City-RES Project Summaries

Urban Renewable Energy Projects

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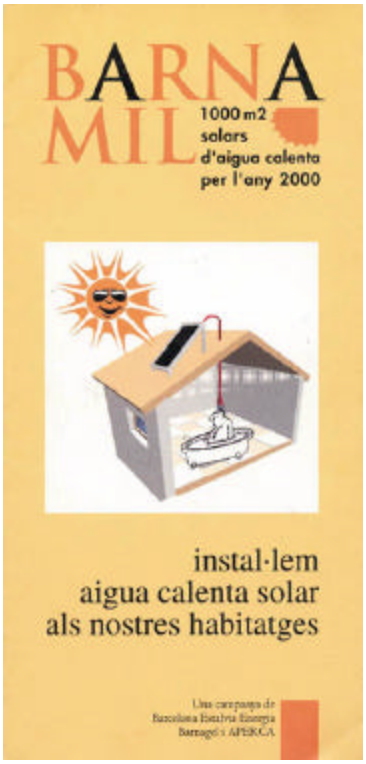
Housing regulations to develop solar energy

Barcelona (ES) – 1,653,000 inhabitants

Despite its reputation for having a high number of hours of sunshine, Spain has not yet made the most of its solar energy potential. Local initiatives are currently being developed, like in Barcelona where the municipality, the local energy agency, enterprises and associations have joined forces to define a development strategy.



In 1997 several groups of citizens and associations in Barcelona set up BARNAMIL, the stated goal of which is to promote the use of solar systems. To this end, they have associated themselves with the local energy agency of Barcelona - BARNAGEL, the Catalan Association of renewable energy enterprises (APERCA) and the municipality.

BARNAMIL has set itself the objective of installing 1000 m² of thermal solar collectors on residential buildings with the support of the European Commission, the Spanish Government and the Municipality (which contributes 20% of total investment amount). The Municipality is also developing the installation of similar systems on sports complexes, schools and civic centres.

To go even further, a new housing regulation was adopted by the City Council in July 1999, the "By-law for the installation of solar thermal collectors on buildings". New constructions and retrofitted buildings will have to provide for the future installation of solar collectors for producing sanitary hot water. This provision will apply to any type of constructions: blocks of residential flats, shops, industries, sports centres or hospitals etc.

This regulation is really revolutionary and is an example to other municipalities.

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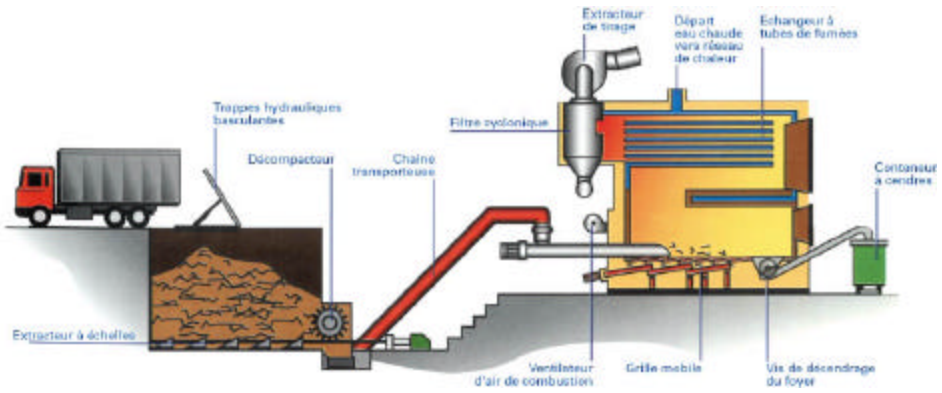
A district heats with wood

Dole (FR) - 26,600 inhabitants

Reaching the objective of 12% of renewable energy in Europe by the year 2000 means a great deal of importance must be given to biomass wood for the production of heat and electricity. Apart from the Nordic regions that use this energy extensively, some municipalities have committed themselves in this direction. Dole installed two wood fired boilers in 1998.



A central boiler room was built in the middle of the 1960s to feed a heat network that provides heating and hot water to 1,800 homes, a hospital, two school complexes, a secondary school, a shopping centre and several establishments with a social vocation. A reflection on the rehabilitation of the local power station led the municipality to study the possibility of using biomass wood and connecting a second hospital to the heat network.

In September 1998, a 3.2 MW wood fired boiler was commissioned. It supplies more than one third of the energy required by the area while using 12,000 tons of wood residues annually. Ashes are used as fertiliser.

Only a few months after this first installation, a social housing organism installed another wood fired boiler in a building of 286 dwellings, with gas as complementary energy.

These achievements were made possible thanks to a strong municipal commitment, an active support from the Governmental Agency (ADEME) - which launched a “biomass wood and local development” plan in 1994 - and an extremely active community life in the region.

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A city gives a national impulse

Dunkirk (FR) – 71,000 inhabitants

Wind energy in town is not very often found, notably for space-related reasons. In Dunkirk, the municipality played an essential role when the first wind turbine engine in France was installed and following that for the development of the technique.

A feasibility study was carried out as soon as 1989 for the installation of a first 300 kW wind turbine. The project received the support of the European Commission and erection took place in 1991. At that time, there was no legislation in force nor electricity purchase rate. Everything had to be invented.

This first installation created a dynamic current in the region: in 1996, a wind farm with 9 wind turbines totalling 2.7 MW was commissioned.

On this occasion, the Regional Council of the Nord-Pas-de-Calais Region launched with both public and private partners a semi-public company called “Eoliennes Nord-Pas-de-Calais” the objective of which is exclusively to install and run wind energy projects in the region.

In 1999, a first wind turbine engine was installed in a second wind farm located in Widehem (80 km from Dunkirk). This farm will include 6 turbines, each with a maximum capacity of 750 kW and built by a French manufacturer specialising in the nuclear industry.

The first French *“off-shore”* project situated off Dunkirk has completed design stage and should be achieved in a near future.

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Solar hot water for sanitary purposes in homes

Geneva (CH) – 159,000 inhabitants

Solar thermal has not succeeded yet in largely penetrating the urban market. However some policies designed and implemented at local level are opening the way, as for example in Geneva.

In 1988, the city council of Geneva decided to raise a loan of 1.26 million Euro to create a fund for the promotion of thermal solar installations. By mid-1999, the fund was almost exhausted. The first installations were erected on public buildings and notably on sports complexes.

Since 1994 however, the collectors have been installed as a matter of priority on municipal living quarters where they can fully demonstrate their usefulness in supplying the energy necessary to pre-heat hot water for sanitary purposes.

The high number of flat roofs on blocks of flats owned by the municipality offer good conditions for using solar energy. These flat roofs must be renovated every 20 or 25 years and it is on the occasion of these retrofitting operations that solar systems are installed by local companies.

The total collector surface area covers 1990 m² in 1999. These installations allow to save 1 % on the overall thermal needs of the municipality.

The Municipality of Geneva also created at the end of 1998 an “energy” fund provisioned by the increase in energy prices. This fund will progressively grow to total 0.6 million Euro in 2003 and will be used to subsidise energy-efficient, renewable energy or co-generation installations.

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Rebuilding in harmony with the climate

Kalamata (GR) – 45,000 inhabitants

Renewable energy only takes on full effect when energy consumption levels of buildings and equipment are as low as possible. Building in harmony with the climate –to limit the needs for heat and cooling – is a common sense measure but is far from always being applied. The Municipality of Kalamata integrated this aspect when they proceeded to rebuilding operations after the 1986 earthquake.

Building operations took place between 1992 and 1994. The project includes 9 meter-high buildings totalling 120 dwellings. The limitation of thermal needs (which are quite low) and more specifically the need for air-conditioning during summertime had to be factored in. Different techniques were used:

- calculation of the annual heating demand of the houses by a simulation software,
- optimum organisation and orientation of the buildings with blinds designed to optimise both heat and lighting,
- distance between the buildings for a maximum solar load in winter and a minimum load in winter thanks to the broad-leaved trees planted in between,
- installation of solar collectors to cover c.a. 60% of hot water requirements,
- double casing external walls,
- adaptation of glazing types to the different rooms in the house,
- roof ventilation system based on the circulation of air between the tiles.

An appraisal made in 1996-97 revealed a decrease in energy consumption by 35 to 65%, depending on the type of dwellings.

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The South starts to exploit its solar resources

Palermo (IT) – 700,000 inhabitants

European examples of solar energy use show that - apart from in Greece where this technique is highly developed – it is not always enough to have a good insolation for a political decision to be taken. Palermo, which offers ideal conditions for using solar energy, has decided to start exploiting this inexhaustible resource.

A study was conducted under the ALTENER programme to assess the solar energy potential of Palermo. Considering a committed *"solar energy" scenario*, collectors could be installed to cover a surface area of 50,000 m². Hot water requirements from households are currently met up to 75% by electricity, prices are elaborated according to a sliding scale and the city has a large number of flat roofs: all these are favourable conditions for a cost-effective use of solar energy.

A series of actions were initiated to get solar energy off the ground:

- a marketing strategy was defined with students from technical schools, "solar workshops" were organised,
- the Energy Agency *MEDEA* (Mediterranean Agency for renewable energy and water) was created in relation with the Municipality of Catania,
- 7 solar installations (from 6 to 16 m²), including three 1995 Eurosolar prize-winners, were fitted on social buildings,
- 30 solar installations were erected in 1997 on state schools,
- 6 solar installations on multi-family houses were commissioned in 1997 as pilot sites for the municipal energy supplier *A.M.G*. Six different types of solar collectors were tested to conform with a broader dissemination strategy.

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Biogas from liquid waste used to power vehicles

Stockholm (SE) 1 040 907 habitants

Stockholm's 700,000 inhabitants make almost four million journeys per day. As in many cities, road traffic is the main source of pollution in Stockholm (between 70 and 80% of emissions) and is responsible for most of energy consumption.

In order to improve the quality of life and the environment in the long term the Municipality of Stockholm has decided to introduce vehicles running on biogas produced from liquid waste treatment in sewage plants.
This project is the result of a strong political will at local level to set up a partnership between public and private players supported by the Swedish authorities and the European Commission.
In 1996, a pilot site for the production of biogas was built and a first series of 20 vehicles with a dual petrol/biogas carburation were put into service.

The "tanker lorry" and the filling stations were also partly financed by the European project *ZEUS.*

At the end of 1997, the manufacturer Scania delivered its first lorry running on biogas and capable of transporting biogas to refill up to 160 cars from the production site to the distribution site. Today 200 cars with a dual petrol/biogas carburation are currently running in Stockholm.

The result of the measurements carried out indicate that a dual petrol/biogas carburation vehicle emits fewer pollutants when running on biogas than on petrol.

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Straw-fuelled combined heat and power plant

Rudkøbing (DK), 5.000 inhabitants

In 1989 the municipality of Rudkøbing and the utility, Fynsværket I/S decided to build a combined heat and power plant in the city of Rudkøbing – fuelled with straw supplied by farmers in the surrounding area. The plant today covers up to 90 % of the heat consumption in the city.

In 1986 the Danish government decided to support the erection of local combined heat and power plants which use biomass as a fuel. The municipality of Rudkøbing wanted to improve the town's district heating which at that time was supplied from a waste incinerator and oil fuelled heating plant. Since there is no natural gas supply in this part of Denmark, a biomass fuelled plant was an obvious choice for the town.

A new plant was built and financed by Fynsværket A/S but the project was supported in many ways by the municipality. The local policy makers supported the building of the plant from the start and, as soon as the project was accepted by the state, they included the plant in the regional planning scheme. The total investment was approximately 8.7 million ECU.

The plant employs four permanent staff and has a capacity of 2.3 MW power and 7.5 MW heat. In the winter peak the heat production covers 90 % of the heat demand of the 1,700 households supplied by the town's district heating network.

The straw consumption is approximately 13,000 tonnes/year. This is supplied by a local association for farmers who live within a radius of approximately 50 kilometres from the power plant.

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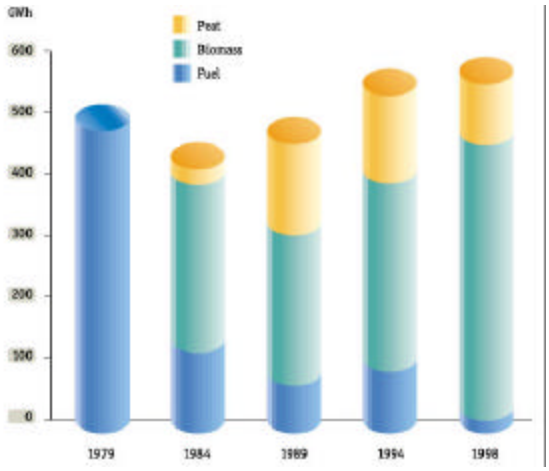
A city with 80% RES supply

Växjö (SE) – 70,000 inhabitants

The introduction of district heating in Växjö at the end of the 1970's marked the launching of an incentive policy in favour of local energy sources.



14,000 flats, 1,700 houses, the hospital as well enterprises are now connected to the heat network. In 1980 a 28 MW biomass fired boiler was commissioned in replacement of the oil fired one. Given the success of this first major installation, it was decided in 1983 that a steam boiler would be converted to burn biomass and peat. In 1996 the energy company built a new biomass fired cogeneration unit able to produce 220 MW of heat and 37 MW of electricity. Since 1998 about 80% of the fuel is biomass and 15% peat.

Between 1979 and 1998, emissions dropped by 93% for SO_2, 59 % for NO_x and 60% for dust particles. As for CO_2 emissions they were reduced by 86%.

A study entitled "Utilisation of biomass as a source of energy in the regional context" demonstrated that this policy is supported by the political leaders, the population and most of the industries. Support from the central government and commitment from the directors of the municipal energy company VEAB to develop biomass as a viable source of fuel from a commercial point of view largely contributed to this success.
Development of electricity generation from various fuels in Växjö
Energie-Cités graph, source info VEAB Växjö

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Photovoltaic energy on large scale

Amersfoort (NL), 122.000 inhabitants

The City of Amersfoort and the Dutch energy supplier REMU used the opportunity of the building of a completely new neighbourhood (Nieuwland, 5.000 homes and about 70 ha for industrial purposes) to experiment with photovoltaic energy. They not only concentrated on the technical aspects, but also on the availability of the technique.

Hence, several very interesting projects have been planned and/or achieved. Among them :

- three low-energy primary schools: in two of them, provisions were made to integrate solar panels, respectively with 124 and 192 modules,
- the "1 MW photovoltaics project": based on an average of twenty square meters of solar panels per house and a peak capacity of 100 W per m^2, a specification was made in 1994 to build about 500 houses. Construction should be finished by 2000,
- solar energy on fifty rented dwellings: the Amersfoort housing corporation project was completed in 1996: 5.6 m^2 of solar collectors and 22.5 m^2 of solar cells have been installed on the roof of each house.,
- 19 "owner occupied homes" with solar power: Preparations started in 1995 with the last houses being completed in 1998,
- two semi-detached “balanced energy houses" , whose annual energy consumption is fully covered by solar energy, were built in 1997/8. One house is used for dwelling purposes, the adjoining one serving as an Information Centre for Sustainable Energy open to the public.

By mid-1999, 1.150 homes in Nieuwland will have been equipped with solar collectors.

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When the city find out new means for wind energy

Dortmund (DE), 597 000 inhabitants

Wind energy is not only a technique. Its development requires a series of management measures. The city of Dortmund has developed a very innovative method to boost wind technology within its own territory.

A study of the potential of the city for wind energy was published in 1995. It identified the potential of the area within the city limits for wind energy and identified 7 sites suitable for 150 kW wind turbines taking into account factors such as visual impact and noise. However the technology progressed and the City decided to construct a 500 kW turbine on one of these sites.

The financing is the most innovative aspect. The project received a grant of nearly 64.000 Euro from the European Union. The balance of about 447.000 Euro had to be found from other sources. The municipal utility (DEW) advanced the money needed to build the turbine and looked for means of obtaining a loan afterwards, actually involving a large number of members of the local community in its funding but in an unusual way: DEW has offered bonds to members of the local community - effectively a loan over 10 years.

The bonds are in three denominations, from 153 to 511 Euro. They will be reimbursed at nominal value after 10 years. Interest of 3% is guaranteed, based on the turbine operating the equivalent of 1000 hours at full output thus the utility is taking the most significant risk. According to the preliminary study, the overall return over 10 years would be 5% for an output of 1450 hours typical of that obtained in the first year's operation.

In February 1999, all the bonds - i.e. 1830 altogether – had been sold, and the 447,000 Euro to be funded by DEW had already been raised publicly.

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A new lease of life for an old geothermal power station

Prenzlau, DE (23,000 inhabitants)

In former-GDR, the presence of underground hot water due to favourable geological conditions used to be exploited by three geothermal power stations. The power station of Prenzlau continued in operation till 1989. It is having now a new lease of life.

It was used to supply 500 dwellings. But the exploitation of geothermal water caused damages to the underground “cavities”, and the plant was shut down. In 1991, a new and less harmful technique was developed.

The technique used to exploit hot water is quite simple. Hot layers are first of all identified by means of a 3,000 meter long underground boring. Cold water is injected into these layers, where it gets warmer, and is then taken back to the surface. The hot water cools off as it is being used and is then re-injected into the circuit. This method requires little maintenance and is highly reliable.

Thermal energy is not put to the same use in winter and in summer. In summer, hot water is supplied to the connected buildings through a geothermal heat pump (350-500 kW output). In winter, it supplies part of the energy required by the fuel-oil and gas fired district heating station. During this period, geothermal energy is used to warm up the return circuit of the heat network, thus increasing its energy efficiency.

The cogeneration unit has a combined 10.5 MW output and supplies 2,000 dwellings - including 1,200 with water and heat - two schools, gymnasiums and three commercial buildings. The building costs were split between the Federal Republic of Germany, the Land of Brandenburg and the City of Prenzlau with a grant from the European Commission. Since its installation in replacement of an old lignite fired plant, CO_2 and CO emissions have been reduced by 20%.

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