Global Vision for Gas

The Pathway to a Sustainable Energy Future

Presentation and discussion of IGU-publication
"Global Vision for Gas: The Pathway towards a Sustainable Energy Future"

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Oslo, 21 February 2013

The global energy future

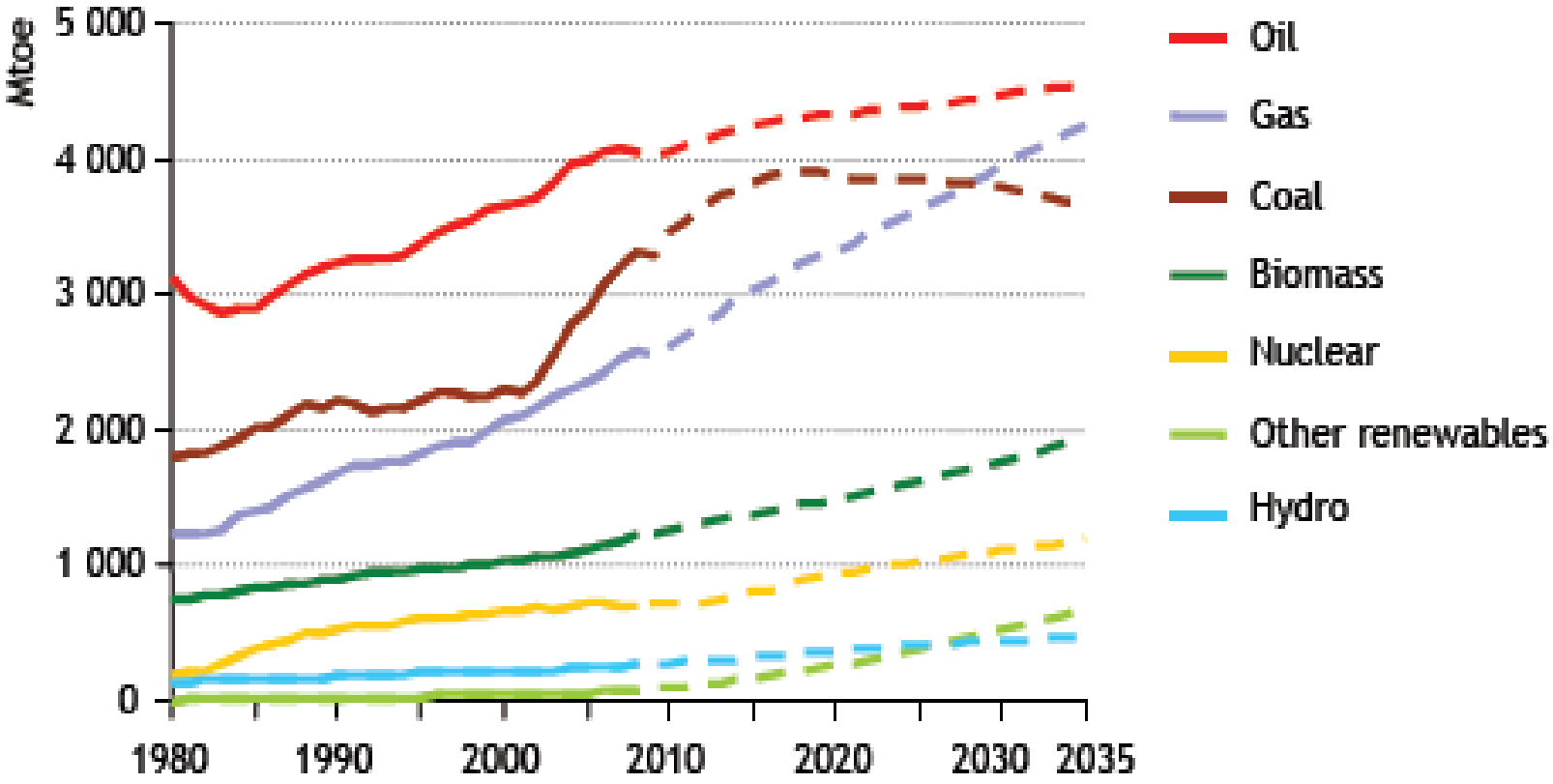
Impacting the global framework:

- Rising population – from ca. 7 to 9 billion in 2050
- Human strive for a better life
- Technological progress
- Air quality & climate change concerns

The world needs:

- More energy
- Cleaner energy
- Safe energy
- Affordable energy

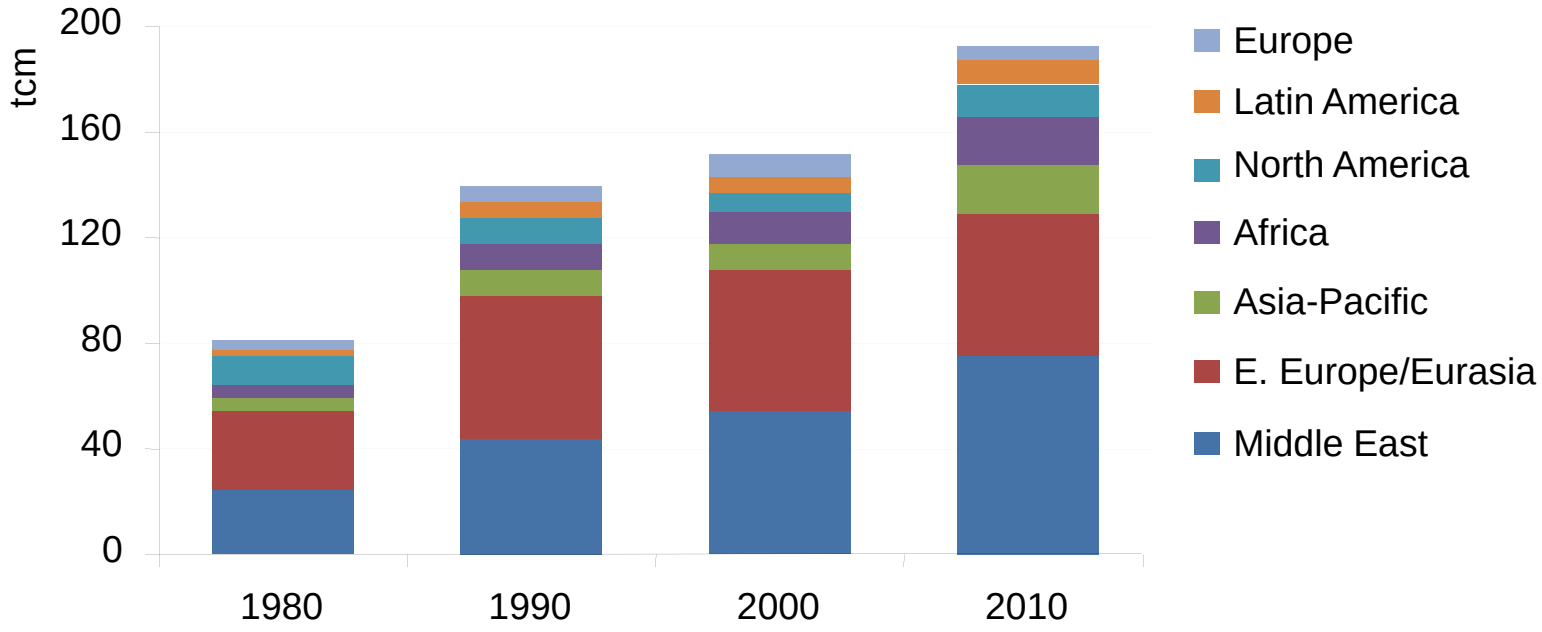
Growing energy demand – need for all energy sources available



Source: IEA, The Golden Age of Gas, 2011 (the GAS scenario)

Conventional reserves: plenty and more to come

Growing proven reserves



Global proven gas reserves have more than doubled since 1980, reaching 190 trillion cubic metres at the beginning of 2010

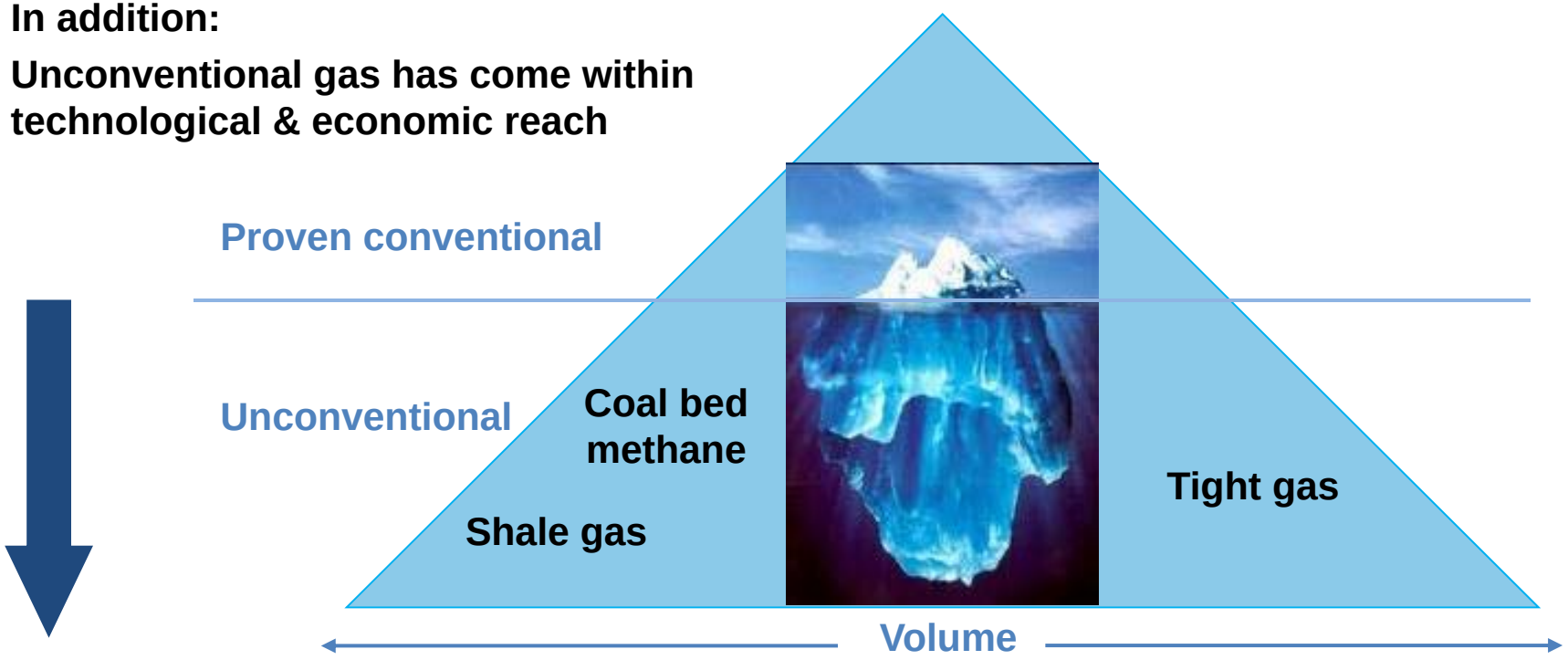
Source: IEA 2011

Natural gas resources are abundant

Proven conventional reserves* are growing

In addition:

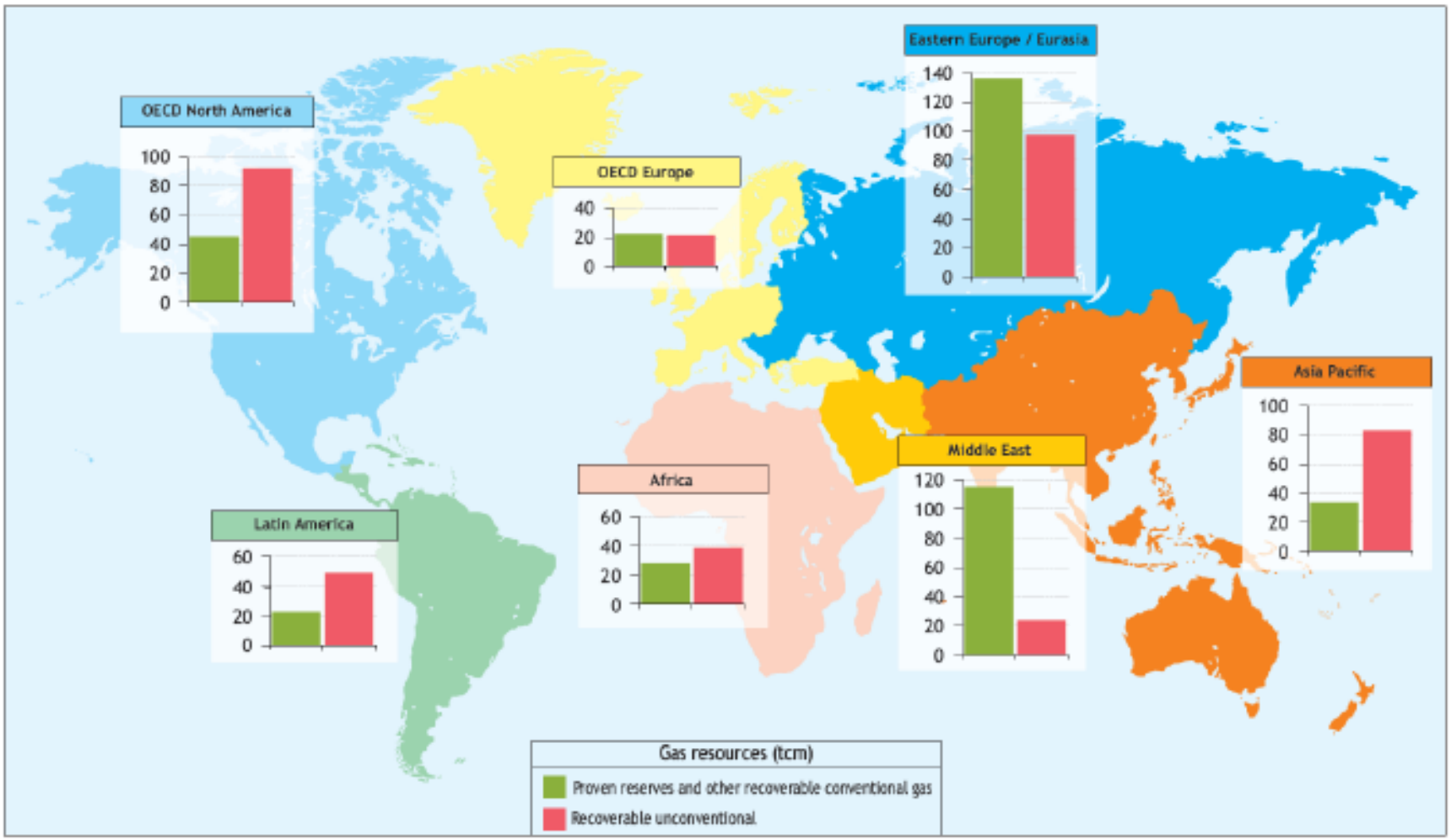
Unconventional gas has come within technological & economic reach



The total long-term recoverable conventional gas resource base is more than 400 tcm, another 400 tcm is estimated for unconventionals: only 66 tcm has already been produced. ***- IEA-Golden Age of Gas 2011-***

* 190 tcm in 2010

World gas resources – Conventional (green) & unconventional (red)



Source: IEA 2011

Natural gas can enable renewable energy

Natural Gas - Wind - Solar

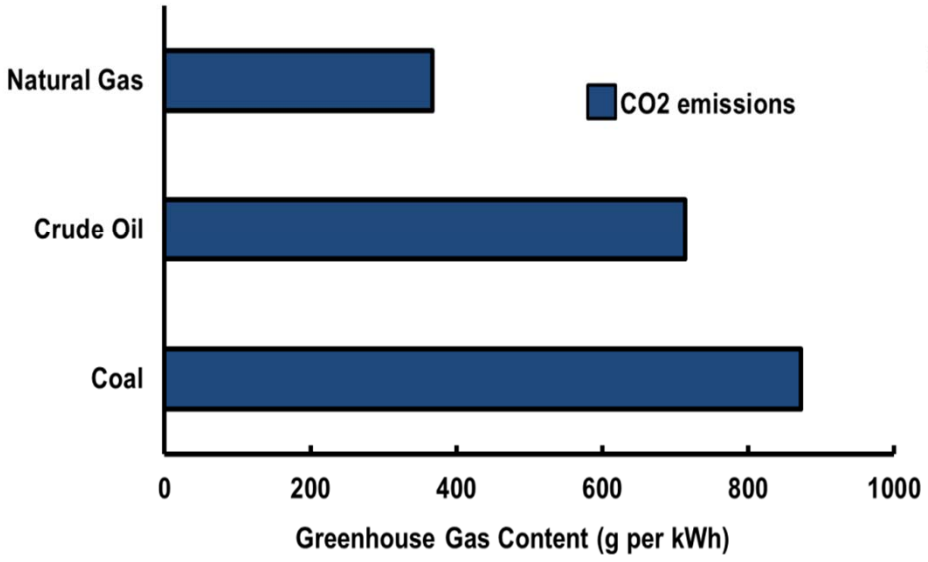
Natural gas can produce clean base load support for variable renewables

An ideal combination

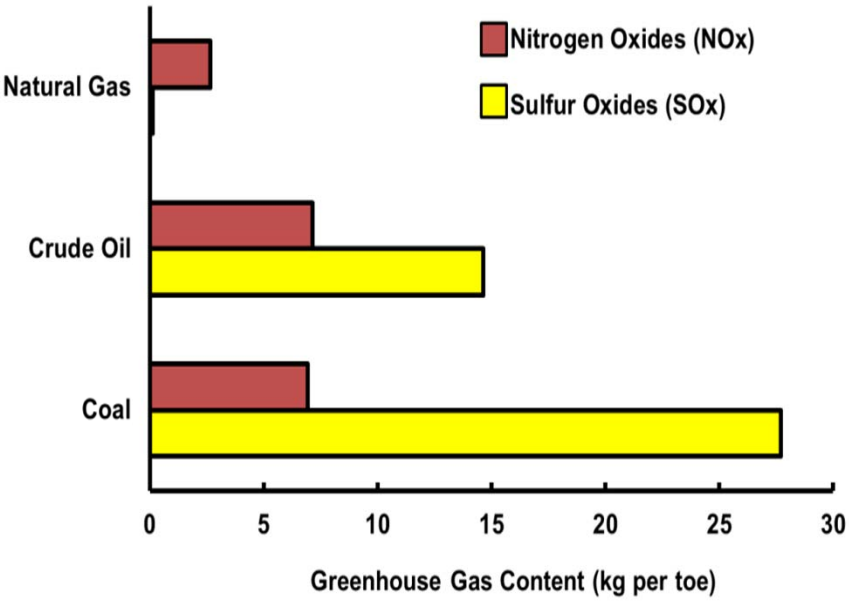
Natural gas can contribute to better air quality and to mitigating climate change

Natural gas is a clean-burning and low carbon fuel

Carbon dioxide emitted during electricity generation by fuel*



NOx and SOx content by fuel



Ad *: Power generation efficiencies assumed: Natural gas 55%, crude oil 37%, coal 39%

Natural gas for transportation

Natural gas is applicable for most kinds of transportation

Investment in natural gas infrastructure does not predetermine future energy landscape

Adaptability of natural gas is key advantage:

- **Gas-fired generation can evolve in a variety of directions:**
  - Capture carbon through retrofit technology
  - Partnership with variable sources of renewable power generation
  - Greater inclusion of carbon-neutral biogas

- **Gas pipeline and storage system provides further future options for:**
  - CO_2
  - Biogas
  - Hydrogen

Natural gas:
Addressing the key global challenges

Key global challenges:

- Population Growth & Resource Availability
- Economic Development & Employment
- Energy Poverty & Public Health
- Air Quality & Climate Change
- Mobility
- Affordability

Role of natural gas:

Abundant resources

Industrial feedstock & employment creation

Reduce urban smog & indoor pollution

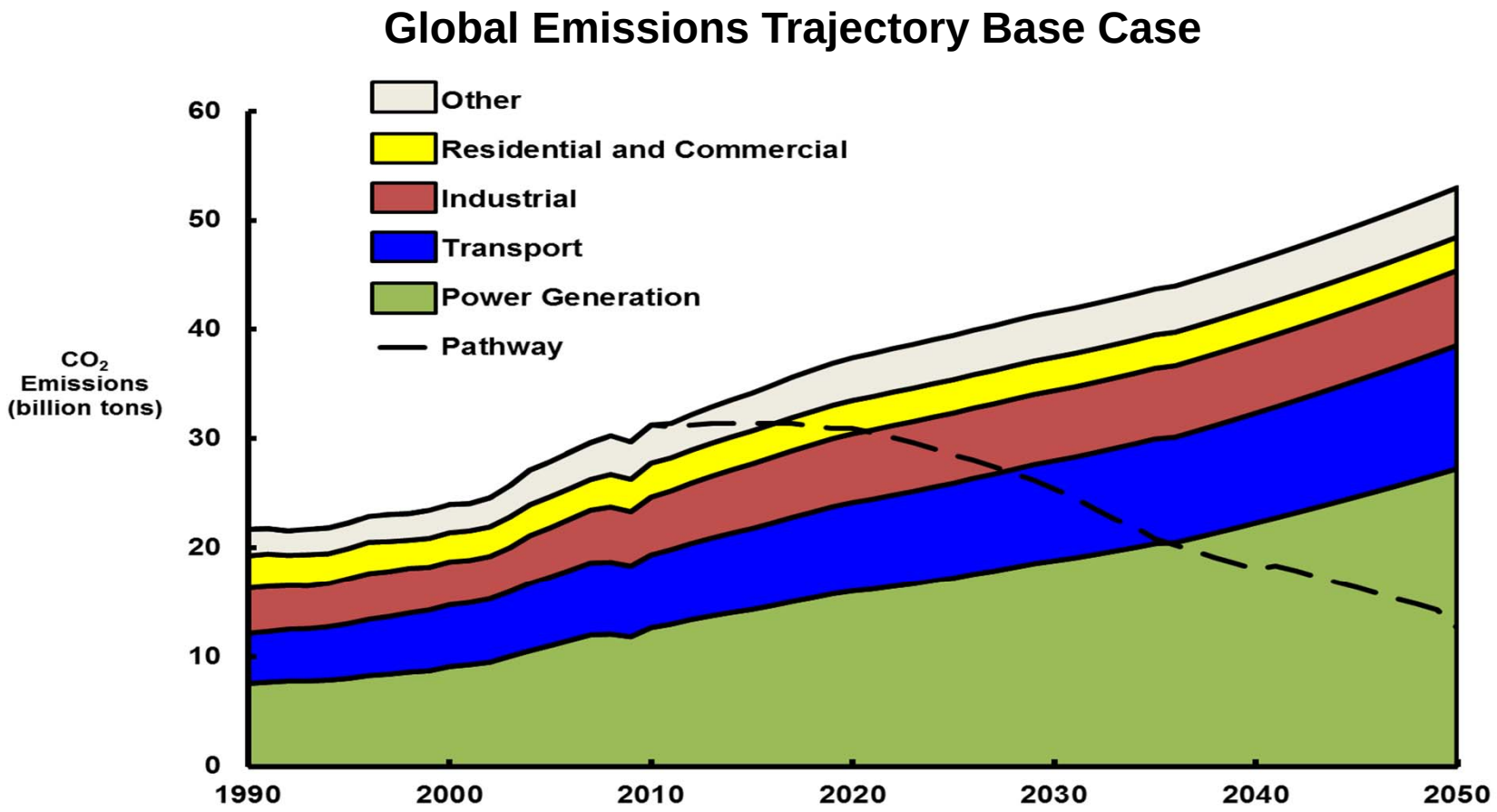
Low emissions

LNG, CNG & electricity for transportation

CCGT as lowest cost low-carbon technology

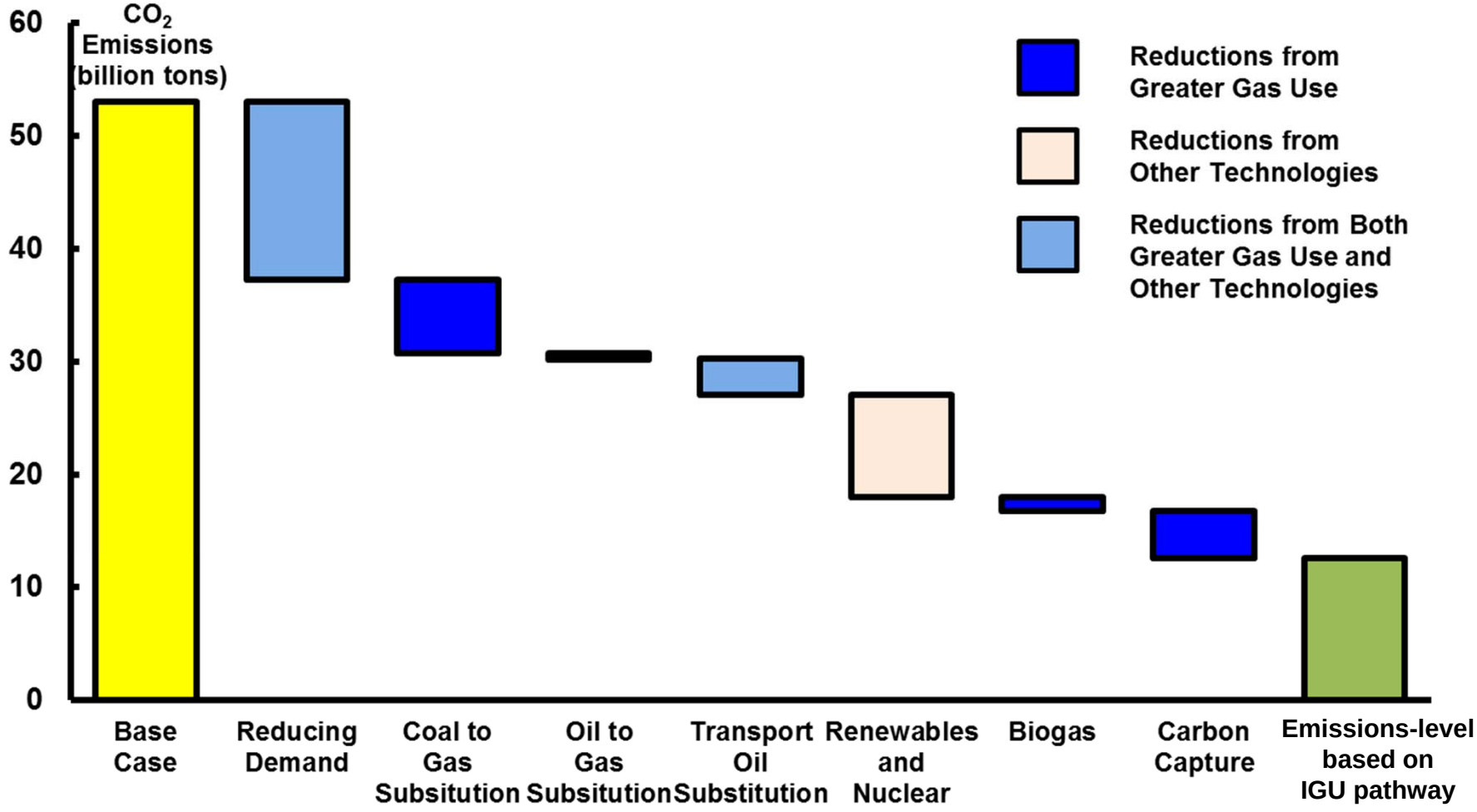
The Pathway towards a sustainable future

Meeting future global energy needs – whilst addressing air quality and climate change concerns



Vision Pathway highlights various CO_2 abatement options and technology choices

Calculation for 2050



A robust and sustainable energy policy

- **Energy efficiency & savings**
- **Use more gas in power generation and transportation**
- **Phase in renewable energy**
- **Develop Carbon Capture and Storage technology**

Gas: The fuel of today and tomorrow!

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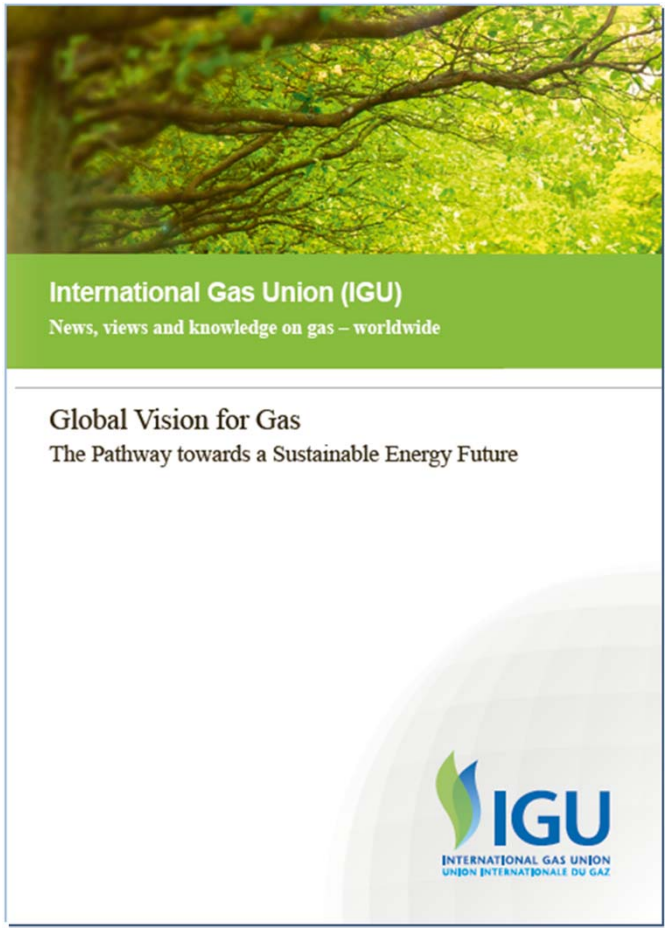

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Thank you

For your attention

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