

# Sweden Today

26th Year No 2 2007





# SAS environmental work in constant development

Environmental issues and sustainable development play a central role in SAS strategy. We take our environmental responsibility seriously and our ambition is to be among the very best environmental performers in the industry. SAS has advocated the inclusion of the air-travel industry in the EU Emissions Trading Scheme from 2011. Until this time, our customers can purchase carbon dioxide offsets for journeys they take with us. One of the many projects we are working with is “Green Approaches” to Arlanda Airport, a technique used for approaches that saves fuel and reduces emissions and noise. Read more about our environmental activities in the SAS Group’s Annual Report and Sustainability Report, available at [www.sasgroup.net](http://www.sasgroup.net), where you will also find the SAS Emission calculator.



SAS Environmental Program

A STAR ALLIANCE MEMBER 

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# Hot topic

The word "baltic" is British slang for cold, as in "put your hat on, it's bloody baltic out there". And indeed the body of water which gives the word its meaning and which laps at Sweden's east and south coasts is rather chilly for about ten months of the year. But this year, thanks to an early heat wave, bathers were taking their first dip at the beginning of June – a full month earlier than normal.

Yes, for those of us in northern Europe, this whole climate change thing seems pretty OK – for the moment at least. However it is not with a completely clear conscience that my adopted countrymen and women plunge into the inviting – although increasingly algae-infested – Baltic as summer gets into full swing. The Swedes have long formed one of the more environmentally-aware nations, and they are fully conscious of the effect their high standard of living has on the planet. And most are willing to do something about it. They have long seen themselves as the world's environmental conscience, firing accusing looks at other nations in much the same way as those cows on our front cover are doing.

Now, with the climate issue the undisputed No 1 global topic, this headstart is proving to be good business for Sweden. From Dublin to Danzao town, Swedish companies find themselves in huge demand for their technology and expertise. The bioenergy industry has more export business than it can handle; sales records are tumbling monthly; and at a cellulose ethanol pilot plant in northern Sweden they are getting concerned that all the visits by fascinated foreign delegations are distracting them from their work. Even the United States' ambassador in Stockholm is acting as cheerleader for them back home, with the full support of his good friend George Bush.

In this year's environment/cleantech special we are proud to present some of these companies and their technologies, from biogas to wave power to waste disposal. We visit some of the nation's leading seats of learning to report on the research which will lead to the next generation of renewable fuels, and on how the application of years of expertise is helping companies take a long-term view of their sustainability.

We also shine our spotlight on southern Sweden, one of the country's fastest growing regions which will be the destination for several hundred American businessmen and women later this summer keen to tap into the possibilities here. The two nations have a long trading history and friendly relations, even though Prime Minister Fredrik Reinfeldt's recent audience with Mr Bush at the White House hardly appeared to be a meeting of equals, regardless of mutual platitudes about the other being a "strong leader".

But with a very topical issue number two off to press, it is time to join the crowds heading for a summer by the surprisingly welcoming waters of the Baltic. We wish you a warm – although hopefully not too warm – and pleasant summer.

## David Wiles

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Moo era: climate concern reaches tipping point



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# How green is my valley

BY ALAN HARKESS

• Looking out of the open window of my flat here in central Malmö on yet another warm evening, a sense of global crisis seems far removed from the sounds of well-being and social harmony emanating from the courtyard barbecue below.

According to the meteorologists, the average annual temperature during eight of the past ten years in southern Sweden has been substantially above the long-term average. Indeed the past twelve months have been the warmest on record in southern Sweden. The average increase in temperatures of around three degrees Celsius over the past year has dramatically increased the consumption of barbecue oil in this part of town. From the perspective of the northern latitudes of the northern hemisphere, a rise in temperature of three degrees Celsius may not be an altogether unattractive proposition, particularly for the aficionados of the outdoor barbecue. However to paraphrase Al Gore, this process is accompanied by certain "inconvenient truths". Firstly there is strong evidence to assume that these changes are not a "one-off" occurrence. The United Nations IPCC (Intergovernmental Panel on Climate Change) has assembled a growing body of evidence which strongly suggests that human activity is changing the climate, especially through emissions of greenhouse gases. Its estimates of global warming during the rest of the century predict increases in average temperatures ranging from two to six degrees. Changes at the upper end of the spectrum would lead to massive dislocations in the distribution of production, consumption and living patterns worldwide. Secondly, the evidence of global warming also suggests that these changes in temperature are not linear i.e. due to feedback mechanisms in the warming process, especially the interaction of changes in sea and air temperatures, the distribution of temperature rises will be unevenly spread across the planet. Targeting a "cosy" two-degree rise in temperatures in northern latitudes may be a risky bet. Thirdly, as the Stern Review of the Economics of Climate Change argued, the overall costs and risks of climate change will be equivalent to losing at least five per cent of global GDP each year now and forever. These are "risks of major disruption to economic and

social activity, on a scale similar to those associated with the great wars and the economic depression of the first half of the 20th century." Secondly, the Stern Review argues that "the benefits of strong early action outweigh the costs". Its headline conclusion is that early action to stabilise emissions at 550ppm CO<sub>2</sub>eq by 2050 would cost one per cent of GDP in terms of lost output and investment in abatement whereas the costs of climate change could be of the magnitude of five to 20 per cent!

## Has business got the message?

In its recent review of the business sector and climate change, the Economist pointed out that the business sector was initially highly defensive – if not hostile – to the idea of global warming. Substantial sections of the scientific establishment in Sweden, for example, cast doubt on the scientific evidence presented by the IPCC and were opposed to the idea of government programmes to reduce greenhouse gas emissions by taxation. Nowadays there are few signs of the argument that climate change is not happening or that measures to reduce carbon emissions would not be worthwhile. The evidence produced by the IPCC and the meteorological data illustrated above have helped to change minds. Has business got the message?

According to Kjell Mårtensson, Senior Lecturer in Environmental Economics at Malmö University, companies are now operating in a much tougher environment in political, economic and financial terms. At the micro level, companies have introduced systems of environmental management that seek to improve resource allocation from an environmental perspective. Monitoring systems and environmental certification are used as instruments to raise environmental standards. These methods are naturally partly demand-driven. Customers/shareholders/municipalities increasingly require that products and production processes take account of environmental impact. Financial institutions are increasingly aware that environmental aspects may affect the risk assessments of their investments.

At the macro level, the business sector is increasingly subject to the need to adapt to the government's long-term environmental policy goals. In terms of its commitments under the Kyoto protocol, Swedish emissions of greenhouse gases over the past six years have been on average

3.7 per cent below 1990 levels. Over the same period, GDP has grown by around 25 per cent.

The previous government introduced a policy whereby higher levels of energy and other forms of environmental taxation would be "exchanged" for lower levels of taxation on labour. It was argued that economic welfare would benefit from a reduction of negative external effects on the environment at the same time as one reduced the disincentive effects of high rates of marginal tax on labour. According to Mats-Olof Hansson, Senior Economist at the Swedish Ministry of Finance, increased taxation in the energy and environment area over the period of this policy amounted to €2.2bn whereas taxation on labour was reduced by €1.8bn. As Hansson points out, this linkage between labour and environmental taxation no longer exists under the new alliance government. However it is worthy of note that the government continues to expand expenditure in the environmental field (e.g. its new

by supporting the introduction of a Carbon Commission that would have an analogous role to that of the Board of Governors of the Bank of Sweden which has the authority to implement the government's policy on inflation with reference to changes in interest rates. The board of the Carbon Commission would, according to Mårtensson, adjust environmental taxation to take account of changes in the level of greenhouse gas emissions in relation to the government's overall policy goals.

## Pricing carbon

Although the market does undoubtedly "sanction" incorrect decisions through its inability to take sufficient account of externalities (road/rail and congestions costs) and distortions to competition (electricity pricing), the nexus of moral and economic pressures pushing governments, business and consumers to making more "correct decisions" should nevertheless not be underestimated. Under the auspices of the Kyoto protocol, the EU has already put a price on carbon through its Emissions Trading System. Under pressure from state legislators, several states in the USA are contemplating similar measures. These economic pressures are backed up by the moral pressure to be seen to be doing the "right thing".

How does one put a price on carbon? There are two approaches to the choice of policy instrument: a system of environmental taxation which operates principally through quantity adjustments to price changes; and the so-called cap and trade or emission trading system (the EU-ETS) which creates a commodity market for carbon, or rather, as the Economist puts it, for "not-carbon" i.e. certificates that indicate the amount of tonnes of carbon dioxide of greenhouse gas equivalent that have not been emitted by the seller but may be emitted by the buyer. Economic theory argues that this may combine "the best of both worlds" setting an administrative cap or bubble over an area and allowing the actors to reach efficient decisions by comparing the marginal cost of emission reduction with the price of emission certificates. Companies required to enter the market to purchase certificates would have an incentive to buy from the most efficient least-cost source of emission reduction. A key corollary benefit from this first international emissions trading scheme is that it generates automatic transfers between countries while delivering these least-cost solutions. This may be a more efficient method of establishing a uniform price of carbon than harmonising environmental taxes. Phase One of the scheme was launched in 2005 and will run to the end of 2007, while Phase Two will run from 2008 to 2012.

Revenue from energy and environmental taxation 2007	€ bn
Energy taxation	
Electricity	2.0
Petrol	1.6
Other fossil fuels	0.6
Carbon dioxide taxation	
Petrol	1.2
Other fossil fuels	1.5
Other forms of energy related taxation	0.35
Motor vehicle taxation, congestion charges	1.6
Total	8.76

subsidy of around €1,100 for the purchase of an eco-friendly car) at the same time as it has substantially lowered taxation on labour.

The argument that the business sector has become increasingly aware of the environmental consequences of its decision-making is met with some scepticism by Mårtensson. In a recent article in the daily Svenska Dagbladet, he warned of an over reliance on the marketplace. The choices that are made in the business sector between, for example, different forms of energy and transport, are biased by the failure of the price mechanism to accurately reflect the environmental costs and benefits of different alternative decisions. This has not only consequences for the efficiency of resource allocation for the present generation. It also has far reaching distributional considerations for both present and future generations. Governments have an overriding responsibility through their support and information systems to take account of these efficiency and distributional considerations. Mårtensson concludes his article

Variations in global near-surface land temperature  
Temperature variations in degrees C



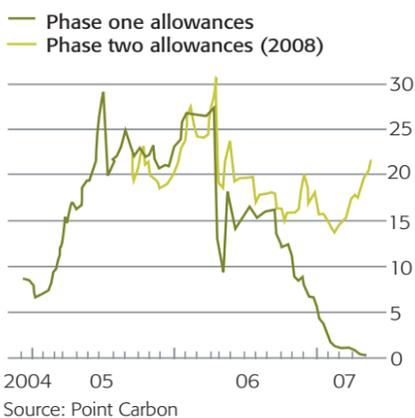
Source: Hadley Centre

### Volatile prices

Both systems have their strengths and weaknesses. According to Hansson at the Ministry of Finance, there may be advantages in a tax system that allows its actors to predict with some degree of certainty the price for carbon. On the other hand, energy taxes are regressive and in certain countries will almost certainly be politically impossible. In the majority of poor countries, energy prices are extremely high. A number of criticisms have been levelled at the first phase of the ETS. For instance, Stefan Persson at EON energy trading argues that the extreme volatility of the price of emission allowances during this first phase has undermined its credibility. This price volatility would appear to be the

### Carbon crash

EU ETS price, €



result of an over-generous cap in Phase One creating an over-supply of certificates. This turbulence has been particularly evident in the deregulated Nordic electricity market and it is here that a lot of the criticism towards the ETS has been directed. In the Nordic area, electricity is generated principally by means of nuclear and hydropower. These sources are relatively efficient and have no carbon emissions. However, according to Persson, the price of electricity on the Nordic market is set with reference to the higher marginal costs of the coal and oil-fired plants in Denmark and Germany. These plants are net purchasers of emission certificates which raises electricity prices even further. The free issue of certificates also tends to encourage investment in plants that use fossil fuel. This would appear to be a worst case scenario where the low-cost nuclear and hydro producers take home excess profits without any incentive to innovation. Inefficient fossil-fuel generating plants continue in existence and the bill is paid by the consumer who receives no environmental benefits. This is indeed a painful learning experience for Nordic electricity consumers.

### Global example

The Stern Report highlighted a number of important issues in relation to the emission trading scheme. Firstly under the Kyoto protocol, Clean Development Mechanism (CDM) enabled EU-based industry to purchase carbon reductions from the cheapest source, including projects and programmes being implemented in the developed world. These CDM credits are especially attractive since they can be used during both phases of the scheme. Between 2005 and 2006, the CDM market volume expanded threefold, especially in China. Secondly, there is an obvious difficulty in securing scarcity in the market since the overall cap is not set centrally but is rather the sum of decisions in 25 member countries. As the report concludes, "this underlines the need for stringent criteria on allocation levels for member states and robust decisions by the European Commission". Thirdly, some commentators have queried the organisational aspects of trading emission allowances. An organisation such as EON energy trading is specialised in trading decisions which may lead to some overall fragmentation in the decision-making structure of the organisation in relation to investment decisions.

Carbon pricing is only one part of a strategy to tackle climate change. However, in spite of the initial problems of the scheme and notwithstanding the difficulties in extending it internationally, there is nevertheless a tangible demonstration effect as similar schemes are underway in a wide range of countries including the USA and South Korea.

## Thank you for the venue

After six months of searching, a venue has been found for the much-anticipated ABBA museum.

The "interactive event building" dedicated to one of the world's most successful pop groups will be a 100-year-old warehouse on the south quay of central Stockholm.

"It's really great that the location for the ABBA museum has now been finalized," said the Mayor of Stockholm, Kristina Axén Olin. "The museum will be a new and important attraction that strengthens Stockholm's international reputation as a tourist town. The location of the custom house, right across from the Gröna Lund amusement park, is an excellent spot for a museum."

Group members Björn, Benny, Agnetha and Anni-Frid gave their backing to the idea last November, and the couple behind the idea have been trying to find an appropriate venue since.

ABBA the Museum will occupy more than 4,000sq metres on three floors of the lower part of the building. Fans will be able to experience the story of Sweden's most successful musical export through the very latest sound, image and multimedia technology. There will also be a replica of the Polar Studios where the band recorded their hits. Renovation of the building – which is owned by Stockholm City Council – is due to start later this year, and the museum will open its doors to the public in the spring of 2009.

Only The Beatles and Elvis Presley have sold more records than ABBA.



SOS answered

## Shake-up at Sony Ericsson

A phone which lets you shuffle through your music by shaking it is among Sony Ericsson's new offerings, recently unveiled in Berlin.

The W960 Walkman phone is aimed at the top end of the market where it will compete with products such as Apple's much-hyped iPhone. It has built-in WiFi wireless access, a touch screen, and enough memory to store up to 8,000 tunes. Both it and the new W580 feature Shake Control, which allows you to skip your music forward by shaking it one way, back by shaking it another, and shuffling your playlist by shaking it back and forth.

"Although the range of phones and accessories is at the heart of Sony Ericsson's music offering, it's the user experience which really makes the Walkman phone unique," said Ben Padley, Music Group marketing director at Sony Ericsson.

The phones were among six new mobiles and three Bluetooth watches – which allow the use to control their phone with their watch – presented by the Swedish-Japanese manufacturer at the launch.

The state-of-the-art K850 Cyber-shot phone, with its 5 megapixel camera, is bristling with new gadgets like a new media browser which allows you to view photos, music or podcasts in one place and search photos by the month they were taken. It also has BestPic, a new image technology that takes nine pictures in quick succession allowing you to choose the best one, auto focus and a Xenon flash.



Snappy mobile

## Furniture sector sitting pretty

The Swedish furniture sector has reported its best first quarter ever, with both domestic and international sales on the rise. Exports during the first three months of the year were up ten per cent to a value of €103m.

"The Swedish furniture industry has made up for the ground it lost during the 1990s and doubled both production and exports over the last ten years," said Katarina Lagerbielke from Trä- och Möbelindustriförbundet, the industry's trade organisation. "Strong, healthy companies are continuing to take market share outside of Sweden thanks to their strategic and systematic efforts."

Exports have increased across the board, although it is office furniture which has been the most successful segment. The Nordic countries remain the largest export markets for Swedish manufacturers, together with the UK, France and Germany.

Sweden's furniture makers, who number around 650 companies, produced goods worth €2.3bn last year, of which €1.5bn was exported. The industry is concentrated in the regions of Småland and Västra Götaland, and many companies are owner-run family concerns.

"Within the Swedish furniture industry there is tradition and knowledge of producing furniture with both form and function, and we are entering a time where simplicity, timelessness and sustainability are increasingly in demand," said Lagerbielke.

"The industry has modern industrialists who are also skilled businesspeople and brand builders. We can effectively produce high-quality products and we understand how to take them out and sell them."



Peek by Blå Station

## Swedish brand worth €347bn

The Swedish "brand" is the eighth strongest in the world, and worth €347bn, according to the latest nation branding index.

The ranking, carried out by Anholt Nation Brands, puts Sweden above the US, Japan and the other Nordic nations.

"Our strength is that people think Swedes are nice, and that many people want to live here," said Olle Wästberg, general director of the Swedish Institute. "Our weak point is culture; we need to find new icons like Ingmar Bergman and ABBA."

Sweden ranked highly in the areas of trustworthiness, human rights, environmental issues and tackling poverty. According to Simon Anholt, who started the index, Sweden could climb in the rankings if it highlighted its monarchy more.

Each quarter around 26,000 people in 35 countries are asked for their opinion about various nations and their people, politics, culture and so on. The first time Sweden was involved in the index, in 2005, it had the strongest brand of the 11 participating countries.

"It is great that such a small country comes so high up," said Thomas Brühl, MD of Visit Sweden, which markets Sweden abroad. "The fact that we have slipped a little is because more countries are involved now, like the UK and Canada."

The value of Sweden's brand has risen 16.5 per cent in the last year. The UK topped the poll, followed by Germany, Canada, France, Switzerland, Australia and Italy, followed by Sweden.

Hot cross

## Nasdaq takes over Swedish stock exchange

• OMX, the Swedish stock exchange, has agreed to a €2.8bn takeover by US Nasdaq. In what is the latest consolidation in the sector, the combined company will process an average daily volume of 7.4 million trades, worth around €46bn.

The OMX board said the merger would create "the largest global network of exchanges and exchange customers linked by technology", although in terms of the total value of trading the combined company handles it will not reach the €9.5bn of NYSE Euronext.

Under the terms of the deal, Nasdaq shareholders will own 72 per cent of the combined business with OMX investors – including Investor AB, and Nordea Bank – owning the remainder.

Magnus Böcker, Chief Executive Officer of OMX, said: "This combination creates a new leader in the exchange industry. By utilizing the combined entities' joint expertise and competencies we will create an outstanding platform for future growth. Issuers, members, information vendors and investors on both Nasdaq and OMX Nordic Exchange will all benefit from its new global context. The combination also provides benefits for OMX's global technology customer base, as it enables an increased focus on research and product development in the most important and fastest growing areas of the exchange technology market."

### Technology leadership

Robert Greifeld, Chief Executive Officer of Nasdaq, said that the future of exchanges was about technology, flexibility and scale. "Nasdaq and OMX together deliver all of these benefits. Our technology leadership and track record in linking trading platforms means we will offer issuers and investors unique benefits which were not available in one company until now. This combination provides our organizations with the ability to grow and accelerate the global flow of equity capital. At the same time, it provides us with an excellent platform for further expansion into derivatives and other asset classes. Our organizations bring together very complementary businesses, and we see many new opportunities for growth in an era of unprecedented change and development for exchanges."

Urban Bäckström, chairman of OMX, said: "For OMX, as a company that has always been known for its innovative and groundbreaking approach within the exchange industry, this is the natural next step. This will also strengthen the Nordic region as a financial centre."

OMX, which operates exchanges in Stockholm, Helsinki, Copenhagen, Reykjavik and the Baltic states, made an audacious bid for the London Stock Exchange seven years ago, while Nasdaq had made no secret of its ambition to expand with further acquisitions after failing in its own bid for LSE.

The combined company will have 2,349 employees in 22 countries with pro forma revenues for the financial year

2006 of more than \$1.2 billion (SEK8.3 billion).

Greifeld will serve as CEO and Magnus Böcker as president. The board of directors of the combined company will consist of 15 members, including nine representatives from Nasdaq, five representatives from OMX and Greifeld.

Magnus Böcker:  
platform for growth



## Trade winds blow Götheborg home

• After 20 months at sea and 77,777 kilometres, the Götheborg, the replica of an ill-fated 18th century trading ship, made a triumphant return to her home port of the same name.

The homecoming, watched by an estimated 200,000 people under clear blue skies, went more smoothly than that of her namesake 262 year ago, when the original vessel sank in mysterious circumstances as she neared home.

This recreation of the voyages of the great trading ships of the 18th century was a triumph not only of marine engineering and seamanship, but also of Swedish trade, and not least with China. On the Götheborg's many stops on its round-the-world adventure, the corporations sponsoring it have used the accompanying publicity and unique meeting locale onboard to raise their profiles, build new contacts and sign new deals.

"This is a unique project which has been driven by real enthusiasts and been a fantastic success," said Fredrik Arp, CEO and president of Volvo Cars. "For Volvo Cars the Swedish East Indiaman has been an important part of

up to welcome us."

The original ship sailed from Sweden to China to import tea, spices and porcelain in exchange for silver. The three-masted wooden trader was returning from a two year-long voyage to China in 1745 when her homecoming ended in disaster. In full view of the crowds who had massed to see her, she ran aground in the entrance to Göteborg harbour and sank. The crew survived, although quite why she went down was never discovered.

With time she was forgotten about until found by a diver 240 years later. The idea was then hatched to recreate the ship – using the original techniques and in full scale – and retrace her steps.

### Coverage worth billions

The epic voyage of the replica – which is identical to the original to the casual observer but packed with modern machinery – took it from Göteborg to Cadiz, across the Atlantic to Recife in Brazil, down to Cape Town and Port Elizabeth in South Africa, on to Fremantle on the west coast of Australia and then up to Shanghai via Jakarta and Canton. The return trip took in stops at Hong Kong, Singapore,

Chennai, Djibouti, through the Suez Canal to Alexandria and then Nice, with the final stop in London before her grand homecoming.

All those behind the project were in agreement that it had been a more than worthwhile investment. "The East Indiaman has been an enormous success," said Göran Johansson, chairman of Göteborg City Council. "The attention which the ship has received above all in Asia is worth several billion kronor in marketing terms."

Chinese President Hu Jintao with Swedish King Carl Gustav and Queen Silvia on deck



The crew works under a tropical sun

our relations connected to our start of production in China."

Among the welcoming party waiting for the Götheborg – which is one of the largest full-rigged wooden sailing ships in the world – as she entered Frihamnen were Chinese President Hu Jintao, Swedish foreign Minister Carl Bildt, the Swedish King and Queen and Prince Carl Philip. She and her crew received a 21-gun salute as they were guided to the quay by two tugboats. "I feel humbled," said Peter Kaaling, who captained Götheborg into port. "It's fantastic that so many people have turned



Singapore was one of 16 stops



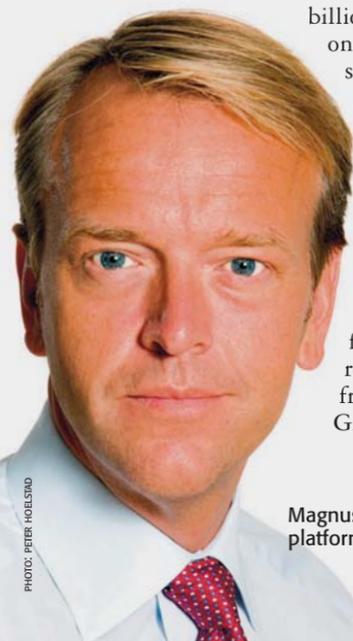
Götheborg passes under London's Tower Bridge

Volvo Group managing director Leif Johansson said: "For Volvo it was important to create relations with China, which is a very important and interesting market for the Volvo Group. Our choice to be an official partner coincided well with the development of Volvo's business in China. From a purely business perspective, we are very happy with the result. We reached the goals we had set for our investments, and anything above and beyond that is a bonus for us."

Magnus Kårestedt, MD of the Port of Göteborg, said: "The Swedish East Indiaman is a door-opener. We have been able to show off what we can do, have had many useful discussions, and put Sweden on the map, so for us this has been the perfect sponsorship project."

The presence of the Chinese President – who was accompanied by Foreign Minister, Environment Minister, and Trade and Industry Minister – in Sweden to greet the ship turned into something of a Swedish-Chinese businessfest. Hu and his entourage had a private meeting with Sweden's foremost financial dynasty, the Wallenbergs, plus Ericsson boss Carl-Henric Svanberg and Electrolux MD Hans Stråberg. During the visit, Ericsson signed a deal with China Mobile worth a cool €45m, daughter company Sony Ericsson signed a deal with China's biggest mobile retailer China Postel worth €47m, and Scania and Jiangsu Alfa Bus signed an agreement on the manufacture and marketing of buses.

The ship will be open to the public on weekends during June, August and September. During July, it will tour the Swedish west coast and be open to visitors.



# No end in sight for Swedish boom

• It's full speed ahead for the Swedish economy – still. The economy continues its steady upwards trajectory, and there are no clouds on the horizon, according to the OECD. Even one of the traditional weak spots, unemployment, is looking positive, with new figures showing big increases in employment during the spring leading to the lowest levels of joblessness for 16 years.

In fact, things are so good with the economy right now that the word "bubble" is never far from many people's minds. Surely, those who have been through it all before are thinking, it has to stop somewhere? But the OECD's latest economic outlook for Sweden thinks not. Or at least not yet.

"The Swedish economy continues to grow rapidly without showing signs of weakening," says the report, released at the end of May. The report forecasts growth for this year of 4.3 per cent, which is only slightly lower than in 2006.

"Private consumption will be particularly strong, reflecting the significant improvement in the labour market," the report continues. "As the output gap is clearly positive, underlying inflation will continue to increase from previously very low levels."

The labour market reforms implemented earlier this year by Fredrik Reinfeldt's centre-right government will increase potential employment, according to the report, which goes on to say that given the strength of the economy, it is an excellent time to pursue further labour supply reforms as that will prolong the current expansion. "It is also important that fiscal policy does not add further stimulus, and the Central Bank will need to raise policy rates further."

The Swedish economy has been in a state of high growth and low inflation for a number of years, but unemployment has always been a sticking point, and indeed was a key factor in the Social Democrat-led government losing the last election to the centre-right alliance. That problem now seems to be solved, with figures for the end of May showing that 154,000 people, or 3.3 per cent of the workforce, were unemployed – the lowest level since 1991. That is a drop of 33,000 people compared with the same period last year. At the same time 81,000 job vacancies were

advertised at job centres in Sweden amounted to 81,000 in May, nearly 25,000 more than for May last year.

## Spend spend spend

More people at work means more money in pockets, and indeed private consumption is rising. The OECD forecasts 3.6 per cent increase in private consumption this year, and 3.7 per cent next year, helped along by rising wages and lower taxes.

Another OECD report released at the end of May recommended that Sweden instil more competition in the public sector, cut red tape and liberalise labour markets if it is to meet the challenge of an ageing population and maintain its high standards of social welfare.

Meanwhile, a survey of surveys from the Invest in Sweden Agency (ISA) concluded that Sweden is the world's second most attractive economy for foreign investment. The ISA report, Business and Investment Opportunities, includes a "composed competitiveness" index that compiles the findings of nine authoritative reports on international competitiveness.

As well as measuring "hard" economic data, the 48-nation index includes "soft" factors such as quality of life, which are becoming more sought-after by international investors.

The United States tops the standings, followed by Sweden in joint second place with Finland.

The ISA report notes that Sweden was the world's 15th largest recipient of foreign direct investment in nominal terms in 2001-2005 and one of the largest recipients on a per capita basis.

The country accounted for almost half of all inward investment to the Baltic Sea region in 2001-2005, with an inflow of €40.7bn – more than double the figure for Finland.

ISA director-general Kai Hammerich said: "Sweden is clearly in a strong position. Foreign investors are attracted by Sweden's high competencies across many sectors and that we are an interesting market for the entire Baltic Sea and Northern Europe region."

Among the source surveys for the study were: World Economic Forum, 2006; Institute for Management Development (IMD), 2006; UNCTAD, 2006; World Bank, 2007; Trend-Chart, 2007; Transparency International, 2006; and Economist Intelligence Unit (EIU), 2005.



Movers and shakers: Fredrik Reinfeldt and George Bush talked climateSilvia on deck

## Green talk at the White House

• Environmental issues topped the agenda when Swedish Prime Minister Fredrik Reinfeldt met US President George Bush at the White House.

The Swedish leader walked away from the May meeting without any firm commitments from Bush on climate change measures, but was personally assured that the President shared his concerns on the issue.

"The Prime Minister made this a centre point of our conversation, and I fully appreciate and understand why," said Bush after their one-hour meeting. "I appreciate the leadership you've taken on this important issue, not only in your country, but at the EU as well. It's noticeable to me here in the United States, and I congratulate you for being the strong leader that you are."

Reinfeldt, who presented his host with a Swedish-made brushcutter as the traditional gift, returned the "strong leader" compliment to Bush, but several times during his US visit expressed his hope that the next US President will have a different climate strategy.

"You are struck by his enormous presence and wide knowledge," said Reinfeldt of Bush. "He is also a very jovial person, who jokes and is relaxed. You feel the force of his leadership."

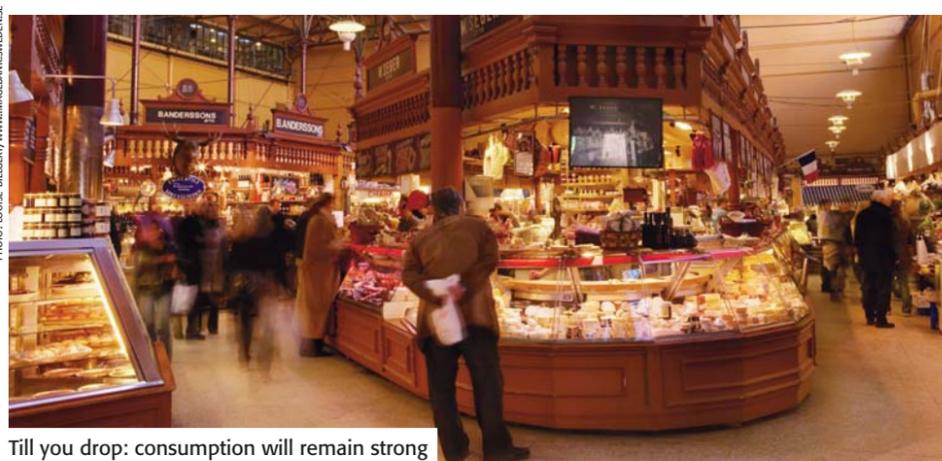
## Building a green economy

Reinfeldt's meeting the following day was with a politician with whom his environmental ambitions match a little more closely – California Governor Arnold Schwarzenegger. The Governor stands on the left wing of the Republican Party, and Reinfeldt has moved his Moderate Party in the same direction.

Schwarzenegger said that California – the US state with then strictest environmental laws – shared Sweden's enthusiasm for "building up the economy while protecting the environment". "I'm sure we can learn from each other," he said.

Reinfeldt wants Sweden to play the same role globally as California plays in the US – that of pacemaker on environmental issues. "We cannot meet a global issue by believing we can solve it in Sweden," said Reinfeldt. "But being in front is important. Sweden wants to do that, California wants to do that, and the more people follow, the better."

Other stop-offs on Reinfeldt's first official visit to the US included the UN in New York to meet Secretary General Ban Ki-Moon, Speaker of the House Nancy Pelosi in Washington DC, and the National Renewable Energy Laboratory in Denver.



Till you drop: consumption will remain strong

## Big NYC deal for Skanska

Swedish construction giant Skanska has landed its largest ever order in the US, worth €750m.

The contract is for the Croton Water Filtration Plant in New York, which supplies the City of New York with drinking water. The plant, with a capacity to treat 1.2 million cubic meters of water per day, is located at the Moshulu golf course in the Bronx.

Skanska's assignment includes both the construction and installation work. Most of the plant is constructed in concrete covering a footprint area of 35,000 square metres. The plant is being built on four levels underground. Skanska is responsible of the concrete work, but not excavation. Some 200,000 cubic meters of concrete and 27,000 tons of rein-

forcing steel are expected to be used. Skanska's project includes installation of machinery and piping as well as control equipment.

The project is being carried out in a joint venture with Tully Construction, which has the remaining 20 percent of the contract amount.

The project starts later this summer. Construction work is scheduled to be completed in 50 months and the start-up phase is expected to take an additional six months. Skanska is currently building and up-grading six water treatment plants in New York.

It will be Skanska's largest project ever in the US. The second largest is the New Meadowlands Stadium being built for the New York Jets and New York Giants, valued at €1m less.

## Still sexy at 60

• Saab enthusiasts from around the world descended on the town of Trollhättan to mark the 60th anniversary of one of Sweden's most iconic brands.

It was in June 1947 that the aircraft manufacturer – the name stands for Svenska Aeroplan Aktiebolaget – unveiled its first car in the staff canteen. More than four million cars later, and today Saab has sales in more than 60 countries.

The company, which is now owned by US General Motors, has been a pioneer in a number of areas including safety, ergonomics and turbocharging, and its ethanol-powered 9-5 BioPower is among Europe's best selling "green" cars. The design of the original Saab car, called the 92, owed much to its aerospace heritage, and indeed was one of the first cars to be tested in a wind tunnel at the development stage. Only two of the 16-strong project team, who were aircraft engineers, had a driving licence.

The marque has developed something of a cult following. "You either love them or you hate them," one Swedish auto executive has said. Saab has a reputation for quirkiness, with unique touches like its "Night Panel" dashboard display and the ignition situated between the seats.

In a number of the James Bond books, the British spy drove a Saab 900 Turbo, and green-minded billionaire businessman Richard Branson recently took delivery of a 9-5 BioPower.

A question mark hung over the future of the brand after a number of years of falling sales, but Saab managed to set a global sales record last year with 133,167 cars, an increase of 5.4 per cent over 2005. Sales in Europe were up by 11 per cent.

Shortly before the anniversary celebrations, Saab unveiled its 2008 9-3 range, which draws on inspiration from its award-winning Aero X concept car.



Topless beauty: Saab's 2008 9-3 convertible



Sweden's R&amp;D spending is twice the EU average

PHOTO: HANS BAURING/WWW.FACEBOOK.COM/SWEDEN.SE

R&D expenditure in relation to GDP per sector, per cent 2005	Business enterprise sector	Higher education sector	Government sector	Total
Israel	3,58	0,72	0,24	4,71
Sweden	2,88	0,81	0,18	3,88
Finland	2,46	0,66	0,33	3,48
Japan	2,39	0,43	0,30	3,18
Korea	2,30	0,30	0,36	2,99
Iceland	1,48	0,36	0,71	2,86
USA	1,88	0,36	0,33	2,68
EU15	1,19	0,42	0,24	1,87
Norway	0,82	0,45	0,24	1,51

Source: SCB/Statistics Sweden

for 0.81 percent and the government sector for 0.18 percent. Statistics Sweden found that R&D activities are strongly concentrated to the counties where the biggest companies are located and to regions with universities and university colleges. Stockholm and the counties of Västra Götaland – where Göteborg is located – and Skåne – where Malmö is located – together account for 77 percent of total R&D spending in the business enterprise sector, and 74 percent of the total person-years performed in the business enterprise sector. It is these three areas where most large companies and universities are located. When regional expenditure in R&D is measured as a share of regional GDP, the report showed that the big city regions in Sweden are among the top in the EU.

The number of citations in scientific articles is often used as a measurement of the impact of research and its importance. Looking at citations of Swedish research, it can be seen that Swedish research is cited approximately 13 percent above the world average. Patents are also used an indicator for research. Internationally, Sweden has a high number of patents measured per million inhabitants.

In the R&D table, after Israel and Sweden come Finland (3.48 per cent), Japan (3.18 per cent), South Korea (2.99 per cent), Iceland (2.86

per cent) and the US (2.68 per cent). The EU average was 1.87 per cent.

#### Competitiveness up

Meanwhile, a separate report published in May found that Sweden has advanced five places to ninth spot in the latest global competitiveness rankings. The report, the World Competitiveness Scoreboard 2007, published by Swiss management institute IMD, identified Sweden as one of four countries to have improved their competitiveness which will soon be able to challenge the US as the world's most competitive economy.

"The US is still number one but other nations are catching up quickly – Switzerland, the Netherlands, Sweden, China and Germany are on the way up," says Professor Stéphane Garelli, director of Director the IMD's World Competitiveness Centre.

Kai Hammerich, director-general of Invest in Sweden Agency, says Sweden's improved ranking confirmed the attractiveness of its business climate to foreign investors.

"It is pleasing that Sweden has advanced in a number of surveys, including this one by IMD. Foreign investors are attracted to countries with a good climate for companies and individuals alike."

## Sweden tops Europe's R&D league

• New figures show that Sweden spends more of its national income on research and development than any other country in Europe, and globally is only topped by one other nation.

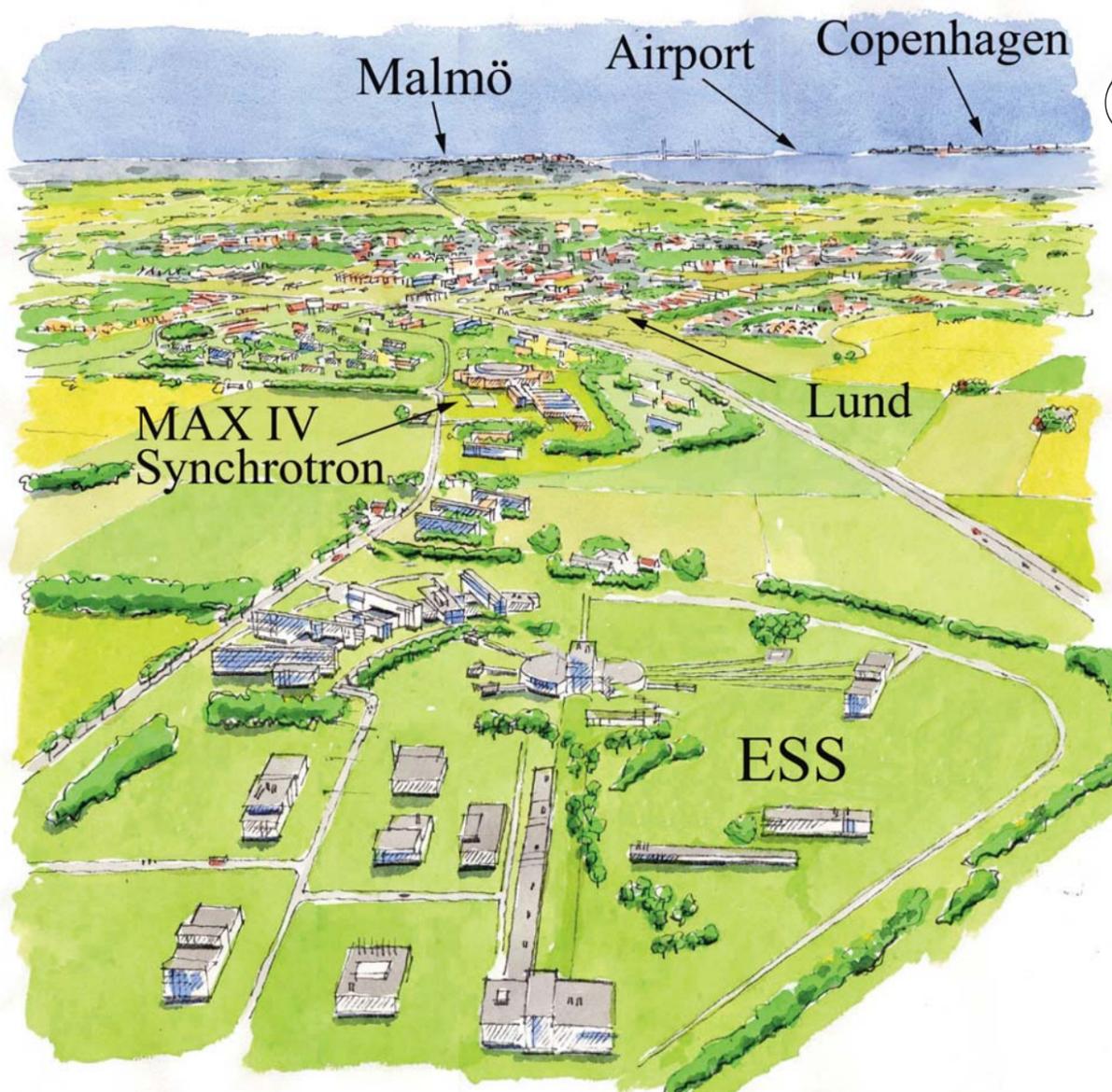
The figures, from Statistics Sweden (SCB), show that the country's total R&D expenditure across all sectors in 2005 was €1.5bn, up from €1.0.8bn in 2003. Sweden's total R&D spending amounted to 3.88 percent of national output, which is twice the average of the EU-15 member states.

Globally, Sweden's R&D investments are surpassed only by Israel, which channels 4.71

percent of its gross domestic product to this area. "Those are impressive figures, but a large proportion of their R&D is defence research," says SCB statistician Thomas Molin.

Statistics Sweden, the government statistics agency, said its figures were more comprehensive than the OECD's annual R&D league table, which does not include the private non-profit sector.

The data show that Sweden's R&D boom is spearheaded by the private sector, which contributes 2.88 percent of the 3.88 percent total. Much of the industrial R&D in Sweden comes from the likes of large companies like Ericsson and AstraZeneca. Higher education accounts



[www.ess-scandinavia.org](http://www.ess-scandinavia.org)

## EUROPEAN RESEARCH LABORATORY IN SWEDEN

Materials research underpins progress in new products. Lund in southern Sweden is the leading site candidate for the location of a new world-leading international research laboratory - the European Spallation Source - which will attract thousands of researchers from all over Europe and the rest of the world.



# Kick-starting transatlantic business

• About 800 companies from Sweden and America will descend on southern Sweden later this summer for what has become the most important business, trade and networking event between these nations with their traditionally close links.

The Swedish-American Chambers of Commerce's (SACC) Entrepreneurial Days, which run from August 20 to 23, has a proven track record of generating new transatlantic business, and this year it takes place in what is arguably Sweden's most dynamic region.

"The Entrepreneurial Days are unique and unusual," says Gunilla Girardo, president of SACC-USA, which is the umbrella organisation for 20 regional Swedish-American Chambers of Commerce in the US. "This is not a conference – it is the start of a long-term relationship."

The host cities for the 2007 Swedish-American Entrepreneurial Days event are Växjö, one of the world's most sustainable cities and a leading centre of environmental technology; Malmö, part of one of Europe's top life science clusters; telecom-focused Karlskrona; and Kalmar, with among its many strengths interior design, clean tech and logistics.

This year's event features specific programmes for a number of industries where Sweden is among the world leaders; bioenergy, food & health, heavy vehicles, information & communication technology, interior & design, life sciences, logistics, packaging & transportation, research & development, wood industry & building products, as well as a one-day programme focusing on Sweden as a gateway to the Baltic.

Girardo says this year's programme boasts

a number of new features, based on what participants are looking for. "The matchmaking will be expanded to include matchmaking with venture capital companies from both Sweden and the US," she says. "We have bounced that idea off a few venture capital firms and they really liked it. So this will be a good way to help Swedish companies to get expanded access to capital."

Also new is a help-, expert- and advisory desk which will be open throughout the event. "You don't need to book meetings beforehand; you can just go there and meet with experts in finance, marketing, accounting, venture capital – you name it," says Girardo. "It will be staffed throughout the conference."

## Speed-dating for companies

This year's event will also be more comprehensive than ever before, being held over four days. The programme features a number of panel discussions on topics including economic and regional development, young entrepreneurship, and intellectual capital in international business relations.

"I am really excited about the economic development discussions in particular," says Girardo. "In the US some of the regions we work with are very effective in how they do economic development and SACC has played a key role in some of those relationships that have formed. I think it is very useful for

Swedish communities and economic development professionals here to hear what works in the US. They know how to do it, and I think they can help with Swedish economic development also."

The matchmaking part of the programme – described as "speed dating for companies" – consists of 30-minute back-to-back prearranged meetings. "You can accomplish a lot of in half an hour," says Girardo. Participants fill out a simple form in advance stating what they are looking for, be it an agent, distributor or partner. "We take that and find you a match," says Girardo. "If it is an odd field or an odd company, we go out in our network and look for the right contact. We can really custom tailor it to what companies are looking for, and you get a schedule a week or so before you come so you know which companies you will be meeting with. And the Americans will fill up every empty matchmaking slot they can to squeeze in as much as possible. We always have other meetings that happen spontaneously, but the sooner you sign up for it the better programme we can provide."

As usual the list of speakers will include distinguished names from the worlds of academia, business, and politics from both sides of the Atlantic. Among those already confirmed include US Ambassador to Sweden Michael Wood, Torsten Jansson, CEO of New Wave Group, former tennis pro and partner at Case Investment Stefan Edberg, Bengt Andersson, President and CEO of Husqvarna, and Hans Pihl, CEO of Deloitte Sweden.

## Baltic springboard

Southern Sweden, which covers the counties of Blekinge, Kalmar, Kronoberg and Skåne, is home to 2.3m people – about a quarter of the national population. Its location, with four of Sweden's ten largest shipping ports, makes it a perfect springboard to the Baltic region and Poland with their 100m-plus consumers.

"Working with our partners here we have

identified the strongest industries, and those industries have endless opportunities in the US and vice versa," says Girardo. "We sell Sweden as a gateway to the European market and the enormous market potential there. We talk about the good corporate climate here, the infrastructure, the highly-educated workforce. Those are bottom-line facts that get the attention of the Americans."

Girardo says that one sector which will be particularly in focus at this year's Entrepreneurial Days is bioenergy. "There is big interest in the US at the moment, and Sweden is at the cutting edge so there are endless opportunities there for Swedish companies in that field."

About a third of the participating companies at this event – which is now in its tenth year – are from the visiting country. At last year's event in Lidköping, 180 of 755 companies were from the USA. At the return event in Chicago, 140 of 450 companies came from Sweden.

Girardo is expecting the 2007 event to be as well attended as last year's. "We have customers that come back every year," she says. "They see this as the main event for them to generate new business. And that is probably the best feedback

you can get – customers coming back over and over again. You can see results from two years ago; a company you met back then calls you today. Business doesn't always happen overnight, but there are some great examples of companies that have walked away with almost signed contracts during the event too. Anything can happen when all these entrepreneurs and business people meet."



Husqvarna boss Bengt Andersson



Gunilla Girardo

Upwardly mobile: ICT will have an industry-specific programme



## 'Streamlining business possibilities'

Steve Carter, executive vice-president of April System and 3glogix, says his visit to the 2006 Entrepreneurial Days in Lidköping was his third in as many years. "Every year has created new business contacts. These meetings bring many new people, new ideas or concepts, and new business opportunities to consider."

Carter says there are several aspects of the Entrepreneurial Days programme that make it unique and more effective than "traditional" business conferences. "An example of this uniqueness is the Business Matchmaking sessions usually not seen in many US conference formats. This really has a time-effective characteristic streamlining the business possibility process. These pushes most likely will double our business size in the relatively short time of less than three years, with projections for a more global market growth picture spanning to and from Sweden."

## Programme highlights

### Sunday, Aug 19:

Växjö: visit to Råshult, birthplace of Linnaeus; golf tournament

### Monday, Aug 20:

Växjö: panel discussion on Successful Strategies for Economic Development and Regional Development; Banquet dinner and presentation of SACC Entrepreneurial Award.

### Tuesday, Aug 21:

Växjö: interactive exhibit and business matchmaking, plus industry-specific programmes

### Tuesday Aug 21 – Wednesday Aug 22:

Karlskrona: entrepreneurial days for IT and Wireless Applications

### Wednesday, Aug 22:

Malmö: interactive exhibit and business matchmaking, plus industry-specific programmes.

### Thursday, Aug 23:

Malmö: Keynote addresses, Gateway to the Baltic presentations, Grand Finale banquet dinner.

Råshult, birthplace of Linnaeus



# Visit binds Swedish-Dutch ties

• The latest chapter in the long history of trade between Sweden and Holland has been written after a visit to northeast Skåne by the Swedish Chamber of Commerce in the Netherlands.

A group of some 30 members of the chamber were in the region for a tour which also took in Copenhagen, high-tech university city of Lund, and Älmhult – the home of Ikea.

“The Dutch are looking for some space and some business opportunities,” says Kjell-Åke Johansson, managing director of Investment Promotion in Skåne Nordost, who was one of the hosts for the visit. He says the two nations

On the northeast Skåne leg of their trip, the visitors – from the public and private sectors and academia in the Netherlands – visited the expansive Perstorp Industrial Park, the city of Kristianstad, and spent the evening at the nearby 13th century Bäckaskog Castle. The evening featured a presentation by Kristianstad Municipality on its Spirit of Food profile, and one from the Dutch city of Groningen.

“I was proud to be able to show this part of Skåne to our visitors,” says Johansson.

The Swedish Chamber of Commerce in the Netherlands has some 170 member companies, including the Dutch subsidiaries of Swedish multinationals such as Atlas Copco, Ikea and Electrolux. Its chairman, Henk Lokin, says that following the visit, one of the participants is investigating the possibility of establishing at Perstorp Industrial Park where there is heavy industry present but they try together to minimise the effects on the environment, and try to develop

new technology to even further diminish the effect.”

## Idyllic setting

Investment Promotion in Skåne Nordost is a collaboration between seven municipalities –

Bromölla, Hässleholm, Hörby, Kristianstad, Osby, Perstorp and Östra Göinge – in northeastern Skåne, which is home to about 200,000 inhabitants and nearly 14,000 companies. Despite its idyllic setting with expansive forests and numerous lakes, the region is home to a surprising amount of industry; 24 per cent of the workforce is involved in industrial production, compared with 19 per cent for Sweden as a whole. Companies in the region include many major global players, such as Absolut Vodka, Schenker BTL, Scania and Stora Enso Nymölla. Food production is also a key industry, and information technology is growing in size and importance.

“We are close to the big markets in Europe, and only one and a half hours from Copenhagen,” says Johansson. “We have a lot of space and good living here – house prices are about a third of what you would expect to pay in Malmö.” Business leaders in northeast Skåne are also hoping for infrastructure improvements – both road and rail – to further boost the region. Following the success of the Dutch visit, Investment Promotion is planning to create similar initiatives with other Swedish chambers of commerce in Europe.

“We are planning to start a new project next winter aiming at more contacts for the small and medium-sized companies in our region,” says Johansson. “We have already started to form

some reference groups for the wood and wood processing industry, the food industry, construction industry, housing companies, transport and logistics and so on.”

Investment Promotion in Skåne Nordost has also been busy helping regional companies with contacts on the other side of the Baltic. In March, five companies visited Poland following contacts with three local chambers of commerce there.

“We had a few very different meetings and the result was rather surprising – all five participating Swedish companies got new business contacts during this visit,” says Johansson. “They are now working on following up these contacts. In some cases there has already been contracts signed between the Polish and the Swedish companies. So this trip was a great success; we have never reached such a result so quickly.”



Easy communication: Swedes and Dutch talk business at Bäckaskog Castle

get on well. “Our cultures are somewhat similar, they like our country, the climate, the scenery, and we can communicate easily. We have seen a great interest from Holland to invest in Scandinavia and to move here.”



Bäckaskog Castle

# yes

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The Öresund Bridge has been a key factor in southern Sweden's growth

## Southern success built on broad base

• The south of Sweden is thriving. Its growth is built on a broad base of industries, from the life sciences to information and communication technology to biofuels. Investors – both domestic and international – are pouring money into the region at the same rate as local entrepreneurs are establishing exciting new companies. And its geographic position means it is being targeted by multinationals as a base for operations targeting the markets of the Baltic States, Poland and beyond.

The Öresund region spans the southern and western Skåne and the region of Denmark that faces it, including the Copenhagen metropolitan area. "The economy is booming at the moment," says Anders Olshov, managing director of Öresundsinstitutet, a research institute focusing on regional economics and development. "Private consumption is growing fast in both Denmark and Sweden, and building activity is very high as there has been a shortage of housing. There are a lot of people moving to the region, and the rate of growth is higher than in much of the Nordic area."

Home to many leading high-tech companies, particularly within the ICT and life science sectors, the region has become a magnet for foreign investment, topping the Scandinavian rankings for inward investment, and rating within the top three in Europe. A recent analysis based on Ernst & Young's European Investment Monitor database showed that the

Öresund Region had become the most important investment region in Scandinavia. Among the multinationals that have set up operations in recent years are Honda, Toyota, L'Oreal and BMW Spare Parts.

The Öresund region is home to Medicon Valley, a life science cluster which stretches across the Öresund Strait to the Copenhagen area. The cluster employs more than 41,000 people in life science and accounts for nearly two thirds of Scandinavia's life science output.

Hans Henecke, director of economic development and innovation at Region Skåne, draws comparisons between the region and the Bay Area in northern California. "They are on a different scale, of course, but there are similarities because you have the big city, San Francisco, on the other side of the water in Copenhagen, you have the equivalent of Silicon Valley in the Malmö-Lund area, you have the equivalent of Marin County and other beautiful places around the coast for people who can make the choice themselves of where they want to live and work. They can have everything here."

### Success story

Lund, already one of northern Europe's most innovative cities and a major life science centre, is itself riding a wave of high growth. The city's established companies are thriving, its science park, Ideon, is fully booked and churning out success after success, while a new bio-incubator promises to produce the next generation of medical technology startups.

The physical expansion of the city continues apace, with the Lund NE corridor the focus of development. Already underway in this area of Lund is the expansion of mobile manufacturer Sony Ericsson, which is in the process of building 27,000 sq m of new property, effectively doubling the size of its presence in the city. Here is also the proposed site for the European Spallation Source, the massive research facility which the Swedish government has announced its intention to back (see separate article p. 13).

Having survived industrial meltdown in the early 1990s, Malmö, the major city in the region has bounced back to become one of Scandinavia's success stories.

Less than two decades since it lost nearly a quarter of its jobs as heavy industry closed down, knowledge-based industry has taken its place, and massive public and private sector investment in infrastructure has reignited the local economy. Business has awoken to the investment possibilities created by its location, and around 20 national and international companies have moved their European or Nordic headquarters to Malmö in the last two years alone. Now the growing new university is attracting thousands of young people to the city, giving it one of the youngest populations in the country.

### Reach the sky

Malmö has seen a number of major building projects in recent years, not least the massive Öresund Bridge to Copenhagen. The 190 m-tall Turning Torso, the tallest residential structure Sweden and the second-tallest in Europe, has become a symbol for the city and is the focal point of Western Harbour, which has been built on land recovered from the sea over the last century. Western Harbour is a shining example of sustainable urban development and contains some of the most exciting architecture in the city, as well as many of its most exciting companies. The aim is to create 500 residential premises and working premises for 300 people per year over the coming years.

The biggest infrastructure project underway in Malmö today is the €1bn City-tunnel project, which will improve access to the city from the surrounding region. Expected to be completed in 2011, it will be used by 350 passenger trains every day. The day it opens, the new Triangeln station in the city centre will instantly become the third-largest train station in Sweden.

In the city of Kalmar received the single biggest investment from abroad last year. Construction work has now started on the Sweden China Commodity Wholesale Market, an international trade centre with an exhibition hall with premises for 1,100 companies. The idea is that the centre will generate interest among wholesale companies throughout Europe who will come to Kalmar to view and purchase Chinese products. There will also be housing in connection with the trade centre as well as a hotel. The

total investment is valued at around €62m.

Kalmar was competing for the investment with a city in Finland, another in Sweden, as well as Amsterdam. Thomas Davidsson, director of Kalmar's Business Relations Office, says Fanerdun chose the city for a number of reasons. "First was our location in the centre of the expansive Baltic Sea Region. The infrastructure, which has great potential, was another reason. Kalmar's airport, railway station and port are located in the city centre. And Fanerdun also appreciates the commitment of the municipality and the beautiful environment."

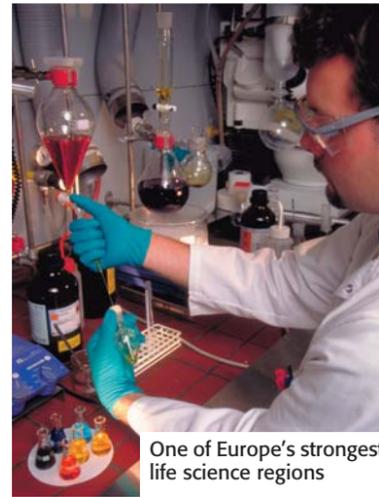
### IT comeback

Blekinge is staging a comeback after suffering hard in the IT crash of 2001-2, and is today home to a number of high-tech clusters. Soft

Center in Ronneby is a development centre with businesses, education and research in IT, all under the same roof. More than 80 companies with about 1,200 employees collaborate with a few thousand students and researchers at the Blekinge Institute of Technology (BTH). TelecomCity in Karlskrona is an internationally leading development environment with the focus on telecommunications. The network consists of more than 40 members and is a unique collaboration between businesses, the technical institute and the community. Halda

Development Centre in Svängsta encompasses small and mid-sized businesses that train, develop or manufacture primarily in the areas of precision mechanics, electronics, computer technology and software engineering. There is also an EC group at the centre that conducts training in the field of IT.

The city of Växjö, apart from being a centre of design – as part of the Kingdom of Glass and the Kingdom of Furniture – as well as heavy vehicles, is also a global role model for bio-energy solutions. The city has been using bio-energy for its district heating system for more than a quarter of a century, and is now a magnet for visitors from the public and private sectors and academia wanting to pick up tips and technology from the pioneers.



One of Europe's strongest life science regions

Picturesque Karlskrona is home to Telecom City



## Google buys Marratech

Google has looked to Sweden for new videoconferencing technology, acquiring the flagship software of Stockholm-based Marratech.

Under the deal, Google has agreed to acquire the intellectual property and software of the 15-person videoconferencing company.

"As of today I'm an employee of Google," Marratech founder Peter Parnes said at the time of the deal. He stressed that future efforts to develop the software would be in Sweden – a declaration echoed by Google.

Commenting on the deal in an Internet blog, Google vice president Douglas Merrill

said: "We look forward to learning from the extraordinary ingenuity of Marratech's engineers as they focus on desktop conferencing research and development in Sweden, where they will continue to be located."

Marratech's conferencing software, which is desktop-based rather than Web-based, is a collaboration tool that includes video, text chat, voice over Internet Protocol audio, and a "whiteboard" feature for documents, presentations or charts.

Google pays €9 million for Marratech's software, according to Swedish technology publication Ny Teknik.

## Alfa Laval big in ethanol

Alfa Laval, world leader in heat transfer, centrifugal separation and fluid handling, has received an order for a process line to the new bioethanol plant Biowanze in Belgium. The plant is one of the largest outside the USA and an important step in order to reach the EU directive stating that 5.75 per cent of all vehicle fuel should come from renewable sources by 2011. The combined order value is about €3.3 million.

The new plant has a total production capacity of about 300 000 m<sup>3</sup> per year which is enough to power more than 250 000 cars.

"I am proud that Alfa Laval can contribute to lowering the carbon dioxide emissions in Europe. At the same time I see the order as further evidence of our strong and leading position within the renewable vehicle fuels," says Lars Renström, President and CEO of Alfa Laval.

The raw materials used in the plant consist of wheat and sugar beet juice.

## New perspective on brain function

A newly-started research collaboration between Karolinska Institutet and AstraZeneca has already generated results. For the first time, the conditions have been created to study one of the brain's most important neurotransmission systems – the glutamate system – in living people.

Glutamate is one of the most common neurotransmitters in the human brain and is involved in virtually all brain functions. But even though researchers' PET cameras can produce images of other important neurotransmission systems, such as the dopamine and serotonin systems, until now it has not been possible to capture images of the glutamate system. This is because there has not been any suitable tracer that can bind specifically to the receptors in the glutamate system.

In collaboration with Karolinska Institutet, AstraZeneca has now developed such a tracer, which makes it possible for the first time to study the glutamate system in the brains of living people.

"The glutamate system is an area of keen interest for research, especially for gaining an understanding of neuropsychiatric disorders," says Professor Lars Farde at Karolinska Institutet and AstraZeneca. "11 anti-psychotic medicines currently available on the market work via the dopamine system, for example. However, it may well turn out that glutamate receptors are even better drug targets."

Within the framework of this same collaboration, a state-of-the-art PET camera has been purchased for use in both academic research and pharmaceutical development.

"The new PET camera will allow us to study the brain with a much higher richness of detail than previously," says Professor Christer Halldin of Karolinska Institutet. "And thanks to the new tracer, we will be able to explore an entirely new neurotransmission system through high-resolution imaging."

## IBM to buy Telelogic

IBM is to buy Malmö-based Telelogic for €51m.

"From today's next generation entertainment devices to tomorrow's space-information systems, software is the lifeblood of complex systems," said Dr. Danny Sabbah, general manager, IBM Rational Software. "IBM's acquisition of Telelogic will complement our entire portfolio to help our clients drive efficient and effective software development processes that are vital to product delivery."

Telelogic provides software development solutions and has more than 8,000 customers worldwide, primarily in aerospace and defence, telecommunications and automotive industries. The company has more than 1,100 employees and operations in 22 countries. Last year the company reported revenues of about €155m. Bo Dimert, chairman of the board of Telelogic,

said: "After carefully evaluating the offer and considering the future prospects of Telelogic, it is the board's opinion that the transaction is favourable to our shareholders. Therefore, the board unanimously recommends this offer. By combining with IBM, Telelogic will have a greater opportunity to accelerate its growth globally and be able to provide customers a more comprehensive solution for complex software development."

Anders Lidbeck, president and CEO of Telelogic, said: "This transaction creates potential for offering our customers further support in developing and implementing complex systems across the globe. Our combined customer base will now be able to leverage a full powerful end-to-end set of products and services. For our employees, the transaction has potential to create new, interesting opportunities world-

wide in a leading IT company."

In a joint statement, IBM and Telelogic said: "Together, Telelogic and IBM will be able to expand and accelerate its customers' ability to define, model, build, test, deliver and govern the development of complex systems with higher quality and faster time to market. Telelogic will also benefit from access to IBM's worldwide sales and services organisation."

Telelogic products help organisations define, model, build, test, deliver and govern the development of software used in complex systems such as aircraft radar or automobile anti-lock braking systems. Its customers include Airbus, Alcatel, BAE SYSTEMS, BMW, Boeing, DaimlerChrysler, Deutsche Bank, and Ericsson.

Telelogic was founded in 1983 and today has operations in 22 countries worldwide. It has its US headquarters in Irvine, California, and has been publicly traded for seven years.

## Retail chains flock to Sweden

Foreign retailers are lining up to establish operations in Sweden. Buoyed by robust consumer spending, Sweden's retail market is currently one of the hottest in Europe and the last 12 months have seen a succession of foreign retailers enter the market. Boulton, a UK shopping retail property owner with 27 shopping malls in Sweden, says attracting foreign retailers is a key strategy.

"It's part of our business concept," says Bo Falk, Boulton's Sweden manager. "The Swedish market is strong and retail volumes have been fantastic for many years but selection has been rather limited."

UK clothing chains River Island and Primark are among the European retailers currently preparing to reach out to Swedish consumers.

Other new entrants include German shoe retailer Deichmann and Dutch jeans specialist G-star. Clothing retailers Dressman of Norway and Portuguese group Zara have also expanded their presence. German fashion chain New Yorker is due to open its first Swedish store early next year and UK soap manufacturer Lush is also planning to open a series of outlets.

Fredrik Bergström, managing director of the Swedish Research Institute of Trade, says foreign retailers were keen to tap into Sweden's consumer spending boom. "Sweden has the strongest retail market in Europe outside the Baltic states and Slovakia," he says.

## Riding high in e-business

Sweden is the second-best country in the world for e-commerce, according to the latest global rankings published by the Economist Intelligence Unit. The country advanced from fourth place in last year's survey to join the United States in second spot. Denmark topped the rankings for the second year running.

However, both the US and Denmark saw their overall e-readiness scores weaken slightly in 2006, while Sweden strengthened its position.

"E-commerce activity and ICT skills [in Sweden] are impressive," the EIU said. "The country enjoys Europe's highest rate of employees with ICT specialist skills, and 53 percent of its employees use the Internet at work, well above the EU norm of 36 percent. Swedish businesses are also Europe's top online buyers."

The EIU added that Sweden "stands out for the prominence of ICT in research and development and total employment".

In 2003 Sweden spent a third of its R&D budget on ICT – amounting to one percent of GDP, the EIU said. This was second only to Finland and three times more than the EU average. The survey covered 69 leading IT nations worldwide, measuring their "e-readiness."

Key factors for countries' e-readiness include the business climate for e-commerce, internet usage and access, technological infrastructure and the presence of ICT in schools.

### To Do List:

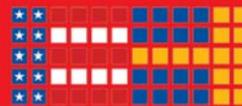
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# Neutron source will be carbon neutral

• The world's most powerful neutron source will be carbon neutral and powered by wind energy should Scandinavia's bid to host it be successful, its backers have announced.

The €1.2bn facility will effectively have zero energy costs within just a decade, and will also contribute heat to the local district heating system.

When operational, the European Spallation Source (ESS) will require around 38MW of electricity per year to power the linear accelerator and other equipment with which scientists from around the world will conduct experiments in fields ranging from nanotechnology to micro-electronics. That is the equivalent of the energy needs of a town of around 12,000 people, with an accompanying annual electricity bill of some €m.

But Colin Carlile, who is guest professor at the University of Lund and part of the ESS-Scandinavia team working to get ESS located in Sweden, says that an energy policy has been created the likes of which have not even been considered before for a large-scale scientific facility. "Environmentally this facility will be first rate," he says.

Key to this energy policy will be a wind park which ESS-Scandinavia will build off the Swedish coast at a cost of about €120m. "This will provide the power needs for the facility integrated over the year," says Carlile. "That means that at the end of the year when you look at how much the windmills have generated, it will equal the amount of power that has been used at the facility."



Lund University will host the ECNS conference

A report commissioned by ESS-Scandinavia concluded that the return on this investment will be about €10m per year, meaning that the wind park will pay for itself in about a decade. After that point, the facility's only energy costs will be the maintenance costs for the wind park – about €m per year. "So we estimate we will save about €m a year by doing this," says Carlile. "But more importantly we will cushion ourselves against future fluctuations in the price of electricity."

The design of the facility itself, which will occupy a site about the size of a golf course to the northeast of Lund should the Scandinavian bid be successful, will also have environmen-

tal considerations uppermost. "The use of energy will be minimised at every point in the facility," says Carlile. Lights and electrical equipment will automatically turn themselves off when not in use, the building will be aligned to get maximum benefit from the light and warmth from the sun, and daily targets will be set for energy use.

## Frontrunner

Other countries are competing to be the host of the facility, which will be a pan-European although not an EU project. The bid that gets the most backing from other European nations will be the one that succeeds. The main competition is from Hungary and Spain, while there are ambiguous signals coming from the UK. But with the Swedish government pledging its support and €25m in funding earlier this year, the Scandinavian bid is generally agreed to be the one to beat. "Spain is two years behind us, Hungary is three years behind, and the UK is not even on the horizon," says Carlile.

A negotiating team led by Allan Larsson, a widely-respected former Swedish finance minister, has been visiting neighbouring countries to explain the Scandinavian bid and to start the discussion process. "We have had an overwhelmingly positive response," says Carlile.

Larsson has also come up with a financing solution – effectively a bridging loan – which will allow for supporting countries to commit to the project without having to initially draw from their own coffers. This approach, which will use the European Investment Bank as guarantor, has been met with enthusiasm.

In another significant milestone for the Scandinavian bid, an ESS unit will be established at Lund University. "It will put the whole thing on a professional footing and will carry on with the necessary preparatory work to make sure the project can be constructed on time, within budget and within the specifications," says Carlile.

Lund University is to be the host of the 4th European Conference on Neutron Scattering (ECNS) at the end of June, to be opened by the Swedish Research Minister Lars Leijonborg. The ESS-Scandinavia consortium will use the opportunity of the conference to push its case to the 700 international experts gathering for the event. The scientists will get the chance to visit the proposed site, and Carlile says other events will be used to "raise consciousness" of the strength of the Scandinavian bid. "The idea is that we create such a momentum and support for ESS in Lund that it becomes unstoppable."

Carlile believes that the Scandinavian bid could attract the necessary support to become the site of ESS within the next few months. "Momentum is gathering, and I can see that by the time people are back at their desks after the holidays, a decision on the site will not be far off."

Once that decision is taken, construction work would begin within two years, and the facility would be operational in 2018.

## QlikTech on prestigious list

When looking for new players that will be the IT leaders of the future, one company to watch is Lund-based QlikTech.

The Swedish business intelligence software firm has just been named by top US technology magazine Red Herring as one of 100 "most promising companies driving the future of technology."

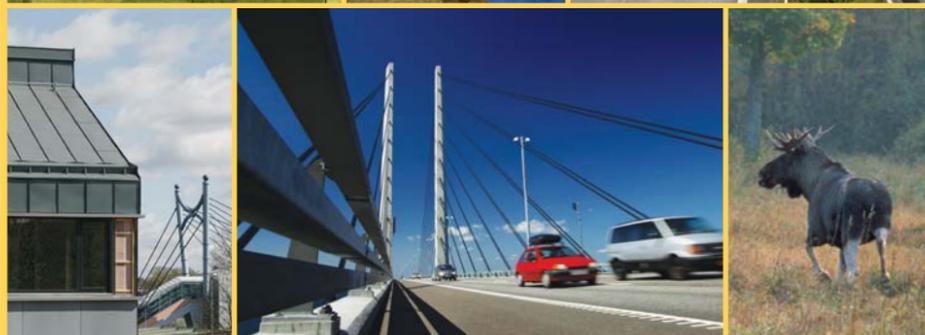
The award, whose previous recipients include Google, Ebay and Skype, is made to private technology companies seen as future leaders in the high-tech industry. Founded in 1993 at the Ideon technology park allied to Lund University, QlikTech makes next-generation business analysis software that enables ultra-fast searches of data.

"We have discovered a way to replicate how the brain searches for information," says QlikTech chief executive officer Måns Hultman, explaining the technology. "This makes it very easy for the user to learn how to use our product, and the information is stored in the computer's primary memory, which gives very short response times."

The software is used by businesses and individuals to perform sophisticated analysis of large portions of data. QlikTech, owned by a group of Swedish and international venture capital firms, has its research and development headquarters in Lund and its international base in Pennsylvania.



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# Environment Cleantech

The green revolution is now underway.

Doomsday documentaries, chilling official reports and wall-to-wall media coverage have over the past 12 months brought the world to a tipping point of consciousness about the threats of climate change.

Global warming deniers have been put in the same bracket as Holocaust deniers; a major multinational bank has pledged \$100m to tackle climate change; Australia has announced plans to ban incandescent light bulbs and replace them with fluorescent bulbs – which could cut CO2 emissions by 4m tons by 2012; in Sweden nearly one in five new cars sold is a “green” car; and the British government has appointed a Climate Change Minister.

The world’s two biggest producers of greenhouse gases have been making what many perceive to be the right kind of noises. US President George Bush joined the leaders of the West’s leading economies at the G8 summit in pledging

to make “substantial” cuts in greenhouse gas emissions, and pledged that any successor to the Kyoto accord would be negotiated through the UN (as long as India and China join in). And China, which is expected to soon take the US’s place as CO2 polluter No 1, announced that in “blazing a new path to industrialisation” it would increase efficiency, make greater use of renewable energy, and increase forest cover.

There are still many people who feel that the costs of tackling climate change are too high; that their “carbon footprint” won’t make a difference; that the benefits are too distant. And what hope is there, they say, when a recent report reveals that worldwide CO2 emissions are rising faster than

the worst-case scenario of the UN?

But the prophets of doom are more than balanced by the optimists, many of whom believe that technology will play a major role in saving humankind from a disaster of its own making. The most recent report by the UN’s Intergovernmental Panel on Climate Change (IPCC) concluded that devastating global warming can still be avoided without excessive cost by improving energy efficiency and by using existing solutions like biofuels and other renewable technologies.

It is here that Sweden is leading the way.

# 'An international role model'

• A traditional closeness to nature and the fact that the country has no fossil fuels of its own and therefore has long needed alternatives means that the whole environment/climate change/renewable fuels debate is well advanced in Sweden.

Look past the fact that the Swedes love their big, thirsty Saabs and Volvos and vintage American cars and you will find a country where environmental issues rate highly. A recent study found that seven out of ten Swedes are worried about climate change – a level of concern that would certainly be matched in other nations – but the same study also found that four out of ten were also actually willing to lower their standard of living to help stop global warming. The nation has managed to reduce its greenhouse gas emissions between 1990 and 2005 by seven per cent – while growing the economy by 36 per cent – in part due to the replacement of oil for heating with locally produced bio-energy.

Sweden's politicians over the last two decades or so have in general done an admirable job when it comes to the environment. The Swedish carbon dioxide tax introduced in 1991 has been described by one expert as "one of the most successful climate-political strategies which has been brought in anywhere in the world". And the previous Social Democratic government made headlines and won plaudits from announcing the intention to wean the nation of oil within 15 years.

But what of the new centre-right government? Fredrik Reinfeldt and his colleagues came to power with hardly a mention of the environment, successfully focusing instead on jobs. Now having got down to the business of running the country, the government has started pushing the environmental agenda at the international and domestic levels. It has announced plans to cut greenhouse gas emissions by 30 per cent by 2020 – trumping EU proposals to cut emissions by 20 per cent – and recently launched a Commission for Sustainability with the aim of creating a cohesive approach for action to prevent climate change. More concrete measures include tax relief on the purchase of "green" fuels and cars, and the demand that 85 per cent of cars purchased by the public sector run on environmentally friendly fuel.

Sweden takes over the presidency of the EU in 2009, and Prime Minister Reinfeldt plans to use the opportunity to play a leading role in any successor treaty to the Kyoto Protocol, whose emissions targets expire in 2012.



Pointing to progress: from left, Swedish Environment Minister Andreas Carlgren with his German and Indonesian counterparts Sigmar Gabriel and Rachmat Witoelan at the Midnight Sun meeting



In an exclusive interview, Sweden Today spoke to Environment Minister Andreas Carlgren about environmental challenges and opportunities, and what Sweden can teach the world about thinking green while staying in the black.

*Sweden Today: How high a priority is the environment for the government?*

Andreas Carlgren: It is fair to say it is one of our main priorities. During the election campaign the high level of unemployment was the main issue and was the key to us getting elected. But I think that besides that the climate change issue and the task of reaching a global agreement is the main priority. This spring it has been the number one issue for the prime minister, and of course it always is for me.

*ST: What are the government's main environmental aims?*

AC: As the coming President of the European Union we hope to prepare, support and be a key player in a global agreement on the climate issue. That is one thing I hope will be a result for us and we intend to really push the issue.

Another is to reach national consensus backing the national climate policy. That is another part where I really hope for far-reaching results here in Sweden. I hope Sweden will be an international example and a role model for others to follow.

Thirdly, there is the marine environment. There is money in the budget on a completely different level than before, and I think we will end this period with results, measures and programmes far beyond what has been done before.

*ST: Sweden often puts itself forward as an example of how you can have a strong economy while still looking after the environment. What can it teach other countries?*

AC: First of all I think we can teach other countries that a concrete policy to decouple [the relationship between economic growth and the increased use of energy and other resources] really works. We have managed to achieve economic growth of 36 per cent since 1990 while at the same time going far beyond our Kyoto targets and reducing our emissions by seven per cent. Since the 1970s we have reduced our carbon dioxide emissions by 40 per cent, while at the same time having GNP growth of more than 100 per cent. So both in a 40-year per-

spective and in a 15-year perspective we have achieved this decoupling. It started with the process where we wanted to get rid of the dangerous dependence on oil. Sweden started programmes to do this during the 70s and we could see that some of the main results were economic growth and reduced emissions. Another important thing is how we started to develop bioenergy together with district heating, and this is important in Sweden both for heating and for electricity generation. Internationally you could use the same technology with the same possibilities for cooling.

The third important thing has been the carbon tax introduced in 1991 [levied on the use of oil, coal, natural gas, petrol and aviation fuel]. This has had a large influence on emissions reduction.

*ST: Recent reports have shown that Swedish cars are the worst polluters in the EU and that CO2 emissions from industry rose last year. Yet in Sweden there is a higher than average ownership of green cars and a high engagement in environmental issues among the public as a whole. What has gone wrong?*

AC: First of all you could say that we are not so very far from the objective of ending our dependence on oil. The former government formulated the goal of ending our dependence on oil by 2020 and I am sure this will be part of what I hope will be national objectives that we can formulate together with as many parties as possible next year. But the great challenge is of course the transport sector. It is true that our cars are quite big compared with Europe, and that they are quite old, and they use too much energy. That is a part of what we are now trying to change. The new green car subsidies are built on the principle that we shouldn't decide what technology people should use, but rather how much they should reduce their emissions and their energy use in their cars. That is the start of a new policy.

*ST: The US ambassador to Sweden is busy promoting Swedish alternative energy technology to American investors. Is this not a job for the Swedish government?*

AC: We really welcome his initiative and it shows what a great interest there is for Swedish companies. Of course the Swedish government should do more, and we have already started work in the new government to form a strategy together with business, and we also have put aside more money in the budget to support these programmes. We will also be focused on cooperation with other countries, as with the US. I think this will increase our competitiveness.

*ST: How important do you think technology is for protecting the environment, and how much is down to influencing people's behaviour?*

AC: To look at it from a personal point of view, I was on the internet and was looking at a website where you can test how many 'globes' you consume with your own lifestyle. The average Swede uses about three and a half globes. I discovered that because I don't have a car and some other things I used 2.2 globes. Then I tried to minimise in each alternative. I became a vegetarian, I cut down on flying, just tried to do everything right. And still I used one and a half globes. This illustrates that just by changing your own behaviour you can never save the Earth. What we need are the scientists, the political decision-makers, and the business leaders to save the world. And that has to be done globally.

*ST: Are you positive that steps will be taken in time to tackle climate change and protect the environment?*

AC: On many aspects, yes. I think we have come to a turning point when it comes to people's awareness. Here in Europe you could say that it is the top issue in most countries. We have seen a great shift, both in people's awareness and politically. But as I sit in some of these international meetings I still meet sometimes a great cynicism and ignorance to towards environmental issues. So there is still a struggle going on and it is a huge challenge, but we have to solve it as the alternative is catastrophe.

*ST: Just what is it with Swedes and the environment anyway?*

AC: We are one of the smallest national populations in the world but we live in one of Europe's biggest countries by size. That has created a special relationship with nature. Every Christmas we try to bring nature into our

houses with the tree and everything else and in the summer we try to move our house out into the garden and stay outside as much as possible. So there is this relationship year round where you surround yourself with nature. There is a long history behind it but in every stage of our small Swedish civilisation this connection is developed in new ways.

## Midnight Sun lights way to Bali conference

Swedish Environment Minister Andreas Carlgren hosted his counterparts from 27 countries in northern Sweden for an informal discussion on international action on climate change.

The Midnight Sun Dialogue on Climate Change, at Riksgränsen in mid June, was the third in a series of such dialogues following one in Greenland in 2005 and another in South Africa last year.

In a statement after the meeting, Carlgren said: "We all share the same fundamental goal: the climate system has to be protected for the benefit of present and future generations. This requires substantial reductions of greenhouse gas emissions based on the principle of common but differentiated responsibilities. At the same time we have recognized that action must be a part of the global effort to achieve sustainable development world-wide, to support economic and social development, and to reduce poverty."

Carlgren said the discussions meant those present had a clear picture of the various countries' positions before the Conference of Parties in Bali in December. "It was felt that the conclusions by the European council and those of the G8 summit have created favourable prospects for the negotiations at this conference in Bali. In particular we considered that it would be possible to agree on the main elements of a climate regime for the period after 2012."

# Business leaders call for action

• When meeting the German Federal Chancellor Angela Merkel in Berlin in May, business leaders united in the 3C initiative called for a global policy to reduce the emissions of carbon dioxide and other greenhouse gases to acceptable levels as rapidly as possible whilst providing secure and affordable energy for a stable, global development.

The Business Leaders' Initiative 3C (Combat Climate Change) is a global opinion group consisting of companies showing leadership by demanding an integration of climate issues into the world of markets and trade facilitated by means of a global framework coming into force in 2013. In May a selected number of member leaders met with German Chancellor Angela Merkel.

"We are all concerned with the way climate change poses a threat to humanity, to sustained welfare and to global security. We already have the technology to drastically reduce the carbon dioxide emissions, but lack the financial incitements to do so. Therefore we need strong leadership, from politicians as well as from companies," says Lars G Josefsson, President and CEO of Vattenfall.

#### Launched in January

The 3C Initiative was launched in January of this year when presented to the European Commission's President José Manuel Barroso in Brussels. There has been a significant interest among the world's leading companies to join. Today 40 companies from 11 countries on 4 continents participate (see list below). The 3C companies are committed to take their share of the responsibility to combat climate change and they are prepared to take action now. The support of the global community is needed to create incentives for commercial solutions, technological development and market-based investments.

The 3C initiative has set up an internal working process based on three themes:

- Promoting efficient policies by mapping abatement potentials in the global economy.
- Making use of markets by developing Emissions Trading Systems and flexible mechanisms.
- Achieving a strong technology push by supporting and disseminating key technologies.

"Let us join forces around a common vision of a low-emitting, sustainable society and let us together create and promote a common roadmap that will, step by step, lead to the realisation of this vision," says Lars G Josefsson.

#### The companies participating in the 3C initiative are:

ABB, Alcan Inc., Alstom, Areva, Bayer, British Petroleum BP, British Sky Broadcasting Ltd, Centrica, CEZ Group, China National Offshore Oil Corp., Citigroup Inc., Deutsche Bahn, Deutsche Post, DONG Energy, Duke Energy Corporation, E.ON AG, EnBW AG, Endesa S.A., Enel, Eskom, Fortum, General Electric Co, Hitachi Ltd, Iberdrola, Luftansa, Munich Re Group, Norske Skog, NRG Energy, Nuon, Otto Group, PG & E Corp., PNM Resources, RAO UESR, Reuters, SAS, SAP, Siemens, SUEZ, Tata Power Company Ltd, Wallenius Lines, Vattenfall and Veolia.

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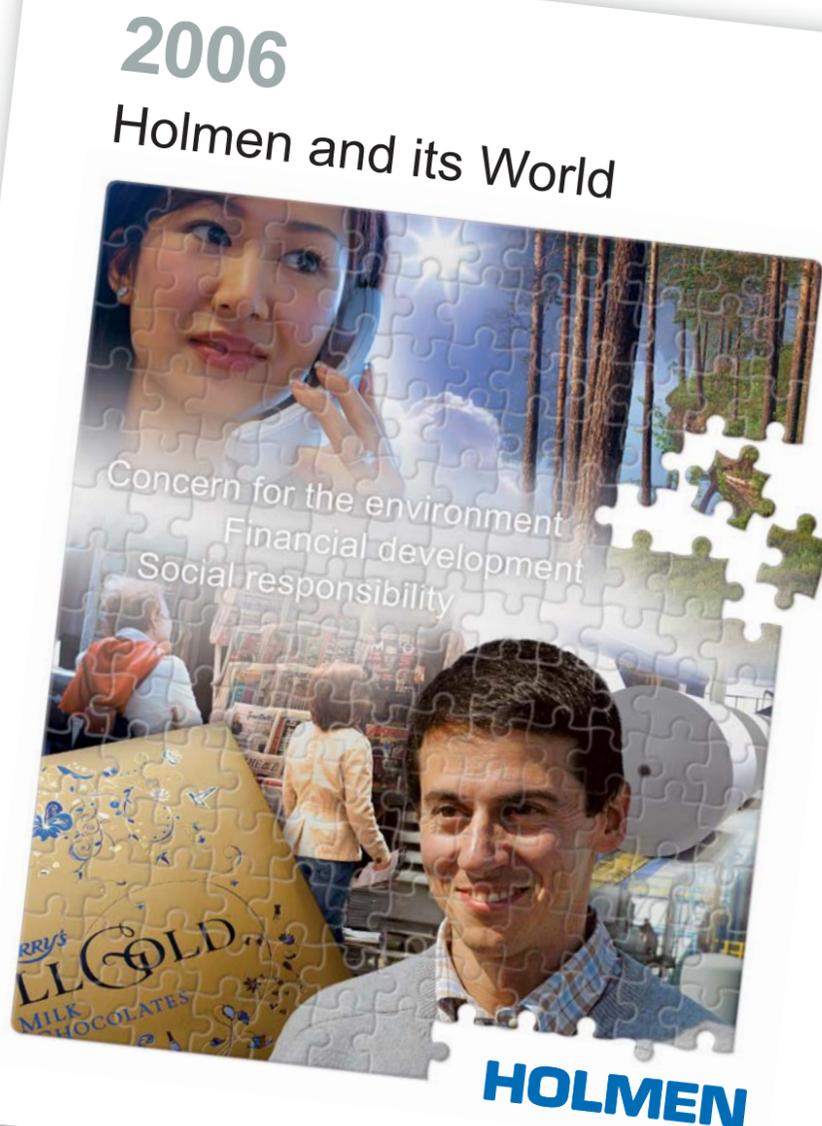
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# Ambassador on a green mission

Michael Wood:  
"technology is  
key to tackling  
climate change"

• Michael Wood, the US Ambassador to Sweden, has created quite a stir in the Swedish environmental technology sector. The former businessman and close personal friend of President George Bush is on a mission to identify promising Swedish alternative energy innovations that can benefit from cooperation with the American private sector, researchers at American universities, or US Government agencies. He is travelling the length and breadth of the nation to see for himself some of the exciting technologies which could play a role in weaning the world off fossil fuels, and then presenting his portfolio of companies to American venture capitalists.

"I really do believe that technological breakthroughs are the single most important key to an appropriate response to concerns about climate change," Ambassador Wood said in an interview with Sweden Today. "And I just happen to be ambassador in Sweden, which has a terrific research and development infrastructure. Sweden is famous for breakthroughs in medical technology and life science technology, and I am finding out in my travels that they are also very advanced in areas of alternative energy technology."

## Presidential backing

When Ambassador Wood was picked for the post by Mr Bush in the summer of last year, he shortlisted three topics on which to focus his energies during his tenure: encouraging Sweden to join NATO; promoting democracy abroad; and cooperation on alternative energy.

He says that both the Swedes he discussed his choices with and Mr Bush thought he should choose the latter, and his timing was perfect. "Most people who are involved will agree that sometime in the early fall of last year the whole world seemed to reach a tipping point on climate change concerns. So I was convinced I had picked the right topic. I liked the decision when I made it, and the tipping point that was reached made it seem like an even better idea."

He threw himself into his task and took the subject matter to heart, even going out and buying an ethanol-powered, Swedish-made Saab. "I didn't lack for environmental concerns or knowledge of technology developments in alternative energy a year ago, but I have certainly learned much more about the subject," he says. "I have read every article I can find, I have read a dozen books, I have talked to experts from many different countries. I have set about making myself as knowledgeable as possible and opening my mind to as many ideas as possible."

Together with the staff at the Stockholm embassy, Ambassador Wood drew up 29 specific goals for what he has termed his "One Big Thing", which fall into the four categories of research and development, financing and investment, public awareness, and policy exchange. In the policy exchange category, he cites as an example of an area where the US can learn from Sweden the Swedish law that all petrol stations above a certain size must sell alternative fuels.

"The President knew that there are about

650 gas stations in Sweden where ethanol is available, and about 850 in the US," he says. "The Swedish figure represents about 15-20 per cent of the total, whereas 850 in the US represents about six tenths of one per cent. So the President's question was how did Sweden do that? That is an example of the kind of policy decision where I think the US can study what Sweden has done."

Meanwhile to promote cooperation on research and development, Ambassador Wood is establishing a Fulbright professorship for alternative energy research at Chalmers University of Technology in Gothenburg.

## Positive response

The ambassador has visited companies from Örnköldsvik in the north to Lund in the south, and has received a number of company CEOs at the embassy. His travels have also taken him to most of Sweden's leading technical universities. Asked what technologies have impressed him most, he names a second-generation ethanol made out of wood chips, and a technology for the gasification of municipal waste.

The companies that made it on to his list of 30 were carefully vetted before being presented to a gathering of west coast venvap firms at Stanford University in April. Ambassador Wood says the response from the potential investors was positive. "Of course it is not the sort of situation where someone is going to write a cheque on the spot, but the process was begun. We are now exploring the idea of having a follow-up mission for the members of that group that were most interested to come to Sweden and meet with members of the Swedish government and the CEOs of the companies that were on the list. That would be another step in the process. At this early stage I would say the interest among US investors is quite high."

Inevitably the response from the Swedish environmental technology sector has been enthusiastic; who wouldn't want a top-ranking US diplomat acting on their behalf?

"Yes, they seem to like it," says Ambassador Wood. "The only negative comments I have heard – and I don't believe these are directed at me or our effort – is why can't the Swedish banks or investors themselves provide the funding to help these companies take off?"

Coincidentally or not, Maud Olofsson, the Swedish Minister for Enterprise and Energy,

has recently announced funding for promising young companies, particularly in the alternative energy technology sector. "So now the possibility exists that a Swedish inventor with a great idea for second generation biofuels could end up with a US venture capital firm backing them along with the support of the Ministry of Industry, and that would be a nice example of the cooperation between the US and Sweden on alternative energy," says Ambassador Wood.

## Seatbelt of alternative energy

According to the ambassador, his friend in the Oval Office has been full of encouragement and support for the initiative. "He is interested in whether I will be able to find an idea or an inventor or a technology or a policy in Sweden that we can use in the US to get where we want to go more quickly," says Ambassador Wood. "In one of my meetings, a former CEO of Volvo reminded me that there are two Swedish inventions that today you can find on any car made anywhere in the world – the seatbelt and the catalytic converter. So I guess what I am trying to do is find the seatbelt of alternative energy."

DW

### Among the "investable" Swedish companies are:

- **Bioprocess Control Sweden:** biogas production optimiser
- **ChromoGenics Sweden:** smart windows
- **Climatewell:** solar cooling system
- **Effpower:** bipolar vehicle batteries
- **Electric Line:** electric vehicle propulsion system
- **Parans Daylight:** fibre optic solar lighting
- **Seabased:** wave power solutions
- **Sekab:** bioethanol, cellulose ethanol
- **SkyCab:** personalised rapid transit systems
- **Swedish Biofuels:** 2nd generation biofuels

## Swedish/Californian biogas agreement

The United State's largest gas supplier, Southern California Gas Company, has signed a contract with a Swedish company, Scandinavian Biogas, to investigate possibilities of large-scale production of biogas from biological waste in California.

"The Governor of California, A. Schwarzenegger, is very committed to renewable energy. That we received the contract to investigate the possibilities of large-scale biogas production proves how far ahead Sweden is in this area," says Per Ewers, CEO Scandinavian Biogas.

Southern California Gas Company, with 16 million customers, is planning one or more biogas production facilities, with manure and slaughterhouse waste as probable primary substrates. The facilities may combine the production of ethanol and biogas, which greatly expands their total capacity.

Two million cows makes agriculture one of the biggest industries in California. This provides great potential to produce biogas for electricity and as a vehicle fuel. Sweden has already achieved much success, and we will benefit greatly from Scandinavian Biogas's experience," says Phil Baker from Southern California Gas Co.

Sweden is considered a world leader in the production of biogas as vehicle fuel, with over 7000 gas-driven vehicles and production of more than 16 million normal cubic meters for 2005, which corresponds to about 18 million liters of gasoline. Biogas has now surpassed natural gas as the main gas-based vehicle fuel. Sweden's leading position creates excellent opportunities to become a prominent export nation for both technical expertise and the construction of biogas facilities.

Scandinavian Biogas, based in Uppsala, is growing fast, mainly due to the increasing interest for biogas as a climate friendly alternative to gasoline and diesel. The core business concept is to optimize production of raw biogas from waste water treatment plants and to produce biogas from other organic materials, such as stillage from ethanol production plants.

## Biofuel firm selected for Pentagon funding

Swedish Biofuels AB, a Stockholm-based company that develops alternative motor fuels, has been selected to receive research funding from the Defense Advanced Research Projects Agency (DARPA), a division of the U.S. Department of Defense. The U.S. Embassy in Stockholm facilitated contacts between Swedish Biofuels and DARPA and assisted Swedish Biofuels in framing the grant request. According to Michael Wood, the U.S. Ambassador to Sweden, "This shows we are on the right track in our efforts to build cooperation between the U.S. and Sweden in the area of alternative energy. There are some great ideas in Sweden that can be developed with American assistance."

Subject to negotiation, Swedish Biofuels is expected to receive approximately €1.5 million in initial funding to begin the process of developing a jet fuel containing 100 per cent biocomponents. The Embassy supported the project as part of the "One Big Thing," (see article to the left). DARPA may provide additional funding to continue the work toward a biofuel jet fuel if the initial efforts are successful.

Swedish Biofuels AB was established in 2000 and has developed motor fuels containing high energy biocomponents for standard motor engines and the advanced technology to produce such biocomponents. In the DARPA project, Swedish Biofuels will apply this technology to jet fuel. Company founder Dr. Angelica Hull says, "Developing a 100 per cent biological jet fuel is a great challenge. But we have the know-how to do it." Swedish Biofuels' research is based on grain crops. Currently there is no jet fuel on the market containing biological components.

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# Opening up a world of possibilities

• By being a pioneer in the sector, Sweden has been able to build up a leading reputation within environmental technology. To ensure that reputation is used to best effect in generating business, the Swedish Environmental Technology Council (Swentec) was established.

“One of our main purposes is to map and analyse environmental technology in Sweden, and this is important because we have a very good reputation in environmental matters,” says Berit Gullbransson, Swentec’s director. “There is an interest from the government in environmental technology, but we have to know what is going on so we can utilise our national resources in the best way.”

Swentec, which was set up last year, has been tasked with strengthening business opportunities and competitiveness for the estimated 3 700 Swedish companies within environmentally-adapted goods, manufacturing processes and services in both the domestic and international markets. Swentec’s board consists of leading figures from the public and private sector, as well as smaller businesses, consultants and networks.

“We want to be a modern authority, small and flexible, and our role is also to coordinate and concentrate,” says Gullbransson, who is a former environment director at paper giant SCA. “We coordinate the activities within the area”. Because environmental technology is such a hot area right now, there are so many different initiatives so it is good to have a good overall view. So we keep an eye on what is happening in the south of Sweden, what is happening in the north and how they can take advantage of each other.”

Another key task is to see that the public and private money being funnelled into the sector is used in the right way, and Swentec has also created a role for itself as a meeting point for the industry. “We sometimes use the phrase one-stop shop,” says Gullbransson. “If smaller enterprises contact us we can tell them where to go and the same for international inquiries.”

### Playing to strengths

Swentec is using its position as a national centre to compile in-depth reports on the various sub-sectors under the environmental technology umbrella. Its first, published earlier this year, concerned biofuels and bioenergy. It highlighted companies with high potential and looked into the various types of support they need from authorities or agencies. It became one of the sources for US Ambassador Michael Wood’s list of promising Swedish companies presented to American investors.

“When we made this investigation about bioenergy and biofuel we mapped what kind of companies we have in Sweden, and then we looked at the pos-

sibilities,” says Gullbransson. “Then we presented our materials to the Swedish Trade Council, who then looked at what foreign markets these companies could fit into.”

A similar effort will now follow for the water treatment area and the waste handling and waste management sector, where Swedish companies have a wealth of experience and competence. “Again we will look into what we have and what our strengths are in Sweden. “We have to focus on being in the right place and on working with others,” says Gullbransson.

Swentec was part of a Swedish delegation – which also included Environment Minister Andreas Carlgren – which visited California in January. The trip was part of the Memorandum of Understanding between Sweden and California, and among Swentec’s contributions was a seminar on biogas held in Sacramento and another on the Sustainable City concept and energy efficiency, held in Los Angeles.

“There was great interest from the American companies, especially from dairies and farms and how to upgrade to use biogas,” says Gullbransson. “There was also considerable interest from various agencies, the energy authorities and the environmental department on how to get that knowledge at the policy level.”

Swentec is also in the process of compiling a report on the market with the biggest potential for environmental technology firms – China. “We have a lot of big companies working in China, and there are many regional initiatives underway, lots of contacts between municipalities, but now it is time for business,” says Gullbransson.



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Berit Gullbransson: ‘our role is to coordinate and concentrate’

PHOTO: ESTER SORRI

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## Irish to invest in Swedish wind power

Irish renewable energy group Airtricity is to invest €800 million in wind farms in Sweden as part of a drive to increase its wind power operations in Europe outside its domestic market.

The company, one of the world’s largest wind generators, has spent six months examining the Swedish market and locating business partners, receiving assistance from Invest in Sweden Agency in this process.

Airtricity chief executive officer Eddie O’Connor says: “Sweden offers great conditions for wind power – partly because there are large uninhabited areas of land and partly because the financial incentives provided by the Swedish government make it easy to establish profitable wind farms.”

The company, which has just launched operations in Portugal, aims to build 125 wind turbines in Sweden and expects its investments to lead to the creation of 20 jobs in the country. Airtricity is planning to build its first Swedish wind turbines in 2008 or the year after.

“Wind power is the most profitable form of renewable energy we have today,” said Örjan Hedblom of Swedish wind power association SVIF. “It only takes three years to build a wind farm compared to up to ten years for hydropower or nuclear plants.”

The main problem for wind generators is a shortage of turbines, which has pushed up prices and causes project delays.

## Climate expert is top of the profs

• He has been labelled “the pop star of climate change” by one Swedish tabloid and has emerged as one of few recognisable faces in the wall-to-wall media coverage of the climate debate in Sweden.

Christian Azar:  
‘technology is  
doubled-edged sword’

While the same newspaper’s claim that “when the long-haired professor Christian Azar talks climate, women faint and kids swarm around him as if he was a pop star” may be overdoing it a bit, the football-playing, salsa-dancing academic is in huge demand as a speaker, panelist and interviewee.

Azar, 38, is Professor of Sustainable Industrial Metabolism at Chalmers University of Technology in Göteborg. His image is just about as far away from that of the typical academic as it is possible to be – he listens to Bob Marley, for instance – but his credentials are impeccable; he is on the board of several international journals and a member of a number of international research groups and committees, including the Intergovernmental Panel on Climate Change (IPCC).

Through his research, Azar aims to understand the long-term dynamics of energy and materials use. Among the issues he deals are where targets should be set for concentration of CO<sub>2</sub> in the atmosphere; what sort of policy options will encourage the likes of China and Brazil to accept targets; and what technological options are available to meet those targets.

Among his tools he uses is energy systems modelling – developing models of the global energy system and setting targets for the atmospheric concentration, and then letting the model pick the technologies that provide the required energy, but at the same time meeting the carbon emissions constraints introduced into the model.

Using such models, Azar has shown that the limiting of emissions will not necessarily have to come at the expense of further economic progress in the developing world. “At present, industrialised countries emit roughly ten times more CO<sub>2</sub> per capita than developing countries,” Azar says in an interview on Chalmers’ website. “If we are to stabilise the climate at levels that may be considered safe, CO<sub>2</sub> emissions should ultimately be reduced to levels below those prevailing in developing countries today. Meeting the objective of the UN convention on climate change is not an easy challenge. We have, nevertheless, developed energy system models that demonstrate the technical and economic feasibility of meeting stringent emission constraints at the same time as welfare improvements are achieved throughout the world.”

Azar says that technology is a double-edged sword – it is both the cause of many environmental problems and also a key to solving them. “Combustion of fossil fuels causes CO<sub>2</sub> emissions while solar cells might offer ways of obtaining cleaner energy.” He points out that cars in the 1930s consumed less fuel per kilometre than the average car of today. “The reason of course is that other characteristics, such as acceleration, speed, safety and comfort, have been

considered more important than fuel efficiency. Whether technology will bring us closer or farther away from environmental sustainability depends on the path technological development takes.”

### Rising sun

Renewable energy is a key leg of Azar’s research, and he sees solar energy and biomass as two sources with particular potential. He says the amount of solar energy reaching the earth is about 10,000 times greater than the total present use of fossil fuels, hydro-power and nuclear power. “It is important to make sure that there are niche markets where solar cells can thrive. This would create incentives for continued R&D aimed at solar cells and larger production volumes, which would lower production costs.” This, in turn, would enlarge the market potential for photovoltaic (PV) cells. “An analysis of the material requirements and constraints for new solar cells is necessary to gain an insight into which type of PV technology society and industry should focus on,” he says.

Azar says that biomass from short-rotation plantations is predicted to play a key role in the drive for lower CO<sub>2</sub> emissions, but highlights the concerns about the effects this could have on the food crops with which they compete for growing space. “Since bioenergy plantations generally are monocultures, this might have a negative impact on biodiversity. However, plantations may also be established to reduce erosion and prevent soil degradation. Furthermore, they would require large areas of bioproduktive land to play a significant role on a global scale.” Azar says there is a “considerable risk” that bioenergy will compete with food production, as farmers will grow energy crops if there is more money to be made from them than from growing food. “But since we need food, food prices will rise to the point where food production is competitive,” he says. “We have shown that this might increase food prices by a factor of two, although uncertainty ranges are large.”

While the urban poor may suffer at the hands of higher prices, some poor farmers may benefit from getting higher prices for their crops. “An improved understanding of the possible environmental and social consequences of large-scale bioenergy plantations is important when designing land-use policies, since it is possible to counteract at least some of the potentially negative impact,” says Azar.

According to Sweden’s “pop star of climate change”, the sticking point when it comes to the widespread use of renewable energy is not so much technological as political. “There’s no scarcity of renewable energy, there’s just a lack of will to penalise fossil fuels so that the new technologies gain ground.”

## Cleantech fund rides the growth wave

• Sweden and the Nordic nations offer a wealth of interesting investment opportunities in cleantech companies, according to the co-founder of a private equity fund aimed at the sector.

Anders Frisk, together with American Andre Heinz, has started Sustainable Technologies Fund, which aims to invest in companies with proven clean technologies.

He says the conditions for investing in the sector are ideal. “Today we have a situation where we have both strong market drivers and a big and growing pool of companies. We are living in a situation where energy is a scarce commodity; we have an increasing population worldwide competing for the same kind of resources, which will drive up prices. It is gigantic fundamental change which will create a lot of business opportunities.”

Frisk thinks Nordic companies are well placed to capitalise on those opportunities. “We believe that the Nordic countries have very interesting technologies – maybe not the largest companies worldwide, but if you boil it down to the technology level, they have the leading technology in many areas.”

He points to wind and solar technology, cutting-edge wave technology, and bioenergy expertise. “Then you have the more traditional end-of-pipe technologies – recycling, purification, waste management, driven by legislation and subsidies, and a general desire among citizens in this region to take care of nature and the environment.”

### Pushing the pedal

Frisk and Heinz – scion of the food empire of the same name – launched Sustainable Technologies Fund in January 2007. It has a mandate to do investments worldwide, but is focusing primarily on the Nordic countries, and will invest in established companies with sales of €2m to €5m. “We are not targeting the seed or start-up stage; companies need to have a proven technology, they need to have a market that is out there asking for their products or services,” says Frisk.

Fully deployed, the fund will invest in about ten to 14 companies, at about €5m to €10m per company, with an investment period of five years. The fund’s lifetime is set to eight years, but could be extended up to ten. To date Frisk and Heinz have met with about 60 companies from their database of 1,000.

“There are a lot of companies that have until recently experienced a fairly slow but steady growth, that are now experiencing dramatic change due to the high and volatile energy prices, global climate change, energy security, together with the fact that cost per kilowatt for renewable energy technologies are coming down to healthy levels,” says Frisk. “Many of the companies we meet are up and running, they have products, they have clients, but they are not used to this situation, and are thinking about pushing the gas pedal harder and taking their chance to ride this growth wave.”

Frisk says Sustainable Technologies Fund aims to be an important partner for these companies, sharing the risk and providing the necessary expansion capital to take a company and its products on to the export market. “We are not primarily seeking to take a ‘tech bet’ where you invest in unproven technologies that might have a market in ten years.”

### Time and experience

The fund seeks to take a 20 to 49 per cent stake in companies. “The idea is not to come in and run the company,” says Frisk. “The companies must be run by the entrepreneurs because they are in an entrepreneurial phase. Therefore we are not interested in having a majority stake.”

He says they will focus on being specialists in one stage and in one sector. “It is my experience and my belief

that if you are going to do venture investing, a lot of it is about managing growth, hiring people, being close to the entrepreneurs, adding experience and time.”

Not casting their net too widely will also be important. “We will not invest in too many companies,” he says. “We will be more involved and deploy more money over time, instead of spreading the risks worldwide as many other cleantech investors and other generalists do.”

Heinz and Frisk will exploit their respective networks – Heinz in the US and Frisk in China – when the time comes for the companies to grow internationally.

Frisk and Heinz both have extensive experience of sustainable development, such as from the Swedish-based non-profit organization The Natural Step, which specialised in education and consulting around sustainable development. Frisk says this experience is fundamental to their investments. “This is a fairly new industry and there are a lot of fund managers interested in doing something here, but just like any other you have to know the industry you are in. You don’t have to know all the technologies down to the detail level, but you have to have an overview on the fundamental market drivers and why that is happening.”

### Corn versus cars

He points to the ethanol industry as an example. Until recently corn- and sugar cane-based ethanol was held up as a potential long-term replacement for petroleum, but in recent months question marks have been raised about its long-term sustainability. “I’m not saying ethanol is wrong, but as an investor you have to take into consideration how ethanol as a transportation fuel fits into the long term. People start to realise corn- or sugar-based ethanol is competing with food and agricultural land. Is it really sound that we have Americans running around in their SUV’s powered by corn-based ethanol while Mexicans can’t get food on their table because corn prices have doubled?”

Frisk says their fund is more interested in, for example, biodiesel, which doesn’t necessarily compete with agricultural land, has a broader feedstock, can use waste products, and allows more efficient combustion. “That is taken from a strict resource sustainability perspective, and when investors start to understand that, that will have dramatic effect on how stocks will perform,” he says. “We apply the backgrounds we have with The Natural Step to our investment analysis. That is a way to avoid risk from a strictly scientific and business perspective. Other investors try to do good both financially and for the environment, but with a lack of competence the good intentions might go wrong. And that is bad for sustainable development, because then critics will get fuel for their arguments that it was just a bubble with nothing behind it.”

Anders Frisk:  
‘change  
creates  
business  
opportunities’



# Forest sector takes key role in climate issue

• Studies by NASA and Columbia University blame manmade greenhouse gases and warn of dangerous climate consequences. Although carbon dioxide emitted from petrochemical products in combustion engines is the major culprit, reducing emissions in fields such as the forest industry promises feasible, faster, and significant reductions.

For Sweden's forest industries, providing vital goods and services in an efficient and a sustainable manner has become part of daily business challenges that are being undertaken by the sector's own trade and employers' organisation, The Swedish Forest Industries Federation (SFIF). The federation represents around 60 pulp and paper mills owned by 29 groups of companies and some 150 sawmills owned by about 80 companies, plus other firms closely affiliated with pulp, paper and sawn timber.

During travels abroad, Marie S. Arwidson, SFIF's Managing Director, has observed that "our firms are among world leaders in develo-

ping certification, sustainable forest management and also environmentally-oriented processes in our factories".



Green growth: Swedish forest industry is a leader on environmental issues

wood provides energy for warmth, cooking, and so on. A healthy forest industry demands new planting and maintenance. These are major opportunities through which the forest industries can contribute to societies," says Arwidson.

Forest products contribute to dampening the greenhouse effect by absorbing carbon dioxide and furthermore by storing this in trees and wood products. Producing lumber requires less energy than plastic, metal or concrete, and

wooden buildings capture carbon for hundreds of years. As an example, an ordinary EU home contains 12-20 cubic metres of wood, and therefore can store up to 13 tons of carbon dioxide.

"The more forest that grows, and the more forest products that we use, the better that it becomes for the climate," says Arwidson.

## Priority with politicians

"Things are serious now," says Lars-Erik Axelsson, who works with energy and political issues at SFIF. "This is a high priority issue, and many politicians now realise that it's possible to find solutions by taking advantage of opportunities that are available in Sweden's forest industry."

Unlike fossil fuels, forest products can be converted into energy that can be replenished. Numerous Swedish companies (such as Holmen - see accompanying article) are involved in the production electricity and biofuel. For paper production, recovered fibre has become an increasingly important raw material.

The forest industry is Sweden's largest consumer and likewise producer of biofuel. Averages for Swedish forest industries show electrical energy consumption being 20-25 per cent self sufficient today. The branch uses some 22 TWh annually, of which five are generated by forestry companies themselves, and this is predominantly from biofuel. A further increase in output from 5 TWh to 6.5 TWh per year can be expected. Only ten to 15 per cent involves fossil fuels, and Axelsson thinks that this portion will continue shrinking.

Christina Wiklund, Environmental Director of SFIF, declares, "We must break our dependency on oil. Here is where raw materials from the forest have great importance."

She reports that, since the end of the sixties, pulp and paper production in Sweden has doubled while, at the same time, energy consumption for this volume has decreased by nearly 80 per cent. The TMP process has also helped to reduce oil consumption. In addition, SFIF's policies promote far reaching environmental implementation in the forest industry's transportation activities, both over land and at sea.

"The Swedish Forest Industry will participate and develop both diversity and increased production so that the forest can be sufficient both for raw materials as well as increase availability of biofuel," promises Arwidson.

## Environmentally friendly papermakers

• On the Financial Times Sustainability Index, FTSE4Good, Storebrand SRI and Global 100, Holmen ranks among the world's best companies in terms of sustainability.

The entire Scandinavian forest products industry, and especially the Holmen Group, is far ahead when it comes to the environment, says Lars Strömberg, Group Director of Sustainable and Environmental Affairs.

With three decades of experience within the forest products industry, Strömberg's responsibilities include producing the firm's environmental reports, which Holmen has done now for a dozen years. Published since 2004, their yearly sustainability report is "about more than just the environment" and has "become something of a reference book for everyone who is interested in our company," says Strömberg.

## Holmen's world

While reaching beyond corporate business itself, this environmental report, "Holmen and Its World", shows the firm's selection and use of raw material and resources, its development for the future, an overall and comprehensive concern for the environment and the company's high standards of social responsibility are described.

Holmen meets a lot of its electricity requirements from internal sources. Holmen also owns, wholly or in part, 23 hydropower stations that produce 20-25 per cent of its total electric energy requirements. In addition, the Group produces back-pressure power at some of its biggest mills, so the self-sufficiency ratio is about 30 per cent.

"Energy costs a lot of money, and we use a lot of energy at Holmen, especially at Holmen Paper, our printing paper business area. Therefore, it's in our interests to keep energy use as low as possible," says Strömberg.

With over a million hectares of productive forest land in Sweden, Holmen's business is based on wood raw materials from sustainably managed forests. In the next five years, the Group expects that the need for fossil fuels at the Swedish mills will be reduced by 75 per cent. This will reduce carbon dioxide emissions by 200,000 ton.

## Homemade energy

Biofuel, mainly in the form of bark and wood-containing liquors from the sulphate pulp process, covers about half of Holmen's thermal energy requirements. Combined with heat recovered from the TMP process, almost two-thirds of Holmen's thermal energy needs is produced internally.

The company estimates that it will be possible to more than double production of biofuel in Sweden within about 15 years. "Besides using biofuels, many of the energy saving measures being adopted by Holmen entail procedures, construction and other activities at our facilities that increase our Group's overall effectiveness," says Strömberg.

EU targets stipulate 56 per cent recycling of papers and periodicals. About 70-74 per cent of Swedish paper is recovered. In 2006, Holmen used 1,025,000 tonnes of recovered paper at two Swedish mills and one Spanish mill. Advanced water utilisation and purification is another far-reaching endeavour of the firm.

Higher yield per hectare is another environmentally-friendly accomplishment, and Holmen aims to increase in its forests' growths by 25 per cent in 30 years. In the longer term, they believe that 50 per cent is attainable.

Company statements assert that solutions for environmental problems perhaps present mankind's greatest challenge. They maintain positive approaches toward initiatives to master these threats. "Our sustainability activities put Holmen at the forefront in the public eye," says Strömberg.



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## Boom time for bioenergy industry

Forest waste is a major source of bioenergy in Sweden

• Growing global concern for climate change has meant a bonanza for Sweden's bioenergy industry. The ever-increasing flow of official reports, documentaries and newspaper articles about mankind's impact on the planet, as well as fears of rocketing oil prices, have been matched by spiralling orders among boiler makers, biofuel producers and bioenergy consultants.

"The increased interest in climate change and renewable energy has had a huge effect on the industry," says Kent Nyström, MD of Svebio, the Swedish Bioenergy Association. "I have talked to manufacturers who have not been able to answer all the queries they receive. They are just too busy."

Sweden has become a leading bioenergy nation through experience. With no domestic reserves of coal oil or natural gas, the country was forced to find alternatives by the oil crises of the 1970s. So while other nations are now rushing to develop renewable sources of heat and fuel and the equipment to burn them, Sweden is able to draw on around 30 years of experience. Today more than a quarter of the nation's total energy demand comes from biofuels, generating more energy than hydropower or nuclear power, and accounting for more of its heating needs than oil.

Nyström says that Sweden does not have any specific specialities in the field. "It is hard

to put your finger on one sector – we are good at all of them because we have dealt with them for so long. We are pretty unique because we have such a big broad home market. We have small, middle and large scale. We have gaseous, liquid and solid biofuels. We have electricity production, heat production, liquid fuels for vehicles. I think we have all sectors covered at the same time. And we are somewhat unique with our big district heating sector which is mostly bioenergy fuelled. Sweden is a big collective heating country and on these heat demands we produce electricity as well."

About 115 terrawatt hours (TWh) of bioenergy are produced each year in Sweden, a figure which has grown from 48 TWh in 1980. This comes from five biomass sources: bi-products of the forest industry, such as sawdust, bark and rotten wood; black liquor, a bi-product of the pulp industry which produces electricity, steam and heat for the industry and accounts for about a third of Sweden's bio-

energy; farming crops, such as wheat which is used to make ethanol for automotive fuel; peat; and industrial and domestic refuse, which can be burned to make biogas.

### 'Bubble won't burst'

KMW ENERGI, which develops and manufactures biomass-burning combined heat and power (CHP) plants, is one of the recent success stories. Last year it took orders valued at around SEK 700m on the Nordic market alone, and this year it expects export orders to start rolling in.

Sales manager Christer Rosendahl says: "I usually compare it with the IT bubble, but this bubble will not burst. I think that we are in the same situation, not just with bioenergy but renewable energy in general, but the difference is that this market has more substance. This is about energy, this is about surviving. There are a lot of big issues mixed up here. From top politicians to an ordinary person filling their car with petrol this is a huge issue and a huge market."

Rosendahl says that being a Swedish company can have its advantages when looking for business overseas. "Companies abroad know that Swedish companies have this experience

and they trust Swedish companies. Our licensee in the US said that even the Americans recognise that the Swedes are best in this area."

But Rosendahl says he would like to see more help from the Swedish government for domestic companies looking to break into the export market. "We have the know-how, we have the technology, we have the experience, but we do not have the power of Volvo or Ericsson."

### Help wanted

All this interest has meant that Swedish firms are expanding as never before, particularly in the biggest growth area of middle-sized boilers and middle-sized cogeneration plants.

"They will have to increase their personnel and get more subcontractors," says Nyström. "If they dare to expand, it is the right time to do it."

He says that while many are trying to take on new staff – KMW Energi is in the market for five new engineers to cope with demand – they are not doing so at the rate the branch organisation would like them to. "It is a big step to double the size of their enterprise. You have to get investors to invest in more workshops, you have to start cooperation with other equipment manufacturers, and there are many potential problems."

But there is hesitation to expand among some companies. Nyström says that some family companies are wary of bringing in external investors, while others are uncertain just how long the good times will last.

Svebio was founded in 1980 when bioenergy accounted for about ten per cent of Sweden's energy supply, most of it used internally within the forest industry. A non-profit organisation, Svebio has played a major role in the development of bioenergy, initially providing the network necessary for the commercial use of wood chips in district heating systems. Its conferences have played an important role in turning bioenergy into a commercially-accepted fuel.

Svebio also takes part in delegations abroad in cooperation with the Swedish trade Council and Swedish embassies. A recent matchmaking event in Dublin shows just how much interest Swedish bioenergy companies are generating abroad. "There were six Swedish companies there and 155 Irish delegates, most of them representing companies, came to meet them," says Nyström. "There were about 20 Irish companies interested in joint ventures, buying licences, or becoming a retailer for each Swedish company."

Nyström says that offers have poured in for Svebio and its member companies to visit countries from China to Chile. "But I hesitate because these are not our closest and most natural markets. We must concentrate on closer to home. The whole of Europe is now open to us, and when Europe is full of Swedish equipment then we can go to South America and India."

DW

## New ethanol method turns waste into profits

• A new method for producing ethanol fuel from the waste products of the forest industry and agriculture has been developed by a company in Lund.

Taurus Energy was until earlier this year focused on prospecting for oil under another name. But in a sign of the times, it has switched from fossil fuels to the development of biofuels.

The environmental benefits of ethanol have been called into question recently, with reports pointing out that the large-scale growing of the plants from which it is produced will drive deforestation, push small farmers off the land and lead to food shortages.

But Taurus Energy's technology for making second-generation ethanol avoids these problems as it uses the leftovers of other industrial processes as its raw material.

"We don't use resources that would otherwise be used to support humans in some way, only waste products," says Lars Welin, Taurus Energy's managing director. "We turn this waste into profits."

Welin explains that ethanol has traditionally been made by heating a mixture of sugar,

water and yeast. "This sugar that you produce alcohol from in this way contains six carbon atoms in the molecule, but there is also sugar that has five carbon atoms in the molecule," he says. "Until now it has not been possible to ferment this kind of sugar into ethanol, but this is what our 12 patents are able to do. They can produce alcohol based on carbon five atoms in the sugar molecule. This is brand new."

The first generation of ethanol, available as E85 fuel today, is produced mainly from maize and sugar cane where only use the starch and the sugar is used. "So you use the fruits," says Welin. "With today's technology you cannot make ethanol from the stem, from the leaves and so on. In the existing process these are waste products which today are either burned or turned into animal feed, but we can use them to make ethanol with this new technology. And this can also be done all over the world with cellulose from trees. From the whole tree we can produce ethanol."

### Wide interest

Welin says the technology has great potential, with the biggest business opportunities in agricultural areas of southern Europe, the US, Brazil and India. "Wherever you have agriculture, then we have big potential."

Taurus Energy's business idea is to sell licences for the technology, and the firm recently signed a memorandum of understanding with an Indian company. "The company is involved in producing agricultural fertilisers, but there are many other types of company that are looking at this as a new potential business area for them," says Welin. "It is not only those involved today in gasoline production."

Taurus Petroleum has its roots in Lund-based Forskarpatent, which aims to support researchers with the commercialisation of their patents. Forskarpatent has over the last five or six years collected together 12 different patents around the production of ethanol filed by a number of leading professors working independently at different universities around the world. "When Forskarpatent had assembled these 12 patents they were considering how they could put them on the market in the best way," says Welin.



That opportunity presented itself in the form of Taurus Petroleum Development, a stock exchange-listed company which was involved in prospecting for oil in Morocco. "They didn't find any oil, but they had the company on the stock exchange and still had some money left," says Welin. "So it was decided that Forskarpatent should buy out approximately 70 per cent of Taurus. Then they changed the name of the company and its business switched from petroleum development to ethanol."

The researchers, who today own about 30 per cent of Taurus Energy, have been retained by the company to give technical support as it works on the process of introducing the technology on to the market. Their patents concern modifications made to regular bakery yeast used in the fermentation process.

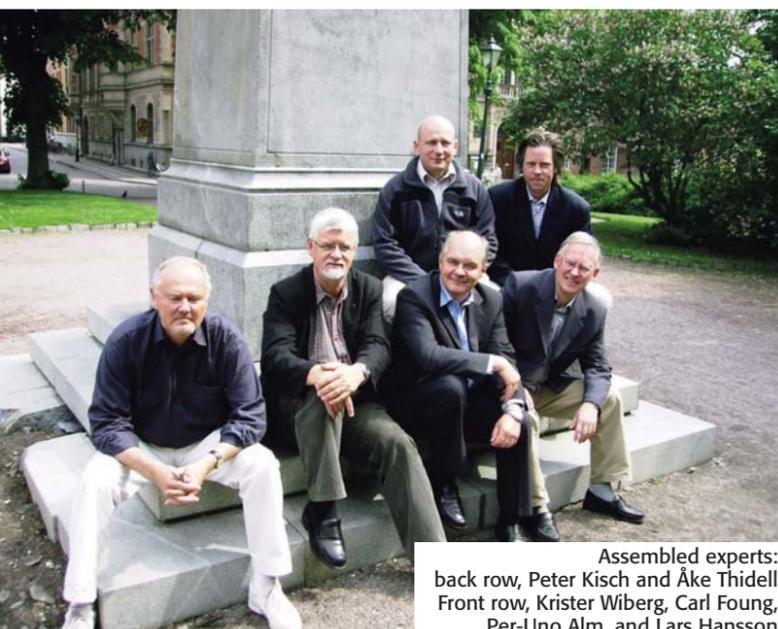
### Proven technology

Taurus Energy has proven its technology in laboratory scale in Lund and the next step will be to prove it in a pilot plant. Welin estimates that full-scale production could start in three to five years.

"We already have some very interested potential customers who are ready to purchase the technology as it is today, but for us it is more profitable if we can run it successfully in a pilot plant, and then the technology will be much more valuable."

# A bridge of sustainability between academia and society

• The International Institute for Industrial Environmental Economics (IIIEE) is engaged in multidisciplinary research activities with the aim of furthering systems of production and consumption that support sustainable development. It is part of Lund University – the largest institution of research and higher education in Sweden – and its watchwords are “prevention is better than cure”.



Assembled experts: back row, Peter Kisch and Åke Thidell. Front row, Krister Wiberg, Carl Foug, Per-Uno Alm, and Lars Hansson

Thomas B. Johansson, director of IIIEE, says: “The institute works on environmental protection in the context of sustainable development, and we do this through education and research with a more intensive interaction with society than the university at large. In the articles that follow are some examples of local interaction that we are engaged in towards the objective of sustainable development. This enriches the work at the institute, makes adapted research information available to partners, and helps increasing the penetration of new ideas in society.”

Project Coordinator at IIIEE Carl Foug

says that when it comes to climate change, there is no doubt that universities have a responsibility – and at the same time a great opportunity – to support society in its efforts to establish long-term “survival” plans. “But the level of success is also a question of how to organize a multidisciplinary approach.”

A group of experts has been assembled from IIIEE, DeLabs, Respect Europe and KW Architects. “We are acting as pioneers, getting knowledge and experiences – hopefully useful – for a new kind of relevant research and education, which will be needed and requested in future,” says Foug. “We probably also will open up for new kinds of exciting relations between the university and different actors in the society.”

Lars Hansson says that socioeconomic analyses of environmental impacts have become very important, both when it comes to assessment of environmental policies with support of cost benefit analysis, and in the implementation of market-based instruments such as green taxes. “This is especially relevant in transport and energy-related projects, but also more and more when it comes to ecosystem services in general,” he says.

Åke Thidell says that over the years, IIIEE has dealt with analyses of how individual enterprises relate to their environmental issues. “The aim has always been to provide guidance to preventative strategies for the enterprises’ individual environmental works, considering lowest possible negative impact from the activities.”

Krister Wiberg says that Carl Piper, who is featured in one of the following articles, is an extraordinarily good example of someone who wants to contribute solutions to the common and impending environmental challenge of climate change. “He is opening up for an interesting development of knowledge at the same time as he is – with characteristic bravery – cross-pollinating ideas.”

## Interpreting research

While Sweden’s universities – and indeed those elsewhere – are awash with creative thinking in the area of sustainable development, getting that knowledge out to society to be applied for the benefit of all remains a problem. DeLabs, in Landskrona, is a spin-off from IIIEE which acts an interpreter between these two worlds and so facilitates the spreading of that knowledge.

“There is a large chunk of knowledge that never goes beyond academia’s walls,” says Peter Kisch, DeLab’s director. “The other side of the coin is the fact that society – or more importantly the companies – only ask for things they know, along the same lines of thinking. So these are two worlds that do not really match. Our idea is to bridge this dysfunctional situation between academia and society, with a particular focus on sustainable development. Our prime focus is the fact that the turnover rate of knowledge is too low. We want to make things happen!”

Other projects DeLabs has been involved in cover areas from innovative marketing of high-quality organic food to dental applications for a tree resin to environmentally-friendly windows. “Our role is to act as a cata-

lyst or an interpreter of academic knowledge into those projects,” says Kisch. Taking the Högestad project as an example, he says the estate’s owner’s chief interest is the future of agriculture. “If he goes to the university and asks about pine tree forest management, for example, the problem is that he gets a very specific answer. But initially he doesn’t need a specific answer; he needs a more holistic and generic strategy of which direction he should be going, and then you can hook in the different detail ideas. In that sense the group act as a partner and a catalyst for moving knowledge from research to companies or society in general.”

## Fundamental shift

Kisch says there is underway today a fundamental shift in the way research is done. “We are moving from the old days in which universities were studying the world and then delivering the truth because knowledge and research are now accessible to all. So the research and innovation process is changing itself,” says Kisch.

“There is no way you can drive development with the old way of thinking. When you talk about acceptance of new solutions, then you need to interact more with society. Faced with the twin challenges of the rapid development in society and the growing threat of climate change, universities should focus on finding mechanisms or organisational setups to allow for the movement of knowledge to society.”

“The traditional way for a university to work and think is to be independent and say that nobody should interfere with what we are doing,” says Kisch. “But I don’t think that is a very good way of moving ahead. Universities no longer have a monopoly on knowledge and research, so if they don’t get accustomed to the new world of abundant knowledge and research, then they are going to have problems. It is a question of survival for all parties.”

## Report guides port growth

• The seaside town of Ystad, on the southern tip Sweden, has long been an important connection point with the Continent across the Baltic Sea. Now Poland’s accession to the EU has opened up new trade and tourism opportunities in both directions, and the municipality of Ystad – best known abroad as the setting for the best-selling Wallander crime novels – is keen to capitalise on them.

The town’s port, through which timber and wood products head south, and steel, chemicals and Ikea furniture come north, is set for a major expansion to allow for what port officials hope will be a doubling of traffic.

As part of the planning process, the Port of Ystad turned to IIIEE to assess what challenges and opportunities the expansion would create, as well as its effect on the environment and the local community. “We wanted to get a neutral view of these connections between the environment, the economy, port handling and so on,” says Lars Börjesson, MD of Ystad Hamn Logistik, which runs the port.

Deputy MD and financial manager Johan Lundqvist, says the report looks at the macro-economic impact of the port. “What they have done is they have tried to calculate what the financial aspects of the environmental impact are.”

Ystad port handles 1.8m ferry passengers each year, of which 1.3m pass through on the way from the Danish island of Bornholm to Copenhagen. The other half million are travelling between Ystad and Swinoujscie in Poland. The latter is the source of the bulk of Ystad port’s freight, with around 2.5m tons passing through the port each year.

Börjesson says that an expanded port would make it an attractive destination for other ferry operators. “Other owners in the Baltic are showing an interest in us so we have to plan for that.”

An expansion of the port is also needed to enable it to take the next generation of ferries. “Traffic has increased considerably in recent years and the port is too narrow for the vessels,” says Börjesson. “We have a maximum length today of 170m and the next generation of ferries will be 207m. The draught is also not enough – we have a depth of 7.20m guaranteed and it allows us 6.50 maximum, and they are close to that today.” The expansion of the port will replace the existing three shorter ferry

berths with two longer ones, the inner breakwater will be removed and the outer one added to. In total 1m cubic metres will be dredged from the port to allow for bigger vessels.

## Uniquely long-sighted

Such a large redevelopment brings with it a number of environmental considerations which IIIEE’s report examined, such as moving port operations to the far side of the port and away from residential areas of the town, and reducing noise and emissions from the port. This could be achieved by allowing ferries to connect up to mains electricity and therefore turn off their engines while in port.

The report, which is believed to be uni-

que in its long-sighted approach to the redevelopment of a Swedish port, has been used in the port’s application to Sweden’s Environmental Court and in its application for EU funding through Motorways of the Sea.

The expansion of the Port of Ystad has at times been a sensitive issue in the town, but Börjesson says he hopes the report has gone some way to alleviating people’s concerns. “There are a lot of feelings involved in this subject. It is a tough mission to convince people that things are not as bad as they think they are, so this is why we need a report such as this. [The report’s authors] were out in the town meeting people, doing interviews and at public meetings they stood up and give their professional view on these questions.

“This was the first step in our cooperation with the institute but I am sure we can continue it.”

At present the port is somewhat disconnected from the rest of the town and there is nothing there to attract casual visitors to the area. But the report also addressed how the port area can be redeveloped to make it a part of the town. “The report had some good solutions about how this could be done and how the town could benefit from the port even more than it does today,” says Lundqvist. Börjesson adds: “A key question was ‘is Ystad a port town or a town with a port?’ We would like it to be a port city.”



Officials at the Port of Ystad are hoping to double its traffic

PHOTO: © YSTAD HAMN LOGISTIK AB

# Power to the people

PHOTO: FOREST AND KIM STORER



Lund Energikoncernens's planned biofuel powerplant (below) could be fuelled by hemp and elephant grass

• As an energy provider, Lunds Energikoncernen has to take account of the demands of both its customers and its owners on issues of price and environmental impact. But because it is municipally owned, it does not have to focus as hard on the bottom line as some of its competitors, and so is able to think and act a bit more long term.

"If you are a privately-held energy company then you are just in it for the money, but I guess one of the benefits of a municipality having an energy company in its portfolio is that it should be able to use it in the community's best interests," says Magnus Thysell, Lunds Energikoncernens's head of business development.

Those best interests include reducing the impact of Lund Energikoncernens's operations on the environment, both on the local and the global scale. The company already sources 63 per

cent of the fuel it uses to generate energy from renewable sources, with just 14 per cent from fossil fuels, and has managed to reduce CO<sub>2</sub> emissions by over 100,000 tons. But it wanted a more long-term environmental strategy, and so turned to IIIIEE. "This is obviously a very broad topic, and IIIIEE help us find out what we as a municipal energy company should be focusing on," says Thysell. "To be honest I was not sure what they could do for us, but after we met it was clear that they had done this before. We are a Swedish company with a focus on southern Sweden, but feel secure that we have a partner that has their hands on the whole picture."

## Brand benefits

Thysell says there are both ideological and purely business reasons behind taking a more long-term view of operations. "Obviously we would like to make some money out of it, but had we been a company listed on the stock exchange or privately held, I think the middle-term focus would have been so much greater. But I would be lying if I said that everything that has happened recently has not had a big impact on what both we think and what our customers think. The Stern Review, the Al Gore movie,

and a number of Swedish TV programmes have really brought up the focus on climate issues in the company."

Lunds Energikoncernen is the fifth-biggest energy company in Sweden in terms of infrastructure and has 163,000 customers throughout southern Sweden. Owned by Lund, Lomma, Eslöv and Hörby municipalities, it has been ISO 14001 certified for a number of years, but has never used an environmental commitment in its sales pitch.

"That is what we want to do now, to focus on being a sustainable and environmentally-friendly supplier of energy services," says Thysell. "I think where we will definitely find a benefit is in the trademark. Just be able to create an environmentally-friendly profile will create value, because we have seen in the last couple of months that customers are looking for energy suppliers who are climate neutral."

## Local knowledge

Thysell says that while environmental expertise was top of their list when they approached IIIIEE, the fact that the internationally-renowned environmental institute was in their backyard was a bonus. "Basically we were after knowledge, but obviously it is a huge advantage that they are here in Lund. We are in southern Sweden so we could be working with a university in Göteborg or Växjö or elsewhere. But with everything else that is happening here in Lund – the possibility of getting ESS here, a huge drive for wind power – it seems like there are so many different jigsaw pieces that fit together."

The local aspect should also help with creating contacts with other actors. "What IIIIEE will help us with is to create opportunities for us to meet companies or private investors or entrepreneurs here in our geographic area, and that will be more dynamic for us."

Thysell says that with consolidation in the Swedish energy industry continuing, one of Lunds Energikoncernens's main strategic goals is to grow. Renewable fuels will play a key part in that growth: the company is planning a new 155MW biofuel-burning combined heat and power plant, and the possibility of buying forests or buying farms to grow biofuels has been discussed. Thysell thinks that linking up with other municipally-owned power companies in Sweden will also be necessary long-term. "We think that for our customers we are a better alternative than a foreign-owned company. What we would like to see is that municipalities around Sweden combine their forces on windparks, biofuels and biogas projects."

# A 150-year perspective

• For many company bosses, thinking long-term means thinking ahead to Q1 next year. Carl Piper works on an altogether different scale: about 150 years.

Piper is Skåne's largest private landowner and the recipient of awards for his work with sustainability on the Högestad and Christinehof estate which has been in his family for 13 generations. The aim of his stewardship of the 13,000 hectare estate, which is roughly half agricultural land and half forest, is to minimise the negative environmental impact on the land while increasing the positive. Steps include extensive planting of deciduous trees, organic farming methods, and opening up the land for recreation and cultural activities. IIIIEE has become involved to help guide Piper as he plans for the next century and beyond.

The estate was founded in 1747. One Christina Piper – the current owner's great-grandmother – started a mining business around the alum found in the area. It was the only known source in northern Europe at that time and she became very rich. Under the fideikommiss (estate in tail) system, she received the estate against a pledge to pass it to the next generation in the same or better condition. The system was abolished in the 1960s and the land is today owned by a company of which Carl Piper is managing director.

"Creating this back in 1747 was a kind of sustainability, although maybe not in the way we look at it today," says Piper, who as a member of the nobility has a title, but refuses to use it. "It was sustainability in the way it was passed from one generation to the next. The other way of looking at sustainability is related to how fast we see the climate is changing and what that means for our way of doing business. It scares me. For my children I am not too afraid, but for my grandchildren I am very afraid. I don't think we realise how great the changes are that we have to make to our way of living to cope with this."

## Looking into the future

Piper says that taking a long-term perspective on the running of the estate is crucial, which

is why the input from IIIIEE has been so appreciated. "For many big companies their way of looking at time is from Q1 to Q2. Then you have the politicians, and they think in terms of four years until the next election. But when we plant beech trees today it will take about 150 years before they are ready to cut."

The estate has a ten-year rotation plan for its 7,000 hectares of forest. A decision was taken in 1993 to replace the softwood species with hardwood. At the time the forest was about 70 per cent softwood, and the plan is to change that to 70 per cent hardwood over the coming decades. "There is no future for softwood in this part of Sweden," says Piper. "We are already south of the southern limit for where it grows naturally, and with the current rate of climate change this limit will move further north. There is no reason to put something in the earth that the earth does not want to have."

Growing crops for biofuels is a possibility for the estate, although no decisions have been made. Houses on the estate are already heated by a small-scale district heating system that burns bales of straw, and they are investigating a renewable alternative to diesel for the vehicles – either ethanol or biodiesel.

Currently 20 per cent of the agricultural output is organic – a proportion Piper would like to increase. "But it is not that easy because the whole farming system is adapted to the chemical farming way," he says, pointing out that there are no mills or bakeries in the area for the organic grain they have grown previously.

Experts from IIIIEE are putting the final touches to a report on the long-term possibilities for the estate. "What IIIIEE has done is to give us knowledge, and the possibility to get more knowledge," says Piper. "We have asked them to look into the future and try to understand what the world will be like in 50 years and 100 years and how can we adapt to that. Not only the physical changes, but also related to how our minds will change and what it is that makes our minds change."

"So IIIIEE is one of our most important partners when we try to look into the future. But also for me personally. I dropped out of Lund University some 45 years ago, and now I am back."

Carl Piper and his son Fredric: 'IIIIEE has given us knowledge'



PHOTO: STRIKEN QUAPP

# New technology boosts biogas profitability

• An award-winning technology from a new Lund company promises to increase the profitability of biogas plants. Biogas Optimizer will also add an element of stability and reliability into the currently unstable biogas production process.

Biogas Optimizer has been developed by Bioprocess Control, which was on the list of 30 exciting Swedish companies which the US ambassador to Sweden presented to US venture capitalists earlier this year. The application was named the year's top cleantech innovation at a recent Swedish innovation competition. Now the company behind it is seeking both financial backers and partners in the biogas industry to help bring the technology on to the rapidly-growing market.

"We bring to the market a way to both increase the stability of the process and accelerate the production of gas," says Bioprocess Control's managing director, Kristofer Cook. "For some of those who invest in biogas production the profitability is quite low, so our ambition is to increase the profitability by getting more biogas out of a production facility." Cook says that increases in gas production of the order of ten percent are possible with the technology, although considerably greater increases can be achieved.

The technology was one of a number being developed at Lund University by Jing Liu, who is one of the leading researchers in the field. "We decided that this application was the one that had the greatest likelihood of being a successful first product from a portfolio of many

other products," says Cook. "We are merging two different areas: an understanding of biotechnology and biogas and industrial automation."

Dr Liu, who is today head of R&D at Bioprocess Control, was recently selected to lead the biogas research group at the newly-formed Chinese Academy of Science Qingdao Research Institute for Bioenergy and Bioprocess Technology. "This will allow us to gain access to an exciting pipeline of new innovations as well," says Cook.

## Better knowledge, better management

Biogas plants are typically built in an over-dimensioned fashion – that is, the reactors are much bigger than the actual capacity utilised. This means systems are operated way below their maximum capacity, and thus there is scope to increase gas production.

"What our technology does is measure different parameters in the environment," says Cook. "With this information we control how much substrate gets pumped in and when. Better knowledge of what information exists allows for better management of the system."

The basic principle is much the same as with a turbocharger in a car. "With a turbocharger you introduce more gasoline to the motor and get more energy out of the engine. In our case you introduce more substrate into the reactor and get more biogas out over the same amount

of time, at the same time as you get increased stability."

Biogas Optimizer will not be an off-the-shelf solution; rather it is 90 per cent complete with the remaining ten per cent specially adapted to each site.

"The good thing about our system is the digestion technology works today – it is not like we are introducing a whole new way of generating renewable energy," says Cook.

"There is a long history of biogas production, large-scale production is growing substantially, and this growth will continue globally as biogas becomes a step on the road towards a hydrogen-based society. What we are doing is simply optimising an existing process." Cook says that other knowledge-based optimisation techniques will be integrated into the product.

Bioprocess Control and its application have received much coverage in the trade press, which has in turn led to widespread interest from the biogas industry. "It is something of a unique position when potential customers actually call you, and now it is about capitalising on that position," says Cook.

The company was formed last year, and at the moment product development and business development are developing in tandem. "We are certainly not going to wait for the perfect product to be developed," says Cook. "We are testing the product on a pilot scale basis, and from that we will go on to a number of early adopters next year. Then we will increase sales activities in parallel with our development activities."

Bioprocess Control aims to partner with project managers at biogas sites, distributors of biogas related technologies and other organisations with an interest in the biogas industry. "We are a niche player and I think we fit nicely into the value chain," says Cook.

Kristofer Cook and Jing Liu: award-winning innovation



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# Environmental objectives get business backing

PHOTO: BO LIND/WWW.IAGCBANK.SWEDENSE



A balanced marine environment is one of the objectives

• If Sweden is to achieve its highly ambitious Environmental Quality Objectives (EQOs) the engagement of the business community is needed. So the involvement of Svenskt Näringsliv (the Confederation of Swedish Enterprise) in the next in-depth EQO report to the government has been welcomed as a positive step.

“Swedish enterprises are a key player in order for us to reach the objectives,” says Robert Andrén, head of secretariat at the Environmental Objectives Council, which was set up to promote consultation and cooperation in implementing the EQOs. “That the private sector and Svenskt Näringsliv are more positively into having a discussion, having a dialogue and contributing is something I perceive as very, very positive.”

The EQOs were adopted by Swedish parliament in 1999 with the aim of handing over to the next generation a society where the main environmental problems have been solved. The 16 objectives include reduced climate impact, clean air, a non-toxic environment, a balanced marine environment, thriving wetlands and sustainable forests. To reach these goals, set for the year 2020, public agencies, organisations, enterprises and individuals in Sweden are all expected to devote more effort to environmental issues and sustainable development. Interim targets have also been set.

## Costs of inaction

The Environmental Objectives Council is in the process of compiling one of its four-yearly in-depth evaluations to the government which will examine not only what progress has been made towards achieving the objectives, but also proposing new tools and policies to make them achievable.

The Confederation of Swedish Enterprise’s contribution to the next report will include an analysis of to what extent SMEs have incorporated the objectives into their operations, another looking at how larger corporations have taken them into consideration, while a third examines views on the EQO from within the private sector.

Also new to the next report, due to be delivered to the government next year, will be an analysis of the potential consequences of measures taken to protect and improve the environment.

“If there is a ban on, for example, using fossil fuels in agriculture, then that will have a bearing – a cost – on the agricultural sector,” says Andrén. “We need to look at how big that cost is and what kind of effect that will have on other political objectives like having a living rural environment. On the other hand, and this is very important, we have also said that

there is a need to give a picture of the socio-economic consequences of not bringing in such a ban; what would that mean for bad air quality and what would that then cost society in the number of deaths and costs for healthcare? It is not just the costs of action, but also of inaction.”

So now all authorities, both at the regional and national level, and private organisations and enterprises that contribute to the report, should take consequences into consideration. “If you propose a new tool or a new measure, you need to give us a good picture of the socioeconomic consequences,” says Andrén.

## Growing awareness

Until now, coloured smiley faces have been used in the reports to show the progress made towards the objectives. In next year’s report, arrows will also be used to show the trend for each objective: that things are moving in the right direction, even if the target will not be reached, for example, or vice versa.

“What we have realised is that the closer we are getting towards 2020, the more red faces we will probably have,” says Andrén. “It is not easy to reach these objectives – they are very ambitious – but by using the arrows we will show the trends behind the objectives.”

Andrén says that despite the fact that all of the objectives have earned either a red face (unlikely to be achieved) or yellow face (could be achieved if considerable effort is made), the trends behind most of the objectives are looking positive.

Also positive is the growing awareness of environmental issues, says Andrén. “What we are seeing is an increased focus on environmental problems; people are more conscious now. That has followed from having climate change on the political agenda and in the media more. What we see today is that more and more actors in society, among private enterprises, organisations of various kinds, are becoming involved.

“Also today we have four out of five local municipalities with local environmental objectives based on our national ones, or about to finalise them. That, together with the fact that all 21 county administration boards now have their own regional objectives, shows that the awareness is growing.”

# Water treatment expert wins Stockholm prize

• A pioneer in the development of the understanding of biological and chemical processes for the safe supply and treatment of water has been named the winner of the 2007 Stockholm Water Prize.

The work of Professor Perry L. McCarty, from Stanford University, California, has led to more efficient biological treatment processes, in particular anaerobic (oxygen-less) treatment systems for municipal and industrial wastewaters, biological nutrient removal, and the development and use of biofilm reactors.

In its citation, the nominating committee said: “He has established the role of fundamental microbiology and chemistry in the design of bioreactors. Professor McCarty has defined the field of environmental biotechnology that is the basis for small-scale and large-scale pollution control and safe drinking water systems.”

The Stockholm Water Prize is a global award founded in 1990 which is presented annually by the Stockholm Water Foundation to an individual, organization or institution for outstanding water-related activities. The activities can be within fields like education and awareness-raising, human and international relations, research, water management and water-related aid.

Prof McCarty will receive the award from Sweden’s King Carl Gustav at a ceremony in Stockholm during World Water Week in August.

Prof McCarty’s work combines knowledge in physical, chemical, biological and microbiological processes which are then transferred into technical development widely used all over the world as the basis for design and operation of wastewater treatment systems. His other important contribution was the identity of mechanisms for biodegradation and the fate of hazardous and anthropogenic trace chemicals, as well as appropriate engineering for water quality improvement of ground- and surface water and soils.

An educator and researcher at Stanford since 1962, Prof McCarty is a member of the National Academy of Engineering and an Honorary member of the American Water Works Association and the Water Environment Federation, and a Fellow of the American Association for the Advancement of Science, the American Academy of Arts and Sciences, and the American Academy of Microbiology.

## Exemplary model

Meanwhile, the Stockholm Industry Water Award for 2007 goes to PUB Singapore, for its holistic approach to water resource management. PUB, which is the national water agency for Singapore, charged with waste- and storm-water management in the city state, will receive the award for its work making water use sustainable for different sectors of society in a unique and challenging urban island environment. The development and implementation of the complete management system is ongoing but has taken place over a period of about 40 years.

PUB’s approach has resulted in a lower dependence on external water sources by diversification of water sources, including water re-use, desalination, storm-water storage in new water storages and supply of very high quality recycled water to industry with some internal reuse of this supply.

“PUB has succeeded in combining all the complex components of a well-functioning water management system that has been accepted by the general public, business and industry,” says Lars Gunnarsson, chairman of the Award Committee. “The PUB story would fit well as a study example in the education of water managers. This is an exemplary model of integrated water management in a framework of good policy and innovative engineering solutions.”

The Stockholm Industry Water Award is an honorary award that recognises innovative corporate development of water and wastewater process technologies, contributions to environmental improvement through improved performance in production processes, new products and other significant contributions by businesses and industries that help improve the world water situation. It was established in 2000 by the Stockholm Water Foundation in collaboration with the Royal Swedish Academy of Engineering Sciences and the World Business Council for Sustainable Development.

This year’s World Water Week features about 40 seminars and nine workshops at the Stockholm City Conference Centre between 12 and 18 August. The theme of this year’s conference is “Progress and Prospects on Water: Striving for Sustainability in a Changing World.” One whole day of the event will be given over to the challenges associated with water and climate change. Other topics will include balancing water for food and ecosystems, and water supply and sanitation.

Singapore’s national water agency won the Stockholm Industry Water Award



## Award for Växjö

The City of Växjö in southern Sweden won the award “Sustainable Energy for Europe Award” 2007 during the European Sustainable Energy Week this spring. Former mayor Carl-Olof Bengtsson and environment officer Henrik Johansson received the award at a ceremony Brussels.

The city’s overall work with climate change was recognised as their reason for receiving the number one award, with major factors including political consensus and its good co-operation with several actors. In 1996 the politicians of the City of Växjö, Sweden, took a unanimous decision to become a fossil free city and initiated the Fossil Fuel Free Växjö programme to reduce human impact on global climate change. Now, more than 50 per cent of energy comes from renewables, and in the heating sector, nearly all energy comes from biomass.

The changes have resulted in a 24 percent per person reduction of carbon dioxide emissions between 1993 and 2005 and they are on track to achieve 50 per cent reduction by their 2010 goal.

## ABB will warm 1 m Chinese

ABB has completed the delivery of one of China's largest district heating projects, bringing clean and energy-efficient heat to one million people and eliminating greenhouse gas emissions of more than 500,000 tons a year.

The combined heat and power system brings clean, efficient and optimal heat to one million residents in the Daoli district of Harbin in northeast China. Harbin has one of the coldest, harshest climates in China, with temperatures constantly below zero for six months of the year.

The new district heating system ensures Daoli residents enjoy indoor temperatures of at least 18°C and a cleaner healthier outdoor environment made possible by the removal of more than 2,000 coal-burning boilers that consumed 300,000 tons of coal a year.

The replacement of coal-fired boilers with energy-efficient ABB technology brings an immense reduction in annual emissions of greenhouse gases, adding up to more than 500,000 tons of carbon dioxide (CO<sub>2</sub>), 2,200 tons of sulfur dioxide (SO<sub>2</sub>), 11,000 tons of dust and 7,500 tons of soot.

### Autonomic adjustment

The solution pumps hot water from a power plant through underground pipes to heat exchangers which heat up water in the secondary distribution network and feed it into consumer radiator systems. The temperature and flow velocity of the water adjusts automatically according to indoor heat consumption and outdoor temperature.

ABB's scope of supply is far-reaching and ranges from pre-insulated pipes and heat exchangers to several hundred energy-efficient variable frequency drives, an advanced SCADA network management system, as well as project management and operator training.

The €100 million installation is included in the Clean Development Mechanism (CDM) contract between Denmark and China. Denmark has agreed to buy the CO<sub>2</sub> reductions achieved by the installation for the next ten years in order to meet its greenhouse gas emission reduction targets. The market price for CO<sub>2</sub> is currently € per ton.

## Promoting clean electrical power



• Working under the association name of Power Circle, a cluster of central Sweden's top electrical firms and organisations are promoting the future of this clean and vital technology.

Following closely behind the Swedish forest, steel and chemical industries, annual exports from the country's electrical power manufacturers and suppliers reach about \$5.5bn and account for 100,000 jobs, of which 45,000 are in their own territory covering Mälaren Valley, the broad area around and east of the capital.

As a collective mission to promote and further enhance the position of the Swedish electric power industry, Power Circle contributes to its competitiveness, provides effective representation for the industry in public affairs, and promotes the role of electric power in the advancement of society.

Established in 2005, Power Circle represents one of world's largest electric power clusters. Members of Power Circle are at the forefront in electrical power R&D, education, manufacturing, construction, generation, transmission, distribution and consumption. Power Circle and its members have cooperating connections in the EU and internationally.

### Big firms and offshoots

For integrating resources and collaborating on solutions, Power Circle unites companies, research centres, laboratories and universities. The association is hosted by the Royal Swedish Academy of Engineering Sciences, and sponsored by some 23 members including ABB,

Vattenfall, Bombardier Transportation and Svenska Kraftnät. Offshoots from these big companies have grown and are now also joining Power Circle.

Defining the need for Power Circle, CEO/Chairman Stig Goethe says, "Some people these days believe that electricity is a dirty word, but nothing could be further from the truth. In fact, electrical power is clean from an environmental standpoint. The particular means of generating electrical power is what can cause environmental problems."

Furthermore, he contends that there is no such thing as electrical "energy". Instead, electricity is the flow of electrons transferred by electrical power technology to another geographical point that collectively constitute electricity – and this push can be generated using fuels including wind, water, oil, light, atomic fission, and so on. Once this electrical force arrives at its end user, it delivers heat, motion, etc. Its use is so widespread that electricity itself has become irreplaceable. Therefore, electrical power production technology is indispensable, too.

### Three-way electrical pie

Nearly all countries need more electricity and electrical power systems. Two billion people in the world have no electrical power at all.

Another two billion have extremely limited supplies of electricity.

"We're in the lucky third of the world that has lots of electricity to provide the power that's needed by our modern societies. There is an enormous world market, and this benefits from Sweden's advanced position in electrical power technology. The demand of electricity creates enormous potential in the foreign market. Exporting electrical power technology is easier for Sweden to accomplish than exporting activities because there is less international competition in this field," says Goethe.

Power Circle is a lobbying organisation. "We keep politicians informed. We speak with the public. We hold speeches and lectures, and we publish the results of an amount of research that we conduct that describes this field and its importance," says Goethe.

Serving as an industry trademark, Power Circle disseminates information to the government, the public, and to the EU about the significance of electrical power technology. Another purpose entails being a link that strives to obtain sanctions to continue investment and expansion in the areas of electrical power technology.

Education and research are also important focal areas for Power Circle. At centres and universities in Ludvika, Västerås, Uppsala and Stockholm, world leading R&D in electric power generating, electric power storage, high voltage transmission, control systems, automation, operation, using IT in electric power systems, maintenance of electric power systems and electric engines for the industry and heavy vehicles is conducted.

### Hybrid passenger cars

"We are also active in bringing investments to this field. For instance, Power Circle encouraged R&D and utilisation of superconductors in motors and brakes for railway trains. This technology continues to be developed for potential energy saving use in hybrid fuel passenger cars," says Goethe.

This illustrates Power Circle's work to illuminate the fact that electrical power technology is a field with powerful growth potential. Looking forward, Goethe is convinced that discovering new techniques in the future is a key to changing the world, societies, and nations.

"To continue Sweden's leadership in electrical power technology, Power Circle also works toward interesting young people to enter studies of electrical power technology. Electrical efficiency as well as production are vital areas for the future that require the best young minds to solve. If we can interest a new generation in electrical power technology – instead of merely being angry because adverse conditions exist – then we have come quite a long way toward solving the world's environmental problems," says Goethe.



Stig Goethe: foreign potential

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WEST SWEDISH ENVIRONMENTAL EXPORT

# Envac on its way to Wembley

• A string of large and prestigious international orders has earned Envac a place as one of Sweden's most successful environmental technology companies.

The automated waste collection system manufacturer has in recent months won its first UK contract – for the urban development around the new Wembley Stadium – and its largest order to date at the multi-billion-euro Pearl Qatar luxury island.

“The technology is making inroads everywhere and there is more interest than we have ever seen before,” says director of marketing and communications Jonas Törnblom. “It is looking very good for us.”

Envac's vacuum-powered underground automated waste collection systems have now been installed in 30 countries, giving the company a 70-plus per cent global market share. The Stena-owned company's turnover of €2m last year – its highest ever – was an increase of nine per cent over 2005.

Envac's Wembley project, will involve the collection of around ten tons of waste per day from households, retail, and office premises when fully built out. There will be separate receptacles for recyclable, non-recyclable, and food waste, either in the common areas of multi-storey buildings or in courtyards.

“There are considerable space savings to be made inside the buildings, but also labour savings,” says Törnblom. “We estimate that the estate management will save ten full-time employees who would otherwise be employed collecting and handling the waste inside the estate.”

Another benefit of the system is hygiene; there is no risk of overflowing bins, no odours,

no cockroaches and no rats. Törnblom says there are also social benefits of such a system. “We try to design these waste receptacles as a meeting point for residents. In these types of developments you often have both social housing and very expensive housing and it can be very difficult for the two to meet. The central loca-



London Calling: the Wembley project is the latest prestigious deal for Envac

tion will also improve the residents' propensity to separate their waste.”

Törnblom says that the strong development of real estate prices both in London and elsewhere means the system becomes much more lucrative for the operators because of the space savings and the handling improvements. “We save space for the developer which can be used for other types of premises.”

## Pearl of a project

In Qatar, Envac has been awarded a €1m contract to install an extensive waste system on The Pearl, a lavish development being built on 400 hectares of reclaimed land in the Persian Gulf off Doha. Here Envac will handle waste from luxury homes, five-star hotels, marinas and top-end retail facilities.

Last month the Stockholm-based company announced a €20.6m contract for a mainly residential area covering 9.5m sq metres north of Seoul, Korea. Four parallel underground waste handling systems will handle waste from over 46,000 households. The customer, the

development but the result is fantastic,” says Törnblom. “You do away with all the trash on the streets and open up the city for other activities. You don't need to have refuse trucks going through the city. The value to the environment is larger in these historic and attractive city centres than the new urban developments.”

Envac has won its first contract in the US, in Indiana, which it regards as its pilot installation on that market. “We are not really exploring the US at the moment,” says Törnblom. “We have been planning on using Canada as our entry into the US because of the greater similarity of norms, rules and customers to Europe.”

## Curiosity and scepticism

Despite its runaway success, and the fact that Envac has delivered over 600 systems since the 1960s, Törnblom says there is always some initial hesitance among customers when Envac enters a new market. “There is a lot of curiosity but they are still often sceptical about whether it could really work. Waste handling has not been a prioritised issue on the urban development agenda. It has been neglected compared with the rest of the urban infrastructure – sewage and water and so on – which is all part of a grid today.

“Most cities collect waste in much the same way as we did in the Middle Ages; they drive around and pick it up house by house. When we talk to developers it is sometimes difficult for them to really understand what the true costs are with waste collection in their developments.”

But that is changing rapidly now, especially in the UK because of the move towards sustainable urban development, highlighted recently in Gordon Brown's plans for a series of “eco-towns” across the country. “Traditional ways of building communities are questioned and they are looking to find new solutions, new technologies which improve the urban environment and the global environment,” says Törnblom.

# Give plastic trash bags the sack

• A unique material composition developed by Wermland Paper allows its WP Biokraft, used in sacks and bags, to decompose rapidly in nature and, thereby, comply with EU regulations regarding landfills.

About half of all household waste is biodegradable. Amassed in mountainous heaps in landfills, the plastic bags that contain this garbage can take up to 400 years to biodegrade. The EU prohibits bio-disposal use in landfills, which puts the pressure on regional governments to

start sorting waste. This means that they need bags and sacks as system components in the disposal systems.

Speciality paper producer Wermland Paper undertook developing and producing WP Biokraft in the beginning of this decade. “The EU demands better sorting and composting of everyday garbage, and this has made the invention of WP Biokraft especially important. Nordic homes commonly use large paper sacks for household waste, and this gave us a good estimate of the needs, size and applications

of the market,” says project manager David Jaretorp.

After years of research and testing, Wermland Paper has introduced a material that decomposes in less than 112 days, yet is strong enough to hold together while it contains household wastes that can contain up to 50 per cent moisture until it reaches its final resting place in nature.

## Solves a global problem

“Wermland Paper is proud to have developed a product that can deliver solid benefits for the environment over the entire world. After all, the environment is a global issue,” says Christer Simrén, MD.

“One stumbling block has been the lack of a suitable container for the biodegradable waste. Many people have certainly experienced problems with leaking and smelly receptacles under the kitchen sink. With bags and sacks made of WP Biokraft, decomposition can begin as soon as wastes are cast into the garbage and without mess or odours.”

Jaretorp points out that WP Biokraft's biodegrading process is faster than that of any other material on the market. The material in WP Biokraft can hold water and yet resist breaking apart from interior or exterior moisture. Moreover, it contains neither plastic nor genetically-modified corn starch. The paper's performance has been certified by the Swedish National Testing and Research Institute (SPFI).

Under proper storage conditions, without humidity, the paper remains fresh and useable for normal periods of time until the bags are filled and set out for disposal services to gather and remove. The paper is also strong enough to hold garden trimmings.

“After determining quality parameters and production methods in close networks with customers, evaluation of the paper began two

to three years ago, and commercial deliveries started last year. Today, we're systematically filling orders, and there is a rapid increase of these, too. We supply rolls of the WP Biokraft paper to converters – manufacturers who produce sacks, bags and other products in varying sizes,” says Jaretorp.

The finished sacks are sold by the converters to waste disposal companies, communities, etc., who place them with businesses or households. He adds that demand from communities has been so large that sales volumes have doubled in a short time.

## Numerous uses

Printing can be added on bags according to the needs of end users. “We foresee many different areas for applications for this sort of material where you can use biodegradable benefits to offer to environmentally conscious shoppers in groceries, boutiques, and so on,” says Jaretorp.

“There is a large and growing demand among Swedish buyers, and we are convinced that WP Biokraft has the potential of becoming a successful export product,” adds Simrén.

Germany, France and the UK are target markets for WP Biokraft. “European governments are adapting their waste disposal systems much more rapidly than before. Of course, the other overseas markets, such as Asia, have huge problems,” says Jaretorp.

Over 80 per cent of the production from Wermland Paper is exported to some 70 countries. Wermland Paper's annual production volume is 165,000 tonnes, and 40 per cent of this is accounted for by sack papers, which include the new WP Biokraft. Today with 371 employees, annual turnover of about €10m and owned by Procuritas, Wermland Paper was formed in late 2003 by merging the Bäckhammar and Åmotfors mills, both established in the 19th century.

Christer Simrén: 'solid benefits for the environment'





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# Stockholm to share clean vehicle expertise

• Stockholm is a world leader when it comes to use of environmentally-friendly vehicles and fuels, and this autumn it will be sharing its experiences with the world.

The Clean Vehicles and Fuels European Symposium and Exhibition will attract international experts to the Swedish capital for an event which is the biggest of its kind in Europe.

"We have had a market breakthrough for these vehicles here in Stockholm, while many other countries and other cities they are just starting the work," says Gustaf Landahl, chairman of the event who is also responsible for city's projects on clean vehicles. "It is beneficial for them to learn from the experiences of other places, because there is a lot to learn about how to go about this."

The three-day event consists of one day for Swedish buyers of fleet vehicles, with the other two given over to international days featuring seminars on a range of issues. Among the speakers will be the team behind the Stern Report on the financial implications of the climate challenge for the transport sector; US Ambassador Michael Wood on the business opportunities presented by renewable fuels; as well as Swedish Minister for Enterprise and Energy Maud Olofsson.

"This is the only event which has a focus exclusively on clean vehicles and fuels, with both an exhibit and a symposium," says Landahl.

The exhibition itself will feature a wide range of products and ideas from the field of clean vehicles and fuels. Exhibitors will include vehicle manufacturers, fuel producers and distributors, and sustainable transport companies.

A technical tour will include a guided visit to Stockholm Public Transport for a demonstration of its "clean" buses, as well as a biogas production plant and a clean fuels filling station.

#### One in five

Stockholm is setting an example for the rest of Europe and indeed the world to follow when

it comes to clean vehicles. One in five new cars bought today in the city either runs on renewable fuels such as ethanol or biogas, is a petrol-electric hybrid or a "city car" with high fuel efficiency and low emissions. There are about 30,000 of them on the streets of the city, as well as over 400 buses running on ethanol or biogas.

"This is unique in an international comparison," says Landahl. "It has been developed over the last four years thanks to the incentives we have put in like reducing the tax on fuels, common procurements to get vehicles on the market, and work with the fuel providers to put up the filling stations."

Attendees at the event will include people from all levels of the public sector involved with transport and environmental issues, representatives of the private sector, as well as individuals keen to explore for themselves the potential and benefits of clean vehicles.

Landahl says there are four reasons why Clean Vehicles and Fuels is both an important and a timely event. "Firstly, we have to have vehicles that reduce the local pollution. Cities have problems meeting air quality directives in Europe and elsewhere, and traffic is growing all the time."

Second is greenhouse gas emissions. "We have to find ways to bring them down, and traffic is the area that is most difficult," says Landahl. "The number of vehicles is growing and this is the area where the problems are the greatest and the targets are not being met."

The third reason is the impending approach of so-called peak oil, the date after which oil production is predicted to go into terminal decline, and the necessity this creates for finding alternatives.

Landahl says the fourth reason is that bio-fuels can create local jobs. "Ethanol and biogas from methane can be produced locally so you can create local jobs rather than just sending your money to other parts of the world for oil."

The Clean Vehicles and Fuels European Symposium and Exhibition takes place at Stockholm International Fairs from November 7-9.



Green machine: Stockholm is a global role model

## SCA runner up

SCA has been ranked number two in a compilation of the world's most environmentally friendly companies undertaken by EIRIS (Ethical Investment Research Services), a leading provider of independent, global responsible investment research, and The Independent newspaper.

Jan Åström, CEO of SCA, is very pleased about the distinction and cites in particular the overall perspective applied by the survey. "It is a great pleasure to receive this attention for the breadth of our environment work", comments Åström. "We are working consciously with the carbon dioxide issue, and during the past year we reduced our emissions by 4 per cent. But there are also many other areas in which we are making substantial progress, such as waste management, water use and raw material recycling."

In its survey, EIRIS reviewed the entire fibre flow, from FSC-certified forest management to the production process and reuse of products.

According to Patrik Isaksson, Director of Environmental Affairs at SCA, EIRIS includes thousands of companies in its analyses. "EIRIS is one of the leading European players when it comes to socially responsible investment research, with approximately one hundred institutional investors and fund managers among its customers," says Isaksson.

# 'Holy Grail' found in Örnsköldsvik

• Despite being all but unpronounceable to most who come here from overseas, the northern Swedish town of Örnsköldsvik has become the Mecca of the renewable fuels industry. This industrial port town of 55,000 people, 600km north of Stockholm, is home to what is probably the most advanced cellulose ethanol plant in the world.

While ethanol powered cars are a common sight in a number of countries today, the shortcomings of the fuel on which they run – first-generation ethanol distilled from sugar cane, wheat or corn – are quickly becoming apparent. Chief among these is the fact that land growing crops for fuel cannot grow crops for food. Cellulose based ethanol, on the other hand, which can be produced from all type of waste products from agriculture, forest industry or even households, avoids these problems, and is being billed as the most promising alternative to gasoline and diesel.

The centre of all the attention is a pilot plant run by the SEKAB group, and it is to here that researchers, politicians and energy industry executives have been flocking to watch and to learn. SEKAB is the largest bioenergy company in Scandinavia, the largest provider of biofuels to the market in northern Europe, and a world leader in developing the second generation of ethanol from cellulose. At the helm is Per Carstedt, who during 15 years of international promotion of sustainable ethanol has earned himself the moniker Mr Ethanol and who is something of a guru in renewable energy circles. "Everyone is talking about cellulose ethanol as the Holy Grail, but we have been into this for 20 years," he says.

The pilot plant, which was part financed by the Swedish government and the EU, was opened in 2004 and is today the workplace of about 20 operators and ten researchers who are applying cutting-edge research conducted in Swedish and other international universities.

"This plant has all the process steps," says Carstedt, who is also chairman of the BioAlcohol Fuel Foundation. "We are putting wood chips in one side and getting ethanol out at the other side. We are producing ethanol, but that is not the point. The point is that we are producing new cutting-edge knowledge, particularly about the industrial processes."

## Seamless transition

The next step will be to industrialise the process, although full-scale commercial production is still a number of years away. "We have a lot of respect for what it takes to take this to the industrial level," says Carstedt. "When you work with this and you get your hands dirty you also realise what the challenges and the reality of this are. We are ready now to build the plant that is about 50 times larger, but that is still not full commercial scale."

The timescale SEKAB is working to is to have the next plant up and running by about 2010, to further fine-tune the process and then to have full-scale production taking place by around 2013. All the while the company will continue to produce ethanol based on the current first-generation technology. "That is the plan," says Carstedt. "To provide the fuel to the market with the existing knowledge in parallel with developing the new technology where you can access the enormous amount of new feedstock that is cellulose. Hopefully these two can seamlessly run into one another."

Carstedt says the global interest in renewable fuels combined with SEKAB's reputation means that interest in the company has become somewhat overwhelming. "To be honest it distracts us from doing the day-to-day work," says Carstedt. "We have enormous interest from the US, from Europe, from China. It boosts the ego but it's not good for our focus on developing the technology."

The interest comes from the research community, from the political community – an OECD conference was recently held in Örnsköldsvik – plus from companies looking to become players in the renewable fuels sector. Carstedt himself has been trying to cut back his own hectic schedule to focus on business. In the week before speaking to Sweden Today he had been in Brazil, and China the week before that. The next week the destination was Africa.

"I have tried to reduce it now because we are focusing now on getting these things to work," he says. "The company has grown

from 75 to 160 people in 12 months, so there is a lot of work to be done just building up the organisation." He has also had to reduce to a minimum the number of seminars he gives. "I was doing that a lot when most people didn't understand this challenge. Now they do, but there is another challenge now, and that is to make things happen."

SEKAB is organised into four business units. SEKAB E-Technology focuses on R&D in industrial processes for cellulose-based biofuels in bio-refineries, while SEKAB Industrial Development takes care of the industrial development and future construction of cellulose-ethanol combines. "Those two are working in conjunction to develop the new technology but also seeing to what extent we can develop that worldwide, so the technology can be used everywhere," says Carstedt.

SEKAB International is a project organisation for international investment in production plants, and SEKAB BioFuels & Chemicals is responsible for the provision, refinement and marketing of bioethanol as fuel and chemicals, and is northern Europe's largest provider of ethanol.

## Making an impression

SEKAB has been singled out by US Ambassador Michael Wood as the company he has been

most impressed by on his mission to find American investors for Swedish renewable fuels technologies, and Carstedt says this reaction is a common one. "People see what we are doing, and they see that things are really happening."

The fact that SEKAB does not make too much noise about its progress also means that visitors to the plant are often surprised by just how advanced the technology is. "We have a policy of not doing press releases; we don't brag about what we do," says Carstedt. "That is part of our nature coming from northern Sweden; we try to do the things and then let the results talk for themselves instead of trying to attract a lot of attention."

Carstedt speaks in impassioned terms about man's impact on the environment, but his fears are balanced to some extent by the knowledge that he is sitting on a technology that could go some way to reducing that impact. "I am very positive that we will deliver large-scale solutions with cellulose ethanol," he says.

"However, I have been involved with this for 15 years, but I am even more worried today that I was five years ago. The signals we are getting from researchers regarding the accelerating climate change are just getting more and more scary. And if we in parallel are running into a shortage of fossil fuels then you can bet we are heading towards chaos on this planet because the entire industrial system, including agriculture, transportation and energy, is dependent on fossil fuels.

"So even if I am very optimistic about us and others being able to provide solutions, I am afraid that the world has underestimated the time it takes until that really makes a large-scale difference. And unfortunately in that time the probability is still high that we will run into really big disruptions in the global economy, because of a shortage of fossil fuel and the effect that climate change has through hurricanes, drought and flooding around the world."

Carstedt fears that if and when we enter this more disruptive mode, people will become more short-sighted and lose focus on the end goal of sustainable development

"That scares me, but it also gives me more energy to work with this."

DW

## Green cars facts

36,611 'green' cars sold in Sweden 2006 (majority E85 ethanol, but also biogas and hybrid-powered)

156 per cent increase over 2005

'Green' cars accounted for 13.5 per cent of new car sales 2006

Saab 9-5 BioPower was top seller (10,941 sold), followed by Ford Focus Flexifuel (5,483)

Per Carstedt: 'results speak for themselves'



# Project boosts steel's green credentials

• Concern for the environment has long been a part of the day-to-day operations of the Swedish steel industry. But a unique four-year research project involving the industry and academia is aiming to significantly reduce environmental impact through increased recycling, reduced emissions and creating greater efficiency. The result will not only be environmental improvements, but also increased competitiveness for the Swedish steel industry.

The Steel Eco-Cycle project (Stålkretsloppet), which is coordinated by the Swedish Steel Producers' Organisation (Jernkontoret), involves researchers from leading technical universities, research institutes as well as many of the country's top steel firms, and has attracted interest from overseas.

The end results will be significant: a reduction in carbon dioxide emissions of 1m tons per year; a reduction of energy use in the industry of 600GWh/year; and an end product which is lighter and stronger and therefore has knock-on effects on efficiency in for example vehicles.

Programme director Birgitta Lindblad says the project is the result of discussions between the steel industry, researchers, authorities and research finance agencies: "We started thinking about the eco-cycle of steel and had a lot of discussions with these other actors. We came to the conclusion that what is most important for the future of the steel industry was the eco-cycle: to decrease the use of virgin materials, decrease the amount of waste, and reduce the impact on the climate."

Assistant programme director Göran Andersson adds that bringing together the different parts of the circle to integrate results is key to achieving these goals. "We have very good research in the steel industry itself, but if we are looking at the chain, the whole steel eco-cycle, we can make very good improvements by combining research results from different parts."

## Pioneering approaches

Sweden has long been a world leader in steel research and the industry here is one of the most research intensive worldwide. The strong research infrastructure focusing on advanced grades of steel has allowed companies to remain highly profitable despite operating relatively small-scale plants and paying higher wages than competing low-cost countries.

The €3m Steel Eco-Cycle initiative, which

runs until next year, has won praise from foreign experts. Members of the scientific review panel which recommended that the Steel Eco-Cycle project get the go-ahead concluded: "The emphasis on energy-efficiency in making technically-advanced high-strength steels displays a confidence in technical development not found elsewhere in the world. Other industries would doubtless focus on circumventing the difficulties in making these technically-advanced products, leaving environmental concerns as a secondary consideration. Outstanding technical ability allows the Swedish steel industry to pioneer approaches that others will be forced follow as environmental pressures accumulate worldwide."

Funding for the Steel Eco-System project is split between industry and Mistra, the Foundation for Strategic Environmental Research. Mistra, which contributes €4.6m, plays an important part in environmental research in Sweden by supporting projects with a long-term perspective. The main part of Mistra's funding is focused on broad-based interdisciplinary programmes, and it distributes around €22m to research in Sweden each year.

The steel companies that are taking part in the project have a direct influence on the research being conducted in the sub-projects and can therefore ensure that the results will be useful to the industry. "One of the strengths of the project is that knowledge levels are raised simultaneously among all the different competences that are taking part," says Andersson. "The participants from industry and academia get the opportunity to develop together a cutting-edge competence in the environmental area which they will be able to apply in the development of new processes and new steel products."

## Economic motivation

There are 11 sub-projects underway within Steel Eco-Cycle. "We have consciously chosen research projects so that all the important stages

in the steel eco-cycle are included and so that there is an economic motivation within the industry," says Lindblad. "The projects are aimed at improved scrap handling, new melting concepts, and environmentally-friendly construction techniques."

Among the projects is one developing methods for the simultaneous preheating and surface cleaning of steel scrap which has the potential to increase both resource and energy efficiency, while improving the working environment in steel facilities. Another, involving researchers from across Europe as well as Sweden focuses on improved steel scrap quality through the use of lasers to analyse the chemical makeup of scrap.

"We have a lot of exciting results but they are very preliminary at this stage," says Andersson.

Elisabeth Nilsson, president of Jernkontoret, who has been involved in the industry in Sweden for over 20 years, says that the project's goals are ambitious and will make a significant contribution to Sweden's efforts to tackle climate change. "It is being discussed that the European Parliament should stay in Brussels to save 20,000 tons of CO<sub>2</sub>," she says. "The cut in CO<sub>2</sub> that we are talking about for the Swedish steel industry is 50 times more. So this is a lot of CO<sub>2</sub> we are talking about."

The steel industry is one of the pillars upon which Sweden's economic success is based; two hundred years ago it accounted for about 70 per cent of the nation's exports. Today exports remain crucial to the industry, with about 85 per cent of production exported. A key part of Jernkontoret's activities focus on lobbying at the national and European level to ensure that the industry's access to these overseas markets remains unhindered.

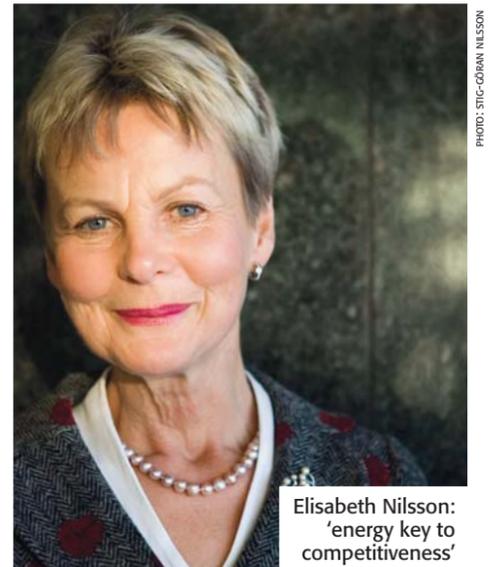
## Bright future

Nilsson says that demand for Sweden's specialties in advanced steels remains high today. "Our companies today are doing very well. The

investment level is very high both at home and abroad, hopes for the future are high. Our companies are earning a lot of money and employing highly skilled people."

Nilsson says that environmental issues have been increasing in importance in the industry in Sweden for several decades. "One reason is the more stringent environmental legislation, but it is also because now it is no longer acceptable to have a polluting plant. You can't attract new people to a business that has a bad reputation. And the people that are leading these companies want to be out in nature with their children. So it is a genuine interest. They will not tolerate that their plant doesn't look good. It should look clean, be clean, and be attractive as a workplace. So they are working very hard to improve the environmental situation."

But another factor is quite simply the bottom line. "Reducing energy consumption saves money," says Nilsson. "The environment and costs go hand in hand, and energy is a key issue in our future competitiveness."



Elisabeth Nilsson: 'energy key to competitiveness'



## Steel Eco-Cycle facts

**budget:** €3m  
funded by industry and Mistra, the Foundation for Strategic Environmental Research

**duration:** 4 years

- aims:**
- reduce energy use by 600GWh/year
  - reduce CO<sub>2</sub> emissions by 1m tons/year
  - make steel constructions 25 per cent lighter
  - increase competence and increase competitiveness of Swedish steel firms

[www.stalkretsloppet.se](http://www.stalkretsloppet.se)

# High-strength steel raises fuel economy

• Much of the debate around environmental impact and climate change has focused on the transport system and in particular on fuel types. While more environmentally-friendly fuels like methanol and biodiesel can reduce harmful emissions, the use of higher strength – and therefore lighter – steel in vehicles will also help reduce environmental impact by reducing fuel consumption.

At the forefront of the manufacturer of these extra and ultra high-strength “Green Steel” grades is SSAB Swedish Steel. “Every kilo saved reduces the amount of carbon dioxide emissions,” says Jonas Larsson, manager of the Environment Department at SSAB Swedish Steel’s rolling mill in Borlänge. “We can guarantee that our Green Steel benefits sustainable development in all the stages of manufacturing, production and final use. And furthermore, steel is the most recycled material in the world.”

As the debate on environmental issues has intensified, so has interest grown in SSAB’s products. The company reported its strongest ever quarter for Q1 this year, with profits up by 38 per cent to €1.55bn. Deliveries of extra and ultra high-strength sheet increased during the quarter by 25 per cent compared with last year, and Larsson is convinced that high demand will continue far into the future. “Thus far it has been quite easy to market the extra and ultra high-strength steels to the manufacturers of cars, trucks trailers and all kinds of rolling stock,” he says. “These are areas where it is easy to see the benefits of lighter products. However using less steel is good within most segments of industry.”

## Weight = emissions

A clear example of just how big a difference using lighter and stronger steel can make can be seen in the side-dumper trailers manufactured by Brazilian company Pastre. “This is a highly-specialised trailer for the transportation of sugar from the plants to refineries,” says Larsson. “In all it does 28,000 kilometres a month and it has a total weight of 57 tons.”

By going from mild steel to Domex 700 MC, extra high-strength hot-rolled steel, and Docol 1000 M, ultra high-strength cold-rolled steel, the Pastre trailer can take an additional payload of 2.2 tons each trip. This makes every 20th journey unnecessary, saving 26 tons of carbon dioxide per trailer and year – which is more than 10,000 litres of diesel costing approximately €9,000 in Europe. “The calcu-

lations are made on one single trailer,” says Larsson. “In this case there are 25 trailers in the fleet and if all of them were made of extra high-strength steel it would reduce carbon dioxide emissions by 650 tons a year.”

SSAB Swedish Steel, which was formed from the merger of three steelworks in 1978 and employs more than 9,000 people in 40 countries, has been producing extra and ultra high-strength steel for more than 20 years. But it is only fairly recently that the steel’s environmental advantages have been in focus.

“It was primarily developed to give a lighter and stronger steel, and it first came into use in products where strength and low weight were essential for the final customer,” says Larsson. “Two typical examples are crane booms and impact beams, as well as other safety details in cars.”

Although there is an obvious environmental advantage in both these examples, this was hardly mentioned at first. “But today we can use the experience from manufactured products to calculate exactly what impact the use of extra and ultra high-strength steels have had from an environmental point of view,” says Larsson.

## All-time high

The actual manufacturing process for extra high-strength steel is also kinder on the environment than lower grades of steel, generating close to 20 percent less carbon dioxide emissions per square metre compared with mild steel. This was shown last year when SSAB had an all-time high production of these steel grades, while it also had an all-time low for carbon dioxide emissions per tonne of produced steel.



Jonas Larsson

“Even our production process is saving energy and reducing emissions of carbon dioxide and other compounds,” says Larsson. “And by using less iron ore we can contribute even more to a better environment.”

But it is when vehicles made with high-strength steel are in use that the environmental advantages come to the fore; 80 per cent of environmental impact comes when the car, truck or trailer is in daily operation.

“Lower weight either results in more payload or reduced fuel costs. In both cases it is beneficial for the environment as well as profitable for the user,” says Larsson. “No other material offers this excellent combination of manufacturing properties, strength and good economy.”

Let’s roll: SSAB’s deliveries of ultra high-strength sheet are up by a quarter



Scrapheap challenge: car dismantlers are a major client for Stena Gotthard

## Top award for Stena Gotthard

• Recycling company Stena Gotthard has scooped a prestigious Ford World Excellence Award for its services to the automotive giant. It is the first time a waste management or recycling company has won such an award, which usually goes to component suppliers.

“The award shows that we are not only good on price and service but also on the way of working and the level of commitment we have developed in the company,” says Stena Gotthard’s managing director, Monica Svenner. “We make things better for our customers and therefore they are loyal to us.”

The company – Sweden’s biggest processor of ferrous and non-ferrous scrap – is part of the family-owned Stena Metall Group, which in turn is part of the Stena Sphere which is active in everything from shipping to property to finance.

Much of the material Stena Gotthard recycles comes from manufacturing industry, but also from municipalities and from car dismantlers. “We do a total concept waste management programme for the companies,” says Svenner. “We take care of all types of waste products and help our customers with developing their systems and doing so in an efficient way. We also increase the competence in the company around waste and waste management.”

Ford’s award – one of only 15 Gold Awards presented to its thousands of global suppliers – was given in recognition of Stena Gotthard’s work as a supplier to Volvo Cars. Stena Gotthard, which employs around 650 people in Sweden, works at a number of Volvo plants around the country, handling not only scrap metal but also paper, plastic, wood and hazardous waste. The awards are presented to suppliers that excel in quality, cost, and delivery.

## Innovative recycling

Svenner says that besides the obvious environmental reasons for recycling, economic considerations play an important role in the growth of the industry. “Obviously there is a big focus on environmental issues at the moment, and so the major benefit here is that if you use recycled material instead of virgin material you save a lot of the world’s resources,” she says. But you also save a lot of energy. “Making steel from virgin material takes four times as much energy as making it from recycled scrap,” says Svenner. “For aluminium it is 20 times more. So there is great potential for saving energy there.”

Swedish industry is aware of this and is recycling ever more today, meaning more business for Stena Gotthard, which is active within the Swedish Steel Producers’ Organisation’s Steel Eco-Cycle project (Stålkretsloppet) to reduce the environmental

impact of the steel industry.

“We see today that we are taking more waste for recycling instead of landfill,” says Svenner. “Even if our other volumes are increasing, the amount that goes to landfill from our organisation is going down.”

Stena Metall Group is the Nordic leader in recycling and environmental services. “Our goal is to be a pioneer in customer solutions, production and competence in the recycling area,” says Svenner. “The aim is to become better in every area and stay a step ahead with innovative solutions for customers, environment and society.”

In a move which has filled a gap in the research world and is expected to have long-term environmental benefits, the Stena Metall group has endowed a unique professorship in industrial recycling at Chalmers University of Technology in Göteborg which will be funded for at least ten years. The professorship will focus on chemical engineering, and development areas include recycling of rare metals, and recycling metals and plastics from waste which is otherwise incinerated or dumped in landfill.

“Creating this professorship will put the issue of recycling at a higher level within academia here in Sweden which we think is very important,” says Svenner. “It will create the possibility to have research done within areas which are important to the industry but which are so long-term that companies do not have the resources to do it. We also hope that more students will want to work in the recycling area, and perhaps work with us.”

In September, Stena Gotthard will merge with three other companies within the group – Stena Scanpaper, Stena Miljö, and the recently acquired Reci Industri – to form Stena Recycling. “We will have all the competences within the same organisation which means we will be able to serve our customers even better,” says Svenner.

Monica Svenner: ‘customers are loyal’



At the Centre for Renewable Electric Energy at Uppsala University, research is ongoing into three energy sources that have great potential for replacing fossil fuels. Led by one of the world's leading engineers in the field, Mats Leijon, researchers are working on technologies for wind, wave and marine current power which could be produced on a large scale and therefore become cost-efficient energy solutions. The centre is within the Division for Electricity, which is part of the Department of Engineering Sciences, and is based at the Ångström Laboratory in Uppsala. Here we look into the work under way at the centre, and present the companies which have spun off from it.

# Large-scale renewable energy solutions

• Professor Mats Leijon boils down the work of his colleagues and students at the Swedish Centre for Renewable Electric Energy at Uppsala University into one succinct sentence: "Our goal is to get cheap access to renewable energy in large quantities."

Leijon and his colleagues are aiming to achieve this from the as-yet largely untapped sources of waves, wind and marine currents – basically harnessing natural movements and converting them directly to electricity. The technologies being developed are CO2 free, relatively simple, highly efficient, and designed with mass production in mind.

hours (TWh) of electricity per year off the British coast. "That is half a nuclear power plant," says Leijon. "In two years you have built one nuclear power plant. Just getting the permits to get one nuclear power plant built takes about 15 years, so from that perspective it can go very fast. And people don't realise this."

Working on this industrial scale, Leijon says that after 20 years a full 100 TWh of wave power – a quarter of national consumption – could be deployed around Britain's coasts.

"So by thinking in those terms it is a total other ballgame than if you are building one unit at a time," he says. "And it is the same yields for all the concepts."

15 PhD students, and on its steering committee sit representatives from government authorities as well as state-owned energy supplier Vattenfall and representatives of electricity-intensive heavy industry in Sweden.

"What is interesting for me is that you keep the system perspective here," says centre coordinator Katarina Yuen. "Rather than being really specialised on just one small part and then zooming out and realising that it doesn't work in reality, you get the bigger picture first and then you zoom in on the details."

Leijon says he has followed a strategy of picking the best and the brightest to work with at the centre. "You want to work with people

who are better than yourself. I like to work together with very talented people, and I am very proud of my colleagues. By trying to be creative yourself and listening to the others and then seeing how it all fits together, you can create a lot."

Leijon made his name while working at industrial giant ABB's Corporate Research Department.

There he hit upon an idea which solved the 100-year-old conundrum of how to develop a high-voltage generator that could be connected directly to the power grid. His Powerformer, which led to higher efficiency, better availability, lower maintenance costs and reduced environmental impact, is regarded at the biggest thing to happen in generators in the last century.

Recognising that the energy supply would become an increasingly pressing issue, Leijon returned to academia in 2000, a time when

climate change and renewable energy were not yet Global Topic No 1 and when IT was where the excitement was at. Leijon says he made his decision based on the analysis of, and prognosis for, energy consumption that was available at the time. "And it is now worse than we expected then," he says.

## Money isn't everything

Leijon has been quoted in the Swedish press as saying that he is not particularly interested in technology – a curious statement for one of Sweden's top engineers. "I think [the energy issue] is rather important for mankind, and if you can contribute to that then I think you are happy about it," he says by way of an explanation.

But the reluctant technologist is willing to describe himself as an environmentalist "but not the type you see on the street," he says. "I think we are of much more use doing good engineering in this area."

That good engineering is starting to bear fruit, and companies have been set up to commercialise the research carried out at the centre – Leijon's "energy empire", as one magazine put it (see following articles). All will require investment of a long-term nature – perhaps 20 or 30 years, he says.

"There is a lot of fast money available now, but we are not so interested in it because it will not give the accomplishments that I want to make sure that we get – cheap global access to renewable energy. You shouldn't be greedy if you want to attain this. Instead you have to think in other terms. If it goes well we will earn a lot of money, but this is not the major issue for this development. It is very difficult to have that attitude in a global environment. But if you want to create solid companies in the long run where you and your colleagues have influence and we can avoid traps, then we have to build it up in another way."

## All in the mind

So what is it that is holding back wave, wind and marine current power? Is it the politics or the technology? Neither, says Leijon. "It is just that people's mindset is not there yet. They don't realise what could be done. They think about building large units or they think about building more complicated units, but we do it very simply and ready for mass production. There is the difference in thinking."

When speaking to Leijon and his team, this word "simple" pops up again and again. It is the same clarity of thought that helped him tackle the 100-year-old generator riddle that has helped create these exciting renewable energy technologies. Leijon says: "Some people say this was a big risk project, but it is not; everything we are doing was known about before, but we are doing it in another way."



Applied knowledge: Hans Bernhoff and Mats Leijon



The renowned Ångström Laboratory

With the exception of the Nimby (not in my back yard) argument, these renewable energy technologies are fairly uncontroversial. Most people would welcome them as a small-scale contributor to the national grid, but surely few would regard them as major energy sources for the future? But this is precisely what Leijon has in mind. He says that by using the mass production techniques employed in the car industry, one factory could produce enough wave power generators to produce 5 Terawatt

## World authority

Leijon is regarded as Europe's – and therefore the world's – leading authority on renewable electric energy conversion. He set up the centre within the Division for Electricity, which in turn is part of the Department of Engineering Sciences, in 2004 with financial backing from Vinnova (the Swedish governmental agency for innovation systems) and the Swedish Energy Agency.

The centre has eight senior researchers and

## Going against the flow

Current Power's business plan is to commercialise the marine current turbines being developed under Mats Leijon's leadership at the Division for Electricity.

Its product will be a turnkey power plant based on marine current turbines, direct-driven generators and the infrastructure to connect them and deliver the power to the grid. The company's design uses vertical axis turbines, on the same basic lines as Vertical Wind's turbines.

"There are not many companies in this business at the moment," says managing director Karin Thorburn, who is also a researcher at the division. "Most of the other companies are dealing with technology which is quite similar to traditional wind power, with a two- or three-bladed turbine and gearbox. With that you are quite dependent on the direction of the flow, and if you have a tide you would have to turn the blades around. But with the vertical axis turbine we can use any flow."

Current Power Sweden AB was set up in 2005 after the researchers behind it took part in the Venture Cup business plan contest. The company is currently in the process of filing patent applications in a number of countries.

Thorburn says the company has attracted a lot of interest. "Everyone is positive when I tell them what I work with. Some people think that marine currents could be the future. Of course I think that, but it's good to hear it from someone else."

## Bigger than hydropower?

When Billy Johansson was asked by Mats Leijon to join the board of a new company, he accepted – until he found out it was involved with wave energy. "I said forget it," says Johansson, who is a former president of ABB Generation in Sweden. "I didn't think wave energy could be economical in the future. But when I saw the solution, I realised immediately that it had great potential."

Today Johansson is managing director of the Seabased Group, which comprises mother company Seabased AB, Seabased Industry AB and Seabased Energy British AB. Around 20 people are employed at the companies, which are commercialising the wave power research at the Swedish Centre for Renewable Electric Energy Conversion at Uppsala University.

"We are making an industrial application of their research," says Johansson. "We are working on more practical things like putting the plant together on the drawing board and finding the optimum solutions for both the unit and the whole system, which will be beneficial for our customers in the future."

Seabased intends to find those customers first on the home market, before turning its attention to Britain, the rest of Europe, then Asia and the Americas.

Johansson believes wave power will be a major source of energy in the future. "When we finalise the technological solutions for wave power it can be as big as hydropower, or potentially even bigger."

## Harnessing the wind

Swedish Vertical Wind is the company set up to commercialise the results of the wind power research at the Swedish Centre for Renewable Electric Energy Conversion.

It uses a vertical axis design which is quieter, more tolerant of harsh wind conditions, and simpler, with only one movable part, compared with the horizontal axis wind turbines commonly used today.

"In the future a simpler and more robust design could compete with the horizontal axis wind turbines," says managing director Hans Bernhoff, who is also an associate professor. "The simplicity is also interesting if you are looking for lower maintenance costs."

The vertical axis wind turbine design has been around since the 1930s, but never perfected. "The challenge has been that the turbine develops a huge torque which you have to be able to control," says Bernhoff. "But we think this is very well suited to the generators we work with – directly-driven permanent magnet generators which can be designed to have a very large overload capacity. Thus we don't need any mechanical control – we can do it with electricity which allows for much higher reliability and higher efficiency."

Swedish Vertical Wind is currently operating a 12kW prototype outside Uppsala in cooperation with the university, and the next stage is to build a small commercial turbine, for which the company is looking for partners. A commercial version could be ready next year.

# Unique design promises cheaper wind power

• While wind power has many advantages and is the one of the more developed forms of alternative energy, converting wind energy into electricity remains relatively expensive. In order to address this drawback, researchers at the Swedish Centre for Renewable Electric Energy Conversion are working on a unique solution which they hope will reduce these costs and therefore make wind power more attractive.

While the wind turbines familiar today use a so-called horizontal axis design driven by a propeller, this new solution uses a vertical axis configuration – think rotary washing line.

Sandra Eriksson, who is one of three PhD students working on the project, says: “We believe that this design can be more cost effective than a horizontal axis turbine. It is a simpler design using less material, so we believe that the cost for the actual unit would be less, and it would need less maintenance due to this simple structure.”

Quietly confident: vertical design produces less noise



PHOTO: JON KJELLIN

There is no gearbox – which is known to fail on wind turbines – and because the turbine can be driven by wind from any direction, there is no yaw or pitch mechanism needed.

“The goal for us is to have a system that would cost less per kilowatt hour,” says Eriksson. “The aerodynamic efficiency may be lower or equal to that of a horizontal axis wind turbine, but we believe it would still be more cost effective.”

## Saving costs

One of the three PhD students working on the project is looking into the aerodynamics of the design, investigating the flow of wind after it hits the blades of the turbine. The other two are working on a direct-drive generator – which will be installed at ground level, not at the top of the structure as in the traditional turbines – which will eliminate the need for a transformer, thereby saving on costs and maintenance.

“We are trying to look at the whole system, so we are looking at the coupling between the turbine and the generator, and we are looking at vibrations within the driveshaft and the structural mechanics of the whole machine,” says Eriksson. “And we are also looking at the system aspects, like designing a load for the generator, and what we will do with the electricity that is generated.”

Late last year the team erected their first prototype, which stands six metres tall and has five-metre long blades. It is expected to generate 12 kW at winds of 12 m/s. “What we are doing now is evaluating this turbine and measuring its performance to compare with our models,” says Eriksson.

Opponents of wind power have often cited the noise generated by the turbines in their opposition, but the team believes their design avoids this particular problem. “We believe that this design will give a less intrusive noise because we will have a slower rotational speed than the horizontal axis so you won’t get the same ‘sweeping’ noise,” says Eriksson.

# The wave of the future?

• It is emissions- and carbon dioxide-free, does not spoil the view, and might actually improve its immediate environment. Wave power will never be the silver bullet solution to the world’s energy needs, but it does have significant advantages over many traditional and renewable energy sources.

Researchers from the Swedish Centre for Renewable Electric Energy Conversion are working on a new concept to generate electricity from the motion of the sea. At a test site off the coast of Lysekil on Sweden’s west coast, the Islandsberg Wave Power Project uses a system with a buoy and a linear generator. As the buoy moves up and down with the waves, it drives the generator on the seabed. The generator and buoy are linked by a rope.

The first buoy, deployed last year, has already successfully generated electricity, and

will be joined by two more this summer. A total of ten generators will be installed at the site and will generate about 300,000 kWh per year – roughly the amount of electricity consumed in a year by about 20 households. Were the technology to be adopted on a large scale in Sweden, wave power could generate about 10 TWh annually – about two per cent of national demand. Globally, the potential for wave energy is in the region of 10,000 to 15,000 TWh.

“There is great potential in the oceans around the world,” says PhD student Simon Tyrberg. “If you are in the right place there is plenty of energy to tap into.”

## High energy density

Two of the benefits of wave power are a high degree of utilisation – wave conditions around Sweden’s coasts are suitable for generating electricity about 35 to 50 per cent of the time, which is more than with solar or wind power

# Underwater turbines exploit current assets

• While marine and tidal currents flow far more slowly than the wind blows, the higher density of water means they have far greater energy content. Add the fact that flows are both predictable and constant, and you have a source of renewable energy with huge potential.

If it were to be possible to harness this energy, marine and tidal currents could contribute in the region of 50 TWh of pollution-free electricity to the European grid each year. Researchers at the Swedish Centre for Renewable Electrical Energy Conversion hope to do so with vertical axis turbines placed on the sea- or riverbed. Research assistant Mårten Grabbe says: “To just build a turbine and a generator and make sure it works – that is easy and we could do it today. But to do it such a manner that will work for ten years with as little maintenance as possible, that is the \$10,000 question, and that is the reason we have chosen to work with this technology.”

The concept is a simple one with only two moving parts: the turbine and the rotor of the generator. There is no gearbox, no electro-mechanical brake, and no pitch system for the blades or jaw mechanism for the turbine. “Keeping it mechanically very simple limits the need for maintenance and limits the number of parts that could break down,” says Grabbe.

He and his colleagues recently finished the first prototype generator and are now conducting the first tests. Several articles on their research have been published in international journals. When external funding is secured, the project will be expanded and further researchers taken on.

## No emissions

The first major challenge the team has faced is designing the special generator. “This is no off-the-shelf solution,” says Grabbe. “It is specifically designed for the nature of marine and tidal currents. But that is our strength; we can go out to the site and measure the currents, then go back to the office and design a generator that is suited to specifically that current.” The next big challenge will be installing a proto-

type on the seabed. “Maybe it would be easier for someone coming from the offshore industry, but for us from the university it will be a bit tricky,” says Grabbe.

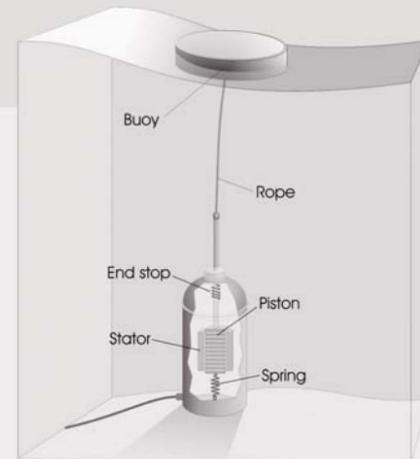
The benefits of marine current electricity are clear: no emissions of greenhouse gases or indeed anything else, and no visual or audio intrusion. “Then if you compare with other renewables like wind power or solar power, marine currents are much more stable and predictable,” says Grabbe. “You know exactly how they move and they never stop. That is a great advantage.”



University challenge: researchers Sandra Eriksson, Mårten Grabbe and Simon Tyrberg

PHOTO: MAGNUS STÅLBERG

Generating electricity on the sea floor holds great potential in countries like Great Britain where there are large tidal currents, but also in developing countries or in areas where building hydropower dams is not allowed or not possible. “According to some reports marine and tidal currents could deliver up to five to six per cent of the electricity demands of the UK,” says Grabbe. “It may not sound like much, but in money terms that is a huge amount.”



Wave power has huge global potential

“The environment is very harsh,” says Tyrberg. “First you have the salt water, and then the tremendous powers involved with large waves coming in during storms. This puts high demands on how sturdy you make the equipment.”

A balancing act is needed between equipment which is rugged enough to withstand a battering during storms, and sensitive enough to be able to produce energy in calmer conditions.

The basic approach of the Islandsberg project has been to keep it simple. “Making the system as uncomplicated as possible, in combination with the fact that we have tried to put the expensive and complicated equipment on the bottom and away from the waves, are the two things we think could make this project succeed where others have failed,” says Tyrberg.

– and high energy density. “That means that to access the same amount of energy you don’t need to build structures as large as you do for wind power or solar energy,” says Tyrberg. “If you want to produce a certain amount of energy with solar panels, for example, you need to cover maybe half a football field, whereas to access the same amount of energy you only need a couple of generators with buoys three or four metres in diameter.” That makes the technology cheaper, which in turn means the energy is cheaper. As the generators will act as artificial reefs, they could actually increase local biodiversity.

The biggest technical challenges for the researchers are posed by the forces of nature.



A green landing at Stockholm/Arlanda Airport

## 'Coasting' planes save on fuel and emissions

• The aviation industry has been painted as something of a bogeyman within the climate change debate recently due to the effects of aircraft emissions at high altitudes. But LfV, the Swedish civil aviation authority, has proved that a concerted effort can minimise the industry's environmental impact

LfV is operating a system which, by allowing aircraft to essentially coast into Stockholm's Arlanda Airport on approach, cuts down on not only fuel usage and emissions, but also noise. The initiative has generated considerable interest in the aviation world, and besides being rolled out at other Swedish airports in the near future, it could become an international standard and bring benefits globally.

Michael Standar, LfV's head of Air Navigation Services Support and Development, says: "Green Flights has been an enormous success. It creates a perfect situation for everyone; airlines, passengers and communities."

The Green Flights system – which is also known as Green Approaches – coordinates the actors involved in air transport to a greater extent than has happened previously, to the benefit of all. "Today a pilot flies the aircraft, air traffic control controls the traffic, the airport monitors or operates the airport," says Standar. "Until now they have each done that in splendid isolation, but when you start thinking that we all have an interest in making this flight as efficient as possible from its departure to its arrival, you see that you have to cooperate to a greater extent than has been the case until now."

Key to the initiative is agreeing on a time for arrival at the aircraft's destination, rather than a departure time, as is the norm today. Right after take-off, air traffic controllers use a data link to send a message to the aircraft's flight management computer specifying the approach path that should be used for the airport. The aircraft's computer responds by calculating an exact arrival time based on current flying conditions, which is then sent back to the air traffic control centre, where it is automatically inserted in the list of upcoming arrivals. The flight management computer also calculates the exact time when the aircraft's approach to Arlanda should commence, and this is chosen to enable the aircraft to essentially coast all the way down to the runway, thereby reducing exhaust and noise.

### Lower costs, lower prices

A more exact arrival time also has advantages on the ground; it allows ground staff to be ready at the gate when the aircraft arrives, neither early nor late, and means that pas-

sengers have waiting time at the gate or in baggage claim. Standar says that depending on the aircraft, fuel savings can be between 100 and 400kg. "If you save that much on one flight, that is a lot of fuel and a lot of money for each airline. But if you can do that with 25 airlines flying into an airport, then it is a huge amount." The fuel savings equate to several hundred kilos of carbon dioxide emissions per flight.

Standar says the bottom line is that the passengers will benefit, but also that it could lead to improvements in the quality of aviation fuel in the future. "If you can save fuel it means lower costs for the airline, which means that in the long run it will make it possible for airlines to lower their prices. But if you take the next step, flying an aircraft down on idle will put different requirements on the engine manufacturers and also put different requirements on the fuel refineries so you can ask for better fuel. If you get R&D working in that direction you can probably do something to improve departures as well."

In another environmental initiative from LfV, passengers flying to or from Arlanda are now being offered the possibility of making their trip climate neutral by offsetting their share of the emissions generated by their flight. A passenger travelling from Stockholm to London can neutralise their net emission by paying around €6. Although a number of other travel market participants have already launched web-based services for offsetting carbon dioxide emissions, the LfV service is the first to take into account the entire journey, including ground transport, and the first that offsets emissions other than carbon dioxide that are also believed to be climate changing.

LfV itself has been climate neutral for more than a year and has succeeded in halving the carbon dioxide emissions from its own operations from 40,000 tons to 20,000 – despite a rise in passenger numbers. A number of other companies and organisations operating at Arlanda have also begun working towards becoming climate neutral.

"One of my top priorities is to work with anything within LfV to make us as green as possible," says Standar. Another innovation at Arlanda is what is effectively a giant thermostat where snow can be stored and then used to cool airport buildings during summer. It also works the other way round, storing sun-warmed water to heat buildings during the winter months.

"The environment is a very important factor for us in Sweden," says Standar. "Anything we can do to make sure we can make a positive impact on environmental issues is high up on our agenda."

## Flying into the wild green yonder

• SAS Scandinavian Airlines is offering its customers the possibility to offset the carbon dioxide emissions generated by their flights. The move is the latest step by the carrier as it seeks to minimise the effects of its fleet on the environment.

SAS is also involved with the Green Approaches programme to save on fuel but also reduce noise pollution for those living near airports.

Niels Eirik Nertun, SAS's environmental director, says the airline felt that with global concern for climate change and its consequences increasing, the time was right to launch the carbon offset scheme. "British Airways was the first to launch such a scheme, but we are second and my guess is that others will follow."

Nertun says that the voluntary scheme is an intermediate step. "What we are waiting for, and what we have been at the forefront of, is the adding of aviation into the European Emission Trading Scheme, which will happen in 2011. The carbon offset scheme is something we want to offer to our customers in the meantime."

SAS passengers are guided via the group's website to a homepage set up by the airline's partner in the scheme, the CarbonNeutral Company. After calculating the CO<sub>2</sub> emissions from their trip, passengers can choose to financially support one of a number of sustainable development projects in New Zealand, China or India, all renewable energy projects. A typical return flight between Scandinavia and Europe generates approximately 300kg of CO<sub>2</sub> which will cost approximately €1.50.

Significant fuel savings stand to be made from the Green Approaches programme, for which SAS was picked to be the test airline. SAS is conducting trials of the system at Stockholm's Arlanda Airport, with a view to rolling out the system across Europe at a later date. China is also interested in the technology.

So far around 1,000 test landings have been done by SAS for Eurocontrol, the European organisation for the safety of air navigation. "This creates a triple-win situation," says Nertun. "When we do a continuous descent we save on average 150kg of fuel. That means more than 400kg of CO<sub>2</sub> which is absolutely

an environmental advantage, but 150kg is also money. There are improvements when it comes to noise pollution, and this way of conducting a landing is also safer because the flight control at Arlanda knows the aircraft's position in four dimensions, so this creates the possibility to have more capacity especially in peak hours."

### Environmental awards

SAS has continued its environmental work on a number of fronts, again winning awards for its environmental and sustainability reports in both Sweden and Denmark. A report published by the group in March based on its eco-efficiency indicators showed that in 2006 it used fewer resources and generated less pollution per passenger kilometre than at any time in its history.

"The debate around emissions and climate change has intensified, but we haven't actually changed any attitudes or goals because we have been consistent during the last ten years," says Nertun. During the past year the group also sold off its hotel arm SAS Radisson, which will change its corporate social responsibility profile and risks.

SAS is looking forward to using biofuels in its fleet, which it expects to become possible around 2010 or 2012. The company has been cooperating with the Swedish company EcoPar which has already conducted tests of its Biojet A1 fuel. "We think that in the short term there will be a blend of say ten or 15 per cent biofuel into the normal fuel which will cut CO<sub>2</sub> emissions by the same amount," says Nertun.

He says that SAS fully recognises the impact aviation has on the environment, but that this must be balanced against the benefits it brings in terms of facilitating globalisation. "If globalisation is the way forward to reach the UN's Millennium Goal of halving poverty in the world, we will need investment and trade, and aviation is the only infrastructure that will reach that sort of goal," he says. "You see a kind of balance – on the one hand we have the burden on the environment, but on the other hand the benefits for society, through business and tourism and so on, which far outweigh the burden we put on the environment."

Thumbs up: SAS pollution is at an all-time low



## Aircraft engines for the future

Volvo Aero and the Swedish Government, through Vinnova (the Swedish Governmental Agency for Innovation Systems) are each investing €7 million in a commercial demonstrator program. The investment will be used in the company's development of lightweight components for more fuel efficient and thereby more environmentally compatible aircraft engines.

Vinnova's decision is positive for Volvo Aero, which has worked for sometime for Sweden to gain a national program to develop more environmentally compatible air transport.

"The decision was highly pleasing, since Sweden has never previously had a commercial demonstrator program in aviation. Aviation faces major challenges to deal with environmentally," states Volvo Aero's President Olof Person. "We can contribute with lightweight technology so that the aviation industry comb-

ined shall achieve the emissions targets agreed by the entire industry in Europe."

Vinnova's aim with the so-called "Aviation technology and demonstrator program" (Swedish acronym FLUD) is to promote sustainable growth in Sweden through needs-motivated research.

These goals coincide with Volvo Aero's FLUD project, "Swedish demonstrator for environmentally compatible aircraft engines." At the European level, Volvo Aero is participating in the forthcoming Joint Technologies Initiatives (JTI) within the EU's seventh framework program. The initiative in the aviation field is designated "Clean Sky," in which Volvo Aero is participating within SAGE (Sustainable And Green Engine), in cooperation with Rolls-Royce, Snecma, MTU and others.

# Sweden-China city plan is a 'golden project'

• China's cities, the engines behind the country's phenomenal economic growth, have become a byword for environmental pollution. Now one city in the southeast of the country is calling on Swedish environmental technology to guide it towards a more sustainable development.



Karl-Erik Grevendahl signs an agreement with Danzao Town mayor Yongkang Fong

Sweden's Sustainable City concept, honed on the domestic front in developments such as Hammarby Sjöstad in Stockholm and Malmö's Western Harbour, has already been successfully exported to Toronto in Canada. There planners behind the huge Toronto Waterfront development drew on Swedish experience as they sought a more joined-up approach to sustainability.

Now the Sustainable City concept has attracted the interest of city leaders in Danzao Town, in Guangdong province. "There is a big need for the Sustainable City concept in China," says Karl-Erik Grevendahl, director of international affairs at Sustainable Business Hub, which is based in Malmö. "And the business possibilities there are huge." Sustainable Business Hub is now working as matchmaker between Danzao Town and a number of

Swedish companies in the environmental technology sphere.

The Sustainable City concept was created by Swedish Trade Council, the Swedish Environment Ministry and the Ministry for Foreign Affairs. At its heart is a holistic and integrated approach to the large-scale urban supply systems for energy, waste and water. "This is open for others to participate in and to use the concept in different cities around the world," says Grevendahl. "There are interesting examples of it all over Sweden."

The link with Danzao Town was established when Grevendahl was in China together with a delegation from Region Skåne. The vice-minister of the province of Guangdong had asked for help with developing the Nanhai National Demonstration Eco-Industrial Park in the town. "This business park is the first

Chinese third-generation business park and focuses on eco-industry."

The fact that the southern Swedish region of Skåne has a "sister province agreement" with Guangdong was instrumental in the partnership developing "In China that is very important," says Grevendahl. "It opens up doors that otherwise would be closed. It is one of a combination of factors that I think will make this a golden project; a combination of the sister province agreement, our long-term relationship, a concept that is holistic, and Swedish know-how."

## Pick'n'mix

Sweden's historical links with China also helped. "Sweden was the first western country to recognise the Peoples' Republic of China as a state. And they still remember that. They are also aware of how Sweden has been working with environmental issues for decades."

Step One in the project will be to make a small initial feasibility study. "We will focus on the needs in Danzao Town," says Grevendahl. "What are the needs they know about and what are the needs they don't know about. At the same time we will think about how the Swedish products and know-how could come into this project. We have to focus on both sides." Next will be a conference on sustaina-

ble cities in Guangdong in autumn 2008. "At the same time we will cut the ribbon to start up this huge project," says Grevendahl.

Grevendahl compares the offer he was able to present to Danzao Town with a paint pallet. "You can either use the whole pallet or take some of the colours," he says. "We found out that the competences and products we have in Sweden could be very useful in the development of Danzao Town."

Sustainable Business Hub is a non-profit member organisation which is financed by Region Skåne, Skåne county council, the Ministry for Foreign Affairs and Nutek, as well as its private sector members. The size of the companies involved ranges in size from one to 15,000 employees, and they come from the length and breadth of Sweden. About half of Sustainable Business Hub's operations focus on foreign markets, particularly Poland, south China, Singapore, the UK and the Middle East.

Grevendahl says that cooperation with Chinese companies will be a key part of the Danzao Town project. "We have to work with Chinese competences as well. It is a combination that will benefit both Sweden and China – a win-win situation. They get a better environment and job creation, and we get to sell products and services, so it is a good combination."



Swedish companies are working with water and air emissions at this factory

# Exports set to build on record year

• A record sales year for biofuel combustion plant manufacturer KMW ENERGI could be just the start of things. The Norrtälje-based company landed sales last year for over €75m on the Nordic market alone. With several irons in the fire on the Portuguese market and licensees getting busy in Korea and the US, KMW ENERGI is now expecting international sales to take off.

"We are now in the position where it could be one plant or five plants in Portugal," says sales manager Christer Rosendahl. "I think this year we will also have a project in North America, and in 2008 the exports will really start to increase. I am very positive for the future."

KMW ENERGI was founded in the mid-50s and has built itself a reputation as one of the leading suppliers of biofuel combustion plants to Swedish municipal heating companies. Its plants can run on anything from peat and waste wood to briquettes, exceed Sweden's stringent emissions control regulations, and are known for their reliability and low maintenance costs.

Last year the company sold five combined heat and power (CHP) plants in Sweden, Finland and Norway, and has sold another this

year. It has also this year sold a turnkey turbine installation in Sweden worth over €5m.

"We are working flat-out," says Rosendahl, adding that five or six new engineers and fitters are being sought to enable the company to keep up with demand.

## Projects in pipeline

KMW ENERGI has signed up a licensee in the US for the North American market and one in Korea who may in the future also cover the whole Asian market. They will manufacture the plants to KMW ENERGI's tried and tested design. "We are in a position now where they are building up their strategies for the market," says Rosendahl. "In North America the licensee is looking for partners and workshops and construction companies and so on

before he goes out for the market. He wants to be prepared."

Rosendahl says the North American market presents huge opportunities. "The market is so big and is pushing so much. Our licensee has a lot of experience and contacts from earlier business, so we already have at least ten projects in the pipeline thanks to earlier contacts."

Portugal provides a number of interesting possibilities for the company. "We are in discussion with several clusters of companies which are looking for licences to produce electricity for the grid," says Rosendahl. KMW ENERGI's quotes for the work have been high, but Rosendahl is still confident of getting the contracts. "They know that this costs a lot of money, but they can see that we have high quality products. You will get the money you invest back because you can run these plants for 20 or 30 years and make a lot of money on it."

Rosendahl says that what customers get by investing in the higher-cost option are a number of advantages, including flexibility in fuel. Another is the ability to use fuels with high moisture content: from ten to as high as 65 per cent moisture, while still being able to meet demands on emissions and power effect.

Rosendahl says it is not necessarily the steam side of the plant but rather the fuel side where the company has the advantage. "That is what we have a lot of experience of, and not just us but Swedish companies in general."

He says that the experience the company



KMW ENERGI has ten projects in the pipeline

has built up on the Swedish market gives it a distinct advantage over the domestic companies on foreign markets which are just now getting involved in the industry. "We have been doing this for 50 years and we have already met all the possible problems."

# Centre of energy excellence

• As a forerunner in the development of sustainable energy systems, Chalmers Energy Centre (CEC) gathers, coordinates and activates performances of R&D networks.

Sun, wind and water – renewable sources of energy – plus storage of energy are among the topics that research at CEC focuses upon. To obtain synergies in research and education and to facilitate implementation of large R&D projects, Chalmers University of Technology in Göteborg has gathered energy research into CEC. Here, interdisciplinary research is an important cornerstone. Starting in 2004, there are nine institutions today and over 200 researchers that comprise CEC.

“For many years, Chalmers has substantially invested in research networks in environment and energy areas, and CEC is one significant example of this dedication. CEC is needed because individual sectors or disciplines have difficulty in organising things over broad fields of endeavour,” says Bertil Pettersson, programme director and head of Chalmers Energy Centre.

an arena around which flows dialogues and communications within researchers, government and the commercial sector regarding investments, projects, programmes and applications. This consists of five functional platforms: transport systems and infrastructure; energy use in buildings; industry; power and heat production; and energy systems that relate to the seven prioritized areas.

“CEC works from the national perspective in areas relating to Sweden’s interests and we study the comprehensive perspective that considers both needs of individual companies and specific fields as well as the work of public authorities. The research results are valuable to decision makers and politicians. Energy-oriented public bureaus, authorities and departments are important for assignments and finances,” explains Pettersson.

Gathering expertise and resources in the field of energy in a centre makes the CEC an internationally competitive partner for research financiers, authorities and trade and industry.

## Products of CEC

Pettersson says that there are three “products” of CEC. One identifies the need for research investments. Another product is the research project itself. The third entails leaving these results to commercial firms so that they can use them in applications.

“It’s important at CEC to release results in a manner that leads to practical applications,” says Pettersson. Therefore, CEC’s activities ensure that research results become known, made available and applied.

CEC also monitors ongoing EU energy programmes, presents Swedish opinions, and fields inquiries from EU authorities. CEC’s international scope includes sustainable energy systems projects with the EU and universities in other countries.

For instance, its affiliation with the Alliance for Global Sustainability (AGS) entails cooperation between Massachusetts Institute of Technology (MIT), Technical University in Zurich (ETH) and Tokyo University.

“It’s important that Chalmers activities meet the needs of the future and contribute to this country’s strong leadership as an international competitor in the area. Therefore, I believe that the CEC will develop and expand in the future so that our multidisciplinary, system-oriented energy research projects will be kept at the forefront focusing on the development of sustainable energy systems” says Pettersson.



Bertil Pettersson

## Seven platforms

CEC operations concentrate on research in areas called “platforms” that cover: renewable sources of energy plus storage; use and supply of energy in the construction and real estate sector; future production, transfer, distribution and use of electricity in Northern Europe; control systems and climate policy; holistic approach to the use of biofuels in industry and society; technologies, systems and consequences for society of carbon dioxide separation and storage; and transport and the infrastructure. IT and materials related issues are other significant topics.

To interrelate these platforms, CEC has



From know-how to show-how at Elmia

PHOTO: LARS KROON

# Getting the full bioenergy picture

• Visitors to next year’s World Bioenergy 2008 in the city of Jönköping will get a complete view of this thriving industry thanks to a unique combination of conference sessions, field excursions and tradeshow in one comprehensive event.

“People go home with a holistic perspective of bioenergy,” says project manager Alan Sherrard. He says the main theme of the event is the commercialisation or implementation of bioenergy technologies and solutions. “In order to do that it is not enough to just talk about what is possible to do. You also have to go out into the field and look at a site, look at a pelleting plant or a combined heat and power plant or a harvesting operation, talk to the people running these operations as well as meet the suppliers. You get to do all those things at this event. You take part in the conference in the morning, you go on a study tour in the afternoon, and meet up with exhibitors in between. And that means you see how the whole system works rather than just looking at one aspect of it.”

The third World Bioenergy takes place next year from May 27 to 29 at Elmia and follows the very successful “Taking you from Know-How to Show-How” concept from the previous two events. World Bioenergy is attended by suppliers, manufacturers and buyers of products, equipment, technology and competence within the global bioenergy sector. The previous edition held in 2006 attracted over 4,200 participants from 60 countries.

Sweden is the ideal host for such a gathering of bioenergy expertise and technology. More than a quarter of the total energy used in the country comes from a bioenergy source, and globally Sweden has the most extensive experience in the commercial implementation of industrial bioenergy solutions.

“This has not come overnight,” says Sherrard. “It has been a process going on for many years, year by year increasing its relative market share in an expanding energy market. That means there is a wealth of industrial experience accumulated over a very long time in bioenergy terms, whereas many other countries are just beginning to get into this now.”

The conference itself will, as in previous years, feature leading speakers from the field. Topics this year will include certification and standardisation of biomass, market developments and trends, and developments in the transport sector. The end of each day of the con-

ference features an optional short field excursion where delegates can see how the theory works in practice. The trips take in facilities covering everything from gaseous biofuels to large-scale pellet production to energy from agriculture.

And the trip to and from the event need not be wasted time: pre- and post-conference transfer tours from Arlanda Airport in Stockholm and Copenhagen’s Kastrup Airport include study visits along the way to assorted bioenergy facilities.

## Unique focus

Getting this complete picture of the bioenergy business framework helps speed up the all-important process of doing business, explains Sherrard. “The larger and more complicated the project in question is, the longer the procurement process tends to be. This is partly due to the lengthy information research process especially for those wanting to get into the business. That is also why our concept is so interesting both for the exhibitors and those that come to visit. To make a strategic business decision you need direct access to all the necessary market and technical information in context as well as the contacts with people who can help you make it happen. Here, you shorten that research process down considerably time-wise. And of course in business, time is a precious commodity. Visitors can find out how to get involved, what technologies and solutions to use, visit a reference facility for that and then go home to decide what the next move should be. They have the contacts already in place and just need to pick up the phone or send an email to start the ball rolling. If you just go to a stand alone trade show or a conference you don’t get the holistic view as they generally pre-suppose that you are already in the business and know what you’re looking for which is not necessarily the case in this rapidly expanding industry sector.”

The event, which will be the largest international bioenergy conference of the year, features a huge diversity of systems and solutions suited to a wide variety of business situations. “What makes World Bioenergy different is it is so unique in its focus,” says Sherrard. “There are plenty of other trade shows and conferences that have renewable energy or bioenergy as a component, but if you compare just the bioenergy aspect of it then this is the largest and the most international must-attend event.”



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# Opening doors to eco-business

• In recent years, innovative companies in the environmental sector in West Sweden have multiplied dramatically. Ecoex-West Swedish Environmental Export helps open doors to export markets for these enterprises.

With years of experience in producing successful solutions, West Sweden companies are world leaders in development of cleantech. Collaboration between government, industry, companies and research gives advantages to West Swedish environmental technology this have resulted in numerous solutions for sus-

tainable development.

One indication of how hot Sweden's environmental sector is becoming is shown by the example seen with Ecoex, a project sponsored by the municipalities in West Sweden. In only two years since its inception, Ecoex has exposed its region's environmental-oriented firms to potential markets from China and Europe to California so successfully that the organisation's scope may soon now expand to include its Scandinavian neighbours.

Around the world today, there is an abundance of public and private customers that are interested in environmental products and services.

The hard part for suppliers to get their hands on potential sales, however, is being able to know precisely where these potential customers are located in the world. For firms in West Sweden, some help and guidance was needed.

## Exports, jobs, growth

"West Sweden's political leaders observed that we have many good environmental companies, however, the amount of exports was rather low in comparison to the potential in this field. Politicians here realised that they could play an important role as a door opener with the ultimate purpose of increasing exports in this market from West Sweden and also create growth and likewise employment in our region," says Maria Strömberg, Project Manager at Business Region Göteborg AB.

Transportation, logistics, clean vehicles, waste management, recycling, water purification technologies, bio-energy, energy-saving technology and IT solutions are among many segments in the West Sweden area that offer products and services for export. Ecoex coordinates contacts between West Sweden's environmental companies and decision makers outside Sweden that require environmental expertise and serves as a network, contact broker, and public relations office.

"We aim toward developing export competence here at home among small environmentally oriented companies so that they become confident in making investments in their respective export activities. From another perspective, we work with selected markets in which there are great export potentials and where we can assist in shortening the process of reaching these companies' potential customers," explains Strömberg.

Today, some 270 companies in

the small to medium-size range are served by Ecoex, which is managed by Business Region Göteborg AB, financed by the Västra Götaland Region and also involves both financially and operatively Innovatum AB in Trollhättan as well as Green Market Sweden AB in Falköping.

## Two-way promotion efforts

"Ecoex accompanies Swedish companies abroad to their potential customers and, in the other direction, brings these potential customers to the West Sweden region to discuss their needs, to demonstrate our own solutions and make introductions to local companies. One great strength of our project is being familiar with the companies and identifying their needs to develop export competence as well as assisting them in making business arrangements," says Strömberg.

She says that Ecoex has target markets are Poland, France, Norway and, to a limited degree, the USA. Ecoex brought some 17 West Sweden companies to Chicago this year to meet potential customers during Entrepreneurial Days, which was sponsored by the Swedish-American Chambers of Commerce.

"The project has so far arranged four environment seminars in throughout France with a successful outcome when it comes to business results for the participating companies. In the near future, we will assess the potential in Italy, and we will also commence activities at the beginning of 2008 in China," says Strömberg. "In the future, we'll consider working to group companies so that they can deliver larger system solutions. Ecoex will be growing because the potential and the demands for Swedish environmental technology are quite substantial."

Ecoex was initially planned to function until the end of this year but with the increased environmental awareness growing worldwide, she is certain that the project will last into the future.

"We're working with the Oslo region, Norway and the Skåne region in South of Sweden, Norway, on marketing assembled Scandinavian environmental exports and, thereby, becoming more widely based to handle large markets such as China. After this year, we will function as Ecoex Scandinavian Environmental Export," says Strömberg.



Ecoex coordinates contacts between West Sweden firms and decision makers abroad

## Expo gears up for 2008

• Expectations for environmental innovations and new technology are already high for the 11th biannual Eco-Tech Scandinavia environmental technology trade show in Göteborg in the autumn of 2008.

Late last autumn, 116 exhibitors, 2,600 visitors and 1,665 companies gathered for three days in Göteborg at the Swedish Exhibition Centre during Eco-Tech Scandinavia's exhibition, which became an exciting venue for meetings and business in environmentally oriented industries.

Among records that were set, the event attracted 50 per cent more international guests than the previous year. Besides European media coverage, Chinese television filmed the event, and a Chinese delegation attended.

"More companies were represented than previously, and I think that the environmental focus of the event as well as our matchmaking services were reasons contributing to the overall increases," says manager Ann Åfeldt.

### Repeating successes

She says that Eco-Tech Scandinavia 2008, that will take place October 7-9, will repeat successes from last year's show including seminars and conferences. Some 290 participants attended ten seminars. "We began with a general event each day that was for everyone and followed this with four parallel seminars," says Åfeldt.

Overall themes that were represented by companies in sections on

the exhibition floor will again focus on product areas including Waste and Re-cycling, Energy, Transport, Environmental Competence and Air, and Soil and Water. Another returning feature, Speakers Corner, will also showcase an array of environment-profiled personalities being spontaneously interviewed.

"Water and energy will be significantly large areas of the Eco-Tech Scandinavia 2008 exhibition. Our Innovation Street, which will also reappear, will introduce newly started companies that are still in incubator phases," reports Åfeldt.

Eco-Tech's successful matchmaking portion, through which some 80-100 meetings were arranged during the exhibition, will be offered in 2008, and the networking at the exhibition will again be in service. Åfeldt says they are likely to present the prosperous theme of Capital, which was visited by many risk capitalists.

Another winning feature that will repeat

in 2008, Biogas Highway, aims again to gather around 30 companies that range from waste sweeping firms to consultants, biogas enterprises or builders of fuel stations at a cooperative section. Along with prominent Swedish firms, this included some international companies from Denmark, Germany and the UK last year.

"Much interest was generated from visitors to Biogas Highway. Now that knowledge about these firms and their technologies is improved, there are better conditions for doing business in our area," says Bernt Svensén, manager of the sponsoring organisation, Biogas West, which is a cluster that stimulates the production and distribution of biogas and promotes the market for biogas-powered vehicles.

### Partner found

In connection with this last year, the Hardstaff Group from the UK demonstrated a heavy-duty diesel truck that uses Dual Fuel, a com-

ination of methane and diesel, and delivers the full power of a diesel engine. "During our time at Eco-Tech 2006, we had three days to look at all the stands and also attend seminars. We probably met a future partner who is a process control manufacturer. It was a very good show, we were honoured to be there and it was fantastic," says Trevor Fletcher, the Hardstaff Group's MD.

Furthermore, Åfeldt says that they plan focus in 2008 on special areas such as meeting places where visitors will have the opportunity to mingle with one another. "Much happens around the exhibition itself, and we will integrate this more with the conference and meetings that we present. We are now working with industry organisations as advisors to create Eco-Tech Scandinavia 2008. This will be a brilliant opportunity for environmental companies to demonstrate products and contact purchasers from European and international markets."



Organisers expect next year's event to build on past successes

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## World-première for ethanol hybrid bus

• A full-size low-floor city bus that cuts fossil CO<sub>2</sub> emissions by up to 90 percent if fuelled with ethanol and saves at least 25 percent fuel – that's the essence of Scania's hybrid bus concept. The concept bus is conceived to make a major contribution towards sustainable public transport.

The concept bus achieves all of these objectives, while meeting the lowest emission levels (Euro 5 and EEV). It also appeals to passengers because it is convenient and comfortable, to drivers with manoeuvrability for the tightest city environments and to operators since it uses technology designed to last the life of the bus. Energy storage makes use of supercapacitors, which are much more robust than batteries in heavy-duty operation.

### Demonstrates commitment

Debuting at the UITP public transport congress in Helsinki 21-24 May 2007, the concept bus is the result of a three-year development project conducted at the Scania Technical Centre in Södertälje, Sweden.

Hasse Johansson, Group Vice President Research and Development says: "Making public transport more convenient to attract more passengers is the best way to combat congestion and reduce environmental problems in cities. Scania's concept bus, with its low floor, big doors, uncluttered interior and automatic tick-

eting system is a big step in this direction. Passenger comfort and circulation are outstanding for a full-size city bus.

"The ethanol hybrid concept bus demonstrates Scania's commitment to participate in the transition into a sustainable urban transport system – a transition that needs to start right away. We see no reason to wait for other new fuels and technologies that could become viable in ten years' time.

"With our innovative hybrid-drive concept we improve fuel economy and cut emissions by at least 25 per cent and running on ethanol reduces fossil CO<sub>2</sub> emissions by up to 90 per cent. This combination of technologies paves the way for affordable and realistic city transport for many years to come.

"We are truly proud of this achievement," he concludes.

Twelve conventional ethanol buses equipped with Scania's hybrid-drive system will start regular operation in Stockholm in 2008 and 2009 in cooperation with the city's public transport operator, SL (Storstockholms lokaltrafik). Ten of these are partly financed by the Swedish Energy Agency.

Scania considers ethanol to be by far the most cost-efficient renewable fuel on the market today, taking into account factors like availability, infrastructure and access to proven technology. Depending on production method, fossil CO<sub>2</sub> emissions are cut by up to 90 per cent.



Scania's concept bus cuts CO<sub>2</sub> emissions by up to 90 per cent

### First hybrid train

Rail technology specialist STT has become the first European company to fit a hybrid engine to traditional diesel locomotives, radically reducing emissions and fuel consumption.

Working with US counterpart Railpower, Nässjö-based STT has developed technology to convert diesel locomotives to more environmentally friendly hybrids partly powered by batteries.

The technology minimizes the advantages of idle running diesels. Conventionally powered shunting locomotives often run idle for as much as 75 percent of their time in active use.

Stellan Hagman, STT chief executive officer, says: "It's extremely exciting to be first in launching a technology which gives so many advantages, both environmental and financial."

The hybrid trains, whereby battery modules are fitted as a complement to existing diesel motors, reduced emissions of nitrous oxides and diesel particulates by 80-90 percent. The new technology cuts fuel consumption by half and also dramatically reduces noise levels – a key advantage in urban areas. The hybrid locomotives, now being used by transport company CargoNet in Stockholm, were best suited for use as shunting and switching engines.

### Germans invests in Uppsala

The German Faulhaber Group is investing €4.5 million in Uppsala-based micro motor manufacturer PiezoMotor.

The Swedish company specializes in tiny but powerful motors that can be used in consumer electronics, navigation systems, medical technology and other applications.

The two companies had signed an extensive cooperation agreement aimed at launching "innovative custom designed precision and micro systems based on proprietary 'piezo motor' technology."

Founded in 1997 as a spin-off from Uppsala University, PiezoMotor said the tie-up was a breakthrough and would enable it to move from the development phase to full-scale manufacturing.

"We're talking about very large volumes and we simply don't have the capacity to manufacture them ourselves," says chief executive officer Per Oskar Lithell.

Faulhaber intends to use PiezoMotor's micro motors in its products, which include micro drive units and systems used in medical technology equipment. Under the terms of the deal, Faulhaber is purchasing a minority shareholding in PiezoMotor.



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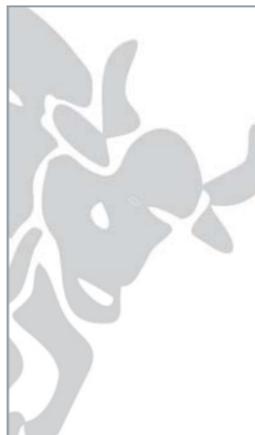
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## Test Site Sweden – An Environment V.I.P. Lane

**Imagine a congested highway packed with commuters on their way to work. Since you are driving an environmentally friendly car, you are safely passing the queue by cruising in a dedicated highway lane. The Test Site Sweden project is planning for an additional 5th lane of the E45 highway from Trollhättan to Göteborg.**

The lane will be a part of a substantial automotive proving infrastructure initiative and will be available to clean technology cars when not used for testing purposes.

Test Site Sweden is a cooperative project between the Swedish vehicle manufactures, the Swedish road administration, the region of Västra Götaland and Vinnova (the Swedish Governmental Agency for Innovation Systems). Test Site Sweden is unique in its ambition to cover the complete chain of testing activities from virtual testing, prototype testing and verification in real traffic.

The Test Site Sweden project is lead by Lindholmen Science Park where key players within automotive and transport, mobile communications and modern media technology are brought together. All have overlapping interests regarding the advanced use of information and communication technology.

For more information about Test Site Sweden contact the project leader Peter Öhman at [peter.ohman@lindholmen.se](mailto:peter.ohman@lindholmen.se)

Environmental testing is one of the focus areas of Test Site Sweden. To meet the testing demands of clean technology vehicles, Test Site Sweden is planning several environmental testing facilities for the E45 highway:

**Traffic flow testing:** Transponder technologies for speed control, exact position monitoring and other ITS systems

**Electrical vehicles testing:** Electrical charging stations

**Fuel testing:** Infrastructure for all fuels (such as CNG, LNG, Ethanol, RME, Hythane) together with well-defined road profile for precision consumption testing

**Service Stop:** A “base camp” for the environmental testing activities in the middle of E45. It will provide fuels at requested mixtures, charging facilities, workshops, garages, telecommunications and hotel and conference facilities.

Other focal areas of Test Site Sweden are safety, logistics, communication and community security. In each area, Test Site Sweden provides dedicated infrastructure, support systems and tools to conduct state-of-the-art vehicle development testing, verification or validation.



# “Waste is what’s left when imagination runs out”

Christian Ekberg, the Stena Endowed Professor of Industrial Materials Recycling

**Stena has endowed a unique professorship in industrial materials recycling at Chalmers University of Technology in Göteborg, Sweden. It is another step in Stena’s efforts to develop resource-efficient recycling processes and contribute to society’s long-term sustainability.**

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