



# THE MUSIC STOPS

## NET ZERO AND NATIONAL SECURITY

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WITH A FOREWORD BY  
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**NETZERO**  
WATCH



## The Music Stops: Net Zero and national security

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## About the authors

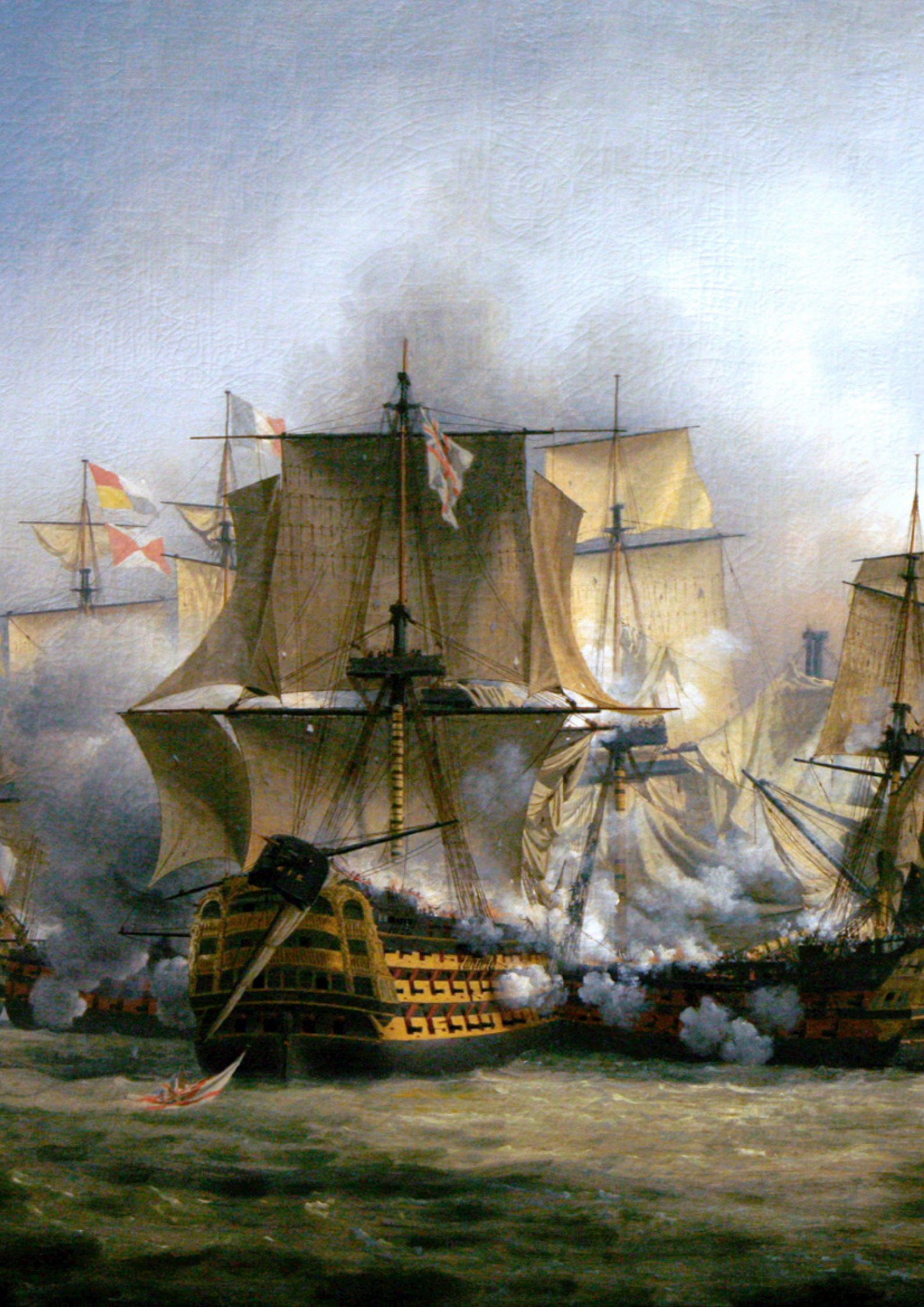
Sir Gerald Howarth was Member of Parliament for Aldershot 1997–2017 and Minister for International Security Strategy 2010–12.

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Guy de la Bédoyère FSA is a historian and broadcaster, with particular expertise in Roman Britain.







## Foreword

*by Sir Gerald Howarth*

Most of us have lived our lives in peace since the last European conflagration was brought to an end by the Allies in 1945, almost 80 years ago. Yes, the Cold War presented us with the real possibility of nuclear Armageddon, but that ended over 30 years ago. Since then, although, fortunately, determinedly resisting the siren calls to dismantle our nuclear deterrent, we and most of our allies have happily taken the so-called 'peace dividend', steadily reducing our conventional defence capability.

All of a sudden, it's a massively different story. Correctly gambling on a total lack of Western resolve, Putin tore up the 1995 Budapest Memorandum signed by his predecessor Boris Yeltsin (along with co-signatories Bill Clinton and John Major), under which the parties agreed to respect the sovereignty, independence and – crucially – the existing borders of Ukraine. In return, Ukraine would give up its huge arsenal of nuclear weapons. Putin annexed Crimea with complete impunity in 2014 (having already annexed part of Georgia in 2008). As he began sabre-rattling about Ukraine being taken over by Nazis, in Washington President Biden reassured him that not only might a 'minor incursion' be tolerated, but, were Putin to invade, there is no way the US would put American boots on the ground.

Today, NATO leaders are openly talking about the possibility of a full-scale European war as Putin seeks, unapologetically, to rebuild a state more akin to his beloved Soviet Union. The 1930s policy of appeasement of Hitler and failure to rearm until the last minute combined to embolden the tyrant, much as Russia's advance is spurring on others, such as Iran and China, where President Xi has made no secret of his intent to reincorporate Taiwan into his communist fiefdom.

One would have thought that this background would serve as a wake-up call, with our leaders making defence of the realm and our collective wider interests their number one priority. Yes, the UK (under Boris Johnson's leadership, let us not forget) led the way in galvanising a Western response to the invasion of Ukraine, and President Biden has belatedly sent substantial quantities of US kit, but the overall response has been too slow and too little.

Meanwhile, there is no let up in the policy of Net Zero, which seems to remain the top priority of all three main parties. This excellent and timely paper, compiled by three learned academics, not only exposes the intrinsic nonsense of Net Zero (closing down UK steel plants and importing steel products from coal-powered China and shipping them half way round the world does nothing to cut carbon emissions) but serves as a valuable wake-up call. We need to recognise the critical importance of maintaining – even rebuilding – sovereign capability. As the former Labour defence minister, Lord Drayson, said, 'Without sovereign capability you have no operational sovereignty'.

As Professor Prins argues powerfully, our adversaries are weaponising our 'green' thinking against us, rubbing their hands with glee as we sacrifice our defence capability on the altar of Net Zero. As Professor Kalghatgi points out, a 65-tonne Challenger II tank would require lithium-ion batteries weighing 89 tonnes and battlefield re-charging stations! In the air, whilst Sustainable Aviation Fuel (SAF) may well develop over time, what about the impact on food production that it would entail? As Veterans for Britain is quoted: 'It is not the job of MoD to engage in "climate catastrophism" virtue signalling but to prepare to defend the realm, quite possibly quite soon.'

Guy de la Bédoyère correctly asserts that it is vital to look strong. 'In a world of ambition, nationalism and competition, you must be able to defend yourself. I hope beyond anything else there isn't going to be a war, but one of the best ways of making sure one breaks out is to make yourself look like a pushover.'

Let us therefore do as the authors urge: let The Music Stop, ignore the Net Zero targets, and focus on national security. Our adversaries are watching us like hawks, so let us leave them in no doubt: we are rearming and rebuilding, and Net Zero is firmly on hold.





# THE MUSIC STOPS

**STEEL, ELECTRICITY  
AND NATIONAL SECURITY**

**GWYTHIAN PRINS**





## The Music Stops

*Gwythian Prins*

There is a respectable peacetime economic case for closing the Port Talbot blast furnaces and ceasing production of basic oxygen steel (BOS) in the United Kingdom, and it is set out by the leading trade economist Catherine McBride.<sup>1</sup> She shows how much British steel-making of any type has declined by volume, and how chronically dependent what remains is upon imported raw materials. She also explains how much EAF – electric arc furnace – steel production from recycled scrap has increased worldwide: for example, 70% of American steel in 2022 came from that source. Finally, she shows how globally dominant China and India have become in BOS, as witness 90% of China's 1 billion ton steel production in 2022. China and India have massive economies of scale, and also access to domestically controlled raw materials, giving end-to-end control: in the Chinese case, both coking coal and iron ore, and in the Indian case, iron ore but with need to import coking coal. In contrast, the UK currently has to import both iron ore and coking coal at scale to feed the condemned blast furnaces.

While neither of the Asian giants exports much primary steel – in the Chinese case, only 40 million of 1 billion tons produced – both are major suppliers of steel *products*. The UK buys more steel products from China than from anywhere else, and therein begin the problems, starting, as the trades unions correctly underscore, with the loss to Chinese factories of 'added value' jobs in steel fabrication. There are also physically insoluble issues of steel quality control in buying finished steels this way. Buying from China is not like buying from Japan.

On the one hand, Japan is now once more fully bound within the Free World alliance systems having inscribed a century-long and agonising circle through alliance with Hitler and nemesis in defeat in 1945. Japan is happily back to the modern equivalent of the 1902–23 Anglo-Japanese Naval Treaty. On the other hand, it decided in recent decades to specialise in exquisite, very high quality special steels, with high added value (and price), which can be used with confidence in strategically critical applications. Japan today leads the way in developing the very expensive process of using hydrogen to make such high-grade product.

For Britain, however, in consequence of the Cameron/Osborne so-called 'golden age' of trade with China, now ended, we are laid open to strategic and technical risks and to exportation of high-quality jobs, thus further de-industrialising our native workforce, as described. The Cameron 'golden age' was short-lived, but nevertheless deeply unwise. His alchemy produced no gold. It remained lead, which today weighs us down. 'While the UK doesn't matter to China, China matters to us,' McBride observes sharply.

There is also an unrespectable case for closing the Port Talbot blast furnaces and replacing them with EAFs. It is the one that the government supports and, with a half billion pound bung, proposes to pay Tata Steel to effect: you can be sure that they wouldn't do it otherwise. This is the claim

of some contributions on the fantasy road to 'Net Zero', where the harder you try the more you fail.<sup>2</sup>

However, in two major reports,<sup>3</sup> the iron and steel trades unions have blown that alleged 'Net Zero' gain out of the water, pointing to the obvious: BOS steel not produced in Port Talbot will be produced elsewhere and imported to this country. So there is zero reduction to global carbon dioxide emissions and there is the addition of emissions from ocean transport. Without pig iron, there is also loss of full-spectrum virgin steels capability, loss of high-quality jobs and the social devastation of lives in South Wales.<sup>4</sup> The unions' plan is on the right side of history, and should simply go further: ignore the Net Zero targets and focus, on national security grounds, on securing a domestic balance of BOS and EAF production. France and Germany both have a 70/30 split, for example. The unions plainly understand the industry better than any civil servant or think tank genuflecting to decarbonisation targets.

Therefore, this is the moment when the music stops. The Port Talbot closure harshly exposes the costs of luxury 'green' beliefs, just as we are entering the second phase of a global war. It is a war of different theatres and modes of conflict: simultaneously 'hot' (kinetic) in Ukraine and the Middle East, and with Taiwan threatened; 'cold' (economic) with China, Russia and Iran; and 'grey' (psychological, cyber and subversive) with all the enemies of the Free World. Major recent statements by NATO's Military Committee chairman,<sup>5</sup> the Head of the Army<sup>6</sup> (and Norwegian and Swedish CDSs<sup>7</sup>) and the Defence Secretary<sup>8</sup> finally inform the public of these inconvenient facts. This is no drill.

These concerns touch upon the question of Port Talbot directly, and add to the many powerful objections to the closure decision. It must be reversed – we cannot be dependent on imports for the full range of necessary steels to rebuild our arsenals – the Navy first and foremost – and most ridiculously, we cannot be dependent for them on our global antagonists. China's coal-fired economy is why it can readily build its new navy, just as we once did and must again. Always to be borne in mind is that, in the real world, coal is king.

The 2023 IEA Coal Report states that '...In 2022, global coal demand reached its highest level ever [8.42 billion tons].<sup>9</sup> Today, coal remains the largest energy source for electricity generation, steelmaking and cement production – maintaining a central role in the world economy'. The IEA's central prediction is for this record to be broken in 2023 [8.54 bt], with all major growth occurring in Asia, where China, India and Indonesia are all increasing output. Demand for met (metallurgical) and PCI (pulverised coal injection) coal for steel-making is seen to be strong and steady. IEA speculation that these structural trends may change because of renewables policy and deployment is just that – speculation. The focus in this short paper is on how and whether Europe in general and the UK in particular will depart from their off-trend attempts at policy-



not market-driven, suppression of fossil fuels.

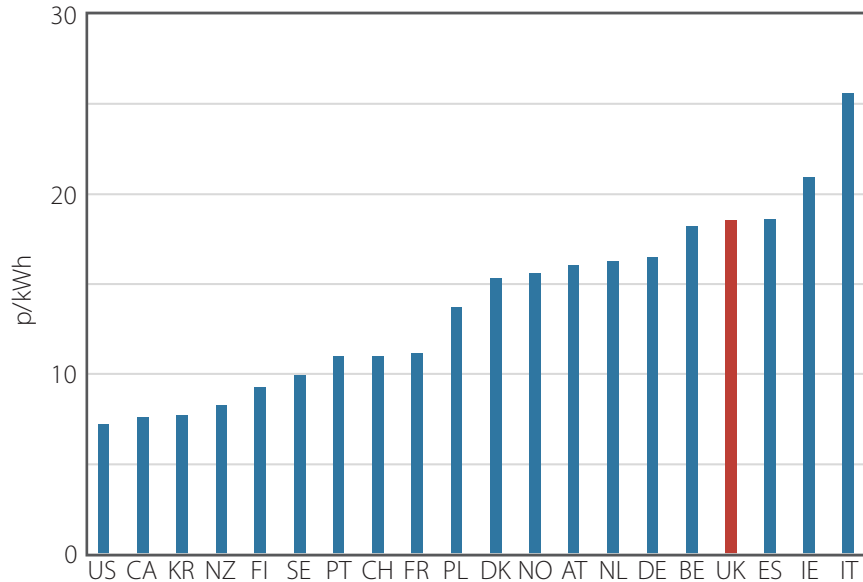
Catherine McBride’s primary argument for replacing BOS steel-making with EAF is concern about reliance on imported strategic raw materials. However, she also observes that UK electricity costs are among the most expensive in the world.

High electricity prices destroy the case for EAFs as well, *or for any unsubsidised steel production in the UK at all*. EAFs require abundant and stable electricity supplies, such as they have in the USA.

The cause of the UK’s crippling electricity price? Net Zero.

Figure 1: International industrial electricity prices in 2022.

Including taxes. Source: DESNZ.



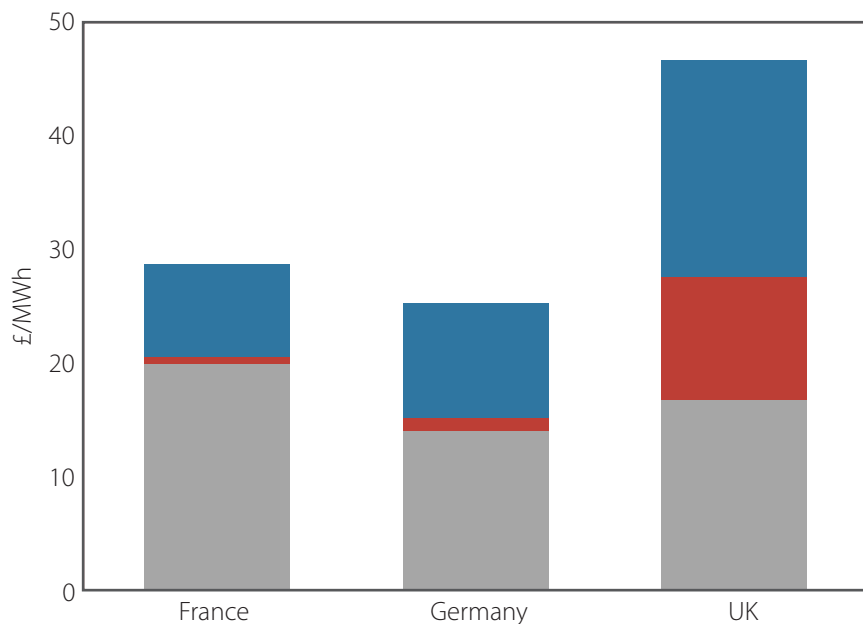
Specifically the 60% burden of policy costs (40%) and network costs (20%<sup>10</sup>) shown in Figure 2. The proportions are more important than the historic absolute figures. So the issue is not BOS versus EAF steel: it’s Net Zero’s all pervasive toxicity, poisoning UK power generation.

*Policy costs* include subsidy regimes (bungs) to build, deploy

Figure 2: Energy prices in France, Germany and the UK, 2021–22

Source: UK Steel.

- Policy costs (incl. carbon costs)
- Network costs
- Wholesale costs





and - when there is too much wind - to switch off non-dispatchable so-called 'renewable' generators: so-called because in full lifetime cycle energy audit they are not nor can be.

*Network costs* come in three parts: system costs (renewables make price-setting gas turbines less efficient); balancing costs (dealing with intermittency) and grid costs (more transmission hardware). Balancing costs are structural for now because of the current and foreseeable future failure to have a viable storage solution: big Li-ion batteries are certainly not it, on performance and spontaneous combustion evidence.<sup>11</sup> Lacking storage means that either power has to be shifted around a reinforced smart-switching grid which currently we do not have or firm power 'peakers' need to be brought on-line at premium prices. In order of speed on-line, these are: instant pumped storage hydro which is of necessity physically limited capacity; biogas engines burning gas recovery from waste sites, likewise; conventional diesel farms sometimes handily co-located with solar farms nowadays by enterprising rent-seeking developers as a way of profiting from Net Zero's problems, whichever way works; Open Cycle Gas Turbines and ramping Combined Cycle Gas Turbine stations up and down, which are better run steadily.

In our 'pre-war' world,<sup>12</sup> what must change? First secure the grid. With news of delays to Qatari LNG shipments,<sup>13</sup> upon whose regular arrival at Milford Haven we depend, UK grid security and stability are left dangling precariously on two threads: interconnector imports and undersea gas pipelines, which the Russian Navy's Special Submarine Operations force (GUGI) could easily interdict. Oil and gas platforms as single-point targets have long been understood to require protection; but all offshore infrastructure with underwater supply pipes and wires is vulnerable and, as the attack on the Nordstream gas pipelines on 26 September 2022 showed,<sup>14</sup> very hard to anticipate, prevent or prove. It was, as Mark Bowden wrote, "the most consequential act of sabotage in modern times" and, whoever did it, it broke a taboo and for better or worse thereby set a precedent.

Be it delivered by pipeline, by ship or home-drilled, regardless of source, gas is dangerously central to our energy security, given that uncontrollable wind and solar simply destabilise the grid: beware the *Dunkelflaute* my beamish boy! Therefore, grid security has to be assured mainly by gas, the only large remaining firm power source, in the manner just described above. The UK's main gas storage site at Rough, which re-opened in 2022, has been doubled in capacity to 54 billion cubic feet of gas in 2023,<sup>15</sup> which sounds like a big number but is, in fact six days' national reserve,<sup>16</sup> which does not compare that well with Germany's average storage at 89 days, France's at 103 days, and the Netherlands' at 123 days. The obvious step of permitting Bowland Shale fracking remains blocked.



Therefore, by elimination, there is only one broad highway to safety. It returns to the global trend set by Asia; and in Europe, it is to follow the example of Germany, erstwhile home of deep-green eco-politics. After the disaster of the *Energiewende*, and in a hard-headed way, Germany is moving back to base-load coal – yes Old King Coal – but not coal as you think you know it. Advanced ultra super-critical technology (AUSC<sup>17</sup>) is clean coal that achieves close to 50% thermal efficiency. This is a thermodynamically competent and richly mature technology.

In tandem, we must also fix our import vulnerabilities in coal and iron ore. Take a deep breath as that reality hits home.

For the UK, this means re-opening South Wales premium hard coal and other deep mines, because we need domestic supplies to power the grid cheaply and reliably once more. No form of nuclear will be made ready quickly enough, while GE's AUSC plants are available today: look at the speed with which German stations are built. We will also need Cumbrian met coal to supply coke to Port Talbot and to Scunthorpe, so that we can still have domestic pig iron for the full range of virgin steels.

We then once again acquire the Grid with flexibility and interchangeable dispatchable firm power options that currently we do not have, which can once again be employed in an approximation of a rational 'merit order', in which the least-flexible and least-cost generators provide continuous base load. With its flexibility and modes, gas takes on principally a role as intermediate and peaking power, as earlier mentioned, as such a high-quality fuel should be used. We shall need to re-engage the wartime mentality of strategic stockpiling; and thank goodness that Sweden, currently on the threshold of entering NATO, will be on our side this time in terms of iron ore exports, unlike during the Second World War.

Recognising the strategic risk in renewables' fragility leads to the inevitable conclusion that subsidy plugs and bungs must be pulled. Bungs like the one given to Tata to get it to build the EAF at all, essentially to compensate for electricity costs driven uneconomically high by Net Zero.

'And what of our decarbonisation targets?', many outraged voices may wail. 'What of Net Zero?', the subject which is on every lip but which few understand? The music stops there too.

Belief that the 1988 Hansen 'control knob' CO<sub>2</sub>/global temperature close-coupling hypothesis is incontestable fact validates belief in the importance of achieving 'Net Zero' as a policy priority. However, the major finding of thirty five years of global climate systems research is that the 'close coupling' hypothesis does not hold that settled status: it is vitiated by two fundamental errors in its theory of knowledge and by a major technical error by the IPCC (see *Archimedes' Fulcrum* pp. 9–13).

In fact we can more accurately assess the *benefits* from anthropogenic CO<sub>2</sub> emissions in terms of enhanced plant growth, which



is the simpler task (with clearer cause and effect pathways), than the *risks* from anthropogenic CO<sub>2</sub> emissions to global security, relative to other risks, which is the more complicated task. Insofar as the hypothesised risks justify any action, 'no regrets' adaptation is all that is wise, as some of us have argued for two decades.<sup>18</sup> 'No regrets' means doing things that one would have done anyway, such as improving flood control.

The hypothesised risks from carbon dioxide are 'wicked' problems. This means that they cannot be reliably mitigated, because there is insufficient understanding of cause and effect to give confidence that this single variable is dominant in the myriad cybernetic feedbacks that keep the climate stable within the mysteries of the self-organising complex adaptive systems which characterises its dynamic form. For open, inquiring minds, the principal gain in knowledge over this generation has been greater certainty that we are less certain than James Hansen was more than thirty-five years ago.

Therefore outside the closed belief system of eco-zealotry, which displays all the characteristics of a cult, in the real, hard world of geopolitics, the 'wicked' problem that is risk in anthropogenic carbon dioxide ranks pretty low; and, for our adversaries, not at all. They weaponise our 'green' thinking against us.<sup>19</sup>

The reversal of the Port Talbot blast furnace closure on national security grounds; a return to domestic coal for power and for steel; pulling the subsidies plug on renewables-that-are-not; and jettisoning of Net Zero targets – so glibly conjured into being on the back of inadequate<sup>20</sup> and deceptive<sup>21</sup> data and unthinkingly nodded into law to give Mrs May a semblance of a 'legacy' – will be the signal that reason and clear-thinking have returned.

We shall once again have economics as if the defence of the Realm, the wealth and health of its citizens, and indeed the health of the environment too – which is no paradox – really mattered.

That true environmental visionary E.F. Schumacher was never apologetic about his career with the National Coal Board. No more should we be about clean coal now, as the noises of eco-zealotry in the isle subside and we awaken as if from a dream.

'As you from crimes would pardoned be, let your indulgence set me free.'

## Notes

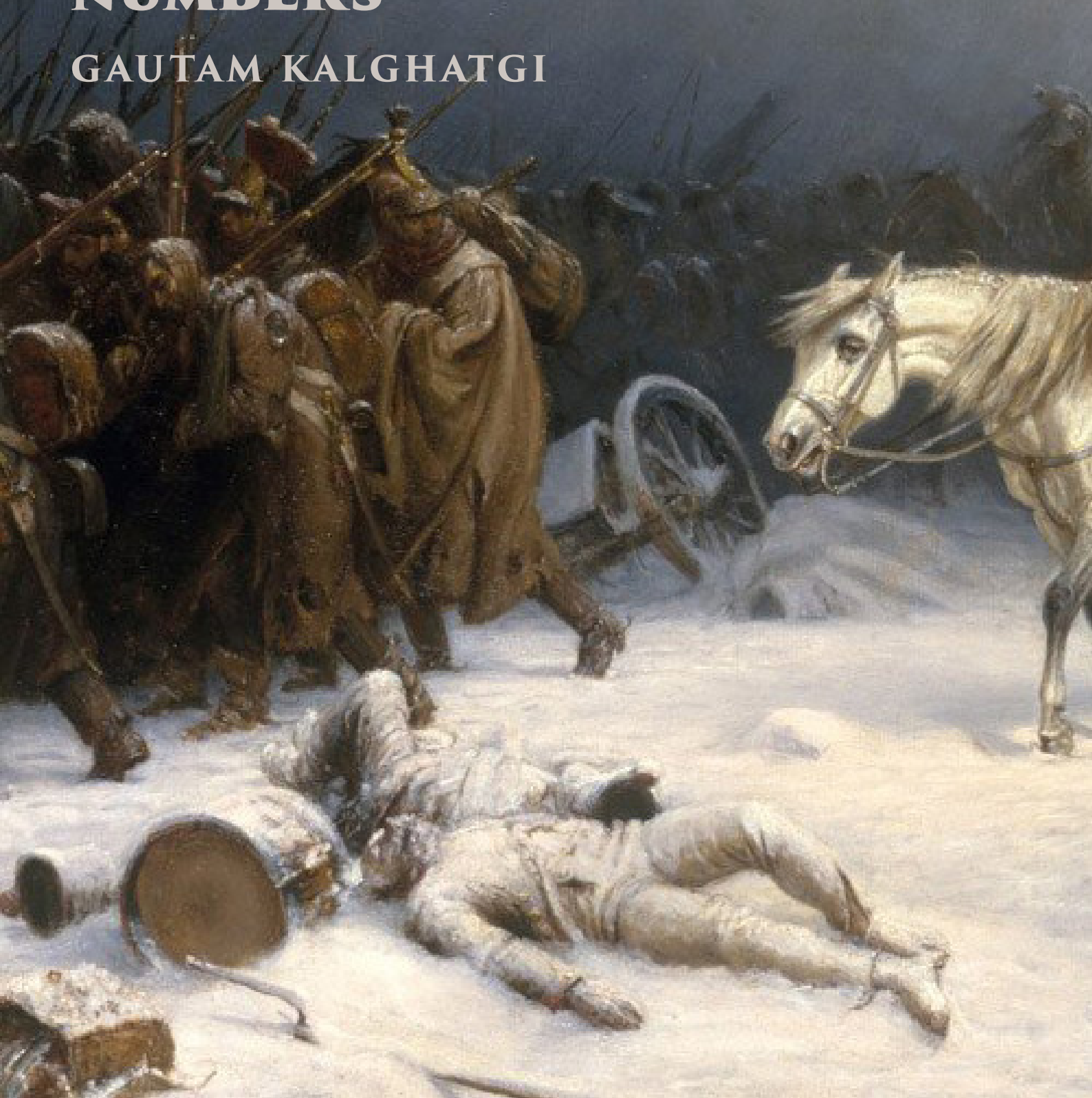
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# DANGEROUS FANTASIES

**'ZERO-CARBON' PLANES,  
TANKS AND SHIPS IN  
NUMBERS**

**GAUTAM KALGHATGI**





## Dangerous Fantasies

Gautam Kalghatgi

### Indispensible energy density

Military vehicles are powered by internal combustion engines running on petroleum-derived liquid fuels, usually diesel, which have the required high energy density. There have been many recent suggestions that such vehicles should also aim to be 'zero carbon'. Though it might be considered admirable in some circles that whatever killing needs to be done should be achieved in a carbon-friendly way, it is impossible to achieve such a strangely contradictory goal. Such vehicles cannot be run on batteries, given the capacity needed and the difficulties of charging them in a combat zone.

### Aircraft

For instance, in May 2021, *Defence News* reported that Air Chief Marshal Mike Wigston, the then Chief of the Air Staff (CAS), wanted British military aircraft to aim to hit the net-zero target by 2040.

What does that mean in numbers? The maximum take-off weight of an early fourth generation Eurofighter (Typhoon) aircraft – unit for unit the most expensive fighter ever built – is 21,000 kg and it carries 4000 kg of fuel with an energy content of 49 MWh. A lithium-ion battery pack with the same energy content would weigh around 13 times the maximum take-off weight of the aircraft, assuming an energy density of 180 Wh/kg for the battery pack. And where, pray, would the Air Chief Marshal put said batteries? The same CAS was also pilloried for ordering such extreme application of 'Diversity, Equality, Inclusion' criteria in fast-jet pilot selection that all normal candidates (well-educated, highly motivated, white men, regardless of sexual preferences) would be excluded in favour of those with 'protected characteristics'. That no more works in the cockpit than batteries, or, more realistically, SAFs (synthetic aviation fuels) do in the wings. SAFs might one day meet the MIL-T-83188D standard, which is the performance requirement for JP-8 (military-grade jet fuel). but the process energy input plus opportunity/cost in land for feedstock crops (power density) mean that there would be no obvious real environmental benefits.



## Fighting vehicles

Similarly, *Popular Mechanics* (April 2020) reported a plan by the US military to have electric armoured vehicles. What are the numbers here?

A light armoured vehicle (L-ATV) weighs 4667 kg with a range of 300 miles and has dimensions of 6.2 m length and 2.5 m width (Wikipedia). Extrapolating from the Tesla S Long Range car (2100 kg weight, 100 kWh battery, 300 miles range), the L-ATV will need a battery of at least 220 kWh capacity weighing 1200 kg. Under 'peak sun', modern solar panels produce 150 Watts per square meter. So, if the LATV has to be charged by solar energy, it has to be parked under peak sun for about 95 hours\* to fully charge the battery, even if its entire top surface is covered by solar panels – impossible to arrange in a combat zone. Or else, a dedicated charging infrastructure has to be set up. Incidentally, a Challenger 2 tank weighs around 65 tonnes and carries around 1600 litres of diesel, with 16 MWh of energy. A lithium-ion battery pack with the same energy content would weigh around 89 tonnes on its own. Is the plan to tow this thing around on a trailer behind the tank?

## Ships

Finally, an aircraft carrier like HMS Prince of Wales, with a displacement weight of 65,000 tonnes, has electric final drive powered by marinised gas turbines and diesels. There are two Rolls-Royce Marine Trent MT30 36 MW (48,000 hp) gas turbine generator units and four Wärtsilä diesel generator sets (two 9-MW, 12,000 hp and two 11-MW, 15,000 hp). The ship carries around 3500 tonnes of fuel, with an energy content of 41000 MWh. A battery pack with the same energy content would weigh around 150,000 tonnes. It would take 17 days to charge fully at the rate of 100 MW, assuming the battery did not catch fire at such high charging rates. Incidentally, the Tesla Supercharger is rated at 0.25 MW. Where in the design of the ship would these things be stowed? And where would one find sailors prepared to go into action in such an infernal machine? And what of the ocean pollution when it gets sunk or spontaneously combusts? And how does anyone propose charging a mega-battery set in the middle of a North Atlantic gale in mid-winter, hunting Russian submarines? Oh yes – of course – install Wärtsilä diesel generation sets – see above – (and fuel bunkering) if there is any hangar space remaining to top up the batteries to run the electric final drive. And once that is all done, how would this carrier carry, its aircraft, let alone put them into action?

## Conclusion

In all cases, with such large batteries, the greenhouse gas emissions reduction will be very small or non-existent on a lifecycle

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\*  $220 / (0.15 \times 6.2 \times 2.5)$

basis because of the large amount of energy needed for battery manufacture. There will also be huge, unsustainable, environmental challenges and health impacts associated with the mining of materials required.

The scope for using alternative fuels, already mentioned, is very limited. Even if it were possible to manufacture biofuels, such as ethanol, in a carbon-neutral way, they still contain less energy per kilogram (or per litre) than liquid hydrocarbons, and so are fundamentally unsuited for aviation – the aircraft has either to carry more of such fuel for the same mission or reduce its range and speed.

Hydrogen, meanwhile, has huge challenges with manufacture, distribution and storage on board the vehicle, making it wholly unsuitable for use in military applications. Electrofuels, made from combining CO<sub>2</sub> with hydrogen, are extremely inefficient to produce and would also have insurmountable supply chain issues.

Hence the fantasy of having zero-carbon military vehicles will have to remain just that – a fantasy. Why are we even being obliged to write a formal rebuttal of such nonsense on stilts?

In China, fossil fuels will be reserved for some military purposes in the long term (note that their promise is for carbon neutrality in 2060; some emissions will remain). We, of course, should make the same exclusion, as we belatedly begin to rebuild our armed forces, something we will do if we are slightly sensible. But it appears that we are not. The MoD has a three-star 'green' champion, and a drive towards BEV armoured vehicles and fighter aircraft running on biofuels. As the commanders of Veterans for Britain observed:

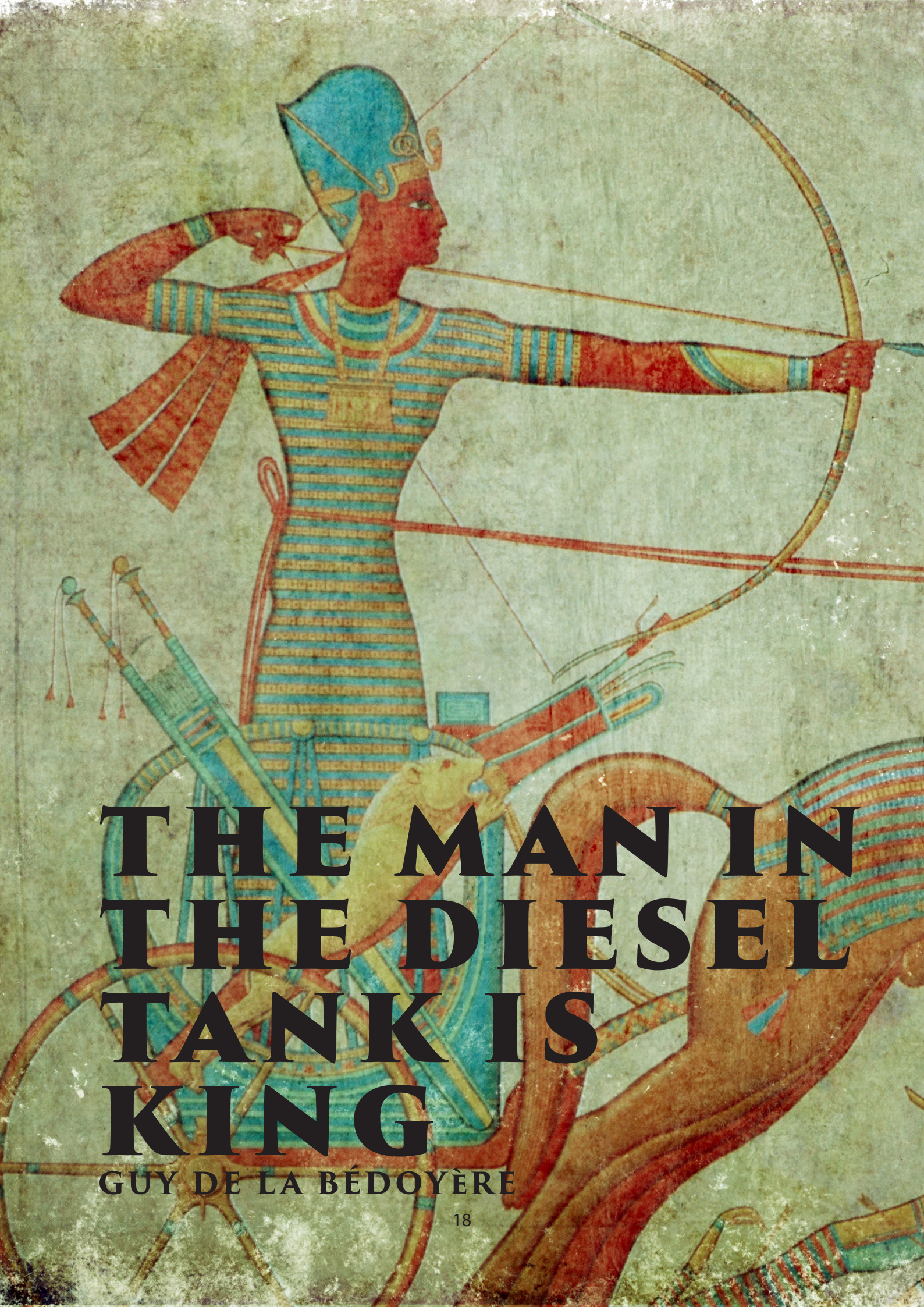
...the ambition to substitute less energy dense 'carbon free' fuels for avgas in aerjets or marine applications, or diesel in other military vehicles, has trivial if any environmental benefit but has certain operational penalty...swapping Battery Electric Vehicle drive-trains into heavy AFVs [Armoured Fighting Vehicles] is a frightening prospect. Who would wish to be in a tank with a lithium battery fire?

They concluded acidly:

...Thank goodness, therefore, that Dowding and Parks didn't spend their time worrying about running their Spitfires and Hurricanes on recycled chip oil or household waste instead of fighting and winning the Battle of Britain. It is not the job of MoD to engage in 'climate catastrophism' virtue signalling but to prepare to defend the realm, quite possibly quite soon.

The 'green' actions of the Ministry of Defence are the kind of thing that make the generals of the People's Liberation Army rub their hands in glee.





**THE MAN IN  
THE DIESEL  
TANK IS  
KING**

**GUY DE LA BÉDOYÈRE**



## The Man in the Diesel Tank is King

Guy de la Bédoyère

In the land of Net Zero, the man in the diesel tank is king.

Among the sayings attributed to the celebrated Chinese general Sun Tzu are 'all warfare is based on deception', 'the supreme art of war is to subdue the enemy without fighting', and 'appear weak when you are strong and strong when you are weak'.

It's another thing altogether when a country plans not to fight and makes itself weak while also taking care to appear so. In a dangerous world, being on your toes is essential.

Back in the middle of the 16th century BC, northern ancient Egypt was controlled by a group called the 'shepherd kings', or Hyksos. They invaded from what is now Syria, and pushed back native rulers, establishing their own regime. They achieved this with one very simple tactic: they had chariots.

The Hyksos chariots were a bit cumbersome, and seem to have had four warriors in them. But because the Egyptians at the time didn't have chariots, the Hyksos' equivalent of tanks were cutting edge.

When an Egyptian leader called Ahmose materialised, on a cometh-the-moment, cometh-the-man basis, to lead the fight back, he didn't assume the Hyksos would leave their chariots at home on his behalf so that it would be a fair fight.

Instead, Ahmose ordered the Egyptians to start making chariots too, creating a whole new industry. The Egyptians made their chariots smaller, lighter, and faster so that they could fight a Bronze Age *Blitzkrieg* war. Ahmose led these vehicles into battle and pulverised the Hyksos, whose chariots had become obsolete in an instant.

The blistering Ahmose established the 18th Dynasty, reunified Egypt, and ushered in its greatest line of kings, who presided over an unprecedented era of wealth, power, and – most important of all – national security. That all rode off the back of military strength. Ahmose's descendants took care to have themselves portrayed firing arrows at their enemies while hurtling along in chariots. The chariot-borne Egyptian pharaoh had become the new template of power.

I'm not extolling the virtues of conquest and brutality, which were the foundation of Egypt's new success. Much more pertinent is that Egypt's enemies for a good long while made no attempt to attack or invade the country.

One of the last of the kings of that dynasty was Tutankhamun in the late 14th century BC, whose tomb was famously found, almost intact, in 1922. On his body was an iron dagger, made of iron from a meteorite. At this time this



spectacularly hard metal, which cut through bronze like a wire through cheese, was beyond the wit of man to smelt. Only a king could own one.

Within a few centuries the secret of the high temperatures needed to smelt iron had been discovered. Humanity, for good or ill, entered the Iron Age. No-one went to war with a Bronze Age sword after that unless he wanted to lose or be conquered. The Roman Empire was an Iron Age state.

When the Romans went to war against the Carthaginians in the First Punic War (264–241 BC) they were not a naval power, even though the Carthaginians were. The Romans used a wrecked Carthaginian ship as a template and built their own, adding improvements in the form of the corvus boarding ramp. Yes, it was trial and error, but they won their first engagement with the Carthaginians in the Battle of Mylae in 260 BC because the enemy was complacent, and the Romans tried harder.

It was a long and hard struggle, with catastrophes along the way, but Rome won that war against Carthage, and the next two as well, and ended up as the most powerful naval force in the Mediterranean.

The principle is always the same, and the dynamic is the process of technological development, which at its fastest is and always has been driven by warfare. The unavoidable fact is that it is impossible to stand still or diminish the effectiveness of a nation's armed forces without making it a sitting duck for a more ambitious rival's greed.

Sometimes governments fail to see what is obvious to others. In the lead-up to the Second World War, Geoffrey de Havilland was pioneering plans for a high-speed unarmed twin-engine bomber made of wood, which he could see had the potential to make a huge difference. He faced opposition in official circles, mainly from Lord Beaverbrook, but he persisted with his research. By 1941 trials of the Mosquito demonstrated that de Havilland had created an aircraft capable of stunning performance, and one of the fastest operational aircraft at the time. The Luftwaffe were so stunned that if anyone managed to shoot a Mosquito down it counted as two kills. Of course, the Mosquito's day was short, with jets superseding piston-engined aircraft after the war, but that's not the point: at the time this superb aircraft presented a massive advantage over the enemy.

Yes, of course arms reduction treaties exist, and they've been a mechanism for trying to inhibit the recklessness of unrestrained militarisation by encouraging mutual compliance in stepping back. They can and do work – up to a point. But there has never been a situation where everyone is prepared to play ball at the same time.

There's another aspect of this which is far more important. That is the ability to manufacture the means of one's defences. In the real world there is simply no conceivable possibility of any serious nation unilaterally trying to cripple its capacity either to

produce the raw materials or manufacture the hardware with which to defend itself and expecting to survive.

Extraordinarily though, that is quite literally what seems to be happening in the United Kingdom today. The decision to shut down the blast furnaces at the Port Talbot steelworks in pursuit of 'cheaper' and 'greener' methods is only one more in a series of self-inflicted reductions in our ability to defend ourselves.

It might be admirable to aspire to fight green wars but unless all the belligerents sit around a table first and agree to a whole series of unenforceable COP-style green armaments policies, it might just be more expedient to surrender from the word go.

There is no future for Net Zero in warfare, the armed forces, or manufacturing. We cannot defend ourselves with electric tanks made of papier-maché steel, to use them as a metaphor for any other aspect of military technology.

We can't have a situation in which, during a war, our factories are at the mercy of windpower generated by turbines in the middle of a sea, beyond us to defend in a meaningful way, or can't function at full bore simply because it's a still day. Nor can we depend on an energy source that isn't up to the job, however much of it we have, just as in the same way the Bronze Age fizzled out in the face of iron.

It might be better for everyone if we were all susceptible to such limiting factors, but the world doesn't work like that. The 'enemy', whoever that turns out to be, will kit itself out with whatever will make it most likely to be able to win and seize what it wants, whether that is territory or resources, or just power. And if that means the enemy goes to war with faster, more reliable, and more powerful equipment then that's exactly what its troops will have to hand.

In 1939–40 the Germans had prepared for a modern war while Britain and France had dithered. The Germans lost in 1945 because they overreached themselves. By then the Allies (which effectively means mainly the US) had poured their almost unlimited resources into record-breaking technological development, and creation of manufacturing capacity on an unprecedented scale, but only just in time. The Germans probably had some of the best equipment, but they couldn't produce it in sufficient quantities, despite resorting to synthetic oil. And that's just as important as the equipment itself. The Tiger tank might have been as good as ten Shermans, but the Allies had eleven Shermans and they could keep making eleven Shermans.

It may be an unpalatable aspect of human society, but if there's one thing history tells you, it is what people are like, though one of the most debilitating developments in modern society is an ignorance of history. Indeed, the subject is being squeezed out of the curriculum in the UK and it's not the only place, Parliament included.

In a world of ambition, nationalism and competition, you must be able to defend yourself. I hope beyond anything else there isn't



going to be a war, but one of the best ways of making sure one breaks out is to make yourself look like a pushover.

Clean energy in a domestic and civilian context is a desirable and laudable aspiration to be welcomed, but dogmatically trying to make going green a strategic and tactical priority on the battlefield is the stuff of religious cults. There is no room for such indulgences.

Obviously, wars never go to plan and the outcome is ultimately likely to be determined by luck, hubris, and unforeseen catastrophes. The Roman historian Tacitus mused on how 'fate and circumstances are generally due to chance'. He was right, but you can go a long way to making your own luck.

We have no idea what shape the next war will take. Cyber assaults are all too likely in the future, but they won't change the fact that if we ever need to pull ourselves together and fight back to defend a physical island then we'll have to kiss Net Zero for our armed forces goodbye on the spot, if we haven't had the wit to do so already. But by then it might be too late.

Here's hoping we don't have to find out the hard way.

I can finish no better than with a quote from the Greek historian Polybius who wrote c. 140–130 BC:

'So great is the difference both to individuals and to states between carefulness and wisdom on the one hand, and folly with negligence on the other, that in the latter case good fortune actually inflicts damage, while in the former disaster is the cause of profit.'







For further information about Net Zero Watch, please visit our website at [www.netzerowatch.com](http://www.netzerowatch.com).

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