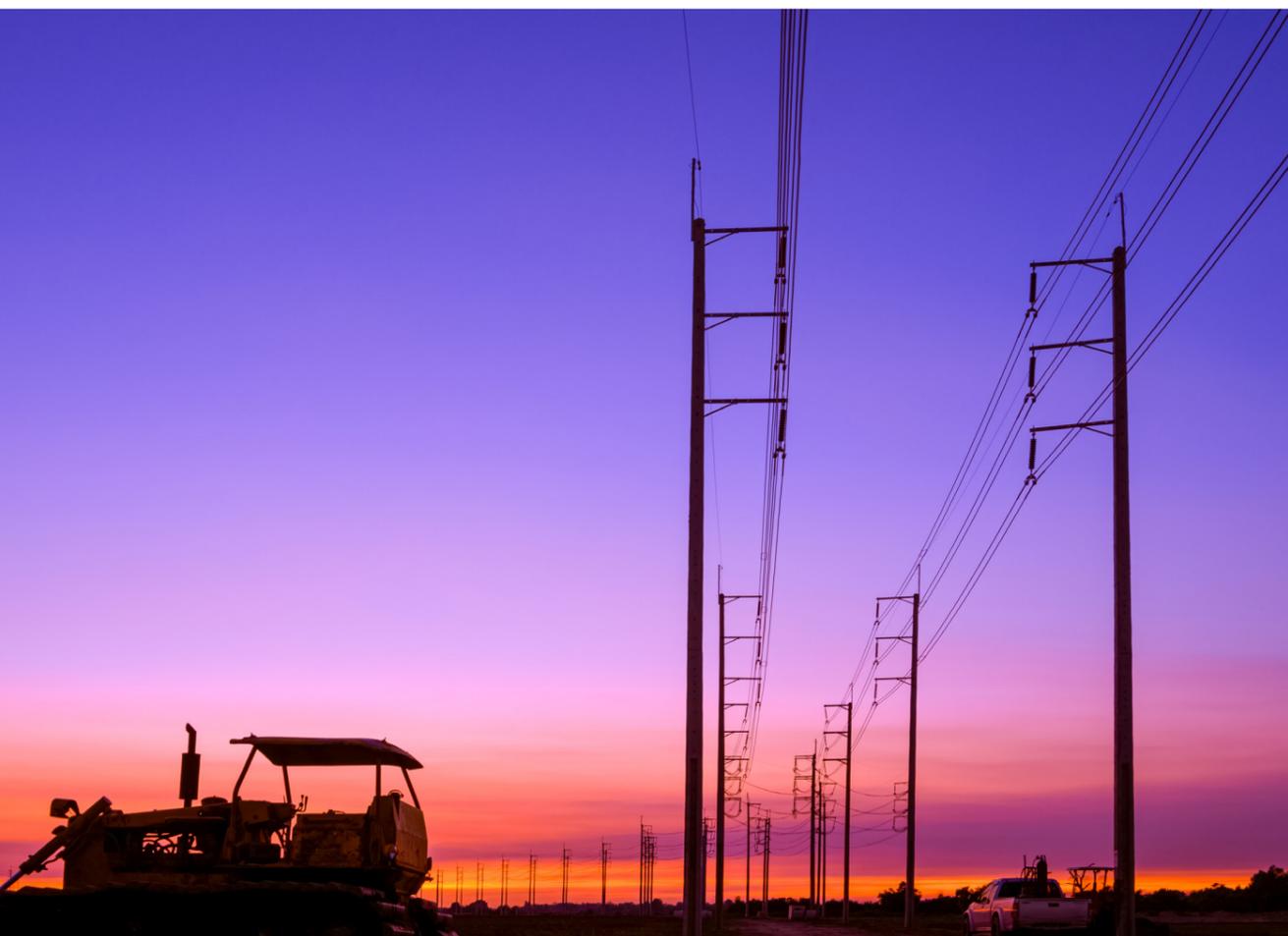




ASSETCOOL
THERMAL METAPHOTONICS

AUTOMATING POWER LINE
UPRATING AND MAINTENANCE

INNOVATING TODAY, FOR THE ENERGY NEEDS OF TOMORROW



ASSETCOOL IS RELENTLESSLY FOCUSED ON REDUCING THE \$/MW, \$/KM AND OUTAGE TIMES ASSOCIATED WITH UPRATING AND MAINTAINING OVERHEAD LINES.

A powerful new tool for transmission and distribution network operators.

Transmission of energy is the bottleneck of the energy transition. Many problems in overhead lines are surface phenomena (solar radiation absorption, heat dissipation, corrosion, ice accretion, noise emission). These often require expensive heavy engineering upgrades or limit service life.

AssetCool has developed innovative functional coatings for power lines that deliver capacity enhancement, corrosion protection, corona noise reduction, and extended service life. Applied in the factory or in-situ with first in the world power line coating robots or roll to roll conductor coating lines.

Facilitating the electricity transition by moving from a paradigm of capital-intensive projects and heavy engineering to robotics and advanced materials science.

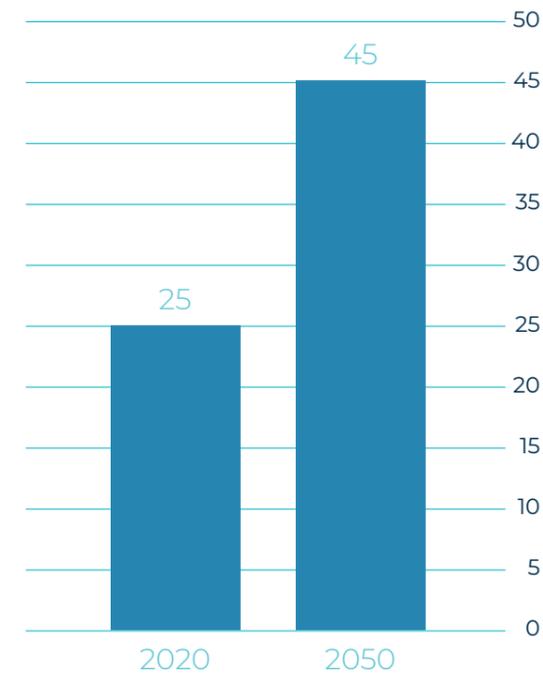


AI WILL SUCK UP 500% MORE POWER IN THE UK IN 10 YEARS

John Pettigrew, National Grid UK CEO, 2024.

THE PROBLEM: THERMAL RATING CAPACITY ON OVERHEAD LINES

NET ELECTRICITY GENERATION (TRILLION KWH)



Source: US EIA, 2020

"The U.S. grid may need to double in size by 2035 to accommodate expected demand and generation growth and meet decarbonization objectives...Siting, permitting, and construction of new transmission infrastructure taking up to 10 years to build out in some past cases, pressures are compounding on the existing transmission system"

US DOE, Pathways to Commercial Liftoff: Innovative Grid Deployment, 2024.

STATICALLY RE-RATING THE CAPACITY OF OVERHEAD CONDUCTORS

Statically re-rating the capacity of overhead conductors currently involves re-conductoring (~\$350,000/km, 3-5 years to plan and execute) or building new lines (~\$1,000,000+/km, 3-10 years to plan and execute).

Objectively, technologies that discontinuously minimise the following metrics in relation to overhead line uprating and maintenance are essential:



TIME TO ADDITIONAL CAPACITY



\$/MW UPRATING COST



OUTAGE TIMES

THE PROBLEM: THERMAL RATING CAPACITY ON OVERHEAD LINES

OVERHEAD LINE PROBLEMS: SURFACE PHENOMENA

Capacity Constraints

Two critical parameters for overhead power line capacity are solar absorptivity, α , and thermal emissivity ϵ . Typically in power lines these are 0.5/0.5 or 0.8/0.8 respectively.

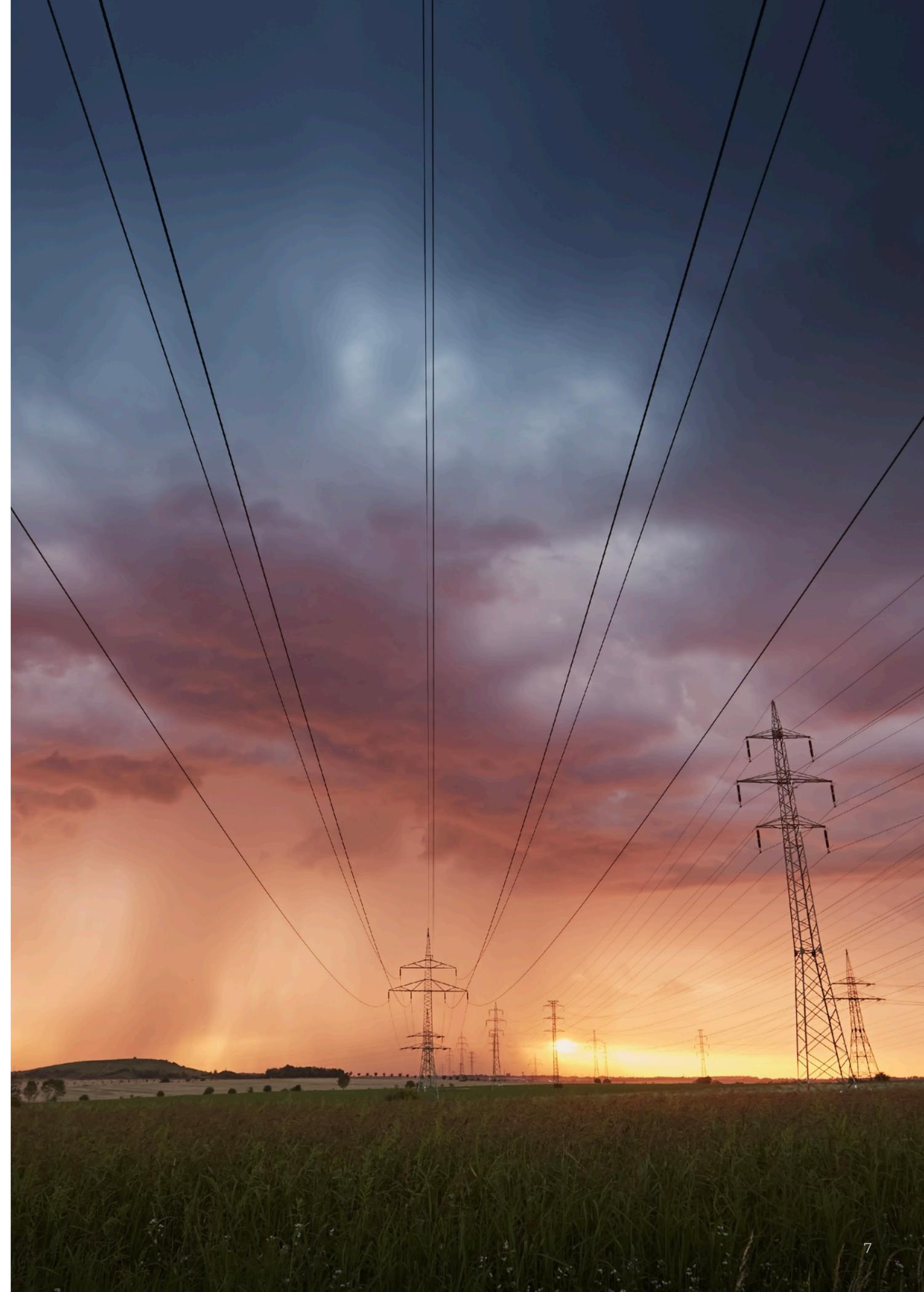
Corona Noise

In wet conditions, power lines emit more noise due to enhanced corona discharge. This is particularly prevalent after voltage uprating. The audible noise output is related to the geometry of the water on the surface. The “water contact angle”.

Corrosion

Corrosion poses specific challenges for overhead power lines in coastal, marine, and desert regions due to the unique environmental conditions in each of these areas. Some power lines have been known to last only 5 years in the harshest conditions.

Addressing all these problems may need significant engineering interventions, with long planning and outage times.





THE SOLUTION: FUNCTIONAL COATINGS

SURFACE MODIFICATION OF OVERHEAD CONDUCTORS, IN THE FIELD OR IN THE FACTORY, CAN ADDRESS OVERHEAD LINES UPRATING OR MAINTENANCE ISSUES IN A COST EFFICIENT AND NOVEL WAY

Problem	Coating Solution	AssetCool Product
Thermal constraint on capacity	Reduce solar absorption, increase heat dissipation	SE01 (Factory) SE02 (Field)
Corrosion reducing service life	Advanced anti-corrosion surface protection.	SE03 (Field)
Corona noise, resident complaints	Induce superhydrophilicity to minimise corona noise	SE05 (Factory or Field)



90-95% REDUCTION IN COSTS
AND 80-90% REDUCTION IN
OUTAGE TIME RELATIVE TO
RECONDUCTORING

CAPACITY-N - advanced power line coating robotic system



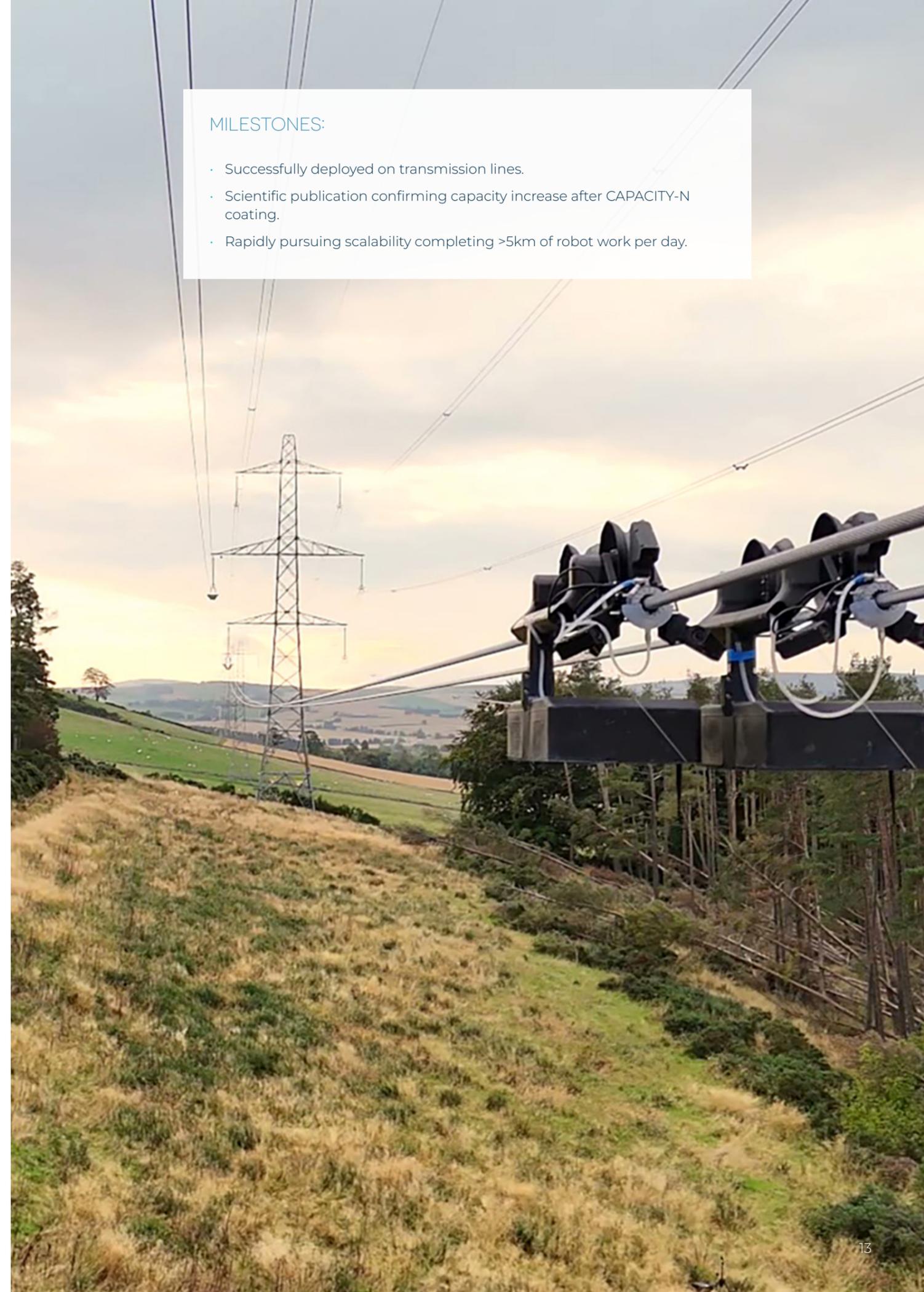


CAPACITY-N

ADVANCED POWER LINE COATING ROBOTIC SYSTEM

CAPACITY-N is an advanced robotic system engineered to apply functional coatings directly on overhead power lines. This innovative approach allows utilities to upgrade or maintain their existing infrastructure without the need for extensive reconductoring, offering significant savings in both time and money. With CAPACITY-N, you can achieve:

- 90-95% Reduction in Costs: By eliminating the need for heavy engineering and labour-intensive processes, CAPACITY-N drastically cuts down on maintenance expenses.
- 80-90% Reduction in Outage Time: Our system substantially reduces service interruptions relative to reconductoring projects.



MILESTONES:

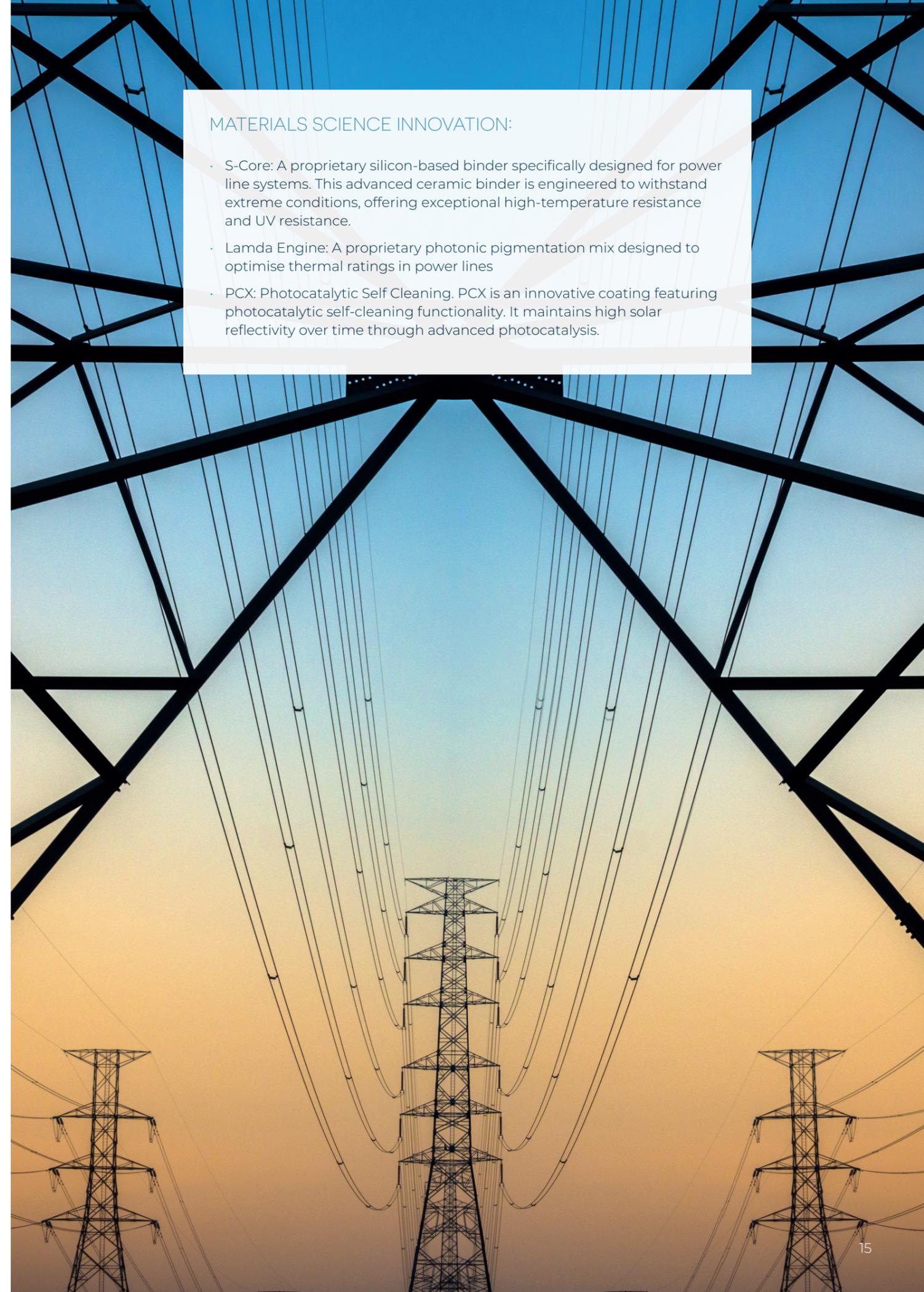
- Successfully deployed on transmission lines.
- Scientific publication confirming capacity increase after CAPACITY-N coating.
- Rapidly pursuing scalability completing >5km of robot work per day.



SE01

FACTORY APPLIED PHOTONIC COATING

- Photonic Coating for overhead conductors which passively cools by simultaneous reflectivity and thermal emissivity.
- Up to 30% increase in capacity, 10% reduction in losses on HTLS conductors.
- Designed for maximum durability, utilising inorganic materials.
- Independently tested and proven in field trials and accelerated aging.
- 10's of kilometres manufactured and installed.
- Purpose built factory application line.
- Absorptivity 0.18
- Emissivity 0.93



MATERIALS SCIENCE INNOVATION:

- S-Core: A proprietary silicon-based binder specifically designed for power line systems. This advanced ceramic binder is engineered to withstand extreme conditions, offering exceptional high-temperature resistance and UV resistance.
- Lamda Engine: A proprietary photonic pigmentation mix designed to optimise thermal ratings in power lines
- PCX: Photocatalytic Self Cleaning. PCX is an innovative coating featuring photocatalytic self-cleaning functionality. It maintains high solar reflectivity over time through advanced photocatalysis.



SE02

FIELD APPLIED PHOTONIC COATING

IN-SITU APPLICATION OF SE02 TO POWER LINES
OFFERING UP TO A 30% INCREASE IN CAPACITY
UTILISING EXISTING CONDUCTORS AND RIGHT OF
WAY.

- The direct application of SE02 to overhead power lines can offer a 30% increase in capacity at 5% of the cost of reconductoring, via the CAPACITY-N power line coating robot.
- The coating has over 80% solar reflectance and 0.93 thermal emissivity, passively cooling existing power lines.
- Proven and demonstrated on utility assets, with detailed temperature data verifying uprating.

MATERIALS SCIENCE INNOVATION:

- S-Core: ST-Core, a significant material science innovation to make a surface-tolerant inorganic siloxane binder that ensures absolute weather resistance and UV stability.
- Lambda Engine: A proprietary photonic pigmentation mix designed to optimise thermal ratings in power lines.



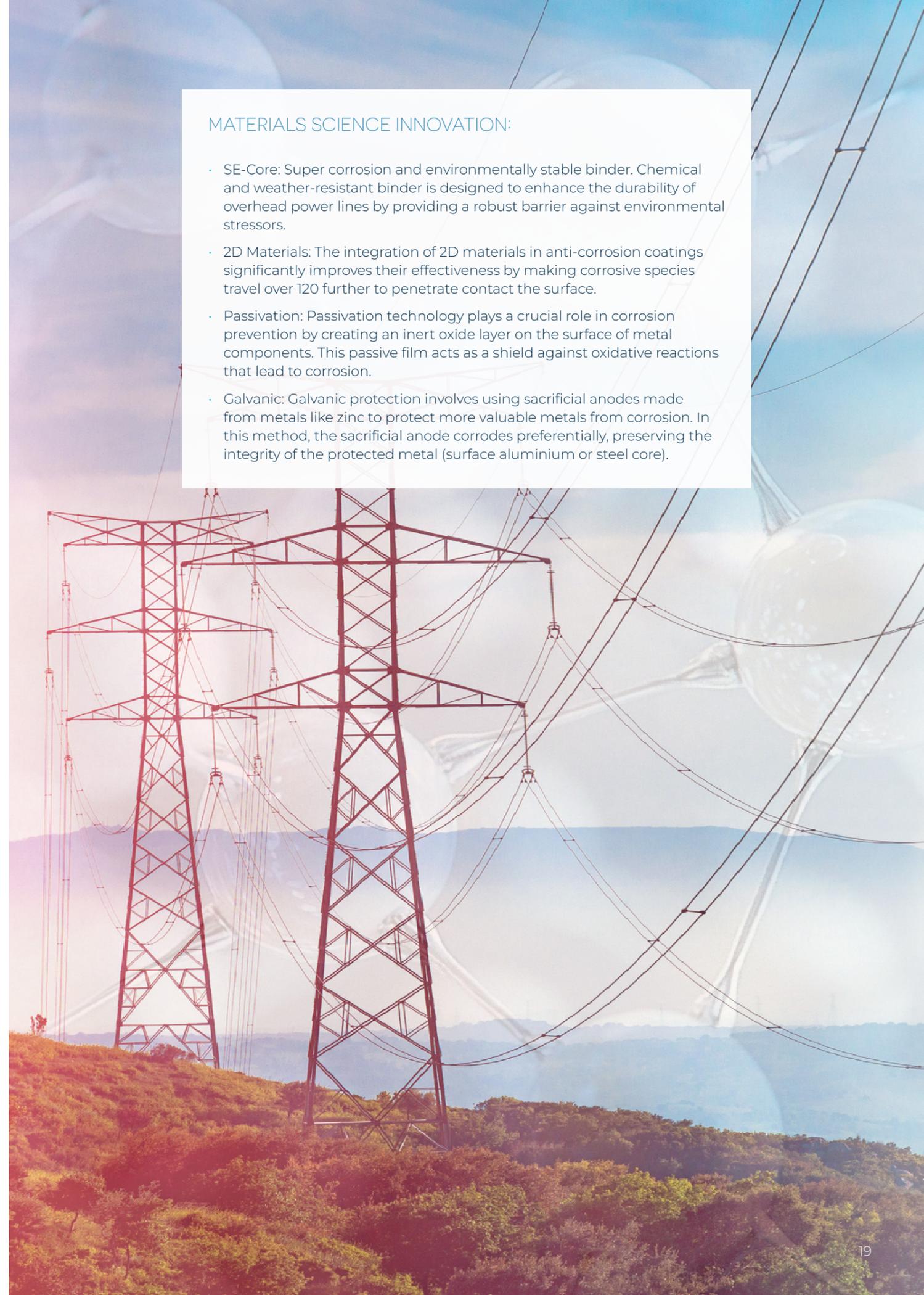
SE03

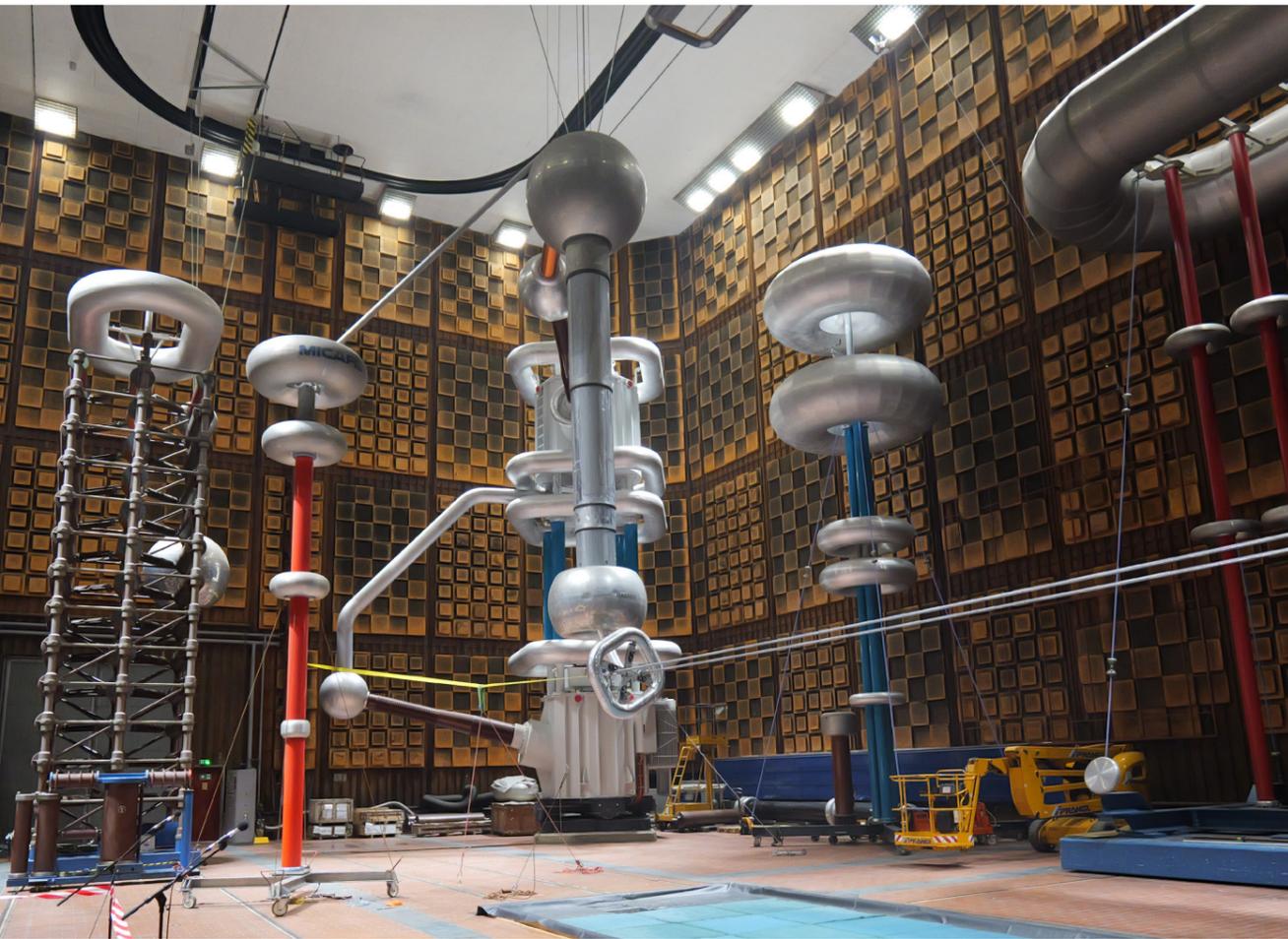
ANTI-CORROSION COATING FOR OVERHEAD CONDUCTORS

- Overhead power lines face significant challenges due to corrosion, particularly in aggressive environments such as deserts, coastal regions, and industrial areas. Corrosion is a major issue as it can lead to the deterioration of conductors, resulting in reduced efficiency and potential power failures. In coastal and marine environments, the presence of salt in the air accelerates corrosion, compromising the structural integrity of power lines over time.
- AssetCool's SE03, a triple effect anti-corrosion coating offers an effective solution to overhead power line corrosion in harsh environments like deserts, coastal, and industrial areas. This coating utilizes 2D materials, passivation technology, and galvanic zinc to significantly reduce the contact of corrosive species with the conductor's surface and core.

MATERIALS SCIENCE INNOVATION:

- SE-Core: Super corrosion and environmentally stable binder. Chemical and weather-resistant binder is designed to enhance the durability of overhead power lines by providing a robust barrier against environmental stressors.
- 2D Materials: The integration of 2D materials in anti-corrosion coatings significantly improves their effectiveness by making corrosive species travel over 120 further to penetrate contact the surface.
- Passivation: Passivation technology plays a crucial role in corrosion prevention by creating an inert oxide layer on the surface of metal components. This passive film acts as a shield against oxidative reactions that lead to corrosion.
- Galvanic: Galvanic protection involves using sacrificial anodes made from metals like zinc to protect more valuable metals from corrosion. In this method, the sacrificial anode corrodes preferentially, preserving the integrity of the protected metal (surface aluminium or steel core).





SE05 SUPERHYDROPHILIC CONDUCTOR COATING

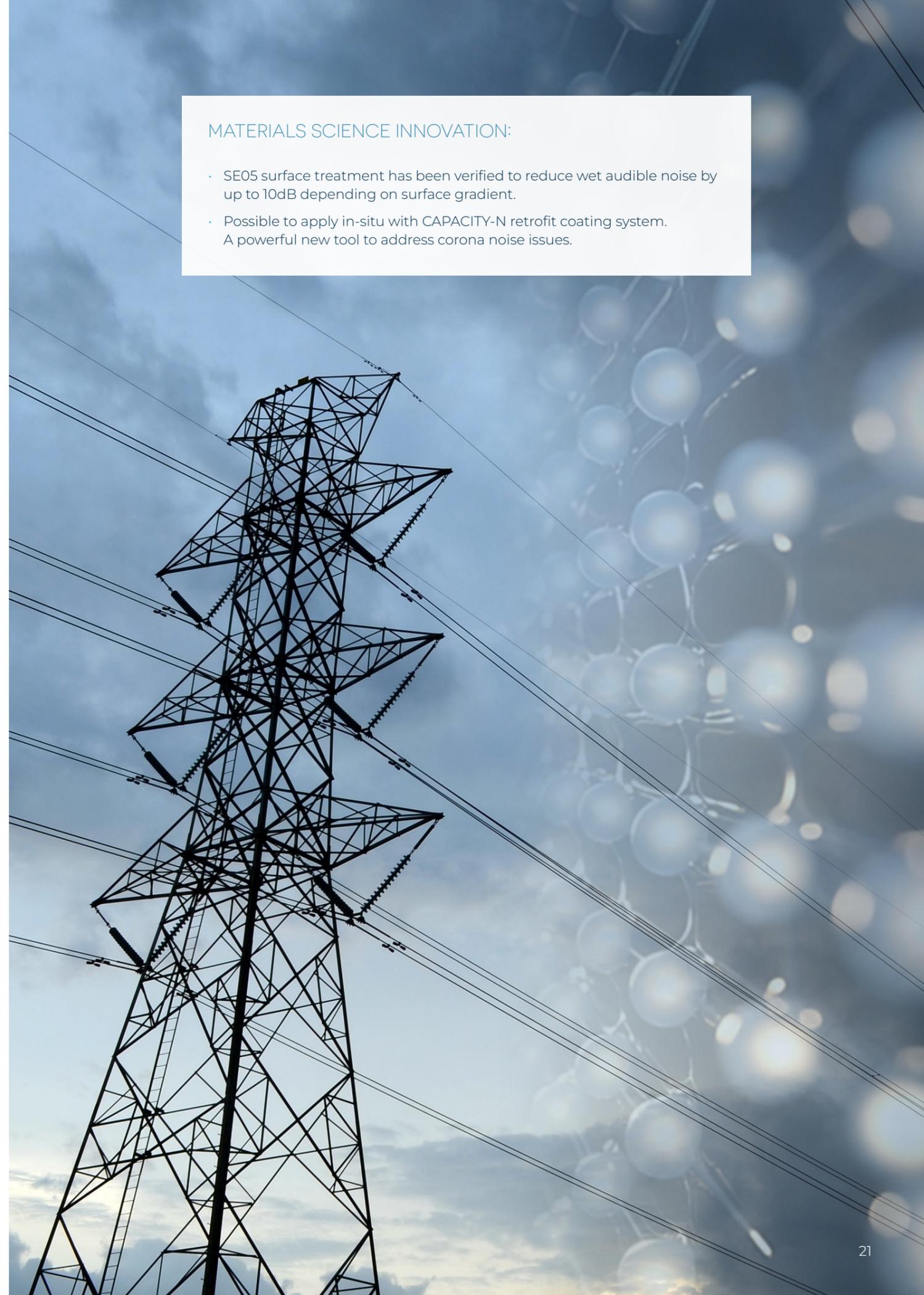
Rain, fog, and high humidity. When these conditions are present, the lines experience an increase in corona discharge, a phenomenon where ionization occurs around the conductor due to high voltage. This ionization is exacerbated by water droplets on the lines, leading to a significant increase in audible corona noise. This wet audible corona noise can cause disruptions for nearby communities, violate noise regulations, and indicate potential energy loss due to inefficient operation of the power lines.

AssetCool SE05 is an advanced superhydrophilic inorganic nano coating specifically engineered to address the problem of wet audible corona noise on overhead power lines. The SE05 coating transforms the surface properties of the lines, allowing them to become superhydrophilic, which means water spreads quickly and uniformly across the surface instead of forming droplets.



MATERIALS SCIENCE INNOVATION:

- SE05 surface treatment has been verified to reduce wet audible noise by up to 10dB depending on surface gradient.
- Possible to apply in-situ with CAPACITY-N retrofit coating system. A powerful new tool to address corona noise issues.





CABLE MANUFACTURING PARTNERSHIP

Application of functional coatings to conductors at the point of manufacture allows for the production of higher performance and more efficient conductors.

At AssetCool, we have invested heavily in developing dedicated Manufacturing Engineering competences and apply these in cable manufacturing partnerships.

With a focus on innovation and efficiency, the corner stone is "CAM-ACU" Coating Application Module - Accelerated Curing Unit Processing line, a state-of-the-art solution capable of achieving production speeds of over 20 meters per minute for continuous coating and curing, ensuring that every product meets the highest quality standards.

ASSETCOOL PARTNERSHIP CAN OFFER:

CAM-ACU Technology: Modular, scalable production line designed specifically for coating overhead conductors in a roll to roll fashion.

Manufacturing Engineering Services:

As part of the partnership, we continue to bring our iterative design and innovation, driving efficiency, increasing throughput, improving margins. SOP Documentation and QA/QC: Rigorous standard operating procedure (SOP) documentation is at the heart of our operations.

Proven Scalability:

Transmission scale projects have already been manufactured and installed and the technology is being rapidly adopted by a global network of cable manufacturing partners.

Power System Expertise:

AssetCool is native to the power systems space, so can collaborate deeply on coated conductor marketing, value proposition and drive sales to conductor manufacturers.

GET IN TOUCH NOW

One of our core values is collegiality in innovation. It would be a pleasure to hear from you and provide any more information you need.

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