Natural Gas Industry Study to 2030

Enabling Solutions for Energy Demand and Environmental Challenges

Sylvie D'Apote
Colin Lyle

24th World Gas Conference
ARGENTINA | 2009
5-9 October

The Global Energy Challenge:
Reviewing the Strategies
for Natural Gas

STRUCTURE OF THE PRESENTATION

- Background
- Methodology
- Main Results – IGU Expert View
- Policy Implications – IGU Green Scenario
- Other Challenges
- Conclusions

BACKGROUND : STUDY OBJECTIVES

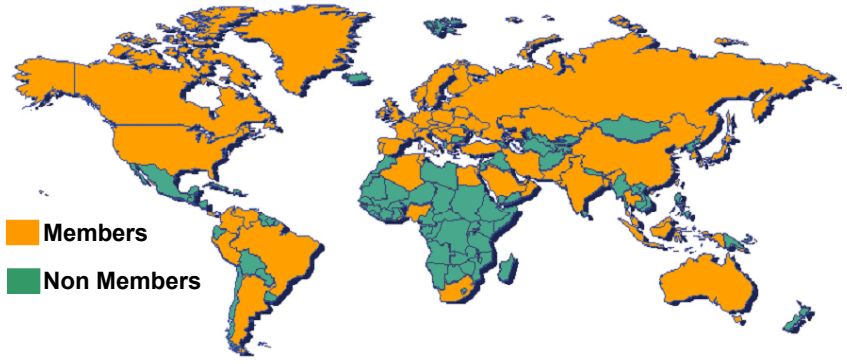
- **"To review the perspectives and strategies for the natural gas industry in the period up to 2030"**
- **"To inform the discussion about the role of natural gas in a more sustainable energy future"**
- **The genesis of this report:**
  - a 3-year project, with input from the IGU Committees
  - not a Committee report, but represents the view of the whole industry

24th World Gas Conference
ARGENTINA | 2009
5-9 October

The Global Energy Challenge:
Reviewing the Strategies
for Natural Gas

BACKGROUND : GLOBAL INPUT FOR 2030 STUDY

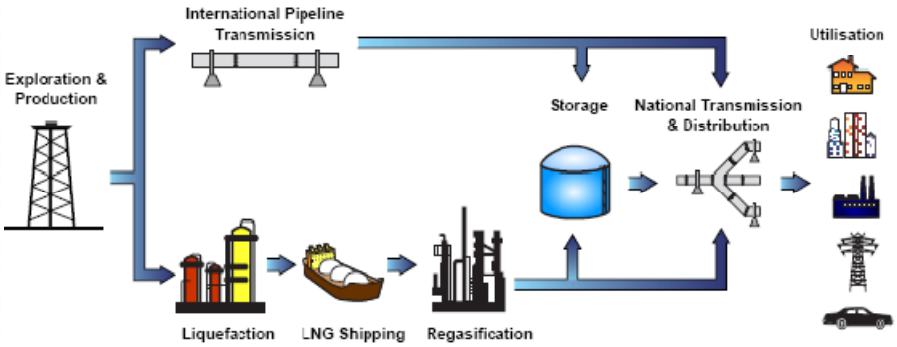
Developed by IGU members across the world



IGU represents over 95% of global gas sales

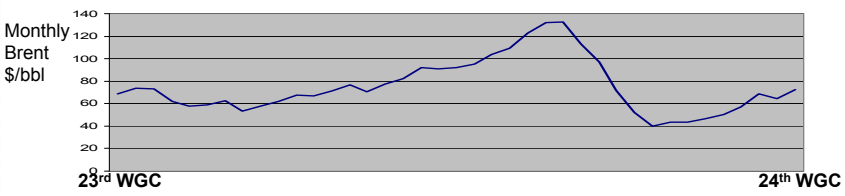
BACKGROUND : SECTOR INPUT FOR 2030 STUDY

Perspectives from all parts of the gas chain



METHODOLOGY :

- 2007 reference case shared with the whole IGU community
- Feedback from regional and gas chain perspectives
- Changing short-term commercial realities (e.g. oil price)

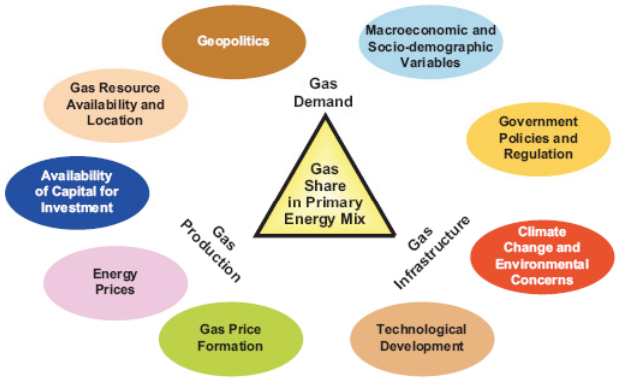


- Long-term views were consolidated - IGU Expert View Scenario
- Global financial crisis, dataset reviewed Spring 2009
- At a global level - IGU Green Policy scenario

Main Results

The IGU Expert View Scenario

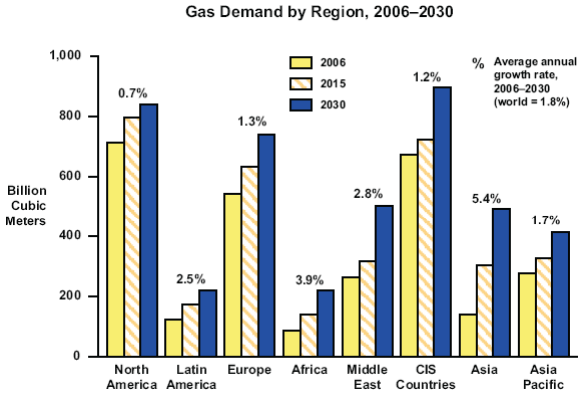
RESULTS: Main Drivers for Gas Market Growth



24th World Gas Conference
ARGENTINA | 2009
5-9 October

The Global Energy Challenge:
Reviewing the Strategies
for Natural Gas

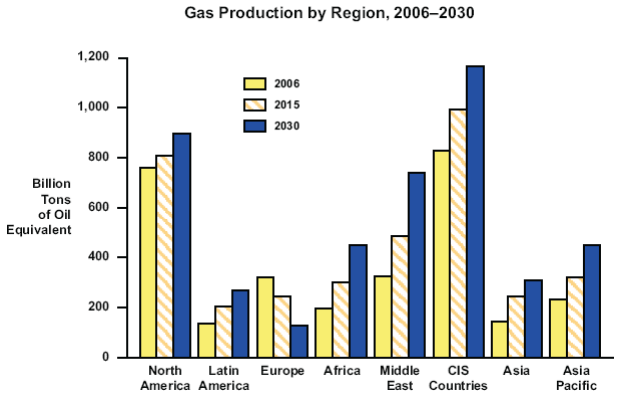
RESULTS: World Gas Demand averages 1.8% p.a. growth



24th World Gas Conference
ARGENTINA | 2009
5-9 October

The Global Energy Challenge:
Reviewing the Strategies
for Natural Gas

RESULTS: Globally, production continues to satisfy demand



24th World Gas Conference
ARGENTINA | 2009
5-9 October

The Global Energy Challenge:
Reviewing the Strategies
for Natural Gas

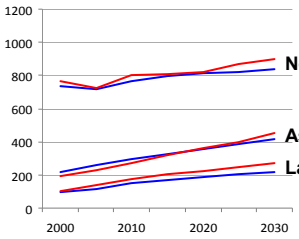
RESULTS : Gas Supply and Demand in IGU regions

North America, Latin America & Asia Pacific 'balanced'

Regional gas supply and demand to 2030 (bcm pa)

Regional supply potential

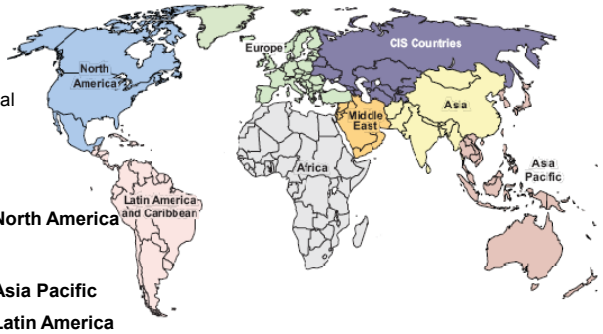
Regional gas demand



North America

Asia Pacific

Latin America



24th World Gas Conference
ARGENTINA | 2009
5-9 October

The Global Energy Challenge:
Reviewing the Strategies
for Natural Gas

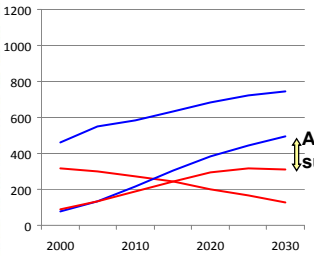
RESULTS : Gas Supply and Demand in IGU regions

Asia and Europe importing more gas

Regional gas supply and demand to 2030 (bcm pa)

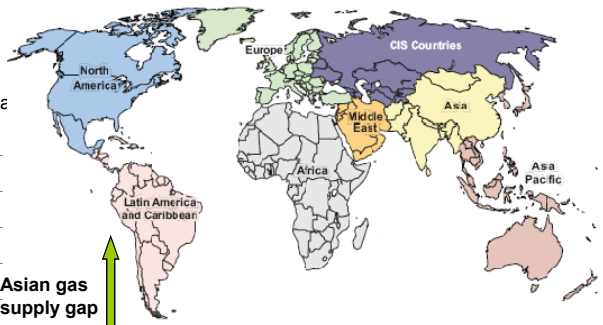
Regional supply potentia

Regional gas demand



Asian gas supply gap

European gas supply gap

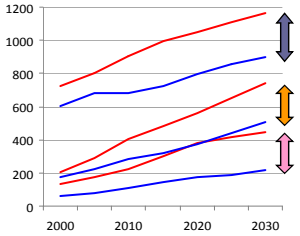


RESULTS : Gas Supply and Demand in IGU regions

Africa, Middle East & CIS increase export potential

Regional gas supply and demand to 2030 (bcm pa)

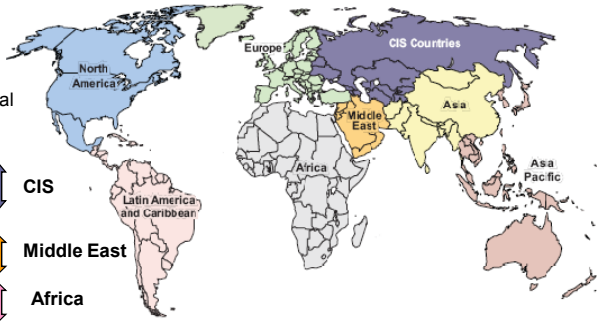
Regional supply potential
Regional gas demand



CIS

Middle East

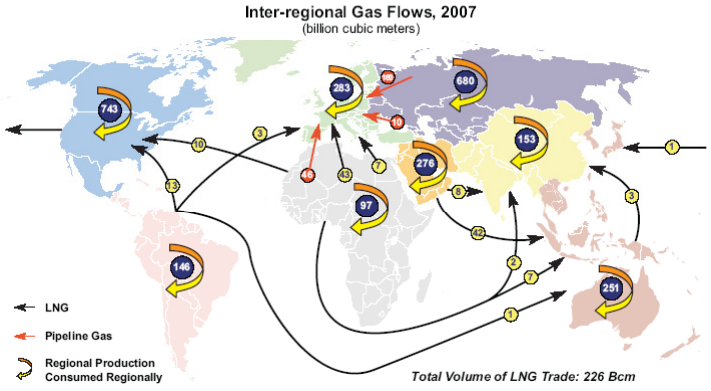
Africa



Regional export potential matches the supply gaps in Europe and Asia

RESULTS : Trade between the IGU regions (2007)

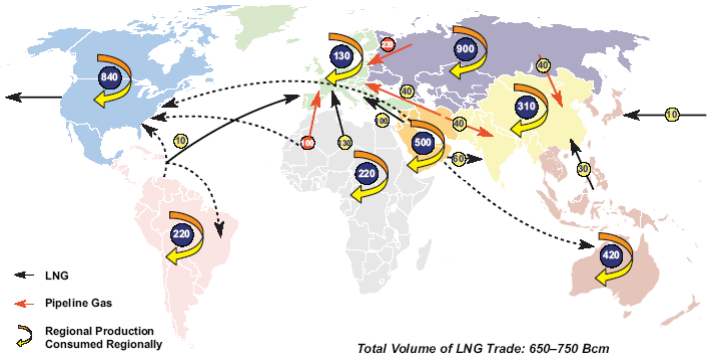
International gas trade is already well established



RESULTS : Trade between the IGU regions (2030)

More efficient inter- and intra-regional gas trade

Estimated Inter-regional Gas Flows, 2030
(billion cubic meters)

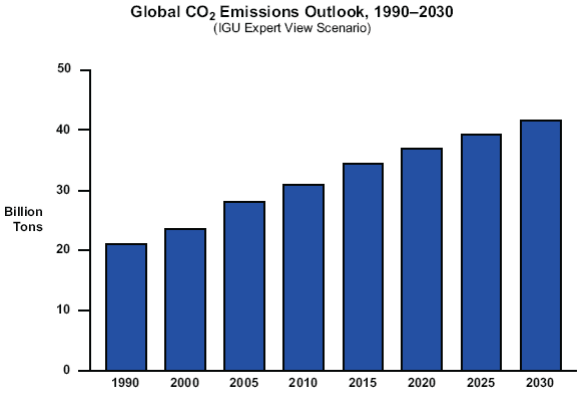


Total Volume of LNG Trade: 650–750 Bcm

Policy Implications

The IGU Green Policy Scenario

POLICY IMPLICATIONS: CO2 Emissions continue to rise. Is this a sustainable development path?



Sustainable Development and Climate Change

Acknowledgement:
The next four slides are from

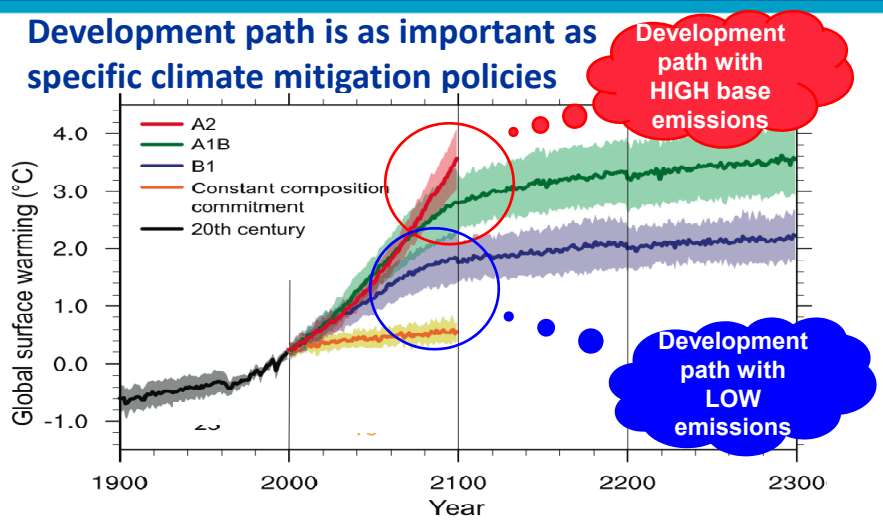
Jayant A. Sathaye
Lawrence Berkeley National Laboratory
Berkeley, CA

http://ies.lbl.gov

24th World Gas Conference
ARGENTINA | 2009
5-9 October

The Global Energy Challenge:
Reviewing the Strategies
for Natural Gas

Development path is as important as specific climate mitigation policies

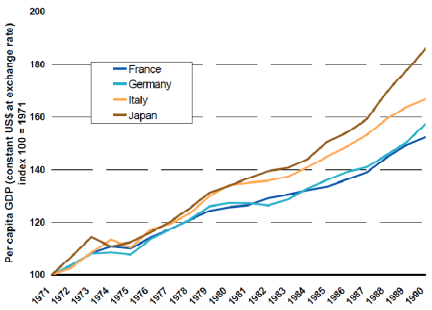


24th World Gas Conference
ARGENTINA | 2009
5-9 October

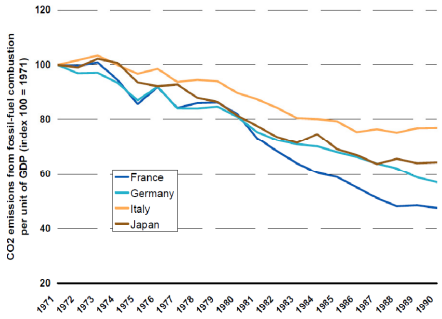
The Global Energy Challenge:
Reviewing the Strategies
for Natural Gas

Different development pathways: Reactions to the first oil shock in France, Italy, Germany and Japan

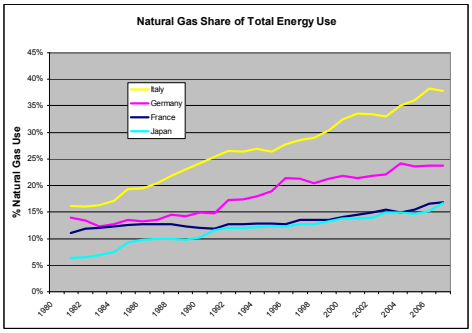
Evolution of GDP per capita (1971 – 1990)

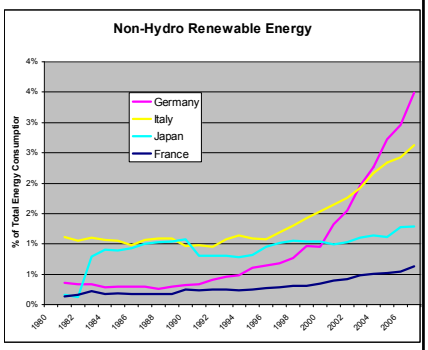


Evolution of CO2 emissions from fossil-fuel combustion per unit of GDP (1971 – 1990)

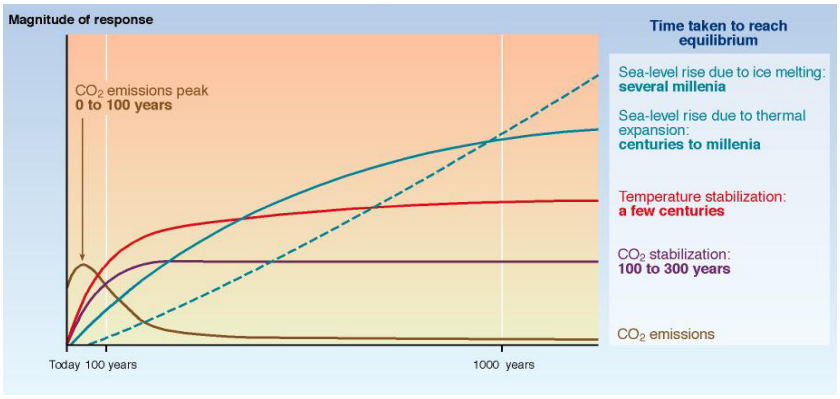


Different development pathways: Increased use of Natural Gas and Non-Hydro Renewable Energy accompanied CO2 emission reduction and GDP/capita increase, in each country.





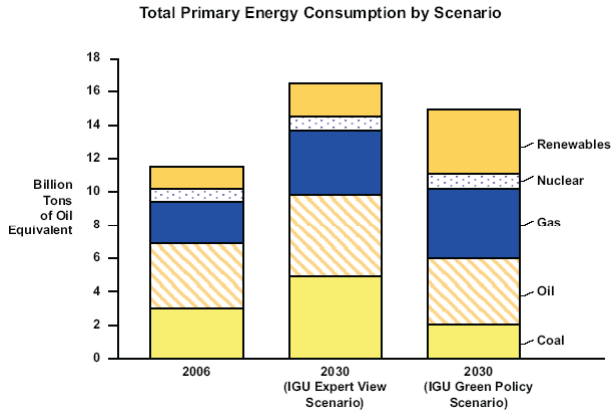
CO_2 Concentrations, Temperature and Sea Level continue to rise long after emissions are reduced



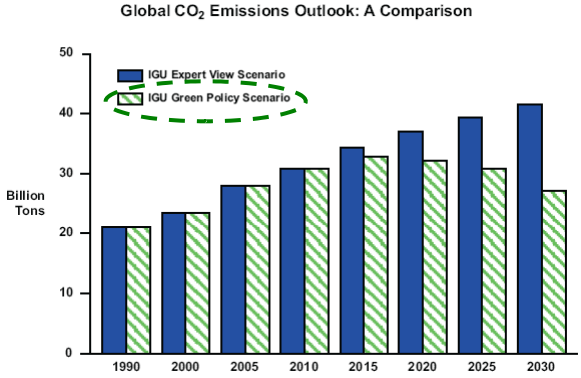
THE IGU GREEN POLICY SCENARIO – Main Assumptions

- Global political agreement that CO2 emissions must start to reduce well before 2030...
- ... implemented by a global agreement to include the 'Cost of Carbon' in the wholesale price of fossil fuels
- Thus the consumer pays a commodity price for fuel that favours more efficient use of fuels and fuels with lower carbon content
- Renewable energy is main direct beneficiary, and all other (non-development) subsidies for renewable energy are phased out.
- Technology transfer is facilitated and the political barriers to international trade (including gas projects) are eliminated

THE IGU GREEN POLICY SCENARIO: Results /1
Gas enables growth in renewable energy



THE IGU GREEN POLICY SCENARIO: Results /2
Global CO2 emissions on a downward trend



But we need 450 bcm/y more natural gas to enable this

Making It Happen:
Other Challenges

Financing and Investment

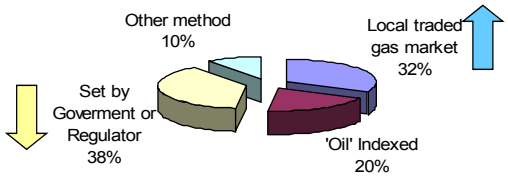
Geopolitics

Technology and Innovation

Human Resources

OTHER CHALLENGES : Financing and Investment

- Large scale of the identifiable need for new investment
- New risks associated with the changing nature of regulation
- The consequences of the financial crisis of 2008/09
- Changes in gas price formation (pie chart is for global market in 2007)



- Despite the economic uncertainty, the natural gas industry can and must invest through the current economic cycle if it is to reach its full potential.

OTHER CHALLENGES : Geopolitics

- Natural gas will remain a political business
- Government interest: access to national resources, infrastructure & markets.
- Are continuing inter-government tensions inevitable?

Countries with Largest Gas Production and Reserves

World Ranking	Share of Global Gas Production		Share of Global Proven Gas Reserves	
	Country	(percent)	Country	(percent)
1	Russia	19.6	Russia	23.4
2	United States	19.3	Iran	16
3	Canada	5.7	Qatar	13.8
4	Iran	3.8	Turkmenistan	4.3
5	Norway	3.2	United States	3.6

- Natural gas geopolitics will be studied in the next triennium (2009–12) by a special task force set up by the Malaysian IGU presidency.

OTHER CHALLENGES : Technology and Innovation

- **Widening the Horizon for Gas Resources**
  - Broaden production capabilities, the shale revolution
- **Responding to Environmental Imperatives**
  - Integrating gas industry capabilities to enable CO2 capture and storage, incorporate biogas expansion, etc…
- **Technology Alone Is Not Enough**
  - Advancement and wider use of CHP, including hybrid systems and natural gas fuel cells, but cost of gas grid for developing countries can be a barrier
- **Encouraging Technological Transfer**
  - With increased trade, fair and efficient technology transfer is a key issue for political leaders and gas industry management

24th World Gas Conference
ARGENTINA | 2009
5-9 October
The Global Energy Challenge: Reviewing the Strategies for Natural Gas

OTHER CHALLENGES : Human Resources

- **Public perception**. Is natural gas perceived alongside oil, as a 'sunset industry', rather than a 'sunrise industry' that complements newer and environmentally friendly energy sources?
- **Career perceptions.** Does the industry offer good prospects for career growth and advancement?
- **Industry expertise.** Much was lost through consolidations since the 1980s, how will industry cope with future hiring and layoffs?
- **Age of workforce**. Why is it among the oldest of any industry?
- **Workforce nationalities**. International and national consideration?
- **Financial crisis**. Recruitment and retention complications. (cutbacks both on capital projects and human resource budgets).

Another priority for the Malaysian IGU Presidency (2009-12)

CONCLUSIONS : Summary of Quantitative Results

Key Quantitative Results of the Study

	Primary Energy Demand (million tons of oil equivalent per annum)	Gas Demand (Bcm per annum)	Gas Demand (Tcf per annum)	Gas Share in Primary Energy Demand (percentage)	CO_2 Emissions from All Fuels (million tons per annum)
IGU Experts View Scenario, 2030 (continuation of current policy trends)	16,500	4,300	153	23	41,600
IGU Green Policy Scenario, 2030 (global agreement, high cost of CO_2)	15,000	4,800	168	28	27,200
The World Today (for comparison)	12,000	3,000	106	21	30,000

Source: IGU.

24th World Gas Conference
ARGENTINA | 2009
5-9 October

The Global Energy Challenge:
Reviewing the Strategies
for Natural Gas

CONCLUSIONS : The gas industry towards 2030

- Natural gas is an increasingly abundant fuel
- An enhanced role for gas in global energy demand as an enabling fuel for mitigation of climate change
- Efficient use in traditional markets, new combinations with renewable energy sources
- Expansion of international trade, especially LNG
- Further regional integration and intra-regional trade
- Investment must continue through the current economic cycle
- Political and geopolitical issues need resolution to achieve continuous optimum economic development

Thank you

Sylvie D'Apote - sdapote@gasenergy.com.br
Colin Lyle - cl@gmi.eu.com