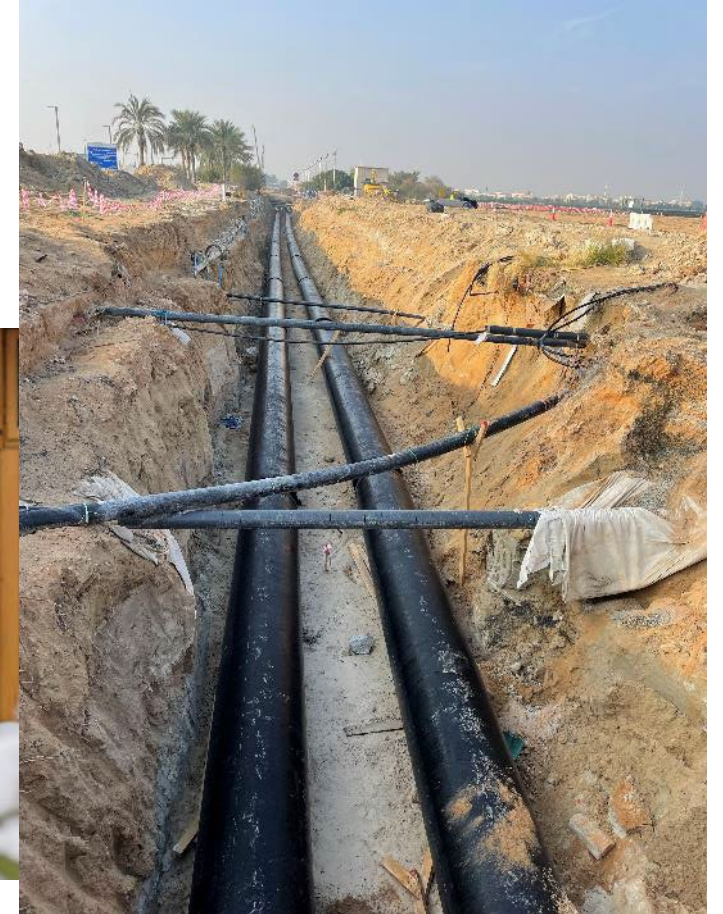


Renewable heating and cooling in the energy transition

Dr Ute Collier

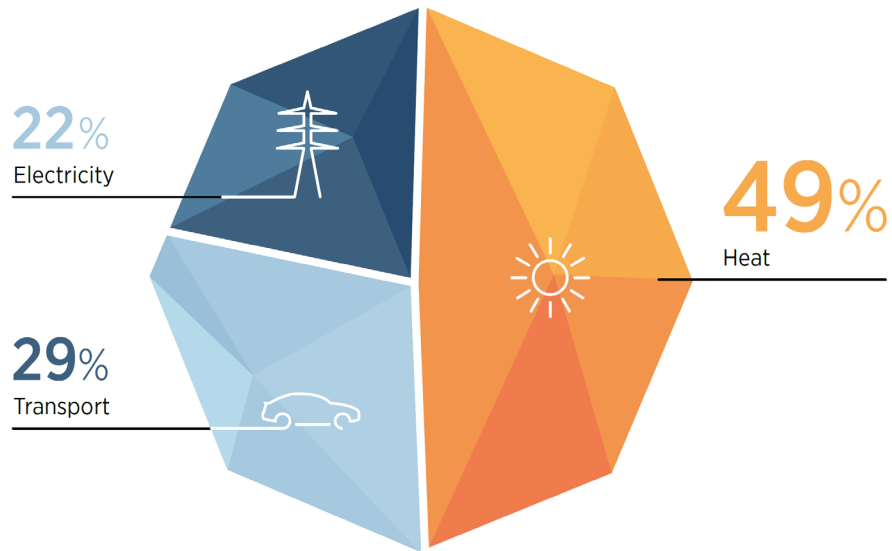
Deputy Director of Knowledge, Policy and Finance Centre (KPFC)

19 April 2023, Sarajevo, Workshop on District Heating and Cooling

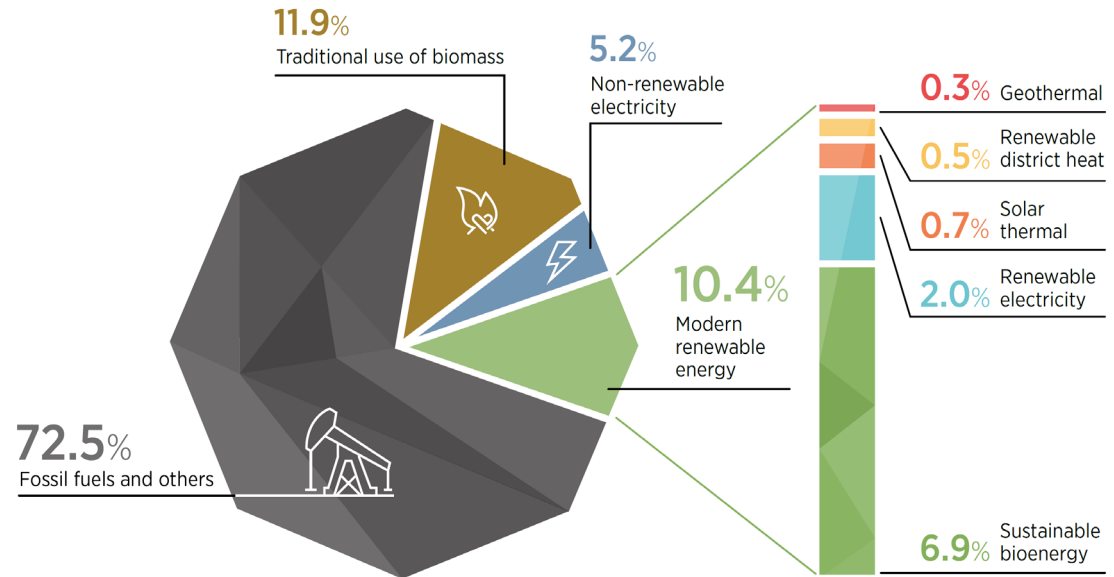


Heating and cooling accounts for half of total energy demand

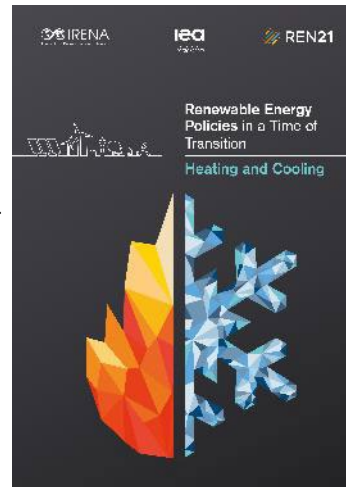
Total final energy consumption shares by end use, 2019









Total final energy consumption in heating and cooling, by source, 2019

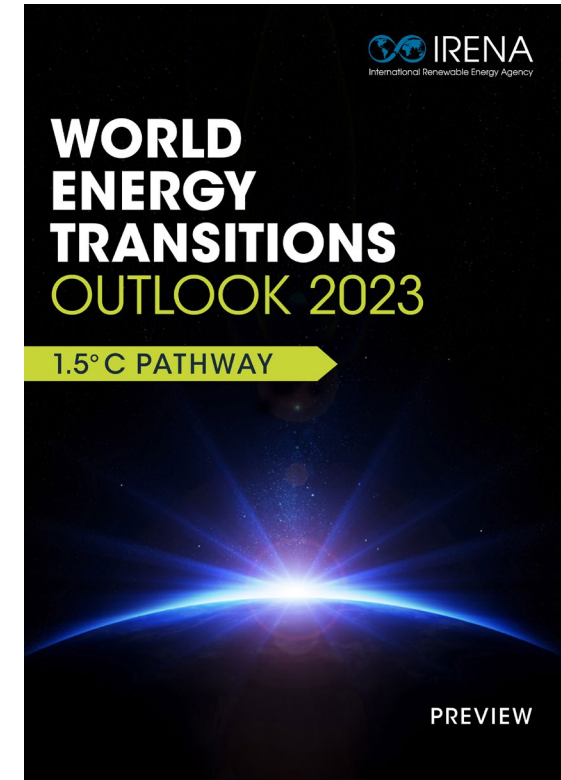


Source: IRENA, IEA and REN21, 2020



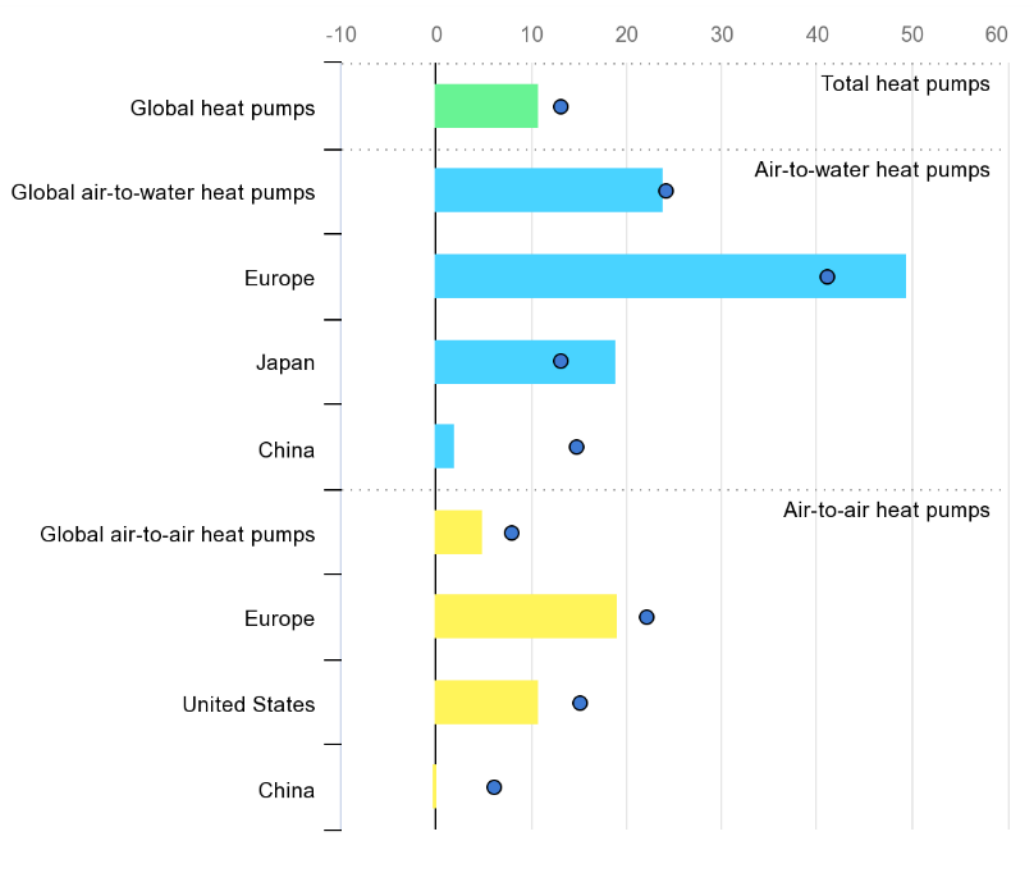
Renewables-based end-use decarbonisation needs to be scaled up massively

Indicators	Recent years	2030 ¹⁾	2050 ¹⁾	Progress (Off / on track)
DIRECT RENEWABLES IN END-USES AND DISTRICT HEAT				
Share of renewables in final energy consumption	19% ⁸⁾	34%	83%	
Solar thermal collector area	746 million m ² /yr ⁹⁾	1 700 million m ² /yr	3 700 million m ² /yr	
Modern use of bioenergy (direct use)	1.5 EJ ¹⁰⁾	44 EJ	56 EJ	
Geothermal consumption (direct use)	0.4 EJ ¹¹⁾	1.3 EJ	2.2 EJ	
Renewables based district heat generation	0.9 EJ ¹²⁾	4.3 EJ	12 EJ	
Investment needs for renewables end uses and district heat ²⁸⁾	13 USD billion/yr ¹³⁾	269 USD billion/yr	216 USD billion/yr	



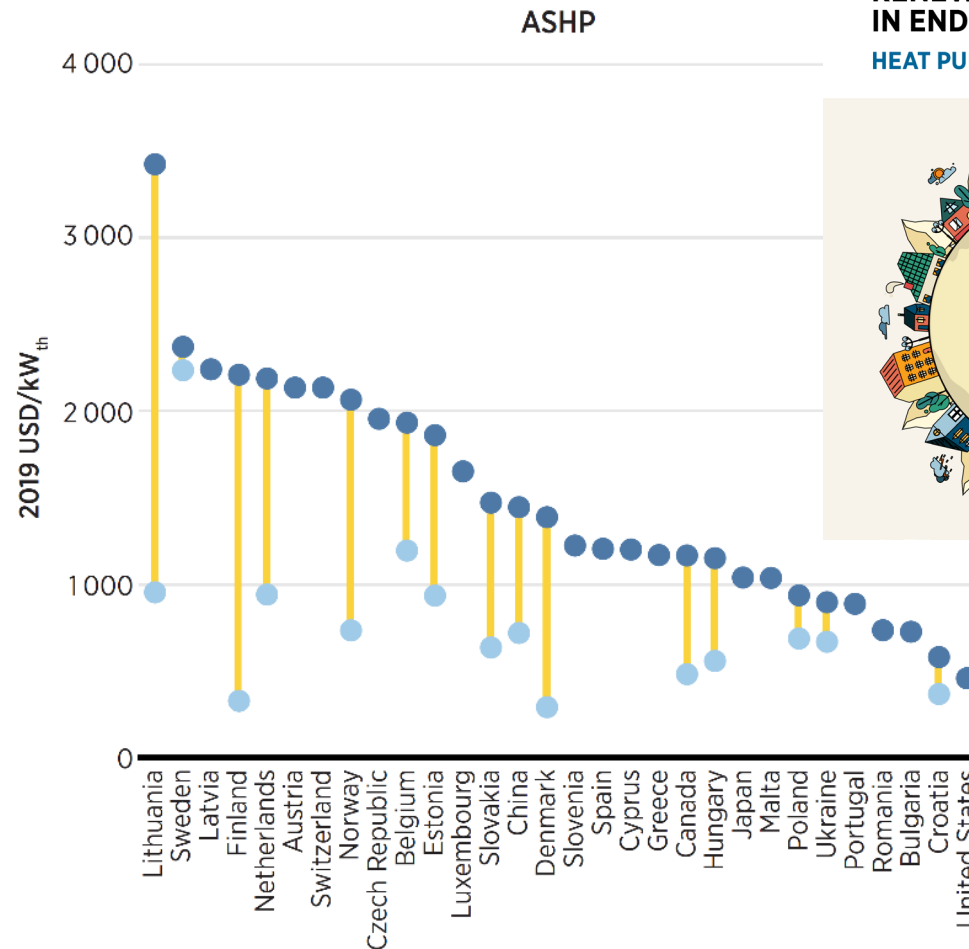
Heat pumps are becoming an increasingly popular solution

Annual growth in sales of heat pumps in buildings worldwide and in selected markets, 2021 and 2022



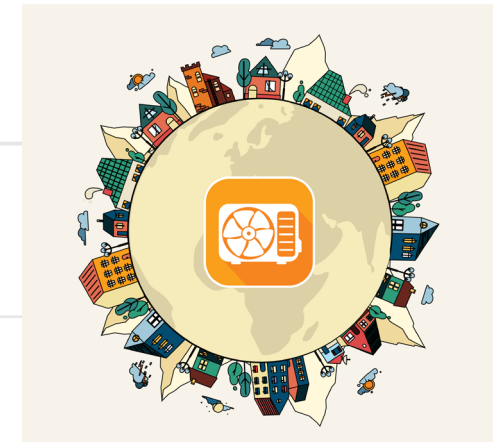
Source: IEA (2023). Licence: CC BY 4.0

Cost of heat pumps in some markets, 2019



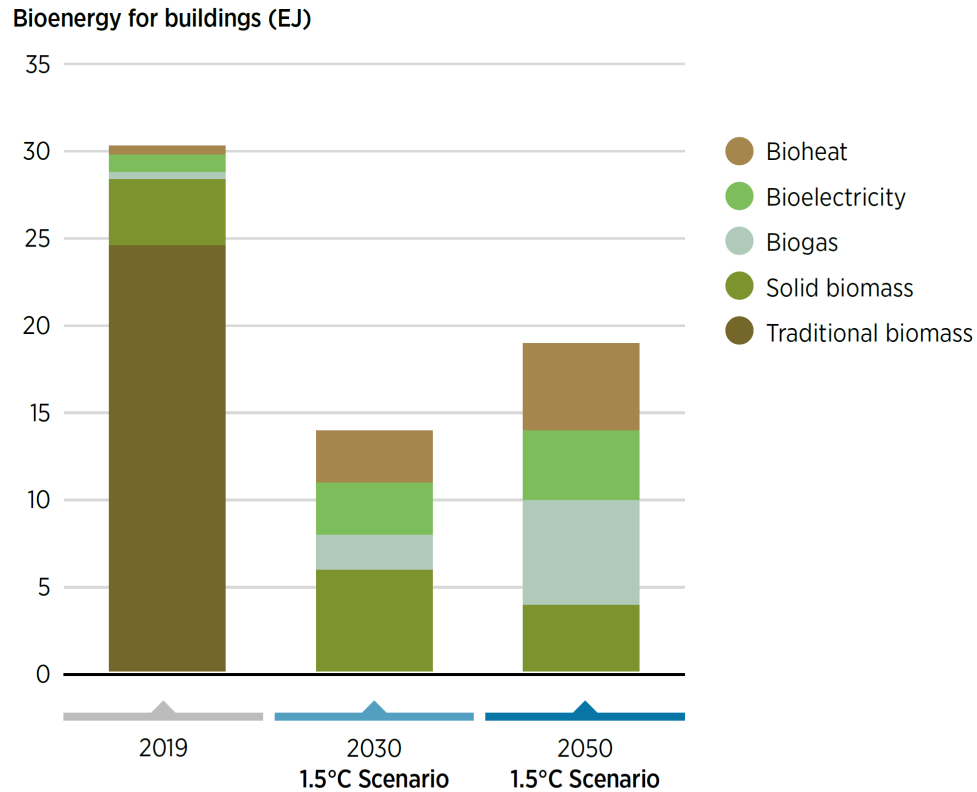
Source: IRENA (2022)

RENEWABLE SOLUTIONS IN END-USES
HEAT PUMP COSTS AND MARKETS



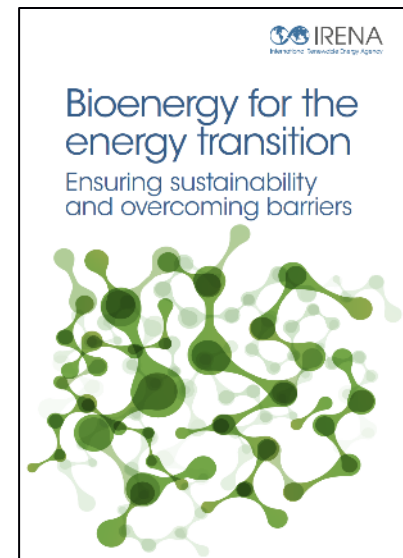
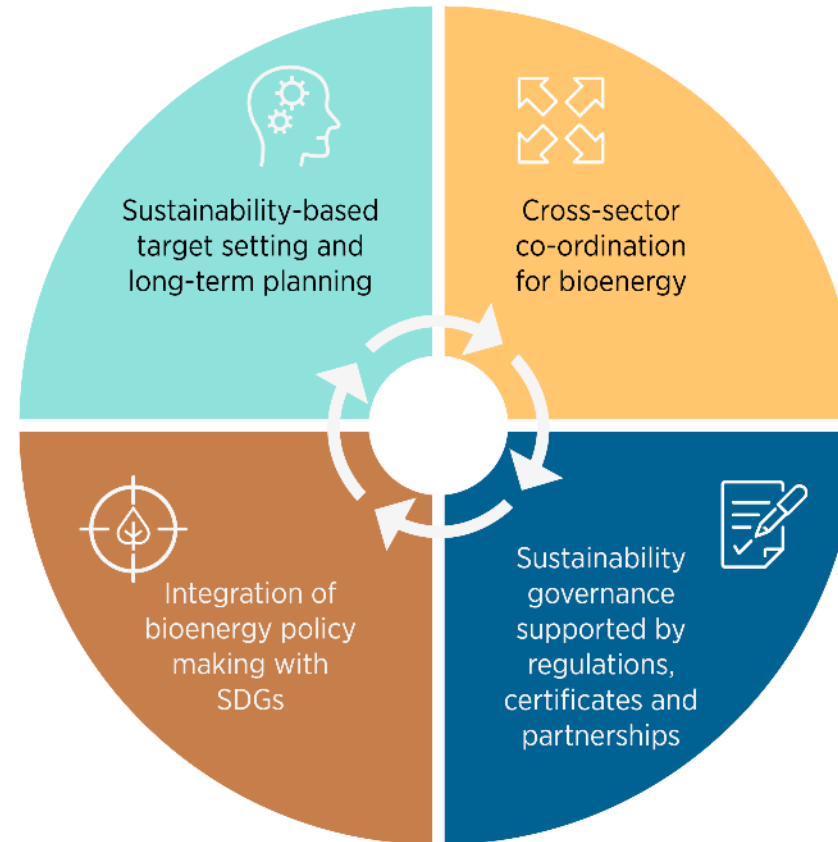
Sustainable bioenergy can also decarbonise heat demand

Bioenergy consumption in buildings in the 1.5°C Scenario



Source: IRENA, 2022

Policy framework for sustainability of bioenergy



Solar thermal heat and geothermal also play a role

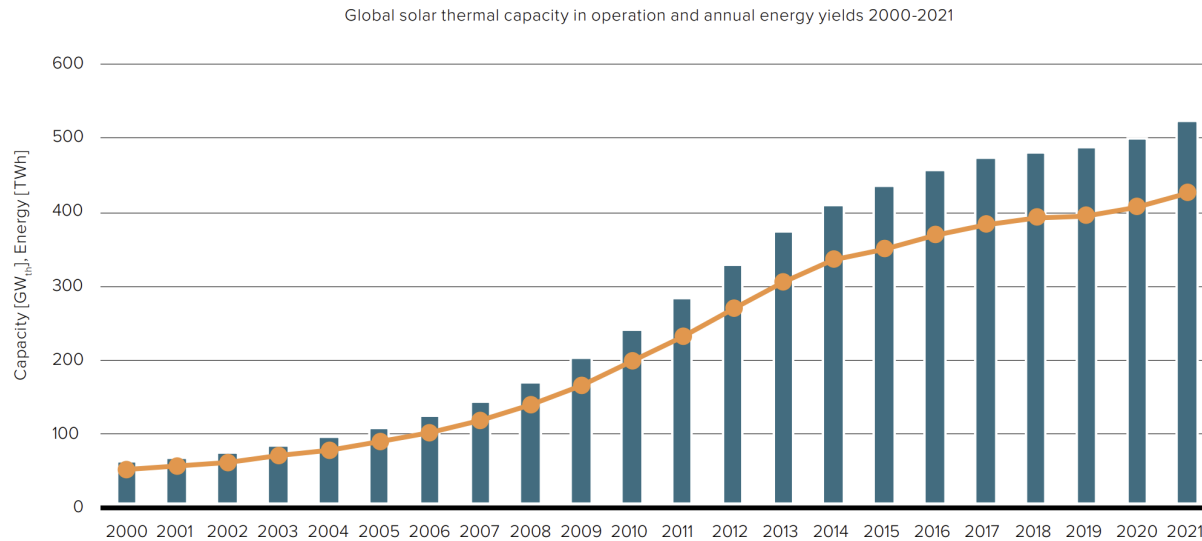
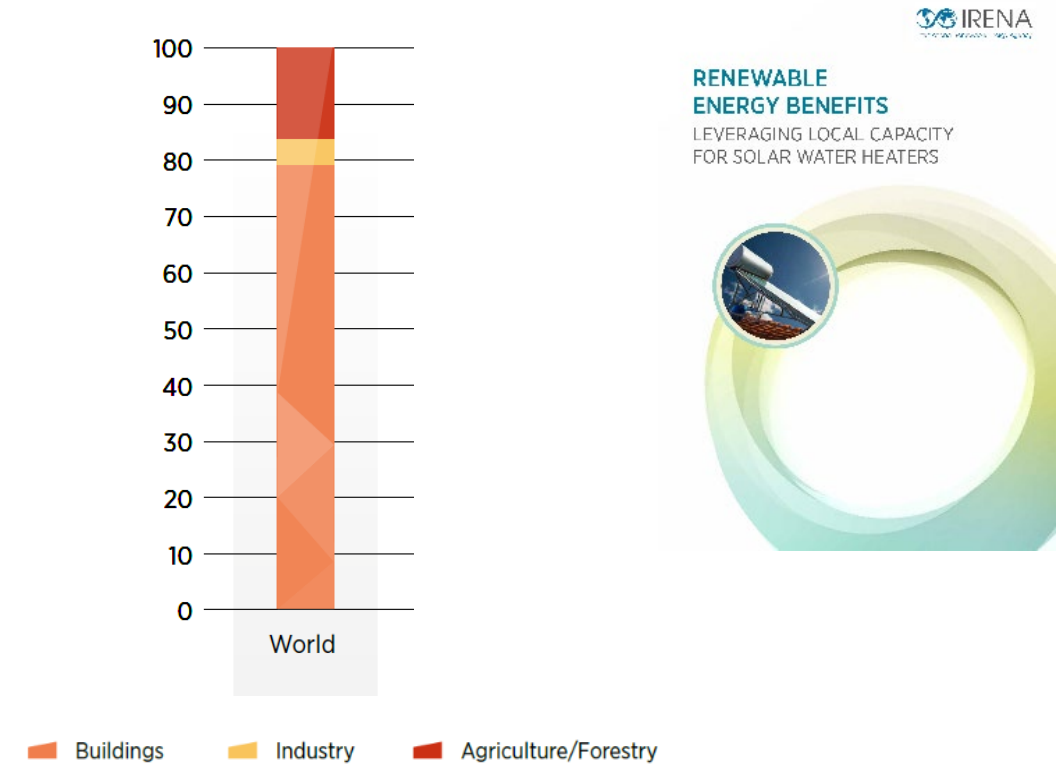


Figure 2: Global solar thermal capacity in operation and annual energy 2000-2021

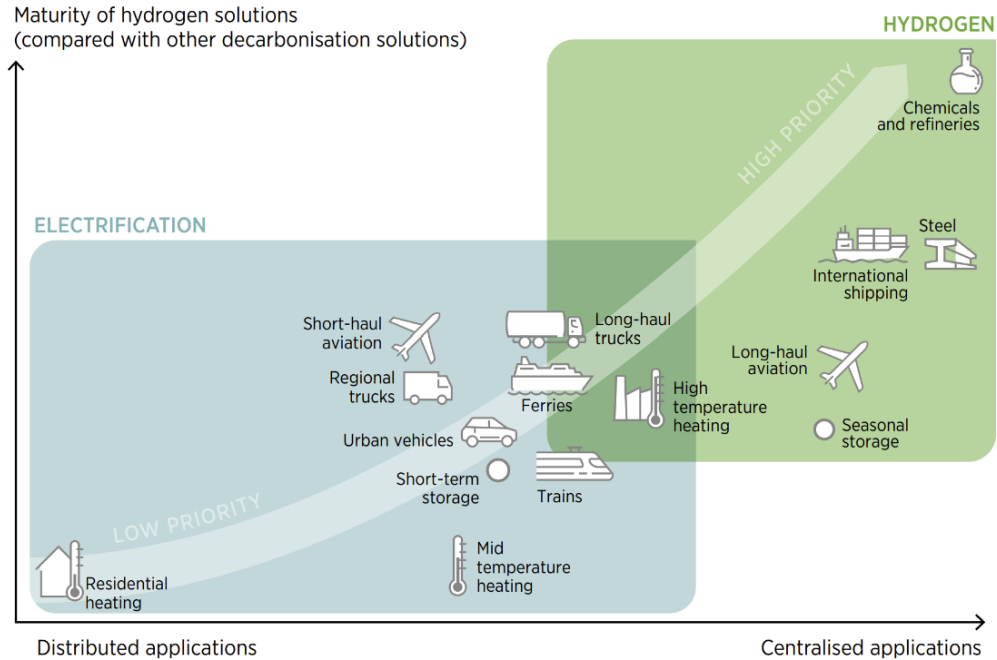
Source: Solar heat world wide, 2022

Global geothermal heat use by sector, 2020 (%)



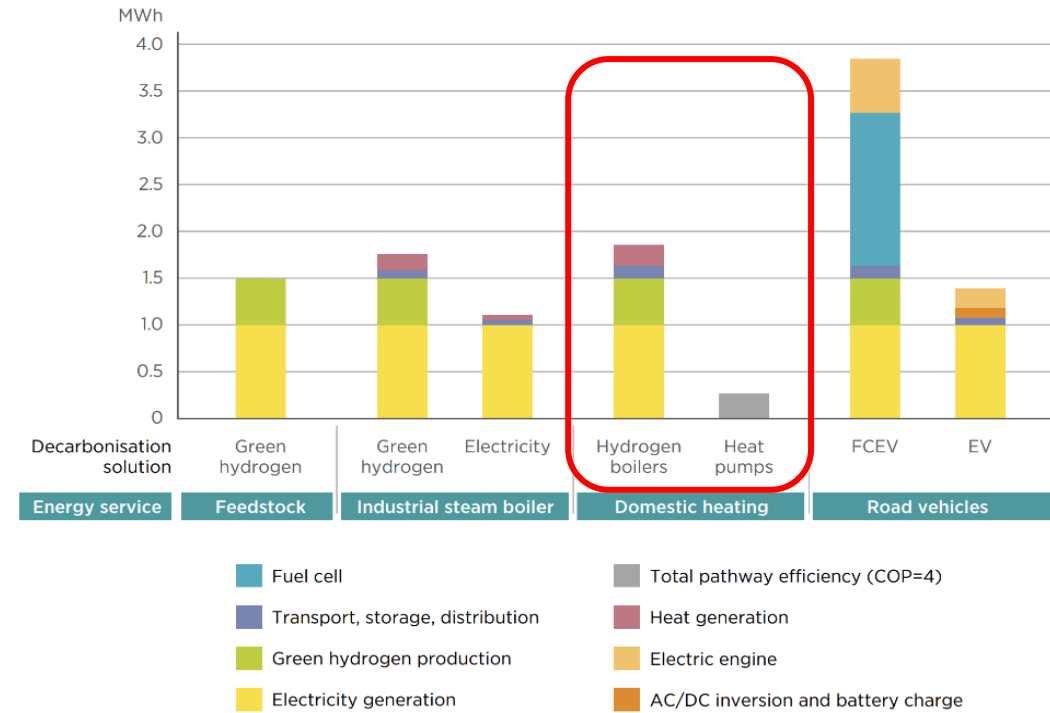
Source: IRENA, IEA and REN21, 2020; IRENA, 2022

Green hydrogen policy priority



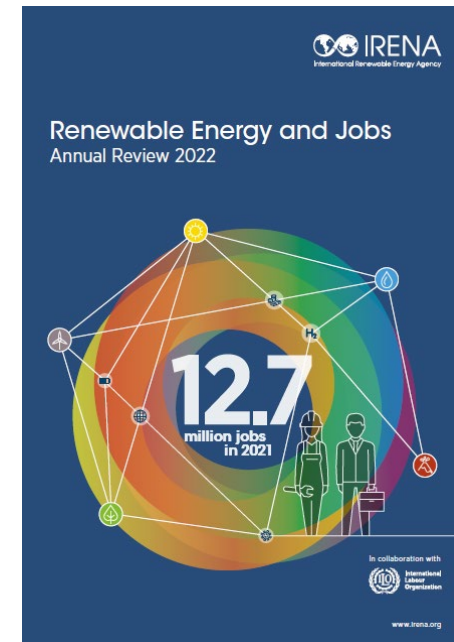
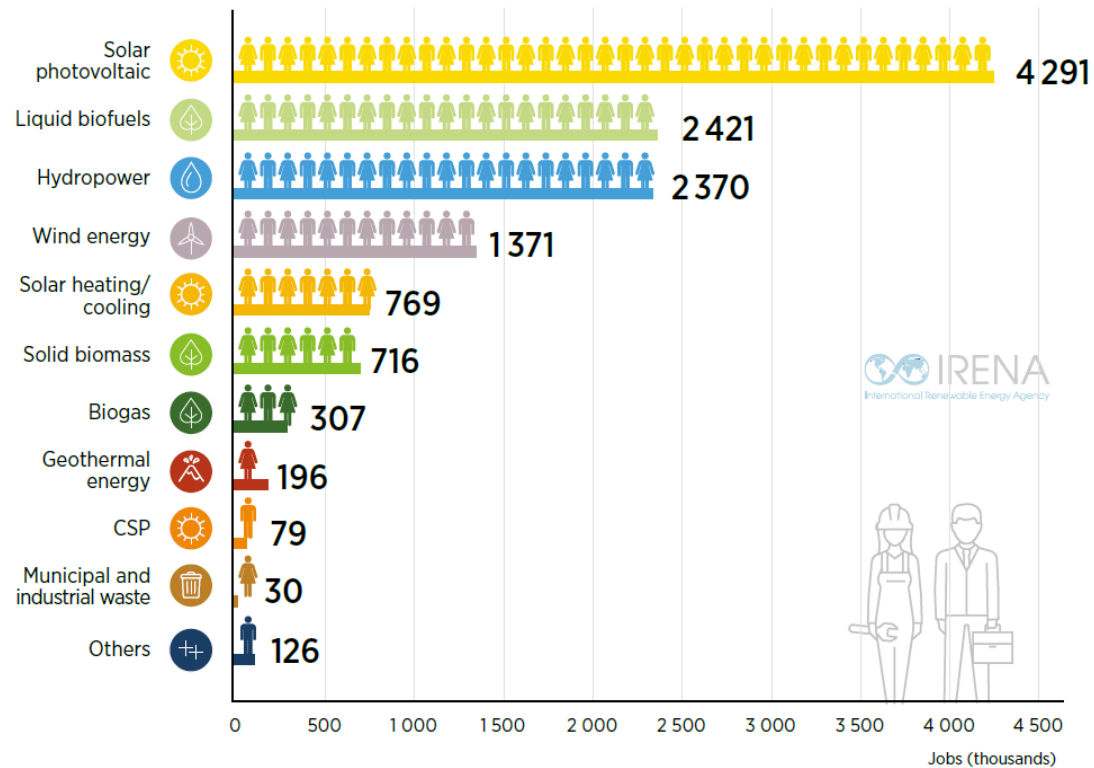
Source: IRENA, 2022

Renewable electricity generation needed for 1 MWh by energy services and by transformation passage

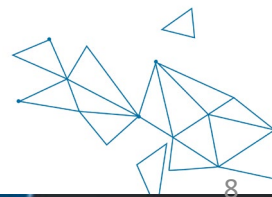


Renewable heating and cooling is creating millions of jobs

Global renewable energy employment by technology, 2021

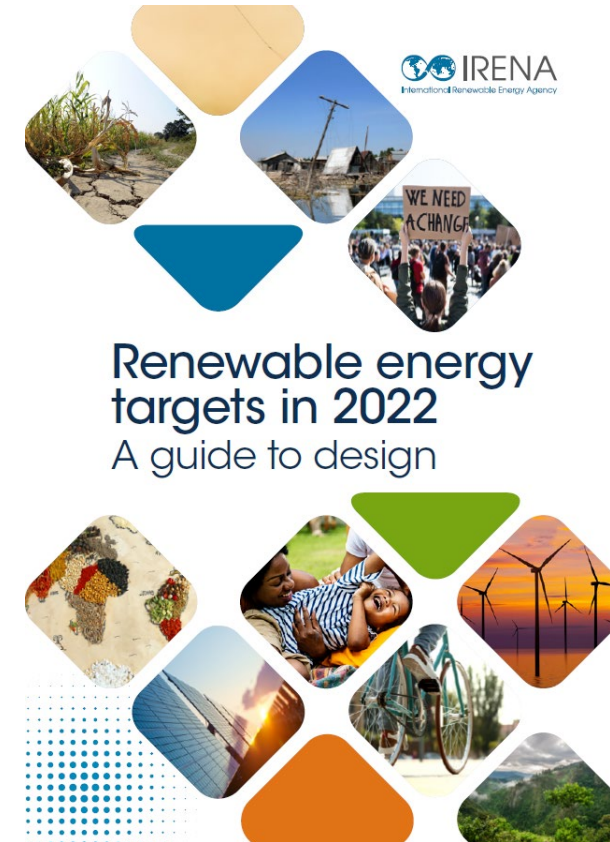
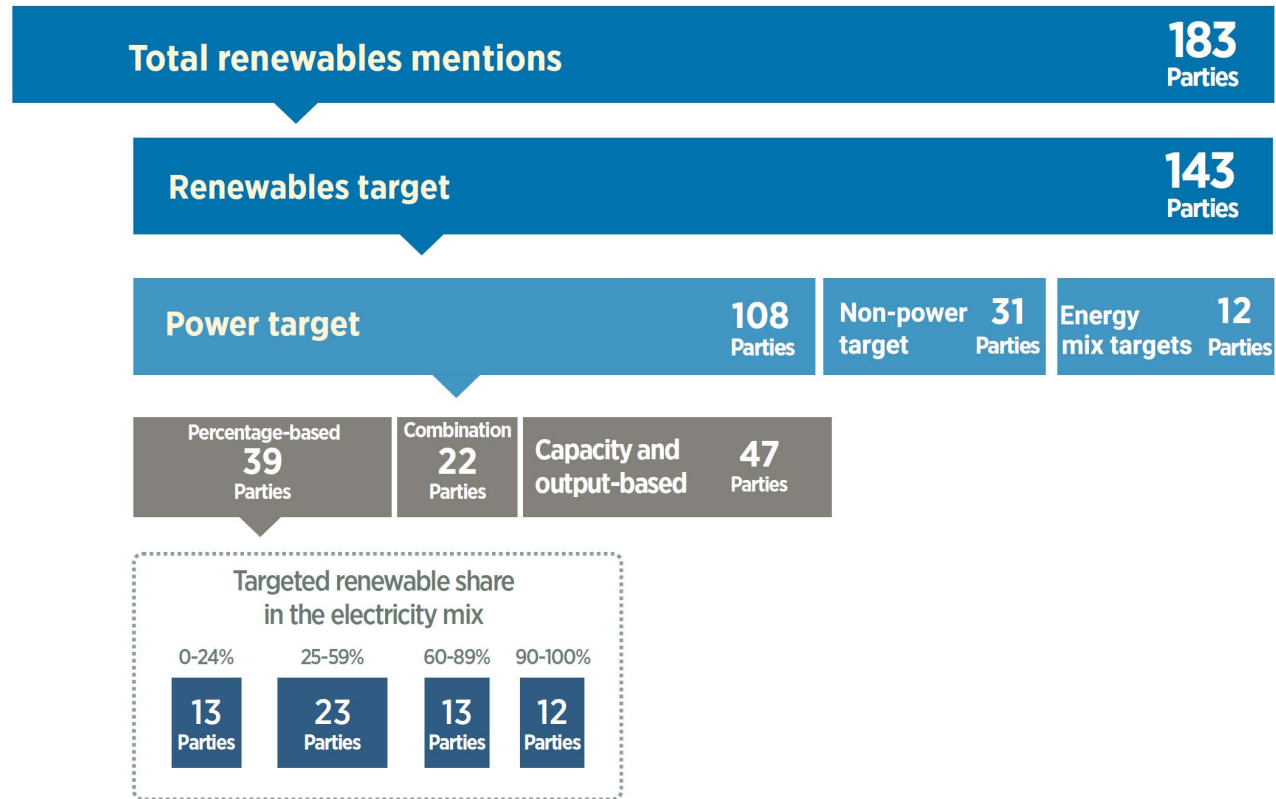


Source: IRENA, 2022



However, heating and cooling remain lag far behind the power sector in terms of targets & policies

Renewable energy targets in NDCs, 2022



Source: IRENA 2022



Thank you!

