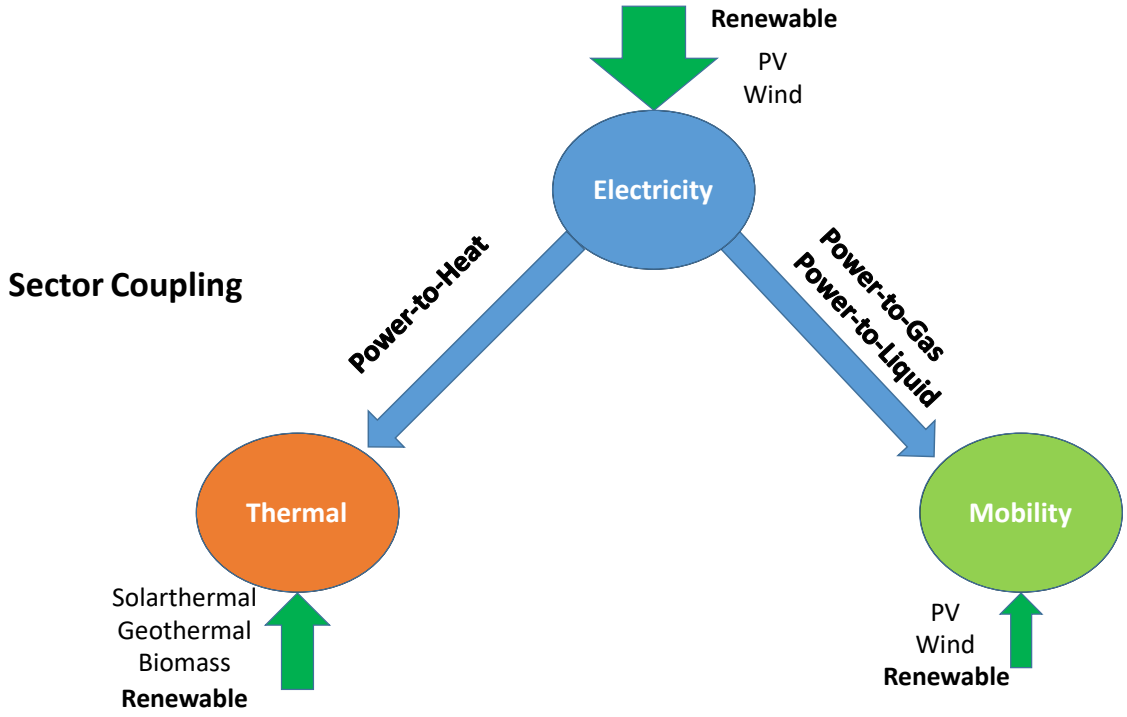
“Flexible Sector Coupling by Energy Storage Implementation”

A new ECES Annex Proposal and possible collaborative action within the IEA Energy Technology Network

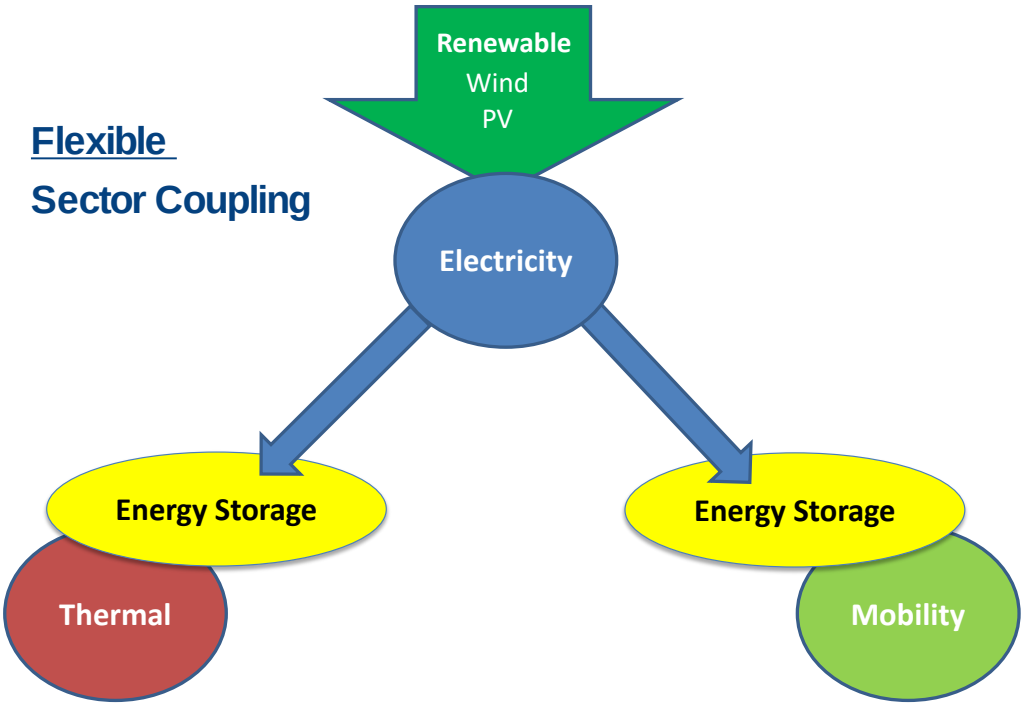
Introduction

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 be in the electricity sector.

By coupling the sectors, the demand pattern of the “consuming” sectors, “thermal” and “mobility”, can help to better utilize the renewable input in the electricity sector. 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")

Structure of the Proposed Annex

Main Goal

The Discussion on sector coupling shall always be on flexible sector coupling including energy storage, since this provides the decoupling of supply and demand in time.

Objectives

The key objectives of the proposed Annex are:

- Identify energy storage technologies for actual sector coupling applications (paths in the picture above) 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 task shall deal with:

- 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,…)