

## TITLE OF THE TALK

*Beyond the Zeitgeist: energy and climate policy assuming the laws of physics trump the rules of economics*

## THEME

Special Session: From incremental to radical transformation: reconciling energy systems with 2°C carbon budgets.

## SUMMARY

Set against the hubris of the political and economic hegemony and palpable failure of the market Zeitgeist to oversee anything other than an exponential rise in emissions, this paper will begin to frame an alternative vision. Not one of abstract optimisation, hidden algorithms and black box models, but rather one based on IPCC carbon budgets, transparent arithmetic, iteration and humility in the face of many uncertainties. Such an agenda not only opens up a new framing of climate change but also asks questions as to the appropriateness of the reductionist and disciplinary institutions of academia for resolving systemic and globalised issues.

## ABSTRACT

### Background

With widespread political support the IPCC's first report was published in 1990 - almost a quarter of a century ago. At the time, emissions trading, carbon prices and a suite of market instruments were expected to chart a course for the global community well away from the perils of "dangerous climate change". But four sets of IPCC reports later and heading towards the twenty-first round of international negotiations in Paris 2015, it is evident that despite the initial optimism the global community has abjectly failed to live up to its own early expectations. Emissions of carbon dioxide in 2014 are over 60% higher than in 1990 [1]; in the seven years since the last round of IPCC reports we have emitted a further 200 billion tonnes of carbon dioxide into the atmosphere; and, perhaps most concerning of all, the rate of growth in emissions in this new millennium is almost three times higher than that of the last decade of the twentieth century.

### Context

The Intergovernmental Panel on Climate Change's (IPCC) fifth assessment report (AR5) provides policy makers with the clearest framing yet of the scale of the climate challenge - in terms of mitigation and impacts/adaptation. For the first time the IPCC offers explicit carbon budgets for different probabilities of staying below the 2°C characterisation of dangerous climate change [2,3]. These carbon budgets provide a quantifiable basis for gauging the fitness of international, national and sectoral policy suites in delivering the requisite rates and timeframes of mitigation [4,5].

With specific focus on CO<sub>2</sub>-only emissions from the energy system, this paper will revisit the framing of the mitigation challenge in accordance with the AR5 carbon budgets for given probabilities of 2°C.

### Method

The IPCC's "likely" global carbon budget range (630-1180GtCO<sub>2</sub> for 2011-2100) [2] and the Synthesis report's headline 2°C budget (1000GtCO<sub>2</sub>) [3] will be adjusted to take account of emissions related to four specific criteria, thereby providing a post 2020 carbon budget range for energy. These criteria are: **1.** emissions from 2011-2014 (~140Gt); **2.** short-term emissions for 2015-2020 (~180-200Gt); **3.** total process emissions from cement production post 2011 (>150Gt) [6]; and **4.** total emissions from deforestation post 2011 (~50-100Gt) [3,4,7].

Assuming an unprecedented agreement emerges from the 2015 Paris round of climate change negotiations (COP 21), including stringent policies for reducing emissions from cement and deforestation, post-2020 carbon emissions from energy will be constrained to between 100-600Gt for a "likely" chance of meeting the 2°C commitment. Interpreting this into rates of mitigation from the energy system provides a radically different complexion of the challenge. Should the Paris COP set in train a 2020 peak in global CO<sub>2</sub> emissions from energy, subsequent mitigation rates would still need to increase rapidly towards 10% p.a. by 2025 and be maintained at or around that rate until their elimination by 2050. However, the inclusion of even weak equity criteria (under which less industrialised nations would reach a peak in their emissions later than their wealthier counterparts), imposes yet earlier and steeper rates of mitigation on most mature industrialised nations [4]. In any case, the analysis illustrates that the rates of CO<sub>2</sub> growth in the near-term strongly influence the rate of future emission reductions to remain within the 2°C carbon budget range.

## Conclusions

Such unparalleled rates of mitigation are incompatible with the current political and economic hegemony, as are the physical, ecological and social impacts of exceeding the 2°C threshold. Set against the inevitability of radical change, this presentation focuses on the mitigation agenda, framing a technical and socio-economic programme inline with the 2°C carbon budget range.

The social and political repercussions of constraining emissions, and hence access to fossil fuels, to that dictated by 2°C carbon-budgets is interpreted by many as too restrictive and socially regressive to be of practical use. Whilst not shying away from the deep systemic implications of such budgets, this presentation nevertheless develops a more positive and solutions-oriented regime.

With rising prosperity and an increasing population, the scale of the climate challenge in this globalised twenty-first century demands an alternative toolkit to the reductionist and disciplinary framing of knowledge typical of the twentieth century. A systems-oriented and interdisciplinary mind-set acknowledges inevitable unknowns and addresses them through concepts of resilience, iteration and learning-by-doing (particularly with respect to energy demand), rather than idealised and abstract optimisation. The presentation will close with some provisional insights and practical examples of responding to this intellectually more challenging agenda.

## References

- [1] Global Carbon Project. <http://www.globalcarbonproject.org>
- [2] IPCC AR5 Synthesis Report (2014)
- [3] IPCC AR5 Working Group III. (2014) Mitigation of Climate Change.
- [4] Anderson, K., & Bows, A., (2011), Beyond dangerous climate change: emission pathways for a new world, Philosophical Transactions of the Royal Society A, 369, 20-44, DOI:10.1098/rsta.2010.0290
- [5] Frame, D. et al. (2014) Cumulative emissions and climate policy. Nature Geoscience 7, 692-693. doi:10.1038/ngeo2254
- [6] Private communication with the GCP cement specialist working at [CICERO](http://www.cicero.no) and on the [Global Carbon Project \(c http://www.globalcarbonproject.org\)](http://www.globalcarbonproject.org). Nov 2014.
- [7] Hansen et al. (2013). Assessing "Dangerous Climate Change". PLOS one Vol.8. Issue 2. pp.1-26 e81648