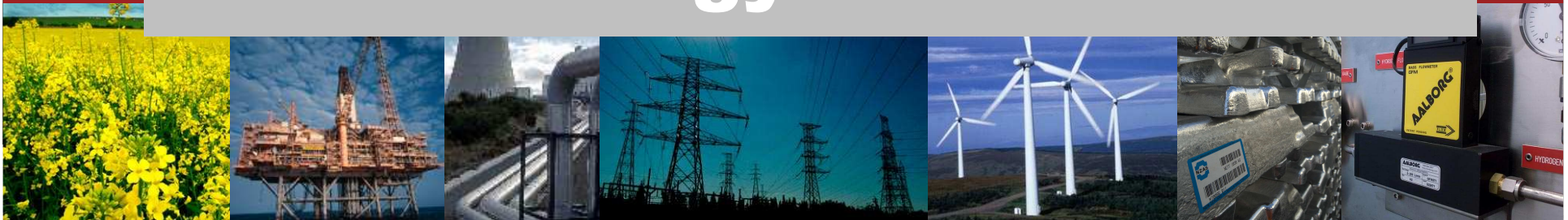




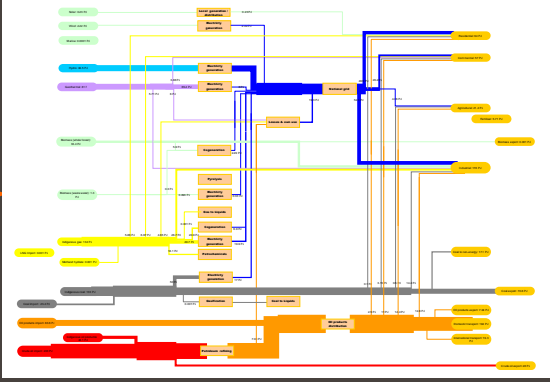
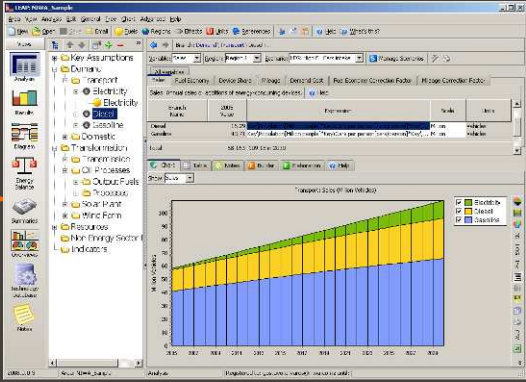
# New Zealand's EnergyScape

EFNZ panel discussion

How can EnergyScape  
contribute to New Zealand's  
energy future?



# EnergyScape framework



## Develop a inventory of energy assets

- Capacity (peak & firm), timescale ...
- GHG, water, land, \$,  $\eta$ , risk ...

Seeking: Order of magnitude, not detail

## Implement simple analysis tools

- LEAP
- Modified national energy summary

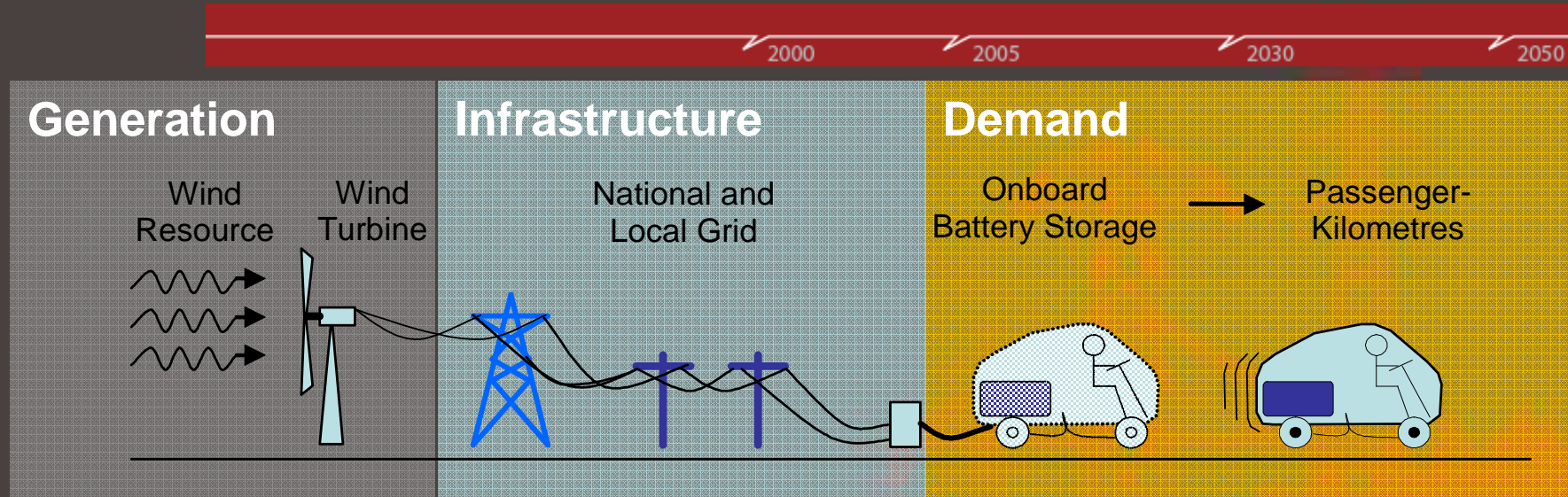
Seeking : Easily maintained collaborative data handling

## Undertake initial analysis

- Initial and verify scenarios ('continuity' & objectives
- Identify knowledge / research gaps
- Understand drivers (steady state & dynamical)

Seeking: An unbiased basis for informing policy & research direction

# Pathway capture ...

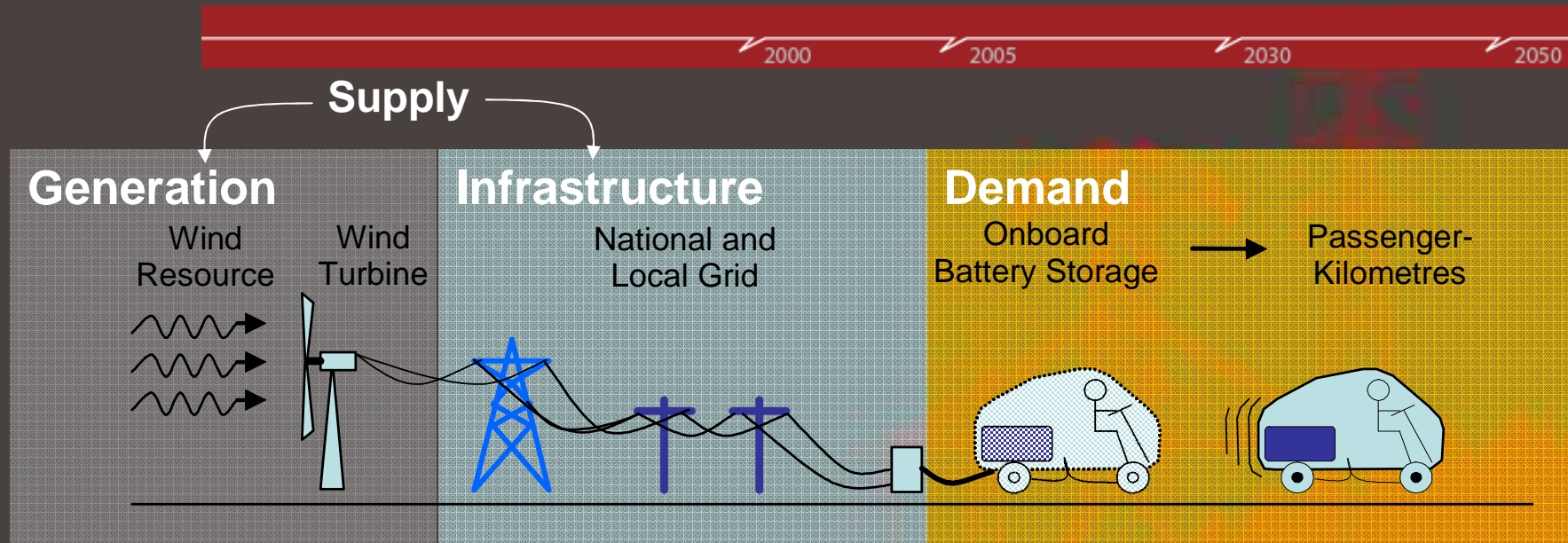


- **Manapouri hydro**
  - Commissioned 1969
  - 2063105E, 5505235N
  - 850 MW peak
  - 5,290 GWh (19 PJ) pa
  - 7 yrs research / RMA; 6 yrs const.
  - \$2.6 billion (2005 Capex)
  - \$250 million × 150 years?
  - 3 × 710 risk stars during construction
  - 14,200 ha & 36.8 million m<sup>3</sup>/d water
  - Minimal GHG emissions
- **2009 Diesel-electric hybrid**
  - Imported 2009
  - Regional distribution by VKT
  - 9,600 vehicles ≡ 18.2 million kPt/y
  - 0.25 PJ diesel & 0.1 PJ (29 GWh) pa
  - 3 yrs research / RMA; 0 yrs const.
  - \$0.4 billion (2005 Capex)
  - \$11.3 million × 15 years?
  - 3 × 12300 risk stars during research
  - 0.1 ha & 0 m<sup>3</sup>/d water
  - 113 ktCO<sub>2</sub>/yr = \$2.26 million pa

**Capturing order of magnitude ...**

**Understandable econometrix ...**

# Pathway capture ...



Fertiliser	Wood pellets	Comb Heat Power	Algae liquids	Electric rail	Landfill gas
Distributed Gen	Fisher-Tropsch	Solar power	Hydrogen gas	Waste Biodegestion	Bio refinery
Coal to Liquids	Hydrogen Ref	Hydrazine	Wind dam	REDOX batteries	Sequestration
CNG /LNG	MeOH fuel cells	Hydrogen gas	Organic PV	Hot dry rock	
1; 2° & 3° biofuels	Electric vehicles	Petroleum refinery	Solar Hot Water	Supercritical water	Wave energy

Needs to be adaptable to capture foreseen and unforeseen ...

Clear documentation of assumptions is critical ...



# Impact on sustainability ...

2000

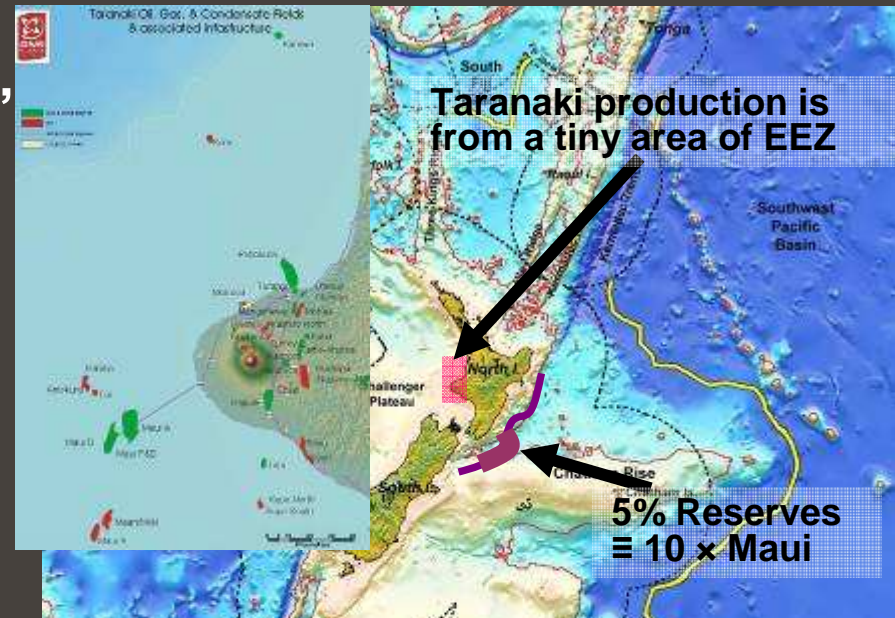
2005

2030

2050

## Bring awareness to the opportunities ...

- New Zealand is currently locked in an “Energy Security” mindset ...
  - Oil & gas potential
  - Export revenue
  - Energy security
- Risks in fossil fuel market
  - Economic standstill
  - Tui’s relief of import bill is temporary
- Other opportunities
  - Methane hydrate
  - Lignites
  - Purpose grown biomass



A \$25/bbl future

Yeah right.

Tui

New Zealand's EnergyScape



# Impact on wellbeing ...

2000                      2005                      2030                      2050



- Increased public awareness / understanding
  - Climate change mitigation
  - Fossil fuel uncertainty
- Increased utilisation of lower grades of heat eg.
  - Geothermal direct
  - Passive & hot water solar
- Quantify trends in consumer spending & associated inequities
- Impacts of community and individual scale distributed generation

# Impact on climate change

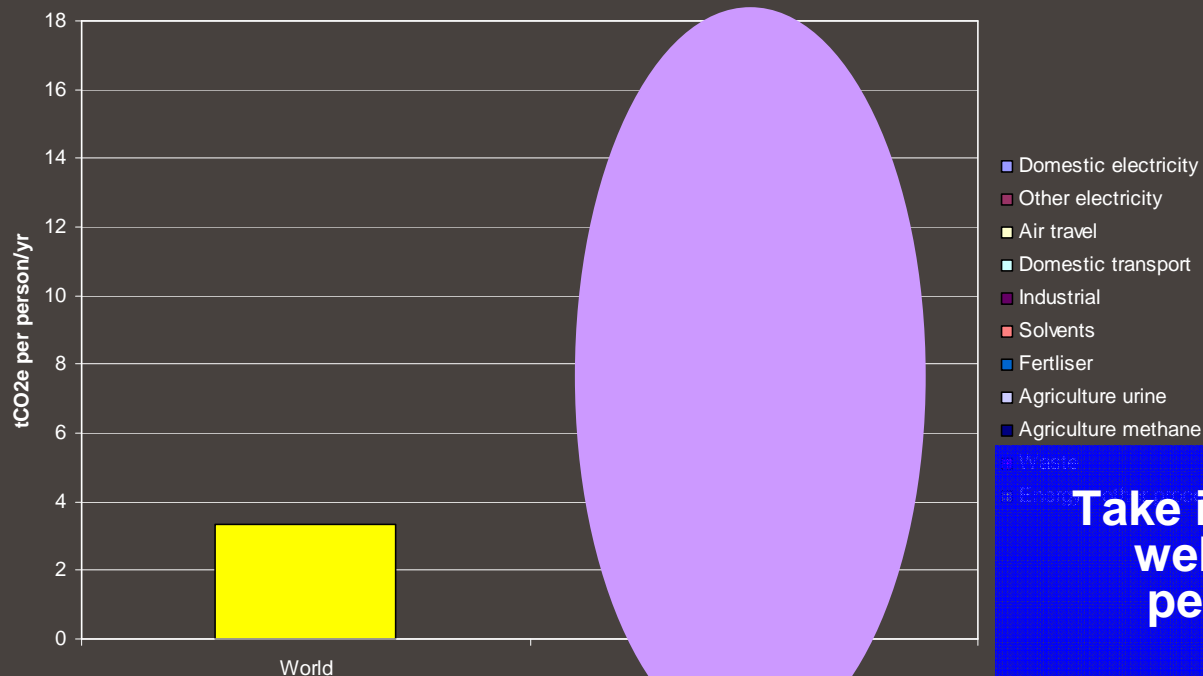


## Can quantify (magnitude) a range of policy scenarios

- Agriculture demand
- Fossil fuel demand /supply
  - Urban planning
  - Behaviour
  - Regulation
- Economics
  - Agriculture / tourism value
  - Fuel import bill
  - “I will if you will”
  - Sensitivity to major exporters
- Cost of inaction



GHG Emissions Profile



Take international as well as national perspective ...

# Impact on climate change

2000

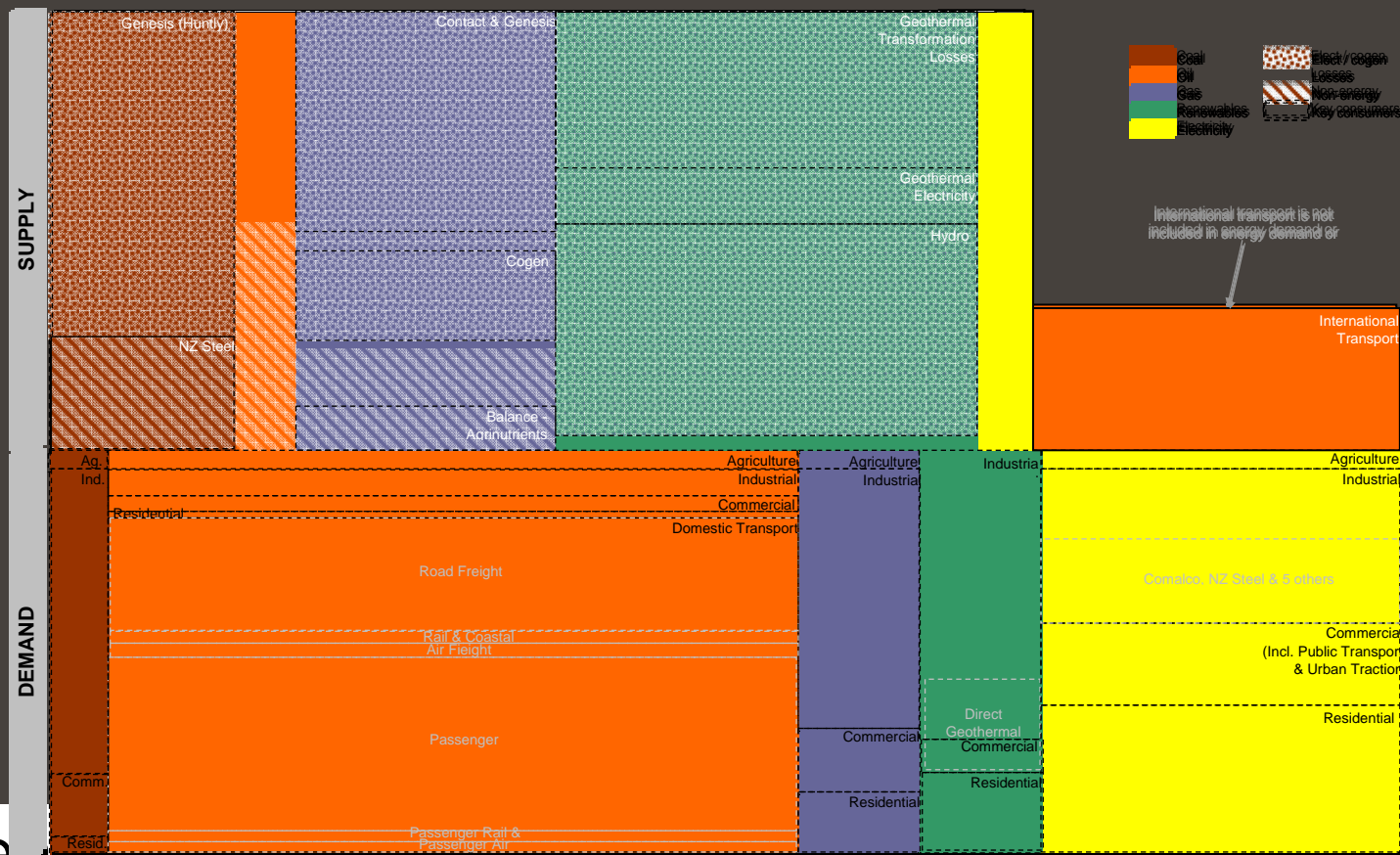
2005

2030

2050

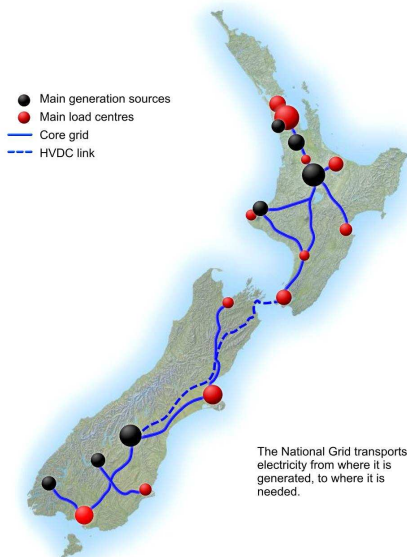
## Need broader range of transport & process heat solutions

- World price taker?
- Gas / coal or biomass to liquids?
- Electric vehicles for freight?



New Zealand's Energy Scapes

# Bringing it all together



2000

2005

2030

2050

- **Being sustainable:**
  - Maintaining the means to obtain services
  - Exploit oil, gas, methane hydrates, biomass?
  - GHG mitigation  $\equiv$  focus on electricity?
  - Understand fuel price impact on inequality
- **Need to quantify and communicate visually**
  - What needs to be done
  - How can it be done
  - How fast can we do it
- **Need to broaden transport alternatives**
  - Gas / coal or biomass to liquids?
  - Electric vehicles for passenger & freight?
  - CSS & Hydrogen?
  - Distributed generation?



# New Zealand's EnergyScape

2000

2005

2030

2050

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