# THE EUROPEAN ENERGY MARKET

The European energy market is going through comprehensive restructuring. From having been national monopoly markets, the entire European market will now be open to competition by 2007. Market actors are adapting themselves to this new market. Of Vattenfall's primary markets – the Nordic countries, Germany and Poland – the Nordic countries and Germany are deregulated while the Polish market is still regulated.

Historically, the energy sector has been strictly regulated, but for the last 15 years a wave of change has swept over the world's energy markets. In Europe, deregulation began in England and Wales. Today, several electricity markets are completely open to competition, see map page 17. In accordance with the EU's electricity market directive, all countries shall have deregulated their markets to 100 per cent by 2007 at the latest. The advent of market mechanisms has brought greater efficiency and an increased customer focus. Deregulation has given consumers the opportunity to freely choose their electricity suppliers and has brought increased ability to customise price and risk profiles. For electricity providers, the requirement of market levels in returns on assets has, in many cases, led to privatisation and the public listing of companies. The changes have also brought pressure to cut prices and costs, lower margins and increased competition. Market development has stimulated the capital intensive energy companies within the energy sector to grow, in particular through mergers and acquisitions across national borders. Vattenfall has also followed this development and expanded its operations throughout Europe. Five years ago, Vattenfall had almost all of its operations in Sweden. Today, turnover is four times as much and more than two thirds of our employees are found in Germany and Poland.

## Vattenfall's market position

| | Sweden | Finland | Germany | Poland |
|---|---|---|---|---|
| Generation | 1[4] | 1[4] | 3 | 7[1] |
| Electricity trading | Top 3[4] | Top 3[4] | Top 3 | – |
| Distribution | 2 | 2 | 4 | 6[2] |
| Sales | 1 | 2 | 3 | 6[2] |
| District heating | 4[4] | 4[4] | 1 | 1[3] |

1) Fourth market position if only privatised companies are included.
2) First market position if only privatised companies are included.
3) Only heat generation.
4) In the Nordic countries.

### The price of electricity reflects a functioning market

Unlike as in a regulated market, prices in a competitive market are determined by supply and demand. Electricity producers sell their electricity in a market where actors, including consumers, can make active choices to hedge themselves against price increases and take advantage of price decreases. Price variations depend, to a large degree, upon which type of energy dominates in the power system. In the Nordic countries, hydro power makes up a major portion of the electricity supply, while coal-based power dominates in Germany and Poland. In the Nordic countries, prices are directly affected by the water supply, which makes the Nordic market very volatile, since the water supply depends on the amount of rainfall. However, during periods of low water supply, Nordic electricity prices are also affected by coal-fired power plants and thereby indirectly by price developments in the coal market.

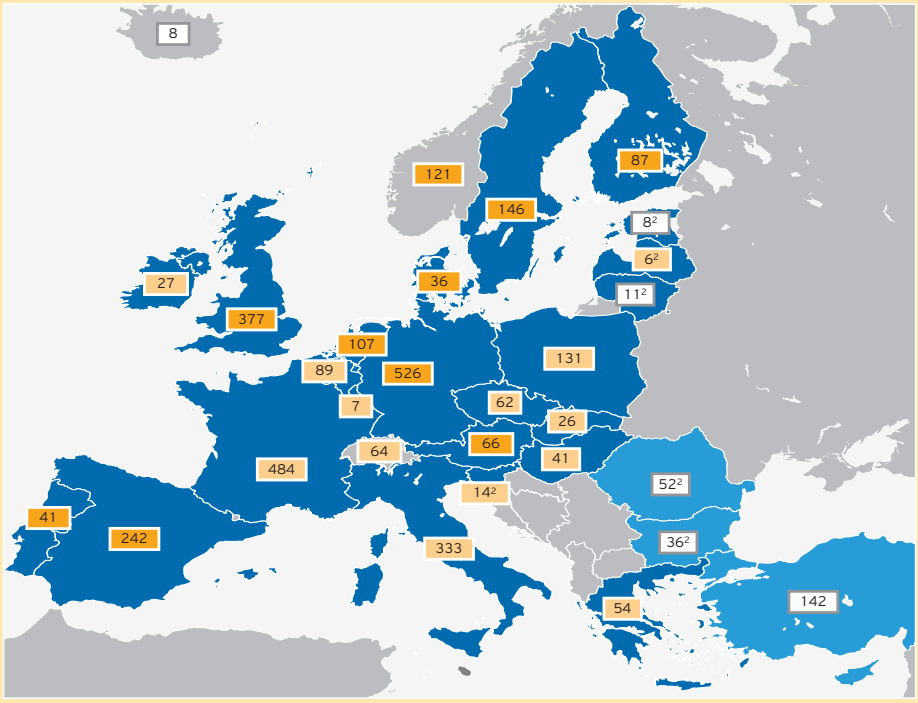
### Deregulation in generation and sales

As a rule, in the old monopoly structure, the entire value chain, consisting of generation, transmission, distribution and sales, belonged to the same company. After deregulation, generation and sales have been opened to competition while transmission and distribution, which are natural monopolies, will remain strongly regulated even in the future. This regulation shall, according to the EU, be administrated by an independent regulator and may be implemented in accordance with different models.

### New role for network operators in deregulated market

The role of network operators has changed with deregu-

## The European electricity market (Consumption[1] 2004, TWh)




Completely deregulated.

Partially deregulated. Expected to be deregulated 2004–2006.

No or some deregulation. Expected to be deregulated 2007.

The degree of deregulation is based upon the European Commission's estimation of the portion of the total energy volume (based on consumer consumption) for which the market is deregulated. In the diagram, completely deregulated is the equivalent of 100 per cent of the volume being available on a deregulated market, partially deregulated is the equivalent of over 40 per cent, and so on.

EU country

EU candidate country

1) Source: IEA (International Energy Agency).
2) Consumption 2002.

### Important events 1989–2007

**1989** UK electricity market deregulated

**1991** Norwegian electricity market deregulated

**1995** Finnish electricity market deregulated

**1996** Swedish market deregulated and EU's first electricity market directive

**1998** German market deregulated

**1999** Danish market deregulated

**2003** The EU's new electricity market directive with regulations concerning, among other things, the separation of operations. 'Green certificates' introduced in Sweden

**2004** Market opening for non-household customers

**2005** Trading in emission allowances begun in the EU

**2007** Market opening for household customers

lation. Network operations are a natural monopoly since it would not be economically feasible from a societal point of view to introduce market competition by, for example, building parallel sets of power lines. Fees for using the networks are therefore monitored and regulated by an independent authority. The principles governing regulation vary between countries. In certain cases, fees and network tariffs are approved directly by the authority in advance, so-called ex ante regulation. In other cases, the network operators set the fees and the network authority checks them subsequently, so-called ex post regulation. Models can also be cost-based or incentive-based.

As a rule, cost-based regulations do not provide incentives for the network companies to reduce costs. In other models, the network company's income is regulated instead, which motivates companies to reduce costs.

Common to all legislation and monitoring models, however, is that they must:

- Enable network access for all users.
- Provide operators a reasonable return on invested capital.
- Provide network operators the possibility and incentive to increase efficiency and security of supply.
- Protect the customer from being abused by the monopoly.

In Germany, Finland and Sweden, network pricing models are currently being developed. In Sweden, a calculation model, the 'Performance Assessment Model', has been developed. This model estimates the benefit to the consumer and, in accordance with the model, a reasonable cost for the network area in question. This cost is then used as the basis by the regulator when evaluating a company's network tariffs. In Finland, a new regulatory model was introduced in January 2005. In Germany, the government has decided on the main points of the network regulations within the scope of the new energy law (EnWG). Until now, the parties in the German electricity market have themselves voluntarily formed the rules,

which has made it difficult to achieve transparency in network tariffs. Regulation is expected to start in mid-2005. A transition to some form of incentive model is to take place within two years of regulation. In Poland, important steps towards a deregulated market have been taken with the establishment of an independent network operator, PSE Operator, which is a subsidiary of the Polish national grid operator PSE. The next step in the Polish deregulation process involves, among other things, regional distribution companies, which must separate distribution and sales activities by the middle of 2007.

## Changes in the European energy offering

Generation capacity still exceeds consumer demand in Europe. Over time, this excess capacity will disappear, in part as aging facilities are retired and in part because consumption is expected to increase throughout all of Europe. Southern Europe is expected to show the highest growth, at approximately 2.5 to 3 per cent a year, while Northern and Western Europe are expected to show lower growth. In Eastern Europe, growth is estimated to be approximately 1.8-2 per cent a year. In Sweden, there is a political agreement stating that nuclear power, which at present provides approximately half of all electricity generated, shall be phased out. In Germany, there is an agreement between the nuclear power producers and the government regarding the phasing out of nuclear power and, in addition, major parts of fossil-based energy generation in Europe needs to be replaced before 2020. Assuming that no changes in these agreements take place, we face a capacity gap where an estimated 350,000 MW will need to be replaced in Europe (EU 25) by 2030. The fact that environmental requirements are being tightened at the same time as capacity is scheduled to be lowered poses a major challenge since, according to predictions, capacity in the renewable energy sector will continue to represent less than 15 per cent during this time period.

## The internal market will continue to develop

The European Union has had a major impact on the development towards increased competition in energy markets through the so-called directives that have been passed and thereby must be introduced into national legislation. Additional legislation is introduced on an ongoing basis. At the same time that it is creating an internal energy market, the EU also has to deal with increased environmental requirements, in part in response to the threat of global climate changes. The Kyoto protocol means that the EU has obliged itself to reduce emissions of greenhouse gases by a total of 8 per cent by 2008/2012 compared with 1990. As a result, trading in carbon dioxide emission allowances was introduced in 2005.

Despite harmonisation work within the EU, the progress made in deregulation varies greatly between countries. For that reason, the European Commission and other bodies continue to push for the deregulation of energy markets and integration across borders. At the beginning of 2004, the European Commission established guidelines for how the internal energy market should be developed in the medium-term. Among other things, the EU states that cross border trade should be stimulated in order to increase competition, and thereby economic efficiency, in the energy sector. National markets shall be integrated to form larger regional markets. The Nordic countries are seen as having the most well developed regional market. One area which the European Commission identified as lagging behind considerably when it comes to deregulation is the natural gas market. To date, it is difficult to speak in terms of a relatively representative market price for gas. One problem is that access to transport on equal terms varies, which is an important prerequisite for a transparent gas market.

## New EU countries will eventually have great influence

On 1 May 2004, an additional ten countries were granted membership into the EU. These countries have thereby agreed to open up and deregulate their energy markets. Their combined electricity consumption totals around 300 TWh, which means that the combined European electricity market totals approximately 2,900 (EU 25) TWh. Eventually, integration of these countries will have great impact on the future European energy market. Poland's entry into the EU in May, for example, opened the Polish market to actors from other EU countries by eliminating the import and export monopolies. New rules for cross border trade will lead to increased trade between countries.


INVESTMENTS IN ONE COMMON BRAND

# "WE WANTED TO PROVIDE A FEELING OF ENERGY"

Today's international Vattenfall has primarily grown through the acquisitions that have been carried out during the past five years. Intensive work has been underway since then to integrate these operations with one another. One part of this work is the edification of 'One Vattenfall' and the introduction of a common, cohesive brand.

This is not only a question of developing consumer awareness regarding Vattenfall, but is also very much a question of, for example, creating a common cultural platform and transparency with regard to stakeholder groups. Regardless of region, stakeholders should be able to know what to expect from Vattenfall. In addition, the introduction of a brand provides considerable efficiency advantages.

In Poland, for example, the Vattenfall brand began its introduction during 2004. There, consumers have also been literally given an understanding of what they can expect from Vattenfall. Part of this introduction to the brand entailed Vattenfall installing infrared heating and extra lights in bus shelters around Warsaw and in Silesia.

"We wanted to do something other than the usual print campaign, something that showed our business and how it contributes to society," says Piotr Kedzierski, who worked on the project.

The bus shelters are only part of the brand introduction in Poland, but have been very much appreciated.

"The reactions from the public have been very positive," Piotr Kedzierski continues.

"This is the first time an energy company has done such a comprehensive brand campaign in Poland, so for many it also serves as an introduction to the energy sector."

# CONSOLIDATION AND FOCUS ON CORE BUSINESS

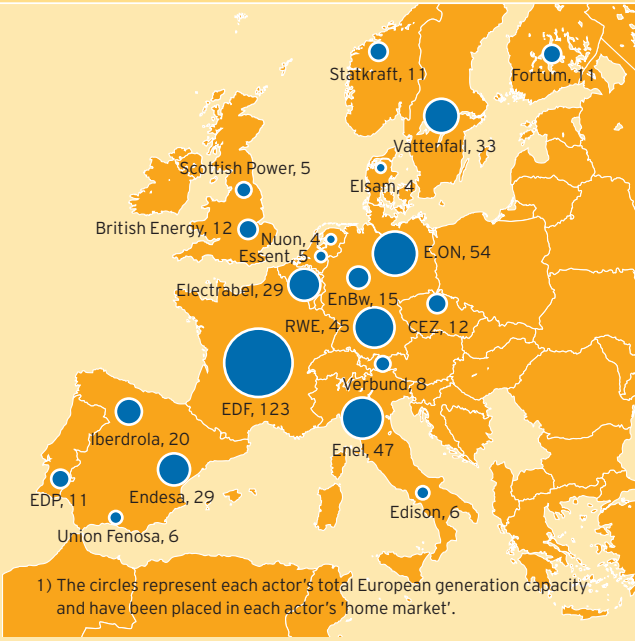
For a number of years, the prevalent strategy among the major European energy utilities was growth through the acquisition of companies outside their own domestic markets. But since 2002/2003, large utilities have instead focused on consolidation and integration of acquired companies, divesting non-core operations and reducing debt.

The changes in the major European actors' strategies that began during 2002 continued during 2004. From having invested in rapid international growth during a succession of years, primarily through debt-financed acquisitions, which resulted in dramatically weakened balance sheets, these actors have changed focus. Now they focus on the consolidation and integration of acquired companies, cash flow improvement, divestment of non-core business and debt reduction.

Actors can be roughly divided into the following four categories:

- Vertically integrated utilities that have invested in growth outside their respective domestic markets, like French EDF, German RWE and E.ON, Swedish Vattenfall and Spanish Endesa.
- Utilities that have attained strong positions in regional markets, like Enel in Italy, Fortum in the Nordic countries, Iberdrola in Spain, Essent and Nuon in Benelux, EDP in Portugal, Scottish Power and Scottish and Southern Energy in Great Britain.
- Multi-utility companies, such as French Suez and Veolia, with several product areas in addition to electricity and gas, such as water, waste disposal and transport, and with operations in several geographical markets. The British gas and electricity supplier Centrica can also be considered part of this group.
- Other utilities, such as the municipality-owned German Stadtwerke, specialised utilities such as French gas supplier Gaz de France, British transmission and gas network company National Grid Transco, Norwegian hydro power producer Statkraft, and a number of more-or-less local actors, such as German EnBW and EWE, Spanish Union Fenosa, Belgian Electrabel (half owned by Suez) and others.

**European actors, electricity generation capacity in Europe 2003, GW[1]**

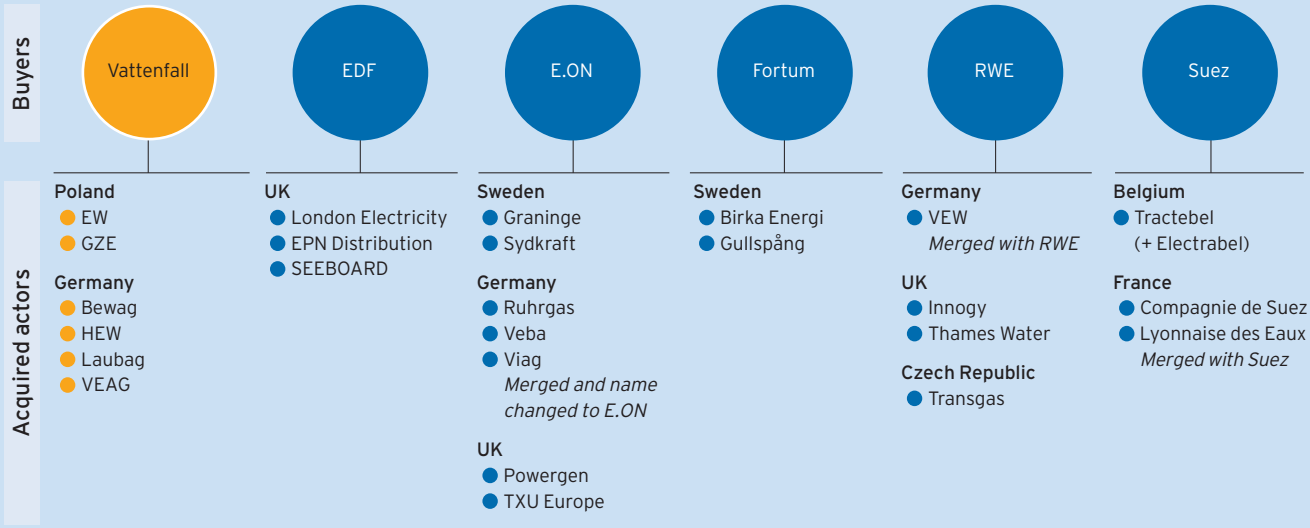



1) The circles represent each actor's total European generation capacity and have been placed in each actor's 'home market'.

## Strong earnings trend during 2004

In general, companies have succeeded well with the desired restructuring, helped by rising energy prices and effective price hedging strategies that led to increased profitability. Several companies have also been able to improve their debt profile by amortising their debt, extending the maturity of their debt portfolio, taking advantage of lower interest rates and renegotiating credit facilities. During the year, the rating agencies upgraded more energy companies than they downgraded, unlike recent years where the downgrades outnumbered the upgrades. Prudent financial strategies have benefited bond investors and other lenders. At the same time, however, shareholders' demands for increase in value have led to several of the major utilities announcing more generous dividend distributions and even buying back shares. At the same time that large utilities have indeed expressed a will to grow more, they have also more or less uniform-

## Major structural deals in the European energy market since 1999




**Market share, %**

| | Nordic Gen. Volume 380 TWh | Gen. Germany Volume 490 TWh | Distr. Sweden 5.2 million cust. | Distr. Finland 2.2 million cust. | Distr. Germany ~40 million cust. | Heat Poland Volume 48.9 TWh |
|---|---|---|---|---|---|---|
| Vattenfall | 21 | 16 | 17 | 12 | 8 | 27 |
| E.ON/Sydkraft | 8 | 29 | 20 | 7 | 17 | |
| RWE | | 37 | – | | 18 | 2 |
| Fortum | 14 | – | 17 | 13 | – | – |
| Statkraft | 11 | – | – | – | – | – |
| Helsinki Energi | 2,4 | – | – | 11 | – | – |
| EnBW | – | 11 | – | – | 12 | – |
| Polish State | – | – | – | – | – | 30 |
| Other | 43 | 7 | 46 | 57 | 45 | 41 |

ly declared that they have no intention of inflating bid amounts to the previous unrealistically high levels. As a rule, the utilities have also committed to maintaining a certain minimum rating level.

Those power generators whose production assets are less sensitive to rising fuel prices, such as nuclear power, hydro power and lignite-based plants, have gained improved margins in electricity generation due to the fact that market prices for electricity have increased, as a result of dramatic rises in oil and coal prices and other factors. Parallel to this, their own production costs have remained almost unchanged.

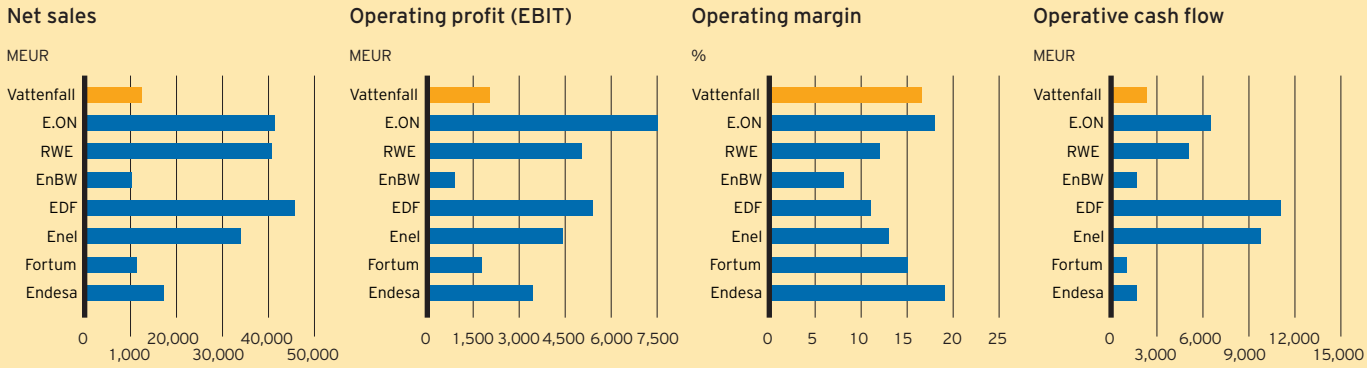
Those markets which are now next in line for consolidation are located primarily in Eastern Europe and Russia. In these areas, the energy sector is subject to deregulation and restructuring and growth is high. E.ON and Enel, among others, made considerable acquisitions in Hungary and Slovakia during 2004. Smaller acquisitions have been made in this region by Gaz de France, Fortum and RWE. In the Nordic countries, it is primarily the Danish market which is subject to consolidation. The Danish government's ambition is to create a large national energy company that can meet the competition from major international actors. With this goal as motivation, they have supported the state-owned gas company Dong's attempt to merge itself with the largest Danish electricity company, Elsam. In the Netherlands, the government has proposed that network operations be separated from the integrated utilities, which has caused turbulence as this is expected to lead to a weakened

financial position. But this has also created expectations regarding consolidation and changes in ownership structures. In Spain, the government has indicated that it looks positively upon consolidation among the Spanish actors.

## Preparations for new privatisation

During the year, no extensive privatisations took place. On the other hand, the French government has decided to partially privatise Europe's largest electricity utility, EDF, and the gas utility Gaz de France. The decision to list EDF during 2005 has been preceded by widespread protests from employees, who fear worsened employment and retirement conditions. Intensive discussions between company management and the French government have taken place regarding the necessary capitalisation and all signs indicate that the government will take over EDF's

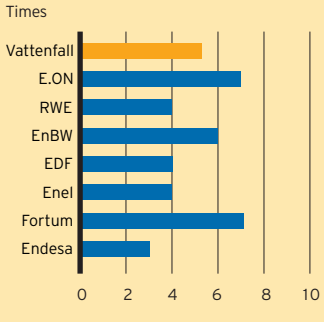
## Competition overview (As of 30 September 2004 unless otherwise stated)



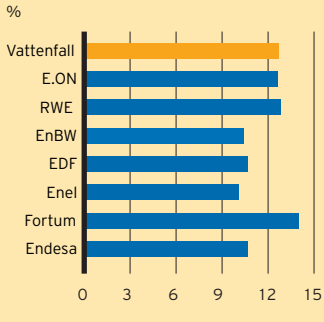

| | Vattenfall | E.ON | RWE | EnBW |
|---|---|---|---|---|
| **Country** | Sweden | Germany | Germany | Germany |
| **Listed** | Not listed<br>100% state-owned | Listed | Listed | Listed (EDF owns 45%) |
| **Electricity sales, TWh** | 203 (2003) | 387.6 (2003) | 300 (2003) | 127 (2003) |
| **Number of customers** | 5.8 million | Electricity: 27 million<br>Gas: 17 million | Electricity: 21 million,<br>Gas: 11 million,<br>Water: 70 million<br>(population served) | 4.5 million |
| **Primary products** | Electricity, heat | Electricity, gas | Electricity, gas, water | Electricity, gas, water |
| **Primary markets** | The Nordic countries, Germany, Poland | Central Europe, the UK, the USA, the Nordic countries, Eastern Europe | Germany, the UK, the USA, Eastern Europe | Germany |
| **Strategies** | • Focus on electricity and heat in the Nordic countries, Germany and Poland<br>• Realise synergies across national borders and create "One Vattenfall"<br>• Continued value creating growth in neighbouring areas | • Focus on electricity and gas – take advantage of synergies<br>• Integration under the motto "One E.ON"<br>• Continued expansion – focus on Central – and Eastern Europe | • Multi-utility<br>• Take advantage of synergies between electricity and gas<br>• Continued consolidation – reduce costs and improve financial position | • Refocusing on electricity operations in Germany<br>• Improve profitability and restore financial balance with substantial cost-cutting<br>• Continued divestment of non-core operations |

very large pension obligations. In Italy, the government has reduced its ownership in Enel from 61.3 per cent to 42 per cent during the year and in Finnish Fortum, oil operations will be separated from the group during the spring of 2005. In new EU member state Poland, it is the government's ambition to continue its privatisation of the energy sector, even if interest from potential foreign investors has been limited, partially due to the current uncertainty regarding the scope of regulation and excessively high pricing. In the Netherlands, privatisation of national grid operator TenneT and integrated utilities like Essent and Nuon is being discussed. In Portugal, EDP's attempt to take over the state-owned Gás de Portugal has been rejected by the EU's anti-trust authority.

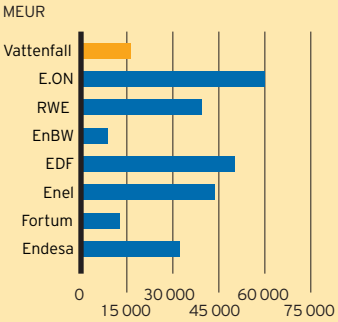
**Interest coverage ratio**



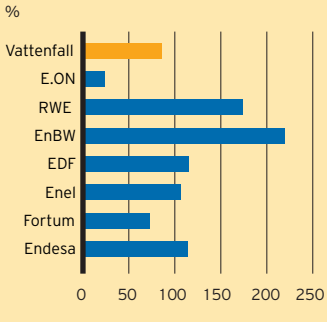

**EBIT/Capital employed**




**Capital employed**

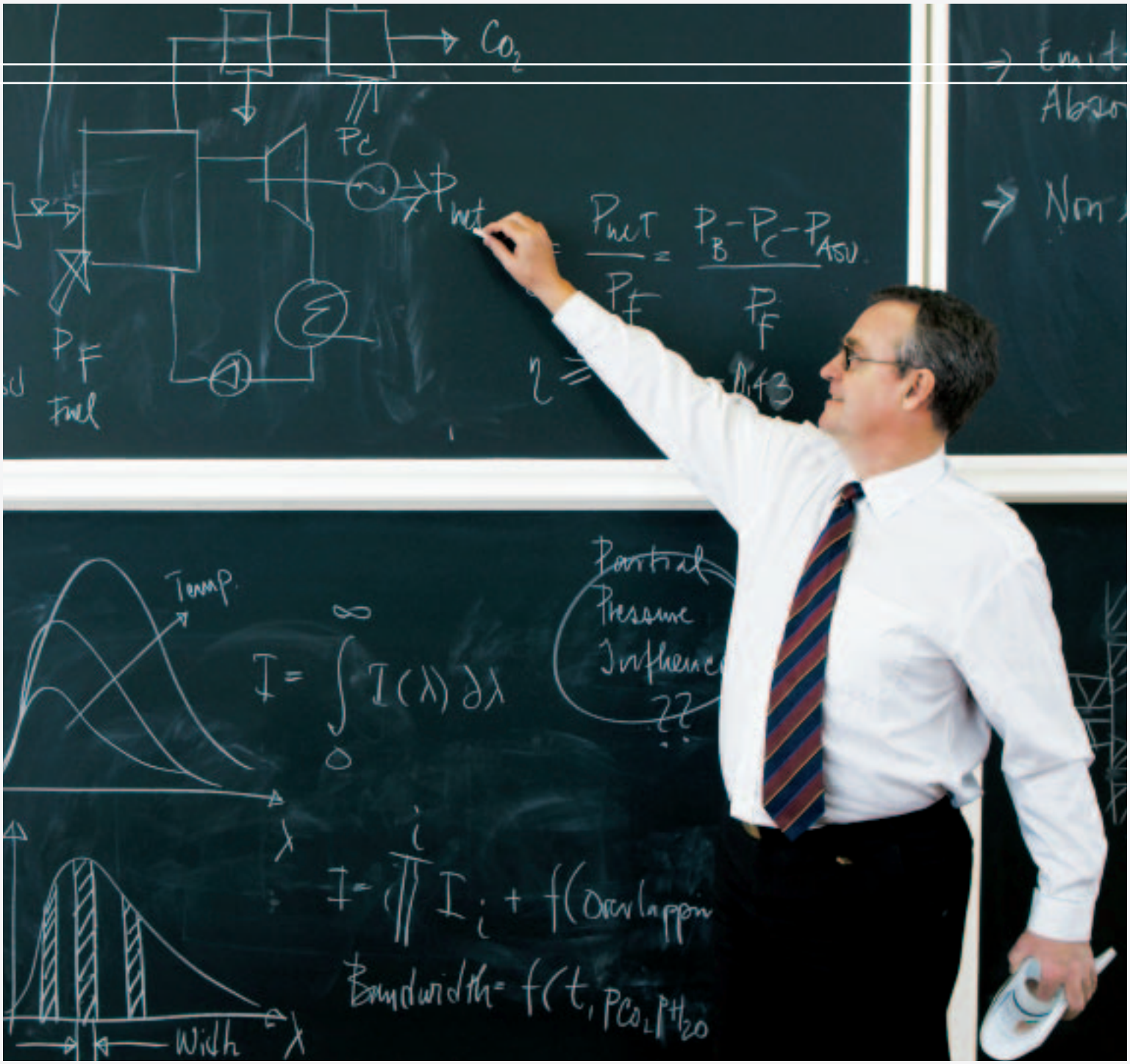



**Debt/equity ratio, net**




| EDF | Enel | Fortum | Endesa |
|---|---|---|---|
| France | Italy | Finland | Spain |
| Not listed,<br>but planned for 2005/2006 | Listed. 42% state-owned | Listed<br>59.3% state-owned (Dec. 2004) | Listed |
| 519 (2003) | 152 (2003) | 44.7 (2004) | 132 (2004) |
| 42 million<br>(of which 27 in France) | Electricity: 30 million,<br>Gas: 1.9 million,<br>Telecom: 28.3 million | 1.4 million (network customers) | 11 million Spain<br>11 million Latin America |
| Electricity | Electricity, telecom, gas | Electricity, oil, gas, heat | Electricity, gas, telecom |
| France, the UK, Germany<br>(Italy, Spain, Latin America) | Italy, Spain, (Slovakia) | The Nordic countries,<br>the Baltic States | Spain, Portugal, Latin America,<br>Italy, France |
| • Preparing for privatisation<br>• Widen product portfolio to include gas and energy services, for example<br>• Improve profitability<br>• Divest non-core operations | • Regional expansion but focus on Italy and Eastern Europe<br>• Focus on core operations – energy (electricity, gas)<br>• Divest telecom operations (WIND) | • Expansion in the Nordic countries, and Russia<br>• Separate oil operations | • Shifted focus from multi-utility to core operations electricity and gas (possible telecom divestment)<br>• Consolidation of assets in Spain and Latin America<br>• Investments in new production capacity (CCGT & renewable energy) |

Rolling 12-month values as of 30 September 2004 for all except EDF (June 2004).
Main source: Barclays Capital. Sources for Products/Primary markets/Strategies: Moody's, S&P, Vattenfall.
Definitions: Capital Employed (Total Capital) = interest-bearing debt + equity incl. minority interests. Operative cash flow = FFO +/– changes in working capital.




INVESTMENTS IN TECHNOLOGY FOR REDUCED EMISSIONS

# "IF WE TAKE CLIMATE ISSUES SERIOUSLY, WE HAVE TO DO SOMETHING."

Lars Strömberg works at Vattenfall with the development of the carbon dioxide-free power plant. This is part of Vattenfall's work with managing the environmental impact its own operations. Another important part is Vattenfall's work with renewable energy sources, see page 33–35. Of current world energy consumption, a little over 13 per cent is derived from renewable sources while more than 80 per cent comes from fossil fuel. The International Energy Agency (IEA), the International Energy Agency, predicts that renewable energy sources, such as wind power, will continue to represent less than 15 per cent of world consumption for another 20 to 30 years.

For this reason, work is underway on methods for creating coal-fired power plants with low or no emissions. Carbon dioxide and the other combustion by-products are collected and the carbon dioxide is liquefied and pumped down into the bedrock. The goal is to have an initial large-scale demonstration facility ready by 2015, and the construction of a smaller pilot facility will begin in 2005.

"We don't need to invent anything new; it's more a matter of developing and adapting," says Lars Strömberg.

"Initially, storage will take place in the same geological formations where gas and oil have been stored for millions of years. The technology for storing carbon dioxide in this way has already been tried on a large scale and the risk of leakage must be judged as very small."

# PRICING IN VATTENFALL'S MARKETS

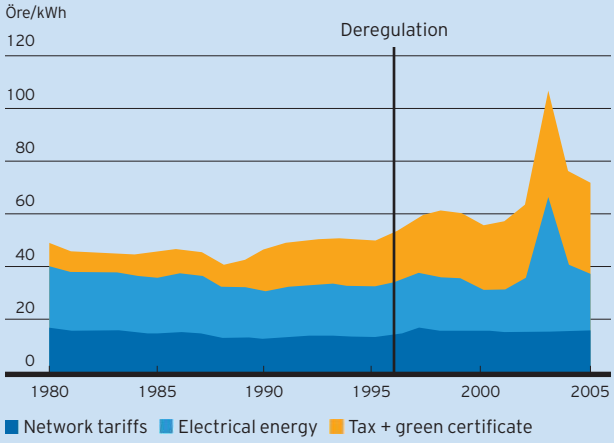
Electricity prices are still set on a regional level to a large extent. Within Vattenfall's markets, the Nordic countries have progressed the furthest towards a well functioning market. In Germany, development is towards increased transparency and greater liquidity. In Poland, development has only just begun.

The price of electricity is still, to a large extent, dependent upon local generation conditions. In central Europe, where fossil-based power is predominant, the price of electricity is mainly determined by fuel prices, primarily coal and gas, and generation capacity. In the Nordic countries, where hydro power stands for a very large portion of power generation, it is the water supply that has the largest impact on price trends. The price of coal is also influential. During 2005, trading in emission allowances was introduced in Europe, which in the long term is expected to drive the price of electricity up. As the allocation of emission allowances on a national level for the first trading period of 2005–2007 covers – for the most part – the demand, no dramatic price increase is initially expected. Emission allowances for the first trading period have been distributed free of charge to power producers. For the second trading period, 2008–2012, the total volume of emission allowances is expected to be reduced, and a certain portion to be auctioned off to the highest bidder. Trading in emission allowances is then expected to clearly affect the electricity markets with increased prices, especially in those countries which have a high proportion of fossil-based energy generation. One problem is that different countries apply different principles in connection with the allocation of these rights, which may lead to decreased efficiency and unfair competition.

## The price of electricity is based on the last generated unit

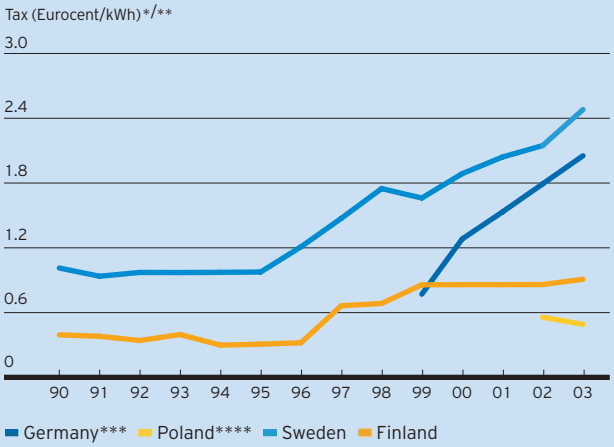
In a well functioning market, it is the marginal cost, in other words, the variable cost for the last generated unit, which determines the market price. In the Nordic countries and in Germany, wide scale trading takes place on the NordPool and EEX electricity exchanges, which

**Electricity prices and taxes in Sweden**




Electricity price trend in 1990 monetary values for a small, electrically heated house in Sweden before and after deregulation, expressed in öre/kWh (100 öre = SEK 1).
Source: Svensk Energi.

**Taxes on household electricity (VAT/other fees not included)**




*) Prices in EUR to facilitate comparison, 1 eurocent = approximately SEK 0.09.
**) During the years 1990–1998, the conversion factor from national currencies to ECU has been used to attain prices in EUR.
***) Energy tax on electricity introduced in 1999.
****) Energy tax on electricity introduced in 2002.
Source: Swedpower.

quote market prices daily. Production facilities are brought online in accordance with a prioritisation system which is usually called 'merit order dispatch' and which means that the facility which has the lowest variable cost is put in use first. When demand rises, increasingly expensive types of generation are brought into operation. This also explains why the electricity prices on the Nordic market are affected so strongly by water levels. When water levels are low, more costly forms of energy must be used to a larger extent or electricity must be imported, which is immediately reflected in rising prices on NordPool. The price for the last generated unit represents market equilibrium, that is, the point where supply meets demand. This market price is then used for all delivery since the spot market is designed as an auction market. In the forward market, the price is also set as a function of supply and demand, but the price applies only to the individual contract. Forward prices reflect the market's expectation concerning the future price of electricity. Deregulation of the different markets has brought more effective pricing.

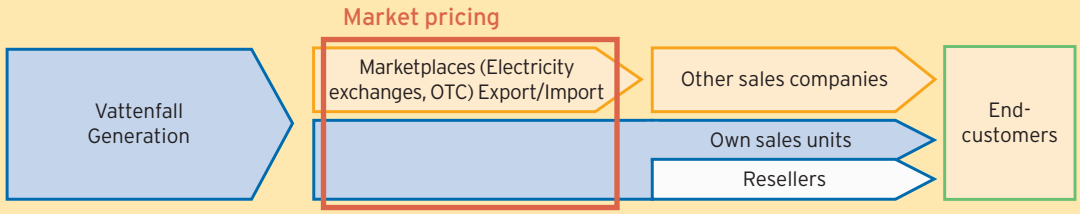
In those countries where deregulation has progressed the furthest and where trade is well developed, such as in the Nordic countries, market prices are used as a reference in connection with sales to end-customers. In Germany, many contracts are still traded outside the energy market, on the so-called OTC market (Over The Counter). In practice, however, there is currently no price difference seen between the German electricity exchange prices and OTC prices for long-term standard contracts.

In certain markets, it is still not uncommon not to use the market price as a reference in connection with sales to end-customers. This makes it difficult for new actors to establish themselves in these markets.

## Squeeze on profitability in sales and electricity network operations

Despite the fact that the household market is still characterised by low customer mobility, deregulation led to intense competition between electricity suppliers with regard to price and product offerings. This led to margins in sales operations being squeezed to low levels.

Network operations are regulated and authorities pressure network operators to reduce network tariffs, which squeezes profitability and risks dampening the




### Generation

The generation of electricity from hydro power, nuclear power, fossil fuel and a smaller proportion of wind power, biofuel and waste. Vattenfall's generation consists of hydro power (20%), nuclear power (37%) and fossil fuel (43%).

### Electricity trading

Vattenfall and other actors sell electricity via marketplaces to sales companies or to major resellers. A certain portion of Vattenfall's generation goes directly to Vattenfall's sales units. The price paid by the sales units is determined in the marketplaces.

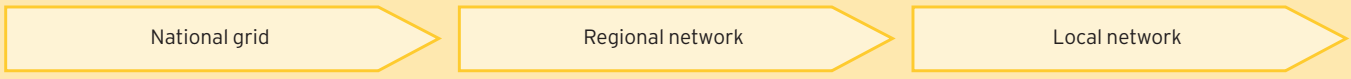
### Sales

Private persons and industries sign delivery agreements with the different actors at the sales stage. Prices are regulated via various types of agreement between sales companies and customers.

### Marketplaces

Electricity is traded on electricity exchanges or in the OTC market. Actors such as producers, resellers and very large industrial companies trade on the electricity exchanges. Some major actors are both producers and suppliers, and act as both buyer and seller on the electricity exchanges. In the OTC market, which is outside the exchange, actors trade directly with one another. Pricing in the OTC market often reflects expectations regarding the electricity exchange's market price. The import and export of electricity over national borders take place depending on the differences in market price between the countries.

## Distribution chain




### Transmission

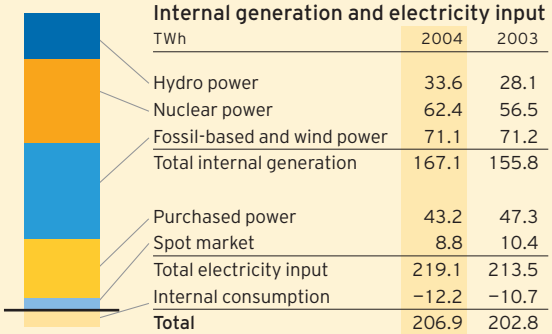
The national grids are the large high-voltage networks that transport large volumes of electricity over longer distances. National grids are for the most part state-owned in the Nordic countries and Poland, while in Germany they are owned by the electricity companies. Vattenfall owns national grids in Eastern Germany and the Hamburg region.

### Distribution

Regional and local electricity networks transport electricity to end-customers. Vattenfall and other large actors share the market with regional and local network companies.

## Volumes

### Vattenfall's electricity generation



**Internal generation and electricity input**

| TWh | 2004 | 2003 |
|---|---|---|
| Hydro power | 33.6 | 28.1 |
| Nuclear power | 62.4 | 56.5 |
| Fossil-based and wind power | 71.1 | 71.2 |
| Total internal generation | 167.1 | 155.8 |
| Purchased power | 43.2 | 47.3 |
| Spot market | 8.8 | 10.4 |
| Total electricity input | 219.1 | 213.5 |
| Internal consumption | –12.2 | –10.7 |
| **Total** | 206.9 | 202.8 |

### Vattenfall's electricity sales

**Sales**

| TWh | 2004 | 2003 |
|---|---|---|
| Sweden | 45.2 | 44.8 |
| Finland | 6.2 | 5.7 |
| Germany | 82.3 | 87.0 |
| Poland | 12.0 | 12.0 |
| Other countries | 7.3 | 9.8 |
| Spot market | 33.4 | 24.9 |
| Total electricity sales | 186.4 | 184.2 |
| Deliveries to minority owners | 19.5 | 17.9 |
| Other | 1.0 | 0.7 |
| **Total** | 206.9 | 202.8 |

incentive to invest. From a customer perspective, it is important that the regulation models provide an incentive to invest and maintain good quality.

## Electricity suppliers are the link between the electricity exchange and the end-customer

Most customers, regardless of whether they are private individuals or industrial customers, use an electricity supplier to purchase their electricity. Electricity suppliers are responsible for acquiring electricity, normally through the purchase of electricity on exchanges, and packaging it for the end-customer. Dependent upon the demands and risk profile the consumer desires, different forms of contracts are offered, such as variable rate or fixed prices for various time periods. Without an electricity supplier, customers would themselves be forced to trade on the electricity exchange, which would be both costly and risky. Some form of financial security is required to obtain permission to trade on the electricity exchange, as is a minimum volume. Electricity suppliers charge a certain percentage of the electricity price in exchange for this service.

## The Nordic market

### NordPool – the Nordic electricity exchange

The price of electricity in the Nordic countries is primarily set on the Nordic electricity exchange, NordPool, which is owned by the national grid operators Svenska Kraftnät in Sweden and Statnett in Norway. The market area covers Sweden, Norway, Finland and Denmark. NordPool comprises two marketplaces. The first – the spot market – is an auction-based trading place where different actors can purchase and sell physical deliveries of electricity on an hourly basis for the coming day. In addition to the spot market, there is also a market for trade in standardised financial contracts, in which futures or forwards are traded up to three years ahead of time. NordPool's trade and liquidity are good. More than 300 actors traded during 2004, trading 167 TWh on the spot market, an increase of 40 per cent compared with 2003. Total electricity consumption in the Nordic countries in 2004 was 391 TWh. The volume of NordPool's financial market in 2004 was 590 TWh, an increase of 8 per cent compared with 2003, which is partly due to the fact that a number of new actors appeared during the year. For more information regarding Vattenfall's trading activities, see page 49.

### Dramatic increases in electricity prices due to low water levels, high coal prices and increased taxes

The first year after deregulation in Sweden, in January 1996, prices throughout all of the Nordic countries were at a relatively high level, but then fell strongly to very low levels for four years until 2001/2002. These developments are explained by the hydrological balance. 1996 was a relatively dry year while the following years were charac-

terised by high levels of precipitation. Well filled reservoirs led to drastically reduced market prices. Many of the actors that had prepared themselves for continued low electricity prices were quite surprised when electricity prices shot sky high in 2002; price increases caused by the low water levels after an unusually warm and dry summer and autumn in combination with rising coal prices. Not until the end of 2004 did water levels return to their normal levels, which also led to lower price levels. In Sweden, electricity taxes since deregulation have increased by approximately 150 per cent, in Denmark by 100 per cent, and in Finland and Norway by 80 and 75 per cent respectively. More than 40 per cent of a private customer's electricity bill is currently comprised of taxes and fees.

## The German market

### The German electricity exchange

German electricity trade began in 2002 on the European Energy Exchange, EEX, in Leipzig. Turnover and liquidity has increased but is still lower than NordPool. At the end of 2004, there were 123 actors active on the EEX, compared with 112 the previous year. The largest trade volumes outside the exchange are still found in the so-called OTC market, but both the spot market and financial trade on the EEX continue to develop.

In practice, there is no price difference between German electricity exchange prices and OTC prices for long-term standard contracts. In 2004, a total of 397 TWh was traded on the EEX, of which 60 TWh on the spot market and 337 TWh on the financial market. In all, volume increased by 6 TWh compared with the previous year. The EEX strives to increase liquidity and has introduced the possibility for parties to clear their OTC contracts as a part of these efforts, which means that the counterpart risk is transferred to the exchange. Germany is Europe's electricity market with an annual electricity consumption of about 530 TWh, equivalent to 18 per cent of the EU's entire consumption. The market was deregulated in one blow in 1998 when all German electricity customers gained the right to choose their electricity supplier. The German market has since undergone a dramatic restructuring and the large German energy utilities are currently among Europe's largest companies (see also page 22–23). The largest portion of sales to customers is still provided through the various local energy companies, most often the municipality-owned Stadtwerke. German electricity prices fell dramatically before and in conjunction with deregulation as a result of surplus capacity and because the established actors defended their market shares with aggressive price cuts towards customers in order to prevent new actors from gaining a foothold in the market. After the price turbulence of the first few years, the market stabilised and in 2004 an increase in prices was even seen. Strongly rising prices for raw materials and freight prices for coal, combined with substantial tax increases, are behind the price increases. Despite the latest price increases, however, consumer electricity prices are still lower than they were in the mid-1990s, before deregulation. Taxes and various fees currently comprise 40 per cent of customers' electricity costs. Among the factors which will affect the development of German electricity prices in the future is the expected lack of capacity in Germany, the resulting increased need for investment and the new European trading system for emission allowances.

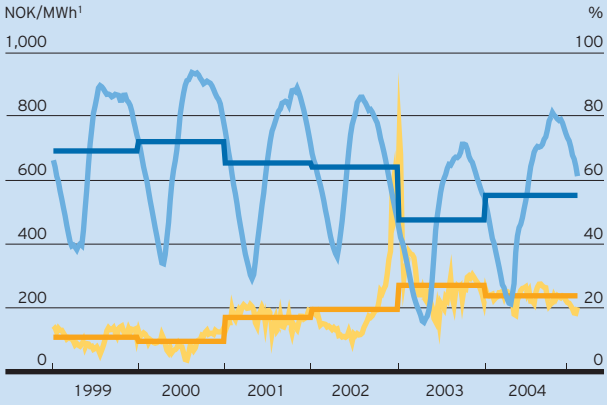
## The Polish market

### Low volumes on the Polish electricity exchange

Trade on the POLPX, the Polish Power Exchange, has been underway since 2000. Trade volume, however, is still low and liquidity poor. Trade also declined in 2004 compared with 2003 – from 2.6 TWh to 1.9 TWh, to be compared with total electricity usage in Poland of 131 TWh. The main reason for the low volume is that electricity producers sell about half of their net generation under long-term delivery contracts to PSE (Polish Power Grid Company). PSE then sells the electricity on to sales companies. In addition, sales companies, which sell electricity to end-customers, must purchase a certain part of their electricity from combined power and heating plants and renewable energy sources. As a result, only about 40 per cent of all electricity generated in Poland is available for trading. The Polish government has presented a revised plan to end the long-term delivery contracts. The plan must first be approved by the EU Commission, however, and then by the Polish parliament. A considerable share of the long-term delivery contracts between producers and PSE, however, end during 2005–2007, which can potentially improve market liquidity independently of the government's plan. An additional reason for the low volume of

## Price trends

### Price trends in the Nordic countries

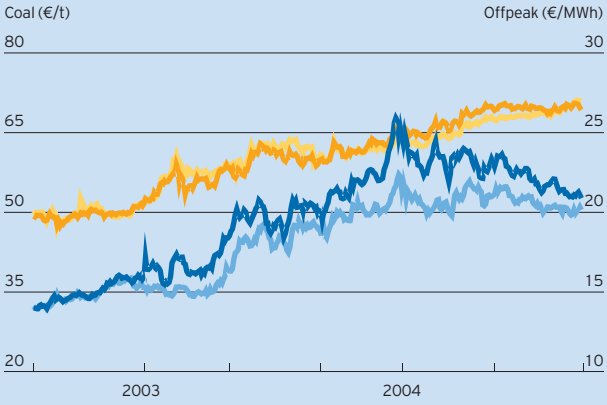



The low precipitation of 2002 continued to affect electricity prices in the Nordic countries at the beginning of 2004. In 2004, levels stabilised and by January 2005, water levels were higher than normal, which was reflected in the electricity price trend. The very dramatic price increase at the end of 2002 reflects both the low reservoir levels and the colder than normal weather conditions.

- Spot price (NOKSYS), NordPool weekly average
- Spot price (NOKSYS), NordPool annual weekly average
- Water level in Nordic reservoirs as a percentage of maximum possible
- Water level in Nordic reservoirs as a percentage of annual maximum average

Source: NordPool, Vattenfall
1) Exchange rate: 1 NOK=1,0880 SEK, 1 NOK=0,1208 EUR
1 SEK=0,1110 EUR, 1 EUR=9,0070 SEK

### Price trends in Germany




The effect of the price of coal on the price of electricity in Germany is especially noticeable in the forward market. Electricity producers buy coal in advance and sell, in the same way, their electricity generation in advance in order to hedge prices against changes that can have a negative impact on profitability. In this way, prices can be hedged, for example, two years before the actual deliveries are to take place. During 2003 and 2004, coal prices increased in the world market and German electricity price trends developed accordingly. The deviating trend during the last quarter can be explained by other factors, including trading in emission allowances. The diagram shows developments in forward contracts for coal and German forward prices for 'off-peak[2]' electricity for delivery in 2005 and 2006 respectively.

- El 2005 OffPeak (€/MWh)
- El 2006 OffPeak (€/MWh)
- Coal 2005 (API2) (€/t)
- Coal 2006 (API2) (€/t)

2) 'Off-peak' means prices for the hours between 9pm and 8am.
Source: EEX, Tradition Financial Services, Vattenfall.

trade is the conditions under which actors without their own generation or network assets must trade on the POLPX. Polish electricity prices to household customers are still regulated. Discussions concerning deregulation of the Polish electricity market have been underway since the beginning of the 1990s. Until 2000, the price of electricity was set by the authorities. For that reason, the price of electricity also fell in real terms between 1994 and 1998. Since 2001, however, electricity providers no longer need to wait to get their prices approved, which has led to rising prices. Prices are still lower compared on an international level, but the difference is expected to disappear during the coming years. With a medium-term perspective, prices may also rise due to the relatively low reserve capacity – in practice, only 10 per cent. Reserve capacity can in turn be affected by the expected increase in consumption in Poland and the need to replace old generation facilities.

Electricity usage per capita in Poland is at present only 40 per cent of the EU average, but is estimated to increase by 1.8 per cent per year. A considerable portion of capacity stems from the 1960–80s and must be replaced by 2017 in order to meet the EU's environmental requirements.

# TRUST AND RESPONSIBILITY

Having good, firmly established trust on the part of customers, the general public, politicians, authorities and the media is a central issue for Vattenfall. Creating this trust requires active and responsible environmental efforts.

Vattenfall's task is to deliver electricity and heat at competitive prices. We must also maintain high quality, in an increasingly electricity-intensive society. At the same time, the importance of progress within the environmental area has grown to be one of the key issues with which to win increased trust. Energy supply is connected to considerable social responsibility. The way in which Vattenfall (and other energy companies) is perceived by the media, politicians, investors, public institutions and authorities strongly affects public opinion.

For Vattenfall, setting the goal of becoming a leading company within the environmental area is therefore both a necessity and an opportunity. A necessity because our operations are very capital intensive and the economic value of our assets must be secured. But also because, as one of the major actors in the European energy market, Vattenfall's behaviour is continually scrutinised with a critical eye. It presents an opportunity since it is a prerequisite for obtaining the trust of customers, maintaining good relationships with authorities, pursuing permits and recruiting qualified personnel.

## The energy challenge – safe, reliable, inexpensive energy without undesired effects

Today, 64 per cent of the world's electricity needs are met with fossil fuel, such as coal, oil and gas, and 17 per cent with nuclear power. At Vattenfall, 42 per cent of our generation is based on fossil fuel and 37 per cent is based on nuclear power.

The reason that these types of energy make up such a large portion of the world's electricity generation is that both have qualities that make them attractive in many ways. Above all, they can provide large amounts of energy at a relatively low cost and with great reliability. Neither the combustion of fossil fuel nor nuclear power is dependent upon the weather, as wind power is, nor are they dependent on natural regional conditions, as hydro power is.

Despite these good qualities, both energy types have undesirable effects. The combustion of fossil fuel creates large amounts of carbon dioxide emissions and contributes to global warming. This is one of the greatest challenges currently facing our society. Nuclear power leaves radioactive waste, which must be safely stored away from our living environment for one hundred thousand years.

Since our society is currently dependent on these types of energy, Vattenfall works in several areas to deal with the undesirable effects. Vattenfall both works with the development and optimisation of existing techniques and invests heavily in renewable forms of energy.

With more efficient and cleaner processes, the nega-

## EU measures against greenhouse gas emissions

**The Kyoto protocol**
Requires EU member states to reduce their total greenhouse gas emissions by 8 per cent before 2012 compared with 1990.

**The EU system for trading in emission allowances**
A tool for meeting the EU's obligations under the Kyoto protocol in a cost-effective manner.

**Emission allowances trading**
Trading in emissions allowances.

**Emissions**
Emissions of greenhouse gases into the atmosphere.

**Greenhouse gases**
Carbon dioxide ($CO_2$), methane ($CH_4$), nitric oxide ($N_2O$), hydrofluorocarbons (HFC), perfluorocarbons (PFC) and sulphur hexafluoride ($SF_6$). Initially, trade will only concern carbon dioxide.

**Trading periods**
2005–2007 and 2008–2012.

**Allocation/National allocation plans**
Developed by each member state with information on the total number of emission allowances and their distribution.

**Start of the trading system**
Trading within the EU began on 1 January 2005.

## Vattenfall and the environment: Modern facilities and a large proportion of hydro power

In keeping with the ambition to be 'Number one for the environment', Vattenfall is developing opportunities to reduce carbon dioxide emissions from fossil fuel-fired power plants. There are primarily three types of measure available.

- Optimisation of existing facilities. By increasing the efficiency in the process, emissions per unit of energy are reduced.
- Increased use of energy sources with less carbon dioxide emissions per unit of generated energy, such as biofuel (biofuel does not increase the net levels of carbon dioxide, since biofuel is included in a natural cycle).
- Separation of carbon dioxide from the combustion process and permanent storage in geological formations. Several processes and sub-systems for this are in commercial operation in other industries, such as the oil industry, primarily on a smaller scale.

Considerable investment in research and development (R&D), primarily in the combustion of biofuel and the separation and storage of carbon dioxide. The latter technique has been judged to hold great potential for reaching cost levels that are competitive within the framework of the emission trading system. Development takes place both within Vattenfall and in large collaborative programmes where Vattenfall works together with equipment manufacturers, other energy companies and universities and colleges. Efforts cover the entire chain, from separation processes through transport solutions to techniques and knowledge building regarding the storage of carbon dioxide in geological formations. Vattenfall has also taken the initiative in leading a larger EU programme for the development of separation techniques. The overall goal is to be able to build a large-scale demonstration facility, 'The carbon dioxide free power plant', to show the viability of the technology (see case on page 24).

**Efficient utilisation and less environmental impact**

Vattenfall's production facilities for fossil fuel are among the world's most modern. The majority of the fossil fuel Vattenfall uses is used in combined heat and power plants in Germany and Poland, providing efficient fuel utilisation with less environmental impact as a result. As Vattenfall has a high proportion of hydro and nuclear power in the Nordic countries, the combined emission levels are low, which provides a competitive advantage in the European energy market.

Vattenfall also owns or partially owns six nuclear power plants (a total of eleven reactors) in Sweden and Germany. Nuclear power provides approximately 40 per cent of Vattenfall's electricity generation. Nuclear power produces practically no carbon dioxide emissions. Availability and reliability are good and the technology is cost-effective.

tive effects of the combustion of fossil fuel can be considerably reduced while the positive aspects, in the form of cost-efficiency and reliability, are retained. Maintenance investments in nuclear and hydro power are being made to increase efficiency.

In the area of renewable energy, Vattenfall is planning large investments in such areas as wind power. In 2004, for example, Sweden's largest wind power park, Olsvenne 2, was put into operation. Vattenfall also plans to invest SEK 1.5 million to build Örestad wind power park, comprising 48 wind turbines.

Through Svensk Kärnbränslehantering, Vattenfall promotes the development of methods for final storage of spent nuclear fuel.

### Trading in emission allowances introduced

The EU's influence in shaping the new electricity market has increased progressively during recent years. There are two main factors behind the EU's increased involvement: the strong belief that a more efficient electricity market can speed up the slow economic development in Europe and the ambition to lead development towards a sustainable and responsible society.

The ongoing climate change is one of the issues that dominate the European environmental debate today. In order to reduce emissions that produce the so-called greenhouse effect, the EU is introducing a system for trading in greenhouse gas emissions. The system came into effect at the beginning of 2005, and initially covers only carbon dioxide.

The basic mechanism of the system is that all incinerators over a certain size must have the number of emission allowances corresponding to their carbon dioxide emissions, and that these allowances can be traded within the entire EU. Each EU country has an emission budget in accordance with the so-called burden sharing agreement of the EU's undertakings in the Kyoto protocol.

Each country has an authority that allocates emission allowances to the facilities participating in the system. The principles for allocation are decided within each member state, but must not conflict with the EU rules on government subsidies and competition. In almost all EU countries there will be a shortage of emission allowances. Year by year, the allocation will be reduced in accordance with the agreed emission reductions.

As their scarcity increases, the market price of emission allowances will rise. Plants will always have to weigh up the options of buying emission allowances or taking physical measures to reduce emissions.

In this way, physical measures will be steered towards where they are most cost-effective. The price of emission allowances will be determined by their scarcity, that is, the collective reduction of emissions in accordance with the EU's emission budget, and the costs of achieving these reductions. Estimations of the future prices for emission allowances vary greatly.

The price of emission allowances will affect the price of electricity. According to Vattenfall's calculations, an emission allowance price of EUR 5/ton will equate to an increase in the electricity price of EUR 2–3/MWh. If the price is EUR 10/ton, the increase will instead be EUR 4–7/MWh.

## Uncertainty surrounding the future of nuclear power

At the end of 2004, the Swedish government decided that Barsebäck 2 will close on 31 May 2005.

Between 2013 and 2023, the majority of the remaining nuclear power units in Sweden and Finland will have been in operation for 40 years.

Reinvestments would make it possible to further extend their lifetimes. However, some of the oldest and smallest units may be closed for financial reasons before 2020. This would mean a reduction in capacity of between 4 and 22 TWh. The Finnish government has recently given the go-ahead for construction of a fifth nuclear power plant, which will provide a capacity of 12 TWh annually as of 2009/10. Germany currently has 18 active nuclear power plants, but a political agreement has now been reached to cease electricity generation based on nuclear power.

In most countries, capacity will also disappear as old fossil fuel-fired power plants reach the end of their lifespans and have to be phased out.

What will replace all this capacity, and how will it be done? Most likely, the degree of environmental impact and the level of taxes and fees will determine which type of new electricity generation is possible. Many different techniques and new types of power plants are available. Which techniques are finally chosen will depend on how the investors assess the long-term possibilities of financial profitability in each individual case.

The planning and construction of a new power plant takes a long time. A suitable location must be found and purchased, a permit must be obtained, environmental aspects must be documented and approved, project planning must be carried out and contracts must be negotiated. Because the market has not yet experienced long-term capacity shortage, no knowledge of the effects can be expected. To summarise, we can say that the uncertainty surrounding the future of nuclear power and even the phasing out of old fossil fuel-fired power plants creates uncertainty in investment planning and in Europe's future electricity price development.

## Emissions considerably reduced

Today, Vattenfall's operations produce considerably less emissions than they did in 1990, which is the comparative year for the Kyoto protocol. Carbon dioxide emissions are now 29 per cent lower for every kWh of heat generated and 36 per cent lower for every kWh of electricity generated. In comparison, according to the Kyoto protocol, the EU is to reduce emissions by 8 per cent. Our operations in Germany represent the greatest reduction and comprise a full 90 per cent of the total reduction in emissions in the German electricity and heat industry. Even if other sectors are included, Vattenfall's German operations still represent about a sixth of the reductions achieved thus far in Germany.

Emissions have been reduced by almost 58 million tons, which can be compared with Sweden's total emissions of 60 million tons. Emissions of dust particulates has declined by 99 per cent, and acidifying emissions have also been reduced by some 90 per cent. Vattenfall continues to work towards further reducing emissions. More information is available in Vattenfall's Corporate Social Responsibility Report 2003 (Vattenfall's Corporate Social Responsibility Report 2004 will be published in September 2005).

# RENEWABLE ENERGY SOURCES

Vattenfall works with many different types of renewable energy, primarily biofuel, hydro power and wind power. They comprise an important part of the development of an energy system that supports sustainable development in society. Vattenfall's ambition is to have a leading role in renewable electricity and heat production.

The importance of renewable energy sources increases as the business conditions develop. Vattenfall's ambition is to have a leading role in renewable electricity and heat production in prioritised markets where the commercial prerequisites are present. By standing at the forefront and driving development forward within the framework of its commercial activities, Vattenfall can contribute to ecologically and financially sustainable development.

Of current world energy consumption, a little over 13 per cent is derived from renewable sources and about 7 per cent from nuclear power. The remaining roughly 80 per cent comes from fossil fuel. The proportion of renewable energy in Vattenfall's heat production is currently slightly more than 20 per cent (15 per cent 2002) while the figure for electricity generation is approximately 20 per cent (18 per cent 2002). The proportion of electricity generated using renewable energy sources, excluding hydro power, is 0.4 per cent.

## Vattenfall's work with renewable energy

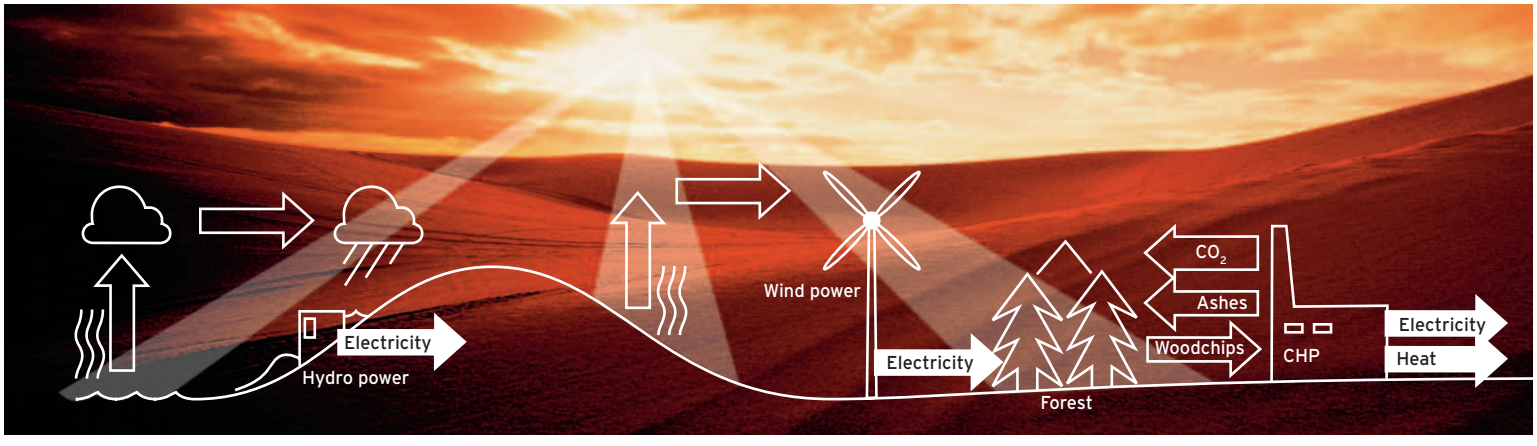
Since 1997, Vattenfall has invested almost half a billion SEK in R&D within the field of renewable energy sources, mainly within hydro power, biofuel-fired plants and wind power. Moreover, we examine the possibilities offered by other systems, such as wave power technologies, in order to meet and prepare ourselves for future demands on our energy production. Possibly even more important, during the same period, Vattenfall has invested more than SEK 5.5 billion in production capacity for renewable energy sources in the Nordic countries alone. Vattenfall is examining the possibilities for making additional, larger investments in renewable energy. Such investments require stable and long-term support systems. If these efforts are implemented, the investment sums will be of the order of several billions of SEK.

As well as pursuing the large-scale commercial development of hydro power, wind power and biofuel, Vattenfall actively monitors the research and development of technologies that could comprise a part of a future energy system. Vattenfall also participates in both Swedish and German programmes in areas involving such things as wave power, hydrogen gas, black liquor gasification, fuel cells, geothermal power and solar power.

### Renewable fuel

Vattenfall operates approximately one hundred plants using renewable fuel in Sweden, Finland, Germany and Denmark, making Vattenfall the world's largest buyer and user of biofuel. In Vattenfall's Swedish heat and CHP production, renewable fuel comprises around 75 per cent of the energy supply. When expanding heat production facilities in the Nordic countries, biofuel is the natural choice for Vattenfall. Renewable fuel comprises a considerable portion of heat production in Finland. In Germany and Poland, however, with the exception of waste, renew-

Renewable energy sources make use of solar radiation falling on the Earth and do not consume finite natural resources.



able fuel cannot currently compete with coal in district heating production due, for example, to limited supply contra demand and limited systems for the extraction and transport of renewable fuel.

With great dedication, Vattenfall has worked with bio energy for 30 years. Current development work, concerning, for instance, the combined combustion of different fuels, aims to increase availability, reduce environmental impact and cut maintenance costs. Experience from our Nordic operations is relayed to our combined heat and power plants in Warsaw, Poland and other places. Vattenfall is currently establishing a new facility in Hamburg with a capacity of 20 MW based on recycled wood within the framework of the German subsidy system. In Uppsala, Sweden, a new waste-fired unit (400 GWh/year heat) was commissioned in January 2005.

### Hydro power

In Sweden, Vattenfall has about 90 hydro power plants, about 40 of which are small-scale, while in Finland we have twelve hydro power plants, mostly small-scale. The hydro power plants in Sweden and Finland provide about 33 TWh during a normal year. In Germany, Vattenfall has twelve hydro power plants, mostly pumped storage power stations.

Vattenfall's earlier major expansion ventures and existing large holdings of hydro power assets have given us a very good understanding of how new environmentally-friendly hydro power facilities ought to be designed. Two investment programmes, totalling SEK 6.5 billion, are underway and involve hydro power station maintenance work and upgrades in order to increase production, improve environmental performance and reduce maintenance costs. Together, these investments will provide an additional 300 GWh a year by 2013, and this electricity generation will be entitled to Swedish green certificates.

### Wind power

In the Nordic countries, Vattenfall has 45 wind power plants, generating a total of about 60 GWh, almost 10 per cent of Sweden's total wind power production of nearly 700 GWh. In December 2004, we acquired the rights to construct an additional wind power park at Lillgrund in Öresund, off the south coast of Sweden. This wind power park will multiply Vattenfall's holdings and is planned to comprise 48 wind turbines with a combined capacity of about 330 GWh, which will increase Sweden's total wind power generation by more than 40 per cent. Through the acquisition of building permits for Lillgrund, Vattenfall has taken the step from small to large-scale wind power generation. On its own initiative, Vattenfall has also developed a 60 GWh off-shore wind power project outside Karlskrona, Sweden, and we expect to receive all necessary permits in 2005. Several additional acquisitions and proprietary wind power development projects are planned for the near future.

Shore-based wind power is now a relatively mature technology with high availability. The technology is still developing towards increasingly larger turbines, which provide better utilisation of wind resources and result in reduced production costs. The next large development step is the establishment of off-shore wind power, which will be accompanied by improved wind and generation conditions, but will also entail increases in technical difficulties and costs.

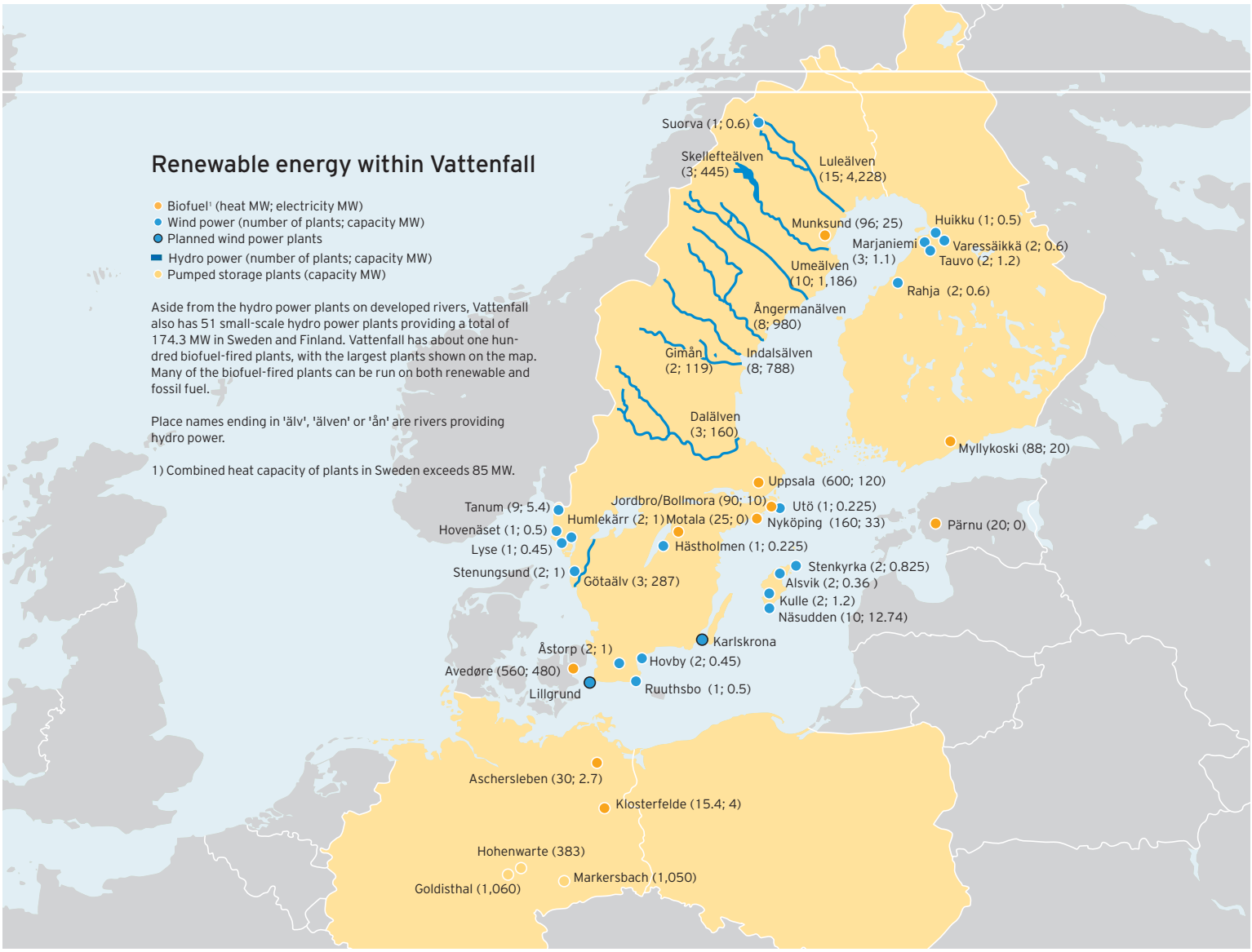
During the past 30 years, Vattenfall has driven development forward by building and evaluating new technology together with manufacturers. The development areas that Vattenfall is currently working on are primarily focused on off-shore wind power and the integration of wind power plants with the electricity system.

## Finland, Poland, Sweden and Germany – Varying conditions

The EU has established a goal that by 2010, 12 per cent of our energy shall stem from renewable energy sources, compared with 6 per cent in 1997. The equivalent figure for electricity generation is 22.1 per cent by 2010, compared with 13.9 per cent in 1997.

As far as possible, electricity generation is based on the resources available in each country. In the Nordic countries, for example, the conditions for hydro power electricity generation are very good, as is the supply of biofuel. In Germany, on the other hand, coal is the primary energy source.

The use of renewable types of energy is also governed by the formulation of each country's legal and economic frameworks, as well as operating costs and capital costs for the different techniques. New production, and renewable production in particular, generally entail greater costs than existing production. In order to facilitate investments in




renewable production, many European countries have introduced various subsidy systems. The recently introduced European trading system for carbon dioxide emission allowances also moves matters in this direction.

### Nordic Countries

The 'green certificate' system was introduced in Sweden in 2002 with the aim of adding 10 TWh of new electricity generation from renewable energy by 2010. Vattenfall's assessment is that this goal can be reached by the middle of the next decade. This new production can be expected to comprise equal parts wind power and biofuel-fired generation within industry and combined power and heating plants. Vattenfall, for example, has taken its first step towards this goal with the planning of the wind power park at Lillgrund.

With more widespread acceptance for wind power construction and with additional improvements in the way permits and authorisation are dealt with in Sweden, the rate of development in wind power generation could be further increased.

### Germany

In Germany, a solution has been chosen wherein the owner of renewable production is guaranteed a certain pre-determined income per kWh while the investment is repaid, which has led to considerable increases in the construction of shore-based wind power. Germany is now the world's largest wind power user and renewable production represents about 5 per cent of total production. Today, the extent is so great that the necessary expansion of electricity transmission capacity in order to cope with the wind power is lagging. An important issue now is to gain the prerequisites, primarily permits, to erect new power lines within a reasonable time, but also to ensure network stability and operation.

### Poland

Poland has chosen a solution wherein electricity suppliers must buy a pre-determined amount of renewable production in proportion to their sales. This proportion will be increased gradually from 2.85 per cent in 2004 to 9 per cent in 2010. In order to reach this goal, expansion will most likely be necessary in biofuel-fired production as well as in hydro power and wind power, which in turn will place heavy demands on the development of market mechanisms and regulations.