

**APPENDIX B:
EXAMPLE OF A
PROJECT
PROPOSAL
PREPARED IN
ACCORDANCE
WITH THE DANISH
HEAT SUPPLY ACT**

Project proposal
for installation
of an air-water
heat pump and
an electric
boiler at
NN_Housing

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1. Summary

On behalf of the independent institutions DSI NN_Housing and DSI NN_Housing II, No Name Foundation hereby submits a request to Svendborg City Council for approval of this project proposal to establish of a 300kW air-to-water heat pump and a 350kW electric boiler to cover the heat demand of the residential building complex NN_Housing. The motivation for this proposal is that NN_Housing would like to move away from fossil fuels, and since district heating is not expected to become available in the area, heat pump technology represents the most viable alternative.

NN_Housing residential building complex, located at the addresses Eghavevej 2-34, Troense on Tåsinge, 5700 Svendborg, is distributed across two cadastral registers 33b and 33c Troense By, Bregninge. It comprises 82 terraced houses and a shared facilities building with a gas-fired boiler central. The boiler central is legally a block heating station that covers the entire heat demand of the building complex and qualifies as a collective heat supply system under the Danish Heat Supply Act. Consequently, the proposed heat pump and electric boiler require approval from Svendborg City Council in accordance with the Statutory Order No. 697 of 6 June 2023 on the approval of projects for collective heat supply systems under the Heat Supply Act (Legislative Order No. 124 of 2 February 2024) .

For approval, it is a prerequisite that the project is in accordance with the objectives of the Heat Supply Act to promote the best use of energy from a socio-economic perspective for building heating and domestic hot water supply.

As demonstrated in the conclusion, the proposed project is socio-economically advantageous compared to relevant alternatives. Moreover, based on Svendborg Municipality's climate goals, continuing the use of natural gas as the primary fuel is not considered relevant as a future reference.

2. Responsible for the Project

Svendborg Municipality, as the local heat planning authority, is responsible for processing the project proposal in accordance with the Heat Supply Act.

SDI NN_Housing and SDI NN_Housing II are responsible for the project proposal, which has been prepared in collaboration with Rambøll Danmark A/S. They are also responsible for the establishment and operation of the proposed air-to-water heat pump and electric boiler.

3. Relationship to Planning and Legislation

3.1 Municipal heating planning

The project proposal affects the residential building complex NN_Housing, which is located on 2 cadastral registers with the following ownership:

- Cadastral register no. 33b - Troense City, Bregninge, owned by DSI NN_Housing with 46 townhouses and a shared facilities building with a gas-fired boiler central, all built in 1969.

- Cadastral register no. 33c - Troense City, Bregninge, owned by DSI NN_Housing II with 36 townhouses built in 1982.

The use of these registers is regulated by "Town planning bylaw no. 32 for an area around Eghavevej - Troense", adopted on 7 October 1971. The bylaw assigns Svendborg City Council a central role in the assessment of the project proposal and in ensuring that the new facilities do not significant nuisance for the neighbours. The statute specifies that: "No activity of any kind may be carried out within the area, which by dust, smoke, smell, noise, vibrations or by its appearance or in any other way, at the discretion of the city council, is a disadvantage for the residents." Furthermore, that "according to the present town planning bylaw, only Svendborg City Council is responsible". Svendborg City Council is assessed to fulfil this through the municipality's screening in accordance with the Environmental Impact Assessment Act and environmental assessment in accordance with the Environmental Protection Act (see next section).

In accordance with the national political climate agreements and strategies, Svendborg City Council adopted "Heating Plan 2030" on 20 Dec. 2022. The plan acts as a guideline in relation to collective and individual heat supply, especially in connection with the phasing out of natural gas areas. Here, the Troense heat planning area including NN_Housing is laid out for individual heat supply. The prerequisite for the project proposal is that no district heating is expected in the area.

The project proposal is in line with Svendborg Municipality's "Climate Action Plan 2022", which has been prepared within the framework of the municipalities' climate cooperation in DK2020 and in accordance with the climate planning that the city network C40 Cities is behind.

3.2 Relationship to other legislation

The project proposal's heat pump system and electric boiler are covered by the Environmental Impact Assessment Act (Legislative Order no. 4 of 03/01/2023). In Annex 2 of the Act, the project falls under point 3a) Industrial plant to produce electricity, steam, and hot water. A project listed under Annex 2 cannot commence until the municipality has provided written notification to the developer, based on the application and screening decision, confirming that the project is not expected to have a significant environmental impact. This means, cf. § 21 of the Act, that the project must be screened according to the criteria in Appendix 6 to assess whether it will cause a significant impact on the environment and in case must be subject to an environmental impact assessment and permit. A project of the type described is normally not expected to have a significant environmental impact.

In relation to the Environmental Protection Act (Legislative Order no. 1093 of 11/10/2024), the developer makes a separate request to the municipality to assess whether the construction phase of the heat pump system and the electric boiler require environmental approval. This will be relevant if the construction phase can cause temporary environmental impacts that potentially exceed normally permitted limit values. In this case, it is assessed that the establishment of the new heat production facilities will not significantly affect the environment.

Within the framework of the Electricity Supply Act, the licensed electricity grid company within the geographical area is responsible for ensuring that there is sufficient capacity in the electricity grid for both the new heat pump and the new electric boiler. Electricity will be supplied from a new 0.4/10 kV transformer station, which electricity grid company establishes nearby NN_Housing.

4. Investment Estimates

NN_Housing is currently heated by the building complex' own block heating station, which is in the joint facilities building at Eghavevej 22. The station consists of two gas boilers with a heat output of 235 kW and 245 kW respectively. They cover the full heat demand of the building complex comprising space heating and domestic hot water.

As NN_Housing wants to phase out fossil fuels, and there is no prospect of district heating in the area, this project proposal is based on a previous technology assessment, which concluded that it would be most optimal to switch to an air/water heat pump.

As shown in appendix 1, the heat pump system is placed on the open grass area south of the building. A 300 kW CO₂ air/water heat pump will be established here, surrounded by a 4 m high noise shielding screen to comply with the Danish Environmental Protection Agency's indicative limit values for noise. In addition, a heat accumulation tank of 4.5 m³ is installed. The heat is transferred to the heat supply central through a 100-meter district heating pipeline and is expected to cover approx. 87% of NN_Housing's annual heat demand. The remaining approx. 13% will be covered by the new 350 kW electric boiler, which will be operating as a peak and reserve load boiler. The electric boiler will be housed within the existing boiler central, one of the gas boilers being removed, while the other gas boiler is kept (for the time being) as a reserve.

As an alternative to an air/water heat pump, a ground heating system with the same capacity and heat coverage can be established. Compared to the air/water heat pump in the project proposal, a ground source heat pump achieves a higher annual COP, and it is quiet, as a fan is not required to extract heat from the air. Since horizontal ground heating pipes will require a larger area than there is available at NN_Housing's lawn, the ground heating system will be established with vertical boreholes into the ground to extract heat. It is considered possible to obtain permits for heat extraction with vertical boreholes, as NN_Housing is in an area where there are no special conditions for the protection of drinking water resources.

Another alternative is to establish smaller, separate air/water heat pumps placed in their own shed and with a noise-shielding screen at each of the 16 residential buildings and at the joint facilities building. This means that the gas-fired heat production central and the heat distribution pipelines between the buildings can be completely shut down. It is assumed that these heat pumps can draw on the existing electricity grid capacity without additional Ampere purchase.

Investment estimates for the air/water heat pump with the electric boiler as well as for the two alternatives are shown in Table 1. New radiators, control valves and an adjustment of the internal heating system at

NN_Housing have been added to the investment estimate. This will make it possible to use the heat pumps more optimally by lowering the operating temperatures, which will also reduce heat consumption by approx. 5% due to less heat loss from the hot water pipes and better control of the heat in the homes.

It should be mentioned that the alternative of vertical ground heating system is associated with a lot of uncertainty at the current stage, which means a more uncertain construction estimate. It is about the fact that, because it has not been investigated to what extent the soil conditions are suitable for heat recovery through vertical boreholes, the number of boreholes required can vary considerably. The investment estimate assumes the best possible soil conditions. It should also be mentioned that the boreholes would require permission from the municipality, because the chemical composition of the brine that transports the heat from the ground to the heat pump is a potential contamination risk for soil and groundwater.

Table 1: Investment estimate for the project proposal's air-water heat pump and alternatives

Investment estimate Unit: 1000 DKK	Project proposal: Heat pump + electric boiler	Alternative: Vertical ground heat	Alternative: Building heat pumps
Heat pump system	1.900	1.600	3.060
Electric boiler	350	-	-
Excavation and assembly work	680	2.980	350
Electricity capacity and switchboards	1.120	440	0
Noise shielding	75	0	510
Upgrading the radiator system	765	765	765
Project management and administration	350	400	350
Contingencies	520	620	500
Total investments	5.760	6.805	5.535

5. Time Schedule

Following municipal approval of the project proposal, tendering and contracting are planned for early 2025. The installation and commissioning of the heat pump system and electric boiler are expected to take place by the end of 2025, depending on delivery timelines for critical components.

6. Restrictive Covenant and Land Acquisition

Since the heat pump installation may impact neighboring properties visually, through noise, and due to its location, it is recommended to register a restrictive covenant. This will ensure the system is installed and operated in compliance with approved conditions, thereby minimizing any potential nuisance to neighbors. In contrast, the electric boiler, which will be housed within the existing boiler central, does not require a

restrictive covenant as it is not expected to affect the surrounding environment. The project will not involve any land acquisition.

7. Negotiations with Other Supply Companies

Negotiations with the licensed electricity grid company regarding the connection agreement are underway to ensure compliance with all legal and technical requirement.

8. Economic and Climate Assessments

8.1 Socioeconomic assessment

The socio-economic calculations have been carried out in accordance with the Danish Energy Agency's regulations, i.e. "Guidance in socio-economic analyses in the energy area" published July 2021, as well as "Socio-economic calculation assumptions for energy prices and emissions, 28 February 2022", supplemented with information from the Ministry of Finance's Key Figures Catalogue of June 2024.

The social-economic discount rate is set at 3.5%. The Project planning horizon is 20 years from 2025 to 2044. Differences in expected technical lifetimes are regulated by including scrap values after 20 years in the year 2044. The following technical lifetimes are assumed:

- Upgraded radiator system, pipe system etc.: 40 years.
- Large heat pump and electric boiler: 20 years.
- Smaller building air/water heat pumps: 16 years.

The scenario analysis with socio-economic net present value (NPV) calculations are shown in Appendix 2. The results are summarized in Table 2. With the given calculation method, the total socio-economic costs over 20 years for a central air/water heat pump with an electric boiler are the lowest, while the alternatives: a vertical ground heating system and building heat pumps are respectively 14% and 3% more expensive.

The social-economic costs of keeping the existing gas heating system unchanged are also presented in the table. It is estimated that the operation can continue with the existing gas boilers, but their age is expected to result in an increased need for replacement of worn components and a higher risk of unforeseen repairs, in addition to regular maintenance.

Furthermore, considering Svendborg Municipality's climate goals, maintaining the current gas heating system is less relevant for the socio-economic comparison in this project proposal. As per § 16, subsection 5 of the statutory order on the approval of projects, preserving gas as the primary fuel is considered not to align with the municipality's objectives.

Table 2: Socioeconomic cost for the project proposal and the alternatives

Socioeconomic assessment NPV costs 20 years 3,5 % Unit: 1000 DKK	Existing gas-firing*	Project proposal: Heat pump + electric boiler	Alternative: Vertical ground heat	Alternative: Building heat pumps
Capital costs	0	5.631	6.303	6.410
D&V costs	935	739	2.442	740
Energy and environmental costs	10.888	5.164	4.447	4.771
Total net present value	11.823	11.534	13.191	11.922

*Assumed not relevant for the decision by the City Council

The following sensitivity assessments have been carried out, and the result is shown in Table 3:

1. The Climate Council's CO₂ price projection 2024 (higher than the Ministry of Finance's projection).
2. Investment costs 25% higher.
3. The electricity price level 25% higher.
4. The electricity price level 25% lower.

It can be seen from the sensitivity calculations; the central air-to-water heat pump provides the lowest social costs in all variants.

Table 3: Socioeconomic sensitivity assessment

Socioeconomic sensitivity assessment Unit: 1000 DKK	Project proposal: Heat pump + electric boiler	Alternative: Vertical ground heat	Alternative: Building heat pumps
Basis	11.534	13.191	11.922
Climate Council CO ₂ e-price forecast	11.546	13.409	11.930
Investment costs + 25%	12.941	14.767	13.524
Electricity prices +25%	12.386	13.960	13.111
Electricity prices -25%	9.815	12.422	10.733

Note that the obligations for the electricity grid company to ensure the necessary power capacity for its customers (including necessary investments) are included in the Ampere purchase price used in the calculations.

8.2 Company and end-user financial assessment

Since the investment is expected to be covered by grants from No Name Foundation, capital costs can be disregarded in the company and user financial assessment. As shown in Table 4, the heat bill for the end-

users will only consist of the energy costs as well as the costs for administration, operation, and maintenance.

As can be seen from the table, the heat bill will be halved if the proposed project is implemented, assuming the current price level for gas and electricity continues in the future. Company and user finances are also set out in appendix 3.

Table 4: Company and end-user heat expenses per year for project proposal and existing gas-firing

Prices ex VAT Price level year 2024	Unit	Existing gas-firing	Project proposal: Heat pump + electric boiler
Capital costs	DKK 1000/yr	0	0
Heat supply costs	DKK 1000/yr	945	435
Administration and services	DKK 1000/yr	70	59
Total heat expenses	DKK 1000/yr	1.015	493
Number of households		82	82
Average heat bill per household	DKK/yr	12.378	6.017

8.3 Emission reductions

If the proposed project is implemented, the annual CO₂ emissions from the heat supply of NN_Housing will be reduced from today's 249 tonnes to around 4 tons in 2035. This is because electricity is expected to be decarbonized over the next decade.

9. Conclusion

The project proposal must be approved in accordance with the Heat Supply Act, which aims to promote the most efficient socio-economic use of energy for building heating and domestic hot water supply. Additionally, the Act seeks to improve the environment and reduce the energy supply's dependence on fossil fuels.

The assessment in this project proposal is that the establishment of a 300kW air-to-water heat pump combined with a 350kW electric boiler will be the most favourable solution from a socio-economic perspective. In addition, this solution aligns with the goals of improving the environment and reducing dependence on fossil fuels. Therefore, it is recommended that the project proposal be approved in accordance with the Heat Supply Act.

For Svendborg Municipality, the proposed project is in line with the municipal plans: "Climate Action Plan 2022" and "Heating Plan 2030". However, this benefit is not a condition of approval.

