

計畫名稱：輸配電系統電力品質提升與代輸技術之發展及運轉規劃

執行單位

國立中正大學電機工程系

計畫主持人

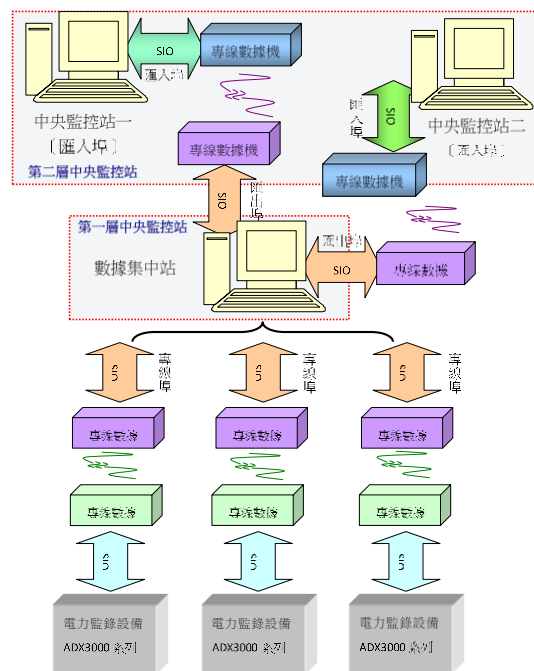
張文恭 教授

- 因應我國電業自由化與大量再生能源併入電網之目標，為了降低對電力網路之衝擊，透過配電自動化技術與電力品質控制技術，改善電力系統的電力品質，並考量台灣電力系統與大量再生能源併網進行壅塞管理的模擬分析。

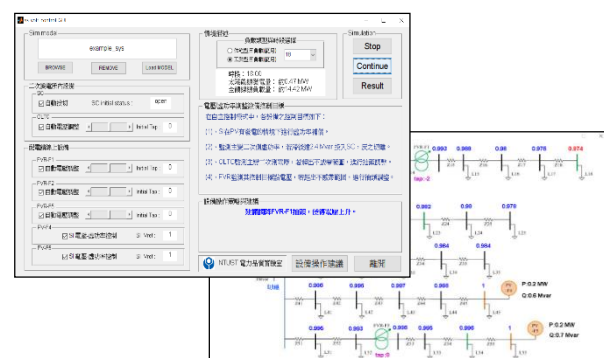
✓ 電力品質干擾來源追蹤演算法之開發、IED功能與通訊機制應用等，有產生專利智財或可移轉潛力技術之可能。

✓ 已獲證專利：

- 低壓無載起動測試下之估測法
- 以人工智慧即時分析及修正供電異常之方法
- 具有功率追蹤器之燃料電池系統



▲ 變電所饋線IED下載資料匯出埠/匯入埠示意圖



▲ 二次變電所主變壓器轄區電壓控制介面



▲ 壅塞線路視覺化系統介面

● 技術介紹

因應我國電業自由化與大量再生能源併網之目標，本計畫針對以下議題進行探究：(1)變電所饋線IED接收之故障電流值自動回傳DDCC及輔助應用可行性探討及故障檢測研究，(2)大量再生能源對智慧配電系統的影響與應對策略，(3)電力自由化下電力代輸制度的設計與運作方式，(4)考慮大量再生能源發電預測之電力市場競標與電力代輸計算，(5)電力市場下輔助服務及壅塞管理之研究。

● 目前發展情形

1. 完成變電所饋線IED與數據集中器的通訊任務。
2. 開發二次變電所主變壓器轄區電壓控制介面。
3. 提出適合台灣電業環境之電能轉供費率架構及建議作法。
4. 大量再生能源發電預測對於電力市場競標之研究。
5. 建立臺灣電力市場適用的頻率調節結算制度。
6. 評估台電系統在高占比再生能源併入情境下之輸電瓶頸分析。

Enhancement of Power Quality for Transmission/Distribution Network and Development of Wheeling Technologies and Operations Planning

Execution Unit

Department of Electrical Engineering, National Chung Cheng University

Project Director

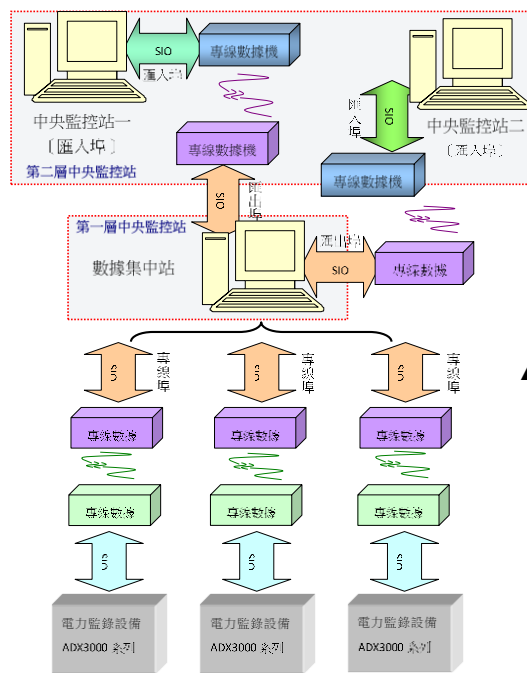
G. W. Chang, IEEE Fellow

Under the development of the electricity liberalization and high renewable energy penetration, investigation of distribution automation and the voltage control strategy are necessary to reduce the impact on Taiwan's electricity network. It is very important to identify transmission bottlenecks in advance after the high penetration renewable energy integration. The goal of this program is developing renewable energy and making sure the power supply is stable in Taiwan.

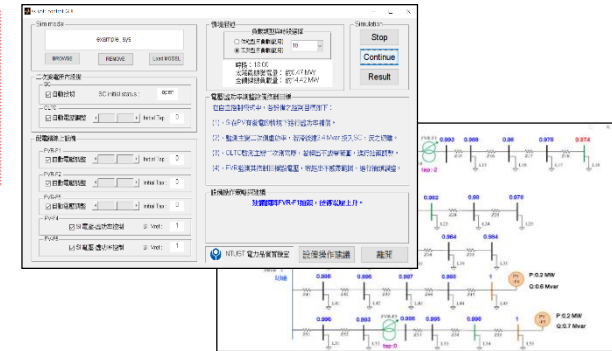
✓ The development of IED communication technology and power quality disturbance source tracking have potential to apply for intellectual properties and patents.

✓ **Authorized Patent :**

- ❑ Estimation method under low-voltage no-load starting test
- ❑ A method for analyzing and correcting power supply anomalies in real time based on artificial intelligence
- ❑ Fuel Cell System with Power Tracking



▲ The Output and Input Port of IED in Substation



▲ Voltage Control Interface for Main Transformer Feeding Area in Secondary Substation with Photovoltaic Generation



▲ Visualization Platform of Congestion Analysis

● Introduction

Under the development of the electricity liberalization and high penetration renewable energy integration, this program investigates (a) feasibility study of automatic returning fault current values received by substation feeder IED to DDCC and fault location detections, (b) study and mitigating strategy of impacts of integrating large amount of renewable energy resources to smart distribution system, (c) wheeling mechanism design and operation under electric utility deregulation, (d) study of electricity market bidding and wheeling calculation with considering renewable energy resource output forecast, (e) study of ancillary services and congestion management under electricity market.

● Current Development

1. Implementing the communication technology between intelligent electronic devices (IED) of substation feeders and distribution dispatch control center
2. Development of voltage control interface for main transformer feeding area in secondary substation with photovoltaic generation.
3. Providing foundations of wheeling charges structure and recommended practices that are suitable for Taiwan's electrical industry under future development of liberalization of Taiwan's electricity market.
4. Research of renewable energy prediction for power market bidding
5. Proposing the suitable ancillary services for Taiwan's electricity market.
6. Identifying transmission bottlenecks in advance after the high penetration renewable energy integration.