

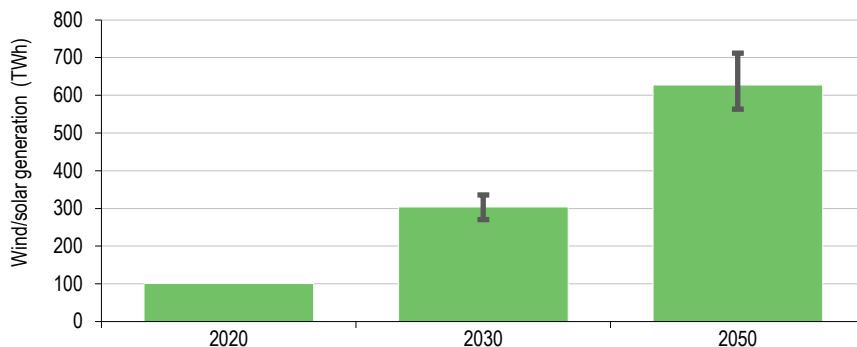
# Gresham House Energy Storage Fund

Initiation of coverage

A rapidly growing fund with scope for NAV uplifts

Gresham House Energy Storage Fund (GRID) invests in a diversified portfolio of utility-scale battery energy storage systems (BESS) in the UK and Ireland. It is the largest UK listed BESS fund and the largest operator in the market, and it is growing rapidly. GRID owns 17 operational projects with capacity totalling 425MW, which have delivered a good performance since inception. It also has eight projects (comprising a further 415MW) under construction and due to begin operating in 2022, and expects total capacity to exceed 1,500MW by 2024. BESS are a key part of the UK's commitment to reach net zero carbon emissions by 2050. Demand for these units is projected to rise from 1.4GW today to an estimated 42GW by 2050, according to National Grid. We believe GRID's asset valuation policy is conservative relative to its peers, providing scope for potential NAV uplift. GRID's manager, Ben Guest, has the funding to deliver the current pipeline and in our view, it is possible that GRID may raise further funds in 2022 to drive growth in 2023 and beyond. The fund has a high dividend policy, currently paying a dividend of 7.0p per share.

## Intermittent renewable supply must triple by 2030 and grow sixfold by 2050



Source: National Grid Future Energy Scenarios. Note: Based on an average of Consumer Transformation, System Transformation and Leading the Way scenarios, all consistent with 1.5°C average temperature increase. Grey vertical bars indicate margins of error.

## Analyst's view

GRID generates revenues from various sources, including energy trading, which the manager expects will become the fund's greatest source of revenue over the long term. There is also the possibility of NAV uplifts as the fund's pipeline projects come online. GRID may therefore appeal to investors seeking a high and regular income, capital growth and portfolio diversification from assets uncorrelated to conventional financial markets. The fund may also interest those focused on sustainable investments contributing to climate change mitigation.

## Premium may decline on NAV uplifts

GRID's share price has traded at a premium to cum-income NAV since inception, thanks to strong investor demand for exposure to this asset class, the attractive, regular dividend, healthy dividend cover and the possibility of NAV uplifts, given GRID's conservative valuation policy. However, in the absence of further share price rises, the premium may narrow as and when any such uplifts are realised.

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Investment trusts  
Renewable energy infrastructure

16 February 2022

**Price** 133.5p  
**Market cap** £585m  
**AUM** £490m

NAV\* 111.9p  
Premium to NAV 19.3%

\*Including income. As at 30 September 2021.

Yield 5.2%

Ordinary shares in issue 437.8m

Code/ISIN GRID/GB00BFX3K770

Primary exchange LSE

AIC sector Renewable Energy Infrastructure

52-week high/low 134.0p 111.0p

NAV\* high/low 111.9p 95.6p

\*Including income.

Net gearing\* 0.0%

\*As at 30 September 2021.

## Fund objective

Gresham House Energy Storage Fund seeks to provide investors with an attractive and sustainable dividend over the long term by investing in a diversified portfolio of utility-scale battery energy storage systems located in the UK and Ireland. In addition, the company seeks to provide investors with capital growth through the reinvestment of net cash generated in excess of the target dividend.

## Bull points

- A high and regular dividend and the prospects of significant capital growth as GRID's projects become operational and are re-valued upwards.
- Returns are not correlated to the absolute level of wholesale power prices and are not dependent on any subsidies.
- BESS are making a significant contribution to the UK's transition to 'net zero' emissions.

## Bear points

- Competition in the BESS market is increasing as more players enter the sector.
- GRID has a short track record of trading power prices.
- While degradation is assumed in financial projections, batteries still need to be used and managed carefully to avoid battery degradation that limits their useful life.

## Analysts

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**Gresham House Energy Storage Fund is a research client of Edison Investment Research Limited**

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## Fund profile: Battery fund generating income & growth

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Gresham House Energy Storage Fund (GRID) was launched in November 2018 and is listed on the Specialist Fund Segment (SFS) of the London Stock Exchange. The fund seeks to provide investors with an attractive and sustainable dividend and capital growth over the long term, by investing in a diversified portfolio of utility-scale BESS located in the United Kingdom and the Republic of Ireland. It is the largest UK fund listed in the battery storage sector and the largest operator in the market, being more than twice the size of its closest competitor, Gore Street Energy Storage Fund (GSF) in terms of operational capacity. The fund's dividend policy currently targets dividend payments of 7p per share. Dividends are paid quarterly in equal instalments. GRID also targets a net asset value (NAV) total return of 8% pa (unlevered) and 15% levered once leverage is fully utilised and other value-adding activities (such as project extensions and battery size increases) have taken place. Returns are not correlated to the absolute level of wholesale power prices and are not dependent on any subsidies.

In July 2021, GRID raised £100m in equity at a price of 112p/share and in September 2021, it established a new five-year debt facility totalling £180m. The company has scope to assume gearing up to 50% of gross asset value (GAV) and, once fully drawn, GRID expects this new debt facility to result in gearing of 25–30%. The trust publishes its NAV quarterly and its results for the financial year to end December 2021 will be published in early April 2022.

GRID's Alternative Investment Fund Manager (AIFM) is Gresham House Asset Management. Ben Guest has managed GRID since inception and he and his family owned 3.3% of the fund's shares (as at end December 2021). The fund is a constituent of the Association of Investment Companies (AIC) Renewable Energy Infrastructure sector.

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## Battery energy storage schemes (BESS): A brief overview

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The key aspects of the UK BESS sector and its role in the transition to renewable energy sources are discussed below.

- BESS are utility-scale energy storage units that import and store electricity increasingly generated by wind and solar power and release it to the national grid when demand, and prices, are higher.
- BESS are essential to the realisation of the UK government's commitment to 'net zero' by 2050, as the country transitions from emission-intensive coal- and gas-fired power generation and nuclear generation, to mainly zero carbon energy generated from renewable sources such as offshore wind and onshore wind and solar.
- The UK's increasing dependence on intermittent wind and solar generation requires more flexibility to meet electricity demand. Current system flexibility is mainly provided by gas-fired power plants, which can vary their output to respond to changes in renewable generation. Consequently, as renewables penetration increases, and therefore as the intermittency of operation becomes more pronounced, electrical energy storage will become increasingly important in ensuring that the system can operate without interruption. National Grid, the system operator, sees battery storage providing the largest share of this capacity.
- At present, there are c 1.4GW of operational battery projects and 20GW of utility-scale battery storage projects in the pipeline in the UK, across 800 projects. Project sizes are increasing, with an average capacity of c 50MW in Q220.
- The UK is Europe's most mature market for electricity storage and holds a dominant position in the European battery storage market, with Independent Commodity Intelligence Services (ICIS)

forecasting that the UK will maintain the largest share of the EU's storage capacity over the next decade, at around 25% through the 2020s and increasing to 35% after 2028.

- BESS owners can generate revenue in three ways. Firstly, they can enter commercial contracts to provide frequency response services to National Grid, and secondly from trading power, both in the wholesale market and in the Balancing Mechanism (which is operated by National Grid). Fluctuations in demand, and often sharper and less predictable fluctuations in supply, mean energy prices can be very volatile. It is this volatility that provides BESS owners with trading revenues. Such volatility is a fundamental part of the electricity market due to the emergence of intermittent renewables, which is resulting in marginal demand being met by different technologies. These technologies in turn have a wide range of marginal costs of generation: from around zero for renewables, to more than £100/MW hour for peaking plants at today's gas prices. Lastly, 5–10% of GRID's revenues, on average, are earned from Capacity Market contracts, which are awarded to dispatchable energy sources, such as gas-fired power plants, that can be switched on and off in response to demand. (Renewables are therefore not eligible for these contracts).
- BESS operators with longer duration capacity (eg those that can discharge continuously for over an hour when fully charged) will be well placed to capitalise on the rapidly rising demand for renewable energy, and the commercial and trading opportunities it is generating.

See the [Appendix](#) (page 17) for a detailed discussion of the BESS industry, revenue sources and the market outlook.

## The fund manager: Ben Guest

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### The manager's view: Expecting NAV uplifts & planning growth

GRID's lead fund manager, Ben Guest, who is also a significant shareholder in the fund, has driven the fund's continuous growth since its acquisition of the 70MW operational Seed Portfolio at its initial public offering (IPO) in November 2018. GRID now has 425MW of capacity from 17 BESS investments already in operation. GRID is already the UK's largest BESS operator, as well as its largest listed energy storage fund, and Guest has plans for further significant growth, including the commissioning in 2022 of its next eight projects totalling 415MW in capacity. In addition, GRID's announced project pipeline will take the portfolio to 32 projects, totalling over 1,500MW of capacity, by 2024, according to a trading update published by the fund in January 2022 (Exhibit 1). This includes its first international project, in Ireland, which will add 180MW of operational capacity.

Guest points to several factors that he believes are positive for GRID's outlook. Foremost among these is that GRID's NAV appears set to rise over the coming year and beyond. 'GRID is an NAV growth, as well as an income story', he says. This is a function of the high unlevered internal rates of return (IRRs) at which GRID is acquiring projects. These projects are subsequently revalued at the prevailing weighted average discount rate (WADR) as they come on stream. Scope for NAV increases is also a function of the potential for the WADR, which stood at 10.5% at end Q321 (down from 10.7% at end June 2021), to decline over time. The 15 new BESS projects set to come online between now and 2024 – roughly tripling the fund's operational capacity – are therefore likely to be supportive of further increases in GRID's NAV (see the following section for details).

Further, GRID is aiming to drive up IRRs by driving down both its cost of construction and its cost of capital. This latter goal is being realised thanks in part to the fund's recently secured £180m debt facility (see details below). This facility is allowing most of GRID's pipeline to be significantly funded with debt priced at the Sterling Overnight Index Average (SONIA) +300bps. Another key aim for Guest is to drive down the fund's break-even point (fixed costs/sale price per unit - variable costs per unit). A capital structure that includes a modest amount of debt is achieving this, while increasing scale is driving operational cost improvements.

In November 2020, some changes to GRID's investment policy guidelines broadened its investment options. Until then, the fund was only permitted to invest in established, operational projects, but shareholders gave approval for GRID to invest up to 10% of GAV on construction projects that it sources and builds itself, combined with the scope to spend a further 15% of GAV on related equipment. As reported in GRID's recent trading update, the manager expects the change to result in a meaningful reduction to the total cost of acquiring and commissioning projects. Given these anticipated cost savings, Guest expects new build projects to dominate future investments, although he will remain open to acquisitions of operational projects if attractive opportunities emerge.

Shareholders approved a further investment policy change in November 2020, which now allows GRID to invest up to 10% of GAV in Ireland. To date, Guest has not exercised this option, but the fund has announced a project commissioning in Ireland in 2024.

One further development that Guest sees as supporting GRID's growth prospects is a change in UK planning laws in 2020, which now allow BESS projects larger than 50MW to seek planning consent from local authorities, rather than being treated as nationally significant infrastructure projects (NSIP), which require approval at the national level. This change simplifies planning approval for BESS projects larger than 50MW and offers access to operational economies of scale. GRID is already taking advantage of this change. Its investment pipeline includes six UK projects with capacity greater than 50MW, including one with 180MW capacity (Exhibit 1).

The growth in GRID's portfolio of assets will, of course, expand its revenue base. Also, Guest expects revenues to be increasingly generated from energy trading. Energy trading has been a core element of GRID's strategy since inception. Guest argues that such trading is inherently profitable; like other commodities, energy can now be acquired during periods of low energy prices, stored, and sold at times when volatility and prices are high. Guest expects trading to be the fund's main source of revenue from 2022. This shift in revenue sources will be assisted, in the manager's view, by the improving outlook for energy trading, as well as the commoditisation of the frequency response market, which Guest has been predicting since the fund's IPO (see Performance section for further discussion).

## Asset allocation

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### Current portfolio positioning

In early 2021, the manager completed the acquisition of 110MW of operational projects. As the year progressed, the fund signed share purchase agreements (SPAs) for the acquisition of a further 602MW, 415MW of which were under construction at the end of 2021 and are expected to become operational in 2022.

At end December 2021, GRID was invested in 32 BESS projects across England, Scotland and Ireland, of which 17, totalling 425MW of capacity, are operational and generating multiple revenue streams (Exhibit 1).

GRID's average project size has increased significantly since its first post-IPO investment in the 5MW Wolverhampton project in 2019, to 50MW, and the manager forecasts that the deployment of existing investments and projects in its identified pipeline will be sufficient to maintain GRID's market share of 25–30%, around the same level as at its IPO in 2018. The manager is also looking further ahead to potential projects for 2024 and beyond, including other opportunities in Ireland, as discussed above.

In addition to expanding GRID's portfolio of BESS assets, the manager is also focused on operating efficiency, and in H121 achieved an operational up-time across all operational assets of 99.4%, with

most sites achieving close to their potential. Battery degradation has been lower than forecast due to the lighter than expected load imposed from use in the provision of frequency response services, but to ensure a margin of safety, the manager has not altered projections as to when batteries may need to be replaced.

**Exhibit 1: Investment portfolio (as at 31 December 2021)**

Existing assets	Location	Capacity* (MW)	Battery size* (MWh)	Site type	Commissioning status	Ownership status
1. Staunch	Staffordshire	20	3	Battery & generators, 0.5MW import	Operational	100% owned
2. Rufford	Nottinghamshire	7	10	Battery & generators, symmetrical	Operational	100% owned
3. Locklease	Bristol	15	22	Battery, symmetrical	Operational	100% owned
4. Littlebrook	Kent	8	6	Battery, symmetrical	Operational	100% owned
5. Roundponds	Wiltshire	20	26	Battery & generators, 16MW import	Operational	100% owned
6. Wolverhampton	West Midlands	5	8	Battery, symmetrical	Operational	100% owned
7. Glassenbury	Kent	40	28	Battery, symmetrical	Operational	100% owned
8. Cleator	Cumbria	10	7	Battery, symmetrical	Operational	100% owned
9. Red Scar	Lancashire	49	74	Battery, symmetrical	Operational	100% owned
10. Bloxwich	West Midlands	41	47	Battery, symmetrical	Operational	100% owned
11. Thurcroft	South Yorkshire	50	75	Battery, symmetrical	Operational	100% owned
12. Wickham	Suffolk	50	74	Battery, 40MW import	Operational	100% owned
13. Tynemouth	Tyne & Wear	25	13	Battery, symmetrical	Operational	100% owned
14. Glassenbury Extension	Kent	10	10	Battery, symmetrical	Operational	100% owned
15. Nevendon	Basildon	10	6	Battery, symmetrical	Operational	100% owned
16. Port of Tyne	Tyne & Wear	35	23	Battery, symmetrical	Operational	100% owned
17. Byers Brae	West Lothian	30	30	Battery, symmetrical	Operational	100% owned
<b>Operational portfolio (A)</b>	<b>UK</b>	<b>425</b>	<b>462</b>			
18. Enderby	Leicestershire	50	50	Battery, symmetrical	Target COD**: Q122	100% owned
19. Coupar Angus	Scotland	40	40	Battery, symmetrical	Target COD**: Q122	100% acquired subject to satisfaction of conditions
20. Arbroath	Scotland	35	35	Battery, symmetrical	Target COD**: Q122	100% acquired subject to satisfaction of conditions
21. Stairfoot	West Yorkshire	40	40	Battery, symmetrical	Target COD**: Q122	100% acquired subject to satisfaction of conditions
22. West Didsbury	Manchester	50	50	Battery, symmetrical	Target COD**: Q222	100% owned
23. Melksham East & West	Swindon	100	100	Battery, symmetrical	Target COD**: Q322	100% owned
24. Penwortham	Preston	TBC	TBC	Battery, symmetrical	Target COD**: H222	100% owned
25. Grendon	Northamptonshire	TBC	TBC	Battery, symmetrical	Target COD**: H222	100% owned
26. Project York	York	TBC	TBC	Battery, symmetrical	Target COD: H222	100% acquired subject to satisfaction of conditions
27. Project Elland	West Yorkshire	TBC	TBC	Battery, symmetrical	Target COD: Q123	100% acquired subject to satisfaction of conditions
28. Project Bradford West	West Yorkshire	TBC	TBC	Battery, symmetrical	Target COD: Q123	100% acquired subject to satisfaction of conditions
29. Monet's Garden	North Yorkshire	TBC	TBC	Battery, symmetrical	Target COD: Q223	Exclusive to GRID
30. Lister Drive	Merseyside	TBC	TBC	Battery, symmetrical	Target COD: Q223	Exclusive to GRID
31. Project Bradford West 2	West Yorkshire	TBC	TBC	Battery, symmetrical	2023	Exclusive to GRID
32. Project Monvalet	Rep of Ireland	TBC	TBC	Battery, symmetrical	2024	Exclusive to GRID
<b>Pipeline (B)</b>		<b>TBC</b>	<b>TBC</b>			
<b>Total Portfolio (A) + (B)</b>		<b>TBC</b>	<b>TBC</b>			

Source: Gresham House Energy Storage Fund. Note: \*Capacity in MW is the flow rate of energy, while MWh is battery size, ie storage capacity. A 1MW connection with a 1MWh battery takes 1 hour to discharge. \*\*In construction, target completion date.

Guest is also mindful of the need to optimise the duration of GRID's battery assets. Battery duration measures the amount of time a BESS can take to discharge from full, before depleting itself. Having a longer duration increases a battery's potential revenue, particularly when trading intraday volatility in power prices. This is a key consideration for the manager, given his plans to increase energy trading (as discussed above). All of GRID's new projects have durations of one hour or longer, and, as addressed in its latest trading update, the fund is committing to at least two new two-hour projects in coming months.

Guest notes that adding a second hour of storage costs less than 50% of the cost of the first hour, and also carries little in the way of incremental operating costs.

## Performance, revenue & future prospects: All positive

**Exhibit 2: Five-year discrete performance data**

12 months ending	Total share price return (%)	Total NAV return (%)	CBOE UK All Companies (%)	MSCI World High Dividend Yield Index (%)	World Renewable Energy Index (%)
31/01/18	--	--	11.3	4.0	13.3
31/01/19	--	--	(3.9)	(1.3)	4.3
31/01/20	10.4	6.5	10.5	9.6	44.4
31/01/21	7.8	8.6	(8.6)	(5.5)	197.9
31/01/22	25.7	16.0	19.3	16.0	(35.3)

Source: Refinitiv. Note: All % on a total return basis in pounds sterling.

Increasing demand for the services provided by BESS has ensured that GRID's performance has been strong over 2021, and since its inception in November 2018. GRID publishes its NAV on a quarterly basis and the latest available figure relates to end 30 September 2021. On an NAV total return basis, GRID returned 8.7% over the nine-month period to end September 2021, and a cumulative 34.2% since inception (as at end January 2022). The total return on GRID's share price is higher. Over the comparable nine-month period to end September 2021, GRID's share price rose 10.7%, reflecting an increase in the size of GRID's share price premium over cum-income NAV to 11.25%, from 10.8% at the end of the previous financial year to end December 2020. At end January 2022, GRID's total share price return since IPO was 54.1%.

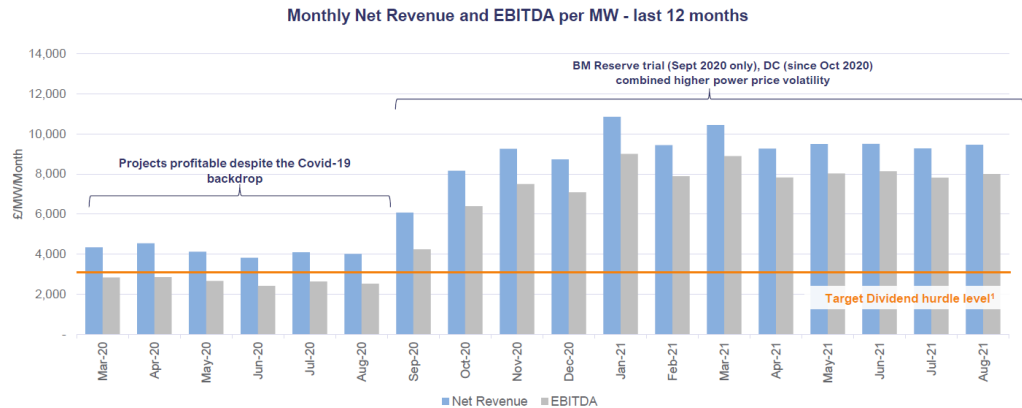
The increase in GRID's NAV over the three months to end September 2021 to 111.91p per share, from 109.9p per share at end June 2021, was due to several factors, including the revaluation of 100MW of projects under construction. The company values projects at book value and only increases their valuations as they become operational. The NAV was also boosted by cash generated by the portfolio, by a 0.25 percentage point reduction in the discount rate on merchant cash flow and by the beneficial impact of raising £100m in July 2021 at 112p, a premium to the prevailing NAV. These positive influences on the NAV were partially offset by the payment of dividends and a modest downward revision to revenue forecasts.

In terms of GRID's performance relative to the market, the company does not have a formal benchmark, and its assets are very different to conventional financial instruments, but for the purposes of a general comparison, we have used the CBOE UK All Companies Index as a proxy for the UK equity market, and the MSCI AC World Index as a broad international comparator. Exhibit 6 also includes the MSCI World High Dividend Yield Index given GRID's focus on providing investors with an attractive dividend. As can be seen from Exhibits 5 (right-hand side) and 6, GRID outperformed the UK market, the World Index and World High Dividend Index in the year to end January 2022 on a share price basis. It has also outpaced the UK market and the high dividend index since inception on both a share price and NAV basis and the World Index on a share price basis. We will publish an update on GRID's performance for the year to end December 2021 following the release of the fund's annual report in early April 2022.

GRID considers its dividend cover as another measure of its performance, and this rose significantly during FY21 (to end December 2021). In its recent trading update, GRID confirmed that its portfolio generated earnings sufficient to provide full dividend cover during the most recent financial year, up from 0.78x for FY20 (see Dividend section for further discussion). GRID also announced that its portfolio generated EBITDA 'in excess of £40m' during FY21, more than doubling EBITDA of £15.6m in the previous fiscal year. Exhibit 3 shows monthly net revenues and underlying portfolio EBITDA per MW per month, which have been rising steadily since late 2020.



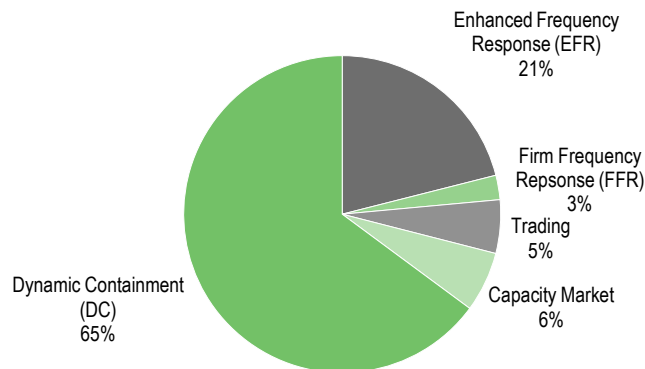
### Exhibit 3: EBITDA per MW per month, as at end August 2021



Source: Gresham House Energy Storage Fund. Note: Line represents estimated EBITDA/MW needed to be earned from trading (including TRIADS) and/or Frequency Response (ie excluding capacity market revenues, estimated at £420/MW/month) to cover GRID's ongoing costs (OCF) and to meet a 7.0p dividend, having fully invested the current and subsequent pipelines.

As shown in Exhibit 4, revenues as at end June 2021 (the latest available figures) continued to be dominated by Frequency Response Services (FRS), as expected, given the structural shortage of BESS capacity to meet demand across the grid. Dynamic Containment (DC), Enhanced Frequency Response (EFR) and Firm Frequency Response (FFR) contributed 89% of revenues (see Appendix for details). Power trading (spread capture) opportunities are taken advantage of as they arise and trading income accounted for 5% of revenues during the period, driven mainly by opportunities early in the year when energy price volatility reached extreme levels for a brief period (as discussed above). Capacity market contracts comprised the balance of revenues.

### Exhibit 4: GRID portfolio revenue split – as at end June 2021



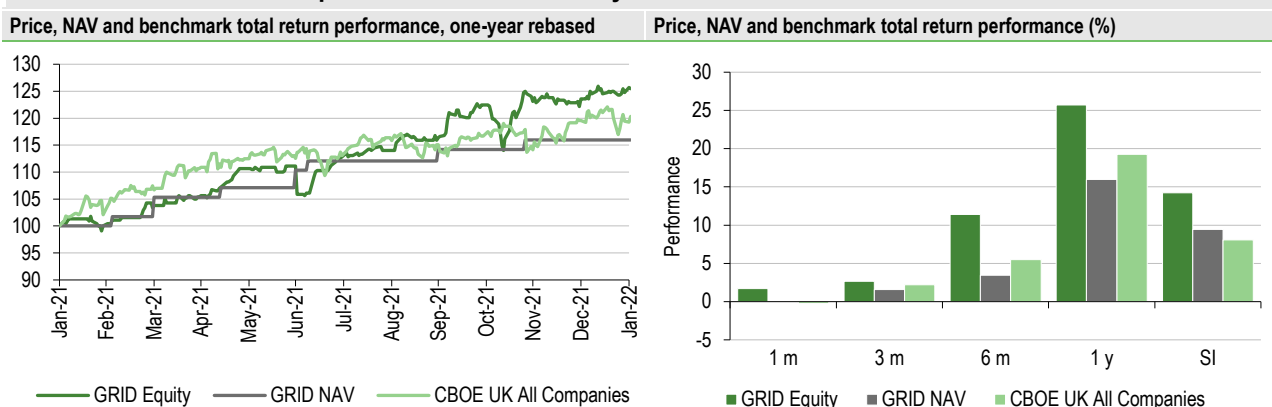
Source: Gresham House Energy Storage Fund

Trading accounted for only a relatively small proportion of GRID's revenue in H121, because high energy prices meant that providing power to National Grid was a more lucrative use of battery capacity. However, GRID expects trading revenues to grow substantially over time. National Grid is changing the way it procures power to four-hourly procurements, rather than on a daily basis. This means there will be a couple of points during each day when energy will be in excess supply, and therefore cheap. This supply of low-cost energy, combined with GRID's rapidly rising storage capacity, which increases its scope to exploit trading opportunities as they arise, and the expected increase in power price volatility, leads GRID's manager to expect the fund's revenue split to shift dramatically towards trading revenue. He expects trading revenues to exceed 50% of revenues in 2022 and eventually represent an even greater proportion of GRID's income.

GRID's revenue prospects from other sources, and hence the outlook for dividend cover, also appear positive. The shortfall in available battery capacity that has underpinned the bulk of GRID's revenues from FRS is expected to diminish over the coming year, as its new batteries become operational and as National Grid adopts a new form of contracting to manage its power requirements more efficiently. However, this should be offset by a significant rise in revenues as GRID commissions a large number of new BESS projects, many of which will come on stream in Q122 (Exhibit 1). In addition, higher leverage should also enhance revenues. This favourable earnings outlook should support dividend cover into 2022 and beyond. In the January 2022 trading update, the fund stated that it anticipates achieving full dividend cover again during FY22, with cover continuing to improve progressively as new projects are commissioned during the year.

However, an even more significant consideration for investors, as stressed by the manager (see the Manager's view section above), is the prospect of increases in GRID's NAV. As the BESS currently under construction become operational, they will each be revalued upwards from book value, in accordance with GRID's valuation policy. In addition, GRID may make further downward revisions to its discount rate from its current level of 10.5%, as its weighted average cost of capital declines following the deployment of its recently arranged debt facility. This would provide a further boost to its NAV. In its January trading update, GRID stated that it expects FY22 NAV growth 'towards the upper end of the target range of 8–15%'.

#### Exhibit 5: Investment trust performance to 31 January 2022



Source: Refinitiv, Edison Investment Research. Note: One-year and since inception performance figures annualised.

#### Exhibit 6: Share price and NAV total return performance, relative to indices (%)

	One month	Three months	Six months	One year	Since inception
Price relative to CBOE UK All Companies	2.0	0.5	5.6	5.4	30.0
NAV relative to CBOE UK All Companies	0.3	(0.6)	(1.9)	(2.8)	13.2
Price relative to MSCI AC World Index	5.9	4.0	7.6	8.0	1.8
NAV relative to MSCI AC World Index	4.2	2.9	(0.0)	(0.3)	(11.3)
Price relative to MSCI World High Dividend Yield Index	1.6	(2.6)	5.7	8.4	31.4
NAV relative to MSCI World High Dividend Yield Index	(0.1)	(3.6)	(1.9)	(0.0)	14.4

Source: Refinitiv, Edison Investment Research. Note: Share price and benchmark data to end-January 2022, NAV at end-September 2021. Geometric calculation.



**Exhibit 7: NAV performance versus benchmark since inception**


Source: Refinitiv, Edison Investment Research. Note: Benchmark is a broad global infrastructure index.

## Peer group comparison

GRID is a member of the AIC Renewable Energy Infrastructure sector, which has 19 constituents invested in a variety of renewable energy strategies. Most aim to provide shareholders with regular income. Like GRID, many have been established relatively recently. The popularity of renewable investment strategies with investors means that the shares of most of these funds trade at a premium to their NAV (Exhibit 8).

**Exhibit 8: Selected peer group as at 31 January 2022\***

% unless stated	Market cap £m	NAV TR 1 year	NAV TR 3 year	NAV TR 5 year	NAV TR 10 year	Premium/discount (cum fair)	Ongoing charge	Perf fee	Net gearing	Dividend yield
Gresham House Energy Storage	584.5	16.2	34.2	-	-	19.3	1.3	No	100	5.2
Aquila Energy Efficiency Trust	85.3	-	-	-	-	(12.0)	1.3	No	100	5
Aquila European Renewables Income	355.4	3.2	-	-	-	0.8	1.3	No	76	5.1
Bluefield Solar Income Fund	602.2	5.4	24.2	49.9	99.2	4.6	1.1	No	100	7.2
Downing Renewables & Infrastructure	142.1	5.8	-	-	-	0.6	N/A	No	88	4.8
Ecofin US Renewables Infrastructure	91.5	5.3	-	-	-	(1.3)	1.5	No	55	1.6
Foresight Solar	614.8	23.6	21.1	45.6	78.0	(6.0)	1.2	No	88	7.2
Gore Street Energy Storage Fund	400.2	9.0	35.6	-	-	11.6	2.3	Yes	50	6.1
Greencoat Renewables	865.4	5.1	16.2	-	-	11.2	1.2	No	122	6.1
Greencoat UK Wind	3,267.1	20.0	27.4	65.0	111.6	6.3	1	No	127	5.8
HydrogenOne Capital Growth	109.3	-	-	-	-	8.4	N/A	No	66	0
JLEN Environmental Assets Group	697.3	8.3	15.4	34.7	-	6.3	1.3	No	100	7.2
NextEnergy Solar	600.5	10.0	15.7	38.9	-	(1.8)	1.1	No	127	7.3
Octopus Renewables Infrastructure	605.6	9.1	-	-	-	4.2	1.1	No	89	4.8
Renewables Infrastructure Grp	2,893.0	5.2	25.4	54.8	88.9	12.5	0.9	No	97	6
SDCL Energy Efficiency Income	1,043.3	8.2	21.3	-	-	9.8	1	No	82	5.5
Triple Point Energy Efficiency Infra	94.0	(0.1)	-	-	-	(1.2)	1.9	No	100	5.3
US Solar Fund	237.1	3.7	-	-	-	3.3	1.5	No	95	3
VH Glob Sustainable Energy Opp	340.9	-	-	-	-	9.0	1.6	No	40	0
<b>Simple average (19 constituents)</b>	<b>738.3</b>	<b>8.6</b>	<b>23.6</b>	<b>48.2</b>	<b>94.4</b>	<b>4.3</b>	<b>1.3</b>		<b>92</b>	<b>4.9</b>
<b>GRID rank in peer group</b>	<b>10</b>	<b>3</b>	<b>2</b>	<b>-</b>	<b>-</b>	<b>1</b>	<b>6</b>		<b>4</b>	<b>11</b>

Source: Morningstar, Edison Investment Research. Note: \*Performance as at 31 January 2022 based on ex-par NAV. \*\*Ordinary shares only. TR = total return. TER = total expense ratio. Net gearing is total assets less cash and equivalents as a percentage of net assets.

Gore Street Energy Storage Fund (GSF) is GRID's closest direct competitor, as it is the only other UK investment trust currently investing exclusively in BESS. Harmony Energy is a new entrant into the sector. It conducted its IPO in November 2021, but it will only have operational projects in its portfolio from late 2022 or 2023, so comparisons with GSF are the only meaningful ones available at present.

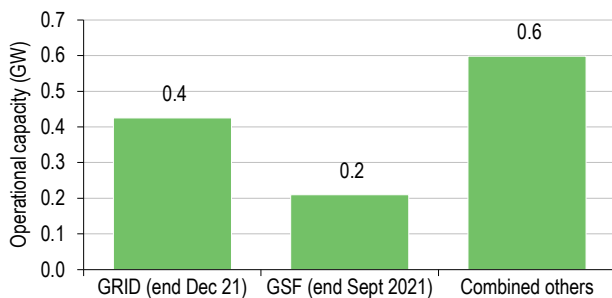
Like GRID, GSF listed in 2018 and aims to provide investors with a relatively high level of income. GRID is significantly larger than GSF in terms of both assets under management and operational

capacity. (As per Exhibit 1, GRID currently has 425MW of operational capacity, while GSF had 210MW at end September 2021, excluding pre- and in-construction projects). GRID has outperformed GSF over the past year, and although its three year returns do not quite match GSF's, GSF's total return over this period was driven in part by recovery from a modest fall in its NAV during 2019. As both funds launched in the same year, a more meaningful comparison of performance is provided by using returns since inception. On this basis, GRID has outperformed GSF in both NAV and share price terms, returning 34.2% and 54.1% respectively (as discussed above) since its launch, while GSF has returned 24.2% on a NAV basis and 26.5% in share price terms on the same basis. Other metrics provided in Exhibit 8 show that GRID's share price premium is wider, and its ongoing charge is significantly lower. Unlike GRID, GSF charges a performance fee. However, GSF's yield is higher.

Several other factors distinguish GRID from GSF:

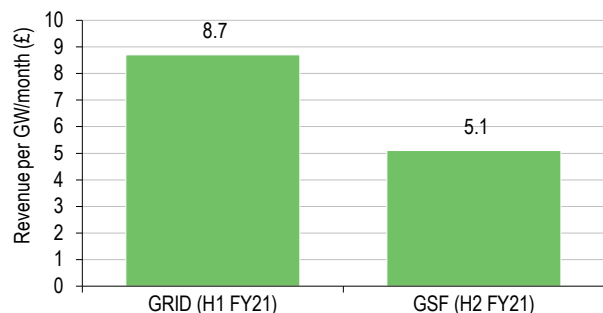
- In our view, GRID has a more conservative valuation policy than GSF.
- GRID expects to fully cover its dividend in FY21 and has signalled that it expects to do the same in FY22 (see discussion below), whereas GSF's dividend cover stood at less than 0.5x at end September 2021 (based on quarterly earnings for the four quarters to end September 2021).
- GRID uses a higher, and hence more conservative, discount rate, presently 10.5%, compared to GSF's discount rate, which varies between 6.0% and 9.5%, depending on the project.
- GRID currently owns 100% of all projects, giving it full control over the management and utilisation of all its assets, while GSF often provides seed capital or invests in projects with other equity partners.
- The average size of GRID's projects is almost 50MW (as at end December 2021), larger than the average size of GSF's projects, which stood at 21MW at end September 2021.
- GRID's average monthly revenue per gigawatt of capacity during the first half of FY21 (to end June 2021) was £8.7m, substantially above that achieved by GSF in the second half of its financial year (to end September 2021), see Exhibit 10.
- GRID's greater operational capacity means that it has a larger revenue base over which to spread overheads, resulting in better margins. As Exhibit 12 shows, based on disclosures from GRID and GSF results presentations, GRID's EBITDA margin for the six months to end June 21 was 90%, over 20pp higher than GSF's.

**Exhibit 9: GRID had double the battery storage capacity of its nearest peer**



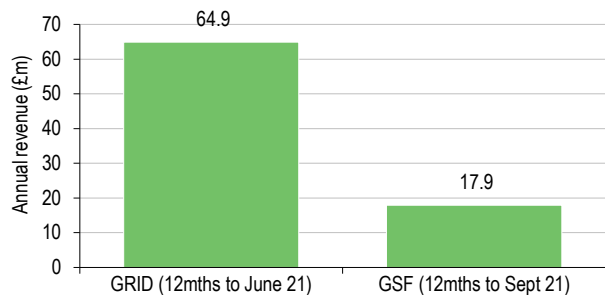
Source: Edison Investment Research based on National Grid, GRID and Gore Street Energy Storage Fund (GSF) data

**Exhibit 10: GRID's capacity appears to generate more revenue than its nearest peer**



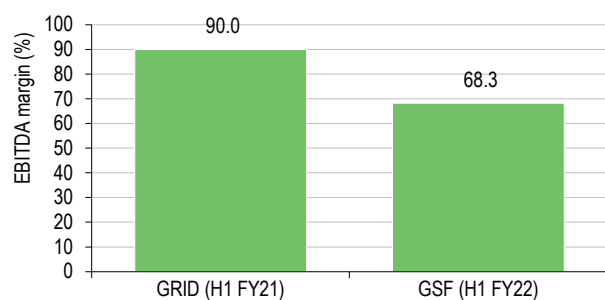
Source: Edison Investment Research based on company presentation and Gore Street Energy Storage Fund (GSF) data

**Exhibit 11: GRID revenues were over three times greater than its nearest peer**



Source: Edison Investment Research based on company presentations

**Exhibit 12: Greater scale leads to higher margins**



Source: Edison Investment Research based on company presentations

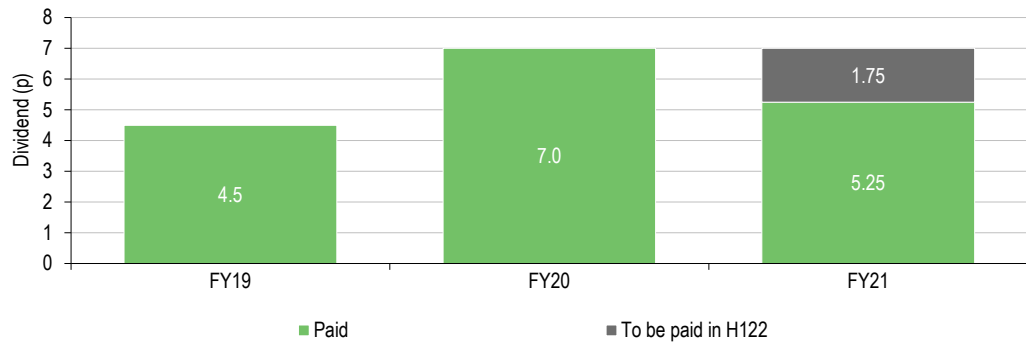
## Dividends: 100% covered, and expected to rise

GRID's dividend policy targets dividend payments of 7.0 pence per share (currently yielding 5.2%) for the financial year ended 31 December 2021 and the following year. Dividends are paid in four quarterly payments a year, covering the periods to end March, June, September and December, in the form of interim dividends. No final dividend is paid.

Dividends paid to date with respect to FY21 amount to 5.25p, comprising three payments of 1.75p, paid on 4 June, 30 July and 17 December 2021, for the periods ended March, June and September 2021 respectively. A further 1.75p dividend for the final quarter of the year was announced on 14 February 2022 and will be paid on 25 March 2022 (Exhibit 13). This will take dividend payments for the calendar year to 7.0p per share, in line with GRID's target and, as discussed above, these payments will be fully covered by operational earnings, despite the additional dividend burden for H221 created by the July 2021 £100m equity raise, which increased the number of shares in issue (see Capital structure, life of the company and ownership section below). This 100% cover compares with dividend cover of 0.78x for the financial year ended 31 December 2020 (FY20) and 0.48x for H120. In its trading update of 10 January 2022, the board also indicated that it expects its dividend target of 7.0p per share for FY22 to be fully covered, 'with cover continuing to improve progressively as new projects commission during the year'.

The board has indicated that it intends to maintain the dividend at 7.0p/share. The dividend yield, at 5.2%, is presently competitive. In addition, excess cash flow can be reinvested at very attractive rates at present, so there is no compelling reason for the board to raise the dividend. However, with the dividend set to remain at 7.0p/share in 2022 and beyond, if the NAV sees uplifts over time as we expect, the dividend yield is likely to decline accordingly. Perhaps with this in mind, the board reserves the right to retain within the revenue reserve a proportion of the company's net income in any financial year, for subsequent distribution to shareholders at the board's discretion. At end June 2021, the fund's revenue reserve stood at £22.1m (unaudited) compared to £13.5m at end FY20.

**Exhibit 13: Dividend history since inception**



Source: Gresham House Energy Storage Fund, Edison Investment Research

## Premium: May narrow on NAV uplifts

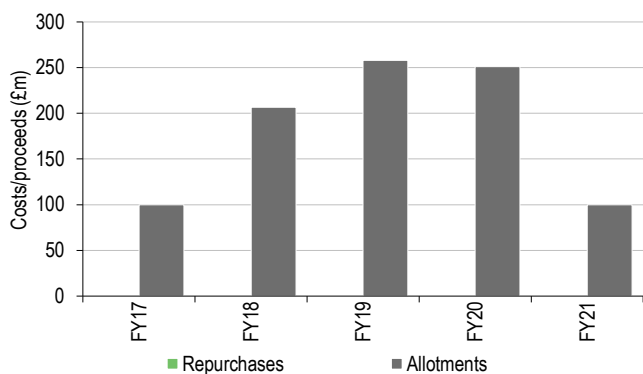
GRID's shares have traded at a premium to cum-income NAV since its launch in 2018. The premium is currently 19.3%, compared to its average of 8.3% since inception. To meet demand for shares and to raise funds to finance the trust's growth, the board issued 89.3m shares, raising £100m in equity, in July 2021. This issuance was significantly over-subscribed and orders were scaled back to ensure the company maintains capital discipline and minimises cash drag. Shares were issued at a price of 112p, a premium of 5% to the NAV at the time. The board also has capacity to repurchase 14.99% of shares each year, although it has not undertaken any share buybacks to date.

The trust's current premium is no doubt due at least in part to GRID's attractive and regular dividend, as well as its position as the largest participant in the BESS market. The prospect of potential NAV uplifts may also be supporting the share price. However, the premium may narrow as and when any such uplifts are realised.

**Exhibit 14: Premium/discount since inception**



**Exhibit 15: Share issuance**



Source: Refinitiv, Edison Investment Research

## Investment process: Diversified projects and revenues

GRID's manager, Ben Guest, has 27 years' investment experience in infrastructure, public equities and venture capital. He began his fund management career at Lazard Asset Management in 1994. He founded Hazel Capital (now part of the GH New Energy division) in April 2007, which invested in

energy infrastructure and cleantech. He holds a BEng in mechanical engineering from Imperial College.

Bozkurt Aydinoglu and Gareth Owen work closely with Guest. Aydinoglu has 27 years' experience in clean energy, telecoms and technology industries. He has worked alongside Guest for 13 years, first at Hazel Capital and then at Gresham House (GH), where he co-manages the GH New Energy venture capital trusts and sources and executes new opportunities. Owen has 20 years' experience in infrastructure project finance. He worked with Guest as a partner at Hazel Capital and joined GH in November 2017 when Hazel Capital was acquired by GH. He has responsibility for executing investments and holds a BEng and an MSc in engineering project management from the University of Manchester and an MBA from Imperial College Business School.

Guest, Aydinoglu and Owen are part of a growing team, currently numbering 15 people. Between them, the team possesses deep experience in the markets for renewables and energy, including in technical and commercial operations, project development execution and asset management. Guest and his colleagues have well-established relationships with representatives of National Grid, the Department of Business, Energy and Industrial Strategy, the regulator, contractors and other stakeholders.

## Investment policy

GRID's investments in individual projects are held within special purpose vehicles (SPVs, also referred to as ESS project companies). The company will seek legal and operational control through direct or indirect stakes up to 100% in such ESS project companies, but may participate in joint ventures or co-investments.

It is the manager's intention to invest primarily in ESS projects using lithium-ion battery technology, as he considers this technology to have the best risk/return profile. However, the company may in future invest in projects using alternative battery technologies.

Investments are made with a view to holding assets until the end of their useful life, which is usually around 20 years, although ESS may also be disposed of where the manager determines that such realisation is in the interests of the company, for example for realising cash for reinvestment. Projects will be selected with a view to achieving appropriate portfolio diversification by geography, size and revenue source.

Until recently, GRID only acquired or provided loan finance to projects substantially completed and ready for commercial operation, and to those upgrading or increasing the size of existing sites. However, a change in the investment policy approved by shareholders in November 2020 permits the company to take on construction risk by acquiring ESS projects that are ready to build, provided that the bulk of the payment is only paid when construction is substantially complete, and the project is capable of commercial operation. Investment in each ready to build project will include a put option to transfer the project back to the seller in certain circumstances.

## Investment process

GRID's manager is responsible for sourcing new projects and managing the investment process for such projects, consistent with the investment policy outlined above. Guest and his team use their extensive contacts among developers, EPC contractors and other investors to source potential acquisitions.

GRID's board and the manager have developed several tools to review the ongoing performance of each project. These include monthly and quarterly dashboards detailing the performance of each investment in relation to forecast income streams and performance against costs. As the company deploys capital, the board focuses on the underlying investment model for each new investment, to ensure it meets the company's investment objectives.

## ESG considerations

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GRID's projects form a key part of the United Kingdom's transition to renewable, low carbon energy sources. As such, the fund is making a significant and increasing contribution to the UK's efforts to reduce carbon emissions and meet the government's commitment to reach net zero emissions by 2050. At present, the UK lacks sufficient energy storage to capture all the renewable energy produced by wind and solar generators. In 2020, UK wind energy generation was curtailed on 275 days, losing energy that could have powered over a million homes for a whole year. BESS are a cost-effective way of avoiding such curtailments and GRID is at the forefront of increasing the availability of such storage.

According to calculations made by Gresham House Research, GRID's portfolio of BESS ensured that an estimated 63,000 tonnes of CO<sub>2</sub> emissions from gas-fired power generation were avoided last year, while over 82,000 tonnes of emissions have been avoided since GRID's launch. In addition, the company's impact will continue to increase as its portfolio grows, and as renewable energy penetration rises.

In addition to this contribution to the UK's transition to net zero emissions, GRID's manager has integrated the principles of sustainable investment into every stage of GRID's investment process and across the lifecycle of each individual investment. He proactively manages a range of potential environmental, social and governance (ESG) risks and seeks to make a positive social, economic and environmental impact, while also delivering strong financial returns.

To this end, GRID uses a Sustainable Investment Framework (SIF) based on core ESG themes. The core themes are:

- Environment: carbon, emissions and pollution, natural resource management and waste management.
- Social: employment, health, safety and well-being.
- Governance: governance and ethics.

This framework is used to structure analysis, and to monitor and report on a broad range of ESG risks that may have a material impact on proposed transactions, as well as guiding engagement activity once an investment is made.

GRID's manager employs an ESG decision tool based on these themes to identify potential material ESG risks that need to be managed and mitigated. This tool enables the manager to track and monitor ESG considerations at the various stages of the investment and management process for each new battery site. The tool also incorporates actions that can be taken to mitigate ESG risks throughout the holding period.

ESG considerations are integrated into the lifecycles of each investment as follows:

- At the preliminary due diligence stage, the SIF will be used to assess the project at a high level, to identify material ESG issues requiring further investigation during the due diligence stage. If identified risks are judged as unlikely to be managed or mitigated, the project may be abandoned at this stage.
- At the due diligence stage, the ESG decision tool is used to uncover material ESG risks that require monitoring or mitigation, and to identify ESG issues that have the potential to drive current or future value.
- During the period of investment appraisal and acquisition of each project, a summary of the manager's ESG analysis is included in board submissions, with action plans to either mitigate or capitalise on identified ESG factors.
- During the asset's construction and operation, the manager aims to build and operate projects with minimal disruption to the environment and local communities. GRID's manager has developed a supply chain policy for BESS, and increased engagement with suppliers and



contractors, to ensure it only works with providers who strive to reduce the environmental and social impacts of their battery production processes and operations. For example, contractors are expected to sign up to battery disposal regulations, in anticipation of the future development of appropriate recycling technologies. Guest has also initiated collaboration with other BESS owners and developers to achieve a common high standard for suppliers and contractors.

- GRID's investments in assets are long term and, where possible, the company improves the value and lifespan of assets through the extension of licences and the adoption of technology that optimises energy output, without materially increasing land use or environmental impact.
- The manager is also reviewing the carbon footprint of current operations to set an action plan to reduce its emissions.

GH is a signatory to the UN Principles of Responsible Investment and has been awarded the top rating of A+ PRI for infrastructure strategies and the LSE's Green Economy Mark. GH is also a signatory to the UK Stewardship Code and a member of the UK Sustainable Investment and Finance Association (UKSIF).

## Gearing

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In September 2021, GRID successfully completed a debt raising process, which provides the fund with a five-year £180m total debt facility, comprising a £150m capex facility and a £30m revolving working capital facility. The facility is provided by a syndicate of banks including the Commonwealth Bank of Australia, Lloyds Bank, NatWest and Santander. The interest rate is 300 basis points over SONIA (before hedging), which currently stands at around 0.05% (five basis points). The capex facility also provides for an additional line of credit (an uncommitted accordion), which could increase the total amount borrowed up to £380m over time. This facility significantly improves the company's weighted average cost of capital, reduces cash drag and improves the company's dividend cover for a given revenue level. The proceeds will be used to fund the remainder of GRID's pipeline (Exhibit 1) and possibly to fund other projects. GRID has the capacity to assume gearing up to 50% of GAV and this new debt facility is anticipated to result in gearing of 25–30% once fully drawn. However, the fund is currently ungeared.

GRID may use derivatives for currency, interest rate and power pricing hedging purposes and for efficient portfolio management. However, the board does not anticipate that an extensive use of derivatives will be necessary.

## Capital structure, life of the company and ownership

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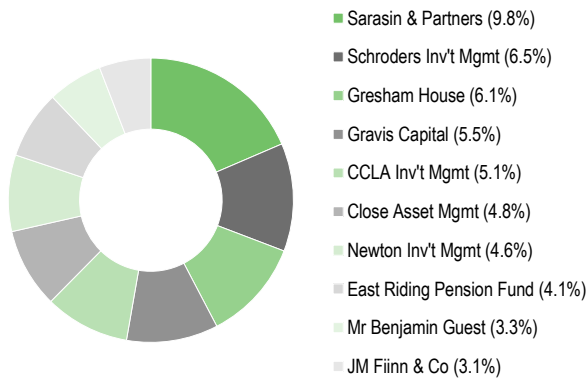
GRID was launched in November 2018 via an IPO that raised £100m at a cost of 100p per share. Investment management services are provided by Gresham House Asset Management, which is wholly owned by Gresham House (GH), an AIM-quoted specialist alternative asset manager. Incorporated in 1857, GH is one of the oldest listed companies in London still in operation. It provides funds, direct investments and tailored investment solutions, including co-investment across a range of highly differentiated alternative strategies: new energy and sustainable infrastructure, forestry, housing, public equity and private assets. Ben Guest, lead fund manager of GRID, has been managing director and head of GH's New Energy division since November 2017.

GRID is structured as an investment trust, with one class of ordinary shares. Since inception, GRID has undertaken several additional rounds of capital raising, the most significant of which took place in July 2021. This raised £100m in equity via the issue of 89.3m new shares, at a price of

112p/share. There are currently 437.8m shares in issue. Ben Guest, GRID's lead fund manager, held 3.3% of GRID's shares at end December 2021, the ninth largest holding (see Exhibit 16).

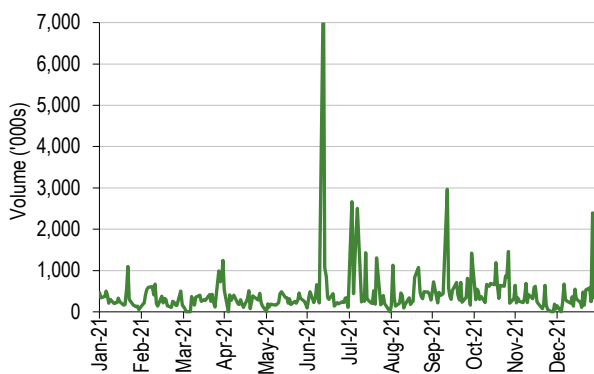
Shareholders will have the opportunity to vote on the continuation of the company at the 2023 AGM and every fifth meeting thereafter.

**Exhibit 16: Major shareholders (ordinary shares)**



Source: GRID, as at 31 December 2021

**Exhibit 17: Average daily volume (ordinary shares)**



Source: Refinitiv. Note: One year to end January 2022.

## Fees and charges

Gresham House Asset Management provides alternative investment fund management services to GRID, which pays an incremental management fee of 1.00% up to £250m, 0.9% above £250m and 0.8% above £500m. For the six months to end June 2021, the ongoing charge was 1.27% and the board anticipates that this charge will fall over time, driven by the forecast rise in the company's NAV. GRID's ongoing charge is lower than comparable listed funds (see Peer group comparison section above).

## The board

**Exhibit 18: GRID's board of directors**

Board member	Date of appointment	Remuneration for six months to 30 June 2021	Shareholdings at 30 June 21
John Leggate (chairman)	24 August 2018	40,000	46,875
David Stevenson	24 August 2018	22,500	18,330
Duncan Neale (audit committee chair)	24 August 2018	31,250	13,425
Catherine Pitt	1 March 2019	22,500	23,093

Source: Gresham House Energy Storage Fund

## Appendix

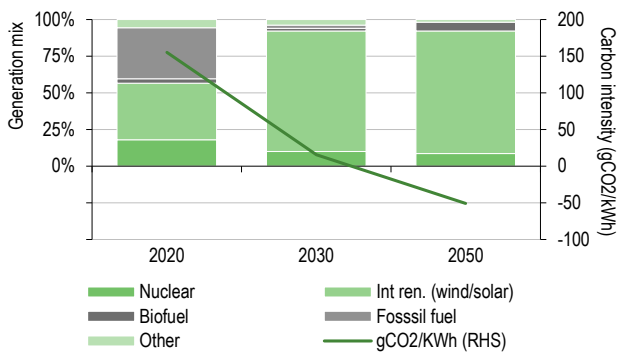
### Market outlook: More battery storage vital for ‘net zero’

For the UK to meet its legal ‘net zero’ commitment (decarbonisation consistent with limiting the global temperature increase to 1.5°C) by 2050, rapid change in the power sector is required.

Residual coal and gas electricity generation (33% of the UK total in 2020) needs to be completely phased out by 2035, according to National Grid and the International Energy Agency (IEA).

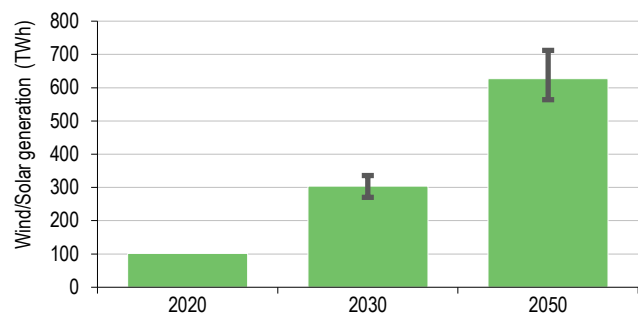
Replacing this generation and supporting the expected acceleration in demand from transport and heating requires a substantial increase in ‘intermittent’ wind and solar generation. National Grid estimates that UK wind and solar generation needs to triple by 2030, rising from 37% of domestic generation to c 80%.

**Exhibit 19: Forecast UK generation mix and carbon intensity**



Source: National Grid Future Energy Scenarios. Note: Based on an average of Consumer Transformation, System Transformation and Leading the Way scenarios, which are all consistent with 1.5°C increase in temperature.

**Exhibit 20: Intermittent renewable generation must triple by 2030 and grow sixfold by 2050**



Source: National Grid Future Energy Scenarios. Note: Based on an average of Consumer Transformation, System Transformation and Leading the Way scenarios, which are all consistent with 1.5°C increase in temperature. Grey vertical bars indicate margins of error.

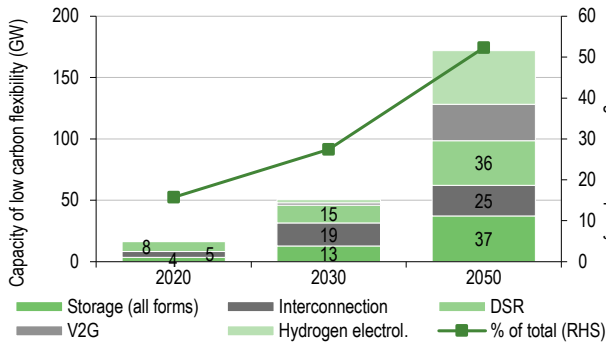
This level of intermittent generation creates huge system challenges. The supply of electricity must, at all times, be managed to match demand. While fossil fuel-based generation is ‘dispatchable’ – capable of being dialled up to meet demand – energy generation from intermittent renewable sources is not. This can lead to supply shortfalls: surges in demand, caused, for example, by cold weather, may not be matched by supply if the wind is not blowing or the sun is not shining. It can also create the opposite problem: excess supply. Periods of strong winds, or the diurnal peak in solar radiation, can lead to excess energy generation from renewable sources, resulting in the curtailment (switching off) of renewable generation. This effectively wastes ‘free’ electricity. Reducing thermal generation also lowers grid inertia, so that minor demand and supply imbalances cause fluctuations in grid operating frequency.

Countering these effects requires an electricity system that is much more flexible, able to respond to swings in the demand/supply balance at short notice and cope with wide gaps in peak-to-trough net demand (residual demand once intermittent renewables have been subtracted). Currently, this flexibility is largely provided by natural gas-based generation. However, the transition to net zero means gas-fuelled energy generation will need to be phased out over the next decade and replaced by low carbon alternatives. Three options appear set to dominate over the next decade:

- Interconnection: interconnections with adjacent markets on the continent and Ireland can export and import electricity. Since the IFA-2 connector to France came online in January 2021, the UK has had 6GW of interconnection capacity (6% of UK generation capacity).
- Demand-side response (DSR): certain (typically heavy industrial) users can be paid to scale back consumption to reduce demand at peak periods (currently 6.5GW).

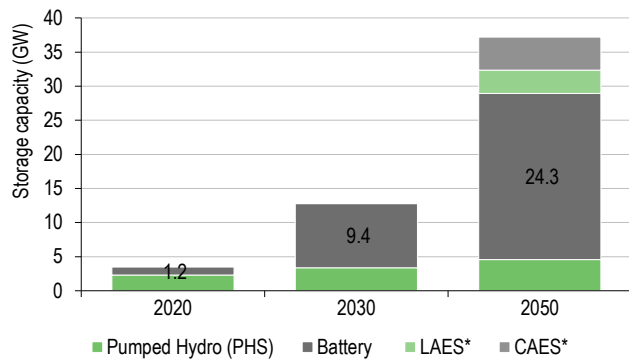
- Storage: the UK currently has 3.7GW of electricity storage capacity, of which 2.3GW is pumped hydro storage (PHS) and 1.4GW is battery based. Storage can be used to smooth demand/supply imbalances by charging and storing energy during periods of excess generation and discharging during periods when generation falls short of demand.

**Exhibit 21: Total storage also expected to triple by 2030...**



Source: National Grid Future Energy Scenarios. Note: Based on an average of Consumer Transformation, System Transformation and Leading the Way scenarios, which are all consistent with 1.5°C increase in temperature. DSR = demand side response. V2G = vehicle to grid.

**Exhibit 22: ...with batteries expected to dominate growth (an 8x increase, 22% CAGR\*\* in 2020–30e)**



Source: National Grid Future Energy Scenarios. Note: Batteries are expected to be lithium based. \*Compressed/liquid air energy storage (CAES/LAES) are expected to play a role beyond 2030. \*\*CAGR = compound annual growth rate.

Currently these three forms of low carbon flexibility account for 16GW in total, 16% of UK generation capacity. They will all need to grow substantially to meet the challenge of intermittency and replace natural gas, and we expect storage, and more specifically battery storage, to lead this growth. Lithium-ion based batteries with low round-trip losses and fast response times are the lowest cost form of storage and able to provide a range of services to the grid (see below). Global electric vehicle adoption is likely to ensure lithium-ion batteries retain a cost advantage. National Grid estimates that total storage will rise to 13GW by 2030 in the UK, driven by 8GW of incremental battery capacity (an eightfold increase and 23% compound annual growth rate). GRID believes that 10GW will be needed before 2025, and 30GW by 2030.

Beyond 2030, vehicle to grid (V2G) and green hydrogen are likely to absorb some of the growth in low carbon flexibility, and other storage technologies (such as compressed air energy storage) may begin to play a role. Nevertheless, battery storage is still expected to grow steadily.

## How battery storage assets make money

### 1) Revenues from National Grid

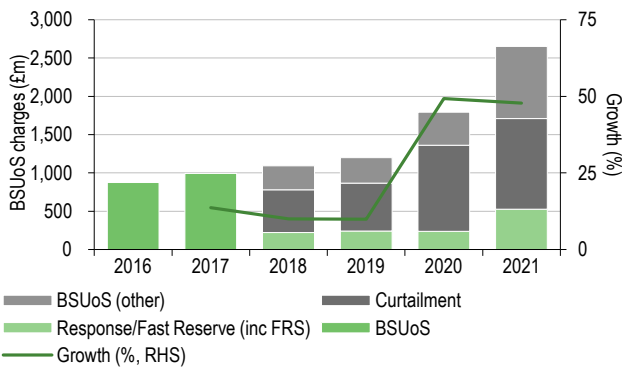
The system operator, National Grid, procures a range of so-called 'balancing services' (paid for by charging generators, and users, Balancing Services Use of System, or BSUoS, charges), to ensure supply and demand are balanced. The names of these services, their terms and their relative significance are constantly evolving, but in essence they provide:

- Reserve Capacity via the Capacity Mechanism: Capacity Market contracts are awarded to provide back-up capacity that can generate electricity in the event of a supply shortfall. Capacity contracts are specified at different levels of duration and starting dates;
- Frequency Response Services (FRS): short-term contracts are awarded to ensure stability in the network's operating frequency (50Hz) within parameters defined by Ofgem. These services are segmented by contract duration, and technically, by response time, amount of power delivered at various frequencies, accuracy of response and recharging parameters; and
- TRIADs (three half-hour settlement periods of high demand): annual peaks in demand, typically during cold winter evenings, which, by definition, determine the maximum required network

capacity. Making payments to large electricity generators to meet peak demand, and charging consumers to disincentivise demand at peak times, can lessen the need for costly investment in generation and the network.

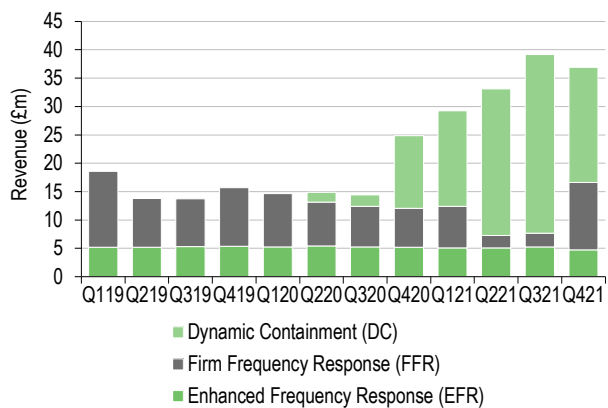
In 2021, the total value of UK BSUoS charges was £2.7bn. Battery operators, alongside providers of other forms of low-carbon flexibility, as well as natural gas generators, bid for these contracts. BESS revenues depend on the balancing service – reserve capacity, frequency response or demand side response – although there are some regulatory limits on the involvement of BESS in the bidding process. Growth in the overall market has risen in the past couple of years (Exhibit 23), as rising intermittency drives an increasing need for balancing services. This has been offset, to a certain extent, by the falling cost of providing these services.

**Exhibit 23: Evolution of the overall BSUoS market in the UK over the last six years**



Source: National Grid. Data from Monthly Balancing Services Summary <https://data.nationalgrideso.com/balancing/mbss>.

**Exhibit 24: Growth in DC from Q420 onwards has increased overall FRS revenue**



Source: National Grid. Data from Monthly Balancing Services Summary <https://data.nationalgrideso.com/balancing/mbss>.

Much work has gone into estimating how BSUoS may evolve as intermittent renewable penetration rises. Historically, BSUoS (currently £4/MWh) have risen by £1/MWh for every 10pp increase in intermittent renewable penetration, but estimates from the UK Energy Research Centre (UKERC) (based on international studies) suggest they could rise more sharply beyond this point, reaching £26/MWh for penetrations of up to 85%. Arguably 2020 provided a glimpse into this future. The impact of COVID-19 on demand saw payments for curtailed wind and solar generation nearly double to £1.1bn and total BSUoS costs rose 50% y-o-y. BSUoS reached over £5/MWh and 20% of total generation costs in Q2. With these costs ultimately passed onto consumers, National Grid is under pressure to manage these payments. Regulatory barriers currently preventing battery assets from providing many of these services are steadily being removed, reducing the payments made to natural gas generators and helping to stem the increase in BSUoS costs.

One BSUoS segment that batteries have already penetrated is the FRS. GRID generated 76% of its revenues from FRS in 2020. The FRS market grew strongly in 2020, but growth is not expected to continue at this pace. In October 2020, a new FRS service called Dynamic Containment (DC) was launched, with stricter performance requirements than historical FRS services such as FFR, including faster response times and a much higher reporting requirement (20 times per second). This increased demand led to greater demand for FRS than there were batteries available to provide FRS services and, combined with the fact that not all market participants were able to meet these requirements, competition diminished, and providers of DC pricing benefited from a 40% price premium (£17/MWh vs £12/MWh for other FRS) until the end of Q320. We estimate that GRID's average revenue per megawatt rose 70% between H120 and H220, with DC accounting for 33% of its total 2020 revenue, despite only operating for a few months. DC revenues rose to £16.2m (65% of operating revenue) in H121.

Since Q420, pricing has fallen as the number of batteries available to offer DC increased and as procurement of DC moved from daily to four-hourly, meaning that National Grid could contract less capacity during those four-hourly periods that demand for DC was lower. However, two other new FRS services are due to be introduced in the near term. National Grid expects to introduce Dynamic Modulation (DM) and Dynamic Regulation (DR) in April 2022. The net result of these developments is that GRID will migrate its revenue generating activities to trading (described below), something the manager has foreshadowed since IPO.

## **2) Trading or merchant income**

In addition to revenue from the system operator, batteries can also generate income directly from other market participants. The storage capacity of BESS means that operators can purchase energy from renewable sources at times when it is being produced cheaply, for example, when there is a lot of wind, or when demand is low, and store it until demand, and thus energy prices, rise and the energy can be sold at a profit. 'Asset optimisers' such as EDF and Flexitricity deploy advanced algorithms to anticipate periods of peak or trough pricing, and BESS operators can supply energy to these electricity traders when prices are high.

### **Increasing price volatility underlines need for battery storage**

As the UK grid becomes more reliant on intermittent renewable energy sources, the frequent variations in electricity supply are underlining an increasing need for battery storage investment. Intraday swings currently range from zero, up to 19GW for wind and 14GW for solar. This increased volatility and frequency of output swing is resulting in market prices fluctuating from negative prices to over £100/MWh in multi-hour intervals. For example, in September 2021, day ahead peak prices registered above £700/MWh, with prices spiking at c £5,000/MWh, and the baseload power price hit a record high of £230/MWh, compared to a 2020 range of £60–92/MWh.

Several other recent disruptions further highlight the long-term opportunity for battery storage operators such as GRID. On 4 March 2020, lower than expected wind power generation caused the system price to spike to £2,242/MWh – at that point the highest price in 19 years. However, this was surpassed by a system price of £4,000/MWh on 8 January 2021. National Grid now allows GRID to trade and offer FRS simultaneously, creating additional revenue potential and giving GRID scope to make better use of batteries in general.



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