



Heerhugowaard Stad van de Zon (City of the Sun)

Spatial planning in the Netherlands is a very complicated process that is initiated by the government. Due to the dense population the national government assigns areas for future urban development in White Papers. The provinces, in this case the province of North Holland, have a role in coordination and further development of assigned urban areas.

The area between the North-Holland municipalities of Heerhugowaard, Alkmaar and Langedijk, abbreviated HAL lokatie (HAL-location), was identified as a future urban development for housing in the Fourth White Paper on Spatial Planning (Vierde Nota Ruimtelijke Ordening Extra, abbreviated VINEX). The City of the Sun (Stad van de Zon) is a part of this HAL-location, and is located within the territory of Heerhugowaard.

Both the province and the three municipalities involved in the HAL-location have high ambitions with regard to quality of building, quality of living and above all energy and CO₂ reductions. When the development of the HAL-location started, the application of PV was strongly supported by a national research program on solar energy, financed by the Ministry of Economic Affairs and coordinated by the national energy agency Novem. With strong support for PV available it was obvious that a low energy housing area should focus on PV, combined with low energy demand, passive solar energy and solar thermal energy. The project developer involved, who owned a large part of the HAL-location, also had similar ambitions as far as quality, energy and reduction of CO₂ is concerned.



Heerhugowaard Stad van de Zon (Solar City), July 2006

The idea of a low energy solar housing quarter within the HAL lokatie arose in 1992 and the ambitious name Stad van de Zon was conceived. The development of Stad van de Zon is one of the biggest solar projects ever realized. This huge project has won many awards but has also had to overcome major funding problems in order to be realized. Part funding for 5MWp of PV in the HAL lokatie was obtained from the European Commission under the SunCities project; with matching funding from the national government. However the ending of a national subsidy program by the Dutch Government part way through the project caused major problems which



had to be overcome by innovative financing schemes. The long time frame necessary for the development of a new town means that, although the first phases were completed in 2002, the project is still only two-thirds complete. Keeping a project on track for that length of time is very challenging and has involved many problems.

As part of the PV UP-SCALE project, interviews have been held with many people who involved in the development of the City of the Sun (Heerhugowaard). These included former members of the project in the start-up phase and persons still involved in the realization phase. The stakeholders were the municipality of Heerhugowaard, the project developer, the energy utility company, energy consultants and urban planning consultants. Besides the interviews reports and the results of workshops held previously were reviewed.

Development of the Solar City

The idea of making a solar city first arose in 1989, when the first off-grid solar powered house in the Netherlands was built in the city of Castricum, about 20 km from Heerhugowaard. The owner of the house was working with the province of North Holland in the field of renewable energy. The province wanted to stimulate replication of the project. Heerhugowaard was one of the few municipalities with an energy coordinator whose primary task was to improve the energy efficiency of municipal buildings, and who also had close contact with the Provincial Renewable Energy department.

1989: The first Solar House: the "Zonnehuis" in the Netherlands



1991: Scaling up to 10 terraced houses

The municipal department of housing in Heerhugowaard had set a goal of decreasing the living costs for tenants. Energy was an important component of total living costs at the time, so reduction of energy consumption contributed substantially to reduction of living costs as well as providing environmental benefits. Furthermore, a local project developer / building contractor wished to develop low energy houses as much as possible. In cooperation with the project developer, the municipality, the provincial energy department and the future tenants, ten terraced solar houses were designed and built for the social rental sector (project Butterhuizen).



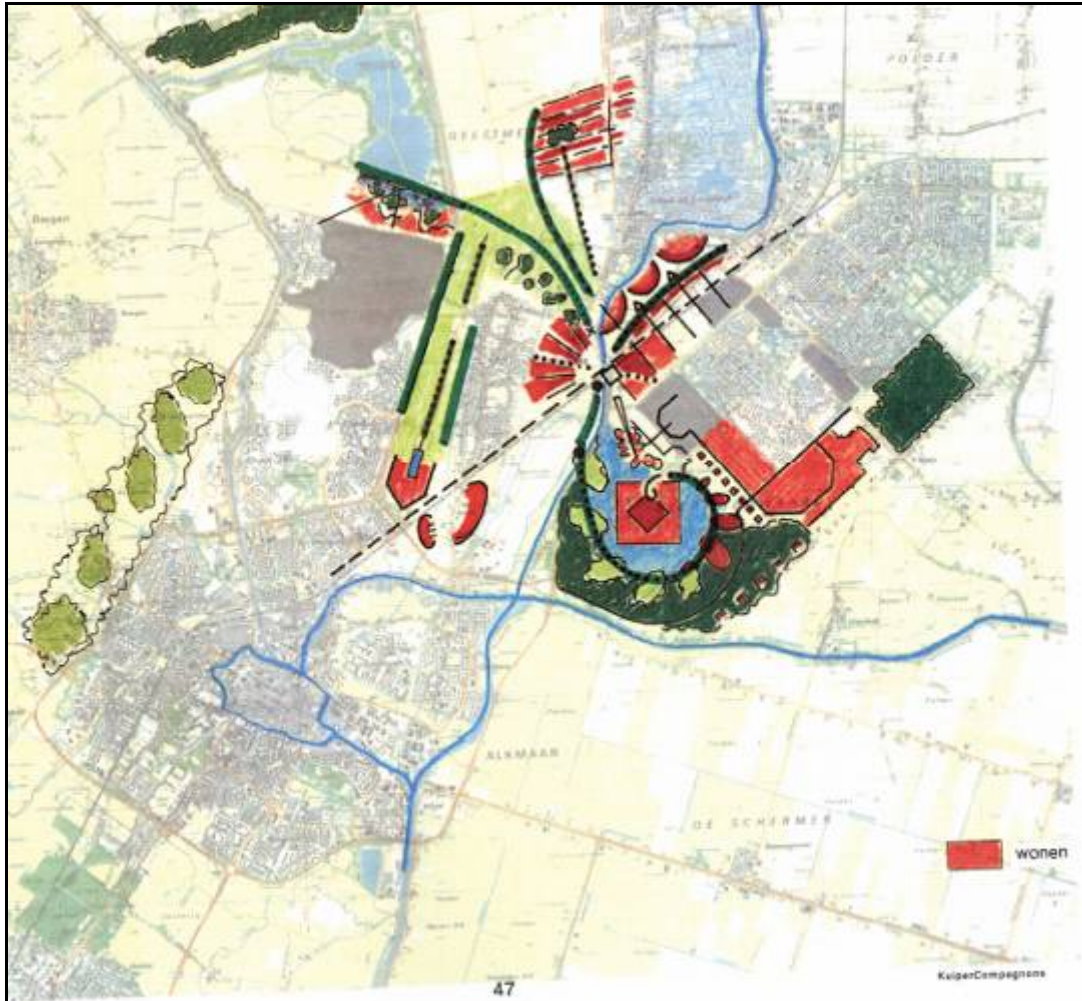
*1992: Project
Butterhuizen,
Heerhugowaard, (10
houses with a total
output of 24KWp).*



Community involvement was achieved by the involvement of the future tenants in the design process. They were selected as being willing to live in a solar powered house. The project was officially commissioned in December 1991 by the Governor of the province of North Holland.

1991-1993: Cooperation of Heerhugowaard, Alkmaar and Langedijk in developing the HAL-location

In 1992, upon the request of the member of the provincial government, the municipalities of Heerhugowaard, Alkmaar and Langendijk started cooperation in the development of a new town called HAL-lokatie. In an early meeting concerning the way the three independent municipalities could co-operate, the world famous planner Ashok Bhalotra, who was invited by the city of Heerhugowaard, introduced sketches for a city largely based on passive solar techniques (1993). Based on these sketches a "structural sketch" was made for the HAL-location (in the Dutch planning procedure the structural sketch is the first visualization of the points of departure). The Stad van de Zon (the name was introduced by Bhalotra) saw her first light.



City of the Sun, 1998 Source: Kuipers Compagnons

1997: Schedule of Requirements for the Solar City

The ideas for the solar city were further developed in 1997, when the schedule of requirements for the area which is now Stad van de Zon was defined. Environmental aspects had a high priority in this schedule of requirements. With the help of Cees Duijvestein, professor of Environmental Urban Design at Delft University of Technology, a plan for the environmental quality of the area was prepared. Furthermore, national policy was becoming more and more focused on reduction of CO₂ emissions and the government was providing financial support for initiatives in this field.

A study on how to define the optimal energy infrastructure, subsidized by the Dutch energy agency Novem, led to the idea to make a fully CO₂ neutral quarter, where the energy demand was much reduced (the energy performance of the buildings had to be twice as good as required by the Building Code) whilst energy was generated by PV and, if necessary, a wind turbine.

The schedule of requirements was prepared by about 30 parties involved in the process of urban planning. It was important to have the future partners involved in the process in a very early stage, as their involvement and participation in the design and development process would reduce future objections. The high level of ambition, expressed in the name of the project Stad



van de Zon (City of the Sun) contributed to the enthusiasm of politicians, the involved parties and the citizens. During the political decision making process there was hardly any opposition. To ensure the continuation of the plan, even if political or personnel changes should occur, the project leader Rob Piers brought the decision making process to the city council level, not only for the political decisions, but for all decisions that were important to the continuation of the process.

Two aldermen had political responsibility for the project with support from a steering committee including managers of the departments involved and the project developer (who was also the owner of the land where Stad van de Zon was going to be built).

1998: PV in urban design. Development and financing

As soon as the detailed urban design and architectural aspects were in sight, a PV workshop was organized for architects and PV system manufacturers, resulting in draft designs and a book. The workshop was repeated in 2002. Financial models and alternatives were developed, resulting in the conclusion that subsidies were required in order to realize the project. Subsidies were obtained from the European Commission (under the SunCities project), the utility NUON (a public body at the time), the province of North Holland and the Dutch government.

However, the Dutch government very abruptly stopped subsidising PV. As a result the project was in danger of losing the EC subsidy which was only to be paid if the Dutch government contributed as well. To solve this problem and allow the project to continue a new subsidy scheme came into force for a short time. The difference compared to the previous scheme was that in the former scheme the subsidy was allocated in advance, before the project was finished. However the new subsidy scheme only paid the PV owner after purchase of the PV system. In many cases in the Stad van de Zon, the owner is the occupier, who consequently would have to finance both the PV system and the house purchase. For many owner occupiers this could be a major barrier. However, the municipality Heerhugowaard, the utility NUON and the province of North Holland created a guarantee fund, thus making the EC subsidy possible. In addition, specific agreements were made with the Dutch ministry to be sure about continuation of the new subsidy scheme for Stad van de Zon.

In 2005 a conference was organised within the framework of the SunCities project, resulting in a number of recommendations for risk management in large scale solar power projects in the built environment [7].

Final Realization of the Solar City

The 5 MW project involves the municipalities of Alkmaar (1 MW), Langedijk (400 kW) and Heerhugowaard (3.6 MW). In each municipal area the developments are split into a number of phases which have been developed at different dates. In all projects and in all stages the province of North Holland and the utility NUON were involved.

In 2004 a final report written by ECN (Energy Research Centre of the Netherlands) with the title "Solar City, 5MWp PV in the HAL" summarized the progress and results of the 5MWp project and concluded the end of the formal activities of project office HAL. At that time the status of the PV installations in the 5MWp HAL project was as summarized in the table below.



		Project	PV – Wp	Nr. of dwellings	Date of Completion	PV realized
H	Area 1	Steigers/Sportlandgoed	366.960	79	2004	64,8%
	Area 2	Carré	2.275.000	+/- 1400	2007	0%
	Area 3&4	De Glazen Stad	953.900	+/- 280	2007	0%
		Total Heerhugowaard	3.595.860	2900	2007	6,6%
A	Phase 1	De Tuinen	300.000	262	2002	100%
	Phase 2	De Tuinen/Waterzoom	704.140	210	2003	100%
		Total Alkmaar	1.004.140	472	2003	100%
L	Phase 1	PV Lagune/Energierent	260.000	75	2002	100%
	Phase 2	Mayersloot-West	140.000	?	Preparing	0%
		Total Langedijk	400.000	?	?	65,0%
		Total HAL	5.000.000	?	-	30,0%

Status of PV projects in municipalities Heerhugowaard, Alkmaar and Langedijk in 2004

An updated version of the table from 2004 was made recently. Steady progress has been made in finishing the project and it is expected that the Solar City part of the project in Heerhugowaard will be completed by the end of 2008. The Alkmaar part of the project was finished in 2003. The council of Langedijk decided on the 25th of March 2008 to finance the building of Mayersloot West. A summarized version of the updated table is given below

		Project	PV - Wp	Nr. of dwellings	Date of Completion	PV realized
H	Area 1	Steigers/Sportlandgoed	366.960	79	2005	100%
	Area 2	Carré	2.275.000	+/-1400	2008	59,2%
	Area 3&4	De Glazen Stad	953.900	+/- 280	2008	19,8%
		Total Heerhugowaard	3.595.860	2900	2008	52,9%
A	Phase 1	De Tuinen	300.000	262	2002	100%
	Phase 2	De Tuinen/Waterzoom	704.140	210	2002-2003	100%
		Total Alkmaar	1.004.140	472	2003	100%
L	Phase 1	PV Lagune/Energierent	260.000	75	2002	100%
	Phase 2	Mayersloot-West	140.000	?	?	0%
		Total Langedijk	400.000	?	-	65,0%
		Total HAL	5.000.000	?	-	63,3%

Status of PV projects in municipalities Heerhugowaard, Alkmaar and Langedijk in 2008



In recent years the 5MWp project received numerous awards, handed out by Novem, the Dutch Organization of Energy and Environment. In December 2000, Heerhugowaard received the Energy Award (category: new buildings) for the level of innovation of the project and the perfect example it could set other municipalities.

So far, 5 project developers have been involved in the 5MWp project and have gained experience with photovoltaic systems, they are:

- Vos Alkmaar B.V. (2003 Roof Award Winner with the Solar City PV system development). Vos Alkmaar is developing the more expensive housing in the 3.6 MW Solar City part of the project. They have also been involved in project development in the 1.0MW part of the project in Alkmaar.
- Bouwfonds Property Development. Bouwfonds is involved in the development of the more affordable housing in the 3.6MW Solar City part of the project. They have also been involved in project development in the 1.0 MW part of the project in Alkmaar.
- Bouw Combinatie Heerhugowaard. BCH has so far realized utility buildings like schools and a sport centre in the 3.6 MW Solar City part of the project in Alkmaar.
- Henselmans Building Enterprise. Henselmans is involved in developing the 400 kW part of the project in Langedijk.
- Bink Bouw B.V. Bink is involved in developing the 400 kW part of the project in Langedijk.

As well as being the urban developer of the Solar City, Ashok Bhalotra from Kuiper Compagnons, is also the architectural supervisor in the HAL-area. A great number of architects have been involved in the 5MW project including BEAR Gouda, Nowotny Rotterdam, INBO Woudenberg, 19 Het Atelier Zwolle, Roy Gelders Amsterdam, Hans Wagner Amsterdam, BBHD Schagen, Taneja Hartsuyker Amsterdam and Van den Oever Zaaijer & Partners Amsterdam.



Summary of problems, barriers, solutions and recommendations

Earlier experiences in Amersfoort, Nieuwland, another urban area where 1 MW of building integrated PV was installed in 1996 [8], were very useful for the development of Stad van de Zon. Urban designs of both areas were made by the same architect. However, compared to the Nieuwland project, there are a number of differences. In Nieuwland the utility REMU was the leading party and the owner of the PV systems. In Langedijk (400 kW), the first phase of Stad van de Zon, the utility NUON is the owner of the PV systems. However, in Alkmaar and Heerhugowaard the owner-occupier of the houses developed by Vos Vastgoed is the owner of the PV system. Initially, the occupiers were not very interested, but back counting electricity meters increased their interest. In the Heerhugowaard project the municipality had the lead. Initially the utility was rather reluctant, although they became more and more enthusiastic and cooperative during the process.



Amersfoort Nieuwland, 1996

Looking back at the process several things can be noticed:

- The initiative was highly dependent of the enthusiasm of persons working with public bodies and able to convince political decision makers. Furthermore, as PV cannot compete with other forms of energy generation (both conventional and renewable) subsidy is a prerequisite. As the Dutch government is very unreliable as far as subsidies for renewable energy are concerned, the government was the uncertain factor in the process. In addition bureaucratic procedures caused numerous problems.
- The project developer, although very cooperative and wishing for low energy buildings, was very demanding. The developer wanted to avoid future claims caused by uncertain and unproven construction methods. In some of the previous large-scale Dutch PV projects, the PV modules were used as the water-proof layer in the roof construction, causing problems of leakage and condensation. In Heerhugowaard the project developer insisted on a watertight construction, fully separate from the PV system. This requirement raised the price of the project. Furthermore, the project developer had to guarantee the functioning of the PV systems to the future owners. The EU, as subsidiser of the project, requires 6 years of guarantee as a minimum. Before purchasing the house, the owner/occupier had to sign a contract that to maintain the PV system for at least 10 years. This was a "product guarantee" not a "power guarantee".



- Many of the architects had no experience with PV, and some had no knowledge of PV. A few of the architects went on to design other PV projects after having designed a housing complex for Stad van de Zon. It should be noted however that shortly after the design process of Stad van de Zon, the Dutch government stopped financial and political support of PV. Consequently, architects were seldom asked to design a building with integrated PV again.

From a purely technical point of view, there were no problems in the design and realisation of the project.

One of the “barriers” in the process was lack of knowledge of PV by the urban designer. The urban designer had designed houses that were not able to have PV mounted on them and were not south facing. All the designs are controlled by Ashok Balothra, the urban designer who is responsible for the total concept of the Solar City. Architects can consider PV as a limitation for the designer, not as a challenge. The first criterion for a house design is: the house must be sold. Second: it must look nice. PV may be only one of the minor criteria. However it is important to keep PV in view. The energy coordinator of Heerhugowaard is participating in the design team and tries to keep PV high on the agenda.

Getting the project financed was the largest challenge in the process. There are three major subsidising bodies: the Dutch government, the province of North Holland, and the European Commission. When the project started, the Dutch government provided subsidy within the framework of the National Research programme for Solar Energy –PV (NOZ-PV) This subsidy scheme stopped and was replaced by a subsidy scheme called Energy Performance Scheme (Energieprestatie Regeling EPR). The EPR was an incentive to reduce the PV-system investment when it is installed by the owner/buyer. According to the EU the EPR was not a project subsidy but a subsidy for the owner/buyer. This was not a firm project foundation as the EPR could be cancelled by the Dutch government. This worse case scenario became reality in 2003 when the EPR stopped. The EU then demanded more security with respect to the project finances. In response the energy company, the province of North Holland and the municipality of Heerhugowaard founded the guarantee fund. This fund guaranteed 3,5 euro/Wp for a total of 1,5 MWp. Basically thanks to the EC there is now a guarantee fund.

The major concern was the instability of the Dutch subsidy policy, combined with the rigidity of the European Commission with regard to the time frame and planning of the project. The time frame was too narrow; the Commission required 4 years as a maximum for the project realisation, which proved to be impossible for the development of a new town. At the mid-term evaluation an extension of the project time line was requested. Eventually a two year extension was allowed. The mismatch between the EU time frame and real life in the project continues to cause problems. According to the contract, the project's finalisation date is 29 February 2008. However the current construction schedule predicts that only 2/3 of the project will be realised by that time. An official opening is planned in 2008.

Contrary to expectations when the project started, the price of PV in the Netherlands has risen tremendously, due to huge demand in Germany and the unstable subsidy policy of the Dutch government. However, PV is absolutely a "must" in Stad van de Zon. Purchasing PV in Germany or China is an option which is currently being examined. Furthermore, the fact that Stad van de Zon requires 3.4 MW of PV may attract suppliers and help to reduce the price. It was initially hoped that this huge project would help to reduce PV prices in the Netherlands but according to the project leader this project has had little influence on the price of PV. In his opinion attention



became focused on innovative financing during the project which distracted from technical inventiveness [9].

All parties that had anything to do with the 5 MW project were represented in the HAL consultative body: municipalities, province, energy supplier, ECN, consultants, etc. The province took care of continuity in the project; the requirements of the EU could be used to speed up decisions. All parties in the financial constructions had a function in stimulating each other. All parties had their own reason to find a solution for the risen problems, and nobody dared to step out of the consultative body. Thanks to the complexity of the project, the project still exists.

Sources of further information

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Photo: Project Butterhuizen, Heerhugowaar, by C.W.A. Baltus

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