

THE NATIONAL TRUST – SRI LANKA LECTURE ON
THURSDAY 25TH JULY 2019

“CLEAN, GREEN AND FREE: SOLAR ELECTRICITY FOR 2035”

By Surrey Distinguished Professor S. Ravi P. Silva

The 118th Session of the Monthly Lecture Series of the **National Trust - Sri Lanka** will be held at the HNB Auditorium, 22nd Floor, HNB Towers, 479 T.B. Jayah Mawatha, Colombo 10 at 6.30p.m. on Thursday 25th July 2019.

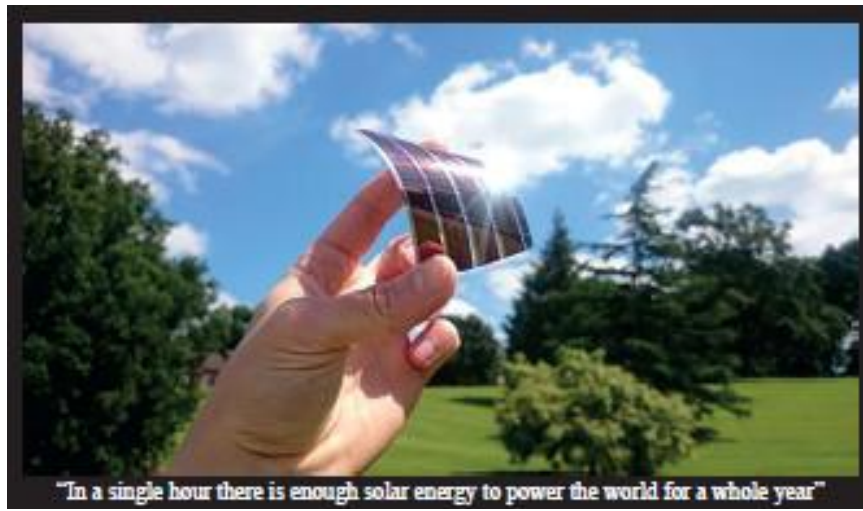
Modern society runs on electricity. Its abundance dictates the quality of life be it residential, transportation, industry or within the leisure sectors of a nation. Although Michael Faraday demonstrated the first electricity generator nearly two centuries ago in 1831, we are still on a journey in understanding the full potential of electromagnetic phenomena and very much dependent on the electricity produced for everyday comforts in society. Energy use per capita within a nation could even be used as a proxy for its developed status and quality of life. With increasing populations, and the empowerment of society, the expectation is that governments will need to provide more energy per capita on a more equitable basis.

At present fossil fuels dominate the energy mix, with close to 80% of the world energy provided by the combustion of these fuels. This status has been virtually unchanged over the last two decades despite its impact on climate change. Solar energy has been expanding at over 40% per annum for over a decade. Yet, solar electricity at present accounts for barely 2% of the entire energy provision. Yet, the energy generation worldwide is going through major change. The dominance of fossil fuel-based energy generation is being challenged, predominantly by cheap crystalline silicon solar cells coming to the market. Would the story end here? What happens with the steady progress envisaged in the organic-inorganic plastic electronic technologies era?

Solar energy has come a long way since the 1970's where it cost US\$74 per Watt to an eye-watering US cents 20 per Watt at present. In California 400 MW of Solar Electricity was auctioned at US\$20 per MWhr in July 2019, and then US\$17 per MWhr in Brazil. These numbers correspond to US cents 2 per kWhr for generation; with new energy storage adding a further US 1.6 cents per kWhr to account for intermittency. If this is the case and commodities are driven by the famous Adam Smith axiom of Supply and Demand, why is it that our energy bills keep going up ... rather than down, with technology development? What are the energy cost drivers, and do they apply to the World Energy provision and by extension to Sri Lanka?

Within this talk, we will discuss novel technologies being progressed using 4G (4th Generation) solar cells that include perovskites and show how these will all develop into a very interesting decade of technology development in flexible organic electronics as part of the energy mix. The routes for higher efficiency organic cells, while maintaining the low-cost base will be discussed. The need for flexible energy scavenging sources and novel energy storage ensures “energy materials” will be at the heart of any new technologies to be introduced. Routes to manage the photonic spectrum including demonstrating the darkest building on earth (Pyeongyang Olympics Hyundai pavilion in the form of VANTA black coatings), being exploited for improving the light-matter interactions of 4G solar cell technologies will be discussed.

The current drivers for energy provision, security and energy mix will be analysed, and question why humanity appears to be stuck on fossil fuels. In the future is it possible that the paradigm of paying for electricity can be overturned and even enter a process where we are able to deliver free electricity and energy by 2035. We will examine the potential of energy scavenging to supply all energy needs for society, including wearable technology and if this can be realised at zero cost to the consumer. The future is bright and the potential ever expanding.



Professor Ravi Silva is Surrey Distinguished Professor and the Director of the Advanced Technology Institute (ATI) and Head of the Nano-Electronics Centre (NEC) at the University of Surrey. Ravi completed his undergraduate and postgraduate degrees at the Engineering Department at Cambridge University. *MA, PhD (Cambridge), CEng, CPhys, FIET, FInstP, FREng, FRSA*

His research has resulted in over 600 presentations at international conferences, over 550 journal papers with over 18,500 citations to his work. He has been the recipient of several international awards including a recent James Joule Medal from the Institute of Physics (2018). Past awards include the IEE Achievement Award (2003) and the Albert Einstein Silver Medal and Javed Husain Prize from UNESCO (2003), the Royal Society Clifford Patterson Prize (2011) and an IET premium JJ Thompson medal (2014) for outstanding contributions in nanotechnology. Prof Silva was awarded the Government of Sri Lanka Presidential Award (2016), in recognition of contributions in the field of nanotechnology. He is a visiting professor to four universities in China and two universities in South Korea and Editor in Chief of the Journal on Energy and Environmental Materials.

Prof Silva was advisor to the Ministry of Science and Technology in Sri Lanka in 2008 to set up the Sri Lanka Institute of Nanotechnology and the Nano-Science Park NANCO (private) Ltd. He remains an advisor to these activities and is on the board of directors. He has worked with the National Science Foundation (NSF), Sri Lanka to establish nanotechnology as a vehicle from which to create wealth for the nation that will allow for poverty alleviation in the country.

Prof Silva is involved with research collaborations with many national and international partners both from academia and industry. He has also acted as advisor to many national and international organisations, including governments from USA, South Korea, Japan, China, India, Sri Lanka, Singapore, Saudi Arabia, Israel, Hong Kong, Portugal, Canada, Brazil and Europe. He is a Fellow of the Royal Academy of Engineering United Kingdom and Fellow of the National Academy of Sciences in Sri Lanka. In 2017, he was appointed Honorary Director to the Zhengzhou Materials Genome Institute (ZMGI) in China, and in 2018 was awarded the Outstanding Overseas Researcher Office for the Henan Province, China.

The National Trust – Sri Lanka conducts monthly lectures on the last Thursday of each month. The lectures are open to the members and the public at a nominal fee. The HNB Sustainability Foundation is the principal sponsor of the events of the National Trust – Sri Lanka.

Further information can be obtained from the Trust Office Tel 2682730 / 0778081214 at the Post Graduate Institute of Archaeology, 407, Baudhaloka Mawatha, Colombo 7.