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As complexity and flexibility increases, model-based tools supporting investment and operational decisions in increasingly complex and flexible systems

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energyPRO:

a software for modeling, analysing, and optimising complex energy systems

Agenda
DBDH webinar

21st of April 2026

1. **Introduction to EMD**
2. **Introduction to energyPRO**
3. **energyPRO 5.1**
4. **energyPRO 5.1 – illustration of use and examples**
5. **vectIO**

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Renewable Energy Software & Consulting

EMD is a global company supplying software and consultancy services for design, planning, documentation and operation of wind and solar energy projects as well as complex distributed energy projects.

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EMD Vision & Mission

Vision

Lead the transition to renewable energy supply, ensuring a sustainable future.

Mission

Collect and systematise the latest research, development, and experience within sustainable energy systems and pass on this knowledge through innovative software products and consultancy services.

energyPRO:

a software for modeling, analysing, and optimising complex energy systems

Use it for

energyPRO

District Energy Sector

Design efficient and economically viable district heating systems.

Sector coupling

Optimise interactions between electricity, heat, cooling, and transportation for maximum efficiency and sustainability.

Water Treatment

Integrate renewable sources, reduce costs, and enhance sustainability.

Decarbonization strategy

Optimize energy systems, assess feasibility, and make strategic decisions.

Hybrid projects

Integrate and develop Hybrid Projects (PV + Wind + BESS), maximize efficiency, and ensure economic viability.

Environmental factors and ESG

Integrated energy system

Increase efficiency, reduce costs, and achieve your sustainability goals.

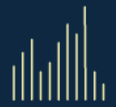
Power-to-X

Optimize energy conversion, analyze economic feasibility, and integrate renewable energy sources.

And more!

Based on a modular structure

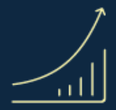
energyPRO



FINANCE
Investments, financing, cash flows, development in demands and prices.

OPERATION
Optimization of energy plant operation for a short term period.

MARKETS
Simulation of energy plants participating at more than one electricity market.



ACCOUNTS
Long-term income statements and balance sheets for business plans.

DESIGN
Calculation and optimization of production and operational economics in energy plants.

COMPARE
Make alternatives in the **same project file, to** compare key investment **figures.**

INTERFACE
XML call to energyPRO to perform multiple calculations with different parameters.

REGION
Energy and economic calculations for several sites or on a regional basis.

OPTIMIZE
Optimize the size of PV, CHP, heat pump, storage or any new asset.

Thanks to the modular structure, energyPRO can be customised for any kind of energy project.

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Based on a modular structure

energyPRO

Thanks to the modular structure, energyPRO can be customised for any kind of energy project.

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Model, analyze & optimize
energyPRO will help you in every stage of the process

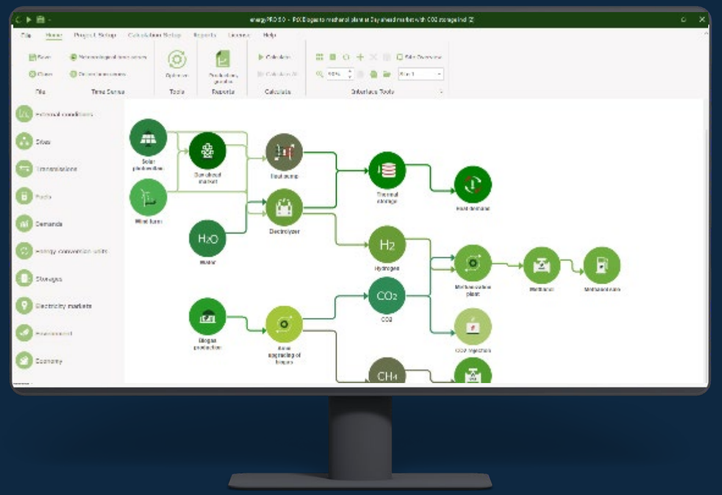
Graphical interface
Model an arbitrary energy system to see the relevant connections

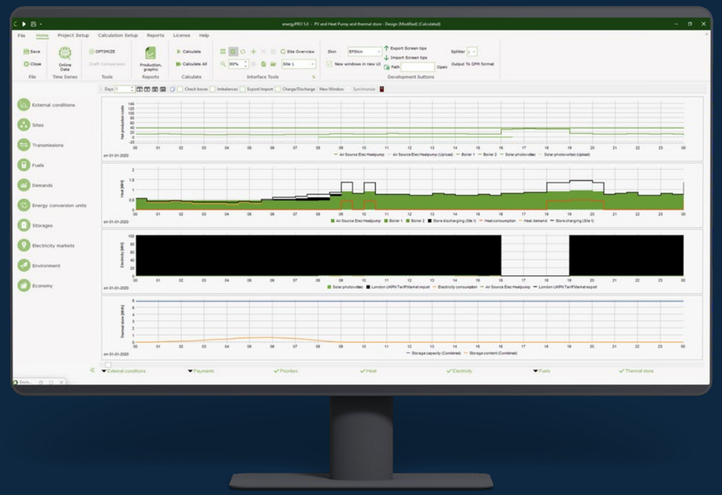
Calculation
Automatically calculate the optimal operation

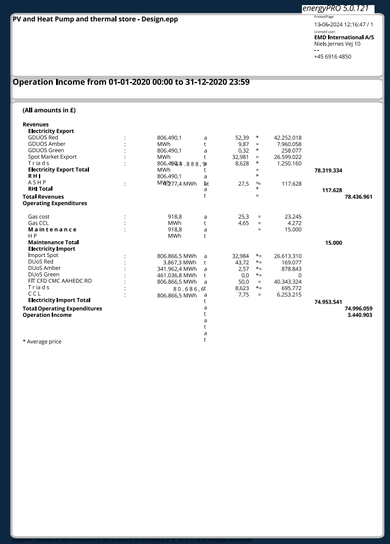
Interactive plots
Visualize data, set the desired constraints & analyze your model

Reports
Export detailed reports for your stakeholders

Iterative process
Continuously optimize and improve your system







energyPRO 5.0.121

PV and Heat Pump and thermal store - Design.epp

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Operation Income from 01-01-2020 00:00 to 31-12-2020 23:59

(All amounts in £)

Revenues							
Electricity Export							
Spot	:	806,490,1	a	52,39	*	42.252.018	
GDUOS Amber	:	MWh	t	9,87	=	7.960.098	
GDUOS Green	:	806,490,1	a	0,32	*	258.077	
Spot Market Export	:	MWh	t	32.981	=	26.599.022	
T r ia d s	:	806,490,1	a	8,628	*	1.250.160	
Electricity Export Total		MWh	t		=		**78.319.334**
R H I		806,490,1	a		*		
A S H P	:	MWh 277,4 MWh	kr	27,5	=	117.628	
RHI Total			a		*		**117.628**
Total Revenues			t		=		**78.436.961**
Operating Expenditures							
Gas cost	:	918,8	a	25,3	=	23.245	
Gas CCL	:	MWh	t	4,65	=	4.272	
M a i n t e n a n c e	:	918,8	a		=	15.000	
Maintenance		MWh	t				
Maintenance Total							**15.000**
Electricity Import							
Import Spot	:	806,866,5 MWh	a	32,084	*=	26.613.310	
DUoS Red	:	3,867,3 MWh	t	43,72	*=	169.077	
DUoS Amber	:	341.962,4 MWh	a	2,57	*=	878.843	
DUoS Green	:	461.036,8 MWh	t	0,0	*=	0	
FIT CFD CMC AAHEDC RO	:	806,866,5 MWh	a	50,0	=	40.343.324	
T r ia d s	:	8 0 . 6 8 6, 6	a	8,623	*=	695.772	
C C L	:	806,866,5 MWh	a	7,75	=	6.253.215	
Electricity Import Total			t				**74.953.541**
Total Operating Expenditures			a				**74.996.059**
Operation Income			t				**3.440.903**
			a				
			t				
			a				
			t				

* Average price

Optimisation in energyPRO

energyPRO determines the most cost-effective operational strategy by solving a **profit-based unit commitment problem** using a **Mixed-Integer Linear Programming (MILP) solver**.

The software explores all possible combinations of operational decisions to find the **global optimum**, ensuring the lowest operational expenditure (OPEX).

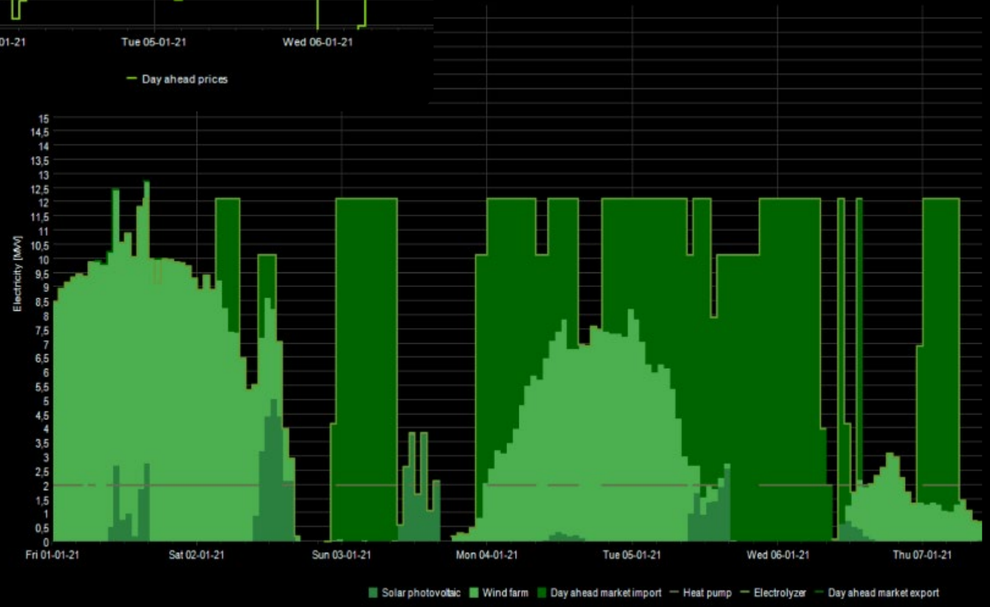
Finding the optimal operation of the units in your existing energy system

How? →

- Optimal sizes of the units
- Optimal mix of technologies

by comparing different scenarios and possibilities

- with the COMPARE
- and OPTIMIZE module



energyPRO 5.1
- Towards full generalisation of resourcers

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PtX in energyPRO

From simple energy systems like

→ Storage

to sector coupling

→ Cooling

→ Heating

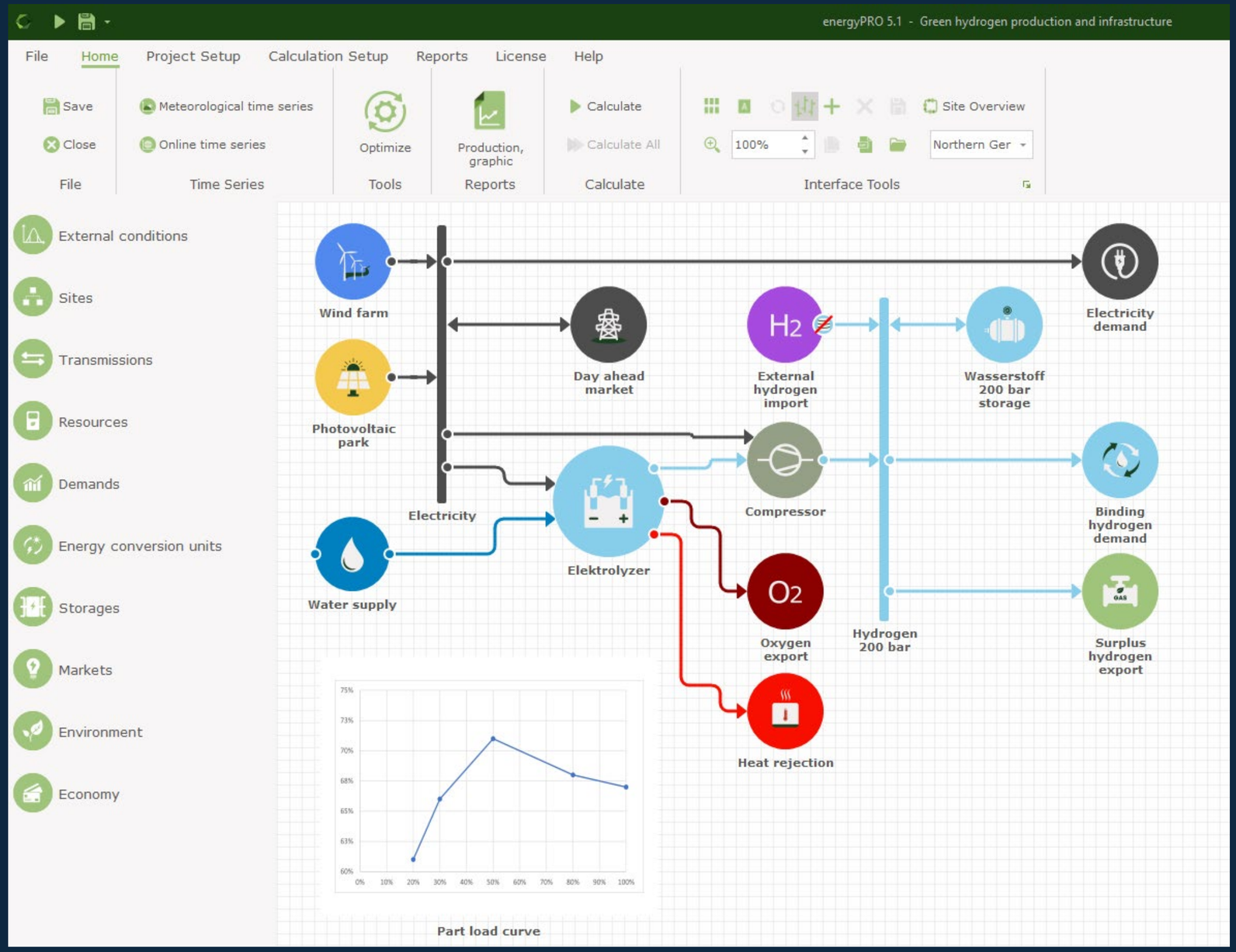
→ E-Fuels

Including add-on supplies like

→ water

Model the complete value chain based on all

→ Resources



As complexity and flexibility increases, model-based tools supporting investment and operational decisions in increasingly complex and flexible systems

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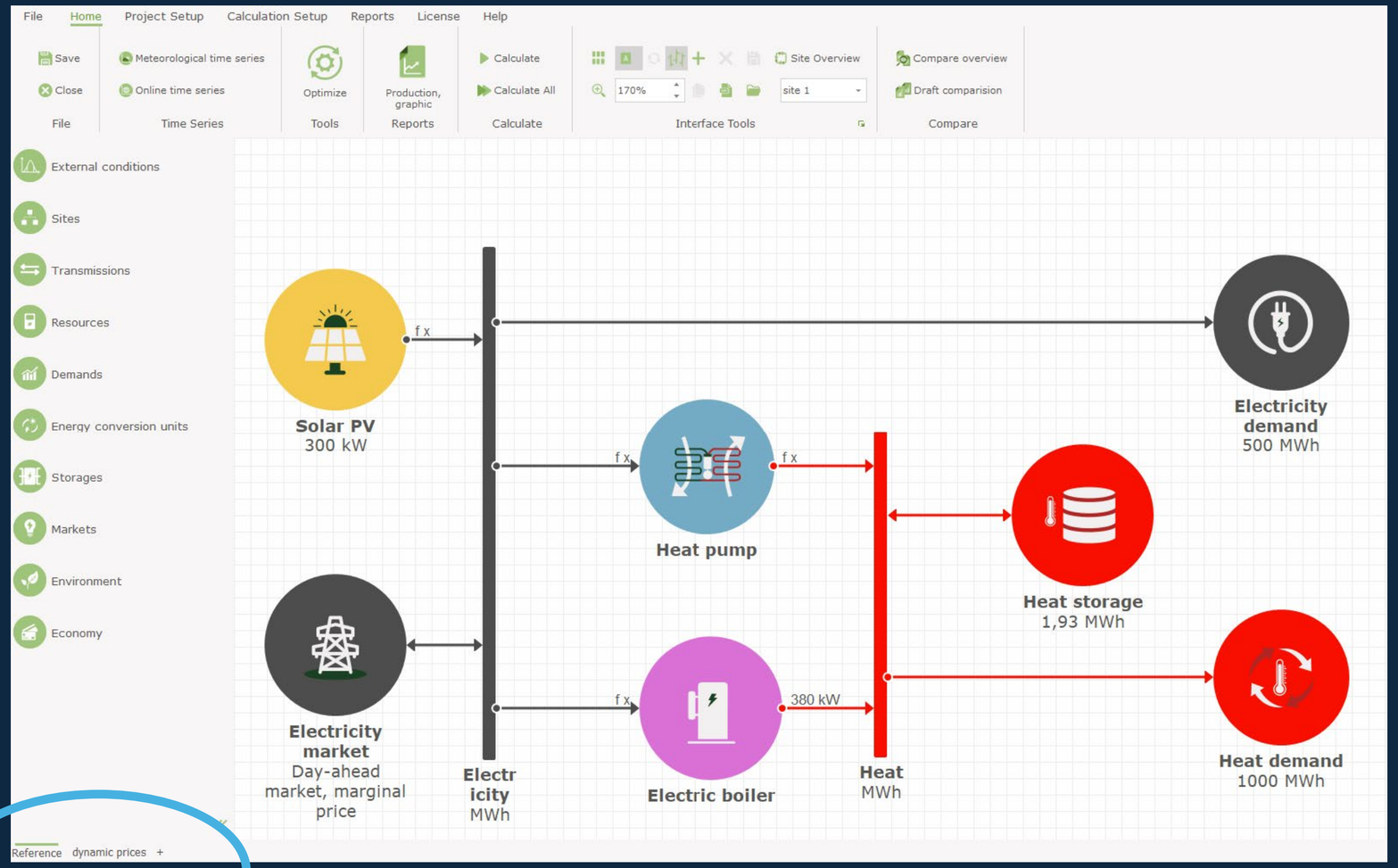
1. Set up your reference → digital twin

2. Analyse different scenarios



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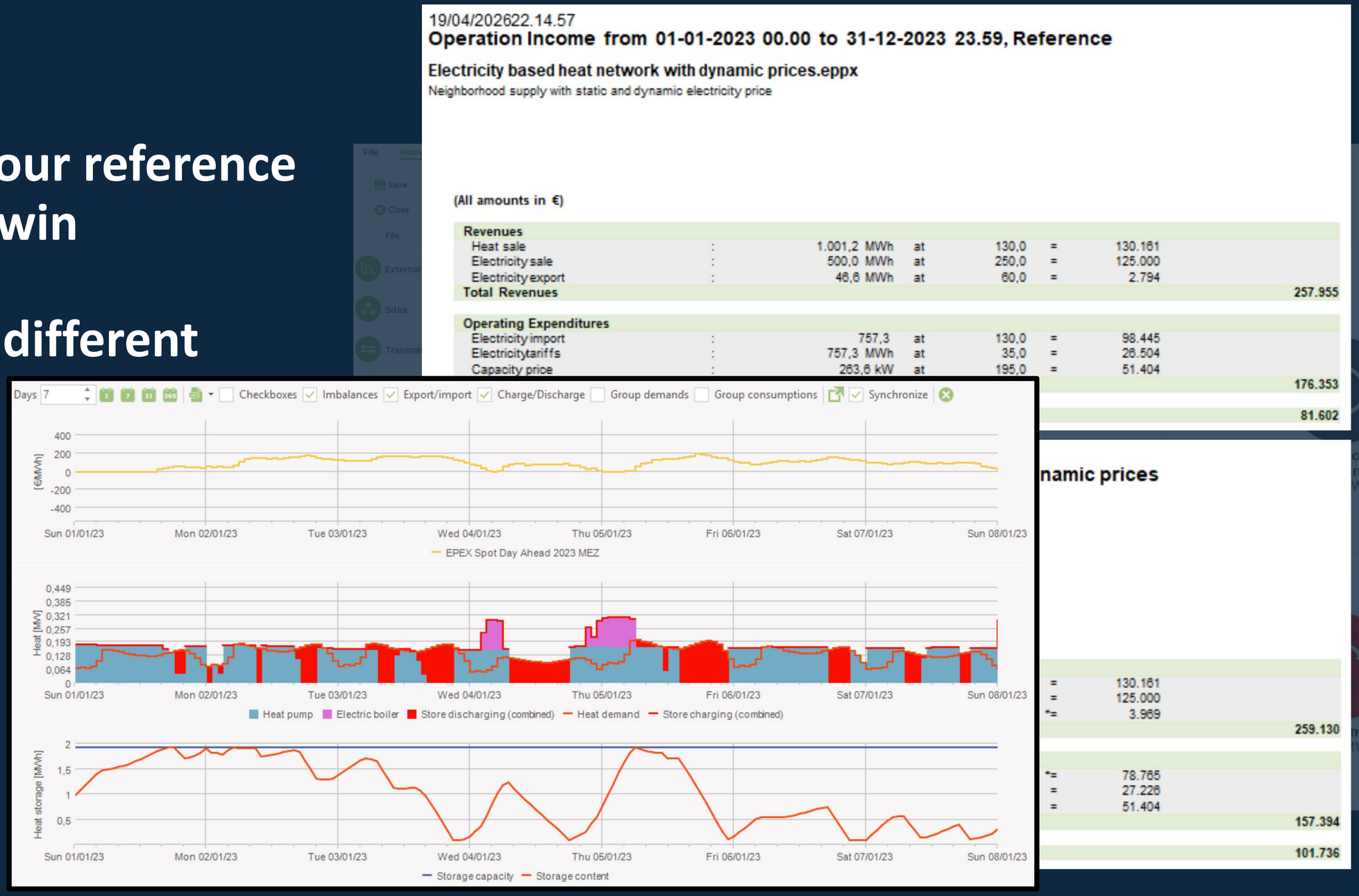

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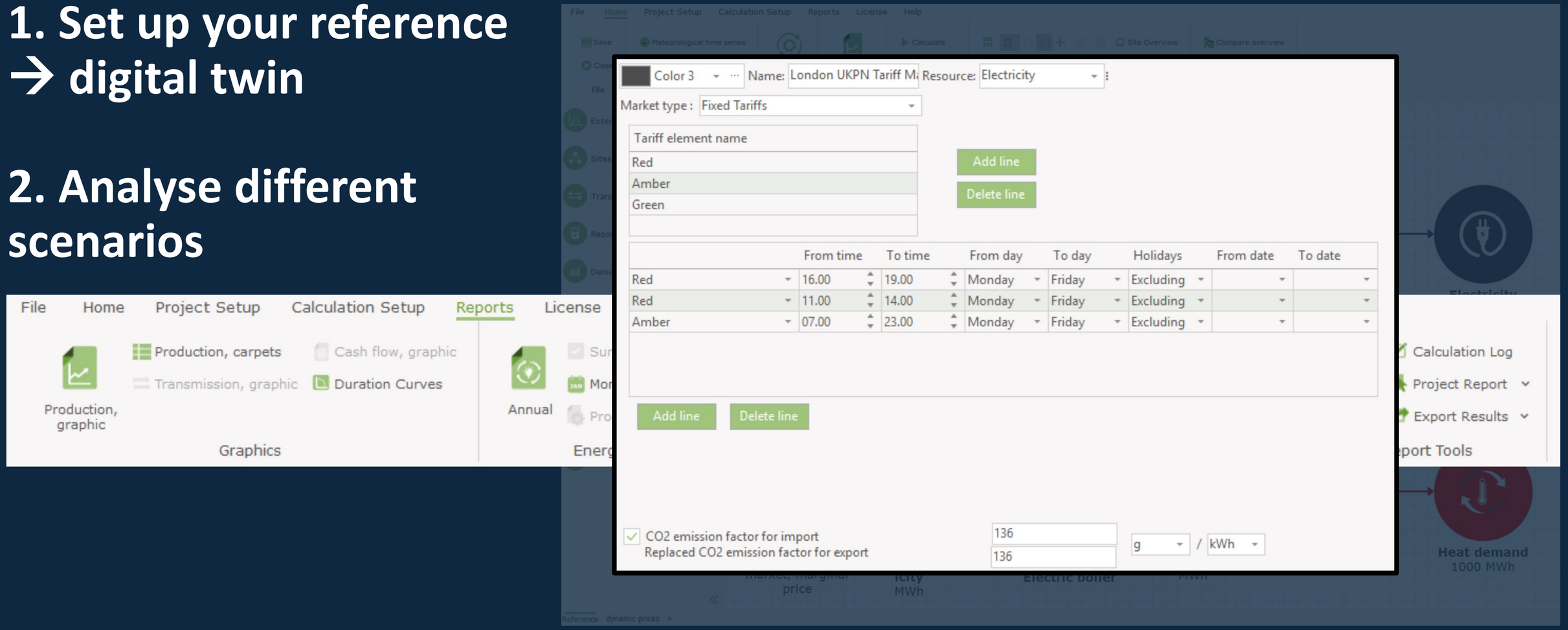

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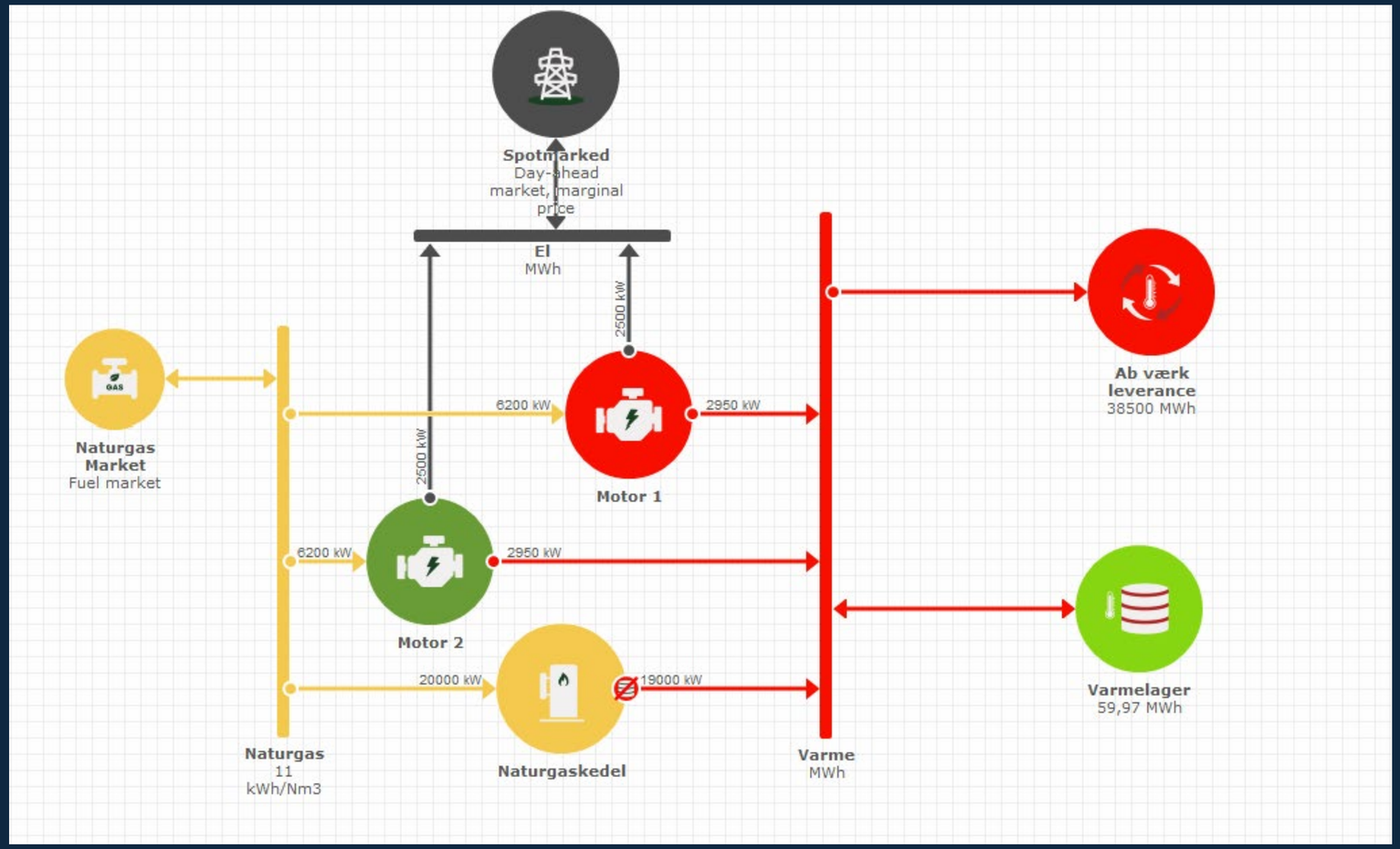

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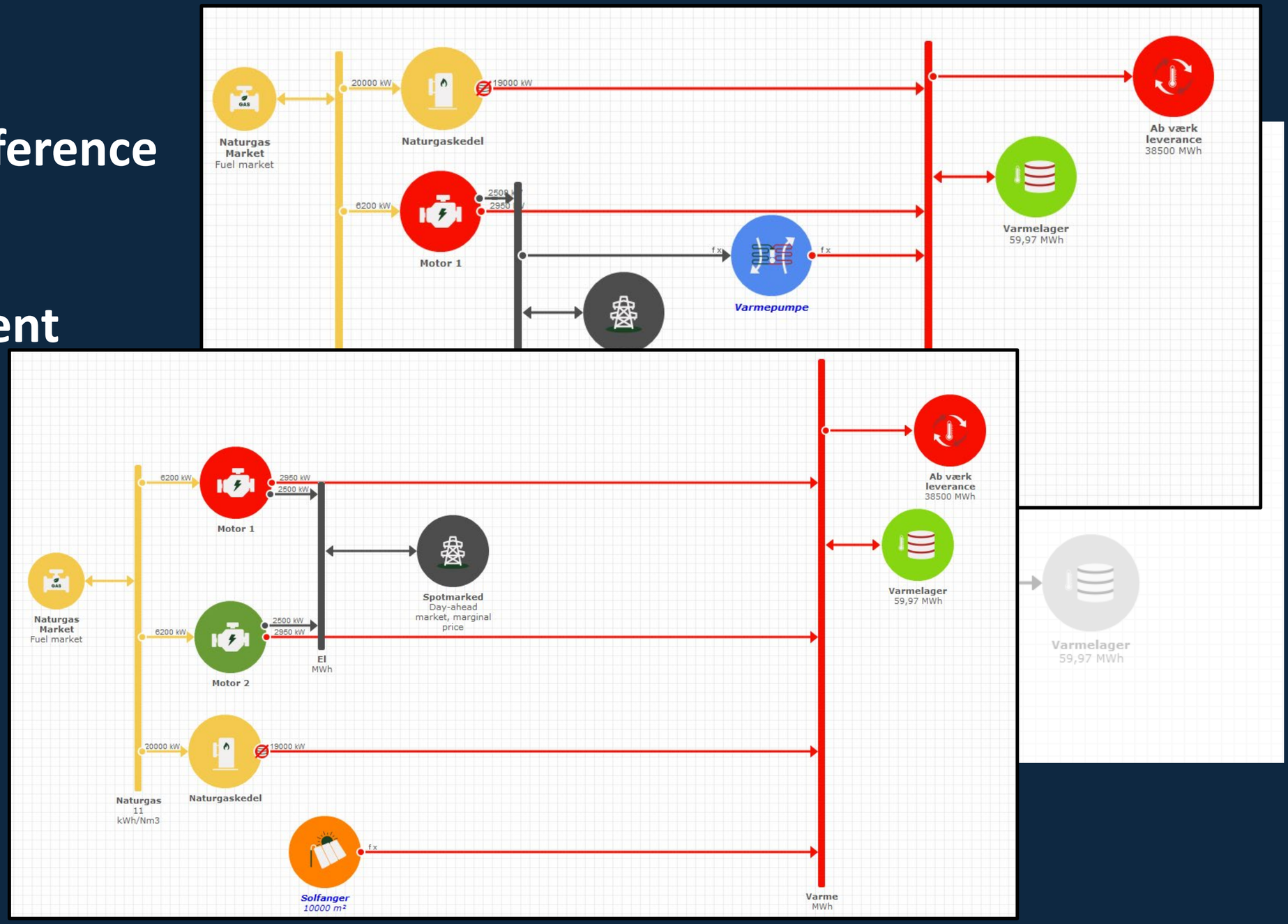

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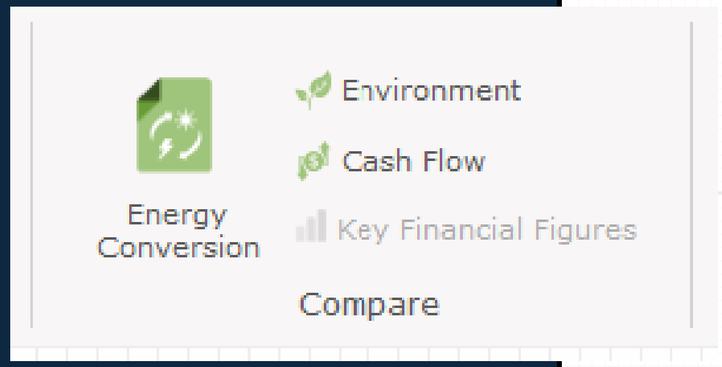

Compare cash flow

Kraftvarmeværk i 2026, med alternativer.eppx

Calculated period: 01/2026 - 12/2026
(All amounts in DKK)

	Reference	Varmepumpe alternativ	Solfanger alternativ
Revenues			
Salg af el	15.307.162	9.644.854	13.624.624
Revenues Total	**15.307.162**	**9.644.854**	**13.624.624**
Operating Expenditures			
Indfødnings og balancetarif el	90.477	52.232	78.732
Gaskøb	19.529.786	10.186.908	17.267.109
Gastransport omkostninger	3.060.577	1.537.197	2.678.890
Energiafgift			
Motor 1	2.651.890	1.527.058	2.287.080
Motor 2	2.572.380	1.488.862	2.259.017
Refusion af afgifter på motorer	-3.144.120	-1.815.070	-2.735.976
Naturgaskedel	1.962.061	675.168	1.738.466
Energiafgift Total	**4.042.210**	**1.876.019**	**3.548.587**
CO2 afgift			
Motor 1	3.723.767	2.144.286	3.211.503
Motor 2	3.612.120	2.090.651	3.172.098
Refusion af afgifter på motor	-4.414.954	-2.548.710	-3.841.840
Naturgaskedel	3.480.566	1.197.704	3.083.923
CO2 kvoter	7.075.509	3.553.725	6.193.116
NOx afgift			
Motor 1	65.195	37.542	56.226
Motor 2	63.240	36.603	55.536
Naturgaskedel	16.130	5.551	14.292
NOx afgift Total	**144.565**	**79.695**	**126.054**
Metan afgift			
Motor 1	636.607	366.582	549.031
Motor 2	617.520	357.413	542.295
Metan afgift Total	**1.254.127**	**723.995**	**1.091.326**
Drift-og vedligehold			
Motor 1	510.300	293.850	440.100
Motor 2	495.000	286.500	434.700
Naturgaskedel	187.291	64.449	165.947
Drift-og vedligehold Total	**1.192.591**	**644.799**	**1.040.747**
Varmepumpe			
Køb af el i spotmarkedet	0	3.908.208	0
Elafgift	0	28.554	0
Nettarif til det lokale elnet	0	535.381	0
Nettarif til Energinet.dk	0	820.917	0
Drift og vedligehold	0	309.623	0
Varmepumpe Total	**0**	**5.602.682**	**0**
Operation expenditures Total	**42.791.342**	**27.141.181**	**37.650.246**
Net Cash from Operation	**-27.484.180**	**-17.496.327**	**-24.025.622**

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Flexible assets

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→ Power every decision

vectIO

Optimal Planning

vectIO uses powerfull solvers and detailed digital plant models to continuously deliver the most cost-efficient and up-to-date operation plans.

Intuitive Interface

vectIO's user-friendly interface offers a clear visual overview og plant operations, making complex data easy to understand and act on.

Decision Support & Transparency

vectIO provides clear insights, scenario comparisons, and fully transparent calculations to support confident, data-driven decisions.

Electricity Market Participation

vectIO calculates profitable market bids and enables automatic submission to ensure swift, informed participation in electricity markets.

1. Set up your reference
→ digital twin

2. Analyse different scenarios
→ potential future digital twin

DH related examples

- A new system
- Decarbonisation of an existing system
  - electrification
  - RE technologies
- Storage
- Changes in heat demand
  - expansions
- Sector coupling (excess heat)
- Changes in markets – volatile prices and (the growing) need for resilience

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→ Smarter energy starts with energyPRO

2600+

User Activations

With over 2,600 user activations globally, energyPRO proves its status as a leading energy modeling and optimisation software.

400+

Companies & Institutions

energyPRO is utilized by over 400 companies and institutions including utilities, manufacturers, planning authorities, engineering firms, and research institutions.

25+

Countries Trust energyPRO

More than 25 countries around the world trust energyPRO. From district heating networks in Northern Europe to renewable integration in Asia and North America.

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→ Think energy differently

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