

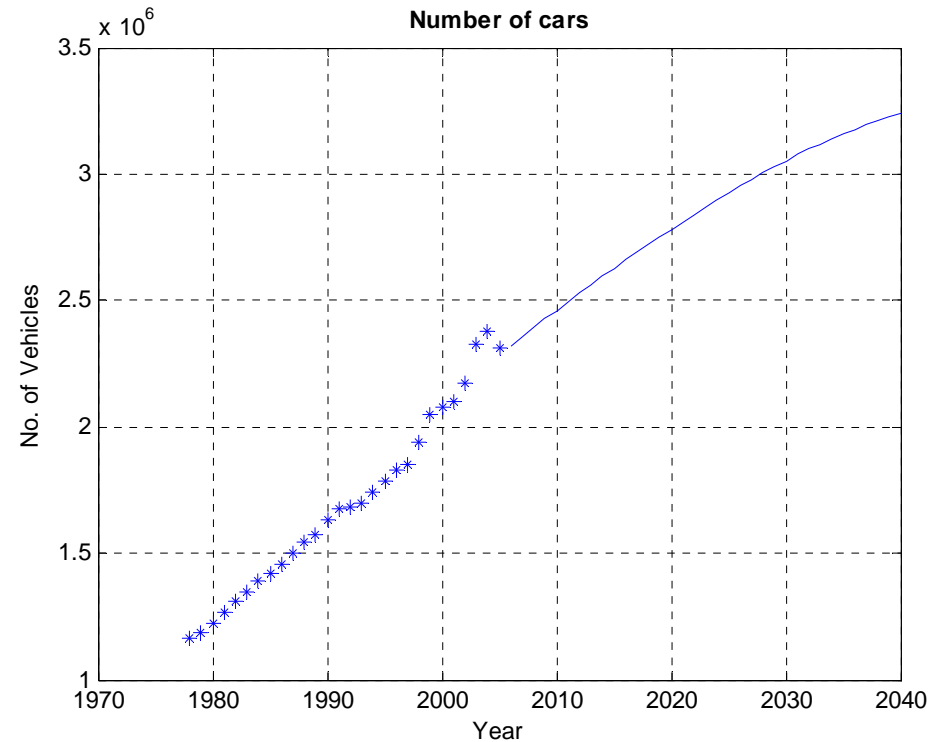
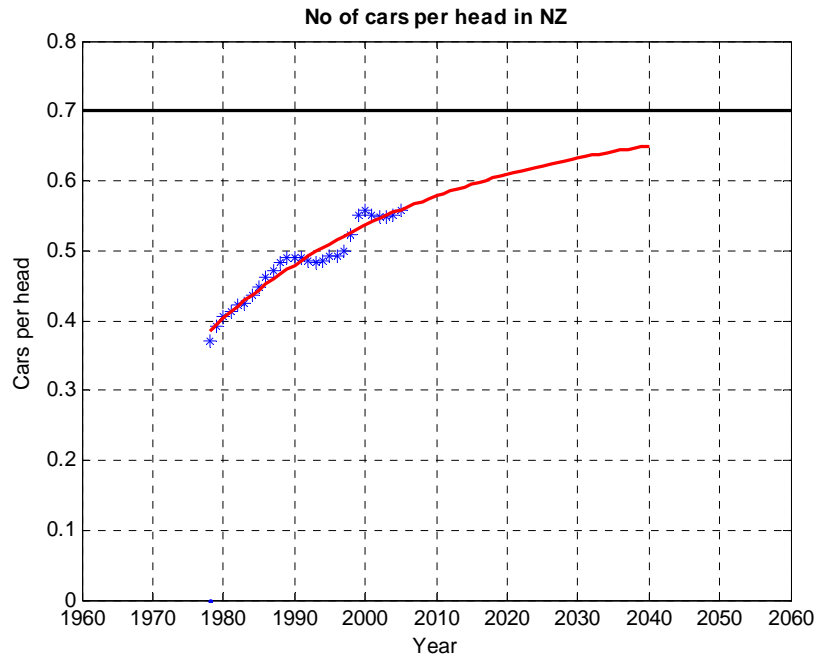
# Electric vehicles demand forecast

Erwan Hemery and Bruce Smith

# Introduction

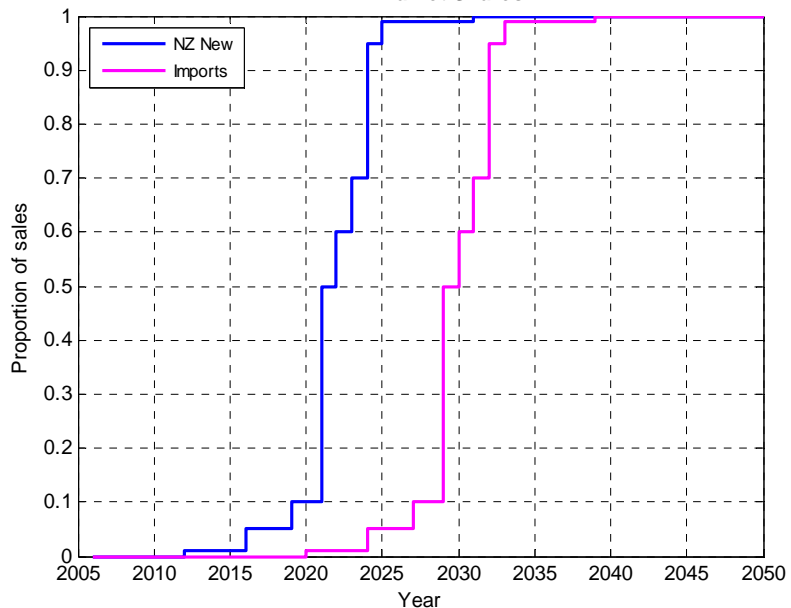
- Growing interest in Electric Vehicles (EVs)
- International developments
- EVs included in the SoO scenarios
- Plug in Hybrid Electric Vehicle (PHEVs)
- PHEV forecasting
- Form load duration curve for use in GEM
- Investigate impact on generation build

# Fleet composition

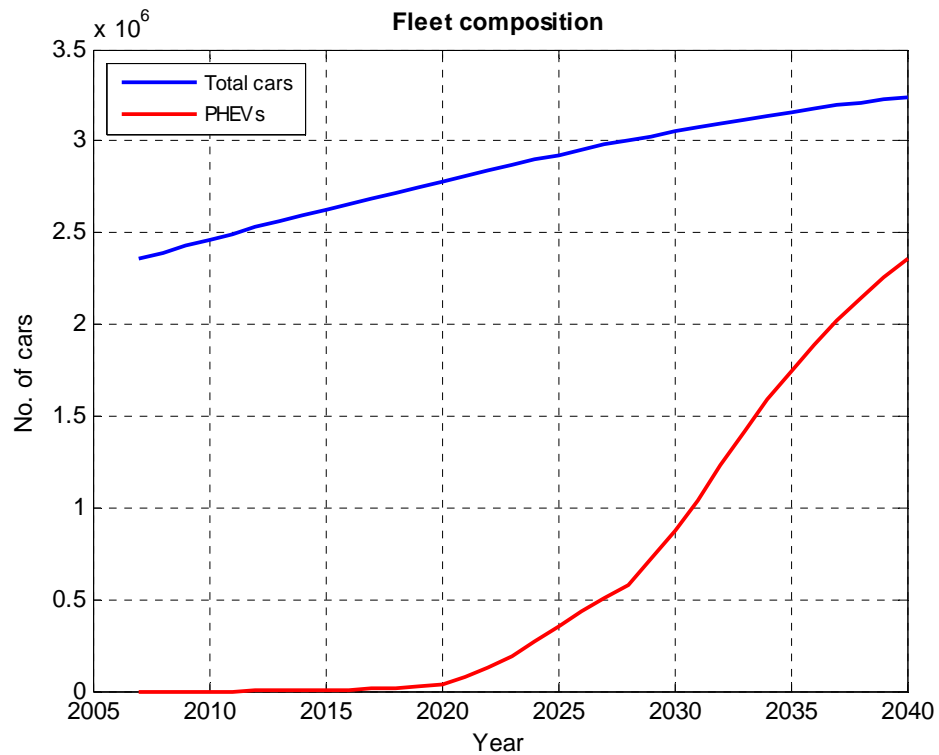


<http://www.med.govt.nz/upload/33318/modelling-transport-energy.pdf>

PHEV Market Shares

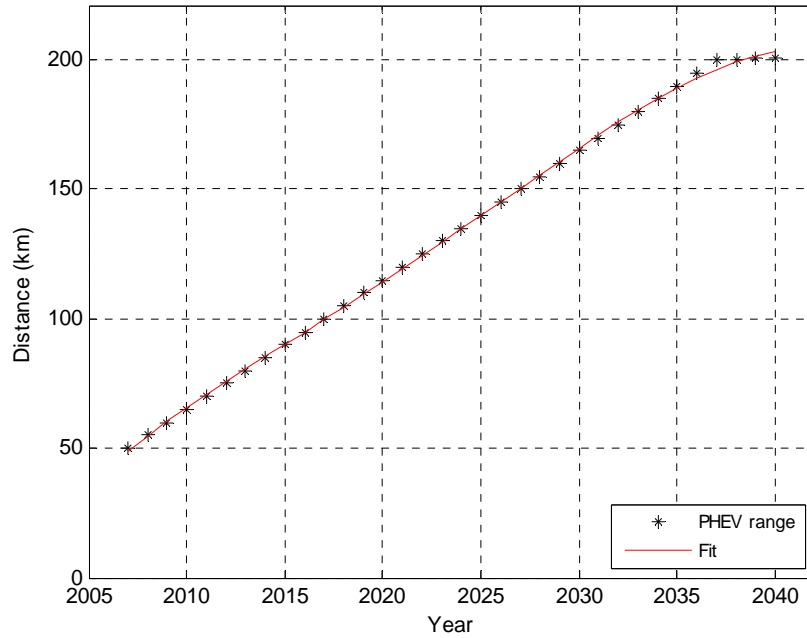


Fleet composition



# PHEV specifications

PHEV range forecast



For example:

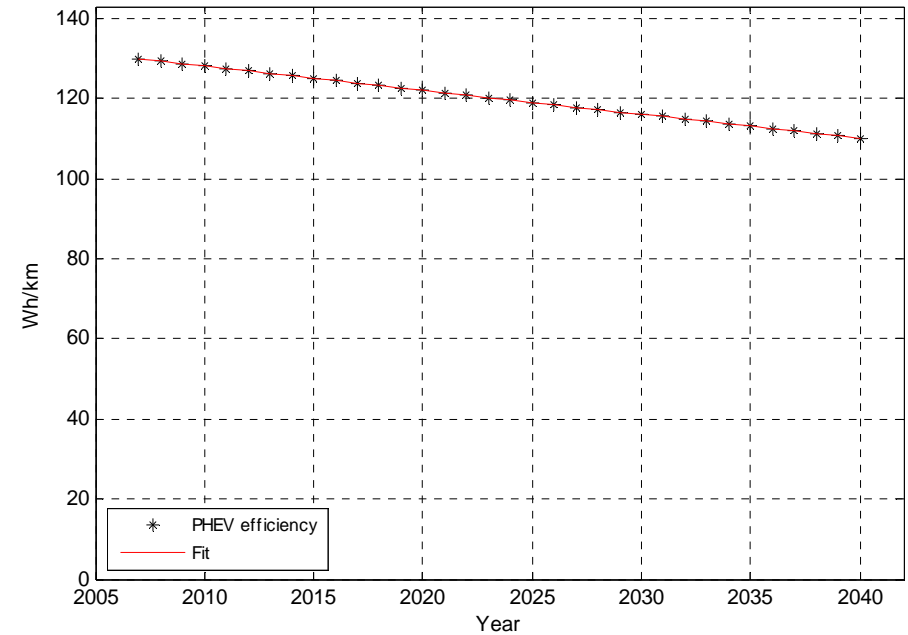
**Nissan Hypermini:** 90 Wh/km

**Tesla Roadster:** 106 Wh/km

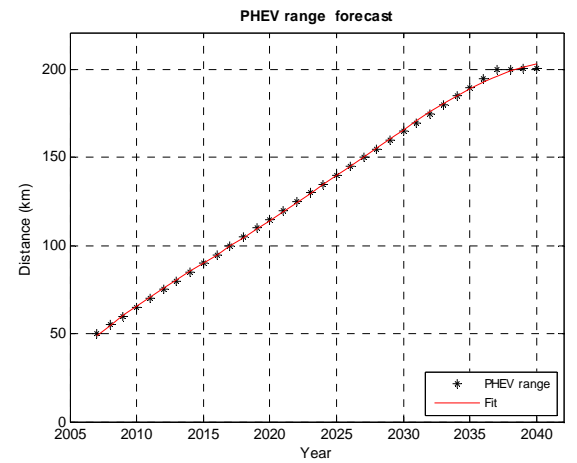
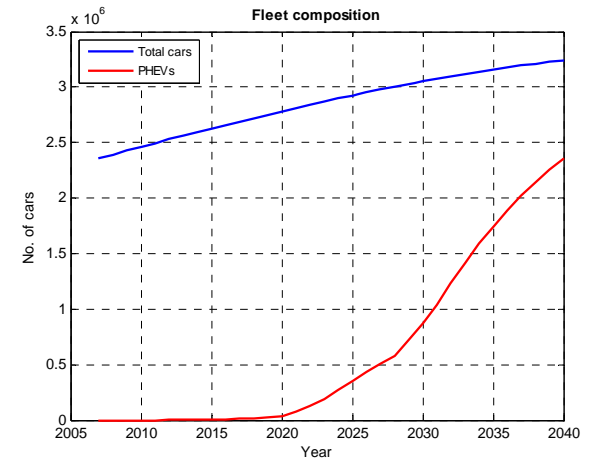
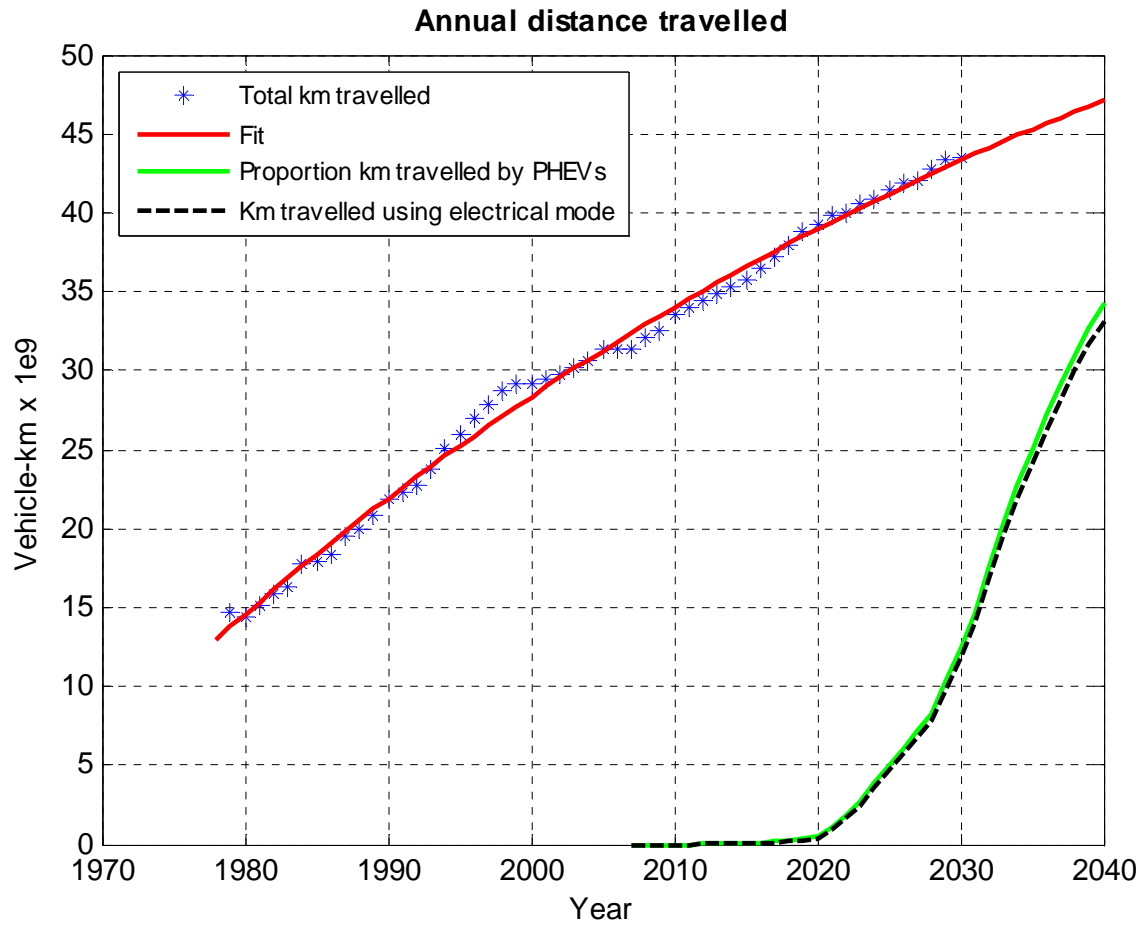
**Toyota Prius hybrid:** 160 Wh/km

**Wrightspeed X1:** 124 Wh/km

PHEV efficiency forecast

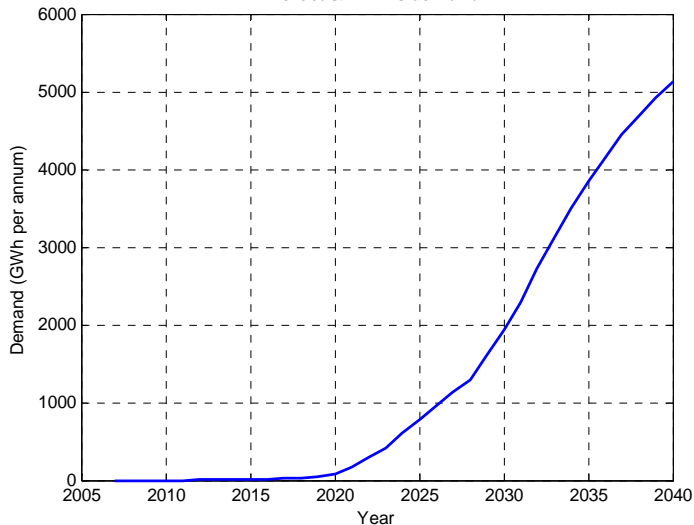


# Annual distance travelled



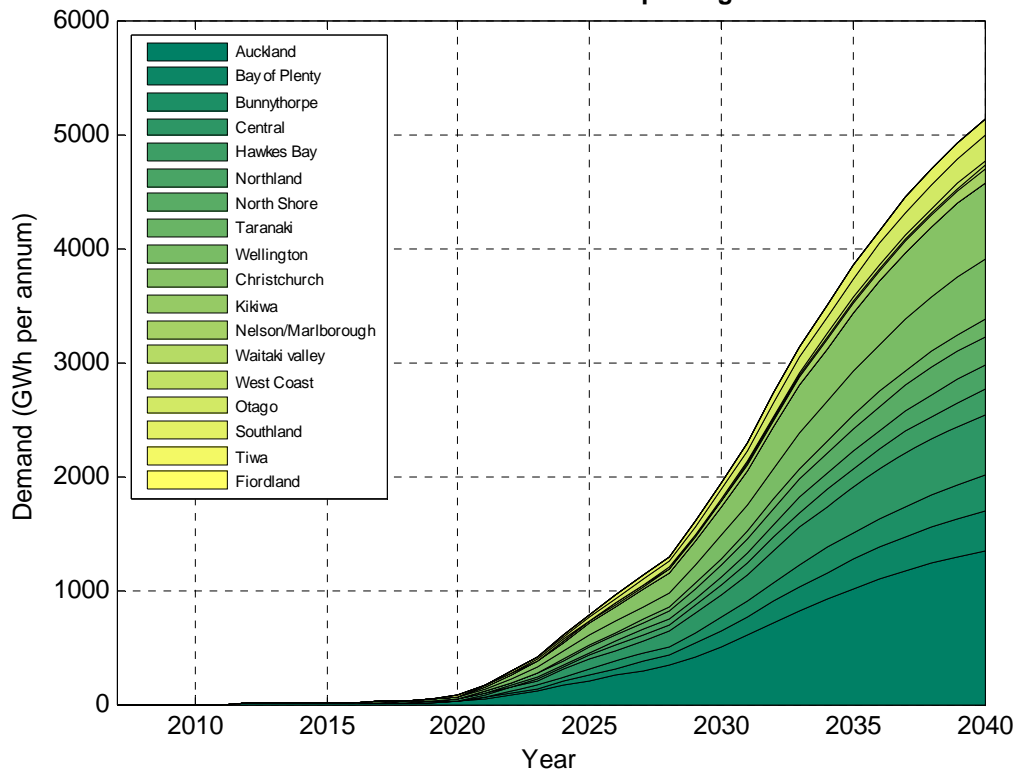
# PHEVs Electric demand

Forecast PHEVs demand

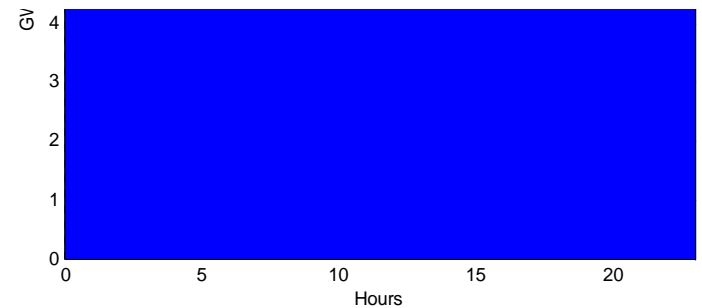
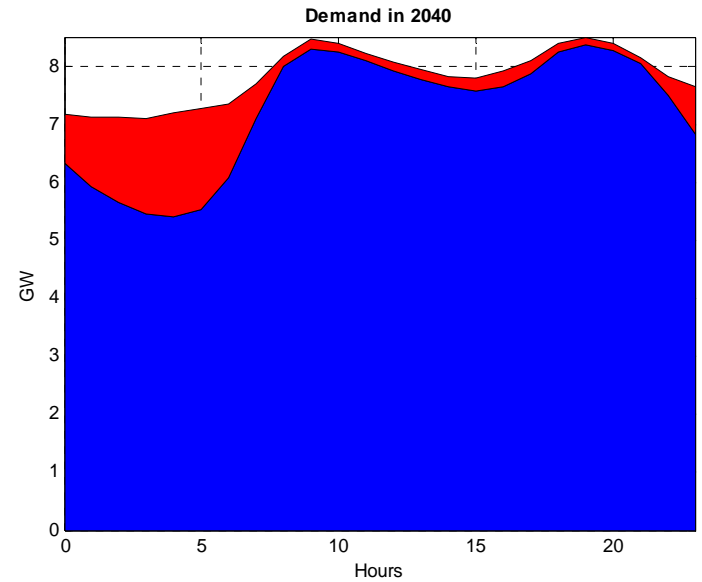
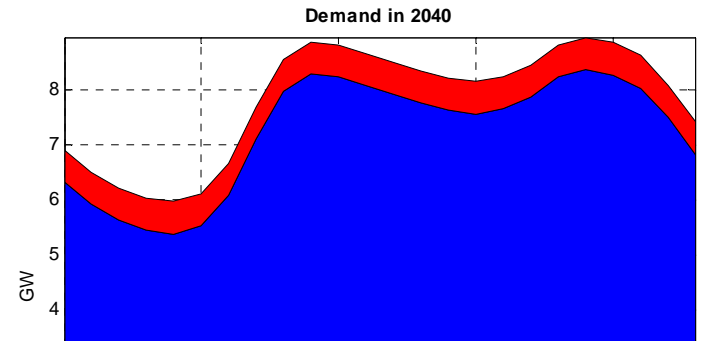
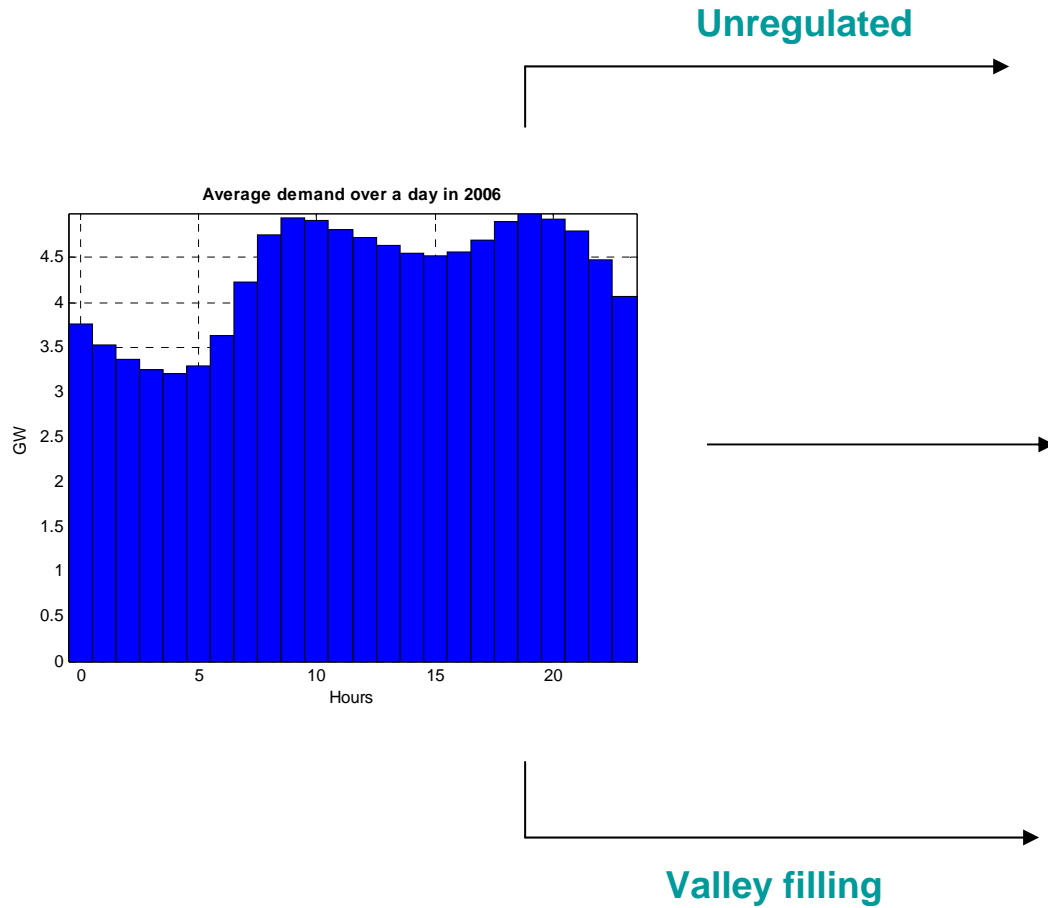


Used km travelled in the “NZ travel survey” to get the proportions of km travelled for each region

Forecast PHEVs demand per region

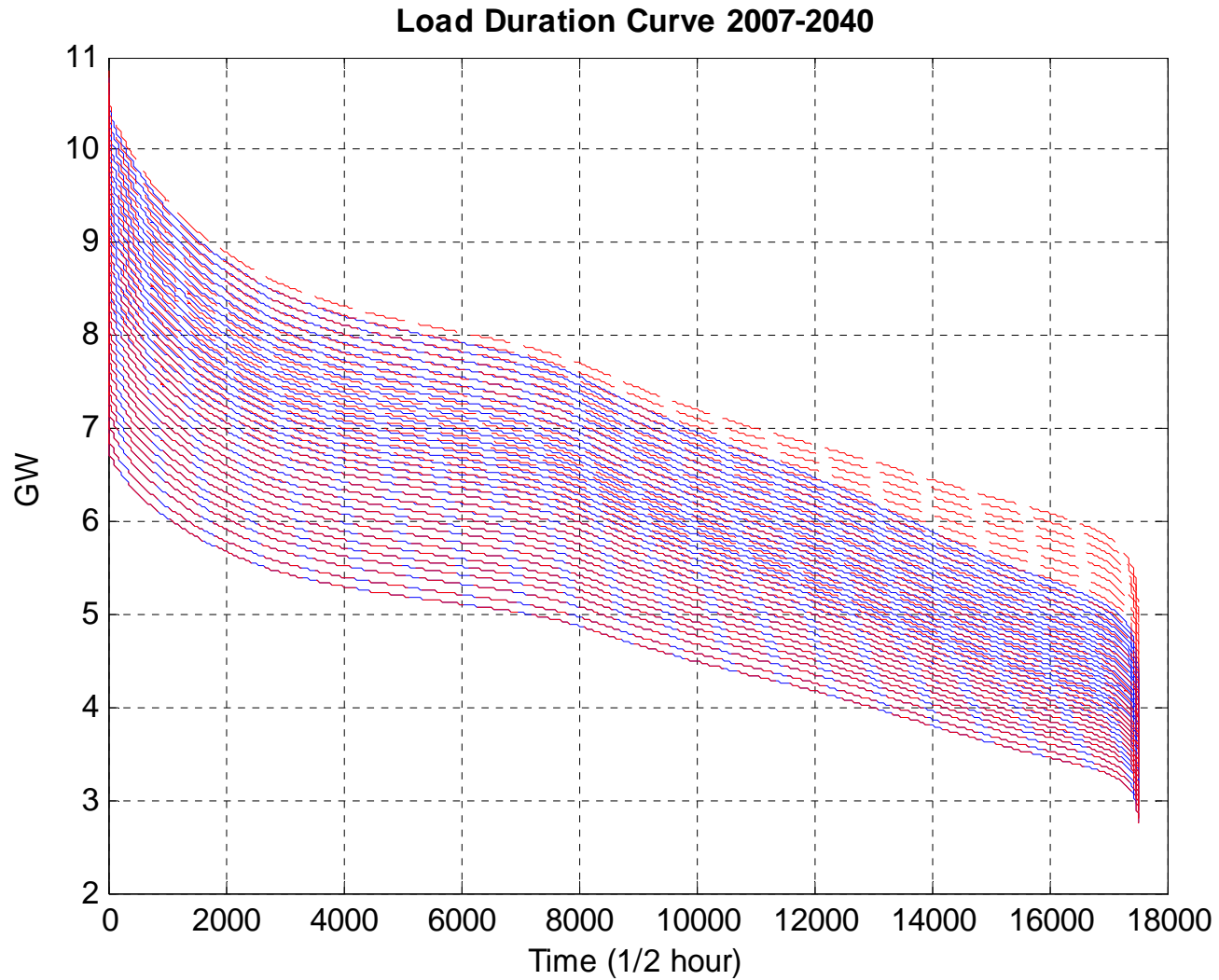


# Recharging time

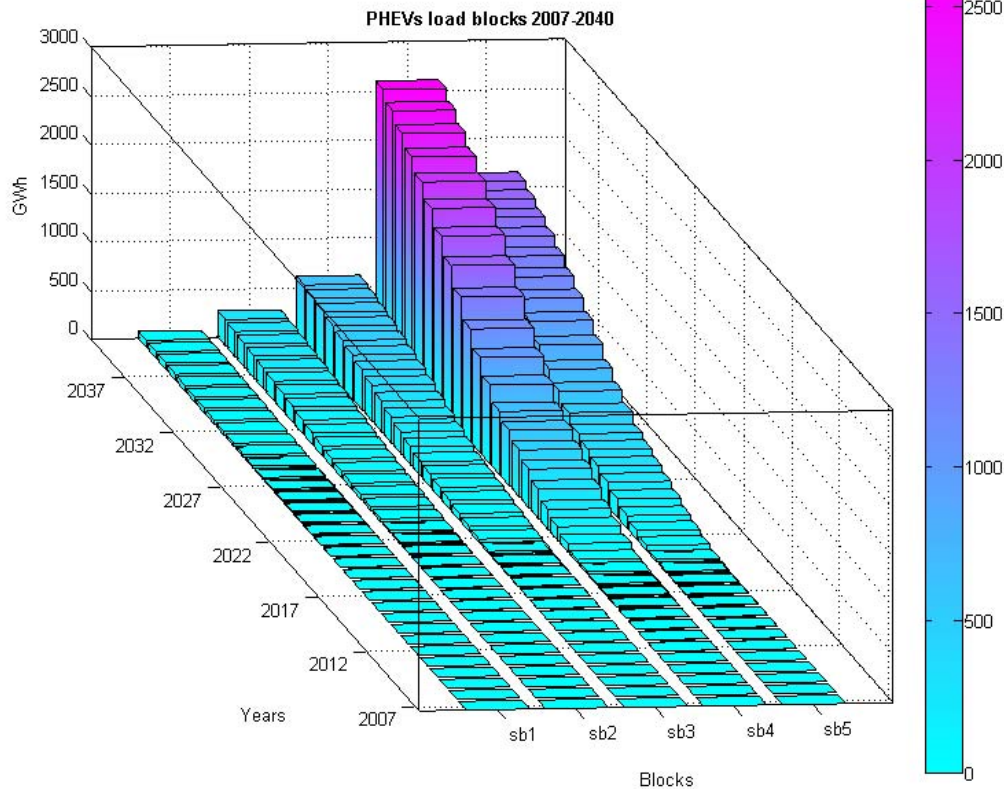




# Load Duration Curve (LDC)



# PHEVs Load Blocks

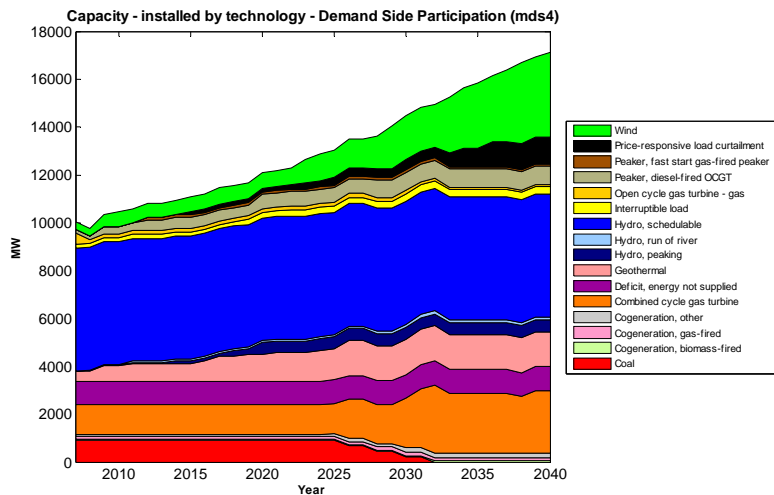


Input for GEM

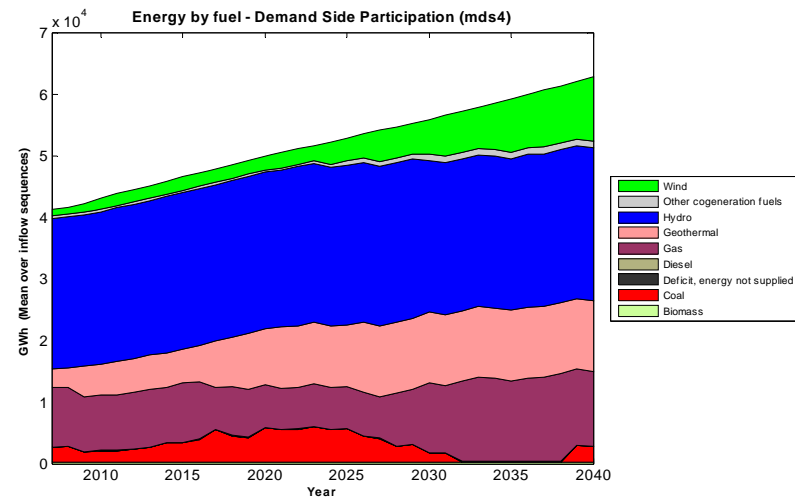
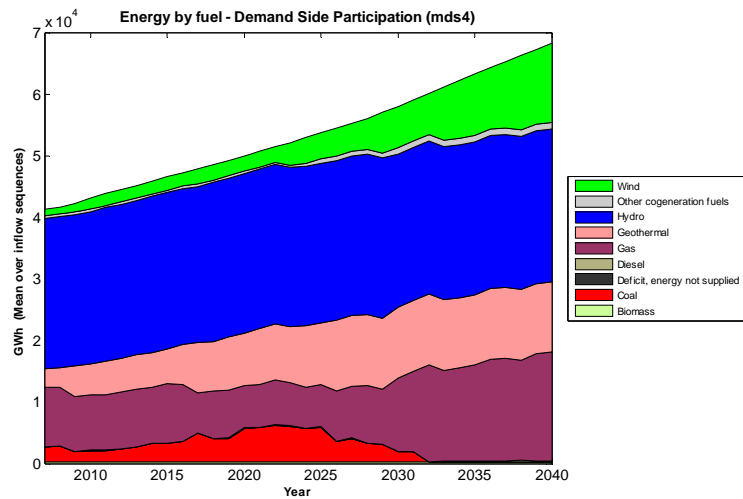
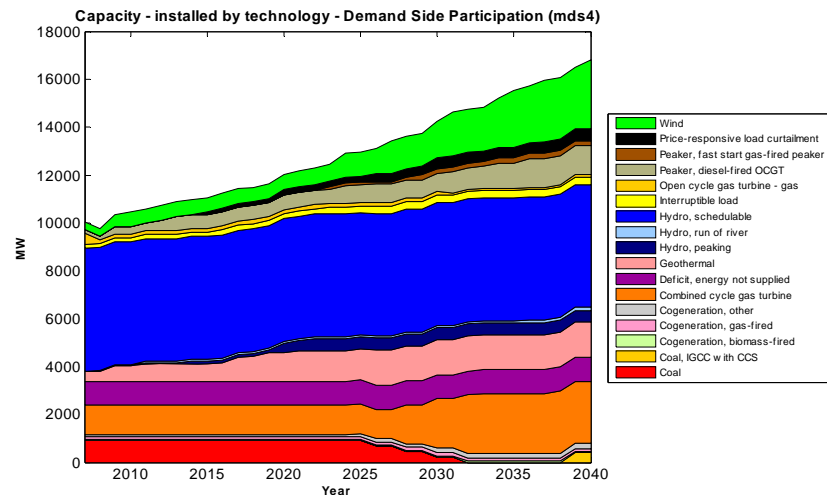
The screenshot shows an Excel spreadsheet titled 'PHEVs load blocks 2007-2040'. The spreadsheet contains a grid of data points for each year and block combination. The columns represent years from 2007 to 2040, and the rows represent the five load blocks (sb1 to sb5). The data values are numerical, representing load in GWh, and are color-coded according to the scale shown in the 3D chart. The spreadsheet is used as input for the GEM (Generation Expansion Model) software.

# PHEV impacts

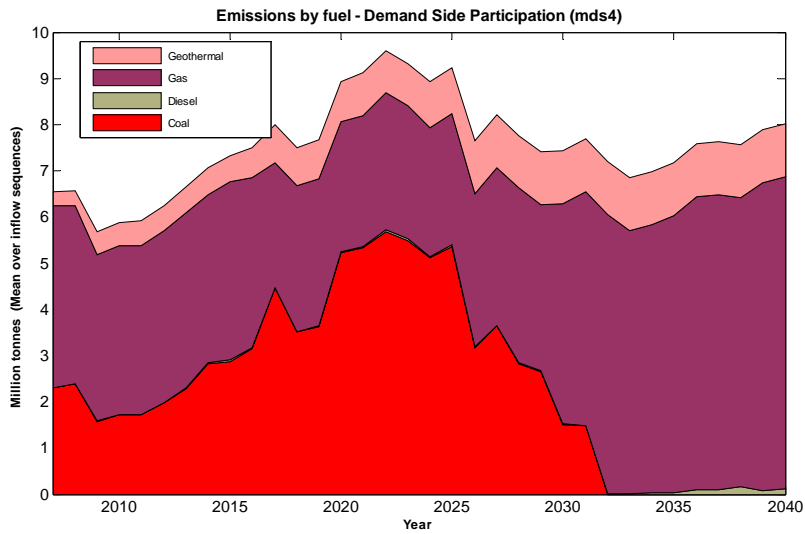
## PHEVs



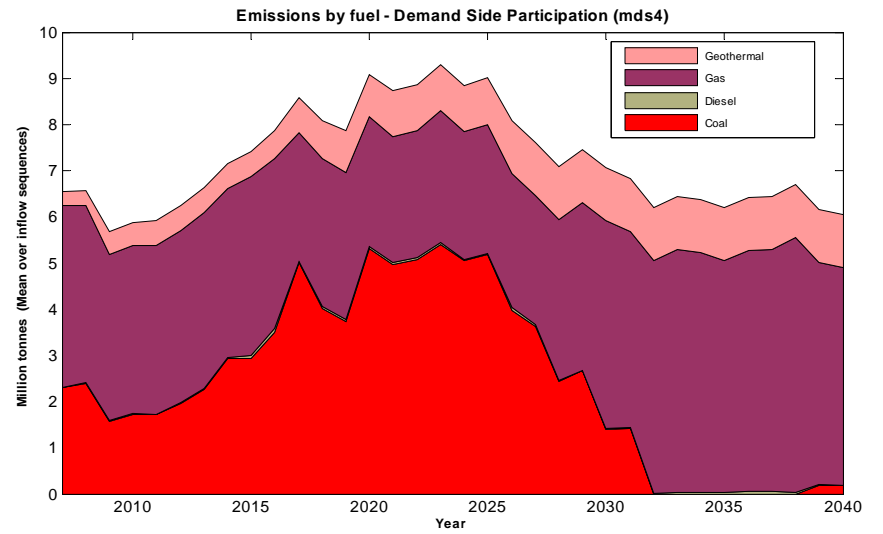
## No PHEVs



## PHEVs

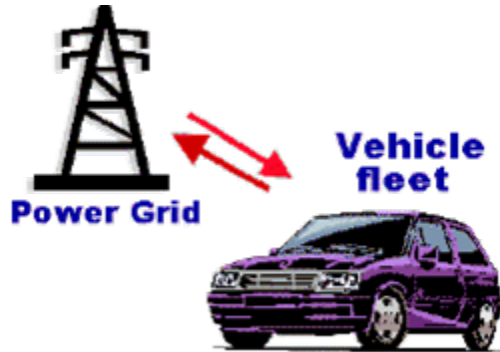


## No PHEVs



# Vehicle to Grid (V2G)

## V2G concept

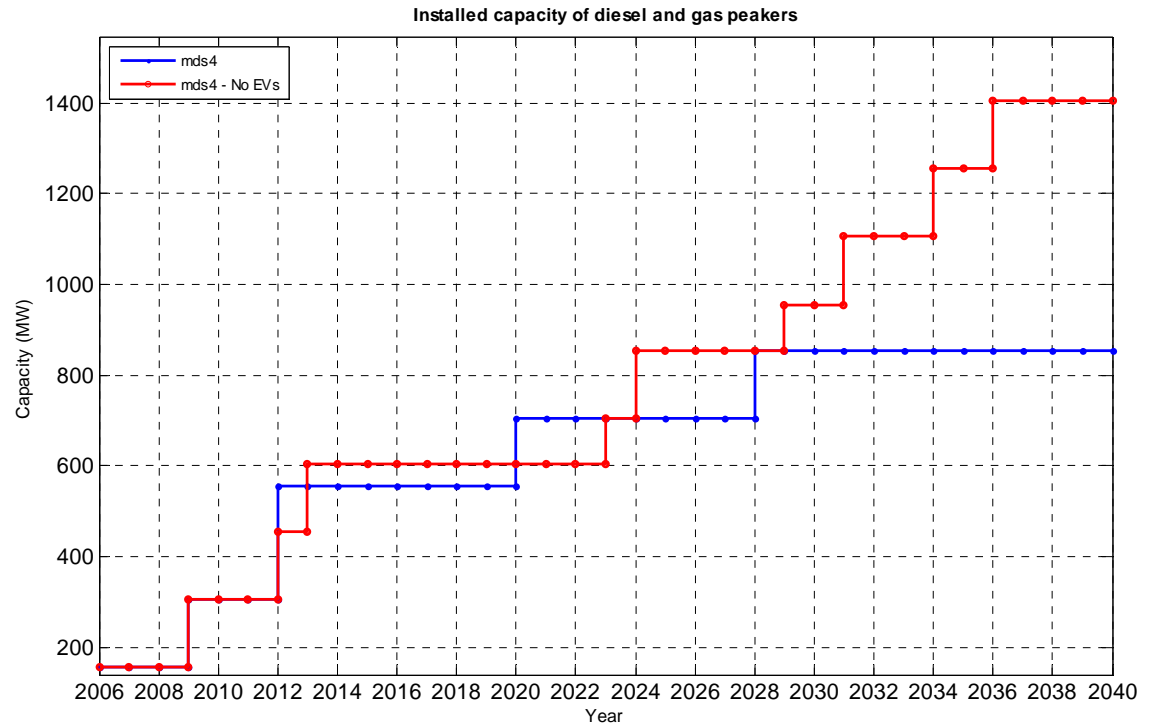


<http://www.udel.edu/V2G/>

- Storage
- Peak power
- Spinning reserve
- Frequency keeping

## GEM

- V2G has been modelled as price responsive load curtailment from 2030
- It is only present in the demand side participation (mds4)



# Summary

- Reasonable to include EVs demand in some SoO scenarios,
- The Commission has produced an energy demand estimate,
- The energy demand looks modest ~ 5000 GWh in 2040,
- The recharging time seems to be a crucial parameter
- V2G has been included in one scenario and has the effect of replacing some peaking generation (in practice, by providing ancillary services).

