Gas & LNG Business Forum

World Gas Supply (Conventional and Unconventional Gas Map), Market and Commercialization

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The global energy future

- Rising population – 9 billion in 2050
- Human strive for a better life
- Technological progress
- Climate change concerns
IEA forecasts growing gas demand in the future

Source: IEA WEO 2010

World energy demand expands by 45% between now and 2030 – an average rate of increase of 1.6% per year – with coal accounting for more than a third of the overall rise.
Technological progress

- Unconventional gas
  - Shale gas, tight gas and coal bed methane

- LNG Developments
  - Large scale plants, ships, terminals

Impact on availability and affordability
Natural Gas reserves: plenty & more to come

Proven conventional reserves* are growing

In addition:
Unconventional gas has come within technological & economic reach

The total long-term recoverable gas resource base is more than 850 tcm, only 66 tcm has already been produced.

- IEA-WEO2009 -

* 185 tcm in 2008
Natural Gas is affordable – including unconventional

Long-term gas production cost curve

Note: 5 $/MMBtu gas compares to less than 30 $/bbl oil

Source: IEA WEO 2009
Affordability of Gas

U.S. Oil and Natural Gas Prices
1994-2009

Source: EIA
Prices of Natural Gas and Coal
2007-2009

Source: CME, NGSA
Cost of Electricity Generation

- Variable O&M
- Fuel
- Capital

2008 cents per kilowatt-hour:
- IGLB (Integrated Gas and Wind)
- Natural Gas Combined Cycle
- Advanced Supercritical Pulverized Coal
- Wind turbines
- Coal Integrated Gasification Combined Cycle
- Nuclear

Natural gas in power generation
- climate friendly

- Replace coal with gas
- GHG reduction potential

CO2 emission for different types of power generation

- Old coal plant: 300%
- State-of-the-art coal plant: 200%
- New CCGT: 100%

Source: Deutsche Bank/Statoil
Replace coal with gas

Reduction of particles and soot
Fuel switching potential

Percentage of lignite and hard coal in power generation

- **Poland**: 93%
- **China**: 79%
- **India**: 68%
- **Denmark**: 55%
- **USA**: 51%
- **Germany**: 51%
- **World**: 39%

2005 Data
Natural Gas can enable renewable energy

Natural Gas - Wind - Solar

Natural gas can facilitate production of intermittent renewables

An ideal combination
Efficient and clean partner for renewables

Example
Onshore wind supplies some 2700 hrs of intermittent power backed up by 4300 hrs of gas-fired power, ensuring that supply meets demand.

- Wind and solar energy is volatile.
- Gas-fired generation capacity can enable wind and solar power supplies.
Cost of reducing CO2 emissions

Cost of saving carbon emissions
€ per tonne of CO2 by 2030

- Building gas-fired power stations instead of coal-fired: €0.5
- Building nuclear plant: €10.5
- Building wind farm: €22.4
- Building coal-fired plant that captures CO2 emissions: €37.5

Source: McKinsey
Public and policy perceptions

GHG Emissions Spectrum

Clean Energy
- Solar
- Nuclear
- Wind
- Natural Gas

Fossil Fuels
- Oil
- Coal

Source: IHS CERA/IGU
A robust & climate-friendly energy policy

- Enhance energy efficiency and savings
- Increase the use of gas in power generation
  - Gradually replace coal with gas
- Phase in cost-effective renewable energy
- Develop Carbon Capture and Storage technology

Pick the "low-hanging fruits" first!
Policy-makers and regulators:

- Give natural gas the role it deserves in the energy future
- Give clear signals to the industry
- Gas supports employment and a sustainable economy

Gas:

Part of the long term energy solution