



25th Energy Community Electricity Forum

Virtual Forum – WebEx connection

**Session 1 – Electricity Markets between Crisis Management and Take-Off
Greening the energy sector – closing down or kicking off?**

Staying on the green path

IRENA

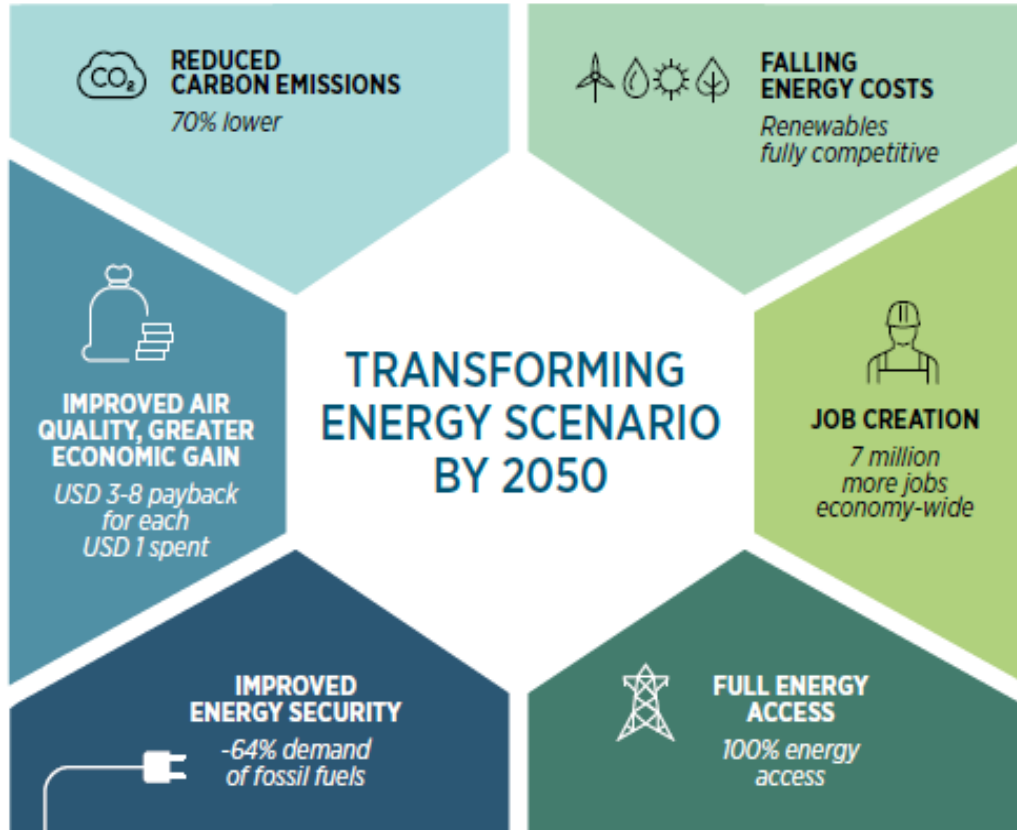
Ricardo Gorini

*Presentation based on
IRENA Global Renewable Outlook*



Pandemic crises and the recovery: IRENA Transforming Energy Scenario

Aligning the long term and short term goals

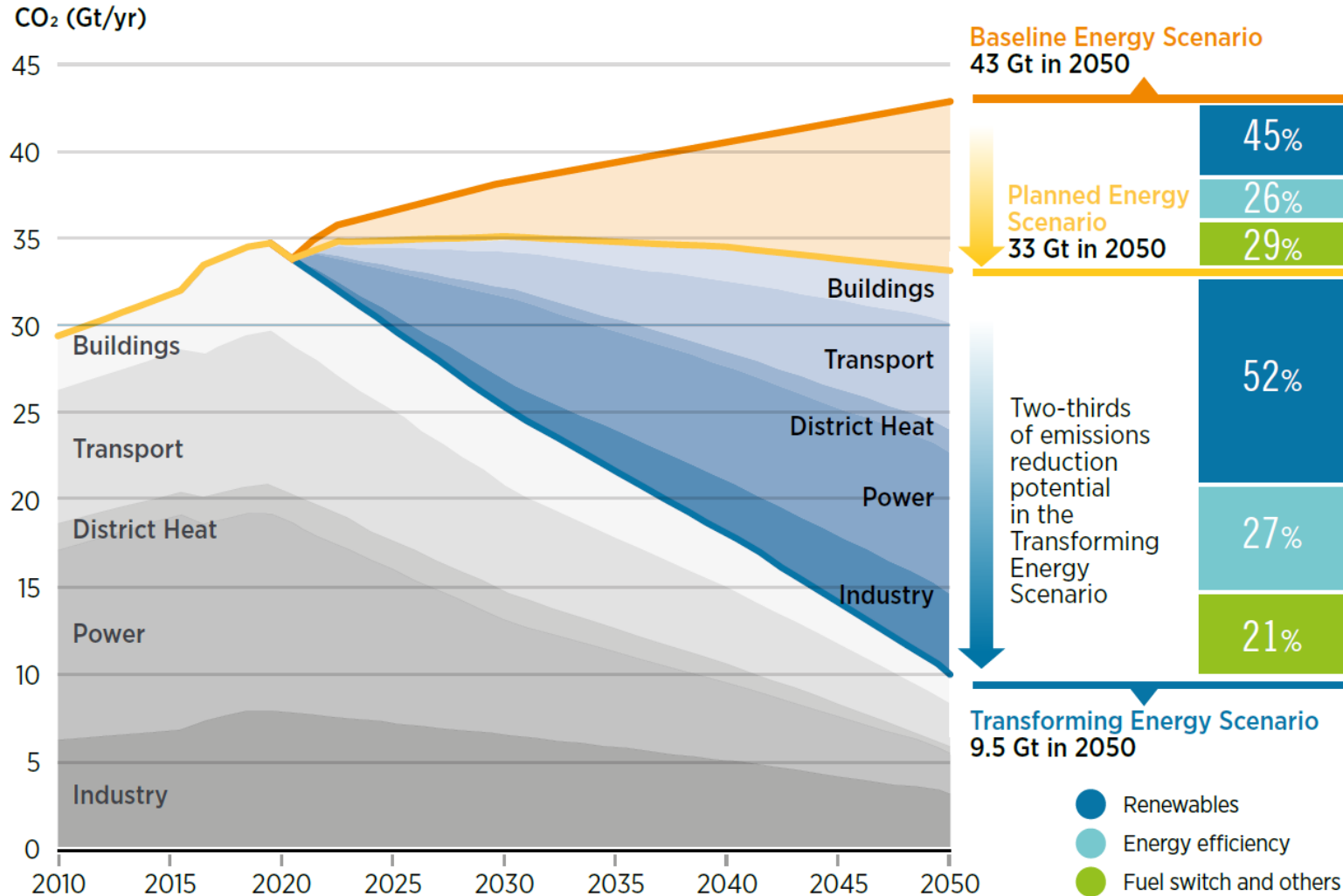


- **Pandemic crises:** COVID19, socioeconomic, climate change
- **How long and severity: effective coordination** aligning goals and policies
- **The recovery** stimulus packages: **Aligning objectives:** policies that foster - jobs, economic growth, less local pollution, energy security (access and affordability), lowering CO2 emissions.
- **Green and resilient path - IRENA - Transforming Energy Scenario:** Acceleration of Electrification with renewable energy and energy efficiency: technically feasible and economically beneficial



Electrification with renewable and efficiency

Energy-related CO2 emissions, 2010-2050

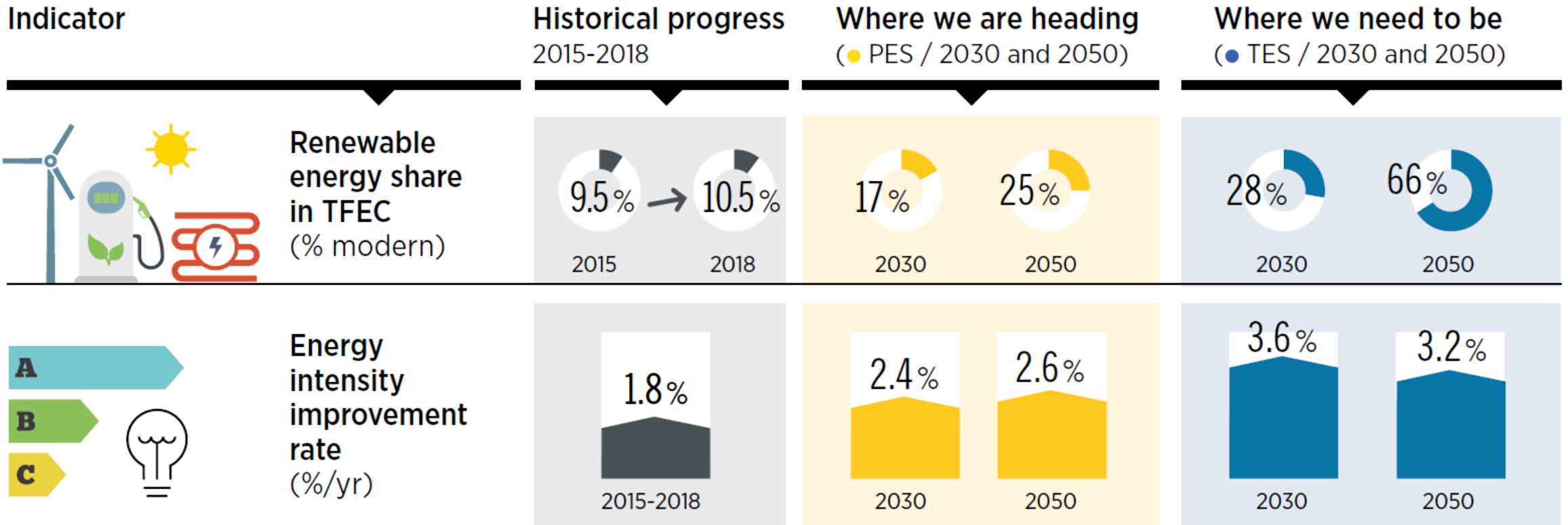


- To achieve the Transforming Energy Scenario, **energy-related CO₂ emissions need to fall by 3.8% per year on average until 2050.**
- Annual energy-related CO₂ emissions would need to **decline by 70% below today's level by 2050.**
- **Over half of the necessary reductions come from renewables and one quarter from energy efficiency measures.**



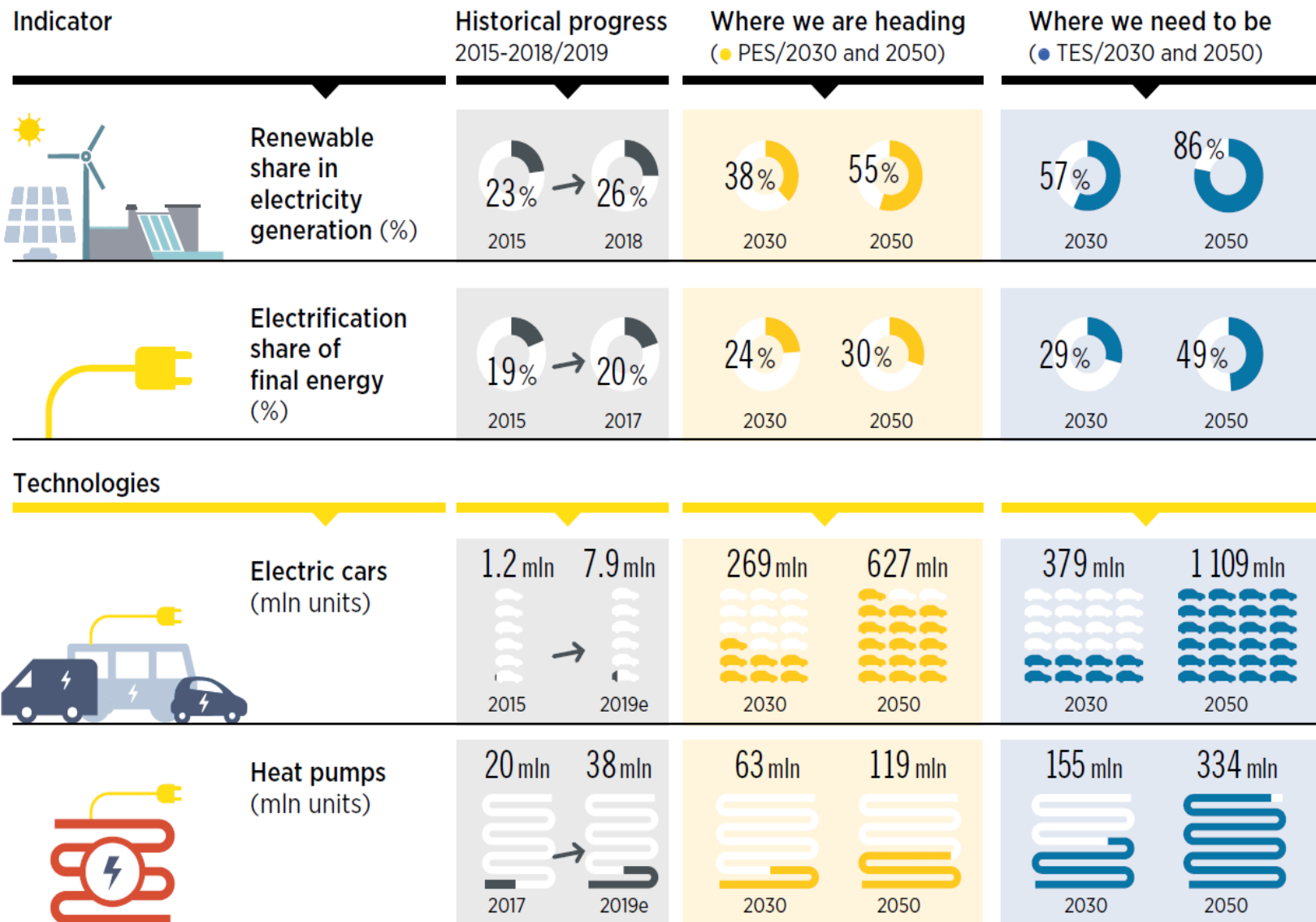
Renewables in the global energy mix: Six-fold increase

Energy efficiency improvements must be scaled up rapidly and substantially.





An increasingly electrified world

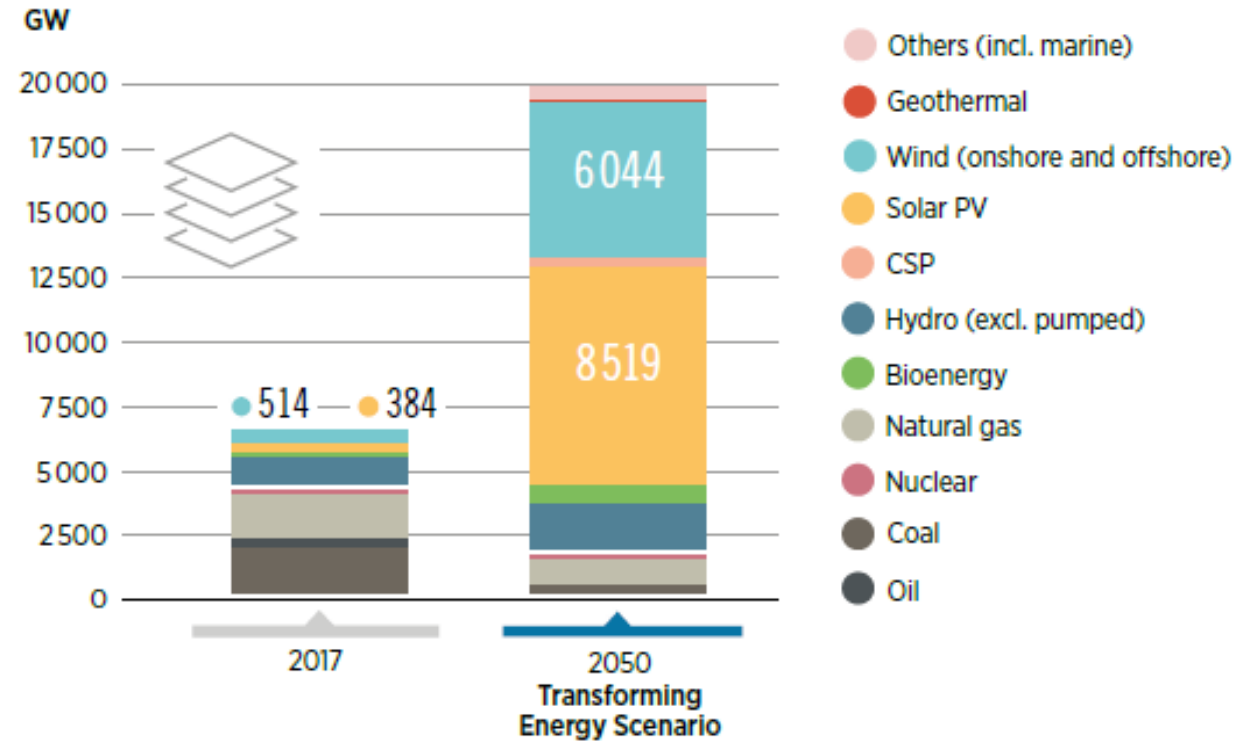
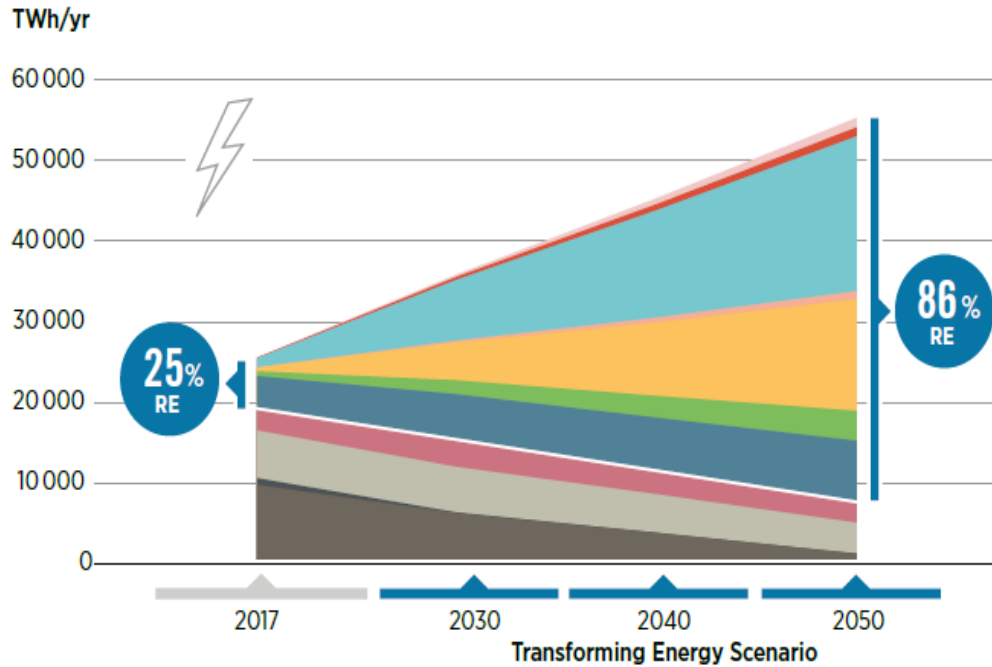


- RE share in electricity generation from 26% today to 57% by 2030 and 86% by 2050.

- The electrification of end uses will drive increased power demand to be met with renewables



Solar PV and wind will lead the way in the power sector

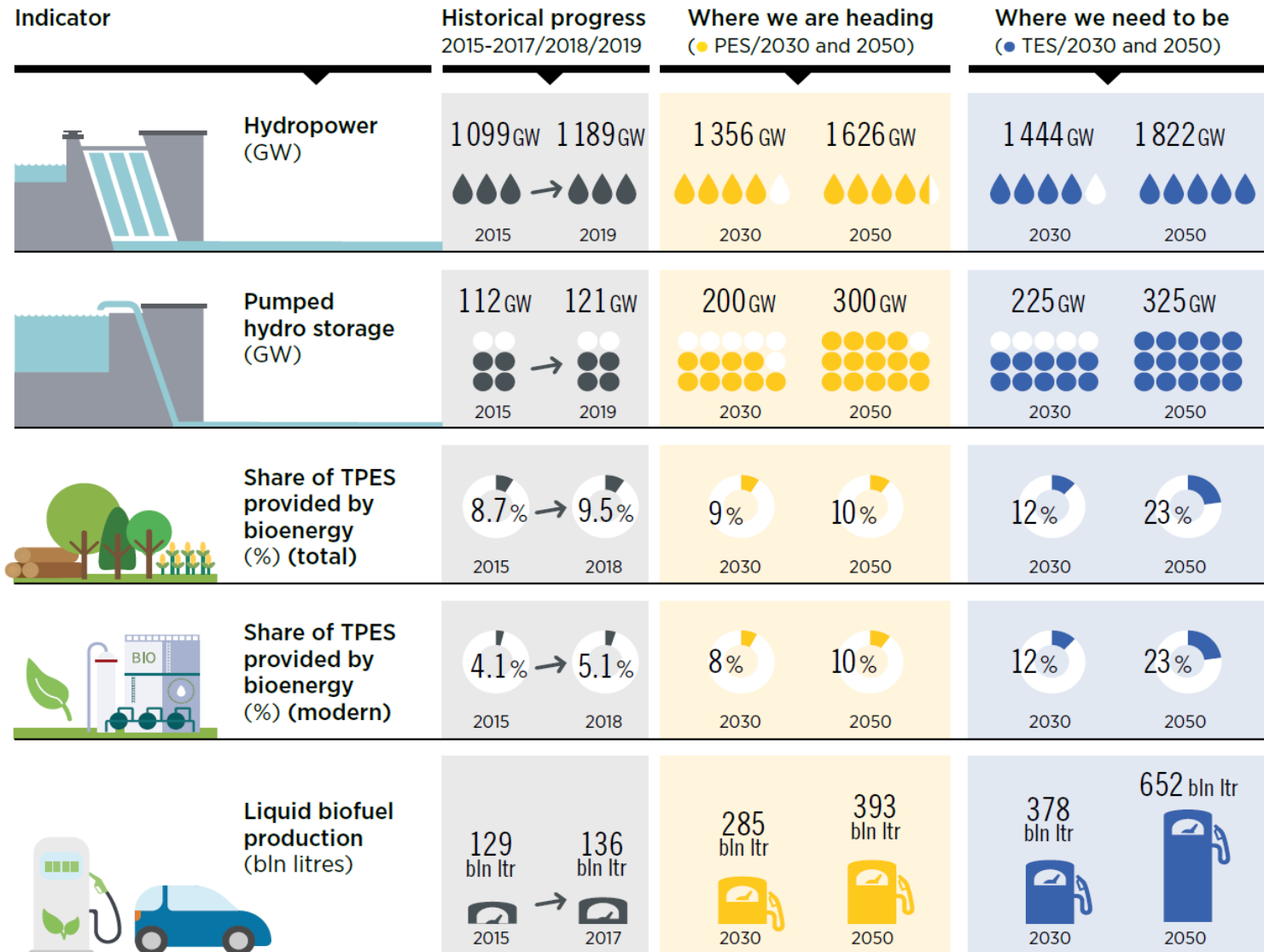


- **Wind power would be a major electricity generation source**, supplying more than one-third of total electricity demand. **Solar PV power would follow**, supplying 25% of total electricity demand.

- Power system capacity would need to grow to **20 000 GW by 2050**, with over **70% of it coming from solar PV and wind**.



Hydropower and bioenergy: essential synergies

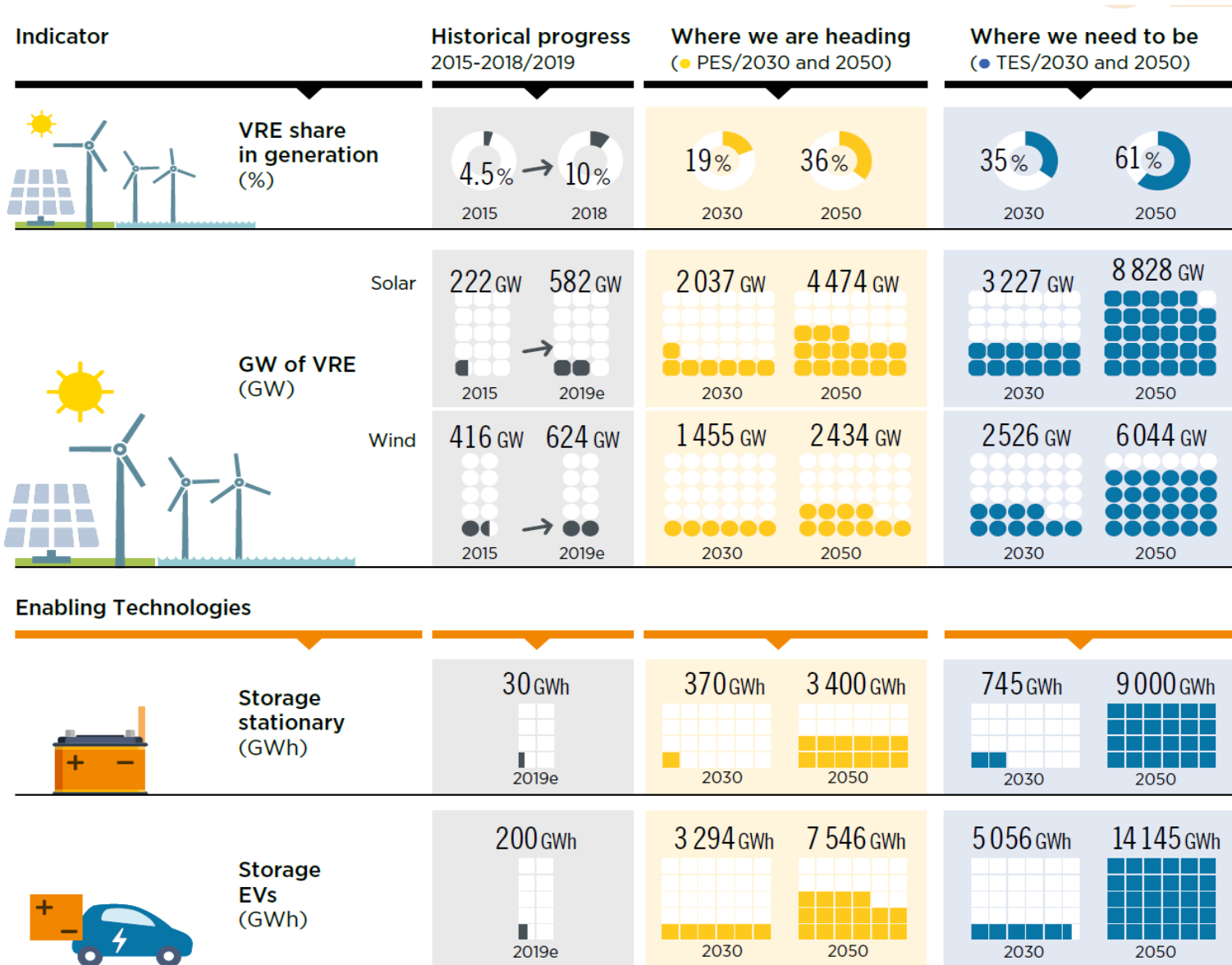


- **Hydropower can bring important synergies to the energy system of the future.** In the Transforming Energy Scenario, hydropower capacity would need to increase 25% by 2030, and 60% by 2050.
- **Bioenergy will become increasingly vital in end-use sectors.** In the Transforming Energy Scenario, it plays an important role, particularly in sectors that are hard to electrify, such as in shipping and aviation and in industry, both for process heat and use as a feedstock.

Note: The total bioenergy share includes traditional uses of biofuels. In PES their use is reduced considerably by 2030, but not entirely phased out, whereas in TES their use is entirely phased out by 2030.



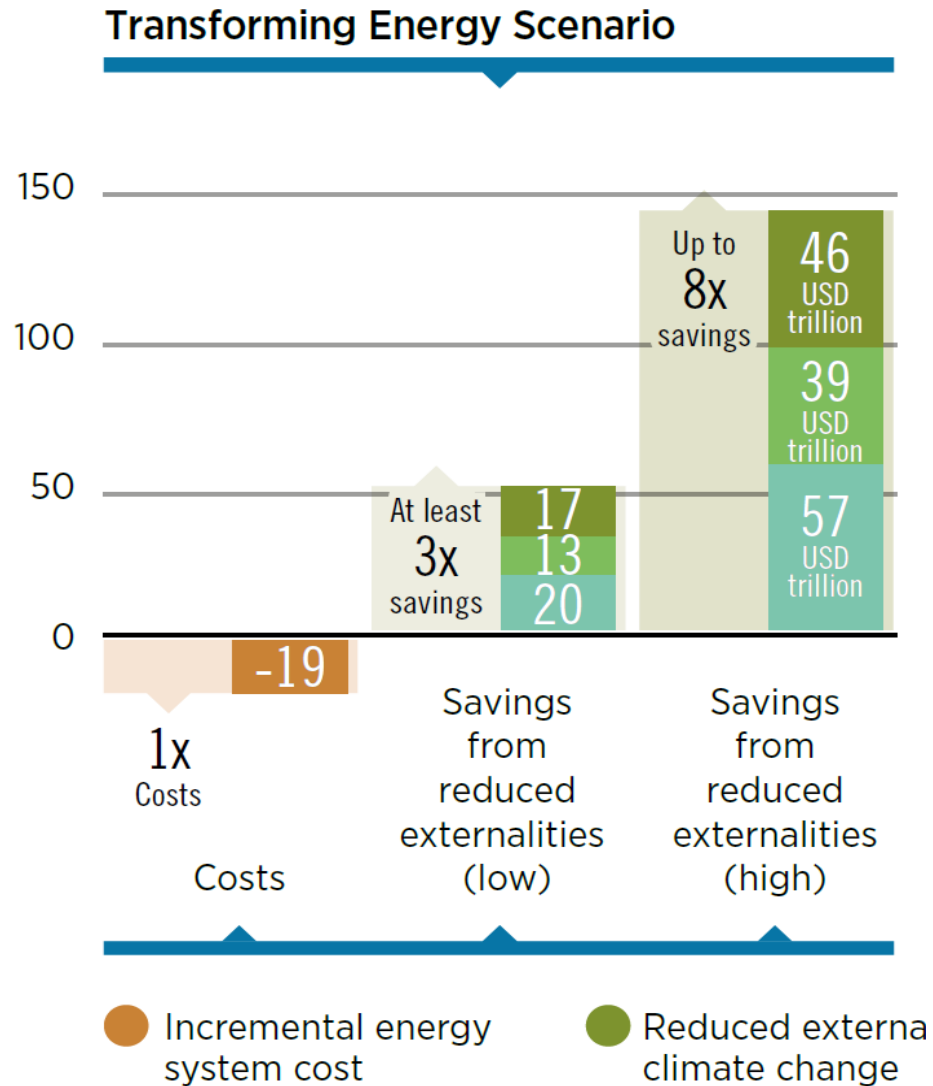
Transforming Energy Scenario: Technically feasible



- **Flexibility in power systems is a key enabler for the integration of high shares of variable renewable electricity** – the backbone of the electricity system of the future.
- **Power systems must achieve maximum flexibility**, based on current and ongoing innovations in enabling technologies, business models, market design and system operation.
- On a technology level, **both long-term and short-term storage will be important for adding flexibility.**



Transforming Energy Scenario: Economically beneficial



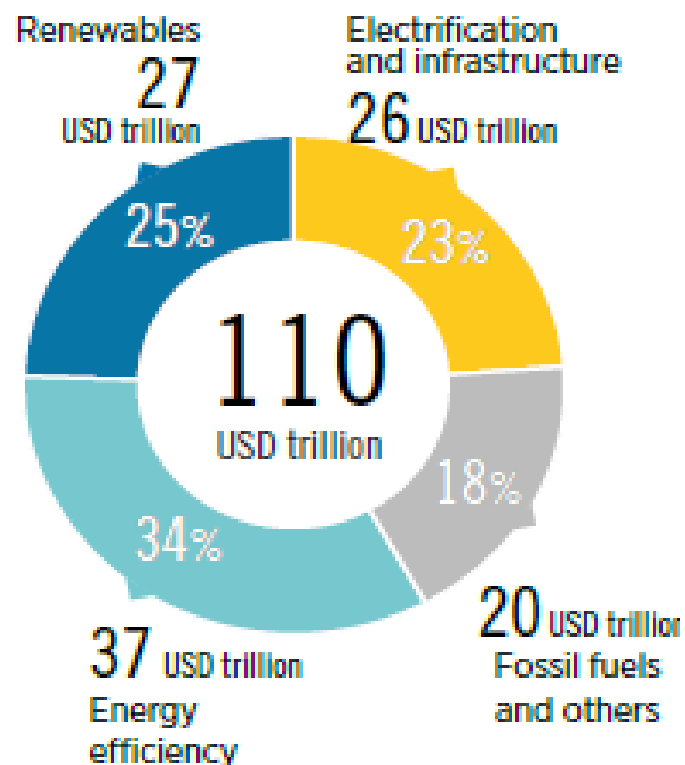
- The payback for accelerating renewables deployment and efficiency measures is many times larger than the costs.
- In the Transforming Energy Scenario, **every USD 1 spent** for the energy transition would bring a **payback of between USD 3 and USD 8**.



Transforming Energy Scenario

New investment priorities: renewables, efficiency and electrification

Transforming Energy Scenario (TES)
cumulative investments between
2016 and 2050 (USD trillion)




- **Total investment in the energy system in the Transforming Energy Scenario would reach USD 110 trillion by 2050, or around 2% of average annual GDP over the period.**
- **Of that total, over 80% needs to be invested in renewables, energy efficiency, end-use electrification, and power grids and flexibility.**
- **Annual investments in energy transformation amount to USD 2.7 trillion per year globally.**
- **323 and 165 USD billion per year, EU and rest of Europe.**



To know more about the Global Energy Transformation, this and other IRENA publications are available for download from www.irena.org/publications

For further information or to provide feedback, please contact the REmap team at remap@irena.org.

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Transforming Energy Scenario: Power Sector actions now

ACCELERATE RENEWABLE CAPACITY ADDITIONS TO GENERATE ADEQUATE POWER WITH LOW-CARBON TECHNOLOGIES

- 1) Identify and map renewable energy resources and develop a portfolio of financeable projects for the medium to long term.
- 2) Construct no new coal power plants and plan and implement an end-of-life phase-out of coal capacities.

UPDATE GRID PLANNING TO ACCOMMODATE RISING SHARES OF VARIABLE RENEWABLE ENERGY (SOLAR AND WIND)


- 1) Develop a flexible power system (with flexible supply, storage, demand response, power-to-X, electric vehicles, digital and ICT technologies, etc).
- 2) Update grid codes.
- 3) Deploy micro-grids to improve resilience and expand energy access with renewable sources.
- 4) Deploy super-grids to interconnect regions.
- 5) Deploy cost-reflective tariff structures by properly readjusting the balance between volumetric charges (USD/kWh), fixed charges (e.g. USD/meter-month) and, where applicable, demand charges (USD/kW).

SUPPORT DISTRIBUTED ENERGY RESOURCE DEPLOYMENT

- 1) Incentivise energy consumers to become prosumers.
- 2) Support regulatory and pricing policies, including rights to generate and sell electricity, tariff regulation and grid-arrival policies.
- 3) Enable energy aggregators to foster use of distributed energy resources.



Transforming Energy Scenario: Buildings actions now



REDUCE ENERGY CONSUMPTION IN BUILDINGS

- 1) Establish or enhance energy-efficient building codes and standards (including for appliances and equipment).
- 2) Adopt retrofitting and renovation programmes, including financing schemes.
- 3) Incentivise retrofits and adjust construction codes in cities and states.
- 4) Combine energy efficiency and renewable energy measures (e.g. public policies to integrate these technologies in renovations of public buildings).

SUPPORT AND FOSTER DER DEPLOYMENT

- 1) Remove barriers that prevent prosumers from actively helping to transform the energy system.
- 2) Promote community ownership models and innovative financing schemes.
- 3) Accelerate the roll-out of smart meters.
- 4) Capitalise on smart-home and digitalisation schemes to allow demand management and strengthen grid services.

SCALE UP THE RENEWABLE SHARE IN THE BUILDINGS SECTOR

- 1) Promote low-carbon heating technologies (e.g. heat pumps, solar heating, modern bioenergy for heating and cooling).
- 2) Apply these renewable energy technologies through district heating.
- 3) Phase out traditional biomass as a cooking fuel and replace it with clean and efficient cookstoves (biogas, modern solid biomass, electricity).



Transforming Energy Scenario: Transport actions now

REDUCE TRANSPORT VOLUME AND CONGESTION

- 1) Adopt advanced digital communication technologies to improve urban transport planning and services (e.g. re-routing to reduce traffic congestion).
- 2) Promote mobility services (e.g. autonomous driving, vehicle-sharing).
- 3) Accelerate the shift from passenger cars to public transport (electric railways, trams or buses).
- 4) Deploy low-emissions city trucks.

ACCELERATE THE SHIFT TO ELECTRIC MOBILITY

- 1) Set minimum standards for vehicle emissions.
- 2) Give electric vehicles (EVs) priority in city access.
- 3) Incentivise the development of charging infrastructure.
- 4) Strengthen links between the power and transport sectors with integrated planning and policy designs (vehicle-to-grid services).

PRIORITISE BIOFUELS IN ROAD FREIGHT, AVIATION AND SHIPPING

- 1) Introduce specific mandates for advanced biofuels, accompanied by direct financial incentives and financial de-risking measures.
- 2) Adopt supporting policies to scale up sustainable production of first- and second-generation biofuels.
- 3) Eliminate fossil-fuel subsidies and implement carbon and energy taxes to increase the competitiveness of renewable-fuelled shipping and aviation.



Transforming Energy Scenario: Industry actions now

REDUCE ENERGY CONSUMPTION IN INDUSTRIES

- 1) Promote circular economy (material recycling, waste management, improvements in materials efficiency, and structural changes such as reuse and recycling).
- 2) Establish energy efficiency standards and ramp up actual efficiency levels.

ENABLE CORPORATE SOURCING OF RENEWABLES

- 1) Support a credible and transparent certification and tracking system for corporate renewable energy use.
- 2) Consider an energy market structure that allows for direct trade between companies of all sizes and renewable energy developers, e.g. through power purchase agreements (PPAs).
- 3) Work with utilities and other electricity suppliers to provide green corporate procurement options.
- 4) Empower companies to invest directly in self-generation.

ACCELERATE LOW-CARBON TECHNOLOGY DEPLOYMENT FOR INDUSTRIAL PROCESS HEATING

- 1) Remove existing barriers and Incentivise low-carbon heating methods (e.g. solar thermal heating, modern bioenergy and heat pumps).
- 2) Support emerging biomass and hydrogen technologies. Replace fossil fuel-based with renewable-based feedstocks and process heat (e.g. in iron and steel subsectors, ammonia production).