Is 90% renewable electricity by 2025 achievable?

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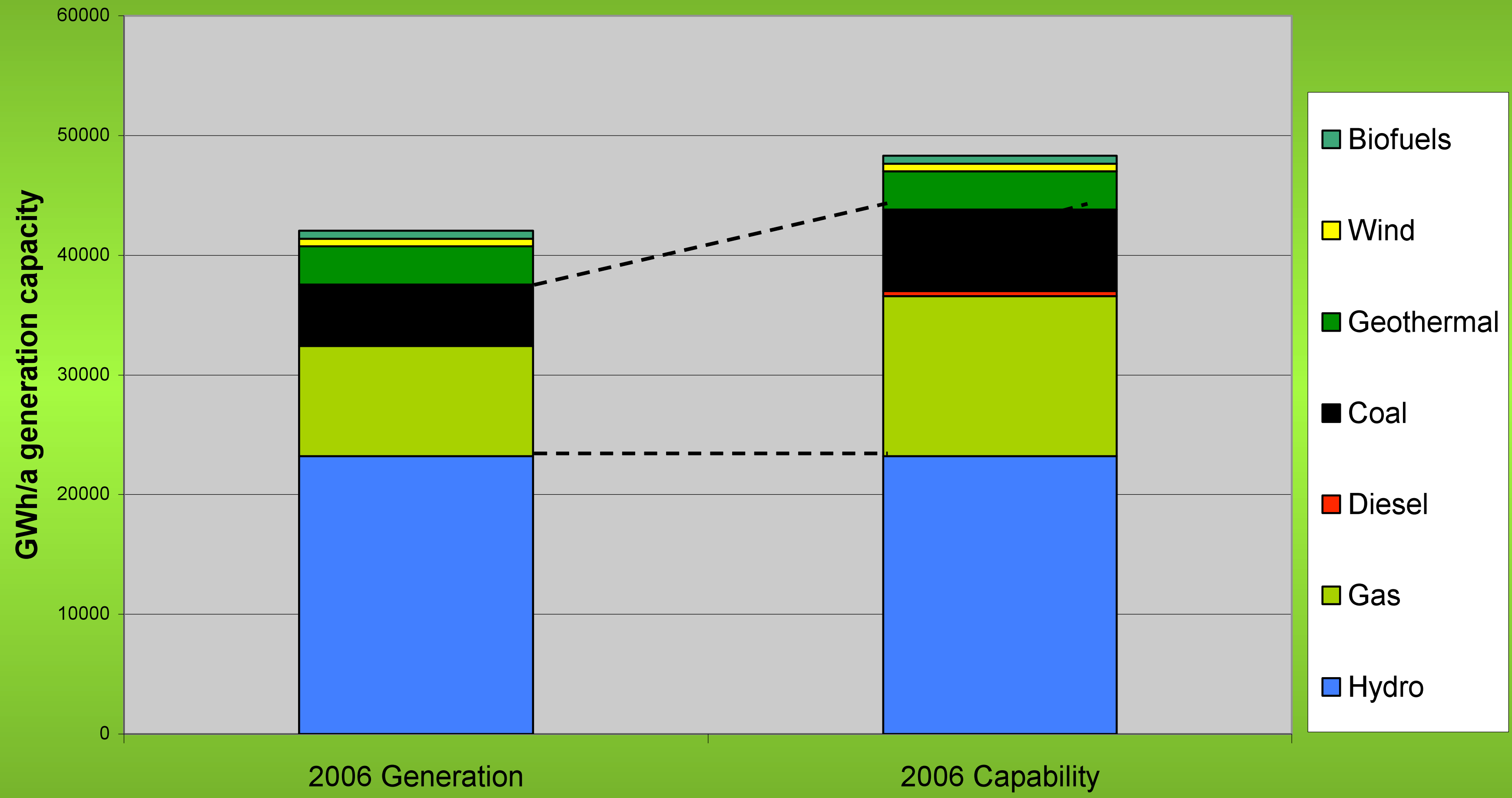
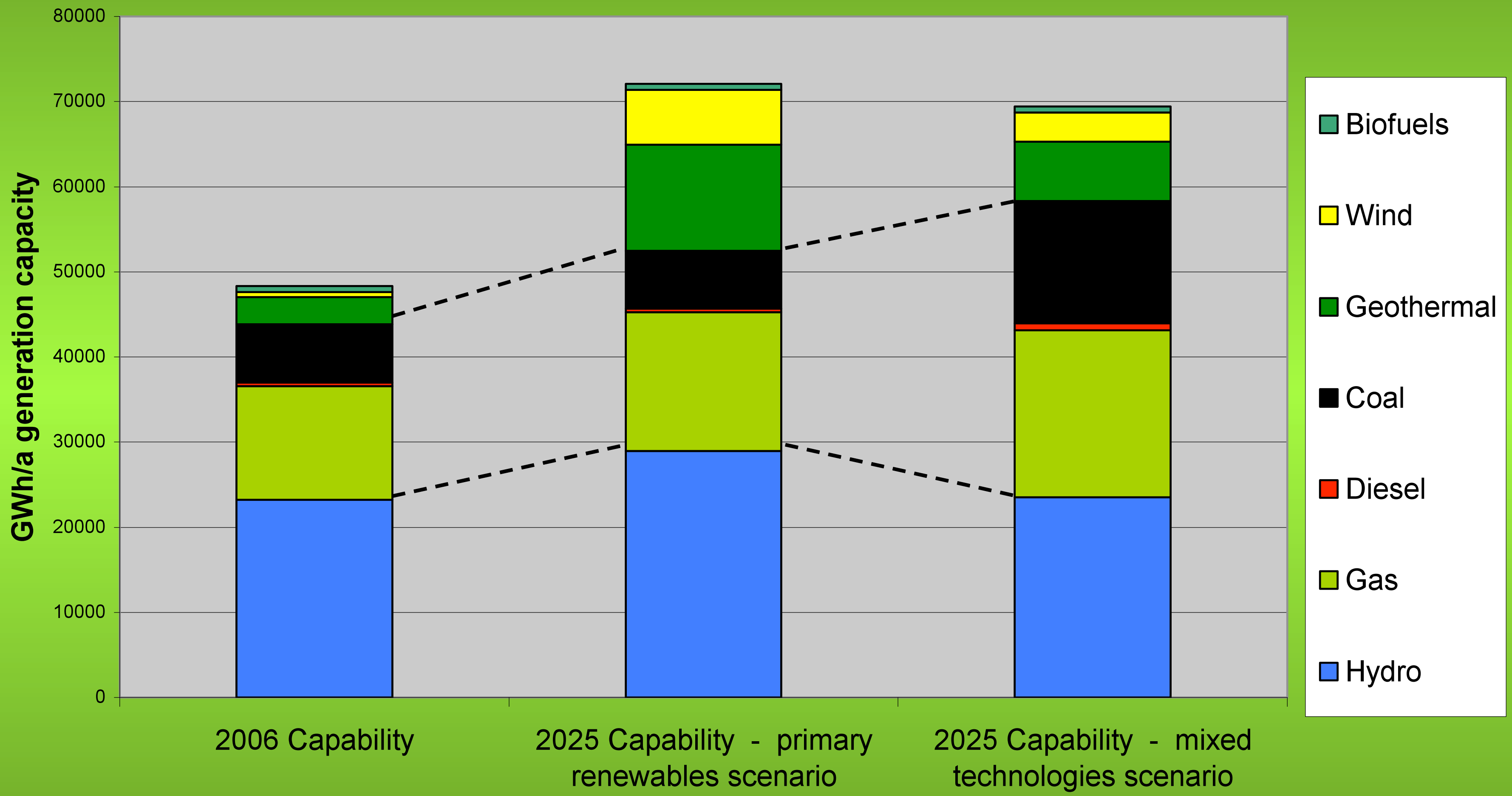
Electricity Generation and Capability by fuel in 2006



Source:- Energy Data File

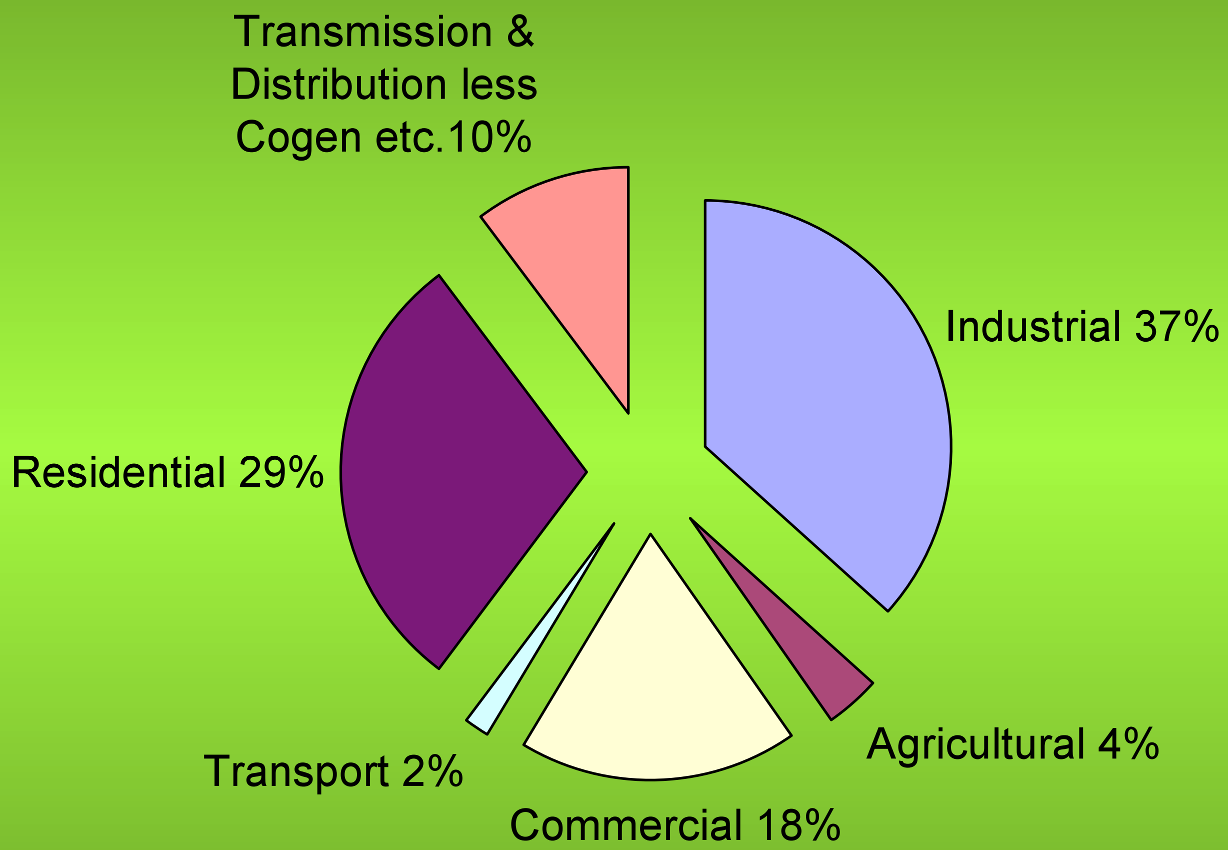
Generation capability scenarios for 2025

(Based on Electricity Commission Grid Planning Assumptions 2008)



Electricity Commission Grid Planning Assumptions 2008

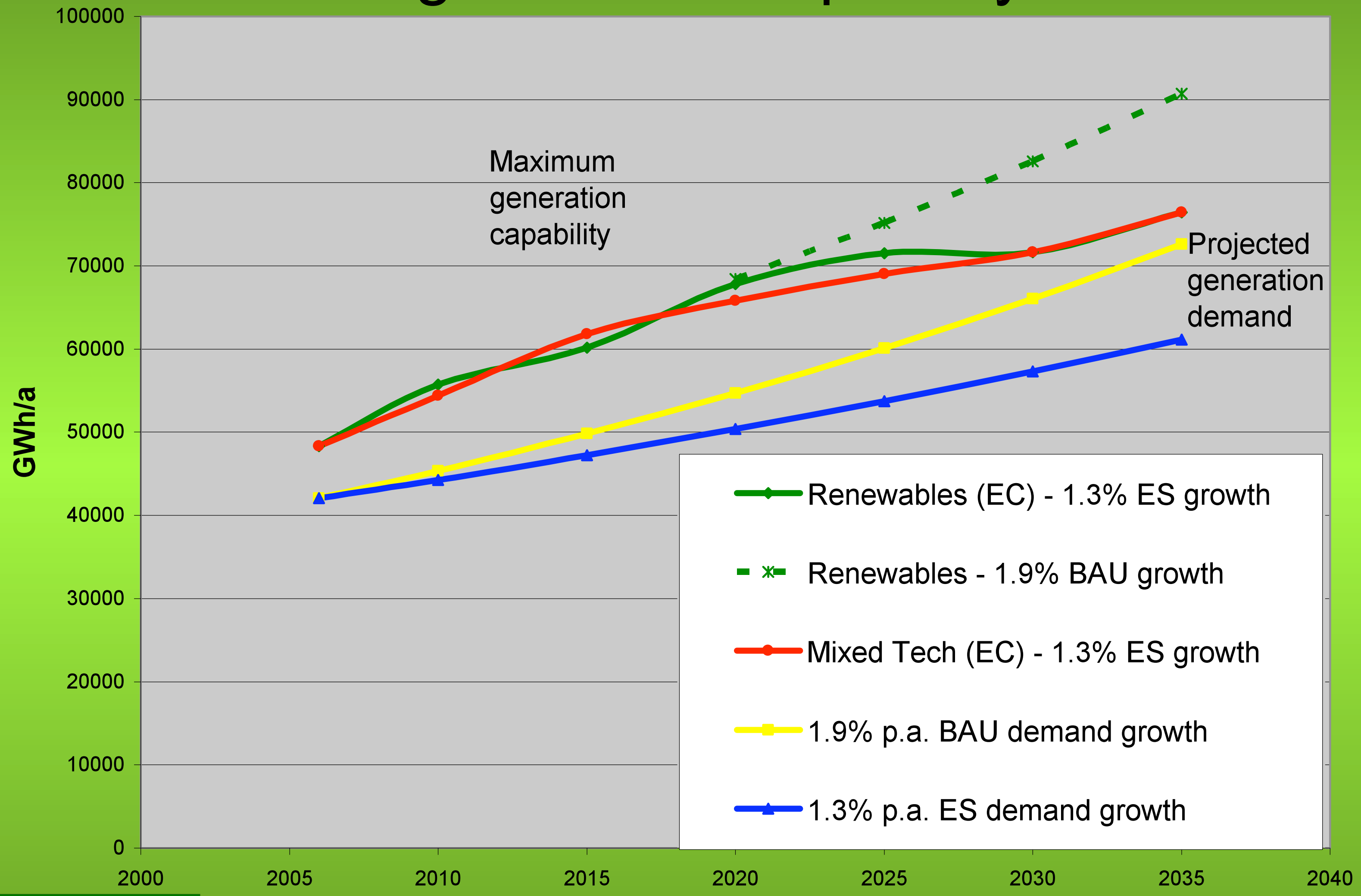
Distribution of electricity between sectors in 2006



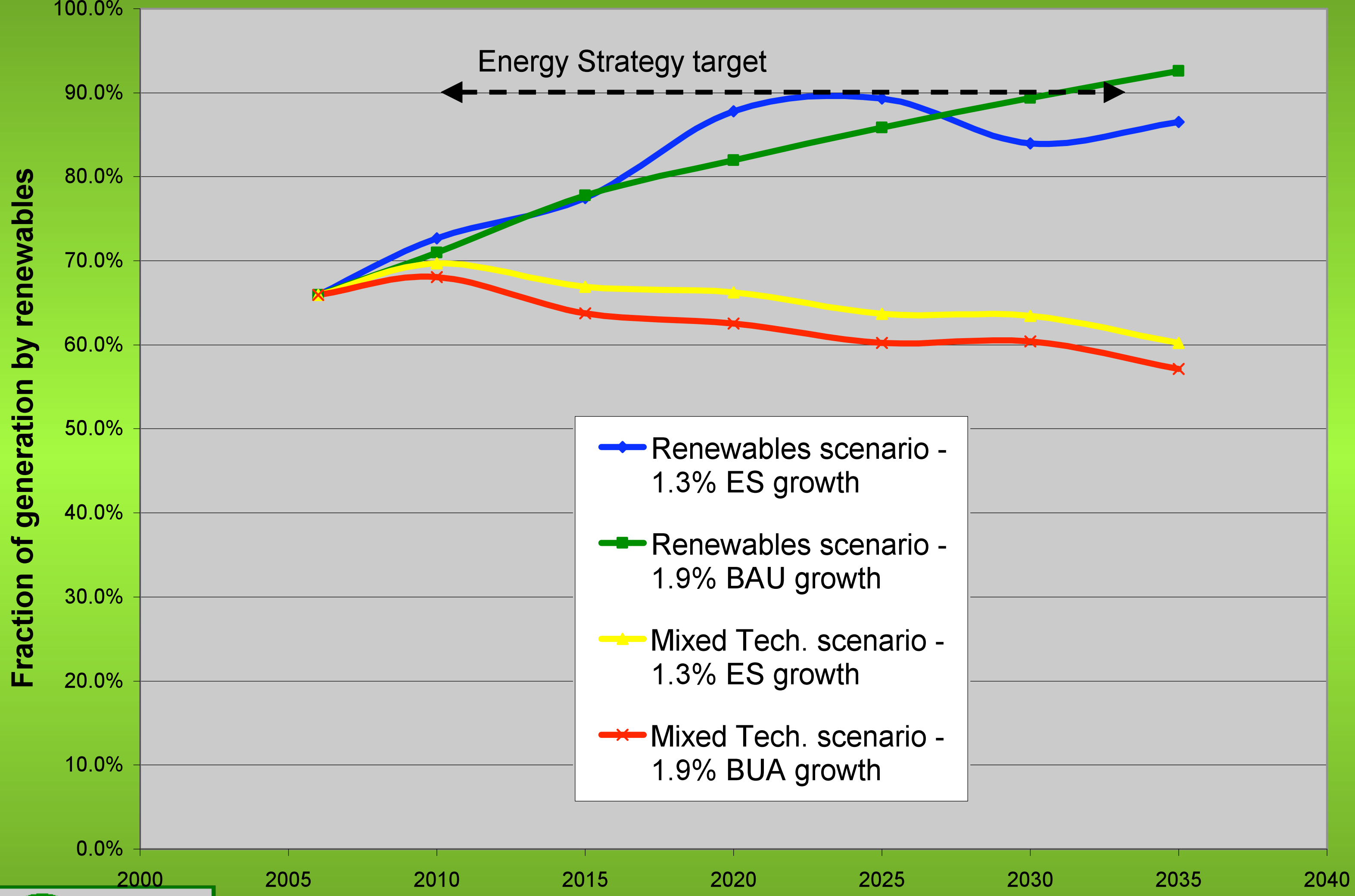
Source – Energy Data File

- The Energy Strategy (ES) growth projection is
  - 1.3% per annum overall growth in electricity demand for NZ
- Business-As-Usual (BAU) growth projection assumptions
  - Population increases according to the central estimate from Statistics NZ
  - Demand in the Residential and Commercial sectors increases at a constant GWh/capita rate
  - Demand in the Industrial sector continues the 2001-2006 growth rate, which was 2.4% per annum increase on the GWh/capita rate
  - The small demand in the transport sector continues at a constant GWh /capita rate (i.e. no significant effect of EVs)
  - Demand by Agricultural sector remains constant
  - Transmission + Distribution - Embedded Generation = 10%
- On this basis the BAU growth projection is
  - 1.9% per annum overall growth in electricity demand for NZ

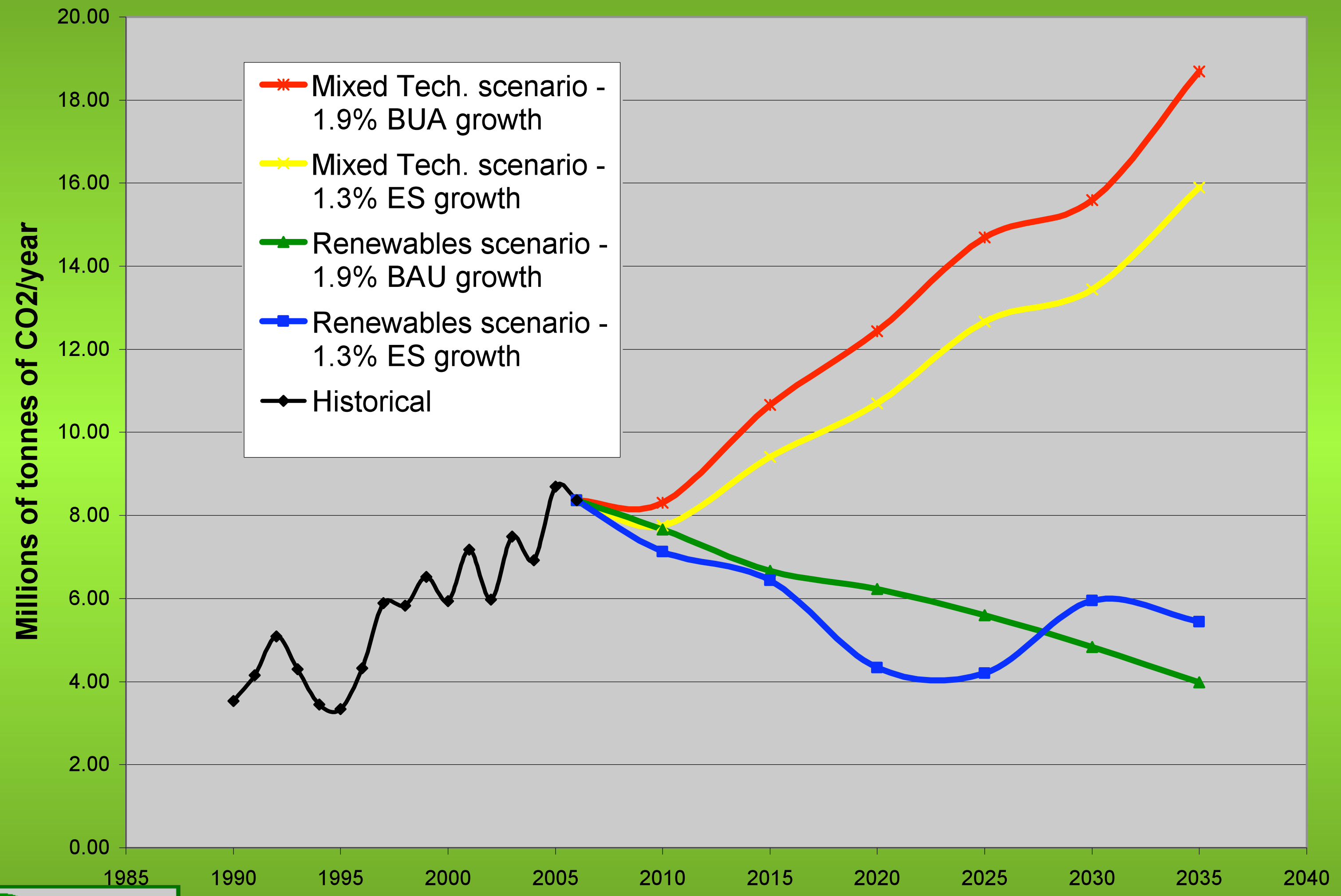
Comparison of Generation demand with generation capability



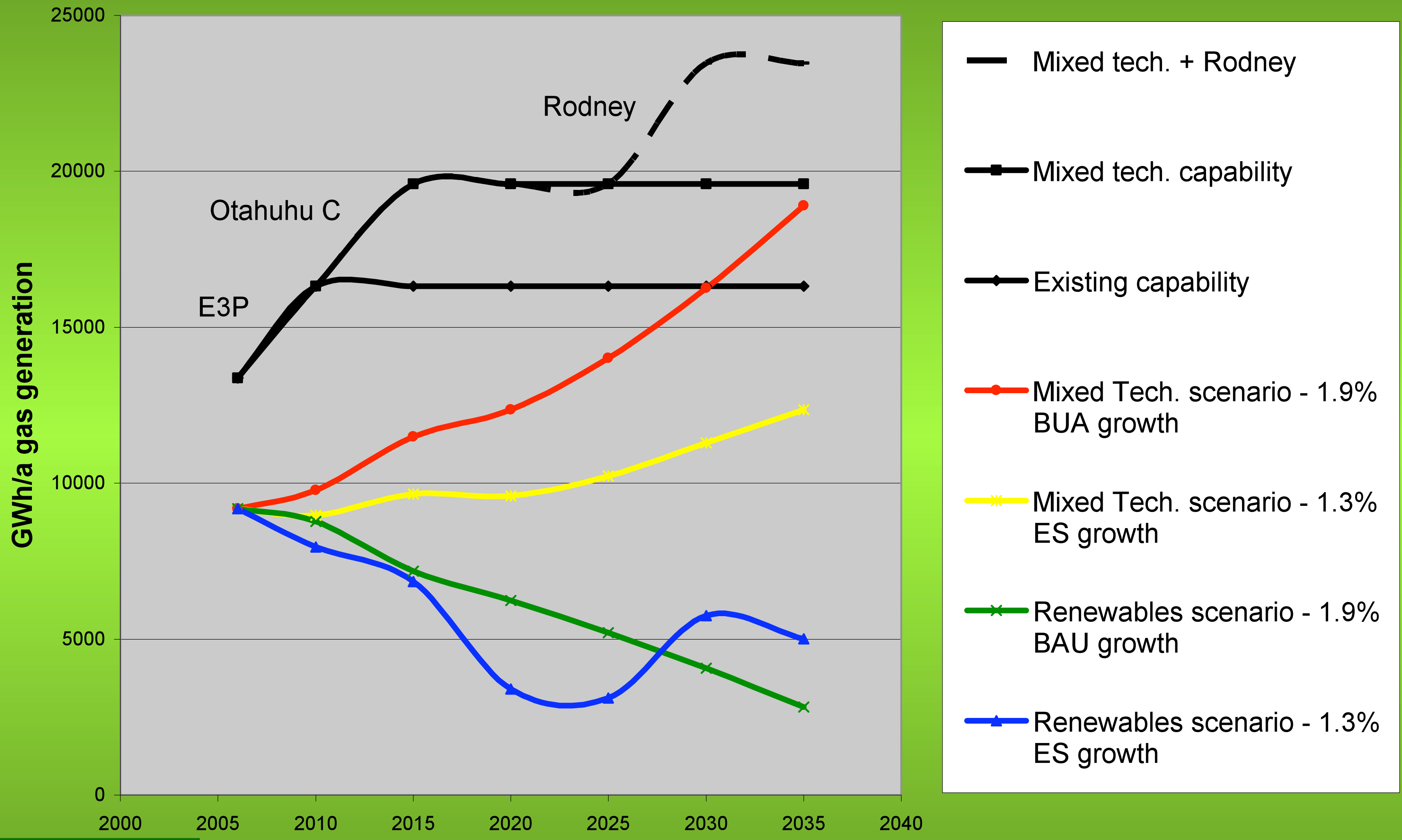
Meeting the 90% renewables Energy Strategy Target



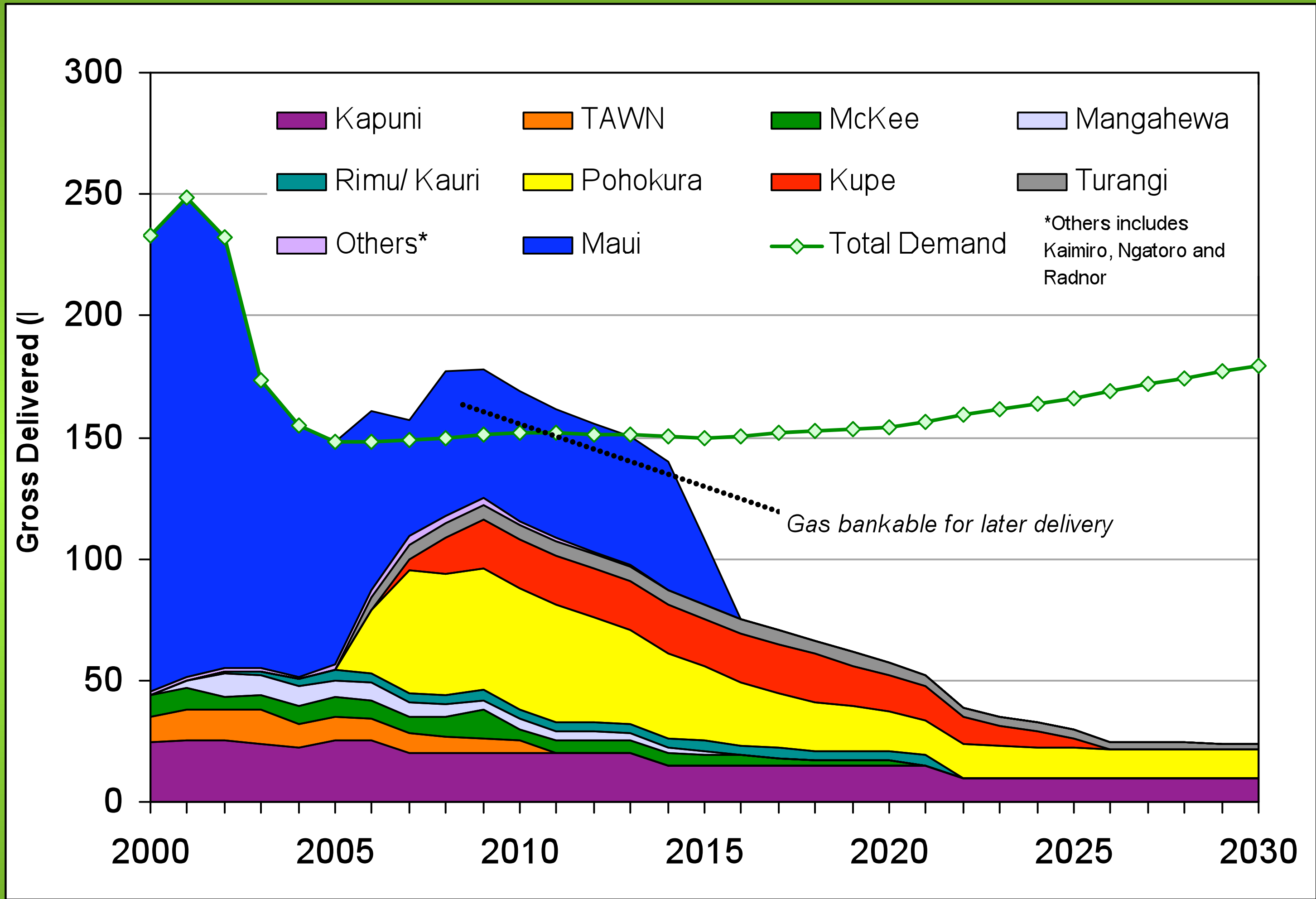
Consequences – CO_2 emissions from Power Generation



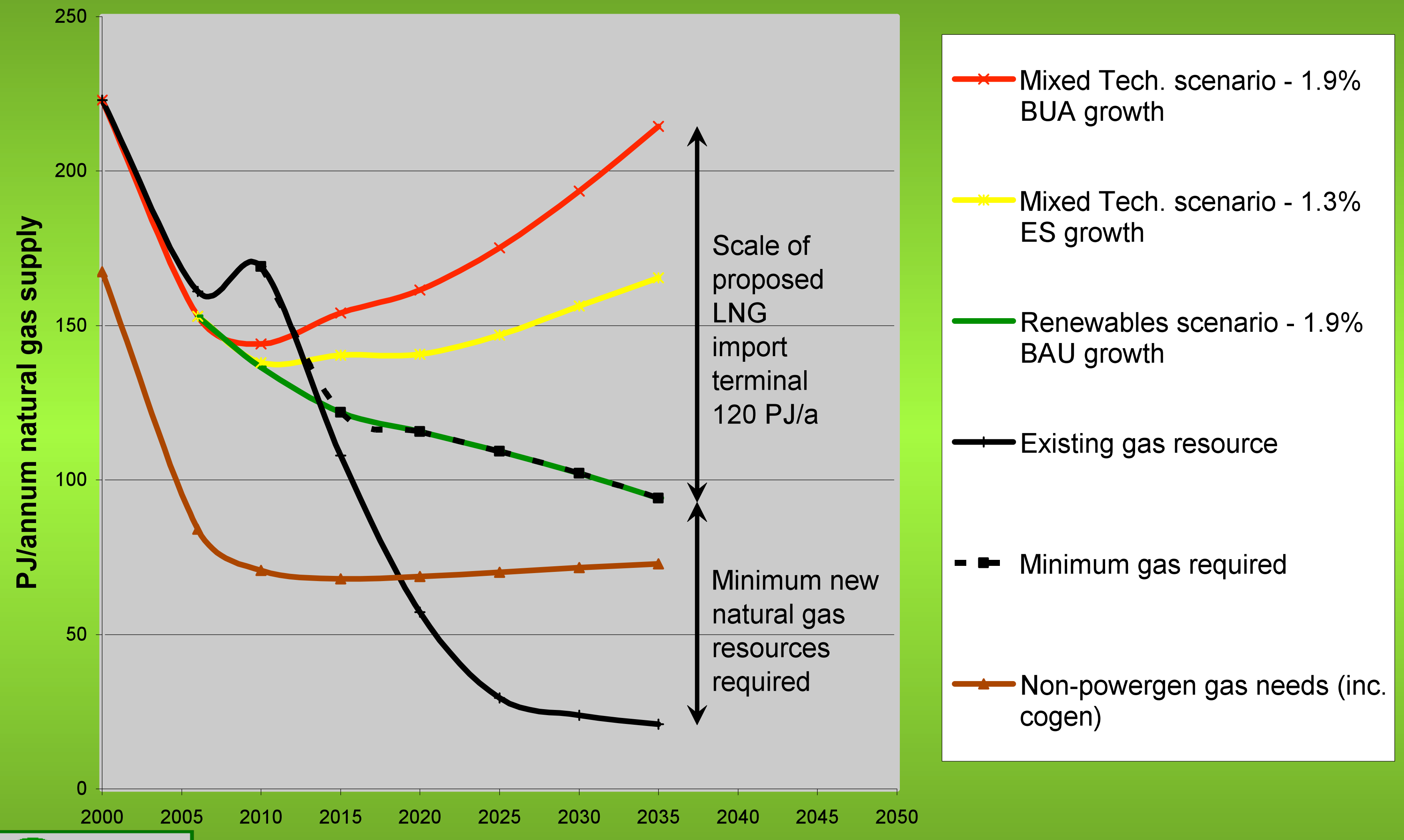
Consequences – Gas fired generation capacity



Natural gas resources in New Zealand



Consequences – Natural gas supply



Cost of Electricity from LNG

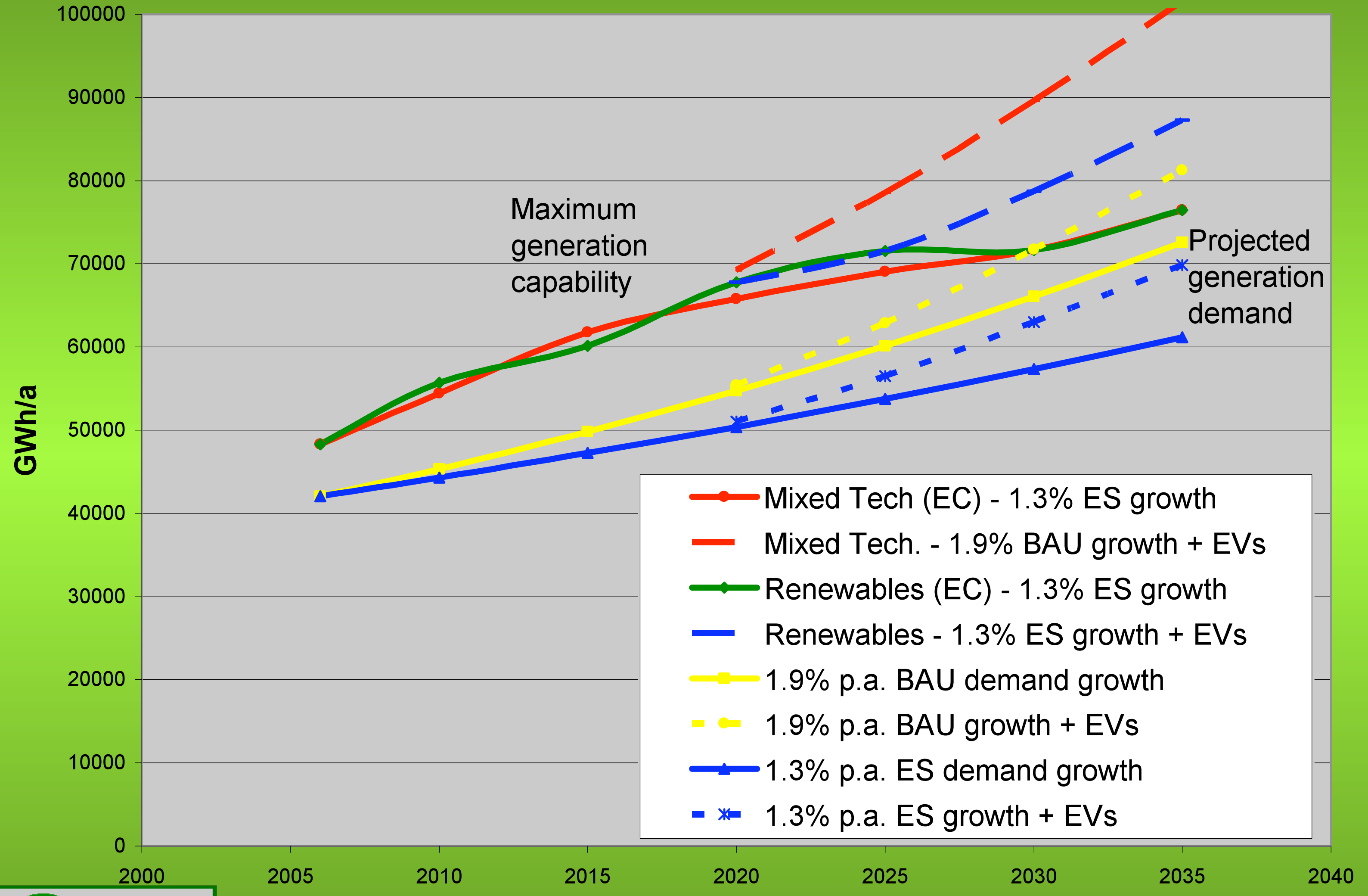
- Assumption 1 – Long term oil price = $100/bbl
  - Therefore crude oil price equivalent to NZ$24 /GJ
- Assumption 2 – LNG price becomes the same as crude oil price an energy basis
  - Therefore long term LNG price = $24/GJ
- Assumption 3 – Efficiency of power gen in a CCGT station = 50%
  - Therefore Fuel element of power gen from LNG = 17.3 c/kWh
- Assumption 4 – non-fuel costs = ~3 c/kWh
  - **Cost of electric power from LNG = ~20 c/kWh**

Cost of power from a large windfarm = < 10 c/kWh

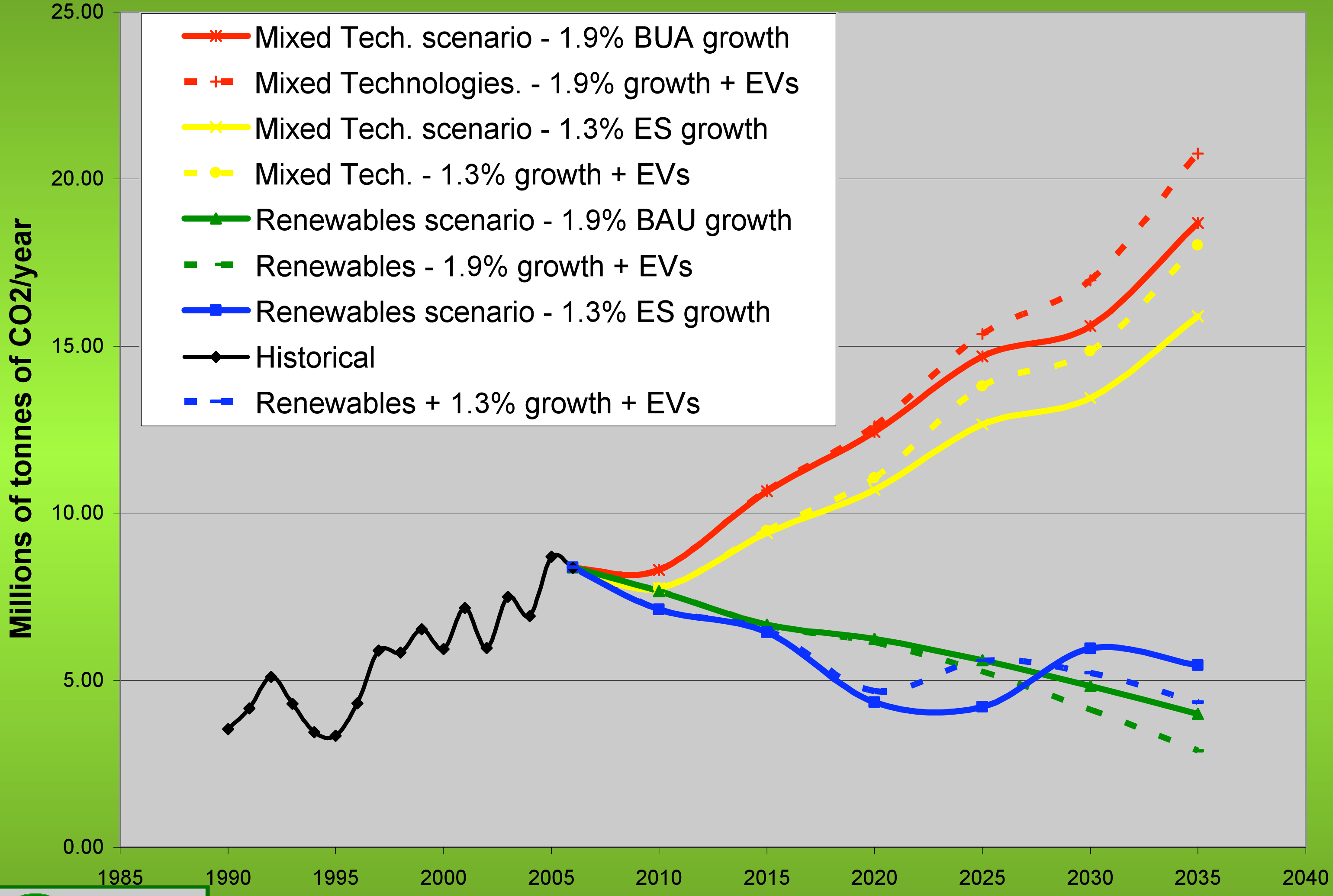
Sensitivity to Electric Vehicles - Assumptions

- Transport demands grow in proportion to population growth
- Electric vehicles (EVs) deliver transport services with one third of the purchased energy input of conventional vehicles
- The uptake of EVs grows to 10% of the transport fleet by 2025, 20% by 2030 and 30% by 2035.
- Primary Renewables Scenario
  - Additional electricity is supplied by additional renewable generation equivalent to increasing wind generation fraction in 2035 from 35% to 45% of total generation with the Business-as-Usual demand growth scenario.
- Mixed Technology Scenario
  - Additional electricity is supplied two thirds by new fossil generation and one third by new renewable generation equivalent to increasing wind generation from 12% to 15% of total generation with the BAU scenario.

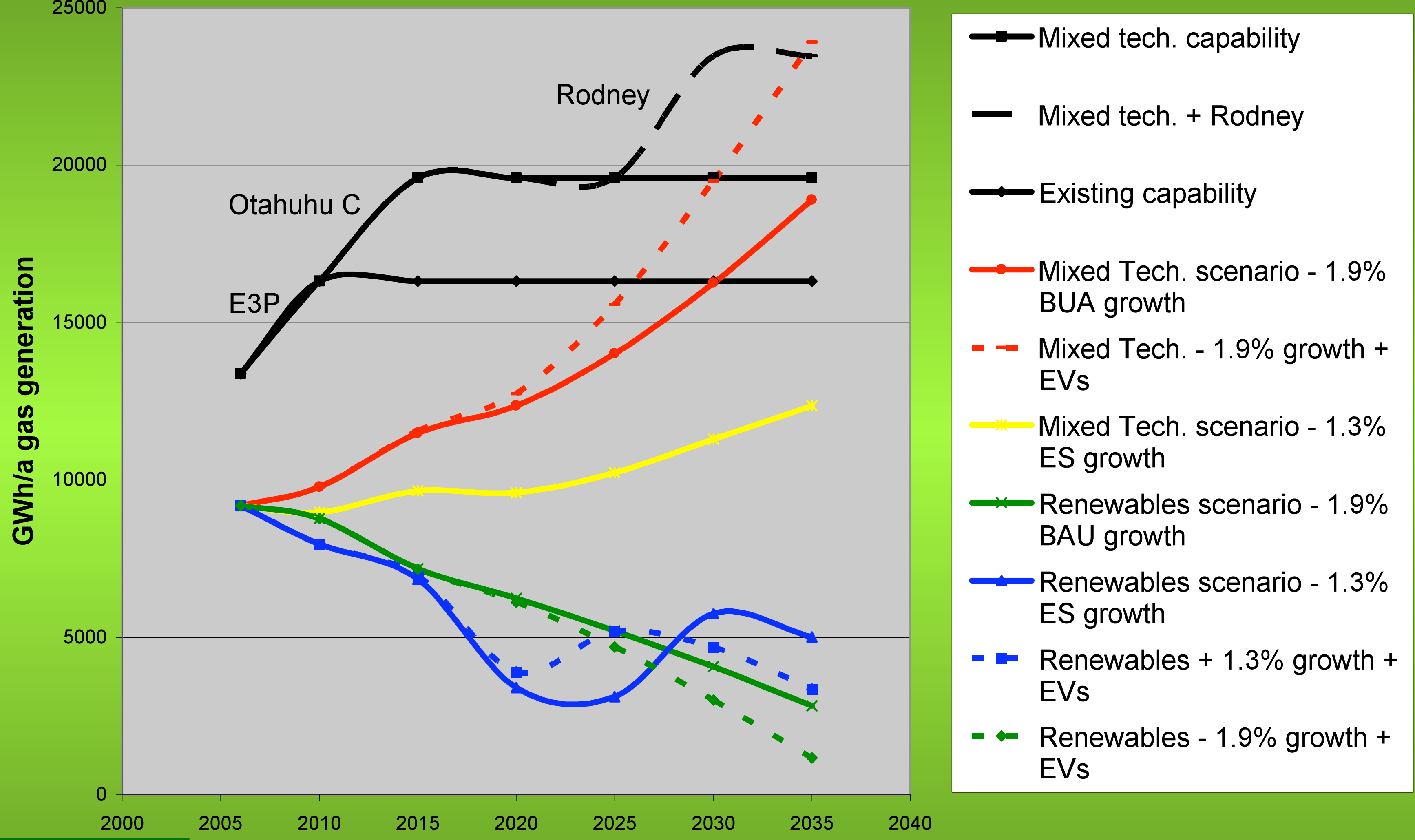
Effect of EVs on total generation capability



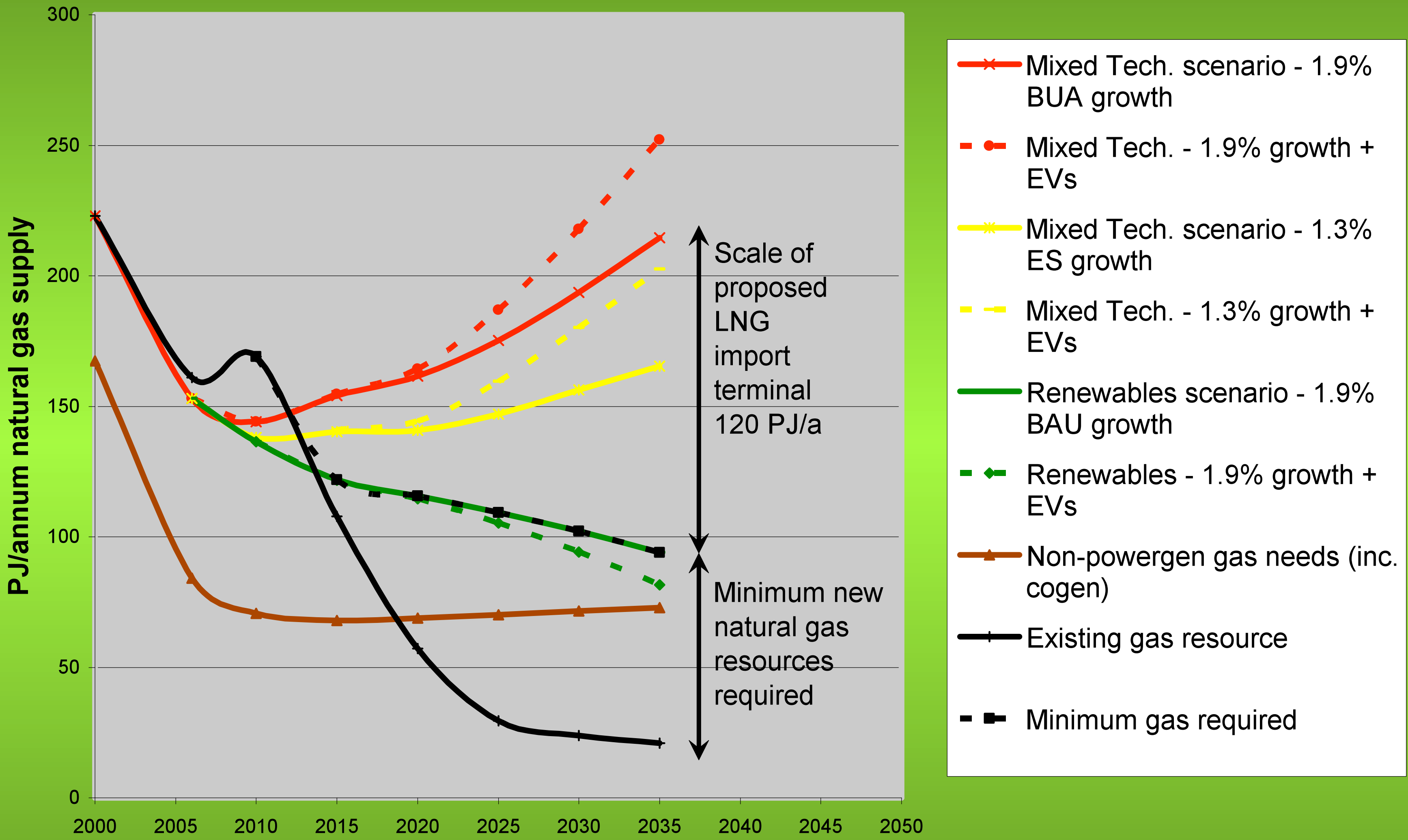
Effect of EVs on CO_2 emissions



Effect of EV's on Generation required



Effect of EVs on Natural Gas requirements



The Energy Strategy Pathway

- 90% renewable electricity generation by 2025 can be achieved without any new coal or gas fired power plants provided electricity demand growth can be constrained to 1.3% per annum
- CO_2 emissions from power generation would halve by 2025, but would not fall back to1990 levels until after 2040
- Electric vehicles might be accommodated with additional renewable plants equivalent to an increase in wind generation to about 45% of total generation y 2035
- New natural gas requirements of 95 PJ per year by 2035 would be required to meet all gas demands, provided Huntly power station is retained in service.

The Business-As-Usual Pathway

- By 2025 there would be three new coal fired power station and one new gas fired station reducing the renewable generation share to 57% under BAU.
- CO_2 emissions would double by 2025 and would reach 20 million tonnes per year by 2035 (6 times 1990 levels)
- Electric vehicles would require an additional 720 MW of fossil generation plant plus an increase in wind fraction from 12% to 15%,
- Natural gas requirements would necessitate the importating of LNG resulting in electricity generation costs about double the cost of wind generation together with large balance of payments implications and strategic risk

Which pathway should NZ follow ?