

International Energy Agency

TCP

Energy Conservation through Energy Storage (ECES)

“Flexible Sector Coupling by Energy Storage Implementation”

A new ECES Annex Proposal and possible collaborative action within the

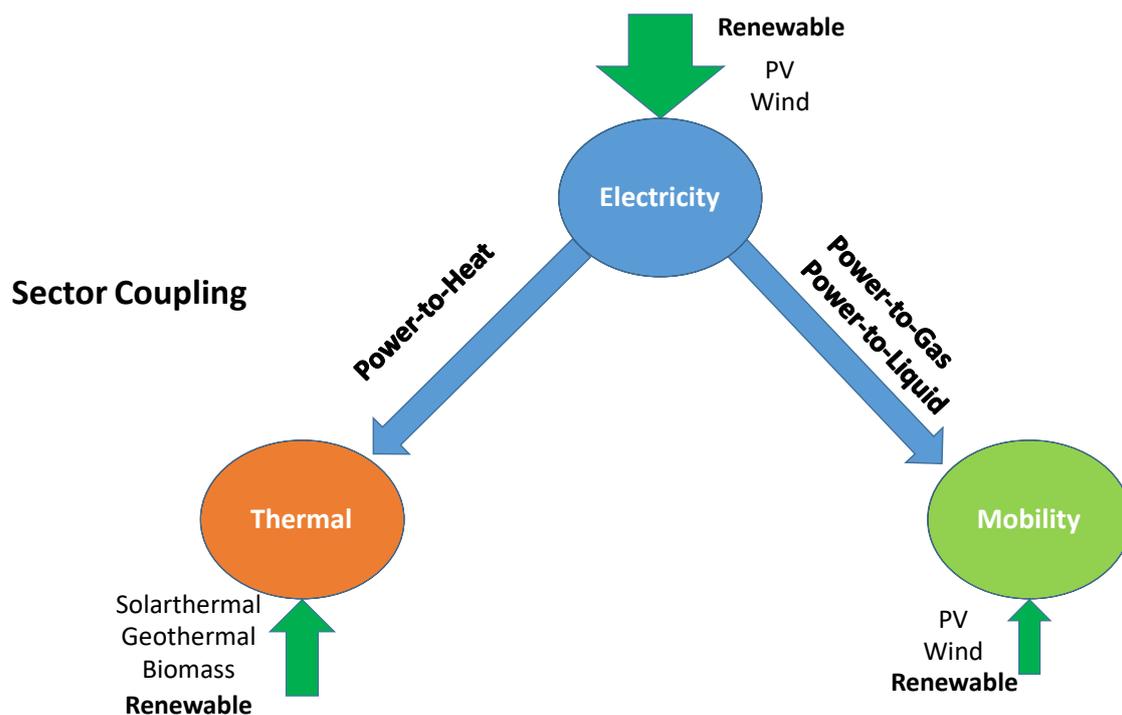
IEA Energy Technology Network

Draft Work Plan

Version 0

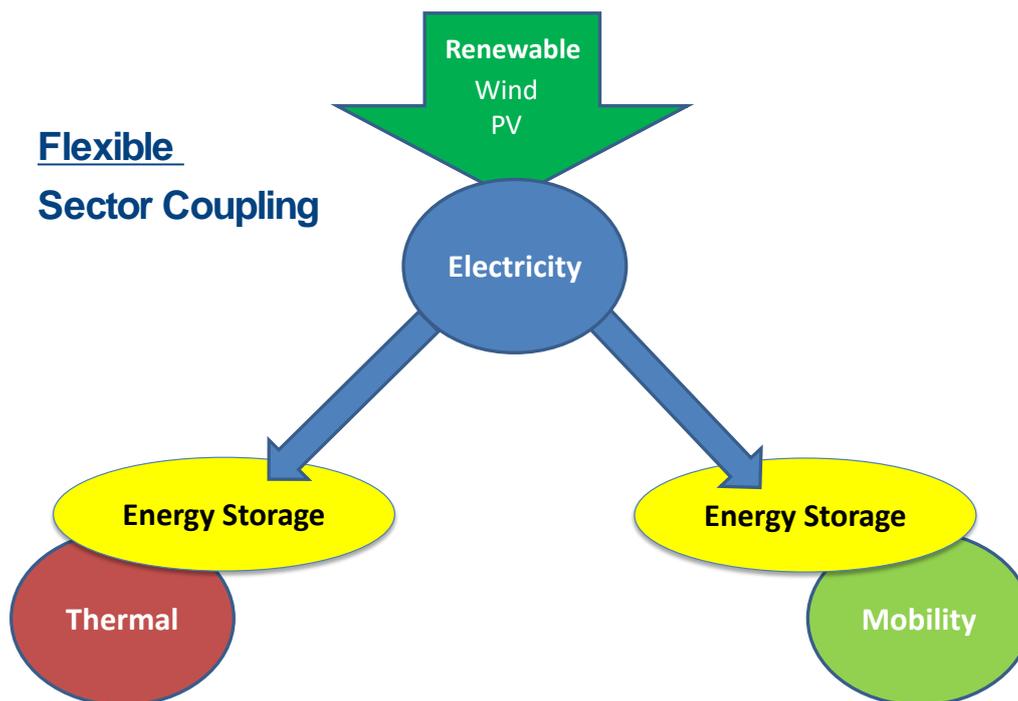
1. Introduction

The main input of renewable energy in our future energy system will come from wind and PV, which supply renewable electricity to our grids. Reaching higher shares of fluctuating renewables in the grids may cause a variety of problems. In order to avoid this and at the same time to even further increase the share of renewables in the system, renewable electricity can be distributed to other sectors, mainly the heating (and cooling) and the mobility sector.



The figure above shows the coupling of the three sectors electricity, thermal (heating and cooling) and mobility, which can be realized by different technologies like power-to-gas or power-to-heat. Each sector can have its own direct renewable input. However most of the expected input will come from the electricity sector.

By coupling the sectors, the demand pattern of the “consuming” sectors, “thermal” and “mobility”, can help to better utilize renewable electricity. By implementing energy storage technologies between the sectors, where the energy has to be transformed (e.g. into heat and cold) or stored anyway (for mobility applications), the match of fluctuating supply and demand can be managed. The figure below shows the **flexible sector coupling** approach.



By the implementation of energy storage technologies, like thermal, chemical or electrical storage, renewable electricity can be available on demand in the thermal and mobility sector. This can relieve local distribution grids and raise the usable share of renewables in general.

Furthermore storage technologies on the thermal side are in most cases less expensive compared to electricity storage. To decouple the availability of wind and PV from the mobility demand synthetic fuels stand for an efficient storage solution for the coupling of the electricity and the mobility sector.

The advantages of “Flexible Sector Coupling by Energy Storage Implementation”:

- Energy storage is able to **increase the share of renewables** in the heat and mobility sector
- Energy storage can **provide flexibility** to all sectors („renewables on demand“)

2. Structure of the Proposed Annex

Main Goal

Main Goal of the Annex is to clarify the possibilities and the impact of energy storage implementation in sector coupling.

Objectives

The key objectives of the proposed Annex are:

- **Definition** of “Sector”, “Sector Coupling” and “Flexible Sector Coupling”
- Identify **energy storage technologies** for actual sector coupling applications (paths in the picture) and their properties/requirements
- **Potential for storage implementation** for each path between electricity and heat and electricity and mobility
- **Technical and economic comparison** to “no-storage” sector coupling scenarios
- Prioritizing most **promising storage configurations** for sector coupling applications

Scope

The Annex shall task deal with the impact of **energy storage** implementation between the sectors when it comes to sector coupling. It is important to focus strictly on energy storage only – energy in and energy out – in this proposed Annex and to neglect other options like power-to-X or demand side management. This does not mean at all that these options are not appropriate, but it is necessary to limit the scope in order to provide a manageable work load.

The Annex shall work on:

- All energy storage technologies
- All applications in the heating and cooling sector (heating and cooling of all kind of buildings, DHW, process heat/cold for industry)
- All applications in the mobility sector (cars, trucks, busses...) and all propulsion technologies (EV, fuel cell, hydrogen,...)

Proposed Subtask-Structure

Subtask 1: Definitions and Nomenclature

In close collaboration with the IES division System Integration of renewables, SIR, and all other relevant parties (like the German Energy Storage Association, BVES) the main expressions like “Sector”, “Sector Coupling” and “Flexible Sector Coupling” shall be defined. In this context also the exclusive focus on energy storage (“energy to energy” only) has to be taken into account. This shall clarify the above mentioned scope of the Annex work.

At the same time this subtask shall also give a short overview of related activities on topics like demand side management, demand side integration, power-to-chemicals or power-to-X and so on. Differences of these approaches to the actual focus of this Annex shall be made clear.

A final nomenclature of this Annex shall be defined.

The work plan of Subtask 1 comprises the following activities:

➔ tbd at the workshop

Subtask 2: Technologies and Applications

- Subtask 2 a: Thermal Sector / Building and Industry
 - Subtask 2 b: Mobility Sector /Public & Private Transportation
- ➔ tbd at the workshop

Subtask 3: Potentials and Scenarios

➔ tbd at the workshop

Subtask 4: Business Cases and Legal Frameworks

➔ tbd at the workshop

1. Activities

The activities in this Annex will be structured in Subtasks.

➔ Detailed description of the subtasks

2. Work Program - Main Activities and Time Schedule

This Annex shall commence first of January 2019 and remain in force until 31st of December 2021.

Phase 1: January - July 2019

- Kick-off workshop and Experts Meeting
- Finalize decisions on the Subtask structure and the work programme
- Overview on the contributions from participating countries

Phase 2: July – December 2019

- First open workshop at the IEA in Paris and Experts Meeting
- Overview on the contributions from other IAs
- Subtask 1 (according to workplan)
- Subtask 2 (according to workplan)

Phase 3: January - July 2020

- Second internal ECES workshop and Experts Meeting
- Subtask 1 Continue (according to workplan)
- Subtask 2 Continue (according to workplan)
- Subtask 3 (according to workplan)

Phase 4: July – December 2020

- Second open workshop at the IEA in Paris and Experts Meeting
- Subtask 1 Continue (according to workplan)
- Subtask 2 Continue (according to workplan)
- Subtask 3 (according to workplan)
- Subtask 4 (according to workplan)

Phase 5: January - July 2021

- Third internal ECES workshop and Experts Meeting
- Subtask 1 Continue (according to workplan)
- Subtask 2 Continue (according to workplan)
- Subtask 3 (according to workplan)
- Subtask 4 (according to workplan)

Phase 6: July – December 2021

- Fourth internal ECES workshop and Experts Meeting
- Subtasks compiling all results
- Preparation of the Final Report
- Final Open Workshop at the IEA in Paris to deploy key findings

3. Results

The major outcomes of the proposed Annex will be:

➔ tbd at the next two workshops

4. Specific obligations and responsibilities of the Participants

Each Participant shall

- provide the Operating Agent with detailed reports on the results of the work carried out
- collect, assess and report to the Operating Agent data on ongoing projects in the field of energy storage
- participate in the editing and review of draft reports on the Task

- be prepared to host semi-annual experts meetings and arrange work-shops
- cooperates positively on the technology transfer within participating and to non-participating countries
- participate in activities to enroll new members to the Annex by spreading information about the Annex and act in technology transfer to non-member countries where appropriate

5. Specific obligations and responsibilities of the Operating Agent

In addition to the obligations enumerated in Article 8 of this agreement the Operating Agent shall:

- Prepare and distribute the results mentioned in Article 7 above
- At the request of the Executive Committee organize workshops, seminars, conferences and other meetings
- Provide the semi-annually and other periodic reports to the Executive Committee on the progress and the results of the work performed under the programme of work
- Provide to the Executive Committee within six month after completion of all work under the Task a final report for its approval and transmittal to the Agency
- In coordination with the Participants use its best effort to avoid duplication with activities of other related programs and projects implemented by or under the auspices of the Agency or by other competent bodies
- Provide the Participants with the necessary guidelines for the work they carry out assuring minimum duplication effort
- Coordinate the efforts of all Participants and ensure the flow of information in the Task
- Perform such additional services and actions as may be decided by the Executive Committee acting by unanimity

6. Funding

(a) Semi-annual meetings. The Participants shall be prepared to host semi-annual meetings. The cost of organizing and hosting meetings shall be borne by the host Participant.

(b) Publications. The Operating Agent shall meet the cost of publishing the reports and summary assessments described in Article 7 above.

(c) Individual financial obligations. Each Participant shall bear all the costs it incurs in carrying out the Task activities, including reporting and travel expenses.

(d) Task-Sharing requirements. The Operating Agent should devote 6 man-months per year to the work in the Annex. The Participants are expected to devote 3 man-months per year to the work in the Annex.

7. Operating Agent

Forschungszentrum Jülich GmbH, Germany acting through

- Dr. Andreas Hauer, Bavarian Center for Applied Energy Research and

is designated as Operating Agent.

8. Information and Intellectual Property

(a) Executive Committee's Powers.

The publication, distribution, handling, protection and ownership of information and intellectual property arising from this Annex shall be determined by the Executive Committee, acting by unanimity, in conformity with this Annex.

(b) Right to publish.

Subject only to copyright restriction described in Article 12(i) below, the Participants shall have the right to publish all information arising from this Task, except proprietary information, as defined in Article 12(c) below.

(c) Proprietary information.

The Participants and the Operating Agent shall take all necessary measures in accordance with this Article, the laws of their respective countries and international law to protect the proprietary information provided to, or arising from this Task. For the purpose of this Annex, proprietary information shall mean information of a confidential nature such as trade secrets and know-how which is appropriately marked provided that such information:

- (1) Is not generally known or publicly available from other sources;
- (2) Has not previously been made available by its owner(s) to others without obligation concerning its confidentiality;
- (3) Is not already in the possession of the recipient Participant(s) without obligation concerning its confidentiality;

It shall be the responsibility of each Participant supplying such proprietary information and of the Operating Agent for developing proprietary information to identify each information as proprietary and to ensure that it is appropriately marked.

(d) Production of Relevant information by Governments.

The Operating Agent should encourage governments of all Agency Participating Countries to make available or identify to the Operating Agent all published or otherwise freely available information known to them that is relevant to the Task.

(e) Production of relevant information by Participants.

Each Participant agrees to provide to the Operating Agent all previously available information and information developed independently of the Task which can assist or is needed by the Operating Agent to carry out its function in this Task, which is freely at the disposal of the Participant and the transmission of which is not subject to any contractual and/or legal limitations under the following conditions:

- (1) If no substantial cost is incurred by the Participant in making such information available at no cost to the Task therefore;

(2) If substantial costs must be incurred by the Participant to make such information available at such charges to the Task as shall be agreed between the Operating Agent and the Participant with the approval of the Executive Committee;

(f) Use of confidential information.

If a Participant has access to confidential information which would be useful to the Operating Agent in carrying out the studies, assessments, analyses or evaluations called for in this Task, such information may be communicated to the Operating Agent but shall not become part of any report or other form of documentation issued as part of this Task, nor shall it be communicated to the Participants except as may be agreed between the Operating Agent and The Participant who supplies such information.

(g) Acquisition of Information for the Task.

Each Participant shall inform the Operating Agent of the existence of information that can be of value to the Task but which is not freely available and each Participant shall endeavor to make such information available to the Task under reasonable conditions in which event the Executive Committee may, acting by unanimity, decide to acquire each information.

(h) Reports on work performed under the Task.

The Operating Agent shall provide reports on all work performed under the Task and the result thereof including studies, assessments, analyses, evaluations and other documentation but excluding proprietary information in accordance with Article 12(c) above.

(i) Copyright.

The Operating Agent, or each Participant for its own result, may take appropriate measures necessary to protect copyrightable material generated under this Task. Copyrights obtained shall be the property of the Operating Agent, for the benefit of the Participants provided, however, that Participants may reproduce and distribute material, but shall not publish it with a view of profit, except as otherwise provided by the Executive Committee.

(j) Authors.

Each Participant shall, without prejudice to any rights of authors under its national laws, take necessary steps to provide the co-operation from its authors required to carry out the provisions of this Article. Each Participant shall assume the responsibility to pay awards or compensation required to be paid to its employees according to the laws of the country.

9. Participants

- **Forschungszentrum Jülich GmbH, Germany**
- **Other Contracting Parties/Sponsors**
 - Denmark
 - Germany
 - Switzerland
 - ... tbd at the next two workshops