

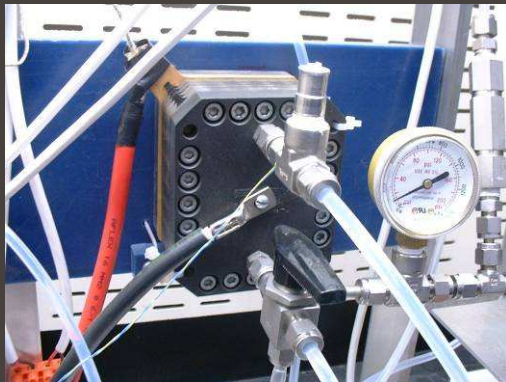
# Where to Place Hydrogen Research Effort?

2000

2005

2030

2050



New Zealand's EnergyScape



# Why Look at Hydrogen?

2000

2005

2030

2050

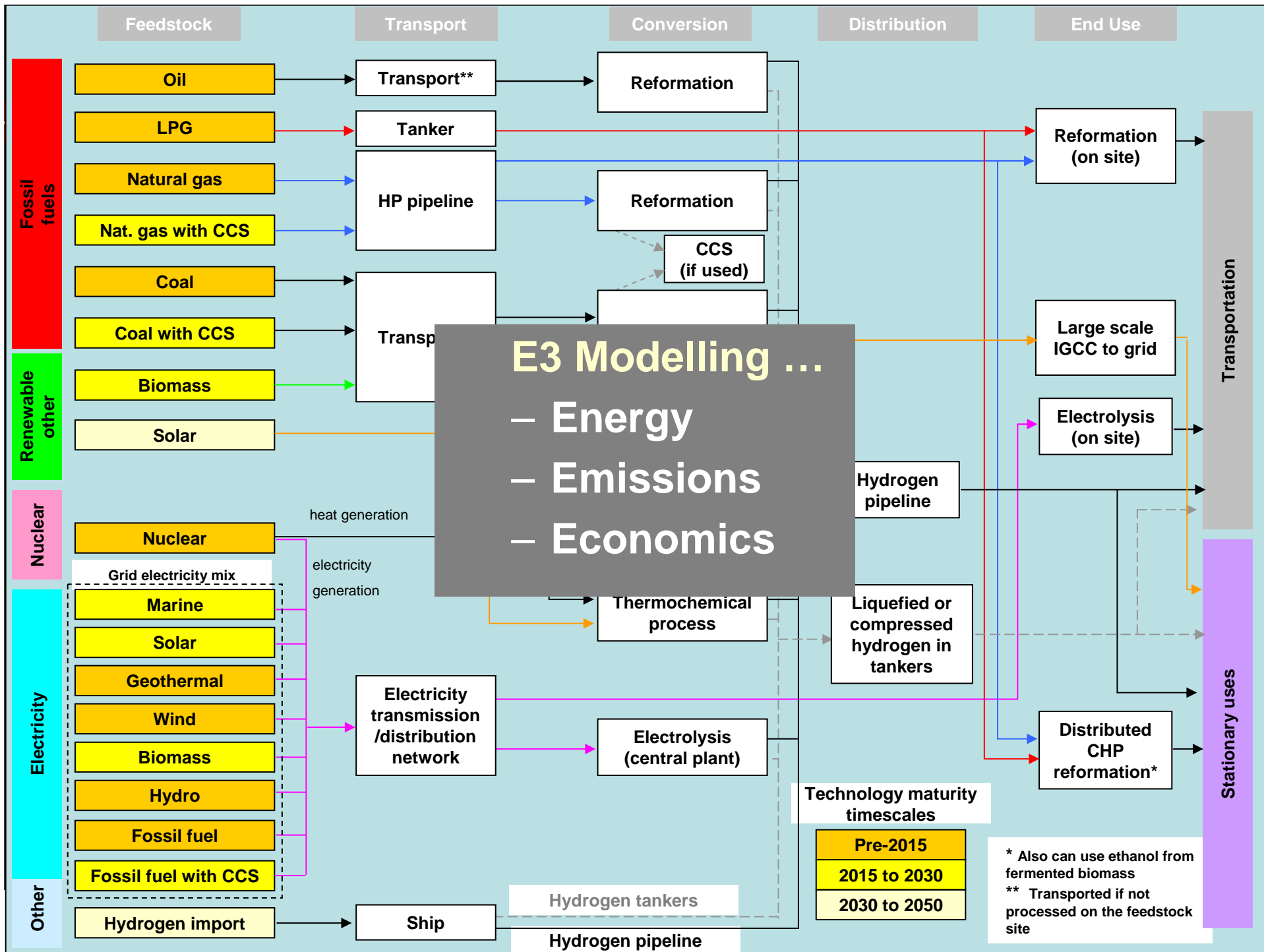
Some comments from past meetings ...

- **Is hydrogen just too far out there?**
  - Hydrogen has potential of a great energy carrier
  - Potential for a paradigm shift in how it could be used.
- **Why now?**
  - Require plans so that it can be a future option
  - They may simply require maintaining a watching brief.
- à **The hydrogen Energyscape Project**
  - Assume that it has happened,  
now how did we get here?

# Stage One – Situation Analysis

2000 2005 2030 2050

- **Globally:**
  - 138 refuelling stations in 25 countries.
  - 63 planned for 2007
  - 600 FC vehicles
- **New Zealand:**
  - 55,000 tpa
  - Consumed on site
  - 10 x for future transport
- **Future Options ...**



**Feedstock**

**Transport**

**Conversion**

**Distribution**

**End Use**

**Fossil fuels**

Oil

LPG

Natural gas

Nat. gas with CCS

Coal

Coal with CCS

**Renewable other**

Biomass

Solar

**Nuclear**

Nuclear

Grid electricity mix

**Electricity**

Marine

Solar

Geothermal

Wind

Biomass

Hydro

Fossil fuel

Fossil fuel with CCS

**Other**

Hydrogen import

Transport\*\*

Tanker

HP pipeline

Transport

Electricity transmission /distribution network

Ship

Reformation

Reformation

CCS (if used)

Thermochemical process

Electrolysis (central plant)

Hydrogen pipeline

Liquefied or compressed hydrogen in tankers

Technology maturity timescales

Pre-2015

2015 to 2030

2030 to 2050

Reformation (on site)

Large scale IGCC to grid

Electrolysis (on site)

Distributed CHP reformation\*

Transportation

Stationary uses

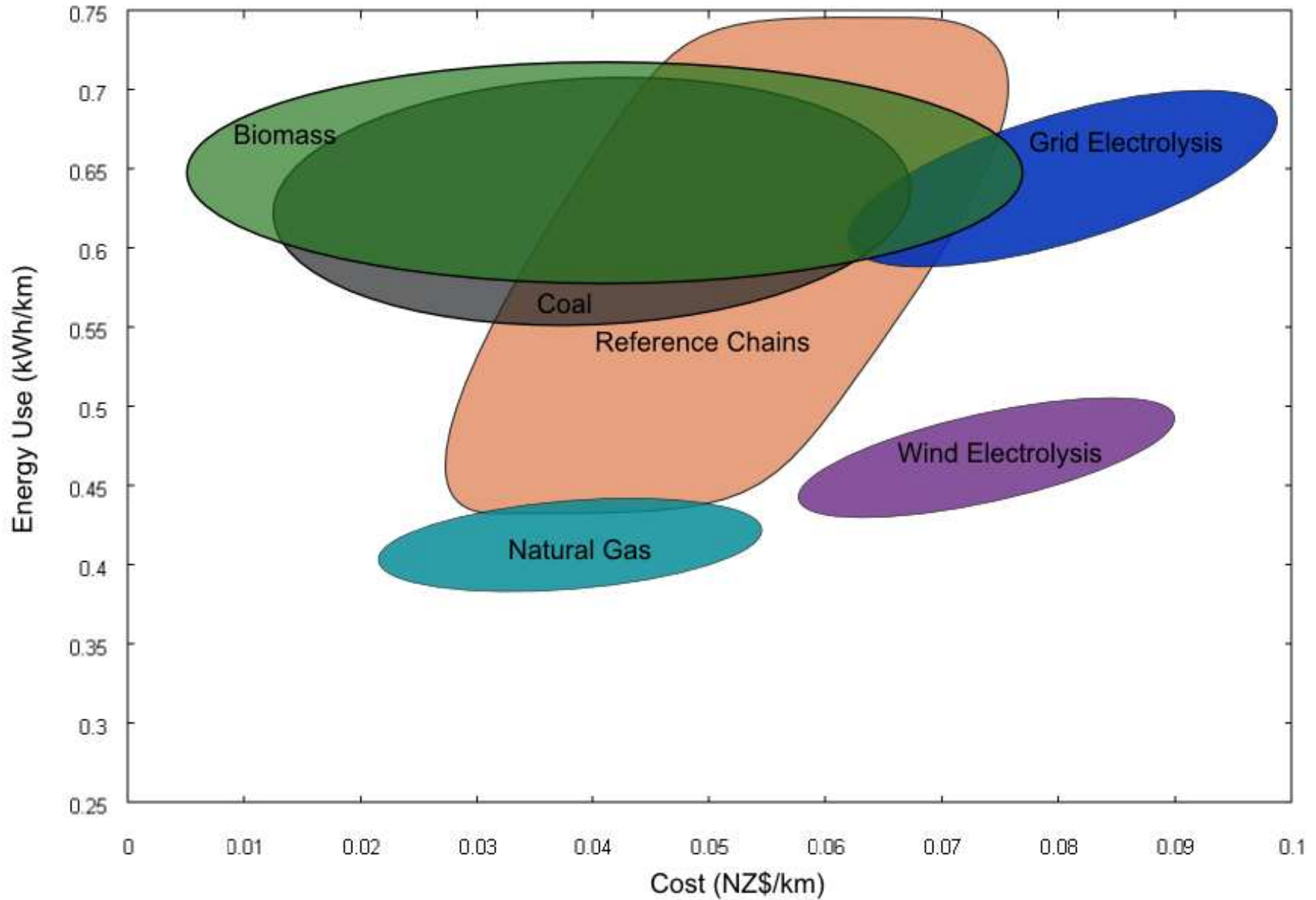
heat generation

electricity generation

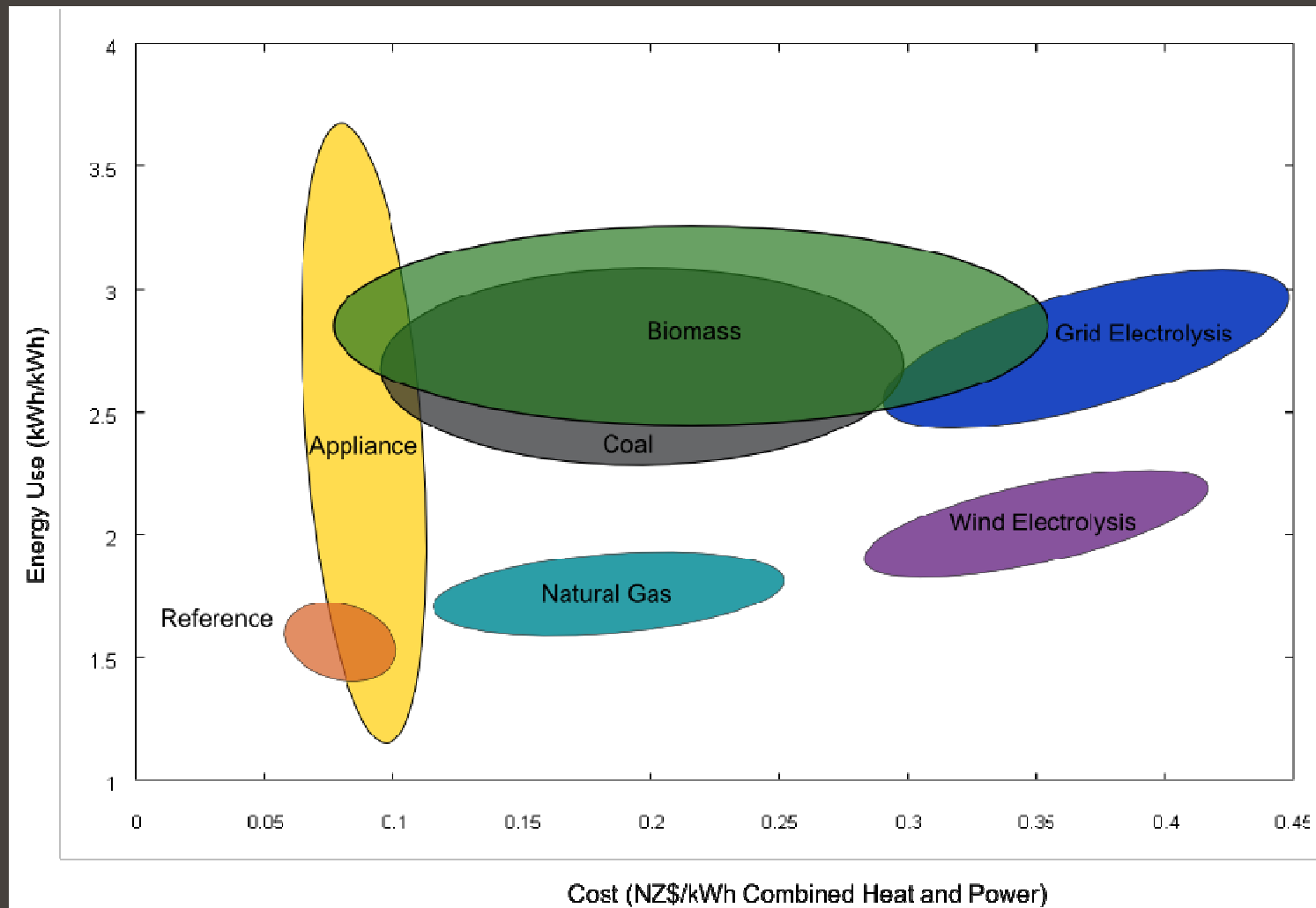
Hydrogen tankers

Hydrogen pipeline

# Results from E3 Analysis - Transport



# Stationary applications



New Zealand's EnergyScape



# Next Steps

2000 2005 2030 2050

- **Integrated modelling to provide to various demand scenarios (STELLA):**
  - What are the possible transition strategies
  - What if we wait?
- **Integrated EnergyScape scenario:**
  - Without hydrogen
  - With hydrogen