MCAST
MALTA COLLEGE of ARTS, SCIENCE & TECHNOLOGY

Institute of Electrical and Electronics Engineering

2017 September/October MC & WG Meetings and Conference

Prof. Dr. Inġ. Eur. Ing.

Chamber of Engineers

OXFORD BROOKES UNIVERSITY

ktu kaunas university of technology 1922

Brian Azzopardi

Ph.D. PG.C.H.E. B.Eng.(Hons.) Cert.F.E.
C.Eng. EI Chartered Energy Engineer
S.M.I.E.E.E. M.I.E.T. M.E.I. M.R.S.C

brian.azzopardi@mcast.edu.mt
www.mcast.edu.mt

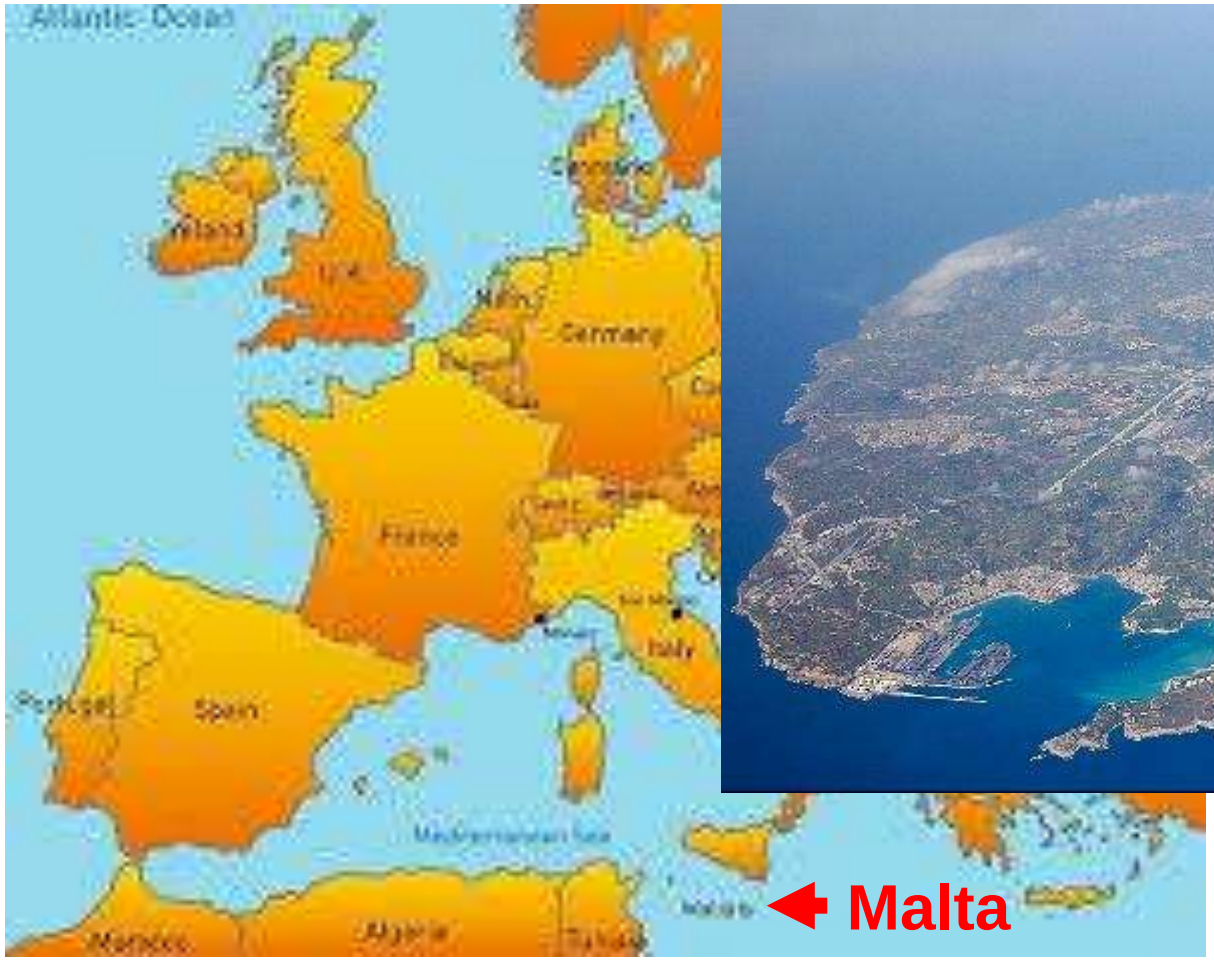
brian.Azzopardi@ieee.org
www.brianazzopardi.eu

MCAST
MALTA COLLEGE of ARTS, SCIENCE & TECHNOLOGY

Institute of Electrical and Electronics Engineering

INTRODUCTION

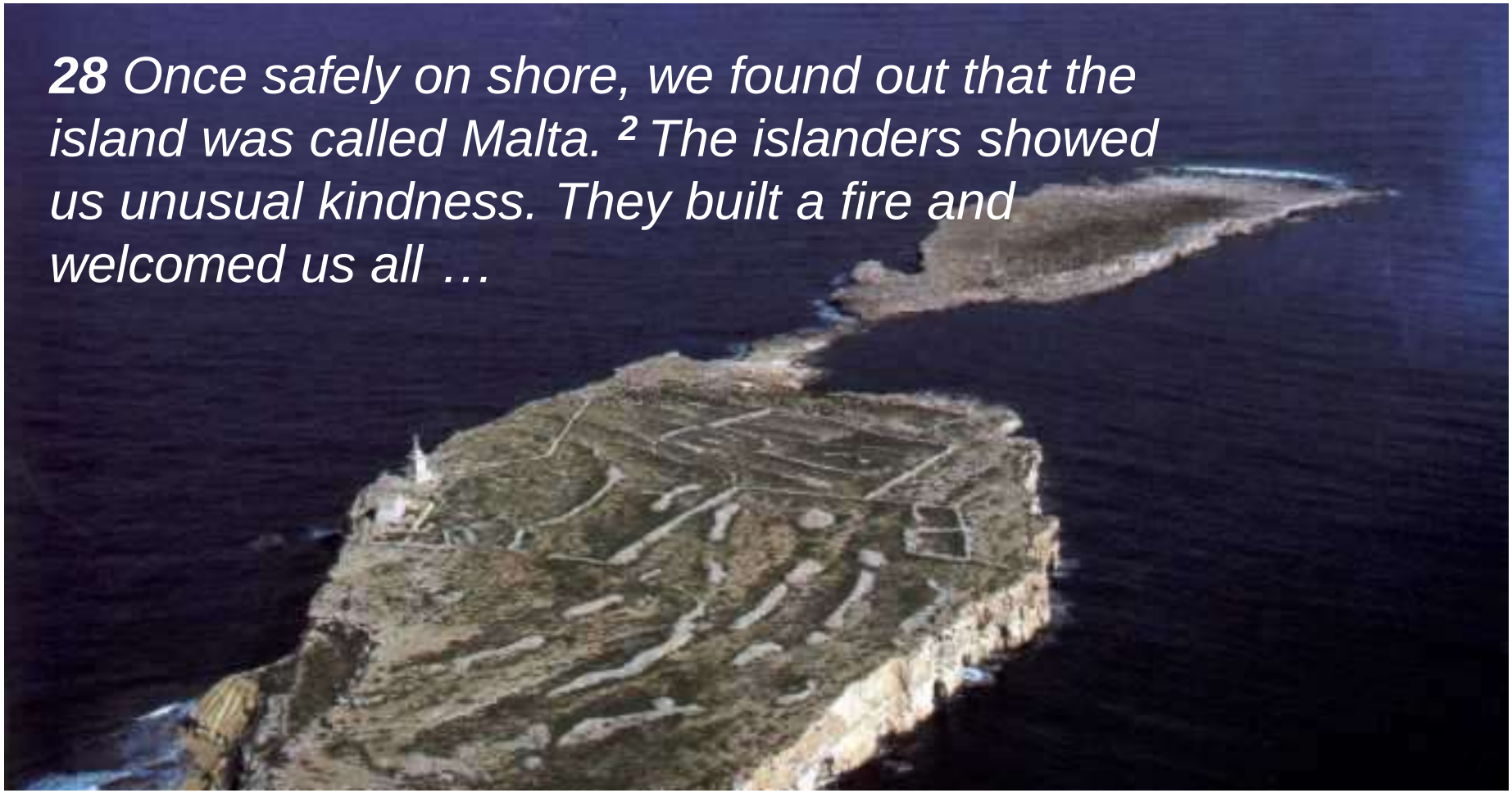
www.mcast.edu.mt



MCAST
MALTA COLLEGE of ARTS, SCIENCE & TECHNOLOGY

Institute of Electrical and Electronics Engineering

2017 September/October MC & WG Meetings and Conference



MCAST
MALTA COLLEGE of ARTS, SCIENCE & TECHNOLOGY

Institute of Electrical and Electronics Engineering

2017 September/October MC & WG Meetings and Conference

MCAST
MALTA COLLEGE of ARTS, SCIENCE & TECHNOLOGY

Institute of Electrical and Electronics Engineering

2017 September/October MC & WG Meetings and Conference

September Independence Day, Notte Bianca Valletta, St Francis of Assisi, Sliema

October Lady of the Rosary, Gudja & Tarxien, Mdina Grand Prix, Birgu Festival, Mdina Festival, Our Lady of Good Health, Rabat, Rolex Middle Sea Race

MCAST
MALTA COLLEGE of ARTS, SCIENCE & TECHNOLOGY

Institute of Electrical and Electronics Engineering

INTRODUCTION

www.mcast.edu.mt

Our research portfolio is growing rapidly
Solar installations and outdoor testing and education facilities
Expertise in electronics, electrical, environment, economics …

MIEMA
Malta Intelligent Energy Management Agency

MCAST
MALTA COLLEGE of ARTS, SCIENCE & TECHNOLOGY

Institute of Electrical and Electronics Engineering

INTRODUCTION

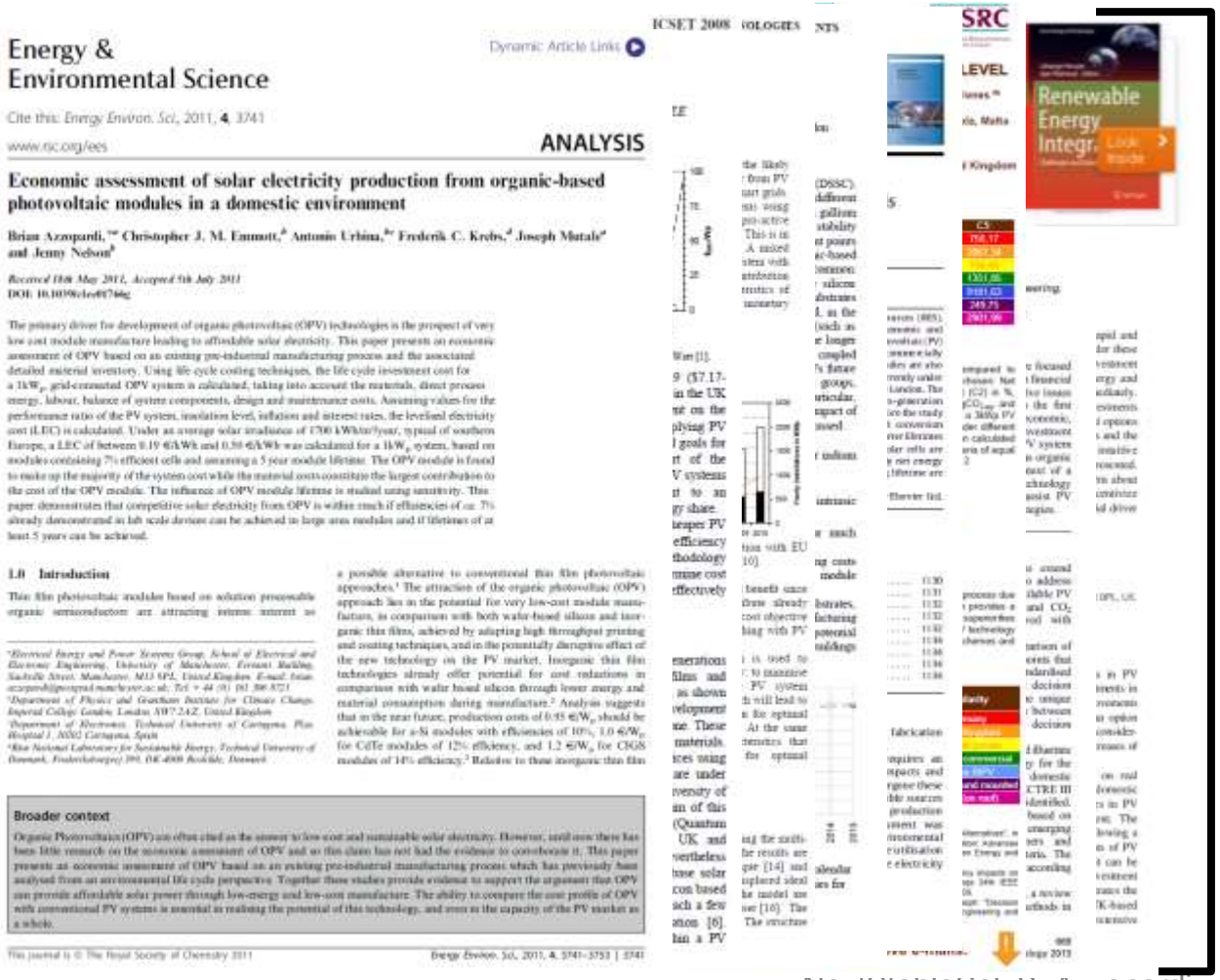
www.mcast.edu.mt

Pioneering in PVs national and international levels

15+ years experience

Since 2007 on OPV
HybridSolarCell project
WISE-PV project

Over 70 publications mostly on PVs



Energy & Environmental Science

Dynamic Article Links

Cite this: Energy Environ. Sci., 2011, 4, 3741

www.rsc.org/ees

ANALYSIS

Economic assessment of solar electricity production from organic-based photovoltaic modules in a domestic environment

Brian Azzopardi,*[a] Christopher J. M. Emmott,[b] Antonio Urbina,[b] Frederik C. Krebs,[d] Joseph Mutale[a] and Jenny Nelson[b]

Received 18th May 2011, Accepted 5th July 2011
DOI: 10.1039/c1ee01766g

The primary driver for development of organic photovoltaic (OPV) technologies is the prospect of very low cost module manufacture leading to affordable solar electricity. This paper presents an economic assessment of OPV based on an existing pre-industrial manufacturing process and the associated detailed material inventory. Using life cycle costing techniques, the life cycle investment cost for a 1kW$_p$ grid-connected OPV system is calculated, taking into account the materials, direct process energy, labour, balance of system components, design and maintenance costs. Assuming values for the performance ratio of the PV system, insolation level, inflation and interest rates, the levelised electricity cost (LEC) is calculated. Under an average solar irradiance of 1700 kWh/m^2/year, typical of southern Europe, a LEC of between 0.19 €/kWh and 0.50 €/kWh was calculated for a 1kW$_p$ system, based on modules containing 7% efficient cells and assuming a 5 year module lifetime. The OPV module is found to make up the majority of the system cost while the material costs constitute the largest contribution to the cost of the OPV module. The influence of OPV module lifetime is studied using sensitivity. This paper demonstrates that competitive solar electricity from OPV is within reach if efficiencies of ca. 7% already demonstrated in lab scale devices can be achieved in large area modules and if lifetimes of at least 5 years can be achieved.

1.0 Introduction

Thin film photovoltaic modules based on solution processable organic semiconductors are attracting intense interest as a possible alternative to conventional thin film photovoltaic approaches.[1] The attraction of the organic photovoltaic (OPV) approach lies in the potential for very low-cost module manufacture, in comparison with both wafer-based silicon and inorganic thin films, achieved by adopting high throughput printing and coating techniques, and in the potentially disruptive effect of the new technology on the PV market. Inorganic thin film technologies already offer potential for cost reductions in comparison with wafer based silicon through lower energy and material consumption during manufacture.[2] Analysis suggests that in the near future, production costs of 0.93 €/W$_p$ should be achievable for a-Si modules with efficiencies of 10%, 1.0 €/W$_p$ for CdTe modules of 12% efficiency, and 1.2 €/W$_p$ for CIGS modules of 14% efficiency.[3] Relative to these inorganic thin film

Broader context

Organic Photovoltaics (OPV) are often cited as the answer to low cost and sustainable solar electricity. However, until now there has been little research on the economic assessment of OPV and so this claim has not had the evidence to corroborate it. This paper presents an economic assessment of OPV based on an existing pre-industrial manufacturing process which has previously been analysed from an environmental life cycle perspective. Together these studies provide evidence to support the argument that OPV can provide affordable solar power through low-energy and low-cost manufacture. The ability to compare the cost profile of OPV with conventional PV systems is essential in realising the potential of this technology, and even in the capacity of the PV market as a whole.

This journal is © The Royal Society of Chemistry 2011 | Energy Environ. Sci., 2011, 4, 3741–3753 | 3741

MCAST
MALTA COLLEGE of ARTS, SCIENCE & TECHNOLOGY

Institute of Electrical and Electronics Engineering

2017 September/October MC & WG Meetings and Conference






MCAST
MALTA COLLEGE of ARTS, SCIENCE & TECHNOLOGY

Institute of Electrical and Electronics Engineering

INTRODUCTION

www.mcast.edu.mt

brian.azzopardi@mcast.edu.mt

Skype: bryan.azzopardi