



The Energy Farm

- **Bioenergy Information Center**
- **Courses and seminars**
- **Guided tours to local bioenergy facilities**
- **Consulting**
- **Production of biofuels and bioheat**

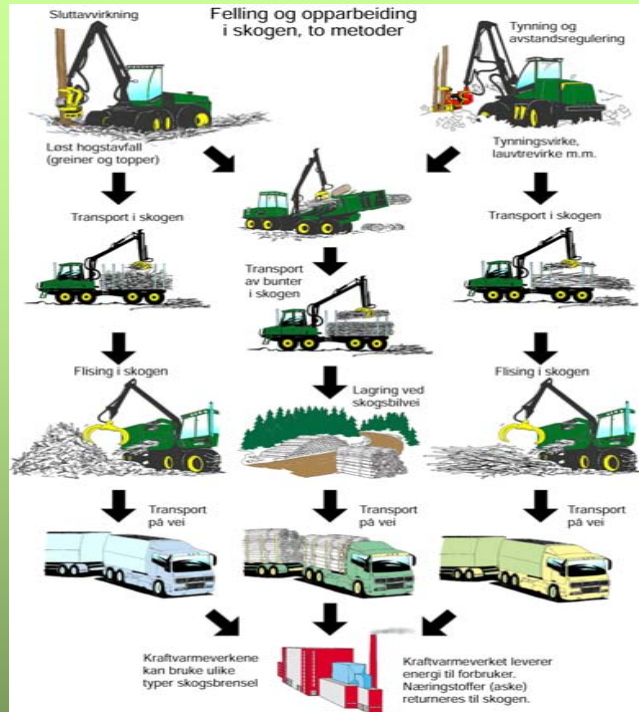




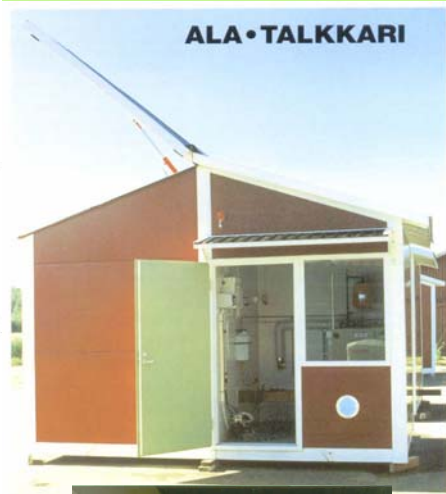
The Energy Farm

– bringing bioenergy R&D into practice

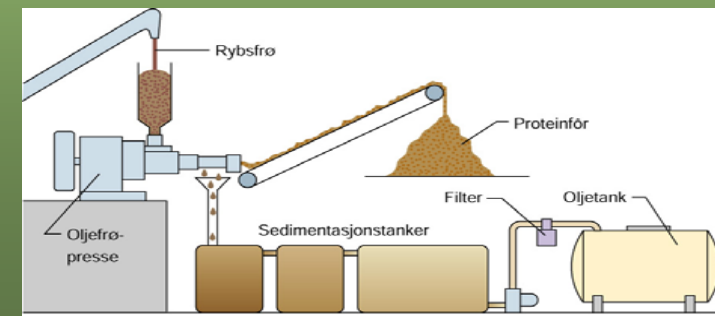
Biomass logistics



Heat production



Biofuels





The Energy Farm

The Energy Farm is self-supported with 85-90 % of its direct energy consumption:

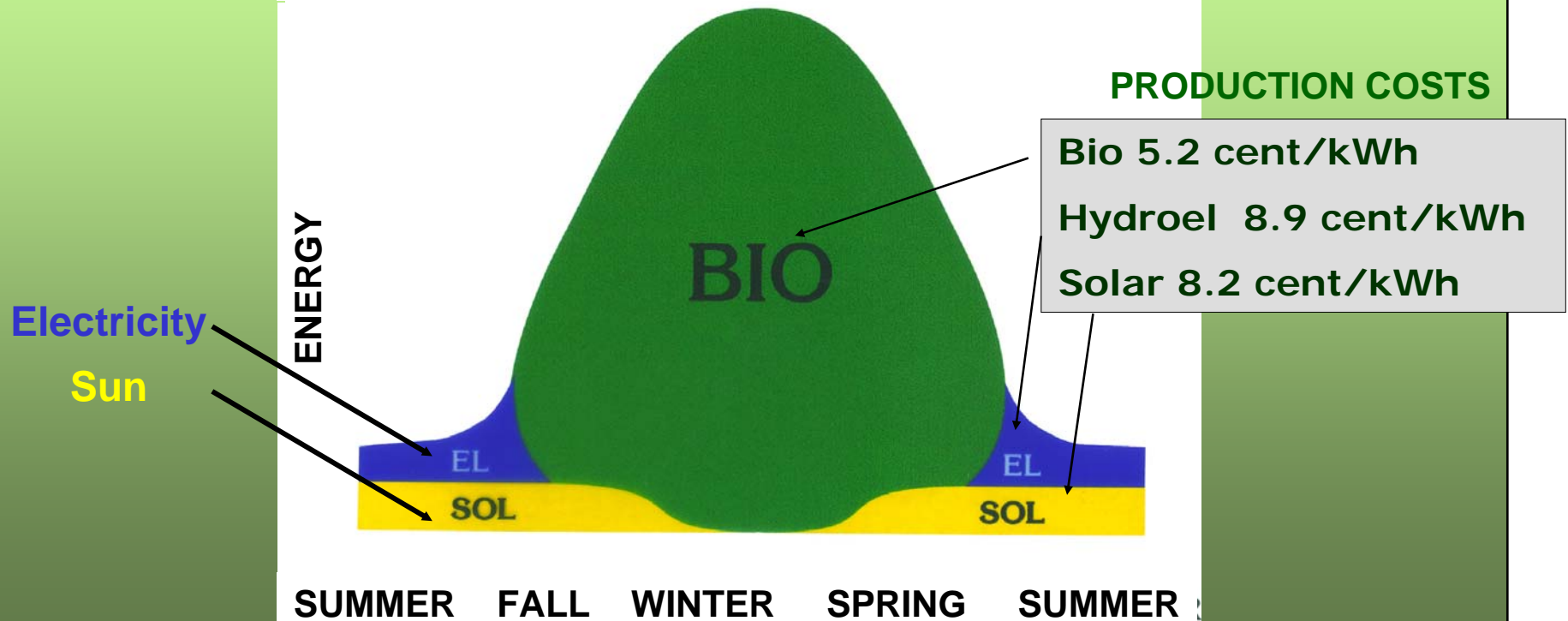
- **Heat production using wood chips from the forest**
- **Solar heat production**
- **Liquid biofuels for transportation**





Energy carriers for heating purposes

Solar, hydroelectric and bioenergy heating





Courses at the Energy Farm

Subjects

Open courses and seminars :

- Bioenergy in local energy planning
- Forest management adapted to bioenergy production
- Bioenergy from the forest. Felling, transportation, processing and distribution of forest chips.
- Small and large scale bioheat production and distribution.
- Organization of small scale heating entrepreneurs
- Wood Fuel Education – EU project Bioenergy Technology transfer Network

Specially designed courses and seminars :

- Courses for forest owners associations and information consultants of forest companies
- Training programs for bioenergy in the school
- Courses for politicians and administrators in municipalities and counties

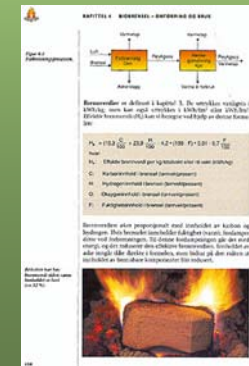
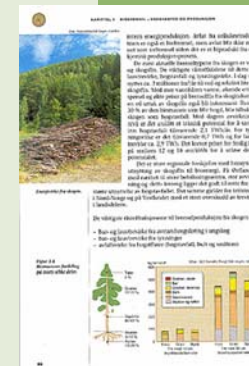
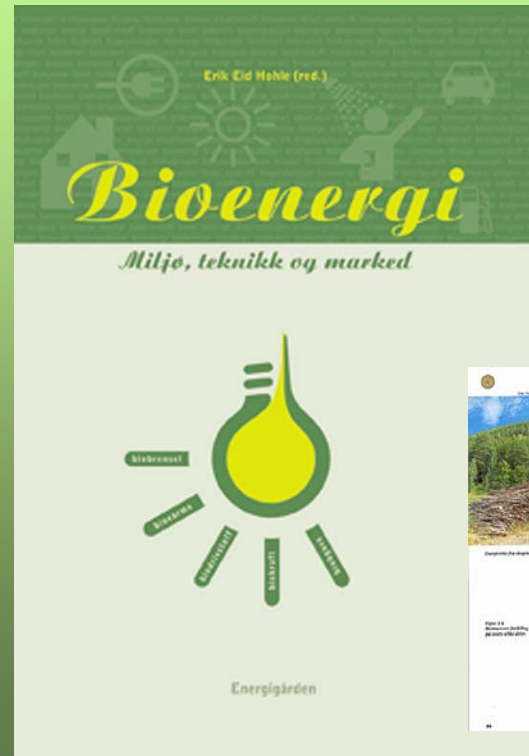




Bioenergy textbook

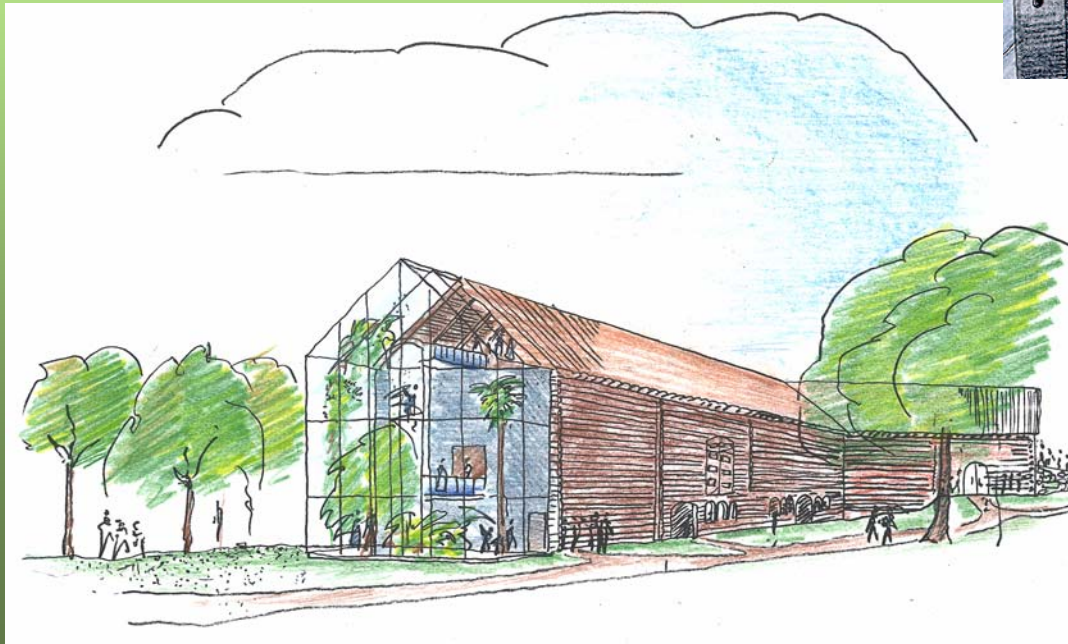
”Bioenergy – Environment, Technology and Market ”

- Edited by The Energy Farm in 2001
- First Nordic and European reference and textbook on bioenergy
- Language: Norwegian (English edition in progress)
- 20 authors
- Attractive design
- 400 pages





Bioenergy exhibition center - "The global greenhouse"





The bioenergy region of Hadeland



Inhabitants: 25 000

Bioenergy utilization

Small scale heating

| | |
|-----------------------------|--------|
| Wood stoves | 11 000 |
| Pellet furnaces | 150 |
| Central heating, fire wood | 25 |
| Central heating, wood chips | 20 |
| Central heating, straw | 1 |

Large scale heating

| | |
|-------------------|---|
| Bark and saw dust | 4 |
| Straw | 1 |
| Biogas from waste | 1 |

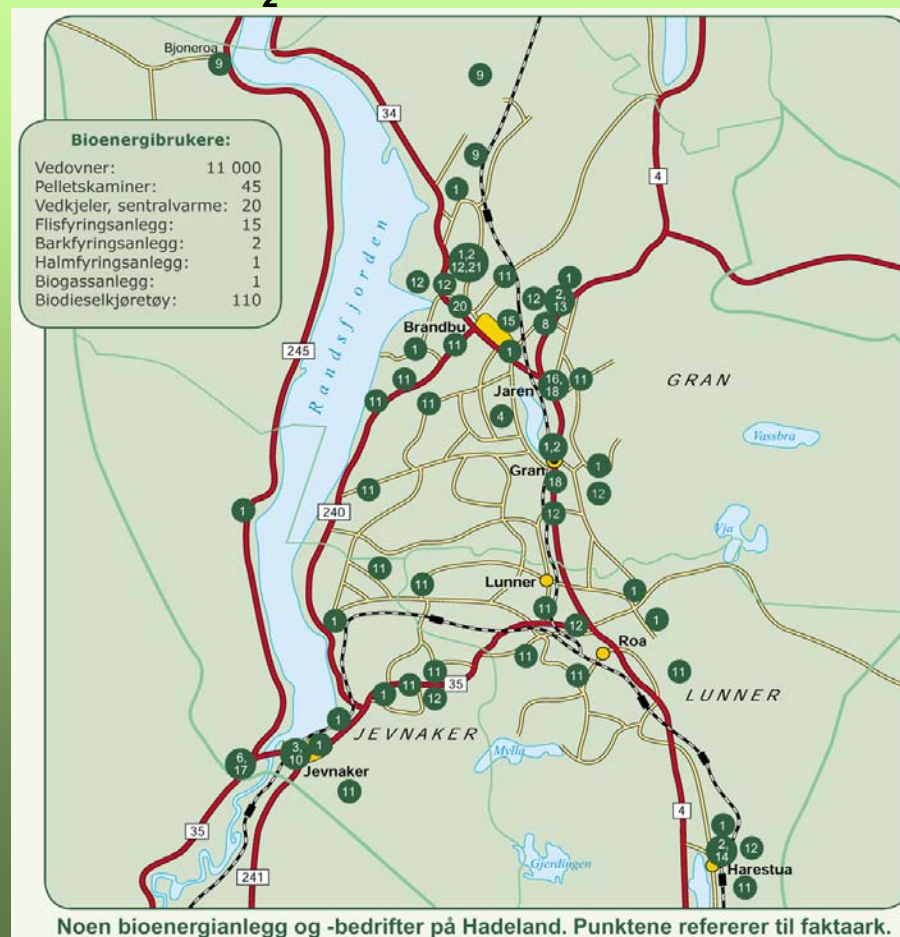
Biofuel

| | |
|--------------------|-----|
| Biodiesel vehicles | 110 |
|--------------------|-----|

Biopower

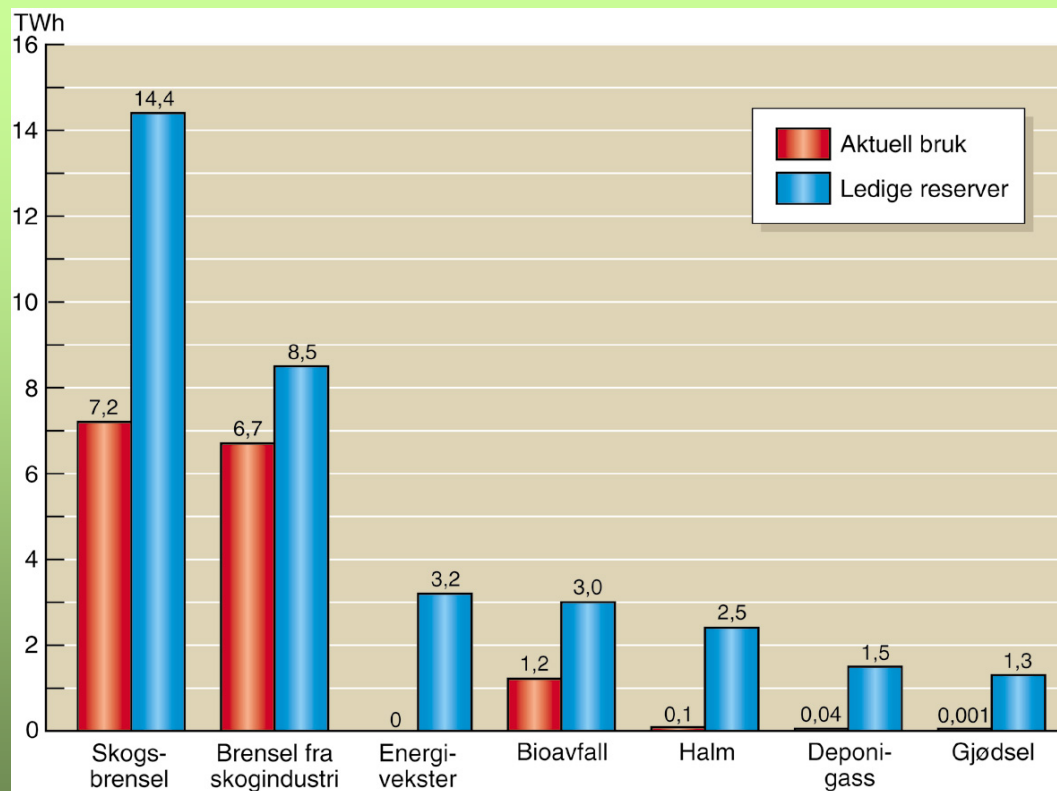
| | |
|-------------------|---|
| Biogas from waste | 1 |
|-------------------|---|

- 40 % increase in bioenergy use (1986 -2000)
- Biogas use and replacing fossile oil have lead to 25 % lower CO₂ emission





Bioenergy use and potential



Bioenergy in Norway

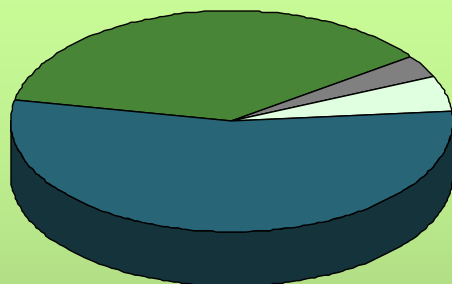
- Use: 16 TWh
- Potential: 45 TWh
- Political goal: 18 TWh innen 2005
- Major resource: Forest fuel



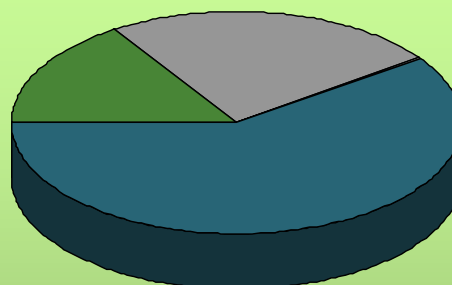
Bioenergy use in Nordic countries: 231 TWh

5% biopower and **95% bioheat**

Sweden (2002): 100 TWh

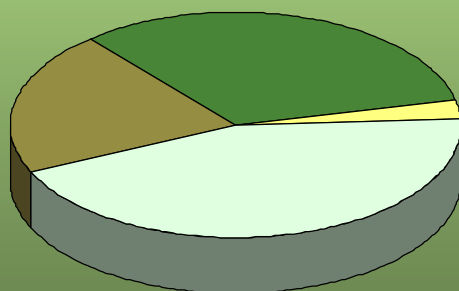


Finland (2000): 97 TWh

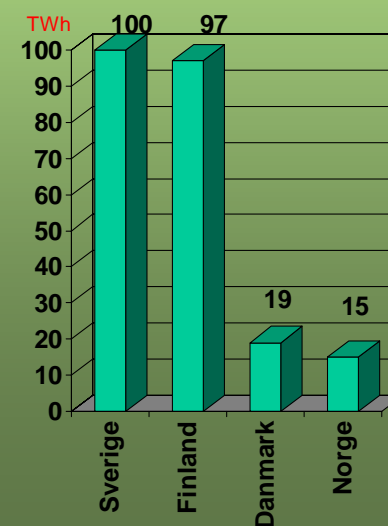
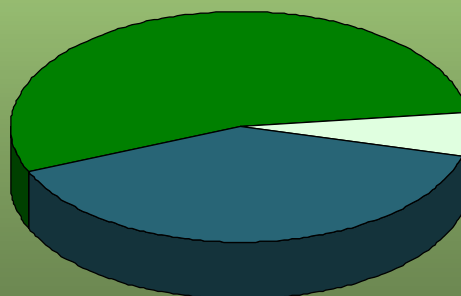


- Biproducts forest industry
- Forest fuel
- Waste
- Straw
- Peat
- Biogas

Denmark (2000): 19 TWh



Norway (2000): 15 TWh



Bioenergy in Nordic countries: 231 TWh


Hydroelectric power in Nordic countries: 205 TWh



The world's largest biomass based CHP-plant - Alholmens Kraft, Finland

Technology delivered by Norwegian owned industry

Alholmens Kraft
Världens största bioenergi kraftverk
i Nordisk samarbete



**Electrowatt-Ekonos ansvarsområden
i projektet var:**

- Projektutveckling
- Miljökonsekvensbeskrivning
- Förprojektering
- Projekterings- och projektledningstjänster
- Processplanering
- Upphandlingstjänster
- Projektering av hjälpsystem
- 3D-modellering

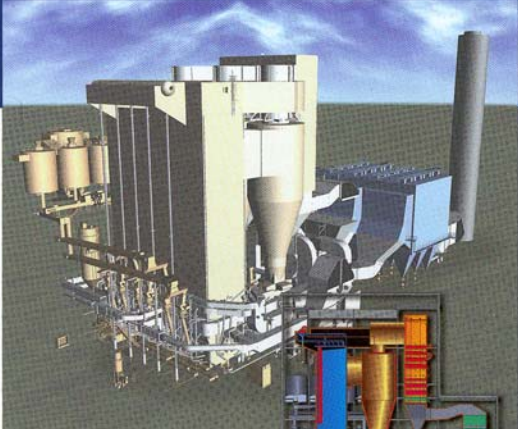
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When nature requires cleaner power...



- World's largest biomass-fired CFB boiler
- CHP plant:
 - process steam for paper mill
 - district heating to town
 - electricity for owners
- Latest design in steam-cooled cyclones
- High availability and reliability

Alholmens Kraft's CFB boiler, Pietarsaari, Finland
Steam: 550 MW_e, (240 MW_t), 194 kg/h, 165 bar, 545°C

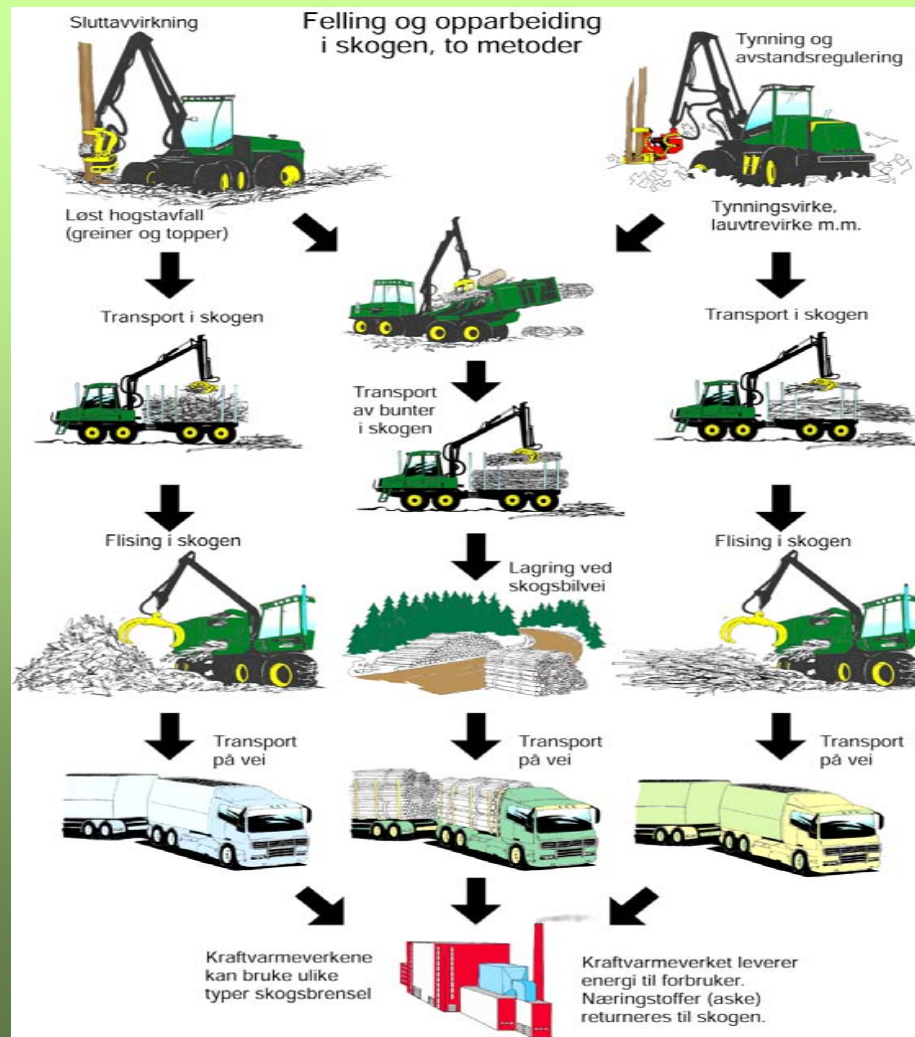
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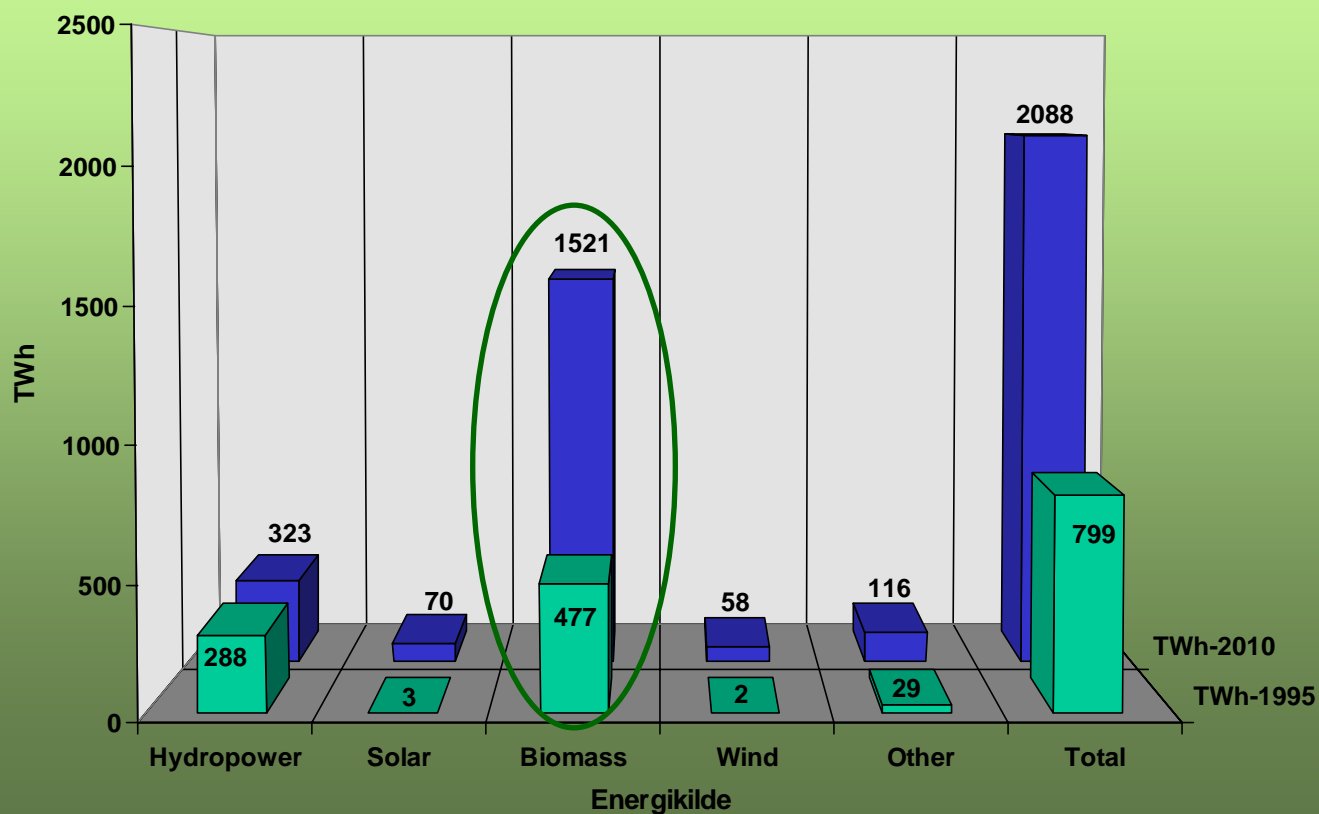
Production and distribution of forest chips





Renweable energy in Europe

Planned increase in renewables in the EU 1995 - 2010





Biofuel for transportation in Europe



EU-directive on the introduction of biofuels for transportation:

- 2% within 2005.
- At least 5 % within 2009.



Worldwide energy use

Bioenergy Other renewables

15 %

5 %



80 %

Non-renewables

Annual bioenergy use worldwide
116.000 TWh

- 15 % bioenergy

Bioenergy is the only, or most important energy carrier for 60% of the world population