FACULTEIT INGENIEURSWETENSCHAPPEN
EN ARCHITECTUUR

Interreg
2 Seas Mers Zeeën
SOLARISE
European Regional Development Fund

EUROPEAN UNION

LOCAL STORAGE

Prof. dr. ir. Jan Desmet: Solarise Webinar 09/03/2021

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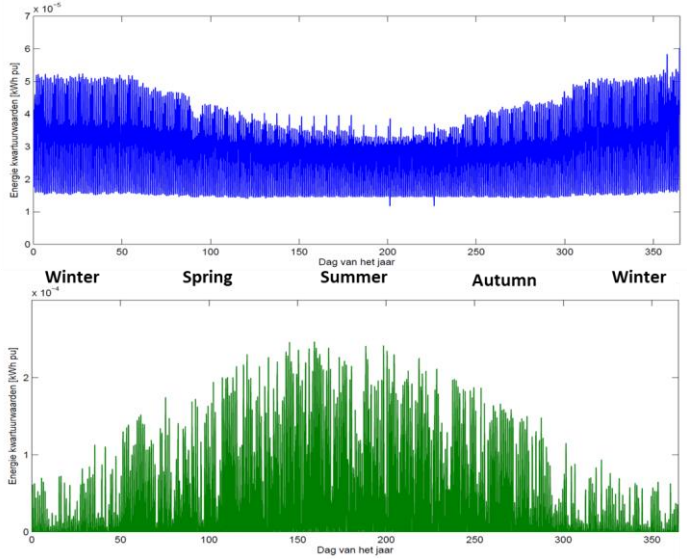
INTRODUCTION

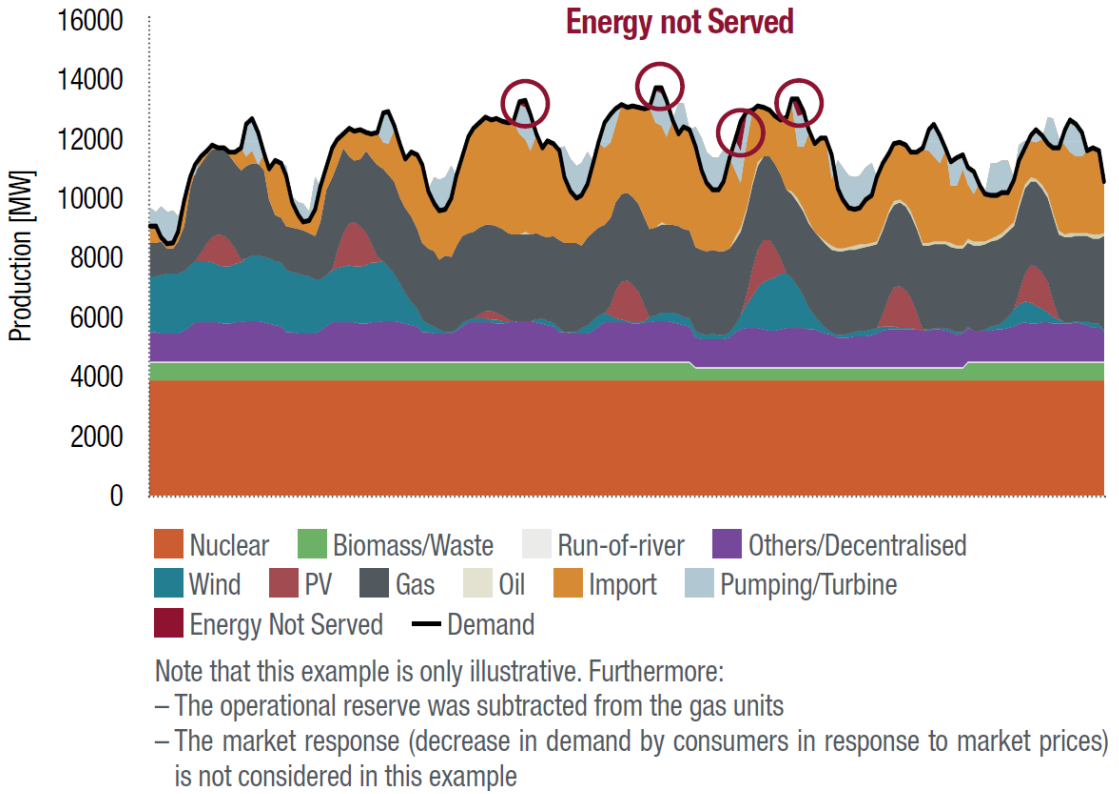
Unbalance between production and needs

In order to meet supply demand (in terms of power generation), generation must continuously adapt to demand on the grid.

Due to the volatility of renewable sources, this is a challenge to keep the frequency constant.

→ Exchange Congestion & Flexibility

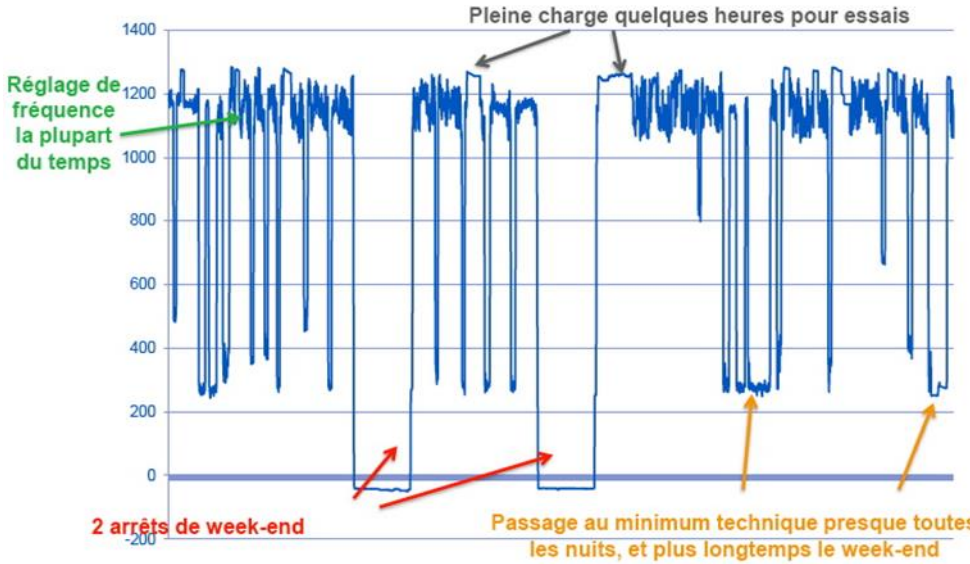


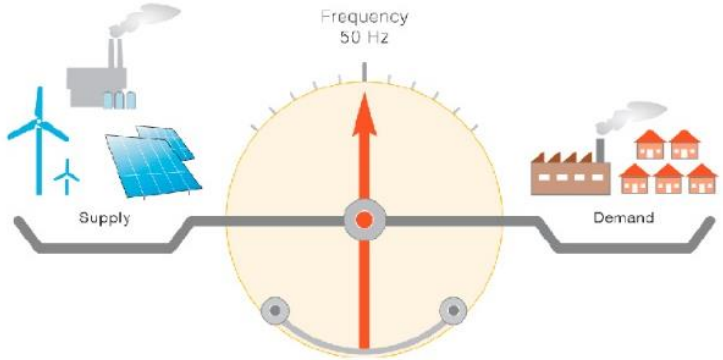


https://www.iea.org/publications/insights/insightpublications/Getting_Wind_and_Sun.pdf

INTRODUCTION

How to control





Power lines (roads) cannot transport power (cars) (overload/files)

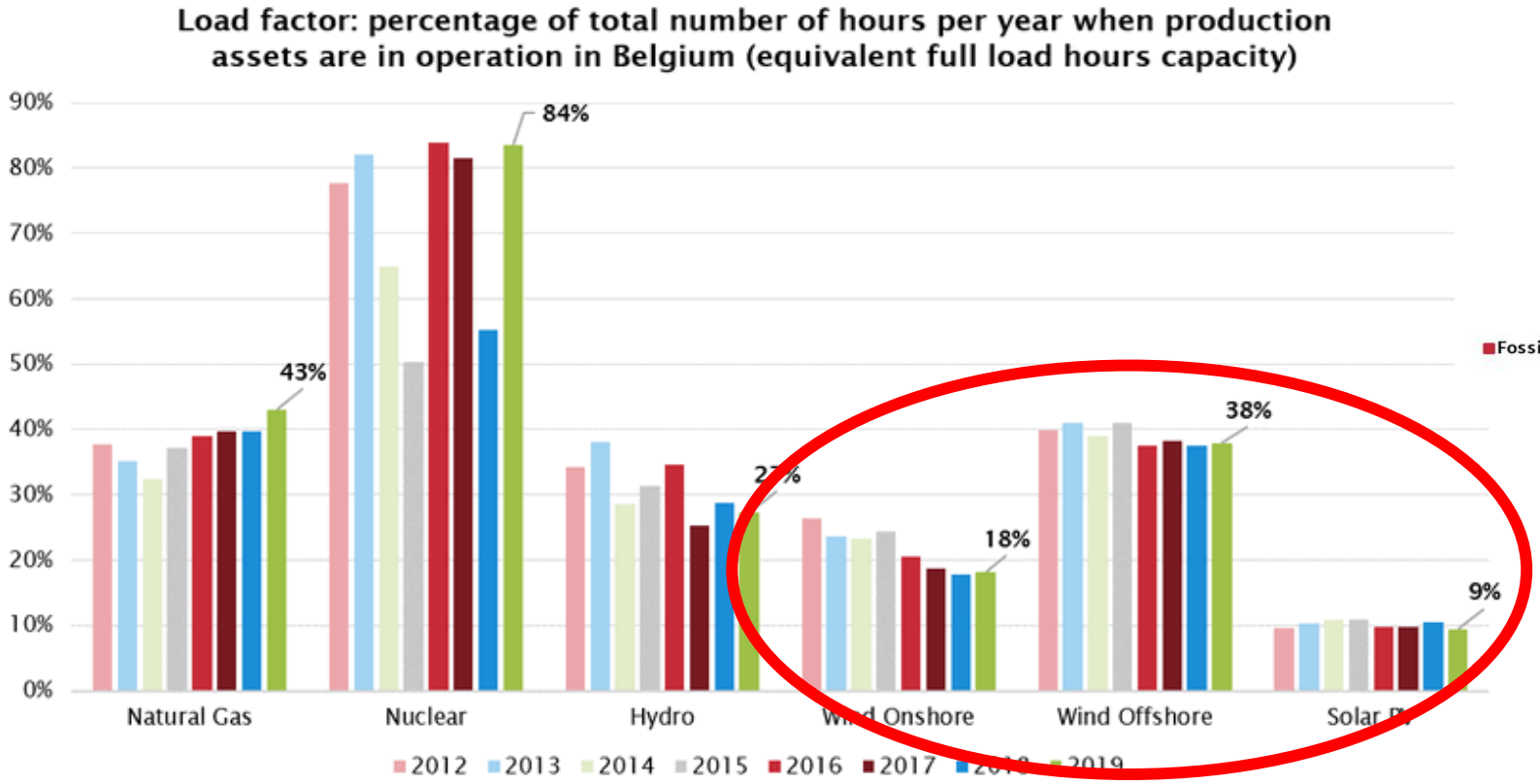
Is temporary phenomenon (weather conditions/working hours)

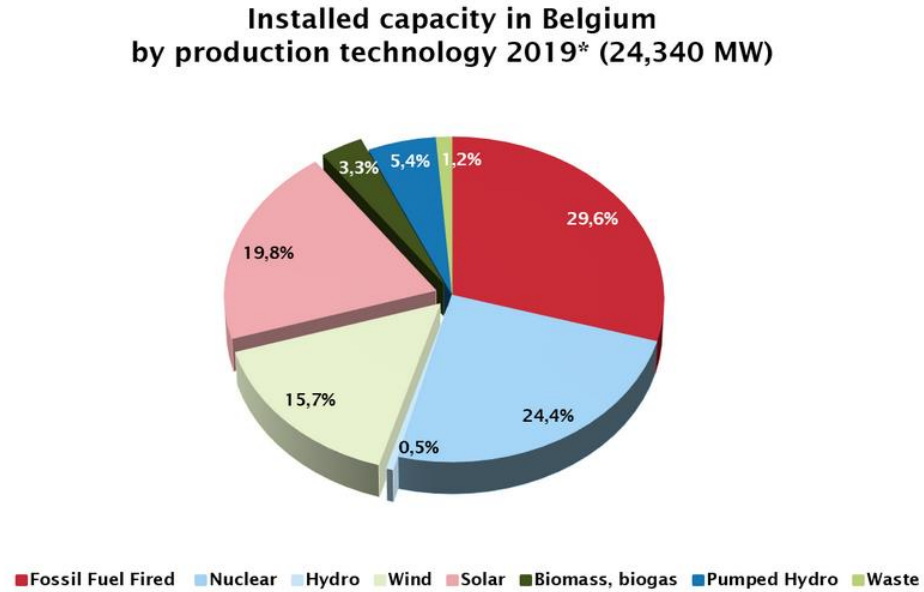
Power regulation and control in function of overvoltage

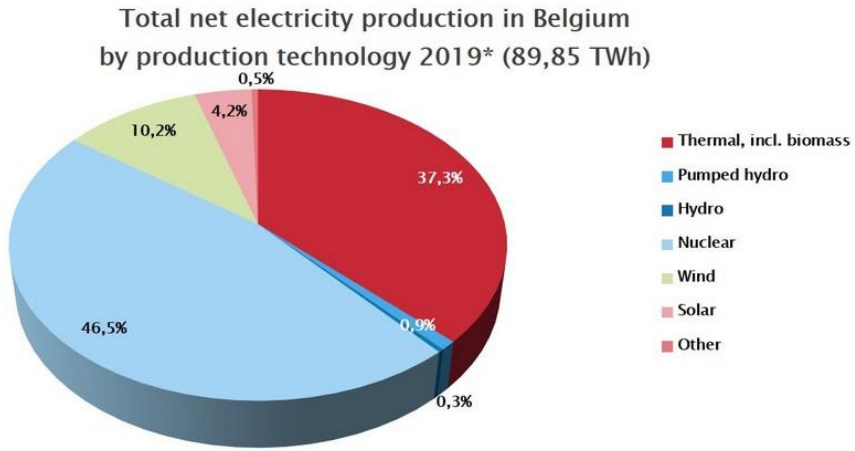
Problem: Must be done in **real time**

ENERGY PRODUCTION

Impact of renewables







More than 35% of production is RES and hardly provides 15% of demand

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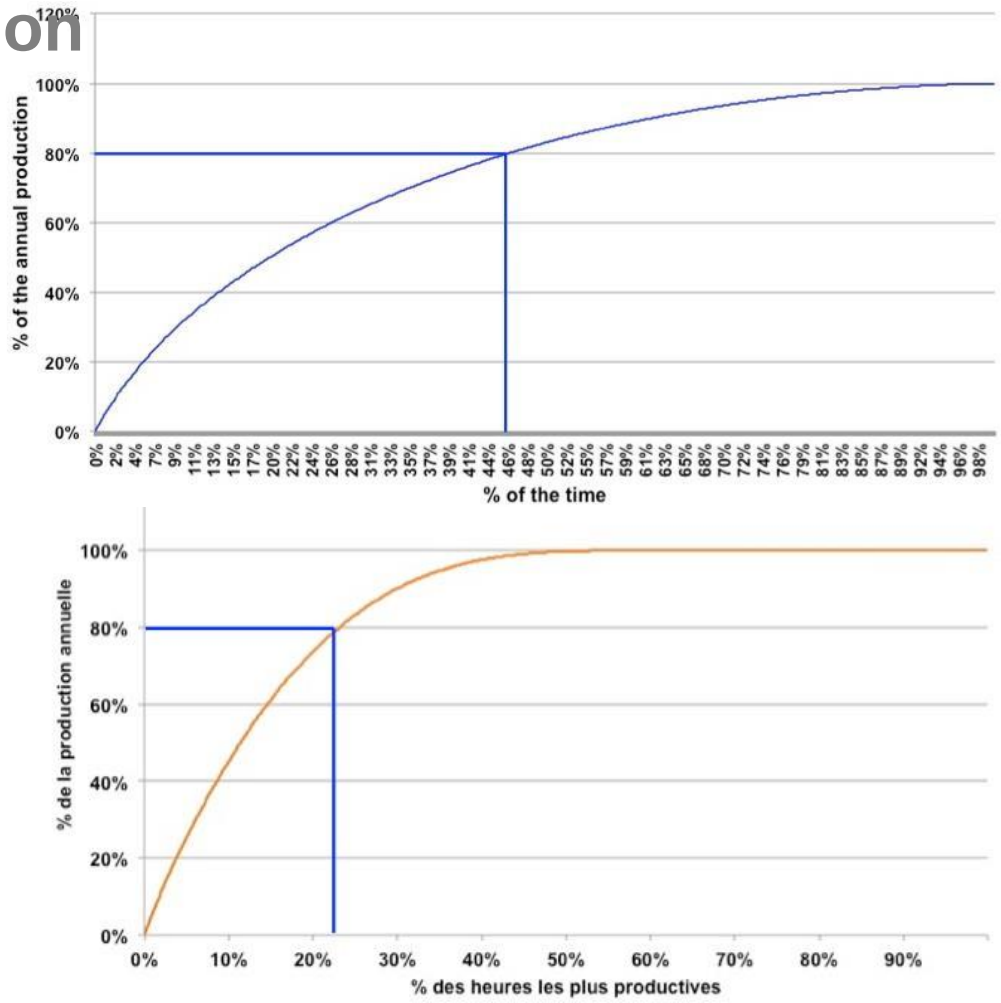
RENEWABLE ENERGY

Reality about renewable energy production

If, with renewable sources, we "only" have 20% energy supply that has to be supplied 55% of the time by wind or 75% of the time by sun, then we have a problem....
"Dunkelflaute' is an originally German term for the coincidence of 'Dunkelheit' (darkness) and 'Windflaute' (windlessness). What can we do to be able to use electricity even during days of "darkness"?



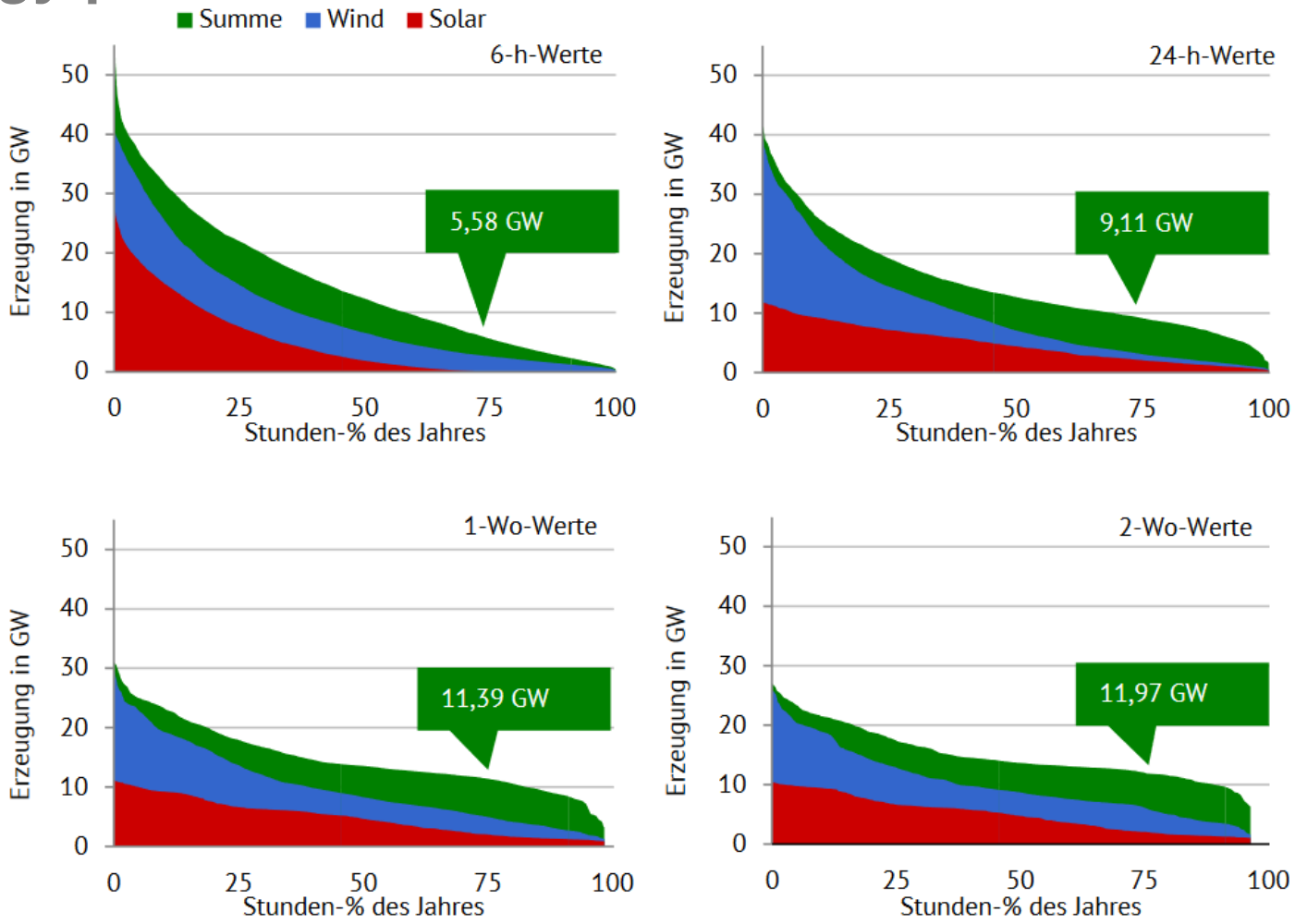
RENEWABLE ENERGY

Reality about renewable energy production

Simultaneity effect of solar and wind production taken at different time bases.

The more averaging takes place, the lower the necessary peak power will be and the more "even" the yield seems to be.

Depending on the time window considered and the averaging, completely different results are obtained



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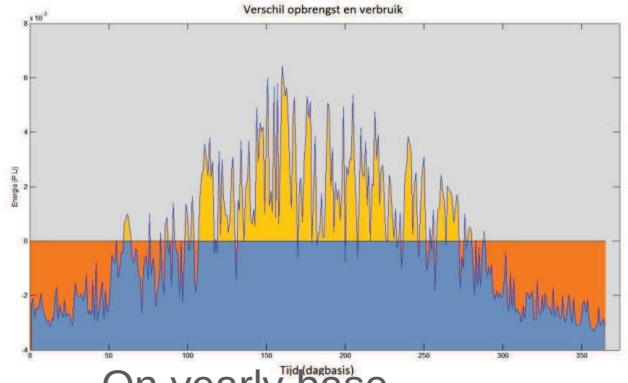
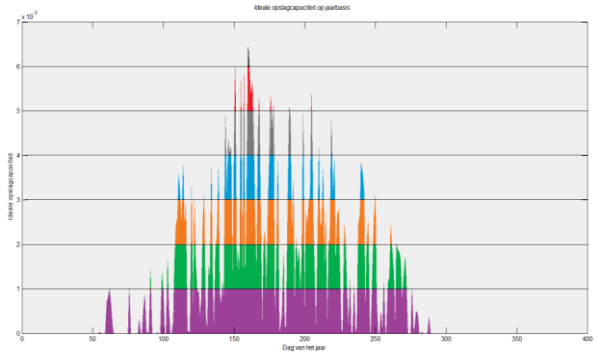
STORAGE

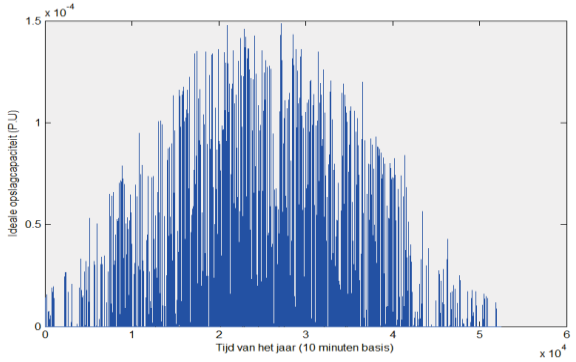
How to deal with storage



On yearly base



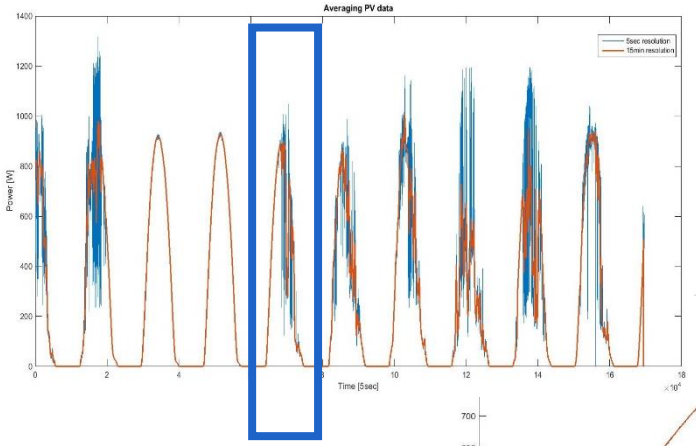
Use of storage on day base

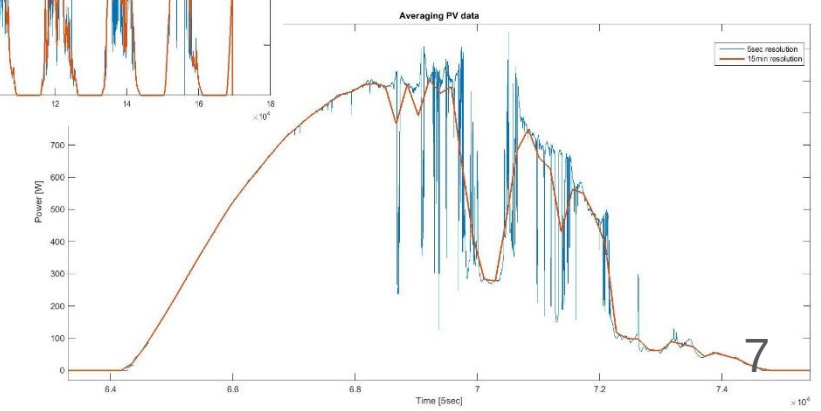


Use of battery on 10’ base

Energy storage highly relevant challenge

- Future technology solutions
- Power (ST) versus energy (LT) storage
- Technological limitation of storage medium
- Utilization





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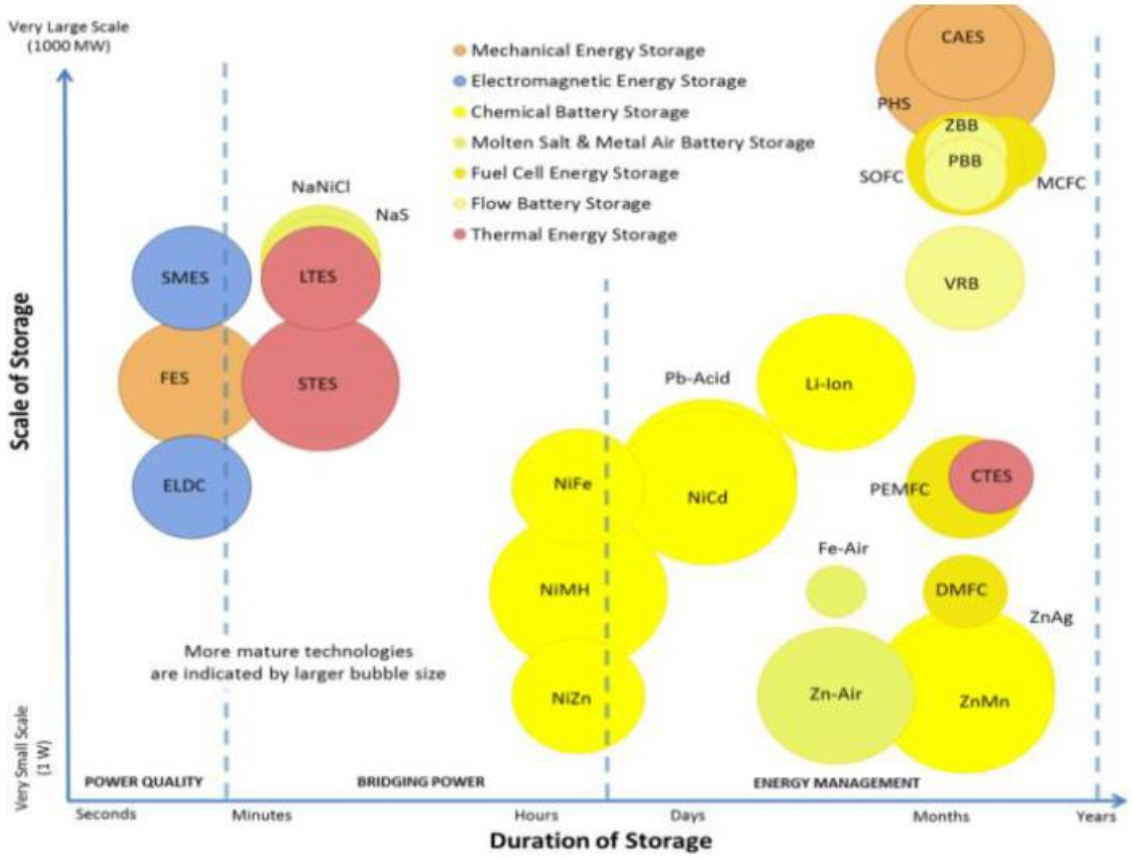
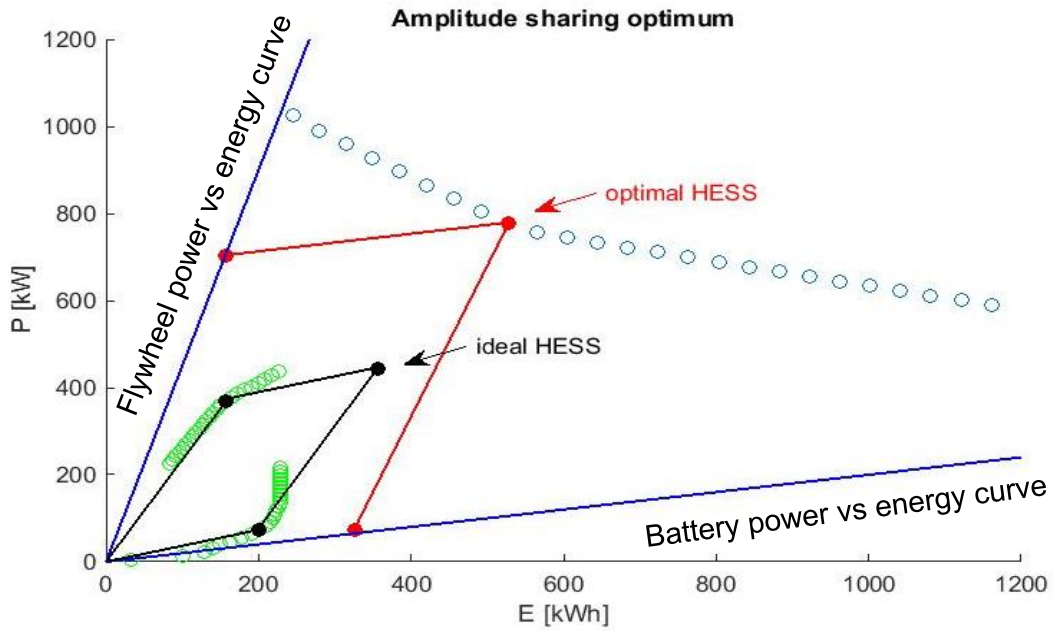
Difference between energy and power storage

- Combining energy and power requirements in both load and yield profiles
- Prepare "merit order" for storage (Ragone plot)
- How long and how fast should I store how much energy for?

Power axis





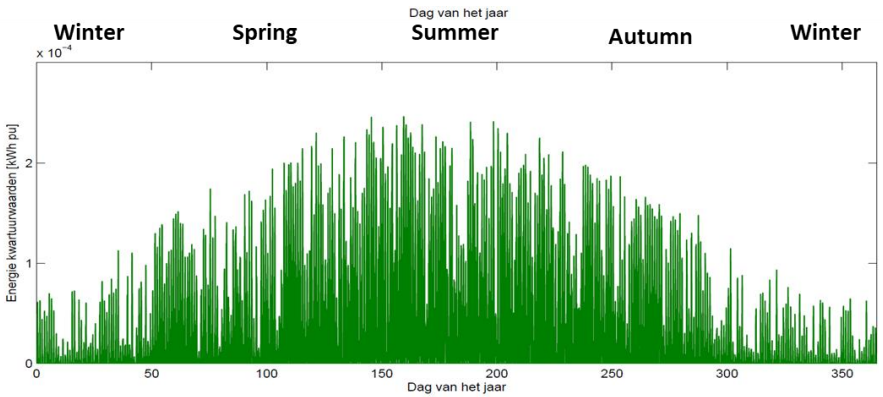
Energy axis

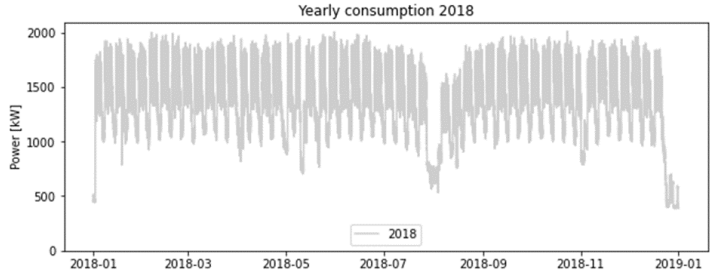
Energy & Power Quality

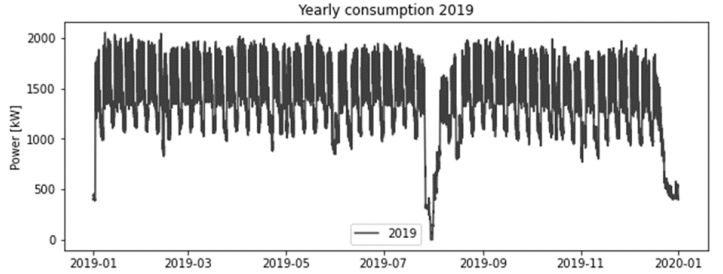
STORAGE

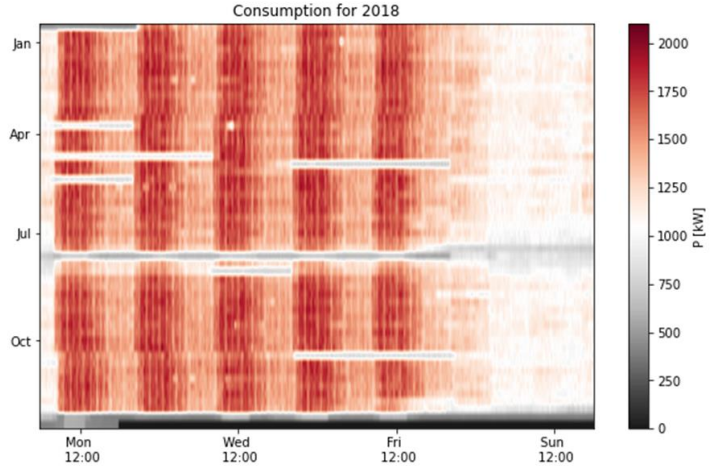
Potential as a function of load profiles

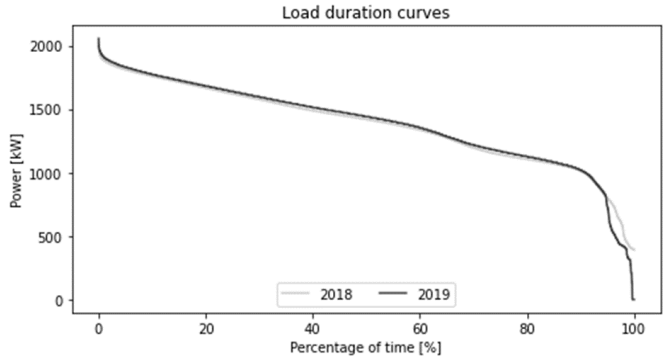
- Analysis of instantaneous consumption profile
- Analysis of the instantaneous yield of RES
- Consumption pattern analysis
- Load duration analysis











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STEPS

STEPS: STORAGE OF ENERGY & POWER SYSTEMS IN NWE

In the last decades a massive growth of distributed power production from renewable energy sources

Stakeholders want to maintain grid stability and optimize their business models

Many SMEs in the NWE area have developed these solutions, but hard to validate their products.

Transnational action is needed to benefit from their innovations, since otherwise, traditional battery products from overseas corporates will outpace them.

Limited access to test beds: Emerging energy storage products often take years to reach pre-commercial TRL. Having access to testing sites is crucial for any SME's pathway to commercialisation and market-access and, ultimately, to drive innovation and job creation in NWE.

Fragmented regulation: Each country has its own energy market regulations which influence a products' technical specifications and the profitability of the business model.

There are three key pillars for creating a transnational environment in which innovative, sustainable and safe energy storage products can be developed more efficiently with maximised commercial usability and international competitiveness:

STEPS

Goal

1 **Regional energy regulation** and legislation will be explored to help SMEs tailor their solutions to foreign market conditions.

2 **Engagement with actual end-users** will take place in form of regional "user-boards" where individual needs for medium capacity storage are analysed and ideal testbeds identified.

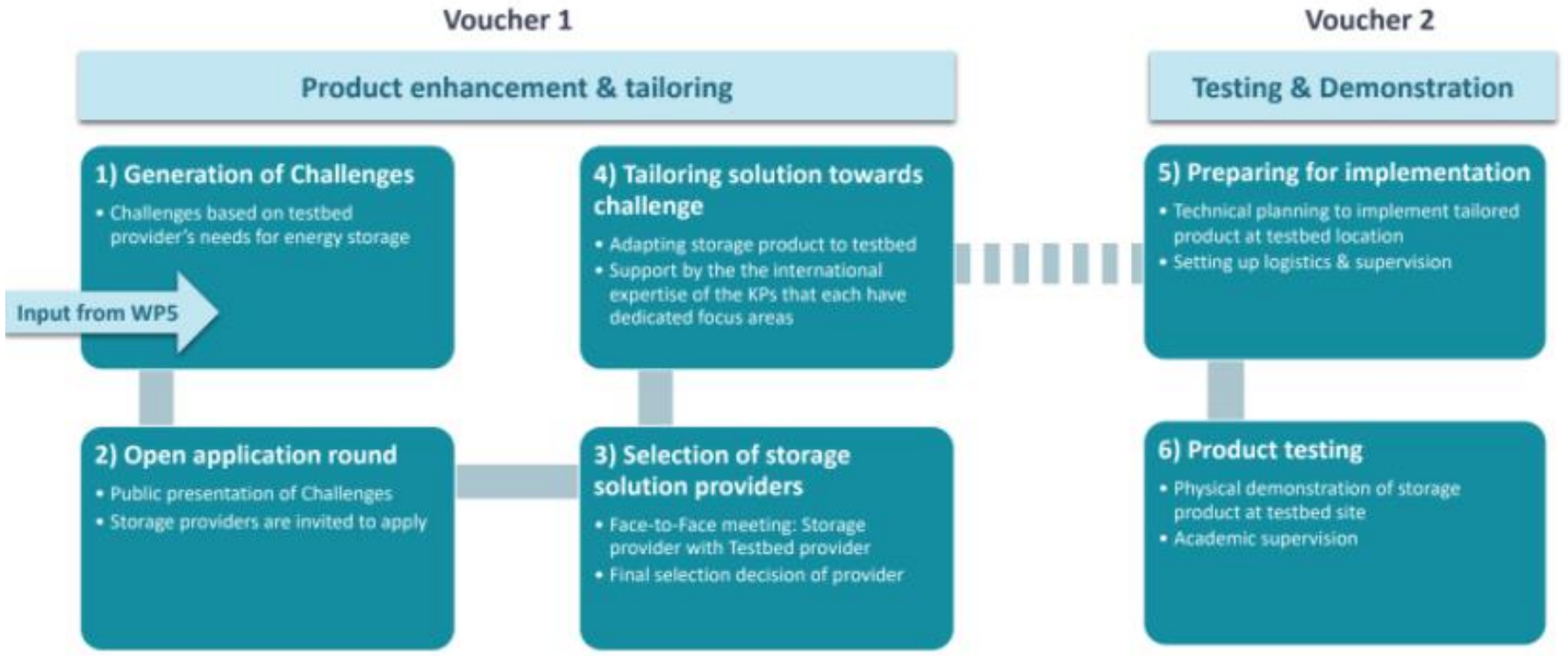
3 **Connecting SMEs with suitable end-users** from all across NWE to demonstrate storage solutions at client testing sites, help reshape their business cases and adapt their technology on a cross-regional level.

To accelerate innovation in medium-scale energy storage, STEPS is planning to bring 25 new storage products & solutions to a pre-commercial level.

STEPS will drive down the time energy storage SMEs typically spend on technology demonstration before reaching market maturity from an average of 5 years to 1-2, while maintaining maximum commercial usability.

STEPS

Business support program



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