

The Role of IRENA in Technology Transfer

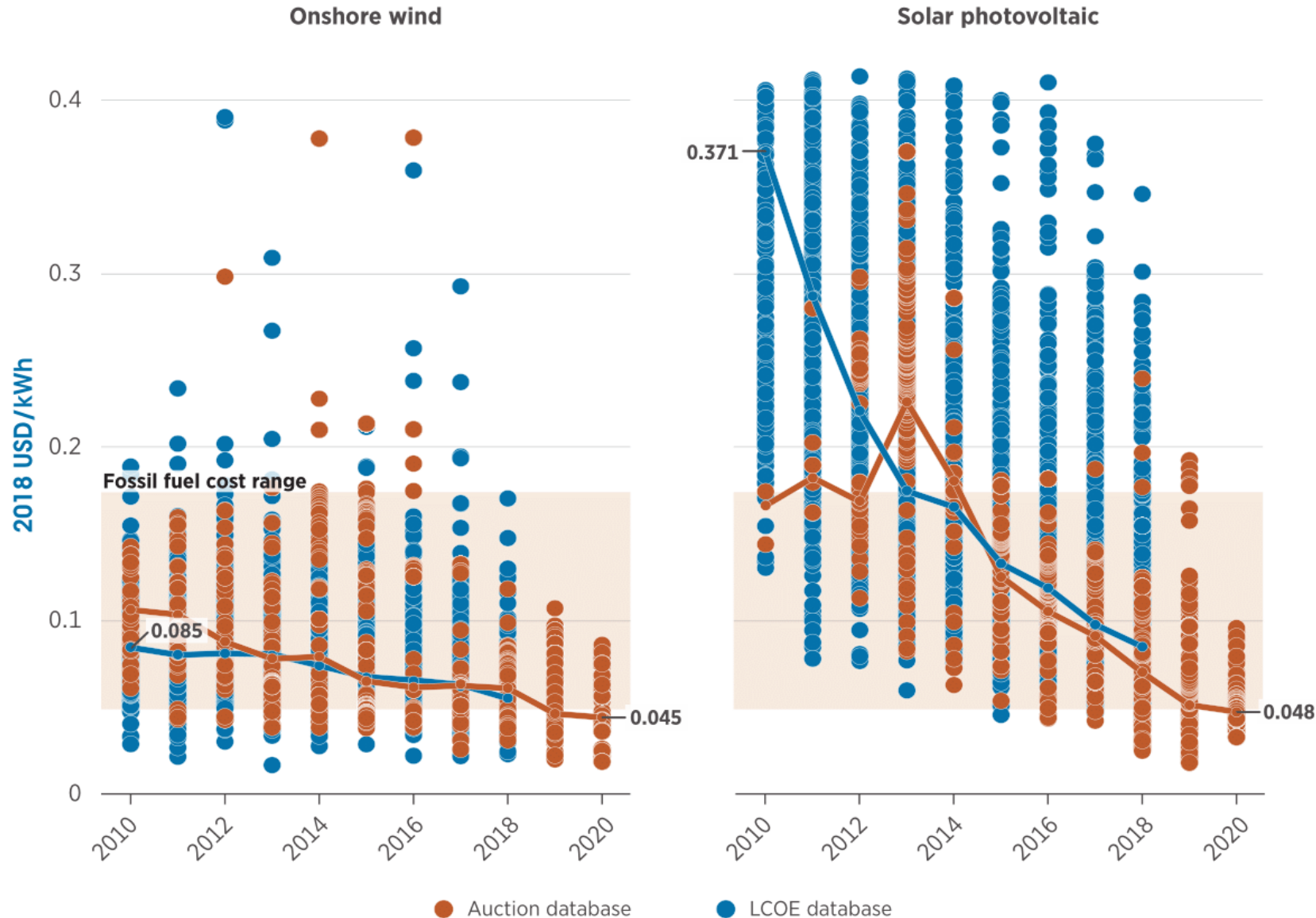


Dolf Gielen
Director, Innovation and Technology, IRENA
LCS-Rnet 11th Annual Meeting, Rome, Italy, 17 October 2019

What's happening now?

- Some energy transition progress during the past decades, but not enough
- GHG emissions continue to rise while 1.5 degrees becomes more pertinent
- Global energy transition needed in the coming 30 years – much faster than before
- Disagreement on how such a transition can be achieved and what it should look like
 - 2 degrees or 1.5 degrees, and their Gt CO₂ pathway implications
 - The role of hydrogen and PtX: potentially very important but uncertain
- Specific sectors with particular challenges: aviation, shipping, petrochemicals, cement, etc.
- Energy transition will have a profound impact on fossil fuel supply and demand

Solar & Wind: LCOE/auction price evolution overview - Continued rapid cost reduction in the coming years

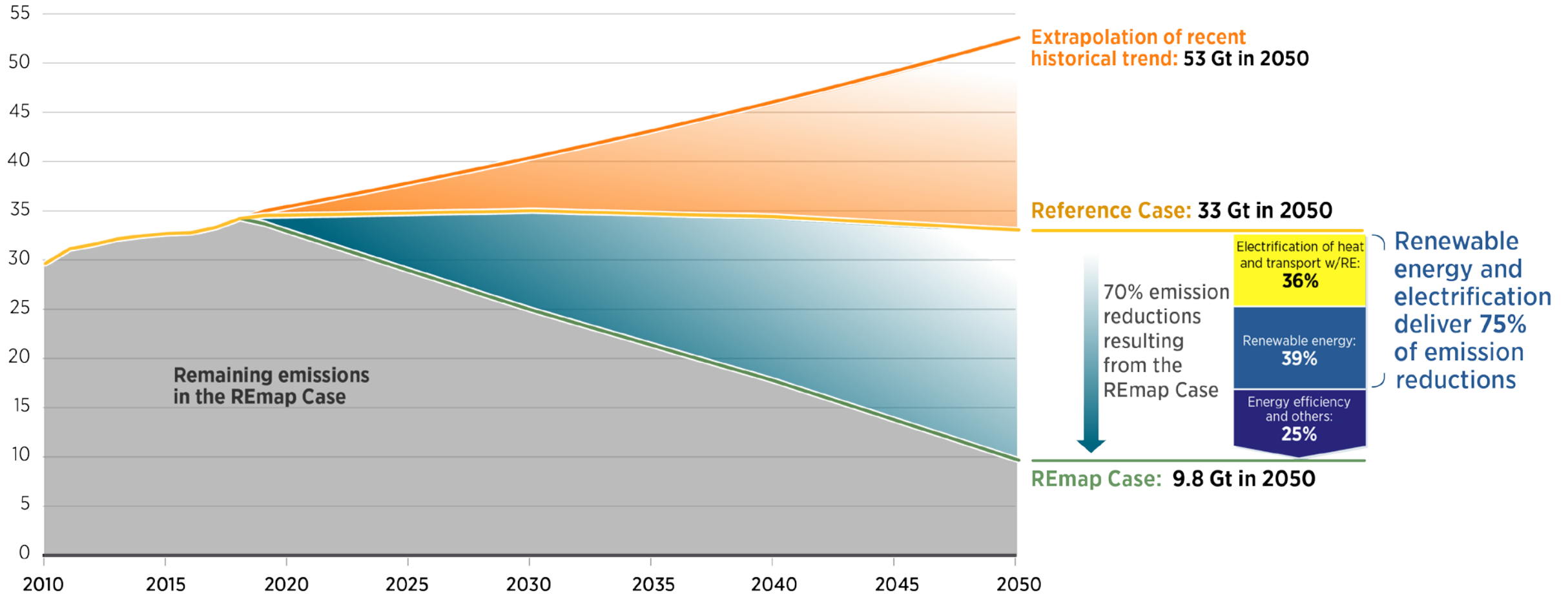


IRENA costing database of 15000 large scale RE power projects and 1.5 million rooftop PV systems

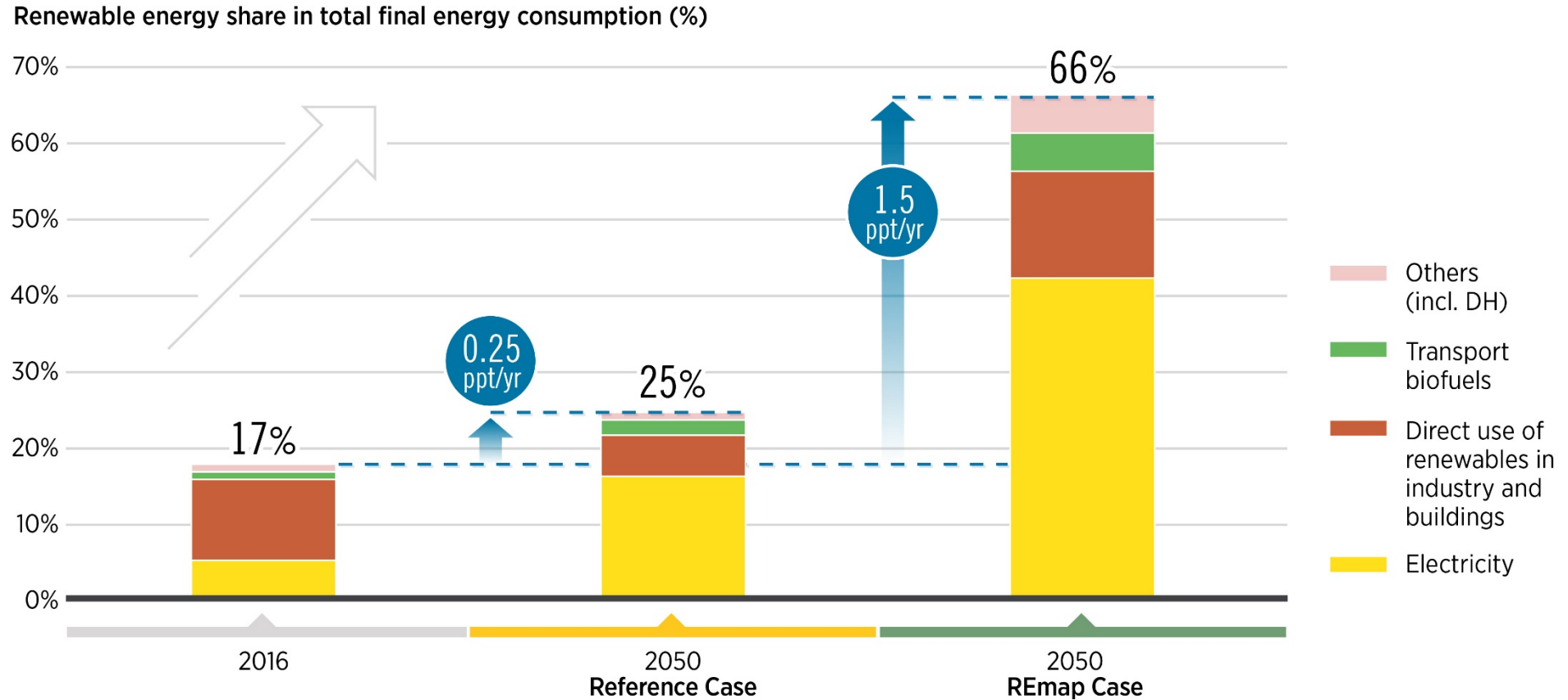
Covering half of all existing and planned RE capacity

Renewables & electrification can deliver 75% of energy-related CO₂ emission reductions needed

Annual energy-related CO₂ emissions, 2010-2050 (Gt/yr)

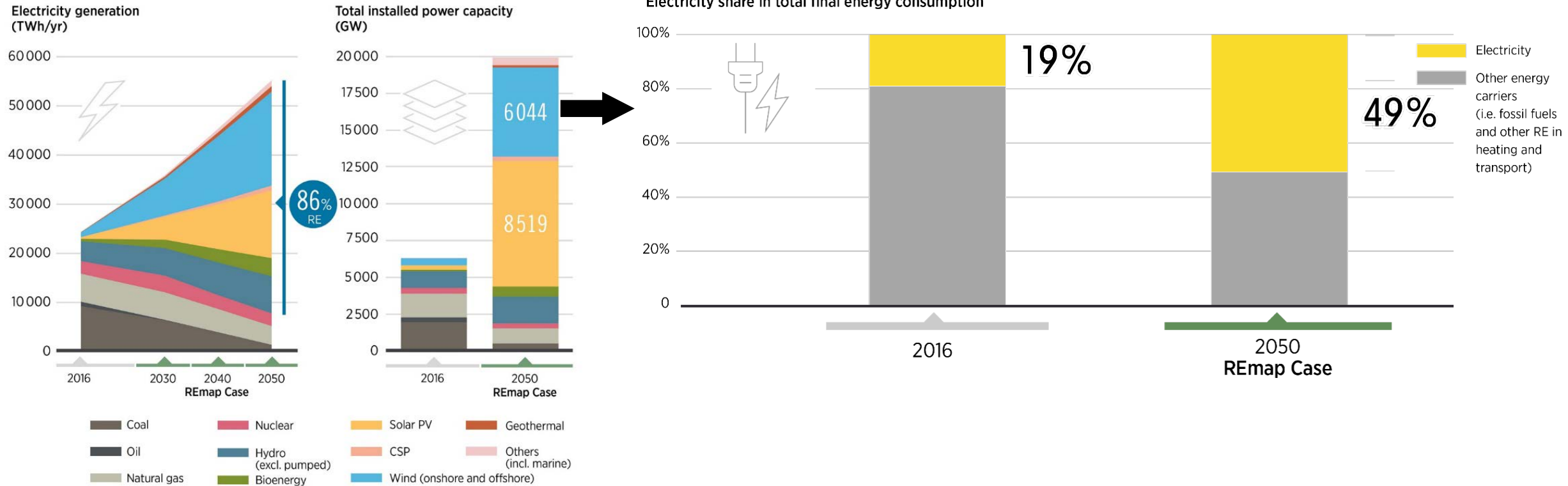


Growing share of renewables in final energy consumption – RE power and electrification are key



The share of renewables in total final energy consumption (TFEC) needs to **ramp up six-fold** – from a historical average of 0.25 percentage points per year to almost 1.5 percentage points per year.

Electrification paired with renewables is a major solution for decarbonisation



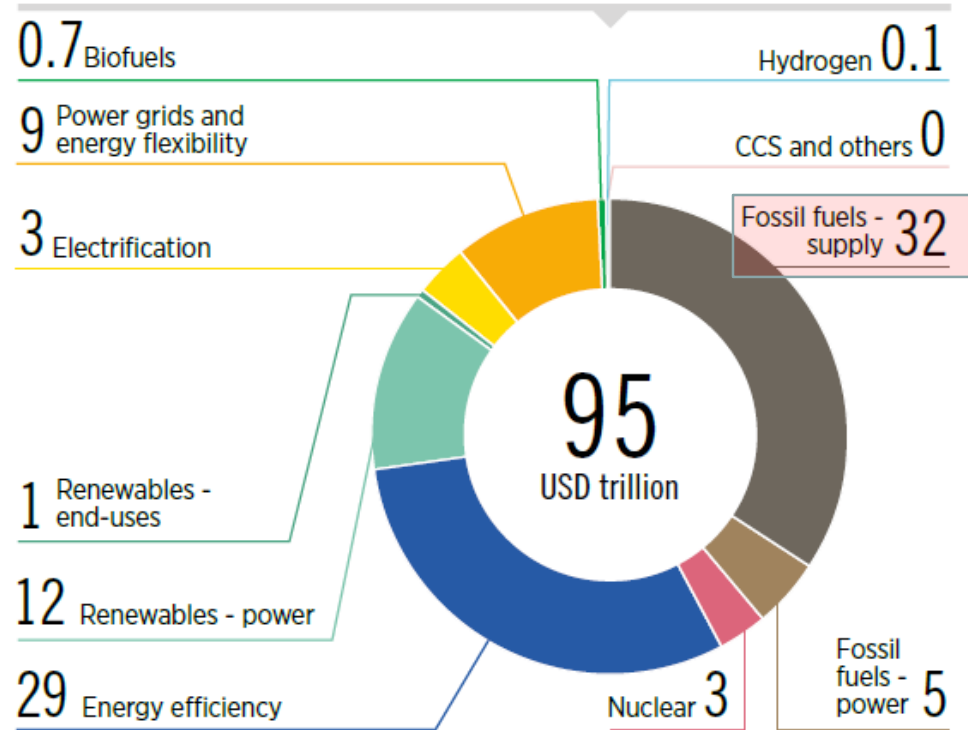
By 2050,

- Electricity becomes the central energy carrier
- 86% of electricity generation will come from renewables

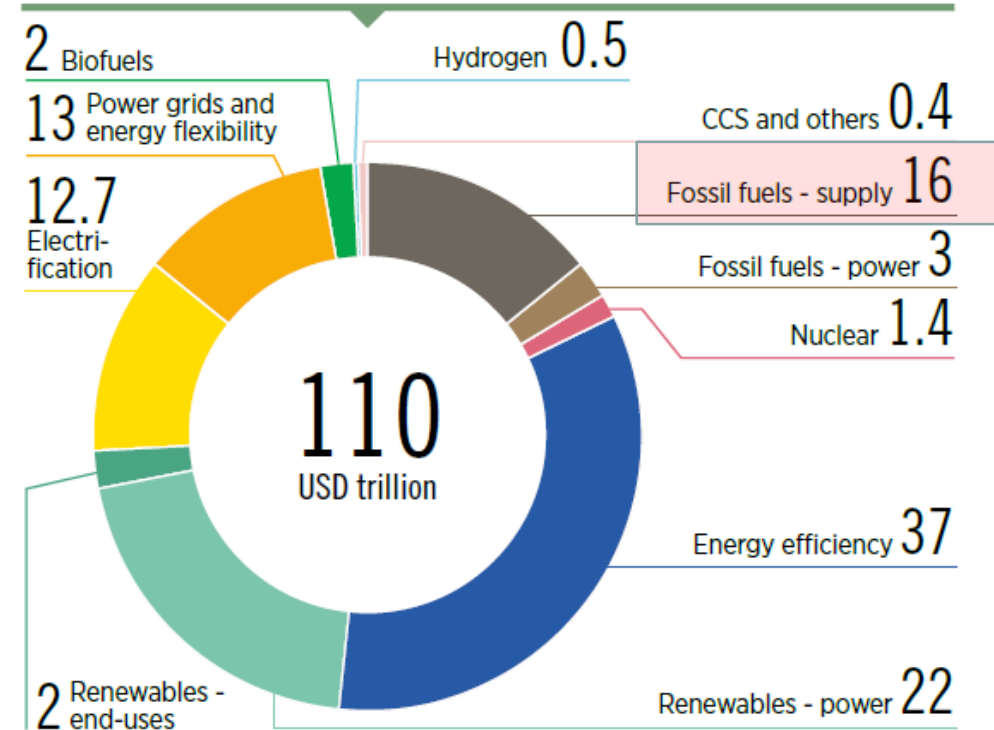
A transformed energy system: Scaling up renewables not just for power, but also for heat and transport

Investment will need to shift from fossil fuels to EE, RE and electrification of heat and transport applications

Reference Case investments between 2016-50 (USD trillion)



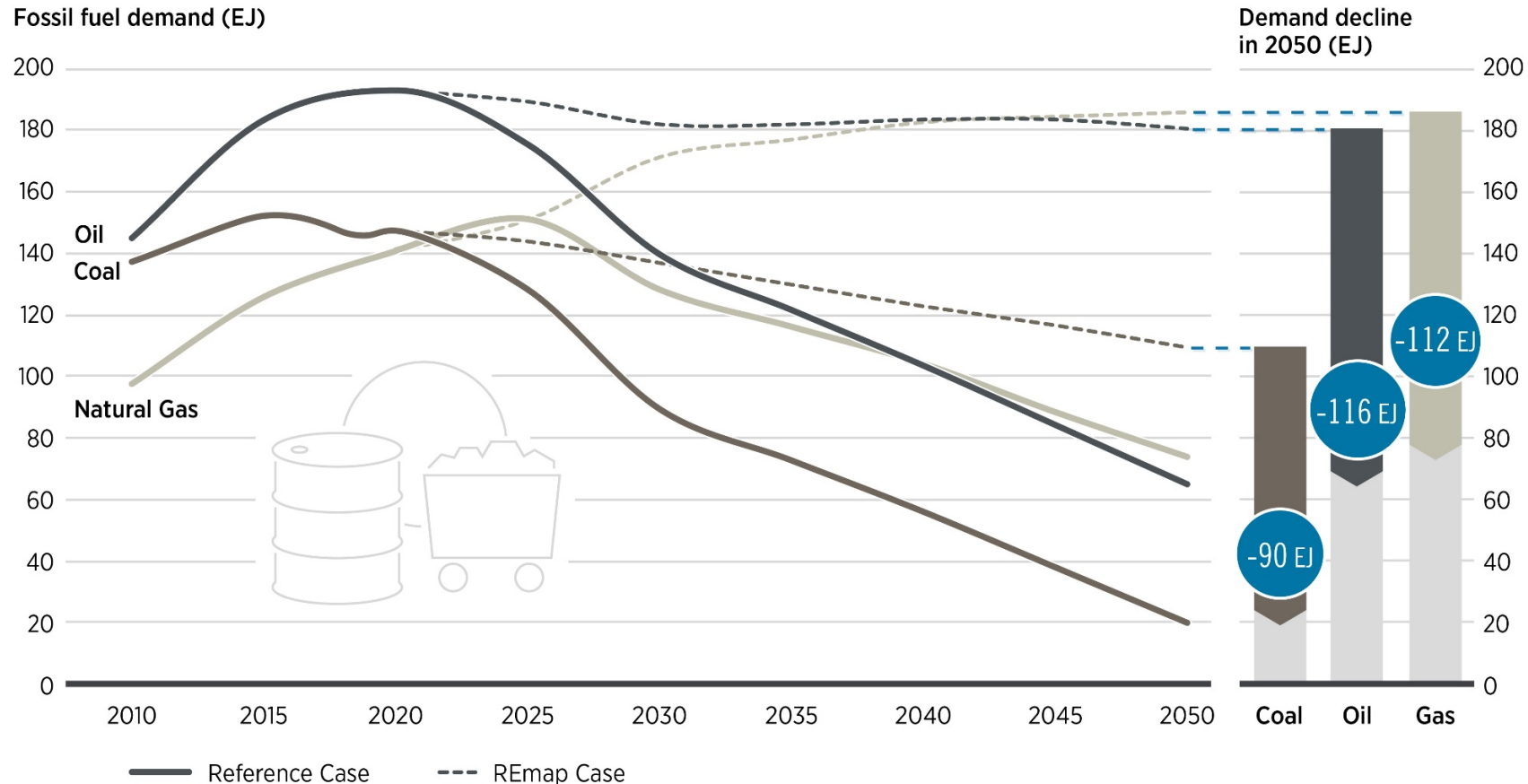
REmap Case investments between 2016-50 (USD trillion)



Cumulative investment of USD 110 trillion must be made between 2016-2050 predominantly in low-carbon technologies, averaging around 2% of global GDP per year. The REmap Case requires an increase in investments of USD 15 trillion, but also a significant shift into electrification, renewable energy and energy efficiency technologies which would then cover four-fifths of total cumulative investments.

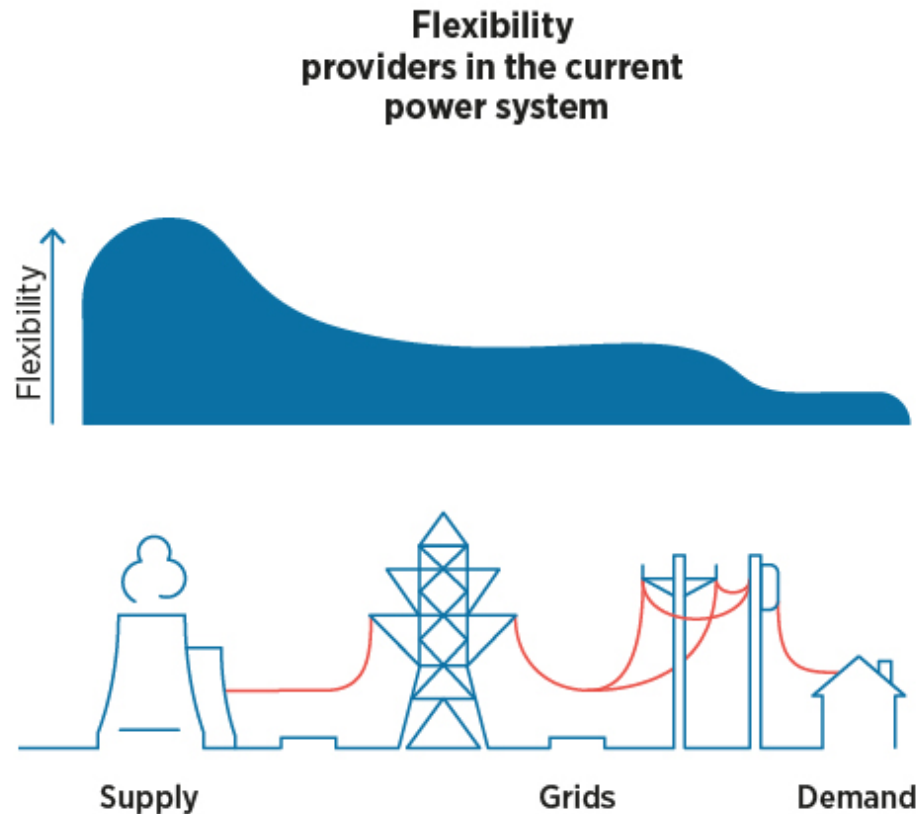
Declining global demand for fossil fuels

Fossil fuel use (left, PJ/yr), 2015-2050; decline in fossil fuel usage by sector REmap Case relative to Reference Case (right, in 2050)

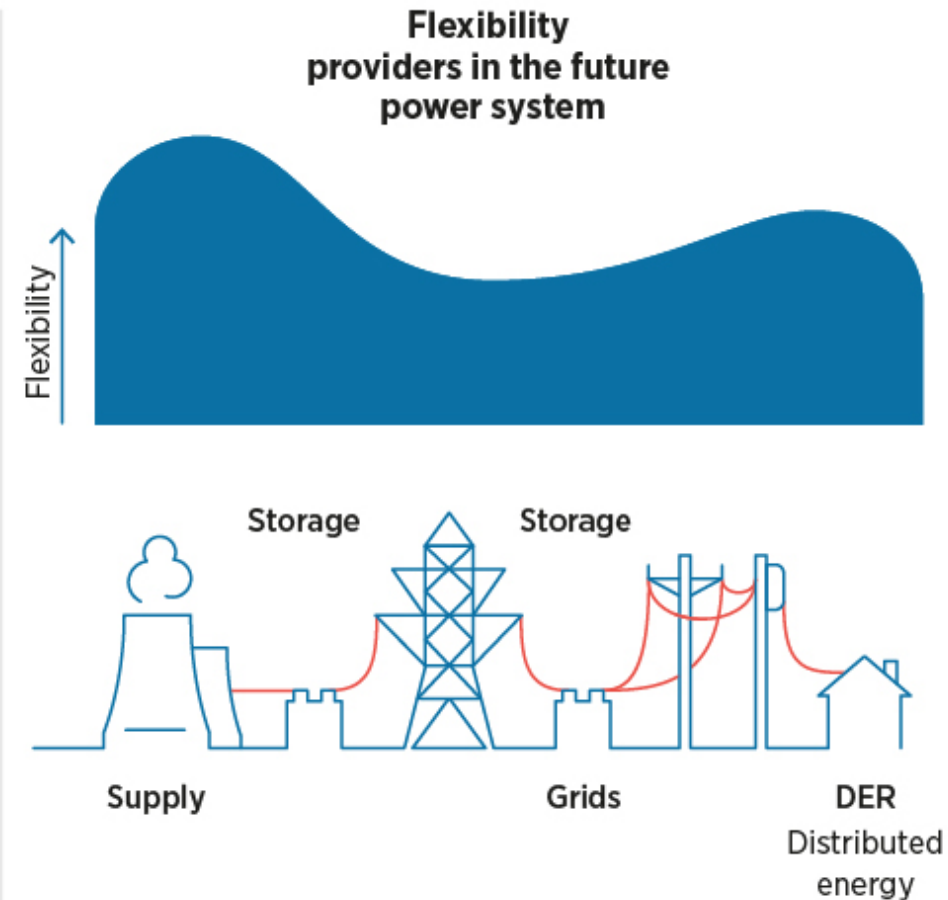


With accelerated uptake of renewables, both oil and coal demand decline significantly and continuously, with natural gas demand peaking around 2025. Natural gas would be the largest source of fossil fuel in 2050.

Unlocking flexibility across the whole power system

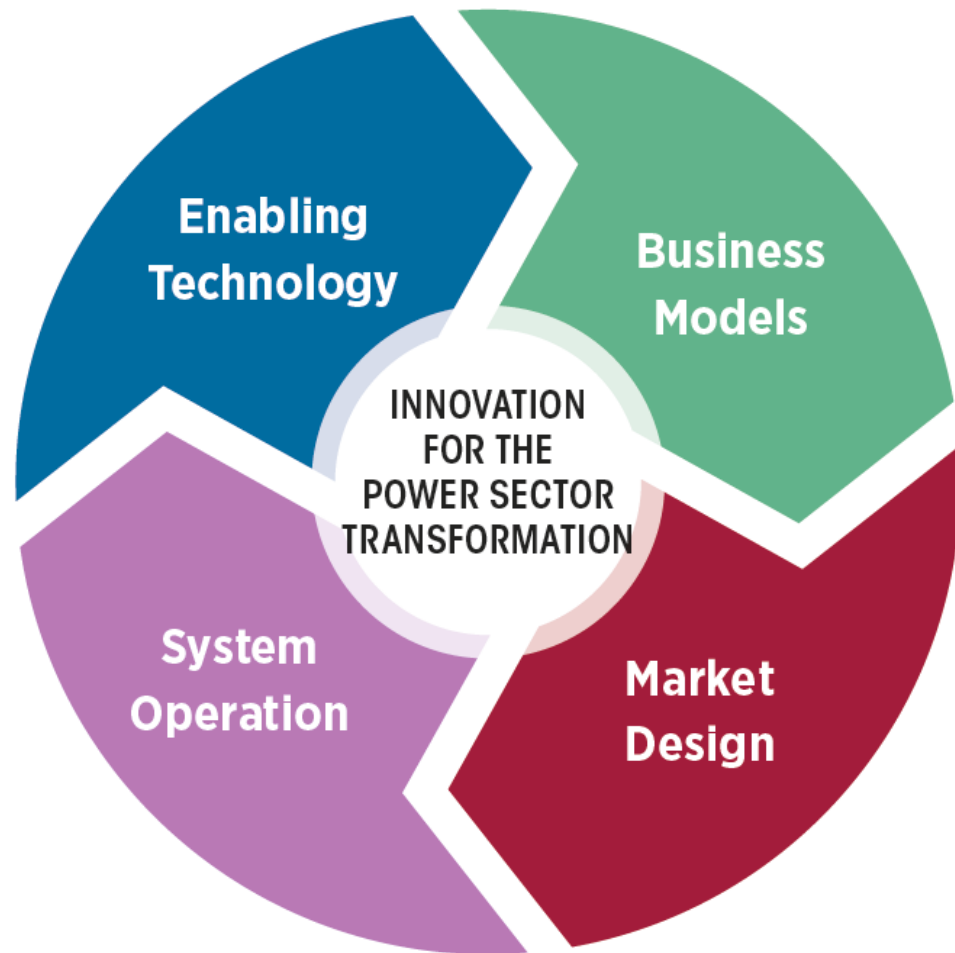


Flexibility sources: Flexible generation



Flexibility sources: Flexible generation; Regional interconnections and markets; Demand response; Storage; Power to X

Combine Innovations to Create Flexibility Solutions for Distributed and Utility-Scale Solar PV



Example 1:

DER providing services to the grid

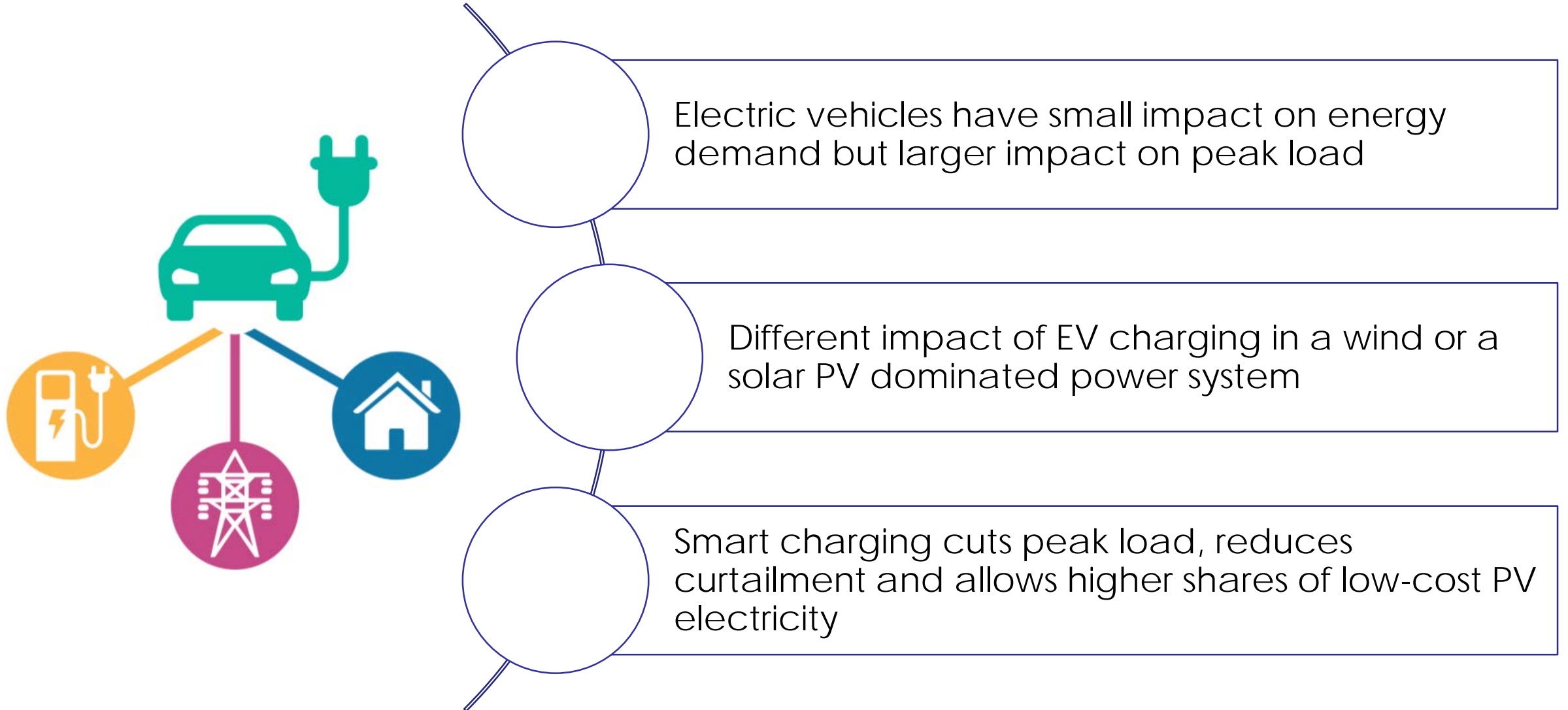
- BtM batteries / Smart Charging for EVs / Power-to-heat + IoT / AI & Big Data / Blockchain
- Aggregators
- DER participation in wholesale market / New products on ancillary service market
- DSO-TSO co-operation

Example 2:

Increase VRE integration while avoiding grid reinforcements investments

- Utility-scale battery storage / Power-to-hydrogen / Power-to-heat + IoT / AI & Big Data
- Virtual power lines / Dynamic line rating

Impact of smart charging on solar PV and wind integration



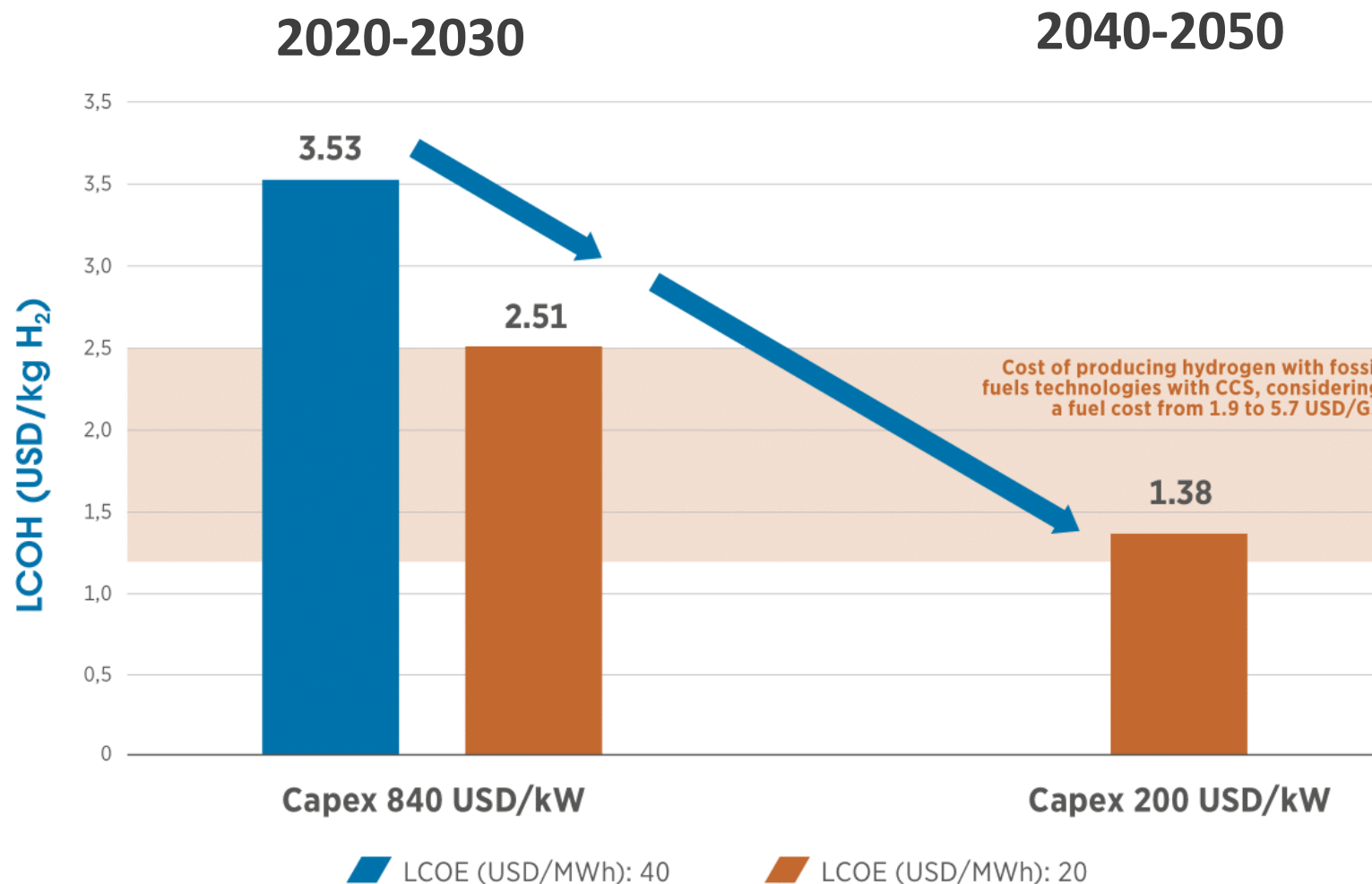
- The bulk of direct CO₂ emissions is related to iron making process
- Today iron making is coke and coal based
- Interesting opportunities to use hydrogen (from renewable energy)
- Hydrogen-based Direct Reduced Iron (DRI) production is technically feasible
- DRI is a bulk commodity
- Solution: replace iron ore imports with imports of DRI produced at the mining site
- Consider import of DRI that is produced with renewable H₂ from countries such as Australia and Brazil.



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Hydrogen production costs

Presently accelerating investments in eletrolyzers worldwide



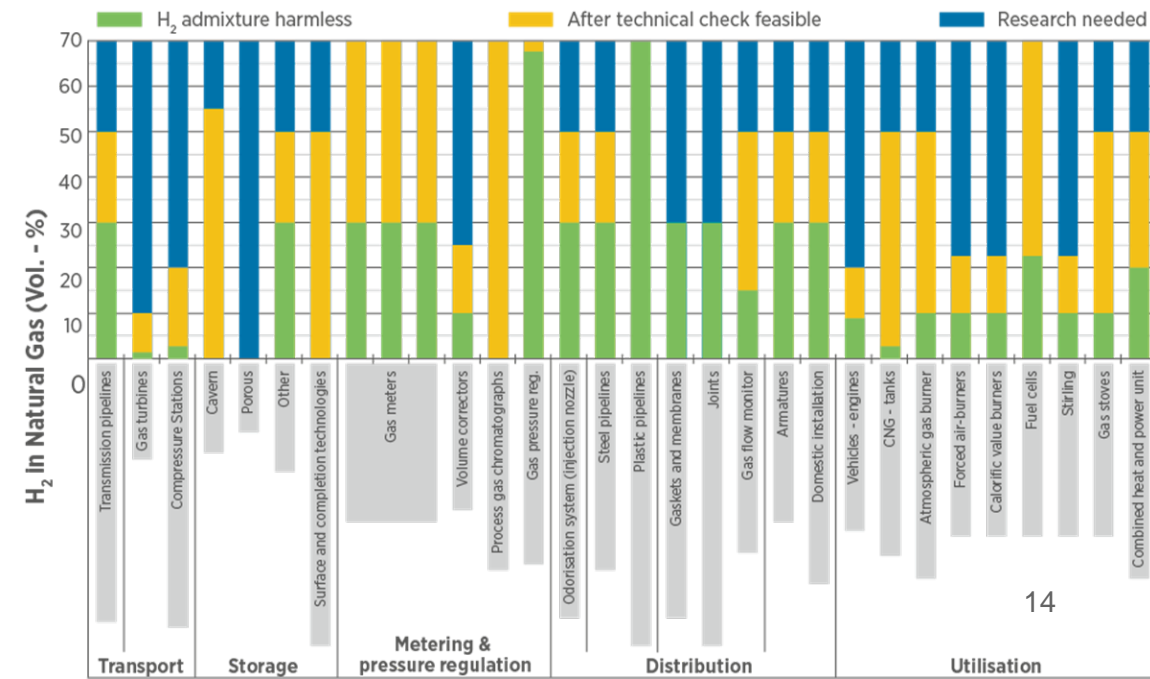
Hydrogen from renewables is close to competitiveness at best solar and wind regions.

Key assumptions Electrolyser Load factor: 4200 hours (48%), conversion efficiency 75%

Hydrogen energy solutions for cities

- Clean hydrogen supply is critical – blue and green hydrogen (from renewables)
- About 1000 hydrogen fuel cell buses worldwide
- About 400 hydrogen refueling stations worldwide
- 250 000 fuel cells for electricity & hot water in Japan
- Netherlands, UK plans for replacing natural gas with hydrogen gas
- Standards for gas systems need attention for widespread deployment
- H21 North of England
 - Plan for replacing natural gas with hydrogen
 - Use existing gas distribution system
 - Investment decision 2023

Source IRENA 2018 based on DVGW



Long-term Energy Scenarios (LTES) for the Clean Energy Transition campaign was launched in 2018 May

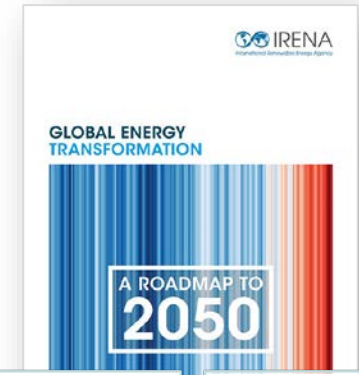
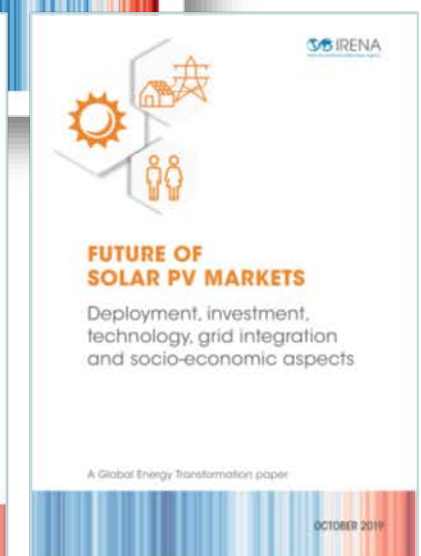
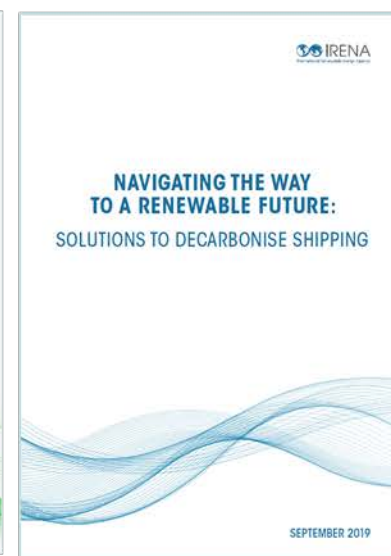
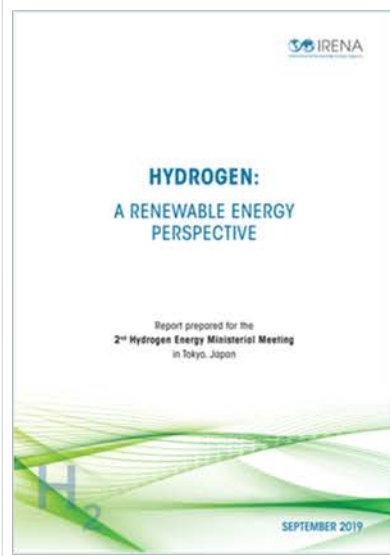
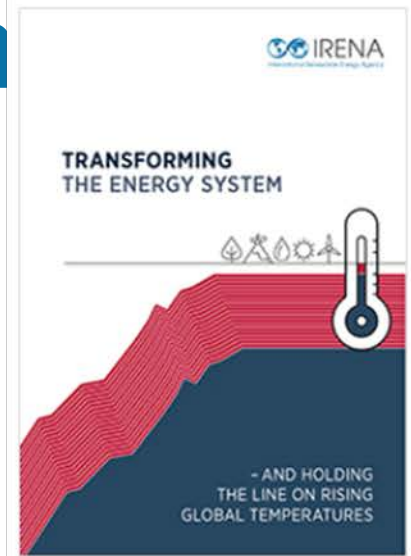
11 Member Countries



7 Technical Partners



LTES Campaign is be supplemented with IRENA's global platform - Energy Transition Scenarios Network (ETS-Net) launched in April 2019 at the LTES International Forum in Berlin



September

October

October

November

April

Thank You !

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