EuroSciCon

Annual Summit on
Renewable & Sustainable Energy

August 13-14, 2018
Paris, France

Alessandro Romagnoli, Trends in Green chem 2018, Volume: 4
DOI: 10.21767/2471-9889-C1-007

LIQUID AIR AS NOVEL ZERO EMISSIONS ENERGY VECTOR: AN OVERVIEW FROM TECHNO-ECONOMIC PERSPECTIVE

Alessandro Romagnoli
Nanyang Technological University, Singapore

As the world shifts to ever greater proportions of intermittent renewable energy generation, it is widely accepted that energy storage will become increasingly vital. But so far the debate has focused on largescale pumped hydro, which is geographically constrained and smaller scale lithium-ion batteries, which are expensive and heavy. Each has its advantages, but both store electrons, whereas 50%+ of energy demand is thermal; and neither is well suited in providing cooling demand for which is booming across the tropical regions. Liquid air or liquid nitrogen store energy as thermal energy, rather than electrons alone, making it a highly efficient and zero-emission means of providing cooling in both buildings and vehicles. Air turns to liquid when refrigerated to around -194°C and can be conveniently stored in insulated but unpressurised vessels. Exposure to heat even at ambient temperatures causes rapid re-gasification and a 700-fold expansion in volume, which can be used to drive a turbine or piston engine. The only exhaust is clean cold air. Regasification also gives off large amounts of valuable cold, which makes liquid air an excellent means of storing energy when cold and power are required simultaneously. The aim of this talk is that of analysing the current advancement and research activities around liquid air energy storage. The talk will look into the basic principles of liquid air energy storage, the solutions to increase roundtrip efficiency (e.g. waste heat recovery) and reduce specific consumption; this will be assessed in stand-alone mode as well as in grid/micro-grid scale context. The techno-economic analysis will show the opportunity to include liquid air as part of an integrated system that includes, for instance, waste-to-energy plants, goods vehicles as well as LNG (Liquefied Natural Gas) regasification terminals; novel and more advanced concepts contemplating liquid air will also be discussed.

Biography

Alessandro Romagnoli, after completing his PhD in 2010 worked as Research Associate at Imperial College London. He acted as Research Co-Investigator in projects looking at engine downsizing, waste heat recovery, and mild-hybridization of powertrain technology in passenger vehicles as well as in optimization and design of novel turbine concepts. He collaborates extensively with world leading OEMs in powertrain R&D (Jaguar Land Rover, Lotus, MHI, Honda, and ABB). In 2013, he joined Nanyang Technological University as an Assistant Professor. His responsibilities include teaching undergraduate courses, run lab-tutorial, supervising PhD students and FYPs. His research activity in NTU encompasses several aspects related to propulsion, energy efficiency and thermal energy recovery and management. Examples of his current research include the study on Liquid Air Energy storage, Cold Energy Recovery from LNG regasification, waste heat recovery such as Thermoelectric Generators and Organic Rankine Cycles.

a.romagnoli@ntu.edu.sg