



# Chevron's Business-Driven Actions on Greenhouse Gas Emissions Management

Asilomar Conference on Transportation and Energy

**Arthur Lee**

**25 August 2005**



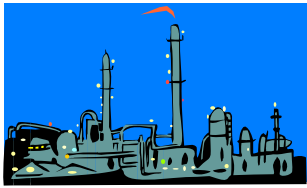
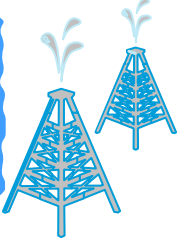
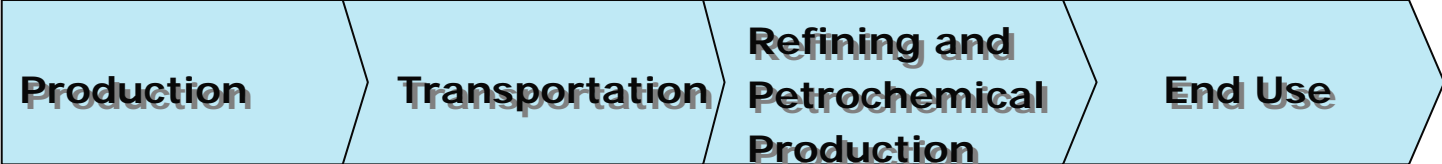
# Business-Driven Actions on Greenhouse Gas Emissions Management

- **Strong Centralized Greenhouse Gas Management**
- **Management Processes and Tools Integrated to Business**
- **Carbon Markets Team**
- **Partnerships**

# Importance of Climate Change Issue to Chevron



## CO<sub>2</sub> and methane emission sources



- Combustion and rotating equipment, flaring, venting
- Gas associated with oil production

- Pipelines
- Vessels
- Vehicles

- Heaters
- Boilers

- Customer use of gasoline, diesel, and coal

- CO<sub>2</sub>
- Methane

- CO<sub>2</sub>
- Methane

- Primarily CO<sub>2</sub>

- CO<sub>2</sub>

Sources

Emission

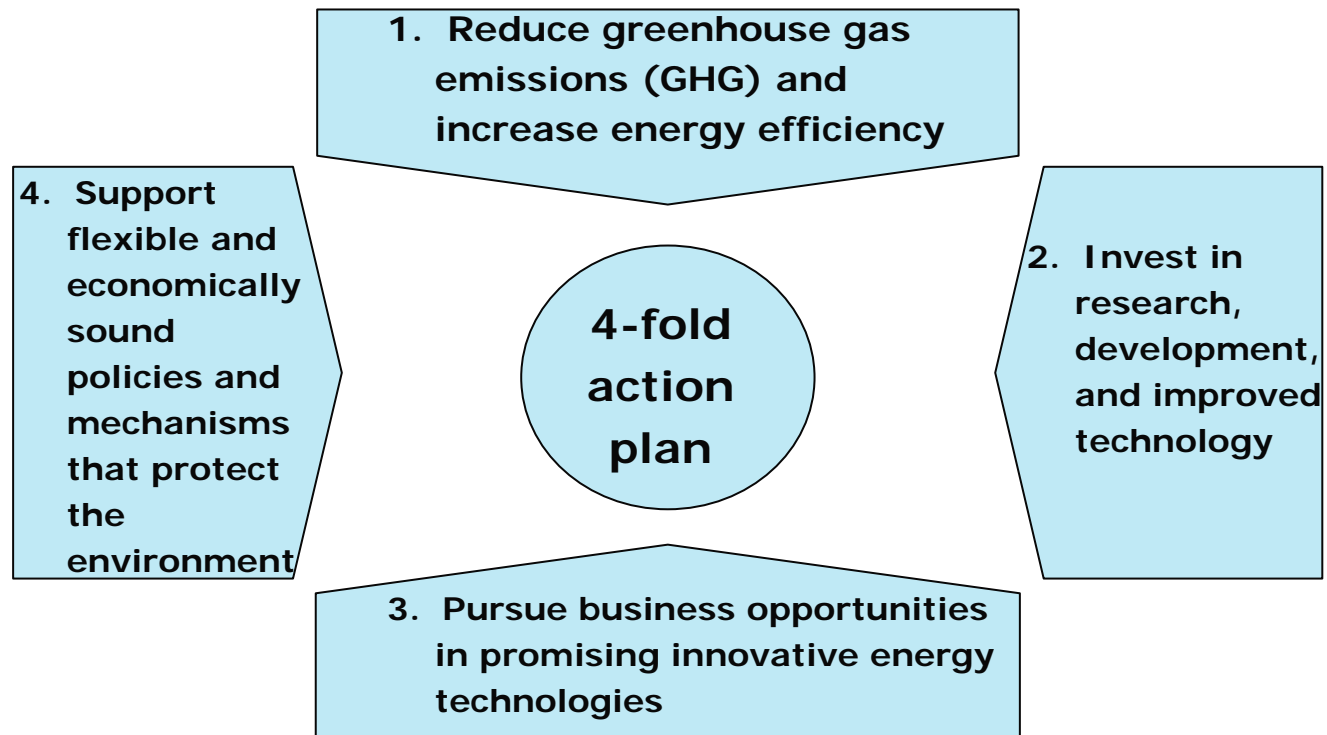
# Four-Fold Plan of Action

Position

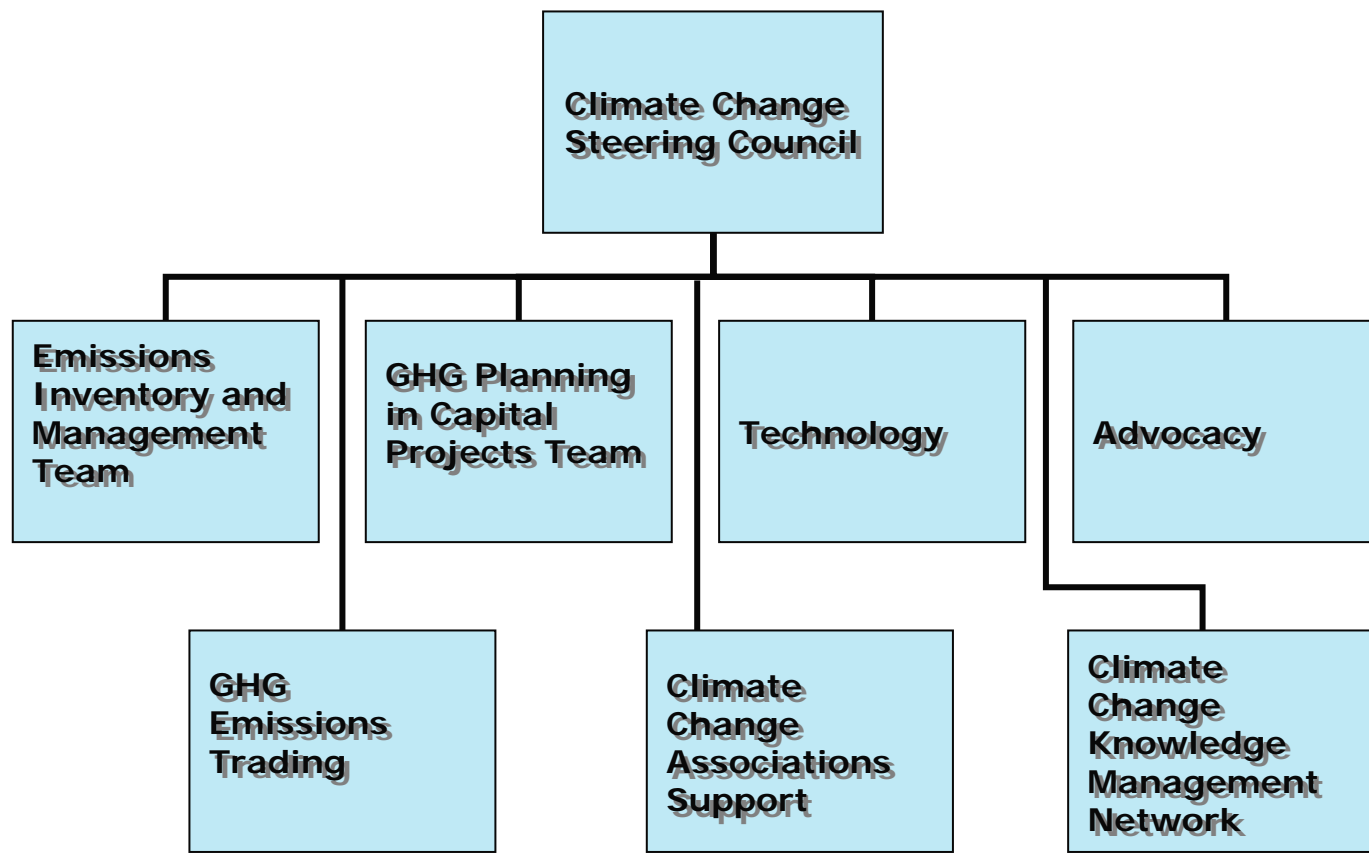
- We at Chevron Corporation are responding to increasing climate change concerns by integrating an action-based approach into our business strategy

Plan

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

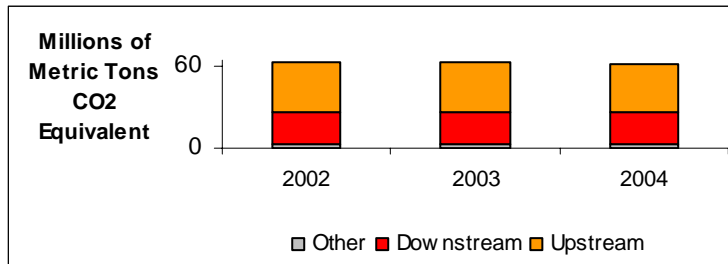
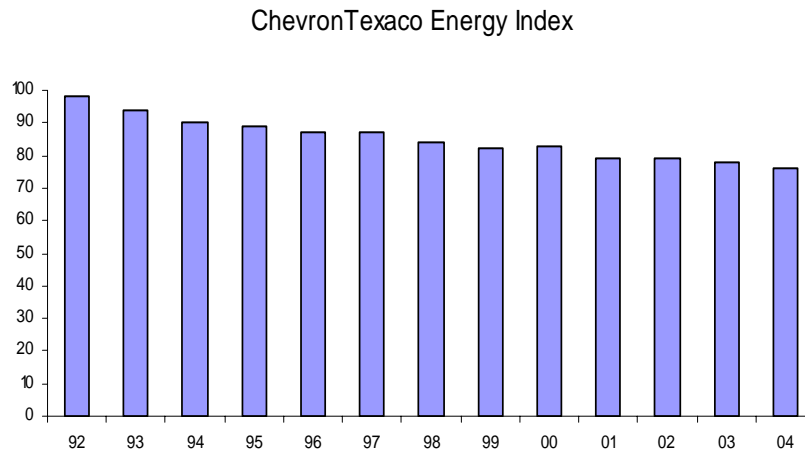


# Organization of the Climate Change Steering Council and Supporting Teams



- Additional teams will be added as needed

# Actions and Results



2002, 2003, and 2004 Equity share emissions do not include Chevron Phillips Chemical and Dynegy. Other includes shipping, global power, coal & corp. services

Greenhouse Gas Emissions Accounting To Become Standardized --CVX SANGEA™ software has role

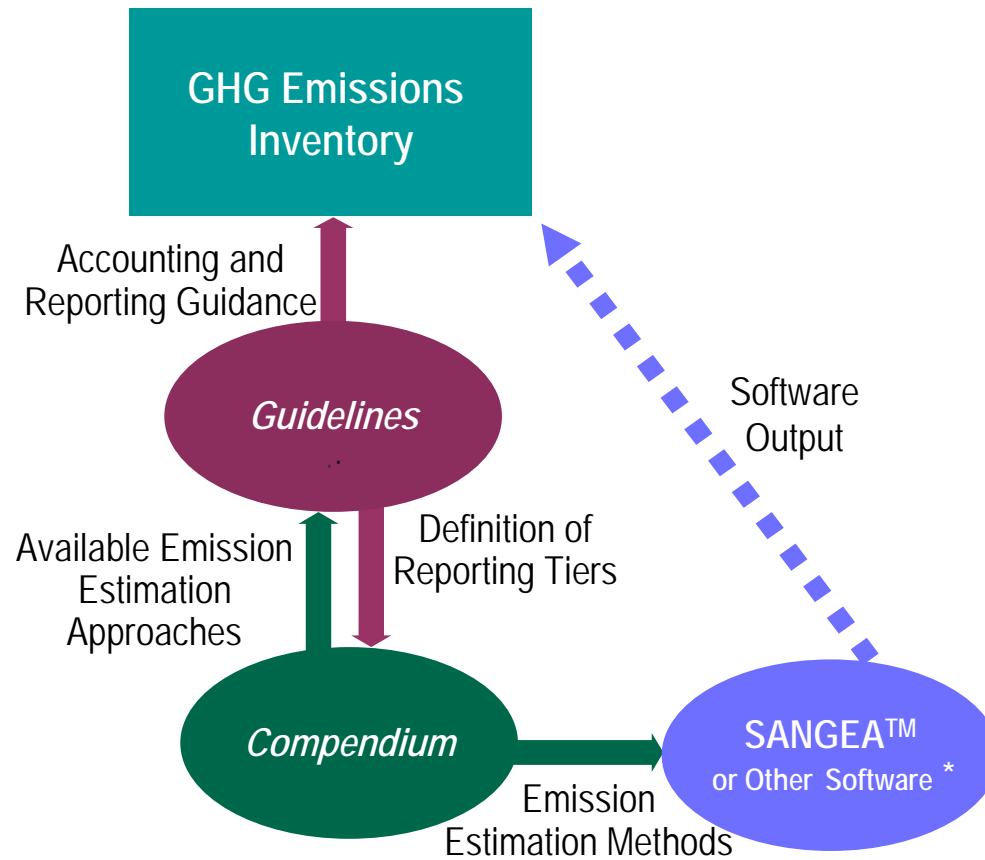
CVX Energy Efficiency Improved 24% from 1992. US Refinery Plans an Additional 10% by 2012 via API Commitment to the US.

CVX OpCos Set Emission Goals for 2005 and Forecast 2005-07

CVX To Reduce Upstream Flaring/Venting in Nigeria and Angola. F/V is 24% CVX GHG

Gorgon Project – State-of-art CO<sub>2</sub> Reinjection Program Planned in Australia (2-3 million metric tons per yr)

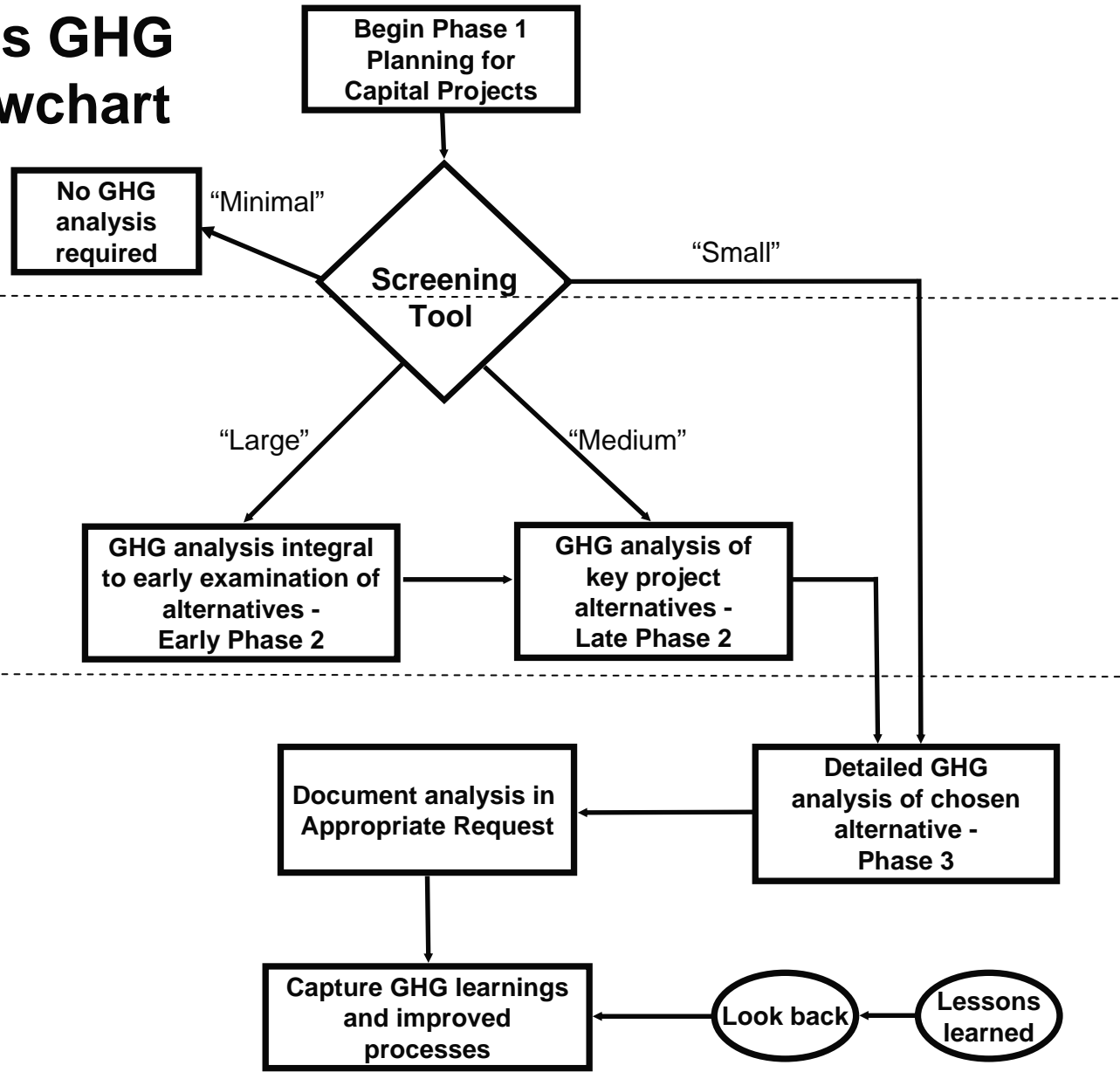
# Emissions Estimation Framework



\*Emission calculations made following Guidelines accounting and reporting procedures and Compendium emission estimation methods.

# Capital Projects GHG Evaluation Flowchart

GHG Evaluation Tools
<b>Phase 1</b> -GHG Management Primer -GHG Screening Tool
<b>Phase 2</b> - GHG Screening Tool - GHG Emissions Projector - GHG Mitigation Planning Tool - Example Project GHG Evaluations - Contact GHG Management Expert Resource - Mergers & Acquisitions Tool
<b>Phase 3</b> - SANGEA™ Inventory System - GHG Emissions Projector - Mitigation Planning Tool - Example Project GHG Evaluations - GHG Forecasting



# Greenhouse Gas Emissions Management at Chevron Corporation: Path Forward



## World Class Performance

### Focused Improvement

### Foundation

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



**Long Term Forecasts**  
**External Reporting**  
**Standardized Accounting**

- 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.

# Climate Change 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.

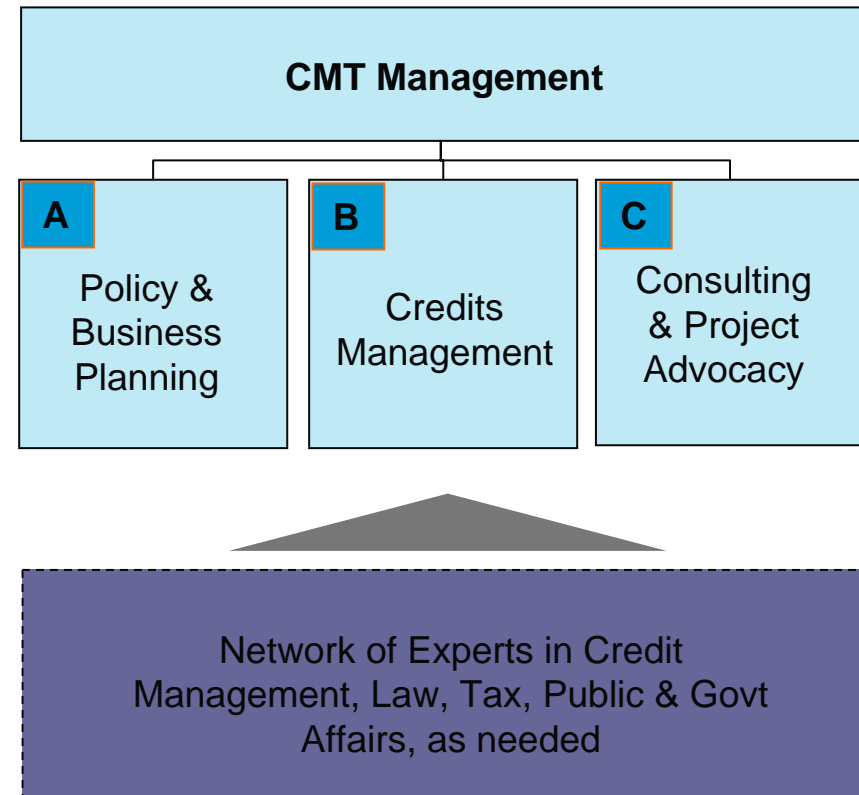
## **In the transport area, G8 Gleneagles Plan of Action commits the nations to:**

- Launch a Global Bioenergy Partnership to support wider, cost-effective, biomass and biofuels deployment, particularly in developing countries where biomass use is prevalent
- Encourage the development of cleaner, more efficient and lower-emitting vehicles
- Promote their deployment by adopting ambitious policies to encourage sales of such vehicles, including public procurement to accelerate market development

# Carbon Markets Team (CMT) Organizational Functions

- CMT has three primary functions:
  - Policy and Business Planning
  - Credits Management
  - Consulting and Project Advocacy
  
- The initial CMT organization is designed to successfully execute a specific strategy.
  - Small organization with minimum number of functions
  - Project manager emphasis
  - Reliance on Network of Experts
  
- *Driven by signposts and earning the right to grow, CMT should be capable of preparing to grow.*

CMT Organizational Structure



## Business-Driven Actions

- Climate Change Related Joint Industry Projects
- Operating Companies' and Business Units' Activities in Support of 4-Fold Action Plan
- "Practical Hydrogen" – Hydrogen Infrastructure Development

# Climate Related JIP Involvement

Partial List ...

- CO2 Capture Project
- CO2CRC
- IEA Weyburn
- MIT Carbon Sequestration Initiative
- WestCarb (DOE Regional Partnership)
- Global Gas Flaring Reduction Partnership
- Industry Consortia: API, IEA, IPIECA (chairs Climate Change Working Group), CO2NET

# Chevron Energy Solutions – Energy Efficiency Project (US Postal Service, West Sacramento, CA)



# Chevron Energy Solutions - Solar Photovoltaic Installation (Public Library, City of Richmond, CA)



# 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.

## Upstream



## Liquefaction



## Shipping



## Regasification



## Marketing & Pipelines



## Power

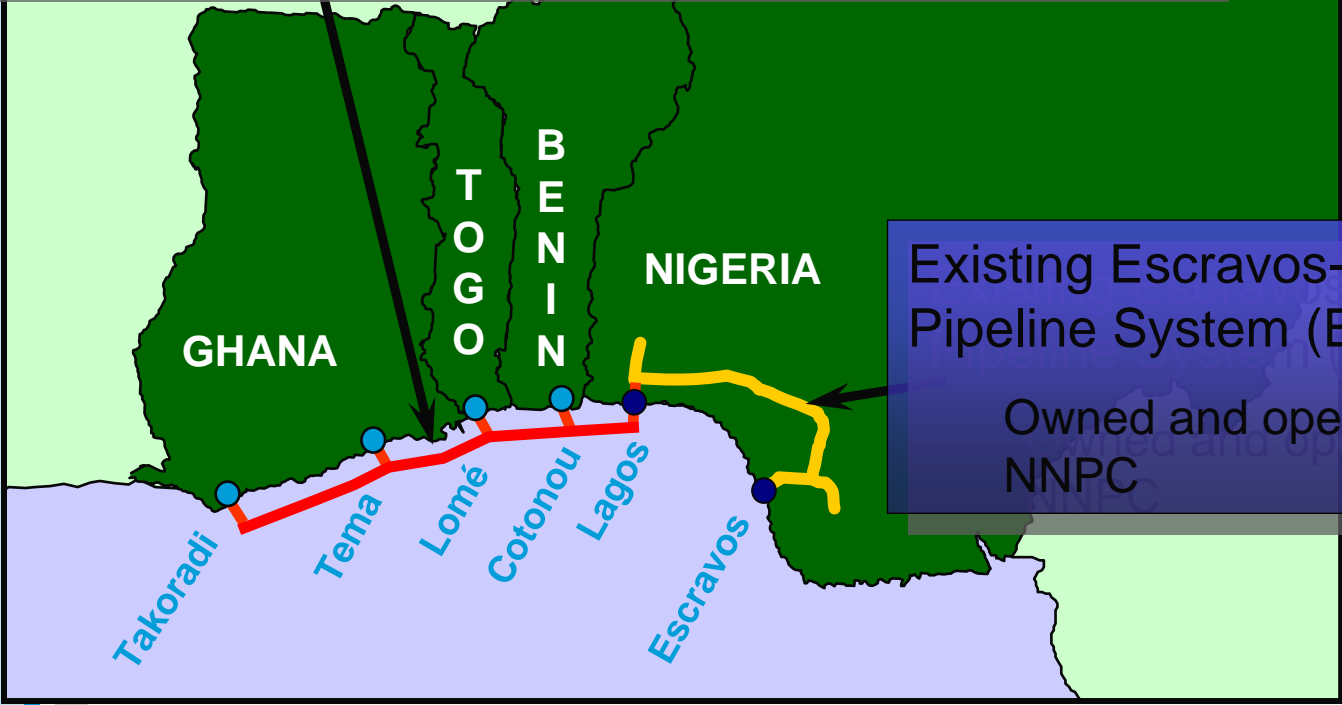


# West African Gas Pipeline Nigeria to Ghana



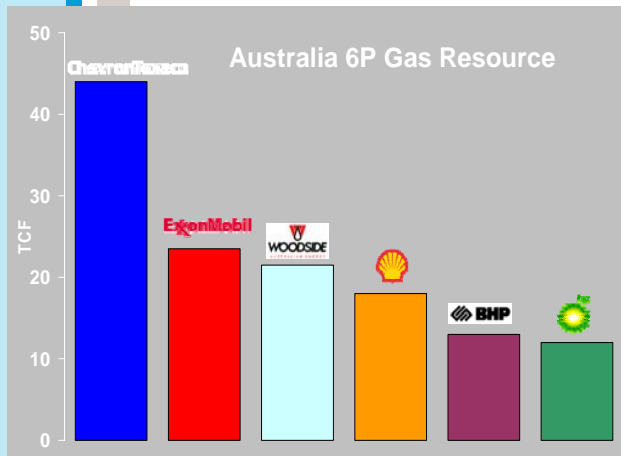
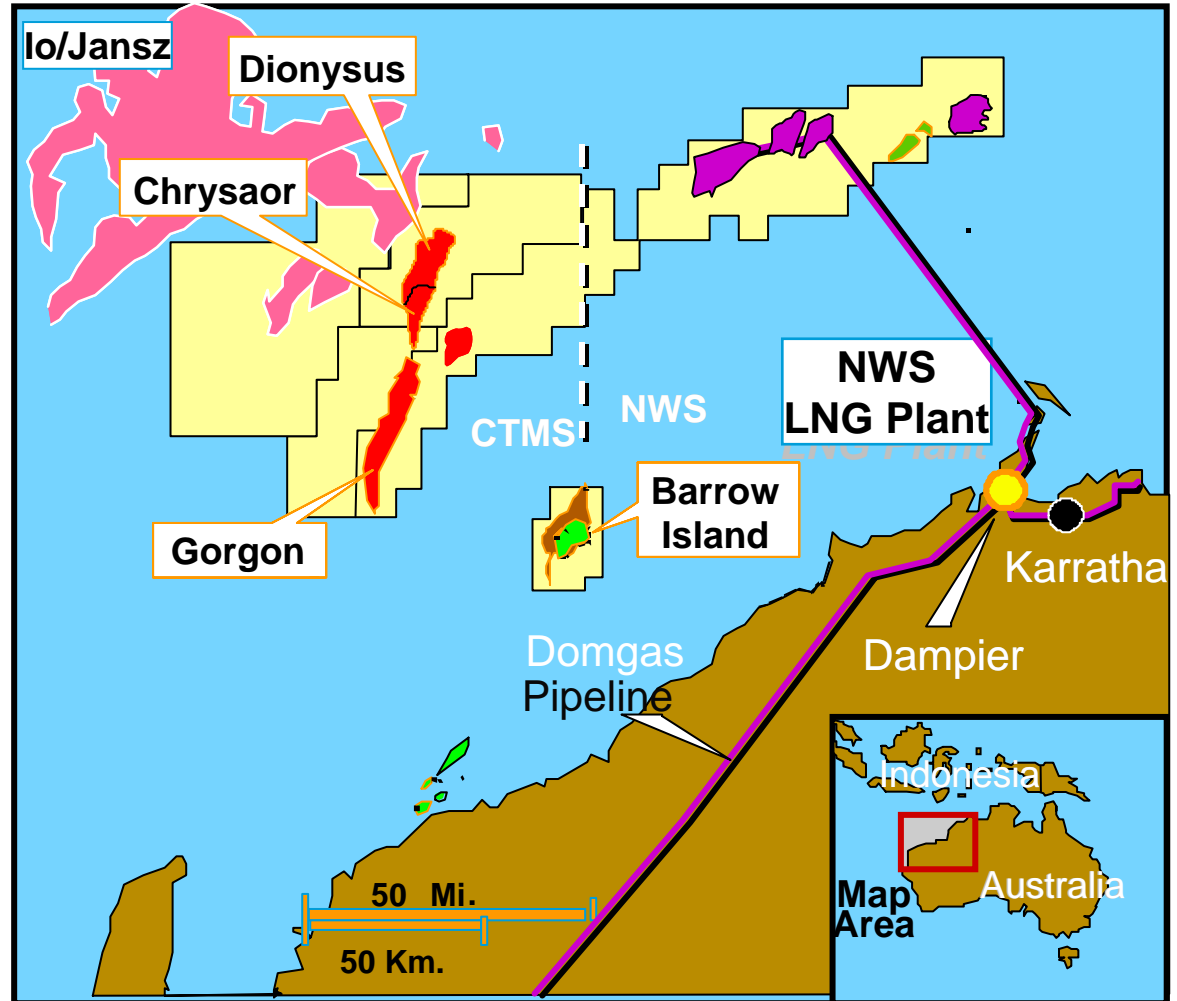
**West African Gas Pipeline (WAGP)**  
Gas transmission system owned and operated by WAPCo, extending from the ELPS to landfalls in Benin, Togo and Ghana

**Existing Escravos-to-Lagos Pipeline System (ELPS)**  
Owned and operated by NNPC



# 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 CO<sub>2</sub> 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”***



## Gorgon Gas Development Greenhouse Gas Management Strategy

The Gorgon Development Greenhouse Gas Management Strategy for a Barrow Island development is to:

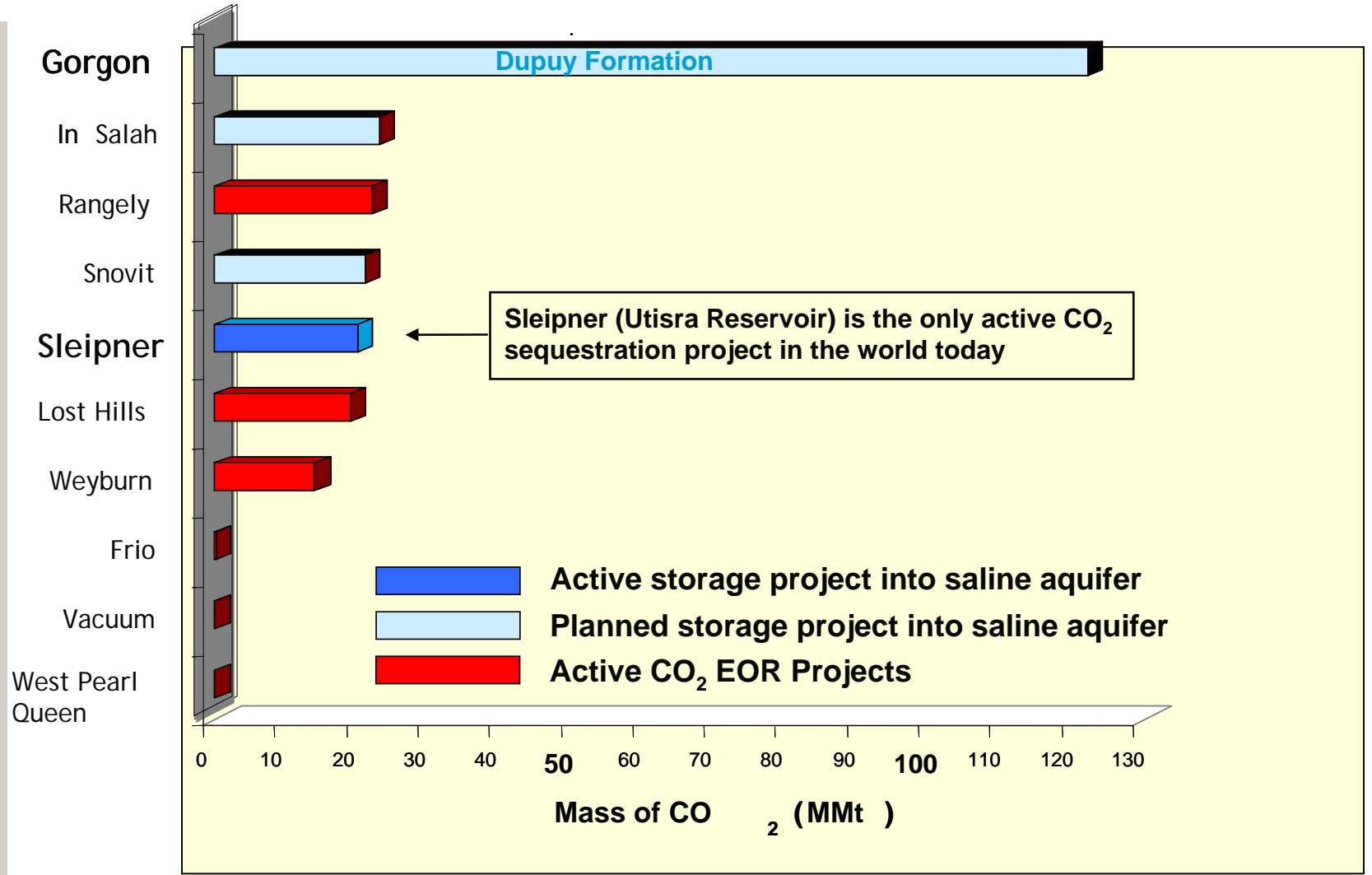
- Demonstrate via lifecycle analysis that a Gorgon gas development and LNG export results in a net reduction in global greenhouse gas emissions relative to other fossil fuel alternatives.
- Design the production facilities to incorporate current best practices in thermal efficiency and greenhouse emission control where practicable.
- Develop a project to re-inject the removed reservoir CO<sub>2</sub> into the Barrow Island Dupuy saline reservoir, unless it is technically infeasible or cost-prohibitive. This will involve:
  - Pursuing a stepwise process to: develop a reservoir CO<sub>2</sub> re-injection project, demonstrate technical feasibility, and ensure costs to the project are not excessive.
  - Selling treated gas to meet domestic gas customer requirements and re-inject the removed reservoir CO<sub>2</sub>.
  - Commencing re-injection as soon as practicable after the processing facilities commissioning and start-up process.
  - Implementing re-injection of reservoir CO<sub>2</sub> by installing a single train of injection equipment, sized for the full volume of reservoir CO<sub>2</sub>.
- Investigate potential synergies with existing Barrow Island operations and implement measures that minimise greenhouse emissions and enable full use of associated gas production where practicable.
- Pursue projects and opportunities which provide net conservation benefits and enhance greenhouse gas removal from the atmosphere.
- Continue existing funding for greenhouse gas related research and development projects such as CRC's and technological research.
- Review options for funding additional value-added research and development or demonstration projects.
- Pursue potential opportunities for external sale or use of separated reservoir CO<sub>2</sub> as a chemical feedstock or enhanced oil recovery agent.
- Develop a contingency plan that could provide a partial offset for reservoir CO<sub>2</sub> if a sequestration project proves infeasible. Options may include:
  - Maturing alternative re-injection sites that could be developed in the future such as a depleted gas reservoir.
  - Creation of emission reductions or offsets external to the Gorgon gas development.
  - Sequestration opportunities such as forestry.
  - Additional research funding.
- Meet the commitments within the LNG Action Agenda including the revision of the existing Gorgon Greenhouse Challenge Cooperative Agreement.
- Continue to advocate increased use of gas based fuels, in preference to more carbon intensive options, to reduce greenhouse emissions.
- Participate constructively in the development of greenhouse policy at both the State and Commonwealth level.

Paul Oen  
Gorgon Area General Manager

Created on 25/06/2003 11:12 AM

DOC ID: 030650006 rev 0

# Comparison of Global CO<sub>2</sub> Re-Injection Projects

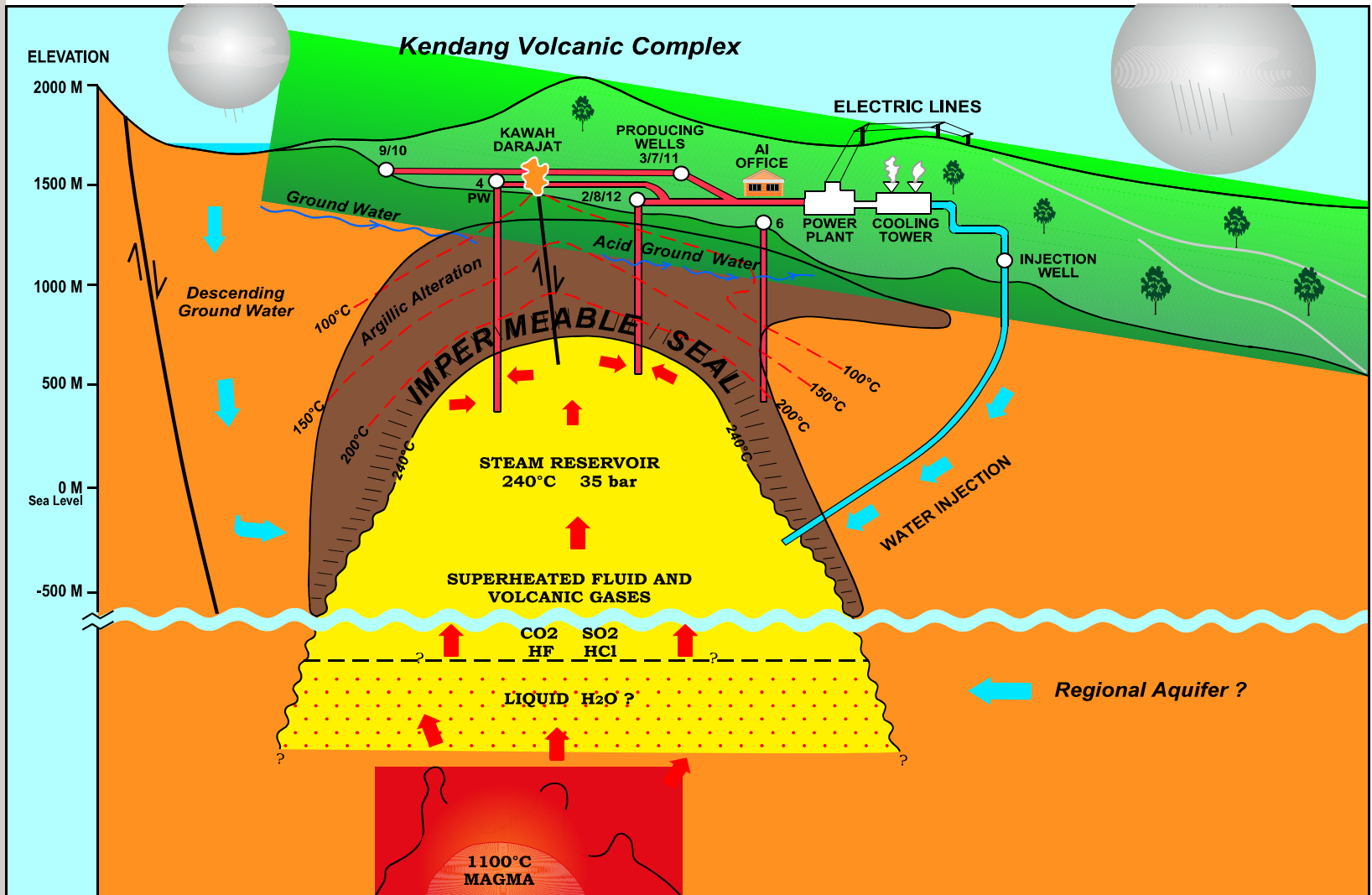


# Darajat Geothermal Expansion

- **110 MW Expansion of Darajat geothermal power project**
- **Will help meet electricity demands of Java, Madura and Bali, where supply shortages are anticipated**
- **Will help Indonesia avoid more than 400,000 tons per year of CO<sub>2</sub> emissions**
- **Darajat's geothermal resources are abundant, clean, renewable.**
- **Resource operated by Chevron Energy Indonesia Ltd (CTEI)**



# Darajat Geothermal Expansion



# Chevron Technology Ventures

Find, Launch, and Grow New Energy Technology Businesses

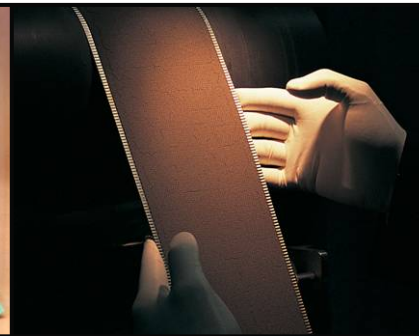
- Add new intellectual capital and organizational capability
- Create options in disruptive technologies
- Augment core R&D
- Add value chain extensions
- Adding a new operating sector



Hydrogen Business Unit



Emerging Energy Business Unit



Molecular Diamonds LLC



Venture Capital Equities

# Technology Ventures: Renewable Energy Systems

Solar Mine project in the Midway-Sunset heavy oil field



Renewable energy systems  
integrated into oil field operations

Nerefco Project, Rotterdam refinery



# 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

# Practical Hydrogen - Navigating the Transition



Public - Private partnerships play a central role

Today

*Transition Stage*

Future



R&D  
Demonstration projects  
Specialized stationary power applications

Prototype fleet and energy infrastructure systems

Distributed economic hydrogen-based energy & transport systems

Petrochemical

- **Test bed for new component technologies**
- **Community interaction, outreach, and education**

- **Sufficient size and complexity**
- **Cost-efficient - leverages the existing energy grid**

# U.S. DOE Hydrogen Fleet & Infrastructure Demonstration & Validation Project



5 year project to showcase practical application of H<sub>2</sub> 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 H<sub>2</sub>-based distributed power generation, FCVs and vehicle fueling infrastructure



Educate key audiences about H<sub>2</sub> 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 H<sub>2</sub> 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 H<sub>2</sub> 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