

The background is a deep blue with a complex, abstract pattern of concentric, wavy lines and small white dots, resembling a stylized representation of energy or a digital network.

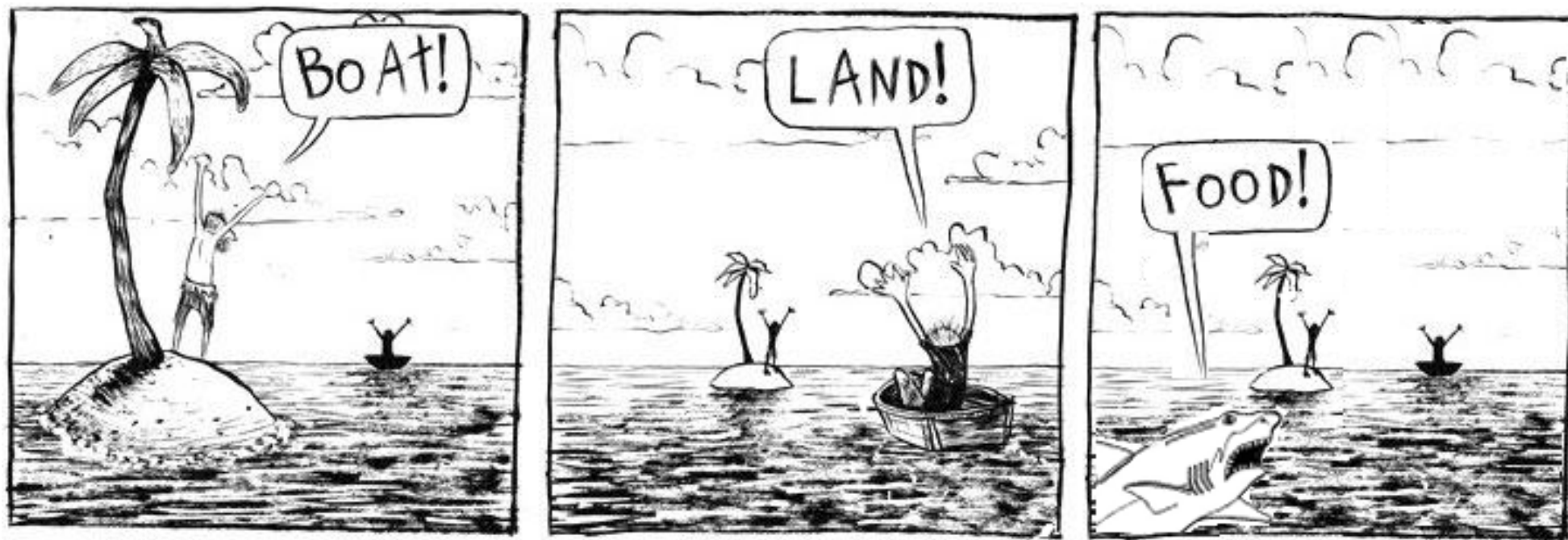
The world of energy is changing

... and we are deeply involved.

ing Marco J. Bijkerk

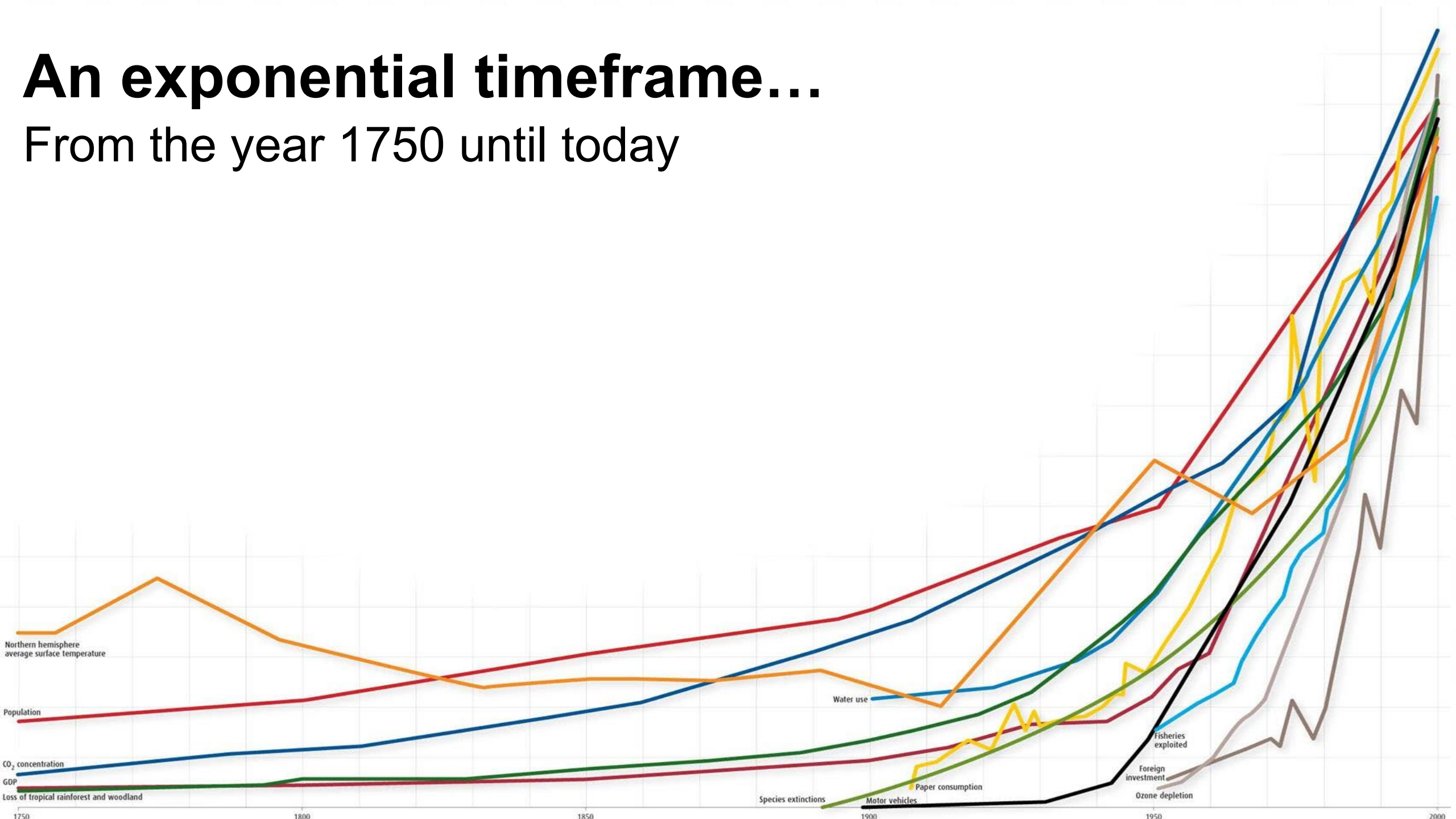


Energy transition

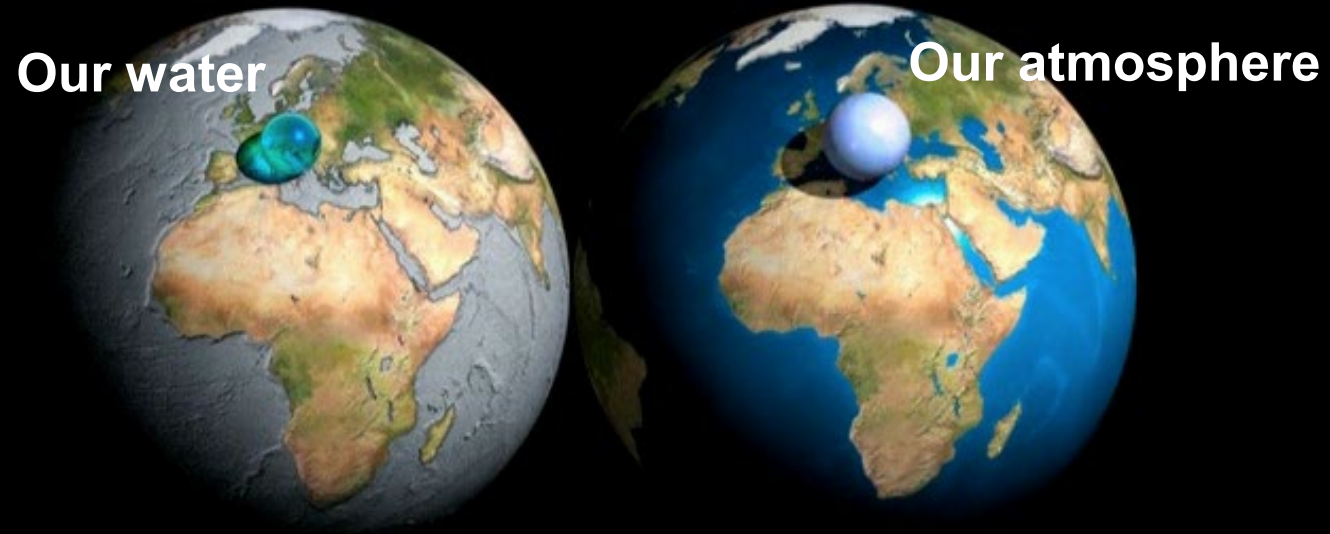


An exponential timeframe...

From the year 1750 until today



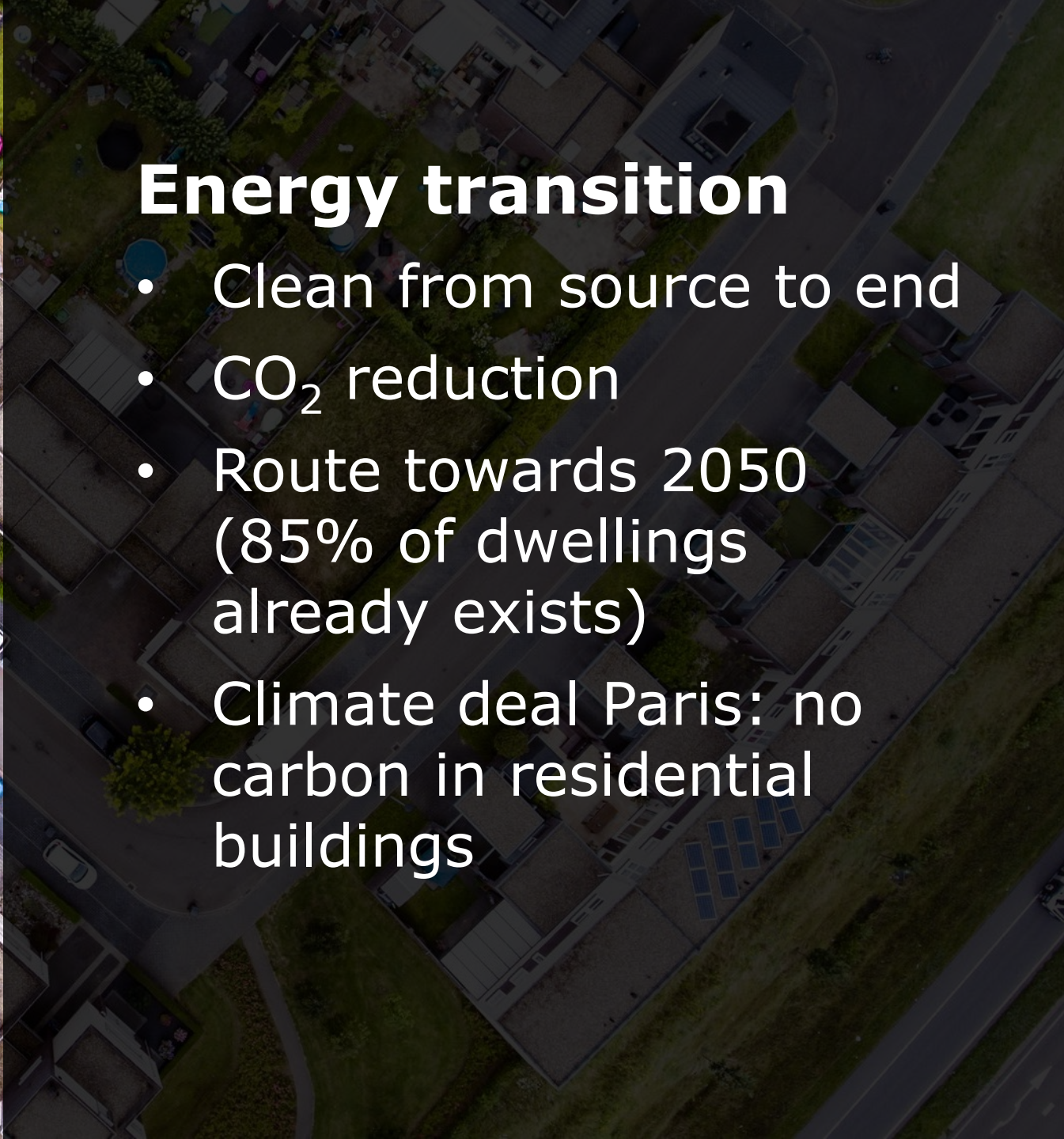
Vulnerable world

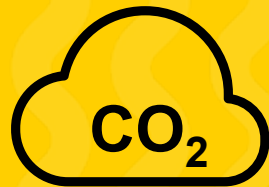




Energy transition

- Clean from source to end
- CO₂ reduction
- Route towards 2050 (85% of dwellings already exists)
- Climate deal Paris: no carbon in residential buildings





Our CO₂ ambitions

2018*



2050

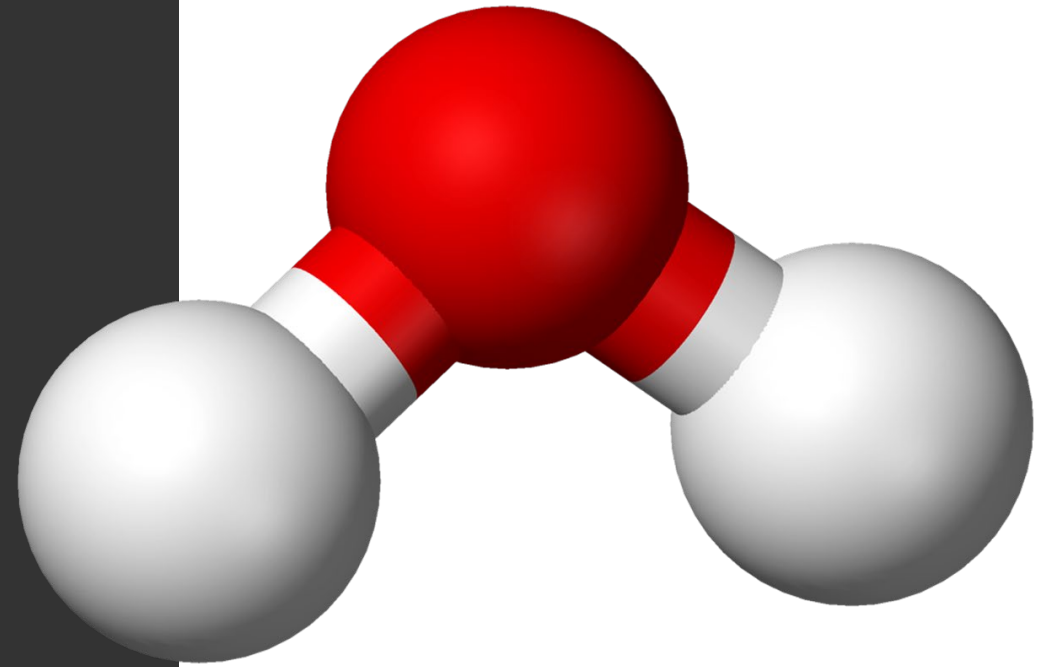
Now 5000 kg CO₂
emission per year, per
household

No carbon allowed
@residential
applications

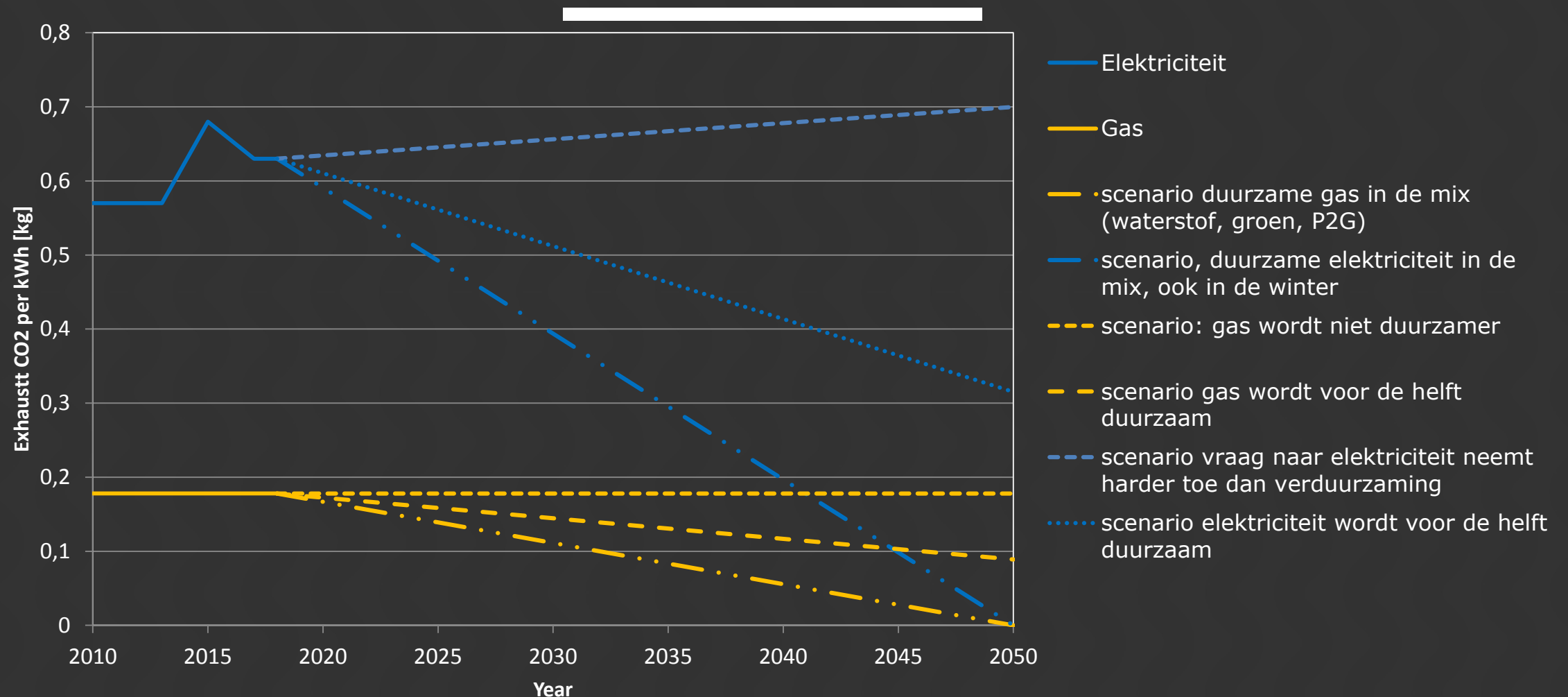
* Current carbon emission only for
heating, electricity and hot water

But..

**What is
CO₂?**



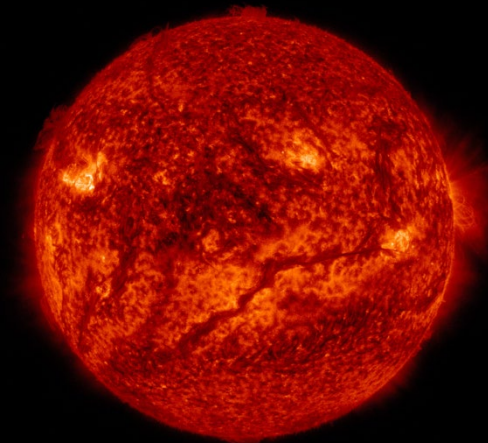
Co₂ intensity: exhaust of CO₂/kWh





Input = output

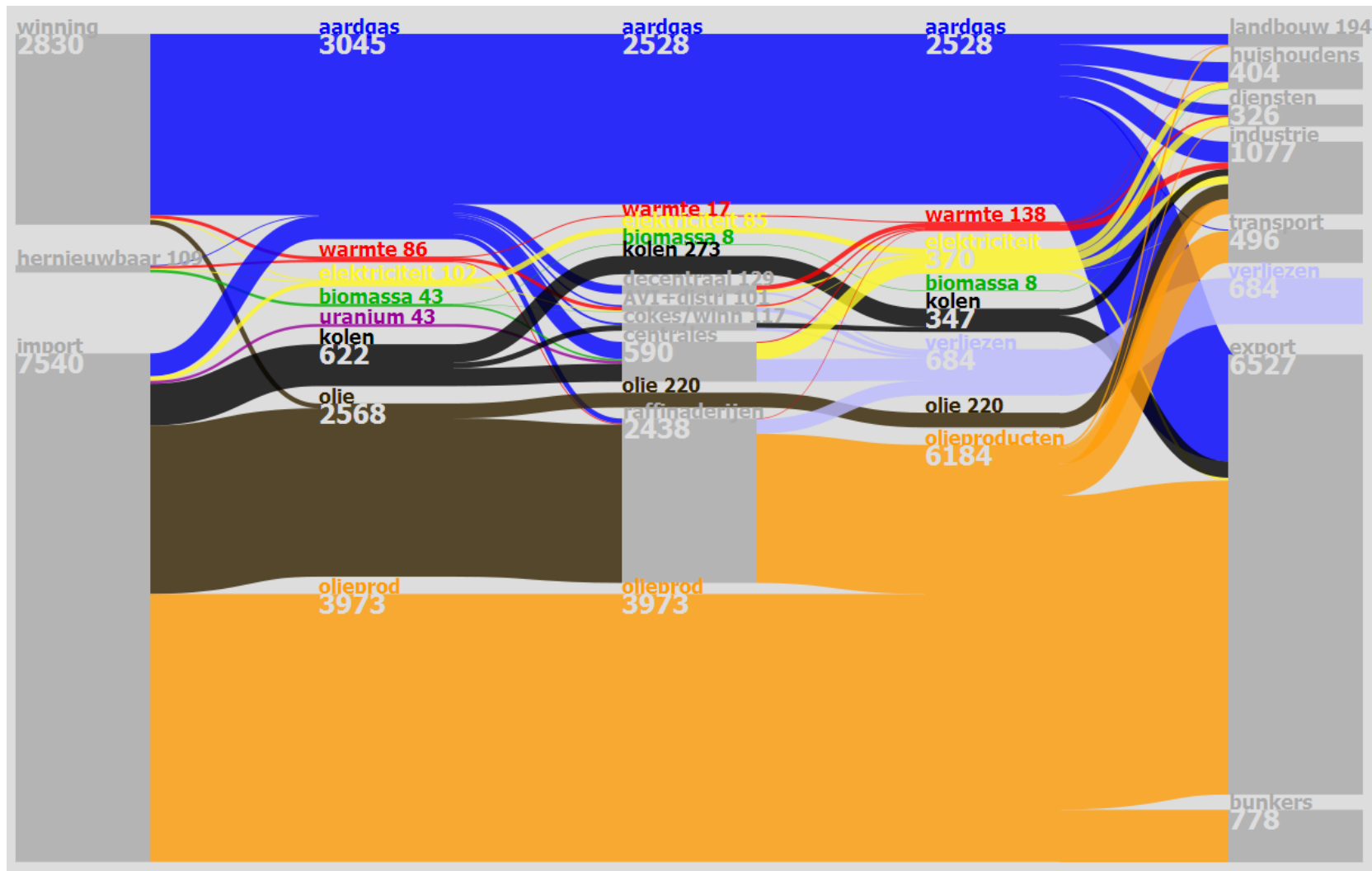
58 kWh/pp/day



15300000000000000kWh

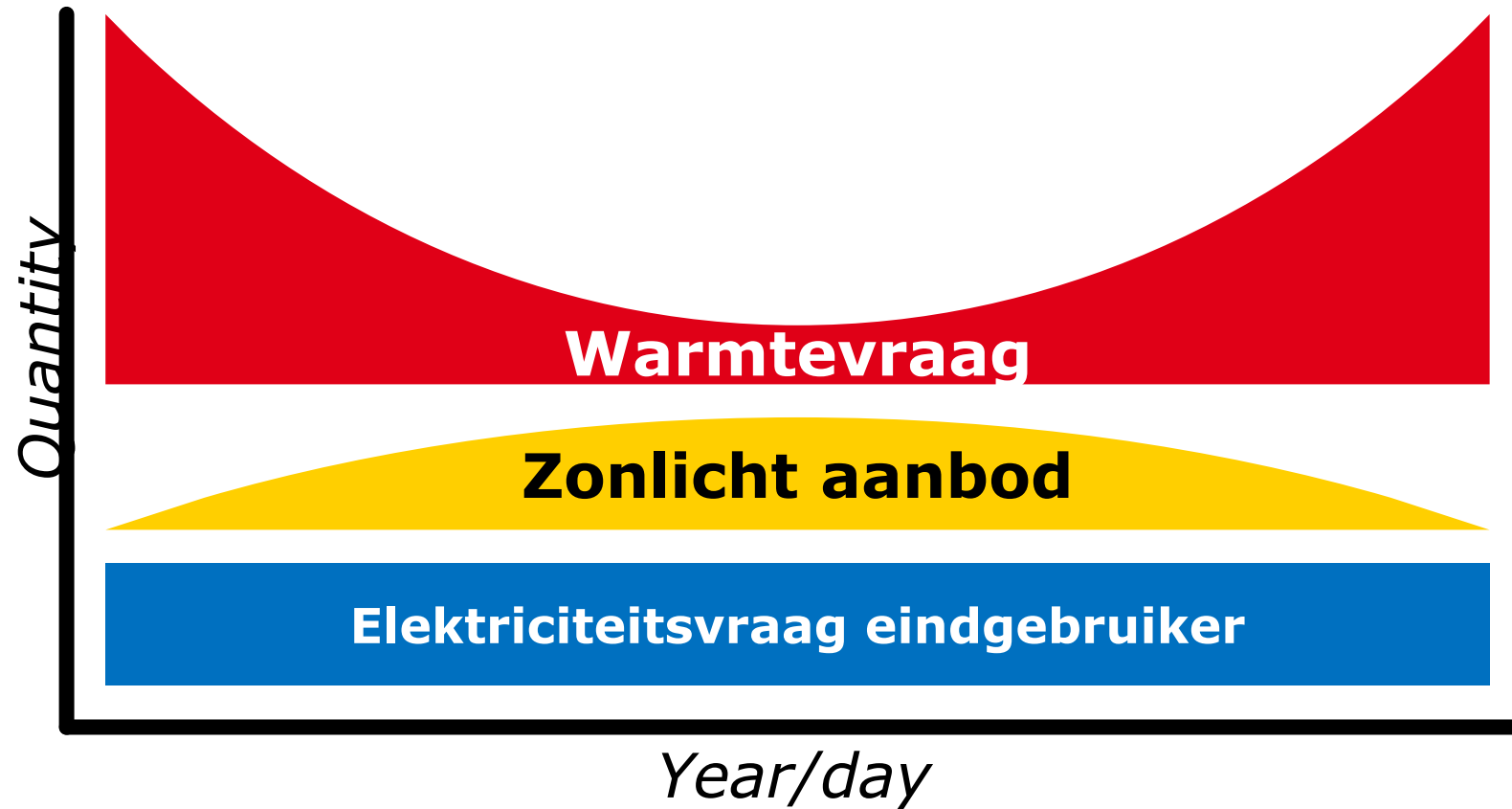
Everything electric?

Supply



Demand

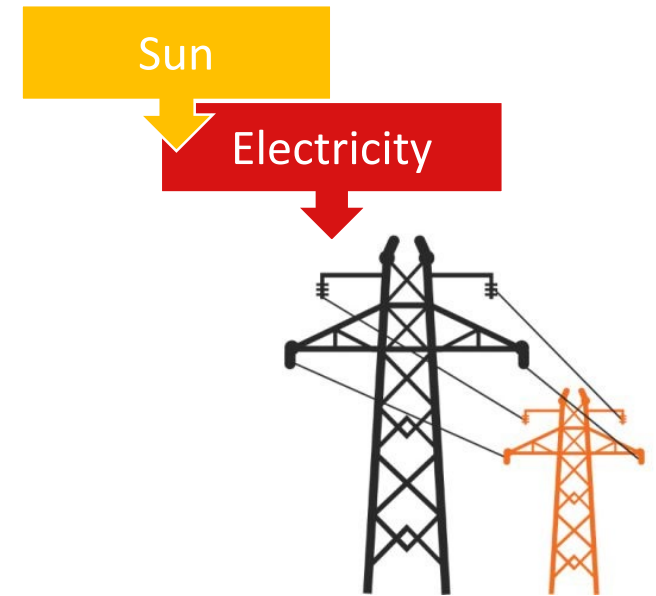
Supply & demand are not in balance



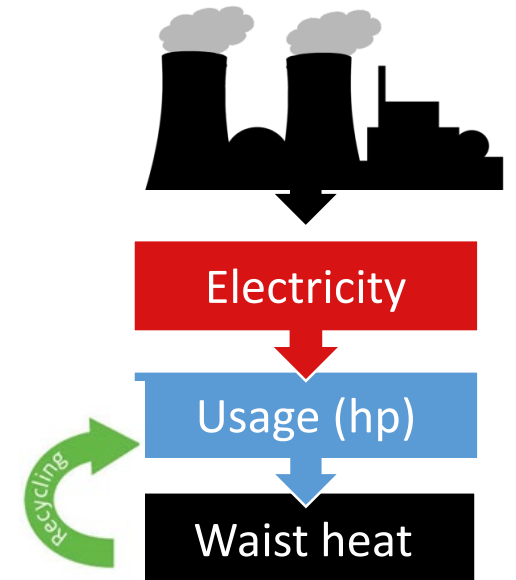
Energy management:

- Supply and demand are not in balance
- without → 100% sustainable not possible
- Inefficient transport

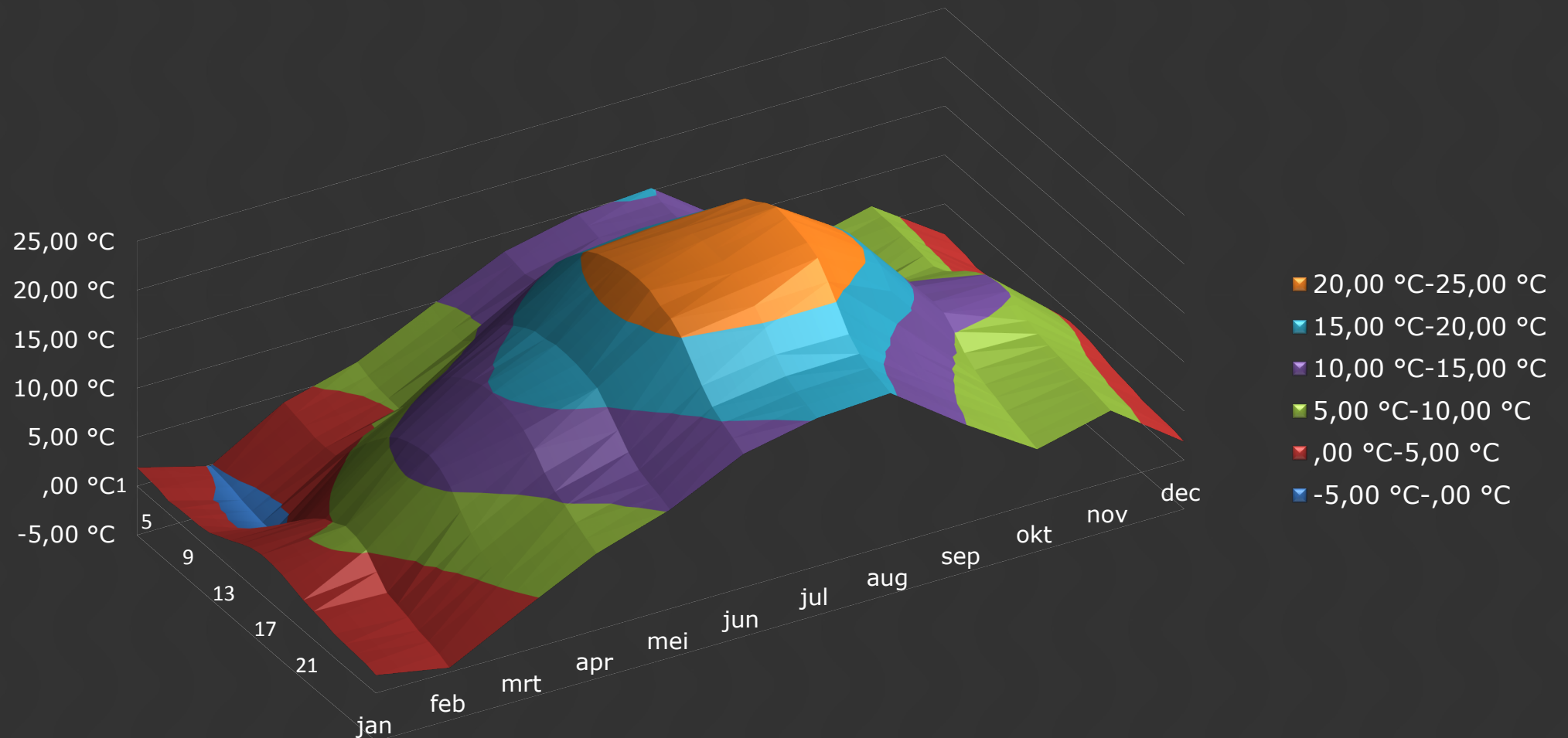
Supply



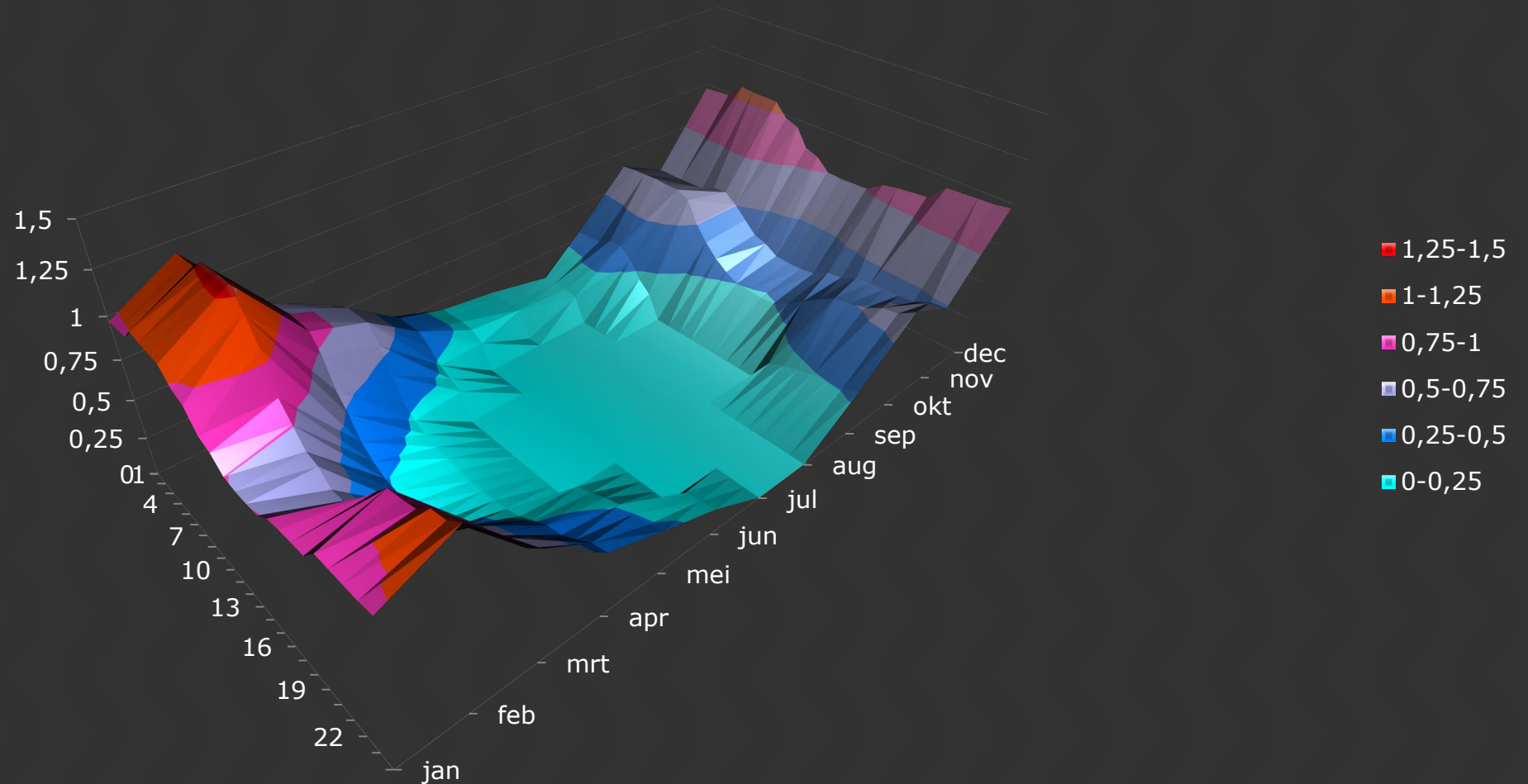
Demand



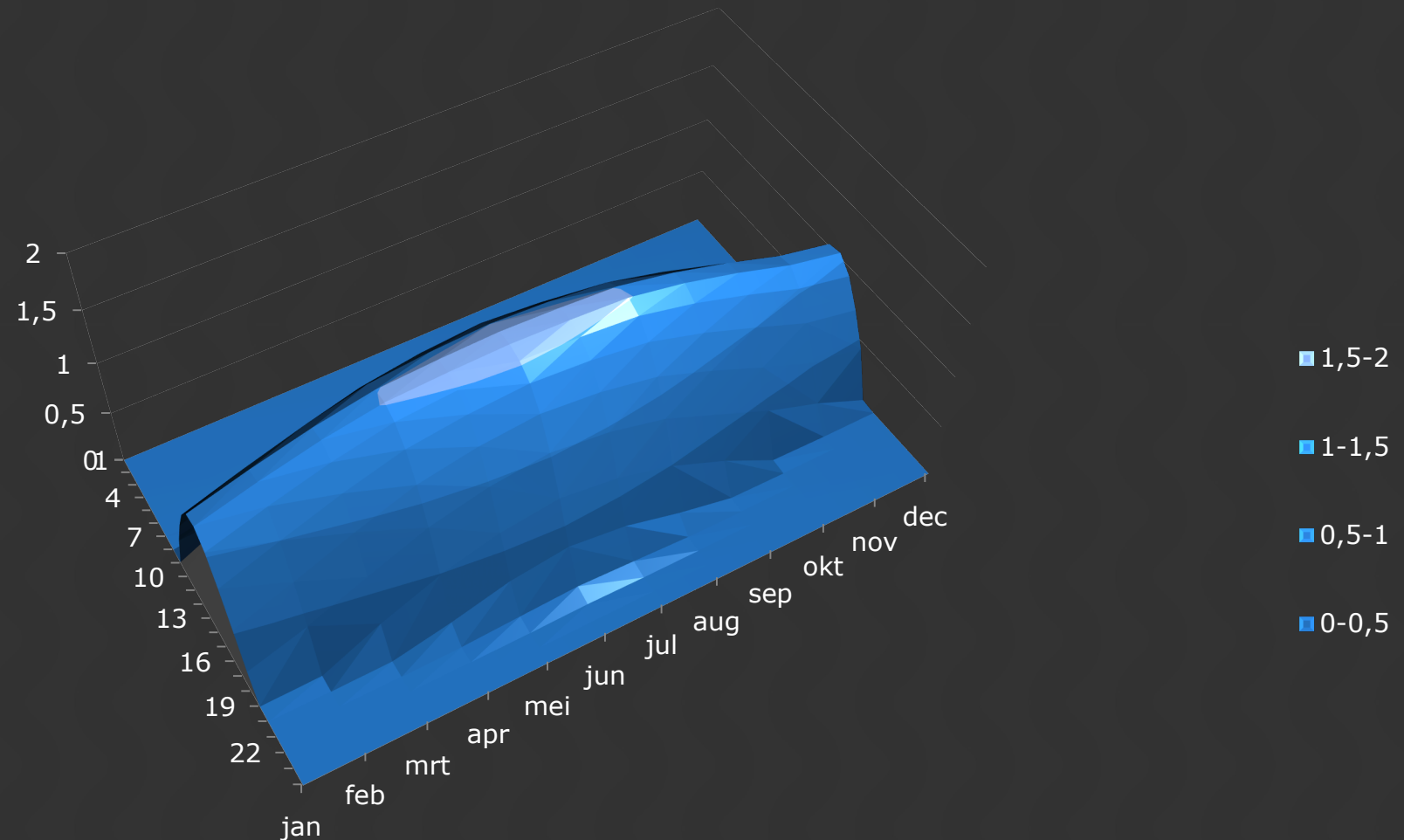
Year round hourly temperature



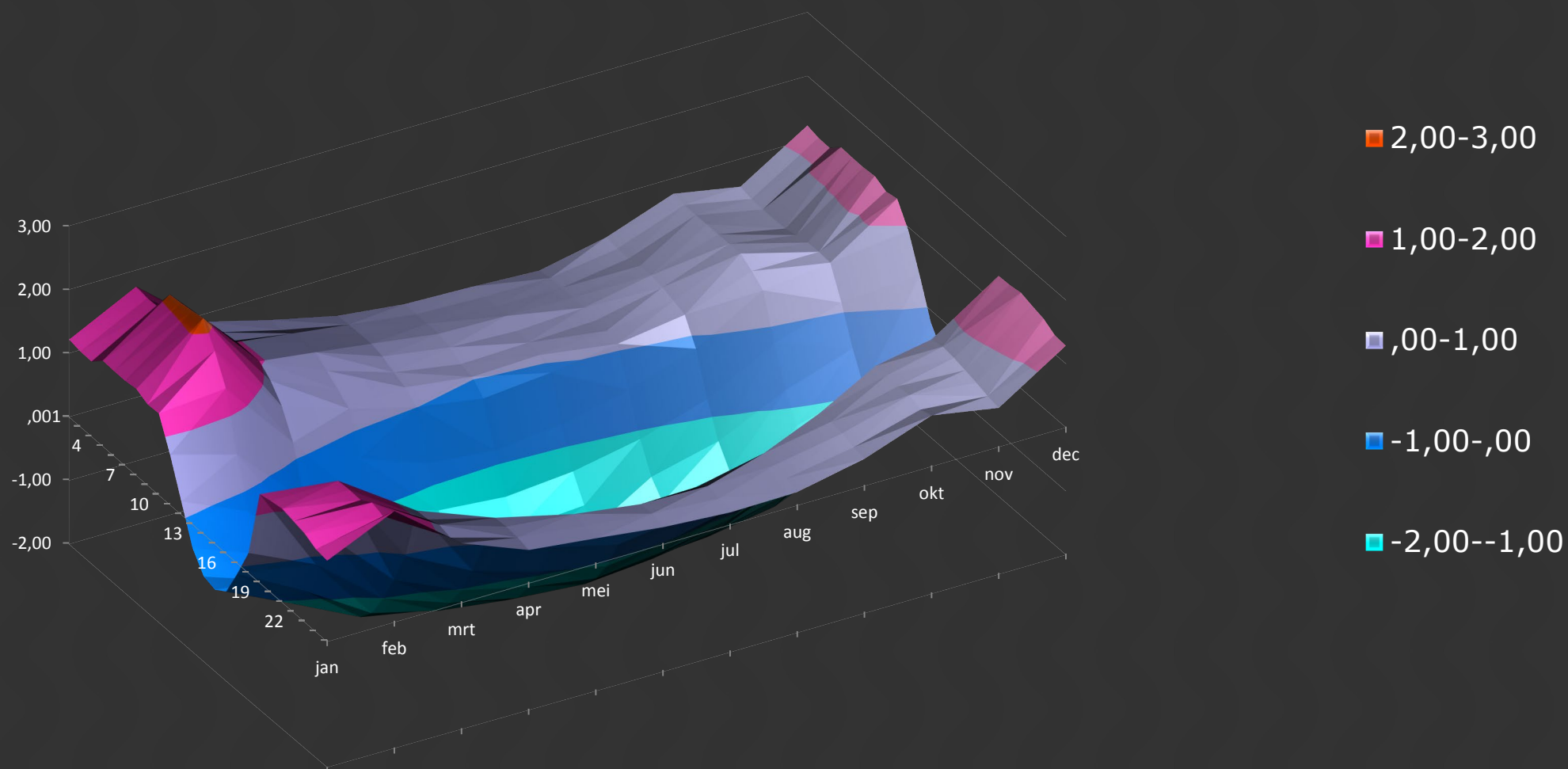
Power a Heat Pump needs



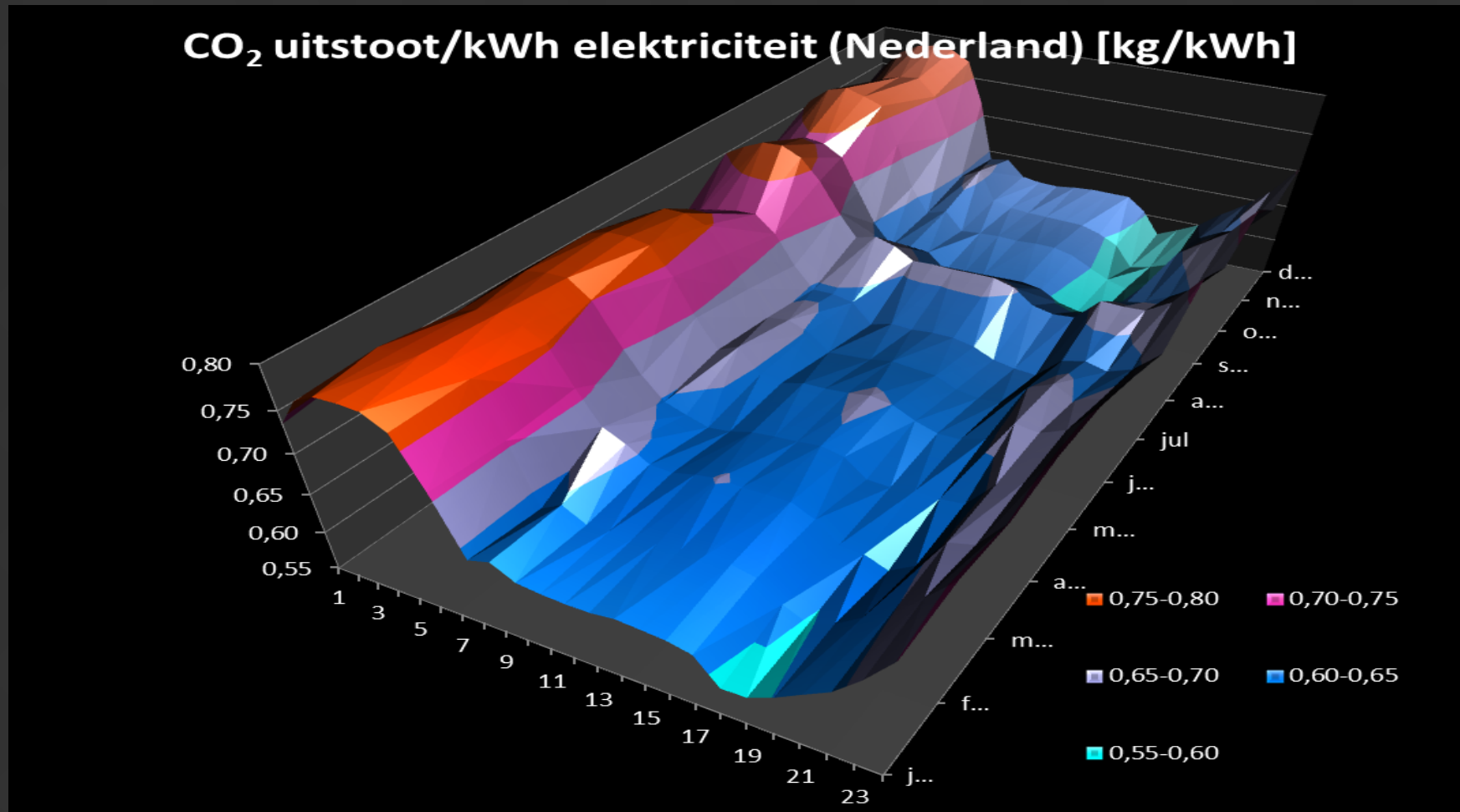
Electricity from pv-panels



Year round hourly electricity import & export



What's the problem?

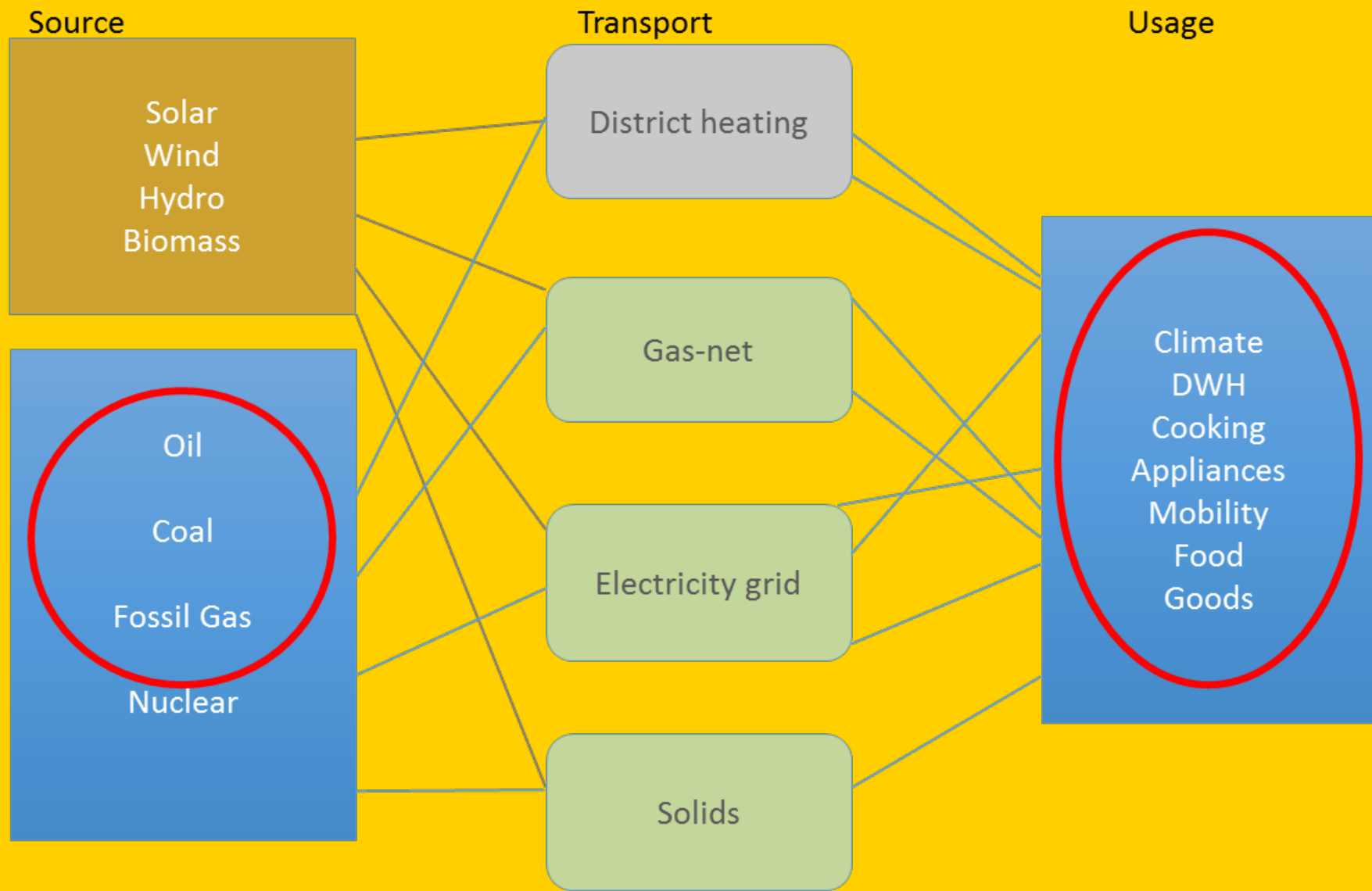




Energy transition

Energy management is our problem

Storage & transport



The truck or the load?





Energy transition

**All-electric is not
the answer...**



**Let's focus
on CO₂!**



Energy transition

So, what's the answer?

CO₂ cycle



CO₂

+

H₂O

+



→

$\eta = 0,01 \%$

C₆H₁₂O₆

+

O₂



C₆H₁₂O₆

+

O₂

→

CO₂

+

H₂O

+

energy

$\eta = 10 \%$

System η : = 0,001%



The characteristics

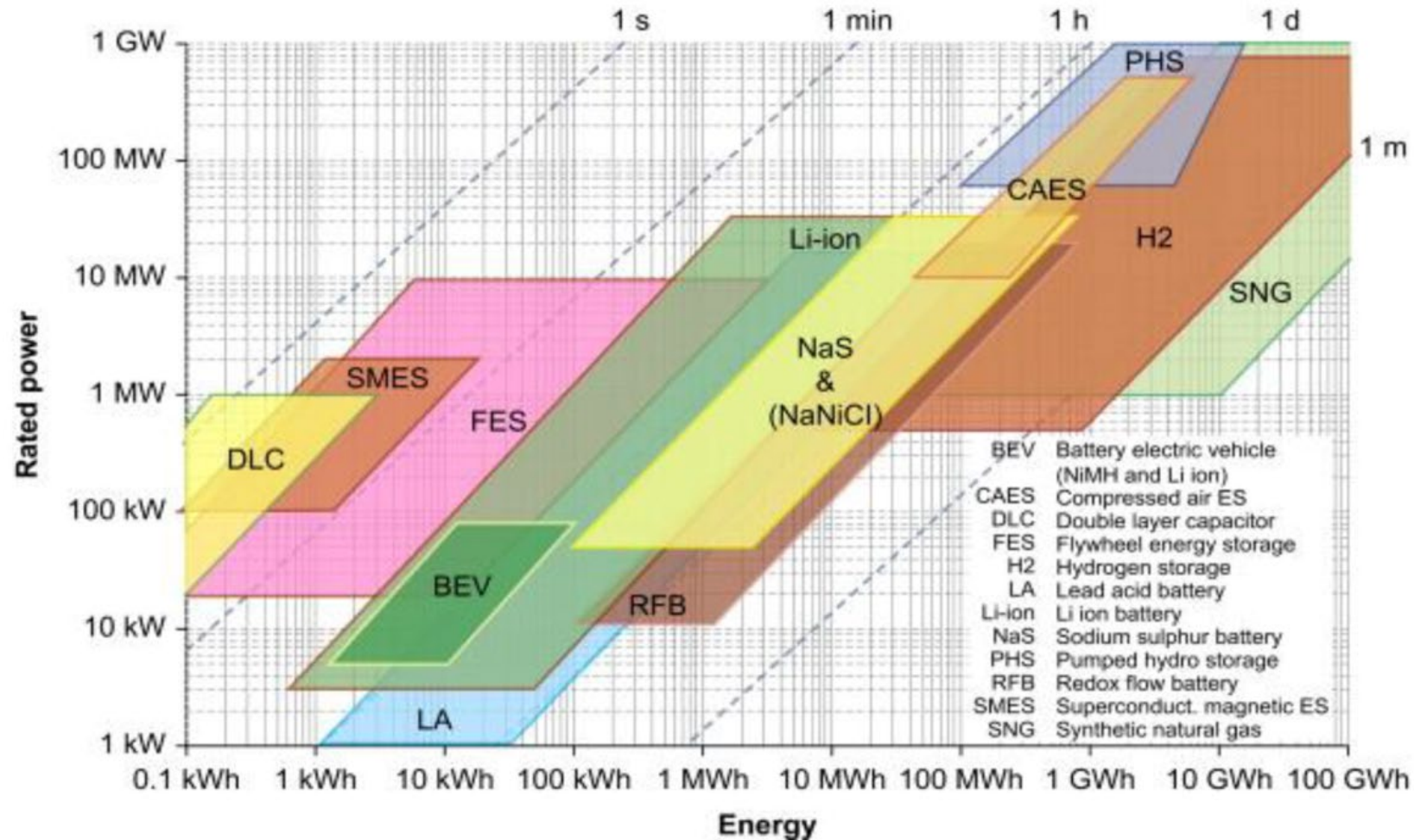
- 100% sustainable
- There are users of energy
- Transport of energy
- No new CO₂ is created, It's completely circular, The system is in balance and short living CO₂ is no problem
- Supply and demand are not connected
- Storage in chemicals
- **Efficiency is a bit low.....**



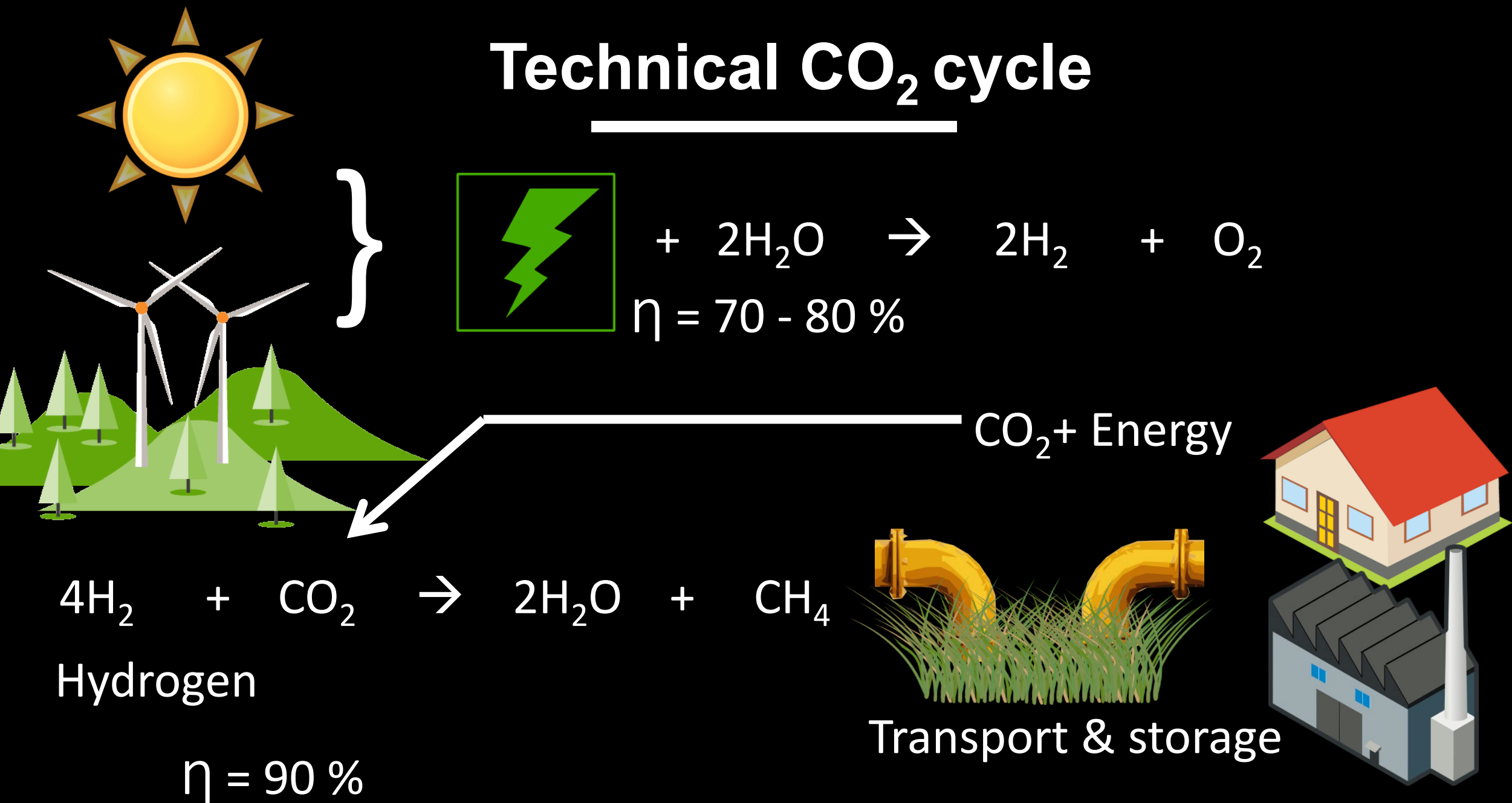
Energy transition

Back to our world..

Storage capacity compared



Technical CO₂ cycle





NL: 3147 PJ jaar

**Op zonlicht met transport van H_2 :
3000km² (50 x 60 km woestijn)**

Rozenburg

Test van 2 ketels op 100% waterstof

Maart 2019

Gemeente Rotterdam

Ressort wonen

DNV-GL

Bekaert

Stedin

Remeha

Ondertekening 5 okt 2018







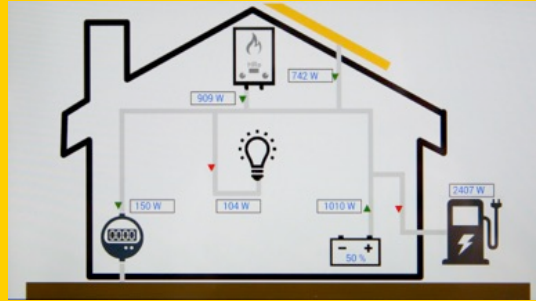
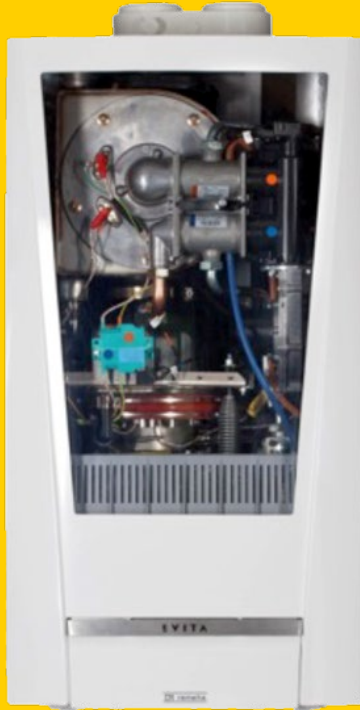
HYDRA



Energy transition

Another perspective

The installation





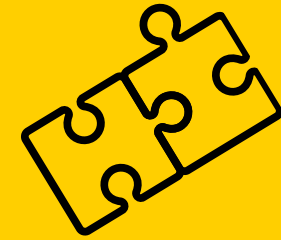
Ambition

- 90% grid independency
- realize >90% CO₂ reduction



Challenge

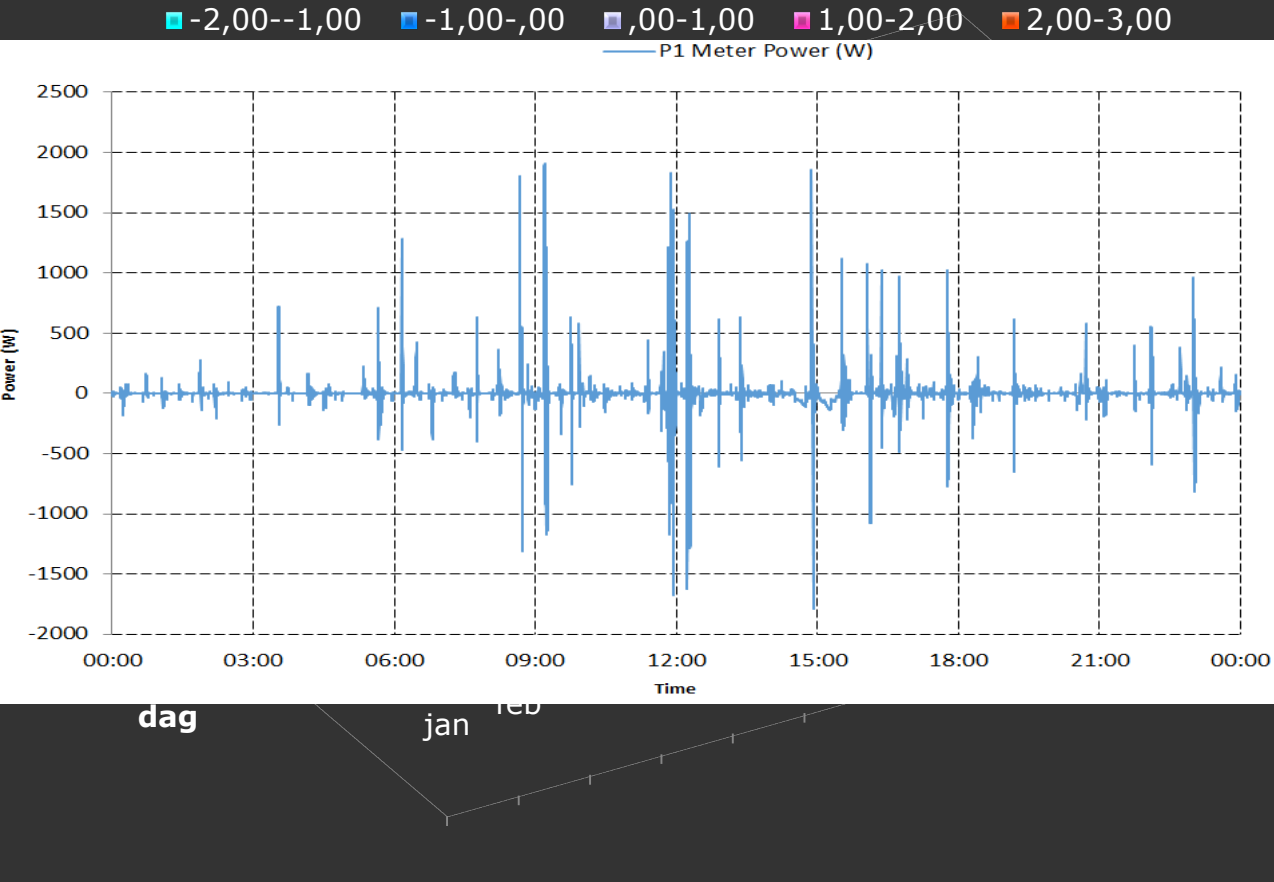
- Imbalance between supply & demand (>80%)



Result

- Let's have a look

Electricity demand and production (total) [kW] Average house with PV and u-chp



The results

- 90% grid independency
- Realized more than >90% CO₂ reduction



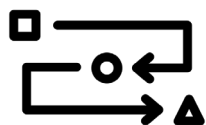
Energy transition

Several ways to sustainability

Energy carriers



Electricity



Heating
networks



Gas

Natural sources



Solar



Wind

Technology



Storage & transport

2018

1%

4%

95%

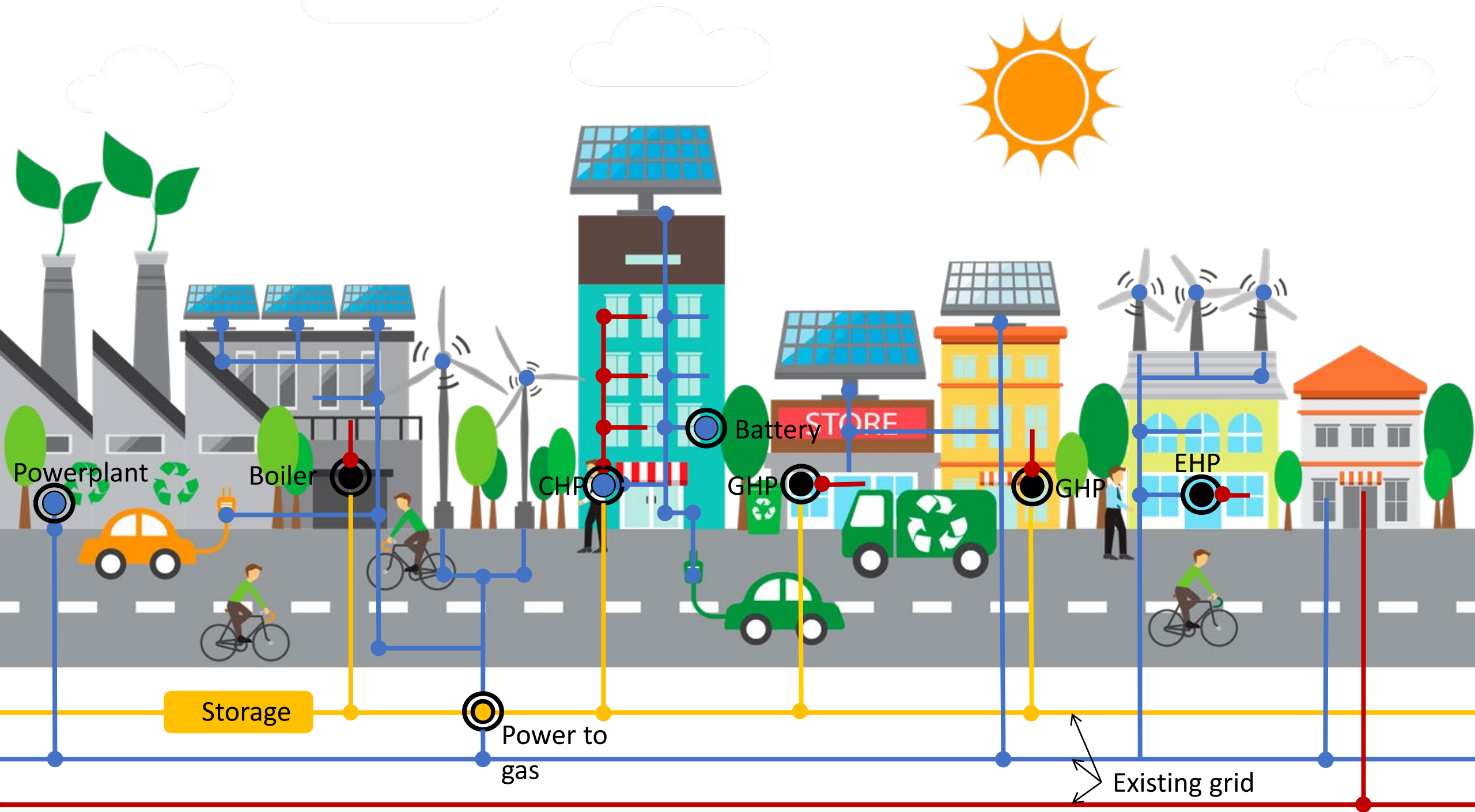
2050

20-30%

20-30%

40-60%

Fits within the current infrastructure



☐R remeha

Thank you