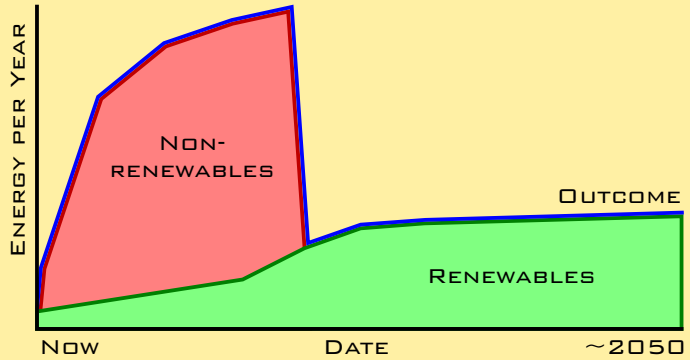
Avoiding Climate Change Disaster

Carbon Budget

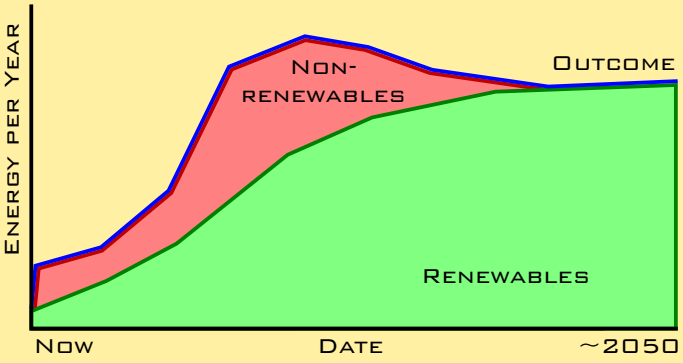
To limit global warming to 2 degrees, we can release only a certain amount of greenhouse gas into the atmosphere. As of 2015 this worldwide carbon budget was about 909 billion tonnes CO2. As we burn more fossil fuels and release more greenhouse gases, we reduce the remaining budget. The sooner that we seriously start to address the problem, the larger the carbon budget we have remaining at our disposal to help us transition to a sustainable energy scenario. The consequences of exceeding this carbon budget would be dire for all life, and result in mass extinctions. In short, we simply cannot afford to go over budget – it is the most important challenge to our civilisation.

Staying within budget

We have to transition to a steady state solution where we run our society entirely on renewable energy. In getting from where we are today to that state we must stay within the carbon budget. We can effect this transition by a combination of energy supply and demand measures. The sooner we embark on a rapid increase of renewable supply and a serious programme of demand reduction, the more likely we are to avoid a hugely disruptive outcome.



This graph shows a business as usual approach to energy consumption and a slow increase of renewable energy production. As we approach our carbon budget (the pink area), we speed up our renewable energy production capability. But, it is too little, too late, and the outcome is that we are able to meet only a small fraction of our energy needs with renewable resources.



This graph shows a concerted effort to reduce our energy demand in combination with an earlier and faster increase in renewable energy production. This allows our carbon budget to go further, leaving us with a much larger installed capacity for production of renewable energy and a lower energy demand. The outcome is a sustainable energy system capable of maintaining a workable civilisation.

Policy Implications

Climate change is the single largest challenge facing humankind, and we are running short of time for implementing a solution which will limit temperature rise to 2 degrees. We must focus ourselves on effecting this energy transition with a vigour normally only seen in wartime. The finite carbon budget must not be wasted. Our energy use priorities must be food, shelter and powering the transition to a wholly renewable sustainable energy supply.

Bad ideas

We cannot afford to waste energy on the unnecessary. Examples include major armaments projects (Trident, aircraft carriers) and large scale infrastructure schemes which do not contribute to the energy transition (HS2, major road and airport schemes, space ports).
Nor can we afford to implement fake solutions which would only make the problem worse. Fracked shale gas is not only a fossil fuel, but has a greater carbon footprint than coal. Hydrogen as an end use fuel is impractical as it would need entirely new infrastructure and has a low energy density which makes it unsuited to heating or transport use. Nuclear fuel is not a renewable resource. Nuclear power stations are hugely dangerous, a diversion of funding which could be used for renewables, and are highly likely to be switched off permanently after the next large disaster leaving stranded liabilities. Geoengineering is far too risky, and any positive impacts would be accompanied by negative consequences. Carbon capture and storage has not been proven, and reduces the efficiency of the power plant so that about 40% more fossil fuel (and hence power plants!) would be required to achieve the same output.

There is no magic bullet.

Good ideas

The only energy sources that do not increase the heating of the biosphere are derived from solar energy. We must deploy only energy supply solutions harnessing solar, wind, rain and biomass, alongside extensive energy demand reduction measures.

Even in the UK, the potential for solar electrical power generation is significant, as is the opportunity for harvesting and storing solar heat on a large scale. Our wind resource, onshore and offshore, is huge, and could more than satisfy the entire electrical demand. Power to Gas plants use surplus renewable electricity to produce methane from water and CO2. The resulting methane can be used to fuel existing gas fired power stations for balancing power when solar and wind do not meet demand. Alongside the rapid increase in renewable production, we must decrease energy demand dramatically. There is potential to cut demand by 80% with measures such as:

Electrical

- LED lighting everywhere, immediately

Transport

- Massive reduction in transportation – prioritised as per wartime economy.
- Essential long haul transportation (e.g. food) to use renewable fuel synthesised via Power to Gas.

Heating

- All new buildings to Passivhaus standard, requiring minimal input for space heating, saving 90% on current building standards.

- All existing buildings to be supplied with district heating from combined heat and power, reject heat from Power to Gas plants, and large solar heat arrays.

For more information see www.energypolicy.co.uk/avoiding_climate_change_disaster

Gordon Taylor & Phil Driscoll, June 2017