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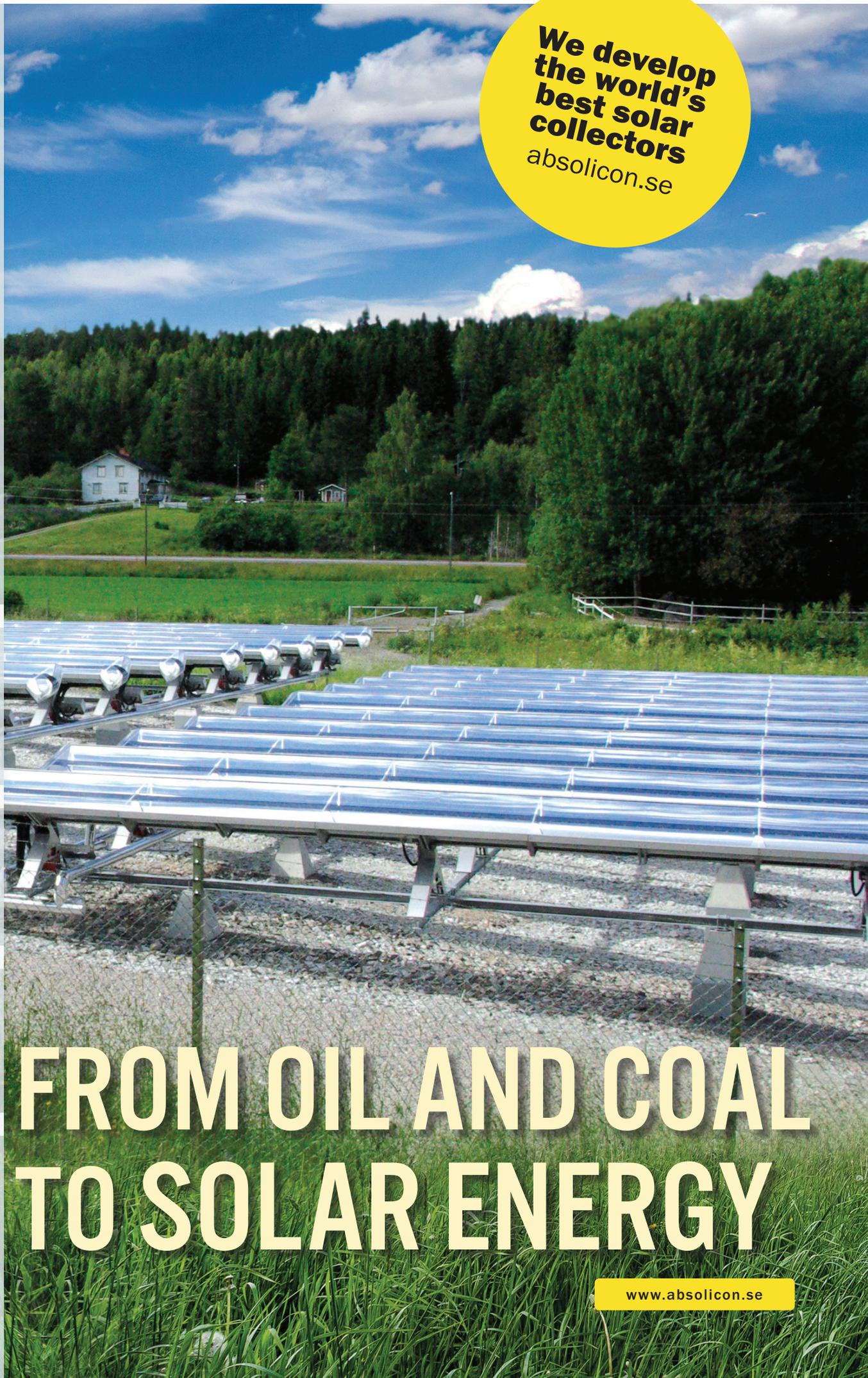
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**We develop
the world's
best solar
collectors**
absolicon.se



FROM OIL AND COAL TO SOLAR ENERGY

LEADER



Joakim Byström
Founder and CEO

A BIG STEP TOWARDS A FOSSIL FUEL-FREE WORLD

Work on rolling out Absolicon's concentrated solar collectors worldwide is now accelerating.

Firstly, on 16 December China made public an extremely ambitious plan for solar heating. This five-year plan requires the installation of 27 million m² of solar collectors in the district heating network and in Chinese industries.

Then we received an order from Heli New Energy for a production line for Absolicon's solar collector, worth SEK 25 million and meaning that Absolicon will have a head start in the new market and opening the way for the sale of additional production lines in China.

This means that we are now taking the third step in the plan that we established when we started the business in 2013, by building two production lines, one in Sweden and one in China. For many years now, we have hand-built two solar collectors per day. Thanks to the unique characteristics and high performance of our solar collectors, we have been able to sell to a variety of customers. Now we will have a robotized production in which glass and plates are fed in and a complete

solar concentrator will roll off of the line every six minutes at a fraction of the cost. An important step forward!

In my job, I am often asked just how sure we can be that climate change is in fact a result of our greenhouse gas emissions. I then normally refer to the enormous amount of research carried out all over the world which formed the basis for the Paris Agreement. Climate research has to a large extent been carried out in Germany and the United States – with one billion dollars being invested in climate research each year under President George W. Bush.

However, when the climate change negotiations in Paris began, every nation on Earth had its own scientific advisors and the majority their own research programmes in the field of climate change, with no one wanting to be dependent on the research of a few countries.

Saudi Arabia, a country almost wholly dependent on oil, started their own climate research centre. India, China and Australia, all with large national resources of coal, also have their own climate researchers.

When the nations of Earth then met in Paris, they decided – with the support

of their scientific advisors – to conclude an agreement. This represented a fantastic success for common sense; that 197 countries realised that this agreement was necessary to their respective futures and duly signed.

Now what remains is the work to reverse the development and begin to reduce emissions. The goal is zero net emissions. This demands both political measures, technological development and changes to lifestyles. Here, we see daily positive decisions and increasing interest.

It is pleasing for our continued work that Absolicon's shares are developing so positively. A healthy stock exchange value increases our chances of financing our expansion and also opens the way for the acquisition of companies that can provide us with a stronger starting position for this international expansion.

At Absolicon, we intend to sell the world's best concentrated solar collectors for industry, solar cooling and large industrial roofs!

With sunny best wishes

WELCOME TO ABSOLICON



Christer Olsson and Bianka Magyari.

When you get in touch with Absolicon, you will probably be answered by Christer Olsson or Bianka Magyari. Together, they take care of our guests, customers and shareholders.

Absolicon has an efficient administration for dealing with large or small projects. Office manager Christer Olsson has been with us since 2007.

Together with Bianka Magyari, he makes certain that everything is functioning. He is responsible for day-to-day contacts with suppliers, Swedish customers and Absolicon's shareholders.



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AFTER PARIS – the world is working for the environment

After Paris, the nations of the world have gathered around a common goal; to reduce the increase in greenhouse gases in the atmosphere to zero.

197 countries, in principle every nation on Earth with the exception of Syria, Uzbekistan and Nicaragua, have signed the Paris Agreement.

The Agreement has two long-term goals:

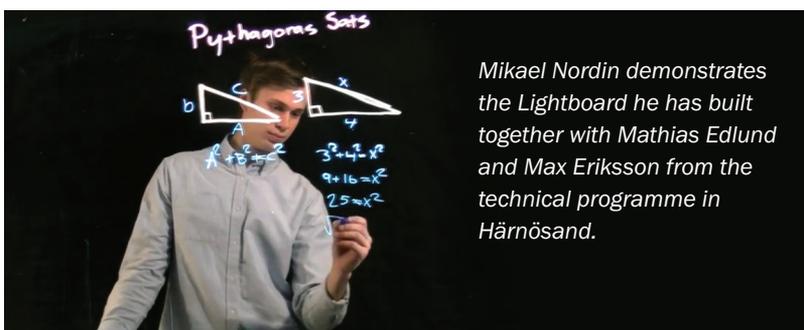
- To keep the global temperature increase well below 2°C, and attempt to reach under 1.5°C.
- To reach a balance between emissions and reductions, that is to say zero net remissions of greenhouse gases by the second half of the twenty-first century.

The Paris Agreement does not define any binding limits on emissions. Instead, each country is obliged to openly reveal their emissions and every fifth year set their own future goals through Nationally Determined Contributions (NDC) that show what reductions in greenhouse gases they intend to make.

Unfortunately, the plans that have so far been submitted will not achieve the 2°C target. The Climate Tracker organisation estimates that these undertakings would mean a rise in temperatures of over 3°C, meaning that these plans must be honed considerably.

Sweden's climate legislation: zero net emissions by 2045

The Cross-Party Committee on Environmental Objectives has agreed that, By 2045, Sweden is to have no net emissions of greenhouse gases into the atmosphere and should thereafter achieve negative emissions. Climate Minister **Isabella Lövin** (Swedish Green Party) has now proposed a climate act that regulates how we are to achieve this, with annual follow-up in the budget process.



Mikael Nordin demonstrates the Lightboard he has built together with Mathias Edlund and Max Eriksson from the technical programme in Härnösand.

LIGHTBOARD – New technology to improve Skype meetings

These days, many business meetings that would once have required long journeys now take place over Skype. Absolicon has a small Skype studio that provides high-quality transmissions.

Together with the Härnösand Technical College, Absolicon has manufactures a *Lightboard* that

allows the user to draw and explain during a Skype call. The project is part of students' course work in Young Entrepreneurship, where complete Lightboards can be purchased.

Every year, Absolicon carries out projects in collaboration with sixth-form students and university engineering students.

RESEARCH INCREASES EFFICIENCY

Absolicon is running a number of exciting development projects with various universities. New materials for solar collectors and component testing are important elements.

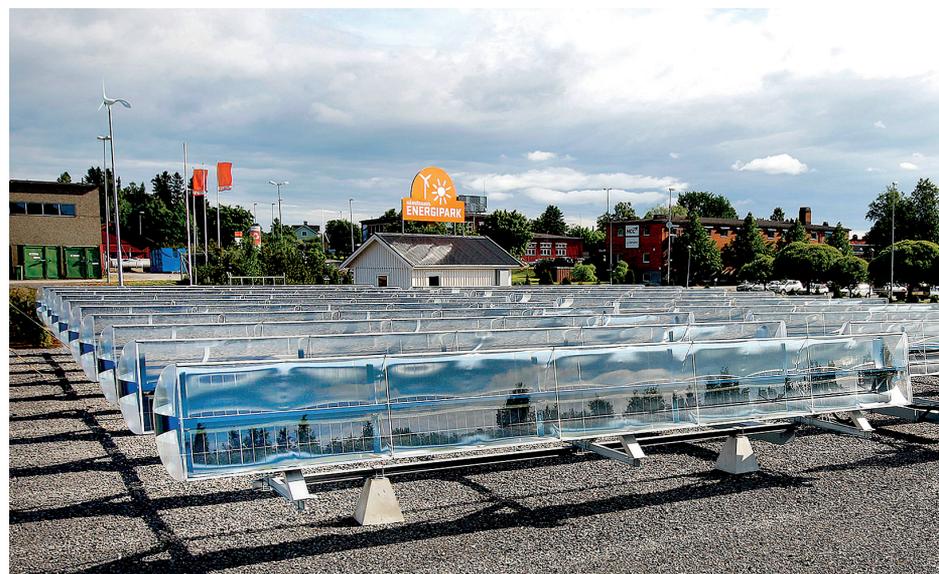
"We subject components to a variety of tests and wear and tear. We freeze, heat, grind and irradiate them with ultraviolet light. If they pass all laboratory tests, we can be sure that they will work for 25 years in a solar collector," explains **Jonatan Mossegård**.

Jonatan is also in charge of the new black absorbent surface being developed by Absolicon together with Umeå University. The aim is to develop an even blacker surface with low heat loss.

This knowledge will result in new solutions to increase the efficiency of Absolicon's solar collectors.



The material's characteristics are first measured and then tested in Absolicon's climate chamber; first down to -20°C and then up to 80°C with full humidity. After several hundred such cycles, the material's characteristics are once again checked.



Absolicon's solar collector in Energiparken (The Energy Park)

THIS IS HOW OUR TECHNOLOGY IS PROTECTED

Absolicon already has two patents but our level of ambition is high and the company is now employing its own patent engineer to work every other week at our Härnösand office. The aim is to create a broad patent portfolio that effectively protects against copies of our solar collectors and production lines, as well as to patent a variety of solutions for industrial solar energy.

"We are constantly developing new solutions and have a bank of inventions that we have not had time to patent. We can create overarching intellectual property rights protection with patents and registered designs and trademarks," says Joakim Byström, CEO of Absolicon Solar Collector AB.

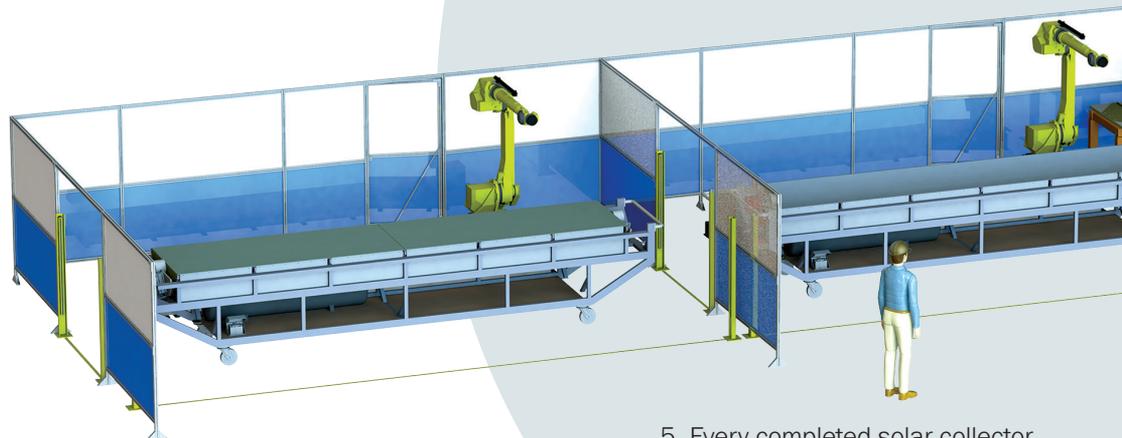
In the past, patents have not been respected in China but, gradually, patent protection is being strengthened and patents are now a natural strategy even for Chinese companies when developing new products. However, Absolicon's strength also lies in the fact that our system knowledge, the company's combined expertise throughout the chain *product – manufacture – integration – installation*, is difficult to replicate.

The robots on the production line will produce

ONE SOLAR COLLECTOR EVERY 6 MINUTES

1. Plate arrives on three ton reels which are unrolled, cut and shaped in specially built machines. Hardened glass sheets, with a nano coating to prevent dirt from bonding and to remove glare, come from the other direction.

At the Härnös Works in Härnösand, Absolicon are building a production line capable of producing a solar collector every 6 minutes, or 100,000 m² per year. As well as manufacturing solar collectors, the plant will also be a showroom for the technology and a pilot line for new production solutions.



Absolicon's vision is a world in which oil and coal are exchanged for concentrated solar energy for the heating of water and steam in industries and district heating networks. For the last ten years, Absolicon have been manufacturing solar collectors at their Härnösand factory. These solar collectors have been manufactured by hand, with two to three units completed per day. Installations have been carried out in eight different countries, in a variety of climate zones and for a variety of uses, for example for schools, hospitals, district heating networks and industrial zones.

New solar collector for mass production

Over the past two years, Absolicon has focused its efforts on developing a new solar collector, adapted to mass production, and a robotized production line for mass production. The order from China on 23 December (learn more on page 6) fired the starting pistol for Absolicon's robotized production line and work is now fully underway.

One solar collector every 6 minutes

The new production line consists of ten assembly wagons and six work stations where solar collectors

are assembled. In full production on a single shift, the production line will manufacture 100,000 m² of solar collectors per year.

"By utilising robots in mass production, we reduce manufacturing costs. Our goal is the make solar energy the cheapest source for industry and district heating," explains Joakim Byström, CEO of Absolicon Solar Collector AB.

The price of the completed solar collector is partly dependent on the volumes of components it is possible to purchase and partly on labour costs. One challenge of manual production is to maintain high and uniform quality. However, by standardising each operation and combining with measurements, solar collectors can be manufactured quickly and precisely.

"We feed in glass and plate in one end and get a solar collector out at the other end every six minutes," explains Joakim Byström enthusiastically.

The production line will be demonstrated for customers

The production line in Härnösand serves

three purposes; the manufacture of solar collectors, a demonstration facility, and a pilot line for new solutions.

"It is here that we will sell production lines. When we are able to show our customers both complete installations and a complete production line, we can offer them an unforgettable experience, a revelation about how simple it is to solve a part of their transition to clean energy," says Joakim Byström.

In addition, Absolicon will continue to develop different solutions, improvements that will first be implemented at Härnösand before they are offered to production lines worldwide.

The new production line is expected to be in service at the beginning of 2018.

5. Every completed solar collector is carefully measured and tested before being individually certified.

HÄRNÖSAND

Delivery worldwide by container

The Härnösand production line will be responsible for delivering solar collectors to other countries until they have their own production lines. Härnösand was once Sweden's third largest port and is equipped to receive container ships. In this way, large deliveries of solar collectors can be shipped at low cost to Hamburg for forwarding to customers worldwide.



EVERY SOLAR COLLECTOR IS QUALITY ASSURED

Artificial eyes check the shape

Absolicon is developing new methods for certifying that every solar collector we manufacture has exactly the right form.

A camera with an image recognition system looks down on the solar collector and can measure the exact shape of the reflector.

"Currently it is a manual job to inspect each solar collector," explains **Jonatan Mossegård**, research manager at Absolicon's Research and

Development department.

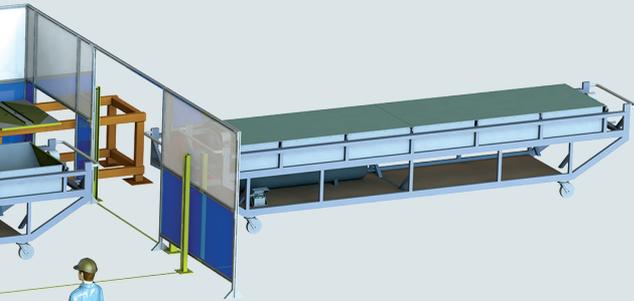
Thanks to the fact that a camera can recognise an objects and edges in the same way as the human eye, we can carry out the same work on the production line in a few minutes.

This development work is one of several exciting projects in which robust mechanical construction and high-tech solutions combine to ensure maximum performance from solar collectors.

200 m² of Absolicon X10 at Dala-Elektrolindningar follows the sun during the day and produce electricity and heat for district heating network.

2. Solar collectors are built on wagons that follow a track through the production line, stopping for six minutes at each work station.

3. Glass and plate are lifted onto the assembly wagon with different lifting aids and two six-axis industrial robots glue the components to one another



4. The robots are served by five operators and three reserves who also take care of the stores and stock work stations with components. One manager and an assistant handle quality control, deliveries and material ordering.



The sun heats the industries in **SMEDJEBACKEN**

Entrepreneur Ingemar Löf runs a local district heating network using biofuel and solar collectors from Absolicon.

Ingemar Löf's company, Dala Elektrolindningar has been heating using wood chips since 1980 but when Ingemar took over the property and needed to change the old boiler, he began to consider offering local businesses heating from a joint district heating network.

Ingemar built a pipe system connecting neighbouring properties and a local petrol station and began to deliver heating using a new 700 kW wood chip boiler. However, summers proved to be a problem.

"The reason that I installed solar collectors was that the large boiler didn't run very well in the summer. When the weather was finest, around midsummer, it was awkward to fire up," explains Löf. "I felt that I needed to find a solution so that I didn't need to burn chips in summer."

Through the internet, Ingemar came into contact with Absolicon and together we began to plan a solar collector installation on the factory roof.

"I carried out a solar heating installation as early as 1975, when I was a scout leader. We had American scouts visiting and I then ran a 50 metre black plastic hose on a barn roof to provide them with hot water for showering."

Together, they employed the services of energy consultant Gunnar Lennermo and designed an installation of concentrated solar collectors capable of generating both electricity and heat,

the Absolicon X10. Ingemar made the decision to invest in solar collectors from Absolicon, along with an storage tank.

The 200 m² of concentrated solar collectors went into service in 2012 and since then the large boiler is switched off between April and September each year. For six months of the year then, the energy needs of the local businesses are met entirely by solar collectors with storage tank and a small pellet boiler.

"When carrying out this type of installation, it helps to be interested in technology and engaged in environmental issues. It demands a certain amount of handwork on the part of an interested machinist, and that I am!"

There is still capacity available on the network to connect more businesses. There is another industrial park on the other side of the road that could be connected to Ingemar's network. There they currently burn 200 m³ of heating oil every year.

"Less and less people are using heating oil and as oil tankers make fewer deliveries, delivery becomes more expensive. In the end, there will be so few burning oil that it will no longer be economically viable to run an oil tanker. Then, those who still have oil heating will have to quickly find a new heating solution."

Ingemar is engaged in the issue and doesn't feel that we here in Sweden are investing enough in phasing out the remaining oil heating facilities.



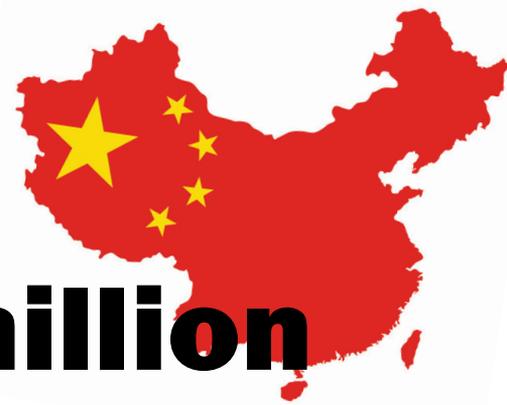
County Governor Maria Norrfalk in conversation with Ingemar Löf inside the heating plant.

"Sweden still subsidises heating oil to industry. I'm meeting Energy Minister Ibrahim Baylan in a couple of weeks and I'll be telling him that we need to do away with subsidies on fossil fuels."

The same year as the installation of solar collectors, Ingemar Löf's environmental initiatives were recognised by County Governor **Maria Norrfalk**.

"I was honoured and pleased that, after so many years of hard work, I received this recognition that someone has seen efforts I've made on behalf of the environment," says Ingemar Löf.

First production line sold to **China** for 25 million



Absolicon has signed an agreement with Heli New Energy in Sichuan Province to deliver a first production line for concentrated solar collectors in China. The contract is worth in the region of SEK 25 million.

Throughout 2016, there has been a great deal of interest from China in Absolicon's new T160 solar collector. Absolicon has been invited to a number of events and conferences, including the Low Carbon Technology Summit with the Asian Development Bank.

Absolicon has negotiated in both Beijing and Sichuan and, step by step, the company has developed a deal with its Chinese partners.

On 16 December, the Chinese National Energy Administration released its solar energy plan and on 23 December 2016, Absolicon signed an agreement with Sichuan ZhongQian Heli New Energy Technology Co. Ltd in Sichuan Province for the delivery of a first production line for concentrated solar collectors to China. The contract is worth in the region of SEK 25 million.

Included in the delivery to China is approximately 400 m² of concentrated solar collectors to be used for one or more pilot installations for marketing in China.



Joakim Byström presents Absolicon's solar collector to the Asian Development Bank and Mr. Xiangqun, Executive Vice Governor of Hunan Province, China. Photo: Yuan Ning

The two companies that have joined together to form Heli New Energy and purchase the production line are two very different companies.

Xinkun is a family-owned industrial company run by a father and son with operations in several different sectors. They have extremely high quality levels and among other things manufacture crankshafts and connecting rods for European sports cars and steam turbine blades. However, they also undertake more robust forging, producing the enormous cast hubs for the very largest wind turbines.

Their production workforce numbers 600 employees.

They also have a comprehensive contracting business and have erected many of the skyscrapers in Mianzhu. Xinkun also run the city's public buses. When Absolicon visited them, we stayed at a holiday resort owned by Xinkun, a large hotel with warm springs in the rose-growing district outside Chengdu.

Within Heli New Energy, Xinkun is responsible for premises, logistics and production of solar collectors.

Jointeam is an energy consultancy company with its head office in Beijing and fifteen provincial offices in China. They work as energy-efficiency consultants, primarily to the building industry but also to manufacturing industry.

Jointeam enjoy excellent political contacts, for example they succeeded in gaining access for Absolicon's T160 solar collector to the US-China Climate Summit where, among others, US Secretary of State John Kerry participated, as one of twenty examples of innovative technology in China.

They have experience of installing both solar cells and vacuum tubes and good knowledge of solar energy and it various applications.

Jointeam will sell the solar collector installations and integrate solar collectors into existing customers' existing heating and steam systems.

Heli New Energy is jointly owned by Jointeam and Xinkun and has a registered share capital of RMB 30 million (approx. SEK 40 million) which, together with loans is sufficient for the acquisition of the production line and for ordering materials in China for the first large solar collector field.

CHINA'S FIVE-YEAR PLAN IS A GAME CHANGER

China's National Energy Administration has set a target of installing 7 million square metres of solar collectors for district heating networks and 20 million square metres for industry by the end of 2020.

In China, five-year plans set the conditions for the country's future development and there is both political will and large investment capital available to back them up. Over recent years, air pollution has become a greater problem – especially in the sunnier climes of northern China.

On 16 December 2016, the Chinese National Energy Administration (NEA) released the solar energy part of the thirteenth five-year plan, signalling

a worldwide revolution in large-scale solar heating.

Northern China has large district heating networks which are generally coal-fired. The NEA has decided that within four years, by the end of 2020, four million square metres of solar collectors will be installed in these district heating networks in order to reduce the burning of coal. In addition, demonstration facilities with a further three million square meters of solar collectors will be built outside major cities. As a comparison, it has taken Denmark 30 years to install 1.2 million square metres for their district heating networks.

Furthermore, the NEA has decided that 20 million square metres of solar collectors are to be installed

in industry, an area of use which Absolicon has studied carefully but in which there are currently very few installations worldwide. The majority of the solar collectors available on the market are not capable of delivering the necessary temperatures above 100 °C. The Chinese investment means the kick-starting of an entirely new solar heating market that, with time, will spread across the world.

The value of these two solar heating programmes can be estimated at over SEK 30 billion. Similar investments are being made for solar cells and solar collectors for family homes. This investment in solar energy is linked to the cancellation of over 100 planned coal-fired power stations in a bid to reduce emissions.

China's smog to be fixed by **SWEDISH SOLAR COLLECTORS**



At Härnösand Central bus and train station, Absolicon has installed 42 m² of concentrated solar collectors. Photo: Pawel Maronski

COMPANY FACTS

Absolicon is a world-leading supplier of concentrated solar collectors.

The company has a unique technology, based on 20 years of research, for extracting energy in various forms from solar collectors.

Concentrators make it possible to reduce the cost of manufacture and installation while at the same time providing higher energy yields in the form of solar electricity, solar cooling, solar heating and solar steam.

Solar energy entrepreneur Joakim Byström has succeeded in securing a spectacular deal to supply an entire production line for Absolicon's concentrated solar collectors to China. The solar collectors, which generate heat and steam at up to 160 °C, will be used to replace heating oil in Chinese industries and reduce the country's smog problem. Absolicon's CEO Joakim Byström tells us about the deal.

The agreement signed with the Chinese consortium Heli New Energy means that Absolicon will install a robotised production line for solar collectors in Sichuan Province, China. It is planned that the production line will be ready by the end of 2017 and will then manufacture a solar collector every six minutes.

This is a fantastic story that began in 2014 when a Chinese mayor visited Sweden and decided to take Absolicon technology to China.

"Initially, we were reluctant to take a gamble on such a large market as China but, with the support of **Mr. Chen** we felt that it was worth the risk," says Joakim Byström. "Mr. Chen was aware of the imminent investment in solar energy in China and promised to help us.

For around 10 years, Absolicon has been manufacturing their concentrated solar collectors by hand in Härnösand. However, in order to reduce costs, the focus in recent

years has been on developing a new type of solar collector adapted to mass production on a robotized production line.

"This deal means that we are now putting our plan into action and will begin to build production lines. Using robots, we will then be able to produce solar collectors at a fraction of the cost," says Joakim Byström.

China has enormous problems with air pollution. The order from China comes as a result of the Chinese Government's latest five-year plan that stipulates that 20 million square metres of solar collectors will be installed in Chinese industry by the end of 2020.

"Now that Chinese industry is being encouraged to make the transition to solar energy, a great demand is being created for concentrated solar energy. Absolicon's technology is based on small parabolic troughs which can be easily installed on industrial roofs," says Joakim Byström.

Absolicon's share price doubled when news of the company's plans for a production line in China were made public. Absolicon has many local shareholders in Härnösand who have supported the company from its inception but, in total, the company has 1,200 shareholders across Sweden. Joakim Byström and his family do however own a majority of the shares.

Absolicon's new T160 solar collector is capable of delivering temperatures of up to 160 °C to drive industrial processes and is far more efficient than traditional solar collectors. Test show that, at a working temperature of only 85 °C, the T160 can deliver

50% more energy per year compared to the best solar collector on the market today. This means that the new solar collector is competitive not only in industry but also for district heating networks.

"Absolicon has developed an extremely efficient solar collection technique with a global market. With the Chinese production line, we can finally begin to mass produce our new solar collector. Our goal is to install our solar collector in every nation on Earth," concludes Joakim Byström.

1.5
million m²



In total, worldwide between 1985 and 2016, approximately 1.5 million m² has been installed in district heating and industry

27
million m²

Through the 13th 5-year plan, China has decided to install 27 million m² in industry and district heating networks in the four years between 2017-2020



Vojen's district heating network is a good example of how Absolicon sees the future of how towns are supplied with energy. Outside the town, there is a solar collector field that supplies the district heating network with hot water and a storage tank that can retain heat. With the T160, the field could provide 30-50% more energy from the same surface area.

DENMARK

A world-beater at solar district heating

In Denmark, it is becoming increasingly common for municipalities to build large solar collector fields that warm seasonal stores where solar energy can be saved from summer to winter.

During the 1980s and '90s, several solar heating fields were installed in Sweden to produce district heating, for example a 5,500 m² field in Falkenberg installed in 1989. These large solar heating installations erected in Sweden during the 1980s were at the time the largest in the world and the majority of the large-scale solar collector fields installed around the world since then have been based on Swedish technology. However, when Vattenfall discontinued their work on solar energy to concentrate on German brown coal, development in Sweden stagnated.

One country that followed the Swedish model was Denmark. In total, there are now 1.2 million m² of solar collectors installed in the Danish district heating network. Those Danish municipalities that otherwise use natural gas for district heating have, over the past decade, invested the equivalent of SEK 3 billion in solar collector fields in order to reduce energy costs and carbon dioxide emissions.

The expansion of Danish solar heating continues apace and many

new fields are planned. Previously it was largely Danish suppliers who carried out installation but now more solar collector manufacturers are attempting to enter the market.

By building large ponds with styrofoam covers, in Denmark it is now also possible to store solar heat from summer to winter. The heat from the summer sun is fed into the pond and saved until winter. Heat is also stored in boreholes and in buried steel tanks. In comparison to electricity, heat is relatively easy to

store from summer to winter.

Denmark and Sweden have approximately the same amount of sunshine and solar collectors produce just as well along the coast of northern Sweden as in Denmark. Which energy source is to be used in district heating is instead steered by political decisions and taxes on various fuels. The development of the Danish network shows that the sun has enormous potential even in Sweden.



Absolicon T160

solar energy for district heating networks

Kwh/m²
600

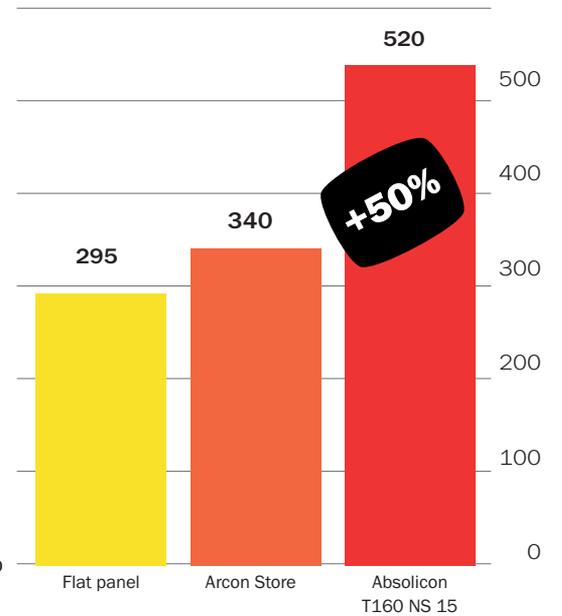
The Absolicon T160 is constructed for the higher temperatures required in industry. However, DTU has demonstrated that the T160 solar collector also outperforms traditional technology when installed in district heating networks, something which may have large implications for future energy supply.

At the Technical University of Denmark (DTU) in Copenhagen, solar heating research has been going on for decades, contributing to the technology's rapid expansion in Denmark. Continuity is important in research and at DTU they have been measuring solar radiation from various parts of the sky using the same instruments for 30 years!

It is well-known that concentrated solar collectors are superior to any other technology at temperatures over 120 °C. Absolicon tasked DTU with evaluating the measurement results from SP and comparing

them to standard solar collectors. DTU concluded that the T160 gives a 50% higher yield than the best flat solar collector at temperatures as low as 85 °C, something which surprised the researchers.

The next stage of Absolicon's plan is to install a small demonstration facility in collaboration with DTU for those Danish district heating plants who wish to procure solar collectors. More efficient solar collectors can considerably increase profits for Danish installations.



Annual production in Denmark for three different types of solar collector



Peter Kovacs, solar energy expert and test manager.

This is how the test experts work

SP in Borås have tested the Absolicon T160 and specific solar collector parameters.

Many people believe that solar collectors are tested by measuring production over a full year.

However, as weather varies from year to year, this is an unreliable method. Instead, the test institute uses mathematical tools to create a model of the solar collector.

SP in Borås is a leader in this field.

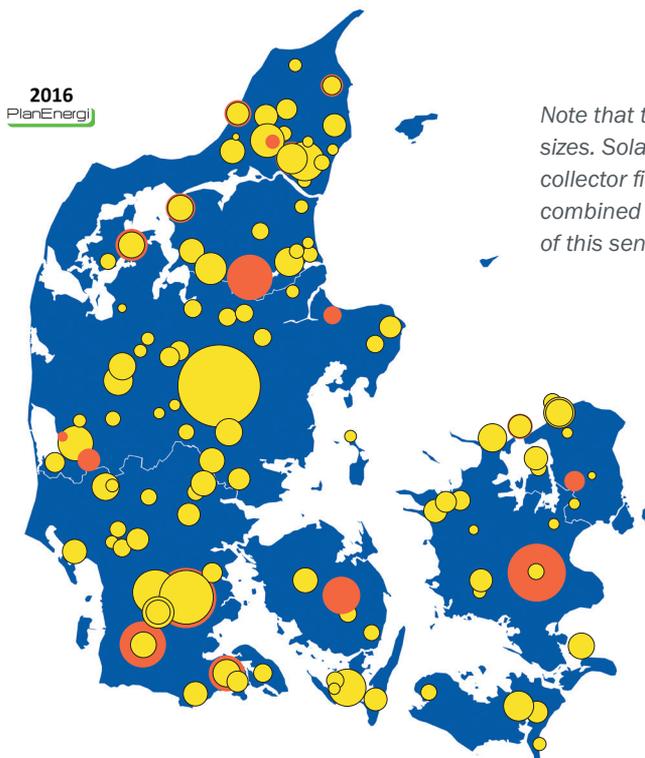
"We comply with an international standard,

ISO 9806, which we also participated in developing. We use a dynamic testing method that works well even when the weather is partly cloudy," explains **Peter Kovacs**, test manager and solar energy expert at SP.

Basically, it is a matter of measuring the solar collector's efficiency at various working temperatures, angles and levels of solar radiation. Then, the set of parameters in the solar collector model that best matches the measurement values is decided mathematically.

"It takes approximately three weeks to characterise a solar collector if the weather is good," explains **Peter Kovacs**. "Then, using those parameters it is possible to calculate how much energy the solar collector provides over the course of a year at various locations on the planet and under different operating temperatures."

The method was developed in the 1990s by the Swedish researcher **Bengt Perers** and has since become a part of the world standard for testing solar collectors.



2016
PlanEnergi

Note that the circles represent only the installations' relative sizes. Solar energy is extremely efficient and where the solar collector field to be drawn to the scale of the map, their combined area would be equivalent to the full stop at the end of this sentence.

■ In operation
■ Planned/planned expansion
 Total collector area (in operation): 1,302,331 m²
 Total collector area (planned) 269,189 m²

FACTS

DANISH SOLAR HEATING

In Denmark, district heating networks often use gas turbines running on natural gas to provide both electricity and heating. When electricity is expensive, these produce maximum electricity and feed excess heat to storage. With excess electricity, they remove the stored heat with heat pumps and allow the gas turbine to stand idle. Solar energy fills the energy store during the summer so that there is another heat for the entire winter.

PEAK OIL

We must adapt to less oil

In 2000, Kjell Aleklett was one of those who coined the term Peak Oil and formed the Association for the Study of Peak Oil & Gas (ASPO). Today he is Professor Emeritus in Global Energy Systems at Uppsala University.

"People thought that I was a nut when I began working on Peak Oil but we're already there. The extraction of oil is decreasing all the time and will never increase again. Our research showed that the peak for conventional oil would come in 2013-14 but by 2007 it had already peaked. Then, 70 million barrels a day were being produced. Today, we're down to 65. If you add unconventional oil, like oil sands and fracking, then it still appears that total oil production may have reached its maximum in 2015," says Kjell Aleklett.

Will oil run out?

We will continue to produce oil, it will never run out entirely. However, since 1987 we have been consuming more oil than the industry has been able to find and when reserves dwindle, consumption must decrease. Oil production cannot increase at the same pace as mankind's energy needs are increasing.

Do people understand that they're using more oil than we will be able to produce in the future?

It's a matter of slow change. In general, people don't have that long-term understanding, peak oil doesn't happen from one day to the next, it's about changes occurring over a long period of time.

How will oil production be affected over the next few years?

There is no longer much room for manoeuvre to speak of. Peak Oil for crude oil, for commercial oil, has already been reached. Production

peaked in 2007 at 70 million barrels a day and has been decreasing since then. Today, eighty percent of oil fields find themselves in a situation in which their average production is falling by six percent a year.

The fields that are currently in production will see a decrease of three million barrels a year. That great a reduction cannot be replaced with new fields or finds. So, there is no going back. World production of commercial oil will continue to decrease all the time.

Why can't oil production increase again?

One concept that is important to understand is that you can never pump up oil without having a reserve in the ground. You can't produce an unlimited amount from this reserve. Calculations show that the maximum amount of oil that can be pumped per year is six percent of the reserve remaining in the ground.

Oil companies must explain that, in future, they will produce less oil than they do today, but that isn't what the market expects. If the oil companies tell the truth today, their shares will crash. That's the situation they find themselves in.

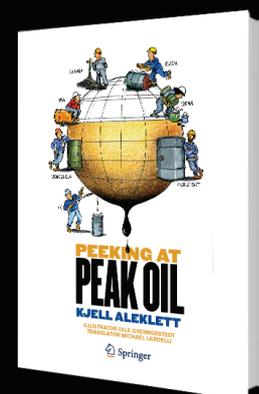
Instead, a phenomenon that we see today is larger companies buying up smaller ones in order to maintain their production figures, where the oil they're finding isn't enough.

In 2015, we produced over 30 billion barrels of oil while we discovered just under 2.5 billion

barrels. The remainder was taken from the reserve.

What do you think about fracking?

Fracking is a new method but it won't be able to maintain its level of production as long as predicted. Fracking reached its maximum level in March 2015 and has been decreasing since then. The US Department of Energy states that fracking will deliver 7 million barrels a day in 2040 but my understanding is that the geological formations cannot provide such amounts.



- *When and where has oil formed?*
- *How much have we used?*
- *How much is left?*

These are a few of the questions that are answered in the book En värld drogad av olja (A World Addicted to Oil) by Kjell Aleklett, published in 2016.

“The fact that we will soon have consumed half of all conventional crude oil should be enough to make most people realise that it is high time to take drastic measures for the future.”

How do you see the energy supply of the future?

The amount of solar energy striking a small area of the Sahara would meet the world’s energy needs. This means that Earth receives more energy from the sun than we need but, as yet, we don’t have the methods to harvest solar energy.

One concept that I think would interest many people is the idea of having their own solar charging station. You should be able to charge the car from your own solar cells, a self-sufficient fuel solution. If it were seen as ‘cool’ to have your own charging station, that kind of business idea would contribute to rapid development.

How is China dealing with Peak Oil and Peak Coal?

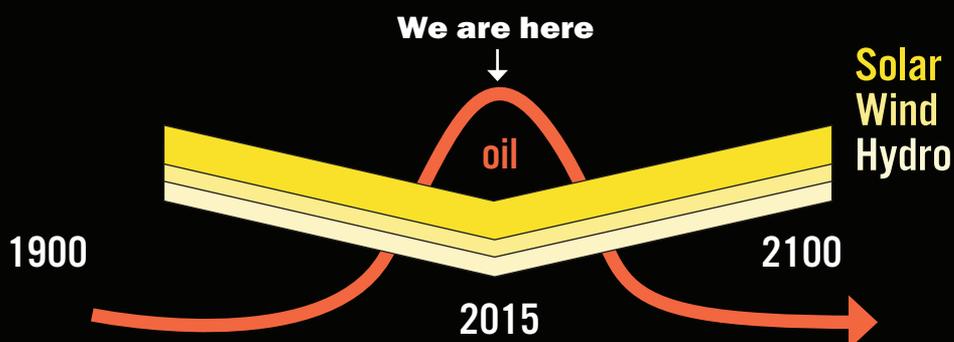
Part of China’s thirteenth five-year plan is to fend off Peak Oil. They understand that they have to invest in renewable energy. China’s own coal production has also reached its peak and it’s no longer possible to increase

production. So, it was very easy for China’s president to say that a change is needed. For China, alternative energy sources are the way forward for creating a good economic future for its people.

How quickly can the transition to wind and solar energy take place?

You have to remember that both wind turbines and solar panels first need to be manufactured. This uses fossil fuels, for example in the manufacture of steel and cement. In future, fossil fuels must be replaced with large amounts of bioenergy. To completely avoid using fossil fuels is extremely difficult. We must have a future with the best possible interaction between fossil fuels and renewable energy sources. What is needed for the world’s growing population is to quickly move from the small volume of renewable energy we have today to the volume we need to achieve.

Unfortunately, it appears that there will be a global energy deficit during the 2030s.



CHRONICLE



Tomas Käberger is a professor at Chalmers University of Technology. He was Director General of the Swedish Energy Agency from 2008-2011.

From oil and coal to renewable energy

“The Stone Age did not end for lack of stone...” So said the then Saudi Arabian oil minister Ahmed Zaki Yamani in 1973. He predicted that new energy technologies would make it possible to use other energy sources at such low cost that oil would one day be left in the ground.

The following decade showed nuclear power to be terribly expensive. In addition, the partial meltdown of the US reactor at Three Mile Island proved that safety was far from assured. Thereafter, it was renewable energy and energy efficiency that remained as long-term alternatives.

The development of these alternatives is proceeding ever faster and the evolution of information technology has left us better able to control energy use in electricity and heating. New technology such as LEDs reduce energy consumption drastically.

Bioenergy systems have developed to the extent that biofuel can now out-compete coal in Sweden without subsidies or taxes and wind power now accounts for twice as much electricity production globally as nuclear power. Solar electricity has also shown a rapid cost decrease and at the end of 2016 could be procured for around 3-4 cents per kWh in the sunniest parts of the world and 6 cents in Denmark.

These price reductions are the result of industrial experience and of the fact that expansion is being carried out on a sufficiently large scale to be efficient. Technology for the production of solar heating has the same opportunity to rapidly decrease in price through industrial experience and upscaling. The potential is greatest at high temperatures, where heat pumps find it hard to compete.

In June 2015, 42 years after Yamani’s Stone Age speech, one of his successor, Ali al-Naimi, is walking into an OPEC meeting in Vienna. As he climbs the stairs, he is asked what he is hoping to learn from the meeting. He rejects the suggestion that he might want to hear about shale oil and gas. Loudly and clearly he says that he wants to hear about solar energy! “Is it an opportunity for Saudi Arabia?” the reporter wonders. “It is an opportunity for everyone!” replies the oil minister forcefully.

With the price of solar and wind energy at around 3 cents per kWh, it is cheaper than crude oil which, at the time of writing, costs USD 55/barrel. The Oil Age will not end for lack of oil. It will end because renewable energy is cheaper and less polluting.

Yes or No

Absolicon's CEO selected as a climate leader in Al Gore's organisation

After serving as Vice President to Bill Clinton, and having lost the 2000 presidential election to George W. Bush, Al Gore increasingly dedicated himself to climate change issues. His film *An Inconvenient Truth*, based on Gore's lectures, was released in 2006 and in 2007 he was awarded the Nobel Peace Prize. Using some of the money from the film and Nobel Prize, he started the organisation *Climate Reality*.

The organisation runs campaigns such as I AM PRO SNOW, through which Olympic gold medal winners, ski resorts and politicians focus attention on how climate change is threatening winter sports, and the 24 Hours of Reality broadcast event.

However, *Climate Reality's* primary function is to train speakers from every country and social group to talk about the climate. Thus far, over 10,000 people between the ages of 12 and 89, from a variety of professions and backgrounds, have been trained.



Former Vice President and Nobel Laureate Al Gore trains thousands of climate lecturers each year to deliver the world famous lecture from the Oscar-winning film *An Inconvenient Truth*. One of the participants in 2017 was Joakim Byström.

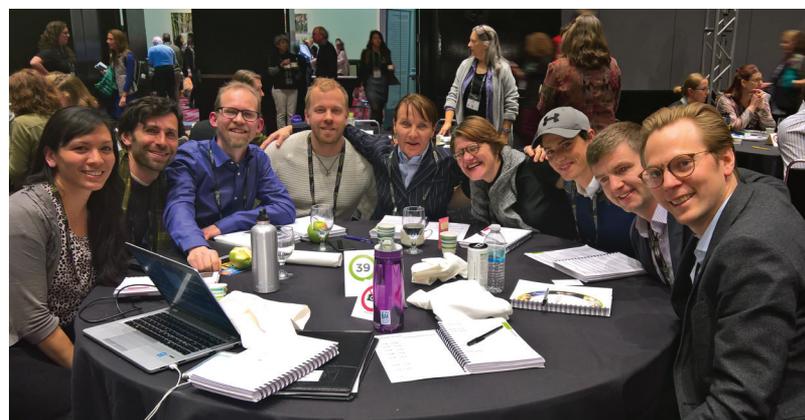
Al Gore himself was the main speaker at the training course in Denver and he gave his two hour long presentation, with over 300 pictures and many films, twice (!) to make sure the message was clear.

He used pictures of Earth taken from the moon to show how thin our atmosphere is. It is apparent how taken he still is by the fragility of life on Earth and how small humanity is in a broader perspective. When we alter the climate, we release enormous natural forces such as storms, forest fires, droughts and torrential rains that sweep people away like rag dolls.

A large part of the lecture consists of scenes from the climate-related

catastrophes that have affected the Earth over recent years, such as Hurricane Sandy that left New York under water in 2013, one of the most costly natural disasters in US history, and Typhoon Haiyan which killed 6,500 people in the Philippines and was the strongest typhoon ever measured over land.

Al Gore listed the three things he believes are most important;



Joakim Byström with delegates at the Scandinavian table at Al Gore's Denver training course.

to win the argument, to buy in an environmentally-friendly manner and to exercise political influence. He then made a confession:

"I used to think that being environmentally friendly was good but wouldn't really make any great difference. But I have truly been convinced otherwise and I admit that I was wrong. As more consumers make environmentally-friendly

choices they influence business and business influences politicians."

He challenged everyone to contact their politicians and explain the following:

"If you do the right thing for the climate, you will get my support and the support of all of my friends but, if you don't, I won't give up until I have defeated you in the next election!"

He also participated in all panel debates and finished off with a rousing speech in which he made comparisons with other great victories for mankind.

Al Gore's three points:

- 1. WIN THE ARGUMENT – CONVINCING THAT CLIMATE CHANGE IS CAUSED BY HUMANS**
- 2. BE A GREEN CONSUMER – BUY ENVIRONMENTALLY-FRIENDLY GOODS**
- 3. INFLUENCE POLITICIANS – IT'S MORE IMPORTANT TO CHANGE A LAW THAN TO CHANGE A LIGHT BULB**

In Trumps USA with Al Gore

When my daughter and I attended the Paris Climate Conference in December 2015, we met Al Gore's Climate Reality organisation. They train speakers to pass on Al Gore's message on climate change.

The idea was hatched to participate in one of these training courses in search of ideas as to how I, in turn, could communicate the complex issue of climate change. In my application, I described how Absolicon developed and how I, in a variety of organisations, have worked on behalf of the climate.

In January 2017, I was informed that I had been chosen to participate in a course in Denver, USA. At the same time, our office received an extremely exciting commercial contact in Colorado and I decided to kill two birds with one stone and make the trip.

Denver is situated on the edge of the Rocky Mountains and their snow-covered peaks loom over the city. Even here though, climate change is apparent – the large pine forests have suffered from drought and heat. This has resulted in extensive attacks from pine beetles, a species of bark beetle native to the forests of western North America that, together with other beetles, have resulted in the death of 800 million trees in Colorado. This has damaged 70% of the pine forest and the epidemic has only halted because most of the more sensitive smaller pines are now dead.

Heat and drought also mean that forest fires, common to the area, now form enormous seas of fire – in 2012 and 2013, Colorado experienced its three largest fires in modern history.

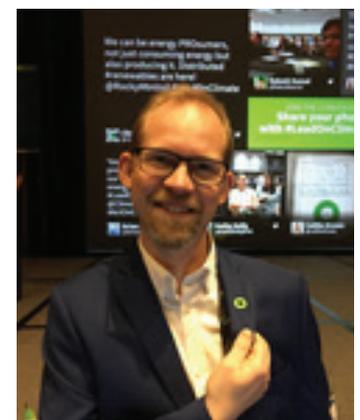
I had a few hours to spare and visited Dinosaur Ridge – a sandstone ridge where hundreds of finds of bones and other traces of dinosaurs have been made. The coal and oil that we use today has formed from carbon deposits stored in the ground in the age of the dinosaurs. As we burn these fossil fuels and free the stored carbon dioxide, we also free part of the dinosaur's warmer climate.

Our trip gave us a good insight in domestic US politics. Many America's still refuse to believe that climate change is the result of man-made emissions. Another opinion expressed was that we need not concern ourselves with the climate as "we will soon be given a new Earth by God". Unfortunately, the climate debate has become politically polarized, with Republican's not officially admitting the climate threat and opposing any measures to fight it.

One insight that struck me was how tied to capital and business US politicians are. Al Gore returned time and again to how big business, through political contributions, has politicians under its thumb and that, if voters fail to monitor them closely, they may make calamitous decisions.

The course included an acclaimed presentation by Leah Greenberg, Chief Strategy Officer of the Indivisible organisation, established by former Obama staffers to prevent President Trump from implementing his decisions. In the same way as the Tea Party prevented Obama from driving through his own policies, so Invisible plan to use thousands of local groups to monitor and influence their members of Congress and Senators to vote against Trump legislation.

The course demonstrated how climate change is already changing the lives of hundreds of millions of people, but it also provided hope that emissions could be quickly halted.



Joakim Byström, Climate Reality Leader



"The climate-change issue is the greatest challenge of our times; comparable with the struggle against slavery, against racism and for women's rights. These met with great difficulties but the struggle continued until, finally, the discussion came down to a simple choice – yes or no – and then, the outcome was inevitable.

Al Gore has battled against climate-change deniers and offered examples

of researchers who have accepted under-the-table payments to write scientific articles to order.

"The opposition to these great issues consisted of sowing doubts, creating distractions, spreading lies, anything to prevent people from understanding the moral issues. When the argument is won and people and humanity can take a stand, change will come quickly.



Al Gore held his climate presentation twice (!) and led numerous panel discussions over the three days.



Great interest in Absolicon on the stock market

Jonas Hemmingsson at Eminova has acted as Absolicon's advisor in conjunction with new share issues and the company's listing on AktieTorget.

"Sweden is experiencing strong interest in young tech companies in the field of renewable energy. Despite tougher competition from many hot companies, Absolicon's development since listing on AktieTorget has so far been hard to beat. We believe that this is because Absolicon is good at explaining what and how they're doing. Understandable products, a clear market focus and transparency are a recipe for credibility with discerning investors," explains **Jonas Hemmingsson**.

A fund broker is the intermediary who receives subscription notes, sends out settlement notes, receives payment for shares and then distributes the shares to the shareholders in conjunction with new issues. They also assist with stock market listings, preparing prospectuses and with ongoing financial advice to listed companies. Eminova specialises in smaller businesses and especially sharp northern Swedish companies!

Distribution of ownership offers both breadth and expertise

To finance Absolicon through a public share offering followed by listing the company on AktieTorget was a strategic decision that was taken several years prior to the listing.

"We have previously financed projects through business angels and regional investment funds," explains **Olle Olsson**, Chair of the Board of Absolicon. "However, now we have over 1,200 owners and are listed on AktieTorget, it feels as if we have a more long-term and secure financial base."

Among Absolicon's owners are both small savers and those with more capital.

"We see the strength in also having a number of larger owners who can contribute expertise and can take long-term responsibility to support the company in the various phases it will pass through," says Olle Olsson.

Absolicon collaborates with the Swedish Shareholders' Association to disseminate information about the company.



Thomas Gidlund

AKTIETORGET

A unique market place for small businesses

Thomas Gidlund was previously head of sales and business development at AktieTorget and helped in the listing of many companies.

"Sweden is a unique country where smaller companies are able to obtain investment capital through the share market," says Thomas. Buying shares in a growth company means taking a big risk but it also offers the possibility of returns that would otherwise be unimaginable." AktieTorget has by and large the same regulations as the larger stock markets but is easier and cheaper for companies.

4 in-demand sectors in cleantech

Cleantech Group report that in 2016 there were four sectors that attracted over one billion dollars in risk capital investments – solar energy, transport, food and energy efficiency. In solar energy, 75 large risk capital investments were made to a total value of USD 1.3 billion (SEK 12 billion).

Some of these investments were in mature companies that may benefit from the fact that renewable energy is now cheaper on some markets than fossil fuel-driven power stations.

Absolicon's shares gave Härnösand residents 10 million

Since its inception, Absolicon has been strongly rooted in Härnösand and many of the company's early shareholders were friends and family members of the Byström family.

Staffan Nyström, former lecturer in mathematics at Mid Sweden University, is one of those Härnösand residents who invested in Absolicon shares.

"I am socially engaged and I see that it is possible to influence the society around me. If I can, I usually invest in that which offers a positive future development. I want to gain knowledge and contribute to a better society," says Staffan.

Some people have sold some of their shares, while others have held on to them. Staffan Nyström belongs to the latter category.

"I believe in the idea of solar energy and don't speculate with the intention of making money," says Staffan.



Staffan Nyström is one of many Härnösand residents to invest in Absolicon.

Of the SEK 6.2 million share capital Absolicon has accumulated, 37% percent has come from a total of 165 Härnösand residents. The shares were listed on AktieTorget on 22 June 2016 at SEK 40 and, as of the turn of the year, they were risen to SEK 97. Shares owned by Härnösand residents were then worth SEK 16 million!

Absolicon's shares were listed on AktieTorget at SEK 40 on 22 June. Absolicon then had around 1,200 shareholders and 952,500 shares.

Share name: Absolicon
Abbreviation: ABSL
ISIN code: SE0007387022

Fund broker: Market: Eminova
AktieTorget



A 15-year-old Joakim Byström is awarded second prize in FinnUpp 85 by the King.



Awards ceremony for the Sustainable Stockholm Award 2006

ROYAL INSPIRATION

Absolicon's CEO, Joakim Byström began life as an inventor at a tender age by winning a prize at inventor competition FinnUpp 85, an award that was presented by the King.

During his time as export director at Logosol, where he dedicated himself to sustainable forestry and climate issues, Joakim received an award from King Carl XVI Gustaf's 50-year Fund for science, technology and the environment.

Thirty years after FinnUpp, he once again visited Stockholm to accept his prize, this

time for the new solar collector!

"My encounters with the Royal Family have been important to me and have encouraged me to develop my ability to develop products," says Joakim.

Joakim has also been the recipient of the World Wildlife Fund's Carl Mannerfelt Prize for "combining a deep engagement with technology, environment and sustainability issues with a documented ability to disseminate his knowledge".

Absolicon sends Christmas present to Médecins Sans Frontières

In December, Härnösand companies Absolicon and Logosol took the initiative to Höga Kusten Industrigrupp, in collaboration with property developer Roger Akelius, donating SEK 500,000 to Médecins Sans Frontières.

"Médecins Sans Frontières is one of the organisations that is able to make a difference to the victims of the war in Syria," says **Joakim Byström**, instigator of the collection and CEO of solar energy company Absolicon.

Höga Kusten Industrigrupp brings together the regions leading technology and export companies on issues relating to regional cooperation, skills supply, research and development. Together, the companies within the group represent a large proportion of the region's exports and several thousand jobs.

"The companies in Höga Kusten Industrigrupp work in a global market and we saw an opportunity to come together to make a difference for



Médecins Sans Frontières vaccinates children in many countries against pneumonia.

people in vulnerable areas," says **Malte Frisk**, CEO of Logosol, chairman of Höga Kusten Industrigrupp and the man who led the collection.

What made the opportunity more interesting was the initiative to double every crown donated to humanitarian aid organisation Médecins Sans Frontières during December.

We, the companies donated around SEK 250,000 between us and, as **Roger Akelius** has agreed to match any donation, this means that half a million crowns will go to Médecins Sans Frontières," explains Malte Frisk.

Among the companies donating 25 000 each were Absolicon, Logosol, Edmo Lift, Elpress, Stringo, Haglöf

Facts



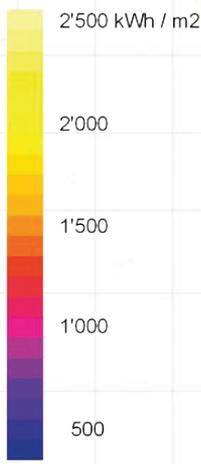
MÉDECINS SANS FRONTIÈRES

Médecins Sans Frontières is an international, independent, medical humanitarian organisation that delivers emergency aid to people affected by armed conflict, epidemics, natural disasters and exclusion from healthcare. MSF offers assistance to people based on need, irrespective of race, religion, gender or political affiliation.

and Mondi Dynäs, while many others contributed a similar amount.

Learn more about Höga Kusten Industrigrupp, its member companies and the initiative at www.hkig.se

Solar radiation map showing the annual influx of direct solar radiation at various locations around the world.



The sun shines all over the world!

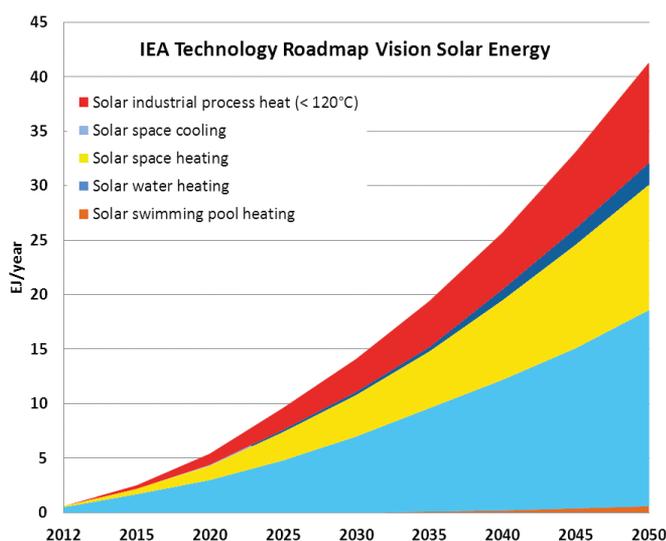
Solar energy can be used anywhere in the world, from sunny California to the South Pole. Absolicon's solar collector has been proven to work well in Sweden but it will provide three times the yield in southern Spain.

Absolicon's solar collector focuses light in the same way as a magnifying glass. Absolicon has the expertise to manufacture solar collectors that simultaneously produce electricity and heat with cooled solar cells, as well as solar collectors for solar heating and solar steam at up to 160 °C. Solar collectors work efficiently in large fields in any climate, even in Sweden. But of course, the more the sun shines, the greater the production!

IEA prognoses for growth in the solar energy sector

The International Energy Agency (IEA) recently presented its roadmap for solar heating and solar cooling. Based on this, Absolicon has estimated how many m² of solar collectors will be required and what investment this will entail.

The IEA's conclusion is that, by 2050, 15-20% of the world's heating, industrial process heat and cooling can be supplied by solar energy. The necessary investment in solar collectors is SEK 5,000 billion. For electricity, the IEA believes that parabolic solar collectors and flat solar cells will be able to provide 27% of world needs.



The diagram shows the IEA's Technology Roadmap Vision for how solar heating and solar cooling may develop up to 2050.

BEAMING ENERGY



SOLAR STEAM

Industry currently uses enormous amounts of fossil fuels. Industries often use a oil-burning or natural gas powered steam boiler for supplying steam around the factory to provide heat for various processes.

Potential: Using concentrated solar collectors, it is possible to produce solar steam that is fed directly form the steam boiler. According to IEA prognoses, 3 billion m² of solar collectors could be installed in industry by 2050.

Our installations: Pilot installation at Energiparken in Härnösand.



SOLAR COOLING

Solar heat can run a solar chiller to generate cost-free air conditioning for a building.

Potential: Through the use of heat from solar collectors, it is possible to generate cooling. According to IEA prognoses, 1 billion m² of solar collectors for air conditioning could be installed by 2050.

Our installations: Absolicon have carried out an installation with solar cooling for the local hospital in Härnösand. During 2015, a similar installation was supplied to a regional hospital in northern Spain.



SOLAR HEATING

Industry uses enormous amounts of fossil fuels. Industries often use an oil-burning or natural gas powered steam boiler for supplying steam around the factory to provide heat for various processes.

Potential: Using concentrated solar collectors, it is possible to produce solar steam that is fed directly form the steam boiler. According to IEA prognoses, 3 billion m² of solar collectors could be installed in industry by 2050.

Our installations: District heating plant in Härnösand Energy Park.



SOLAR ELECTRICITY

By using solar cells, it is possible to generate your own electricity on your roof. Electricity can also be generated by using the heat in solar collectors to drive a turbine. Unused electricity can be fed into the power grid

Potential: Germany has installed more solar cells than anywhere else in the world, with 5.8% of production during 2014 coming from solar electricity.

Our installations: Absolicon has several installations producing electricity and heat using solar cells, including with turbines.