



School of Civil and Environmental Engineering

# Integrated demand-supply model for charging infrastructure of Electric Vehicles



**Student: Shuangqing Gong**

**Supervisors: A/Prof. Taha Hossein Rashidi**

**Dr. David Rey**

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# Content

- Background
- Location of Charging Infrastructure
- Problems
- Research Topics
- Modelling methods
- Potential solutions
- Conclusions

# Background

- Electric Vehicles (EV)
- Charging Infrastructure
- Challenges
  - Range anxiety
  - Maintenance

# Location of Charging Infrastructure

- Vehicle-Miles-Travelled (VMT)
- Economic growth, social development, environmental protection
- Maximal demand coverage
- Energy systems
- Travel patterns
- Policies

**ALL DONE**



# Problems

- How demand on charging infrastructure will be affected?
- It is important to model the transport and power system together, but why?
- Trade-off between cost, benefits, and other considerations.
- Multiple constraints

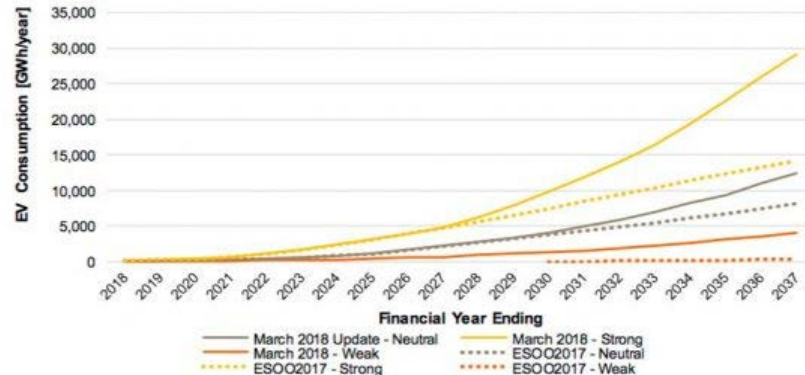


Figure 2. Forecasting of EV consumptions for the next two decades (Giles Parkinson 2018)

# Research Topics

- Availability of Charging Infrastructure
- Integrated model between transport and energy system.
- Incentives to be provided when major employers provide energy

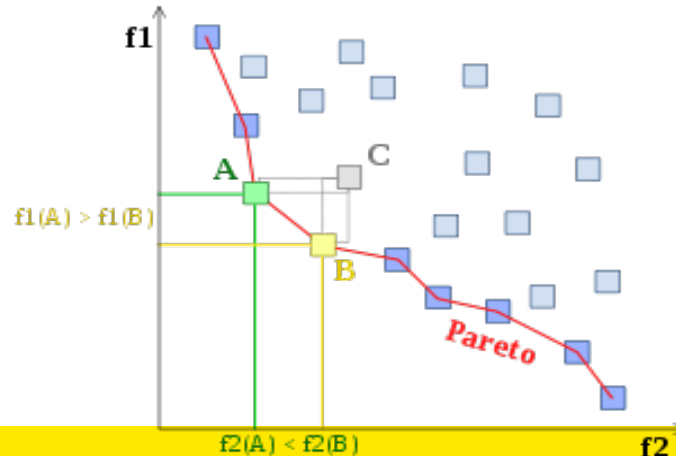
# Modelling methods

- Agent-based models for demand modelling
- Integration between agent-based models and multi-objectives optimization in the network
- Make the demand as the parameter feed forward to the network



# Potential Solutions

- Multi-objective optimization within the network
- Looking for the Pareto Solutions.
- Simulation on EV drivers' behaviours on the challenges with different scenarios
- When search for the best solution of the network, ML methods might be used. e.g. Random Forrest.



# Conclusions

- Location of Charging infrastructure
- Current research gap in modelling the location of charging infrastructure
- Integrated demand-supply model for EV charging infrastructures

# Reference

- Giles Parkinson 2018, Renew Economy, accessed 12 November 2018, <https://reneweconomy.com.au/aemo-just-doubled-forecast-ev-uptake-australia-66789/>

# Thank You!

