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Energy Futures
Shell Energy Scenarios to 2050

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Shell energy scenarios to 2050

Summary presentation at IFA Shanghai 2009

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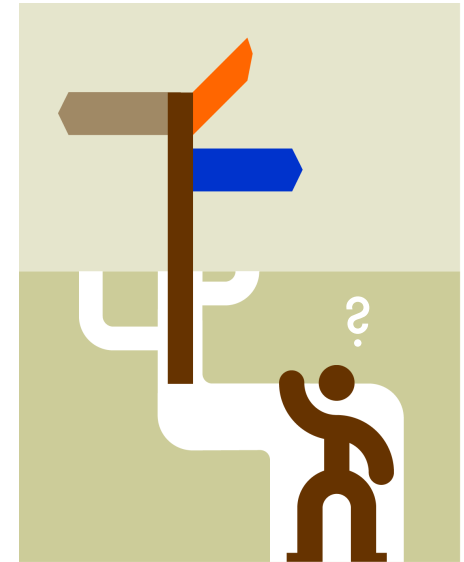
Where/what/who

energy



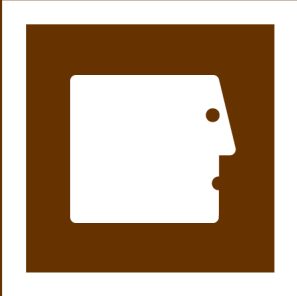
At Shell we use scenarios (rather than forecasts) to explore alternative futures

- To improve decision making
- To prepare leaders to anticipate and manage uncertainty
- To identify threats and opportunities more quickly
- To provide balance between long term thinking and short term considerations



Scenarios explore alternative futures

The present



The path

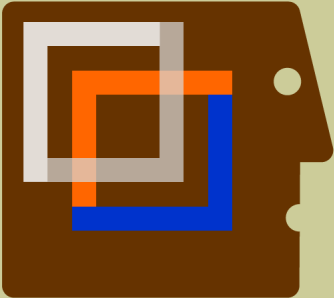


The future

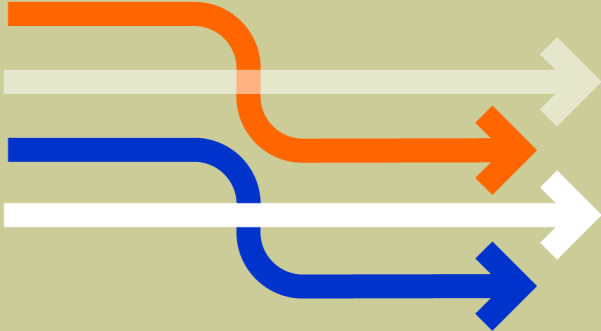


Forecast

Current realities (mental maps)



Multiple paths

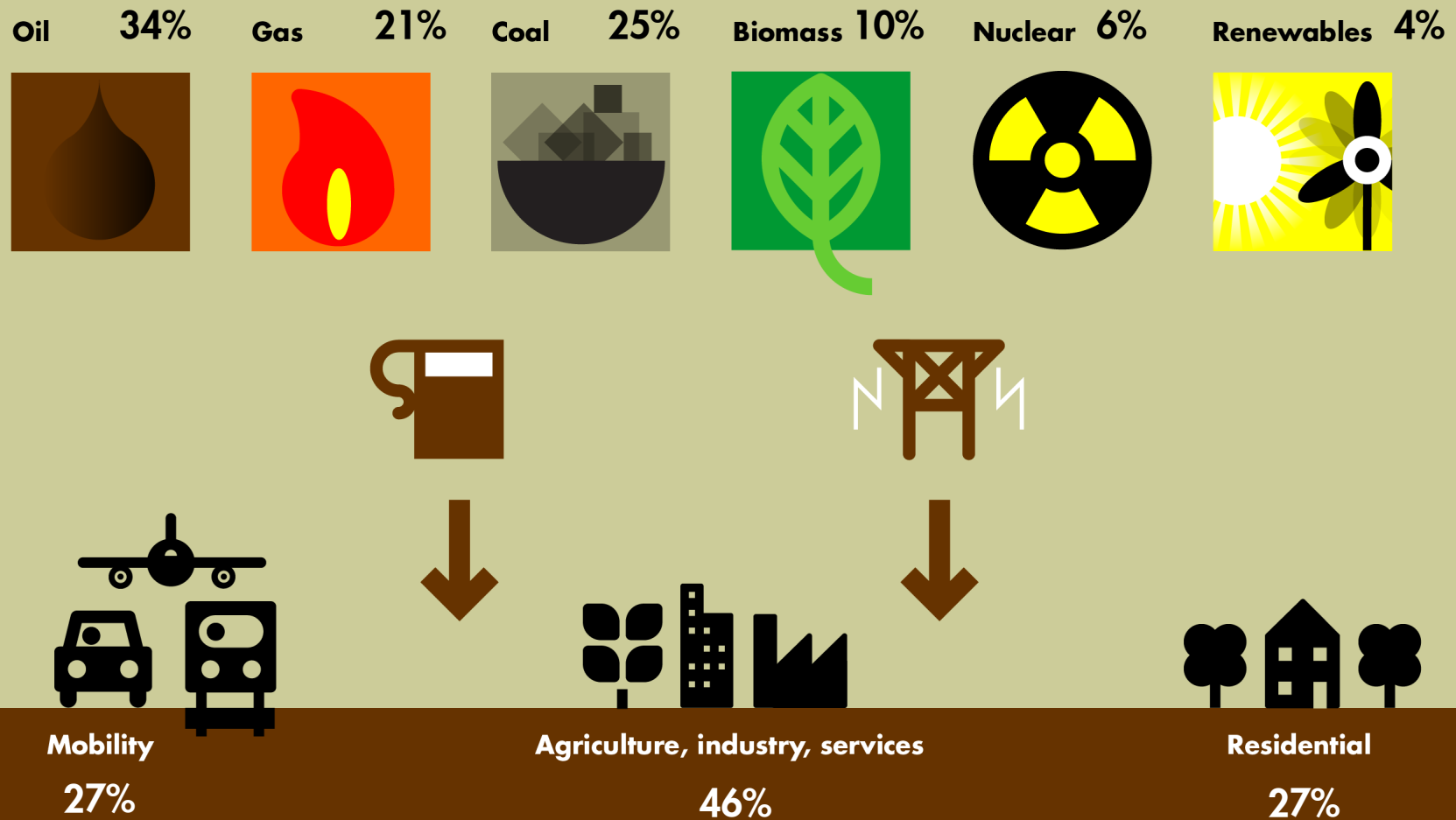


Alternative futures



Scenarios

The energy system today sets the context for the future

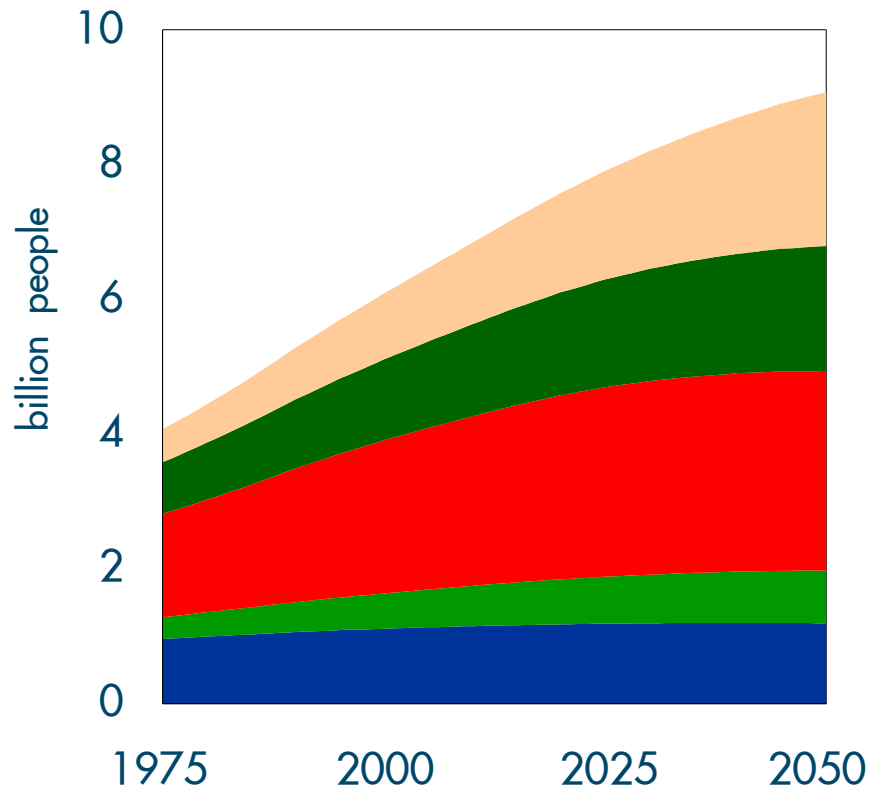


Source: Shell International BV; UN Population Division

World population 6.6 bln; 50% in urban environment

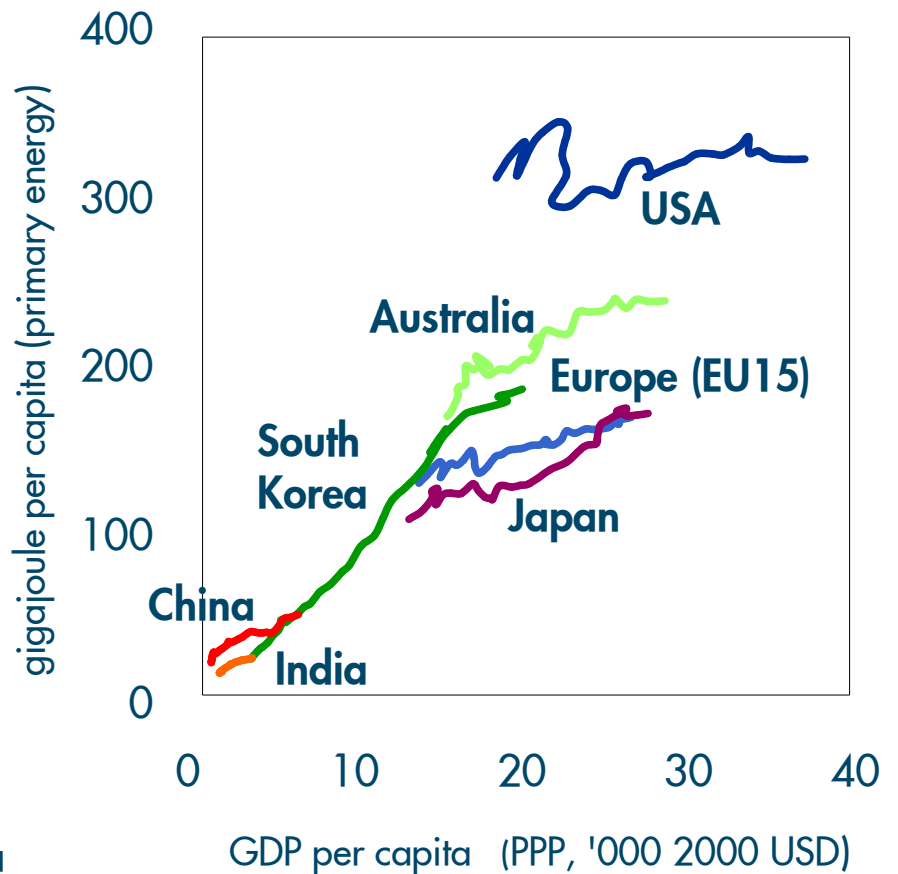
For energy, growth in population and prosperity are key drivers of demand

Population



- North America & Europe
- Latin America
- China & India
- Asia & Oceania
- Middle East & Africa

Energy demand per person -History



Three hard truths will shape the future of the energy system

- Surge in energy demand
- Supply will struggle to keep pace
- Environmental stresses are increasing

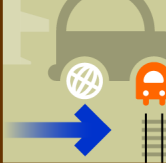


Shell energy scenarios

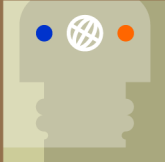
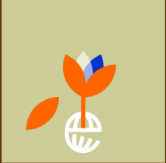
Demography



Demand



Environment



Choices



Resources



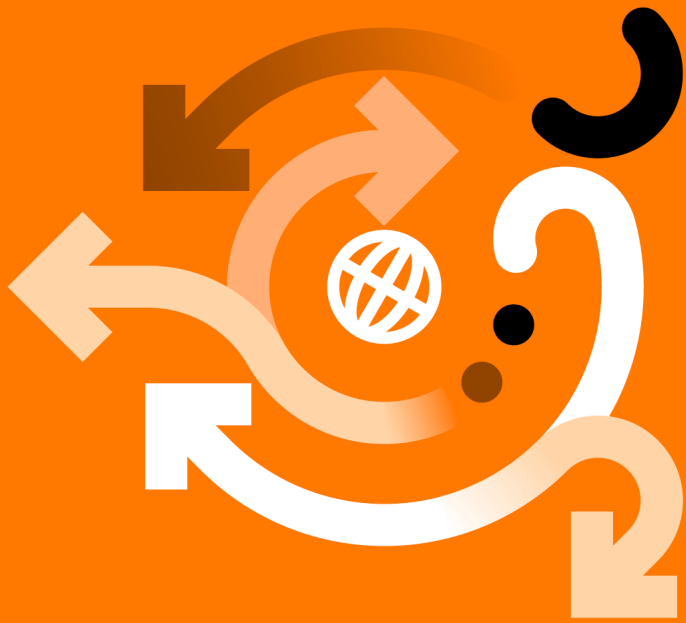
Technology



National supply focus
and reactive change

BLUEPRINTS
SCRAMBLE

Emerging coalitions
And accelerated change



SCRAMBLE

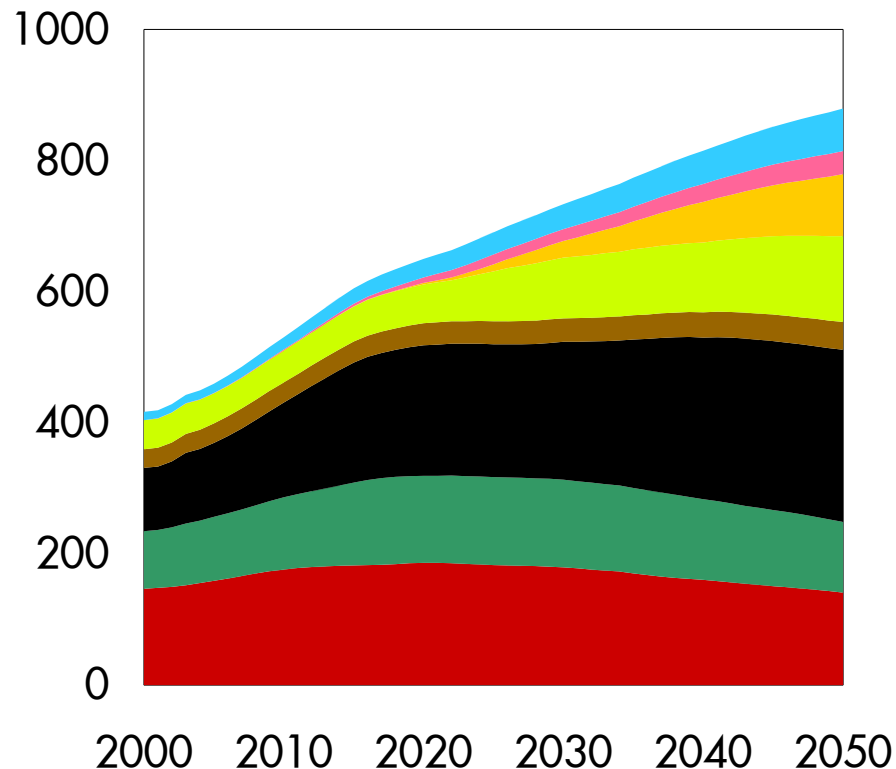


BLUEPRINTS

Scramble - What this means for energy



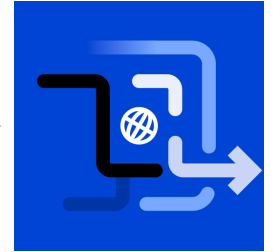
Total primary energy (EJ per year)



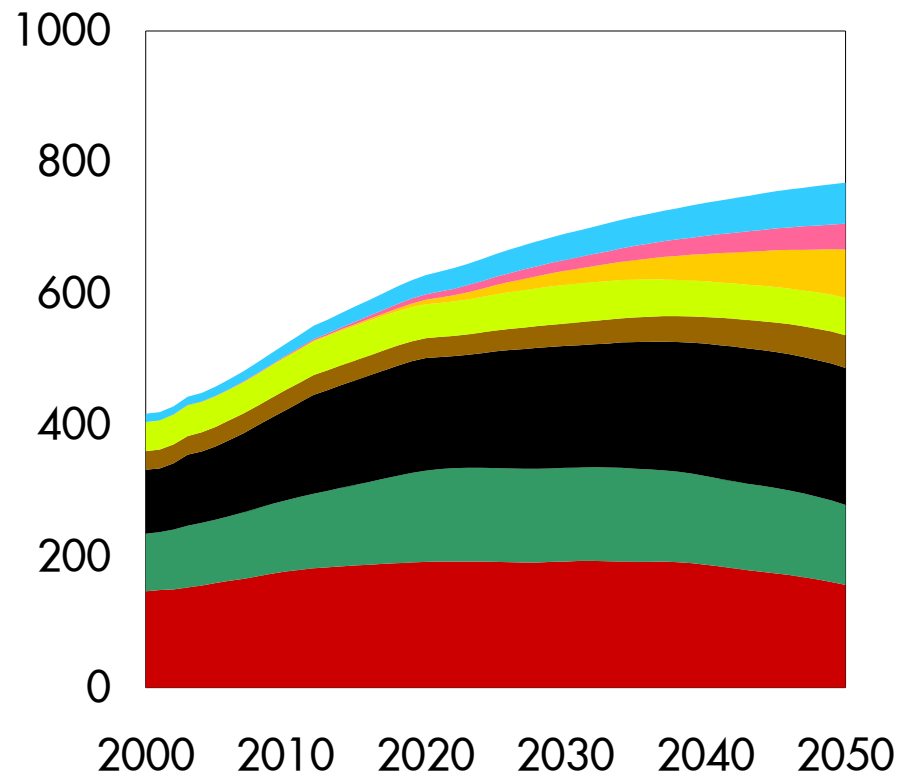
■ Oil ■ Gas ■ Coal ■ Nuclear ■ Biomass ■ Solar ■ Wind ■ Other Renewables

- Focus on existing infrastructure
- Sequential responses to hard truths
- Volatile energy prices
- Knee-jerk reactions to climate events
 - No effective carbon pricing
 - Adaptation
- Flight to coal, then biofuels
- Renewables forced in by mandates
- Patchwork of national standards

Blueprints -What this means for energy



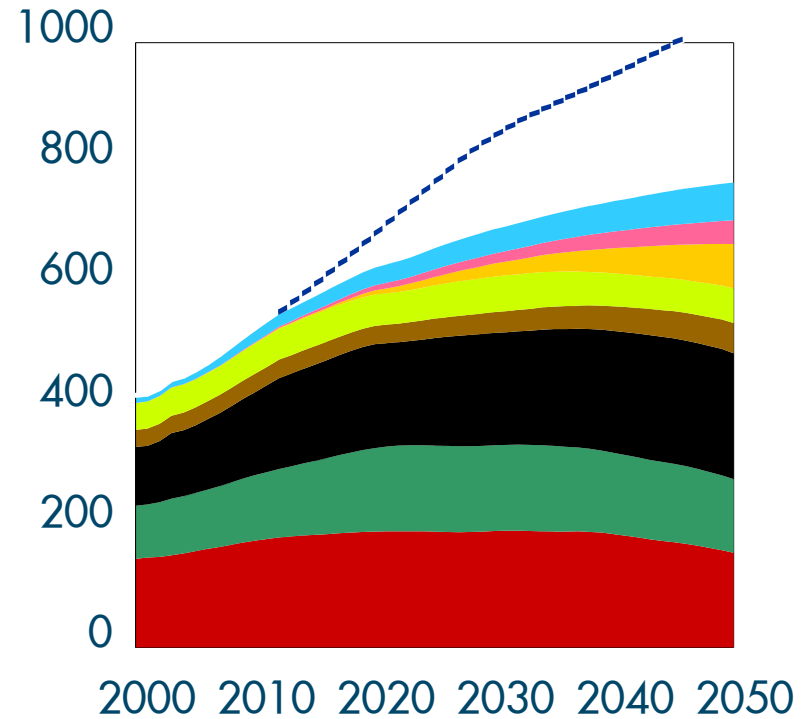
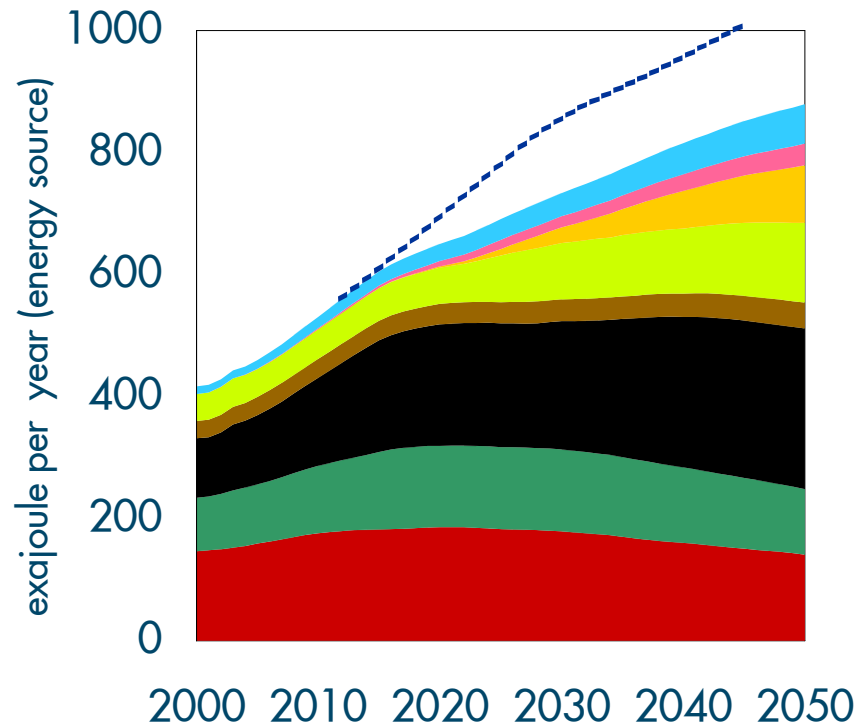
Total primary energy (EJ per year)



■ Oil ■ Gas ■ Coal ■ Nuclear ■ Biomass ■ Solar ■ Wind ■ Other Renewables

- Broad anticipation of challenges
- Critical mass of parallel responses to hard truths
- Effective carbon pricing established early
- Aggressive efficiency standards
- Growth shifts to electrification
- New infrastructure develops
- CCS emerges after 2020

Comparing the scenarios: energy mix

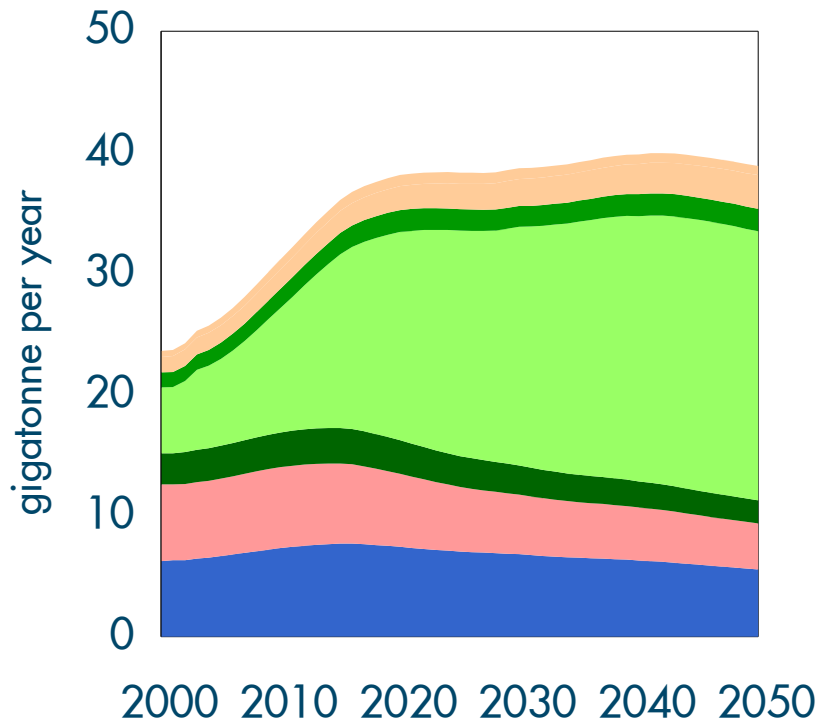


■ Oil
 ■ Gas
 ■ Coal
 ■ Nuclear
 ■ Biomass
 ■ Solar
 ■ Wind
 ■ Other Renewables
 ----- "Business as Usual"

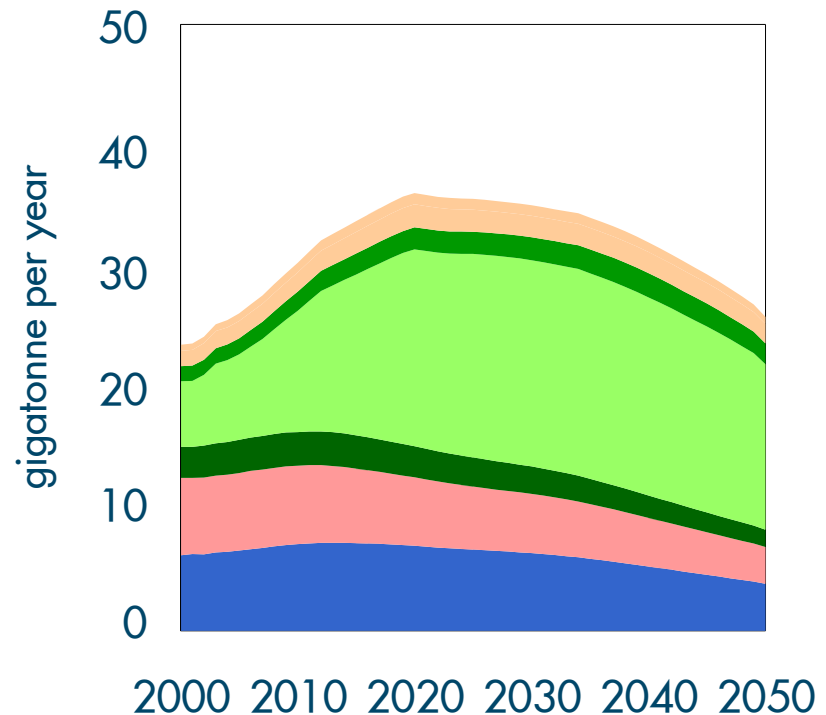
Implications for direct CO₂ emissions from energy



Late reactions



Early actions



■ Europe

■ Asia & Oceania - Developed

■ Latin America

■ North America

■ Asia & Oceania - Developing

■ Middle East & Africa

In summary – what we have learned



- 🌐 The three hard truths are **very** hard
- 🌐 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

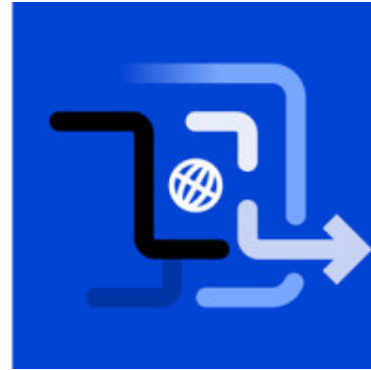
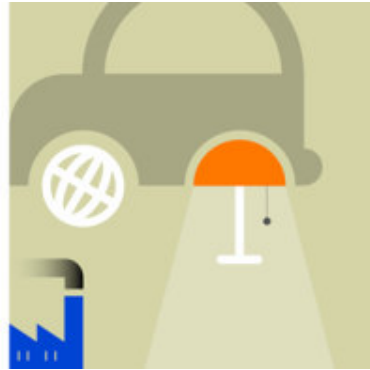
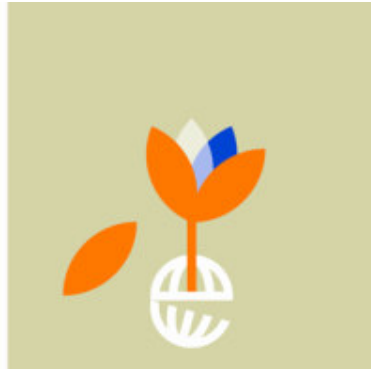
Six reduction pathways

- Increasing the efficiency of our operations, seeking to be first quartile.
- Establishing a substantial capability in Carbon dioxide Capture and Storage (CCS).
- Continuing to research and develop technologies that increase efficiency and reduce emissions in hydrocarbon production.
- Proactively developing low-CO₂ sources of energy, including low-CO₂ fuel options.
- Helping manage energy demand by growing the market for products and services –that help customers use less energy and emit less CO₂.
- Working with governments and advocating the need for more effective CO₂ regulation. Voluntary actions like setting emissions targets are not enough.

Can Shell's experience help?

Sharing Shell's current responses as an example

- Increasing our own efficiency
 - New Fertilizer Production Technologies?
- Establishing capability in CO₂ technologies
 - Responding to the Biofuel changes? – 1st Gen vs. Next Gen
- R&D into efficient technologies
 - New Products with increased nutrient efficiencies? e.g. N and P
- Aggressive development of low CO₂ footprint products
 - Shift to higher nutrient concentration densities for logistics?
- Helping our Customers with CO₂ footprints
 - Physical properties of fertilizers?
- Working with Government for effective CO₂ regulation



www.shell.com/scenarios

For more information



