Explore the future of energy with
Research and Technology

Sieg nach Punkten: Nicht schön – aber nachhaltig

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A sustainability scenario: an unlikely case?

From a statistical perspective:

- Sustainable scenarios imply a sudden and dramatical inversion of the long-lasting trend of rising CO_2 emissions

From a scenario perspective:

- A sustainable development scenario is a very narrow path. There are not too many ways to construct it, but there are overwhelmingly many ways to construct credible and comparable non-sustainable scenarios

From a game theory perspective:

- Climate protection involves 200 parties. There is hardly any way to make them to collaborate without any exception

From a social perspective:

- There is a clear trend towards sustainability in countries with a high GDP per capita, but most people do not live in these countries. For the energy sector, surveys indicate that security of supply and low-cost energy are still prioritized by most people

An old debate…

Photo: Hans Scherfgens, 1977, https://commons.wikimedia.org/wiki/File:Bundeskanzler_Helmut_Schmidt.jpg

Helmut Schmidt
Bundeskanzler 1974-82

„Die Verbrennung jeder Art von Kohlenwasserstoff führt zu einer gefährlichen Aufheizung des Erdballs“

„Im Jahre 2010 werden wir kein Öl mehr haben. Dann werden alle Autos mit Batterien fahren.“

1979

Hybridisation of the Heat Supply of Single-Family Houses with Split Air Conditioners

Split Air Conditioners are **technically air-to-air heat pumps** for cooling and for heating.

They are installed in one ore more rooms, not attached to the heating system. Heating of other rooms and domestic hot water (DHW) will still be provided by the existing gas boiler.

Theses pro hybridization:

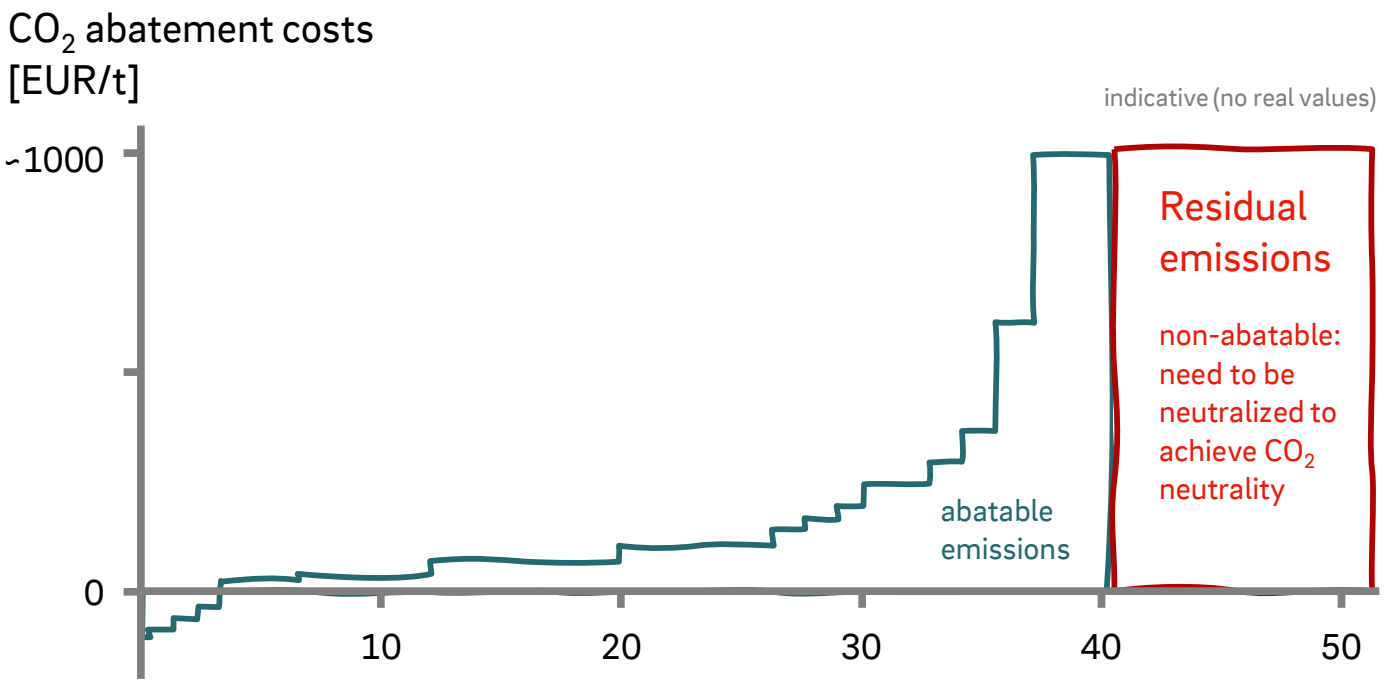
- Peak heat demand over the whole winter and especially in "the dark-winter-dull" will be problematic due to grid-load and electrical energy production limitations.
- COP of the Heat Pump potentially much higher in the **shoulder seasons** and without DHW.

indoor unit – up to 5
in multi split systems

outdoor unit

Bild von Lucio Alfonsi auf Pixabay

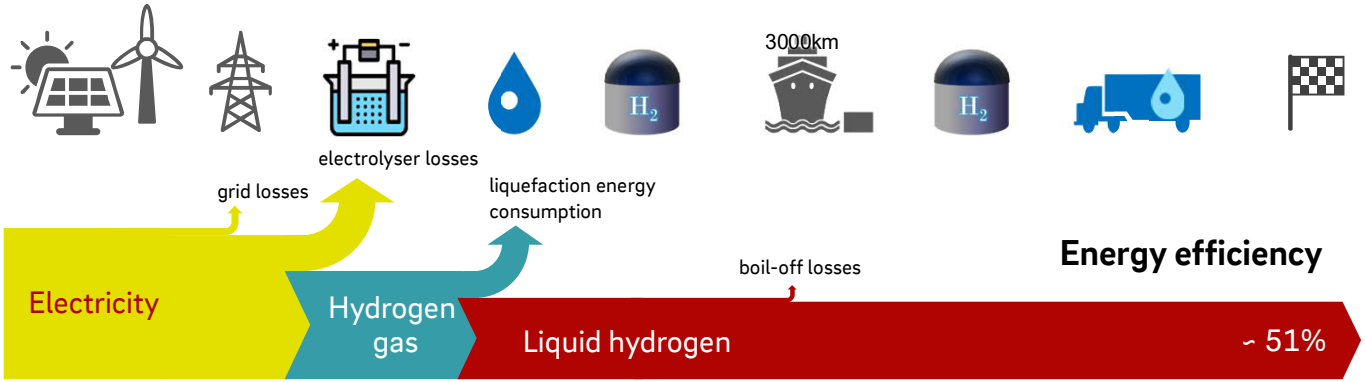
Negative emissions: Compensation of non-abatable emissions



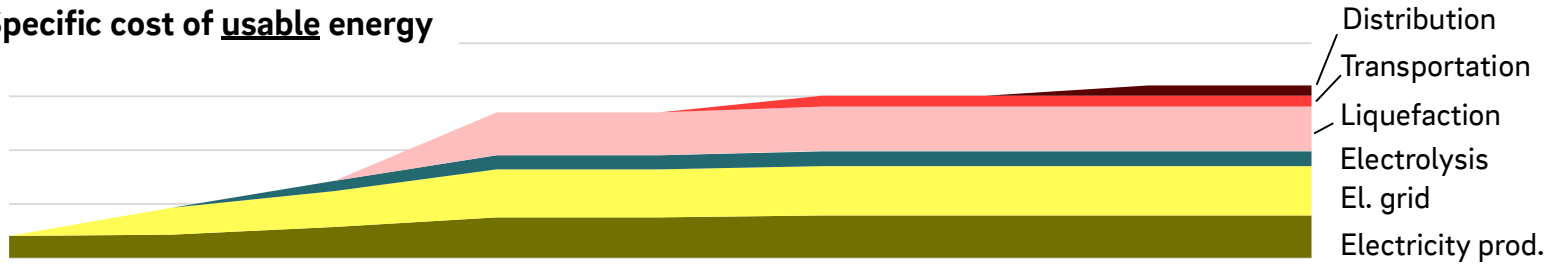
Overall estimate for CO_2 removals in 2050:
5-15 Gt/a

The value chain of imported hydrogen

Optimistic 2050 estimates West-Sahara



Specific cost of usable energy



The losses along the value chain cause increasing specific costs

Conclusion

What do we need to do ?