Supporting Statement and Technical Justification – Haile moor Mine

ENWL Overview

The British electricity grid is not a single continuous network, it is divided into 14 regional distribution grids, these are managed separately by distribution network operators providing electricity to properties within their respective areas. Electricity North West Limited (ENWL) is one of 14 distribution network operators which covers the North West regulated by Ofgem and the majority of electricity enters our network from the National Grid.

Figure 1

ENWL are responsible for maintaining and upgrading 13,000 km of overhead power lines and more than 44,000 km of underground electricity cables and much more. This covers the diverse communities between the beautiful Lake District landscapes to the bustling city of Manchester and all the wonderful towns and villages located in-between

Essential to the operation of this network is our communications infrastructure, which is strategic in its use of different mediums to ensure reliability and cost-effectiveness. By leveraging fibre, copper, and radio, we can control your assets effectively while avoiding dependence on third-party networks.

In rural location, given the challenges of connecting to fixed copper or fibre networks, radio communication systems offer a practical solution when traditional infrastructure is not accessible. Radio provides the necessary flexibility and reliability to maintain communication and control over our assets, this flexibility ensures that the network remains robust even in hard-to-reach areas.

Our network in the North West is one of the most reliable in the country with £2 billion investment planned, this investment aims to support the region's transition to greener energy, improve the reliability of the electricity network, and enhance customer service, especially for those in vulnerable circumstances

The investment will focus on several key areas:

- Upgrading and maintaining the electricity network to support the increased demand for clean energy
- Reducing the time customers are without power by 20%.
- Enhancing customer services and supporting vulnerable customers, including those in fuel poverty.
- Investing in innovative technologies and engineering to keep the network reliable and efficient.

The Cumbria ring is a crucial 132kV network encircling Cumbria, which requires significant upgrades to ensure a reliable power supply to both industrial and domestic customers in Cumbria, as well as facilitating the region's transition to greener energy. This network, with connections to the National Grid at Harker near Carlisle and Hutton near Kendal, primarily consists of extensive overhead tower line circuits and typically operates in a closed configuration, interlinking the two grid supply points (GSPs).

The upgrades will involve replacing 154 kilometres of overhead lines and rebuilding 54 pylons, enhancing capacity, and integrating new technologies to accommodate the rising demand for electricity and renewable energy sources.

Key Objectives of the Project:

- Increased Reliability: The upgrades aim to reduce the frequency and duration of power outages in the region.
- Resilience to Extreme Weather: Cumbria is prone to severe weather conditions, including storms and flooding. The improvements are designed to make the network more robust against such events.
- Support for Renewable Energy: The upgraded network will better accommodate the integration of renewable energy sources, such as wind and solar power, which are increasingly important in the region.
- Futureproofing: The project ensures the network can handle future increases in electricity demand, particularly from electric vehicles and other low-carbon technologies.

Key Components of the Project:

- New Substations: Construction of new substations to improve the capacity and efficiency of the network.
- Upgraded Power Lines: Replacement or reinforcement of existing power lines to reduce faults and improve performance.
- Advanced Monitoring Systems: Implementation of smart grid technologies to monitor and manage the network more effectively.
- Underground Cabling: In some areas, overhead lines are being replaced with underground cables to reduce vulnerability to weather-related damage.

Timeline and Progress:

- The project has been ongoing for several years, with significant milestones achieved. ENWL has been working closely with local communities, stakeholders, and contractors to minimize disruption and ensure the upgrades are completed efficiently.
- Benefits to the Region:
- Improved Power Supply: Residents and businesses will experience fewer interruptions to their electricity supply.
- Economic Growth: A more reliable network supports local businesses and attracts new investment to the area.
- Environmental Impact: The project supports the transition to a low-carbon economy by enabling greater use of renewable energy.

The following picture shows the extent of the Cumbria ring (figure 1).

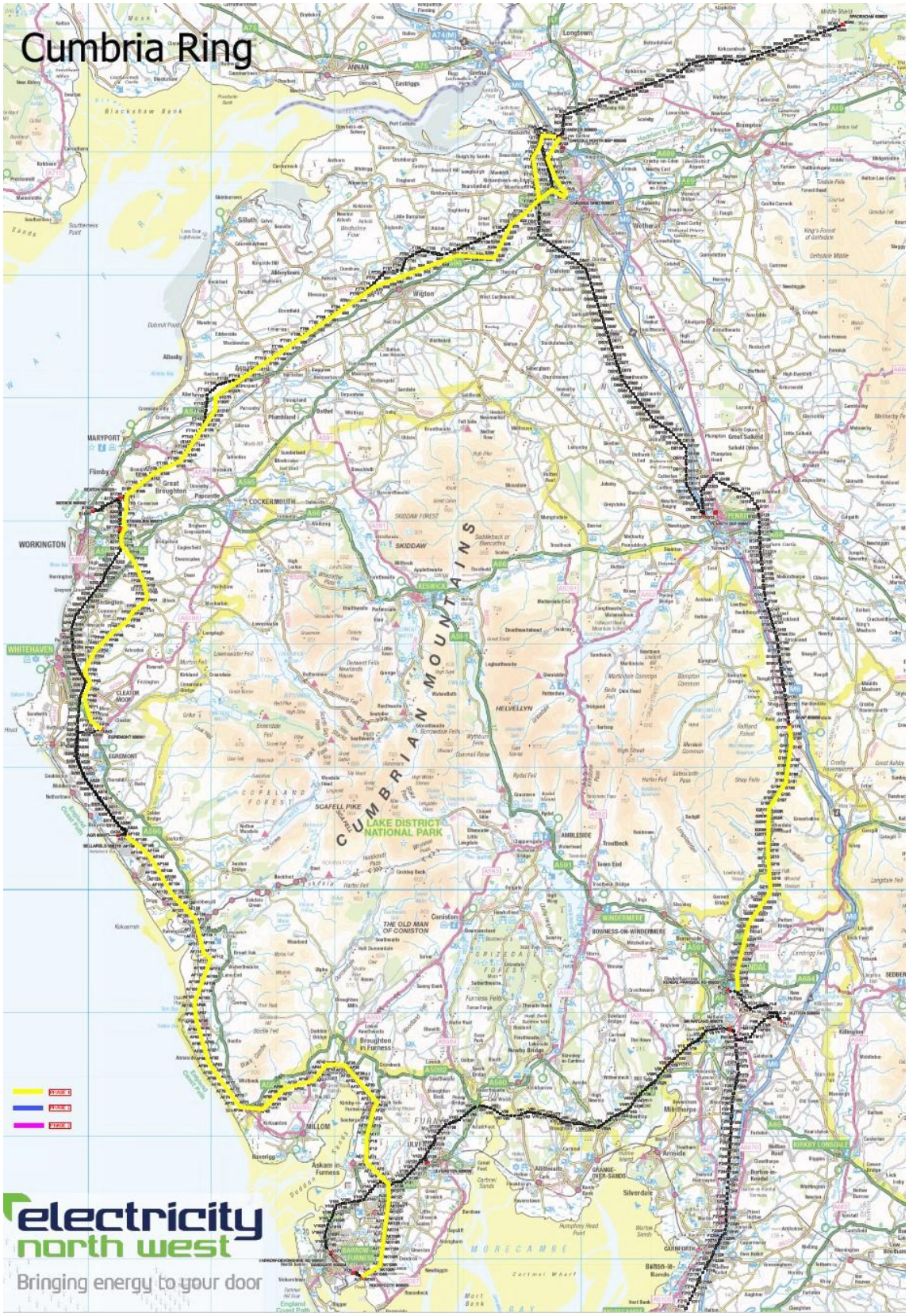

Cumbria Ring
CUMBRIAN MOUNTAINS
LAKE DISTRICT NATIONAL PARK
WORKINGTON
WHITEHAVEN
COCKERMOUTH
KESWICK
AMBLESIDE
WINDERMERE
BOWNESS-ON-WINDERMERE
PENRITH
SKIDDAW
SCAFELL PIKE
HELVELLYN
THE OLD MAN OF CONISTON
Askam in Furness
Broughton in Furness
MILLOM
electricity north west
Bringing energy to your door

Figure 2

The first stage of this refurbishment is the AF Transmission line part of the wider Cumbria ring.

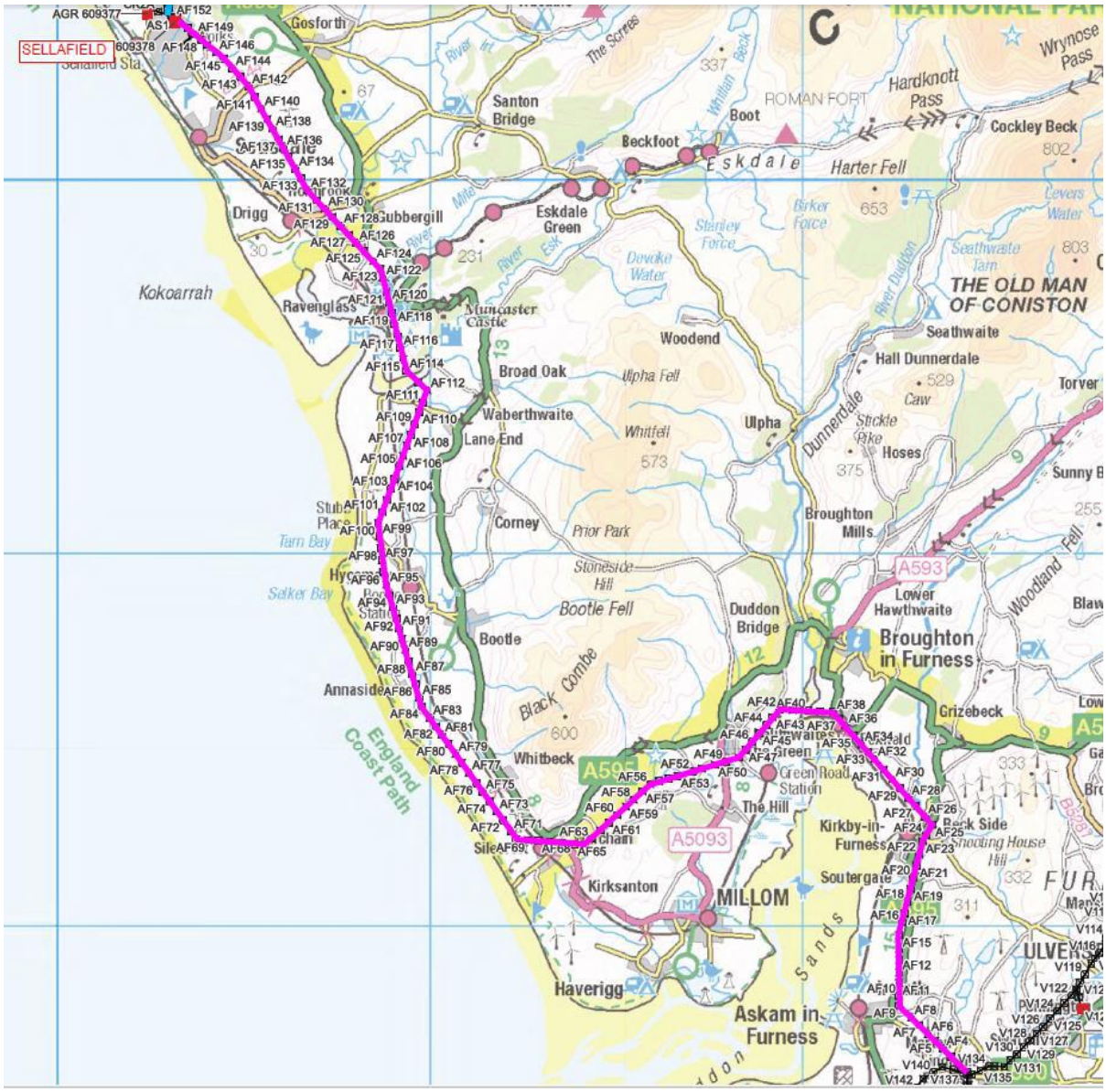


Figure 3

AF Transmission Line (Historical Data)

- 132kV 3Ø Double Circuit Transmission Line
- Connects Roosecote and Sellafield substations – 47km
- Built in 1955 – 152 Towers,
- Partly refurbished in 1995/1996 (79 towers replaced)
- Mostly runs at the west coast in marine environment.
- Runs near many existing and new housing estates
- Passes through various Environmentally Protected sites
- Current tele-communication through OPGW

Planned - key definitive works for the project

- 51 towers – Full Replacement
- 03 towers – replacement with Parallel BE
- 08 towers – Major Steelwork Replacement
- 15 towers – Steelwork Replacement
- 08 towers – Full foundation replacement
- 01 tower – Major Foundation repair
- 38 towers – Muff replacement
- 1600 – Insulator sets replacement
- 282km – Phase re-conductoring ACCC Olso
- 47km – EW re-conductoring Horse equivalent OPGW

The existing infrastructure is utilized to deliver robust business-critical Operational Technology (OT) services, predominantly through the overhead earth conductor referred to as OPGW. OPGW stands for Optical Ground Wire, a type of cable used in overhead power lines. It serves a dual purpose:

- Electrical Function: Acts as a ground wire, providing shielding and protection for the power line from lightning strikes and electrical faults.
- Communication Function: Contains optical fibres within the cable, enabling high-speed data transmission for communication networks, enabling real time monitoring and control of the energy network e.g, SCADA systems,

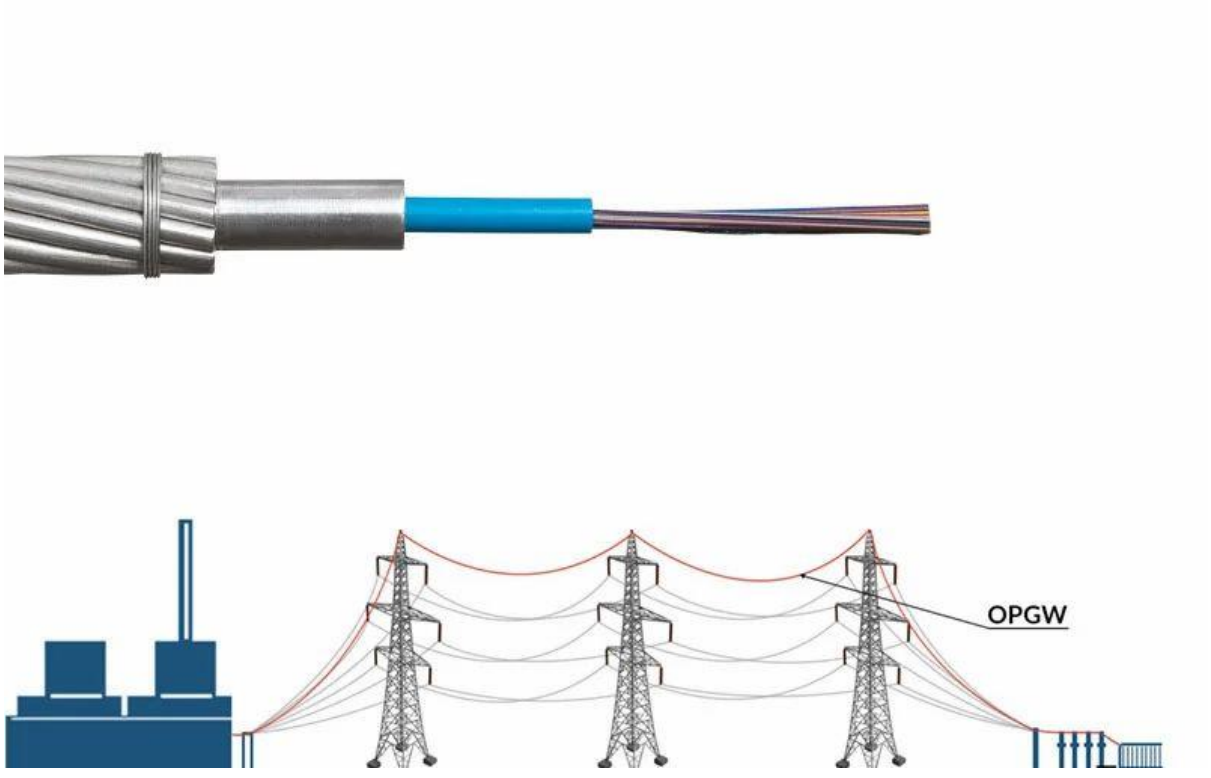


Figure 4

West Cumbria Operational services at risk

Throughout the upgrade project, power lines including the OPGW will be replaced, consequently, the ENWL's business-critical OT services will experience a lack of resilience during this timeframe, this could result in the loss of important operational communications.

Several risks have been identified during the replacement works to our operational network.

- Inability to manage and effectively Control the Electricity Network assets thus failing a directive to maintain electricity supplies to customers.
- Inability to meet Statutory and License obligations in service restoration.
- Failure of electrical feeder Safety Protection Equipment.
- Substantial customer Interruptions and 'Customer Minutes Lost' penalties from OFGEM.
- Placing Electricity North West Limited's license to operate at risk.
- Places personnel and plant at risk of potential Failure and Injury or damage
- Operation of offices disrupted in Penrith, Carlisle, Workington and Barrow

The operation of ENW infrastructure is in line with the government's own definition of CNI

https://www.cpni.gov.uk/critical-national-infrastructure-0

The UK government's official definition of CNI is:

'Those critical elements of infrastructure (namely assets, facilities, systems, networks or processes and the essential workers that operate and facilitate them), the loss or compromise of which could result in:

- Major detrimental impact on the availability, integrity or delivery of essential services – including those services whose integrity, if compromised, could result in significant loss of life or casualties – taking into account significant economic or social impacts; and/or
- Significant impact on national security, national defence, or the functioning of the state.'

Affected Services

Protection Services Affected by AF-Line Outage

From	To	Circuit Description
Harker	Seaton 132kv	Sellafield - Seaton 1 Blocking replacing (PRO06109-0611302)
Egremont	Harker	Temporary circuit provided for Nick Hayton - Harker to Egremont intertripping equipment
NATLAND	ROOSECOTE	Natland to Roosecote Protection replacing BT AXUK305218
SEATON	HARKER	Seaton 405 – Harker 405 RFL9745 (Blocking) (SEATON 2 / STAINBURN 2 / SELLAFIELD) CH3
SEATON	Sellafield 132kv	Equipment Q Seaton 2/ Harker Blocking RFL9745
Roosecote	Hutton	Hutton (305) / Natland (110) / Ulverston (110) / Roosecote (405) - Acceleration 1st Main
Roosecote	Hutton	Hutton (305) / Natland (110) / Ulverston (110) / Roosecote (405) - Acceleration 2nd Main
Roosecote	Hutton	Hutton (405) / Natland (210) / Ulverston (210) / Roosecote (605) / Natland (305) - Acceleration
Sellafield	Roosecote	Sellafield (1005) / Roosecote (105) / Barrow (110) 9745GD
Roosecote	Natland	Hutton (405) / Natland (210) / Ulverston (210) / Roosecote (605) / Natland (305) 9745GD
Carlisle 132	Beckburn	Carlisle 132 to Beckburn WF Protection
SELLAFIELD	STAINBURN	Stainburn to Sellafield Inter tripping Equipment S (RFL9745 digital) (Sellafield (105) Stainburn
SELLAFIELD	STAINBURN	Stainburn to Sellafield Inter tripping Equipment R (RFL9745 digital)
HUTTON SUPER GRID	ROOSECOTE	Inter Tripping circuit between Hutton and Roosecote Power Station replacing BT AXNU963140

Harker	Carlisle North	Intertripping circuit between Harker and Carlisle North. New GT2 transformer 9745GD
SELLAFIELD	HARKER	Sellafield 505 – Harker 105 HSDIT40 EGREMONT 2 (PRO06105-0611305) EQ O
SELLAFIELD	HARKER	Sellafield 505 – Harker 105 RFL9745 (Blocking) (SEATON 1 / STAINBURN 1 / SELLAFIELD) CH1
Harker 132kv	Sellafield 132kv	VF INTERTRIP EGREMONT 1 replacing (PRO 06105-0611303) EQ N
Harker 132kv	Sellafield 132kv	VF INTERTRIP STAINBURN 2 replacing (PRO 06105-0611306) EQ Q
Harker 132kv	Sellafield 13	VF INTERTRIP SIDDICK replacing (PRO 06105-0611306) EQ P Sellafield 505 Siddick 1 Seaton 305 Harker 105
Harker 132kv	Sellafield 132kv	Sellafield - Seaton 2 Blocking replacing (PRO06105-0611302)
Harker	Sellafield 132kv	9745GD C37.94 via SHFI-2 card (Harker (805)/ Sellafield (605))
Harker	Sellafield 132kv	9745GD C37.94 via SHFI-2 card (Harker (1405)/ Sellafield (105))
Roosecote	Sellafield 132kv	Siemens Siprotec via Siemens optical media convertor (Sellafield (1405) Roosecote (505) Barrow (GT2))
Aspartia 33 kV	Wharrels Hill WF	Equipment - W
Stainburn 132kV	Maryport 33kV	Equipment - E
Aspartia 33 kV	Wigton 33kV	Equipment - A
Wigton 33kV	West Newton WF	Equipment - C
Shap	Penrith	9745GD C37.94 via SHFI-2 card (Penrith (GT1)/ Shap (GT1))

NMS / CLASS Services Affected by AF-Line Outage

Reference	Substation	Number	RTU No	CLASS?
NMS_R6A	ANNIE PIT		609303 0063	CLASS
NMS_R6A	BARROW-DEVONSHIRE RD		609001 0047	CLASS
NMS_R6A	BECK BURN WF		609599 0129	
NMS_R6A	BGC WESTFIELD POINT SC2		609010 0241	
NMS_R6A	BOWATERS		609002 0257	
NMS_R6A	CARLETON		609364 0249	
NMS_R6A	Carlisle BSP New - Container		609609	
NMS_R6A	CARLISLE GRID NEW		609609	
NMS_R6A	CARLISLE GRID OLD/BSP		609609	
NMS_R6A	CARLISLE NORTH BSP		609595 0490	
NMS_R6A	CHATSWORTH ST		609003 0048	CLASS
NMS_R6A	CLEATOR BESS		609352 0148	
NMS_R6A	EGREMONT		609351 0081	
NMS_R6A	EGREMONT (2nd RTU)		609351 0082	CLASS
NMS_R6A	EMBLETON		609305 0064	CLASS
NMS_R6A	FLIMBY WIND FM		609313 0083	
NMS_R6A	FUSEHILL		609603 0056	CLASS
NMS_R6A	GREAT CLIFTON		609318 0500	
NMS_R6A	HARKER		609600 0034	
NMS_R6A	HDA N01		609306 0246	AVC
NMS_R6A	HDA N02		609307 0042	AVC
NMS_R6A	HENSINGHAM		609356 0076	CLASS
NMS_R6A	JAMES ST		609604 0055	CLASS
NMS_R6A	KENDAL-PARKSIDE RD		609051 0050	CLASS
NMS_R6A	LEYLAND NATIONAL		609310 0211	CLASS
NMS_R6A	LOCAL CARLISLE MM		602001 0513	
NMS_R6A	LOCAL KENDAL MM		601001 0512	
NMS_R6A	MARYPORT		609309 0066	
NMS_R6A	MIDWAY		609354 0210	CLASS
NMS_R6A	Moorhouse PV Array		639559	
NMS_R6A	Newbiggin On Lune		609662 0281	
NMS_R6A	Newtongate		609668 0026	
NMS_R6A	PENRITH BSP		609657 0028	
NMS_R6A	PETTERIL BANK		609606 0057	CLASS
NMS_R6A	QUAYSIDE		609325 0238	

NMS_R6A	ROOSECOTE	609029 0041	
NMS_R6A	SANDGATE	609004 0045	CLASS
NMS_R6A	SEATON 132KV	609320 0497	
NMS_R6A	SELLAFIELD	609379 0079	
NMS_R6A	SELLAFIELD	609378 0080	
NMS_R6A	Selsmire	609663 0112	
NMS_R6A	SHAP	609659 0029	
NMS_R6A	SIDDICK	609302 0062	
NMS_R6A	SLIPWAY	609355 0077	CLASS
NMS_R6A	STAGSTONE FARM STOR	0046	
NMS_R6A	STAINBURN	609311 0060	CLASS
NMS_R6A	TATA STEEL	609325 0238	
NMS_R6A	VICKERS CENTRAL	609011 0217	
NMS_R6A	VICKERS NORTH	609005 0218	
NMS_R6A	WESTLINTON	609617 0130	
NMS_R6A	WHARRELS HILL WF	609300 0491	

NMS / CLASS Services Affected by AF-Line Outage

Reference	Substation	Number	RTU No	CLASS?
NMS_R6A	WILLOWHOLME		609602 0150	CLASS
NMS_R6A	WINSCALES NO 2		609315 0507	
NMS_R6B	ALSTON		609652 0268	
NMS_R6B	Ambleside		609058 0154	CLASS
NMS_R6B	Armistead Wind Farm		609020 0093	
NMS_R6B	ARNSIDE		609052 0213	
NMS_R6B	Askam		609038 0275	
NMS_R6B	Askerton Castle		609610 0469	
NMS_R6B	ASPATRIA		609304 0065	CLASS
NMS_R6B	BENTHAM		609963 0069	
NMS_R6B	BR NATLAND		609070 0235	
NMS_R6B	Capontree		609611 0270	CLASS
NMS_R6B	Caton Moor Wind Fm		609921 0488	
NMS_R6B	Catterall BR		400224 0282	
NMS_R6B	Catterall Water Wks		609912 0283	
NMS_R6B	CLAUGHTON		609919 0230	
NMS_R6B	Coniston		609039 0280	
NMS_R6B	Dalton		609008 0277	
NMS_R6B	Easton		609612 0470	
NMS_R6B	GILLSROW		609666 0088	
NMS_R6B	Glaxo		609037 0074	
NMS_R6B	Grange		609040 0023	
NMS_R6B	Hallburn WF		609597 0155	
NMS_R6B	Haverthwaite		609041 0144	
NMS_R6B	HELLRIGG WIND FARM		609620 0004	
NMS_R6B	HEYSHAM		609900 0022	
NMS_R6B	HEYSHAM BOW 132KV		609890 0038	
NMS_R6B	HEYSHAM OEL WINDFARM		609895 0515	

NMS_R6B	HUTTON	609000 0049	
NMS_R6B	Hutton End	609653 0263	
NMS_R6B	INGLETON	609964 0253	
NMS_R6B	KESWICK	609308 0200	CLASS
NMS_R6B	Kinkry Hill	609613 0269	
NMS_R6B	KIRKBY LONSDALE	609053 0209	CLASS
NMS_R6B	KIRKBY MOOR	609043 0267	
NMS_R6B	KIRKBY STEPHEN	609660 0208	CLASS
NMS_R6B	Kirkby Thore	609654 0274	CLASS
NMS_R6B	Lambirgg WF	609063 0072	
NMS_R6B	Leadgate Regulator	668042 0443	
NMS_R6B	Little Salkeld	609655 0272	CLASS
NMS_R6B	Mean Moor WF	609033 0115	
NMS_R6B	Melling	609958 0172	
NMS_R6B	Mintsfeet	609054 0053	CLASS
NMS_R6B	Morton Pk	609605 0030	
NMS_R6B	Newby	609656 0261	
NMS_R6B	Orchard End Windfarm	609930 0095	
NMS_R6B	PASTURE FM SOLAR	609298 0108	
NMS_R6B	Pirelli	609607 0273	
NMS_R6B	PREESALL	609920 0203	CLASS
NMS_R6B	Quernmore Pk	609913 0264	
NMS_R6B	Sebergham	609615 0224	

NMS / CLASS Services Affected by AF-Line Outage

Reference	Substation	Number	RTU No	CLASS?
NMS_R6B	SILLOTH		609616 0152	
NMS_R6B	Skelton C		609667 0279	
NMS_R6B	SPADEADAM		609621 0032	
NMS_R6B	TALLENTIRE HILL WIND FM		609250 0092	
NMS_R6B	TRIMPELL PRIMARY		609918 0018	
NMS_R6B	ULVERSTON		609036 0024	CLASS
NMS_R6B	WESTNEWTON WINDFARM		609295 0061	
NMS_R6B	WHASSET		609056 0054	CLASS
NMS_R6B	WHINFELL		609690 0227	
NMS_R6B	WIGTON		609618 0035	
NMS_R6B	Windermere		609057 0025	CLASS
NMS_R6B	Wreay PV		609614 0136	
NMS_R6B	YEALAND		609915 0252	
NMS_R6B	SEDBERGH		609055 0212	

An algorithm is currently deployed on the 11/6.6kV system in ENWL for fault identification, sectionalisation and restoration of supply using SCADA (Supervisory Control and Data Acquisition) devices. The operational system used to do this is called FLISR, Fault Location, Isolation, and Supply Restoration is a process used in electrical distribution systems to quickly identify faults, isolate affected sections of the network, and restore power to customers as efficiently as possible. This process is essential for minimizing downtime and improving the overall reliability of the power supply. A breakdown of the key components:

Fault Location: The system detects where a fault (such as a short circuit) has occurred on the network. Modern smart grid technologies, including sensors and automated systems, this helps avoid unnecessary manual inspections and reduces the time it takes to respond to issues.

Isolation: Once the fault is located, automated switches (often called reclosers or circuit breakers) are used to isolate the affected section of the network. This limits the area impacted by the fault and prevents the issue from spreading to other parts of the grid.

Supply Restoration: After isolating the fault, the system works to restore power to unaffected areas by rerouting electricity through alternative paths (using the existing network infrastructure). For the faulted section, repairs may be necessary, but customers in other areas can be quickly re-energized.

The goal of FLISR is to reduce the time customers are without power by automating the detection, isolation, and restoration processes, ultimately improving service reliability. This is especially important for minimizing the impact of faults on businesses and homes.

It can be seen that without a solution in place the network would be under substantial risk.

Solution

To overcome the loss of the communication function of the overhead cable, the solution involves the installation of high capacity microwave links within the Cumbria ring at several key points. The following Figure 3 shows the network that is required to be constructed to mitigate the risk on the loss of assets during the refurbishment works.

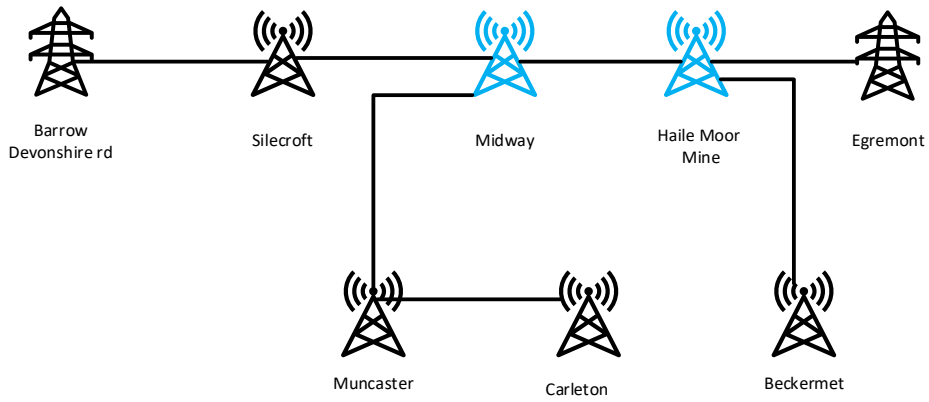


Figure 5

The items shown in blue indicates where new construction work is required and all other assets in black involve a reuse of existing infrastructure such as Pylons and Radio Towers. The solution in Figure 5 ensures the security of the Cumbria ring from Barrow to Egremont during the refurbishment works. New Construction consist of:

- Midway – Increasing height of existing 15m tower to 23m
- Haile moor Mine – Construction of new 18m tower

To get to the planned infrastructure indicated in figure 5 the following design and planning process was followed.

• A desktop evaluation of the existing infrastructure

• Radio path profile theoretical and actual

• The path profile is then backed up by a field survey, where the following are confirmed, confirmation of Line of Sight (LOS) - this checks critical obstacles, verification of position and altitude of the sites

• Review of existing infrastructure including structural assessments, lease and legal agreements, wayleaves, planning applications, license applications

• Building of new sites GEO surveys, environmental surveys, visual impact assessments, consultation with local authorities, piled sites, etc

• Production of documentation for planning and design

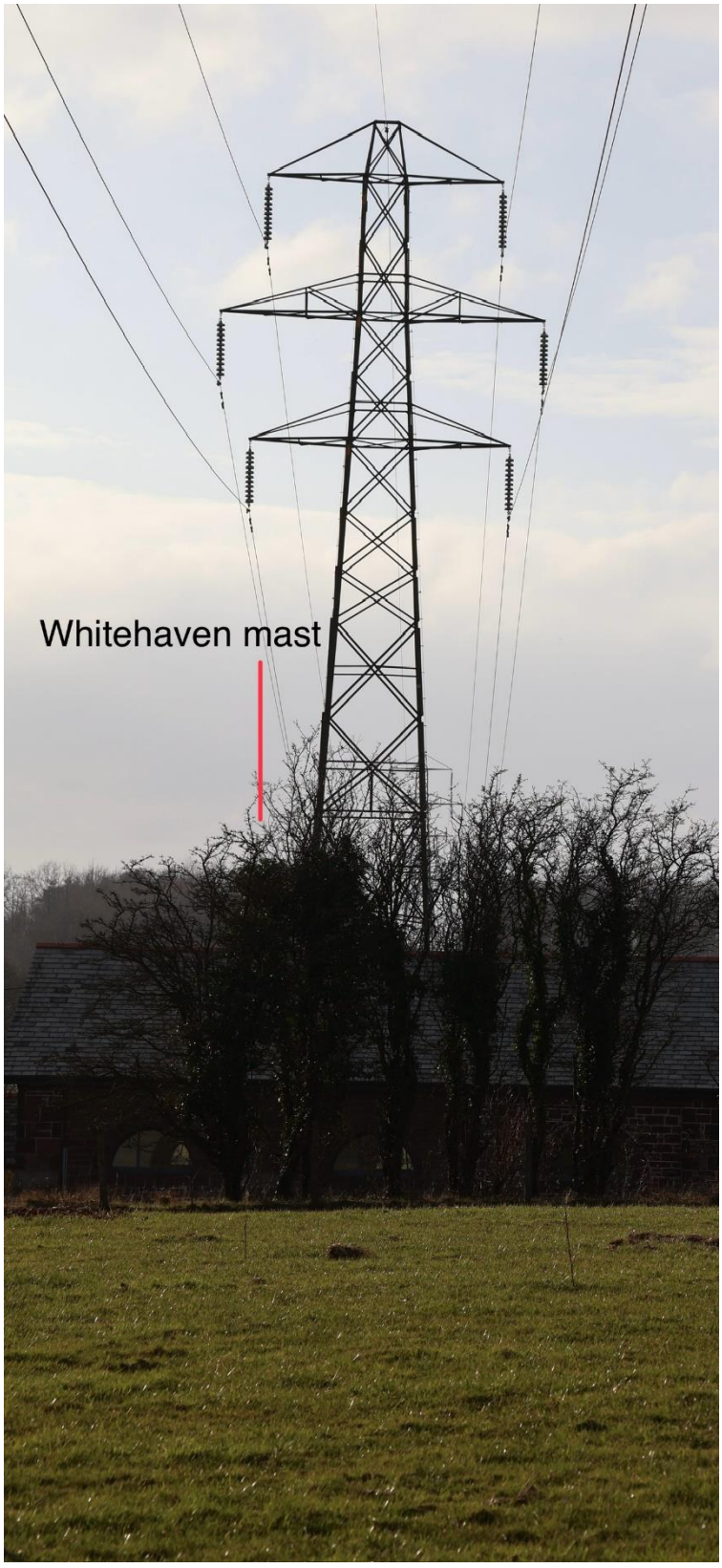
Existing Telecoms infrastructure considered in the design

Several existing third party telecoms infrastructure were considered in the design phase, but these were eliminated due to the reasons stated below.

Whitehaven – Ivy Hill – Arqiva site number 13701 *(54.49681, -3.55790)*

Whitehaven on Ivy Hill facing Midway does show a clear path profile, however there is ground clutter which makes it unsuitable, there are trees approximately 220m away and two 30m electricity pylon approximately 2.25km and 1.3km away from Midway blocking the path. Also of concern would be the path passes over Sellafield and with the decommissioning of the plant it cannot be predicted if the crane used for this will be moved into the path.

The second hop from Whitehaven to Egremont which is again obstructed by trees, Pylon and overhead lines in close proximity to Egremont Substation.



Due to these obstacles in both hops, this site was eliminated.

Arqiva Site Number 141793 *(54.49949, -3.55836)*

This site was eliminated because it is a cellular tower and the construction type is not suitable to accommodate ENW's requirements of two additional microwave antennas due to the current loading on the tower.

sites. This is due to topography and tree clutter in the required paths and would require a height of more than 35m.

Sandwith ENWL Radio site (54.51684, -3.61568)

Eliminated because no line of site with Egremont.

Haile moor mine Airwave site

This site is in the right location to see all the connecting points at Midway and Egremont unfortunately the tower structure in terms of height and construction type is not suitable to accommodate ENW's requirements. Having identified the ideal location, this leaves us with the proposal of a new site build at Haile moor mine. Contact was made with the police who are the users of the Airwave site and no objections were raised on the location of the proposed new structure and they agreed that the equipment ENW are using will not interfere with their existing apparatus.

Alternative Greenfield/Building Solutions

Given the nature of the rural area there were no existing buildings found that could accommodate the required equipment.

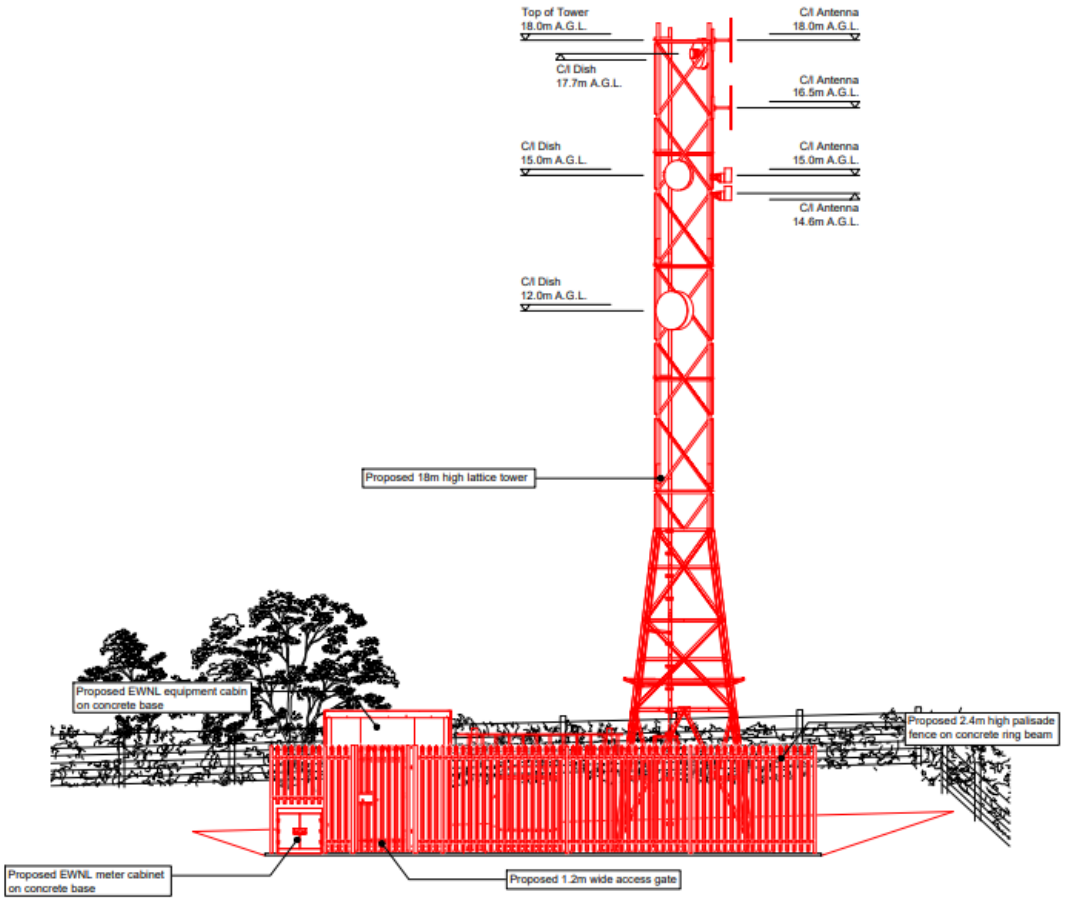
Similarly there were no alternative greenfield options found that would provide the coverage requirement at reasonable height. However, the planning consultation feedback referred to a possible option at the Energy Coast Business Park near Haile. This location has subsequently been investigated but is unworkable as it fails the line of sight to both Egremont and Midway without a height of in excess of 35m.

Solution

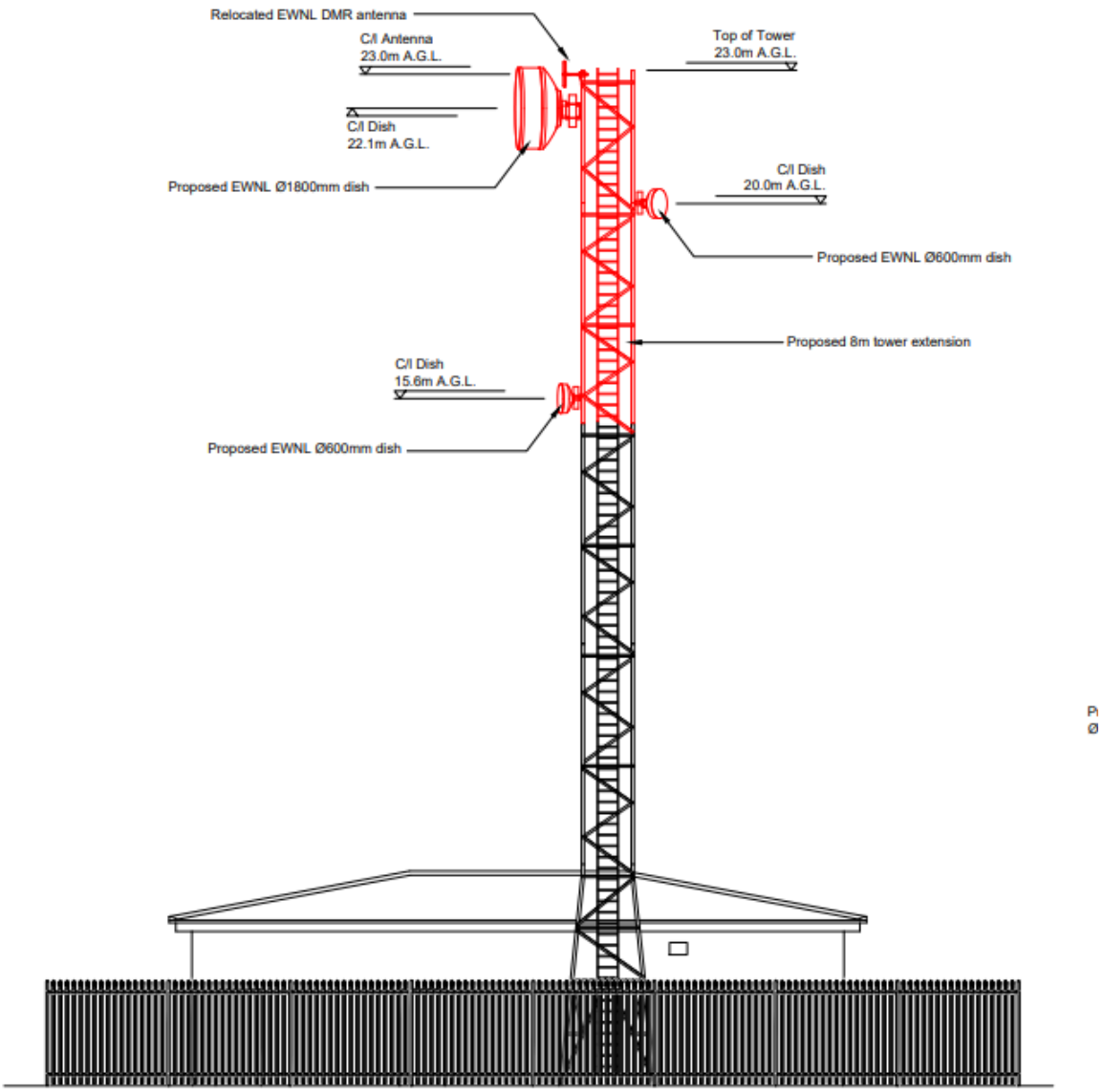
Haile Moor new build was selected because it has clear LOS to both Midway and Egremont

The height at Haile Moor Mine and Midway was a compromise to keep the heights at each site to a minimum to lower the visual and environmental impact.

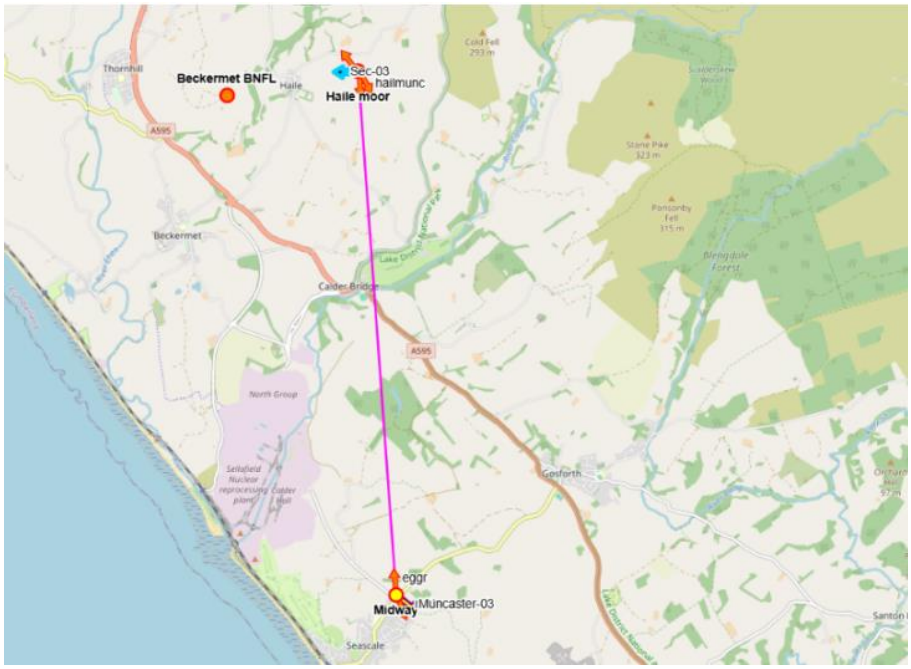
The height first considered At Haile Moor Mine was 15m but from the LOS surveys Haile Moor had to be raised to 18m and Midway to 23m due to the obstruction of trees for the path to Midway. Additionally, there was tree clutter and a concrete pillar obstructing the path from Haile to Egremont (with Haile below 18m), so this height was also necessary for the second path to Egremont.



Haile Moor Mine new build



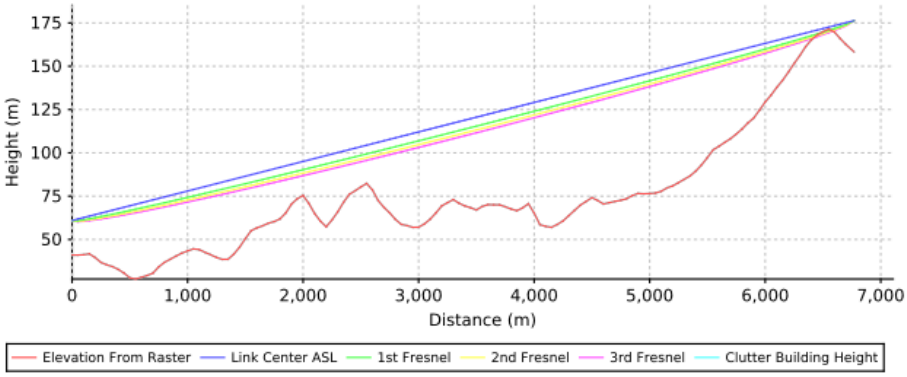
Midway tower extension



Path Details

A end Name : Midway		Z end Name : Haile moor	
Latitude/Y :	54.404526	Latitude/Y :	54.465176
Longtitude/X :	-3.471869	Longtitude/X :	-3.479486
Coordinates Code :	Geographical	Coordinates Code :	Geographical
Earth Elevation (m) :	40.92	Earth Elevation (m) :	158.3
Building Height (m) :	0.0	Building Height (m) :	0.0
Mast Height (m) :	15.0	Mast Height (m) :	30.0
Real Azimuth (°) :	355.82526	Real Azimuth (°) :	175.81908
Real Elevation (°) :	0.9535915	Real Elevation (°) :	-0.9993712

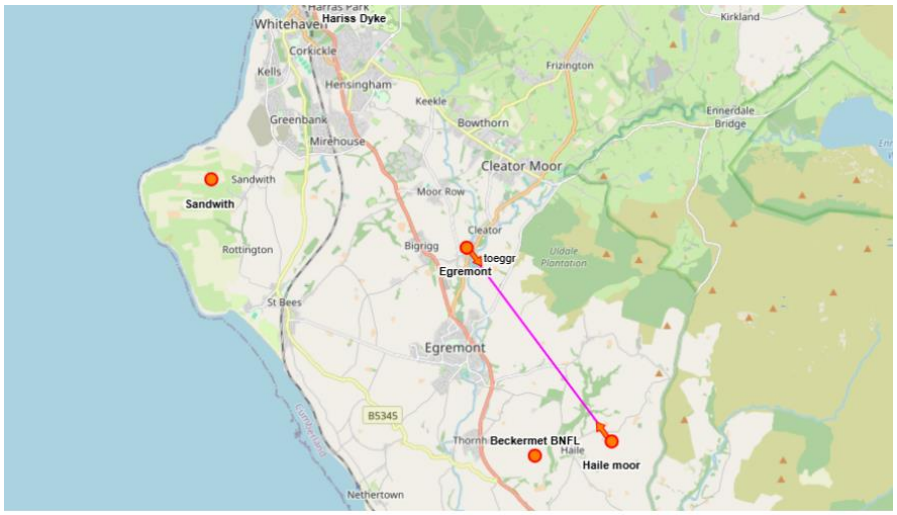
TL Path Profile



Radio and Antenna Configuration Details

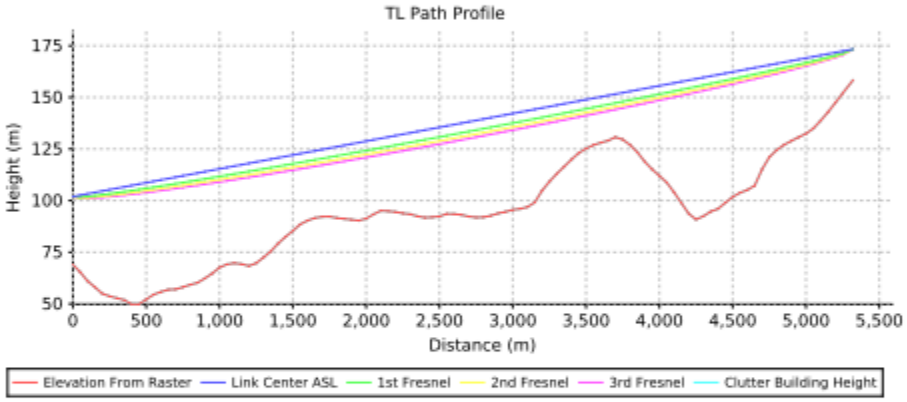
Radio Type :	PtP	Radio Type :	PtP
Configuration :	2+0XPIC	Configuration :	2+0XPIC
Radio Model :	NSS18G056M02_AR	Radio Model :	NSS18G056M02_AR
Frequency (MHz) Tx :	18800.0 / Rx :18800.0	Frequency (MHz) Tx :	18800.0 / Rx :18800.0
Bandwidth (KHz) Tx :	56000.0 / Rx :56000.0	Bandwidth (KHz) Tx :	56000.0 / Rx :56000.0
Antenna Model :	THP06-177Dled01	Antenna Model :	THP06-177Dled01
Antenna Gain (dBi) :	38.5	Antenna Gain (dBi) :	38.5
Antenna Height (m) :	20.0	Antenna Height (m) :	18.0
Ant. Azimuth (°) :	355.82526	Ant. Azimuth (°) :	175.81908
Antenna Tilt (°) :	0.9535915	Antenna Tilt (°) :	-0.9993712
Antenna Type :	Parabolic	Antenna Type :	Parabolic
Ant. Polarization :	Vertical	Ant. Polarization :	Vertical
Coupler Name :	none	Coupler Name :	none

Egremont to Haile Moor Mine



Path Details

A end Name : Egremont		Z end Name : Haile moor	
Latitude/Y :	54.503377	Latitude/Y :	54.465176
Longtitude/X :	-3.528822	Longtitude/X :	-3.479486
Coordinates Code :	Geographical	Coordinates Code :	Geographical
Earth Elevation (m) :	68.93	Earth Elevation (m) :	158.3
Building Height (m) :	0.0	Building Height (m) :	0.0
Mast Height (m) :	10.0	Mast Height (m) :	30.0
Real Azimuth (°) :	143.10059	Real Azimuth (°) :	323.14075
Real Elevation (°) :	0.7505378	Real Elevation (°) :	-0.7865191



Radio and Antenna Configuration Details

Radio Type :	PtP	Radio Type :	PtP
Configuration :	2+0XPIC	Configuration :	2+0XPIC
Radio Model :	NSS18G056M02_AR	Radio Model :	NSS18G056M02_AR
Frequency (MHz) Tx :	18200.0 / Rx :18200.0	Frequency (MHz) Tx :	18200.0 / Rx :18200.0
Bandwidth (KHz) Tx :	56000.0 / Rx :56000.0	Bandwidth (KHz) Tx :	56000.0 / Rx :56000.0
Antenna Model :	THP03-177Dled01	Antenna Model :	THP06-177Dled01
Antenna Gain (dBi) :	34.0	Antenna Gain (dBi) :	38.5
Antenna Height (m) :	33.0	Antenna Height (m) :	15.0
Ant. Azimuth (°) :	143.10059	Ant. Azimuth (°) :	323.14075
Antenna Tilt (°) :	1.1596358	Antenna Tilt (°) :	-1.1956171
Antenna Type :	Parabolic	Antenna Type :	Parabolic
Ant. Polarization :	Vertical	Ant. Polarization :	Vertical
Coupler Name :	none	Coupler Name :	none

Haile Moor additional benefits

PtMP

Installing a Point To Multi Point HUB antennas at 15m and 14.6m would give immediate connectivity to Beckermet substation which would greatly improve the communication connection to it.

Heat map coverage plot from Haile Moor Mine

LMR

The proposed installation of folded dipole antennas mounted at 18m and 16.5m would expand the coverage of ENWL existing LMR system to provide

- An additional 205 points on the network which would allow faster restoration of supply in these areas.
- Critical voice communication when cellular is unavailable