SUSTAINABLE ELECTRICAL ENERGY CENTRE OF EXPERTISE
LECTORAAT BALANCED ENERGY SYSTEMS

# TECHNISCHE SESSIE NETCONGESTIE

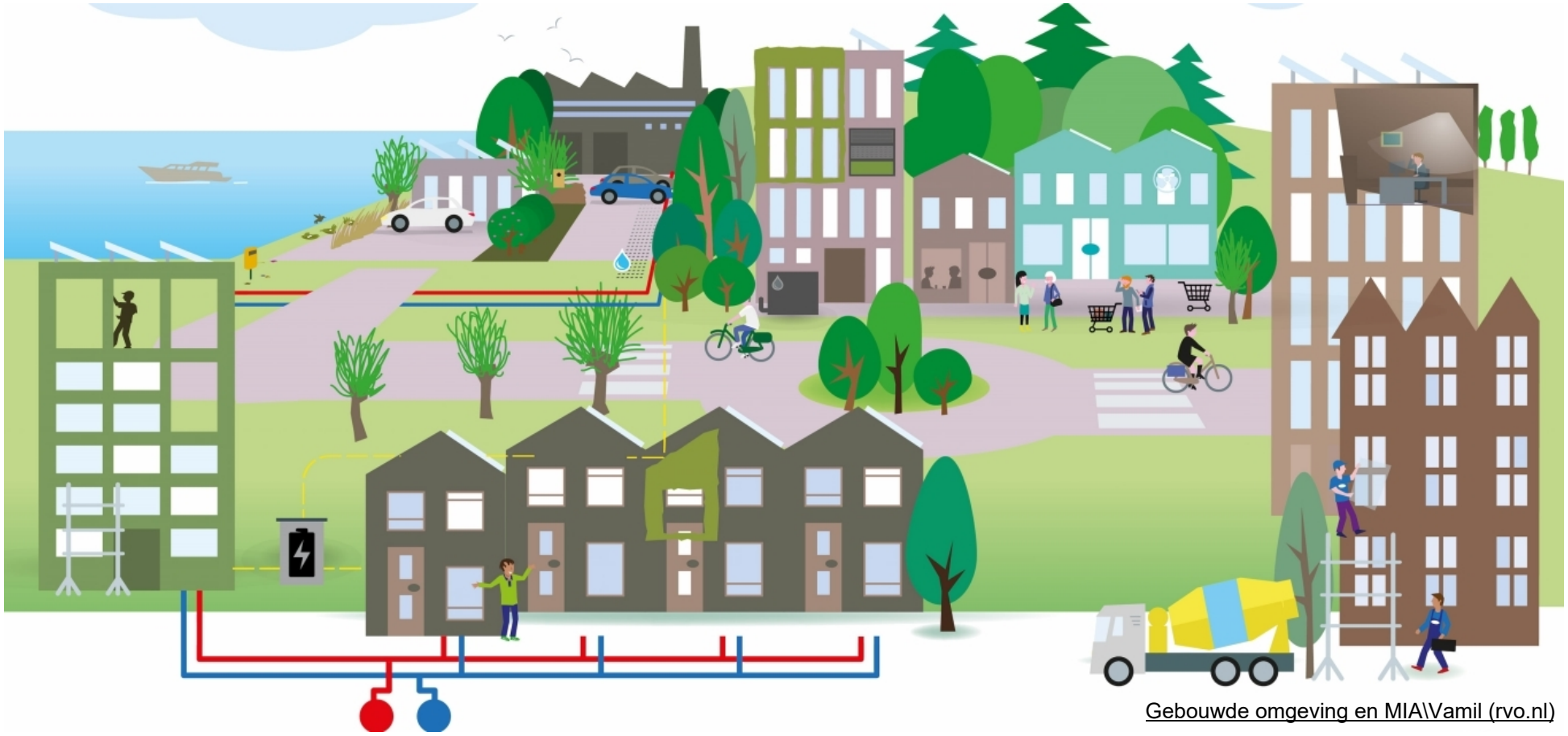
## GEMEENTE ARNHEM

3 APRIL 2024

CAROLIEN KATTENBELT (C.KATTENBELT@HAN.NL)
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# GEBOUWDE OMGEVING



Gebouwde omgeving en MIA\Vamil (rvo.nl)

# CASE STUDY ALL-ELECTRIC VRIJSTAANDE WONING

- Vrijstaande woning (1350m3, 1995, niet na-geïsoleerd)
- 5-persoons gezin met tieners

- Netaansluiting 3x25A

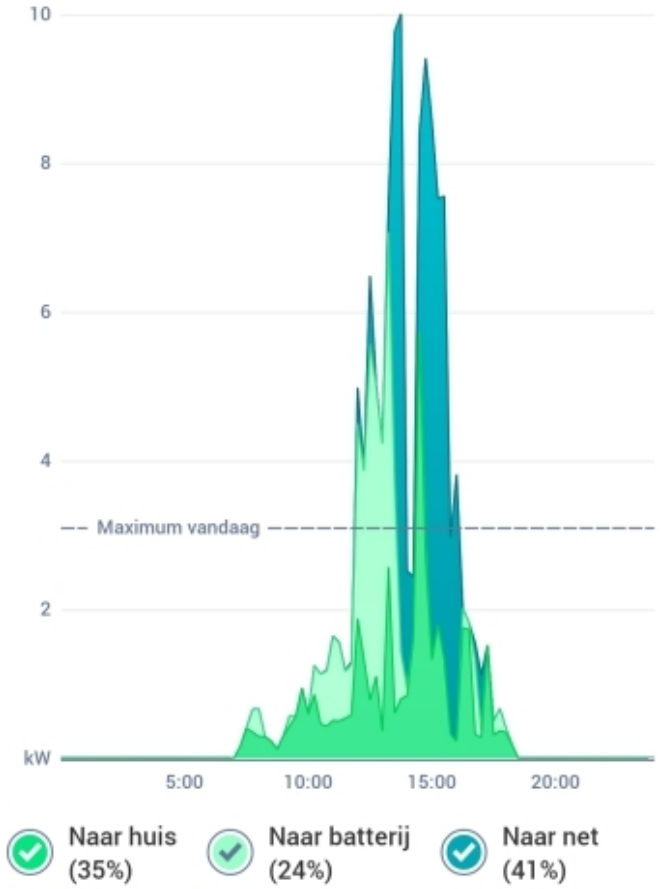
- Zonnepanelen O-Z-W (14-18-14, 17kWp)
- Thuisbatterij (10kWh)
- Bodemgekoppelde warmtepomp (12kW)
- Elektrische auto (50kWh, 35.000km/j)
- Energie management systeem

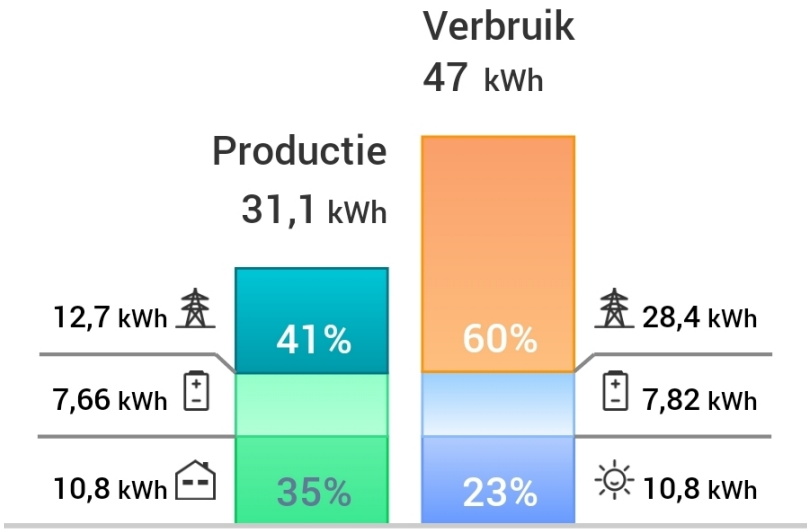


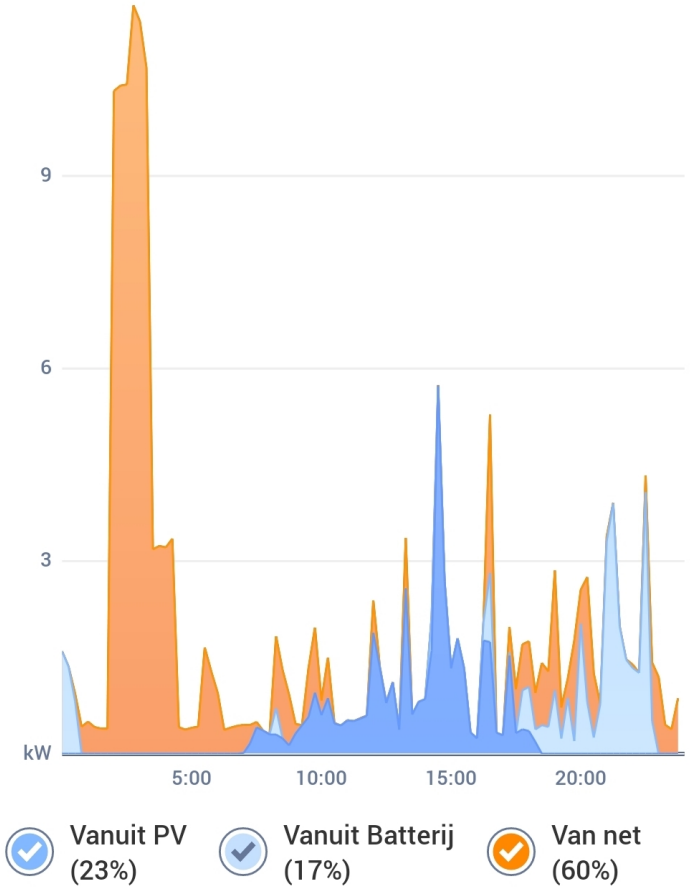



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# ALL-ELECTRIC VRIJSTAANDE WONING ENERGIE ÉN VERMOGEN (18/3/2024)






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# ALL-ELECTRIC VRIJSTAANDE WONING
# ONTWERP VAN DE ELEKTRISCHE INSTALLATIE

- **Vermogen**sbepaling conform norm




| 1 Fase | | | | Vermogen | Gebruiker / Omschrijving |
|---|---|---|---|---|---|
| Groep | L1 | L2 | L3 | Watt | |
| 1 | x | | | 1200 | Hal/Toilet/Keuken/Kantoor/MK |
| 2 | x | | | 1200 | Studeerkamer/Slaapkamer 1&2 /Inloopkast |
| 3 | x | | | 2850 | Wasmachine |
| 4 | x | | | 2500 | Quooker |
| 5 | | x | | 2800 | Oven in bar |
| 6 | | x | | 1000 | Veranda/Toilet/Berging/Garage |
| 7 | | x | | 2400 | Vaatwasser |
| 8 | | x | | 750 | Kelder/Overloop/Badkamers/Werkkast/Inloopkast/Zolder |
| 9 | | x | | 500 | Slaapkamer 3&4/Buitenverlichting |
| 10 | | | x | 2800 | Combi-oven |
| 11 | | | x | 2800 | Woonkamer/Tuinverlichting/Slaapkamer 4 |
| 12 | | | x | 900 | Droger |
| 13 | | | x | 1500 | WTW met Warmtepomp unit |
| | **7750** | **7450** | **8000** | **23200** | |

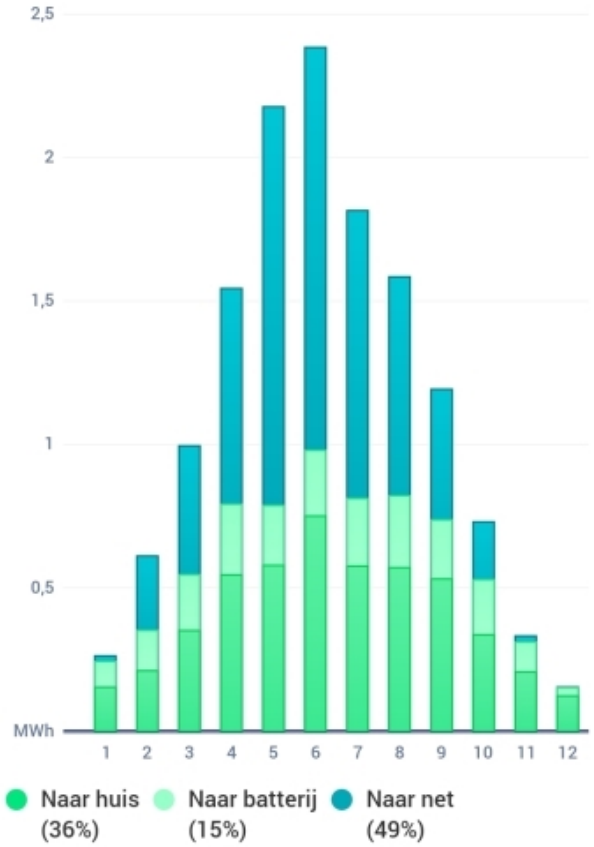
| 3 Fase | | | | Vermogen | Gebruiker / Omschrijving |
|---|---|---|---|---|---|
| Groep | L1 | L2 | L3 | Watt | |
| 1 | x | x | x | 7200 | Inductie kookplaat |
| 2 | x | x | x | 2700 | Bodemgekoppelde warmtepomp |
| | **3300** | **3300** | **3300** | **9900** | |

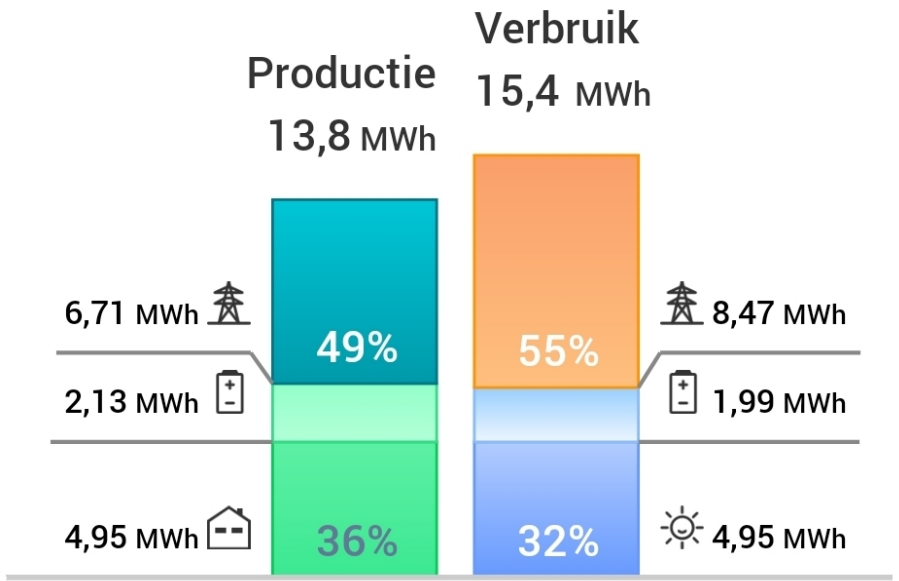
| 3 Fase | | | | Vermogen | Gebruiker / Omschrijving |
|---|---|---|---|---|---|
| Groep | L1 | L2 | L3 | Watt | |
| 3 | x | x | x | 6000 | PV+BAT installatie |
| 4 | x | x | x | 6000 | PV+EV installatie |
| | 4000 | 4000 | 4000 | **12000** | |

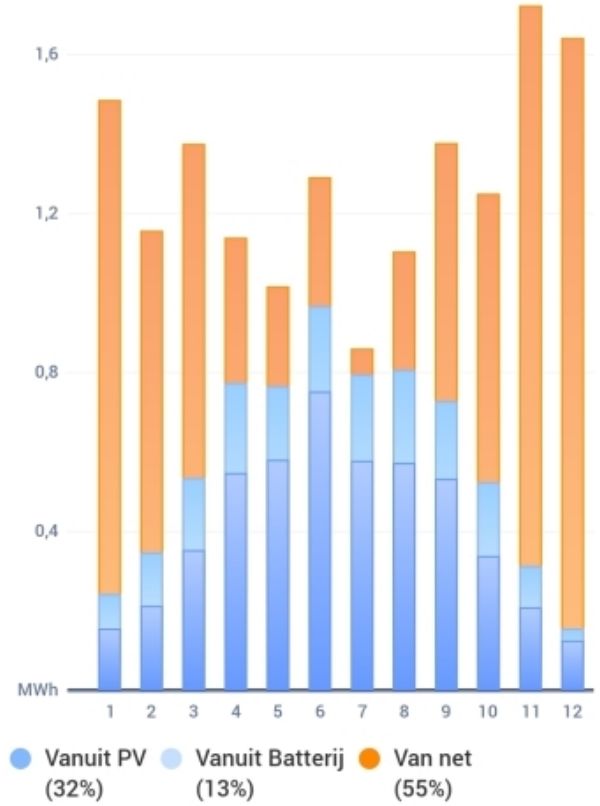
Netaansluiting 3x25A → $P_{max}$=17000W

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# ALL-ELECTRIC VRIJSTAANDE WONING ENERGIE DOOR HET JAAR (2023)



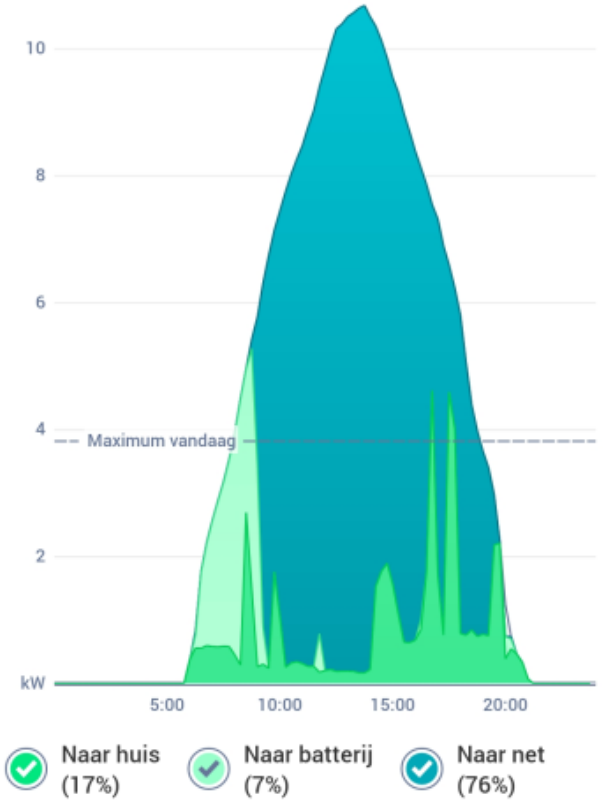



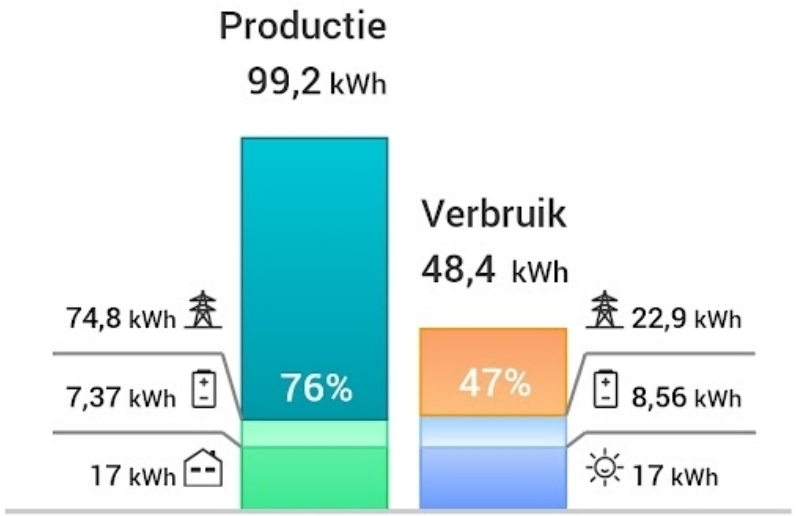






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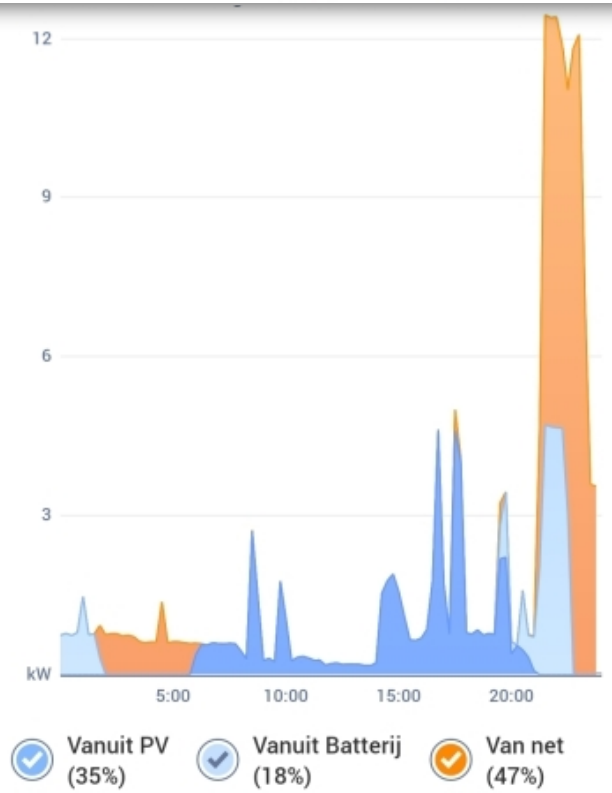
# ALL-ELECTRIC VRIJSTAANDE WONING ZOMER (14/6/2023)





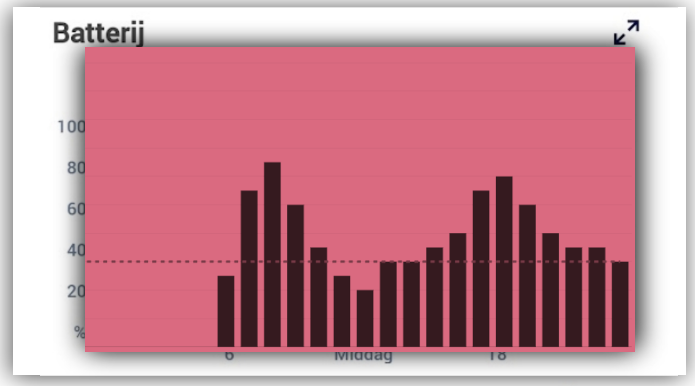


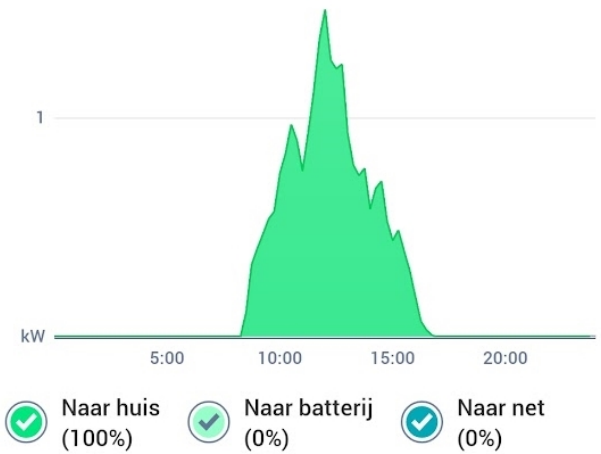


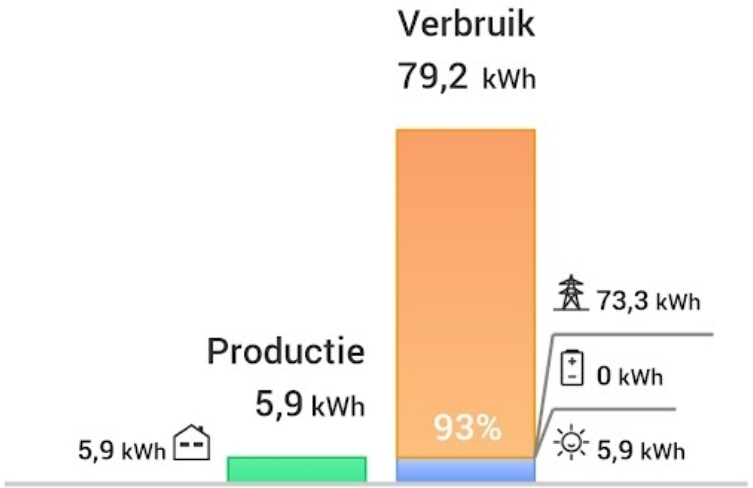


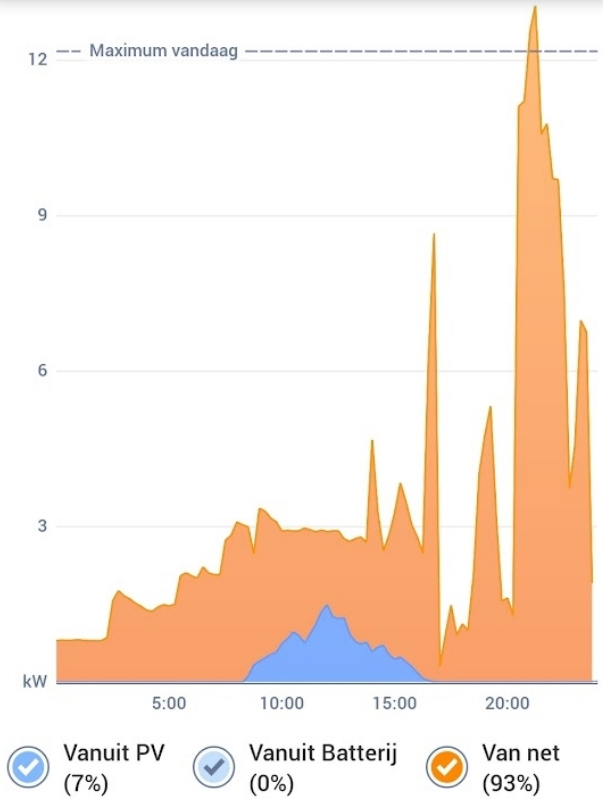

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# ALL-ELECTRIC VRIJSTAANDE WONING WINTER (2/2/2024)



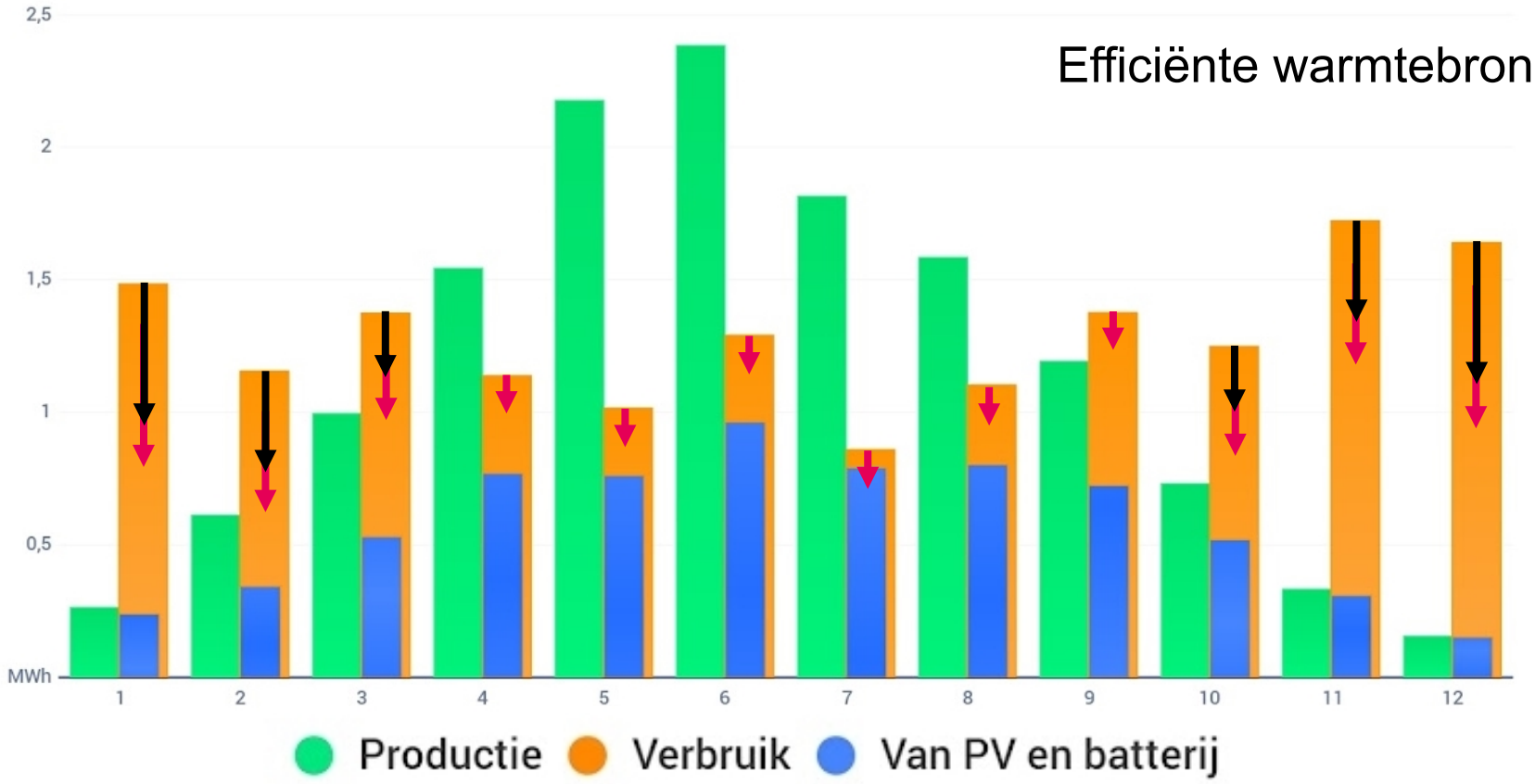



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# OPLOSSINGSRICHTING: WARMTEVRAAG BEPERKEN

Isoleren én ventileren!

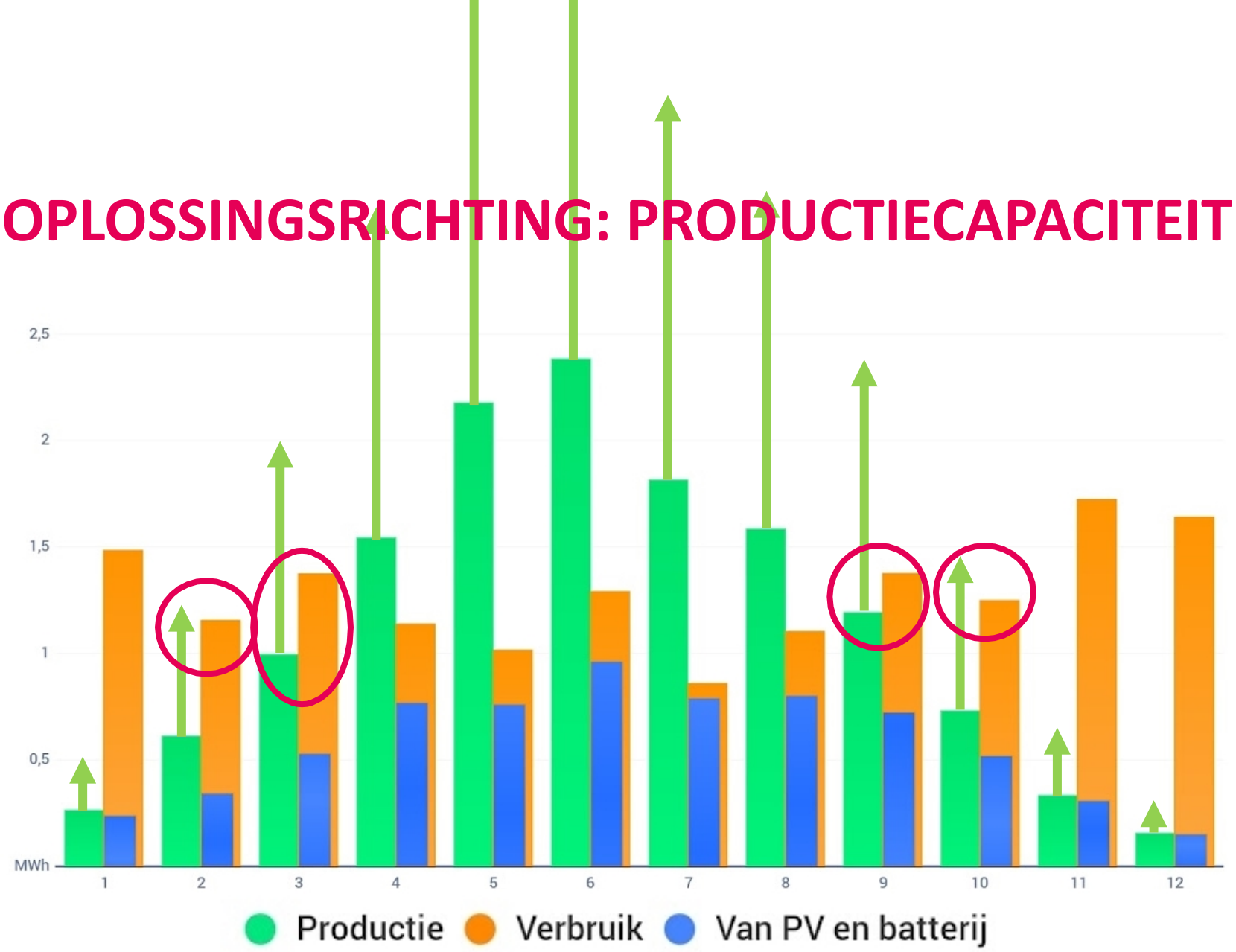
Efficiënte warmtebron(nen!) én afgiftesysteem






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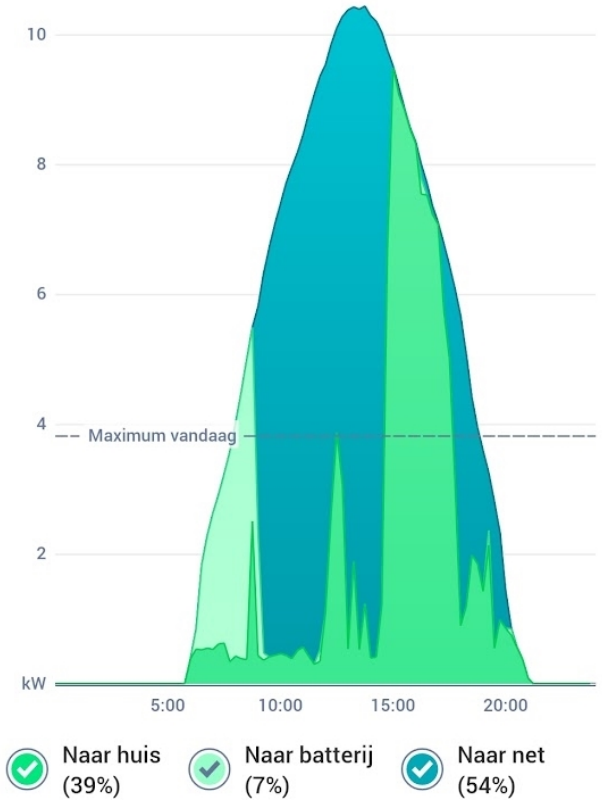
# OPLOSSINGSRICHTING: PRODUCTIECAPACITEIT OMHOOG

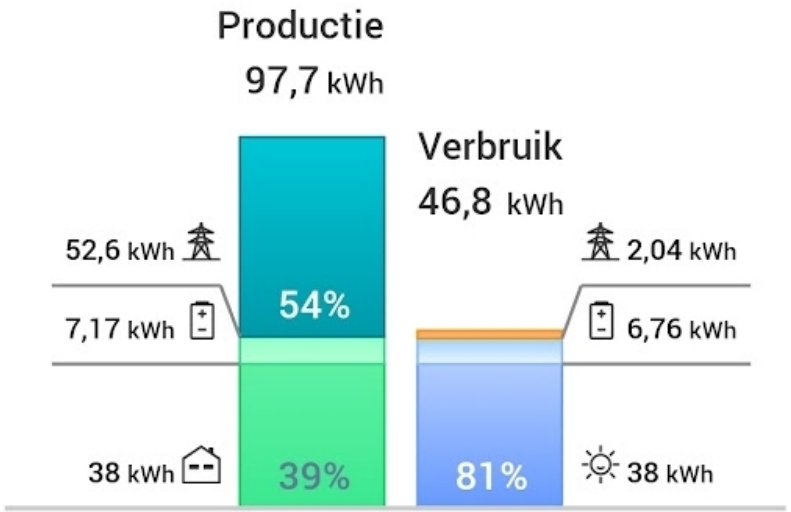



Méér opwek!

Ook warmte!

# OPLOSSINGSRICHTING: FLEXIBILITEIT EMS ZOMER (13/6/2023)









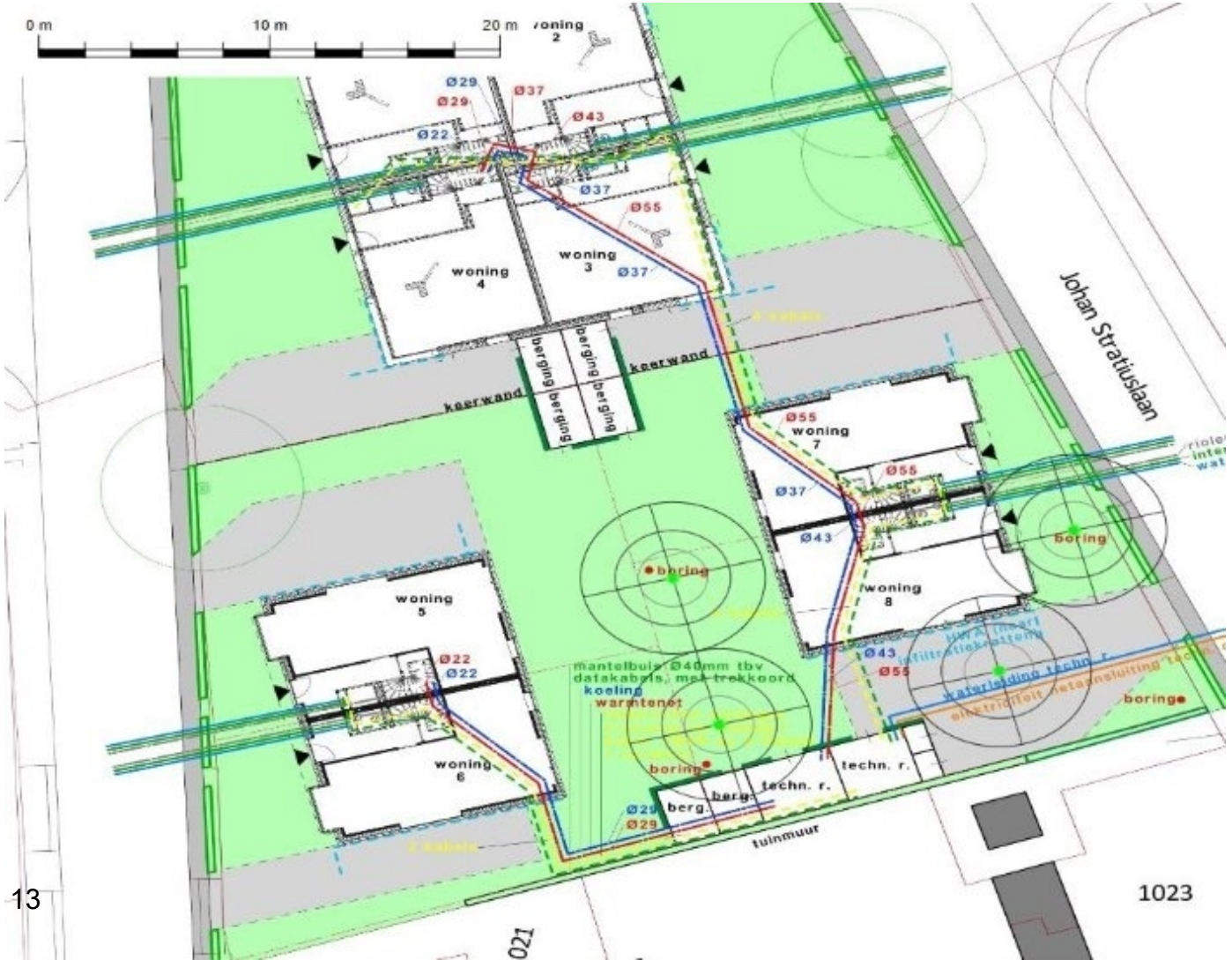
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# OPLOSSINGSRICHTING: COLLECTIVITEIT
# CASE STUDY OPEN HOFKERK IN WOLFHEZE



- 8 woningen
- Netaansluiting 3x80A
- Zonnepanelen O-W (52kWp)
- Opslagsysteem (hybride)
  - Waterstof (1200kWh)
  - Batterij (30kWh)
- Bodemgekoppelde warmtepomp (60kW)
  - Buffertank (1000L)
  - Lokaal warmtenet
  - Booster per woning voor tapwater
- Gedeelde laadpunten elektrische auto's
- Balansventilatie met warmte terugwinning

# OPLOSSINGSRICHTING: COLLECTIVITEIT
# CASE STUDY OPEN HOFKERK IN WOLFHEZE






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# OPLOSSINGSRICHTING: COLLECTIVITEIT
# CASE STUDY OPEN HOFKERK IN WOLFHEZE










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# OPLOSSINGSRICHTINGEN NETCONGESTIE

- Vraag beperken
- Productiecapaciteit verhogen
- Hybride systemen
- Flexibiliteit
  - Bron voor de warmtepomp
  - Opslag
  - EMS
  - Collectiviteit!