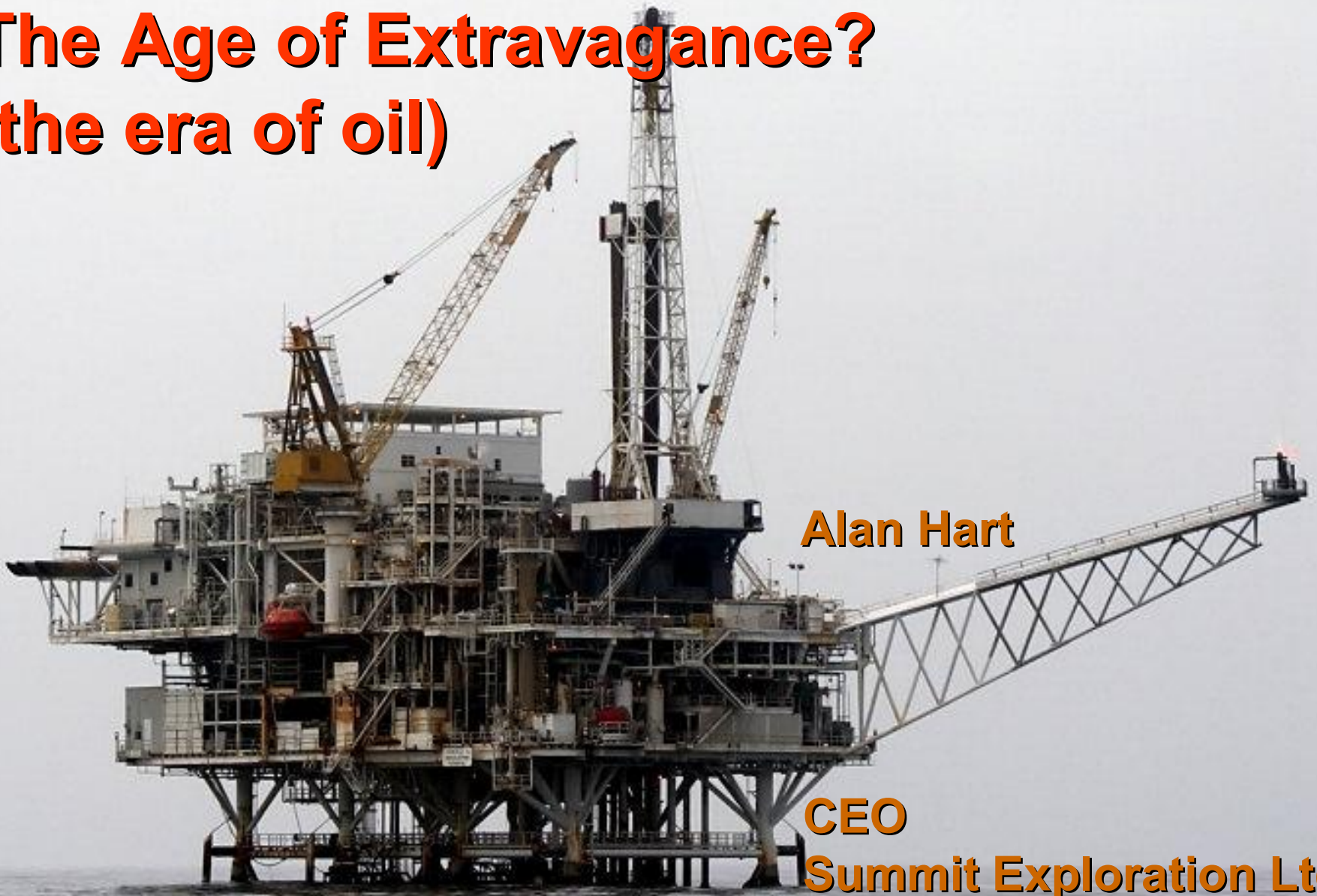


The Age of Extravagance? (the era of oil)



Alan Hart

**CEO
Summit Exploration Ltd.
Nevada, U.S.A.**

What is the 'Peak Oil' problem?



Source: Bennett, The Christian Science Monitor, 2005

Are we running out of oil?

Short term answer, no.

Long term answer, yes.



or, put another way:

The world is consuming its cheaper oil;

US\$2/bbl oil in 1970, \$10 oil in 1999, \$20 oil in 2001, \$30 oil in 2003, \$40 oil in 2005... \$70 oil now

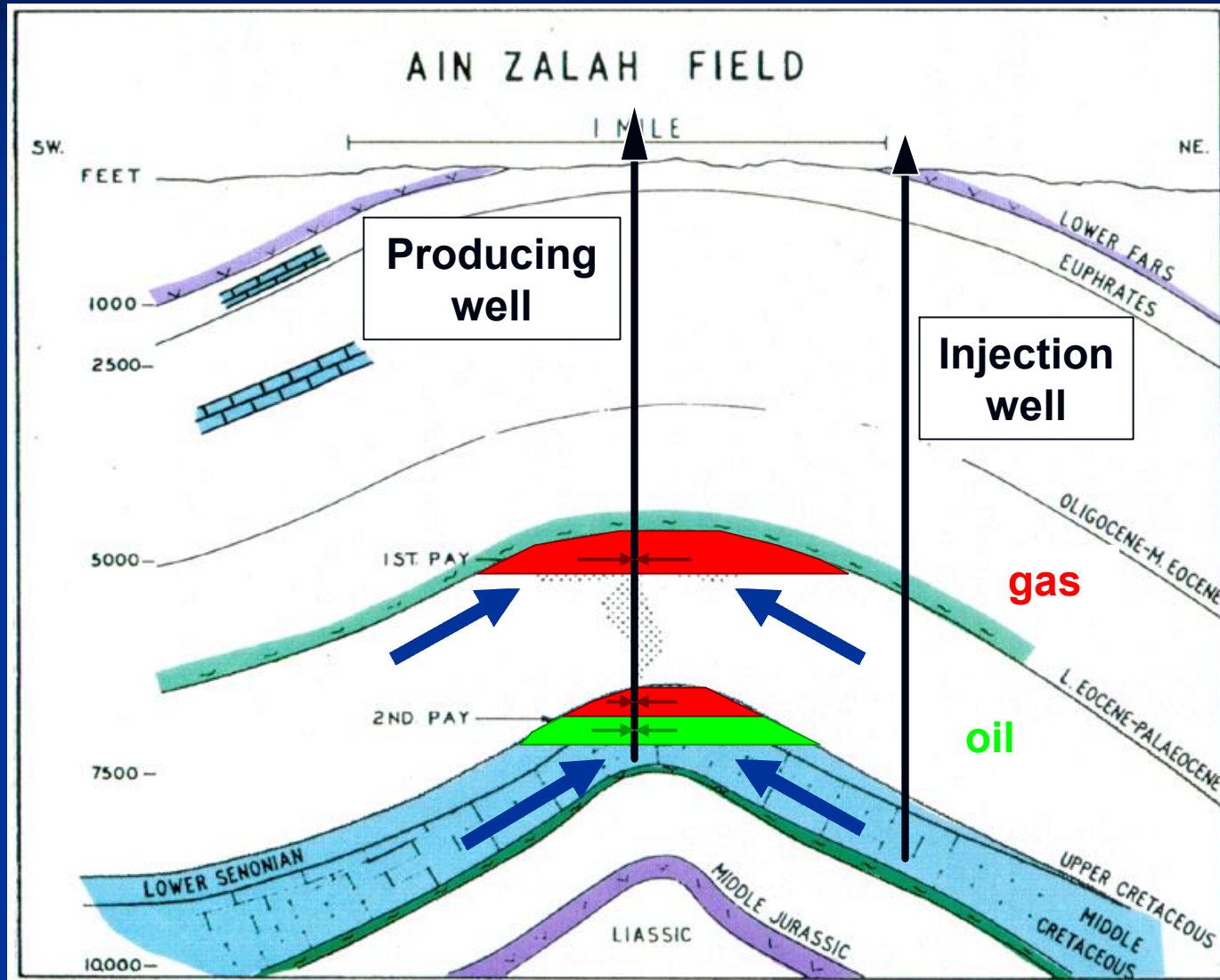
What is a barrel of oil?



42 US gallons = 159 litres

Oil is traded globally by barrels or metric tonnes

Typical oil field schematic

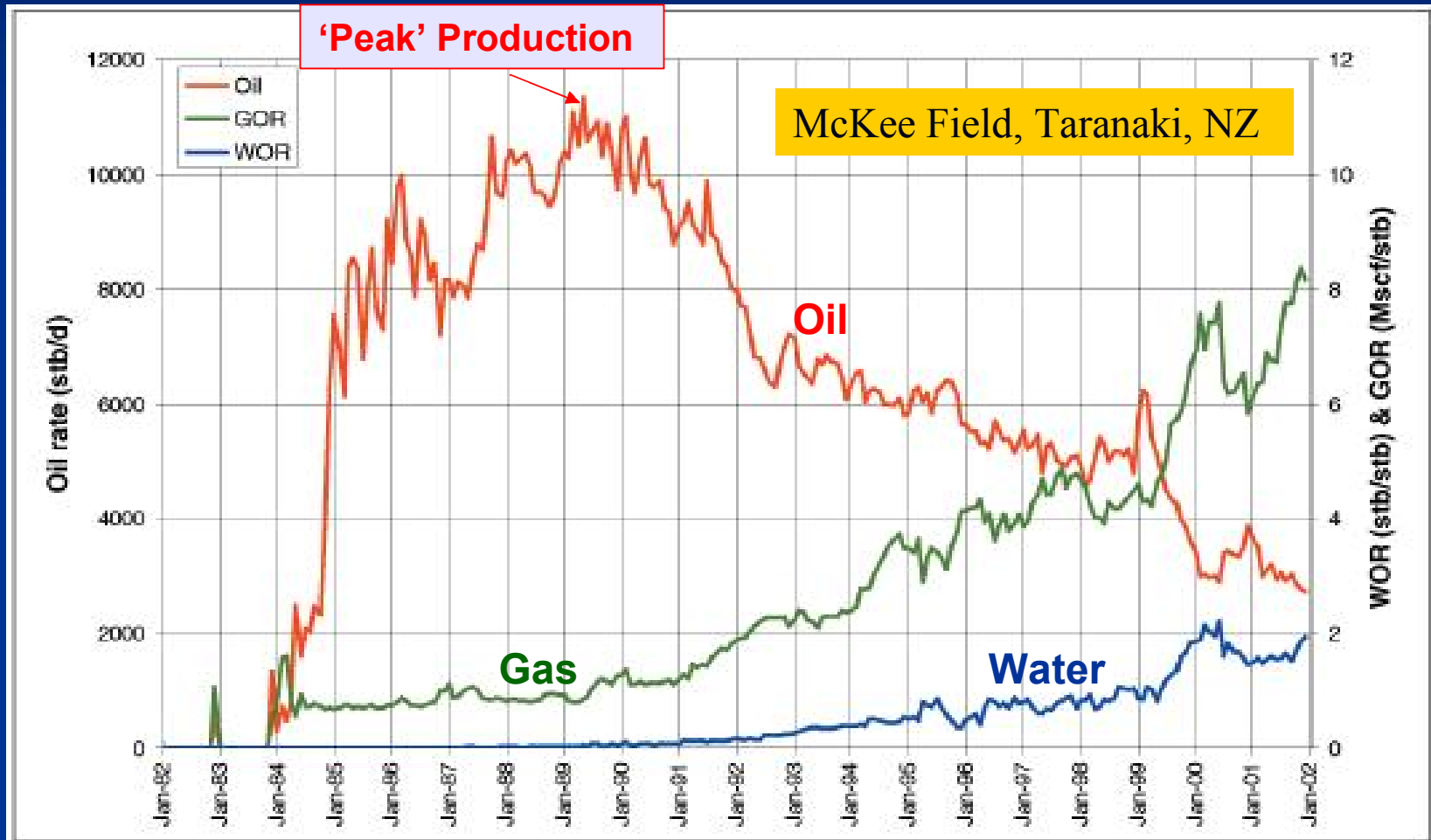


Every field has a limited life

- maximum production: depends on reservoir porosity and permeability, depth, pressure, type of hydrocarbon, etc.
- field life: months, years or decades
- add all the field decline curves in a country to determine the maximum 'peak' rate; add all the countries in the world to determine the global 'peak'
- The production curve looks a like a bell when plotted on a graph...



Typical oil field decline curve



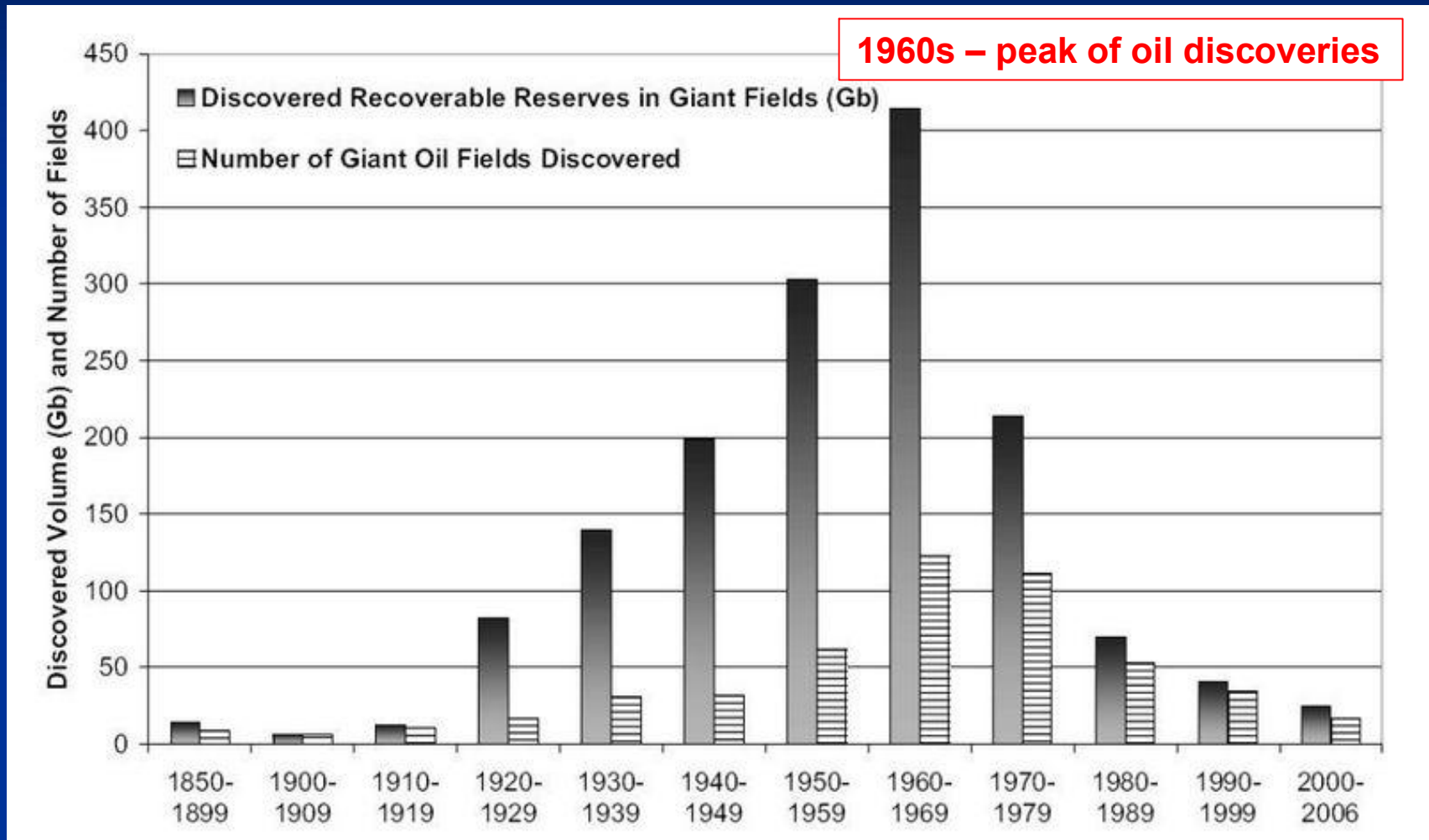
Source: W.O. Boeren, 2004 NZ Petroleum Conference Proceedings

What is 'Peak Oil'?

- like all limited resources, global oil production must someday increase to a maximum rate (the peak) then decrease over time.
- oil production in 15 of the 23 top producing countries has already peaked.
- Saudi (12% of the world's oil reserves) production declining at a rate of 8% per year. So goes Saudi Arabia, so goes the world!
- Global oil production will likely peak by 2010, but does the exact date really matter!



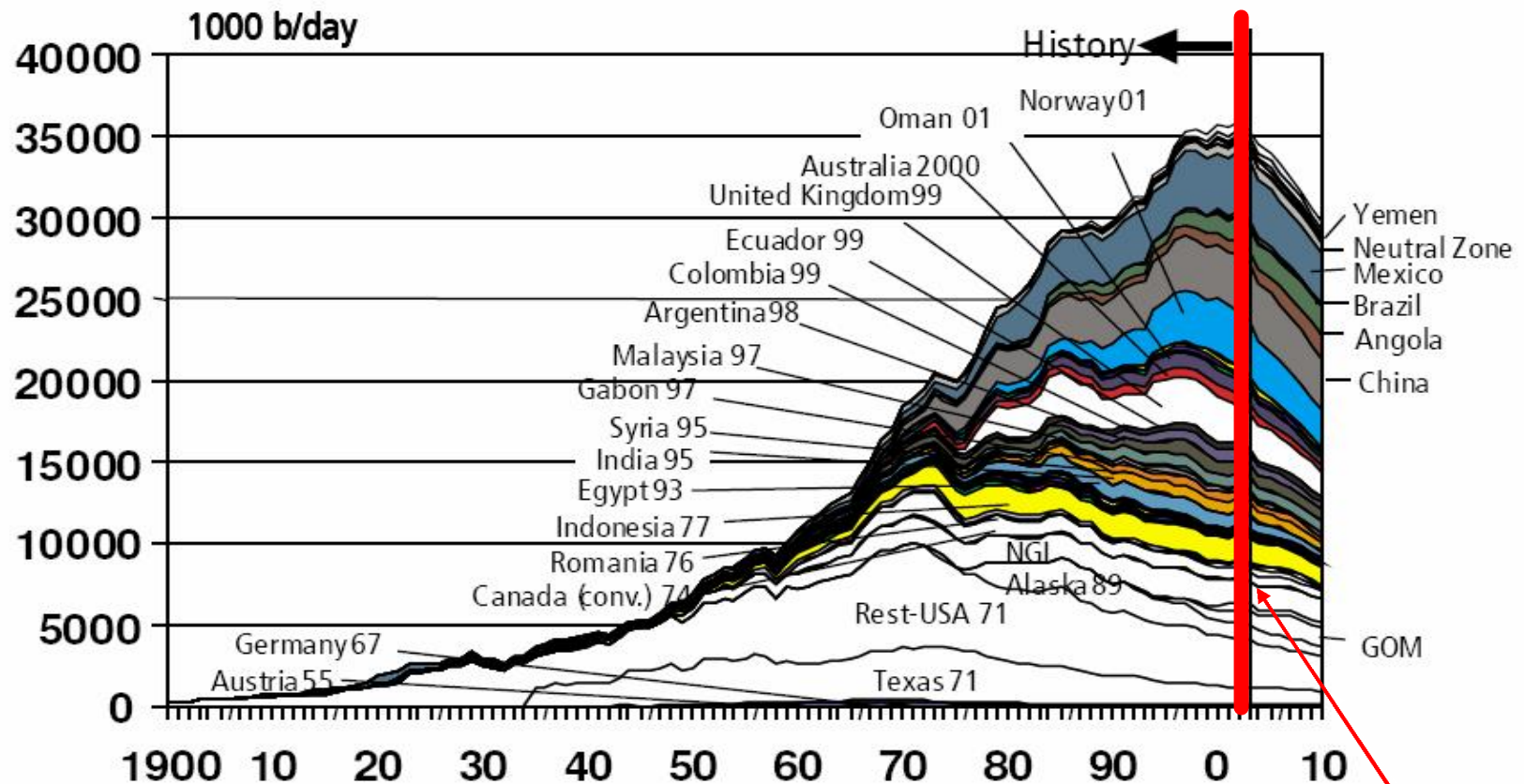
Global oil discoveries by decade



Source: EIA, C. Campbell, et al, 22/07/07

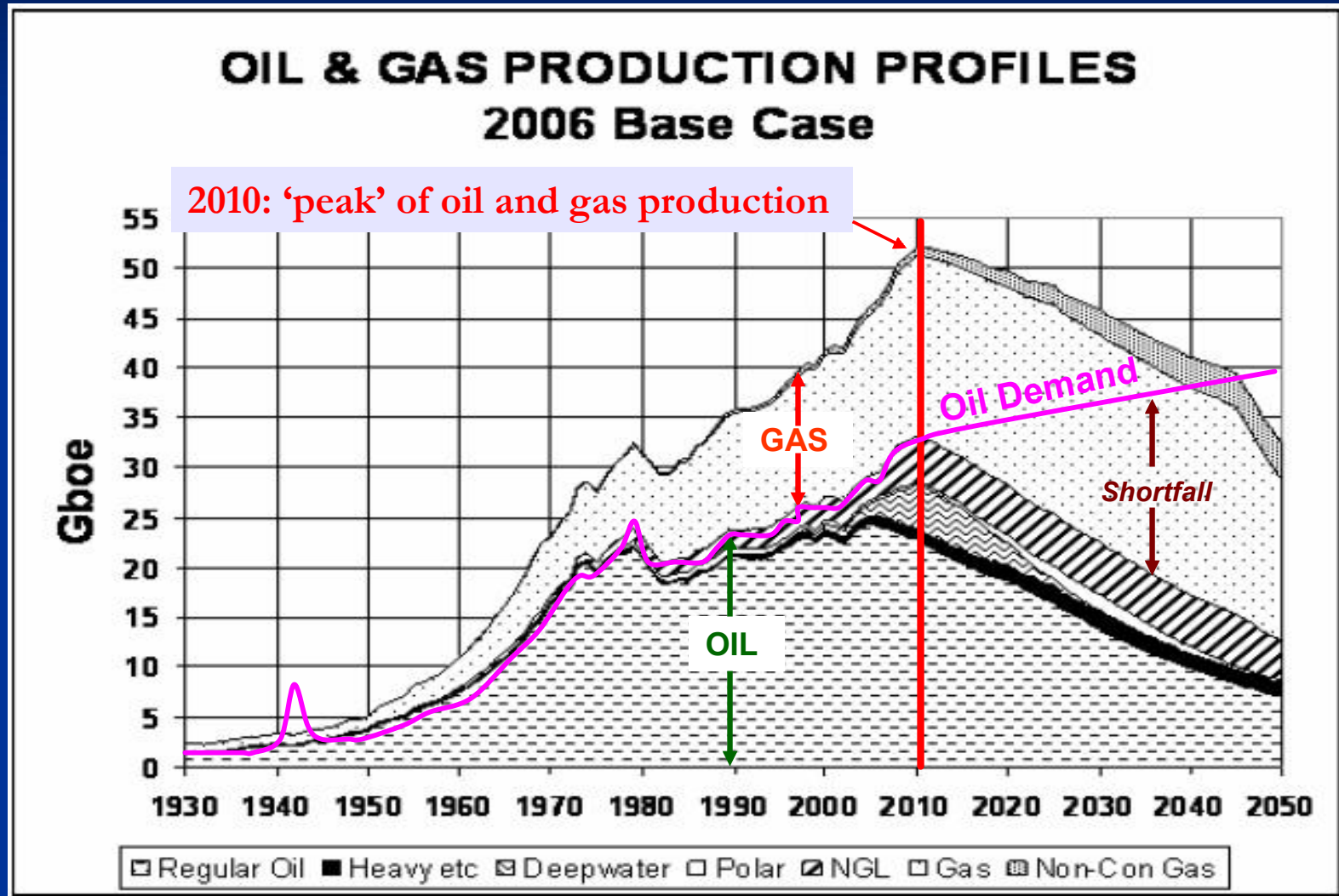
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Non-OPEC oil production



Source: Industry database, 2003 (IHS 2003)
OGJ, 9 Feb 2004 (Jan-Nov 2003)

2010 appears to be the watershed year



The truth and nothing but the truth

- 1st Law of Thermodynamics: energy cannot be created or destroyed, only changed
petrol is converted to heat, water, CO₂, etc. – irreversible process
- nothing is infinitely sustainable
- like all resources, there is a finite amount of oil
- we have consumed almost half of the known global oil resource and demand is increasing

Only greenies and doomsayers believe in 'Peak Oil', right?

Esteemed Professor Gerry Carrington, Head of Physics Department, University of Otago:

“NZ is facing an energy crisis and must prepare for intermittent petroleum supply and significantly more expensive power.

Source: Christchurch Press 17/03/07

Dr. van der Meer, CEO-Shell: “Just when energy demand is surging, many of the world’s major oilfields are in decline.”

Source: Business Times, 25/6/2007

A June 2007 poll shows 60% of oil industry executives believe 'peak oil' is imminent.

Source: AAPG Explorer, May, 2007

NZ imports 93% of its oil requirements (35 million barrels/yr).



The latest IEA report

- On 12 July, the International Energy Agency (IEA) published its latest 5 year predictions on global oil supply/demand.
- 2002 - 'peak oil' will occur after 2025
- 2007 – 'peak oil' will occur before 2012
- This is first international governing body to admit the approaching oil crunch



Has 'Peak Oil' already arrived?

Third world countries always show the first signs of a worldwide tightening of supplies:

- *Nepal* - July brought the worst petrol shortages in history as NOC cannot pay for subsidized supplies from India; taxi drivers stage 'park-in' protests blocking roads to capital
- *Iran* - chronic petrol shortages have caused rationing to 100 litres/month. Oil subsidies on its petrol imports (50%) means government absorbs a loss of \$1.50/litre; 19 petrol stations torched in June-July
- *Senegal* - unable to pay for fuel for its oil-fired power stations, leading to rolling blackouts of electricity
- *Kenya* - industry and transportation grinding to a halt due to chronic petrol and diesel shortages
- *Argentina* - shortage of natural gas is causing havoc with CNG-powered buses and taxis and electricity generation

Distinguish the energy system

- 2 energy systems: petroleum and electricity
- petroleum: naturally derived; used to power vehicles, aircraft, vessels + petrochemicals
- electricity: converted energy from hydro, wind, coal, nuclear, natural gas, oil, solar, tides, wood; used in many ways
- the impending oil shortage will dramatically affect petroleum-based systems and obliquely affect electricity-based systems



Is petroleum really needed?

Besides being the obvious source of petrol, lubricants, aviation fuel, LNG and LPG, petroleum is a major component in manufacturing:



How addicted to oil are we?

- Globally, 90% of transport depends on oil:
 - Automobiles: 800 million
 - Trucks: 20 million
 - Buses: 5 million
 - Aircraft (>100 passengers): 11,000
 - World shipping: 85,000
 - Decked fishing boats: 1.2 million
 - Locomotives: 120,000



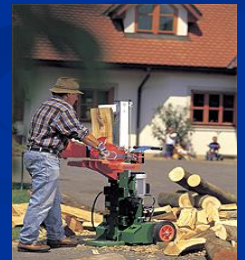
Source: Bruce Thompson, NZ Navy Times Newsletter, July 2005

Is petroleum important to agriculture?

- 6 litres of fuel = 1 kg of feedlot beef
- no fertilizers and pesticides: per acre yield declines from 130 bushels to 30 bushels
- 4-10 calories of fuel produces 1 calorie of grain food energy
- globally, food prices have increased 23% in the last 18 months, paralleling cost of oil and increasing use of biofuels
- 1 litre of petrol = 23 man-hours of physical work

“The food products in an average grocery basket have traveled 215,000 kilometres to your local store.”

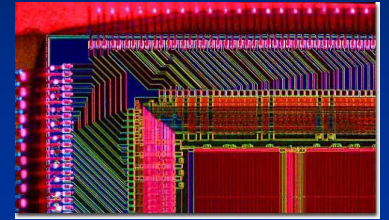
The Christchurch Press, 1 August 2004



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What about manufacturing?

- 630 grams of oil = one gram of microchips
- 3360 litres of oil = one automobile
- 880 litres of oil = electric batteries for a hybrid car
- 10 tonnes of oil = one luxury 50-foot yacht



Source: Geoffery Lean, The Independent, 09/08/07

Oil more expensive to find

- the easiest oil (onshore, near-shore, shallow, near infrastructure) has been found
- now exploration companies are searching in deep water, arctic conditions, greater depths and tight reservoirs.
- these new targets are much more expensive to explore and produce than previous fields.
- so the world is not running out of hydrocarbons, but is running out of historically cheap oil
- More importantly, demand is totally outstripping maximum production of oil from any source.



SUPPLY

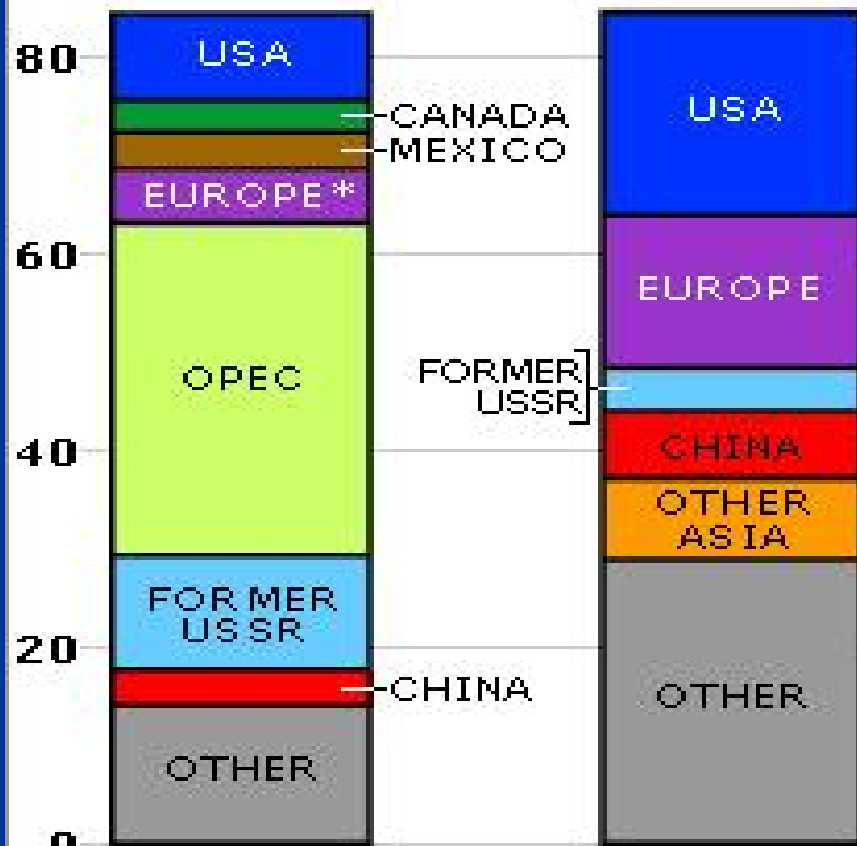
84.8

million
barrels
per day

DEMAND

84.6

million
barrels
per day



* NORTH SEA

SOURCE: ENERGY INFORMATION ADMIN.

Global Supply/Demand

The USA produces 10% of world's oil, uses 24%; Europe's supply/demand is similar

OPEC produces half of the world's oil

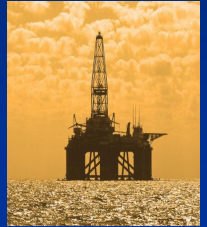
China, India and other Asian countries are increasing consumption 5 to 7% annually

Source: Energy Information Administration: 15 August 2005

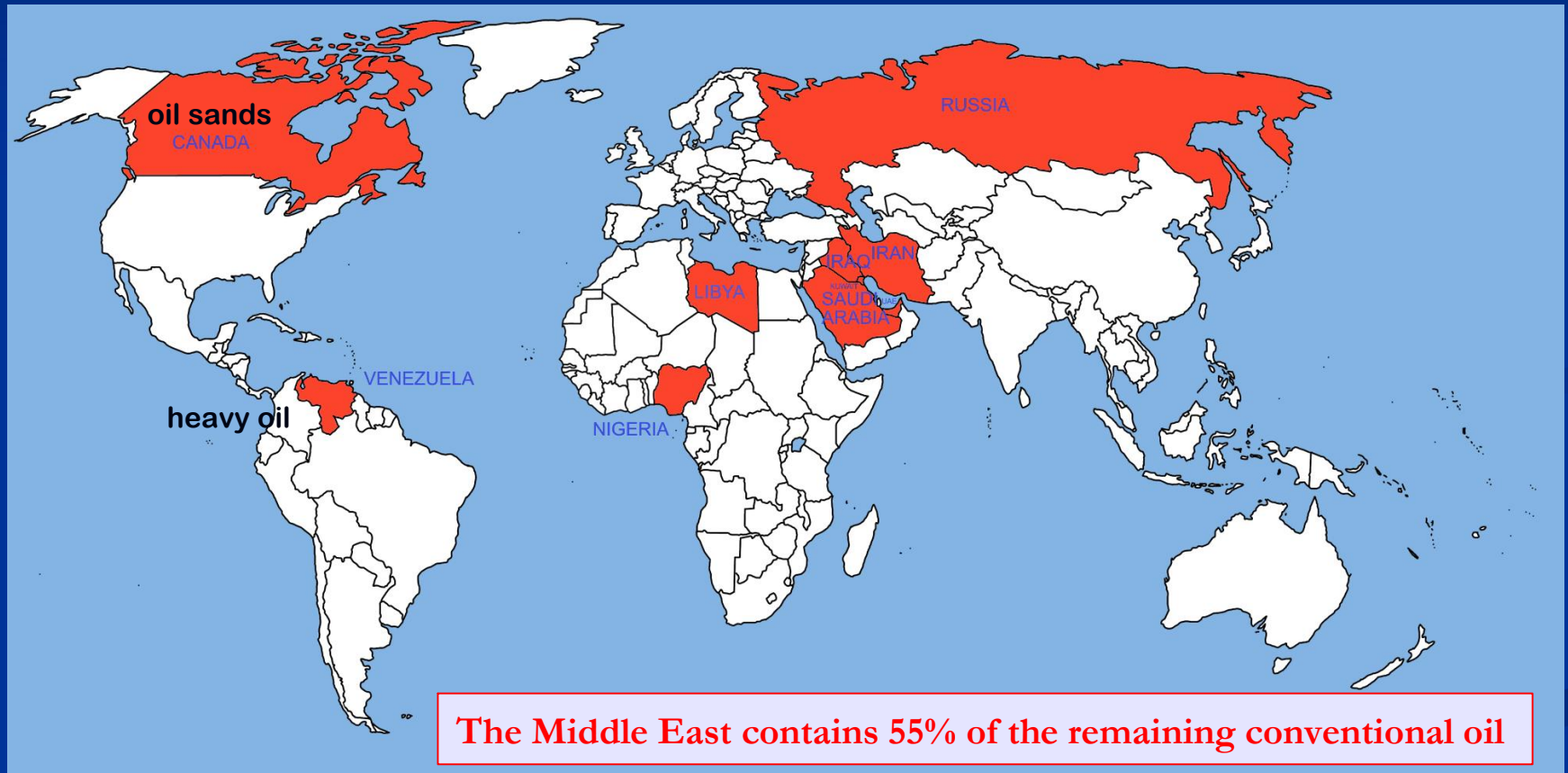
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Oil production cannot keep pace

- new oil discoveries: <5 billion barrels/year
- global oil demand: 31 billion barrels/year
- each year we consume **six times** the oil we discover!
- Near-maximum capacity: drilling rigs, refining facilities and oil tankers; but more importantly – lack of experienced professional engineers and earth scientists



Countries with largest oil reserves



Source: A.M.S. Bakhtiari, Feb. 2006

OPEC falsifies reserves

Year	Abu Dhabi	Dubai	Iran	Iraq	Kuwait	Saudi Arabia	Venezuela	Total
1980	28.0	1.4	58.0	31.0	65.4	163.4	17.0	364
1981	29.0	1.4	57.5	30.0	65.9	165.0	18.0	367
1982	30.6	1.3	57.0	29.7	64.5	164.6	20.3	368
1983	30.5	1.4	55.3	41.0	64.2	162.4	21.5	376
1984	30.4	1.4	51.0	43.0	63.9	166.0	24.9	381
1985	30.5	1.4	48.5	44.5	90.0	169.0	25.0	409
1986	30.0	1.4	47.9	44.1	89.8	168.8	25.6	408
1987	31.0	1.4	48.8	47.1	91.9	166.6	25.0	412
1988	92.2	4.0	92.9	100.0	91.9	167.0	56.3	604
1989	92.2	4.0	92.9	100.0	91.9	170.0	58.1	609
1990	92.2	4.0	92.9	100.0	91.9	257.5	59.1	698
1991	92.2	4.0	92.9	100.0	94.5	257.5	59.1	700
1992	92.2	4.0	92.9	100.0	94.0	257.9	62.7	704
1993	92.2	4.0	92.9	100.0	94.0	258.7	63.3	705
1994	92.2	4.0	89.3	100.0	94.0	258.7	64.5	703
1995	92.2	4.0	88.2	100.0	94.0	258.7	64.9	702
1996	92.2	4.0	93.0	112.0	94.0	259.0	64.9	719
1997	92.2	4.0	93.0	112.5	94.0	259.0	71.7	726
1998	92.2	4.0	89.7	112.5	94.0	259.0	72.6	724
1999	92.2	4.0	89.7	112.5	94.0	261.0	72.6	726

Ref: philhart.com, 2007

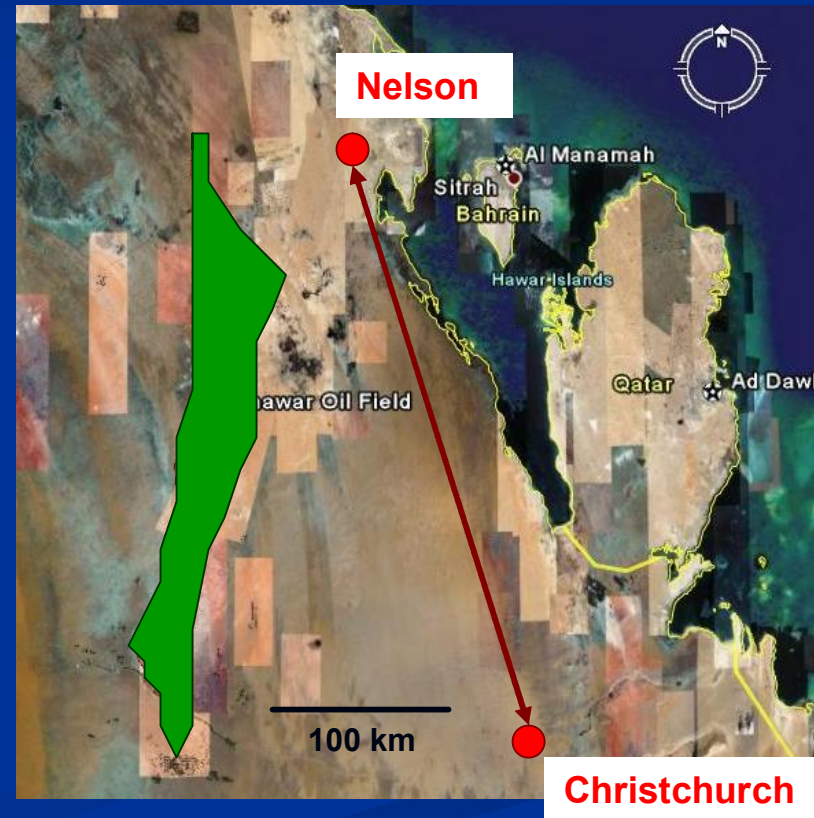
Paper reserves = 726 billion barrels

Actual reserves = about 200 billion barrels

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Is more oil the solution?

- Saudi Arabia's Ghawar Field is the world's largest oil accumulation - 80 billion barrels recoverable.
- If another Ghawar is discovered tomorrow, at current consumption rates....
the new accumulation would supply the global thirst for only three years!



The world's largest oil fields are old

- globally: estimated 78,000 petroleum fields
 - the 120 largest oil fields produce 50% of the world's oil
 - at least 93 of these fields have peaked and are in decline
 - the 14 largest oil fields (20% of global oil) are over 53 years old
 - the 5 largest fields that produce 90% of Saudi Arabia's oil are over 50 years old
- we are currently using oil found decades ago
with little replacement



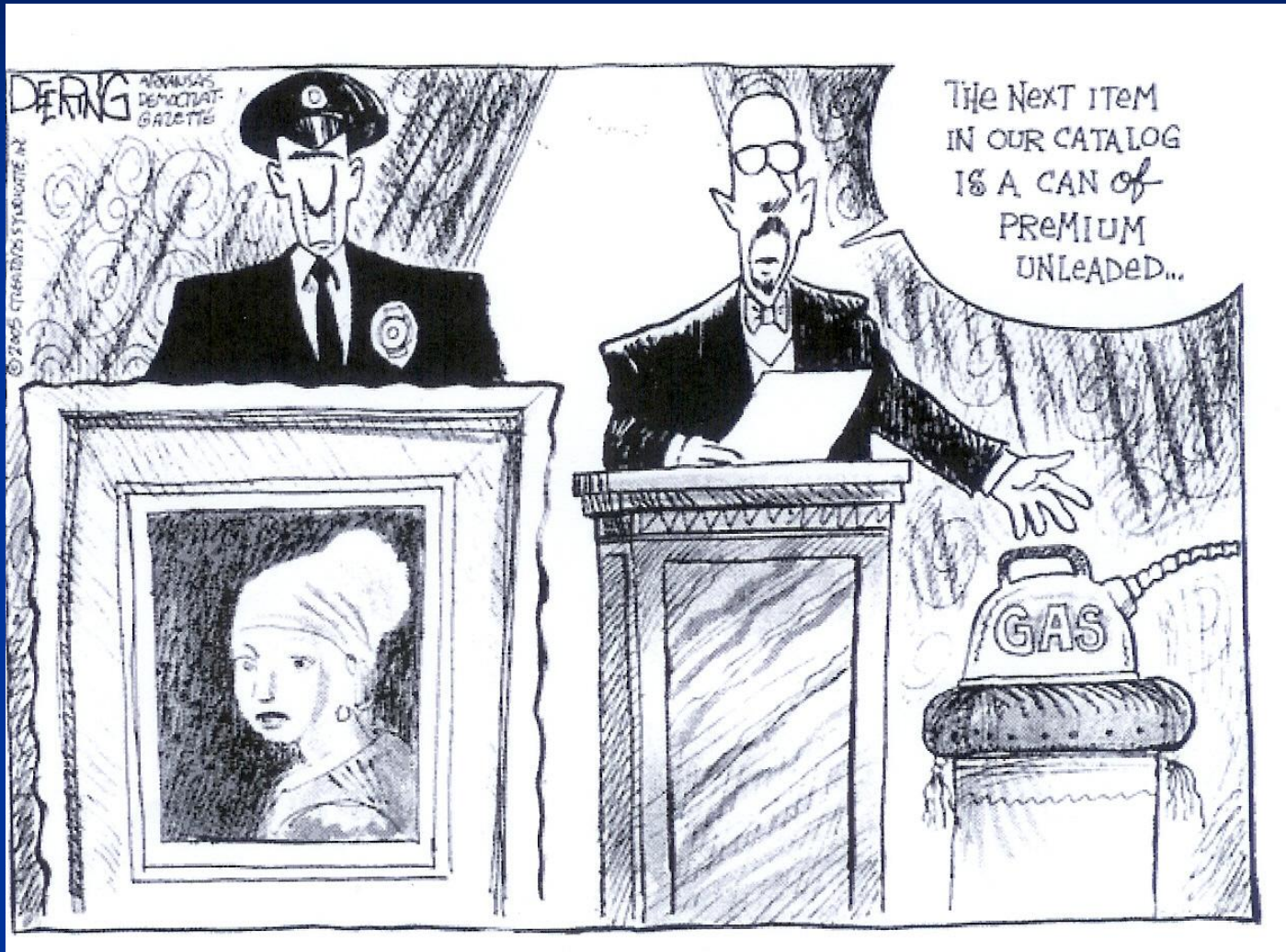
Is the party over?

- Global oil production will peak about 2010
- After 2010, global oil production will begin to decline rapidly ($>2\%$ per year)
- No amount of regulation, intervention policy, hand-wringing or begging will change this event
- conservation will only delay the rate of decline

No, but the keg is emptying quickly!



Doesn't New Zealand have natural gas?



Source: Deering, Arkansas Democrat Gazette, 2005

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New Zealand's gas resources declining

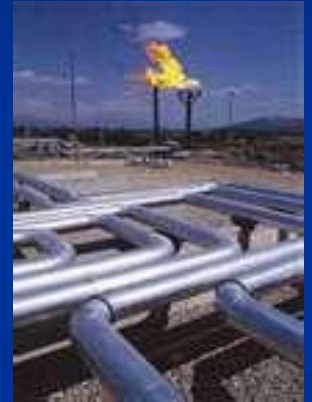
NZ's gas production peaked in 2001

- After Pohokura Field reaches maximum rates in 2008, gas production in NZ rapidly declines

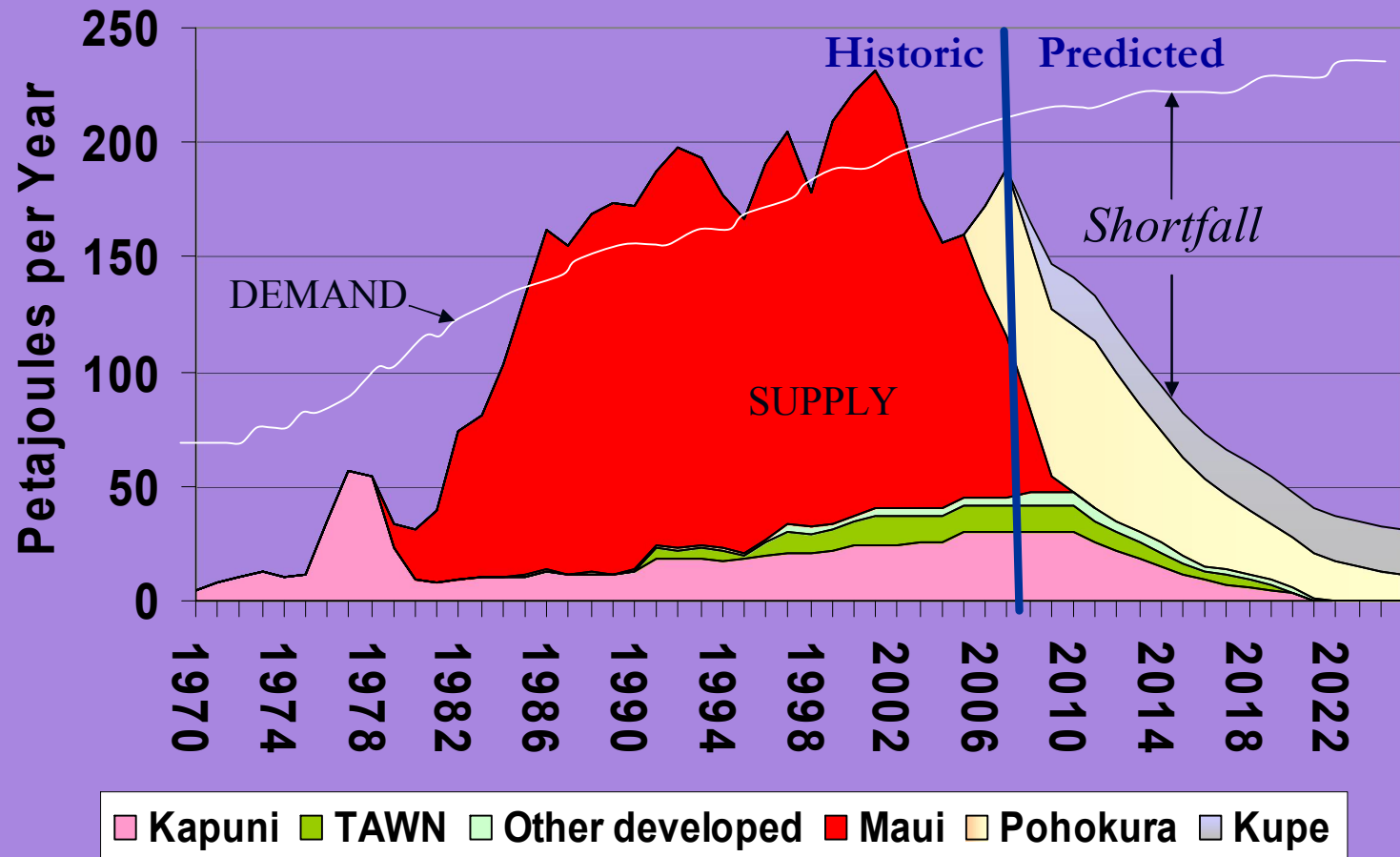
If no new major gas fields are found in NZ:

- By 2012, NZ gas production will decrease by 50%
- LNG will have to be imported at higher cost

Electricity costs will continue to skyrocket!



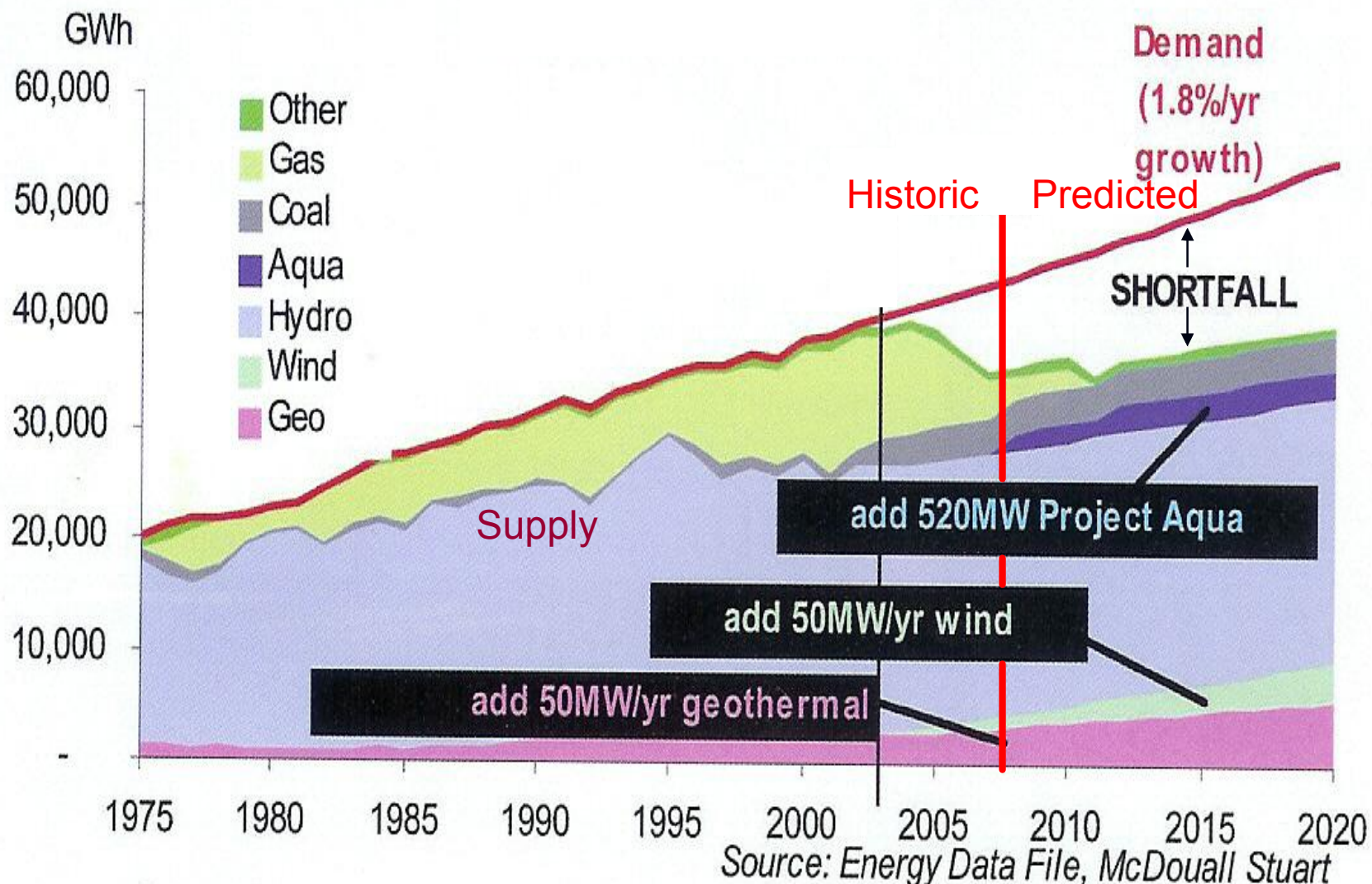
New Zealand gas production



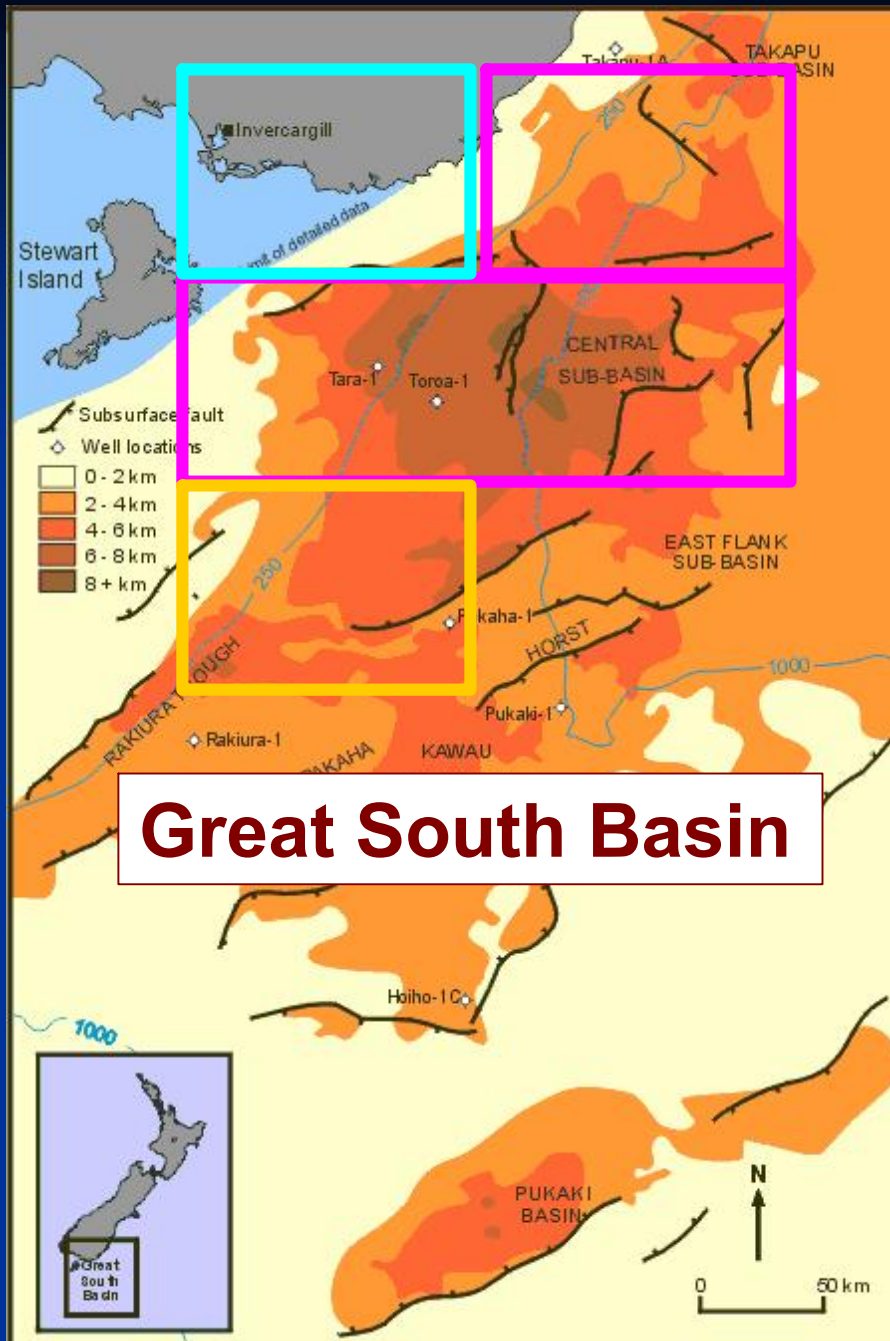
Source: GeoSphere Exploration Ltd., 2004

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New Zealand electricity supply



Crown Minerals 2007 tender



Great South Basin

- OMV consortium
- Exxon/Mobil consortium
- Greymouth Petroleum

Chance of economic
discovery less than 5%

In defense of oil companies



The real story about oil price

- Fact: the entire world economy is based on oil
- oil price is not set by oil companies, but by global demand
- NZ buyers compete against all other global buyers
- the price is set by the highest bidder for each barrel of oil
- don't complain about the oil companies or petrol stations because you, and every other consumer, are the cause of high prices by increased competition for a dwindling resource
- more consumers = stronger demand = higher prices
- cheap oil, like clean water, has been taken for granted
- so it may come as a surprise that cheap oil is not a God-given right; oil is just another purchased mineral... like gold, coal or talc.
- this problem is not new, it is 40 years in the making



Will the price of oil decrease?

In 1980 a 5% supply reduction caused a 400% price rise

2000: US\$10 barrel

2007: US\$70/barrel

- Some petroleum experts predict:

2008 = \$80/bbl

2010 = \$100/bbl

2012 = \$120/bbl

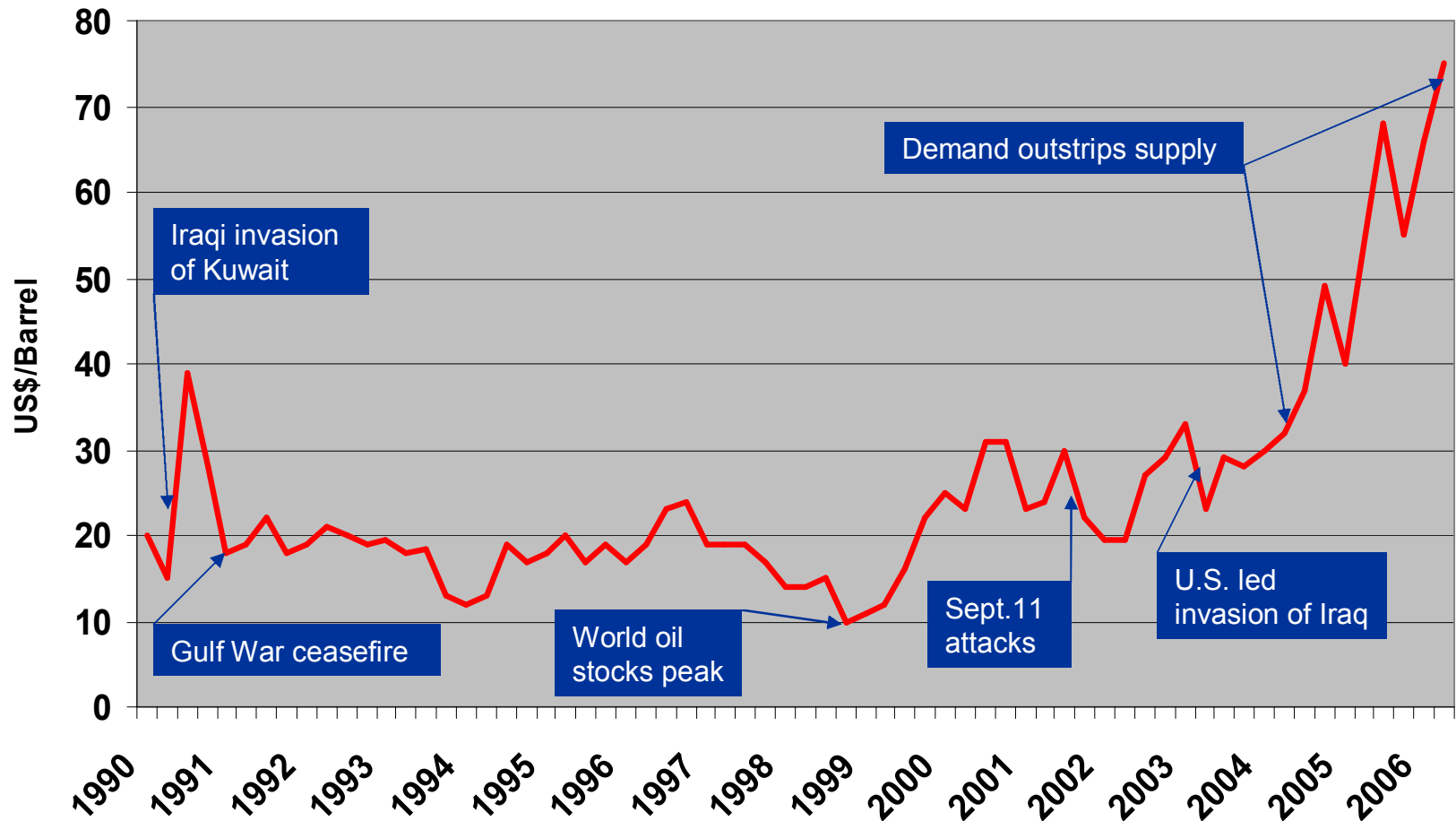
2015 = \$150/bbl

- US\$1/barrel increase = NZ\$0.03/litre increase

- Can you afford NZ \$3/litre petrol in 2012 or \$4/litre in 2015?



North Sea Brent crude oil price



Those greedy oil companies?

<i>US\$ billion - 2006</i>	<u>Exxon/Mobil</u>	<u>Microsoft</u>	<u>Pfizer</u>	<u>Coca-Cola</u>
revenue	377*	44	48	24
gross profit	84	36	40	16
net income	40	13	19	5
net profit margin	10	28	23	21

Until two years ago, oil company profit margins were below 6%, now 10%.

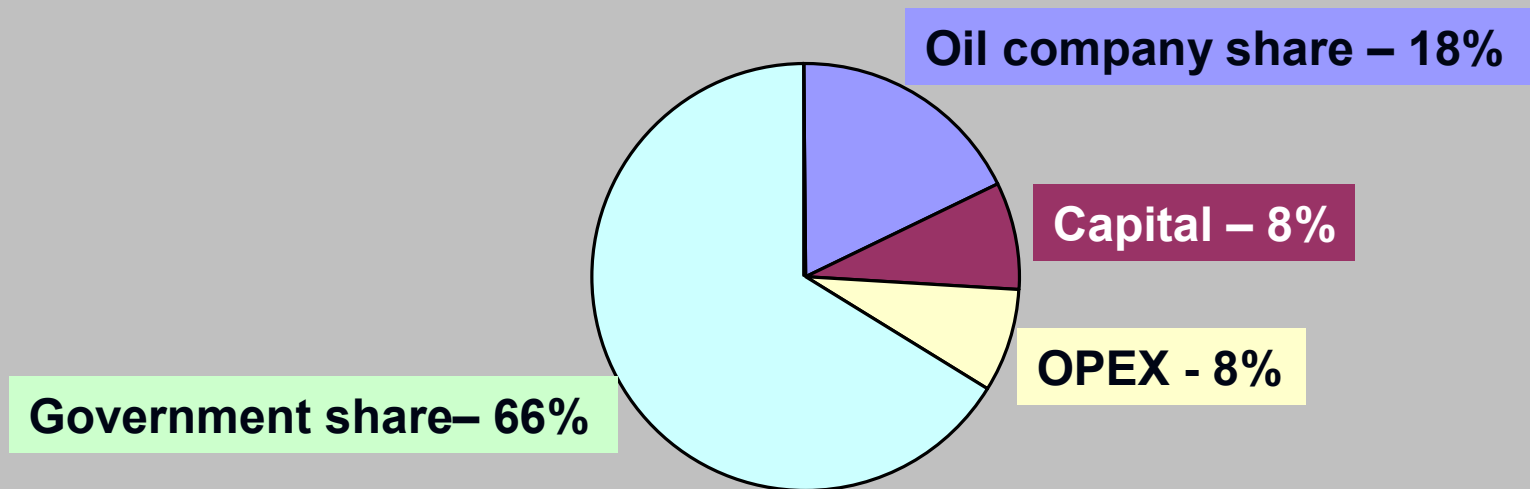
This is less profit margin than many major industries in the world

‘Greed’ may be more applicable to your software or pharmaceutical supplier

*New Zealand 2005 GDP: US\$109 billion

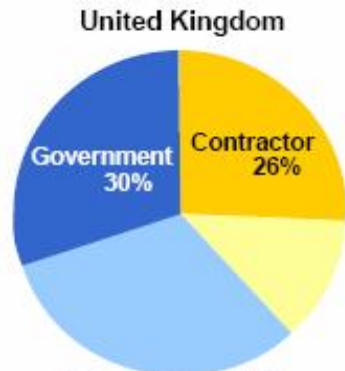
Typical oil revenue split

Malaysia Revenue Split



Government take: $\text{Gross Revenue} - (\text{OPEX} + \text{Capital}) = 78\%$

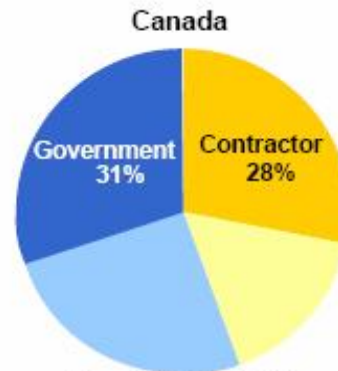
Who gets a piece of the oil pie?



Gvmt. Take: 53%



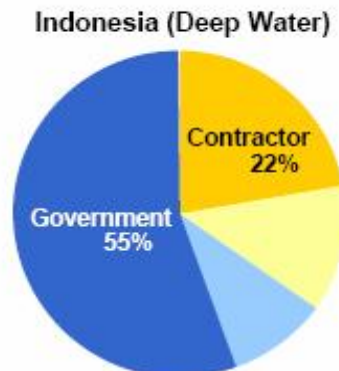
Gvmt. Take: 71%



Gvmt. Take: 53%



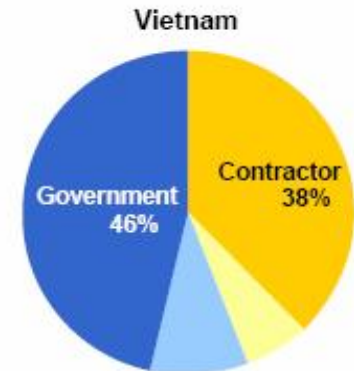
Gvmt. Take: 70%



Gvmt. Take: 71%



Gvmt. Take: 78%



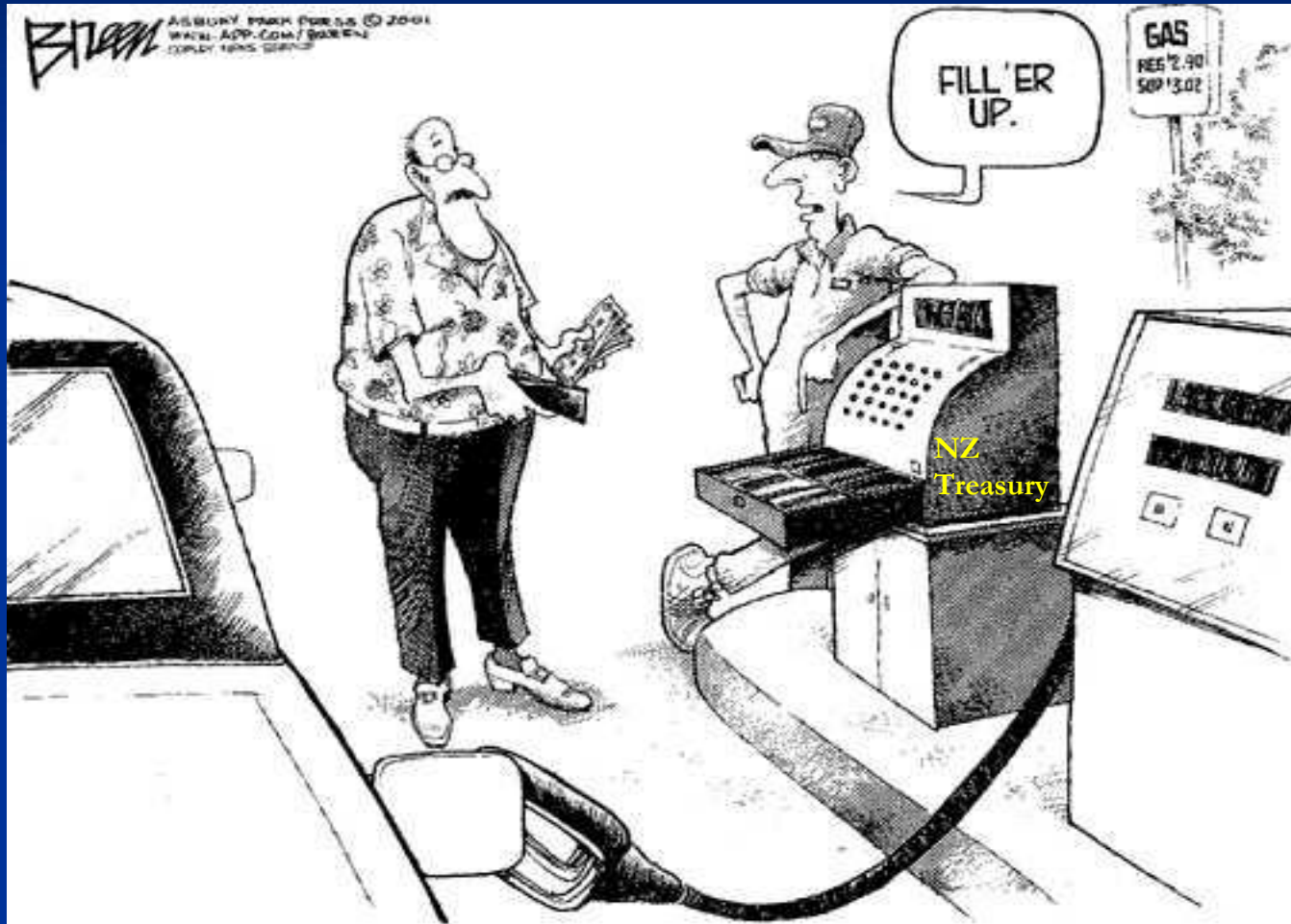
Gvmt. Take: 64%

Syria take: 88%, Libya take: 90%

New Zealand government take: 47%

Government Take (Gvmt. Take) = Total Government Cash Flow / (Gross Revenue - Capital & Operating Costs)

What about petrol sold in NZ?



Courtesy: Breen, Asbury Park Press, 2001

NZ government taxes

- Example -the cost of petrol at NZ\$1.399 per litre:

GST	\$0.1554
Excise tax	0.4120
ACC levy	0.0578
Local authority tax	0.0066
Petroleum fuels monitoring tax	<u>0.0025</u>
Total government tax	0.6320
Oil company fuel cost	0.7669
Total cost at pump	\$1.3989



No matter the cost of petrol, the government tax is about 40-45% of pump price. Government GST tax revenues rise/fall with price fluctuations and are the most important non-visible source of funding for government programmes.

What are governments doing?

- **USA:** conducting Senate hearings to create new energy and tax policies to boost renewable energy, biofuels and efficiency, but the latest GAO report still states ‘peak oil’ will not occur until 2020-2040.
- **UK:** The All Party Parliamentary Group on Peak Oil and Gas (APPGOPO) founded on 27 June 2007 ensuring Gordon Brown’s regime will study the problem.
- **Australia:** Dr. N. Gruen, Treasury Advisor – “Our position on peak oil is ... markets should be allowed to work and prices should be allowed to change to constrain demand and bring on extra supply.”*
- **New Zealand:** government admits that ‘peak oil’ may have validity, but there is no urgency to begin tackling the problem.



*Source: Parliament notes 31/05/07

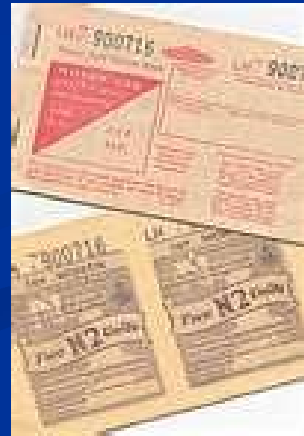
Labour government's energy assumptions

- Oil will remain about US\$60/barrel (wishful thinking!)
- Unconventional oil sources will replace conventional supplies (current estimates: 20% maximum by 2050!)
- Electric vehicles and biofuels can substitute for a “significant quantity” of oil
- NZ economic growth will remain about 3% (how?)
- There is enough time to adjust slowly to changing energy supplies (anyone checked NZ's trade deficit?)

Fearful of a fall in business confidence and investment, the government is waiting to see if a crisis occurs and does not want a repeat of the Muldoon ‘big project’ debacles of the 1980s.

An uneasy solution in time of shortage

- rationing was used in WWII, but the coupon system is unwieldy
- a highly unpopular but more direct approach is an imposed fuel tax of \$2/ liter; only when it costs \$150 to fill a vehicle's tank will the consumer begin to stringently conserve.
- only politicians concerned with the welfare of the nation's future would dare propose such a tax



What about alternative energy sources?



Lee Raymond, CEO, Exxon/Mobil (largest oil company in the world)

- “There is no quick fix replacement for oil, if there was, Exxon/Mobil would be in it.”
- “Nuclear energy is the only viable alternative to produce electricity.”
- “Solar energy is not a viable alternative; it would require 84 square miles of solar panels to replace the energy that a single petrol station sells in a single day. It would require panels covering the entire state of New Jersey to replace the energy dispensed by 100 petrol stations in a single day.”



Can 'Tar Sands' save us?

- Large amounts of oil are locked up in tar sands in Canada, Venezuela, US and the Middle East. Alberta alone may be able to recover 174 billion barrels of oil from tar sands.
- Canada: 600,000 barrels of oil/day at US\$10/barrel
- tar sands must be mined, washed in water and solvents and refined to obtain oil
- 3 barrels of water (steam) = 1 barrel of oil
- large areas environmentally affected
- equipment used in the mining process fuelled by petroleum
- Oil companies in Venezuela have spent US\$30 billion to establish 600,000 barrels of oil per day production from heavy oil deposits. Processing synthetic crude oil from Orinoco sands is expensive (>\$30/bbl), consumes vast quantities of water (steam) and involves difficult proprietary technology.



Athabasca, Canada



Hamaca, Venezuela

There is no current replacement for oil

- **Synfuels:** oil shale or coal must be mined and transported then converted; requires $\frac{1}{2}$ the energy it provides
- **Biofuels:** tradeoff: food for humans or bio-diesel for vehicles? Ethanol is 20% less efficient than petrol; it would require $\frac{3}{5}$ of the U.S. corn crop to meet its 2012 ethanol goal
- **Coal:** must be mined, transported; can be used in rail and large vessels but cannot be used in vehicles or aircraft
- **Hydrogen:** current technology uses petroleum as feedstock; need to develop technology that utilises water (40 years?)
- **Nuclear:** this alternative faces stiff public opposition and dwindling uranium supplies
- **Micro-hydro, wind, solar:** can provide small amounts (15%?) of electricity for power.

Can't technology save us?

- in the oil industry, the latest technology is not increasing yearly discovery rates
- in the oil shale industry, \$30 billion has yielded only 600,000 barrels/day
- commercial quantities of hydrogen fuel from water by 2050? Can we afford conversion to a hydrogen economy?
- the world cannot 'technically solve' its way out of the impending oil shortage



Will there be a mild transition?

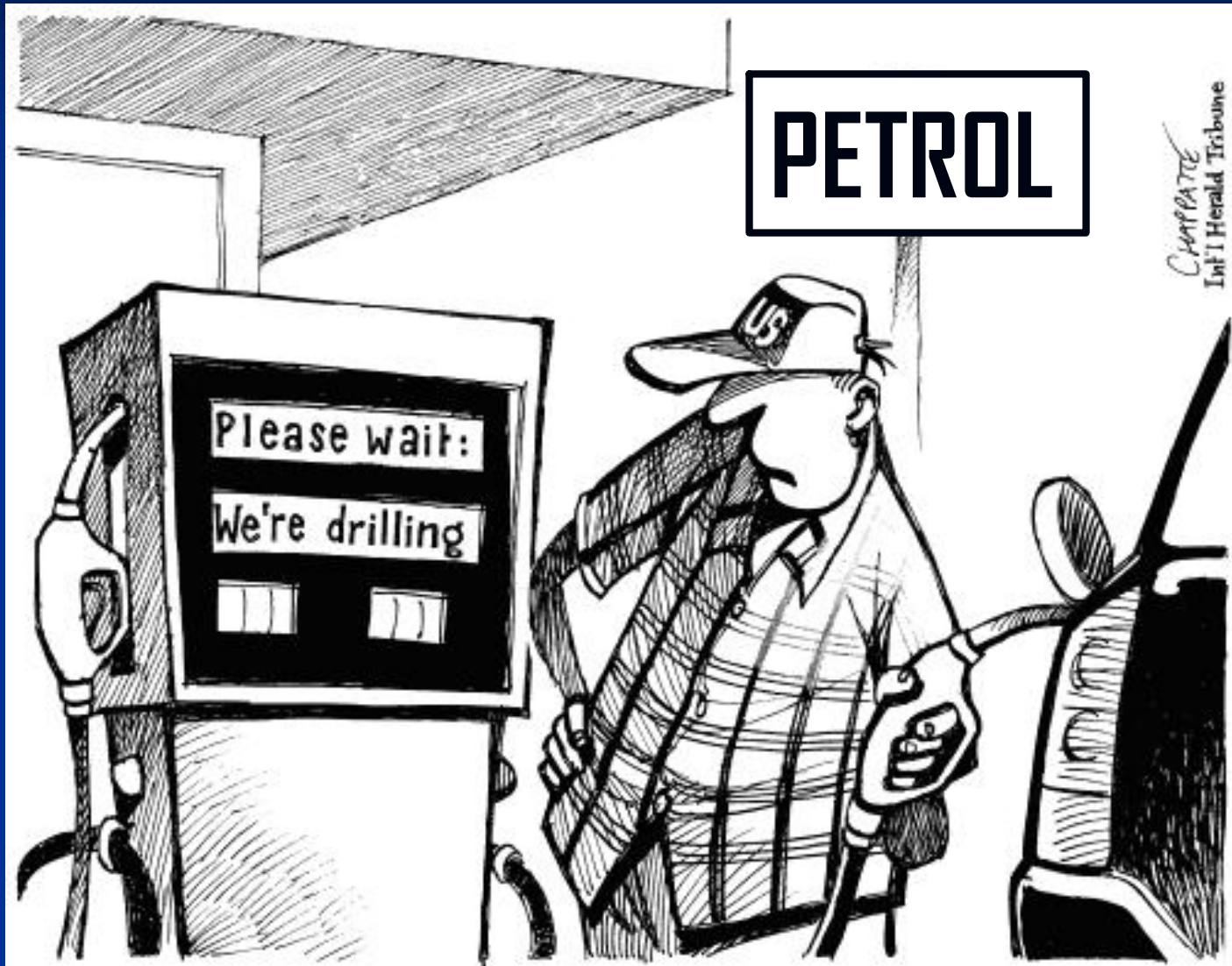
- Wood MacKenzie, a leading Scottish petroleum consultancy, believes oil prices will actually fall due to new biofuels and natural gas liquids; 8.1 million bbls/day extra crude by 2010.
- This outcome would allow a gradual transition from primary oil to alternative liquid fuel sources for the next 5-7 years

Source: CHCH Press 01/08/07

- Cambridge Energy Research Associates, Massachusetts, believes oil supplies will peak after 2030

Source: Geoffery Lean, The Independent, 09/08/07

What would be the most dire outcome?



Source: Chappatte, International Herald Tribune 03/05

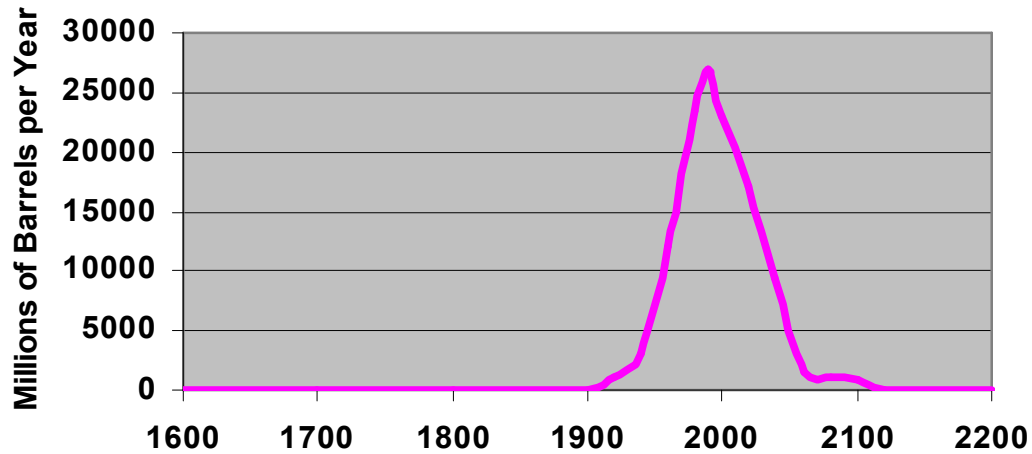
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Pessimistic view of the oil decline

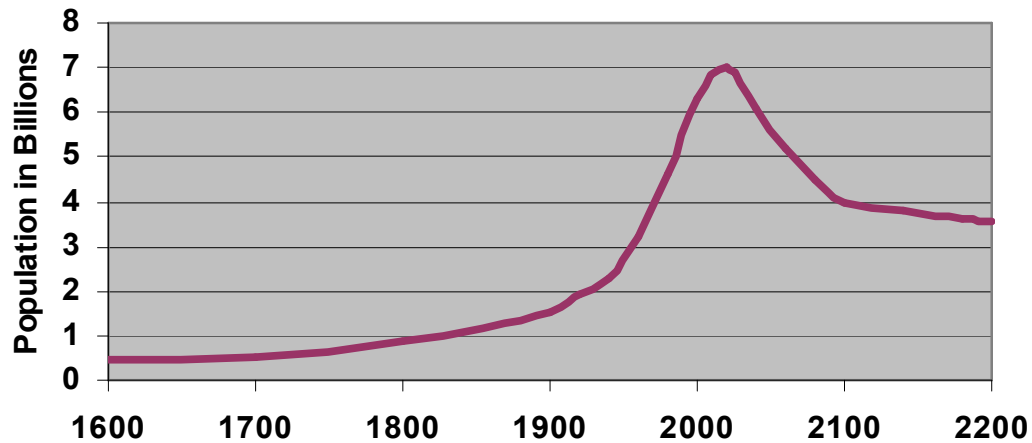
- Without mass transit or electric cars, commuting from suburbia to CBDs will virtually cease, making much of suburban living non-existent
- Global disruption of the transport of people, food, raw products and manufactured goods
- Collapse of global economy
- Widespread panic, conflicts, economic blockades and wars for control of existing oil supplies; insular mentality
- Mass starvation in economically depressed countries due to lack of surplus food from the superpowers; in addition, wealthy countries will decline back to a 1920s situation



WORLD OIL PRODUCTION 1600-2200



WORLD POPULATION 1600-2200

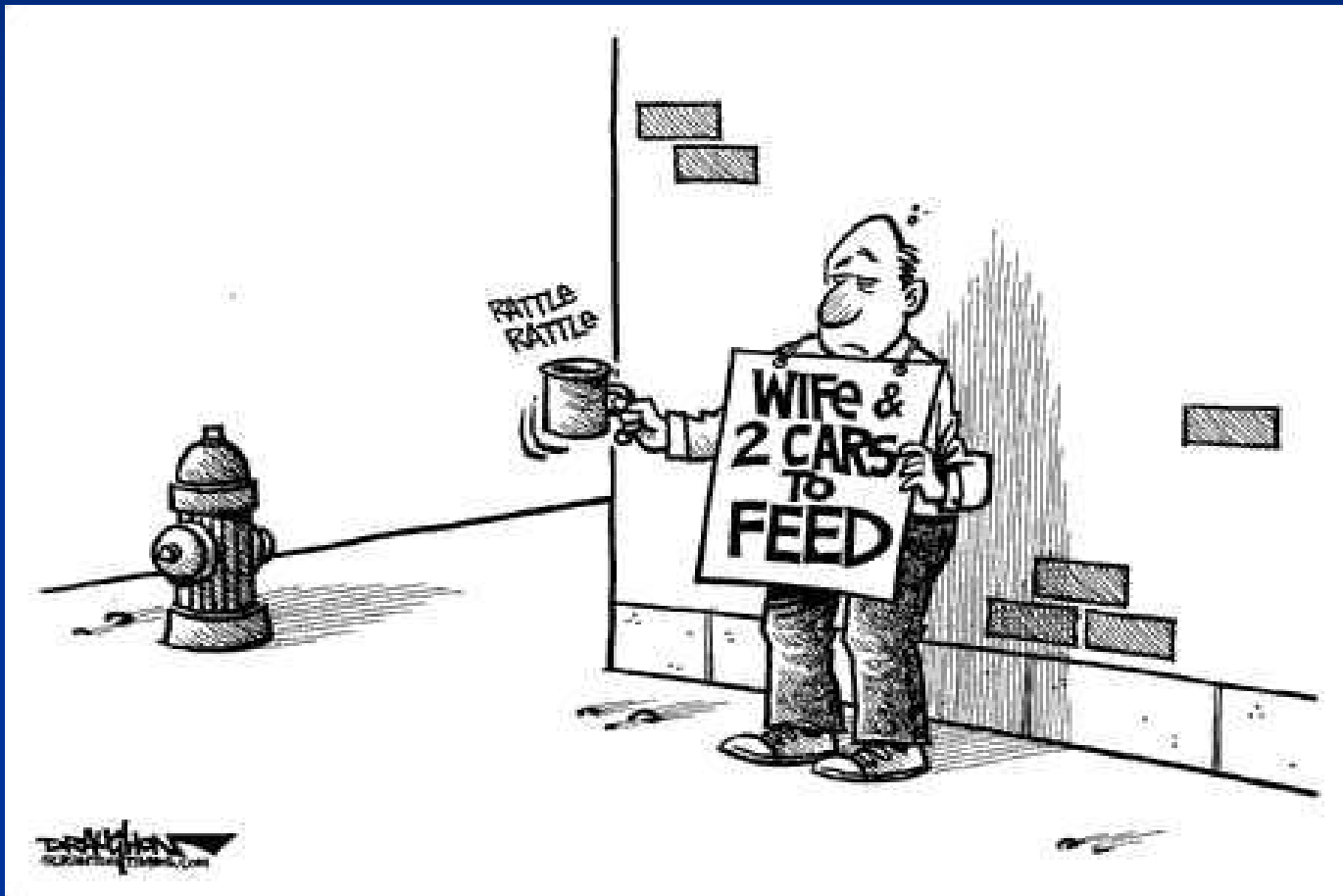


Who will fare the best?

- Subsistence hunter, gatherer and farmers from the more 'primitive' cultures, who never took part in the Age of Extravagance, will be the least affected by the coming oil crisis.
- Therefore, the more that 'advanced' cultures can return to subsistence agriculture and power (gardening, permaculture, seasonal foods, micro/renewable power generation, etc.) the better the local community will fare.



How do we help ourselves?



Courtesy: Draughton, Clarion Times, 2001

How do we mitigate the 'Oil Endgame'?

There will have to be an urgent transition for the next decade from current petroleum usage. The following are global/national actions to assist this weaning:

- develop lighter cars; ultralight, ultrastrong materials like recycled plastic (Hyundai QarmaQ) can halve vehicles' weight and boost efficiency to about 35 kms per litre for a midsize vehicle
- use more electric vehicles (Chevrolet Volt); especially in cities where most commuting is less than 70 km.
- government programme (using rising petroleum taxes) to buy fuel efficient vehicles (cars such as Tata MDI compressed air vehicle) in bulk and lease or sell to low income buyers at costs they can afford; get inefficient cars off the road.



How do we mitigate the 'Oil Endgame'?

- joint-nation research in developing a non-polluting, hydrogen-driven vehicle. Currently hydrogen fuel for experimental vehicles is derived from petroleum.
- need immediate government effort to establish electric mass transit systems and national bus service
- government regulated change of heavy short-haul trucks to hydraulic-hybrid technology
- encourage self-powered transportation



How do we mitigate the 'Oil Endgame'?

- businesses institute energy-saving policies of converting company fleets to fuel-efficient vehicles
- liberate the workforce: work from home using email, fax, video conferencing, ftp sites
- government should promote use of all alternative forms of electrical energy generation: coal, wind, solar, tides, hydro, etc. decrease power generation by natural gas.
- require power companies to buy excess electricity generated by consumer. subsidize micro-hydro on private streams.



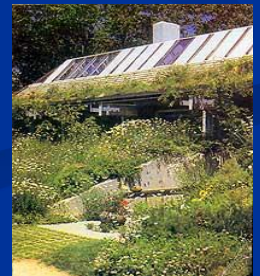
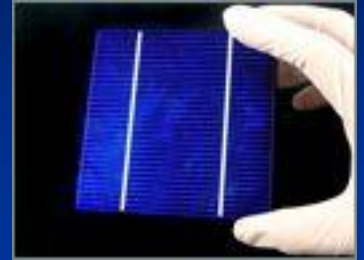
How do we mitigate the 'Oil Endgame'?

- Purchase locally produced food, goods and products to lessen dependence on foreign imports and transported goods. Stop current conversion of productive farmland into housing tracts - this requires more high-density housing in the cities. Lower taxes and grant subsidies to farmers to slow arable land conversion near cities.
- Larger government tax breaks for insulation, solar heating and more energy efficient homes, businesses and manufacturing. Currently the NZ government will loan only \$500 to the taxpayer for alternative power generation conversion. This needs to be 20-50% of project cost for taxpayers to react in large numbers. Invest in the future!



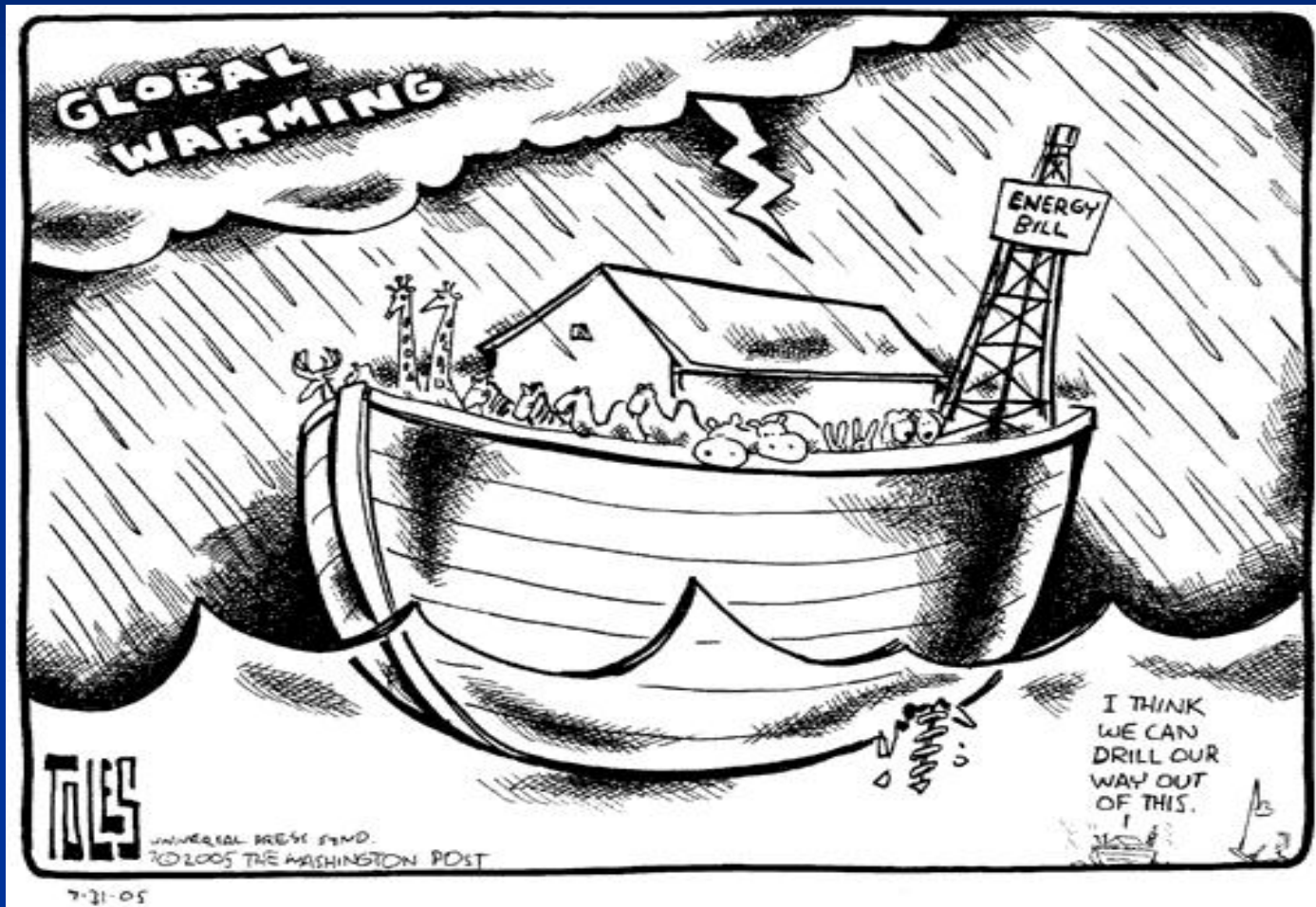
What about the economy?

An economic transition always presents numerous new business opportunities



- California leading the world in eco-makeover:
 - alternative fuel and energy technology
 - recycling
 - carbon-trading
 - energy-efficient design and products
 - laws and regulations enforcing a changeover

What are we leaving our children?



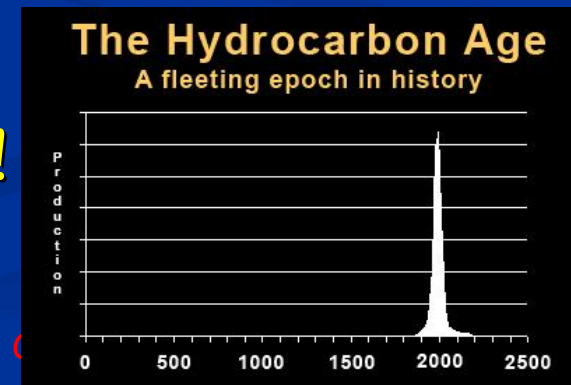
Courtesy: Toles, The Washington Post, 2005

Golden Downs Consulting Ltd.

Am I being too extreme?

Is this presentation fantasy? or you don't like bad news?

- the current status of the oil industry is dire:
 - the global oil appetite is growing each day and production cannot keep pace
- the situation in the Middle East is worsening
- the price of petrol will fluctuate, but steadily rise
- remember history: cultures, economies and civilizations rise and fall
- the worst response is to ignore or deny!



What are your suggestions?

- Why is New Zealand not at the forefront in recognising the dangers 'peak oil' represents? we have few non-renewable but abundant renewable resources and a small population
- the first step to a cure is a diagnosis; recognise what is coming
- quit following, start thinking; act on your convictions
- don't wait for governments to solve this problem
- but do elect officials who will respond to the challenge
- token alterations will fail, only radical changes will succeed
- hard decisions will be easier with the remaining oil resource
- the small community working as a unit will have the best chance to not only survive, but prosper
- the next 50 years may not be as luxurious; but is that a bad thing?

I encourage you to ask questions and contribute your solutions to the problems discussed in this presentation.

“How could we drink up the sea? Who gave us the sponge to wipe away the entire horizon? What were we doing when we unchained this earth from its sun?”

- Friedrich Nietzsche, The Gay Science- 1882

The age of oil: 1900-2050

Alan Hart conducts free presentations on ‘Peak Oil’ to local councils, civic and business groups and social organisations.

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