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The Centre of Expertise for Western Finland – a 18 year journey from "green field" to Co-ordinator for the Finnish Energy Cluster and for the preparation of the Research Road Map 2015 of the Finnish Electricity Distribution Network

Parallel Session 6:
Designing a STP - making the big choices

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Executive Summary

This presentation relates how the Technology Centre Merinova went from a green field start in 1989 to a leading Finnish Science and Technology Park in energy technology. For the past 18 years, Merinova has worked on energy technology projects in a carefully planned and orderly way. As a result Merinova became co-ordinator in the Finnish Energy Technology Cluster and it was given the responsibility of preparing the 10 year strategic research plan for Finnish power distribution networks.

The keys to Merinova becoming a significant player in the field of Finnish Energy Technology research were:

- Support from local public authorities and Vaasa’s strong export industry
- Strict focusing of activities and carrying them out in a systematic manner
- Skilled and experienced personnel

- Creation of the new science and technology laboratory and university level research resources in Vaasa University
- National and international project co-operation
- Establishing Vaasa Airport Park with 2700 employees.

Keywords: **centre of expertise, energy technology cluster, road map, electricity distribution**

Contents of the presentation:

1. General information

Technology Centre Oy Merinova Ab is located on the western coast of Finland, in the city of Vaasa. The city boasts a university and six other institutions of higher education as well as an airport, a railway station and a ferry link to Sweden. Half of ABB's production facilities in Finland and the entire Finnish production of Wärtsilä Finland are located in Vaasa. In addition, Vacon frequency converters, for example, are manufactured in Vaasa.

The city of Vaasa in a nutshell:

- Founded 1606
- Population Vaasa City 58 000
  Vaasa Region 110 000
- Finnish-speaking 73 %
- Swedish-speaking 24 %
- Others 3 %
- Fire of Vaasa 1852, afterwards city was rebuilt in a new location by the sea due to land rising phenomenon
- 13th largest within Finnish Cities

Vaasa is a city of large energy related export industry and its market position is described with a slogan: *"Internationalism is a daily concept in the commercial life of Vaasa"*. In figure 2 you see aerial photo from Vaasa city.

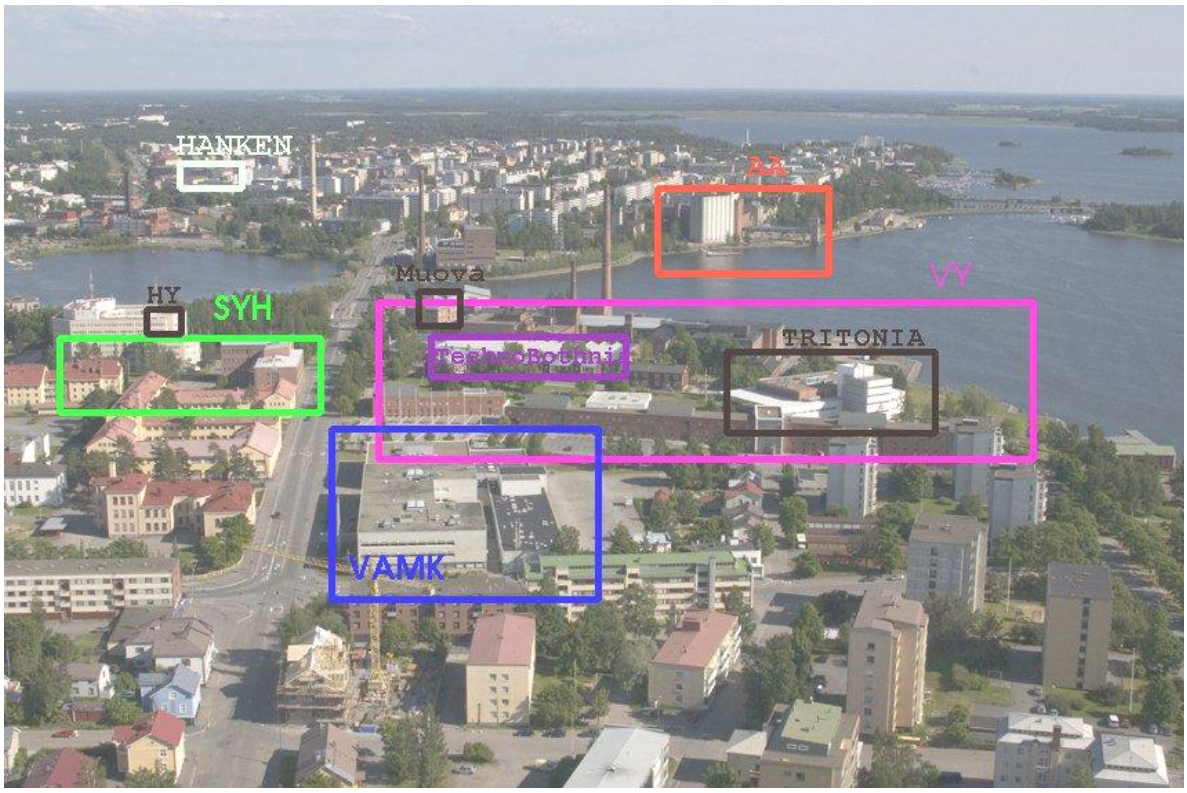


Figure 2. Air photo from Vaasa City

On the map of Finland Vaasa is the most western coastal city on the Finnish continent, see the map of Finland in Figure 3.

Figure 3. Map of Finland

2. Start point of the Centre of Expertise for Western Finland

When Technology Centre Oy Merinova Ab was founded 1989, there was:

- No Technical Faculty at the University of Vaasa
- No Laboratory of Science and Technology at the University of Vaasa
- No Technical Research at the University of Vaasa
- University Level Scientific and technical know- how in Vaasa mainly in the local large Industrial Companies ABB and Wärtsilä
- Polytechnic Institutes for Engineering Education both Finnish spoken and Swedish spoken

3. The First 5 Years of the Centre of Expertise for Western Finland

After establishing Technology Centre Merinova, the first 5 years involved the scoping of operations and the training of personnel in project activities.

Some important milestones from that period are:

- 1989 founded by the City of Vaasa and University of Vaasa with minimum equity capital
- 1990 Directed Share Issue for increasing the number of Shareholders and strengthening the ownership base
- 1990 One Year Time of Messiness
- 1990 Production Simulation Project
- 1992 Startia - New Enterprise Centre Startia of the Vaasa Region was launched
- Learning by stages to operate as a semi public intermediary between large exporting Industries and SME's
- Objectives for the Operations of Merinova are firmed up
- Planning the Technobothnia Laboratory for University of Vaasa and for the Finnish spoken and Swedish spoken Polytechnics
- 1993 Preparing the operational plans for the Centre of Expertise together with Vaasa University
- 1994 - 1998 Investments in Vaasa Province Project
- 1994 Application for the Centre of Expertise Status in Energy Technology and in Energy Economy
- Development of project finance and management skills.

4. Launch of the national Centre of Expertise Programme in 1994

The Centre of Expertise status for Technology Centre Merinova was established in 1994. This was the year, when the National Centre of Expertise Programme was launched in Finland by the Ministry of the Interior.

Some information regarding the status of Centre of Expertise is beneath:

- Half of the basic funding in the programme came from local public investors mainly from municipalities and the other half from the Ministry of the Interior. The projects were funded by the participants and TEKES, Finnish Funding Agency for Technology and Innovation
- Because of the large energy technology companies ABB's and Wärtsilä's active role as shareholders and on the board of managers of Technology Centre Oy Merinova Ab, it was natural that energy technology was selected as the area of expertise on which to concentrate.

5. Membership in the Finnish Science Park Association (TEKEL) 1995

- TEKEL (the Finnish Science Park Association) is the Central Organization of the Science and Technology Parks in Finland
- Merinova differed from all the other members, because it drew its technological know-how from the international energy technology industry and not from technological universities as all the other TEKEL member organisations in Finland

6. Centre of Expertise of Western Finland - Operational Period 1 (1994 – 1998) "Applications of Energy Technology"

- Centre of Expertise Application to the Ministry of Interior at the end of February 1994
- Application was made together with international export industry of Vaasa Region (ABB Vaasa Factories, Wärtsilä Diesel Oy, Kemira Vaasa Factories, and KWH Pipe Oy), University of Vaasa and other higher education units in Vaasa, Finnish and Swedish Polytechnics and Merinova, which then was called Kvarkens Innovation Centre Oy Merinova
- Finland was not yet a member of EU but joining the EU was anticipated and therefore co-operation with the Vaasa's Swedish twin-city Umeå was stressed in the application. Finland became a member of EU from beginning of the year 1995

7. Centre of Expertise of Western Finland - Operational Period 2 (1999 – 2006) "Energy Technology and Economy":

- Centre of Expertise Application was made to the Ministry of Interior for the second period at the end of September 1998
- Application was made together with University of Vaasa, Technology Centre Oy Merinova Ab, international export industry of Vaasa Region (ABB Oy Vaasa Companies, Wärtsilä NSD Finland Oy, Oy KWH Pipe Ab, Kemira Vaasa Factories and as a new comers rapidly growing Vaasa Group Companies; Vaasa Engineering and Vaasa Control)
- Slogan for the second period was *"From the applications of Energy Technology to the Business Operations"*
- Operation model for the period 1999 – 2006, see figure 4.

Total amount of the scheduled projects 1999 – 2006 were 130 and the financing budget of the projects where Merinova was involved 128 660 000 €.

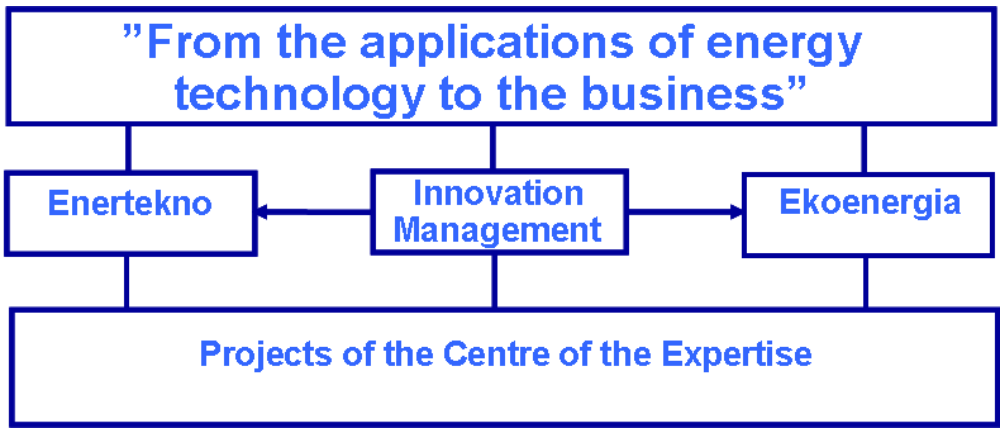


Figure 4. Operation model for the Expertise Centre of Western Finland

8. Development of the University Level Education of Technology in Vaasa 1990 – 2007:

In the figure 5 there is a photo of Campus area of Vaasa University and in the figure 6 the new library building Tritonia of the Vaasa University.

Figure 5. A photo of Vaasa University campus area

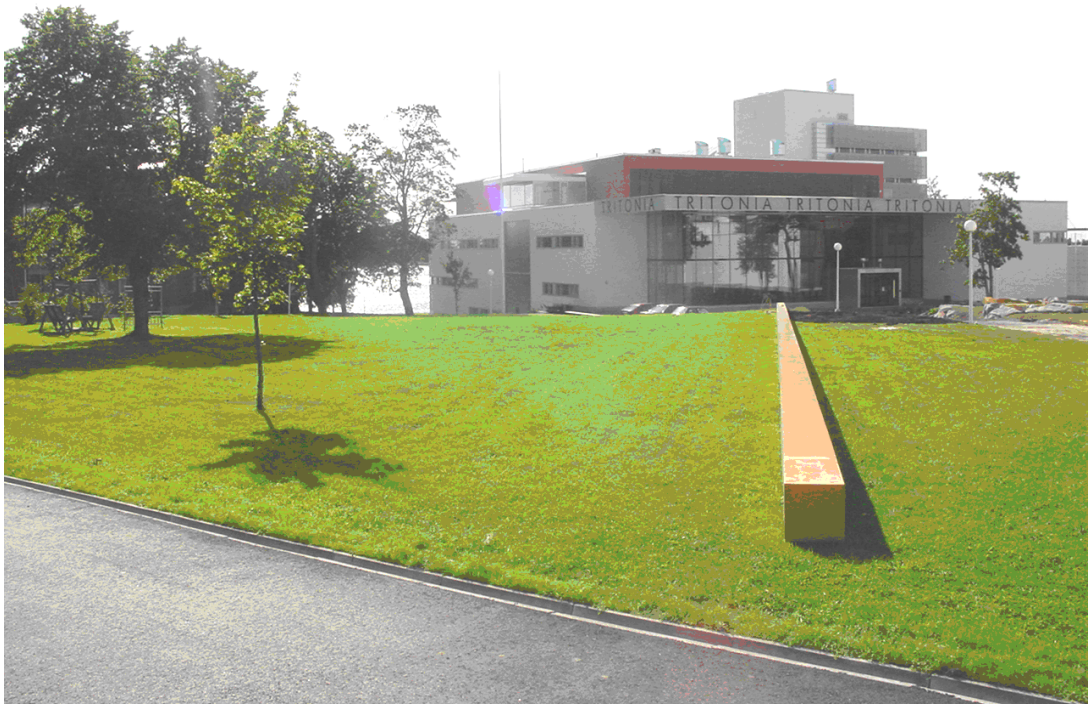


Figure 6. Library building Tritonia of Vaasa University

Different phases of the development of the Vaasa University in technical education:

- 1990 The Master of Science Level Education in Vaasa University started with co-operation agreement with Helsinki University of Technology as a supplementary education for the B.Sc. level students. Two year classes were given in VU with diploma award from the examination being given by HUT
- Later the co-operation agreement with HUT enlargened so, that for the young undergraduates first two year's education was given in Vaasa and they then continued their studies in Helsinki
- The situation was such that all the M.Sc. level education was given in Vaasa University but it was not entitled to hold examinations in Vaasa
- In 2004, after long discussions with Ministry of Education VU had finally got the right to hold M.Sc. level and Dr. level examinations in technology
- In 2007, some tens of M.Sc. graduates in Technology had taken their examinations in Vaasa University and a number of them are now starting their Doctor of Technolgy dissertations.
- Present amount of foreign students in Vaasa is several hundreds. Vaasa university has now 200 foreign exchange students, 190 foreign master degree students and 35 doctoral students coming outside Finland. Vaasa university of applied sciences has 200 foreign exchange students and 280 B.Sc. degree students. Swedish University of applied sciences has 5 % of its students foreigners totally ca. 80 persons. Annually there are made so many incoming international degree student applications for the universities in Vaasa, that all the intake could be manned by foreign students.

9. Development of the Research of Technology in Vaasa 1990 - 2007

The large export industry in Vaasa, ABB and Wärtsilä, have own research and testing laboratories for their products. Total amount of the R&D personnel in Vaasa industry is 800 persons.

The different development phases of the Technobothnia Laboratory are:

- At the beginning of 90'ies, when the Education in Technology started in Vaasa University there was no Laboratory for Science and Technology in Vaasa University. The laboratories in Vaasa were in the ownership of two Polytechnic Institutes in Vaasa
- Planning of the Technical Laboratory for the use of both Vaasa University and the Polytechnic Institutes started and a state of the art laboratory called Technobothnia was created in the old building of Vaasa Cotton Factory. The laboratory was ready to use 1996, see figures 7 and 8.

Figure 7. Main Entrance of Technobothnia Laboratory

Figure 8. Interior view from Technobothnia Laboratory

- When Technobothnia laboratory was ready, there was in Vaasa University still lack of researchers on energy area, because there was no independent education of energy technology in VU
- Therefore local Industry and Vaasa City asked VTT, a large Finnish state owned science and technology laboratory, to establish research unit on energy technology in Vaasa
- VTT's research unit worked in Vaasa in co-operation with Vaasa University and Expertise Centre Oy Merinova Ab which greatly added the know- how in energy technology in the critical years 2001 – 2007, when Vaasa University not yet had its own post-graduate students and researchers in technology

10. Achievements of the Technology Centre Oy Merinova Ab in Vaasa Region

- 1994 Centre of Expertise in Energy Technology status awarded to Merinova
- 1993 - 1996 Co-operation in the planning of the high-tech laboratory Technobothnia
- 1990 - 2004 Founding of the Technical Faculty in Vaasa University
- 1999 Founding of Vaasa Parks Ltd for Property operations
- 2001 - 2007 VTT's Research Unit in Vaasa and its close co-operation with Vaasa University and Technobothnia laboratory
- 2007 Planning of the Institute of Energy Technology in Vaasa University
- 2007… Cluster co-ordinator status in Energy Technology supporting Energy Vaasa Image

11. Impact of the Technology Centre Oy Merinova Ab in Finland

- 2003 - 2007 TEKES Tecnology Programme DENSY, Co-ordinator of 5 year distributed energy systems technology programme
- 2004 - 2005 Chairmanship of the Finnish Science Park Association
- 2006 - 2007 Strategic Development Plan for Finnish Power Distribution Networks ”Road Map 2015 for Electricity Networks, Electricity Use & Electricity Markets”
- 2007 - 2013 Cluster Co-ordinator of Energy Technology in the national Centre of Expertise Programme
- 2007… Group Merinova is a member in the Electricity Research Pool. ER Pool is a seed financing organization for power distribution network research in Finland.

12. International operations of the Technology Centre Oy Merinova Ab

- 1996 - 1998 Ostrobothnia Regional Energy Agency; EU financed Project of Regional council of Ostrobothnia; Founding of the office for promotion of the renewable energy; Prestudies; Demonstration plants; Information distribution; etc.
- 1997 - 1999, TRAIN-IT, Training of IT Innovators (ESPRIT Programme pilot accompanying measure), development of a business plan training course especially for European technologists.
- 1999 - 2000, SUSE, Start-up support for entrepreneurs (PAXIS I Programme validitation project), the developed TRAIN-IT concept and curriculum was submitted to a complex test regarding effectiveness and localization capacity.
- 2002 - 2005, FCIP Network, First Class Industrial Park Network (Interreg III B). The overall objective of the Project FCIP was to improve regional economic structures based on a network of First Class Industrial Parks (FCIPs) and to improve transnational communications.
- 2001 - 2002 Nordgas Project; (Interreg III A); Norway - Western Finland Natural gas pipe line’s feasibility study
- Arctic OPET; EU’s “Organisation for the Promotion of Energy Technology”): Channel to the European Energy Know-how; Utilization of the waste heat of Metsä- Botnia Pulp Factory in Kaskinen
- 2001 - 2003 Codgunet Project,”Connecting Distributed Generation Unit to the Power Distribution Network”; a Nordic co-operation project; Merinova was co-ordinator of the project
- 2002 - 2005 Baltcoast (Interreg III B); as a partner Regional council of Ostrobothnia and as a co-ordinator Technology Centre Merinova; Prestudy of the Off-shore wind power park to Korsnäs
- 2004 - 2005 Synergy ”Strengthening the Competitive Intelligence of the European Distributed Energy Resources”; partner in EU project
- 2006 - 2007 Synergy+ ”Expanding the Competitive Intelligence in the European Distributed Energy Resources Sector”; partner in EU project
- 2006 - 2007 CENCE ”Establishing a co-operative learning platform that facilitates the promotion of entrepreneurial innovation through Connecting Energy Clusters across Europe”; partner in EU Project
- 2007 Participation in IEA Committees under the auspices of DSM and Enard Annexes

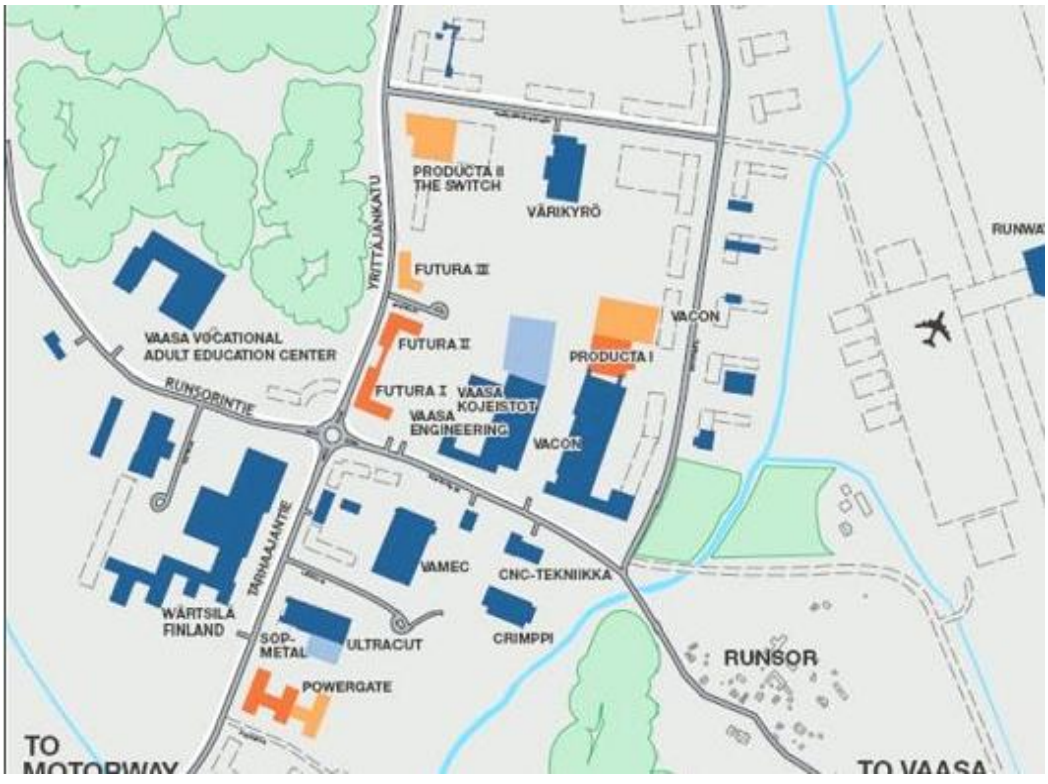
- 2006 - 2009 ASPIRE Aspire "Project is developing Sustainable Energy Communities in peripheral areas of the European Union" Leader of the work package 5 "Aspire Model" is University of Vaasa. This Work Package will be the key aspect of the project in terms of identifying and promoting the benefits of the ASPIRE model, as well as the wider opportunities that exist for replication in other similar communities across Europe
- 2007 - 2009 ADINE – Active Network Management for Distributed Generation; participation in EU Project coordinated by Hermia in Tampere. The aim of the ADINE- project is to develop, demonstrate and validate a new Active Network Management (ANM) method of distribution network including DG and enabling solutions to support it.

13. Property operations

Some milestones of Vaasa Parks Oy are:

- Vaasa Parks Oy, originally named Merinova Kiinteistöt Oy, for construction of buildings was established 1999. Already 1990 were considered real property business, but the recession and bank crisis in Finland prevented then estate investments
- The first Technology House Futura I was finished in 2002 and also Merinova moved in to this building
- The second Technology House Futura II was completed 2004
- The third building built in airport park in 2006 was for industrial production of Vacon Oy
- The fourth building was an office house for Wärtsilä and Fujitsu 2007
- The second industrial facility ready in spring 2008 for The Switch Company is for production of wind power technology
- Total floor area of Vaasa Parks Oy in 2008 is 41 000 m^2

In figure 9 you will find the map of the Vaasa Airport Park, where the Vaasa Parks' facilities are marked with the own colour code.



Oy Vaasa Parks Ab's buildings

Figure 9. Map of Vaasa Airport Park

14. Vaasa Airport Park technology and production facilities

In figures 9 - 12 you will see photos from Vaasa Airport Park and its buildings and enterprises.

Figure 10. Air photo from Vaasa Airport Park Buildings and Enterprises

Figure 11. Technology house Futura I *(Merinova's office location)*

Figure 12. Technology house Futura II

15. Description of Energy Technology Cluster

On the Finnish map in figure 3, on page 5, there are marked the placements of the Energy Technology Cluster's cities. The role and research area of every city is given in figure 13.

Figure 13. Roles of energy cluster cities

Owing in part to the strong boat building industry of the Vaasa region and, because of the diesel- electric propulsion systems used in boats, the Marine Cluster also needed know-how in electric energy technology and selected Merinova to a member of the cluster.

16. Strategic Plan for 10 years for the Finnish Electricity Distribution Network, Electricity Consumption and Electricity Markets: Road map 2015 Project

The following features and objectives must be taken into account in the research and development of Finnish Electricity Distribution networks:

- Life span of the electricity networks is several decades
- Electricity seems to become commodity, about which there can be shortage in the future and its price is rising because of the environmental impacts
- Electricity is a vital resource for the modern information society
- Electricity networks use old and new technology side by side. This causes challenges especially for network automation
- Public control of the network business, changing regulation models and new arrangements in the ownership of network companies cause challenges for the operation of network companies
- Processes between electricity sellers and network companies will be intensified, automatic meter reading will become increasingly common
- The information society expects improvement of the reliability in the electricity distribution
- In the rural areas overhead lines will be replaced by ground cables and more small scale power plants will be connected to electricity networks
- Protection technology and network automation will go through some major changes
- The Finnish Road map 2015 Project considers also international development projects such as IEA's Enard and EU's Smart Grid Programme

17. Research Areas of the Road map 2015 Project

In figure 14 there are given different research areas of the Road map 2015 Project.

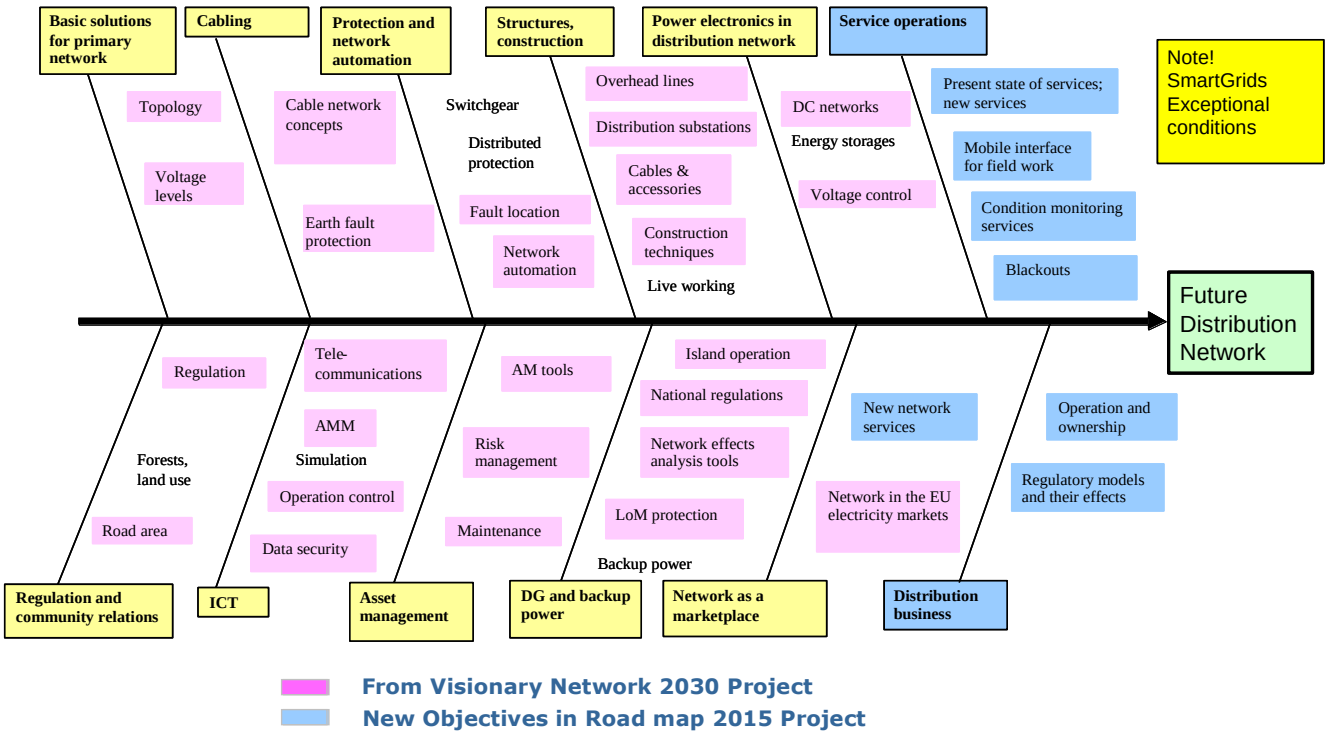


Figure 14. Research areas of Road map 2015 Project

18. Scores of Road map 2015 Projects

In figure 15 the scores of different project proposals are given in Road map 2015 Project.

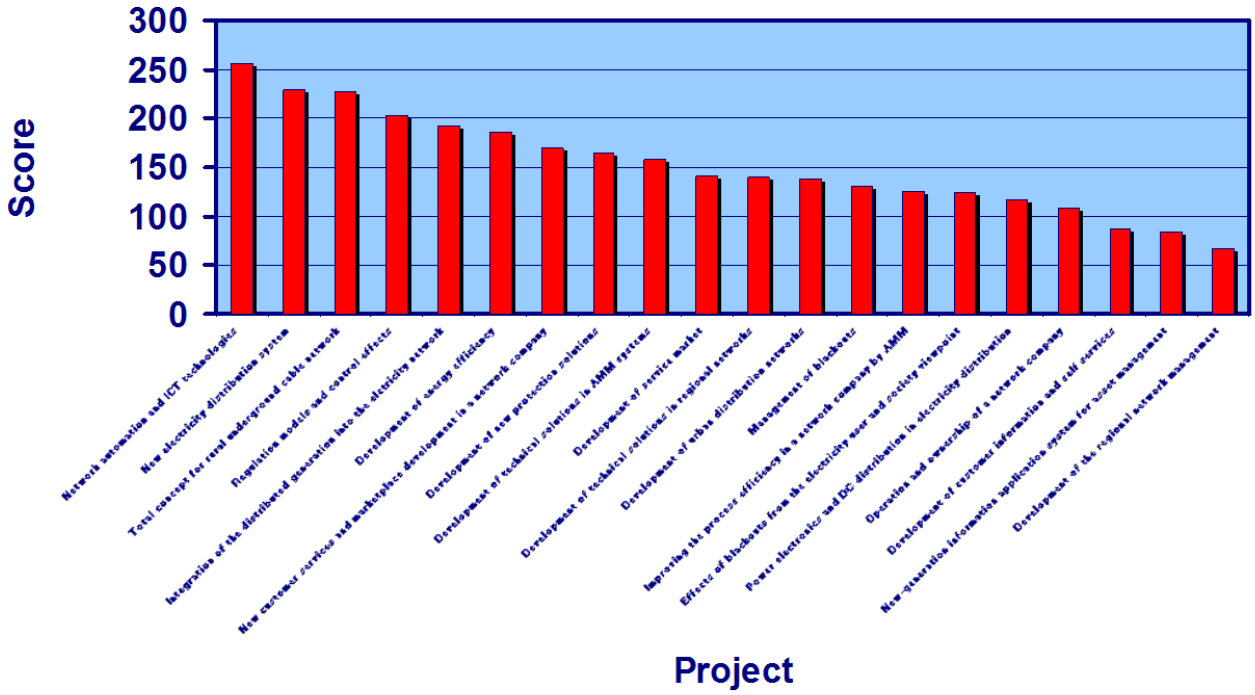


Figure 15. Priority scores of the Road map 2015 project proposals

19. List of Road map 2015 Projects

In table 1 is a summary list in the priority order of the R & D Projects.

Table 1. Project proposals of Road map 2015 in priority order

Project No.	Project title	Costs k€	Years
1	Network automation and ICT technologies	3190	2008 - 2015
2	Total concept for rural distribution network	1400	2007 - 2010
3	Operation and ownership of a network company	1345	2007 - 2014
4	Integration of distributed generation into the electricity network	1000	2008 - 2013
5	Utilisation and development of AMM technology	4744	2008 - 2013
6	Development of service market	591	2008 - 2009
7	Development of new protection solutions	500	2007 - 2009
8	Development of regional networks	1550	2008 - 2015
9	Development of urban distribution networks	830	2008 - 2012
10	Effects of blackouts from the electricity user and society viewpoint, management of blackouts	850	2008 - 2012
11	Power electronics and DC distribution in electricity distribution	1490	2007 - 2011
12	New-generation information application system for asset management	860	2008 - 2010
	Total k€	18346	

20. Future activities of the Technology Centre Oy Merinova Ab 2008 - …

The work on energy technology in the Technology Centre Oy Merinova Ab continues. It is forecast that among other things the following subjects will have important role in Merinova's work load:

- 2008…2013 Cluster coordination of the Energy Technology
- Participation in the Projects targeting to the goals of EU Energy Policy: 20 % Energy Saving, 20 % Increasing of the Renewable Energy Sources, 20 % Reduction of the Greenhouse Gases
- Reinforcement of the Nordic and International Co-operation Basis of the Centre of Expertise in Energy Technology
- "Learning by doing": Improving Competence of the Human Resources of Oy Merinova Ab by participating in the Projects of Sustainable Energy Technologies.

21. Lessons learnt

There are some important facts which have helped Technology Centre Oy Merinova Ab to advance as a significant player in the field of the Finnish Energy Technology Research and Development:

- Start as a local actor with support of the local public authorities and strong export industry was important
- Finding the right focus for the activities was important for getting the projects started and financed
- Skilled experienced personnel were a key resource for successful operations. Knowledge of the research area and skill to manage projects and find financing for them were important
- Creation of the new science and technology laboratory and university level research resources together with Vaasa University and large export Industry were important for co-operation in technology development projects
- Development of national and international project co-operation with TEKES, Finnish Energy Technology Companies (Electricity Research Pool), Universities, EU SmartGrids, IEA Enard etc. led to success
- Operational responsibility on the National Technology Development Programme (DENSY) strengthened the contact net significantly
- Position of Cluster Co-ordinator in the Centres of Expertise on Energy Technology area gives national and international impact
- Strategic Research and Development Plan of the Finnish Power Distribution Technology for 10 years: "Road Map 2015 on Electricity Networks, Electricity Use & Electricity Markets", see www.merinova.fi for new project possibilities.

22. Summary

During the existence and period of influence of Merinova, a diverse industrial and technological business park, Vaasa Airport Park, has been built in the immediate vicinity of Vaasa Airport.

Companies housed in the business park vary from incubation enterprises testing their business ideas to rapidly growing and active global enterprises in energy technology businesses.

Also large corporations work in Airport Park, one of them the leading manufacturer of diesel power stations and ship diesel engines: Wärtsilä Finland. Rapidly growing export companies of Vaasa Airport Park include variable speed AC-drive manufacturer Vacon, wind power machine manufacturer The Switch Ltd. and Vamp Ltd., which produces protection relays for electrical power distribution systems.

Merinova currently employs roughly 20 experts of business and innovation activities and energy technology. Their educational backgrounds vary from bachelor to doctorate level and their levels of experience from years of background in international industry or research to newly graduated Masters of Science in Technology.

The number of jobs at Vaasa Airport Park has doubled since the beginning of the new millennium. Currently, around 2,700 people are employed within the business park, when in 2000 the figure was some 1,300.

The present sum of the project budgets, where Merinova is involved, is more than 20 M€.

New jobs, new innovations and new production volumes have been generated to such a degree, that Vaasa is now one of the fastest growing technology centres in Finland.