

NZ Energy Security:

**Is coal a long term supply choice
or just a short term backstop?**



The transition to a renewable energy future should balance

Demand

- Level
- Quality
- Flexibility

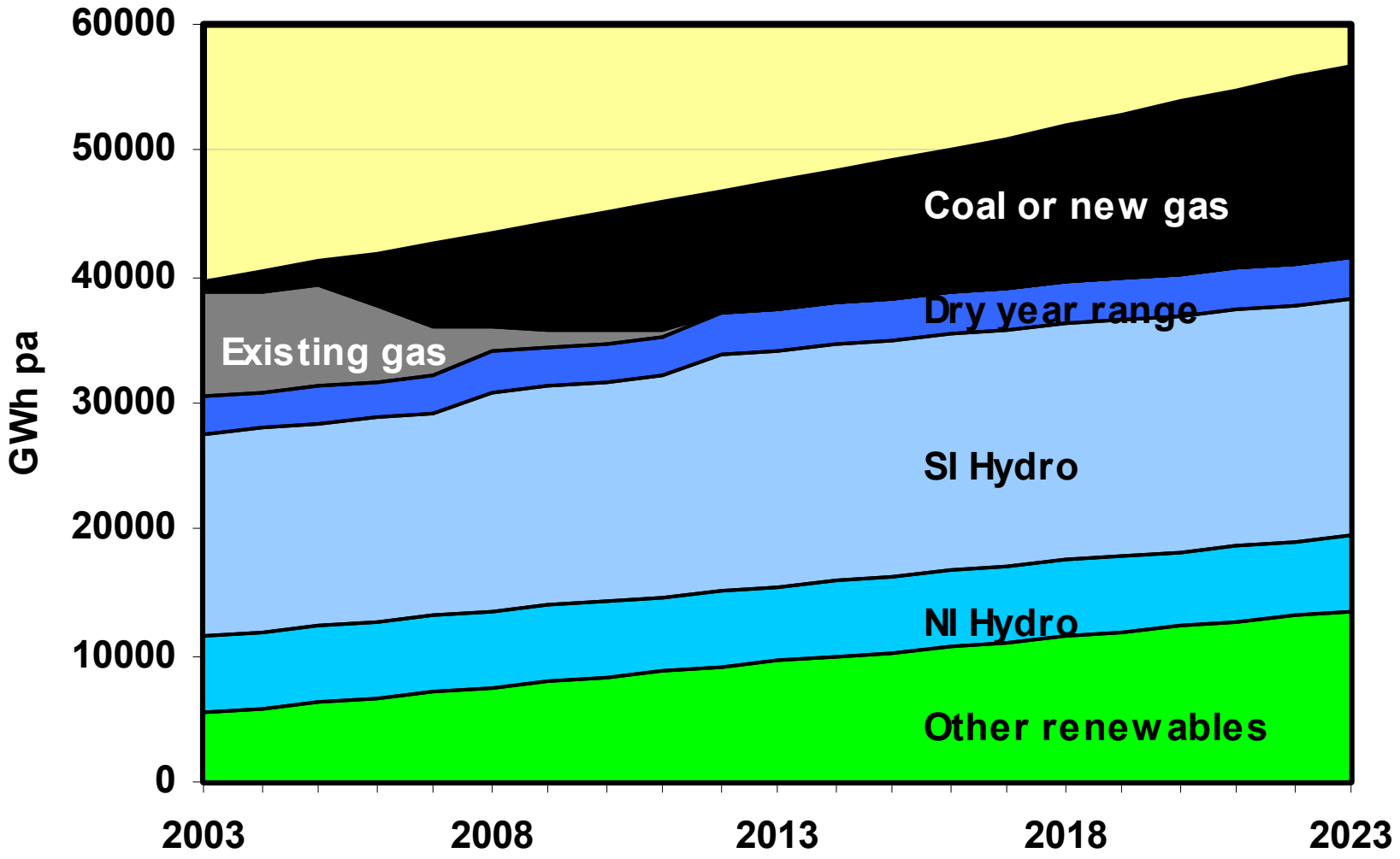
Supply

- Security
- Cost
- Externalities

Timing



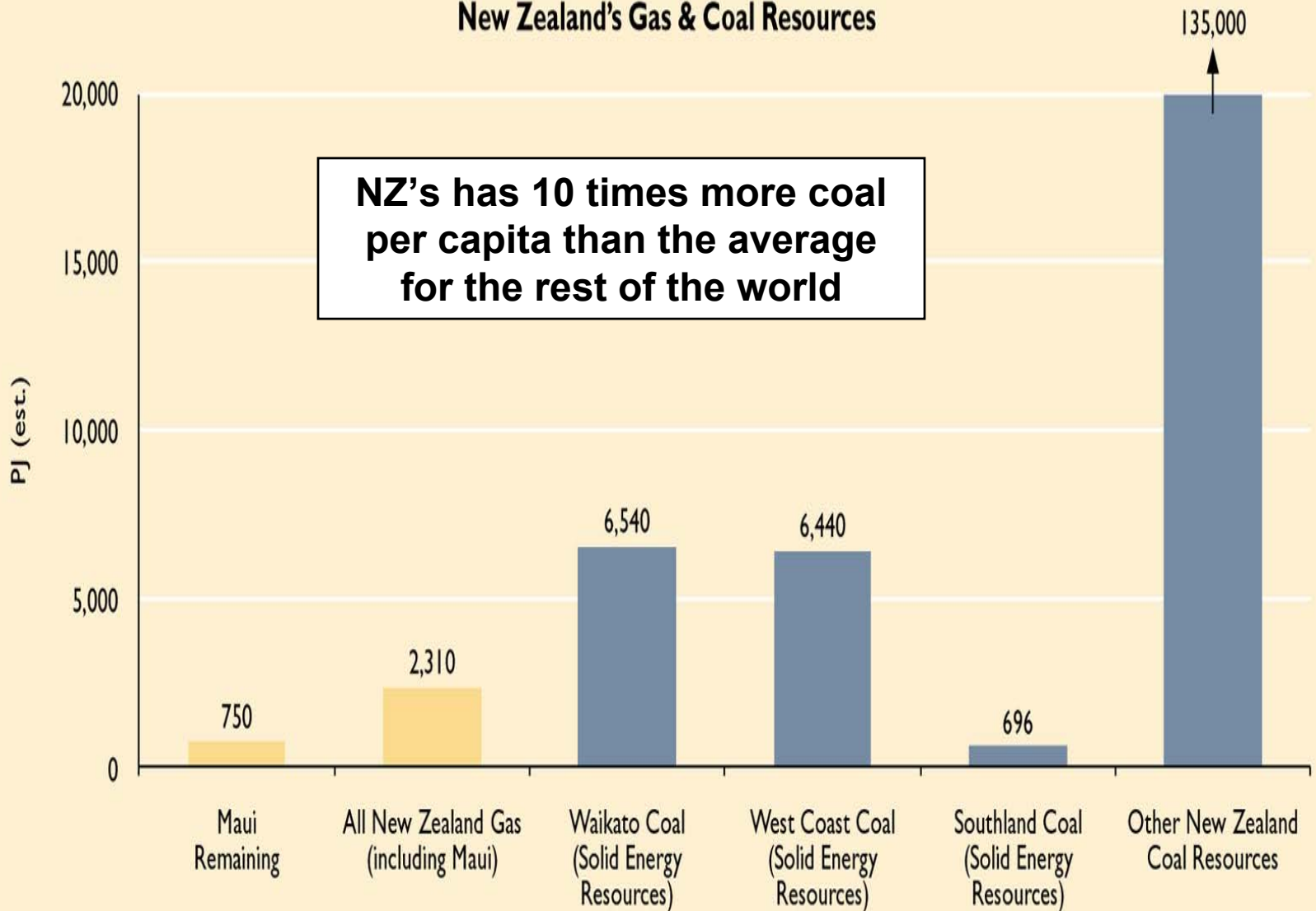
Electricity demand growth means NZ will have to use substantially more gas or coal in the medium term ...





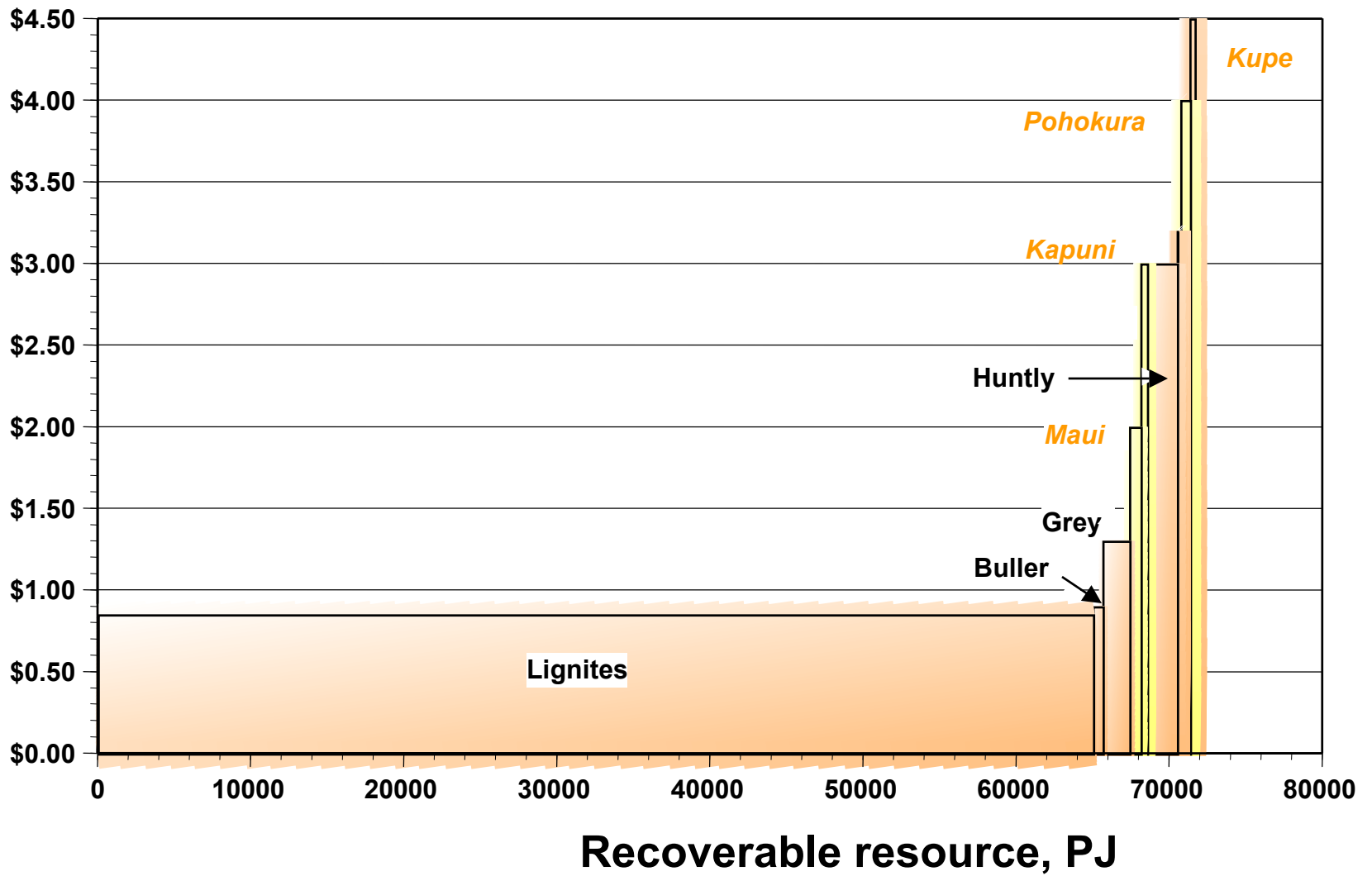
... but NZ's recoverable energy reserves are dominated by coal (150,000 PJ), not gas (3,000 PJ) ...

New Zealand's Gas & Coal Resources



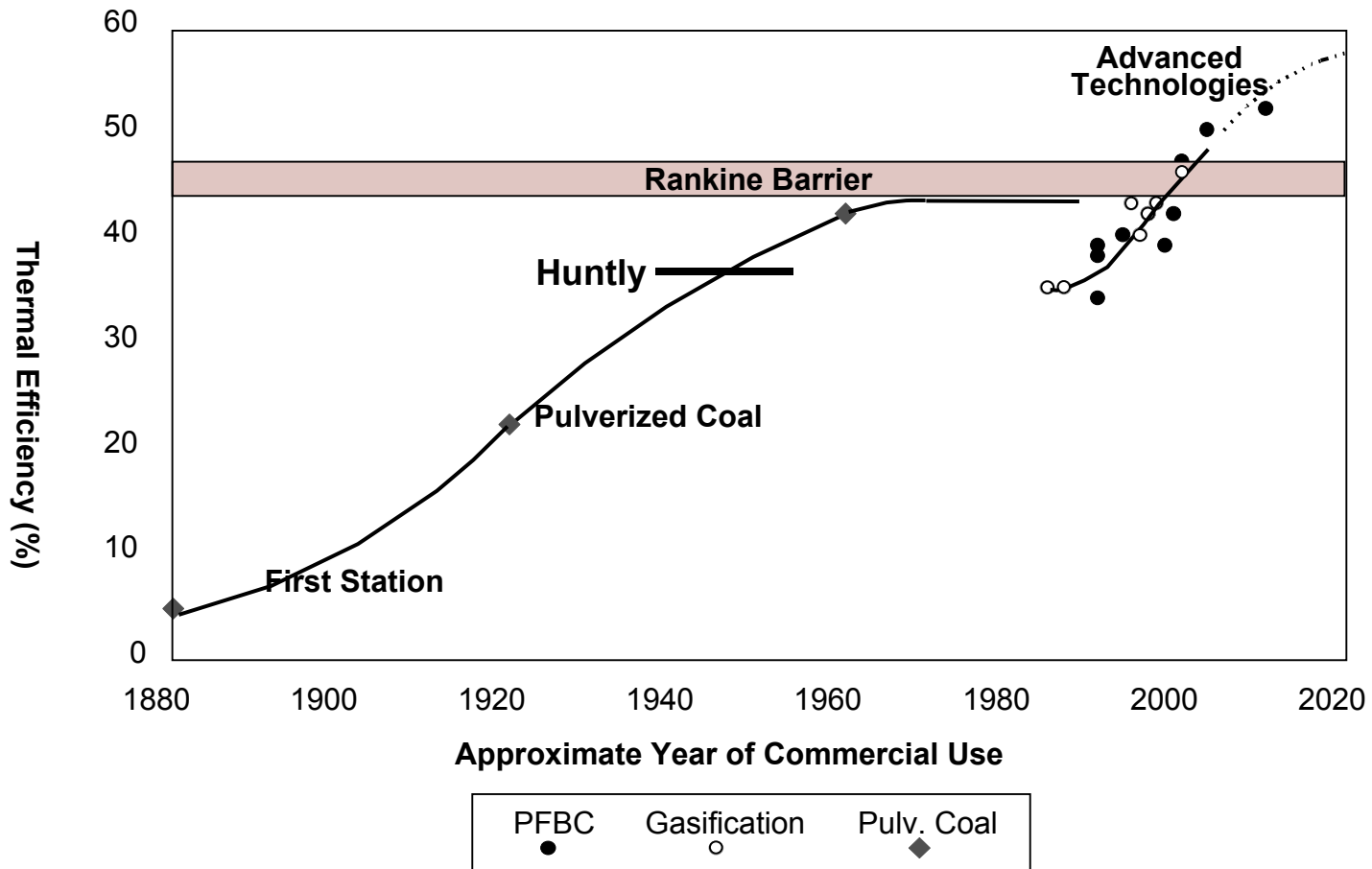


... and coal offers energy at under \$3.50 / PJ,
with most under \$1.00/PJ





New "Advanced Generation Technologies" will "break" the Rankine efficiency barrier ...

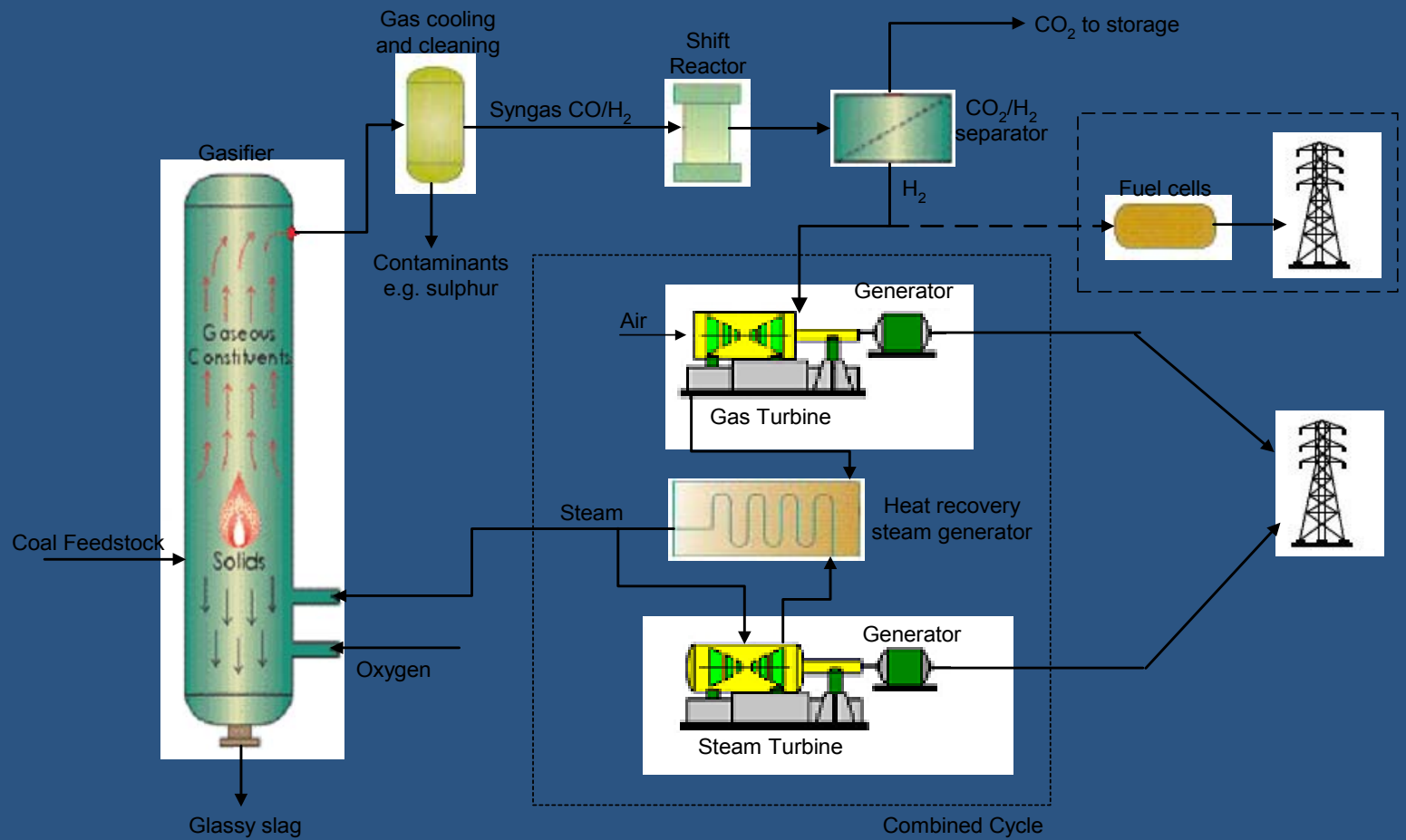


- +45-50% expected in the next 3-5 years
- If coal is gasified effectively gas generation technology can be applied
- The major problem has been hot gas clean-up
- Ceramic filters now used successfully to clean gas streams



... increase efficiencies, reduce SO₂, NO_x and particulate emissions even further and capture up to 100% of CO₂

IGCC and Carbon Dioxide Capture

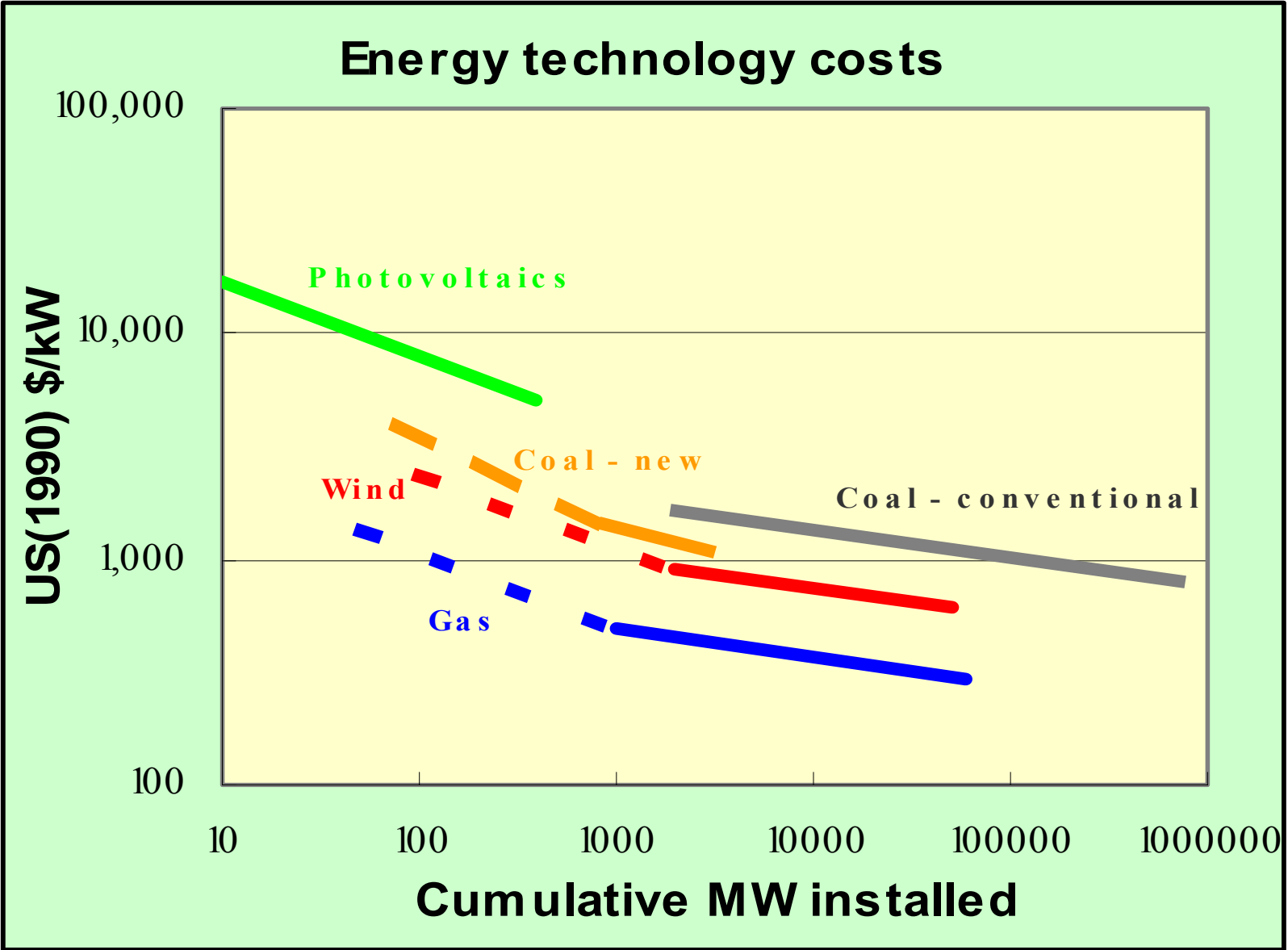


The US is spending \$5B on “Clean Coal” Technology
... and has commissioned a plant with zero CO₂ emissions





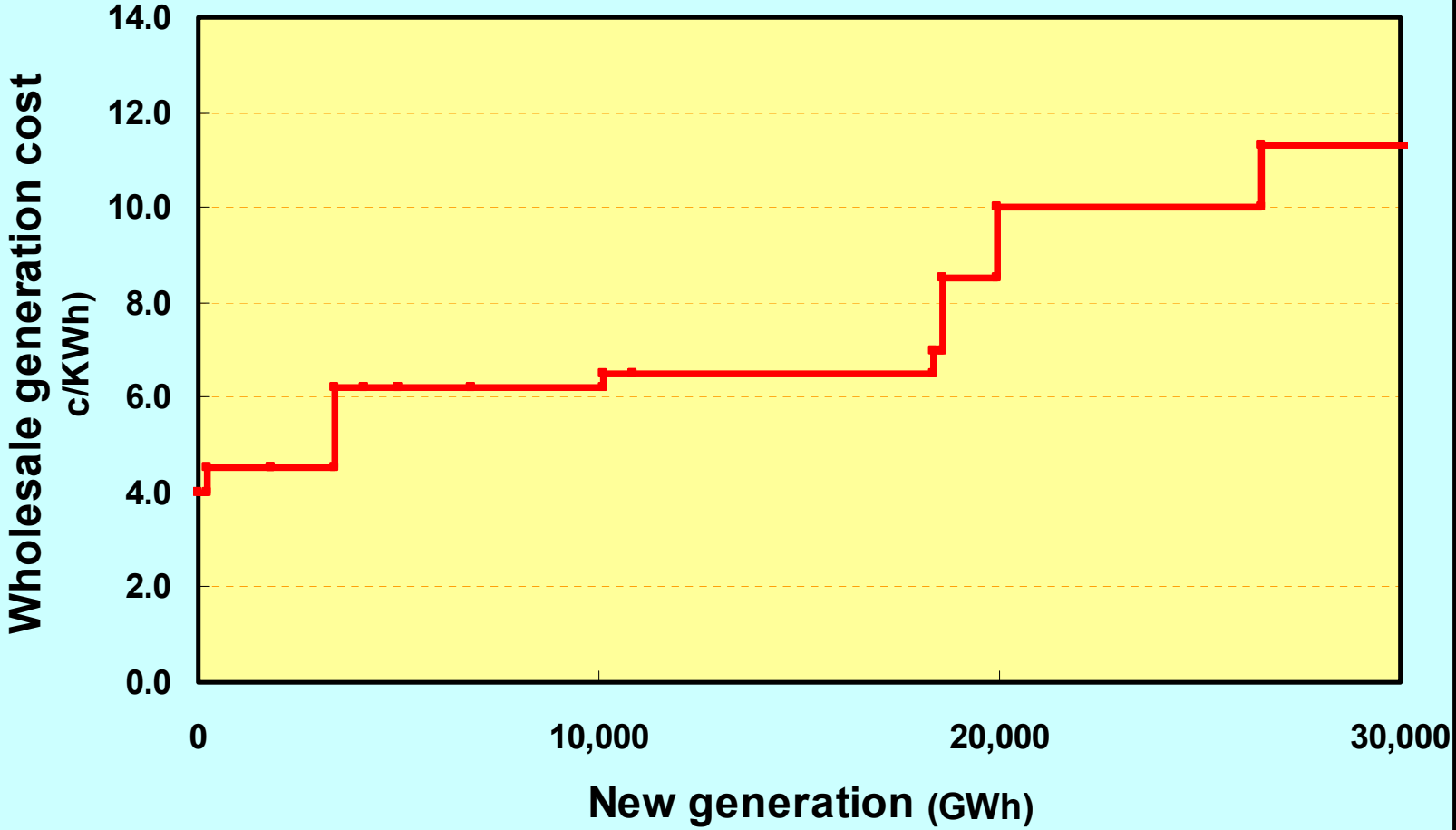
New generation coal technology will decrease in cost, like all other technologies

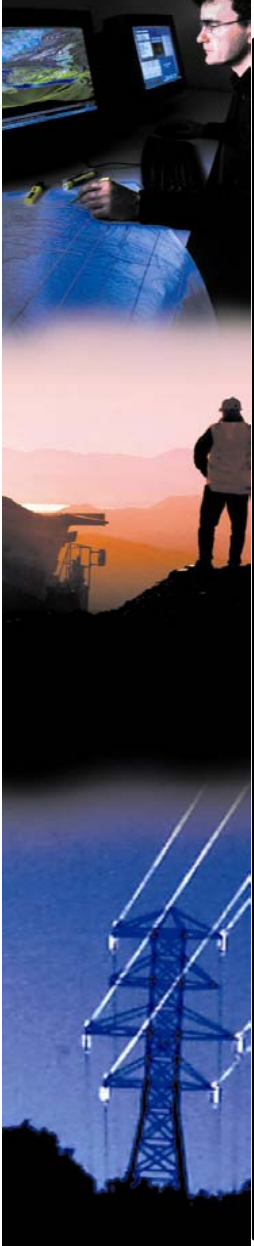




NZ's future electricity generation will be significantly more expensive ...

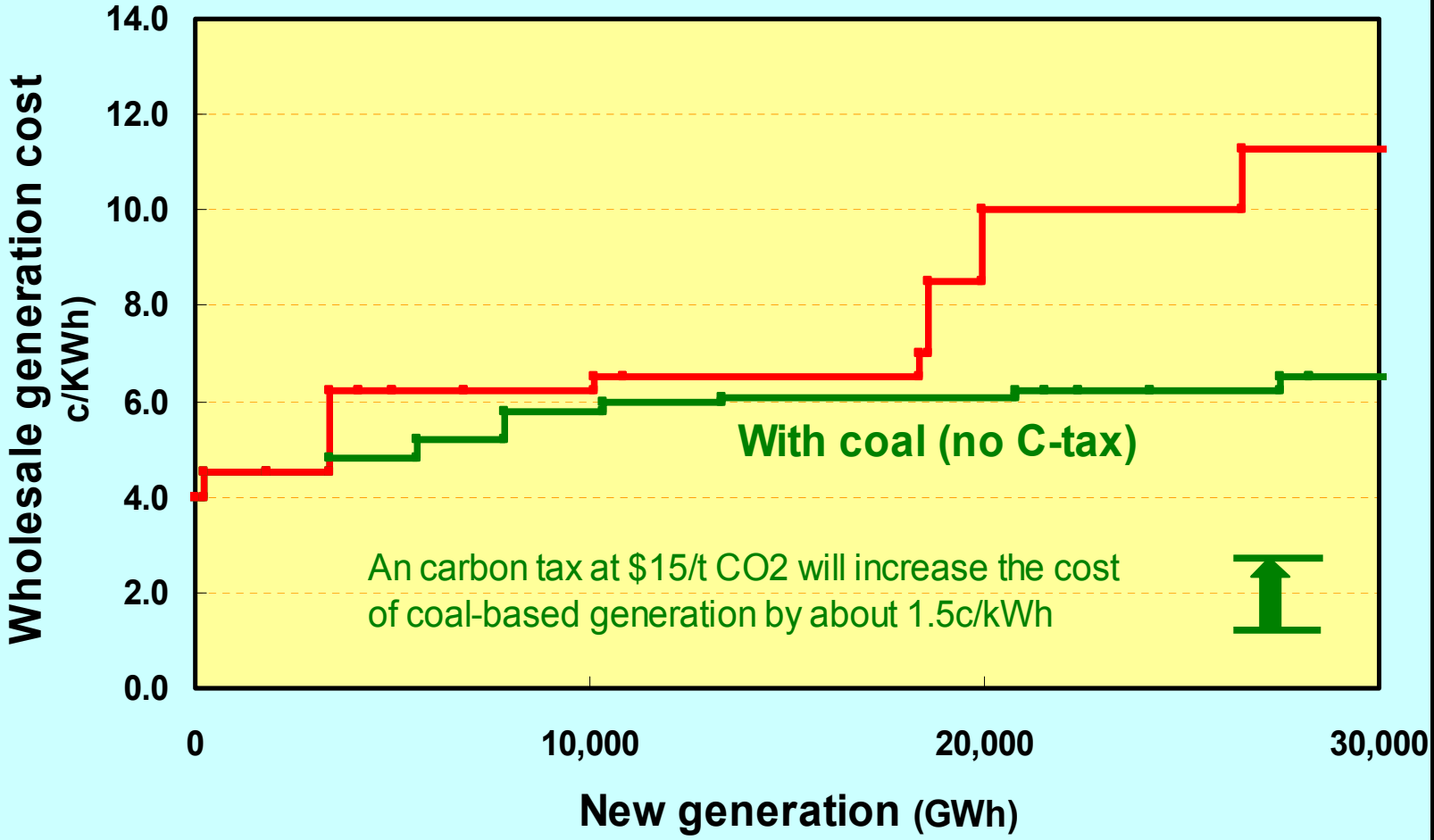
**Cumulative costs of likely new generation to 2025
- no new coal generation**





... but “unlimited” coal-based generation is possible at under 6c/kWh

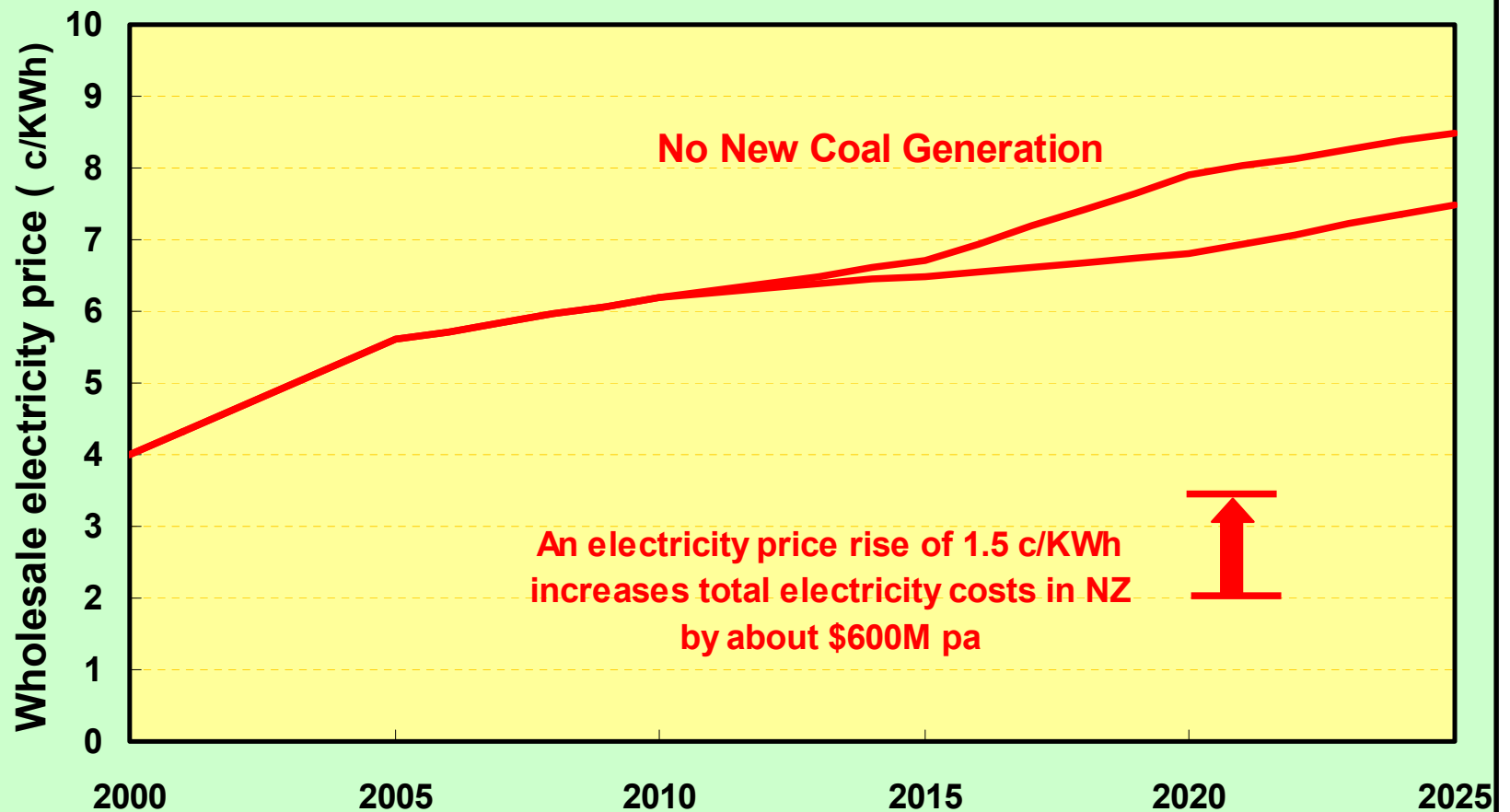
**Cumulative costs of new generation to 2025
- with coal, no C-tax**





Without new coal generation, electricity prices are forecast to rise steeply ...

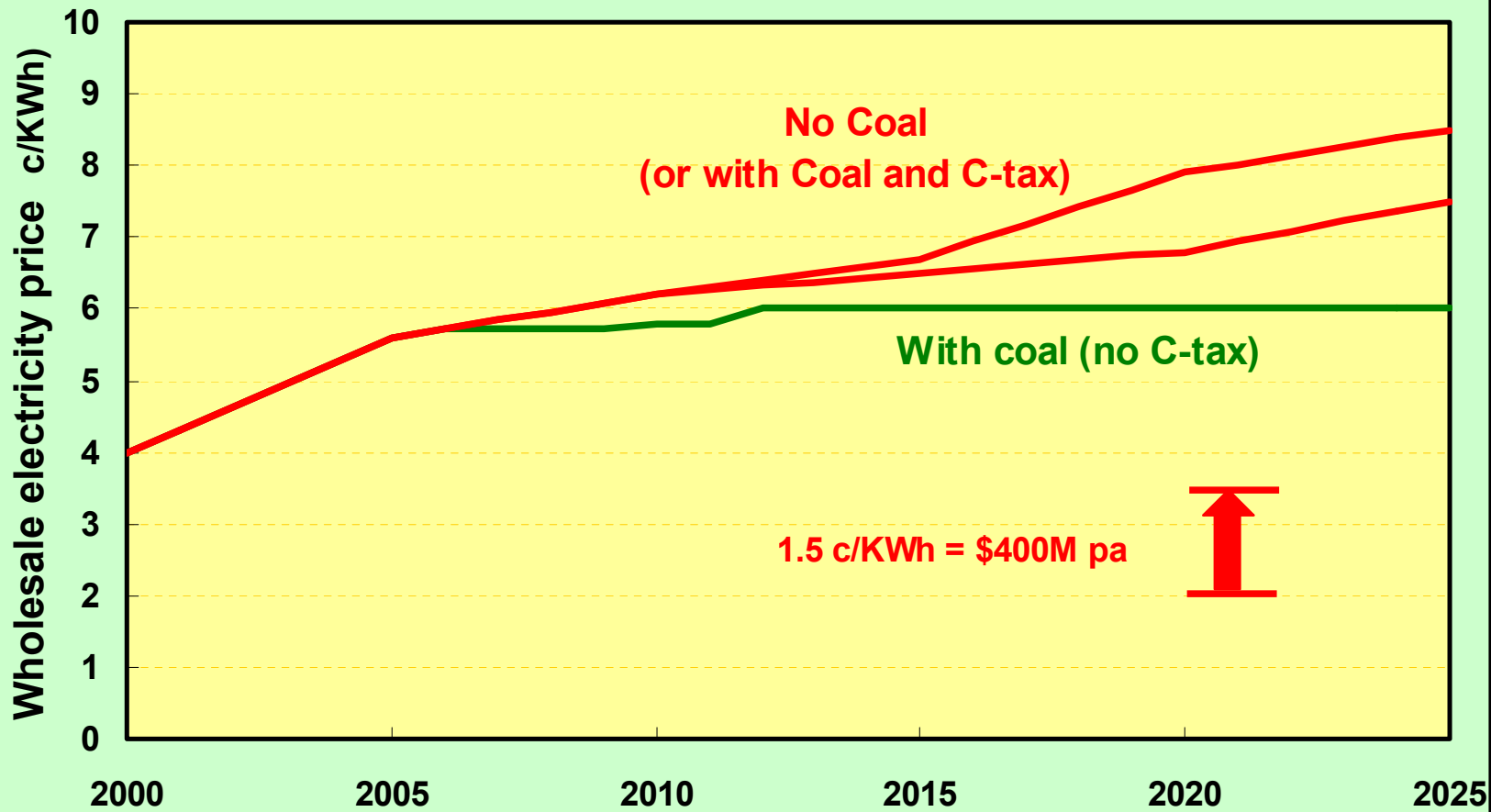
Average wholesale electricity prices to 2025





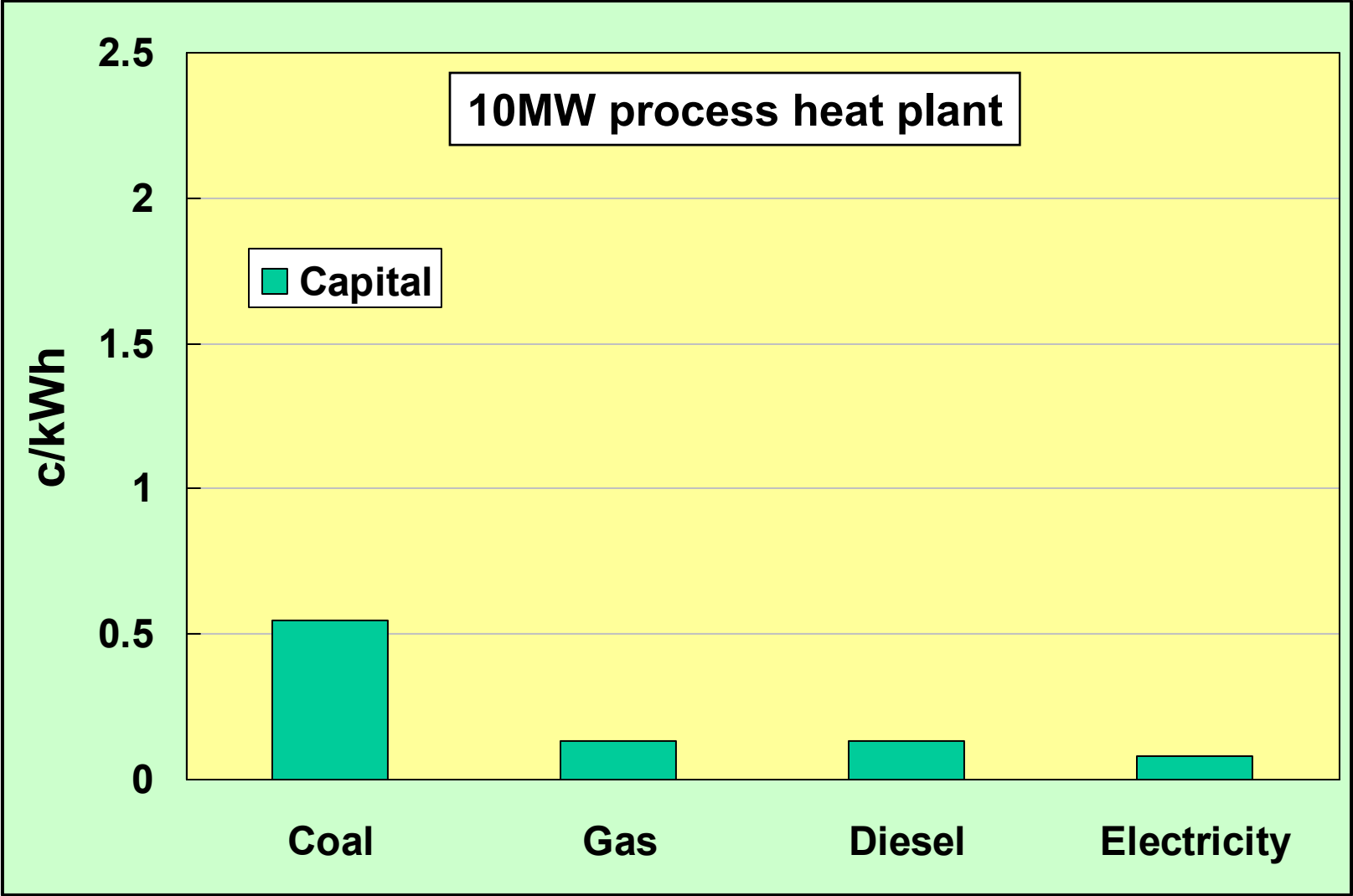
... but coal can cap the price of electricity at ≤6c/kWh

Average wholesale electricity prices to 2025

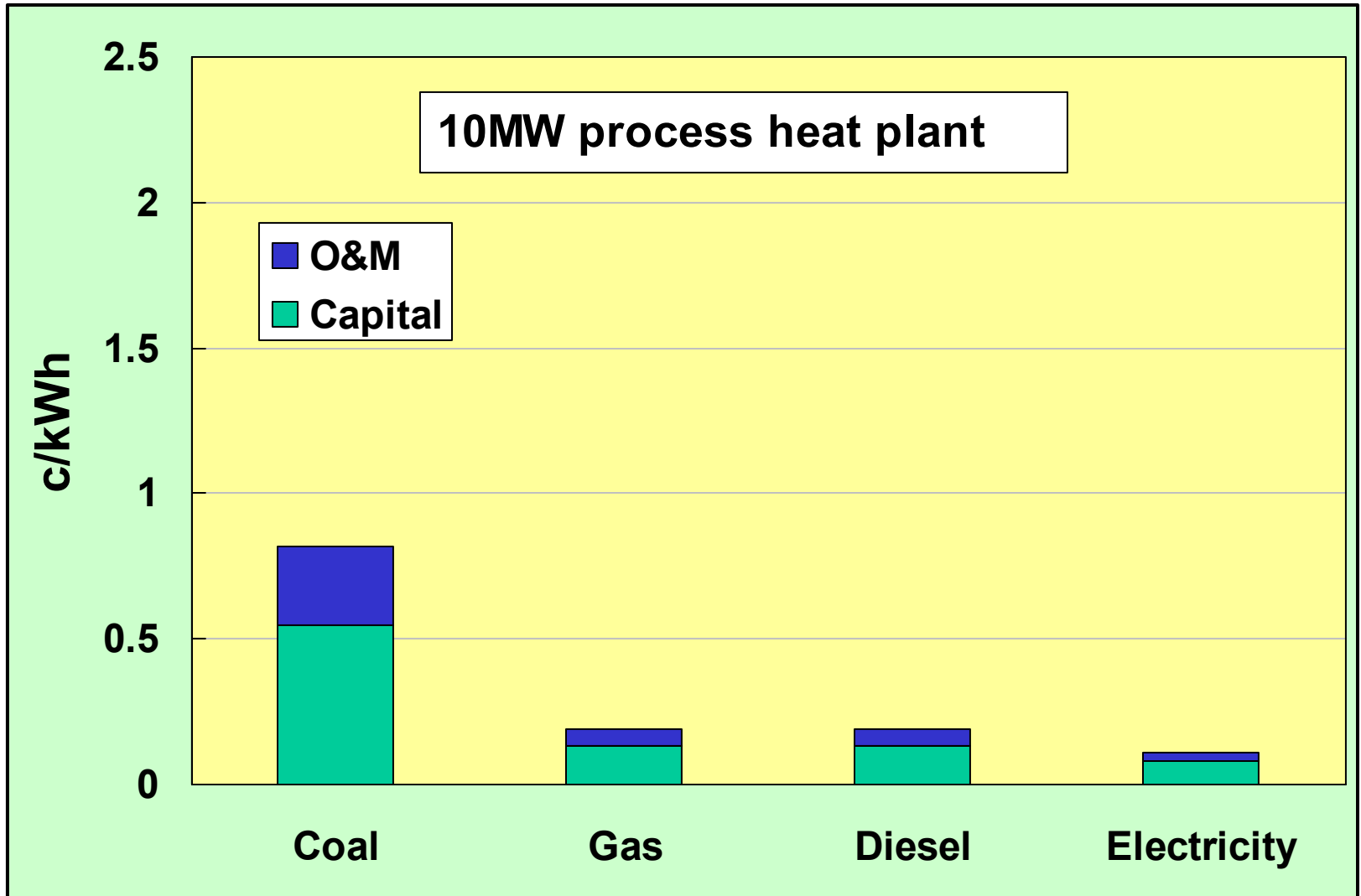




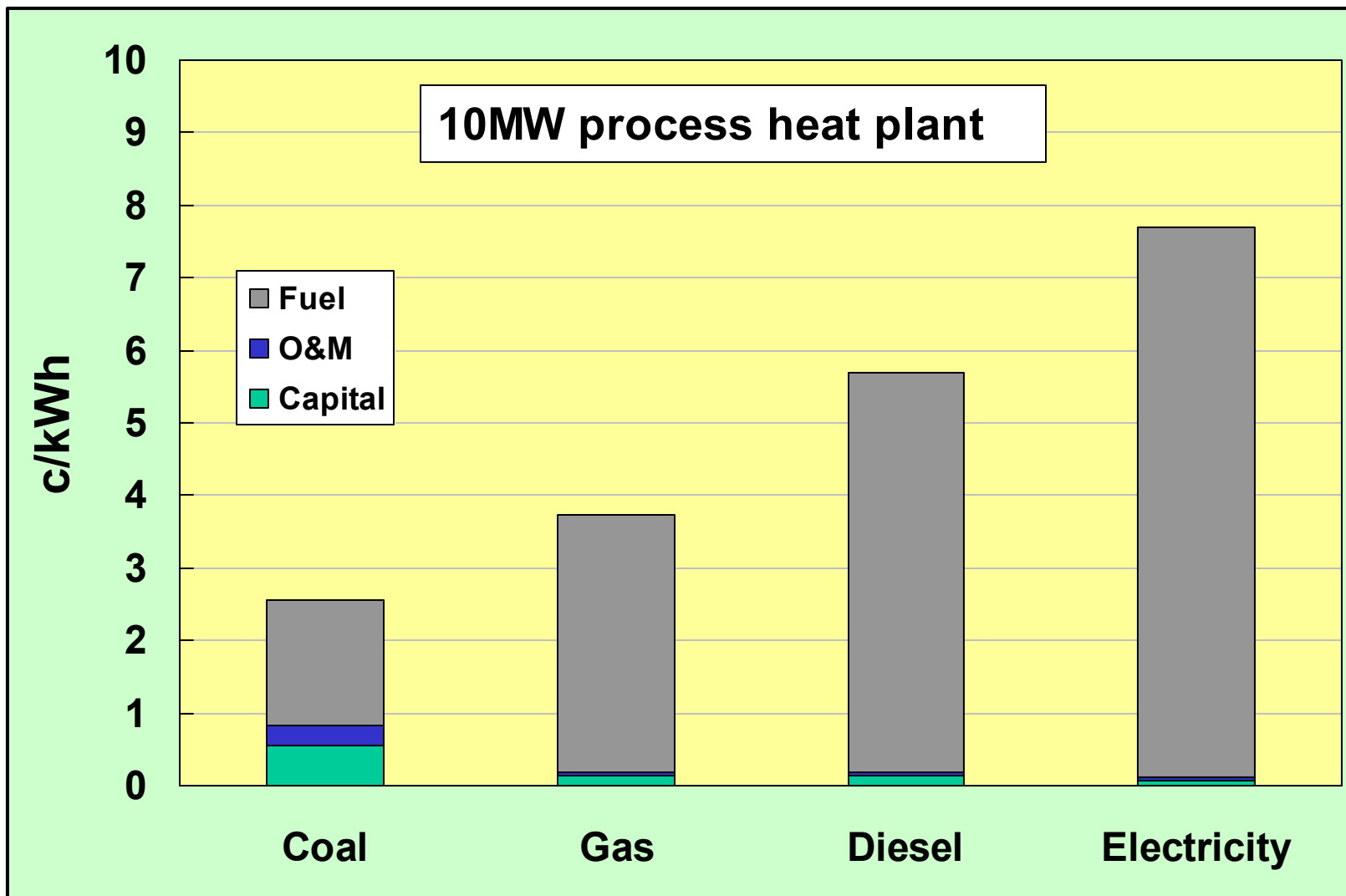
Coal for direct industrial use is even more competitive, despite having the highest capital costs ...



plus O&M ...

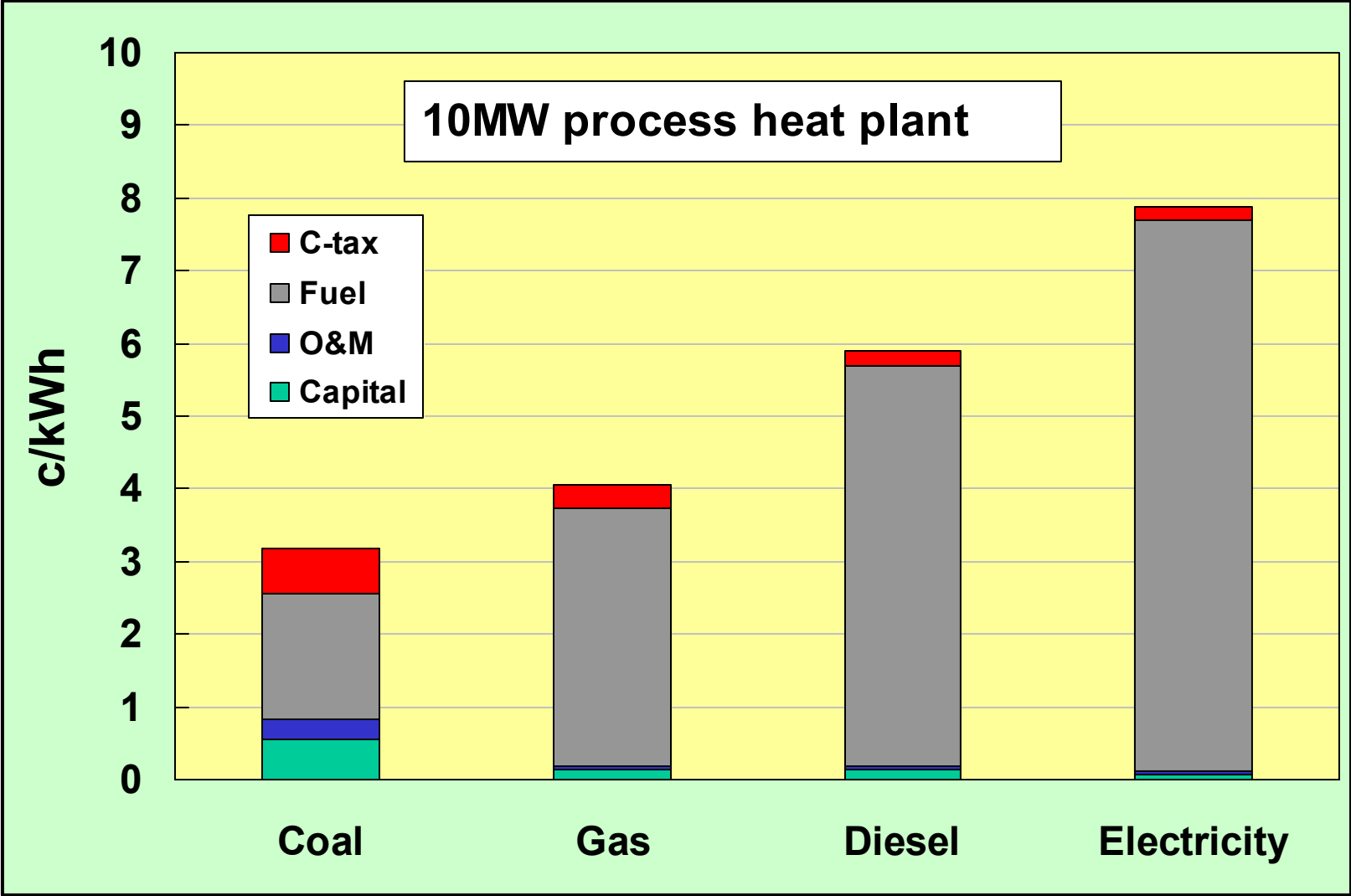


plus fuel ...





**Coal remains the lowest cost option for direct energy ...
even with a carbon charge at \$15/t of CO₂**





Coal is a strategic economic asset for NZ, not just a short term supply backstop

1. Increasing coal use will:

- meet demand growth for electricity and primary energy
- provide flexible base and reserve capacity
- provide the quality of energy supply needed by NZ industry

2. NZ's energy supply is secured by coal:

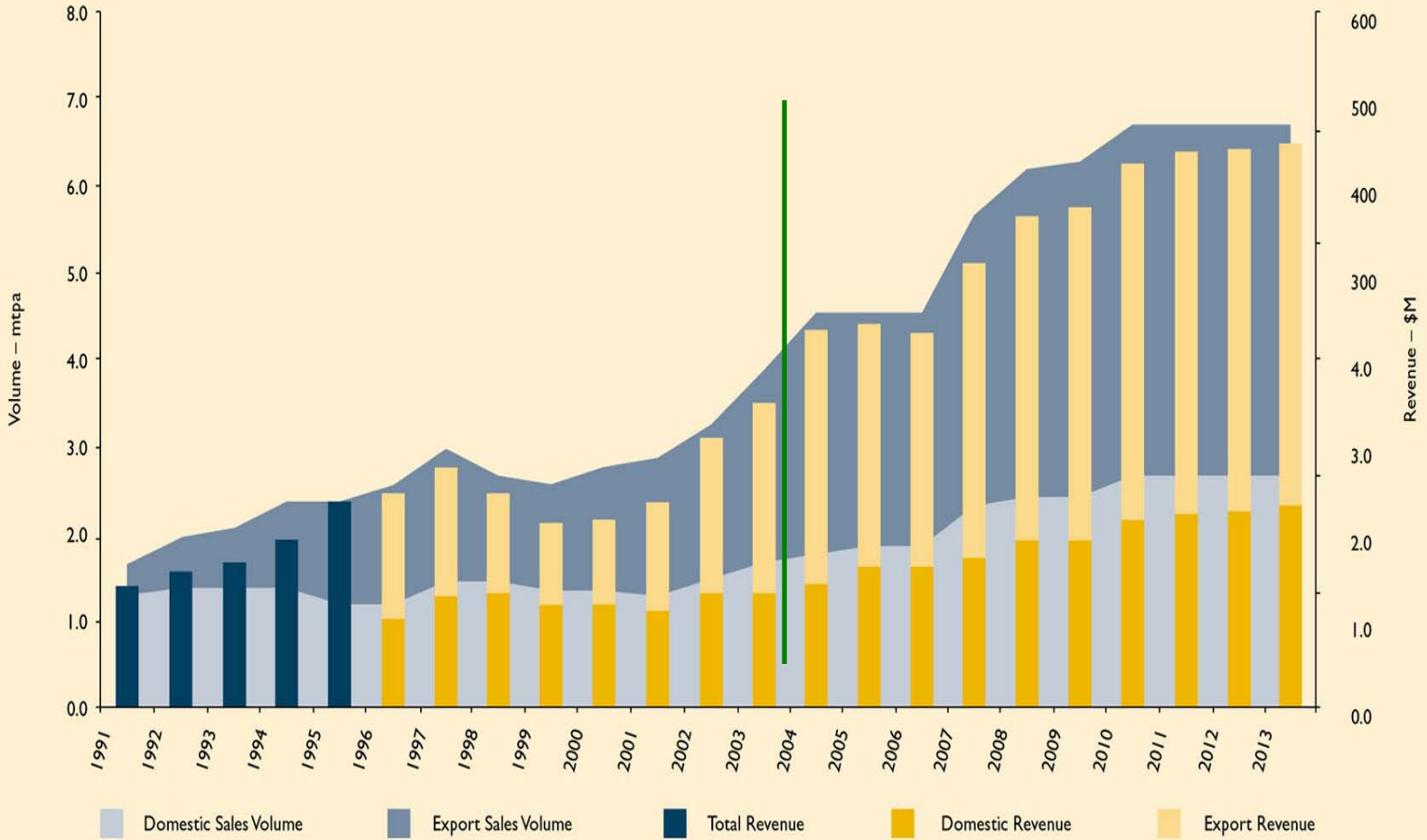
- independent of the rest of the world
- at today's prices "forever", increasing NZ's global competitiveness
- with minimal local environmental impacts
- and with CO₂ reduction technologies developing rapidly

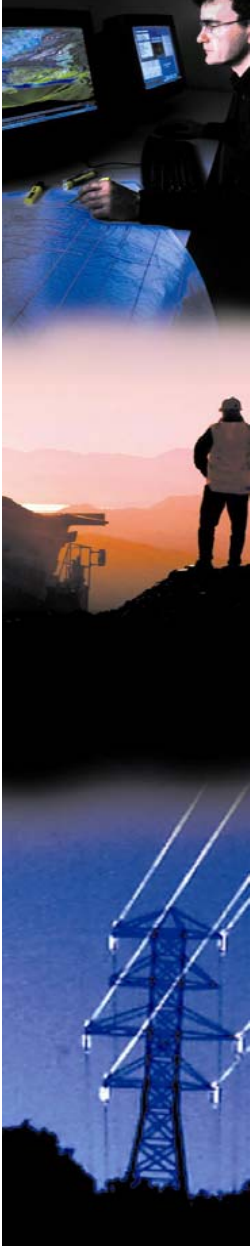
3. Coal allows NZ to manage a long term transition to renewable energy with no economic impacts



Driven by demand, Solid Energy's coal production is growing at >20% pa and will double within 5 years

Sales Volumes and Revenues 1991 - 2013





... and global demand for coal is growing similarly as the economics of oil & gas reserves decline

