

# 出國報告

(出國類別：開會)

## 參加「第 16 屆國際能源經濟學會 (IAEE)歐洲年會」

服務機關：台灣電力公司

姓名職稱：郭秋英(訓練所所長)

紀穎秀(企劃處主管責任中心)

派赴國家：斯洛維尼亞

出國期間：108 年 8 月 23-31 日

報告日期：108 年 10 月 16 日

## 行政院及所屬各機關出國報告提要

出國報告名稱：參加「第 16 屆國際能源經濟學會(IAEE)歐洲年會」

頁數 87 含附件：是否

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關鍵詞：再生能源、電力市場、電動車

內容摘要：(二百至三百字)

國際能源經濟學會(IAEE)係全球從事能源經濟研究最重要的國際性學術組織，每年皆透過各會員國及各地區分會舉辦年會及研討會。我國為 IAEE 主要會員國之一，本公司亦為 IAEE 之重要團體成員。

本次出國任務為參加 2019 年國際能源經濟學會第 16 屆歐洲年會，本屆年會主題為「未來十年之能源轉型 (Energy Challenges for the Next Decade)」，聚焦討論未來能源藍圖的機會與挑戰、新型態能源市場、數位時代的能源產業、能源的使用、國際間能源轉移的管制，以及氣候變遷等內容，並參訪 Brežice 水力發電廠( Hydro Power Plant Brežice )，該電廠是薩瓦河下游六座水力發電廠中的第五座，在薩瓦河下游的所有發電廠都在 Brežice 指揮室進行操作，為維護生態環境，此電廠亦設有魚道。

透過出席本次會議，不僅可以蒐集並了解目前全球最新的能源經濟情勢、能源管理技術與未來發展趨勢，並可跟不同國家的電力能源專家與產業人士交流，以供本公司未來經營與發展之借鏡。

本文電子檔已傳至出國報告資訊網  
(<http://report.nat.gov.tw/reportwork>)

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## 參加「第 16 屆國際能源經濟學會歐洲年會」

### 壹、前言

#### 一、緣起

國際能源經濟學會（The International Association for Energy Economics, IAEE）成立於 1977 年，係全球從事能源經濟研究最重要的國際性學術組織，每年皆透過各會員國及各地區分會舉辦年會及研討會，其會員涵蓋世界 100 國以上之產官學界，主要宗旨為結合全球能源研究之菁英以解決世界能源供需、經濟、科技、及環保問題。

該學會每年擇一會員國召開全球年會或各分會主辦之年會（如北美年會、歐洲年會及亞洲年會等），邀集各國會員與能源經濟相關專家學者與會，於會議期間充份就各項重要能源議題（如石油、天然氣、電力、再生能源、能源政策、氣候變遷、能源市場等等）之發展、研究與經驗交流、交換意見。

本次第 16 屆國際能源經濟學會歐洲年會（16th IAEE European Conference 2019）係由國際能源經濟學會(International Association of Energy Economics, IAEE)、盧比安納大學經濟商學院 (School of Economics and Business, University of Ljubljana, SEB LU)及斯洛維尼亞能源經濟協會 (Slovenian Association for Energy Economics, SAEE) 共同主辦，於民國 108 年 8 月 25 日至 28 日於斯洛維尼亞首都盧比安納 (Ljubljana, Slovenia)舉行，今年年會主題為：「未來十年之能源挑戰 (Energy Challenges for the Next Decade)」，會議聚焦討論永續能源系統、新型態能源市場經營模式、電力市場機制、能源資源使用、氣候變遷等內容，並參訪

Brežice 水力發電廠( Hydro Power Plant Brežice ) ，該電廠是薩瓦河下游六座水力發電廠中的第五座，在薩瓦河下游的所有發電廠都在 Brežice 指揮室進行操作，為維護生態環境，此電廠亦設有魚道。

鑑於本公司面臨經營環境改變及能源轉型的挑戰，以及數位化時代的來臨和氣候變遷，本次歐洲年會討論內容及參訪行程與本公司業務息息相關，將有助於本公司規劃及推動轉型發展。透過出席本次會議，不僅可以蒐集並了解目前全球最新的能源經濟情勢、能源管理技術與未來發展趨勢，並可跟不同國家的電力能源專家與產業人士交流，以供本公司未來經營與發展之借鏡。

## 二、行程與出國人員

### (一) 行程紀要

本次出國計畫奉核定於民國 108 年 8 月 23 日啟程，同年 8 月 31 日返國，共計 9 天。茲將行程摘述如下：

1. 8 月 23 日~24 日：去程（台北→盧比安納）

2. 8 月 25 日：報到及特別會議

10:00 am to 8:00 pm Conference Registration

11:00 am to 6:00 pm PhD Day: Seminar 1, Seminar 2 & Special  
Seminar

3. 8 月 26 日：第 1 天會議

07:30 am to 06:00 pm Conference registration

09:00 am to 09:30 am Conference Opening and Welcome Address

09:30 am to 11:00 am Opening Plenary Session

11:30 am to 01:00 pm Dual plenary session I

11:30 am to 01:00 pm Dual plenary session II

02:30 pm to 04:00 pm Concurrent Sessions 1A to 1G

04:30 pm to 06:00 pm Concurrent Sessions 2A to 2G

07:00 pm to 10:30 pm Cultural/Social Event and Conference  
Cocktail Dinner

4. 8 月 27 日：第 2 天會議

08:00 am to 05:30 pm Conference registration

08:00 am to 09:00 am European Affiliate's Leaders Meeting

09:00 am to 10:30 am Dual Plenary Session III  
09:00 am to 10:30 am Dual Plenary Session IV  
11:00 am to 12:30 pm Concurrent Sessions 3A to 3G  
02:00 pm to 03:30 pm Dual Plenary Session V  
02:00 pm to 03:30 pm Dual Plenary Session VI  
04:00 pm to 05:30 pm Concurrent Sessions 4 A to 4G  
07:00 pm to 10:30 pm Cultural/Social Event and Gala Dinner

5. 8月28日：第3天會議

08:00 am to 12:00 pm Conference registration  
09:00 am to 10:30 am Concurrent Sessions 5A to 5G  
11:00 am to 12:30 pm Concurrent Sessions 6A to 6G  
01:30 pm to 03:00 pm Concurrent Sessions 7A to 7G  
03:30 pm to 05:00 pm Closing Plenary Session

6. 8月29日：參訪 Brežice 水力發電廠(Hydro Power Plant Brežice)

7. 8月30日~31日：返程（盧比安納→台北）

(二) 出席人員

本次年會共有來自全球各地能源經濟相關專家學者共約 185 人發表論文，共有 301 位會員出席會議。本公司奉核定由郭所長秋英及紀課長穎秀等 2 員出席與會。

### 三、會議內容重點

本次「第 16 屆國際能源經濟學會歐洲年會」大會主題為「未來十年之能源挑戰 (Energy Challenges for the Next Decade)」，會議共有兩大部分，一部分是全員出席的「主題座談」(Plenary Sessions)，另一部分是分組進行的「分組研討會議」(Concurrent Sessions)。

開幕主題座談(Opening Plenary)主題為「2030 年的能源樣貌：挑戰及機會 (Energy Landscape of 2030 : Challenges and Opportunities)」，由國際能源經濟學會(IAEE)的主席 Christophe Bonnery 擔任主講人，並由 ENTSO-E 的秘書長 Laurent Schmitt、擁有 40 年產業經驗的國際能源專家、現任 CSIS 能源與國家安全計劃高級研究員 Edward C. Chow，以及歐洲能源監管機構合作局 (ACER) 的首任主任 Alberto Pototschnig 三位專家學者進行報告及與談。座談內容強調能源轉型是未來全球既定的發展趨勢，包括 3D-去碳化 (Decarbonization)、數位化 (Digitalization) 及去中心化 (Decentralization)，考驗各國能源政策如何實現這三個面向的平衡，以及未來能源業者在潔淨能源等方面的種種挑戰。

「主題座談」含開幕、閉幕共有 5 個時段計分 8 個場次，除開幕座談主題「2030 年的能源樣貌：挑戰及機會 (Energy Landscape of 2030 : Challenges and Opportunities)」外，其他分別為：「未來電力市場的前景 (Prospects for Future Electricity Markets)」、「未來天然氣和石油市場的前景 (Prospects for Future Natural Gas and Oil Markets)」、「數位世界中的能源：能源產業基礎的持續變化 (Energy in the Digital World : The Shifting

Fundamentals of the Energy Business)」、「最終能源使用的挑戰：創新，技術，效率 (Challenges in the Final Energy Use : Innovation, Technology, Efficiency)」、「能源與氣候：能源轉型的國際治理(Energy and Climate : International Governance of Energy Transition)」、「消費者，產消合一者和個人用戶的未來角色 (Future Role of Consumers, Prosumers and Prosumagers)」、以及閉幕座談的「歐洲能源部門在全球能源產業中的：現狀與未來 (Europe's Energy Sector in the Global Energy Industry : State-of-affairs and the Future)」。

另一部分為「分組會議」(Concurrent Sessions)，共分 8 大場次子題，分別針對能源市場、氣候變遷、能源效率、電力市場、再生能源、化石燃料、家庭用戶行為、核能發電、能源政策、交通-低碳及電動車、儲能技術、能源模型、創新科技及各國案例研究等議題進行討論，共發表 185 篇的論文。

- (一) 第 1 場次(Concurrent Session 1 )子題包括：1A. 能源市場及碳排放；1B. 能源模型；1C. 氣候變遷；1D. 能源效率；1E. 再生能源-風力發電；1F. 天然氣；1G. 最佳學生論文獎等 7 項子題，共 28 篇論文發表。
- (二) 第 2 場次(Concurrent Session 2 )子題包括：2A. 電力裝置容量；2B. 彈性及儲能-需求面反應；2C. 能源政策-支持再生能源；2D. 家庭用戶行為；2E. 各國案例研究；2F. 石油；2G. 運輸-低碳的未來等 7 項子題，共 26 篇論文發表。
- (三) 第 3 場次(Concurrent Session 3 )子題包括：3A. 能源市場整合；3B. 彈性與儲能；3C. 能源政策-碳市場；3D. 家庭用戶行為；3E. 再生能源-太陽光電；3F. 核能發電；3G. 交通

-電動車等 7 項子題，共 28 篇論文發表。

- (四) 第 4 場次(Concurrent Session 4 )子題包括：4A. 能源市場-能源和裝置容量市場；4B. 能源建模；4C. 氣候變遷；4D. 能源效率；4E. 各國案例研究；4F. 煤炭和核能的淘汰；4G. 走向永續能源未來的軌跡等 7 項子題，共 28 篇論文發表。
- (五) 第 5 場次(Concurrent Session 5 )子題包括：5A. 電力；5B. 能源建模；5C. 能源政策-碳稅與脫碳；5D. 家庭用戶行為；5E. 可再生能源-空間容量分配；5F. 能源投資與金融；5G. 能源市場，創新與新技術等 8 項子題，共 25 篇論文發表。
- (六) 第 6 場次(Concurrent Session 6 )子題包括：6A. 能源市場；6B. 彈性與儲能；6C. 能源獲取與能源貧困；6D. 家庭用戶行為；6E. 再生能源；6F. 能源投資與金融；6G. 交通-政策和家庭用戶的選擇等 7 項子題，共 24 篇論文發表。
- (七) 第 7 場次(Concurrent Session 7 )子題包括：7A. 能源市場-市場設計與交易安排；7B. 能源建模；7C. 能源政策-低嘆政策；7D. 公司業績；7E. 能源社區的作用；5F. 能源與經濟；7G. 交通-電動車能源市場等 7 項子題，共 26 篇論文發表。

## 貳、行前資料準備

為提升本公司奉派與會人員對會議的參與度，並對國際能源各類議題內容能有更深入的了解，在前往參加此次國際型的能源會議前先向企劃處電業組取得相關資料，針對國際電業及國際能源等相關最新資訊有一個概略的了解，加強與會者對國際電業情況及歐洲能源政策等背景知識，以期在會議時能快速進入狀況，吸收更多的國際能源最新資訊。以下為此次會議行前蒐集的相關國際電業參考資料：

### 一、能源轉型方面

#### 1. 全球--巴黎協定及永續發展目標岌岌可危

- 國際能源總署(IEA)新近發表的” 2019 全球能源投資” 報告中指出，對再生能源及能源效率的投資金額，已嚴重威脅到要達成巴黎協定及聯合國永續發展目標(United Nations Sustainable Development Goals(SDG)的各項努力。全球能源投資連續 3 年下滑，2018 年超過 1.8 兆美元，與 2017 年相當。即便這些投資穩定，但因核准的各項傳統油、氣之新投資專案減少，致使全球持續穩定成長的用電需求難以達成。
- 依據 IEA 永續發展情境(SDS)，要達成巴黎協定的目標，再生能源須在 2030 年倍增，亦即在 2018-2030 年間，全球每年應平均增加 300 GW 方有可能。但 IEA 警告，儘管再生能源增加 7%，但發電部門的碳排卻成長 1.7%。能源投資面臨前所未有的市場、政策、技術等各項不確定因素，但最根本卻是對發電端的投資不足以符合用電、

環保、永續需求等多重目標。過去數年對各項低碳的再生能源、核能、能源效率、電池、CCS 的投資，占總電力投資的 1/3 且呈現停滯不前現象，遠遠不符要達 2/3 才能達到永續發展的各項目標。

## 2. 歐洲--歐盟計劃 2050 年實現碳中和

- 歐盟執委會(EU Commission)新主席范德里恩提出 2030 年碳排放量應較 1990 年減少 50-55%(原目標為 40%)，除了公開呼籲全球各國致力達成各自之氣候目標外，其提出 2050 年實現碳中和之目標，期望最快可於明年 2 月擬具法律草案，如此勢必在歐盟既有之減排時程上，另增加力道與速度，方可實現 2050 年碳排放量較 1990 年減少 80%的目標，其具體之整體減排計畫業已承諾於 2021 年提出。
- 芬蘭預計在其輪值歐盟理事會主席國(EU Council Presidency)半年期間(2019 年 7-12 月)，加快減排計畫，並要求各會員國於年底確立其 2030 能源與氣候計畫，主要係針對具約束力之再生能源目標(占比達 32%)，以及不具約束力之能源效率目標(達 32.5%)提出行動策略。
- 歐洲天然氣產業聯盟(Eurogas)希望歐盟明定具約束力目標(binding target)，以利於再生能源氣體如氫能、生質沼氣(biogas)與生質甲烷(biomethane)取代化石燃料成為主要燃料。

## 3. 英國--新首相承諾推動核電

- 英國新首相鮑里斯強森(Boris Johnson)在就職演說上表

示，英國將基於自由貿易和相互支持的原則與歐盟達成更好的協議，並同時兌現脫歐承諾。

- 強森在 7 月 25 日首次向下議院發表談話，即表達對核電的“熱情”支持，其表示現在正是復興核電的時候，並相信核能必將成為英國能源結構的一部分，而核能亦將有助於英國實現其碳排放目標。在英國現有 8 座核電廠中，有 7 座將在 2030 年除役，而新建計畫在過去兩年中面臨財務不確定性。而在 7 月 22 日強森當選為保守黨黨魁當日，政府啟動了一場關於為大型核電廠提供資金的諮詢會，以及提出 1,800 萬英鎊(約 2,200 萬美元)投資小型模組化核反應器的計畫。

#### 4. 法國--國會更新法國能源目標

- 2019 年 7 月底在法國國民議會與參議院經協商後達成共識，國會以修法方式更新法國的能源目標。新修正內容包括加大再生能源目標，並將核電占比降至 50%的目標延後十年至 2035 年實施。另外，新法還將 EDF 每年向競爭者提供的受管制核能發電量上限，從明年開始提升至 150 TWh。
- 參議院在本次協商導入更具體的目標，以促進再生能源發展，包括到 2028 年水力發電目標達 27.5 GW，2024 年離岸風電的新目標為 1 GW，而由低碳再生能源生產出來的氫氣，目標是在 2030 年可提供現在所有氫氣消耗的 20%(含工業氫氣消耗的 40%)。

#### 5. 中國--國家能源集團計畫增加超低排放的煤電裝置容量

- 中國最大的火力發電國營企業-國家能源集團(China Energy Group)計畫今(2019)年以建置超低排放(ultra-low emission)煤電

機組，增加裝置容量達 6GW，來滿足持續攀升的用電需求；亦期望在 2020 年能另增加容量達 5GW。目前，各地區因風能及太陽能供電不足，且天然氣的價格高昂，中國政府選擇以煤電來滿足各地區的用電需求。

- 為減少碳排放量及增加發電效率，國家能源集團將以效率高的煤電機組，取代規模小且高污染的舊機組，進而提高總裝置容量。截至 2018 年為止，國家能源集團所營運的燃煤電廠總裝置容量為 175GW，占其總裝置容量的 77.4%，為中國總體電力裝置容量的 10%。

#### 6. 日本\_日本福島第二核電廠將除役

- 2011 年發生東日本大地震後，隔年東京電力公司(Tepco)決定將造成福島核災主因的第一核電廠除役。而今(2019)年 7 月東京電力公司董事會決議正式將福島第二核電廠 4 座反應器關閉，預估將耗資 2,700 億日圓完成除役工作。

#### 7. 澳洲\_政府將核能納入電源的可行性研究範疇

- 澳洲自由黨籍能源部長已要求環境與能源常設委員會進行調查核能作為電源的可行性研究，目標是在今年年底前完成報告。儘管能源部長要求進行此項調查，其堅持認為沒有改變該國廢除核電的計畫，但認為政府不考慮新興核能技術是不負責任的作法。部長對小型模組化反應器表示興趣，並認為它們與傳統核電廠不同。
- 工黨能源發言人抨擊，政府應把重點放在批發電價上漲的實際解決方案上，並認為前述調查對澳洲來說並不切實際，因為至少得花上幾十年才能讓核電廠在澳洲營運。

- 澳洲國立大學(ANU)的能源變遷研究所所長表示，風能和太陽能與儲能電池的組合成本將持續下降並成為最便宜的供電模式，但亦表示國家應定期對核能技術進行研究與審查，以了解當前核能技術最新發展和成本。

## 二、電力市場方面

### 1. 全球\_Innogy 規劃與石油公司合作進軍美國離岸風電市場

- Innogy 再生能源執行長表示，目前美國離岸風電計畫已成為歐洲大型電力公司鎖定之重要目標市場，考量石油產業舊有商業模式的侷限性，大型石油公司積極進軍再生能源市場。Innogy 規劃與石油巨擘建立合作夥伴關係，期在蓬勃發展的美國離岸風電市場大展拳腳。
- Innogy 內部仍在評估是否參加 2020 年初在紐約舉行的風電招標，並補充說明其不太可能單獨行動，將積極尋求合作夥伴來建設大型離岸風場。
- Innogy 認為電力公司和石油公司是興建離岸風場的絕佳合作夥伴，因為相關計畫需要大量資金，且石油公司具有豐富的海上平台作業經驗，但目前除了 Equinor 之外，其他公司尚未開始建造離岸風場，對 Innogy 而言，目前正是建立合作夥伴的良機。
- Innogy 在今年 2 月已與 Stiesdal Offshore Technologies A / S 合作，將於 2020 年對浮動式離岸風機進行測試，Innogy 認為該技術相當關鍵，因為許多潛在的離岸風電市場的海床正在急劇下降(如日本和加州等)。

### 2. 歐洲--歐盟計劃 2050 年實現碳中和

- 歐盟執委會(EU Commission)新主席范德里恩提出 2030 年碳排放量應較 1990 年減少 50-55%(原目標為 40%)，除了公開呼籲全球各國致力達成各自之氣候目標外，其提出 2050 年實現碳中和之目標，期望最快可於明年 2 月擬具法律草案，如此勢必在歐盟既有之減排時程上，另增加力道與速度，方可實現 2050 年碳排放量較 1990 年減少 80%的目標，其具體之整體減排計畫業已承諾於 2021 年提出。
- 芬蘭預計在其輪值歐盟理事會主席國(EU Council Presidency)半年期間(2019 年 7-12 月)，加快減排計畫，並要求各會員國於年底確立其 2030 能源與氣候計畫，主要係針對具約束力之再生能源目標(占比達 32%)，以及不具約束力之能源效率目標(達 32.5%)提出行動策略。
- 歐洲天然氣產業聯盟(Eurogas)希望歐盟明定具約束力目標(binding target)，以利於再生能源氣體如氫能、生質沼氣(biogas)與生質甲烷(biomethane)取代化石燃料成為主要燃料。

### 3. 德國--EnBW 在北海 Hohe See 離岸風電廠開始供電

- EnBW 表示其在北海 497 MW 之 Hohe See 離岸風電廠，首座風機在 7 月中旬已開始運轉供電。EnBW 亦同時在北海建造 112 MW 之 Albatros 離岸風電廠。目前，兩處離岸風電總數 87 座風機中已有 49 座完成。EnBW 表示，若天氣允許，平均每天有兩座風機可投入運轉。其預計在 2019 年底前，將所有風機共 609 MW 的容量併網上線。
- 位於 Hohe See 和 Albatros 的風機一旦全面投入營運，將足以提供慕尼黑所有家庭的用電需求。EnBW 與加拿大的投資夥伴

Enbridg 公司共同合作，EnBW 持有每項計畫 50.1%的股份，而 Enbridg 擁有其他 49.9%的股份。

#### 4. 英國--E.ON UK 將為轄下 330 萬用戶提供 100%綠電

- E.ON UK 規劃透過轄下的風場、生質能和太陽能電廠為轄下 330 萬家庭用戶提供 100%綠電，可自動轉換且無需額外費用。此係首間英國六大供電公司(Big Six)之創舉，強力回應民眾對氣候變遷危機的擔憂。E.ON UK 執行長表示，即便集團規劃將其再生能源資產出售予 RWE，轄下用戶仍可繼續向其購買綠電，權益將不會受損。
- E.ON UK 係英國最大的再生能源發電業之一，在英國擁有並營運超過 20 個陸域和離岸風場，該公司透過一系列的改革措施，以取得足夠的清潔能源來滿足用戶需求，同時亦希望藉此降低用戶流失至其他再生能源售電業，如 Ovo 能源、Bulb 能源及殼牌公司。YouGov 今年進行的一項調查顯示，若價格合理，超過五分之三的英國人將轉向再生能源售電業購電。

#### 5. 法國--免除自用太陽能稅賦

- 7 月 9 日法國經濟暨財政部釐清，無論太陽設備自有或租用者均無須課稅(the internal tax on the final consumption of electricity, TICFE)。此對再生能源開發商的商業模式提供極具誘因的條件，其價值亦可確定。
- 太陽能免課徵 22.5 歐元/MWh，使法國私人住宅、商業和工業場所安裝太陽能的獲利能力大增。法國太陽能協會表示太陽能發電成本為 70-80/MWh，TICFE 免稅使其競爭力大增。此政策的確定將使法國太陽能產業在確認其客戶不須支付太陽

能稅額下，更能推出創新的商業計畫。

- 環境法學專家亦表示，法國營運商可放心提供協力廠商投資協定，為太陽能設備提供融資、安裝和租賃服務。然而，協力廠商投資人要因此受惠，即應將其太陽能裝置以租賃方式進行銷售。
- 目前，電表下游的任何轉售或集體自用電力仍受 TICFE 的管制，僅可通過立法修正才能取消。Enerplan 支持經濟財政部和生態團結轉型部就此類契約之相關業務推展，並將在今年年底投票核定 2020 年金融法。
- Enerplan 遵循 2018 年 12 月的歐盟指導方針，其要求所有成員國允許協力廠商投資發展自用電能。

### 三、新興技術與創新服務方面

#### 1. 新加坡\_ABB 建置 40 座電動巴士 10 分鐘快速充電站

- ABB 宣布為 2020 年在新加坡啟用的 40 輛單層電動巴士，提供充電基礎設施，合作對象分別為比亞迪新加坡和 ST Engineering Land Systems，上述兩家公司分別取得新加坡陸路交通管理局(LTA)20 輛單層電動巴士的訂單，訂單價值分別為 1,700 萬新幣和 1,500 萬新幣。相關細節分述如下：
  - (1) ABB 已與 ST Engineering Land Systems 簽署合約，將提供 ST 工程即將推出的 20 輛單層電動巴士 4 座 450 kW 充電器，充電器將通過自動屋頂連接系統運作，使其能夠在不到 10 分鐘的時間內快速充電，有足夠的動力行駛 35 公里。
  - (2) ABB 亦將提供比亞迪新加坡的 20 輛電動巴士車隊 10 座 150kW 夜間充電系統，每個充電樁將可允許兩輛電

動公車同時充電，所有 20 輛電動巴士在 4.5 小時內即可完全充滿電，為全天營運提供足夠的動力。

## 2. 新加坡\_啟動電動車革命

- 新加坡道路上行駛電動車的數量明顯增加，此係政府和民間共同合作且多管齊下的努力成果，該國 2015 年的永續發展藍圖中提出汽車發展願景，除推廣使用大眾運輸工具外，亦積極推動採用更環保和更清潔的車輛。電動車符合此一藍圖，因為其更安靜及無二氧化碳排放量，預期可改善整體生活環境。
- Tesla 執行長 Elon Musk 不久前才砲轟新加坡缺乏對電動車的 support，四個月後，Dyson 宣布新加坡將成為其電動車的製造總部。其實 Elon Musk 的不滿並沒有影響新加坡電動車的既定發展期程，其可從下列電動車四大發展面向之進程一窺端倪。

(1) 電動巴士：新加坡西部的電動巴士已經完成測試，南洋理工大學和瑞典汽車公司 Volvo 推出世界上第一輛自動駕駛電動巴士，已經在受控環境中通過測試，目前正準備應對真實的交通狀況。雖然其行駛範圍僅 25 公里，但搭配快速充電系統，只需 6 分鐘即可完全充電。

(2) 電動車購買補助：購買電動車可享受高達 20,000 美元的退稅，但過去市場擴張速度緩慢，該國電動車革命起點始於 2016 年的 12 輛，到 2018 年攀升至 560 輛，市場發展速度過慢係缺乏普及的充電網絡，但隨著國營之新加坡電力公司配合政策積極增設充電站後，市場形

貌才明顯大幅改變。

(3)充電站數量增加：國營 SP 電力集團在今年 1 月已建置 38 個充電站，規劃在 2020 年前完成 1,000 個電動車充電站。站內的高速充電器能夠在一小時內完成中型汽車充電，較家用充電器快 6 到 8 倍，充電站皆設置在飲食購物中心附近，在用餐購物的空檔時間汽車亦可完成充電。Blue SG 係新加坡首個大型電動汽車共享服務公司，已開放 99 個充電站供公眾使用，規劃到 2020 年將開放超過 300 個充電站，亦對整體電動車推廣有所助益。

(4)共乘服務：東南亞共乘霸主 Grab 將在新加坡車隊推出 200 輛新電動車。事實上，第一批 20 輛電動車已經在道路上行駛，其餘車輛將在今年年底前逐步推出。受益於與 SP 集團合作之充電站享有充電優惠和電動車不需要燃料，Grab 司機預期收入將增加 25%<sup>3</sup>。德國--EnBW 在北海 Hohe See 離岸風電廠開始供電

### 3. 印度\_規劃興建 1,000 座電動車充電站

- 印度政府規劃在主要城市建置 1,000 座電動充電站，合計安裝 6,000 個充電樁，俾利於電動車充電需求。相關充電站皆須遵循印度電力部去年 12 月發布之電動汽車充電基礎設施-指導方針和標準，每個充電站至少有六個充電樁，其中四個充電樁為快速充電器，另外兩個充電樁則為慢速或中速充電器。
- 充電樁標準必須涵蓋日本 CHAdeMO(電力輸出最小 50 kW)，歐洲聯合充電系統(CCS)(電力輸出最小 50 kW)，

印度 Bharat 標準(15 kW 直流輸出和 10 kW 交流輸出)，  
Type-2 型交流(最小 22kW 電力輸出)。

- 本計畫依安裝場所區分為三類，分別為商場、政府建物(如政府醫院和公共部門辦公室等)、住宅區。在人口超過 400 萬的 8 個都市中，將選擇 5 個都市共建置 250 個充電站。至於人口超過百萬的城市，則從 45 個城市中挑選 20 個，合計建置 500 個充電站。其餘特殊類別城市則將建置 250 個充電站。相關部門預計於今年 11 月就設置充電站一案進行招標作業，得標公司必須在明年 10 月之前完成充電站建置。

## 參、國際經濟能源學會簡介

### 一、成立宗旨

國際能源經濟學會（The International Association for Energy Economics, IAEE）成立於 1977 年，為全球能源經濟領域之重要國際性非官方組織，所屬會員涵蓋世界共 100 國以上的產官學界，並在世界各地設有分支機構，具有極大影響力。其主要宗旨為結合全球能源研究的菁英，探討解決世界能源供需、經濟、科技、及環保等問題。

能源是世界社會與經濟快速發展不可或缺之要素，但在過去數世紀以來，整個世界不斷發展之同時，卻帶來能源過度耗用及環境破壞等問題，即使專家學者們不斷發出警訊，並研究如何有效運用及保護環境，卻沒有因此減輕問題之惡化程度。隨著科技與通訊的發展一日千里，全球化進展更為快速，區域間之經濟、社會、環境等變化更具連動性，至今能源及環境問題已不再是單一區域努力就可解決，而是需要全球各國共同研商解決方案且落實執行之全球性議題。

### 二、參與「國際經濟能源學會」緣起與目的

國際經濟能源學會(IAEE)每年擇一會員國召開全球年會、各分會亦不定期主辦年會(如北美年會、歐洲年會及亞洲年會等)，皆邀集各國會員、政府代表、學術能源決策機構、企業代表與能源經濟相關專家學者與會。在年會期間 IAEE 或是各分會廣邀產官學研各界重量級代表，充份就各項重要能源議題，如石油、天然氣、再生能源、核能、電業市場、能源政策、氣候變遷、

最新科技等等之發展及研究，進行經驗交流與交換意見，在國際能源經濟領域具有極大的聲望與影響力。

其中 IAEE 亞洲年會係由我國主動發起促成：台灣於 2007 年 11 月初由中油公司舉辦第 1 屆 IAEE 亞洲年會，會議參與及討論情形熱絡，各國與會代表亦極為推崇我國對於 IAEE 亞洲年會成形之熱心支持。

我國「中華民國能源經濟學會(CAEE)」亦為 IAEE 分會之一，為我國能源部門與 IAEE 間之主要溝通管道。每年藉參與各項 IAEE 會議，與各會員國保持密切之聯繫，除可提升國際能見度、加強國際間能源經濟領域之交流與合作外，更可鞏固我國在國際能源經濟學會之地位。

同時本公司亦為 IAEE 之重要團體成員，每年皆考量 IAEE 或各分會之全球年會暨各項研討會會議主題屬性與適切性，選擇參加 IAEE 或各分會所舉辦之年會及研討會，藉此國際能源活動之重要平台，蒐集各會員國在能源經濟、能源管理及能源技術等方面之經驗與作法，提供本公司釐訂電力經營策略及制定電力能源科技之參考，並提升本公司在能源經濟與能源管理技術方面之水準。

## 肆、「第 16 屆國際能源經濟學會歐洲年會」重要議題內容

以下摘選與電業相關度較高的議題，以作為本公司決策及營運時的參考。

### 一、再生能源議題

#### (一) 海上風電容量擴展對德國未來的風能預測的不確定性之影響

(The Effect of Offshore Wind Capacity Expansion on Uncertainties in Germany's Day-Ahead Wind Energy Forecasts)

##### 1. 概要

在過去的二十年中，德國陸上風電裝置容量不斷增加，到 2018 年底總裝置容量約為 56GW，同時亦安裝了約 5.6 GW 的海上風電場，並於 2013 年開始增加大量裝置容量。這些大容量為可再生能源發電做出了巨大貢獻。大型的海上風力發電場預計將於 2019 年建成或完全投入使用。到 2025 年，德國的海上風力發電總裝置容量將幾乎達到 12 GW。

由於對風速預測的不準確，風力發電的預測存在不確定性。這會影響電廠運營商的日後決策，例如常規發電廠的承諾發電量，在決策時已考慮到可再生能源發電的預測。風力發電的特點是可變性和有限的可預測性。此外，它會在一天中的所有時段影響電源系統，並且不一定與負載一致。由於擁有大型風電場，海上風輪機得到了更高程度的整合。通常，海洋條件和較大的風輪高度導致海上風力渦輪機的高風速。由於風速與功率輸出之間存在立方關係，因此與低風速相比，風速預測誤差會導致中高風速時的輸出存在更大的偏差。這可能意味著，即使與同等大小的陸上風速偏差相比，海上風速偏差對風力發電預

測誤差的影響更大。

本文從 ECMWF 數據庫（特別是可公開獲得的 CAMS 即時數據和 ERA5 數據集）中以較高的地理分辨率分析了預測風速和實際風速，由此產生的偏差用於評估（i）陸上和海上的風速預測是否存在差異；以及（ii）如果由於更高的風速，更大的海上風電容量合併以及更大的風速預測誤差，海上風電擴張是否會給整體的風力發電預測帶來更大的不確定性。

## 2. 研究方法

首先，進行描述性統計分析以評估特定位置的風速與實際風速之間的差異。針對系統偏差、偏差的平均大小、偏差的變化，以及極端偏差的大小評估偏差。

其次，建立一個基於機器學習的極端隨機樹（Extra Trees）模型，將風速與位置特定的容量和容量加權的輪轂高度相結合，轉換為整體的風力發電量。根據不同的裝置容量情況，使用訓練模型將所有可用的預測和實際風速時間序列轉換為風能。這樣做是為了（i）使用 2018 年底的實際裝置容量的基本案例，（ii）具有額外 5 GW 的海上風能的案例，以及（iii）具有額外 5 GW 的陸上風電的案例。其所得的時間序列用於比較預測的集合風能與實際的集合風能之間的偏差。比較這三種情況下的偏差分佈，以評估海上容量擴張是否會導致總體風能預測的偏差更大。

## 3. 結果

由於大型風力渦輪機和風力渦輪機在風力發電場中的大量累積，海上風力發電量在地理上的整合程度更大，這意味著受到預測誤差影響的同時，海上風力發電量將增加。

此外，由於海上風速平均高於岸上風速。結果顯示，海上

位置受風速預測偏差影響的標準差更大，平均幅度更高。再者，離岸的大幅度偏差要比陸上的大。

Extra Trees 模型的結果表明，海上風電容量的擴增會增加中高預測誤差的頻率，即 1-5 GW 範圍內的偏差，這比陸上風電容量的擴張要大得多。但是，在陸上擴張下的預測出現了更頻繁的極端偏差。

#### 4. 結論

考慮到計劃中的德國海上風電場將在未來幾年內增加容量，預購隔日電力的前一日市場（Day-Ahead）可能會在可用風能方面受到更大的不確定性。然而，極端事件似乎並沒有隨著海上風力發電容量的擴大而增加。除了在網格中的幾個節點上更集中地集中海上風能的饋電之外，在計劃間歇性可再生能源的整合時，還必須考慮到海上風速預測誤差的程度和可變性。

未來的研究應該在更長的時間內驗證模型的性能。此外，自下而上的風電饋送基礎模型可以作為 Extra Trees 模型的附加性能基準，其優點在於減少了對數據的編譯工作。

(二) 在孟加拉國部署大規模太陽能電氣化的經驗教訓。“最後一英里”能變成最前嗎？

(Lessons from deploying large scale solar electrification in Bangladesh.Can the Last-Mile Become the First? )

#### 1. 概要

孟加拉國基礎設施發展有限公司根據 IDCOL 實施的國家電氣化計劃部署了超過 400 萬個太陽能家庭系統（SHS），在分散、

由下而上的離網電氣化發展中脫穎而出 (International Monetary Fund 2018)。大型太陽能計劃因其有效的行業政策以及獨特的“最後一英里”分銷和最終用戶融資模式而得到廣泛認可。Khandker 等 (2014) 以及 Bertsch 和 Marro (2015) 等人對該計劃進行了廣泛的討論並確定了主要的成功因素，然而卻缺乏了關於部署的組織模型的總體批評性討論，包括該計劃應對 SHS 安裝率大幅下降所面臨的最新挑戰的能力有限 (Tyabji and Chase 2016)。本文的目的是總結孟加拉國二十年來的太陽能電氣化，並在機構建模的背景下提供有關經濟和管制的見解。批判性分析引發了關於如何探索群體電氣化潛力的進一步討論，即如何透過分散電網 SHS 的由下而上演進實現電網基礎設施，從而進一步發展分散式 SHS 電氣化的有效性。通過將分散的現有和新的用電，存儲和發電機互連來落實基礎設施建設，從而實現基於生產者和本地價值創造的對等經濟。

## 2. 研究方法

首先，我們專注於歷史和背景因素。除其他外，我們的分析包括世界銀行的廣泛發現 (Martinot, Cabraal 和 Mathur, 2001; 世界銀行 2002; Sadeque, Zubair 等, 2014) 以及專門的政策研究論文 (Asaduzzaman 等, 2013; Tiedemann, 2015)。該計劃自 2002 年成立以來，一直在探索該計劃的演變過程。特別關注了四個主要利益相關者的觀點：最終用戶、分銷商、供應商以及政府/公共部門。儘管關於 SHS 計劃的業務模型，其有效分佈和成功因素的文獻非常豐富，但是從制度角度來看卻很少受到關注。因此，第二步，我們根據部署的組織模型探索該程序。在生產和融資的兩個基本方面進行區分，我們創建了一個框架，該框架可確定基礎組織模型及其增強和複製的一般潛力。最後，

我們介紹了群體電氣化作為近期挑戰的一種解決方案。通過互連太陽能家庭系統的由下而上的電網基礎設施可能會呈現出可持續的離網電氣化的新高度。

### 3. 初步結果

我們的分析為孟加拉國太陽能電氣化計劃提供了一致且歷史悠久的概覽。

IDCOL 是負責協調和實施的公共實體，已被證明是高效率的單一聚合商，可以為孟加拉國農村地區的大規模 SHS 進行融資、標準化和部署。根據他們的政策，可以解決配電方面最後一步的主要挑戰-融資以及提供負擔得起的高質量 SHS 和有效的客戶服務。該計劃的政策結合了針對最終用戶的 SHS 有吸引力的所有權模型，負擔得起的消費者貸款以及受到補貼和弱勢通貨貸款激勵的高度強制和發展的本地分銷和國內供應方。如今已經出現了一個當地的太陽能產業，目前擁有 133,000 多名員工（IRENA 2018）。我們的機構分析確定了多個利益相關者之間生產/分配和融資維度的結構合理的劃分。由基礎設施機構 IDCOL 代表的公共部門正在協調該計劃的政策級別並管理其財務方面，而 SHS 的執行、生產、部署和維護則由私營部門承擔。但是，尤其是分銷方面的主要特點是非營利性運營。非政府組織和慈善基金會通常負責最後一英里的分配，這有助於整體研究結果，即農村太陽能電氣化的複雜性要求動態和混合的公私合作模式（PPP）。關於群體電氣化，對孟加拉國已安裝的 SHS 負荷曲線的研究表明，超過 30% 的發電沒有得到有效利用（Kirchhoff，2015 年）。

根據世界銀行多層框架（MTF）的規定，部署 SHS 僅提供有限的 1 級/2 級電力取得（Bhatia 和 Angelou，2015 年）。但是，

使用智能 ICT 技術和 DC Nano 網絡方法可能將孟加拉國的 SHS 基礎設施推向新的高度 (Walsh, Groh 和 Chowdhury, 2015 年)。群體電氣化的概念是在點對點的水平上將太陽能基礎設施網絡化，具有提供高效率且有效的類似於網格的基礎設施的潛力 (Groh and Koepke 2014)。Narayan 等人的最新研究 (2019) 證實，互連的 SHS 會導致一定數量的電力供應。群體電氣化支持最終用戶向類似電網的能源基礎設施發展，從而實現了 4 級/ 5 級電力取得。

#### 4. 結論

孟加拉國的案例證實，大規模的太陽能電氣化可以得到有效管理和成功實施。IDCOL 作為該計劃的唯一聚合商，已將有效的混合 PPP 付諸實施，從而實現了高安裝率以及本地太陽能行業本身的持續增長。隨著時間的流逝，該計劃已成為一項行業政策，其成功源於各個參與者的密切合作。

籌資和輸配/發電的關鍵機構層面組織良好，然而，一個新的監管框架被提出了，該框架應解決最近的挑戰並促進群體電力的採用。

## 二、 電力市場議題

### (一) 北美電力市場整合：輸電和發電計劃的定量分析

(Electricity Market Integration in North America: A Quantitative Analysis for Transmission and Generation Planning)

#### 1. 概要

在《巴黎氣候協定》和國家自主貢獻的提交框架內，美國、墨西哥和加拿大為溫室氣體減排設定了宏偉的目標。此外，墨西哥、許多美國的州和一些加拿大的州都有具體的再生能源目標。因此，在未來幾十年中，大量間歇性可再生電力的整合將成為未來北美能源系統的主要任務之一。儘管有一些跨國界的合作正在進行，區域內的合作仍有很大潛力。除其他靈活性選項外，不斷增加的國際電力市場整合以及跨境容量擴展有助於高比例的再生能源的整合過程。

美國和加拿大的電網已經高度互連，這為兩國帶來了好處，例如提高了電力可靠度、安全性、可負擔性和韌性，並增加了經濟利益。加拿大相對潔淨的電力生產可以幫助美國實現其潔淨能源的目標，並為過度波動的可再生能源提供抽蓄水力蓄能能力。

但是，跨美墨邊境的電力貿易明顯減少，電網缺乏必要的基礎設施。與加拿大的潔淨電力生產相似的，在墨西哥部署光伏發電的潛力很大。因此，本研究不僅考慮了美國和加拿大，還考慮了墨西哥的電力系統，研究了提高總體跨境傳輸能力的好處。

#### 2. 研究方法

本研究使用成本最小的經濟調度模型來量化跨境電力貿易

增加的收益。我們特別強調可再生能源的可變性以及需求的結構。一些需求方靈活性（DSM）選項也可採用。

根據北美互連網，該大陸分為八個不同的市場區域（請參見圖 1）。對於每個區域，都要考慮區域差異的輸入數據，例如已安裝的發電和儲存容量、發電的邊際成本、可再生能源生產的波動以及用電需求。根據現有的跨境傳輸能力，跨境電力貿易受淨轉移能力（NTC）的限制。區域市場以每小時為單位計算一年。

為此，我們計算了四種跨境傳輸能力和可再生能源比例不同的方案。在可再生能源發電容量的當今和未來比例不斷增加的情況下，研究了跨境容量擴展的影響。然後將結果與反映現狀的情境以及具有可再生容量擴展但沒有電網擴展的情境進行比較。透過對這四種方案的比較，可以洞悉北美電力系統的市場整合對雄心勃勃的可再生能源目標的有利程度。

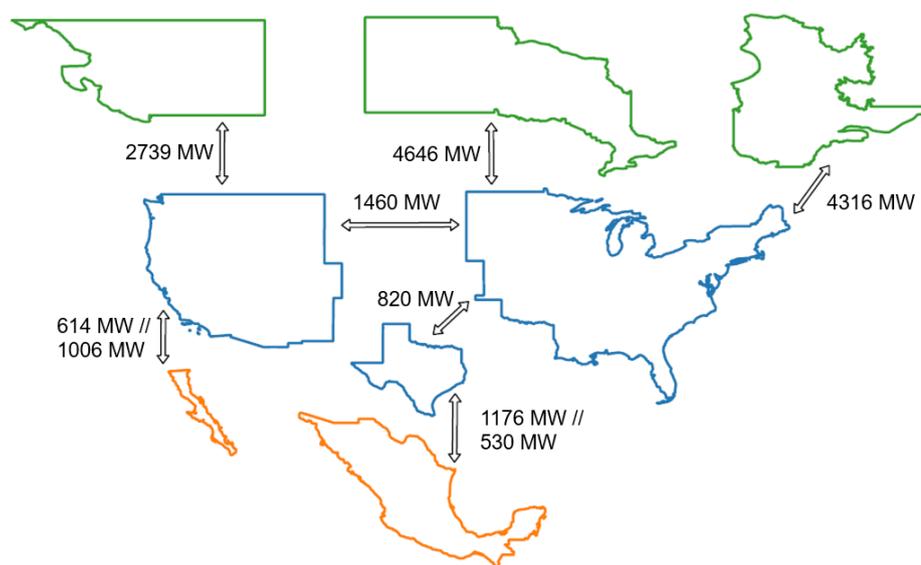


圖 1：基於現有跨境容量的區域劃分和淨轉移能力

### 3. 初步結果和結論

該模型已經建立並且已經開始進行首次試運行，我們收集結果直到 2019 年 5 月。但是，從第一次模型運行開始，已經出現了一些趨勢：基於增加的跨境傳輸能力的方案也說明了系統總成本的降低，即使在當今美國可再生能源比例相對較低的情況下，它也能提高整體可再生能源的產量。在將來可再生能源比例更高的情況下，這種影響可能會進一步增強。結果還顯示，德克薩斯州和墨西哥之間以及魁北克和美國東部之間的現有跨境傳輸能力正在不斷得到充分利用。因此，對政策的影響可能包括關於在特定區域擴大跨境傳輸能力的建議。對於高比例的可再生能源，由美國、加拿大和墨西哥組成的北美市場整合可以為系統所需的靈活性邁出第一步。

### 三、 交通運輸議題-電動車

#### (一) 電動汽車密度對當地電網成本的影響

( Good Chargers? The Impact of Electric Vehicle Density on Local Grid Costs )

##### 1. 概要

運輸的電氣化被認為是減少溫室氣體排放的有效措施，這已成為挪威氣候政策戰略的一部分。我們觀察到，挪威乘用車車隊中越來越多的人變成了電動車，到2018年，新車銷售比例將超過30%。但是有文獻表明，透過模擬演習，發現有充分的理由可以預期電動汽車（EV）的充電會給當地電網帶來巨大的未來成本，除非採取某些措施。Hattam 和 Greetham (2017) 研究了電動汽車如何影響低壓網絡中鄰域水平的負載曲線。Azadfar, Sreeram 和 Harries (2015) 鑑於其對電網管理的影響，從一天中的時段、持續時間、頻率和用電量方面研究了電動汽車駕駛員的充電行為。巴頓等 (2013 年) 探討了當電動汽車充電變得更加顯著時電網平衡所面臨的挑戰，並強調了需求端管理的重要性，即隨著電力負荷從高峰需求時段時移到非高峰時段、以及可再生能源供應不足時段時移到高供應時段。其他研究也認為，需求端管理（例如 Haidar, Muttaqi 和 Sutanto, 2014 年; Masoum, Dilami, Moses, Masoum 和 Abu-Siada, 2011 年）可以替代配電變壓器站的昂貴升級。

##### 2. 研究方法

在本文中，我們使用固定效應回歸模型在平衡模板上進行模板數據分析，該模板具有2008-2016年期間109個DSO的年度數據。這使我們得到了一個平衡的模板，總共包含981個觀

測值。

該數據集是通過合併 3 個數據集而得到的。我們將(1)來自挪威水資源和能源局 (NVE) 的 DSO 成本和用於監管產出的數據，與(2)NVE 的 DSO 合法運營區域的數據，以及(3)市政當局的資料進行匹配，最後可以將其與挪威統計局在市政級別上已註冊汽車的數據合併。

主要的內生變量是 DSO 的年度總成本。總成本是營運成本、資本成本、折舊成本，及 CENS (未供應的能源成本和能源網絡損失的成本) 的總和。自變量將是 NVE 用於調節的 DSO 輸出變量；用戶、變電站和高壓線路的公里數以及其他我們感興趣的變量，即電動汽車的數量。由於這是一個固定效應模型，因此不包括 NVE 在其監管計算中使用的定時因素。

### 3. 初步結果

我們發現，DSO 經營範圍內擁有的電動汽車數量對資本成本的影響有小的正相關，這在 10% 的水平上是顯著的。對總成本的影響較小，且在 10% 的水平上之統計不顯著 (針對 DSO 的聚類調整了標準誤差)。在所有其他成本組合中，其結果在統計上都不顯著。

### 4. 初步結論

研究結果為文獻提供了支持，這些文獻預計電動汽車將迫使 DSO 提前升級其基礎設施，從而導致更高的電網投資成本。但是，這種影響還不足以建議 DSO 的監管機構 NVE 將 EV 密度作為成本驅動的背景因素納入其監管。儘管挪威是世界上電動汽車比例最高的國家，但電動汽車在全國範圍內仍僅占汽車總數的 7% (在某些城市中高達 12%)。因為數字仍然相對較

小，將電動汽車確定為 DSO 的成本驅動因素可能還為時過早。  
但是，既然我們已經建立並運行了模型，則可以在有新數據可用時快速更新我們的估計。

#### 四、核能相關議題

##### (一)我們可以全部淘汰嗎？市場干預如何影響德國的電力供應安全 (Can We Phase-Out All of Them? How Market Interventions Impact Security of Electricity Supply in Germany)

###### 1. 概要

在福島第一核能電廠災難後，德國政府決定逐步淘汰核能電廠，直到 2023 年（德國政府，2011 年）。相反的，核能電廠容量的減少部分被燃煤電廠的擴大所替代（Morris and Peht, 2016）。但是，這種情況對德國的碳足跡產生了負面影響。儘管如此，為了實現自己設定的氣候目標，目前將實施另一項政策驅動的燃煤電廠淘汰。所謂的“成長、結構變化和就業委員會”提出了燃煤電廠退役的一般條款（德國政府，2018 年），預計將減少可銷售的燃煤電廠，到 2022 年將減到約 15 GW 褐煤（2018 年底為約 20 GW）和約 15 GW 硬煤（2018 年底為約 23 GW）。有關未來幾年中可控電廠的相應退役路徑，請參見圖 1。該委員會計劃進一步降低容量直到 2030 年，並且最遲將在 2038 年終止德國的燃煤發電。

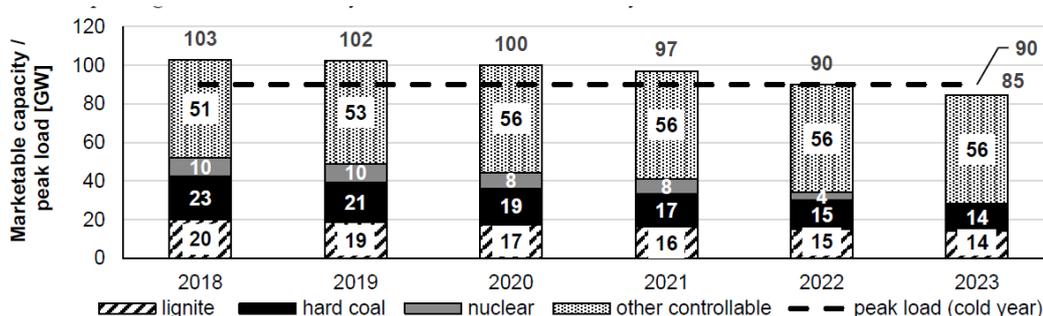


圖 1：德國可控電廠的可銷售容量和高峰負荷

除了補貼間歇性可再生能源外，在這些正在進行的市場干預的背景下，電力供應安全的話題在當前的辯論中日益興起。有人擔心，由政策驅動和非競爭性地淘汰核電廠和燃煤電廠，可能導

致需求超過可用生產能力的情況。隨著這些發展，對可靠的科學方法和電力供應安全評估的需求不斷增長。

因此，本文的主要研究目標是調查電力市場中非競爭性干預措施的可能後果，如上所示：我們（1）評估其對供應安全的影響，以及（2）分析市場機制能夠透過刺激增加裝置容量的投資來消除負面影響到何種程度。對於我們的分析，我們定義了降低燃煤電廠容量的不同方案，這些方案反映了尚未進行的政治辯論的可能結果，尚未完全關閉的燃煤電廠比例和轉移到所謂的“能力儲備”以支持供應安全。對於每種減少情境，我們都會評估2020年，2022年和2023年對供電安全的影響(中期觀點)。

## 2. 研究方法

在這種情況下，我們開發了概率安全評估工具，作為亞琛工業大學傑里科能源系統模型的模組，用於供電安全。該模型結合了可再生饋電和電力需求以及常規電廠的動態（非）可用性兩者的隨機波動。為了反映天氣影響的隨機性，我們每小時對30個不同天氣年（1986-2015年）進行模擬。這使我們能夠針對未來的不同情況對電源的安全性進行科學合理的評估。

此外，我們進行了一項經濟分析，調查在裝置容量不足的時期內的稀缺價格是否能為燃氣電廠和儲能系統的投資創造足夠的市場激勵機制，以填補可能的裝置容量缺口。因此，我們分析了市場競爭是否會導致有效的市場結果。

## 3. 結果

根據我們的模型輸出，我們得出供應安全性的關鍵指標，例如所謂的負載概率損失（LoLP），負載期望損失（LoLE）和未服務預期能量（EEnS）。我們認為，這些指標是有關供電安全，逐

步淘汰化石電廠以及有關可再生能源在多大程度上能夠彌補這一差距問題的討論的重要基礎。

我們的第一個結果顯示，德國的歷史供電安全絕對水平在裝機容量大幅減少的中期未來情境中是站不住腳的。此外，我們的結果表明，當將承擔電力負荷的負擔轉移到間歇性可再生能源時，供電安全對天氣影響的依賴性日益增加。最後，我們的模型輸出顯示了其對可用的進口裝置容量變化的顯著敏感性。因此，德國的供電安全水平逐漸取決於鄰國的政策決定。

關於經濟分析，我們的結果表明，從福利的角度來看，歷史的供電安全絕對水平是無效的。因此，我們可以得出結論，電力供應的安全不僅應針對技術需求，而且應側重於經濟需求。

#### 4. 結論

我們評估政策驅動和非競爭性市場干預的可能後果。我們的發現基於概率的 JERICHO 能源系統模型，並暗示有計劃的封存活動難以維持歷史供電安全絕對水平。關於政策含義，我們得出以下結論：

- 很難預測複雜能源系統中市場干預的所有後果。

- 因此，政策制定者應考慮使用市場工具為主，例如二氧化碳證書或稅收來調節系統的可持續電力供應，而不是仔細研究計劃經濟方法。

- 此外，有必要激勵短期內在德國增加電廠和存儲容量的投資，以避免效率低下的頻繁的負載削減措施。

- 為了創造一個可靠的環境並確保潛在投資者的計劃安全，必須對可靠的政治計劃進行長期的定義。

-最後，我們的結果要求加強國家能源政策的國際協調，因為一個國家的供電安全水平可能會受到鄰國政策決定的嚴重影響。

## 五、 能源政策議題

### (一) 能源 v.s. 2030 年歐盟電力市場聚焦於裝置容量的再生能源支持政策之經濟分析

(Economic analysis of energy vs. capacity focused renewable support policies for the 2030 EU Power Market)

#### 1. 概要

歐洲的政策制定者在執行可再生能源支持政策時考慮了幾個政策目標。其中包括以最低的成本實現雄心勃勃的可再生能源目標，並通過邊做邊學來促進技術進步。為了在短期內實現某個再生能源目標，基於能源產出精心設計的補貼機制被認為比以裝置容量為導向的政策更具成本效益 (Meus 等人 2018)。但是，如果邊做邊學是累積兆瓦投資的函數而不是累積兆瓦時的產出的函數，那麼與裝置容量安裝(而非能源產出)相關的政策可能會更有效地降低技術成本 (Andor 和 Voss, 2016 年; Huntington 等人, 2017; Newbery 等人, 2018)。

此研究使用歐洲基於市場的發電投資和調度的詳細模型，探討了基於能源與裝置容量的再生政策對成本和技術的影響。裝置容量與能源補貼的選擇可能會顯著影響再生能源投資的數量和結構，以及其成本。在本研究中，我們詢問在更現實的情況下，歐洲聯盟 (包括英國，挪威和瑞士) 將取得什麼樣的成果，其中考慮了整個歐洲的市場條件，輸電限制和可再生能源的發展機遇。特別是，我們比較了以能源為重點 (上網電價或可再生能源投資組合標準 (RPS)) 和以裝置容量為重點 (投資補貼) 的可再生能源政策對 2030 年使用歐盟範圍內輸電的歐盟電力市場的影響約束電力市場均衡模型。我們還考慮了 Newbery

等人提出的以裝置容量為中心的政策的更複雜的變數（2018），它將支付每兆瓦時的補貼，但最多只能達到每兆瓦容量的最大兆瓦時數。我們關注的具體問題如下：不同政策如何影響可再生能源和不可再生能源發電投資、電力成本、可再生能源產量、補貼金額和消費者價格在 2030 年的組合？具體而言，基於裝置容量的政策是否會導致大量投資和可能的學習？我們還將研究能源和容量政策與有關跨國界可再生能源信貸交易的政策之間的相互作用。特別是，我們會評估國家政策目標對可再生能源發電量或裝置容量（整體或每種技術）的效率，並在資源質量、網絡約束和能源效率不高的情況下，將其與歐盟範圍內具有成本效益的可再生能源投資分配進行比較。歐盟各個國家/地區的電力系統結構。

## 2. 研究方法

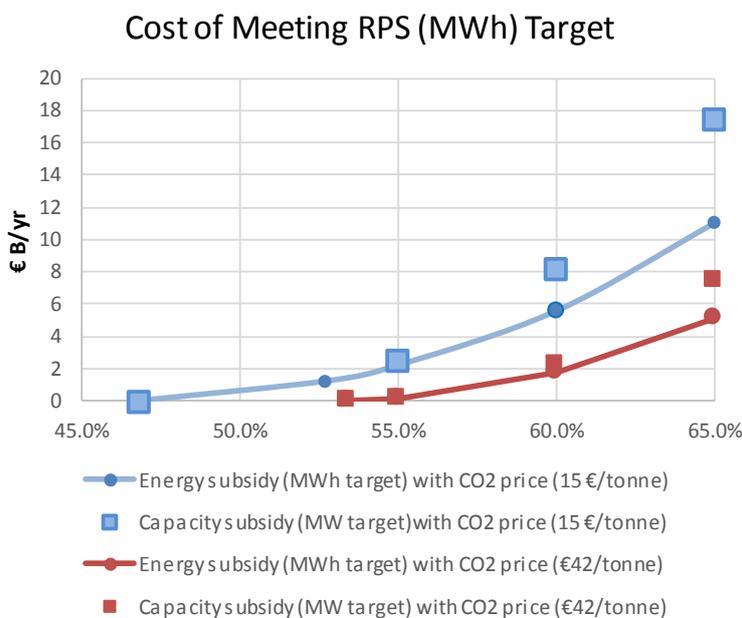
我們使用電力市場模型來確定透過出售能源將獲得哪些可再生投資，以及由此產生的淨成本，然後必須從補貼中收回這些成本。這些淨成本必須考慮不同時間和地點的電價，而電價又取決於整個網絡中供需的同時相互作用；僅關注可再生資源資本和運營成本的分析方法將錯過這些關鍵的相互作用。

計算得出的能源價格和可再生能源補貼是對於能源以及可再生容量或能源的供需結果，為了實用起見，我們使用 1200 小時的樣本（從 Gorm 等人的 2015 年的八年數據中採樣）來捕獲一年內的負荷和可再生能源輸出的可變性，並計算 2030 年的靜態（單年）平衡，而不是多年的時間範圍。

## 3. 結果

圖 1 比較了無可再生能源政策的基準情景下，實現替代能源

水平和裝置容量目標的歐盟範圍可再生能源支持政策的增量成本。我們認為，可再生能源政策總體上假設了一個歐盟範圍內的目標，而沒有特定國家/地區的強制性規定，此外，我們假設所有可再生能源均享有相同水平的補貼。



儘管以裝置容量為中心的政策會為雄心勃勃的 MWh 目標帶來相似的成本，但隨著目標變得更加雄心勃勃，它們變得相對昂貴。使用 MWh 電價差額補貼制度(Feed-in premium, FiP)而不是按裝置容量付費，相對起來較為便宜，因為為直接達到所需目標的產品 (MWh 而不是 MW) 付款是實現該目標的最佳方法。如果目標是通過裝置容量促進技術改進，那麼我們會觀察到相反的效果。以裝置容量為中心的政策是達到可再生能源一定容量水平的經濟有效 (最佳) 方式，而透過能源補貼實現相同水平的可再生能源成本更高。

此外，較高的碳價可以促進可再生能源的普及 (總能源中的 53% 比 47%)，而無需額外的補貼。其次，由於選擇一種類型的策略來實現另一種類型的目標而導致的效率低下已被消除。

圖 1 (左) 顯示，透過使用容量競標來實現 65% 的能源目標所帶來的成本增加下降了一半以上，從大約 70 億歐元/年 (CO<sub>2</sub> 價格為 15 歐元/噸) 降至不到 30 億歐元/年 (CO<sub>2</sub> 價格為 €42/t) (圖中最右邊的點)。同時，圖 1 (右) 顯示，使用基於 RPS 能源的政策來實現 377 GW 可再生能源投資的容量目標，與在較低碳價下使用容量政策相比，每年將多花費約 30 億歐元。在較高的碳價下，每年只需要多花費約 15 億歐元。因此，我們得出的結論是，透過使用一種策略來實現另一種宏偉目標而導致的每年約 10 億歐元的效率低下仍然成立，但影響的程度較小。

#### 4. 結論

我們的研究結果表明，能源效率與以裝置容量為中心的可再生能源政策取決於歐盟的可再生能源目標。如果目標是達到可再生能源在總消費量中的一定份額，那麼使用能源補貼來實現給定的可再生份額目標要比使用基於裝置容量的機制更為有效。如果目標是透過容量安裝促進技術改進，那麼使用容量補貼機制來實現給定的容量安裝目標可能會比使用基於可再生能源補貼的方法便宜得多。此外，沒有可再生能源信用交易的國家，其再生能源特定目標大大增加了再生能源政策的成本。我們的分析表明，歐洲內部有很大的協調和改進可再生能源政策的空間，這將有助於降低實現可再生能源生產的總成本。

## 六、電價制定議題

### (一) 是時候該追上浮動電價訂定的腳步了

#### (Time to Pick up Pace of Dynamic Electricity Pricing)

##### 1. 概要

隨著應對氣候變化的對抗日益激烈，來自風能和太陽能等可再生能源的間歇性發電正逐漸取代可按需求調度的化石燃料發電。一直以來，由於電暖氣和車輛使用的增加，我們預計電力需求將增長。在這種背景下，我們迫切需要提高對電力需求的應變能力。間歇性發電的水平越高，意味著就越需要以更高成本來保留可調度的發電。這意味著在需求不足的幾個小時中，減少過剩的可再生能源發電也要付出一定的代價。

解決發電間歇性不斷提升這個問題的一種方法是向更廣泛的消費者提供動態的價格信號，以鼓勵他們在晴天或大風期間、遠離典型的系統高峰時間，或在周末企業和大型工業用戶休息時使用電力。為此，歐洲聯盟正在促進動態使用時間（time-of-use，TOU）費率，作為隱性需量反應的一種形式。歐盟的清潔能源計劃要求成員國確保每位最終客戶都有權從其供應商處獲得動態電價合約，允許他們根據實時價格信號調整用電量。借鑒學術文獻和在北美實施 TOU 費率的經驗，我們進行了一項全面的多國研究，以審查 TOU 費率在六個歐盟成員國中的廣泛實施程度，並評估是甚麼因素鼓勵（或阻止）其成功深入這六個歐盟成員國。

##### 2. 研究方法

TOU 費率已經存在了一段時間，但僅在少數幾個國家才開始廣泛實施，特別是針對住宅和小型商業用戶。我們對歐洲六個國

家（英國，德國，西班牙，挪威，瑞典和芬蘭）提供的電力零售電價進行了全面審查。透過對主要市場參與者、電力供應商和消費者協會進行調查，並透過分析公開的市場數據，我們評估了採用動態分時電價的程度，並評估了鼓勵和阻止其滲透的因素。我們還探討了供應商採用的策略，以提高需求對實時價格信號的反應能力。最後，我們從有關 TOU 定價的廣泛學術文獻、在安大略省實施 TOU 定價的長期經驗以及最近將 TOU 定價作為加利福尼亞州大多數住宅客戶的默認選擇中汲取了經驗。

### 3. 結果

除西班牙外，在抽樣的歐洲國家中，居民消費者對動態 TOU 費率的採用率很低。動態使用分時電價的採用率較低，主要是由於人們普遍對管理用電缺乏興趣、轉換用電方式能節省的幅度不大，以及智慧電錶的普及程度有限。

西班牙對 TOU 費率的普及率很高，這在很大程度上是因為監管部門決定將其設置為默認選項：消費者可以放棄使用而不是使用。這與其他地區（例如安大略省和加利福尼亞州）的經驗相吻合。這也與行為經濟學中的解釋一致，即面對複雜決策設置的消費者傾向於保留在為他們選擇的默認選項中。

家用技術的創新可以提供一種替代監控的方法，並使動態的 TOU 資費對消費者更具吸引力。尤其是，智能設備可以使用戶獲得更多的潛在節省空間，並且透過使流程自動化，可以使消費者免於手動監控並即時反應價格變化的麻煩。

### 4. 結論

動態 TOU 具有改善需求的價格反應能力的潛力，但起步緩慢。

西班牙是個例外，西班牙 40%的消費者現在都採用動態定價，因為監管機構將其設為默認的受監管資費選項。改善需量反應能力的另一種可能的途徑是透過創新。不久之後，使智能家用電器能夠反應即時能源價格信號的技術將變得越來越普遍。

## 肆、參訪 Brežice 水力發電廠

Brežice 水力發電廠(Hydro Power Plant Brežice, HPP Brežice) 47.4 MW HPP Brežice 是下薩瓦河下游六座水力發電廠中的第五座。它是一種川流式和水庫型水力發電廠，擁有三台垂直發電機組，額定總排放量為 500 m<sup>3</sup>/s，五個溢洪道，年平均發電量為 161 GWh。

HPP Brežice 約佔斯洛維尼亞目前年發電量的百分之一，並提供了實施輔助服務的可能性。該電廠以及下薩瓦河下游其他的五座水力發電廠目前由在 HPP Brežice 當地值班的 HESS 操作員統一執行運轉操控作業。

### 關於 HESS

Hidroelektrarne na Spodnji Savi, d.o.o (簡稱 HESS) 成立於 2008 年，是一家斯洛維尼亞水力發電有限責任公司，擁有 44 名員工。其核心任務是促進和改良新的水力發電廠的建設，並致力於持續、可靠、具有競爭力和環境友善的發電。

該公司的運營和水力發電廠的建設在很大程度上受《利用下薩瓦河能源潛力的特許協議》和《關於利用下薩瓦河能源潛力的特許條件的法律》(ZPKEPS-1) 約束。

透過在薩瓦河下游建造的 HPP 各項目，HESS 公司目前是斯洛維尼亞和其周邊地區最大的可再生能源開發商之一。此外，該項目還將有助於利用可再生能源發電，從而使斯洛維尼亞共和國能夠履行對歐盟在可再生能源方面的承諾。

除了進行投資外，HESS 還為已經完工的水力發電廠（HPP Boštanj、HPP Arto-Blanca 和 HPP Krško）部署了運行和維護系統，以優化水力發電廠的運行，同時提供最大的安全性和可靠度。

電廠導覽的部分從介紹 Brežice 電廠的模型開始。我們的導覽也正是 HESS 派駐於該電廠的操作員，他為我們解釋電廠的運行及其建造過程。這次導覽在 HPP Brežice 指揮室進行，斯洛維尼亞 Sava 河下游的所有發電廠的運行操作都在此進行。而該電廠為了環境友善及敦親睦鄰，我們在電廠的外面也看到了來散步的民眾和水生生物通道（魚道）。



Brežice 水力發電廠全景



Brežice 水力發電廠內部發電機組



導覽員以機組模型來說明該電廠之發電機制



導覽員以圖片解說電廠的興建過程



導覽員以圖片解說電廠的操控機制



為維護生態、友善環境，於電廠旁建設的魚道

## 伍、心得與建議

本次參加 IAEE 歐洲年會的地點不同於往年，是在東南歐一個較鮮為人知的國度斯洛維尼亞，並在斯洛維尼亞大學的經濟學院裡面舉行，設備與環境都相當樸實，讓我們有一種重返校園當起校園新鮮人的感受。此行讓我們對於目前國際最新能源經濟趨勢、國家政策走向及科技發展，像是氣候變遷、交通運輸、再生能源、能源效率、電業市場等方面，都有更廣泛的瞭解，未來將視需要提供給公司做決策上的參考依據。

此外，本次會議能有機會與全球的學者專家互動交流，交換彼此不同國家的能源經驗與想法，真的是很難得的經驗，不僅能拓展自己的國際觀，也可將這些資訊內化為核心能力，期許未來能夠將之應用於工作上，更不禁想到，如果能有更多的公司同仁有機會參加這樣的會議，對公司或許有不小的幫助。因此，建議公司可利用本公司總管理處的地利之便，將來亦可與台大相關系所合作，在台大校區舉辦類似的能源經濟或電業新知交流研討會議，屆時亦可鼓勵公司同仁就近多多參與。

再者，這次會議中可看到很多來自各國年輕有為的學生發表論文，可見各國都積極培育新一代的能源經濟人才，因此建議公司應積極針對具潛力的年輕同仁給予參與國際研討會的機會，以提升其能源經濟相關領域之能力，並增加其發表論文與演講的能力，以培養公司能源經濟相關之專業人才。

最後，本次參訪的 Brežice 水力發電廠，可說是麻雀雖小五臟俱全，規模雖然不大，但可看出他們在環境保育及敦親睦鄰

方面的努力，而該河域上所有發電廠都在 Brežice 水力發電廠進行操控，可見他們對人力運用上的精簡也不遺餘力。

# 附件 1：大會議程手冊摘錄 (Conference Program)



16th IAE  
European Conference  
Ljubljana, Slovenia  
25–28 August 2019



IAEE INTERNATIONAL ASSOCIATION OF ENERGY MANAGERS



SEB



SAEE



School of Economics and Business, University of Ljubljana (SEB LU)

## Energy Challenges for the Next Decade





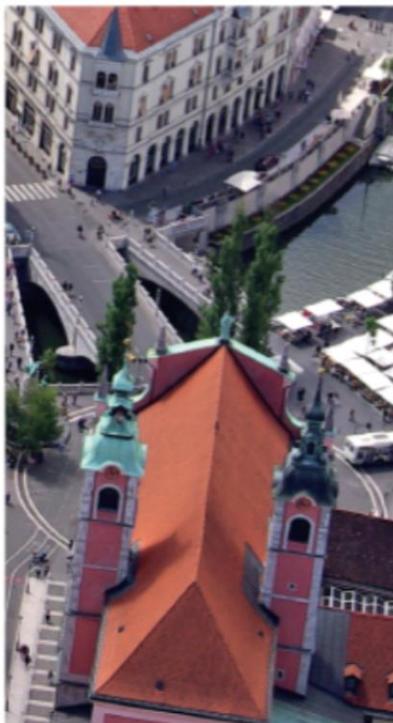
# WELCOME TO LJUBLJANA

Energy markets are becoming increasingly complex. Over the past decades, we have witnessed tremendous changes in the industry's fundamentals induced by policy and technological advancements, which required redesigning of markets. Climate policies aimed at decarbonisation extensively contributed to the changed energy mix. Recent shifts in geopolitical relations with the EU partners additionally add to the industry's complexity and uncertainty. The EU energy policy in the next decade continues to be directed towards achieving competitive, secure and sustainable energy system, which calls for huge investments in infrastructure and low-carbon technologies with increased private sector and consumer engagement.

The central topic of this conference is to assess the impacts and identify the main challenges of these disruptive changes for all energy sectors through the entire value chain in order to design a sustainable energy policy for the following decade. The main question to be addressed is: Have we learned from the past experiences and mistakes how to design effective policies involving all stakeholders – consumers, companies, governments and society?

We welcome 300 participants from 40 countries to be a part of this debate. We hope you will enjoy the conference and the vibrant city of Ljubljana, the Green Capital of Europe in 2016 and the seat of ACER.

Nevenka Hrovatin  
General Conference Chair



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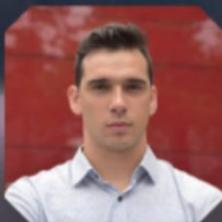
Associate Professor,  
School of Economics  
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Conference

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School of Economics  
and Business, University  
of Ljubljana



PhD Day

**Janez Dolšak**

Doctoral student, School  
of Economics and  
Business, University of  
Ljubljana; SAE



PhD Day

**Ivana Jovović**

Doctoral student, School  
of Economics and  
Business, University of  
Ljubljana; SAE

# Welcome to Ljubljana and enjoy the conference

5 ■



**Your IAEE 2019 Ljubljana Conference Team**

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**Jelena Zorić**

School of Economics and Business, University of Ljubljana

# PLENARY SESSIONS

Monday, 26th of August

## OFFICIAL OPENING WELCOME AND INTRODUCTION:

Welcome Address and  
Opening Statements

9:00 a.m. – 9:30 a.m.  
Large Hall

**Nevenka Hrovatin**, General Conference Chair, School of Economics and Business, University of Ljubljana (SEB LU)

**Marjan Eberlinc**, President of the Energy Industry Chamber of Slovenia, CEO of Plinovodi d.o.o.

**Metka Tekavčič**, Dean of School of Economics and Business, University of Ljubljana (SEB LU)

**Alenka Bratušek**, Minister of Infrastructure, Republic of Slovenia

**Christophe Bonnery**, IAAE President, 2019

## OPENING PLENARY SESSION:

Energy Challenges and  
Opportunities

9:30 a.m. – 11:00 a.m.  
Large Hall

**Chair: Christophe Bonnery**, IAAE President, 2019

• **ENERGY TRANSITION - THREE DS: DECARBONISATION, DECENTRALISATION AND DIGITALIZATION** - Laurent Schmitt, ENTSO-E

• **EUROPEAN ENERGY STATE-OF-THE-ART: AN OUTSIDE VIEW** - Edward C. Chow, CSIS

• **CLEAN ENERGY PACKAGE AND THE FUTURE CHALLENGES FOR THE ENERGY SECTOR** - Alberto Pototschnig, ACER

## DUAL PLENARY SESSION 1 AND 2:

1 Prospects for Future  
Electricity Markets

2 Prospects for Future Natural  
Gas and Oil Markets

11:30 a.m. – 1:00 p.m.  
1 - Large Hall, 2 - Small Hall

**Chair: Hans Auer**, Vienna University of Technology

• **A TALE OF TWO MARKETS: CONTRACTS FOR RENEWABLE AND CONVENTIONAL GENERATORS** - Richard Green, Imperial College Business School

• **HEADING TOWARDS SUSTAINABLE AND DEMOCRATIC ELECTRICITY MARKETS** - Reinhard Haas, Vienna University of Technology

• **SECTOR COUPLING, FLEXIBILITY, AND OUTLOOK ON THE 2ND PHASE OF ENERGY TRANSITION - EXPERIENCES FROM THE WINDNODE PROJECT** - Markus Graebig, WindNODE consortium

**Chair: Kostas Andriopoulos**, ESCP Europe Business School

• **GAS MARKETS AND INFRASTRUCTURE** - Karolina Čegir, Energy Community Secretariat

• **THE GROWING ROLE OF LNG IN EUROPE** - Lucie Roux, ESCP Europe Business School Alumna

• **GEOPOLITICS IN THE EUROPEAN GAS** - Tatiana Mitrova, SKOLKOVO Business School

## Tuesday, 27th of August

### DUAL PLENARY SESSION 3 AND 4:

**3** Energy in the Digital World:  
The Shifting Fundamentals of  
the Energy Business

**4** Challenges in the Final Energy  
Use: Innovation, Technology,  
Efficiency, Conservation

9:00 a.m. – 10:30 a.m.  
3 - Large Hall, 4 - Small Hall

### DUAL PLENARY SESSION 5 AND 6:

**5** Energy and Climate:  
International Governance of  
Energy Transition

**6** Future Role of Consumers,  
Prosumers and Prosumagers

2:00 p.m. – 3:30 p.m.  
5 - Large Hall, 6 - Small Hall

Chair: Christian von Hirschhausen, Berlin University of Technology

- *MAKING THE ENERGY TRANSITION HAPPEN - SMART TECHNOLOGIES AND NEW BUSINESS MODELS* - Galper Artač, Petrol
- *DIGITALIZATION IN THE ENERGY WORLD: THE ROLE OF BIG DATA, ARTIFICIAL INTELLIGENCE, BLOCKCHAIN AND CYBER SECURITY* - Christoph Burger, ESMT Berlin
- *COMPETITIVENESS OF DIFFERENT RENEWABLE ENERGY COMMUNITY CONCEPTS IN A SMART ENERGY FUTURE* - Hans Auer, Vienna University of Technology

Chair: Reinhard Haas, Vienna University of Technology

- *ELECTRIFICATION IN TRANSPORT: ECONOMICS AND ENVIRONMENTAL ASPECTS* - Amela Ajanović, Vienna University of Technology
- *MARKETS FOR NEW ENERGY STORAGE TECHNOLOGIES* - Georg Erdmann, Berlin University of Technology
- *ENERGY EFFICIENCY POLICY IN (CENTRAL) EUROPE - TARGETS, INSTRUMENTS, AND INVESTMENT* - Michaela Valentová, Czech Technical University in Prague

Chair: Andreas Lösche, University of Münster

- *WHAT DOES THE PARIS AGREEMENT IMPLY FOR THE GOVERNANCE OF LONG TERM LOW EMISSIONS DEVELOPMENT STRATEGIES?* - Frank Jotzo, Australian National University's Crawford School of Public Policy
- *CURRENT DISCUSSIONS ON ENERGY AND CLIMATE TARGETS* - Georg Zachmann, Bruegel
- *WHAT IS THE INVESTMENT FRAMEWORK NEEDED TO PERFORM THE ENERGY TRANSITION?* - Maria Sicilia, ENAGAS

Chair: Jelena Zorić, School of Economics and Business, University of Ljubljana (SEB LU)

- *UNDERSTANDING CONSUMER BEHAVIOUR: ENERGY EFFICIENCY GAP, BOUNDED RATIONALITY AND THE ROLE OF ENERGY RELATED FINANCIAL LITERATURE* - Massimo Filippini, ETH Zurich, Università della Svizzera Italiana
- *ENERGY PROSUMAGE, ENERGY POVERTY, AND ENERGY JUSTICE* - Reinhard Madiener, RWTH Aachen University
- *HOW SHOULD BUSINESS MODELS CHANGE IN CONSUMER DRIVEN ENERGY MARKETS?* - Dejan Paravan, GEN-I

# PLENARY SESSIONS

Wednesday, 28th of August

## CLOSING PLENARY SESSION:

Europe's Energy Sector in the  
Global Energy Industry: State-  
Of-Affairs and the Future

3:30 p.m. - 5:00 p.m.  
Large Hall

Chair: Yukari Niwa Yamashita, IAEA President-elect 2019

- *ENERGY SCENARIOS, PROJECTIONS AND MODELLING (ACADEMIC APPROACH)* - Pantelis Capros, National Technical University of Athens
- *WHAT NEXT FOR EUROPEAN ENERGY POLICY? SUGGESTIONS FOR THE NEW EUROPEAN COMMISSION* - Michael Pollitt, Cambridge Judge Business School, University of Cambridge
- *SOUTH EAST EUROPEAN ENERGY CHALLENGES AND OPPORTUNITIES* - Atanas Georgiev, Sofia University St. Kliment Ohridski



Photo: Ebel, Author: Jost Gantler

# Concurrent Sessions Overview

Concurrent Sessions/Room	P-019	P-021	P-217	P-128	P-016	P-127	P-126
Concurrent Sessions 1A to 1G, Monday 26.8.2019, 2:30 pm to 4:00 pm	1A Energy Markets I: CO2 Emissions	1B Energy Modelling I	1C Climate I	1D Energy Efficiency I	1E Renewables I: Wind	1F Natural Gas	1G Best Student Paper Award
Concurrent Sessions 2A to 2G, Monday 26.8.2019, 4:30 pm to 6:00 pm	2A Electricity I: Capacities	2B Flexibility & Storage I: Demand Response	2C Energy Policy I: Renewable Support Policies	2D Household Behaviour I	2E Country Studies I	2F Oil	2G Transportation I: Low Carbon Future
Concurrent Sessions 3A to 3G, Tuesday 27.08.2019, 11:00 am to 12:30 pm	3A Energy Markets II: Market Integration	3B Flexibility & Storage II	3C Energy Policy II: Carbon Markets	3D Household Behaviour II	3E Renewables II: Solar	3F Nuclear Power	3G Transportation II: Electric Vehicles
Concurrent Sessions 4A to 4G, Tuesday 27.08.2019, 04:00 pm to 05:30 pm	4A Energy Markets III: Energy & Capacity Markets	4B Energy Modelling II	4C Climate II	4D Energy Efficiency II	4E Country Studies II	4F Coal and Nuclear Phase-Out	4G Special Session: Revealing Trajectories Towards a Sustainable Energy Future
Concurrent Sessions 5A to 5G, Wednesday 28.08.2019, 9:00 am to 10:30 am	5A Electricity II	5B Energy Modelling III	5C Energy Policy III: Carbon Tax & Decarbonization	5D Household Behaviour III	5E Renewables III: Spatial Capacity Allocation	5F Energy Investment & Finance I	5G Energy Markets, Innovation & New Technologies
Concurrent Sessions 6A to 6G, Wednesday 28.08.2019, 11:00 am to 12:30 pm	6A Energy Markets IV	6B Flexibility & Storage III	6C Energy Access & Energy Poverty	6D Household Behaviour IV	6E Renewables IV	6F Energy Investment & Finance II	6G Transportation III: Policies & Household Choices
Concurrent Sessions 7A to 7G, Wednesday 28.08.2019, 01:30 pm to 03:00 pm	7A Energy Markets V: Market Design & Trading Arrangements	7B Energy Modelling IV	7C Energy Policy IV: Low Carbon Policies	7D Firm Performance	7E The Role of Energy Communities	7F Energy & the Economy	7G Transportation IV: E-mobility

# CONCURRENT SESSIONS

## Monday, 26th of August

**1A - 1G**  
2:30 pm to 4:00 pm

### Session 1A: Energy Markets I - CO2 Emissions (P-019)

Chair: Einar Hope  
(Norwegian School of Economics)

#### *The Impact of a Carbon Tax on Cross Border Energy Trading Abstract*

Authors: Bowei Guo (University of Cambridge), David Newbery, Giorgio Castagneto Gissey  
Presenter: Bowei Guo (University of Cambridge)

#### *Scenarios for Decarbonizing an Integrated European Energy System - First Results From a Top-down-bottom-up Modelling Approach*

Authors: Leonard Göke (TU Berlin, Workgroup for Infrastructure Policy), Claudia Kemfert, Konstantin Löffler, Pao-Yu Oel, Christian von Hirschhausen  
Presenter: Leonard Göke (TU Berlin, Workgroup for Infrastructure Policy)

#### *Equilibrium Forward Premium and Optimal Hedging in Electricity Markets With Green and Brown Producers*

Authors: Shanshan Yuan (Carlos III University in Madrid), Juan Ignacio Peña  
Presenter: Shanshan Yuan (Carlos III University in Madrid)

#### *Pass-through of CO2 Emission Costs to the Italian Electricity Price in the Third Phase of EU-ETS: A VECM Analysis*

Authors: Fulvio Fontini (University of Padova), Massimiliano Caporin, Samuele Segato  
Presenter: Fulvio Fontini (University of Padova)

### Session 1B: Energy Modelling I (P-021)

Chair: Lisa Ryan (UCD)

#### *Reliability Based Design Approach to Stochastic Supply Planning Including Renewable Energy Sources*

Authors: Matthias Ondra (Vienna University of Technology)  
Presenter: Matthias Ondra (Vienna University of Technology)

#### *Application of Benders Decomposition to CVaR-constrained Unit Commitment Decisions in Large Energy System Models Considering Feed-in Uncertainties*

Authors: Moritz Nobis (RWTH Aachen University), Alexander Lindner, Carlo Schmitt  
Presenter: Moritz Nobis (RWTH Aachen University)

#### *Model-based Analysis of the Contribution of the Gas Supply System to the Integration of Fluctuating Renewable Electricity Generation*

Authors: Hedda Gardian (German Aerospace Center (DLR)), Hans Christian Gils  
Presenter: Hedda Gardian (German Aerospace Center (DLR))

#### *The Pricing of Univariate European Crack Spread Option with Jumps*

Authors: Lenny Suardi (UNSW), David Colwell  
Presenter: Lenny Suardi (UNSW)

### Session 1C: Climate I (P-217)

Chair: Eirik Schroeder Amundsen  
(University of Bergen)

#### *Navigating Various Flexibility Mechanisms Under European Burden-sharing*

Authors: Marc Velle (EPFL - LEURE)  
Presenter: Marc Velle (EPFL - LEURE)

#### *Fossil Fuel Subsidies and the Paris Agreement*

Authors: Sebastian Rausch (ETH Zurich), Jan Schneider  
Presenter: Jan Schneider (ETH Zurich)

#### *Analysing Transfer Flows of the Swiss Emission Trading Registry: What Can We Learn About the Carbon Market Under the Kyoto Protocol?*

Authors: Regina Betz (Center for Energy and the Environment, ZHAW)  
Presenter: Regina Betz (Center for Energy and the Environment, ZHAW)

#### *Climate Change - a Challenge for the Grid? - Results from an Economic Model for Germany*

Authors: Ulrike Lehr (Institute for Economic Structures research (GWS)), Markus Flaute, Lara Ahmann  
Presenter: Ulrike Lehr (Institute for Economic Structures research (GWS))

### Session 1D: Energy Efficiency I (P-128)

Chair: Joachim Schleich  
(Grenoble Ecole de Management)

#### *Quantifying and Comparing Economy-wide Rebound Effects in Europe*

Authors: Anne Berner (University of Göttingen), Stephan Bruns, Alessio Moneta, David Stern  
Presenter: Anne Berner (University of Göttingen)

#### *Energy Subsidies, Energy Intensity and Management Practices*

Authors: Helena Schweiger (EBRD), Alexander Stepanov  
Presenter: Alexander Stepanov (European Bank for Reconstruction and Development)

#### *Long-term and Step-by-step Deep Renovation Approach: Including Building Owners' Ability to Invest in a Retrofitting Optimisation Model*

Authors: Iná Mala (TU Wien), Andreas Möller, Lukas Kranzi  
Presenter: Iná Mala (TU Wien)

#### *Endogenous Energy Efficiency Improvement of Large-Scale Refurbishment in the Swiss Residential Building Stock*

Authors: Sergey Arzoyan (EPFL), Marc VIELLE, Quirin Oberpiller, Michel Zimmermann  
Presenter: Sergey Arzoyan (EPFL)

### Session 1E: Renewables I - Wind (P-216)

Chair: Jaroslav Knápek  
(Czech Technical University in Prague, Faculty of Electrical Engineering)

#### *Benefits of Spatial Integration: Optimal Allocation of Wind Capacity in Europe According To Modern Portfolio Theory*

Authors: Javier López Prol (Wegener Center for Climate and Global Change, University of Graz), Fernando De Llano Paz, Anxo Calvo Silveira, Sungmin O  
Presenter: Javier López Prol (Wegener Center for Climate and Global Change, University of Graz)

*The Effect of Offshore Wind Capacity Expansion on Uncertainties in Germany's Day-Ahead Wind Energy Forecasts*

Authors: David Schönheit (TU Dresden, Lehrstuhl für Energiewirtschaft), Dominik Most  
 Presenter: David Schönheit (TU Dresden, Lehrstuhl für Energiewirtschaft)

*Managing Spatial Sustainability Trade-offs: The Case of Wind Power*

Authors: Paul Lehmann (University of Leipzig/UFZ), Erik Gawel, Charlotte Geiger, Jennifer Hauck, Jan-Niklas Meier, Philip Tafarte, Daniela Thrän, Elisabeth Wolfram  
 Presenter: Paul Lehmann (University of Leipzig/UFZ)

*The Dynamics of Renewable Energy Investment Risk: a Comparative Assessment of Solar PV and Onshore Wind Investments in Germany, Italy, and the UK*  
 Authors: Florian Egli (ETH Zürich)  
 Presenter: Florian Egli (ETH Zürich)

### Session 1F: Natural Gas (P-127)

Chair: **Atanas Georgiev** (Sofia University "St. Kliment Ohridski")

*Natural Gas Market Globalization Revisited*  
 Authors: Evangelos Kyritsis (VATT), Anne Neumann  
 Presenter: Evangelos Kyritsis (VATT)

*Oil and Gas Development on Private Land: Landowner Absenteeism and Willingness to Lease*  
 Authors: Claudia Hitaj (USDA Economic Research Service), Daniel Bigelow, Rebecca Hernandez  
 Presenter: Claudia Hitaj (USDA Economic Research Service)

*Natural Gas Involvement in China's Energy Transition*  
 Authors: Silvana Mima (CNRS), Olga Garanina  
 Presenter: Olga Garanina (Graduate School of Management, St Petersburg University)

*The Strategy Analysis of Liquefied Natural Gas Security in Taiwan*  
 Authors: Kuei-Lan Chou (Industrial Technology Research Institute)  
 Presenter: Kuei-Lan Chou (Industrial Technology Research Institute)

### Session 1G: Best Student Paper Award (P-126)

Chair: **Massimo Filippini** (ETH Zürich & Università della Svizzera Italiana)

*Germany's Market Transparency Unit for Fuels: Fostering Collusion or Competition?*  
 Authors: Marco Horvath (RWI - Leibniz Institute for Economic Research)  
 Presenter: Marco Horvath (RWI - Leibniz Institute for Economic Research)

*Economically, Do Environmentally Regulated Firms Perform Worse? Evidence from the German Manufacturing Sector*

Authors: Maja Zarkovic (University of Basel)  
 Presenter: Maja Zarkovic (University of Basel)

*Electric Vehicles and Consumer Choices*

Authors: Filip Mandys (University of Surrey)  
 Presenter: Filip Mandys (University of Surrey)

*Model Based Dispatch Optimisation for Residential Districts - Analysing the Integration of Electricity Storage Systems and Their Environmental Impact*

Authors: Steffen Lewerenz (Pforzheim University)  
 Presenter: Steffen Lewerenz (Pforzheim University)

## 2A - 2G 4:30 pm to 6:00 pm

### Session 2A: Electricity I - Capacities (P-019)

Chair: **Jean-Michel Glachant** (Florence School of Regulation)

*Evaluation of the Need for Capacity Remuneration Mechanisms: Impact of Design Parameters and Key Assumptions*  
 Authors: Kris Ponceliet (KU Leuven), Steffen Kaminski, Erik Delarue  
 Presenter: Steffen Kaminski (KU Leuven)

*The Future of Capacity Remuneration Mechanisms in the EU*  
 Authors: Giuseppe Franco Ferrari (studio legale), Inigo del Guayo  
 Presenter: Inigo del Guayo (University of Almeria)

*Strategic Reserve for Switzerland: Is it Needed and (how) Would it Work?*  
 Authors: Moritz Schillinger (University of Basel), Jonas Savelsberg, Hannes Weigt, Ingmar Schleicht  
 Presenter: Moritz Schillinger (University of Basel)

*Relevance and Potential for Industrial On-site Electricity Generation on a European Scale*

Authors: Patrick Dossow (Forschungsgesellschaft für Energiewirtschaft mbH (FfE)), Serafin von Roon, Timo Kern, Andrej Guminski  
 Presenter: Patrick Dossow (Forschungsgesellschaft für Energiewirtschaft mbH (FfE))

### Session 2B: Flexibility & Storage I - Demand Response (P-021)

Chair: **Fulvio Fontini** (University of Padova)

*Adjusting or Shifting? - The Economic Differences Between Demand Response and Energy Storages in a Long-run Equilibrium Model*

Authors: Amelie Sitzmann (Energiewirtschaftliches Institut an der Universität zu Köln gGmbH), Martin Hintermayer  
 Presenter: Amelie Sitzmann (Energiewirtschaftliches Institut an der Universität zu Köln gGmbH)

*Simulation-supported Quantification of Demand Response Actions Applied in a Block of Residential Buildings*  
 Authors: Xiubei Ge (EIFER - European Institute for Energy Research), Enrique Kremers, Malcolm Yadack  
 Presenter: Xiubei Ge (EIFER - European Institute for Energy Research)

*Swarm Demand Response: Virtual Storage by Small Consumers*  
 Authors: Joachim Geske (Imperial College London)  
 Presenter: Joachim Geske (Imperial College London)

*Disruption and Collaboration: the Growth Strategies for Demand Response Business Models in Finland*  
 Authors: Hanna-Liisa Kangas (Finnish Environment Institute SYKE), Salvatore Ruggiero, Tiina Ohrling, Salla Annaia  
 Presenter: Hanna-Liisa Kangas (Finnish Environment Institute SYKE)

### Session 2C: Energy Policy I - Renewable Support Policies (P-217)

Chair: **Ivan Diaz-Rainey** (University of Otago)

*Economic Analysis of Energy vs. Capacity Focused Renewable Support Policies for the 2030 EU Power Market*  
 Authors: Ozge Ozdemir (PBL Netherlands Environmental Assessment Agency), Benjamin F. Hobbs, Marit van Hout, Paul Koutstaal  
 Presenter: Ozge Ozdemir (PBL Netherlands Environmental Assessment Agency)

*How not to Design Renewable Energy Auctions: Endogenous Rationing*  
 Authors: Ann-Katrin Hanke (Karlsruhe Institute of Technology), Karl-Martin Ehrhart  
 Presenter: Ann-Katrin Hanke (Karlsruhe Institute of Technology)

*Comparing Second-best Strategies to Manage a Spatially Heterogeneous and Interacting Externality of RES Development*  
 Authors: Charlotte Geiger (Leipzig University), Paul Lehmann  
 Presenter: Charlotte Geiger (Leipzig University)

# CONCURRENT SESSIONS

Monday, 26th of August

*The End of the Beginning: Evolution of the French Large-Scale Renewable Electricity Supply Support Scheme*

Authors: Arash Farnoosh (IFPEN (IFP School))  
Presenter: Arash Farnoosh (IFPEN (IFP School))

## Session 2D: Household Behaviour I (P-128)

Chair: **Souvik Datta** (Fachhochschule Nordwestschweiz)

*Home Energy Audits: What Can We Learn from a Field Experiment?*

Authors: Nina Boogen (ETH Zurich), Claudio Damiano, Massimo Filippini, Adrian Obrist  
Presenter: Nina Boogen (ETH Zurich)

*Behavioral Anomalies and Energy-related Individual Choices: the Role of Status-quo Bias*

Authors: Julia Blasch (Vrije Universiteit Amsterdam), Claudio Damiano  
Presenter: Julia Blasch (Vrije Universiteit Amsterdam)

*Household Preferences for Load Restrictions - Is there an Effect of Pro-Environmental Framing?*

Authors: Lars Persson (Umeå University), Thomas Broberg, Aemiro Daniel  
Presenter: Lars Persson (Umeå University)

*Developing a Consumer Model of Opportunity*

Authors: Cordella Frings (University of Cologne, Chair of Energy Economics), Broghan Heigson  
Presenter: Cordella Frings (University of Cologne, Chair of Energy Economics)

## Session 2E: Country Studies I (P-216)

Chair: **Georg Erdmann** (TU Berlin)

*Environmental Impacts of Germany's Future Energy System*

Authors: Christiane Reinert (RWTH Aachen University), Nils Baumgärtner, Sarah Deutz, André Bardow  
Presenter: Christiane Reinert (RWTH Aachen University)

*Meta-Analysis of Country-Specific Energy Scenario Studies for Neighbouring Countries of Germany*

Authors: Soner Candas (Technical University of Munich), Andrej Guminski, Claudia Fiedler, Christoph Pelling, Clara Luisa Orthofer  
Presenter: Soner Candas (Technical University of Munich)

*Phasing Out Nuclear-policies in Germany and Europe*

Authors: Hermann-Josef Wagner (Ruhr-Universität Bochum, LEE)  
Presenter: Hermann-Josef Wagner (Ruhr-Universität Bochum, LEE)

*Revisiting the Oil Price-Macroeconomy Relationship in the US: The Role of Model Specification and Sample Period*

Authors: Erkal Ersoy (Heriot-Watt University)  
Presenter: Erkal Ersoy (Heriot-Watt University)

## Session 2F: Oil (P-127)

Chair: **Kostas Andriopoulos** (ESCP Europe Business School)

*Low Oil Investments and Emergence of Climate Risk: the End is Now or Just Business Cycle as Usual?*

Authors: Sindre Lorentzen (University of Stavanger), Petter Osmundsen  
Presenter: Sindre Lorentzen (University of Stavanger)

*Oil and Gas Investments: Effect of Oil Price Fluctuations*

Authors: Bård Misund (University of Stavanger), Petter Osmundsen  
Presenter: Bård Misund (University of Stavanger)

*Dynamic Relationship Between CDS Premia Volatility and Oil Shocks*

Authors: Ibrahima Bah (University of Montpellier 1)  
Presenter: Ibrahima Bah (University of Montpellier 1)

*Oil Price Shocks and Cost of Debt - Evidence from U.S. Oil Firms*

Authors: Johannes Lips (Justus-Liebig University), Christoph Funk, Karol Kempa  
Presenter: Christoph Funk (Macquarie University)

## Session 2G: Transportation I - Low Carbon Future (P-126)

Chair: **Gurkan Kumbaroglu** (Bogazici University)

*A Low Carbon Future of Transport in Ireland: an Approach with an Integrated Transport Model Coupling with Computer General Equilibrium Model*

Authors: Shiyu Yan (Economics and Social Research Institute (ESRI) (Ireland)), Kelly de Bruin, Emer Denny  
Presenter: Shiyu Yan (Economics and Social Research Institute (ESRI) (Ireland))

*Estimating the Spatial Effects of CO2 Emission Control Policy in the Transportation Sector Among U.S. States*

Authors: DooHwan Won (Pusan National University), Jaewon Lim, Sandy Dall'erba  
Presenter: DooHwan Won (Pusan National University)

*The Role of Gas in Cost-Effective Green Transport Transitions - a Whole Energy Systems Modelling Assessment Applied to Denmark*

Authors: Erik Ahlgren (Chalmers Univ Technology), Dejene Hagos  
Presenter: Erik Ahlgren (Chalmers Univ Technology)

*Clean Sky-technology Diffusion Modeling for a Better Understanding of the Air Transportation Future*

Authors: Xueying Liu (Institute for Future Energy Consumer Needs and Behavior, E.ON Energy Research Center, RWTH Aachen University), Reinhard Madlener  
Presenter: Xueying Liu (Institute for Future Energy Consumer Needs and Behavior, E.ON Energy Research Center, RWTH Aachen University)

## Tuesday, 27th of August

**3A - 3G**  
11:00 am to 12:30 pm

### Session 3A: Energy Markets II - Market Integration (P-019)

Chair: **Ingele Tietze** (Pforzheim University)

*Integrating European Electricity Markets - What Impact for Consumers and Producers?*  
Authors: Lisa Ryan (UCD), Ewa Lazarczyk, Guneet Kaur  
Presenter: Lisa Ryan (UCD)

*Electricity Market Integration in North America: A Quantitative Analysis for Transmission and Generation Planning*  
Authors: Elmar Zozmann (Workgroup for Infrastructure Policy / TU Berlin), Cllial Lizbeth Rodriguez del Angel, Theo Schönfisch, Andrea Ruiz López  
Presenter: Elmar Zozmann (Workgroup for Infrastructure Policy / TU Berlin)

*Is the U.S. Natural Gas Market Integrated or Segmented? A Dynamic Study of Regional Natural Gas Prices*  
Authors: Hayette Gattaoui (IESEG School of Management)  
Presenter: Hayette Gattaoui (IESEG School of Management)

*Uncertainty in Integrated Electricity and Gas Markets - Analysing the Economic Impact*  
Authors: Thomas Möbius (BTU Cottbus-Senftenberg), Igor Riepin, Felix Müsgens  
Presenter: Thomas Möbius (BTU Cottbus-Senftenberg)

### Session 3B: Flexibility & Storage II (P-021)

Chair: **Reinhard Haas** (TU Wien)

*Local Flexibility Markets in Smart Cities: Interactions Between Positive Energy Blocks*  
Authors: Stian Backe (The Norwegian University of Science and Technology), Pedro Crespo del Granado, Güray Kara  
Presenter: Stian Backe (The Norwegian University of Science and Technology)

*Evaluation of Peer-to-Peer Electricity Sharing in Prosumer Communities*  
Authors: Mahdi Karami (RWTH Aachen University, EON ERC), Reinhard Madiener  
Presenter: Mahdi Karami (RWTH Aachen University, EON ERC)

*Is Sector Coupling a Well-Defined Strategy?*  
Authors: Jasmine Ramsebner (EEG TU Wien), Reinhard Haas  
Presenter: Jasmine Ramsebner (EEG TU Wien)

*The Influence of Energy Prosumers' Arbitrage Strategy on Power System Flexibility: A Game Theoretic Approach*  
Authors: Donghoon Ryu (Hanyang University), Jinsoo Kim  
Presenter: Donghoon Ryu (Hanyang University)

### Session 3C: Energy Policy II - Carbon Markets (P-217)

Chair: **Richard Green** (Imperial College Business School)

*Assessing Shocks and Overlapping Policies in the EU ETS - Can the Reform Live up to its Promises?*  
Authors: Lukas Schmidt (Institute of Energy Economics (EWI) at the University of Cologne), Martin Hintermayer  
Presenter: Lukas Schmidt (Institute of Energy Economics (EWI) at the University of Cologne)

*Welfare Distribution Effects of Introducing a Multicountry Carbon Price Floor in the 2030 EU Power System*  
Authors: Marit van Hout (PBL), Ozge Ozdemir, Paul Koutstaal  
Presenter: Marit van Hout (PBL)

*The Reformed EU ETS - Intertemporal Emission Trading with Restricted Banking*  
Authors: Martin Hintermayer (EWI, Institute of Energy Economics), Johanna Bockiet, Lukas Schmidt, Theresa Wildgrube  
Presenter: Martin Hintermayer (EWI, Institute of Energy Economics)

*Carbon Leakages: Towards Tailored Policies to Reduce Emissions Embodied in the EU Petrochemical Sector*  
Authors: Michel Zimmermann (École Polytechnique Fédérale de Lausanne), Vincent Moreau  
Presenter: Michel Zimmermann (École Polytechnique Fédérale de Lausanne)

### Session 3D: Household Behaviour II (P-128)

Chair: **Elena Fumagalli** (Copernicus Institute of Sustainable Development, Utrecht University)

*Social Norms and the Residential Electricity Mix*  
Authors: Joëlle Velvart (University of Basel)  
Presenter: Joëlle Velvart (University of Basel)

*Individuals' Preferences, Displacement Effects of Pollution Costs and the EKC Curve: an Empirical Investigation*  
Authors: Marco Baudino (Université Côte d'Azur, CNRS-GREDEG)  
Presenter: Marco Baudino (Université Côte d'Azur, CNRS-GREDEG)

*Attitudes to Renewable Energy Technologies: A Survey of Irish Households*  
Authors: Sanghamitra C. Mukherjee (University College Dublin)  
Presenter: Sanghamitra C. Mukherjee (University College Dublin)

### Session 3E: Renewables II - Solar (P-216)

Chair: **Regina Betz** (Center for Energy and the Environment, ZHAW)

*Model-based Assessment of Concentrated Solar Power in Spain: A Case Study Analysis*  
Authors: Franziska Schöniger (Energy Economics Group, TU Vienna)  
Presenter: Franziska Schöniger (Energy Economics Group, TU Vienna)

*An Economical Analysis on the Installation of Photovoltaic Cell (PV) and Battery in the Residential Sector*  
Authors: Yoshiki Ogawa (Toyo University)  
Presenter: Yoshiki Ogawa (Toyo University)

*Short-term Photovoltaic Power Forecasting: A Statistical Approach*  
Authors: Dragana Nikodinosa (BTU Cottbus-Senftenberg; FG Energiewirtschaft)  
Presenter: Dragana Nikodinosa (BTU Cottbus-Senftenberg; FG Energiewirtschaft)

# CONCURRENT SESSIONS

Tuesday, 27th of August

*Integrating Solar Photovoltaics into Singapore's Long-Term Energy Technology Portfolio*

Authors: Anthony Owen (Energy Studies Institute, National University of Singapore)  
Presenter: Anthony Owen (Energy Studies Institute, National University of Singapore)

## Session 3F: Nuclear Power (P-127)

Chair: Christian von Hirschhausen (TU Berlin / DIW Berlin)

*"Nuclear Diplomacy" - State of the Art of Nuclear Power Plants Exports and some Econometric Analysis*

Authors: Christian von Hirschhausen (TU Berlin / DIW Berlin), Anne Neumann, Lars Sorge  
Presenter: Christian von Hirschhausen (TU Berlin / DIW Berlin)

*Cost Estimates and Economics of Nuclear Power Plant Newbuild: Literature Survey and Some Modelling Analysis*

Authors: Simon Bauer (Technische Universität Berlin), Ben Wealer, Christian von Hirschhausen, Claudia Kemfert  
Presenter: Simon Bauer (Technische Universität Berlin)

*The Economics of Radioactive Waste Management - Status Quo, Lessons Learned and Policy Perspectives*

Authors: Ben Wealer (TU Berlin and DIW Berlin), Christian von Hirschhausen  
Presenter: Ben Wealer (TU Berlin and DIW Berlin)

*The Relationship between Nuclear Power and Military Expenditures: A Panel Data Analysis*

Authors: Lars Sorge (DIW Berlin and TU Berlin)  
Presenter: Lars Sorge (DIW Berlin and TU Berlin)

## Session 3G: Transportation II - Electric Vehicles (P-126)

Chair: Erik Ahlgren (Chalmers Univ Technology)

*Coping with Uncertainties Induced by Battery Electric Driven Vehicles in Distribution Grids*

Authors: Roland Broll (Universität Duisburg-Essen), Paul Baginski, Christoph Weber  
Presenter: Roland Broll (Universität Duisburg-Essen)

*Good Chargers? The Impact of Electric Vehicle Density on Local Grid Costs*

Authors: Paal Wangsness (Institute of Transport Economics), Askill Halse  
Presenter: Paal Wangsness (Institute of Transport Economics)

*Generation Z Ready to Embrace the Electric Vehicle Revolution? Predictors of Electric Vehicle Adoption by Young and Older Adults in Austria*

Authors: Paula Brezovec (Alpen-Adria-Universität Klagenfurt), Nina Hampf, Robert Sposato  
Presenter: Paula Brezovec (Alpen-Adria-Universität Klagenfurt)

*Analysis of CO2 Emission Reduction and Energy Interactions in Turkey Via Genetic Algorithm and Buems-macro for Electric Vehicles*

Authors: Cem Tiranlar (Bogazici University)  
Presenter: Cem Tiranlar (Bogazici University)

## 4A - 4G 4:00 pm to 5:30 pm

### Session 4A: Energy Markets III - Energy & Capacity Markets (P-019)

Chair: Reinhard Madlener (RWTH Aachen University, FCN-E.ON ERC)

*Analyzing the Effects of European Co-Optimized Day-Ahead Energy and Reserve Market Coupling*

Authors: Emily Little (RTE), Marco Schudel  
Presenter: Emily Little (RTE)

*Energy and Reserve Markets: In(ter)dependent in a High-RES World*

Authors: Kenneth Van den Bergh (KU Leuven), Erik Delarue  
Presenter: Kenneth Van den Bergh (KU Leuven)

*Impact of Renewable Auctions on Renewable Energy Promotion taking the Spatial Dimension into Account*

Authors: Samak Sheykha (E.ON ERC), Reinhard Madlener, Frieder Borggrete  
Presenter: Samak Sheykha (E.ON ERC)

*Onshore vs. Onshore Wind Energy: Effects of the Technological Capacity Mix on Regional Market Values in Germany*

Authors: Manuel Elsing (EIFER - European Institute for Energy Research), Hannes Hobbie, Dominik Most  
Presenter: Manuel Elsing (EIFER - European Institute for Energy Research)

### Session 4B: Energy Modelling II (P-021)

Chair: David Broadstock (Hong Kong Polytechnic University)

*Integrating Energy System Modelling and Life Cycle Assessment for both Cost and Environmental Optimisation of a Decentralised Regional Energy System*

Authors: Lukas Lazar (Pforzheim University), Ingela Tietze  
Presenter: Lukas Lazar (Pforzheim University)

*Methodological Analysis of Investment Decision Making Algorithms in Long-term Agent-based Electricity Market Models*

Authors: Zhenmin Tao (KU Leuven), Jorge Moncada, Kris Ponciet, Erik Delarue  
Presenter: Zhenmin Tao (KU Leuven)

*Economic Evaluation of Energy Resilience in a Virtual Power Plant*

Authors: Felipe Sabadini (RWTH), Reinhard Madlener  
Presenter: Felipe Sabadini (RWTH)

*Shaping Social Acceptance of Energy Projects*

Authors: Mathilde Tessier (MINES ParisTech), Sandrine Selosse  
Presenter: Mathilde Tessier (MINES ParisTech)

### Session 4C: Climate II (P-217)

Chair: Yukari Niwa Yamashita  
(Institute of Energy Economics, Japan)

*Evaluations on Consumption-Based CO<sub>2</sub> Emissions in Europe*  
Authors: Takashi Homma (Research Institute of Innovative Technology for the Earth (RITE)), Shuning Chen, Junichiro Oda, Keigo Akimoto  
Presenter: Takashi Homma (Research Institute of Innovative Technology for the Earth (RITE))

*Prediction the CO<sub>2</sub> Emissions of China and Identify its Drivers*  
Authors: Zhili Zuo (China University of Geosciences(Wuhan))  
Presenter: Zhili Zuo (China University of Geosciences(Wuhan))

*Low Carbon Strategic Analysis of Taiwan's Industrial Sector*  
Authors: Wei-Chen Liao (Institute of Nuclear Energy Research), Fu-Kuang Ko  
Presenter: Fu-Kuang Ko (Institute of Nuclear Energy Research)

*Blockchain in the Energy Industry - Comprehensive Analysis of Potential Use Cases*  
Authors: Michael Hinterstocker (FfE GmbH), Alexander Bogensperger, Andreas Zeiselmaier, Christa Duffner, Serafin von Roon  
Presenter: Michael Hinterstocker (FfE GmbH)

### Session 4D: Energy Efficiency II (P-128)

Chair: Mona Chitnis (University of Surrey)

*Usage Disaggregation of Smart Meter Data of Japanese Commercial Customers Using Random Forest Regression*  
Authors: Minao Watanabe (The University of Aizu), Kenta Ohtji  
Presenter: Minao Watanabe (The University of Aizu)

*Conveyance, Envy, and Home-Owners Adoption of Energy-Efficient Appliances*  
Authors: Joachim Schleich (Grenoble Ecole de Management), Corinne Faure, Marie-Charlotte Guehlin, Gengyang Tu  
Presenter: Joachim Schleich (Grenoble Ecole de Management)

*Energy Efficiency and Institutional Quality: The Role of Energy Efficiency Governance*  
Authors: Josue Barrera Santana (University of La Laguna), Gustavo A. Marrero Díaz, Francisco J. Ramos Real  
Presenter: Josue Barrera Santana (University of La Laguna)

*Analyzing Heterogeneity among Residential Energy Consumers in Slovenia: is there Room for Energy Efficiency?*  
Authors: Janez Dolšak (University of Ljubljana, School of Economics and Business), Nevenka Hrovatin, Jelena Zorić  
Presenter: Janez Dolšak (University of Ljubljana, School of Economics and Business)

### 4E: Country Studies II (P-216)

Chair: Jacek Kamiński  
(Mineral and Energy Economy Research Institute of the Polish Academy of Sciences)

*The Arctic and Siberia as Megaregions in the Period of Global Climate Warming: Economic and Geopolitical Perspectives*  
Authors: Vladimir Suprun (Foundation for socio-prognostics research "Trends")  
Presenter: Vladimir Suprun (Foundation for socio-prognostics research "Trends")

*Benefits and Costs of Conventional and Renewable Power Sector in Siberia*  
Authors: Natalya Gorbacheva (The Institute of Economics and Industrial Engineering within the Siberian Branch of the Russian Academy of Sciences)  
Presenter: Natalya Gorbacheva (The Institute of Economics and Industrial Engineering within the Siberian Branch of the Russian Academy of Sciences)

*Renewable Electricity Energy Policies: Case of Turkey*  
Authors: Kemal Sarica (Isik University), Esin Tetik Kollugil  
Presenter: Kemal Sarica (Isik University)

*Market Design of an Energy Exchange: The Case of Greece*  
Authors: Filippos Ioannidis (Aristotle University of Thessaloniki), Kostas Andriopoulos, Kyriaki Kosmidou, Georgia Makridou  
Presenter: Filippos Ioannidis (Aristotle University of Thessaloniki)

### 4F: Coal and Nuclear Phase-Out (P-127)

Chair: Andreas Loeschel  
(University of Muenster)

*Can We Phase-Out All of Them? How Market Interventions Impact Security of Electricity Supply in Germany*  
Authors: Lars Nolting (RWTH Aachen University), Aaron Praktikrjo  
Presenter: Lars Nolting (RWTH Aachen University)

*A Multi-criteria, Multi-actor Approach to Germany's Coal Phase Out: Contrasting Short With Long Term Phase Out Options*  
Authors: Christopher Ball (Forschungszentrum Jülich GmbH), Stefan Voegelé  
Presenter: Christopher Ball (Forschungszentrum Jülich GmbH)

*Coal Phase-out Implications for Steam Coal Producers: The Risk of Asset Stranding*  
Authors: Christian Hauenstein (TU Berlin), Roman Mendelevitich, Franziska Holz  
Presenter: Christian Hauenstein (TU Berlin)

*Assessing Coal Plant Exit Trajectories for Australia*  
Authors: Frank Jotzo (Australian National University), Salim Mazouz  
Presenter: Frank Jotzo (Australian National University)

### Session 4G (Special Session): Revealing Trajectories Towards a Sustainable Energy Future (P-126)

Chair: Eyjólfur Ingi Asgeirsson  
(Reykjavik University)

*Introduction: Methodological Overview and Past Development Trajectories of the Icelandic Energy System: Lessons for the Future*  
Authors: Brynhildur Davíðsdóttir (University of Iceland)  
Presenter: Brynhildur Davíðsdóttir (University of Iceland)

*Implications of Fiscal-Induced Electromobility Transition on Iceland's Energy-economic System*  
Authors: Ehsan Shafiei (Finnish Environment Institute), Brynhildur Davíðsdóttir, Hlynur Stefánsson, Eyjólfur Ingi Asgeirsson, Reza Fazeli, Jonathan Leaver  
Presenter: Ehsan Shafiei (Finnish Environment Institute)

*Modelling Geothermal Resource Utilization By Incorporating Resource Dynamics, Capacity Expansion, and Development Costs*  
Authors: Nathalie Spittler (University of Iceland/ University of Clermont Auvergne), Ehsan Shafiei, Brynhildur Davíðsdóttir  
Presenter: Nathalie Spittler (University of Iceland/ University of Clermont Auvergne)

*Stakeholder Engagement for the Development of Indicators for Sustainable Energy Development*  
Authors: Ingunn Gunnarsdóttir (University of Iceland), Brynhildur Davíðsdóttir  
Presenter: Ingunn Gunnarsdóttir (University of Iceland)

*Identifying Robust Development Trajectories for the Icelandic Energy Systems Towards Carbon Neutrality Using MCDA*  
Authors: Reza Fazeli (University of Iceland), Bjarnhéðinn Guðlaugsson, Ingunn Gunnarsdóttir, Brynhildur Davíðsdóttir, Ehsan Shafiei  
Presenter: Reza Fazeli (University of Iceland)

# CONCURRENT SESSIONS

Wednesday, 28th of August

5A - 5G  
9:00 am to 10:30 am

## Session 5A: Electricity II (P-019)

Chair: **Moritz Nobis**  
(RWTH Aachen University)

*Optimizing Congestion Management by Integrating Redispatch into the Day-ahead Market*

Authors: Ksenia Poplavskaya (AIT Austrian Institute of Technology / TU Delft), Gerhard Totschnig, Fabian Leimgruber, Laurens de Wries, Gerard Doorman  
Presenter: Ksenia Poplavskaya (AIT Austrian Institute of Technology / TU Delft)

*The Role of Frequency Regulation with High-Penetration of Renewable Energy Sources*

Authors: Claudio Agostini (Universidad Adolfo Ibanez), Shahriyar Nasirov, Carlos Silva, Franco Armijo  
Presenter: Claudio Agostini (Universidad Adolfo Ibanez)

*The "Current" Battle of the Currents: AC vs. DC - An Applied Lock-in- and System-Good Economics Approach*

Authors: Florian Weiß (TU Berlin), Christian von Hirschhausen, Raluca Dumitrescu, Daniel Philipp  
Presenter: Florian Weiß (TU Berlin)

*The Impact of Distribution Grid Injection Limits on the Investment Strategy of Prosumers*

Authors: Chiara Gorrasi (Katholieke Universiteit Leuven), Kenneth Bruninx, Erik Delaue  
Presenter: Chiara Gorrasi (Katholieke Universiteit Leuven)

## Session 5B: Energy Modelling III (P-021)

Chair: **Hans Auer**  
(Energy Economics Group (EEG))

*The Impact of Sector Coupling Options on Electricity Systems - An Evaluation of Different Flexibility Options*

Authors: Mario Kendzioriski (Technische Universität Berlin), Wolf-Peter Schill  
Presenter: Mario Kendzioriski (Technische Universität Berlin)

*The Value of Intraday Electricity Trading - Evaluating Opportunity Costs of Units Distributing on Local Flexibility Markets*  
Authors: Timo Kern (Forschungsgesellschaft für Energiewirtschaft mbH), Serafin von Roon  
Presenter: Timo Kern (Forschungsgesellschaft für Energiewirtschaft mbH)

*Local Energy Sharing Considering Different Technologies, Individual Preferences, and Contributions*

Authors: Theresia Perger (Vienna University of Technology), Hans Auer  
Presenter: Theresia Perger (Vienna University of Technology)

*On the Characterization and Evaluation of Flexibilities in Energy Management Systems*

Authors: Carlo Corinaldesi (Technische Universität Wien), Daniel Schwabeneder, Andreas Fleischhacker, Georg Lettner  
Presenter: Carlo Corinaldesi (Technische Universität Wien)

## Session 5C: Energy Policy III - Carbon Tax & Decarbonization (P-217)

Chair: **Frank Jotzo**  
(Australian National University)

*Tax or Turn Off: That is the Question Some Insights in Power Sector Emissions Reduction Measures' Effectiveness in a Small, Open Economy*

Authors: Danielle Devogelaer (Federal Planning Bureau)  
Presenter: Danielle Devogelaer (Federal Planning Bureau)

*Dosis Facit Effectum Why the Scope of the Carbon Tax Matters - Evidence from the Swedish Residential Sector*

Authors: Anita Thonipara (IfH Göttingen University of Göttingen)  
Presenter: Anita Thonipara (IfH Göttingen University of Göttingen)

*How Effective was the UK Carbon Tax?—A Machine Learning Approach to Policy Evaluation*  
Authors: Mirjam Kosch (ZHAW), Jan Abrell  
Presenter: Mirjam Kosch (ZHAW)

*Prices vs. Percentages: Use of Tradable Green Certificates as an Instrument of Greenhouse Gas Mitigation*  
Authors: Arild Heimvik (University of Bergen, department of Economics), Eirik S. Amundsen  
Presenter: Arild Heimvik (University of Bergen, department of Economics)

## Session 5D: Household Behaviour III (P-128)

Chair: **Nina Boogen** (ETH Zurich)

*An Examination of Domestic Appliance Curtailment Contracts*

Authors: William Brazil (Economic and Social Research Institute), Jason Harold, John Curtis  
Presenter: William Brazil (Economic and Social Research Institute)

*Preferences for Environmentally Friendly and Unfriendly Measures to Control the Climate at Home: a Stated Choice Analysis for Germany*

Authors: Moritz König (University of Kassel), Andreas Ziegler, Victor von Loessi, Claudia Schwirplies  
Presenter: Moritz König (University of Kassel)

*Optimization of Behaviors by IoT for Energy Efficiency in Smart Buildings*

Authors: Lucas Desport (Mines ParisTech), Sandrine Selosse, Gilles Guerassimoff  
Presenter: Lucas Desport (Mines ParisTech)

*Do Households in Developing Country Choose Energy Efficient Air Conditioner?: Evidence From the Philippines*

Authors: Miwa Nakai (Waseda University), Minoru Morita, Majah-Leah Ravago, Toshi Arimura  
Presenter: Miwa Nakai (Waseda University)

### Session 5E: Renewables III - Spatial Capacity Allocation (P-216)

Chair: **Shahriyar Nastrov**  
(Universidad Adolfo Ibañez)

*Trade-offs Associated with the Spatial Allocation of Future Onshore Wind Generation Capacity – a Case Study for Germany*

Authors: Philip Tafarte (University of Leipzig)  
Presenter: Philip Tafarte (University of Leipzig)

*Minimum Distances or Economic Siting Incentives? – An Ecological-Economic Analysis of Instruments for Governing Future Spatial Wind Power Deployment*

Authors: Felix Reutter (Heimholtz Centre for Environmental Research - UFZ)  
Presenter: Felix Reutter (Heimholtz Centre for Environmental Research - UFZ)

*Trade-offs between Regionally Equitable and Cost-Efficient Allocation of Decentralized Renewable Electricity Generation*

Authors: Jan-Philipp Sasse (University of Geneva, Renewable Energy Systems), Evelina Trutnevite  
Presenter: Jan-Philipp Sasse (University of Geneva, Renewable Energy Systems)

*Potential of Offshore Power-to-gas to Compete With Onshore Blue Hydrogen*

Authors: Machiel Mulder (University of Groningen)  
Presenter: Machiel Mulder (University of Groningen)

### Session 5F: Energy Investment & Finance I (P-127)

Chair: **Boyko Nitzov** (ACER)

*Acquisitions in Markets with Frictions? The German Electricity Distribution Sector*

Authors: Dominik Schober (ZEW)  
Presenter: Dominik Schober (ZEW)

*Cross-Border Oil and Gas Mergers and Acquisitions Transactions and its Geography-Based Comprehensive Overview*

Authors: Sevat Özgür (University of Vienna), Franz Wini  
Presenter: Sevat Özgür (University of Vienna)

*The Cost of Debt of Renewable versus Fossil Fuel Firms: Evidence from the U.S. Energy Sector*

Authors: Karol Kempa (Frankfurt School of Finance & Management gGmbH), Ulf Mosiener, Oliver Schenker  
Presenter: Oliver Schenker (Frankfurt School of Finance and Management gGmbH)

*Taxation and Extraction Rates*

Authors: Petter Osmundsen (University of Stavanger), Aksel Hiorth  
Presenter: Petter Osmundsen (University of Stavanger)

### Session 5G: Energy Markets, Innovation & New Technologies (P-126)

Chair: **Michael Poititt**  
(University of Cambridge)

*Pricing Mechanisms and Market Designs in Peer-to-Peer Electricity Trading*

Authors: Jens Weibezahn (Technische Universität Berlin), Alexandra Lüth, Jan Martin Zepter, Pedro Crespo del Granado  
Presenter: Jens Weibezahn (Technische Universität Berlin)

*Potentials of the Sharing Economy for the Electricity Sector Regarding Private Capital Involvement and Decarbonisation*

Authors: Ingela Tietze (Pforzheim University), Pia Szichta, Lukas Lazar  
Presenter: Ingela Tietze (Pforzheim University)

*Innovation in the UK Electricity Supply Industry: Whose - and What - Innovation?*

Authors: Geoffroy Dolphin (University of Cambridge Judge Business School), Michael Poititt  
Presenter: Geoffroy Dolphin (University of Cambridge Judge Business School)

## 6A - 6G 11:00 am to 12:30 pm

### Session 6A: Energy Markets IV (P-019)

Chair: **Lars Bergman**  
(Stockholm School of Economics)

*Real-Time Pricing and Imperfect Competition in Electricity Markets*

Authors: Stephen Poletti (University of Auckland), Julian Wright  
Presenter: Stephen Poletti (University of Auckland)

*Non-Linear Demand Curves in Electricity Markets: Impact on Market Power Estimation*

Authors: Yi Wan (Paul Scherrer Institute), Martin Densing  
Presenter: Yi Wan (Paul Scherrer Institute)

*Hedging Instruments in Electricity Markets for New Technologies - a Long-Term Perspective*

Authors: Helene Linda Huber (University of Vienna - Faculty of Business, Economics and Statistics), Jörn Richstein, Karsten Neuhoff  
Presenter: Helene Linda Huber (University of Vienna - Faculty of Business, Economics and Statistics)

*Electricity Futures and Stock Market Response to Electricity Sector Material Disclosures*

Authors: Ivan Diaz-Rainey (University of Otago), Xing Han, Greg Sise  
Presenter: Ivan Diaz-Rainey (University of Otago)

### Session 6B: Flexibility & Storage III (P-021)

Chair: **Joachim Geske** (Imperial College London)

*Influence of Electric Vehicle Uptake on Competitive Dynamics of Storage Technologies in Electricity Sector Applications*

Authors: Martin Beuse (ETH Zürich), Bjame Steffen, Tobias S. Schmidt  
Presenter: Bjame Steffen (ETH Zurich)

*Energy Storage Investment in Switzerland: A Household Model Approach Linking Heat and Electricity*

Authors: Héctor Antonio Ramírez Molina (University of Basel), Hannes Weigt  
Presenter: Héctor Antonio Ramírez Molina (University of Basel)

*From Single Family Buildings to Energy Communities - Economic Viability of Upscaling Battery Storage Systems*

Authors: Albert Hiesl (Technische Universität Wien)  
Presenter: Albert Hiesl (Technische Universität Wien)

*Pumped Hydro Storage in France: Stand-Alone Market Player, TSO Service Provider or EDF Nuclear Fleet Support*

Authors: Corentin Simon (Université de Nantes), Rodica Lohel  
Presenter: Corentin Simon (Université de Nantes)

### Session 6C: Energy Access & Energy Poverty (P-217)

Chair: **Nevenka Hrovatin**  
(University of Ljubljana, School of Economics and Business)

*Energy Poverty and Energy Inequality in Japan: a Direct Measurement Approach*

Authors: Shinichiro Okushima (University of Tsukuba)  
Presenter: Shinichiro Okushima (University of Tsukuba)

*Subjective Well-Being and Energy Poverty: New Insights from the Combination of Objective and Subjective Indicators*

Authors: Rinaldo Brau (University of Cagliari), Erica Delugas  
Presenter: Rinaldo Brau (University of Cagliari)

*Paying for Green Energy: The Fiscal Incidence of Renewable Energy Support Mechanisms in the EU*

Authors: Lawrence Haar (Oxford Brookes University), Doctor Laura Haar  
Presenter: Lawrence Haar (Oxford Brookes University)

*Lessons From Deploying Large Scale Solar Electrification in Bangladesh. Can the Last-Mile Become the First?*

Authors: Georg Heinemann (TU Berlin, WIP, Workgroup for Economic and Infrastructure Policy), Raluca Dumitrescu, Christian von Hirschhausen  
 Presenter: Georg Heinemann (TU Berlin, WIP, Workgroup for Economic and Infrastructure Policy)

### Session 6D: Household Behaviour IV (P-128)

Chair: **Claudio Agostini** (Universidad Adolfo Ibañez)

*Residential Energy Efficiency Investment and Demand Response under Different Electricity Pricing Schemes: a Hybrid Physical-Microeconomic Approach*  
 Authors: Walid Matar (KAPSARC)  
 Presenter: Walid Matar (KAPSARC)

*Designing Effective and Acceptable Energy Policies for a Low Carbon Heating Consumption*

Authors: Elena López Bernabé (Basque Centre for Climate Change (BC3))  
 Presenter: Elena López Bernabé (Basque Centre for Climate Change (BC3))

*Time to Pick up Pace of Dynamic Electricity Pricing*

Authors: Abbas Hussain (Frontier Economics)  
 Presenter: Abbas Hussain (Frontier Economics)

*Utilising Applied Behavioural Research to Execute Subsidy Reform in Kuwait*

Authors: Hessah AIOjayan (Kuwait University)  
 Presenter: Hessah AIOjayan (Kuwait University)

### Session 6E: Renewables IV (P-216)

Chair: **Machiel Mulder** (University of Groningen)

*Measuring Regional Impacts of an Energy System Transformation - a Contribution to Sustainability Analysis*

Authors: Philip Ulrich (Institute of Economic Structures Research (GWS mbH)), Ulrike Lehr  
 Presenter: Philip Ulrich (Institute of Economic Structures Research (GWS mbH))

*A Version of Net Metering for a Set of Households after the Feed-in Tariff Regime*  
 Authors: Yoshihiro Yamamoto (Takasaki City University of Economics)  
 Presenter: Yoshihiro Yamamoto (Takasaki City University of Economics)

*The Long-Term Effect of Renewable Electricity on UK Employment*

Authors: Theodoros Arvanitopoulos (University College London)  
 Presenter: Theodoros Arvanitopoulos (University College London)

*Analysis of Consumer Preference on a*

*Hypothetical Green Certificate Program in Korea: Application of a Choice Experiment*

Authors: Jeonghwan Bae (Chonnam National University), Hojeong Park  
 Presenter: Jeonghwan Bae (Chonnam National University)

### Session 6F: Energy Investment & Finance II (P-127)

Chair: **Simon Cadez** (University of Ljubljana)

*Evaluating the Impacts of Auctions on Financing Conditions for Renewable Energy Projects*

Authors: Mak Dukan (Technical University of Denmark), Lena Kitzing  
 Presenter: Mak Dukan (Technical University of Denmark)

*Rethinking Renewable Energy Auctions: Revenue Stabilisation Instead Of Support Payments*

Authors: Lena Kitzing (Technical University of Denmark), Barbara Breitschopf  
 Presenter: Lena Kitzing (Technical University of Denmark)

*Mapping Climate and Energy Finance: Lessons Learnt from Czechia and Germany*

Authors: Michaela Valentová (Czech Technical University in Prague), Aleksandra Novikova, Jaroslav Knápek  
 Presenter: Michaela Valentová (Czech Technical University in Prague)

*Pricing of Associated Petroleum Gas, the Feedstock of GPPs, Considering Environmental Aspects*

Authors: Rohollah Mahdavi (Sobhan Institution for Energy Studies (SIES)), Ali Taherifardhanjani, Hamed Sahebbonar, Mostafa Pourkaveh Dehkordi  
 Presenter: Mostafa Pourkaveh Dehkordi (ISU)

### Session 6G: Transportation III - Policies & Household Choices (P-126)

Chair: **Amela Ajanović** (TU WIEN)

*Vehicle Tax Design and Car Purchase Choices: A Case Study of Ireland*

Authors: Ivan Petrov (University College Dublin), Lisa Ryan  
 Presenter: Ivan Petrov (University College Dublin)

*The Cost of Driving: Choices, Policies*

Authors: Boyko Nitzov (ACER)  
 Presenter: Boyko Nitzov (ACER)

*The Impact of Preferences and Socio-Economic Factors on Households' Travel Mode Choice*

Authors: Alessandro Silvestri (Basque Centre for Climate Change (BC3)), Sébastien Foudi, Ibon Galarraga  
 Presenter: Alessandro Silvestri (Basque Centre for Climate Change (BC3))

## 7A - 7G

1:30 pm to 3:00 pm

### Session 7A: Energy Markets V - Market Design & Trading Arrangements (P-019)

Chair: **Carlos Silva** (Universidad de Chile)

*Revisiting the Trading Arrangements of the Nordic Electricity Market?*

Authors: Lars Bergman (Stockholm School of Economics)  
 Presenter: Lars Bergman (Stockholm School of Economics)

*The Competitive Effect of EU Transparency Reforms: Evidence from Nord Pool*

Authors: Ewa Lazarczyk (Reykjavik University), Chloé Le Coq  
 Presenter: Ewa Lazarczyk (Reykjavik University)

*Proposing a Framework for Cross-Border Electricity Trade in South America*

Authors: Shahriyar Nasirov (Universidad Adolfo Ibañez), Carlos Silva  
 Presenter: Carlos Silva (Universidad de Chile)

*Investors' Perspectives on Factors Influencing Bidder Participation in the Chilean Energy Auctions*

Authors: Shahriyar Nasirov (Universidad Adolfo Ibañez), Carlos Silva, Diego Jorrete  
 Presenter: Shahriyar Nasirov (Universidad Adolfo Ibañez)

### Session 7B: Energy Modelling IV (P-021)

Chair: **Pantelis Capros** (E3MLab)

*Run-Time Reduction for Linear Optimizing Energy System Models*

Authors: Yvonne Scholz (German Aerospace Center), Karl Klén Cao, Manuel Wetzel, Kai von Krbek, Hans Christian Gils, Benjamin Fuchs, Frieder Borggrete  
 Presenter: Yvonne Scholz (German Aerospace Center)

*Quantifying The Worst Case Impact Of INC-DEC Gaming on a Redispatch Market*

Authors: Simon Voswinkel (University of Duisburg-Essen)  
 Presenter: Simon Voswinkel (University of Duisburg-Essen)

*Energy System Response to Future Uncertainties*

Authors: Sannamari Pilpola (Aalto University), Peter Lund  
 Presenter: Sannamari Pilpola (Aalto University)

*Stochastic Generation of Household Electricity Load Profiles in 15-minute Resolution on Building Level for Whole City Quarters*

Authors: Sally Köhler (University of Applied Sciences Stuttgart)  
Presenter: Sally Köhler (University of Applied Sciences Stuttgart)

### Session 7C: Energy Policy IV (P-217)

Chair: **Jelena Zoric** (University of Ljubljana, School of Economics and Business)

*Towards Decarbonizing the European Building Stock: Policies and Their Impact on Vulnerable Household Groups*

Authors: Andreas Müller (Technische Universität Wien)  
Presenter: Andreas Müller (Technische Universität Wien)

*Evaluating the Use of Bioenergy With Carbon Capture and Storage to Achieve Energy Transition and Decarbonization*  
Authors: Sandrine Selosse (MINES ParisTech - Centre for Applied Mathematics)  
Presenter: Sandrine Selosse (MINES ParisTech - Centre for Applied Mathematics)

*The Impact of Low-Carbon Policy on Stock Returns*

Authors: Alessandro Ravina (Paris I Panthéon-Sorbonne University), Rania Hentati Kaffel  
Presenter: Alessandro Ravina (Paris I Panthéon-Sorbonne University)

*Low-carbon Electricity Generation Scenarios for Tanzania: Implications for the Country's Economy and the Environment*

Authors: Matteo Rocco (Politecnico di Milano), Elena Fumagalli  
Presenter: Elena Fumagalli (Copernicus Institute of Sustainable Development, Utrecht University)

### Session 7D: Firm Performance (P-128)

Chair: **Dominik Schober** (ZEW)

*Electricity Market Restructuring and Plant Generation Costs: Evidence from the United States*

Authors: Souvik Datta (Fachhochschule Nordwestschweiz), Massimo Filippini, Chiara Lo Prete  
Presenter: Souvik Datta (Fachhochschule Nordwestschweiz)

*Productivity Growth in Electricity and Gas Networks in Great Britain since Privatisation*

Authors: Michael Pollitt (University of Cambridge), Victor Ajayi, Karim Anaya  
Presenter: Michael Pollitt (University of Cambridge)

*Environmental Regulations and Firm Performance: An Application of Porter Hypothesis on Turkish Manufacturing Industry*

Authors: Ezgi Ozkirim (University of Ljubljana, School of Economics and Business), Nevenka Hrovatin, Istemi Berk  
Presenter: Ezgi Ozkirim (University of Ljubljana, School of Economics and Business)

*Corporate Environmental Responsibility and Financial Performance: an Empirical Examination*

Authors: Simon Cadez (University of Ljubljana)  
Presenter: Simon Cadez (University of Ljubljana)

### Energy Communities (P-216)

Chair: **Julia Blasch** (Vrije Universiteit Amsterdam)

*Energy Communities as an Enabler for PV*  
Authors: Johannes Radi (TU Wien), Andreas Fleischhacker, Georg Lettner  
Presenter: Johannes Radi (TU Wien)

*Quantifying the Social Potential of Community-Based Energy Cooperatives to Contribute to EU-28 Climate and Renewable Energy Targets*

Authors: Cristian Pons-Seres de Brauer (Energy Institute at Johannes Kepler University), Jed Cohen, Johannes Reichl, Andrea Kolimann, Valeria Azarova  
Presenter: Jed Cohen (Energy Institute at Johannes Kepler University)

*Economic Viability of Local Energy Communities: A Special Focus on PV and Different Settlement Structures*

Authors: Bernadette Fina (AIT - Austrian Institute of Technology), Hans Auer, Werner Friedl  
Presenter: Bernadette Fina (AIT - Austrian Institute of Technology)

*Willingness to Pay for Microgrids to Enhance Community Resilience*

Authors: Chelsea Hotaling (Energy Futures Group), Stephen Bird, Martin Heintzelman  
Presenter: Martin Heintzelman (Clarkson University)

### Session 7F: Energy & the Economy (P-127)

Chair: **Adonis Yatchew** (University of Toronto)

*Revisiting the Growth Hypothesis for the Renewables in the Energy-Growth Nexus*

Authors: Minyoung Yang (Hanyang University), Jinsoo Kim  
Presenter: Minyoung Yang (Hanyang University)

*Energy Retrofit in a Post-Natural Disaster Context: Effective Driver of Resilient Growth?*

Authors: eisa valeriani (Università di Modena e Reggio Emilia), Maria Giovanna Bosco  
Presenter: Maria Giovanna Bosco (Università di Modena e Reggio Emilia)

*A Glimpse at the Marginal Product of Energy From the Lens of a Time-varying Panel Data Production Function With Latent Type Heterogeneity*

Authors: David Broadstock (Hong Kong Polytechnic University)  
Presenter: David Broadstock (Hong Kong Polytechnic University)

*Royalties and Fiscal Equalization - the Case of Swiss Hydropower*

Authors: Werner Hediger (HTW Chur), Marc Herter, Christoph Schuler  
Presenter: Werner Hediger (HTW Chur)

### Session 7G: Transportation IV (P-126)

Chair: **Matej Švigelj** (University of Ljubljana, School of Economics and Business)

*E-Mobility from a Multi-Actor Point of View*

Authors: Stefan Voegelé (Forschungszentrum Juelich), Christopher Bail, Wilhelm Kuchshinnich  
Presenter: Stefan Voegelé (Forschungszentrum Juelich)

*Insights into the Strategic Roll-out and Usage of Public Charging Infrastructure in Germany*

Authors: Laura Prawatky (NOW GmbH Nationale Organisation Wasserstoff- und Brennstoffzellentechnologie), Dr.-Ing. Franziska Lobas-Funk  
Presenter: Laura Prawatky (NOW GmbH Nationale Organisation Wasserstoff- und Brennstoffzellentechnologie)

*Corri-door Project: Did it Really Boost the French Electric Vehicle Market?*

Authors: Bassem Haidar (Centralesupélec), Jan Lepoutre, Pascal Da Costa, Yannick Perez  
Presenter: Bassem Haidar (Centralesupélec)

*Applying Best-Worst Scaling to Assess Consumer Preferences for Alternative Fuel Vehicles in Japan*

Authors: Kentaro Yoshida (Kyushu University)  
Presenter: Kentaro Yoshida (Kyushu University)

# POSTER SESSION

Tuesday, 27th of August

**Foyer between  
lecture rooms in the  
ground floor**

**12:30 pm to 2:00 pm**

**Life Cycle Cost and Global Warming Potential**

*of a Wooden Detached House in Finland*  
Authors: Nargessadat Emami (University of Iceland), Jukka Heinonen, Björn Marteinsson, Jani Laine  
Presenter: Nargessadat Emami (University of Iceland)

**An Optimization Approach for the Economic Dispatch Problem Incorporating the Effects of Retail Power Markets**

Authors: Nikolaos Koltsakis (Energy & Environmental Policy lab, School of Economics, Business & International Studies, University of Piraeus)  
Presenter: Nikolaos Koltsakis (Energy & Environmental Policy lab, School of Economics, Business & International Studies, University of Piraeus)

**Corporate Social Responsibility and Chinese Energy Industry**

Authors: Kun Li (Beijing Normal University)  
Presenter: Kun Li (Beijing Normal University)

**Transition Towards Electricity Scarcity Pricing in Poland: Lessons Drawn from International Experiences**

Authors: Pablo Benalcázar (Mineral and Energy Economy Research Institute, Polish Academy of Sciences), Patryk Nalepka  
Presenter: Pablo Benalcázar (Mineral and Energy Economy Research Institute, Polish Academy of Sciences)

**Benchmarking Carbon Savings and Economic Effectiveness of Renewable Energy Sources: A Methodological Comparative Study**

Authors: Saeed Alokkiah (Imperial College London)  
Presenter: Saeed Alokkiah (Imperial College London)

**Behaviour-driven Battery Electric Vehicle Charging Decisions and its Implications for the German Power System**

Authors: Niklas Wulff (German Aerospace Center (DLR)), Felix Steck, Carsten Hoyer-Klick, John Erik Anderson  
Presenter: Niklas Wulff (German Aerospace Center (DLR))

**A Speculative Trading Model of Electricity Market**

Authors: Jun Maekawa (Ritsumeikan Univ), Koji Shimada  
Presenter: Jun Maekawa (Ritsumeikan Univ)

**Economic Barriers for Energy Crop Development: Lessons Learnt from Czechia**

Authors: Jaroslav Knápek (Czech Technical University in Prague, Faculty of Electrical Engineering), Kamila Vávrová, Tomáš Králík, Martin Beneš  
Presenter: Jaroslav Knápek (Czech Technical University in Prague, Faculty of Electrical Engineering)

**Comparative Analysis on Environmental Kuznets Curve Focusing on the Turning Point**

Authors: Taeyoung Jin (Hanyang University), Jinsoo Kim  
Presenter: Taeyoung Jin (Hanyang University)

**Energy Efficiency Financing: A Review of Risks and Uncertainties**

Authors: Daniel Hill (Vienna University of Economics and Business)  
Presenter: Daniel Hill (Vienna University of Economics and Business)

**Intermittent Capacity Resources in the Polish Capacity Market: The Case of Wind Power**

Authors: Aleksandra Komorowska (Mineral and Energy Economy Research Institute of the Polish Academy of Sciences), Jacek Kamiński  
Presenter: Aleksandra Komorowska (Mineral and Energy Economy Research Institute of the Polish Academy of Sciences)

All conference participants will have the chance to cast their ballot in the ballot box at the registration desk on Tuesday, 27 August 2019 until 4:00 pm.



Photo: Pinar, Author: Jaka Krančič

# PhD Day

## Sunday, 25th of August

25 ■

### ***Seminar 1: How to write papers for publication in scientific journals?***

**Location:** Senate Conference Room, SEB LU

**Time:** 11:00 am to 1:00 pm

**Speaker:** **Adonis Yatchew**, University of Toronto, Editor-in-Chief of the Energy Journal.

**Description:** It is very important for PhD students and young researchers to learn how to present their research findings clearly, and how scientific papers should be structured. However, these topics are rarely covered in depth in PhD programmes. This seminar with Professor Yatchew is intended for PhD students and young professionals that want to learn how to write papers for publication in scientific journals. The lecturer is Editor-in-Chief of the Energy Journal, one of the most important scientific journals in the field of energy economics, and his experience and advice are indispensable for every aspiring researcher in this area.

**Break:** 1:00 pm to 1:30 pm

### ***Seminar 2: How to present research work in scientific conferences?***

**Location:** Senate Conference Room, SEB LU

**Time:** 1:30 pm to 4:00 pm

**Speakers:** **Georg Erdmann**, Berlin University of Technology and **Markus Graebig**, WindNODE Project Leader.

**Description:** It is a common and disappointing experience at conferences: Excellent content gets lost in poor presentations. We want to help you and your audience make the most of your opportunity to be on stage. This workshop will focus on the delivery rather than the content of scientific presentations. Best-practices both from the academic and the business world will be applied in order to make presentations as effective as possible. Topics will range from "mind your audience", "identifying key messages", "developing a clear storyline and storyboard" to "designing state-of-the-art slides" and "performing on stage". All of this will be practiced in a hands-on workshop: Participants in the workshop are invited to deliver 10-minute presentations, followed by detailed feedback and recommendations for improvement. Participants that received the acceptance notification for their paper, and that are interested in presenting and receiving feedback on their presentations during the workshop should send an e-mail stating their interest at: [iaee2019jubljana@oyco.eu](mailto:iaee2019jubljana@oyco.eu). We have time for a maximum of 5 presentations - slots will be allocated to students selected by the conference organisers.

**Break:** 4:00 pm to 4:30 pm

# PRE-CONFERENCE SEMINAR

Sunday, 25th of August

## Special Seminar open to all conference participants: *Teaching energy - where does one begin?*

**Location:** Senate Conference Room, SEB LU

**Time:** 4:30 pm to 6:00 pm

**Speaker:** **Adonis Yatchew**, University of Toronto, Editor-in-Chief of the Energy Journal.

**Description:** The seminar covers 'Ten Big Ideas' which are necessary for understanding today's energy issues and focuses on bare essentials that need to be communicated to a novice in the field of energy economics. The lecturer is Editor-in-Chief of the Energy Journal and Professor at the University of Toronto where he teaches undergraduate and graduate courses in energy economics, graduate courses in econometrics and 'big ideas' courses on energy with colleagues in physics and classics.



Photo: Pua Iqbal Cave. Author: Edna Heigl

# POST-CONFERENCE SEMINAR

27 ■

Thursday, 29th of August

## Energy Transition & Power Markets

**Location:** Executive Conference Room, SEB LU

**Time:** 9:00 am to 5:00 pm

The seminar will be given by **Richard Green**, Professor of Sustainable Energy Business at the Imperial College Business School in the United Kingdom.

The aim of this post-conference seminar is to give participants an overview of key economic and policy issues surrounding the transition to low-carbon electricity in market-based systems.

### **Programme:**

#### **9:00 am to 10:30 am Lecture 1: Fundamentals of electricity**

What do you need to know about the workings of the electricity industry in order to understand the challenges we face in decarbonising the power system? This session concentrates on how economic costs can be minimised subject to the technical constraints imposed by the need to meet demand at all times without overloading the grid.

10:30 am to 11:00 pm Coffee break

#### **11:00 am to 12:30 pm Lecture 2: Electricity markets**

How should the electricity industry be organised, and if a liberalised market is introduced, what rules should it have? This session will cover optimal prices for power, how to pay for capacity, and different ways of pricing transmission constraints. It will discuss the difference between "US" and "European" market designs, and how the operating constraints faced by power stations can affect electricity prices.

12:30 pm to 1:30 pm Lunch

#### **1:30 pm to 3:00 pm Lecture 3: Renewables and storage**

Wind turbines and solar PV panels are becoming dramatically cheaper, but how does the intermittent nature of their output affect their value to the power system? Electricity storage has the potential to absorb surplus energy and release it later – how far can this help system operators to manage the variable output from renewable generators?

3:00 pm to 3:30 pm Coffee break

#### **3:30 pm to 5:00 pm Lecture 4: Emissions savings**

How much have renewable generators already reduced our carbon emissions, and how should we measure this?

The sessions will set out the economic theory underlying these issues with a "tutorial" approach, but will also present a number of recent research papers that explore these issues.

# SOCIAL PROGRAMME

## Sunday, 25th of August

### Welcome Reception

6:00 pm to 8:00 pm

Location: School of Economics and Business, University of Ljubljana  
Address: Kardeljeva ploščad 17, Ljubljana

### Student Happy Hour

09:00 pm to 11:00 pm

Location: Pivnica Lajbah  
Address: Grudnovo nabrežje 15, Ljubljana



**Meeting Point:** The meeting point for Student happy hour is at the IAEE Conference Entrance of SEB LU (please consult the map of SEB LU). All students attending the Student happy hour will receive a free welcome drink!

## Monday, 26th of August

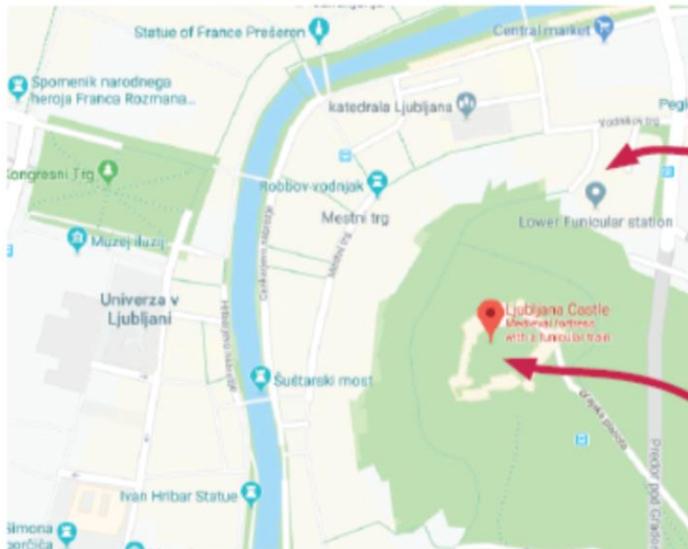
### Conference Cocktail Dinner

7:00 pm to 10:30 pm

Location: Ljubljana Castle  
Address: Grajska planota 1, Ljubljana



**Meeting Point:** The IAEE 2019 conference organizing team from SEB LU will meet you at the castle funicular (Lower funicular station, address: **Krekov trg 4, Ljubljana**) to accompany you to the Ljubljana Castle with the funicular. **The conference badge is your entrance ticket to the funicular.**



### Meeting Point

Lower Funicular Station  
Address: Krekov trg 4, Ljubljana

Location of Ljubljana Castle and Lower Funicular Station

### Conference Cocktail Dinner

Ljubljana Castle  
Address: Grajska planota 1, Ljubljana

Please note that the funicular capacity is limited to one cabin with a maximum of 33 persons per ride, and 15 full cycles per hour. Therefore, participants are kindly requested to begin assembling at the meeting point starting from 06:30 pm. Ljubljana Castle is also accessible on foot. Please find more information on walking paths here: <https://www.ljubljanskigrad.si/en/visit-us/how-to-get-to-the-castle/>.

**About the Castle:** Ljubljana Castle has a rich past. Since its early period, the Castle has served a number of purposes – from a residence, a military outpost, fort, countryseat, and prison, to a tourist and cultural centre. In addition to the historical significance enjoyed by all visitors, the Ljubljana Castle is also becoming an important cultural centre for Ljubljana. It is a popular venue for exhibitions, theatre plays, and concerts.



## Tuesday, 27th of August

### Gala Dinner

7:00 pm to 10:30 pm

Location: Cankarjev dom

Address: Prešernova cesta 10, Ljubljana

Guests will be welcomed with a drink, followed by a seated dinner and award ceremony.



**Meeting Point:** The meeting point for Gala Dinner is directly at Cankarjev dom. Please be sure to use the entrance located at the Trg Republike. Cankarjev dom is in the city center, in the walking distance of majority of conference hotels. In the event that you are arriving from SEB LU, take bus 6 or bus 11 in the direction of city center to get to bus stop 'Konzorcij', from which Cankarjev dom is in five minutes walking distance.

**About the Cankarjev dom:** The Cankar Centre, also known as Cankarjev dom or Cankar Hall is a multipurpose centre. Designed by Prof. Edo Ravnikar, the student of the notable master of architecture Jože Plečnik, Cankarjev dom is an architectural gem, whose splendour has not diminished with time. Gala dinner will be held in Grand Reception Hall. Proclaimed a cultural heritage monument, the hall is considered one of the finest in Slovenia.



### Gala Dinner

Cankarjev dom

Address: Prešernova  
cesta 10, Ljubljana

Location of  
Cankarjev Dom

### Tesla vehicle test drive

At the 16th IAAE European Conference you will have the opportunity to experience the unique performance and technology of a Tesla electric vehicle, arranged by GEN-I, the conference golden sponsor! Book your slot, and our drivers will take you for a ride in the vicinity of Ljubljana. Please note that the number of time slots are limited. For more information and booking, please visit the Conference Registration Desk.

# TECHNICAL TOURS

All information about technical tours and departure times are available at the Conference Registration Desk. For additional details and booking you may also contact IAEE 2019 Official Travel Office Go Green at [iaee@go-green.si](mailto:iaee@go-green.si). Please note that the minimum number of participants is 16, and that in case of a lower number of participants the price might change or the Technical Tour may be canceled.

## Sunday, 25th of August 2019

### Technical tour to Kidričevo Compressor Station and Ptuj Wine Cellar

**Duration:** 8 hours

#### Guided tour of Kidričevo Compressor Station

The Kidričevo Compressor Station is an important part of Slovenian transmission network, and it provides uninterrupted supply and transfer of natural gas in the Republic of Slovenia. Discover more about Kidričevo Compressor Station during this very informative and insightful guided technical tour!

#### Guided tour of Ptuj Wine Cellar

Wine is one of the most important building blocks of the history of Ptuj, the oldest town in Slovenia, aging back to the year 69 a.d. The Ptuj winery hosts the largest and most famous collection of vintage wines in the region. Guided tour of the cellar includes the audio-visual presentation titled "When the drop sparkles", cheese bread roll and tasting of the 4 different wines.

## Thursday, 29th of August 2019

### Technical tour to Hydro Power Plant Brežice and Otočec Castle

**Duration:** 6.5 hours

#### Guided tour of the hydro-power plant Brežice

The tour starts with the presentation of the model of the hydro power plant Brežice, located on the Sava River. The guide will explain the operation of the power plant and its building process, and then proceed to HPP Brežice command room, where all power plants on the lower part of river Sava in Slovenia are operated from. The tour ends outside, where you will have a chance to see the power plant's spillway, a passage for aquatic organisms (fish trails) and the accumulation pool.

#### Otočec Castle and food tasting

Otočec Castle is the only castle situated on a river islet in Slovenia, surrounded by a beautiful and picturesque landscape. The tour also includes food tasting, so be sure to sign up and try some of the local specialties of Dolenjska region!

# School of Economics and Business University of Ljubljana

The School of Economics and Business, University of Ljubljana (the SEB LU) was established in 1946. It is one of 23 faculties and 3 art academies of the University of Ljubljana, which is the largest public university in Slovenia with over 40,000 students. The School of Economics and Business is the largest higher education and research institution in the field of business and economics in Slovenia, and also the university's biggest centre for executive education.

The SEB LU is among only 77 business schools in the world which have the so-called "triple crown" accreditation (EQUIS, AACSB, AMBA). It is positioned as a school of choice within Central Europe and has international partnerships with around 200 leading universities world-wide. It also hosts the only Confucius Institute located at a business school in Central and Eastern Europe, which was awarded for its excellence in 2018.

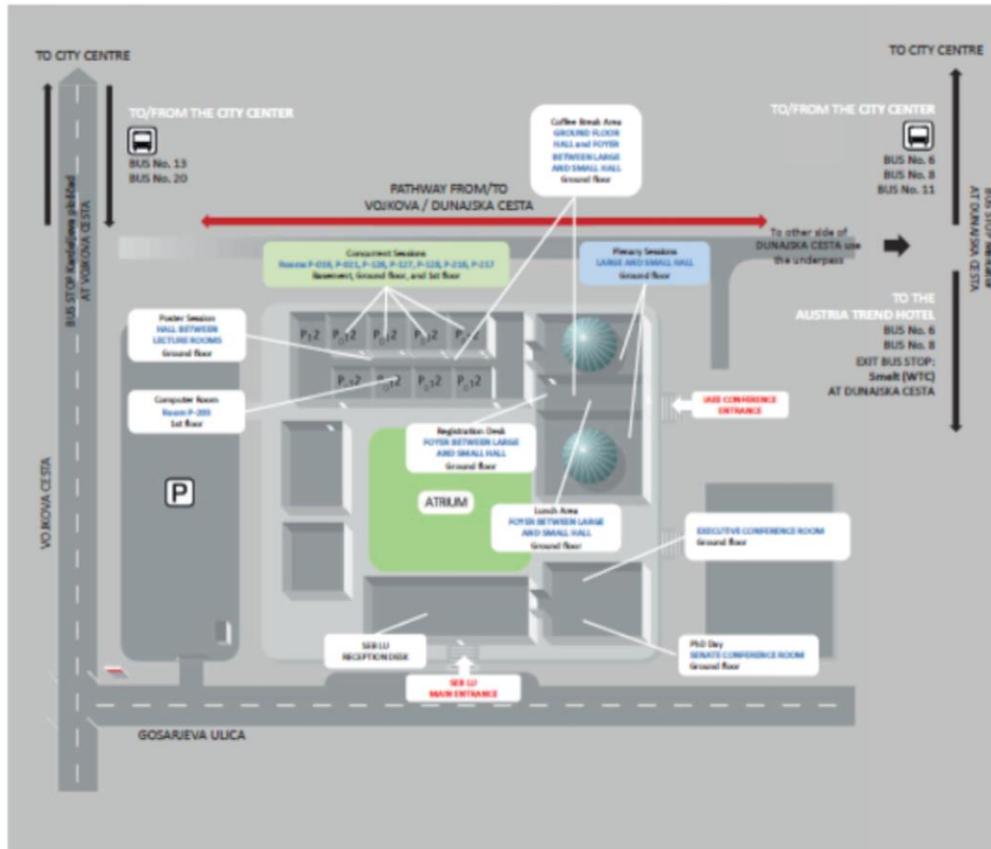
The SEB LU's core values are: eagerness to learn, creativity, entrepreneurialism, integrity, respect, inclusiveness. Following the adoption of the SEB LU's new 2016-2020 strategic plan, its new mission is to broaden horizons and build competences for the socially responsible management of business and economic challenges.

The SEB LU provides education at all levels (undergraduate, graduate, doctoral, executive and lifelong learning) and in most key areas of specialization. It offers Bologna type programmes in all three cycles (3+2+3 structure). Prospective students can choose among 17 study programmes at three different study levels (undergraduate, graduate, doctoral). Almost all of them are aimed at an international audience and are consequently offered in English (in parallel to constitutionally required Slovenian study tracks). Furthermore, several double and joint degree programmes with renowned schools are also offered. Close to a thousand international students study at the SEB LU each year or attend its famous Ljubljana Summer School "Take the Best from East and West", which last year attracted over 500 students from more than 40 different countries.



# SEB LU MAP

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FLOOR	EVENT	ROOM
Basement	Concurrent Session	P-019, P-021
Ground Floor	Plenary Session	Large Hall, Small Hall
	Concurrent Session	P-126, P-127, P-128
	Poster Session	hall between lecture rooms
	PhD Day	Senate Conference Room
	Post-Conference Seminar	Executive Conference Room
	Meetings	Senate Conference Room, Executive Conference Room
	Student Breakfast	Senate Conference Room
	Coffee Breaks	foyer between Large and Small Hall, Hall between lecture rooms
	Lunches	foyer between Large and Small Hall
	Registration Desk	foyer between Large and Small Hall
1st Floor	Concurrent Session	P-216, P-217
	Computer Room	P-203

# USEFUL INFORMATION

## Address of the Conference Venue

School of Economics and Business, University of Ljubljana, Kardeljeva ploščad 17, SI-1000 Ljubljana,  
Phone number: +386 1 5892 400

## Registration Desk

The desk is located in the Main Lobby (ground floor) and open on:

- Sunday 25 August: 10:00 am – 8:00 pm
- Monday 26 August: 07:30 am – 06:00 pm
- Tuesday 27 August: 08:00 am – 5:30 pm
- Wednesday 28 August: 08:00 am – 12:00 pm

## Access to the Conference Rooms and Social Events

All participants will receive a conference package and a badge during the registration at the conference. The badge must be worn all times and is your entrance ticket to the session rooms and any events organized outside the conference venue.

## Computer and Internet Access

Open wireless internet connection is included in your registration fee (select "EF public", no password is required).

Participants have also the possibility to use the computers in the room P-203 (first floor).

Login information: username = efdogodek, password = efl.

## Uploading Your Presentation

Presenters can upload their presentations to a special IAEE-related (folder "IAEE2019") partition of the FELU server using any of the computers made available to delegates in computer rooms and session rooms.

Login information: username = efdogodek, password = efl.

## Lost Property

Please contact the registration desk in the Main Lobby (ground floor), if you have lost or found any item.

## Emergency Situations and Medical Services

In case of emergency call 112 (SOS - Ambulance, Fire Brigade) or 113 (Police). These calls are free. No region code is required.

## Fire Alarm and Evacuation

In case of fire alarm you are required to evacuate the building immediately without further delay. The security staff will direct you to the emergency exits.

## Smoking

SEB LU is a non-smoking facility. We kindly ask you to respect this.

## Copying Service

A copying service COPIS is located in the basement of the SEB LU.

**Transportation:** Please see <https://iaee2019ljublana.oitco.eu/gettingtotheconference> for more information.

#### Official IAEE 2019 Airport Transfer Service

Participants have the option to book airport transfers, hotels and sightseeing trips at reduced rates during the registration process through our third-party provider Go Green, which is the Official Travel Office for the conference (The company name is Ekoturizem).

#### Shuttle Transfer Service

Ljubljana is approximately 30 min drive from the Jože Pučnik Ljubljana Airport. The shuttle service will run through the day and please note maximum waiting time at the airport (upon arrival or at departure) is 40 minutes to combine transportation. In case of an emergency please call our 24/7 Office phone number: +386 (0)51 303 404.

Arrival Shuttle Transfer Service will be organized on Saturday, 24 August 2019 and Sunday, 25 August 2019 from Airport Jože Pučnik Ljubljana (Slovenia) to the official IEEE 2019 hotels/IAEE 2019 venue.

Departure Shuttle Transfer Service will be organized on Wednesday, 28 August 2019 and Thursday, 29 August 2019 from the IAEE 2019 venue/official IEEE 2019 hotels to Airport Jože Pučnik Ljubljana (Slovenia).

#### Individual Transfer Service

Individual transfers will be also organized for all participants and accompanying persons from all nearest airports (Airport Jože Pučnik, Ljubljana; Ronchi Airport, Trieste; Marco Polo Airport, Venice; Airport Franjo Tuđman, Zagreb) to the hotel/venue and back for a maximum of 3 people per car/passenger with no waiting time and an English-speaking driver.

Please see the following link for rates and additional information:  
<https://iaee2019ljubljan.oyco.eu/gettingtotheconference>.

#### Other transfer options from the Ljubljana Airport

There are regular bus lines leaving from the Ljubljana Airport to Ljubljana daily. The buses stop in front of the 'Departures' entrance to the Ljubljana Airport (please note that buses are less frequent on Saturdays and Sundays).

Different shuttle-van services operate from Ljubljana airport. Their stops are in front of the 'Arrivals' entrance to the Ljubljana airport.

#### Parking

Parking options are available in the area surrounding the SEB LU. The entrance to the largest parking in the proximity of SEB LU is from Gosarjeva ulica. Please find the rates here:  
[http://www.ef.uni-lj.si/visit\\_us](http://www.ef.uni-lj.si/visit_us).

#### Public Transportation

Please note that for using public transportation in Ljubljana, you need to have purchased and topped-up your Urbana card. **Urbana card** cannot be purchased or topped-up on the bus. Additionally, the bus fare cannot be paid directly on the bus in cash.

There are 5 buses at your service and School of Economics and Business can easily be reached via:

- Bus routes no. 13 (Sostro) and no. 20 (Nove Stožice); you may get in at the bus stop Turist, Dalmatinova or Bavarski dvor (bus stops in the city centre), the exit bus stop is **KARDELJEVA PLOŠČAD**
- Bus routes no. 6 (Črnuče), no. 8 (Brnčičeva) or no. 11 (Ježica); you may get in at the bus stop Konzorcij, Ajdovščina or Bavarski dvor (bus stops in the city centre), the exit bus stop is **MERCATOR**

Both stops are approximately 200 m from the conference venue.

You can also download **Urbana Mobile Application** which offers a user-friendly experience for smartphone owners equipped with NFC technology and with Android 4.4 or higher. Here is the QR code:



- 36 **Urbana single city card** is a no-contact smart card, allowing quick and convenient cash-free payment for rides on Ljubljana city buses. The Urbana card can also be used to pay for cable-car rides to the Ljubljana Castle, parking fees for white zones and parking lots managed by Javno podjetje Ljubljanska parkirišča in tržnice as well as the services of the Ljubljana City Library.

How to purchase Urbana? You can buy it at the "Urbanomat" (Urbana city card vending machine), which are located at several bus stops around Ljubljana, or at various points of sale. We suggest you take a look at links on conference web page for more information: <https://iaee2019ljubljana.oico.eu/gettingtotheconference>.

#### **Taxi**

For taxi service please dial +386 41 97 00 00 or +386 41 445 406 or ask for help at the Conference Registration Desk. We recommend you to order a taxi service by phone because stopping a taxi on the street could be more expensive.

#### **Time Zone**

Time zone currently used in Slovenia is CEST (Central Summer European Time). Slovenia is thus two hours ahead of the Greenwich Mean Time (GMT+2).

#### **Foreign Exchange and Banking**

The euro is the official currency in Slovenia. The exchange office closest to the conference venue is located in the World Trade Centre Ljubljana, two blocks away from SEB LU on Dunajska cesta 156. All major international credit cards are accepted in shops, hotels and restaurants. Traveller's cheques are also accepted by all banks, travel agencies and hotels, and in many shops. Foreign exchange services are also available at hotels. Most banks are open weekdays from 8 am to 4 pm. ATMs (Automatic Teller Machines) are available 24/7 and located throughout the city. Almost all ATMs have a language key which enables you to follow the instructions in English.

#### **VAT**

Value-added tax is nearly always included in quoted prices (9,5 % or 22 %). Numerous shops advertising "Tax-Free Shopping" in their windows make it possible for visitors from non-European Union countries to receive a refund of value added tax paid on a minimum of 50 euros worth of goods purchased in a single shop within a single day on condition that the goods are taken outside the country within three months from the purchase date.

#### **Electricity**

Electricity in Slovenia is a 230 Volts 50 Hz system. Slovenia uses the Europlug (CEE 7/16). This is the plug used in most other European countries.

#### **Opening Hours of Retailers**

Most stores are open weekdays at least from 9 am to 7 pm and Saturdays at least from 9 am to 5 pm. On Sundays large stores are open from 9 am to 3 pm.



Photo: Tomaz Torkar, Author: Nasa Cuppa d.o.o.

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## General conference sponsor



## Golden sponsors



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## Conference sponsors





# CONFERENCE ORGANISERS

**IAEE** INTERNATIONAL  
ASSOCIATION *for*  
ENERGY ECONOMICS  
[WWW.IAEE.ORG](http://WWW.IAEE.ORG)

University of Ljubljana

**SEB** SCHOOL OF  
ECONOMICS  
AND BUSINESS

**SAEE** SLOVENSKO  
ZDRUŽENJE *za*  
ENERGETSKO EKONOMIKO

<https://iaee2019ljubljana.oyco.eu/>

**#IAEE19LJ**

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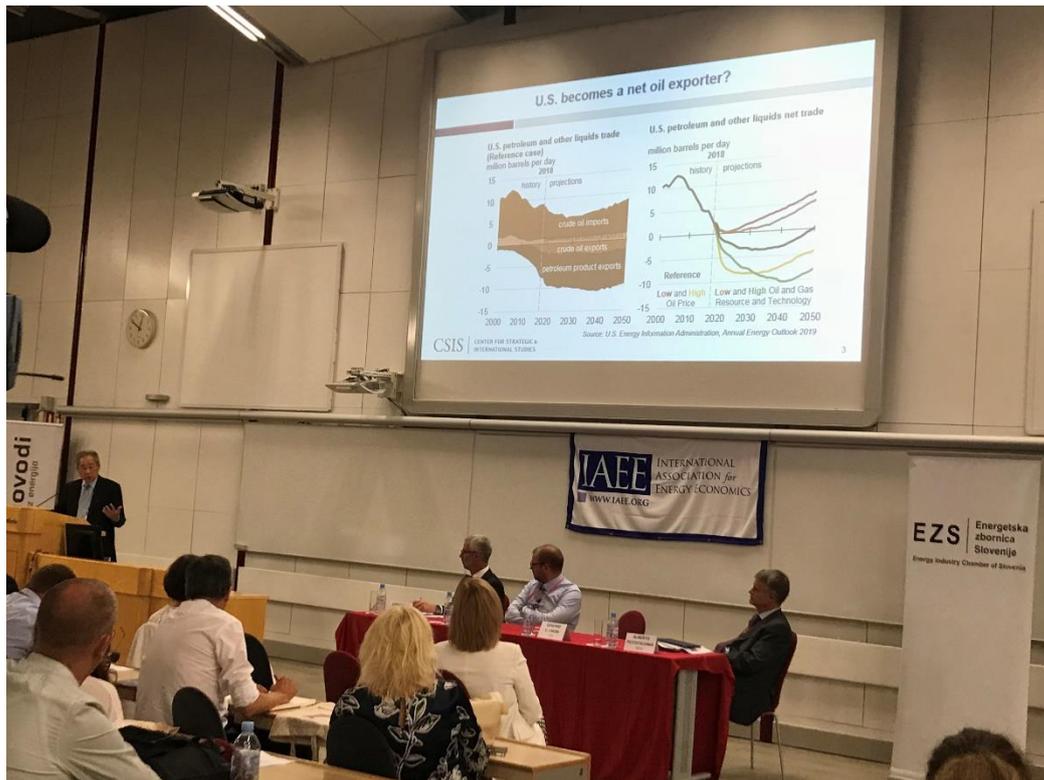
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照片說明：與大會旗幟合影



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照片說明：在斯洛維尼亞城堡舉行的雞尾酒晚會



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