

GBLALE ENERGITRENDER OG NORSKE MULIGHETER

Statkrafts Lavutslippsscenario

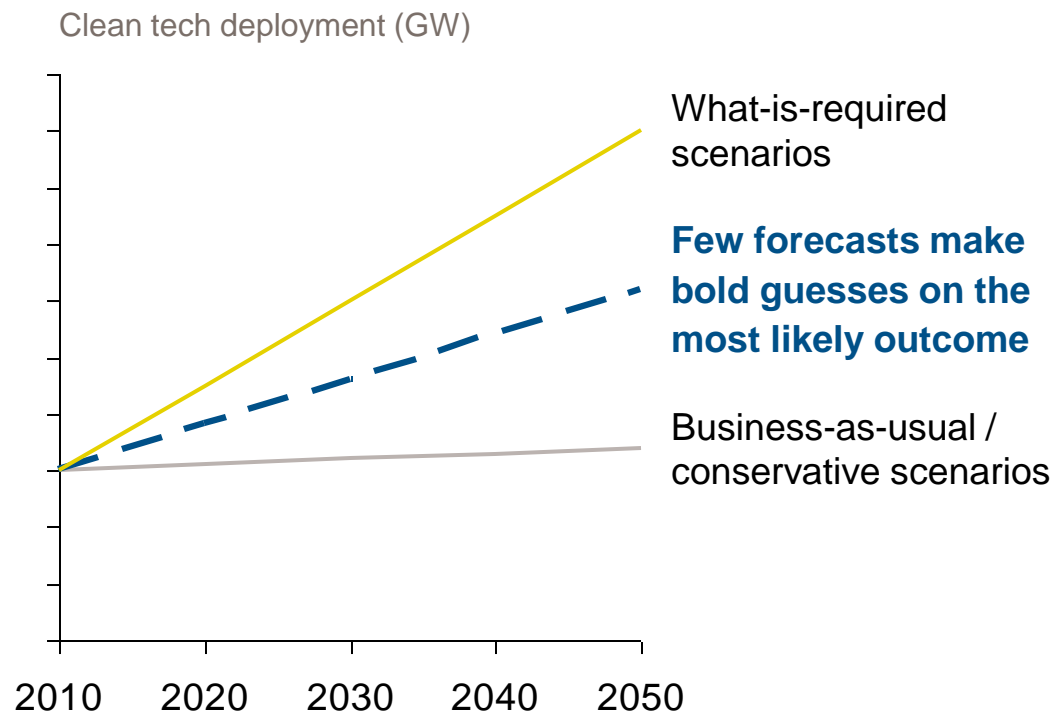


Few views on clean tech & policy seem balanced

External sources are often:

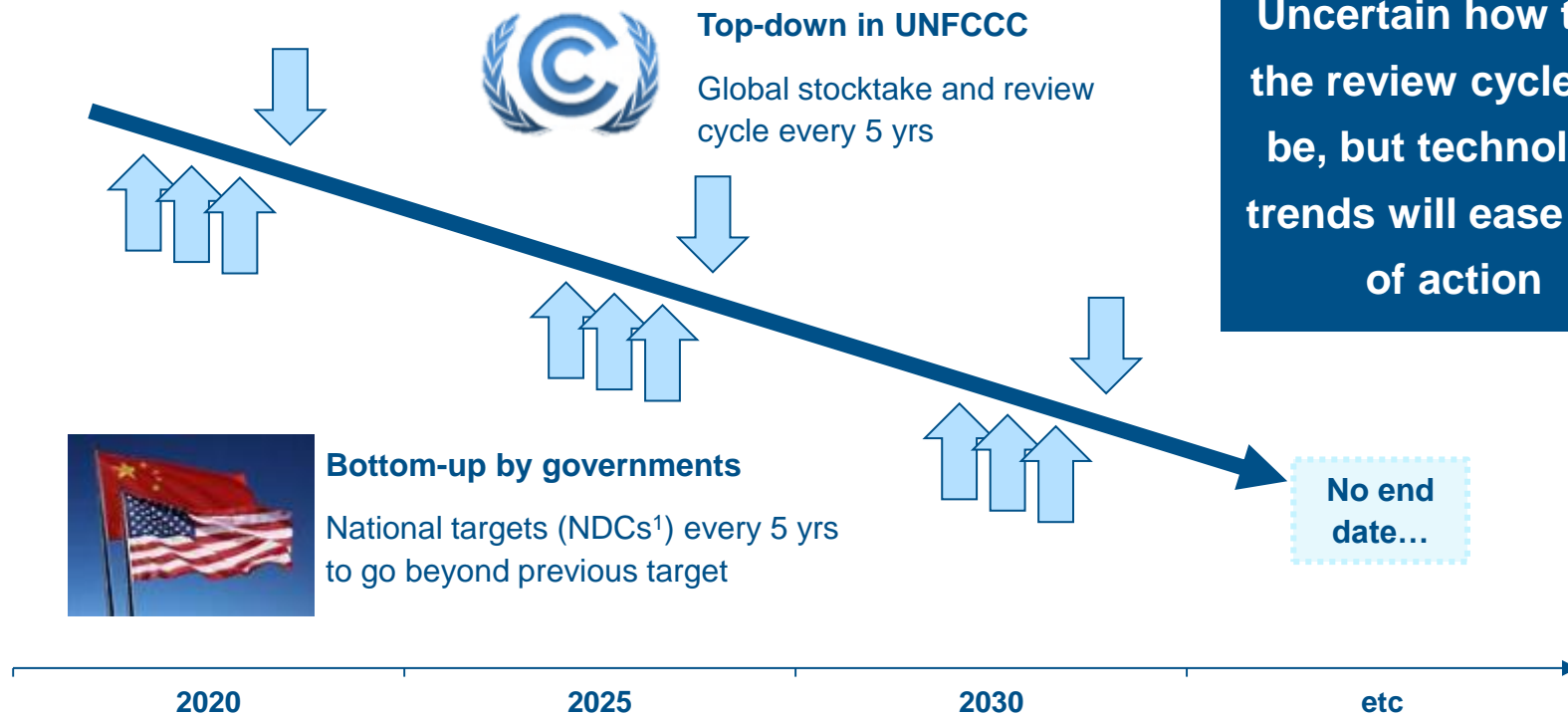
- ▶ **Too conservative** on clean technology and future policy, using business-as-usual logic. Often used in call-for-action rhetoric.
- ▶ **What-is-required** scenarios, on what it takes to limit global temperature increase to 2 degrees
- ▶ **Incomplete**, not giving a global view across fuels (industry associations. etc.)

Typical spread of forecasts for clean-tech deployment



We observe strong policy push...

World emissions (GtCO₂e)



Uncertain how tight the review cycle will be, but technology trends will ease cost of action

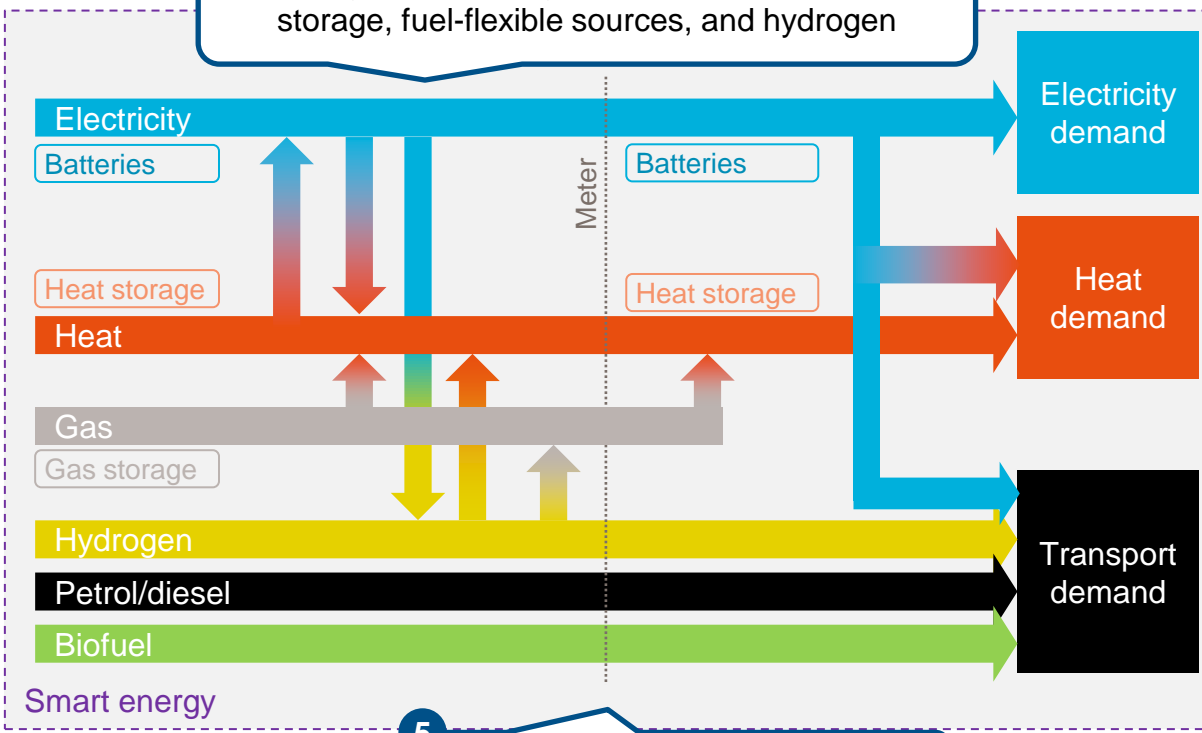
...and strong technology trends

1 More renewables generation overall

2 Convergence of energy sectors by electrification, storage, fuel-flexible sources, and hydrogen

3 More flexible demand

4 More distributed generation and storage



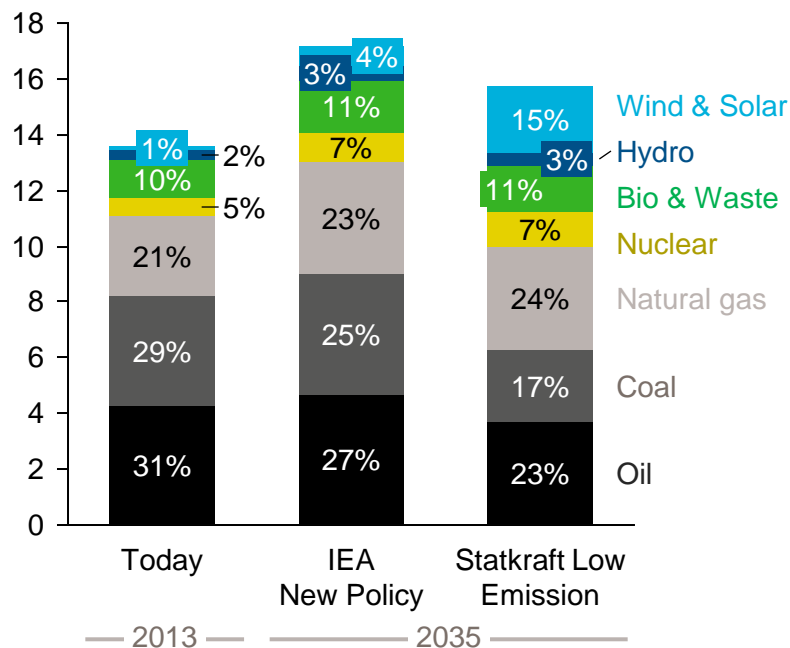
5 Smart and efficiently operated

A scenario based on a mutually reinforcing cycle of technology development and climate policy

- ▶ Continuing today's RES trends
- ▶ Allowing for clean-tech trends in transport and other end-use sectors
- ▶ Assuming policy-makers tighten in accordance with Paris 5year cycle

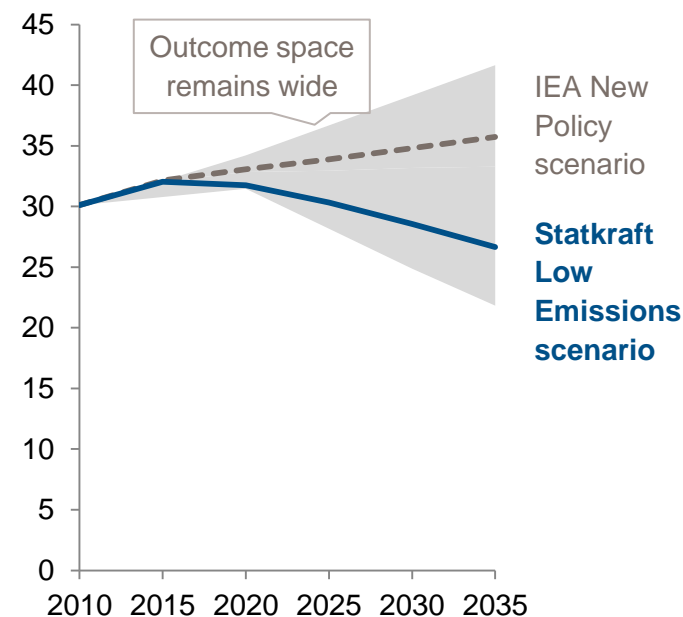
Energy supply and usage greener...

World's primary energy demand (Billions toe)



...bending emission pathways earlier

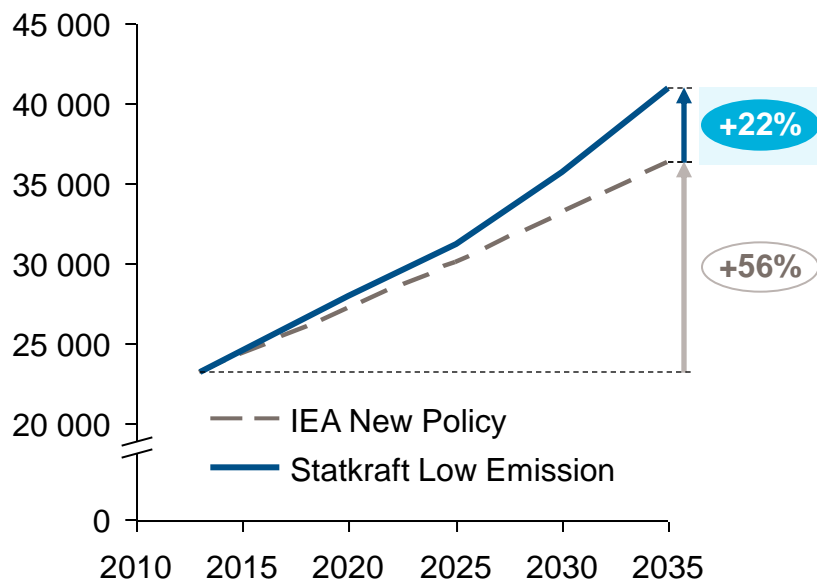
World's energy-related emissions (GtCO₂e)



Electrification increases power demand further

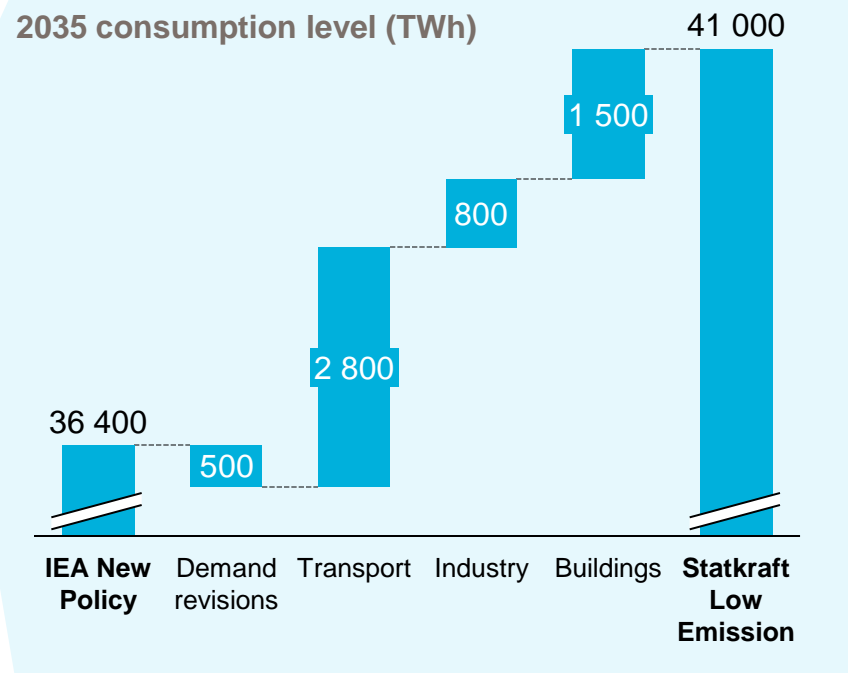
Demand increase beyond IEA forecast

Global electricity consumption (TWh)



from all sectors, yet most from transport

2035 consumption level (TWh)



Increasing share of intermittent generation challenges the power system

More renewables makes the supply-side less flexible, and requires increasing flexibility elsewhere

1 Letting the market forces drive the change

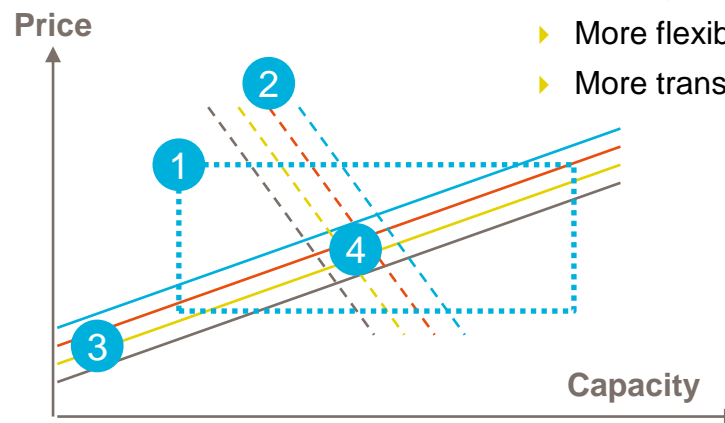
- ▶ Price signals both on carbon and electricity
- ▶ Allowing for real scarcity pricing will trigger development of existing and new sources of flexibility
- ▶ Better primary, secondary and balancing markets

2 Active demand-side

- ▶ Smart buildings' load controlled
- ▶ Electric heating turning on/off
- ▶ Smart charging of electric vehicles
- ▶ Controllable industry load (hydrogen, heat)

3 New flexibility in supply

- ▶ More gas motors
- ▶ Using existing CHP flexibly
- ▶ More bio and geothermal
- ▶ Making existing gas and coal more flexible
- ▶ More flexible hydro (pumped + reservoir)
- ▶ More transmission

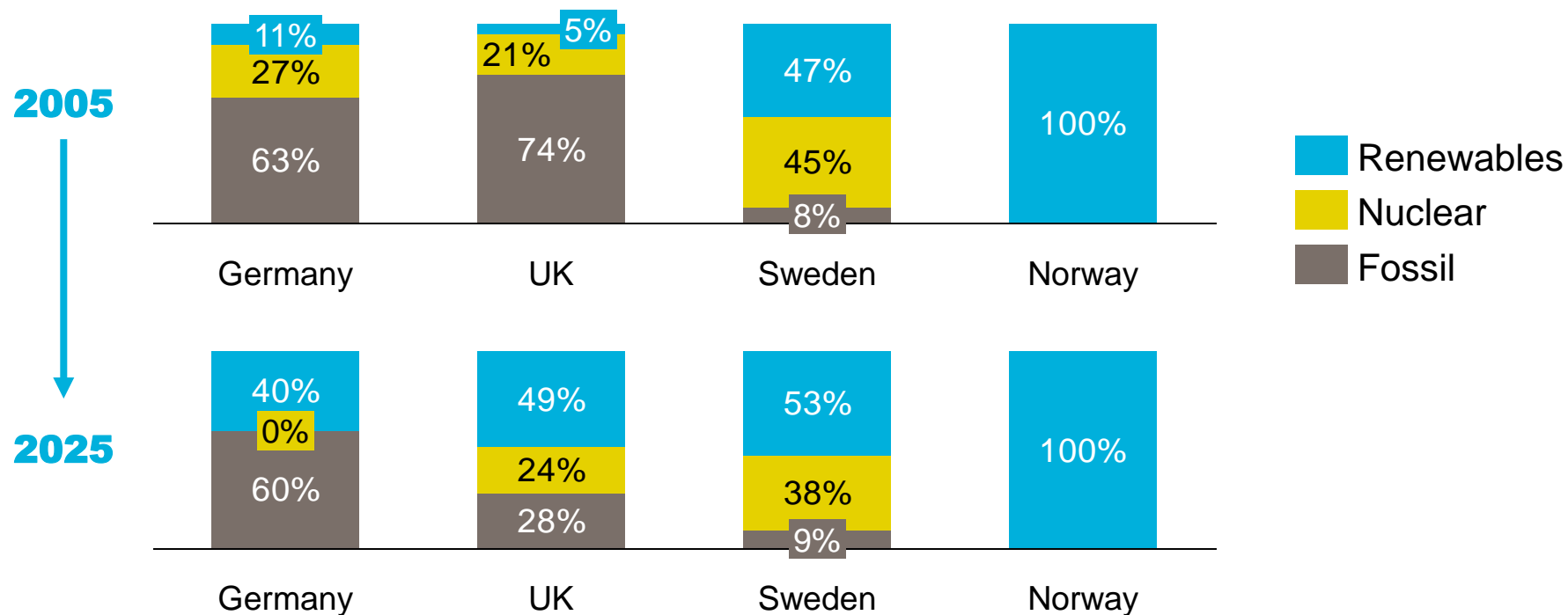


4 Pure flexibility technologies

- ▶ Batteries and other electricity storage
- ▶ Thermal storage, Chemical storage

Norway's power sector already decarbonised...

Electricity production mix very different across countries





THANK YOU



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