

Content overview

- Meaning, purpose and scope of scenario planning
- Scenarios and decision making
- Scenario development methods
- **Scenario practice in the world of energy**
- Fundamental driving forces/key uncertainties
- World Energy Scenarios – The future of nuclear (2019)

Content of this session

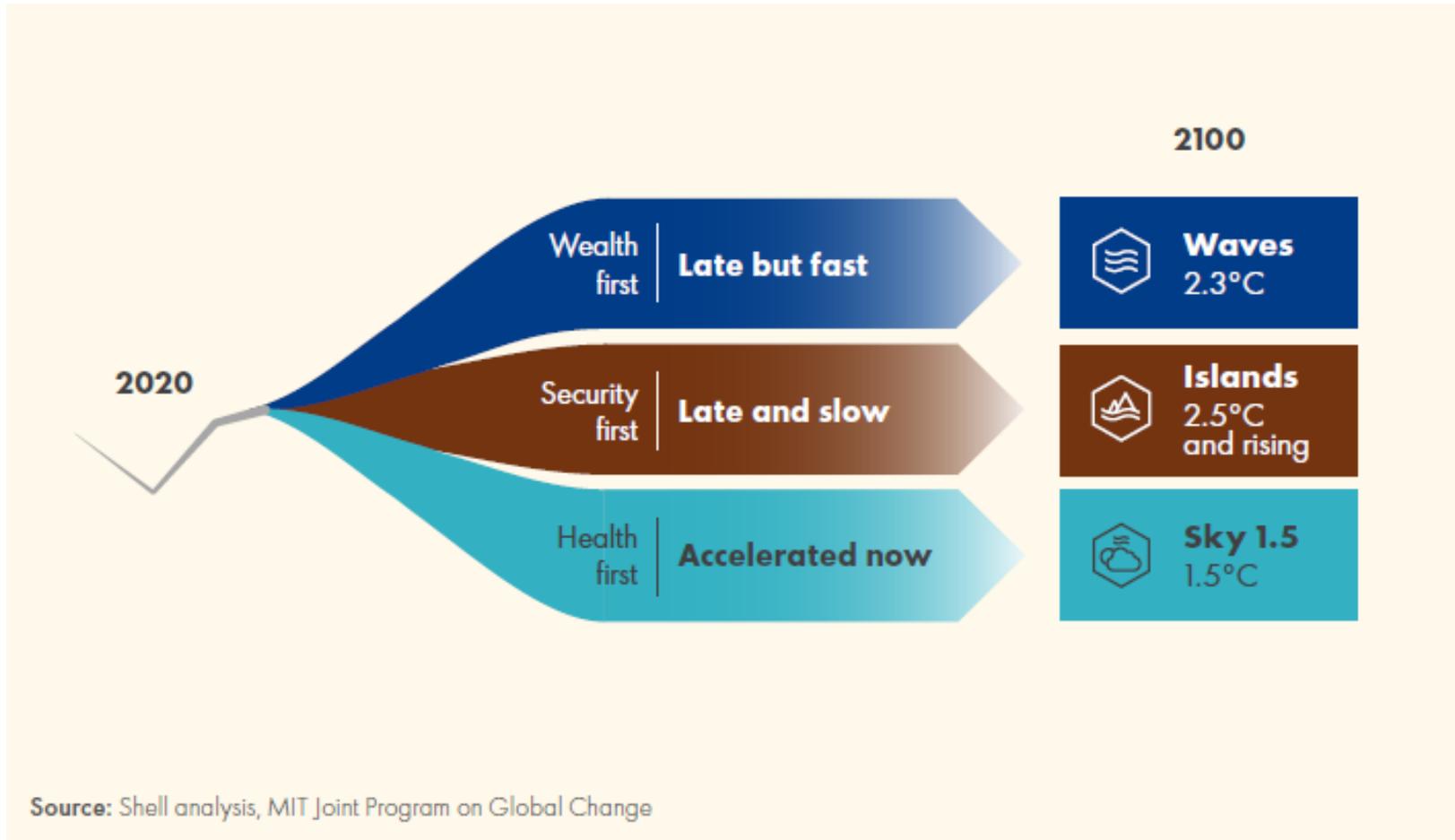
- Shell
- Equinor
- Other companies
- IEA
- World Energy Council

Shell scenarios

- Pioneered the use of scenarios for business in the 70s
- Founding father: Pierre Wack
- No regular refresh sequence, but new scenarios every 3-5 years

www.shell.com/energy-and-innovation/the-energy-future/scenarios.html

Shell scenarios



- Started to publish scenario based outlooks in 2012
- Seem to have settled on three archetypes:
 - Reform – market driven
 - Rivalry – nationalistic world
 - Rebalance – aiming to achieve < 2 deg warming
- These are updated annually

www.equinor.com/sustainability/energy-perspectives

Equinor

Two scenarios that capture where the world could be heading...



Reform

- Economic growth prioritised
- Market and technology driven
- Current policy momentum



Rivalry

- Focus on energy security
- Geopolitical uncertainty and volatility
- Trade tensions and isolationism

... and a path to a sustainable future



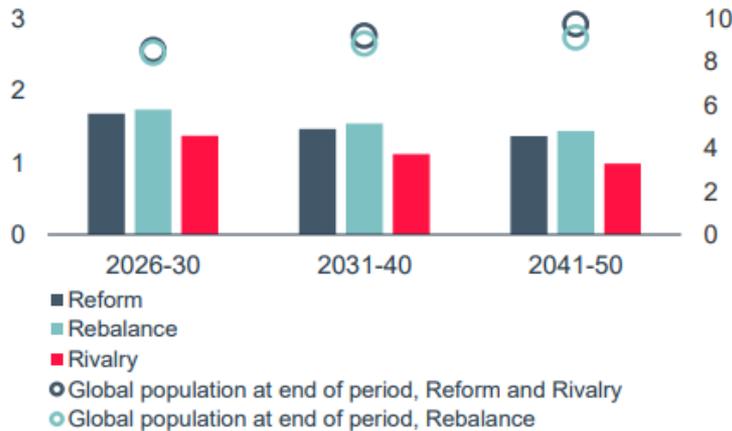
Rebalance

- Immediate and coordinated international action
- Consistent with well below 2°C Paris agreement target
- UN sustainable development goals met

Some Equinor scenario assumptions

GDP per capita growth and population development

Real annual change, % (lhs) and billion people (rhs)



Assumptions of Covid-19 are uncertain, but lead to a slight dent in economic activity below Covid-19 expectations. Historically, followed by a long-lasting increase in demand and lower labour participation rates. Demand imbalances increase the risk of supply mistakes and might lead to a less resilient world which could be partially offset by an acceleration of new technology. Going forward,

the world may experience similar outbreaks of virus, but with better preparedness, and thus reduced impact, is expected.

Global growth in *Reform* is lower than the historical growth rate of 2.9% seen since 1990. This is primarily caused by weaker demographics and decreasing catch-up potential for emerging market economies. Increasing carbon levels in the atmosphere lead to a moderately negative climate impact on economic growth from the mid-2030s onwards. The global economy grows on average by 2.2% per year between 2026 and 2050, and China surpasses the US economy around 2030.

Rebalance describes a movement towards a more just world, where economic activity to a larger extent takes place within the limitations imposed by our planet's ecological boundaries. Western governments facilitate a

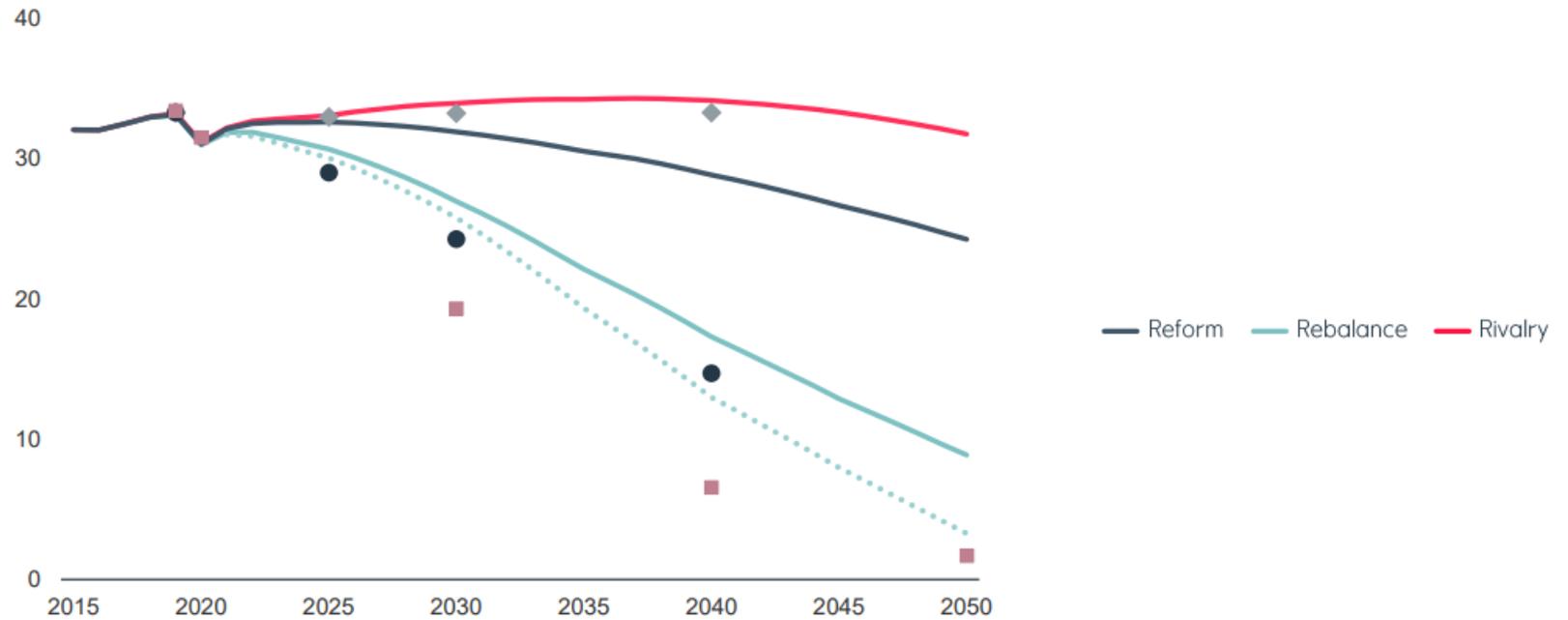
rapid transmission of know-how and technology to emerging economies, coupled with debt relief and investments. Imports of goods and services are made more expensive by pricing of negative externalities, to aid emerging countries and stem excessive consumption. There is a significant cut in waste and the phase-in of a circular economy, shifting focus to well-being rather than resource-intensive consumption. Although GDP growth in industrialised regions slows, they all experience a positive development in absolute and per capita terms. This, along with rapid growth in emerging economies, results in the beginnings of a convergence between the richest and poorest countries. Environmental and societal externalities are priced into products and energy subsidy schemes are mostly removed. In *Rebalance*, the world experiences reduced negative climate impact, and average GDP growth for the period as a whole is 2% per year.

Rivalry depicts a world with sanctions and inefficient markets that dampen technology development. Political and economic resources are channelled to less productive purposes. The economic growth in *Rivalry* averages 1.8% per year, increasingly impacted negatively by climate change. GDP is 9% lower than in *Reform* by 2050. Economic development is markedly poor, especially in the Middle East and North Africa.

Equinor

Global CO₂ emissions

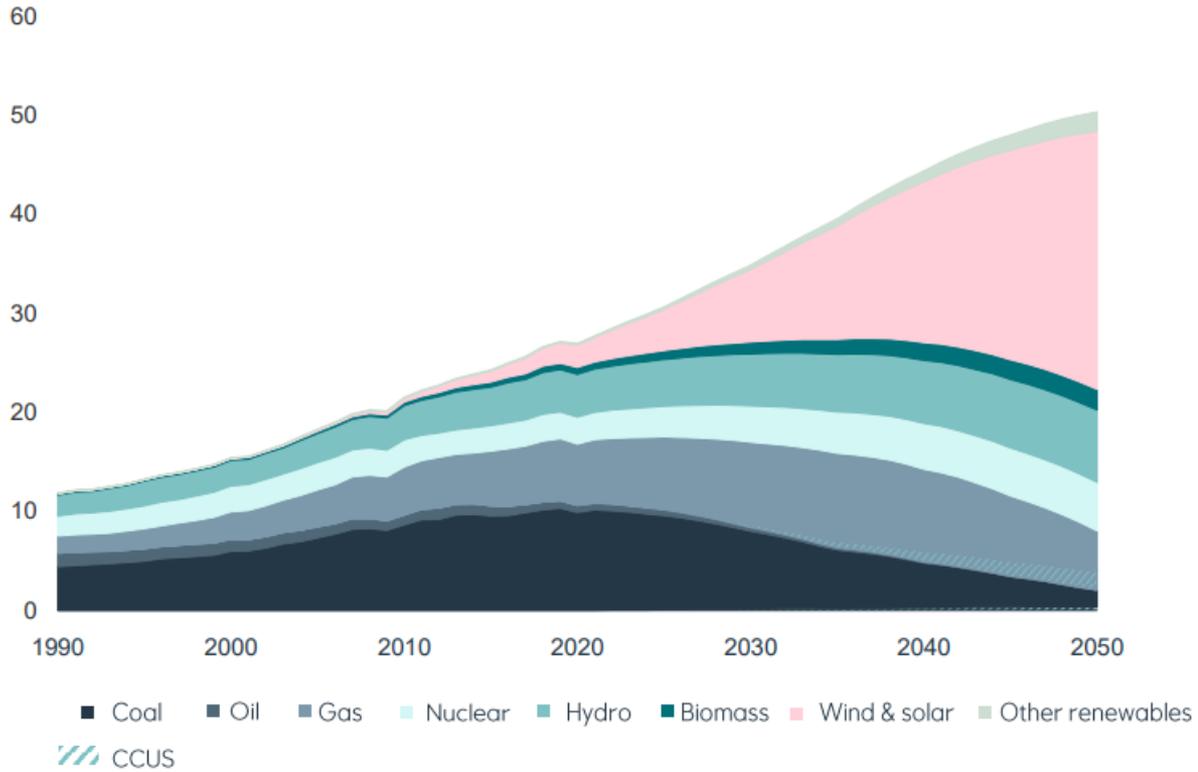
Gt



Equinor rebalance scenario

Power generation

Thousand TWh



Other companies

- There are only few oil and gas companies that have a well developed and established scenario practice (Shell, Equinor)
- Others provide single forecasts or outlooks:
 - ExxonMobil, CNOOP, etc.
- Some have more recently moved to a scenario approach
 - BP
- Limited use of scenario planning in power sector

World energy council (2019)



Modern Jazz. A market-led, digitally disrupted world with faster-paced and more uneven economic growth.



Unfinished Symphony. A strong, coordinated, policy-led world, with long-term planning and united global action to address connected challenges.



Hard Rock. A fragmented world with inward-looking policies, lower growth and less global cooperation.

www.worldenergy.org/transition-toolkit/world-energy-scenarios



World Energy Outlook 2021

- **Stated Policy Scenario**
 - ..based on **policies currently in place**
- **Announced Pledges Scenario**
 - ..based on **climate commitments that are made**
- **Net Zero Emissions by 2050**
 - .to achieve **net zero emissions** by mid century

www.iea.org/topics/world-energy-outlook

A crude categorization

Organization	National Orientation	Market & Technology Drive	Green Policies towards 2deg
Shell (2021)	Islands	Waves	Sky 1.5
Equinor (annual, 2021)	Rivalry	Reform	Rebalance (Renewal before)
World Energy Council (2019)	Hard Rock	Modern Jazz	Unfinished Symphony
IEA (annual, 2021)	N/A	N/A	Net Zero 2050
BP (annual, 2021)	N/A	N/A	Net Zero