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台電彰濱風電廠址區域化風場系集預報之應用評估研究

Ensemble Forecast of Regionalized Wind Field at Taipower Changbin Wind Farm

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摘　要

台電在完成第一二期離岸風場後，將展開長達 20 年的運維工作，掌握海域環境條件是非常重要的一環。本研究透過國內外氣象預報資料(公里解析度)蒐集，並採用商用 WindSim 風能評估軟體降尺度模擬彰濱區域風場(百公尺解析度)，最終迴歸分析歸納跨尺度風場轉換函數。建置完成的「台電彰濱風電廠址風能系集預報展示系統」將作業化下載即時氣象預報資料，藉由跨尺度風場轉換函數快速推估至本公司彰濱風電場。並根據鄰近即時氣象觀測資料，應用誤差累進修正技術滾動校正推估結果，以提高準確度。未來在風場應用上，即可透過客製化預報展示系統，視覺化展示即時預報成果，或透過資料串接加值成為各項再生能源發電所需資訊，滿足未來長期的風場營運需求。

Abstract

After the completion of the first and second phases of offshore wind farms, Taipower will carry out 20-years operation and maintenance(O&M)work, and mastering the environmental conditions of the sea is a very important part. This study collects domestic and foreign meteorological forecast data(kilometer resolution), and uses WindSim, a commercial wind energy assessment software, to downscale and simulate the wind field of Zhangbin Wind Farm(100-meter resolution). The final regression analysis includes the cross-scale wind field transfer function. The completed "Taipower Zhangbin Wind Farm Wind Energy Collection Forecast Display System" will download real-time weather forecast data, and quickly estimate it to the company's Zhangbin Wind Farm through the cross-scale wind field transfer function. And based on the nearby real-time meteorological observation data, the error progressive correction technology is used to roll and correct the estimation results to improve the accuracy. For the wind farm application in the future, the customized forecast display system can be used to visually display the real-time forecast results, or the information required for various renewable energy power generation can be added through data concatenation to meet the long-term wind farm operation needs in the future.

關鍵詞(Key Words)：彰濱風電場(Changbin Wind Farms)、系集預報(Ensemble Forcasting)、動力降尺度(Dynamical Downscaling)。

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FOUND 設計成果可靠度探討-鐵塔基礎設計再精進

Reliability of FOUND Program Design Results - Refinement of Tower Foundation Design

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摘　要

本文主旨在探討以 FOUND 程式應用於鐵塔基礎設計時，考量程式未依最新混凝土結構設計規範修訂內建參數，進而探討其設計可靠度，文中以 69kV 鳳林~光復線#2 鐵塔基礎新建工程為研討案例，檢討 FOUND 設計成果，探討其設計流程的盲點與程式的限制及其產生後續影響，供各單位未來辦理設計時參考。

Abstract

The main purpose of this paper is to discuss the design reliability of the FOUND program when applying to the design of tower foundation, taking into consideration the situation that the built-in parameters of the program have not been revised in accordance with the latest codes for concrete structure design. In this paper, the foundation construction project of the 69kV Fenglin-Guangfu line #2 tower is taken as a case study to review the FOUND design results, and to discuss topics such as the blind spots in the design process, the limitations of the program and their subsequent impact, for the reference of relevant units of the company.

關鍵詞(Key Words)：台電自行開發程式集(FOUND)、MIDAS 套裝軟體(MIDAS Design+)、鐵塔基礎設計(Tower Foundation Design)、設計檢核(Design Check)、程式應用(Program Application)。

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智慧綠建築之使用管理與應用-以福和 D/S 多目標使用大樓新建工程為例

Utilization Management and Application of Intelligent Green Buildings - Taking Fuhe D/S and Multi-objective Complex Building Project as an Example

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摘 要

智慧綠建築依據國人生活習慣與文化特性，考量建築節能、環境永續，並善用台灣現有資訊與通訊科技優勢，提出人文與科技兼顧的智慧綠色生活願景。透過綠建材評定制度，保障國人健康，遏止劣質建材傾銷，並促進國內優良建材產業市場商機，達到雙贏目標；透過智慧建築認證制度，彰顯建築物之差異化價值，加速國內智慧建築之發展，提高我國建築物品質。本文以「福和D/S暨多目標綜合大樓新建工程」為例，規劃完工後取得銀級智慧建築標章及鑽石級綠建築標章，並結合於由施工階段導入之BIM技術，將智慧綠建築技術應用於大樓使用設施管理。

Abstract

Based on the living habits and cultural specificity of Taiwan society, intelligent green buildings, putting building energy conservation and environmental sustainability into consideration and making good use of Taiwan's existing information and communication (ICT) technology advantages, propose a vision of smart green life that combines humanities and technology. The green building material evaluation system not only helps protect the health of the citizens, curb the dumping of inferior materials, but also boosts the market of high-quality building materials, so as to achieve a win-win goal. Through the certification system of intelligent buildings, the differentiated value of buildings is highlighted, the development of domestic intelligent buildings is accelerated, and the quality of domestic buildings is improved. Taking the Fuhe D/S and Multi-objective Complex Building Project as an example, shortly after its planning is completed, it has obtained the Silver Intelligent Building Label and the Diamond Green Building Label, and during the construction stage, introduced the BIM technology and applied intelligent green building techniques to its management of building facilities.

關鍵詞(Key Words)：綠建築(Green Building)、綠建築標章(EEWH)、智慧建築(Intelligent Building)、建築資訊模型(Building Information Modeling, BIM)。

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居家能源管理系統(HEMS)應用服務及商業模式研究

Applications and Business Model for Home Energy Management System (HEMS)

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摘 要

因應電業法修法及再生能源轉型政策，台灣電力市場將逐步邁向自由化，然而如何在自由競爭的市場快速累積用戶群，並發展經常性獲利的商業模式，將是重要的議題。

本研究針對國內與國外產業進行調研，並分析國內產業環境，總結出通訊業者為居家能源產業最大的競爭對象，建議可與智慧家庭廠商合作，提高消費者體驗。

在場域實證上，本研究於期初進行網路千人問卷，定義目標客群，並招募 102 戶用戶，實際於社區實證、蒐集數據。根據體驗問卷結果，建議將推廣重點集中於焦點客群，並持續擴充系統功能，使焦點客群體驗更佳進而提升願付價格。同時，本研究將用戶累積之數據進行資料探索與區域特性分析、選址分析、精準行銷等加值應用，未來市場值得期待。

Abstract

In response to the amendment of the Electricity Act and the renewable energy transformation policy, Taiwan's electricity market will gradually move towards liberalization, and how to win customers in a competitive market and develop a business model to make regular profits will be an important issue. Therefore, we conduct a research on domestic and foreign industries, and analyze the domestic industrial environment, and conclude that telecommunication companies will be the biggest competitors in the home energy industry. It is recommended to cooperate with smart home manufacturers to improve consumer experience. In terms of field demonstration, at the beginning of this research, an online survey of 1,000 people was conducted to define the target customer group, and 102 customers were recruited to conduct actual community demonstration and data collection. According to the results of the survey, it is recommended to focus the promotion on the key customer groups and continuously expand the system functions to increase their willingness to purchase the service. In addition, this research uses the accumulated customer data for data exploration, regional characteristics analysis, site selection analysis, precision marketing and other value-added applications. In conclusion, the market for value-added electricity data applications has great potential.

關鍵詞(Key Words)：居家能源管理服務(Home Energy Management Service)、能源事業轉型(Transformation of the Energy Business)、HEMS 商業模型(HEMS Energy Management Business Model)、加值服務(Value-added Services)、數位精準行銷(Digital Marketing)。

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非侵入式家電負載解析技術精進與商業應用模式研究

A Study on NIALM Technology Refinement and Business Application Model

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摘　要

透過智慧電表大數據分析開創各種商業加值服務，為全球電業公司目前積極發展業務方向。非侵入式家電負載解析技術為智慧電表大數據分析之關鍵技術，利用智慧電表所提供每15分鐘電力參數，以人工智慧演算法，解析出主要家電之用電負載，以提供節電、負載移轉等需求面管理，以及居家活動偵測照護等加值服務。

本研究使用高頻暫態電力特徵NIALM技術，於實驗屋辨識10種家庭一般常使用的電器，其整體負載辨識率可以達到90.6667%，對比於使用高頻穩態特徵如實功率、需功率及電流總諧波失真率的平均80%高出許多。

此外，發展遷移學習技術，利用非電力資訊之相似性比對，以樣本家庭戶的家電模型，來解析非模型訓練智慧電表用戶之細部用電，以利擴大相關應用之商業推廣。最後，導入50戶實場域進行技術及商業模式驗證，並進而規劃出後續異業結盟之商業合作模式。

Abstract

Smart meter big data analysis may create a variety of commercial value-added services and help global power companies actively develop their business. The non-intrusive home appliance load analysis technology is the key for smart meter big data analysis. Using the power parameters provided by the smart meter every 15 minutes, the artificial intelligence algorithm is used to analyze the power load of major household appliances to provide demand-side management measures such as power saving and load transfer, as well as value-added services such as home activity detection and care. In this study, we use the high-frequency transient power featured NIALM technology to identify 10 kinds of electrical appliances, which are commonly used in households, in the experimental house, and the overall load identification rate can reach 90.6667%, much higher than the average THD ratio of 80%. In addition, by developing transfer learning technology and using the similarity comparison of non-electricity information, we analyze the detailed electricity consumption of non-model-trained

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smart meter users with the home appliance model of sample households, so as to facilitate the expansion of commercial promotion of related applications. Finally, import 50 real-world households were introduced to verify the technology and business models, and then plan a business cooperation model for subsequent cross-industry alliances.

關鍵詞(Key Words)：智慧電表(Smart Meter)、非侵入式家電負載解析(Non-Intrusive Appliance Load Monitoring)、遷移式學習(Transfer Learning)。

天然氣的供應轉型-台灣2050邁向淨零排放之核心關鍵

Transformation of Natural Gas Supply-The Key for Taiwan to Achieve 2050 Net-Zero Emissions

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摘　要

隨著各國紛紛推動淨零排放政策，對於國內能源供應及企業經營將有極大衝擊，預期各國能源供應結構之調整將無法避免。因再生能源發展尚在進行中，無法立即全面取代化石燃料，低碳之天然氣將扮演兼具穩定供應以及減碳效益之能源過渡橋梁。我國之天然氣供應於淨零轉型短中期可透過引進碳中和 LNG、燃氣電廠加裝 CCS 等方式，以達成減碳排效果；長期下，當 CCUS、合成天然氣與氫能等關鍵技術發展成熟後，可預期再生能源、天然氣與氫氣三者供應系統相互配合以形成碳循環供應鏈。若欲達成2050年淨零排放目標，台灣政府與天然氣業者需就關鍵技術儘早進行研發投資與設備建置。

Abstract

As more and more countries promote net zero emission policies, there will be a great impact on the energy supply and business operation in Taiwan. It is expected that the adjustment of worldwide energy supply structure will be inevitable. As the development of renewable energy is still in progress, fossil fuels cannot be replaced immediately. Therefore, low-carbon natural gas will act as an energy transition bridge for owning the advantages of stable supply and carbon reduction benefits. In the short and medium term of Taiwan's net-zero transition, natural gas can reduce carbon emissions by introducing carbon-neutral LNG and installing CCS in gas-fired power plants; .in the long-term, when key technologies such as CCUS, synthetic natural gas, and hydrogen energy are mature, it can be expected that the supply systems of renewable energy, natural gas and hydrogen will cooperate with each other to form a carbon cycle supply chain. To achieve the target of 2050 net-zero emissions, the Taiwan government and natural gas companies need to invest in R&D and facility construction for key technologies as early as possible.

關鍵詞(Key Words)：淨零排放(Net Zero)、碳捕捉、再利用及封存(Carbon Capture, Utilization and Storage)、碳中和 LNG(Carbon-Neutral LNG)、合成天然氣(Synthetic Natural Gas)。

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「溫室氣體減量及管理法」修法草案對電力業之影響及評析

Effects of the Draft Greenhouse Gas Reduction and Management Act on the Electric Industry in Taiwan

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摘　要

台電公司身為國營事業，多年來肩負電力供應與品質之任務外，亦致力推動各項溫室氣體管制策略，包含透過盤查掌握溫室氣體排放量，展開多元減量措施(如：低碳燃料轉換、增進能源效率、推動節電及發展再生能源等計畫)，並規劃碳權經營，以達成政府賦予之減量責任。為因應行政院環境保護署近年推行《溫室氣體減量及管理法》修法工作，包括 2050 淨零排放目標入法、提升層級強化氣候治理、增訂氣候變遷調適專章、強化排放管制及誘因機制促進減量、及徵收碳費專款專用等工作，上述修法方向將影響國內電力業經營管理，本研究以電力業角度追蹤修法動態、深入瞭解與解析。

主要研究重點：(一)解析《氣候變遷因應法》修法內容、(二)借鏡先進國家制度及推動經驗、(三)研析對國內電力業營運可能造成之影響、(四)研提國內電力業因應《氣候變遷因應法》策略建議。

Abstract

As a state-owned enterprise, Taipower has not only been responsible for stable and high-quality power supply, but also committed to promoting greenhouse gases (GHGs) control strategies, including grasping GHG emission through inventory and launching multiple reduction measures, such as low-carbon fuel conversion, energy efficiency improvement, promotion of electricity conservation and development of renewable energy, etc., and planning of carbon credit management to achieve the reduction responsibility assigned by the government. The amendment of the "Greenhouse Gas Reduction and Management Act", promoted by the Environmental Protection Administration, Executive Yuan, includes accommodating the 2050 net zero emission target into the Act, upgrading the level of public administration to strengthen climate governance, adding a special chapter on climate adaptation, strengthening emission control and incentive mechanisms to promote reduction, and the collection of special fund for carbon fees (the above-mentioned revision direction

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will drastically affect the operation and management of the domestic electric industry). This study tracks the dynamics of the said amendment and reviews its effects to the electric industry. The main focuses of this study include (1) analyzing the major amendment of the Act, (2) learning from advanced countries' systems and promotion experience; (3) analyzing the possible impact on the operation of domestic electric industry, (4) putting forward suggestions on strategies for the domestic electric industry to respond to the Act.

關鍵詞(Key Words)：溫室氣體減量及管理法(Greenhouse Gas Reduction and Management Act)、氣候變遷因應法(Climate Change Act)、溫室氣體減量策略(Greenhouse Gas Reduction Strategies)。

台電綠網之瀏覽滿意度與環保推廣成效分析

Browsing Satisfaction and Environmental Protection Promotion Effectiveness of Taipower Green Net

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摘　要

台灣電力公司(以下簡稱台電)環境保護處於民國 104 年建置「台電綠網」，記錄台電人對於環境與鄉土的用心，也期盼發揮正向影響力，邀請民眾一同關注環保。綠網設立截至 111 年已邁入第 7 年，為評估網站之營運成效，進而作為改善綠網經營策略的依據，本次研究透過問卷調查執行，期望具體掌握受眾輪廓、受眾瀏覽滿意度，並評估綠網對於環保理念推廣的影響力。

根據分析結果，綠網瀏覽滿意度受到以下因素的正向影響，包含受眾本身的環保意識、造訪頻率、對網站資訊內容的評價、以及版面配置操作是否方便等。而綠網瀏覽滿意度則對於台電的企業社會責任、電業知識科普、再生能源的發展重要性、環境保護理念等四大項的了解與認同，均有正向的影響關係。

本文是綠網首度進行受眾分析，藉由本次調查所建立的基準點，未來若持續進行資料蒐集，將有助於往後的網路行為分析及推廣策略應用。

Abstract

The Department of Environmental Protection of Taiwan Power Company established the "Taipower Green Net (TGN)" in 2015 to record the company’s care for the environment and homeland, and to exert a positive influence inviting the public to pay attention to environmental protection. Uuntil 2022, It has been the 7th year since the establishment of TGN. To evaluate the operational effectiveness of the website and then serve as a basis for improving TGN's business strategy, this research, through questionnaire and survey, hopes to know more about the website visitors’ profile and their satisfaction with TGN, and evaluate the influence of the Net on the promotion of environmental protection concepts. According to the analysis results, the browsing satisfaction of TGN is positively affected by the following factors, including the audience's own environmental awareness, visit frequency, evaluation of the website information content, and whether the layout operation is convenient, etc. The browsing satisfaction of TGN has a positive impact on the understanding and recognition of Taipower's corporate social responsibility, popularization of electric power knowledge, the importance of renewable energy development, and environmental

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protection concepts. This is the first time that TGN conducts audience analysis. Based on the benchmark established in this survey, and it has obtained a high percentage of positive responses on various topics. The benchmarks established in this survey and incessant data collection in the future will be helpful for TGN to analyze the website visitors' behaviors and implement strategic applications.

關鍵詞(Key Words)：台電綠網(Taipower Green Net)、環保意識(Consciousness of Environmental Protection)、瀏覽經驗(Browsing Experience)、瀏覽滿意度(Browsing Satisfaction)、企業形象(Corporate Image)、企業社會責任(Corporate Social Responsibility)、環保網站(Environmental Protection Website)。