Energy Competence Centre

Energy Delta Convention Groningen 2008

System Integration : Track V


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Wind & Gas
Hans Revier:
Energy &
Environment
5A
Knowledge &
Environment
Dave Pinchbeck:
R&D network
ecc
Hans Appel:
SenErgy
Jan Peter Nap:
Energy
Farming
5B
Technology &
Efficiency
Jan de Wit:
Bottom-up

Flexibility needs for the electricity supply

Contribution from gas infrastructure

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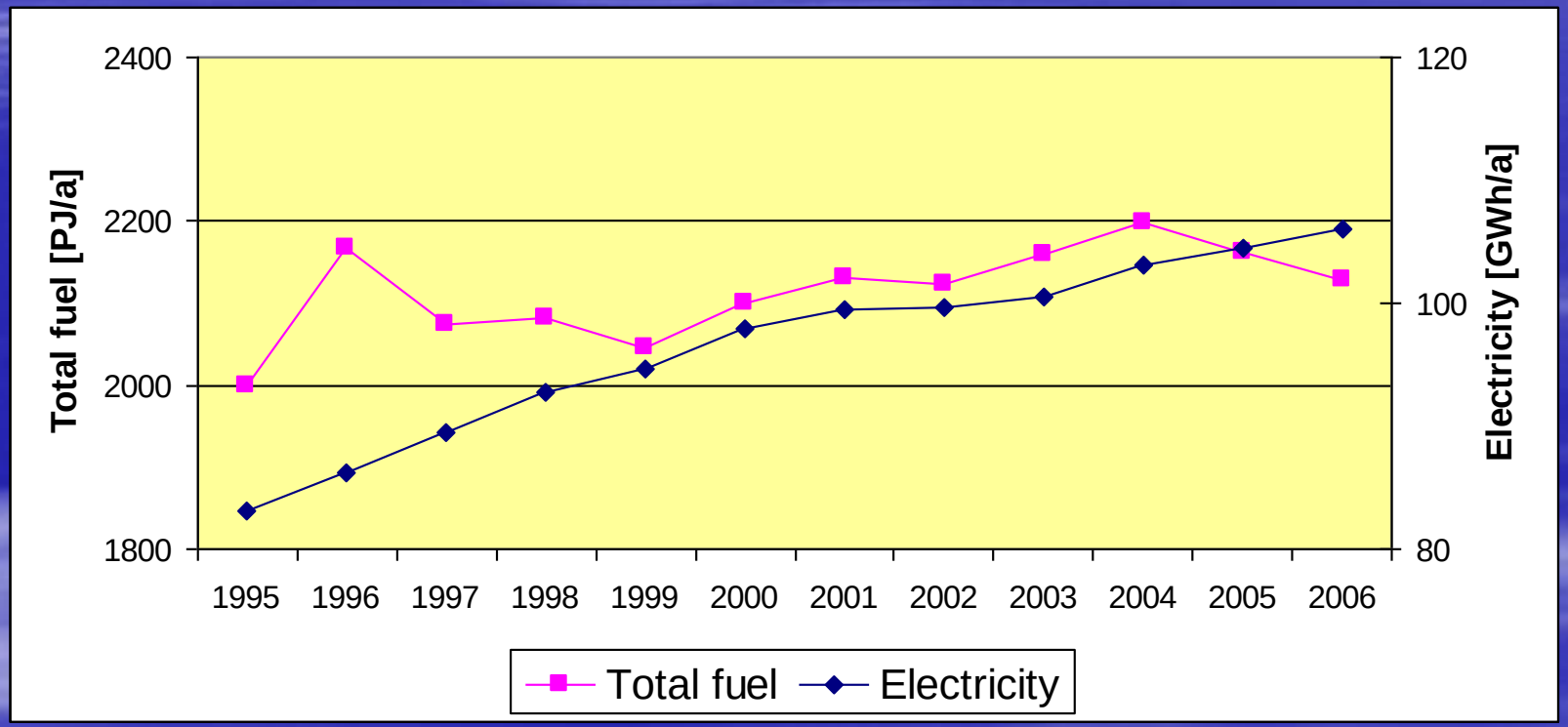
Content

- Energy consumption in the Netherlands
- Wind energy contribution in the Netherlands
- Need for flexibility for the electricity supply
  - Centralised solutions
  - Distributed solution
- Summary
- Concluding remarks

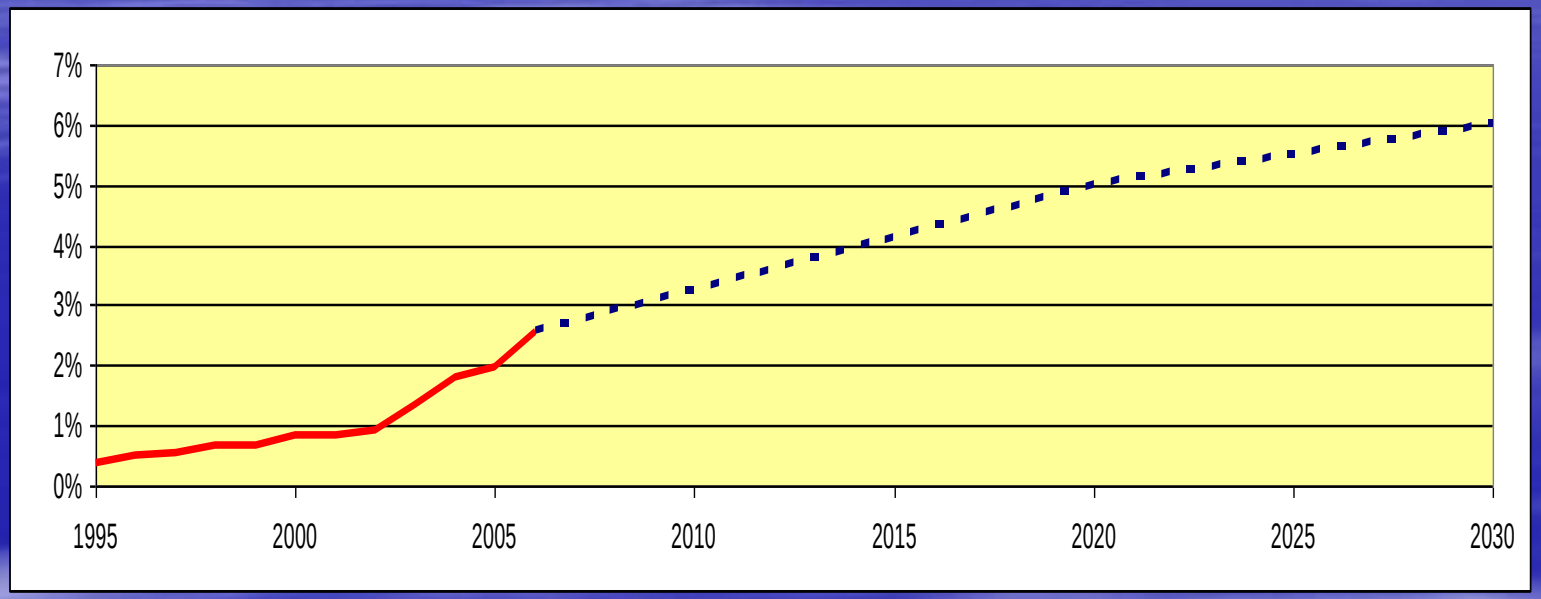
Energy consumption

in the Netherlands; source: eu



Wind energy contribution

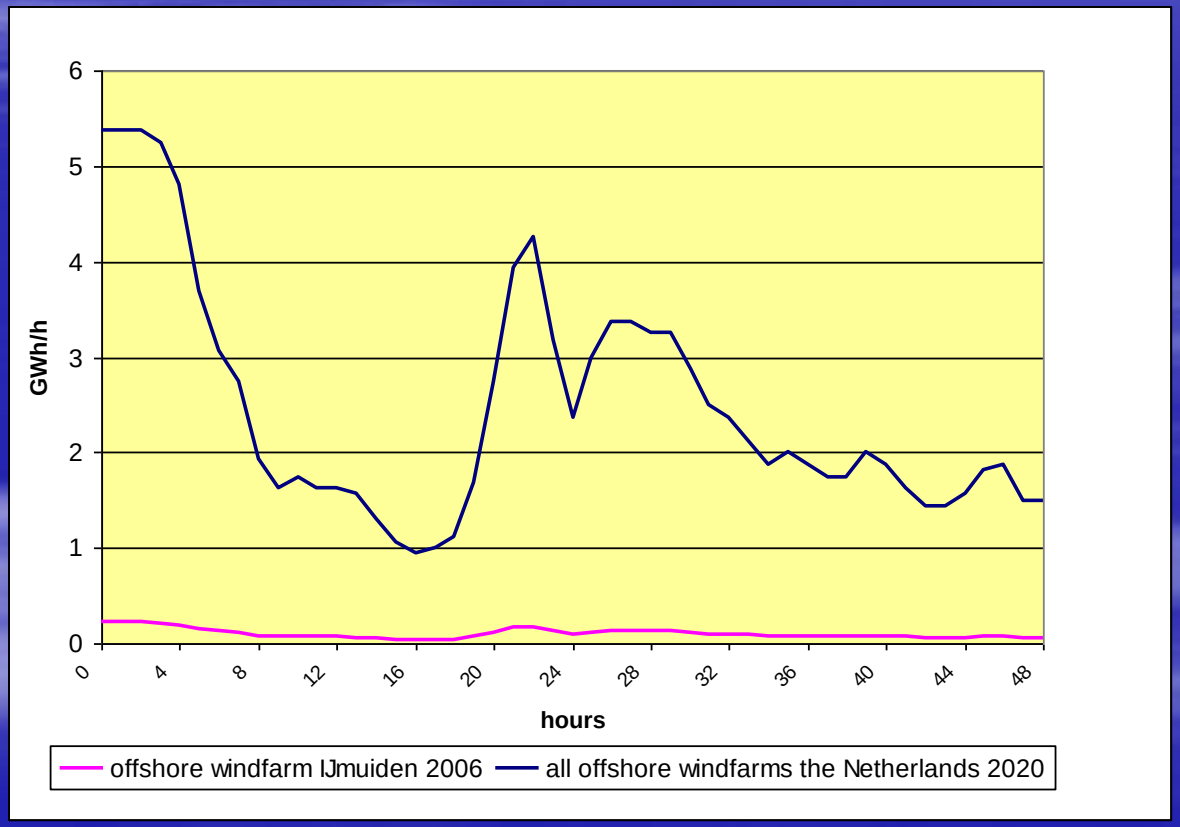
in the Netherlands; source: eu



- 2006 wind 2,6%
- 2020 wind ca 5 % (6000 MW in North Sea)
- 2030 wind ca 6 %

Example of the need for flexibility

- Windfarm IJmuiden 3-4 april 2006: 246 MWh/h
- All offshore windfarms in the Netherlands 2020: 6000 MWh/h



> Leveling is key

Possible solutions

Centralised

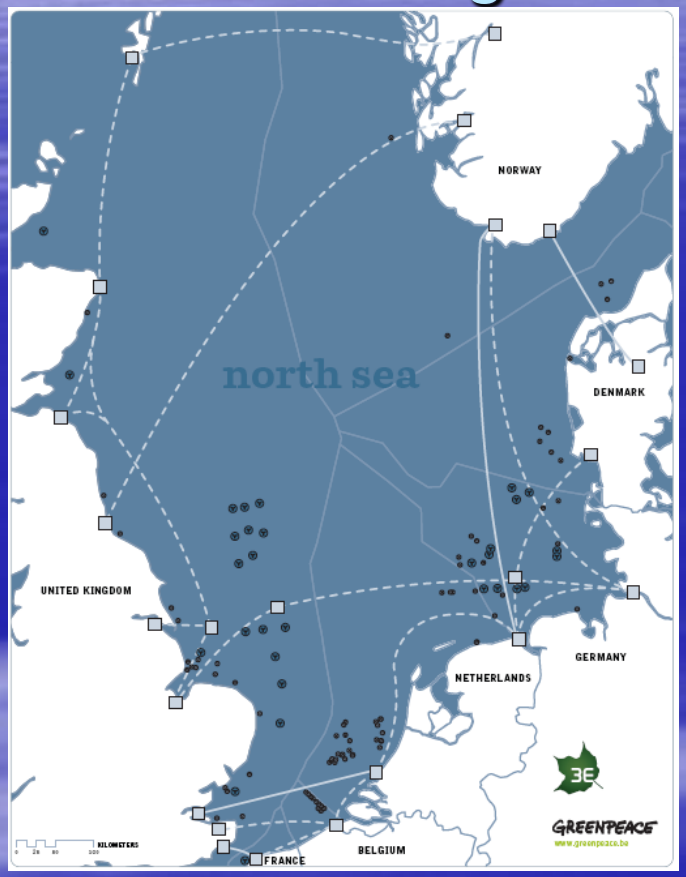
- Interconnecting wind farms (Greenpeace)
- Centralised storage (Lievense)

Distributed generation and storage

- µ-chp + thermal storage

Centralised (Greenpeace)

Interconnecting wind farms at the North Sea



A proposal from Greenpeace and **3E** in the report :

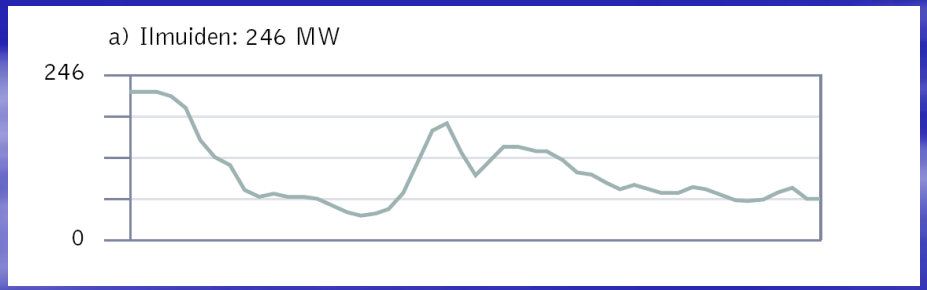
"a north sea electricity grid **[r]evolution"**

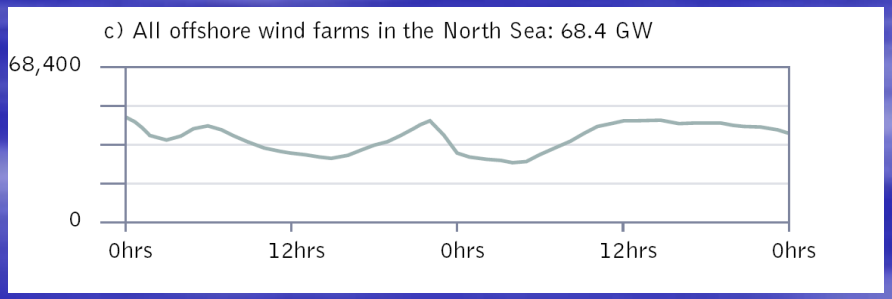
September 2008

Centralised (Greenpeace)

To connect all offshore windfarms of the Netherlands with all offshore farms in the North sea;

- About 6200 km grid line needed; costs 15 – 20 Billion Euro
- Investment for the Netherlands ca 2.5 Billion Euro





Advantages of interconnecting windfarms (Greenpeace)

- in the past by the need of interconnectors for security of supply and long-term trade,
- today by the demand for trade and the subsequent requirement for commercial interconnectors
- in the future by the need for grid connection of multi-gigawatt wind farm clusters far from shore

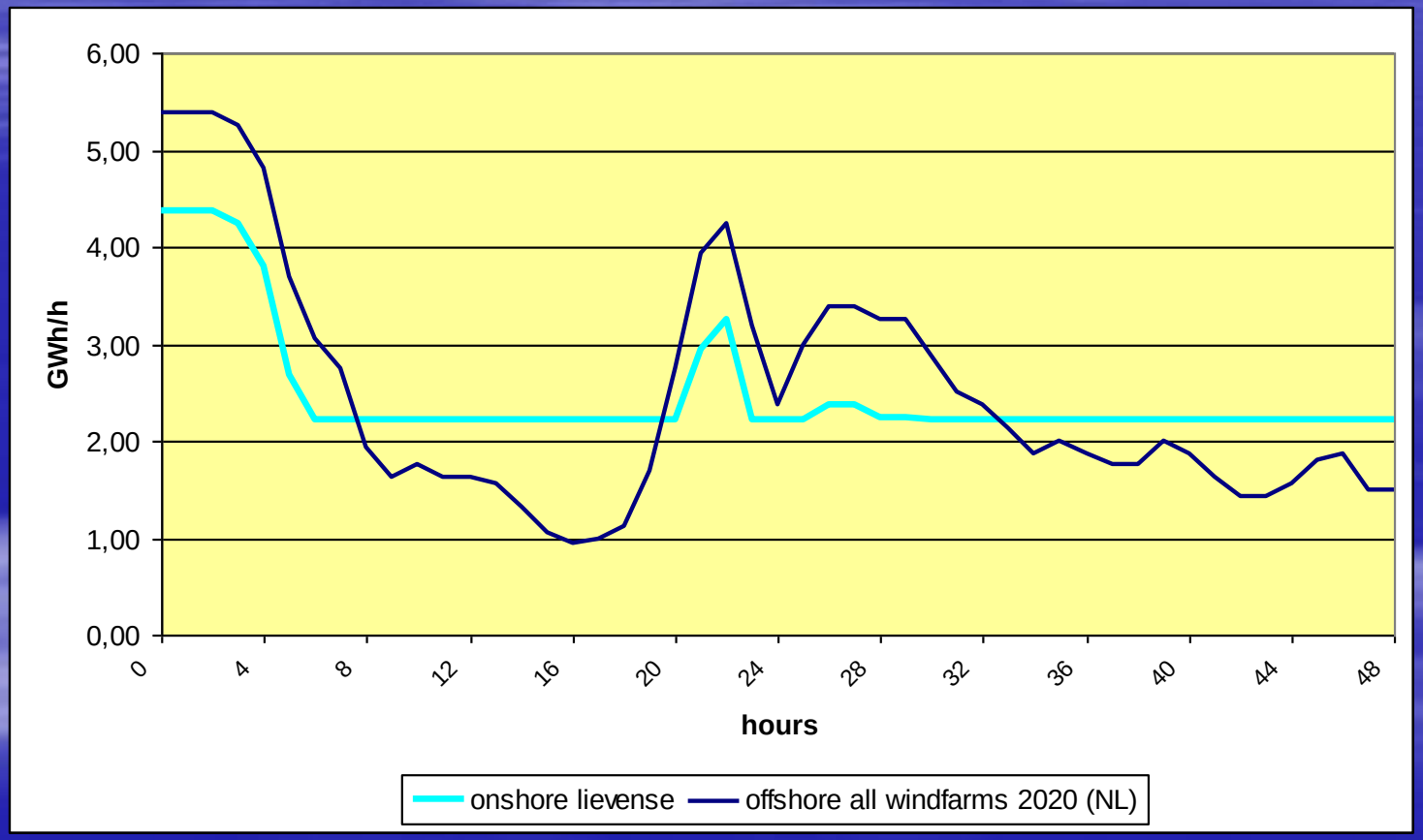
Centralised (Lievense)

Pumped hydro accummulation (PAS)

- 1500 MW of power supply average during at least 12 hours (2 million households)
- Investment euro 2.65 billion (quoted)

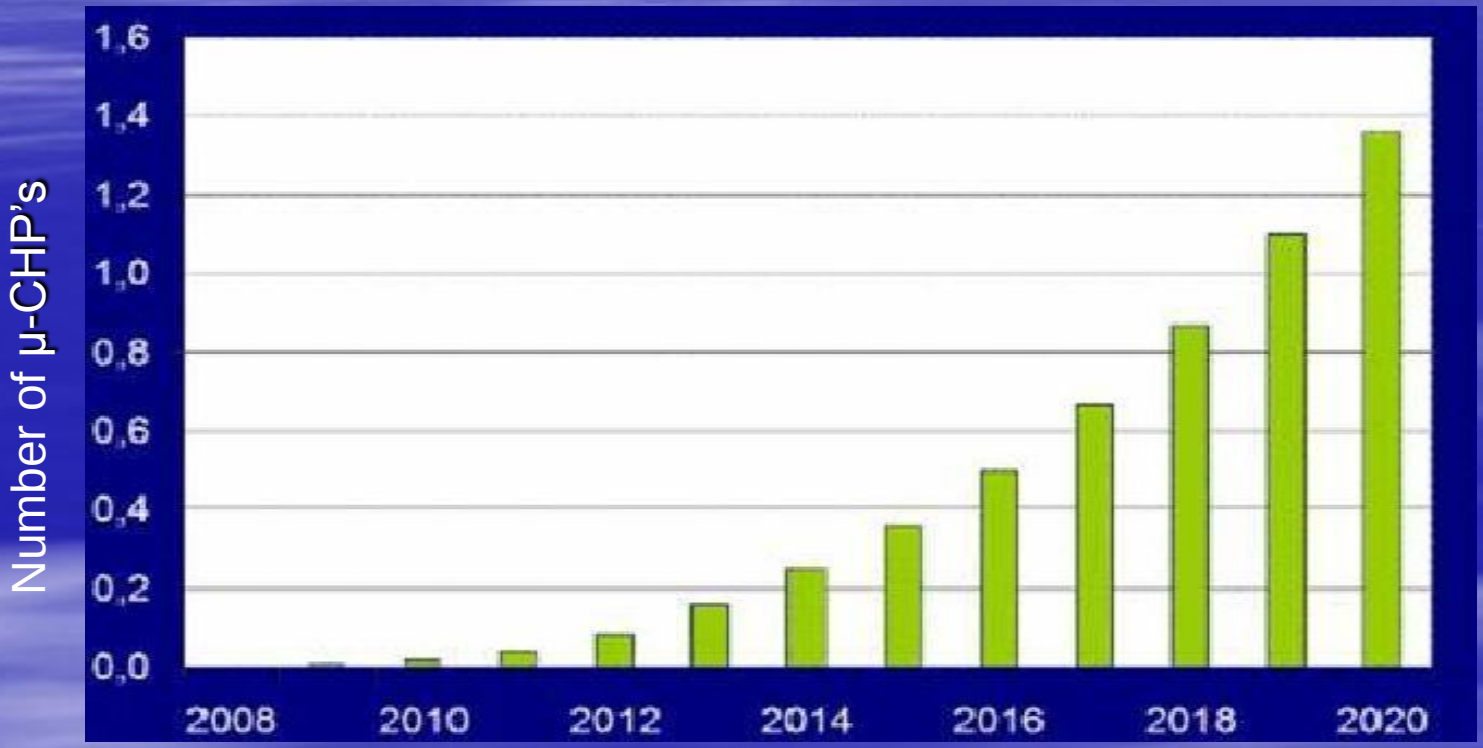
Centralised (Lievense)

Pumped hydro accummulation (PAS)



Distributed generation and storage

µ-CHP market development in the Netherlands
(source GasTerra 2008)



- 2020 1,3 million µ-CHP's
- 2030 4 million µ-CHP's

µ-CHP's

Needed E_{th} hot tap water / day: 11 kWh_{th}

Characteristics µ-CHP's:

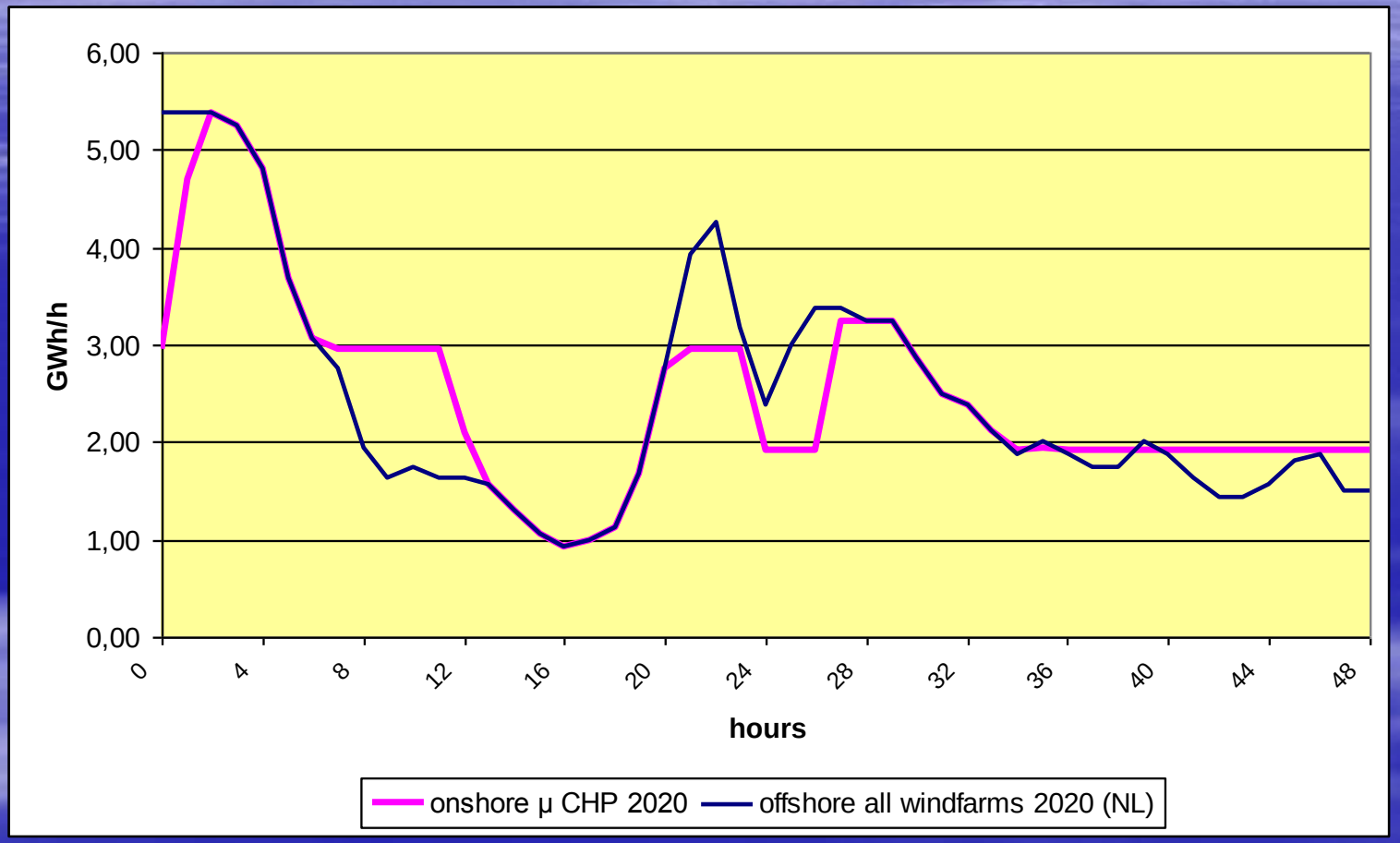
- Ratio Heat/Power = 2.5/1
- Storage capacity 0.20 m^3

Per day:

- Heat 11 kWh_{th}
- Power 4,5 kWh_{el}

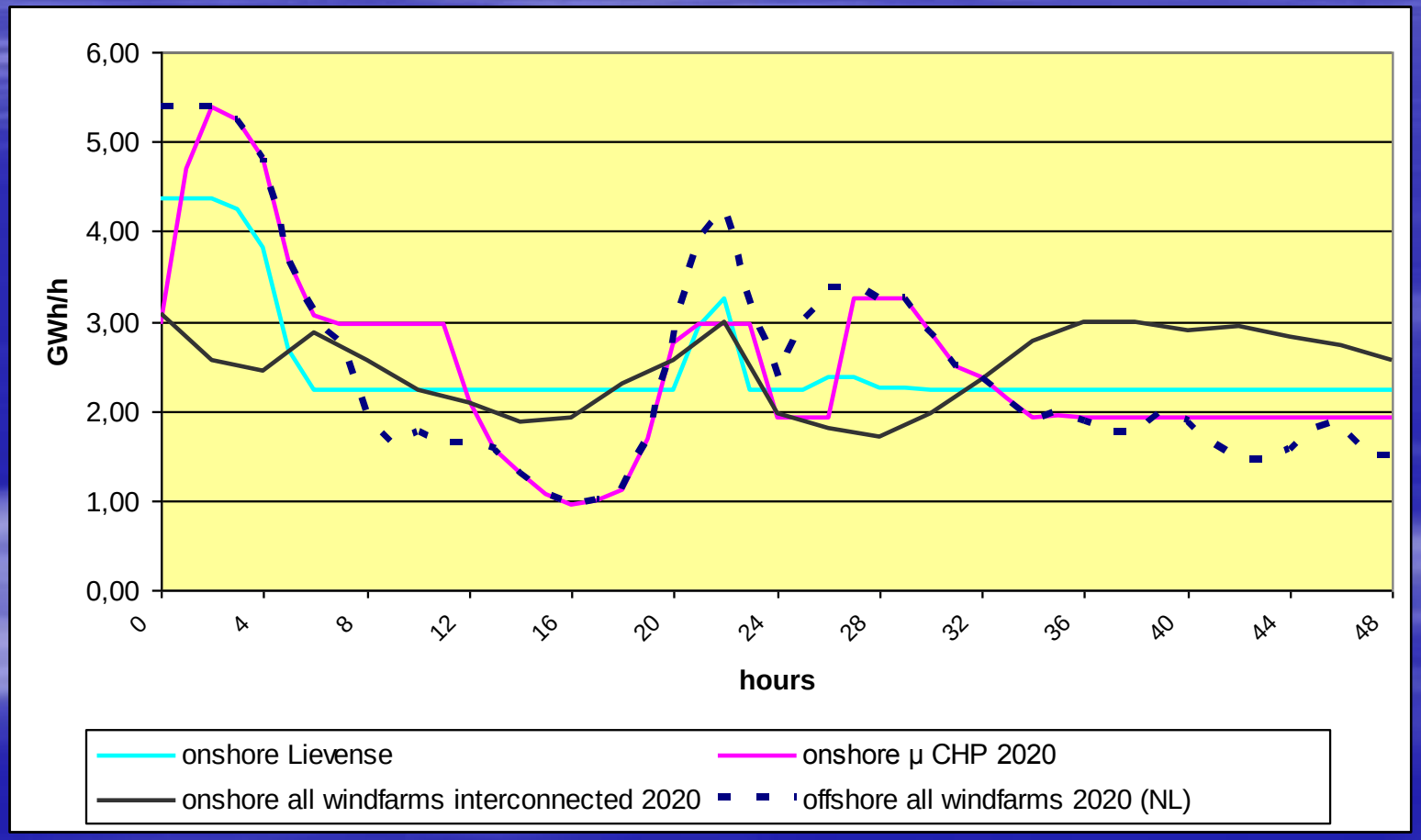
2020: 1,3 million µ-CHP's

Distributed generation and storage

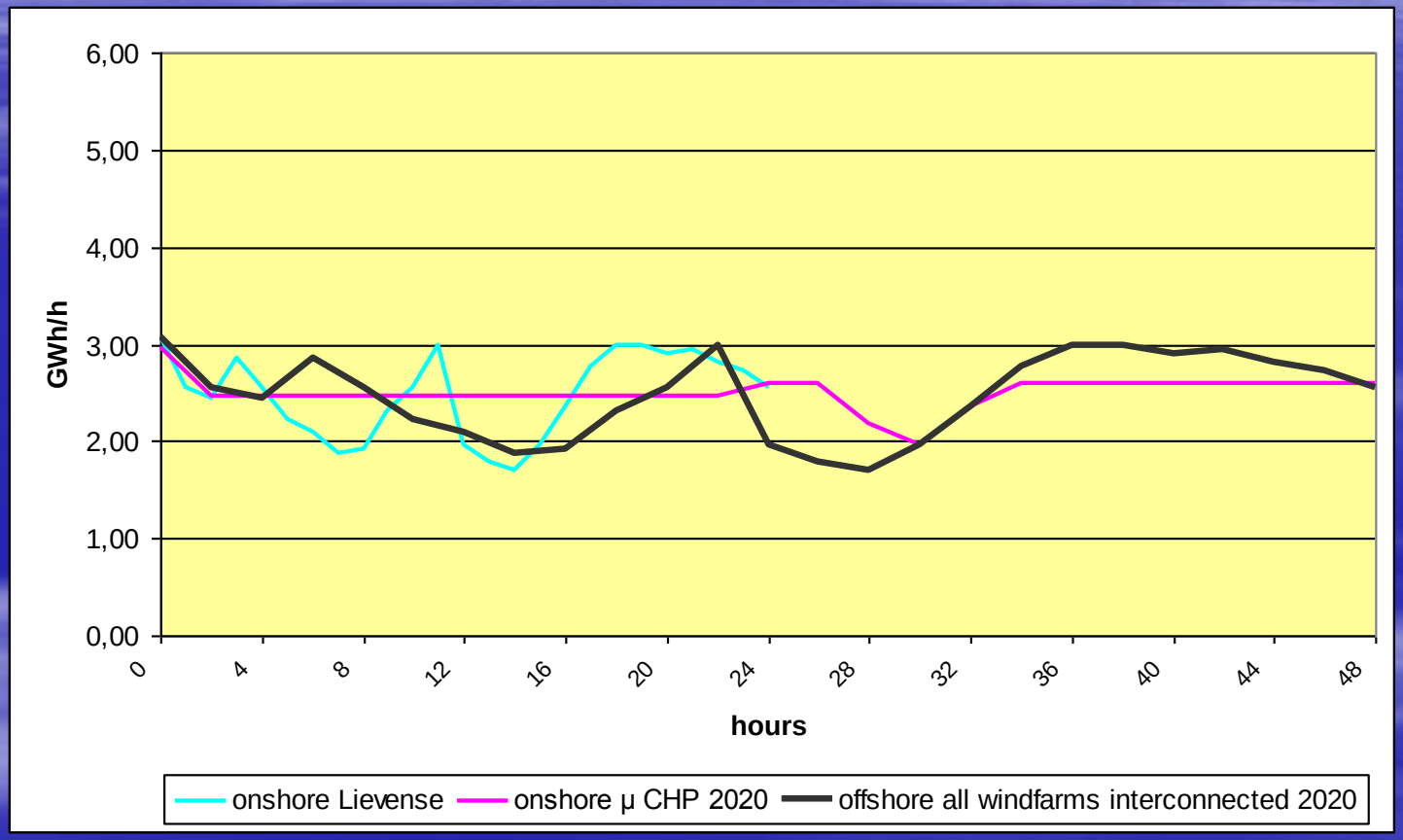


Comparison

Interconnecting windfarms; central storage; µ-CHP



Interconnecting windfarms combined with central storage (Lievense) or µ-CHP 2020



Interconnected offshore windfarms + µ-CHP a perfect match!

Storage capacity Lievense too much!

Occupation degree

Lievense / μ-CHP

	Lievense	μ-CHP
storage	20 GWh_{el}	5,6 GWh_{el}
Occupation degree	57%	100%

Conclusions

Connecting windfarms (Greenpeace)	Central storage (Lievense)	µ-CHP
Investment 2,5 Billion €	Investment 2,65 Billion €	Investment None

Concluding remarks

- Comparison qualitative
- μ-CHP competitive for flexibility
- Interconnected offshore windfarms + μ-CHP a perfect match
- Strategic for natural gas facilitating sustainability
- Extra investment in heat storage?
- Electricity storage?
- Increasing electric mobility?

Suggestion 1: work out strategy case of natural gas adding flexibility to the electricity supply

Suggestion 2: to define R&D and innovation to make the case a reality