

燃料電池模組電能調配應用技術創新前瞻計畫

執行單位

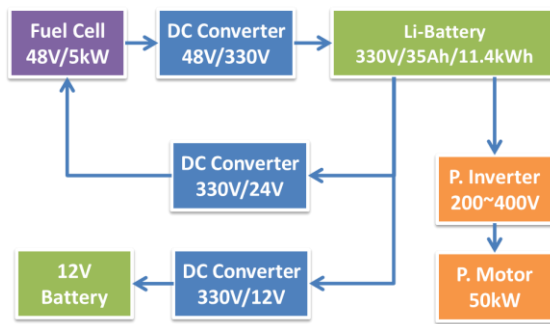
車輛研究測試中心

計畫主持人

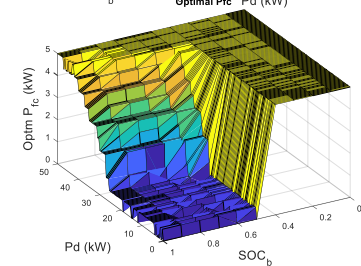
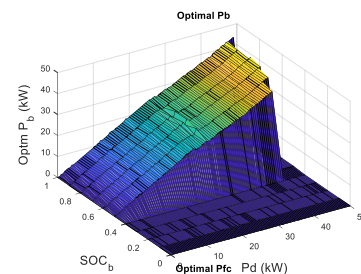
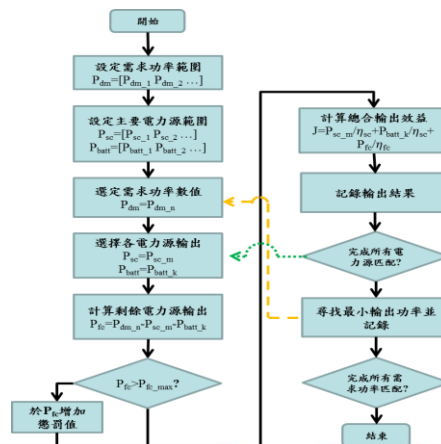
林博煦博士

- 針對定置用燃料電池系統應用於車輛應用之機構、電力、通訊與控制等介面探討，並解析燃料電池車輛專利提出國內產業可布局之技術項目。並針對搭載燃料電池之電動車輛之多電力源系統，進行應用情景分析與最佳化電能調度管理策略建立，藉以提高整體系統之電力供應效益。

- 「多電源供電分配系統及其分配方法」專利申請：針對具備多電力源之系統，依據最小等效能耗法進行全域式的電力輸出匹配，可達到最佳總和輸出效率結果，可適用於具備燃料電池及多電力源車輛，或是、儲能系統與式電並存之智慧電網系統。



多電力系統架構



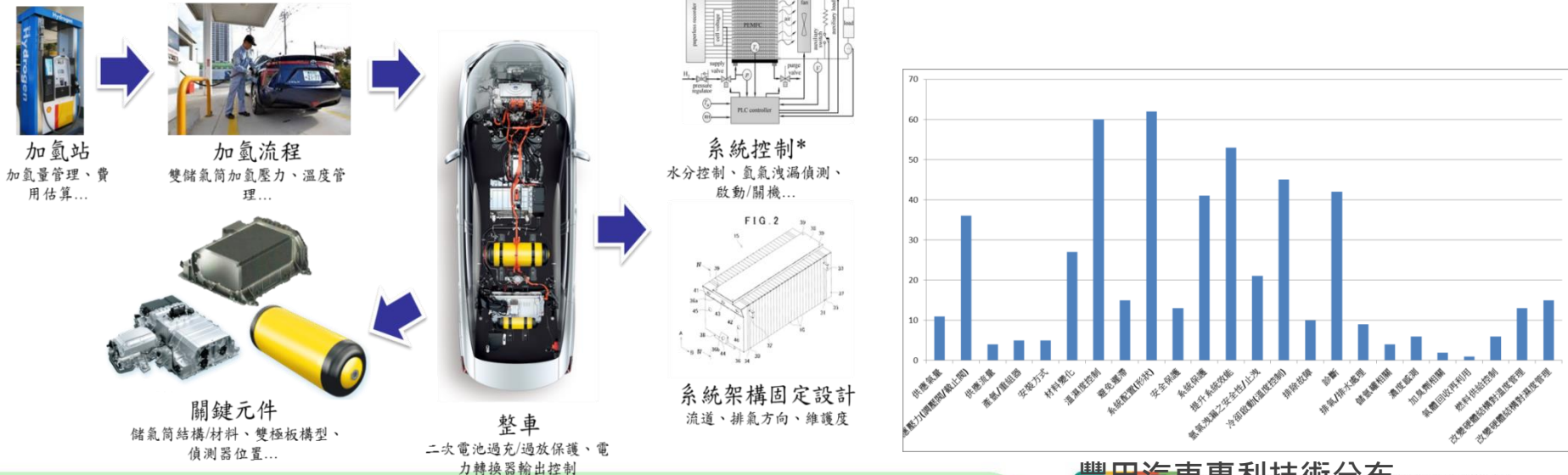
電力最佳調配結果

● 技術介紹說明

- ✓ **多電力源調配應用技術**：發展全域式多電力源電能調配機制，依據各電力源輸出特性，依序匹配尋找在不同需求功率下的最佳用電效率調配比例
- ✓ **燃料電池模組應用設計**：針對定置型燃料電池於車輛應用時，需加強與增加之技術建議，包含有系統管理、電力輸出控制/保護、供氣與冷卻、失效偵測與安全防護以及系統架構與流道設計等。

● 技術效益/專利佈局

- ✓ **多電力源調配應用技術**：攜帶 6m^3 氫氣之燃料電池可提供約 2.98kWh 額外電力，實車實驗結果顯示，扣除附件電力消耗，實際續航里程可提升約23%；並且透過全域式多電力源調配機制，可降低氫氣使用量約4.5%。
 - 產出3件多電源供電分配系統及其分配方法專利申請



Electric Energy Control Technology for Fuel Cell Module

Execution Unit

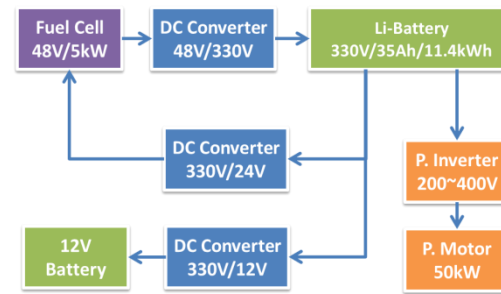
Automotive Research and Testing Center

Project Director

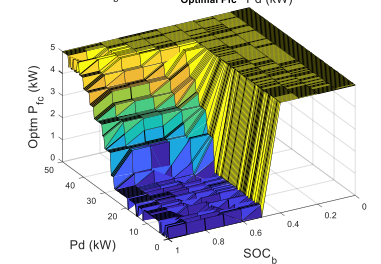
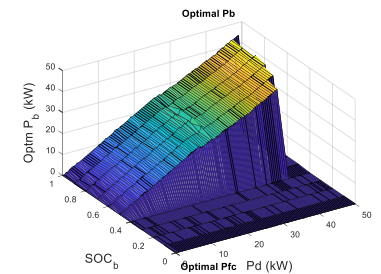
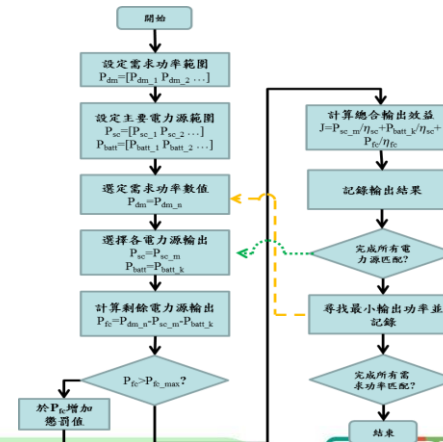
Po-Hsu Lin

- A analysis of the necessary improvement for adopting the stationary fuel cell system into the vehicle which includes the fuel supply, system structure, control algorithm and communication, etc.. An global optimal power distribution algorithm is developed for improving the energy efficiency of the electric vehicle with multiple electric energy sources.

- Patent "Power Distribution System using Multiple Rechargeable Power Sources and Method for Distributing Power using Multiple Rechargeable Power Sources": The control algorithm provides the optimal distribution ratio based on the status of the SOC and SOH of the li-ion batteries or ultra-capacitors, and also the temperature and pressure of the fuel cell system, etc.. The method is able to be applied to the overall possible operation region to find a global results for the target vehicle.



Multi-energy structure



Power Distribution Result

Technologies

- ✓ **Multiple Energy Distribution Method:** A method for finding the global optimal distribution ratio for the electric vehicle which carries the multiple electricity sources. The characteristics of the electricity system such as SOC and SOH for lithium battery or ultra-capacitors, and the temperature or gas pressure of the system will be considered.
- ✓ **Fuel Cell System Application Design:** Suggestions for adopting the stationary fuel cell system into the vehicle are made based on the real system operation and the analysis results to the Toyota fuel cell vehicle patents. The

Performance

- ✓ **Multiple Energy Distribution Method:** The algorithm is able to help the fuel cell system to extend 23% of the electric vehicle mileage and save 4.5% of the hydrogen usage.



加氫站
加氫量管理、費用估算...



加氫流程
雙儲氣筒加氫壓力、溫度管理...



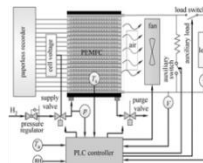
整車

二次電池過充/過放保護、電力轉換器輸出控制



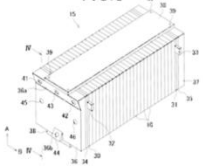
關鍵元件

儲氣筒結構/材料、雙極板構型、偵測器位置...



系統控制*
水分控制、氫氣洩漏偵測、啟動/開機...

FIG 2



系統架構固定設計
流道、排氣方向、維護度

