EVE – the Finnish electric vehicle programme – including a co-Nordic dimension

Markku Antikainen
Coordinator
EVE – Electric Vehicle Systems
Tekes – the Finnish Funding Agency for Technology and Innovation

Target year turnover expected from company projects: 6.2 billion euros

The projects created 1,260 new or replacing products, services or processes

In SMEs, one euro from Tekes produces 21€ in annual turnover

50 out of 47 fastest-growing technology companies in Finland are Tekes customers

2,900 funding applications
1,700 development ideas tested
1,240 rejected applications

Applications processed in 71 days

570 M€ Funding for companies and research organisations, 570 million euros

350 million euros for company projects, of which 135 million for young growth companies

68% of company funding to SMEs
Starting point

- Strong international trend towards eMobility
- Several national and international synergic programmes ongoing
- Small domestic automotive industry
- Strong mobile machine industry already utilizing electrification
- Grid ready for electric mobility
- 1,5 M (with slight modifications) ready charging poles
- Requiring arctic conditions
- Long driving distances (especially to summer cottages)
- High level of technology, especially in ICT and electronics
- Government not willing to flag for any specific sustainable power source
EVE – Electric Vehicle Systems

Need
- Innovation of new business in the growing field of electric mobility
- Creation of international partnerships for electric mobility business

Solution
- EVE programme with different research and demonstration areas

Benefits
- Well established high quality development environment
- Really demanding testing conditions for all purposes

Users
- Enterprises, universities and research institutes
- Public authorities developing electric mobility infrastructure

EVE
- Electric Vehicle Systems programme 2011-2015
- Budget 100 MEUR
- 100 + participants
- 68 projects ongoing
- Part of Smart Living focus area of Tekes
- Strategic partnership possibilities for technology and service developers
- www.tekes.fi/programmes/EVE
EVE – from Research through Testing and Demostration to Business

* Vehicles: Light and passenger vehicles and heavy machinery included
Vehicles

- **Battery capacity growing slowly, no quantum leap to be awaited soon**
  - PHEV premium models pave the road to electrification?
  - More range with more money
  - Reduction of cost and enhancing of efficiency (50/200 by 2020?)

- **Safety and reliability issues**
  - In arctic conditions range easily half of normal

- **Public transport solutions under development**
  - Optimized electricity utilization in public transport

- **Price**
  - Governmental support and incentives needed
  - Financing alternatives and support
  - Lower total cost of ownership
eStorage2–Aalto University

**Need**
- To understand better the characteristics of a battery cell and module
- To make drivecycle simulations of EVs and non-road mobile machinery
- To design a full battery system for a dedicated vehicular application

**Solution**
- Experimental cell testing to reveal aging and thermal characteristics
- Experimental module testing for modeling purposes and BMS research
- Experimental pack testing to validate the battery model

**Benefits**
- Knowledge about aging characteristics at various temperature and rate
- Impedance plots and thermal characteristics for thermal design
- A validated battery model for cell-, module-, and pack-level

**Users**
- Designers of vehicles and their battery systems
- BMS developers

http://www.ecv.fi/estorage2/
WintEVE – EV’s in Winter Conditions

Need
- Testing and demonstration solutions for arctic conditions

Solution
- Testing ecosystem based on collaboration between Arctic Research Center and testing service providers in Lapland

Benefits
- Combination of world class testing environment and experience
- Technology tested in arctic conditions works elsewhere

Users
- EV manufacturers, OEM’s
- Suppliers of charging technology and end user services, utilities etc.

www.centria.fi
www.winteve.fi
eSled – Electric Snowmobiles’ Demo Fleet

Need
- Tourists to experience the nature in its purest form
- Environment friendly solution for snowmobile safaris

Solution
- Battery electric snowmobile
- Zero emission application

Benefits
- Low operating costs
- Silent operation
- Zero emission

Users
- Ski resorts
- Safari operators
- Tourists

www.esled.fi
www.ecv.fi/esled
eBUS – Testbed for Development

Need
- Things to take into account when planning electric bus operations
- EV-component manufacturers need experience of real life solutions.

Solution
- Test mule bus for component testing and references
- Field tests on actual bus line in Espoo (line 11)
- Laboratory tests for efficiencies and driving cycle dependence

Benefits
- Unique set of tools and facilities for overall comparison of electric buses and their sub systems
- Knowledge to be used as a basis for electric bus development and procurement and for planning the future electric bus systems

Users
- Bus and component manufacturers, cities, public authorities, research institutes

www.ecv.fi/ebus
Infrastructure and Services

- Ecosystem research and development
- Identification, testing and supporting of new business models and services
- Community level demonstrations, living labs including electric traffic as an essential means of transport
- International collaboration, benchmarking, information exchange of best practices
- International collaboration in standardization
- Education, communication, marketing
Public Low Carbon City Facilitation

Need
- Identifying the role of the public policy and the societal prerequisites for EV proliferation

Solution
- Mapping patterns of governance and management models
- Actor and process analysis on the emerging cooperation forming the institutional infrastructure for the EV platforms

Benefits
- Benchmarking of success stories on high profile EV-projects, experiences of mainstream cities with moderate policies.
- Comparison between a well resourced vanguard (Shenzhen, China) and a newcomer (Espoo)

Users
- Enterprises, cities and researchers developing EV platforms and having an interest in the societal prerequisites of their success

http://ytk.aalto.fi/en/

Case Espoo: Networks influencing the EV proliferation
- A & B influence the landscape of the socio-technical mobility system and generate policy pressure for EV promotion. A also builds up the EV business ecosystem.
- C & D create changes in the present mobility regime
eSINi – Electric Vehicle Charging Infrastructure for Urban Environments

Need
- Enabling introduction of electric vehicles in Finland
- Sustainable solutions for electric mobility

Solution
- Test bed to support finding holistic and sustainable solutions and creating viable charging and service network for electric mobility

Benefits
- Well studied and tested infrastructure and service solutions
- Integration of charging infrastructure and power grid

Users
- EV users: private and public organizations, consumers
- Organizations and authorities developing electric mobility

www.esini.fi
EMO – Electric Mobility Operator, Platform And Operator Interfaces

**Users and vehicles**
- Information "Where to charge"
- Joint use "Charging in all poles"
- Clearing "Compensation for parties"

**Information interfaces for utilities**

**Interfaces for services**

**Necessary basic services**
- Hubject Transnova

**Potential additional services**
- User support and background services for utilities
- Management and maintenance of charging network
- Design and construction of charging network
Helsinki EV Platform by electrictraffic.fi

- **User in focus**
  - User centric design emphasized in the infrastructure and services

- **Open platform open interfaces**
  - IT platform enables sharing of information and provides channel for traffic related SW and app development

- **Ecosystem model**
  - Multi ecosystem based structure and business model enabled

- **Advanced electricity networks**
  - Low CO2 generation using hydro and sustainable energy as primary energy sources
  - High adaptation rate of SG 2.0
## Northern Collaboration 23.5.2013
Ilmarinen Building, Porkkalankatu 1, Helsinki

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<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Speaker(s)</th>
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<tr>
<td>9:30</td>
<td>Registration and coffee</td>
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<tr>
<td>10:00</td>
<td>Opening words</td>
<td>Raine Hermans</td>
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<tr>
<td>10:10</td>
<td>Introduction of Electromobility – National approach</td>
<td>Jarmo Tuisk</td>
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<td>Estonian experience in creating electric vehicle ecosystem</td>
<td>Jón Björn Skúlason</td>
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<td>Icelandic approach</td>
<td>Anders Lewald</td>
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<td>The Norwegian EV success - how and the way forward</td>
<td>Asbjørn Johnsen</td>
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<td>Swedish approach</td>
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<td>12:00</td>
<td>Lunch</td>
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<tr>
<td>13:00</td>
<td>Introduction of Electromobility – Business approach</td>
<td>Eero Elenurm</td>
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<td>Electromobile Estonia - a business view</td>
<td>Elias Pöyry</td>
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<td>Business Approach to Electric Mobility Operator</td>
<td>Ole Henrik Hannisdahl</td>
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<td>Why are thousands of Norwegians buying EVs? Lessons learned from the</td>
<td>Jens Christian Lodberg Høj</td>
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<td>Norwegian marketplace</td>
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<td>Electromobility – the option for new business models</td>
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<td>14:30</td>
<td>Coffee</td>
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<td>15:00</td>
<td>Panel discussion: Collaboration in practice, benefits and barriers</td>
<td>Piia Pasanen</td>
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<tr>
<td>15:45</td>
<td>Closing words</td>
<td>Martti Korkiakoski</td>
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<td>16:00</td>
<td>Networking</td>
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<tr>
<td>17:00</td>
<td>End of session</td>
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The Market – When?

Current EV stock 150,000+ (IEA EVI)
EV Stock in Finland: BEV 122, PHEV 187

2012
- Norway 10,000
- Denmark 1,400 (EVI)
- Sweden 1,200 (EVI)
- Estonia 600
Support and Incentives

- Norway
  - Apr 2013 number of EV’s 12,000
  - No taxes
  - In Oslo, usage of the bus lane, free parking in city spaces.
  - 4,000 charging posts and 130 fast-charging stations.

- Denmark
  - No registration tax
  - Free parking in Copenhagen

- Sweden and Finland
  - Support for demonstration projects

- Estonia
  - Maximum 50% support of purchase price depending on battery capacity
  - 165 fast charging stations
ECV – Tubridi

Need
- Energy efficient mobile working machines; reduced fuel consumption, reduced emissions

Solution
- Virtual simulation of mobile working machines with Hardware-In-Loop (HIL) testing possibility of power transmission components
- Answers to questions like:
  - “What is the load cycle like of that special working machine?”
  - “How much is fuel consumption reduced by hybridisation?”
  - “What size of energy storage should I choose?”

Benefits
- Load cycle generated without measurements, basis for hybridization
- Sizing of the components (energy storages, electric motors, …) fast and easy by simulation tests
- Faster product development with less prototypes (huge and expensive)

Users
- Product development of mobile working machines and power transmission lines.

www.ecv.fi/tubridi/

HIL-simulator
- Model of working machine
- Model of environment
- Movement platform
- Testing of real components
  - Electric motors
  - Frequency converters
  - Energy storages

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- juha.pyrhonen@lut.fi

DM 04-2011
ECV – eStorage2

User need
- Understanding advanced battery technology for different applications
- Identifying the feasibility and limitations of current battery technology
- Design and optimization of traction battery systems for specific applications

Solution
- State-of-the-art research facilities for advanced battery technology
- Bridging the gap between fundamental and industrial R&D
- Linked to industrial projects and development platforms to verify technology

Benefits
- Choice of technologies by benchmarking, validation and comparison
- Development of optimized components by demonstrations
- Cost savings and risk management through right technology choices

Users
- Enterprises developing electric vehicles and mobile machinery
- Stakeholders developing electric mobility infrastructure
- Open cross-cutting competence centre for electrochemical energy storage

www-address: http://www.ecv.fi/estorage2/

General Information (optional)
- 2 research parties
- 8 industrial parties
- Research facilities for battery cells, modules and packs
- Planned overall budget 2.4 MEUR (4 years)
Arousing Public (and Media) Interest

Feb 5 2012, -26 Centigrade

Apr 29 2013

ERA, Electric Raceabout by Metropolia

Acceleration 0-100 km/h 6 sec.
Operation range 200 km
Energy consumption is equivalent to fuel consumption as 2,35/100 km
Top speed 200 km/h
Thank You!

- Consortia web pages
  - [http://sahkoinenliikenne.fi/](http://sahkoinenliikenne.fi/)
  - [http://www.evelina.fi/](http://www.evelina.fi/)
  - [http://ecv.fi](http://ecv.fi)
  - [http://winteve.fi](http://winteve.fi)
- LinkedIn group
  - [http://www.linkedin.com/groups/Tekes-Electric-Vehicle-Systems-4069395?gid=4069395&trk=hb_side_g](http://www.linkedin.com/groups/Tekes-Electric-Vehicle-Systems-4069395?gid=4069395&trk=hb_side_g)