



COOLESTSG WEBINAR ON CRYOGENIC CO-GENERATION AS A BACK-UP POWER SOLUTION FOR GREEN DATA CENTRES IN TROPICAL ENVIRONMENTS

COOLEST SG



Date: Wednesday 8 September 2021

Time: 1400 - 1500 Hours

Venue: Zoom

The event is open to CoolestSG Consortium members and government agencies. A Zoom link will be sent to registered attendees no later than two days from the event. For registration click [here](#) or scan the below QR Code no later than two days from the event.



Event Organizer: Cooling Energy Science and Technology Singapore - CoolestSG Consortium

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Assoc Prof Alessandro Romagnoli and Dr Fadhel Ayachi

INTRODUCTION

Data centres are essential to the modern, digital age. They enable the processing and storage of the data that underpins the functioning of everything from global financial markets to logistics for our food to government to social media networks which connect people around the planet. Demand for data processing and warehousing is also projected to increase significantly in years to come, as increasing numbers of people 'come online', as digital communications become more entrenched in every element of their lives, as e-commerce grows and as the 'internet of things' begins to see data collected from even seemingly mundane equipment.

However, the infrastructure which is required to support this proliferation of data has, to date, been energy intensive and anything but green - data centres are in the top 10 of unsustainable industries globally due to their consumption of large amounts of electricity. A substantial quantity of that energy is used to provide cooling to servers and systems which would otherwise overheat. The impact of data centres is made worse using polluting diesel generators to provide backup power, which contributes directly to CO2 levels and to localized air pollution issues in Singapore through the emission of particulate matter (PM) and NOx. Therefore, addressing both power supply and cooling simultaneously, while making data centers more energy efficient would have a positive impact.

Over the past few years, [the Thermal Energy Systems Lab @ NTU](#) has investigated the potential of alternative zero emission liquid air systems, which utilize cryogenic fluids (liquid air and/or liquid nitrogen), to provide efficient 'green' power and cooling back-up. In today's webinar Assoc Prof Alessandro and Dr Fadhel Ayachi will present their research study supported by NRF and IMDA which looked at system level optimization and component design/testing of an integrated system for data centres cooling. In parallel the economics of operating the proposed system in a data center environment to meet power and cooling demands both commercially and sustainably has also been assessed in the research study.

PROGRAM OUTLINE

1355 Admittance of attendants to the event

1400 Introduction and presentation of the speakers

1405 Presentation by

Assoc Prof Alessandro Romagnoli

School of Mechanical and Aerospace Engineering, NTU

Co-Director, Surbana Jurong - NTU Corporate Lab

Director, Multi-Energy Systems and Grids Cluster at ERI@N

Dr Fadhel Ayachi

Senior Research Fellow, Surbana Jurong - NTU Corporate Lab

1440 Q&A

1455 Closing of Event

1500 End of Event

ABOUT THE COOLESTSG CONSORTIUM

CoolestSG is a national consortium set up by NRF in 2018. The task of the CoolestSG Consortium is to bring stakeholders together to catalyze co-development between researchers and industry of novel low-energy cooling technologies and/or passive/integrated designs and to translate research into deployment and commercialization with the aim to promote Singapore as a forerunner in cooling technologies.

Screenshots may be taken during this webinar.

ABOUT THE SPEAKERS

Alessandro Romagnoli is an Associate Professor in the School of Mechanical and Aerospace Engineering at the Nanyang Technological University of Singapore. Since 2020, Alessandro has been appointed as Co-Director of the Surbana Jurong - NTU Corporate Lab, a S\$61 million investment set up to develop next-generation sustainable solutions for the urban and industrial environment. Since 2015 Alessandro is also serving as Director of the Multi-Energy Systems and Grids Cluster at the Energy Research Institute at NTU (ERI@N).

During his time at NTU, Alessandro established the Thermal Energy Systems Lab @NTU which focuses on industrial energy efficiency, power generation - from large scale to distributed energy generation applied to micro-grids, and energy systems integration for different energy mix - including renewables and energy storage. Focus is being put on Liquefied Natural Gas, Cryogenic Energy Storage (Liquid Air Energy System and Hydrogen), Waste Heat Recovery and Thermal Energy Storage. Alessandro's work also covers studies on the Cold-Economy for Singapore and developing countries by developing predictive and intelligent algorithms for optimal design, planning and integration of diversified energy systems.

Alessandro's research activity is mainly focused towards serving the industry by providing advice and viable solutions for some of their most pressing challenges, such as reducing carbon footprint, energy efficiency, and energy prosumption. Alessandro is advising the World Bank - International Finance Corporation on energy related projects looking at maximizing energy efficiency in cold energy applications. Alessandro has published more than 100 articles in top-tier research journals, and he is recipient of several awards and recognition in the academic and research field.

Fadhel Ayachi joined the Energy Research Institute at NTU (ERI@N) in 2017 and he is a Senior Research Fellow at Surbana Jurong - NTU Corporate Lab and has been working on a novel zero-emission concept of cryo-cogeneration systems for Green Data Centres.

He graduated in 2003 with an Engineering degree from the National Institute of Applied Sciences of Tunisia (INSAT - Tunisia). From 2003 to 2010, he worked in ENI Group as an Executive Engineer in charge of the operational procedures related to gas compression stations and turbomachines. In 2009, he obtained a Master Degree in Energy & Transfers (INSAT - Tunisia), then prepared a PhD in Energy & Process Engineering in France from 2010 to 2013 at the PROMES-CNRS Laboratory in Perpignan (Processes, Materials and Solar Energy) and the Center for energy Efficiency of Systems in Paris (CES Mines Paris-tech). Afterwards, Fadhel achieved a post-doctorate from 2014 to 2016 at the French Alternative Energies and Atomic Energy Commission (CEA) in Grenoble.

Fadhel's research work has followed the energy system axis and the energy component axis. He was interested in the thermodynamic optimization of energy processes especially the low and medium grade Waste Heat Recovery processes as well as the Thermo-Electric Energy Storage by means of thermodynamic cycles. Fadhel was also interested in the retrofitting at lab scale, the experimental investigation, and the modeling of the expansion devices in particular the scroll expander and the radial-inflow turbine.