

# **THE SUSTAINABLE ENERGY IMPERATIVES**

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## **THE "TWIN IMPERATIVES" FOR SUSTAINABLE ENERGY (from both a global and a New Zealand perspective)**

1. Global warming/climate change issue and the long term sustainability of the planet's environment and resources.
2. Future availability and cost of oil imported into New Zealand (peak oil?), and also future availability and cost of natural gas post-Maui (imported LNG??)

These are the "drivers" for future sustainability energy policies.

## **IMPERATIVE 1**

- A disservice to science is done by doomsday predictors ("end of civilisation as we know it within a century") but an equal disservice is done by those who deny the seriousness of the problem ("a mild warming within the next century which is generally beneficial")
- Global warming leads to:
  - changing and more unpredictable weather patterns
  - more extreme weather events, including storm and flood disasters, hurricanes, droughts etc.
- Recently the international reinsurance company Munich Re stated that weather-related inflation adjusted annual economic losses have risen 14 times over the last 40 years.

## **IMPERATIVE 1** (Cont'd)

19<sup>th</sup> World Energy Congress, Sydney, September 2004

- 2300 people present from all continents
- Representatives of all the world's leading energy organisations present (including major Oil companies).
- Global climate change was a serious concern of the conference.
- All agreed that it is a major issue, with little if any dissent.
- The conference stated that delivering sustainability has become a clear priority of the energy sector.
- The principal conclusion of the conference was that sustainable energy solutions are achievable.
- But the challenges are many and need to be tackled urgently if sustainability is to be achieved this century.

## **IMPERATIVE 1**(Cont'd)

- Since the beginning of the twentieth century concentrations of carbon dioxide in the atmosphere have risen from 270 to 380 parts per million (ppm)
- The present figure is known to be 25% higher than at any time during the past 400,000 years.
- A growing number of Governments and experts have concluded that the world's policy should aim to stabilise concentrations of carbon dioxide in the atmosphere at between 500 and 550ppm over the next century.
- Otherwise, beyond this limit, severe climate instability will be of serious concern.

## **IMPERATIVE 1**(Cont'd)

- Long term carbon dioxide concentration measurements (since 1958) on top of Mauna Loa (a 3300m high volcano in Hawaii) show:
  - An average increase of 1.3ppm over the 46 years
  - In recent decades it has gone up to 1.5ppm
  - For 2001/2 the increase was 2.08ppm
  - For 2002/3 it was 2.54ppm
  - "The rise in annual rate above 2ppm for two consecutive years is a real phenomenon"
- If future annual growth rate continues at 2ppm, the 500ppm "threshold" could be reached by year 2065 and 550ppm by the year 2090.

## **IMPERATIVE 2**

- There is now considerable discussion around the world about "peak oil" (when oil production peaks and then gradually declines).
- There is also considerable disagreement about when it might occur – any time from "next year" to 2050?
- There is no doubt that oil prices have risen dramatically in the past twelve months due to:
  - Geopolitical risks of supply (not just in the Middle East but also in Venezuela and more recently Nigeria)
  - Increasing demand, especially in China and India.

China's population now 1.4 billion

India's population now 1.05 billion

Their energy economies are growing annually at 9% and 7% respectively.

## **IMPERATIVE 2** (Cont'd)

- In New Zealand we are becoming increasingly dependent on imported oil ("Self sufficiency" has decreased from nearly 50% in the early 1980's to around 20% now).
- This makes us extremely vulnerable to supply fluctuations and balance of payments issues if the price rises dramatically (such as in 1973/74)
- The running down of the Maui field highlights a future shortage problem with natural gas.
- Do we want to increase our vulnerability by turning to LNG as a solution?

**ISSUES DISCUSSED AT THE SEF CONFERENCE ON  
"SUSTAINABLE ENERGY FUTURES", WELLINGTON  
19-20 NOVEMBER 2004**

1. The Government's sustainable energy – programme of action (October 2004).
  - This document is "excellent in parts". It is very good on policy analysis but weak on discussing actions to be taken.
  - How does an "overarching document on Government Policy" actually relate to "detailed actions on the ground"?
  - Lacks a sense of urgency. May take 1-2 years to put a programme in place?

## **GOVERNMENTS SUSTAINABLE ENERGY DOCUMENT**

(Cont'd)

- What time frame should be considered?
  - 9 years is the limit of the vision of most politicians (3 election terms).
  - 100 years is too long for most people to visualise
  - 50 years is "about right" because:
    - a. it is in the active lifetime of ones' grandchildren – so should be able to visualise.
    - b. NZ population expected to peak at 4.8 million in about 50 year's time.

## **GOVERNMENTS SUSTAINABLE ENERGY DOCUMENT**

(Cont'd)

- Comment by Alan Pears (RMIT)
  - When comparing energy options it is important that they be compared on the same basis.
  - For example, when comparing a new transmission line option versus a demand side option (greater energy efficiency or demand side management).
  - Therefore don't compare a 50 year return on a transmission line with a 2-3 year return on the demand side option.

## **FUTURE ENERGY OPTIONS**

### **1. GREATER DIVERSIFICATION OF ENERGY SOURCES**

- Use more alternative fuels for transport such as ethanol and biodiesel, especially using by-products from industry (such as dairy industry for ethanol and meat wastes/fats for biodiesel)
- Hydrogen – the transportation fuel of the (longer-term) future?
- Use more alternatives for heating.
  - Biomass wastes for industry/co-generation.
  - Wood pellet burning for home heating
  - Solar water heating (residential and commercial)
  - Use more gas for direct heating and water heating of homes already on gas reticulation networks (ban the slogan "electricity the only one you need"?)

## **FUTURE ENERGY OPTIONS (Cont'd)**

### **2. ENERGY EFFICIENCY/DEMAND SIDE MANAGEMENT**

Alan Pears (RMIT) presented a detailed paper on "Understanding the Energy Efficiency Resource Base – it's bigger than most people imagine".

Steve Goldthorpe presented a paper on "Estimated Scope for Energy Efficiency Uptake to 2050" and compared future energy demand for:

Option 1 - conservative view that we are now at 67% of our energy efficiency potential.

Option 2 - Optimistic view that we are now at 25% of our energy efficiency potential and progressively moving towards those targets over the next 50 years.

Note: potential electricity savings in the USA have recently been estimated at 40-50% of expected load growth over the next 20 years by more end-use efficiency and load smoothing.

## FUTURE ENERGY OPTIONS (Cont'd)

### 3. RENEWABLE ENERGY SOURCES

Wind Energy	-	High potential. Already economic when carbon credits are applied. Costs of wind power are still falling while other energy costs are rising.
Hydro	-	Zero potential for large hydro (post Project Aqua) upper and lower Clutha possibilities.
	-	Limited potential for smaller hydro (10-100MW), perhaps 500MW total is economic?
Geothermal	-	Limited future potential? MED predict another 250MW by 2025.
Biomass	-	Big potential from forestry wastes (especially from the "wall of wood")?
	-	Limited potential from energy farming of crops?
Photovoltaic	-	Too costly at present for general use but applicable in remote locations? In future cost will come down as cost of other energy sources rise.
Wave, Tide, Currents	-	Further into the future?

**FINAL THOUGHT – I. CHEM E. JOURNAL  
OCTOBER 2004**

ARTICLE BY KEITH ORCHISON –  
AN AUSTRALIAN ENGINEER

- Security of energy supply, especially electricity, is now an important political issue in many countries.
- Was the removal of Gray Davis as Governor of California partly as a result of the electricity supply problems encountered there recently?
- Environmental advocates argue still that sustainable development should not be allowed to be trampled on by energy security rhetoric.
- That might be laudable but it cannot be denied that energy security is a prerequisite for sustainable development.
- Pursuing environmental excellence, reducing greenhouse gas emissions and sustaining cost-effective secure electricity supplies are indivisible goals. There is a need for a uniform national approach to all the elements that underpin the achievement of these goals.