

Renewable energy sources shall cover, by 2010, 12 % of the total EU energy consumption. This is the objective that the Community agreed on in its white book on "renewable energies". At the same time, a European-wide action plan has been set up. In order to achieve these goals, local communities do need to actively contribute to this. The Dutch city of Apeldoorn, is developing concrete plans for realising in existing and new build area's, 10% sustainable energy-use in 2008 as an intermediate goal for striving after 100% sustainable energy-use at long term (2020!).

THE CITY

Apeldoorn, a town with 153 000 inhabitants, is located 70 km to the east of Amsterdam on the edges of the Veluwe, the largest national park in the Netherlands.

Apeldoorn is principally a residential and army city but also has some industries like paper manufacturing, colorant factories and pharmacological companies. The textile and plastic industry is important as well.

Climatic Data:

Solar radiation: 970 kWh/m²a

Average annual temperature: 9,4 °C



CONTEXT

Apeldoorn has been progressive on the environmental questions for many years. In 1995, the city was designated as "Solar Netherlands' City". Since then, Apeldoorn has achieved a reputation for being the city of promotion and development of sustainable policies.

The beginning was in 1991 when the "Environmental Policy Plan 1991-2000" expressed clearly that the City Council had the firm intention to progress in the climate way. That plan was followed by the "Energy Policy Plan 1995-2000", the "Energy Execution Plan 1997" and the "Plan for sustainable, adaptable and flexible building 1997". In November 1998, NUON and the City of Apeldoorn signed a climate-agreement that will be reviewed in 2002. An inventory of potentials and chances for "Sustainable energy in Apeldoorn till 2008" has been launched in 2000 followed by a policy note "Sustainable Apeldoorn". Finally, in 2001, "Apeldoorn Energy Neutral City", a very ambitious study aiming for a 100 % sustainable energy-use in 2020 has been realised. It is a strategic concept for reaching energy-sustainability within the city-boundaries. The objective is, considering the possibilities and circumstances in Apeldoorn, to optimise/maximise the use of sustainable energy in Apeldoorn within the balance of energy-neutrality.

EXPERIENCE OF APELDOORN

Energy studies in Apeldoorn have pointed out that based on the present technological and economical possibilities, a 10% energy-sustainability in 2008 and a 50% energy-sustainability in 2020 seem to be realisable in new build and existing areas in Apeldoorn. The most important energy-supply-options in these studies are energy-saving measures in dwellings and buildings, the use of green electricity and the use of biomass for the production of sustainable heat and electricity. Nevertheless, the City Council fixed a 100% sustainable-energy use as the objective for 2020 which is indeed a great challenge.

Since many years the City of Apeldoorn co-operates very closely with local stakeholders in the field of the generation of energy with RES. The latest example is the signature of a covenant, in September 1999, by the Municipality of Apeldoorn and

- NUON, a leading regional utility company,
- Veluwe Afval Recycling (VAR), the regional waste recycling company,
- TNO-MEP (Environment, Energy and Process Innovation of Apeldoorn) and
- GASTEC NV, the Dutch centre for gas technology.

In the covenant, the parties agreed to continue and intensify the common effort to realise scenarios for a sustainable energy supply in the development areas of Apeldoorn. They wish to focus the joint venture on achieving the most progress possible in the coming three years in developing and realising one or more options for a sustainable energy (infra)structure, such as:

- biomass gasification technology, particularly focused on the gasification of residual substances (biomass) resulting from the composting and sorting progress at the VAR;
- converting fuel gas to a sustainable gas suitable for the gas network;
- transport, storage and combustion of fuel gas or sustainable gas (in engines);
- tepid water network in combination with heat pumps so as to be able to use industrial residual heat from the Ecofactory to supply heat to residential areas;
- gas network in combination with very energy-efficient homes, gas-fuelled heat pumps and micro-heat/energy for the heat supply to (parts of) the residential areas;

In the following paragraphs, older and more recent projects will be detailed:

Woudhuis-Project (1.000 Solar thermal roofs).

To carry out the Woudhuis project (1993-1997), a team was formed, consisting of representatives from the municipality, the housing construction company and a consultancy, and presided over by the energy supplier NUON with each party having a specific task to fulfil. For example, NUON provided information to house owners -through a special review, the *Zonnewijzer*-, carried out surveys and inspected the existing systems. The company was also responsible for co-ordinating subsidies. The company ITA installed 1000 solar water heaters. Owners were free to choose the company of their choice for the other installation work; however, this work was mostly awarded to ITA.



Each of the systems has an effective collecting area of 2.8 m² and a 100 litre storage tank. The components and the installation work are guaranteed for five years. One of the central points of the solar project lies in the quality assurance and the measuring of data relating to

the system's efficiency. The inhabitants of Woudhuis were asked to take readings of their power, gas and water consumption.

The success of the Woudhuis-project has encouraged the municipality to continue its strategy in terms of solar energy and provided the impetus for the second project which involves the installation of 1000 solar systems in the Osseveld construction area. In May 1996, promotion of SDHW-systems was started for existing buildings and grants were available from the Dutch government, NUON and the City of Apeldoorn itself.

Ecofactory project.

The City Council of Apeldoorn is developing a sustainable "zero CO₂-emission" industrial site of 65 ha called Ecofactory. Last year, it has decided to build in this sustainable park and surroundings a wind farm of 10 MW. NUON will develop this project, which comprises 5 wind turbines of 2 MW each.

The main task of Apeldoorn Council is to facilitate the development. The Quality Plan is subdivided into three packages: *the Basic package* includes all measures and activities for which the Council takes responsibility; *the Location Conditions package* includes a number of prerequisites to be met by businesses before they can be assigned a location at the Ecofactory; *the Plus package* comprises measures intended to give an extra boost to sustainability.

The sustainable character of the Ecofactory has been quantified in the Quality Plan, and is subdivided into nine quality themes. The five primary themes include Energy, Water, Waste, Land Use, and Accessibility. The plan fits into a drive to enable economic development as well as curbing its environmental side effects. Energy will be derived from the sun, wind power and biomass energy.

The main sustainable energy focus is on Biomass. The first way of producing this type of energy is through a huge poultry litter combustion plant developed for an English/Dutch Joint Venture, Fibroned Ltd, which produces 30MW of clean energy and 10MW of sustainable heat. A second way is through gasification of Biomass at the VAR (Veluse Afval Recycling) area which provides biogas at this area nearby Ecofactory. The wind power is represented by the 5 turbines that we already mentioned. In the field of solar energy, the emphasis is on withdrawing heat from access roads on the industrial site, by using an innovative piping system with storage capacity in the asphalt, called WinnerWay. The WinnerWay serves for prolonging services of the road by cooling in summer and heating in winter to keep the surface ice-free and for using it in the nearby residential development Groot Zonnehoeve. Also, the Apeldoorn City Council decided in 2001 the construction of a district heating network to transport the generated heat to existing buildings in the city and to new build areas.

The first two companies who will settle down at Ecofactory are a production company and a company who stores frozen food. The building activities started in 2001.

The plan itself is praised for its quality and ambition level. For that reason, Ecofactory won the so-called "Energy award 1999" by NOVEM, the Dutch Governmental Organisation for Energy and Environmental affairs

Others projects.

Other additional options are needed for reaching, in the long term, an energy sustainability greater than 50%. Possible options are hydrogen and SNG (Synthetic Natural Gas or upgraded biogas).

Instructed by the city of Apeldoorn, GASTEC NV, the Dutch centre for gas technology, investigated in 1999, as a continuation of the VAR-project, the technical and economical aspects of upgrading biogas into SNG for feeding into the existing gas grid in Apeldoorn. The

total financial investments for a gasification plant and the biogas-upgrading process are estimated at 19 million euros. The gasification plant takes the greatest part of this investment. Further investigation is needed to reduce the investments and to optimise the quality and composition of the biogas.

At this moment Apeldoorn is participating in the Altener biomass/biogas project. The aim of this project is to investigate relevant technical and financial factors determining the feasibility of a biogas installation in Apeldoorn. Part of the study is to investigate the relevant feasibility-factors for the use of SNG by gasification, methanisation or digestion of biomass. In this project, Apeldoorn is co-operating with Solagro, a company in Toulouse, considered as the expert in France on the topic of biogas upgrading for network injection.

The Altener project should be considered as a market study to determine the potential for gas injection in regard to various technical and economical conditions for grid injection.

EVALUATION AND OUTLOOK.

Today the share of sustainable energy in energy supply of Apeldoorn is about 3%. To cover 10% of the energy demand in 2008, considerable efforts are still to be undertaken. Nevertheless, as the actions mentioned above have reached important results, an optimistic outlook is permitted. Some of the results reached are:

- Installation of 571 solar collectors during the year 2000, and installation of 400 during the last year;
- Installation of 2941 m² PV-systems (equivalent to 294.1kWp) ; 1908 m² of these on apartment buildings , 970 m² on public buildings and 63 m² on private housings;
- Use of Green Electricity: 3752 persons use this energy at the rate of 12 millions kWh.

FOR FURTHER INFORMATION

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