



# NATURAL GAS IN THE ENERGY MIX

KEEI & Energy News Conference  
on Natural Gas  
20 February 2013  
Seoul



Duncan van Bergen  
General Manager, Global Gas & LNG Market Development

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# POPULATION GROWTH PRESENTING ENERGY TRILEMMA

## ISING ENERGY DEMAND, SUPPLY PRESSURE, CLIMATE CHANGE



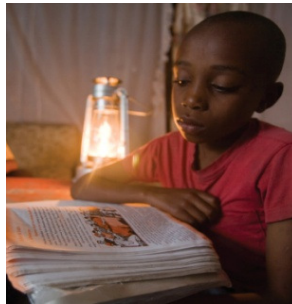
**9 billion** people, **75%** living in cities

(**2 billion** more than today)



**2 billion** vehicles

(**800 million** at the moment)



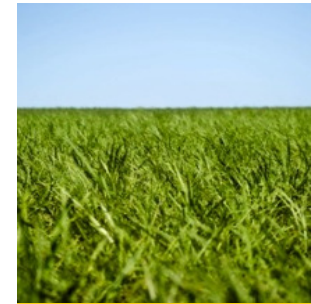
Many **millions** of people will rise out of energy poverty; with higher living standards energy use rises



Energy demand could **double** from its level in 2000.. .. while CO<sub>2</sub> emissions must be **half** today's to avoid serious climate change



Twice as efficient, using **half** the energy to produce each dollar of wealth



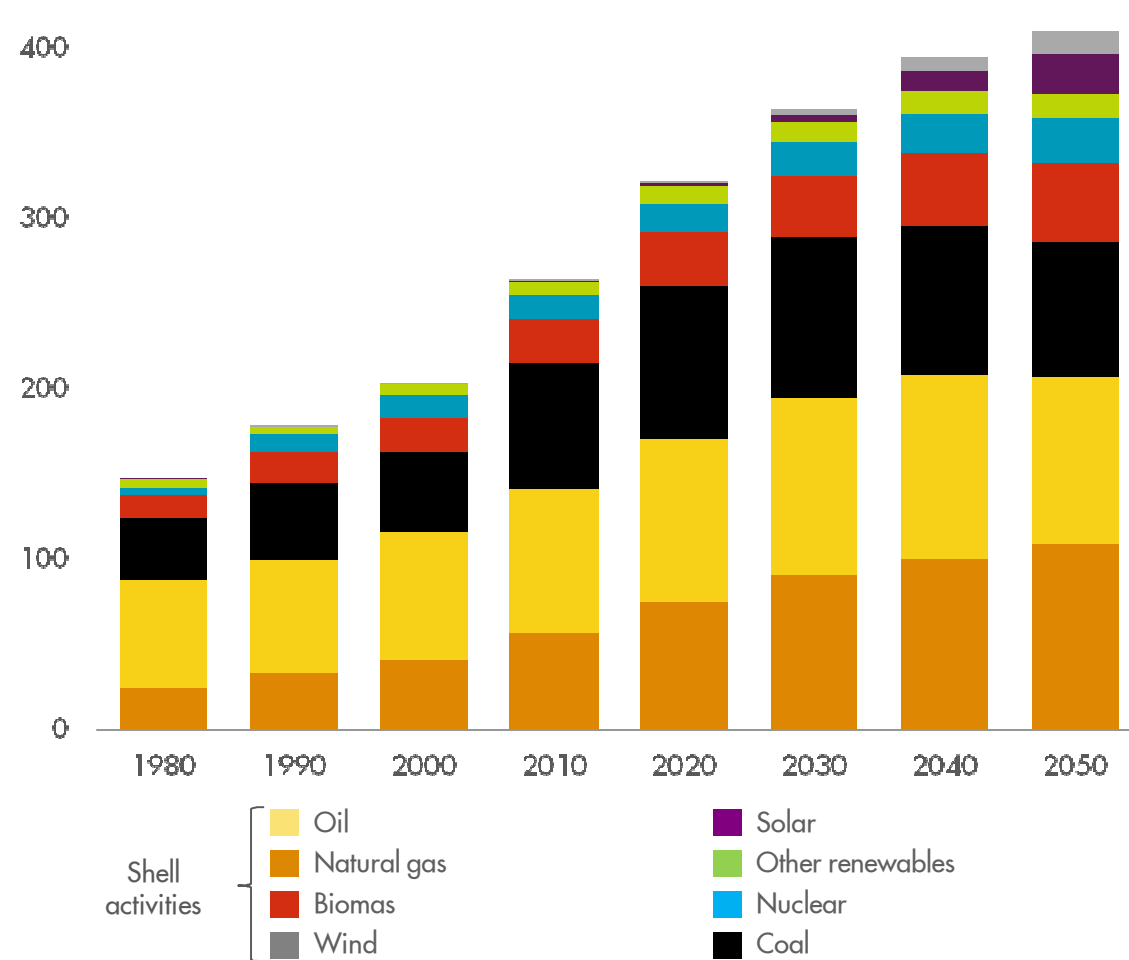
**3** times more energy from renewable sources

How to ensure secure, competitive and environmentally responsible energy system?

# FOSSIL FUEL WILL PROVIDE 60% OF WORLD'S ENERGY IN 2050

## DEMAND GROWTH

Energy demand outlook in million boe/d



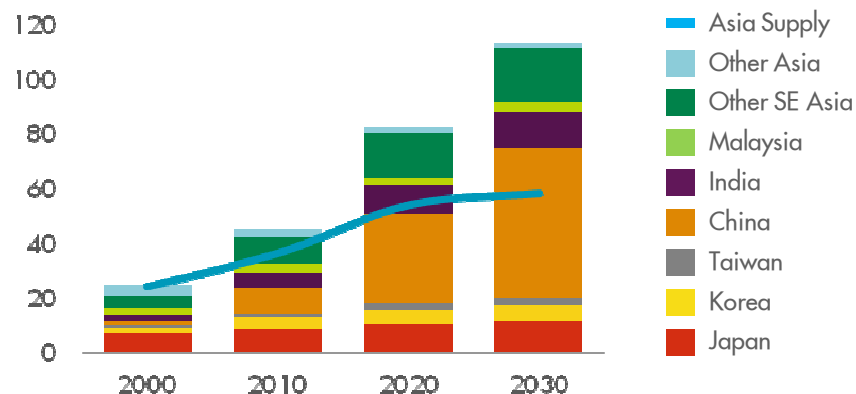
- Energy demand +60% 2010 – 2050
- Hydrocarbons dominate outlook
- Gas demand doubling 2010-2050

► GAS THE CLEANEST FOSSIL FUEL IS  
UNIQUE & BEST POSITIONED TO  
MEET THE ENERGY TRILEMMA

# REGIONAL GAS DEMAND DEVELOPMENT

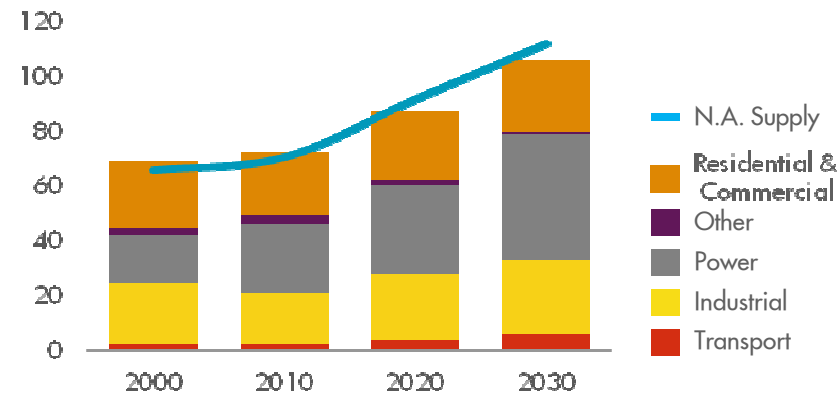
## ASIA DEMAND

Bcf/d



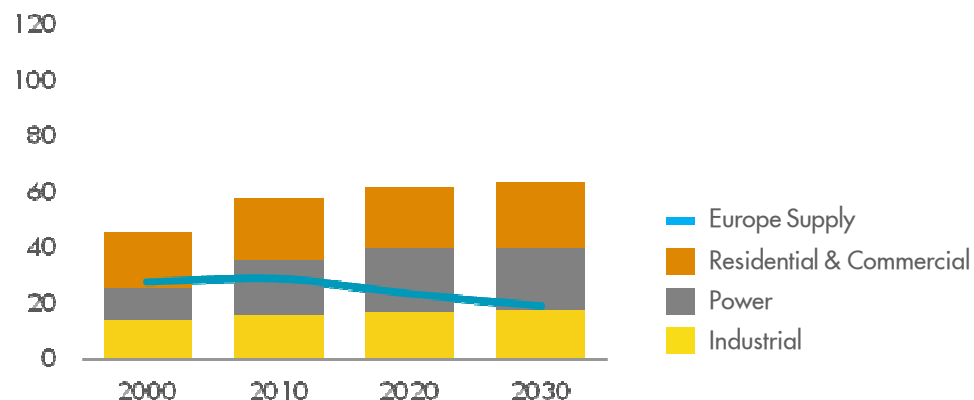
## NORTH AMERICA DEMAND

Bcf/d



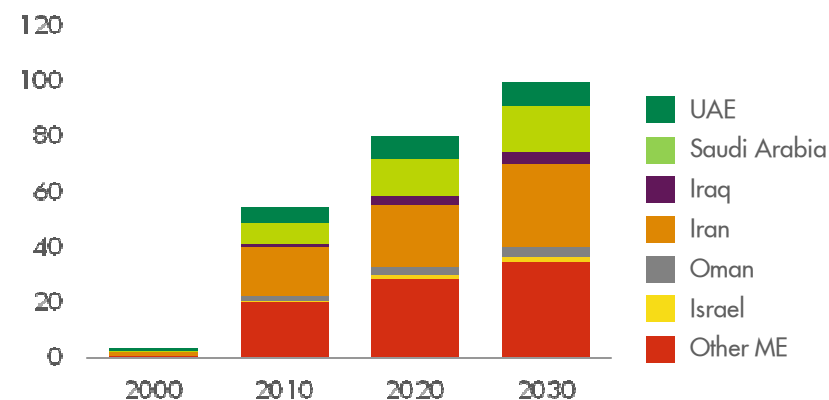
## EUROPE DEMAND

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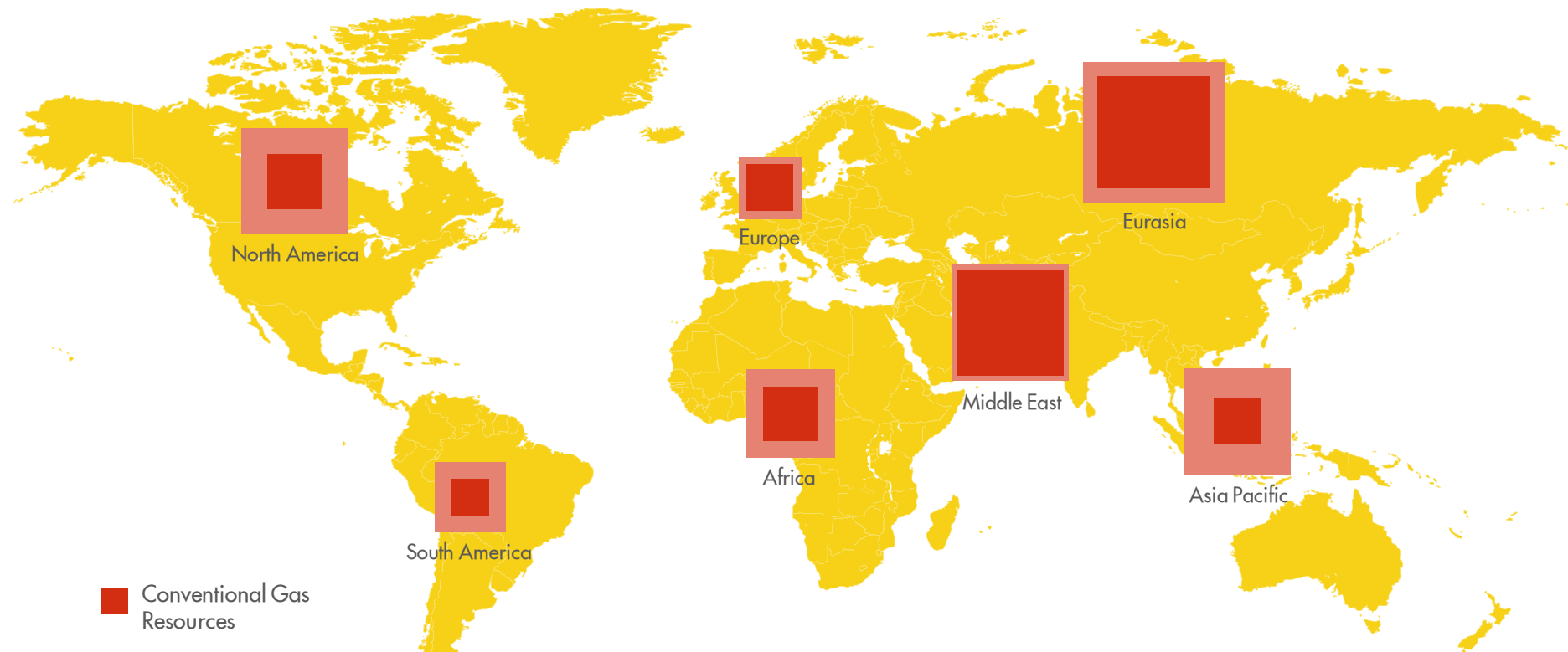
## MIDDLE EAST DEMAND

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# HUGE GLOBAL GAS RESOURCES TO MEET DEMAND GROWTH

GAS RESOURCES ARE PLENTIFUL, GROWING AND GEOGRAPHICALLY DIVERSE



■ Conventional Gas Resources

■ Tight/Shale Gas and CBM Resources

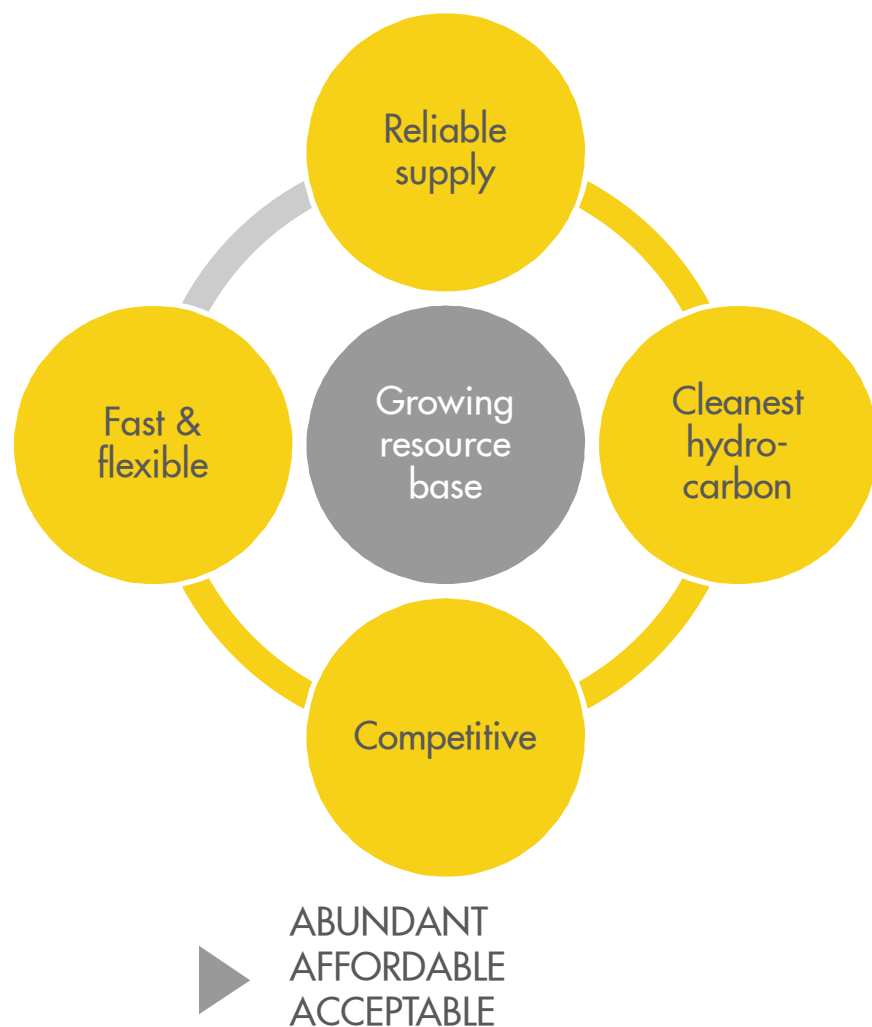
- Conventional and unconventional recoverable gas resources can supply >250 years of current global gas production
- Tight/Shale gas and CBM are transforming the global gas market
- Shell believes that increased use of natural gas, replacing coal, for electric generation is crucial to lowering global CO<sub>2</sub> levels

Source: Shell World Energy Outlook 2012, Wood Mackenzie, Shell Interpretation

	REMAINING RECOVERABLE RESOURCES (TCM)	EQUIVALENT IN YEARS OF CURRENT PRODUCTION
Conventional	405	130
Tight/Shale Gas and CBM Resources	380	123
<b>Total</b>	<b>785</b>	<b>253</b>

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# GAS IS UNIQUE—REPRESENTS OPTIMAL BALANCE



Positive global support for gas

- Economic and jobs potential
- Balanced tight/shale regulation
- Contribution to a low-carbon future

New supply chains emerging

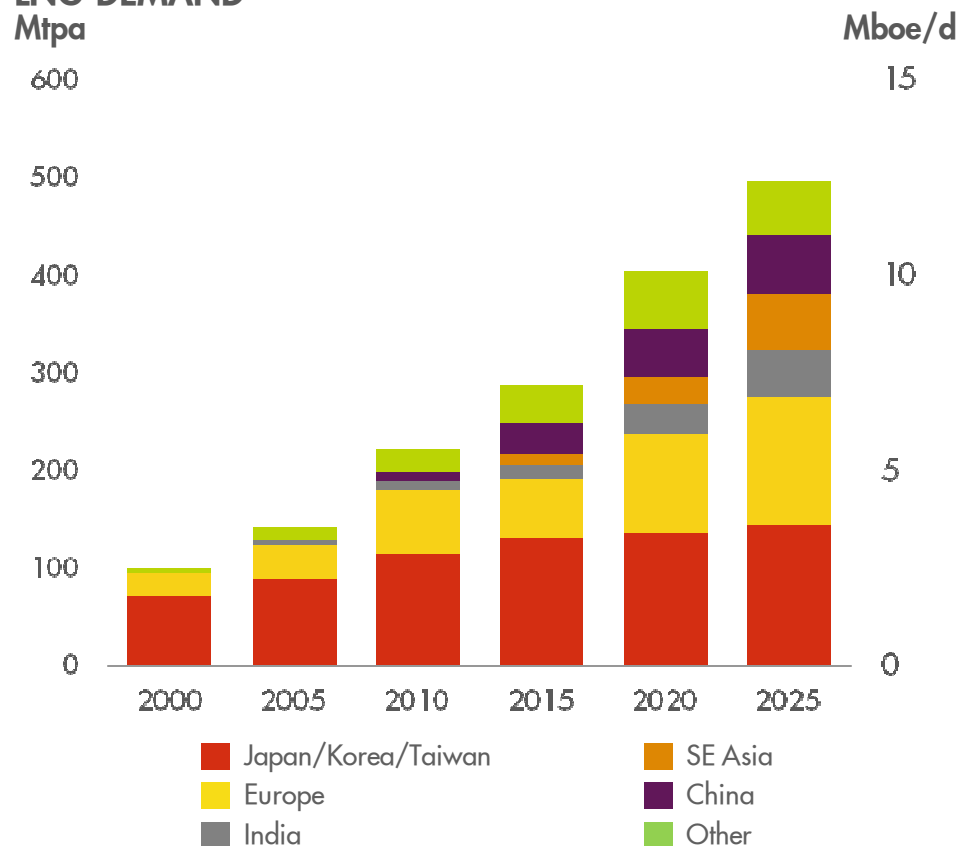
- LNG from North America
- Tight/shale gas in Europe, Africa, Asia Pacific

New market opportunities

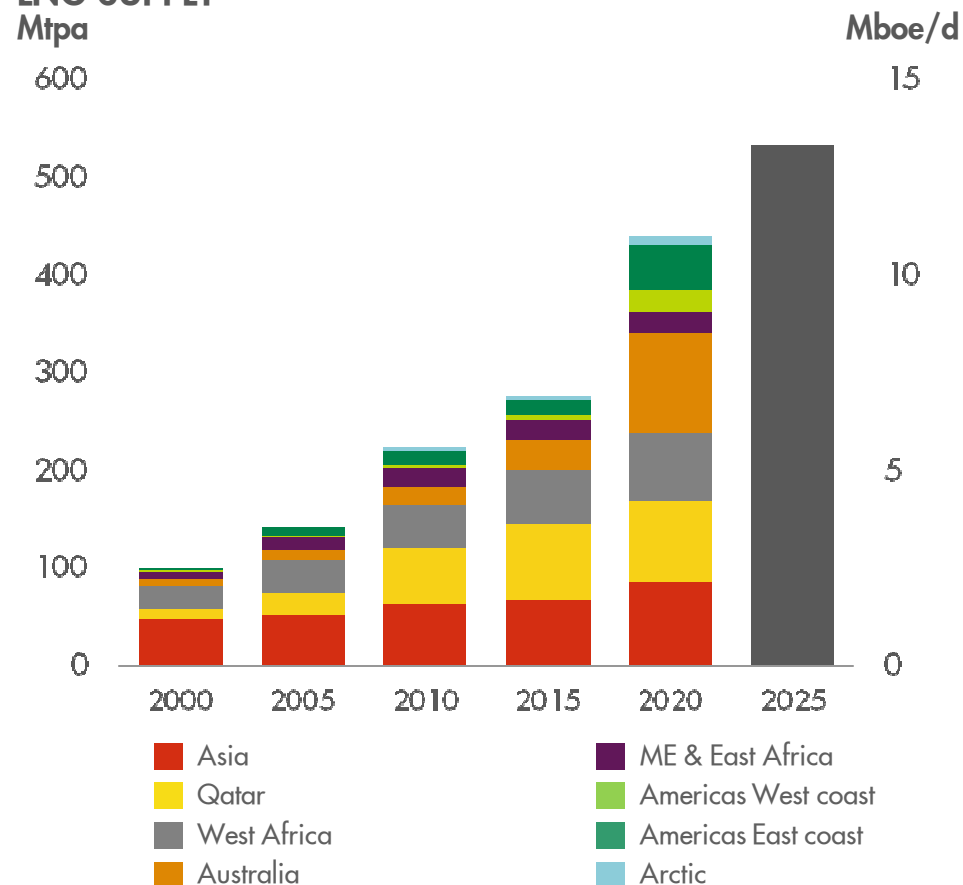
- Gas in transport
- Replacing liquid fuels in industry

# LNG SUPPLY AND DEMAND DYNAMICS

## LNG DEMAND



## LNG SUPPLY\*



\* Risked view of all LNG supply projects

**DEMAND DOUBLE 2010 – 2020**  
**SUPPLY RESPONSE**  
**> \$700 BILLION IDUSTRY INVESTMENT 2010-2025**



# US SHALE GAS TRANSFORMING SUPPLY PICTURE

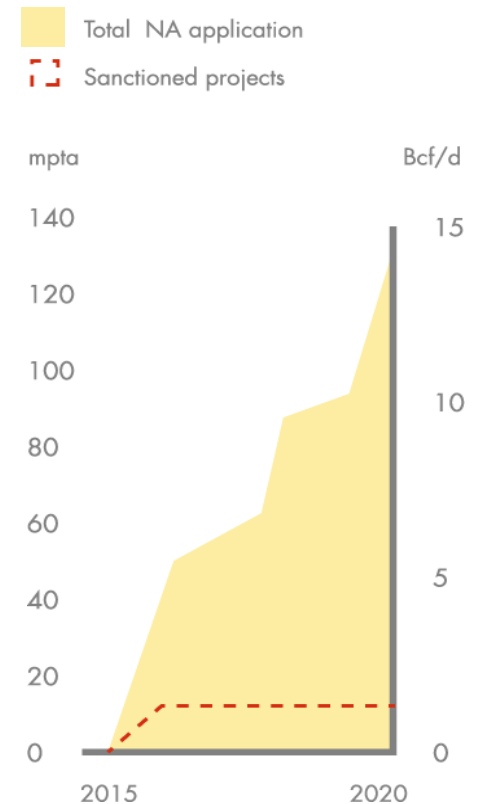
## INDUSTRY LNG EXPORT PLANS



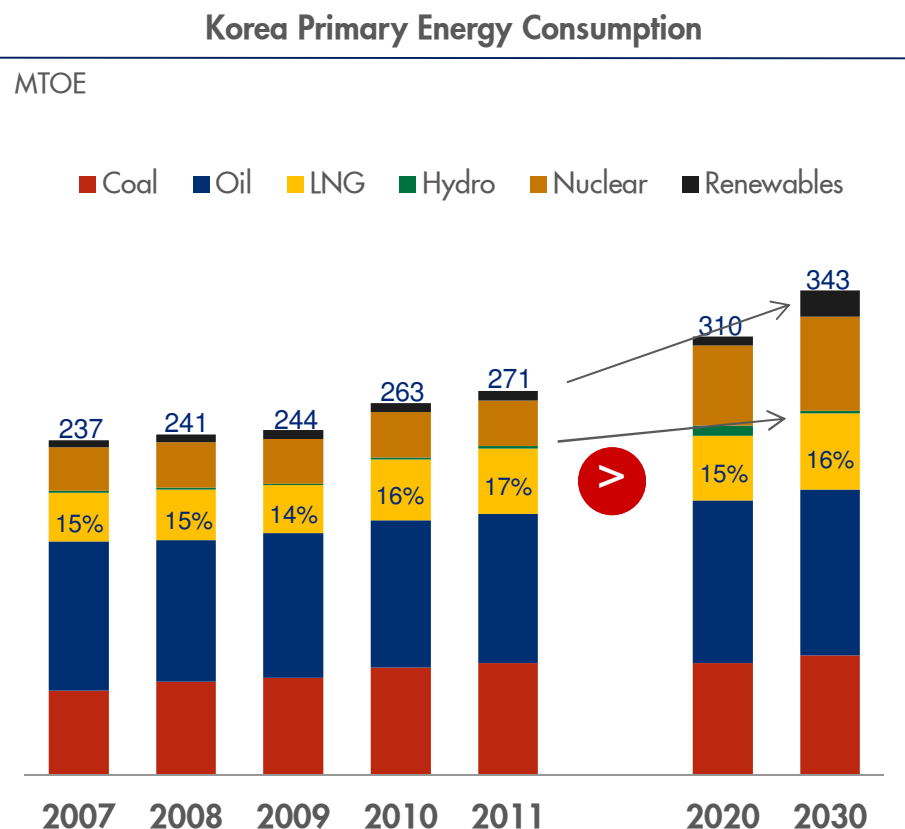
## MAJOR OPPORTUNITY FOR AMERICA GAS INDUSTRY

- PERMITTING
- >\$300 BLN INDUSTRY FINANCING REQUIREMENT
- PRICE AND MARKET CONSIDERATIONS

## NORTH AMERICAN LNG EXPORT DEVELOPMENT



# KOREA'S ENERGY POLICY RELYING ON NUCLEAR AND RENEWABLES TO DELIVER LOW CARBON ENERGY SYSTEM



- New Energy Policy directions rightly recognizes need to re-orient from previous focus on stable energy supply for economic growth and living standards to 'higher quality' energy for sustainable development
- Projections show almost exclusive reliance on nuclear and renewables to deliver this
- Natural gas's role as unique fuel: clean, abundant and competitive not being leveraged fully

Source: Korea Energy Economics Institute

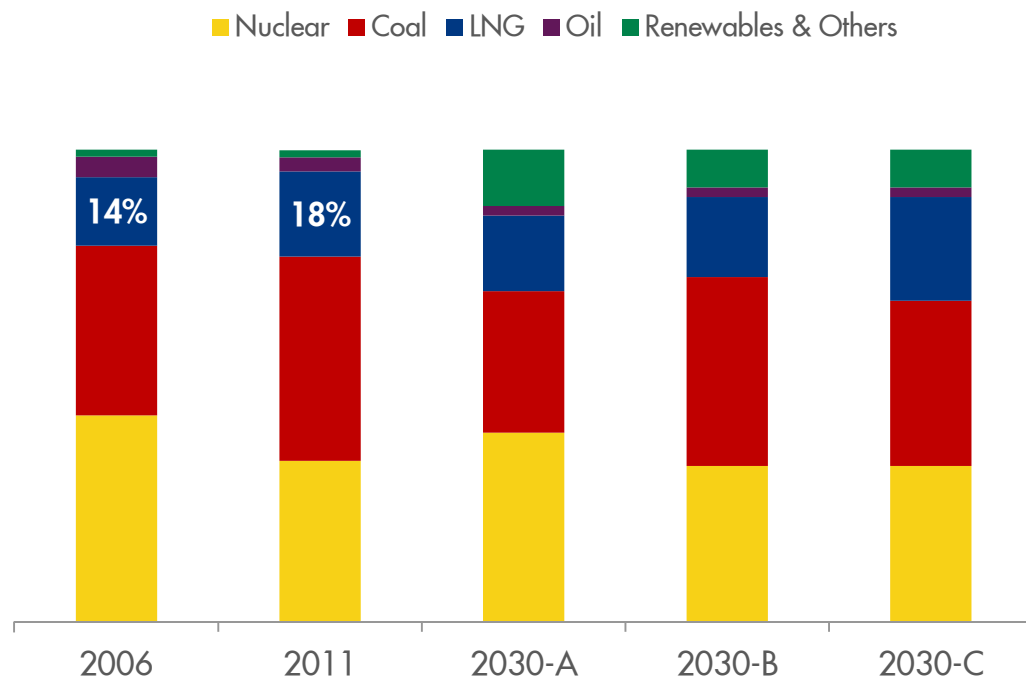
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# KOREA CAN LEARN FROM EUROPE'S EXPERIENCE

Power Generation Mix



- Case A – Reliance on nuclear and RES to deliver 'higher quality' energy for sustainable development has risks:
  - Social acceptance for rapid nuclear growth amidst governance issues
  - Heavy subsidy required to accelerate RES growth (e.g. Europe)
- Case B – Nuclear and RES fall short of targets and coal makes up shortfall; Korea with polluting/high carbon energy system – uncompetitive in a carbon-constrained world
- Case C – 'Clean' gas makes up for shortfall; Korea's energy system robust/competitive in a carbon-constrained world; providing 'higher quality' energy

Analytical work for Europe demonstrated that gas can provide more cost-optimal path to achieve a competitive low carbon energy system

Note: Cases A, B, C for 2030 are **hypothetical only** where A represents high nuclear & RES; case B is where nuclear and RES fall far short of expected targets and high carbon emission coal makes up the shortfall; case C is where low carbon emission gas makes up shortfall

Source: Korea Energy Economics Institute, KPX; Shell

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# THE CHOICE IS CLEAR: GAS IS UNIQUE, IT IS *THE* FOSSIL FUEL OF THE FUTURE



OR



