SSEN DISTRIBUTION- ED3 FLUID FILLED CABLES (FFC) MANAGEMENT STRATEGY

Environmental Protection and FFC Removal Pathway

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Scottish & Southern Electricity Networks

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1. INTRODUCTION

Scottish and Southern Electricity Networks Distribution (SSEN Distribution) operates and maintains electricity distribution networks across the north of Scotland and central southern England. Some parts of these networks include Fluid Filled Cables (FFCs), which were installed to provide reliable high-voltage electricity supplies. FFCs use insulating fluid to support their electrical performance. They can continue to provide reliable service, but a loss of fluid may affect the surrounding environment. These assets therefore require careful inspection, monitoring, maintenance and, where appropriate, replacement.

Our long-term aim is to remove FFCs from our network by latest 2050 - in a planned and responsible way. Until that work is complete, we will manage each cable according to its condition, operating history, environmental setting and importance to the electricity network. Our approach has four parts:

- **Understand risk** by maintaining updated asset, condition and environmental information.
- **Manage risk** through inspection, condition monitoring, maintenance and effective incident response.
- **Reduce risk** through targeted repairs, leak reduction and environmental protection.
- **Remove risk** by replacing FFCs with modern cable systems that do not require insulating fluid.

The Office of Gas and Electricity Markets (Ofgem) expects Distribution Network Operators (DNOs) to “accelerate the removal of FFCs and to reduce the environmental risk they pose while they remain in service.” Ofgem also requires a clear removal trajectory, an evidenced baseline, annual milestones and a pathway beyond ED3.

This strategy maintains security of electricity supply while delivering a balanced and practical route towards the complete phase-out of FFCs. SSEN's long-term ambition is to eliminate FFCs entirely by 2050, this commitment is subject to the necessary regulatory approvals and allowances through the Price Control process.

2. BACKGROUND

2.1. What is a Fluid Filled Cable?

FFC is an underground electricity cable that uses insulating fluid to maintain electrical insulation and support reliable operation. FFCs were installed several decades ago, before modern solid-insulated cable systems became established.

The insulating fluid is held under controlled pressure, a change in pressure or fluid level can indicate a defect or leak. The cable may remain electrically operational during the early stages of leakage, so condition monitoring is important for identifying changes before they result in outage or more serious environmental event.

SSEN Distribution’s FFC population includes 132kV, 66kV and 33kV circuits across the Scottish Hydro Electric Power Distribution (SHEPD) and Southern Electric Power Distribution (SEPD) license areas. In accordance with the ED3 price control baseline, the network contains approximately 1,100 kilometres of FFC.

2.2. Why Fluid Filled Cables require specific management?

In accordance with **ENA Engineering Recommendation C135** and the **ENA–Environment Agency National Operating Code**, the main environmental risk is the release of insulating fluid to land or water. The impact depends on:

- The quantity and type of fluid;
- How quickly the leak is detected;
- The cable location and depth; and
- Proximity to watercourses, groundwater and protected sites

While cable age is an important consideration, it is not a complete measure of risk. In line with ENA guidance and industry good practice, assessments should consider cable condition, leakage history and environmental sensitivity. Cables in sensitive areas may require enhanced monitoring, while those with repeated leaks or repairs may require intervention regardless of location.

Leaks must be managed and reported in accordance with applicable environmental-regulatory requirements: the Environment Agency (EA) in England and the Scottish Environment Protection Agency (SEPA) in Scotland. Key performance measures include kilometres of FFC in service and removed, fluid top-up volumes, and leakage performance. Ofgem has identified kilometres of FFC in service, kilometres removed and cable fluid top-up volumes as important measures for monitoring progress and environmental impact.

3. RISK-BASED FFC MANAGEMENT APPROACH

FFC risk will be managed through a continuous, evidence-based process of understanding, managing, responding to, reducing and ultimately removing risk. Decisions will combine asset condition, fluid performance, environmental sensitivity, network criticality and deliverability. The approach aligns with established cable operations and maintenance practice and Ofgem's expectation that ED3 investment is supported by clear engineering evidence and integrated with wider network planning.

3.1. Understand Risk

Effective FFC risk management depends on complete, reliable and current asset information. We will apply the Common Network Asset Indices Methodology (CNAIM) to provide a consistent, risk-based assessment of asset health, probability of failure, consequence of failure and overall asset risk. CNAIM combines the Health Index and Criticality Index to produce a monetised Risk Index, considering safety, environmental, network-performance and financial consequences.

SSEN continues to maintain an FFC asset register covering cable location, type, age, route length, operating voltage, fluid system, condition, repair history and recorded fluid use. This information will be assessed alongside environmental and network data, including:

- Cable condition and operation records;
- Frequency and volume of fluid top-ups;

- Leakage and repair history;
- Proximity to rivers, groundwater and protected habitats;

The CNAIM scoring assessment will be reviewed when new condition information becomes available, following a leak or repair, and during the regular investment-planning process. Where FFC-specific environmental factors are not fully represented within the standard model, supplementary engineering assessment will be applied and documented. That would include opportunities to coordinate work with wider network investment or upgrade. This approach provides a current and consistent view of FFC risk, rather than relying on cable age or a one-off condition assessment, and supports the prioritisation of monitoring, maintenance, mitigation and replacement.

3.2. Manage Risk

FFCs remaining in service will be managed through inspection, pressure and fluid monitoring, and operational control. Monitoring will be proportionate to cable system condition, leakage history, environmental sensitivity, network criticality and the expected remaining service life of the circuit. Monitoring arrangements may include:

- Review of fluid pressure and reservoir levels;
- Trending of fluid top-up rates;
- Inspection of pressure equipment, tanks and cable accessories;
- Checks for visible signs of leakage; and
- Investigation of abnormal pressure or fluid consumption.

Where abnormal pressure or fluid use is identified, the cause will be investigated and the cable's continued operation assessed. The decision will consider the likely leak rate and location, cable condition, environmental consequences, network requirements, and the practicality of repair or replacement.

For abnormal leak cases, perfluorocarbon tracer (PFT) cable tagging may provide a practical means of locating fluid leaks. However, cable tagging is not treated as a routine monitoring measure across the FFC population. It requires specialist setup, tracer injection, sampling and analysis, with associated cost and operational planning. This would generally be disproportionate for circuits approaching 60 years of age that are already prioritised for complete replacement.

When an FFC leak is suspected or confirmed, our immediate priorities are to protect communities, maintain network safety and minimize environmental harm. Actions will include locating and isolating the leak, containing released fluid and notifying the relevant environmental authority where required. The affected cable will be repaired or replaced, the site cleaned and restored, and the cause, response, and volumes of fluid released and recovered recorded. Incident findings will inform the risk assessment of similar assets and support current and future Ofgem environmental reporting requirements.

As not every FFC can be replaced immediately, proportionate measures will be applied until replacement is completed. These may include repairing confirmed defects, enhancing pressure and fluid-level monitoring, increasing inspection frequency, installing local containment, improving emergency access and reviewing operating arrangements. Fluid top-up volumes and trends will be monitored as indicators of cable performance and environmental risk, with abnormal changes triggering further investigation. Repairs will be undertaken where they provide a safe and effective response, but repeated repairs will not be used as a substitute for replacement where a cable presents a continuing or increasing risk.

3.3. Reduce Risk

Until full replacement of the FFC is completed, risk will be managed through targeted interventions and enhanced monitoring. This may include repairing confirmed defects, monitoring fluid pressure level, reviewing operational arrangements, and in case of leak implementing appropriate local measures to reduce environmental impact. Where repairs provide a safe and cost-effective solution, they will be used to maintain

service. However, repeated repairs will not be relied upon where a cable continues to present an increasing operational or environmental risk, and replacement will remain the long-term solution.

Fluid top-up volumes will be monitored on a monthly basis as a key indicator of cable condition and potential leakage. Significant changes in fluid consumption or asset performance will trigger further investigation and review.

Progress will be measured through annual reporting of kilometres of FFC in service, kilometres removed, cumulative removal over ED3, cable fluid top-up volumes, leakage incidents, and delivery against agreed replacement commitments. These measures will help demonstrate both the reduction of environmental risk and progress towards the long-term removal of the FFC network. Performance will be reviewed through SSEN Distribution's asset management and environmental governance processes, with corrective actions identified where delivery deviates from plan.

3.4. Remove Risk

The permanent removal of risk is achieved by replacing FFCs with modern solid-insulated cable systems. This removes the need for insulating fluid, eliminates the potential for future fluid leakage, and reduces environmental, operational and maintenance risks. FFC replacement will be prioritised using a risk-based approach that considers both asset health and environmental risk. Two complementary investment drivers will be applied:

- Network Asset Risk Management (NARM): Replacement of cables identified as high risk due to deteriorating condition, poor reliability, asset health indicators, leakage history, increasing maintenance requirements, or risk to network performance and customer service.
- Environmental Action Plan (EAP) Accelerated Removal: Removal of cable circuits that present a higher environmental risk, even where asset conditions remain relatively good. This includes cables located near watercourses, groundwater protection zones, drinking water sources, environmentally sensitive locations, or circuits with a history of operational difficulties and fluid management concerns.

This approach ensures investment is directed towards the cables that present the greatest overall risk while delivering best value to customers. Where practical, replacement work will be coordinated with wider asset replacement, reinforcement and outage programme’ s to reduce disruption, avoid multiple interventions on the same asset and improve delivery efficiency.

The ED3 programme will target the highest-risk cables first and provide a clear pathway towards the long-term removal of the remaining FFCs portfolio. Progress will be monitored through annual reporting of cable length removed, reduction in FFCs remaining in service, environmental performance and delivery against agreed commitments.

As complete network-wide replacement cannot be achieved within a single price control period, SSEN Distribution will maintain a longer-term removal strategy beyond ED3. This pathway will be regularly reviewed and updated using the latest asset condition, performance and environmental risk information to ensure investment remains targeted at areas of greatest need. The achievement of replacement targets is subject to approval of regulatory allowances by Ofgem.

4. LONG-TERM PATHWAY TO FFC REMOVAL

SSEN Distribution recognises that complete replacement of the FFC network cannot be achieved within a single price control period. During ED3, investment will be focused on the highest-risk sections of the network, combining both NARM drivers and EAP accelerated removal activities to maximise environmental and customer benefit.

Beyond ED3, the remaining FFC population will continue to be assessed using a risk-based approach that considers asset condition, leakage history, environmental sensitivity, network criticality and deliverability. Replacement programmes will be reviewed and updated as new asset and environmental information becomes available, ensuring investment remains targeted at the areas of greatest need and is coordinated with wider network reinforcement and replacement activities where practical.

This phased approach provides a credible and deliverable pathway towards SSEN Distribution's long-term ambition to eliminate FFCs from the network by 2050, subject to regulatory approval and funding, while maintaining a safe, reliable and resilient electricity network for customers.

5. OUR COMMITMENT

SSEN Distribution will manage FFCs responsibly for as long as they remain part of our network. We will act promptly where performance changes, direct investment towards the greatest risks and replace cables through an evidence-based program. Our commitments are to:

- Monitor and manage cables according to risk;
- Respond effectively to leakage incidents;
- Reduce fluid top up and its environmental effects;
- Replace the highest-risk cables first;
- Publish measurable ED3 targets and annual progress; and
- Maintain a credible pathway towards complete FFC removal.

This strategy provides an end-to-end approach, from routine operation and incident response to planned replacement and long-term removal. It will help us protect the environment, maintain reliable electricity supplies and make well-supported investment decisions on behalf of our customers.

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