BUILDING RESILIENT NETWORKS

Protecting Wooden Infrastructure in a Net-Zero Future

WHITE PAPER
December 2025

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1.0 FOREWORD

BY RICHARD GEORGE, CHIEF EXECUTIVE OFFICER, POLESAVER

Europe's utilities stand at a crossroads. The next decade will define how effectively they can build networks that are not only robust and reliable, but also sustainable and compliant in a rapidly evolving regulatory landscape.

Timber poles have been a trusted part of utility infrastructure for over a century. Yet the future of this essential material now depends on their ability to adapt to changing regulations and environmental pressures.

Current and proposed changes to regulations concerning the use of creosote as a ground contact wood preservative represent a seismic shift for the industry, one that challenges utilities to modernise their approach to asset protection. Rather than viewing this change as a threat, it is an opportunity to rethink resilience through innovation, sustainability, and smart materials.

At Polesaver, we believe the future belongs to infrastructure that lasts longer, performs better, and aligns with global sustainability commitments. This paper positions ground-line barrier technology as a proven, scalable solution to protect wooden infrastructure in the net-zero era, combining technical performance with strategic foresight.

Resilience isn't about standing still, it's about evolving.

RICHARD GEORGE

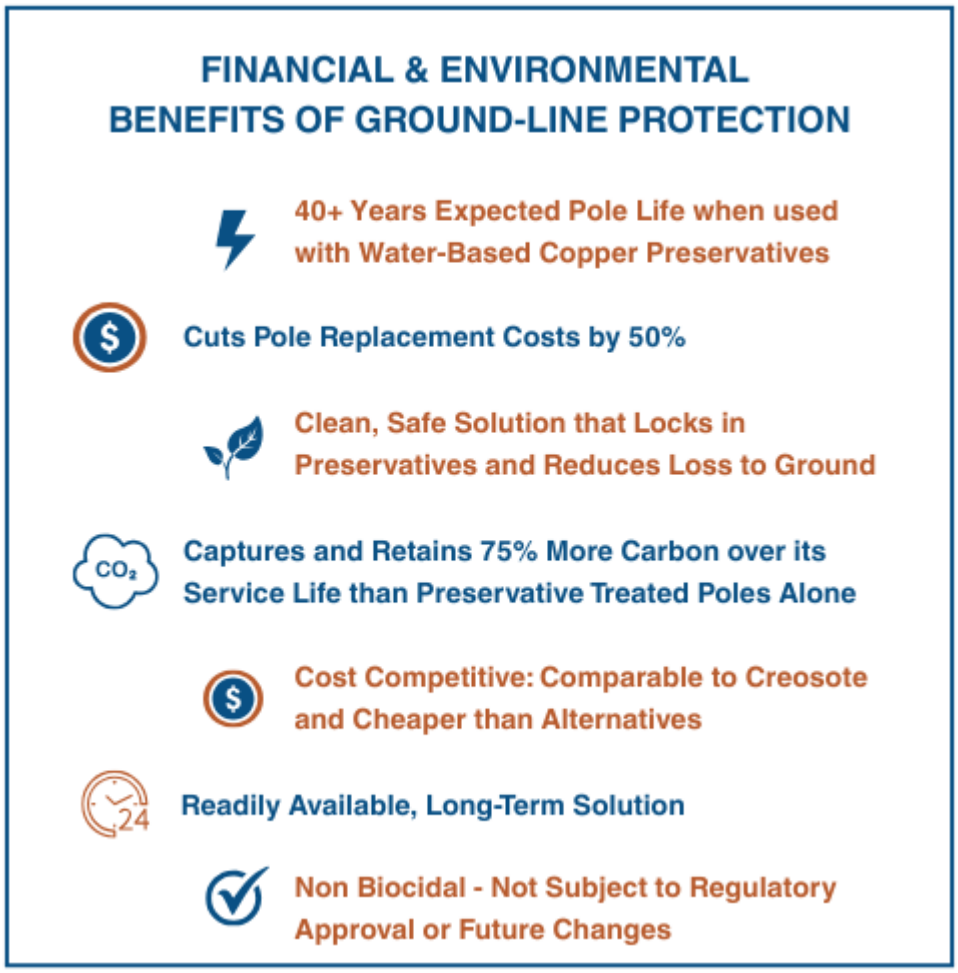
Chief Executive Officer, Polesaver

2.0 EXECUTIVE SUMMARY

As Europe and the UK move toward a net-zero future, utilities must balance network resilience with sustainability and regulatory compliance. Wooden poles remain a renewable, cost-effective, and reliable backbone for energy networks, but the phase-out of creosote and CCA in 2005 is driving demand for alternative, environmentally responsible protection solutions.

With over five million electricity distribution poles estimated to be in service across the UK, forming only part of a far larger European network, the scale of the infrastructure supporting power delivery is substantial[1]. This asset base is critical to maintaining reliability and enabling the transition to smarter, low-carbon systems. As modernisation, electrification, and distributed energy resources expand across Europe, future proofing pole infrastructure has become essential. The forthcoming creosote ban underscores both the regulatory imperative and the opportunity to deploy durable, sustainable, and compliant pole technologies that will underpin resilient, net zero ready networks.

Polesaver Rot-Guards™ offer a proven solution that protect against ground-line decay, the leading cause of pole failure, extending service life, reducing carbon emissions, and optimising lifecycle costs. Backed by decades of research and field data, this technology enables utilities to build stronger, cleaner, and future-ready networks whilst reducing long-term asset replacement costs.


FINANCIAL & ENVIRONMENTAL
BENEFITS OF GROUND-LINE PROTECTION
40+ Years Expected Pole Life when used with Water-Based Copper Preservatives
Cuts Pole Replacement Costs by 50%
Clean, Safe Solution that Locks in Preservatives and Reduces Loss to Ground
Captures and Retains 75% More Carbon over its Service Life than Preservative Treated Poles Alone
Cost Competitive: Comparable to Creosote and Cheaper than Alternatives
Readily Available, Long-Term Solution
Non Biocidal - Not Subject to Regulatory Approval or Future Changes

3.0 CHANGING REGULATORY LANDSCAPE

THE DECAY CHALLENGE

Wooden poles have supported power and communication networks for over a century, yet the ground-line zone remains their weak point, prone to decay from rot causing fungus.

Historically, creosote and CCA have been the wood preservative of choice in the fight against decay. Yet, growing environmental and health concerns have made this approach increasingly unsustainable.

- The EU REACH Regulation and UK HSE Guidance are accelerating the phase-out of creosote for most industrial applications.
- Utilities and infrastructure operators are now required to transition toward safer, environmentally responsible alternatives.
- Broader policy frameworks, including the EU Green Deal and the Circular Economy Action Plan, reinforce the need to reduce chemical dependency and sustainably extend material service life.

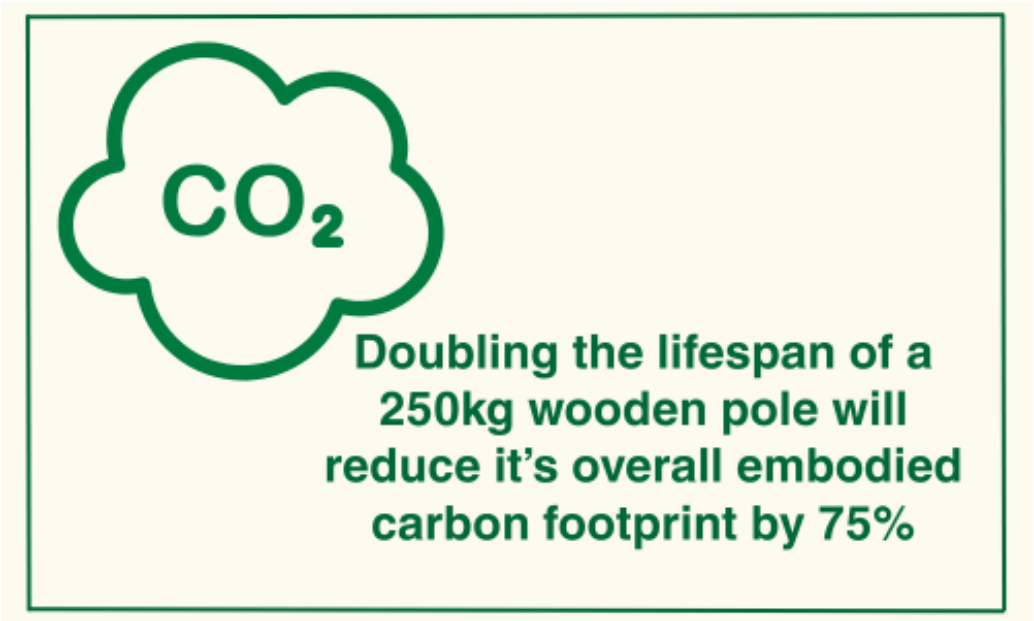
This regulatory shift represents both a challenge and an opportunity, driving innovation toward cleaner, longer-lasting, and fully compliant wood protection technologies that meet modern sustainability objectives.

4.0 RESILIENCE IN A NET-ZERO ERA

Resilient infrastructure is about more than uptime – it's about lasting performance with minimal environmental impact.

Each time a pole fails prematurely, utilities incur unnecessary emissions from pole replacement, transport, and installation. Depending on the type of pole material chosen, the emissions and replacement costs can escalate quickly.

By maximising the service life of the most environmentally efficient material, Polesaver champions the continued use of wood as the preferred pole material to enable utilities to achieve measurable progress toward Scope 3 emission reductions and corporate net-zero goals.



5.0 THE ROLE OF BARRIER TECHNOLOGY

PROVEN PROTECTION AGAINST ROT

Polesaver Rot-Guards™ protect against decay by creating an impenetrable barrier around the ground-line zone of wooden poles.

DUAL-LAYER DESIGN – THE KEY TO SUCCESS

- **Custom formulated inner thermoplastic layer:** Melts, penetrates and seals the pole surface locking in preservative and blocking oxygen, moisture and fungus to prevent decay.
- **Outer thermoplastic sleeve:** Heat shrinks to provide a tough, durable outer layer which provides long-term protection for the inner coating.

It is important to note that not all pole wrap products protect the ground-line as effectively as Polesaver Rot-Guard™. Single-layer products applied with adhesive or mechanical fixings often trap moisture between the wrap and the pole surface, creating ideal conditions for fungus to thrive and accelerating the process of decay.

KEY FEATURES OF POLESAVER ROT-GUARD™

- ✓ Independently field tested over 25 years [4]
- ✓ Adds an additional 20 years to pole life
- ✓ No loss of pole strength from day 1 to year 35 – MOR tested [6]
- ✓ Continues to protect as timber expands and contracts
- ✓ Compatible with all preservatives and wood types
- ✓ Non-toxic

6.0 ECONOMIC & OPERATIONAL RESILIENCE

SUSTAINABILITY & COST EFFICIENCY GO HAND IN HAND

By extending the service life and reliability of wooden utility poles, Polesaver delivers measurable economic benefits. By preventing ground-line decay, the primary cause of pole failure, Polesaver reduces the need for frequent inspections, remedial treatments, and early replacements. This enhanced durability also minimises the risk of unexpected pole failures, leading to fewer unplanned outages and lower emergency response costs. The result is a substantial reduction in lifetime expenditure, as utilities are able to preserve and optimise their existing assets, unlocking value from long-term resilience rather than recurring maintenance cycles.

SUPPORTS ASSET MANAGEMENT STANDARDS

Polesaver Rot-Guards™ align with:

- ISO 55000 / PAS 55 – Asset life extension and risk mitigation.
- ESG reporting metrics – reduced material consumption and waste.

COMPARATIVE MATERIAL ANALYSIS – BUILDING THE CASE FOR PROTECTED TIMBER

As utilities transition toward net-zero infrastructure, material selection must balance longevity, carbon performance, safety, and cost efficiency.

The table below (next page) compares pole material against key lifecycle and operational criteria.

CRITERIA	Wood Creosote	Wood Water-Based Copper Preservative	Wood Water-Based Copper Preservative + Dual-Layer Barrier	Steel	Concrete	Composite
TYPICAL SERVICE LIFE	40-50 years [2]	20-30 years	**40-50 years** [4]	30-40 years [2]	40-50 years [2]	30-50 years [2]
INSTALLED COST	Low	Lowest Cost	Low (product cost offset by life extension)	2-3 x wood	2-3 x wood	3-4 x wood
FAILURE MODE	Ground-line decay over time as creosote leaches or depletes	Susceptible to ground-line decay	**Minimal decay** [4] **(Barrier prevents ingress)**	Corrosion at base / welds	Brittle (snaps under load) low tensile strength	UV degredation, resin softening, fire vulnerability
MAINTENANCE NEEDS	Medium (Periodic inspection for decay, occasional replacement)	High (Inspections, remedial treatments, replacements)	Low (Reduced life-cycle inspections)	Medium (Corrosion monitoring / coatings)	Medium (Crack inspections)	Medium (UV/Fire checks, harder to repair)
LIFETIME EMBODIED CARBON (KG CO2 PER POLE) [2]	-250kg carbon negative	-136kg carbon negative	**-302kg carbon negative**	+920kgs	+1423kgs	+946kgs
ENVIRONMENTAL RISKS	Creosote classified as hazardous; potential soil and water contamination. Already banned for some uses	Preservatives migrate over time	Environmentally friendly barrier locks in preservatives	High energy / coke based production	High emissions in production process	Petrochemical resins, non-recyclable
FIELD ADAPTABILITY	Easy to cut, drill & climb	Easy to cut, drill & climb	**Easy to cut, drill & climb**	Difficult to modify	Difficult to drill	Difficult to drill and modify
EMERGENCY RESPONSE	Fast, lightweight handling, but unpleasant to handle; requires protective clothing and adherence to handling regulations due to irritant and environmental properties.	Fast, lightweight handling	Fast, lightweight handling	Slower, heavy equipment required	Very slow (Crane required)	Moderate (Lighter than concrete but costly)
PROVEN TRACK RECORD (40+ YEARS DATA)	Yes (Extensive historical field data, widely used for decades)	Yes (Modern preservatives rely on accelerated lab test data)	**Yes (Validated by lengthy field trials & accelerated lab test data)**	Yes (Corrosion is a long-term risk)	Yes (Operational burdens remain)	No (20-30 years max in the field)

KEY INSIGHTS

- **Service life:** Preservative treated timber + a dual-layer barrier achieves creosote-equivalent longevity and maintains pole strength through protecting the weakest part of the structure.
- **Carbon Footprint:** Timber remains a carbon-negative material, particularly when service life is maximised. Steel, concrete, and composites carry high embodied carbon burdens.
- **Operational Efficiency:** Wood poles are lightweight and easily transportable, and retain climbability and non-conductivity, improving safety for field crews.
- **Sustainability:** Polesaver Rot-Guards™ lock in preservatives, maintain pole strength and ensure compliance with environmental standards.

Conclusion: Protected timber – specifically treated to UC4 standard and fitted with a Rot-Guard™ – delivers the optimal balance of sustainability, durability, and total cost of ownership.

When protected with Polesaver Rot-Guards™, timber outperforms higher-cost, higher-carbon alternatives to the metrics that matter most to operators of resilient, sustainable network.

7.0 SUSTAINABILITY AND COMPLIANCE ALIGNMENT

Ground-line protection enables utilities to meet environmental and governance expectations without structural compromise.

Alignment snapshot:

- **EU Green Deal: Resource efficiency & pollution prevention.** One of the fundamental pillars of the EU's ambitious aim to make Europe the first climate-neutral continent by 2050 focuses on resource efficiency. By extending the service life of wooden utility poles, reducing the need for replacements, conserving raw materials, and preventing soil contamination, Polesaver Rot-Guards™ directly contribute to a more sustainable, resource-efficient utility network.
- **UN SDGs: SDG 9 (Industry, Innovation & Infrastructure), SDG 12 (Responsible Consumption & Production).** For utilities, the UN Sustainable Development Goals (SDG 9 and SDG 12) emphasise building resilient, innovative infrastructure and promoting responsible resource use. Polesaver Rot-Guards™ support these goals by increasing the durability of utility poles, reducing material waste and maintenance needs, and supporting sustainable consumption and production practices through longer-lasting, more efficient infrastructure.
- **Corporate ESG Reporting: Demonstrable reduction in waste and embodied carbon.** ESG reporting requires clear evidence of efforts to reduce waste and embodied carbon in operations and assets. Polesaver Rot-Guards™ help achieve these targets by prolonging pole life, cutting down on replacements and associated emissions, and lowering the overall carbon footprint of infrastructure — providing measurable sustainability benefits for corporate ESG disclosures.
- **Non-biocidal and Exempt from Biocidal Product Regulation.** Polesaver Rot-Guards™ are inherently non-biocidal and therefore sit entirely outside EU and UK Biocidal Product Regulation (BPR) regimes. This regulatory neutrality removes exposure to future preservative-related compliance shifts, streamlines specification and procurement, and ensures uninterrupted long-term deployment. For utilities, it provides a strategically resilient ground-line protection solution, one that enhances asset durability without introducing additional regulatory complexity or chemical-risk governance burdens.

8.0 FIELD TEST DATA

FIELD TEST DATA

25-Year BRE EN252 Field Study [4]

Conducted by the Building Research Establishment (BRE), this long-duration field trial began in 2000, when creosote or CCA (now both restricted under EU Regulations) were the preservative treatment of choice of wooden utility poles. The aim of the trial was to assess the effectiveness of total barrier sleeves in enhancing decay resistance when used in conjunction with standard preservative treatments.

Methodology

- **Material:** Scots pine sapwood stakes, dip-treated with chromated copper arsenate (CCA) at ~0.09 lb/ft³ (1.40 kg/m³), matching standard utility specifications.
- **Treatment Groups:**
  - **Control:** CCA dip-treated stakes only
  - **Total Barrier:** CCA dip-treated stakes fitted with total barrier sleeves extending 200mm (8") below ground and 100mm (4") above ground.
- **Testing Conditions:** Exposed to natural environments for 25 years, following **AWPA E7-21** and **EN 252** field testing standards.

Results – Average Notional Mean Decay Rate

The point at which decay was first visible on the stakes was pushed back by 20 years in the sleeved stakes. Highlighted in the table below:

Average Notional Mean Decay Rate

YEAR	2001	2003	2005	2006	2008	2012	2016	2020	2025
Control	0	0.2	0.8	1.1	2	3.2	3.4	4	4
Sleeved	0	0	0.2*	0.2*	0.3*	0.3*	0.3*	0.6*	0.9**

**Slight decay at tips of stake ** Slight decay at tips of stakes and above ground (1 sample)*

EN252 decay ratings: 0 = No Decay, 1 = Slight Decay <1mm, 2 = Moderate Attack <3mm (1/8"), 3 = Severe Attack, 4 = Total Failure

Seven Year Field Test – Three UK Test Sites [3]

This seven-year UK field study was conducted to assess the performance of various ground-line protection systems for utility poles under different environmental conditions. The research focused on how effectively each system — including preservative-only, partial barrier, and total barrier treatments — could prevent decay and control moisture in the critical ground-line zone where deterioration most often occurs.

Methodology

- **Sample Setup:** The ACQ-treated utility poles (10-inch diameter) were prepared and divided into three treatment groups:
  - **Preservative-only** (control)
  - **Partial barrier systems**
  - **Total barrier systems**
- **Installation:** Poles were installed at three UK test sites (Peterborough, Penistone, and Reading), chosen to represent a range of soil types and moisture conditions – from dry sandy soil to wet, high water table environments.
- **Exposure Period:** All samples were assessed after seven years under natural environmental conditions to simulate real-world performance.
- **Assessment Focus:** Periodic inspections measured decay progression, moisture content, and overall pole integrity, particularly at the ground-line zone – the area most prone to decay.

This approach allowed a direct comparison of how effectively each treatment method protected poles from decay across varying site conditions.

Results – Average Moisture and Decay Rating

Protection System	Average Moisture Content (top of sleeve/grade)	Moisture Content Range	Decay Rating
ACQ	29.50%	29-33%	2 poles - severe attack
ACQ + Partial Barrier	33.90%	22-60%	1 pole - moderate attack
ACQ + Total Barrier	21%	13-33%	No attack on any poles

Ten Year Field Test – Poles in Service in Uganda [5]

Uganda's electricity distribution network uses CCA treated hardwood poles. In service failures are relatively high due to severe ground conditions. Typically poles last approximately 10 years, far below the expected lifespans typical in well-performing networks. Fungal decay and termite attack concentrated around the ground-line being the dominant causes of failure. The independent study assessed whether Polesaver Rot-Guards™ (sleeves), already deployed on over 300,000 poles in Uganda, improve in-service durability when applied to treated wooden poles in real network conditions. The study provides field-based evidence regarding the effectiveness of sleeves in mitigating decay, deterring termite attack, and reducing moisture and checking-related degradation.

Methodology

An in-field assessment was carried out on 200 utility poles installed between 2016 and 2024 across Kampala and Wakiso districts. Of these, 113 poles were fitted with sleeves and 87 served as un-sleeved controls. Data collection involved:

- **Visual inspection** to determine the severity of fungal decay and termite attack (classified into four severity levels based on proportion of wood affected within one metre of the ground line).
- **Ground-line moisture content (MC) measurements** using standard field moisture testing.
- **Surface checking analysis** (measuring length and width of checks within one metre of the ground line).
- **Descriptive statistics and independent T-tests** were used to evaluate differences between sleeved and un-sleeved poles.

The study integrated field measurements with literature review and interviews with UMEME staff to contextualise the findings.

Results – Proven Protection Against Fungal and Termite Attack

- **No fungal decay** was present in the sleeved poles, compared to an attack rate of 4.6% in un-sleeved poles.
- **No termite attack** was present in the sleeved poles, compared to an attack rate of 5.75% in un-sleeved poles.

The study demonstrates that Polesaver Rot-Guard™ sleeves provide highly effective protection for in-service treated distribution poles even in harsh African soil conditions. No correctly installed sleeved poles showed signs of fungal or termite attack, even those with installation errors, performed markedly better than un-sleeved poles across all deterioration metrics. Ground-line moisture and checking were not adversely affected. The findings validate sleeves as a reliable, field-proven method for maximising pole life, reducing failure rates, and lowering long-term asset replacement costs in tropical, high-risk environments.

9.0 CASE STUDIES

PROVEN IN THE FIELD

European Distribution Network Operator

Rovakaira Oy distributes electricity across northern Finland, serving 31,000 customers within a 28,800 km² area through a 7,000 km distribution network. Operating inside the Arctic Circle, the utility faces some of the world's harshest weather conditions including temperatures as low as –51°C, heavy snow, and strong arctic winds make maintenance and reliability critical.

- Wooden poles were traditionally treated with creosote or CCA (now restricted under EU regulations).
- Previously the operator averaged 120 line faults and replaces 2,000 poles annually.
- Since trials began in 2011, over 10,000 poles protected with Polesaver have been installed on the network and Rovakira has seen an overall reduction in outages, and repair and maintenance costs.
- Polesaver Rot-Guards™ are now standard fit on all new poles used in extreme arctic conditions.

Canadian Distribution Network Operator

Newfoundland Power serves 256,000 customers across 155,000 square miles in eastern Canada. When replacing poles in the Windsor Lake watershed, which supplies St. John's drinking water, the utility faced strict environmental restrictions banning traditional wood preservatives due to the risk of chemical leaching into the water supply.

- Polesaver Rot-Guards™ have been used in these ground sensitive conditions to add an additional 20 year lifespan to untreated western cedar poles.
- Previously, untreated poles were lasting just 8 years.
- Based on an average pole replacement cost of $3,000, the 28 year (lifetime saving) made on this niche project by adopting Polesaver Rot-Guards™, is $1.32m.

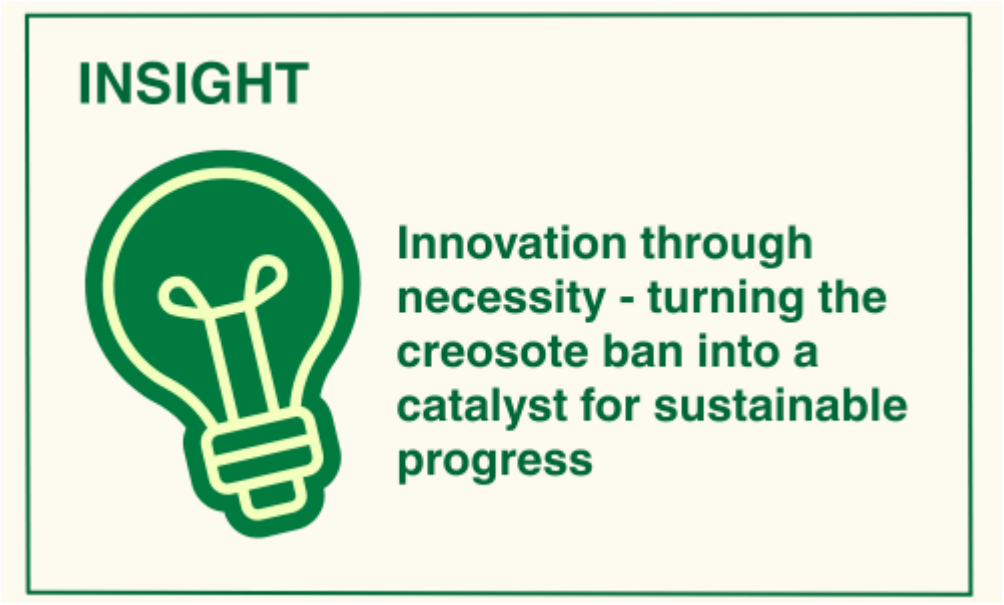
10.0 INNOVATION DRIVING RESILIENCE

THE CREOSOTE BAN IS A CATALYST FOR CHANGE

The utility landscape is changing – electrification and distributed generation are driving demand for flexible and sustainable infrastructure. Timber should continue to play a vital role when paired with modern material science.

Polesaver Rot-Guards™ embody the next generation of resilience:

- **Passive protection** – reduced inspection intervals & maintenance free.
- **Compatibility with digital asset tracking systems** – RFID tag built into the sleeve to support asset tracking requirements.
- **Non-toxic, environmentally friendly product** – fully compliant with forthcoming preservative regulations and protected from future legislative changes.



11.0 CONCLUSION

THE REINVENTION OF WOODEN POLES

The decline of creosote does not signal the end of wooden poles, it marks their reinvention. With Polesaver Rot-Guards™, utilities can fully unlock the value of modern, sustainable wood preservation systems and extend the relevance of wooden poles well into the net-zero era.

Polesaver Rot-Guards™ enable utilities to extend pole life by decades even when paired with more environmentally sound preservatives.

- **Achieve 40+ year expected service life** when used alongside readily available, water-based copper preservatives whose regulatory licensing is expected to remain stable over the long term.
- **Deploy a cost-competitive solution**, comparable in price to creosote-treated poles and materially cheaper than alternative pole materials.
- **Leverage the inherent carbon-holding advantage of wood**, supporting corporate decarbonisation goals and reducing embodied carbon versus steel or composite options.
- **Adopt a readily available, proven technology** that integrates easily into existing procurement and treatment pathways.
- **Expand deployment into environmentally sensitive areas**, as the clean, non-biocidal sleeves lock in preservatives, minimise ground loss, and enable safe use near watercourses.
- **Significantly reduce whole-life costs**, cutting maintenance and replacement cycles while improving network reliability.
- **Meet evolving regulatory and ESG expectations with confidence**, supported by long-term durability, reduced environmental impact, and a future-proof compliance profile.

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ABOUT POLESAVER

Polesaver is a UK-based innovator in timber protection technology with over 30 years of field experience and installations in more than 30 countries. Its patented Rot-Guard™ Sleeve is the global standard for preventing ground-line decay and sustainably maximising the life of wooden utility poles.

Head Office: Gloucestershire, UK

www.polesaver.com

info@polesaver.com