BREAKTHROUGH
National Centre For Climate Restoration

BRIEFING NOTE

"Net zero 2050": A dangerous illusion

JULY 2021

SUMMARY

- "Net zero 2050" emissions (NZ2050) is not just a goal, but a strategy for COP26 to lock in many decades of unnecessary fossil fuels use well past 2050, with an unsustainable, business-and growth-as-usual economic pathway, dangerous "offset" trade-offs, and unacceptable risks of unstoppable climate warming.
- NZ2050 scenarios being promoted by the world's central bankers have up to 50% of primary energy use coming from fossil fuels in 2050, "offset" by use of unreliable carbon accounting and land-based measures — including bio-energy — which impinge upon and may decrease land for cropping even as demand for food increases by half over the next 30 years This agenda is supported by the fossil fuel industry and by "climate activist" investor groups..
- Long-term targets are an excuse for procrastination. The short-term matters most. Emergency action to cool and protect the most vulnerable climate and ecosystems is vital. Failure to do so right now may make long-term targets irrelevant if cascades of system-level biophysical changes are triggered.
- At the present level of warming of 1.2˚C, climate change is already dangerous, with some system-level tipping points already crossed and others dangerously close. A return to the safe climate conditions of the Holocene requires rapid decarbonisation and drawing down atmospheric carbon dioxide to more stable levels. The policy aim must be "a big minus" in emissions, not "net zero" emissions.
- Saying NZ2050 is "the best we can do" is caving into an unsustainable and dangerous future, and giving up on protecting major Earth systems and ecologies. The NZ2050 scenarios will not save the world's coral reefs, nor stop rapid and devastating Arctic change nor prevent the inundation of low-lying small island states, or the triggering of societal collapse in parts of the world.

"We have arrived at the painful realisation that the idea of net zero has licensed a recklessly cavalier 'burn now, pay later' approach which has seen carbon emissions continue to soar… The time has come to voice our fears and be honest with wider society. Current net zero policies will not keep warming to within 1.5˚C because they were never intended to. They were and still are driven by a need to protect business as usual, not the climate. If we want to keep people safe then large and sustained cuts to carbon emissions need to happen now."

— James Dyke, Robert Watson and Wolfgang Knorr,
"Climate scientists: concept of net zero is a dangerous trap", The Conversation, 22 April 2021

- **Net zero pledges are everywhere.** The goal of "Net zero 2050" (NZ2050) greenhouse gas emissions is centre stage leading up to the global climate conference in Glasgow in November 2021. A majority of nations support the goal, as do many global corporations including fossil fuel producers such as Shell, BP and Exxon, investors and, in Australia, the major business lobby groups.
- **But NZ2050 is not just a goal, it also represents a strategy:** it is a contested space about the energy mix, the pace of change and economic and social pathways to 2050. A number of high profile NZ2050 scenarios have been produced, including by the Intergovernmental Panel on Climate Change (IPCC), the International Energy Agency (IEA) and the central bankers' and financial regulators Network for Greening the Financial System (NGFS).
- **Lacking short-term ambition:** Despite the growing enthusiasm for this seemingly positive development, a global stocktake of net zero plans finds 80% fail to meet a minimum set of robustness criteria and lack substance and short-term ambition, leading to greenwashing and marketing deception (Joshi, Renew Economy, 24 March 2021), and a catastrophic failure to form action that will provide meaningful protection. When advocates support NZ2050 they are tacitly supporting a dangerous agenda leading up to COP 26 in Glasgow that will codify an unsustainable pathway with continuing high fossil fuel use, dangerous "offset" trade-offs, and unacceptable risks of unstoppable climate warming.
- **Long-term targets are an excuse for procrastination.** The short-term matters most: "What we do in the next 3-4 years, I believe, will determine the future of humanity," says former UK Chief Scientist Sir David King. He says emergency action to cool and protect the most vulnerable climate and ecosystems is vital. Failure to do so right now may make long-term targets irrelevant if cascades of system-level changes are triggered, for example in the Arctic.

We need a "big minus", not "net zero"

"Since the beginning of industrialisation, most of the CO_2 emitted (57%) has been taken up by natural processes. In fact, while emissions from fossil fuels, cement production and deforestation have been growing exponentially (at 1.65% per year since 1850), my own research has found that natural sinks on land and in the ocean have been almost exactly keeping up with the growth. Processes on land alone are responsible for taking up about a third of human CO_2 emissions. So for every kilo of carbon emitted by a car or a power plant, about 350 grams will end up in a tree trunk, a leaf, or decomposed into the soil...

[So there is a] fundamental problem with the [European] Commission's approach [to carbon sinks]. It is a subtle form of double accounting that sets a precedent for more significant accounting tricks further down the line – or by other countries with larger land carbon sinks. The problem is that when scientists calculated how much CO_2 we can emit and still keep within the safe limits of the Paris Agreement, nature's free carbon sucking service was already included. The net-zero goal is strictly in addition to that. By the time we hit net zero, we actually need those natural sinks to continue functioning, taking up over 22 billion tonnes of CO_2 per year and continuing to reduce CO_2 levels in the atmosphere below where they ended up at the net-zero point. Because current levels of atmospheric CO_2 are not safe. In other words, the needed net zero really is a "big minus".

— Wolfgang Knorr, Is the EU 'cheating' on its net-zero emissions plan? Here's what the science says, The Conversation, 30 September 2020

1. NET ZERO 2050 SCENARIOS ARE MISLEADING AND WILL LEAD TO DEVASTATING WARMING OUTCOMES: WE NEED ZERO EMISSIONS BEFORE 2030

- **False assumption 1:** Based on IPCC reports, NZ2050 scenarios, such as those of the IEA (*Net zero by 2050: A roadmap for the global energy sector*), assume a carbon budget for 1.5˚C, but there is none; the global warming trend is likely to exceed 1.5˚C by 2030, perhaps earlier, regardless of the emissions path this decade (Tebaldi et al, 2020, *Earth System Dynamics*, 12: 253-293). This warming is a consequence of past emissions and the fact that sulfate-based aerosols, a by-product of burning fossil fuels, are temporarily masking more than 0.5˚C of warming (Samset et al, 2018, *Geo. Res. Lett*. 45:1020-1029), but this mask will quickly dissipate as fossil fuel use decreases.

- **False assumption 2:** The published NZ2050 scenarios will not keep warming to the levels they claim. The IEA scenario claims to keep below 1.5˚C for the whole century, but this is not credible. In various ways, these scenarios overestimate the carbon budget, underestimate warming to date, ignore or underestimate relevant physical processes/feedbacks, use too-low estimates of climate sensitivity and/or underestimate future physical damage and economic losses (Spratt and Dunlop, 2021, *Carbon Budgets for 1.5 & 2˚C* briefing note, Breakthrough).

- **Climate change is already dangerous and the Earth has already passed several tipping points:** for coral reefs, Arctic sea ice and some Antarctic glaciers. Greenland and the Amazon are also close to tipping at just 1.2˚C of warming. Further tipping points could be triggered at low levels of global warming and a cluster of abrupt shifts could occur between 1.5˚C and 2˚C (Lenton et al, 2020, *Nature* 575:592-595). 2˚C may trigger a "Hothouse Earth" scenario in which climate system feedback mechanisms and their mutual interaction drive the Earth System climate to a point of no return, whereby further warming would become self-sustaining (Steffen et al, 2018, *Proc. Natl. Acad. Sci.* 115:8252-8259).

- **Carbon budgets for the 2˚C target** have unacceptable risks of failure and make optimistic assumptions that the climate system is not close to triggering a cascade of tipping points. But even accepting the IPCC's over-optimistic carbon budget for 2˚C at face value, 2050 is the wrong timeline, by decades:

    - **The world needs to be at zero emissions by 2030** for the 2˚C target, based on three assumptions: 1. Mitigation expenditure no more than 3% of GDP; 2. No geoengineering; 3. Climate sensitivity is not low (Lamontagne et al, 2019. *Nature Climate Change*, 9:290–294).

    - **Double-digit annual mitigation rates are required of developed countries.** Without a belief in the successful deployment of planetary scale negative emissions technologies, double-digit annual mitigation rates are required of developed countries, from 2020, if they are to align their policies with the Paris Agreement's temperature commitments and principles of equity (Anderson et al, 2019, *Climate Policy* 10:1290-13040).

    - **The warming for the level of greenhouse gases in 2019 may be greater than 2˚C,** using CMIP6 models (Huntingford et al, 2020, *Climatic Change* 162:1515–1520).

Climate triangulation:

Set bold target in the distant future

- Announce incremental actions
- Provide justifications / rhetoric framing small step as 'in line' with bold action
- The world is being cooked alive by companies and institutions that claim climate leadership

- Alex Steffen Futurist & Analyst

2. NET ZERO 2050 PROVIDES A PATHWAY FOR THE FOSSIL FUEL INDUSTRY TO KEEP POLLUTING FOR LONGER THAN NECESSARY

- **"Net" zero scenarios, both from the IEA and NGFS, include significant fossil fuels use well beyond 2050**, to be counter-balanced by "offsets" such as land-based carbon farming and forestation, and bioenergy with carbon capture and storage (BECCS), or buying credits in developing nations. For example:
  - In the influential NGFS "Below 2C" scenario, fossil fuels comprise 50% of global primary energy use in 2050. In their preferred "NZ2050" scenario it is 32% in 2050.
  - The Shell Energy 2021 *Transition Strategy* 2021 commits to reducing "our total absolute emissions to net zero by 2050", but plans to increase gas production and use "nature based solutions" as offsets.
  - The IEA NZ2050 scenario includes 22% of primary energy from fossil fuels in 2050, with 11% using carbon capture and storage, and the other 11% being offset.

3. "NET" MEANS OFFSETS FOR BURNING MORE FOSSIL FUELS AND DECREASING FOOD-GROWING CAPACITY

- **Carbon sequestration actions**, including forestation, better storage of land carbon, direct capture technologies, and BECCS from crops and waste, are forms of carbon dioxide removal (CDR) that should be used to reduce atmospheric CO_2 back to safe levels, the "big minus" goal. Carbon sequestration in the NGFS NZ2050 scenario is almost 8 billion tonnes of CO_2 by 2050, including more than 3 billion tonnes from BECCS, even though current drawdown from BECCS is practically zero.
- **Less crop land, more biofuels**: In the NZ2050 scenarios, CDR is used to "offset" or counter-balance emissions from continuing fossil fuels use, even after 2050. And emphasis is given to bioenergy, which provides around 20% of primary energy in 2050. BECCS uses crops grown for energy, and competes with land for food. This means that in the NGFS NZ2050 scenario, the amount of land available for crops ***decreases*** by 8% by 2050, even as GDP doubles and population grows by 20% in 30 years. Global demand for food would likely be around 50% higher than at present, with less cropland than now, which makes this land-use assumption heroic.
- **Reliance on large scale CDR deployment** as offsets runs the risk that anticipated future CDR could dilute incentives to reduce emissions now, a phenomenon known as mitigation deterrence (Grant et al. 2021, *Envir. Res. Lett*.,16:064099), or "moral hazard". Of the CO_2 emissions savings to 2050 in the NGFS NZ2050 scenario, almost half come from technologies under development rather than those already in the market. Whilst the scenarios rely on a good deal on CDR, it is acknowledged by NGFS that CDR is a big "if", because such technologies "only currently take place on a limited scale and face their own challenges".

BECCS versus land for food

"Across the scenarios produced by the Intergovernmental Panel on Climate Change (IPCC) with a 66% or better chance of limiting temperature increase to 1.5˚C, BECCS would need to remove 12 billion tonnes of carbon dioxide each year. BECCS at this scale would require massive planting schemes for trees and bioenergy crops.

It has been estimated that BECCS would demand between 0.4 and 1.2 billion hectares of land. That's 25% to 80% of all the land currently under cultivation. How will that be achieved at the same time as feeding 8-10 billion people around the middle of the century or without destroying native vegetation and biodiversity?"

— James Dyke, Robert Watson and Wolfgang Knorr,
"Climate scientists: concept of net zero is a dangerous trap", The Conversation, 22 April 2021

4. NET ZERO 2050 IS NOT "THE BEST WE CAN DO": BIG BUSINESS WANTS IT BECAUSE IT MEANS PROLONGED POLLUTION & UNSUSTAINABLE GROWTH

- **Saying net zero 2050 is "the best we can do" is caving into an unsustainable and dangerous future, and giving up on protecting major Earth systems and ecologies.** The NZ2050 scenarios will not save the world's coral reefs, nor stop rapid and devastating Arctic change or prevent the inundation of low-lying small island states. Due to the proximity of systemic tipping points, "winning slowly" (with growth-as-usual incremental change) is the same as losing. There is no longer any gradualist solution which, for example, might allow the existing economic approach to be preserved with even substantial change. Discontinuity and disruption are now inevitable: either by moving too slowly and allowing a climate-warming physical and social catastrophe, or moving at the emergency speed necessary to achieve a "big minus" goal of returning Earth to a safe climate.

- **Climate emergency**. Contrary to the unrealistic NZ2050 scenarios that pretend we can double GDP and feed more people on a higher living standard with less cropland and growing water insecurity, a global climate emergency-level mobilisation that makes climate the first priority of climate and politics provides the best pathway. This is not a pipedream but a practical necessity. Australia Institute research in November 2019 found a clear majority of Australians agree the nation "is facing a climate emergency" requiring emergency action and in response, governments should "mobilise all of society", as they did during the world wars.

    - "The climate emergency is our third world war. Our lives and civilization as we know it are at stake, just as they were in the second world war." — **Joseph Stiglitz**, economist and Nobel Laureate, 4 June 2019.

    - "The economic mobilisation during WWII continues to be the best reference point for the scale and pace of economic and social intervention required.." — **Paul Gilding**, Former CEO Greenpeace Australia, September 2019

    - "We are literally in a climate emergency, and... we are increasingly hearing that this is the fight of our lives." — **Patricia Espinosa**, executive secretary of the UNFCCC, 17 June 2019

- **Big business supports net zero scenarios because it is "growth-as-usual"**.The NZ2050 scenarios assume that the world economy will continue to grow for another 30 years as it has in recent decades, such that global production doubles between 2020 and 2050. Given that most resource use has not been significantly decoupled from production, this implies that the human world will become even more destructive of the planet and its finite resources. If at present humans consume 1.7 planet's worth of resources each year, how much more irreparable damage will be done by 2050, and how many more of Earth's planetary boundaries will be exceeded? No scenarios focus on lower-growth alternatives.

5. NZ2050 PATHWAYS ARE ARTIFICES OF ECONOMIC MODELS THAT UNDERESTIMATE CLIMATE IMPACTS

- **Unpredictability**: NZ2050 scenarios, such as those developed by the IPCC and NGFS are based on climate-economy-energy models known as Integrated Assessment Models (IAMs). These models "may not be able to accurately predict the economic and financial impact of climate change because of the complexity of the links and the intrinsic non-linearity of the related phenomena" (Bolton et al. 2020, *The green swan: Central banking and financial stability in the age of climate change*, BIS).

- **Social construction:** Depending on how modellers perceive the roots of the problem to be solved, they will "design the model structure, including possible instruments and relationships within the model accordingly… Hence, the very structure of a model depends on the modeller's beliefs about the functioning of society" (Ellenbeck & Lilliestam 2019, *Energy Research & Social Science* 47:69-77). Consequently, IAM results have the capacity to privilege particular pathways and entice policymakers into thinking that the forecasts the models generate have some kind of scientific legitimacy.

- **Damage underestimation:** The propensity of IAMs to underestimate physical damages and to rely on unproven technologies make them a deeply flawed tool for policymaking. The IAM-based NZ2050 scenarios for NGFS chronically underestimate future damage, tipping points, and system cascade effects. The NGFS physical risks estimates "do not capture the risks from sea-level rise or severe weather. They also assume socioeconomic factors such as population, migration and conflict remain constant even at high levels of warming" (NGFS 2021, *Climate scenarios for central banks and supervisor*). Such scenarios are not fit for purpose.

6. NZ2050 SCENARIOS HAVE UNACCEPTABLE RISKS OF FAILURE

- **Poor risk management:** NZ2050 scenarios are based on models and carbon budgets generally associated with a 50 or 66% chance of staying below the target, that is, a one-in-two, or one-in-three, chance of failure, for example in the *IPCC Fifth Assessment Report* and the 2018 Special Report on *Global Warming* of 1.5˚C. We would never accept those risks of failures in our own lives. Why accept them for impacts which may destroy civilisation as we know it?

- **The "fat tail" risk is underestimated.** A model that predicts 2˚C of warming has an approximately 10% chance of 4˚C (based on Wagner & Weitzman, 2015, *Climate Shock: The economic consequences of a hotter planet*, Princeton University Press). Likewise, scenarios with a 50% chance of not exceeding the 1.5˚C target have a 33% chance of exceeding 2˚C of warming, and a 10% chance of exceeding 3˚C of warming. Such risks are unacceptable.

- **There is no carbon budget for the 2˚C target** if a prudent risk-management approach is taken, with attention given to the high-damage, high-end possibilities rather than middle-of-the-road probabilities (Spratt, 2015, *Recount: It's time to do the math again,* Breakthrough, Melbourne).

- **Climate change is an existential risk** to human civilisation, that is, to contemporary society (Lenton et al, 2020, Nature 575:592-595). This requires special precautions beyond conventional risk management practice if the increased likelihood of "fat tail" (high end) risks are to be adequately dealt with. The IPCC carbon budgets do not do this (Spratt and Dunlop, 2018, *What Lies Beneath*, Breakthrough, Melbourne).

- **Precautionary action must be taken** to ensure that tipping points with catastrophic outcomes are not triggered. In short, emission reduction efforts must be reframed as emergency action to reach net zero emissions by 2030, plus drawdown to reduce atmospheric carbon concentrations from the current unstable 420ppm CO_2 (in excess of 500ppm CO_2e if all greenhouse gases are included) to well below 350ppm CO_2.

- **Urgency**: The latest extreme climate impacts around the world, in the Western USA and Canada, the Arctic, Siberia, the Amazon and Western Europe are only the latest demonstration of the profound irresponsibility of relying on a NZ2050 framing for serious climate action.

Wall Street's favourite climate solution is mired in disagreements

Jess Shankleman Akshat Rathi, Bloomberg, 2 June 2021 (extracts)

"Create a market that turns a ton of removed carbon into a commodity just like corn or copper, and money will flow from the emitters to the fixers. That's the theory behind the new carbon-offset market being conceived by Mark Carney, a former governor of the Bank of England, and Bill Winters, the chief executive of Standard Chartered Plc… Carney says the unified market for carbon offsets could be worth $100 billion by the end of the decade, up from about $300 million in 2018… If Carney's forecast for market demand proves correct, hundreds of companies will soon begin a buying spree for carbon offsets. Just the 18 oil majors that already have net-zero goals will eventually need to erase 3.3 billion metric tons of annual emissions, according to clean-energy researchers at BloombergNEF. That's nearly 18 times the amount of carbon offsets issued in 2020…

"The danger is that cheap offsets can be used to avoid the hard work of actually cutting emissions. The practice is so common that the certificates are often described by critics as "papal indulgences," reminiscent of the way Catholics in the Middle Ages made payments to the Church to eliminate the stain of sinful deeds…

"Verifying that an offset corresponds to a ton of CO_2 removed from the real-world atmosphere is a problem climate experts have been trying to solve for years. The new market would only compound this difficulty by demanding clear answers to thorny questions. Should the market allow trade in forest-protection offsets linked to well-documented failures? For how long should an offset remain valid after the original carbon removal?"

Big oil's net-zero plans show the hard limits of carbon offsets

Kate Mackenzie, Bloomberg, 1 March 2021 (extracts)

"The carbon emissions generated by our current industrial and agricultural systems are going to lead to a disaster far worse than insolvency without vigorous efforts to reduce them. If promises to offset them with carbon-absorbing activities are to be worth anything, they're going to need to be more than aspirational words on paper.

"Take Royal Dutch Shell Plc… the company plans to increase its total fossil fuel output in the near term by boosting gas production, and the majority of its capital expenditure will continue to go towards oil and gas. To get to net zero while doing that, it plans to capture 120 million metric tons of carbon dioxide per year via "nature-based" offsets by 2030.

"A Greenpeace UK study of its earlier 2019 pledge to use forest conservation to offset its emissions said such a promise would have to account for as much as 6% of the world's capacity to absorb carbon in forest land.

"As more companies follow suit, the total volume of offsets they rely on will quickly exceed the ability of the planet to provide them. Without more concrete near-term actions, "net zero" risks becoming a fairytale providing cover for the heavy emitting industries, particularly those in the fossil fuel sector who have aggressively blocked climate action (emphasis added).

"Fears that CDR would become a loophole in net-zero plans have lurked for years. Experts worried that unrealistic assumptions about negative emissions were being baked into advice policymakers were receiving from scientists."

Written by: David Spratt & Ian Dunlop | August 2021