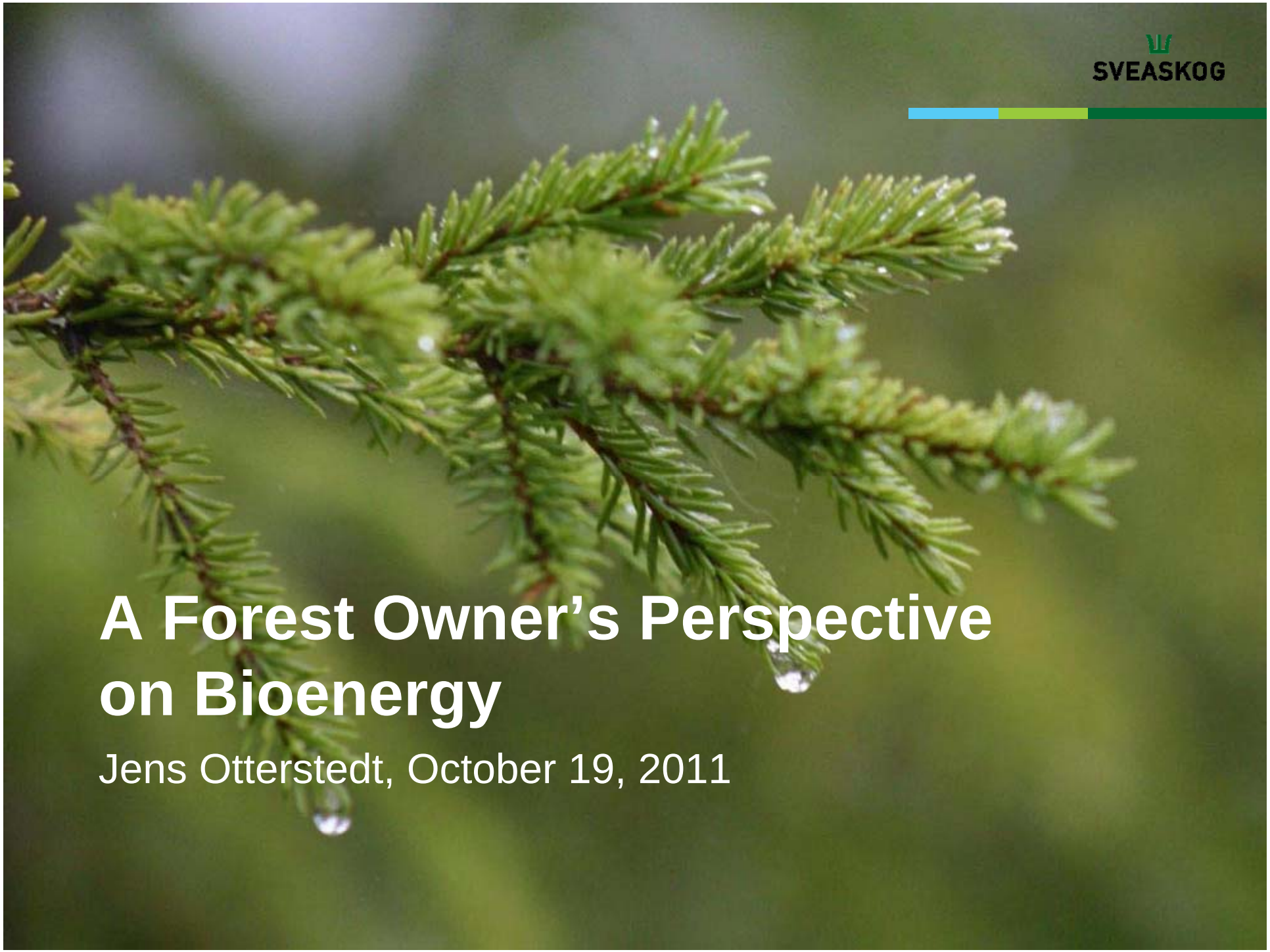


A Forest Owner's Perspective on Bioenergy

Jens Otterstedt, October 19, 2011

Agenda

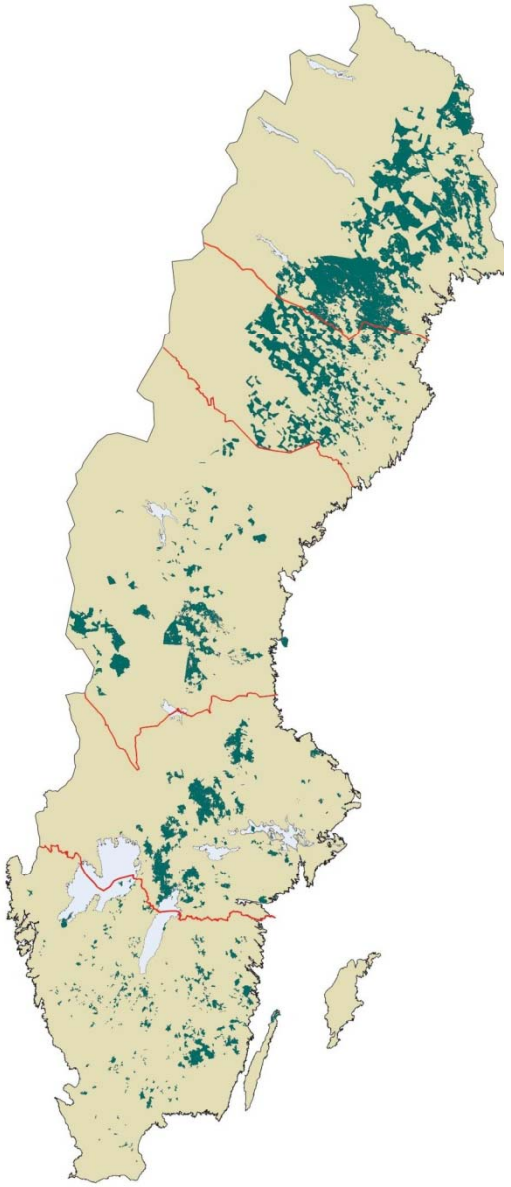
- **Sveaskog – the leading forest owner in Europe**
- The bioenergy challenge
- Sveaskog’s answers to the challenge

Sveaskog is a forest owner with its base in the (Swedish) boreal forests

- 600 million hectares
- 18 % of the world's forest land
- 20 % of the world's industrial timber
- Absorbs and retains carbon – positive climate effect

Sveaskog - Sweden’s largest forest owner

- Sweden's largest forest owner: 15% of the productive forest land
- Leading supplier of sawlogs, pulpwood and bioenergy
- Engages in land transactions, offers hunting and fishing opportunities
- Sveaskog´s forest is managed and cleared in accordance with FSC principles
- Makes land available to local entrepreneurs working with nature-based tourism
- Annual sales: SEK 7 billion
- 730 employees



To increase the return on our capital we need to broaden & develop the use of the forest fiber and the forest land

The trees

Slash (tops and branches)

Stemwood

- Pulp wood
- Sawlogs

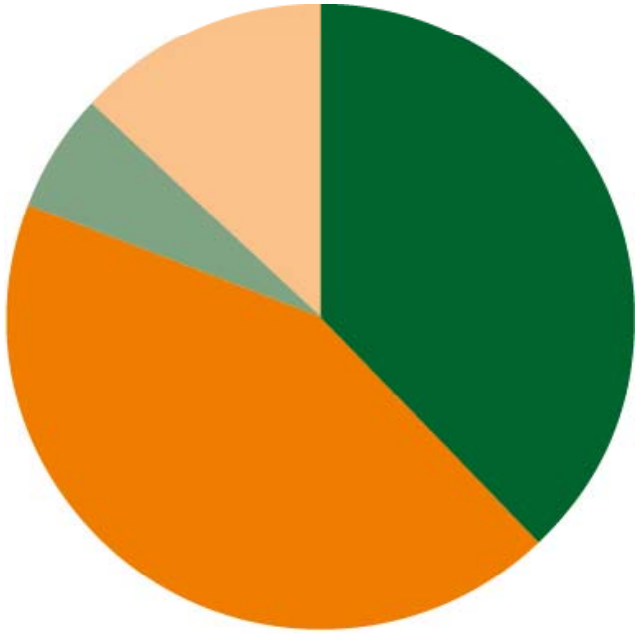
Stump

The land

Sawmills and the pulp & paper industry most important customers

Sveaskog's products

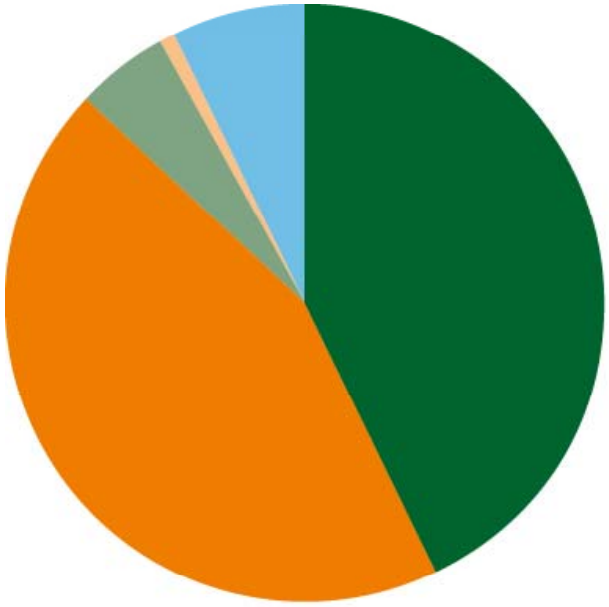
Percent by volume



Sawlogs 38%
Pulpwood 43%
Chips 6%
Biofuel 13%

Sveaskog's customers

Percent by sales



Sawmills 43%
Pulp and paper industry 44%
Heating plant 7%
Planting customers 5%
Entrepreneurs, arrendators 1%

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SVEASKOG
We face some serious challenges!!

New Political Framework in Europe -> growing demand for bioenergy -> challenges (& opportunities)

Climate threat

Energy security (and cheaper energy)

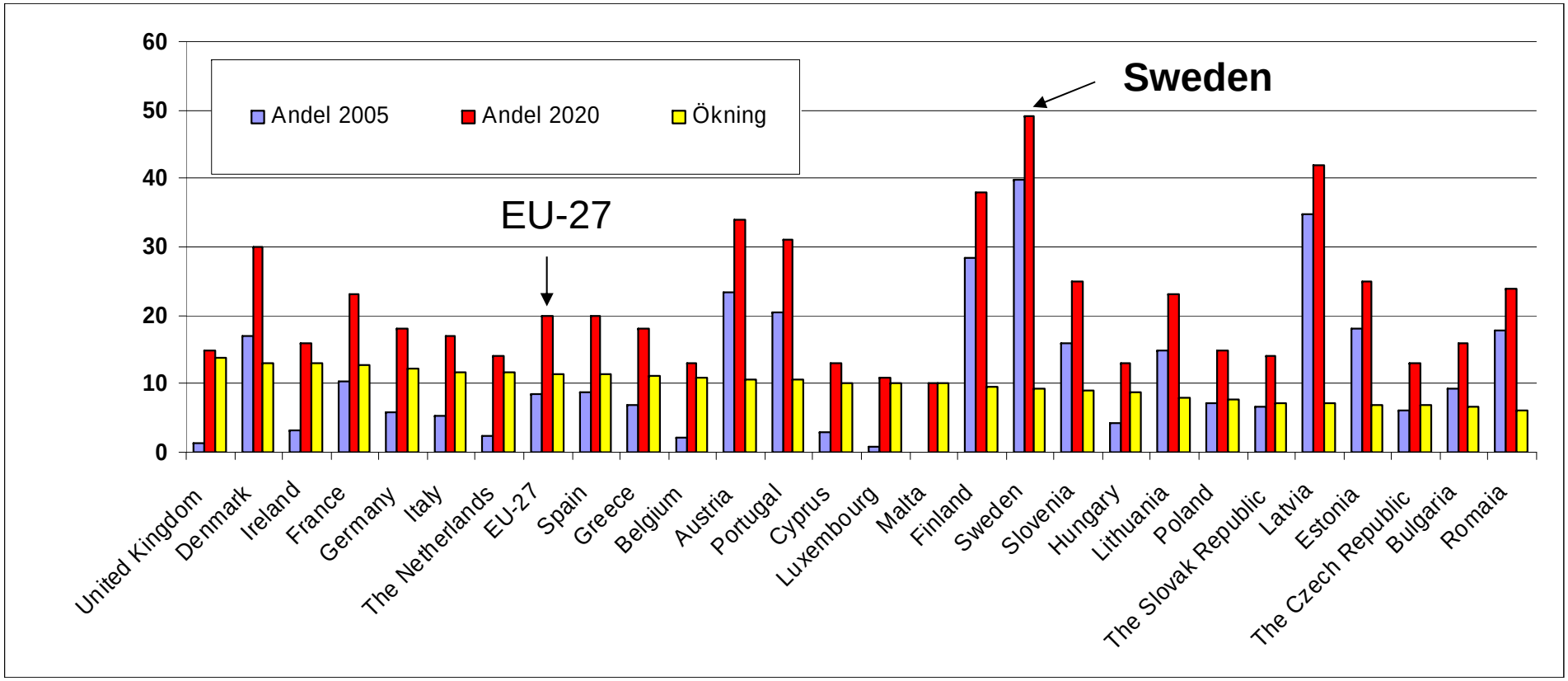
Regional politics

EU directive 2020

- 20% reduction in emissions
- 20% improved energy efficiency
- 20% renewable energy
  - Of which 10% renewable transport fuels

Sweden's renewable target 2020 is the highest within the EU

Share renewable energy 2005 and 2020-target



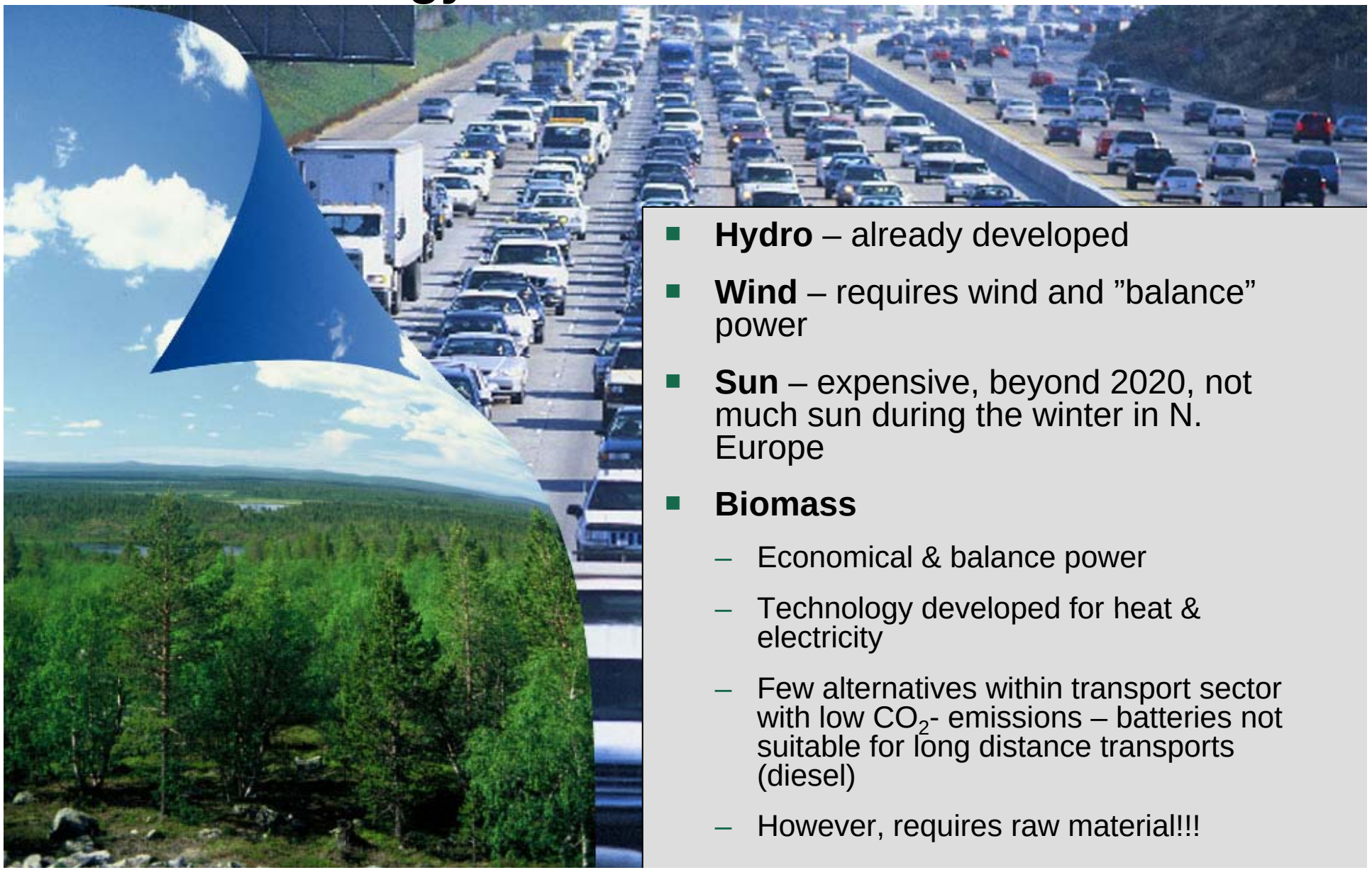
Lots of biomass for energy will be needed…

- < 1 million m^3 (~2 TWh energy)
- Yearly forest growth (roundwood) in Sweden = 100 million m^3
- Swedish energy demand = 400 TWh

Source: SKU


…but we also need more nature conservation & responsible forestry…

Why bioenergy? The most versatile renewable energy source



- **Hydro** – already developed
- **Wind** – requires wind and ”balance” power
- **Sun** – expensive, beyond 2020, not much sun during the winter in N. Europe
- **Biomass**
  - Economical & balance power
  - Technology developed for heat & electricity
  - Few alternatives within transport sector with low CO_2- emissions – batteries not suitable for long distance transports (diesel)
  - However, requires raw material!!!

What are our key challenges?

- **European biomass demand for energy will double until 2020**
- **Huge challenge to mobilize the required biomass, forests are key**
- **Biomass prices likely to increase**
- **Biomass imports (outside of Europe) will increase**
- **Sustainability will be an issue in some regions**
- **Efficient use of biomass should be encouraged**
- ***New technologies needed, especially to replace fossil in transport sector* - gasification technology very important!!**

Sweden has showed that a transition from fossil to renewable energy is possible

Share renewable energy (final)

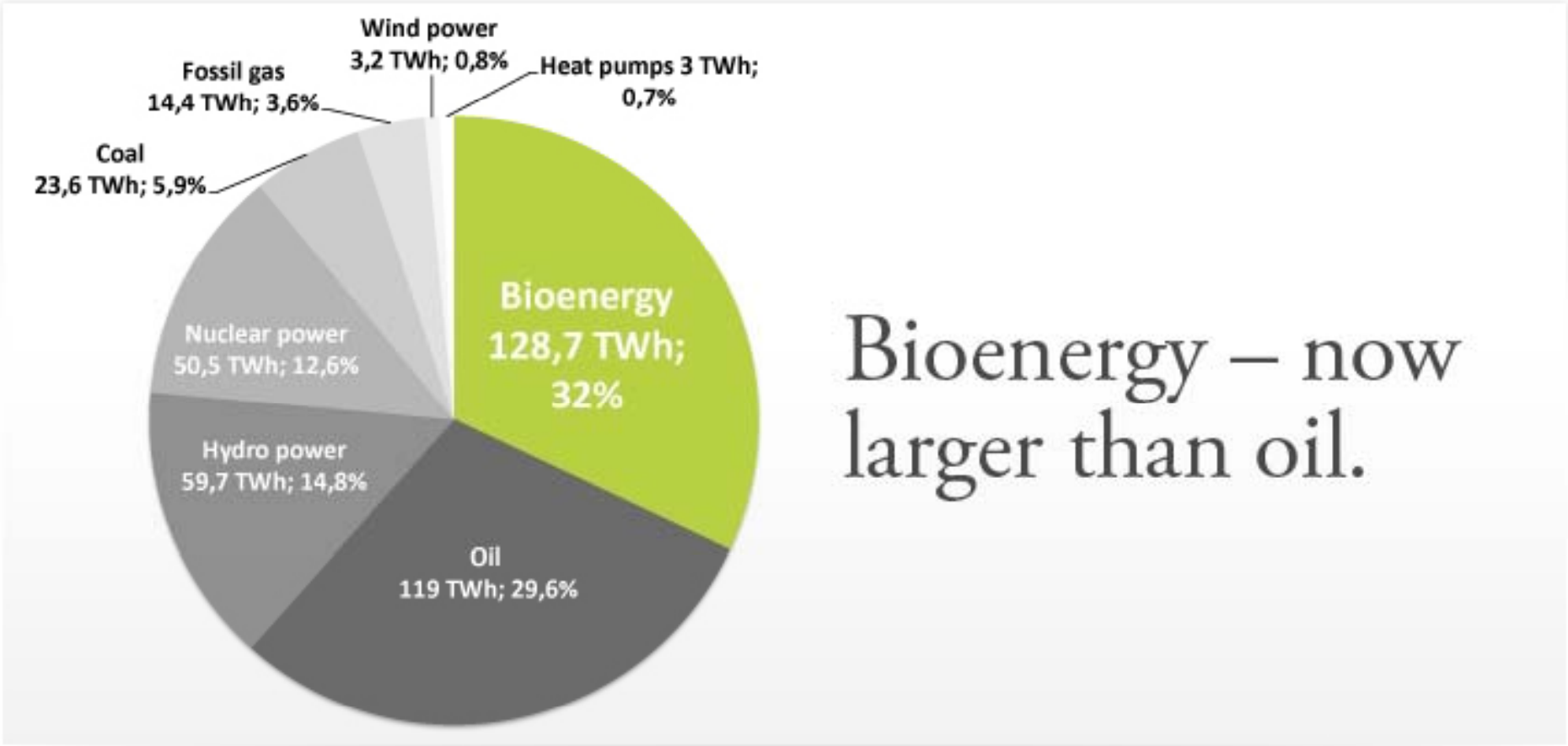
Sweden; 1990-2020; Percent

Swedish drivers

- In addition to energy security, increasing oil prices and climate
  - Relevant natural resources (hydro and forests)
  - Developed forest industry (chemical pulp production use lots of bioenergy)
  - Political will (incentives e.g. CO_2-tax (1991), green certificates (2003), subsidies)

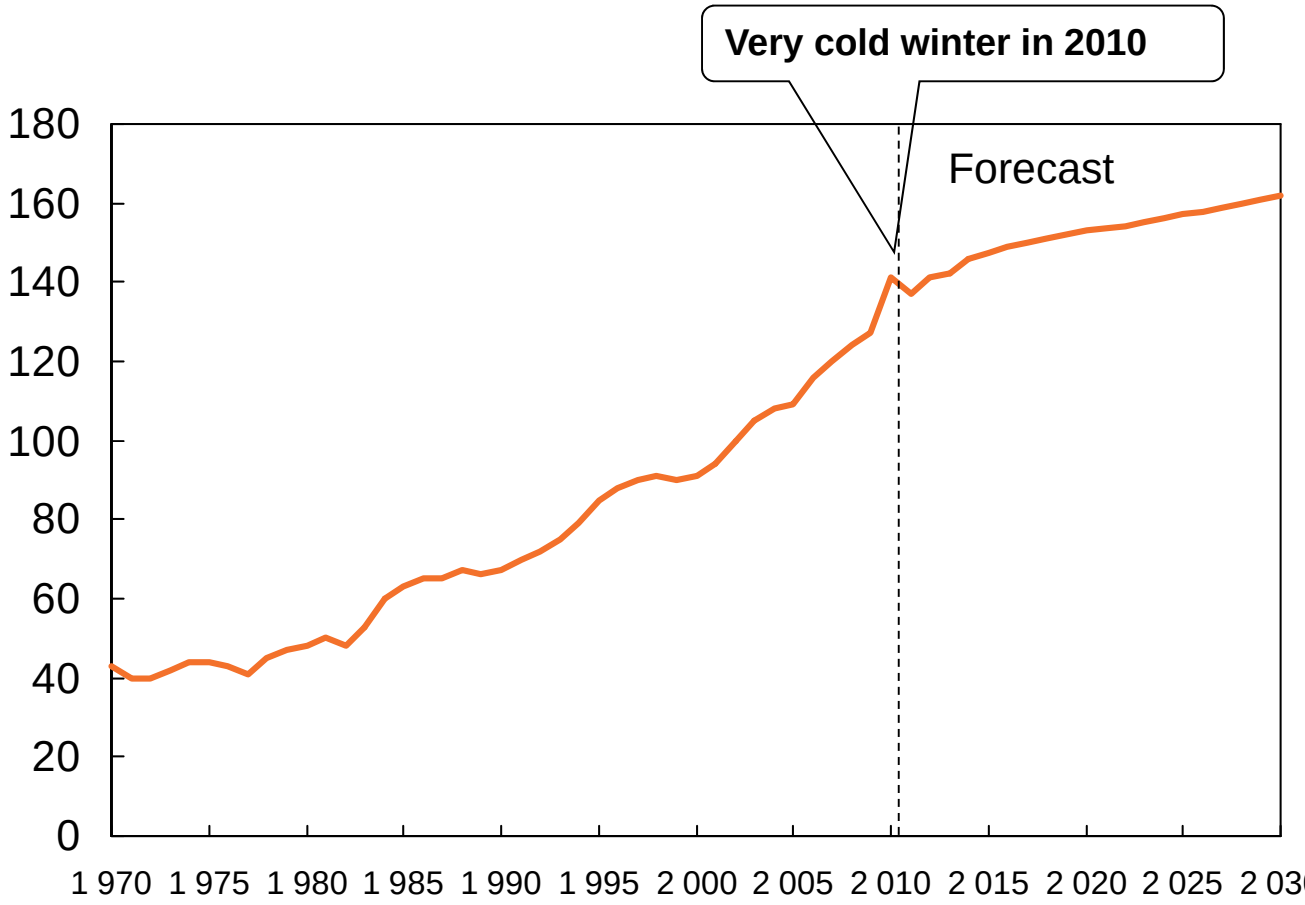
Today, bioenergy is Sweden's largest energy source

Final energy in Sweden 2010



Swedish bioenergy demand has grown strongly and will continue to grow

1970-2030; primary bioenergy supply; TWh



Bioenergy forecast (TWh)
2010: 141
2012: 144
2020: 153
2030: 162

Bioenergy demand 2010 (TWh)

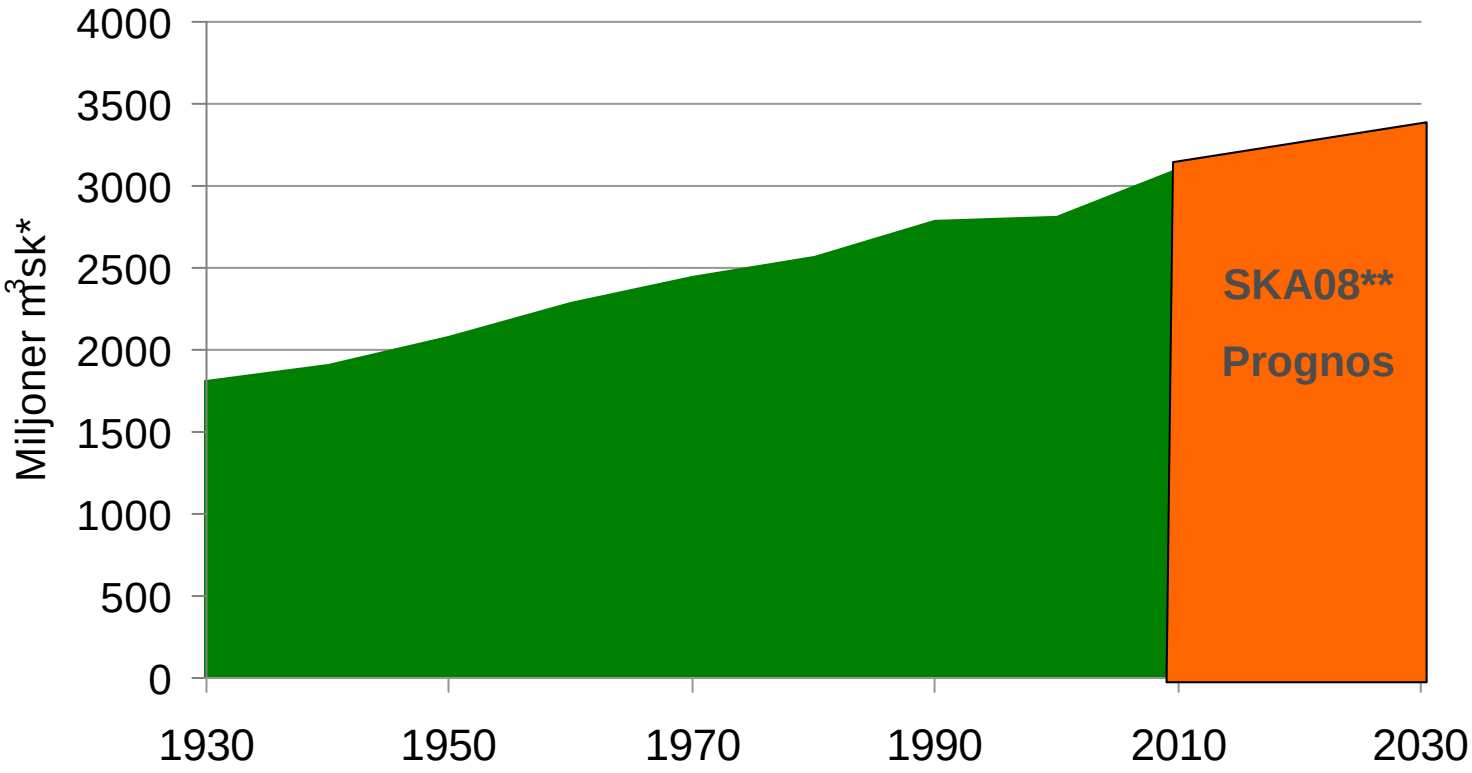
Industry	54
District heating	47
Houses/service	19
Power	16
Transport	*5*

Bio sources 2010 (TWh)
Forest ~ 115
Other ~ 26

One important driver has been district heating expansion based on bioenergy

- **1970**
  - **16 TWh district heating**
  - **~ 100% oil/coal**
- **2010**
  - **60 TWh district heating**
  - **> 80% bioenergy, peat, waste**

Have the forests disappeared? No, the forest inventory has increased



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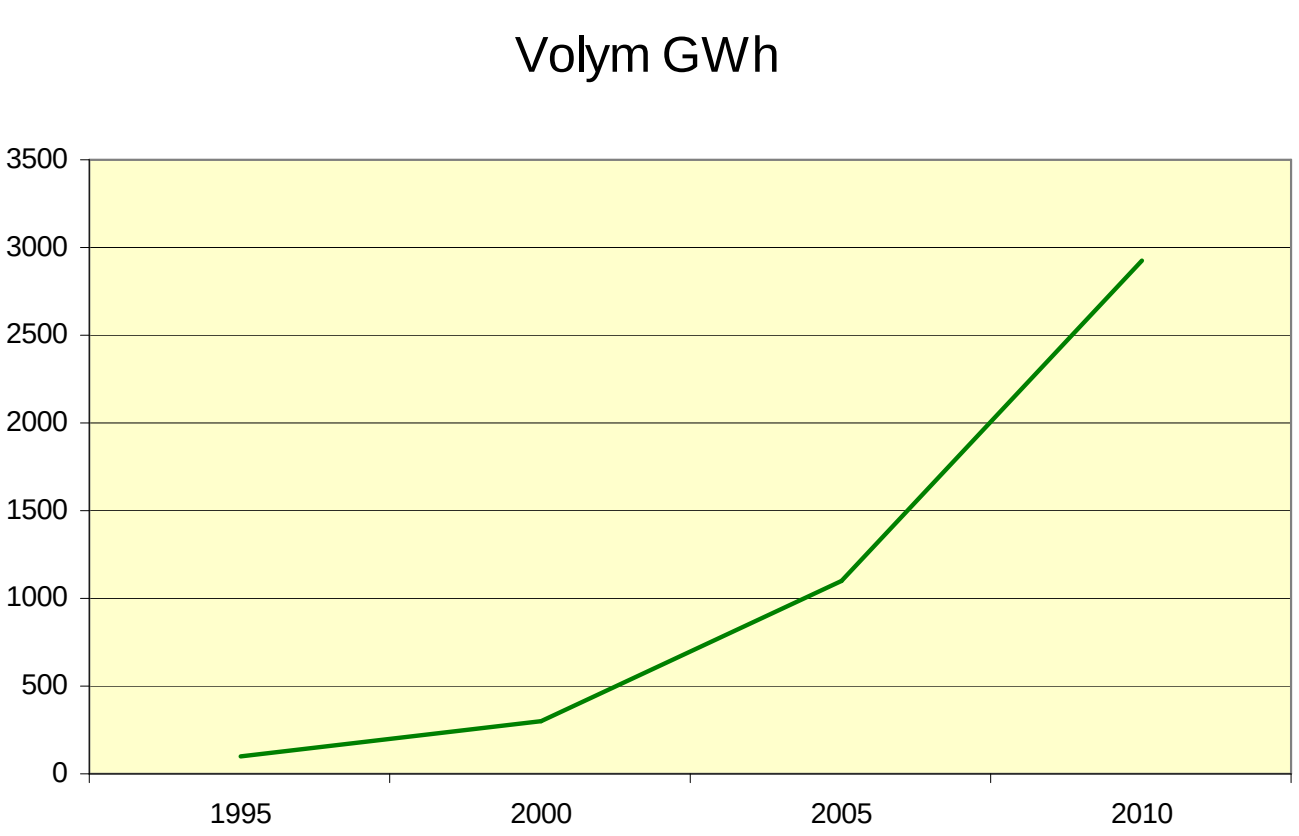
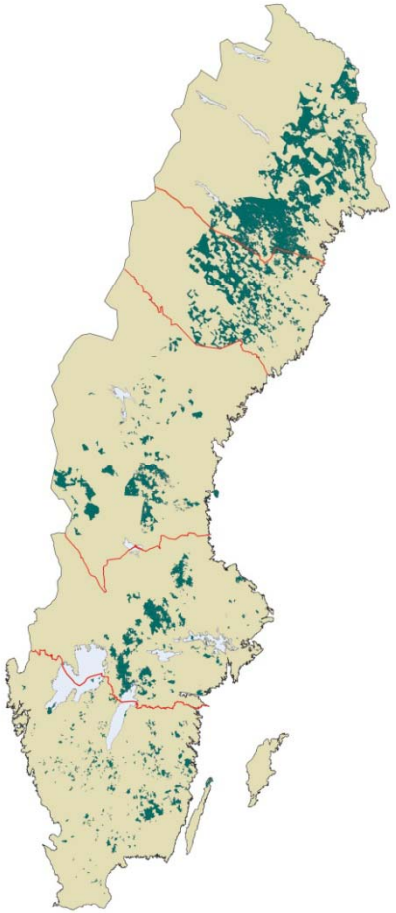
We have expanded our bioenergy business rapidly





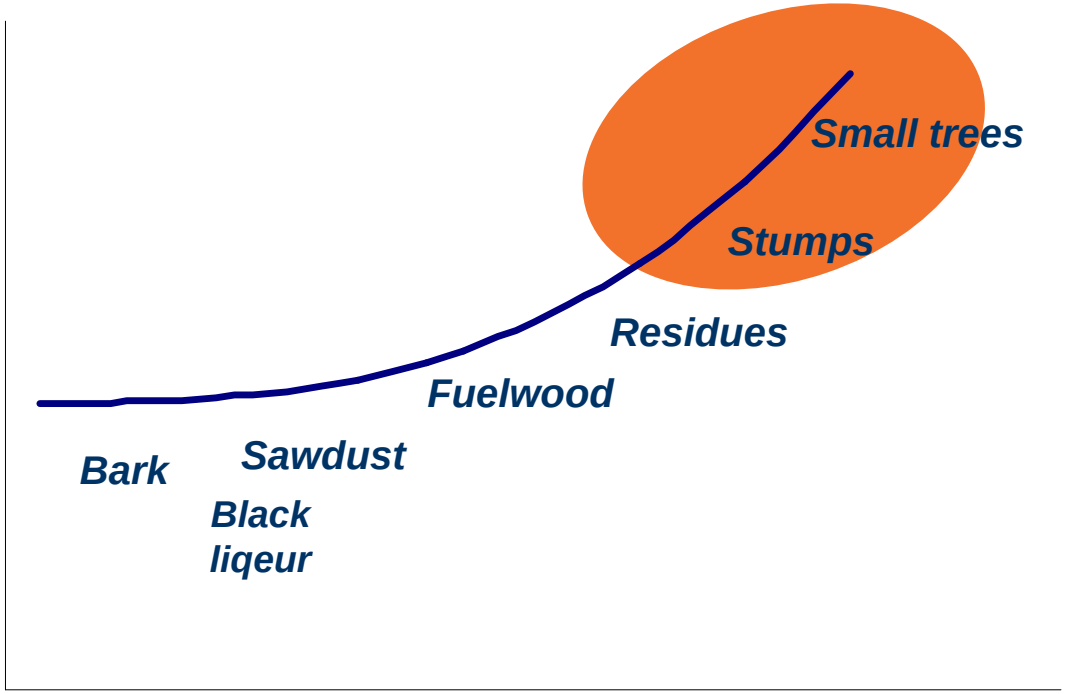
By 2030, our target is increased forest growth by about 20%

Measures for increased growth

- **In new forest** (e.g. cultivated seeds and plants, fast growing species)
- **In existing forest** (e.g. good forest management, fertilizing, ditches, shorter rotations)

New assortments needed and we need to use more parts of the tree

New assortments



More parts of the tree

Slash (tops and branches) 19%

Stemwood 60%

Stump 21%

More forest residues

New assortments?

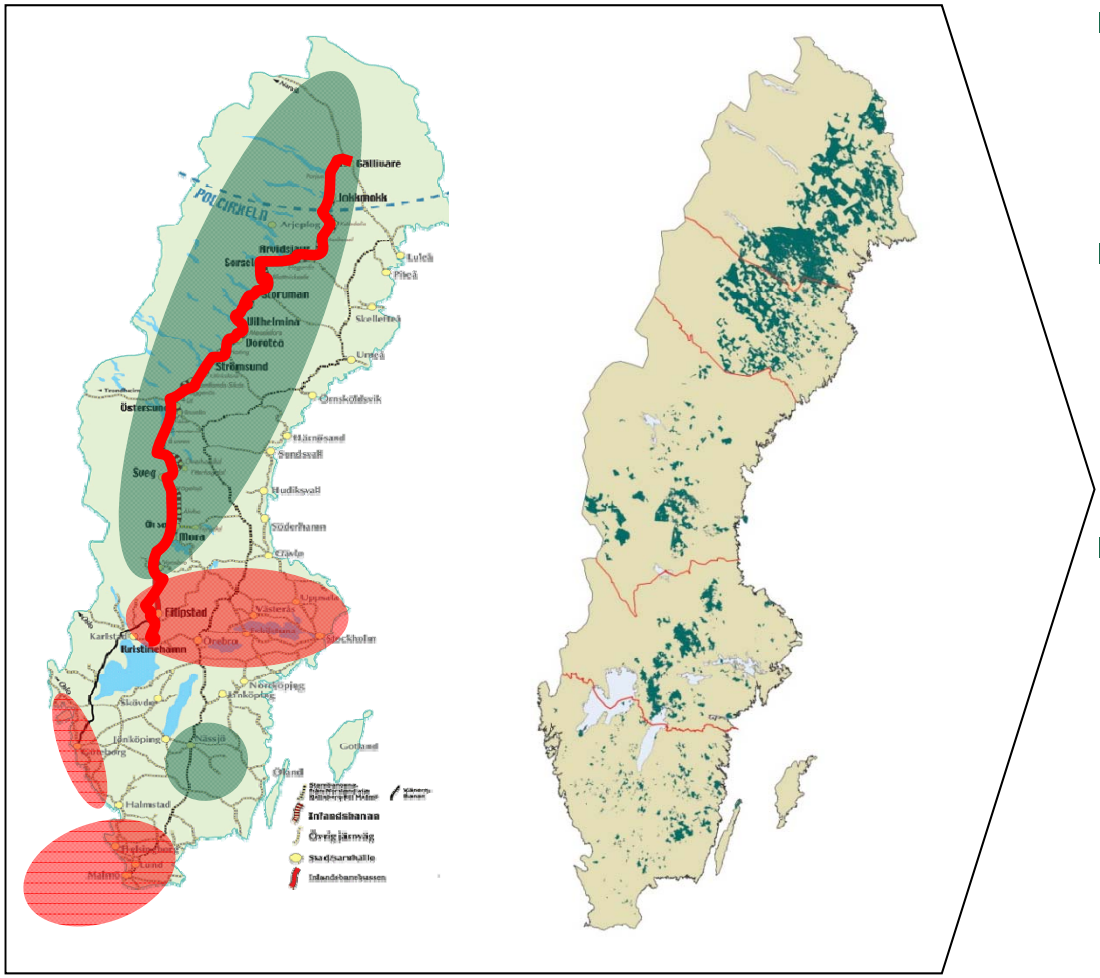
Logistics costs have to be reduced – new technology needed

Compacting and unloading systems

Slash bundles

More tonnage

More value-added bioproducts need to be developed



- In some Swedish regions there is a risk of a bioenergy surplus (forest residues)
- The surplus must be upgraded locally or sold/exported to other regions/countries
- Today it is a huge challenge to transport green/wet bioenergy (forest residues) long distances due to high transport costs per energy unit

Bioenergy examples

Gasification?

Torrefaction?

Pyrolysis?

In May 2010, SunPine started producing 2nd generation biodiesel

March 2007


sunpine
GREEN DIESEL
– A NATURAL CHOICE
sunpine
SECOND GENERATION BIODIESEL
TRAVELS FIRST CLASS!

Inauguration in May 2010

The forest is our future!