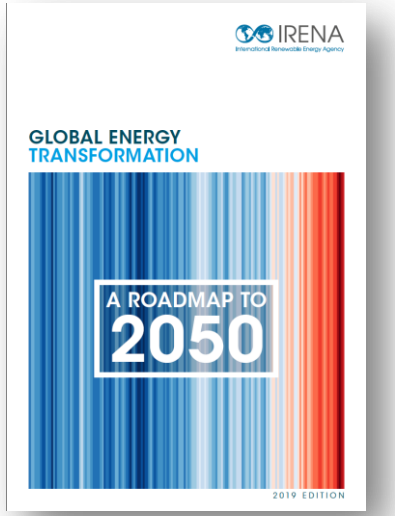
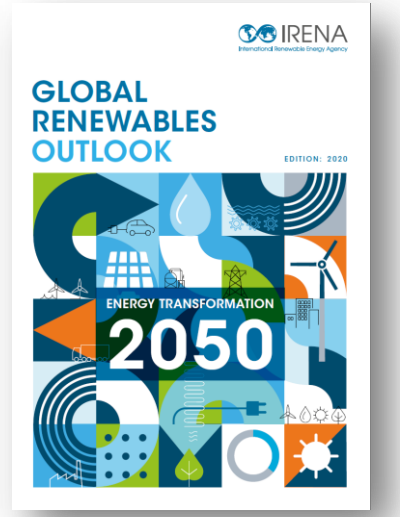
The world knows what is needed for energy transition

- Phase out coal power rapidly
- Accelerate deployment of renewable power significantly
- Enhance the flexibility of power systems to enable higher solar and wind shares
- Electrify transport & heating
- Use clean hydrogen where direct electrification is not possible
- Deploy bioenergy
- Apply CCS for remaining emissions including CDR/BECCS
- Use energy wisely and efficiently
- *There is a general agreement on these principles amongst experts*



2019
2 degrees scenario
Emissions -70% by 2050



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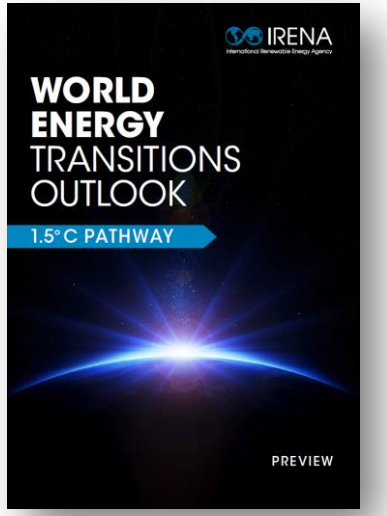
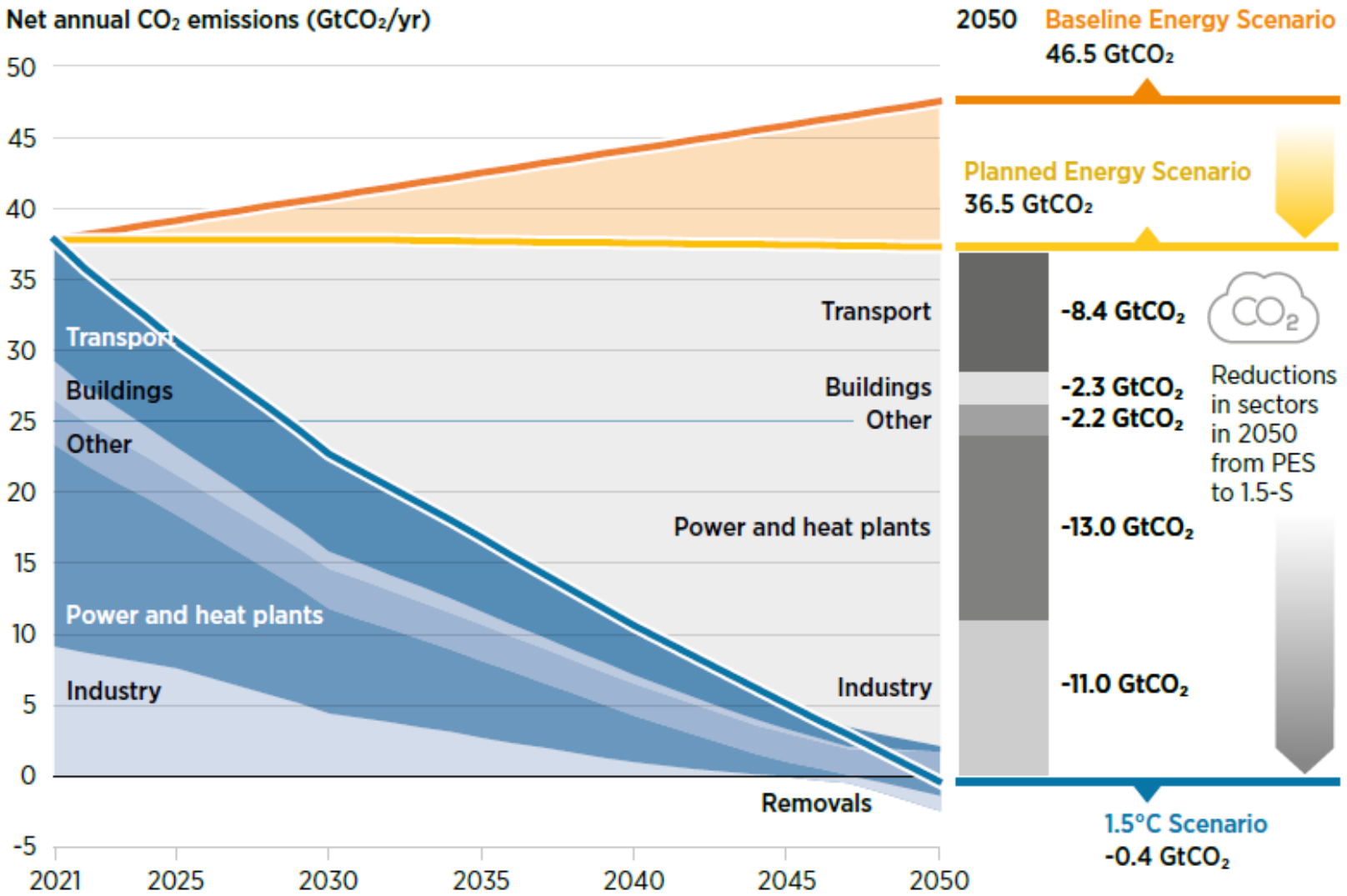


March 2021
1.5 degrees scenario
Net zero emissions by 2050

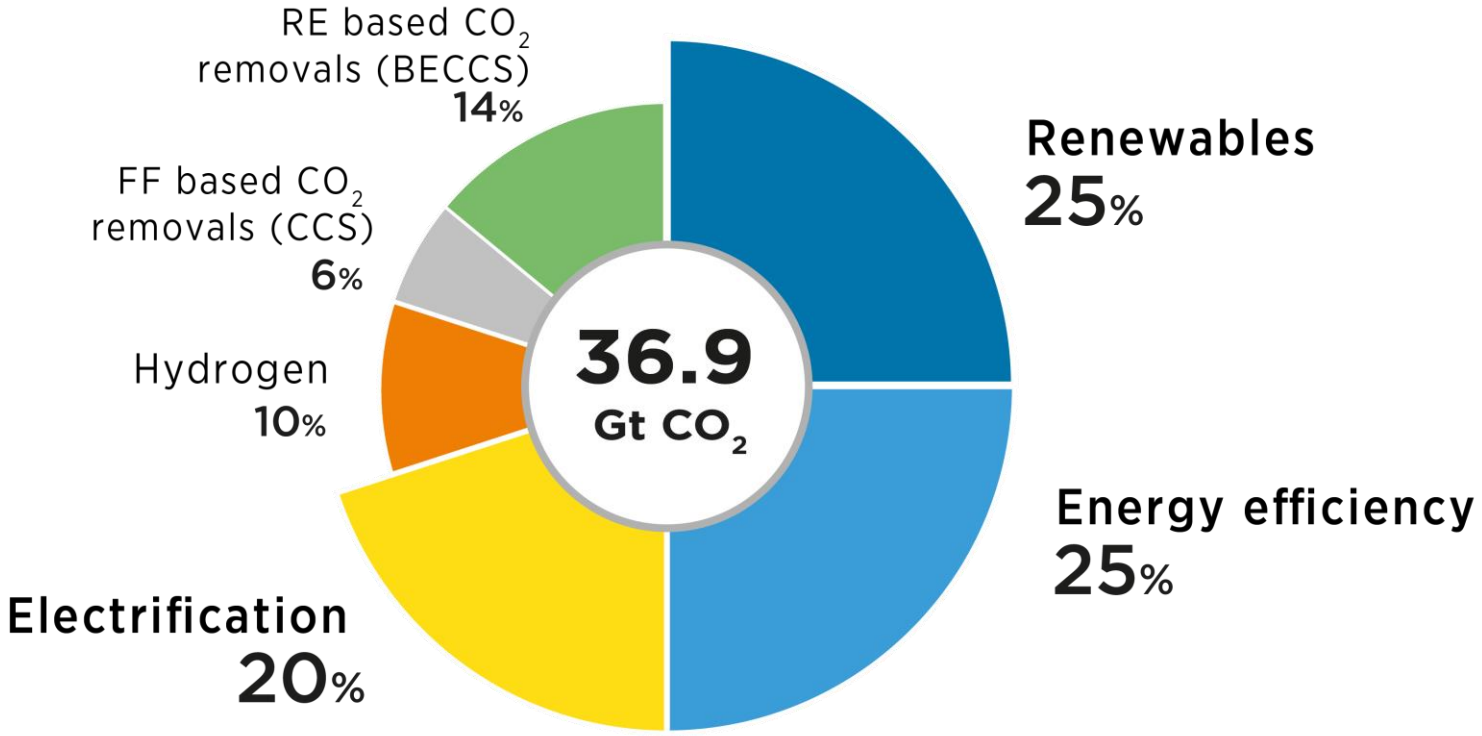
Net zero emissions by mid-century

- **Planned Energy Scenario:** Baseline emissions continue to rise, while the policies of governments result in flatlining of emissions
- **1.5C Scenario:** global CO2 emissions need to drop to net zero by 2050
- **2020-2030 must be the decade of action:** steepest decline necessary over the next 10 years.



Renewables, efficiency and electrification dominate energy transition

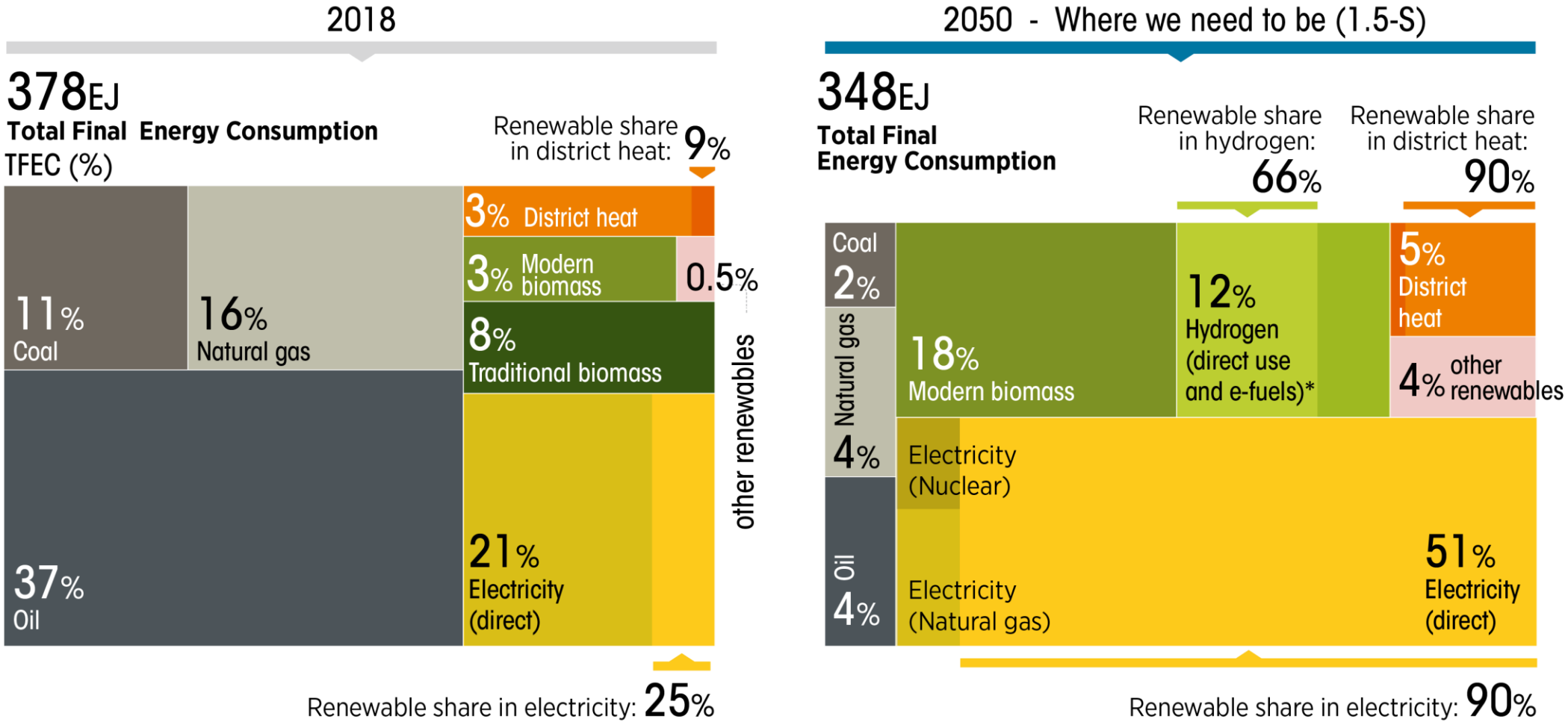
Six components of the energy transition strategy



90% of all decarbonisation in 2050 will involve renewable energy through direct supply of low-cost power, efficiency, electrification, bioenergy with CCS and green hydrogen.

IRENA analysis of leading scenario studies shows robustness of renewables-based solutions: https://energypost.eu/18-energy-transition-scenarios-to-watch-where-they-agree-and-disagree/

Electricity is the central energy carrier in future energy systems



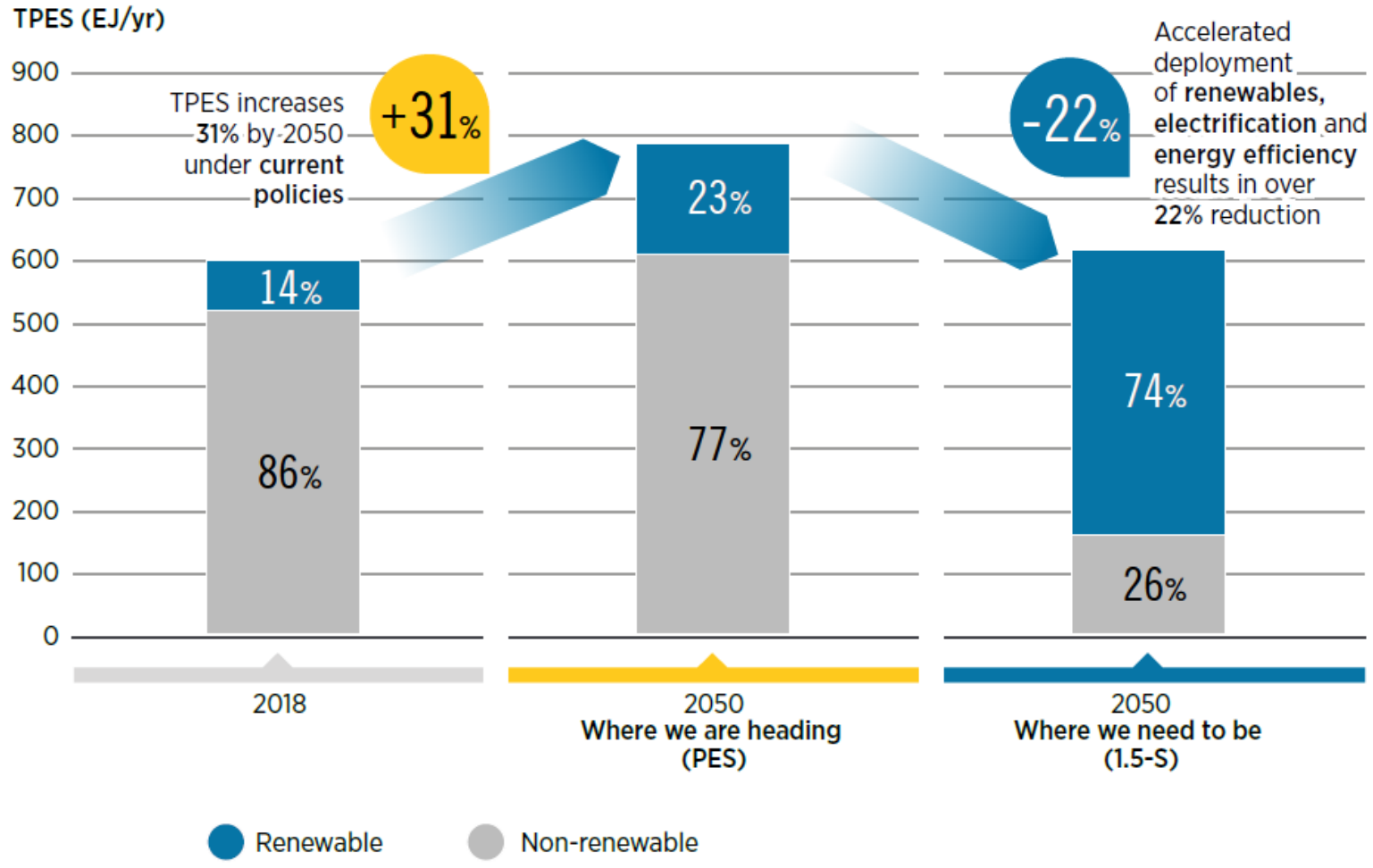
- 90% of total electricity needs will be supplied by renewables by 2050
- Direct-use of electricity makes up over half of final energy consumption
- Hydrogen provides 12% of final energy consumption (renewable share in hydrogen: 66%)

The global energy supply must become more efficient and more renewable

- The share of renewable energy in total primary energy supply (TPES) must grow from 14% in 2018 to 74% in 2050 in the 1.5° C Scenario.

This entails:

- An 8-fold increase in the rate of growth of renewables.
- A 2.5-fold increase in the rate of energy intensity improvement.

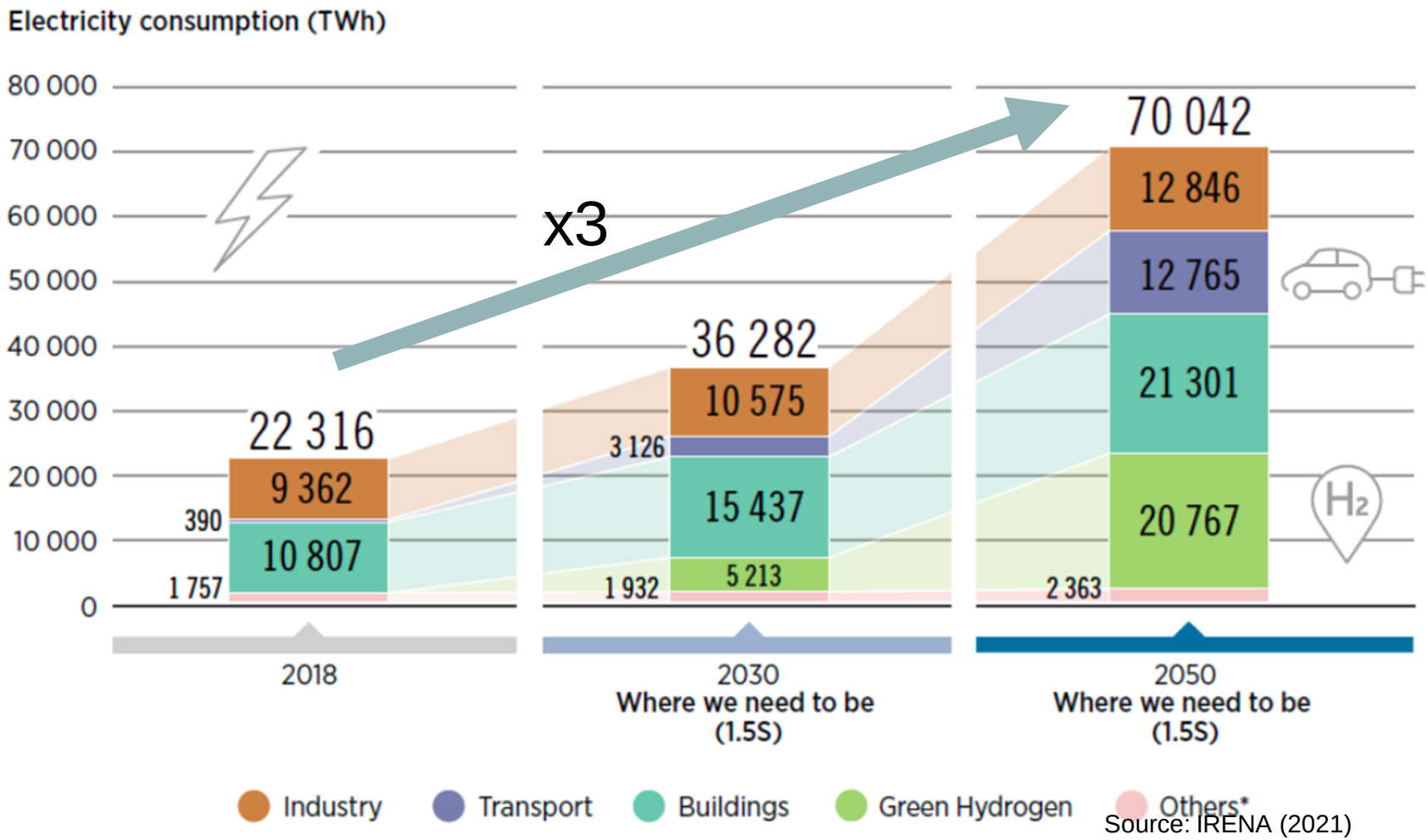


Global power supply projections in a 1.5C scenario

Growing electricity demand for green hydrogen production

- By 2030, coal generation would halve and eventually would be phased out by 2050.
- Global renewables capacity additions need to increase four-fold this decade.
- The share of renewables would grow to 90% in 2050 from 25% in 2018.
- VRE like wind and solar would grow to 63% of all generation in 2050, compared to 10% in 2018.
- Such power systems will require increased flexibility.

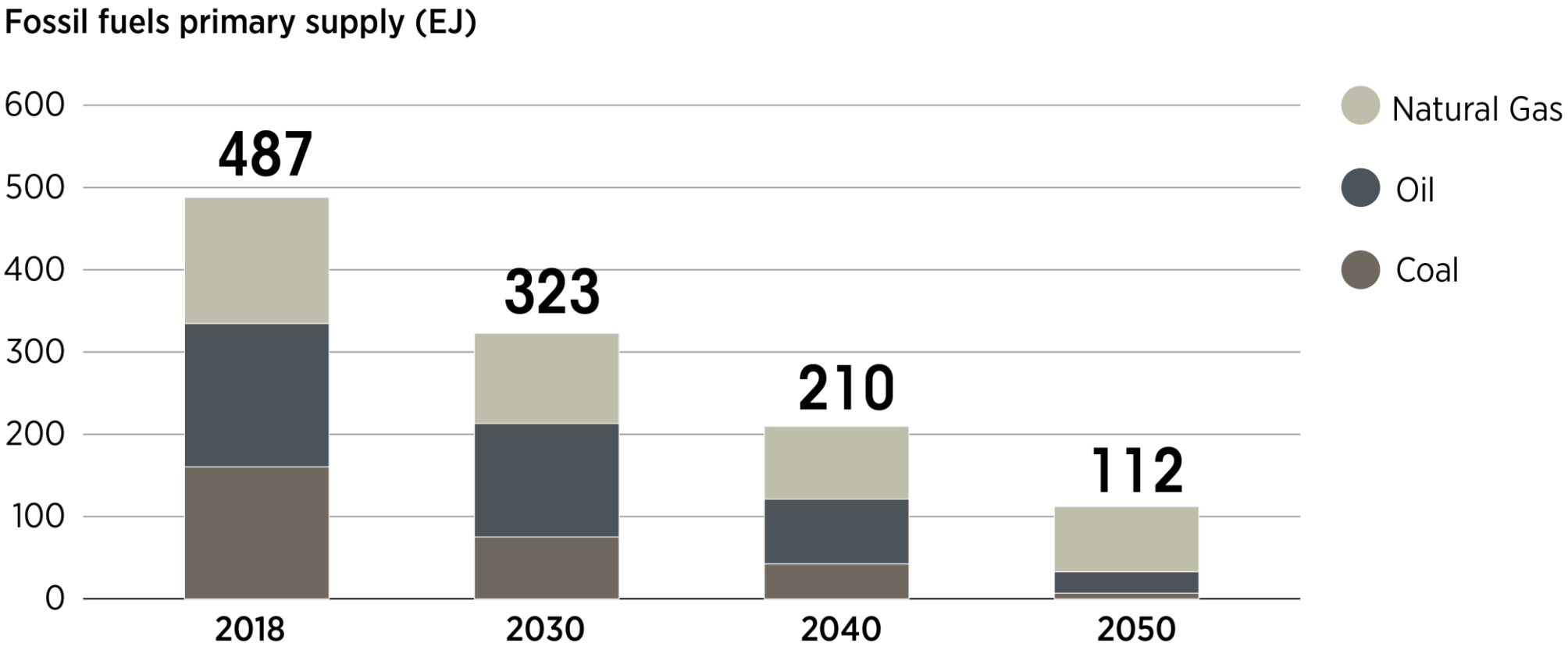
Electricity consumption by sector, 2018, 2030 and 2050 (TWh/yr) in the 1.5°C Scenario



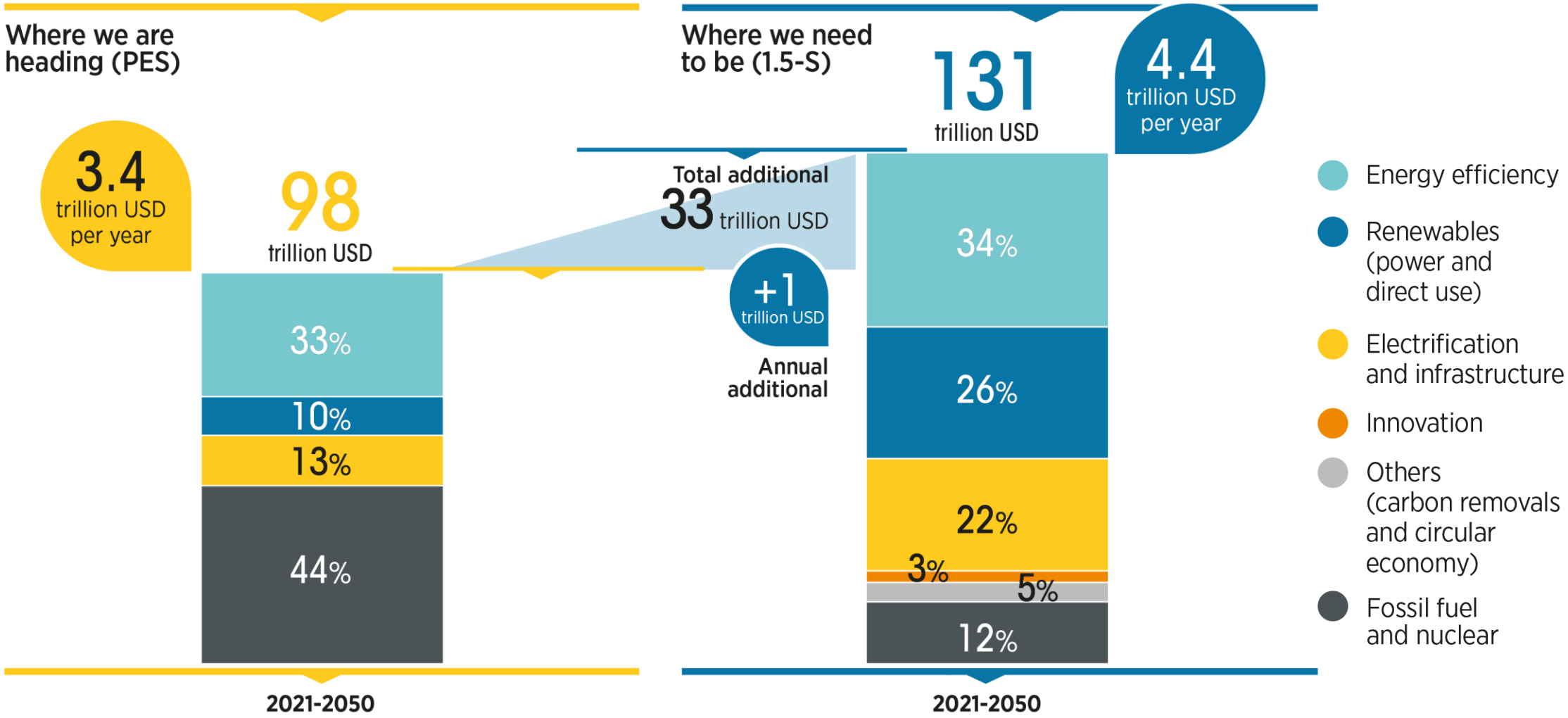
Source: IRENA (2021)

Declining importance of fossil fuels

Fossil fuel use could decline by more than 75% by 2050, with coal use almost entirely phased out by 2050, and most oil demand as well, leaving natural gas with demand a little over half of today's level.

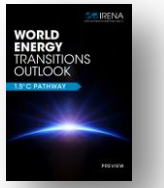


New investment priorities: renewables, efficiency and electrification



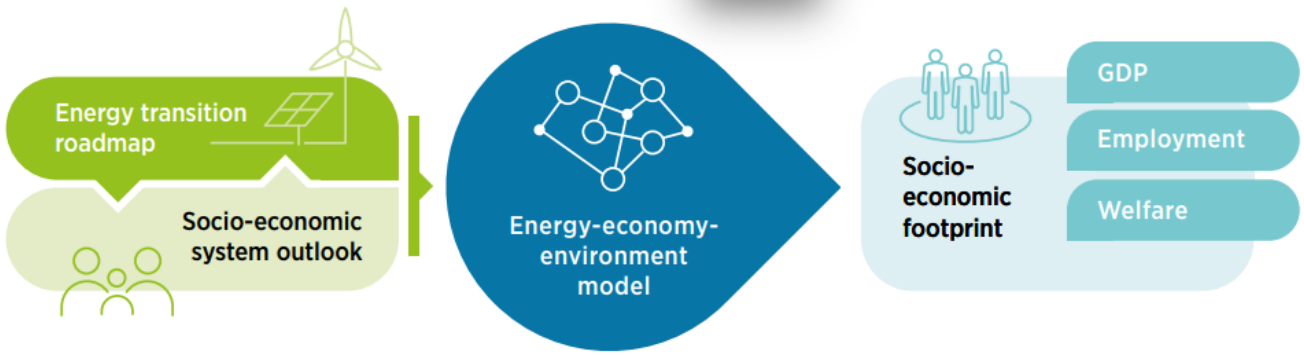
A climate-safe future calls for the scale-up and redirection of investments towards energy transition technologies, away from fossil fuels.

Socio-economic analysis (full report June 2021)

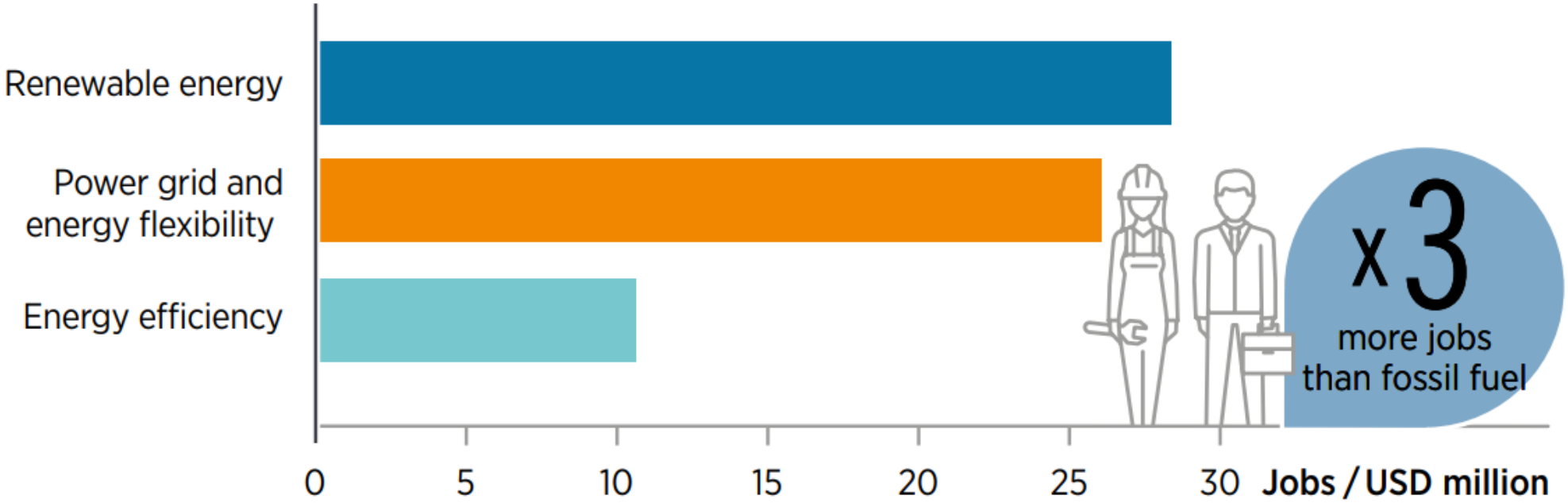


IRENA
International Renewable Energy Agency

Socio-economic systems will play a fundamental role in deploying fast transitions needed to stabilise global warming at 1.5°C. IRENA's socio-economic footprint analysis provides an integrated systemic approach to evaluate the outcomes of energy transition pathways.

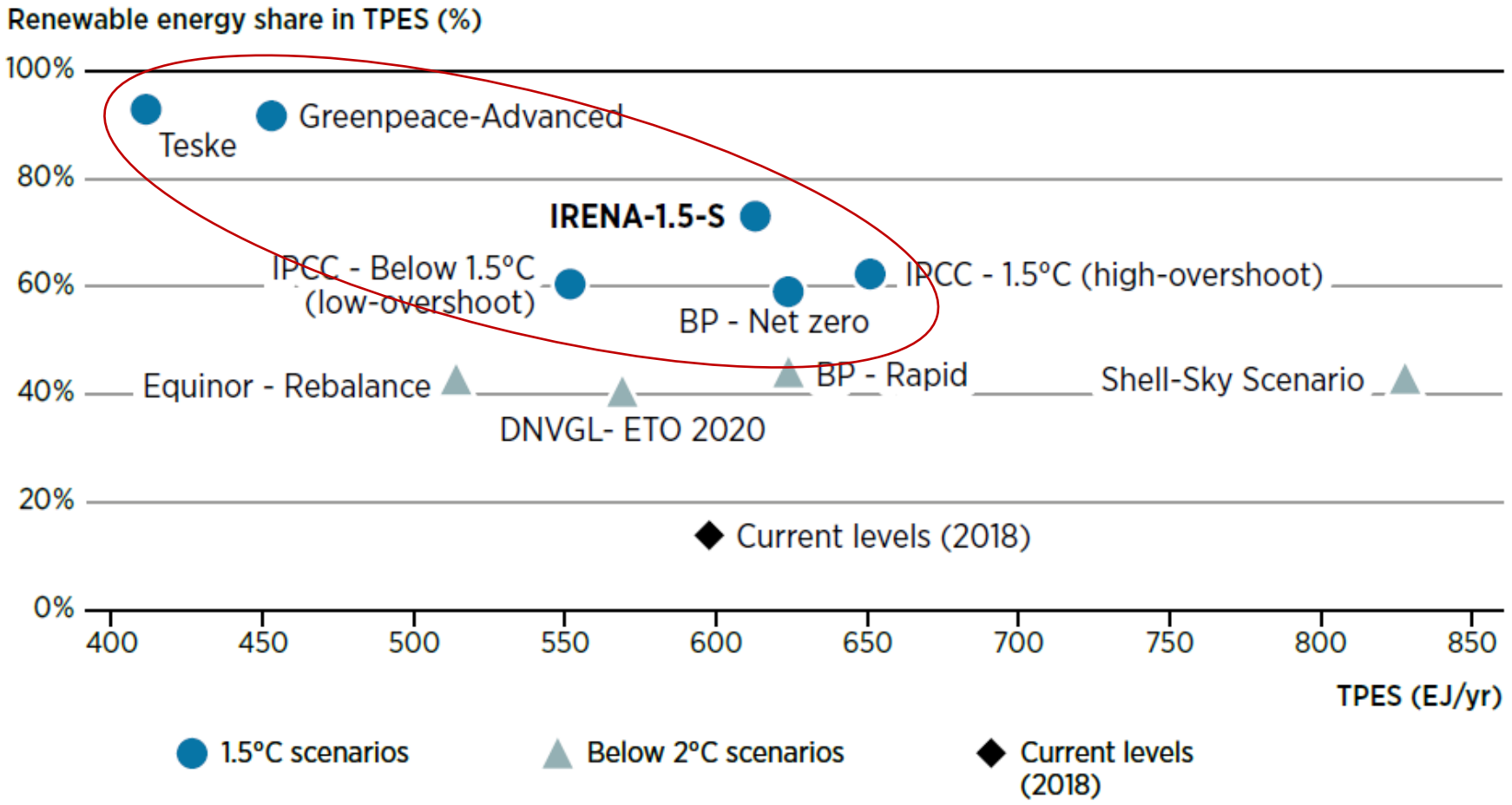


Ex. Employment



Emerging consensus on the role of renewables and electrification

- 1.5° C scenarios consider a minimum of 60% renewables share in TPES in 2050.
- Agreement on energy efficiency and electrification being essential in achieving 1.5° C.



IRENA analysis of leading scenario studies shows robustness of renewables-based solutions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18 energy transition scenarios to watch: where they agree and disagree
May 21, 2021 by Dolf Gielen, Asami Miketa, Ricardo Gorini and Pablo Carvajal — 1 Comment

Targets to focus on:

- Energy intensity
- Renewables share in primary energy
- Renewable power generation
- EV sales
- Hydrogen demand
- Biomass,
- Reducing global emissions by 50% by 2030.

Indicators of energy transition pathways 2050

		USA	China	EU	India	World IEA NZC	World IRENA 1.5C	World IAMs 1.5C Scenarios
Renewables share (in primary energy)	[%]	48-76	54-68	69-97	74-77	67	79	>50
Final energy	[EJ/yr]	44-52	64-134	12-29	44	344	348	300-500
Electrification (% of final energy)	[%]	48-59	52-59	58-73	46	49	51	NA
Renewables in power generation	[%]	69-94	61-89	86-100	95	88	90	60 – 80
Primary biomass use	[EJ/yr]	12.2-14.7	6.5-22	2.1-8.1	8.9	102	153[1]	150
Hydrogen production	[Mt/yr]	69-180	35-117	11-108	46-47	528	613	126
CCUS	[Gt/yr]	0.78-1.06	0-0.9	0.11-0.6	0.4	5.4	3	15
CO2 capture BECCS (part of CDR)	[Gt/yr]	0-0.66	0	0-0.51	0	1.2	4	<6
Net emissions 2050	[Gt CO2/yr]	-0.5 – 0.1	0.1-1.3	-0.9 – 0 •	1.3	0	-0.4	-9 – 6
Other CDR	[Gt CO2/yr]	-0.84 - -0.5	-0.8 or N/A	-0.79-0	-0.9	1.0	0.5	Net zero
Sources		1,2,3,4	5,6,7,8,9	10,11,12,13,14	15,16	17	18	19, 20, 21

https://energypost.eu/18-energy-transition-scenarios-to-watch-where-they-agree-and-disagree/