



Date: Friday 20 May 2022

Time: 16.00 - 17.30

Venue: Zoom

Speaker: Mr Bob Shatten, President of TeraCool

The event is open to CoolestSG Consortium industry, IHL and RI members, its invited guests 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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INTRODUCTION

The decision on where to build a data centre depends on a number of factors. Some of them include the availability of land, outdoor temperature conditions and the availability of renewable energy. These factors are not something that Singapore, being a city state located in the tropics with natural gas as the main source of energy for electricity generation, has in its favour. Other factors where Singapore comes out more favourably are the availability of fibre optics, proximity to data service demand, low tax rate and a stable electricity supply as well as, at least along its shoreline, an abundance of water.

To address the above shortcomings data centre operators can look at new innovative locations for data centres and use waste cooling, something that seldom is used, whereas using waste heat has found more use, especially in cold climates.

The end-use combustion generates the majority (80–90%) of the CO₂ emissions from the natural gas value chain and has also received due attention in academic research and political discussions according to an [IEEE study](#). Delivery of natural gas direct from source via pipelines is according to same IEEE study generally a cheaper and less energy intensive alternative than liquefying the gas, shipping it in tanks and regasification in an LNG terminal. A large amount of cold is released in the regasification process when the liquid gas is being vaporized and fed into pipelines at the LNG terminal. Moreover, during the regasification process natural gas physically expands 600 times and this expansion can drive turbines and generate electricity that could be used by the data centre. Expansion turbines are utilized at some LNG terminals primarily in Japan.

There is considerable risk aversion in the data centre industry and there is also an impeccable safety record at LNG terminals. The development of cooling systems for data centers would not be considered highly risky, neither in terms of technology development nor implementation, just a matter of properly sizing and instrumentation of heat exchangers, pumps, safety systems, control systems etc and use equipment rated for the hazardous zone it will be placed in if it cannot be placed in a non-hazardous zone. Many LNG terminals have already valves in place as they plan for cryogenic energy off-takers.

In this webinar, Bob will share his technical work, market knowledge and efforts from the last 8 years trying to bridge the gap between data centres and LNG terminal operators in Asia, Europe and the US and discuss costs and benefits.

PROGRAM OUTLINE

- 15.55 Admittance of attendees to the event
- 16.00 Introduction
- 16.05 Presentation by Mr Bob Shatten, President of TeraCool LLC
- 17.00 Q&A
- 17.20 Closing of Event
- 17.30 End of Event

ABOUT THE COOLESTSG CONSORTIUM

CoolestSG is a national consortium set up at NUS in 2018 with funding support from NRF. The task of the CoolestSG Consortium is to bring stakeholders together to catalyse co-development between researchers and industry of novel low-energy cooling technologies and/or passive/integrated designs and to translate research into deployment and commercialisation with the aim to promote Singapore as a frontrunner in cooling technologies.

ABOUT THE SPEAKER

Mr. Bob Shatten is a founder and President of TeraCool, LLC, a venture that has developed an energy efficiency method for the data center and Liquefied Natural Gas (LNG) industries that provides significant mutual economic and environmental benefits through heat transfer and zero emissions power generation. The industrial ecology method utilizes and recovers heat from the data center and refrigeration capacity from the LNG terminal, both energy sources otherwise wasted. He is co-inventor of U.S. Patent 6,668,562: "A System and Method for Cryogenic Cooling from Liquefied Natural Gas".

Bob is also a co-founder of Boreal Renewable Energy Development formed in 2003 and has worked in renewable energy development, microgrid and power plant development and environmental engineering for more than 30 years. He is currently based in Niamey, Niger implementing a large utility-scale renewable micro-grid for the U.S. Embassy, Niger.

As an entrepreneur, he has formed three other environmental related ventures in the renewable energy, energy conservation and recycling fields. His efforts range from staff and project management, power plant siting and regulatory approval, construction oversight and management, to environmental due diligence. He has taken project sites from concept through regulatory approval and into operation at sites domestically and internationally. Bob partnered in solar PV developments in Oregon that delivered over 75 MW.

Prior to working in the energy industry, Mr. Shatten was an environmental consultant at Arthur D. Little Inc., R.W. Beck Inc. and a Regional Project Manager at the U.S. Environmental Protection Agency.

Educational Background:

BS - Environmental Engineering, Northwestern University, 1983

MS - Civil Engineering, Stanford University, 1988



Mr Bob Shatten, President of TeraCool LLC



ABOVE: LNG and Data Centres - New partners in the race to reduce energy consumption and carbon emissions from data centre cooling.

LEFT: CO2 emission intensities in kg/Sm3 oe (kg/ standard cubic metre oil equivalents) for natural gas production and across the supply chain for piped natural gas LNG in Norway. Source: [IEEE Study](#).

