WESTERN POWER DISTRIBUTION

INNOVATION

NEXT GENERATION NETWORKS

Solar Storage

Battery Disposal

WPD_NIA_004

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1. Overview

The 'Solar Storage' project is funded through Ofgem's Network Innovation Allowance (NIA). Solar Storage was registered in April 2015 and the operational phase, focussed on the testing of the battery operating regimes was completed by April 2018.

Solar Storage set out to install and operate a battery at Higher Hill farm to;

1) Quantify the potential value to network operators and others of integrating storage with solar generation by demonstrating a set of use cases.

2) Use real-world operation of an integrated utility scale storage / generation system to provide data to regulators and potential investors.

3) Demonstrate safe, reliable operation of the system under operational conditions.

The battery chemistry is Lithium Iron Phosphate, which is less energy dense than Lithium Ion batteries but has the advantage of having greater thermal stability and is at lower risk of overheating.

Image 1 – Solar Farm

Image 2 - Regional whereabouts

Upon completion of the operational phase, WPD also wanted to take the opportunity to further the learning achieved within the project and endeavour to achieve the greatest value to customers by selling the battery and returning the proceeds, net of costs back to Ofgem. Not only will this reduce the overall cost of innovation trials, but it should also ensure that the battery from the trial can continue to provide positive outcomes through continued social and environmental benefits as well as further learning.

There is no precedent for publicly selling off the assets from an innovation trial to offset its costs, and in fact there is no public record of a used battery of this scale being sold that we could find. For this reason it was decided that WPD would work with Smart Grid Consultancy (SGC) to run a closed tender process but publicly extend invitations for any interested parties to participate.

The key objectives of the sale would be to;

1) Vacate the plot on which the battery had been operating for the trial and reinstate in line with the temporary planning conditions granted to enable the operational phase.
2) Identify a new owner through a tender process then manage and document the process of decommissioning.
3) Where possible, ensure subsequent use of battery by its new owner achieves broader benefits over and above solely financial opportunities.
4) Establish an indicative value for used energy storage assets to provide the industry with some indication of asset value depreciation.
5) Return the funds generated from the sale back to Ofgem to offset the costs of the trial.

2. Details of the Battery

The battery being sold was less than 2 years old 300kVA, 640kVAh containerised unit. The battery cells were from BYD and the Operating Systems from RES. Additional components included the fire suppression system and air conditioning. The RES management systems software and Air Conditioning were both significantly upgraded after early results of the testing indicated that the original specification were not fully adequate and would benefit from the additional investment. Full details of the battery performance including analysis of the usage data including efficiency and degradation are included in the main report for the trials operation.

The battery tender also included the ancillary items which included two spare BYD cells, transformer and power monitoring equipment.

The battery installation at the solar farm was commissioned on reinforced concrete plinths for the battery and the ancillary equipment which were enclosed within a high metal mesh fenced compound. The fencing was erected following the delivery of the battery to site.

The battery was connected to the solar farm downstream of its transformers and not directly to the networks, therefore responsibility for the commissioning was dealt with by their approved contractors, and the same would be required for disconnection.

Image 3 - Battery installation / delivery

Image 4 - Plinth mounting prior to Fencing Installation

Image 5 - Fully operational installation with security fencing

3. Process and Timescales

The decision to seek a sale of the battery as part of the decommissioning exercise at the end of the project was taken at the beginning of March 2018. The process was limited by the requirement to vacate the land no later than the 13th of August, in order that a sale of the solar farm to which the battery was connected could proceed without the complication of the third-party asset affecting the terms of the sale. While on the face of it this could be anticipated to offer a great deal of time there would be several stages in the process that would have to be achieved within available period.

- Expressions of Interest Published at the beginning of April and closed **27th April**
- Tender Pack issued to interested parties initially on the **12th May,** but this subsequently slipped to **Monday 21st May**
- If respondents required any additional information regarding the assets, then any enquiries deadline by **Friday 25th May**.
- Responses to enquiries to all interested parties by **17:00 Tuesday 29th May.**
- Completed tender questionnaires submission deadline no later than **Wednesday 6th June**.
- An assessment of the submissions will be carried out and a short list of up to 4 carried forward and notified, including any clarification questions from WPD by **Tuesday 12th June**.
- An open day will be offered during the **week commencing 18th June** for all shortlisted parties provided an opportunity to inspect the current installation. This also offered an opportunity to confirm accessibility for loading of the battery and an opportunity to ask questions of the project team who have been operating the battery installation during the Innovation Trials.
- Clarifications responses and any adjustments to the original tender required to be submitted for best and final submission no later than **Monday 25th June 2018**. At this stage the assessment between the shortlisted bidders would be scored solely on the highest financial offer.
- Successful respondent announced no later than **Friday 29th June 2018.**
- Contractual completion and transfer of funds anticipated to be concluded by the **end of July 2018**
- Battery removal from site subject to electrical decommissioning to be completed by no later than the **Monday 13th of August 2018**

4. Expression of Interest

As there was no precedent for marketing a battery of this size and type that we were aware of, we wanted to ensure that there was a broad approach and not just targeted at traditional 'energy companies' involved in the generation, sale or supply of energy. With the changing landscape of electricity shifting increasingly to more distributed architecture it was likely that there could be interest from many different types of organisations. We therefore contacted organisations who had previously registered as stakeholders on other innovation projects, as well as social media notices and a sponsored article in the 'The Energyst'. This is a free publication with a strong online presence and one of the leading media organisations specialising in reporting on GB energy, but their readership extends to to a significant number of large consumers too.

At the time of the expression of interest it was expected that the successful bidder would also assume responsibility for the reinstatement of the site to comply with the temporary planning conditions that were granted to facilitate the trial. This was to include the removal of fencing and breaking up of the plinth into aggregate. The aggregate was to then be spread on the surrounding private roadways the landowner has to access the solar farm and fields. This may have concerned other potential bidders and deterred them from coming forward, as this would have been an activity that for would require bidders to subcontract to a third party to fulfil. The same is potentially true of the decommissioning and transport. This represents a further justification as to why we wished to share the knowledge gained so as to assist any future buyers and sellers of containerised battery systems.

the energyst

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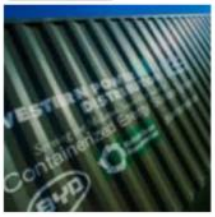
YOU ARE HERE: HOME / DSR / ONE CAREFUL OWNER: 300KW BATTERY USED IN INNOVATION TRIALS FOR SALE

One careful owner: 300kW battery used in innovation trials for sale

APRIL 12, 2018 BY SPONSORED POST — LEAVE A COMMENT

SPONSORED



SGC seeks expressions of interest from parties interested in acquiring a containerised lithium ion phosphate battery following its use in Network Innovation Trials. A significant volume of performance data is included in the sale.

The 300kW, 640kWh unit that has been participating in test for just over a year to see how well it can provide multiple services, such as peak lopping the output from the solar park, arbitrage, supplying energy to the distribution grid at peak times etc.

The battery was funded as part of an innovation trial. As such, the DNO, Western Power Distribution, will return proceeds of the sale to Ofgem.

The battery is self-contained and can be transported by lorry. Relocation should be a realistic prospect and it would extend the learning of the innovation project to understand the costs and issues associated with battery relocation.

If storage assets can be relocated at a reasonable cost, then purchasing this type of battery may be a useful strategy to reduce risk. It should be noted that the purchaser will also be required to 'make good' the site from which it is being removed, and details relating to this will be provided to interested parties.

As the storage system has been used for operational trials there is a great deal of performance data relating to the battery capabilities that will be available to interested parties as part of the procurement exercise and to satisfy any due diligence that is necessary before concluding any transaction.

The expression of interest period will run until the 27th April after which SGC will manage the engagement between the current owner and interested parties.

For further information or to express your interest, please send your details to lisa.hendry@grid-smart.co.uk

Click here to see if you qualify for a free subscription to the print edition of The Energyst, or to renew.

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Image 6 - Expression of Interest Article from 'The Energyst'

The expression of interest closed on the 27th of April as planned and achieved 20 responses from parties who wished to receive a copy of the full tender pack. As hoped, we had a diverse selection of organisation types at this stage. We are not publishing a list of the actual respondents as we have not sought permission to do so, however we have included some analysis on them below.

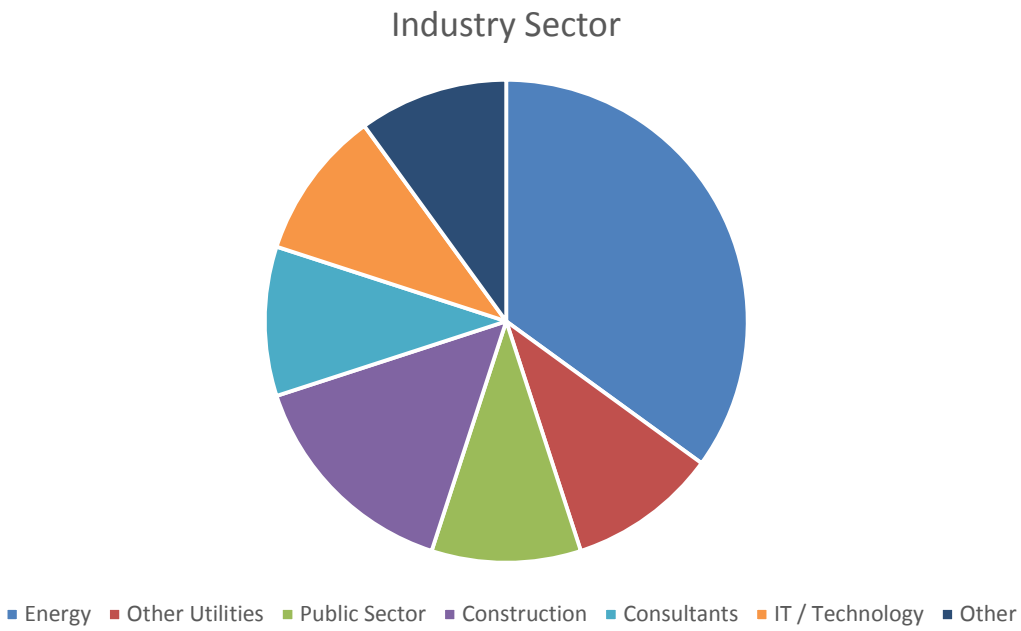


Figure 1 - Expressions of Interest by Industry Sector

From the 20 respondents there was unsurprisingly a greater proportional interest that came from Energy related businesses although the nature of these did demonstrate its own diversity of sub categories.

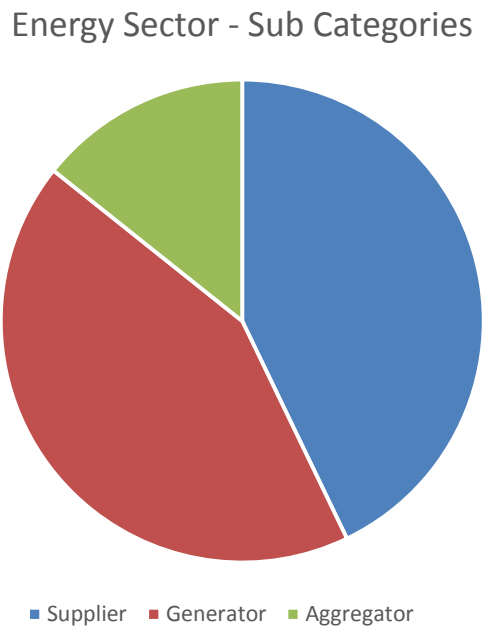


Figure 2 - Expression of Interest- Energy Sub Categories

Some other observations that we made during the EoI process that is more anecdotal or derived through assumptions are listed below;

- The majority of respondents were located in the South of England with the furthest coming from Scotland, which if successful would have been deployed to an island on the West Coast. There were also two from Wales, but these were still relatively close for transportation and redeployment. We have assumed from this that potential purchasers recognise the cost and effort require to relocate and therefore there is a geographical sensitivity when tendering. Naturally, some of the companies that responded did so from an address that may not specifically relate to where the asset may end up being relocated. At the expression of interest stage, any details offered in relation to where and how it was to be used were offered entirely voluntarily.
- Several respondents spoke with SGC and stated their interest was increased over buying a new battery as the unit being offered, included actual performance data and that there had been investment made during the trial to rectify performance issues. Several expressed concerns over their experience of manufacturers stated specifications not being achievable in reality. Therefore, despite already having been used and marginally degraded it offered greater certainty of expected future operational performance.
- In spite of making the EoI period run for a full month, the potential bidders were heavily biased towards the final week. The slight uplift in the 2nd week was largely down to the publishing of advertorial by 'The Energyst'

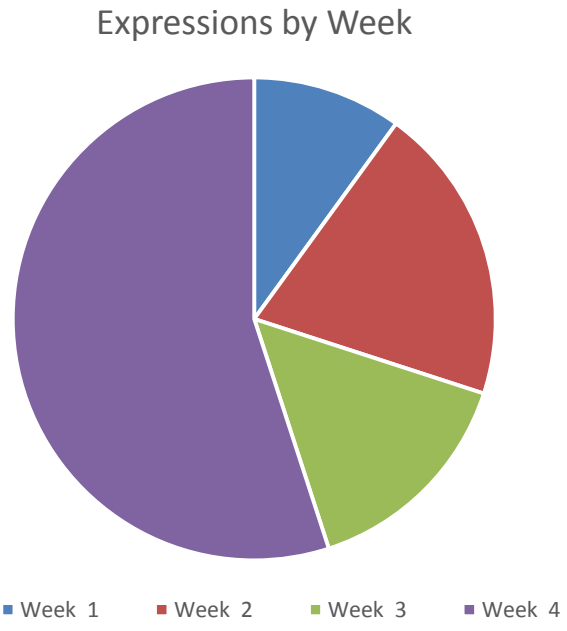


Figure 3 - EoI by week of the notice period

5. Tender Pack

A comprehensive tender pack was compiled by SGC to include as much information as possible to assist bidders in making their assessment as to the potential value the battery may represent to them. This was vital to gain the confidence of potential bidders with such limited secondary sales market information that could be referenced to establish its expected price.

There was unfortunately a delay from the intended publishing date which was the 12th May which was stated in the expression of interest. All parties who had expressed an interest were kept informed of the delays and progress toward publication of the tender pack. The delay was due to several issues that occurred and were out with the control of WPD.

- The data from the innovation trial on the Solar Farm had not yet been compiled and readied in a format that where an extract could be provided. This would be one of the key elements that a potential bidder would wish to review in order to fully assess the current condition of the battery and its likely degradation over time.
- Licensing of the operating software, maintenance and warranties were all provided by RES but were limited to the duration of the trial. WPD therefore wanted to offer an indicative cost for the extension of these to the new owner, which would represent a significant cost that potential bidders would want at the very least to be able to estimate. As this was an abnormal request it understandably took RES a bit of time to produce a response that could be included in the pack
- There was a change in situation at the Solar Farm which could result in it being offered for sale, and as a result there was a necessity to review the overall tender process and attempt to accelerate the original timeline to conclude with removal of the battery no later than the 13th August. This was the original end of the temporary lease date, but it had been expected that there would have been no issue to extend this by up to two months to allow greater time for the sale process to run. Ironically, the need to condense the timeline resulted in a delay while the process was refined and condensed.
- A further area of concern to potential bidders may have been the conditions relating to the reinstatement of the land to meet both the landowner's requirements and that of the temporary planning conditions. An opportunity arose in the elapsed period from the initial EoI where the reinstatement requirement was intimated to simplify the process. WPD engaged with the landowner directly to agree a cost to reinstate the land himself, following the battery removal. This simplification of deliverables assisted greatly in the reduction of the overall process timeline to bring it within the new 13th August deadline. After negotiations a suitable payment was agreed to transfer all reinstatement responsibilities which would be funded from the winning bidder's payment. It was expected that the bidders could then feasibly increase their offer by at least the expected cost of their estimate to reinstate.

The tender pack was finally issued to all bidders by SGC on the 21st May. They were emailed with an attached ZIP folder and a guidance document. The cover note also included for convenience diary event entries for the key dates in the initial phase of the tender. The most immediate of those were also contained within the cover note to ensure that the

urgency of their requirement to act was clear. The first deadline was for additional questions by the end of the same week.

- If respondents are seeking any additional information regarding the assets then any enquiries should be submitted by email by **17:00 Friday 25th May**.
- All questions and associated answers will be circulated to all respondents no later than **17:00 Tuesday 29th May.**
- Completed tender questionnaires should be submitted with and supporting information by email no later than **17:00 Wednesday 6th June**. Documents should be provided in pdf format and submitted by email to WPD
- An assessment of the submissions will be carried out and a short list of up to 4 submissions will be carried forward and notified of their success progress including any clarification questions by **17:00 Tuesday 12th June**.

In addition to the tender guidance document which has been included as Appendix A of this report, the tender pack contained the following;

A) Sales Tender Solar Battery 2018 - financial bid submission
B) Higher Hill Farm ESS Schedule 1–Technical Specification and Scope of Supply REDACTED for Distribution to WPD
C) System Schematic / Layout
D) System Secondary Wiring Diagram
E) System Secondary Power Distribution Diagram
F) System Schematic Diagram 01
G) System Schematic Diagram 02
H) System Schematic Diagram 03
I) Operating Performance Report Extract (Capacity Fade)
J) Copy of Round Trip Efficiency Tests
K) BYD 'as built' drawings
    a. System Schematic Diagram
    b. System Primary Wiring Diagram
    c. System Secondary Power Distribution Diagram
    d. System Secondary Wiring Diagram
    e. System Communication Schematic Diagram
    f. System Communication Wiring Diagram
    g. Gas-suppression system wiring diagram
    h. System grounding wiring diagram
    i. Overall Layout
    j. The fixation between container and Foundations
    k. Sketch Map of the hole at the bottom of Container
    l. The container outside frame line
    m. System Layout
    n. Load Distribution on Container Floor
    o. The structural layout of container floors

p. Basic Foundation Sketch Map

L) Technical Drawing 03502D3001-01 for foundation plinth
M) Technical Drawing 03502D3002-01 for foundation plinth
N) Indicative offer for extension of operating software from RES
O) Optional – indicative offer of warranty and maintenance from RES

6. Tender Questionnaire / Responses

The tender questionnaire contained within the pack required to be returned to WPD to be assessed and establish a shortlist of bidders who would then attend a site visit where they could address any assumptions then revise the financial offer aspect of their submission. The final submission would then be assessed solely on their final bid so that WPD count achieve the best return to offset the cost of the trials and best outcome for customers. However to qualify for the final shortlist it was decided that we would also seek to gain the greatest benefit to customers by attempting to ensure that we endeavor to identify opportunities where the battery could feasibly achieve wider benefits. As a result the questionnaire included questions so as to identify whether there were social, environmental or further learning benefits from its intended future use. Each question was to be answered in no mare than 250 words, with weighted values being given to the responses. 40% of the score was based on answer to Q1 with 10% allocated on each of the remaining answers.

Information required	
Q1	Please state your plan for the Solar Battery if successful in this process
Q2	It is expected that DSO and TSO will increasingly look to flexibility provided by customers to manage constraints. Would the intended use be likely to be compatible with system support programmes?
Q3	Has there been any prior analysis relating to the new proposed location of the battery so as to offer a reasonable indication that the battery can be connected to the network?
Q4	Does the proposed future use of the battery have any broader social benefits?
Q5	Does the proposed future use of the battery expect to support any carbon, air quality or other environmental benefits?
Q6	Based upon the future intended purpose of the Battery, will operational data be able to be shared with WPD or made available publicly to further the understanding of energy storage?
Q7	The energy storage market and electric vehicle adoption are in their infancy but expected to continue to grow significantly. Will the proposed use of the battery be likely to provide any positive support to the changing use of the networks?

The total score from all the questions above then related to 45% of the score which was then used to score the overall response with remaining 55% based on an assessment of their logistics plans and financial bid.

It may have be due to a combination of the tight timescales to respond and 45% of the weighted score requiring bidders to declare the intended use that we experienced a very significant drop off in the interest from bidders. We did however receive adequate interest in order to carry out an assessment process and take forward three viable submissions to

the final stage of the tender process. Due to the confidential nature of the bidding process we are unable to release further details about the content of each submission.

7. Site Visits

The three successful bidders were notified of their successful progression and a single date during the week commencing the 18th was agreed and invitations were extended to attend on Tue 19th June. SGC arranged access with the land owner and the visit was supported by BSR who had operated the battery on behalf of WPD during the trial and had been involved with the deployment of the battery from the initial installation. BSR were also the operator of the Solar Farm and the battery was connected directly to their infrastructure, so their role was invaluable in being able to answer the questions raised by the bidders.

The bidders were not isolated from each other and there was a degree of overlap between the escorted visits which was beneficial in ensuring that all participants had the opportunity to ask questions where answers were shared. In spite of this SGC recorded the details of the queries and circulated the responses to all parties following the visit.

All parties also acknowledged that this stage of the process was of great value in terms of fully appreciating the detail of what they were buying, but in particular the opportunity to speak with BSR who have to be commended on the level of knowledge they were able to demonstrate and share on the day. It also gave the bidders an invaluable opportunity to inspect the location and assess the logistical requirements associated with its uplift and removal from site. As BSR will require to undertake the disconnection from their assets which are downstream from the point of connection to WPD's network, the opportunity to discuss the allocation of responsibilities and process of disconnection was of yet further assistance in addressing any remaining uncertainties.

8. Final Assessment / Award

The deadline for the final submissions from the final bidders was set as the 25th June which was respected by all three who revised appropriately their final financial bid. These were presented to WPD's procurement department and management for approval and the highest offer was provisionally awarded the opportunity to purchase the battery subject to contracting and agreeing a detailed plan for the logistics.

A meeting was subsequently scheduled for the 23rd July by WPD procurement to conclude the outstanding contractual arrangements and agree a detailed plan for the decommissioning and removal ahead of the 13th August deadline. With regards to the logistics, WPD's role was primarily to facilitate the discussion and assist where required to ensure that a viable plan was in place between BSR and the winning bidder.

9. Contracting / Logistics

A simple contract was put in place with the winning bidder to cover the sale of the battery and cover a few key conditions relating to the completion of responsibilities.

Collection - Relocation, Decommissioning and Transportation

Battery and ancillary equipment will be decommissioned in accordance with the following Scope of Works

- Produce all health and safety, quality and environmental management documentation including Risk Assessment and Method Statements (RAMS) for: -

Decommissioning;

- Lifting and transportation of the Higher Hill energy storage container (ESC) and associated balance of plant (BoP) consisting of;
  - transformer;
  - LV pillar;
  - 11kV ring main unit (RMU)
  - Metering Cabinet containing the Power Quality Meter
  - 2 Spare Batteries cells
  - Air conditioning system
  - Fire suppression system

- Decommission the RESolve control system;
- Check that the internal cabling between the ESC and associated Balance of Plant is dead;
- Cut the internal cabling between the ESC and associated Balance of Plant at duct level and leave original cable in situ;
- Make the ESC, 11kV/415 transformer, RMU and Metering Cabinet suitable for transport;
- Permanently Remove WPD Branding from the exterior of the ESC

Caveats;

- BSRL will be undertaking the HV switching to de-energise the Higher Hill Energy Storage Scheme prior to the 8th August.
- Suitable Crane/Hiab equipment to be utilised by the Buyer
- Suitably qualified driver for the transportation of hazardous loads to be provided by the Buyer
- Removal of WPD branding from exterior of container by the Buyer
- Health & Safety assessment to be under taken by the Buyer
- Suitable precautions to be taken for 'IMO Hazard classification 9' loads by the Buyer

Commercial considerations & Timescales

- The Buyer shall make payment in advance of Collection, Relocation, Decommissioning and Transportation, no later than close of play **7th August 2018**
- Payment to be made in GBP via the Seller's Electronic Billing Request
- The Buyer is required to comply with the completion date of 13th August. The battery and associated equipment require shall be removed from site no later than the completion date.

10. Uplift and Removal

The result of the all the efforts in the sales process culminated on a 2-day exercise to disconnect the battery. The first day was dedicated to the decommissioning of the battery system which included ;

- discharging the battery to a stable state
- disconnection of telecoms that had been utilised for remote operation
- disable air conditioning and fire suppression systems
- decommission RESolve control system
- Remove WPD decals
- Isolate Battery from BSR electrical supply connection
- Isolate from supplies and unmount ancillary plant from plinths ready for uplift.

Image 7 - Aerial overview of site prior to removal

Image 8 - Site access to battery

Image 9 – Day 1, BSR Engineers isolating and disconnecting ancillary assets

With all the preparatory work completed on the first day, the second day would be dedicated to the uplift and transportation of the sale items from the High Hill site. The driver of the uplift vehicle was provided with the address of the main farm buildings rather than the exact location and a worthwhile recommendation for any organisations carrying out a similar operation in future would be to use one of many freely accessible services to provide accurate locational information. SGC used a google maps link for the site visit day but a new service called 'what3words' available online (http://what3words.com) and via smart phone app is potentially even more user friendly. When the vehicle arrived it initially drove directly down the farm access track to the site entrance only to identify that it would need to be approached in reverse in order to successfully complete a manoeuver to locate the vehicle appropriately on site. This could have been avoided if the purchasers contractor had provided a project manager or surveyed the site in advance, producing a suitable

method statement. BSR and SGC representatives wearing hi-vis provided traffic control enabling the driver to revers back out of the site before turning and reversing back down.

Image 10 – Traffic stopped to allow vehicle to turn and reverse down access road

Once access to the site had been achieved by the experienced driver set up the outriggers on spreader boards once aligned with the battery. This does require there to be access to the compound and at least twice the length of the vehicle beyond that point in order to enable the vehicle to line up alongside. Hydraulic alarms are then lowered and chains connected to the lifting point at the bottom of each end of the containerised unit. The actual lifting action once set up only took a few minutes to complete before inspecting the load and being able to reverse back out of the fenced compound.

Image 11 – Uplift vehicle aligning with battery and setting outriggers

Image 12 – Aerial view of vehicle aligning with battery and setting outriggers

Image 13 - Ground level view of lift in progress

Image 14 - Battery lift and loading on to transporter

Image 15 - Loaded transporter leaving site driving forwards

The final phase on the second day was carried out using a hi-ab vehicle. It was significantly smaller and therefore was not presented with any issues with site access and was able to turn on site to avoid reversing up the access road. The hi-ab crane was first used to extract the disconnected cables that remained in the ducting helping fulfil the requirement to reinstate the site. The hi-ab then uplifted all remaining ancillary assets, securing them on the flat bed before transporting to the purchaser's site for reconnection.

Image 16 - Hiab vehicle to uplift ancillary assets

Image 17 - Removal of cable tails from ducting

11. Final Outcome

Due to the confidentiality of the tender process and the winning bidder's request not to publish detail regarding the terms of the purchase or exactly how they will be repurposing the unit, we are unfortunately limited in what can be shared within the report. We do however recognise that much of the interest from readers will be to try and assess the likely value for batteries within the secondary market. It also became apparent from the respondents to the initial EOI that there was added interest in the battery due to previous negative experience, which was referenced anecdotally by a number of those engaged in the processes. It was suggested that for a significant number of early adopters of storage technologies in the form of batteries, they had been unable to achieve the performance that was expected, based on the specification they purchased. This was certainly reflected in some of the experience within the trial and the reason that there had been additional investment in this unit including an upgrade to the air conditioning system to manage the operating temperature more effectively, as well as repeated enhancements to the control software by RES. By publishing all the details of the battery performance and its round trip efficiency data the sale was actually of greater interest to several parties than purchasing a new asset direct from manufacturers, although this was coupled with the expectation of paying less than for a brand new unit.

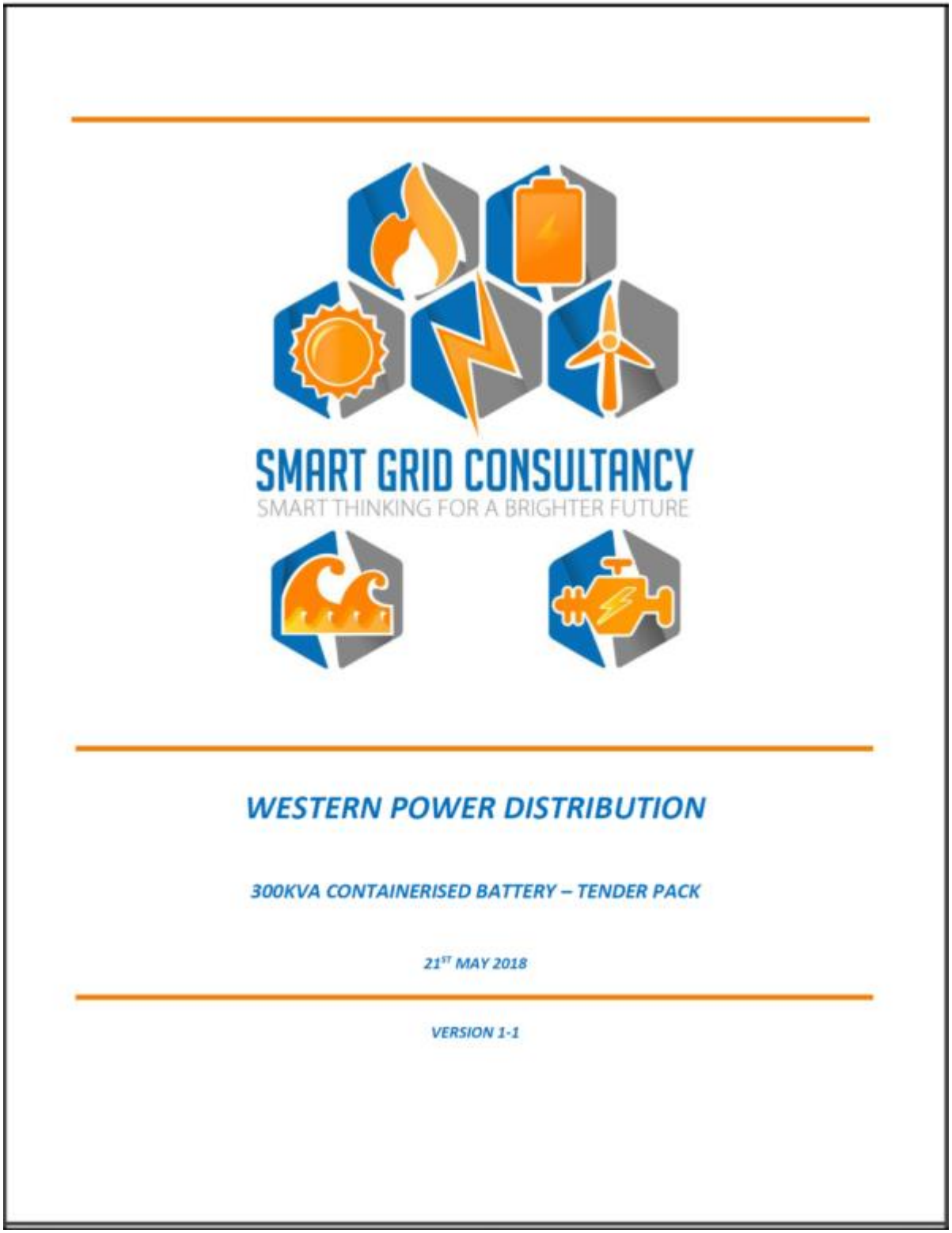
For many potential bidders, there wasn't a specific application that they had in mind for the battery and the process that we followed, which intended to score the bids on the broader benefits of how it was to be repurposed presented a barrier to their ongoing participation. The submissions that we did receive for assessment were able to be categorized into two use cases. The first was where there was insufficient connection capacity available for the import or export of electricity for the intended future operations at a site, or to enhance the financial performance at a renewable generation facility. These have very different financial potential benefits to the bidders with the expectation that the first use case is likely to result in a higher potential bid submission. This is due to being compared with an established high-cost for a larger connection, or where there is a significant delay in the ability to provide the increase which may limit the core function of the site. Alternatively, those submitting a price based upon the economic enhancement they can achieve from intermittent generation through making it more predictable or participation in ancillary services can be expected to offer a much lower valuation based on the speculative nature of their business case.

The winning bidder is involved in the motor industry and intends to establish an EV testing facility that would require additional supplies to their site that isn't readily available at an acceptable cost. The battery will therefore facilitate the ability to charge up during periods such as at night and then support vehicle charging which may also include the testing of fast charging systems that operate at higher rates and are in important area of technical exploration. The use case will therefore allow the site to charge the battery at off peak periods where not only will there be lower local demand and network demand, but should also attract a lower energy tariff. It was on this basis that the winner was able to make an offer that was higher than the other bidders and was significant enough to ensure a satisfactory return of funds to Ofgem and therefore demonstrate better value to customers.

Glossary

Term	Definition
BESS	Battery Energy Storage System
BMS	Battery Management System
BRE / NSC	Building Research Establishment / National Solar Centre
BSRL	British Solar Renewables Limited
BYD	Battery manufacturing company that supplied the solar storage battery.
DG	Distributed Generation
DNO	Distribution Network Operator
DSO	Distribution System Operator
EoI	Expression of Interest
ESC	Energy Storage Container
EMS	Energy Management System
HV	High Voltage
LCNI	Low Carbon Networks and Innovation
LV	Low Voltage
NIA	Network Innovation Allowance
PoC	Point of Connection
PV	PhotoVoltaic
RES	Renewables company that managed the battery installation and developers of the RESolve control software.
SGC	Smart Grid Consultancy
WPD	Western Power Distribution

12. Appendix A – Tender Guidance Notes



SMART GRID CONSULTANCY

SMART THINKING FOR A BRIGHTER FUTURE

WESTERN POWER DISTRIBUTION

300KVA CONTAINERISED BATTERY – TENDER PACK

21ST MAY 2018

VERSION 1-1

300KVA BATTERY – Tender Pack

1 INTRODUCTION

This document and its associated appendices are intended to provide parties who have expressed an interest in acquiring the 300kVA / 640kVAh battery with sufficient information and instruction on how to participate in the tender process. The 'Tender Pack' will provide potential bidders with the following;

- Tender guidance
- Tender questionnaire
- Technical Specification of the battery and ancillary equipment offered in the tender
- Record of operational performance during trial
- Single Line Diagrams for the above
- Technical Drawings for foundation plinth
- Conditions of sale
  - Current location of the battery and remediation requirements for the test site
  - Timescale for transfer of ownership
  - Transportation
  - Branding
- System Schematic
- Original manufacturers specification *(redacted)*
- Original manufacturers operation and maintenance manual
- Indicative offer for extension of operating software from RES
- Optional – indicative offer of warranty and maintenance from original manufacturer

2 BACKGROUND

The battery currently offered for sale was a core component of an Innovation Trial. The trial called 'Solar Storage' was funded through Ofgem's Network Innovation Allowance (NIA). Solar Storage was registered in April 2015 and and completed its operational phase of testing in April 2018. Solar Storage committed to install and operate a battery at Higher Hill farm to;

1) Quantify the potential value to network operators and others of integrating storage with solar generation by demonstrating a set of use cases.

2) Use real-world operation of an integrated utility scale storage / generation system to provide data to regulators and potential investors.

3) Demonstrate safe, reliable operation of the system under operational conditions. The battery chemistry is Lithium Iron Phosphate *(which is less energy dense than Lithium Ion batteries but has the advantage of having greater thermal stability and is at lower risk of overheating)*

The reduction in the cost of battery storage, along with increased demand for fast response flexibility services has generated interest in battery storage technology. Battery installations can vary in size from domestic to large grid connected installations. The project considered the use cases for a moderately sized battery (300kVA, 640kVAh) co-located with a solar farm. Integrating storage with renewable generation potentially offers a route to addressing some or all the following issues, and therefore the trial was designed to test these hypothesis:

(i) Renewable generation does not predictably match peak local demand.
(ii) Renewable generation is often 'spikey', which can introduce short-term impacts on grid voltage or other quality of supply factors.
(iii) Unpredictability, lack of control mechanisms and power quality mean grid operators use very conservative rules to allocate grid connections.
(iv) Grid operators have to introduce new equipment to manage power quality, a service which could be provided by operators of utility scale renewable installations.
(v) Without the ability to respond quickly to local surges in load, grid operators manage network capacity within tighter limits than might otherwise be possible.
(vi) Introducing two or more active storage or quality management devices onto the same HV circuit may cause them to interact with each other and have a negative impact on power quality.

For any parties who are interested in the details of the project and its results, these are published by Western Power Distribution alongside the rest of the Innovation Portfolio of Projects.

https://www.westernpower.co.uk/Innovation/Projects/Current-Projects/Solar-Storage.aspx

As the majority of the funding provided for the trial was provided through the NIA mechanism which is ultimately funded through contributions from customers, WPD is keen to ensure that they achieve the best value for them. While the majority of this benefit will be achieved through the learning that is published, there is also an opportunity to return some capital investment through responsible decommissioning of the assets procured. It is for this reason that SGC have been appointed to manage the process of this sale of assets in conjunction with WPD Procurement Department.

The criteria that will be used to determine the best value for customers is not restricted solely to achieving the highest financial valuation. We are keen to be able to demonstrate best efforts to ensure that the battery is repurposed in a manner that is deemed to be good for customers as well as the industry as a whole. This means the tender criteria will not be limited solely to highest bids, but there will be assessment of other elements that acknowledge broader benefits including, but not limited to;

- increase the likelihood of future storage supporting distribution networks
- generate new learning which will be available to the energy industry as a whole

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- achieve demonstrable carbon savings
- contribute to the growth of the flexibility services market
- benefit vulnerable or fuel poor customers
- support the drive for cleaner air and environment

3 PROCESS

The tender questionnaire is enclosed entitled *'SALE OF WPD ASSETTS, REQUEST FOR BID, SOLAR BATTERY'* and requests that tender respondents provide additional information regarding the intended purpose for the battery should they be successful.

- Tender Pack issued to interested parties **Monday 21st May**
- If respondents are seeking any additional information regarding the assets then any enquiries should be submitted by email to lisa.hendry@grid-smart.co.uk by **17:00 Friday 25th May**.
- All questions and associated answers will be circulated to all respondents no later than **17:00 Tuesday 29th May.**
- Completed tender questionnaires should be submitted with and supporting information by email no later than **17:00 Wednesday 6th June**. Documents should be provided in pdf format and submitted to jbarrett@westernpower.co.uk
- An assessment of the submissions will be carried out and a short list of up to 4 submissions will be carried forward and notified of their success progress including any clarification questions by **17:00 Tuesday 12th June**.
- An open day will be offered during the **week commencing 18th June** for all four of the parties who are successfully shortlisted which will provide an opportunity to inspect the current installation. This will provide an opportunity to confirm accessibility for loading of the battery and an opportunity to ask questions of the project team who have been operating the battery installation during the Innovation Trials.
- Clarifications responses and any adjustments to the original tender should be submitted to jbarrett@westernpower.co.uk for best and final submission no later than **17:00 Monday 25th June 2018**.
- Successful respondent announced no later than **17:00 Friday 29th June 2018.**
- Contractual completion and transfer of funds anticipated to be concluded by the **end of July 2018**
- Battery removal from site subject to electrical decommissioning to be completed by no later than the **Monday 13th of August 2018**

4 LOCATIONS AND SITE RESTORATION

The battery is currently located at a Solar Farm near Glastonbury in Somerset. The landowner who supported the trial allowed for a limited area on the facility to be modified in order that the battery and ancillary equipment could be sited. It is a condition of the original agreement with the landowner that

the area utilised should be returned to a similar state to how it was before the project. As a result of this contractual condition the tender requires the battery decommissioning and removal to be completed before the termination of the lease. An open day will be offered for the shortlisted bidders to attend prior to final bid submissions due on the 25th June. This should provide an opportunity to complete a physical inspection of the assets included within the sale as well as determine any logistics relating to access and asset removal. When the 'Expression of Interest' was initially published it was expected that the winning bidder would be required to accept responsibility for the remediation of the site but this has subsequently been addressed in order to simplify the procurement for all parties concerned.

Assumed status of site at commencement of decommissioning;

- The battery was isolated before removal by opening and locking off the supply from the WPD substation.
- Any other isolation required in terms of the telecoms cables has been carried out with the assistance of RES/BSR as appropriate.
- The company performing the removal and restoration have control of the site and safety documentation / assessments etc. are in place.

Image 1 – Solar Farm

Image 2 - Regional whereabouts

Image 3 - Battery installation / delivery

Image 4 - Plinth mounting prior to Fencing Install

Image 5 - Completed installation

5 TENDER PACK CONTENTS

Below is a list of the documents contained within the Tender Pack

A) Tender Questionnaire Criteria 1
B) Sales Tender Solar Battery 2018 - financial bid
C) Higher Hill Farm ESS Schedule 1–Technical Specification and Scope of Supply REDACTED for Distribution to WPD
D) System Schematic / Layout
E) System Secondary Wiring Diagram
F) System Secondary Power Distribution Diagram
G) System Schematic Diagram 01
H) System Schematic Diagram 02
I) System Schematic Diagram 03
J) Operating Performance Report Extract (Capacity Fade)
K) Copy of Round Trip Efficiency Tests
L) BYD 'as built' drawings
    a. System Schematic Diagram
    b. System Primary Wiring Diagram
    c. System Secondary Power Distribution Diagram
    d. System Secondary Wiring Diagram
    e. System Communication Schematic Diagram
    f. System Communication Wiring Diagram
    g. Gas-suppression system wiring diagram
    h. System grounding wiring diagram
    i. Overall Layout
    j. The fixation between container and Foundations
    k. Sketch Map of the hole at the bottom of Container
    l. The container outside frame line
    m. System Layout
    n. Load Distribution on Container Floor
    o. The structural layout of container floors
    p. Basic Foundation Sketch Map
M) Technical Drawing 03502D3001-01 for foundation plinth
N) Technical Drawing 03502D3002-01 for foundation plinth
O) Indicative offer for extension of operating software from RES
P) Optional – indicative offer of warranty and maintenance from RES