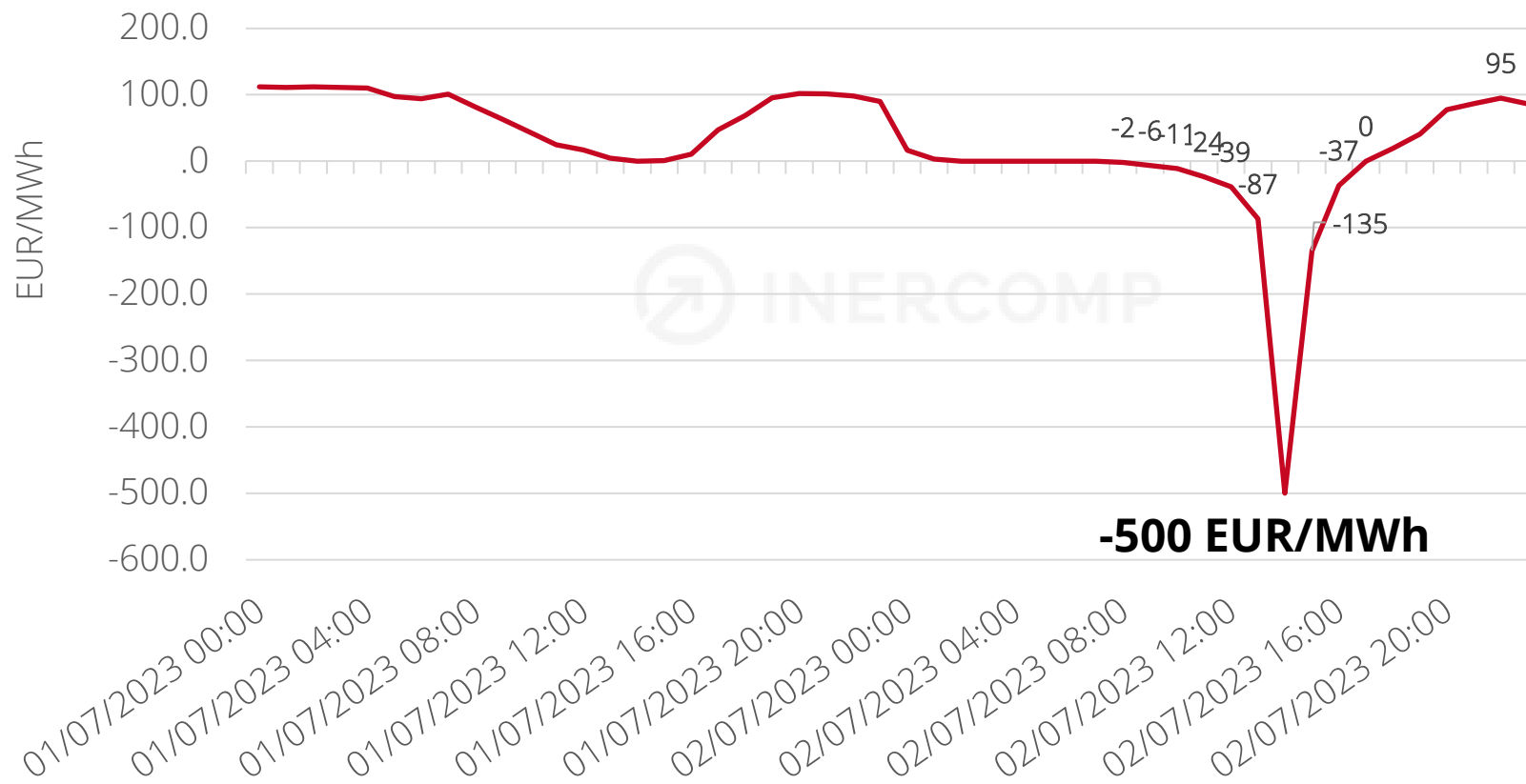


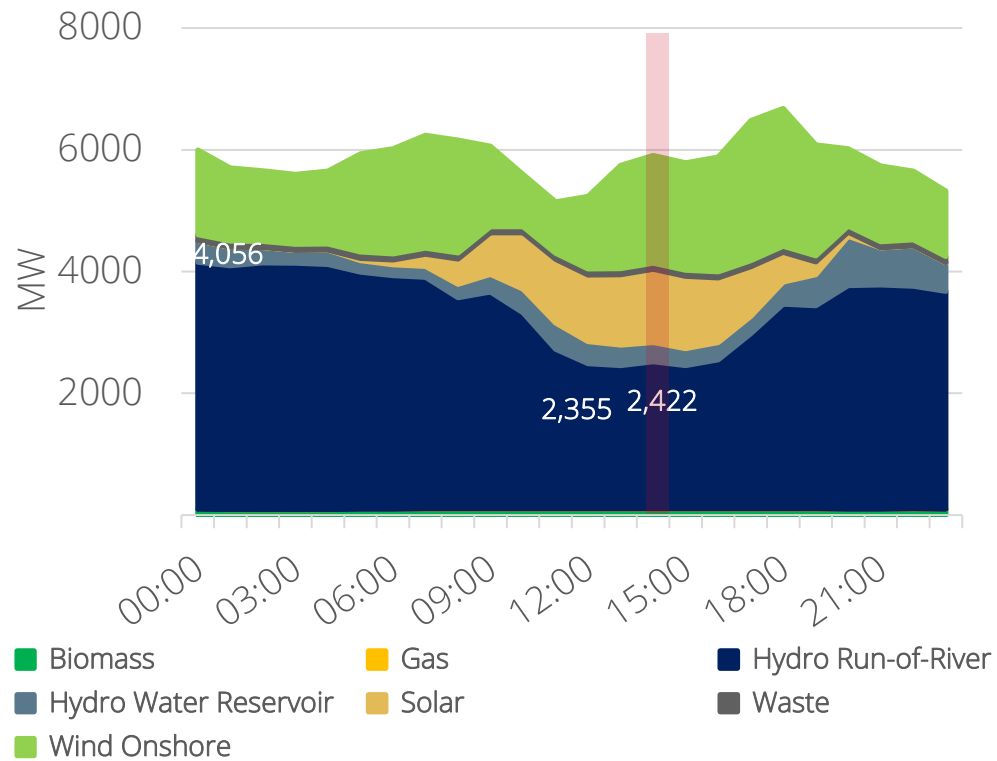
## Austrian Day-Ahead Power prices – 01.07.2023 – 02.07.2023



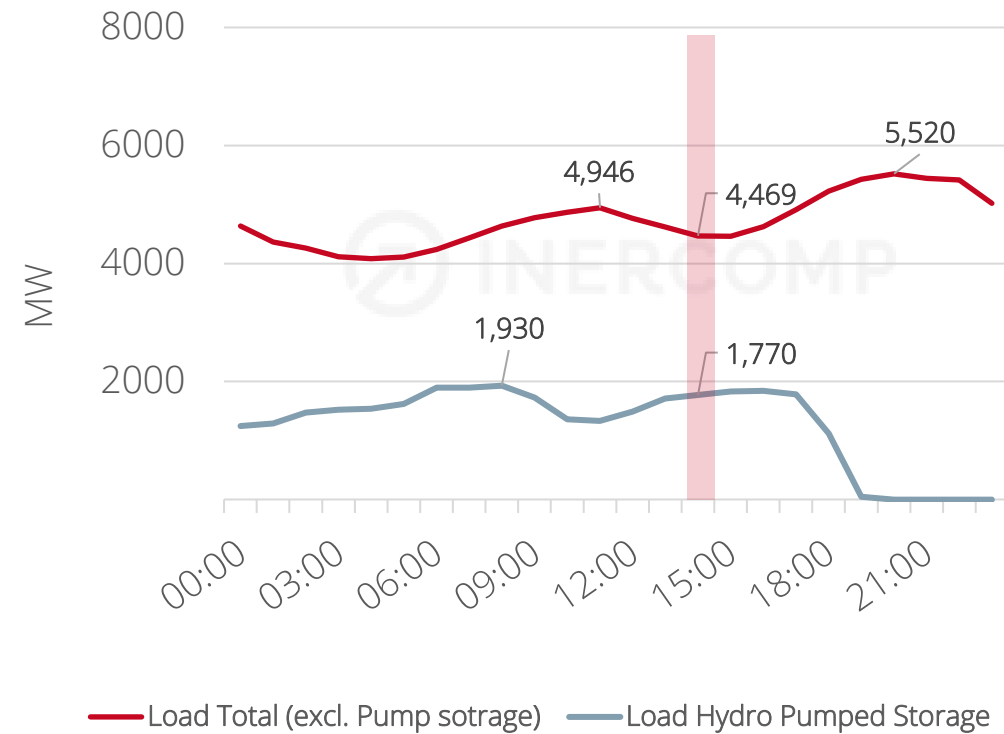
- ⊕ Lowest possible price (due to SDAC rules)
- ⊕ Auction was redone – order books were opened again and additionally offers were allowed
- ⊕ Despite the second auction around, the price remained at -500 EUR/MWh

# Electricity System Austria - 02.07.2023

## Generation



## Load



# Demand side flexibility – P2H

Christoph Zehetner

27.09.2023

## Industrial process heat and P2H

- ⊕ In 2020, **22% of the total energy demand** in Germany was used for **industrial process heat** (*numbers for Austria not available*) – the majority of this heat was being provided by gas boilers or combined heat and power plants (CHP)
- ⊕ **Power-2-Heat (P2H)** is a potential substitution for gas boilers for providing industrial process heat. P2H is a form of **direct electrification** of industrial processes, and therefore also helps decarbonising industries. P2H plants are available with a capacity of up to 60 MW.
- ⊕ P2H is characterised by comparably **low investment cost** (150k-200k EUR/MWh), an **efficiency rate close to 100%** and a very **high degree of flexibility** (30 sec from 0 to max load)

## Steam cost comparison 2024 – Baseload

### Power2Heat

Energy cost	131,40 EUR/MWh
Grid and taxes	11,50 EUR/MWh
<b>Total</b>	<b>142,90 EUR/MWh</b>

**99%**  
Efficiency

**144,40 EUR/MWh**

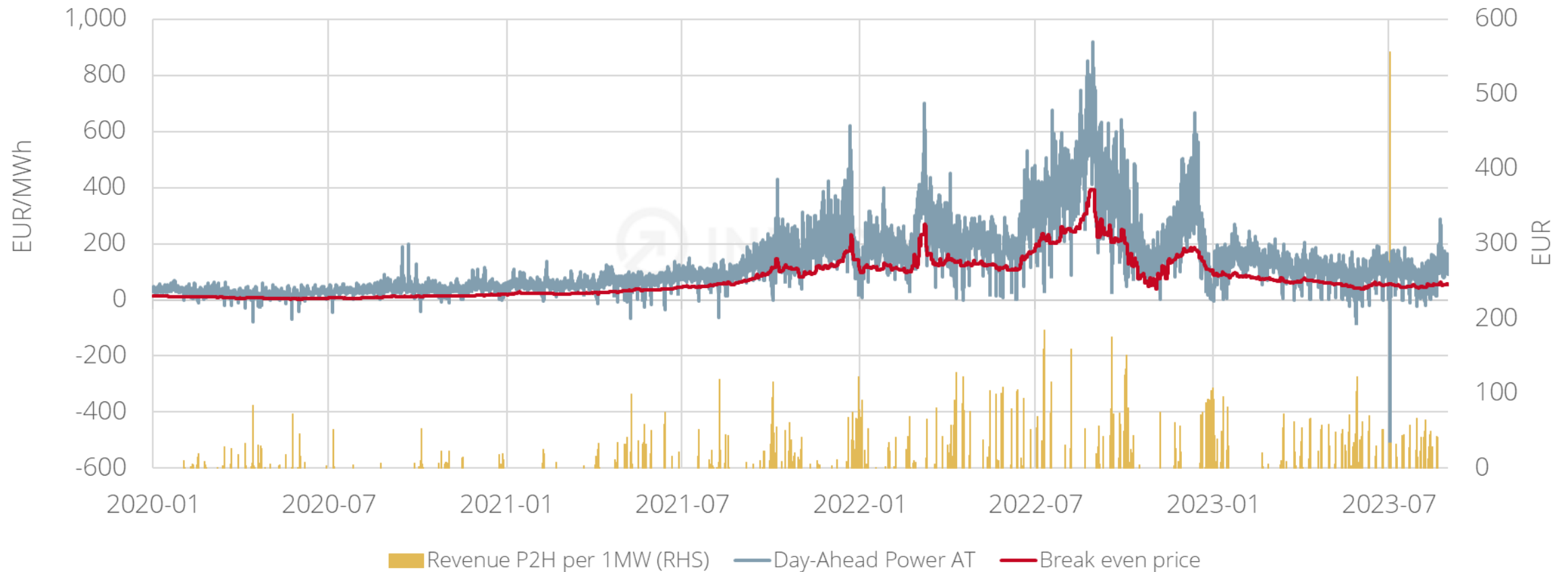
### Gas boiler

Energy cost	50,40 EUR/MWh
Grid and taxes	5,10 EUR/MWh
CO2	16,50 EUR/MWh
<b>Total</b>	<b>72,00 EUR/MWh</b>

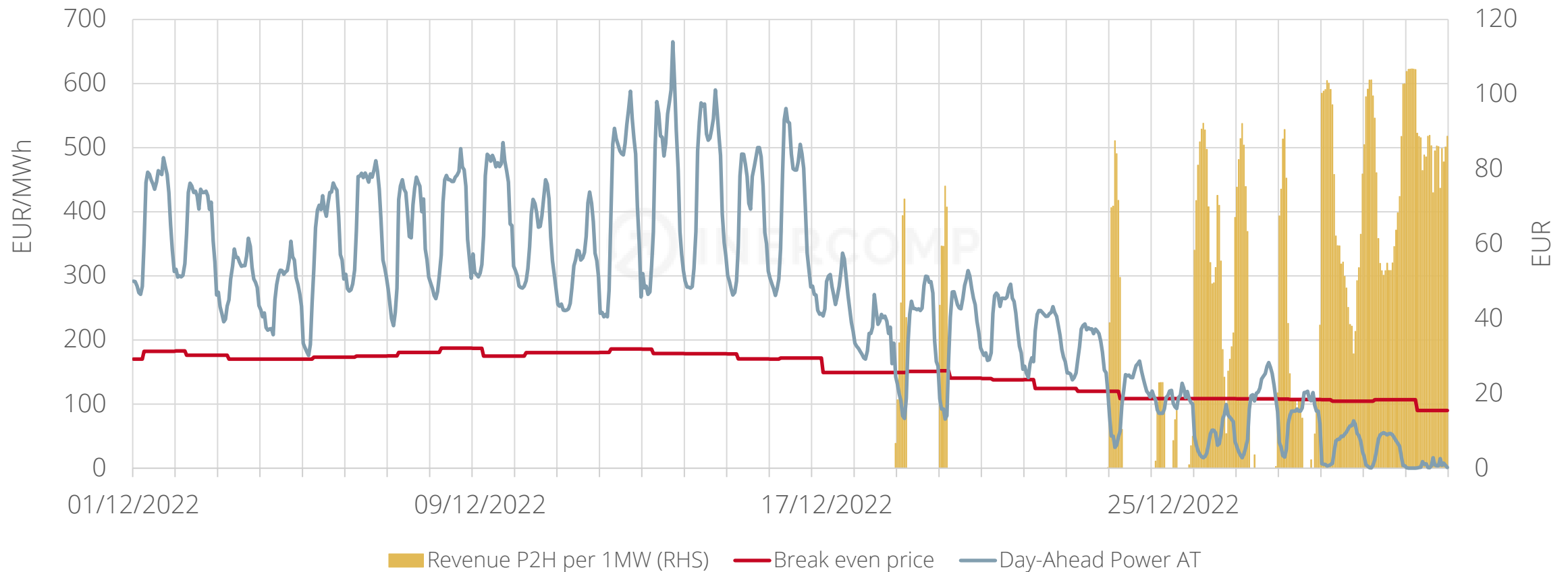
**84%**  
Efficiency

**85,70 EUR/MWh**

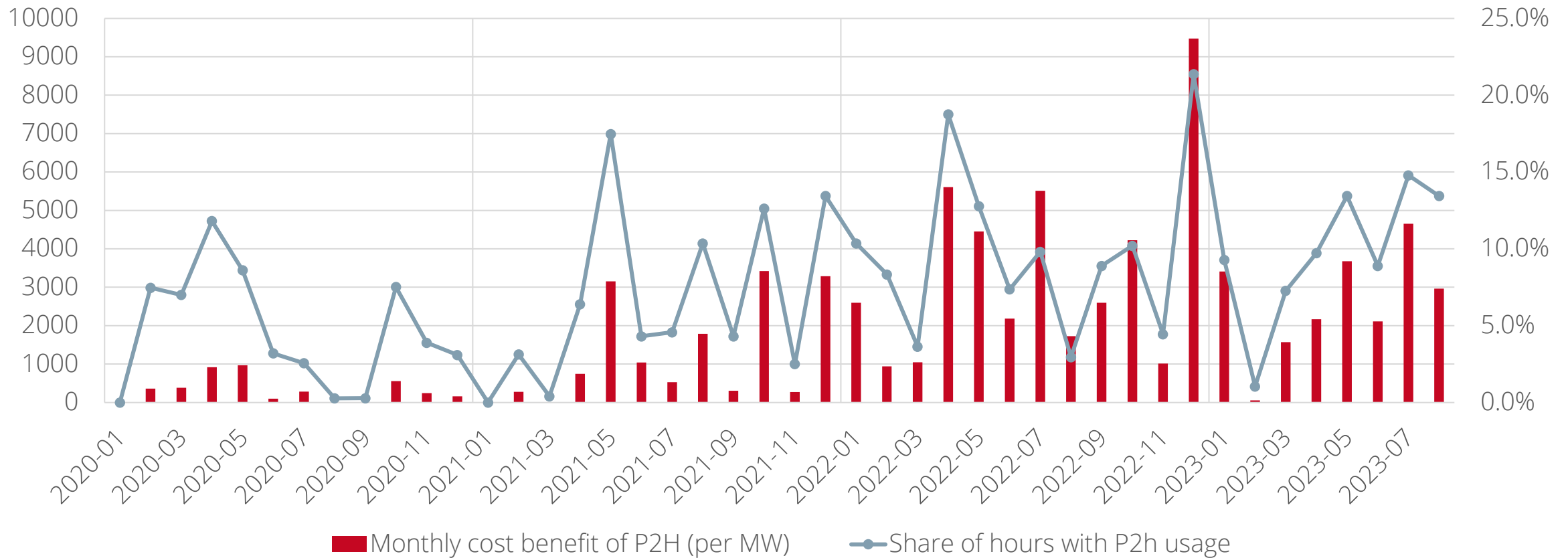
## Advantage of P2H based on hourly basis (2020 - 2023)



## Advantage of P2H based on an hourly basis (December 2020)

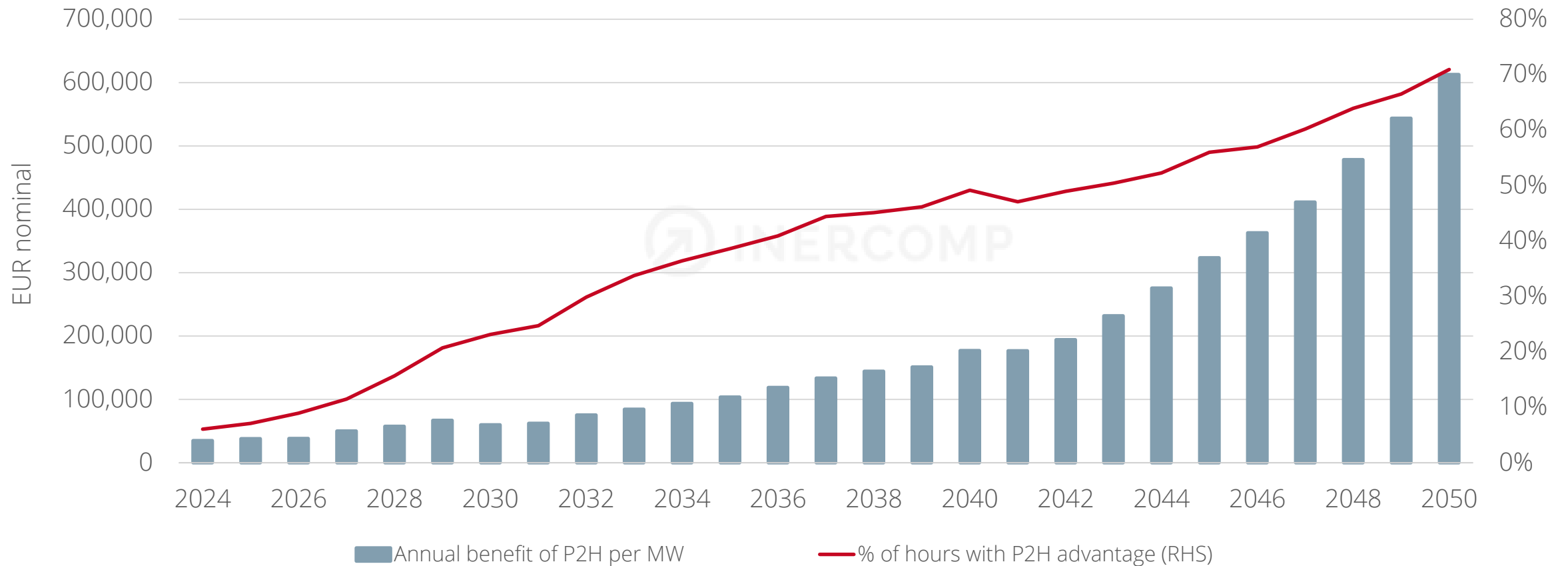


## Monthly cost benefit of P2H since 2020





## Usage of P2H until 2050 – Based on „ICIS’ long term fundamental model“



## Major hurdles for the implementation of P2H

- ⊕ Capacity based grid cost
  - Upper Austria, voltage level 3 (Netzebene 3): 19.800 EUR/MW/a
  - Does the current grid tariff structure, which has been developed for a power system based on conventional baseload power plants still make sense in a power system with an ever growing share of volatile renewables? – *Need for regulators & politics to change the framework for grid cost!*
  
- ⊕ Physically, available grid capacity
  - Grid capacity is already now a bottleneck for the deployment of renewables – large scale electrification would intensify that bottleneck and would need significant lead time and coordination with the respective DSOs

## Last but not least...

- ⊕ The high degree of flexibility makes P2H the perfect asset for balancing energy markets, especially for negative „automatic Frequency Restoration Reserve“ (aFRR)
- ⊕ This market shows exceptionally high revenue potential in the last months
  - The average remuneration per MW (including avoided gas and CO2 cost) was around 350.000-400.000/a
- ⊕ This offers the opportunity to swiftly amortize this asset – to address opportunities of the future spot market whilst simultaneously decarbonizing industrial production.

# Thank you for your attention. Happy for all questions and remarks!

## **Inercomp GmbH**

Gersthofer Strasse 29-31  
1180 Vienna, Austria

+43 1 470 23 22  
office@inercomp.com  
www.inercomp.com

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