

WKK-ontmoetingsdag

Cogeneratie klaar voor de toekomst



Flex en valoriseren

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Cogen Vlaanderen Ontmoetingsdag 2023

CHP & FLEX valorisation

26/10/2023



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Introduction

About Entras

- ⊗ ENTRAS is an independent advisor for energy-intensive industries (1 to 1000 MW)
- ⊗ We deliver strategic advice for energy projects
- ⊗ ENTRAS develops data driven tools
- ⊗ Our scope: from consulting to real time steering of energy assets



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Today's topics

How to valorise FLEX for CHP?

- ⊗ What is FLEX?
- ⊗ Why is FLEX relevant?
- ⊗ How to exploit FLEX?



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What is FLEX?

Flexibility is everywhere



Flexibility = ability to adjust supply and demand
= "Any element that influences energy use at any moment"

Examples ...

- the ability to change output power
- the ability to change consumption
- any storage volume represents an opportunity
E.g. digester volume, water storage, product storage, pipelines, ...
- any freedom in process parameters represents an opportunity
E.g. temperature range, level range, flow range, ...

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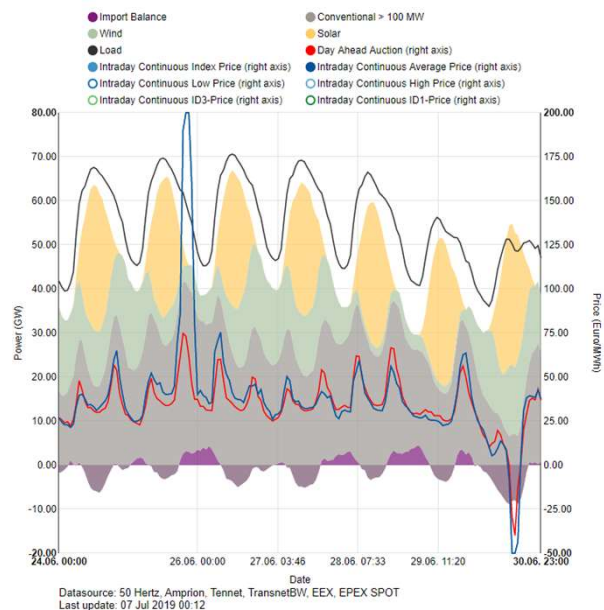
Why is FLEX relevant?

Valorisation & system advantages

Today's energy systems need to be flexible, to allow high capacity of wind and solar energy in the system

This is reflected in market systems to reward flex efforts

The value within these market systems has increased, which reflects the growing need for flexible assets



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Why is FLEX relevant?

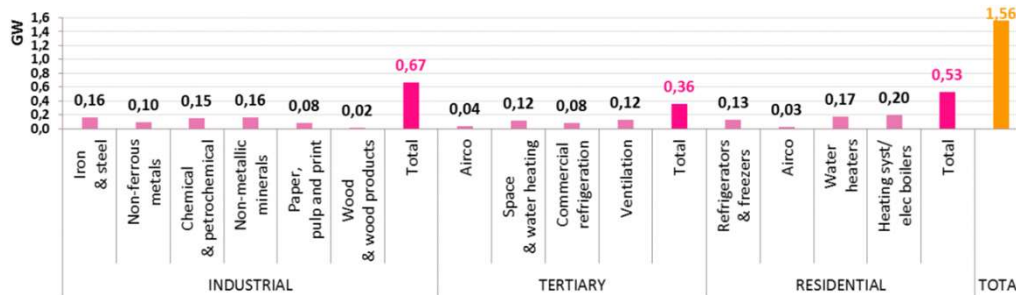


Valorisation & system advantages

Subsidy schemes are (becoming) less attractive or are repealed.
Flex valorisation offers extra revenues

Battery systems offer a solution – but expensive

Process flexibility offers a solution – unlocking flex is complex



Demand Response in Belgium - Source: Sia Partners

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Why is FLEX relevant?



How is flexibility valued on the electricity markets?

<p>TIME ARBITRAGE</p> <ul style="list-style-type: none"> > Day ahead market > Intraday market > Imbalance market 	<p>Making profit by charging at low prices and discharging at high prices. Various markets with various time scales. Contractual freedom.</p>
<p>ANCILLARY SERVICES</p> <ul style="list-style-type: none"> > FCR, aFRR, mFRR > Congestion management 	<p>Selling services to system operators. Contribute to grid balancing and management. Standardised products and contracts, less freedom.</p>
<p>SUPPORT MECHANISM</p> <ul style="list-style-type: none"> > CRM > Project based subsidies 	<p>Financial support from local, regional or federal governments.</p>
<p>SYNERGIES</p> <ul style="list-style-type: none"> > Prevent curtailment > Behind the meter 	<p>Synergies by optimal configuration. Wind/PV park coupling & industry integration.</p>

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Why is FLEX relevant?



Relevancy for a CHP





- ⊗ “Any element that influences energy use at any moment”
- ⊗ Examples related to CHP:
 - **Link with heat demand:** Allowable temperature range for heat application
Storage volume: hot water tank
 - **Link with gas supply:** Biogas production: digester volume
 - **Link with gas production plant:** Possibility to exchange electricity production for gas production
Feeding rhythm
LNG storage volume
 - **Link with other system components:** Heat pump
Solar / wind energy
e-boiler (steam)
Trigeneration (electricity – heat – chilled water)

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How to exploit FLEX?



Some examples with CHPs

-  **Heatflex:** a way to optimise value in the energy transition
-  **Biogee:** arbitrage between gas- and electricity prices
-  **Industries:** multiple asset dispatch
-  **Sootblo:** flexibility & operations

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Example: Flexible heat with CHP

Heatflex – optimizing heat storage in an industrial context (1/2)

- ⊗ Energy storage can be used for time arbitrage in energy markets
- ⊗ Goal is e.g. to lower the levelised cost of energy or to minimise CO2 emission
- ⊗ Thermal Energy Storage could store heat in a complex industrial energy system
- ⊗ Dispatching storage requires a careful analysis of many constraints

Storage efficiency
Capacity
Charge/discharge power

Grid connection capacity
Electricity price

COP / efficiency
Maximum power

Efficiency
Maximum power
Gas price
CO2 price

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Example: Flexible heat with CHP

Heatflex – optimizing heat storage in an industrial context (2/2)

- ⊗ Calculate optimum operation of a given system with heat storage
- ⊗ Determine levelised cost of heat
- ⊗ Optimise the sizing of energy system components
- ⊗ Assessment of costs and revenues based on historical data

Period [years]	
Levelised cost of heat [Euro/MWh_th]	48.34
Levelised cost of heat, gas only [Euro/MWh_th]	57.64
Levelised cost of heat, grid only [Euro/MWh_th]	44.6
Variable costs	
CO2 cost [kEuro]	0.29
Gas cost [kEuro]	1.19
Electricity cost [kEuro]	267.48
Total cost [kEuro]	268.95
Volumes	
Electricity offtake [MWh_e]	2908.33
Heat Pump heat generation [MWh_th]	8725
Gas Burner gas consumption [MWh_hhv]	38.89
Heat Storage exchanged energy [MWh_th]	2444
Heat Supply volume [MWh_th]	8760
CO2 volume (grid + gas) [t]	475.24
Full load hours	
Process_fth	8759
Heat Pump full load hours [hr]	4362.5
Gas Burner full load hours [hr]	19.44
Capex	
Heat Pump capex [kEuro]	740
Gas Burner capex [kEuro]	400
Heat Storage capex [kEuro]	150

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Example: Biogas production plant with CHP

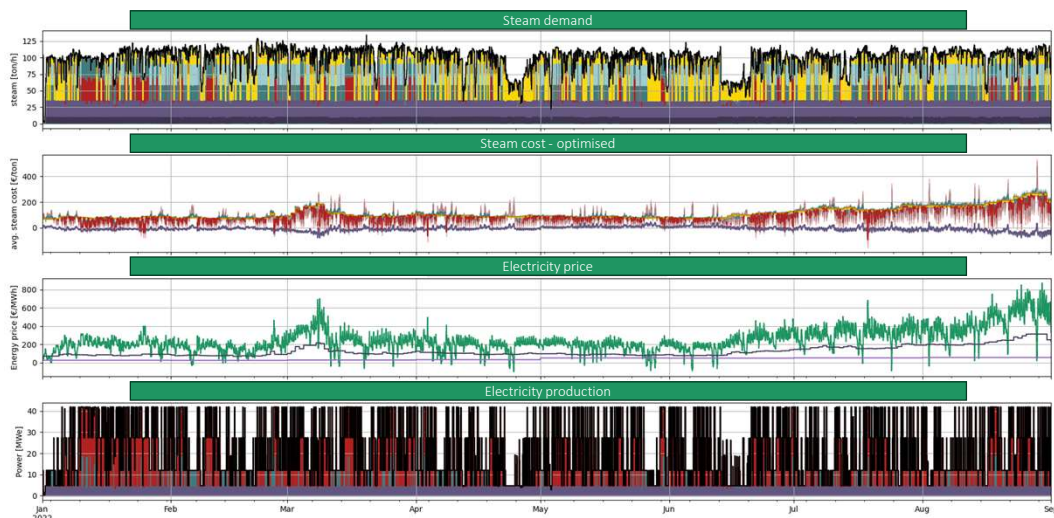
Biogee – time arbitrage for biogas plants



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Example: Industrial site with multiple CHPs

Industries: multi-asset optimized dispatching – local production units



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Example: biomass CHP

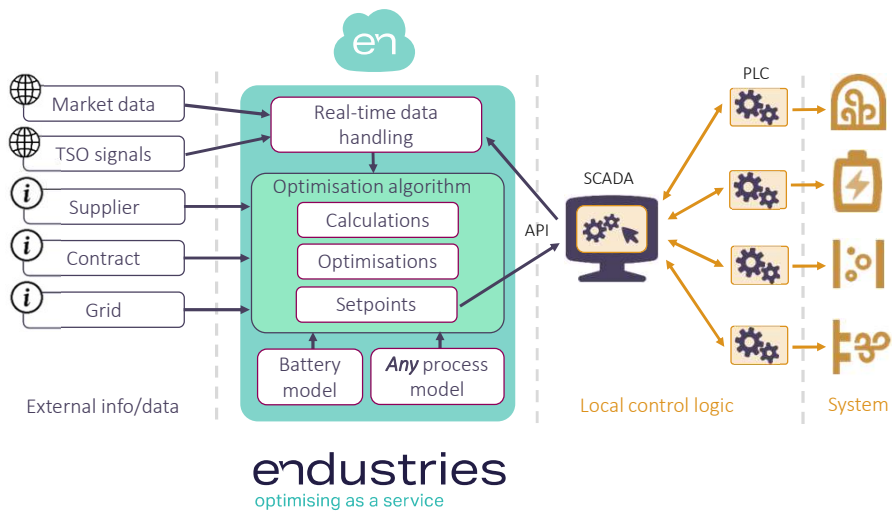
Flexibility valorisation combined with operations



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Example: Tool set-up

Economical optimisation in real-time



industries
optimising as a service

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Thank you Questions?

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