STEPS TO ACHIEVING 100% RENEWABLE ENERGY USE

MALMÖ, SWEDEN

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Malmö aims to boost supply, improve efficiency and reduce demand for energy

The City of Malmö has reduced both its total and its per capita energy consumption in recent years. Renewable energy use has also grown, albeit not yet at a scale or pace to place the city-wide renewable energy target within reach.

The amount of renewable energy (wind, solar and biogas) produced by the municipality more than doubled from 6 916 megawatt hours (MWh) in 2016 to 16 660 MWh in 2017.

Malmö aims to achieve 100% renewable district heating supply by 2020

Renewable energy production across the city – beyond what the municipality itself produces – reached 416 500 MWh in 2017, up 14% from the 366 100 MWh the previous year. This is equivalent to almost a quarter of its total energy (City of Malmö, 2017a). Most of this figure represents electricity generation, the bulk of which stems from wind power.

In order to achieve the target of meeting 100% of local demand with renewable energy, demand side reductions and efficiency gains must be matched with more significant supply side generation.

The challenge of an ambitious renewable energy target

Sweden is a European leader in renewables. With a 52.6% share of energy from renewable sources (including renewable electricity, renewable heating and cooling, and renewable energy consumed in transport) in 2014, the country has already surpassed its own goal of supplying 50% of its energy from renewables by 2020 (European Environment Agency, 2016). Urban-level ambition, as is seen in Malmö, is critical for reaching nationwide goals.

In order to reach its goals while also satisfying needs for housing and employment, Malmö has launched an ambitious campaign of revitalisation and development. Over the past 25 years, abandoned brownfield sites and industrial spaces have given way to energy efficient buildings and attractive public spaces. Wind energy has grown substantially both offshore and onshore, and mixed-use, resource-efficient urban districts are becoming the norm in Malmö.

Sweden is already a European leader in renewables

Actions taken

The 2015–2018 Action Plan for the Environmental Programme published in May 2015 details key actions and indicators within each of the five working areas established in the Environmental Programme (City of Malmö, 2015). It includes the following measures for renewable energy:

- Identify measurable targets for PV and solar thermal systems, hydro-power, wind and biogas.
- Investigate and increase the share of renewable energy generated within Malmö's boundaries.
- Set up pilot areas for low-energy design in the buildings sector and the production of local renewable energy where developers are selected based on ambition, experience and dedication.
- Encourage the formulation of clear national rules concerning the establishment of plants for thermal gasification, wind power and other forms of renewable energy.
- Investigate alternative financing models for the establishment and development of renewable energy.
- Promote an increased share of renewable energy in the district heating supply to Malmö.

Some of the indicators and targets were updated after 2015; the share of renewable energy in the district heating supply to Malmö is to increase to 100% by 2020 (City of Malmö Newsroom, 2017).

The goal of 100% city-wide renewable energy also requires full electrification of its transportation system. Malmö's actions and indicators in this working area reflect ambitious targets at the national level: Sweden has targeted a 10% renewable energy share in the transport sector by 2020 and a fossil-fuel-free transport sector by 2030 (Swedish Institute, 2017). Transport related actions and indicators defined in the 2015–2018 Action Plan are as follows (City of Malmö, 2015):

- Develop a new eco-car strategy – referring to cars in the municipal fleet that are powered by biogas, hydrogen or electricity (including plug-in hybrids).
- Conduct a thorough investigation of parking, its costs, consequences and fees.
- Establish a bicycle-sharing programme.
- Expand the charging infrastructure for electric vehicles.
- Work towards consolidating goods flows, primarily with freight bicycles and electric vehicles.
- Begin construction of a sustainable service station providing only biogas, hydrogen and charging infrastructure.
- Improve conditions for walking, cycling and public transport.


Photograph: Shutterstock

Nearly a quarter of Malmö's power production is currently from renewables

Results to date

Scaling up renewable energy and corresponding solutions in the building and transport sectors is essential if Malmö is to achieve its goal of becoming a climate neutral municipality by 2020 and a city run fully on renewables by 2030.

Realising the vision

Incorporating the ambitious targets for climate neutrality and renewable energy into the Comprehensive Plan for Malmö has provided a structure which influences activity across various municipal departments. In order to realise the visions for 2020 and 2030, total energy demand across all sectors will need to be reduced, while renewable and recovered energy production will need to increase.

Transforming municipal operations

Malmö appears to be on track to achieve the municipal targets set for 2020, with one target already completed. In 2015, Malmö reported 100% renewable electricity supply for all municipal operations. Approximately 94.5% of this came from power procured by the municipality, with the remaining 5.5% being self-produced, largely through wind power. The purchase of two wind turbines in 2014, combined with increased production at municipal solar power plants, enabled municipality-generated output of renewable electricity to jump to 16 660 megawatt hours (MWh) in 2017, an almost 30-fold increase over the 559 MWh produced in 2009. If plans for the construction of large wind turbines on Malmö's Northern Harbour and Outer Ring Road come to fruition, annual generation could rise by an additional 36 000 MWh per year – enough to power 13 000 households (City of Malmö, 2016a).

Strong progress has also been made towards improving municipal energy efficiency and reducing the total electricity required to run municipal buildings. In the 2009 Environmental Programme, Malmö set a target of 141 kilowatt hours per square metre (kWh/m^2) by 2020, compared to a 2001 baseline of 218.3 kWh/m^2. In 2017, the City reported a value of 148 kWh/m^2 (City of Malmö, 2017a).

These positive trends in energy efficiency, renewable energy development and climate-neutral urban infrastructure provide a strong foundation for achieving the municipal goal for climate neutrality by 2020. By 2016, citywide CO_2 emissions of 1.37 million tonnes were down from 2.21 million tonnes reported in 2010 (City of Malmö, 2017c). While this equals a reduction of 38%, it is only 6.6% lower than in 1990, reflecting the fact that emissions have grown strongly over the past three decades.

Energy efficiency, renewable energy and climate-neutral urban infrastructure provide a strong foundation

Pursuing a renewably-powered Malmö by 2030

As Malmö continues to grow, achieving its 2030 targets will require continued commitment to energy-sensitive urban development, scaling-up of renewable energy production capacity and energy efficiency improvements.

Malmö's own renewable energy production grew from 387 700 MWh in 2009 to a record 435 000 MWh in 2015, but fell to 366 000 MWh in 2016 due to reductions in the wind sector. Roughly 23% of Malmö's energy production is currently from renewables (City of Malmö, 2017a).

In terms of energy efficiency, Malmö has set an interim target of reducing electricity consumption per capita from a 2004 baseline of 26 MWh to 22 MWh by 2020. By 2013, the most recent year for which a value has been provided by the city, demand had decreased to 23 MWh, indicating that the target will be achieved. Developments in the transport sector have helped in this regard; public transit ridership for work and school commutes increased from 12% in 2003 to 21% in 2013 (City of Malmö, 2017a). Furthermore, the eco-car strategy raised the share of the municipal fleet powered by biogas, hydrogen or electricity (including plug-in hybrids) to close to 84% in 2016. An ambitious target of 95% by 2020 is now in place (City of Malmö, 2017a).

Yet despite these positive developments, CO_2 emissions rose steadily, from 1 460 000 tonnes in 1990 to as high as 2 210 000 tons in 2010; however, this was accompanied by a population increase of almost 100 000 people. Despite the population growth from 2010 to 2015, CO_2 emissions have returned to 1 500 kilotonnes. Nonetheless, the interim goals of 873 kilotonnes by 2020, and climate neutrality by 2030, remain ambitious (City of Malmö, 2017a).

Malmö's harbour side is currently being used as a test area within the EPIC 2020 (IEE) and Delad Energi är Dubbel Energi (VINNOVA) projects, and the results from this collaboration on resource-efficiency will feed back into the City of Malmö's own strategies and procedures, therein creating further opportunities for symbiosis. Additionally, national governments and international financing bodies can provide frameworks and instruments for more effective action and planning.

Malmö has achieved 100% renewable power use in municipal operations

Costs and financing

The City of Malmö has allocated over EUR 27 million to various district heating and district energy projects. There has also been significant private investment in renewable energy over the past 15 years, partly in collaboration with the city. Altogether, sustainability investments in excess of EUR 100 million in Malmö have been made. The municipality has also held successful discussions with E.ON – one of the private utilities operating in Malmö – aimed at reducing the fossil fuel share of existing district energy systems and opening a district heating facility using only biomass. E.ON and Malmö signed an agreement to ensure that the city's district heating system will be 100% renewable by 2020. The facility in question has now been purchased in part by the municipally-owned real-estate company.

To scale up its renewable energy deployment to levels consistent with the 2030 target, further investment is needed. The wind energy projects in the Outer Ring Road and Northern Harbour, which would produce significant amounts of energy, will each cost EUR 150 million. The need for alternative financing models specifically looking at shared ownership for large scale solar installation and for the establishment and development of other renewable energy has been emphasised within the Action Plan for Environment (see box).

One mechanism that the City of Malmö is exploring is green bonds – a fixed-income financial instrument that can be issued either by central government, multi-national banks, corporations or municipalities directly to help finance climate-related projects. As discussed in IRENA (2016), green bonds can help gain access to capital markets and attract institutional investors and long-term finance into the renewable energy sector. Following a 2016 mandate from the City Council, Malmö municipality investigated the possibility of Green Bonds and adopted a proposal on 8 August 2016. Green bonds are seen as a proven approach to directing investment towards environmental targets and sustainability goals (City of Malmö, 2017b).

Mapping alternative financing models

The financial mapping report being developed by the City of Malmö incorporates urban development funds, green bonds, social impact bonds, the need to co-ordinate private and public investment, crowd funding and the need to integrate some form of valuation model (which can reasonably describe the ecological and social values created by actions in, for example, residential areas as monetary values) in these models.

The financing models envisioned in this mapping effort include a mix of private and public funds, and the development of a pay-for-performance approach in which the municipality and private actors share the economic risk.

Source: Correspondence with City of Malmö, June 2017.

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