Tower Painting	
Name of Scheme/Programme	Tower Painting
Primary Investment Driver	Asset Health
Scheme reference/ mechanism or category	SPNLT20114/Overhead (Tower) Line
Output references/type	NLRT2SP20114/33kV OHL Tower NLRT2SP20114/132kV OHL Tower, NLRT2SP20114/275kV OHL Tower, NLRT2SP20114/400kV OHL Tower
Cost	£10.3M
Delivery Year	2026
Reporting Table	C0.7/C2.2a/C2.3/C2.4b/C2.5/C2.5a
Outputs included in RIIO T1 Business Plan	No

Issue Date	Issue No	Amendment Details
July 2020	Issue 1	First issue of document
August 2020	Issue 2	XF route length corrected

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1 INTRODUCTION

SPT expect its steel towers to have a service life of more than 100 years. Tower steelwork is made up of mild and high tensile steel that has been hot dipped galvanised. Over time the galvanisation will become thinner and eventually break down leading to the steel work rusting. To ensure the maximum service length is achieved then towers require to be painted to protect the galvanising layer. This justification paper supports the proposal to carry out tower painting on 764 towers of different construction and operating voltages. SPT has a year on year tower painting programme which forms part of SPT routine maintenance regime for overhead line towers. The following routes have been selected for tower painting in the RIIO-T2 period. The routes have been selected based on their condition at the end of RIIO-T2 following modelling in in CBRM which implements SPT's NARM models.

Route	Voltage (kV)	Length (Km)	Number of Towers
CB	132	11	39
P	132	43.2	169
AD	33	1.8	7
AK	132	2.5	8
AP	132	10.4	38
YQ	275	3.4	11
CG	132	4.7	1
XN	275	10	33
X	132	4.5	18
CE	132	12.5	41
XF	275/400	25.5	84
N (019-078)	132	15.3	60
N(080-100)	132	5	21
CD	132	12.7	46
XD	275	32	113
ZG	275	4	13
XW	275	3.6	12
XX	275	15.5	50

2 BACKGROUND INFORMATION

SPT have identified assets for the tower painting programme based on condition, not based on a nominal time interval. The condition rating of tower steelwork is informed by high resolution images taken during aerial condition assessment surveys which are then reviewed by trained technicians. We continually monitor the condition of our assets and strive to continually improve the quality of the data we capture. We consider the condition of tower steelwork by sub-dividing a tower into 4 groups as follows: legs, bracings, cross arms and peaks. The assessment then informs the overall score we apply to tower steelwork. We apply the following scoring criteria to tower steelwork

Condition Score	1	2	3	4	5
Description	Satisfactory, galvanising or protective coating intact with no rust breakthrough	Minor deterioration: discoloration of galvanising, very minor rust spots: algae growth on paintwork	Slight or Moderate rust breakthrough, up to 15% of surface area affected	Severe rust breakthrough, more than 15% of surface area affected.	Steelwork is mechanically unsafe and requires urgent replacement: damaged steelwork; wasted or missing steelwork; laminated rust, rust holes in steelwork.

Typical images of steel work condition score 1 to 5 are as follows;

Condition Score 1

Condition Score 2

Condition Score 3

Condition Score 4

Condition Score 5

We have applied the condition scores for each tower into the NARM models using the CBRM modelling tool and selected the routes which will have towers with a steelwork condition between condition score 3 and 5 by the end of RIIO-T2. Ideally, we should aim to paint our towers when they are at condition score 3 however this is not always possible due to several factors, most notably the ability to obtain system outages. The tower painting programme is aimed at recovering all tower steelwork to a condition score 1, if we find steelwork we believe cannot be recovered to that level we will carry out works to stabilise the degradation and then plan steelwork replacement

2.1 Data Collection

As part of the SP Energy Networks (SPEN) OHL inspection regime, aerial photographic information in conjunction with site specific investigations such as conductor corrosion monitoring, conductor sampling, steelwork inspection and foundation intrusive have been employed to provide a detailed condition analysis of the OHL components. For this project data was collected using:

- Aerial photographic inspection.

2.2 Data Analysis and Interpretation

The collected condition data has been collected and analysed in accordance in line with criteria outlined in this paper and a condition score assigned accordingly. The condition scores are input into CBRM and the condition of the towers steelwork modelled at the end of RIIO-T2. This has led to the selected routes being for chosen for tower painting, please see overleaf:

Route	Voltage (kV)	Length (Km)	Number of Towers	% Condition Score 3-5 2026
CB	132	11	39	62
P	132	43.2	169	98
AD	33	1.8	7	86
AK	132	2.5	8	13
AP	132	10.4	38	100
YQ	275	3.4	11	55
CG	132	4.7	1	100
XN	275	10	33	33
X	132	4.5	18	33
CE	132	12.5	41	76
XF	400	25.5	84	74
N (019-078)	132	15.3	60	95
N(080-100)	132	5	21	95
CD	132	12.7	46	37
XD	275	32	113	90
ZG	275	4	13	92
XW	275	3.6	12	8
XX	275	15.5	50	36

All the above routes have towers which will be between condition score 3 and 5 by the end of RIIO-T2. SPT plan to paint all towers on the above routes rather than have selected interventions. Painting all towers on these routes during RIIO-T2 will reset the towers to the same condition. This will minimise the number of repeat visits and associated set up costs and minimise the disruption to our stakeholders on whose land or towers are built.

3 OPTIONEERING

Two options have been considered based on the requirements identified within the condition assessments produced for tower painting, where Option 1 has been recognised as the only viable option which meets the project objectives.

Option	Status	Reason for rejection
Baseline - Do nothing: • Deferral of tower painting to RIIO-T3 (2027).	Considered	This option is unacceptable as it will lead to a significantly increased steelwork replacement programme being undertaken in RIIO-T3 as many of the towers will have deteriorated beyond a condition that can be restored by painting.
Option 1 -Tower Painting of all towers on identified routes	Considered and Proposed	

Option 2 – Tower Painting on selected towers within routes	Rejected	This will lead to multiple visits to routes to address a small number of towers leading to increased site set up costs and disruption to land owners.

4 DETAILED ANALYSIS

Option 1 achieves the main objective of addressing corrosion and providing protection of the tower steelwork on identified routes ensuring the assets achieve a maximum possible operating life whilst reducing the need for steelwork replacement. Painting all the towers on each route minimises site set up costs when compared to a more targeted intervention and minimises multiple visits to towers and inconvenience to land owners.

4.1 Selected Option

The basis of individual unit costs has been the SP Transmission MoSC (Manual of Standard Costs) tool which refers to costs incurred during previous similar projects. The cost used to build the tower painting programme from the SP Transmission MOSC are free of risk. The capital cost incurred in RIIO-T3 cannot be fully calculated at this time as delay of tower painting activities and continued deterioration of the asset condition will likely lead to the towers in this programme to require steel work replacement rather than painting which would require inspection at the point of investment decision to be accurately calculated.

5 CONCLUSION

The two options proposed have been reviewed in terms of scope feasibility, cost, timescales and construction risks with Option 1 demonstrating the primary objective of lead assets replacement whilst affording greatest reduction in risk to the network.

In line with the costs prepared, the proposed scope of works and CBA analysis, option 1 Tower painting programme s the selected option:

- Scheme Total Cost: £10.3m
- Timing of investment: 2022-2026
- Declared outputs:

Asset	Type of Activity	Addition/Activity (each)
33kv Tower	Refurbishment	7
132kV Tower	Refurbishment	441
275kV Tower	Refurbishment	232
400kV Tower	Refurbishment	84

- Price control period of outputs: 2022—2026

6 Future Pathways – Net Zero

6.1 Primary Economic Driver

The primary driver for this investment is asset condition and risk. The investment does not have a strong reliance on environmental benefits.

6.2 Payback Periods

This operational maintenance intervention permits the expected life of the asset to be achieved and avoids unnecessary additional costs to replace tower steelwork were it not to be completed.

6.3 Pathways and End Points

The network capacity and capability that result from the proposed option has been tested against and has been found to be consistent with the network requirements determined from the ETYS and NOA processes. Additionally, the proposed option is consistent with the site-specific capacity requirements from SPT's Energy Scenarios.

6.4 Asset Stranding Risks

Electricity generation, demand and system transfers are forecast to increase under all scenarios. The stranding risk is therefore considered to be very low.

6.5 Sensitivity to Carbon Prices

The activity is not sensitive to carbon prices.

6.6 Future Asset Utilisation

It has been assessed that the preferred option is consistent with the future generation and demand scenarios and that the risk of stranding is very low.

6.7 Whole Systems Benefits

Whole system benefits have been considered as part of this proposal. The capacity and capability of the preferred option is consistent with the provision of whole system solutions.

7 Outputs included in RIIO T1 Plans

N/A