COMMERCIAL IN CONFIDENCE

Getting Building Fund: **Gate 2 Business Plan v20.10.2020**

Riding Sunbeams Apollo Ltd

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Introduction

This business case, based on the five case model, sets out proposals to build and connect the world's first MW scale renewable solar energy plant directly powering the railways located in the heart of East Sussex. The Project and organisations involved in developing the project are detailed within this section. The five cases of the business follow.

The Project

The project sets out to build and connect the world's first MW scale renewable solar energy plant directly powering the DC railways located in the heart of East Sussex. Delivered in an innovation collaboration between green tech startup Riding Sunbeams and Network Rail to develop the route to market for subsidy free renewable energy generators to directly supply the UK's largest energy user. As outlined in the UK's 2020 transport decarbonisation white paper, Riding Sunbeams' solar railways will save on both carbon and costs, bringing benefits to the region's renewable energy capacity and to our local communities through options for community investment.

This project seeks to challenge business as usual and provide benefits through considered intervention and innovation for the region:

- The first proven route-to-market for direct-wire PPAs, and the technical and commercial framework to help guide Network Rail's low carbon power procurement trajectory
- Create green employment opportunities. Over a 25 year lifetime of the project we estimate the a solar farm will support 40 jobs from development, construction, operations and maintenance, finance, environmental management, community engagement and administration
- Benefit the region's electricity network resilience and provide capacity enhancement solutions whilst opening up renewable energy capacity for the rail industry
- Saving of annual carbon per MW of around 245t/CO2e
- Stimulate local social and environmental impact through the development of community benefit and options for community investment.

Organisation Overview

Riding Sunbeams

Riding Sunbeams is a world-leading renewable energy developer, focussed on decarbonising rail traction networks through the direct wire connection of unsubsidised, community owned direct-wire renewable generation. In partnership with Network Rail, Riding Sunbeams pursues a "triple bottom line" – low carbon renewable energy generation, connected directly to the rail traction system at a commercial price, with significant social impact for lineside communities.

This means working closely with community energy groups to develop commercial projects, with a key requirement that once operational, majority ownership is offered to the local host community. Riding Sunbeams has developed technical solutions to the power electronics interface needed to permit solar generators to connect directly into both the *DC and AC rail traction systems to safely and efficiently supply power to trains on the network. (*In the South East region our rail traction system is DC.)

Working alongside Network Rail, Riding Sunbeams has tested this solution with our "First Light" real-world demonstrator solar PV unit connected to the Wessex Route in Aldershot during 2019. The First Light demonstration unit connecting a solar PV array to an ancillary transformer on the Wessex Route DC rail network went live in autumn 2019, and successfully proved the viability of Riding Sunbeams' connection solution in a real-world operating environment.

In 2020 with Riding Sunbeams' technical solutions proven, Network Rail is pushing this innovation through compliance procedures to permit large scale renewables to connect to its systems, and developing a new procurement framework for private wire traction power supply that is capable of underwriting capital investment in new generating assets.

Network Rail

Network Rail is the single biggest unregulated consumer of electricity in the UK, procuring around 3.2TWh of electricity centrally for the entire rail industry each year. This is equivalent to roughly 1% of the UK's total electricity demand. Network Rail have explicitly targeted direct supply of renewable traction power as a priority for Control Period 6 (2019-2024) via a new formal Challenge Statement: "Using Large Scale Renewable Developments to Enable Decentralised Supply to the Rail Infrastructure." This identifies "developing solutions to enable private-wire generation directly to the traction or non-traction infrastructure" as a specific research need, and recognises the important business opportunity for Network Rail in pursuing this agenda. Riding Sunbeams work to date has been the first major contribution to meeting this challenge. Network Rail engineers have carried out a preliminary appraisal of options for using alternative energy sources on their traction systems. This identified solar PV plus storage, integrated at DC traction substations, as the option offering the greatest potential benefit to their networks.

Network Rail's new Traction Decarbonisation Network Strategy (ref. 1.3.3) recommends hundreds more route miles of the UK's railways for electrification in the Southern Region over the coming years, with a key role for direct supply from lineside renewable generators in meeting this new demand for traction power and aligning with Net Zero ambitions.

Southern Region

The Kent, Sussex and Wessex routes together consumed 1.38TWh of traction electricity in 2015/16, at a total cost to train operators of £114m. Our analysis indicates that each DC traction substation in the Southern Region should on average be able to comfortably accommodate intermittent supply from a connected ~1MWp+ solar array. This scale of solar capacity should be big enough to support the fixed development and connection costs for each array. In most cases this would mean the array would provide 100% or more of the substation's traction demand for four or five months of the year (roughly, May-August). At these times, any surplus would flow onto neighbouring track sections, implying that we should avoid connecting solar PV at this scale to contiguous substations. The South of England enjoys some of the highest solar irradiance levels in the UK, but it is also home to some of the most congested electricity distribution networks. Community Energy South's (CES) members have conducted a high level audit of land use constraints around the 540 traction substations in the Southern Region. Their findings suggest that around three quarters of these have suitable lineside opportunities for solar development.

If 1MWp solar farms were developed and connected at half of the 400 or so suitable locations, this would generate the equivalent of 15% of the Southern Region's total traction electricity demand - currently a £17.1m a year market. This percentage assumes that storage is used where necessary, so the commercially optimal proportion may be somewhat lower, but will certainly exceed 10%. As storage costs continue to fall over the coming years, the commercially optimal proportion will rise as a consequence.

About the site and community

The site has been developed by Cuckmere Community Solar (CCS) which is a Community Benefit Society established in 2016. The CCS mission is to build a solar farm that not only will provide clean energy for the equivalent of 800 homes, but also provide a haven for wildlife, benefits to the community both financially and environmentally, and inspire other communities across the UK to act by choosing renewable energy to help prevent the progression of climate change.

The consented 4MW solar farm is located in East Sussex near to the village of Berwick and north of the railway line that runs between Eastbourne and Lewes on its way to Brighton and London. CCS have worked tirelessly with their local community and stakeholders from Wealden District Council to bring this project to life.

Having received consent for the solar farm CCS were challenged with having to develop a new business model with the ending of the feed in tariff subsidies. This is exactly the solution that was driving Riding Sunbeams to find a new market for unsubsidised renewable energy. Collaborating alongside Riding Sunbeams, CCS was one of the six Riding Sunbeams projects to complete the 2018 traction feasibility stages alongside Network Rail and as it had successfully achieved planning consent was considered a focus for this solution.

CCS and Riding Sunbeams have together built up community and stakeholder support including from Wealden District Council who on 24th July 2019 unanimously approved a motion to declare their Climate Emergency Declaration, committing to work towards achieving net-zero carbon emissions by 2050 for both the Council's own operations and the wider Wealden area, and to pursue efforts to bring this date forward if possible and support communities who are committed to this ambition.

During 2019 and 2020 Cuckmere Community Solar were awarded Phase 2 grant from the Rural Community Energy Fund (managed by the region's Energy Hub) to continue the commercial route to market with Riding Sunbeams to deliver the world's first solar MW sized connection to the railway and create local community benefit through the project.

1/ Strategic Case

In the UK and internationally there is an accelerating shift from carbon-based diesel powered rail traction to electrified railways. UK railways use 1% of our electricity. Demand for traction power is rising as is pressure to decarbonise offering massive opportunity for low carbon electricity to power the UK's largest energy user.

The cost of decentralised renewable energy technologies like solar PV has fallen dramatically in recent years to the extent that many governments (including ours in the UK) are now withdrawing public financial support, leaving these technologies to 'stand on their own two feet'. A consequence of this is the loss of long term revenue certainty to underwrite investment in these capital intensive projects. Investment in new generating infrastructure including renewables requires the assurance of stable, long-term markets.

The ideal customer is an on-site, industrial scale energy user supplied behind the meter via a "private wire" rather than over the grid (avoiding costly grid access charges) and able to commit to a very long term power purchase agreement (PPA) with a AAA credit rating buying electricity for decades ahead.

Network Rail is the single biggest unregulated consumer of electricity in the UK, procuring around 3.2TWh per annum of electricity centrally for the whole rail industry, via a ~£300m per annum, ten year contract. This is equivalent to around 1% of all UK electricity demand.

The problem is solving well defined technical, system and commercial challenges, and in doing so opening this commercially attractive opportunity to decarbonise transport networks.

1.1/ Business strategy

Our vision is to power trains with commercially priced and unsubsidised renewable energy with a positive social impact. This has never been done before, and we are the only company in the world to have developed a complete solution for doing so. This project in East Sussex will enable us to work in collaboration with Network Rail to prove that MW scale solar can be directly connected to the railways and in providing this open up the market for region wide solar connections.

Riding Sunbeams has a mission to supply public transport systems with unsubsidised, price competitive low carbon energy and to encourage community and commuter investment in generating assets to provide social impact for railways users and host communities alike.

Electric trains run on renewable electricity have a carbon footprint that is nearly one hundred times lower than diesel trains. By connecting renewable energy we can inspire rail users to travel in a low carbon way, and with a genuine sense of ownership over the solution.

1.1.2/ Summary of benefits for connection solar railways

The UK government has indicated an investment in infrastructure, including rail, to aid a path to recovery post COVID-19. Now more than ever, it is vital that public money is spent in a way that delivers maximum benefit to more people. Riding Sunbeams overriding strategy and Triple Bottom Line deliver low carbon energy that is cost competitive, reduces capacity on the network and provides social impact. This strategy aligns with the development of the Common Social Impact Framework for Rail developed by Network Rail and RSSB for use by the rail industry.

By connecting the world's first MW scale solar power station to the railway we are committing to the following benefits:

- ***Cost reduction –*** For the same or a lower price as Network Rail currently procures grid electricity, Riding Sunbeams can deliver renewable, low-carbon electricity which entails social and environmental value, thereby reducing overall costs
- ***Carbon reduction –*** Riding Sunbeams' direct-wire renewable electricity supply is the lowest carbon option available to Network Rail. Purchasing Renewable Energy Guarantees of Origin (REGOs) is the first step towards decarbonising and diversifying Network Rail's electricity supply, but procuring renewable energy through PPAs and direct-wire is necessary for full decarbonisation.
- ***Capacity increase –*** Riding Sunbeams can provide additional direct-wire electricity supply in areas of network squeeze. Such areas are characterised by technical constraints to the amount of electricity that can be supplied through transmission and distribution networks. By supplying electricity directly into substations, capacity can be increased without costly transmission and distribution network upgrades.
- ***Customer satisfaction –*** Riding Sunbeams intends to open share ownership of the individual community solar traction projects to the public, and especially to rail commuters, so that they will have a share in the services that will be partially powered by community and commuter co-owned generation capacity.
- ***Connecting communities –*** By enabling local people and commuters to own and benefit from the clean energy powering trains, Riding Sunbeams can help Network Rail create social value through "connecting communities through better use of railway assets". Community benefit funds also allow community groups to help address fuel and mobility poverty.

1.3/ Riding Sunbeams - our work so far

Riding Sunbeams has worked since 2017 to develop the route to market for this solution working with The Greater South East Energy Hub, BEIS and their regional energy strategies that are now embedded in the Strategic Economic Plans for the South East Strategic Economic Partnership.

- 2017 we worked with Network Rail, Imperial College London Energy Futures Labs, Innovate UK and Riding Sunbeams co-Founders (10:10 Climate Change Charity and Community Energy South) to develop the needs case for direct wire renewable energy to power the third rail railways in the South East. Riding Sunbeams Solar Railways Report
- 2018 we led a feasibility study on six sites to investigate real life options funded by BEIS and Defra's Rural Community Energy Fund which has now been adopted into the Greater South East Energy Hub. These studies were undertaken with the Rail Traction Energy teams at Network Rail Wessex Region. Before Dawn Report
- 2019 we successfully delivered the Department of Transport and Innovate UKs First of a Kind competition to deliver the world's first pilot site in Aldershot that successfully resulted in the Rail Industry Compliance and Standards for connecting solar directly to the railway. First Light Report
- 2020 we are now preparing this project to test the first MW sized plant to the railway in East Sussex on a consented 3.75 MW solar farm connecting to Network Rail's Selmeston Substation

1.3/ Industry strategies that call for rail decarbonisation

This section outlines the industry strategies that have been published over the last 4 years to support the decarbonisation of the railways. These strategies align with SELEP's Economic Strategy Statement which is an update to the region's Strategic Economic Plan:

SELEP Economic Strategy Statement - SMARTER FASTER TOGETHER.

The Economic Strategy Statement underlines SELEPs commitment to work for a more productive and prosperous south east in which everyone has the opportunity to succeed. The statement is the update to the region's Strategic Economic Plan and aligns with the Government's Industrial Strategy.

Within this Statement there are five identified priorities and there are clear links between Riding Sunbeams Solar Railways: and the Creating ideas and enterprise priority as this priority considers innovation. There are also links with the Accelerating infrastructure priority as this section includes discussion around supporting decarbonisation and identifying alternative ways to produce the required energy to power transport. This project aligns strongly with the Working together priority demonstrating partnership work with Network Rail and the Community Energy

Sector to bring the project forward. We have also demonstrated within our Economic Evaluation the benefits for up to 40 jobs to support the project and this demonstrates the Developing tomorrow's workforce priority:

Each of SELEP's Priority areas relate to the Riding Sunbeams Solar Railways project:

- **Priority One: Creating ideas and enterprise**
- **Priority Two: Developing tomorrow's workforce**
- **Priority Three: Accelerating infrastructure**
- **Priority Four: Creating places**
- **Priority Five: Working together**

The priority areas are supported by the overall strategy with the work smarter, faster and together themes all of which the Riding Sunbeams Solar Railways project aligns with:

Work 'SMARTER' – translating our impressive jobs and business growth into a long-term increase in productivity.

Deliver 'FASTER' – developing solutions to unlock the housing and infrastructure that we need, and to ensure the efficient connectivity that will underpin productivity gain.

Work 'TOGETHER' – both across SELEP, and with our neighbours in London and or neighbouring LEPs, across the Greater South East, with Government and with business.

1.3.1/ Transport Decarbonisation Plan

The Rt Honorable Grant Shapps MP, Secretary of State for Transport wrote in his introduction to the Transport Decarbonisation Plan the following call to arms:

'Network Rail is actively pursuing large-scale carbon reduction activities across its estate and operations through its internal Decarbonisation Programme, aiming to improve energy efficiency, energy management practices and innovate in the areas of renewable energy, energy storage, low carbon design and transitioning the vehicle fleet to electric.

This document marks the beginning of a conversation to develop the policies needed to decarbonise transport. As we prepare to host the UN's annual climate change conference COP26 in Glasgow this November, we will publish our Transport Decarbonisation Plan which will set out how we intend to transform the movement of people, goods and services to reach net zero.' Reference: Decarbonising Transport: Setting the Challenge

Riding Sunbeams Case Study - extract from the DecarbonisingTransport: Setting the Challenge document:

Riding Sunbeams project

The 'Riding Sunbeams: First Light' demonstrator project, funded through the DfT and Innovate UK 'First of a Kind' competition, is a world-first initiative to directly power trains using solar energy. Electrified railways and solar power are key technologies for tackling climate change by moving Britain away from reliance on fossil fuels.

The modular nature of solar generation and the diffuse nature of the energy resource – sunshine – means it can be deployed almost anywhere, from small rooftop arrays to solar farms a mile wide. This feature of solar PV makes it an ideal candidate for installation on rail corridors and south-facing embankments, turning otherwise unproductive land into a renewable-energy-generating, productive asset. Network Rail is one of the UK's biggest landowners. Although some rail stations and trains have begun to install solar PV in Britain and elsewhere, this is the first time that anybody has connected solar generation directly to rail traction networks to power trains.

Source: Andy Aitchison, Riding Sunbeams

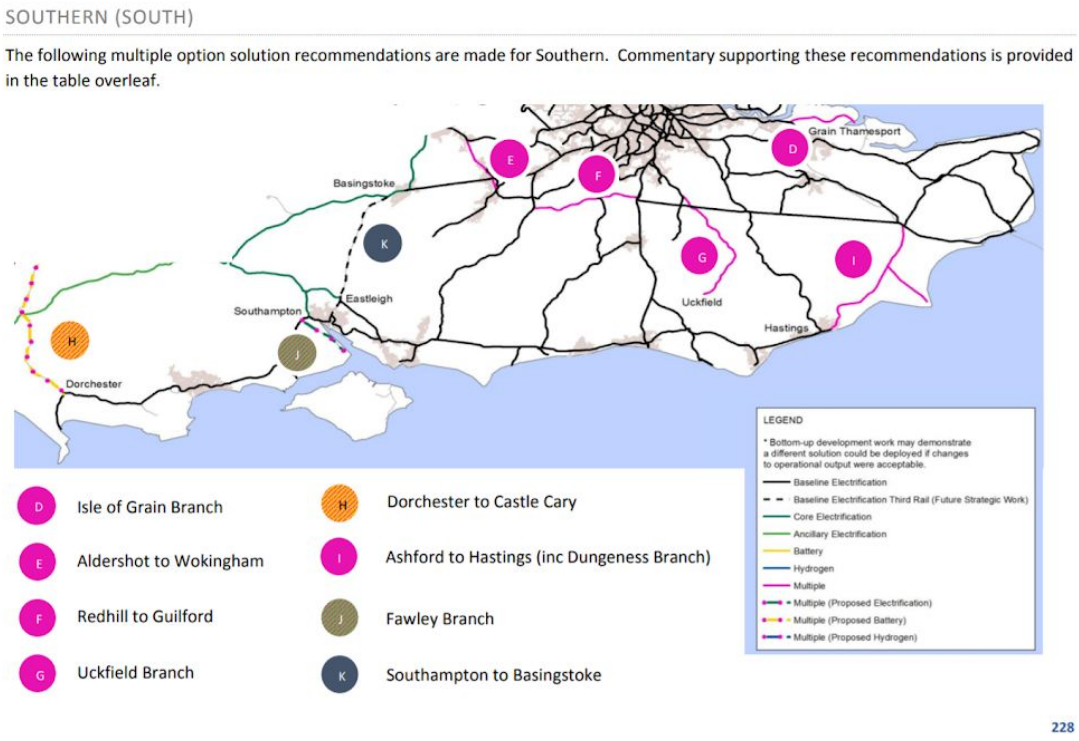
1.3.2/ Decarbonisation – Rail Safety and Standards Board (RSSB) Final Report to the Rail Minister 20/07/2019

Britain is leading the world on setting clear targets to reduce carbon, and so it's critical that all industries – including rail - play their part. The report recognised that GB rail can be a major contributor toward net zero carbon by 2050. The Rail Taskforce has considered a number of pathways toward reducing carbon and outlined five strategic recommendations for the rail industry including electrification and decarbonisation. These recommendations are further expanded in this report: Decarbonisation - Our Final Report to the Minister

1.3.3/ Traction Decarbonisation Network Strategy (launched 10/09/2020)

The Traction Decarbonisation Network Strategy (TDNS) has been published by the Network Rail STE System Operator team and outlines the target of UK wide and specifically Southern Region required electrification, hydrogen and battery traction options to achieve the most cost-effective low carbon outcomes. This aligns with this project and future market opportunities alongside regional capacity, customer and community intervention and the benefits of direct wire renewables for decarbonisation and regional net zero ambitions.

Map: TDNS published report outlines diesel routes in the South East that are planned to transition to DC electrification:



1.4/ Regional Energy Strategy that supports solar railways

In 2016 the Department for Business, Energy and Industrial Strategy committed to the Industrial Strategy and undertook to support the UK's 38 Regional Local Enterprise Partnerships to undertake Local Area Energy Plans. This resulted in EnergySouth2East Energy Strategy for the region. This strategy has now been embedded within the TriLEP regions' Strategic Economic Plans and within that strategy, Riding Sunbeams solar railways approach is named and supported as one of the leading delivery models to a low carbon green economy.

Extract from the Local Energy Strategy, Project Model #7 as follows:

Project Model #7: Solar energy for Network Rail:

What: *Support the development of renewables to power a significant regional energy consumer*

Why? In the Tri LEP region the Kent, Sussex and Wessex rail routes together consumed 1.38TWh of traction electricity in 2015/16, at a total cost to train operators of £ 114M. Analysis indicates that each traction substation in the Southern Region should on average be able to comfortably accommodate intermittent supply from a connected ~1MWp solar array.

This is further referenced in the Project Model Delivery plan taken from SELEP's EnergySouth2East Action Plan and Project Models publication - see extract below:

Project Model	Project Model	Potential Action	Action Leads	Timeline
#7	**Solar energy for Network Rail** In the Tri LEP region the Kent, Sussex and Wessex rail routes together consumed 1.38TWh of traction electricity in 2015/16, at a total cost to train operators of £ 114M. Analysis indicates that each traction substation in the Southern Region should on average be able to comfortably accommodate intermittent supply from a connected ~1MWp solar array.	Identify all key stakeholders relevant to Renewables development along with Network Rail and setup regular Collaborative committee to regularly refresh and maintain outreach across the industry with developers, Community Energy South, Riding Sunbeams project and key regional stakeholders such as supply chain, representative bodies, etc.	Tri-LEP Strategic Energy Delivery Group and relevant Local Authorities Community Energy South Network Rail Greater South East Local Energy Hub	Immediate
		Engage market to identify solar, wind and renewables project pipeline. Review, analyse and priority rank project to unlock up-to 5 pending projects to be used as Renewables Demonstrators.	Tri-LEP Strategic Energy Delivery Group Greater South East Local Energy Hub Network Rail	Short-term
		Conduct feasibility studies of the identified (up-to) 5 projects and commence development as Renewables Demonstrators	Tri-LEP Strategic Energy Delivery Group Greater South East Local Energy Hub Network Rail, Community Energy groups	Short-term
		Facilitate investment discussions through outreach and workshops	Tri-LEP Strategic Energy Delivery Group Greater South East Local Energy Hub	Short-term
		Delivery of (up-to) 5 Renewables Demonstrators - with sharing of lessons learned around the business model, investment mechanism, technical delivery and operation	Tri-LEP Strategic Energy Delivery Group Greater South East Local Energy Hub Network Rail, Community Energy groups, local developers	Short-term
		Commence roll-out of a targeted 200 renewables projects across the tri-LEP region, based on learning from the Renewables Demonstrators	Tri-LEP Strategic Energy Delivery Group Greater South East Local Energy Hub	Medium-term

2/ Economic Case

Our technical connection solution and commercial framework provide a route to market for third party generators (ideally community or charitably owned), and is capable of underwriting capital investment in new capacity to provide low carbon, lower cost traction electricity for public transport providers.

We have undertaken an Economic Benefits Assessment and the analysis on cost benefit demonstrates this project is classified as having a very high Value for Money. See table below extracted from Appendix B where the full analysis and sensitivity testing is provided:

Table 1-3: Results from the cost-benefit analysis. Prices in £2021

Costs (discounted)	CAPEX	[redacted]
	OPEX	[redacted]
	Grid energy costs	-[redacted]
	Present Value of Costs (PVC)	-318,811
Benefits (discounted)	GHG emission reduction	555,222
	Air pollution reduction	406,879
	Present Value of Benefits (PVB)	962,101
Net Present Social Value (NPSV)		1,280,912
NPSV/k		0.21
Benefit Cost Ratio (BCR)		-3.02
VfM category		Very high (and financially positive) VfM

2.2/ Options table

There are several options to deliver the objective to substantially decarbonise the rail traction network. These are summarised in the table below, illustrating their comparative strengths in the timely and economic delivery of decarbonisation, cost reduction, capacity increase, innovative solution and lack of reliance.

2.2.1/ Evaluation approach

A summary of the relative benefit and deliverability of the options to decarbonise the rail traction system is as follows:

- ***Weak*** - The approach is unlikely to deliver significant benefit within a predictable timeframe
- ***Good*** - The approach could deliver significant benefit within a medium-term timeframe on an economic basis
- ***Very Good*** - The approach offers an immediately deliverable significant benefit (defined cost and programme) with a clear delivery date

	Options	Carbon reduction	Cost	Capacity Increase	Innovation	Increased resilience	Network Rail resources required
1	**Do nothing - Business as usual**	Weak	Weak	Weak	Weak	Weak	Very Good
2	**Network rail sleeve energy through a "Green PPA"**	Good	Good	Weak	Weak	Weak	Good
3	**Direct Wire purchase of third party renewable generation**	Very Good	Very Good	Very Good	Very Good	Very Good	Very Good
4	**Network Rail develops generation on sidings, roofs, etc.**	Good	Weak	Weak	Good	Good	Weak

The Cuckmere project contributes to the decarbonisation of the DC rail network and mitigates the network's demand for peak-time energy from the grid, which is at capacity across the south east. Dedicated direct-wire renewable generation adds renewable generation to the grid mix, whilst releasing capacity on the existing power grid. The beneficial impact of this is delivered by this project quickly, at a point on the network of capacity constraint and additional supply requirement from the rail network, particularly at peak times.

The gradual decarbonisation of the grid will take a number of years with progress being affected by numerous policy and unpredictable market influences. By contrast, the project represents a much more immediate demand-led planned intervention which will deliver vital local economic and decarbonisation benefits.

The project facilitates Local Area Energy Planning by addressing the peak demand issue characteristic of the local rail system, where demand is very heavily skewed towards commuter times which coincide with wider peak demand on the grid both locally and nationally. The project is therefore consistent with a whole system engineering approach designed to address immediate demand from a significant consumer whilst releasing capacity on the grid. The project represents the only way to achieve this joint benefit practically and at pace. The site is consented and planning conditions have been discharged, and collaboration with Network Rail ensures that the connection will be made.

To explain the option of sleeving agreements, an example is TfL's proposed renewables contracts to power London's Tube network towards the ambition for the London Underground to be zero carbon by 2020:

City Hall plans to scope out a market for Power Purchase Agreements to meet the Underground's electricity demand so that London's entire Tube network could be powered by renewable electricity directly purchased from wind and solar farms within the next decade. Like Network Rail, Transport for London (TfL) is one of the UK's largest consumers of electricity, with its 1.6TWh annual power demand (equivalent to that used by more than 437,000 average homes or roughly 12% of all households in the Capital). This move is aimed at testing the market for securing TfL's electricity through Power Purchase Agreements (PPAs) with renewables generators, which would allow Tube trains to be supplied with power directly from wind and solar projects, rather than from the mix of clean and fossil fuel generators offered via the National Grid. The TfL ambition is to consider purchasing up to 10% of the network's power demand via renewable PPAs by spring 2022 - subject to market approval from its Finance Committee later this year - with a view to contracting 100% by the end of the decade.

However, such sleeving agreements arrangements do not directly increase low carbon energy generating capacity (although increased demand should over time encourage investment in low carbon generating assets). Sleeving agreements do not directly address the overall demand deficit on the grid and from a specifically economic perspective mean that the customer is still subject to connection charges. All of these issues are addressed by the proposed direct-wire connection approach.

Alternatives to Cuckmere site have been selected on the basis of suitable site availability and access adjacent to the rail network, and proximity to a suitable connection point where there is an immediate demand requirement from the rail system. Significant investment has already been made in 2 government funded feasibility studies to demonstrate the delivery and viability of this site and, crucially, the project can be delivered by March 2022.

The investment and delivery model for the local community will be offered the opportunity to invest in the project, and therefore benefit directly from it. It also increases the speed of delivery, as community energy projects can result in a much more efficient process for site selection, acquisition and achieving planning permission.

Summary site options analysis undertaken by Riding Sunbeams. Through Riding Sunbeams' work with Network Rail we have been developing feasibility studies and analysis on the below sites. We started the analysis by mapping the traction lines that had future potential capacity constraints and matched this with connection ability to substations and track parallel huts and also existing local community and stakeholder relationships. The two front running projects have been Cuckmere in East Sussex and [redacted]

Option analysis					
Site	Capacity	Planning	Traction data	Connection type	Requirements
[redacted]	x				
[redacted]	x		x	x	
[redacted]	x		x	x	
Cuckmere*	**x**	**x**	**x**	**x**	**x**
[redacted]			x		
[redacted]			x	x	x
[redacted]	x		x	x	
[redacted]	x		x		
[redacted]	x	x	x	x	x
Measurements	Capacity required for financial business case	Planning required by local authority to proceed to R&D	Real time data for traction line monitored second by second	Connection type reviewed with NR Asset Team	Requirements analysis undertaken by steering group

**Cuckmere (CCS) is the preferred option as it was one of the six Riding Sunbeams projects to complete the 2018 traction feasibility stages alongside Network Rail. It successfully achieved planning consent and meets all criteria as the options analysis table shows.*

The Tri LEP Regional Energy Strategy Project Model #7 (referenced in 1.4 above) supports the development of renewables to power a significant regional energy consumer - solar energy for Network Rail. In the Tri LEP region the Kent, Sussex and Wessex rail routes together consumed 1.38TWh of traction electricity in 2015/16, at a total cost to train operators of £ 114M. Analysis indicates that each traction substation in the Southern Region should on average be able to comfortably accommodate intermittent supply from a connected ~1MWp solar array.

3/ Commercial Case

Based on the strategic R&D and commercial partnerships that Riding Sunbeams has established with our key customers in the UK - Network Rail, Transport for Wales, Transport for London and the devolved rail system operators, our approach is to fund and develop the first commercial scale direct wire solar generating site to connect to the UK DC rail traction network. This is made possible by building on our collaboration to date with Network Rail on detailed feasibility studies and our world-first demonstrator site in Aldershot in 2019.

This project will be the first MW+ scale direct wire solar connection to the Network Rail DC network, and will be sited in their Wessex region. As well as delivering a fully commercial project, the project includes an 18+ month advanced R&D programme to achieve the required Rail Industry Readiness Level for the MW connection, and testing the model commercial framework and power purchase agreement to fund and develop the future pipeline of MW+ generating sites in collaboration with local community energy groups.

The outcomes of this work will be to enable Network Rail to procure direct wire renewable energy at scale on the basis of Riding Sunbeams "Triple Bottom Line" approach - decarbonisation of the rail traction network by providing unsubsidised direct wire renewable energy at or below the price Network Rail currently pay with baked-in community ownership / social impact to deliver policy objectives.

This approach will enable Network Rail to procure MW scale renewable energy generation at scale and pace from 2022, and provide a commercial model which can be adopted by other UK customers including Transport for Wales and Transport for London in relation to both DC and AC networks. This commercially fundable model will be equally transferable to the international market offering global opportunities for UK innovation to transform the carbon footprint of the most efficient and extensive transport infrastructures.

In parallel Transport for Wales is in principle keen to buy renewable traction power from line-side generators at sites we have worked with them to identify in the Green Valley Lines study. Riding Sunbeams is modelling the potential role of line-side storage as well as designing power electronics and a methodology for connecting renewables to AC networks.

3.1/ Commercial approach

The key output of this project is a commercially operational solar site that provides electricity to Network Rail through a direct connection. To prove the commercial model it is key that the site is at least in part owned by external parties, and that there is a long-term Power Purchase Agreement in place to allow the site to earn a revenue from selling the electricity to Network Rail - and that this should be competitively priced compared to Network Rail’s normal cost of buying electricity.

As this is the first project, and that there is a chance (albeit small) that there could be an unforeseen technical or regulatory issue preventing the site from selling electricity to Network Rail - it will initially be owned by Riding Sunbeams and have a significant element of grant funding. The replicable model will be based on the PPA or other commercial agreement agreed in this project.

3.2/ Procurement Route

The Riding Sunbeams team has extensive experience delivering compliant procurement processes for publicly funded and highly regulated major infrastructure projects in the energy sector.

At a practical level, Riding Sunbeams will be supported throughout the required procurement processes, as required, by Local Partnerships. Local Partnerships is a joint venture between the Local Government Association, HM Treasury and the Welsh Government. It occupies a unique position in the public sector, facilitating change by working impartially and collaboratively across all parts of central, local and regional government and the devolved administrations.

Local Partnerships provides capacity and capability in the delivery of projects across sectors, including those in renewable energy. Local Partnerships will advise Riding Sunbeams throughout the procurement of the key elements of this project, as required. Local Partnerships experts have significant experience in the development, delivery and procurement of EPCs, solar farms and PPAs.

More information can be found at https://localpartnerships.org.uk/our-expertise/energy/

Procurement route is as follows:

a. Riding Sunbeams (RS) will be the recipient of the grant.

b. RS and CCS form a SPV to build the solar park.

c. This SPV then leases/rents the solar park to Network Rail for a period of 1-4 years for them to test it and the connections to the railway to their satisfaction.

d. The asset is under the control of the SPV for the remainder of its lifetime, generating energy that is expected to be sold to Network Rail (although they cannot guarantee this at this stage as any PPA will need to be subject to a competitive process); the SPV will investigate other potential purchasers of the power as a risk mitigation strategy.

3.3/ Commercial risks

There are two key risk elements that relate to the commercial risks. These would be a key insurmountable technical issue (which from all previous projects is very unlikely) and an insurmountable regulatory issue with entering into a power purchase agreement (which is again very unlikely based on previous work).

These two cases lead to the following retained risks by the SPV:

Technical

This risk is that no electricity can be provided to Network Rail due to an unexpected, insurmountable technical issue. Noting that risks held by the SPV are split between the founding shareholders, Riding Sunbeams and Network Rail.

Retained risk/liability	Who bears this risk	Value	Note
Ongoing Land Rental	SPV*	c. £[redacted]	Index linked
Business rates	SPV	c. £[redacted]	
Decommission site	SPV	TBC	Very unlikely
Ongoing O&M of project	SPV	£0	Project and assets would be decommissioned and/or sold
Community Benefit Fund	SPV	£0	This would not be due if no electricity is supplied to Network Rail
Value of project lower than investment	SPV	£[redacted]	The project can connect to grid or another local third party offtaker.

Regulatory issue with commercial power purchase agreement

This risk is that electricity can be provided to Network Rail, but no power purchase agreement can be signed between the SPV and Network Rail due to an unexpected, insurmountable regulatory issue. In which case Riding Sunbeams will execute the option to reconnect the scheme directly to the DNO.

Retained risk	Who bears this risk	Value	Note
UKPN does not increase capacity as planned	SPV	c£1m	This is very unlikely as works have begun to increase capacity by 2024. There is also 0.8MW of capacity currently available and storage could be implemented.

3.4/ Proposed payment mechanism

3.4.1/ Project payments into SPV

The capital costs of the project are being raised by Riding Sunbeams supported by Riding Sunbeams shareholder Thrive Renewables plc. The proposed payment mechanism is for the injection of capital into the SPV over the course of the c.15 month delivery timetable based on project milestones. These milestones will be dictated largely by the construction contracts which will form over 50% of the project total project costs.

The spend profile of the project is currently being developed in more detail, and indicative costs and a whole-life financial model in Section 4 of this document.

3.4.2/ Income into SPV

Network Rail will pay the SPV to lease/rent the assets for a fixed period of time whilst undertaking technical testing. Following this period the SPV will sell the electricity.

3.5/ Social impact

There will be a Community Benefit Fund paid annually from the SPV to Cuckmere Community Solar, used for socially impactful projects. As mentioned previously, this is subject to the project being a technical success.

3.6/ Innovation partnership or appropriate commercial relationship

As part of our Department for Transport funded First Light project in 2019, our summary statement delivered to Innovate UK was as follows:

'The lowest risk and most cost effective route for Riding Sunbeams to achieve full commercialization and for Network Rail to be able to issue a full, open tender to procure power from line-side renewable generators, appears to be through an exclusive, time limited

Innovation Partnership between Riding Sunbeams and Network Rail. This would enable the first MW scale site(s) across the Southern Region to be financed, built and commissioned during 2020-2022.'

We therefore believe the most appropriate way to deliver this project is through an Innovation Partnership with Network Rail, whilst we are open to considering other options that deliver the same outcomes. This procurement route, designed specifically to address the need to bring forward innovation on a commercial basis, enables collaboration between Network Rail, Riding Sunbeams and community energy groups without compromising or prejudicing competition rules or the procurement of future projects.

An Innovation Partnership procedure is essentially a procurement process combined with an R&D contract. Authorities are then able to purchase the 'end result' of the R&D exercise, without having to undergo a new procurement procedure. The procedure was designed to drive innovation and can only be used in circumstances where a solution is not already available on the open market. Therefore, participants in the Innovation Partnership will be asked to create something which does not already exist and should be tailored towards solving a particular problem or 'challenge'. This procedure is particularly attractive to SMEs who often find it easier to innovate in comparison with their larger competitors. Therefore, as in this case, it results in a more innovative product or service.

One of the key advantages of an Innovation Partnership is that the R&D phase is separate to the subsequent purchase of the solution. In other words, the authority is not (usually) under any obligation to purchase the 'end result' of the R&D exercise, but has the option to do so if it wishes. Therefore, it may be easier to discourage internal stakeholders from imposing selection criteria which inadvertently exclude SMEs/start-ups (e.g. minimum turnover requirements, parent company guarantees etc.), as the authority is not committed to actually purchasing at the end of the procurement process which will select the innovation partner(s).

Innovation Partnerships are particularly helpful where: a solution to a 'problem' is required; the "authority" (Network Rail) does not have the budget to fund the entirety of the research required to investigate potential solutions on its own or appoint a third party to do this; and/or the authority wishes to retain the flexibility to explore a solution(s) in more detail (including potentially working with the supplier(s) as part of the R&D phase) before awarding a contract to purchase the goods, services or works.

The alternative commercial relationship with Network Rail could be a property transaction where Network Rail lease the assets from the SPV for a fixed amount of time whilst undertaking technical assurance.

4/ Financial case

The financial model details an investment case where the project has a net internal rate of return [redacted] for Riding Sunbeams based on their investments, noting that this is even more impressive as there are overheads on this project that would not be replicated when the market is opened.

This site would therefore act as a vehicle to prove that the technical and commercial hurdles can be overcome and to open the market for direct-wire solar power, whilst also providing electricity at a price competitive with that which Network Rail is currently paying. The assumption is that there will be a [redacted] year PPA at [redacted] per kWh on a take or pay basis, and this will provide an assured income for the project. There would also be a significant Community Benefit Fund paid out for the duration of the project.

4.1/ Project Costs

The total project capital cost will be £[redacted] for a 3.75MW scheme. This includes the capital expenditure costs of building the asset, technical compliance and testing, management and also the legal costs associated with securing a suitable commercial arrangement. The grant contribution to the Riding Sunbeam's project costs is £2,527,500

There is a general 5% contingency allowance for the total project capital costs and detailed sensitivity tests have been undertaken.

Lifetime operational costs and revenues are included in the financial model.

4.2/ Financial Model

We have created a financial model for the site, which is submitted alongside this application. This includes the development and construction costs, expected revenues and operating costs for the lifetime of the project.

The revenues are expected to come from Network Rail, in return for the power the site provides to power the trains, under an agreement called a power purchase agreement. This is expected to be on a [redacted] year term, at [redacted] per kWh and will ensure the ongoing operations and maintenance of the site, as well as paying into a community benefit fund. Under this arrangement, the cost of electricity will be on parity with Network Rail's current electricity contracts.

It is expected that the project costs would be recovered by the project within the lifetime of the site from the sale of electricity to Network Rail.

4.3/ Community benefit

This scheme has a significant community benefit built in, expected to deliver social impact.

The current financial model allows for £[redacted] per annum as a community benefit fund for the lifetime of the commercial operation of the project, which will be used for items such as local environmental projects, energy awareness and local sustainable transport.

4.4/ Cost apportionment

The cost apportionment between Riding Sunbeams and the Getting Building Fund grant is detailed in the table below. The costs are also categorised into the key elements of the project. Capital costs are at 2020 prices, with the expectation that the full costs will be spent by 31st March 2022. We do not envisage any material inflationary increase in the capital costs before delivery of the project. Operating costs are inflated from 1st December 2022.

Please note that there are approximately [redacted] of internal and [redacted] of external sunk costs incurred by Riding Sunbeams.

	[redacted]	**RS via GBF 2020-2021**	**RS via GBF 2021-2022**	**RS internal**	**RS Investment**
IDNO Direct Wire Programme to connect solar farm to NR Connection	[redacted]	[redacted]	[redacted]		[redacted]
3.75MW Solar Farm Construction and commissioning	[redacted]	[redacted]	[redacted]		[redacted]
Network Rail Connection Interface and Compliance testing	[redacted]	[redacted]	[redacted]		[redacted]
Network Rail Project Management	[redacted]	[redacted]	[redacted]		[redacted]
Solar Railways Commercial Framework for roll out to market	[redacted]	[redacted]	[redacted]		[redacted]
Project Management (RS)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Legal (RS)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Construction insurance	[redacted]			[redacted]	[redacted]
Rights acquisition*	[redacted]			[redacted]	[redacted]
Contingency at 5%	[redacted]			[redacted]	[redacted]
Total capex	[redacted]	**1,685,001**	**842,499**	[redacted]	[redacted]

*This is subject to ongoing commercial agreement

The project operational costs are expected to be covered by income from selling electricity to Network Rail under a Power Purchase Agreement or other commercial agreement. The details and sensitivities around this are detailed in section 4.6 below.

The financial model includes annual maintenance costs under O&M (Operations and Maintenance), which total £[redacted] . For equipment renewals, an annual contribution to the major parts replacement reserve of £[redacted] for equipment renewals. There is also an asset management fee of £[redacted] for managing the site. The prices are baselined to 2021, with the first inflationary uplift from 1st December 2022.

Table inserted below details lifetime operational costs:

Operating Expenses	
Asset Management Fee	£
Audit and Tax	£
Health & safety management	£
Community Benefit Payment	£
Rates	£
Insurance	£
O&M	£
Land rental	£
Import electricty and comms cost	£
Major parts replacement reserve	£
Total Operating Costs	£

***note costs redacted from table**

4.5/ Grant financial year spend

The table below details the expected grant expenditure in the two financial years:

2020-2021	**2021-2022**
1,685,000	842,500

4.6/ Project sensitivities

The **discount rate** is at the discretion of the investor based on their views on the project and risk appetite. The [redacted] discount rate is a standard (possibly conservative) figure that we use on solar projects. Given the anticipated PPA with NR price risk will be mitigated and another investor may have different views on the risk profile of the project. Note that we have seen solar projects targeting investment that only offer [redacted] IRR returns and investors have been willing to accept this even with development/construction risk. We have assumed the same discount rate for NR when in reality we do not know how they will view the project.

Inflation is assumed at 2.2% p.a, which is the standard RPI inflation assumption that we use when modelling projects based on a conservative approach. Within the model there is the ability to set individual inflation rates for the revenue side (NR PPA and export power price) and the

opex side. At the moment it is 2.2% across the board although this could change, in particular with respect to the NR PPA where we will have to agree some inflation mechanism.

In terms of **sensitivities:** we have included capex risk contingencies, and are currently running sensitivity scenarios. In total 11 sensitivities have been modelled to aid the evaluation of the risks and opportunities to the project. One of the key risks identified is regarding the base load of electricity demand on the Network Rail traction supply network, and this has been modelled on a curtailment basis. We have also modelled the site as if there is the potential to sell excess electricity back to the grid.

The scenarios and sensitivities modelled are as follows:

- **Inflation:** High, low and base case
- **Revenue:** NR PPA price high, low and base case
- **Opex and Capex:** Higher and base case
- **Usage:** 75% and 50% take or pay (with and without export sales to grid)

Table detailing outputs of sensitivity modelling:

***Table redacted**

The outputs of the sensitivity analysis are good and represent a wide variety of pessimistic scenarios to address an allowance for optimism bias. All models include the CAPEX contingency of 5% of total cost. The key metric used to help understand the risk is the value of the project within two years of commercial operation, assuming sale to an investor requiring a [redacted] IRR. It is imperative that this value is positive to ensure that a profitable project will exist - that both generates a return and can cover the operational costs for its lifetime.

Scenario 4 is an extreme worst case and would likely be addressed in the design stages of the project. Under this scenario, the project will only have 50% of the power produced purchased by

Network Rail and the rest being curtailed - with a modest PPA price indexed in line with inflation. Under this case the site would still have a value of [redacted] when coming to disposal within two years of operation

Scenario 7 details a case where the total operational costs increase by 10%. In this case the project would have a value of [redacted]

Scenario 8 details a case where the total project capital costs increase by 5% from [redacted] (which includes a 5% contingency) to [redacted]. In this scenario, the project would be worth [redacted] within two years of operation compared to the base case of [redacted].

A more optimistic scenario is detailed in Scenario 10. In this case, the PPA costs are closer (but still less) than the price that Network Rail are currently paying. Under this scenario the project value would be [redacted] - which would represent excellent value for money on a path finder project of this type.

From the sensitivity analysis and previous work, it is clear that the key drivers in the project for long term profitability revolve around the PPA price and indexation - and matching the output of the solar site to that of the railway demand.

The key learning is that in all examined cases the project will be profitable for an incoming investor when it comes to disposal of the asset - which means the project will operate and provide the relevant benefits for the full lifetime.

5/ Management case

5.1/ Governance & Monitoring

Overall governance of the project rests with the Board of Riding Sunbeams who operate in accordance with all requirements of private companies in their conduct, operation and reporting. The Board is chaired by Jamie Andrews, an experienced founder and Chair who co-founded Loco2 and grew the company before selling to French national rail operator, SNCF. Prior to that he held a number of roles at technology companies and is a specialist in fostering agile/lean business practices. He is joined on the Board by a highly experienced executive and non-executive board with experience across public and private Boards, and also the Riding Sunbeams Chief Executive, Ivan Stone. Ivan brings wide international experience to the Board and has played a key role in delivering some of the UK's biggest infrastructure investments.

5.1.1/ Project Delivery Board

Under the Riding Sunbeams Board of Directors, a Project Delivery Board (PDB) will be established as illustrated in the diagram below. The PDB is responsible for:

- Approving the project scope of work, programme and budgets as well as any changes
- Securing necessary approvals where required.
- Signing of completion of each stage of the project and authorising the start of the next
- Procurement and financial reporting
- Ensuring all operational regulatory requirements are adhered to
- Monitoring project risks and taking any appropriate actions to mitigate, including escalating to the Riding Sunbeams where agreed
- Coordinating communication and engagement with stakeholders

The PDB will meet monthly and report up to the Board of Riding Sunbeams for strategic oversight and performance monitoring. Monthly monitoring and financial reports against key milestones, together with any escalated risks from the risk register will form the core of the documentation. Assurance will also be provided through an agreed reporting framework to ensure that decisions are accountable and that the project benefits continue to outweigh the costs.

Day to day project expenditure will be managed through a standard contract and purchase order process supported by delegations of authority for financial approvals between officers and directors, with an approval mechanism overseen by the PBD. These processes will be captured in a company procedures manual which will be subject to routine quality audit and KPIs.

An organogram of the recommended PDB* is provided below:

***Organogram redacted due to personal information**

[redacted]

5.1.2/ Executive Steering Board - Commercial Power Purchase Agreement

An executive steering board will be established with senior Network Rail, Riding Sunbeams and relevant industry representatives such as the Department for Transport and the Rail Safety and Standards board. Riding Sunbeams has established that there is a challenge in joining up the various elements of a direct-wire power purchase agreement, including the various departments within Network Rail and also from a statutory and regulatory standpoint. Therefore an executive steering board with a key focus on delivering the power purchase agreement will be established to efficiently bring together all the relevant parties required to proceed with the agreement.

An organogram of the recommended ESB* is provided below:

***Organogram redacted due to personal information**

[redacted]

5.2/ Key roles and Responsibilities

A summary of the key personnel and roles are described below.

Ivan Stone - Chief Executive Officer and Senior Responsible Officer

Responsibility: Ivan will take overall responsibility for project governance, and reporting and accountability in relation to the project.

Experience: [redacted]

Ollie Pendered - Director of Partnerships and Sponsor

Responsibility: Ollie Pendered is Sponsor and will be responsible for consultation and strategic partnership management to ensure partners remain aligned on the project objectives and are supported when project blocks need careful consideration and negotiation.

Experience: [redacted]

Clare Marten White - COO and Chair of Project Delivery Board

Responsibility: Clare will take overall responsibility for the project planning, procurement, delivery and commercial operation and will Chair the PDB.

Experience: [redacted]

Alex Byford - Chief Technology Officer and Senior Project Manager

Responsibility: Alex will oversee delivery of the project from conception to commercial operation. This will include contract and commercial management, procurement, technical assurance and financial responsibility.

Experience: [redacted]

Vacant: Project Manager

Responsibility: Reporting to the senior project manager, the project manager will be responsible for day to day delivery of the project programme, negotiating and managing contracts for delivery of the project on site, providing weekly reports and supervising work on site.

[redacted] **- Investment Analyst**

Responsibility: [redacted] is responsible for the financial modelling of the project, including construction and whole-life operations.

Experience: [redacted]

[redacted] **- Technical Lead Advisor**

Responsibility: [redacted] will provide expert insight and guidance on the design, delivery and financing of the overall solar project from his vast experience in the industry. This will include

financial forecasts and yield projections, power purchase agreement negotiations and also any acquisition and disposal transactions.

Experience: [redacted]

[redacted] **- Technical Advisor**

Responsibility: [redacted] will provide the detailed technical guidance on novel and innovative system specifications that will be unique for connecting solar power by direct-wire to the rail traction network. This will include analysis of demand data captured at the point of connection, to harmonise with the yield forecast expectations. [redacted] will also integrate into the technical team to provide the full range of design understanding from the point of connection to the solar generation.

Experience: [redacted]

Jane Ollis, Non Executive Director - Chair of Executive Steering Board

Responsibility: Jane will Chair the PDB.

Experience: [redacted]

[redacted] **Senior Investment Manager**

Responsibility: [redacted] will provide expert commercial guidance during the PPA development

Experience: [redacted]

Leo Murray, Director of Innovation

Responsibility: Leo Murray will be responsible for all public relations, social media and email communications to keep a diverse audience engaged and excited about the long term project benefits.

Experience: [redacted]

Network Rail

Responsibility: Network Rail will have a Scheme Sponsor, providing strategic oversight and direction to the project. This is likely to be [redacted], who was the scheme sponsor on our extremely successful First of a Kind 2019 Innovate UK project with Network Rail.

[redacted]**)** and their team will undertake the role of Principal Designer as required, and provide relevant design engineers to aid with specification of the primary, secondary and projections system requirements.

There will also be a **Project Manager** providing day-to-day technical support who will be assigned closer to the project start date. It is also envisaged that Network Rail will draw on their own approved suppliers to undertake the physical construction works on their assets at the point of connection.

Cuckmere Community Solar

Responsibility: Cuckmere Community Solar (CCS) undertook the project development including securing planning permission, and are providing the land rights for the solar site. CCS will also receive, manage and deliver the ongoing Community Benefit Fund. Post commercial operation of the project, it is envisaged that Cuckmere Community Solar will undertake a community fundraise and purchase a stake in the project at a commercial price. Their **Chair Dr Alister Scott** has established a board of industry leaders and local stakeholders to support CCS mission to build a solar farm that provides community benefit and local investment opportunities.

[redacted]

5.3/ Key stakeholders

In developing this business case and the GBF Riding Sunbeams has been actively supported by Maria Caulfield MP, Lewes District Council and Wealden District Council (Planning Authority). We are the only named project within the Regional South2East Energy Strategy and

listed within the pipeline in the recently published Greater Brighton City Region's Local Area Energy Plan.

Statement of Community Consultation:
A detailed communications plan will be developed to support the development stages of the project through to March 2022. This will need to take into account the construction phases of the project liaison with the local planning authority at Wealden District Council and the impact on the local community. Coordination with Network Rail, Riding Sunbeams along with the good will and work to date carried out by Cuckmere Community Solar will be essential to mitigating any local issues.

Stakeholders

- Berwick and Arlington Parish Councils
- Local Community
- Cuckmere Community Solar
- Maria Caulfield MP
- Wealden District Council (Planning authority)
- Lewes District Council (Neighbouring)

Regional Stakeholders

- Political
- Local Authority
- Business Community
- UK Power Networks
- Community Energy Sector

Industry and Political

- Network Rail
- Regional and National
- RSSB
- ORR
- Department for Transport
- Department of Business, Energy and Industrial Strategy
- Ministry of Housing, Communities and Local Government

5.4/ Media Relations

Our publicity strategy has three key components, media, events and public summary outputs. We will establish a media relations strategy outlined below and coordinate this with Network Rail and GBF Stakeholders. We have been offered support from Wealden and Lewes District Media teams to support local communications.

Print

National news coverage is uncertain in the present context, but should be targeted. Public support for and media discourse around a 'green recovery' and fiscal stimulus specifically for new infrastructure spending offer promising hooks for mainstream coverage for both securing Get Building Fund support in the first instance, and subsequently for delivery of the new generating assets via our innovation partnership with NR. Riding Sunbeams is already known to many of the UK's national energy, transport and environment correspondents at broadsheets. We can guarantee large scale national media coverage for community refinancing through share or bond issues to the public, although this is technically beyond the scope of this project plan.

Regional and local news coverage is highly achievable, and very important given our specific ambitions in the Southern Region. We should be able to secure coverage in regional news titles, not least because we are pushing for either East Sussex or Kent to be the first place to trial MW scale traction-connected solar. It is essential we are able to place stories in local news titles in order to build local awareness and support for our triple bottom line agenda in the region.
The new electrification proposed for the region in the Traction Decarbonisation Network Strategy is also likely to be subject to high levels of interest and debate, and we should aim to promote and advocate for these proposals. We should lead with a story on the GBF funding; seek to provide commentary in stories around the potential for new electrification in the region; and follow up with intensive drives around construction and commissioning of the first MW scale solar traction project/s.

Specialist press will be an easy sell. Both the rail and renewable energy industry press are following Riding Sunbeams' work closely and will be keen to report details of progress. The significance of the first MW scale solar traction assets will not be lost on these journalists and editors. We should also try to place stories in more mainstream popular tech outlets like Wired.

Broadcast

National television coverage, inc. magazine coverage such as the One Show, may be achievable at the commissioning stage. We should certainly aim at minimum for a TV spot on BBC South and ITV Meridian daily news; we may be able to get a small mention at the point of securing the funding, but once we have solar panels going in next to the railway we are likely to be able to secure a lead story or feature on regional broadcast.
Radio coverage is likely to be a good bet initially as there is no requirement for visuals, and the story has wide potential interest. Riding Sunbeams has not had much exposure on Radio 4 yet so it could even be possible to secure a national radio story on a magazine such as Costing the Earth. Regular coverage on local radio stations is very achievable.

Events

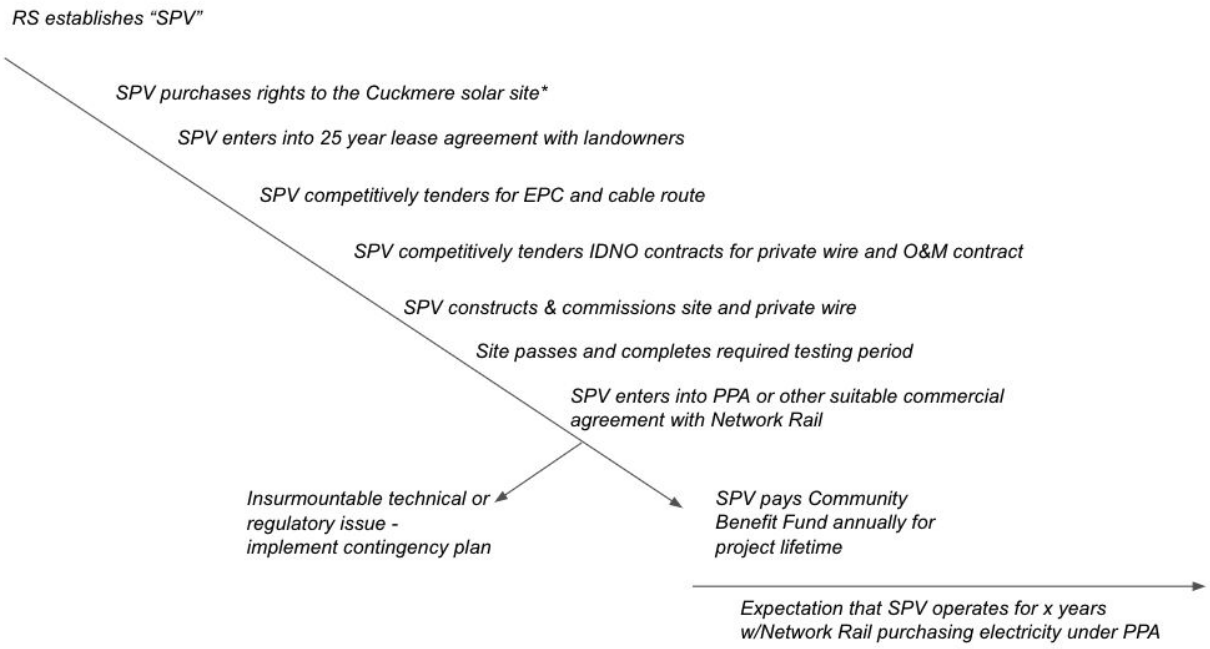
Local events will inform the local community about the impacts locally of the scheme and create opportunities. Riding Sunbeams is well placed to coordinate industry level showcase events.

Riding Sunbeams founder organisation Community Energy South is well positioned to support regional level events including supply chain and stakeholder strategies.

Public reports
We'll produce a glossy brochure outlining the key facts and economic, social and environmental benefits of our first MW scale site, similar to the one produced following our Aldershot demonstrator, for use in both securing local public and stakeholder support for the initial solar scheme itself but also as a pitch document to open up commercial opportunities in other regions and traction energy markets.

5.4/ Programme overview

The diagram below illustrates the critical path for the project along it's key stages of planning, consultation and delivery.



5.5/ Project Milestones

The table below sets out the key milestones and **Appendix A** provides a high level programme delivery chart.

Milestone	Category	Date
Network Rail and Riding Sunbeams enter into heads of terms	Governance	Oct-20
Data logging equipment installed at Selmeston	Technical	Oct-20
Riding Sunbeams and Network Rail enter into agreement	Governance	Nov-20
Project Delivery Board established	Governance	Nov-20
Notification of GBF grant award	Financial	Dec-20
SPV governance agreed	Governance	Dec-20
Riding Sunbeams “SPV" Limited Company	Governance	Jan-21
Full system design complete	Technical	Jan-21
SPV purchases rights to the Cuckmere solar site*	Commercial	Jan-21
SPV enters into lease agreement with landowners	Commercial	Jan-21
SPV awards contracts for EPC, ICP and NR connection provider	Commercial	Jan-21
SPV awards contracts for O&M	Commercial	Feb-21
Private wire construction begins	Technical	Feb-21
Solar farm construction beings	Technical	Feb-21
Final Heads of terms agreed for commercial agreement	Commercial	Feb-21
First draft commercial agreement	Commercial	May-21
SPV awards contracts for IDNO	Commercial	Jul-21
Final form of commercial agreement	Commercial	Sep-21
Private wire construction complete	Technical	Aug-21
Solar farm construction complete	Technical	Aug-21
NR Point of Connection Works complete (inc. protection upgrades)	Technical	Aug-21
Private wire route adopted by IDNO	Commercial	Sep-21
Full system commissioned	Technical	Oct-21
Draft O&M processes established	Technical	Oct-21
Site passes and completes required testing period & analysis	Technical	Dec-21
First version O&M processes implemented	Technical	Jan-22
SPV enters into commercial agreement with Network Rail (Commercial Operation Date)	Commercial	Feb-22
O&M contract begins	Commercial	Feb-22

The table below sets out the key SELEP funding milestones.

Milestone	**Date**
Business Case submission	11th September 2020
Gate 1 review complete	25th September 2020
Inter-gate calls	W/c 28th September 2020
Updated Business Case submission (Gate 2 submission, including S151 sign off)	9th October 2020
Forward Plan publication	22nd October 2020
Business Case publication on SELEP website	23rd October 2020
Gate 2 review complete	23rd October 2020
Board papers to SELEP Accountable Body	3rd November 2020
Papers to Democratic Services	10th November 2020
Agenda Pack Publication	12th November 2020
Accountability Board meeting	**20th November 2020**

The table below sets out the key SELEP GBF reporting milestones.

Milestone	**Category**	**Date**
Quarterly Report 1	Governance	Feb-21
Quarterly Report 2	Governance	May-21
Quarterly Report 3	Governance	Aug-21
Quarterly Report 4	Governance	Nov-21
Quarterly Report 5	Governance	Feb-22
Project completion report	Governance	TBC - c.April-22

5.6/ Risk Management Strategy

A proactive risk management methodology will be implemented for this project to ensure that risks are continuously identified, owners assigned and mitigation measures put in place.

The status of each risk will be reviewed monthly by the PDB and weekly by the SRO and immediate team, who will escalate emerging risk as required, upwards to the Riding Sunbeams Board if required.

Risks will be categorised into five main areas:

- Project and programme risks related to delivery
- Construction risks
- Consultation and stakeholder acceptance
- Reputational risks to the project partners
- Statutory and regulatory processes
- Financial and funding risks

The principles of the risk management strategy will reflect ISO31000 Risk Management and will be integrated into a comprehensive risk management strategy appropriate to a publicly accountable organisation - our preferred model for this is illustrated by the example in this link which relates to local council risk management strategy.

Our team is very familiar with writing, managing and delivering risk management in power infrastructure delivery organisations such as National Grid, UKPN and Network Rail.

5.6.1/ Project and Programme Risks

Scoring mechanism: Low -1 / Medium -2 / High -3

No	Description	Likelihood	Impact	Rating	Mitigation
PAP-001	Delays to approval processes	2	3	6	Control PPA is likely to be the most challenging process, so will set up Executive Board on PPA with industry representation from DfT and RSSB We will use GRIP project management process to fit with Network Rail standards Ongoing engagement with key stakeholders to ensure any potential issues are dealt with prior to becoming time critical, for example early discussions with Network Rail Product Acceptance team have already begun, and there is likely to be limited requirements
PAP-002	Unable to fill vacant team positions	1	1	1	Accept The key team is largely formed and it is unlikely there will be any major issues with recruitment in the current climate.
PAP-003	Delays and inefficiencies due to multiple delivery partners	2	3	6	Control Oversight with an experienced senior project manager, and a day-to-day project manager to manage the key interface issues. There will be a Project Delivery Board which will bring together the key project managers from the various parties.
PAP-004	Critical resource in Network Rail not available due to	1	3	3	Control

	COVID-19 operational issues				Where possible all activities that can be undertaken external to Network Rail will be delegated. Network Rail are forecasting resource levels through their Requirements document, and the executive steering board will also assist with securing key resources. Network Rail also now understands the new 'business as usual'. We also have experience in collaborative working with Network Rail as demonstrated by our successful delivery to programme and budget of the Aldershot 37kWp site.
PAP-005	Unexpected technical issue rendering direct-wire connection of PV impossible	1	3	3	Control Significant money has been spent on both theoretical and practical studies to de-risk all the known technical concerns. This includes the Aldershot demonstrator site and the BEIS and Department for Transport funded feasibility studies. However, there is a residual risk on a first of a kind project that there may be a currently unknown issue.
PAP-006	Contract risks - poor contract drafting, scoping etc.	1	2	2	Avoid The use of suitable experienced and qualified staff and legal support will be used to avoid this issue. Familiarity with appropriate and tested contract forms reduces the risk of poor drafting.
PAP-007	UK Power Networks G99 procedure takes longer than expected	1	2	2	Control Early meetings have taken place with UK Power Networks, and this is unlikely to be a major issue. Any concerns over spill to grid may be addressed with a Grid Constraint Panel and other power electronics.

5.6.2/ Construction risks

No	Description	Likelihood	Impact	Rating	Mitigation
CON-001	Ground risks e.g. contamination	2	1	2	Accept This will be accepted and is factored into project contingency. Archeological survey has been undertaken with no issues.
CON-002	Unexpected weather conditions	2	1	2	Accept Contractors will be familiar with UK working and this will be treated appropriately in contract documents.
CON-003	COVID-19 causes inefficient working, increased costs and timescales	2	2	4	Control Contractors will be aware of the 'new normal' requirements for working, and these practices have been in effect for a number of months so this will be

					factored into work programmes.
CON-004	Impacts of COVID-19 and Brexit reduce availability and/or increase cost of materials	2	3	6	Control There is a possibility that it may be more difficult to source materials due to the impact of Brexit and COVID-19. The project will endeavour to minimise the impact by placing material orders as soon as is practical, and may use storage facilities within Great Britain

5.6.3/ Consultation and stakeholder acceptance risks

No	Description	Likelihood	Impact	Rating	Mitigation
CSA-001	Unable to commission due to Network Rail safety process	1	3	3	Control Early discussions with Network Rail Product Acceptance team have already begun, to ensure correct process is followed
CSA-002	Local residents may not want scheme and may actively oppose	2	1	2	Control Stakeholder management plan, local visits and sensitive traffic management plans. Community Benefit Fund and community share raise. Public relations and media strategy to preempt or respond to any issues.

5.6.4/ Reputational risks to the project partners

No	Description	Likelihood	Impact	Rating	Mitigation
REP-001	Accident or incident on site leading to poor Public Relations - proper selection of contractors	1	1	1	Reduce A qualification process and full tender process will be used for the contractors used on the project, with safety records and attitude being a key weighting criteria and will be pass/fail on key issues. During the project active client oversight to implement a strong safety culture.
REP-002	Unable to sell site back into community ownership	1	1	1	Reduce A full public relations plan will be used between the key parties, and responses will be drafted for this unlikely issue. Cuckmere Community Solar are briefed and aware of the risk, and will accept as condition during rights transfer.

5.6.5/ Statutory and regulatory processes risks

No	Description	Likelihood	Impact	Rating	Mitigation
STA-001	Unable to negotiate PPA with Network Rail due to regulatory issue				Note: Considered under commercial risks.
STA-002	Unable to secure required planning consents	1	3	3	Accept Site has planning permission granted and material work has started (access track). Cable route will be under Network Rail statutory powers,or require a minor variation to the planning consent and point of connection at Selmeston will be Permitted Development.

5.6.6/ Financial and funding risks

No	Description	Likelihood	Impact	Rating	Mitigation
FIN-001	Unable to negotiate PPA with Network Rail due to internal process issue				Note: Considered under commercial risks.
FIN-002	Railway electricity usage reduces forecast baseload demand	2	3	6	Control The project team is currently arranging further data-logging devices to be installed at Selmeston substation to capture demand, though some estimation will be required due to a currently reduced timetable. The site will be constructed based on the levelised demand requirements.
FIN-003	Network Rail unable commit funding	1	1	1	Accept Network Rail have commited in writing to fund the project in principle as detailed in the financial model.
FIN-004	Currency fluctuations	2	1	2	Accept There may be a larger issue post-brexit with the purchase of materials, therefore we will seek to place large orders as soon as possible to reduce the risk exposure.
FIN-004	Poor delivery and results from community benefit fund	1	1	1	Control CCS is a registered community benefit society with the FCA with an excellent board of directors, [redacted]Community benefit fund will also be paid annually by the SPV so there will be some oversight.

5.7/ Project Management Process

5.7.1/ Monitoring, Evaluation and Reporting

Monitoring and Evaluation for the project will follow the SELEP reporting templates and provided in Appendix C.

Network Rail projects typically follow an established and well practiced project management process called Governance for Railway Investment Projects (GRIP).The GRIP process is likely to be applied to the physical point of connection as this is on a Network Rail operational asset. For the overall project which includes the cable route, solar site and commercial PPA it may be prudent to follow the GRIP process for simplicity, with exceptions where items are not relevant to ensure efficient delivery within a sensible process and to maintain the speed and flexibility of an innovation project. If the GRIP process is not followed, alternatives we will consider include other industry standard procedures such as the Royal Institute of British Architects (RIBA) Plan of Work.

The key stages of the GRIP process are:

- GRIP 1 – Project Output Definition
  Includes the technical Detailed Route Requirements Document DRRD
- GRIP 2 – Feasibility
- GRIP 3 – Outline Design Option Selection
  Review and confirmation of the concept drawing option
  Review and confirmation of other items such as the PV installation location and size, HV cable location, HV NR connection point and asset boundary definition.
- GRIP 4 – Outline Design
  Provides a design ready for review and signoff with asset owner/Client and relevant stakeholders
- GRIP 5 – Detailed Design
  Provides a design ready for construction
- GRIP 6 – Construction & Commissioning
- GRIP 7 – Scheme Handback for Maintenance
  This includes the process of asset disposal and transfer
- GRIP 8 – Project Closeout

5.8/ Previous Experience

The team put together for this project are highly experienced, with established track records and reputations within their individuals specialisms, bringing together complementary core competencies in:

- Project management - the Riding Sunbeams team has a wealth of experience in managing the delivery of novel, complex and challenging major infrastructure projects in

the energy, transportation, development and wider infrastructure sectors as our team profiles describe.

- Electrical and mechanical engineering - the Riding Sunbeams core team and our partners bring relevant engineering expertise and experience recognized by industry and peers both in the UK and internationally.
- Social entrepreneurship - our founders, Possible and Community Energy South are pioneers in creating and nurturing successful social entrepreneurs and community groups, especially in the UK energy sector.
- Stakeholder engagement - genuine and effective stakeholder engagement lies at the heart of Riding Sunbeams's ethos and we have the capability to deliver this based on our teams cumulative experience of broad-based engagement on energy infrastructure and investment.
- Strategic communications and marketing/media - the experience of the Riding Sunbeams teams is reinforced by the specialist communications resources of Possible
- Rail infrastructure provision - Key members of the Riding Sunbeams team have professional rail industry experience which is reinforced by our strategic partners, including Ricardo.
- Energy infrastructure provision and operation - the team are drawn from senior managerial and technical roles global energy infrastructure investors and operators, including National Grid.
- Renewable energy development,
- Social impact frameworks and community energy and ownership models - Community Energy South has been the catalyst by which hundreds of community energy groups have successfully delivered viable community owned renewable energy projects providing substantial social impact.
- Start-up business development - the Board have led the successful launch and commercialisation of technology-based start up businesses and have a demonstrable track record in taking innovation through research and development, investment, and ultimately to market.
- Investment - the Board and team provides experience and credibility recognised by investors and familiarity with investment negotiation and due diligence processes.
- Financial planning - experience of financial planning and management backed by appropriate professional advisors ensure that Riding Sunbeams provide sound governance and robust financial planning and reporting.

This project will also help us to reinforce our capability and enhance our advisory team in the following areas:

- Negotiating detailed Power Purchase Agreements (PPAs)
- Financial modelling
- Commercial and legal agreements

Appendix A - Milestone Programme

Milestone	Category	Sep-20	Oct-20	Nov-20	Dec-20	Jan-21	Feb-21	Mar-21	Apr-21	May-21	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22
Network Rail and invites Riding Sunbeams to tender for Innovation Partnership enter into heads of terms	Governance																			
Data logging equipment installed at Selmeston	Technical																			
Riding Sunbeams awarded Innovation Partnership with Network Rail enter in	Governance																			
Project Delivery Board established	Governance																			
Notification of GBF grant award	Financial																			
SPV governance agreed	Governance																			
RSA and NR establishes "SPV" Limited Company	Governance																			
Full system design complete	Technical																			
SPV purchases rights to the Cuckmere solar site*	Commercial																			
SPV enters into lease agreement with landowners	Commercial																			
SPV awards contracts for EPC, ICP and NR connection provider	Commercial																			
SPV awards contracts for O&M	Commercial																			
Private wire construction begins	Technical																			
Solar farm construction beings	Technical																			
Final Heads of terms agreed for PPA commercial agreement	Commercial																			
First draft commerical agreement	Commercial																			
SPV awards contracts for IDNO	Commercial																			
Final form of commerical agreement	Commercial																			
Private wire construction complete	Technical																			
Solar farm construction complete	Technical																			
NR Point of Connection Works complete (inc. protection upgrades)	Technical																			
Private wire route adopted by IDNO	Commercial																			
Full system commissioned	Technical																			
Draft O&M processes established	Technical																			
Site passes and completes required testing period & anaylsis	Technical																			
First version O&M processes implemented	Technical																			
SPV enters into commerical agreement with Network Rail (Commercial Operation Date)	Commercial																			
O&M contract begins	Commercial																			

1. Appendix B: Economic assessment

1.1. Introduction

Ricardo Energy & Environment is a leading advisor to public sector and private sector organisations. We provide independent, expert, technical and economic advice to our clients.

Ricardo provided the analysis of the benefits, costs and wider impacts of Riding Sunbeam Apollo's business case application for funding for the Building Back Better fund.

This analysis draws on the experience of Ricardo's economic team on a range of previous projects that use Treasury Green Book appraisal guidance including:

- Assessing the costs and benefits of renewable hydrogen and trackside electricity storage using DfT's Transport Appraisal Guidance for the Rail Safety and Standard Board (RSSB T1199).
- Assessing the carbon, air quality and cost benefits using DfT's Transport Appraisal Guidance for options to decarbonise rail freight in the UK (RSSB T1160).
- Developing the business case and Treasury Green Book cost benefit analysis for an application to a LEP for an energy infrastructure investment (client confidential application successful).
- A full Treasury Green Book evaluation of the Defra & BEIS Rural Community Energy Fund (RCEF) that supporting locally owned community energy projects.
- Assessment using Treasury Green Book methods of the costs and benefits of Clean Air Zones for several city areas, including Nottingham, Bradford and Tyneside.

The cost-benefit analysis focuses on monetizable direct costs and benefits. To complement this analysis without double counting, wider economic impacts in terms of jobs generated and other indirect impacts are considered separately.

1.2. Cost-benefit analysis

1.2.1. General assumptions

- **Guidelines followed**:
  - HM Treasury (2016), Green Book.
  - HM Treasury: Supplementary Green Book Guidance (most recent reports, data books available).
  - DfT (2018), Transport Appraisal Guidance.
  - DfT (2016), Value for Money Supplementary Guidance on Categories.
- **Reference scenario**: Do-nothing scenario. The intervention does not take place and Network Rail continues to purchase electricity from the grid for the equivalent traction energy.
- **Price base year**: 2021. GDP deflator from TAG Data Book has been used to convert to 'real' base year prices.
- **Appraisal period**: 25 years. From 2021 to 2046.

- **Discount year:** 2021.
- **Social discount rate:** 3.5%. Following the recommended value for Social Time Preference Rate (STPR) in Green Book.
- **Optimism bias:** 5% for CAPEX and 1% for OPEX. Following ranges for standard civil engineering in Supplementary Green Book Guidance – Optimism bias.

1.2.2. Costs

- **CAPEX**: Investment model for the project scenario as included in the financial with 5% optimism bias.
- **OPEX**: Operational costs for the project scenario taken from Riding Sunbeam's financial model. Community benefits have been excluded as they a transfer from the project promoters to the community fund. 1% optimism bias considered.
- **Grid energy cost**: Under the counterfactual scenario, Network Rail is purchasing electricity from the grid for rail traction equivalent to the annual energy generation in the project scenario (i.e. 3,844 MWh in 2022). The cost of grid electricity (12.4 p/kWh in 2022) is taken from the Treasury Green Book supplementary appraisal guidance on valuing energy use and greenhouse gas (GHG) emissions (Table 4, central value, industrial applications). Project PPA revenues are a transfer from Network Rail to the project owners and, hence, are have a net zero effect in terms of societal costs.

Table 1-1 describes costs under the reference and project scenario based on the assumptions above. Since OPEX and grid energy costs vary over time, we present only the 2025 value as a reference.

Table 1-1: Costs under the counterfactual and project scenario. Prices in £2021

	Counterfactual (Do-nothing)	Project scenario	Additional cost
CAPEX	0	[redacted]	[redacted]
OPEX (2025 undiscounted)	0	[redacted]	[redacted]
Grid energy cost (2025 undiscounted)	515,157	0	-515,157

1.2.3. Environmental Benefits

- **GHG emissions**: Under the counterfactual scenario, electricity from the grid used for rail traction (i.e. equivalent to solar energy generation in the project) has associated GHG emissions. As the grid decarbonises, the GHG from grid electricity drops substantially. Electricity emission factors are taken from the Treasury Green Book supplementary appraisal guidance on valuing energy use and greenhouse gas (GHG) emissions (Table 1, long-run marginal, industrial applications). GHG emissions are then monetised using carbon prices for traded sectors (i.e. covered by the EU Emissions Trading System) (Table 3, traded, central).
- **Air pollution emissions**: Under the counterfactual scenario, electricity from the grid used for rail traction (i.e. equivalent to solar energy generation in the project) is also associated to air pollutant emissions. Air quality damage costs from electricity use are taken from the Treasury Green Book supplementary appraisal guidance on valuing energy use and greenhouse gas (GHG) emissions (Table 15, national average).

Table 1-2 describes environmental effects under the reference and project scenario based on the assumptions above. We present the 2025 and 2035 figures to show the evolution of these effects

over time and, in particular, the reduction in GHG emissions under the counterfactual scenario as the grid decarbonises.

Table 1-2: GHG and AQ emissions under the counterfactual and project scenario. Prices in £2021

	Counterfactual (Do-nothing)	Project scenario	Difference
GHG emissions (tonnes of CO2e in 2025)	820	0	-820
GHG emissions (tonnes of CO2e in 2035)	256	0	-256
GHG emission costs (£ in 2025)	41,020	0	-41,020
GHG emission costs (£ in 2035)	32,030	0	-32,030
Air pollution damage costs (£ in 2025)	22,086	0	-22,086
Air pollution damage costs (£ in 2035)	25,462	0	-25,462

1.2.4. Economic Analysis

The Present Value of Costs (PVC) is negative, which means that, over the appraisal period, savings in grid electricity costs outweigh additional costs of the project. This is consistent with the fact that the PPA price can be set at [redacted]p/kWh, below the price of grid electricity for Network Rail.[1]

The Present Value of Benefits (PVB) from reduced GHG and air pollution emissions is £962,101 over the appraisal period. This leads to a total Net Present Social Value for the project of £1,280,912 and a Net Present Social Value (NPSV) over capital costs of 0.21. Since the PVC is negative, the Benefit Cost Ratio is also negative, meaning in this case that there is an overall cost reduction and positive benefits.

Following DfT's Value for Money Supplementary Guidance on Categories (see Figure 1-1), **the project is classified as having a very high Value for Money**.

Table 1-3: Results from the cost-benefit analysis. Prices in £2021

Costs (discounted)	CAPEX	[redacted]
	OPEX	[redacted]
	Grid energy costs	[redacted]
	Present Value of Costs (PVC)	-318,811
Benefits (discounted)	GHG emission reduction	555,222
	Air pollution reduction	406,879
	Present Value of Benefits (PVB)	962,101
Net Present Social Value (NPSV)		1,280,912
NPSV/k		0.21
Benefit Cost Ratio (BCR)		-3.02
VfM category		Very high (and financially positive) VfM

[1] The price of grid electricity according to BEIS central scenario industrial applications is 12.4 p/kWh in 2020. EC4T electricity tariffs applied by Network Rail the FY 2019/20 are 12.422 p/kWh (link)

1.2.5. Sensitivity analysis

Results have been tested against sensitivities for the following variables:

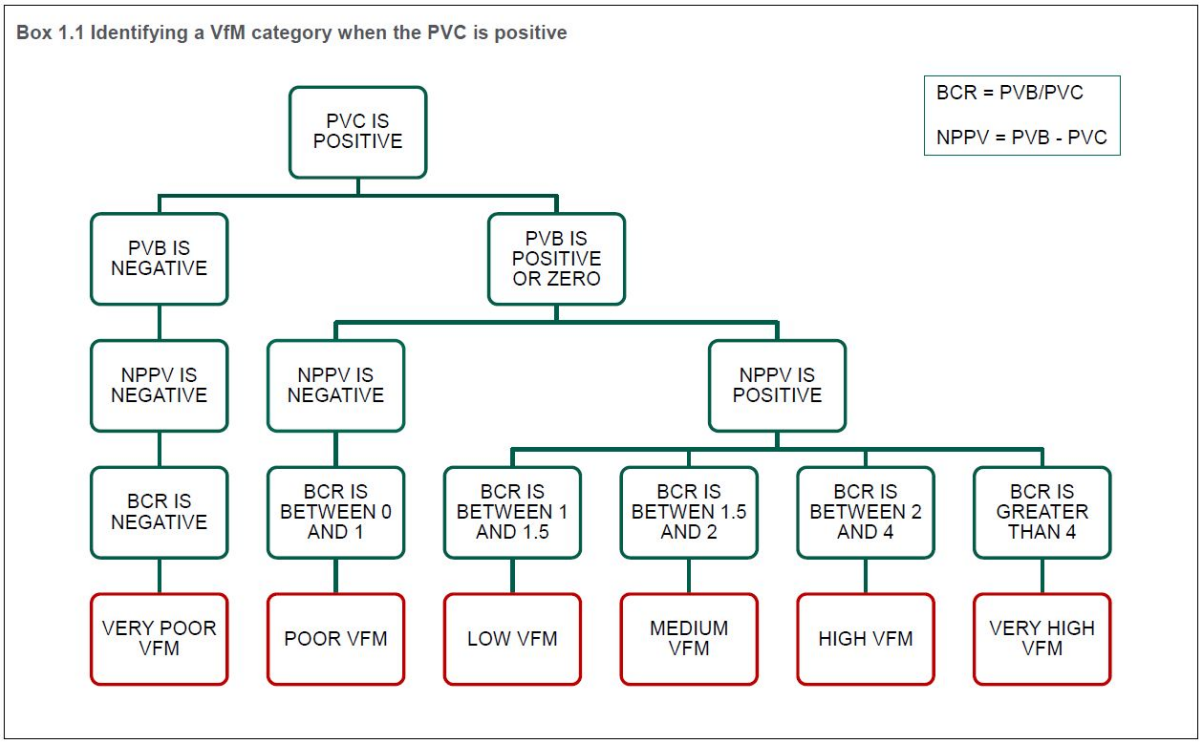
- **Carbon price**: From central to low value (4£/tonne of CO_2e in 2021)
- **Retail electricity price**: From central to low value (11.4 p/kWh in 2021)
- **CAPEX**: Optimism bias increase from 5% to 20% (CAPEX up to £7 million)

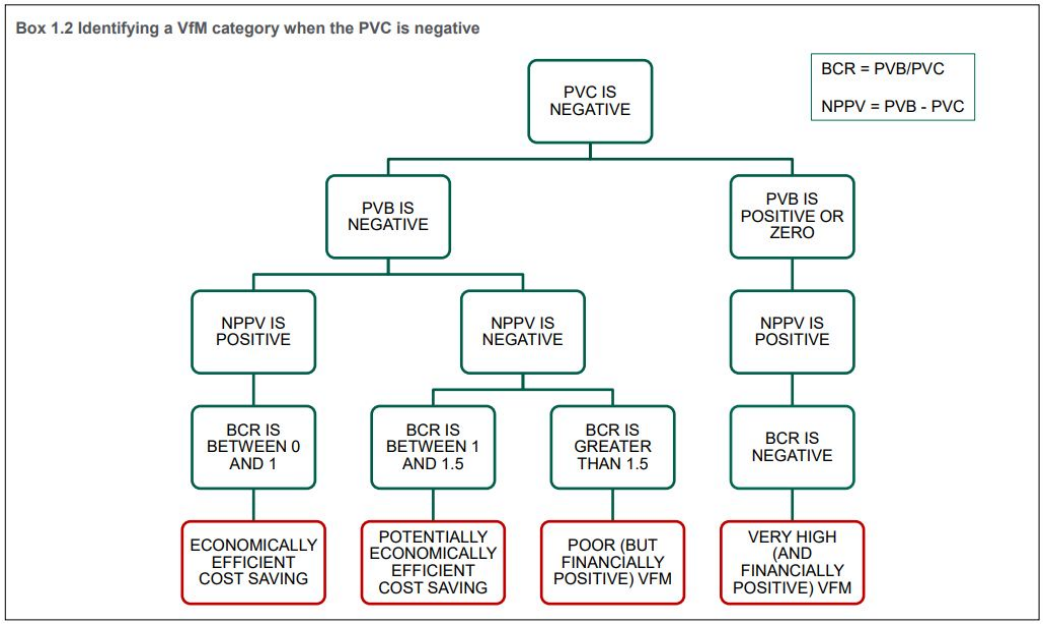
These sensitivity tests separately lead to positive NPSV and BCR>1. Only when the three variables are stressed at the same time, the NPSV drops to a negative value with a BCR below 1, which would mean that the project would deliver a poor VfM. However, this situation is considered very unlikely.

Table 1-4: Results of the sensitivity test

Sensitivity test	PCV	NPSV	BCR	VfM category
Low carbon price	Negative	Positive	Negative	Very high VfM
Low retail electricity price	Positive	Positive	Between 2 and 4	High VfM
Very high CAPEX	Positive	Positive	Between 1.5 and 2	Medium VfM
All previous combined	Positive	Negative	Between 0 and 1	Poor VfM

Figure 1-1: VfM category when PVC is positive. Source: DfT (2016) Value for Money Supplementary Guidance on Categories





1.3. Wider economic impacts

1.3.1. General assumptions

- **Guidelines followed**:
  - HCA (2014), Additionality guide.
  - HM Treasury: Supplementary Green Book Guidance (most recent reports, data books available).
- **Reference case / Deadweight**: Do-nothing. Without the intervention, the outcomes in terms of new jobs created and other economic benefits to the community would not be produced.
- **Target area**: South East region.
- **Price base year**: 2021. GDP deflator from TAG Data Book has been used to convert to 'real' base year prices.
- **Appraisal period**: 25 years. From 2021 to 2046
- **Discount year:** 2021.
- **Social discount rate:** 3.5%. Following the recommended value for Social Time Preference Rate (STPR) in Green Book.

1.3.2. Labour market impacts

- **New jobs**: 40 jobs (FTE) generated in total related to the construction, development and operation of the project.

Table 1-5: New jobs created by activity

Activity	Jobs (FTE)	Duration (years)
Construction	22.25	2
Construction - Admin	1.75	2
Development - Technical	5.5	2
Development - Admin	1	2
Operation - Admin	1.5	25
Operation - Monitoring and evaluation	0.25	3
Operation - Crowd funding	1	2
Operation - Technical	3	25
Operation - Asset maintenance	3.75	25
Total	**40**	

- **Gross impact:** The gross economic impact of the new jobs is measured with the output per FTE for the South East region taken from the Office of National Statistics - Region by industry labour productivity. The value for 2018 is converted to 2021 prices with the GDP deflator.

- **Leakage:** This measures the proportion of outputs that benefit those outside of the South East region. Jobs of shorter duration (2 or 3 years) are more likely to benefit those outside the South East region because of their temporary nature. However, the level of employment leakage for long duration jobs during the operational phase is considered marginal. Following HCA's Additionality guide (Table 4.3) and taking a somewhat conservative approach, we consider short duration jobs to have a high level of leakage of 50% and long duration jobs to have a low level of 10%.

- **Displacement**: This measures proportion of intervention outputs/outcomes accounted for by reduced outputs/outcomes elsewhere in the South East region. Administrative jobs are considered to have a higher level of displacement compared to technical and construction jobs, which require more specific skills. Following the HCA's Additionality guide (Table 4.8), administrative costs are considered to have a medium level of displacement of around 50%. Technical and construction jobs are allocated to the category of low displacement, with a displacement effect of 25%.

- **Substitution**: This effect arises where a firm substitutes one activity for a similar one to take advantage of public sector assistance. It can be thought of as "within firm" displacement. Riding Sunbeams is fully dedicated to the provision of PV so no substitution effects are expected.

- **Multiplier**: This relates to further economic activity (jobs, expenditure or income) associated with additional local income and local supplier purchases. The multiplier effect of short duration jobs is likely to be more limited. Following the HCA's Additionality guide (Table 4.14), we take the recommended values at regional level. Short duration jobs are linked to the low level with a multiplier of 1.3, while long duration jobs are considered as high level, with a multiplier of 1.7.

Table 1-6: Assumptions to estimate the net output per year. Prices in £2021

Activity	Gross total output per year	Leakage	Displacement	Substitution	Multiplier	Net total output per year
Construction	1,280,132	50%	40%	0%	1.3	499,251
Construction-admin	66,912	50%	50%	0%	1.3	21,746
Development - technical	338,491	50%	40%	0%	1.3	132,011
Development - admin	38,236	50%	50%	0%	1.3	12,427
Operation - Admin	92,316	10%	40%	0%	1.7	84,746
Operation - monitoring and evaluation	9,559	50%	50%	0%	1.3	3,107
Operation - crowd funding	61,544	50%	40%	0%	1.3	24,002
Operation - Technical	184,631	10%	40%	0%	1.7	169,492
Operation - Asset maintenance	215,753	10%	40%	0%	1.7	198,061

Table 1-7: Net Present Value associated to employment effects. Prices in £2021

Activity	NPV
Construction	[redacted]
Construction - Admin	[redacted]
Development - Technical	[redacted]
Development - Admin	[redacted]
Operation - Admin	[redacted]
Operation - Monitoring and evaluation	[redacted]
Operation - Crowd funding	[redacted]
Operation - Technical	[redacted]
Operation - Asset maintenance	[redacted]
Total NPV	**8,839,734**

In summary, **the new jobs associated to the project would lead to an indirect economic benefit for the South East region of around £9 million** over the duration of the project.

1.3.3. Other impacts

The project has two wider impacts:

Firstly, from the start of the project operation there is a payment to local community groups of [redacted] per annum as a community benefit fund for the lifetime of the commercial operation of the project, which will be used for items such as local environmental projects, energy awareness and local sustainable transport.

This community fund will support expenditure in the local area, where this reduces energy use through energy efficiency improves there will be further financial benefits.

Secondly, there is expected to be a transfer of [redacted] of the project equity to local shareholders in year 4. This means that local shareholders will receive dividends and are likely to spend some of this in the local economy.

These impacts cannot be quantified at this stage of the project with sufficient precision and are only evaluated in qualitative terms. These would not affect the cost-effectiveness presented in section 1.2 because these are both transfers from the project owners to local energy users, so have a net zero effect in terms of societal costs.

Appendix C - Monitoring and Evaluation Plan

Please see attached