
Strategic Resources: Are Markets for Minerals and Energy up to the Challenge?

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“Prediction is very difficult, especially about the future”

Neils Bohr (1885 - 1962)



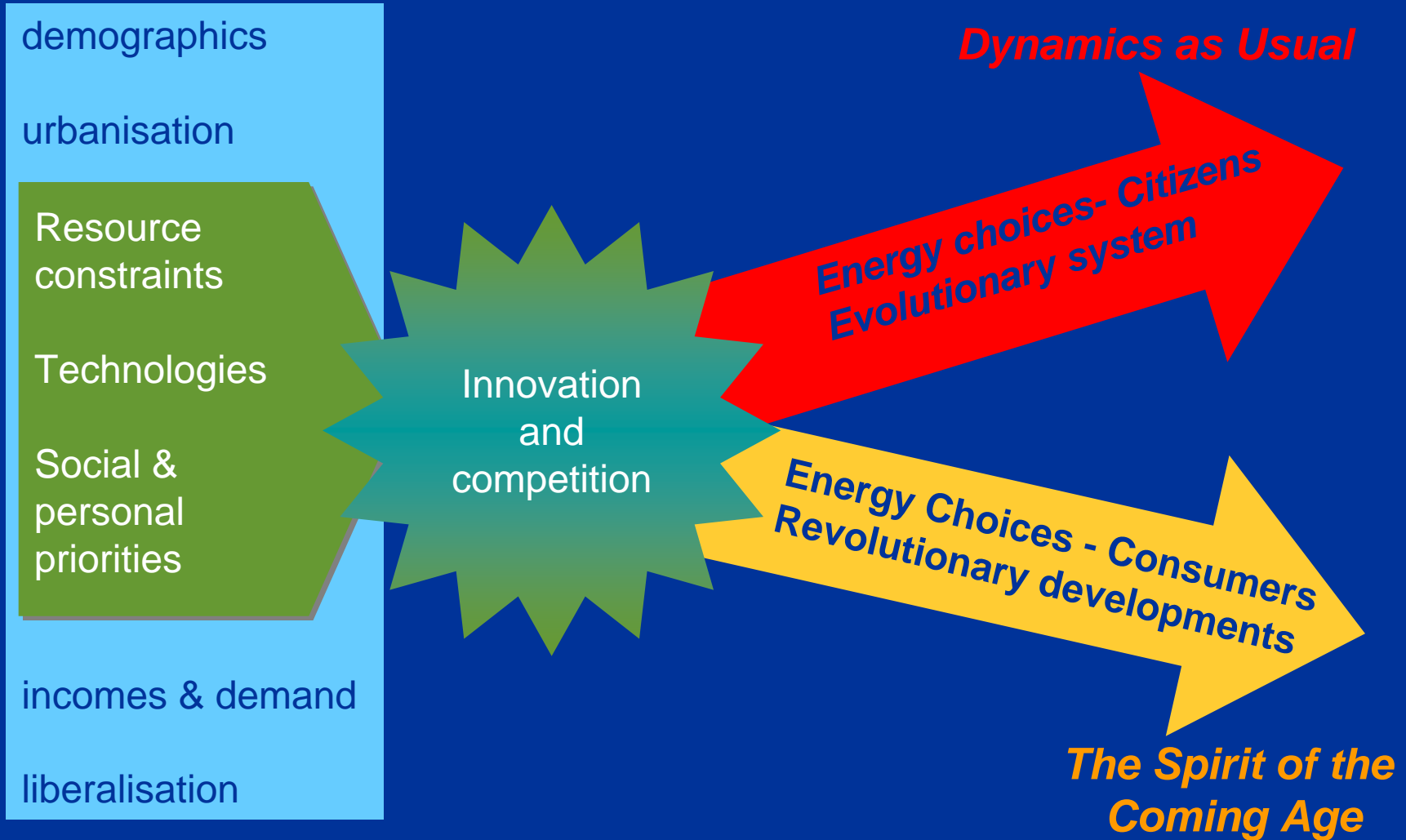
Scenario Planning

In Shell, we use long-term energy scenarios – looking out over 50 years – to help us understand how energy systems could change.

Scenarios are not an exercise in prophecy, they are designed to challenge our thinking so that we can make better business decisions today – helping us fulfil our commitments to our customers and society.



Energy Branching Points



Long Term Energy Scenarios

Dynamics as Usual

“Health and Security”

Incumbent technologies respond
Renewables promoted.

Gas favoured but security concerns.

Renewables ‘boom then bust’ until
new generation and storage
solutions emerge around 2030.

**Towards a renewables dominant
electricity and liquid fuels world**

Spirit of the Coming Age

“Convenient and Unobtrusive”

Revolutionary new technologies.
Convergence around fuel cells.

Abundant gas provides backbone

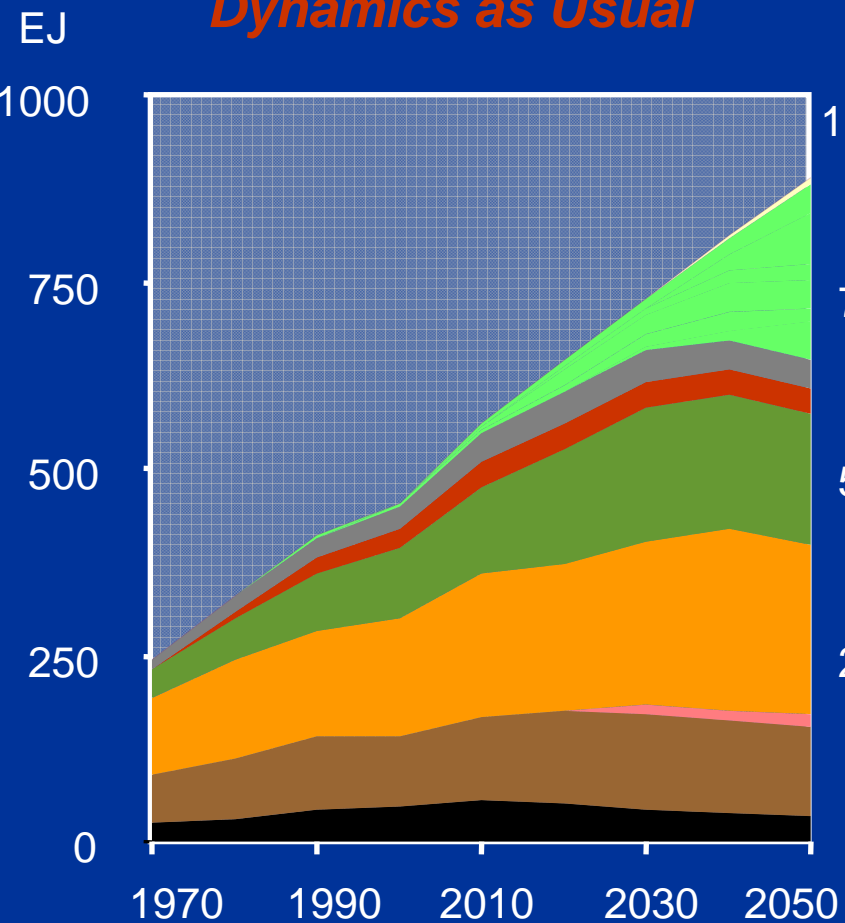
Large scale renewables pulled
by H₂ demand post 2030.

**Towards a fuel cell dominant
hydrogen economy**

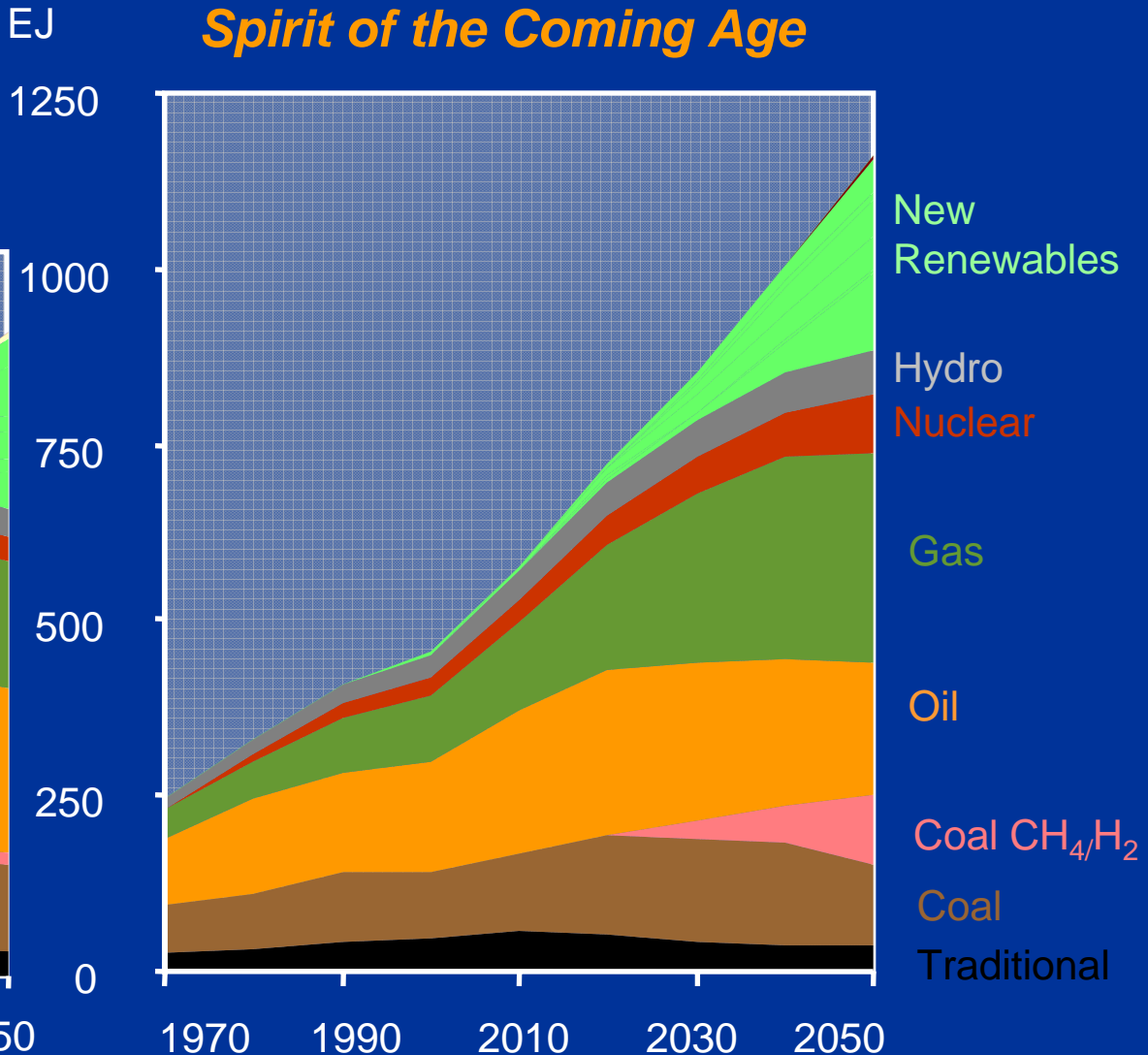


Primary Energy Comparison

Dynamics as Usual



Spirit of the Coming Age



Scenarios - Common Features

- Natural gas as a bridge fuel over the next two decades and the importance of mitigating supply security fears.
- Strong pressures which oil markets will face as new vehicle technologies diffuse.
- Gradual shift towards distributed heat and power for economic and social reasons.
- Potential for renewables, particularly solar and biofuels, to dominate primary energy supply in the longer term.



LNG Specific Factors

Recent History shows:

- Long-term contracts largely prevail
- Take or Pay contracts
- Growing number of LNG markets
- Gas is competitive for power generation at base-load levels with CCGT technology

Regional and Global Pressures shaping the future:

- Market liberalisation, new entrants (and exits)
- Weak demand forecasts from the key Japanese market and uncertain future business outlook
- New entrants into the upstream
- At the margin short-term and build up volumes into USA, Spain etc. increasing but still small
- LNG ships procured on non-project dedicated basis
- Some investment in LNG capacity ahead of firm sales
- US LNG demand growth expected to be significant

Overall LNG remains key in meeting the global demand for gas



End



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Back up Slides



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Dynamics as Usual

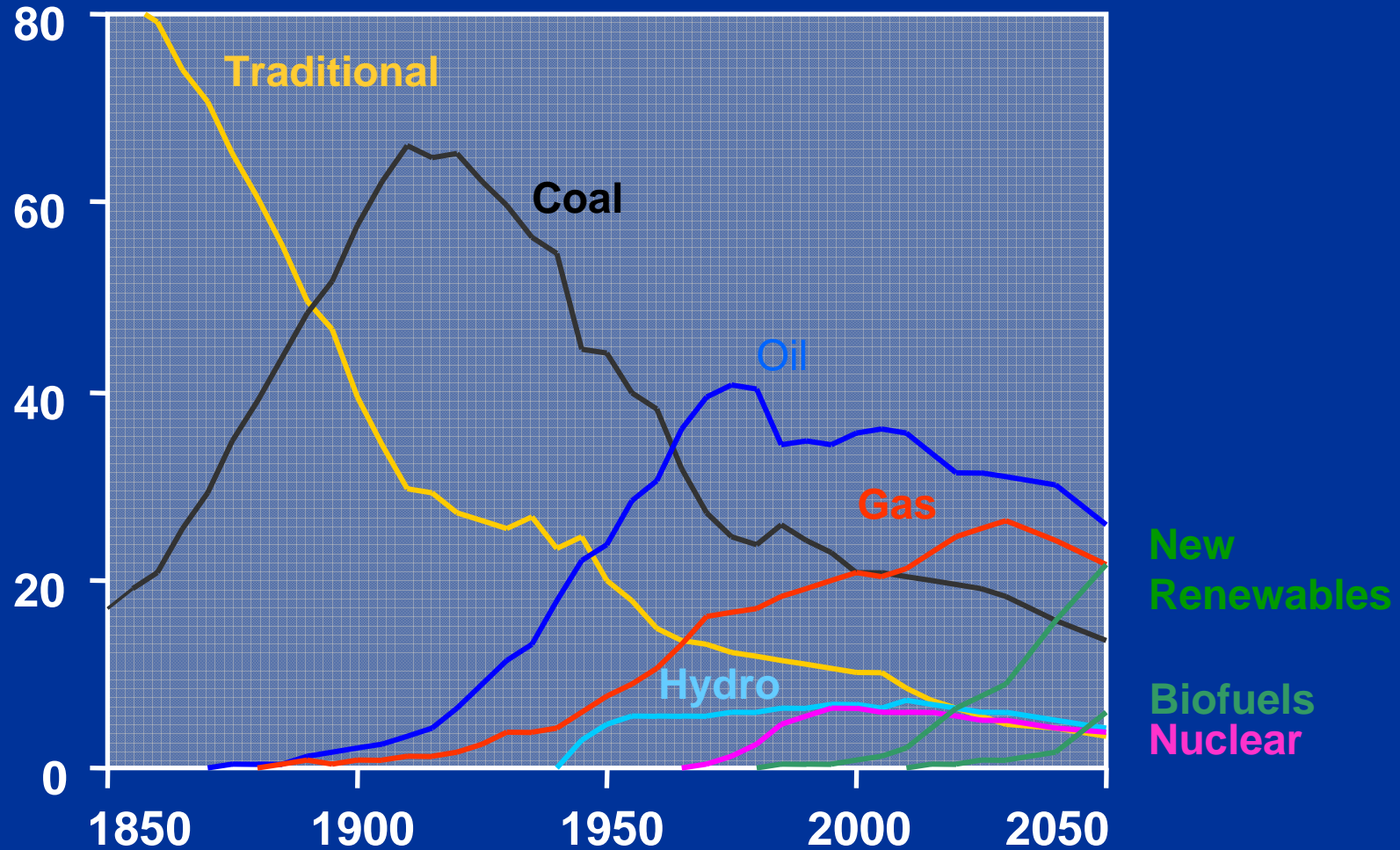
Societal pressures for “clean”, “secure” and “sustainable” energy push a direct path to renewables, supported by gas in the medium term

But only after advances in energy storage and a next generation of renewables around 2025. Vehicle efficiency advances prolong the oil transition.



Energy Transitions Dynamics as Usual

% of Primary Energy



Spirit of the Coming Age

Consumer demands for more convenience, flexibility and independence, supported by advanced hydrocarbon technologies, provide an infrastructure bridge to a hydrogen economy.

Longer term this creates a large demand pull for sustainable hydrogen and renewables.

