Climate Scare Could Be Gone By 2030

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The New Zealand Government's published modelling for its Carbon Zero Bill estimates a wealth loss of $200-300 billion over 30+ years of 'blood, toil, tears and sweat' to increase New Zealand's 2050 net emissions reduction target from 50% to 100%.

The NZIER report is at pains to say that its modelling "should not be seen as a cost-benefit analysis", nor a prediction of what will happen in future. It is merely the calculated outcome of certain assumptions – key ones being (a) *there will be no exogenous technological change* and (b) the following things would happen as "business as usual" (BAU)[1] without policy changes:

- Electric vehicles will reach 65% of the fleet by 2050.
- A methane vaccine will be available from 2030.
- Unidentified innovations will deliver a 50% reduction in emissions by 2050.
- The 'rest of the world' will take strong action on climate.

These massive predicted losses are the result of increased energy taxes or other deliberate Government interventions in the economy. This results from the assumption that the desired emissions reductions will not flow naturally from advances in technology or constant improvements and innovations in the supply or usage of energy.

The Technology Assumption

The assumption of 30 years of stationary technology is obvious nonsense. One need only to look back to the pre-internet era of 1990 to know that the entire world can change drastically from one decade to the next.

There will be new ways to produce and consume energy and they will become more and more efficient. There will be a range of options for personal transport and goods distribution. A recent article in *The Australian* points to the 20th century precedent of the Green Revolution:

> *"Through practical innovation — irrigation, fertiliser, pesticides and plant breeding — the Green Revolution increased world grain production by an astonishing 250 per cent between 1950 and 1984, raising the calorie intake of the world's poorest people and reducing the incidence of serious famines. Instead of tinkering around the edges, innovation tackled the problem head-on. Instead of asking people to do less with less, innovation offered the ability to produce more with less."*

While 99% of the carbon-reducing innovations will be patented in 'the rest of the world', New Zealand can also play a role by deliberately being an 'early adopter'. Not by picking winners, but by ensuring that the myriad roadblocks and all the red tape (such as the RMA) are rapidly overcome or circumvented.

Generation IV reactors

The first breakthrough will likely be the full commercialisation in China of a next-generation nuclear energy system, with electricity outputs costing approximately UD$3 per MWh – less than the cost of any other baseload system, including new coal-fired plants. This is widely expected to occur in less than ten years (see Annexe below) and thereafter to ride down the price-volume curve.

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[1] i.e., without any change in existing 2018 policies. While the "innovations" are expected to be very expensive, these costs are unknown and therefore omitted. Who pays is also omitted.

Even before the rollout of Generation IV energy systems, China's version of the Generation III EPR system has reduced capital costs by about half over the past decade. Developers now say that a $20 carbon tax would be sufficient to enable new Generation III reactors to compete against coal.

Nuclear (Gen III) is already the preferred new power source in those countries that account for 100% of the global growth in baseload energy demand – China, India, S Korea, Iran and Saudi Arabia. Once Gen III reactors are available, all countries will have strong economic incentives to repurpose the sites of existing coal plants and substitute nuclear reactors.

The opposition of the Green lobby has forestalled new nuclear plants in the USA and much of the EU since the Green Mile Island incident of 1979, and this resistance was re-energised by the 2011 Fukushima disaster. However, many Green movement leaders have reversed their stance and now consider nuclear energy to be the solution rather than the problem. These converts include such notables as James Hansen, 'the father of global warming', who pointed out (before the Paris Agreement):

> *"A build rate of 61 new reactors* [Gen III] *per year could entirely replace current fossil fuel electricity generation by 2050. Accounting for increased global electricity demand driven by population growth and development in poorer countries, which would add another 54 reactors per year, this makes a total requirement of 115 reactors per year to 2050 to entirely decarbonise the global electricity system in this illustrative scenario. We know that this is technically achievable because France and Sweden were able to ramp up nuclear power to high levels in just 15-20 years."*

Major Emitters

The five countries most heavily engaged in the new nuclear race produced approximately two-thirds of the world's long-term gases in 2017.

	% Global CO2	**GtCo2**
China	29.34	10.9
USA	13.77	5.1
EU	9.57	3.5
India	6.62	2.5
Russia	4.76	1.8
	64.06%	23.8

By 2030, China is expected to have increased its 2010 emission levels by 50-100%, while the International Energy Agency predicts that emissions in India (pdf, 6.22 MB) will *treble* over the 2010-30 period. These two alone will comprise two-thirds of the global total within a decade, so the five major nuclear competitors will likely exceed *80%* of global CO2 emissions by the time Gen IV nuclear begins to make its impact.

How will this affect the Paris Agreement?

As soon as it becomes apparent that the "nuclear era" is replacing the "fossil fuel era" for economic (rather than political) reasons, the Paris Agreement objective of limiting anthropogenic global warming to 2°C since pre-industrial times (1.2°C since 1995) will have been met.

The IPCC's projections of future warming are based on four mutually-incompatible scenarios, or "representative concentration pathways", regarding future emissions of CO_2. The UN has no opinion on the relative likelihood of any scenario, which is outside the realm of the physical science, and leaves this pick to its member governments.

The expectation that the 2°C ceiling will be breached by 2050 is based on the worst case, known as RCP8.5, which anticipates a massive increase in both global population and the carbon-intensity (i.e., coal use) of world energy production. This apocalyptic vision dominates the grossly exaggerated claims most favoured by activist groups and all worst case possibilities, however unlikely, invariably dominate the media treatment of climate change.

The best case, called RCP2.6, assumes that the carbon intensity of energy falls away dramatically in the second half of the 21st century, ensuring that the 2°C ceiling is never reached. Under this very likely scenario, human-caused global warming never becomes 'dangerous'.

Projected change in global mean surface air temperature for the middle and late 21st century relative to the reference period of 1986-2005 [IPCC-AR5-WG1 Table SPM.2]

Scenario	Mean 2046-2065	Mean 2081-2100
RCP2.6	1.0°C	1.0°C
RCP4.5	1.4°C	1.8°C
RCP6.0	1.3°C	2.2°C
RCP8.5	2.0°C	3.7°C

Demand side forecasts

The advance of nuclear technologies will address the supply side of the global energy economy, augmenting the success of other market-driven improved-efficiency sources.[2]

The pace of global emissions growth has already eased sharply from its peak in the early years of this century. Carbon intensity (CO_2 per energy unit) is already decreasing in all sectors, having fallen 20% over the 10 years from 2006 to 2016 (from 60kg to 48kg per MMBtu). If maintained, that BAU improvement rate of 2% per annum will itself see emissions drop by one-third by 2030.

On the demand side, energy intensity (energy use per unit of GDP) has been improving globally since 1990 with its decline averaging 1.5% per annum since 2001. This constant efficiency improvement is simply driven by the market and is not an outcome of climate policies.[3]

McKinsey's April 2019 report "The decoupling of GDP and energy growth" forecasts aggregate global energy demand will plateau in 2030 and thereafter begin to decline. This is a far cry from the forecast exponential demand growth which under-pinned climate anxiety at the time of the 2009 Copenhagen Conference of the Parties. The McKinsey prediction is wholly incompatible with the scenarios that would drive either RCP8.5 or RCP6.0.

It is already widely accepted that RCP8.5, the 'apocalypse scenario', is extremely unlikely and may even be impossible. It cannot be long before policymakers around the world conclude that RCP2.6 is the only likely pathway, whereupon the perceived urgency for mitigation action will

[2] e.g., advanced solar farms + battery storage in desert areas.

[3] In the USA, which has longer records, energy intensity has declined steadily since its peak in 1950.

surely dissipate overnight. Schoolchildren can stop marching. The Paris Agreement will become redundant. The climate scare will be over.

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Annexe : Status of Advanced Nuclear Technologies

R&D co-operation between the G20 countries in the Generation IV Forum (GIF) led to the publication of a *Technology Roadmap Update* as long ago as January 2014 which selected six diverse systems, all of which offer "*significant advances in sustainability, safety and reliability, economics, proliferation resistance and physical protection."* They range from small modular reactors (SMRs) to nation-scale multi-gigawatt facilities, all providing baseload power.

The UN's International Atomic Energy Agency (IAEA) says there are currently four SMRs in advanced stages of construction in Argentina, China and Russia and estimates the global market at $150 billion per year by 2040. Canada describes SMRs as the "next wave of innovation" and expects to have its first demonstration plant in operation by 2026.

China already has 46 uranium-powered reactors producing 42 GWh per annum, with 11 more under construction and 51 planned. Since 2015, the Chinese Government has deferred construction of Generation IV plants pending completion of the long-delayed Generation III plants which were being built in partnership with USA (Sanmen) and France (Taishan) respectively. Both came on line late last year and four demonstration plants for China's own Hualong One Gen III design are on schedule. China hopes to build 30 overseas reactors as part of its "Belt and Road" initiative, earning about $145 billion by 2030.

China is also moving fast on its Linglong One 100 MW SMR with its first use to generate heat for a residential district, replacing coal-fired boilers. A thorium-powered pilot plant cooled by molten salt may be completed next year and the technology is expected to be fully commercialised by 2030.

India has 20 uranium-based nuclear reactors producing 45 GW of electricity already in operation and has another six under construction, 17 planned, and 40 proposed. It claims to be "leading the pack" on the use of thorium.

*S*cale in Asia is already driving down the cost of Gen III reactors and capital costs are only about half of what they were a decade ago. Industry groups claim Gen III would be made viable in Australia by a carbon price of $20 per tonne.

The USA has been kept out of the race for decades by its set-in-cement atomic regulatory morass. These handcuffs were finally demolished by the Nuclear Energy Innovation and Modernisation Act which became law on 14 January and the Nuclear Energy Leadership Act which is now before both Houses with bi-partisan support. The US Nuclear Regulatory Commission has developed a vision (pdf, 689 KB) for "the next nuclear renaissance."

US current policy is to catch up to China and Russia[4] and have fully commercial Gen IV plants in operation by 2030. Its ThorCon technology aims to produce CO_2-free electricity at 3¢/kWh - cheaper than coal.

There are 126 reactors in 14 EU Member States, providing more than one-quarter of the bloc's overall generating capacity. The European Sustainable Nuclear Industrial Initiative is funding three Generation IV reactor systems, one of which is a gas-cooled fast **reactor**, called Allegro, 100 MW(t), which will be built in an eastern European country with construction expected to begin in 2019.

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[4] A full-scale ThorCon prototype, a fission reactor with a liquid molten salt fuel containing thorium+uranium, should be built and operating within four years.