

Peak Oil

New Zealand's Response

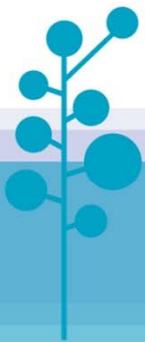
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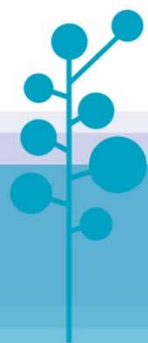
Content

- New Zealand Energy Situation
- International
 - History
 - International Energy Agency projections and modelling
 - World Energy Outlook 2010 scenarios
- Domestic policies:
 - Emissions Trading Scheme (ETS)
 - Electric vehicles
 - Petroleum Action Plan
 - Investment in public transport



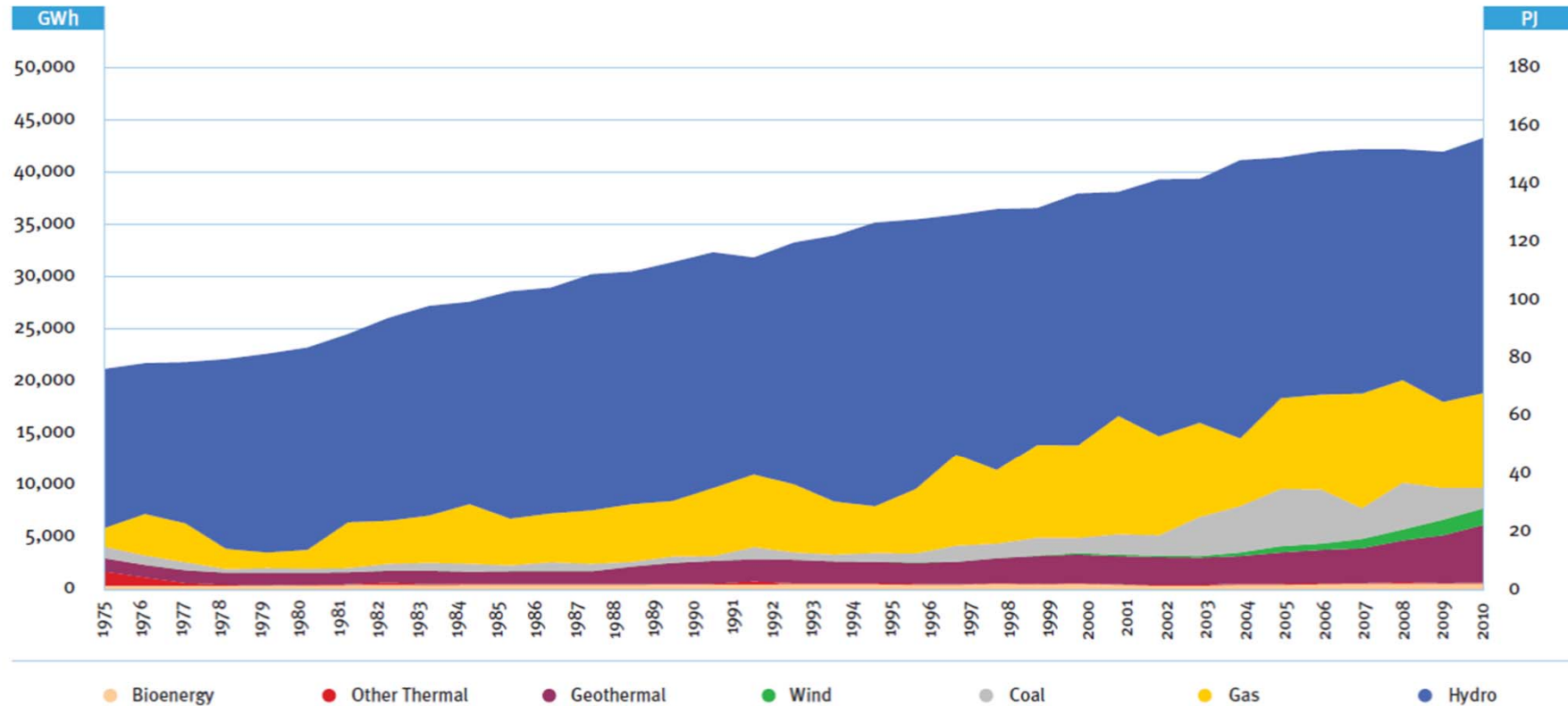
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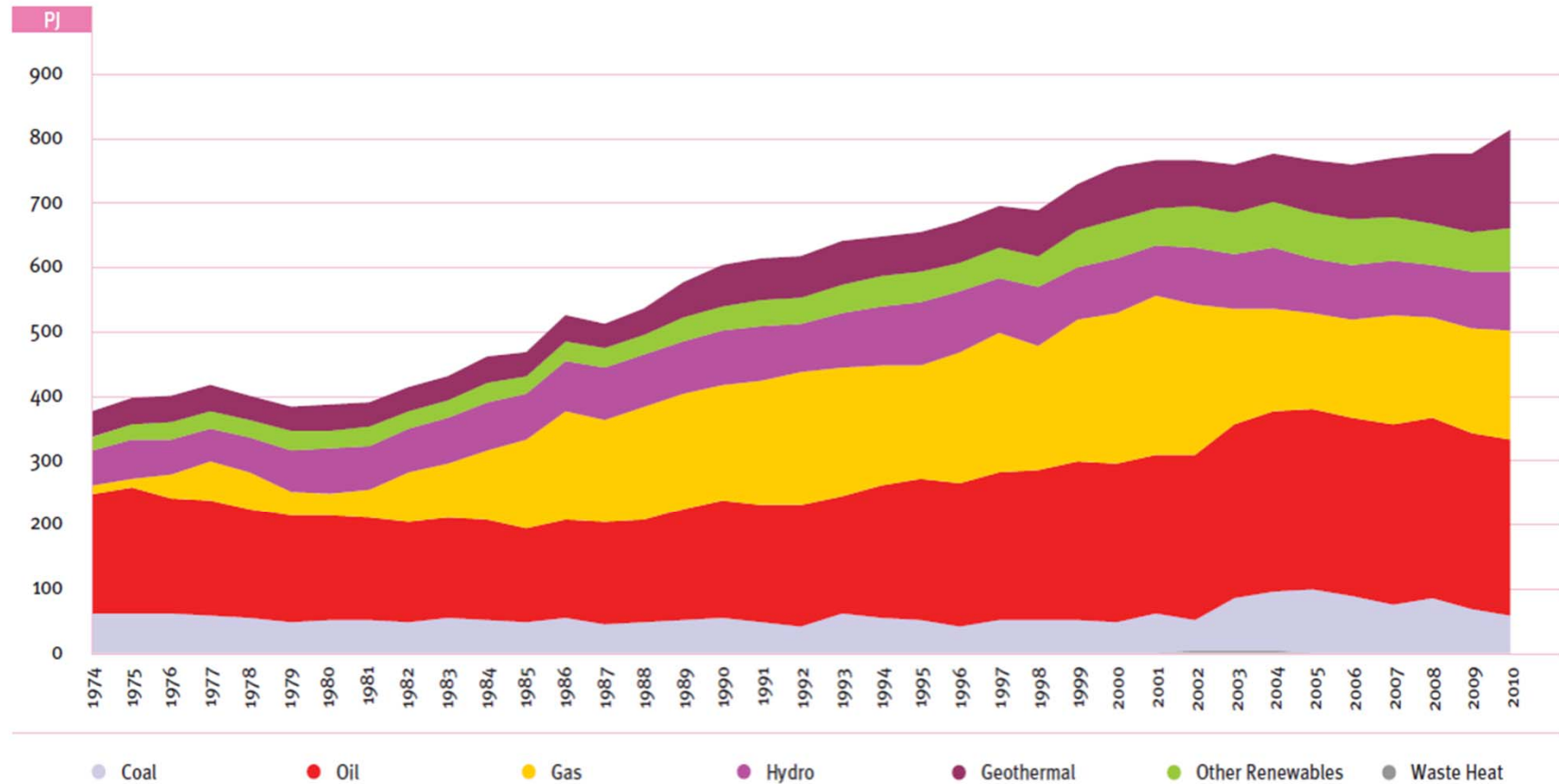
Electricity Generation by Fuel Type

Figure G.2: Net Electricity Generation by Fuel Type



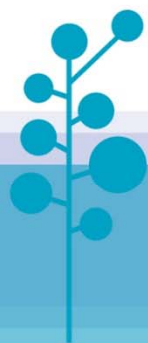
New Zealand Primary Energy Supply

Figure A.2: Total Primary Energy Supply

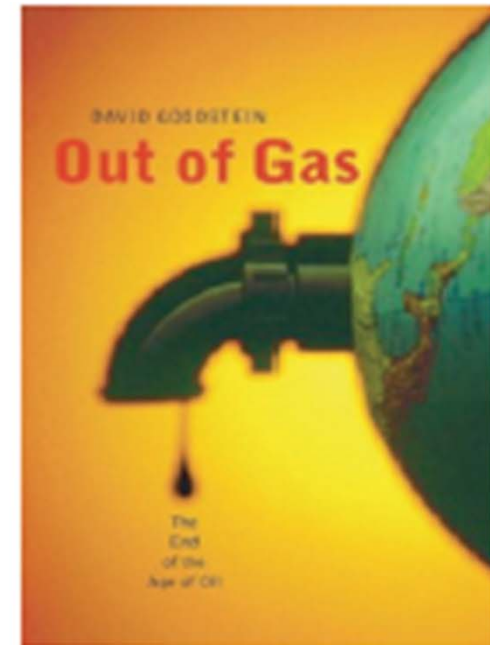
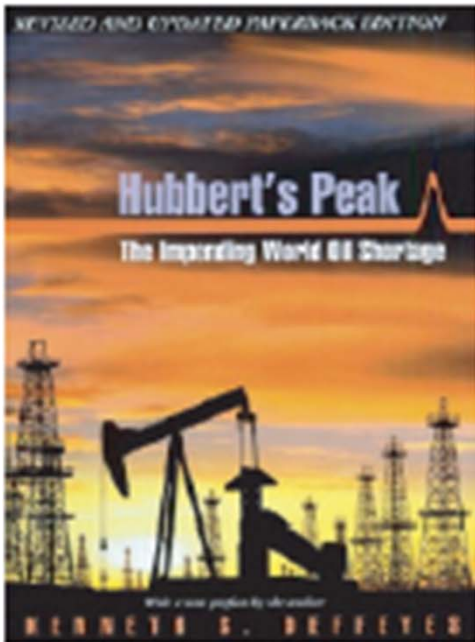


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Many people worry about 'peak oil'

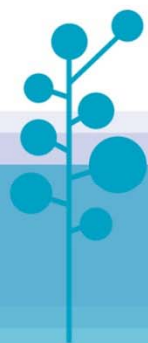


But let's have a look at history

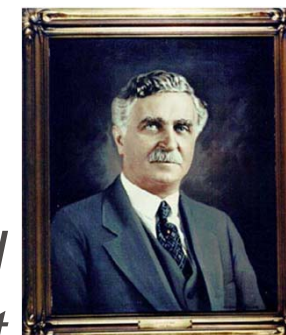


Oil in the US

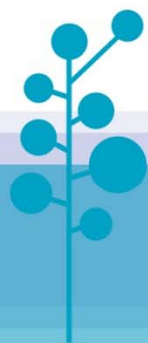
- *“Little or no chance for oil in California”* US Geological Survey, 1865
- *“We have oil [in the US] for 4 years”* Chief Geologist (Pennsylvania) 1874
- *“Little chance that oil will be found in Kansas or Texas”* US Geological Survey, 1891 [14 b barrels have since been produced from these 2 States
- *“Peak US production ~ 3 years”* Chief Geologist, US Geological Survey, 1919



Oil in the US



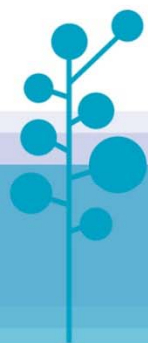
- *“We have apparently used up 40% of our oil supply ... need a countrywide thrift campaign ... to save this essential resource” US Geological Survey Director 1920*
- US oil supply will last 26 y *USGS 1909*
- US oil supply will last 20 y *USGS 1922*
- Oil left for only 13 y *US Dept of Interior 1939*
- Oil left for only 13 y *US Dept of Interior 1951*



Hotelling's Rule (1931)

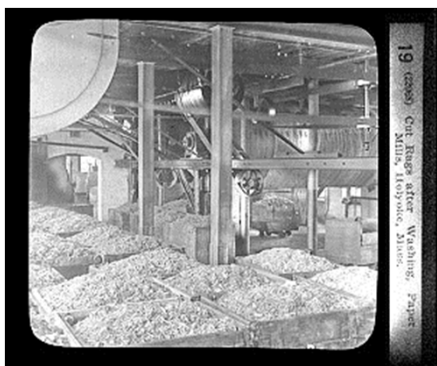
- Extraction of low cost resources before high cost resource → costs rise over time
- Greater scarcity → prices increase
- Price increase → demand and production decrease over time
- i.e. gradual switch to alternatives!

But is there any evidence for this?



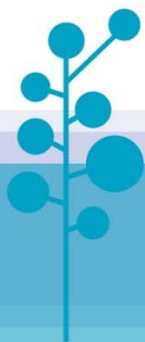
Comparison 1: Paper

- UK 1860s : Fear of paper shortage
- Up to that point



- paper was mostly made from rags
- demand for paper was quickly outgrowing supply

- But, then we realised paper could be made from plants!



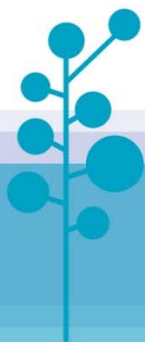
Comparison 2: UK Coal

- Jevons (1865): The Coal Question



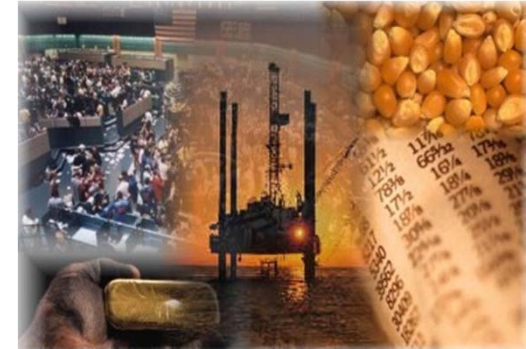
Royal Commission on Coal Supplies (1871)

- *“exhaustion of our coal mines”*
- *“Coal in truth stands not beside but entirely above all other commodities”*
- *“England’s manufacturing and commercial greatness, at least, is at stake ...”*
- *“I see no prospect of any substitute being found for coal”* Prof. Tyndall



Finite Resources ...

- Earth's natural resources are finite, i.e. if used continuously, they will be exhausted.
- BUT the effective stocks of natural resources are continually expanded by technological developments



	DISCOVERED	UNDISCOVERED
COMMERCIAL	RESERVES	PROSPECTIVE RESOURCES
SUB-COMMERCIAL	CONTINGENT RESOURCES	

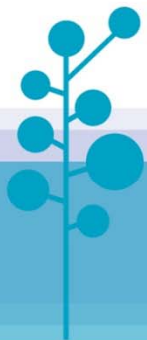
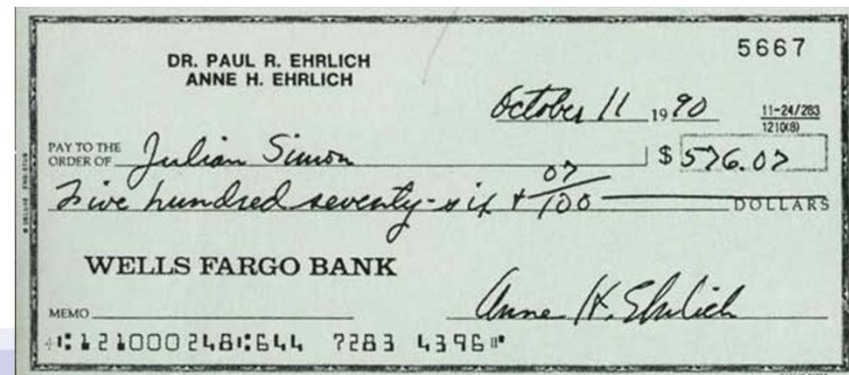
Finite Resources (cont...)

In the context of pricing and resource scarcity ...

- People will look more for it
- People will use it more efficiently
- People will develop substitutes

Simon – Ehrlich Bet 1980 – 1990

- Five resources (Ehrlich's choice); price difference (copper, chrome, nickel, tin, tungsten). Price of all dropped.
- Ehrlich mailed Simon a cheque



Problems with pessimists ...

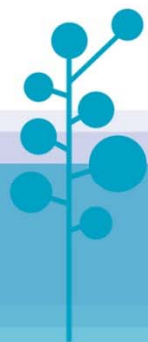
- **Unknown quantity** of ultimately recoverable resources (historically underestimated)

And

- **Future demand** (growth exaggerated)

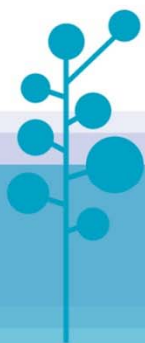
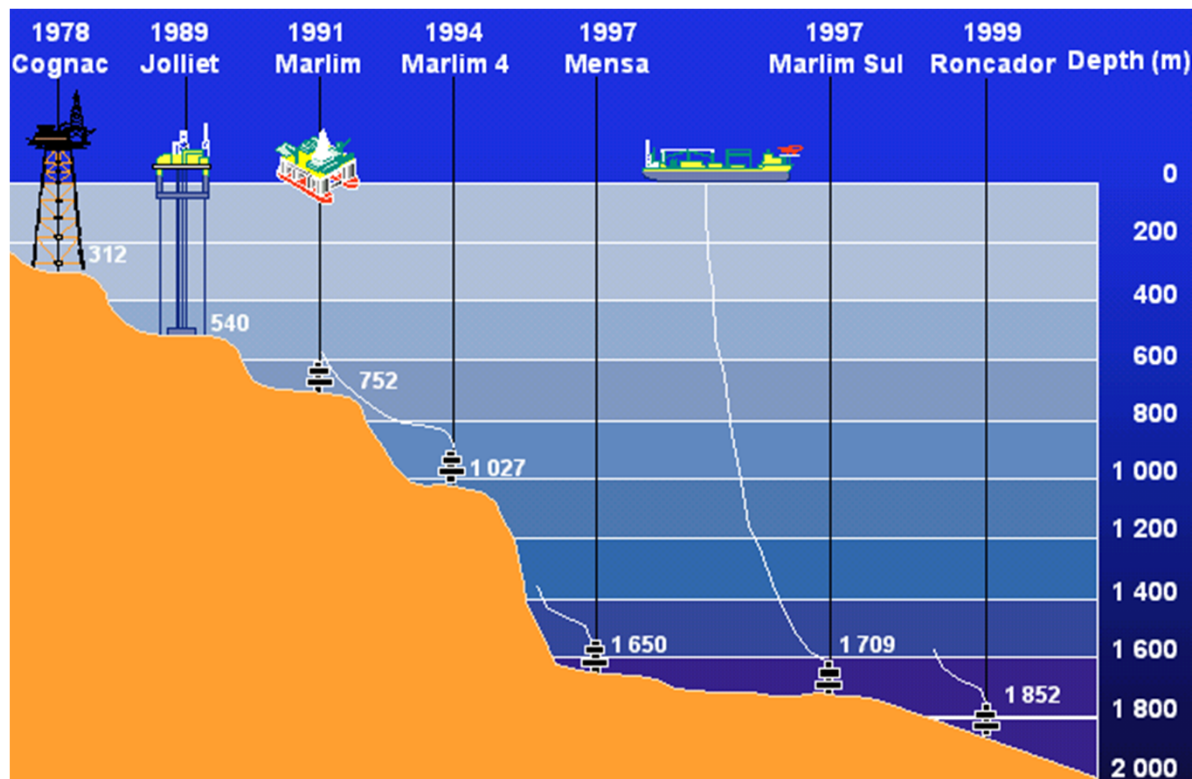
And, not enough emphasis on

- Substitutes
- Technological advances



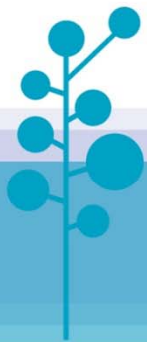
Problems with pessimists (cont ...)

- Offshore wells
- Tar sands
- Natural gas
- Shale gas
- Biodiesel
- Ethanol
- Hydrogen
- Hybrids



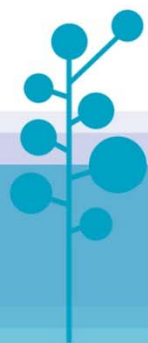
International Projections

- New Zealand is a member of the International Energy Agency (IEA), which provides credible information on the global oil market.
- The IEA World Energy Outlook (WEO) 2010 projects that global oil production from currently producing fields is in decline; but that new fields and unconventional sources will ensure that demand continues to be met until at least 2035.



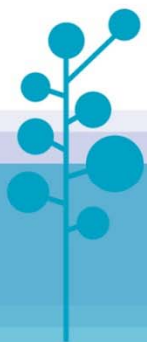
International Projections (cont...)

- There are many different projections and scenarios, made with many different assumptions and variables.
 - Shale gas in USA. Whereas the USA expected to be a gas importer, shale gas production has increased significantly.
 - Electric/hybrid vehicles.
 - New discoveries/technologies.

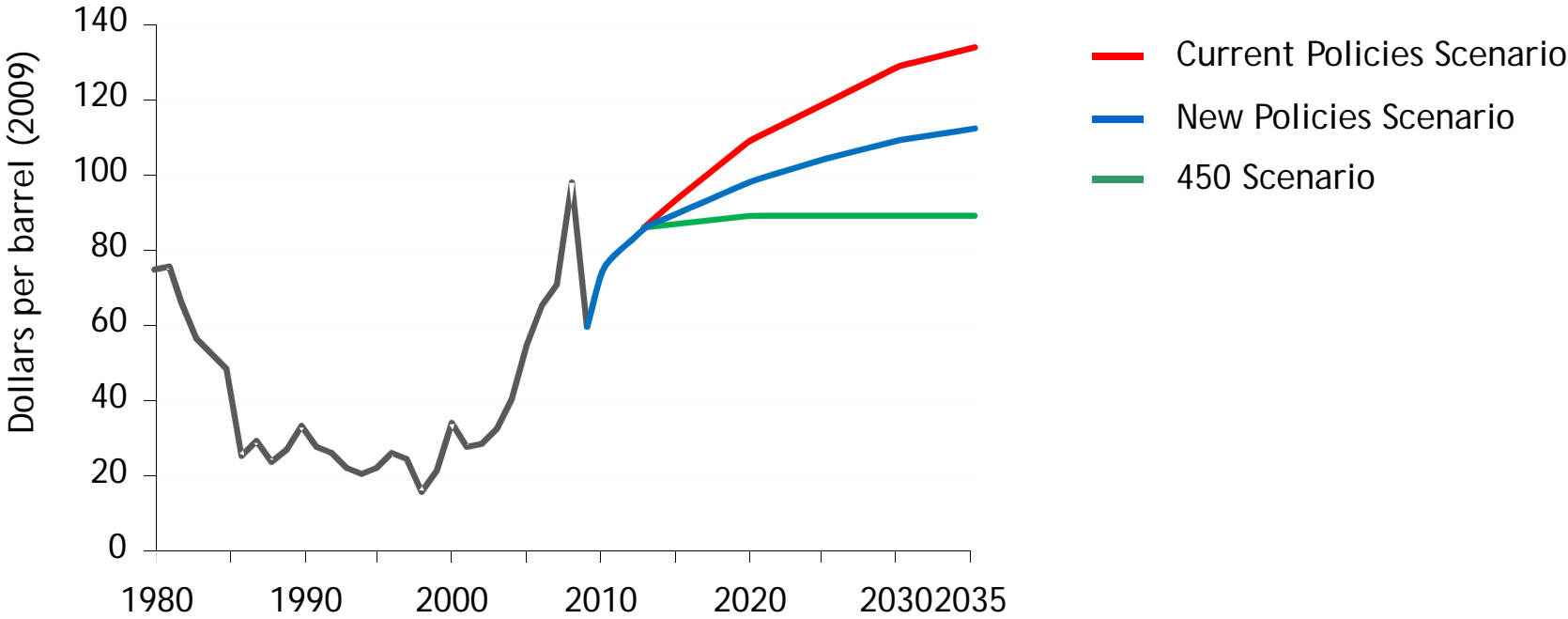


World Energy Outlook 2010

- WEO 2010 is made up of three separate scenarios:
 - **Current policies scenario**;
 - **New policies scenario** (in which governments are presumed to introduce new policies to reduce fossil fuel demand and promote renewable energy uptake); and
 - **450 scenario** (based on countries meeting Copenhagen Accord pledges to limit global warming to a rise of 2°C – roughly equal to 450ppm).
- Each scenario projects that demand for oil will be able to be met in 2035.
- The makeup of supply (conventional: non-conventional oil production) and the price required to balance supply with demand change from scenario to scenario.



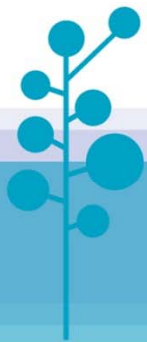
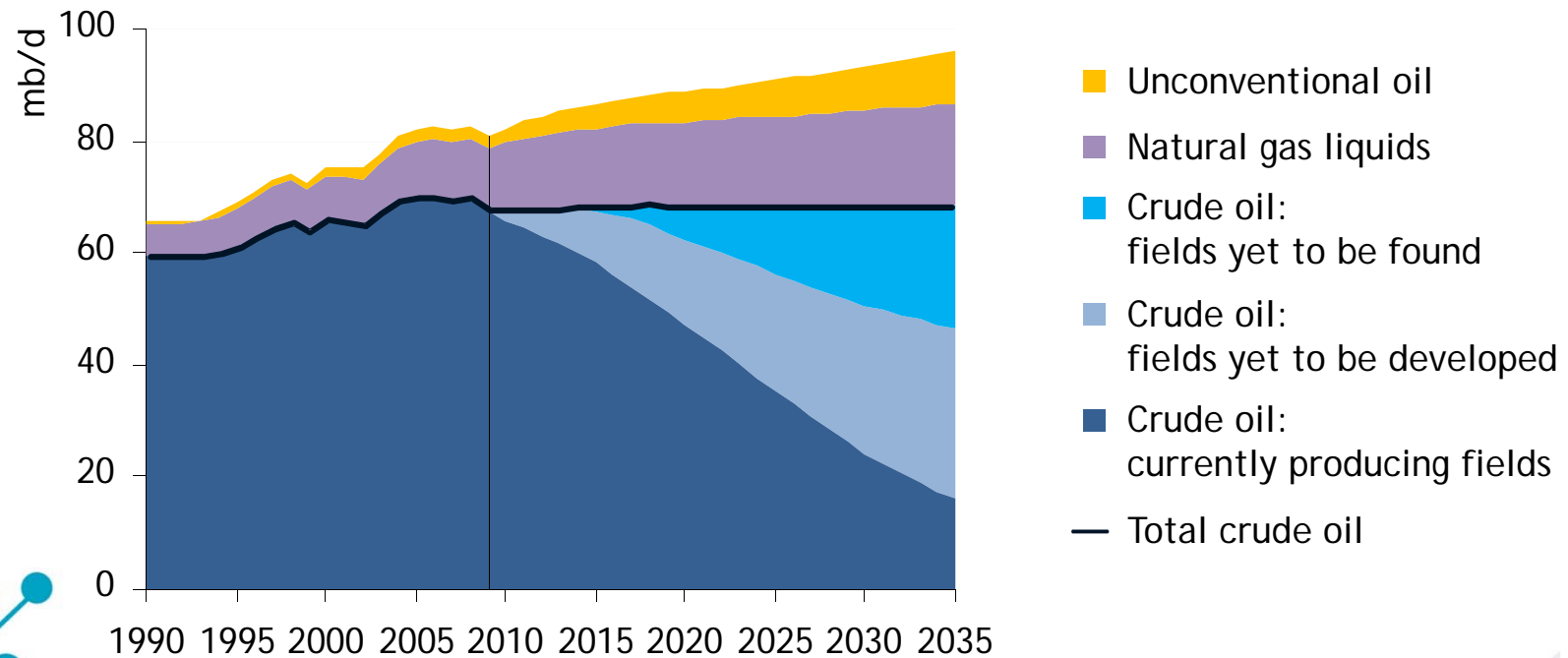
IEA Oil Price Modelling



Scenario	CO ₂ price in 2035 (\$/tCO ₂)	International oil price in 2035 (\$/bbl)	Effective oil price in 2035 (\$/bbl)
Current Policies	42 in EU	135	152 in EU
New Policies	50 in OECD	113	134 in OECD
450 Scenario	120 in OECD	90	139 in OECD

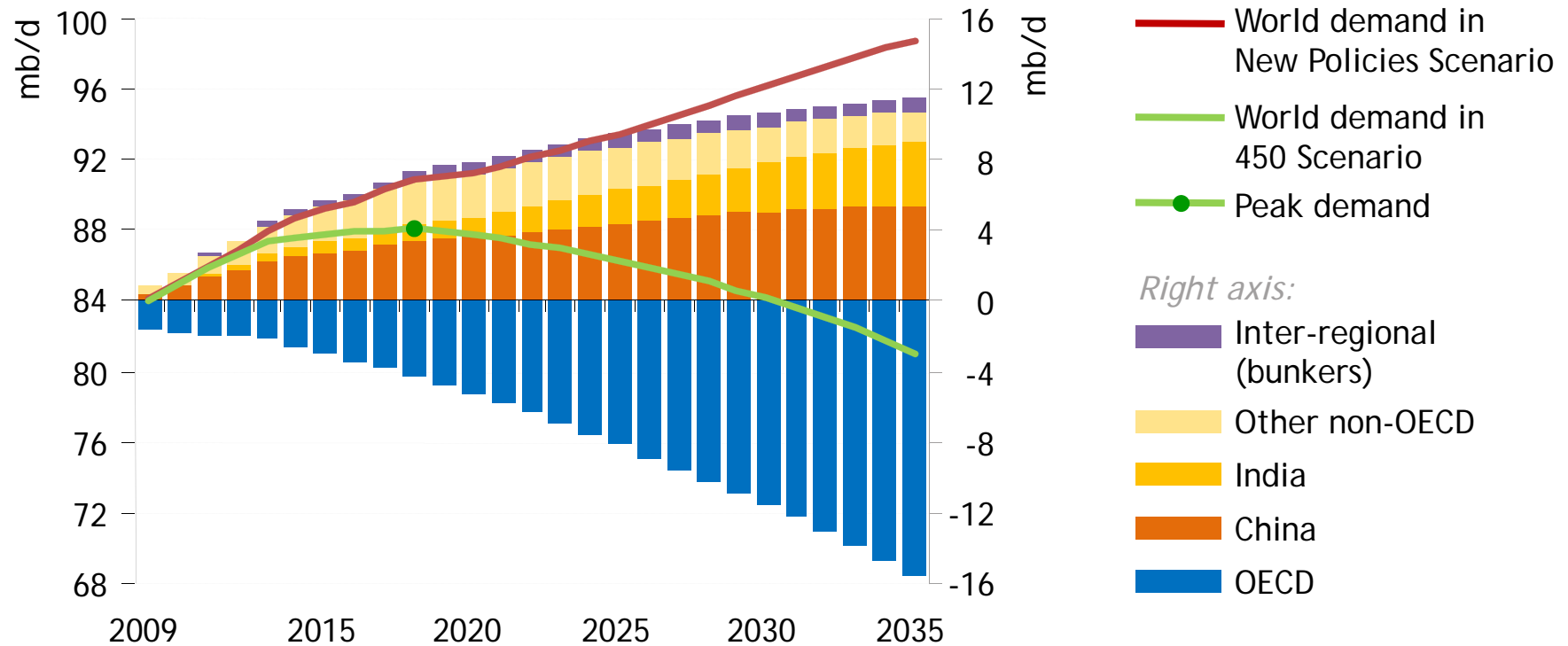
World Oil Production by Type: New Policies Scenario

World oil production by type in the New Policies Scenario



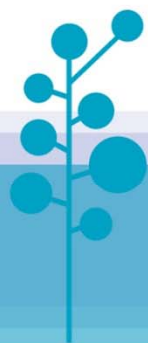
World Oil Demand by Scenario

Oil demand in the 450 Scenario



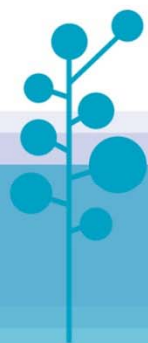
Summary of WEO Messages

- Overall, the message is one of increasing real oil prices, and increasing use of non-conventional oil to meet demand.
- In addition to natural gas liquids, non-conventional oil will be chiefly made up of:
 - Canadian oil sands;
 - Venezuelan extra-heavy;
 - Oil shales; and
 - Coal to liquids.



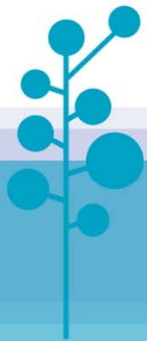
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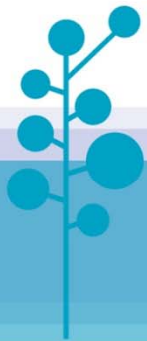
Domestic Policies

- The Government takes the view that while we are going to require fossil fuels for the foreseeable future, there are actions we can take now to reduce our dependence on oil and facilitate a transition to alternative sources of energy.
- These actions include:
 - New Zealand Emissions Trading Scheme
 - Encouraging entry of biofuels and electric vehicles to the NZ market
 - Investment in public transport infrastructure; and
 - The Petroleum Action Plan



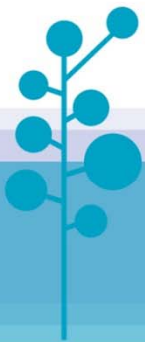
New Zealand Emissions Trading Scheme

- The Government introduced the Emissions Trading Scheme (**ETS**) in July 2010, which puts a price on greenhouse gases to provide an incentive to reduce emissions.
- Since 1 July 2010, suppliers of liquid fossil fuels have had obligations to pay for carbon emissions under the ETS.
- These obligations have been passed on to consumers in the form of higher prices. This incentivises energy efficiency improvements and alternative fuel options.



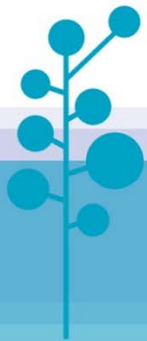
Encouraging Entry of Biofuels and Electric Vehicles

- The Government encourages entry of both biofuels and electric vehicles into the New Zealand market, and will act to stimulate new market developments or remove barriers where appropriate.
- It has put in place a grants programme for production of New Zealand biodiesel to put it on the same favourable financial footing as bioethanol.
- The Government has also exempted electric vehicles from road user charges until 2013 to encourage uptake.



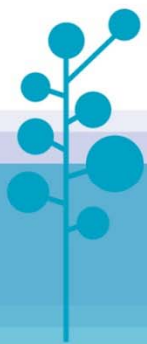
Investment in Public Transport Infrastructure

- The Government is making significant investments in transport infrastructure, including for public transport, cycling and walking, that will enable and encourage energy efficient transport choices.
- Examples include \$1.6 billion on upgrading and electrifying the Auckland metro rail system, and a further \$485 million for Wellington passenger rail.

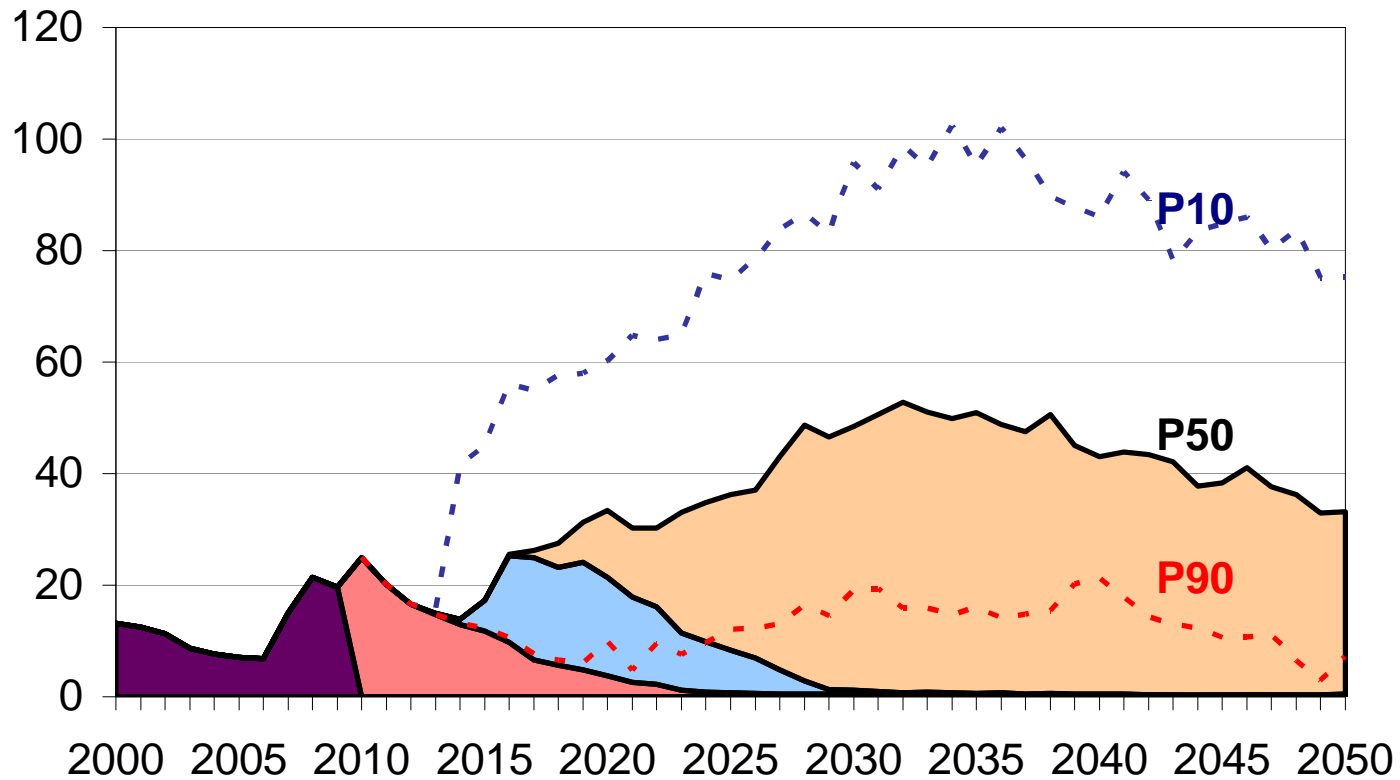


Petroleum Action Plan (PAP)

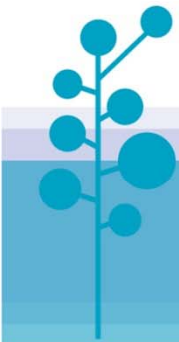
- The Government objective for petroleum is *to ensure New Zealand is a highly attractive global destination for petroleum exploration and production investment, such that we are able to develop the full potential of our petroleum resources.*
- In November 2009 the Government released its Petroleum Action Plan to focus work over 2010 and beyond.
- In time it is hoped this will improve our net position and reduce our dependence on imported oil.



Annual oil production, mmbbl (mid exp / mid price)

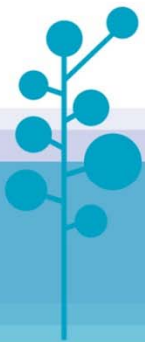


- Frontier new discoveries P50
- Taranaki new discoveries P50
- Forecast Production from Existing Fields
- Historical Production



PAP actions underway

- **Capability review** – Crown Minerals replaced with New Zealand Petroleum & Minerals - larger group has a stronger commercial focus and greater leadership responsibilities
- Reviewing the **fiscal and royalty framework** to ensure the Government receives a fair return from petroleum resources while providing sufficient incentives for investors
- Investing in data acquisition to **improve resource knowledge** and foster more investment, particularly in frontier resources
- Reviewing the **legislative framework** for the petroleum sector



Questions?

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Ministry of Economic
Development



Manatū Ōhanga