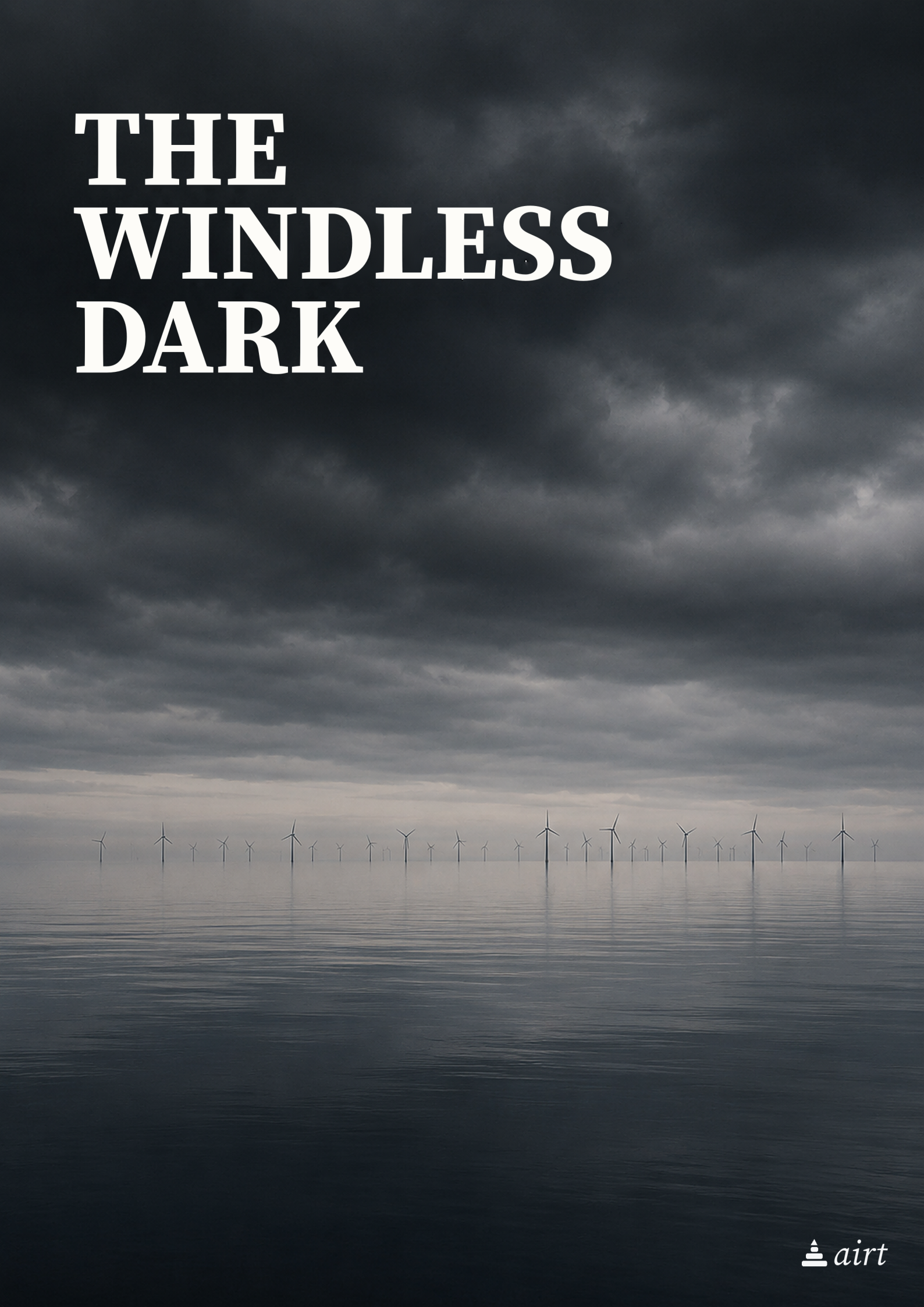


# THE WINDLESS DARK



# The Windless Dark

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*A dead calm powers no compute. On firm power, long-duration storage, and the concrete nobody will pour.*

There is a hole in every argument about Scottish energy, and it opens on a still, cold evening in February: the windless dark the Germans were sensible enough to name, a dunkelflaute. The whole case for soaking up curtailed wind, for siting flexible demand where the surplus is stranded, for treating a data centre as a sponge rather than a parasite, concerns the surplus hours, when the wind is dumping power we cannot use. It says nothing about the deficit hours. And the deficit hours are about to get worse.

Torness, Scotland's only nuclear station, carries an estimated 585 cracks in a graphite core that cannot be mended, only monitored.<sup>1</sup> Its life has been stretched to 2030, but the closed reactors at Hunterston and elsewhere say that date bends only one way. When it goes, Scotland's firm floor on a windless winter night is Peterhead burning gas, the rain-fed hydro of the Highland dams, a few hours of pumped storage at Cruachan and Foyers, and a cable to England down which we normally export and would, that night, have to import. A renewables superpower kept alight on its worst evening by a gas station, the old dams, and a wire to a neighbour stilled by the same weather.<sup>2</sup> Scotland's peak demand is around 5.5GW, and on a calm winter evening the country has long leaned on imports from the south to meet it; that was true when there were three large stations north of the border, and there will soon be none.

This is the limit that the flexible-load argument cannot talk its way past. A data centre that follows the wind is a genuine asset in the surplus hours, and the best modelling we have confirms it lowers system cost.<sup>3</sup> But the flexibility that does the work is the shifting of deferrable jobs across hours, within a day. A dunkelflaute is not a peak that arrives at six and clears by nine; it is a high-pressure system that can sit over the North Sea for the better part of a week. No amount of clever scheduling rides that out. Pumped hydro measures its endurance in hours; the windless dark measures itself in days. Add the steady draw of half the nation's homes and a flexible load has nothing left to flex toward: there is no surplus to chase. But a load built to shed can still do the one useful thing left in the dark, the mirror of what it does in the light: switch off, by design and on demand. A load that stands down when the system is short is firm headroom by another name, the same interruptibility that soaks the surplus working the

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<sup>1</sup>Torness carries an estimated 585 graphite core cracks (The Ferret, 2025); EDF extended its life to March 2030 in December 2024, "subject to inspections" (World Nuclear News).

<sup>2</sup>Scotland's firm capacity and the import dependence are set out in ClimateXChange, "Meeting Scotland's peak demand for electricity" (Gill and Bell, University of Strathclyde, March 2017): Scottish peak demand of approximately 5.5GW; Peterhead CCGT of about 1,180MW (with around 780MW mothballed in the mid-2010s, roughly 400MW operating in the market and about 750MW held as contingency/winter reserve); conventional capacity in Scotland fallen to about 4.7GW after the Cockenzie and Longannet closures; and a standing reliance on imports from the rest of GB "when it is calm." Pumped storage at Cruachan (about 440MW) and Foyers (about 300MW). The report is now nearly a decade old and predates Hunterston B's 2022 closure, the Torness life-extension, and the Eastern Green Link reinforcements, so its structural picture holds even where its snapshot numbers have moved. SSE Thermal for current Peterhead operation.

<sup>3</sup>Christopher R. Knittel, Juan Ramon L. Senga and Shen Wang, "Flexible Data Centers and the Grid: Lower Costs, Higher Emissions?", NBER Working Paper No. 34065, July 2025 (not yet peer-reviewed). The flexibility modelled is the shifting of deferrable load across hours within a day; the authors are explicit that some tasks cannot be postponed at all, and the modelling does not extend to multi-day interruption.

deficit from the far side. It generates not a watt, and the homes still need the watt it cannot make, so it widens the gap rather than closing it. Flexibility is the permission, not the plan: the surplus problem and the deficit problem are different animals, and only one of them is solved by being clever about when the servers run.

There is a blacker comedy folded into this. The objections lodged against the Auchtertool sheds are access to a local wildlife site,<sup>4</sup> the ruined sixteenth-century Hallyards Castle the buildings may sit over, and a blot of six 35-metre sheds on the rural skyline; the real environmental bill of the whole arrangement, the gas we will burn to cover every dunkelflaute, draws barely a murmur. Net zero, it turns out, is brought to you by Peterhead, asterisk and all: save the view, and we will settle the carbon later.

The corollary, which neither side of the data-centre row quite reaches, is that the missing conversation is not about more wind. We have plenty of wind, and increasingly nowhere to put it. It is about firm power that ignores the weather: the dispatchable, low-carbon capacity that keeps the lights on when the wind has gone and the sun set hours ago. And there the answer is bleak, because every candidate is built, blocked, or imaginary.

Run the list. Conventional hydro, the rain-fed dams the Highlands already hold, is the one firm, low-carbon source Scotland owns: it runs straight through a still week, limited only by the water behind it. But the big dispatchable sites were dammed last century; the couple of gigawatts that surveys still find is mostly small, scattered, run-of-river, the sort that runs thin in the same frozen calm, not the great reservoir blocks that ride one out. Pumped storage is not generation at all but a battery of water, charged by surplus wind, and in a days-long calm there is no surplus to charge it, so it discharges once and waits for the weather, useless across the very event that defines the problem. Nuclear is firm, low-carbon, and closing, ruled out on cost, on a build too slow to replace Torness in time, and on a cleanup bill it has never honestly costed, so leave it for another essay. Gas with carbon capture is unbuilt; hydrogen turbines do not yet exist at the scale a grid needs. Read singly, each one fails, and that is how the question is always put: name the single firm low-carbon source that covers a week of February, and there is none. But no one was ever going to cover it with one. The answer is a portfolio Scotland could assemble and has not: a cable to weather it cannot share, to Norway, whose reservoirs do not care about a North Sea high; interruptible demand that sheds when the grid is tight; storage for the day-long gaps; and a thin, rarely-fired peaker for the deep ones. Build none of it, and what is left when the wind dies for days in February is this generation's answer: a gas station, burning three hundred million years of buried sunlight to cross a week of calm.

Scotland has built its way out before. The North of Scotland Hydro-Electric Board, conjured by Tom Johnston in 1943, dammed the glens and wired ninety per cent of the Highlands inside two decades, a public enterprise that asked no one's leave and whose dams still carry the load on a windless night.<sup>5</sup> That is the nerve the moment asks for again. The trouble is it now has

<sup>4</sup>Fife Council screened the scheme out of an Environmental Impact Assessment, judging that it would have “no significant effects on the environment”; the developer concedes “the absence of a formal EIA” while maintaining that its own reports suffice. No ecological survey of the Auchtertool Linn Wildlife Site has been published, so what beastie, what burd, what floer or lichen bides in the Linn stays unkent and uncounted: a reckoning nobody was asked to make. Central Fife Times, “Auchtertool data centre: Fife Council has no environmental report” (June 2026).

<sup>5</sup>The North of Scotland Hydro-Electric Board (1943-1990), created by the Hydro-Electric Development (Scotland) Act 1943 under Tom Johnston, who chaired it from 1945; from Loch Sloy onward it connected about ninety per cent

nowhere low-carbon to point: the glens are dammed, the one firm source that could be built at the scale of the gap is the nuclear the country has forsworn. Which is no loss to mourn: seventy years of cleanup estimates, each sold as the final figure and each buried by the next, are a floor dressed as a ceiling, and the bill on the mess we already own will still be landing on taxpayers not yet born when they retire. That is the measure of any costing on a new reactor. And what a bold public programme could pour tomorrow, the Coire Glas store, banks a surplus it cannot refill in a drought of wind. We could pour Tom Johnston's concrete all over again and still not light the still Thursday.

And the building is coming anyway, at a scale he would have recognised. A wall of pumped-storage schemes is queuing for the Highlands, the biggest cluster of them on Loch Ness, which holds more water than any other lake in Britain and lies just sixteen metres above the sea. More than forty gigawatt-hours of storage are planned on that one loch alone. The largest is Glen Earrach, a two-gigawatt scheme the developer costs at around £3bn. It has the look of the second Hydro Board the argument keeps calling for. It is nothing of the kind. Every scheme is pumped storage, and a battery the size of a sea-loch is still a battery: it feasts on the blustery surplus and starves in the long calm.

Scheme	GW	GWh	Status	Cap & floor	Developer
Earba	1.8	40	Consented	Yes	Gilkes/SSE
Coire Glas	1.45	30	Consented	Yes	SSE
Glen Earrach	2.0	34	Application	No	Glen Earrach
Fearna	1.8	37	Application	No	Gilkes/SSE
Balliemanoich	1.5	45	Application	No	ILI
Loch Kemp	0.66	9	Inquiry	Yes	Statera
Loch na Cathrach	0.5	n/d	Consented	Yes	ILI/Statkraft
Cruachan 2	0.6	n/d	Paused	No	Drax
Corrievarkie	0.6	14.5	Scoping	No	ILI
Glenmuckloch	0.21	1.6	Consented	Yes	Bucleuch

Build the lot and it comes to some eleven gigawatts and two hundred-odd gigawatt-hours: a single day's discharge against the deficit, and then it waits for the wind. We are pouring concrete in the glens again, in earnest.

But the deepest obstacle is not the objectors at all; it is the meter. Under the current transmission regime the cost of not building is socialised across every consumer's bill, while locational charges punish anyone who generates where the wind is, so no single party ever has to pour concrete to make the waste stop.<sup>6</sup> The market has already returned its verdict: not one pumped

of the Highlands by the 1960s. Coire Glas (Loch Lochy), up to about 1.5GW and 30GWh, awaits a final investment decision and the UK cap-and-floor support mechanism. Wikipedia, North of Scotland Hydro-Electric Board; SSE Renewables.

<sup>6</sup>Generation TNUoS in north Scotland reached about £19/kW in 2019-20 against roughly minus £2.50/kW in south-east England, that is, a payment to connect near demand. No new pumped storage has been built in Britain since Dinorwig in 1984; the UK long-duration storage cap-and-floor mechanism was announced in October 2024, and Ofgem shortlisted dozens of schemes in September 2025, the energy minister Michael Shanks describing it as end-

storage scheme has been built in Britain since Dinorwig in 1984, and it took a bespoke state backstop, the long-duration cap and floor, to make Coire Glas thinkable at all. The energy minister now sells that backstop as “reversing the legacy that has seen no new long duration storage built for 40 years,” which is a government admitting, in its own words, that the market it presides over will not build the thing the transition needs. And note what the backstop buys: pumped storage that smooths the surplus, not firm power that covers the deficit; even the concrete the public purse will pour does not reach the dark.

On this narrow point Common Weal are simply right, and ahead of their own [briefing](#): the concrete that decarbonisation needs is precisely the concrete a privatised, nationally-priced market will never fund on its own, and only a public mandate of the kind that dammed the glens ever has. That mandate is not free. The cap and floor underwrites the duds at the bill-payer’s expense, just as the Hydro Board socialised its dams across the rates. A public bill for storage that exists beats a private market that builds none. But be honest about what it leaves standing: the surplus made to pay, and the deficit still met by gas, because the one low-carbon firm answer big enough to change that is the one the country has ruled out.

So the firm-power question and the data-centre question are one question seen from two ends. A flexible load makes the surplus pay; nothing yet built or permitted covers the deficit it leaves behind. Do the first and refuse to face the second, and you have a grid that is brilliant on a blustery Tuesday and, on a still Thursday in February, kept alive by burning gas while everyone argues about warehouses. The mix that would shrink that gas to a thin, honest bridge is buildable now, and we are building almost none of it. A dead calm powers no compute. The concrete that answers it is already being poured, at Peterhead, and the only thing we will not do is call it by its name, or cost the thing it is meant to be a bridge to.

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ing the legacy of “no new long duration storage built for 40 years.” NESO’s balancing costs, of which Scottish constraints are a large part, are projected to climb toward £8bn by 2030 absent faster network build. Ofgem; NESO; Energy-Storage.News; New Civil Engineer (24 September 2025).