



Federal Ministry
for Economic Affairs
and Climate Action



MITTELSTAND
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Wind-to-Hydrogen: How green hydrogen production from Wind energy can help decarbonize all sectors of the Finnish and European energy systems

Florian Widdel
German Renewable Energies Federation (BEE)
Helsinki, May 9th 2023



Facilitator



Who we are - The German Renewable Energies Federation (BEE)

As the umbrella organization for the renewable energy (RE) sector in Germany, the BEE bundles the interests of 50 associations, organizations and companies with 30,000 individual members, including more than 5,000 companies.

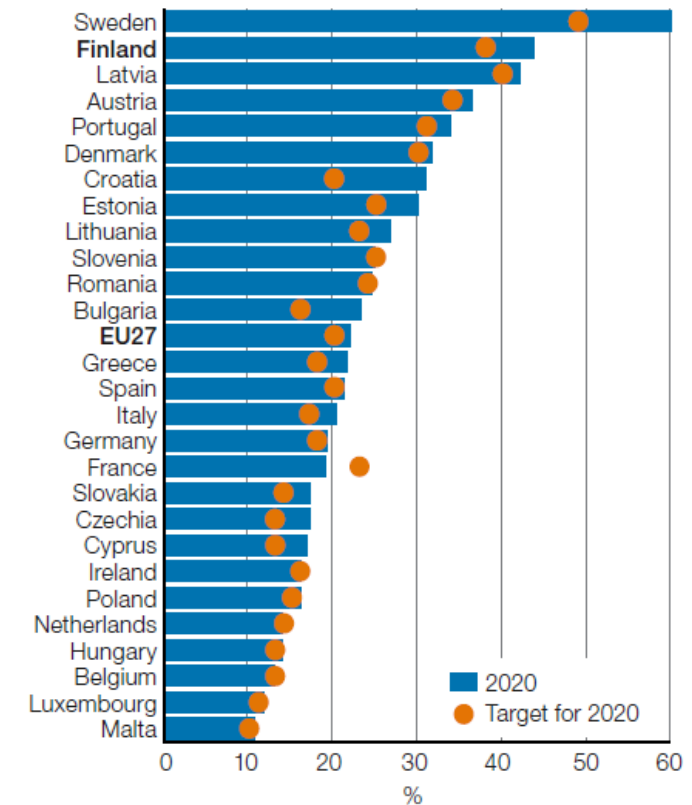
Our goal: 100 percent renewable energy in the areas of electricity, heat and mobility.



Finland's overall share of renewable energy sources (RES) is high compared to its European neighbours..

- The share of RES in gross final energy consumption is already at 42 % in 2020
- Germany in comparison still has a relatively low RES share in gross final energy consumption: Approx 20% in 2020
- Finland (and the other Nordic countries) offer favorable conditions for fast energy transitions: low population densities, availability of a wide variety of RES

Shares of renewable energy in gross final energy consumption in 2020 and the country-specific EU targets for 2020, %



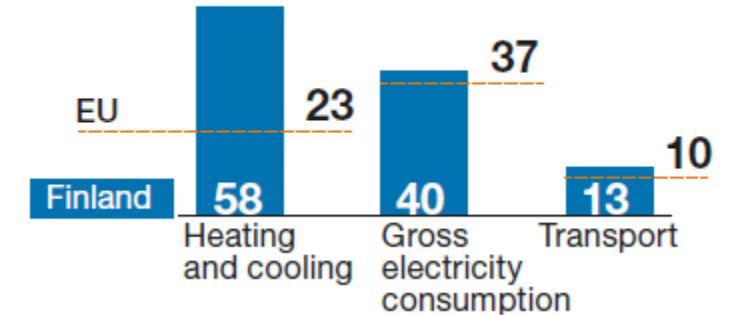
Source: Eurostat

..but: Finland's lead is mostly due to its heavy use of biomass in the heating sector

- The use of biomass (wood residues, forest chips) in the heating sector is traditionally high in Finland and has been further expanded in the last 20 years
- The heating sector is therefore already far ahead in terms of RES shares
- The other sectors of the energy system are within the European average.

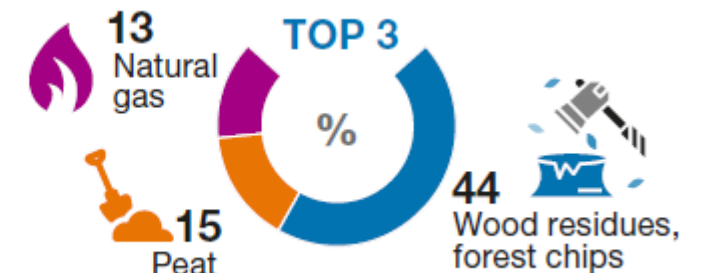
Sectoral RES shares, %
2020

Share of RES



Source: Eurostat/Shares, Statistics Finland

Fuel
consumption
in production
of district
heat
2020

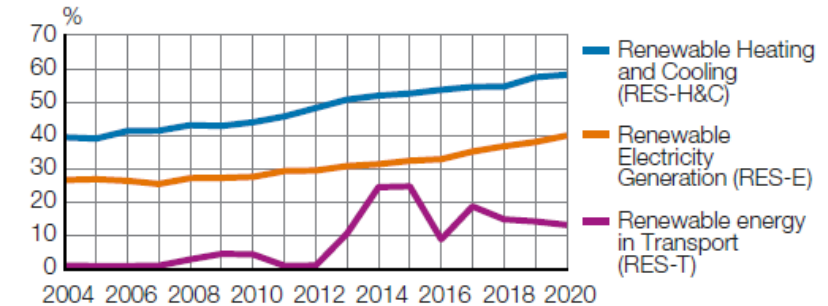


Source: Finnish Energy

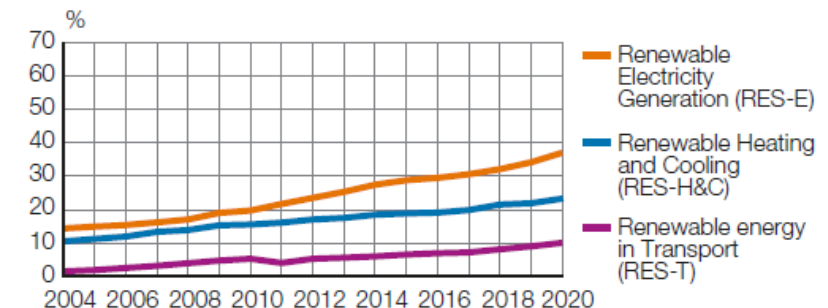
The electricity and transport sectors are „only“ average in European comparison

- The electricity and transport sector are lagging behind the heating sector in terms of RES shares and are within European average.
- The shares of RES in the transport sector is even regressing compared to 10 years ago
- The electricity sector already had a RES share of around 30% 20 years ago and is only raising its RES share relatively slowly

Renewable energy indicators: Share of renewable energy by sectors 2004–2020 in Finland, %, ¹⁾



Renewable energy indicators: Share of renewable energy by sectors 2004–2020 in EU27, %, ¹⁾

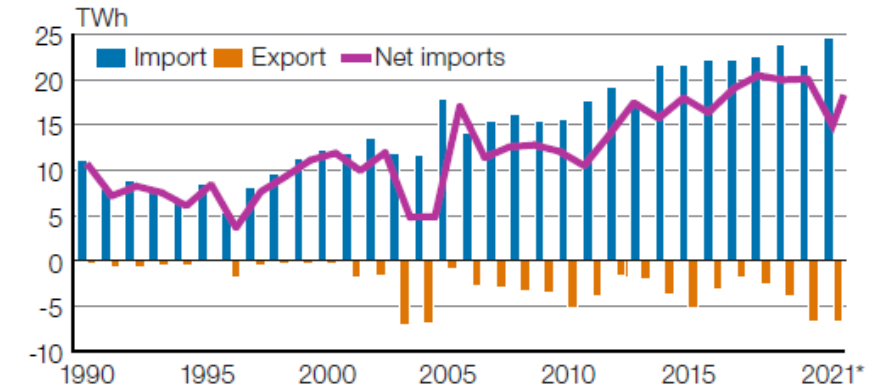


Source: European Commission

Finland should use all options to make itself more independent from electricity imports...

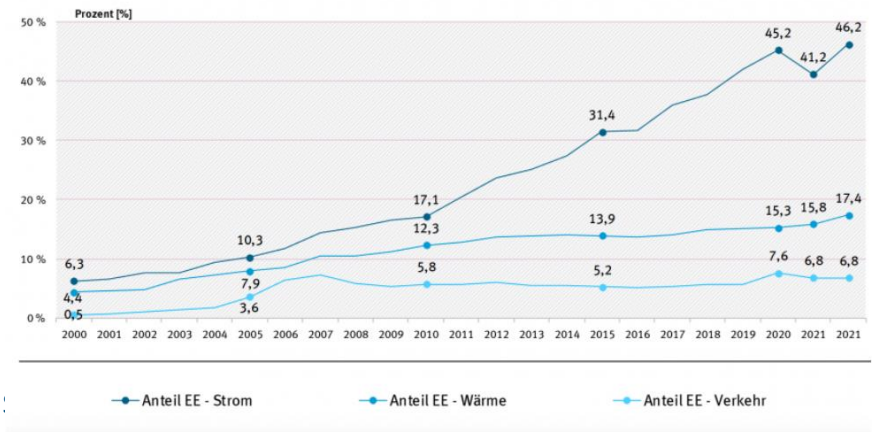
- The amounts of electricity that needed to be imported by Finland have constantly been increasing over the past 30 years, the country is a net importer of electricity
- Germany's situation is different: The share of RES in the electricity sector has increased sharply (46 % in 2021), the country is a net exporter; transport and heating lag behind
- With more electrical applications upcoming Finland should use all options to produce more electricity at home

Imports and exports of electricity 1990–2021*



Source: Finnish Energy

Anteil erneuerbarer Energien am Bruttostromverbrauch, am Endenergieverbrauch für Wärme und Kälte sowie am Endenergieverbrauch im Verkehrssektor
Entwicklung von 2000 bis 2021



Source: Umweltbundesamt

..and one important option for reaching that goal is Wind power

- Germany's and Finland's areas are about equal, but their population density varies tremendously
- Nevertheless Germany's currently installed Wind capacity and share in electricity production is much higher than Finland's

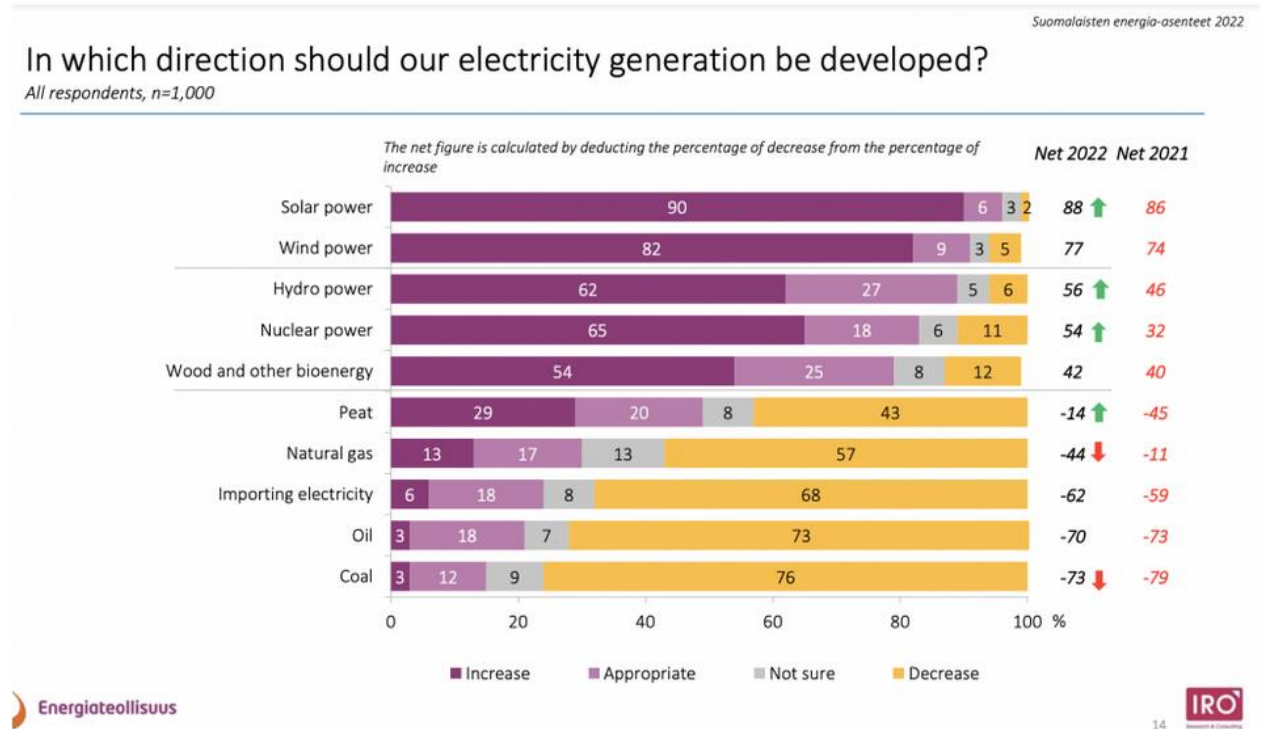


	Germany	Finland
Population in millions	83.7	5.5
Area in km ²	357	338
Population density in people / km ²	236	16
Installed wind power in GW (2021)	58	3.2
Share of Wind power in electricity production (2021)	22 %	10 %

Source: German and Finnish Wind power associations / Statistics Finland, Statistisches Bundesamt

The strong expansion of Finnish wind power is favoured by the Finnish people

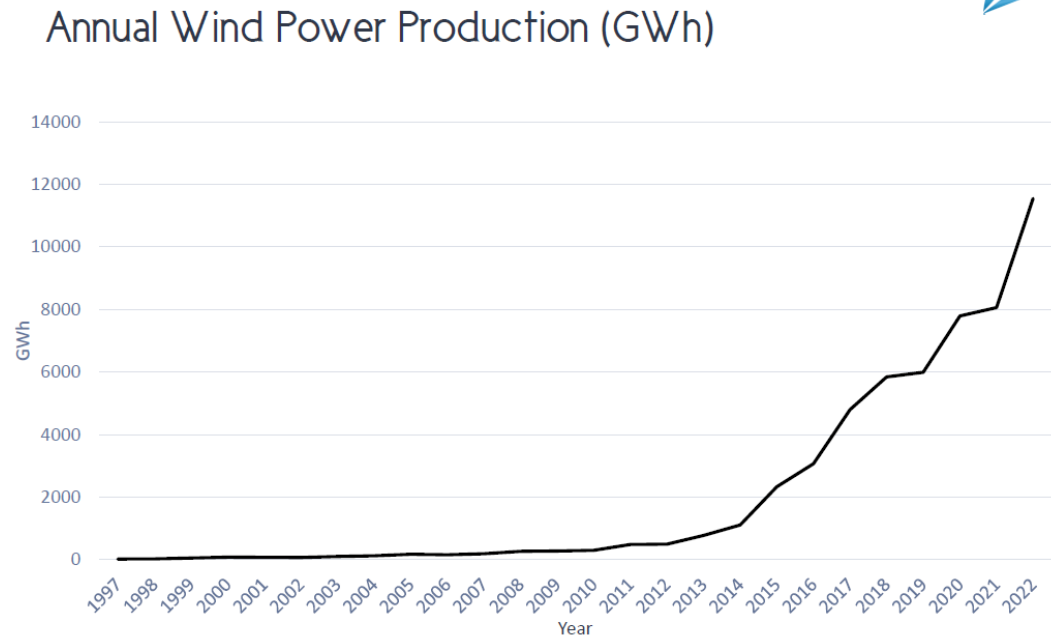
- The popularity of wind power is high – 82% of Finns support increasing wind power
- Only Solar power is more popular, with an approval rate of 90 %
- 68 % see it as important to decrease electricity imports and increase self-sufficiency



Source: Finnish Energy Attitudes survey

Finnish wind power is already picking up pace, but it could only be the beginning

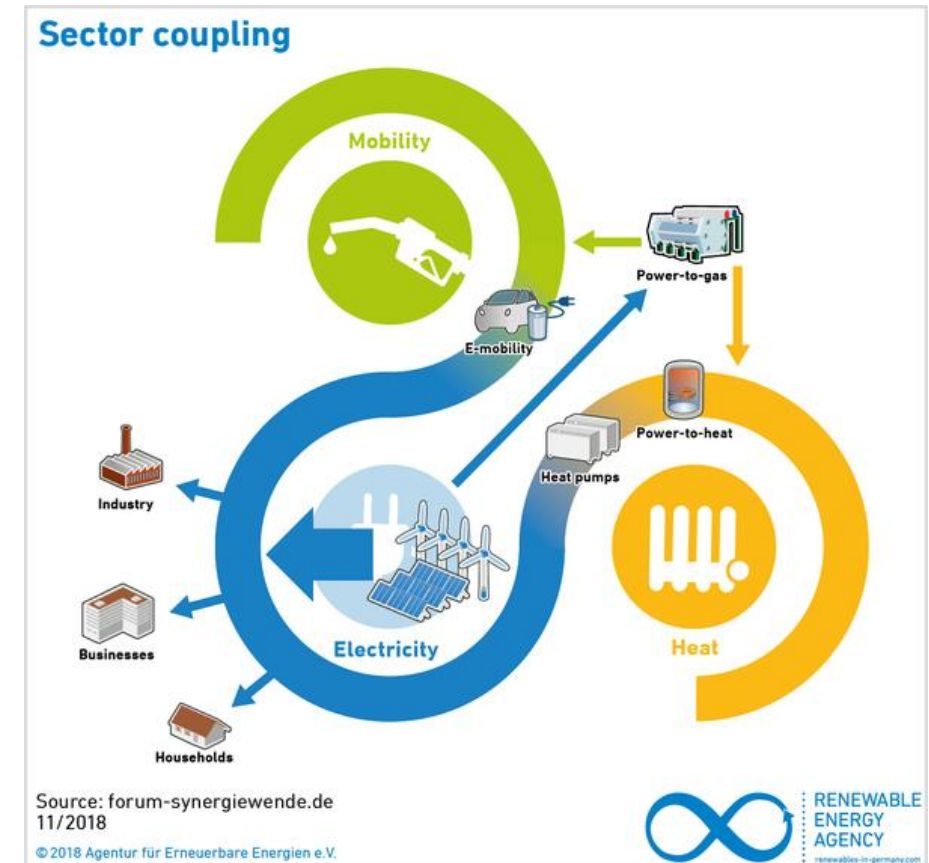
- From 2012 / 2013 wind power in Finland has gained momentum. There is also a large number of wind projects in the planning phase
- According to the Finnish wind power association Finland has the potential to achieve at least 30 TWh of annual wind power production in Finland in 2030 (= 30 % of Finland's electricity consumption at that time)



Source: Finnish Wind Power Association

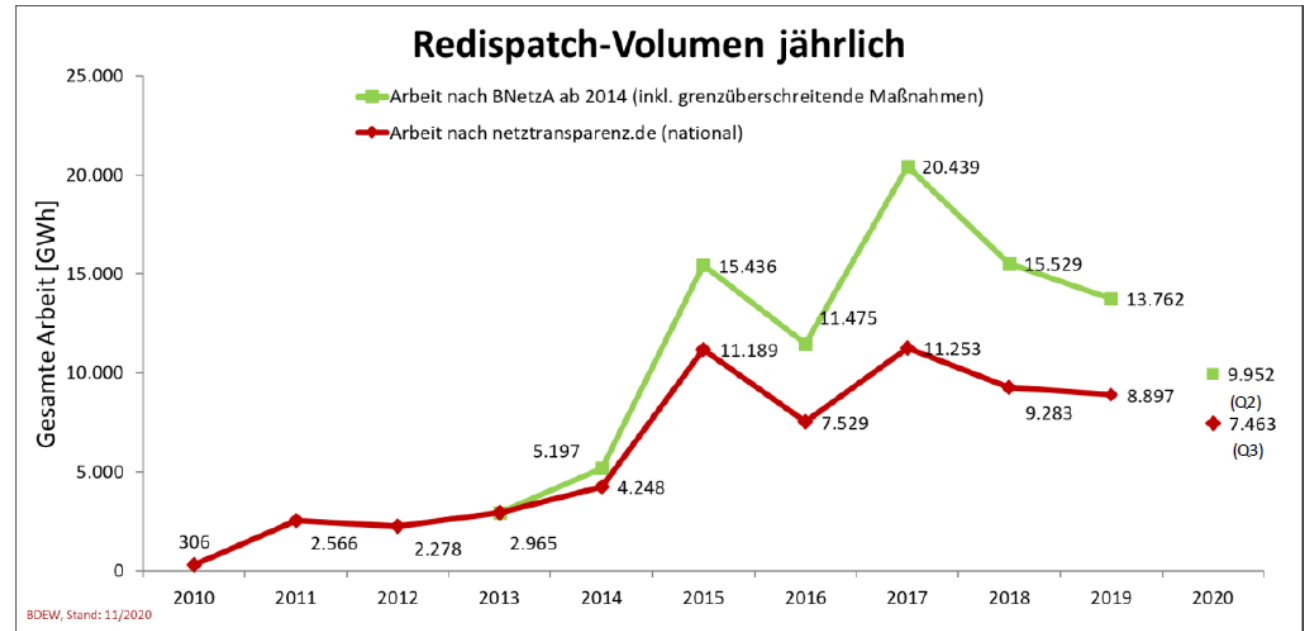
Wind power is not only important for gaining independence in the electricity sector, but can also help decarbonize the other sectors

- Increased shares of wind power will make Finland more independent from energy imports
- At the same time it can help further decarbonize the other sectors (mobility, heating) by using Sector coupling
- Power-to-gas (esp. green hydrogen production) makes it possible to use wind energy also in mobility and heating.



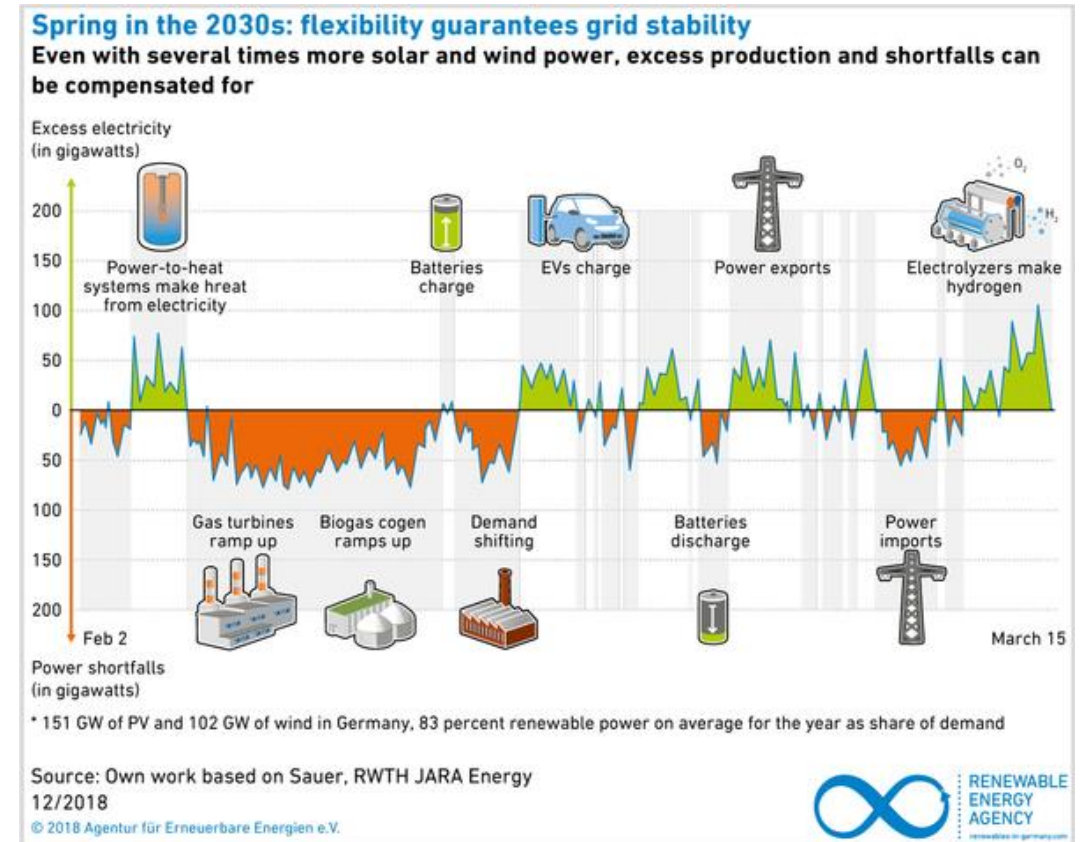
Higher shares of fluctuating Wind and PV can lead to grid bottlenecks, but flexibilities...

- Higher shares of fluctuating RES like Wind (and PV) potentially increase the need for measures to eliminate grid bottlenecks (“Redispatch” measures), since the grid expansion lags behind the expansion of RES.
- But: Besides bringing RE into all sectors of the energy system, the use of flexibilities also helps maintaining grid stability, it thus has two functions



... like green hydrogen can help stabilise the electricity grid

- There is a big variety of different flexibilities ranging from Power-to-Gas (e.g. green H₂) to Power-to-Heat (e.g. heat pumps) to Power-to-Power (e.g. batteries).
- The expansion of RE must be accompanied by a corresponding increase in flexibilities.
- Two functions of green hydrogen:
 - Store RE in gaseous form at times with lots of RE and feed it into the other sectors
 - Reconvert H₂ back into the electricity grid at times with little RE



The hydrogen economy needs the right regulatory framework

- Given the ambitious targets for Wind and PV (80% in the electricity sector in 2030) as well as the large demands for H₂, Germany has set itself equally ambitious targets for hydrogen production (10 GW in 2030), and for Finland it makes sense to do the same.
- Green hydrogen will remain a scarce commodity in the medium term and its use should thus primarily be incentivized in sectors in which no decarbonization alternatives are available
- The production of hydrogen also needs a proper regulatory framework



Source: BEE

Regulatory framework for the production of hydrogen

- From BEE's point of view only the production of green (renewable) hydrogen makes sense, blue (CCS) hydrogen creates problematic path dependencies
- The framework should also ensure that green hydrogen production facilitates grid stability, e.g. by a...:
 - Limitation of full load hours
 - H2 Production primarily close to RES production
- The EU parliamentary process of defining „renewable“ hydrogen is underway, but current criteria are not ambitious enough according to BEE



Brussels, 10.2.2023
C(2023) 1087 final

COMMISSION DELEGATED REGULATION (EU) .../...

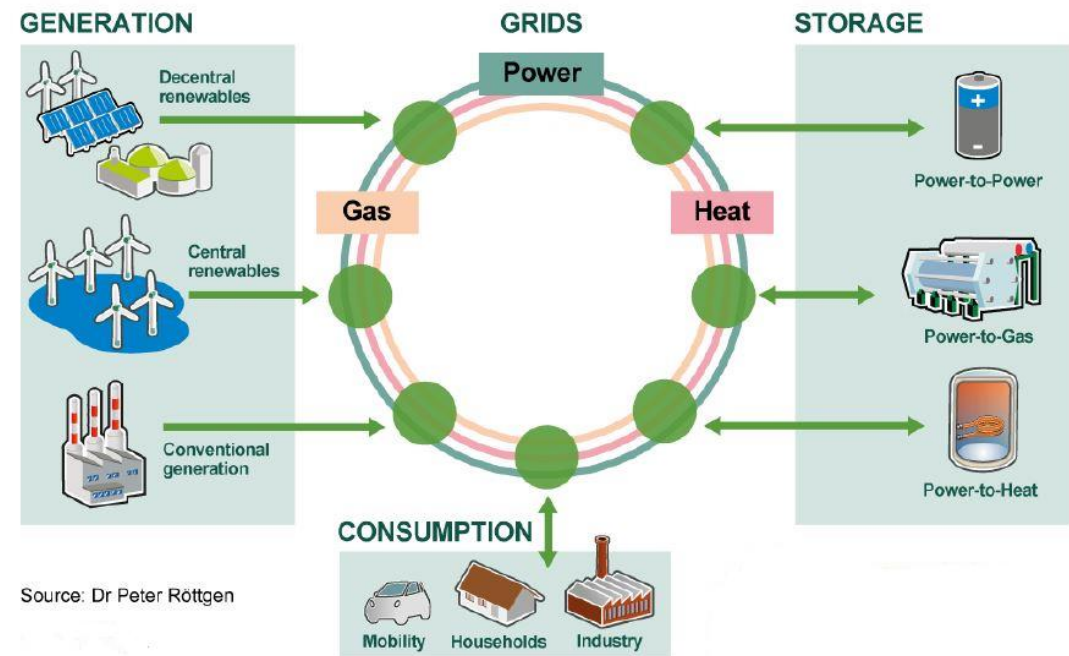
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supplementing Directive (EU) 2018/2001 of the European Parliament and of the Council by establishing a Union methodology setting out detailed rules for the production of renewable liquid and gaseous transport fuels of non-biological origin

The renewal of grid infrastructures must also be tackled

- The ramp up of both RES and hydrogen makes changes to both the electricity, gas and heat grids necessary
- The electricity grid must be reinforced / expanded where necessary
- Gas infrastructures need to either be converted to become H2 ready, newly built or dismantled
- The different infrastructures should not be looked at separately but from a holistic perspective (“system development planning”).

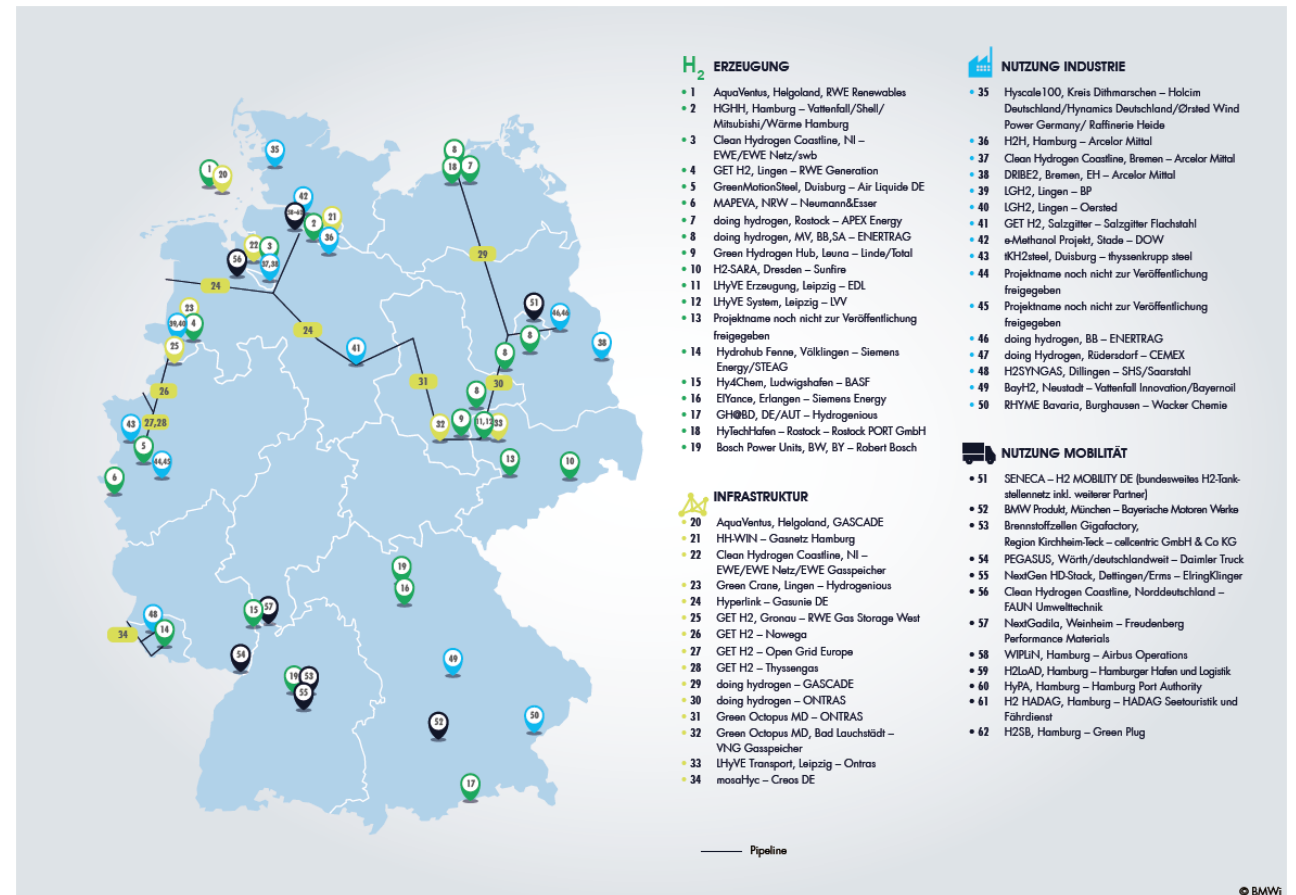
Sector coupling for an integrated energy transition: power, heat and gas



Source: Dr Peter Röttgen

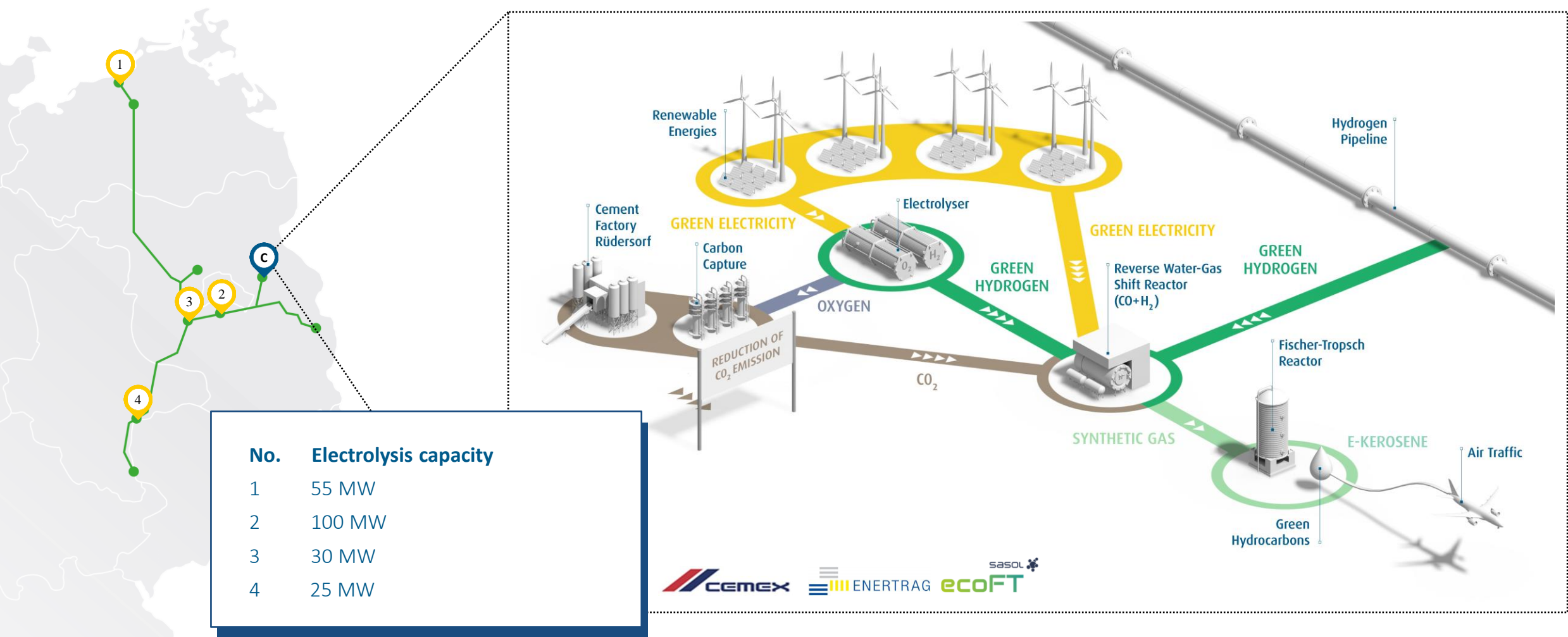
How the hydrogen run up in the EU is being initiated

- In December 2020, 22 EU countries and Norway signed a manifesto paving the way for a clean hydrogen value chain and committing to launch ‘important projects of common European interest’ (IPCEIs) in the hydrogen sector.
- The German Federal Ministry of Economic Affairs and Technology (BMWi) has selected 62 projects to receive government funding as part of Hydrogen IPCEI
- ENERTRAG’s “doing hydrogen” is part of the selection



Source: Federal Ministry for Economic Affairs, BMWi

doing hydrogen by ENERTRAG: Pioneering green hydrogen in East Germany



Source: ENERTRAG



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Thank you for your attention!

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May 9th 2023, Helsinki



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