Sven Werner on European growth potential

Britta Thomsen on the politics of energy

The benefits of BIOMASS

TRENDS in district heating

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Welcome to the first edition of ‘agenda’.

The European debate regarding future energy policy continues to rage. Discussions on energy generation and consumption, and steps to reduce the strain that both have on the environment, are no longer only confined to those in the industry. So important are they that they have penetrated the public sphere as socio-political issues that affect and concern everyone, the world over. But for those of us involved with the industry, the accountability of delivering intelligent long-term energy solutions is tougher than ever.

District heating is the core of Danfoss’ business, the benefits of which clearly align with the kind of energy-efficiency and environmental economy that future energy policies strive towards. ‘agenda’ aims to address and explore key topics regarding future perspectives and growth potential for district heating within Europe. On this front, we launch with a very conclusive feature on the benefits that a growth in district heating poses for Europe prepared by the respected Dr Werner. We also bring to the table a political perspective in an interview with EU Parliament member Britta Thomsen, and consultant Herman Boysen discusses key technical trends within the delivery of district heating solutions.

There is a tendency for district heating to be overshadowed by the more contemporary forms of energy, such as wind power. This stems from the fact that it is viewed as partly old-fashioned. But it has a key role to play in the future energy supply – especially when combined with, for example, CHP, geothermal and biomass – if we are to move towards solutions that are best for society. District heating is no longer just an efficient solution for densely populated areas. Biomass can now create micro district heating networks that effectively serve as little as 100 users.

I do not promote district heating as an exclusive energy form, but I do advocate the need for a more freely competitive environment throughout the European energy market. If all energy industries were forced to compete on equal terms, there would be a greater deal of efficiency within all the offers. And of course, I know that district heating would flourish in the way that it should – for the good of all.

Troels Petersen
Senior Vice President, Danfoss
A warm welcome
The reception area at Danfoss headquarters, designed by Schmidt Hammer Lassen.
SHOWTIME FOR Danfoss Nopro

Following the Austrian biomass district heating company Nopro recently becoming a Danfoss-owned business, the newly-formed Danfoss Nopro will hit the road with its compendium of solutions for two Austrian trade fairs during March. First stop is the Energiesparmesse/expoEnergy, 1-4 March at Messe in Wels. This international trade show for energy efficiency attracts over 850 exhibitors and around 91,000 visitors, and will prove a perfect stage for Danfoss Nopro to present itself for the first time. It will then take up place at the premiere of Haustec, 28-30 March at Messezentrum in Salzburg, a new forum for energy. Welcoming Nopro to the family fold heralds a new chapter in Danfoss history, and a decisive move to secure a major stake in the biomass district heating market – which has a projected growth rate of 15%. “We are already a leading player in the market for district heating substations and controls, and Nopro possesses valuable knowledge and competency within biomass systems, as well as having a good share of the current fast-growing market. Based on this, we believe that together we can make a substantial impact on the market in the coming years,” announced Niels B. Christiansen, Danfoss’ Executive Vice President. Further info at www.haustec.at and www.energiesparmesse.at

Danfoss GO DOMESTIC IN RUSSIA

In the last year, Danfoss has collaborated with Moscow City Council on two major inner city modernisation projects. The supply and installation of individual block heating stations, balancing valves, thermostats and heat cost allocators for two large domestic dwellings has been a great success – creating a 30% and 38% energy-saving return. Based on this achievement, Danfoss products and services will play a key role in the expanded project to the southeast of the city during 2007. It will link eight large domestic units to two central heating stations in order to generate substantial energy-saving benefits for residents and the Council.
ECL APEX ADDS EFFICIENCY TO ROMANIAN DH SYSTEMS

Danfoss, and local partner Elsaco, recently developed complete control systems for 39 substations in the Romanian town Drobeta-Turnu Severin. The client, Termoactiv, is delighted with the control accuracy and reliability of the Danfoss solution delivered. With enhanced data logging and transmission capabilities, it has been able to finely tune the heat supply from a central location and greatly improve overall energy efficiency. The systems were built around the ECL Apex 10 controller and extension modules, and incorporate motorized control valves (VFG & AME), differential pressure controllers and pressure/temperature sensors. They also include various components from Schmidt-Bretten Technology srl, a company that has been Danfoss-owned since September last year. On the strength of the project, Danfoss has been commissioned to replicate the systems in the towns of Bacau, Braila and Craiova. This represents a milestone in Danfoss district heating solutions penetrating the Romanian market.
CREATE A WARM RECEPTION FOR THE G8 SUMMIT

Heiligendamm, situated on the Baltic Coast between Wismar and Rostock, was up until the 1930s one of Germany’s most elegant seaside resorts. In its heyday it attracted European nobility from far and wide, including the family of the Russian Czar. After the Second World War the buildings of Heiligendamm were used as sanatoriums and recovery wards, and under communist rule several of its famous buildings were demolished and replaced by more utilitarian structures.

For decades it stood in slumber. In 2002 the Fundus Group made a major investment to renovate it to its former glory and create one of the world’s most prolific hotel complexes – the Kempinski Grand Hotel Heiligendamm.

With a no-compromise approach to quality, it appointed Danfoss FWT to plan, produce and deliver the heating and water supply for six of its most prestigious buildings with state-of-the-art solutions. Each substation (100-300 kW) for heating, and each stainless steel charging system for domestic hot water, is double equipped. This is to ensure guaranteed performance should any component fail, or any essential maintenance works need to be carried out. All systems are observed and managed via a central electronic regulating system, and the entire resort is connected to a block heat and power plant unit.

Since it opened in 2003, Danfoss FWT’s solutions have served such distinguished guests as George Bush. And as the hotel prepares to host the 2007 G8 summit, we are confident that our systems will provide a congregation of world political leaders with exquisite comfort during their important stay.

Danfoss RIVAL HONEYWELL IN DUTCH MARKET

When the Dutch market received information about the Danfoss AMZ 112 valve and actuator in 2005, it created a great deal of interest. However, it was originally only available in 230 volts, which is non-compatible with the common voltage of the Netherlands.

“Customers demand that they can control the temperature of their DH heated homes from one point, and for many years Honeywell was the only company offering such a solution in Holland. Despite this, we received frequent requests for a Danfoss alternative,” explains Raymond Dries, Internal Sales Supervisor for Danfoss (Netherlands) B.V.

In response, a 24V model was developed for the Dutch market 18 months ago. With sales having already exceeded 5,000 units, it appears that customers in Holland are finally getting what they want, and Danfoss has broken Honeywell’s monopoly of this corner of the market.

“One clear advantage that helps explain the success of the Danfoss solution over the Honeywell offer, is the fact that the AMZ 112-S 24V has a rotating valve with a self-cleaning mechanism. Honeywell’s set has a spindle operated valve that is prone to a build-up of dirt, and that can create problems,” underlines Dries.
For over 30 years, street heating has made Aarhus’ two kilometre pedestrian strip a snow- and ice-free zone for shoppers and traders. Danfoss’ ECL weather compensator currently controls the system – and it is all set to go cyber. In a bid to improve the efficiency and effectiveness of its famously heated pavements, Aarhus Council has agreed to update to the internet-based WebAccess system.

“Surveillance of the system currently relies on a worker driving out to the three technician rooms every day to make sure that everything is as it should be. When we have WebAccess installed, we can access an exact overview of the system from the comfort of our office. We will be able to identify errors quicker, and rectify them immediately. Furthermore, by linking to frost and snow forecasts, we can also start the system before humidity and temperature gauge it necessary,” explains Jens Bruun, Aarhus Council’s Head of Traffic and Roads.

Comparing the cost of one day of snow clearing of Aarhus (approx. €67,000) to the current total annual cost of the heating system (approx. €54,000–€107,000) – it is a staggeringly cost-effective solution. “I have no precise cost-saving data for the WebAccess system, but I have no doubts it will result in a lower bill for the shops who jointly honour the cost,” concludes Bruun.

Danfoss SHOWCASE AT ISH 2007, FRANKFURT

As a hotbed of today’s innovation and tomorrow’s pioneering solutions, ISH is one of the world’s leading business and trade fairs for the manufacturing, construction, engineering and architectural industries. The bi-annual event attracts in excess of 2,300 exhibitors and nearly 200,000 visitors, and this year runs 6-10 March.

At the 2005 ISH, heating technology accounted for 55% of visitor interest. To reflect the global interest in energy-efficient, eco-friendly, cost-effective heating solutions, the core theme for energy technology at this year’s exhibition is renewable energies.

As a frontrunner in this field, Danfoss will have a prominent presence, exhibiting our comprehensive portfolio of ‘smart’ heating solutions. Our main stand will occupy over 500 m² in Hall 10, as well as a presentation of district heating substations, domestic hot water and biomass systems in Hall 8 and heat pumps in Hall 9.

We look forward to meeting visitors, customers and colleagues from around the globe to share technologies and ideas that will help shape the future.

About Britta Thomsen

Britta Thomsen is a member of the Danish Social Democratic Party and Deputy Chairman of the Committee for Industry, Research and Energy in the EU Parliament. She is also an active member of the Women’s Energy Club in Brussels.
Britta Thomsen is headstrong that energy policy must set the kind of goals that will make the necessary inroads to a more energy-efficient and ecologically balanced future, and she takes her role within this very seriously. In an interview with ‘agenda’, she clearly aligns her position on some of the major challenges facing European energy policy, and proposes some definite action to overcome them.

PHOTOS MIKKEL STRANGE, MATTON

To what extent do you believe the EU Parliament is impacting on the Commission’s energy policy making?
In recent years, the Parliament has proved, with such things as the Service Directive, that it is an important institution that can’t and won’t be ignored. During the last term, it has gained a more influential role, and the Commission is listening to us. The Parliament supported, with a big majority, some very ambitious targets for the European energy policy. Unfortunately, the Commission did not have the same courage to promote the same necessary targets for green energy and CO2 emissions. Its energy package is a step in the right direction, but it is not to our standards and we will continue to negotiate and influence them on this. But the targets that have been set for renewables would definitely not have been so high if the Parliament did not set benchmarks and exert pressure.

Do you believe that we are now at a stage where energy within the EU is being driven more by society-centred solutions than economics and politics?
We have two problems that have long-term consequences. The first is security of supply, and the second is climate. This combination has of course made energy a core politics issue and its status has changed – it now makes the daily headlines of the Financial Times. Politicians
“In Denmark we have been very good at supporting district heating at a local level by developing the necessary piping infrastructure. This has allowed us to optimise the benefits it has to offer as an energy system with optimal efficiency.”

It’s good to talk
“I consider myself a ‘practical European’ because my working life has always been influenced by the European cooperation. It is essential to exchange experiences and knowledge about energy within the EU. Denmark has a valuable tradition of energy saving that can be of great value to smaller Member States who want to be better energy savers, but don’t know how. It means they don’t have to invent everything from scratch.”

You recently referred to the Commission shying away from the long-term ‘bigger investments’ that are necessary to address the pressing climate and environmental issues of energy. What do you think is the biggest barrier that prevents the Commission taking that leap?
The biggest problem is that the Commission has not proposed sufficiently ambitious goals concerning renewables and concerning reductions in CO2 emission. It is very important to send a clear message to investors as to what kind of policy we want to realise in the EU – and it should most definitely not be nuclear. Investors need to know what they should do in the future and the Commission should be urging Member States to invest more in renewable, eco-friendly energy. In addition, it has a greater responsibility to monitor that all the Directives are being met. One thing is making new energy legislation, another is securing that the National States are following guidelines that have already been set.

What key measures need to be taken in order to create a more competitive energy market within Europe?
It is simply to implement the single market for energy. Denmark cannot sell energy on the German market, French and German energy is being sold to the UK while British energy cannot penetrate the German or French markets. First there is the issue of opening it up in general, and secondly there is a need for legislation that promotes renewable energy being integrated into all European energy grids.

What further measures do you suggest will help the EU move away from fossil fuels?
In conjunction with the Commission increasing targets, some form of tax legislation would help encourage Member States to think beyond fossil fuels. I’m sure reducing tax on renewables and levying higher taxation on non-renewable energy would make a great difference.

Denmark has historically been seen as a very progressive country regarding green and efficient energy systems. Do you think it still represents a good example to the rest of Europe?
Denmark is still the European expert on renewables and energy efficiency.
We are the best energy savers in Europe and have highly developed CHP systems. It is important that we continue to share this knowledge and experience with other Member States and globally. But the level of CO2 emissions from the large volume of coal we use is still a concern. The current government has not at all been pursuing an ambitious energy policy, and if Denmark is to secure its position as a frontrunner, they need to prioritise cleaner energy more. For example, the EU target set for 2005 regarding bioethanol gasoline has not been met in Denmark. Despite this, no legislation has been passed. Subsequently, companies like Statoil, which has invested a huge amount in this area, are now considering that it is no longer an economically viable option for them.

**District heating is an effective alternative to conventional energy. It is energy efficient and environmentally sound. Do you see it as a major component of the world’s future energy system?**

It is a problem that district heating is so very concentrated across Europe. In the UK, only about 5% of homes use it as their primary energy. In Denmark we have been very good at supporting district heating at a local level by developing the necessary piping infrastructure. This has allowed us to optimise the benefits it has to offer as an energy system with optimal efficiency. In fact, it is a very good solution for the future, especially when combined with biomass generation. Other countries need to think long-term and do the same. For those countries for which the initial economic investment does not seem viable, perhaps there are ways they could be supported. For example, the Cohesion Fund could allocate spend to support this in the future. I think that would be a sensible allocation of resources given that the fund was originally set up partly to support action for a cleaner and safer environment.
Concerns regarding the efficiency, security and environmental impact of traditional energy systems have for some time been at the top of the European political agenda. The 2005/2006 Ecoheatcool project addressed district heating as a sensible long-term solution. Sven Werner reviews the key findings that suggest a potential glowing future for district heating in Europe.

THE ECOHEATCOOL PROJECT

Coordinated by Euroheat & Power, the Ecoheatcool project was established to assess the overall community possibilities from an expansion of district heating and cooling in Europe. Its focus was to analyse commercial heat deliveries (mainly district heat) and other energy supply in relation to the electricity and net heat demands in the industrial, residential and service sectors. It considered 32 European countries: the 25 member countries of the EU (2005), four accession countries (Romania, Bulgaria, Turkey and Croatia) and three EFTA countries (Iceland, Norway and Switzerland). The project selected 2003 as a reference year, and baseline information was gathered from the IEA Energy Balances and relevant Eurostat databases. Six subject reports (available at www.ecoheatcool.org) have been published, and the following summary of two district heating reports goes someway to express the potential benefits that district heating yields for Europe.

THE EUROPEAN ENERGY BALANCE

Figure 1 (page 17) demonstrates the total energy balance of the sample countries during the reference year. The various steps in the energy supply are divided into three added bars. The total primary energy supply of 81.1 EJ includes the total calorific value of all fuels and other energy amounts supplied to satisfy the total energy demand, while the total final consumption includes all energy commodities used by all community sectors. The difference between them reflects what occurs in the energy transformation sector, including power generation, oil refining, central heat generation for district heating systems and distribution losses in electricity and heat distribution systems.

All hydro and nuclear resources and most of the coal were used for generating electricity, while most of the petroleum products, natural gas and combustible renewables are transferred directly to the final energy consumers in the different community sectors. The total heat losses from the energy transformation sector were major – 23.8 EJ – and correspond to 29% of all primary energy supply. Most of this heat was lost in thermal power generation due to low conversion efficiencies. Higher conversion efficiencies in thermal power plants would considerably reduce the energy supply for electricity generation and...
the associated carbon dioxide emissions. For total final consumption, 10.7 EJ electricity and 2 EJ heat (mainly district heat) were delivered. These amounts correspond to 18% and 3.4% of the total final energy consumption (57.3 EJ).

The third bar includes the estimated final end use of heat for various purposes, electricity for power/lightning, and power for overcoming friction, speed change, altitudes and air resistance in transportation. Heat amounts to more than 20 EJ, while electricity use was 10.4 EJ, since some electricity was used for transportation purposes. Also in this third step, the heat losses were huge from high temperature industrial processes, heat generation in local boilers and conversion losses from engines in vehicles.

This analysis of energy balance reveals that the major total heat losses correspond to more than half of the total energy supply. A future European energy system must reduce these losses in order to increase energy efficiency, improve the security of supply and reduce carbon dioxide emissions. District heating has the potential to meet these objectives by recycling existing heat losses in the energy system to satisfy local heat demands on the European heat market.

**THE EUROPEAN HEAT MARKET**

In Figure 2, the total net heat and electricity end use is presented for the whole target area by the three major sectors. The use of natural gas for heat and the use of electricity dominate in all three sectors, having total market shares of 33% each. Commercial heat deliveries, like district heat, had a total market share of only 6%.

The total customer costs for net heat and electricity amounted to 120 billion for the industrial and 270 billion for the residential sectors – 1.1% and 2.6% of the total GDP.

District heat is mainly used for covering heat demands for space heating and hot water preparation in the residential, service and industrial sectors. Furthermore, some district heat is also used in the industrial sector for low-temperature process heat demands. The district heat is distributed in more than 5,000 networks containing 142,000 km trench length of transmission and distribution pipes.

District heating has reached high, almost saturated market shares in Iceland, Denmark, Finland, Sweden, Poland, Estonia, Latvia and Lithuania, but further expansion is possible. The high annual growth rates – 6-10% in Norway, Austria, Italy and Turkey – indicate favourable national conditions for district heating. Despite this, Germany, France and the United Kingdom have no significant growth in district heating. Here lies huge potential.

**POSSIBILITIES WITH MORE DISTRICT HEATING**

The total net heat demand for the industrial, residential and service sectors in 2003 was estimated at 20.8 EJ for the sampled countries. The additional possible potential for district heat sales was estimated at 6.8 EJ/year, 3.4 times higher than the current district heat sales of 2 EJ/year. Hence, no limitations appear with respect to available heat demands for expansion of the European district heating systems.
Figure 1. Energy balance (reference year 2003) for 32 sample countries, divided into primary supply, final consumption and estimated end use.

Figure 2. In total, the market share was 6% for the district heat when electricity was included. Otherwise the market share was 8.9%.
The fundamental idea of district heating is to use local fuel or heat resources without alternative use (the five strategic resources) in order to fulfil appropriate local customer heat demands by using a heat distribution network as a local market place. District heating systems fulfil the fundamental idea to a high extent as key figures (2003) demonstrate:

- 78% share of recycled and renewable heat in the total district heat generated
- 68% came from combined heat and power plants
- 14% of total renewable share, which was higher than the EU target of 12% for 2010
- 7% biomass share, from several hundred systems using biomass in their energy supply (Sweden has a 42% share)
- 1% geothermal share, from about 100 systems using geothermal heat completely or partially, mostly in Iceland and France

The volumes of the five strategic heat source options are summarised in Figure 3 and compared to the current volumes of generated district heat. It suggests that the total available potential for the five strategic resources are about 200 times higher than the current district heat deliveries, and about 20 times higher than the current total net heat demand for the industrial, residential and service sectors in the target area. The highest potential appears for geothermal heat, but the available heat resources from CHP and biomass are also significant. Hence, no limitations appear with respect to available strategic fuel and heat sources for more district heating in Europe.
Doubling European district heat sales, by increasing the district heat share from 6% to 12% in all end use of net heat and electricity, and improving the current heat generation will provide the following total benefits for the 32 countries:

- Higher energy efficiency: reduction of primary energy supply with 2.1 EJ/year (50 Mtoe), which is equal to the current primary energy supply of Sweden.
- Higher security of supply: reduction of the import dependence with 4.5 EJ/year (110 Mtoe), which is equal to the current primary energy supply of Poland.
- Lower carbon dioxide emissions: reduction of 400 million tons/year, corresponding to 9% of the current emissions in target area. This estimated reduction is equal to the current emissions of France from fuel combustion.

These benefits have the same magnitude as the market share for district heat in the target area, revealing that the use of primary energy resources for district heating is very limited. The corresponding carbon dioxide emissions for district heat delivered are also very low, actually 51 g/MJ below zero, since new electricity from CHP plants are assumed to replace existing coal condensing power plants in the European electricity market.

The total change of carbon dioxide emissions, with also the total possible district heating potential included, is presented in Figure 4 for the different community sectors. The diagram shows that when district heating systems grow, the carbon dioxide emissions will be reduced in four sectors: energy, industry, residential and service. The emissions for the transport and agricultural sectors will not be reduced, since district heat is not used in these sectors. The total carbon dioxide reduction will be about 1000 million tons per year for the total possible district heating potential. These results prove the crosscutting abilities of district heating in the European energy balance.

Overall, the evidence substantiates district heating as a crucial component of the European energy system with respect to energy efficiency, security of supply and environmental impact. It boasts the major advantages of recycling heat surpluses from existing energy systems and providing early options for renewables such as biomass, geothermal heat and solar heat.

Torino leads Italy

Danfoss was recently selected from stiff competition to deliver and install 300 substations for a major district heating project in Italy’s Torino Centro area. Aldo Fiamberti – District Heating Manager for AES Torino – provides a snapshot of the growth of district heating in his motherland, explains why Danfoss was awarded a majority slice of the much-coveted contract for Torino’s city centre and considers some major challenges ahead.

TORINO – AT THE FOREFRONT OF GROWTH
The northern town of Brescia spearheaded district heating with the country’s first provision in 1972. “District heating was a complex concept to introduce. I remember one of the first marketing campaigns for my territory creating a great deal of intrigue. It read ‘Southern Torino will be happy – the heat without a boiler is coming’. For a population who could not comprehend heating beyond oil-fired boilers, it was a very strange idea indeed,” recalls Mr Fiamberti.

“Torino developed its first CHP plant in 1982, and since last year it is home to Italy’s biggest district heating plant,” announces AES Torino’s Mr Fiamberti with pride. AES Torino was established in 2001 from an agreement between the City of Torino and two other companies – AEM Torino and ITALGAS – to grow and manage the distribution of natural gas and district heating to premises around the city and in the bordering municipality of Moncalieri.
Aligning the scale of growth of district heating in Italy, recent data prepared by AIRU for the year 2005 reports a total of over 155.5 million m³ of heated space generated by district heating systems. This is an increase in excess of 23.2 million m³ from 2002.

Torino’s district heating network alone currently serves around 360,000 inhabitants with a 36 million m³ supply, and an additional 4 million m³ will be added by next autumn. With a 23% share of the country’s total heated space by district heating systems, Torino is a key player on Italy’s district heated landscape.

“With such a large district heating grid, Torino plays an important role in the growth of district heating in Italy. We lead by example, and many smaller towns rely on us for information about the benefits we have gained from it,” explains Fiamberti.

“The positive environmental effects have been a major driver for Torino expanding its grid. The poor air quality has become a critical political situation. District heating has managed pollution by firstly decreasing the number of oil and gas boilers and natural gas boilers in the region, and secondly by restricting pollution from power stations away from urban areas. Also, with most generation being CHP, any potential heat loss that can be detrimental to environmental conditions is being recovered and well utilized.”

This claim is clearly substantiated in AIRU’s recent data for 2005. It concludes that the working district heating plants in Italy generated a decrease of CO2 emissions equal to 1.623.00 t compared to ‘conventional substituted systems’.

“There are also other major benefits that have helped popularize district heating. Gas is a fuel, and despite maintenance regulations, the risk of explosions and fires in gas boilers is significantly higher than with heat exchange systems. Furthermore, heat exchangers have a much more low-maintenance and simpler-to-use profile, and they are a very cost-effective solution for customers.”

With major expansions of the region’s district heating provision in the pipeline, Torino seems set to continue waving the district heating flag and mentoring neighbouring regions. “We have a very ambitious project pending authorisation. It is for a new power station in the northern area of Torino that will increase the volume of district heating by 14 million m³. Connecting it to the existing plant will enable us to create a grid that will not only extend the capacity of the region’s district heating provision, but also enhance overall reliability. With a potential 54 million m³ supply, the scheme represents one of the biggest city district heating grids in Europe.”

Danfoss SOLUTIONS CONNECT A NEW COMMUNITY

As plans to expand the district heating grid unfold, so do projects to connect vast areas in the region to it. One of these is a large-scale modernization project in Torino Centro that commenced in 2006. So far around 500 operational substations have replaced basement boilers, and there are plans...
to add another 250 this summer – connecting a total of 750 buildings and heating 10 million m³ once the project is finally completed in Autumn 2007. Danfoss secured a 50% (300 units) share of 600 tendered substations to be delivered and installed as part of the project.

“As a public company, AES Torino has a responsibility to make sure we use our spend wisely. We have to select the best companies for projects, and in this case Danfoss was definitely one of them. It does not only have a great deal of experience in the assembly of substations, but also a proven track record in components, such as regulation systems and valves. It was a very thorough selection process and involved visiting Danfoss LPM in Finland, Danfoss Gemina Termix in Denmark and Danfoss Trata in Slovenia in order to get a good operational overview of the business. Our impression was very good, and of course we also took into consideration such factors as the quality of Danfoss products, reliability, reputation and a bid that represented excellent value. Interestingly, many other tenders proposed integrating Danfoss brazed heat exchangers within their offers. This, of course, made us feel very safe and secure with the Danfoss brand,” explains Fiamberti.

“Danfoss is the only supplier in the world able to provide complete district heating solutions, including automatic controls, heat exchangers and substations. It was the right partner for AES Torino because of the very large production capacity available at our nine substation factories around the globe, which have an annual production of more than 100,000 substations. Furthermore, Danfoss has the financial security and the organisational strength that is a prerequisite for many customers in large district heating projects. Torino is currently one of the biggest district heating projects in Europe. Being awarded the supply and installation of such a large volume of substations was a great opportunity for Danfoss District Heating to increase its presence in Italy. The delivery of substations from our factory in Finland had to match the installation capacity of local installation companies, and meet a very demanding heating start-up schedule – which we successfully achieved. District heating in Italy is a growing market, and I am very optimistic that it will be a key territory for us in the future,” adds Kristian Honoré, Danfoss Business Development Manager (Substations).

**A CHALLENGING FUTURE FOR TORINO**

The advent of individual flat substations, and the further benefits they present in terms of increasing energy-efficiency
with a combined heat and water functionality, pose a major challenge for Torino.

“Many of the buildings here are very old, and because of their infrastructure the installation of individual flat substations is a very costly modernisation process. In fact, there are only a few examples of such systems in operation in the area. But given that this is the most effective model of district heating in terms of energy rationalization, we need to promote this solution to construction companies and within the municipality. Political legislation to force construction companies to integrate them into new builds is definitely a way forward,” suggests Fiamberti.

“But this aside, projects like Torino Centro still represent a big step forward. Until such a time when individual flat substations are a viable solution for the area, we can continue to improve the common district heating supply by implementing individual metering. The potential cost benefits involved with this for residents will also encourage them to consider the bigger issues of being more efficient with their supply – and there are many bigger gains to be had from this,” he concludes.

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<td>Vulgas</td>
<td>HKL substations (3.2 MW)</td>
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Optimizing nature’s potential

The world’s vast resource of biomass holds the key to sustainable, clean, efficient and economically viable energy for the future. Anton Koller – Danfoss Regional President, Sales & Marketing – highlights the benefits of biomass energy generation, and summarizes Danfoss Nopro’s biomass district heating offer.

PHOTO MARTIN DYRLØV

Biomass resources cover a wide range of products, by-products and waste streams from the forestry, agricultural and agro-forestry industries, as well as municipal and industrial waste streams. Processing biomass locally can provide enough energy to meet the demands of entire communities. In addition, it reconciles many of the socio-economic issues related to the fossil fuel energy generation that are of global concern.

AN INFINITE ENERGY SUPPLY

90% of biomass energy production uses waste wood from logging and thinning operations. Forests are not only the largest, healthiest and most natural air conditioning systems in the world, but by being in a constant state of growth, they ensure an infinite provision of energy source material. Creating a market for local waste forestry is not only an efficient use of natural resources,
but it can also boost local economy and, in conjunction with replenishment programmes, proactively contribute to the long-term health of woodland.

ENVIRONMENTALLY HOSPITABLE
Wood is CO2 neutral when it is converted into energy through biomass wood chip systems. With minimal emissions (over 80% less sulphur oxide than oil), odours or smoke, wood chip biomass systems conserve the natural balance of the environment and have a positive impact on global warming.

ECONOMICALLY SOUND
Renewable local resources fuel biomass energy systems. It therefore relieves the economic burden and security issues attached to dependency on imported fossil fuels and other foreign energy. This strengthens the national economy and local employment, and allows for more democratic prosperity within the energy sector. This is further enhanced by the fact that, unlike fossil fuels, biomass energy can be traded on local, national and international markets. The cost of biomass energy is currently on a par with oil and gas, but it will not fluctuate in the same way as fossil fuels because it is not prone to the same market forces.

Danfoss Nopro – TOTAL SYSTEMATIC EFFICIENCY
Austria is a pioneer market for biomass district heating systems, which is aided by the fact that 47% of the total area of the country is wood. There are currently more than 400 micro district heating systems, typically covering 100-200 connections.

Having carved a name for itself within systematic energy optimisation, Danfoss Nopro is very much at the forefront of the biomass district heating evolution. With over 200 district heating facilities and over 10,000 transfer units, it is one of the main players on the Austrian and South Tirol markets for stations to the biomass segment.

It is unique in the sense that it delivers a total system solution. On the one hand it is a producer of district heating substations, and on the other a professional partner in terms control and management of district heating networks.

In establishing a micro system Danfoss Nopro supplies everything except the boiler, starting with a comprehensive feasibility study and a full proposal for energy savings. A cost comparison of biomass district heating with oil presents a very attractive economy saving, especially with subsidizing for green energy. Consumers can expect a total economy that is typically up to 50% better than equivalent heating with private oil or gas burners.

A key component of the Danfoss Nopro offer is the unique NECS (Nopro Energy Control System) service and monitoring system it has developed – the centrepiece of an operational business concept for an investor or small group of investors. The key benefit of this monitoring system is that the district heating network is seen as one, integrating all substations and controllers within the network. This combined system increases the efficiency and security of the whole district heating network, from the heating plant to every single household connected. Therefore, it can track individual energy consumption and provide a platform from which to effectively advise on rationalizing it and optimizing the entire energy chain.

A WASTEFUL FUTURE
Conventional district heating systems serve a large volume of people in very condensed areas with combined heat and power. Biomass district heating doesn’t separate the power and distribution in the same way, and it works on a small municipality scale, predominately focusing on heat. However, there are growing examples of extending the efficiency of biomass district heating by using the exhaust from wood burning to generate electricity, and this presents a great opportunity to optimize the use of such systems in the future. Also, there is a great deal of potential to combine biomass with such things as geothermal heating and heat pumps to take it to the next level.

Biomass district heating is one of the most intelligent systems for many European countries. Germany has a remit of 35% renewable energy, which includes biomass, and Russia and Finland have so much wood that they don’t know what to do with it. Danfoss Nopro is committed to taking biomass energy to such a sophisticated industrial level that it can simply be replicated anywhere in the world and secure a place in the future energy system as one of the most effective models. This will no doubt include taking it beyond the micro scales we are used to today.
A climate of trends

Herman Boysen’s expansive knowledge regarding trends in district heating has earned him great respect among the European heating community. Here he highlights some of the most significant recent developments, and describes how they are shaping Danfoss district heating solutions.

PHOTOS MIKKEL STRANGE, Danfoss

We are experiencing a major drive for energy saving within the energy sector. Within district heating, greater efficiency in distribution and house systems, as well as lower energy consumption in buildings and increased comfort, are all key to this agenda. Where it is profitable, district heating is being established, and the trend is to develop low temperature systems in order to reduce heat loss in the pipe net. In areas where the distance to district heating supply systems is too long, the lack of profitability is increasing the popularity of heat pumps as an alternative solution – a corner of the market Danfoss has entered into in recent years.

District heating networks in Europe are among the most efficient in the world. However, the average heat loss from the pipe net is 10-30%, depending on number of branches and insulation of pipe in the network. This volume has to be reduced. Besides improved types of pre-insulated pipes, we are seeing great improvements in house substations with high-efficient instantaneous heat exchangers in the domestic hot water system and the room heating system in order to reduce the heat loss in the pipe net.

There is also a growing focus on hydraulic balancing, not only in house installations, but also in substations and distribution systems. Keeping hydraulic balance in a system reduces the circulated water flow so that all consumers receive exactly what energy they need. This saves pump energy, and a high level of comfort is delivered with minimum energy loss. Hydraulic balance is particularly crucial in house systems, as this is the most important factor for reducing the supply and return temperature within the total system. Differential pressure controllers and flow controllers are an easy and safe way to safeguard hydraulic balance. Balancing valves are becoming increasingly integrated into the control valves for central and decentralised systems, and Danfoss has an extensive portfolio of research, development and products that reflect this trend.

About Herman Boysen:
Educated as a mechanical engineer, Mr Boysen worked for Danfoss District Heating Controls division for 28 years. He also has a decade’s worth of consultancy experience under his belt designing heating and district heating systems. Now semi-retired, he collaborates with Danfoss on selected projects and is a member of the Board for Sønderborg District Heating Company, Denmark.
Substations

**TREND:** It is common in many countries that substations are very big units, serving big supply areas and many buildings – but this is changing. The trend is to move towards substations being split up into small and compact units. The first step is to break it down to one substation for each house, or group of houses. From here, a further development for apartment blocks is to break it down further, so that each flat has its own substation. Major benefits of flat substations include an accurate allocation and measuring of heat consumption in individual apartments, an enhanced hydraulic balance of the water flow in the pipe network, small installation costs (they only require three pipes up into the building) and low adjustment costs.

**Danfoss solution: Akva Multi TDP**
A high performance and simple to operate flat substation. Prefabricated with interconnecting components such as fitting piece and sensor pockets for insertion of a heat metre and strainer. Direct heat generation from a two-pipe system, and the domestic hot water is prepared in the heat exchanger based on a combined flow and thermostatic principle. Has a capacity of 15 kW for room heating and 41 kW for water heating.

System controllers

**TREND:** There is a definite move towards compact multifunctional self-acting controllers. Common functions that are being integrated include temperature control, flow control, differential pressure and flow limitation control, standby control, hot water priority and return temperature limiter. Multifunctional controllers are more cost-effective with regards to installation, and boast a space-saving benefit. Furthermore, they provide optimum function and control for the total system that delivers maximum comfort. They are developed and tailored specifically for the system, rather than being a uniform solution, and therefore provide a more cohesive and balanced performance between the various functions.

**Danfoss solution: AVTI**
A multi-functional controller developed for small heating units with a room heating system and a domestic hot water system. For OEM’s and designed specifically for flat systems supplied from a secondary connected district heating system, a block heating system or a central located boiler system in a dwelling house. The AVTI integrates:
- Differential pressure controller to maintain stable conditions for regulation.
- Hydraulic proportional controller to balance the primary flow with the domestic hot water flow rate.
- Thermostatic valve to adapt the hot water temperature according to the set value and maintain a standby temperature in the heat exchanger.
- Domestic hot water priority to reduce the flow rate in the room heating system in the event of domestic hot water tapping.
Monitoring & communications

**TREND:** Effective monitoring of systems can be used to document optimal function of the system and energy saving in accordance to national energy saving plans and estimate energy savings for promised payback time on investment cost. There is a greater move towards combining electronic controllers with cyber monitoring and communications in order to allow service companies to do this centrally. Cyber data can benchmark weather conditions over time (degree-days) to compare energy consumption over time, it can be used for simplifications of the algorithm in the controller and help save time and energy.

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**Danfoss solution: ECL Comfort with ECL WebAccess**

ECL WebAccess makes ECL Comfort 200 and 300 accessible via the Internet. All you need is a Microsoft Internet explorer and free Adobe SVG viewer software. No special software is required. You can define different levels of access ranging from monitoring to total control of all parameters in the ECL comfort. Data logging and alarms handling are included, and communication can be made via Internet, intranet or modem. ECL WebAccess has its own Internet address, and after installation the heating system is accessible as a standard Internet site. All applications, updates and other new information are placed on the Danfoss Heating portal and can be downloaded to your controller. WebAccess can communicate with up to four ECL comforts.
**COOL PC**

The new ChillTec Ultra TEC CPU Cooler is a solid-state heat pump capable of cooling below room temperature. It automatically monitors the temperature of your computer's processor, and through thermoelectric cooling and heat-pipe cooling it ensures your CPU is kept at the perfect operating temperature. With a meagre 20dB noise level at its lowest 2000-rpm speed and 28dB at its maximum 2800-rpm speed, it is quietly superb. www.ultraproducts.com

**TAKE A STAND**

Laptops are cool, but they get too hot. The burden of excessive temperatures is being challenged by the simple suction of Cool Feet. Attach them to the bottom of your computer to create angled elevation that creates a free flow of air and heat circulation to enhance the performance of your laptop, and provide a more ergonomic angle for your keyboard. A simple solution to a nagging problem – we like it. www.cableyoyo.com

**FLAMING ICE**

Opposites really do attract with the Mathmos Thaw tea light holder. Simply fill the silicone mould with water, and place it in the freezer to create an ice shade for the tea light. Nestling on a reflective polished steel base, the combination of a dancing flame against solid ice creates a dramatic and mesmerizing lighting effect of polar elements. The ice shade takes around three hours to melt away, and the water trickles back into the mould ready to be popped back in the freezer. www.mathmos.com

**GLOVED HEAT**

Glove manufacturer Reusch have teamed up with Interactive Wear AG for a new range of Solaris ski gloves. Featuring state-of-the-art iThermX technology, the lightweight (70 grams per hand) gloves keep your fingers toasty on the piste or while braving sub-zero temperatures. They feature three different operational modes: either constant heating or one of two pre-programmed, sensor-monitored, comfortable temperatures within the glove. Powered by rechargeable lithium ion batteries, you can expect five-hours of heated action in the great outdoors per charge. www.interactive-wear.de
Have your say... receive a giveaway!

We value your opinion. Let us know your thoughts on ‘agenda’ at www.dh.danfoss.com/agenda. In return, every reader will have the opportunity to be selected for a series of one-off gifts, including the new Nokia E65 mobile telephone.
The Safe Choice
Danfoss District Heating Solutions

We are the only company worldwide supplying substations as well as automatic controls for the district heating market. Over the years we have gathered masses of experience by working under all kinds of conditions and with many different heating systems.

We offer a comprehensive and unique range of:

- Substations in all sizes
- Electronic controllers
- Self-acting controllers for differential pressure, flow and temperature control
- Ball valves
- Actuators and valves
- Heat exchangers

Our technological leadership has stood the test of time. Ask our customers!

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