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Federal Ministry
of Transport,
Innovation and Technology

2050

Proceedings

Smart Energy Networks- Research Activities in Europe

February 27th – 28th 2007
Vienna / Austria

www.e2050.at

e2050

The Austrian Strategy Finding Process ENERGIE 2050

The medium and long term security of our energy supply is one of the major concerns of the 21st century. Questions arise, such as: Which paths of progression are preferable? Which technological options need to be developed? Which chances and risks can be identified? In order to clarify such questions and to provide future technologies and solutions, research will play an important role.

Within the frame of the Austrian strategy finding process **ENERGIE 2050**, initiated by the Austrian Federal Ministry of Transport, Innovation and Technology, topics like security of supply, new scenarios as well as the network of global, European and regional strategies are discussed with stakeholders. Long-term strategies and measures along with adequate research goals are developed.

A crucial role is granted to results that have been achieved so far with the "Austrian Programme on Technologies for Sustainable Development", the outcome of EU research projects and experience from international co-operation in the framework of the IEA (International Energy Agency). In this regard, as one of seven key issues for the **new Austrian Energy Research Programme**, the topic of **Intelligent Energy Systems and Grids** was identified as a central area of research for the future.

Hence, it is a pleasure and honour for Austria to host the brokerage event of the European Commission of the First Call in the 7th Framework Programme on the topic of Smart Energy Networks.

The day before **BMVIT is organising a get together of national and regional research programmes** in this area to exchange experiences, discuss common interests and possibilities of collaboration.

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CONTENT

Programme

Feb. 27th: National and Regional R&D Programmes

12.00 Registration / Lunch

13.00 Welcome by the Austrian ministry of Transport, Innovation and Technology
e2050 - The new Austrian Energy Research Programme
Michael Hübner, BMVIT

13.10 The European Technology Platform Smart Grids
Ruud de Bruijne, Senter Novem

13.25 European Research Infrastructure in the field of Smart Energy Networks
Brigitte Weiß, EC

13:40 Energy Base Vienna and the European Network of Excellence DERLAB
Hubert Fechner, arsenal research

14.00 – 17.00 **Presentations of national and regional Research Programmes**
Poster Session of national and regional Projects and Programmes

17.00 Conclusions
Michael Hübner, BMVIT

19.30 Dinner at a typical Viennese "Heurigen"

Feb. 28th: EC Information and Brokerage Day for the 1st FP7 Call

8.00 Registration

9.00 – 17.30 Information by the European Commission about the content of the Work Programme and the first call for proposals, explanation of available funding schemes, presentation of evaluation criteria and process.

Programme "National and Regional R&D Programmes"

12.00 Registration / Lunch

13.00 Welcome
Anton Plimon, Arsenal Research, Austria
Michael Hübner, Ministry for Transport, Innovation and Technologies, Austria

13.10 The European Technology Platform Smart Grids
Ruud de Bruijne, Co-Chair of the Mirrorgroup to the TP Smart Grids

13.25 European Research Infrastructure in the field of Smart Energy Networks
Brigitte Weiß, EC

13.40 Energy Base Vienna and the European Network of Excellence DERLAB
Hubert Fechner, arsenal research, Austria

Presentations of National Programmes
Chair: Michael Hübner, BMVIT

14.00 Smart Grids Activities in the Finnish Distributed Energy Systems Programme
Jonas Wolff, Programme Manager, Technology Centre Merinova, Finland

14.15 ForskEL, the Danish Renewable Energy Research and Development Programme
Lise Nielson, Programme Coordinator, Energinet.dk, Denmark

14.30 The Swiss National Research Programme "Networks"
Patrick Favre-Perrod, ETH Zürich, Switzerland

14.45 R&D for Smart Energy Networks in Austria
Albrecht Reuter, Programme Advisor, IRM, / Michael Hübner, BMVIT

15.00 Coffe Break / Poster Presentation of National Programmes and Projects

15.45 Smart Energy Networks and Energy Storage- A French National R&D Programme
Eric Peirano, Deputy Head, Renewable Energies Department, ADEME, France

16.00 Netherlands National R&D programme Grids
Ruud de Bruijne, SenterNovem / Gert van Uitert, Ministry of Economic Affairs, Netherlands

16.15 RENERGI- Clean Energy for the Future in Norway
Frank Nilsen, Programme Advisor, The Research Council of Norway

16.30 Smart Energy Networks Activities at Nordisk Energy Research
Frank Nilsen, The Research Council of Norway

16.45 Smart Energy Networks Activities in Spanish R&D Programmes
Raúl Reyero, IKERLAN, Spain

17.00 Conclusions
Michael Hübner, BMVIT

19.30 Dinner at a typical Viennese "Heurigen"

e2050 NACHHALTIGwirtschaften

ENERGIE 2050

Austrian Strategy Finding Process and Programme Development

Michael Hübner
Energy and Environmental Technologies
Federal Ministry for Transport, Innovation and Technology

February 27th 2007, Vienna

e2050 NACHHALTIGwirtschaften

Goal of the Initiative

Develop structure and content of future energy research programmes supporting Austrian energy, environment and technology policy

Emphasize strategies and technology options with a high potential for practical implementation

bmvit Bundesministerium für Verkehr, Innovation und Technologie
Smart Energy Networks
Feb. 27th 2007

e2050 NACHHALTIGwirtschaften

Objectives

- Increased R&D budgets
- Enhanced international cooperation
- Emphasis on technology transfer and implementation
- Establishment of additional research infrastructure
- Long term planning horizon
  → “lighthouse projects, integrated projects”

e2050 NACHHALTIGwirtschaften

Direction of Programme:

- Long-term perspective
- Strategic research
- Technology-related topics

Thematic focus:

- Intelligent Energy-Systems
- Energy Efficiency
- Renewable Energy Sources

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Smart Energy Networks
Feb. 27th 2007

e2050 NACHHALTIGwirtschaften

Programme Structure

Strategic Research

- Long term climate impact
- Security of supply, resource management
- “Life style” impact on demand
- Full cost basis

Technological Research

e2050 NACHHALTIGwirtschaften

Technological Focal Areas


Energy systems and grids


Biofuels production (biobased industry)


Energy use in industry


Energy use in buildings


Demand side issues and appliances


Advanced combustion and conversion

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Smart Energy Networks
Feb. 27th 2007

e2050 NACHHALTIGwirtschaften

Process of Programme Development

- **Seven thematic expert networks for programme preparation**
  - Identify priorities, barriers, R&D needs
- **Coordination workshops**
  - Integration of thematic results (overlaps, blind spots)
  - Develop overall priorities and R&D program structure
- **Completion: Summer 2007**

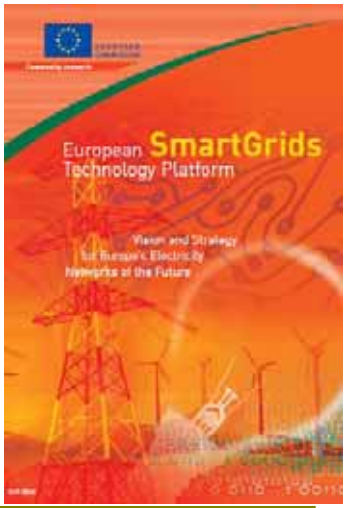
SmartGrids

European R&D for the Electricity Networks of the Future

Ruud de Bruijne
Vice chair Mirror Group
r.de.bruijne@senternovem.nl

Overview

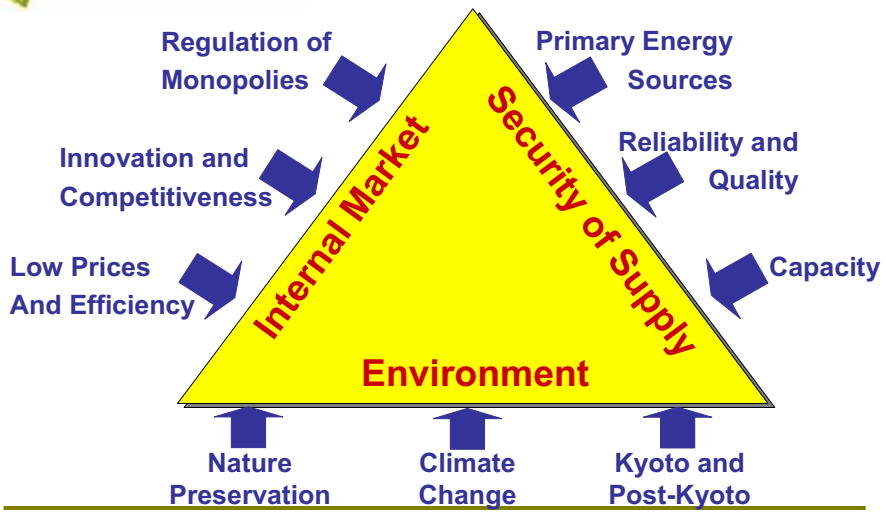
- Electricity market
- ETP SmartGrids
- Vision
- SRA
- ERA-NET SmartGrids



Power System - figures

- 430 million people served
- 2500 TWh/a
- Installed capacity 560 GW
  value: 280G€
- 230,000 km HV network
  value 90G€
- 5,000,000 km MV+LV network

Drivers energy market



Transition: driving factors future grids

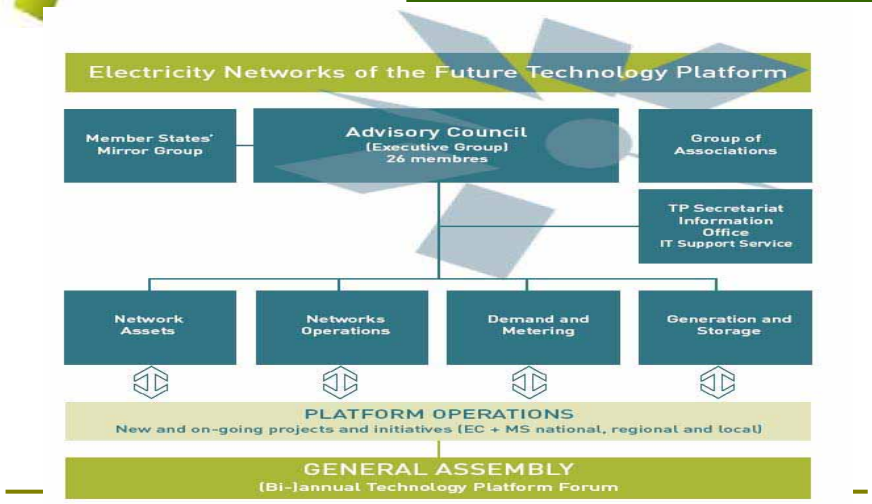
- Investments 2030:
  - Renewal: 300 GW
  - New capacity: 600 GW
- Increased customer participation
- Pressure on more liquid internal market
- Handle grid congestion (with market based methods)
- EC & national policies to low carbon generation, RES and efficient energy use
- Integration of RES and DG
- Progress in technology

ETP SmartGrids Objectives

- Shared vision of private and public sector
- Strategic Research Agenda, increased research effort
- Align RTD projects and new European, national and regional programmes
- Implementation of the strategic research agenda and deployment plan

TP SmartGrids

SMARTGRIDS



SmartGrids vision

SMARTGRIDS

Sustainable, competitive and secured supply

- **Flexible**
  fulfilling customers needs
- **Accessible**
  to all network users, particularly RES and high efficiency DG with zero or low CO2 emissions
- **Reliable**
  assuring and improving Quality of Supply and resilient to hazards and uncertainties
- **Economic**
  best value through innovation, efficient energy management and level playing field competition and regulation

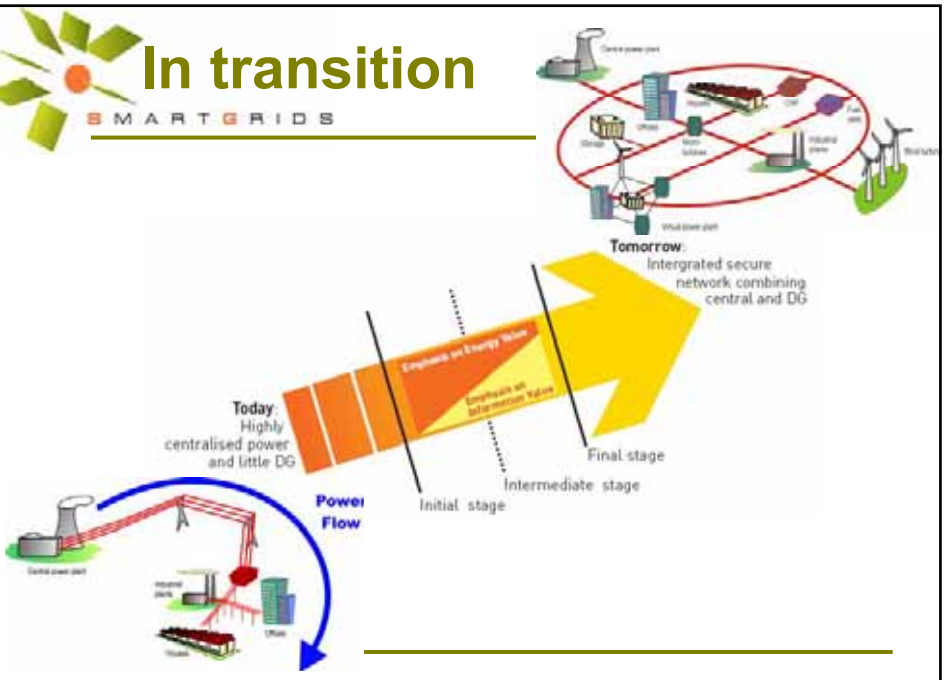
Key elements vision

SMARTGRIDS

- Toolbox of proven technical solutions, rapidly deployed and cost effective to enable power injection for all sources into the existing grid
- Harmonising regulatory and commercial frameworks in Europe > facilitate cross border trading
- Establish shared technical standards and protocols for open access and manufacturer independency
- Information, computing and telecommunication systems for innovative service arrangements, improve efficiency and enhance services
- Interfacing of new and old designs of grid equipment to ensure inter-operability and control

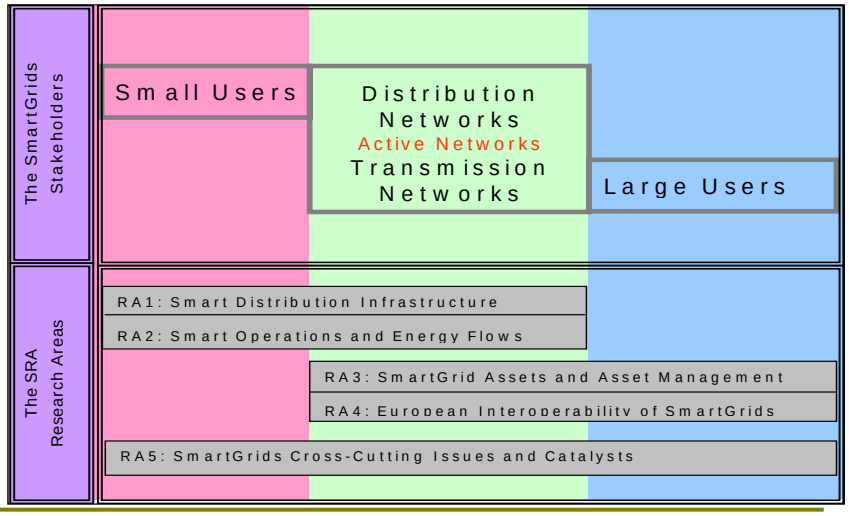
In transition

SMARTGRIDS



Strategic Research Agenda

SMARTGRIDS



ERA-NET SmartGrids

SMARTGRIDS

- Research financed by:
  - industry
  - national & regional programmes
  - EC (FP7, EIB)
- Coordination National & regional programmes => ERA-NET
- Mirror Group willing to support establishment of this ERA-NET

ERA-NET SmartGrids

- Joint strategies
  - joint calls
  - joint evaluation & dissemination approach
  - transnational infrastructure
  - transfer know how
- Focus
  - Transport
  - Distribution
  - Cross cutting
    (regulatory, spatial planning)

ERA-NET SmartGrids

- Step 1: consortium building
- Step 2: objectives, focus, work programme
- Step 3: proposal, submission
- Step 4: kick off

ERA-NET SmartGrids

Status:

- Open to all EU programme owners (Ministries) and – managers (energy agencies)
- So far 6 countries and 1 region already expressed willingness to participate
- ETP SmartGrids connected & supportive
- Michael Hübner & Ruud de Bruijne coordinate establishment ERA-NET and EC proposal
- Available info: discussion paper

European Research Infrastructure in the field of Smart Energy Networks

Brigitte WEISS
European Commission
27.2.2007

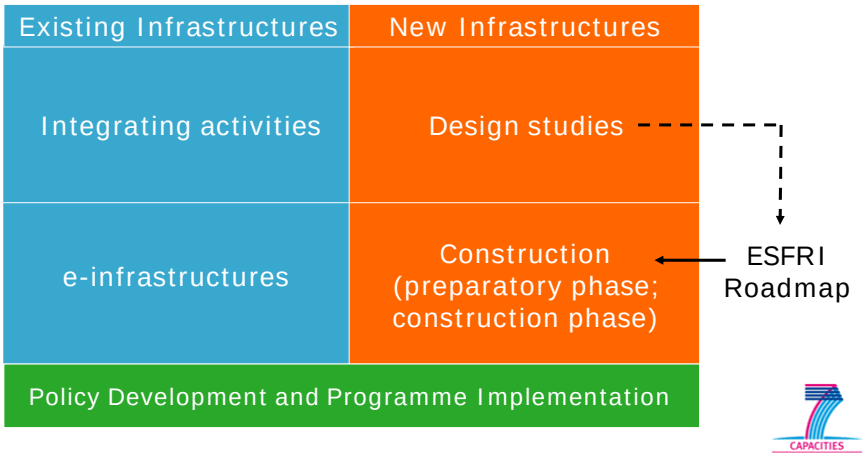
FP7 2007 –2013 Specific Programmes

- *Cooperation* – Collaborative research
- *Ideas* – Frontier Research
- *People* – Marie Curie Actions
- *Capacities* – Research Capacity

+

- JRC non-nuclear research
- JRC nuclear research
- *Euratom*

FP7 Research Infrastructures in brief



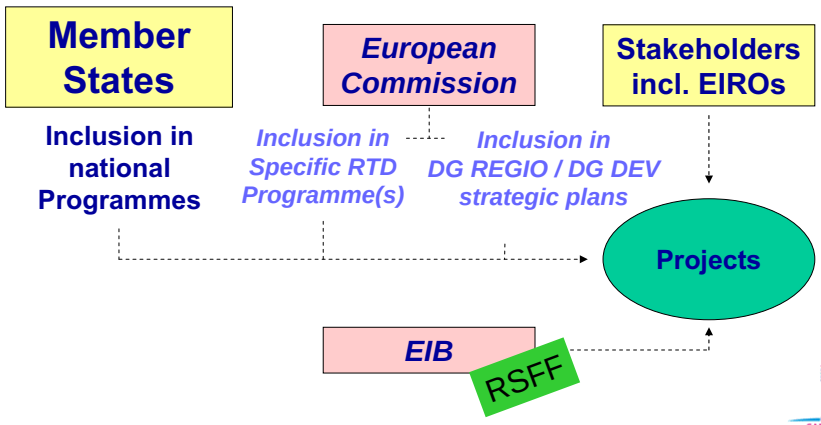
The Community Research Infrastructures action

- "Research infrastructures" refers to facilities, resources and related services used by the scientific community for leading edge research
  - ➔ Major scientific equipment
  - ➔ Scientific collections, archives and structured information
  - ➔ Entities (of unique nature) used for research
  - ➔ ICT-based infrastructures
  - ➔ Can be single-sited, distributed, virtual

Objectives of the Community Research Infrastructures action

- Optimising the use and development of the best existing research infrastructures in Europe (e.g. smart grids?)
- Helping to create in all fields of S & T new research infrastructures of pan-European interest needed by the European scientific community
- Supporting programme implementation and policy development (e.g. international cooperation)

The role of the Community Research Infrastructures action



First call for proposals: new research infrastructures

- For design studies, preparatory phase, and support actions
  - ➔design studies: 35 M€
  - ➔Support actions: 28 M€
- Indicative budget for preparatory phase:
  - ➔34 projects, 130 M€
- Closure: 2nd May 2007
- First contracts to come into force before end 2007

First call for proposals ctnd.

- Design studies
  - ➔Design and feasibility of a new research infrastructure (all fields of science)
  - ➔Technical work, organization, logistics,...
- Preparatory phase:
  - ➔Call limited to 34 projects on ESFRI list (member states commitment)
  - ➔Work comprises all activities that lead to a start of the construction at the end of the PP-project
  - ➔Projects have often been design studies in FP6
- At least 3 member states or associated states

Existing infrastructures

Structure better and integrate, on a European scale, the way research infrastructures operate and develop, in a given class:

- ➔ By opening and optimising the access to and the use of the existing research infrastructures in the different Member States and Associated States
- ➔ By better structuring and integrating, on a European scale, the operation(s) of research infrastructures, and by fostering their joint development (qualitative and quantitative)

Projects: Integrating Activity

Main characteristics of an Integrating Activity

- Collaboration of existing research infrastructures in a given field of science
  - ➔ Ideally all major RI's in Europe in one field
  - ➔ At least 3 member states or associated states
- 3 types of activities obligatory in one project
  - ➔ Networking Activities
  - ➔ Trans-national Access
  - ➔ Joint Research Activities
- Project type: collaborative project + coordination and support actions

Main characteristics of an average Integrating Activity ctnd.

- Average number of contractors: 19 of which 7 are offering access (in FP6)
- Typical duration of 4 years
- Average EC contribution: ~10 M€
  - ➔ Management: ~ 6%
  - ➔ Networking Activities: ~ 15%
  - ➔ Trans-national Access: ~ 36%
  - ➔ Joint Research Activities: ~ 43%
- List of funded projects (FP6)
  http://cordis.europa.eu/infrastructures/projects.htm

IA-SFS (Physics)

developing a pan-European Synchrotron and FEL infrastructure

EC contribution: 27 M€

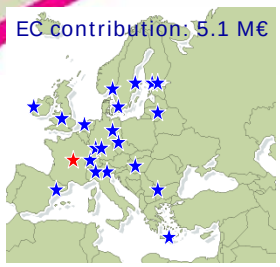
TA (~19 M€):
- 15 installations, with 4000 users from a very broad spectrum of disciplines

NA (~2 M€):
- Specialized workshops, conferences and schools (support areas of transnational cooperation)
- Exchange of scientists

JRA (~6 M€):
- European platform for Protein Crystallography
- Development of:
  - Photo-injector for X-ray Free Electron Lasers
  - Instrumentation for Femto-second Pulses
  - Diffractive x-ray optics
  - Superconducting Ondulator

EUSAAR (Environment)

EC contribution: 5.1 M€



Developing a pan-European research infrastructure for the measurements of atmospheric properties

TA (~0.2 M€):
11 ground-based stations for atmospheric research

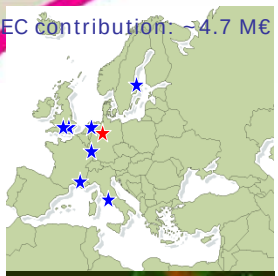
NA (~3.2 M€):
- Standards and exchange of good practices on sampling, measurement and analysis of aerosol parameters
- Training on aerosol sampling and measurements
- Web portal and Database on aerosol products

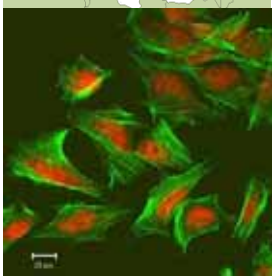
JRA (1.7 M€):
- Methodology for determining aerosol optical density
- Standard procedures for aerosol hygroscopic growth determination
- A real time data collection of aerosol measurements

➢A network of research stations exploiting the diversity of regional backgrounds

EUPRIM-Net (Biomedical Sciences)

EC contribution: ~4.7 M€





Developing a pan-European research infrastructure of primate centres

TA (~1.3 M€):
- Gene, tissue, cell, gamete and serum banks
- Experimental animals

NA (~1.7 M€):
- Standards (SOPs for quarantine and experiments)
- Training on handling (blood sampling, injections...)
- Courses and textbook (primate behaviour, husbandry, nutrition...)

JRA (~1.7 M€):
- Molecular typing methods
- Pathogen detection assays
- Telemetry prototyping

➢Refinement, Reduction, Replacement

Priority topics for RI's

- Health (6)
- Food, Agriculture and Biotechnology (3)
- Information and Communication Technologies (3)
- Nanosciences, Nanotechnologies and Materials (2)
- Energy (5)
- Environment (4)
- Transport (3)
- Socioeconomic Sciences and Humanities (4)

➔ 30 priority topics for RI's in 7 fields of R&D

➔ In call together with bottom up approach

Priority topics for RI's under the targeted approach

- Example Energy:
  To bring together existing research infrastructures
  - Aiming at the development of next generation bio-fuels
  - Integrating European testing and analysis RI for hydrogen and fuel cells
  - For ocean energy research
  - For concentrating solar power research
  - For research on Smart Energy networks

Synergies Cooperation Programme and targeted RI activities: one Example

- Priority topic for RI: *To bring together existing research infrastructures for research on Smart Energy networks*
- Link with the Cooperation programme: *Smart Energy networks, Activity Energy 2007.7 .1 – 7.3*
- Typical existing RI relevant to the topic: EdF, France; ISET Test and certification Centre for Modular System Technology, D; CEA/CENEC/LSEC Laboratory for storage technologies, FR; T&D Consulting / High Power and high voltage laboratories, NL; Arsenal Research, AT;...

Second call for proposals existing Research Infrastr. closing early 2008

- For bottom up and targeted topics
- Indicative budget of 275 M€
  - ➔ 25 to 30 projects to be selected
- Closure: March 2008
- Single stage procedure for evaluation
  - ➔ remote + panel evaluation
- Results within 4 months after closure date
- First contracts will come into force before the end of 2008

No competition within one field of science!

Summary for Smart Grids

- Design study in first call for proposal
  - Closure 2nd May 2007
  - Design and feasibility of a new Research Infrastructure of European significance
- Integrating activity in second call for proposal
  - ➔Closure: March 2008
  - ➔Project includes the leading already existing Research Infrastructures
- Competition between the fields of science, not within one field! (unlike cooperation programme)
- Projects lead to major development of partners

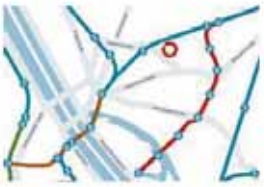
Thank you for your attention

For more information see

http://cordis.europa.eu/fp7

arsenal research
Ein Unternehmen der Austrian Research Centers

Techbase as new Technology District in Vienna



Wien WIRTSCHAFTS FÖRDERUNGS FONDS

HAUS der Zukunft

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Dieses Projekt wird aus EU-Mitteln kofinanziert

Erneuerbare Energietechnologien - EET

arsenal research
Ein Unternehmen der Austrian Research Centers

1st step: Techbase VIENNA (2005)

Erneuerbare Energietechnologien - EET

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arsenal research @ TECHbase Vienna

- MOBILITY and ENERGY
- 195 employees
- 10.000m² Research-infrastructure
- 5.500m² Laboratories

- TECHbase = Center of Competence for
  - Modern Education
  - RTD - Companies
  - international Hightech-Companies
  - Innovative Start-ups

Erneuerbare Energietechnologien - EET

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2nd step: ENERGY BASE (2007-2008)

ENERGY base

Erneuerbare Energietechnologien - EET

arsenal research

ENERGY BASE

- Passive-house Office building
- 4500 m² office rooms
- 1500 m² Laboratories
- 100% heating and Cooling from renewable energy
- Wellness at work (best climate and convenience at the workplaces)
- Total energy reduction 80% compared to standard office building
  - Photovoltaics
  - Solar Cooling
  - Solar heating
  - Heatpump
  - Daylight-Control

Erneuerbare Energietechnologien - EET

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Ein Unternehmen der Austrian Research Centers

3rd step: University of applied Science

Urban renewable energy systems

- Starting September 2007
- 150 Students
- *Context: „Central energy systems and networks in the transition towards implementing more renewable sources“*
- Close cooperation with arsenal research
- Joint research and education activities

Erneuerbare Energietechnologien - EET

arsenal research
Ein Unternehmen der Austrian Research Centers

4th step: ENERGY BASE = One site of European Laboratory for Distribited Energy Ressources (EU Network of Excellence)

DERlab

Partner sites:

- *Kassel (ISET)*
- Milano (CESI)
- Netherlands (KEMA)
- Chambery (FRA)
- Manchester (UK)
- *Bilbao (LABEIN)*
- Lodz (TU)
- Sofia (TU)
- RISO (DK)
- Athens (Uni)

Erneuerbare Energietechnologien - EET

DERlab

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Ein Unternehmen der Austrian Research Centers

- **Integration of leading European Expert-groups aiming at:**
  - Requirements
  - Quality-Criteria
  - Test- und certification-Methods

  ...for distributed power generation

EUROPEAN

Interconnection standard

arsenal research
Ein Unternehmen der Austrian Research Centers

5th step: Innovative Energy companies starting business or moving to the ENERGY-Base

- Renewable Energy
- Power Electronics
- Communication Technologies
- Innovative Buildings
- Distributed Generation
- ...

arsenal research

Austrian Research focus on Smart Grids (I)

- **Engagement in international RTD Cooperations:**
  - EU Technology Platform
    - > Chairing of the Mirror Group
  - EU FP 7
  - IEA ENARD
    - > Workshop for Definition of first ENARD Annex March 20/21 at arsenal
    - > Meeting of the IEA ENARD Executive Committee at arsenal

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arsenal research

Austrian Research focus on Smart Grids (II)

- **National Research on smart grids:**
  - Programme Energy-Systems of Tomorrow
  - Smart grids as an important Focus in new National Energy Research „e2050"
  - Cooperation with Association of Utilities (mainly Network operators)
  - One of the European DER-Lab locations
  - Experimental Facilities at ENERGY BASE (existing and new laboratories)

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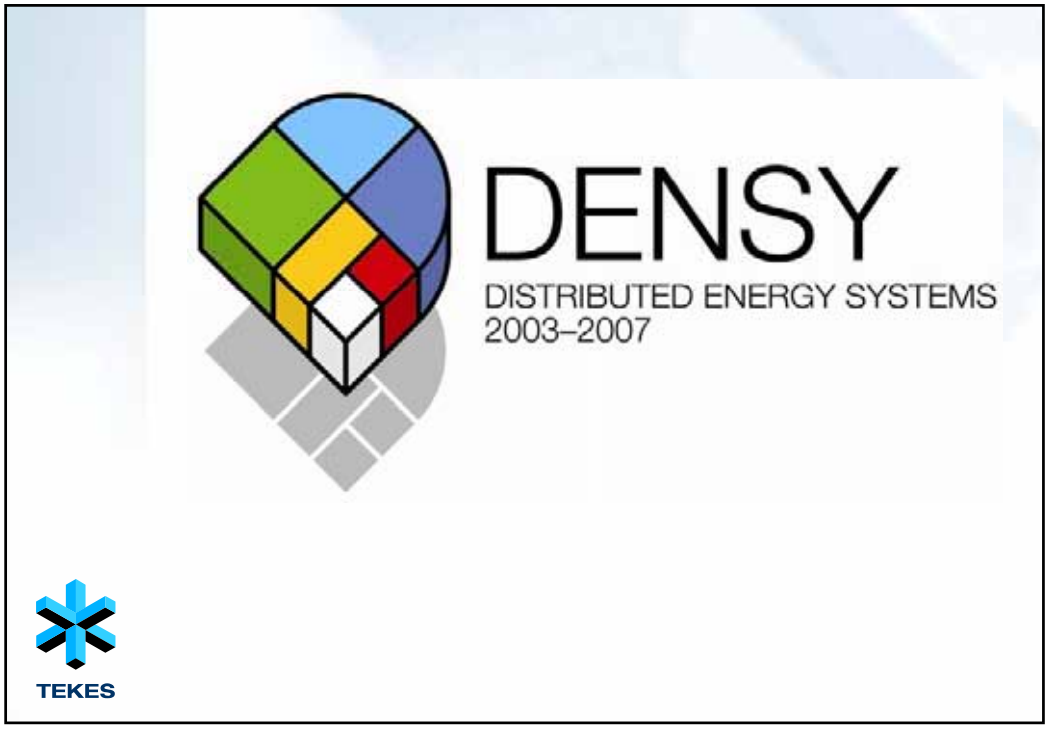
Final Target

- **Vienna Energy Competence Center - NEW Energy Innovation district**
  - > 250 Students, researchers in innovative Energy
  - Companies
  - Laboratories
  - Lecture halls
  - Conference halls

Target:

One of the leading EUROPEAN Centers of Competence in Renewable Energy Technologies and Distributed Energy Ressources


DENSY
DISTRIBUTED ENERGY SYSTEMS
2003–2007
TEKES


DENSY
DENSY - Distributed Energy Systems
Technology programme for the development of distributed energy systems
Duration: 2003-2007
Programme volume: 60 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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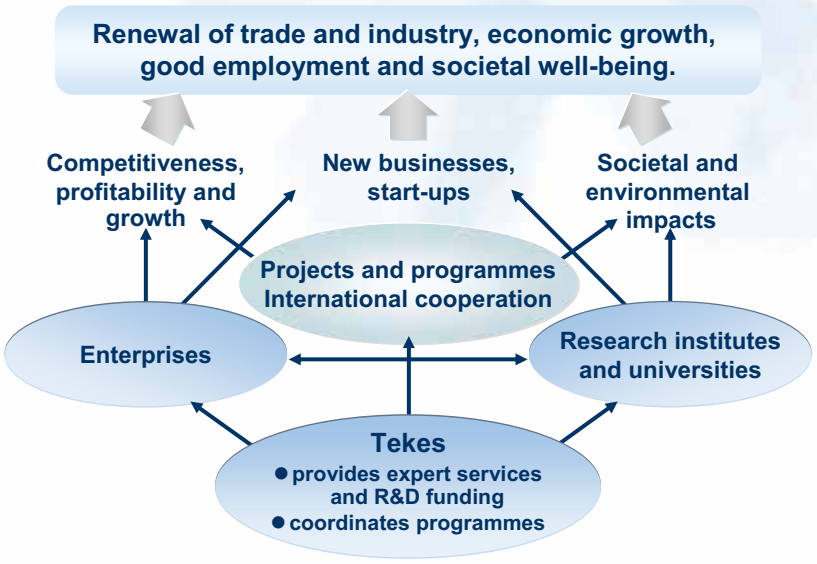
Impact of Tekes activities



TEKES

Key challenges in power transmission and distribution in Finland

- Main part of the grid is overhead line.
- Country is sparsely inhabited and forested.
- Difficult weather conditions (heavy snow fall, high winds, thunderstorms). Worsening?
- Distribution networks built mainly from the 1950's to the 1970's.

➔ Reliability of networks for rural areas.

- Increasing demands on power reliability and quality.
- Developing regulatory models.
- Operation in deregulated energy markets.

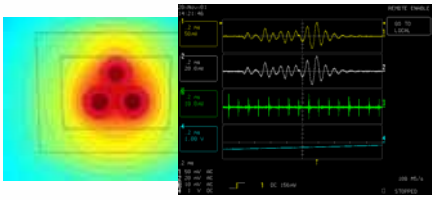
➔ Changing operational environment.

- More cross-border transmission capacity is needed.

TEKES

Tekes' activities in power transmission and distribution R&D

- National technology programme EDISON, Electricity Distribution Automation, 1993…1997
- National technology programme TESLA, Information Technology and Electric Power Systems, 1998…2002
- National technology programme DENSY, Distributed Energy Systems, 2003…2007



TEKES

Milestones in Finnish Power Distribution Technology Development

Microprocessor-based protection relays

Short circuit fault location

Realtime state estimation

Remotely-operated disconnectors

Automated fault isolation and power restoration

High-resistance ground fault indication and location

Network information systems

Tetra digital radio system

IT systems for electricity trading

Energy meter with power quality metering capability

Large scale AMR systems

1980 1990 2000

TEKES

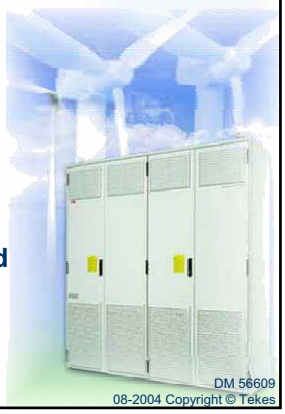
DENSY

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



TEKES

DENSY

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)

TEKES

DENSY

Programme Focus

Business models
- Energy services
- New business concepts
- Customer's decision making tools
- Financing instrumen

Integration
- to local energy source
- to local

System solution
- Intelligent components
- Compatibility
- Modelling and suring tools
- mation,
- d
- ystems

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

"Smart Grids"

nology
- Platforms, applic ons for evaluation functionality and costs
- Technical services, systems and equipment for providing total service concept

Demonstrations

TEKES

DENSY

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

TEKES

DENSY

Programme status

February, 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
- 11research institutes and universities
- Over 140 co-funding companies

- 54 industrial R&D projects
  - Product development
  - Improving manufacturing capabilities
  - Competence building
  - Business development

TEKES

DENSY

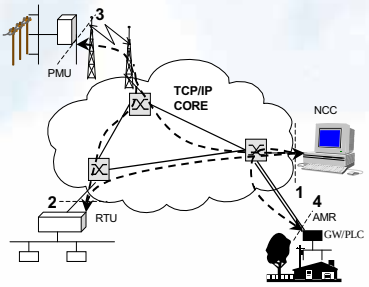
Project group ICT and Automation

Scope

- Application of ICT in energy technology

Objectives

- Platforms, applications models and simulations for assessment of functionality and costs
- Technical services, systems and products in a functional full-service concept



TEKES

DENSY

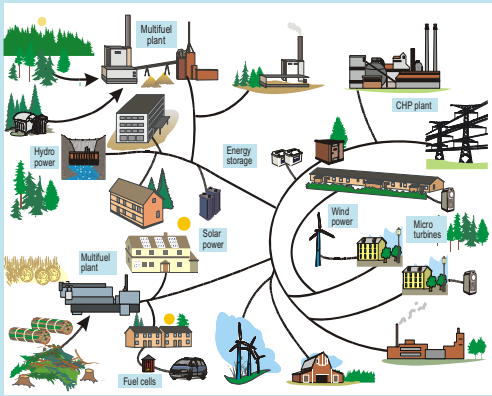
Project group Electric Systems

Scope

- Grid-connection of distributed generation

Objectives

- Proven, reliable and cost-efficient technology for power system integration
- Design tools and economic models for cost optimization
- Energy storage technology



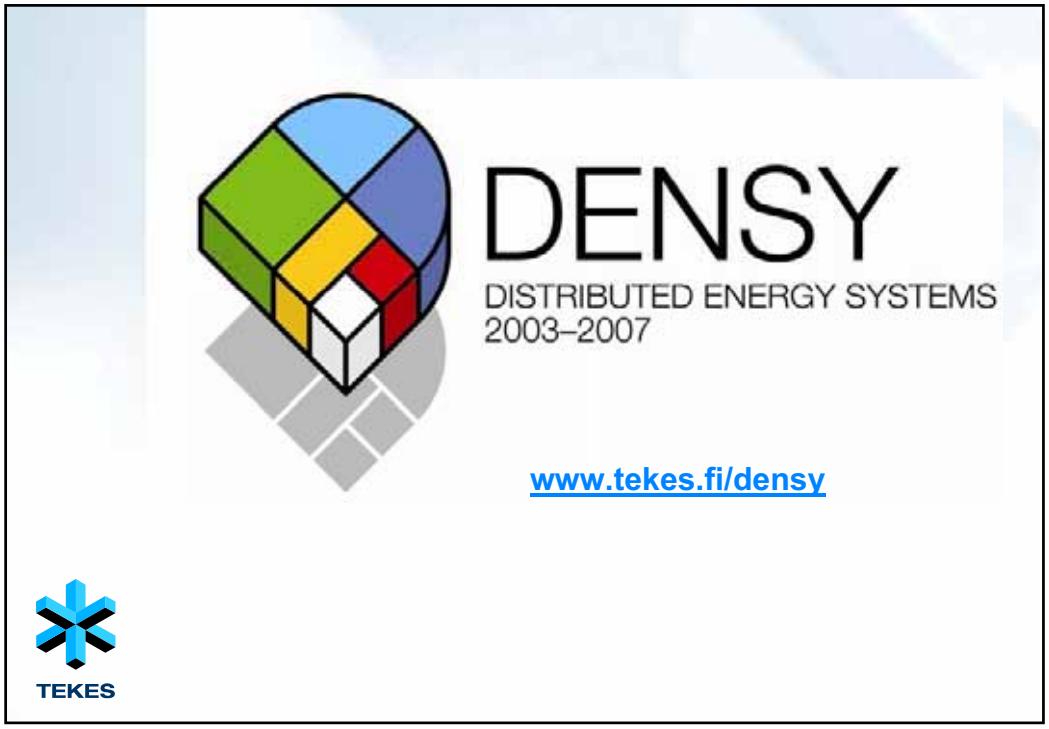
TEKES

Selcted Smart Grids-related Results

- <u>Research results:</u>
- TCP/IP-protocol for network communiction
- Active network management protocols
- Energy storage conceptualisation
- Supercondesator technology (product development underway)
- Modular simulation environment
- MULTIPOWER testing environment

- <u>Industrial products:</u>
- Distributed energy management systems
- Grid connection solutions
- Network management and protection technologies
- Condition monitoring technologies
- Metering technology
- Technology transfer and R&D cooperation (UK, USA)

TEKES


DENSY
DISTRIBUTED ENERGY SYSTEMS
2003–2007
www.tekes.fi/densy
TEKES

ForskEL

The Danish Renewable Energy Research and Development Programme

Lise Nielson
Programme Coordinator
lni@energinet.dk
www.energinet.dk

Energinet.dk

Energinet.dk is the regulator and Transmission system operator of the electricity and natural gas grids of Denmark

Challenges:

Development of a robust power system for efficient integration of large shares of renewable energy and distributed power production while supporting a well functioning market place.

The solution needs to be reached with an optimal consideration for the environment. The most important challenges are integration of renewable power production and an environmentally optimal development of the grid.

This means long term holistic planning in uncertain circumstances.

Strategic goals:

Development of a new system architecture to efficiently integrate large amounts of renewable energy and other distributed production or system ancillary units.

Realisation of the main grid structure for the 40 kV-system and strengthening of the cross-border connections.

Expand and improve our tool box with planning tools such as scenarios, externality and risc assessments.

A new Danish energy policy

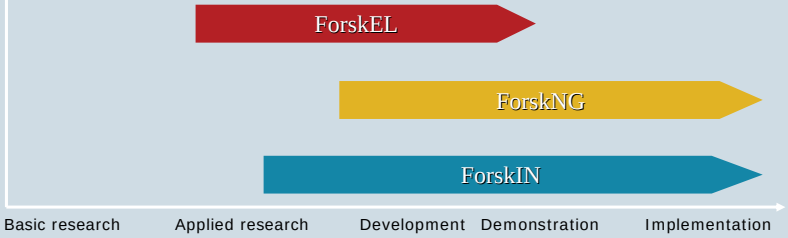
- The Danish government has proposed a new energy policy
- 30% RES in the overall energy system in 2025
- (already covers 28 % of annual power production)
- Wind power covers 50% of electricity demand in 2025
- (wind power covered 100 % of demand on New Years Eve)
- Energinet.dk (Danish TSO) has responded with a research and development programme *EcoGrid.dk* with the goal to develop the new technologies and new market solutions

Overview of Energinet.dk R&D programs

- Public Service Obligation R&D - ForskEL
  - Regulated by law
  - Research, development and demonstration for utilisation of environmentally friendly power production technologies, including safe grid integration
  - 130 mill. DKR/18 mill. Euro annullay
- Off shore environmental surveillance programme
  - Publicly funded R&D to ensure environmental safety in connection to the off shore wind farms
  - 84 mill. DKR/11 mill. Euro for the period of 2001-2006
- Energinet.dk's internal R&D - ForskIN
  - Programme is part of the benchmarked activities as TSO
  - Focus is on security of supply, development of the power system, and environmental issues
  - Annual budgets vary; usually about 10 - 15 mill. DKR/1.5-2 mill. Euro
- National gas grid research – ForskNG
  - Programme is part of the benchmarked activities as TSO
  - The aim is to develop new and renewable gas technologies to ensure security of supply
  - The budget in 2007 (first year of programme) is 4 mill. DKR/0.5 mill. Euro

ForskEL, ForskNG and ForskIN

- ForskEL projects have generel interest and results are in broad demand
- ForskNG projects has an aim to solve specific problems within Energinet.dk gas transmission
- ForskIN projects will help form the direction of development of the future Energinet.dk power system



Focus areas in the ForskEL call for 2007
www.miljovenligelproduktion.dk (2005)
www.miljovenligelproduktion2006.dk

Three main tracks

- Combustion technologies and biorefinery systems
  - Waste and solid biomass (Thermal comb. + thermal gasific.)
  - Biorefinery (Liquid biofuels + cascade thinking)
  - Combined heat and power (Natural gas CHP + mini- and micro CHP)
  - Other technologies (Biogas combustion)
- Fuel cells and energy carrier tecnologies
  - Fuel cells (Fuel cell tecnologies + fuel for these)
  - Energy carriers (Natural gas + hydrogen + liq. biofuels in CHP)
  - Other technologier (Biogas upgrading + gas cleaning)
- Integrated and distribuerede RE-technologies
  - Solar energy (Photovoltaic cells)
  - Control and regulation of power systems (Demand response, integration issues for RE)
  - Other technologies (Windpower + wavepower + other environmentally friendly power produktion technologies)

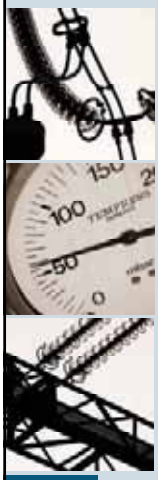
ForskEL and ForskIN – programme interactions

- ForskEL operates with an annual open call
- ForskIN does not have open calls, but relevant applications under ForskEL, that pertains to core activities of Energinet.dk are moved to ForskIN for funding
- Energinet.dk in house research staff is used for reviewing relevant applications and might also be part of the research activities in the projects
- This coordination ensures an optimal sharing and integration of knowledge between Energinet.dk, researchers and companies

ForskIN focus in 2007-2010

- Political decisions may lead to establishment of new, large amounts of RE in Denmark, to be integrated into the grid
- EU has opened the ball with the FP7 call under SmartGrid
- Energinet.dk collected the best applications from the 2006 and 2007 ForskEL calls and is in the process of forming a consortia under the ForskIN label, named EcoGrid
- The project will run in 2007 to 2010, with Energinet.dk and the partners funding phase 0 (consolidation of the consortia) and phase 1 (focusing the scope). The main work in phase 2 will be formed as an FP7 application, with broad European research, TSO, DSO and manufacturer participation.
- Also other projects have broad interest, like the Energy Forecast Project

Energy Forecast
Objective: Customer ethnology



- Project started this year, to work with customers on their level of technical insight.
- Energinet.dk will fund and oversee the project, and also provide model simulations and market price signals.
- A local TV network will broadcast daily energy forecasts, right after the weather guy.
- The challenge is to work out the language and the technically honest terms that will supply the electricity consumer maximum instant knowledge and the ability to act on market price signals.
- Monitoring of the customers in the area (250,000 households) to survey and meter their uptake of the new regime.

New concepts for active customer-integrated distribution networks ***are needed***

- Resources in the distribution networks are not truly integrated and not fully utilized in the power system
  - Wind power, PV, local CHP, micro CHP (incl. fuel cells, micro turbines …)
  - Demand
  - Heating and transportation (e.g. electric car, plug-in hybrid cars)
- Current network architecture is not designed for DG and intermittent sources
  - Flow pattern, protection, reactive power management, losses …
- Active distribution networks are needed
  - Optimal utilization of the distributed resources
  - Active market participation
  - Appropriate emergency response
  - Intelligent customer integration
  - Cost of bits << cost of new hardware

Denmark is a "real-life laboratory"

- High DG penetration in Western DK power system
  - Installed DG: 3,857 MW
  - Average load: 2,469 MW
  - Wind power covers 20% of the load
- Several research activities regarding network and control architectures in progress incl. real-life demonstration

Cell controller pilot project

Coordinated operation of wind and demand at island Bornholm

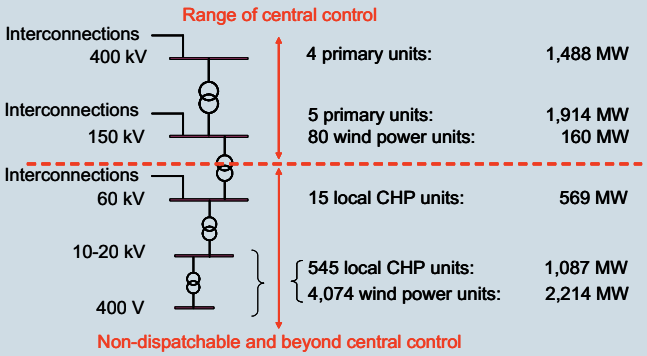
NextGen – future coherent electricity and information system with integrated DG

- Participation of local CHP in markets
- Ancillary services from DG/RES
- Development of IEC61850-standards

Technical University of Denmark
Centre for Electric Technology (CET)

Why we look for new grid operation options

The impacts on power markets, system operation and security of supply are causing concern. Energinet.dk, the TSO of Denmark, is developing new solutions for optimal management of the large DG base at hand.



Production capacity per voltage level in western Denmark, 2005.

EcoGrid challenge

- Need for development of new market-based control concepts and the related network architectures
  - Totally new solutions for power systems with high penetration of DG/RES is needed
- The Danish situation
  - A “real-life laboratory” is available
  - Data and operational experiences exist
- Denmark can contribute to European research on active distribution networks

Areas for cooperation

- Communications
  - What to relay to the TSO
  - What to relay to the DSO
  - What not to relay but just monitor
- How much demand response?
  - Only relevant in emergency mode and only the lower priority demands?
  - Or everyday, integral to the operation of the entire grid?
- What’s the interface between demand response and market price signals?
  - Customer profile, equipment, time to react..
- Case studies
  - Animations, models, simulation data and examples, benchmarks.
  - We need to share generic cases with transparent data sets, to speak the same language. This will provide a short cut to good solutions to the other issues.

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Bundesamt für Energie BFE
Office fédéral de l'énergie OFEN
Ufficio federale dell'energia UFE
Swiss Federal Office of Energy SFOE

Swiss National Research Programme „Networks“

Vienna, 27 February 2007

Presentation Outline

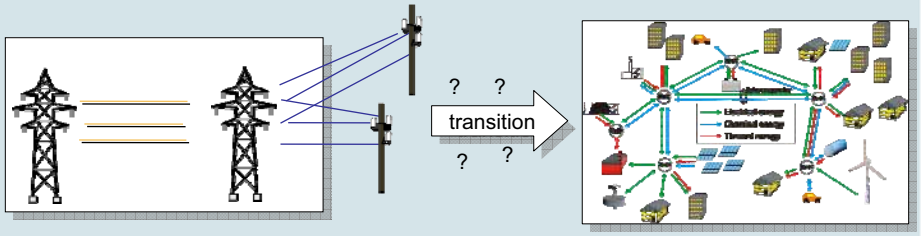
- The research programme:
  - Background
  - Core activities
  - Committee participation
- A project in the programme:
  “Vision of future energy networks”
  - Goals and research activities
  - National and international cooperation
  - Outlook

Background of the Research Programme „Networks“

- Switzerland as „hub“ in Central European energy networks
- new legislative, environmental and technological challenges related to energy networks

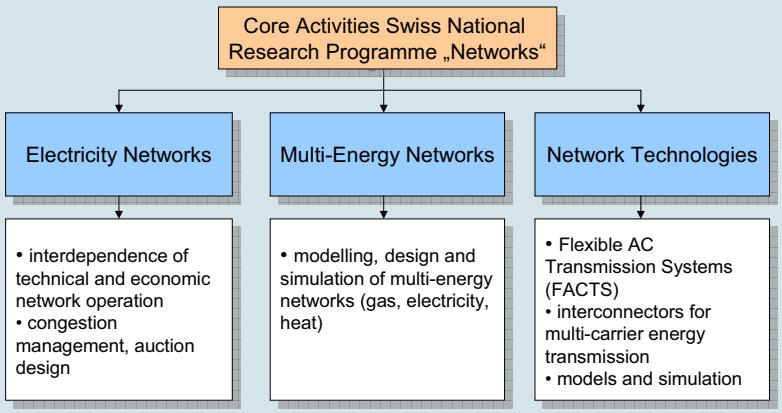
=>

- creation of a **Swiss National Research Programme „Networks“**
- programme officially operable since January 2007

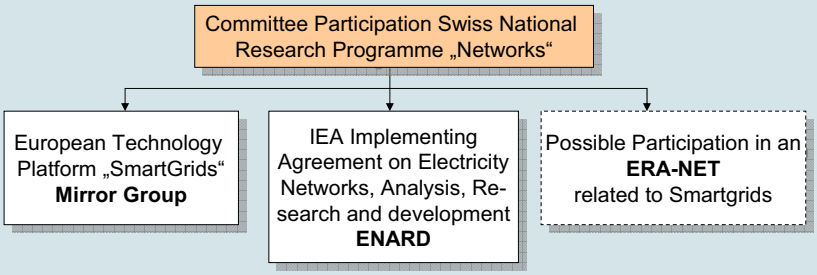


Core Activities of the Swiss National Research Programme „Networks“

„Facilitate, coordinate and promote research in the field of energy networks“



Committee Participation of the Swiss National Research Programme „Networks“



• the Swiss research programme would welcome the creation of an ERA-NET to work jointly on research topics (development of mutual calls etc.)

Major Co-Financed Projects

- Integration of Distributed Generation in Low-Voltage Grids:
  - Pre-study on field test: responsibility, consumer reactions, etc.
  - Definition of the pilot micro-grid (which equipment, etc.)
  - Business plan for realisation
- Integration and Optimisation of Combined Heat and Power Systems in Urban Applications (planned):
  - Optimal operation of heat and electricity networks
  - Extension of existing networks through distributed CHP
- Vision of Future Energy Networks

Vision of future energy networks: Project idea

ETH Eidgenössische Technische Hochschule Zürich Swiss Federal Institute of Technology Zurich

„How will energy networks look like in 2050 and after?“

- Motivation:
  - Increasing penetration of distributed generators (DG)
  - Stochastic (non-dispatchable) generation share grows
  - Public concern about environmental impact of T&D technologies
- Key concepts:
  - Greenfield approach
  - Multi-energy network (electric, chemical, thermal, ...)
  - Energy services rather than load “supply”
  - Integration of mobility as a consumer/storage/converter into the energy system
  - “Physical approach”

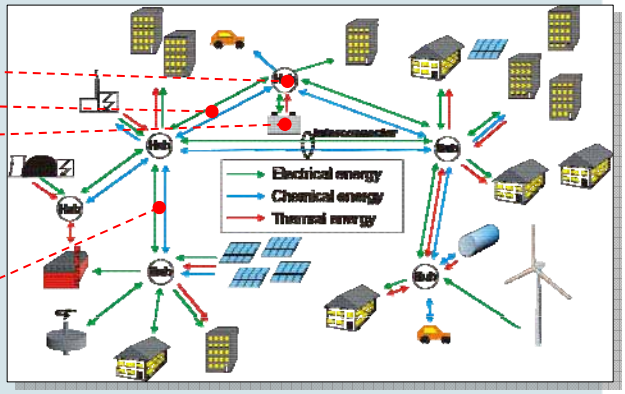
Vision of future energy networks: Results

ETH Eidgenössische Technische Hochschule Zürich Swiss Federal Institute of Technology Zurich

A Framework for future multi-energy networks

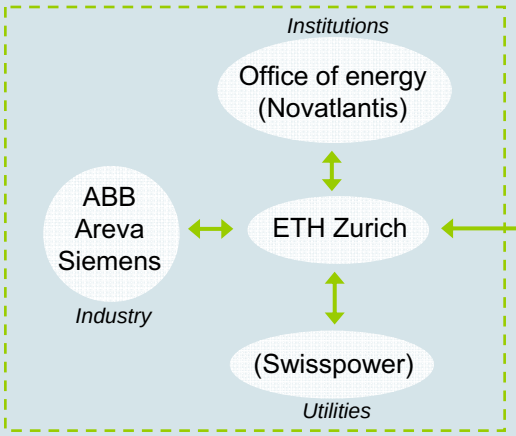
System analysis:
- Power couplings
- Power flows
- Storage models
- Reliability models
- First system layouts

Technological aspects:
- Basic investigation of multi-energy transmission



Vision of future energy networks: Network of Cooperations

ETH Eidgenössische Technische Hochschule Zürich Swiss Federal Institute of Technology Zurich



Academic partnerships

RWTH Aachen
NTNU Trondheim
TU Delft

- Short-lived exchanges
- Joint PhD student seminars
- Definition of common projects

Vision of future energy networks: Outlook

ETH Eidgenössische Technische Hochschule Zürich Swiss Federal Institute of Technology Zurich

- "More theory":
  - Investment and risk assessment
  - Control and dynamics in hub networks
- More interaction:
  - Intensification of international cooperation
  - More dialogue with stakeholders (case studies, e.g.)

→ **The Swiss federal office of energy provides crucial expertise and contacts for the development and spread of research activities**

- Thematic relations to Smartgrids:
  - RT2.1: Operational integration of DG and active consumers
  - RT5.3: Multiple energy carrier systems
  - RT5.6: Underpinning technologies for innovation

Summary

Swiss National Research Program „Networks“

- is operable since January 2007
- focuses on research on electricity networks, multi-energy networks and network technologies
- participates in the Technology Platform „SmartGrids“, IEA ENARD (and ERA-NET)

Contact

Swiss federal office of energy

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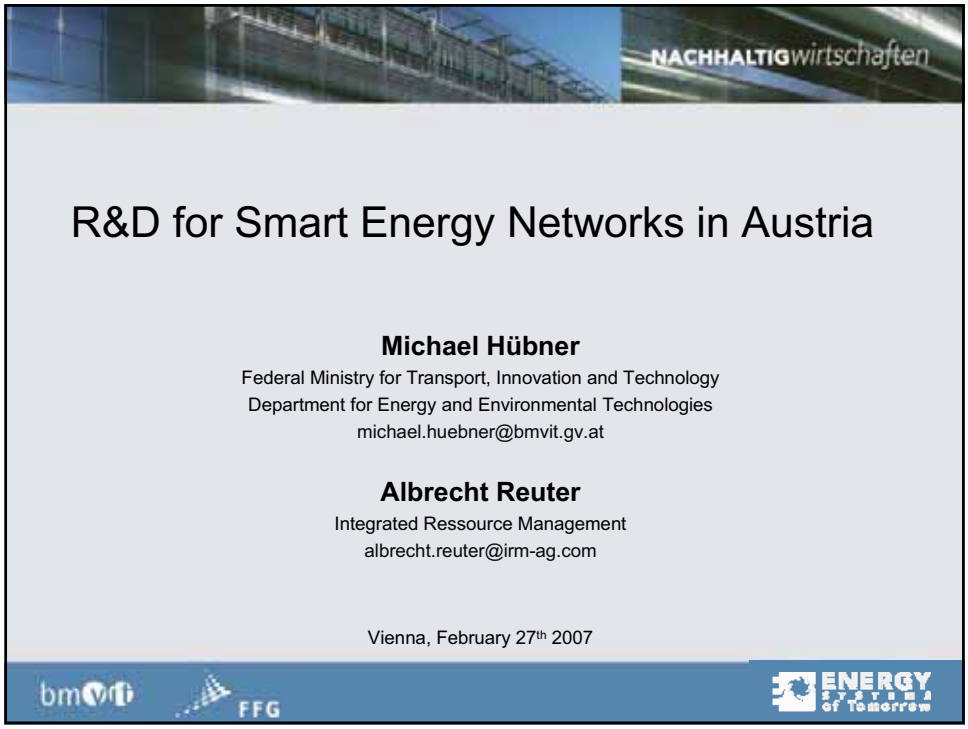
Programme leader „Networks“

thilo.krause@bfe.admin.ch
www.bfe.admin.ch

ETH Zurich

Patrick Favre-Perrod

pfavre@eeh.ee.ethz.ch
www.future-energy.ethz.ch


NACHHALTIGwirtschaften
R&D for Smart Energy Networks in Austria
Michael Hübner
Federal Ministry for Transport, Innovation and Technology
Department for Energy and Environmental Technologies
michael.huebner@bmvit.gv.at
Albrecht Reuter
Integrated Ressource Management
albrecht.reuter@irm-ag.com
Vienna, February 27th 2007
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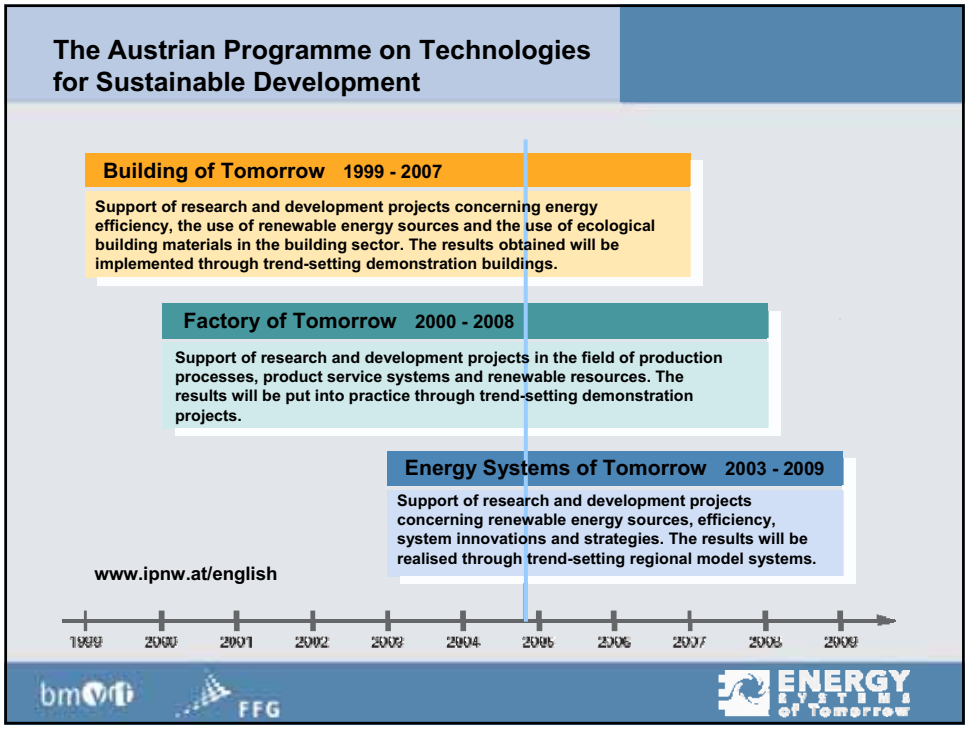
FFG
ENERGY SYSTEMS of Tomorrow


The Austrian Programme on Technologies for Sustainable Development
Building of Tomorrow 1999 - 2007
Support of research and development projects concerning energy efficiency, the use of renewable energy sources and the use of ecological building materials in the building sector. The results obtained will be implemented through trend-setting demonstration buildings.
Factory of Tomorrow 2000 - 2008
Support of research and development projects in the field of production processes, product service systems and renewable resources. The results will be put into practice through trend-setting demonstration projects.
Energy Systems of Tomorrow 2003 - 2009
Support of research and development projects concerning renewable energy sources, efficiency, system innovations and strategies. The results will be realised through trend-setting regional model systems.
www.ipnw.at/english
1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009
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FFG
ENERGY SYSTEMS of Tomorrow

Albrecht Reuter
Michael Hübner

Management Structure

- Program Owner:

  Austrian Federal Ministry of Transport, Innovation and Technology
  Division of Energy- and Environmental Technologies
  Program Development, Strategies, Decision Making, Funding

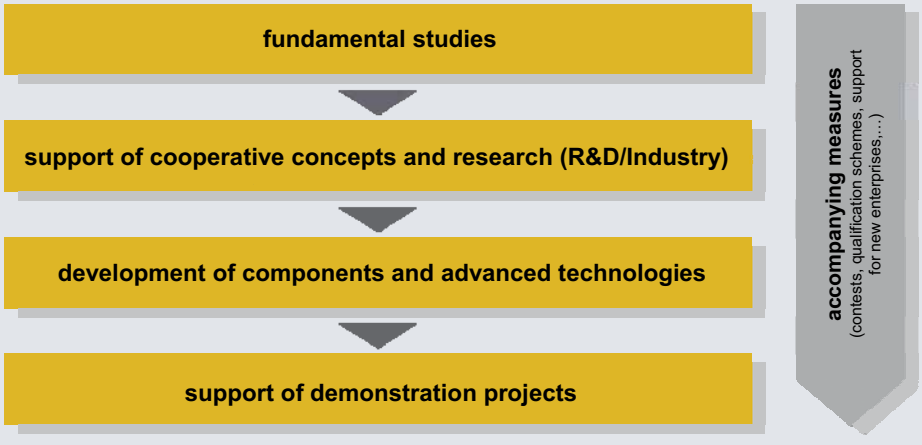
- Program Management:

  Austrian Research Promotion Agency
  Division 1 – Research Promotion of the Economy
  Project Selection (internat. Jury), Project Controlling and Funding

- Thematic Consulting and Project support:

  Thematic / Strategic Program Support, Project Support, Networking

Strategy



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Building of Tomorrow Demonstration sites

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International Cooperation

- Consortia with foreign partners possible in the program
- Cooperation with other national research and technology development programmes in the EC on a programme level in order to exchange know-how and carry out joined activities, joined calls **(ERA-Net)**

ERA-NET Bioenergy · PV ERA-NET · HY-CO · ERA BUILD · SUSPRISE

- Support of the integration of Austrian protagonists in the activities of the International Energy Agency (**IEA**)

  Member in 14 Implementing Agreements

  ENARD: Task Definition Workshop

  March 20th – 21st in Vienna

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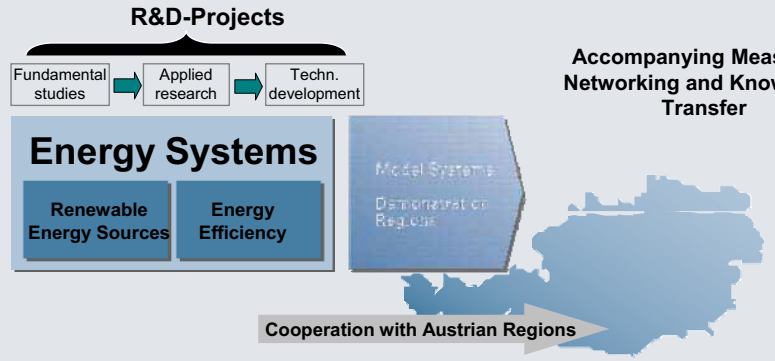
Michael Hübner

Energy Systems of Tomorrow



About 100 projects with more than 11 Million Euro since 2003

Topics:
- Biomass (esp. biogas)
- Distributed generation and integration of renewables
- Polygeneration
- Energy Regions

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Targets

- Improvement of the overall efficiency of energy systems and their components
- Provision of a technological basis for the increased integration of renewable energy sources
- Improvement of the cooperation between science and economy, extension of Austrian technological strengths

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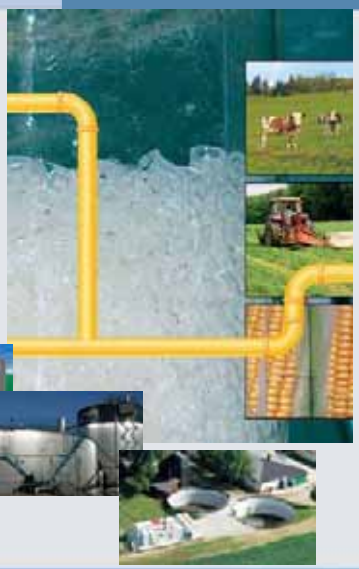
Major Results I:

Feeding Biogas into the Austrian Gas Grid



- Analysis of **framework conditions and options** in Austria
- Development of **gas cleaning and upgrading technologies** (Gas permeation using membranes, Biotrickling Filter)
- **Demonstration plants** (Pucking, Salzburg)
- **Technology transfer, deployment** (Cooperation Projects, Internet Tool, Round Tables, Publications...)

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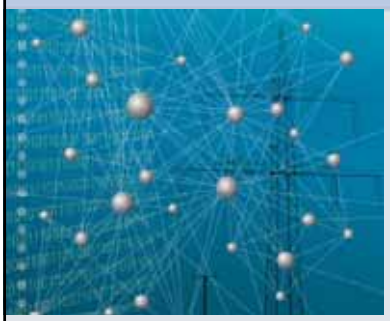
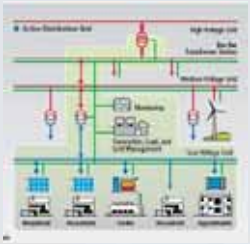
Major Results II: DG and Smart Grids



INTEGRATION OF DISTRIBUTED POWER GENERATION AND OPTIMIZATION OF ELECTRIC ENERGY SYSTEMS

- **IRON- Concept** for an integrated Energy- and Information Network for integral Resource Optimization
- **DG-Demo-Net –** concept and planning of active distribution grid sections with a high proportion of distributed generation.



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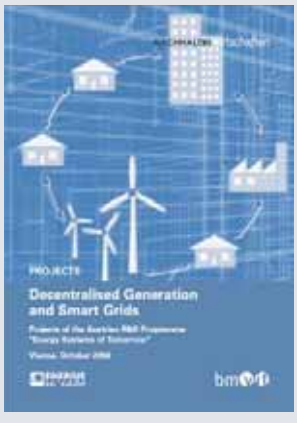
Michael Hübner

Selected Ongoing R&D Deliberations on „Lighthouse Projects“

- **Values and Criteria in Energy Decision Making**
  - **Sustainability, Flexibility, Self-Sufficiency, etc.**
  - **Integrated and Energy Service Approach**
- **Micro-grids in Urban Areas**
  - **DG, Renewables**
  - **DG System Integration, Infrastructure Planning**
  - **Existing versus new building structures**

Further Information

Project Synopsis



“Forschungsforum”

Internet

www.Edz.at

www.e2050.at

Smart Energy Networks and Energy Storage
A national R&D initiative

Eric PEIRANO, ADEME
Deputy Head
Renewable Energies Department

Smart Energy Networks - National and regional R&D Programmes
Vienna, February 27, 2007

Contents

- ADEME in brief
- ADEME's R&D policy
- French energy context and RES targets
- R&D activities : smart grids and energy storage
- R&D activities : DSM and spatial planning
- National R&D initiative

ADEME in brief

- **ADEME's status**
  - public body overseen by the control of three ministries : industry, research and technology, environment
  - created in 1992, 3 headquarters, 26 regional delegations, 1 office in Brussels, over 850 employees
  - new contract : "Contrat d'objectifs 2007-2010"
- **Areas of intervention**
  - waste and soil
  - air pollution and noise
  - renewable energies and energy efficiency (RE and EE)
  - transversal activities (eco-design, international activities, etc.)
- **ADEME's budget**
  - 338,7 M€ / operating budget : 78,7 M€
  - 136,9 M€ for RE and EE

ADEME's R&D policy

- **ADEME's activities**
  - development of knowledge and innovation through R&D support
  - convince : information for local authorities, enterprises, public
  - advise : law and regulations, etc.
  - support to achieve : incentives with new financial and fiscal tools, etc.
- **Development of knowledge and innovation**
  - S-T-M-R approach
  - focus on 10 R&D programs (2007-2010)
  - renewable energies and energy efficiency (RE and EE)
- **R&D programs**
  - EE in buildings
  - deployment of electricity supply from RE sources
  - smart energy networks and energy storage

French energy context (1)

- **International context**
  - reduction of GHG emissions (Kyoto targets + factor 4)
  - reduction of energy intensity
- **European context**
  - energy package : EE, RE, etc.
- **Energy law (2005)**
  - 21% electricity from RE and factor 4
  - EE : white certificates
  - PPI 2006 : targets for electricity production (distributed generation)

→ **New constraints for the networks**

→ **"smart grids", storage and forecasting systems**
demand side management and energy spatial planning

French energy context (2)

- **« Arrêté PPI » (July 2006) : 2010 and 2015 targets**
  - *Wind power : 13,5 GW (1 GW off-shore) and 17 GW*
  - Biomass : 1,2 GW and 2,3 GW
  - Hydro power : 0,5 GW and 2 GW
  - Photovoltaic (PV) : 0,16 GW and 0,5 GW
  - Biogas : 0,1 GW and 0,25 GW
  - Geothermal e- : 0,09 GW and 0,2 GW
- **Main issues :**
  - Wind power : ambitious goals; needs for research (integration)
  - Biomass : supply of bio-fuels
  - PV : grid connected PV (integration in buildings)
  - Hydro power : environmental issues and refurbishment
  - Geothermal electricity : HDR concept

R&D activities

- **Activities funded by ADEME**
  - smart grids, storage and forecasting systems [SG]
  - demand side management (DSM) and spatial planning [DSM]
- **SG**
  - characterization of wind power production
  - forecasting systems (wind power, PV?)
  - distributed generation in stand alone systems
  - PV systems / DG and storage in micro-grids
  - development of simulation tools
- **DSM and energy spatial planning [DSM]**
  - EE of the network components
  - DSM
  - Spatial energy planning methods
  - Smart energy prospectives

[SG]/R&D activities : wind power

- **Estimation of wind power production in France**
  - several studies : ADEME/FEE/ARMINES ; EDF ; RTE
  - scenario : 10 GW of installed power (most likely spatial distribution)
  - 50 years of data (3 years for ADEME's study)
  - supply/demand balancing ; no network constraints
- **Results**
  - complementarity of wind regimes : locally & north/south
  - production ~ 26 TWh / 10 GW = 2,8 GW of thermal power plants
  - variability : annual (+/- 20%) ; seasonal (winter/summer),
  - correlation with warm temperatures
  - intermittency : no need for additional stand-by reserves

[SG]/ R&D activities

- **Development of forecasting systems (wind power)**
  - forecasting based on probabilistic tools (Météo-France/EDF/ARMINES)
  - forecasting with MM5/wind production and climate change (CLIMPACT)
  - downscaling with stochastic modeling (INRIA/CNRS-LMD)
  - ANEMOS project (FP5 ; ARMINES/EDF/Météo-France)
- **Energy storage**
  - li-ion batteries in PV applications (SAFT/CEA-INES/Transénergie)
  - li-ion batteries in micro-grids / quality of supply (SAFT/CEA-INES/Tenesol)
  - electrochemical storage : costs, ageing, LCA, eco-design
- **Smart grids**
  - development of simulation tools (ARMINES/Supélec)
  - stand alone systems with RES and storage (ARMINES ; CEA-INES)

[DSM]/R&D activities

- **Energy efficiency of network components**
  - *decrease transmission and distribution losses (7 to 8% today)*
  - optimization of bus bars in distribution networks : EE and eco-design (*Schneider Electric*)
  - SEEDT project (IEE) : strategies for development and diffusion of EE in distribution transformers
- **DSM in tertiary sector**
  - *DSM and DG in the frame of dynamic load management (peak shaving and load shifting)*
  - estimates of impacts on peak load and energy consumptions (EDF/CSTB), coming experiments (Plan Eco-Energie in PACA Region) [thermal applications and lighting]
  - energy saving contracts / ICT technologies (remote control) (ERGELIS/ Ecole Polytechnique) [heating and cooling]

[DSM]/R&D activities

- **DSM in residential sector**
  - dynamic load management in residential sector
  - distribution networks : environmental benefits of coordinated load control (Supélec) [heating and hot water]
- **Spatial planning**
  - *optimize integration of DG (RES) and storage in distribution networks*
  - understanding the demand ; statistical approach (CIRED)
  - reversal of power flows and variation of local grid voltages (INPG-LEG)
  - evaluation of DSM programs (PACA Region)
  - DSM/DG programs to avoid new infrastructures (PACA Region/EDF)
- **Smart energy prospective**
  - holistic approach on a territory : DG / DSM / networks / town planning
  - how to choose between different scenarios ? (ARMINES/Supélec)

R&D national program (1)

- **Current situation**
  - no coordinated program today in France
  - ADEME's current budget (DG/DSM) ~ 1 M€/year
  - strong research centers : EDF, RTE, Supélec, ARMINES, CEA-INES, GIE-IDEA (economic venture, INPG-LEG/EDF/Schneider), CNRS, etc.
  - major technology providers : Alstom, Areva, Schneider, etc.

→ need for a coordinated action in coherence with initiatives at EU level

- **Two new funding agencies**
  - ANR (National Research Agency, 2005). Public organization/Ministry of Research. Small flexible structure relying on other public organizations for RTD contract management.
  - AII (Industrial Innovation Agency). Public organization/Ministry of Industry. Funding major industrial projects (over 50 M€).

R&D national program (2)

- **[SG/DSM] Existing programs**
  - PREBAT : EE in buildings (ANR/ADEME ; 10 M€/year)
  - PV : technologies and systems (ANR/ADEME ; 12 M€/year)
  - *Energy storage : technologies (ANR)*
- **ADEME's proposal**
  - objective : prepare/adapt transmission and distribution networks to new era (DG/RES, storage, ICT technologies, power electronics, markets, customer driven services, etc.)
  - identify French stakeholders and set up a national coordinated R&D initiative in coherence with EU initiatives
  - identify research needs and build support for an increased public and private research effort on electricity networks

Thank you for your attention

Eric PEIRANO, ADEME
Deputy Head
Renewable Energies Department

Smart Energy Networks - National and regional R&D Programmes
Vienna, February 27, 2007

CNRS Interdisciplinary Energy Program

From 2002-2005 Program

To 2006-2009 Program

Presentation
Pr. Jean Pierre ROGNON
INP Grenoble
Grenoble Electrical Engineering Laboratory (G2ELab [former LEG])

Director "SEEDS" EE French Research Network

2002-2005 Program

CNRS Interdisciplinary Energy Program

1000 persons, 250 teams, 140 laboratories, 65 projects, #2.5 M€ /an.

Energy Sources, Vectors and Use (technology and socio economics)

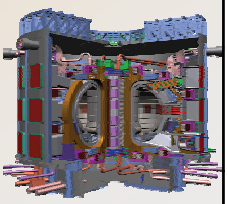
H2 and Fuel cells

Buildings and Photovoltaic

Energy Efficiency

Combustion /biomass/ CO2

Nuclear



Structuring effects

2002-2005 Program

CNRS Interdisciplinary Energy Program

Domains	TOPICS
NEW ENERGY SOURCES	Biomass
	Solar
	Nuclear for future
ENERGY VECTORS	Electricity
	Heat
	Hydrogen

Domains	TOPICS
CLEAN PROCESSES and ENVIRONMENT	Combustion
	Fuel Cells
	Industrial Processes
	Heat Exchangers
	Buildings
	Greenhouse gases
Socio-economy	Determinants of the demand
	Models and data
	Institutions and laws
	Diffusion of innovation
	Security for economy and the society

2002-2005 Program

CNRS Interdisciplinary Energy Program

Types of actions

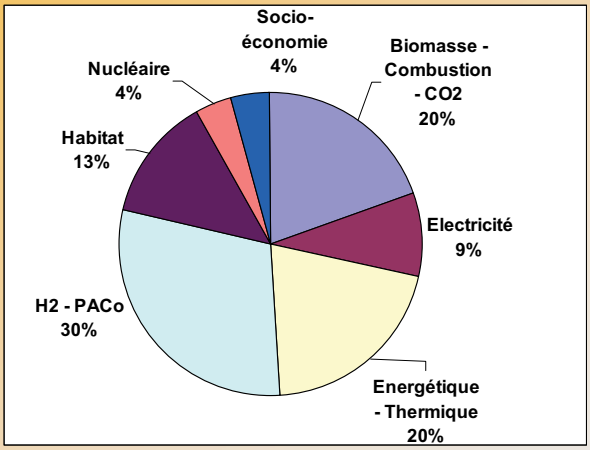
Thematic Analysis Groups [GAT] (# 10 experts)

- ✓Implementation of a thematic community
- ✓State of the art analysis,
- ✓ Identification of fundamental researches to push ahead,
- ✓Scientific Priorities,
- ✓Foresight studies,
- ✓Specific thematic schools, seminars proposal / organisation…

Integrated or Preliminary Research Projects (65)

2002-2005 Program

CNRS Interdisciplinary Energy Program



Thematic Layout

2006-2009 Program

CNRS Interdisciplinary Energy Program

~2.5 M€/year

Road-mapping activities
Structuring activities
Interdisciplinary topics
Exploring researches
Uncovered or less covered topics

CNRS Energy Program

ADEME Programs

ANR Programs

Ongoing ERANET "INNER"

PC7

Total first call 2007: ~1 M€
Including Energy: ~240 M€

Total 2007: 825 M€
Including "Sustainable Energy and Environment" topics

Context

2006-2009 Program

CNRS Interdisciplinary Energy Program

Environment

Socio-Economy

Physics

Materials

Modelling

Energy Production and CO2 reduction

Energy vectors : H2, Heat and Electricity

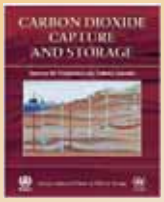
Energy Efficiency and savings

Topics

CNRS Interdisciplinary Energy Program

Biomass

Combustion



CO2 capture and storage

I –Towards Energy production with less CO2

Clean Electricity

Nuclear

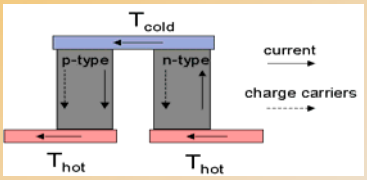
Energy with less CO2

CNRS Interdisciplinary Energy Program

Focusing on Clean Electricity Production

Concentrated Solar

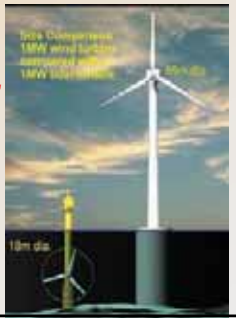
Photovoltaic



Thermoelectricity

Wind

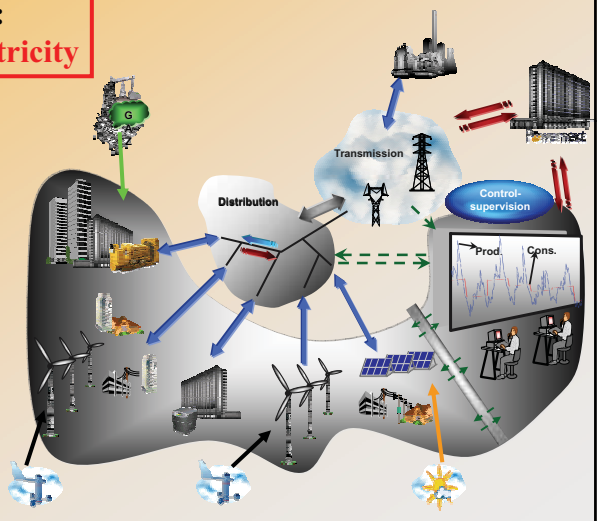
Waves- tides- currents



Topics

CNRS Interdisciplinary Energy Program

II – Energy Vectors:
Hydrogen, Heat and Electricity



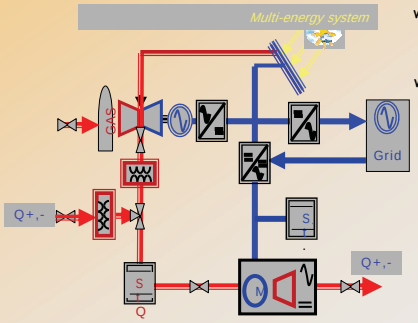
Topics

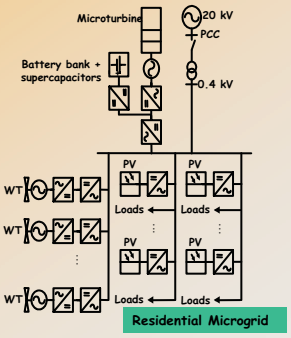
CNRS Interdisciplinary Energy Program

III –Energy efficiency, savings

High efficiency Electronic power converter for wind generator

Devices





Energy systems

H2 and Electricity

CNRS Interdisciplinary Energy Program

Focusing on Electricity in the program

Objectives, from components to systems *(2/2)*

- **More energy efficient and environmentally friendly autonomous or semi-autonomous entities (islands, industrials plants, buildings)**
- **Smart networks integrating large scale distributed generation, self healing, robust to interdependencies (Architectures, management, state estimation, vulnerability and risk assessment, control and protection …)**
- **Optimal predictive and corrective maintenance of electrical devices, fault detection and localisation in devices and networks**

H2 and Electricity

CNRS Interdisciplinary Energy Program

Focusing on Electricity in the program

Objectives, from components to systems (1/2)

- New or More efficient electromechanical converters (generators and actuators)
- **New or More efficient power electronics converters**
- New uses for electricity
- **More performing and dispatchable Distributed Electricity Generation**

H2 and Electricity

CNRS Interdisciplinary Energy Program

Focusing on Electricity in the program

Examples of Related Scientific topics

- **Design and optimization methods (devices and systems)**
- **Models of devices (for design or dimensioning, integration to systems, aging evaluation, fault detection and isolation …)**
- **Optimal architectures and dimensioning of electrical or multi-energy systems**
- **Optimal control of energy fluxes in electrical or multi-energy systems**
- **Models of complex systems such as networks (for simulation, evaluation of interdependencies, risk assessment, control …)**
- **Deterministic, stochastic and heuristic methods for diagnosis**

Cross cutting

CNRS Interdisciplinary Energy Program

IV –Cross cutting topics

Socio Economy & Sustainable Development

- Institutional Obstacles
- Acceptability of Technologies
- Environmental impact of bio fuels mass production…

Physics

- Energy and nanosciences, superconductivity, thermoelectricity…

Materials

- Coupling functional properties to physical phenomena and structural characteristics

Modelling

- Models of devices and systems for optimization
- Models of environment …

Action schedule

CNRS Interdisciplinary Energy Program

End 2006 :

Working groups « Structures and Resources » (from technology to scientific issues, **road maps, priorities,** …)

Call for projects 2007:

Exploring Projects (#15 k€, 1 year, Max)

Integrated Projects (#150 k€, 3 years, Max)

Smart Grids

27th February, Vienna

National R&D programme Grids - Netherlands

SenterNovem
Ruud de Bruijne

Ministry of Economic Affairs
Gert van Uitert

Netherlands Energy Policy

Drivers

- Sustainability
- Affordability
- Security of supply and quality

Ambition (new government, coalition agreement) 2020

- 30% CO_2 reduction
- 20% RES
- annual efficiency improvement 2%

SenterNovem

Background and history

- **Electricity Technology Roadmap – 2025**
- **Grids part of national R&D programmes**
- **Transition approach: National Platform Sustainable Electricity (NL Platform Future Grids)**
- **Participation EU technology Platform: SmartGrids (both AC & MG)**
- **Future: ERA-NET SmartGrids**

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SenterNovem

National R&D programmes

Energy programmes (incl. electricity)
- Funding and Coordination: Ministry of Economic Affairs
- Daily management & administration SenterNovem

National RTD institutes
- ECN, TNO, partly funded by Ministry of Economic Affairs

Scientific programmes
- Universities & RTD institutes, mainly funded by Ministry of Education

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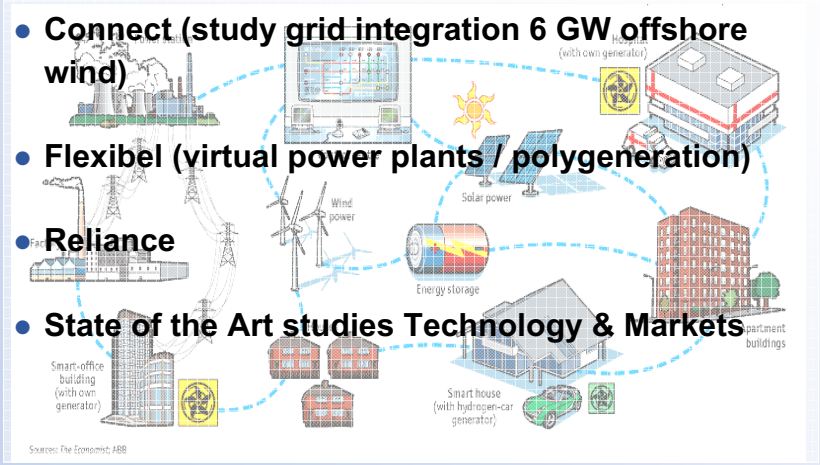
SenterNovem

What is achieved?

- Connect (study grid integration 6 GW offshore wind)
- Flexibel (virtual power plants / polygeneration)
- Reliance
- State of the Art studies Technology & Markets



SenterNovem

What is achieved?

- National R&D programme PREGO
  - Programming by sector (e.g. grid operators)
  - Contractors: ECN, KEMA & DSO's - TSO
- Significance
  - Common understanding among DSO's – TSO
  - consciousness-raising common problems
  - focus: reliability
- Follow up: common RTD programme sector; managed by EnergieNed(Association of NL E-companies)

SenterNovem

What is achieved?

- **Participation NoE DER lab's**
- **Transition Platform Sustainable Electricity**
  - offshore wind
  - transmission and distribution
  - bio energy
  - clean fossil
- **we@sea**
  - Integrated project
  - Consortium industry & RTD institutes

» Tools for wind farm as power plant
» Connect wind farms to onshore grid
» Voltage control, reactive power, transient behaviour
» electricity storage and conversion to H2

maandag 26 februari 2007

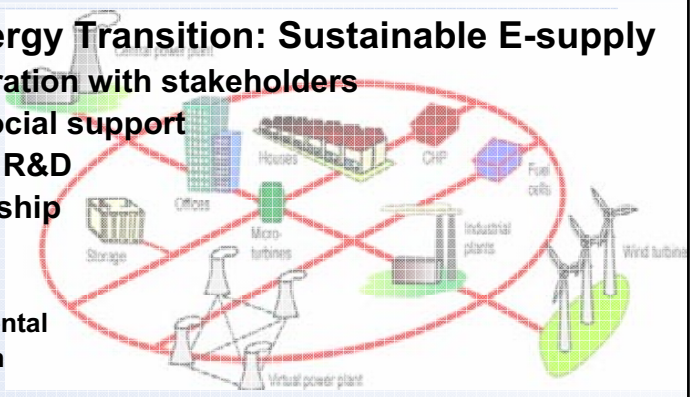
SenterNovem

What is achieved?

Approach: Energy Transition: Sustainable E-supply

- **Close co-operation with stakeholders**
- **Strengthen social support**
- **Connected to R&D**
- **Strong leadership**

=> Captains of industry
=> Interdepartmental administration



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SenterNovem

What is achieved?

- KEMA laboratories:
  - Short Circuit - High-Voltage
  - Electro Magnetic Power Technology (power electronics)
- ECN:
  - Wind turbine & blades test bed
  - Offshore wind test station
- Technical University Delft:
  - High Voltage Laboratory
  - Real-Time Digital Simulator (RTDS)
- Technical University Eindhoven:
  - Power Quality laboratory

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SenterNovem

Netherlands expectations SmartGrids in FP7

- Impact on:
  - More intelligent & adaptive grids
  - More transparent market (power transactions)
  - Grid integration renewables
- Involvement key stakeholders
  - E-generation
  - Transmission; distribution; smart metering
  - End users
  - Other stakeholders (e.g. socio-economic)

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SenterNovem

What can the Netherlands offer FP7 SmartGrids projects?

- Sharing know how from public programmes;
  Know how transfer from institutes to industry
- Power Research Programme
  - Power generation and grids
- Innovation oriented Power Research Programme
  - Electro magnetic power technology
- Facilities, laboratories, modelling
- Participation / co-funding projects EC's 7th FP

SenterNovem

Practical information

- EG-Liaison: ***www.senternovem/egl***
- EGL-Liaison for partner search: ***info@egl.nl***
- SenterNovem: ***r.de.bruijne@senternovem.nl***
- General information: ***www.senternovem.nl***

Forskningsrådet

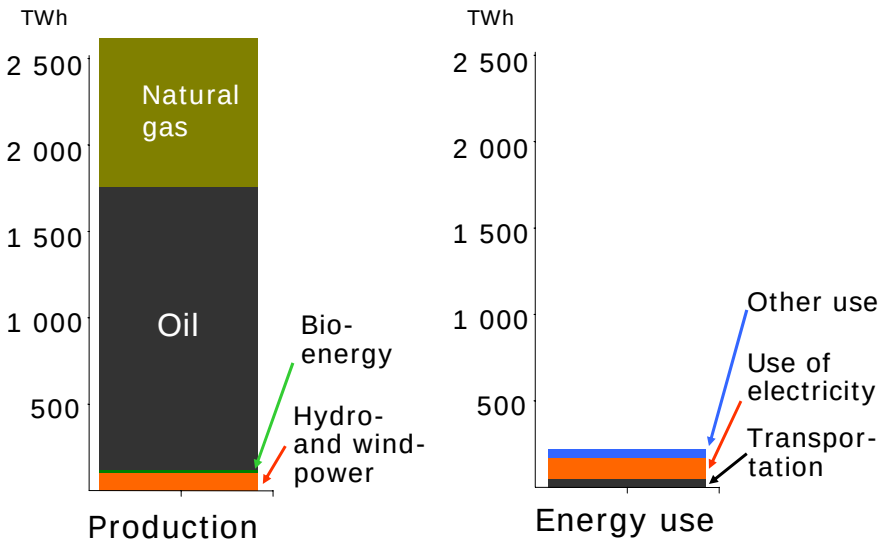
Smart Energy Networks
Vienna 27.02.2007

RENERGI- Clean Energy for the Future

Frank Nilsen
The Research Council of Norway

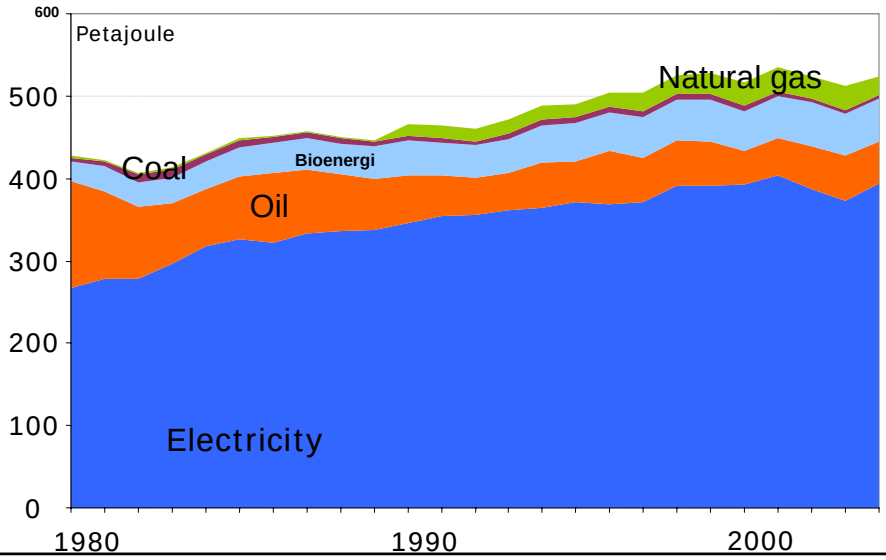
Forskningsrådet

What is the situation in Norway?



Forskningsrådet

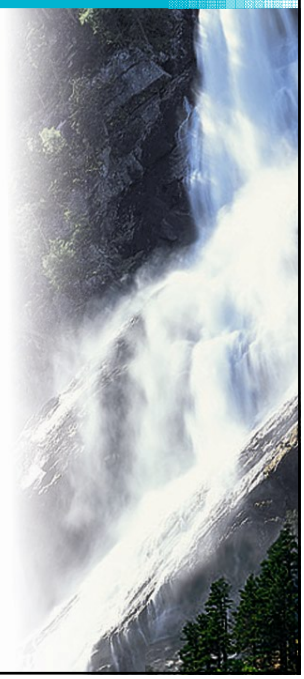
Norwegian stationary energy consumption



Forskningsrådet

Norwegian energy supply

- Increased comsumption
- 75% electricity
- Consumption of electricity higher than production
- Limitations on hydropower
- Climate challenges limit options
- **System Changes**



Forskningsrådet

RENERGI support competence and technology

System Changes

- Electricity from REN, small hydro, wind
- Less electricity for heating
- More heat from REN, bioenergy, waste etc.
- Energy efficiency
- High focus on hydrogen, especially in transport sector

New knowledge and technology needed ⇔ Possibilities for new businesses based on increasing international markets

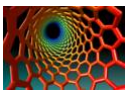
Forskningsrådet

Large-scale programmes

Long-term: 10 years, 10 – 30 M€ per year

Target groups: Industry, R&D circles, gov. admin.

FUGE – Research in functional genomics



NANOMAT – Nanotechnology and new materials

Aquaculture – An Industry in Growth

RENERGI – Clean energy for the future

PETROMAKS – Optimal management of petroleum resources

NORKLIMA – Climate change and its impact on Norway

VERDIKT – ICT core competence and growth

Forskningsrådet

RENERGI – Clean energy systems for the future – general goals of the programme

Multi annual program on Energy Research (2004 – 2013)

- **Focus on energy production and transmission, and stationary and mobile energy use.**
- **Objective:**

  RENERGI is to develop knowledge and solutions as the basis for environment-friendly, efficient and effective management of the country's energy resources, security of supply and internationally competitive economic development related to the energy sector.
- **Budget: 20 mill. € per year,**

  (approx 50% of total costs)

Forskningsrådet

RENERGI - Clean Energy for the Future International cooperation

- EU framework programmes
  - ERA-net
    - HyCo
    - FenCO
    - INNER
- Bilateral agreements
- Project cooperation through international organisations
  - IEA research cooperation through Implementing Agreements
  - International Partnership for The Hydrogen Economy (IPHE)
  - ...

Forskningsrådet

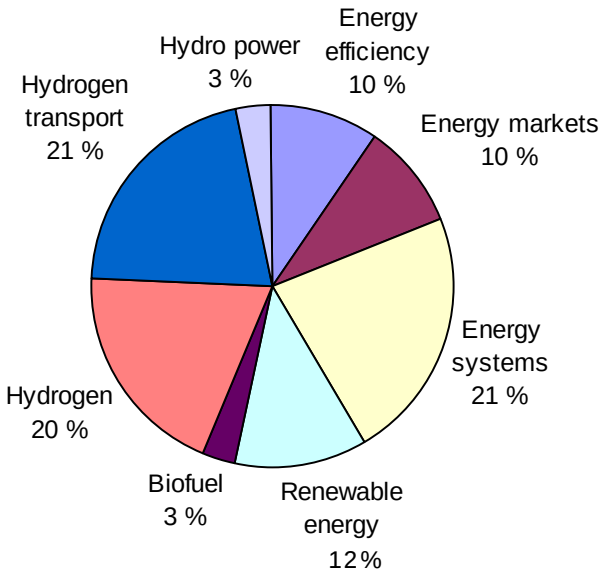
RENERGI - Clean energy technology for the future

Priority research areas

- Energy consumption efficiency
- Energy markets, energy policy and international agreements
- Energy systems
- Renewable energy production
- Hydrogen and Natural gas
- Clean Transport technologies

Forskningsrådet

RENERGI – Distribution 2006



Forskningsrådet

”Energy systems” – the part of RENERGI with strongest link to SmartGrids

”Energy systems” in 2007:

- approx 4,1 M€
- 26 ongoing projects
  - 9 Competence Building
  - 17 Innovation
- Duration of project: averagely 3,5 year
- Total funding from The Norwegian Research Council: averagely 0,6 M€ per project over 3,5 years
- Total project costs: Averagely 1,1 M€ over 3,5 years

Forskningsrådet

Which topics within SmartGrids are covered within RENERGI?

RA1 Smart Distribution Infrastructure

- RT1.1 The distribution networks of the future – new architectures for system design and customer participation (4 projects)
  - Distribution 2020
  - Fault Management for Future Distribution Systems
  - Voltage stabilisation in weak 12-24kV distribution networks with DER
  - Distributed Renewable energy Hydrogen system

Forskningsrådet

Which topics within SmartGrids are covered within RENERGI?

RA2 Smart Operation, Energy Flows and Customer adaption

- RT 2.3 The distribution networks of the future – customer driven markets (1 project)
  - Marked-based end user flexibility

Forskningsrådet

Which topics within SmartGrids are covered within RENERGI?

RA3 SmartGrid Assets and Asset Management

- RT 3.1 Network asset management (4 projects)
  - Risk-based Distribution System Asset Management
  - Thermal and electromagnetic performance of transformers
  - A new concept for power quality and reliability measurement and management

    (Integration og PQ management in asset management)
  - Assessment of technical condition and lifetime of existing and future transmission and distribution components

Forskningsrådet

Which topics within SmartGrids are covered within RENERGI?

RA 4 European Interoperability of SmartGrids

- RT 4.1 Ancillary Services, Sustainable operation and low level dispatching (1 project)
  - Balance management in Multinational Power Markets

Forskningsrådet

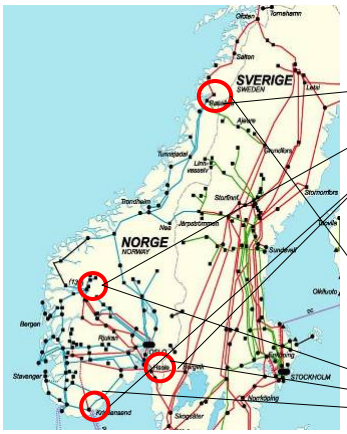
Which topics within SmartGrids are covered within RENERGI?

RA5 SmartGrids cross-cutting issues and catalysts

- RT5.3 Multiple energy carrier systems (2 projects)
  - e-Transport – decisionmaking for regional/local energy planning with mulitiple energy carriers
  - Sustainable energy distrubution system planning methods and models
- RT5.5 Regulatory incentives and barriers (2 projects)
  - Nordic Energy perspectives
  - Market design
- RT 5.6 Underpinning technologies for innovation (3 projects)
  - Next generation sea cables
  - New testing methods for sea cables
  - New compact/low weight solutions for wind energy generator

Forskningsrådet

RENERGI "Energy systems" – major results
"Wide Area Monitoring Systems (WAMS)"



Source: ABB

Operation

- Enhanced operation security
- Increased awareness

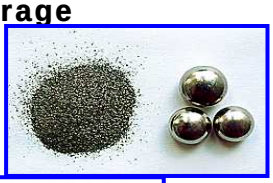
Planning

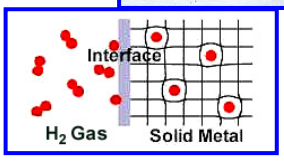
- Increased system knowledge
- System parameter identification

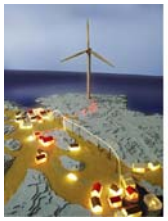
Forskningsrådet

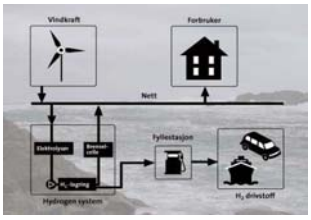
RENERGI "Energy systems" – major results
The Utsira project – Hydrogen for storage

- Hydrogen - solutions for storage
  - In composite tanks, high pressure
  - In solid materials, metal hydrides







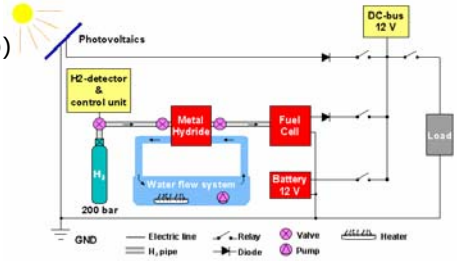


- Hydrogen as energy storage in autonomous renewable energy system – The Utsira Project

Forskningsrådet

RENERGI "Energy systems" – major results Solar industry

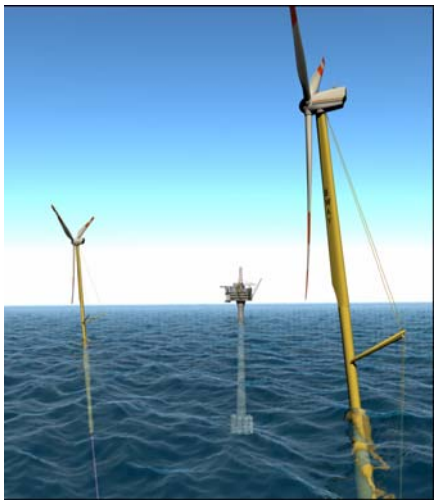
- Solar power/Material science
  - REC – 30 % of world market
- Energy systems
  - Integration of various energy solutions – technical and market (macro)
  - Infrastructure analysis
  - Energy system analysis (micro)

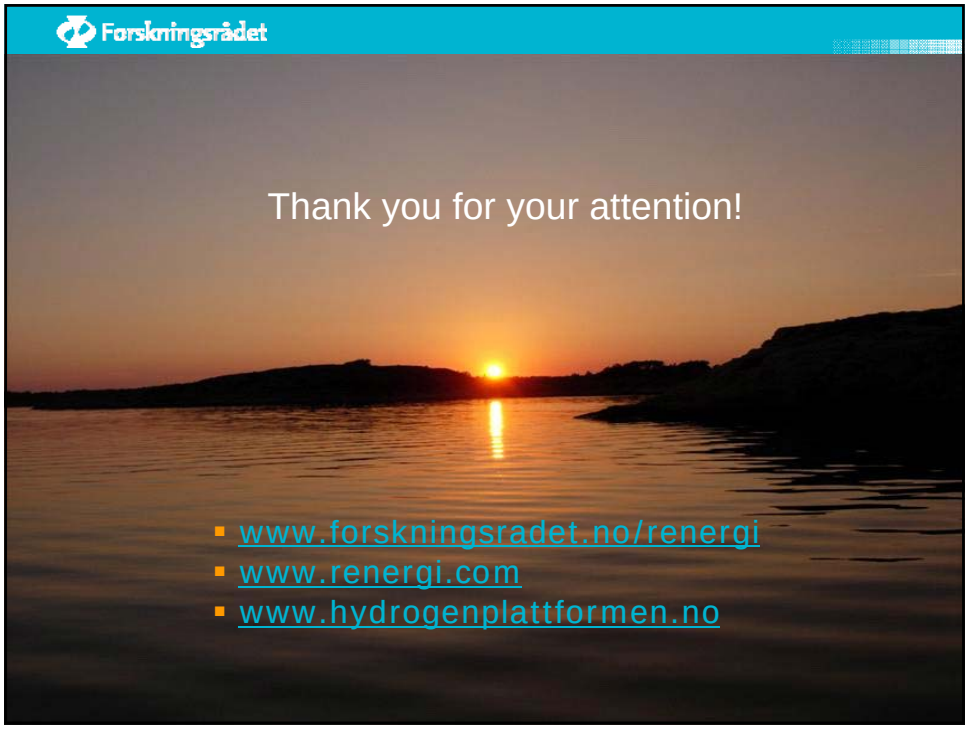


Forskningsrådet

RENERGI "Energy systems" – major results Floating offshore windpower

- Two concepts
  - SWAY
  - Norsk Hydro
- Prototyp 2007
- The idea
  - Large windparks where there is wind 4000 hours per year
  - Less estetic problems
  - 30 – 50 km from shore




Forskningsrådet
Thank you for your attention!
www.forskningsradet.no/renergi
www.renergi.com
www.hydrogenplattformen.no

Nordic Energy Research

Nordic Energy Research

Nordic Energy Research (NER) is a Nordic funding organisation under the Nordic Council of Ministers.

The Nordic countries are Norway, Sweden, Finland, Iceland, Denmark and the autonomous regions Åland, Faroe Islands and Greenland.

NER supports transnational research between research communities in the Nordic and/or Baltic countries.

NER started as a the Nordic Energy Research Programme in 1985 and became an institution – Nordic Energy Research - in 1999

Nordic Bridge to European Non-Nuclear Energy R&D

Nordic Energy Research

- Nordic Energy Research is core partner (workpackage leader 3) in EU Coordinating Actions:
- The HY-CO ERANET
- The INNER ERANET
- Member of the Presidency of the Mirror Group (Member States representation) of the European Hydrogen and Fuel Cell Technology Platform

New projects 2007-2010

Nordic Energy Research

- 17 projects are supported by NER with a total sum of 86 Mil. NOK (app. 10.3 M€)
- Thematic areas of the projects:
  - Integration of the energy markets
  - Renewable forms of energy
  - Energy efficiency
  - The hydrogen society
  - Consequences of climate change on the energy sector

Relevant projects 2007-2010 for the Smart Grid ERANET

Nordic Energy Research

1. Initiation of Nordic AMR (automatic electric metre reading)
   - Project leader Mr Andrei Z. Morch, SINTEF Energy Research, Norway
2. Distributed generation in the Nordic energy market.
   - Project leader Ms Berit Tennbakk, Econ Analysis, Denmark
3. Electricity market group
   - Working for harmonisation of the Nordic electricity market
   - Projectleader Mr Flemming G. Nilsen, Danish Energy Authority
   - An initiative from the Nordic Council of Ministers

NER and Smart Grid ERANET

- NER has valueable experience from two other energy ERANETs
- NER is used to administrate trans-national co-operation projects
- NER presently supports thematic relevant R&D projects
- The NER administration has competence on grid and market issues
- NER is interested in joining the Smart Grid ERANET, but due to capacity reasons, not being a core partner
- NER should probably have a role in connection with WP 2 Strategic Activities, similar to the other two ERANETs

Head office in Oslo

- Birte Holst Jørgensen, Managing Director
- Mikael Forss, Senior Advisor
- Vivi Mathiesen, Senior Advisor
- Lise Jørstad, Project Manager
- Unni Bruaset, Senior Officer
- Amund Vik, Project Assistent







norden
Nordic Energy Research
Thank you for your attention!
www.nordicenergy.net

MINISTERIO DE EDUCACIÓN Y CIENCIA

RDT Spanish National Plan (2004-2007)

ERA NET
SmartGrids

MINISTERIO DE EDUCACIÓN Y CIENCIA

RDT Spanish National Plan (2004-2007)

The name

There is no specific program in Electricity Networks

The Electricity Networks activities are included in the Energy National Program as one of the priority lines in renewable energies.

The Energy National Program is one of the National Programs in the Spanish National Research and Technological Development Plan (2004-2007)

The Spanish National Research and Technological Development Plan (2004-2007) is based on 13/1986 law on "Promotion an co-ordination of the scientific and technical research"

MINISTERIO DE EDUCACIÓN Y CIENCIA

RDT Spanish National Plan (2004-2007)

Responsible

Head of Energy Area → Manuel Montes

The General Secretary of Science and Technological Politics in coordination with all the Ministries is the responsible of the National Research and Development Plan (2004-2007)

Energy National Program
- Research General Direction → Fundamental research (MEC)
- Technological Policy General Direction (Energy Area) → Technical research and development (MEC)
- Energy General Secretary → Industrial research (MITyC)
- CDTI → Industrial Technological Development Centre, focused on companies. (MITyC)

MINISTERIO DE EDUCACIÓN Y CIENCIA

RDT Spanish National Plan (2004-2007)

Framework

Energy National Program

1. Optimization of conventional energies, so that they become cleaner and more efficient technologies
   - Improvement of transport fuels
   - Technologies for clean use of coal and petroleum products
   - Nuclear Fision
   - Poligeneration
   - End use efficiency in energy
   - Energy transport
   - Distributed generation / Active generation
2. Renewable energies and new technologies
   - Wind energy
   - Thermal solar energy
   - Photovoltaic energy
   - Biomass
   - Oceanic energy
   - Hydrogen and fuel cell
3. Fusion Energy

MINISTERIO DE EDUCACIÓN Y CIENCIA

RDT Spanish National Plan (2004-2007)

Selection criteria

There is no differential criteria for Technological Networks

Common criteria

- Identification with the general objectives of the program
- Reduce the cost of the technology
- New concept of technology
- Increase the opportunity to use that technology
- The quality of the proposal
- The quality of the research team
- Guarantee of application of the results
- Needs of the development

MINISTERIO DE EDUCACIÓN Y CIENCIA

RDT Spanish National Plan (2004-2007)

SPANISH PROGRAM INFORMATION:

- **Spanish National Research and Development Program (PN)**
- **Energy National Program (ENP)**

SMARTGRIDS ERA NET EXPECTATIONS

- **Spanish Smartgrids sector**
- **Spanish Smartgrids ERA NET view**

MINISTERIO DE EDUCACIÓN Y CIENCIA

SPANISH PROGRAM INFORMATION

3. Electrical Networks Sector

3.2 Spanish Smartgrids ERA NET view

MAIN GOAL: Strengthen Europe's position in Electrical Networks technology

KEY POINTS:

Increase Spanish industry competitiveness, focused on:

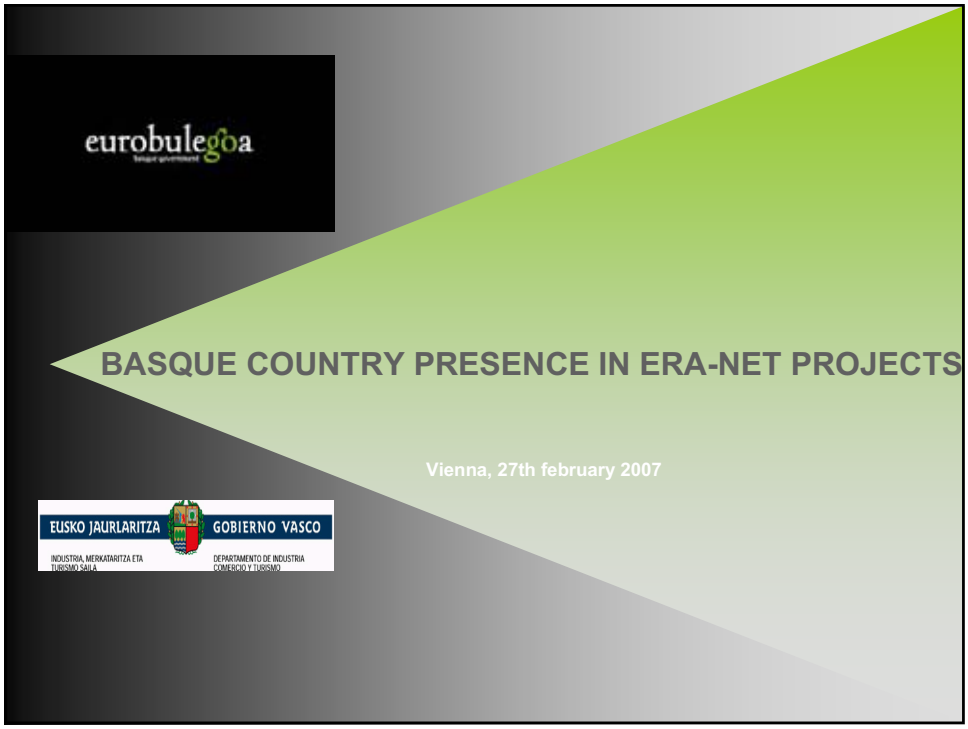
- Contribution to overcome the traditional fragmentation of research efforts in Europe.

-Encouragement of technology transfer from R&D to the industry.

- Adaptation to future electrical distribution systems to facilitate renewable energies integration.

-Provide strategies for pilot joint activities

-Improve Spanish National Plan according to SMARTGRIDS ERA NET conclusion.



What is Eurobulegoa?

Is the Basque agency for the promotion of international research, development and innovation launched and fostered by the Basque Government

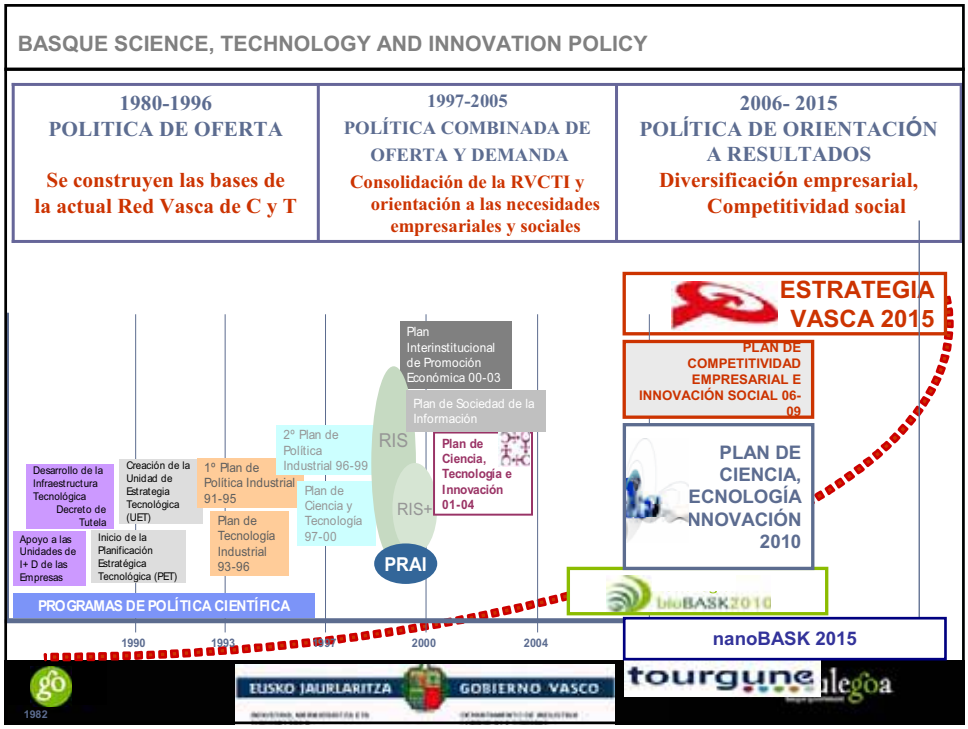
4 main activities:

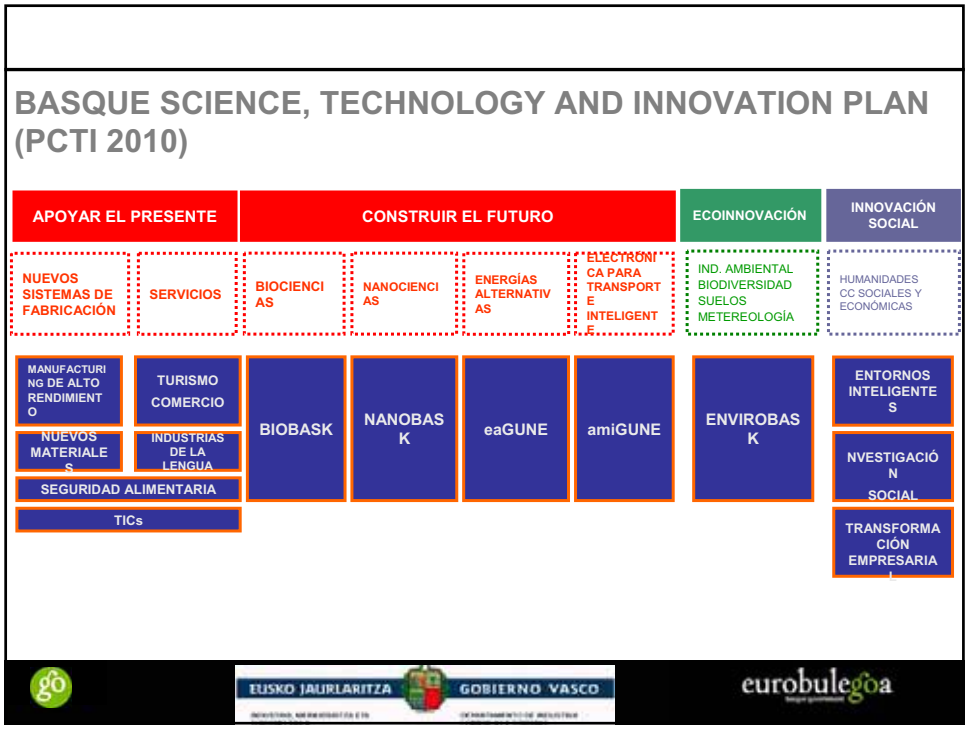
Management and Promotion of International Research Programmes within the Basque Region

Internationalisation of Basque R+D+i Programmes

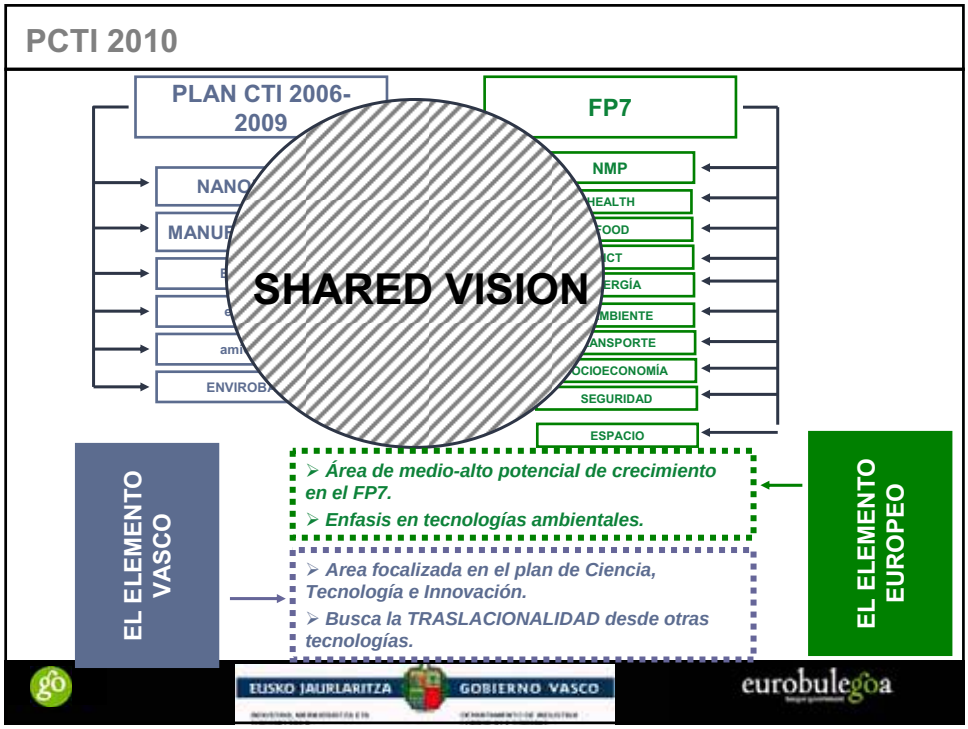
Observatory of the international evolution of research

SME and enterprise stimulation for the participation in Europe


BASQUE SCIENCE, TECHNOLOGY AND INNOVATION POLICY
1980-1996
POLITICA DE OFERTA
Se construyen las bases de la actual Red Vasca de C y T
1997-2005
POLÍTICA COMBINADA DE OFERTA Y DEMANDA
Consolidación de la RVCTI y orientación a las necesidades empresariales y sociales
2006- 2015
POLÍTICA DE ORIENTACIÓN A RESULTADOS
Diversificación empresarial, Competitividad social
ESTRATEGIA VASCA 2015
PLAN DE COMPETITIVIDAD EMPRESARIAL E INNOVACIÓN SOCIAL 06-09
PLAN DE CIENCIA, ECNOLOGÍA NNOVACIÓN 2010
nanoBASK 2015
Plan Interinstitucional de Promoción Económica 00-03
Plan de Sociedad de la Información
Plan de Ciencia, Tecnología e Innovación 01-04
2º Plan de Política Industrial 96-99
1º Plan de Política Industrial 91-95
Plan de Ciencia y Tecnología 97-00
Plan de Tecnología Industrial 93-96
Desarrollo de la Infraestructura Tecnológica Decreto de Tutela
Creación de la Unidad de Estrategia Tecnológica (UET)
Apoyo a las Unidades de I+ D de las Empresas
Inicio de la Planificación Estratégica Tecnológica (PET)
RIS
RIS+
PRAI
PROGRAMAS DE POLÍTICA CIENTÍFICA
1990
1993
2000
2004
1982
EUSKO JAURLARITZA
GOBIERNO VASCO
tourgune
legoa


BASQUE SCIENCE, TECHNOLOGY AND INNOVATION PLAN (PCTI 2010)
APOYAR EL PRESENTE
CONSTRUIR EL FUTURO
ECOINNOVACIÓN
INNOVACIÓN SOCIAL
NUEVOS SISTEMAS DE FABRICACIÓN
SERVICIOS
BIOCIENCIAS
NANOCIENCIAS
ENERGÍAS ALTERNATIVAS
ELECTRONICA PARA TRANSPORTE INTELIGENTE
IND. AMBIENTAL BIODIVERSIDAD SUELOS METEREOLOGÍA
HUMANIDADES CC SOCIALES Y ECONÓMICAS
MANUFACTURING DE ALTO RENDIMIENTO
TURISMO COMERCIO
NUEVOS MATERIALES
INDUSTRIAS DE LA LENGUA
SEGURIDAD ALIMENTARIA
TICs
BIOBASK
NANOBASK
eaGUNE
amiGUNE
ENVIROBASK
ENTORNOS INTELIGENTES
NVESTIGACIÓN SOCIAL
TRANSFORMACIÓN EMPRESARIAL
EUSKO JAURLARITZA
GOBIERNO VASCO
eurobulegoa

PCTI 2010

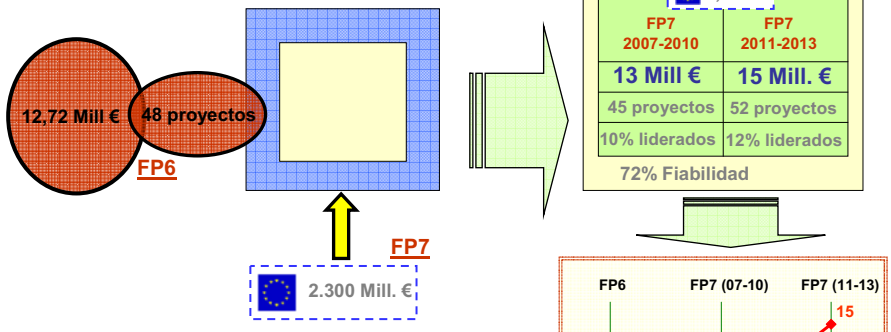


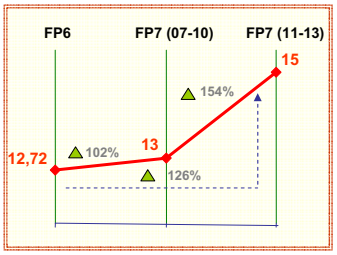
PCTI 2010

CHALLENGES IN ENERGY:

- Development of new fully automated Electric Networks.
- Development of low power generation and high efficiency technologies.
- Renewable energies.
- Development of a new energey vector based on hydrogen.

BASQUE STRATEGY IN AREA 5: ENERGY (FP7)





Medidas

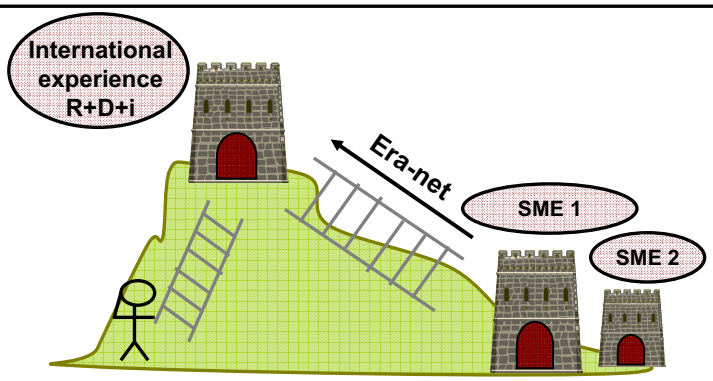
- Documento Estratégico del BCP
- ERANET HYCO
- Acciones promocionales específicas por call

BASQUE PARTICIPATION IN ERA-NET PROJECTS

THE BASQUE COUNTRY HAS ACHIEVED AN EUROPEAN LEADING ROLE IN PARTICIPATION IN ERA-NET PROJECTS.

- ACTIVE PARTICIPATION IN ERA-NET PROJECTS (9 ERA-NET projects. Coordinator of MANUNET ERA-NET).
- 3 JOINT CALLS ALREADY PERFORMED IN 2006 AND 5 JOINT CALLS TO BE LAUNCHED IN 2007.
- MANAGEMENT BOARD MEMBER IN MNT (MICRO AND NANOTECHNOLOGIES) AND EUROTRANSBIO.
- SELECTED BY THE EUROPEAN COMMISSION AS CASE STUDY IN THE 2006 WORKSHOP "*ERA-NET AS A TOOL FOR REGIONAL COOPERATION*".

BASQUE PARTICIPATION IN ERA-NET PROJECTS



ERA-NET as a tool to empower SMEs into international R+D+i experience

Mixing local rules with international approach

EUSKO JAURLARITZA GOBIERNO VASCO eurobulegoa

MOTIVATION TO BE INVOLVED IN ERANET

ACTIVE PARTICIPATION IN ERA-NET PROJECTS (9 ERA-NET projects. Coordinator of MANUNET ERA-NET).

PROYECT	COORDINATOR
EUROTRANSBIO (Bio-tecnología)	Francia: Ministerio de Industria
MNT: Micro y Nanotecnología	Austria: FFF
MANUNET (CA): Manufacturing Abril 2006- Abril 2010	Gobierno Vasco
HYCO (Fuel Cells)	F2-Julich (Germany)
ETRANET: ICT in Industry	Reino Unido: DTI (Subcontratista del CDTI)
COMPERA (Centros de competencia)	IWT Flanders
SUSPRISE (Técnicas Medio Ambientales)	Austria: FFG
SAFEFOODERA (Seguridad alimentaria)	Nordic Innovation Centre(Norway)
INNET: (Innovación-Pymes-Clusters)	Francia: Oseo Anvar

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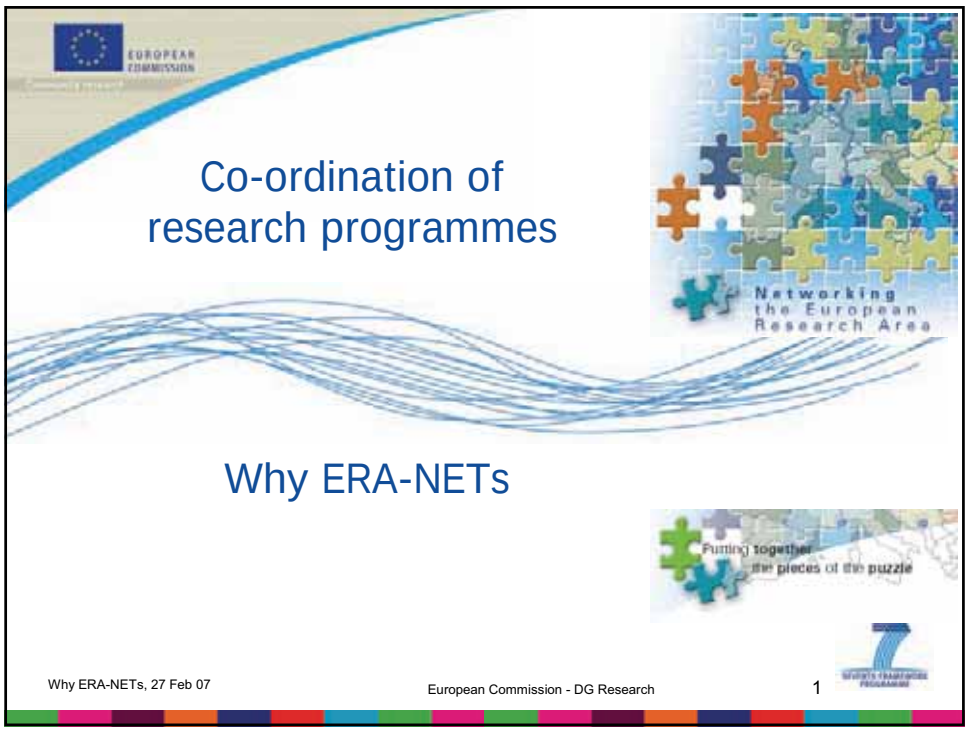
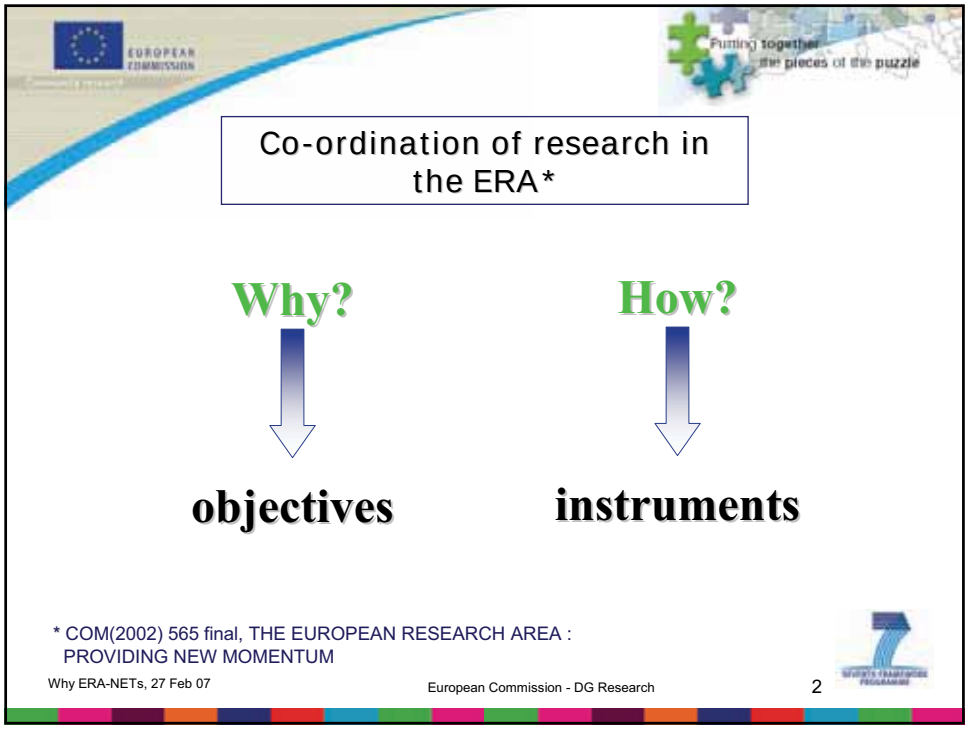
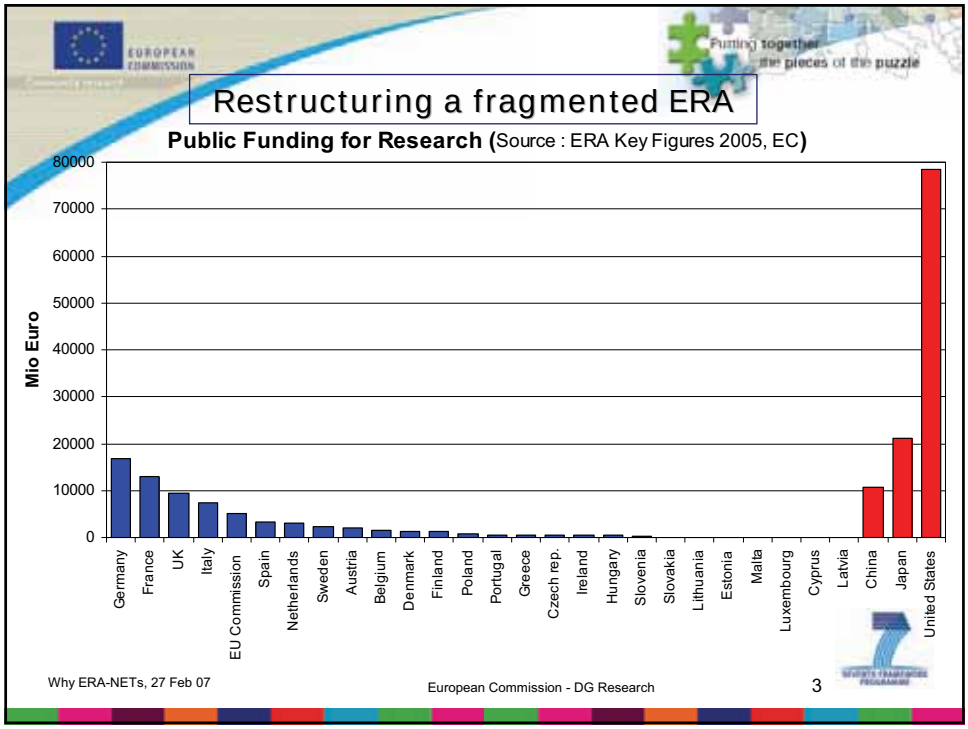
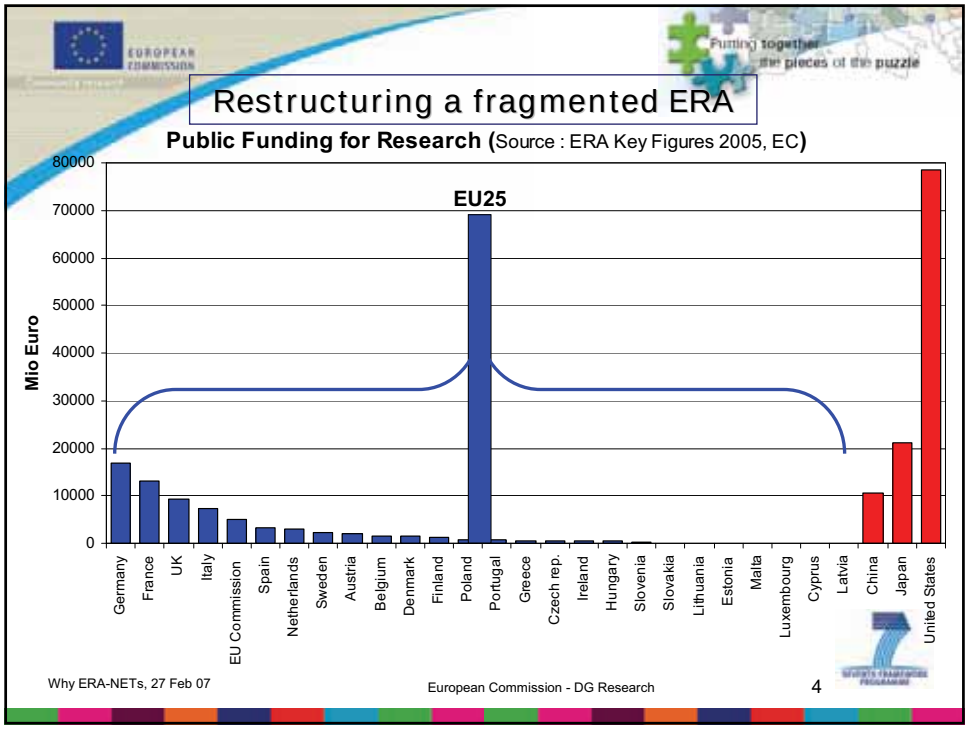
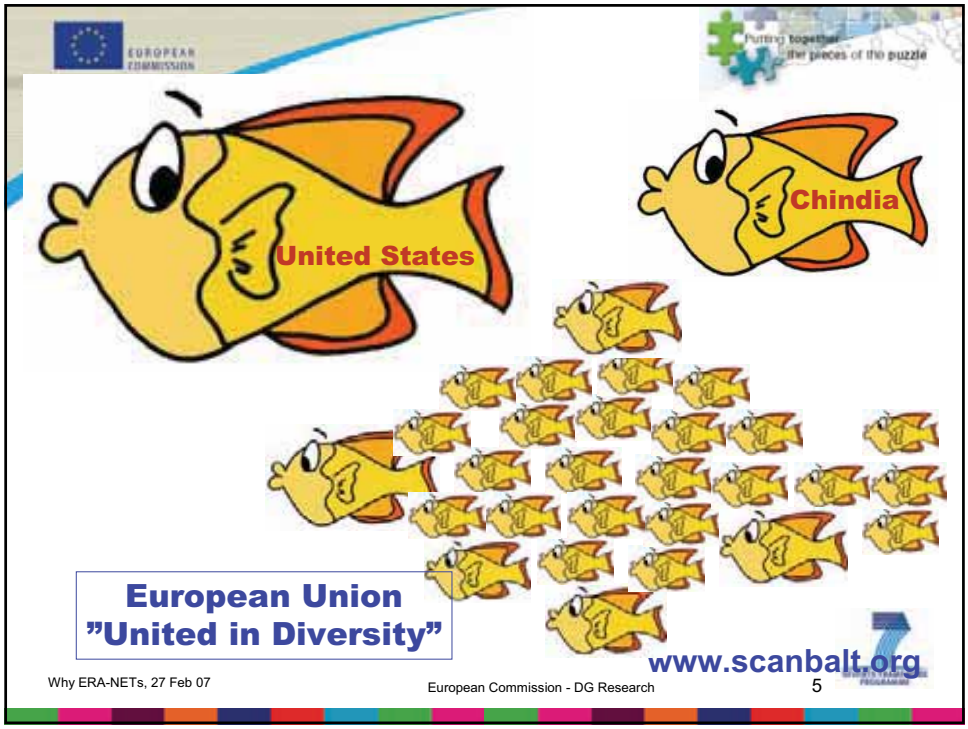

Co-ordination of
research programmes
Networking
the European
Research Area
Why ERA-NETs
Putting together
the pieces of the puzzle
Why ERA-NETs, 27 Feb 07
European Commission - DG Research
1


Putting together
the pieces of the puzzle
Co-ordination of research in
the ERA*
Why?
How?
objectives
instruments
* COM(2002) 565 final, THE EUROPEAN RESEARCH AREA :
PROVIDING NEW MOMENTUM
Why ERA-NETs, 27 Feb 07
European Commission - DG Research
2


Putting together the pieces of the puzzle
Restructuring a fragmented ERA
Public Funding for Research (Source : ERA Key Figures 2005, EC)
Mio Euro
80000
70000
60000
50000
40000
30000
20000
10000
0
Germany
France
UK
Italy
EU Commission
Spain
Netherlands
Sweden
Austria
Belgium
Denmark
Finland
Poland
Portugal
Greece
Czech rep.
Ireland
Hungary
Slovenia
Slovakia
Lithuania
Estonia
Malta
Luxembourg
Cyprus
Latvia
China
Japan
United States
Why ERA-NETs, 27 Feb 07
European Commission - DG Research
3


Putting together the pieces of the puzzle
Restructuring a fragmented ERA
Public Funding for Research (Source : ERA Key Figures 2005, EC)
EU25
Mio Euro
80000
70000
60000
50000
40000
30000
20000
10000
0
Germany
France
UK
Italy
EU Commission
Spain
Netherlands
Sweden
Austria
Belgium
Denmark
Finland
Poland
Portugal
Greece
Czech rep.
Ireland
Hungary
Slovenia
Slovakia
Lithuania
Estonia
Malta
Luxembourg
Cyprus
Latvia
China
Japan
United States
Why ERA-NETs, 27 Feb 07
European Commission - DG Research
4



European Research Area

3 concepts

– the creation of an "internal market" in research
(free movement of knowledge, researchers and technology)

– the restructuring of the European research fabric
(improved coordination of national research activities and policies)

– the development of a European research policy
(taking into account other EU and national policies)

ERA-NET Objective

To develop and strengthen the coordination of public research programmes carried out at national or at regional level.

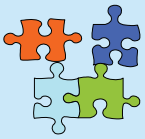
"Programmes" should be understood as entire research programmes, or parts of such programmes, or similar initiatives having the following characteristics:

1. be strategically planned
2. be carried out at national or regional level
3. be financed or managed directly by national or regional public bodies, or by structures closely related (e.g. agencies)

Coordination of national programmes Overview FP7

ERA-NET

Like in FP6: Coordination of programmes
- ✓ **MS agree and fund joint calls/programmes**
- ✓ **EU funding only for coordination**

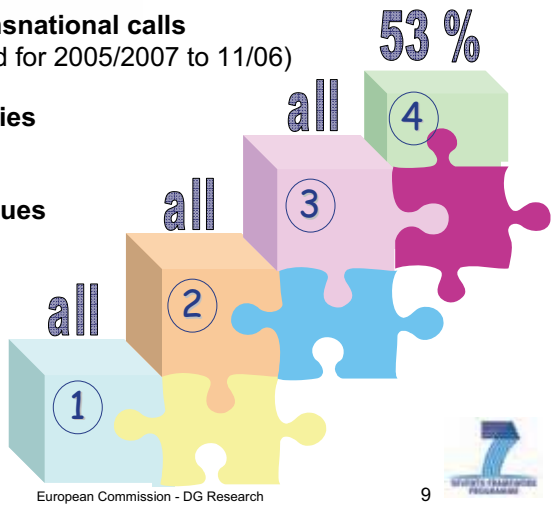


ERA-NET *Plus*

New in FP7: Top up of a single joint call
- ✓ **MS contribute to a joint trans-national call 2/3**
- ✓ **EU funding for research: 1/3 of the joint call**

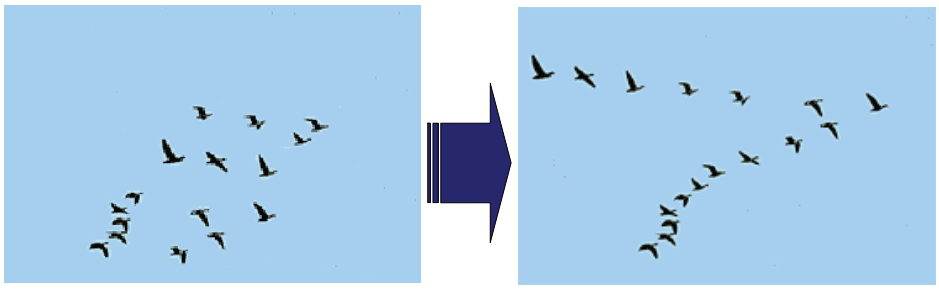
Results of ERA-NET in FP6

- **Transnational calls** (fixed for 2005/2007 to 11/06) — 53 %
- **Joint activities** — all
- **Common strategic issues** — all
- **Information exchange & best practices** — all



Programme coordination for efficiency

Nature shows us the way: Birds coordinating their efforts



71 % gain of efficiency

POSTER SESSION

The RENERGI programme

– Clean Energy for the Future

Energy research covered by RENERGI:

- Renewable energy production
- Natural gas
- Hydrogen
- Energy systems
- Energy markets
- Energy use
- Energy policy and international agreements

www.renergi.com

Norges **forskningsråd**

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Bundesamt für Energie BFE

The Swiss National Research Program "Networks"

ETH
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Program description

Background

Due to its position in Central Europe, the Swiss electricity grid is often assumed to serve as "energy hub". This view is emphasized by the fact that significant flows (electricity and gas) traverse Switzerland. Changing legal regulation as well as the fostering of the Internal European Energy Market impose new requirements on energy production, -transmission and distribution, especially in the field of energy networks. Complementary to such legal changes, the imminent scarcity of natural resources as well as technological progress set incentives for major advances in the field of network infrastructures.

The importance and the prospective impact of the above described developments are reflected by the recent creation of a Swiss national research program on networks and associated technologies.

Technical and Economic Objectives of the Research Program

Related to the above described framework, the program aims at facilitating the following research activities:

- study the impact of technological, economic and legislative changes on network operation and - security of supply
- study the design of new network infrastructures reflecting the increasing use of (renewable) distributed generation facilities and energy storages
- study questions of market regulation, the interdependence of technical and economic operation as well as strategies for long-term network reinforcement

Core Activities of the Research Program

Figure 1 presents a schematic of the core activities of the research program. Generally, three areas of interest have been identified being electricity networks, multi-energy networks as well as network technologies. Rough examples of possible project orientations within each area are detailed in figure 1.

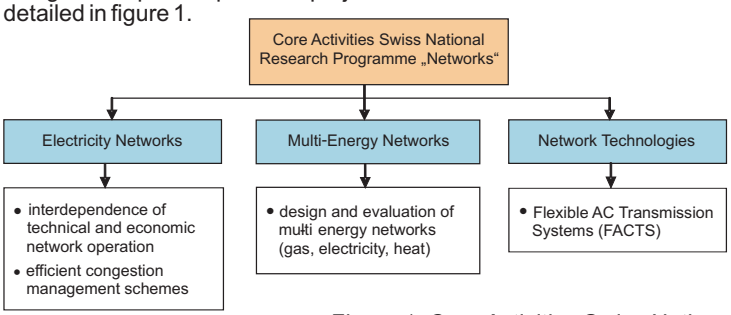


Figure 1: Core Activities Swiss National Research Programme "Networks"

Complementary to the above displayed activities, the program takes an active part in various European committees (see figure 2) in order to foster and coordinate research in the field of smart energy networks.

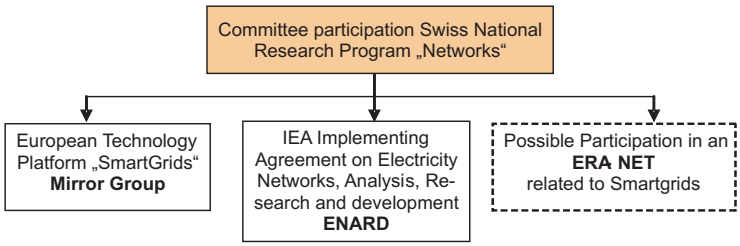


Figure 2: Committee participation Swiss National Research Program "Networks"

Summary and Future Objectives

In late 2006 the Swiss national research program "Networks" has been founded to meet the numerous challenges associated with prospective developments in the field of energy network infrastructures. In 2007 the program has become operable. Core activities are set in the areas of electricity networks, multi-energy networks as well as network technologies. The program also takes an active role in the European Technology Platform "SmartGrids" as well as in the International Energy Agency (IEA) Implementing Agreement ENARD. In the future, the program aims at extending its national as well as international activities in terms of project initiation, support and financing as well as committee participation. The Swiss national program would welcome the creation of an ERA-NET related to Smartgrids in order to facilitate European research in this field.

The "vision of future energy networks" project

Power Systems and High Voltage Laboratories, ETH Zurich

Towards Future Energy Networks

The expected characteristics of future networks are:

- The provision of adequate interfaces for a wider range of participants (small producers, storage, etc.)
- The common management of several energy carriers
- The inclusion of transportation as a consumer/storage/converter into the public energy system.

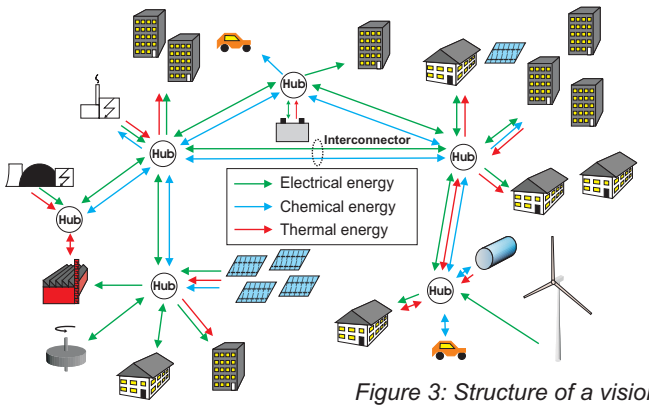


Figure 3: Structure of a visionary multi-carrier energy network

A Visionary Hybrid Approach

In order to investigate future energy network without a bias by historical developments in the networks, a "green field approach" was chosen. The visionary concept is based on two key elements. Converters and storage devices are integrated in so-called energy hubs as shown below. These hubs are supplied by various energy infrastructures and deliver power to loads consuming different forms of energy. The second novel approach concerns the combined transmission of different energy carriers in one device, which is called energy interconnector. Electricity and gaseous (e.g. hydrogen) energy carriers can be transported together in this underground transmission element.

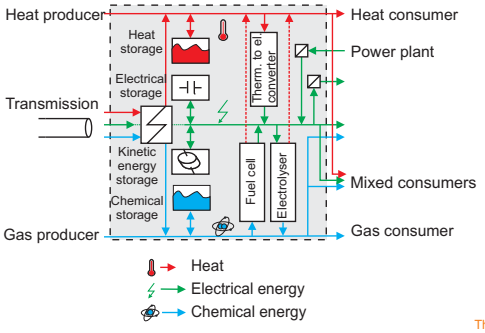


Figure 4: The energy hub is the interface between the network and the participants

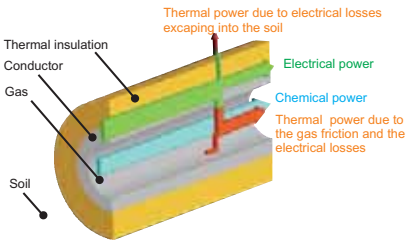


Figure 5: The interconnector for multi-carrier energy transmission

Research Activities

Fundamental aspects:

- Storage modelling and design in stochastically fed systems
- Reliability models for multi-carrier systems
- Power flow and system design in multi-carrier systems
- Hub systems control & dynamics
- Risk and investment analysis

Technological aspects:

- Basic principles for multi-carrier energy transmission

Application:

- Case studies "Baden" and "Swisspower" (planned)

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CADDiN 1 2 3 4 5

"Planning and Operation of Active Distribution Networks and Micro grids"

Research Project supported by Ministry of Science, Education and Sports, Republic of Croatia
Project Number: 036-0361590-1587
Project Status: Start 2007-01-01, End 2009-12-31
Institution: University of Zagreb, Faculty of Electrical Engineering and Computing
Project URL: http://www.fer.hr/en/projects?@=cltj#eu_projekti_11452
Project Coordinator: Prof.dr.sc. Davor Škrlec (davor.skrlec@fer.hr; http://www.fer.hr/davor.skrlec)

CADDiN 1 2 3 4 5

Project objectives

1. development of method addressing optimal sizes, sitting and structure of micro grids in distribution network
2. development of method addressing planning of active distribution networks comprising DERs
3. development of method for optimal reconfiguration and restoration of power supply in active distribution networks
4. development of method addressing unit commitment of distributed generation sources (within virtual power plants and micro grids)
5. development of method addressing economic dispatch of intermitted and non-intermitted DERs aimed at optimising theirs production and also to determine optimal amount of power that micro grid shall draw from the main grid
6. evaluation of the impact of DERs technologies on the planning and control of active distribution networks and micro grids
7. control and monitoring of power quality in active distribution networks and micro grids
8. defining the basic features for active distribution networks and micro grids operation evaluation
9. providing the basic elements for setting up of new and adjustment of the existing acts, sub-Acts and regulatory rules related to the power distribution and supply in active distribution networks

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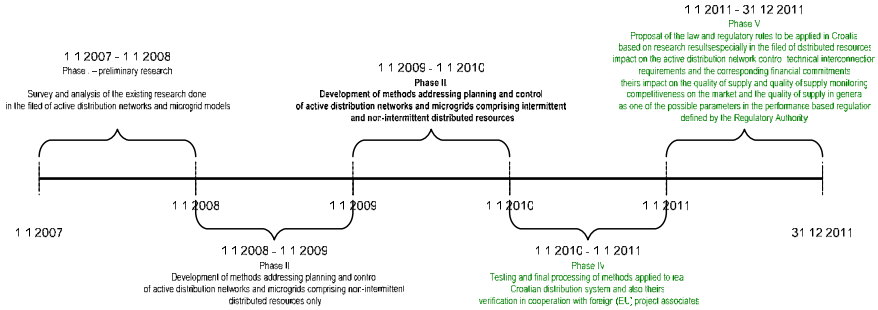
Research plan



CADDiN 1 2 3 4 5

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Demonstration Networks with a High Share of Distributed Generation

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Conceptual design, scheduling and project planning of distribution network branches with active operation and a high share of distributed generation units. Preparations of all requirements for the implementation of innovative demonstration networks with consideration of all relevant players.

Background

Due to current energy related framework conditions within the EC (Directives) the penetration of Distributed Generation (DG) increases continuously and it can be expected that this increase will even grow in the future. As a result of the increasing density of distributed electricity generation, basic questions related to the bidirectional power flow as e. g. reliability aspects (power quality and continuity of electricity supply), stability aspects, network capacity, network-, energy- and load management are massively arising. Research on active integration of DG in distribution networks is ongoing already for a while, but mainly stays at the point of theoretical aspects.

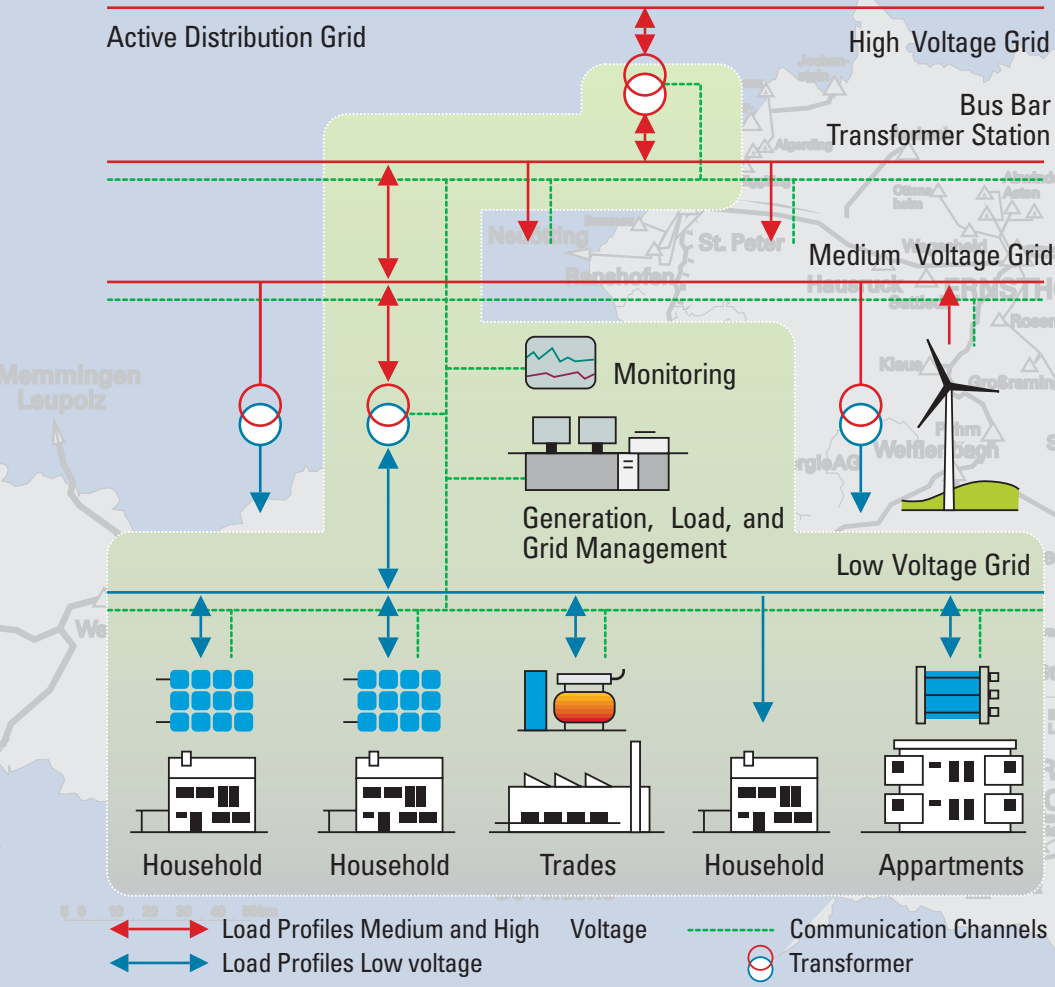
Objective

Projecting of models for the integration of a high as possible share of distributed generation (active network):
– with perpetuation of power quality,
– high macroeconomic profit and
– including all relevant actors
Option: Increase of reliability of supply – ability of intended islanding

Project results

- Comprehensive documentation, analysis and evaluation of international demonstration projects, relevant theoretical research projects and practical experiences of the distribution network operators
- Model systems for the active network operation - presented within a pyramid model "DG-Integration", which presents a rise of complexity of the system
- Technical, organisational and economical projecting for the selected parts of distribution networks
- Letter of intent from for the implementation and realisation relevant players and finance partners

SUSTAINABLEeconomy



Energy Systems of Tomorrow

Demonstration Networks with a High Share of Distributed Generation

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ENERGY SYSTEMS of Tomorrow

IRON CONCEPT
Integral Resource Optimisation Network

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IRON is an integral control network for optimising the utilisation of the resource "electrical energy". The Project provides concepts for new, innovative services for the power market based on the latest advances in the field of modern information and communication technologies.

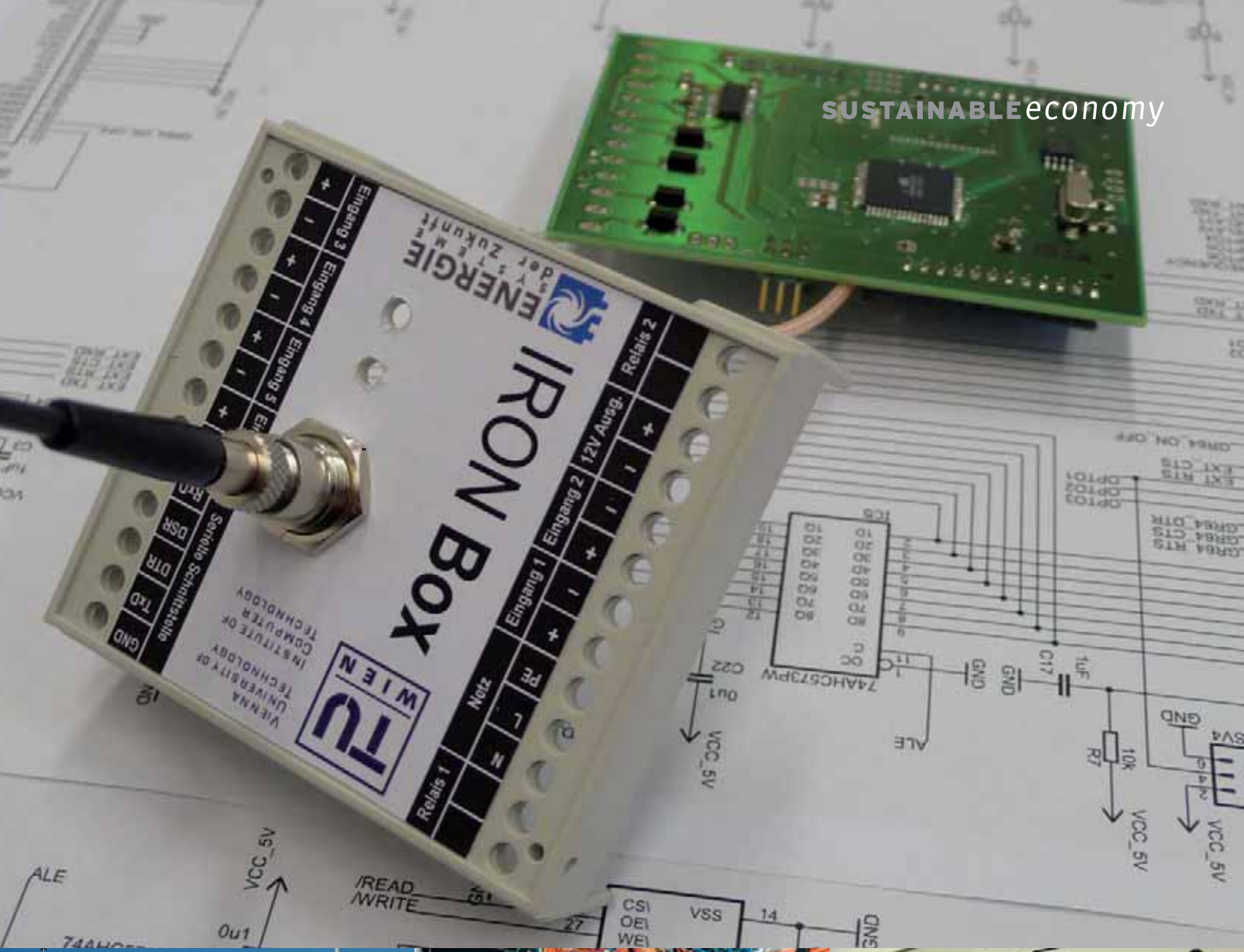
Background

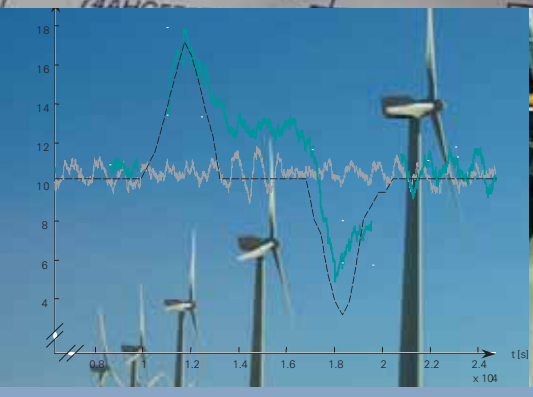
Facing the shortage of energy resources and rising energy costs, it is crucial to increase the efficiency of energy usage. Although already deregulated, today's power markets still lack incentive for wide consumer groups to avoid peak consumption. This project aims to design a distributed and integrated load management infrastructure. Based on a self-controlled load shifting strategy, peak consumption can be reduced and thus overcapacities become obsolete.

Results

- Different load management strategies possible: virtual power plant, peak shaving, online pricing.
- A common communication infrastructure is essential for effective and flexible operation of each option.
- Low costs for setting up and operating the network are crucial for the economic success.
- Currently, no feasible load management devices with communication capabilities are available on the market.
- Prototype design ("IRON Box") shows that low-cost load managers are possible in high volume.
- Load management can gain significant impact on load profiles without loss of user comfort
- Load shift capabilities and thermal storage capacities in the grid can be combined to a large "virtual pumped storage"

SUSTAINABLE*economy*





Energy Systems of Tomorrow

IRON CONCEPT
Integral Resource Optimisation Network

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ENERGY SYSTEMS of Tomorrow

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