

## Work plan of Annex 26

### “Electric Energy Storage - Future Energy Storage Demand”

DRAFT

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Oberhausen, Germany

You are kindly invited to **join the new Annex 26** “Electric Energy Storage - Future Energy Storage Demand”, which is a activity of the “Energy Conservation through Energy Storage” Implementing Agreement of the IEA - <http://www.iea-eces.org/>.

The future of electricity network involves a massive penetration of unpredictable renewable energies. For insuring network stability as well as for maximizing the energy efficiency of such networks, storage is a key issue. Up to now, the integration of renewable energies did not take into account the demand side and was performed in a “fit and forget” way. The optimum evolution in an economic perspective is in the future to have an integration that is respecting the needs. One solution – beneath demand side management and grid extension – is the use of energy storages. The main purpose of adding energy storage systems in the electricity grid is to collect and store overproduced, unused energy and be able to reuse it during times when it is actually needed. Essentially the system will balance the disparity between energy supply and energy demand. Worldwide between 2% and 7% of the installed power plants are backed up by energy storage systems (99% pumped hydro systems). The future demand of energy storage devices is actually unknown. Only the main influence factors on this demand are known.

## I. Technical and economic framework conditions for energy storage systems

The aim is to give an assessment and a comparison about general technical and economical conditions in the different countries. Therefore a survey about realized storage systems, national technical key figures with their future development and economic framework conditions have to be examined.

- a) **Survey about type, number, power, capacity and efficiency of energy storage systems**  
Meta-study, e.g. from Sandia Labs or Fraunhofer; each participant deliver a survey about his country.
- b) **Survey about technical key figures of different countries (power plant fleet, grid structure and their future development in 2030 and 2050)**  
A standardized excel-sheet has to be developed; each participant can fill in the key figures
- c) **Survey about economic framework conditions relevant for energy storage systems (e.g. special tariffs or laws)**  
A standardized excel-sheet has to be developed; each participant can fill in the relevant figures
- d) **Assessment and comparison of technical and economical general conditions**  
Examination and assessment of the collected data from a) to c), putting these figures into a context and give an overview about similarities and differences.

## II. Calculation method to determine spatial demand for electric energy storage

In this core work package a new, spatial mathematical method has to be developed and applied to different “worlds” to derive the grid balancing demand and the energy storage demand as a part of it.

- a) **Survey / assessment of different methods to estimate the demand of energy storages / grid balancing**  
Currently there are only few first estimations (most non-spatial) with rough methods. The aim here is to show the done estimations and to explain both their methods and still unused methods and to collect the estimated energy storage demand for comparison.
- b) **Needed model simplification, parameter priorities, sensitivities, assumptions and definition of the “worlds”**  
Here some simplifications and parameters have to be set to enable the simulation. Additionally three different “worlds”, which means visions of the future, have to be

defined. For example a green world, an atomic world, and a business-as-usual world.

**c) Development of a method to estimate regional demand for grid balancing (=upper limit for energy storage demand)**

In this work package the model has to be developed (spatial load curve, spatial generation curve, spatial import/export and spatial grid limits). From this simulation the demand for grid balancing, which is an upper limit for the energy storage demand, because of competing technologies (II.e), can be derived.

**d) Application of the developed method to the “worlds”**

The method will be applied to the different worlds. The result will be the spatial balancing demand in the different “worlds”.

**e) Deriving the energy storage demand in this “worlds”**

Deriving the energy storage demand from the grid balancing demand by taking into account that there are competing technologies (dispatchable load, grid extension, curtailment etc.)

### III. Applications of electric energy storage systems

In this work package realized and future applications of electric energy storage will be examined to derive business cases and to compare them with real case studies. Last but not least smart grid technologies, which are competing technologies, are taken into account.

**a) Examination of realized typical applications in different regions and possible future applications of energy storage systems**

Both realized applications and future applications have to be examined. The aim is to show regional typical applications, their advantages and disadvantages, and their relation to framework conditions. The future applications will be a result of changes in economic framework (e.g. privatisation) and technical framework (e.g. less dispatchable power).

**b) Business cases and practical case studies for storage systems**

The business cases are more looking into the future, that means this are cases that will be established under future framework. The practical case studies are examinations of realized and running storage applications and the underlying business model.

**c) Survey and assessment of competing technologies**

Grid extension, dispatchable power, and curtailment are some competing technologies. They will be also part of the solution of grid balancing in the future like real energy storages. In this topic different competing technologies will be described and assessed (technical and economical). Co-work to work package II.e.

**d) Interfaces to smart grids**

Smart grids will be a need for intelligent control of load and generation and last but not least for the operation of electric energy storages. In this work package interfaces, control methods, information transfer etc. will be examined.

**IV. Requirements for test procedures**

The aim of this work package is to develop guidelines – derived from applications – for testing energy storage systems.

**a) Overview about current storage technologies**

Here a short technical overview about relevant electric energy storage technologies is needed.

**b) Definition of operation modes of typical energy storage applications**

The usual operation modes of typical applications (see results from III. a) will be described, compared and clustered.

**c) Deriving typical charging / discharging cycles**

From the operation mode a typical one-year-charging / discharging cycle will be developed. This is the base for a simplified and standardized charging / discharging cycle for one typical application.

**d) Guidelines for testing energy storage systems**

As a main result guidelines for testing energy storage systems will be defined. These guidelines have to be standardized for different typical applications.

Sincerely Yours,



Christian Doetsch  
(Operating Agent, ECES Annex 26)