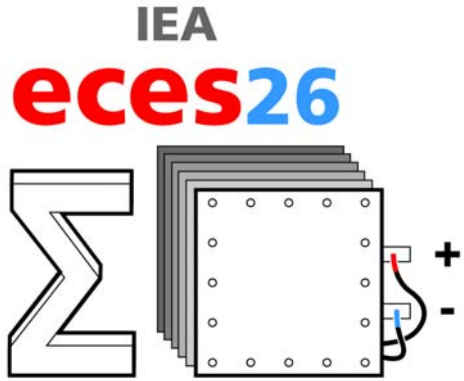
IEA ECES – Annex 26

»Future Electric Energy Storage Demand«



Daniel Wolf

Fraunhofer Institut UMSICHT

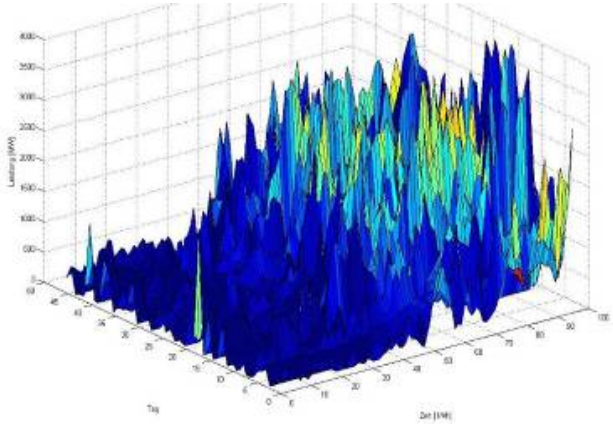
Fraunhofer Network
»Energy Storage System and Grids«

with **new** energy

Fraunhofer
UMSICHT

IEA eces 26
Berlin, 24th Nov. 2010

Why do we need energy storage systems ?

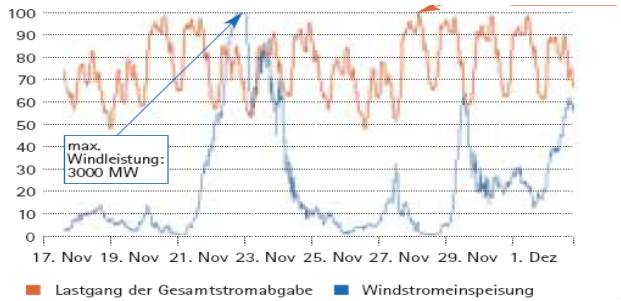


© Fraunhofer

- **Integration of intermittent renewable energies causes fluctuations in the grid**
  - ► grid overload
  - ► lack of electricity

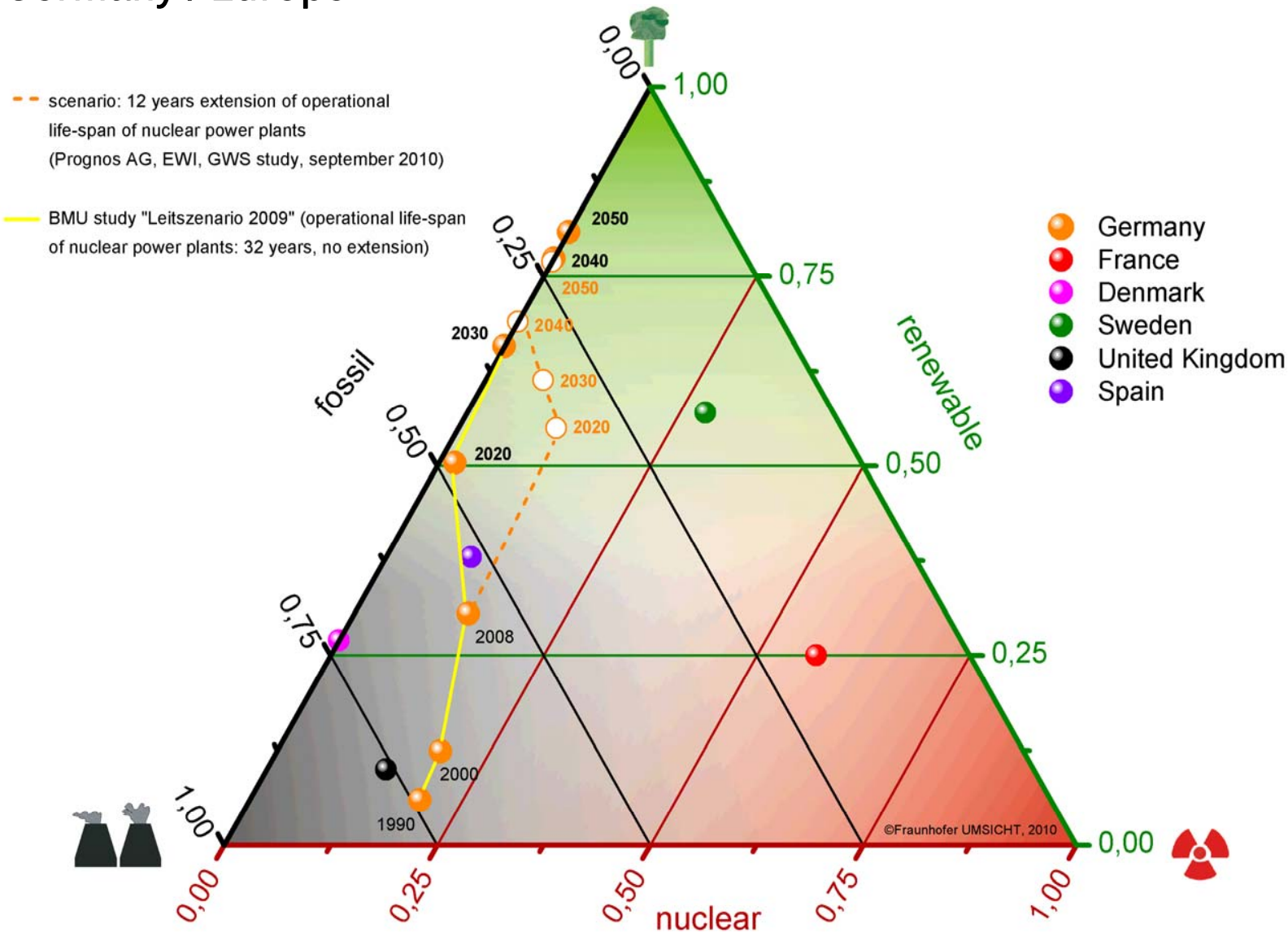
- **Balancing generation and demand is permanently necessary**
  - ► **control or backup power (positive / negative)**

© EON

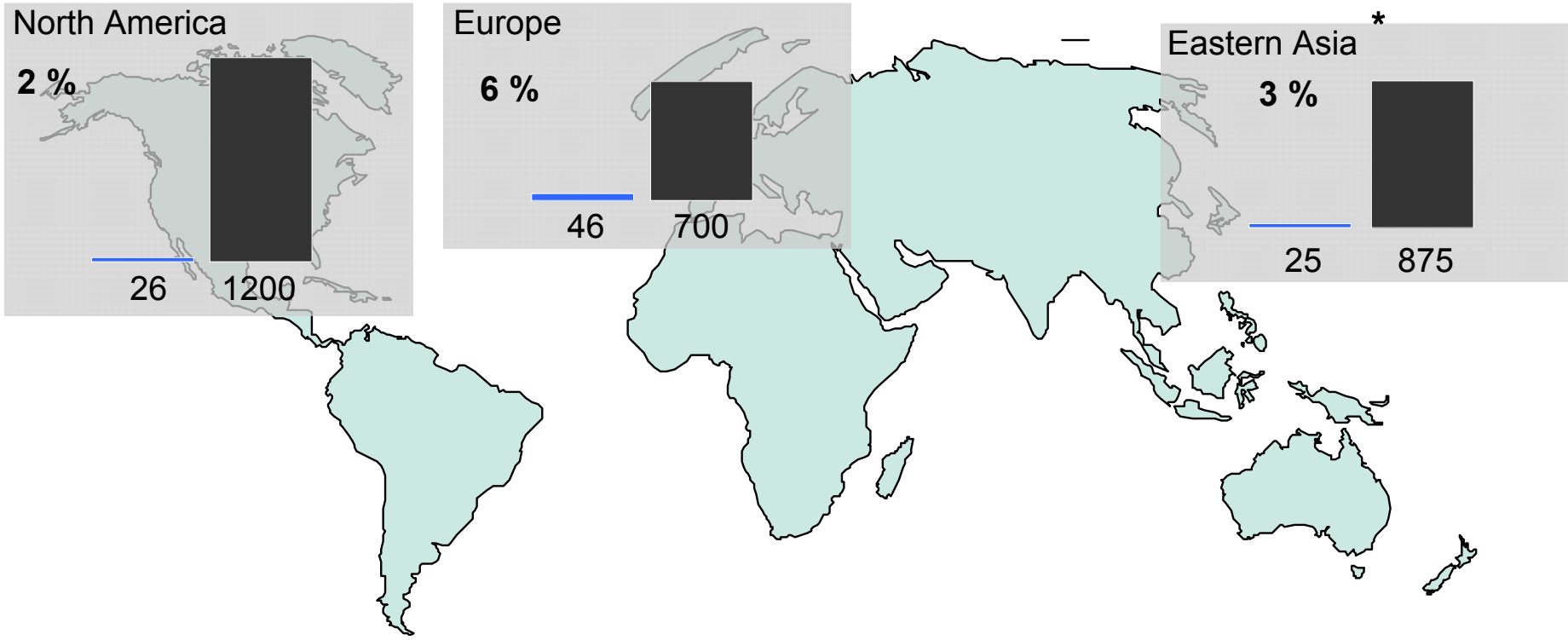


- ► **massive grid extension and upgrading necessary**

Energy System Germany / Europe
[Power]

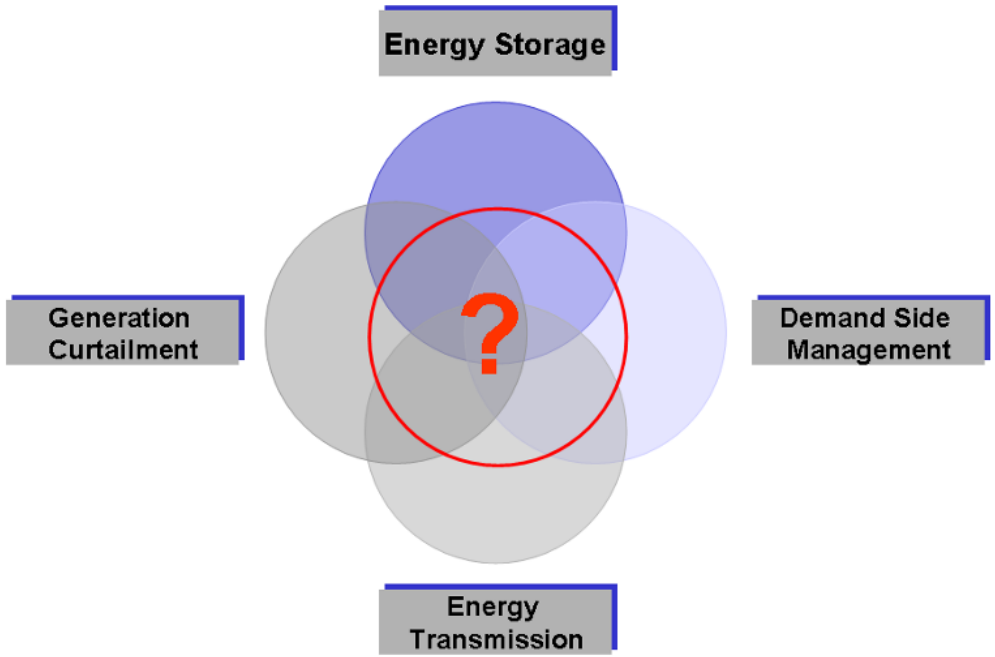


Installed energy storage system vs. installed generation capacity



* Japan, China, Korea, Taiwan

Flexibility options - measurements to balance the grid



- **Flexibility demand…**
  …increases because of fluctuating energies
- **Energy storage systems…**
  … are promising solutions but still expensive and not easy to manage yet
- **Energy transmission…**
  … good technical solution but not easy to realize because of obstacles
- **Generation curtailment…**
  … easy to manage but inefficient because of loss of energy
- **Demand side management…**
  … cheap to realize but currently with a limited potential

ECES Annex 26 »Future Electric Energy Storage Demand«
A View on the (thermal) History

ECES	**–**	**Energy Conservation through Energy Storage**
Annex 1		Large scale Thermal Storage Systems Evaluation
Annex 2		Lake Storage Demonstration Plant in Mannheim
Annex 3		Aquifer Storage Demonstration Plant in Lausanne Dorigny
Annex 4		Short Term Water Heat Storage Systems
Annex 5		Full scale Latent Heat Storage Installations
Annex 6		Environmental an Chemical Aspects of Thermal Energy Storage in Aqufiers and Research and Development of Water Treatment Methods
Annex 7		Innovative and Cost Effective Seasonal Cold Storage Applications
Annex 8		Implementing Underground Thermal Energy Storage Systems
Annex 9		**Electrical Energy Storage Technologies for Utility Network Optimizations (start June 1996, with UK (OA), Canada, Germany, Netherlands)**
Annex 10		Phase Change Materials and Chemical Reactions for Thermal Energy Storage

electric

Fraunhofer UMSICHT

ECES Annex 26 »Future Electric Energy Storage Demand«
A View on the (thermal) History

Annex 12	High-Temperature Underground Thermal Energy Storage (HT UTES)
Annex 13	Design, Construction and Maintenance of UTES Wells and Boreholes
Annex 14	Cooling with TES in all Climates
Annex 17	Advanced Thermal Energy Storage Techniques – Feasibility Studies and Demonstration Projects

Ongoing Annexes

Annex 18	Transportation of Thermal Energy Utilizing Thermal Energy Storage Technology
Annex 19	Optimised Industrial Process heat and Power Generation with Thermal Energy Storage
Annex 20	Sustainable Cooling with Thermal Energy Storage
Annex 21	Thermal Response Test for Underground Thermal Energy Storage
Annex 23	Applying Energy Storage in Ultra-low Energy Buildings
Annex 24	Material Development for Improved Thermal Energy Storage Systems
Annex 25	Surplus Heat Management using Advanced TES for CO_2 Mitigation

ECES 26 »Future Electric Energy Storage Demand« - Preface

The main objective of this task is to develop a method or approach to calculate the **regional energy balancing demand** and to derive **regional storage demand** rasterizing the area and taking into account that there are competitive technical solutions.

Additionally there are two important aspects. On the one hand an overview on the different **technical, economical and legal framework requirements** in the different countries.

Case Studies: Running projects, planned projects and future projects of stationary energy storage systems.

And on the other hand **typical operation modes for energy storages** and derived from this typical charge/discharge curves, needed for future standardizations and test procedures.

ECES 26 »Future Electric Energy Storage Demand« - Work packages

WP 1. Technical and economic framework requirements for electric energy storage systems

WP 2. Calculation Method to determine spatial demand for electric energy storage systems

WP 3. Technical Storage Issue: Application of electric energy storage systems

WP 4. Requirements for test procedures

ECES 26 »Future Electric Energy Storage Demand« - Organization

IEA ECES ExCo Member (Germany)

Dr. Astrid Wille
Project Management Jülich, Energy Technologies ERG1
Forschungszentrum Jülich GmbH, PTJ-ERG1, 52425 Jülich, Germany
Phone: +49-2461-61-2712
Fax: +49-2461-61-3131
E-Mail: a.wille@fz-juelich.de

Rolf Stricker
Project Management Jülich, Energy Technologies ERG1
Forschungszentrum Jülich GmbH, PTJ-ERG1, 52425 Jülich, Germany
Phone: +49-2461-61-1575
Fax: +49-2461-61-3131
E-Mail: r.stricker@fz-juelich.de

ECES 26 »Future Electric Energy Storage Demand« - Organization

Operating Agent (Germany)

Dr. Christian Doetsch
Head of Business Unit Energy Efficiency Technologies
Fraunhofer Institute for Environmental, Safety, and Energy Technology UMSICHT,
Osterfelder Strasse 3, 46047 Oberhausen, Germany
Phone: +49 (0) 208 8598 1195
Fax: +49 (0) 208 8598 1423
E-Mail: christian.doetsch@umsicht.fraunhofer.de

Project start:

- Kick-off Meeting, Oberhausen, 2010-Apr-08
- 2nd Meeting, Barcelona, 2010-Oct-25
- Parallel-Meeting, Shanghai, 2010-Nov-23/25

ECES 26 »Future Electric Energy Storage Demand« - Work packages

WP 1. Technical and economic framework requirements for electric energy storage systems

- Survey about number, capacity and type, efficiency, experience of storage systems
- Survey about technical key figures of different countries (power plant fleet, grid structure, future scenarios/forecasts)
- Survey about economic framework requirements (special tariffs/ laws)
- Assessment and comparison of technical and economical general conditions

Leader work package 1

N.N.

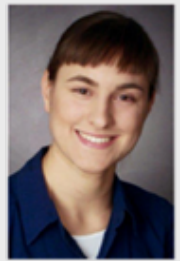
ECES 26 »Future Electric Energy Storage Demand« - Work packages

WP 2. Calculation Method to determine spatial demand for electric energy storage

- Survey/assessment of different methods to estimate the demand of energy storages
- Needed model simplification, parameter priorities, sensitivities, assumptions
- Development of a methodology to estimate regional demand for energy storages
- competing technologies (shares), validation (“Vision of the world”)

Leader work package 2

Dr. Yvonne Scholz
DLR - GERMANY



Yvonne Scholz
Institute of Technical Thermodynamics, Systems Analysis and Technology Assessment (TT-STB), German Aerospace Centre, Pfaffenwaldring 38-40, 70569 Stuttgart, Germany
Phone: +49 (0) 711 6862-296
Fax: +49 (0) 711 6862-747
E-Mail: yvonne.scholz@dlr.de

ECES 26 »Future Electric Energy Storage Demand« - Work packages

WP 3. Technical Storage Issue: Application of electric energy storage systems

- Examination of typical applications in different countries (today/future)
- Business Cases for Storage systems
- Case studies
- Competing technologies (grid extension, DSM, Curtailment) and Interfaces to smart grids (control method, Information transfer etc.)

Leader work package 3

Dr. Peter Radgen
(interim) EON

ECES 26 »Future Electric Energy Storage Demand« - Work packages

WP 4. Requirements for test procedures

- Overview about current technologies
- Definition of typical applications and operation modes for energy storages
- Deriving typical charging/discharging cycles for these applications
- Guidelines for testing energy storage systems

Leader work package 4

Dr. Marion Perrin
INES-CEA - FRANCE

Marion Perrin
CEA-INES
Institut national de l'énergie solaire (INES-CEA, Bourget-du-Lac),
Marion.Perrin@cea.fr
Contact 04 79 44 46 44

ECES Annex 26 »Future Electric Energy Storage Demand«
Participating Research Centers / Companies

Fraunhofer
UMSICHT

ECES Annex 26 »Future Electric Energy Storage Demand«
Participating Countries

Currently participating

Germany	■ Fraunhofer (operating agent) ■ DLR
Belgium	■ VITO
France	■ INES-CEA
Finland	■ VTT
Korea	■ KIST(?)

Interested

Japan	■ MRI ■ NGK
UK	■ Swanbarton
US	■ Longitude West 22
IT	■ ENEA

ECES Annex 26 »Future Electric Energy Storage Demand«
Results from the 2nd Meeting / Collaboration – In Detail

Work packages		Fraunhofer UMSICHT - DE	Fraunhofer AST - DE	DLR - DE	INES - CEA - FR	Korea Inst of Science and Technology -KR KIST/R	Europ. Akademie Bad Neuenahr-Ahrweiler GmbH	TU Dortmund University	RWTH-ISEA - DE	VTT - FI	VITO - BE	N.N.	RWE - COM	Next Energy - COM	EON, Radgen - COM
I	Technical / economic framework														
I. a)	Survey about storage systems		+		+					+	+			+	
I. b)	National technical key figures		++		+					+	+				
I. c)	National economic framework	+	+		+		+			+					
I. d)	General national conditions	++			+		++							+	
II	Method for spatial storage demand														
II. a)	Survey about different methods	+	+		+		+	++	(+)						
II. b)	Assumptions / "worlds"	+	+	+	+		+	+	(+)						
II. c)	Method development for grid balancing		++	+				++							
II. d)	Application of the method			+				+	(+)						
II. e)	Energy storage demand		+	+				++	(+)						
III	Applications														
III. a)	Typical and future applications		+		+					+			+		
III. b)	Business cases and case studies				+								++		
III. c)	Survey competing technologies	+		+	+		+	++					++		
III. d)	Interfaces to smart grid		+		+			+		++	++		+		
IV	Requirements for test procedures				++	(+)									
IV. a)	Overview storage technologies		+	+	++	(+)			(+)	+	++		+	+	
IV. b)	Definition of operation modes		+		+	(+)			(+)	+			+	+	
IV. c)	Typical charging / discharging cycles				++	(+)				+	+		+	+	
IV. d)	Guidelines for testing energy storages				++	(+)				+	+			+	

" ": no participation in this topic
"+": collaboration on a lower level
"++" intensive collaboration

ECES 26 »Future Electric Energy Storage Demand« - Next Steps

Next Steps / Outlook

- Collecting data for the survey about current technologies (WP1)
- Developing a first model for simulating (spatial) energy storage demand (WP2)
- Collecting data to running case studies (WP3)

- Discussion about work package leader WP1 and WP3 (interim)
- Establishing a working structure (work package leaders)
- Attracting new participants
- Integrating work of the engaged companies / industrial participants

Next Meeting

3rd Meeting: approx. April 2011 at INES-CEA in France

Fraunhofer UMSICHT

Fraunhofer UMSICHT
Osterfelder-Straße 3
46047 Oberhausen
www.umsicht.fraunhofer.de

Dr. Christian Doetsch
Tel.: +49 208 8598 1195
christian.doetsch@umsicht.fraunhofer.de