Collaboration between Industry and District Heating Plant

Benefits, barriers, and business models for process heat and surplus heat

/ Project Director Michael Lassen Schmidt

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NIRAS

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NIRAS Odense, Denmark

Over 30 years of experience in project management, especially within energy and district heating, both nationally and internationally.

Professional Experience

2017–present: Project Director at NIRAS (formerly Head of Department)

2014–2017: Project and Energy Market Director at COWI

2006–2014: Managing Director in several companies (including DESMI Danmark A/S, CHR. Boldsen A/S, SAWO A/S, Prepan Danmark A/S)

1992–2006: Different positions within sales, project management, and branch management in technical companies

1976–1987: Electrician

Education

- Beng, Mechanical Engineer, Odense Technical University, 1992
- Electrician apprentice, Odense Technical Gymnasium, 1980
- Various relevant courses, including occupational health and safety, project management (IPMA C), project law, and project economics

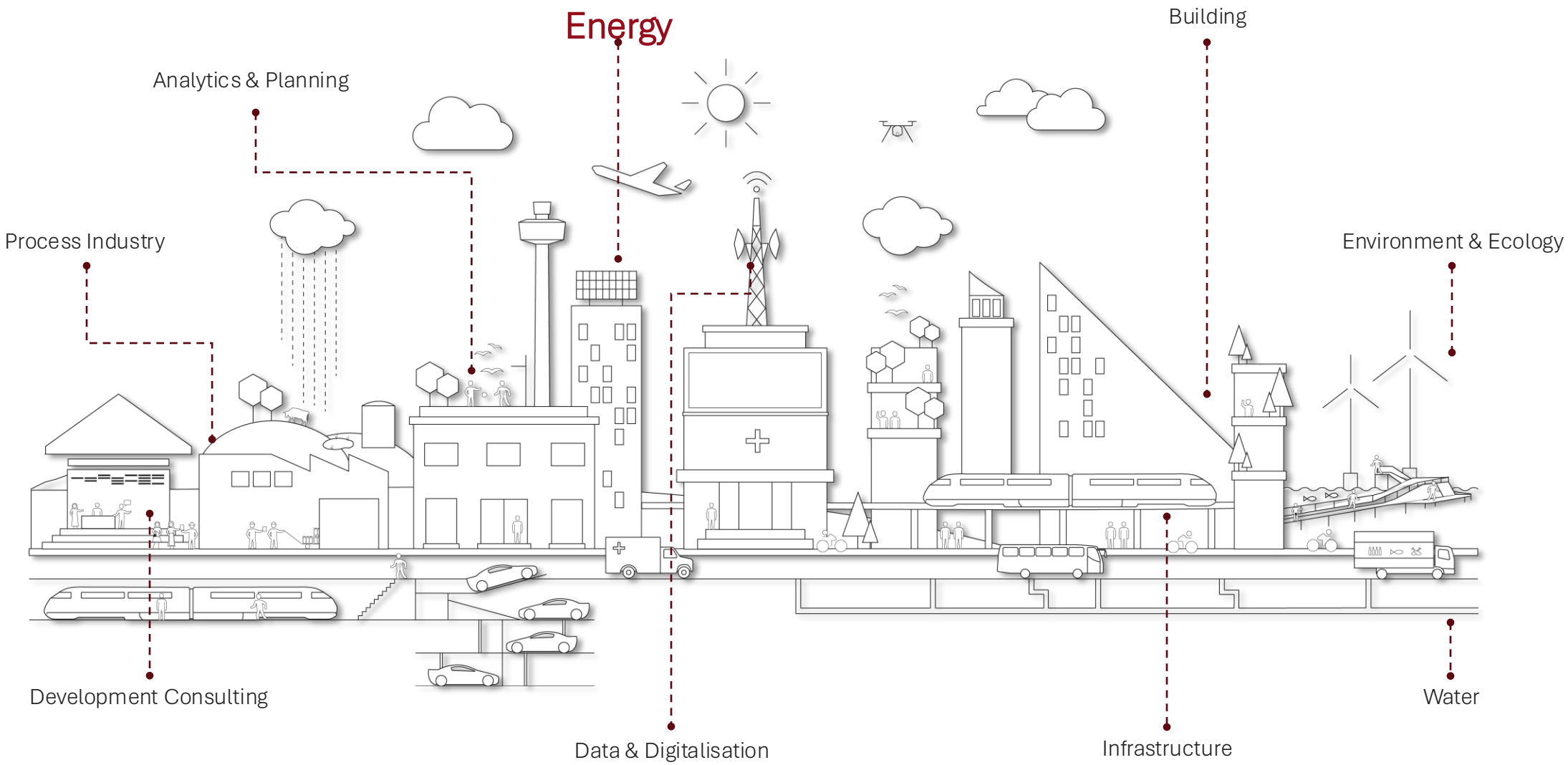
NIRAS - Global Presence

62
Offices

+3,000
employees

8,000
projects

Sectors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Water

POTENTIALS for DH as PROCESS HEAT IN DENMARK

- **Current use of district heating in Denmark**
  Today, only about **1% of process heat** is supplied via district heating, indicating a large untapped potential.

- **Potential heat at 80°C**
  With a supply temperature of 80°C, district heating can cover up to **at least 16%** of the process heat demand in Danish industry.

- **Heat pumps increase energy efficiency**
  Upgrading to approx. 150°C with heat pumps can increase the coverage **to over 40%** of process heat.

BENEFITS and BARRIERS - using District Heating in industrial process heat

Perspective	BENEFITS	BARRIERS
INDUSTRY	Significant **CO_2 reduction** and strengthened ESG profile (thanks to renewable district heating)	**Tax and reimbursement schemes** may favor fossil fuels → district heating becomes less economically attractive
	Economic resilience: reduced exposure to fossil fuel price volatility and CO_2 taxes	**Technical conversion** from steam-based to liquid-based systems requires investment (especially for small companies)
	Higher energy efficiency when combining district heating, surplus heat, and heat pumps	**Investment needs** for high-temperature heat pumps and process adaptation (CAPEX) (especially for small companies)
	Potential for **lower operating costs** over time (especially with high-temperature heat pumps and electrification)	**Risk** associated with changes to production equipment and operations
DISTRICT HEATING	Access to **new heat demand** and economies of scale → lower system-wide heat prices	**Regulatory barriers**, e.g., project regulation hindering expansion
	Efficient **utilisation of industrial surplus heat**, reducing total system energy consumption	Need for extensive **coordination** with companies, authorities, and grid operators
	Strengthened role in the **local green transition** and improved collaboration with industry	**Long-term investment risk** (business model uncertainty regarding contract agreement with company). May influence the consumer price (self-contained).
	Circular energy solution and CO_2 neutrality Combining district heating and heat pumps utilizes surplus heat and promotes CO_2-neutral process heat.	Need for establishing **infrastructure, capacity, and new technologies** (HT-HP, pipelines)

Summary

DISTRICT HEATING AS PROCESS HEAT

	STATUS (DENMARK)
Current share	1% of process heat from district heating
Potential	Up to 40% with heat pumps
Advantages	CO_2 reduction / ESG, lower operating costs, price stability, energy efficiency, capacity utilization, local business cooperation
Barriers	Tax rules, technical conversions, investment needs, risk regarding long-term business model
Projects	RAPIDH, **INTREPIDH**, SPIRIT

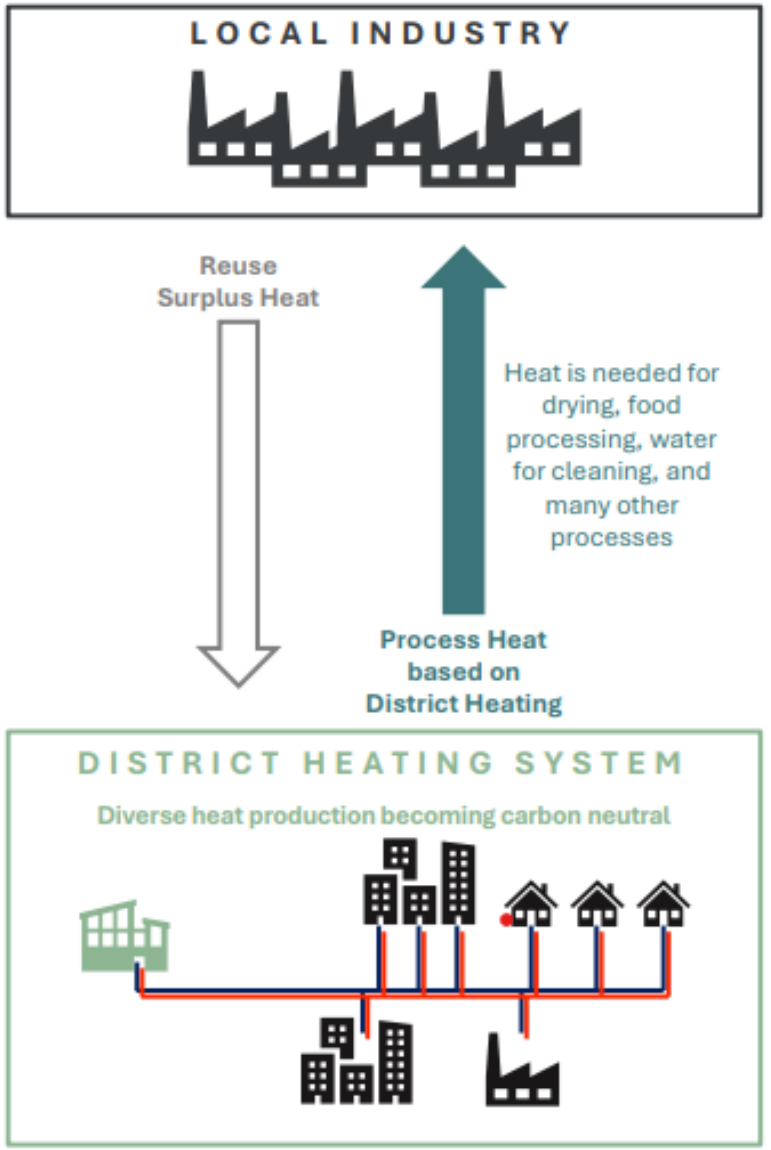
Business Models

Classic supply agreement: district heating plant supplies process heat (capacity payment + variable energy)	ADVANTAGES:	Clear division of roles, low risk for industry, predictable economic, suitable for both
	DISADVANTAGES:	Less flexibel, investment and risk at DH, limited incentive for energy optimization (designed for supplying heat to industry and not from industry til DH
Symbiosis model: industry sells surplus heat and buys (process) heat (2-way relation)	ADVANTAGES:	Both gain from optimization, mutual dependency, ressource utilisation, socio-economic benefits
	DISADVANTAGES:	Complex, negotiations and adaptations, regulatory challenges (price and cost principles)
Heat-as-a-Service contract: supplier finances/runs the technical equipment and sells heat service	ADVANTAGES:	No investment for industry, high flexibility, suitable for technical adaption
	DISADVANTAGES:	Long contracts, higher prices for industy, regulatory complexity
Joint venture: joint investment in connection/high-temperature heat pump with shared revenues	ADVANTAGES:	Joint ownership, shared risk, optimal system optimization,
	DISADVANTAGES:	Complex, capital from both parts, risk of conflict due to market change, long-term commitment

case:

SURPLUS HEAT from a local carpet manufacturer ”EGE TÆPPER” to GRAM DISTRICT HEATING

Cooperation between Industry and District Heating Company



Source:
Best Practice Catalogue, INTREPIDH

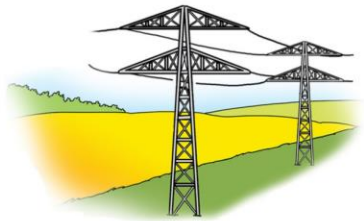
Gram Fjernvarme

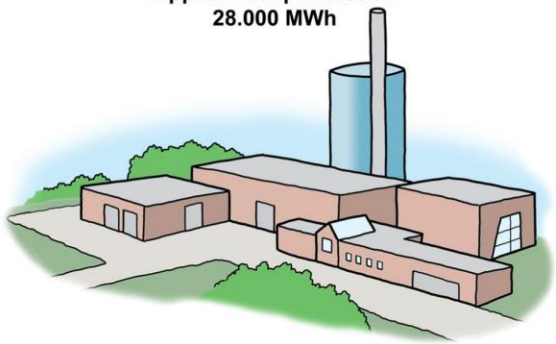
District heating plant

App. annual production
28.000 MWh

ARCON SUNMARK

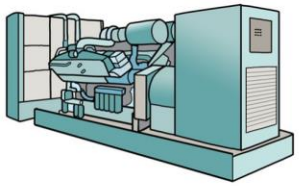
May 2016





City

Gas engine
5,5 MW power

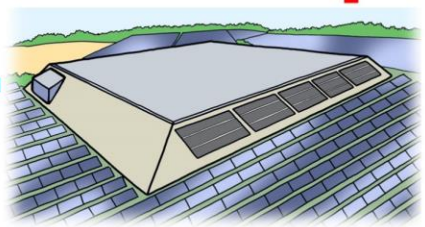


7 MW heat

71 - 74°C

SYMBIOSIS model	HEAT AMOUNT (MWh/YEAR)
Total heat production at Ege Tæpper	2.350
To Gram District Heating	2.000
Into the district heating network	1.000
Back to Ege Tæpper (for heating the office):	1.000

Thermal pit storage
122.000 m³



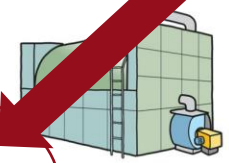
170 kW
photovoltaic

Storage tank
2300 m³

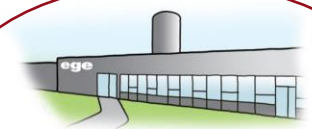
2 MW heat

Hot water

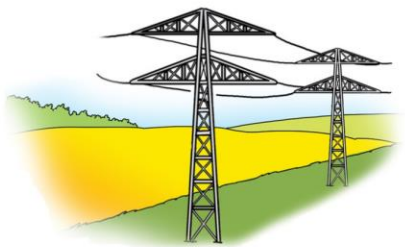
Cold water



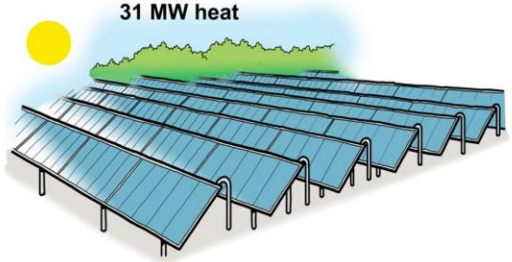
Gas boiler
5,5 MW heat



Ege Tæpper

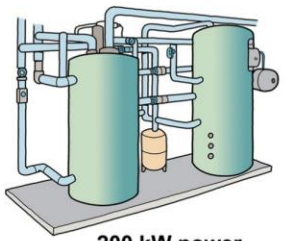


31 MW heat



Solar collectors
44.800 m² (3.565 qcs)

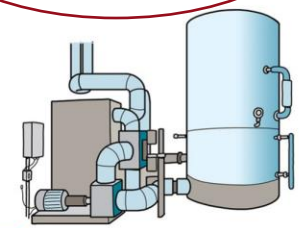
Heat pump



200 kW power
950 kW heat

Hot water

10 MW hot water



Electric boiler

10 MW power

32 - 38°C

NIRAS

Yogisstreg

CASE: Critical key points regarding business model and contract agreements between industry and heating company

GRAM FJERNVARME

POSITIVE

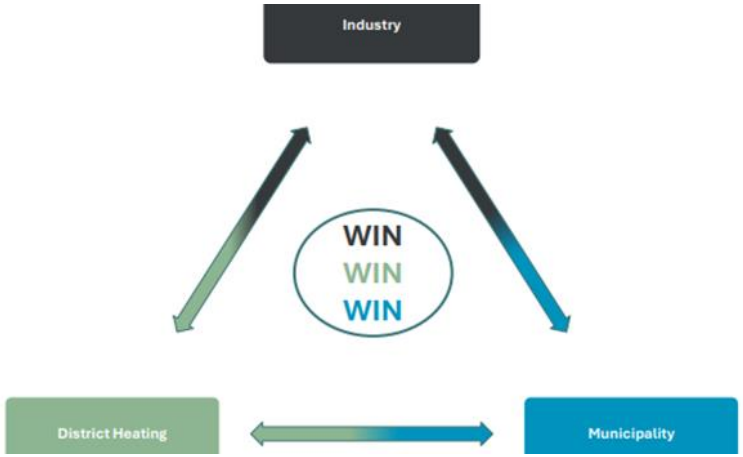
- WIN-WIN situation regarding green profile branding and obtaining green certifications.
- Possible advantageous economic gains regarding buying/selling heat.
- Price cap of surplus heat removed (DK)

NEGATIVE

Investment / payback period (CAPEX):
Who invests in the technical equipment? Depreciation rules usually differ between industry and district heating company. Industry invests short-term with short depreciation (3-5 years). District heating company invests long-term with long depreciation (up to 20 years).

Maintenance of the technical equipment:
Who operates, and services the technical equipment / heat pump? Is there an interest in maintaining good maintenance of the technical facility at the owner of the industry?

Business cooperation:
Who owns the company (cooperate own), and what is the owner's vision regarding buying/selling heat? Is it a well-founded stable company? Is there a risk that the company relocates or closes?



Source:
Best Practice Catalogue, INTREPIDH

How to start and to establish a heat agreement:

Process and governance (step-by-step guide)

1. Map heat demand / surplus heat (temperature volume, operation)
2. Technical / economic pre-analysis (integration, MWh/year, high-temperature heat pump)
3. Early dialogue between the partners (data, requirements, capacity)
4. Framework conditions and regulation (taxes, price)
5. Business case (savings / income, subsidies, risk)
6. Contract (specifications, price, responsibility measurement, ESG)
7. Implementation and monitoring (performance, optimization)

THANK YOU FOR YOUR ATTENTION

MICHAEL LASSEN SCHMIDT