EUROPEAN NUCLEAR CRITICAL CONFERENCE
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RENEWABLE ENERGY SITUATION IN FINLAND

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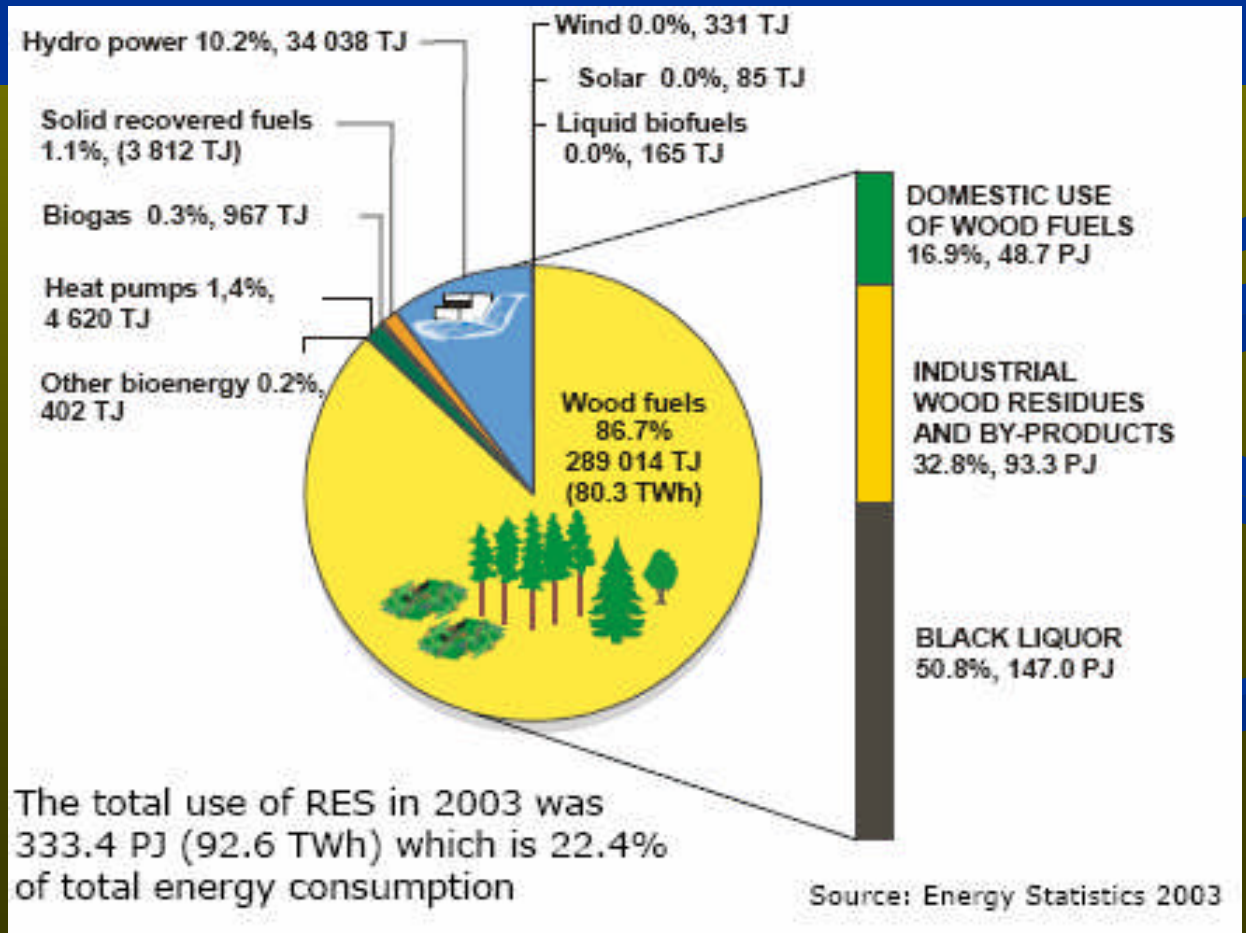
(= Finnish sustainable development NGO of scientists and engineers)

A. RE USE IN FINLAND
B. POTENTIALS FOR INCREASING RE USE IN FINLAND
C. REASONS FOR NOT UTILIZING THE POTENTIAL
D. WAY FORWARD

Background: hydro and some biomass can be seen, but no sun or wind

A. Renewable energy in Finland

- Share of RE of TPES = 24.1 % (in 2006)
- Share of hydropower + industrial wood waste + domestic firewood = 23.4 % (in 2006)
- Share of all other RE = 0.7 % of TPES (in 2006)

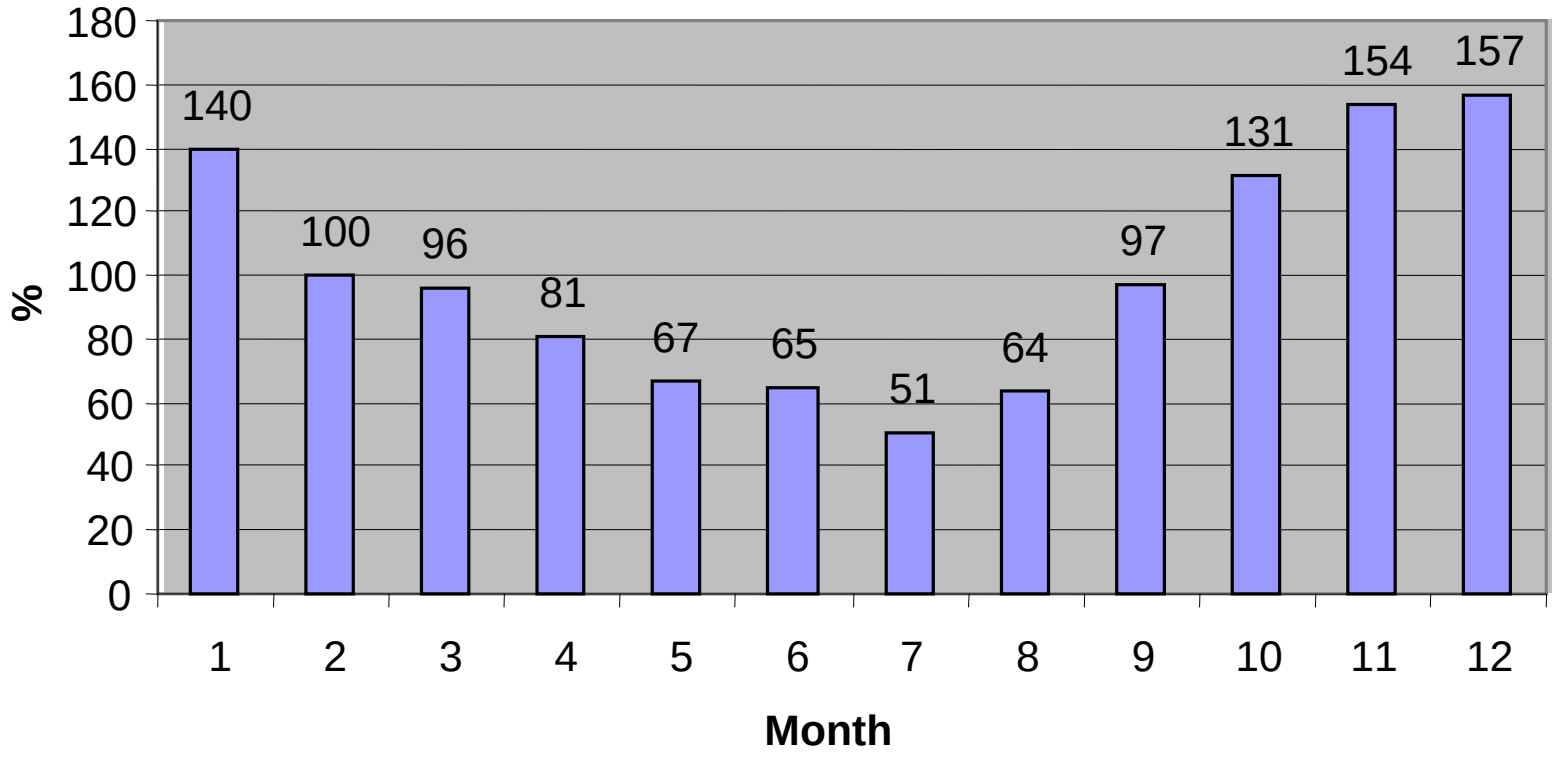


B. Potentials for increasing RE production

Physical reasons for high potential and cheap price:

- Large surface area
- Lot of rivers => cheap hydropower
- Large forest industry cluster => cheap waste wood, large load for CHP heat => cheap CHP (Combined Heat and Power)
- Distributed population => free domestic firewood
- Long daylight time during summer => less capacity and storage needs for solar panels and collectors
- Cold weather:
  - Good load for CHP heat => cheap CHP
  - High efficiency of heat engines => cheap thermal electricity, etc.
  - High efficiency of wind turbines
  - High efficiency of solar panels and solar collectors
  - Little need for cooling in energy intensive industry
  - Power consumption curve similar to wind and biomass CHP production curve

Montly wind power production in Finland in 1995 (VTT 1996)



- Finnish farm energy potentials as an example
- Forest owners have much larger potential
- Much more available off-shore

Source:

- Lampinen A & Jokinen E (2006) Suomen maatilojen energiantuotantopotentiaalit – Ekologinen perspektiivi. (Energy production potentials of Finnish farms – Ecological perspective). Research reports in Biological and Environmental Sciences 84, University of Jyväskylä, Finland, 160 p.
- Funded by Finnish Ministry of Agriculture and Forestry + University of Jyväskylä
- Available in internet (address below)

Picture: traffic use of straw based ethanol in Canada

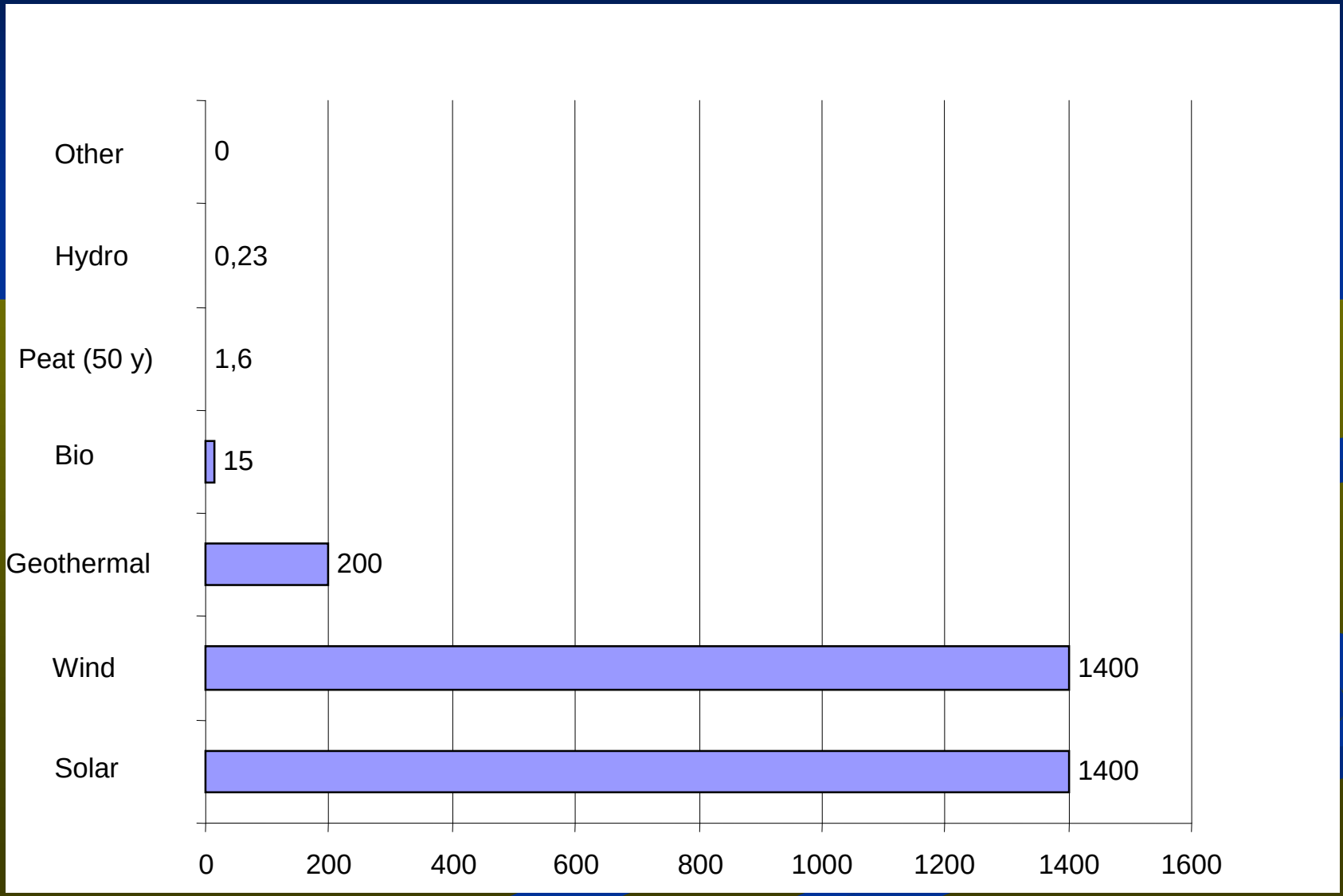
http://ebooks.jyu.fi/1795_6900/9513924971.pdf

Potentials estimated in this study

	Solar	Bio	Geo-thermal	Wind	Hydro	Wave, Tidal, Current	Peat	Fossil	Nuclear
Physical	F, P	F, P	F, P	F, P				0	
Biological	-	F, P	-	-	-	-	-	-	-
Agricultural	-	F, P	-	-	-	-	F	-	-
Technological	F, P	F, P	F, P	F, P			F	0	0
Chemical	-	F, P	-	-	-	-	F	0	-
Ecological	F, P	F	F, P	F, P	F		F	0	
Social	F	F	0	F, P	F				
Economic	F	F	0			0		0	0
Market	F	F	0	0	F	0		0	0

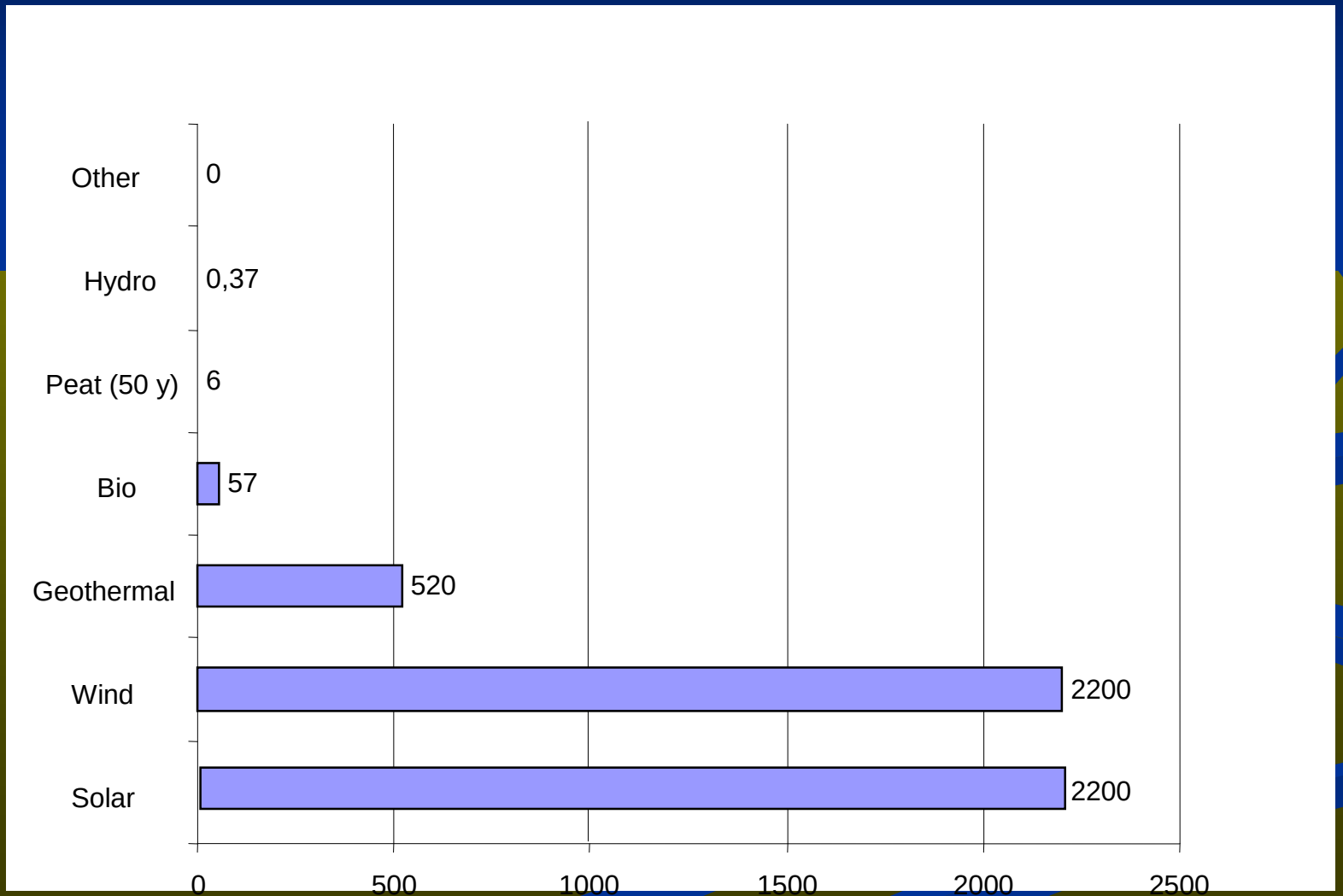
F = estimated for Finland, P = estimated for each province (20),
0 = estimated as negligible, - = not relevant, Empty = not estimated

Ecological electricity production potential of farms vs. Finnish total power consumption



Ecological potential vs. Finnish power consumption [%]

Ecological traffic fuel production potential of farms vs. Finnish total traffic energy consumption



Ecological potential vs. Finnish traffic energy consumption [%]

One alternative for reaching 100 % traffic-fuel self-sufficiency

Priority	Source	Share	Fuels
1.	70 % of putrescible biowaste	10 %	Biogas, direct liquefaction, biodiesel, ethanol
2.	80 % of straw, leaves and tops	20 %	Biogas, ethanol, synthetic
2.	30 % of unused logging residues and forest management waste (wood)	50 %	Synthetic, ethanol
3.	Energy crops 500.000 ha	20 %	Biogas, ethanol, biodiesel, PPO, synthetic
TOTAL		100 %	

C. Why the potentials are not utilized ?

Only two reasons:

1. Very strong domestic resistance
2. Very weak domestic support

Some underlying reasons:

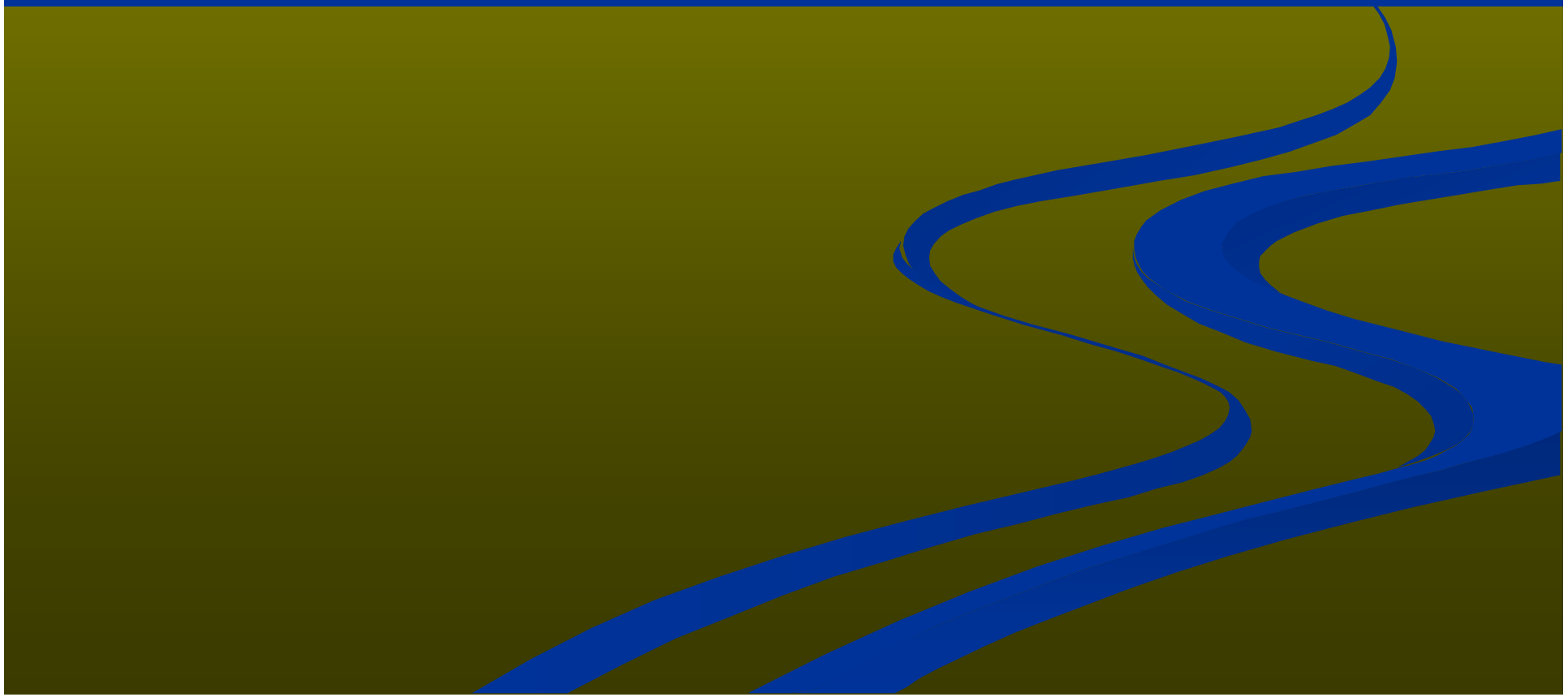
- Poor environmental consciousness
  - If measures have positive environmental impacts as a side effect they are advertised but they are not motives of the measures
  - Climate change is beneficial for Finnish economy
  - Finnish impact on climate change and potential role of mitigating climate change is negligible
- Poor understanding of the various benefits of distributed RE production and inability take them into account in policies and feasibility studies
- ”Reasonable” price of energy is the overwhelming focus of energy policy
- Patriotism means a right for free-riding (EU and UN level), not motivation to use domestic resources

1. Very strong domestic resistance

- Press release of Confederation of Finnish Industries (EK) Chairman Herlin 31.10. ”**Government must talk tough at energy negotiations in Brussels”:**
  - **Finland with 25 % RE share is already above the EU 20 % target so the binding EU RE promotion policy should not apply to Finland; Finland has been a pioneering country for a long time in improving energy efficiency and increasing renewable energy**
  - **RE promotion instruments such as feed-in tariffs should not be taken into use (note: Finland is the only country in the world that utilizes feed-in tariff for non-renewable – and non-renewable energy only)**
- Permanent Secretary of State/Ministry of Finance Sailas 6.11.: ”RE promotion is like shooting into your own knee”
- Ministry of Trade and Industry (MTI) representing Finland in the EU Energy Council has opposed successfully, due to its veto power, all binding RE targets in EU since 1995: everything should be voluntary

Result: free-riding

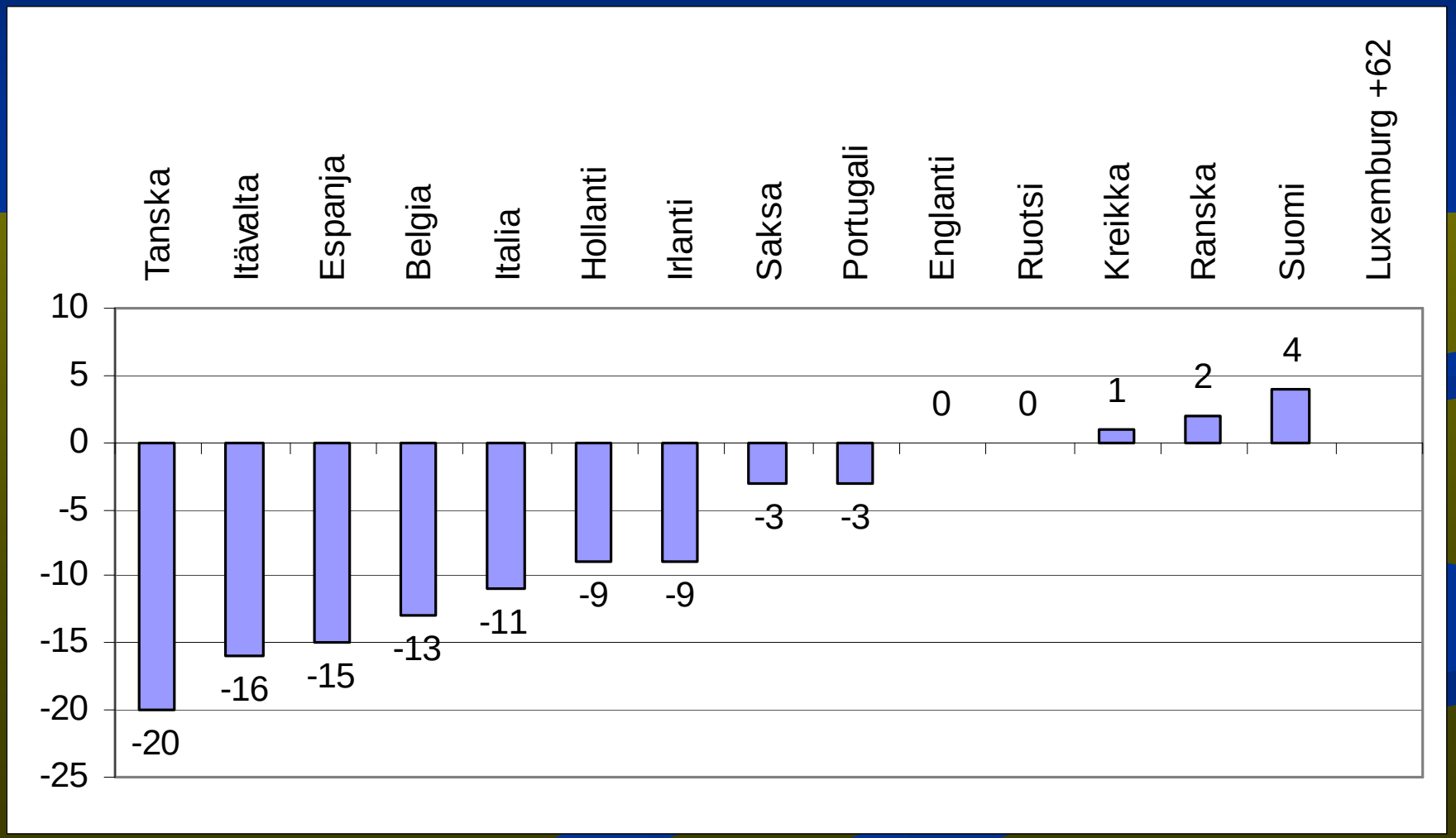
(in EU and UN level)



GHG emissions in industrial countries 1990 – 2003 (UNFCCC 2005)

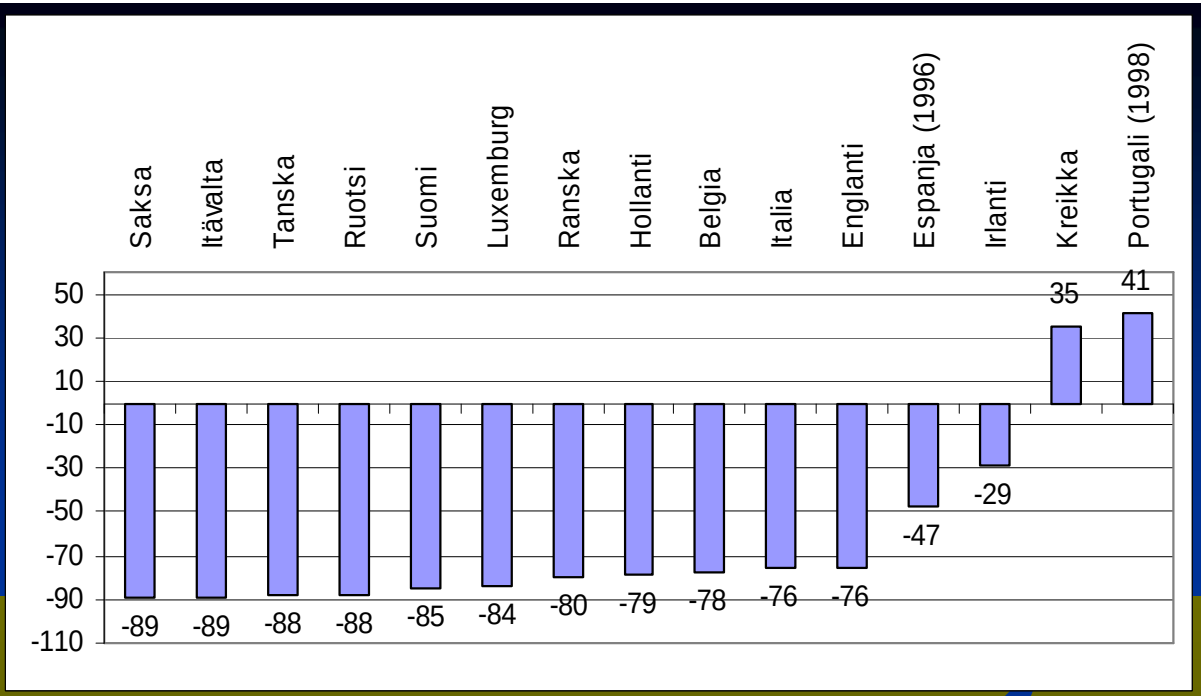
Järjestysluku	Maa	Päästömuutos [%]
1.	Liettua	-66,2
2.	Latvia	-58,5
3.	Eesti	-50,8
4.	Bulgaria	-50,0
5.	Ukraina	-46,2
6.	Romania	-46,1
7.	Valkovenäjä	-44,4
8.	Venäjä	-38,5
9.	Puola	-34,4
10.	Unkari	-31,9
11.	Slovakia	-28,3
12.	Tsekki	-24,2
13.	Saksa	-18,2
14.	Luxemburg	-16,1
15.	Englanti	-13,0
16.	Islanti	-8,2
17.	Kroatia	-6,0
18.	Ruotsi	-2,3
19.	Ranska	-1,9
19.	Slovenia	-1,9
21.	EU15	-1,4
22.	Sveitsi	-0,4
23.	Belgia	+1,3
24.	Hollanti	+1,5
25.	Liechtenstein	+5,3
26.	Tanska	+6,8
27.	Norja	+9,3
28.	Italia	+11,5
29.	Japani	+12,8
30.	USA	+13,3
31.	Itävalta	+16,5
32.	**Suomi**	**+21,5**
33.	Uusi-Seelanti	+22,5
34.	Australia	+23,3
35.	Kanada	+24,2
36.	Irlanti	+25,6
37.	Kreikka	+25,8
38.	Portugali	+36,7
39.	Monaco	+37,8
40.	Espanja	+41,7

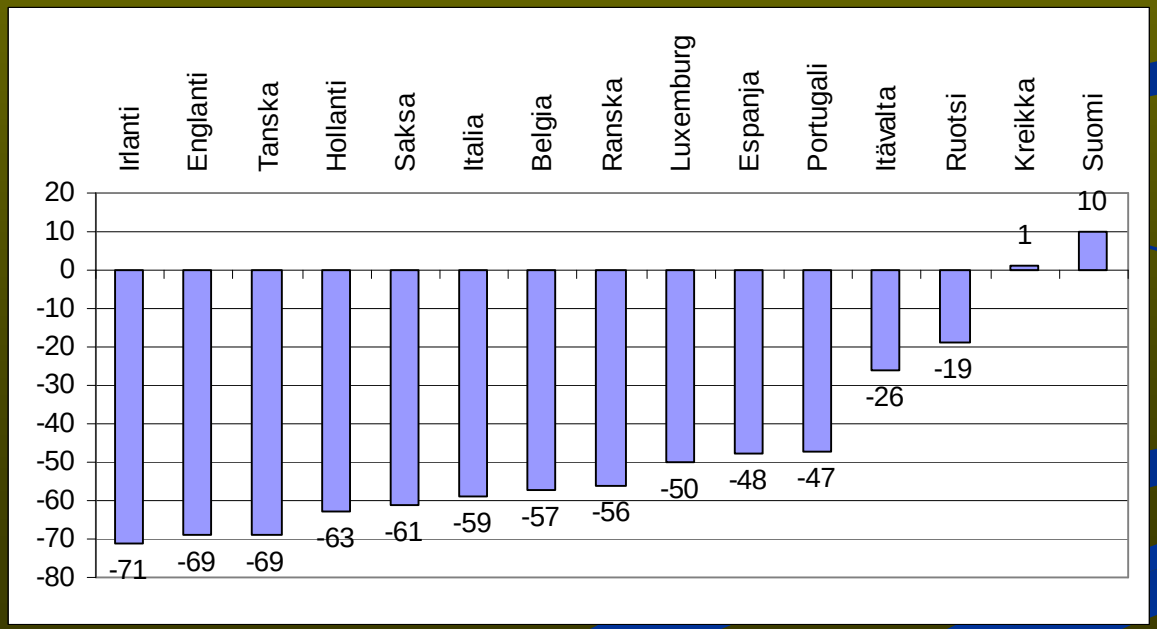
EU-15 GHG emission targets in 2000-2010 [%]



Source: UNFCCC

SO_2 emission changes in EU15 1980-1999 [%]

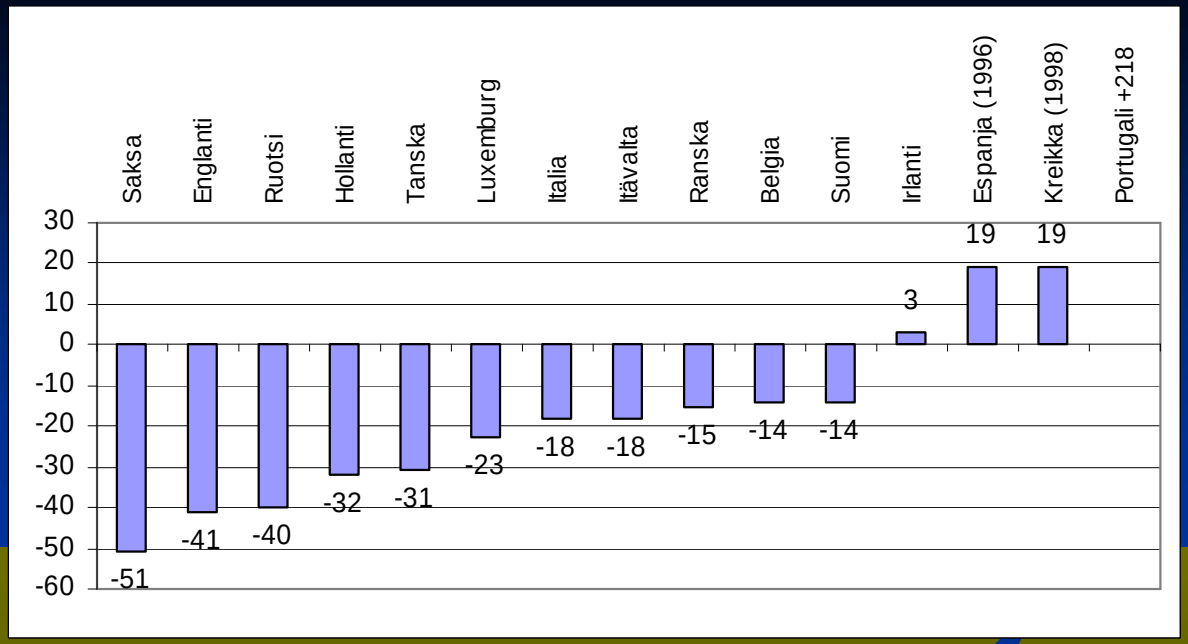


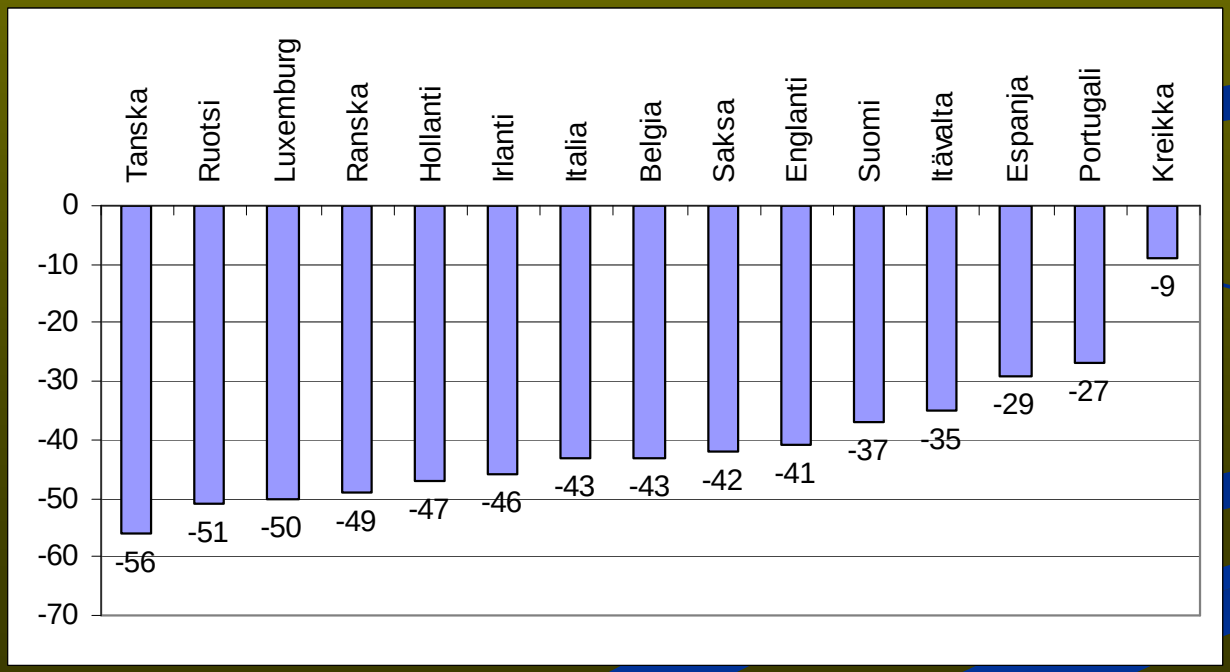


SO_2 emission Gothenburg protocol targets 1996-2010 [%]

Source: UNECE

NO_x emission changes in EU15 1980-1999 [%]

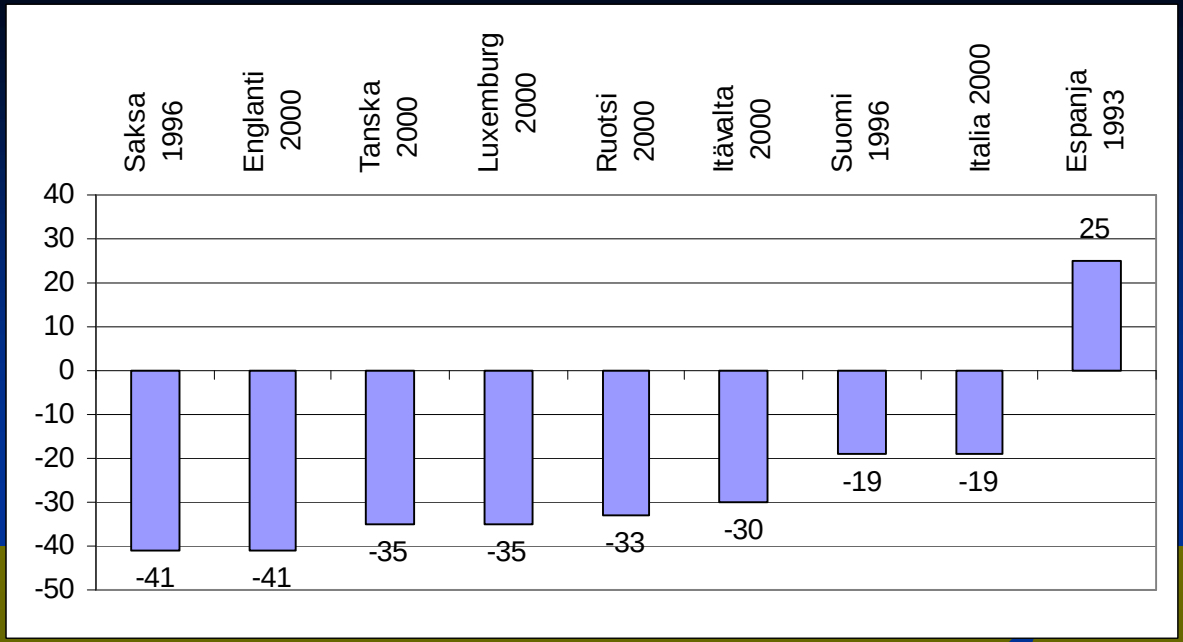


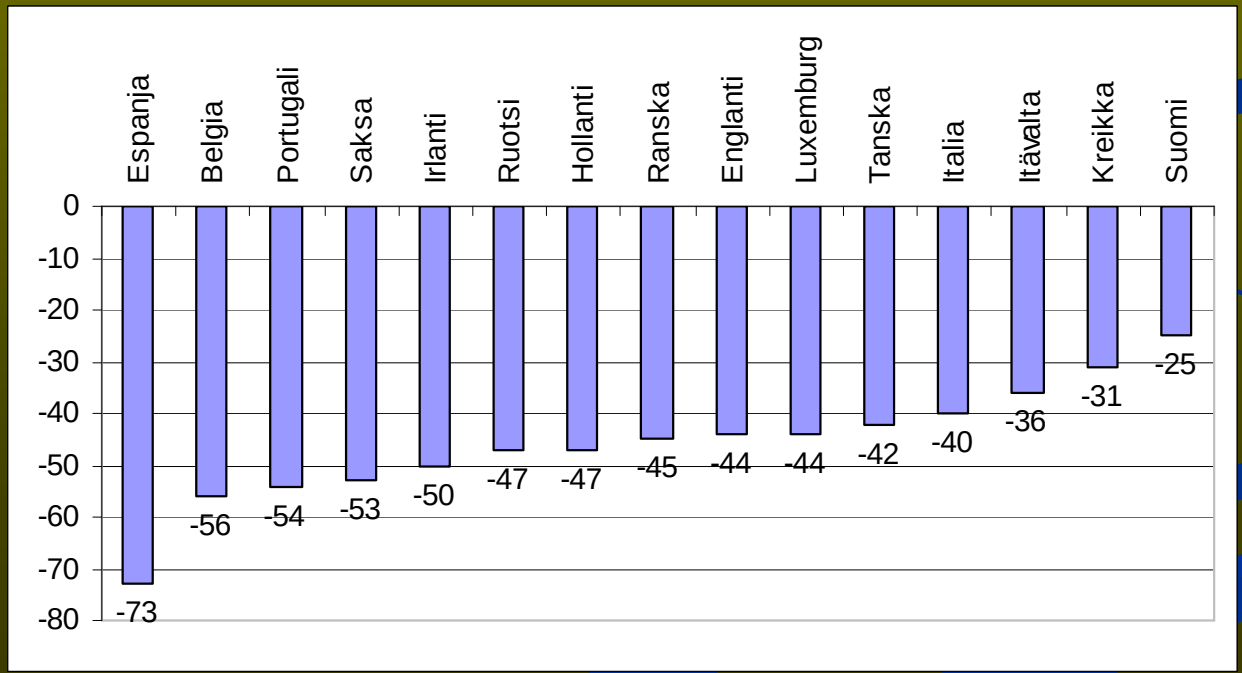


NO_x emission Gothenburg protocol targets 1996-2010 [%]

Source: UNECE

NMVOC emission changes in EU15 from 1988 [%]

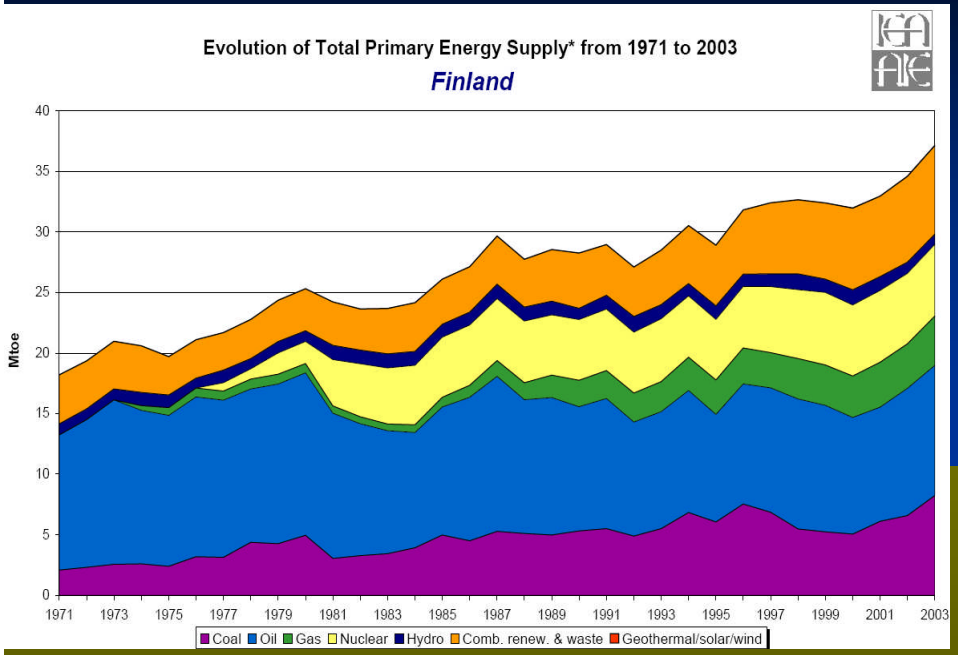


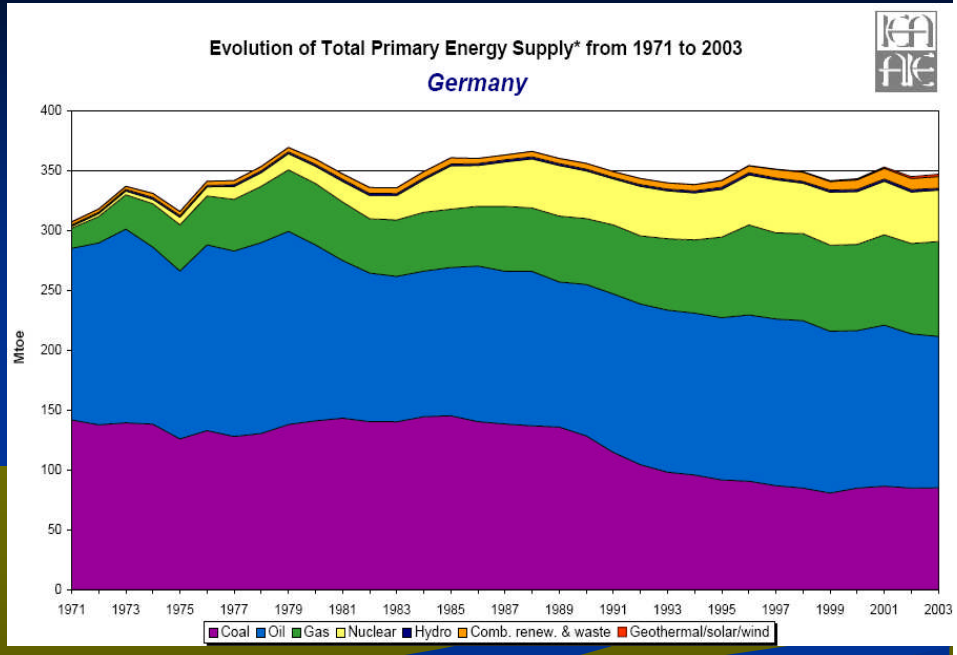


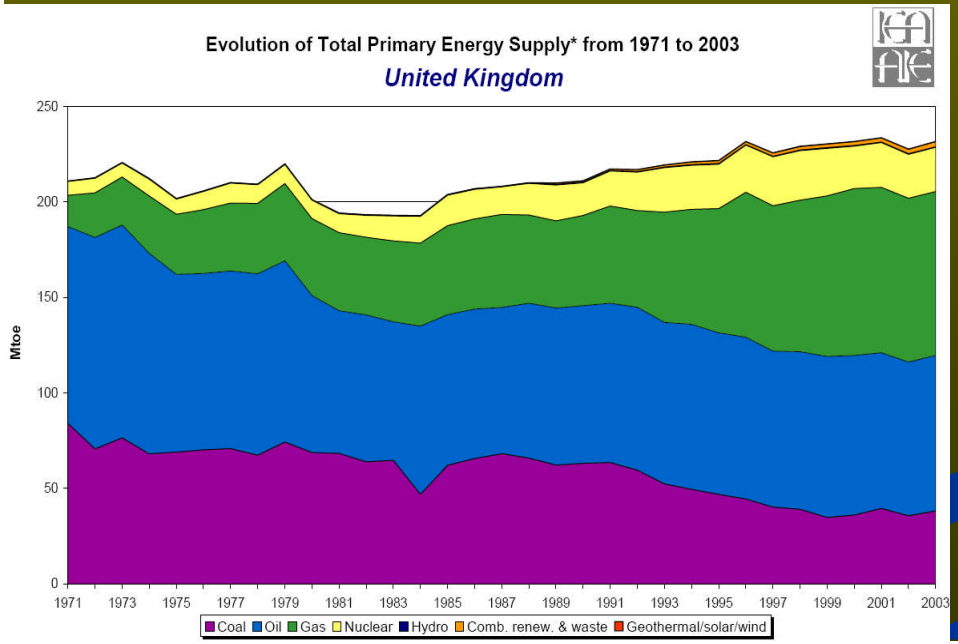
NMVOC emission Gothenburg protocol targets 1996-2010 [%]

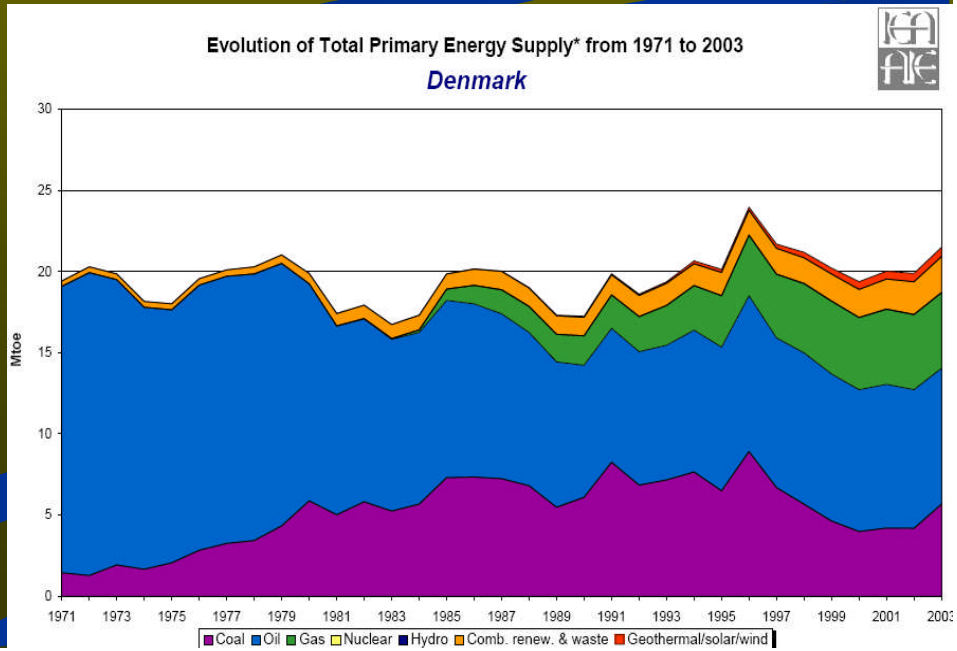
Source: UNECE

Primary energy consumption 1971-2003 (OECD/IEA)







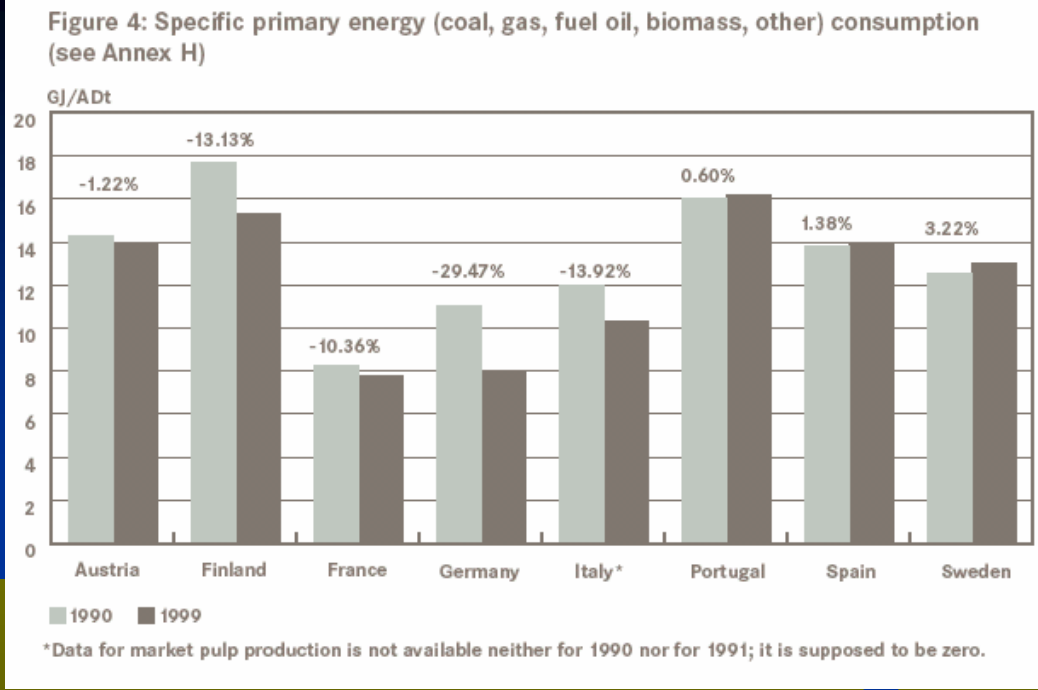


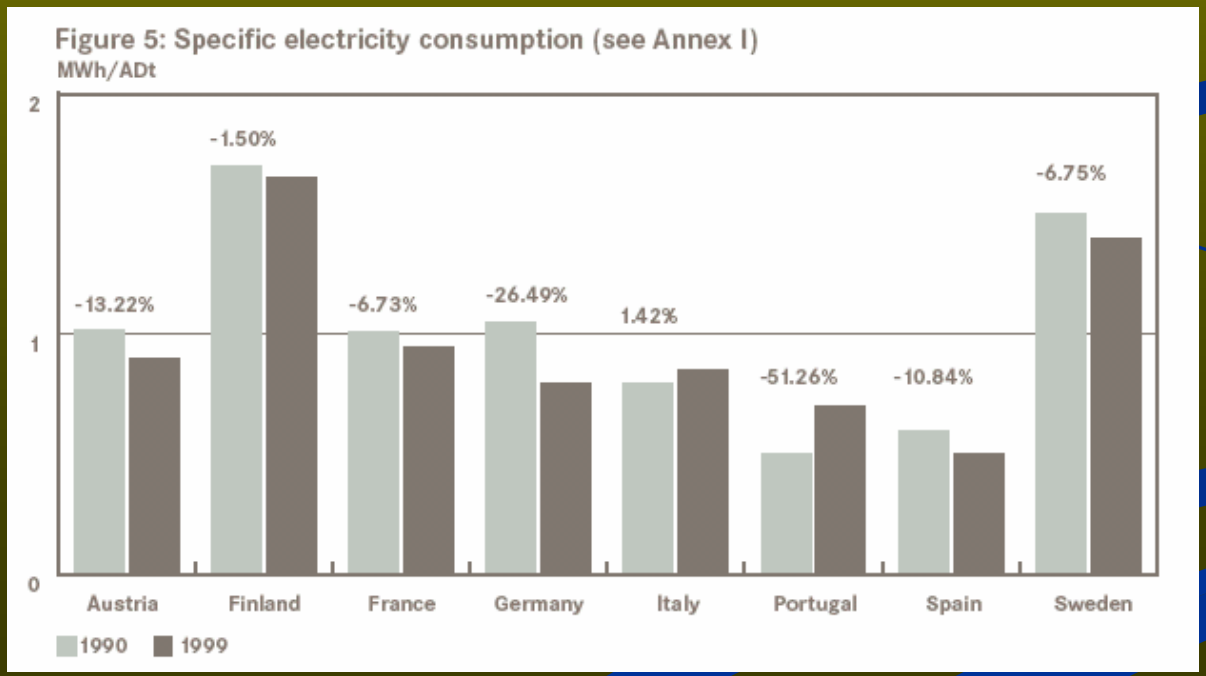
During 1970-2004 in Finland:

- Share of RE in power production decreased from 47 % to 24 %
- Use of RE for heating decreased by 26 %
- Use of electricity for heating increased by 1600 %
- Heating demand increased by 1 %
- Electricity consumption increased by 350 %

(This development has a lot to do with the 4 nuclear reactors that were built in the 1970's)

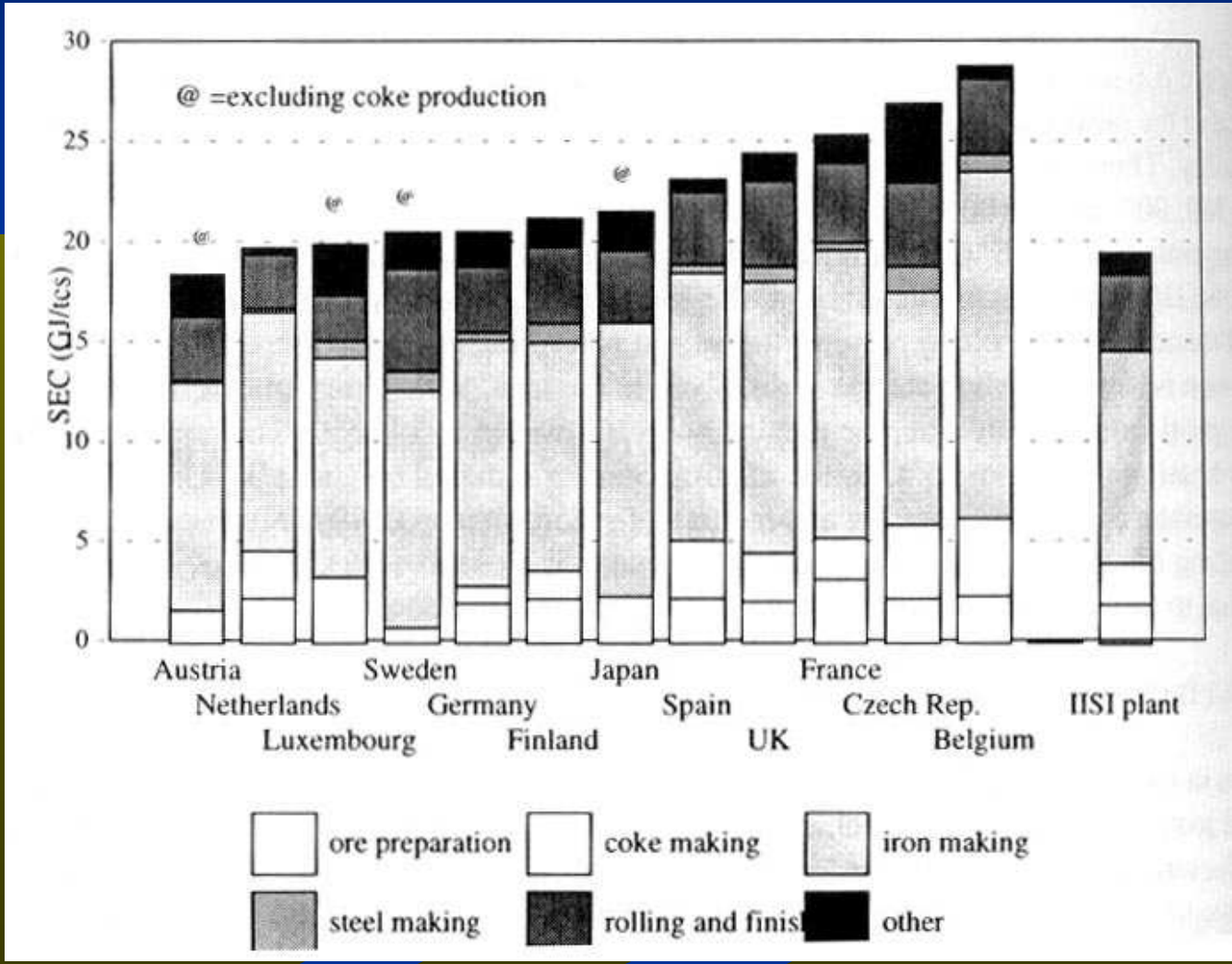
Primary energy efficiency of Finnish paper industry second lowest in Europe (CEPI 2002)



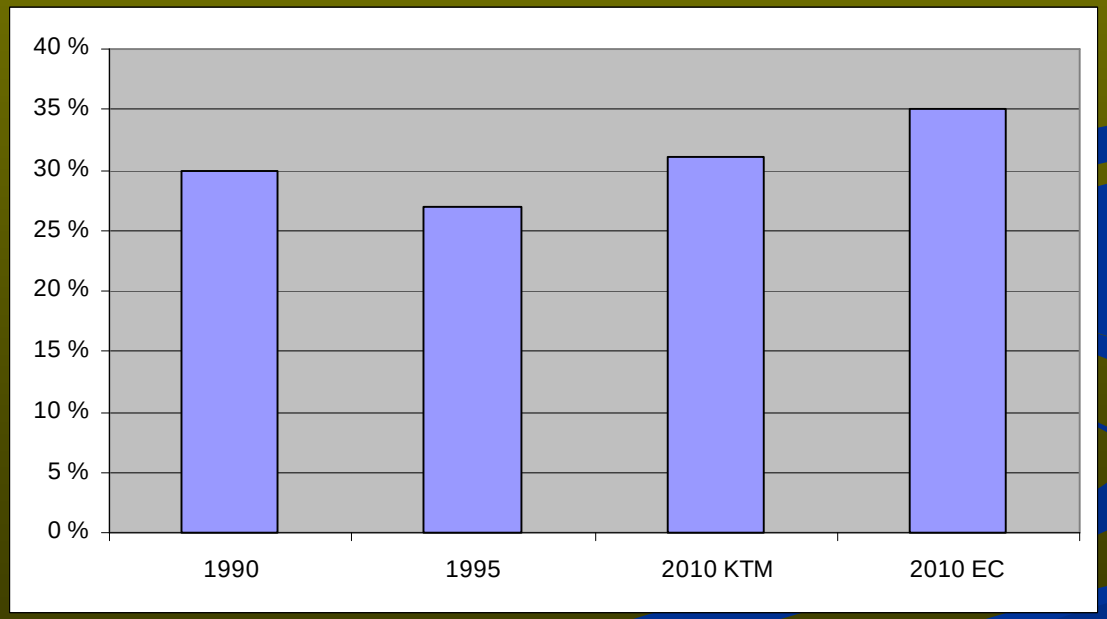


Electric energy efficiency of Finnish paper industry lowest in Europe (CEPI 2002)

Energy efficiency of Finnish steal industry medium level among industrial countries (IISI 1996)



THE EU RES-E directive (2001/77/EC) was discussed in Finland simultaneously with the application of the 5th nuclear reactor



2. Very weak domestic support

- No strong lobbying organizations
- Some organizations that in other countries lobby for RE are not doing so in Finland, e.g. The Central Union of Agricultural Producers and Forest Owners (MTK)
- PhD dissertation V. Varho 2.11. (Univ. Of Helsinki):
  - All of the most visible wind energy experts and promoters in Finland, incl. both wind energy associations, regard wind energy potential in Finland insignificant
  - Their **hope** in the long run is to achive only at most 10 TWh/y capacity, i.e. 80 % of one nuclear reactor
  - Their **expectations** are much less
  - Most results found in Energy Policy 33:1930-1947 (2005)

D. Way forward

- Finland's RE utilization development is dependent on external pressure, especially from EU
  - E.g. strong domestic resistance against taking catalytic converters and unleaded gasoline into use in the 1980's: the transition was possible only due to international pressure
- EU has had an important development role in Finland despite the Finnish veto power
- The new EU treaty will remove the veto power enabling much faster development, the new treaty also mentions RE and climate change explicitly making it much easier to proceed via courts, if needed

The challenge of low market potential of farm energy

- The overwhelming majority of the farm energy potentials remain untapped under present policies and feasibility analyses
- Need for more comprehensive economic analysis, e.g. bioenergy:

Market value of bioenergy under currently common evaluation:

$$V = V_{\text{own heat}}$$

Full value of bioenergy:

$$V = V_{\text{own heat}} + V_{\text{own cooling}} + V_{\text{own electricity}} + V_{\text{own engine fuel}} + V_{\text{own traffic fuel}} + V_{\text{side products for own use}} + V_{\text{sold heat}} + V_{\text{sold electricity}} + V_{\text{sold fuel}} + V_{\text{sold side products}} + V_{\text{gate fees}} + V_{\text{sold sertificates}} + V_{\text{self-sufficiency}} + V_{\text{reliability}} + V_{\text{quality}} + V_{\text{flexibility}} + V_{\text{image}} + V_{\text{employment}} + V_{\text{health}} + V_{\text{environment}} + V_{\text{for municipality}} + V_{\text{for country}}$$ (return for producer!)

Thank You!

Author's biogas car, one of only 9 biogas vehicles in Finland (in the new climate friendly car taxation law this car has higher annual car tax than gasoline-only version)

Author's wind electric bicycle
(the extra cost of household wind power is about 1 cup of coffee per year)