**RENEWABLE ENERGY –**

**ENERGY STORAGE and MANAGEMENT**

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It is an important goal to gradually substitute energy conversion based on fossil fuels by one that is based on regenerative energy sources. As a consequence, electricity production moves from a centralized (one producer and many consumers) to a decentralized (many producers and many consumers) operation. Thus, a revised architecture of energy systems seems necessary. Such novel architectures need to be supported by technical possibilities, a central one being that there are suitable electricity storage devices. While the efficiency is largely determined by the structure (=architecture) of energy systems, challenges lie in the performance of energy storage devices. Criteria are volumetric and gravimetric energy and power density, depending on the specific application, and costs. There are different technical approaches such as storage in batteries (as encased chemical energy), in super-capacitors (as charge in physical systems), or in chemicals (in hydrogen or others) for long term storage, the latter requires a converter (e.g. a fuel cell) to produce electricity again. For stationary systems also physical systems such as compressed air or pumped hydroelectricity are possibilities worth considering (both also require a converter back to electricity). Some of these storage systems will be described and discussed. An important parameter is the time for which storage should be accomplished and how much self-discharge occurs. Technology needs to be evaluated under the aspect of centralized versus de-centralized energy systems. These are the two limiting cases for future energy systems where local electricity production and consumption decide which mixture of both is sensible and which one gives the largest benefit to producers and consumers of electricity.