



International Gas Union



The Role of Natural Gas in a Sustainable Future

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IGU**

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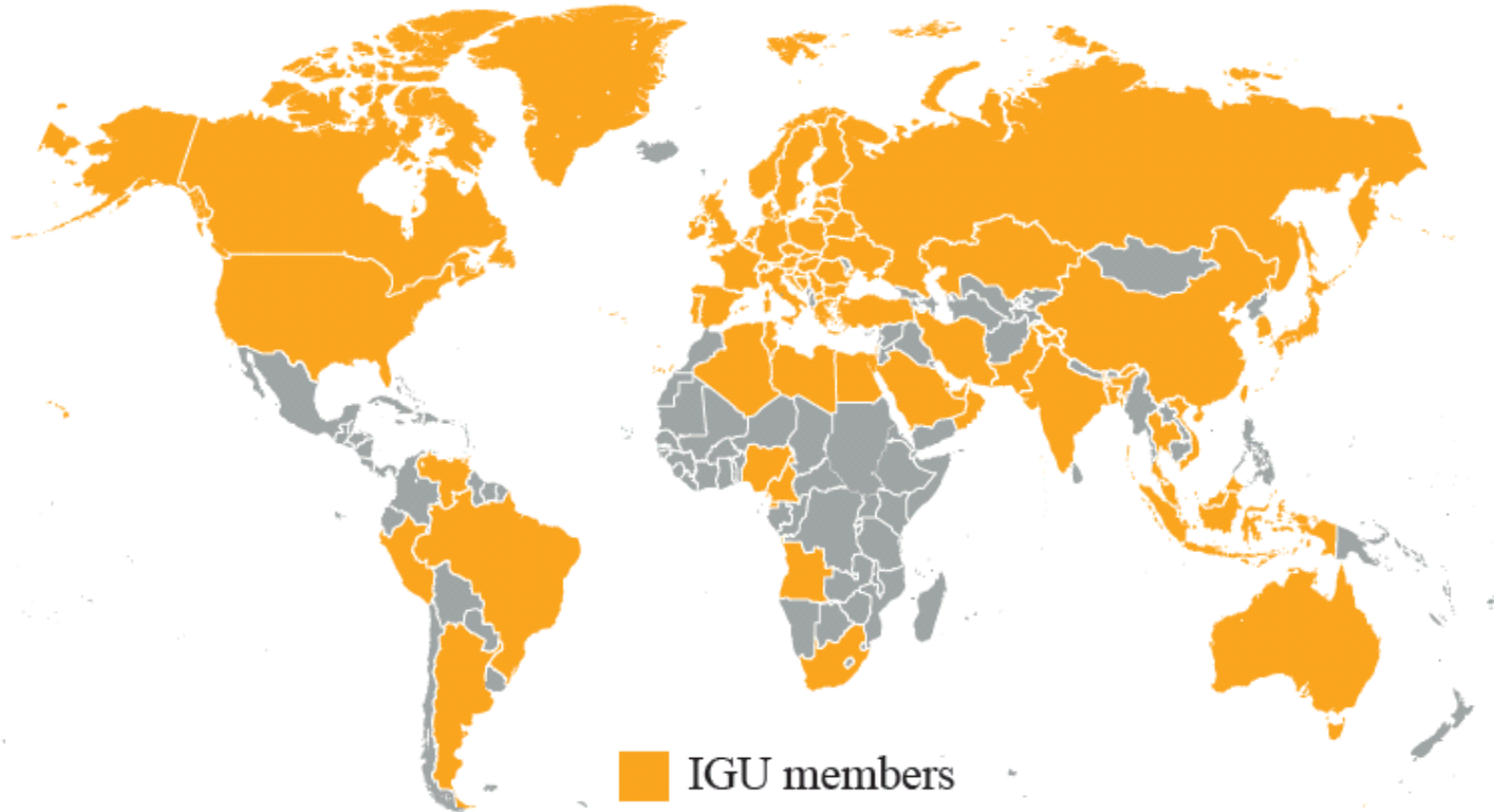




IGU represents around 95% of global gas market



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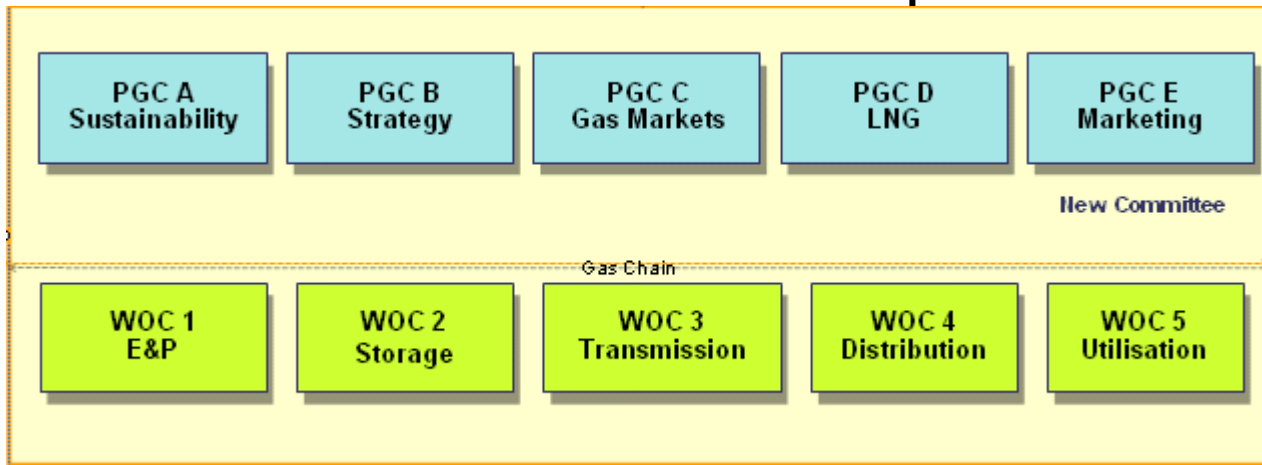
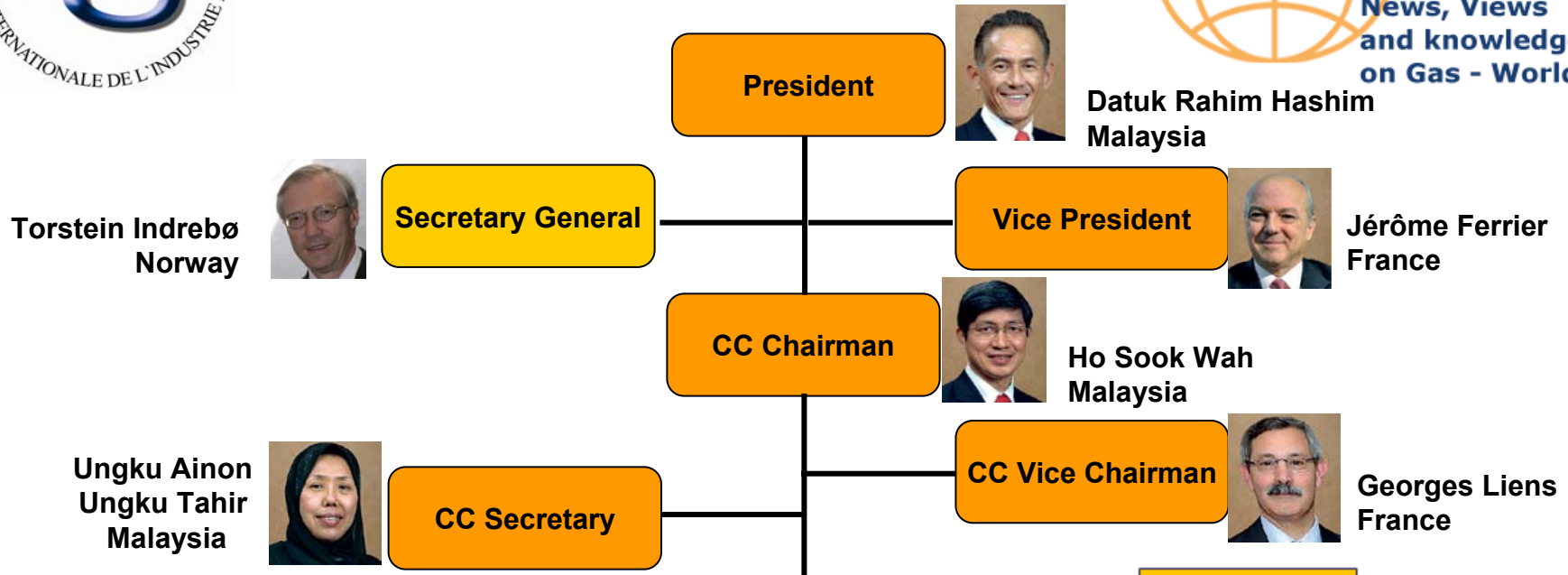


IGU established in 1931





The IGU organisational structure



- TASK FORCES**
1. Building strategic human capital
 2. Nurturing future generations
 3. Geopolitics of Natural Gas





IGU is creating arenas for....



Networking - Knowledge - Dialogue

- **The IGU World Gas Conference**
Buenos Aires 2009
Kuala Lumpur 2012

KUALA LUMPUR
2012
WORLD GAS CONFERENCE



- **Co-sponsor of LNG Conferences**
LNG 16 in Oran, Algeria, April 2010



- **Ministerial Gas Forums**
2nd IEF – IGU Ministerial Gas Forum, Doha, Qatar, November 2010

- **The IGU Research Conference**
IGRC 2011 in Seoul, Korea, October 2011



- **The IGU Gas Event at COP 15, Copenhagen, Denmark, December 2009**





"Safe global forecasting"



- **Population growing to 9 billion in 2050**
- **Enhanced urbanisation and prosperity**
- **Increased focus on climate change mitigation**
- **Times of "easy oil & gas" over**
- **Fossil fuels will dominate next decades**

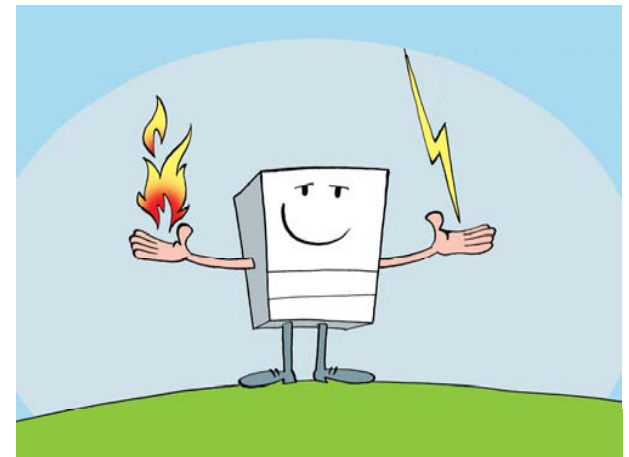
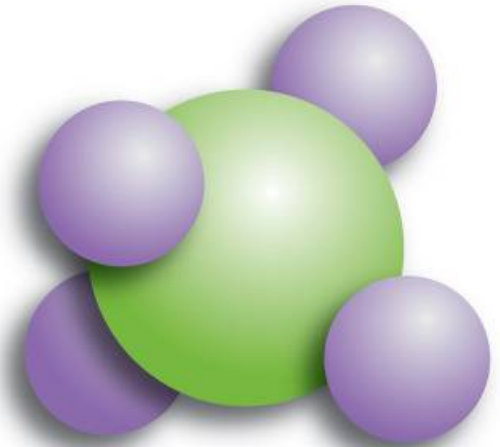




9 Reasons why Natural Gas



- 1) **Competitive** – great added value in markets
- 2) **Multifunctional** – used for more purposes
- 3) **Innovative** – power for innovative developments
- 4) **Everywhere** – no geographical boundaries
- 5) **Future** – fuel of the future
- 6) **Efficient** – driving force for technological improvements
- 7) **Clean** – lowest emission combustion
- 8) **Comfortable** – convenient & space saving
- 9) **Flexible** – interact perfectly with other energy sources



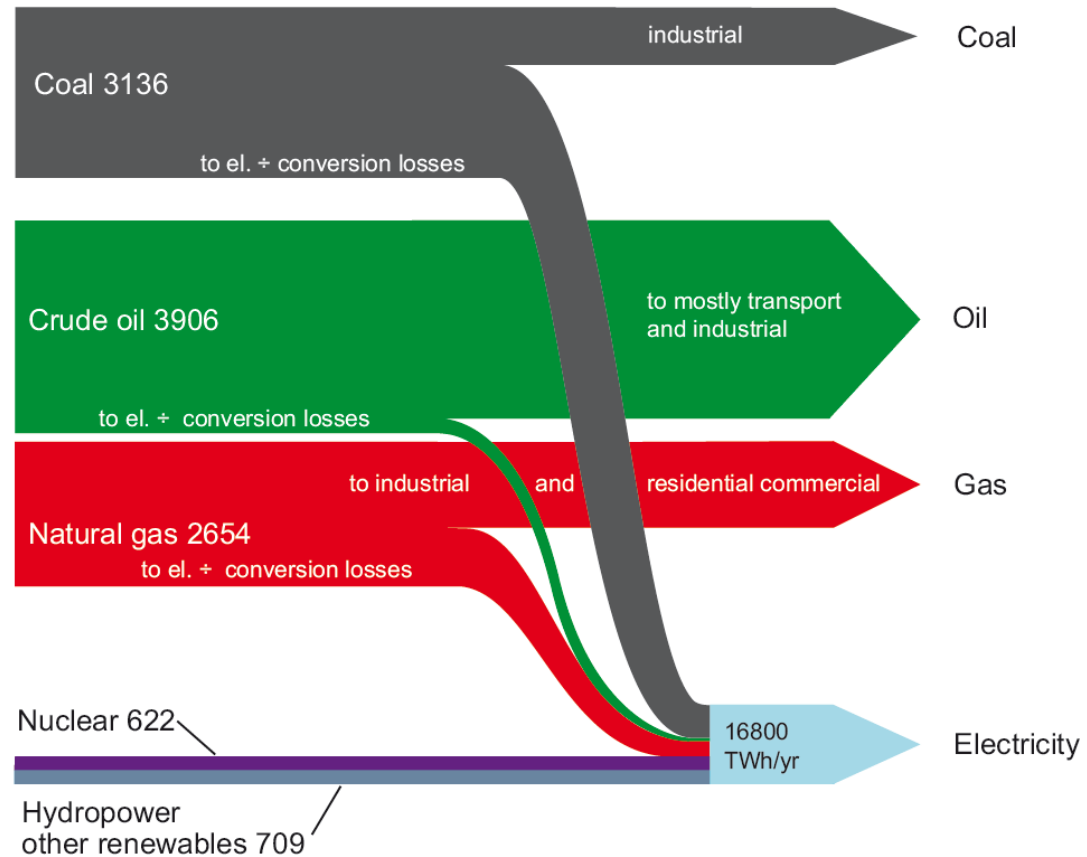


Global energy flows



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The role of
natural gas in
today's energy
picture



(Sources: BP 2008, IEA 2006, EIA 2007)



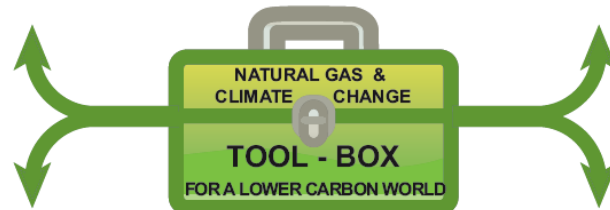
The role of NG in a Sustainable Future



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ENERGY EFFICIENCY	
IN OWN OPERATIONS	FOR NATURAL GAS CUSTOMERS
<ul style="list-style-type: none"> More efficient conversion to electricity & mechanical energy Utilize reservoir pressure and heat energy Design new gas systems based on high future energy- and CO₂ cost-assumptions 	<ul style="list-style-type: none"> Help customers find and use best available technology Make natural gas available in more regions & locations Seek out new end-use types where natural gas is particularly efficient

CUTTING FLARING AND VENTING EMISSIONS	
IN OWN OPERATIONS	FOR NATURAL GAS CUSTOMERS
<ul style="list-style-type: none"> Limit (already low) gas industry flaring and venting to very low levels Limit methane emissions from valves, flanges, start-up/stop, maintenance etc. to very low levels Remediate old town gas systems used for natural gas where applicable 	<ul style="list-style-type: none"> Assist oil industry to reduce their flaring/venting by gathering and transporting this natural gas to market Allow various forms of bio-gas into natural gas grid



CO ₂ - CAPTURE, -TRANSPORTATION AND - STORAGE (CCS)	
IN OWN OPERATIONS	FOR NATURAL GAS CUSTOMERS
<ul style="list-style-type: none"> Store already captured CO₂ in geological formations (e.g. from LNG-plants) Capture & store CO₂ from high - CO₂ natural gas Use CO₂ for enhanced gas recovery Later priority: capture CO₂ from gas turbine and boiler flue gas CO₂ as cushion gas in storages 	<ul style="list-style-type: none"> Sell CO₂ to oil companies for enhanced oil recovery Sell CO₂ -transport and geostorage space for customers

FUEL SWITCHING AND RENEWABLES	
IN OWN OPERATIONS	FOR NATURAL GAS CUSTOMERS
<ul style="list-style-type: none"> Use hydropower, wind etc. as part of the electricity supply to own plants Natural gas fuel for own trucks & ships Ultimately switch to electricity, hydrogen and heat made from natural gas with CCS Natural gas to fuels and chemicals 	<ul style="list-style-type: none"> Switch from coal to natural gas in electricity generation Introduce natural gas in new types of end-use (i.e. shipping, heavy trucks) Introduce natural gas more in energy intensive industries (e.g. steel) Produce and distribute hydrogen Mix bio-gas into gas grid

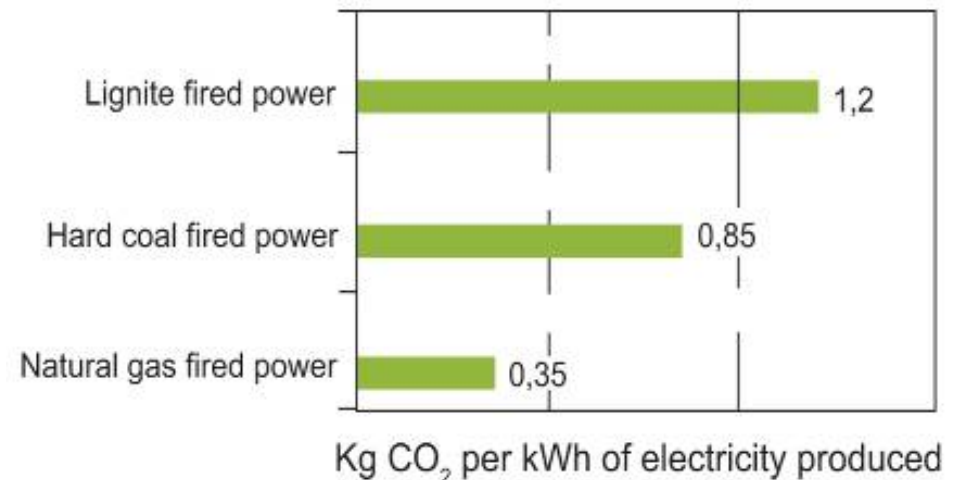




Electricity and natural gas – twins of clean energy



- There is a strong link between the future of electricity and natural gas
- Today 41 percent of global energy related CO₂ originates in electricity generation, mostly from coal
- The positive role of natural gas as part of a climate mitigation strategy is to a large part connected to natural gas – rather than coal - being preferred for future electricity generation

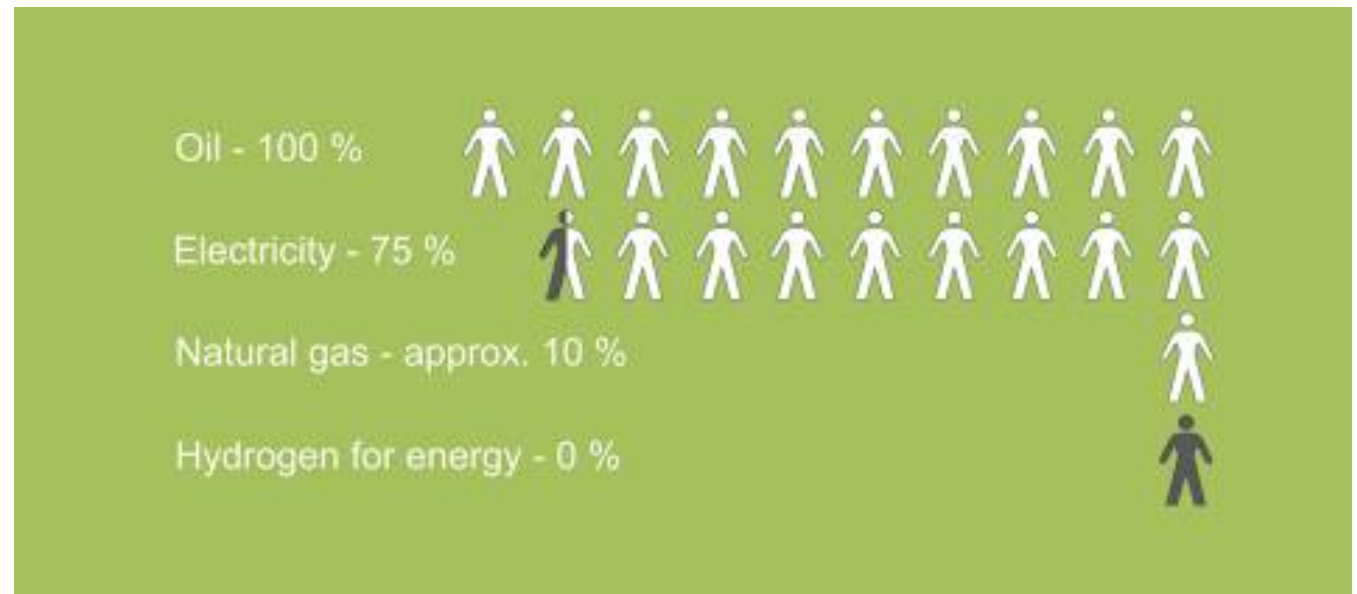




Global Access to Energy



- If natural gas is to play an important role in climate change mitigation, it must become available to more of its potential users
- As indicated in this illustration, natural gas reaches only about 1 out of 10 at present while oil is universally available and electricity available to about 3 out of 4
- This may not be the only way to look at the availability issue, but it still illustrates that it may limit end-use growth

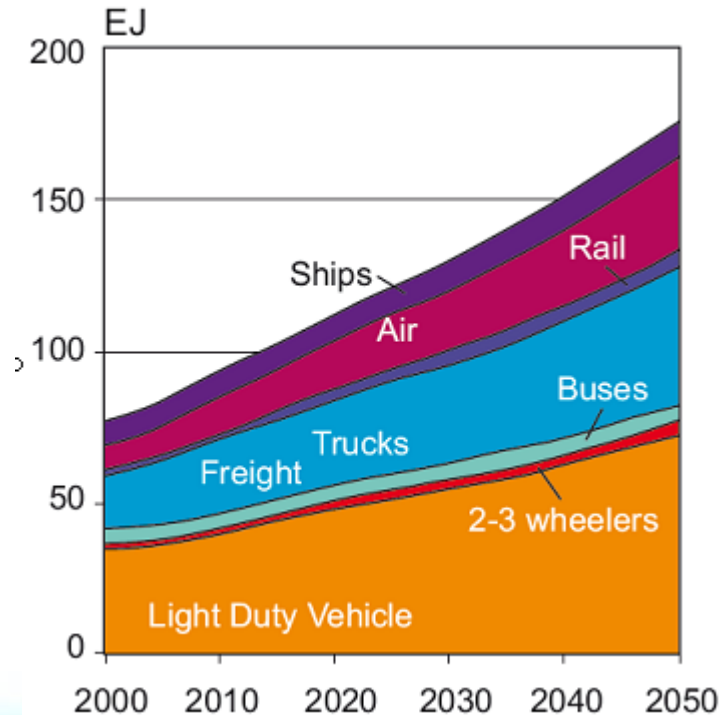




The Transportation Sector



- The use of natural gas as a fuel for all sorts of vehicles (NGV's) are increasing rapidly around the world
- This would greatly enhance local and regional air quality and at the same time boost climate change mitigation
- It is projected that this end-use sector ten-fold to 65 million vehicles by 2020 with a gas use amounting to 14 percent of today's consumption
- Another important – and mostly overlooked – sector is the use of natural gas (LNG) as a ship fuel
- Outside the LNG-trade itself, only a couple of handful's of large ships use LNG as a fuel. Like for vehicles, the benefit to air quality and climate will be substantial
- This is an area where the local availability of natural gas is an important issue



Projected CO2 emissions

(Source: IPCC AR4 WG3)



Natural gas bus in India



LNG-fuelled ferry Bergensfjord





The gas industry as CCS pioneers



- The gas business is the pioneering industry in the area of CO₂-capture, -transportation and -storage
- This is expected to become an important technology for mitigating climate change through keeping CO₂ usually emitted from large point sources away from the atmosphere
- Some energy and climate modellers think that perhaps 20+ percent of necessary mitigation can come from this technology



Sleipner



In Salah



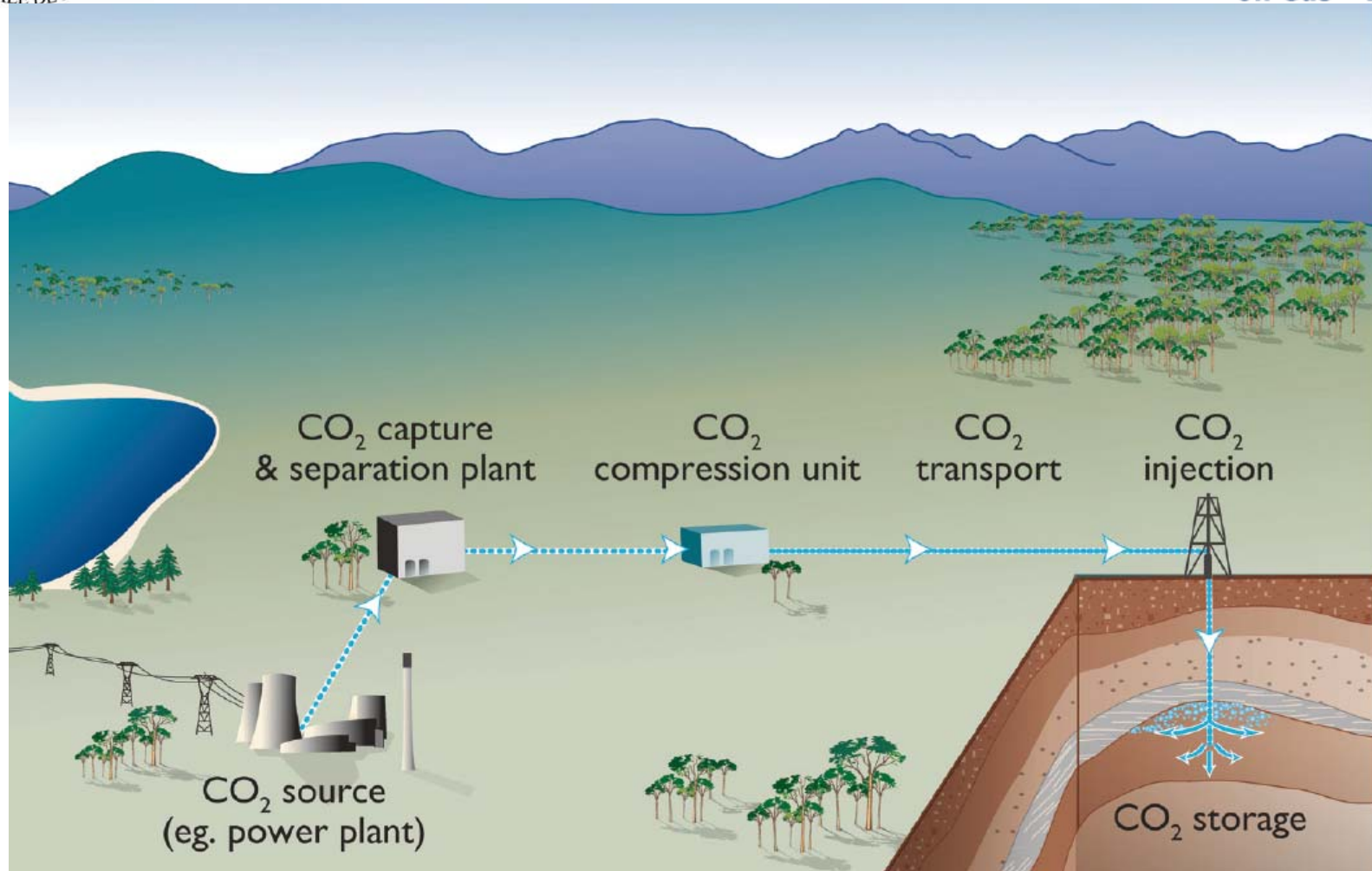
Snøhvit



- There are at present four large scale operating CCS projects in the world.
- From left to right the Sleipner project in Norway, the In Salah project in Algeria, The Snøhvit project in Norway and the Weyburn-Midale projects in Canada



CCS Scheme





Renewables and Natural Gas – Weaving a Mutual Relationship



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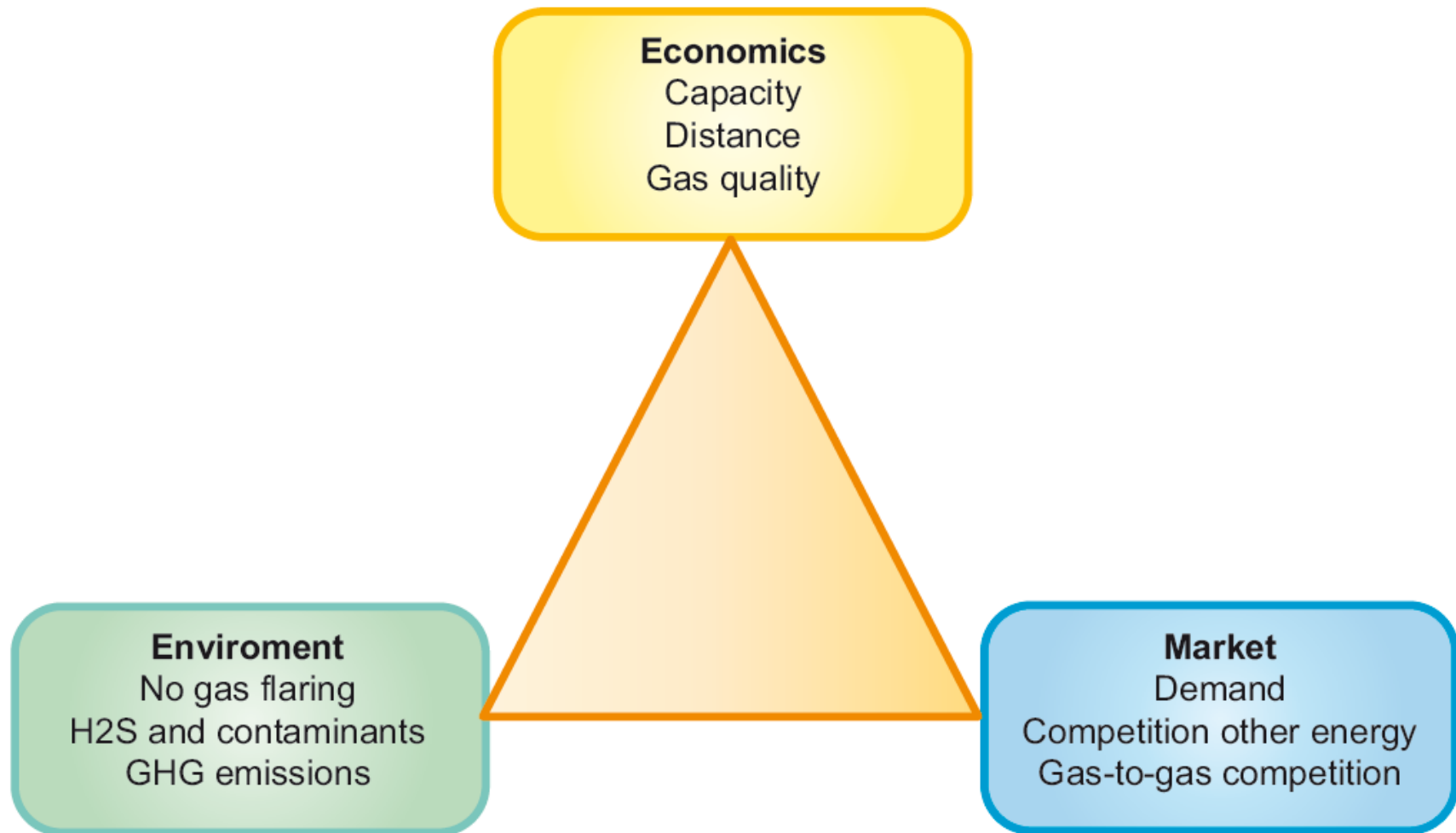
- **The electric grid is used for all generation types (coal, nuclear, wind, solar, geothermal+)**
- **In much the same way we are starting to see the natural gas grid being used for biogas**
- **Renewables are of an intermittent nature and not necessarily available according to customers demand**
- **This is why for instance solar thermal energy team up with natural gas to generate steam (night, clouds)**
- **Gas turbines can start and stop much more rapidly than coal or nuclear boilers for generating electricity. Storable natural gas fired in gas turbines is therefore ideal in combination with fluctuating renewable power**

Biogas plant feeding gas pipeline





Cutting gas flaring for the oil industry



(Source: GGFRP)



Benefits of Natural Gas



- **Cleanest fossil fuel**, highly efficient form of energy
- **Delivered to customers almost totally free of impurities**, chemically less complex
- **Cleaner energy production**

Pollutant (relative; coal 100%)	Natural Gas	Oil	Coal
Carbon Dioxide	56%	79%	100%

- **Highly efficient**, 90% of the NG produces is delivered to customers as useful energy



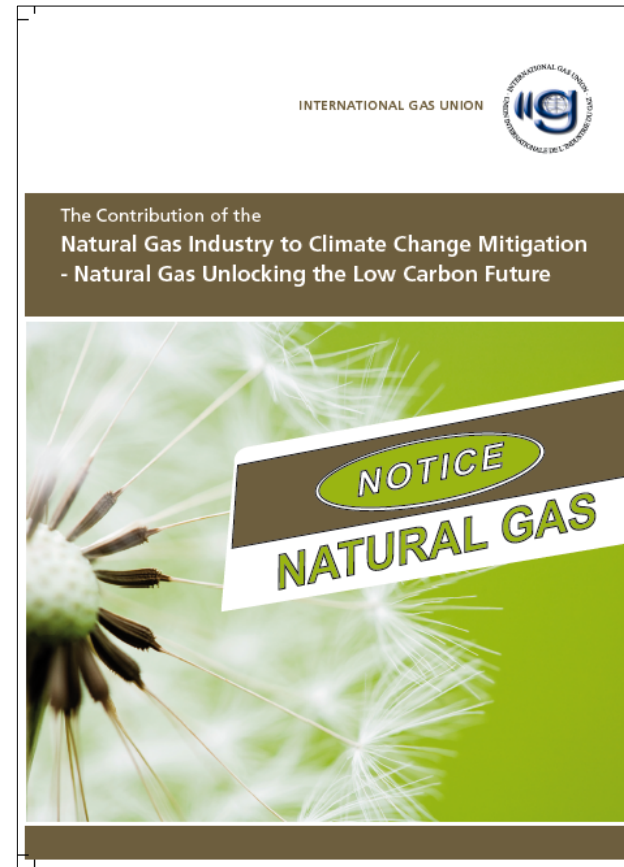
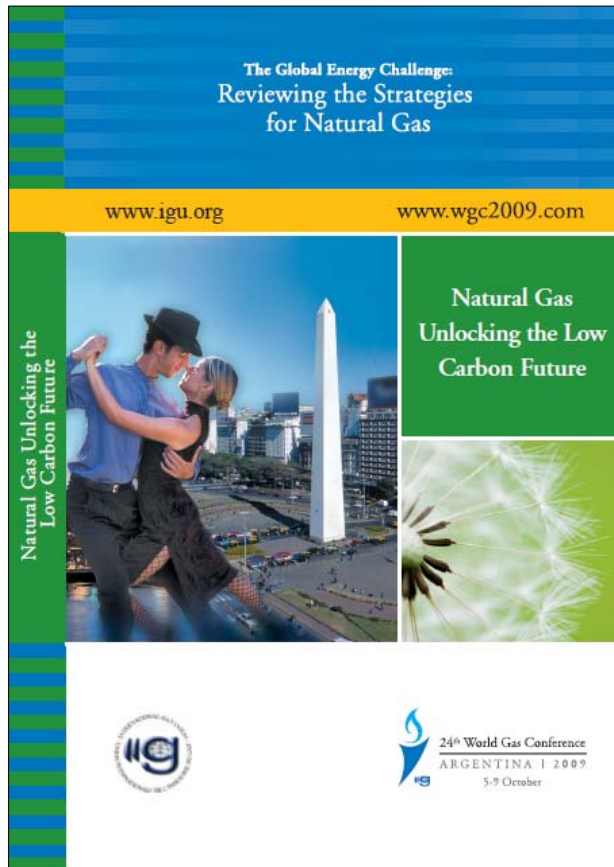


Reports available on www.igu.org



Brochure

Main report





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