Partnerships and Business Driven Actions: Methane to Markets

Methane to Markets

Arthur Lee

6 October 2005
Key Messages

Public-private and intergovernmental partnerships, for example:

- CO2 Capture Project (BP, Chevron, Shell, Hydro, ENI, Petrobras, ConocoPhillips, Suncor)
- Carbon Sequestration Leadership Forum (CSLF)
- Methane to Markets

have the potential for facilitating:

- Demonstration projects and technology collaborations
- Technology transfer
- Progress towards widespread, commercial deployment of new technologies
Key Messages

Methane to Markets can further facilitate the development of technologies to reduce methane emissions and to remove barriers that will expand the market for gas.

Key issues are:

- National policies
- Markets for gas
- Partnerships roles: government-to-government; government-to-private sector; company-to-company
Signposts

• The Kyoto Protocol entered into force 16 February 05
• EU Emissions Trading system began operation Jan 05
• EU market is seeing increasing trading activities. Forwards dominates now.
• Clean Development Mechanism Executive Board registered its first projects which, subject to monitoring provisions and certification, will likely see the issuance of credits in a year’s time
• Some US states are continuing their plans on regional greenhouse gas emissions trading
• Canada is continuing its policy development, including trading. Canada signed agreement with automobile manufacturers to reduce emissions by 5.3 million metric tons per year by 2010.
Broad Portfolio of Energy and Emissions Reduction Technologies

Reducing methane emissions is an important part of reducing overall greenhouse gas emissions beyond any “business as usual” (IS92a) emissions scenarios to a world of 550 ppm greenhouse gas concentration.*

Assumed Advances In
- Fossil Fuels
- Energy intensity
- Nuclear
- Renewables

Gap technologies
- CO2 capture & storage
- H2 and Advances in Transportation
- Biotechnologies (e.g., Bioenergy)

* 550 ppm is the focus of United Nations negotiations for long term emissions reductions

Source: Jae Edmonds, Pacific Northwest National Laboratory
Technology and Policy Drivers

G8 Gleneagles Plan of Action on Climate Change, Clean Energy and Sustainable Development recognizes that advances in a portfolio of technologies are critical for the stabilization of greenhouse gas concentrations.

Technology common ground

- G8 nations disagree over the Kyoto Protocol
- G8 Plan of Action is the common ground.

In the CO2 capture and storage technology area, G8 Gleneagles Plan of Action commits the nations to:

Business-Driven Actions on Greenhouse Gas Emissions Management

- Strong Centralized Greenhouse Gas Management
- Management Processes and Tools Integrated to Business
- Carbon Markets Team
- Partnerships
Importance of Climate Change Issue to Chevron

CO₂ and methane emission sources

<table>
<thead>
<tr>
<th>Sources</th>
<th>Production</th>
<th>Transportation</th>
<th>Refining and Petrochemical Production</th>
<th>End Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combustion and rotating equipment, flaring, venting</td>
<td>Pipelines</td>
<td>Heaters</td>
<td>Customer use of gasoline, diesel, and coal</td>
<td></td>
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<tr>
<td>Gas associated with oil production</td>
<td>Vessels</td>
<td>Boilers</td>
<td></td>
<td></td>
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<tr>
<td>CO₂</td>
<td>CO₂</td>
<td>Primarily CO₂</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Methane</td>
<td>Methane</td>
<td>CO₂</td>
<td></td>
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</tbody>
</table>
Four-Fold Plan of Action

- We at Chevron Corporation are responding to increasing climate change concerns by integrating an action-based approach into our business strategy.

- 4-Fold Plan predicated on **ACTION**

1. **Reduce greenhouse gas emissions (GHG) and increase energy efficiency**

2. **Invest in research, development, and improved technology**

3. **Pursue business opportunities in promising innovative energy technologies**

4. **Support flexible and economically sound policies and mechanisms that protect the environment**
Measurable Results

- Chevron’s energy efficiency improved 24% from 1992. U.S. refinery plans an additional 10% improvement by 2012.
- Chevron’s operating companies have set greenhouse gas emission goals for 2005, and forecast 2005-07
- Greenhouse gas emissions accounting has become standardized – Chevron’s SANGEA™ software has the key role
- Capital projects are required to project greenhouse gas emissions and analyze mitigation options.
- Methane is approximately 11% of emissions.
- Chevron is a member of the US EPA’s Natural Gas Star Program.

Note: 2002, 2003, and 2004 Equity share emissions do not include Chevron Phillips Chemical and Dynegy. Other includes shipping, power & gasification, coal & corp. services.
Greenhouse Gas Emissions Management at Chevron Corporation: Path Forward

World Class Performance

Focused Improvement

Foundation

- SANGEA™
- Data Collection
- Emissions Trading
- Energy Efficiency

Forecasting Tools
- GHG Planning in Capital Projects
- Sharing Best Practices
- Signpost and Scenario Analysis
- Technology Assessment Tools

Long Term Emissions Strategy
- Long Term Forecasts
- External Reporting
- Standardized Accounting

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Emissions Strategy
- Long Term Forecasts
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- Standardized Accounting

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Partnerships

Chevron continues to:

- Execute a Global Gas Strategy across the Gas Value Chain
- Foster climate change-related Joint Industry projects
- Encourage business units’ actions in support of Chevron’s Four-fold Action Plan -- several examples:
  - The Gorgon Project
  - Chevron Energy Solutions
  - Chevron Technology Ventures
- “Practical Hydrogen” – hydrogen infrastructure development
Linking the Gas Value Chain

Forging strong links all along the gas value chain is critical to the commercialization of the significant volumes of remote natural gas resources throughout the world.
Climate Change Related Joint Industry Projects

- CO₂ Capture Project
- CO₂ Cooperative Research Center
- International Energy Agency - Weyburn
- Gulf Coast Carbon Center
- MIT’s Carbon Sequestration Initiative
- WestCarb (U.S. Dept. of Energy Regional Partnership)
- Global Gas Flaring Reduction Partnership
- Industry Consortia: API, IEA, IPIECA, CO2NET
Chevron’s Colombia Production Fields

Distances (miles)

<table>
<thead>
<tr>
<th>Distance</th>
<th>Miles</th>
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<tbody>
<tr>
<td>Rcha City - Chu B Platf.</td>
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</tr>
<tr>
<td>Rcha City - Chu A Platf.</td>
<td>17.5</td>
</tr>
<tr>
<td>Rcha City - Ball Stat.</td>
<td>16.5</td>
</tr>
<tr>
<td>Rcha City - Rcha Stat.</td>
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<td>Ball St. - Chu A Platf.</td>
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<td>Ball St. - Chu B Platf.</td>
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<td>Chu A Platf. - Chu B Platf.</td>
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</table>

Field Discovery

<table>
<thead>
<tr>
<th>Field</th>
<th>Date</th>
<th>Active Wells</th>
<th>Production (MMscf/d)</th>
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<td>BALLENA</td>
<td>JUN. 1973</td>
<td>12</td>
<td>67</td>
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<tr>
<td>CHUCHUPA &quot;A&quot;</td>
<td>NOV. 1973</td>
<td>9</td>
<td>171</td>
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<tr>
<td>CHUCHUPA &quot;B&quot;</td>
<td>-</td>
<td>3</td>
<td>267</td>
</tr>
<tr>
<td>RIOHACHA CITY</td>
<td>SEPT. 1975</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>25</td>
<td>505</td>
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</tbody>
</table>
Chevron’s Colombia Production Fields

Fugitive Emissions Inspection:

- Regular leak detection – Poliken Pipeline Coating

- New project to define the instrument air and utility / starting air requirements
Australia: Vast Resources Offer Clean Fuels Promise and GHG Advances

- CVX is 1/6 Equity Owner in NWS LNG Venture
- CVX is also Operator and Lead Developer of Gorgon LNG with more than 40 TCF in Greater Gorgon area.
Greenhouse Gas – the Gorgon commitment

Gorgon CO₂ sequestration will be the largest such project in the world.

It will be managed through:

- **Greenhouse Gas Management Strategy**
- **Environment, Social and Economic Review commitments**
- **Greenhouse Gas Management Plan**
- **Environmental Impact Assessment process (EIS/ERMP)**

“Greenhouse gas management is part of our business”
Comparison of Global CO\textsubscript{2} Re-Injection Projects

- **Gorgon**
- **In Salah**
- **Rangely**
- **Snovit**
- **Sleipner**
- **Lost Hills**
- **Weyburn**
- **Frio**
- **Vacuum**
- **West Pearl**
- **Queen**

**Dupuy Formation**

- **Sleipner (Utisra Reservoir)** is the only active CO\textsubscript{2} sequestration project in the world today.

**Active CO\textsubscript{2} EOR Projects**

**Active storage project into saline aquifer**

**Planned storage project into saline aquifer**

**Mass of CO\textsubscript{2} (MMt)**
Darajat Geothermal Expansion

- 110 MW Expansion of Darajat geothermal power project
- Resource operated by Chevron Energy Indonesia Ltd (CTEI)
- Will help meet electricity demands of Java, Madura and Bali, where supply shortages are anticipated
- Darajat’s geothermal resources are abundant, clean, renewable
- Will help Indonesia avoid more than ~400,000 tons per year of CO₂ emissions
Chevron Energy Solutions – Energy Efficiency Project (US Postal Service, West Sacramento, CA)
Chevron Energy Solutions - Solar Photovoltaic Installation (Public Library, City of Richmond, CA)
Technology Ventures: Renewable Energy Systems

Solar Mine project in the Midway-Sunset heavy oil field

Renewable energy systems integrated into oil field operations
Advanced Batteries

- The power behind hybrid vehicles
- COBASYS has completed construction of an NiMH Battery Plant
- COBASYS signed a cost-sharing contract to continue the development of NiMH batteries under the sponsorship of the U.S. Department of Energy’s FreedomCar initiative

New Manufacturing Facility
Springboro, Ohio
U.S. DOE Hydrogen Fleet & Infrastructure Demonstration & Validation Project

5 year project to showcase practical application of H2 technology. Chevron is consortium leader and fuel supplier; Hyundai-Kia Motors the vehicle supplier; and UTC Fuel Cells will supply the FC stacks.

Develop and demonstrate safe, convenient, reliable H2-based distributed power generation, FCVs and vehicle fueling infrastructure.

Educate key audiences about H2 as potential fuel for transportation and power generation.

Sites and fleet operators: HATCHI, SoCal Edison, AC Transit and U.S. DOD.

Fueling for up to 32 H2 FCVs.

Integrated Codes & Standards, Education & Outreach Plans.
Opportunities in Early Markets for Hydrogen

High-Quality Distributed Power

• Fuel cell installation in Bellaire, TX and San Ramon, CA

Vehicle Fleets

• AC Transit Fuel Cell Bus Program
• US Department of Energy Project
The Hydrogen Highway: moving to the next phase

Distributed H₂ production, stationary power generation, and fleet fueling
The Hydrogen Highway: moving to the next phase (18 February 2005)

Chino, California

Hydrogen Fueling Dispenser

Unveiling at Chino, California

Groundbreaking at Orlando, Florida
Business-Driven Actions on Greenhouse Gas Emissions Management

Strong Centralized Greenhouse Gas Management
- Executing the Four-Fold Action Plan
- Climate Change Steering Council

Management Processes and Tools Integrated to Business
- Carbon management systems integrated into business planning
- Multiple emissions-reducing project activities

Carbon Markets Team
- Centrally coordinates trading and credit activities worldwide

Partnerships
- Key opportunity areas to address technology and business development