10. Denbury Resources Sequestration Activity
11. Encana Sequestration Activity
12. GDF Suez Sequestration Activity
13. Japan Petroleum Exploration Co. (JAPEX) Sequestration Activity
14. Occidental Petroleum Sequestration Activity
15. OMV Sequestration Activity
16. Pengrowth Energy Trust Sequestration Activity
17. Penn West Sequestration Activity
18. Santos Sequestration Activity
19. Star Energy Sequestration Activity
20. StatoilHydro Sequestration Activity
21. Suncor Sequestration Activity
22. Strike Oil Limited Sequestration Activity
23. Tullow Oil Sequestration Activity

24. Blue Source Sequestration Activity
25. Dakota Gasification / Basin Electric Power Sequestration Activity
26. Enbridge Sequestration Activity
27. Enhance Energy Sequestration Activity
28. Kinder Morgan Sequestration Activity
29. M&M Energy Sequestration Activity
30. N.V. Nederlandse Gasunie Sequestration Activity
31. TransCanada Sequestration Activity
32. Trinity CO<sub>2</sub> LLC Sequestration Activity
33. HTC Purenergy Sequestration Activity
34. Schlumberger Sequestration Activity
35. Technip Sequestration Activity
36. Geogreen Sequestration Activity
37. Anglo American Sequestration Activity
38. Arch Coal Sequestration Activity
39. Peabody Energy Sequestration Activity
40. Rio Tinto Sequestration Activity
41. Solid Energy Sequestration Activity
42. Xstrata Sequestration Activity

**VI. CARBON SEQUESTRATION COMPANY PROFILES**

1. BP Sequestration Activity
2. Chevron Sequestration Activity
3. ConocoPhillips Sequestration Activity
4. ExxonMobil Sequestration Activity

**ORDER FORM: Global Carbon Sequestration Markets and Strategies, 2009-2030**

Please fax this form to Emerging Energy Research at +1 617 551 8481 or call us at +1 617 551 8480

**Study Now Available : Order today and receive immediate access**

**HOW TO ORDER**

Please fill out order form at left and do one of the following:

**1. Fax to EER at +1 617 551 8481**
**2. Scan and e-mail to eersales@emerging-energy.com**
**3. Contact us directly by phone at: +1 617 551 8480 or +34 93 467 6750**
**Emerging Energy Research  
700 Technology Square  
Cambridge, MA 02139 USA  
www.emerging-energy.com**

Emerging Energy Research is a leading research and advisory firm analyzing clean and renewable energy markets on a global basis.

In addition to market studies, Emerging Energy Research offers research advisory services, which provide a continuous stream of business intelligence, competitive analysis and strategic advice. Clients receive detailed Market Forecasts, Strategy Papers, On Point briefings and Analyst access to help them meet a variety of needs within their organization.

If you are interested in learning more about how our Advisory Services can benefit your organization, please contact eersales@emerging-energy.com.

For more information on EER, please visit our website at www.emerging-energy.com.

<b>Name</b>			
<b>Title</b>			
<b>Company</b>			
<b>Address</b>			
<b>City</b>		<b>State/Prov</b>	
<b>Postal Code</b>		<b>Country</b>	
<b>Phone</b>		<b>Fax</b>	
<b>Email</b>			
<b>VAT#</b>			

	US\$	Euro€
<input type="checkbox"/> <b>Single Copy PDF:</b>	\$3,750.-	€2.650.-
<input type="checkbox"/> <b>Corporate License PDF:</b>	\$5,500.-	€3.950.-

**Payment Options:**

Please Bill Me: Purchase Order # \_\_\_\_\_

 Please Charge My Credit Card:  VISA  MasterCard  AMEX

Account Number: \_\_\_\_\_

Expiration Date: \_\_\_\_\_ / \_\_\_\_\_ Security Code: \_\_\_\_\_

<b>Cardholder Name</b>		<b>Date</b>
<b>Signature</b>		