

100% Renewable Europe

How To Make Europe's Energy System
Climate Neutral Before 2050

Monday 27/04






Presentation Cabinet Kadri Simson



#ShineOnSolar #RenewableEU

Scenario overview

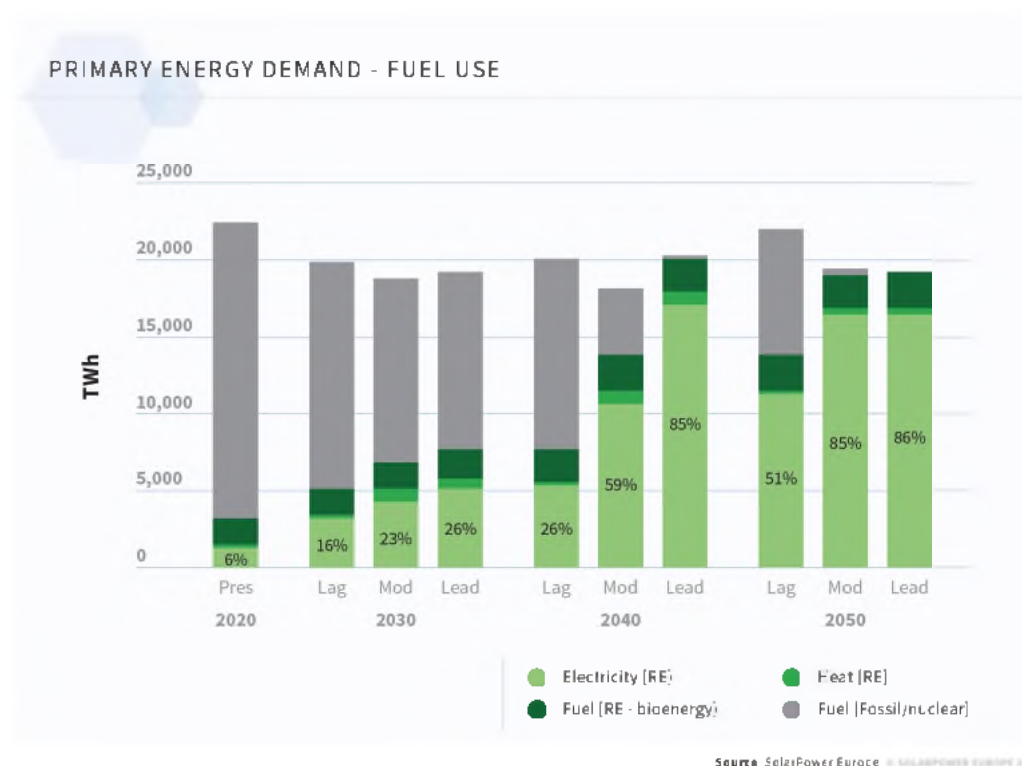
A **100% renewable energy system** enables the EU to become climate neutral **before 2050**, complying with an ambitious 1.5°C Paris Agreement target, and without resorting to carbon sinks.

	LAGGARD	MODERATE	LEADERSHIP
 RE energy share	62% by 2050	100% by 2050	100% by 2040
 Paris Agreement	✗	Achieved 2.0°C	Achieved 1.5°C
 GHG emissions in the energy system	-90% in 2050	-100% in 2050	-100% in 2040
 Fossil fuels phaseout	✗	Achieved in 2050	Achieved in 2040
 Nuclear phaseout	✗	✗	Achieved in 2040

Electrification

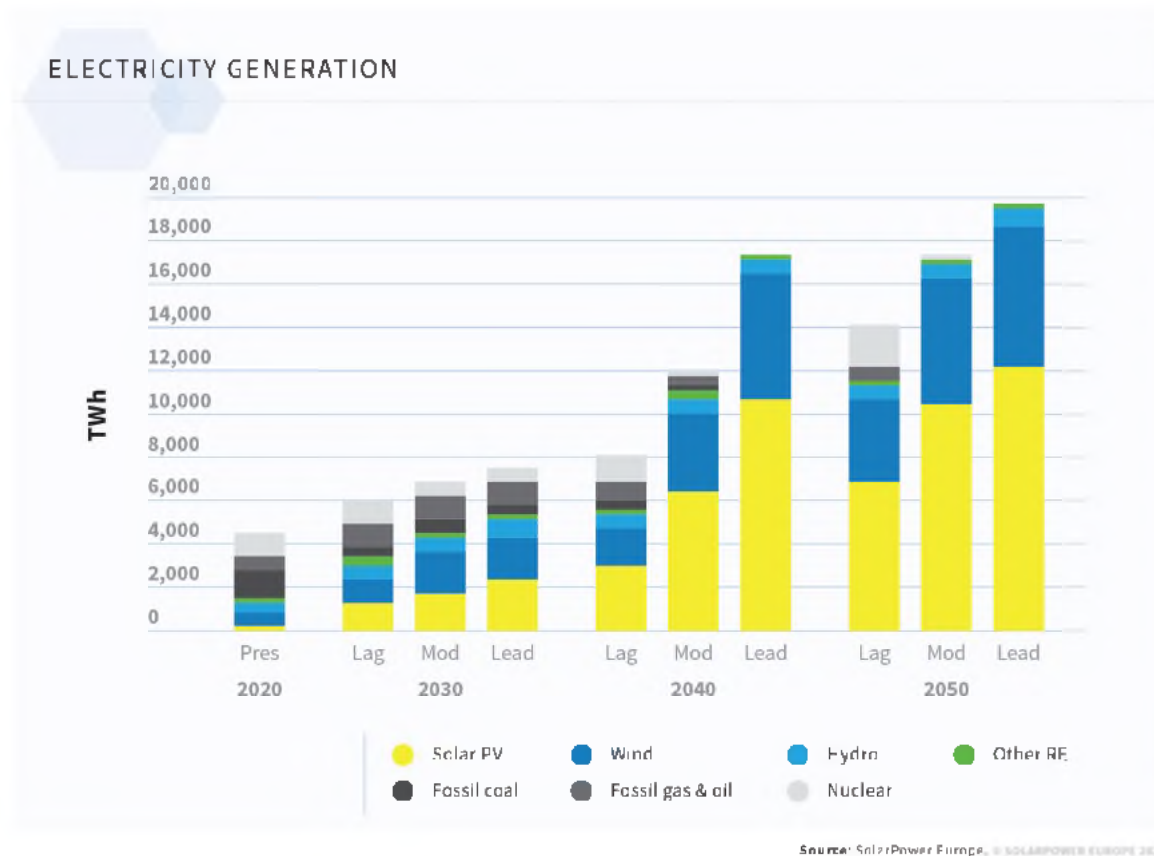
A **high rate of electrification is essential to achieving a 100% renewable integrated energy system.**

The drive towards electrification of about 85% in the 100% renewable scenarios enhances sectoral integration and results in significant system efficiency gains, thus lowering the cost of the transition.



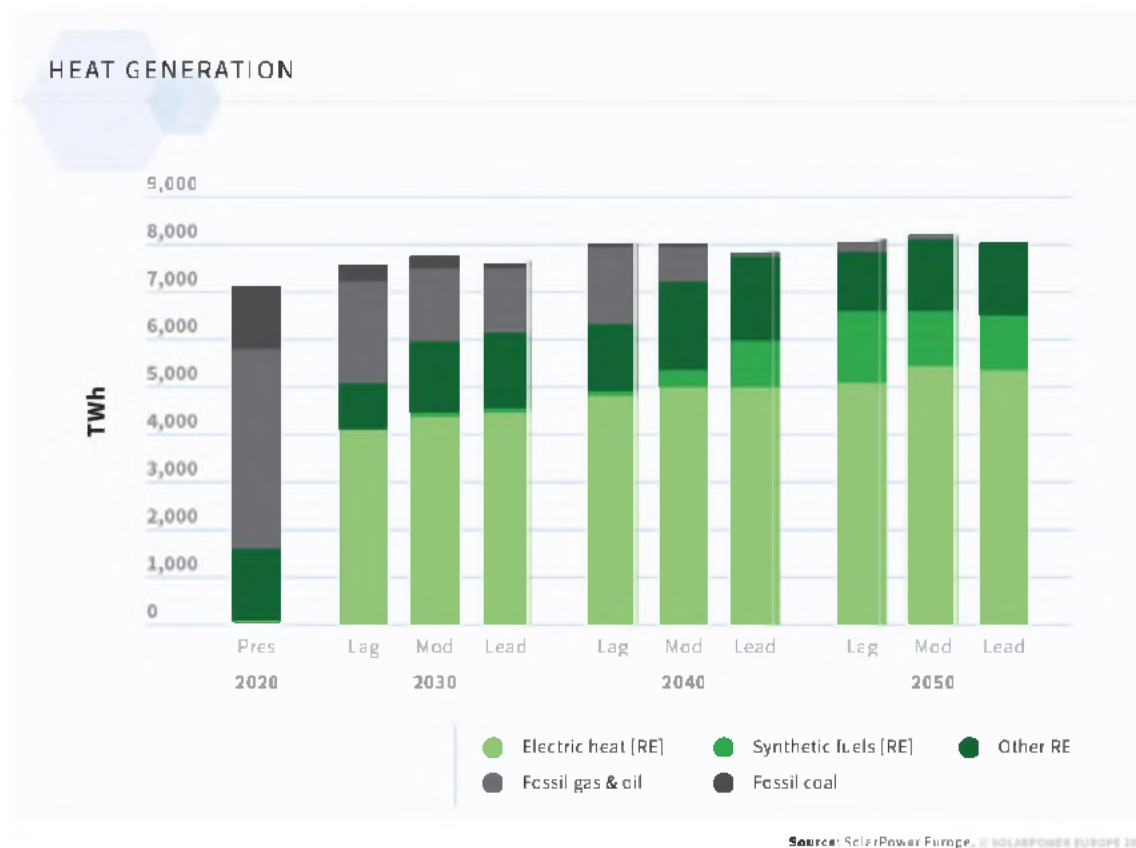
Electricity generation

A **100% renewable energy system is primarily a solar story**. As of 2040, solar PV becomes the dominant source of electricity generation across all three scenarios in Europe. By 2050, reaches at least 48% in the Laggard scenario and up to 63% in the Leadership scenario.



Heat generation

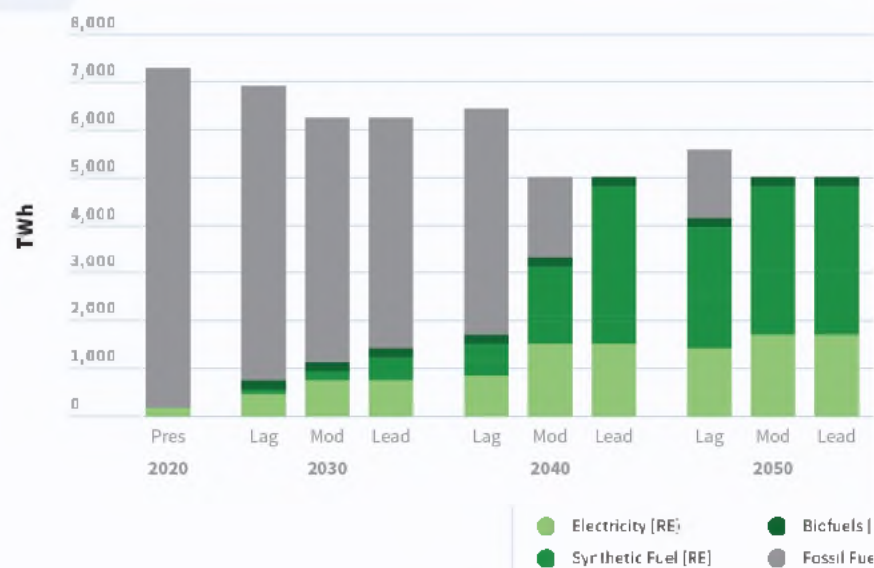
Heat pumps emerge as core part of a 100% renewable energy system, with over 60% share of heat generation by 2050.



Transport

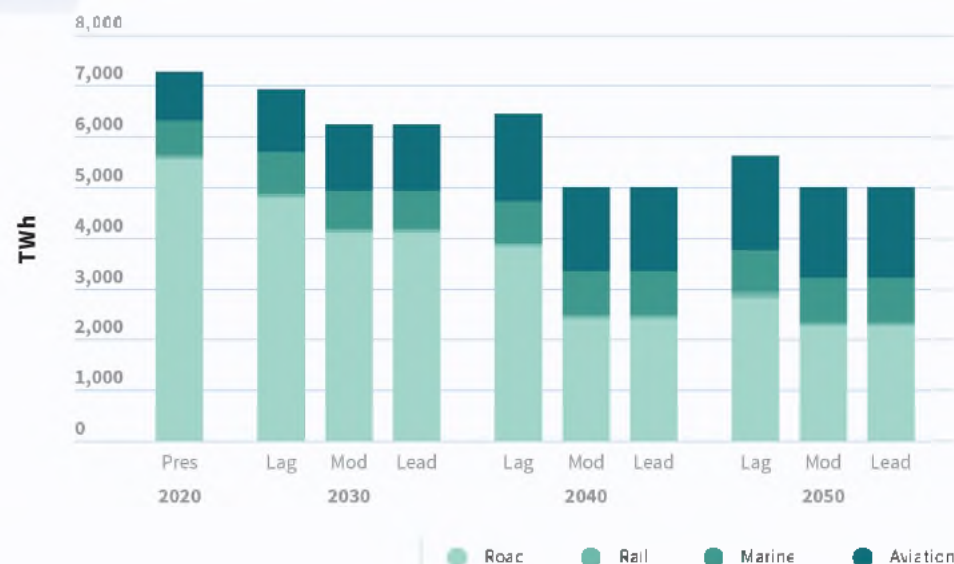
Electrolysers for hydrogen production are crucial technology for a 100% renewables system. While **electricity takes the lion's share to decarbonize road transport**, a 100% renewable transport sector needs **significant shares of synthetic fuels** for marine and aviation.

FINAL ENERGY DEMAND FOR TRANSPORT - FUEL USE



Source: SolarPower Europe, © SOLARPOW

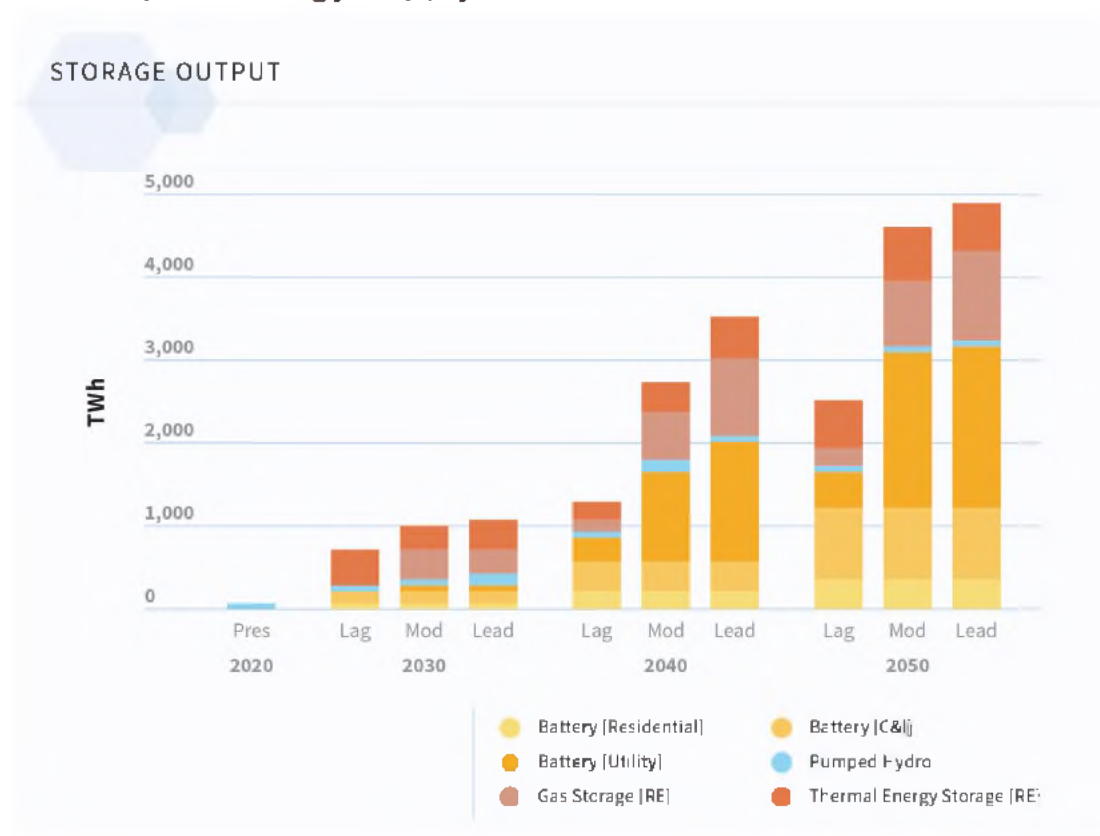
FINAL ENERGY DEMAND FOR TRANSPORT



Source: SolarPower Europe, © SOLARPOWER EUROPE 2020

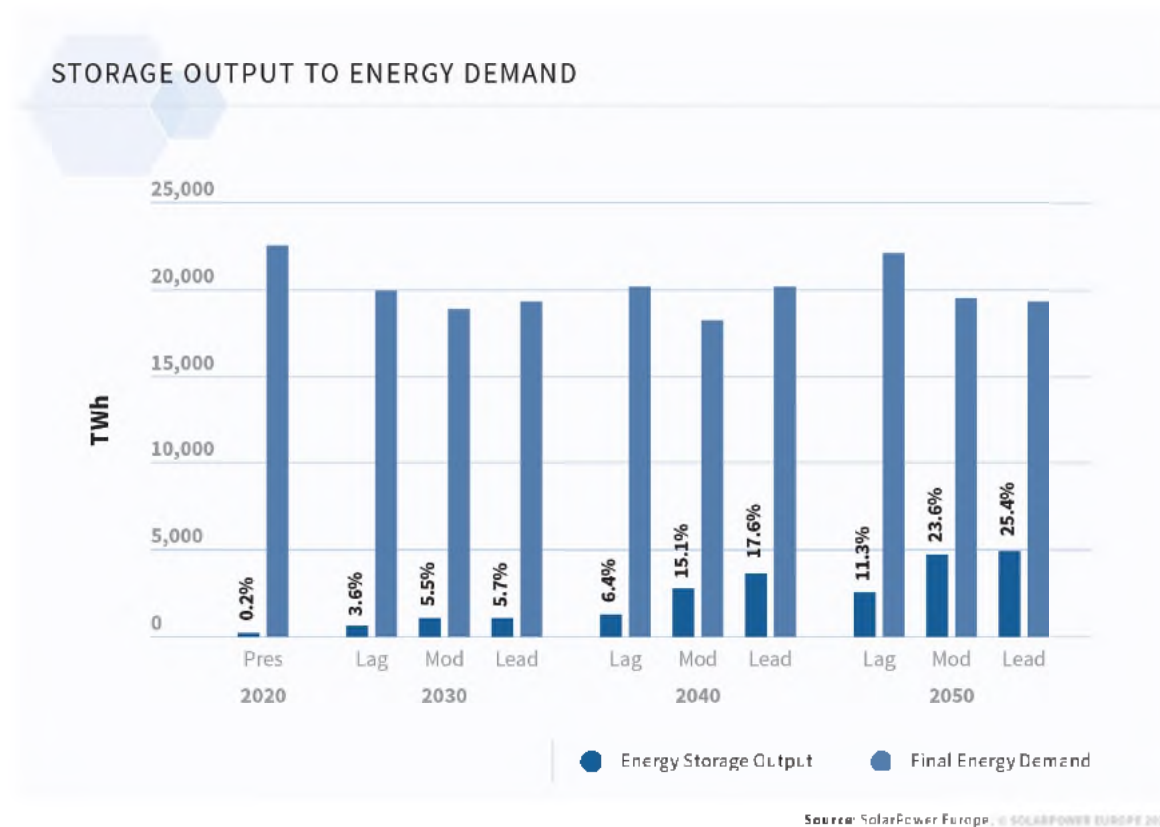
Storage 1/2

Batteries provide the bulk of electricity storage in a 100% renewable energy system. As the share of solar and wind increases significantly beyond 2030, electricity storage becomes crucial in providing an uninterrupted energy supply.



Storage 2/2

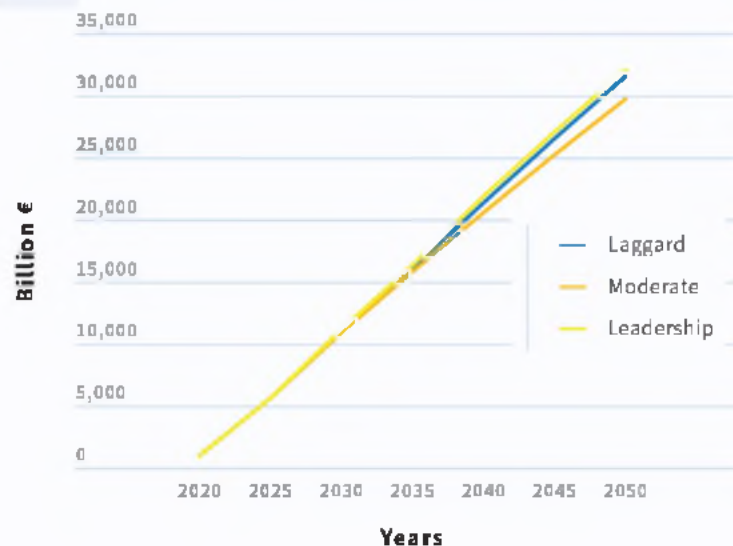
Full **sector coupling** and high **electrification** rates keep the growth of storage output up to 25% of final energy demand in 2050.



Costs

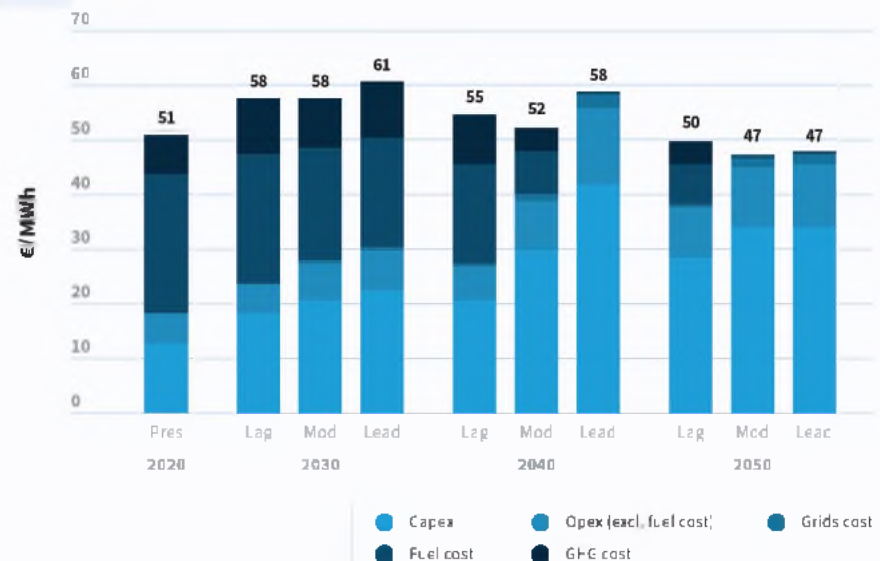
A **100% renewable energy system is the most cost-efficient way to become climate neutral by 2050**. The cumulative costs of achieving a 100% renewable energy by 2050 in the Moderate scenario are 6% lower than the cost of inadequate action in the less ambitious Laggard scenario, which reaches only 62% renewables by 2050, thus missing both the targets of European climate neutrality and the Paris Agreement.

CUMULATIVE ANNUAL SYSTEM COSTS



Source: SolarPower

LEVELISED COST OF ENERGY



Source: SolarPower Europe, © SOLARPWR EUROPE 2021

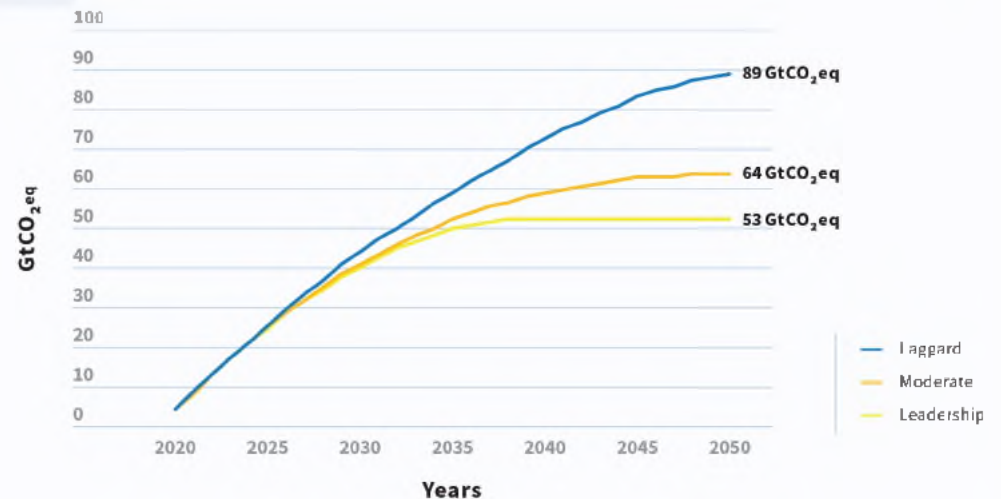
GHG emissions

A **100% renewable transition triggers the sharpest decline in GHG emissions**, by over 60% by 2030, and will be down to zero in 2050, or even 2040 in the Leadership scenario. By contrast, Laggard scenario still emits around 800 million tonnes of CO₂ per year by 2050.

GHG EMISSIONS BY SECTOR



CUMULATIVE GHG EMISSIONS



Policy recommendations 1/2

1. Enshrine objective of **climate neutrality into law** and review **EU 2030 GHG target to comply with the 1.5°C Paris Agreement** (Climate law)
2. **By 2030, prioritise renewable-based electrification** of the EU economy, paving the way to development of competitive and **sustainable hydrogen** solutions

Deep-dive: prioritise renewable-based electrification

- Establish “**Clean Energy Package Implementation Body**”
- Unlock the huge potential of **large-scale solar involving citizens** (climate pact, EU initiative for permitting simplification)
- Develop **pan-European solar rooftop program** as part of upcoming **renovation wave**



Policy recommendations 2/2

3. **Invest in** upgrading, expanding, and modernising Europe's **electricity grids** (Smart sectoral integration strategy, TEN-E)
4. Accelerate deployment of **decentralized flexibility resources** (Smart sectoral integration strategy to push storage, demand-response, EV charging)
5. Roll-out **solar industrial strategy** (EU Industrial policy, Smarter approach to instrument toolbox going beyond IPCEI's for smaller size projects)
6. Develop skills and training program to **unlock potential of solar jobs** (EU skills Agenda, training programs)



100%

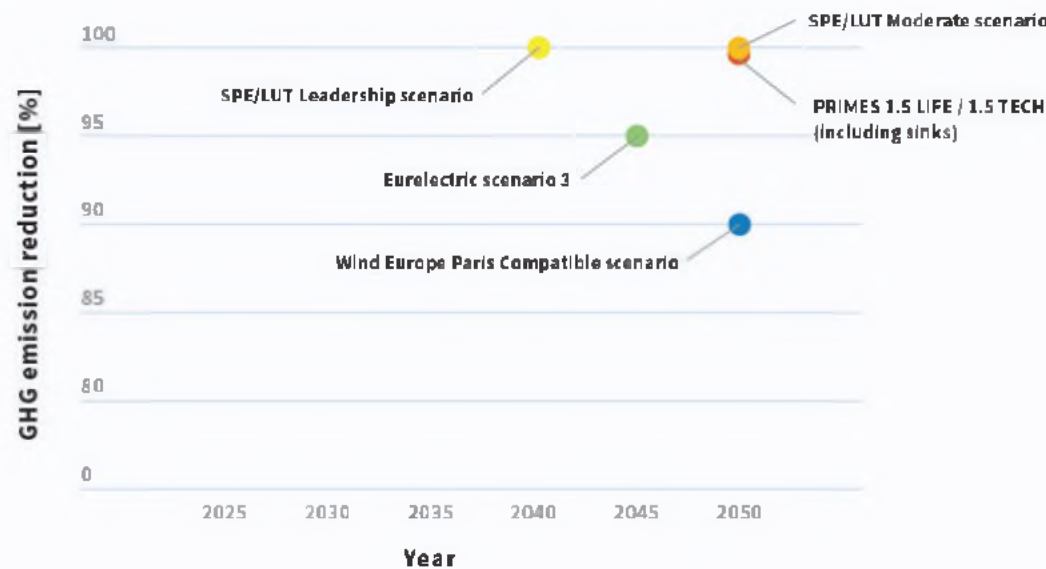
Renewable Europe

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Benchmark

The SolarPower Europe / LUT report has **the highest levels of ambition among peers**. No other study available explores European 100% RE scenario without carbon sinks, not other report models 100% 2040 scenario.

FIGURE 1.2 EU BENCHMARK

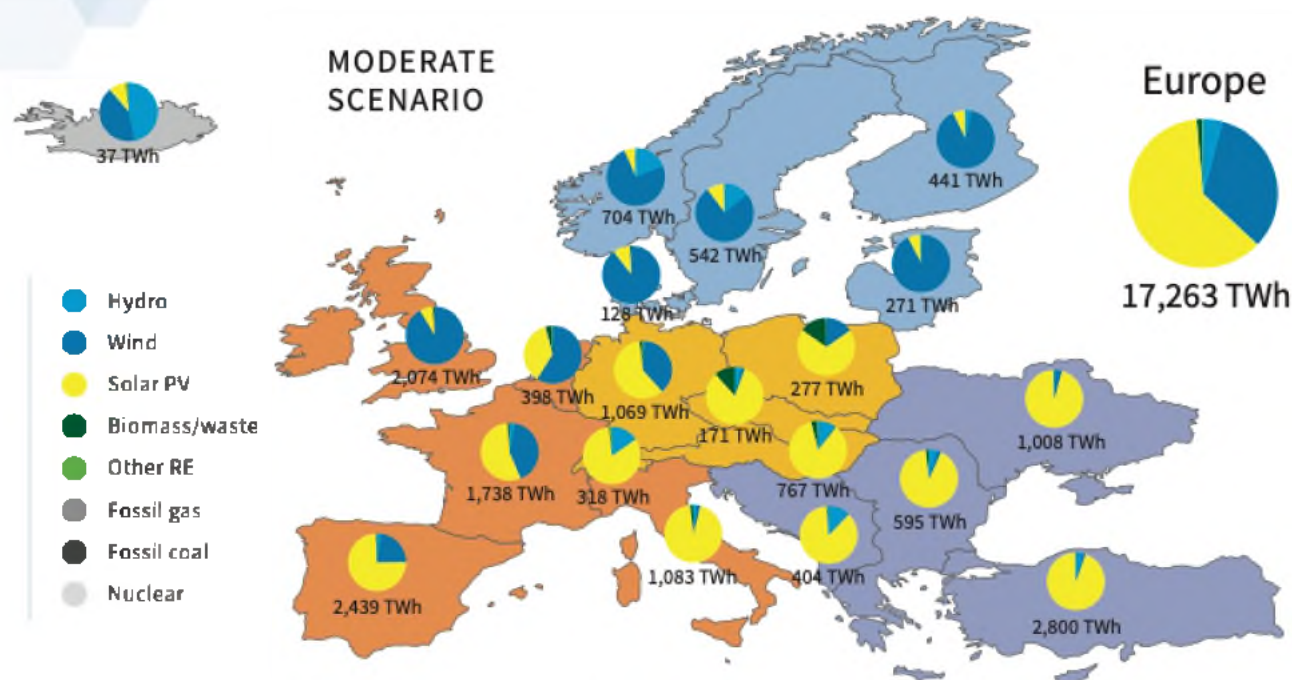


Source: SolarPower Europe, © SOLARPPOWER EUROPE 2019

Regional electricity capacity in 2050 – Moderate

Full sector coupling provides energy security for Europe, with PV capacities predominantly located in the southern regions, while wind energy systems are mainly installed in the northern and western regions of Europe

FIGURE 4.2 REGIONAL ELECTRICITY GENERATION IN 2050 ACROSS EUROPE



Hourly operation of the energy system in France

A **100% renewables-based** and fully integrated energy system in 2050 will **function without fail every day of the year**: Even in the dark winter days the country easily copes with energy demand.

HOURLY OPERATION OF THE ENERGY SYSTEM IN FRANCE

