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Overview of Microgrid research and development activities in the EU

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European Commission

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Present energy policy framework



European Commission

“Increased import dependency, higher energy prices and climate change are common problems for Member States and require a European response....”

...the EU would strongly benefit from an appropriate Strategic Energy Technology Plan for Europe”

Green Paper. March 8, 2006



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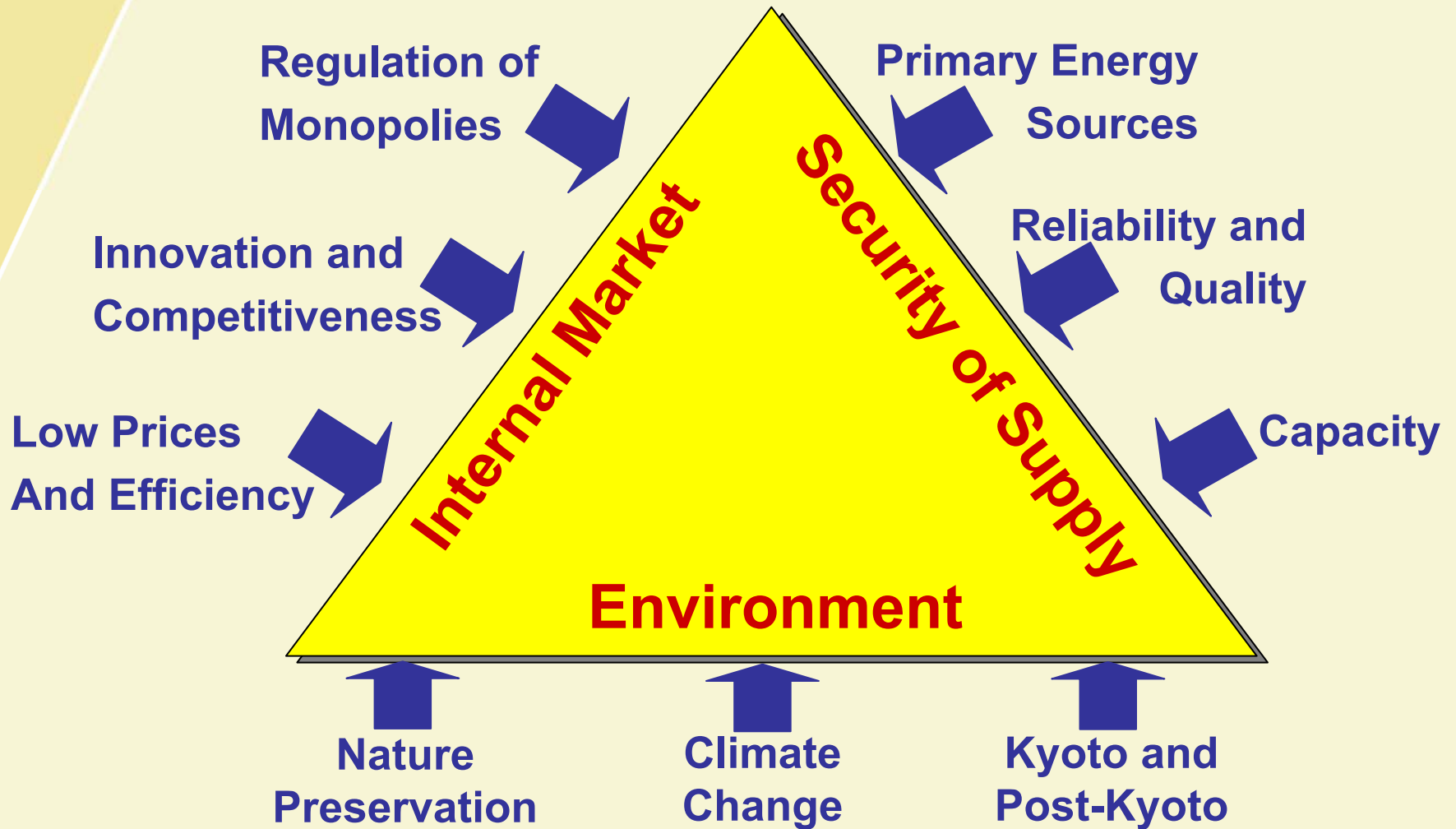
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Drivers towards a sustainable energy development



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The concept of “Smart Power Networks”



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- ❑ “Smart” coexistence of central and decentralised generation with lower carbon generation and efficient demand/response
- ❑ Load trading and cost optimisation by means of dialog towards time-variable tariffs and variable incentives depending on present load
- ❑ Customer integration based on bi-directional communication and large flow of information



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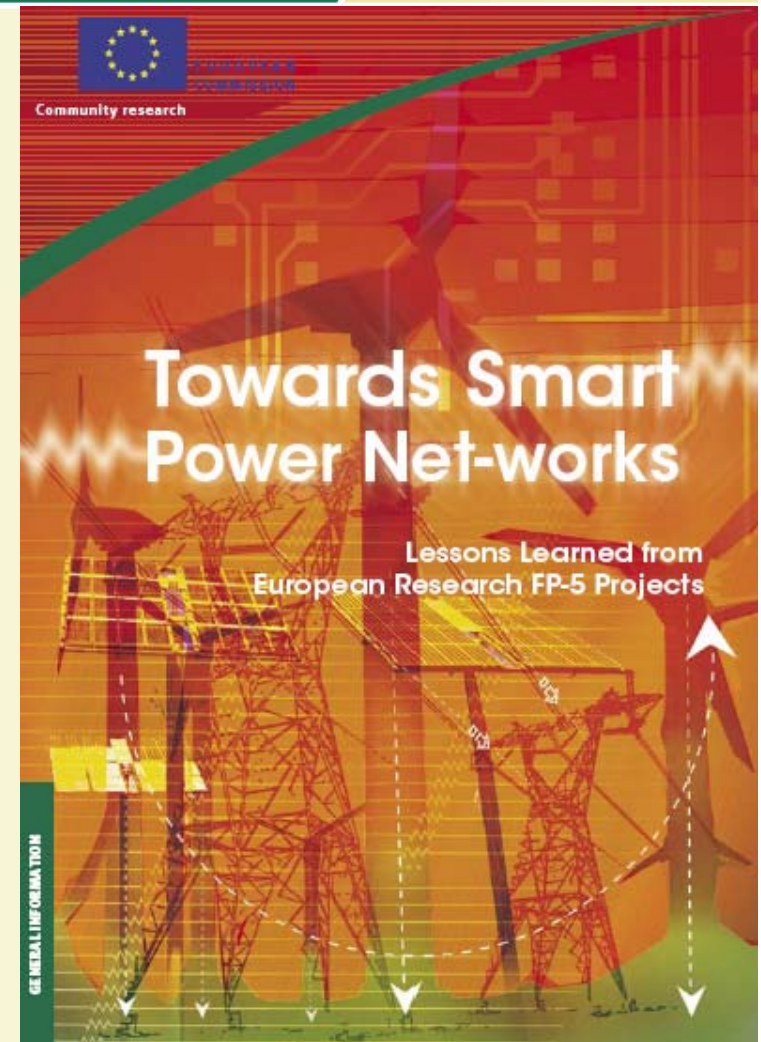
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RTD topics in EU FP5&6 2001-2006 “Smart Power Networks



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- ❑ **ADVANCED GRID ARCHITECTURES**, like active networks, micro-grids, Virtual Power Plants.
- ❑ **DEMAND-PULL APPROACH**, rather than technology push
- ❑ **ENABLING TECHNOLOGIES**: Power electronics, ICT solutions, Storage and High Temperature Superconductivity
- ❑ **COORDINATION**:
 - NoE for DER laboratories
 - CA for TSOs
 - DG-net and SOLID-DER:
 - Support Secretariat for TP-SmartGrids



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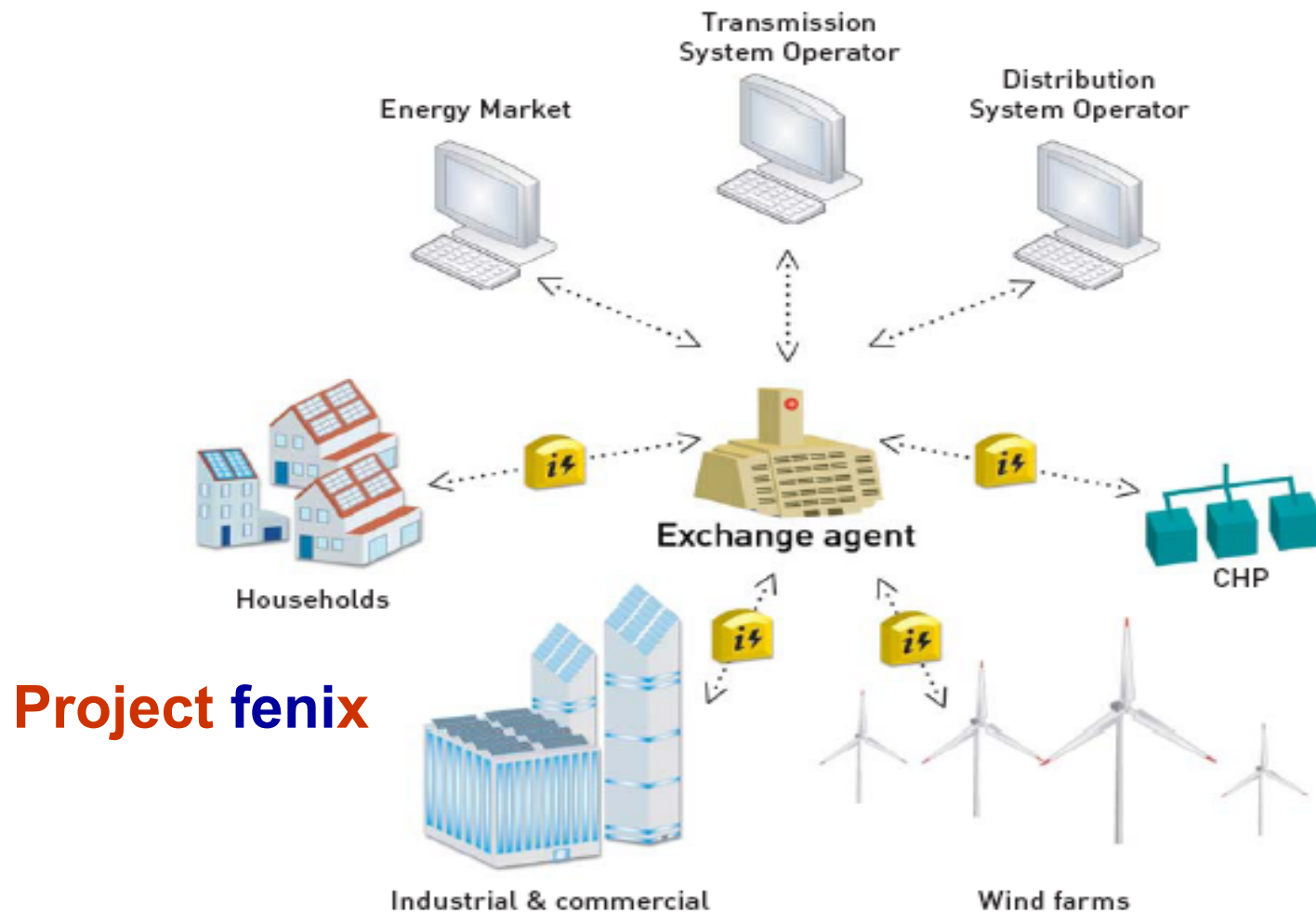
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Relevant EU projects (2001-2006)

Virtual Power Plants



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Project fenix



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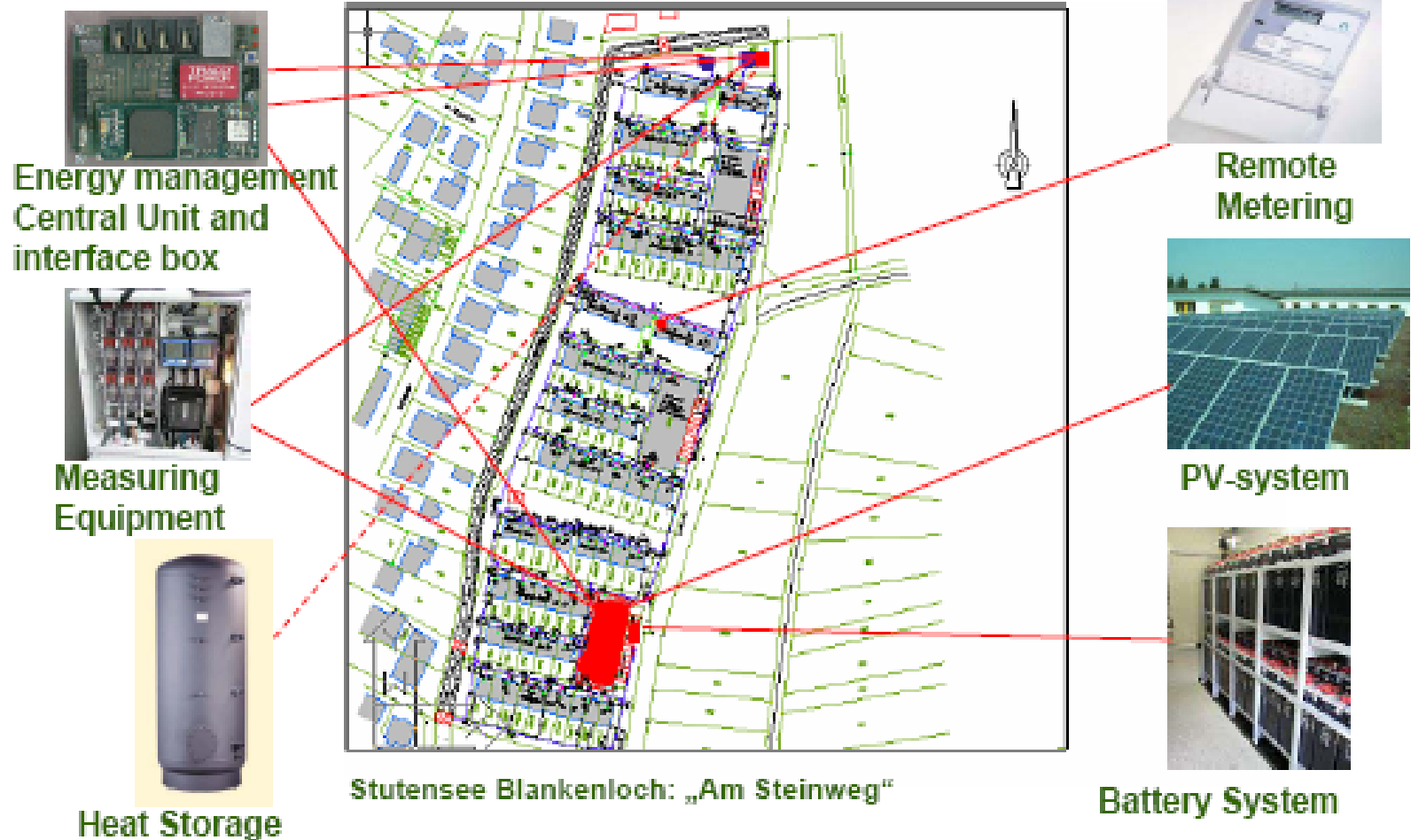
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Relevant EU projects (2001-2006)

Active Networks



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Project DISPOWER



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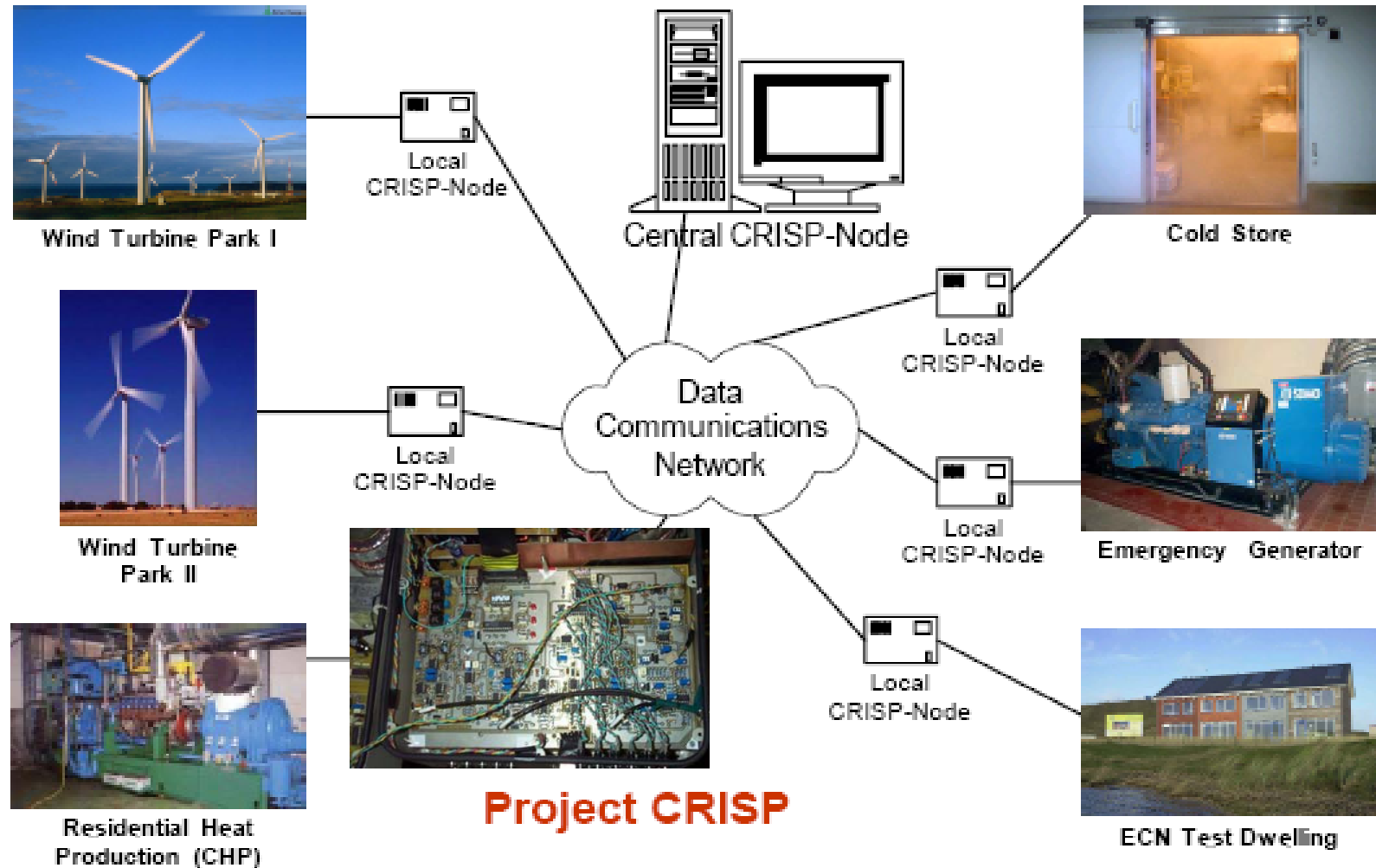
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Relevant EU projects (2001-2006) Demand and response management



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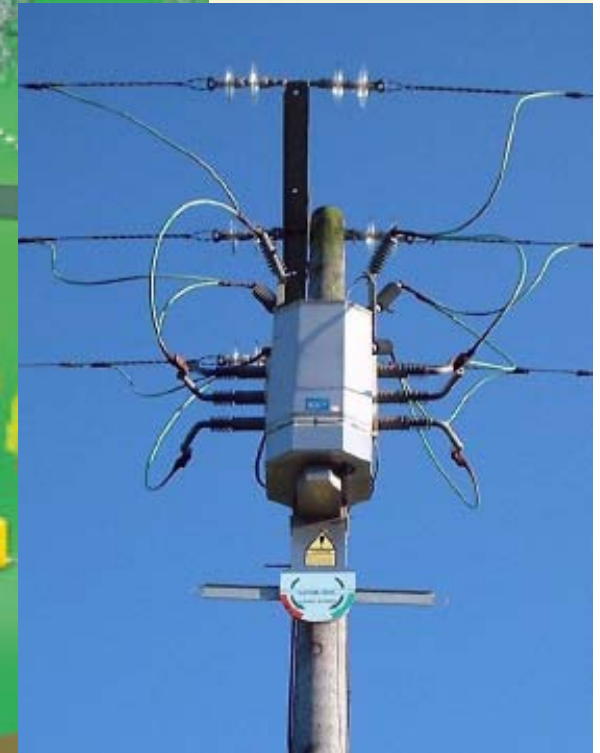
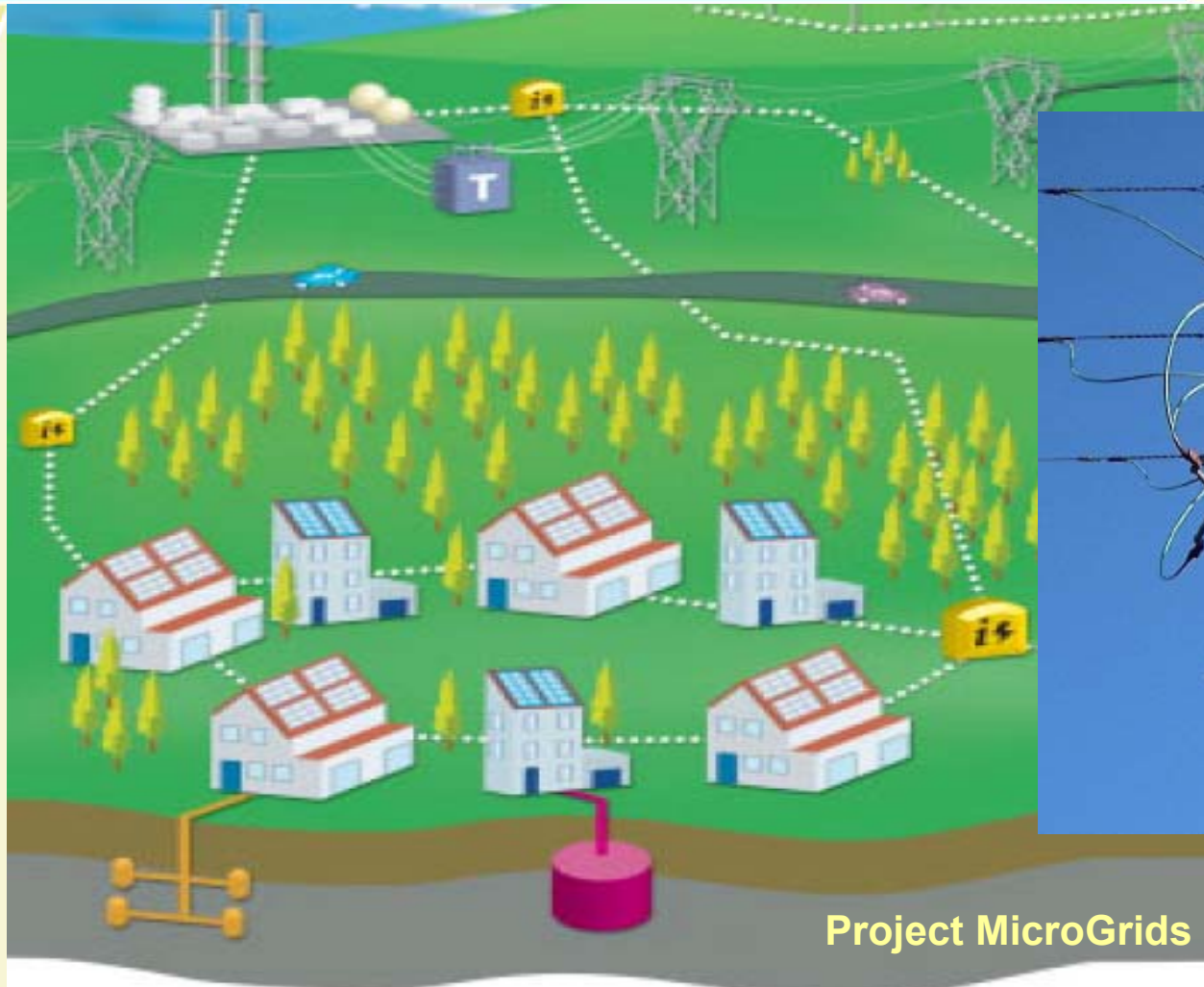
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Relevant EU projects (2001-2006) Microgrids



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Project MicroGrids



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EU-Project Microgrids:

“Large Scale Integration of Micro-Generation
to Low Voltage Grids” (2002-2005)



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**14 PARTNERS,
7 EU COUNTRIES**

GREAT BRITAIN

- UMIST
- URENCO

PORTUGAL

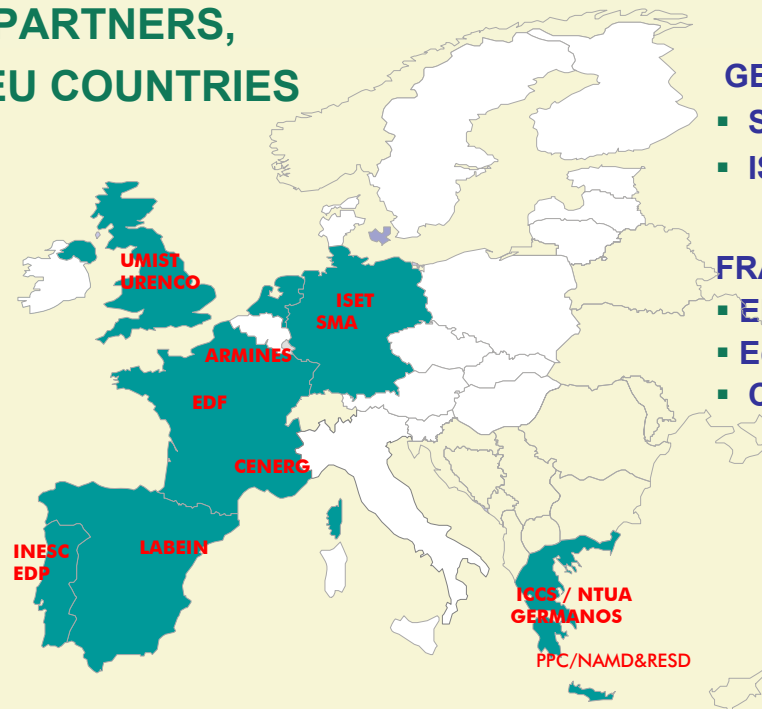
- EDP
- INESC

SPAIN

- LABEIN

NETHERLANDS

- EMforce



GREECE

- NTUA
- PPC /NAMD&RESD
- GERMANOS

GERMANY

- SMA
- ISET

FRANCE

- EDF
- Ecole des Mines de Paris/ARMINES
- CENERG

<http://microgrids.power.ece.ntua.gr>



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Successful results...



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- **Investigation, development and validation of the operation, control, protection, safety and telecommunication infrastructure of MicroGrids**
- **Validate the operation and control concepts in both stand-alone and interconnected mode on Laboratory MicroGrids**



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...further needs identified



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- **Advanced control techniques for local Distributed Resources and load controllers**
- **Integration of several Microgrids into operation. Interaction with DMS.**
- **Standardization and benchmarking.**
- **Field trials to test control strategies on actual Microgrids**
- **Impact assessment of Microgrids on power system operation and planning**
- **Cooperation and learning from alternative, complementary approaches, under development in US, Canada and Japan**



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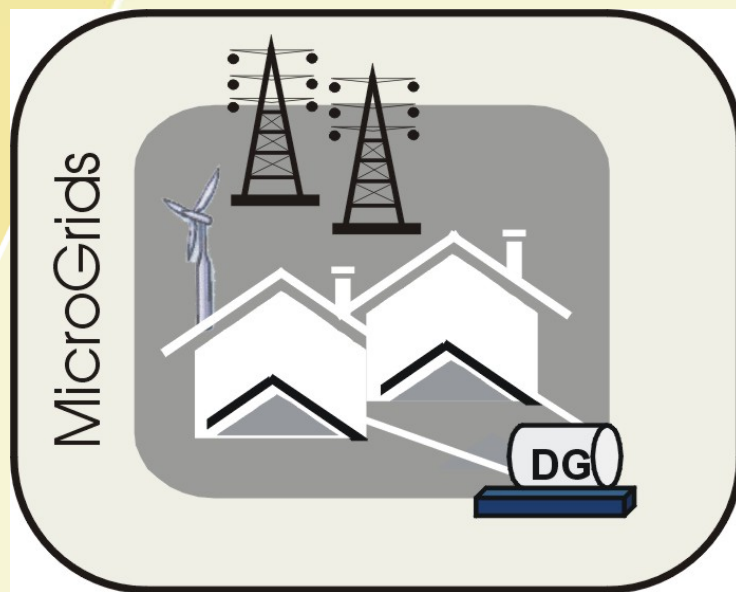
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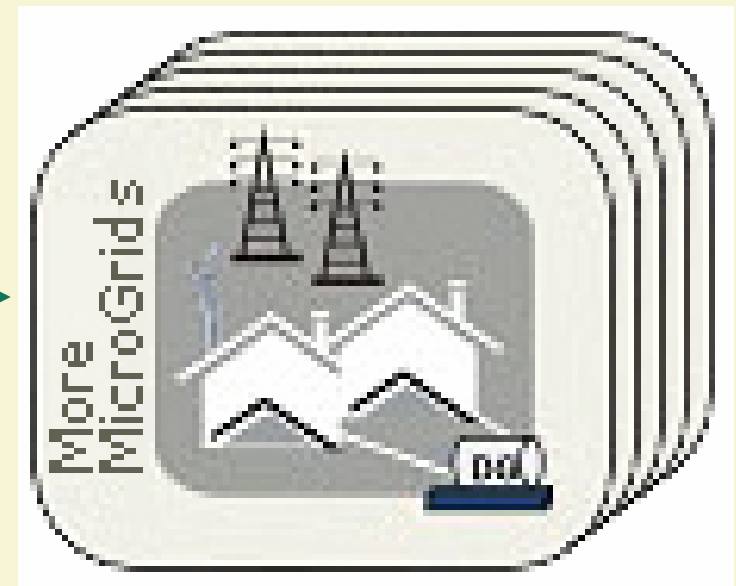
More-MicroGrids (2006-2010)



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4.5M€ budget



8M€ budget



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EU-Project MORE MICROGRIDS

Advanced Architectures and Control Concepts for More Microgrids



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SWEDEN

- ABB

POLAND

- LRPD
- Univ. LODZ

GREAT BRITAIN

- UMIST
- I-POWER

PORTUGAL

- EDP
- INESC Porto

SPAIN

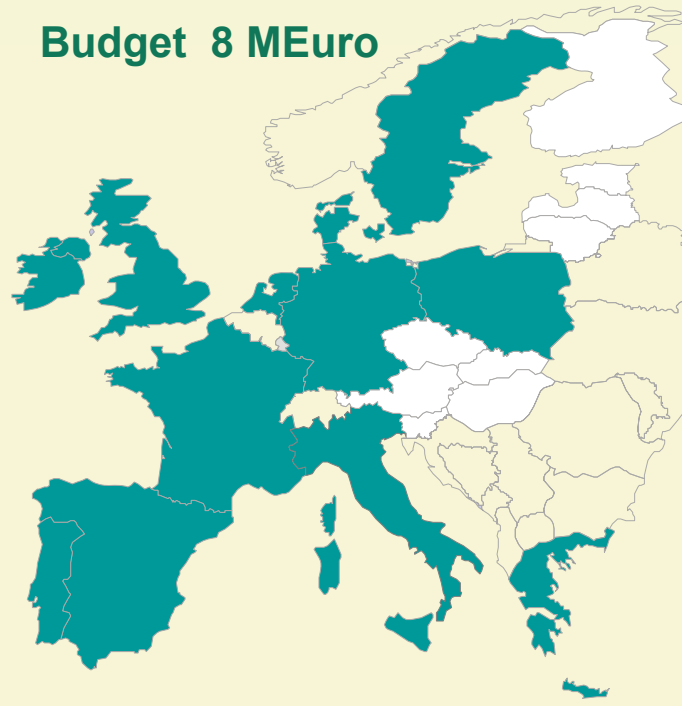
- LABEIN
- ZIV

NETHERLANDS

- EMforce
- CONTINUON



22 PARTNERS
11 EU COUNTRIES
Budget 8 MEuro



GREECE

- NTUA
- PPC /NAMD&RESD
- GERMANOS
- CRES

GERMANY

- SIEMENS
- MVV
- SMA
- ISET

FRANCE

- ARMINES/Ecole des Mines de Paris

ITALY

- CESI

DENMARK

- ELTRA

<http://microgrids.power.ece.ntua.gr>



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More-Microgrids

Scientific and Technical Objectives



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- **Development and field trials of alternative control strategies and network designs (centralised vs. decentralised) to provide efficient operation of Microgrids**
- **Technical and commercial integration of Multi-Microgrids, including standardisation of protocols and hardware**
- **Impact on power system operation and on the development of electricity network infrastructures**



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MORE MICROGRIDS

Pilot Installations



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- **Spain: Labein's Commercial feeder**
- **Greece: Kythnos Island Microgrid**
- **Portugal: EDP's Microgeneration Facility**
- **Netherlands: Continuon's MV/LV facility**
- **Germany: MVV Headquarter Building**
- **Italy: CESI Test facility**
- **Denmark: ELTRA's DNO 150 kV Microgrid**



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Relevant EU projects lessons learned 2001-2006



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- **About 50 Projects supported in FP5 and FP6 - EC €100M- since 2001**
- **Reliability, accessibility and flexibility, are the main issues, but non-technical barriers must be addressed as well**
- **Integration into overall system operation and development is critical; a few smart grids concepts under validation**
- **Successfull mobilisation of efforts at European level**



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EU RTD FP7 SP - Priority 5 ENERGY Research Area “Smart Energy Networks”



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2007-2013

PROPOSED GOALS “SmartGrids”



- **Contribute to the transition of the current electricity grids into a resilient and interactive service network.**
- **Remove obstacles to the large-scale integration of RES & DG.**
- **Develop and demonstrate key enabling technologies, including energy storage**



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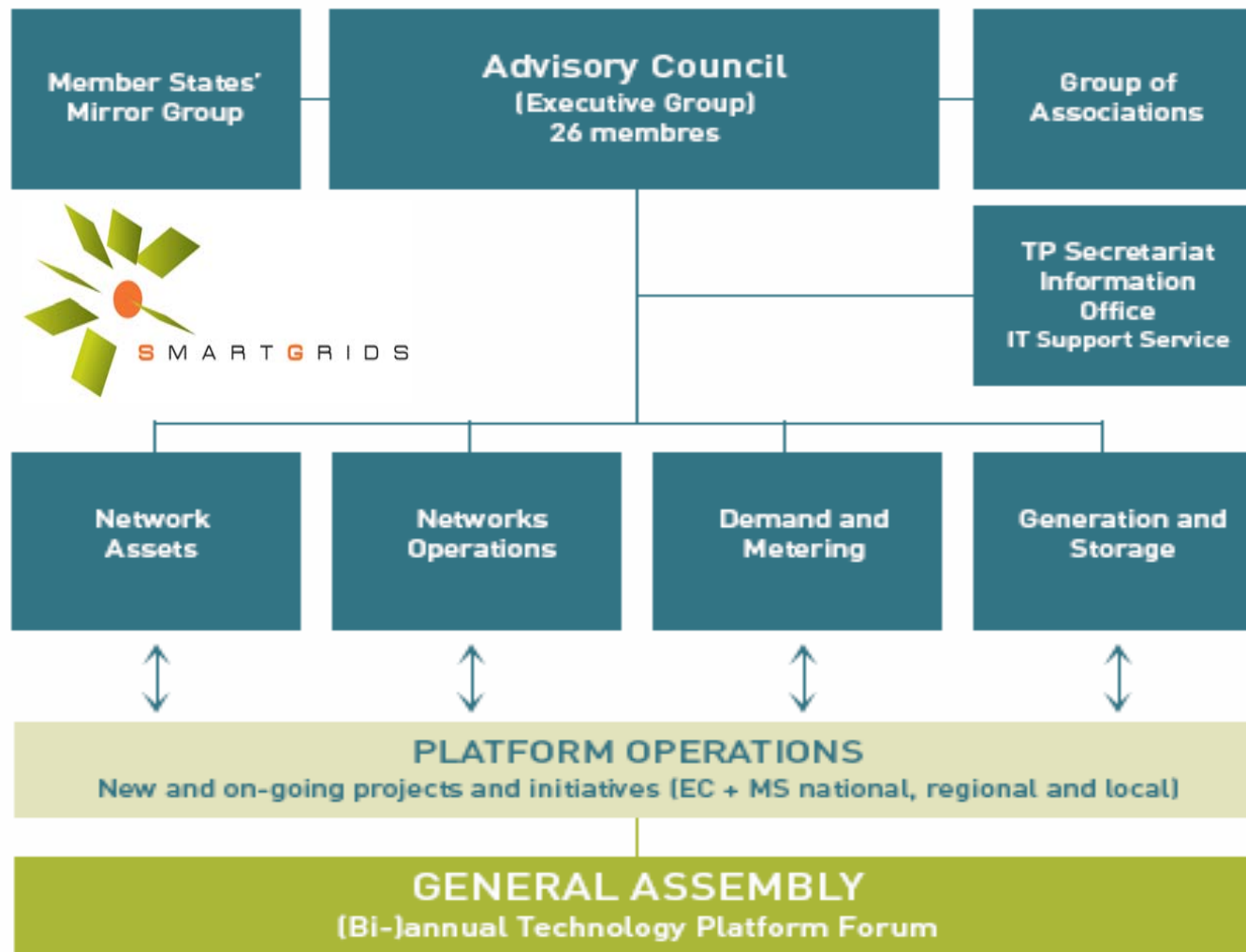
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European Technology Platform SmartGrids



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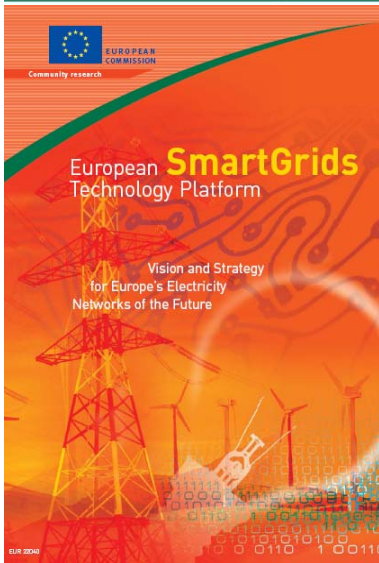
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European Technology Platform SmartGrids



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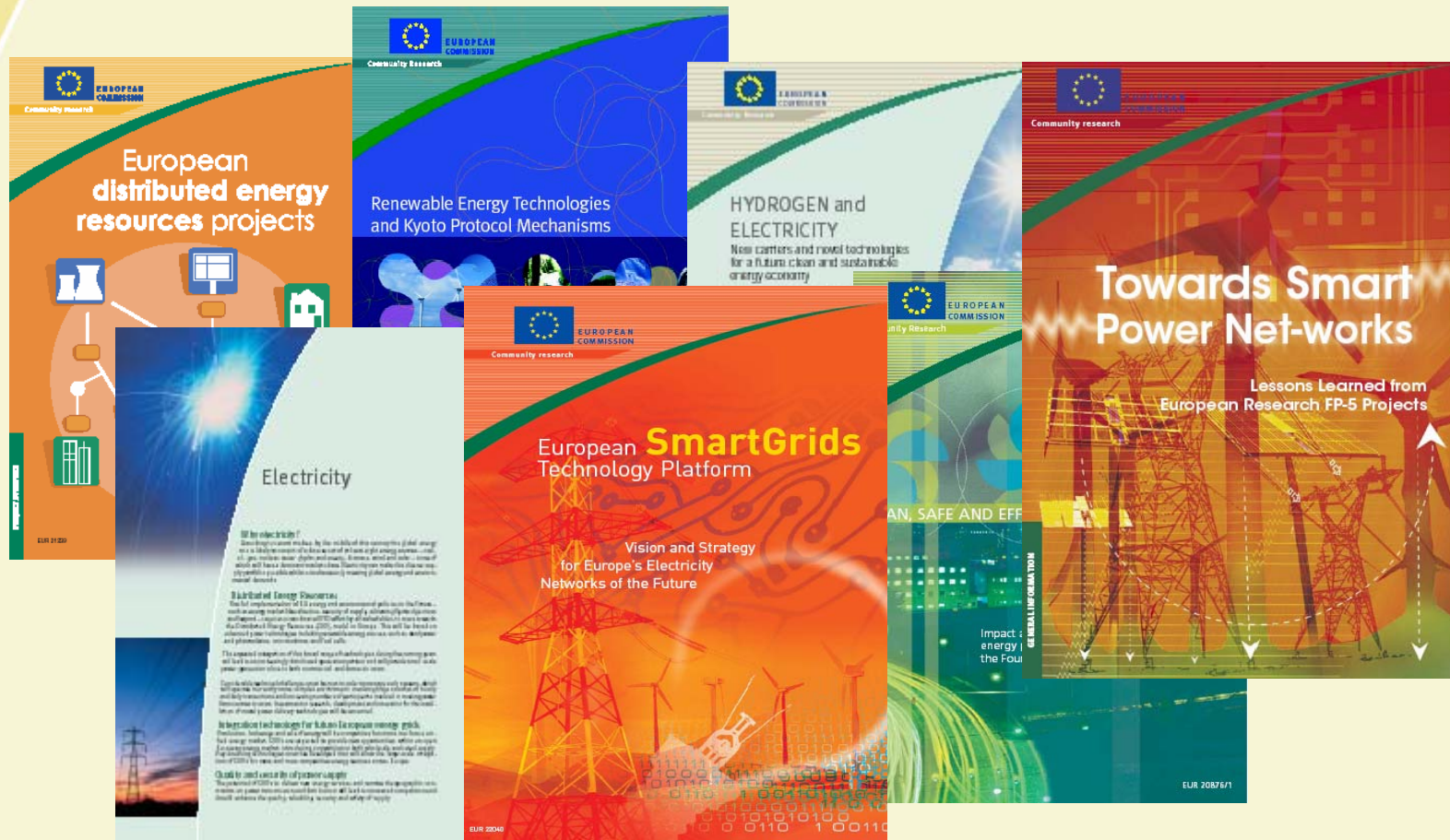
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EU publications and Technology Platform SmartGrids



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http://europa.eu.int/comm/research/energy/index_en.htm



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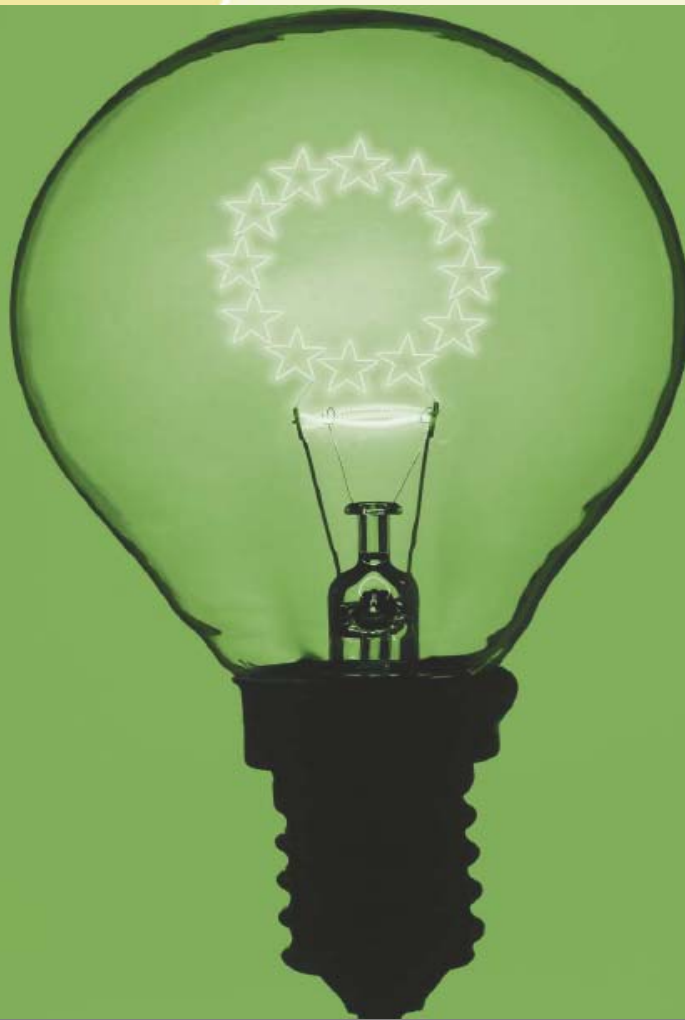
**Thank you for your
attention**



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