Renewable Energies

Hydrogen

Lukas Pietzschmann
lukas.pietzschmann@uni-ulm.de

Center for General Scientific Education
Ulm University

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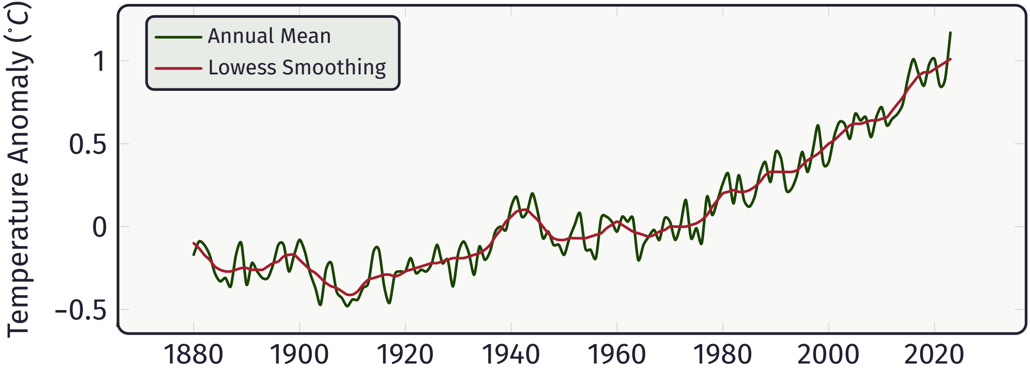
This image was generated by AI

AGENDA

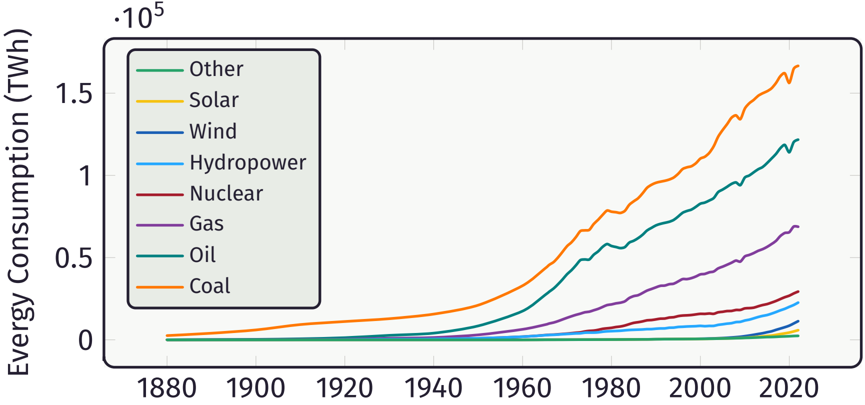
1.1 Global Warming

[Tea24; Len+19]



Energy consumption by source

[RR20]



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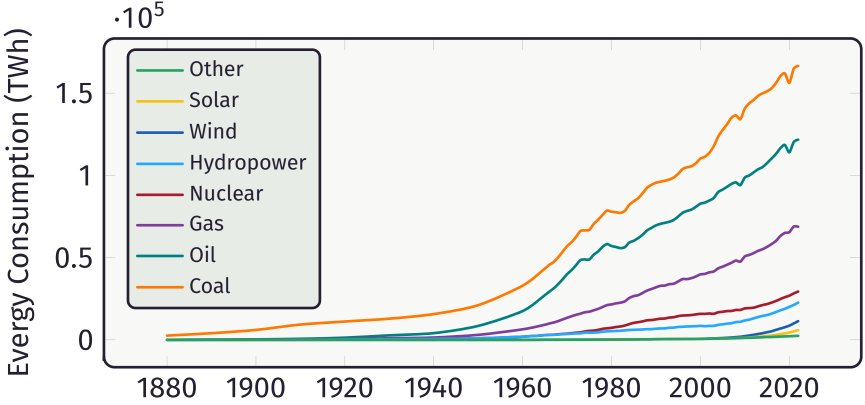

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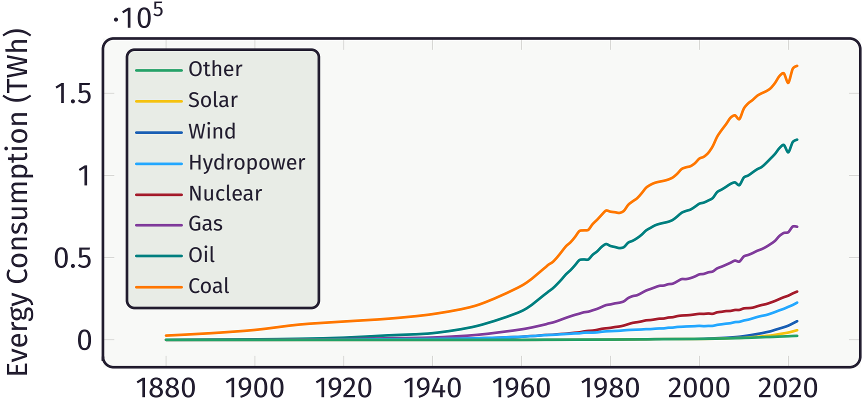

- Note that the data shows the global energy consumption
- In Germany it's not as bad

1.3 How to overcome the problem

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We ignore 1. for now and focus on 2.

2.1 Existing energy storage methods

A small selection

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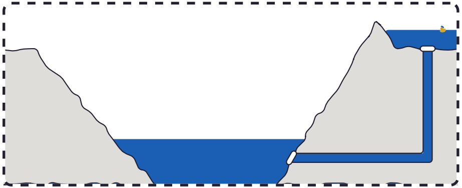
Pumped Storage Plants



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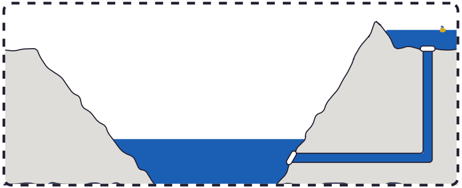

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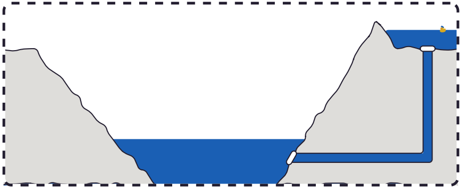

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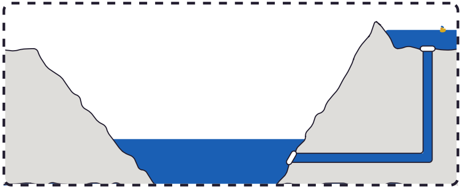
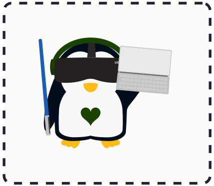


Lithium-ion Batteries



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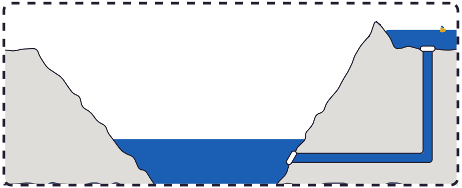

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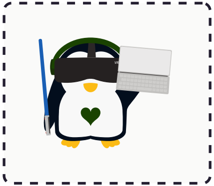

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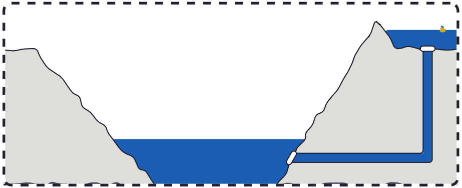

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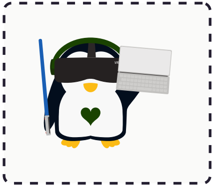

- Already very common
- Lithium is rare and its extraction is complex

Hydrogen as a source of energy

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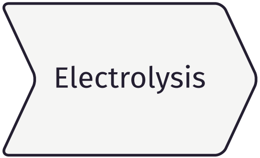

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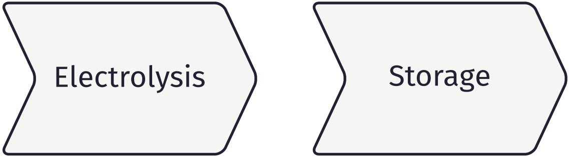

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- The example on the left illustrates how much space is required by 1kg of hydrogen in different states of matter

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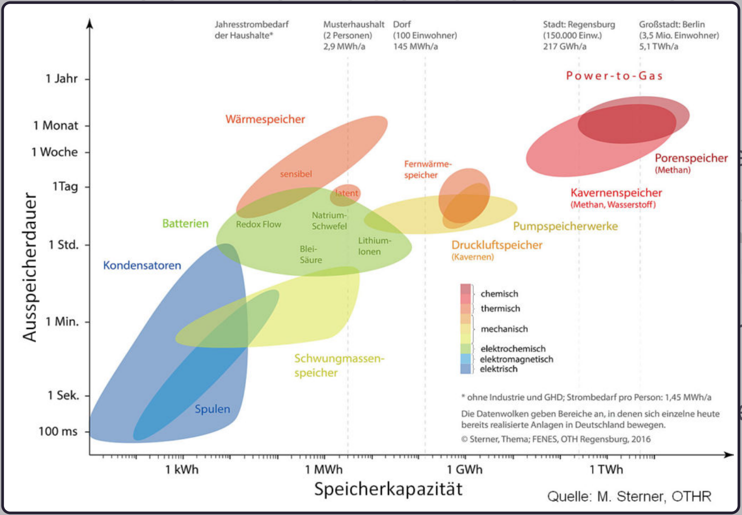

Wasserstoff und Brennstoffzelle – wesentliche Bestandteile einer erfolgreichen Energiewende [Töp19]

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- In a fuel cell, hydrogen and oxygen react to produce electricity, heat, and water
- In this process, roughly 60% of the energy is converted into electricity [Nor]

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- The overall efficiency is worse than that of batteries

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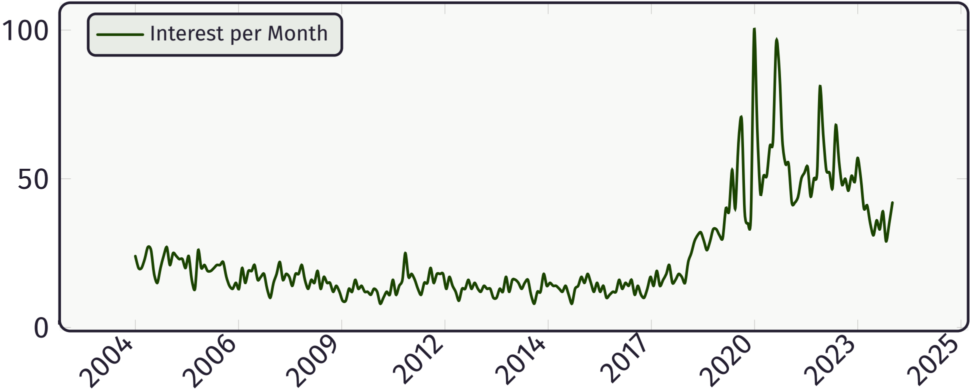

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- Germany will need around 18 million tons of green hydrogen by 2050

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4. REFERENCES (I)

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Lukas Pietzschmann

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lukas.pietzschmann@uni-ulm.de