



Moving towards zero carbon energy for data centers

100% of electricity
100% of the time
matched by zero-carbon purchases

Rob Elsinga – Microsoft
Paul Hauptmeijer – FlexiDAO
Remco Faas - Eneco



Microsoft will be carbon negative by 2030 and will remove all historic emissions emitted either directly or via electricity consumption by 2050



Sustainability Goals by 2030

Carbon negative

Zero Waste

Water positive

Restore more land than we use

Microsoft data centers are key to our sustainability goals



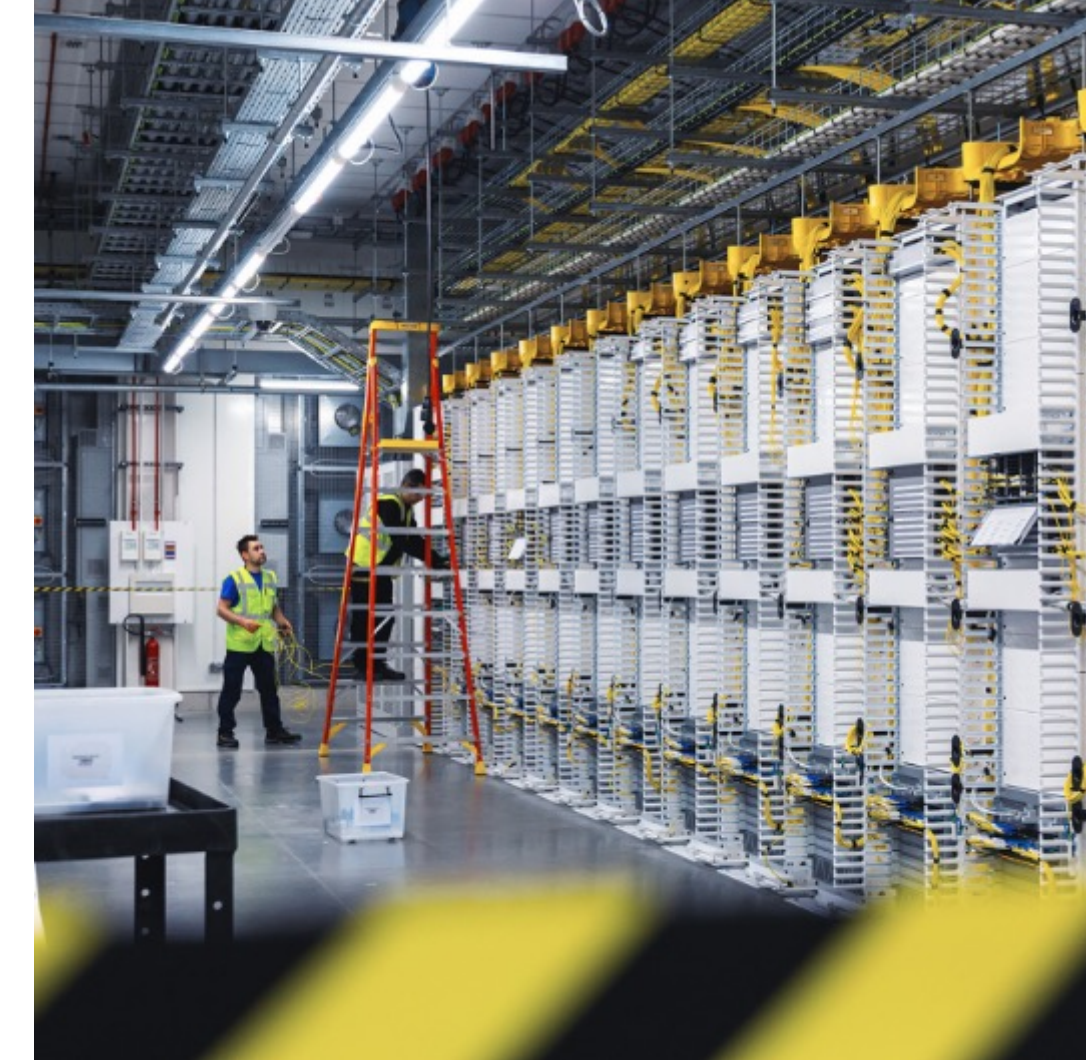
Microsoft has purchased **270 MW of renewable energy in the Netherlands** to support our facilities: 180 MW from the Vattenfall Wieringermeer wind farm and 90 MW from the Borssele 3/4 Eneco wind farm.

Microsoft's North Holland data centers had a **12-month average PUE of 1.14 through July 2021**. Lower PUE (Power Usage Effectiveness) indicates more energy efficient data centers, These data centers are 2X as energy efficient as average customer data centers



Microsoft uses air cooling in our Datacenters in the Netherlands. This method uses **outside air instead of water** for cooling at temperatures below 25 degrees Celsius, reducing water use to less than five percent of the year.

Microsoft's water storage facility uses recycled water from the cooling system. With ECW we intend to collect rainwater for reuse



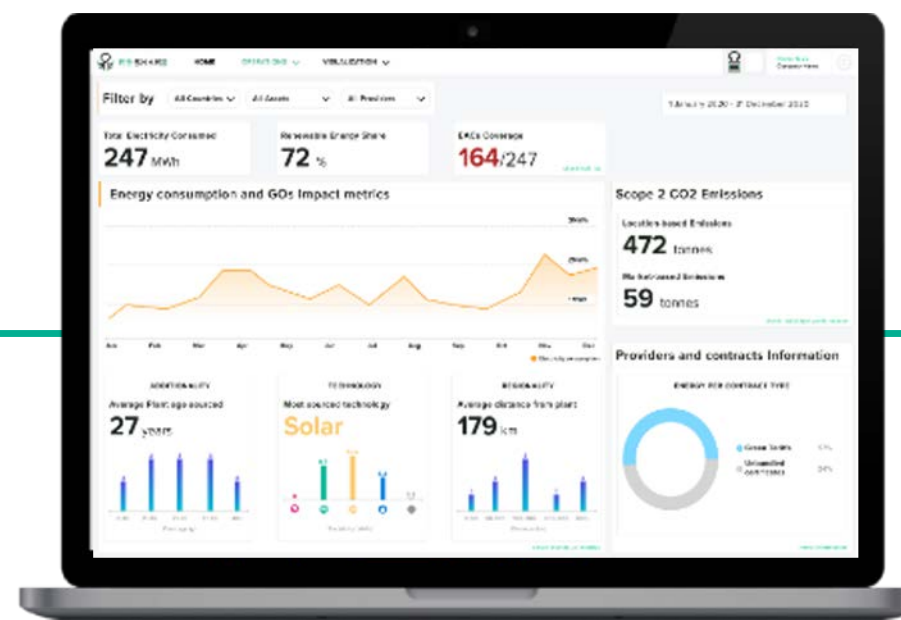
In 2020, we successfully opened our first **Microsoft Circular Center** in our North Holland data centers, which is designed to extend the lifecycle of servers through reuse and thereby support a circular economy for our Cloud.

In March 2021, nearly **82% of the waste from our Dutch data centers was diverted from landfills**. By 2025, 90 percent of the servers and components within our regional data center network will be reused.

Microsoft's 100/100/0 vision and commitment for a decarbonized grid



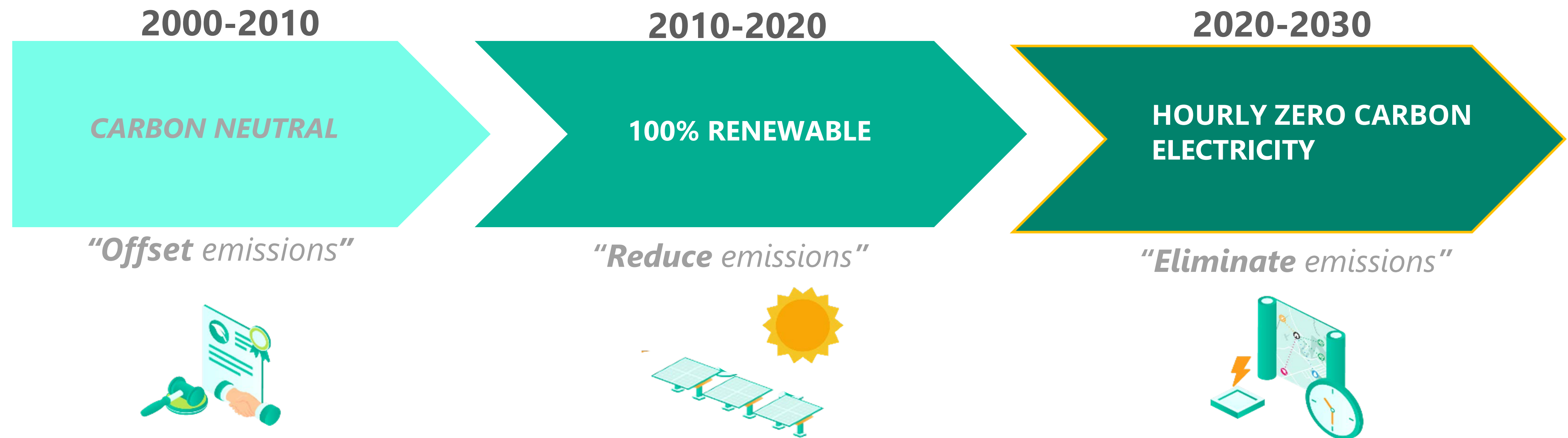
Multi-party hourly matching project for Microsoft's data center in Amsterdam



Currently Microsoft has signed a PPA contract with Eneco for renewable energy from an offshore wind farm. Microsoft has committed to a **100/100/0 goal** in order to truly eliminate emissions from the electricity they buy for its datacenters.

With CertiQ and FlexiDao parties are testing with tracking energy on an hourly basis using the Granular Certificate standard from EnergyTag.

When 100% renewable energy doesn't mean zero carbon *moving from nominally green to truly zero carbon*



A digital "control room" of all renewable energy certificates, contracts and emissions



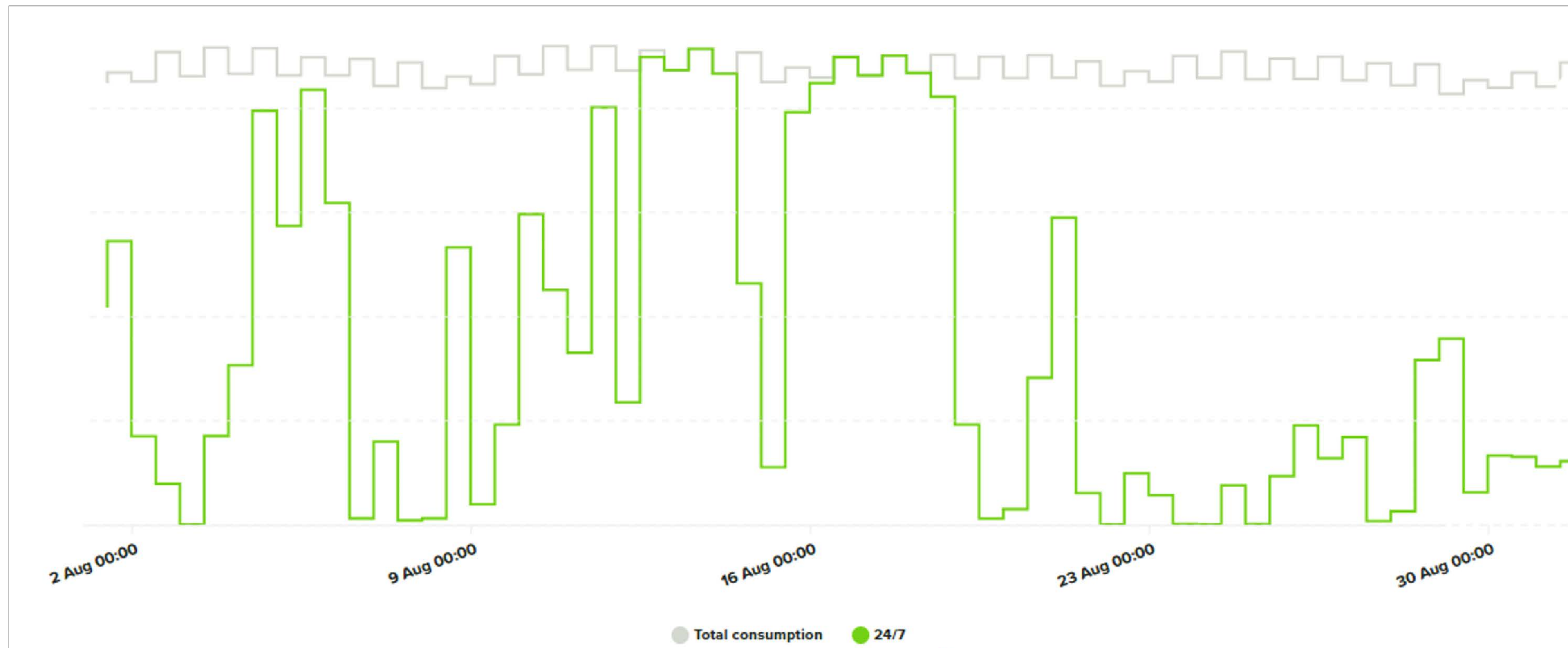
FlexiDAO software tracks the origin of green energy and its CO2 every hour (24/7) with blockchain



On a monthly basis there is still work to do in this example ... (Dummy Data)

24/7 COVERAGE

39%



... while over a week the example results are instead much more impressive!

24/7 COVERAGE

87%



The CO2 emissions mirror the path of the prior slide, with great results in this example.



Microsoft has taken the lead with pilots in Sweden and in The Netherlands.

- We see others going down the same road.
- Data centers as well as utilities. => The world needs them all to reach climate goals!



Business

Achieve 100% Renewable Energy with Microsoft Sweden 24/7 Monitoring | Azure Blogs and Updates



Iron Mountain Adds Hourly Renewable Energy Tracking for its Data Centers

BY RICH MILLER - APRIL 14, 2021 — LEAVE A COMMENT



Operating on 24/7 Carbon-Free Energy by 2030.



Biden pledges to buy 24/7 carbon-free electricity pushed by Clean Air Task Force, Google and others



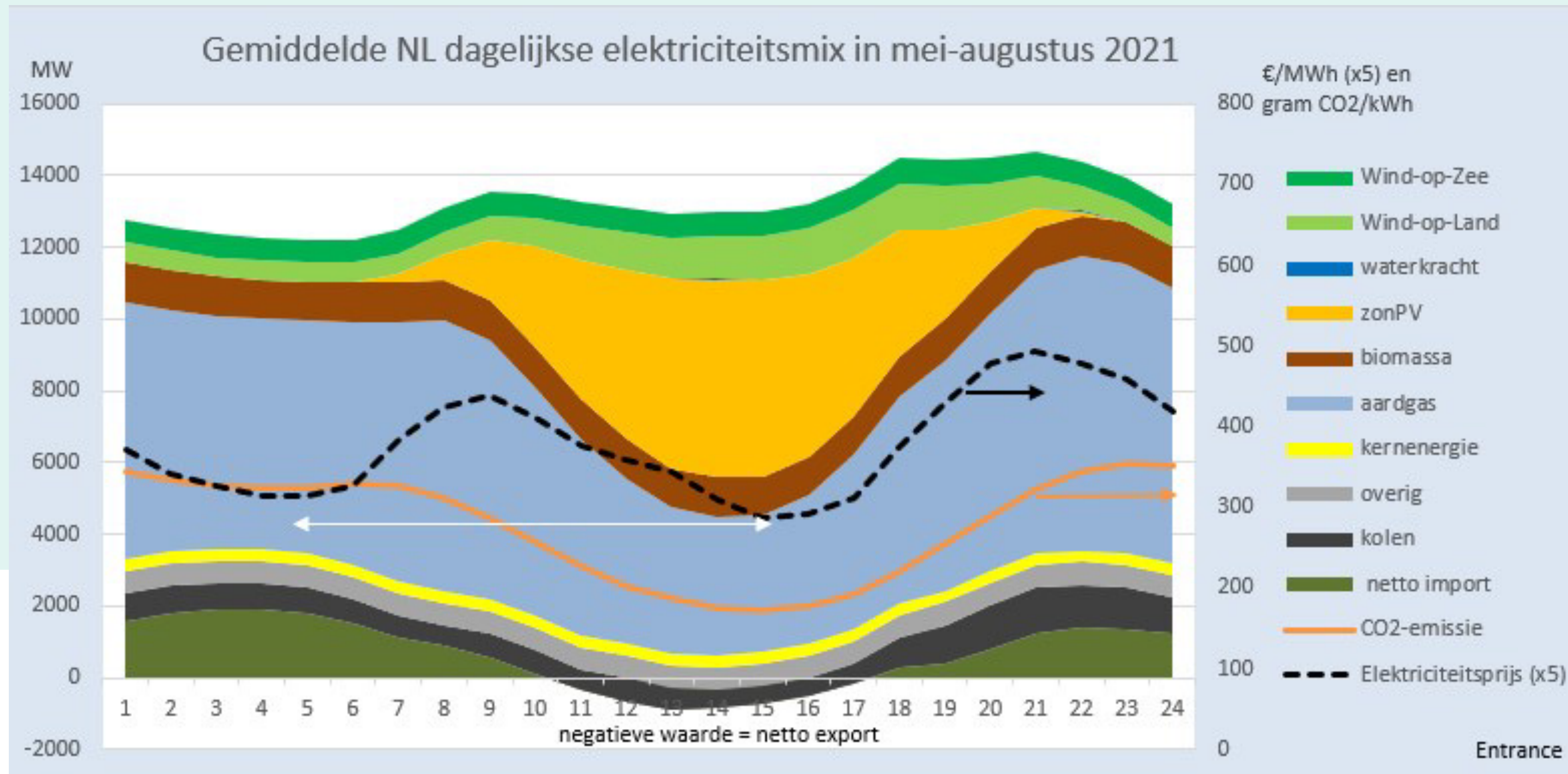
Preliminary Pilot Outcomes

- Innovating together: **Microsoft, ENECO, CertiQ, Ealyze, EnergyTag & FlexiDAO**
- Step closer to the Microsoft 100/100/0 ambition and digital transformation of the energy grid
- The data center sector is key for acceleration of the energy transition.



Demand for CO2-free Flex

Still significant fossil power production in NL (May-Aug21)



Demand for CO2-free Flex

But solar power grows exponential...

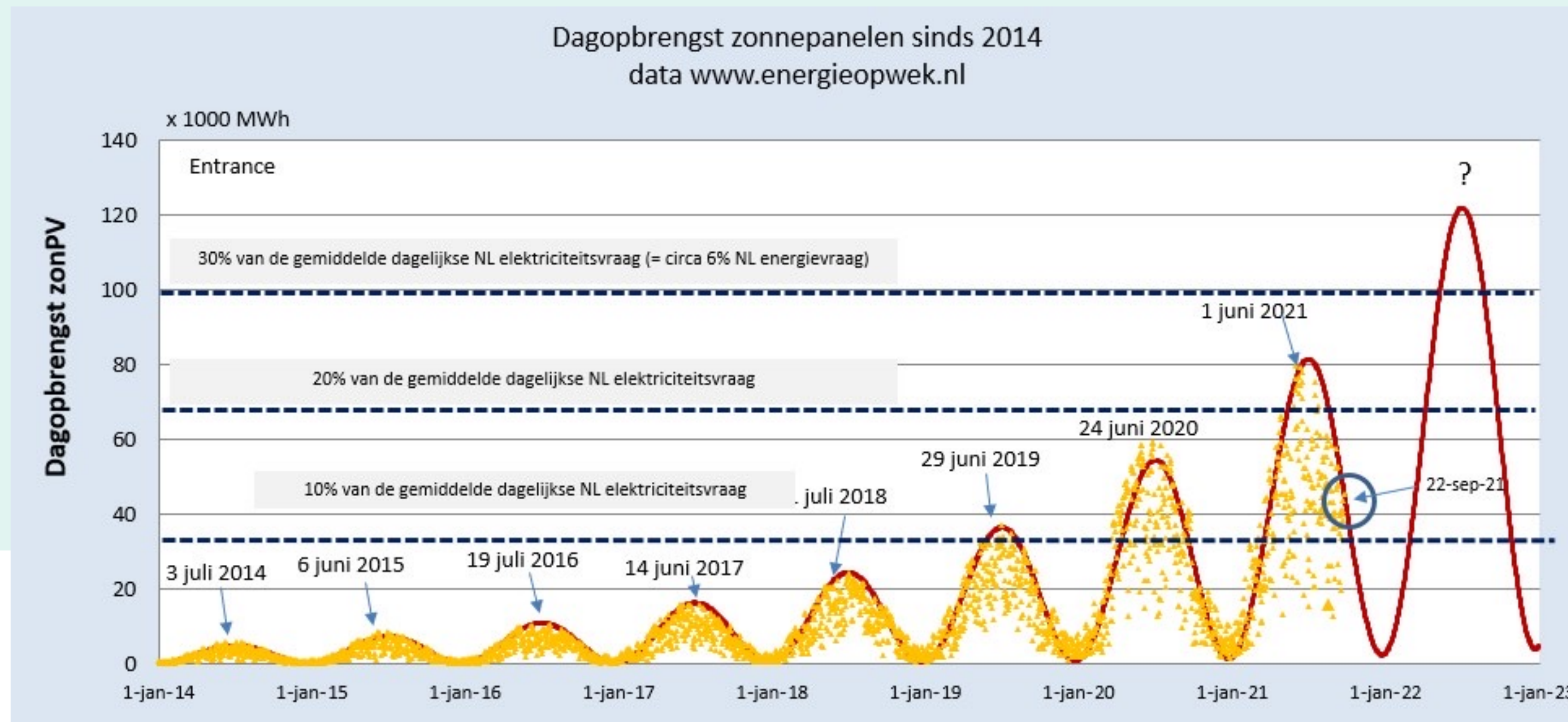


Martien Visser
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Vanmiddag (in september!) kwam rond 14 uur 65% van alle NL elektriciteit van zonnepanelen. In 2017 zou dat, bij identieke omstandigheden, slechts 13% zijn geweest. In 2025 zitten we op een dag als vandaag boven de 100% en moet er fors afgeschakeld worden.

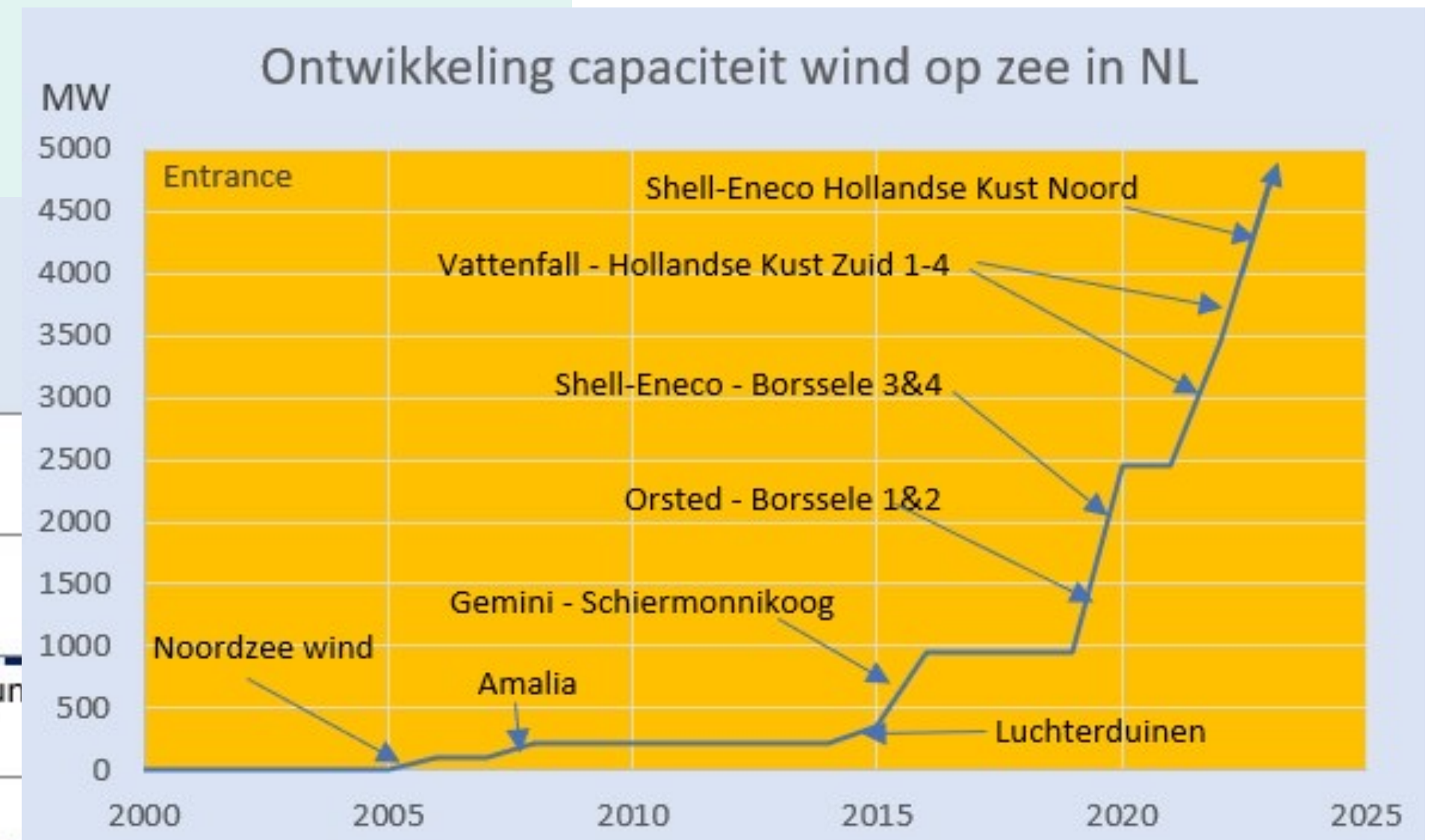
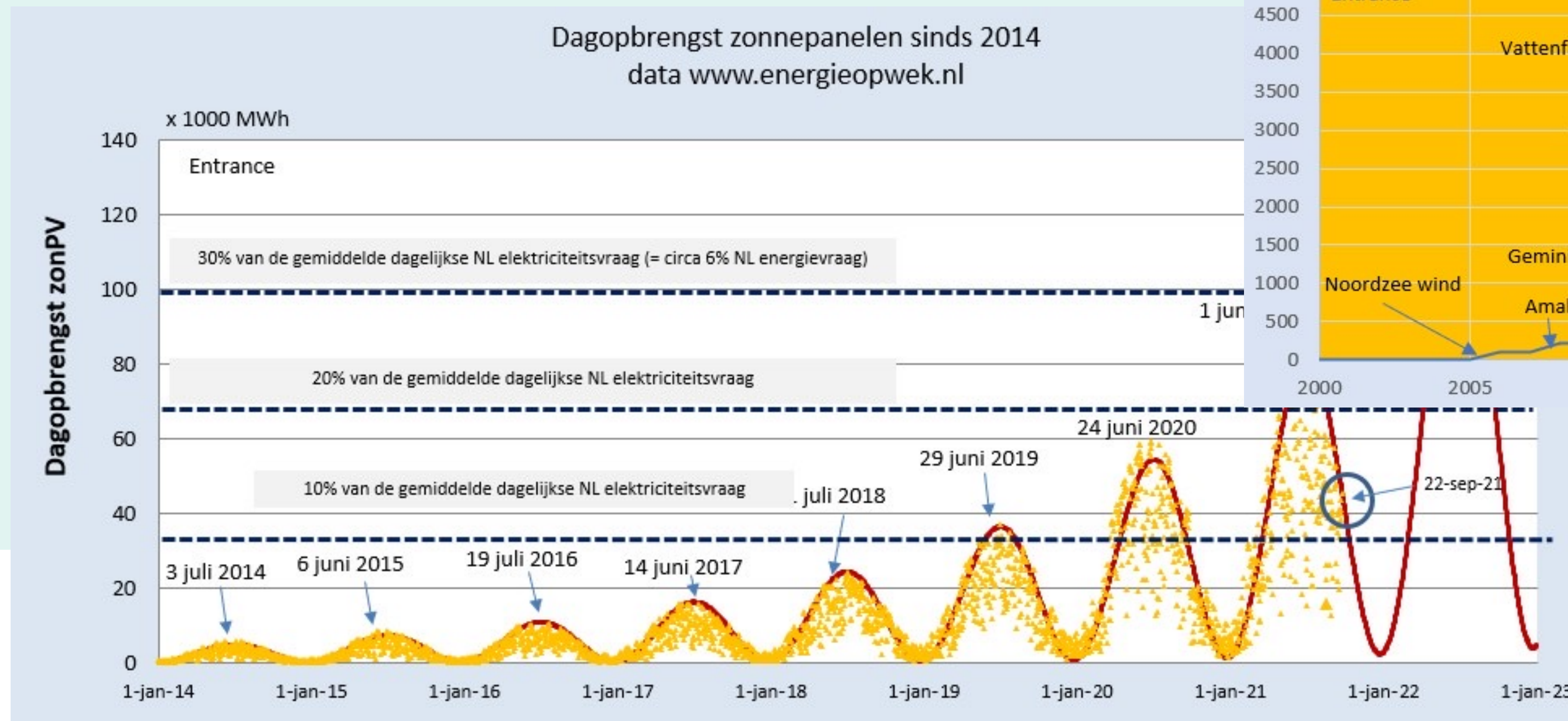
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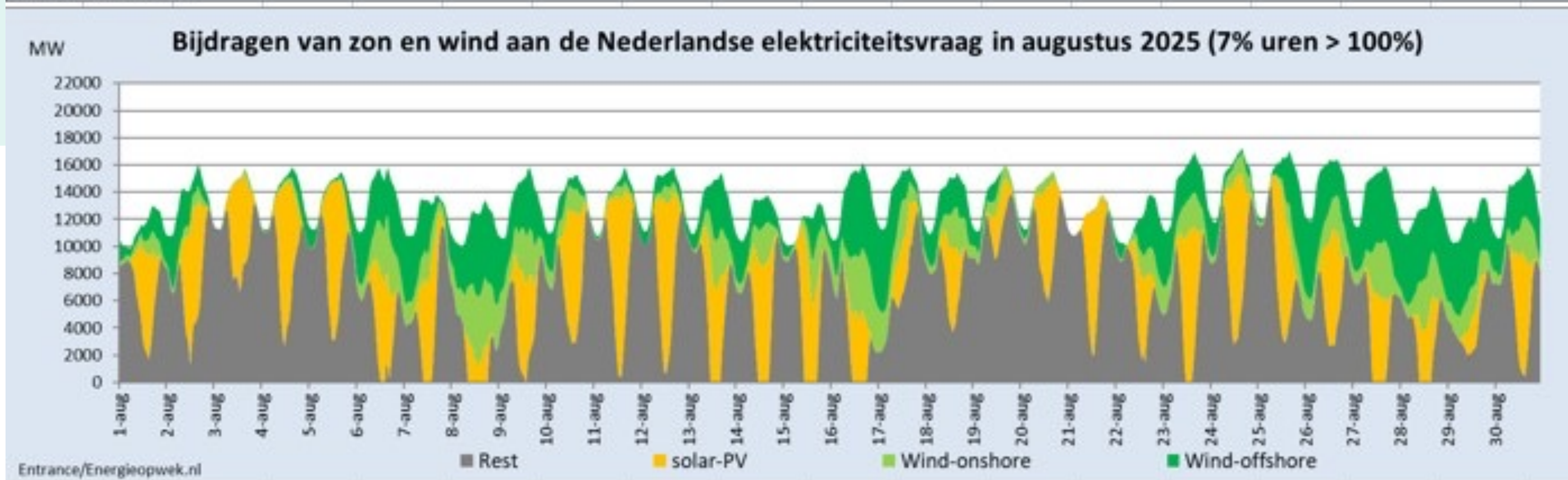
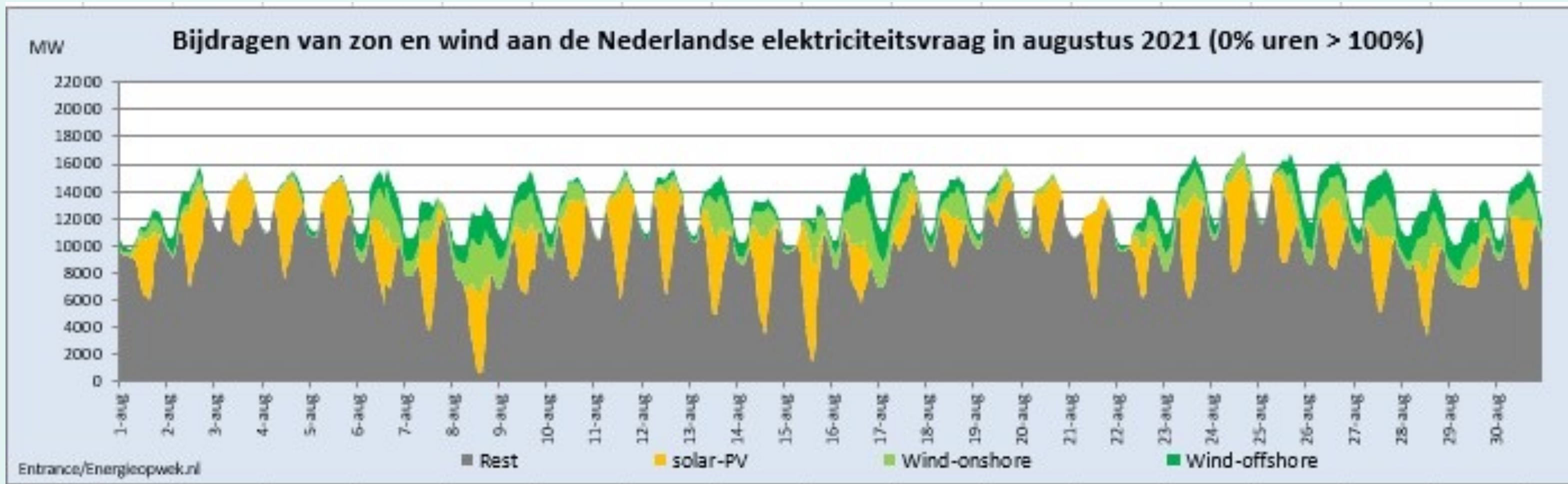
Demand for CO2-free Flex

Add wind offshore to that....



Demand for CO2-free Flex

Even with bad aug-mnth`21 we go to surpluses in 2025



How to anticipate?

- 1) **Optimal production mix**
e.g. contract 25% solar and 75% wind, improves matching score from ca 60% to 70%
- 2) **Demand steering**
if possible and where economical
- 3) **Battery storage**
- 4) **CO2 free Flex** (e.g. H2)



Questions & Answers

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