Climate-smart Hyllie – testing the sustainable solutions of the future

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Close to the world, and close to home. Hyllie is the hub for public transportation in southern Malmö. Hyllie station is six minutes from Malmö Centre and less than 30 minutes by train from Copenhagen. Residences, offices, hotels, parks, schools, playgrounds and a public swimming pool are being built in the area. An arena, a trade fair and convention centre and a shopping centre are already in place.

In this brochure, Hyllie refers to the area of expansion for which the geographical boundaries are stated in the Climate Contract for Hyllie.

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Making sustainability a reality

In Malmö, the environment is a key issue and sustainable development is a driving force that unites many of the stakeholders that operate in the city. The City of Malmö has ambitious environmental goals: by 2020, the city's organisation is to be climate neutral, and by 2030, Malmö will be supplied with 100% renewable energy. Hyllie – Malmö's largest expansion area – will take the lead in the development of a world-class sustainable city. To shoulder this responsibility, in February of 2011, the City of Malmö, VA SYD and E.ON signed a Climate Contract for Hyllie. Under this contract, we jointly undertake to lay the foundation for Hyllie to become the Öresund region's most climate-smart city district and a global benchmark for sustainable urban development. When it is fully developed, the area is intended to comprise about 9,000 homes and nearly as many workplaces.

Hyllie's objectives will only be realised if all of the players active in the development of the city district work together. In the City of Malmö, there are many companies that want to focus on innovative technology, and to contribute to new approaches to transportation, living and working. In Hyllie we are working together to test and develop the concepts that will serve as a role model for Malmö's continued progress as a sustainable city.

Anders Olsson, Executive Vice President, E.ON Sverige; Anders Rubin, Municipal Councilor for Housing and Infrastructure, and Anders Ledskog, General Manager, VA SYD, signed the Climate Contract for Hyllie on 17 February 2011.

2008	2009	2010	2011	2012	2013	2014
Malmö Arena inaugurated		Hyllie Station opened	Climate Contract signed	Malmö Trade Fair and Emporia opened	First apartments ready for occupancy	Waterpark and Sustainability Building inaugurated

100%

renewable or recycled energy

By 2020, Hyllie will be supplied with 100% renewable or recycled energy. The energy supply model is based on Hyllie's potential to create a resource-efficient ecocycle and energy-efficient solutions throughout. The renewable energy will be derived from wind power, solar power and biofuels. A significant share of the energy production will be locally produced in the form of such solutions as solar photovoltaics on the properties. New Hyllie-destined wind-power production is planned in the region and E.ON has commissioned the Flintrännan biofuel-based district-heating plant in Malmö.

The recycled energy comprises energy recycling from waste and wastewater in Hyllie, which generates district heating, electricity and biogas. The electricity and district-heating network will also be capable of using surplus solar energy produced in the properties or surplus from other processes that generate heat where it is needed. A study will determine whether the ground water declivities related to the city tunnel in Hyllie can be used as a source of energy in a district-cooling network.

A vision of the future

In the new sustainable city district of Hyllie, people have a high quality of life, while also living in a manner that is resource-efficient and energy-smart. The energy supply will be based on the ecocycle principle, and waste will be a resource. The energy that will be used will be renewable or recycled. Most people in Hyllie rarely need a car. They are more likely to take the train, tram or bus. Hyllie Station is six minutes from Malmö Centre and less than 30 minutes by train from Copenhagen. Cycling through parklands to the sea or Malmö's city centre takes less than 15 minutes. Many private drivers and business people drive environmentally friendly carpooling cars instead of their own cars. The area has charging stations for electric cars and is close to biogas fuelling stations.

Hyllie is green to its core and close to nature. Parks, planting areas and urban green areas discreetly meld with the open landscapes. Recreational areas where people walk, jog and ride horses, add to the green essence of the city district.

50%
renewable or recycled energy

2015 2016 2017 2018 2019 2020

People in focus – a new approach to living

The rate of urbanisation is increasing globally and Malmö is a growing city. This means new challenges, but also new opportunities since urban areas hold the key to sustainable development. These are the areas where employment opportunities emerge and where there is a strong potential to develop sustainable energy and transportation solutions.

Environmental matters impact everyone at all levels. How we travel, work and live – at home and at the office – has an impact on the local and global environment. Living and working in the Öresund region's most climate-smart city district means that it should be easy to live a climate-smart life. Hyllie will offer ample ability to live, travel and work in an energy and resource-efficient manner.

Mandatory sorting of food waste

Malmö is the first major city in Sweden to introduce mandatory sorting of food waste. The decision applies to all types of buildings – not only single-family houses and apartment blocks, but also businesses, restaurants, large households, offices and stores. The food waste will be used to make biogas for such purposes as fuelling buses and refuse trucks. Ten kilos of food waste generates enough biogas to drive a car for more than ten kilometres.

The smart home

How much electricity and heating can be conserved by controlling your consumption? Part of the development of Hyllie includes implementing a number of pilot projects that can be advanced on in Hyllie. One of these projects is the apartment block, Hållbarheten, in Western Harbour in Malmö, which E.ON has built to develop new energy solutions. The project includes solutions that help people manage challenges with local energy production, electric cars and the control of home heating. The apartments have been provided with electric cars and electric bicycles, and with charging posts, intelligent home controls and detailed metering of energy production and energy consumption. For example, home energy consumption can be controlled through an app and various programmes can be set to decrease the temperature when leaving the house and to have the washing machine start when the level of activity on the electricity grid and the price are lower.

Easy to recycle and sort waste

Does it become easier to sort waste using transparent sorting containers? In Hyllie, VA SYD will work to adapt the recycling and waste sorting systems in accordance with people's everyday lives and use behavioural-science theories to develop solutions that make it easy to make a sustainable choice. VA SYD will also help construct intelligent waste facilities that provide users with direct feedback. In Hyllie, it will also be easy to recycle using mobile recycling centres instead of transporting by car.

Urban farming close to home

Live in an urban area but with the benefits of the countryside. Hyllie will offer excellent urban faming opportunities. In recent years, the interest in urban farming has increased in Malmö and the City of Malmö is promoting urban farming as a successful method for creating a greater sense of community, resulting in more green spaces in urban neighborhoods. Around the new public swimming pool at one end of Hyllie Boulevard, the City of Malmö is making space for allotment gardens, and at other new construction projects in the area, there are plans for allotment gardens for residents adjacent to the properties.

Sustainable travel

The City Tunnel and Hyllie Station have already given people generous opportunities to choose sustainable travel in Hyllie. The centre of Malmö is just a few minutes away by train. In Malmö, 25% of all travel is already by bicycle, and in Hyllie, we are further developing the means to use bicycles. For example, the area is home to Malmö's first Bike and Ride system with amenities for cyclists, including storage boxes, access to air pumps, restrooms, showers and lounges. If you would still like to take your car, Hyllie offers great access to carpools and it will be easy to refuel with biogas or charge your electric car.

Environmentally certified office buildings

Do people experience a greater sense of well-being in environmentally certified office buildings? A study conducted by Skanska together with a group of students from Lund University shows that companies generate energy savings of 25% by relocating to environmentally certified premises. However, it is equally interesting that sickness absence declined by 39% and that productivity increased between 3% and 10%. In Hyllie, companies will have the ability to enhance their environmental profile by moving into environmentally certified office buildings.

Tomorrow's energy systems – smart energy solutions

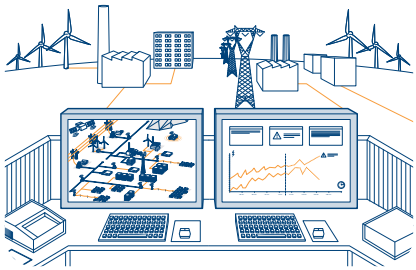
Hyllie is at the forefront of the development of a sustainable energy system. The area will integrate smart grids and other intelligent energy solutions for electricity, heating and cooling. Smart grids creates flexibility in the energy system through better control and monitoring. This enables opportunities for better use of renewable and decentralised energy sources. In Hyllie, people will actively be able to measure, monitor, control and influence their own energy consumption using smart energy solutions, and be able to independently produce energy. To enhance the efficiency of energy consumption, developers that are interested can install flow meters for the individual metering of hot tap water and heating. When combined with Hyllie's energy-efficient properties and the use of electric and biogas-fueled vehicles, this will result in enhanced energy consumption efficiency and decreased climate impact.

By 2020, smart solutions for the regulation of consumption and storage of energy in Hyllie will enable an improvement in the balance between production and consumption compared with current conventional energy systems.

Support for smart grids

The Smart Grids project for a sustainable energy system in Hyllie highlights issues related to the role that consumers, properties and infrastructure will play in future energy systems. Hyllie's energy solutions are not exclusively focused on renewable energy, but also on enabling consumers to become actively involved in their energy consumption. A sustainable approach to transportation, waste management and recycling are other cornerstones. Under the project, an integrated infrastructure system is being developed in Hyllie for electricity, gas, heating and cooling, which focuses on optimising the interaction between central and local production using smart grids. This includes enabling the buildings in Hyllie to utilise the potential provided by the smart grid. A significant share of the energy demand in buildings will be fulfilled by locally produced renewable energy, including solar or wind energy.

The Smart Grids project for a sustainable energy system in Hyllie is supported by the Swedish Energy Agency and is being implemented by the City of Malmö and E.ON in partnership with developers and other companies involved in the development of Hyllie.



The control of energy

An energy monitoring system will be implemented in Hyllie. The system will contribute to balancing the consumption of and access to renewable energy production by monitoring, measuring and regulating power output, thus optimising the city district's energy flows in accordance with price and the share of available renewable production. By including forecasts of such factors as energy prices, energy production capacity and weather, the system can create scenarios on the basis of which properties and consumers connected to the system can act.

Smart buildings with new energy technology

Hyllie will enable property owners, those working in the area and residents to become an active part of the energy system. The first pilot project in Hyllie is already in place. In *The Smart Grids project for a sustainable energy system in Hyllie*, the property company Roth Fastigheter will, in partnership with E.ON, test smart and cost-effective will test smart and cost-effective energy solutions with residents in focus. The apartment block will be fitted with solar thermal collectors and all apartments will be equipped with smart home systems that regulate and control power output and energy consumption. A screen in the hallway will allow tenants to monitor their energy consumption and the associated cost. The property as a whole will also be able to optimise its energy flows in relation to price and production. The pilot project will make it possible to measure the property's ability to store heat, to shave peak loads and to test new pricing models. Residents of the property will achieve a higher standard of living while the property owner will conserve energy and save money as the supply and demand of energy are optimised.

Balance between the consumption and production of energy

The City of Malmö, E.ON and VA SYD have jointly developed an energy balance model that shows the estimated energy demand in Hyllie by 2015, 2020 and 2030. In Hyllie, it will be possible to add all energy flows, both renewable and recycled, to the energy system in the form of heating, cooling, electricity and biogas. The energy balance model demonstrates how much renewable energy surplus will be needed to achieve the renewable and recycled energy goals. The model is currently based on estimated data, but this will be replaced by measured values as the city district is being developed.

Appliances powered by hot water instead of electricity

In Hyllie, there are plans to connect dishwashers, washing machines and dryers to the property's hot-water system. This will be tested in some of the city district's new preschools, among other properties. Since district heating has a lower primary energy value than electricity, this is a smart way to save energy.

What are smart grids?

Historically, energy production has derived from a limited number of major, primary sources. Energy has gone in one direction, from the source and out to consumers and production has been governed on the basis of estimates about future consumption. With a rising share of renewable energy in our society, access will vary since the production of wind power and solar energy, for example, are dependent on the weather. In addition, future energy systems must also be able to cope with large fluctuations in demand. With a significant number of electric cars in the vehicle fleet, there can be major fluctuations in electricity demand within the span of a few hours. Smart grids intelligently integrate all sorts of energy sources, both large and small scale. They also enable property owners, households and businesses to become more active in the energy market through such measures as selling the surplus from their independent energy production. In other words, the energy flow goes in two directions. By using energy when the supply of renewable energy is high and the price is lower, and reducing the consumption of energy when the supply of renewable energy is low, the need for reserve energy or balancing power is minimised.

Smart buildings – equipped for the future

A smarter and more sustainable energy system focuses on the properties and people. Energy consumption is reduced by using the right choice of materials and smart consumer-adapted solutions. In Hyllie, we strive to not only make new construction projects energy efficient, but to also equip them for future energy solutions. To use the energy supplied to the network in the optimal way, the properties must communicate with the overall system – and in certain cases also with each apartment's control system. This function makes it possible to regulate the load in the system, to store and optimise energy, and to maximise the use of recycled or renewable energy. Hyllie's Climate Contract also aims to ensure that a significant share of the properties in Hyllie install some form of local energy production, such as solar and wind energy.

In addition to being smart and energy efficient, the buildings in Hyllie will also contribute to the greenery in the city district. In the plan for the development along Hyllie Avenue, the buildings will offer excellent opportunities for greenery on the balconies, rooftops and walls. For example, prefabricated allotment gardens and spacious planting boxes will be available. Trees or other greenery will be visible from the street and Hyllie's green essence will be visible in the yards with green areas protected from the wind where residents can spend time together and children can play.

A – Energy consumption

All parties engaged in construction in Hyllie comply with the Environmental Construction Programme for Lund and Malmö, Miljöbygg-program SYD. This programme imposes stricter environmental requirements than those at the national level under the Swedish National Board of Housing, Building and Planning's Building Regulations (BBR). In the programme's lowest target level, environmental class C, the requirements will be 10% stricter than BBR's energy requirements.

B – Waste sorting

All area residents will have full waste-sorting facilities adjacent to their property and all housing units will be designed with practical waste sorting solutions.

C – Prepared for the future

In addition to the Environmental Construction Programme, Miljöbyggprogram SYD, the contractors for Hyllie Avenue have developed a sustainability agreement in partnership with the City of Malmö. Among the stipulations in this agreement, the approximately 1,700 apartments that are being constructed will be future proofed so that they can connect to Hyllie's smart grid.

Small-scale production of renewable energy

Many developers in Hyllie plan to focus on solar cells that can be connected to the electricity network or on solar thermal collectors that can be connected to the district heating network. Within the framework of *The Smart Grids project for a sustainable energy system in Hyllie*, interested developers can receive matching funding to establish on-site production of solar energy.

Low-energy housing focused on residents and users

Five developers in Hyllie are members of the *Buildsmart* project, which is headed by the City of Malmö. The project is being financed by the EU and includes residential buildings and commercial premises that will be built in Sweden, Ireland and Spain. The objective of the project is to demonstrate mainstream cost effective techniques and methods for constructing very low energy buildings in various European climates. The buildings that are included in the project will consume less than 60 kWh of primary energy per square meter. Residents and users are central to the project since one of the project's objectives is to promote a more climate-smart approach. The development in Hyllie includes residential units, office space and a preschool, which will feature solutions such as an air-tight building structure, supply and exhaust ventilation systems with heat recovery, smart grids and lighting control with motion detectors. The companies involved in the Buildsmart project in Hyllie include Ikano, NCC, PEAB, Roth and Skanska.

Green rooftops and areas for wild bees

The design of the buildings is important for contributing to the greenery in Hyllie. The City of Malmö's *BiodiverCity* project aims to bolster the city's biological diversity. Within the framework of the project, Skanska is building rooftop biotopes, which resemble Limhamn's limestone quarries, on an office building in Hyllie and equipping them with space for wild bees. The courtyard will feature limestone-rich biotopes, and climbing plants on wire systems will provide greenery for shade.

Use of surplus energy

Hyllie will feature a mix of buildings. There will be a number of different types of properties – including everything from housing units, office buildings and hotels, to major public facilities such as arenas, exhibition venues, public swimming pools and shopping centres. This results not only in a complex level of energy consumption, but also the potential to capitalise on synergies among the various property segments. While one building could have a surplus of energy, another could have a deficit. The residual flows and energy surpluses in one operation could potentially serve as a resource for someone else.

Storing energy in buildings

By constructing buildings that retain heat longer, energy consumption can be optimised and cost savings can be achieved. In 2012, the Hyllie Climate Contract was awarded the Concrete Prize from the construction trade press magazine *Betong*, for its efforts to optimise energy consumption by maximising a building's ability to store heat. Hyllie will test how to regulate a property's energy consumption based on weather forecasts by, for example, proactively storing energy in a building prior to a cold front. In this work, the concrete's structural properties are being studied since they are integral to the ability to store thermal energy.

Sustainable travel – a transition that will endure

One of our greatest challenges today is traffic, which causes problems with emissions, noise, poor air quality and urban congestion. The transportation sector accounts for one-fourth of Sweden's energy consumption and since most of today's vehicles are powered by fossil fuels, we can significantly reduce greenhouse-gas emissions if we switch to other fuels and to more climate-minded means of transportation.

Hyllie aims to make it easy to walk, bike or use public transportation instead of taking your car. Malmö Central Station is a mere six minutes from Hyllie, and central Copenhagen is less than 30 minutes away. Malmö is already growing as a bicycle city, in which about 40% of all work-related travel is by bicycle. From Hyllie, the city and the sea are a 15-minute ride away on scenic bike paths. Buses in Malmö are currently powered by natural gas, biogas or a mixture of the two. However, by 2018, all buses will be powered by fossil-free fuels, and biogas is one of the most important alternatives. It can be produced locally and is classified as the most climate-adapted vehicular fuel.

If you still need a car, there will be access to carpooling in Hyllie. It will also be easy to charge your electric car or refuel with biogas. You can already charge your electric car in Hyllie's commuter parking, Park and Ride, and in the Emporia shopping centre. More charging stations are planned close to the housing in Hyllie. You can refuel with biogas on Kvartettgatan, a traffic junction close to Hyllie.

Carpooling for the masses

For both private individuals and companies, environmentally friendly carpooling vehicles will be an attractive alternative in Hyllie. The number of parking spaces per household is lower than the norm – 0.65 spaces per apartment. In exchange, the contractors will finance a joint carpooling system. Membership is included in the rent during the first five years.

When the Swedish Transport Administration calculated the effects of carpooling, they confirmed that carpooling makes land available that can be used for other purposes. According to the Administration, one car used in carpooling can replace about five private cars. They estimate that one carpooling car can contribute an annual reduction in carbon emissions of between 5.7 and 8.5 tons.

Smart charging of electric cars

One way to optimise the use of renewable energy while also reducing costs, is to decide how and when you want to charge your electric car. As a consumer, you will be informed of the supply of renewable energy in the system and how much electricity costs via a smart phone or tablet. If you want to charge your car in an eco-friendly manner while there is plenty of renewable energy, you can easily pre-programme this feature. This is currently being tested in E.ON's pilot project Hållbarheten in Malmö, and the results of the study will form the basis for the solutions in Hyllie.

Car batteries as a buffer

With smart electricity grids, cars can be charged when electricity is inexpensive and the surplus can be returned when it is more expensive. As a consumer, you can use the electricity yourself or sell it back to the network. In other words, the electric cars can store energy. The electricity grid can essentially be balanced to a certain degree by the electricity that is stored in the cars' batteries as described above being used as a buffer. E.ON is planning to study this in greater detail in the aim of developing a prototype.

Corporate transportation package offers

The City of Malmö wants to make it easier for companies to make sustainable choices for transports. Combining various transportation package offers could make it entirely possible to take the train to Hyllie and have access to an electric car or bicycle during the day and then take the train back home.

Bike and Ride

Malmö's first Bike and Ride facility is located in the new parking garage at Hyllie Station, providing benefits for commuters who cycle. The facility has space for about 1,000 bicycles and parking is free. Bike and Ride offers a number of services and conveniences that have been developed for the benefit of cyclists. There are storage boxes for helmets and rain gear, areas to perform quick repairs, round-the-clock air pumps as well as restrooms, showers and a lounge.

Ten kilos of food waste generate enough biogas to drive a car for more than ten kilometres.

Together, we will make Hyllie the most climate-smart city district in the Öresund region

"In the Hyllie city district, we are testing the solutions that we later want to deploy throughout the city. By as early as 2020, the city district will be 100% sustained by renewable or recycled energy. This is driving developments for the companies that want to be part of achieving this goal. We partner with the developers which set their own targets for their sustainability ambitions and then we develop the systems together."

Katarina Pelin, Environment Director, City of Malmö

"To create lines of communication between various interfaces in the energy system – properties, consumers, distribution systems and production – and to achieve an energy balance throughout the year, we are working on solutions within the term smart grids. We are developing an energy management system for Hyllie that will have the intelligence to determine how we will have to adapt consumption based on various types of forecasts."

Peder Berne, Project Manager, E.ON Sustainable City

"Our initiative in Hyllie is largely based on a philosophy that makes it easy to make a sustainable choice. Many people want to make a sustainable choice but sometimes this fails to materialise. We want to focus on people rather than on technology. In Hyllie, with the help of behavioural science, we will develop waste management solutions that will make it easy for people to make a sustainable choice."

Henrik Aspegren, Director of Development, VA SYD

Read about developments in Hyllie at www.hyllie.com/climate

This informational material was developed with support from of the Swedish Energy Agency

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In February 2011, the City of Malmö, VA SYD and E.ON signed a Climate Contract for Malmö's largest development area, Hyllie. Together, we will make Hyllie the most climate-smart city district in the Öresund region. By 2020, Hyllie should be supplied by 100 % renewable or recycled energy. In Hyllie, we are developing smart grids that will contribute to more efficient energy use. With smart technology, people will actively be able to measure, control and influence their own energy consumption, and to become energy producers themselves. We are developing a new, consistent approach together to build green and harness smart technology. We know that working together brings benefits and generates better results.

Together we can make a more sustainable future possible.

PHOTOS: MALMÖ STAD, MATS PERSSON, FELIX GERLACH, GUGGE ZELANDER, E.ON, VA SYD, COLOURBOX . PRINTER: HOLMBERGS, MALMÖ MAJ 2013