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To the Chair - Productivity Commission Inquiry: “Transition to a lower net emissions economy” (the Transition)

Submission of: Nathan Surendran

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**I wish to appear before the committee to speak to my submission**

"New scientific research is quietly rewriting the fundamentals of economics. The new economic science shows decisively that the age of endlessly growing industrial capitalism, premised on abundant fossil fuel supplies, is over.

The long-decline of capitalism-as-we-know-it, the new science shows, began some decades ago, and is on track to accelerate well before the end of the 21st century.

With capitalism-as-we-know it in inexorable decline, the urgent task ahead is to rewrite economics to fit the real-world: and, accordingly, to redesign our concepts of value and prosperity, precisely to rebuild our societies with a view of adapting to this extraordinary age of transition.

(A groundbreaking study in Elsevier's Ecological Economics journal by two French economists, for the first time proves the world has passed a point-of-no-return in its capacity to extract fossil fuel energy: with massive implications for the long-term future of global economic growth.

The study, 'Long-Term Estimates of the Energy-Return-on-Investment (EROI) of Coal, Oil, and Gas Global Productions', homes in on the concept of EROI, which measures the amount of energy supplied by an energy resource, compared to the quantity of energy consumed to gather that resource. In simple terms, if a single barrel of oil is used up to extract energy equivalent to 50 barrels of oil, that's pretty good. But the less energy we're able to extract using that single barrel, then the less efficient, and more expensive (in terms of energy and money), the whole process.

Recent studies suggest that the EROI of fossil fuels has steadily declined since the early 20th century, meaning that as we're depleting our higher quality resources, we're using more and more energy just to get new energy out. This means that the costs of energy production are increasing while the quality of the energy we're producing is declining.

But unlike previous studies, the authors of the new paper—Victor Court, a macroeconomist at Paris Nanterre University, and Florian Fizaine of the University of Burgundy's Dijon Laboratory of Economics (LEDi)—have removed any uncertainty that might have remained about the matter.)<sup>1</sup>

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<sup>1</sup> Inside the new economic science of capitalism's slow-burn energy collapse. And why the struggle for a new economic paradigm is about to get real. <http://bit.ly/2vRVI51>

## Q1 How can the Commission add the most value in this inquiry?

### **The terms of reference**

1. While there is no specific invitation to submit on the TOR, we consider it important to do so to clarify the scope necessary for of the inquiry. If the terms are interpreted too narrowly, and matters that directly affect our capacity to transition to a low emissions economy can not be considered then the value of inquiry will be thrown into doubt. This would make the Productivity Commissions efforts unproductive. We consider the terms are conflicted.
2. In the Issues Paper it states that the purpose of the inquiry is to “identify options for how New Zealand could reduce its domestic greenhouse gas emissions through a transition towards a lower emissions future, while at the same time continuing to grow incomes and wellbeing” (Terms of Reference, p. 2). Similarly, in the Exclusions it states that the the inquiry "should only consider the implication of a changing limite to inform consideration of different economic pathways along which the NZ economy could grow and develop".
3. On the face of it these statements appear to artificially limit the inquiry to only those pathways that will result in economic gain. The Commission appears to accept this interpretation (Issues p1)
4. This interpretation is consistent with what might be expected from a "productivity commission" and unless they do feel they can consider the question without such artificial limits raises the question as to their suitability for conducting an inquiry of this nature.

### **Alternative view**

5. On the other hand, the TOR also state that "The inquiry should explore NZ and international research and experience" while "the focus should be on practical

applications relevant to NZ's circumstances". and that it "...should have a long term focus..." out to 2050

### **Decline in Energy Return on Energy Invested (EROEI)**

6. It is gradually becoming understood that the amount of oil reserves and increases in them due to for instance fracking is of little significance; what matters is their EROI. If a vast amount of oil were found, but to deliver a barrel of it required the use of all the energy in the barrel, then there would be no point drilling the field.
7. When oil was first discovered the EROI in producing it was over 100/1, but Murphy (2013) estimates that by 2000 the global figure was about 30, and a decade later it was around 17. These approximate figures are widely quoted and accepted although not precise or settled. In other words, oil is rapidly becoming scarcer and more difficult to locate and produce. Thus prospectors are having to go to deep water sources (ER of 10 according to Murphy), and to develop unconventional sources such as tar sands (ER of 4 according to Ahmed), and shale (Murphy estimates an ER of 1.5, and Ahmed reports 2.8 for the oil and gas average.)
8. More recently, Court and Fizaine find that the EROI values of global oil and gas production reached their maximum peaks in the 1930s and 40s. Global oil production hit peak EROI at 50:1; while global gas production hit peak EROI at 150:1. Since then, the EROI values of oil and gas—the overall energy we're able to extract from these resources for every unit of energy we put in—is inexorably declining.<sup>2</sup> Several other studies suggest that this ongoing decline in the overall value of the energy extracted from global fossil fuels has played a fundamental role in the slowdown of global economic growth in recent years<sup>3</sup>.

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<sup>2</sup> Victor Court, Florian Fizaine Long-Term Estimates of the Energy-Return-on-Investment (EROI) of Coal, Oil, and Gas Global Productions Ecological Economics Volume 138, August 2017, Pages 145-159

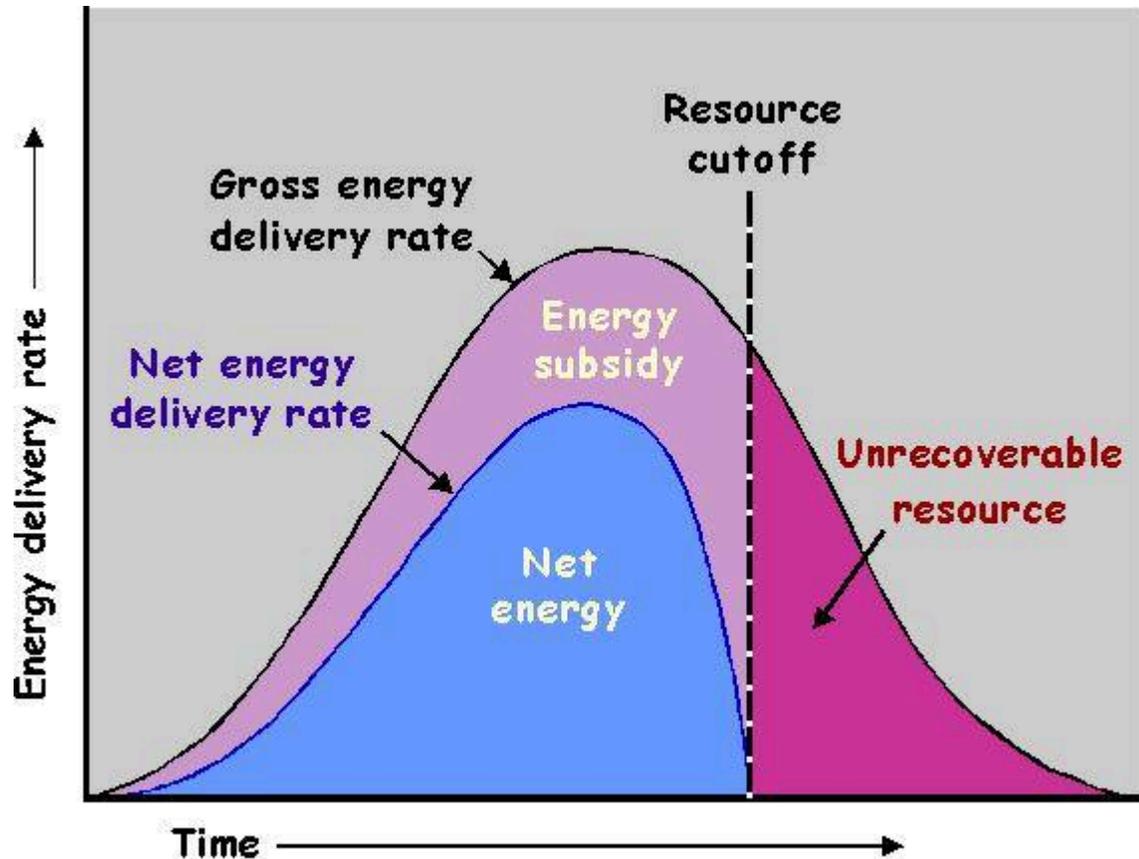
<sup>3</sup> Inside the New Economic Science of Capitalism's Slow-Burn Energy Collapse, Nafeez Ahmed <http://www.pelicanweb.org/solisustv13n10supp4.html>

9. As a result the capital expenditure on oil discovery, development and production is skyrocketing but achieving little or no increase in production. The effect on energy delivery rate is illustrated in Figure xx below. "Resource cutoff" is where "energy in equals energy out" limit in the chart, marks a potentially abrupt end to rational delivery even though substantial resource may remain in the ground, This demonstrates that it's not just about how much is in the ground, but also how profitable its extraction is in financial AND energy terms.
10. Ted Trainer (UNSW) notes:
11. *"Almost no one has the slightest grasp of the oil crunch that will hit them probably within one decade. When it does it will literally mean the end of the world as we know it. Here is an outline of what recent publications are telling us. Nobody will of course take any notice.*
12. *It is gradually becoming understood that the amount of oil reserves and increases in them due to for instance fracking is of little significance; what matters is their EROI. If you found a vast amount of oil, but to deliver a barrel of it you would need to use as much energy as there is in a barrel of oil then there would be no point drilling the field.*

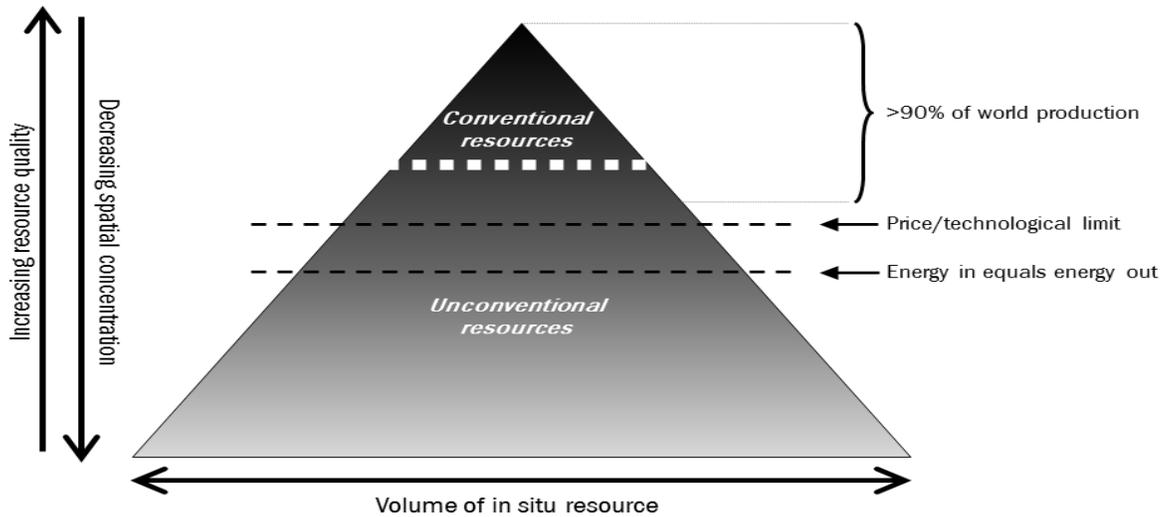
*...As a result the capital expenditure on oil discovery, development and production is skyrocketing but achieving little or no increase in production. Heinberg and Fridley (2016, Fig 1.1) show that capital expenditure trebled in a decade, while production fell dramatically. This rapid acceleration in costs is widely noted, including by Johnson (2010) and Clarke (2017).*

*Why can't we keep getting the quantities we want just by paying more for each barrel? Because the price of the oil in a barrel cannot be greater than the economic value the use of the barrel of oil creates.*

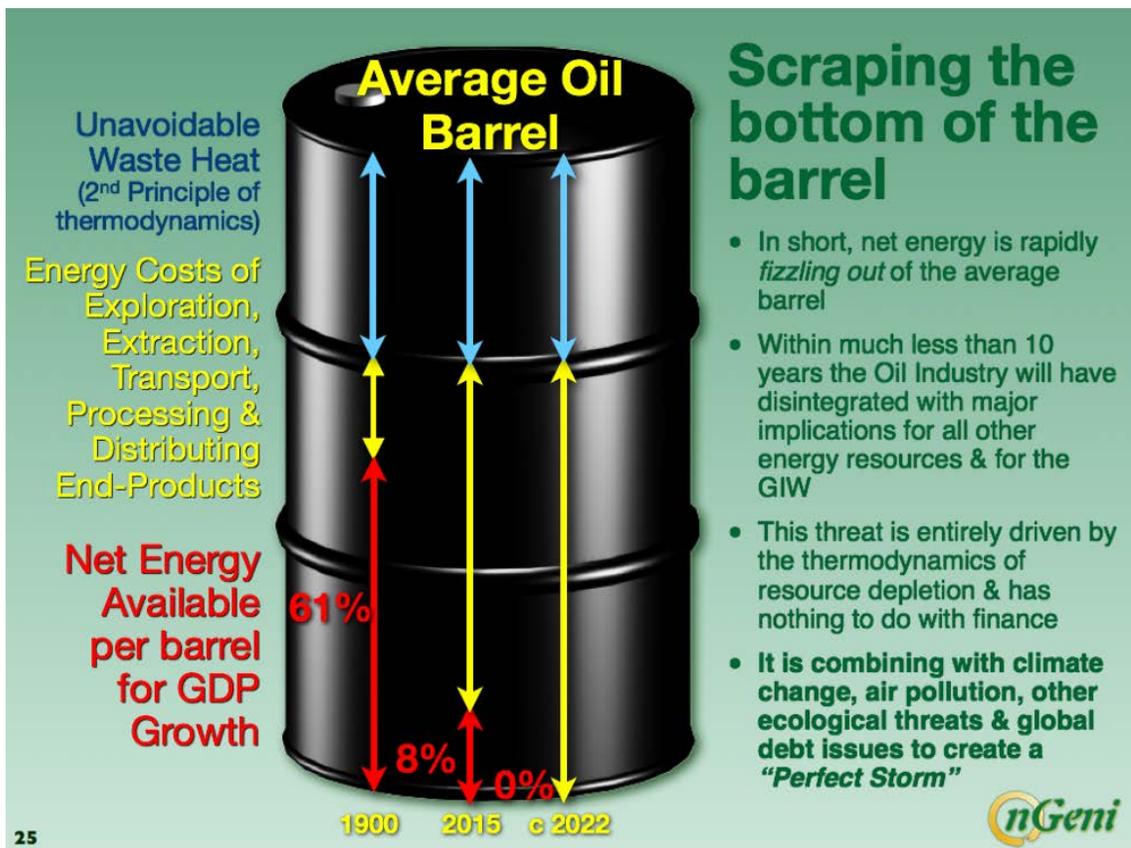
13. This chart illustrates the point that it is not simply about declining resource production rates, concerning though this is. Rather it is the net energy that is delivered per barrel of oil that is declining much faster than this:



- 14.
15. The resource cutoff above is the same as the “energy in equals energy out” limit in the chart below (source: <http://bit.ly/1iqIAJa>), demonstrating that it’s not just about how much is in the ground, but also how profitable its extraction is in financial AND energy terms.



The recent analysis by dissenting Oil Industry insiders, the Hills Group, reported by Dr Louis Arnoux, summarises this information in this chart:



<http://bit.ly/2hJmrMu>

16. The Ted Trainer article continues:

17. *...But there is a far more worrying aspect of your oil situation than that to do with EROI. Nafeez Ahmed has just published an extremely important analysis of the desperate and alarming situation that the Middle East oil producing countries are in, entitled Failing States, Collapsing Systems, (2016). He confronts us with the following basic points:*

*- In several countries oil production has peaked, and energy return on oil production is falling. Thus their oil export income is being reduced.*

*- In recent decades populations have exploded, due primarily to decades of abundant income from oil exports. The 1960 – 2014 multiples for Yemen, Saudi Arabia, Iraq, Nigeria, Egypt, India and China have been 5.5, 4.6, 5.3, 4.2, 3.4, 3.0 and 2.1 respectively.*

*- There has been accelerating deterioration in land, water and food resources. If water use per capita is under 1,700 m<sup>3</sup> p.a. there is water stress. The amounts for the above countries, (...and the % fall since 1960), are Yemen, 86 m<sup>3</sup> (71% fall), Saudi Arabia 98 m<sup>3</sup> (82% fall), Iraq 998 m<sup>3</sup> (88% fall), Nigeria 1,245 m<sup>3</sup> (73% fall), Egypt 20 m<sup>3</sup> (70% fall). Climate change will make these numbers worse.*

*- So, more and more of the falling oil income now has to go into importing food.*

*- Increasing amounts of oil are having to go into other domestic uses, reducing the amounts available for export to the big oil consuming countries.*

*- In many of the big exporting countries these trends are likely to more or less eliminate oil exports in a decade or so, including Saudi Arabia.*

*- These mostly desert countries have nothing else to earn export income from except sand.*

*- Falling oil income means that governments can provide less for their people, so they have to cut subsidies and raise food and energy prices.*

*These conditions are producing increasing discontent with government, civil unrest, and conflict between tribes over scarce water and land. Religious and sectarian conflicts are fuelled. Unemployed, desperate and hungry farmers and youth have little option but to join extremist groups such as ISIS where at least they are fed. Our media ignore the bio-physical conditions generating conflicts, refugee and oppression by regimes, giving the impression that the troubles are only due to religious fanatics.*

*- The IMF makes the situation worse. Failing states appeal for economic assistance and are confronted with the standard recipe; increased loans on top of already impossible debt, given on condition that they gear their economies to paying the loans back plus interest, imposing "austerity", privatizing and selling off assets.*

*- Local elite authoritarianism and corruption make things worse. Rulers need to crack down on disruption and to force the belt tightening through. The rich will not allow their privileges to be reduced in order to support reallocation of resources to mass need. The dominant capitalist ideology weighs against "interfering with market forces", i.e., with the freedom for the rich to "develop" what is most profitable to themselves.*

*- Thus there is a vicious positive feedback downward spiral, to which it would seem there can be no escape, because it is basically due to the oil running out in a context of too many people and too few land and water resources.*

*- There will at least be major knock on effects on the global economy and the rich (oil-consuming) countries, probably within a decade. It is quite likely that the global economy will collapse as the capacity to import oil will be greatly reduced. When the fragility of the global financial system is added (... remember, debt now 6 times GDP), instantaneous chaotic breakdown is very likely.*

*- Nothing can be done about this situation. It is the result of ignoring fifty years of warnings about the limits to growth.*

*So the noose tightens, around the brainless taken for granted ideology that drives consumer-capitalist society and that cannot be even thought about, let alone dealt with. We are far beyond the levels of production and consumption that can be sustained or that all people could ever rise to. We haven't noticed because the grossly unjust global economy delivers most of the world's dwindling resource wealth to the few who live in rich countries. Well the party is now getting close to being over. You don't much like this message ...well have a go at proving that it's mistaken. Nah, better to just ignore as before.*

*...If the foregoing account is more or less right, then there is only one conceivable way out. That is to face up to transition to lifestyles and systems that enable a good quality of life for all on extremely low per capita resource use rates, with no interest in getting richer or pursuing economic growth. There is no other way to defuse the problems now threatening to eliminate us, the resource depletion, the ecological destruction, the deprivation of several billion in the Third World, the resource wars and the deterioration in our quality of life. Such a The Simpler Way is easily designed, and built...if that's what you want to do. (See [thesimplerway.info/](http://thesimplerway.info/)) Many in Voluntary Simplicity, Eco-village and Transition Towns movements have moved a long way towards it.*

## Q8 What are the main barriers to the uptake of electric vehicles in New Zealand?

Biophysical resource constraints.

There is a general pattern of grasping for techno-fixes<sup>4</sup> to 'solve' our resource depletion and climate change related dilemmas. This is understandable, given that government has been heavily influenced by bright green thinking from the likes of Tony Seba. However, there are vast holes in his assumptions that are rarely questioned in mainstream dialog. To name but a few:

- No discussion of the reality of resource constraints associated with key minerals such as lithium
- Assumptions that the size of the private vehicle fleet could be reduced by 80% using on demand self-driving EV's - what about rush hour..?
- No real attempt to implement the highest efficiency options – electrified mass transit options.
- No acknowledgement of energy supply limits, as outlined elsewhere in this submission, and the probable effect on BAU and GDP activity.

For more on this subject, we commend the short, highly readable and very well referenced analysis "When Trucks Stop Running" for a reasonable high level overview, which notes<sup>5</sup>:

*"Okay, okay, I don't mean to say that the latest MuskMobile will "never pan out", just that Concorde generally necessitate too much energy to make them viable without significant subsidies of one sort or another. And that isn't to say that there's anything inherently wrong with subsidies either, just that while Friedemann also points out that "it is energy, not money, that fuels society", it is also energy, not money, that fuels subsidies (money is after all a proxy for energy, as I've previously written).*

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<sup>4</sup> Critique of Techno Optimism <http://bit.ly/2kyd1o3>

<sup>5</sup> Interview with quoted text here: <http://bit.ly/2dqgc6b> . And as this review <http://bit.ly/2qw8SQv>

*In other words, using energy to subsidize energy probably isn't much of a viable long-term plan, but it can certainly score you the starring role as the latest messiah in this age of optimism being valued over facts."*

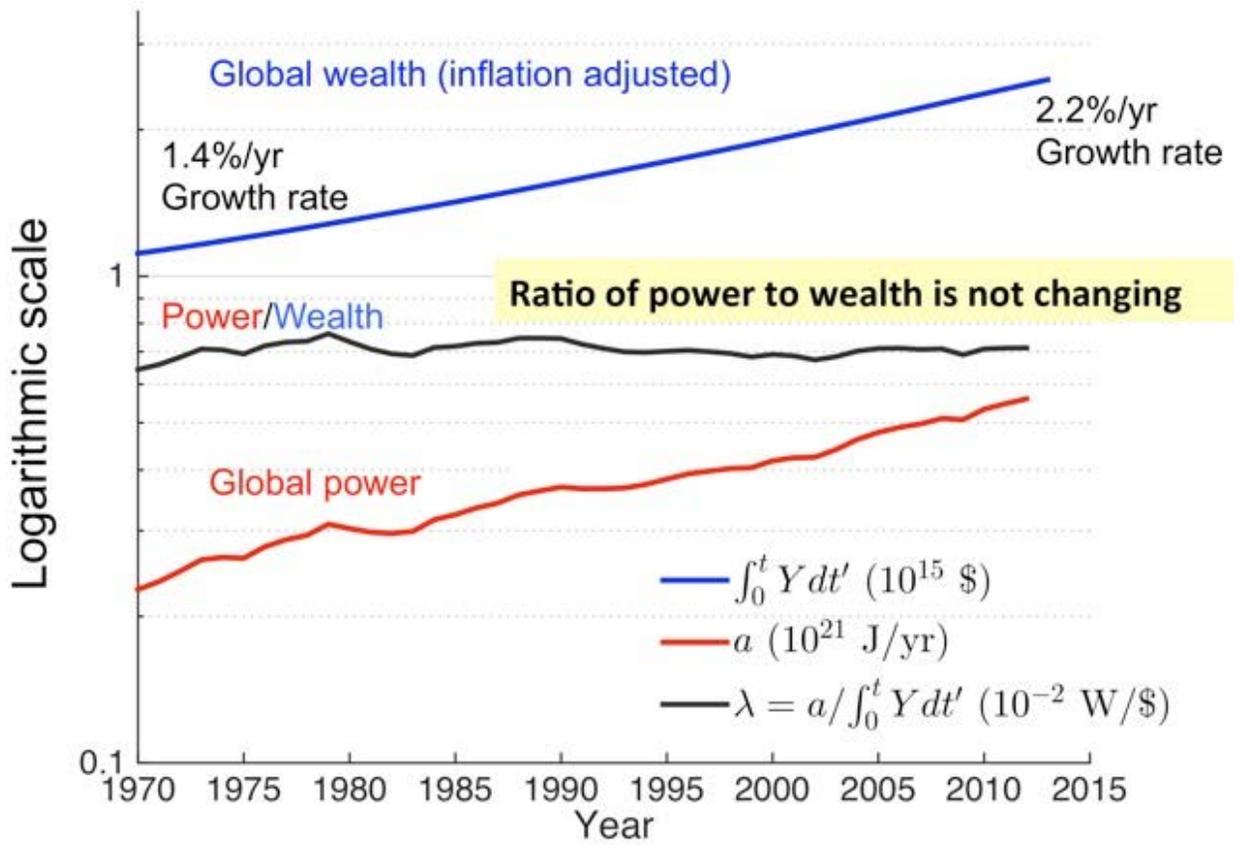
**Q18 Policies to lower emissions from particular sources, technologies and processes can have interactions with emission sources in other parts of the economy. What are the most important interactions to consider for a transition to a low emission economy?**

**Decoupling cannot be achieved as thought.**

18. A wide range of research summarised in this Ted Trainer article and also the peer reviewed paper "A Critique of the Australian National Outlook Decoupling Strategy: A 'Limits to Growth' Perspective" published in the Ecological Economics Journal <https://doi.org/10.1016/j.ecolecon.2017.08.014> , concludes:
19. "We have provided wide-ranging reasons for why the ANO Report, and by implication the Nature article, draw key conclusions that are not in fact established by the modelling study itself. Our lines of critique have focussed on the historically unprecedented decoupling rates required; misconceived carbon budget assumptions; the extraordinary proposal to plant up two thirds of Australia's best agriculture land with carbon sequestering plants, without presenting a convincing case for how to achieve this; deep reliance on CCS technology which to date is not commercially viable; and highly optimistic assumptions about resource efficiency. We have also noted the unacceptable social justice implications of the work and the fact that its claims about 'sustainability' only extend to 2050. To these criticisms, one could also add the fact that the report boldly assumes that no resource scarcity challenges will interfere with this long-term vision of economic growth. If any one of these

assumptions turns out to be misconceived or unachievable, the vision of 'sustainable prosperity' defended in the report will not eventuate. Here we have presented grounds for doubting all of the assumptions, such that cumulatively the report's conclusions must be considered, at best, not established, and, on balance, mostly likely false.

20. By way of conclusion, we draw attention to two key implications of this critique, which are relevant to future attempts to defend green growth by way of the decoupling strategy.
21. The first is the social justice dimension. What does any particular green growth vision assume regarding inequality and global poverty? Defenders of green growth ought to make these assumptions explicit.
22. The second is that green growth advocates must explain how the growth paradigm can put humanity on a longer-term path towards sustainability – a path that could conceivably be viewed as open-ended. Even if growth could be 'green' until 2050 – which we doubt – can it remain green if growth continues through to 2100 and beyond? If not, then the deep transformation beyond growth ought to be initiated without delay.
23. We believe that when these two aspects are brought to the surface, it becomes clear that the decoupling strategy cannot lead to a growing global economy that is just and sustainable for humanity as a whole.”
24. Physicist Dr Tim Garrett’s “Thermodynamics of wealth” analysis again points to the fact that no absolute decoupling has occurred:  
<http://www.inscc.utah.edu/~tgarrett/Economics/Economics.html>



Q21 What type of market-based instruments would best help New Zealand transition to a low-emissions economy?

Climate change has been described as the greatest market failure ever by the Stern Report. Market based instruments are patently incapable of dealing with the need to change, as the current situation proves. Jevon's paradox, or the 'rebound effect' applies, in that the majority of improvements in efficiency are taken as increased throughput / profit rather than as actual savings. Add to this growing population, and other compounding factors, and the reality is that market based solutions are proven to be ineffective in create reductions in absolute emissions that the transition requires.

## Q22 What type of support for innovation and technology would best help New Zealand transition to a low-emissions economy?

The technology most urgently required at this time is social, rather than high-tech machines. Changes to our economics and helping the New Zealand public to develop an awareness of the fundamental problems, and the mind set of sufficiency, or 'enough', can help us to prepare for the constraints that are coming.

Refer to our answer to question 40 for more on how our outlook must change, and the values we must stress to change our thinking this issue.

## Q25 In addition to “core” climate policies and institutions, what other changes to policy settings or institutional frameworks are required to effectively transition New Zealand to a low-emissions economy?

The Resource Management Act is failing to meet its intent. It looks at resource management decisions on an individual basis, failing to take the systems level understanding into account. It leads to a 'death by a thousand cuts' situation.

Changes that could remedy this are to take the current Section 32a reports, which give benefit/costs analysis using the overly-simplistic economic analysis of NZIER, etc and replace it with systems dynamics modelling processes such as those undertaken by Marjan van den Belt (now VUW) in Vermont, Alexandra MacMillan and David Rees in the public health sector in NZ, etc. The aim is to take a more nuanced approach to determining benefits and costs, whilst at the same time building understanding of the key things that drive systems behaviour. This radically improves the chances of policy and resource management decisions that actually meet the goal of a reduction in absolute emissions demanded by the Paris Accord.

Even just taking into account ecological economic perspectives consistently would be a start. The New Economics Institute has released a set of 'Economics for policy-makers' documents that are a good guide, and should be compulsory reading<sup>6</sup>.

## Q40 What does your long-term vision for a low-emissions economy look like? Could a shared vision for New Zealand be created, and if so, how?

Thomas Berry once said "It's all a question of story...we are in trouble just now because we do not have a good story...". The story we repeatedly tell ourselves now is that unfettered growth is a great thing and will deliver still more wealth and happiness. Indeed, it would be a rare day when the National News did not delight or lament in some indicator of growth. Yet if we look objectively at the evidence, be it social or environmental, nothing could be further from the truth.

In pursuit of this story we appear prepared to continually ignore, undermine or override environmental good practice and bottom lines. And even if we acknowledge the idea of limits, such is the power of that story we are unable to accept its real implications for living.

Likewise, the deep contradiction between the lip service given by Government to the concepts of sustainability and resilience compared with what they really seek plays a very large part in our failings to respond effectively to the risk of climate change and reduce emissions. Until this anomaly is reconciled, and we start telling the true story, it is unlikely that we will ever make much progress toward this goal.

Our vision for the future is neatly captured in these two contrasting visions that David C Korten, former World Bank economist, has written. Firstly, our current story, a lament or **“Story for a Dying Earth”**:

- A. *Sacred money and markets: time is money.*
- B. *Time is money. Money is wealth.*

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<sup>6</sup> <http://bit.ly/2gmzznb>

- C. Making money creates wealth and is a defining purpose of individuals, business, and the economy.*
- D. Those who make money are society's wealth creators. Affluent lifestyles are their fair and just reward for their effort and contribution.*
- E. Material consumption is the path to happiness.*
- F. Poverty is a consequence of laziness.*
- G. We humans are by nature individualistic competitors.*
- H. This is a blessing, because the invisible hand of the free market channels our individual and corporate competitive drive for financial gain to choices that maximize economic growth and thereby the wealth and well-being of all.*
- I. Corporations aggregate the talents and interests of people working together to provide the essential jobs, goods, and services that create a better life for all.*
- J. A corporation's profits are the measure of its social contribution.*
- K. As corporations create wealth, governments consume it.*
- L. The functions of government should be limited to assuring the common defense, securing property rights, and enforcing contracts.*
- M. Economic inequality and environmental damage are a regrettable but necessary and unavoidable cost of the economic growth that is essential to eliminate poverty and to drive technological innovation needed to free us from our dependence on nature.*

Contrast this with the following vision, of a **“Story for a Living Earth”**:

- A. Sacred life and living: time is life*

- B. We humans are living beings born of and nurtured by a Living Earth. Real wealth is living wealth. Time is life. Money is just a number useful as a medium of exchange in well-regulated markets.*
- C. Life exists only in community. We humans are creatures of conscience who survive and prosper only as members of a Living Earth community. The prime task of any living community is to maintain the conditions essential to the life of its members. We all do best when we all do well in a world that works for all.*
- D. A connection to nature and community is essential to our physical and mental health and well-being. It is our nature to care and share for the benefit of all. Individualistic greed, ruthless competition, and violence against life are indicators of serious individual and social dysfunction. The economy's assault against Earth's capacity to support life and its drive to grow the gap between rich and poor indicates terminal system failure.*
- E. The purpose of human institutions—whether business, government, or civil society—is to provide all people with the opportunity to make a healthy, meaningful living in a balanced co-productive relationship with Earth's community of life.*
- F. Corporations that seek to monopolize resources and decision-making power in the pursuit of purely financial ends unburdened by the exercise of human conscience have no place in a healthy society.*
- G. Human institutions are human creations. That which humans create, humans can change. Environmental sustainability, economic justice, and a living democracy are inseparable. We have all of them, or we have none of them.*

Behind these elegantly simple statements is a deep, holistic understanding of 'the market'. Korten suggested that the “Story for a Dying Earth”: Sacred Money and

Markets is closest to the hearts of most “democratic” governments who have embraced the philosophy of neoliberal free market economics. In many respects, this embrace has more of the attributes of a religion than a scientific approach to understanding the economy. Even Adam Smith recognised that a truly free market is a myth. Free trade in child labour, plutonium, or heroin would be unacceptable to most people. All markets are not only constructed and regulated but are also manipulated.

Behind the faith in a free market is an ideology that the so-called invisible hand will optimally match supply and demand. No politician or economist has ever explained its workings. Rather, they cling to the concept as an article of faith. It is our contention that they do this in the face of ever stronger evidence that we can't decouple economic activity from resource and particularly energy throughput, nor environmental impacts.

In contrast to this, the Wise Response vision seeks to put economic activity within the constraints that environmental overshoot, declining net energy available from our energy systems, and the imperative of a fair, just, and therefore high wellbeing society requires. The features of this economy are summarised in the document “A Simpler Way” by leading Transition thinker Ted Trainer. He states that:

“We cannot achieve a sustainable and just world order unless we change to:

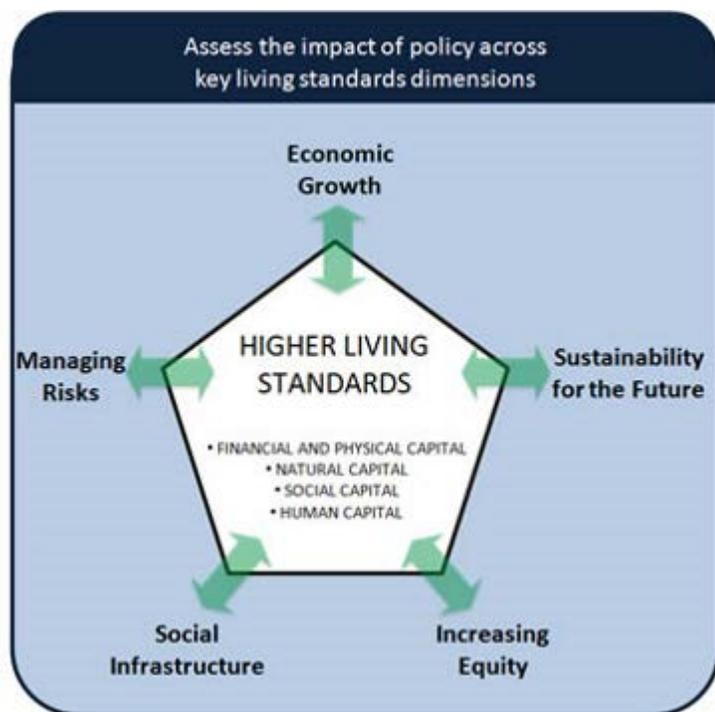
- Simpler lifestyles, much less production and consumption, much less concern with luxury, affluence, possessions and wealth.
- Small, highly self-sufficient local economies, largely independent of the global economy.
- More cooperative and participatory ways, enabling people in small communities to take control of their own development.
- A new economy, one not driven by profit or market forces, and a zero-growth or steady-state overall economy, which produces much less than the present economy.
- Some very different values, especially cooperation not competition, and frugality and self-sufficiency not acquisitiveness and consuming.”

<http://bit.ly/29hAoNP>

The TOR's of the inquiry:

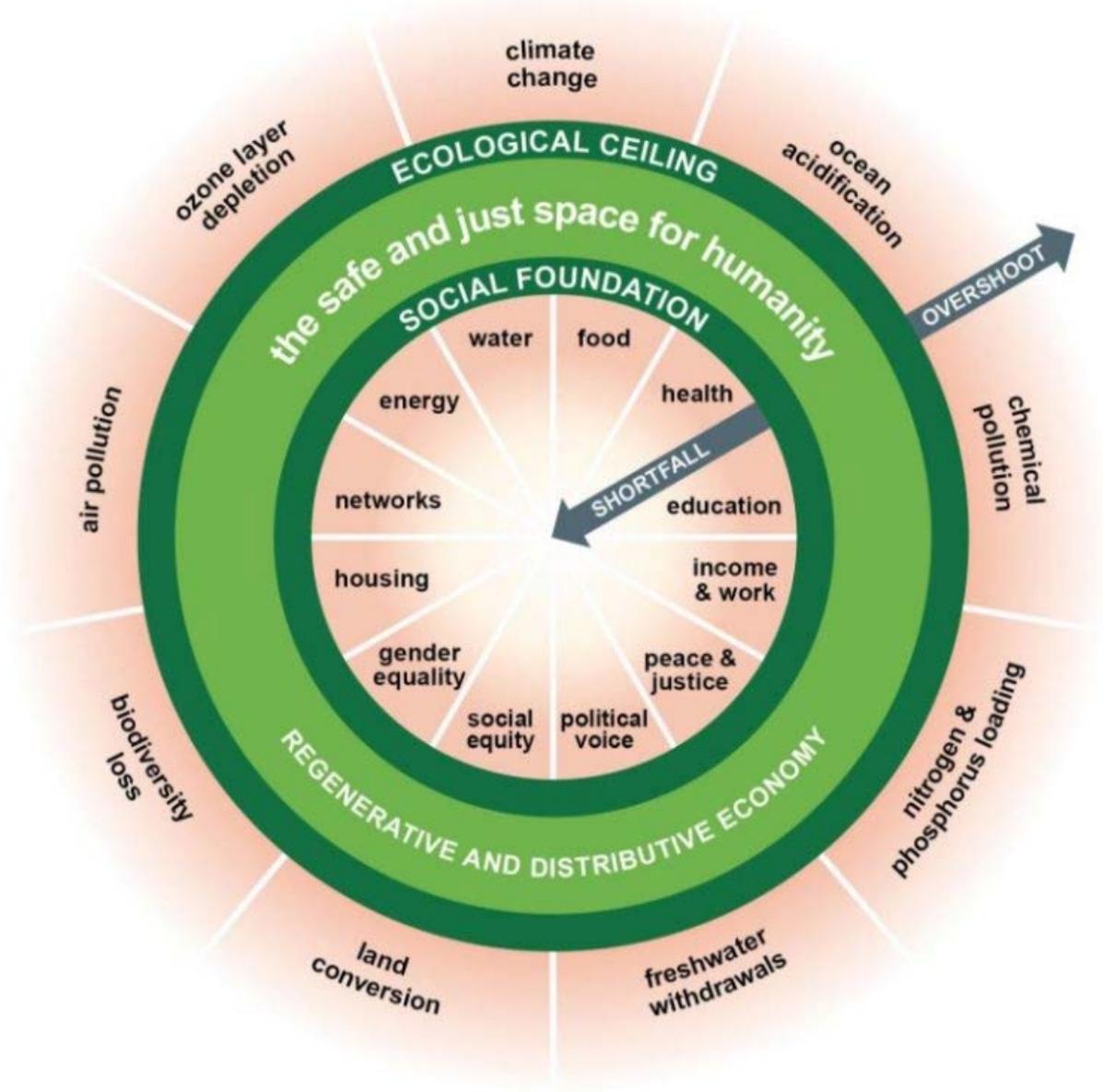
Having painted a values based vision of the fundamental changes needed in our economics, we must now address the TOR's for this inquiry, and specifically, the definition of 'growth'.

The minister's constraints on this inquiry are based on an erroneous understanding of the world founded in neo-classical economic understanding. In the signed letter accompanying the TOR's, the minister displays some understanding of the contradiction of growth as the goal. He specifically states "transition to a lower net emissions future, while at the same time continuing to grow incomes and wellbeing". In this statement the orthodox conflation of income and wellbeing is evident, based on the well worn received truth "a rising tide lifts all boats". The Treasury's 'Higher Living Standards Framework' (HLSF) is an attempt from within to broaden our economic thinking. This framework starts to consider other forms of capital to simply financial capital:



Source: <http://www.treasury.govt.nz/abouttreasury/higherlivingstandards>

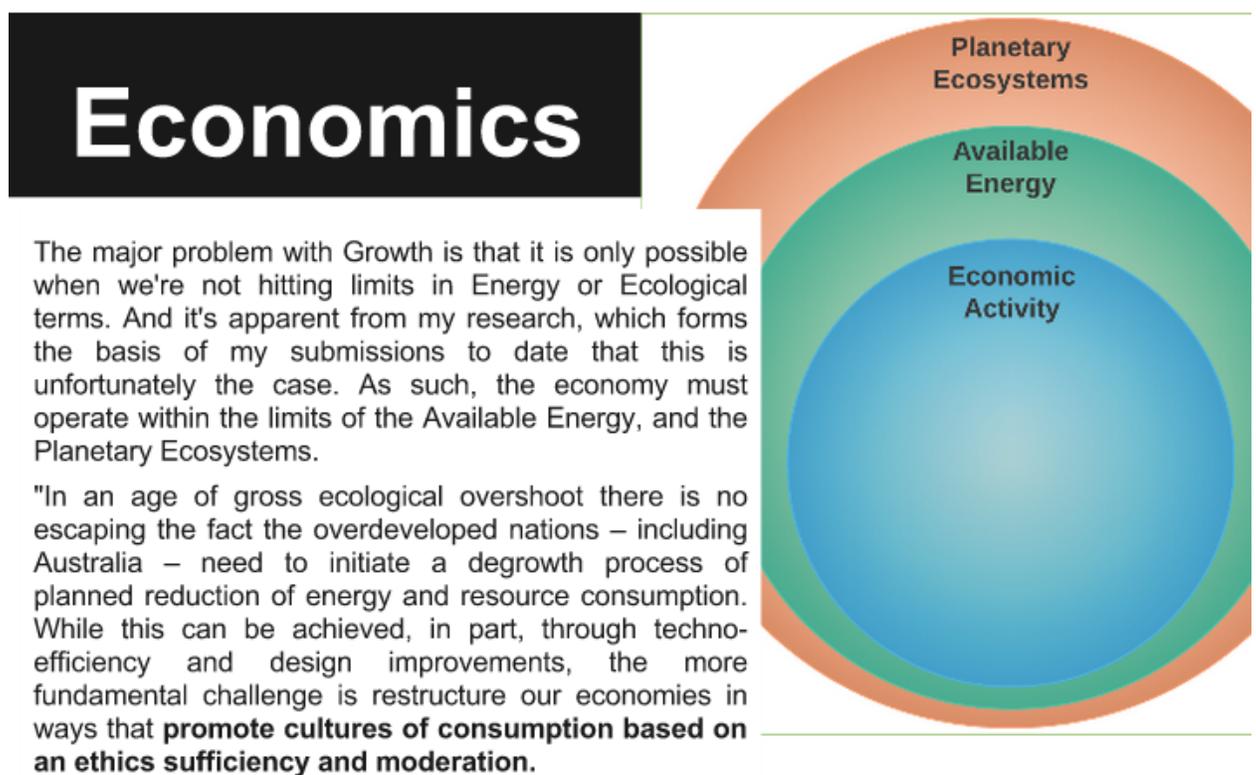
In this diagram, economic growth sits at the head of the table, supposedly to be balanced against the other factors. The visualisation of the 'balanced thinking' of the progressive yet orthodox neo-classical economic visualisation from the HLSF stands in stark contrast to the playfully serious 'doughnut economics' framework from heterodox economist Kate Raworth:



<http://www.kateraworth.com/doughnut/>

Here, the right relationship is identified for the Environmental Limits described by the Planetary Boundaries analysis from the Stockholm Resilience Centre, placing the economy within the constraints imposed by the environment. Also included is the right place for wellbeing, identified as the 'Social Foundation', or the lower bound of 'the safe and just space for humanity'.

However, it is my understanding that again, this does not go far enough, as it doesn't capture the essential role of energy supply in our economics, a point made in the following diagram:



Source for the above: slide 11 of the presentation embedded here:

<http://bit.ly/1FVidRK>

So what thinking develops from this perspective? A financial system insider, Dr Tim Morgan, released a report whilst with Tullett Prebon in 2011 called "The Perfect Storm". The following quotes speak to the financial perspective and the complex, inter-related and nested nature of the factors at work:

- A. The global economy is facing a lethal confluence of four critical factors – the fallout from the biggest debt bubble in history; a disastrous experiment with globalisation; massaging of data to the point where economic trends are obscured; and the approach of an energy-returns cliff-edge - explains Dr Tim Morgan, Global Head of Research at Tullett Prebon in Perfect Storm – energy, finance and the end of growth.
- B. “Combined, these factors have started to throw more than two centuries of economic expansion into reverse,” says Dr Morgan. “If the energy surplus ratio continues to decline as it has been, the economy as we know it is finished.”
- C. In it, he pointed to the same trends we're highlighting in this submission. We agree with his observations in a recent update on his work, where he explains the current situation thus:
- D. “What’s happening now?”**
- E. Though less than six years have elapsed since Perfect Storm, a great deal has changed. Back in 2011, many found it disconcerting that the head of research at a major City institution would put his name to a report stating that a tightening of the energy equation might be bringing 200 years of economic growth shuddering to a halt. Though there were exceptions, much of the mainstream response varied between the dismissive and the derisive. Many, I felt, did not want to accept an analysis which would challenge their fundamental assumptions, as well as predicting an end to a relatively satisfactory state of affairs.
- F. Now, though, this is changing – in two main ways. First, if the Perfect Storm thesis had been wrong, we should know by now, because the economy should be growing strongly, indebtedness should be decreasing as we implement the lessons learned so painfully in 2008 and, above all, there should have been a return to normality.

- G. Instead, we have “secular stagnation”, where such growth as does occur reflects nothing more than the spending of borrowed money. Debt continues to escalate, and the extreme abnormality of ZIRP and other forms of monetary manipulation is doing a great deal of harm. (Even if rates creep up a little, by the way, we will remain a very long way from normality).
- H. Second, economists are now starting to question their prior certainties, with some members of the profession prepared to admit that they may have got it wrong. The credibility of economics itself is in the spotlight.
- I. In short, the economy is moving on in ways that refuse to conform to conventional theory, but bear a closer resemblance to the surplus energy interpretation. The thesis that the real economy would stumble, and that we would go on driving an ever-wider and more dangerous wedge between the “real” and “financial” economies, does seem to be happening.

**J. What is Surplus Energy Economics?**

- K. Very briefly, SEE says that the economy is an energy system, not a monetary one. Prosperity is determined by surplus energy – that is, the energy available after the deduction of the energy which is always used up whenever we access energy.
- L. Our entire history can be seen in this way. As hunter-gatherers, all the energy that people obtained from food was consumed obtaining that food, so there was no surplus, no economy and no society.
- M. Agriculture was the “first great breakthrough” because it created the first energy surplus. Put simply, the greater efficiency of farming compared with hunter-gathering, plus the use of animal labour, enabled twenty people to be fed by the labour of nineteen, freeing the twentieth to do other things. This first energy surplus was small, and most people continued to undertake subsistence activities. But there was now an economy of sorts, and a society developed in parallel with it. People could now, for the first time, invest, sacrificing current consumption to create capital assets (such as barns,

bridges, agricultural implements and rudimentary workshops) which would improve their lot in the future.

N. A vastly bigger energy surplus was created when we learned to tap fossil fuels, such as coal, oil and natural gas. This triggered two centuries of exponential growth, not just in economic output, but in population numbers and energy consumption as well. So sophisticated have economies become that, most notably in the West, very few people are engaged in producing food.

**O. The end of growth?**

P. For decades, people have speculated about the relationship between exponential growth and a finite planet. This debate rages on, but the balance is tilting, in two very obvious ways.

Q. First, we are discovering the limitations of the earth as an ecosystem and, second, the surplus energy which has driven growth in economic output and population numbers is coming under mounting pressure.

R. Where fossil fuels – still well over 80% of our energy consumption – are concerned, two factors are in play. Depletion is robbing us of the gigantic, ultra-low-cost sources of energy which hitherto powered economic growth. Technology is endeavouring to offset this, both increasing the efficiency with which we access conventional fuels, and enabling us to tap energy from renewable sources.

S. Technology will doubtless continue to progress, but we are in danger of complacency over technological solutions. Renewables still account for barely 3% of global energy consumption, and no-one has yet worked out how to power a 747-size jet using renewables, or how to extract 1 tonne of ore from 500 tonnes of rock without using fossil fuels.

T. We should be optimistic about renewables, but also realistic. Renewables can supply energy more cost-effectively than fossil fuel sources discovered and brought on stream today. But my interpretation of the thermodynamic balance

is that renewables are not going to take us back to an age of vast, low-cost, high-surplus energy from giant fields.

#### **U. Measuring the state-of-play**

- V. If the economy is fundamentally an energy system, we need to assess our situation using measures which are energy-based, not financial. One such measure is EROEI (Energy Returns On Energy Invested). Another is ECoE (the Energy Cost of Energy).
- W. I have long postulated an ECoE curve which is trending upwards relentlessly. I want to be quite clear about the lack of available data, which reflects a lack of financial support for research. The trend ECoE curve used here has been developed and refined over several years, and is subdivided by fuel and location. The system I use is called SEEDS (the Surplus Energy Economics Data System). It can only be a “best estimate”, but I derive encouragement from its seemingly good fit with what is happening to the economy.
- X. This overall curve suggests that ECoE has been on a rising trend since the 1960s. Initially, increases were pretty modest, with ECoE increasing from 1.2% in 1970, via 1.9% in 1980 and 2.8% in 1990, to 4.2% in 2000. But, because this is an exponential progression, the rate of increase is rising markedly. My estimate for trend ECoE in 2010 is 6.4%, and this is projected to rise to 9.6% by 2020.
- Y. In short, we have now moved into territory where ECoE, once a number so small that we could afford to ignore it, starts to destroy the capacity for growth.
- Z. The concept of ECoE is best understood as “economic rent”, a charge levied on the economy by the limitations of the earth’s resource set. It is not the same as financial cost, because cost is a closed-system – money spent by, say, a company developing an oil field or a solar project, is a cost to that company, but an income to others, such as contractors, suppliers and employees.

AA. Rather, ECoE is an economic rent, levied by resource limitations but not accounted for when we measure the economy. It can be thought of as a restriction of choice, forcing us to spend more on energy and, therefore, less on other things. It is in some ways analogous to taxation – tax does not reduce gross income, but it forces the recipient to use some of it in a way that might not be his or her preference, reducing how much can be spent in ways that the person might like.

BB. In case this seems remote and theoretical, ECoE is already, and noticeably, eating into our discretionary incomes. As a direct corollary of rising ECoEs, the cost of household essentials has long been rising much more rapidly than general inflation, undermining how much of our incomes we can spend as we choose. I have explained before how prosperity is not a function of how much money someone has, but of how much choice (“discretion”) that person has after paying for essentials.

CC. Finally, ECoE is only tangentially related to the current price of energy to the end-user. As prices soared between 2000 and 2007, and remained high until 2014, massive investment was poured into energy supply. This created a glut which, as well as driving prices down sharply, resulted in a slump in investment. In due course – and depending, of course, on demand – this dearth of investment could drive energy prices sharply higher. But pricing, ultimately, is a cyclical process acting as “noise” around the trend determined by the interplay of depletion and technology.

**DD. What next?**

EE. If the surplus energy interpretation of the economy is correct, growth should continue to prove elusive. But our system is so predicated on growth – a topic for another article – that we cannot accept even stagnation, let alone adjust to decline.

FF. So we have been faking growth by borrowing. By 2008, the debt mountain had become so big that we could no longer afford to pay a normal rate of interest on it, so the authorities adopted ZIRP (zero interest rate policy) in

order to prevent the economy being engulfed. But ZIRP, and other forms of monetary manipulation, cannot resolve the situation, and have their own costs. At zero- or near-zero rates, the economy cannot function normally, and it certainly cannot provide for the future, which is why huge deficits are now imperilling pension provision.

GG. In theory, we might go on faking growth for many more years yet, and I'm pretty sure the authorities will be mightily tempted to try. But this would result in a further escalation of debt, which would also mean that raising interest rates significantly – let alone restoring them to something resembling normality – would become out of the question (which may already be the case). Comparing 2020 with 2015, and taking inflation out of the equation, the world seems likely to grow its GDP by close to \$10tn, but to add at least \$50tn to its \$151tn non-financial debt mountain.

HH. If (or, rather, when) debt escalation reaches crisis point, some kind of write-off might be tried, unless the authorities decide to unleash high inflation in an attempt to destroy the real value of debt. Inflation, which has been described as the “hard drug” of our economic system, can very rapidly get out of control.

II. So here we have some pointers to the future – debt escalation, and/or hyperinflation, both of which would be insane choices, but neither of which are beyond the short-termism of the political class.

JJ. Ultimately, and whichever folly is chosen, faith in fiat currencies is likely to collapse...

KK. People cannot be expected to accept any of the post-growth consequences described here with a resigned shrug. They are not doing so now – instead, and naturally, they are beginning to blame, and repudiate, established political leaderships, and this was the most significant trend to emerge in 2016.

LL. If the economy – and, in the first instance, the financial system – does start to implode, governments are highly likely to resort to coercion, spouting precious claptrap about “the national interest” as they try to maintain their hold on power.

MM. Though the financial and real economies are different concepts, it is impossible for finance to collapse without inflicting grave damage on the real economy. Our economy is essentially fragile, depending on attenuated systems, most obviously for payment and clearing. If you try to envisage running an economy without payment systems, banks, insurance or even trusted money, in a climate in which no one knows who owns or owes what, you will appreciate that the real economy is a hostage to finance.”

I hope that this captures for the commission both the imperatives for change, and a productive suggestion of the type of changes likely to produce positive outcomes for New Zealand.

## Appendices

I note that I support the Law Commission's comments thus:

### Law Commission comments on Productivity Commission inquiry

Productivity probe has got it wrong, say lawyers

Today 26 September 2017 10:00am

THE Productivity Commission is under-estimating the role the Resource Management Act can play in cutting New Zealand's greenhouse gas emissions, the Auckland District Law Society says.

In March, the commission released a [report](#) calling the RMA weak and saying it should be replaced with separate planning regimes for the natural and built environments, and is now investigating how New Zealand can transition to a low-carbon economy while maintaining economic growth.

But in a submission on the commission's [issues paper](#), the Auckland District Law Society says the commission is not putting enough emphasis on the RMA.

"It is with some concerned (we note) that the role of the Resource Management Act is not mentioned in any substantive way in the paper, despite climate change coming within the purview of the act, and it being the primary statute concerning resource management and land use," the society say in its submission.

#### Role clarified

While amendments to the act in 2004 precluded local authorities from directly considering emissions under the RMA, other provisions and two Supreme Court decisions had clarified the climate-change role the RMA should play, the society says.

"... our feedback is that the RMA deserves a greater focus from the commission in how it might be used or better-used to shift New Zealand to a low-emissions economy, especially in terms of its role in land-use decisions," the submission says.

While the commission's paper recognises the importance of the role cities can play in cutting emissions, it doesn't recognise the role the RMA can play in delivering those cuts.

"Although the paper considers the climate change effects of transport, energy, buildings and waste separately, it is the cross-cutting effects of these issues, mainly managed (or exacerbated) through land-use decisions under the RMA, that are equally important," the society says.

## City decisions

“These decisions become most relevant in cities where a low-emissions economy can only be achieved through interconnected and integrated land-use decisions that have climate-change mitigation as their focus and priority.”

Cutting emissions from the New Zealand economy by 2050 is an “extraordinarily tight timeframe” requiring a co-ordinated and “joined-up” approach to cutting emissions and developing resilience, the society says.

“In the New Zealand context, where resource management decisions are primarily made regionally or locally, the RMA and local government are critical to achieving that,” the society says.

“With respect to the commission, its future work on a low-emissions economy must recognise and address that.”

Last month, in a speech calling for [environmental rights to be protected under a constitution](#), constitutional law expert and former prime minister Sir Geoffrey Palmer criticised the Productivity Commission’s analysis of the RMA, particularly the commission’s failure to acknowledge the significance of the Supreme Court’s ruling in the King Salmon case.

## Natural values

In that case, a majority of the court said that protection of outstanding natural values took priority over development.

Sir Geoffrey said the Productivity Commission appeared to under-estimate the importance of the decision.

“I have never been convinced that the economists at the Productivity Commission understood the nature of the jurisprudence developed in the courts, in particular by the Supreme Court, and what it means in practice,” he said.

“The Productivity Commission managed to write a whole report without referring to the King Salmon case. What remarkable mistake.”

Submissions on the commission’s issues paper on transitioning to a low-emissions economy close on October 2.