

30 November 2023

Explanation of Research Report 'Sustainable energy supply for De Waard and the Waardeiland Leiden in focus'

In the coming decades, the municipality's intention is to have every neighborhood in Leiden switch to cleaner energy. We want to emit less CO₂ for cleaner air. Before that happens, we still have many steps to take.

The municipality of Leiden has named the industrial estate De Waard and the Waardeiland as promising neighborhoods to start making the above-mentioned switch. Will it be mandatory to switch? The municipal council has indicated that it only wants to terminate the natural gas supply if an affordable option arises, if residents can decide for themselves how they make this transition and if there is a reasonable period for the switch of at least 8 years. The municipality therefore intends to develop an offer together with the residents of the Waardeiland and the businesses on De Waard, based on a survey to be held early next year. If this offer can be offered before 2026, then the national obligation to switch to a (hybrid) heat pump or another sustainable alternative when replacing the central heating boiler does not apply. You can then still opt for a (hybrid) heat pump or switch to the alternative that the municipality offers (whether or not in collaboration with market parties). The municipality expects that an increasing tax on natural gas and perhaps an additional CO₂ tax in a number of years will make this transition increasingly financially interesting. The Foundation Energy Transition De Waard and Waardeiland (SEDWW), in collaboration with the municipality of Leiden and the province of South Holland, has had Syntraal conduct a study into possible ways for sustainable heating and green energy, including costs, sustainability and feasibility. At three residents' evenings, residents and businesses have already been updated about interim results. The report is now available.

After studying the report, SEDWW concluded in its board meeting of November 28 that the alternatives for the Waardeiland have been well developed, but that the joint sustainable heat and power solution for De Waard and the Waardeiland must be developed in more detail.

The advantages and disadvantages of the different heating solutions are explained in detail in the report. For example, a collective approach has a number of advantages:

- The transition could become cheaper for all parties.
- The pressure on the (full) electricity grid could become more manageable
- It offers opportunities to cool as well
- The residents of the Waardeiland are then not exclusively dependent on a (hybrid) air heat pump. This can lead to many outdoor units appearing on the roofs or on the facades in the neighborhood. If cheap and not properly constructed, these can produce noise and not everyone will find them equally attractive if they do not fit into the Waardeiland 'look'.

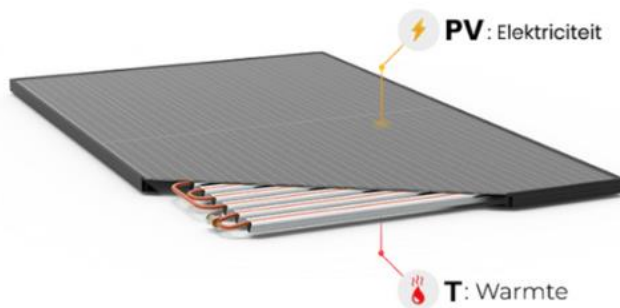
Even if the municipality makes an offer to connect to a collective heating supply, you do not have to use this. An end date may be set for the supply of natural gas and you must have made the transition individually before then (for example with an air heat pump).

A- Heating facilities for the business park De Waard

Syntraal has indicated that it sees a joint heating network with the business park De Waard as less attractive. The building density and therefore the heat demand on the industrial estate is too low for this. Individual heat supply is more obvious for these buildings.

A collective PVT network

With a collective PVT network, the roofs of companies on De Waard are used to generate heat and electricity using 'PVT' panels. The heat that these panels produce is used to feed a heating network. Due to the likely high costs and low heat density at De Waard, this heat supply is considered less desirable by Syntraal. The large roof areas do offer a great opportunity to generate electricity that also benefits the Waardeiland.



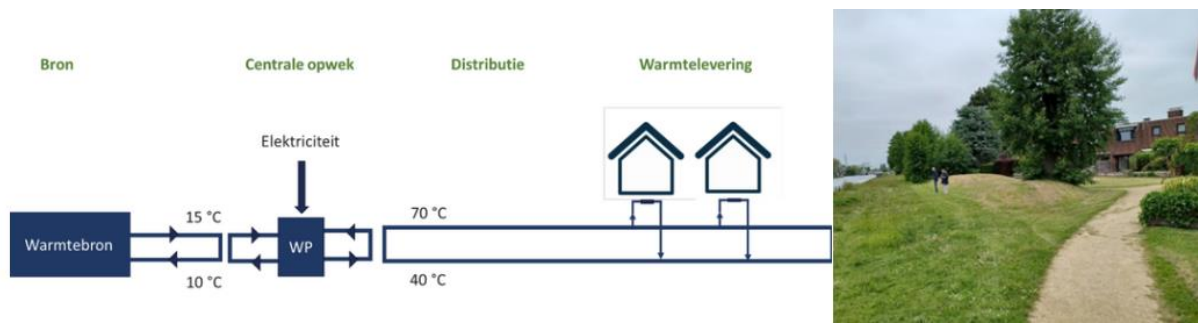
B- Collective heating facilities for the Waardeiland

Syntraal has investigated a number of collective heating facilities for the Waardeiland. All these heating facilities have their own advantages and disadvantages, which are explained in the research report. The following options have been investigated:

1- Collective heating network at medium temperature (approximately 70 degrees)

With a medium-temperature network, the Waardeiland would be connected to a heating network with a temperature of approximately 70 degrees. This heat is either generated from the Rijn-Schie Canal ('Thermal Energy from Surface Water') and upgraded with a collective heat pump for the entire district, or the Waardeiland is connected to the existing district heating network that will be supplied with industrial residual heat from Rotterdam (WarmtelinQ). In both cases, the heat reaches the homes at approximately 70 degrees. A 'delivery set' is installed in the homes that ensures that the heat is connected to the existing hot water system (for heating and hot tap water). There is therefore no need to purchase separate radiators and the current state of insulation is sufficient. The central heating boiler disappears. Syntraal estimates the total investment cost of this heat supply at approximately €7,190 and the annual cost at approximately €3,000.

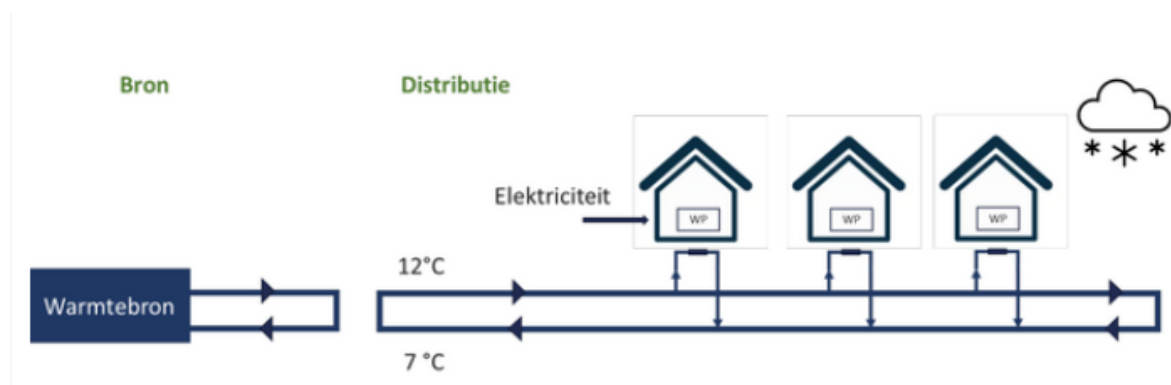
With additional insulation, the investment cost is higher and the annual cost is lower. Given economic developments, rising prices in the coming years must be taken into account.



2- Source network with individual heat pump (approximately 15 degrees)

A 'source network' is a heating network at a low temperature (12 to 15 degrees). In the home, this 'heat' must be upgraded by means of an individual water/water heat pump. A boiler tank must also be installed for tap water. The new generation of heat pumps can emit heat of approximately 75 degrees. This is probably sufficient for the homes on the Waardeiland, so that separate radiators or additional insulation do not have to be purchased for this heat supply. At a lower temperature, the heat pump works more efficiently, which means a lower energy bill. Switching to low temperature radiators (or underfloor heating) ensures that cooling can also be achieved in the summer with a source network. The disadvantage of this heat supply is the space it takes up. Even if the central heating boiler disappears, space must still be found for the heat pump and the boiler tank. The investments are also higher (compared to a medium-temperature heat network) because this heat pump and the boiler tank must also be purchased by the resident. On the other hand, the resident has more freedom than with the medium-temperature network (after all, the resident can determine how much heat is produced and at what temperature) and can cool. Moreover, this variant leads to the highest CO₂ reduction. Syntraal estimates the total investment cost of this heat supply at approximately € 27,330 and the annual cost at approximately € 1,800.

With additional insulation, the investment cost is higher and the annual cost is lower. The annual cost is largely determined by the electricity consumption of the heat pump. In combination with solar panels, the cost for electricity consumption is of course lower. Given economic developments, rising prices in the coming years must be taken into account.



3- A hydrogen network

A hydrogen network has not been taken into account because, according to Syntraal, "the market maturity for residential areas is still too uncertain. Hydrogen is considered more promising for industrial processes."

Individual heating facilities for the Waardeiland

The homes can also make the transition to clean energy individually. Syntraal looked at the following systems:

4a- Air/water heat pump ('air heat pump')

The air/water heat pump uses outside air (through a so-called 'outdoor unit') as a source for a heat pump. The air heat pumps without an outdoor unit are still under development. The new generation of air heat pumps that use propane as a coolant can produce temperatures of up to 75 degrees, eliminating the need for low-temperature radiators or extra insulation. This is the case with the more usual heat pumps. At low outside temperatures, this heat pump has to work hard to get the house sufficiently warm, which may result in a high electricity bill. In addition, maintenance of the outdoor unit is a point of attention. A separate boiler tank is required for tap water. In combination models, this is already included with the heat pump. Syntraal estimates the total investment cost of this heat supply at approximately € 30,230 and the annual cost at approximately € 1,735.

With additional insulation, the investment cost is higher and the annual cost is lower. And here too, in combination with solar panels, the cost for electricity consumption is lower. Given economic developments, rising prices in the coming years must be taken into account.

4b- Heat pump with ground loops ('ground heat pump')

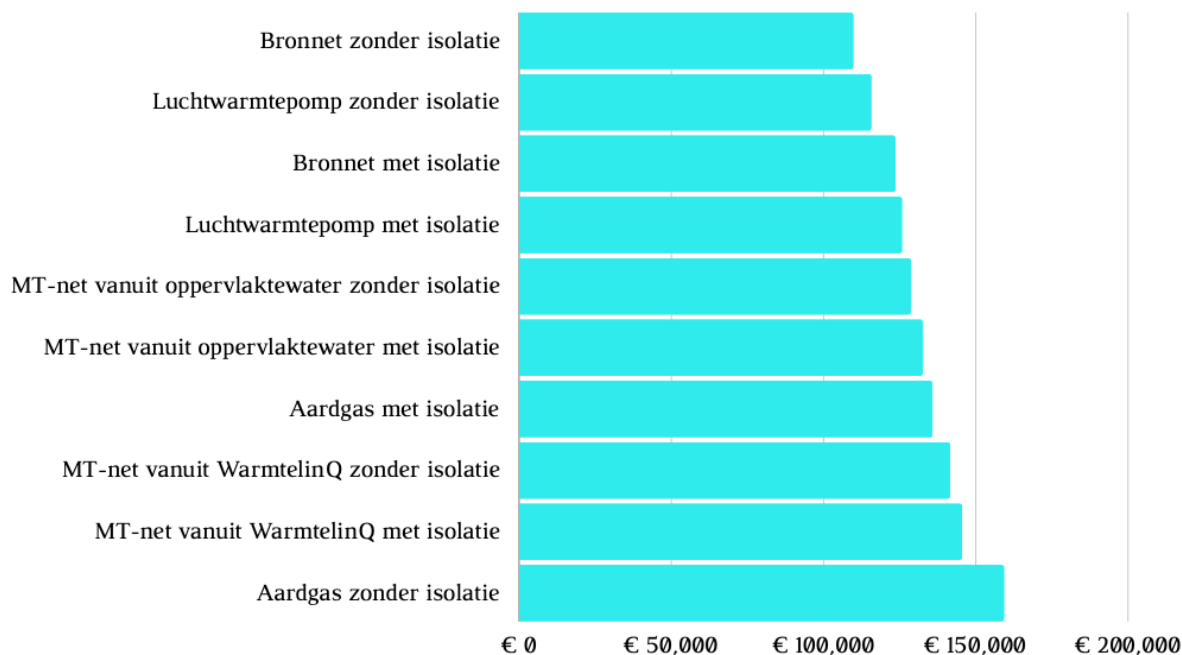
With a ground source heat pump, a few holes of 100-150 meters deep are drilled near the house and ground loops are then installed there. Inside there is a water/water heat pump (with boiler tank) that upgrades this ground heat to a temperature required for the home. The drillings are relatively expensive and if many homes on the Waardeiland use this heat supply, the ground could possibly freeze. Syntraal therefore considers this heat supply to be 'not suitable' as an individual solution for all homes on the Waardeiland.

4c- PVT panels

PVT panels on the roof produce both electricity and heat. However, the heat provided by these panels is not enough to provide the entire home (or business premises) with heat for space heating and hot tap water. These panels are therefore mainly seen as a supplement to another sustainable heating system.

Results from Syntraal

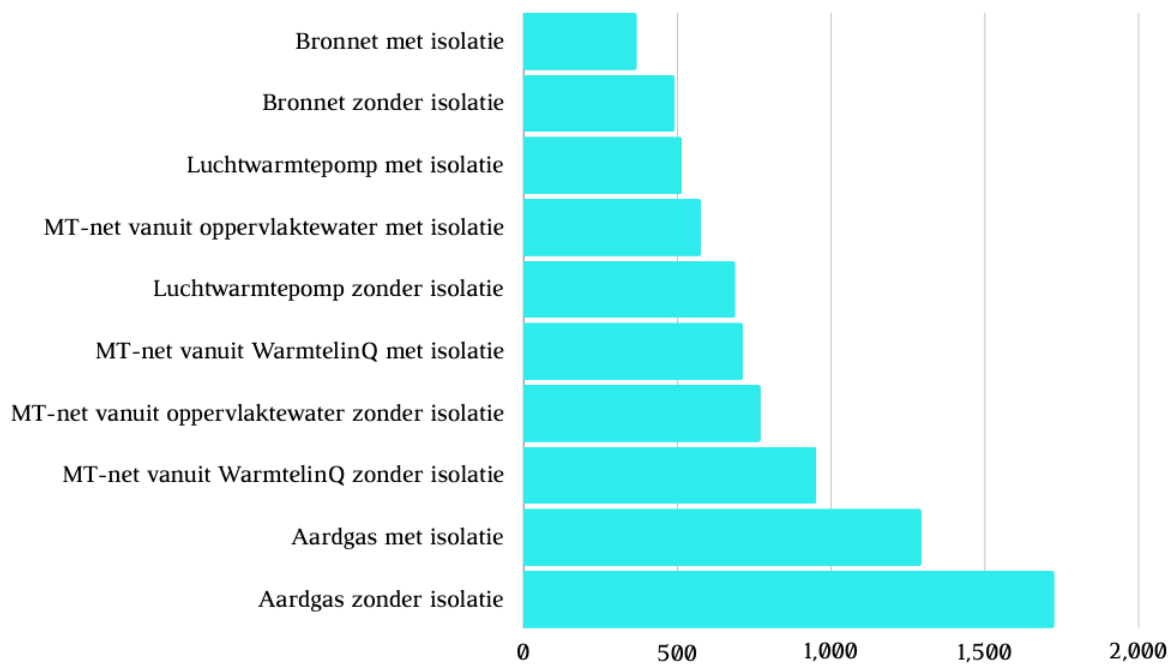
Syntraal has looked at the heating facilities for the homes on the Waardeiland from both the cost and the sustainability aspects. With regard to cost, a 'Total Cost of Ownership' approach has been taken. The cost of all variants was compared with each other over a period of 30 years. This also includes, for example, maintenance and replacement. For comparison, the option of 'remaining on natural gas' has also been included. The results of these calculations can be found in Table 7.1 (page 65) in the report. From 'cheapest' to 'most expensive', the outcome of this TCO calculation (incl. VAT) is:



Bronnet zonder isolatie	Source network without insulation
Luchtwarmtepomp zonder isolatie	Air heat pump without insulation
Bronnet met isolatie	Source network with insulation
Luchtwarmtepomp met isolatie	Air heat pump with insulation
MT-net vanuit oppervlaktewater zonder isolatie	Medium temperature collective network from surface water without insulation
MT-net vanuit oppervlaktewater met isolatie	Medium temperature collective network from surface water with insulation
Aardgas met isolatie	Natural gas with insulation
MT-net vanuit WarmtelinQ zonder isolatie	Medium temperature collective network from WarmtelinQ without insulation
MT-net vanuit WarmtelinQ met isolatie	Medium temperature collective network from WarmtelinQ with insulation
Aardgas zonder isolatie	Natural gas without insulation

This calculation shows that in most cases additional insulation does not pay for itself. It is still recommended for lower CO₂ emissions (as shown in table 7.2), a lower energy bill and a higher comfort experience in the home.

In terms of sustainability, Syntraal came up with the following top 10 (in total emissions in tons of CO₂):



Choice between collective heat supply or individual heat supply

We want to make the choice for a heat supply together as much as possible. Information evenings and polls will follow in the near future to express a preference for a heating supply. The municipality is then asked to develop this preference (whether or not together with market parties) into an affordable offer. If you do not want to take advantage of the offer, you can always opt for an individual heat supply.

What now?

The report will be discussed online with residents and businesses on December 18. In the new year we will organize a new meeting in which we will discuss possible further steps with you. We would like to invite you again.