Rijswijk Buiten, Netherlands

First Energy Zero district with a guaranteed energy contract by an EsCoon Energy Zero Costs

Key facts

Building

Location	Rijswijk, Netherlands
Construction	*date - year*
Heat distribution	*hydronic*
Heated area	*96 m² living*
Level of insulation	*Energy Zero*

Heat pump and source

Number of heat pumps	500
Installed capacity	3 *kW*
Operation mode	*monoenergetic*
Heat source	closed ground loop
Brand and type	ITHO Daalderop WPU4G
Refrigerant	R134a
Sound level	45*dB*

Heating system

Heat demand	Floorheating
Heating temperature	*40°C*

Domestic hot water

Type of system	*Double function Heat Pump*
Max. Temperature	*60°C*
Circulation system	
Legionella measures	*thermal*
Storage size	*150 litres/house*

Number of storage tanks – 1 per house
Storage losses 40Wh
Temperature control – Economy, Comfort

Other information

Electric energy	
Consumption year	*kWh*
Investments costs	*unknown*
PV installation	

Lessons learned

Based on an energy masterplan, the municipality of Rijswijk decided in 2010 to develop a new, all-electric district with 3,500 Zero Energy Dwellings. Since 2013, approx. 500 dwellings have been built and are now occupied; the district continues to develop quickly. The dwellings are well insulated: there is a heat recovery system for both shower and ventilation, a ground source heat pump and 3 kWp of solar panels. RijswijkBuiten, as this well-known project is called, is the first district in the Netherlands where sustainable energy ambitions on this scale have been realized.

The monitoring and research results, both in terms of energy consumption and customer satisfaction, are excellent. For the next phase of construction, plans are currently in the works to further enhance energy efficiency. In addition, energy demand management, battery-powered energy storage and ready access to electrical vehicles will all be incorporated into future developments.

The measured net-zero energy buildings, almost all, when adjusted for temperature variations, produced more energy than expected. These results are in part a consequence of very conservative estimates with regard to energy consumption built in during the design phase of the project. A second reason is that the “other domestic energy use” appears to be lower than expected according to traditional calculation models. The figures show a wide range.

A special characteristic of the Rijswijk Buiten project is that heat pumps and the solar panels are rented by the house owner from an EsCo for € 100 per month. The EsCo provides a 25-year guarantee that the installation will work properly and that the energy required for space heating, domestic hot water and cooling is completely covered by the production from the solar panels. The next step is to implement the usage of electrical vehicles and their batteries for balancing the grid. Another development has been the implementation and synching of the Internet of things to individual homes in order to better equalize the energy production of the solar panels with the energy demand of the buildings.

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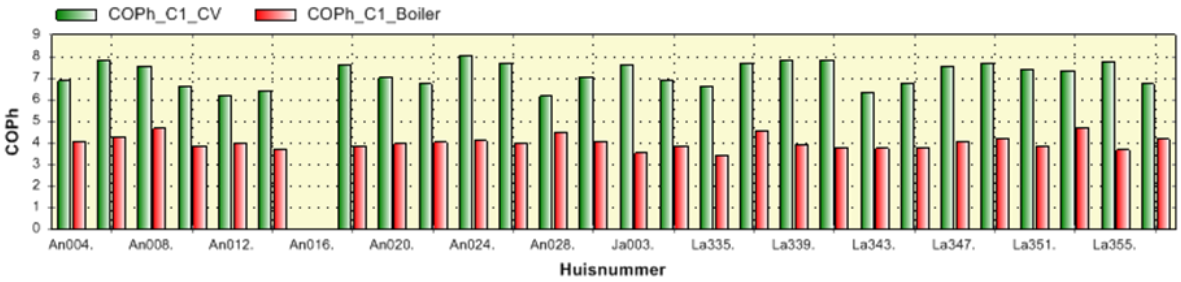

Fig 1 The figure shows relative high COP's for both space heating and domestic hot water

Description of the technical concept

After the first 26 homes were built in 2012, these were monitored for more than a year. Below are the measurements for heat pump usage. These are heat pumps by ITHO-Daalderop WPU4G of approx. 4 -5 kWt_h with a 150 liter domestic hot water storage tank. Each heat pump has an approx. 100 meter deep closed loop ground heat exchanger filled with pure water. The spaces are heated (and cooled in summer) by a floor heating system that operates at an average temperature of 30 °C.

The measured and corrected tap water consumption with 442 kWh is significantly below the assumed use in the EPC of 675 kWh. This attributed to three elements:

- The consumption of hot water in the kitchen is much lower than according to the tap water pattern from the Dutch Standard NEN 7120. As a result, the pipe loss, which is significant in the EPC, is no longer normative for reality.
- Due to a relatively high consumption of shower water, the efficiency benefits as the efficiency of heat recovery is significantly higher than the EPC assumes. It makes a difference whether the efficiency of 55% is achieved over 50% or 70% of the overall hot water consumption.
- The COP is higher than according to theory.

After five years, the vast majority of residents is satisfied or very satisfied with the hot water supply. The percentage is 83% (2% is dissatisfied). The only dissatisfied resident stated that the storage tank is empty very quickly with a rain shower. He has the impression that he was not optimally advised with regard to the size of the boiler. A resident who is not dissatisfied / not satisfied indicates that the storage tank with a capacity of 150 liters is 'just' sufficient for 2 adults and a child and that it takes a very long time for the water to warm up. The pressure of the water is also not too high. A resident who is very satisfied, states that with the 150-liter storage tank there is more than enough hot water available for a family with 2 children.

It is clear that the residents of Rijswijk Buiten are generally satisfied with the hot water supply. A 2010 study shows comparable results with regard to satisfaction with the hot water supply. This study involved 1,391 homes from renovation projects and 1,001 new-build homes (BouwhulpGroep Advies en Architectuur, 2010). The high degree to which the residents of Rijswijk Buiten are satisfied with the hot water supply is therefore not unique..