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應用脈波反射儀特定位地下電纜線路故障區間介紹

Introduction to Location Positioning of Power Cable Line Using Pulse Reflector

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摘　要

　　本文將就 69kV 級以上電力電纜線路故障時，突破電流二分法查修模式，提出快速偵測及診斷技術，在不抽水及不拆接地線的條件下，快速判斷出事故區間，確保供電安全。

Abstract

　　This article will focus on how to use the breakthrough current dichotomy inspection method to quickly detect and diagnose 69 kV or above power cable line fault, and quickly determine the fault interval without pumping water and disconnecting the grounding wire to ensure the safety of power supply.

關鍵詞**(Key Words)**：脈波反射儀(Pulse Reflector)、電纜(Cable)、偵測(Detection)、診斷(Diagnosis)。

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Google Apps Script 結合最佳化演算法創建即時寄送輸電架空線路拉力檢討程式

Google Apps Script Combined with Optimization Algorithms to Deliver Real-time Overhead Transmission Line Tension Information

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摘　要

　　輸電線路架線拉力計算乃為規劃輸電線路建置方案之參考依據，其中輸電導、地線架線拉力設計理論，更是為輸電設計專業知識領域，然其架線設計時需考慮區域風速、風壓、導線種類、最大工作張力、等價跨距及臨界跨距等參數，定義出第 1(最糟)狀態，經由導線懸垂連方程式，求出第 2(平時架線)狀態下之線路架線拉力，其中計算過程十分繁瑣，需使用辦公室電腦程式進行計算，始得獲得平時架線拉力等資料。實際上，現場規劃遷移方案或是施工臨時需求，亟需立即提供弛度及架線拉力等資料，則面臨無法「即時」提供之窘境，爰藉由 Google Apps Script 免費軟體結合最佳數學演算法，重新開發輸電線路架線拉力應用程式，賦予程式「即時」服務功能，以提升工作效能。

Abstract

The calculation of the wire tension of transmission lines is a reference basis for planning the construction of transmission lines. The theory of wire tension design of transmission conductors and ground wires is also a professional knowledge field in power transmission design. However, when designing the wiring, it is necessary to consider parameters such as regional wind speed, wind pressure, conductor type, maximum working tension, equivalent span and critical span to define the first (worst) state, and then through the conductor suspension connection equation, to obtain the line frame of the second (normal wired) state. The afore-mentioned calculation process of wire tension is very cumbersome and requires the use of office computer programs to obtain data such as the normal wire tension. In fact, whether it is an on-site planning, relocation plan or temporary need during construction, information such as sag and wire tension must be provided immediately. In view of this, we use Google Apps Script free software combined with optimization algorithms to develop a new transmission line wire tension application to improve work efficiency by delivering real-time information.

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全國首座山區屋內式開閉所之設計創新及施工實務分享－義和開閉所暨所外連接站

Innovative Design and Construction Practices of Taiwan's First Mountainous Indoor Switch Yard – Yihe Switch Yard and Its External Connection Station

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摘　要

義和開閉所暨所外連接站工程完成後，可將通霄~義和 345kV 線先行雙分歧於既設峨眉～后里 345kV 線再改接至義和開閉所，以強化供電安全及易於電力調度維護。由於工程基地位於大湖鄉義和村山區，除須依本計畫環境影響說明書(含環差報告)之承諾事項辦理，降低對當地景觀視覺衝擊，及申請水土保持計畫審核、加強山坡地雜項執照併建築執照可順利通過。首要之務為思考如何設計出一棟建築物(含 3 座連接站鐵塔)具視覺相容於山中，符合無人化開閉所具節能減碳及配合當地生態，朝自然成林低維護管理為目標，與當地生態及水土保持串聯，達到友善環境，以獲得當地主管機關及居民認同而不反對興建本工程。另外，對於 345kV 連接站鐵塔基礎改以反梁設計，具有防止雨水進入直井、電纜延放簡單且長度減少，及結構體施工容易而提升安全性，值得參考設計。

Abstract

After the completion of the Yihe Switch Yard and its external connection station project, the Tongxiao to Yihe 345 kV line can be bifurcated at the existing Emei to Houli 345kV transmission line and then rerouted to the Yihe Switch Yard to enhance power supply security and improve the efficiency of power dispatch and maintenance. Since the project foundation is located in the mountainous area of Yihe Village, Dahu Township, in addition to complying with the commitments outlined in its Environmental Impact Statement (including the environmental impact report), the project must also minimize the visual impact on the local landscape, apply for soil and water conservation review, and strengthen miscellaneous matters on hillside areas. The primary focus of this project is to design a structure (including three connecting station towers) compatible with the surrounding mountains, the energy saving and carbon reduction features of an unmanned substation, and the local ecology, so as to achieve the goals of environmental friendliness, low maintenance and management costs, and approval of the local authorities and residents. In addition, it is worth mentioning that the foundation of the 345kV connection station tower is changed to a reverse beam design, which can prevent rainwater from entering the vertical shaft, make cable extension simple by reducing its length, and make the structure construction easier and improve safety. The afore-mentioned practices may serve as reference for the company to carry out similar projects in the future.

關鍵詞 (Key Words)：開閉所(Switch Yard)、連接站鐵塔(Connecting Station Tower)、節能減碳(Energy Saving and Carbon Reduction)、反梁設計(Reverse Beam Design)。

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輸電塔基導入自動化環境與大地量測技術精進之研究

Introduction of Automated Measurement Technology for Transmission Tower Foundation in Environment and Geodetic Surveying

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摘　要

過往，維護單位若需進行塔基風險評估，多仰賴人工辦理現地勘查與量測，其不僅僅耗費大量人力與費用外，對於位處偏遠山區之塔基更加費時費力且無形中亦會增加工作人員之工作危害。有鑑於此，引進並發展自動化監測技術更具有其必要性。本研究基於過往塔基微氣象環境監測研發成果，進一步擴充自動化感測至大地量測項目，並提升原有塔基監測系統設計之完整性與可靠性。本研究分別於中部與東部地區增設 4 處塔基監測系統，並透過塔基即時監測資訊平台有效管理每座塔基監測數據與資訊，並進行定性及定量之預警分析。本研究亦進一步進行數據分析，並與鄰近之交通部中央氣象署氣象站監測數據相互比對。此外，為達成將來全面落實塔基監測之目標，在設備佈設位置、高度及方向等亦均研定相關準則以供依循參用。

Abstract

In the past, if maintenance units needed to conduct tower foundation risk assessments, they mostly relied on manual on-site surveys and measurements. This not only consumes a lot of manpower and expense, but also is time-consuming and labor-intensive for tower foundation located in remote mountainous areas, and will also virtually increase the hazards for workers. In view of this, it is even more necessary to introduce and develop automated monitoring technology. This study not only further expands the past research and development (R&D) results of tower foundation micro-meteorological environment monitoring into automated sensing to geodetic surveying projects, but also improves the integrity and reliability of the original tower foundation monitoring system design. In this study, four monitoring systems for tower base were added in central and eastern Taiwan, and each monitoring data were effectively managed through the real-time tower foundation information platform. Qualitative and quantitative early warning analysis is carried out through data statistics and analysis. This research also further conducted data analysis and compared the monitoring data with the nearby weather station of the Central Weather Bureau of the Ministry of Transportation and Communications. In addition, in order to achieve the goal of fully implementing tower foundation monitoring in the future, relevant guidelines have been developed for equipment layout location, height and direction for reference.

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區域用電與預測冷氣資訊分析可視化應用研究

A Study on Visualization Application of Regional Electricity Consumption and Analysis of Air Conditioning Usage Forecast Information

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摘 要

　　研析世界各國區域能效及冷氣使用的預測方法，歸納出臺灣可借鏡之處，利用統計等技術以公開資料完成住宅用電與其他特徵迴歸分析，並找出具節電潛力之村里作為問卷調查目標。同時，建置用電資訊平台，以顯示村里區域的用電及預測冷氣使用資訊，最後提出節能獎勵或補助等措施之改善參考建議，以期擴大整體節電效益。

　　將全國近百萬戶低壓 AMI 用電資料利用 DBSCAN 分群，共分出 19 種用電類型，其中以「晚上用電」、「半夜用電」、「傍晚用電」佔最大比例。藉由分析結果，結合訓練好之空調模型，以 AI 技術解析空調能耗；並利用三個熱點村里之住戶問卷調查作為驗證演算法依據，其準確度高於 80%。

　　最後，整合智慧電表大數據資料庫建置 SAS 圖資系統，呈現以村里為單位之低壓 AMI 用戶的用電分佈及村里特徵。評估區域用電特性，提出可提供政府調整節能獎勵或補助等措施之參考建議。

Abstract

　　This study aims to analyze the prediction methods of regional energy efficiency and air-conditioning usage in various countries around the world, summarize what Taiwan can learn from, use statistical and other techniques to complete regression analysis of residential electricity consumption and other characteristics using public data, and identify villages with energy saving potential as a questionnaire survey target. At the same time, an electricity consumption information platform is built to display electricity consumption and forecast air-conditioning usage information in the village area. Finally, reference suggestions for improvements in measures such as energy-saving incentives or subsidies are put forward to expand the overall energy-saving benefits.

　　The low-voltage AMI electricity consumption data of nearly one million households across Taiwan was grouped using DBSCAN, and a total of 19 types of electricity consumption were classified, among which "power consumption at night" , "power consumption in the middle of the night" , and "power consumption in the evening" accounted for the largest proportion. Through the analysis results, combined with the trained air-conditioning model, AI technology is used to

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analyze air-conditioning energy consumption, and household questionnaires in three hotspot villages are used as the basis for verifying the algorithm, and its accuracy is higher than 80%.

Finally, a SAS graph system was built by integrating the smart meter big data database to present the electricity consumption distribution and village characteristics of low-voltage AMI users based on villages. The aforementioned research results may serve as reference for the government to adjust measures of energy-saving incentives and subsidies, among others.

台電資料治理規劃與推動

Taipower's Data Governance Planning and Implementation

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摘 要

本研究案以 AWS 資料治理框架 Governance@Scale(以下簡稱 G@S)、AWS G@S 核心準則、AWS G@S 成熟度評估與 SWOT 分析、AWS G@S 實施規劃與執行方針為基礎，致力於建立資料治理推動機制及資料規範，透過客製化治理框架與明確的驗證流程，以確保資料平台上正確性與可用性。

在 AWS 資料治理框架 G@S 的八大支柱架構下，將調研、梳理、推動機制和規範制定等工作納入「對齊階段」和「執行階段」，並以逆向工作法根據業務目標進行研討會和訪談，深入了解公司資料治理現狀、差距，提出實施建議。同時，提供資料治理人才賦能計畫，透過培訓確保同仁擁有必要的資料治理能力。

本案希冀台電公司未來各系統擁有資料管理能力及協作機制，實現資料共建、共治、共享的目標，使資料應用達到高效率、高品質、高完整、高可用、高安全的水平，以強化公司競爭力並實現永續經營。

Abstract

This research project is based on the AWS data governance framework Governance@Scale (G@S), AWS G@S principles, AWS G@S maturity assessment and SWOT analysis, AWS G@S implementation planning and execution guidelines, and is committed to establishing a data governance promotion mechanism and specifications, and through a customized governance framework to ensure the accuracy and availability of the data platform.

Under the eight pillars structure of the AWS data governance framework G@S, the work items such as research, sorting, promotion mechanisms and specification formulation are included in the "alignment stage" and "execution stage", and seminars and interviews are conducted based on business goals using reverse working method to gain an in-depth understanding of the current status and gaps of corporate data governance to provide implementation suggestions. At the same time, a data management talent empowerment program is provided to ensure that colleagues have the necessary data management capabilities through training.

It is hoped that in the future, all units of Taipower will have data management capabilities and collaboration mechanisms to achieve the goals of data co-construction, co-governance and sharing, so that data applications can achieve high efficiency, quality, integrity, availability and security to help the company strengthen its competitiveness and achieve sustainable operations.

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電力交易平台市場管理與監視之機制檢討研究

Study on Reviewing the Market Management and Monitoring Mechanisms of Taiwan's Electricity Trading Platform

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摘　要

　　2021 年電力交易平台開設，象徵著台灣電力商品交易進入新的紀元，更多的市場參與者、交易商品與交易型態，均使得市場運作更為複雜，亦為市場營運者帶來市場管理與監視上的挑戰。本研究之目的是基於實務做法與理論基礎，探究電力交易單位應如何建立、執行與改善電力市場管理與監視機制，以達成促進公平交易並維護市場發展健全之目的。首先，本研究蒐集整理北美先進電網的市場監管作法，國際電力市場監管機構大致採用產業經濟學重要理論基礎，市場結構—市場行為—市場績效之架構，此亦與電力交易平台現行作法相符。此外，考量未來電力市場管理越趨嚴峻，宜採用事前措施以減緩市場力影響，本研究亦提出短期採用結構性測試，以及長期導入行為與影響測試之建議。

Abstract

　　The opening of the Electricity Trading Platform in 2021 symbolizes a new era for Taiwan's electric power commodity trading. More market participants, trading commodities and types have made the market operation more complex, and also brought market management and monitoring challenges to the market operator. The purpose of this study is to explore how the market operator should establish, implement and improve the electricity market management and monitoring mechanisms based on practical practices and theoretical foundations, in order to achieve the purpose of promoting fair transactions and maintaining sound market development. First, this study collects and summarizes the market monitoring and management practices of advanced power grids in North America. International power market regulatory agencies generally adopt the important theoretical basis of industrial economics, that is, the structure–conduct–performance (SCP) paradigm, which is also consistent with the current practice of Taiwan's Electricity Trading Platform. In addition, considering that the aforementioned electricity market management challenges will become increasingly severe in the future, it is advisable to adopt ex-ante measures to mitigate the impact of market power. This study also proposes the adoption of structural testing in the short term and the introduction of behavioral and impact testing in the long term.

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