

# CONTINUED STRONG INVESTMENT IN RENEWABLE ENERGY

Vattenfall continues to invest heavily in wind power, and during the year it made a series of significant acquisitions in the UK. New investments are also being made in biomass and hydro power. Vattenfall's goal is to substantially increase its electricity generation derived from wind power, hydro power and biomass-based power.

Vattenfall is investing heavily to increase the share of renewable energy in its production. Vattenfall's strategic direction of Making electricity clean goes hand in hand with its ambition to be Number One for the Environment and take a leading role in the renewable generation of electricity and heat where the environmental, technological and commercial conditions exist. Vattenfall's ambition is to substantially increase its electricity generation derived from wind power, hydro power and biomass-based power.

## Renewable energy increasingly important

At present, renewable sources of energy account for a small part of the world's electricity generation, but they are growing increasingly important against the backdrop of the major climate challenge the world is facing.

According to the International Energy Agency (IEA), approximately 18% of the world's total energy generation is based on renewable sources (2006 figures), of which hydro power accounts for nearly 90%. Most of the world's total electricity generation is based on fossil fuels which accounted for nearly two-thirds of generation in 2006, while nuclear power accounted for approximately 15%.

The EU's target is that 20% of total energy supply will be derived from renewable sources by 2020, compared with today's level of slightly more than 8%.

In the Nordic countries Vattenfall has a comparatively high percentage of renewable energy in its electricity generation mix due to an abundance of hydro power.

In 2008 Vattenfall invested SEK 1,529 million (1,015) in R&D, of which SEK 143 million (77) pertained to research on renewable energy. Vattenfall is participating in national

and European research programmes in the area of ocean energy, black liquor gasification and geothermal energy.

## Continued strong expansion for wind power

At year-end 2008 Vattenfall had a total of 611 MW of installed wind power capacity. Most of this capacity is in Denmark and Sweden, including the Lillgrund wind farm outside Malmö and Horns Rev, the world's largest offshore wind farm off the coast of Esbjerg in Denmark, which is 60%-owned by Vattenfall. The Group's goal is to have 49 TWh of wind power on stream by 2030.

During the year, Vattenfall made a series of acquisitions in the UK in the area of wind power and also entered into a partnership with ScottishPower Renewables to establish new offshore wind power. Read more on pages 14–15.

Vattenfall is continuing its planning work on the Taggen and Trolleboda wind farms, comprising just under 100 turbines and combined capacity of 400–450 MW. Pre-planning and site surveying at Kriegers Flak in the southern Baltic Sea also continued in 2008. The plan is to erect 130 turbines, which will generate enough electricity to meet the needs of 400,000 homes.

## Co-operation with Sveaskog

Vattenfall continues its work on identifying suitable locations to build land-based wind power capacity in Sweden and Denmark. Toward this end, Vattenfall is working together with Swedish forest company Sveaskog in the aim of erecting more than 500 wind power turbines with combined capacity of 1,500 MW, corresponding to the electricity needs of 800,000 homes.

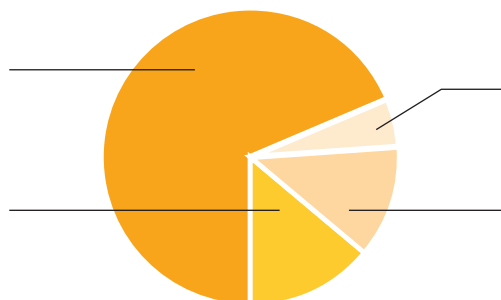
## Planned investments in wind power, hydro power, waste- and biomass-based energy 2009–2013: SEK 54.3 billion<sup>1</sup>

### Wind power: SEK 37.2 billion

An extensive and broad-based investment package to increase wind power generation is in progress in all regions in which Vattenfall conducts operations. Most investments are focused on new generation.

### Hydro power: SEK 7.1 billion

Most investments in this area will be used to upgrade existing hydro power plants, so that they can achieve a higher degree of efficiency and generate more energy. In addition, certain investments are planned in replacement and new capacity.



### Waste: SEK 3.3 billion

Most of the investments pertain to maintenance of existing plants.

### Biomass: SEK 6.7 billion

Vattenfall is continuously upgrading its plants to increase the share of biomass and reduce the share of fossil fuels. Some new construction is also included.

<sup>1</sup>) Vattenfall's total investment programme for 2009–2013 amounts to SEK 191 billion. Read more on page 58.

In Denmark, work is under way to repower older wind power plants with larger, more efficient turbines. Slightly more than 30 new turbines with combined capacity of 100 MW will replace 120 older turbines with combined capacity of approximately 40 MW.

At the Borkum site off Germany's North Sea coast, Vattenfall is participating in the Alpha Ventus development and demonstration project, Germany's first offshore wind farm, which is expected to be operating in 2009. A total of 12 turbines (5 MW each) are being erected. Upscaling turbine size is essential for the profitability of wind power.

Vattenfall's success at managing this strong expansion of wind power depends on its ability to secure deliveries of equipment and components. During the year, Vattenfall signed framework agreements with the suppliers Vestas and Siemens for deliveries of wind power turbines.

### One of the world's largest users of biomass

Vattenfall has more than 30 biomass-fired heat and combined heat and power (CHP) plants and is one of the world's largest buyers of biomass. The goal is to increase the use of biomass as much as possible within the confines of responsible use.

At Midt fynsværket in Odense, Denmark, a straw-burning CHP boiler generating 35 MW electricity and 84 MW heat is currently being built. And at Amagerværket in Copenhagen, a coal-fired CHP station is being converted to accommodate straw.

Vattenfall is also continuously upgrading its plants to increase the share of biomass-based generation and reduce the share of fossil fuels. In Finland, Vattenfall is investing EUR 29.9 million (approx. SEK 283 million) to increase the use of biomass at the Vanaja power plant in Tavastehus. A new biomass station at Vanaja has increased the share of biomass in electricity and heat production from 13% to 19%, and this share will grow to 36% by 2010.

In the Group's German and Polish operations, attempts are being made to enable co-combustion of biomass and coal in coal-fired plants. For several years, a few German plants have been employing co-combustion technology of lignite and digested sludge – another form of biomass.

In southern and central Europe, biomass is currently in short supply, and the market price is steered by gas and oil prices. To address this problem, in Poland Vattenfall has decided to establish a position in the domestic biomass market to mitigate the effects of biomass shortages and be active throughout the value chain.

### Stable access to hydro power

Vattenfall owns and operates 112 hydro power stations in the Nordic countries – mostly in Sweden and a few in Finland. The Group's Swedish hydro power plants generate 30–40 TWh per year, depending on water levels. Vattenfall has an ambitious investment programme for its hydro power operations – some 30 of the Group's hydro power stations will be upgraded by 2013.

In September Vattenfall began construction of the Abel-

## Renewable energy generation in Nordic countries

### Key ratios – energy generation in the Nordic countries that qualifies for electricity certificates, 2008<sup>1</sup>

	Wind	Hydro <sup>2</sup>	Heat	Total
Operating profit, SEK million	243.5	316.2	415.5	975.2
Investments, SEK million	4,719.0 <sup>3</sup>	15.4	1,410.2	5,959.6
Property, plant and equipment <sup>4</sup> , SEK million	7,451.6	317.6	6,072.8	13,842.0
Return on property, plant and equipment, %	3.3	99.5	6.8	7.0

1) Pertains to electricity and heat generation in the Nordic countries according to the official rules that apply for electricity certificates in Sweden.

2) Small-scale hydro power + increases in capacity.

3) Value adjusted compared with previously published information in Vattenfall's 2008 year-end report. A total of SEK 2,525 million pertains to investments in wind power plants and SEK 2,194 million to acquisitions of wind power companies in the Nordic countries and in the UK. The British wind power companies AMEC Wind Ltd and Thanet Offshore Wind Ltd were reported in 2008 under Business Group Nordic.

4) The value of property plant and equipment is calculated as an average over the year.

### Vattenfall's renewable energy generation in the Nordic countries, GWh

	2002	2003	2004	2005	2006	2007	2008
<b>Electricity</b>							
Hydro power <sup>1</sup>	34,309	25,625	30,111	36,155	30,626	33,246	36,086
<b>Electricity generation that qualifies for electricity certificates<sup>2</sup></b>							
Hydro power <sup>3</sup>	156	150	211	214	250	339	440
Wind power	51	54	58	46	534	1,200	1,466
Biomass	525	503	497	547	384	355	446
<b>Total electricity</b>	<b>35,041</b>	<b>26,332</b>	<b>30,877</b>	<b>36,962</b>	<b>31,794</b>	<b>35,140</b>	<b>38,438</b>
<b>Heat</b>							
Biomass	4,020	3,844	4,506	4,577	4,138	4,099	3,912

### Vattenfall's renewable energy generation in Sweden, GWh

	2002	2003	2004	2005	2006	2007	2008
<b>Electricity</b>							
Hydro power <sup>1</sup>	33,996	25,324	29,618	35,801	30,306	32,787	35,564
<b>Electricity generation that qualifies for electricity certificates<sup>2</sup></b>							
Hydro power <sup>3</sup>	156	150	211	214	250	339	440
Wind power	46	47	52	46	75	162	417
Biomass	375	353	347	290	263	164	279
<b>Total electricity</b>	<b>34,573</b>	<b>25,874</b>	<b>30,228</b>	<b>36,351</b>	<b>30,894</b>	<b>33,452</b>	<b>36,700</b>
<b>Heat</b>							
Biomass	3,480	3,144	3,791	3,869	3,452	3,095	2,922

1) Hydro power that does not qualify for electricity certificates.

2) By electricity generation that qualifies for electricity certificates is meant electricity and heat production in the Nordic countries according to the official rules that apply for electricity certificates in Sweden.

3) Small-scale hydro power + capacity increases.

For information about Vattenfall's total electricity and heat generation volumes, see pages 124 and 125.

vattnet hydro power plant, with installed capacity of 4.6 MW, in the municipality of Swedish Storuman. This will be Vattenfall's first newly built hydro power plant in more than 15 years.