European Association for Storage of Energy

EASE

EASE Point of View on Distributed Energy Storage Systems

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1. About EASE:

- The European Association for Storage of Energy (EASE) is the **voice of the energy storage community**, actively promoting the use of energy storage in Europe and worldwide.
- EASE actively supports the deployment of energy storage as an indispensable instrument to **improve the flexibility of** and **deliver services to the energy system** with respect to European energy and climate policy.
- EASE seeks to build a European platform for **sharing** and **disseminating** energy storage-related information.
- EASE ultimately aims to support the transition towards a **sustainable, flexible and stable energy system in Europe**.

1. Members


ABB
ALSTOM
BOSCH
Invented for life
cener
centro nacional de energías renovables
national renewable energy centre
circe
KEMA
DNV
DONG
energy
DTU
EDF
elia
EnBW
Enel
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FIAMM
Group
Italian Passion
Global Energy
Fraunhofer
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Gaelectric
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GL Garrad Hassan
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HYDROGENICS
Advanced Hydrogen Solutions
IK4
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Isentropic
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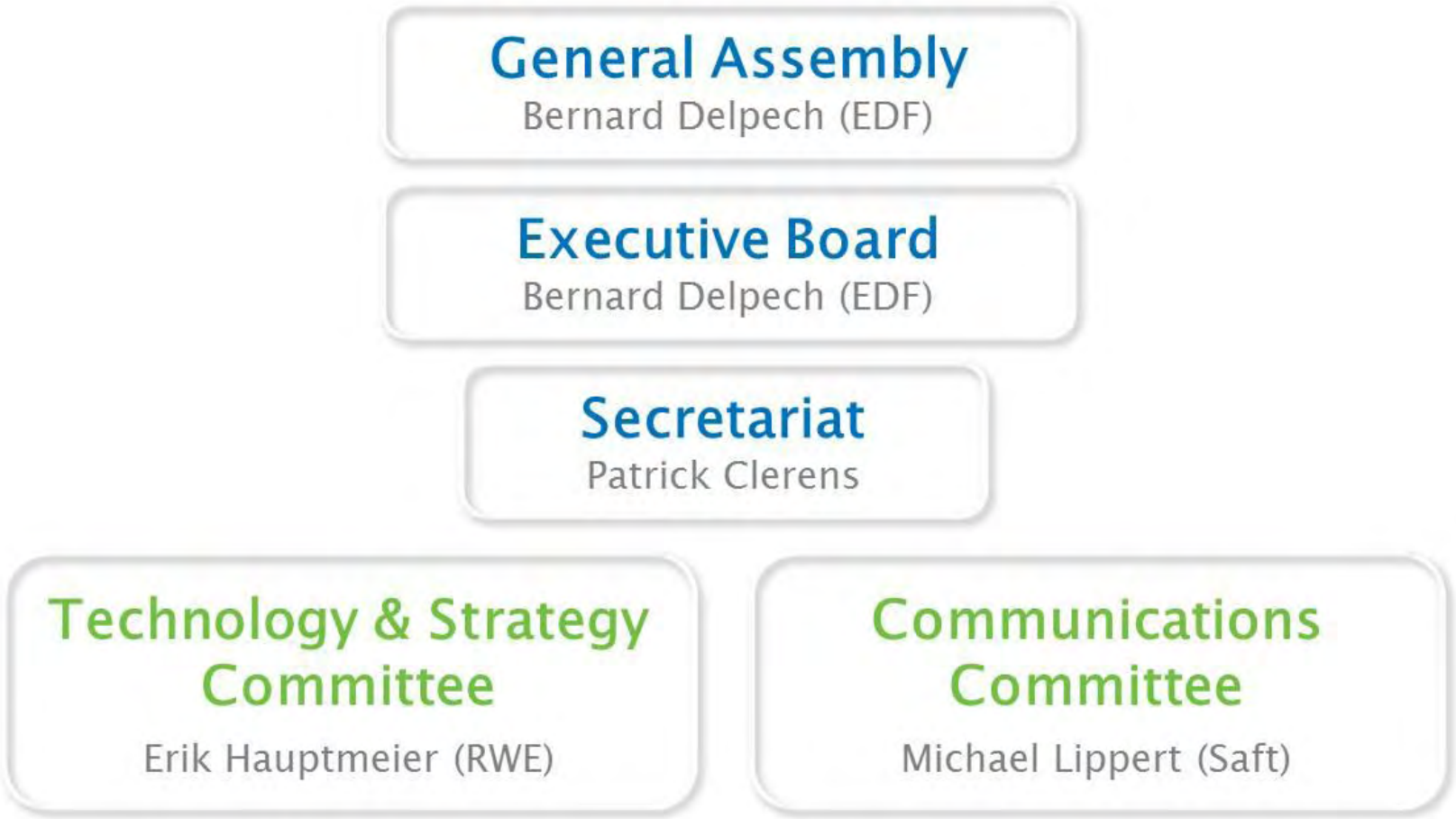
Panasonic
RWE
The energy to lead
SAFT
SAINT-GOBAIN
INNOVATIVE MATERIALS
SIEMENS
TDK
tecnalia
Inspiring
Business

1. Partner Organisations

- National associations

- European associations

1. Organisation Chart



1. EASE Work Programme

Energy Storage

Technology & Strategy Committee

1. Technology

Though not the primary focus of many associations, it is the basis for any kind of associative work: **a minimum common EASE technology knowledge is needed.**

2. Economics

Storage has to be assessed regarding its cost to benefit ratios – for the EC in a macro and for the members in a microeconomic way. Corresponding calculation schemes and key figures need to be derived objectively and promoted by EASE.

3. Regulations

A challenge for Storage systems is proper allocation of revenues and costs. EASE will evaluate the market design. Upon this EASE should also become an interlocutor for the European Commission regarding regulatory issues for storage.

4. Outlook

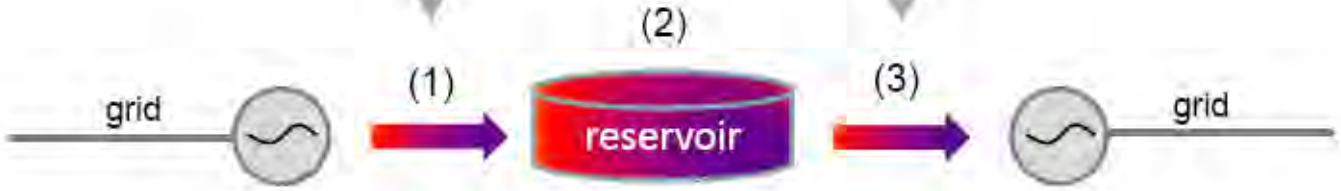
Being advocate of energy storage EASE shall clearly point out the opportunities for and shortcomings of storage nowadays and give recommendation for both, R&D and the energy system evolution including a technical roadmap for storage.

2. Energy Storage (ES) issues

» Diverse ES systems

Value related to **production/consumption balance**, depending on response time, power rating and energy rating:

- How fast it can react? [ms-s-min]
- How much imbalances it can correct? [kW-MW]
- How long it can last? [s-min-hours]



Electricity → Other forms of energy → Electricity

Value related to **inter-temporal arbitrage**

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2. Energy Storage (ES) Issues

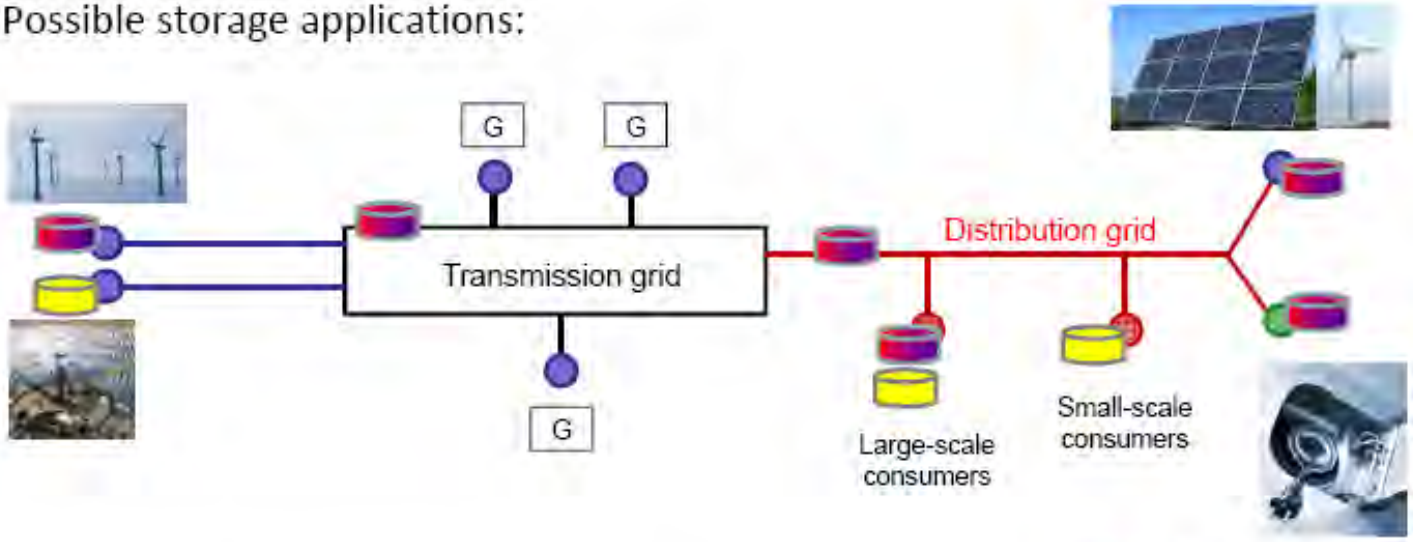
» ES demand

- **The ES need is mainly based on the strong request for the grid flexibility and the grid stability in order to make the complete "Electrical Systems" cope with:**
  - The increase of the peak demand
  - The increase of the level of the intermittent renewable energy
- **However, the ES represents only one possibility among others to improve the grid flexibility**
  - Flexible generation systems
  - Grid (Transmission/Distribution) flexibility upgrades
  - Demand side management
  - Interconnection improvement

2. Energy Storage (ES) issues

» Diverse locations/applications

Possible storage applications:



Categorization of storage by its location:

a) Large-scale storage, connected to the transmission grid,
b) Small-scale storage, connected to the distribution grid,
c) Storage facilities being part of an RES project

'Electric energy storage'

Thermal storage, 'intelligent appliances', etc.

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2. Energy Storage (ES) issues

» Main ES functionalities

	Central Storage	Grid Storage	End-user Storage
Balancing Demand & Supply	- Seasonal / weekly fluctuations, - large geographical unbalances	- Daily / hourly variations, - Peak shaving	Daily variations
Grid Management	-Voltage & frequency regulation - Complement to classic power plants for Peak generation. - participate in balancing markets	-Voltage & frequency regulation - substitute existing ancillary services (at lower CO2) - participate in balancing markets	Aggregation of small storage systems providing grid services EV integration
Energy Efficiency	Better efficiency of the global mix, with time-shift of Off-Peak into Peak energy.	Demand Side Management Interaction Grid – end user	Local production and consumption, Behaviour change Increase value of PV Efficient buildings

Virtual storage plants

Smart grids

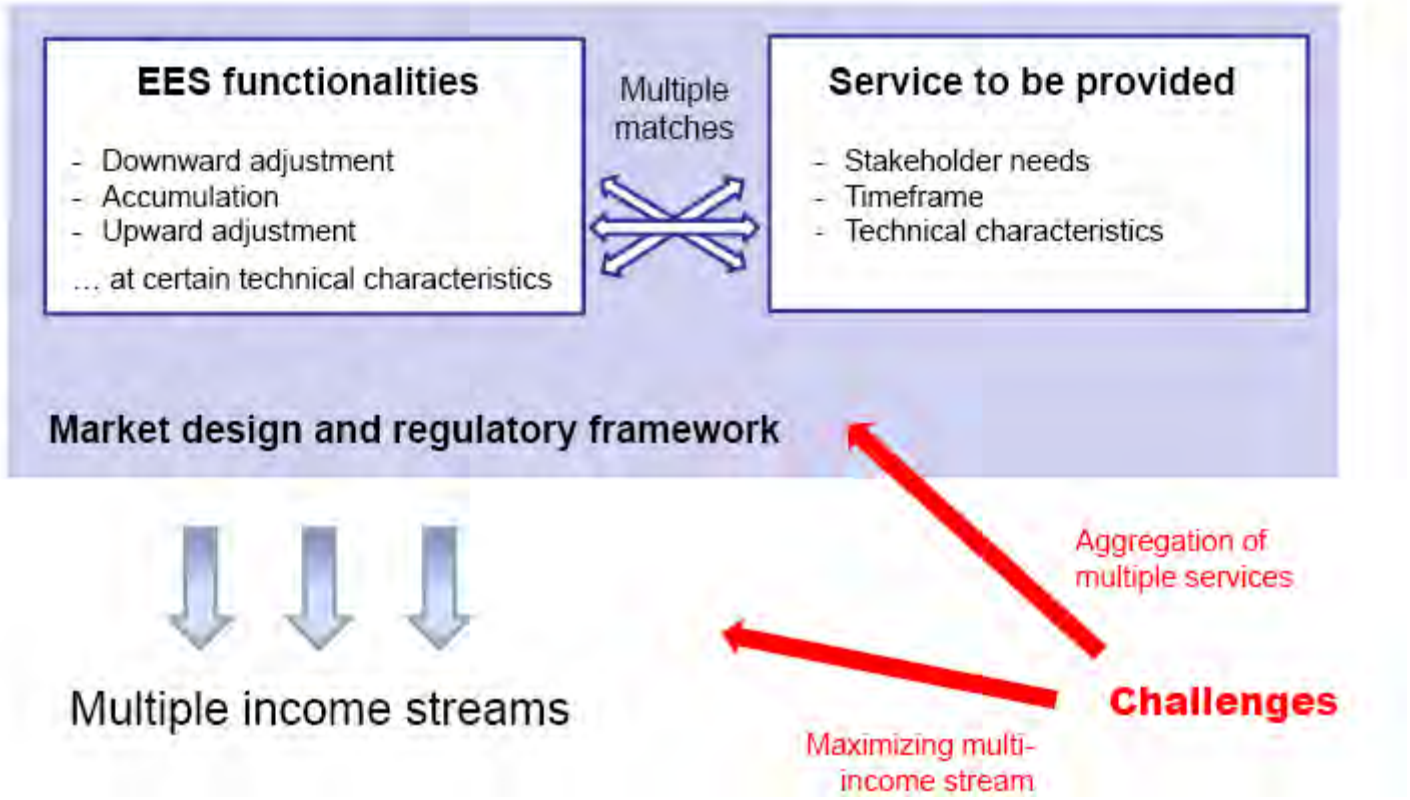
2. Energy Storage (ES) issues

» ES problematic

- Provision of only a single service typically not sufficient to reach cost-effectiveness of EES
  - See e.g.: Lund et al. (2009), Muche (2009), Sioshansi (2009, 2010), Walawalkar et al. (2007), Black and Strbac (2006), Dufo-López et al. (2009), Duque et al. (2011), Fertig and Apt (2011), Kapsali and Kaldelli (2010) Crampes and Moreaux (2009)
- BUT: **Aggregation of different services** can reveal the overall value of EES to the power system, leading to a better economic performance
  - See e.g.: Sandia National Laboratories (2005), EPRI and US DEO (2004), Walawalkar and Apt (2008), He et al. (2010), He et al. (2011), Delille (2010)

2. Energy Storage (ES) issues

» ES business model



2. Energy Storage (ES) issues

» Mix of regulated & deregulated activities?

Deregulated-driven business model

- **Prevailing function involves deregulated activities**
- **Remaining capacities can generate regulated income streams**

- Advantage: Providing regulated services without interfering the deregulated competition
- BUT: Regulated revenue not guaranteed, cost recovery based alone on deregulated services typically not possible

Regulated-driven business model

- **Prevailing function involves activities that generate regulated income streams**
- **Remaining capacities can be used for deregulated activities**

- Advantage: Regulated income source guaranteed, while allowing the possibility to play in deregulated activities
- BUT: Might conflict with unbundling principle if ownership by regulated actor – thus, could interfere with downstream competition

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3. Distributed Energy Storage Systems

» Main specificities

- **Connexion to the Distribution Grid: 2 possible locations**
  - Behind the smart meter or
  - After the smart meter
- **Medium & Small-scale capacities: large portfolio of technologies**
  - Chemical
  - Electrochemical: classic & Flow
  - Electrical
  - Mechanical
  - Thermal
- **EV/PHEV influence**
  - Possibility of experience sharing for some technologies
  - Charging infrastructure
  - V2G concept?
  - Second hand batteries?

3. Distributed Energy Storage Systems

» Suitable to some services

- **Connexion to the Distribution Grid: behind the smart meter**
  - Mainly for the system services given the RES increase
  - Smart Grid
  - Some potential for price arbitrage
- **Connexion to the Customer: both sides of the smart meter**
  - Mainly for energy management (demand response,…) and for ensuring power quality and autonomy
  - Some potential for system services
- **Increase of the distributed RES value**
  - FIT compatibility?
  - Business model of the aggregator?
  - Business model of the Prosumer?

4. Conclusions

» **Energy storage challenges whatever the type: bulk or distributed**

- **Value materialisation because of the following uncertainties:**
  - Compensation scheme for storage among stakeholders
  - Business models for materialising the value streams
  - Ownership of the future ES systems whatever the location and the grid location (transmission or distribution)
- **Cost issue in order to position the different ES technologies in front of the alternative solutions related to the different applications.**

...Thank you for the attention and remember...

Don't miss EASE's 1st Annual Reception
6th November 2012
NRW Representation to the EU

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