The Build-Up of Strategic Energy Storage

29th Meeting of the Technology Executive Committee

Bonn, Germany

September 2024

Future Cleantech Architects

The time to plan storage is now.

1. Global consensus on the relevance of storage – key results from our joint RD&D survey with the Technology Executive Committee
2. Why early planning on storage pays off
3. Overview of storage technologies for power and heat

Future Needs in RD&D Survey

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United Nations Climate Change
Technology Executive Committee

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UN Climate Change & FCA Joint Survey:

- Institutional barriers as major roadblocks to advancing breakthrough climate technology.
- The public sector plays a crucial role.
- Energy storage emerges as the most urgent technology for emissions reduction.

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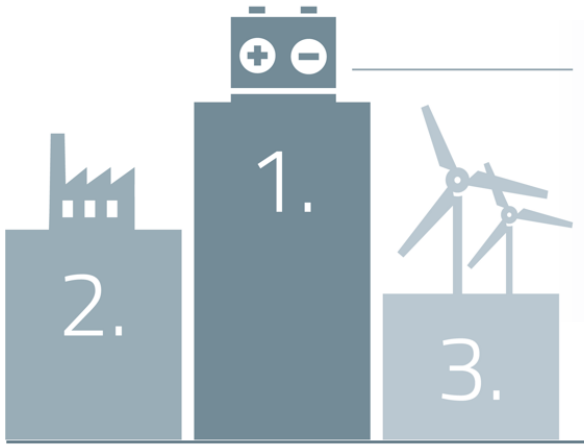
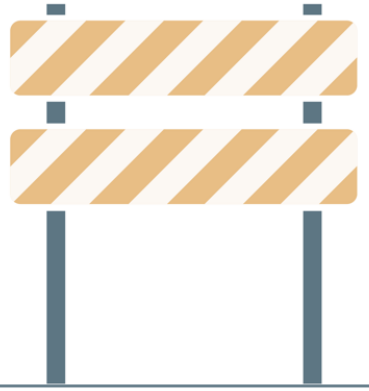
The importance of energy storage

Ranking
(according to respondents)



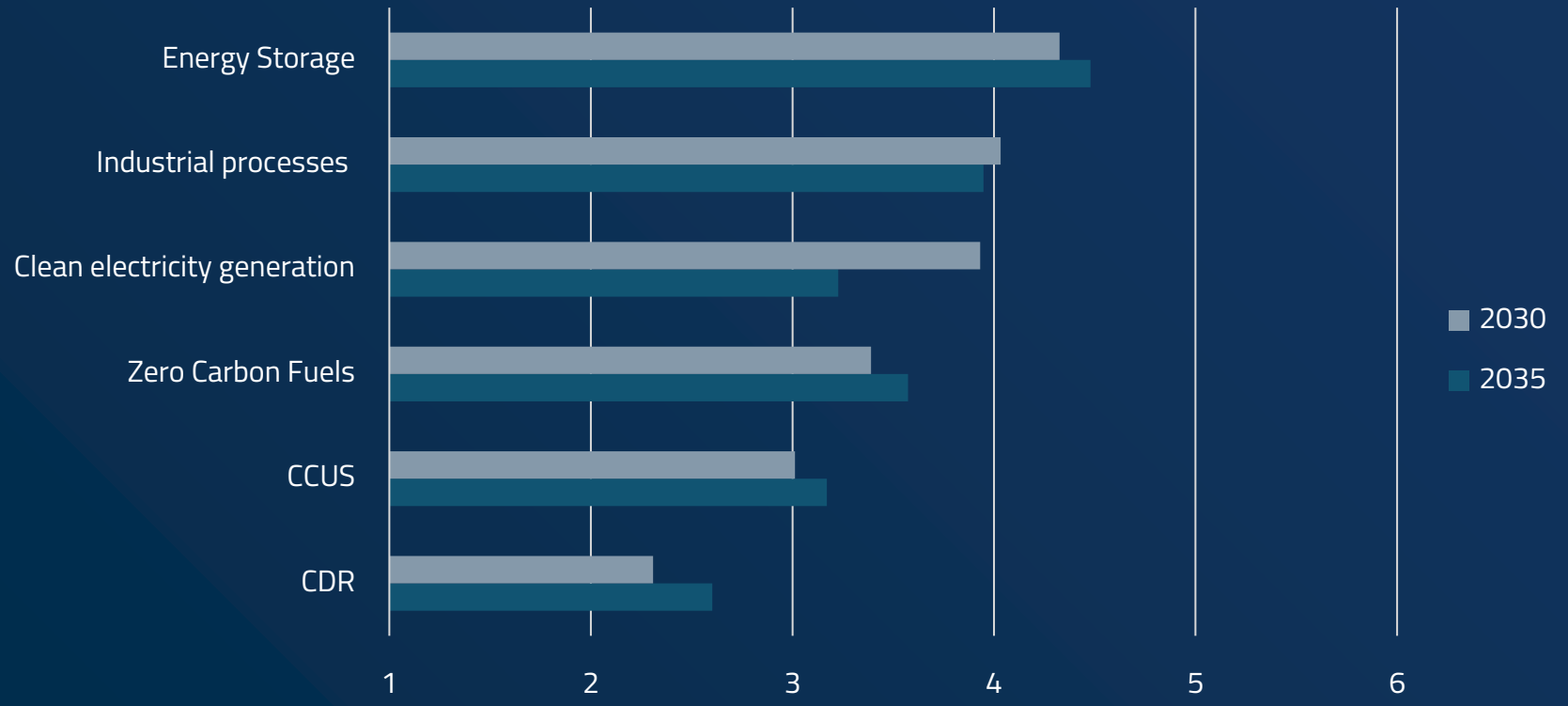
- Ranked #1 priority for 2030 + 2035
- #1 even when excluding storage sector respondents
- Thermal Energy Storage highlighted in particular

Roadblocks
(according to respondents)

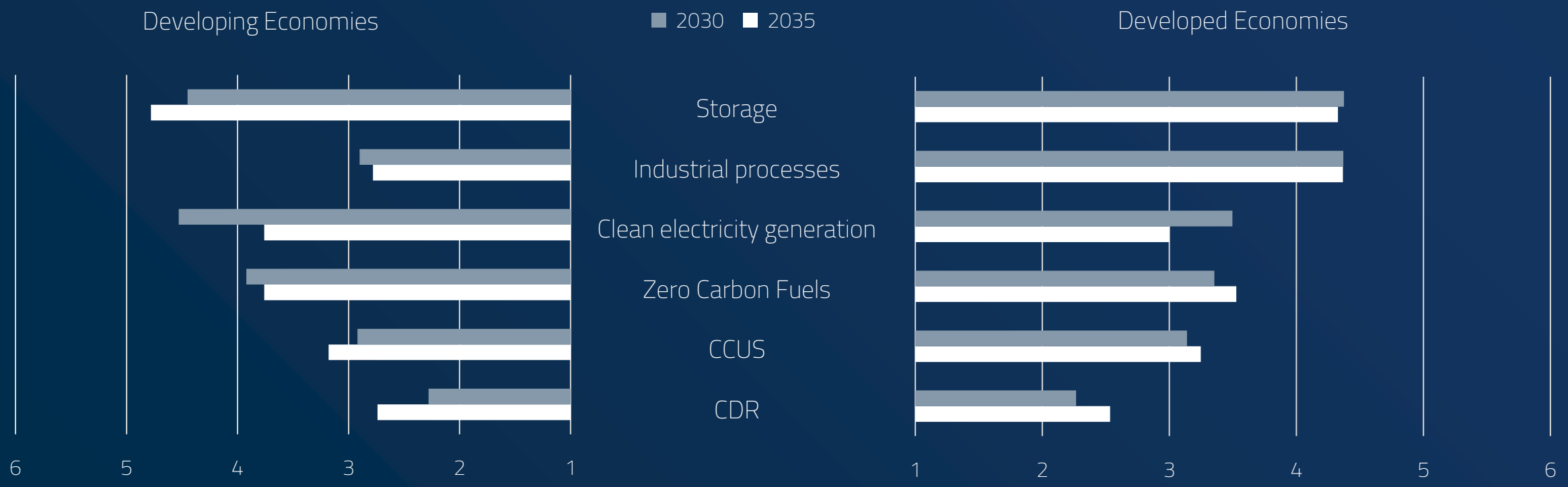


- **Legislation** (chosen by 51%)
- **Political Support** (chosen by 49%)
- **Bureaucracy** (chosen by 49%)
- **Demand** (chosen by 26%)

Early stage technology priorities: Global needs 2030 vs. 2035



Early stage technology priorities: Developed vs developing economies



Why early planning on storage pays off

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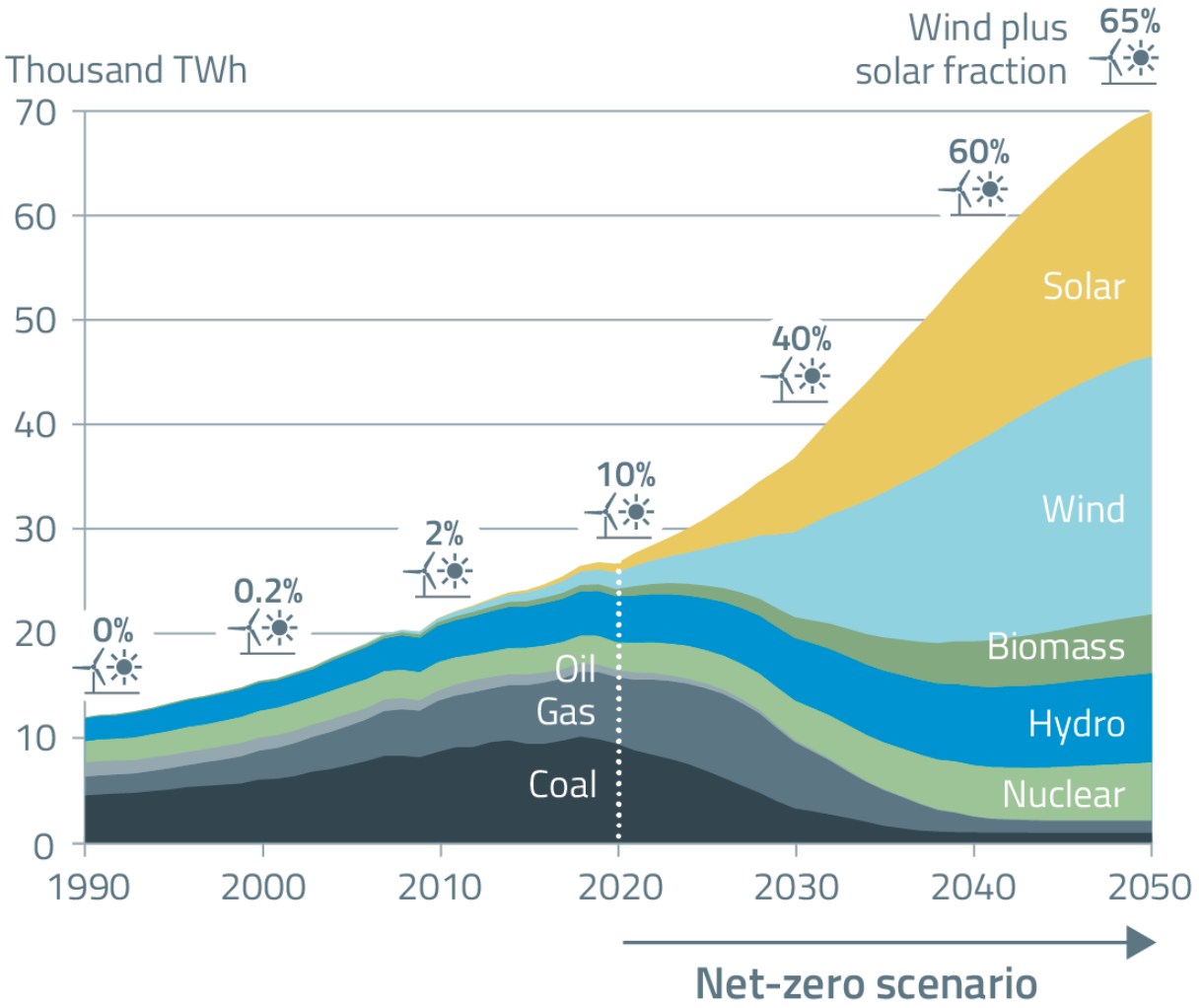
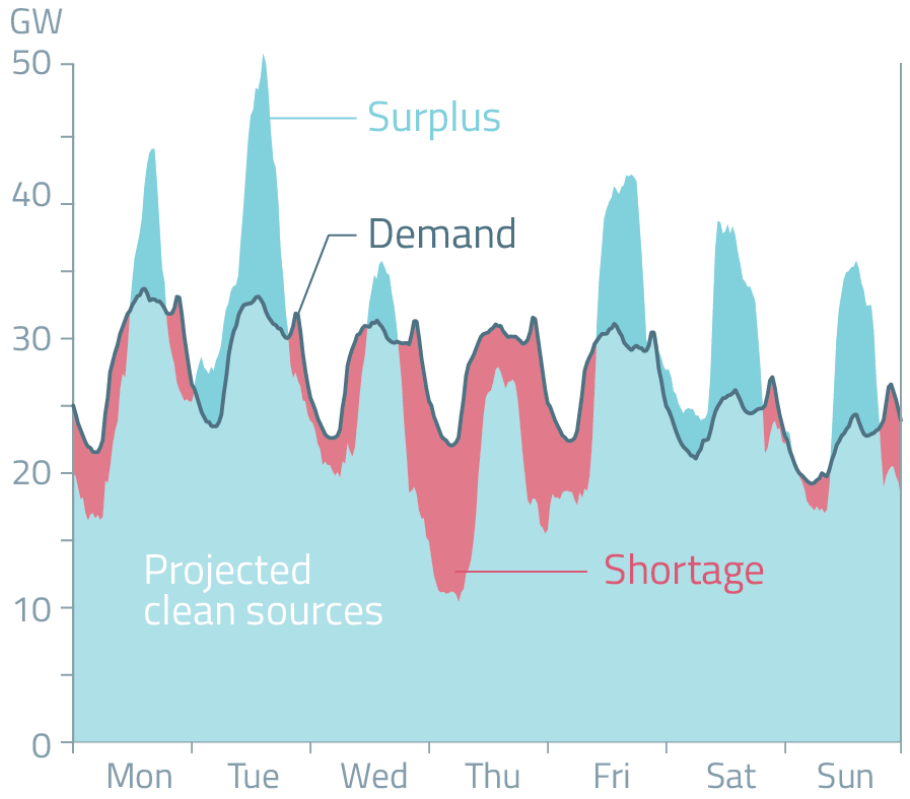
Solar and wind energy will grow to be the backbone of global power systems.



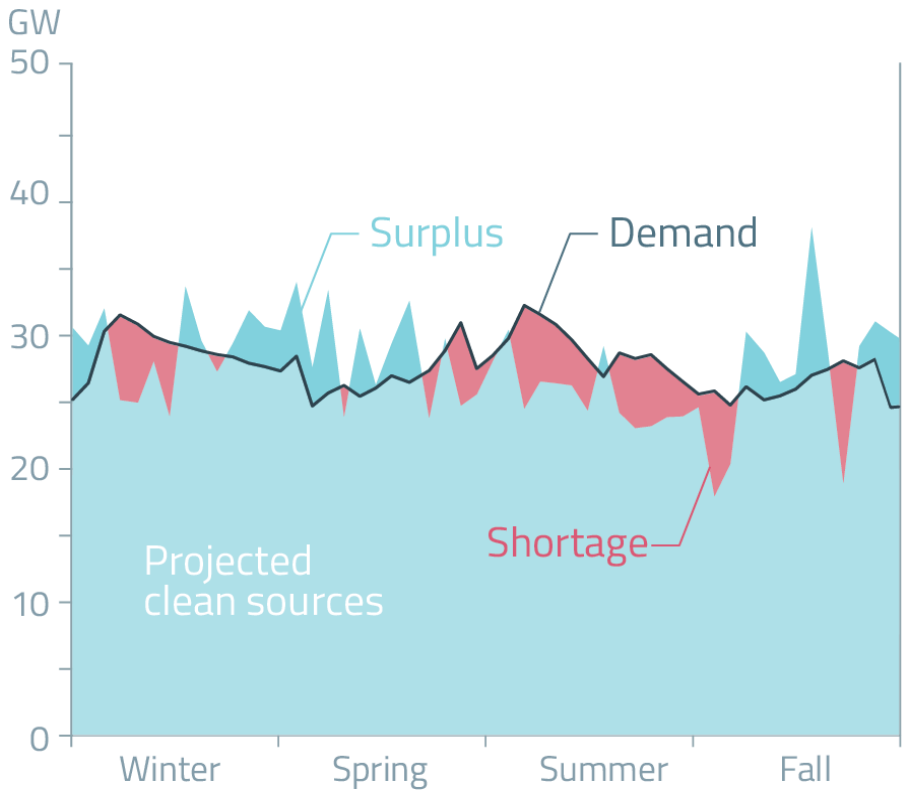
Global electricity generation under a net-zero scenario (thousand TWh/year)

Source: IEA

Wind and solar energy fluctuate over time, requiring daily-to-seasonal flexibility

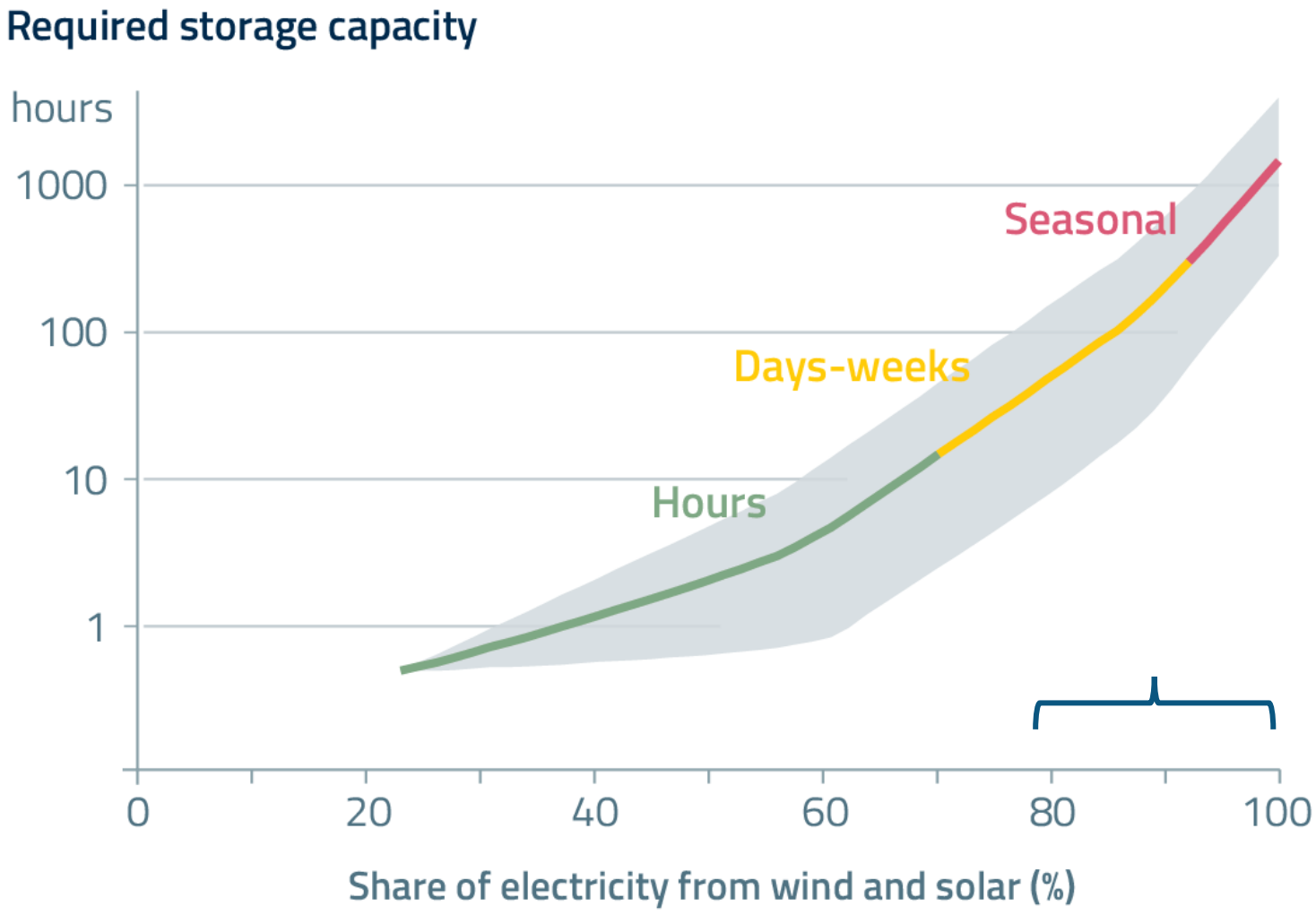


1 week



1 year

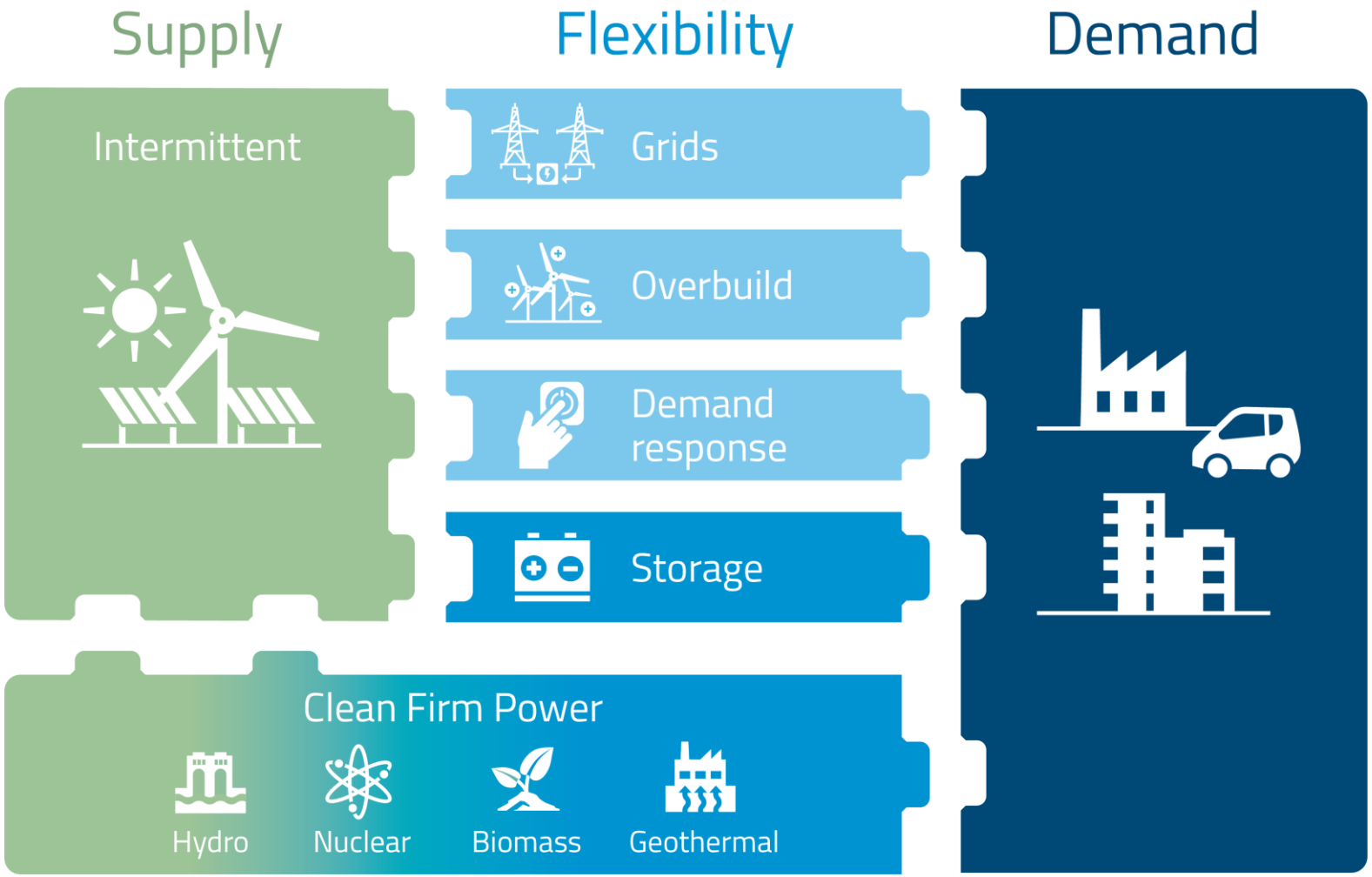
Sources: Spanish electrical grid (ree.es), FCA's modelling



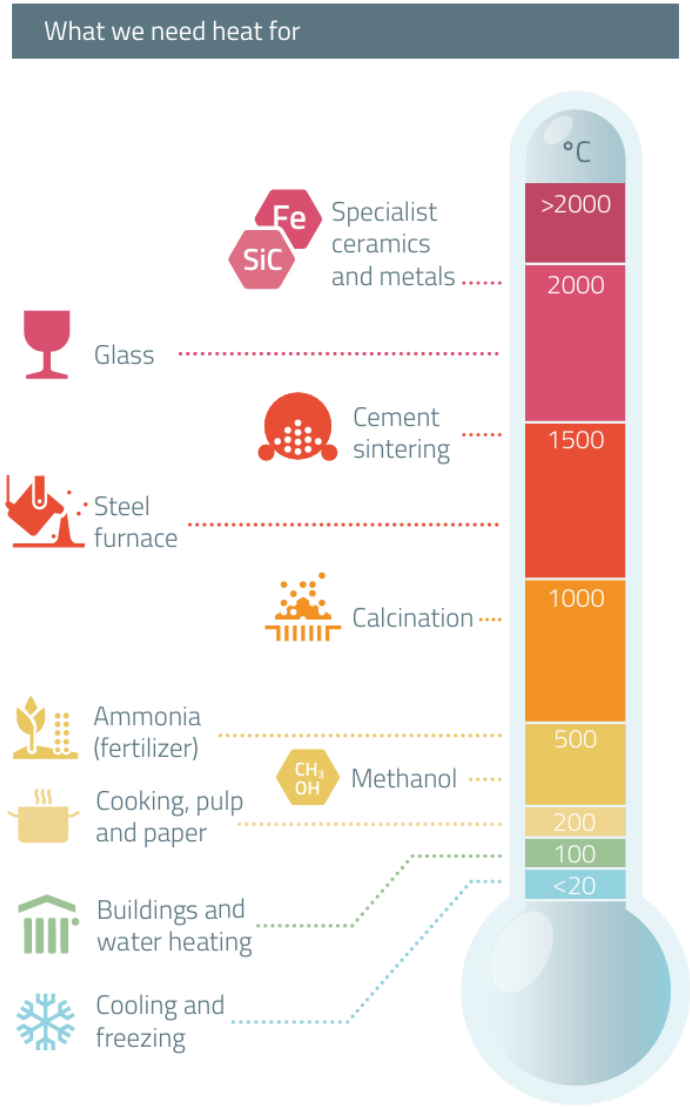
The importance of flexibility tools

Exponential trend: the last chunk matters a lot – dispatchable clean power can help

Source: Albertus et al. (2020), Joule


Supply
Flexibility
Demand
Intermittent
Grids
Overbuild
Demand response
Storage
Clean Firm Power
Hydro
Nuclear
Biomass
Geothermal

- An ecosystem-based strategy to both develop and decarbonize the power sector
- Invest in resilient, no-regrets infrastructure
- Integrate thermal-energy storage into industrial decarbonization plans



Key storage technologies you should consider

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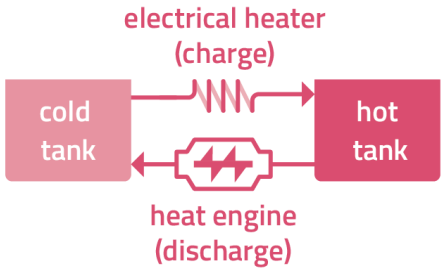
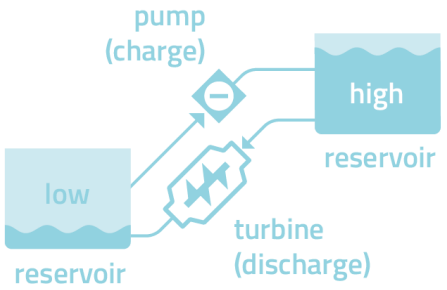
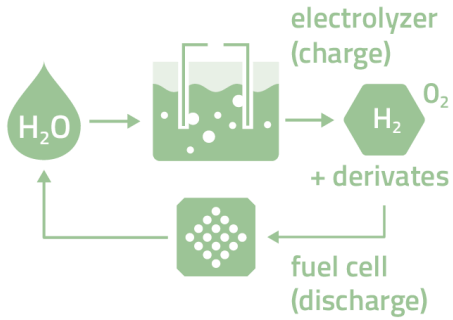
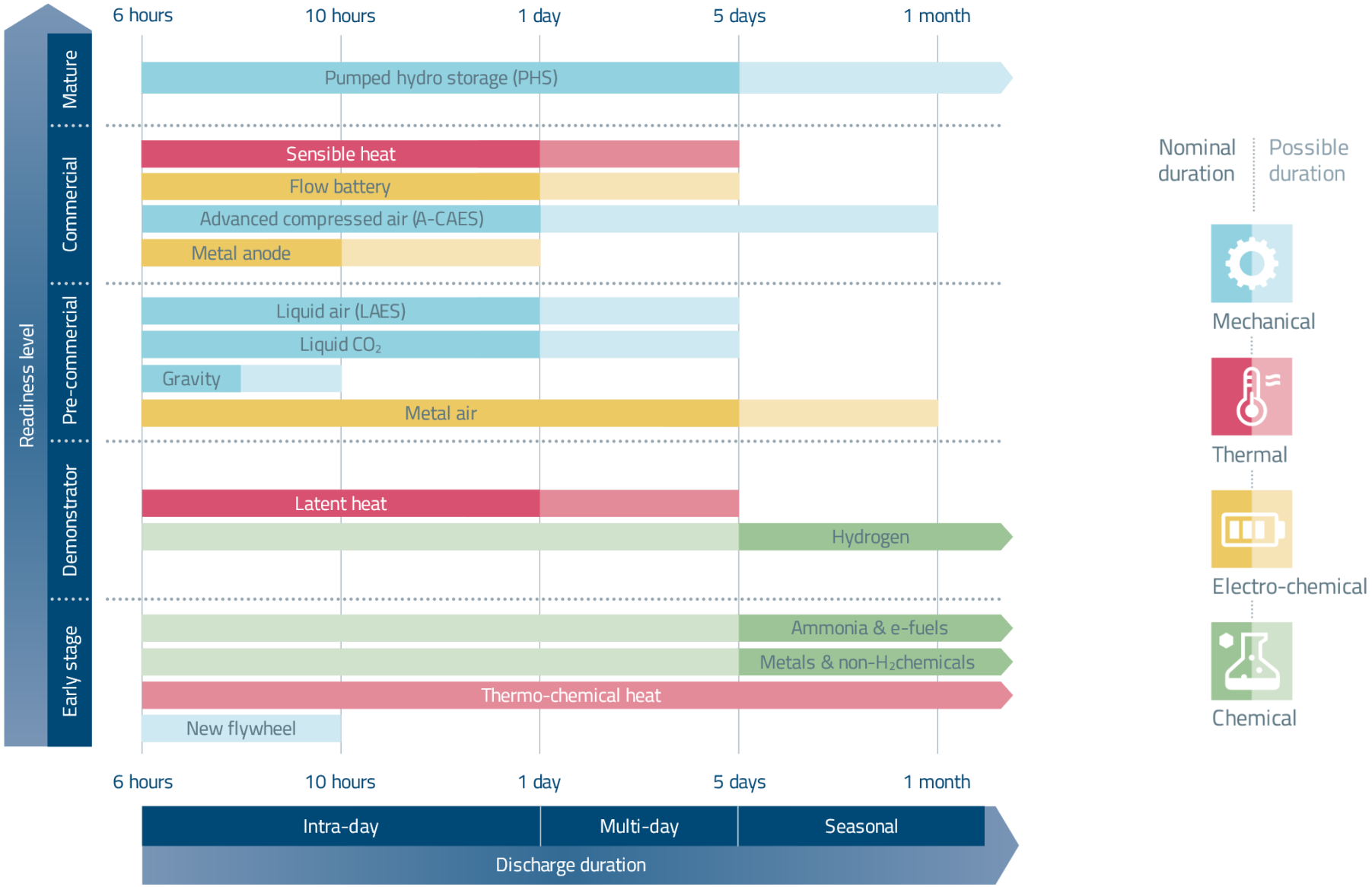
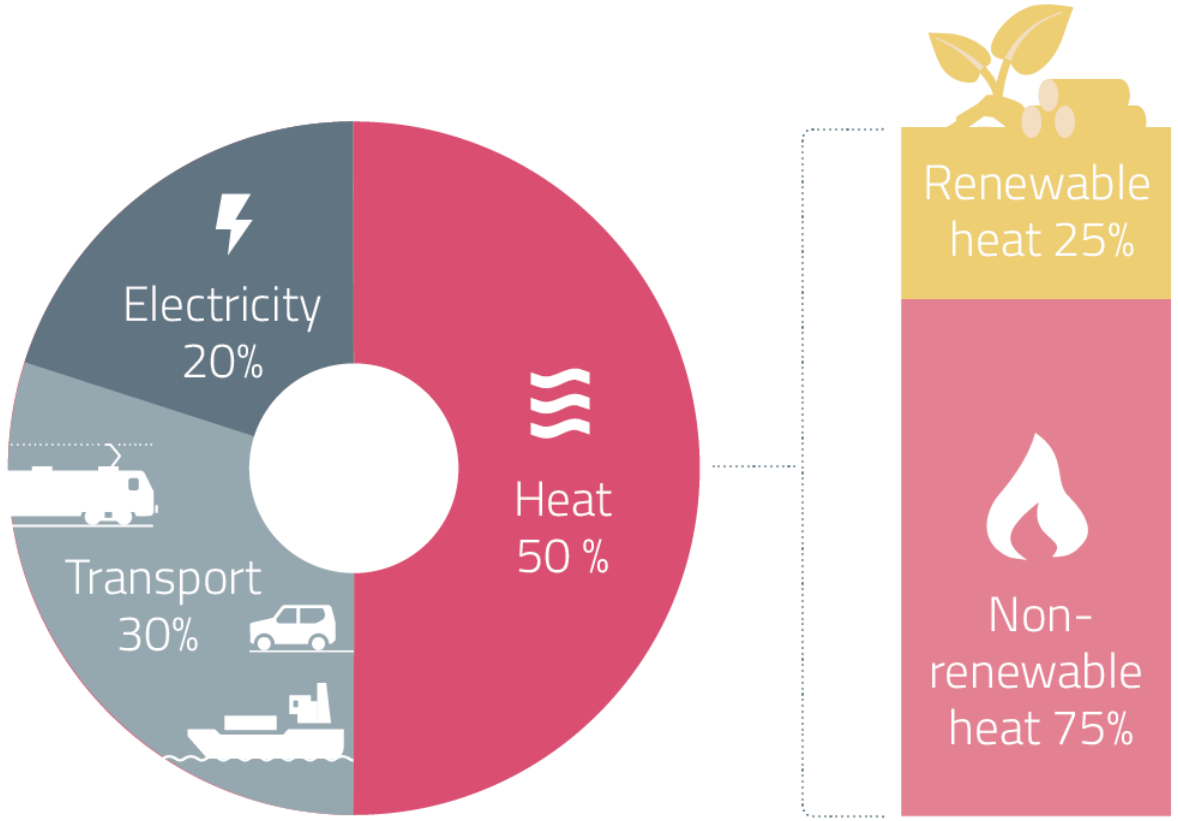
Four families of Long Duration Energy Storage

	Electro-chemical	Thermal	Mechanical	Chemical
Storage family & physical principle	 battery	 electrical heater (charge) cold tank hot tank heat engine (discharge)	 pump (charge) high reservoir low reservoir turbine (discharge)	 electrolyzer (charge) H_2O H_2 O_2 + derivates fuel cell (discharge)
Tech examples (non exhaustive)	Redox flow Sodium Metal-air intra-day	Sensible heat Latent heat Thermo-chemical intra-day multi-day	Pumped hydro Compressed air Liquid air intra-day multi-day	Hydrogen Ammonia Electrofuels seasonal

Storage technologies with various readiness levels and discharge capabilities

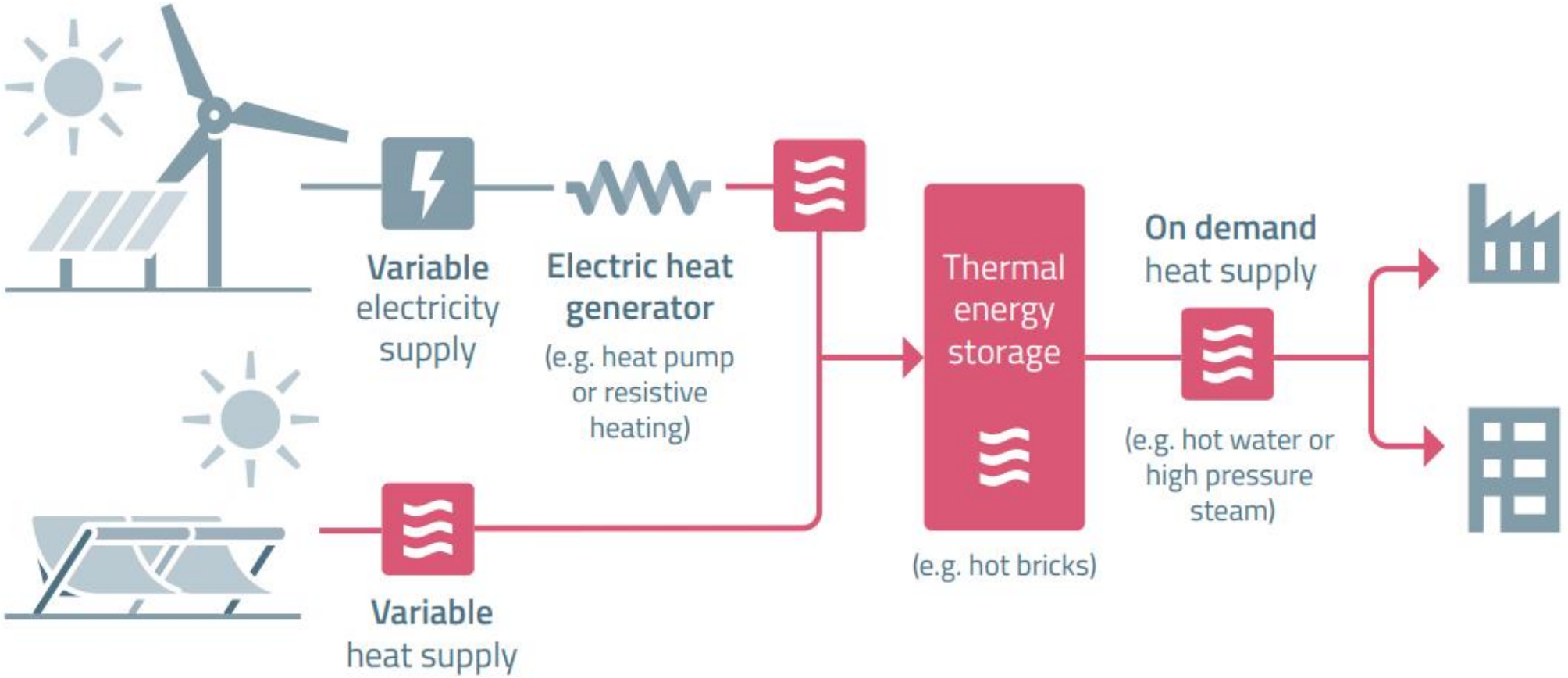


Heat accounts for 50% of global final energy use.

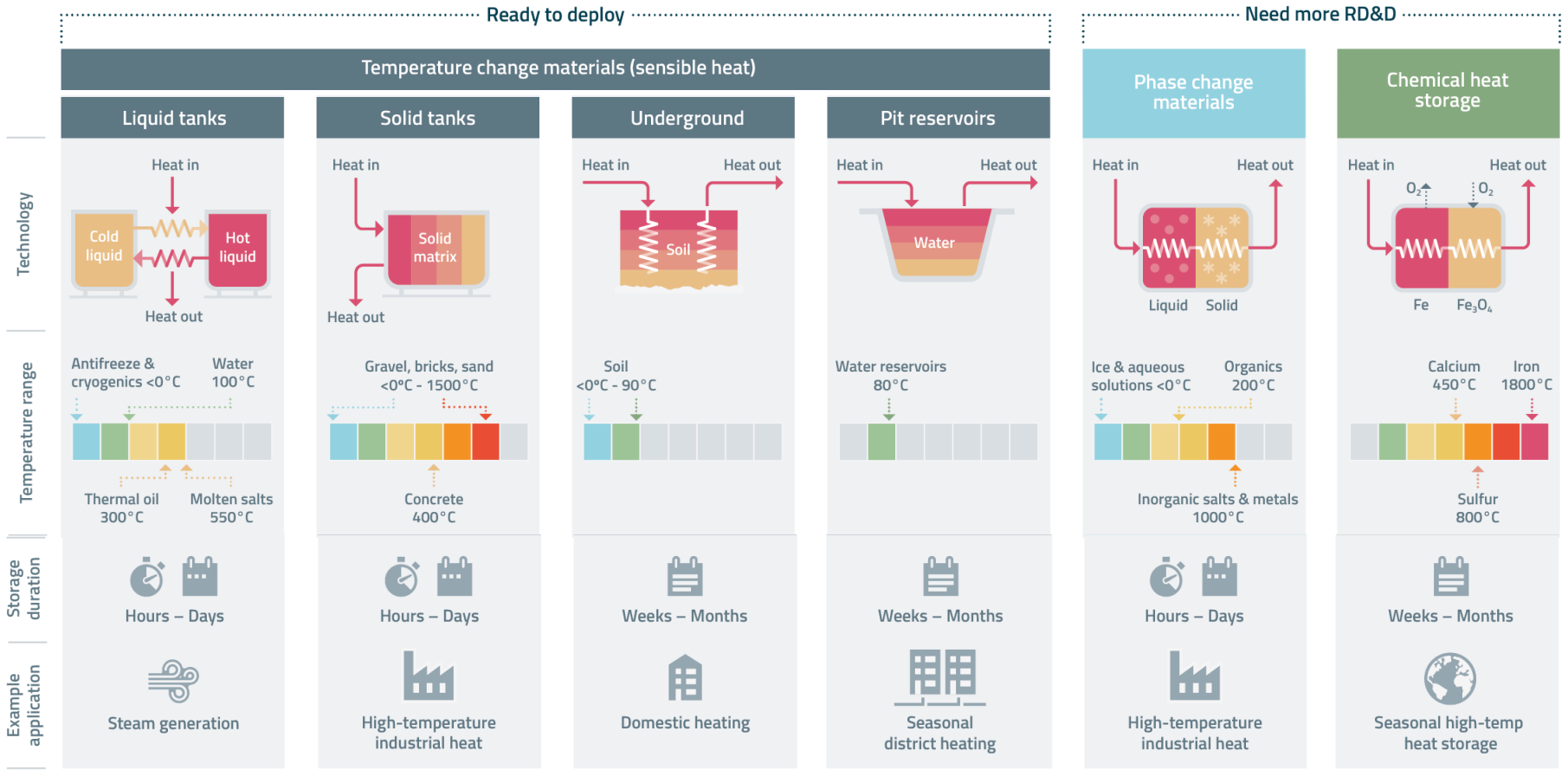


Global emissions (Gt $CO_{2,eq}$/year)

*Mostly from traditional biomass usage


Variable
electricity
supply
Electric heat
generator
(e.g. heat pump
or resistive
heating)
Thermal
energy
storage
(e.g. hot bricks)
On demand
heat supply
(e.g. hot water or
high pressure
steam)
Variable
heat supply

There is more to storage than electric: the potential of thermal energy storage



Coming soon: our toolbox for policymakers

Stay up to Date

Get an overview of cleantech policy tools

Understand best practice use cases and limits

Identify relevant instruments for the sector you target on

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