Power to fuel as a sustainable business model for cross-sectorial energy storage in industry and power plants

Torsten Buddenberg[1], Christian Bergins[1], K.-C. Tran[2], Benedikt Stefánsson[2], Efthymia-Ioanna Koytsoumpa[1], Stephan Schmidt[3]

[1]Mitsubishi Hitachi Power Systems Europe GmbH, Duisburg, Germany

[2]Carbon Recycling International, Reykjavik, Iceland

[3]Chemieanlagenbau Chemnitz, Chemnitz, Germany

Contact

Torsten Buddenberg
Mitsubishi Hitachi Power Systems Europe GmbH
Schifferstraße 80, 47059 Duisburg
t_buddenberg@eu.mhps.com
www.eu.mhps.com

Abstract

The increasing feed-in of fluctuating renewable energy sources (RES) leads to temporary over-supply of electricity and curtailment of RES production plants as well as thermal power plants. While improved grids and energy storage will help to adjust supply/demand in the GWh scale, i.e. storage and distribution in hourly and daily range there are still no visible actions in industry towards large storage.

Cross sectorial energy storage and the production of fuels for the transport sector using the not utilized capacities of low cost electricity offers a unique chance not only to integrate more renewables in the electricity grid but to enable a sustainable, fast de-carbonisation of the fuel sector. Fuels like methanol, gasoline, diesel or kerosene derived from hydrogen produced from RES via water electrolysis and CO_2 capture from industrial CO_2 emissions have lower CO_2 footprint and no competition with food production like bioethanol or bio-oil derived biodiesel do. On the other hand the technology offers a new business model to power producers which are restricted to heat and/or electricity production today to enter the green fuel market.

The presentation will cover case studies on the CO2-intensity, efficiency and economy of CO_2 derived fuels that can be produced by existing technology from excess capacity and RES in power plants, waste incineration or industry. By this a new business model for energy producers and energy intensive industries to co-operate with (petro) chemical industry is derived.

It is also shown by comparisons with traditional biofuels that such an approach will overcome today's barriers of food-competition in the biofuel sector, as the land use footprint of RES in electricity production is mostly neglectable.

This way the linking of thermal power and other carbon intensive industry with the renewable electricity sector can support the decarbonization of not only the electricity and heat sector but also the transportation sector. Moreover this new business model offers traditional power installations a product diversification ensuring sufficient revenues in future markets with high RES penetration.