出國報告（出國類別：參加國際會議與訪問）

受邀演講及英國劍橋大學訪問報告

服務機關：清華大學工業工程與工程管理系
姓名職稱：王小璠 教授
派赴國家：英國
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摘要

全球科學與工程學會(World Scientific and Engineering Academy Society, WSEAS)是國際上推廣科學與工程跨域研究的非營利組織。 每年根據不同的議題在世界各地舉辦國際會議。由於主題皆為當今研發相關題材，且會後也選擇傑出論文出版期刊，每每吸引各國學者踴躍參與。

去年接到該會主席 Dr. Maria Georgieva 的邀請希望我就近年在能源策略與管理問題上的研究心得在第六屆『能源系統、 環境、企業與創新』(6th International Conference on ENERGY SYSTEMS, ENVIRONMENT, ENTREPRENEURSHIP and INNOVATION (ICESEEI '17))為主題的會議上做專題演講。講題為”以穩健最佳化在電價政策下解決太陽光電的設置容量問題-以台灣為例” (A Robust Optimization Approach to Solar Power Installation Capacity under Feed-in Tariff Policy: A Case in Taiwan) 。

由於恰在母校劍橋大學、故聯繫原屬達爾文學院(Darwin College)，獲院長與院友會邀請進駐學院、重享當年學生生活， 也為告別學術生涯畫下難忘的句點。

目次

壹、目的

應邀參加全球科學與工程學會(World Scientific and Engineering Academy Society, WSEAS)在英國劍橋大學主辦之第六屆國際能源系統、 環境、企業與創新國際研討會研討會(6th International Conference on ENERGY SYSTEMS, ENVIRONMENT, ENTREPRENEURSHIP and INNOVATION (ICESEEI '17)) ，並給一主題演講"以穩健最佳化在電價政策下解決太陽光電的設置容量問題-以台灣為例" (A Robust Optimization Approach to Solar Power Installation Capacity under Feed-in Tariff Policy: A Case in Taiwan) 。

同時參訪所屬之達爾文學院(Darwin College) 討論台灣學生就讀與增進校友聯繫狀況。

貳、過程

此行為節省經費， 購買便宜機票，前後轉機便花了將近四天時間。所幸攜帶「從零開始」一書，藉此安靜時刻一氣呵成。 非但不覺無聊，還覺收穫滿滿。 對剛退休的本人甚是頗有心得!!

抵倫敦機場後，旋轉捷運至倫敦市有名的國王十字車站(Kings Cross)，再轉火車至久違的劍橋大學， 拖著疲憊的步伐入住故居「達爾文書院(Darwin College)」。 一路來真是火車如前晃盪、學院依舊書香、 管家(舍監)如故慈藹、惟恍如隔世而已。

前兩日在學院中與院友負責人會談， 並參加有關風險管理的座談， 重溫三十年前的學院生活 。並在校內沿康河漫遊，回數學系館，牛頓數學研究所等，聽三一學院暮鼓晨鐘，看老教授仍手寫黑板教課，又使我對英國文化之深厚底蘊 所造就之現代科學發展有更深一層醒悟。

國際會議開始第一天即是我演講之時。針對政府在太陽能獎勵政策下，企業應如何

因應以保障電力穩定供應是我的演講主題。尤其以我國百萬太陽能屋頂的二十年獎勵政策下，企業應如何建置以有效平衡成本效益的示例，引起在場學者與企業人士相當熱烈的迴響。

參、心得與建議

一、 心得：

此『國際能源系統、 環境、企業與創新會議』已是第六屆 今年特別強調能源系統之創新再利用。 基於能源與環境狀況的迫切性，今年尤對過去之節能減碳政策較保守的策略， 特別針對進一步的循環經濟有在廣度與深度上有進一步的討論。

基於會議之主題 及受邀在全體參與者都在場的禮堂演講機會， 除就理論的角度說明過去在政府政策下企業如何進行分析 以配合電業提供的基載容量，設置最佳的太陽能容量已降低用電成本外， 並以台灣為例說明其成效，，獲相當迴響。

此外能回闊別近三十年的原學院及母校，看母系數學教授仍孜孜不倦手寫黑板教課，保留傳統精神，真是深受感動 。

二、 建議：

「劍橋牛津在台同學會」近幾年均未有聯繫與活動。而在劍橋研讀的台灣同學也幾無人煙。反觀大陸學生卻年年增加。達爾文院友會也表達相當的遺憾之意。 缺少進修意願雖非僅反映在留英的學生數上， 但對提升國內學術水準及擴展年輕學子的眼界卻是有所影響。尤其留英在語文上不但對我學子較易克服， 同時英國接近歐陸，在了解與吸收西方文化， 擴張視野更有地利之便。 如何鼓勵同學到英國作較長時間的進修，而非短期遊學是我們應加強之處。

肆、附錄

一、附件 1

6th International Conference on
ENERGY SYSTEMS, ENVIRONMENT, ENTREPRENEURSHIP and INNOVATION (ICESEEI '17)

The conference will take place at Murray Edwards College, Huntingdon Road, Cambridge, CB3 0DF, UK.

Cambridge, UK

February 24-26, 2017

Plenary Lecture 1:

Experimental and Numeri… th…
Impact of Green Roof Ins… ld…
Integration of a Validated… t…
Building Energy Simulati…
by Prof. Rafik Belarbi, U… elle, FRANCE.

Plenary Lecture 2:

A Robust Optimization Approach to Installation Capacity under Feed-in … Case in Taiwan
by Prof. Hsiao-Fan Wang, National … University, TAIWAN.

BULLETIN BOARD

二、附件 **2**

A Robust Optimization Approach to Solar Power Installation Capacity under Feed-in Tariff Policy: A Case in Taiwan

Hsiao-Fan Wang
Department of Industrial Engineering and Engineering Management
National Tsing Hua University
Hsinchu, Taiwan, ROC

Abstract

Solar power is a potential renewable energy to develop because of its sustainability. From environmental and economic aspects, the government has conducted a policy to subsidize the individuals on installing the solar photovoltaic system from both financial assistance and buy-back assurance such as Feed-in Tariff scheme. It is an incentive to people to have economic-benefits to make profits and environment-benefits to reduce carbon emissions in the investment. Due to the possible risk embedded in this long-term investment, the purpose of this research is to help the investors to evaluate and analyze the expected return and potential risk. In order to achieve the economic and environmental benefits, an analytical model is proposed to determine the optimal installed capacity under the given guaranteed price for specific time period.

Sensitivity analysis are conducted on parameters, including installation cost, maintenance cost, electricity generation and discount rate such that the critical factor to affect the profitability can be identified. Based on this factor, a robust optimization model has been developed from the original deterministic model for evaluating potential risk and uncertainty such that a robust investment will be provided. The robust model has been applied to an enterprise of Taiwan. The risk preferences of decision maker are also considered. The results have shown that the model is able to suggest a robust installed capacity toward the risk preference of decision maker. Through the evaluation of the investment with the performance measures including expected net present value, payback period and internal rate of return, a robust installed capacity has been determined to maximize net benefit.

Keywords: Capacity Planning; Feed-in Tariff; Robust Optimization; Renewable Energy Management; Risk Preference

三、活動照片


COMMEMORATE THE FOUNDATION IN 1964 OF
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