

Electricity

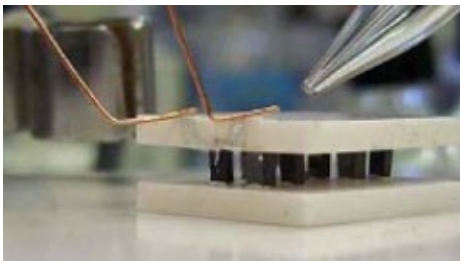
Running Projects



Solar assisted hydrothermal gasification process (SOLAR-HTG)^[1]

Hydrothermal gasification (HTG) is a relatively new technology that is able to convert wet biomass or wastewater in supercritical water into gas, clean water and salts. The main disadvantage of HTG is that it requires relatively large amount of heat at temperature above 500°C. This problem could be solved by supplying the heat required by HTG with an external renewable heat source. This project proposes to study the coupling of a solar thermal plant with a HTG plant in order to increase the HTG conversion efficiency and store the solar energy in the fuel produced.

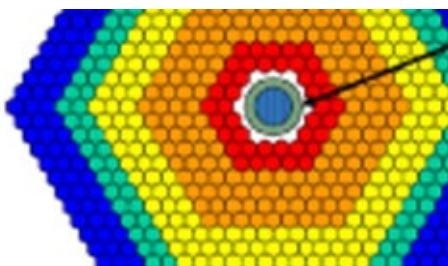
Show full project description^[2]



Integration of high temperature thermoelectric converter for electricity generation in a solid oxide fuel cell system (HITTEC)^[3]

Nowadays, intelligent and sustainable strategies by interdisciplinary thinking are needed to save energy resources and to further reduce fuel consumption as well as CO₂ emission. Towards this direction, a thermoelectric converter, which converts a heat/temperature gradient into valuable electricity, is a promising fuel saving technique: The visionary & challenging research activity of the HITTEC consortium is the development of high temperature thermoelectric modules working as an integrated device in a solid oxide fuel cell system or other heat & power plants in a decentralised concept. Such a combined high-tech system would realize a substantial progress in electric efficiency by converting waste heat directly into highly valuable electricity.

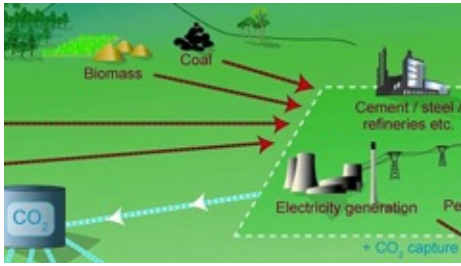
Show full project description^[4]



Methods of Advanced Waste Treatment (MeAWaT)^[5]

This project is following up the work on the microwave internal gelation process and investigation of the use of carbide sphere-pac fuel in sodium cooled fast reactors including the integration into the fuel cycle. The focus of this project is on inherent safe reactor systems with the main purpose of minor actinide incineration for nuclear waste conditioning. Because of its major advantages for the production of fuel containing minor actinides, the microwave internal gelation is a good process, and the sphere-pac is an expedient fuel-form for such future reactor systems.

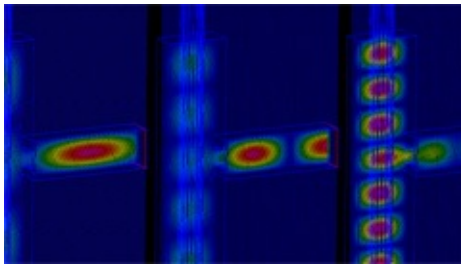
Show full project description^[6]



Carbon Dioxide Management in Swiss Power Generation (CARMA)^[7]

Carbon dioxide (CO₂) capture and storage (CCS) is a set of technologies for the capture of CO₂ from its anthropogenic point sources, its transport to a storage location or treatment plant, and its isolation from the atmosphere. This is only one, though very important, option in a portfolio of actions to fight the increase of atmospheric CO₂ concentration and to mitigate the greenhouse effect and climate change, while at the same time allowing for the continued use of fossil fuels.

[Show full project description](#)^[8]



Platform for Innovative Nuclear FuEls (PINE)^[9]

Presently fast breeder reactor (FBR) fuels consist in pellets made of uranium-plutonium-oxide (U,Pu)O₂, clad in steel tubes. Within the CCEM PINE Platform we shall demonstrate the advantages of chemically and geometrically alternate fuel forms prepared by lesser and «simpler» processes, which show many physical and safety relevant advantages and are less expensive.

[Show full project description](#)^[10]



Novel Wind Energy Extraction Technology (SwissKitePower)^[11]

'Crosswind Kite Power' or 'Airborne Wind Energy' is the idea of using a light, controllable aerodynamic device (commonly referred to as a kite), flying in a crosswind pattern to create power which is transmitted to the ground via a tether (high-strength cable).

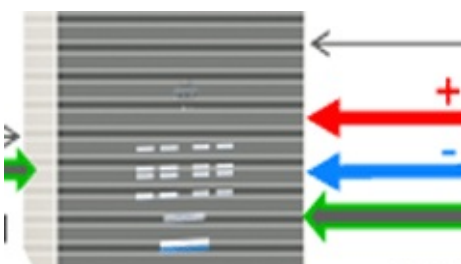
[Show full project description](#)^[12]



Modern methodologies for design, manufacturing and operation of hydropower plants (HydroNet 2)^[13]

Following the strong synergy and promising results achieved in the HydroNet^[14] project, HydroNet 2 pursues the multidisciplinary research by strengthening the monitoring issue and opening the investigation portfolio to hydropower schemes other than pumped storage plants.

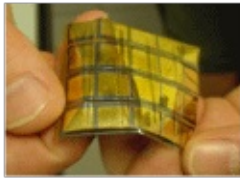
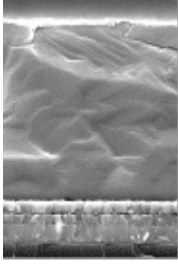
[Show full project description](#)^[15]



Acquisition of an automated battery cell test station (Battery Test Bench)^[16]

Li-ion batteries are rechargeable energy storage systems, which can be found nowadays in different applications, from portable electronics to automotive. Due to their high energy density, Li-ion systems are gaining ground in applications such as electro-mobility or as buffers for power system networks. Some of the expected main results from this project are: identification of degradation mechanisms, assessment of the requirements for reliability, safety and lifetime tests, limitations of the different technologies, and modeling of the degradation/ageing processes.

[Show full project description](#) ^[17]



Exploring and Improving Durability of Thin Film Solar Cells (DURSOL)^[18]

The project objectives are focussed towards the understanding of fundamental degradation phenomena in thin film solar cells. Degradation is due to complex mechanisms related to inherent material stability, interdiffusion across junctions, and due to external influences such as ambient atmosphere and solar light, and it depends on the type of semiconductors being used in the devices and how the solar cells are encapsulated.

[Show full project description](#) ^[19]

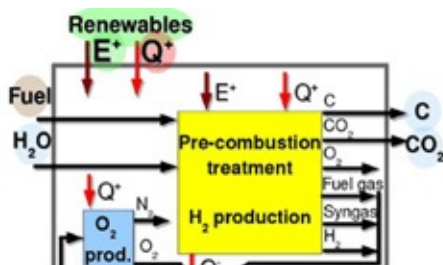
Finished Projects



Modern Methodologies for Design, Manufacturing and Operation of Pumped Storage Power Plants (HydroNet)^[20]

Electricity production in Switzerland relies heavily on hydro power plants, which face new challenges due to the strong increase in short-term energy trading. Modern power plants are expected to operate at variable speed in a wider range of output power with improved efficiency, flexibility and safety. The focus of the project is put on operation and maintenance of hydro power plants with respect to the new economic environment. Besides the generation units, civil engineering and sedimentation issues as well as economical aspects are considered.

[Show full project description](#) ^[21]



Technologies for Gas Turbine Power Generation with CO₂ Mitigation (GTCO₂)^[22]

The world primary energy demand is expected to double by 2050. It is assumed that this increased demand cannot be solely covered by renewable energy sources (such as hydro, wind, or solar), or by nuclear energy. Thus, an increased number of fossil-fuel-powered gas turbine systems for electricity generation will be implemented in the coming decades. The current project addresses specifically the challenge of developing a gas turbine with reduced CO₂ emission.

[Show full project description](#) ^[23]



Battery Replacement using Miniaturized Solid Oxide Fuel Cell (ONEBAT) [24]

The ONEBAT project focuses on the development of a miniaturized Solid Oxide Fuel Cell (SOFC) system with special focus on fuel cell, i.e. SOFC membrane, development and gas processing unit. Main challenges here are the adoption of thin film deposition and microfabrication techniques for ceramic membranes and catalysts as well as their characterization and optimization. The target operating temperature of 550°C is very demanding: it is very low on the one hand for ceramic fuel cell operation and on the other hand for fuel gas conversion to syngas.

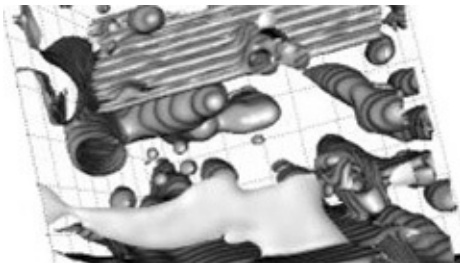
Show full project description [25]



Cost Efficient Thin Film Photovoltaics for Future Electricity Generation (ThinPV) [26]

ThinPV is a project with the mission to mobilize resources in thin film photovoltaics by performing world-class research and development that targets breakthroughs in photovoltaic device efficiency, and cost efficient production. The project is structured into three main parts, part A being oriented towards the short term improvement of plasma deposition processes of thin silicon films, part B addressing hybrid solar cells on the medium to long term and combining dye sensitized solar cells (DSC), Cu(In,Ga)Se₂ solar cells (CIGS) as well as polymer solar cells (OPV). Part C is defined to be an exchange platform to allow for workshops and educational activities.

Show full project description [27]



Platform for High Temperature Materials (PHiTEM) [28]

The three-years PHiTEM project is aimed at acquiring experimental devices, manpower and competences for allowing multiscale characterization of advanced high-temperature materials, including irradiated, i.e. radioactive ones. With the establishing of the platform a unique facility in Switzerland is generated in the field of development and characterisation of advanced materials for advanced future energy power plants.

Show full project description [29]

**) Finished project

URLs:

- [1] : <http://www.ccem.ch/.solar-htg>
- [2] : <http://www.ccem.ch/.solar-htg>
- [3] : <http://www.ccem.ch/.hittec>
- [4] : <http://www.ccem.ch/.hittec>
- [5] : <http://www.ccem.ch/.meawat>
- [6] : <http://www.ccem.ch/.meawat>
- [7] : <http://www.ccem.ch/.carma>
- [8] : <http://www.ccem.ch/.carma>
- [9] : <http://www.ccem.ch/.pine>
- [10] : <http://www.ccem.ch/.pine>

- [11] : <http://www.ccem.ch/.swisskitepower>
- [12] : <http://www.ccem.ch/.swisskitepower>
- [13] : <http://www.ccem.ch/.hydronet-2>
- [14] : <http://www.ccem.ch/.hydronet>
- [15] : <http://www.ccem.ch/.hydronet-2>
- [16] : <http://www.ccem.ch/.batterytestbench>
- [17] : <http://www.ccem.ch/.batterytestbench>
- [18] : <http://www.ccem.ch/.dursol>
- [19] : <http://www.ccem.ch/.dursol>
- [20] : <http://www.ccem.ch/.hydronet>
- [21] : <http://www.ccem.ch/.hydronet>
- [22] : <http://www.ccem.ch/.gtc02>
- [23] : <http://www.ccem.ch/.gtc02>
- [24] : <http://www.ccem.ch/.onebat>
- [25] : <http://www.ccem.ch/.onebat>
- [26] : <http://www.ccem.ch/.thinpv>
- [27] : <http://www.ccem.ch/.thinpv>
- [28] : <http://www.ccem.ch/.phitem>
- [29] : <http://www.ccem.ch/.phitem>

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