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From Bias to Bankability

Cannibalisation, DSCR Covenants and the Term Structure of Storage Revenue

Dr Christopher T. M. Clack
Founder, Compounding Energy Ltd
christopher@compoundingenergy.com

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Abstract. A revenue forecast that holds prices fixed while the storage fleet grows overstates battery revenue by a factor that grows with the fleet. This paper turns that bias into the two numbers a lender writes down: debt capacity and the year a covenant binds. On the series' unchanged stylised Great Britain equilibrium, a two-hour battery commissioned in 2027 is followed through a fifteen-year tenor on two build-out paths, its revenue re-solved at each year's equilibrium as the fleet grows, and passed through a standard project-finance layer with stated inputs. The equilibrium revenue track falls 19% below the price-taking track by 2030 and 25% by 2035 on the reference path, then flattens on the stated background path: the cannibalisation wedge is front-loaded. Debt sculpted to a 1.30× cover on the price-taking track breaches a 1.10× covenant in year three of the tenor in the mean weather year and year two in the low one — one year later per 0.10× of sizing cover — and does not recover under the series' revenue-booking convention, with the minimum cover at the end of the tenor; debt sized on the equilibrium track

is 25% smaller (60% on the fast path). The bias is therefore not a haircut a lender can size without the equilibrium track; it is a term structure that decides the covenant year. Levels are stylised and badged; the shape of the term structure, the sign and order of the debt-capacity reduction, and the early-breach, late-minimum pattern are the results.

Keywords: battery storage, project finance, DSCR, debt capacity, cannibalisation, equilibrium, Great Britain

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1 Introduction

The series has established that battery revenue in Great Britain is a fixed point of fleet, prices and dispatch, and that a forecast holding prices fixed while the fleet grows overstates revenue by a factor that grows with the fleet (Clack, 2026b,c). A lender does not underwrite a factor. A lender underwrites a debt service coverage ratio, year by year over a tenor, and sizes debt so that the ratio clears a covenant in every year of a downside case. This paper carries the bias into those terms. It follows one asset — a two-hour battery commissioned in 2027 — through a fifteen-year tenor on the series' unchanged machinery, re-solving the equilibrium each year as the fleet on a stated build-out path grows, and passes the resulting revenue term structure through a project-finance layer whose every input is stated. The questions are the ones a credit committee asks: how much debt does the asset carry if the revenue case is sized on today's price shape, how much if it is sized at equilibrium, and in which year does a case sized on the former breach a covenant when the latter is what arrives?

The answer has a shape, not just a size. Most of the cannibalisation wedge arrives in the first few years — the fleet's own effect is of the same order in every interval of the path, and it is the background's rising renewables scale that offsets it after 2035 — and a price-taking-sized debt breaches almost immediately while its minimum cover sits at the end of the tenor. That is the reverse of the gas-price stress a storage credit case commonly carries alongside build-out (Clack, 2026d), which, shocked off a forward curve that reverts, bites early and fades. Everything here is stylised and badged as such; the series' production model is graded elsewhere (Clack, 2026a), this stylised machinery is not.

2 Framework

Machinery. The case-study model of Clack (2026d), unchanged and imported as is, as in Clack (2026e) and Clack (2026f): the stylised single-zone Great Britain of Clack (2026b), synthetic demand and renewables, a strictly convex inverse supply representation, and one-, two- and four-hour battery classes dispatched jointly with an aggregate frequency-response product inside one convex welfare program whose duals, served through the representation's stated price floor and cap, are the half-hourly prices. No data-centre load and no flexible cohort are present. Every cell is certified optimal by the solver and passes the primal verification suite at the tolerances recorded in the run manifest (with no flexible cohort its live checks are the balance identity and the state-of-charge bounds).

Years and paths. The tenor runs 2027–2041. Background scales interpolate linearly between the siblings' 2030 and 2035 anchors and two anchors stated here for 2027 (demand 1.00, renewables 1.27, fleet (2, 3, 1) GW) and 2041 (1.18, 2.33, (3, 9, 6)); the 2027 anchor is this paper's scenario input for the price-taking track. The *reference* build-out path passes through the siblings' 2030 and 2035 reference fleets — (2, 3, 1) GW of one-, two- and four-hour capacity in 2027, (3, 5, 2) in 2030, (3, 7, 4) in 2035, (3, 9, 6) in 2041, linear between, about 1.3 GW a year — and is set deliberately below national pathway ambition (National Energy System Operator, 2026); the *fast* path is the reference multiplied by one and a half from 2028 — a single-year step from 6 to 11 GW in the first year of the tenor — reaching 15 GW in 2030 and 21 GW in 2035. Two paths, fifteen years and three synthetic weather years give 90 equilibrium cells.

Two revenue tracks. The financed asset is a two-hour battery; its revenue per megawatt is the two-hour class's wholesale-plus-frequency-response revenue at each year's equilibrium, Balancing Mechanism and Capacity Market excluded as in the siblings. The *equilibrium* track is that revenue year by year. The *price-taking* track is the 2027 equilibrium revenue held flat for the tenor — today's price shape, projected. The wedge between them is the bias of Clack (2026b),

expressed as a term structure; it starts at zero because the 2027 price shape already embeds the 6 GW fleet present in 2027, which is why it is smaller than the storage-free bias that paper reports.

Finance layer. Stated, stylised inputs: opex £12k/MW/yr; debt service sculpted to a 1.30× cover on the price-taking track, which on a flat track is level service; cost of debt 6.5%; fifteen-year tenor; capex £550k/MW, used only to express debt as gearing; covenant 1.10×, the level the public CECadence held-out record recommends as the covenant to test against its downside band (Compounding Energy Ltd, 2026a). Debt capacity is the present value of the service the track supports at the target cover, on annual periods with end-of-year service discounted at the cost of debt and no construction interest, reserve account or tax. The equilibrium track is then tested against the price-taking-sized service: its DSCR by year, its minimum and the year of the minimum, and the first year below the covenant. The downside track is the *low weather year* — the minimum of the three synthetic years in each year of the tenor — and is labelled as such throughout: three synthetic years are not a P90, and a bank's downside band needs a longer record than this bundle carries. With a flat price-taking track and level service, the equilibrium cover in year t is the sizing cover times the ratio of equilibrium to price-taking CFADS; the breach year therefore does not depend on the cost of debt or the tenor, and moves one year per 0.10× of sizing cover — years 2, 3, 4 and 5 at 1.20, 1.30, 1.40 and 1.50× on the reference path (2, 2, 3 and 4 in the low weather year; year 2 on the fast path throughout).

Revenue-booking convention. Revenue is booked on the reconstructed non-simultaneous dispatch of Clack (2026b). In the relaxation a full battery keeps absorbing through its round-trip losses in negative-price half-hours and is paid to do so; the reconstruction books that as no flow. In the siblings' backgrounds this moves revenue by about one percent; here negative-price half-hours rise from 9% of the year in 2027 to 19% in 2035 and 33% in 2041 on the reference path, and the reconstruction lowers the booked two-hour wholesale revenue against the same dispatch at the served price by 1% in 2027, 2% in 2030, about 7% in 2035 and 13% in 2041 (19% on the fast path in 2041; `convention_gap.json` in the bundle). The breach year, the 2030 wedge and the sign and order of the debt-capacity reduction do not depend on that convention; the late-tenor levels, the location of the minimum cover and the absence of recovery are reported under it.

3 Pre-registration and outturn

Four hypotheses and three bands were written before any cell was solved (`PREREGISTRATION.md` in the bundle); three were confirmed outright, one in sign only, and all bands passed. The equilibrium track declines every year on both paths, so the wedge widens monotonically (H1). Debt sized on the equilibrium track is at least 25% below debt sized on the price-taking track on the reference path — by a margin of a quarter of a point — and much more on the fast path (H2). Debt sized on the price-taking track falls below the covenant before year ten on the reference path in the mean weather year — in year three — and earlier in the low weather year and on the fast path, with the minimum cover in the final years, the latter a corollary of a declining track under level service (H3). H4 — that the 2030 wedge on the reference path is consistent in sign and order with the Clack (2026b) naive-versus-equilibrium bias for two-hour batteries — was confirmed in sign but not in order, and is graded by hand against that paper's published table: the 2030 wedge is 19%, a 23% overstatement in that paper's naive-over-equilibrium convention, against 150% at a 4 GW effective fleet there. The difference is explained, not registered: the 2027 price shape already prices the 6 GW fleet present in 2027, and the background that grows with the fleet — renewables 1.27 to 1.45, demand 1.00 to 1.06 — adds spread that closes most of the rest. Bands: the reference path's 2030 two-hour revenue reproduces the two-hour revenue of

the Clack (2026d) bundle's inflexible 0.25 GW cell at the same fleet and scales (£37.4k/MW/yr, the figure Clack (2026e) prints), 2027 exceeds 2030, and every revenue is positive.

4 Results

[Every value in this section is generated by the run matrix of Appendix A at seed 20260901 on the unchanged Clack (2026d) model and passes the physical verification suite; tables are generated from the results files; levels are stylised. Means over three synthetic weather years unless the low weather year is named.]

4.1 The term structure

Table 1: The term structure of two-hour battery revenue over a fifteen-year tenor from a 2027 commercial operation date: the equilibrium track (mean of three synthetic weather years, and the low weather year) against the price-taking track (the 2027 equilibrium revenue held flat), £k/MW/yr, wholesale plus frequency response, with the fleet on each build-out path (1 h/2 h/4 h GW). Wedges are computed from unrounded values. Stylised levels.

Year	Fleet (GW)	Equilibrium	Low weather year	Price-taking	Wedge
Reference path					
2027	2/3/1	45.9	44.1	45.9	0%
2028	2.333/3.667/1.333	42.0	40.1	45.9	9%
2029	2.667/4.333/1.667	39.3	37.3	45.9	14%
2030	3/5/2	37.4	35.6	45.9	19%
2033	3/6.2/3.2	35.4	34.1	45.9	23%
2035	3/7/4	34.7	33.5	45.9	25%
2038	3/8/5	34.5	33.4	45.9	25%
2041	3/9/6	34.3	33.2	45.9	25%
Fast path					
2027	2/3/1	45.9	44.1	45.9	0%
2028	3.5/5.5/2	28.5	27.4	45.9	38%
2029	4/6.5/2.5	26.0	25.2	45.9	43%
2030	4.5/7.5/3	24.3	23.6	45.9	47%
2033	4.5/9.3/4.8	22.4	22.1	45.9	51%
2035	4.5/10.5/6	21.8	21.3	45.9	53%
2038	4.5/12/7.5	21.5	21.0	45.9	53%
2041	4.5/13.5/9	21.2	20.6	45.9	54%

Table 1 is the paper's object. On the reference path the two-hour asset earns £45.9k/MW/yr at the 2027 equilibrium, £37.4k by 2030 and £34.7k by 2035, and then almost nothing more is lost — £34.3k in 2041. The flattening was not registered (H1 registered a monotone widening, which holds) and is a near-cancellation rather than a slowing: the revenue the still-growing fleet takes is offset by income from charging in the negative-price half-hours that the rising renewables scale creates at the representation's stated price floor, while the mean daily spread falls in every year; the post-2035 plateau is therefore a property of this paper's 2041 background anchor. The wedge against the flat price-taking track is 19% by 2030 and 25% by 2035, and stays there on the stated path: four-fifths of the cannibalisation a 2027 asset suffers arrives in the first third of its tenor. On the fast path the same asset earns £24.3k by 2030 and £21.2k by 2041, wedges of 47% and 54%. The low weather year sits a few percent below the mean in every year (£44.1k against £45.9k in 2027) and follows the same shape. Figure 1 plots both tracks.

Table 2: The finance layer (stylised inputs: opex £12k/MW/yr, debt sculpted to a 1.30× DSCR on the price-taking track, 6.5% cost of debt, fifteen-year tenor, capex £550k/MW for gearing context; covenant 1.10×). Debt capacity per MW sized on the price-taking track and on the equilibrium track; the equilibrium track's DSCR on price-taking-sized debt.

	Reference path	Fast path
Debt sized on price-taking CFADS (£k/MW)	245	245
Debt sized on equilibrium CFADS (£k/MW)	183	98
Reduction in debt capacity	25%	60%
Gearing, price-taking / equilibrium	45% / 33%	45% / 18%
Minimum DSCR on price-taking-sized debt (year)	0.85 (year 15)	0.35 (year 15)
First year below the 1.10× covenant, mean weather	year 3	year 2
First year below the covenant, low weather year	year 2	year 2
Minimum DSCR, low weather year	0.81	0.33
Debt sized on the low-weather-year equilibrium track (£k/MW)	173 (30% below price-taking)	93 (62% below price-taking)
Breach year at sizing cover 1.20 / 1.30 / 1.40 / 1.50×	2 / 3 / 4 / 5	2 / 2 / 2 / 2
Break-even flat haircut to the 2027 revenue (mean / low year)	17% / 19%	50% / 52%

Table 3: DSCR by year of tenor on price-taking-sized debt, equilibrium track, mean weather year.

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Reference	1.30	1.15	1.05	0.97	0.94	0.92	0.90	0.88	0.87	0.87	0.86	0.86	0.86	0.86	0.85
Fast	1.30	0.63	0.54	0.47	0.44	0.42	0.40	0.39	0.37	0.37	0.37	0.37	0.36	0.36	0.35

4.2 Debt capacity and the covenant year

Table 2 translates the wedge. Debt sculpted to 1.30× on the price-taking track supports £245k/MW — 45% gearing on the stylised capex. The same rule applied to the equilibrium track supports £183k/MW on the reference path, 25% less and 33% gearing, and £98k/MW on the fast path, 60% less. Table 3 shows what happens to the price-taking-sized debt when the equilibrium track is what arrives: cover is 1.30× in year one by construction, 1.15× in year two, 1.05× in year three — below the covenant — and falls to 0.85× in year fifteen without recovering; in the low weather year the breach comes in year two and the minimum is 0.81×. On the fast path the breach is in year two in either weather case and cover ends the tenor at 0.35×. The pattern is early breach, late minimum: the wedge arrives in the first years and the debt service, sized level on a flat track, does not shrink to meet it. Two further numbers a lender will ask for are in Table 2. Debt sized on the low-weather-year equilibrium track — the sizing a lender would actually do — is £173k/MW on the reference path, 30% below price-taking, and £93k on the fast path. And a flat haircut to the 2027 revenue can stand in for the term structure on the reference path but not on the fast one: a 17% haircut (19% in the low weather year) removes the breach and reproduces the equilibrium-sized debt to within about 4%; on the fast path no haircut below 50% does. The term structure's content is that the right haircut is path-dependent and cannot be sized without the equilibrium track, not that no haircut exists.

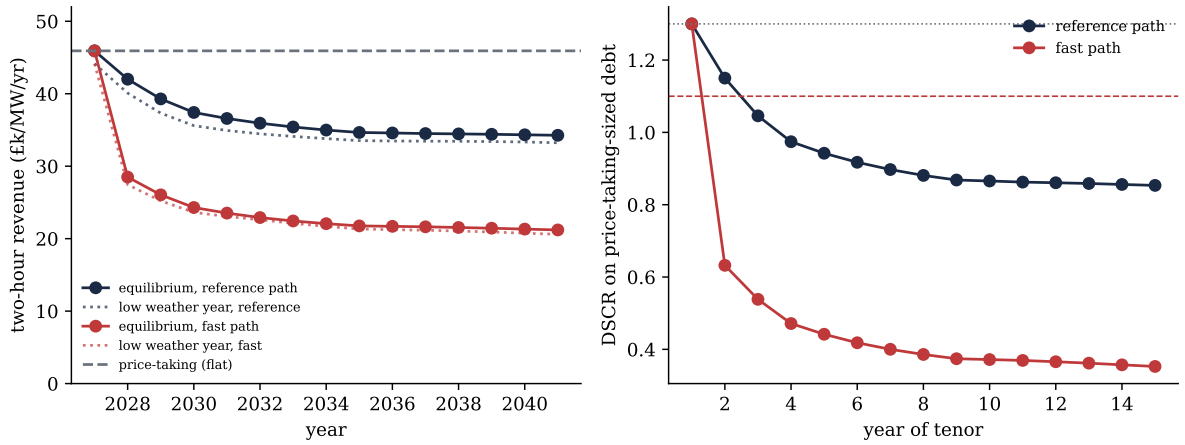

Figure 1: Left: the two-hour revenue term structure on both build-out paths (equilibrium mean and low weather year) against the flat price-taking track. Right: DSCR by year of tenor on price-taking-sized debt, equilibrium track; dashed line the 1.10× covenant, dotted the 1.30× sizing cover. Stylised levels.

5 Discussion

For lenders. A storage credit case sized on today's price shape is not conservative by a margin that a haircut recovers; on this machinery it is out of covenant within three years at a 1.30× sizing cover, four at the 1.40× that Clack (2026b) takes as typical, because the fleet that erodes the revenue is being built during the tenor, not before it. On this machinery the stress that matters is the equilibrium track under the build-out path the lender believes, sized against that track's downside year. The early-breach, late-minimum pattern also says where the sensitivity belongs: on this path the first third of the tenor decides whether the case survives, and a gas-price stress that bites early and fades does not stand in for it.

For sponsors. The reduction in debt capacity is the price of the bias, in the currency the bias is paid in. On the reference path it is a quarter of the debt; on the fast path — 15 GW in 2030, still below the 23–27 GW installed-base projection Clack (2026b) cites, on a single-zone fleet that paper reads as an effective price-setting cohort rather than the installed base — it is more than half. A sponsor who sizes on the equilibrium track raises less senior debt and keeps the asset in covenant; one who does not raises more and meets the covenant year with the wedge already in the revenue line.

Limitations. A single two-hour asset in a single stylised background; two build-out paths, stated, not forecast, the fast one entering with a single-year step; three synthetic weather years, so the downside track is the low year and not a P90; a stylised finance layer with level service and no tail, sizing or refinancing structure beyond the inputs stated; wholesale-plus-response revenue only, with Balancing Mechanism and Capacity Market excluded, which understates both tracks; stylised levels throughout, including a baseline in which revenue per megawatt rises with duration, the reverse of the ordering in the measured CECadence Quarterly GB BESS Index (Compounding Energy Ltd, 2026b). The 2027 price-taking track already embeds a 6 GW fleet, so the wedge is the incremental bias of growth over the tenor, not the storage-free bias of Clack (2026b). Twenty cells that default solver settings could not certify were certified with the solver's equilibration disabled; every served cell is certified optimal and the settings are recorded per cell.

6 Conclusion

The bias of a price-taking revenue forecast has a term structure, and the term structure is what a lender should be looking at. On the series' unchanged stylised equilibrium, a two-hour battery's revenue falls a fifth below its 2027 price shape within the first third of a fifteen-year tenor, a quarter by 2035, and, on the stated background path, stays there; debt sized on that price shape breaches a 1.10× covenant in year three and does not recover under the series' booking convention, and debt sized at equilibrium is a quarter smaller — more than half smaller on a fast build-out. Three of four registered hypotheses landed as expected and the fourth in sign only; all are published with the bands that checked them, on machinery that has not changed since Clack (2026d), in a series whose record is graded in public (Clack, 2026a; Compounding Energy Ltd, 2026b).

A Run matrix and manifest

Scenario `CE-WP-2026-08-stylised-GB`, seed 20260901, code version `2cedb716f388` — the Clack (2026d) case-study model unchanged; the run script (sha256 prefix `b7d1ce12f09b`) sets each year's background scales and fleet and carries the finance layer — pipeline stamp 2026-09-04 14:45 UTC. Run matrix: two build-out paths × years 2027–2041 × three synthetic weather years, 90 equilibrium cells (87 distinct input sets, the paths coinciding in 2027); background anchors and fleet anchors as stated in Section 2; no data-centre load. Horizon: 26 representative weeks at half-hourly resolution, annualised. Finance inputs as stated in Section 2, recorded in the manifest. Verification tolerances, solver settings per cell (70 default, 20 with equilibration disabled), the pre-registration, the per-cell results and the table generator ship with the case-study bundle (available on request). The frequency-response clearing curve and the supply representation's parameters are stylised scenario inputs recorded in the run manifest and not reproduced here.

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