[redacted]

From: Bill Stinson [redacted]
Sent: Thursday, 7 December 2023 6:49 PM
To: IPCN Submissions Mailbox
Subject: Objection to SSD10315 - Bowmans Creek Wind Project
Attachments: 36 - Green Killing Machines.pdf; 210120 - The Dark Side of Renewable Energy.pdf; 231206 - SSD10315 - Objection to Bowmans Creek Wind Project.pdf

[redacted] [redacted]

Dear Professor Clark,

Submission and reference documents attached.

Kind regards,
Bill Stinson

Independent Planning Commission
NSW Government

Submission uploaded:

7 December 2023

Attention: Professor Alice Clark

Objection to State Significant Development Application SSD-10315
Bowmans Creek Wind Project

Dear Professor Clark,

The continuing destruction of the Australian countryside is unacceptable to Australian citizens who support farmers, graziers and regional Australians in their campaign against the irrational development of wind projects and solar projects, which are environmentally destructive.

When determining any planning application, primary consideration should be given to the principles of ecologically sustainable development as stated in:

Federal Legislation - Environment Protection and Biodiversity Conservation Act 1999

3A Principles of ecologically sustainable development

> The following principles are ***principles of ecologically sustainable development***:
>
> (a) decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations;
>
> (b) if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation;
>
> (c) the principle of inter-generational equity—that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations;
>
> (d) the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making;

Considering each of the aforementioned principles, as they relate to SSD-10315:

3A (a) decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations

Wind projects are considered to be short term installations and the push for nuclear energy in Australia and the rest of the world to provide reliable, sustainable, affordable energy while not emitting carbon dioxide will, in my opinion, see this project, if approved, become a stranded asset.

When considering environmental issues there is a dark side to renewable energy. Much emphasis is placed on the worldwide production of carbon dioxide by the burning of fossil fuels. What isn't discussed is the life cycle of wind turbines which includes the sourcing and mining of raw materials to enable the manufacture of wind turbines and their associated infrastructure (See – The Dark Side of "Renewable Energy" – Phases 1 and 2)

Social impacts include, what is increasingly being reported as the use of forced labour by some wind turbine manufacturers in the production of wind turbines (See – The Dark Side of "Renewable Energy" – Phase 4)

3A (b) if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation

Again, there are threats of serious and irreversible environmental damage associated with the manufacture, installation and decommissioning of wind turbines. (See – The Dark Side of "Renewable Energy" – Phases 1, 2, 3, 5, 7, 8 and 9).

Wind turbine blades are not recyclable and are currently buried. Toxic elements in the blades then leak into the water table and poison the groundwater. Currently there is no effective waste management plan for the decommissioning of wind turbines. The bases of wind turbines containing tons of concrete and steel are left in the ground effectively preventing any ongoing use of that area.

Mining leases are required to provide bonds for the rehabilitation of mined areas at the completion of mining operations. No such rehabilitation bonds are currently required for wind projects which has resulted in many abandoned wind projects overseas being left as ghost structures dotting the landscape.

3A (c) the principle of inter-generational equity—that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations;

Wind projects are short-term installations and will not provide meaningful jobs for the local community during their short lifetime as opposed to ongoing employment for locals. As noted in 3A (b), the inground bases of decommissioned wind turbines prevents the land they're built on to be effectively reused. Thousands of tonnes of concrete and steel will remain as a testament to the folly of those who believe wind projects and solar projects are the answer to Australia's energy needs.

With coal, gas and uranium, Australia has energy sovereignty. With wind projects, PV solar projects and batteries we cede our energy generation to a foreign power. Energy security is national security. This is providing meaningful inter-generational equity and security.

There is an ancient Indian saying:

"We do not inherit the earth from our ancestors, we borrow it from our children"

Intergenerational equity for our children, grandchildren and the descendants of all Australians must be foremost in our minds.

3A (d) the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making;

The conservation of biological diversity and ecological integrity should not only be considered in relation to the local areas. The life cycle of wind projects should always be considered in relation to ecologically sustainable development elsewhere (See – The Dark Side of "Renewable Energy" – Phases 1 and 2).

Wind turbines are bird killers. The bird carcasses attract foxes and other feral animals such as feral cats. Foxes and feral cats don't discriminate and kill domestic animals, small livestock and small native mammals.

The proposed Bowmans Creek Wind Project would not be conducive to the conservation of biological diversity and ecological integrity.

The Department of Planning and Environment (DPE) Assessment Report dated November 2023, lists the Likely Significant Impact on Critically Endangered, Endangered and Vulnerable Fauna on the Proposed Site. Critically Endangered, Endangered and Vulnerable Flora on the Proposed Site. Critically Endangered Fauna on the Transport Route. Critically Endangered and Endangered Flora on the Transport Route. There is no amount of biodiversity offset that would compensate for the loss of the listed fauna and flora.

It is ludicrous that while conservationists from Taronga Zoo are working diligently to save the Critically Endangered Regent Honeyeater (see YouTube video below), wind projects, similar to the proposed Bowmans Creek Wind Project, kill thousands of Australia's unique birdlife and bats each year.

https://www.youtube.com/watch?v=D6Ir5XI0QyU

The information in the DPE Assessment Report alone, should confirm that approval must not be given for this environmentally destructive project. As per the EBPC Act clause – "**the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making".**

The five videos below show why wind projects projects need to be stopped to prevent the destruction of Australia's fauna and flora. They were prepared by Steven Nowakowski an environmentalist and supporter of renewable energy until he saw the destruction wrought on the environment by the Kaban Wind Project.

Short Upper Burdekin Film	https://vimeo.com/706882264
Short Kaban Film	https://vimeo.com/633451905
Short Chalumbin Film	https://vimeo.com/582415839
Kaban destruction	https://vimeo.com/775033740
Transition to Extinction	https://youtu.be/QLUH4wqjNm8

The Executive Summary below from the GWPF Report 36 – 'Green Killing Machines' – Andrew Montford succinctly sums up why we shouldn't pursue the rollout of a patchwork quilt of environmentally destructive, toxic, unreliable, unaffordable wind, solar and batteries connected by a web of HV transmission lines threatening Australia's food production capability.

'Renewable energy has developed itself a reputation as being environmentally friendly. This report will show that this reputation is entirely undeserved. Far from improving the world around us, wind, solar, biomass and even hydropower can be highly damaging. A renewables revolution on the scale envisaged by global warming activists will see our landscapes desecrated, our fields industrialised or turned to monocultures, and our wildlife slaughtered.
Far from making the world a better place, renewable energy will destroy all we hold dear.
Is this really what environmentalism has come to mean?'

Australia is signatory to the Paris Agreement 2015 which states:

"Article 2 (b) Increasing the ability to adapt to the adverse impacts of climate change **and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production."**

Other Conditions of Approval to be considered

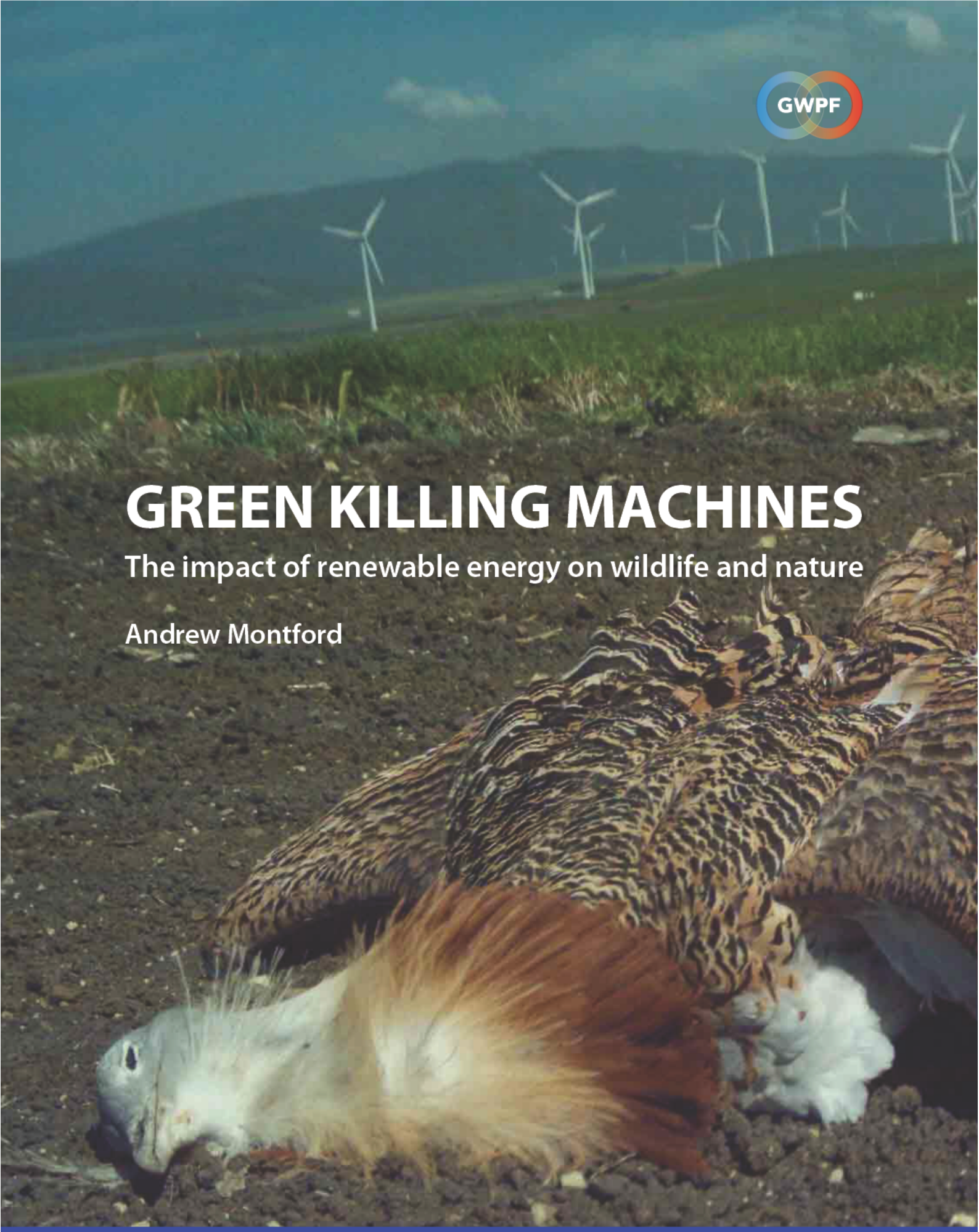
1. a bond is held from start of project with guaranteed finance in place to cover decommissioning and full project removal, disposal and rehabilitation costs at end of life;
2. appropriate regulations are in place to protect threatened and endangered species;
3. large scale renewable projects are subject to full state government approval processes and be made impact-assessable not code-assessable;
4. an appropriate land access framework to protect the environment, cultural heritage and existing land users is established;
5. minimal impact upon existing rate payers is negotiated;
6. Australia's food security is protected by prohibiting large scale renewable projects on prime agricultural land; (See Paris Agreement Article 2 (1) (b))
7. all large-scale renewable projects comply with the same regulations that apply to agriculture and mining;
8. large scale renewable projects are added as a trigger to the EPBC Act;
9. a mandatory code of conduct is established to govern the renewable energy sector and renewable energy proponents' conduct with affected communities."

It is ridiculous that Australia is currently not effectively using its abundant coal, gas and uranium resources to provide an affordable, sustainable and reliable energy generation network for its citizens and businesses.

In conclusion, the Federal Government needs to legislate to remove the prohibition on nuclear energy, which is required to meet Australia's national security needs and not rely on supply chains that use forced labour and are becoming more tenuous.

Yours faithfully,

Bill Stinson



GREEN KILLING MACHINES

The impact of renewable energy on wildlife and nature

Andrew Montford

The Global Warming Policy Foundation

GWPF Report 36

GREEN KILLING MACHINES

The impact of renewable energy on wildlife and nature

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About the author

Andrew Montford is deputy director of the Global Warming Policy Foundation.

Executive summary

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Far from making the world a better place, renewable energy will destroy all we hold dear. Is this really what environmentalism has come to mean?

1 Introduction

Worries about global warming have led to a plethora of policy initiatives, but above all to demands that energy production shift from fossil fuels to carbon-free energy sources, and in particular to renewables. However, progress has been slow. The reasons are numerous, and include nimbyism, planning difficulties, problems with integration into distribution grids, and the very high price of energy from most renewable sources. The percentage of world energy that is delivered by renewables therefore remains very low: windfarms, for example, do not even register 1% of energy output.[1]

However, world energy demand is expected to grow by between 10 and 34% in the period to 2060.[2] Electricity needs are expected to grow even faster, with urbanisation and technological advances leading to a doubling of demand over the same period. This being the case, governments are set on a considerable expansion of renewable capacity.

Renewables have a carefully nurtured 'green' image, yet few people can be unaware that they actually have a significant environmental impact. This report sets out to examine that impact, in particular in the UK, both now and at the end of several more decades of expansion. It then goes on to examine the response of those green groups whose *raison d'être* is supposed to be the protection of the environment.

2 Meeting demand from renewables

How much more renewables capacity might be needed in coming decades? The late Professor David Mackay examined how the UK's energy system might be decarbonised in the future, publishing his findings in a book entitled *Sustainable Energy – Without the Hot Air*.[3] Mackay, a Cambridge engineer and chief scientist at the UK government's Department of Energy and Climate Change, looked at several different energy futures. However, he did so only from an engineering point of view; the cost of the change – almost certainly mind-boggling – did not form part of his analysis. He also freely admitted that he was being wildly optimistic about what might be achieved. Nevertheless, his work is widely respected on all sides for its plain and honest approach to the problems of decarbonisation.

In the first part of his book, Mackay tries to determine just how much energy could theoretically be delivered by individual renewable technologies (finding that the total fell some way short of what might have been hoped for). In this paper, I use Mackay's analysis to show the effects such a 'maxing out' might have on the environment. In the second part of his book, Mackay looks at various ways of balancing energy supply and demand, using blends of renewable and other energy sources and dramatic changes to the nature of demand. Others have attempted similar analyses using Mackay's data, and different assumptions and technology mixes. Therefore, a second focus of this paper is to examine what some of these (allegedly) practical decarbonised energy systems might do to our surroundings.

Wind

With windfarms having sprouted in large numbers across the UK, the public is familiar with the effect they have on landscapes. The impact is primarily from the turbines themselves, but also from having to clear forests to make space for the windfarms, building access roads and lastly, but by no means least, from the networks of electricity pylons that are required to connect the turbines to the electricity grid.[4] However, there is also a considerable, and detrimental environmental effect that goes largely unseen.

There are wildlife impacts, for example. The impact on bats is thought to be particularly serious, with turbines causing pressure waves that make their lungs implode. One recent study raised the possibility that whole populations of some bat species might be threatened.[5] Birds, and particularly raptors, may collide with turbines: direct collision might cause 20 avian fatalities per turbine per year although considerably higher numbers have been mooted. There is a further death toll from power lines, with rates estimated at up to 100 per km/yr, mostly through collision.[6] The Beauly–Denny interconnector, which runs across the Highlands of Scotland to connect windfarms in the north with consumers in the south, might be expected to cause 11,000 avian fatalities each year.[7]

Other effects are thought to be likely, but are either not yet proven or will only be seen once there are more windfarms. For example, it has been shown that the noise from offshore windfarms can disturb marine mammals, but long-term detrimental impacts have not yet been demonstrated. Barrier and displacement effects on birds have been demonstrated though. One study found that gulls, white-tailed eagles, northern gannets and skuas are particularly sensitive to the presence of windfarms,[8] and a recent report suggested that more raptors are now being killed by windfarms than through persecution[9] (some species simply fly around them though[10]). Rogue gamekeepers who persecute raptors are pursued by bird NGOs with the full force of the law. Inexplicably, the same NGOs are all but blind to the destruction wrought by windfarm operators.

Another disastrous impact of wind turbines comes from their manufacture. They use extraordinary quantities of resources; an onshore turbine, for example, might need 1400 tonnes of concrete and 80 tonnes of steel in its foundations alone.[11] Production of neither of these commodities is traditionally viewed as 'green'. For offshore turbines, the figures are considerably larger. 3000-tonne concrete bases are already being installed, and bases many times bigger being considered.[12] Floating wind turbines are no better: those in the recently opened Hywind pilot project off Peterhead have steel bases that are 91 m long and weigh nearly 3500 tonnes.[13]

The magnets used incorporate large quantities of neodymium. Most of the world production of this rare earth element comes from Inner Mongolia, where mineral extraction has had an appalling effect on the environment (the image overleaf shows a rare earth mine in Baotou, Inner Mongolia).

Mackay imagined covering the windiest 10% of the UK with turbines.[14] In keeping with the theme of his book, this is wildly ambitious, but would barely raise enough energy to cover the typical commute to work,[15] and certainly not enough to get home again. This is a very poor return for such a large area of land. However, the situation is even worse, because as a glance at Figure 1 shows, the windiest areas of the UK are the upland areas like the Cairngorms, the Pennines and the Welsh Mountains, and the west Coast of Scotland.

Most of these areas are likely to be off limits for windfarm development because of their environmental sensitivity, so delivering the paltry amounts of energy envisaged will require use of less windy areas and a correspondingly larger land area. And yes, we can reduce the environmental impact by going offshore, but even if we ignore the cost implications, think about the environmental impact. To cover just the energy requirements of daily commutes, we would need a 4-km wind band of turbines right round the UK in shallow waters, and another 9-km strip in deeper waters.[16] Hundreds of millions of tonnes of concrete or steel would be required.

It barely needs to be pointed out that the environmental impact of such changes would be devastating. Figure 2 reworks the UK windspeed map, highlighting the windiest 10% of

Opposite: How many more dead birds?

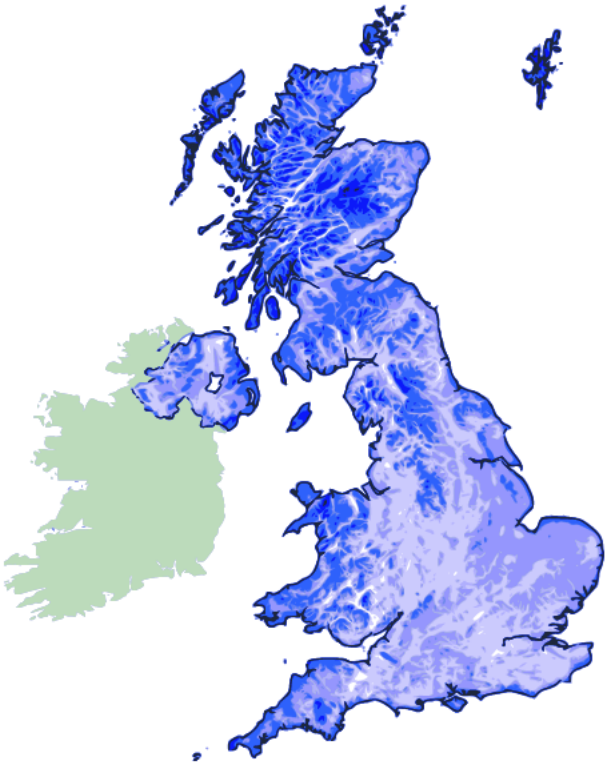


Figure 1: UK wind speed map
Windier areas are in darker shades of blue. Source: Met Office.

the UK land area, as mooted by Mackay. Assuming that much of this area turns out to be off limits to development, then the country would be forced to go into less windy areas: the area in grey is the next windiest 20% of the UK. As can be seen, the Southern Uplands, much of the highlands of Scotland, and the Welsh mountains would still have to be completely industrialised. At this level of windfarm installation, the politically correct refrain of conservation organisations like the Royal Society for the protection of birds (RSPB) – that windfarms are acceptable if correctly sited – are likely to become meaningless. Most locations on which windfarms could plausibly be built would be covered in turbines in practice.

Mackay's 61,000 turbines might be expected to cause upwards of 1 million avian fatalities per year and perhaps even several million.[17] Although appalling, it is worth noting that these numbers are small compared to the estimates of the numbers of garden birds taken by domestic cats each year - perhaps as many as 55 *million*.[18] However, it is worth noting that cats tend to take weak and sickly individuals;[19] wind turbines and electricity cables are not so discriminating. In addition, while cats will take common garden species, windfarms tend to affect:

- species that are rarer or populations that are already under pressure
- species that, because of their foraging habits or sensitivity to disturbance, are likely to be heavily impacted.

One study suggests that the birds most sensitive to windfarms live in precisely those areas where they will have to be installed in practice (see Figure 3).[20] There will simply be no escape for many of our rarest bird species. The result is likely to be a disaster. Is this what the RSPB really, really wants?

Opposite: Rare earth mine in Baotou

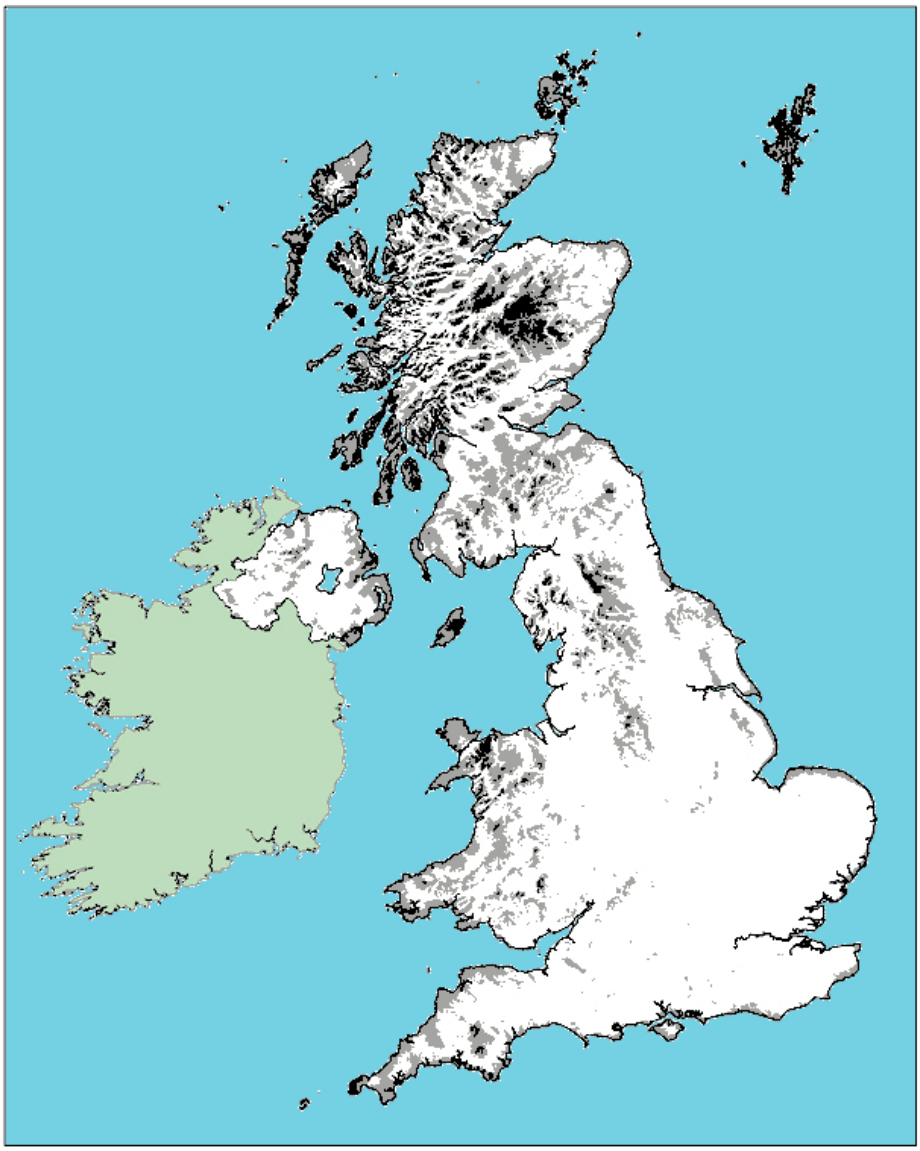


Figure 2: Where can we put all those turbines?
The windiest 10% of the UK is shaded black. The next windiest 20% is in grey.

Bats would not escape either. Although bats are not found on the highest mountains,[22] as noted above, these windiest areas are likely to be off limits to windfarms anyway. However, as wind farms are pushed down into less windy areas, they will increasingly come into contact with bats. For example, the distribution of the Pipistrelle bat, one of the UK's most common species, shows a considerable overlap with areas that are going to have to be used for wind farms. One recent study estimated that the existing wind turbine fleet in the UK might be slaughtering 80,000 bats per year.[23] With Mackay envisaging an increase of nearly an order of magnitude in the number of turbines, it is conceivable that 700,000 bats per year would be killed by the renewables drive, a startling number, when set against a total estimated UK bat population of 2.6 million individuals.[24]

And while it might appear that putting wind turbines out at sea is a more benign approach (if a much more expensive one), in fact it is likely that there would still be an ap-

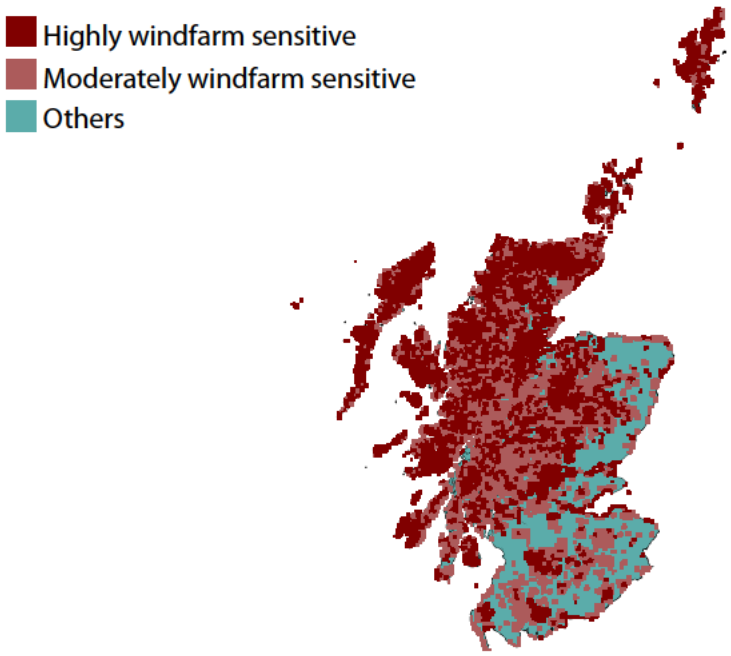


Figure 3: Distribution of windfarm-sensitive bird species across Scotland.[21]

palling price to be paid by wildlife, because where birds and marine mammals can take detours around small windfarms, installations on the scale envisaged by Mackay would almost certainly make it impossible for wildlife to avoid. Who knows what the impact might be?

And all this to deliver just one third of energy demand.[25]

Solar

With solar panels now widely installed around the world, the impacts are, as for wind turbines, relatively well understood. The impacts are slightly different for the three main technologies:

- solar photovoltaics (PV), the familiar solar panels in vast farms or on domestic rooftops
- concentrating solar power (CSP) installations, in which mirrors focus the rays of the sun to a point, heating water, which then drives turbines
- simple heating of domestic hot water using rooftop panels.

For solar PV, the most obvious impact is on the landscape, with a PV installation requiring many acres of space. They are entirely alien to natural landscapes. In addition, there may be some impacts on wildlife: with loss of biodiversity and collision impacts for birds mooted. Barrier effects similar to those caused by windfarms are also likely.

Most of these effects are also relevant to solar CSP installations. This technology is even more land-hungry than solar PV, because they are even more inefficient – the approach is therefore to set up enormous CSP installations in places where land is cheap and the sun shines a lot, typically deserts. However, despite popular belief, deserts are rarely empty. The media have carried prominent stories about birds being literally burned up on the wing as they pass through the concentrated solar rays, with staff at the sites referring the corpses spinning to the ground as 'streamers' (see opposite p. 9). Subsequent research has found that in many cases, the flight feathers were only singed, leading to a loss of the ability to fly

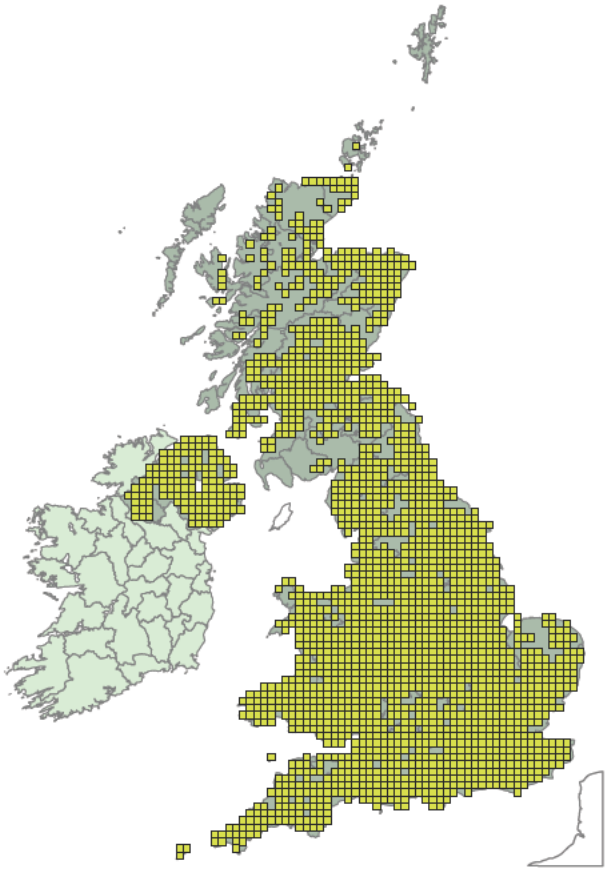


Figure 4: Common pipistrelle bat distribution.
Source: Bat Conservation Trust.

and a slow death through starvation or predation.[26] It was noted during planning for the Ouarzazate solar power station in Morocco that there was a substantial risk to local nesting birds in the area, including the rare mourning wheatear. The project has gone ahead anyway.[27]

The manufacturing processes for photovoltaic panels are also far from green. Many panels are manufactured from silicon, which goes through a two-stage refining process to bring it up to the high levels of purity required. The first stage takes place in an arc furnace, using prodigious amounts of energy, the second also requires high temperatures and involves use of strong acids.

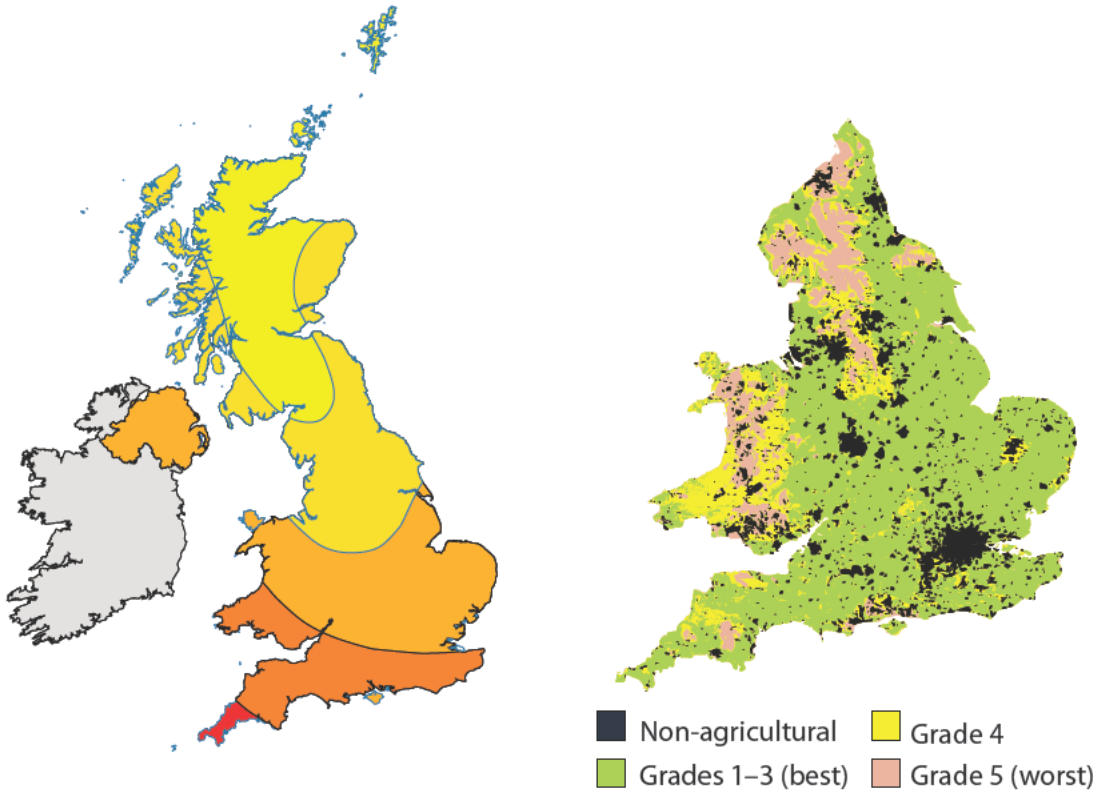
Another environmental impact that is only now beginning to be understood is the problem of what to do with solar panels at the end of their lives. It has already been shown that hazardous materials are washed out of broken solar panels in a matter of weeks,[28] so the issue is likely to become a worldwide problem as earlier generations of panels reach the end of their lives. Mountains of redundant solar panels are already appearing in some countries.[29] While recycling processes do exist, they involve a combination of expensive mechanical procedures and environment-unfriendly chemical ones. And because many of the products of these processes – silicon for example – are low value, the pressure to cut corners, to landfill, or simply to leave the panels to decay will be intense.[30]

So what will the UK look like if we push solar energy as far as we can? David Mackay considered covering 5% of the UK with solar PV farms, which would deliver enough energy

to get the typical commuter to work and back again. Covering every south-facing roof as well would deliver a little more.[31]

5% of the UK is a significant area, equivalent to Cambridgeshire, Gloucestershire, Lancashire and Staffordshire combined.[32] According to Mackay, this level of ambition would require the UK to install 100 times more solar PV than has been installed worldwide to date. Technology offers no way out either because, as Mackay notes, solar panels are already close to their theoretical maximum efficiency in converting light to electrical energy. Solar PV may become cheaper in future, but will still require just as much land.

As Mackay notes, the idea that we do any of this is rather implausible.[33] He does suggest that wind turbines could be installed on the same sites as solar panels, but in the UK at least, the places of high insolation (Figure 5a) are not the same as the windiest places (see Figure 1), so in reality the land required for solar farms would probably have to be in the south of the UK, where there is already considerable pressure on the natural world from housing. And if the best quality farmland is to be kept for food production, then solar panels will have to go on poorer quality land (Figure 5b). The overlap between high insolation and poor-quality land puts many much-loved landscapes under threat. Dartmoor? Exmoor? Do environmentalists really want to see precious landscapes covered in solar panels (and all the pylons and wires required to connect them to the grid)? In what world would this protect rural England, or the birds and other animals that live in it?



(a) Insolation is highest in the south…

(b) …where land quality tends to be high

Figure 5: Where should the solar panels go?

Opposite: Thousands more 'streamers'?

Large-scale hydro

Hydroelectric power plays a key part in electricity generation around the world. In particular, countries that are lauded for generating electricity almost entirely from renewables can only do so because they have ample hydroelectric resources. Costa Rica, the best known example, also has a significant amount of geothermal energy available.

The impacts of large-scale hydro projects are significant. Many are a result of the construction phase, but the unavoidable changes to ecosystems caused by hydroelectric dams are now seen as very serious, with one green NGO citing 'permanent loss of freshwater and terrestrial habitats, drainage of wetland and bogs, and subsequent loss of habitat and species diversity'.[34] A recent scientific review of the sustainability of large-scale hydro power spoke of dams:

> disrupting river ecology, causing substantial deforestation, generating loss of aquatic and terrestrial biodiversity, releasing large amounts of greenhouse gases, displacing thousands of people, and affecting the food systems, water quality, and agriculture near them.[35]

Fish migration can be blocked entirely, and the use of fish passes may only provide a partial solution. There can be ongoing problems with siltation and accumulation of nutrients behind the dam, depriving ecosystems and farmers further downstream of the benefits. Hydroelectric dams also emit carbon dioxide and methane, thus making it hard to understand why climate campaigners tend to see them as part of the solution rather than part of the problem.

A recent article by the doyen of environmental reporters, Fred Pearce, explained how damming of rivers in the Sahel region, south of the Sahara, had caused enormous damage to ecosystems and a great deal of human suffering:

> By blocking rivers, [dams] are drying out lakes, river floodplains, and wetlands on which many of the poorest in the region depend. The end result has been to push more and more young people to risk their lives to leave the region…The Manantali Dam is estimated to have caused the loss of 90 percent of fisheries and up to 618,000 acres previously covered by water.[36]

An article in *Scientific American* wondered if the Three Gorges Dam in China represented, not a way of saving the planet, but an environmental disaster.[37] The dam has a capacity of 22.5 GW. A large gas-fired power station is only one tenth of the capacity, but has considerably less than one tenth of the environmental impact.

As Mackay points out, generation of hydropower needs two things: a large quantity of rainfall and a large drop in altitude. These requirements essentially rule out any schemes placed in lowland Britain: the amount of electricity generated would simply be too small. However, even in highland areas of Britain, there is not much scope for generating large quantities of electricity. If every river was dammed and every drop of water was collected and exploited, you still might only get 7 kWh/day/person. In reality, a much smaller catchment would prove to be exploitable and Mackay guesses this might generate as little as 1.5 kWh/day/person. This is a paltry return for such a large environmental impact.

Damming most of the rivers in the West Highlands (where power per unit area is greatest[38]) with the accompanying 'permanent loss of freshwater and terrestrial habitats, drainage of wetland and bogs, and subsequent loss of habitat and species diversity' is clearly not what most environmentalists imagine their brave new green world would look like. In reality, concern over the environmental impacts of hydroelectric schemes is now so great that

new large-scale schemes are now mostly restricted to the developing world, where the devastation is kept out of sight.

Nevertheless, the green enthusiasts in Whitehall still think it would be possible to double the hydroelectric capacity in the UK, mostly through relatively small projects,[39] so there remains considerable scope for this particular renewable technology to destroy more pristine environments.

Tidal

Tidal power comes in three main variants:

- barrages, which capture a body of water in an estuary at high tide and release it through turbines in the barrage to generate power
- tidal lagoons, which are similar, but with artificial bodies of water created by building retaining walls
- tidal flow, where turbines are placed directly in streams of moving water to generate power in much the same way as a wind turbine.

Despite decades of research, all of these technologies remain in their infancy, with no tidal stream plants or lagoons in commercial operation and few barrages. The impacts are therefore relatively poorly understood.[40] However, for all three types of tidal power, impacts on fish and mammals (sound, strike, loss of habitat) and sedimentation, are considered possible,[41,42] and indeed some environmental NGOs have described these technologies as 'high risk'.[43]

The evidence[44] from the Rance tidal barrage in France, which has been operational since 1966, suggests that there will be:

- severe disruption during construction and then ten years to re-establish equilibrium
- profound changes to ecosystems, with loss of flat fish and sand eels
- fish mortality due to turbines, and sudden changes in water levels
- siltation, converting land within the basin into salt marsh, and causing loss of fish nurseries and bird feeding grounds
- a new equilibrium ecosystem very different to what was there before.

Computer simulations of the effects of tidal flow energy have suggested that the impacts are so significant that the amount of energy extracted from the tides might need to be severely restricted, typically to about 20% of the theoretical maximum and sometimes less.[45] An analysis from the RSPB has found that as little as 168 km^2 of the UK's waters can be categorised as 'prime opportunity' for tidal stream once the environmental and other constraints are taken into account.[46]

Mackay is relatively optimistic about tidal power, and in particular tidal stream power, possibly because it is less likely to come up against public opposition – the environmental costs are out of sight and out of mind – and possibly also because, as noted above, his analysis does not consider costs. He estimates that it might be possible to generate 11 kWh/day/person, with 9 kWh/day/person of this coming from tidal stream plants located at key points in the seas around the UK. It is worth noting, however, that he cannot assess whether any of these sites are exploitable in practice, and he was presumably unaware of the need to restrict output to limit environmental damage.

Another 1.5 kWh/day/person would be delivered by turning the Wash and Morecambe Bay into tidal lagoons, and a little more from a Severn barrage. The Severn barrage scheme was of course cancelled in 2014, after an outcry over the potential environmental damage, but proposals along similar lines have been mooted since the 1920s and are resurrected every five years or so.

The Rance barrage is a small scheme, with a tidal basin of some 22 km^2. The Severn barrage scheme on the other hand, would have been a colossal 500 km^2, with the environmental impacts to match. It would have led to the loss of the intertidal mudflats along the estuary, with a devastating effect on bird and fish species. It would potentially also have increased flooding upriver as far as Gloucester. MPs who looked at the Rance barrage professed themselves shocked by the environmental impact.[47] It is little wonder that the scheme was quashed. Nevertheless, proposals for tidal barrages continue to be mooted, with the Dee, Solway and Humber estuaries all proposed as plausible sites. Lagoons have been proposed for Cardiff, Newport, Bridgwater Bay, Colwyn Bay, and West Cumbria, with another in Swansea now moving closer to reality.[48] The RSPB has described tidal lagoons as a high-risk technology in terms of environmental impact. With so many vast schemes possible, the chance of devastation is dramatic.

Biomass and biofuels

Since the European Union and environmentalists started to encourage the use of liquid biofuels some ten years ago, a plethora of allegedly 'green' technologies have been promoted: domestic and industrial biomass boilers, liquid biofuels, and so on. As the 'industry' has expanded, the adverse effects of such policies have become clear.

In the UK, government policy to increase domestic energy prices to encourage efficiency has led to a boom in the installation in wood-burning stoves, and the inevitable felling of woodlands to fuel them.[49] On a larger scale, the Drax power station in Yorkshire consumes wood on such a scale that pellets are being imported from North America, the forests there being clearcut to meet Drax demand.[50] Unfortunately, the carbon emissions of biomass appear to be similar to those of coal, and therefore approximately double those of gas,[51] and the associated particulate emissions are said by one concerned NGO to be 'worse than coal'.[52] As an energy source, biomass seems to have few redeeming features. Nevertheless, the devastation is being replicated elsewhere. In France, the Gardanne power station will soon burn 850,000 tonnes of wood each year, half of it imported.[53] Even tree stumps are being extracted to burn, leaving nothing for the soil fauna and leading to loss of soil fertility and increased erosion. In its *Black Book of Bioenergy.*, wildlife NGO Birdlife International notes that not even protected forests are escaping the axe in the rush to 'earn' renewable energy subsidies.[54]

Outside of the developed world, biomass burning is of course even less benign. In poorer countries, some 2.5 billion people rely on biomass for cooking, with wood, charcoal and dung the main forms used.[55] Charcoal production is often inefficient and leads to deforestation, while burning dung rather than ploughing it back into fields makes the soil less fertile.

Meanwhile, the rush to increase the use of liquid biofuels has led to hikes in food prices and starvation across the world, land grabbing in Africa and elsewhere, and the felling of rainforests to make way for oil palm plantations, which one writer has described as 'one of the 21st century's greatest ecological disasters'.[56] Nearly half of palm oil consumption in Europe is for incorporation in biodiesel,[57] and the EU has only recently moved towards a

phase out of palm oil in biofuel by 2021. And all this environmental destruction actually seems to have exacerbated the global warming problem: according to one report, carbon dioxide emissions from biofuels are significantly higher than those from diesel, with palm oil the worst biofuel of all.[58]

All this destruction is virtually pointless. As Mackay notes, biofuels are an extraordinarily inefficient way of generating energy – like so many other renewables their demand for land makes them almost entirely uneconomic: if we took *all* of the UK's agricultural land, we could generate barely enough energy to power our commuter's journey home each day. Nevertheless, most observers of the market for renewable energy expect dramatic increases in the use of biofuels. For example, the World Energy Council suggests an increase by a factor of seven by 2030.[59] So while environmentalist concerns have caused 'one of the 21st century's greatest ecological disasters', it appears that this is just the beginning of a headlong rush into environmental armageddon. The demand for land to support the biofuels expansion will increase inexorably and more precious wild places will be lost. The UKERC Energy Data Centre has suggested that marginal lands like the African savannah and the Brazilian cerrado might have to be brought into play, although caveating this idea with a note that the concerns over the environmental impact might be considerable.[60]

3 Eco-disasters from eco-gestures

Small scale and in-river hydro

Small-scale hydro is often presented as more benign than many other forms of renewable energy, but the impacts on fish seem just as serious, and possibly more so, because mitigation measures are seen as less urgent.[61] Once they get larger, the impacts on the landscape can be severe. The Bute Inlet scheme in Canada (now aborted) involved the building of 443 km of power lines, 267 km of roads, and 142 bridges, as well as diverting 17 different rivers.[62]

Mackay notes that these schemes will always be irrelevant to national energy generation:[63] a seven-fold increase in capacity would still only deliver 1.5 kWh/day/person. Nevertheless, the Environment Agency has identified as many as 26,000 suitable sites. This seems like quite a lot of rural development and quite a lot of damage to the natural world for very little return.

Wave

While wave power is often touted as being likely to play a major role in the future energy mix in the UK, in fact it has never been deployed on a commercial basis, so any assessment of the likely impacts is largely theoretical. Possible impacts include coastal erosion, possible pollution from equipment, impact on fish and the wider marine ecosystem, noise, as well as effects on local industries such as fishing and leisure.

Mackay points out that the amount of power that could be extracted from wave power is very limited. A boom along half of the UK's Atlantic seaboard could deliver a meagre 4 kWh/day/person even with absurdly optimistic predictions about efficiency. So wave power is essentially irrelevant to the UK's future. However, this doesn't mean it will not be tried and that the environment will not have to endure the unpleasant side effects.

4 Playing with demand

Mackay is not oblivious to the impossibility of the UK meeting current energy demand using renewables, and the second part of his book is an attempt to try to make ends meet. He does this using a multi-pronged approach. Firstly he reduces his target from the energy required for a typical wealthy person to the amount required on average, losing in particular the enormous energy footprint of the long-haul flights that are mostly the preserve of the better-off. And while the lifestyles of today's rich might normally be expected to be enjoyed by many more people in future, it is not unreasonable of Mackay to try to match current *overall* demand.

He reduces demand by assuming massive changes to the economy, with transport mostly electrified (producing efficiency gains since electric motors are more efficient than internal combustion engines) and heating either not required (through better insulated homes) or produced by heat pumps. And even then, as he freely admits, the energy embedded in imports and food is not taken into account in his figures, so it remains somewhat doubtful whether he really has 'squared the circle'.

Electric vehicles

Playing with demand in this way has not been a happy approach in the past. One early attempt to reduce carbon emissions in the UK was the Blair government's decision to encourage adoption of diesel cars, on the grounds that their carbon emissions were considerably lower than those of their petrol counterparts. The move is now widely seen as an environmental disaster: the high levels of particulate emissions from diesel engines are said to be causing 40,000 deaths from respiratory disease every year (although see below). The mayor of London, Sadiq Khan, even declared it a public health 'emergency'.[64] The result has, of course, been further pressure to switch to electric vehicles.

Unfortunately for their backers, there is now scientific evidence emerging that EVs are not *actually* better than their fossil-fuel equivalents on the particulates front. Contrary to popular belief, the vast majority of transport-related particulate emissions are not from the engines, but instead from tyre and brake wear and so on.[65] However, because EVs are currently on average 25% heavier than ordinary cars, their non-exhaust particulate emissions completely counteract their cleaner exhausts. In other words, the switch to EVs currently looks as though it will make little difference to particulate emissions.

What about the other environmental impacts of EVs? There are already strong hints that they are not going to be nearly as benign as their backers claim. Indeed, quite the opposite. The batteries in Tesla electric cars include substantial amounts of lithium and cobalt, and are said by the US Environmental Protection Agency to have:

> …the highest potential for environmental impacts [including] resource depletion, global warming, ecological toxicity, and human health impacts.

Environmentalists are already concerned about the impacts of mining of both elements, with one lurid report describing 'plumes of sulphur dioxide choking the skies, churned earth blanketed in cancerous dust, [and] rivers running blood-red'.[66] Meanwhile, cobalt mines in the Democratic Republic of the Congo have been accused of using child slave labour and having appalling working conditions.[67] The copper-and-cobalt mining areas around the Congolese city of Lubumbashi are said in one study to be 'among the ten worst polluted places in the world'.[68]

And all this *before* the projected 50–100-fold increase in EV numbers in the next decade and a half.[69]

And the rest

Other aspects of Mackay's attempts to reduce demand are less alarming. In terms of environmental impact, insulating old houses and installing heat pumps are largely benign approaches, although there are other concerns, not least the cost. Ground-source heat pumps tend to be inadequate in very cold weather and so require backup from traditional heat sources. Blown cavity wall insulation frequently leads to damp and is therefore potentially disastrous for homeowners. One estimate suggests as many as three million homes may have been affected.[70] But these are not the concern of the environmentalist.

5 Squaring the circle

After proposing all these measures to reduce demand, Mackay ultimately comes up with a series of plans to meet the remaining demand, and invites interested members of the public to come up with their own proposals too. To facilitate this, he and his colleagues at the then Department of Energy and Climate Change set up the 2050 Calculator website,[71] a simple web interface that allows users to develop their own plans to meet the government's decarbonisation target while balancing supply and demand.

As far as Mackay's own example plans are concerned, some elements are consistent. One of these is the idea of using 30,000 km^2 – focusing on poorer quality agricultural land – to grow wood and special energy crops such as miscanthus grass. As noted above, the problem with this idea is that most of the poor-quality land – agricultural grades 4 and 5 – is off-limits, being of environmental importance or otherwise unsuitable for cultivation of energy crops. That leaves 85,000 km^2 of suitable land in Great Britain, the vast majority of it in England.[72] A small part of this is high-grade land, which will not be used unless the price is right. That means that most of the land used will be of grade 3, which is described as 'moderate' or 'good' land. This is the bread and butter of British farming, representing the vast majority of agricultural land. But a third of it would be used, under Mackay's plans, for a single crop. It's hard to equate this with care for the environment.

Another common element is that a proportion of biofuels is used in the transport system. Unfortunately, this would require use of a further 12% of the UK's land area, another 30,000 km^2 of grade 3 land.[73]

The numbers don't really give a feel for the impact, so Figure 6a tries to do this. Each square is approximately 1000 km^2 and there are 60 of them, 30 light blue for biofuels and 30 dark blue for biomass. The distribution is intended to be approximately representative of where the suitable land is located, so the mountainous regions, scenic districts in the South-West and the high-quality farmland of Cambridgeshire are avoided. Data on land availability in Northern Ireland is not consistent with the rest of the UK,[74] but I have assumed that some energy crops will be planted there. What is clear is that much of the UK would essentially become a monoculture.

After that, the environmental impact varies depending on which of Mackay's plans is looked at. For example, in Plan G, he proposes generating 32 kWh/day/person from wind power. The area required would depend on where the windfarms were located, but it is presumably unlikely to be onshore, since so much of the suitable land is environmentally

sensitive. Figure 6b assumes that they would be placed in deeper offshore waters and the 26 1000 km^2 squares shown represent the area Mackay suggests would be required, with placements based those shown in his map.[75] With this arrangement, birds in Scotland are largely unaffected, but it is hard to imagine that traversing 20 miles of wind turbines[76] might not be a problem for birds further south, such as the gannets that feed on the Dogger Bank.[77] You could build more windfarms but in smaller blocks and spread them out more, but then more birds are affected. The choice is between a cull of a large population or a massacre of a smaller one. Enthusiasts for wind power must choose.

From the text of Mackay's book it is possible to get a sense that he realises the absurdity of most renewables. In several of his plans he uses a large proportion of nuclear energy and/or 'clean coal'. However, his book was published in 2009, thus predating the shale revolution. Mackay later became something of an enthusiast for shale gas, noting its carbon footprint was much better than that of coal,[78] so it is likely that he would have switched to natural gas in these plans.

But circumstances have also changed for another of Mackay's ideas. While he had limited enthusiasm for solar panels in the UK – as we have seen, his ideas for bioenergy mean that there was essentially no space for this other than a small amount produced by covering all rooftops with solar panels – he was keen on the idea of importing solar energy from other countries. As he pointed out, the world's current energy needs can theoretically be provided from a mega-CSP power station with an area of 1 million km^2 (a square measuring 1000 × 1000 km); its future energy could come from two such areas. Whether this is at all plausible in the political world that exists after the Arab Spring is another question.

And the environment suffers too, despite the popular idea that deserts are empty voids. In the USA, the Ivanpah CSP station had to be scaled back because of the risk to the endan-

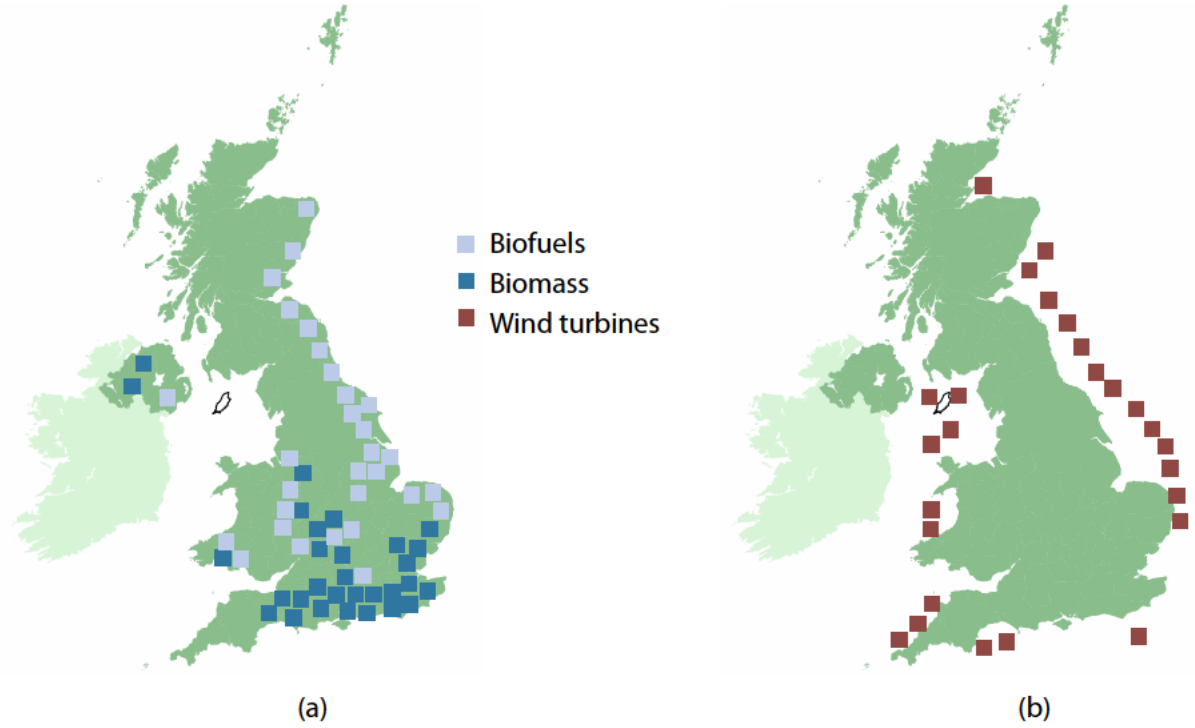


Figure 6: Impact of renewables.
(a) 60,000 km^2 of biofuels and biomass; (b) 26,000 km^2 of offshore wind turbines.

Opposite: Ourzazate: 1 million km^2 of this?

gered desert tortoise; similar problems have affected many other CSP power stations.[79]

And there is little popular understanding of another environmental problem with solar power stations: they actually consume quite a lot of water. With CSP, most of this is for the cooling systems, but some is also needed to ensure cleanliness of the mirrors so that power output is maintained at high levels. The huge Ouarzazate 1 station in Morocco has an area of 4.5 km^2 and uses 1.7 million m^3 of water per year[80] – much more than an equivalent coal-fired power station. It is no accident that the plant is built near a major reservoir. Scaling these values up, Mackay's mega CSP plants would use 756 billion m^3 of water per year, which is nearly a third of the amount of water that falls in the Arab world each year (2576 billion m^3). The idea of scaling up Ouarzazate I is therefore obviously absurd.[81] Fortunately, the second and third phases of the Ouarzazate station use a dry cooling system, which although using less water, is also less efficient at generating electricity. And solar PV appears to be little better. The Adani solar power station in Tamil Nadu, India, uses 200,000 litres of water per day to keep the panels clean.[82]

It is probably also not fair to try put the energy burden of the whole world in North Africa – Americans and Asians have their own deserts. Mackay says that 340,000 km^2 might be required to power Europe and North Africa; scaling up on the basis of a dry-cooled power station suggests that 6 billion m^3 of water might be needed. This is about 12% of what North Africa currently extracts in ground and surface water.[83] In a such a dry region, this is probably unsustainable and almost certainly environmentally disastrous.

6 Environmentalists plan the future

Mackay would probably not disagree with most of what I have written above. As he put it in his book:

> If you don't like these plans, I'm not surprised. I agree that there is something unpalatable about every one of them. Feel free to make another plan that is more to your liking.

While many might use a stronger term than 'unpalatable', this section examines a few of the proposals put forward by others. Usefully, a range of pathways are presented on the 2050 Calculator webpage, and several of these come from green NGOs, so we can see how environmentalists hope to balance the competing demands of humanity, the natural world, and their own fundraising rhetoric. The proposals I will consider come from Friends of the Earth (FoE), the Sustainable Energy Association (SEA), and the Campaign to Protect Rural England (CPRE). In addition, I will discuss an RSPB plan, which although based on the 2050 calculator is not published in the same format.[84] Unfortunately, the 2050 Calculator does allow users a considerable degree of leeway about how they make ends meet, and all three green NGOs exploit this to the maximum. For example, the core of FoE's plan is a near-halving of demand,[85] achieved by moving passengers to public transport and road freight to rail, electrifying transport, manufacturing and cooking, and reducing average room temperatures to 17°C. This is, of course, all rather implausible.

In addition, the calculator allows choices in energy generation that are hard to justify with current levels of technology. A significant proportion of FoE's energy is going to be supplied by gas/biogas power stations equipped with carbon capture and storage (CCS), despite the fact that CCS for gas may never be economic at the low load factors envisaged (and despite FoE's vehement opposition to shale gas developments).[86] Wave and tidal stream turbines are also assumed to carry a share of the burden, despite never having been proven at scale.

With so many drawing board technologies being considered it is hard to understand why nuclear fission is not on the list too.

Nevertheless, even with these dramatic reductions in demand, the green NGOs still come up with plans that will alarm anyone who cares about the natural world.

Bioenergy

Both FoE and CPRE plan to plant vast areas of bioenergy crops.[87] This seems an inexplicable position for organisations that claim to be opposed to monocultures.[88] Indeed, in the case of CPRE it would appear to be a direct contravention of their mission to protect rural England: biofuels on this scale would have an appalling impact on landscapes, wildlife and rural economies. What is worse, the underlying calculations assume that there will be compound growth in yields, sustained for over 50 years.[89] This gives – on paper at least – a considerable reduction in the amount of land required, but if the improvement does not materialise (and we should remember that most green groups oppose genetically modified crops, the most likely source of yield gains), a much larger area will have to be taken out of food production and replaced with energy crops. Rural England will lose, and the campaign for its protection will be the culprit.

The RSPB, who, you might imagine, would be keen to avoid covering agricultural land with energy crop monocultures, claims that it will use much less land[90] for energy crops. However, it is only able to do this by assuming implausibly high energy yields per acre.[91] In reality, they would probably need 10,000 km^2 to generate the power they want. Given that they have identified only a fraction of that area with a low ecological risk to birds and wildlife,[92] its own plans would be just as damaging to landscapes, wildlife and of course birds as those of CPRE and FoE.

But all of these groups pale into insignificance next to the Renewable Energy Association (REA), which believes that we should cover a quarter of the UK's main agricultural land in energy crops. One wonders what CPRE has to say about this.

Onshore wind

Green groups are also surprisingly keen on onshore wind, with FoE wanting 9000 turbines and the RSPB envisaging up to 17,000. As we have seen, these windfarms are going to kill large numbers of birds and bats and cause terrible pollution in China. Thousands of square kilometers of mountain landscapes would be desecrated.[93] The blow is softened somewhat because the calculator assumes that onshore wind farms can capture energy at a rate of 2.5 W/m^2, implying land use of 4000 and 7000 km^2 for FoE and the RSPB, respectively. However, Mackay has stated that 2 W/m^2 is the absolute maximum likely onshore – a typical value for an existing windfarm would be 1.4 W/m^2, and these figures are likely to be lower in future as the best sites are increasingly occupied and windfarms need to be installed on lower ground.[94] Thus the correct figures for the land required may well be at least 5000 km^2 for FoE and 8000 km^2 for the RSPB.[95]

Offshore wind

Offshore wind is a similar story, with FoE and the REA wanting 12,000 5.8-MW turbines occupying 13,000 km^2 and the CPRE wanting even more. The RSPB's High Onshore scenario

sees only 4 km^2 of turbines, although there are 33,000 km^2 in its High Offshore plan, which would present a considerable barrier to ocean birds and mammals.[96]

The areas involved are monstrous enough. Now consider the pollution. A 2 MW wind turbine apparently includes around 350 kg of neodymium in its magnet. If we scale that up proportionally for the larger turbines needed, a ton of neodymium may be required for each machine in the RSPB's plans. With an optimistic lifetime of 20 years, that will mean between 1000 and 3000 tons per year of extra production. World production is currently 21,000 tons per year, so we are considering a 10% increase in world production to meet the extra demand *from the UK alone*. It is hard to imagine the environmental devastation if other countries plan their energy systems on the same basis.

Large-scale hydro

Despite the RSPB's horror of hydroelectric schemes, other green groups seem quite keen to use them. FoE envisages a near-threefold expansion of large-scale hydropower, with 100 km^2 of new reservoirs exploiting – and if the RSPB is to be believed, irreparably damaging – a catchment area of 5500 km^2.

And recall that these figures are predicated on reducing demand by more than 40%, which many would suggest take them into the realms of the implausible. Add to that the reliance on technologies that are unproven at scale (CCS and storage, tidal flow, wave) or that are likely to be impractical (solar in deserts) and the whole exercise starts to look like fantasy. When reality bites, the impact will once again be felt by the natural world.

What happens to our wild places?

In the 2050 Calculator, the 'Other' land category - those areas not used for agriculture, settlements or forest – is expected to shrink dramatically under *every* land-use scenario. This category includes the wild areas so beloved of the general public and, of course, environmentalists too. CPRE and FoE have both opted for a scenario that involves the loss of 37% of these areas. The Campaign for Sustainable Energy's choice leads to losses of 44%. With 'friends' like this, who needs enemies?

Table 1: Land requirements for green groups' energy plans.

	FoE	CPRE	SEA	RSPB*	
	Area required (000 km^2)				
Onshore wind	6	1	1	9	Assuming 1.4 W/m^2
Biofuels	12	12	24	10	Correcting for no yield gain
Forest	30	30	34	?	Per calculator
Hydro catchment	5	3	3	3	Per calculator
Total onshore impact					
Offshore wind	13	14	13	4	At 2.5 W/m^2 (per calculator)
Energy crops overseas†			13	13	
Energy imports		1	1	1	

*High Onshore scenario. †The RSPB and SEA envisage 13,000 km^2 being in other countries, thus damaging their wildlife and landscapes rather than ours.

Opposite: Concreting the moors for turbine foundations

The best case envisaged is a loss of 30% of these areas. With a more aggressive approach to shifting land into the service of the atmosphere, losses of over 40% are envisaged. It is quite possible that the losses of wild places will be worse still, since the 2050 Calculator assumes that food yields will improve by a minimum of 0.9% per annum, an improvement of more than 50% by 2050. In some scenarios, it assumes improvements of 1.5% per annum, and more than 80% more food per acre by 2050. These values are 2–4 times higher than those envisaged in the literature.[97] It is quite possible that we might need to find another 10,000 km^2 of land for food, or import it from elsewhere. In either case, the natural world will be the loser.

7 Conclusions

David Mackay knew all this. Just before his untimely death he gave an interview to the environmentalist, Mark Lynas. A report of the encounter quoted him as follows:

> There is this appalling delusion that people have that we can take this thing that is currently producing 1% of our electricity and we can just scale it up and if there is a slight issue of it not adding up, then we can just do energy efficiency…Humanity really does needs to pay attention to arithmetic and the laws of physics – we need a plan that adds up.[98]

It must be clear that the renewables sums do not add up (and indeed that many green organisations pay no attention to arithmetic!). Mackay was convinced that the future lay with nuclear power and fossil fuels, the emissions of the latter mitigated with CCS.

Nevertheless, the 'appalling delusion' that the future will be powered by renewables still forms the central plank of the energy policies of almost every UK political party. Almost every green NGO still claims to support the idea too. 'The UK can be almost entirely powered by renewables', says Greenpeace.[99] 'We can now see a future where almost all our electricity comes from the wind, wave and sun', says Friends of the Earth[100] (a very different tale to the results they published for the 2050 Calculator, in which fossil fuels continue to provide around 40% of supply, most of it imported[101]). Only the 'miraculous' intervention of CCS prevents this being a problem.

We expect little from militant campaigning groups like Greenpeace and Friends of the Earth. Their continued existence depends on maintaining a steady income, which depends in turn on being able to scare members of the public into handing over their money. However, we normally expect higher standards from the more 'respectable' participants in the environmental debate. So it is hard to understand why the RSPB and the CPRE are willing to continue to support the expansion of renewables.

It is beyond doubt that onshore technologies such as wind, biofuels and solar, if deployed on the scale envisaged by these two organisations, would have an appalling effect on the natural world. The birds and rural landscapes that these two eminent bodies claim to protect would suffer unimaginably.

And the reality would be much, much worse than this. The environmentalists' plans rely on fossil fuels equipped with CCS for a very significant proportion of their energy supply: 40% in the plans of FoE and CPRE. Yet CCS is currently a mirage, and an extraordinarily expensive one too.[102] So the output of renewables would almost certainly have to be at nearly twice the level in these plans, which, as noted above, already assume reductions in demand that border on the absurd.

If the country really were powered by renewables on the required scale, the result would be devastation. Tens of thousands of square kilometres of the UK would be ruined. The wilful blindess of the RSPB and CPRE to the wholesale destruction they are supporting is wholly culpable. It appears as if they have simply decided to betray their members and sacrifice what they were sworn to protect, because some scientists told them it would be hotter in a century's time. How shameful.

Notes

1. Ridley M. Wind turbines are neither clean nor green and they provide zero global energy. The Spectator, 13 May 2017.
2. BP Statistical Review of World Energy (2015) https://www.bp.com/content/dam/bp/pdf/energy-economics/statistical-review-2015/bp-statistical-review-of-world-energy-2015-full-report.pdf.
3. Mackay D. Sustainable Energy – Without the Hot Air. UIT Cambridge, 2009. The book is freely available on the web at www.withouthotair.com.
4. Although sometimes power lines are buried. This reduces the visual impact, but adds significantly to the cost.
5. Frick WF et al. Fatalities at wind turbines may threaten population viability of a migratory bat. Biological Conservation, 2017; 209: 172–177.
6. http://datazone.birdlife.org/sowb/casestudy/powerlines-pose-a-threat-to-italian-birds. The authors reported results for high-voltage (HV, 40–380 kV) and medium-voltage (MV, 1–40 kV) lines. There were minimum fatality rates of up to 0–87/km through collision and 2–20/km through electrocution.
7. Allowing half of the 100 deaths per km cited in the previous reference for the 220 km length of the interconnector.
8. Furness RW et al. (2013) Assessing vulnerability of marine bird populations to offshore wind farms. Journal of Environmental Management, 119, 56–66.
9. Cramb A. (2014) Wind turbines have killed more birds of prey than persecution this year. Telegraph, 29 October. http://www.telegraph.co.uk/news/uknews/scotland/11196172/Wind-turbines-have-killed-more-birds-of-prey-than-persecution-this-year.html.
10. Drewitt AL and Langston RHW (2006) Assessing the impacts of wind farms on birds. Ibis (2006), 148, 29–42.
11. Figures from http://penycymoedd.vattenfall.co.uk/constructing-turbine-foundations-in-pictures/, with their 600 m^3 value for concrete converted to tonnes.
12. Ruiz de Temiño Alonso, I. Gravity base foundations for offshore wind farms. MEng dissertation, University of Cantabria. https://repositorio.unican.es/xmlui/bitstream/handle/10902/3429/Ruiz%20de%20Temi%C3%B1o%20Alonso%20Ismael.pdf.
13. https://www.offshorewind.biz/2017/05/29/statoil-floats-first-hywind-scotland-foundations-off-stord/.
14. Mackay gives the area occupied by the 140 turbines of the Whitelee windfarm at 55 km^2, which amounts to 2.5 turbines per square kilometre. 10% of the UK is 24,250 km^2, so covering it would take 61,000 turbines.
15. Mackay suggests that this is around 25 km.
16. According to Mackay, wind around the UK could deliver 16 kWh/day/person, which would require some 44,000 3-MW turbines, occupying an area two thirds the size of Wales or a strip 4 km wide around the whole of Great Britain. Deeper waters might deliver a larger figure of 32 kWh/day/person, but the turbines required would then occupy a strip of water 9 km wide around Britain.
17. Figures of 20 per turbine are plausible. See discussion in Drewitt AL and Langston RHW. Op. cit.
18. RSPB. Are cats causing bird declines? https://www.rspb.org.uk/get-involved/community-and-advice/garden-advice/unwantedvisitors/cats/birddeclines.aspx.
19. Ibid.

20. Bright J et al. (2008) Map of bird sensitivities to wind farms in Scotland: A tool to aid planning and conservation. Biological Conservation 141; 2342–2356. http://www.academia.edu/download/45616197/Map_of_bird_sensitivities_to_wind_farms_20160514-29229-1sngoj5.pdf.
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About the Global Warming Policy Foundation

The Global Warming Policy Foundation is an all-party and non-party think tank and a registered educational charity which, while openminded on the contested science of global warming, is deeply concerned about the costs and other implications of many of the policies currently being advocated.

Our main focus is to analyse global warming policies and their economic and other implications. Our aim is to provide the most robust and reliable economic analysis and advice. Above all we seek to inform the media, politicians and the public, in a newsworthy way, on the subject in general and on the misinformation to which they are all too frequently being subjected at the present time.

The key to the success of the GWPF is the trust and credibility that we have earned in the eyes of a growing number of policy makers, journalists and the interested public. The GWPF is funded overwhelmingly by voluntary donations from a number of private individuals and charitable trusts. In order to make clear its complete independence, it does not accept gifts from either energy companies or anyone with a significant interest in an energy company.

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34	Humlum	State of the Climate 2018
35	Peiser (ed)	The Impact of Wind Energy on Wildlife and the Environment
36	Montford	Green Killing Machines

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THE DARK SIDE OF "RENEWABLE" ENERGY

- **Environment Destruction, Toxic Technology, Toxic Waste**
- **Inefficient Technology, Outdated Technology**
- **Solar Farms, Wind Farms, Batteries – Who Benefits? Who Pays?**

ABSTRACT

The stated premise for the reduction in the man-made production of CO2, by the "anthropogenic climate change" believers, is to prevent an *existential threat* to human civilization and the environment. If this is the case, it is therefore critically important to consider the impact on human civilisation and the environment caused by wind farms, solar farms and batteries.

Compiled by Bill Stinson

20th January 2021

Introduction

Is the proposed “remedy” worse than the perceived “problem”?

Is this a case of:

Destroy the “environment” to save the “environment.”

UN Secretary- General, Antonio Guterres, at the R20 Austrian World Summit in Vienna on 15 May 2018, reiterated his belief that global warming posed an “existential threat” to humanity.

On the 11 January 2021 at the United Nations One Planet Summit, Antonio Guterres remarked:

“The main goal of the United Nations in 2021 is to build a truly global coalition for carbon neutrality. Every country, city and business must adopt an ambitious roadmap to achieve net zero emissions by 2050”

What is the “existential threat” as espoused by Antonio Guterres.

“In 2019, the phrase *existential threat* became increasingly common in consideration of the climate crisis, often discussed as an *existential threat* to human civilization and the environment as we know them” (*dictionary.com*).

What began as “global warming” in the 1980’s has now morphed into “climate change” because of the failed predictions of imminent environmental destruction determined by numerous computer models. The Earth’s climate having failed to act in accordance with those dire predictions of “catastrophic warming” is now the subject of indeterminate “climate change”.

What is “carbon neutrality”? According to Antonio Guterres and the many disciples of the “climate change” belief, Carbon Dioxide (CO2) is the culprit, driving, as perceived by them, climate upheaval or “climate change”. So, they believe, to prevent indeterminate “climate change”, the man-made production of CO2 must be curtailed. This, according to them, means the phasing out of the use of fossil fuels for (among other things) electricity generation and replacing them with “green” generation of electricity by wind farms and solar farms backed up with batteries.

The stated premise for the reduction in the man-made production of CO2, by the “anthropogenic climate change” believers, is to prevent an *existential threat* to human civilization and the environment. If this is the case, it is therefore critically important to consider the impact on human civilisation and the environment by wind farms, solar farms and batteries.

“Renewable energy technologies, electric vehicles and battery storage require high volumes of environmentally sensitive materials. The supply chains for these materials and technologies need to be appropriately managed, to avoid creating new adverse social and environmental impacts along the supply chain.”
(*UTS – Institute for Sustainable Futures – Responsible Materials Sourcing for Renewable Energy Report - April 2019, page i*)

Environment Destruction, Toxic Technology, Toxic Waste

Let us consider the life cycle phases of wind farms, solar farms and batteries:

Phase 1 – Raw material sourcing – Environment Destruction

"A global "gold rush" for energy materials will take miners into remote wilderness areas (that) have maintained high biodiversity because they haven't yet been disturbed."
(*Praeger University, Mark Mills – What's Wrong with Wind and Solar – at 3.06 https://www.youtube.com/watch?v=RqppRC37OgI&feature=youtu.be)*

"The mining industry necessarily uses oil for heavy machinery, often to generate electricity in remote locations. Global mining already uses nearly twice as much petroleum as the entire country of Germany, and that's before the emerging "gold rush" for energy minerals. The global push for Electric Vehicles will drive up demand for a variety of other energy minerals from 200% to 8,000%. Mining can be done responsibly, but new mines aren't likely to open in America or Europe. Consequently, a handful of environmentalists have begun to worry about the invasion of pristine and fragile ecosystems around the world in hot pursuit of mineral wealth."
(*Mark P Mills – Washington Examiner – Energy & Environment – "The Myth of the Great Energy Transition" – October 1, 2020)*

Phase 2 – Raw material mining – Environment Destruction, Human Rights Abuse, Toxic Waste

"The transition towards a renewable energy and transport system requires a complex mix of metals – such as copper, cobalt, nickel, rare earths, lithium and silver – many of which have only previously been mined in small amounts. Under a 100% renewable energy scenario demand for these metals could rise dramatically and require new sources of primary and recycled metals."
(*UTS – Institute for Sustainable Futures – Responsible Materials Sourcing for Renewable Energy Report - April 2019 page ii*)

"Demand from renewable energy and storage technologies could exceed reserves for cobalt, lithium and nickel, and reach 50% of reserves for indium, silver, tellurium. Reserves are the estimated amount of a mineral that can be economically mined under current conditions. Reserves are a subset of resources, which are the total known amount of a mineral for which extraction may potentially be feasible."
(*UTS – Institute for Sustainable Futures – Responsible Materials Sourcing for Renewable Energy Report - April 2019 page iii*)

"Mining to supply renewable energy technologies occurs in a large number of countries, but a smaller number of countries dominate production. China is the largest producer of metals used in solar PV and wind technologies, with the largest share of production for aluminium, cadmium, gallium, indium, rare earths, selenium and tellurium. In addition, China also has a large influence over the market for cobalt and lithium for batteries. While Australia is the largest producer of lithium ….. The largest lithium mine, Greenbushes in Western Australia, is majority owned by a Chinese company. Similarly, while DR Congo mines more than half of the world's cobalt, '' '
(*UTS – Institute for Sustainable Futures – Responsible Materials Sourcing for Renewable Energy Report - April 2019 page 28*)

"Most of the world's rare earth ores are extracted near Baotou, Inner Mongolia by pumping acid into the ground, then processed using more acids and chemicals. Producing one ton of rare earth metals releases up to 420,000 cubic feet of toxic gases, 2,600 cubic feet of acidic wastewater, and a ton of radioactive waste. The resulting black sludge is piped into a foul,

lifeless lake. Numerous local people suffer from severe skin and respiratory diseases, children are born with soft bones, and cancer rates have soared."
(*The staggering human costs of "renewable" energy – Paul Driessen - Energy - August 9th 2020, page 1*)

"This report documents the hazardous conditions in which artisanal miners, including thousands of children, mine cobalt in the Democratic Republic of the Congo. It goes on to trace how this cobalt is in batteries. Using basic hand tools, miners dig out rocks from tunnels deep underground, and accidents are common. Despite the potentially fatal health effects of prolonged exposure to cobalt, adult and child miners work without even the most basic protective equipment. This report is the first comprehensive account of how cobalt enters the supply chain of many of the world's leading brands"
(DEMOCRATIC REPUBLIC OF CONGO: "THIS IS WHAT WE DIE FOR": HUMAN RIGHTS ABUSES IN THE DEMOCRATIC REPUBLIC OF THE CONGO POWER THE GLOBAL TRADE IN COBALT - Amnesty International Report - 19 January 2016, pdf page 92)

The pollution resulting from rare-earth mining has created soil incapable of supporting crops and water supplies have been contaminated.

"Chinese officials have attempted to counteract these threats by shutting down a large number of mines, especially the smaller and the illegal ones, but there are still severe, large-scale threats that remain unresolved. From north near the Mongolian border to south in Guangdong, China is struggling to clean-up the environment polluted by mining and some claim they are making things worse. The clean-up process is expensive and time-consuming, and some say it could be 50-100 years for the environment to recover."
(How Rare-Earth Mining Has Devastated China's Environment BY EARTH.ORG ASIA JUL 14th 2020)

"Several types of wind turbine, such as the permanent magnet synchronous generator (PMSG), require magnets that orient wind turbines into the wind. These magnets contain rare metals such as neodymium (Nd), praseodymium (Pr), terbium (Tb), and dysprosium (Dy). The estimated demand for Nd is projected to increase from 4000 to 18,000 tons by 2035, and for Dy from 200 to 1200 tons. These values represent a quarter to a half of current world output. There are also concerns over the amount of toxic and radioactive waste generated by these mining activities."
"Energies - MDPI.com - Energy and Climate Policy—An Evaluation of Global Climate Change Expenditure 2011–2018. Published 16 September 2020"

Phase 3 – Raw material processing - Environment Destruction, Human Rights Abuse, Toxic Waste

"While Australia is the largest producer of lithium, the majority of this is shipped to China for processing….. Similarly, ……. China is the leading producer of refined cobalt ….. With a large share of the manufacturing of solar PV and lithium-ion batteries, China is also a large end-market for many of the metals, as well as the largest market for the technologies. Australia, Chile, DR Congo and South Africa have large shares of the production of metals for lithium-ion batteries. Japan, Korea, Canada and Russia have significant production levels of metals for PV, in addition to China '' '
(*UTS – Institute for Sustainable Futures – Responsible Materials Sourcing for Renewable Energy Report - April 2019 page 28*)

"The manufacture of solar panels requires significant natural resources including quartz, coal, silver, copper and highly toxic rare earth elements. Mining those resources is damaging to the environment and destroys habitats.

Processing those natural resources requires generation of significant amounts of electricity. In particular, construction of photovoltaic (PV) cells (i.e. solar cells) requires the extraction of silicon from quartz (i.e. silicon oxide) using carbon. "The first step of solar PV production is gathering, transporting and burning millions of tons of coal, coke and petroleum coke – along with charcoal and wood chips made from hardwood trees – to smelt > 97% pure mg-Si from quartz". Large quantities of coal, coke, charcoal and woodchips must be burnt, with a

consequential substantial release of CO2 into the atmosphere. A "vast amount of deforestation [is] necessary for solar PV production"
(Why Do We Burn Coal and Trees to Make Solar Panels? Thomas Troszak, 14 November 2019, para 2, paras 3 and 15 and reference notes [14] to [16])

"They've long wanted a totally electric vehicle (EV) fleet, which they claim would be clean, ethical, climate-friendly and sustainable. Of course, those labels hold up only so long as they look solely at activities and emissions within California state boundaries – and not where the mining, manufacturing and electricity generation take place. That kind of "life cycle" analysis would totally disrupt their claims.
Consider copper. A typical internal combustion engine uses about 50 pounds (23 kilograms) of this vital everyday metal, the International Copper Association says. A hybrid car requires almost 90 lb (40 kg); a plug-in EV needs 132 lb (60 kg); and a big electric bus can use up to 812 lb (369 kg) of copper. If all 15,000,000 California cars were EVs, they would need almost 1,000,000 tons of copper.

But copper ores average just 0.5% metal by weight, notes energy analyst Mark Mills. That means 200,000,000 tons of ore would have to be dug up, crushed, processed and refined to get that much copper. Almost every step in that process would require fossil fuels – and emit carbon dioxide and pollutants."
(*The staggering human costs of "renewable" energy – Paul Driessen - Energy - August 9th 2020, page 1*)

Phase 4 – Approval – Supply Chains – Modern Slavery, Human Rights Abuse?

"This Act requires entities based, or operating, in Australia, which have an annual consolidated revenue of more than $100 million, to report annually on the risks of modern slavery in their operations and supply chains, and actions to address those risks. Other entities based, or operating, in Australia may report voluntarily.

The Commonwealth is required to report on behalf of non-corporate Commonwealth entities, and the reporting requirements also apply to Commonwealth corporate entities and companies with an annual consolidated revenue of more than $100 million."
(Commonwealth of Australia – Modern Slavery Act No 153, 2018 Clause 3)

"Part 3 Supply chains
24 Transparency of supply chain"
(Modern Slavery Act 2018 No 30 [NSW])

"One of the most shocking new developments since the Conservative Party Human Rights Commission's previous report in 2016 is the revelation that forced labour is now used throughout China in factories which are part of the supply chains of major international corporations. This is revealed through evidence presented directly to our inquiry by several oral witnesses and in several written submissions, and detailed particularly in the report by the Australian Strategic Policy Institute (ASPI) titled *Uyghurs for Sale: 'Re-education', forced labour and surveillance beyond Xinjiang.* That report claims that "the Chinese government had facilitated the mass transfer of Uyghur and other ethnic minority citizens from the far western region of Xinjiang to factories across the country. Under conditions that strongly suggest forced labour, Uyghurs are working in factories that are in the supply chains of at least 83 well-known global brands in technology, clothing and automotive sectors, including Apple, BMW, Gap, Huawei, Nike, Samsung, Sony and Volkswagen."
(The Darkness Deepens – The Crackdown on Human Rights in China 2016-2020 – The Conservative Party Human Rights Commission – January 2021, page 47)

"As US moves to renewable energy, wind turbines from Xinjiang may get caught in political tempest.

- Xinjiang-based Goldwind has supplied material for a large US project that will deliver clean wind power for Microsoft.
- As more information emerges about **the suspected use of forced labour in the region**, the US government has begun restricting trade from the area."

(https://www.scmp.com/news/china/article/3115771/us-moves-renewable-energy-wind-turbines-xinjiang-may-get-caught - US-China Relations, Jacob Fromer and Cissy Zhou 30 December 2020)

"EU-China Comprehensive Agreement on Investment opens manufacturing options, dodges forced-labour issues

The European Commission has finalized its long-anticipated investment agreement with China. While some renewable energy businesses might benefit from improved investment security, IP protection and access to legal remedies in China, the Commission did not address the issue of Uyghur forced labour in China. As a majority block in the European Parliament had previously demanded from the Commission to develop a firm policy to end forced labour in China, there is reason for doubt that the agreement as it stands will be adopted by the EU Parliament."

(PV Magazine – January 13, 2021)

Phase 5 – Fabrication – Large Scale Environment Destruction

"Wind power is not carbon neutral nor environmentally neutral. The construction of a 2 MW wind turbine requires approximately 150 tonnes of coal to make the required steel and concrete with the consequent CO2 emissions. They also require carbon-fibre, resins and rare-earth elements."

(Wind Turbines Are Neither Clean Nor Green And They Provide Zero Global Energy, Matt Ridley, The Spectator, 30 December 2017)

"Among the original group of domestic producers, Goldwind Science and Technology Co. Ltd. (Urumqi, Xinjiang Province) is China's oldest, largest and most experienced manufacturer. Goldwind's 20 percent share of the Chinese market in 2005 has grown, some sources say, to as much as 40 percent, thanks not only to the Renewable Energy Law's local-content mandate but its early push to produce turbines of 1.5 MW and larger, as well.

Goldwind was founded in 1997 when Urumqi-based parent company Xinjiang Wind Energy Co. Ltd. bought a license to manufacture 600-kW wind turbines from Jacobs Energie GmbH, now part of global turbine manufacturer REpower Systems AG (Hamburg, Germany). Goldwind turbines are 90 percent locally produced, including the rotor blades, which are supplied to Goldwind by Zhonghang (Baoding) Huiteng Windpower Equipment Co. Ltd. (Baoding, China).

(Composite World – High Wind in China 7 January 2007)

"With the State support, a batch of wind turbines and parts manufacturing businesses started to exert their main role in technology innovation in various forms, and strived to have their own intellectual property rights (IPR), with some achievements having been made. Goldwind has purchased Vensys based in Germany, which was a design partner of Goldwind in new MW-level turbine design. Thus, Goldwind is now firmly controlling IPRs of dominant products and the technology development rights for new products."

(Chinese Renewables Status Report, October 2009)

"Goldwind in Australia:

- Australia: Agnew Gold Mine - GW140/3000 https://edlenergy.com/
- Australia: Biala (AU) - GW140/3400 https://bialawindfarm.com/
- Australia: Gullen Range - GW82/1500 http://gullenrangewindfarm.com
- Australia: Moorabool North - GW136/3000 Official website: http://mooraboolwindfarm.com/
- Australia: Moorabool South - GW136/3000
- Australia: Mortons Lane Wind Farm - GW82/1500 http://www.newen.de
- Australia: Stockyard Hill - GW140/3000 https://www.stockyardhillwindfarm.com.au/
- Australia: White Rock - GW121/2500 http://www.whiterockwindfarm.com
- Australia Cattle Hill https://cattlehillwindfarm.com/

https://www.thewindpower.net/manufacturer_en_71_goldwind.php

"China, the world's biggest manufacturer of photovoltaic products, had silicon wafer production capacity of 173.7 gigawatts (GW) by end 2019, accounting for 93.7% of the world's total, according to China Photovoltaic Industry Association.

It also took 77.7% of the world's solar panel production capacity, 69.2% of photovoltaic modules capacity and 69% of polycrystalline silicon capacity in 2019. Overcapacity is expected to exacerbate alongside the drop of solar station installation in China, which saw new installed solar power capacity fall 32% in 2019 from a year earlier."

(By Reuters Staff - Reporting by Muyu Xu and David Stanway; editing by David Evans)

Phase 6 – Transportation

"Throughout the solar PV manufacturing process all of the materials and products must be shipped to and from more than a dozen countries around the world in large barges, container ships, trains or trucks – all powered by non-renewable oil"
(Why Do We Burn Coal and Trees to Make Solar Panels? Thomas Troszak, 14 November 2019, para 13.)

Phase 7 – Construction - Environment Destruction, Tenuous Supply Chain, Toxic Waste

"Building one wind turbine requires 900 tons of steel, 2,500 tons of concrete and 45 tons of nonrecyclable plastic. Solar power requires even more cement, steel and glass—not to mention other metals. Global silver and indium mining will jump 250% and 1,200% respectively over the next couple of decades to provide the materials necessary to build the number of solar panels, the International Energy Agency forecasts. World demand for rare-earth elements—which aren't rare but are rarely mined in America—will rise 300% to 1,000% by 2050 to meet the Paris green goals. If electric vehicles replace conventional cars, demand for cobalt and lithium, will rise more than 20-fold. That doesn't count batteries to back up wind and solar grids."
(The International Chronicles - THE DESTRUCTIVE MYTH OF GREEN ENERGY: IF YOU WANT 'RENEWABLE ENERGY' GET READY TO DESTROY THE ENVIRONMENT - August 6, 2019)

"Renewable energy has developed itself a reputation as being environmentally friendly. This report will show that this reputation is entirely undeserved. Far from improving the world around us, wind, solar, biomass and even hydropower can be highly damaging. A renewables revolution on the scale envisaged by global warming activists will see our landscapes desecrated, our fields industrialised or turned to monocultures, and our wildlife slaughtered.

Far from making the world a better place, renewable energy will destroy all we hold dear.

Is this really what environmentalism has come to mean?"
(GREEN KILLING MACHINES – The impact of renewable energy on wildlife and nature – Andrew Mountford – GWPF Report 36, page vii)

Phase 8 – Operation - Environment Destruction, Flora and Fauna Destruction, Inefficient Technology

"Solar farms require vast areas of land to generate power. For example, 25 square kilometres has been required to generate 850 MW in China and 52.5 square kilometres to generate 2,050 MW in India."
(Pavagada Solar Park, India)

"Report on bird and avifauna mortality commissioned by AGL Energy for its Macarthur Wind Farm found that 10.19 birds were killed by each turbine in a 12 month period. (Section 5.4 - 2015 Senate Select Committee on Turbines Report). Based on the the aforementioned report the number of birds (which would possibly include some Vulnerable and Endangered species

of Australia's unique birds) killed by AGL wind farms is estimated to be 44,302 as at 16 November 2020

The enormity of damage to fauna, flora and the landscape is self-evident from those statistics".
(Bat and Avifauna Mortality Monitoring March 2013 to February 2014. Prepared for AGL Energy Limited, June 2014)

''Äustralia is one of only 17 'megadiverse' countries, which together contain more than two-thirds of the world's plant and animal biodiversity. It is home to more animal species than any other developed country, and a whopping 87 per cent of our mammals, 45 per cent of our birds, 93 per cent of our reptiles and 94 per cent of our amphibians are found nowhere else on Earth."
(FAUNA. Australia's Most Curious Creatures – Tania Mc Cartney – ISBN: 9780644279545)

"The destructive nature of renewables is illustrated by the abandonment, on environmental grounds, in 2017, by Michael Schellenberger, 2008 Time magazine Hero of the Environment, of his previous support for solar and wind power and the rejection, on environmental grounds, of solar and wind power in Michael Moore's 2020 "Planet of the Humans"".
(Why Renewables Can't Save the Planet - written by Michael Shellenberger – 27 February 2019)

"The life of solar panels is also subject to shortening because they are susceptible to significant damage by severe storms, with or without hail. The risk of damage in NSW is illustrated by the severe hailstorm of 11 November 2016 that struck far western to central NSW, ranging from Broken Hill to Bathurst and north to Tamworth, with hail the size of golf balls and severe winds removing roofs from houses, smashing windows and damaging cars in Broken Hill"
(Severe Hailstorm Cuts Power to Thousands of Homes in Broken Hill, Bathurst and Tamworth, abc.net.au/news/2016-11-12)

In January 2020, golf ball-sized hail, weighing about 20 grams each, damaged the solar panels on the roof of the CSIRO building in Canberra.

"The significance of the risk of damage (to solar panels) is evident having regard to the facts that the Central West of New South Wales contains hot spots for hailstorms, such as Armidale and Orange."
(Take Cover: 50 Hailstorms in Six Months Shows We're a Hot Spot, Central Western Daily, 14 June 2017)

Phase 9 – Demolition and Rehabilitation

"22.15 Responsibilities for decommissioning and disposal - UPC will be responsible for decommissioning and rehabilitating the land within the development footprint. No cost is expected to be borne by Uralla Shire Council or the local community in this process. UPC has entered into agreements with project landholders, which include appropriate measures to ensure sufficient funds are available for decommissioning and rehabilitation.

At the end of the project's operational life, the PV modules will either be reused or recycled. UPC anticipates that at the time of decommissioning, there will be significantly more recycling options available within Australia. In 2016, the International Renewable Energy Agency (IRENA) reported that up to 85% of the material within PV modules is able to be recycled (IRENA 2016). There may also be opportunities to reuse the PV modules. In lieu of an Australian based solution, the PV modules will be sent overseas for disposal through one of many established PV module recycling programs. The project will have suitable insurances in place to rehabilitate or repower the facility should a natural disaster occur and cause extensive damage to project infrastructure."
(Extract from Report by EMM for UPC Renewables – New England Solar Farm – page 104)

"Monitoring, compliance, enforcement and assurance under the EPBC Act is ineffective. There has been limited activity to enforce the Act over the period of 20-years it has been in effect, and the transparency of what has been done is limited.

The culture of monitoring, compliance, enforcement and assurance is not forceful. This erodes public trust in the ability of the law to deliver environmental outcomes.

There is broad consensus from the regulated community and the experts that advise them that it is not easy to comply with the EPBC Act. Likewise, for the Department, the complexity of the Act impedes compliance, enforcement and assurance.

The monitoring, compliance, enforcement and assurance powers in the EPBC Act are outdated. Powers are restrictive and can only be applied in a piecemeal way across different parts of the Act due to the way it is constructed.

Monitoring, compliance, enforcement and assurance activities are significantly under-resourced."
(Independent Review of the EBPC Act – Interim Report – June 2020 – Professor Graeme Samuel AC - page 92)

Comment: The above extract from the Report by EMM for UPC Renewables in relation to the proposed New England Solar Farm is typical of many of the "end of the project's operational life" clauses in solar and wind farm Environmental Impact Statements. These clauses are incorporated to "include appropriate measures to ensure sufficient funds are available for decommissioning and rehabilitation."

However, the Independent Review of the Environment Protection and Biodiversity Conservation Act (EPBC Act) found that:

"Monitoring, compliance, enforcement and assurance under the EPBC Act is ineffective. There has been limited activity to enforce the Act over the period of 20-years it has been in effect, and the transparency of what has been done is limited."

"Monitoring, compliance, enforcement and assurance activities are significantly under-resourced."

There is no national register which enables checking of compliance with wind farm and solar farm environmental obligations, nor is there a national register which confirms that sufficient funds "are available for decommissioning and rehabilitation" of wind farms and solar farms installations at the "end of the project's operational life."

This failure by authorities to monitor compliance, including the availability of sufficient decommissioning and rehabilitation funds will, in my opinion, lead to abandoned wind farms and solar farms with decommissioning and rehabilitation costs to be met by the landholders or ultimately the public.

Phase 10 – Disposal - Environment Destruction, Toxic Waste

"For PV panels, significant volumes of crushed glass (~ 37,000t by 2035) and Aluminim (~ 11,500t by 2035) are recovered by the low recovery pathway that represents a major fraction of the total waste volume (~ 80 %), however, valuable silicon and other metals are not recovered without further processing. While the low recovery pathway operates at industrialised scales overseas and can potentially recover ~80 % of the material (frames, glass, junction box) this assumes that the crushed glass meets market specifications and further clarification from glass reprocessors is required. Given PV recycling is very immature in Australia this remains uncertain without further research. Considering the unrecovered material (~20% or 11,500 tonnes by 2035 according to the low recovery pathway), this could present a significant process risk by producing a contaminated residual stream (glass fines, polymeric binders, metals) that requires further treatment or disposal. While a range of

treatment processes are being investigated, further R&D is required. Chemical processes investigated for delamination and metal recovery use solvents and would likely produce a liquid waste stream.

This analysis assumes the short lifespan (15 years) has a significant impact on the estimated waste volumes and the totals reported do not consider a collection rate that would likely be very low in the near term without policy intervention."
(University of Technology, Sydney (UTS) Scoping study for photovoltaic panel and battery system reuse and recycling fund - Prepared for NSW Department of Planning, Industry and Environment by UTS Institute of Sustainable Futures & Equilibrium Consulting, March 2020)

General comment: The named recovered volumes seem ridiculously low. They must be based on the relatively small area of currently existing panels. For example, if the existing solar panels could generate 3,000 MW (nameplate), they would occupy 80 square kilometres. How could 80 square kilometres of solar panels produce only 37,000 tonnes of crushed glass and only 11,500 tonnes of aluminium?

"Tens of thousands of aging wind turbine blades are coming down from steel towers around the world and most have nowhere to go but landfills. In the U.S. alone, about 8,000 will be removed in each of the next four years. Europe, which has been dealing with the problem longer, has about 3,800 coming down annually through at least 2022, according to Bloomberg NEF. It's going to get worse: Most were built more than a decade ago, when installations were less than a fifth of what they are now. "The wind turbine blade will be there, ultimately, forever," said Bob Cappadona, chief operating officer for the North American unit of Paris-based Veolia Environment SA, which is searching for better ways to deal with the massive waste.
"Most landfills are considered a dry tomb. The last thing we want to do is create even more environmental challenges."
(Bloomberg Green - By Chris Martin February 5, 2020)

"The non- recyclable wind turbine blades must be buried because their fibre contents prevent them from being able to be cut up"
(SRSrocco report "*The Renewable Green Energy Myth: 50,000 tonnes of non-recyclable wind turbine blades dumped in landfill*", 9 January 2020)

The problem of solar panel disposal "will explode with full force in two or three decades and wreck the environment "because it is a huge amount of waste and they are not easy to recycle" *Michael Shellenberger –23 May 2018*

"The increasing waste stream from Australia's transition to renewable energy systems risks posing a major future waste management issue while detracting from the other benefits of renewable energy.

The International Energy Agency (IEA) forecast that Australia will have one of the most significant accumulated PV waste streams in the world. The recent market analysis by Sustainability Victoria (SV) indicated that PV systems will enter the waste stream in significant quantities from mid-2020, resulting from the solar boom in 2010 that was incentivised by generous feed-in-tariffs and federal government subsidies. It was estimated that approximately 100,000 tonnes of PV panels will enter the waste stream by 2035 Australia-wide, including approximately 30,00 tonnes in NSW. In the case of batteries, Australia is one of the leading markets worldwide for energy storage batteries. However, only 3-5% of all batteries (not including used Lead Acid batteries [LAB]) in Australia are collected for recycling."
(University of Technology, Sydney (UTS) Scoping study for photovoltaic panel and battery system reuse and recycling fund - Prepared for NSW Department of Planning, Industry and Environment by UTS Institute of Sustainable Futures & Equilibrium Consulting, March 2020)

Outdated Technology, Inefficient Technology

"More than $1 billion is spent in Australia every year on distributed photovoltaic systems, from small household systems to 100MW-plus power stations. In every case, the systems are real power stations that form part of the electricity infrastructure of this nation. If we spent $1 billion every year on a new coal-fired power station we would demand rigour and controls to ensure we were getting what we paid for and that it would function as it was specified to function. Why should PV solar be any different?

Solar panels are often regarded as a commodity and a technology that is 100% reliable. They can be.

Most solar panels are made using silicon solar cells. Silicon is almost over-qualified for the job of making electricity; a bit like using a racehorse to collect mail at the end of a driveway. Although it may be over-qualified, silicon solar cells are nonetheless thoroughly reliable and capable of doing the job for decades.

There are many exceptions, but in general Australia has only an emerging culture of checking panel quality. Various reasons are cited for not testing, such as: "The manufacturer has guaranteed the panel performance," or, "No-one else has had any problems with poor panel performance in Australia," and, "No-one else does any testing."

Each of those assertions is false. If it is not checked, what is the value of a manufacturer's guarantee? Problems are rarely advertised but they do exist. On a global scale, Australia has one of the lowest rates of panel testing. In many other countries, testing is mandatory before a solar plant can be financed."
(The solar PV panel problem: high promises, low quality – Ecogeneration - Dr Michelle McCann - August 30, 2017)

"With today's technology, $1 million worth of utility-scale solar panels will produce about 40 million kilowatt-hours (kWh) over a 30-year operating period. A similar metric is true for wind: $1 million worth of a modern wind turbine produces 55 million kWh over the same 30 years. Meanwhile, $1 million worth of hardware for a shale rig will produce enough natural gas over 30 years to generate over 300 million kWh. That constitutes about 600% more electricity for the same capital spent on primary energy-producing hardware."
(The "New Energy Economy" – An exercise in Magical Thinking" – Mark P Mills – Manhatten Institute Report – March 2019)

"The results below only account for the cost comparisons for capital and running costs of the generation installations themselves and the actual electrical power generated accounting for the measured productivity capability of each generating technology. Thus, these figures represent the true comparative cost of the power produced by Weather Dependent Renewables installations.

US EIA costs 2020: 1€ ≅ 1 US$

	EU(28) productivity / load factor	capital cost accounting for productivity	long-term cost accounting for productivity
onshore wind	21.2%	6.2 €bn/GW	22.4 €bn/GW
offshore wind	37.0%	11.8 €bn/GW	53.1 €bn/GW
solar PV	12.7%	10.5 €bn/GW	42.0 €bn/GW
gas-fired	90.0%	1.1 €bn/GW	3.5 €bn/GW
nuclear	90.0%	6.7 €bn/GW	16.1 €bn/GW

The costs projected here ignore the ancillary costs inevitably associated with wind power and solar renewables resulting from:

- unreliability in terms of both power intermittency and power variability.
- the non-dispatchablity of renewables: the wind will not blow and clouds will not clear away to order when needed.
- poor timing of power generation, often unlikely to be coordinated with demand: for example, Solar energy is virtually absent in winter, 1/9th of the output than in the summer period of lower demand.
- long transmission lines to remote generators, incurring both costly power losses in transmission and increased maintenance.
- additional infrastructure necessary for access.
- the costs of essential back up generation only used on occasions but wastefully running in spinning reserve nonetheless.
- any consideration of electrical storage using batteries, which would impose very significant additional costs, were long-term, (a few days), battery storage even economically feasible.
- unsynchronised generation with lack of inherent inertia to maintain grid frequency.
- Weather Dependent Renewables cannot be relied upon to provide a “black start” recovery from a major grid outage.

Importantly, in addition, these cost analyses do not account for:

- inevitable environmental damage and wildlife destruction resulting from Weather Dependent Renewables
- The “Carbon footprint” of Weather Dependent Renewable technologies: they may never save as much CO2 during their service life as they are likely to require for their materials sourcing, manufacture, installation, maintenance and eventual demolition. When viewed in the round, all these activities are entirely dependent on the use of substantial amounts of fossil fuels as feedstocks or as fuels.
- The Energy Return on Energy Invested: Weather Dependent Renewables may well not produce as much energy during their service life as was needed for their original manufacture and installation. They certainly do not provide the regular excess power sufficient to support the multiple needs of a developed society.”

(The Excess Costs of Weather Dependent Renewable Power Generation in the EU (28): 2020 – Edmhdotme – Charles Rotter – 8 June 2020)

Solar Farms, Wind Farms, Batteries – Who Benefits? Who Pays?

"Finally, Ms. Toplensky points out that, "Globally, clean-energy investment is now expected to account for half of total investment in the entire energy sector this year (2020), according to UBS." This may be true, but the benefits of these huge government expenditures may prove disappointingly small. According to the BP Statistical Review, in the year 2000, fossil fuels accounted for 87% of world energy use with renewables (excluding hydro) accounting for less than 1%. In 2018, after billions of dollars spent jamming renewable energy into the market, fossil fuels account for 85% of world energy use and renewables less than 5%. Not much of a transition so far.

Investors are of course always free to risk their money on firms reliant on government handouts for their business success. Shareholders of these companies should remember, however, that governments can withdraw this support just as easily as they can extend it. As consumers begin to see how little they are getting for the billions spent on renewable energy, these shareholder returns could easily vanish into air. I've left for another day a discussion of whether "renewable" is even the right word for solar and wind projects that require fossil-fueled mining, construction, transportation, infrastructure, and regular replacement. Caveat investor." *(Wind and solar are Competitive with Fossil Fuels only in Subsidized Price, not in True Cost - By Bruce Everett PhD - August 2020)*

"The head of $3.7 billion Melbourne fund manager Munro Partners has described climate change as the biggest investment opportunity since the advent of the internet.

Munro Partners chief investment officer Nick Griffin said he expects $21 trillion in capital to shift from old carbon intensive industries to green technologies over the next 30 years, offering an enormous opportunity for investors.

"The one before, it was the internet. This is the next one," he said at GSFM's market outlook forum on Tuesday. "The decarbonisation of the planet is going to happen. Period. There are just too many stakeholders that are on board here.""
(https://www.smh.com.au/business/banking-and-finance/great-place-to-invest-top-investor-says-climate-change-is-the-biggest-opportunity-since-the-internet-20210119)

Comment: Who Benefits and Who Pays?
Investors expect returns on their investments. So, the $21 trillion in capital, as stated by Nick Griffin of Munro Partners in the Sydney Morning Herald article published on 19 January 2021, will be expected to be repaid with interest.

It's obvious that investors expect to benefit from the $21 trillion investment so it will therefore be consumers and businesses who will have to repay the $21 trillion with interest. As Mark P Mills articulated in his March 2019 Manhatten Institute Report "*The "New Energy Economy" – An exercise in Magical Thinking"*:

"With today's technology, $1 million worth of utility-scale solar panels will produce about 40 million kilowatt-hours (kWh) over a 30-year operating period. A similar metric is true for wind: $1 million worth of a modern wind turbine produces 55 million kWh over the same 30 years. Meanwhile, $1 million worth of hardware for a shale rig will produce enough natural gas over 30 years to generate over 300 million kWh. That constitutes about 600% more electricity for the same capital spent on primary energy-producing hardware."

Based on the stated energy outputs in the Mark P Mills report, an investment of 3.5 trillion in natural gas would produce the same energy output over 30 years as the 21 trillion investment in "green" technologies. The "green" technologies option, in my opinion, is an option without the best interests of consumers and businesses being considered.

Is “climate change” following on from “tulip mania” (1637), “South Sea Bubble” (1720), “Mississippi Bubble” (1720), the “Y2K bug” (2000) and the 2008 “Global Financial Crisis” which was triggered by, as stated in the “**Wall Street and the Financial Crisis: Anatomy of a Financial Collapse”** report issued on April 13, 2011 by the United States Senate Permanent Subcommittee on Investigations:

"the crisis was not a natural disaster, but the result of high risk, complex financial products, undisclosed conflicts of interest; and the failure of regulators, the credit rating agencies, and the market itself to rein in the excesses of Wall Street."

Again, in my opinion, the investment in “green technologies” can be demonstrated as involving:

“high risk, complex financial products, undisclosed conflicts of interest; and the failure of regulators, the credit rating agencies, and the market itself to rein in the excesses of green investments!”

Summary

For me, this enquiry into the reasoning behind the drive to fundamentally change the generation and delivery of electricity in Australia, started in earnest about 2 years ago. My profession as a builder taught me to appraise myself of facts before deciding on a course of action in the creation of a new addition to the built environment. The quote “If you fail to plan, you are planning to fail”, which is attributed to Benjamin Franklin, became the mantra on the projects I was responsible for.

“Galileo's championing of heliocentrism and Copernicanism met with opposition from within the Catholic Church and from some astronomers. The matter was investigated by the Roman Inquisition in 1615, which concluded that heliocentrism was "foolish and absurd in philosophy, and formally heretical since it explicitly contradicts in many places the sense of Holy Scripture." *(Wikipedia – Galileo Galilei)*

My enquiries now lead me, in my opinion, to believe that it is the prospect of making significant profits from “green” investments, that is driving the push to impose wind farms and solar farms as the electricity generators of choice. This could be described as, “foolish and absurd in philosophy and formally heretical since it explicitly contradicts in many places the senses of reliability, affordability, availability and security of the generation and delivery of electricity in Australia”.

The cry from the “green evangelists” is that they believe, to prevent indeterminate “climate change”, the man-made production of carbon dioxide (CO2) must be curtailed. This, they further believe, will be achieved by including the phasing out of fossil fuels being used in the generation of electricity and replacing that generation with wind farms and solar farms.

This compilation of information from many sources, shows that this manic drive for the rolling out of “renewable energy”, is a case of:

Destroy the “environment” to save the “environment.”

Where to from here? There are many of us who will continue to communicate and educate wherever, whenever and however we can, that this push by the “green religion” to destroy Australia’s economy and the Australian way of life, must be resisted.

This, I believe, will be achieved by informing Australians about the environmental destruction now occurring and which will continue to occur, if not stopped by those entrusted to protect our environment.