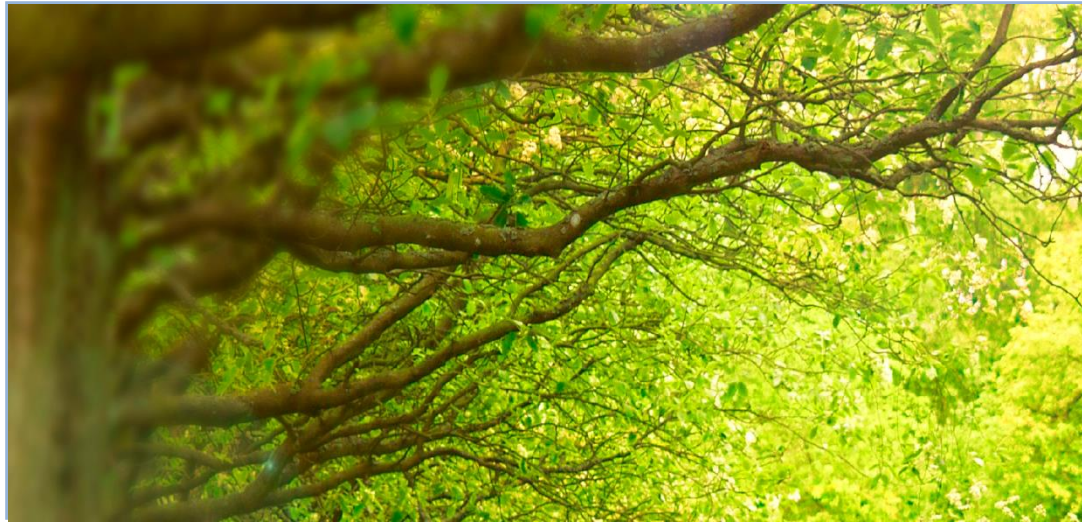


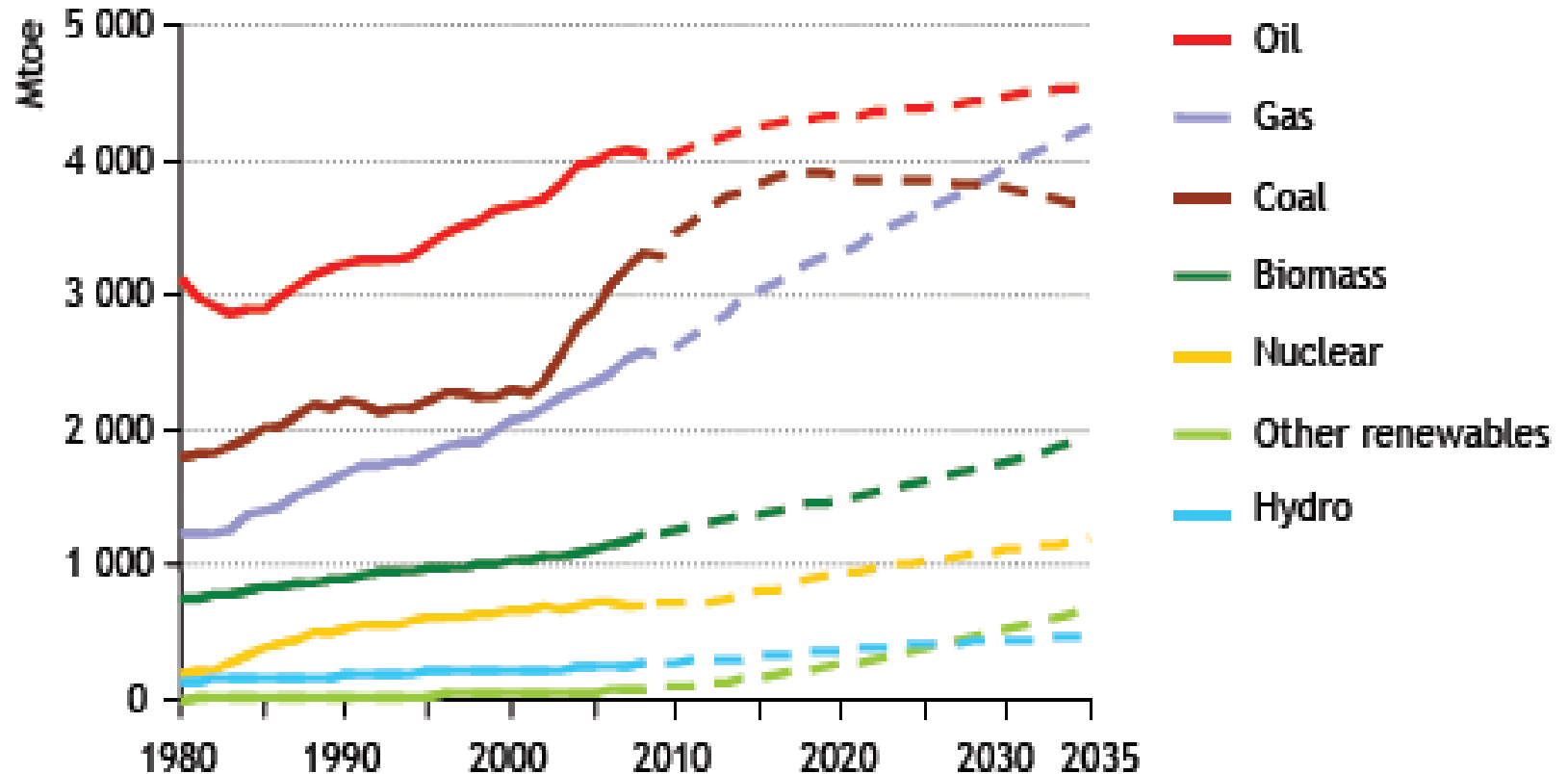
The Global Vision for Gas Opportunities and Uncertainties



FUTURE INNOVATION IN ENERGY PLANNING
Thursday, September 26, 2013

Menelaos (Mel) Ydreos
Vice Chairman, Coordination Committee
International Gas Union

Growing energy demand – need for all energy sources available

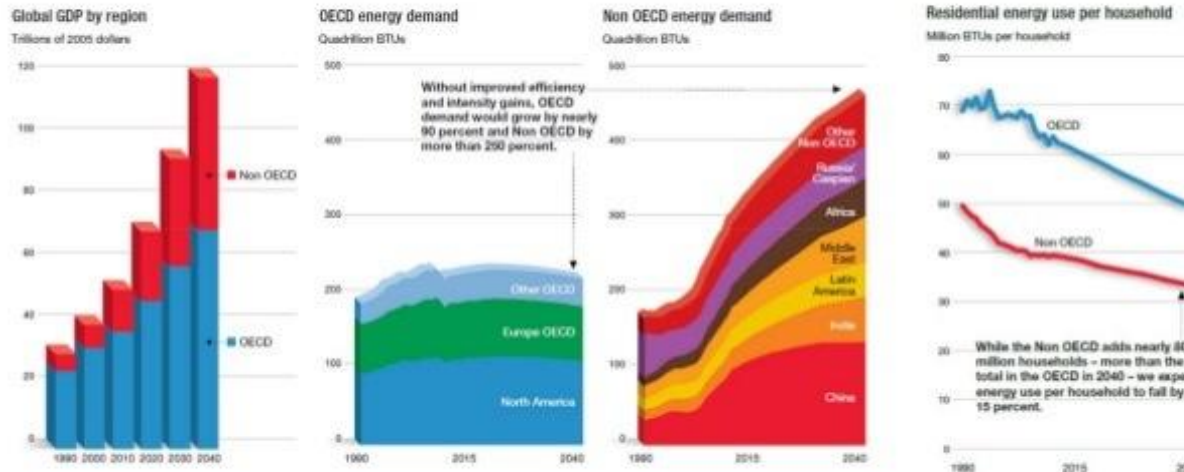


Source: IEA, The Golden Age of Gas, 2011 (the GAS scenario)

An uncertain energy demand future

Global Energy Demand Growth To Decelerate

- ExxonMobil sees global energy demand rising by 20% from 2010 to 2025, but by only 10% from 2025 to 2040.
- Many OECD countries, plus China – populations will change little by 2040. This global population growth deceleration, coupled with gains in energy efficiency, will add significant slowdown to the historical energy demand growth trend.
- Energy demand growth in Non-OECD countries will continue to outpace developed nations of OECD – China’s CNOOC recently paid 60% premium to acquire Canada’s Nexen.



Source: 2012, *The Outlook for Energy: A View to 2040*, ExxonMobil
 Note: OECD: [Organization of Economic Co-operation & Development](#)



Natural Gas: Addressing the World's 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

Feedstock and employment

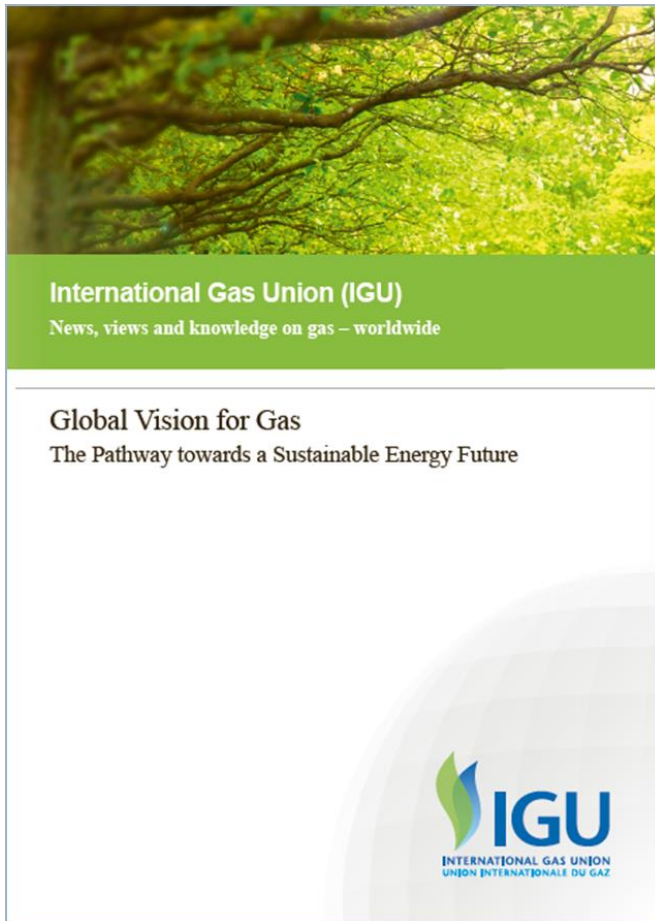
Reduce smog and pollution

Low SO_x, NO_x and CO₂

LNG and CNG for transport

CCGT low cost

Global Vision for Gas: The Pathway towards a Sustainable Energy Future



Download from:

<http://www.igu.org>

Global Vision for Gas

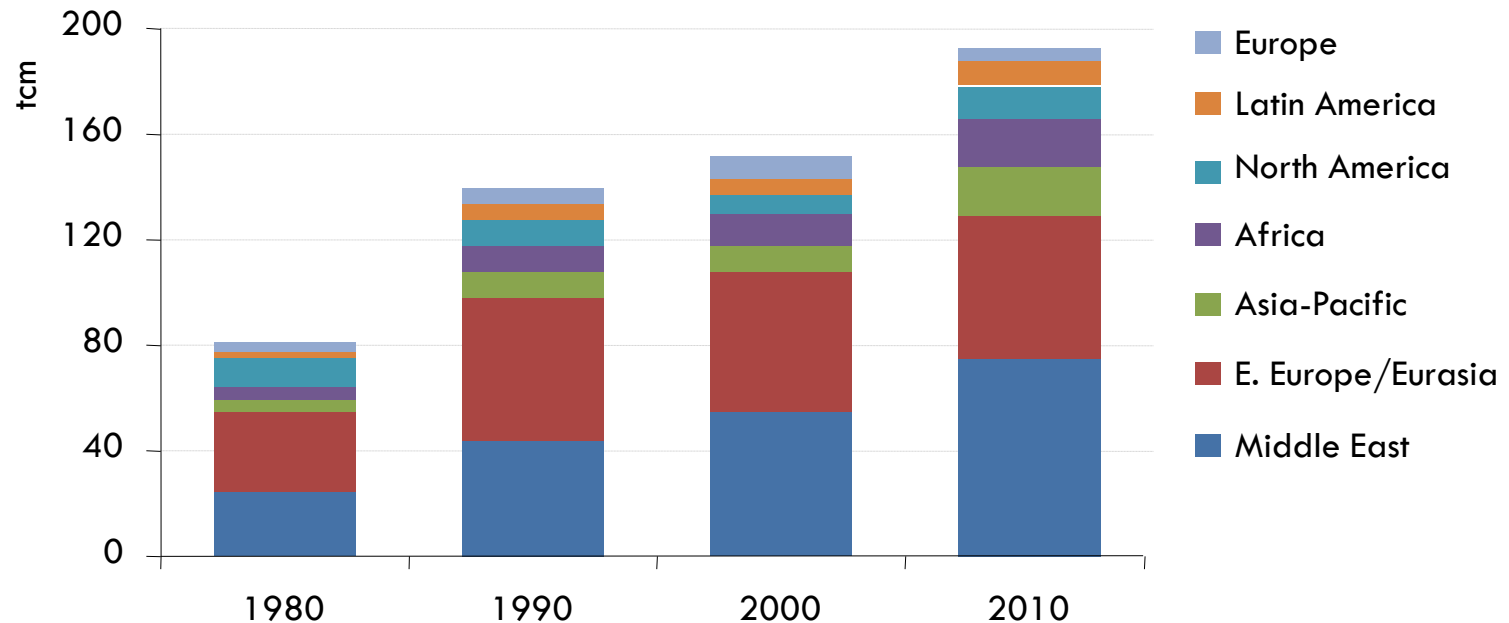
Lays out a clear pathway towards a sustainable energy future

- **Abundant**
- **Available & Accessible**
- **Affordable**
- **Adaptable**
- **Acceptable:**
 - **Sharply reduced greenhouse gas emissions.**
 - **Improved air quality and public health**



Conventional reserves: plenty and more to come

Growing proven reserves



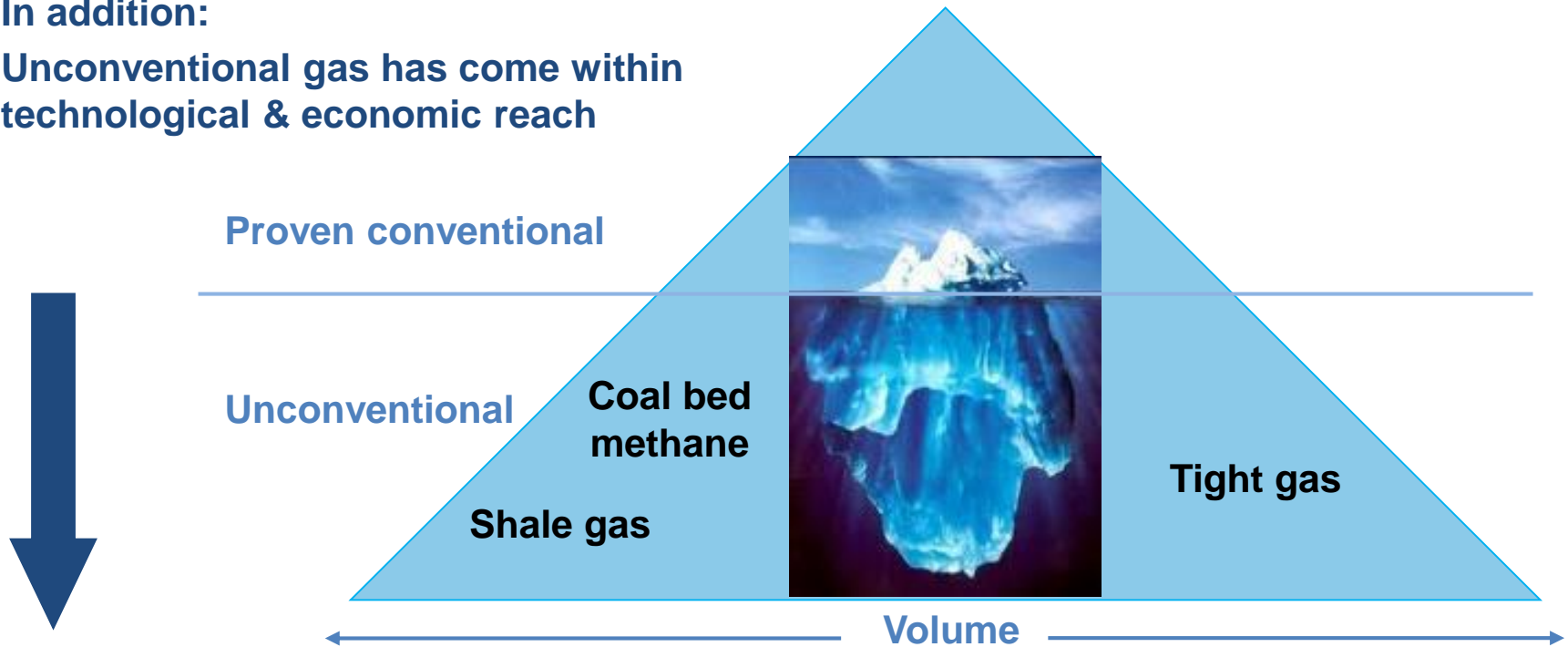
Global proven gas reserves have more than doubled since 1980, reaching 190 trillion cubic metres at the beginning of 2010

Natural gas reserves: plenty & more to come

Proven conventional reserves* are growing

In addition:

Unconventional gas has come within
technological & economic reach



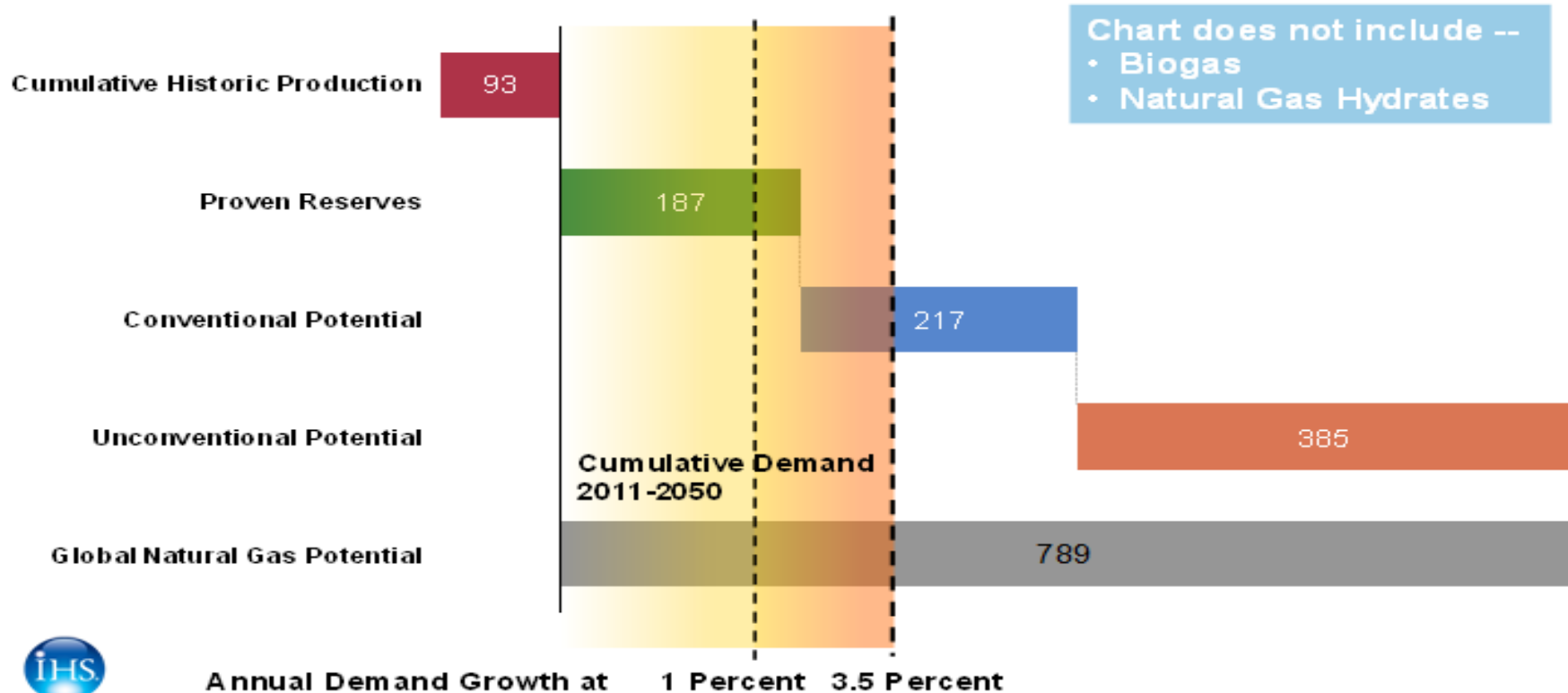
The total long-term recoverable conventional gas resource base is more than 400 tcm, another 400 tcm is estimated for unconventional: only 66 tcm has already been produced.
- IEA-Golden Age of Gas 2011-

* 190 tcm in 2010

Resource Availability

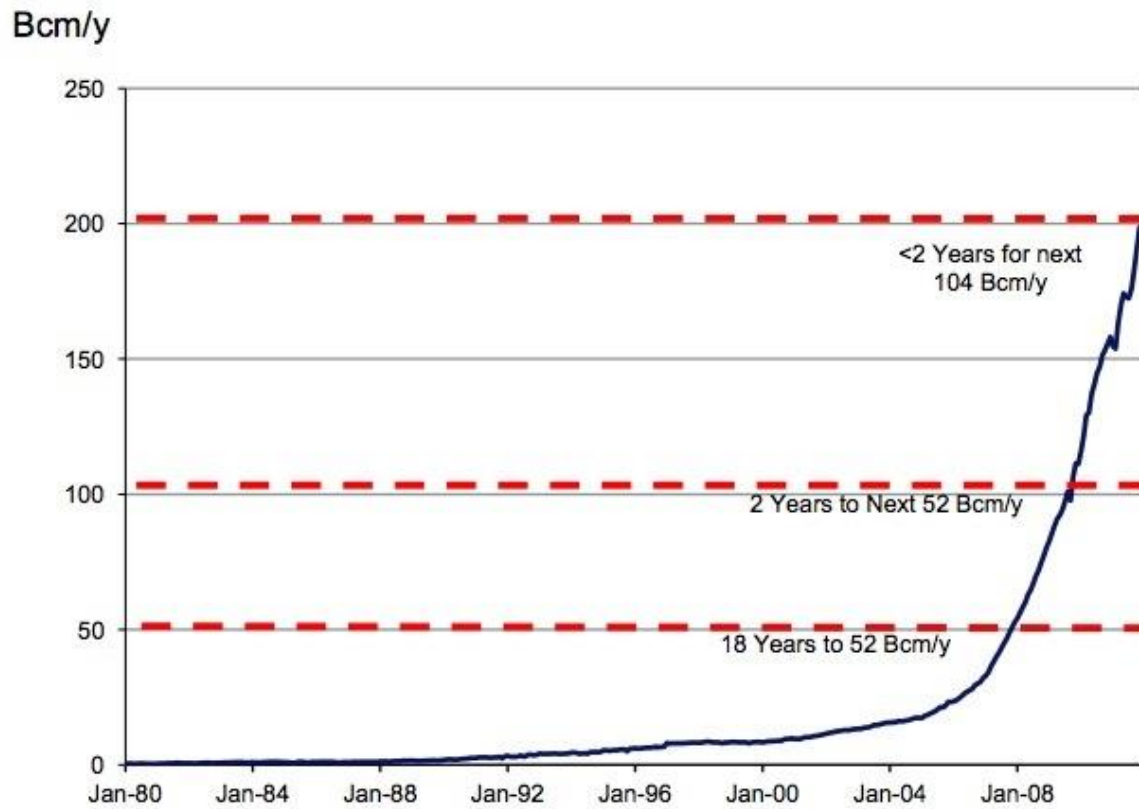
What is the Global Availability of Natural Gas? Global Natural Gas Recoverable Resources vs Demand

(Trillion Cubic Meters)



U.S. Shale Gas Production Growth

Exhibit 1: Shale production growth in the US has been nothing short of extraordinary

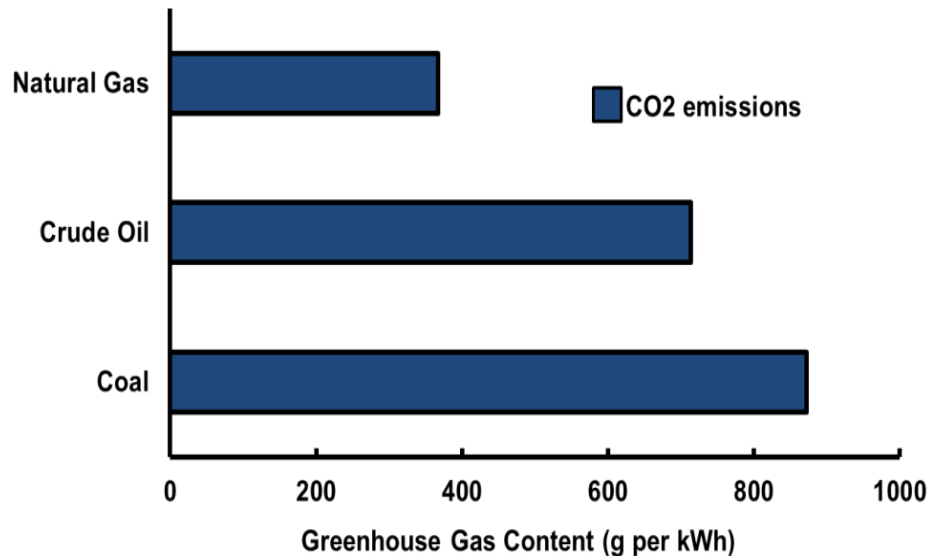


Source: HPDI, Credit Suisse se

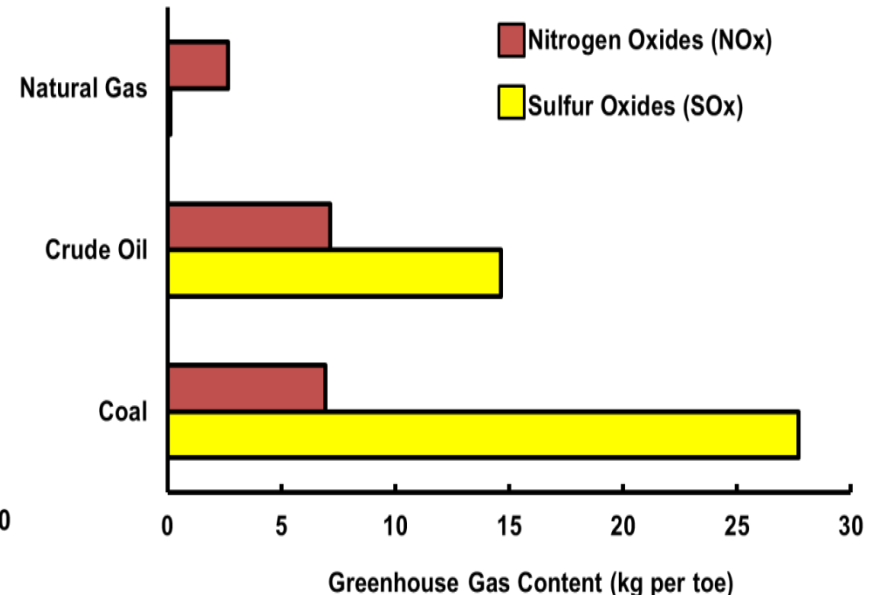
Natural gas can contribute to better air quality and to mitigating climate change

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%

Fabulous renewable resources:

- Windpower needs wind
- Solar power needs sun

Ideal pairing resource

- Gas quickly in place when sun and wind temporarily can not contribute



Natural gas for Transportation

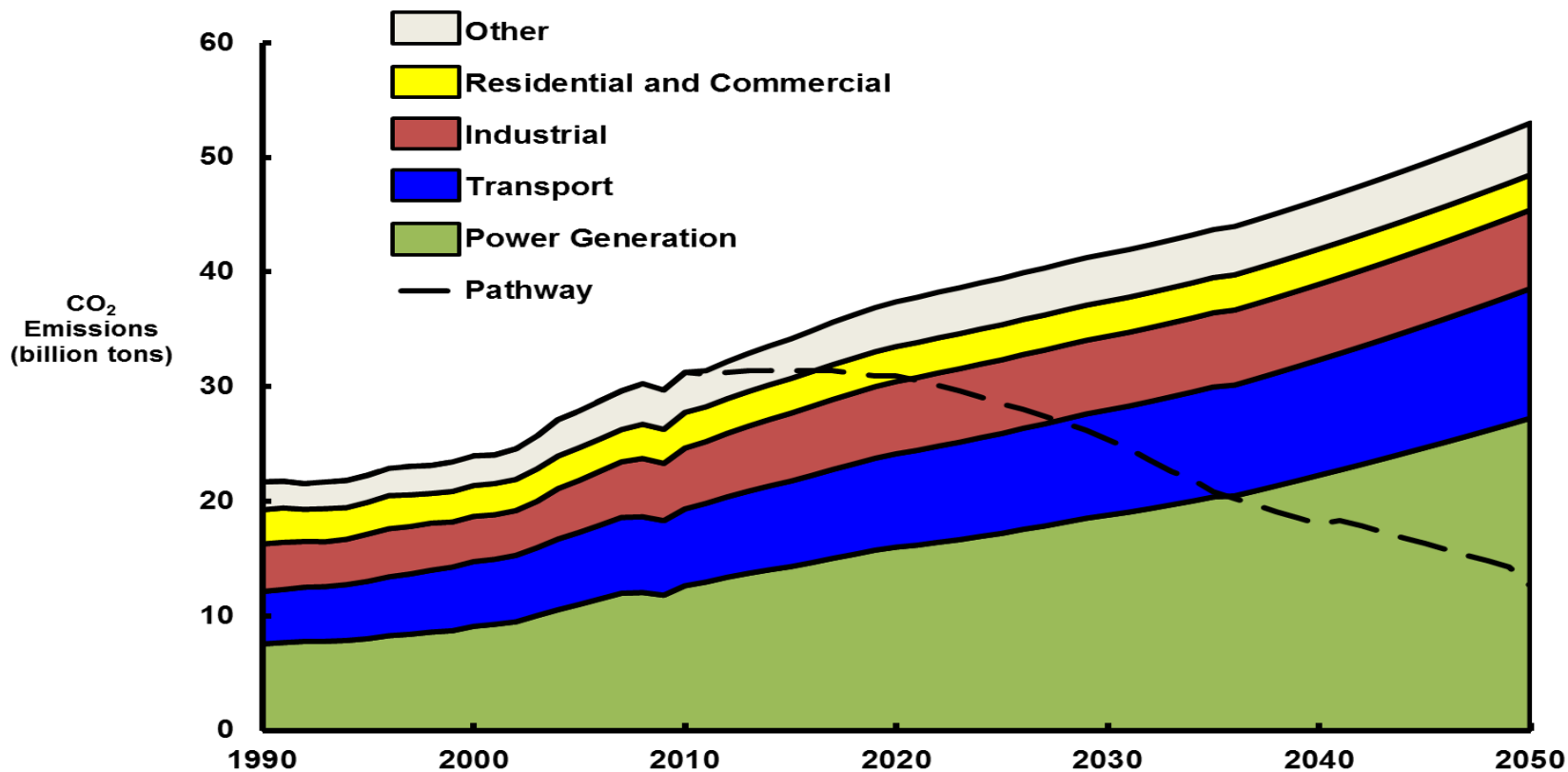


Natural gas is applicable for most kinds of transportation

The Pathway towards a Sustainable Future

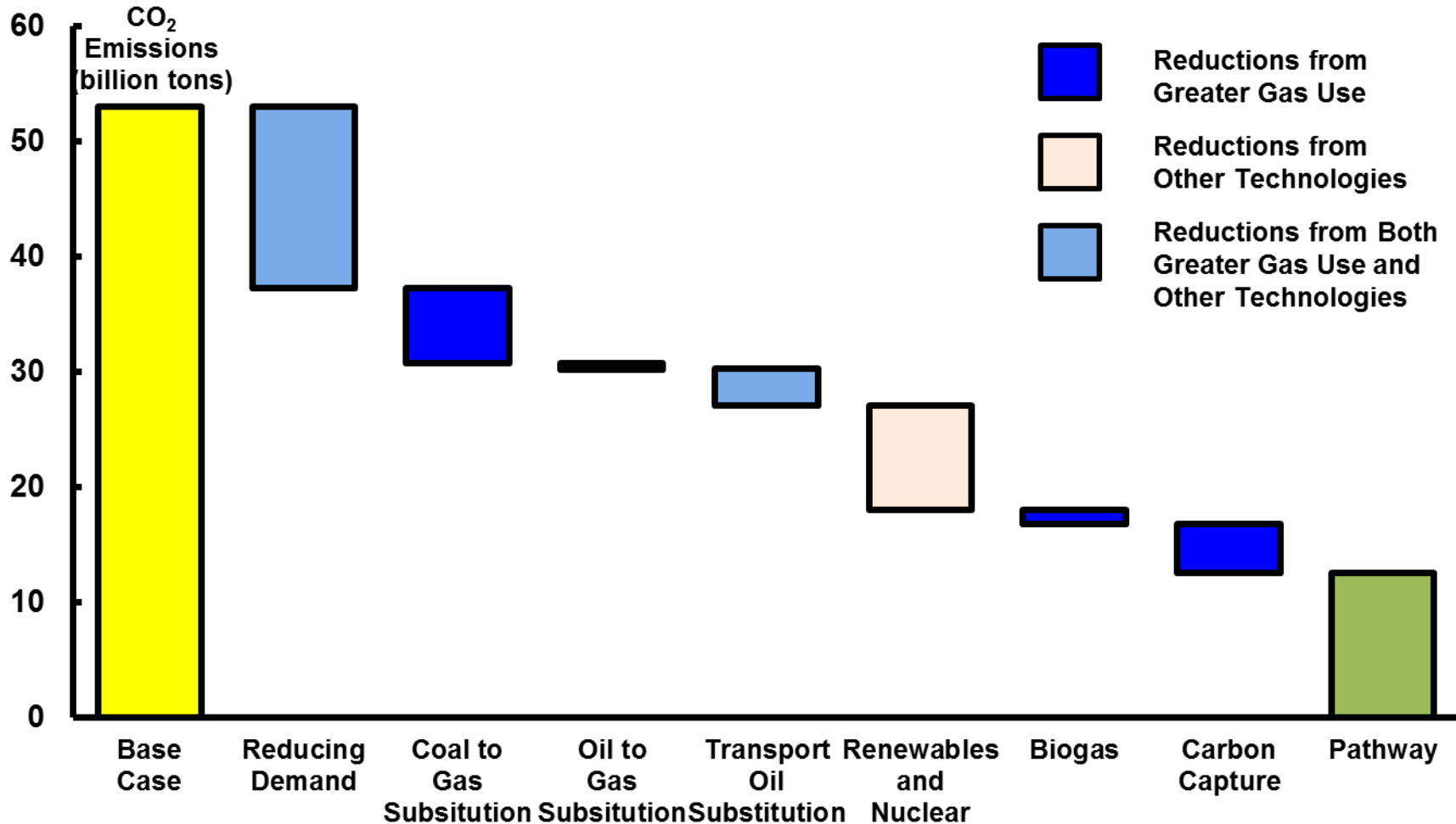
Meeting future global energy needs
whilst addressing air quality and climate change concerns

Global Emissions Trajectory Base Case

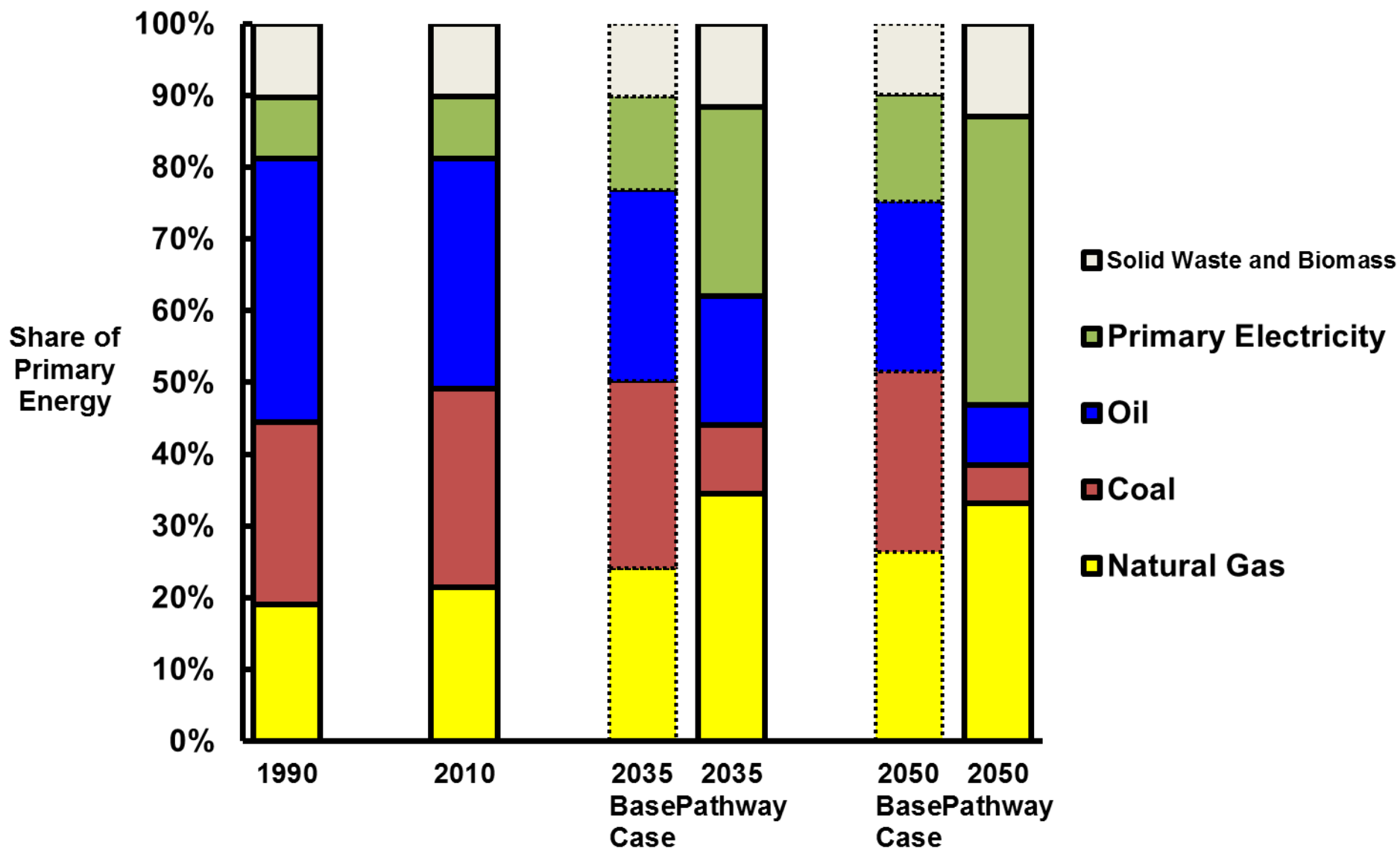


Vision Pathway highlights various CO₂ abatement options and technology choices

Calculation for 2050

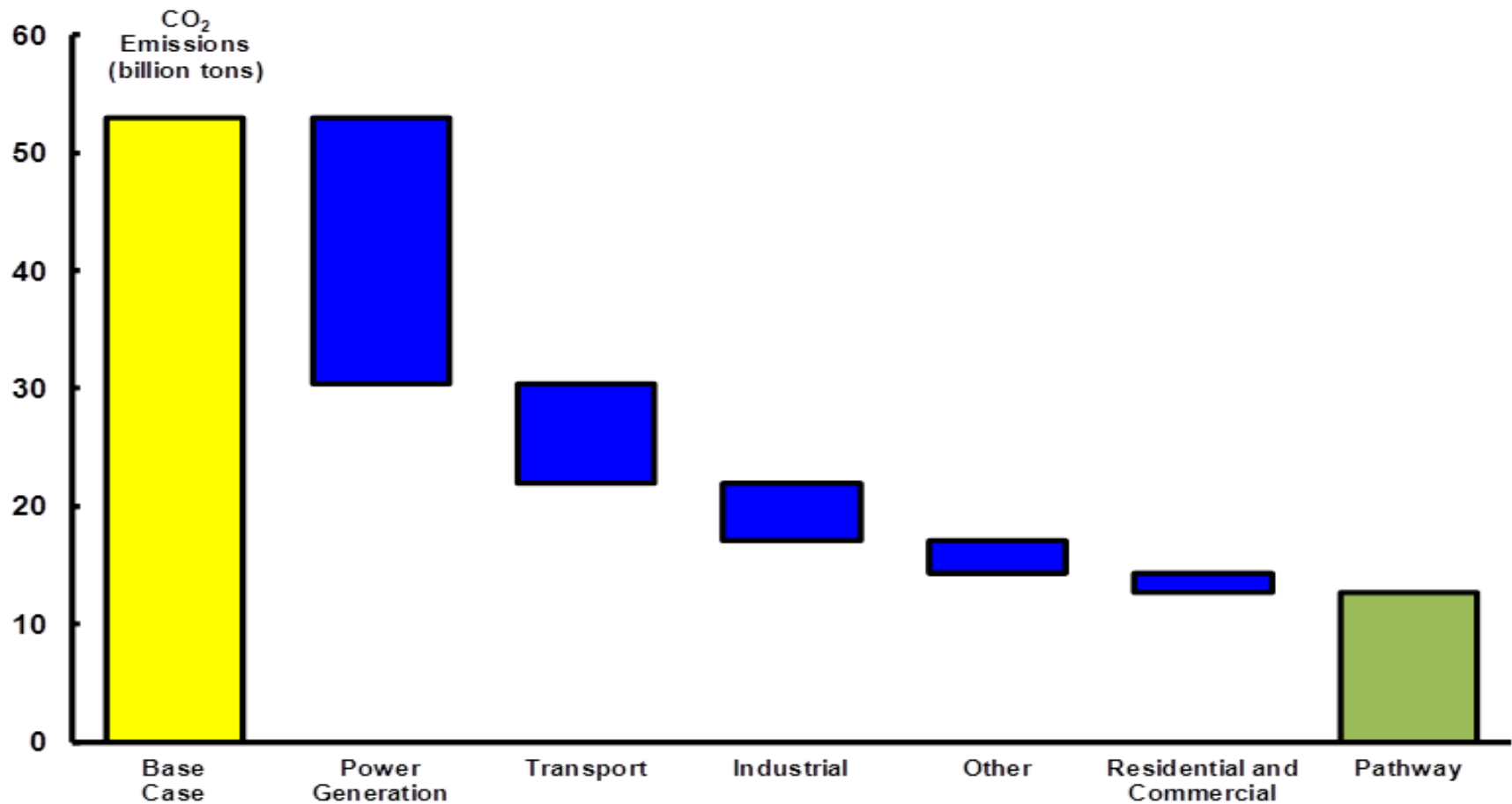


Gas Market Share of Primary Energy



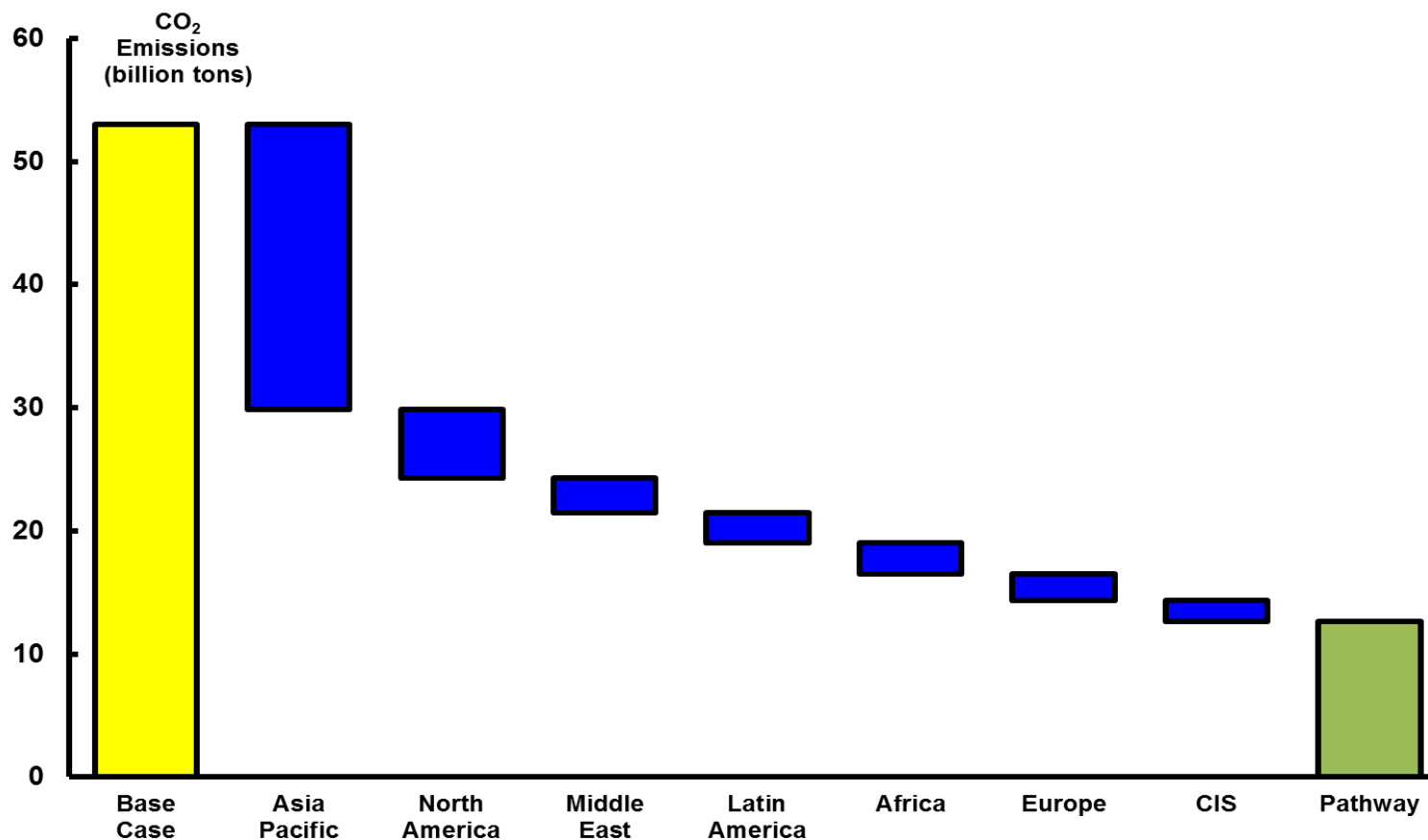
The Vision Pathway Trajectory

Global Emissions Reductions by Sector



The Vision Pathway Trajectory

Global Emissions Reductions by Region



Requirements to realize the potential of gas / LNG for the future – The uncertainties

Politics

- **Conducive policy and regulatory framework**
- **Stable and predictable**
- **Geopolitical considerations**
- **North American energy revolution**
- **Consideration of cost of carbon**

Industry

- **Improve technologies used**
- **Establish trust with all stakeholders**

All

- **Realise the benefits and synergies of integrated energy concept solutions**

Conclusion

