Lessons learned for strategic investment plans in Poland

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Programme for the Environment and Climate Action

LIFE Clean Energy Transition sub-programme

Project number
101119793

Project acronym:
LIFE22-CET-SET_HEAT

Call:
LIFE-2022-CET

Topic:
LIFE-2022-CET-DH

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Agenda

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— SET_HEAT project in brief

— Introduction

— Polish DH sector review

— Key lessons learned

— Conclusions

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SET_HEAT project in brief

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The main activity of the project is strategic planning.

The project addresses the energy transition and decarbonisation of district heating systems in four Eastern European countries through **the integration of low-temperature renewable and waste heat sources** into high-temperature district heating systems.

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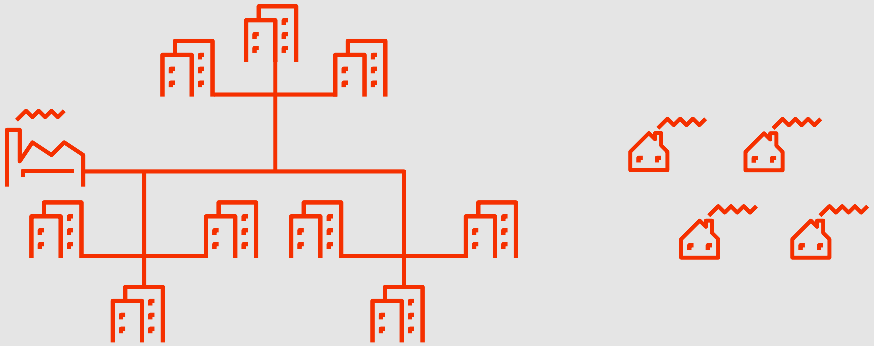
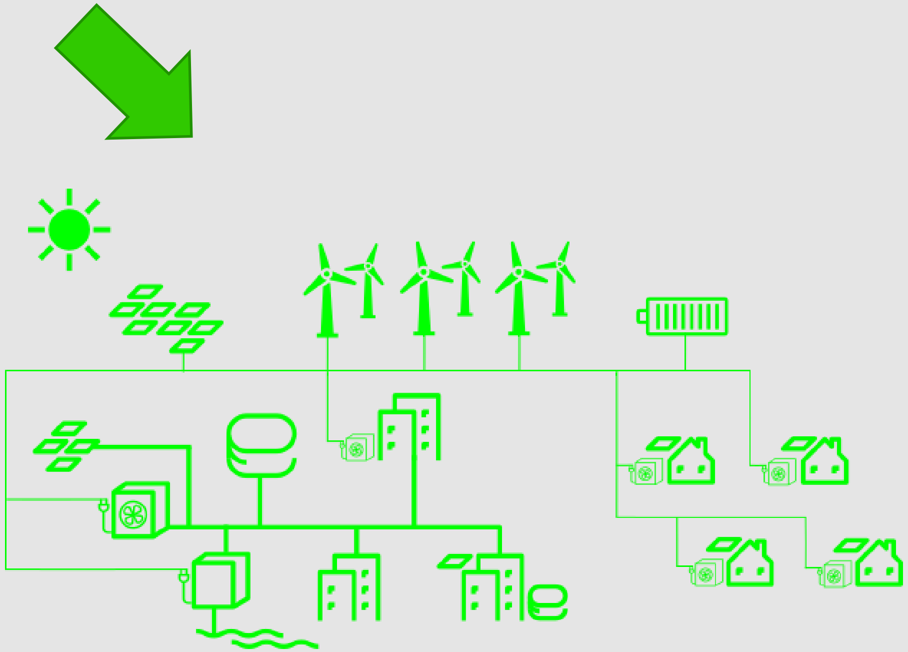
Introduction

European Union has set very ambitious energy and climate policy targets. Those include both the scope of the expected change, and the timeframe.



The drivers:

- EED,
- RED III,
- EU ETS,
- EPBD,
- and more.



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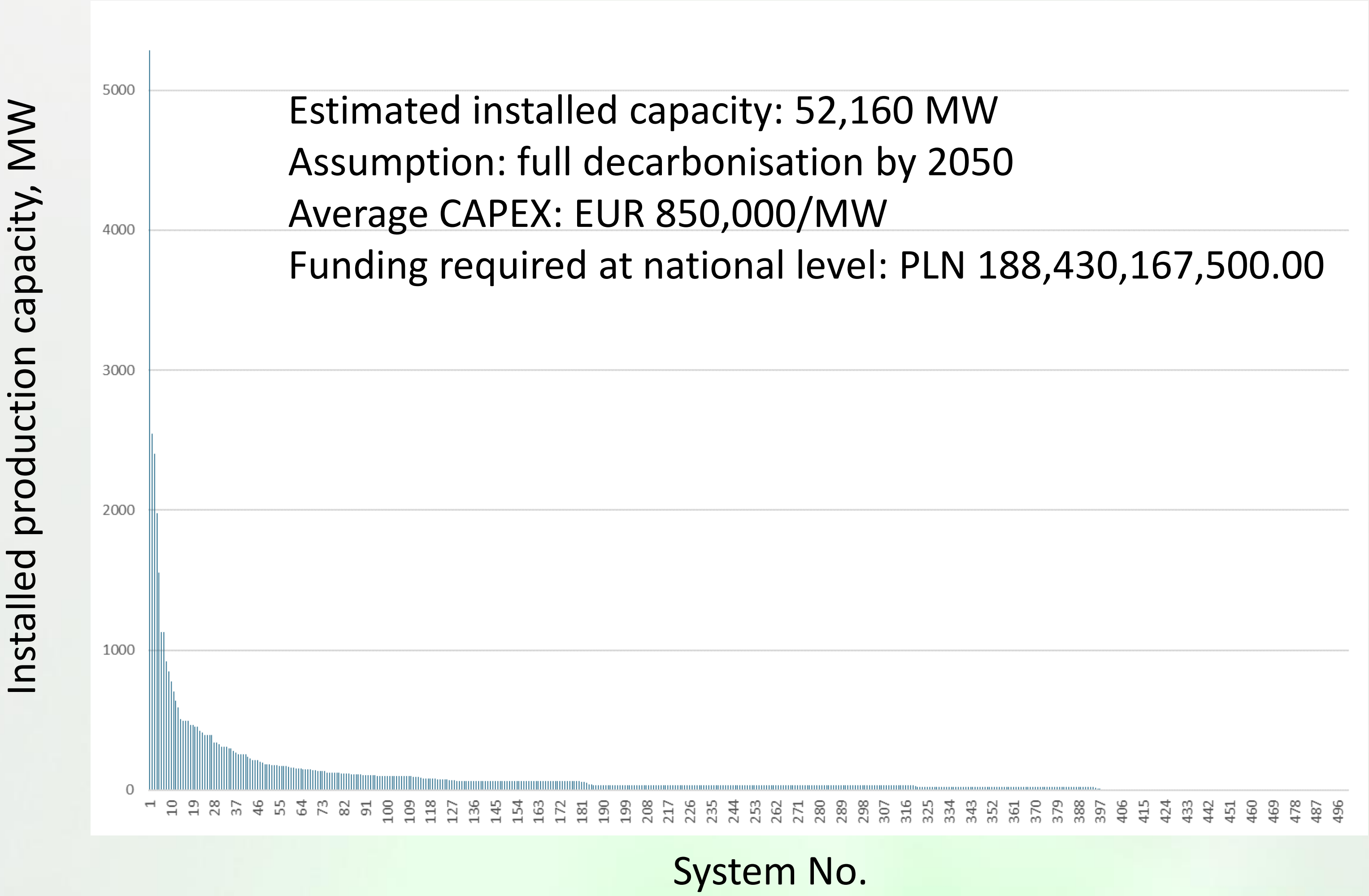
Polish District Heating



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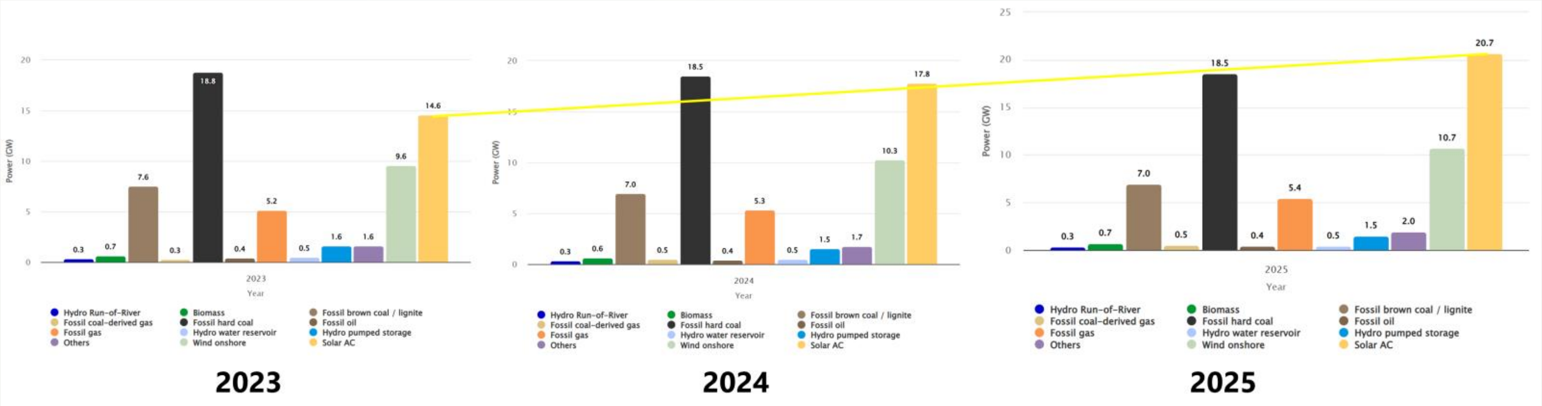
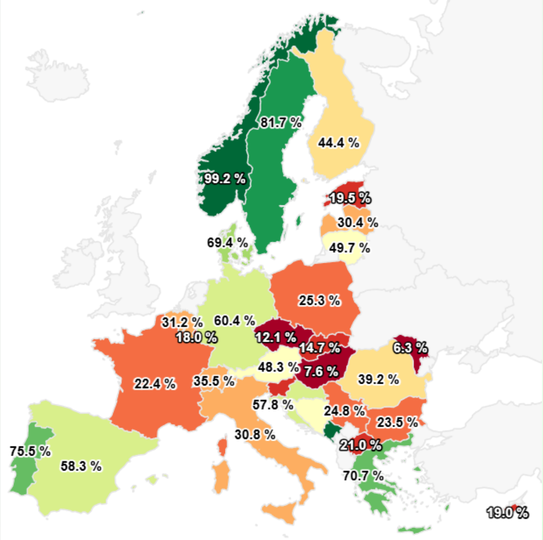
Power System and Market Evolution

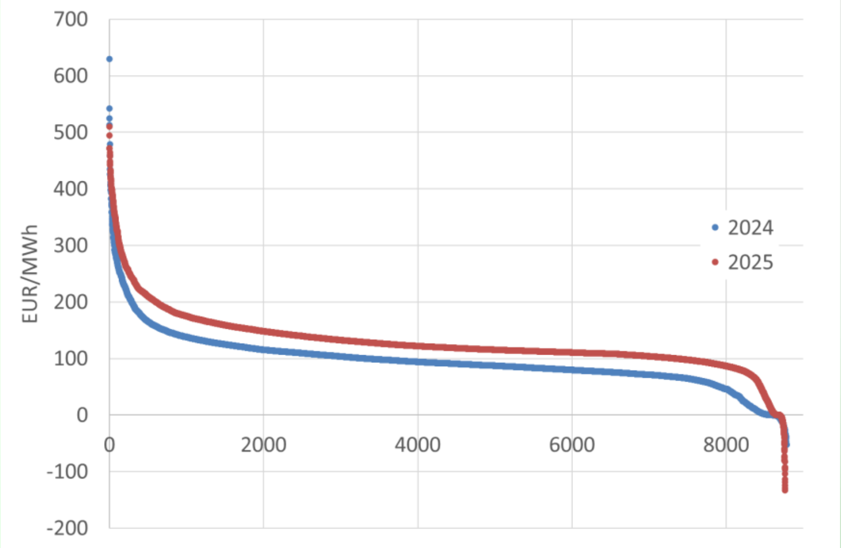
Installed electricity production capacity



2025 share of RES in electricity production



Electricity market price



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What DH companies are planning today?

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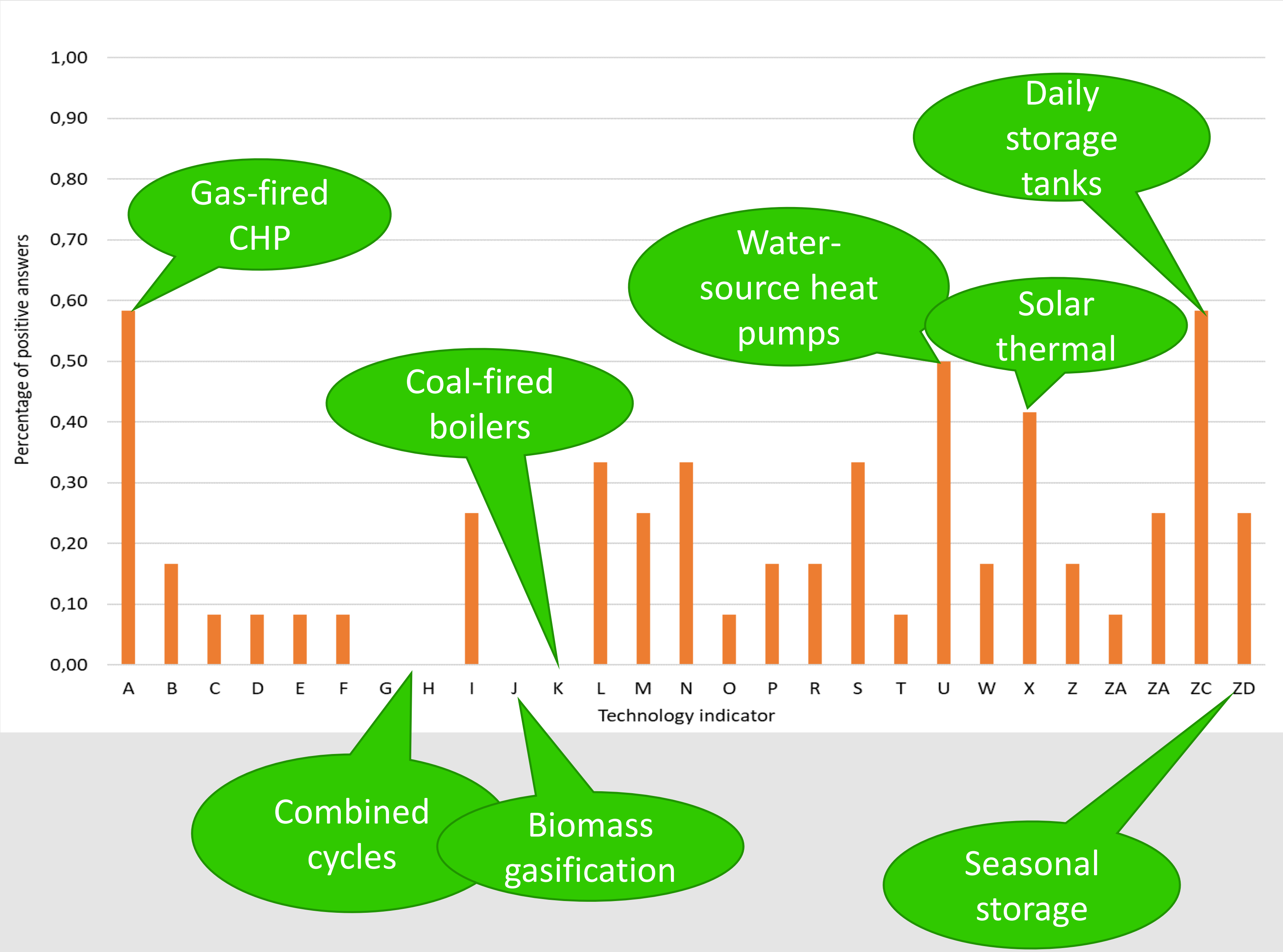

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Gas CHP

- A record high in investment in gas-fired cogeneration within the Polish heating sector.
- An estimated 60–90 gas-fired cogeneration projects are currently under construction or about to begin construction;
- 8–15 combined cycle gas turbine projects;
- The National Fund for Environmental Protection and Water Management anticipates around 130 new high-efficiency cogeneration installations by 2030.
- The waiting time for a gas engine is approximately 2 years, and for a gas turbine approximately 6 years.

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Large Heat Pumps (>1 MW)

City / investor	Status	Heating capacity
Warszawa – OŚ Czajka / ORLEN Termika + MPWiK	plan / contracts	ok. 120 MWt
Warszawa – Przepompownia Żerań / ORLEN Termika	funding / preparation	do 50 MWt
Warszawa – Żerań / ORLEN Termika	funding / preparation	do 145 MWt
Kraków – EC Kraków / PGE Energia Ciepła	plan / preparation	50–100 MWt
Gdańsk – EC Gdańsk / PGE Energia Ciepła	conceptual plan	44–80 MWt
Wrocław – Wrompa / Fortum	implementation / commissioning	12,5 MWt
Gliwice – PEC Gliwice	implementation	12 MWt
ECO Opole	Feasibility study	10 – 12 MW
Rzeszów – PGE Energia Ciepła	preparation / plan for 2027	14 MWt
Solec Kujawski – KPEC Bydgoszcz	design	do 12 MWt
Sochaczew – ciepłownia geotermalna	implementation	2 × 2,5 MWt = 5 MWt
Piaseczno – PC-U Piaseczno	tender / modernisation	ok. 4 MWt
Poznań / Szlachęcin – Veolia + Aquanet	In operation	część układu 2,9 MWt
Biłgoraj – BPEC	In operation	1,1–1,4 MWt
PEC Termowad Wadowice	Implementation	2.16 MWt

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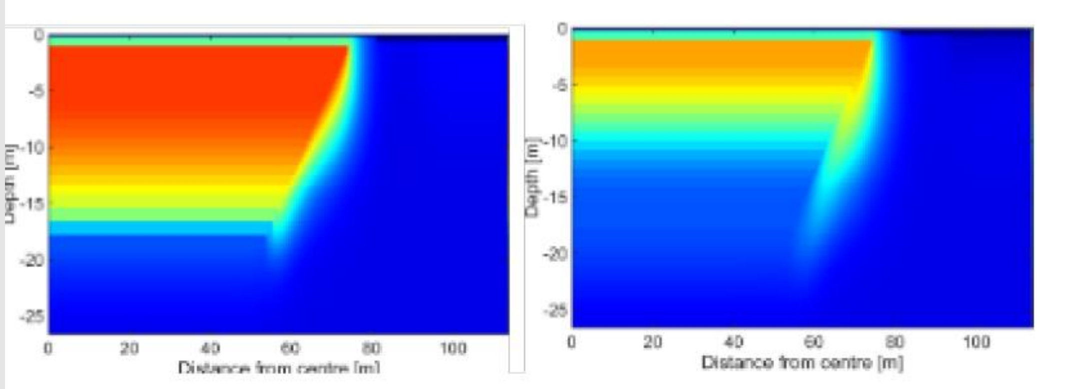
Other projects



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Heat Sources

— In most of the cities analysed, local resources are insufficient

— Example of potential to meet demand: Opole ~30%

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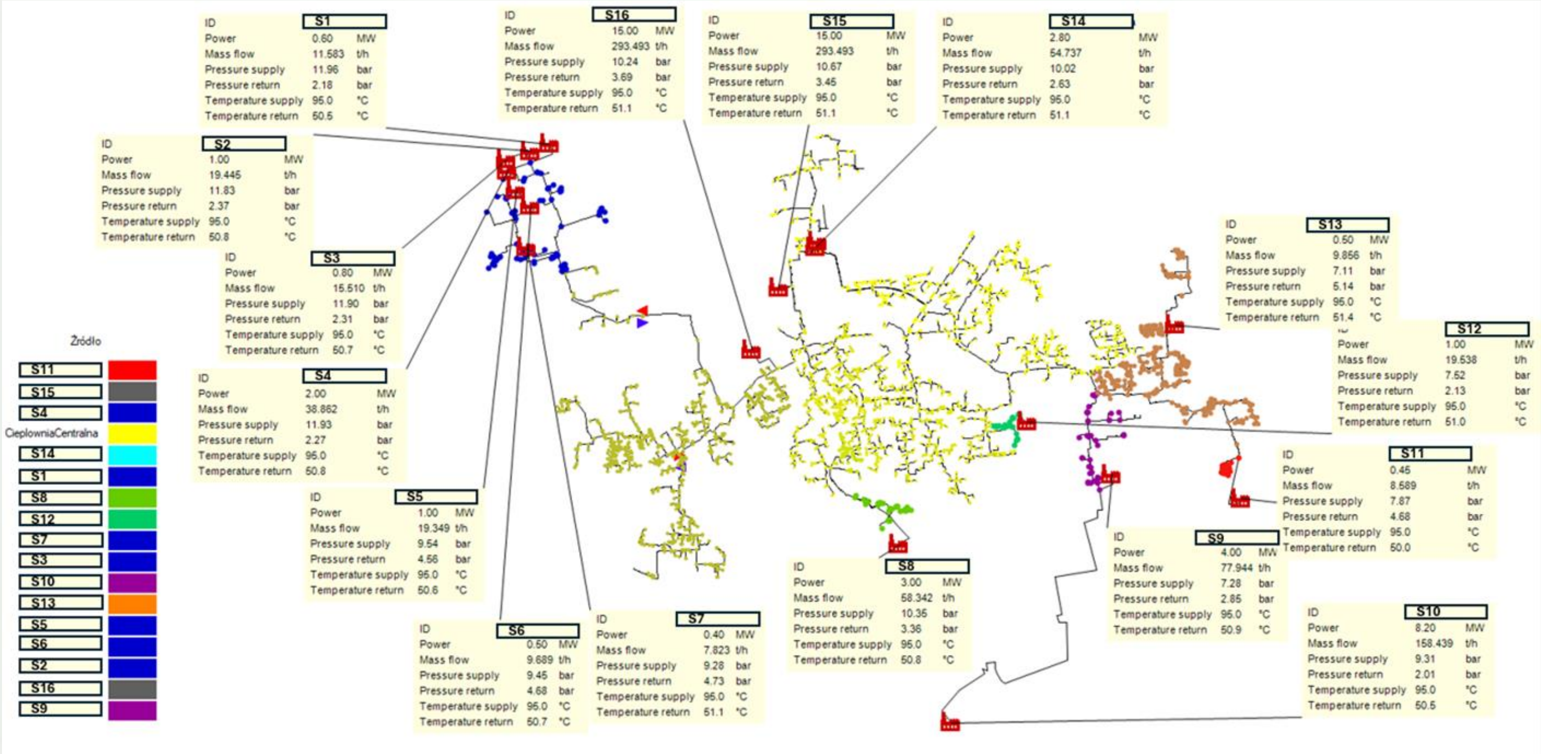
Heat Harvesting – Future DH model

— The use of distributed low-temperature heat sources wherever they are available

— Air-source heat pumps should be considered in most systems

— Storage is essential



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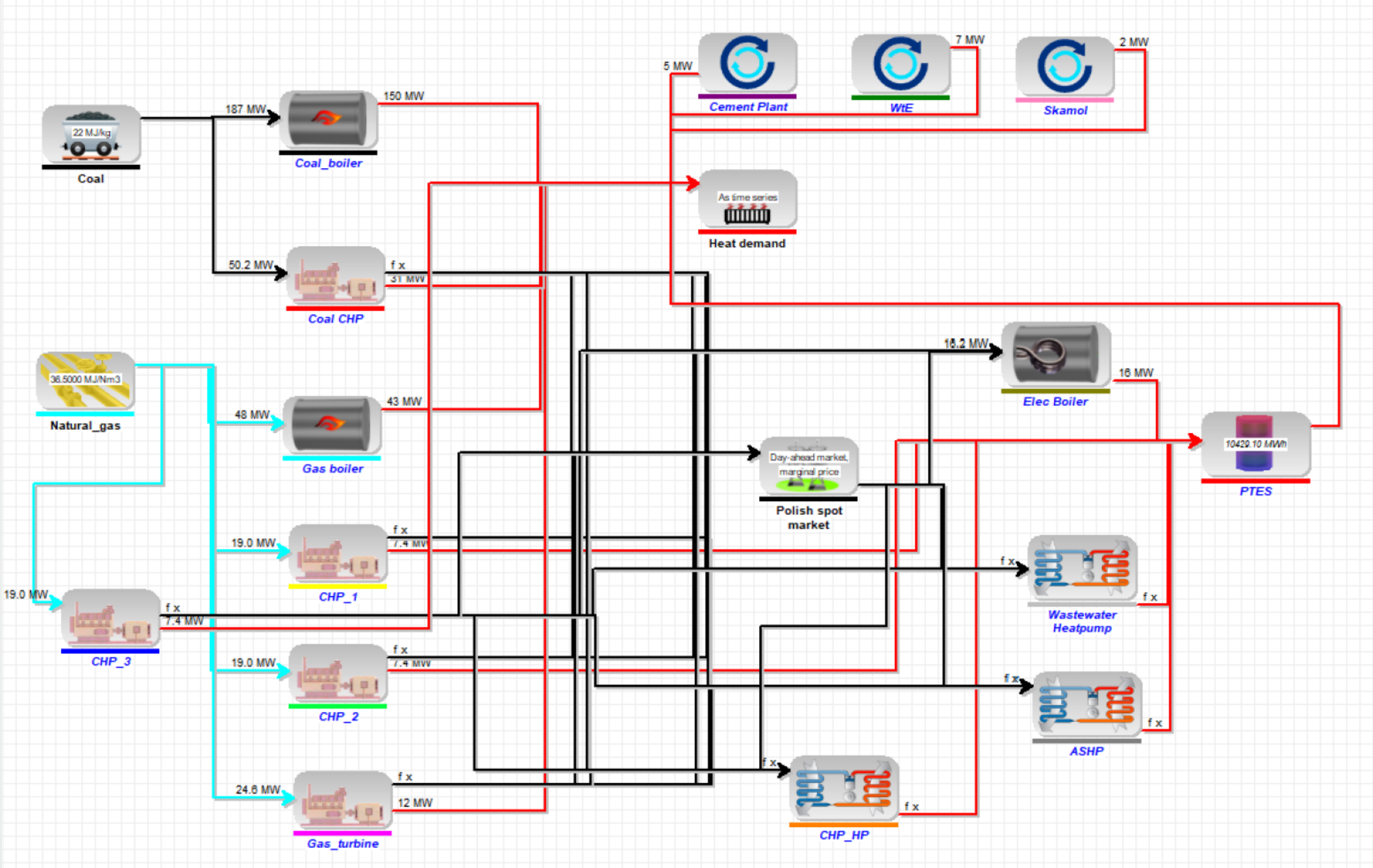
The Economics of Transition

Example Opole (prices as of 2025)



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The Economics of Transition

Example Opole (prices as of 2025)

- Reference case

Operating Expenditures	
CHP_1 cost	583570
CHP_2 cost	581931
GT_cost	94360
Coal_CHP_cost	128672
Coal_Boiler_cost	297531
Gas_Boiler_cost	27287
Gas_cost	12059267
Coal_cost	6652936
CO2_cost_gas	4409083
CO2_cost_coal	10333205
Gas_cost_distribution	854641
Total Operating Expenditures	36022483
Net Cash from Operation	-11,675,556

- 2035, system costs optimised

Operating Expenditures	
CHP_1 cost	541422
CHP_2 cost	414453
GT_cost	106229
Coal_CHP_cost	144858
Coal_Boiler_cost	354776
Gas_Boiler_cost	1139
Gas_cost	14869527
Coal_cost	3473394
CO2_cost_gas	5337451
CO2_cost_coal	5319889
Cement Plant Cost	2029199
WtE Cost	4452218
HP Electricity Cost	-19117
Wastewater HP Cost	121355
ASHP Cost	11815
CHP_HP_Cost	17636
Skamol Cost	218298
ASHP Cost_2	82500
Wastewater HP Cost_2	310276
Electric boiler Cost_2	138510
CHP_3 cost	414453
Gas_cost_distribution	1028017
Total Operating Expenditures	39,368,300
Net Cash from Operation	-13,079,796

- Net -1 404 240 EUR/a

- 2035, system fullfilling EED requirements

Operating Expenditures	
CHP_1 cost	547229
CHP_2 cost	519552
GT_cost	308713
Coal_CHP_cost	420973
Coal_Boiler_cost	964147
Gas_Boiler_cost	3490
Gas_cost	18851250
Coal_cost	1234367
CO2_cost_gas	6607470
CO2_cost_coal	1882215
Cement Plant Cost	2022514
WtE Cost	4452218
HP Electricity Cost	12944
Wastewater HP Cost	236973
ASHP Cost	51213
CHP_HP_Cost	25365
Skamol Cost	653911
ASHP Cost_2	357600
Wastewater HP Cost_2	586267
Electric boiler Cost_2	1177740
CHP_3 cost	519552
Gas_cost_distribution	1276575
Total Operating Expenditures	42,712,277
Net Cash from Operation	-21,939,028

- Net -10 263 472 EUR/a

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The Economics of Transition

- Most scenarios have a negative NPV without public support
- Electricity and CO_2 prices are of key importance
- Required: grants, guarantees, blended finance and EU funding
- New business models and value stacking are required
- Risk of social unacceptability of tariff increases

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Strategic Risks to Address

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— Regulatory uncertainty

— Electricity price volatility and evolution

— Demand forecasting errors

— The risk of tariff increases and a loss of public acceptance

— The risk of stranded assets for gas-fired and cogeneration assets (reduced hours on grid)

— Dependence on the pace of transition in the electricity sector

— Lack of stable investment financing mechanisms

— Increasing operational complexity and cybersecurity

— Technology performance risks

— Stakeholder resistance

— Supply-chain constraints

Key Trade-offs

— Decarbonisation vs costs to consumers

— System flexibility vs operational complexity

— Electrification vs dependence on the energy market

— Ambitious regulatory targets vs the risk of stranded costs

— Business value vs social value

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Conclusions

- Decarbonisation is not primarily a technology problem. The main barriers are regulatory, financial, organisational and socio-economic,
- DH companies are triggering long-term investment roadmaps,
- Although flexibility, resilience and sector coupling are critical, hardly any DH company knows how to monetise them,
- Municipalities and DH operators need planning skills and tools,
- Competencies in regulation, finance and modeling need to be developed in the DH sector,
- Continuous knowledge transfer is required.

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Contact information

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