

International fair for energy, automation, lighting technology and communication systems
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Finnish experiences in designing and funding the renewable energy projects

Juha Poikola

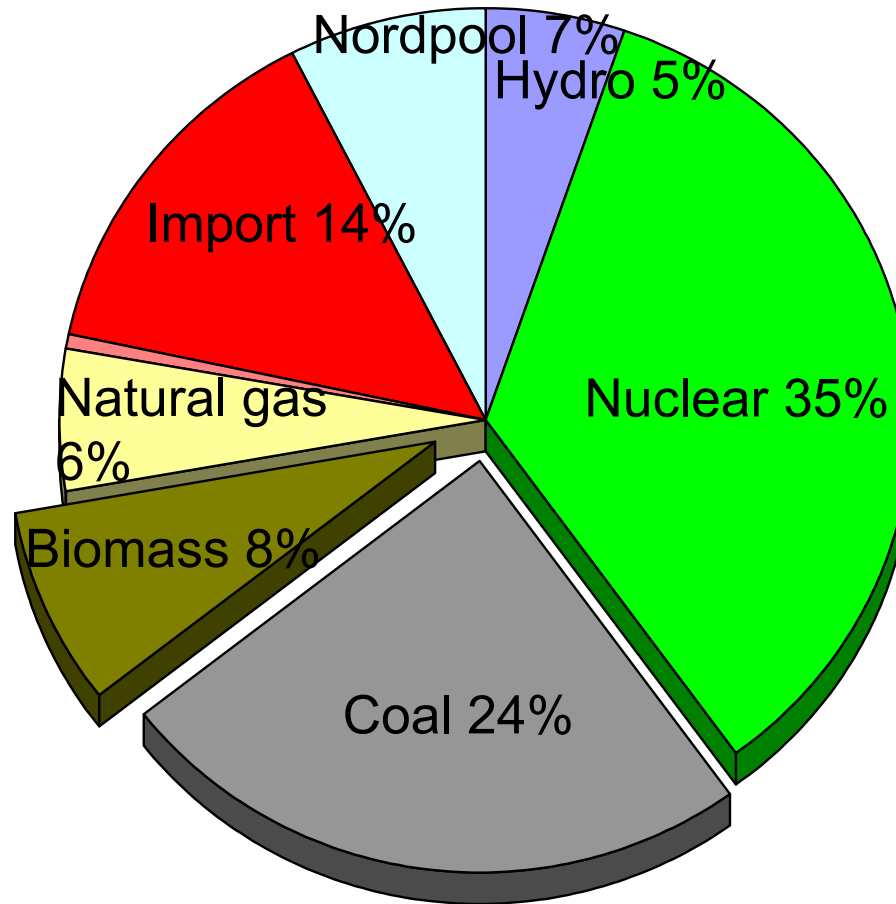
Biofuel procurement manager

Pohjolan Voima Oy

www.pohjolanvoima.fi



Pohjolan Voima's electricity supply 2003



23 TWh

**27% of the
Finnish
markets**





Pohjolan Voima's activities



- **New nuclear power unit**
 - 1600 MW
 - > 3 billion euros
- **Bioenergy programme**
 - 550 MW_e new bio-capacity
 - 620 million euros
- **Windmill programme**
 - 8 new units
- **Waste to energy programme**
 - 1 MW operating
 - 80 MW under preparation





Pohjolan Voima's bioenergy programme



- seven new power plants 1999-2004
- 550 MW_e, 620 MEUR investments (85% of the new biocapacity in Finland)
- 500 000 solid m³ of forest chips
- 4000 ha agro crops, reed canary grass



Pohjolan Voima's biopower plants

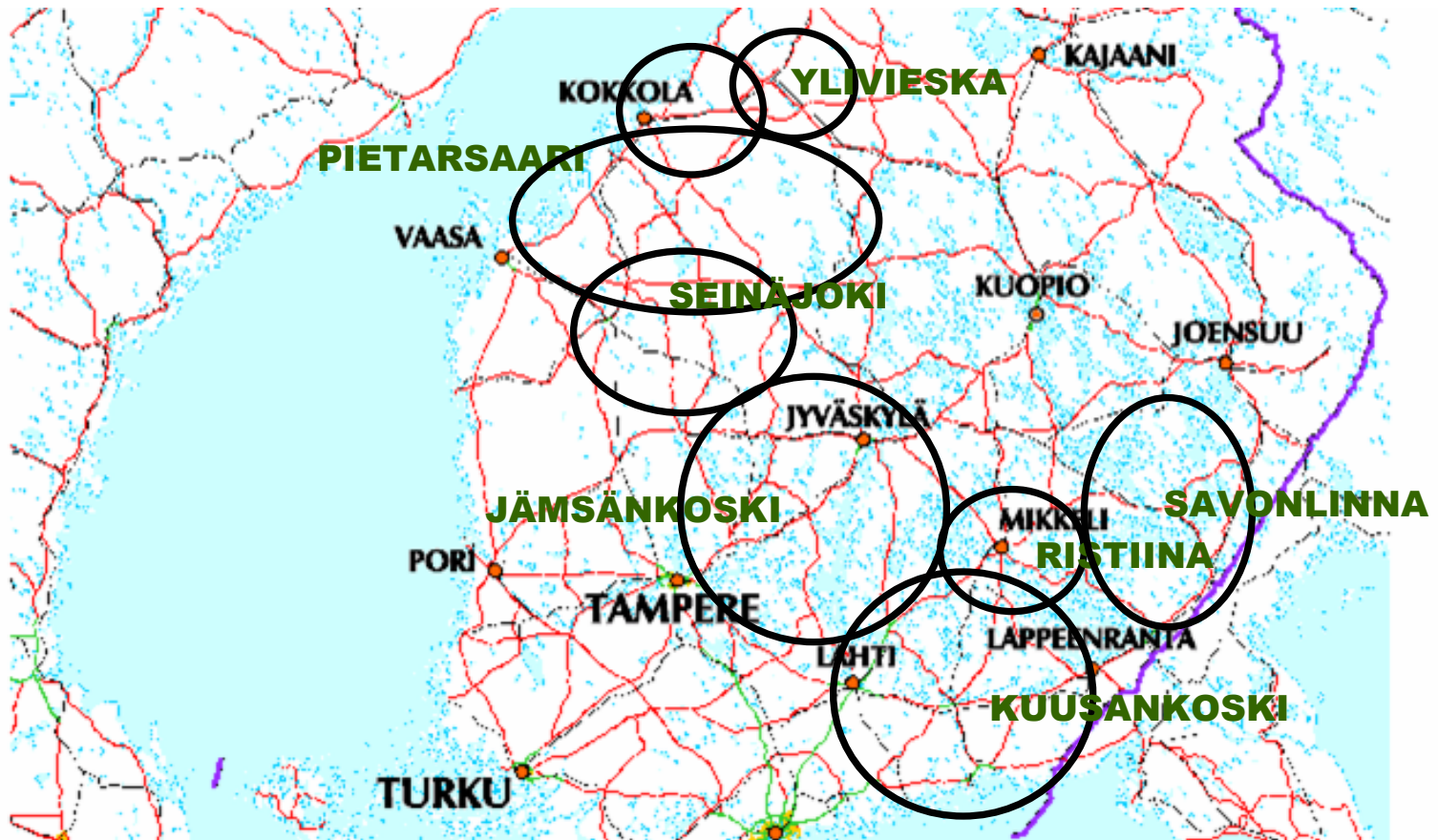
(ownership from 50-100%)

	MW _e	MW _h	Completed
Vaskiluodon Voima, Seinäjoki	125	100	1989
Vieskan Voima, Ylivieska	6	15	1990
Alholmens Kraft	265	210	2001
Kokkolan Voima	20	50	2001
Kymin Voima	76	180	2002
Jämsänkosken Voima	46	130	2002
Järvi-Suomen Voima, Ristiina	10	65	2002
Järvi-Suomen Voima, Savonlinna	17	53	2003
Wisapower	140	400	2004
ALTOGETHER	705	1203	



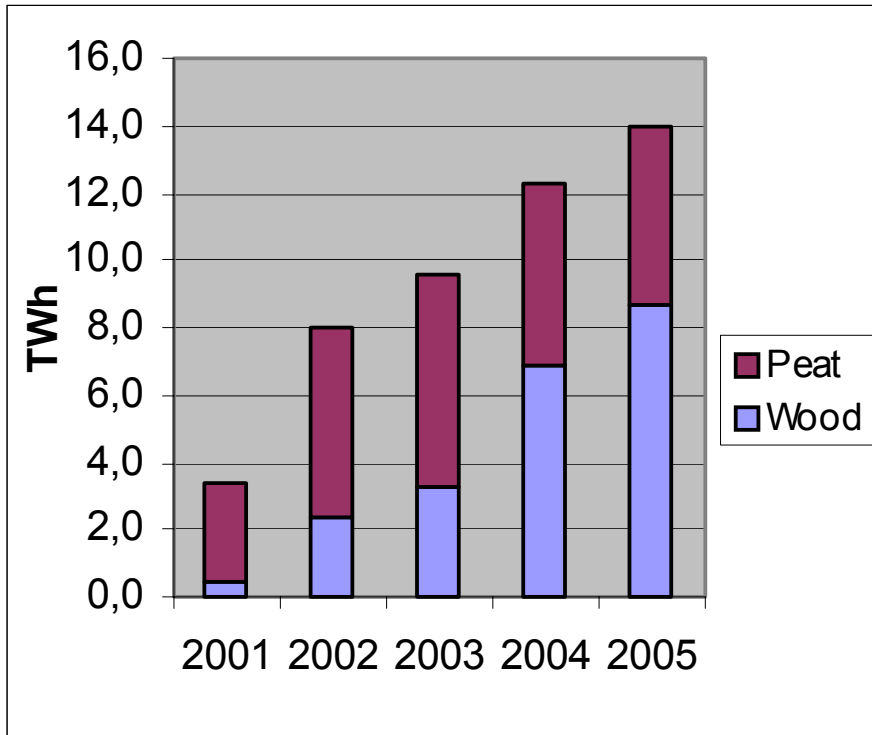


Pohjolan Voima's biomass procurement area

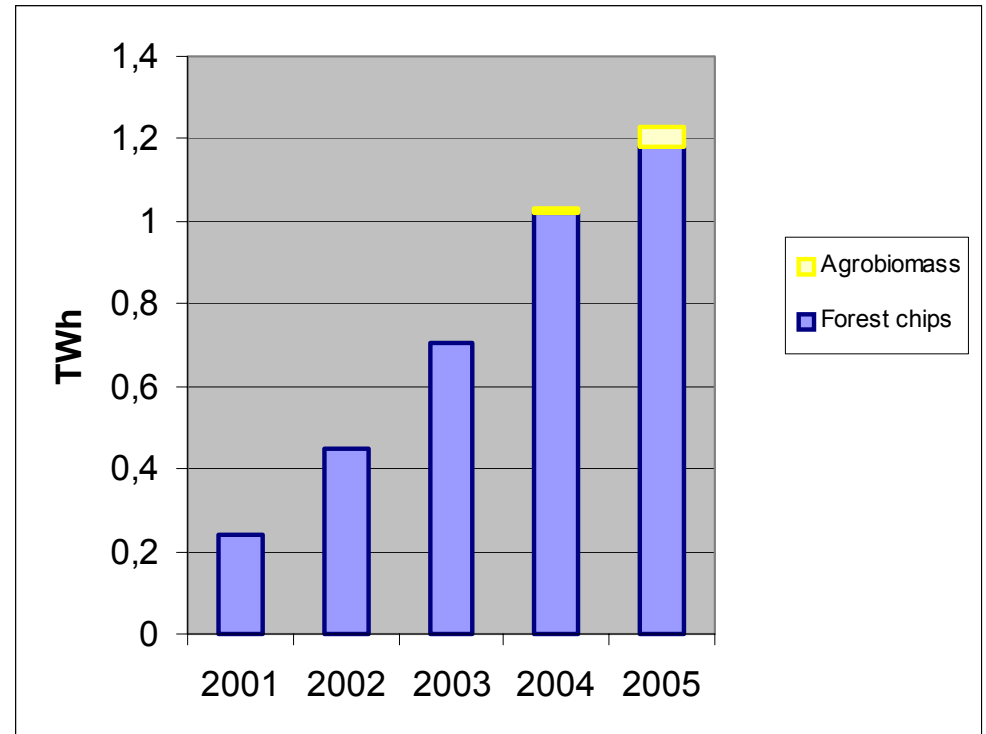




Pohjolan Voima's use of biomass



Use of forest chips and agrobiomass





Pohjolan Voima's bioenergy programme – R&D



1) Logging residue bundler

- developed in parallel with Alholmens Kraft's investment 1999
- national breakthrough year 2002



LUOTETTAVA - VASTUULLINEN - TAITAVA

Tallinn, 12.3.2004
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Pohjolan Voima



Pohjolan Voima's bioenergy programme – R&D



2) Use of stumps

- started in parallel with Jämsänkoski's power plant investment 2001
- prevents the spreading of rotting
- fast growing volumes





Pohjolan Voima's bioenergy programme – R&D



3) Multifunction harvester for thinning and clearing

- high potential in young forests
- cost-effectiveness is improving



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Pohjolan Voima's bioenergy programme – R&D



photo:Maaseudun Tulevaisuus

4) Reed canary grass (*Phalaris Arundinacea*)

- 4000 hectares target
- "an environmentally friendly farming product with unlimited demand"
- profitability need to be improved



LUOTETTAVA - VASTUULLINEN - TAITAVA



Windmill programme



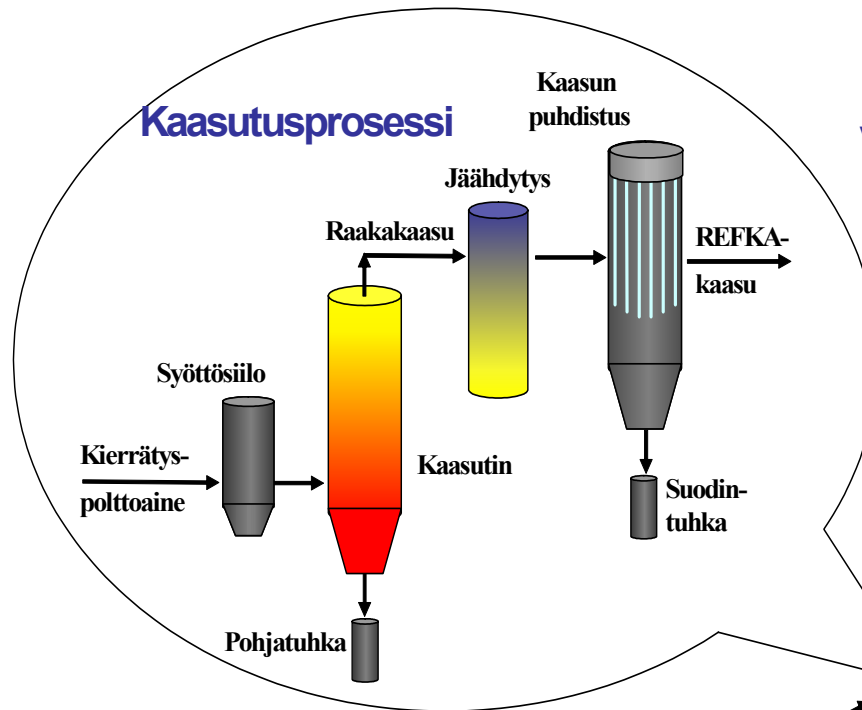
- 8 new units in 2003
- feasibility study for 300 MW off-shore windmill
- ownership in WindWind
 - WWD1 unit ready
 - WWD3 unit during 2004





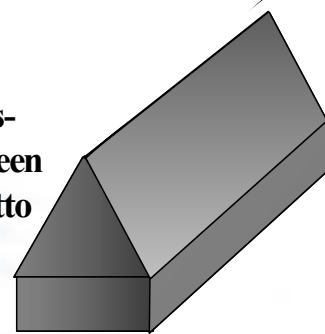
Waste to energy programme (together with Vapo and VTT)

Kaasutusprosessi



REFKA-KAASUN VALMISTUS JA KÄYTTÖ

Kierrätys-
polttoaineen
vastaanotto

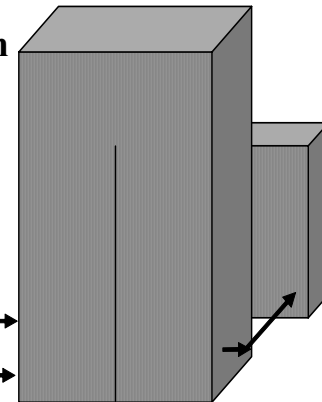


Kattilan
pääpolttoaine
(kivihiili)

Kaasutin



Hiilikattilalaitos



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Pohjolan Voima



Pohjolan Voima's operating principle

- non-profit making company = owners have the right to get energy at cost
- % of ownership = % of the production
- enables our owners to
 - 1) outsource energy production
 - 2) maintain control
 - 3) get energy with low price, without margin





Funding renewables

Environmentally sound and sustainable project

⇒ render possible to get partial financing from EIB, EBRD, NIB

⇒ commercial banks appreciate these institutes





Funding

Pohjolan Voima (PVO) has good rating => low margins

- viable investments
- size, 670 MEUR annual turnover
- healthy equity-to-assets ratio
- non-profit making operating principle
- strong owners
- references => projects carried out successfully





Funding

- PVO is not using Project Finance, daughter company takes loans/leases from financial institutions
- typical financing structure:
 - 20% equity capital
 - 80% borrowed capital
- typical ownership structure
 - >50% PVO
 - <50% other than PVO owners

⇒ one majority owner responsible for the project





Case WinWinD, WWD3



Capacity	3 MW
Total investment cost	3 400 000 MEUR
Investment aid	35 %
Net investment cost	2 210 000 MEUR
Equity (20%)	442 000 MEUR
Loan (80%)	1 768 000 MEUR
Interest rate	5 %
Write off period	20 years
Cost of capital	177 336 €/year
Operation & maintainance (1,5% of the investment)	51 000 €/year
Annual production (2300 h)	6 900 MW
Production costs*	33 €/MWh
Tax benefit	-6,9 €/MWh
Net production cost*	26

* costs does NOT include

- 1) interest to equity capital
- 2) administration cost



Case WinWinD, WWD3



	€/MWh	€/a
<i>Net production cost</i>	26	228 336
<i>10% interest to equity capital</i>	6,4	44 200
<i>Administration</i>	1,4	10 000
<i>Altogether</i>	34	282 536



Finland is a great country to learn about renewables!

Järvi-Suomen Voima Oy, Savonlinna

- 80 MWth biofuel fired BFB
- started production in 2003

