



RTD and non-RTD policies and framework conditions

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eutema



Overview

- non-RTD boundary conditions
 - Market failures and public intervention
 - Cases for power electronics, e.g. VSD
- RTD policies
 - EU, member states, 3rd countries,
 - industry
- Conclusions and recommendations




Societal megatrends

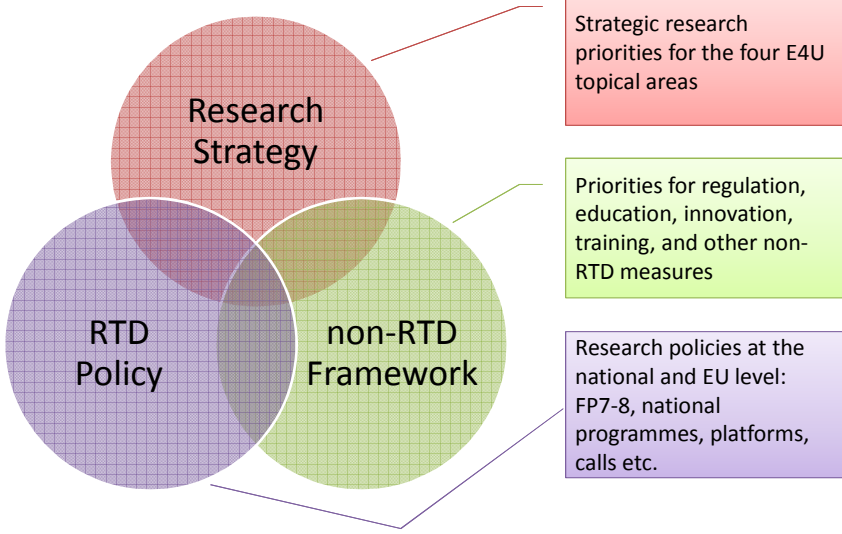
Megatrends:	Consequences for Power Electronics
Mobility	E-car, hybrid car, fuel cell car urban transport, trains, more electric aircraft/ship
Information & communication society	PC, internet, server farm, digital control and system communication body area network (mobile human, mobile miniaturized system)
Energy saving; security, availability and reliability of energy supply; clean environment	Energy efficiency, power quality, electrification, system reliability, intelligent power management, digital control
Comfort; elder society	Electrification, self-learning systems
Urbanisation; basic infrastructure; transport	Electrification
Globalisation	Standardisation

Society megatrends with impact on (power) electronics

Energy Efficiency/ICT
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The RTD policy framework



Strategic research priorities for the four E4U topical areas

Priorities for regulation, education, innovation, training, and other non-RTD measures

Research policies at the national and EU level: FP7-8, national programmes, platforms, calls etc.

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Strategies for Power Electronics Research in Europe
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Public intervention

„Clear price signals alone are not enough“ (WEC 08)
 - efficient appliances, information, technical services are also needed

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    graph LR
      subgraph Market_failures [Market failures]
        M1[Information]
        M2[Agency]
        M3[Financial constraints]
      end
      subgraph Intervention [Intervention]
        I1[Information]
        I2[Risk sharing]
        I3[R&D]
        I4[Regulation]
        I5[...]
      end
    
```

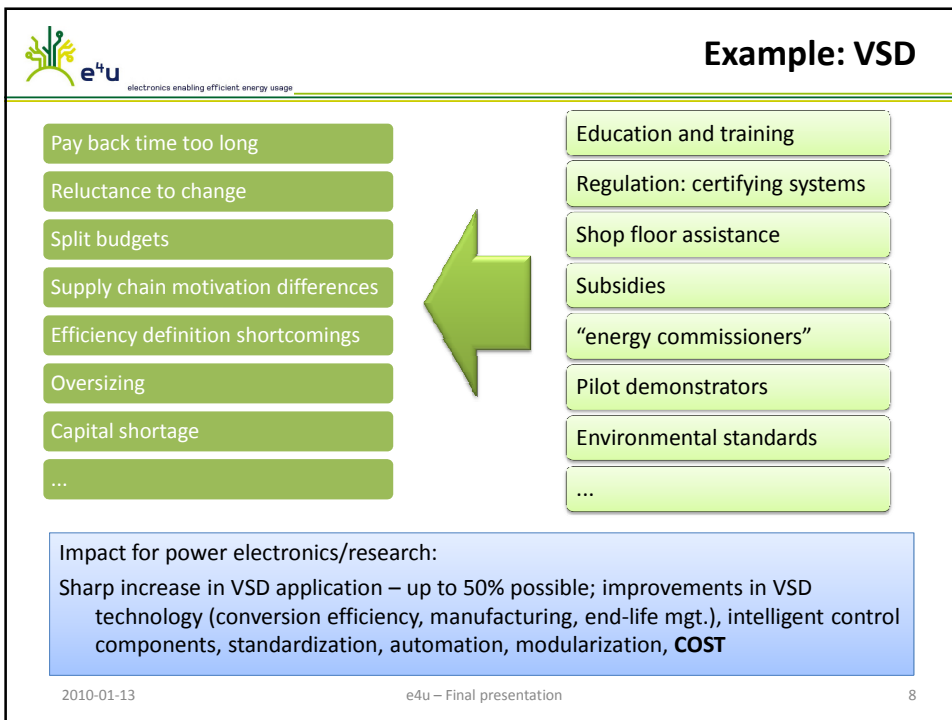
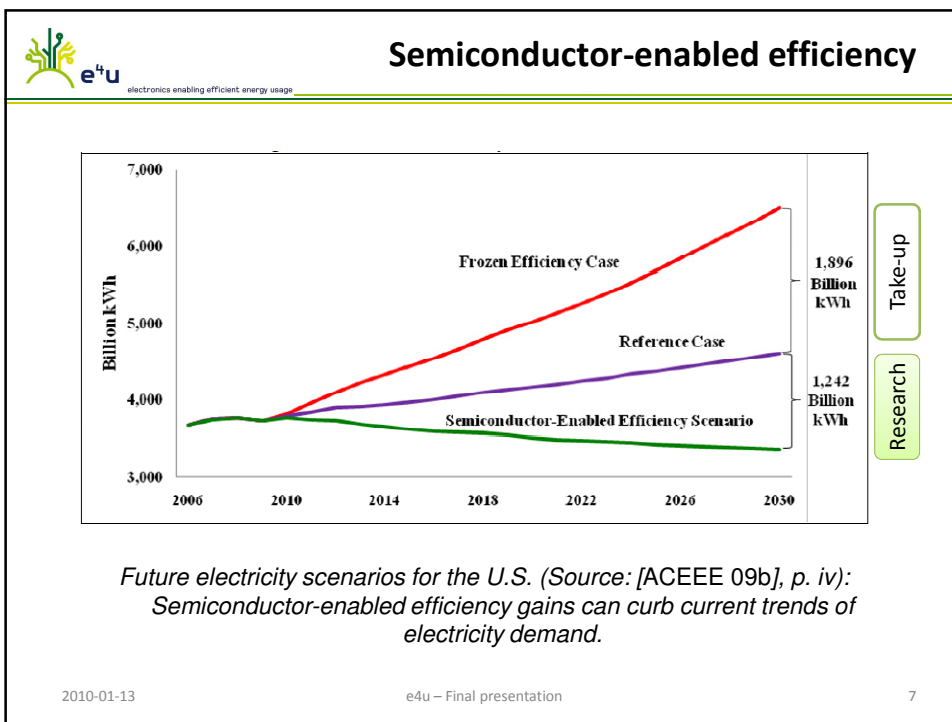
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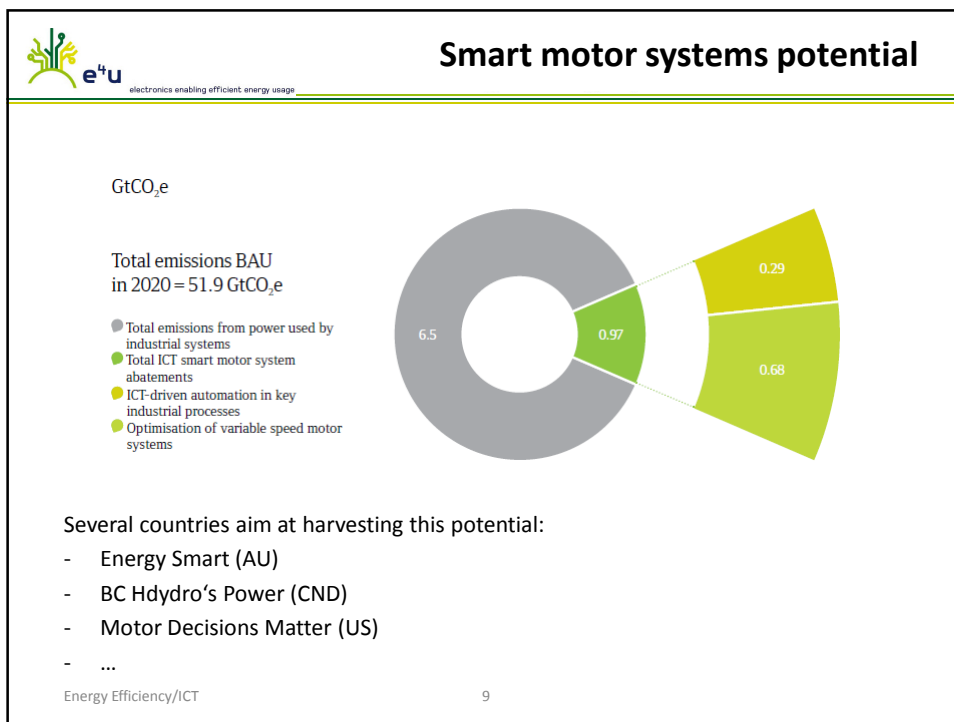
Intervention impact on efficient electronics

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    graph LR
      A[Information dissemination] --> E4U[e4u]
      B[Guidance] --> E4U
      C[Education and training] --> E4U
      D[Regulation and minimum standards] --> E4U
      E[Voluntary commitment] --> E4U
      F[Reporting and benchmarking] --> E4U
      G[Audits] --> E4U
      H[Product labels] --> E4U
      I[Fiscal policies and financial aids] --> E4U
    
```

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European (RTD) Policies


Policies	<ul style="list-style-type: none"> • Green Paper: Doing more with less (05) • Energy efficiency action plan (06) • European strategic energy technology plan
EU Directives	<ul style="list-style-type: none"> • Energy performance of buildings • Ecodesign for EuP • Energy end-use efficiency and energy services
Non-FP	<ul style="list-style-type: none"> • ICT Policy support programme • ICT for energy and environment • Intelligent Energy Europe II (IEE II)
FP7	<ul style="list-style-type: none"> • Cooperation: ICT • Cooperation: Energy
PPPs	<ul style="list-style-type: none"> • Factories of the Future • Energy-efficient buildings • Green Cars

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RTD priorities in the PPPs


- **Energy efficiency in buildings and districts**, coupled with improved quality of life (health, comfort ,environment)
- ICT for ‘smart’ buildings and districts, and the **integration of renewable energy systems**.
- Use of nanotechnologies, **new materials, components, systems** and construction processes, and their integration into energy efficient buildings.
- Large-scale demonstration actions highlighting **innovative technologies in the final phase of their development**.
- Industrialisation of products and components – phase-change materials, insulation materials, smart windows and facades, etc. – contributing to energy-efficiency.
- Adaptation of processes, for building and product design, finding adequate financing, initiating new commissioning procedures, tackling behavioural issues, ensuring knowledge transfer.
- **E4U contribution to ELSA on ICT for energy-positive neighbourhoods**
Increase awareness of power electronics potential to enable energy efficiency research



Member States (RTD) Policies

Austria	<ul style="list-style-type: none"> • New Energies 2020 (Climate and energy fund)
France	<ul style="list-style-type: none"> • French National Strategy for Research and Development in the field of Energy • French Automotive Cluster MOV'EO
Germany	<ul style="list-style-type: none"> • E-Energy (Ministry of Economy and Technology) • Power Electronics to Improve Energy Efficiency (Ministry of Research) • Electric Mobility (Joint Initiative of four German Ministries)
Ireland	<ul style="list-style-type: none"> • Energy Research Strategy (Irish Energy Research Council) • Sustainable Energy Ireland • Science Foundation priority areas
NL	<ul style="list-style-type: none"> • Energy Transition Programme (Senter Novem), Energy Innovation Agenda • Electric vehicle technology
Spain	<ul style="list-style-type: none"> • Strategic action (PNIDI): energy and climate change, sustainable mobility, sustainable edification
Sweden	<ul style="list-style-type: none"> • Programme for improving energy efficiency in energy-intensive industries (PFE)
UK	<ul style="list-style-type: none"> • Energy Research Partnership • UK Energy Research Centre


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Third Countries

Australia	<ul style="list-style-type: none"> Energy efficiency opportunities Climate ready Re-tooling for climate change
China	<ul style="list-style-type: none"> Energy saving of motor systems Energy system optimization Green lighting
Japan	<ul style="list-style-type: none"> Cool Earth-innovative energy technology
New Zealand	<ul style="list-style-type: none"> Energywise homes Energywise businesses, transport, electricity Low-carbon energy technologies fund (RTD)
Singapore	<ul style="list-style-type: none"> Energy efficiency programme office Initiative on new energy technologies centre Energy R&D programme
USA	<ul style="list-style-type: none"> Smart Grid Investment Program (DOE) NSF: CPES, FREEDM, PEEMRC Vehicle Technologies, Solid-State Lighting


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US: RTD

NSF	<ul style="list-style-type: none"> Center for power electronics systems Future renewable electric energy delivery & mgt
DOE ORNL	<ul style="list-style-type: none"> Power electronics machinery research
DOE	<ul style="list-style-type: none"> Vehicle technologies program Solid state lighting program
other	<ul style="list-style-type: none"> Many new programs targeting take-up, dissemination etc.

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Private Industry Initiatives


VESTAS

- Leading wind turbine producer
- Over 38,000 turbines installed
- EBIT of € 668 m Y08
- world's largest research and development centre for wind energy in Aarhus (DK)
- Vestas Power Programme (VPP): strategic collaboration with Aalborg University (DK)
 - € 6 m budget, 2/3 industry
 - Vestas Professor in Power Electronics
 - Vestas Scholarships
 - PhDs and PostDocs
 - Guest professors

ECPE Joint Power Electronics Programme

- ECPE founded in 2003
- 40 companies, 50 European institutes
- joint research programme financed from an industrial research fund of the ECPE partner companies
- Demonstrator projects
 - *Industrial Drives - System Integration*
 - *System Integrated Drive for Hybrid Traction in Automotive*
 - *Power Supplies with Ultra-high Power Density*
 - *Multifunctional Bidirectional DC/AC Converter Intelligent Energy Storage*

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Public Industry Initiatives (ETPs)

European Technology Platforms

EPOSS

TP
Wind

SMART
Grids

ARTEMIS

ENIAC

Electronics/
Energy
Efficiency

Conversion
(SiC, GaN,
packaging)

Power Mgt.
(E Scavenging)

Turbine
components

Network of the
Future

Dist. Energy Mgt.


Embedded
Devices

Energy
scavenging

?

?


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RTD Programme Conclusions

- Programmes today emphasize short-term benefits & applications
- Electrical energy efficiency is considered, but not prominent
- Green ICT is often listed, but only rarely concerning research
- Power electronics is hardly mentioned in general energy efficiency programs at all although it is a key component for realising many of the expected benefits supported in the different initiatives.
- Several industrialized countries have increased efforts for EEff deployment, research and take-up: U.S. created new dedicated research centres focusing on power electronics for energy efficiency
- Only Germany has a dedicated research programme in the EU
- Energy and electronics mentioned in the ARTEMIS and ENIAC, and other ETPs, e.g. EPOS.
- Ample room for improving the positioning of electronics as a means to saving electrical energy in energy efficiency programs.

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R, TD & take-up

All areas – from roll-out to long-term research require attention

Roll-out	Develop	Research
VSD	Smart grid	SiC PE
Intelligent lighting	Advanced lighting	0- power standby
Smart meters	Standardized solutions	energy-aware SW
Low-power stand-by	Business models	power density
...

Energy Efficiency/ICT
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electronics enabling efficient energy usage

E4U Recommendations

- **Explicit mentioning** of electronics in initiatives targeting improved energy efficiency; not just as a technology, but for improved overall energy efficiency.
- **Dedicated programmes** are key to increase the RTD budgets, but also to create the necessary public recognition.
- **Specific calls** concerning components, materials, etc. also support public recognition of this area.
- A new **European Technology Platform** in Electronics for Energy Efficiency.
- **Clarification of topic ownership in agencies and ministries**
- Improved **exploitation** of existing instruments (e.g. the EIT Knowledge and Innovation Communities) can help.
- Application-oriented development should be continued, but **longer-term research** in the field of power electronics should not be neglected.
- Awareness building, training, product labelling, standardization, to be aligned with RTD for an **integrated topical strategy**.
- Electronics for energy efficiency deals with two topics (energy and ICT) and two dimensions (technology and application) and can **create a new area**.

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