



Hydrogen and Fuel Cell Activities in VTT

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VTT IN BRIEF

Units:

VTT Electronics
VTT Information Technology
VTT Industrial Systems
VTT Processes
VTT Biotechnology
VTT Building and Transport

VTT Information Service
VTT Corporate Management
and Services
VTT Technology Studies
VTT Certification

Staff: 2 661

Turnover: 218 M€

- Basic govern. funding to research on VTT's own initiative 33 M€
- Jointly funded projects 108 M€
- Commercial activities 77 M€

Staff breakdown by location:

Oulu	316
Jyväskylä	131
Tampere	294
Lappeenranta	12
Turku	18
Espoo	1 866
Others	16



Bioenergy

Renewable of total energy consumption in Finland 2004

- | | | |
|-------------------|---------|-----------------------|
| • Wood fuel | 20%, | 12 % of electricity |
| • Hydro power | 4 %, | 17 % of electricity |
| • Wind | 0.02 %, | 0.2 % of electricity |
| • Total Renewable | 24 % | 25.3 % of electricity |

Strategy for 2025

- 34 % renewable of total energy

VTT

- VTT Renewables is networking more than 160 people at VTT in bioenergy and wind energy. The largest bioenergy group in EU, active in EU 6th FWP and IEA
- Coordination of EU Bioenergy NoE
- Wind energy
- Biomass combustion for CHP
- Biomass gasification
- Liquid biofuels
- Fuel Cells
- Support for national climate and energy strategy

Hydrogen Strategy work in Finland

VTT Hydrogen and Fuel Cells technology roadmap

- Hydrogen rich fuel from biomass
- SOFC fuel cells for power production
- Industrial applications of PEM fuel cells

VTT Bioenergy roadmap

- Biofuels, biogases, electricity, fuel for fuel cells

Nordic Energy Foresight

- Building the Nordic research and Innovation area in Hydrogen, great variation in different countries-Sweden-Island

National Technology Agency Technology Strategy

- Environmentally sound energy production, hydrogen and fuel cells

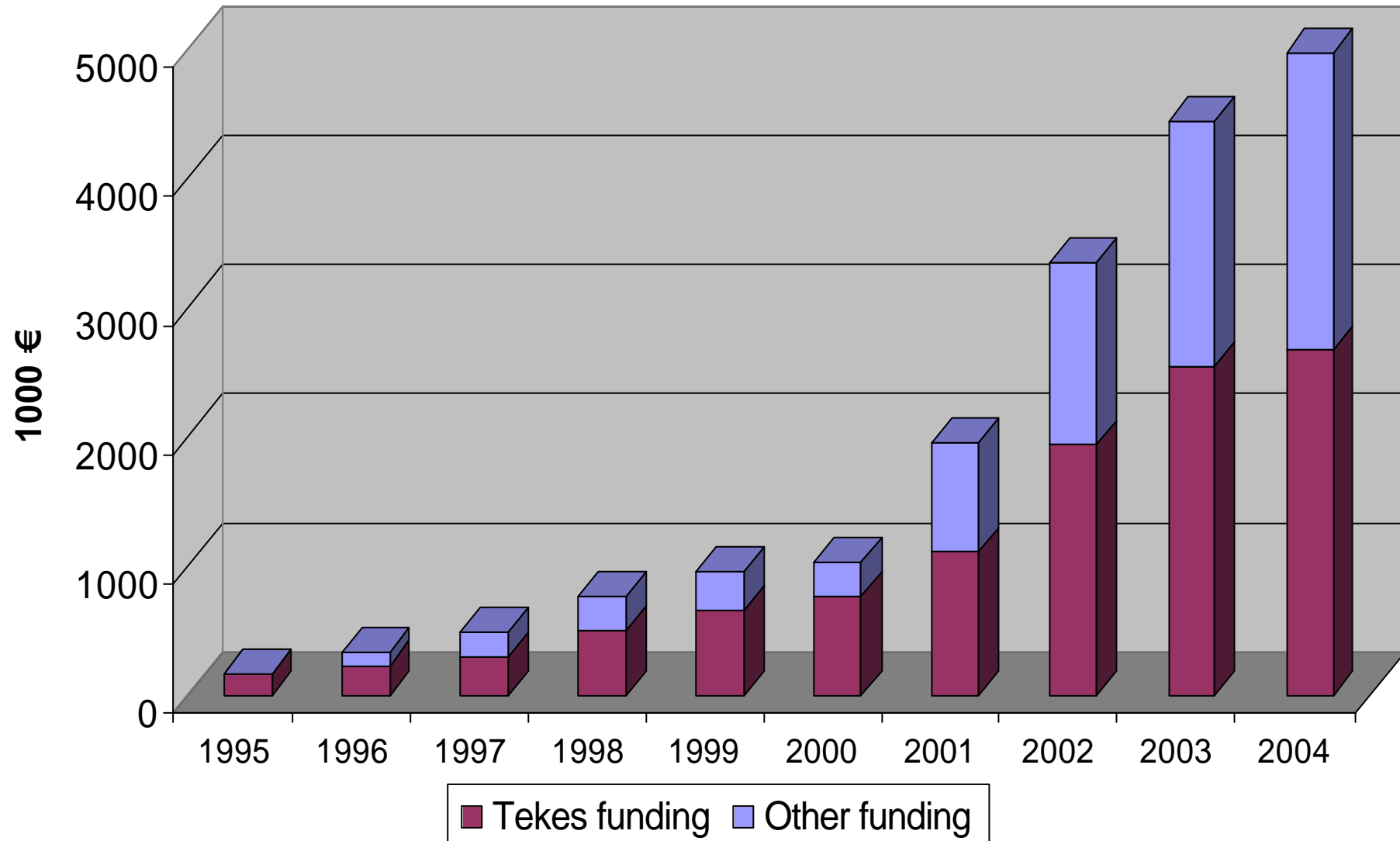
Hydrogen and Fuel Cells Technology Roadmap

- National Technology Agency (Tekes) under preparation

Climate strategy of Finland

- Ministry of trade and Industry (KTM). Hydrogen to be included

FC research funding in Finland (Tekes)



Hydrogen projects

General

- **Hydrogen Energy Foresight in the Nordic Countries (VTT, ABB, Wärtsilä, Fortum)**
- **HySociety 2003-, coordinated by IST, VTT and 20 European partners, Funding: FP5**

Hydrogen rich fuel production

- **UltraCleanGas 2004-6, Coordinated by VTT, participants HUT, Foster Wheeler, Fortum Oil and Gas, Vapo, Funding Tekes VTT and industry**
- **ISCC 2004-6, In situ CO₂ capture for solid fuel gasification, Coordinated by University of Stutgard, 25 European participants, VTT, Funded by EU FP6 and participants**
- **New EU project on fuel for MCFC**

Summary of Fuel Cell projects

Networking

- EU Hydrogen & Fuel Cells technology platform SRA Steering panel
- EU SOFCNet 2003-5, coordinated by ECN, 52 European participants
- FCTESTNET 2003-5, coordinated by JRC Petten, 50 European participants
- IEA Advanced Fuel Cells, ExCo and Annexes SOFC, Stationary applications, PEM, Portable

SOFC

- FINSOFC 2002-6, coordinated by VTT, HUT and industry participates. Topic SOFC systems
- Real-SOFC IP 2004-7, coordinated by FZJ, 26 European participants. Topic SOFC cells and stacks

New SOFC proposals

- FCTESQA IP JRC coordinates. Topic FC testing (VTT in SOFC testing)

PEM and related

- POWERPEM 2004-6 coordinated by VTT, jointly with HUT. Topic 1-10 kW PEM power source
- PEM Drive 2004-7 coordinated by MET, VTT, HUT, LTU. Topic PEM work machine demonstration
- Micro fuel cell 2004-6, coordinated by HUT, VTT. Topic disposable fuel cell for mass production
- KARAOKE 2005-6 Coordinate VTT. Topic fuel cell and hydrolyser catalysts