

Shell energy scenarios to 2050

An era of revolutionary change

Jeremy B. Bentham

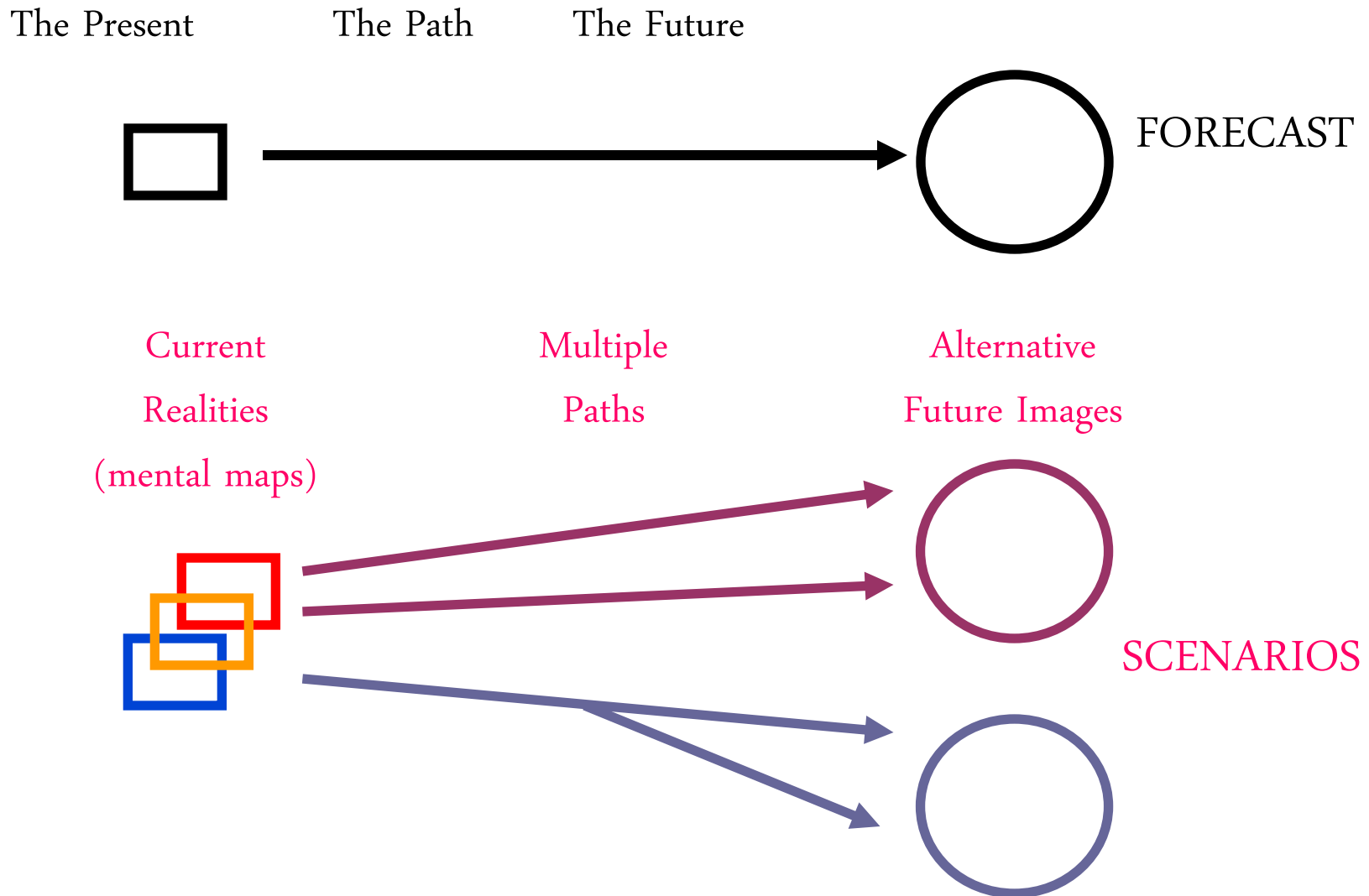
Amsterdam, November 2009



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Transitions are inevitable;
Scenarios help us wrestle with possible futures



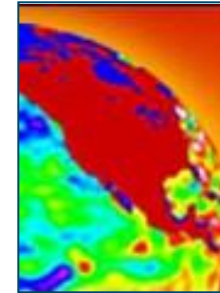
Relevant time horizons



Market
dynamics



Rising demand
New supply sources
Emergent fault-lines

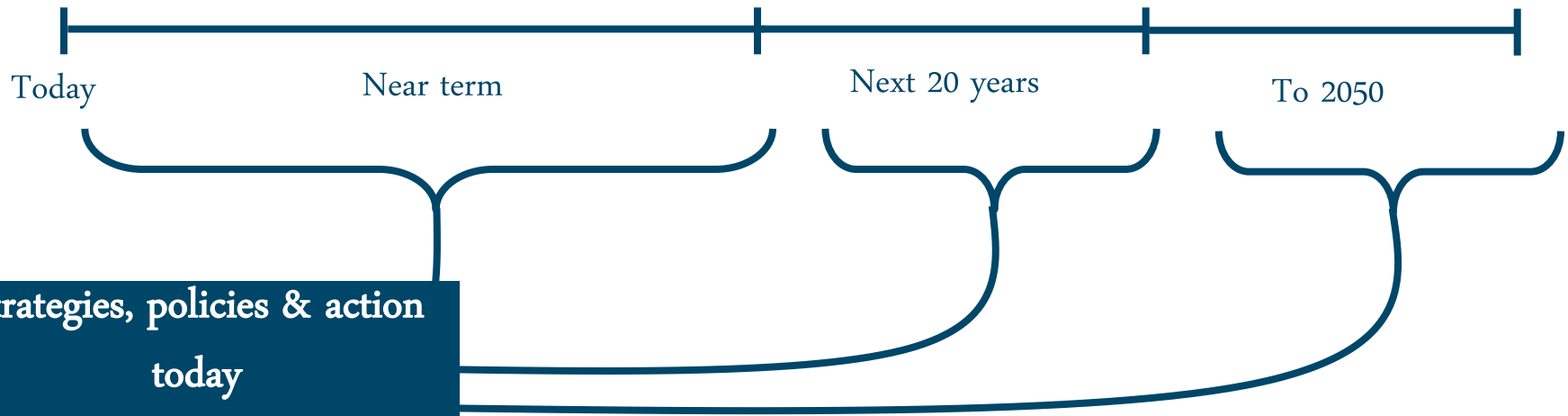


Climate change
Energy needs of 9bn
people



Potential for shocks

Beyond hydrocarbons ?



TINA

SEC

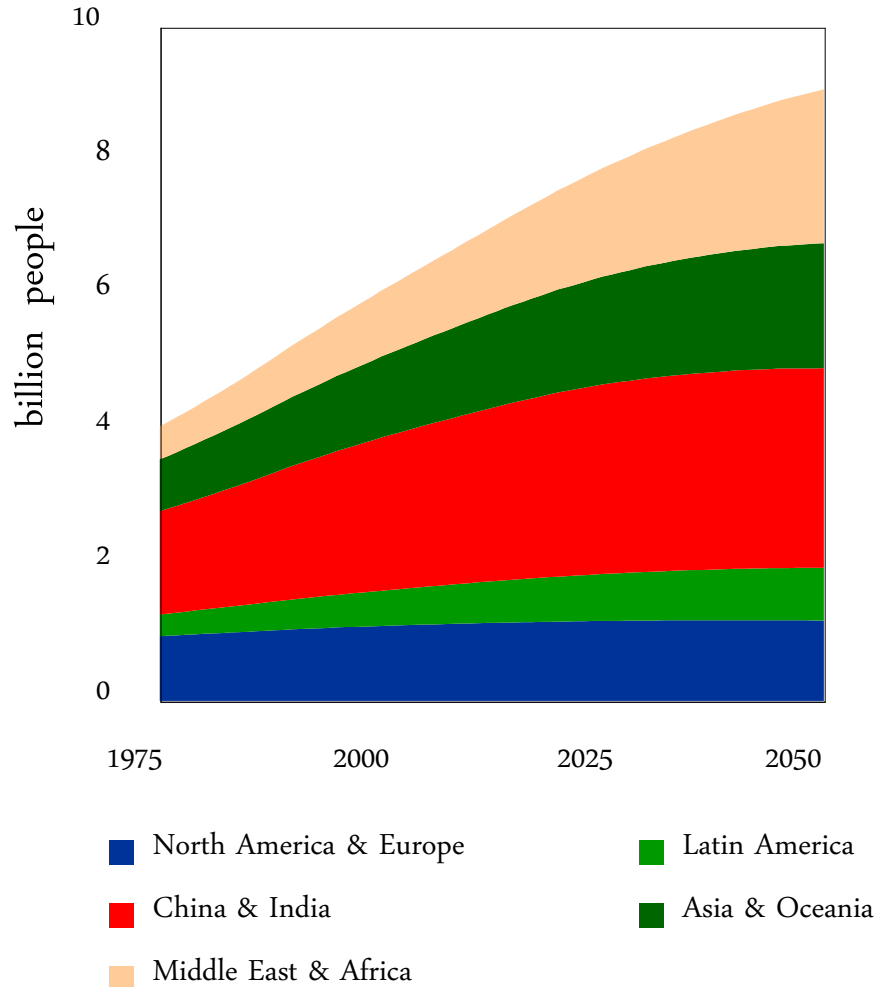
A People-Centred Map of the World



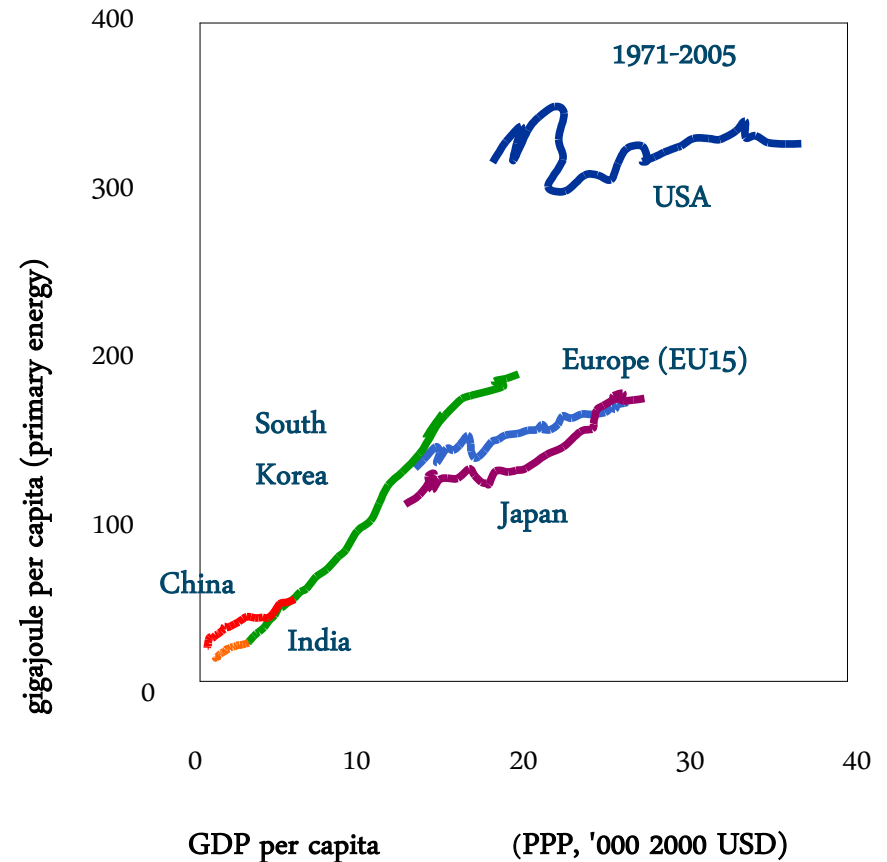
Year 2000; Source Mark Newman, University of Michigan

All energy outlooks driven by the population & prosperity of rapidly growing economies

Population



Energy demand per person -History



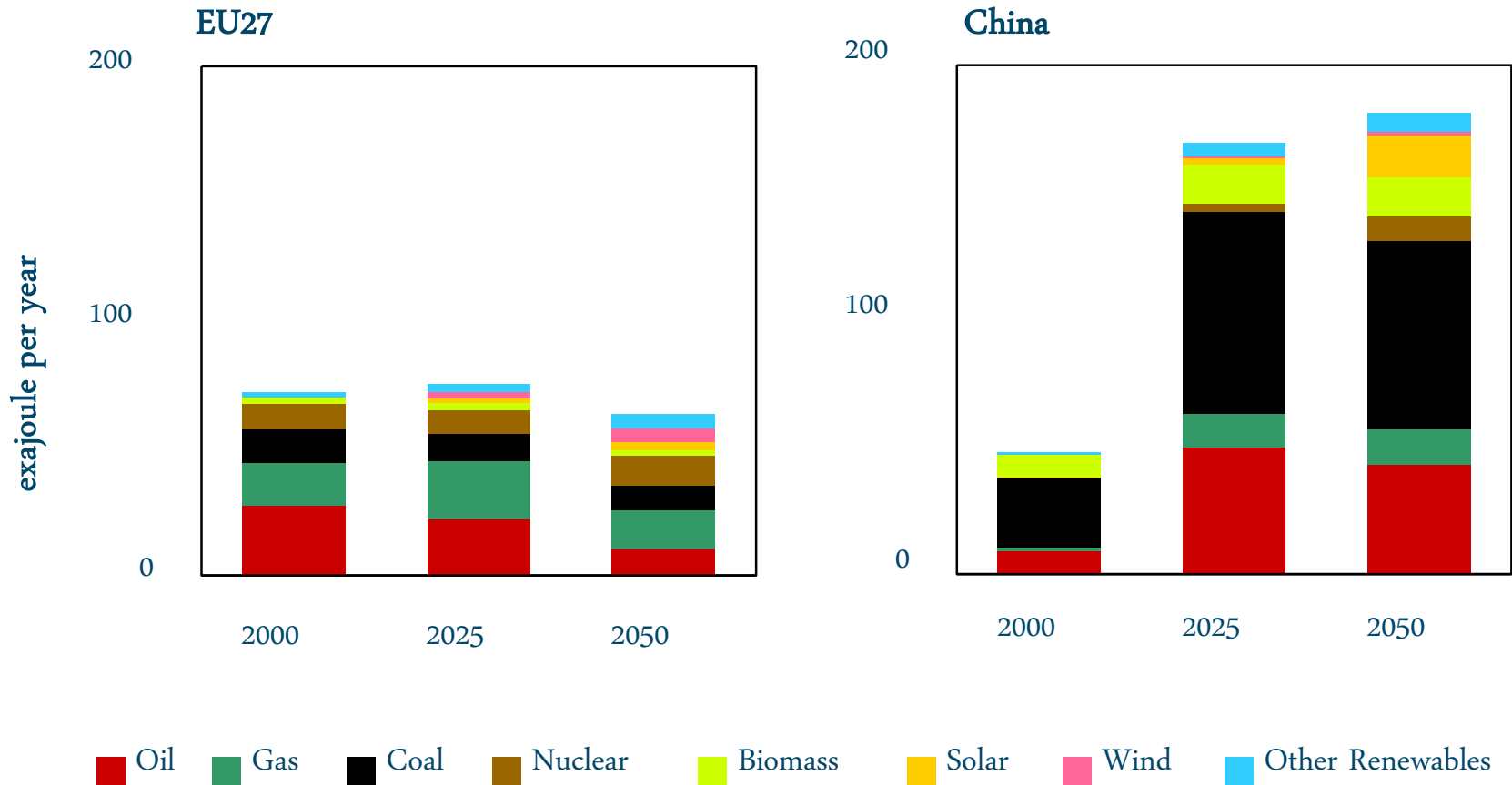
Three Hard Truths

- Surging energy demand
- “Easy” supply will struggle to keep pace
- Environmental stresses are increasing

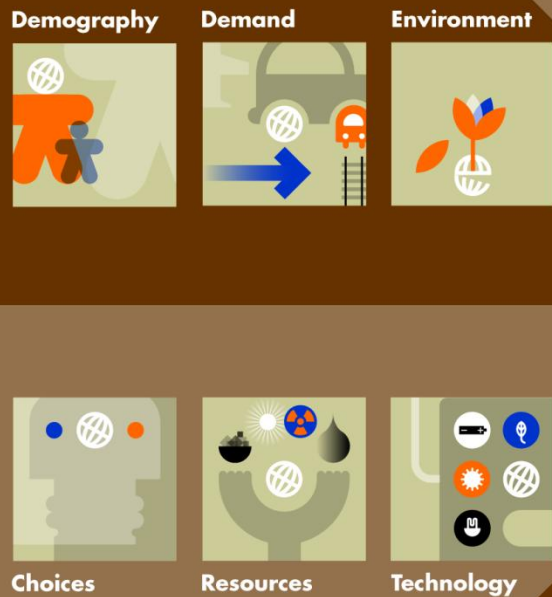
TAN!A

Energy transitions are inevitable ...

Total primary energy demand



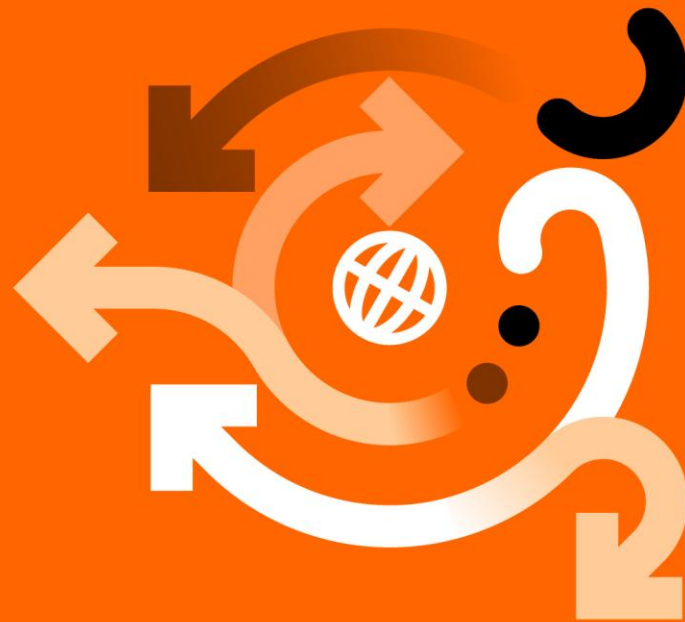
Shell energy scenarios



National supply focus
and reactive change

Emerging coalitions
and accelerated change

BLUEPRINTS
SCRAMBLE



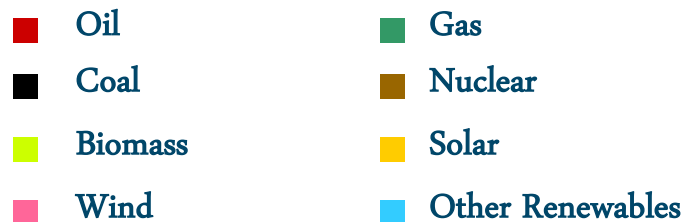
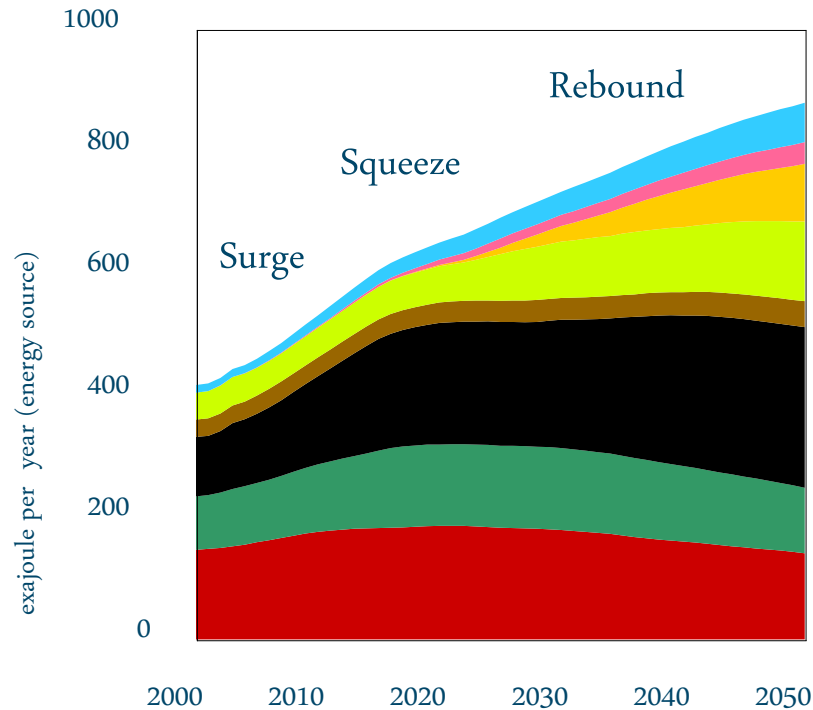
SCRAMBLE

Scramble - Security of supply and fear of losing economic growth

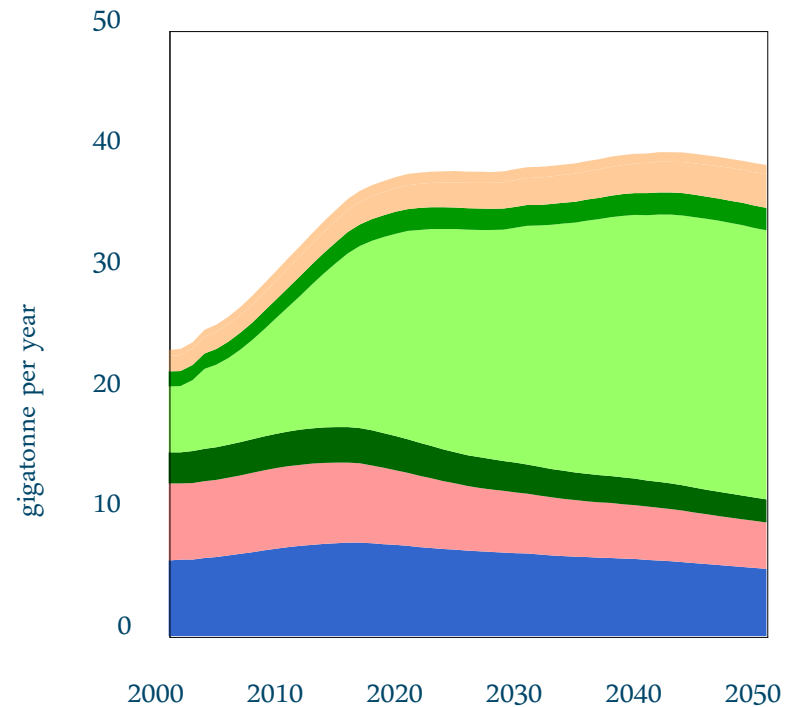


Scramble – supply focus and late responses

Total primary energy demand



Direct CO₂ emissions from energy





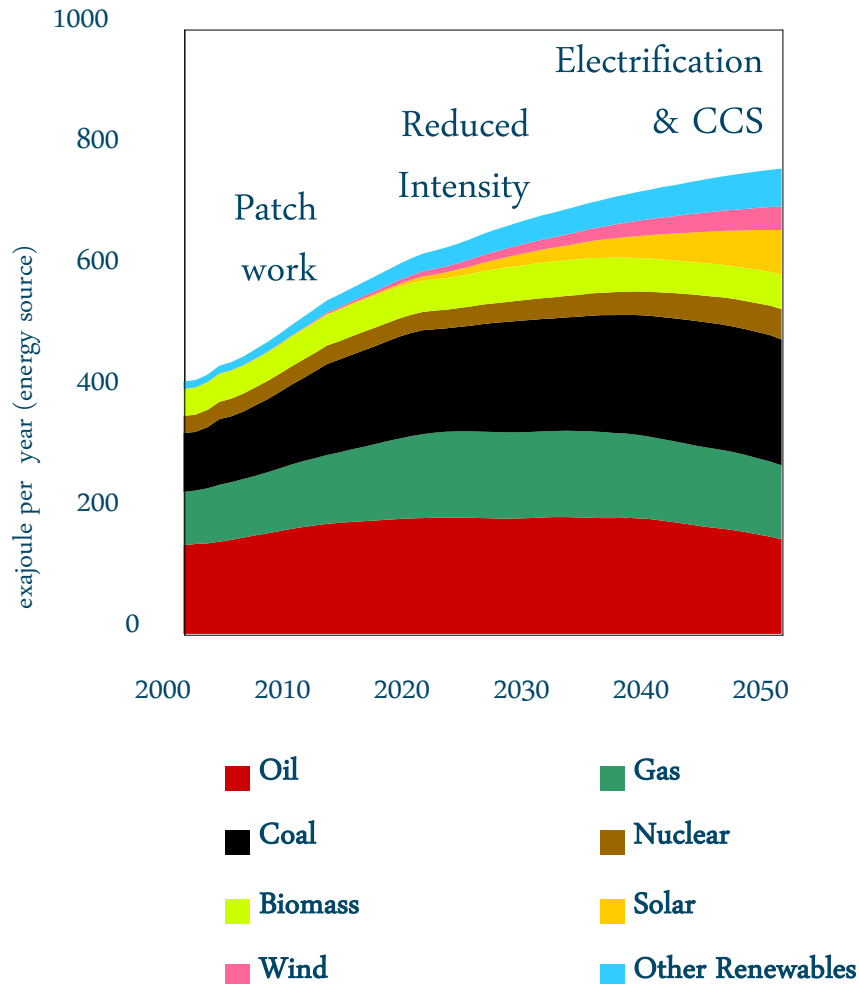
BLUEPRINTS

Blueprints – Energy security and sustainability

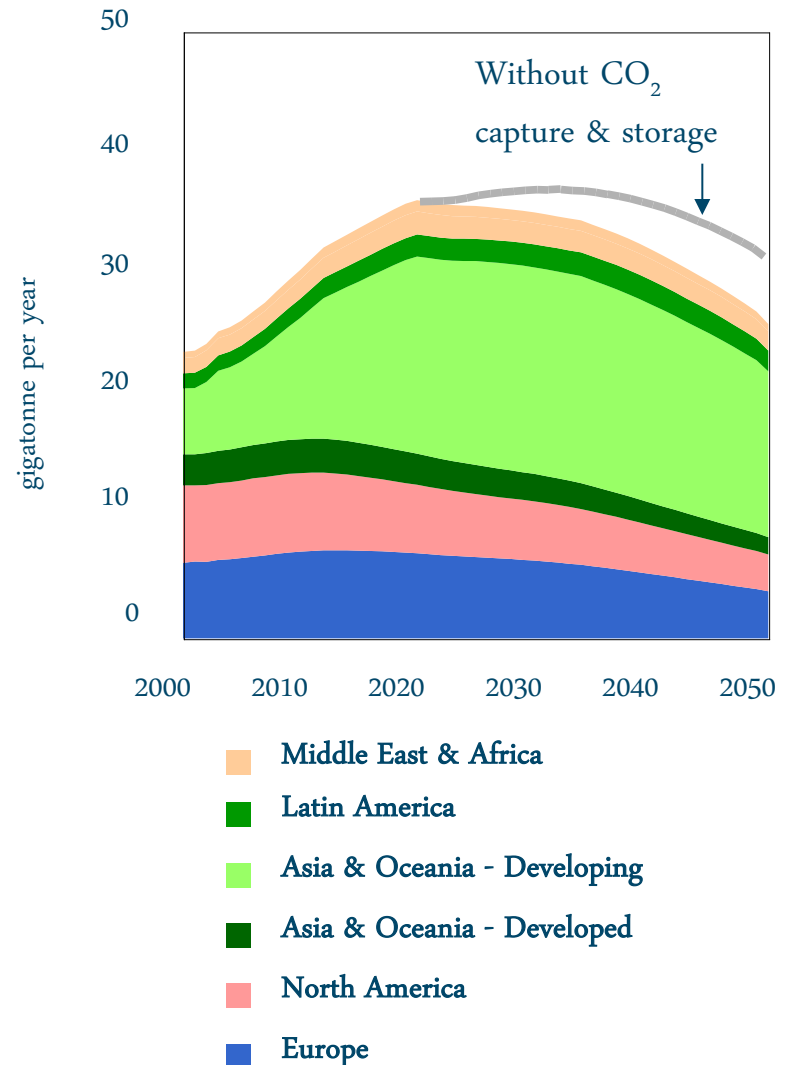


Blueprints – multi-focus and early actions

Total primary energy demand



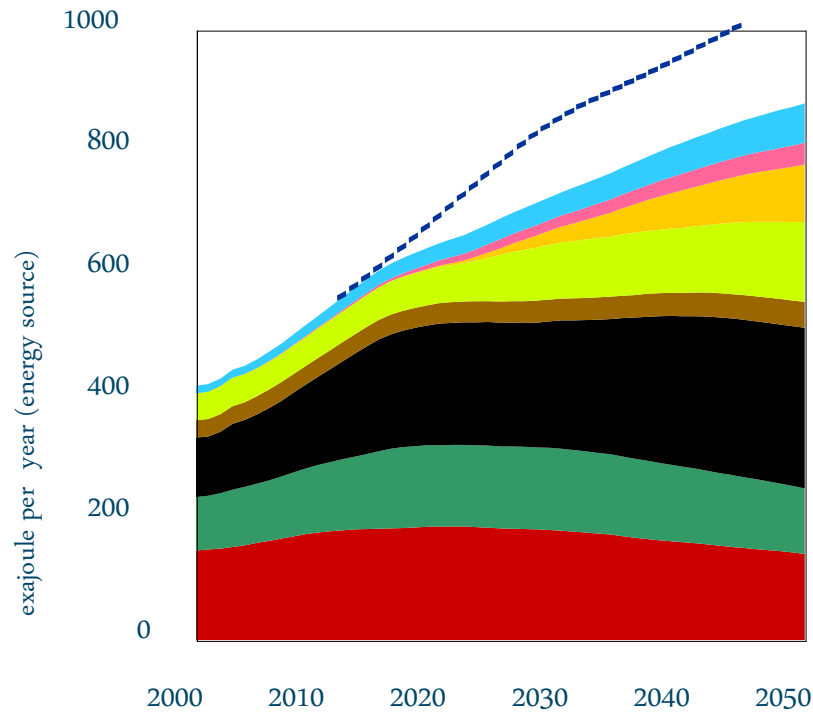
Direct CO₂ emissions from energy



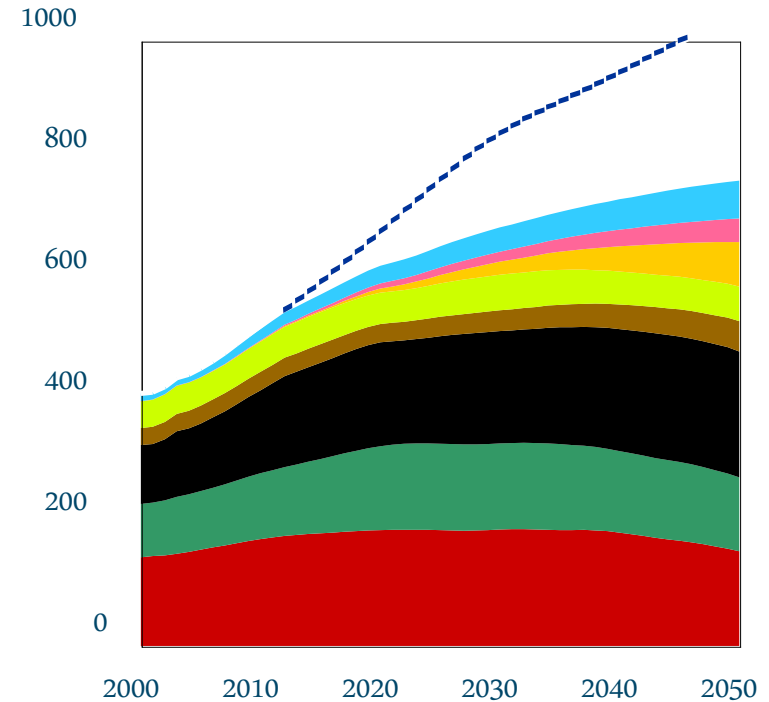
Comparing the scenarios: global energy mix



Scramble



Blueprints



Oil Gas Coal Nuclear Biomass Solar Wind Other Renewables

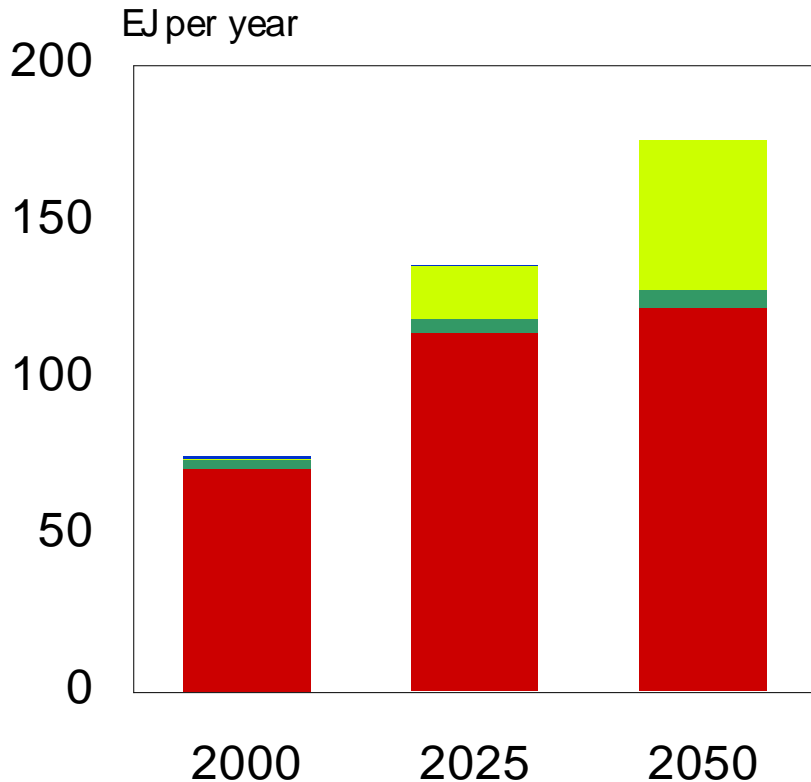
Hypothetical extrapolated "Business as Usual"

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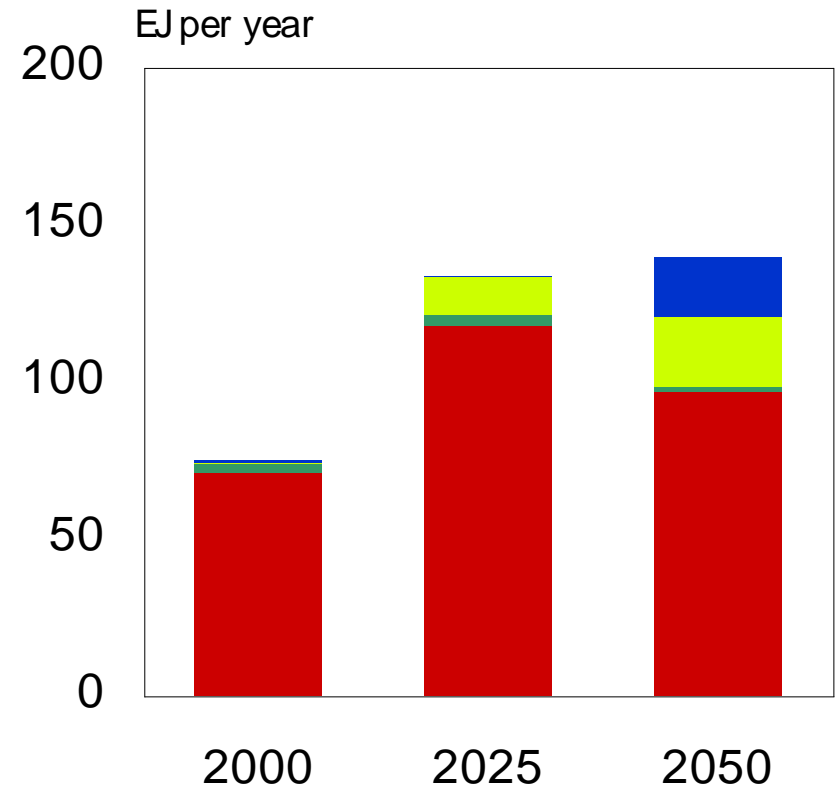
At sector level - what this means for Transport Fuel



Liquid-based fuels



Electric vehicles



■ Liquid fuels fossil-derived

■ Gaseous hydrocarbon fuels

■ Biofuels

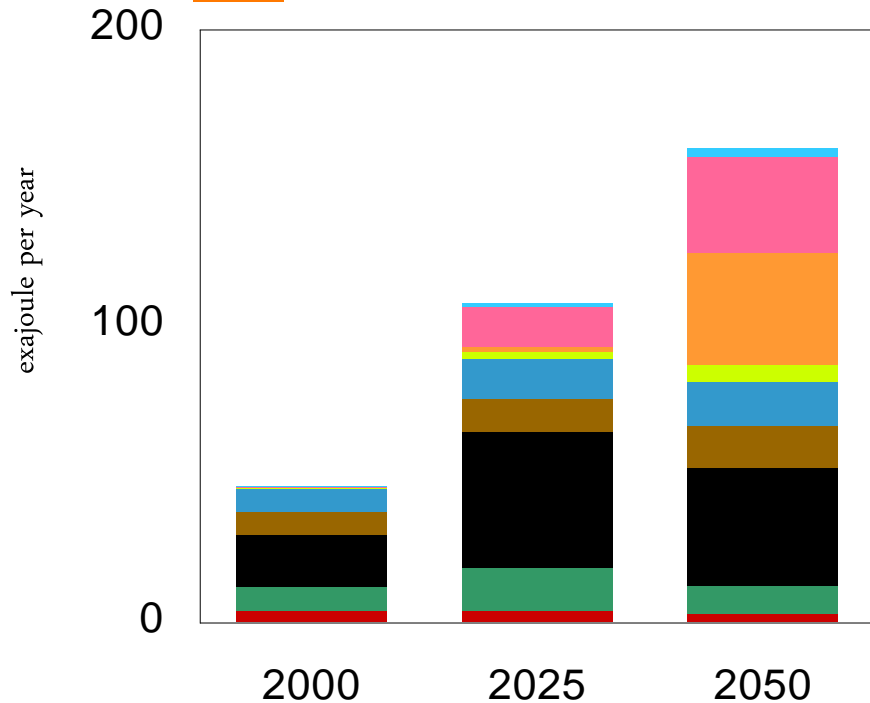
■ Electricity[#]

At a sector level - what this means for Electricity (power generation)

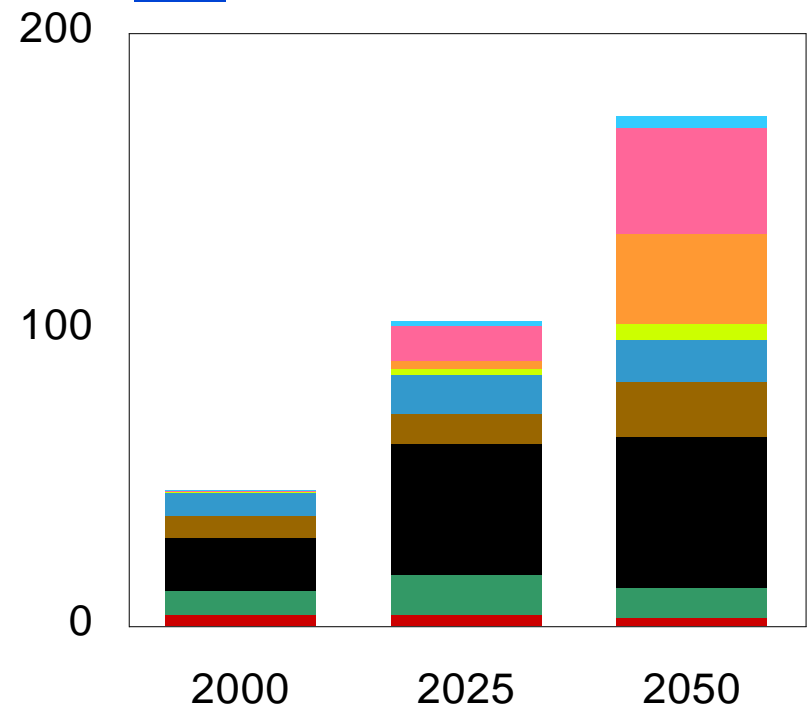
Electricity - Total final consumption by energy source



Scramble



Blueprints



Oil

Nuclear

Solar

Gas

Hydroelectricity

Wind

Coal

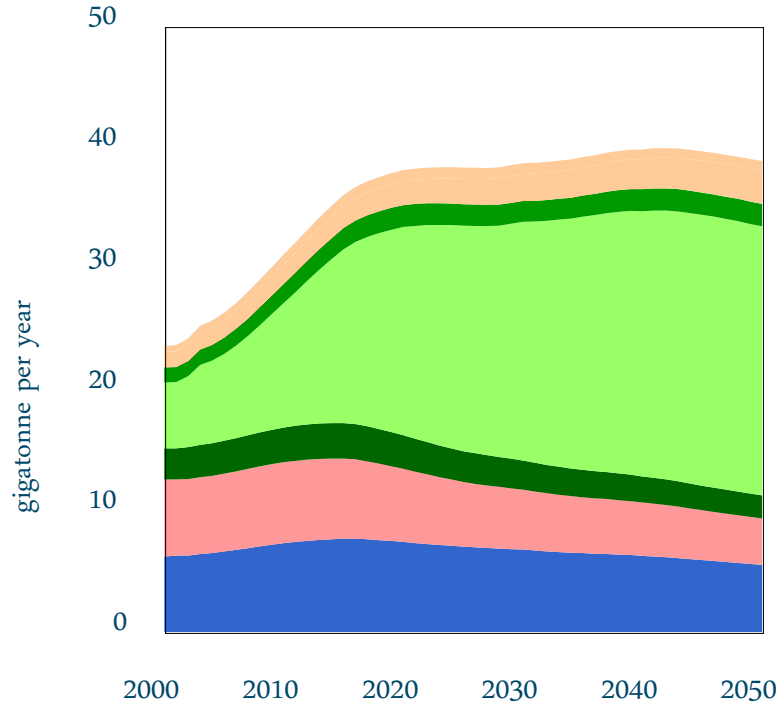
Biomass + Waste

Other Renewables

Implications for direct CO₂ emissions from energy



Late reactions



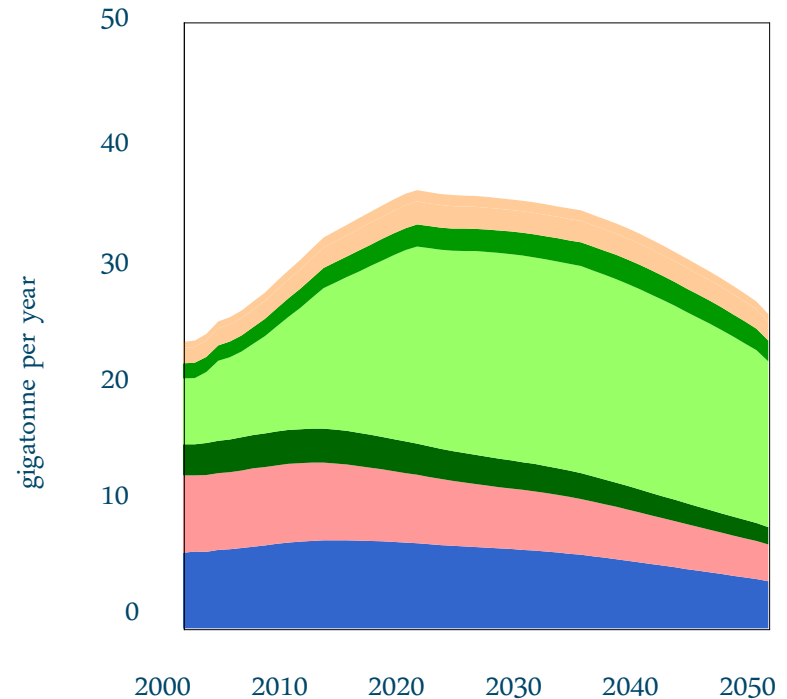
Europe

Asia & Oceania - Developed

Latin America



Early actions

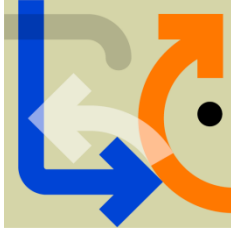


North America

Asia & Oceania - Developing

Middle East & Africa

In summary – what we have learned



- The three hard truths are *very* hard
 - The nature of economic recovery will determine how quickly the pressures become obvious again
- Global transition is both inevitable and necessary
- Technology plays a major role, but no silver bullets
- Political and regulatory choices are pivotal
- The next 5 years are critical

Tackling all three hard truths TOGETHER is essential for a sustainable future

Q&A?

? Q&A?

? ? Q&A?

