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«GIACOMO CIAMICIAN» MASTERCLASS SERIES PRESENTS

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National Research Council (CNR)

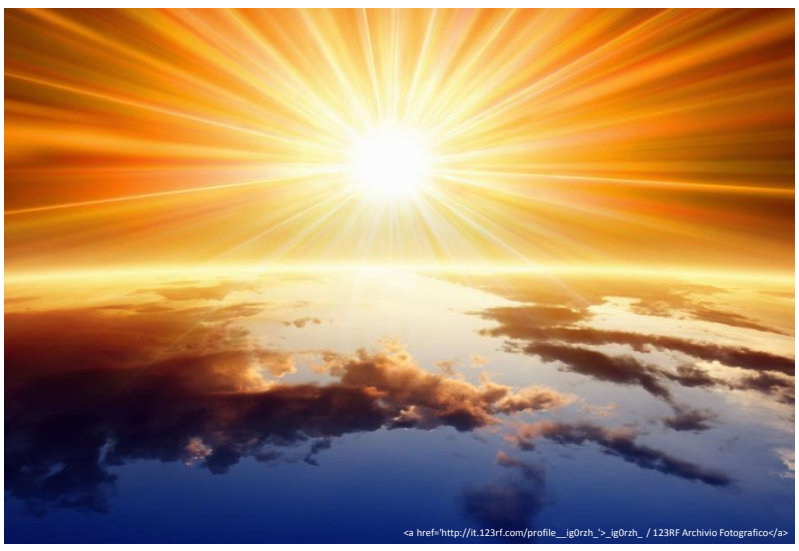
The Transition to a Sun–Powered World

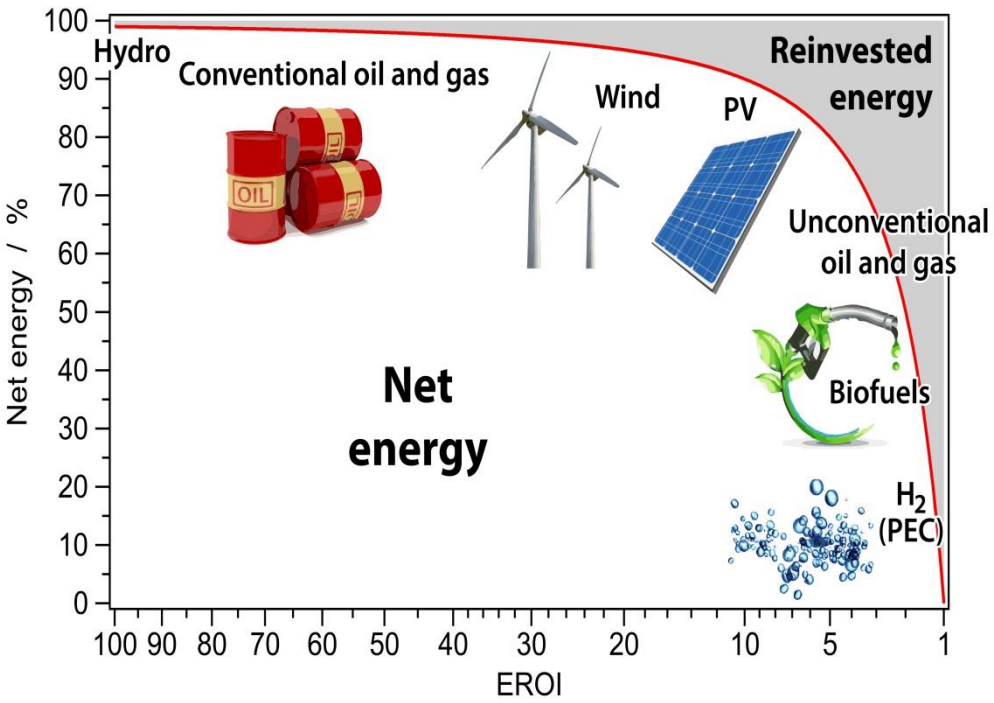
Status, Perspectives, Bottlenecks

Thursday, February 25th, 2016 – 17.30

AULA CAMMARATA – RETTORATO DELL'UNIVERSITA' DI TRIESTE

The energy transition from fossil fuels to renewables is already ongoing, but it will be a long, complex and difficult process to carry out, since the energy system is a gigantic and complex machine spread all over the world. The starting point to outline a possible scenario for this transition is to quantify the unsustainable differences in the availability of per capita primary energy across the planet, setting 2.8 toe/y as a desirable average target to reach, with related consequences. Key renewable energy production data will be presented, which show the remarkable growth of solar electricity technologies and indicate that crystalline silicon PV and wind turbines are the workhorses of the first wave of renewable energy deployment on the TW scale around the globe. The other PV market alternatives (CIGS, CdTe), along with other less mature options under intensive research, will be highlighted, along with the perspectives of solar concentrating options.





As far as fuels are concerned, the situation is significantly more complex because making chemicals with sunshine is far more complicated than generating electric currents. The prime solar artificial fuel is molecular hydrogen, which is characterized by an excellent combination of chemical and physical properties. The routes to make it *via* solar energy will be presented.

The overall discussion takes into account two parameters and concepts that are often neglected in the scientific energy debate: the EROI (Energy Return On Investment) and the fact that the energy transition will not be limited by the availability of photons, but by the availability of natural resources – particularly minerals – which are needed to manufacture energy converters and storage devices on a multi-TW scale. The future solar-powered civilization will be based on energy technologies with relatively low EROI, in the context of an increased global competition for natural resources. Ultimately, this may reveal the physical and energy limits of economic growth.

Nicola Armaroli is research director at the Institute for Organic Synthesis and Photoreactivity (ISOF) of the Italian National Research Council (CNR). His scientific activity is concerned with the photochemistry and photophysics of organic molecules, coordination compounds, carbon nanostructures and supramolecular arrays and materials, with focus on luminescence, light harvesting, energy transfer and electron transfer. These studies aim at developing new materials for lighting technologies and solar energy conversion. He has published over 180 papers on international journals and 5 books. He serves as Associate Editor of Photochemical & Photobiological Sciences (Royal Society of Chemistry) and is a member of the Editorial Board of Chemistry–A European Journal (Wiley–VCH) and Polyhedron (Elsevier Science). He is the chairman of the Working Party on Chemistry and Energy of the European Association for Chemical and Molecular Sciences (EuCheMS).
Nicola Armaroli is a consultant for international institutions on the issues of energy, natural resources and environment and a science communicator for the general public on mass media. Since 2014, he serves as director of Sapere, the first Italian science periodical, established in 1935 (www.isof.cnr.it/?q=content/armaroli-Nicola).

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