

# Life cycle thinking at Vattenfall

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# Agenda

- **Some fact about Vattenfall**
- **Life cycle thinking – what does that mean for a company?**
- **LCA and EPD at Vattenfall**
- **Vattenfall in the future**

## **Magnus Enell**

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# Some facts about Vattenfall

# Vattenfall today – A European energy company



## Facts of today (2010)

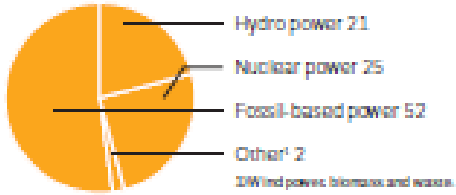
Number of employees:	38,179
Net sales:	213,572 MSEK
Operating profit:	39,952 MSEK
Investments	41,794 MSEK
Electricity generation:	172.5 TWh
Heat generation:	44.5 TWh
Number of customers:	
Electricity	7,5 million
Gas	2 million

## Vattenfall is a leading European energy company

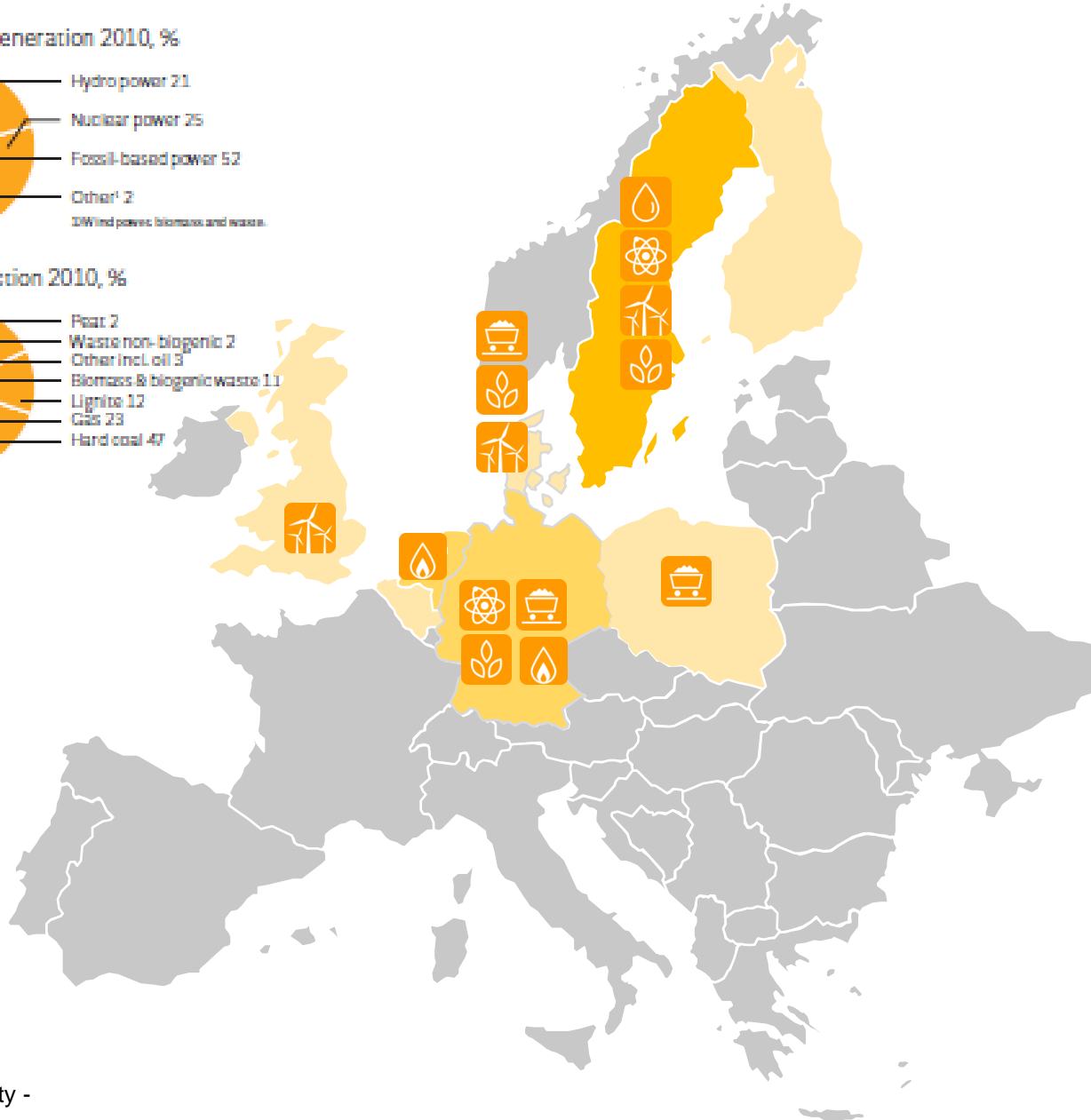
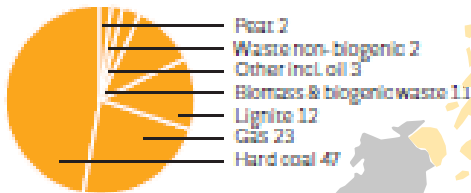
- Operations in eight markets
- Number 5 in electricity generation
- Number 1 in heat production







# Our markets and main energy sources



Electricity generation 2010, %



Heat production 2010, %



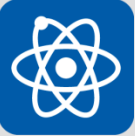





-  Wind
-  Nuclear
-  Gas
-  Biomass
-  Coal
-  Hydro

-  Core markets
-  Other markets

**Life cycle thinking –  
What does that mean for a  
company?**

# Environmental impact of the energy system

		Environmental impact	
	<b>Wind power</b>	<ul style="list-style-type: none"> <li>• Landscape</li> <li>• Ecosystems</li> <li>• Noise</li> </ul>	Intermittent power
	<b>Hydro power</b>	<ul style="list-style-type: none"> <li>• Landscape</li> <li>• Ecosystems</li> <li>• Dam</li> </ul>	Base load, regulating power
	<b>Nuclear power</b>	<ul style="list-style-type: none"> <li>• Uranium mining</li> <li>• Fuel production</li> <li>• Nuclear safety</li> <li>• Waste</li> </ul>	Base load power
	<b>Coal</b>	<ul style="list-style-type: none"> <li>• Climate (CO<sub>2</sub>)</li> <li>• Other emissions (SO<sub>2</sub>, NO<sub>x</sub>, particles)</li> <li>• Fuel extraction, transport etc.</li> <li>• Ashes and by-prod.</li> </ul>	Base load, regulating power and/or heat
	<b>Gas</b>	<ul style="list-style-type: none"> <li>• Fuel extraction, transport etc.</li> <li>• Climate (CO<sub>2</sub>)</li> <li>• Other emissions (NO<sub>x</sub>)</li> </ul>	Base & peak load, regulating power and/or heat
	<b>Biomass</b>	<ul style="list-style-type: none"> <li>• Fuel extraction/land use, transport etc.</li> <li>• Biodiversity</li> <li>• Other emissions (SO<sub>2</sub>, NO<sub>x</sub>, particles)</li> </ul>	Base load and/or heat



Construction impact (resource, emissions) apply to all

# Systematic environmental work

## Management (ISO14001)

- Keep control, laws and permits
- Environmental aspects
- Goals programs
- Continuous improvement

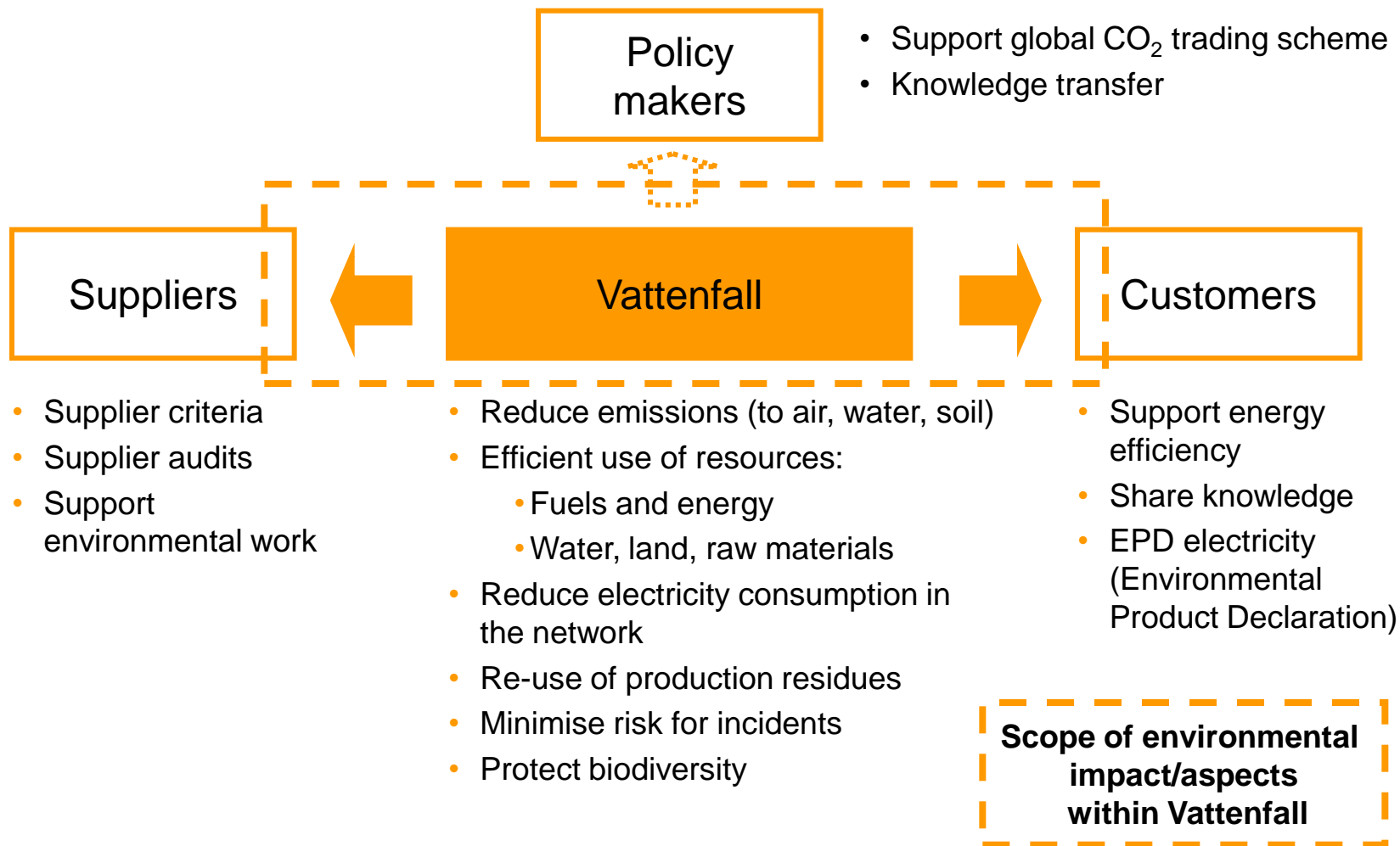


## Tools – LCA (ISO14040 14044), ERA, Biotope method etc.

- Assessment of environmental performance
- Find "hot spots"
- Prioritise business risks
- Value for money in improvements



# Vattenfalls actions to improve environmental performance involves ourselves and others



## **We need knowledge about the whole lifecycle in order to**

- Understand our part and role in the lifecycle
- Formulate relevant requirements on suppliers
- Sketch future scenarios
- Make the “right choices” regarding
  - Procurement and purchase (assessment of suppliers)
  - Processes (e.g. fuel production, waste treatment)
  - Components (e.g. PEX or PVC cable, air or SF6 insulation)
  - Material (e.g. steel or concrete in foundations for wind power)
- Communication with external stakeholders
- Show that we know what we do, to get society’s “license to operate”

# Allocation and system boundaries

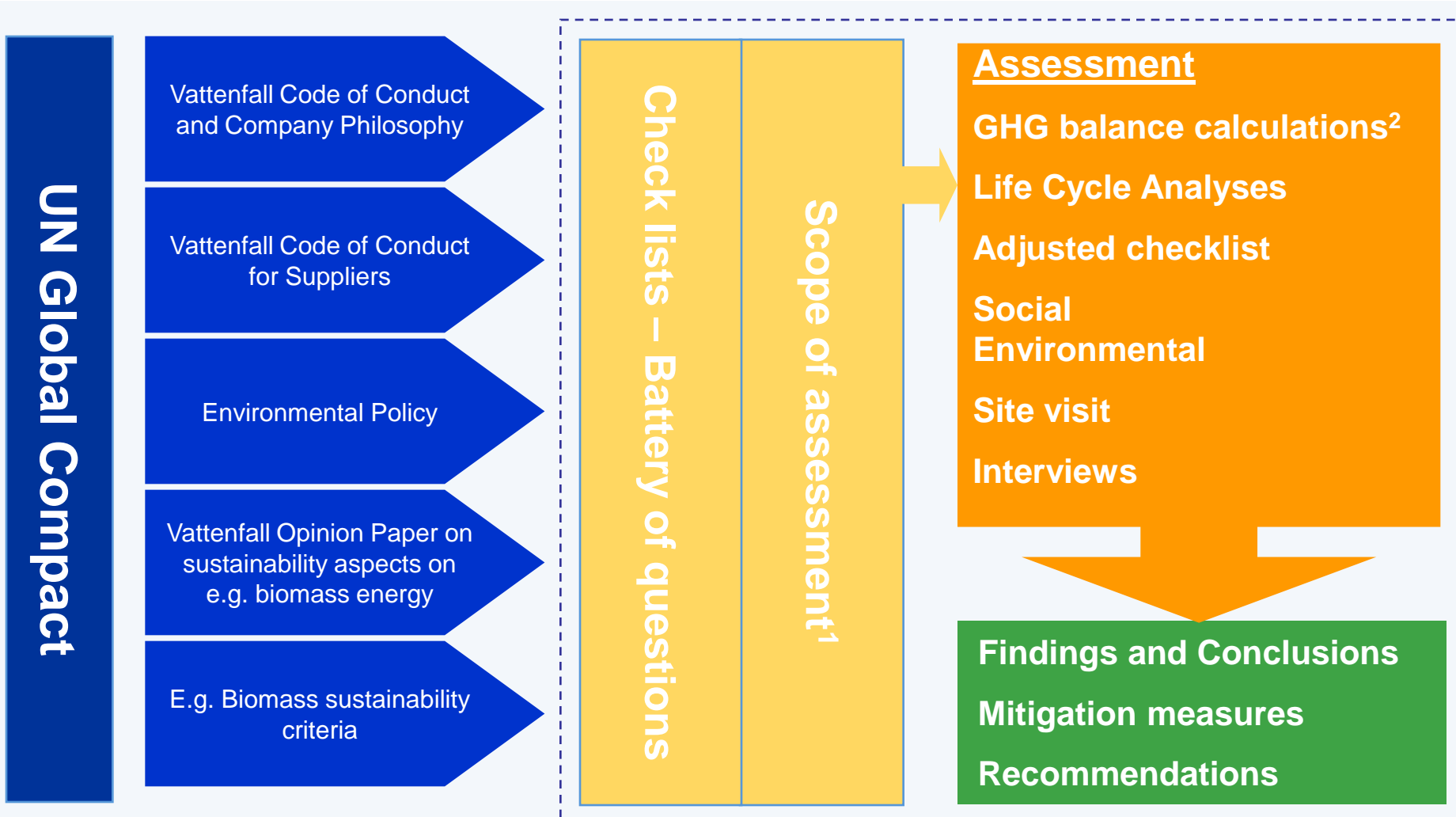
- **The ISO standards for LCA (ISO 14040, 14044) allows:**
  - **Nearly any kind of allocation principle as long as it is clearly documented how the allocation procedure is done.**
  - **You to setup the system boundaries in basically any way as long as they are in line with the purpose of the study.**



**LCA results are highly depending on how allocation principles and system boundaries are defined**

# LCA and EPD at Vattenfall

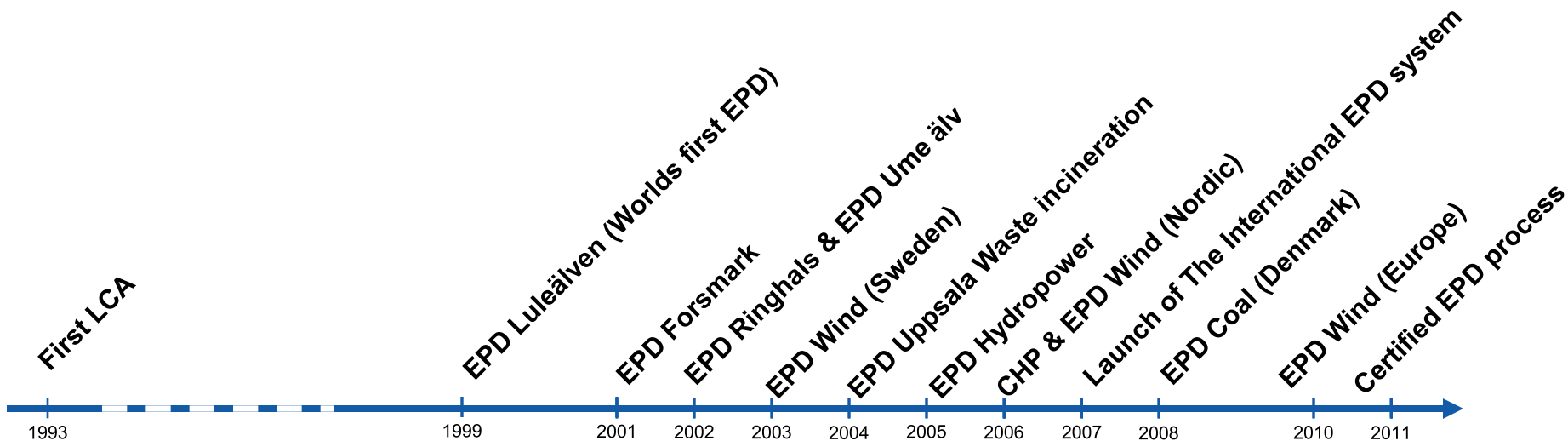
# Methodology for working with sustainability



<sup>1</sup> Based on e.g. country risks, can be simplified if country risks are low

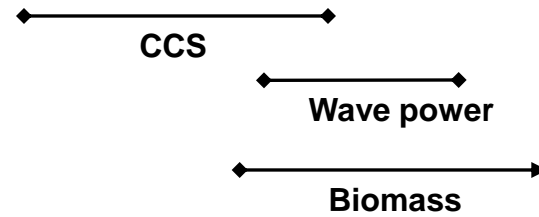
<sup>2</sup> Calculations are made for all cases (either rough or LCA)

# Vattenfall's LCA and EPD work throughout the years



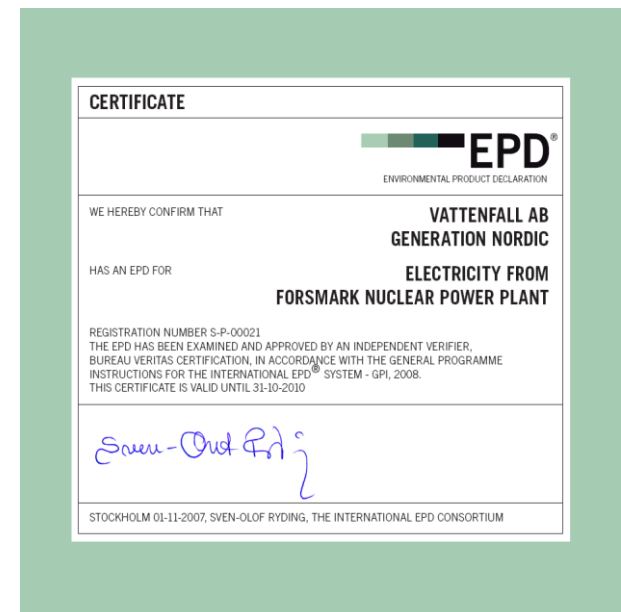
## Other LCAs

- Fuel cells
- Biomass/biofuels
- Natural gas
- Gas turbines
- Photovoltaic
- Electricity networks
- etc



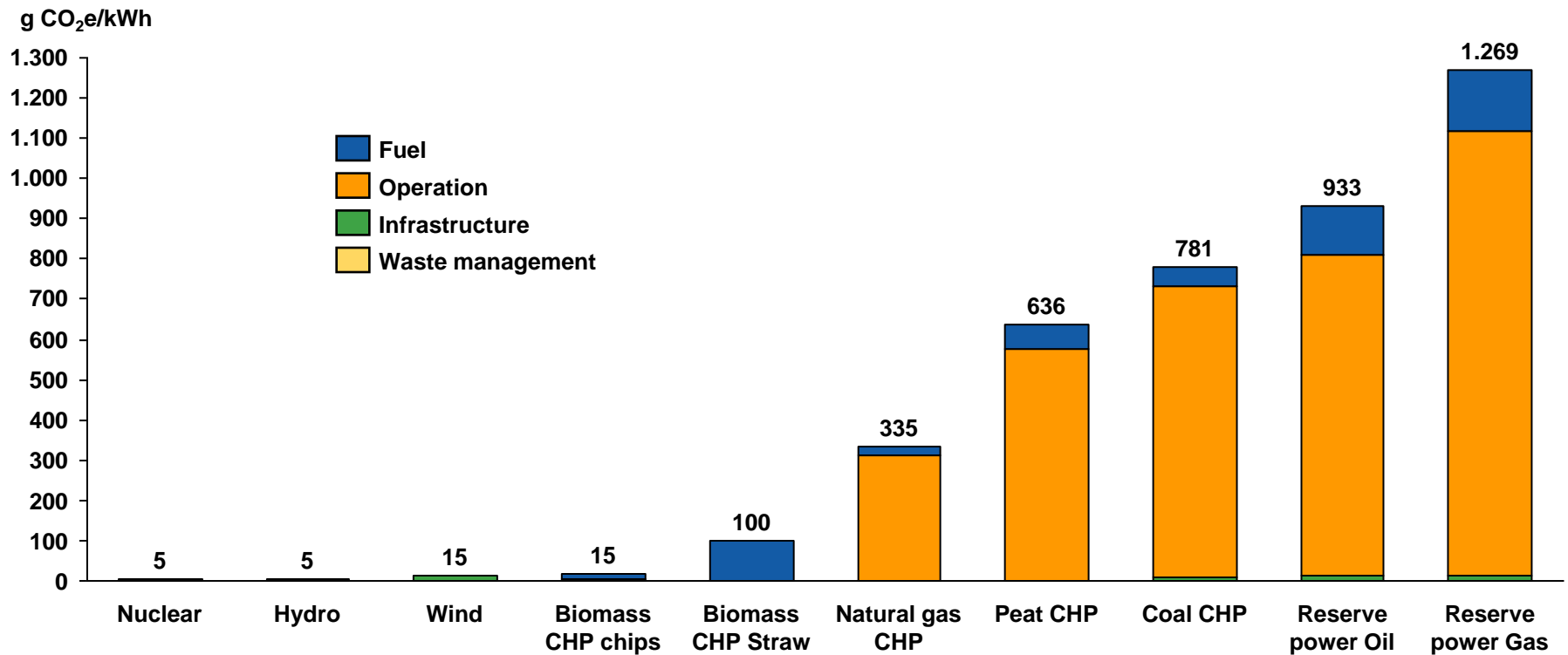
# Certified Environmental Product Declaration (EPD)

- **EPD® – Environmental Product Declaration – an information system to describe environmental properties of products and services based on facts and in a lifecycle perspective**
- **Open for all products and services**
- **Based on ISO 14025**
- **Product Category Rules (PCR) allowing for comparisons**
  - **The LCA in the EPD is calculated according to strict rules that make it possible to compare the EPD results and adding the results through the value chain (modularity)**
- **Third party verification and certification if desired**
- **An EPD® for electricity, steam and hot/cold water comprises**
  - **Lifecycle assessment (LCA)**
  - **Study of biodiversity impacts**
  - **Environmental risk analysis**
  - **Radiology**



# Greenhouse gas emissions from different energy sources

g CO<sub>2</sub> equivalents per generated kWh of electricity (distribution excluded)





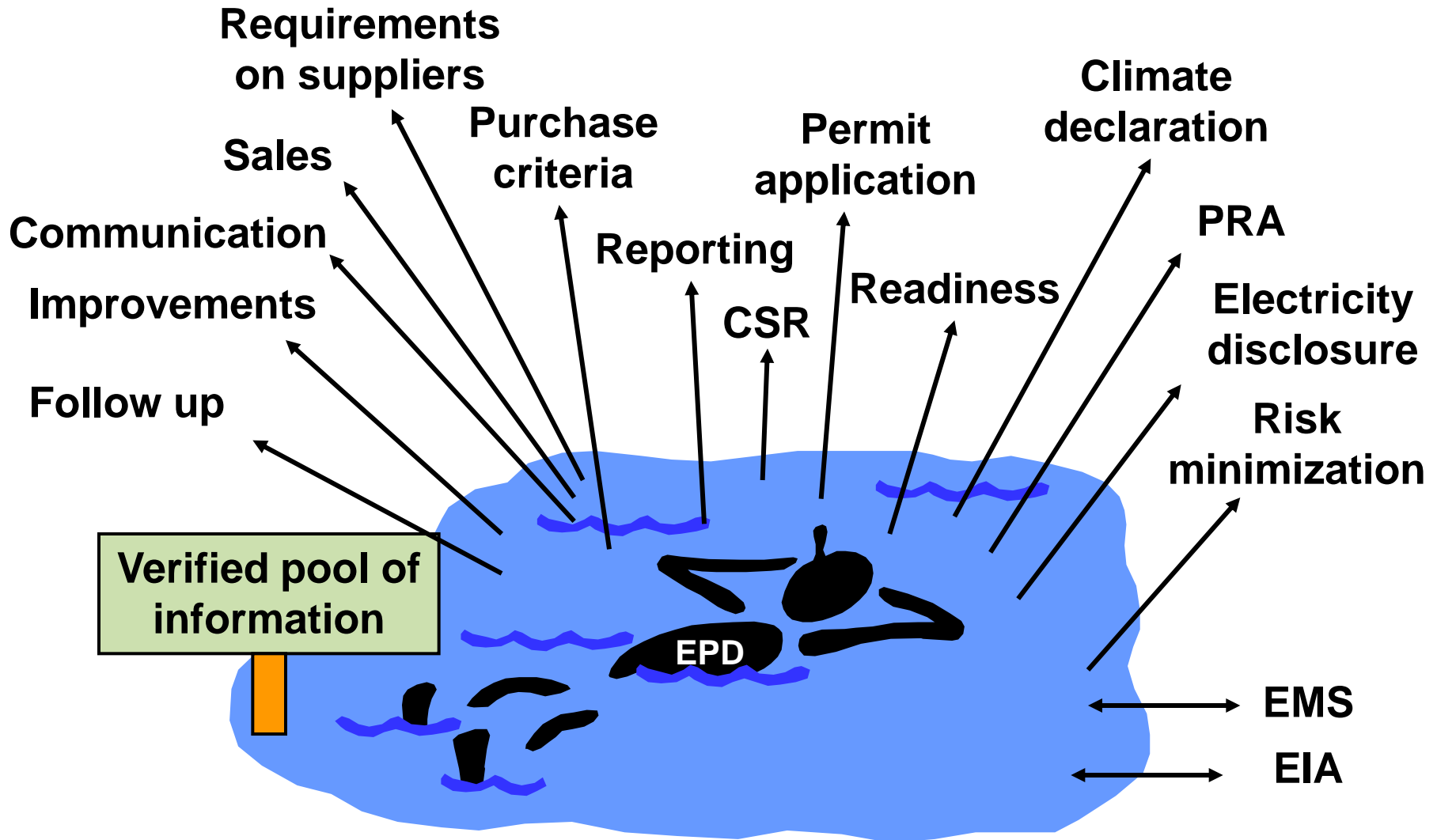
## Within the company

- Interaction with EMS (Environmental Management System)
- Identification of suppliers' hotspots in order to formulate the right requirements
- Input to purchase
- One basis for (re-)investment
- Preparedness for coming laws and regulations (e.g. Electricity Disclosure)
- Interaction with EIA (Environmental Impact Assessment)
- "Verified pool of information" for answering of internal and external questions

## On the market

- Strengthen brand
  - All products even the ones that are controversial
  - Third party verification and certification adds reliability
- Support for long term customer relations, where honesty and responsibility are required
- "License to operate"
- EPD is an opportunity to compete on different basis, not only price
- Answering questions from stakeholders

# Use of EPD



# Vattenfall in the future

# New strategic direction 2011→

## Consolidation phase

Next 2–3 years

### Short-term efficiency improvement programme

- Cost-cutting programme, SEK 6 billion
- Divestment of non-core businesses
- Revised investment plan for 2011–2015 to SEK 165 billion (compared with SEK 201 billion for 2010–2014)
- New business-led organisational structure from 1 January 2011

## Growth phase

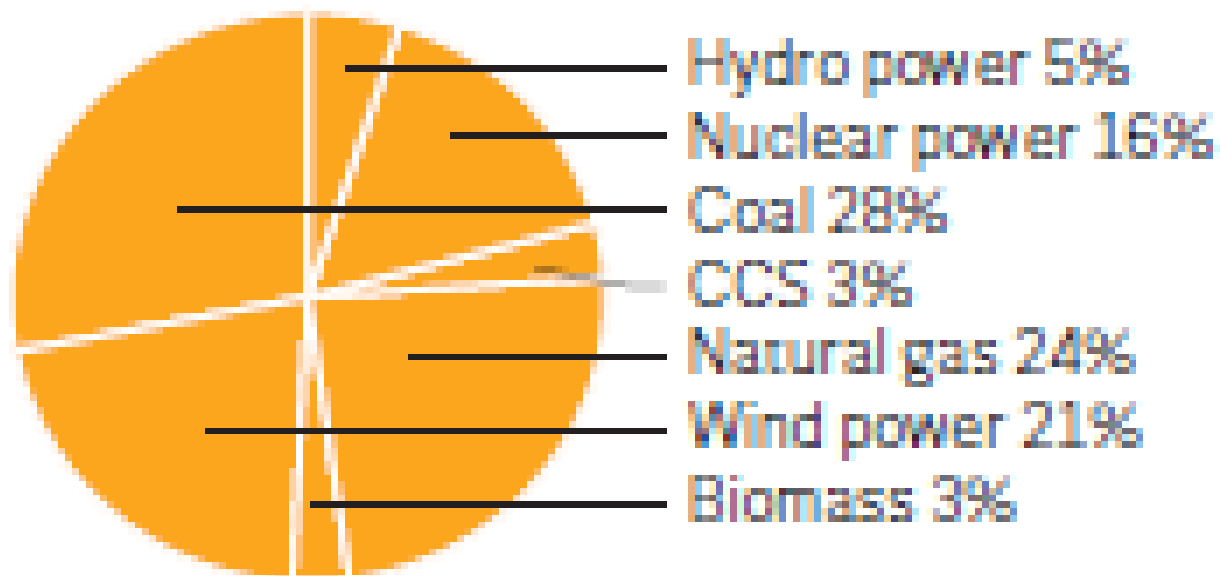
2014–

### Reshaping the generation portfolio<sup>1</sup>

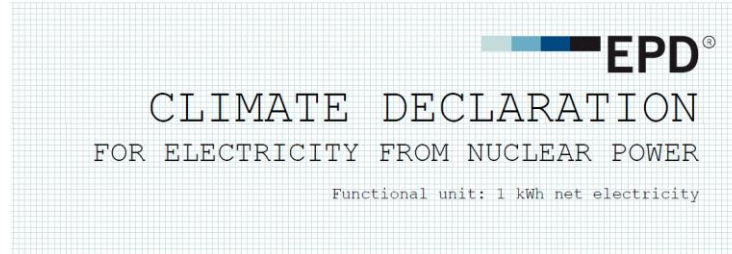
- Focus on growth in low CO<sub>2</sub>-emitting energy production, and in gas
- Focus on large markets with good growth opportunities and on markets in which Vattenfall has sizeable positions
- Reduced CO<sub>2</sub> exposure

1) Read more about the growth phase in Vattenfall's 2010 Annual Report.

## Investments in generation 2011-2015, (SEK 123 billion)



# Example of EPD communication: Vattenfall's climate declarations (coming ISO 14067)



The climate declaration shows the emissions of greenhouse gases, expressed as CO<sub>2</sub>-equivalents. It is based on verified results from a lifecycle assessment (LCA) performed as basis for an EPD® (Environmental Product Declaration), in accordance with ISO 14025.

### Product

Vattenfall AB has majority ownership in seven reactors in Sweden, three boiling water reactors (BWR) at Forsmark (together 3 138 MW and app. 23 TWh/year) and one BWR and three pressurized water reactors (PWR) at Ringhals (together 3 707 MW and app. 25 TWh/year). They are base-load plants of the Swedish electricity system.

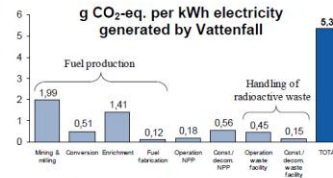


### Company

Vattenfall AB is the fifth largest electricity generator and the largest heat producer in Europe. Forsmarks Kraftgrupp and Ringhals AB, are both part of Vattenfall AB and responsible for the operation of the nuclear power plants. Vattenfall owns 66% of Forsmark and 70.4% of Ringhals. Forsmarks Kraftgrupp AB and Ringhals AB both implement an environmental management system, certified and registered according to ISO 14001/EMAS.

### Climate Declaration

The life cycle stages construction/operation/dismantling of power plants and facilities for handling/storage of radioactive waste as well as the four fuel production stages from mine to power plant have been inventoried and assessed. According to the LCA results the total emission of greenhouse gases is 5,36 g CO<sub>2</sub>-equivalents per generated kWh.



### Other Environmental Information

The complete certified declaration also contains information on calculation methods, greenhouse gas emissions due to distribution of electricity, and LCA results for other emissions, resource use and waste as well as descriptions of environmental risks and impacts on biodiversity in accordance with the EPD® system requirements.

### Contact Details

Contact: Lasse Kyläkorpi  
Vattenfall AB Nuclear Power, SE-162 87 Stockholm, Sweden  
E-mail: lasse.kylakorpi@vattenfall.com



LINK TO MORE INFORMATION: <a href="http://WWW.CLIMATEDEC.COM/1">WWW.CLIMATEDEC.COM/1</a>		EPD PROGRAMME: THE INTERNATIONAL EPD® SYSTEM, WWW.EPD-INTL.COM
EPD REGISTRATION NO: 8-P-00021 AND 8-P-00026 (MEAN VALUE)	FOR CPD/1 2007/08	FOR REVIEW CONDUCTED BY: DEC TECHNICAL COMMITTEE
INDEPENDENT VERIFICATION OF THE DECLARATION AND DATA, ACCORDING TO ISO 14025		
EXTERNAL VERIFIER: BUREAU VERITAS CERTIFICATION		
CLIMATE DECLARATIONS FROM DIFFERENT PROGRAMMES ARE NOT COMPARABLE		
READ MORE ABOUT CLIMATE DECLARATIONS AT <a href="http://WWW.CLIMATEDEC.COM">WWW.CLIMATEDEC.COM</a>		VALIDITY: 2013-12-14

Information on the product

Information on the company

Information on the LCA and climate declaration

GHG emissions in the different life cycle stages

Contact person, contact details and where to find the complete EPD

Information on the independent verification and other formal issues

# Vattenfall is investing in all six energy sources ...

## Development of generation portfolio up to 2020<sup>1</sup>



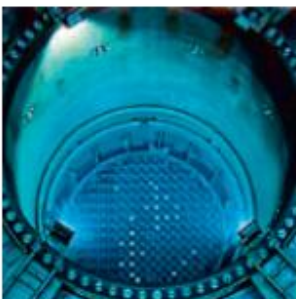
### Coal

The Boxberg and Moorburg plants will be completed, but no other coal-fired plants will be built until they can be built with CCS. In general, coal will become a smaller part of Vattenfall's portfolio after 2015.



### Natural gas

Natural gas will be an important transition fuel for both Europe and Vattenfall. Gas will be a priority investment area for Vattenfall through 2020.



### Nuclear

Vattenfall will remain involved in nuclear power, and will keep options open for growth. Currently, investments are being focused on upgrading and safety improvements.



### Wind

Vattenfall will continue to grow in wind power, primarily in offshore wind. Our generation from wind will have doubled to 4 TWh from 2009 to 2011, and Vattenfall recently secured contracts to develop DanTysk, a major offshore wind farm in the German North Sea. A major development phase associated with the UK Round 3 in East Anglia was initiated in 2010. The potential of this wind project is 7,200 MW in a joint venture with Scottish Power Renewables, with construction starting as soon as 2015.



### Hydro

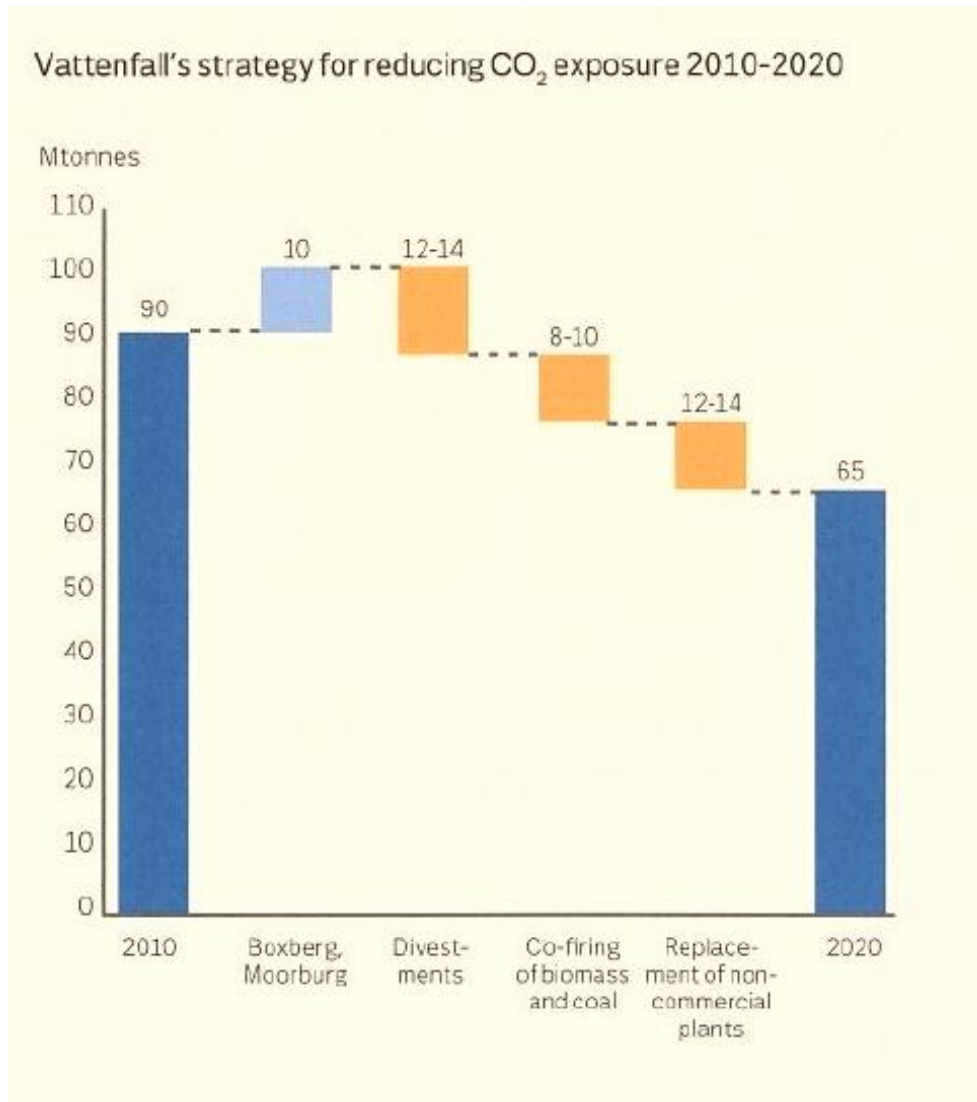
Vattenfall is exploring options for small-scale plants and for purchasing large plants in central and western Europe. France, which has recently opened the operation of its hydro power plants to competitive bids, is one place where Vattenfall may expand.



### Biomass

Vattenfall will be rapidly expanding the role of co-firing biomass in coal-based combined heat and power plants through 2020. The company's target is 50% co-combustion of biomass in coal-fired plants by 2020.

# Vattenfall's CO<sub>2</sub>- strategy for 2010 to 2020





# Thank you for listening

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