

DENSY

DISTRIBUTED ENERGY SYSTEMS
2003–2007



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DENSYS - Distributed Energy Systems

Technology programme for the development of distributed energy systems

- | **Duration: 2003-2007**
- | **Programme volume: 57 million euros**
- | **Programme Manager: Jonas Wolff, Technology Centre Merinova Oy**
- | **Further information:**
www.tekes.fi/densy



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Tekes – Finnish Funding Agency for Technology and Innovation



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Definition of Distributed Energy Systems

”Local, small sized systems for energy conversion, production and storage as well as related services”

- | Real estate-size
- | Block-size
- | Factory-size

- | Production of power, heat and cold
- | Especially renewable energy
- | Independent or connected to power or heat network
- | Mobile, if needed



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Finnish knowhow...

- | **Systems and automation
(Intelligent automation)**
- | **Distributed generation
(Wärtsilä, 50 % of global diesel-markets)**
- | **IT and automation systems**
- | **Substations and remote control
(ABB 20 % market share)**
- | **Generators and gears
(ABB, Metso 30 % market share)**
- | **CHP (world's largest intensity)**
- | **Power from bio energy
(largest share in Europe)**



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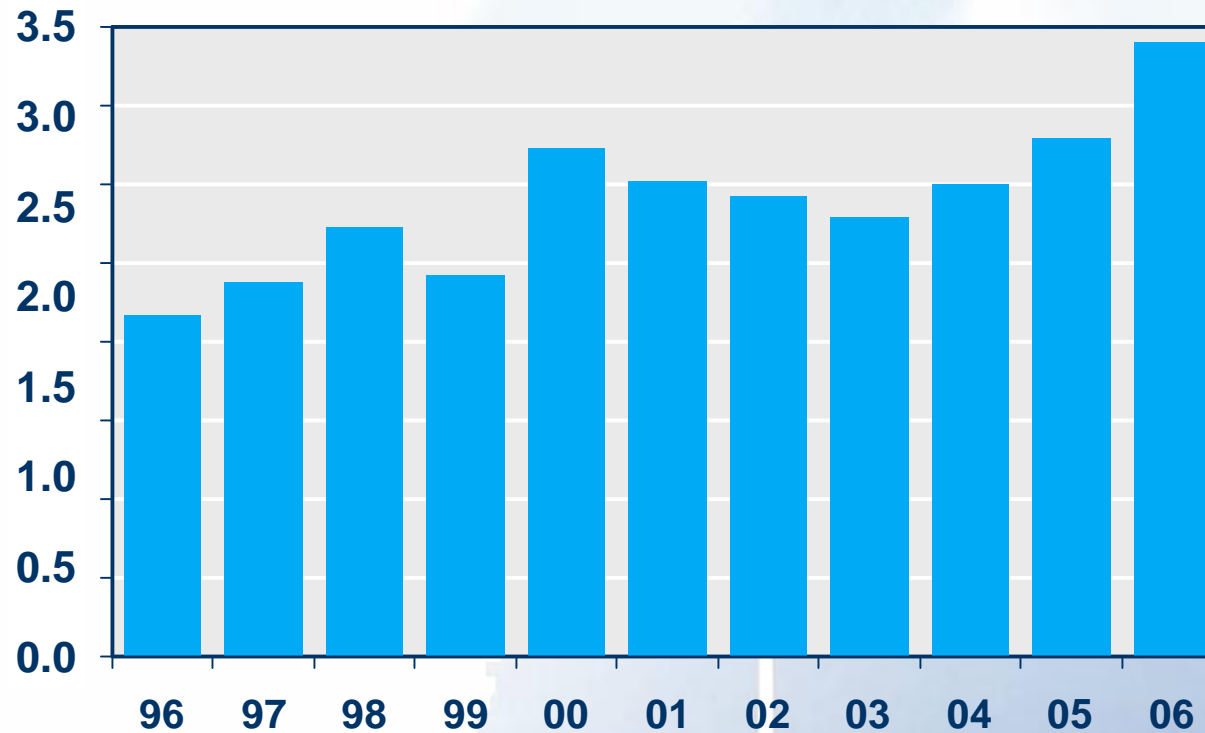


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Exports of the energy technology industry

1996-2006

Billion euros



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Source: Statistics Finland

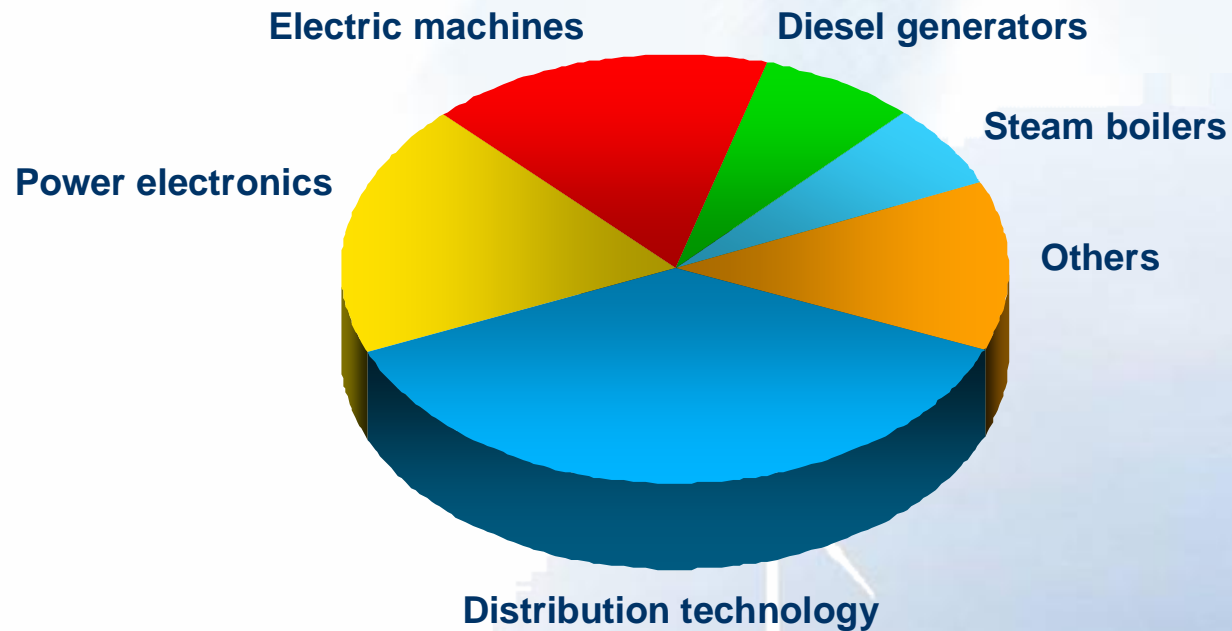
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Energy technology exports by product group

2006



3.9 billion euros



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Programme Focus

Business models

- | Energy services
- | New business concepts
- | Customer's decision making tools
- | Financing instruments

Integration

- | to local energy source
- | to local consumption
- | to customer systems
- | to external energy system
- | DSM

System solution

- | Intelligent components
- | Compatibility
- | Modelling and measuring tools
- | IT, automation, control and supervision
- | Standardized solution
- | Fuel cell and hydrogen systems

Industrial production

- | Mass-production technologies
- | Modularity
- | Design
- | Lean manufacturing
- | Simplicity
- | Standardized solution



Utilizing information technology

- | Platforms, applications, models and simulations for evaluation functionality and costs
- | Technical services, systems and equipment for providing total service concept



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Demonstrations



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Programme Objectives for 2010

- | **Finnish companies, esp. SMEs, develop and produce products and services in a global competitive market**
- | **Finnish technology, know-how and industry is widely recognised in Europe and referred to globally**
- | **The Finnish innovation environment has reached global excellence**
- | **Finnish products and services are leaders in several global niche-markets**



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Programme status

September, 2007

- | **57 research projects in six fields**
 - | **ICT and automation**
 - | **Business concepts**
 - | **Heating and CHP-systems**
 - | **Electrical systems**
 - | **Industrial manufacturing**
 - | **Fuel cell and hydrogen technologies**
- | **11 research institutes and universities**
- | **Over 140 co-funding companies**

- | **66 industrial R&D projects**
 - | **Product development**
 - | **Improving manufacturing capabilities**
 - | **Competence building**
 - | **Business development**



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Electrical Systems

Scope

- | **Grid-connection of distributed generation**

Almost twenty research projects

- 5 research institutes
- Approx. 50 companies
- More than 4 M€
- More than 60 international publications, approx. 100 publications in total, two dissertations and several diploma theses.



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RESEARCH AREAS in Electric Systems

- | **Energy network analyses and management**
- | **Network connection and power generation**
- | **Power system impacts of wind power –IEA collaboration**
- | **Energy storage applications in distributed power system management**
- | **Simulation and laboratory facilities**



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Project List in Electrical Systems

Active Network Management Eldig
Super Capacitor development phase 3, SUPER 3
Energy Storages in Distributed Power Systems, ENVADE+
Middle Sized Energy Storages in Distributed Power Energy Solutions, ENVADE
Energy Storage Technologies in Finnish Wind Power System, ENVATUULI
Active Methods for Distribution Network Management
Network Connection of Distributed Generation and Generators VELKO
Power Distribution and Distributed Generation, ELDIG
DG Development Platform, MULTIPOWER
Estimating the Power System Impact of Wind Power, WINTEG2
Wind & Hydro Integration, WINTEG
IEA Wind Collaboration, Task 19
Dynamic Models of Wind Farms for Power System Studies, TUUMA
Integration of Distributed Generation into Electricity Distribution Network, DIGIN
Maaseudun paikallinen sähkönjakelu ja käyttöjärjestelmä,
A simulation Environment for Grid Connection of Distributed Generation



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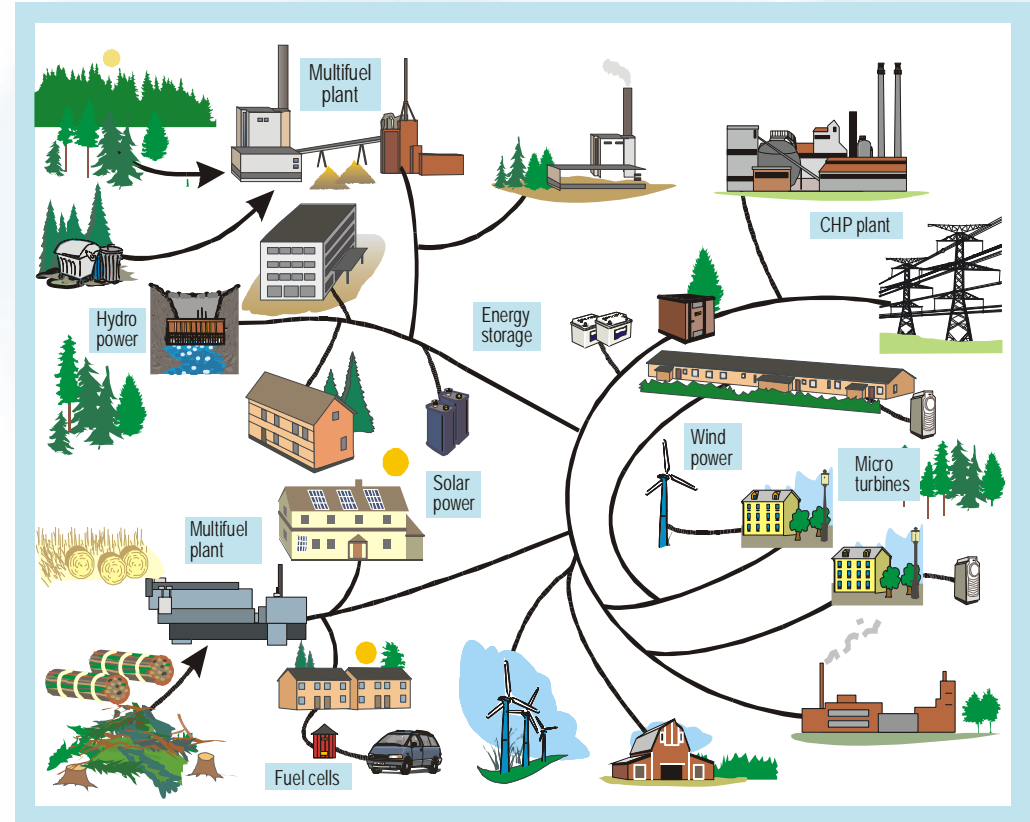


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Electrical Systems - results

Results

- | Active network management protocols
- | Energy storage conceptualisation
- | Supercondesator technology
- | Modular simulation environment
- | MULTIPOWER testing environment



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Heating, cooling and CHP

Scope

- | New visions for district heating

Results

- | Technology for even smaller CHP-systems
- | Polygeneration of power, heating, cooling, and other services and products
- | Electricity from biofuels



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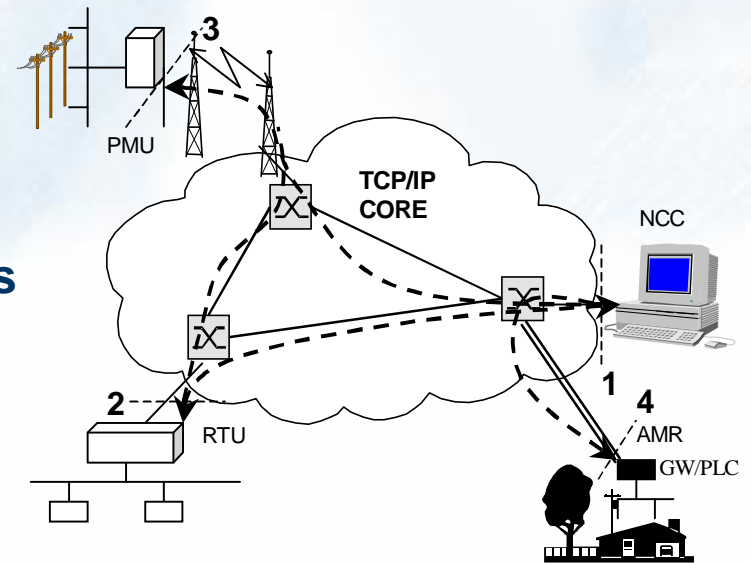
ICT and Automation

Scope

- | Application of ICT in energy technology

Results

- | Network management
- | Energy management systems
- | Condition monitoring



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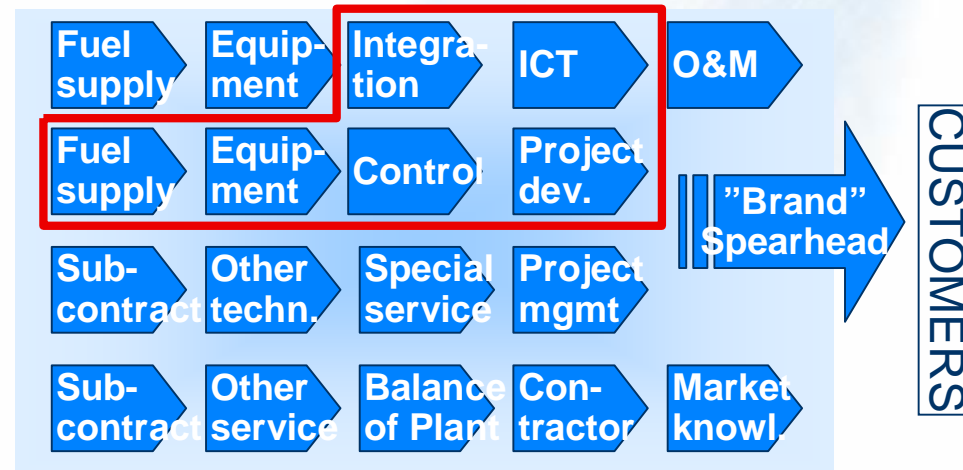


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Business Concepts

Scope

- Define value chains, business opportunities and customer benefits



Results

- Commercialisation of new technologies and services
- Formation and piloting of business networks
- Joint technology transfer efforts (USA, UK)



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Manufacturing Technology

Scope

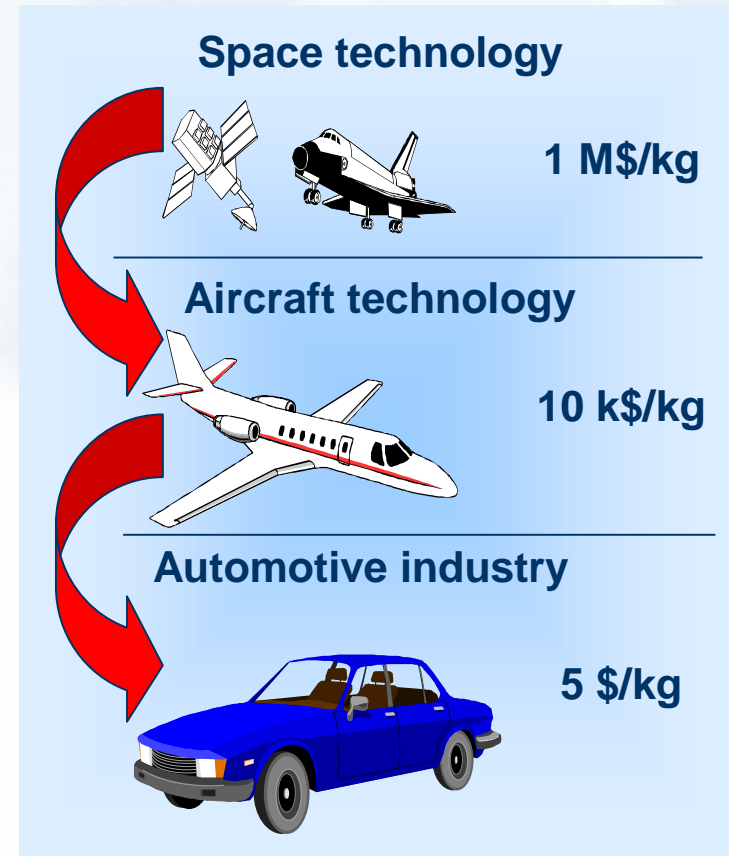
- | Reach cost-efficiency through modular design and mass-production

Objectives

- | Lean manufacturing for growing with markets
- | New materials and manufacturing technology in the energy industry
- | Design for manufacturing and assembly



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Fuel Cell and Hydrogen Systems

Scope

- | Fuel cell and hydrogen technology in energy production

Results

- | Finnish SOFC-network
- | PEM technology for energy production
- | National hydrogen roadmap and business network
- | Followed by a Fuel Cell programme



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Remaining Challenges

| Global markets vs. home markets

- | Small companies find it difficult to develop products domestically.
- | Born Global – difficult in heavy industries
- | Focus on components, not systems
- | Successful companies emigrate (?)

| Markets vs. cost saving investments

- | Modularity and standardisation to be developed
- | Need for small companies to integrate
- | Poor knowledge and understanding of international markets

| Full value of demonstrations

- | Esp. ICT-applications in energy management
- | Large-scale demonstrations (Systems of systems)



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- | More detailed information and results of every project can be found:

www.tekes.fi/density

➔ Closing Seminar

➔ Final Report



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