

## HKS Senior Fellowship: Update on Research Plan

Autumn 2021

Presentation at Senior Fellows meeting: 'Net Zero: on track or the wrong track?'

I intend to present on some of the ideas I am planning on the overall Net Zero carbon emissions by 2050 strategy. With COP26 taking place 1-12 November in Glasgow, this would be a good opportunity for me to test some of my research proposals with fellows, and to get feedback on what the most fruitful avenues of research should be. In the presentation, I will be looking at:

- Was Net Zero a bad or good decision that will have a good or bad outcome? Is the strategy doomed to fail already if many countries cannot meet the commitments made at COP21 in Paris in 2016, and how do we account for population growth, increases in waste, increases in emissions by China and Asia throughout 2030s, but also the growth of consumption in the west- larger SUVs, CO2 consumption through use of data, Bitcoin etc.
- What are the definitions of Net Zero- how was it created, and how do different countries measure Net Zero. Does it matter that different countries are pursuing different trajectories with different meanings? What are the different strategies of companies towards Net Zero, and how effective will offsetting strategies be. What happens if 'fossil free' replaces net zero in the future- will netting
- What are the challenges to the Net Zero strategy over the next 29 years? Is it the right time frame, and what are the pressures that will prevent the outcome of Net Zero from being realised- how can we account for these pressures. Currently, the model for net zero is constructed around National Determined Contributions, but no account is taken of unknowable events. What potential unknowable events should we be factoring to our discussion? Potential challenges include solar radiation/space weather, space debris, volcanic eruption, earthquakes, war. Should we include changes of government and populist movements/revolutions in this discussion.
- What is missing from the Net Zero strategy and COP26? Where is the discussion on methane, and what technologies are being excluded? The role of nuclear, and the complementaries that exist between technologies and renewables (across hydrogen for example). We need to expand the nuclear fleet and extend the lifetime of current plants. Renewables alone, with their unpredictable shutdowns, cannot account for 100% zero carbon energy sources.
- Following this- what are the difficult/impossible to reach areas for decarbonisation- shipping for example? Also what should be done about methane emissions- responsible for one third of global warming.
- What if temperature rises also get much worse, much faster than predicted? We should also be investing in solar radiation geoengineering techniques as an insurance policy. What other technologies should we be adopting, and how can we avoid the pitfalls of early adoption(EV graveyards for example where the cost of replacing battery is more than the resale value of the car), and unintended consequences (rare earth minerals for semiconductors and green technologies- what is the geopolitical implications of increased mining).

I intend to frame the presentation using some of the maxims in the Dan Levy book. Using the presentation, I intend to work up further material into a paper (circa 5-10,000 words long) on this. If my maths improves, I would like to see if I can use some analytic frameworks (I am registered to attend the API 302 class recordings and have been slowly working through reading material) as examples in the paper.

November 2021: I will be attending COP26 and am also working on a paper 'Maximising COP26' with two former UK Energy Ministers, Amber Rudd and Claire Perry. This paper is based on roundtables with Australian, Namibian, French and UAE ambassadors and representatives- looking at the role of nuclear, hydrogen and low emissions technologies. This paper will be circa 5000 words long and will be published shortly before COP. I am also arranging for Amber Rudd and Claire Perry to speak at a HKS seminar in October on the political realities behind climate change negotiations.

December 2021-January 2022: I am planning a possible book entitled 'Mission Zero' which looks at the wider question of the technologies needed to achieve Net Zero. I have taken on a research assistant to help with this task of researching how far advanced new and emerging technologies are, and how they can be adopted at scale. Also what investments/strategic bets do we need to place on these technologies now if they are to succeed in time for 2030, 2040, 2050.

There will be a chapter on each technology, which will likely include chapters on:

- Hydrogen: the saviour of Net Zero?
- Nuclear fission, advanced modular reactors and small modular nuclear reactors.
- Nuclear fusion- has its time come of age?
- Carbon Capture and Storage
- Replacement technologies: fuels, plastics, steel, cement, boilers, planes, trains, automobiles etc
- Complementaries in these technologies which encourage positive cross-partial derivatives. How we look at the interface of these technologies and not study them in silos so we create a systems based approach. Learn lessons from past failures. Right technologies for right countries.
- The role of AI in Net Zero
- Solar Geoengineering
- Human behaviour change- including carbon pricing and taxes. Can we learn from decision theory and history about how to create incentives for humans to adopt new technologies. How can we ensure the Steve Jobs customer is right approach is taken? And when will the price be right?

These chapters may change- I am undecided about the exact scope of the book, and how tightly to draw its remit.

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