

Energiesprong works!

> Net zero energy homes put to the test both on technical performance and customer satisfaction

Energiesprong net zero retrofits make great promises but do they deliver? The performance insights from monitoring over 600 net zero energy retrofits in the Netherlands confirm that, yes, Energiesprong does work! Apart from teething problems in the pilot projects, such as a chaotic building process or insufficient air-tightness, in general the houses perform as promised and tenants are satisfied with their renovated home. Some homes even perform above expectations and are energy positive whilst tenants are really proud of their new wide windowsills and say it feels like if they live in an owner-occupied property.

Energiesprong in Europe

Today over 4.000 net zero energy houses (new build >2000 and retrofit >2000) are in use in the Netherlands and the first 10 performance guaranteed net/near zero energy retrofits have been completed in both the UK and France. In Germany, the first pilot is in preparation. Net zero energy retrofits promise to generate sufficient energy annually to heat the house, provide hot water and power its household appliances. A refurbishment comes with a long-term performance guarantee on both the indoor climate and the energy performance. Money normally spent on energy bills and maintenance pays for the retrofit. This way, residents get a refreshed, warm and comfortable home for the same (or lower) cost of living.

Performance guarantee ensures builder is responsible for monitoring

In order to verify that the building performance meets the guarantees given, energy performance monitoring by the builder is an integral part of an Energiesprong net zero energy retrofit. In the Netherlands, net zero energy homes can apply for the Dutch quality standard; NOM Keur. To meet all specifications of the certification, the retrofits need to meet certain standards on energy performance, indoor climate and consumer satisfaction.

In general, the two most important questions while monitoring are: Do the houses perform according to the performance contract, both on energy performance and indoor climate? And what is the experience of tenants, both going through the refurbishment process and living in their renovated home? As social acceptance is of vital importance for scaling to high volume, tenant satisfaction is key to long term success. Despite this, it is an issue typically ignored in policy making or at least not addressed with sufficient expertise.

Results from the Netherlands

In the Netherlands several projects have been monitored by independent researchers. 613 Energiesprong homes from Stroomversnelling were monitored by the independent Monitoring Taskforce consisting of an external project leader and representatives from all involved builders and social housing associations. All homes were monitored on the execution and delivery of the refurbishment, and 154 homes were monitored over 1 year of usage. From these two projects were monitored more intense:



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- 46 homes in Heerhugowaard were monitored on execution, delivery and usage by TNO, RIGO and van Beek <https://www.energieling.nl/wp-content/uploads/2016/08/MonitoringsresultatenHeerhugowaard-1464682248.pdf> (in Dutch)
- 18 homes in Tilburg were monitored on execution, delivery and usage by by TNO, RIGO and van Beek <https://www.energieling.nl/wp-content/uploads/2017/02/Tilburg-2.pdf> (in Dutch)



Energy performance

The monitoring results show that, in general, the energy performance of net zero homes matches the design and performance specifications, meaning that in practice the net zero energy houses function according to the agreements in the performance guarantee. Space heating usage is for the Dutch homes on average a little more than expected, whereas solar energy generation was higher.

There have been issues with performance in several early projects, one such issue being insufficient air tightness. This is a challenge for some builders as they work hard to get adequate consistency in tolerances in both production and assembly. To achieve sufficient air tightness all elements should connect without any cracks where heat can escape. Monitoring shows that this was a quite common defect in early projects. In response, a blower test has now become part of the delivery protocol for Energiesprong homes.

Such issues are inevitable in the first batch of projects as builders install new products for the first time. Fortunately, these issues are quickly addressed through the monitoring process, allowing subsequent projects to benefit from improved design.

Tenant behaviour can also influence performance. Some tenants wear a warm sweater and use less energy whilst others heat their house more than average or shower a lot. The advantage of live monitoring is that these issues are typically quickly identified, and residents can be educated to avoid higher energy bills in the future. As the performance guarantee applies regardless of tenant behaviour or weather conditions, tenant habits are important.

The tables below show the monitoring results of 46 houses in Heerhugowaard, indicating annual energy generation (opwekking PV), use of space heating (verwarming), household appliance & ventilation use (huishoudelijk + ventilatie) and hot water use (warm tapwater). In 2015, there was more sun than average and therefore the generation of electricity was higher than contracted. In Tilburg there were issues with the settings of installations resulting in higher space heating than contracted. These issues have since been resolved.



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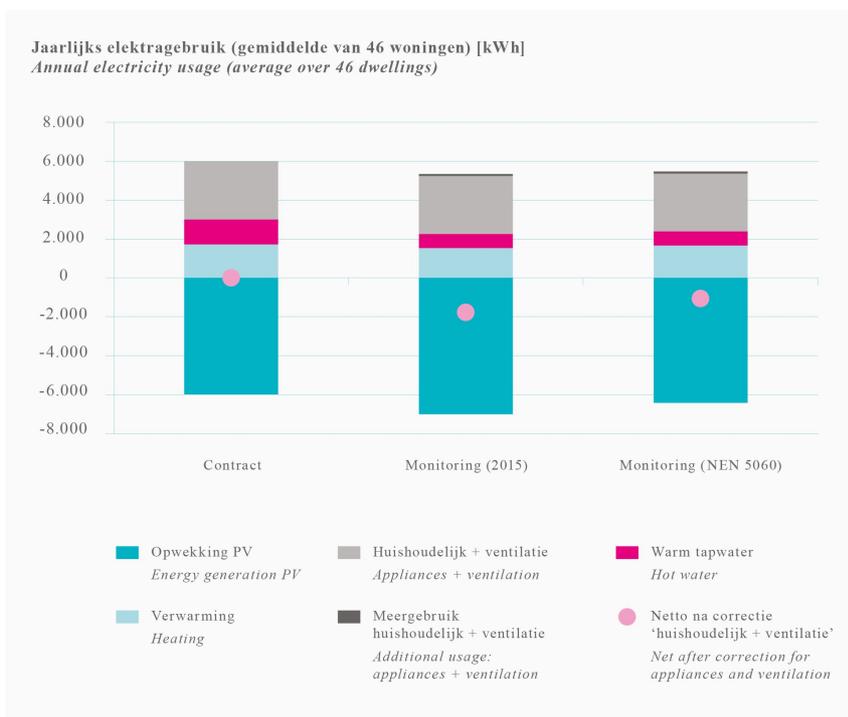


Table 1: Average yearly energy use of 46 homes in Heerhugowaard. Performance is better than contracted on account of higher production of solar energy. The pink dot gives the net result.

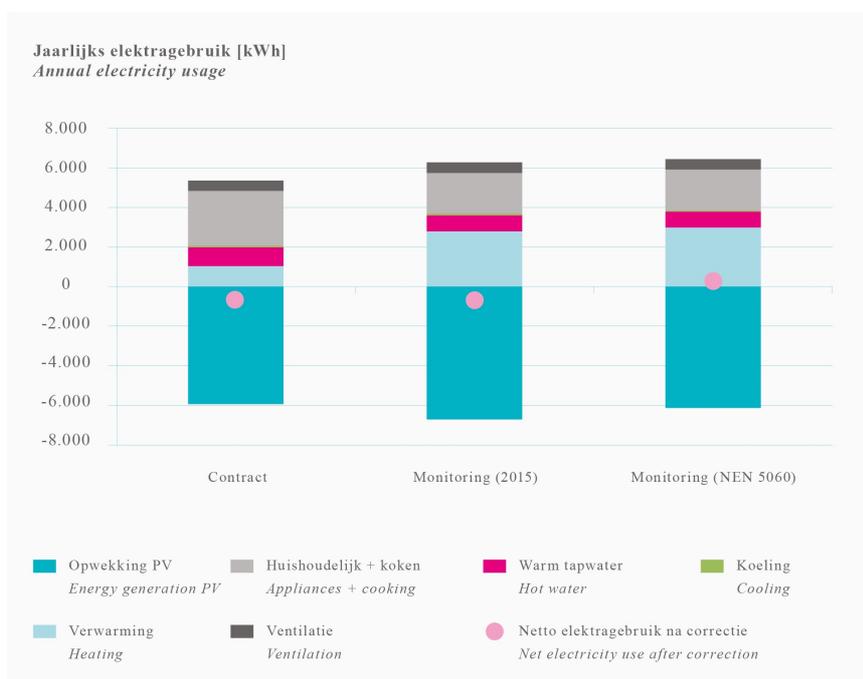


Table 2: Yearly energy use of 18 homes in Tilburg. Homes performed slightly worse than contracted in first year due to issues with the settings of installations.



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Tenant satisfaction

Several aspects of customer satisfaction were measured in the 613 Stroomversnelling projects.

Tenant satisfaction (on a scale of 1 - 10)	
Information provided	6,1
Appointments	5,8
Planning	5,4
Builders	7,7
End result	7,5

Tenants were generally happy with the result of the refurbishment, however they were not so happy with the process. Years of experience with tenant engagement has made it clear that incorporating tenant wishes into the retrofit, clear communication and expectation management are all very important. All builders and social housing associations responded to the results of the evaluation in their next projects. The market development teams have also learned from the results when guiding new parties embarking upon net zero energy projects. This form of support is highly recommended so new parties don't need to make the same mistakes.

The quality of the product is measured very early in the usage after first pilot projects. In Heerhugowaard, where 65% would recommend the retrofit, the whole area with over 250 dwellings is now retrofitted. The construction company for this project, BAM, is currently one of the largest suppliers in the Netherlands of net zero energy homes. For Tilburg, the tenants were less enthusiastic. The construction company for the project in Tilburg, which did not perform as should, has chosen to focus on other segments of the market so they no longer supply in the Energiesprong market. This shows how monitoring points out malfunction of the installations and bad quality products being at a very early stage in the first projects. This saves tenants, suppliers and social housing providers a lot of trouble.

Conclusions

Apart from some teething problems in the pilot projects, Energiesprong homes generally perform as promised and tenants are satisfied with their renovated homes. Some construction companies have struggled to get the quality up to standard, especially in the early projects. With the support of NOM-Keur, the market is weeding out low quality products very quickly: either they improve, or they don't get contracts in the future. When compared to the traditional way of retrofitting (without a performance guarantee) the quality of retrofits where monitoring is mandatory has improved significantly. Both builder and tenant profit from the direct feedback on technical performance and behaviour. Although both parties have to get used to this new way of working and living, the energy usage statistics in the first year speak for themselves.

More information

<https://www.energielinq.nl/wp-content/uploads/2017/02/Tilburg-2.pdf> (in Dutch)

<https://www.energielinq.nl/wp-content/uploads/2016/08/MonitoringsresultatenHeerhugowaard-1464682248.pdf> (in Dutch)



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