EU 2030 electricity demand- supply assessment for key industry sectors

A quantitative assessment for Concawe

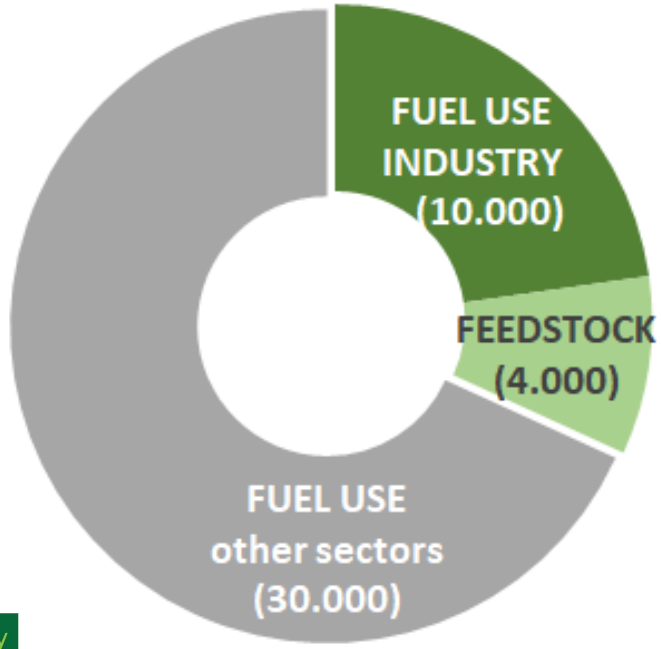
Study re-shaped towards the needs of A.SPIRE

Context, current situation

Overall EU energy situation in 2021 (Eurostat)

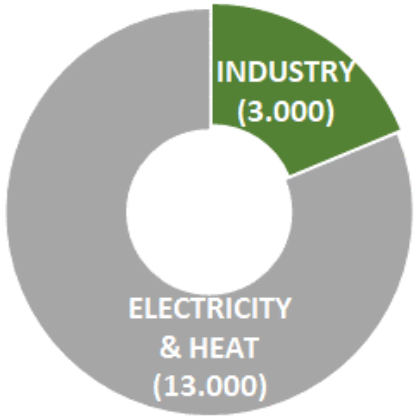
Currently there is around 60.000 PJ/yr gross inland consumption in EU:

44.000 PJ of which 40.000 PJ for fuel use and 4.000 PJ for feedstock used as raw material



32% for industries (ca 3800 TWh out of 12.000 TWh)

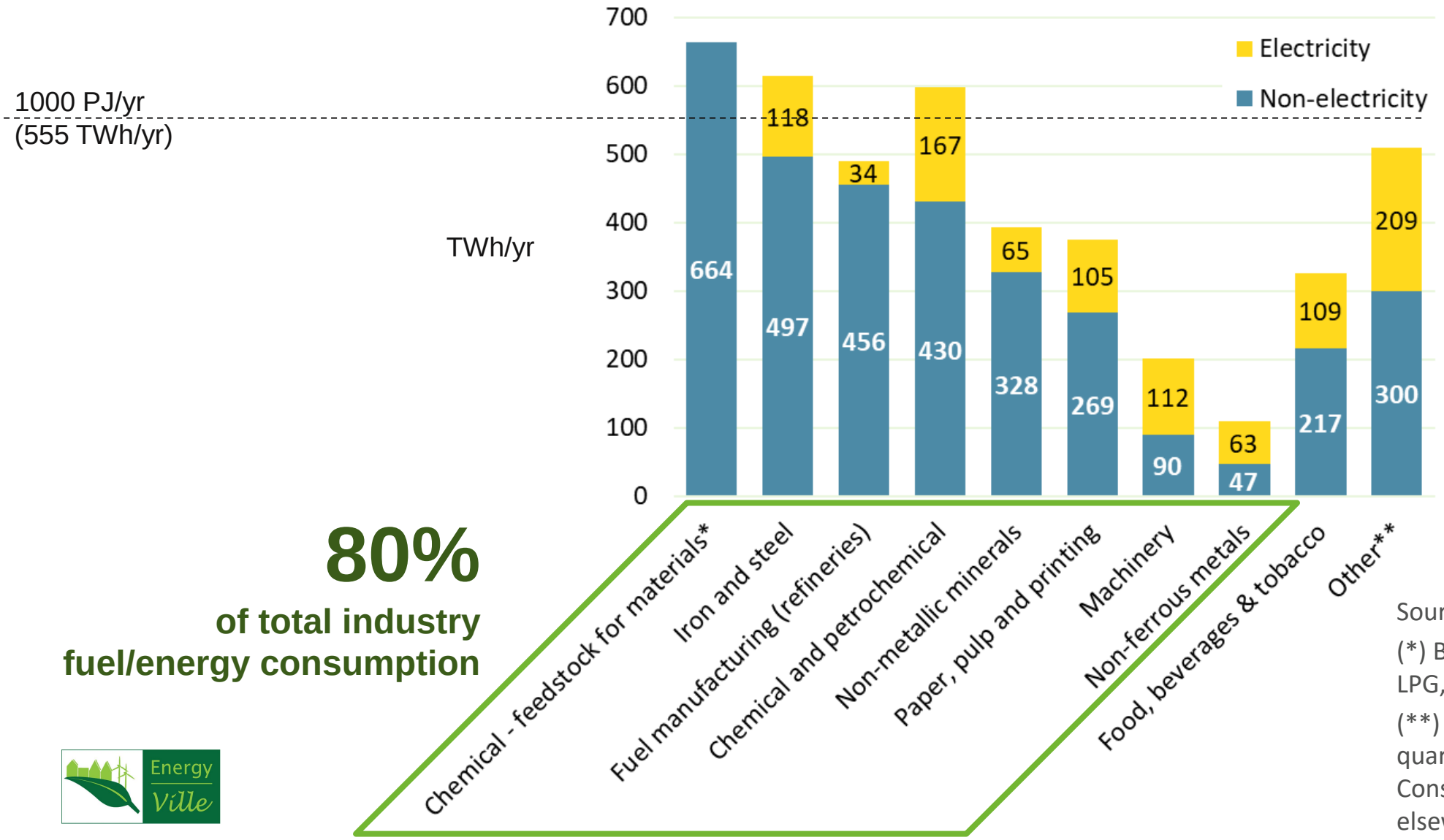
16.000 PJ for transformation and as energy losses



ca 800 TWh used in industries that involve transformation such as refineries

Rounding to simplify the message.

Historical (2018) energy & feedstock demand



About 23% of total industry energy & feedstock is electricity.

80%

of total industry fuel/energy consumption

Source: Eurostat

(*) Based on non-energy uses of LPG, Naphta and Natural gas.

(**) Transport equipment, Mining & quarrying, Wood & wood products, Construction, Textile & leather, Not elsewhere specified (industry)

Renewable electricity needs for the industry

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Electricity needs - Methodology

- Sectors covered by AIDRES
  - Based on the electricity increase of AIDRES EU Mix 2030
  - When higher, aligned to hydrogen use from the RePowerEU initiative, except hydrogen for ‘Industrial heat’.

- Sectors not covered by AIDRES
  - Bottom-up estimate of electricity evolution

Increase of electricity demand by 2030

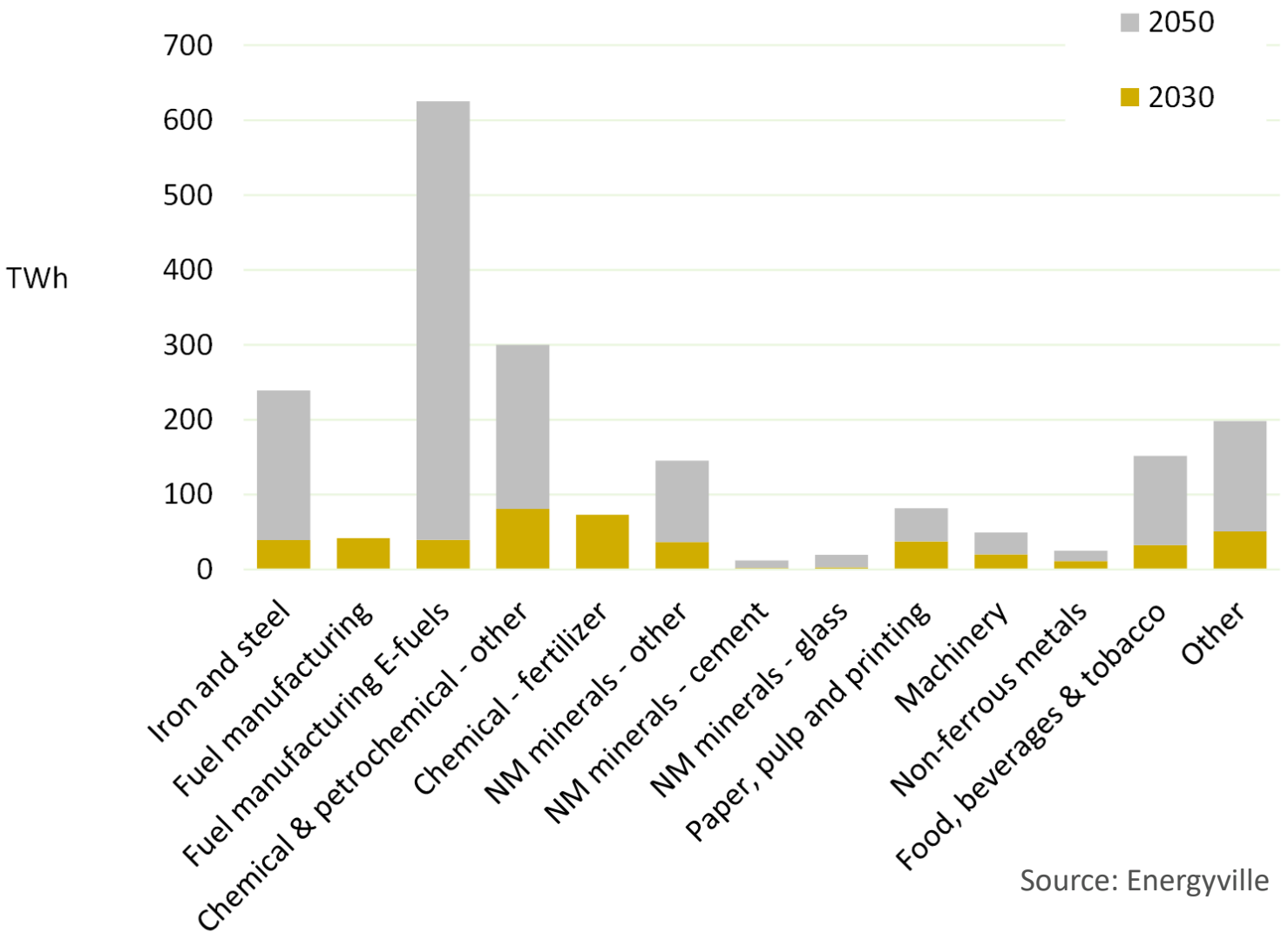
Increase of electricity demand by 2030 (A.SPIRE sectors in blue)	2018 [TWh]	Increase [TWh]
Fuel manufacturing	34	82
Chemical & petrochemical - other	161	81
Chemical - fertilizer	6	73
Other	209	51
Iron and steel	118	39
NM minerals - other	37	37
Paper, pulp and printing	105	37
Food, beverages & tobacco	109	33
Machinery	112	20
NM minerals - glass	13	3
Non-ferrous metals	63	11
NM minerals - cement	14	2
Total EU-MIX	**982**	**468**

A.SPIRE sectors

+385 TWh (A.SPIRE sectors)

Source: Energyville

Increase of electricity demand by 2030 and longer



Total industry:

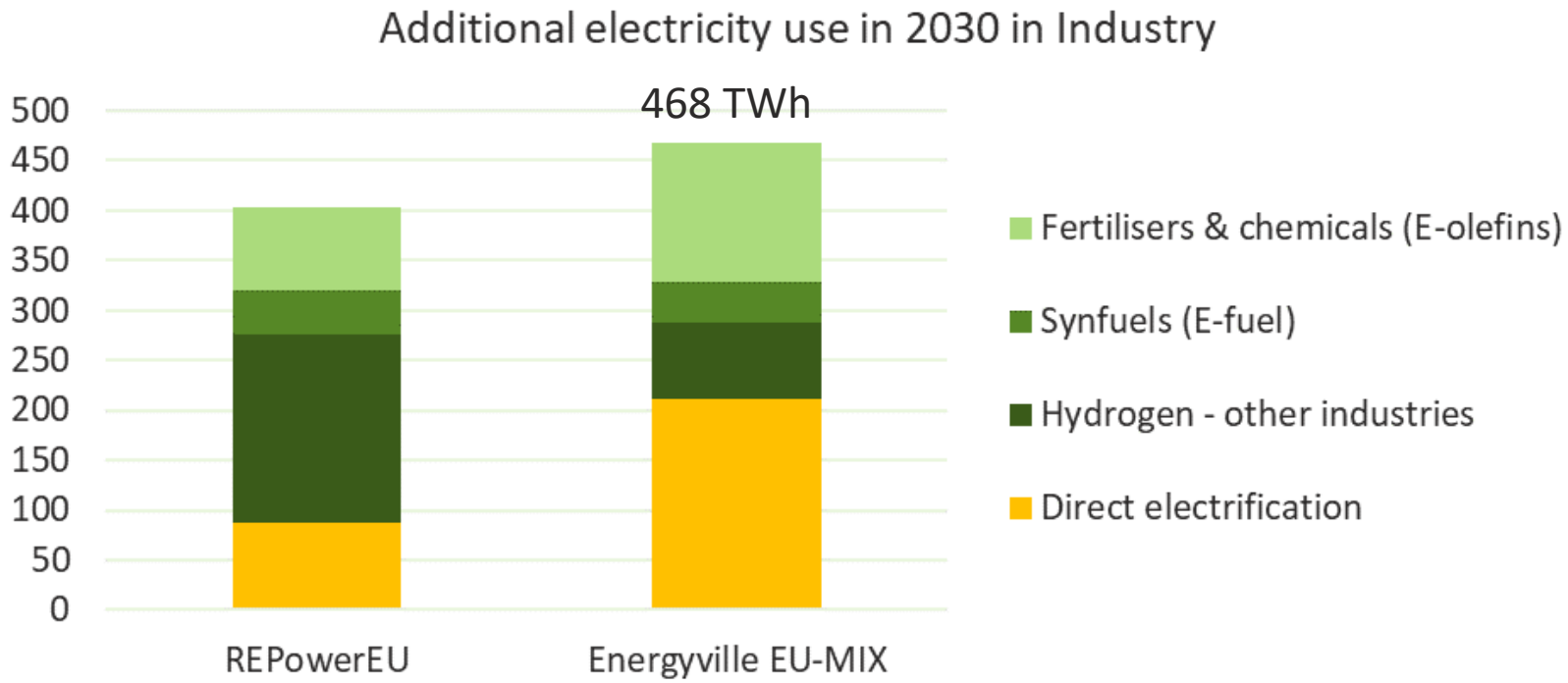
2020-2030: +468 TWh/yr

2020-2050: +1963 TWh/yr

Source: Energyville

Increase of electricity by 2030

Compared to RePowerEU the EU-MIX study projects more direct electrification in industry and less power for hydrogen to industry.



Comments:

- Hydrogen imports not shown (as no electricity required).
- For estimating REPowerEU electricity use for industry sectors, we assume the same import ratio as for the total.

Source: Energyville

Key conclusions – projection industry electricity demand in 2030

- The estimated increase of electricity for industries amounts to around 50% of the historical electricity demand
- Within this increase, around 50% is used for the production of hydrogen and derived fuels or chemicals
- The other half is used for direct electrification of industrial processes

Renewable electricity demand- supply assessment

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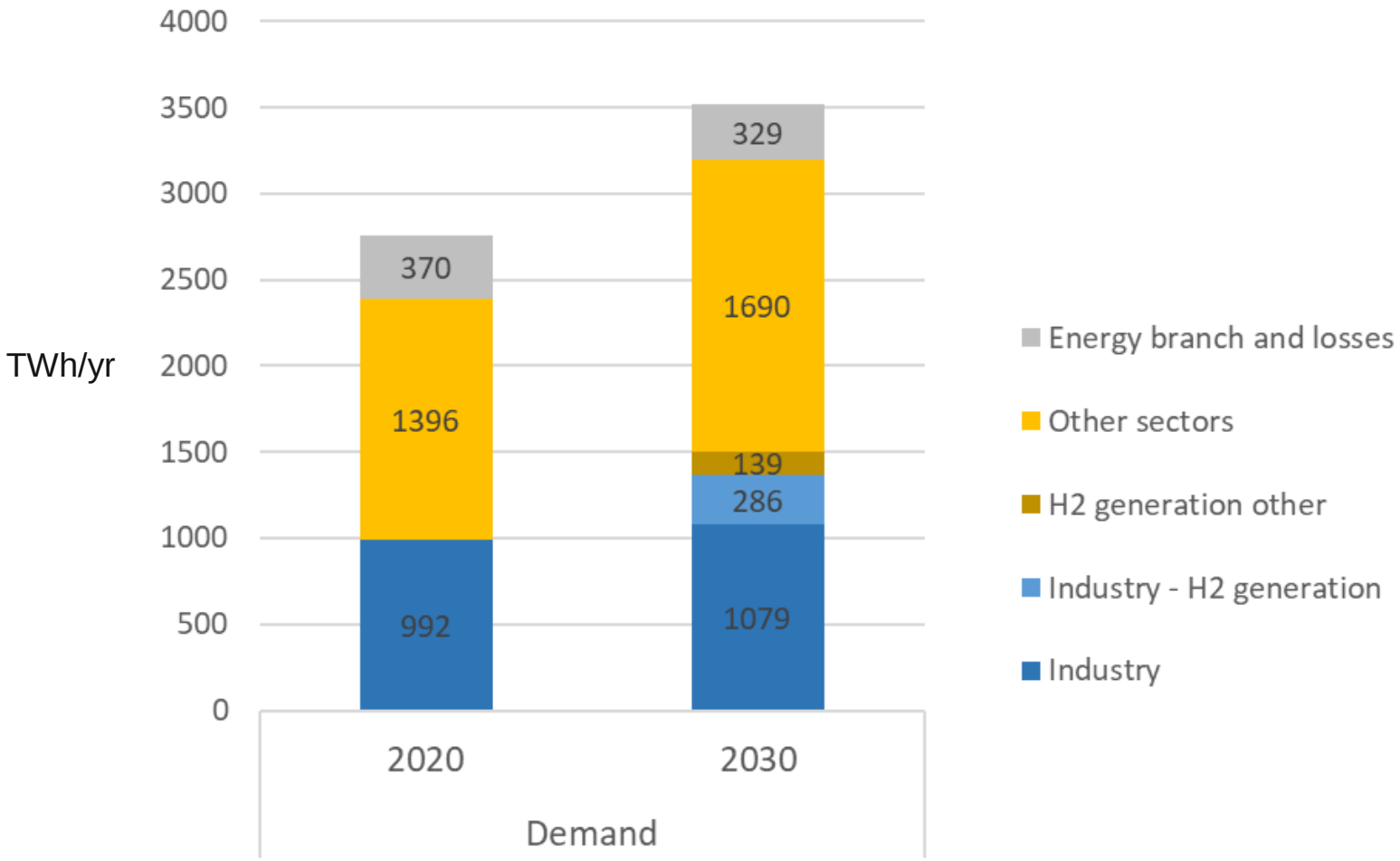
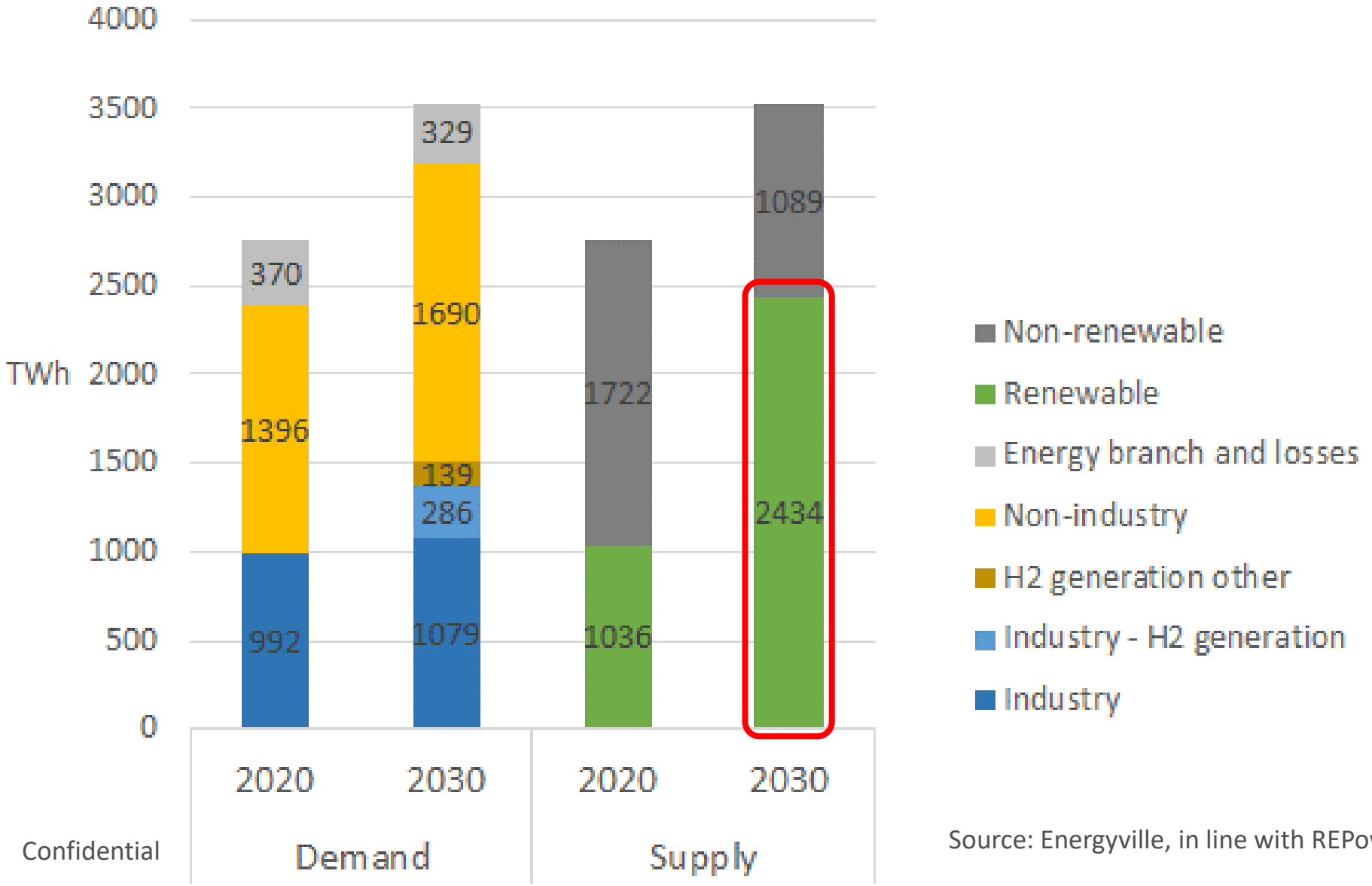
Electricity demand according to REPowerEU - 2030



Source: Energyville, in line with REPowerEU

Electricity supply according to REPowerEU - 2030

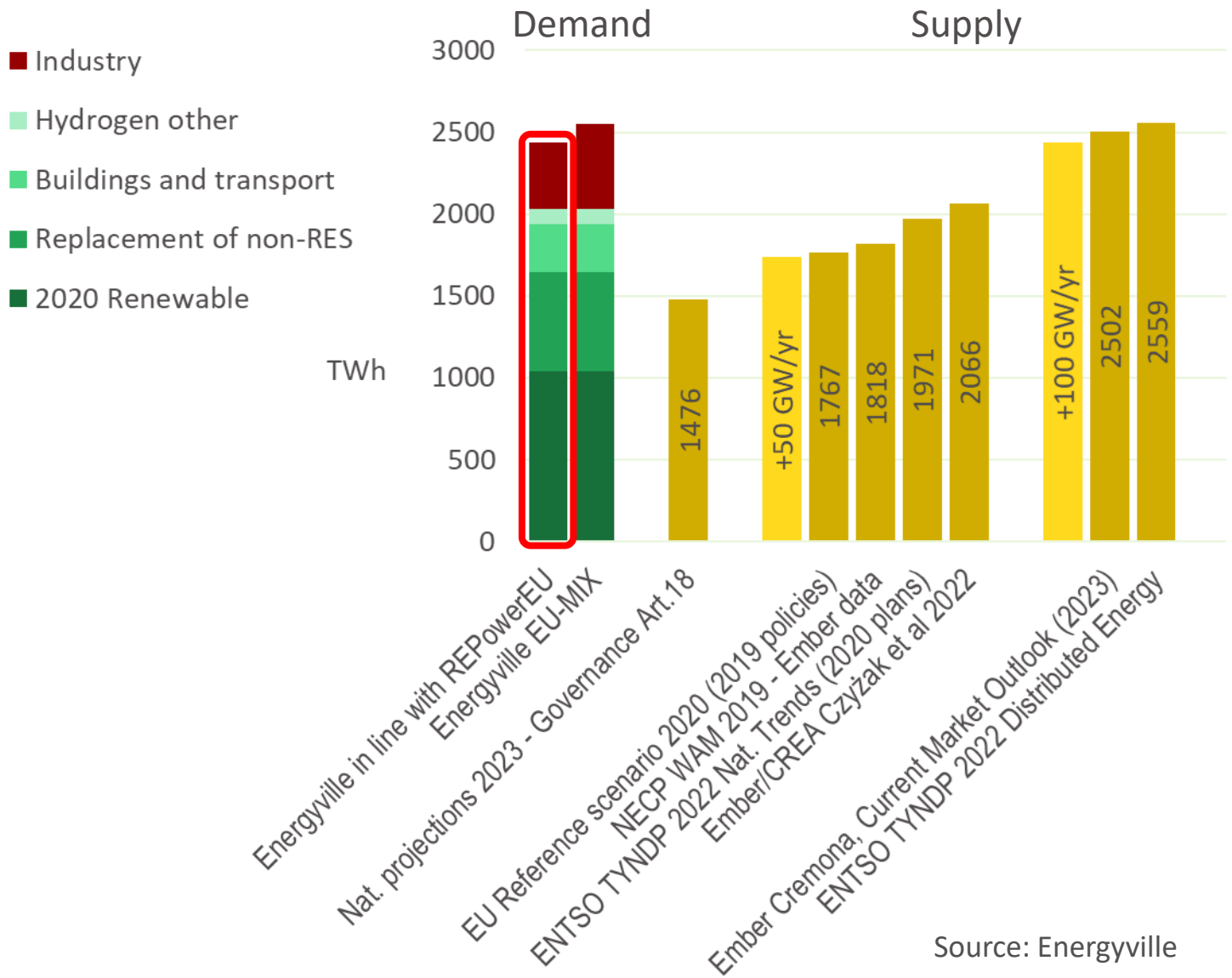


Source: Energyville, in line with REPowerEU

Renewable electricity demand vs supply - 2030

Demand side:

- around **40%** of increase of renewable electricity production will be used to **replace fossil** electricity
- around **30%** of increase of renewable electricity will be used for further **electrification (incl. H_2) of industry**.



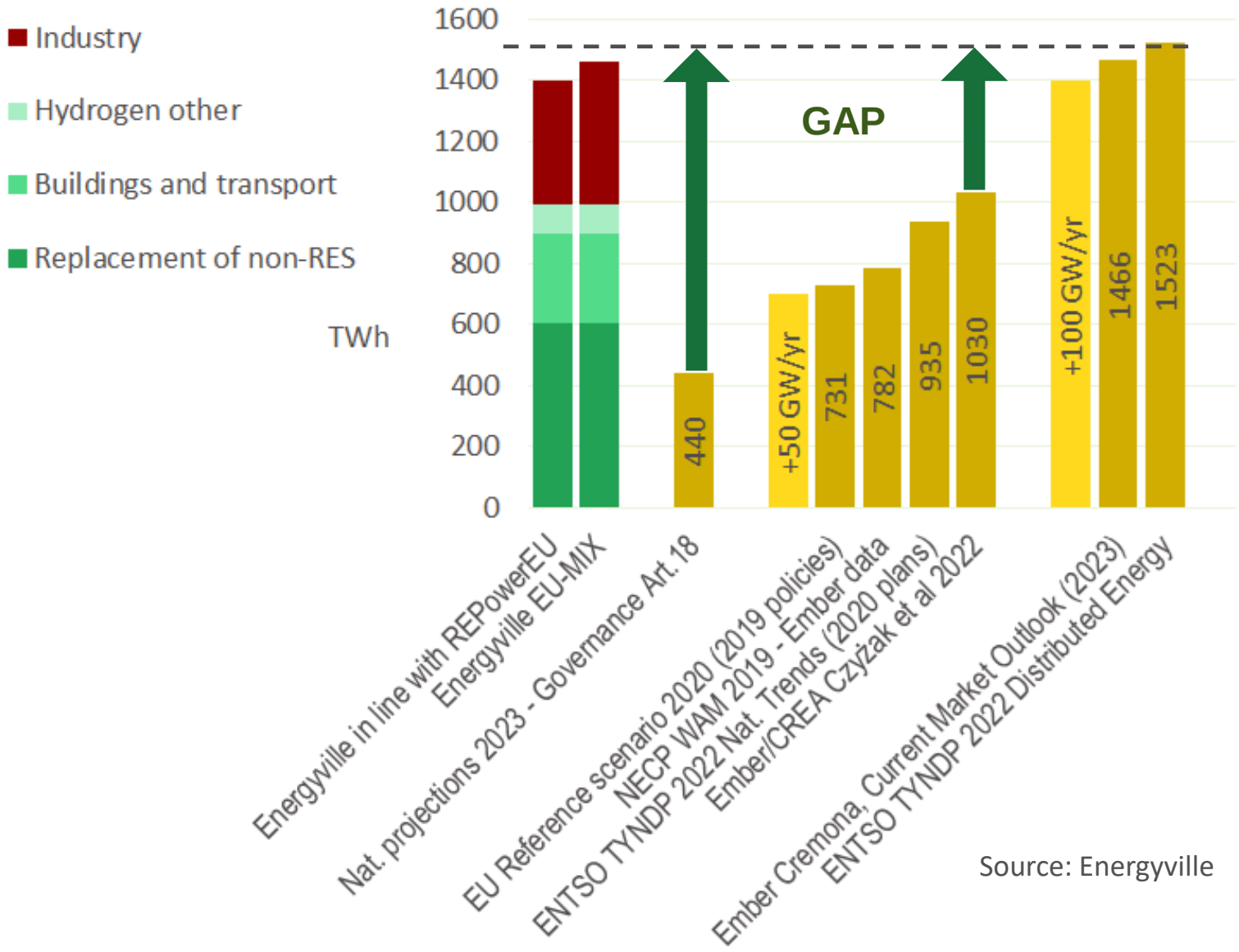
Source: Energyville

Additional renewable electricity demand vs supply - 2030

There is a gap of 1000 TWh between demand of additional renewable electricity and supply in **national projections** that include existing measures.

In scenarios covering **national plans**, there is a gap of 400 TWh/yr or more.

In the Ember Current market outlook, renewable electricity outpaces national plans. A share of 69% renewables is reached in gross final consumption.



Source: Energyville

Key conclusions 2030 – demand vs supply

- **Total** electricity generation will increase by at least 25%
- **Renewable electricity** (RE) will need to increase **by a factor 2.3**
- Future **RE supply will fall short** compared to the RE needs for the process industry in a scenario that incorporates RePowerEU ambitions
- In **national projections** that include existing measures, the RE increase is only **30%** of the required increase, with **a shortage of 1000 TWh**.
- In scenarios covering **national plans**, the RE increase is only **65%** of the required increase, with **a shortage of 400 TWh.**
- An average **100 GW/yr** additional renewable capacity from 2023 to 2030 is required

Key conclusions 2030 – recommended measures

In 2030 there is a significant risk of shortage of renewable energy supply to process industry in transition. To de-risk, following measures can be taken:

- Reinforce innovation towards **energy efficient material production** even more
- Strengthen effort in **efficient electrification** of industrial processes
- Apply innovative approaches for making industrial processes and on-site electricity supply **more flexible**
- **Search for alternatives** to reduce increased use of renewable electricity in process industry
- Make integration of more non-EU **semi-processed raw materials** possible (relying on energy intensive raw material's preparation in global areas with sufficient renewable energy in the future)

THANK YOU !!

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Sustainable Energy Systems Assessment & Modelling

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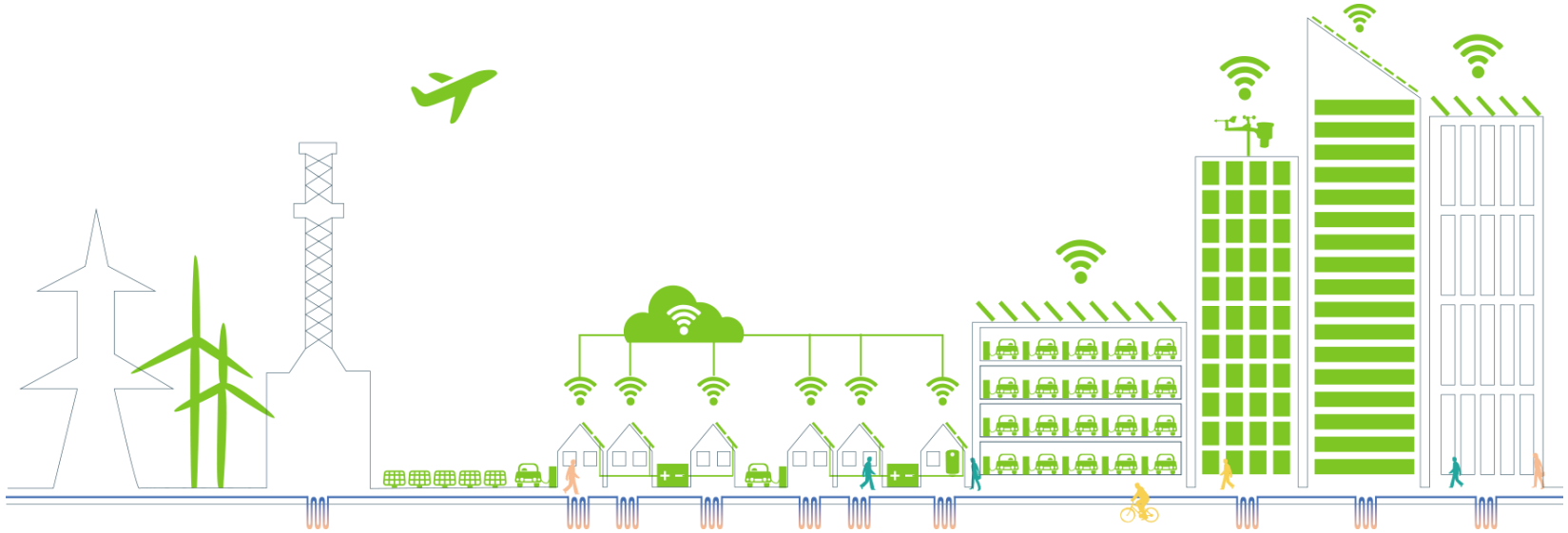
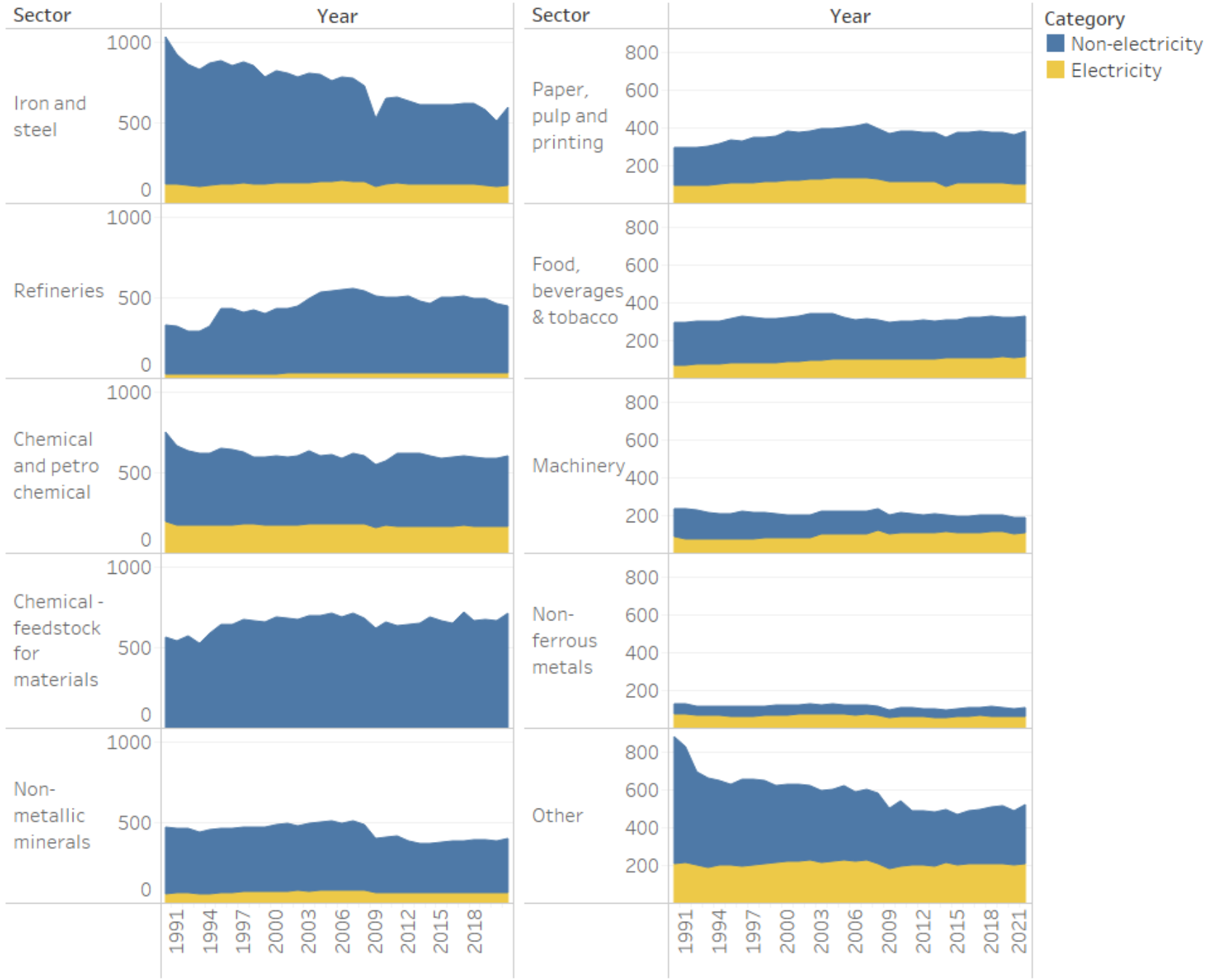
EnergyVille - Mission

- EnergyVille is a top energy research cooperation between the Flemish universities and research centres KU Leuven, VITO, imec and UHasselt

- EnergyVille's mission is to support and accelerate the transition towards a market-based, sustainable energy system



Historical energy demand



Current situation on renewable electricity production

- In 2022, there was 150 GW of hydro and around 400 GW installed EU solar/wind capacity that is growing with about 50 GW/yr (with growth from recent years, there would be +400 GW additional solar/wind capacity by 2030)
- In 2021, renewable electricity generation was around 1000 TWh/yr (of which ±350 TWh/yr hydro and 570* TWh/yr from 350 GW solar/wind).
- Around 370 TWh renewable electricity to industry in average at the moment**.

(*) Eurostat Shares data

(**) Applying total generation RES share from Eurostat Shares (37.5%) to electricity demand from the industry sector.

REPowerEU - 2030 Renewable energy

RES share increases from about 22% in 2021 to 45%* in 2030. The RES share increase (23%pp) can be decomposed in two parts:

- 4%pp - from lower energy consumption (-17%), mostly through electrification of transport
- 19%pp - from higher use of renewable electricity and renewable fuels, around 6.700** PJ (1850 TWh).

About two thirds of the absolute RES increase is electricity or RFNBO requiring at least 1400 TWh/yr renewable electricity***.

(*) The renewables reach a 45% share in 2030 using the definition in RED III

(**) 19% of 35.000 PJ, the estimated denominator (83% of gross final energy consumption of 42.400 PJ)

(***) One third of the RES increase is biofuels, bioenergy for heating, derived heat, ambient heat or renewable cooling

REPowerEU Solar and Wind

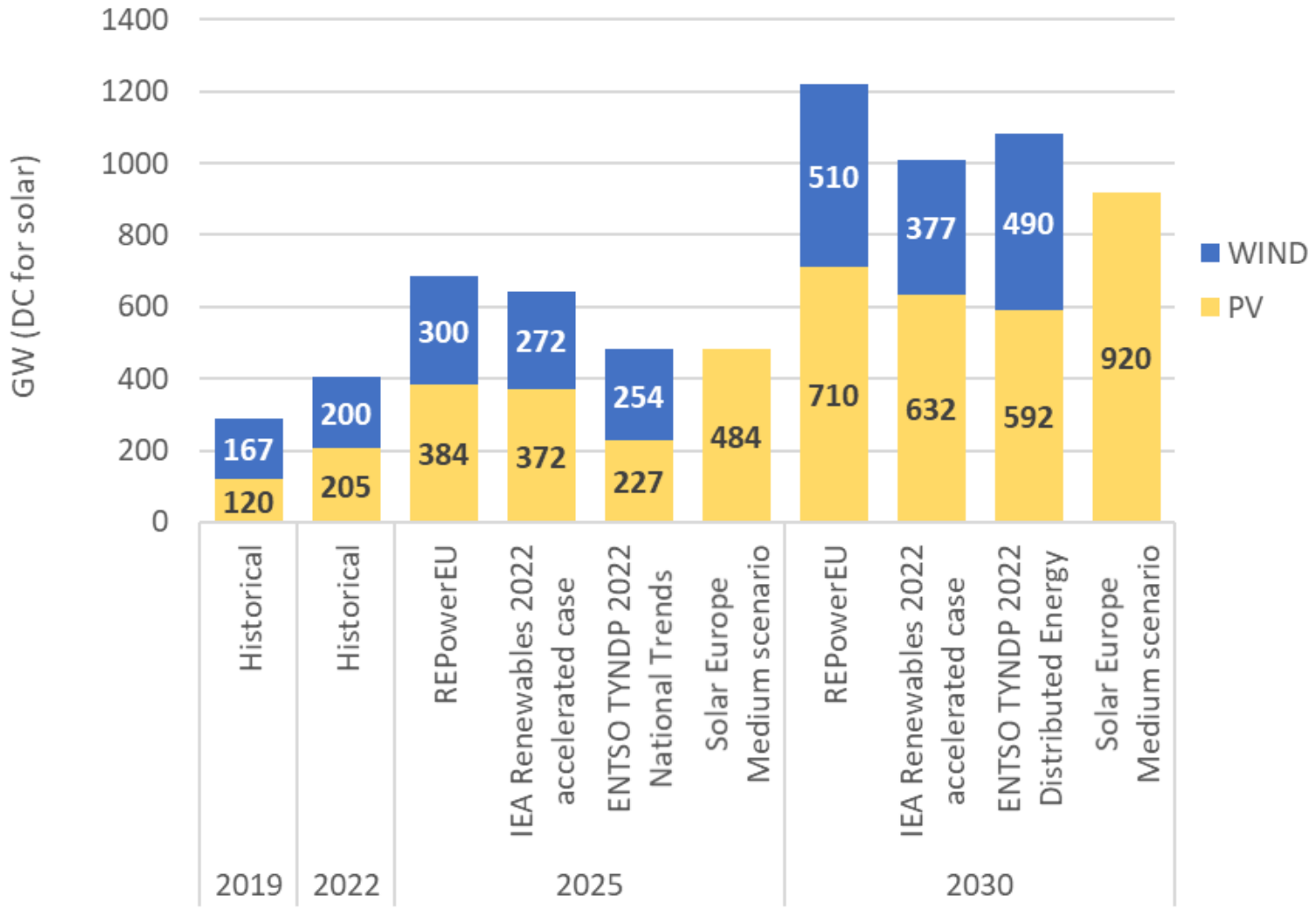
- RePowerEU proposes to have installed about 1100GW solar/wind in 2030 (+750 GW* vs 2021 or +700GW vs 2022)
  - Solar: 164 GW > 592 GW +427 GW x 1100h** = 470 TWh
  - Wind onshore: 173 GW > 399 GW*** +226 GW x 2500h = 565 TWh
  - Wind offshore: 15 GW > 111 GW*** +96 GW x 3800h = 365 TWh
  - **Total solar/wind:** **+ 1400 TWh**
- This would require an <u>average</u> speed of about 100 GW/yr additional capacity from 2023 to 2030.
  - The speed of short-term renewable deployment in EU strongly depends on supply from China, thus global competition will play

(*) A pure extrapolation from historical data results in 1221 TWh (+750GW*570TWh/350TWh)

(**) based on the capacity factor used in the FF55 MIX scenario. For wind onshore, there is a 20% increase in capacity factor compared to the last recent years (2100 h)

(***) Source: <u>Member States agree new ambition for expanding offshore renewable energy (europa.eu)</u> ; onshore 399 = 510 – 111 GW

Projections Solar and Wind



Source: Energyville