This is where the renewable energy of the future is being developed

HÄRNÖSANDS ENERGIPARK

Solar power plant.

Solar energy converted to district heating!


Andreas Einarsson


Pär Marklund

Härnösands Energipark is a unique arena for new and intriguing technology in small-scale energy production. It presently features a solar power plant, a small wind power plant and sun-tracking solar cells. The energy produced goes directly to our customers in both the electrical and district heating networks. Härnösands Energipark represents an opportunity for various players to install, develop and demonstrate full-scale production facilities.
We offer marketing opportunities and compensation for all produced energy!

- **Solar energy for all district heating customers**
- **Study visits for grammar schools, high schools and universities, for example**
- **Unique facility with lab capabilities**

Welcome for a study visit!
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HÄRNÖSAND ENERGI & MILJÖ
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www.hemab.se

HÄRNÖSANDS ENERGIPARK

Härnösands Energipark

- Is a place where small-scale systems for electricity and heat production that are not yet commercially viable, can be built, tested and find a market for their energy.

- Is a showplace for technology and an inspiring meeting place for collaboration between stakeholders, such as local and regional trade and industry, schools, universities, researchers, the Technichus science center and tenant-owners’ associations.

- Is unique due to connection and marketing opportunities being available for both electricity and heat, with the heat being utilized in district heating.

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WHY HAS HEMAB BUILT HÄRNÖSANDS ENERGIPARK?

”We want to contribute to the development of renewable, small-scale electricity and heating production,” says Pär Marklund, project manager and energy engineer. “Together with other energy-related initiatives in Härnösand – such as the academic programs and research at Mid Sweden University and the trade college, as well as the Lumicum Laboratory – we are contributing to Härnösand becoming a seat of authority in development of new energy. Establishing inspirational meeting places between businesses, researchers and education professionals is of the utmost importance, and this is exactly what we’ve done.
”All of Härnösand’s district heating customers are now receiving a portion of their energy from the sun, now that Europe’s first solar power plant for electricity and heating is in operation.”

INSTALLATIONS AT HÄRNÖSANDS ENERGIPARK (Sept. 2012)

SOLAR POWER PLANT Twenty solar collectors with a total active surface of 200 square meters (about 2,150 square feet) are converting sunlight into electricity and heat, which is then distributed via the local electrical and district heating networks . The technology, which won top honors at the Intersolar show in 2011, is based on the concentration of sunlight with a factor of ten. The sunlight is focused on a small high-efficiency solar panel, which generates electricity. To avoid overheating of the solar panel, it is continuously cooled with an integrated cooling loop. The surplus heat is used for heating buildings or tap water. The solar collectors vertically follow the movement of the sun during the day and are automatically turned away in the event of overheating. Each solar collector module (10 cm/4 inches long) is calculated to produce about 700 kWh per year of electricity and 2,700 kWh per year of hot water (at 75 degrees Celsius/167 Fahrenheit). In a further development of the technology and as a result of the developments in the market for solar cells, the manufacturer Absolicon Solar Concentrator AB is looking at solutions solely for heat production and low-pressure steam.

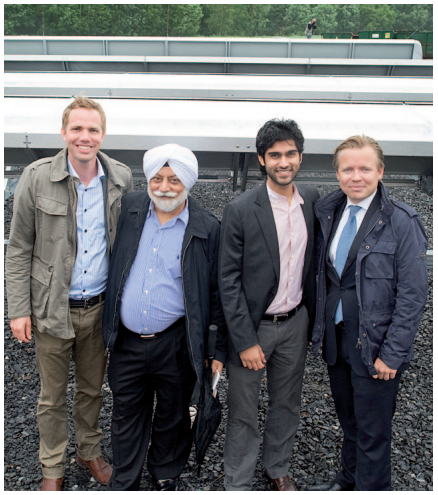
SUN-TRACKING SOLAR CELLS Conventional solar cells for electricity production are best installed directed to the south and at a 45-degree angle. To further optimize the installation, there is a sun-tracking frame that ensures that the solar cells are always pointed directly at the sun. At Härnösand Energipark, a dual-shaft solar collector has been built and equipped with six 300-W solar panels for electricity production. The solar collector is maneuvered along a pre-programmed curve, which increase the degree of utilization by 30–35 percent. From a financial perspective, the increased degree of utilization must be weighed against the cost or against the alternative of investing in more solar panels. In contrast to the solar panels, which in principle are maintenance-free, the mechanical sun tracker requires a certain amount of maintenance with time.

COMPACT WIND POWER PLANTS Large-scale wind power has made breakthroughs on a wide front. There are however, even alternatives for small-scale production of electricity with wind power. In recent years, a number of compact wind power plants have been introduced in the market, of which many have proven to be of inferior quality. At Härnösand Energipark, there is a small wind power plant installed on a 6-meter (20-foot) high light post. The rotor diameter is 1.8 meters (nearly 6 feet), which means that in Sweden, no building permit is required. The turbine has a synchronous three-phase generator with permanent magnets and produces an output voltage of 25 VDC. Connected to this is an inverter for connection to the local electricity grid. Lacking a motor to orient the rotor to the wind, the machine is equipped with an auxiliary starting device. This entails that the turbine is regularly started to determine the direction of the wind. At 12.5 meters per second (about 28 MPH) the generator produces 1 kWh and maximum output is 3.2 kW at 20 meters per second (about 45 MPH). What is significant for this production method is that it requires favorable wind conditions. The relationship between wind speed and wind energy is cubical, which means that electricity production is very much affected by how much the wind is blowing. The conclusion reached by many is that either through own improper investments or through comparison with an investment in solar cells, the risk is considerable that the wind conditions will be not sufficiently good for it to be profitable.

ALGAE CULTIVATION Härnösand Energipark is the current host for a research and development project oriented to greenhouse cultivation of algae. The organic growth of algae vastly exceeds that of other plants. The project’s objective is to determine if under simple forms with small means, that a rational and temperature-assured environment can be established that is favorable to algae cultivation. More specifically, it is being investigated as to whether it is possible to create the right conditions for a growth environment where the greenhouse-like hotbeds are placed floating in water or on level ground. If the research project succeeds, this entails major opportunities for bio-oil production on for example, rivers and lakes in Africa, where there are enormous areas in a favorable climate with natural cooling. Flat farmland in the northern latitudes, with long, light nights, can also be a viable alternative since 75 percent of the year’s hours of sunlight are between April and September. Hugo Wikström from Härnösand is conducting the project, but Nils Ekelund, a professor of plant physiology at Malmö University, is also participating in the project. Various algae with varying properties are being tested to see how robust they are for cultivation according to the proposed model. The photosynthesis that takes place in algae converts about 3–5 percent of the energy into oil, carbohydrates and protein in the plants. The optimal temperature for effective photosynthesis is 24 degrees Celsius (75 Fahrenheit), but must be at least 16 degrees Celsius (61 Fahrenheit). The bio-oil that is formed and stored in the algae can be compared to a built-in battery. The bio-oil is extracted by pressing the algae. The amount of bio-oil corresponds to about 20–50 percent of the dry weight. Algae also contain carbohydrates, which can provide ethanol and bio-gas, as well as protein that can be used as feed, food or bio-gas with significant associated revenues. The investment cost is estimated to be less than SEK 50 per square meter ($7.50 per 11 square feet) for a complete greenhouse concept.

FACTS and POSITIVE SIDE-EFFECTS

- Härnösands Energipark was opened in June 2011
- Last year the facility had 1,700 visitors, including a number of international visitors from among other places, Africa and Asia.
- In competition with many nominated innovations, Absolicon’s X10 solar power plant won first prize at the prestigious Intersolar 2011 show in Munich, Germany



International visitors from among other places, Africa and Asia, have shown interest in Härnösand Energipark.

- A number of residents and businesses have been inspired to invest in their own small-scale production systems for electricity and heating, primarily solar cells
- Härnösand College has installed a solar power plant like the one at Härnösands Energipark, and through special agreement, supplies surplus energy to the district heating system
- 2012–2013: A new travel center is under construction in Härnösand. A solar power plant (electricity, heating) has been chosen for heating, but with district heating as the primary source of basic energy
- 2012–2013: A unique research project is underway with greenhouse cultivation of algae, which converts the air’s carbon dioxide into bio-oil. Contractor Hugo Wikström is managing the project, along with Professor Ekelund from Malmö University

Härnösand Energi & Miljö AB, HEMAB, is a fully owned municipal company with 125 employees and annual sales of about SEK 300 million ($45.3 million). It is important to the Municipality of Härnösand that HEMAB’s operations in district heating, waste management, recycling, soil treatment, water and sewage, the municipal broadband network and electricity distribution function smoothly and are further developed.

VISION; HEMAB shall actively contribute through its operations to making Härnösand attractive, and shall create the conditions for positive development with the relocation of existing businesses and establishment of new ones in the municipality. The company shall provide customers with sustainability, local accessibility and problem-free deliveries.