

## The Myth of Utopia

*Richard Norris calls for realism when addressing the challenges associated with the transition to green energy supply*

The world is embarking on a monumental energy transition with the aim of decarbonizing the global energy infrastructure. While essential, we must not underestimate the scale and difficulty of this transition. Currently 85% of global energy supply comes from fossil fuels. In addition to replacing this existing energy supply with greener, cleaner options, we will simultaneously need to increase the absolute amount of energy available to society due to an expanding global population that is becoming more urbanised and aspires to greater affluence.

In many mainstream media, public opinion and political landscapes, there is a “techno-optimist” belief that replacing fossil fuels with greener and cleaner alternatives will be nothing more than a technological challenge. Moreover, it is widely stated that this cleaner future will also be cheaper, which has the implicit assumption that our lifestyles will be the same or better. In reality, the transition to greener energy sources will require a significant societal shift to a more sustainable way of life addressing both the supply and demand sides of the energy equation. In July 2020, I gave a presentation to the Geological Society Business Forum that outlines some of the challenges that realistically lie ahead.

### Invisible energy

Energy has become invisible in modern society. For many decades in developed countries, and increasingly everywhere, access to secure and affordable energy has become the norm. So normal in fact that it is only ever noticed on the rare occasions when the system has a problem.

Basic economic theory all but ignores the role of energy, focusing on land, labour and capital. The fact that the edifice of modern economics has been built over the last 200 years coinciding with the industrial revolution, during which time technology has provided access to ever better energy supplies, may explain the lack of attention

paid to energy as an input.

The economy seems to revolve around goods and services, money, debt, fiscal and monetary policy and so on. Yet, if you spend money, the goods and services you purchase or use will have an energy footprint. If you save money, the bank will lend it to businesses that sell goods or services with an energy footprint. While debt was not the subject of our discussion, it clearly accelerates energy use by creating money in the “now”.

### Energy is the economy

The use of energy above and beyond simple muscle-power provides enormous leverage to society. When subsistence agriculture generates excess through innovation and technology, it allows members of society to do things other than work in the fields. Inevitably this leads to a positive feedback loop in which those liberated workers produce more technology, as “craftsmen”, as well as creating additional leverage through structures that allow for the allocation of capital, and indeed arts that increase wellbeing.

Under-pinning all complex societies is the input of external energy to supplement the limited capacity of muscle power. Maximum wealth is created by having a very high ratio of energy surplus to energy

input. In the words of a leading academic and author on the subject of energy, Vaclav Smil: “Energy is the Economy”.

The last 70 years have been characterized by a very high net-energy ratio as we have exploited coal, oil, gas and nuclear sources. Abundant and cheap energy provides leverage; we consume roughly 2,500 kilocalories per day as food, but use something like 70-200 times more than this as external energy: that is the petrol in our cars, electricity and gas in our homes, as well as the energy embodied in every good or service we use. The availability of cheap energy has facilitated the consumer society that we have today.

It is no coincidence that human history took a radical new path when the combustion of coal was harnessed via the steam engine. Enormous productivity increases happened through mechanization, and whilst work conditions were grim, overall society got richer.

Whilst the above comment on consumerism is not trivial, overall one can argue that for all of



the current angst, modern society is hugely improved on that of the past. Indeed, every Human Development Index, such as infant mortality, longevity, vaccination rates, poverty rates and deaths from natural disasters, has improved over time and is correlated with wealth and energy use.

### Costing the Earth

Addressing the price of energy is highly complex and politically charged. It is argued that the current cost of energy is artificially low, given that fossil fuels get a “free ride” by distributing all their negative externalities to the global population, whether that be by particulates pollution or greenhouse-gas emissions. This argument is clearly correct, but must also be balanced with the positive impacts impacts, such as the creation of wealth. It seems there is an in-built assumption that we can have all the good, without the bad, by simply transitioning to greener, cleaner and cheaper energy.

Simply swapping out dirty energy sources

for clean ones will not fix the broader issue of the unsustainability of modern consumerist societies. The implication is that lifestyles have to be dramatically down-graded. Protesting in favour of this is easy; actually making significant lifestyle choices much less so. Indeed, the yellow-vest movement in France in 2018-19 was triggered by proposed increases in fuel costs, despite these being for the greater good of funding the energy transition.

### Technology will save us

All Malthusian predictions of an end to growth have been left in the dust of progress. With technological advances, we have been able to harness more and more energy, as well as accessing the required raw materials, leading to the widespread view that technology will save us again.

For the energy transition, reporting on the role of technology is slightly schizophrenic in so much as it alternates between two mutually exclusive positions. Either “the technology exists, it just requires the political will” or the next “silver bullet” technology will solve the difficulties.

The reality is that although current technology can take us some of the way, major advances will be required to decarbonize the more complex parts of the system. In addition, the transition from higher to lower energy-dense sources, such as from fossil fuels to renewables, is unprecedented in human history. Such a change is unlikely to be cheaper, which implies we will all get poorer.

I am not arguing

against the transition to cleaner energy. Rather, I wish to highlight that the reasons for progressing the transition are more complex than simply carbon emissions. Whether we like it or not the era of cheap energy and a high net-energy surplus is drawing to a close. We have exploited most of the easily accessible and cheap sources of oil and gas. The remaining fossil resources, which will be necessary in even the most rapid-transition scenarios, will be more difficult and expensive to access. The on-going transition to renewable energy sources is currently priced by the energy inputs, which are dominantly hydrocarbons. Somewhat counter-intuitively, we need to maximize new renewable energy whilst we still have the luxury of cheap hydrocarbons.

### The other side of the coin

If technology does not deliver new and better energy sources, then significant societal changes will be needed. All of the efforts on the energy supply side will need to be matched by planned, rather than chaotic, reductions in per capita consumption. We can envisage far more sustainable and comfortable, but less excessive and less wasteful lifestyles. How we make this transition on the demand side is an area of study mostly ignored in the rush to transition the energy supply side, but of growing importance.

Energy fundamentally underpins affluent lifestyles. The myth is that we can transition from our current fossil-fuel dominated situation to cleaner alternatives without any negative change in our lifestyles. For that to happen, the new energy landscape must be no less expensive than the current one. But is that going to be possible? And if it isn't, how is the energy transition to be achieved without social and political unrest?

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