

Laborelec

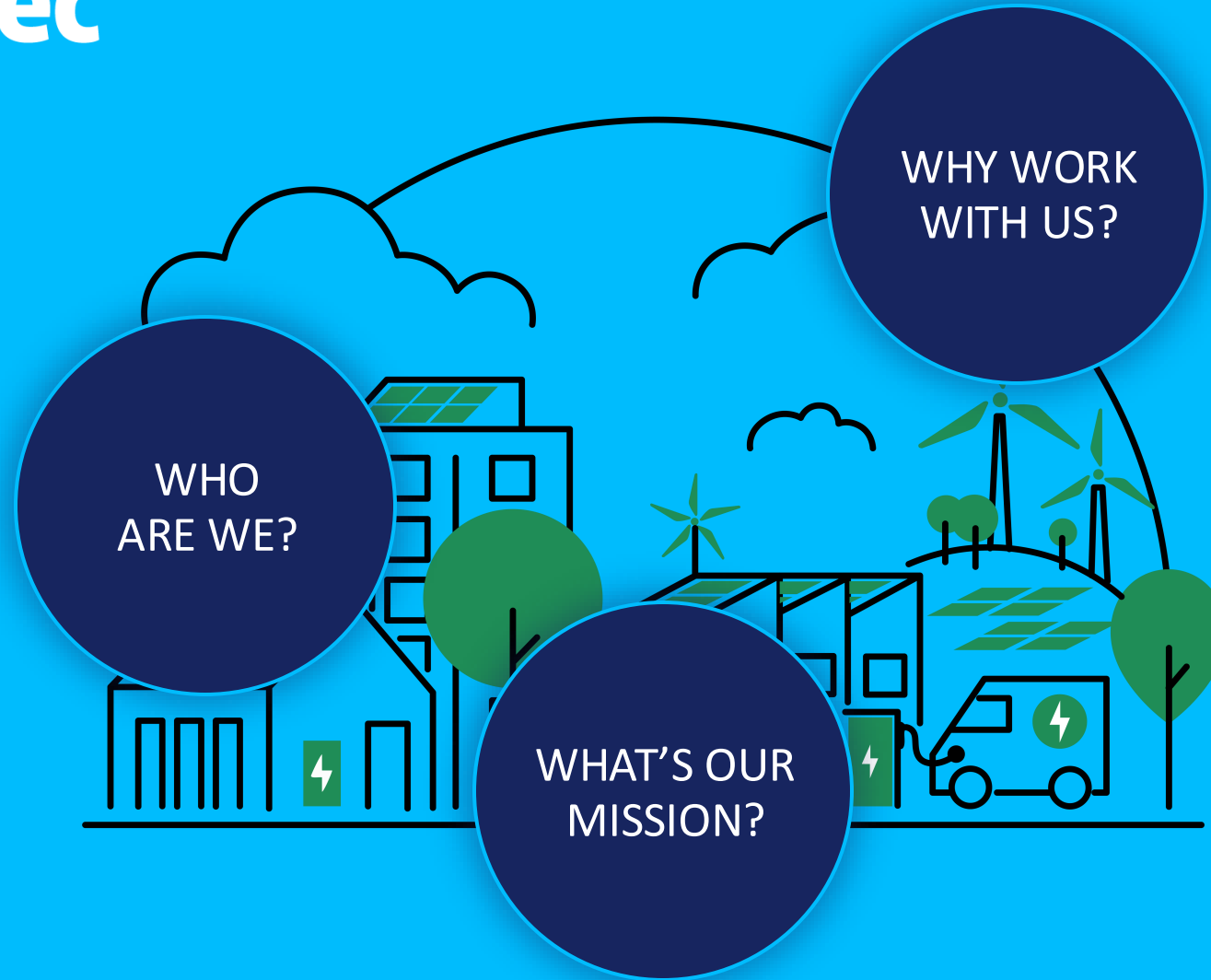
RESEARCH & INNOVATION

OUR COMPREHENSIVE OFFERINGS
IN RENEWABLE ENERGY



Laborelec

RESEARCH & INNOVATION



WHO ARE WE?

Laborelec is a centre of expertise at the forefront of advancing renewable energy solutions, driving innovations and sustainability in the energy sector.



OUR EXPERTISE

Expertise & Know-How
are at the heart of our organization

Expertise
in Renewables

Storage
Expertise

Hybridisation
Expertise

Expertise in Renewables

Laborelec delivers specialist services and R&D for renewable-energy assets and their seamless integration into power grids, focusing on asset performance, interoperability and grid stability.

It leverages cutting-edge technology to optimize renewable returns and support the transition towards a sustainable energy future.





Expertise in Wind Energy

- Assessment and validation of emerging wind technologies
- Wind-resource assessment
- Performance assessment
- Energy yield assessment
- Structural Health & Monitoring
- Aeroelastic analysis
- Condition monitoring & troubleshooting (cabling, transformers, inverters,...)
- Wind farm control optimization
- End-of-Warranty inspections

Expertise in Solar Energy

- Testing emerging PV technologies (including pilot projects)
- PV Design & Performance
- Performance Monitoring & Improvement
- Repowering and Revamping





Storage expertise

- Lab testing, technology assessments and product benchmarking
- Technical qualification / audits
- Project sizing and development
- Safety risks mitigation
- Advanced diagnostics for asset health & performance

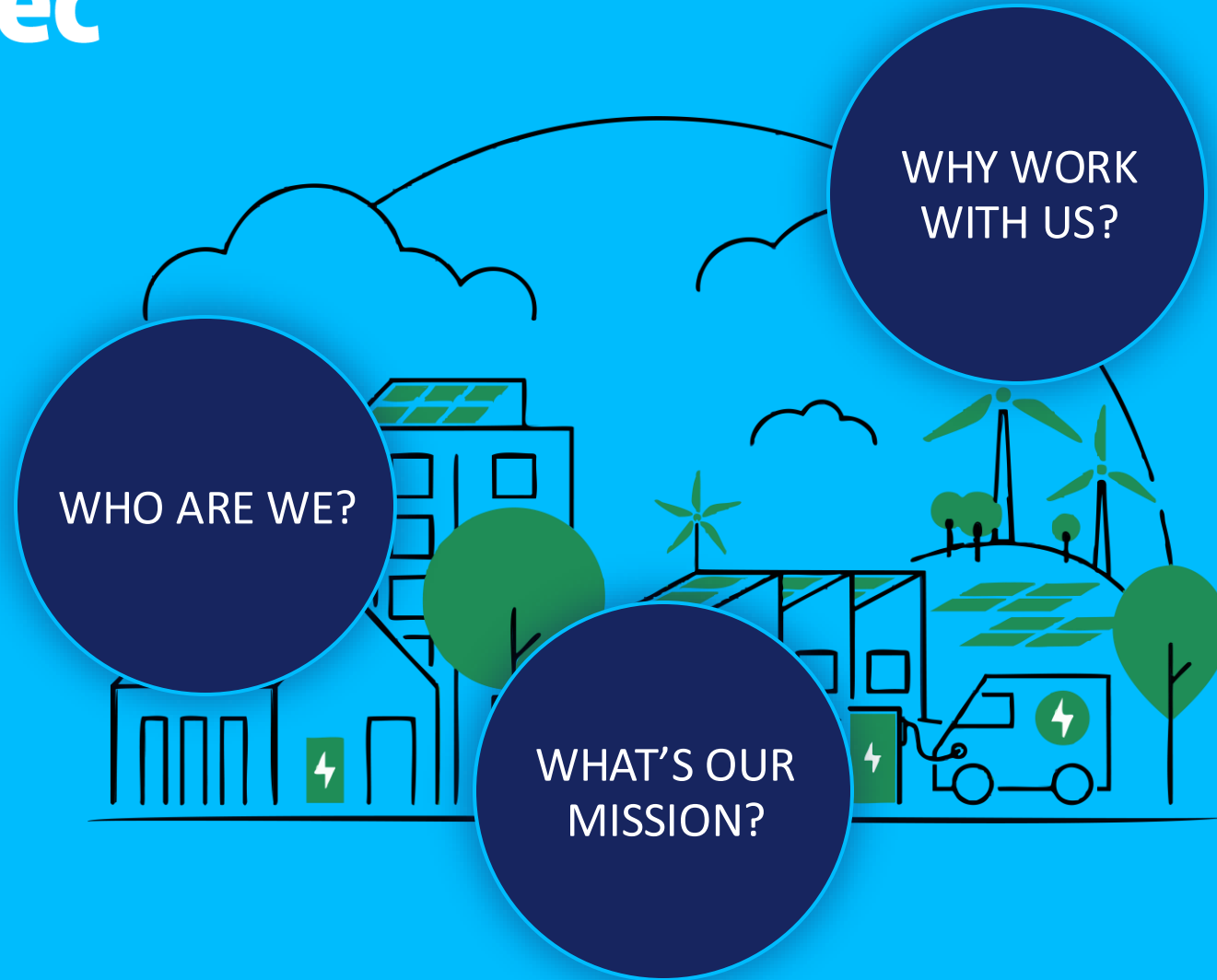


Hybridisation expertise

- Greenfield hybrid system sizing & design optimization
- Retrofit integration & upgrade of existing renewable-storage assets
- Power-plant controller & EMS testing and validation
- Operational performance management, real-time monitoring & diagnostics

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WHAT'S OUR MISSION?

Engie Laborelec's vision is to lead the energy transition by advancing sustainable energy technologies and practices.

Its mission focuses on providing innovative solutions and expertise to create a reliable, clean energy future for all stakeholders.

Laborelec

RESEARCH & INNOVATION



WHY WORK WITH US?

- Single point of contact from offer to project completion
- Multi-disciplinary services by 10+ experts and 50+ collaborators
- Innovative co-construction solutions tailored to project needs
- Proximity and flexibility with quick on-site and remote services
- 60+ years of research & operational expertise in wind projects
- Total confidentiality

Trusted by our clients globally

Energy companies, IPPs, developers, asset managers



Transmission System Operator, Grid Operator



GOs, MDBs, FIs, Industry



OUR MULTIDISCIPLINARY APPROACH

Global, cross-domain
teams delivering
end-to-end energy solutions



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RESEARCH & INNOVATION

THE SOLAR LAB

Our Solar Lab team delivers rigorous testing, performance validation and expert guidance to ensure reliable, high-yield solar installations—from rooftop plots to utility-scale parks.

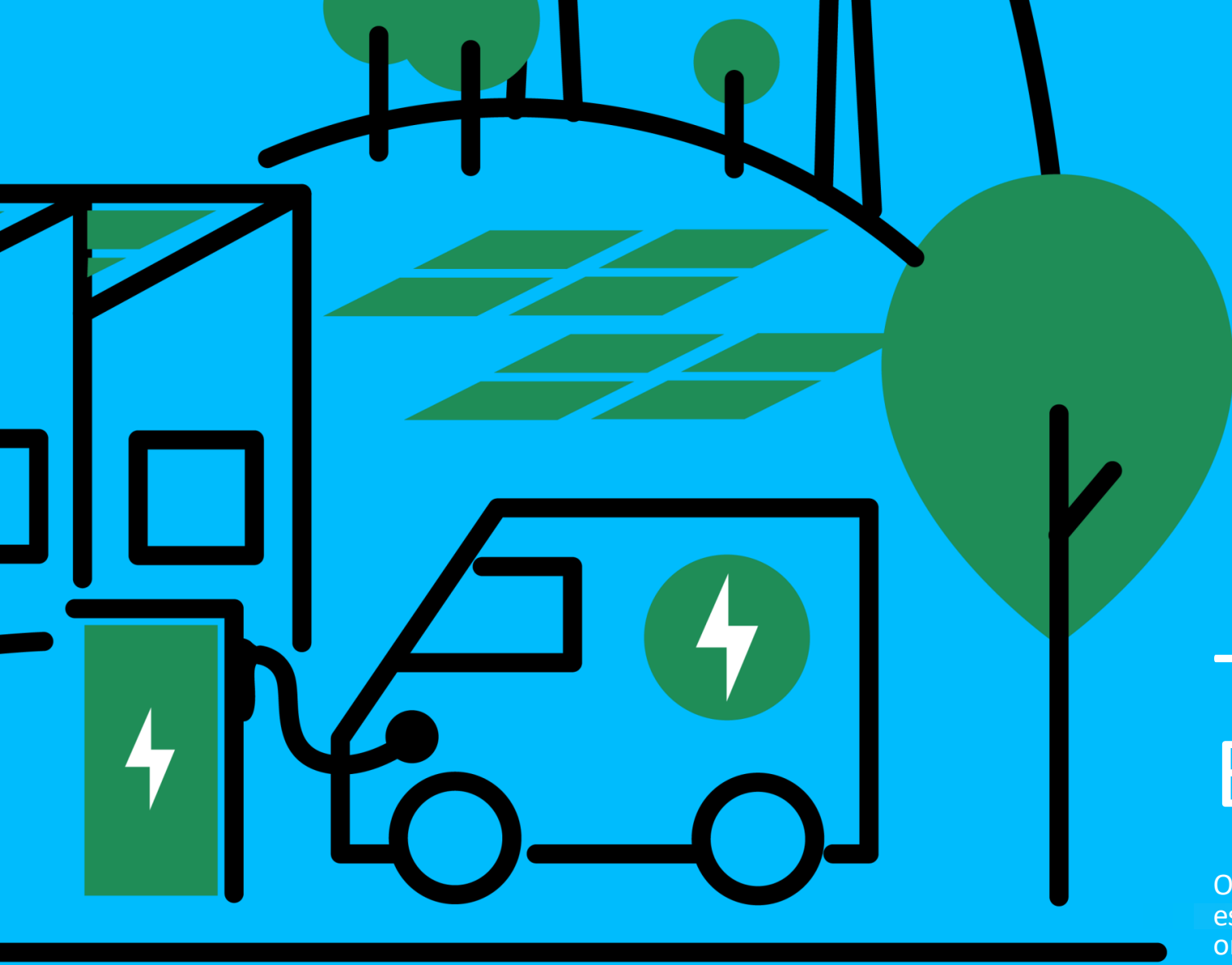
THE WIND LAB

Our Wind Lab team delivers rigorous component testing, performance validation and expert guidance to ensure reliable, high-efficiency wind energy solutions—from individual turbines to utility-scale wind farms.

THE BATTERY LAB

Our team of experts provide valuable expertise essential to a successful and durable project on both small and large scale.





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Our
mission



Our
expertise



Our mission

Technology

We evaluate emerging battery technologies and tailor optimal solutions for every project.

Risk management

We conduct comprehensive risk assessments and implement mitigation strategies to ensure reliable, high-performance storage assets.

Technical and safety guidelines

We develop rigorous technical specifications and safety protocols to guarantee regulatory compliance and protect people and equipment.

Operational excellence

We provide full-lifecycle support—performance monitoring, root-cause analysis and operator training—to maximize uptime and return on investment.

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Our expertise

Technical expertise at every stage of your project, from origination to operation.



Feasibility



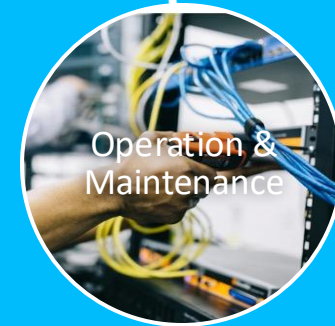
Business Development



Design & work presentation



Realization



Operation & Maintenance



Our expertise

The diagram features a central title 'Our expertise' at the top. A vertical line descends from a small circle below the title, then branches horizontally to the left and right. From the left branch, a vertical line leads to a dark blue box titled 'KNOW HOW'. From the right branch, a vertical line leads to a light blue box titled 'SERVICES'. The 'KNOW HOW' box contains four bullet points, and the 'SERVICES' box contains four bullet points.

Laborelec is your reliable partner during business development.

KNOW HOW

- Deep market insight into BESS products and integrators
- In-house Battery Lab for cell & module performance testing
- Hands-on operational expertise with on-site commissioning and support
- Management of pioneering pilot projects from concept through deployment

SERVICES

- Development of BESS technical specifications & tender dossiers
- Expert support during tendering, bid evaluation & technical reviews
- Contractual advisory on warranties, LTSA terms and digital services
- Compliance assessment against industry norms, standards & certifications

Our expertise

Laborelec supports you to reach your OPS targets in numerous ways.



Operational safety and safety by design



Health and Performance diagnostics for BESS



PCS and Inverter RCA's



Transformer monitoring



Commissioning support



Cell testing & benchmarking

Laborelec

RESEARCH & INNOVATION

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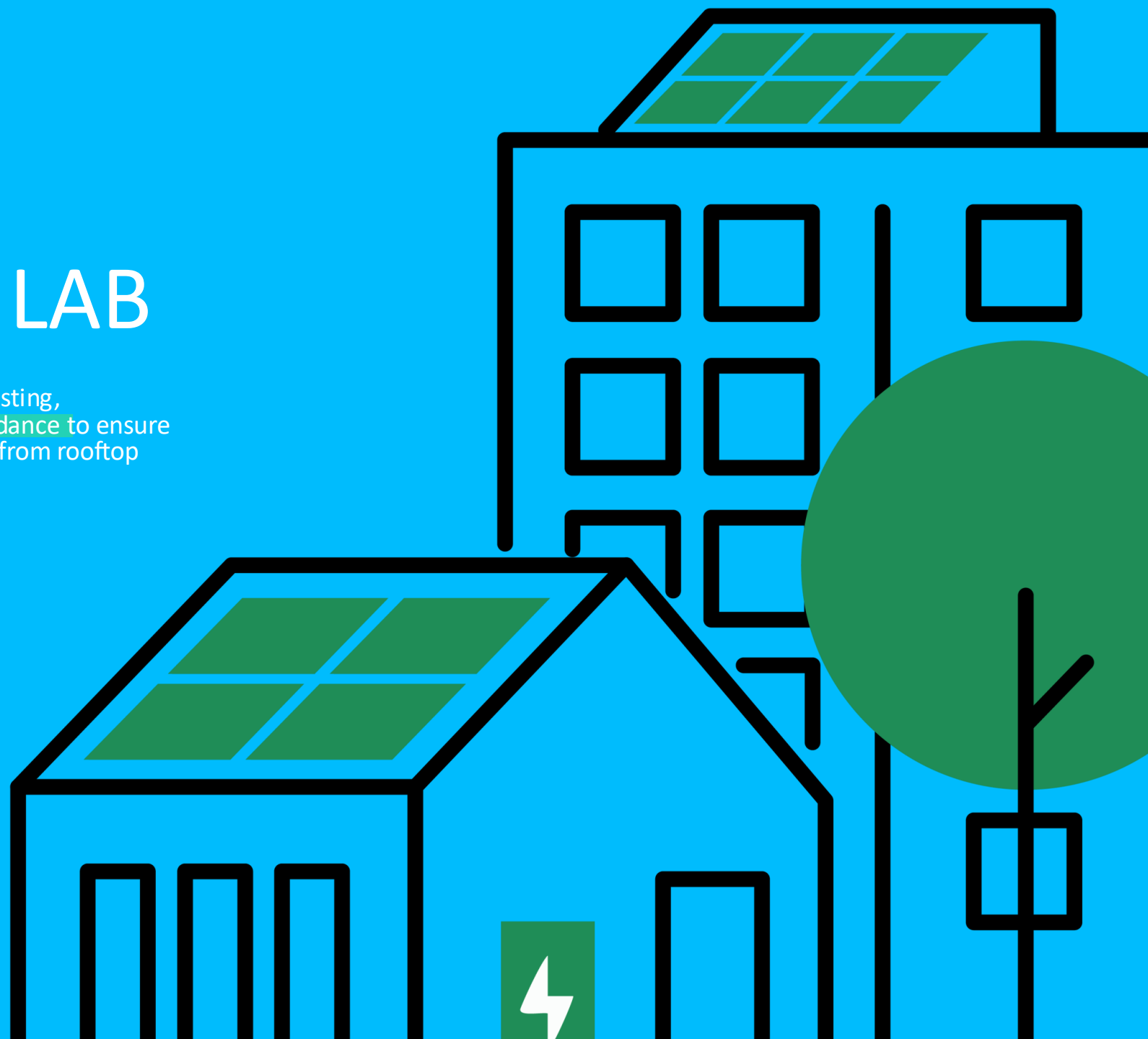
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● Expertise over entire asset lifecycle

● Asset-wide expertise

● Expertise over entire
asset lifecycle



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Asset-wide expertise

Asset-wide expertise



Sub system level expertise

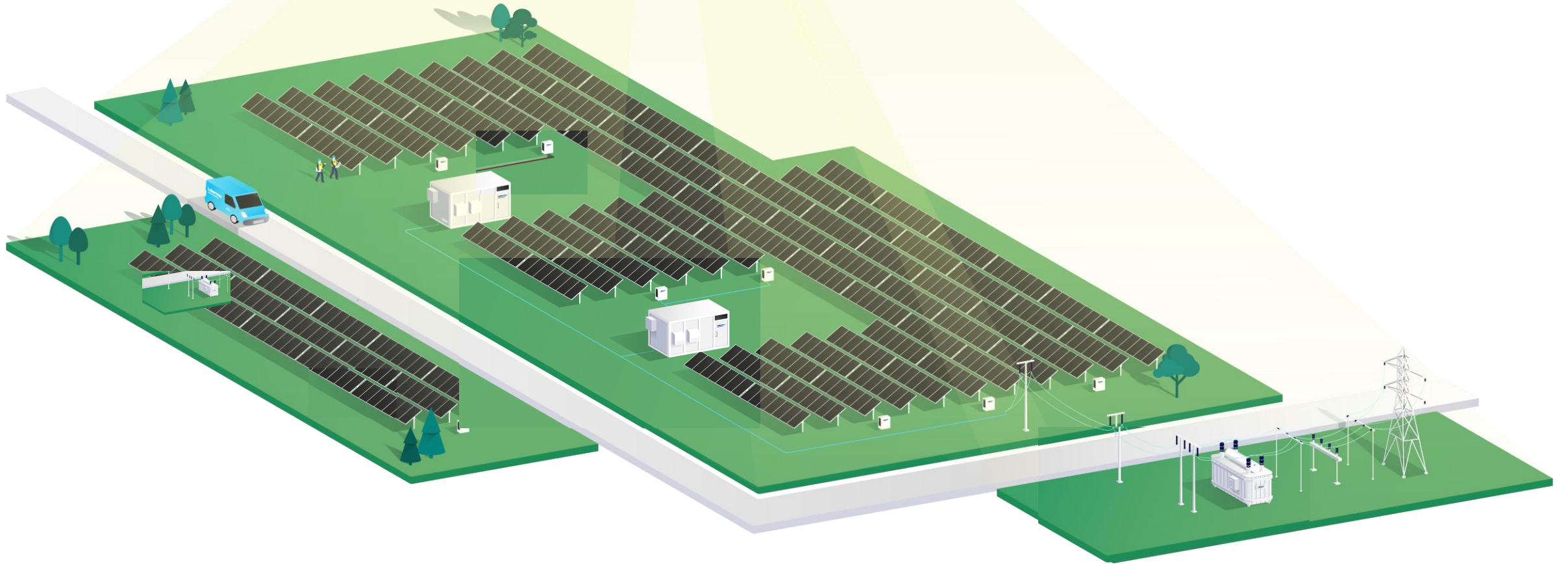
Dedicated specialists in PV modules, inverters, trackers and balance-of-system components—ensuring each building block delivers peak performance and reliability.



Asset level expertise

Dedicated PV plant experts who integrate sub-systems into optimized layouts, deploy advanced control and performance-analysis solutions, and implement best-in-class O&M practices to maximize energy yield and lifecycle value.

Sub system
level expertise



PV STRUCTURES AND FOUNDATIONS

We enhance asset availability, extend lifetime and optimize production.

From supplier selection to structural integrity, we ensure your trackers and foundations perform at their best.

- Supplier Due Diligence & Corrosion Risk Assessment
- Lab testing and On-Site Corrosion Inspections and testing
- Design Validation, Material Selection & Structural Load Analysis
- Non-Destructive Testing and Maintenance Plans
- RCA, Corrosion Mitigation & Structural Integrity Assessment
- Concrete Rehabilitation and Repairs

BENEFITS OF WORKING WITH LABORELEC



Structure lifetime increase after LBE intervention: ~ 10 years



More than 1,2 GW in Mechanic and Structure Services per year



~4 month turnaround from problem to solution (RCA, Lab tests and site testing)

INVERTER TRANSFORMER STATIONS

Responsible for up to 80% of the performance loss rate in solar pv systems, your ITS plays a crucial role in maximizing efficiency.

We ensure efficient design, compliance and long-term performance through.

- Design Review, Control Strategy & Component Optimization
- Performance Monitoring and Control System Updates
- Failure Analysis & RCA
- Transformer Oil Monitoring (Laborelec OneBoard)

BENEFITS OF WORKING WITH LABORELEC



Extensive Power Networks/Inverter Lab and testing equipment



More than 2 GW in Electrical Services per year



Industry leading OneBoard Oil Monitoring



MV/HV TRANSFORMERS & SWITCHGEAR

A Transformer or Switchgear Failure is critical. We ensure efficient design, compliance and long-term performance through:

- Expert Oil Condition Monitoring with Proprietary OneBoard
- Unused Transformer Oil Testing
- Transformer Fleet Management
- OCM and ELEC testing programs
- RCA and Failure Analysis

BENEFITS OF WORKING WITH LABORELEC



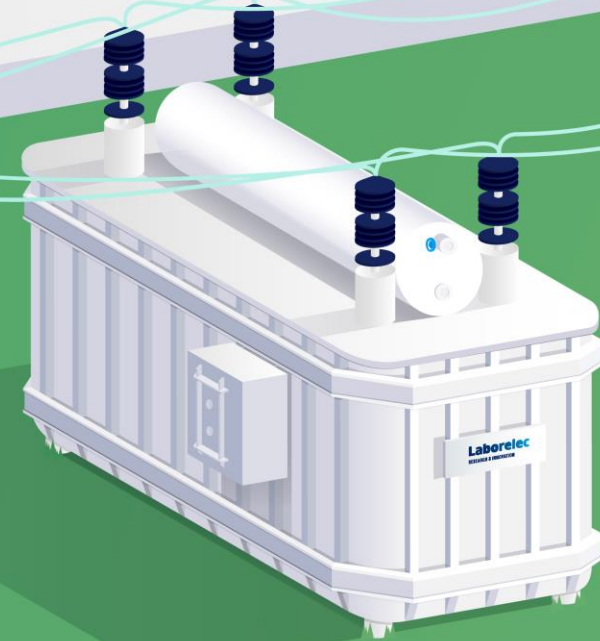
Accredited oil analysis lab, which performs 50 different analytical insulating oil tests



15.000 transformers are monitored at this time



Industry leading OneBoard Oil Monitoring



LV ELECTRICAL BOS

Connectors cables and fuses are often overlooked but are a significant cause of downtime and Riso failures.

We ensure efficient design, compliance and long-term performance through:

- Material Selection and Design Review
- RCAs and Failure Analysis
- Cable and Fuse Quality Assurance
- Insulation Diagnostics, Aging Lab Studies and Lab Tests & Loss Reduction
- Chemical Analysis
- Remaining Life-Time Analysis

BENEFITS OF WORKING WITH LABORELEC



4 Dedicated Materials
Labs for every possible material investigation



Multiple GWs of Cable / Fuse Services for OEMS, IPPS and SOs



Technical Refrente on the largest Nuclear, Wind and Solar sites



PV MODULES, TESTING & INSPECTIONS

We provide insight, quality assurance and optimal performance for the most critical component of your asset:

- PV Module RCAs
- Prevention and Mitigation of Potential Induced Degradation
- Advanced Field Inspection Services
- IV Curve Tracing & Analysis
- IR & EL Imaging Diagnostics
- Soiling Measurements (Soiling Management)

BENEFITS OF WORKING WITH LABORELEC



2 of the largest outdoor labs in the world, in both Chile and Belgium



> 1 GW in PV Module Expertise Services per year



100% Success Rate in Degradation Mitigation and/or claim compensation

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● Expertise over entire asset lifecycle



● Asset-wide expertise

Asset-wide expertise



Sub system level expertise

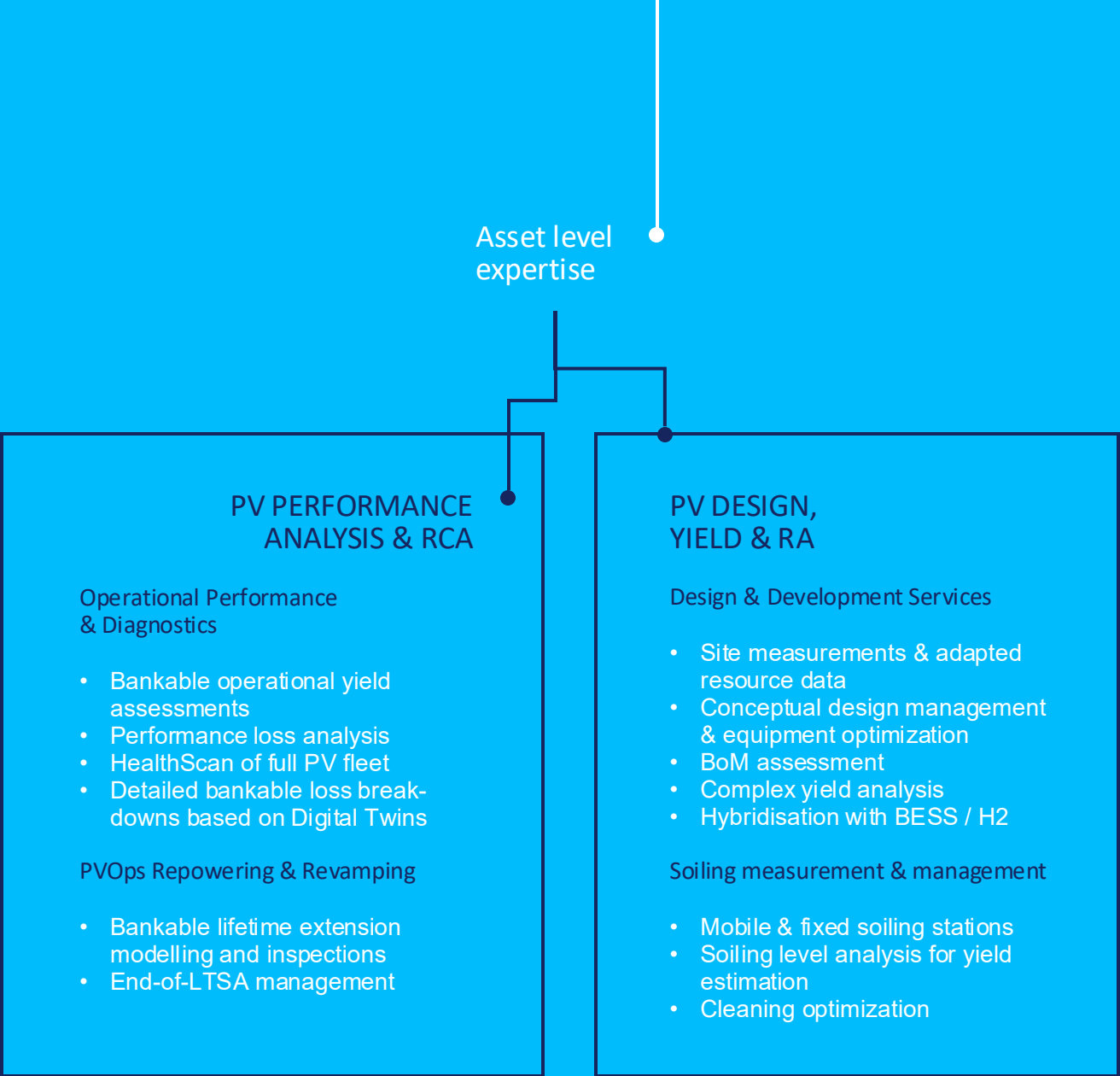
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Asset level
expertise



PV PERFORMANCE ANALYSIS & RCA

Operational Performance & Diagnostics

- Bankable operational yield assessments
- Performance loss analysis
- HealthScan of full PV fleet
- Detailed bankable loss breakdowns based on Digital Twins

PVOps Repowering & Revamping

- Bankable lifetime extension modelling and inspections
- End-of-LTSA management

PV DESIGN, YIELD & RA

Design & Development Services

- Site measurements & adapted resource data
- Conceptual design management & equipment optimization
- BoM assessment
- Complex yield analysis
- Hybridisation with BESS / H2

Soiling measurement & management

- Mobile & fixed soiling stations
- Soiling level analysis for yield estimation
- Cleaning optimization

Asset level
expertise

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BENEFITS OF WORKING WITH LABORELEC



Average recoverable
underperformance
more than 4% per year



More than 1 GW per year of
assets analysed for internal
and lender reporting



**Patented Fleet HealthScan,
Lossbreakdown and
PVOps algorithms**

Asset level
expertise

PV PERFORMANCE ANALYSIS & RCA

Operational Performance & Diagnostics

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Asset level
expertise

BENEFITS OF WORKING WITH LABORELEC



Up to 6% reduction
in LCoE, achieved by
Laborelec services



More than 4 GW in design,
yield and development
services annually



**Patented Soiling
Management Solution**

PV DESIGN, YIELD & RA

Design & Development Services

- Site measurements & adapted resource data
- Conceptual design management & equipment optimization
- BoM assessment
- Complex yield analysis
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Soiling measurement & management

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Laborelec

RESEARCH & INNOVATION

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THE WIND LAB

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THE BATTERY LAB

Our team of experts provide valuable expertise essential to a successful and durable project, on both small and large scale.



A stylized illustration on a bright blue background. It features two green wind turbines with three blades each, mounted on black lattice towers. To the left of the turbines are three green circular shapes representing trees. In the foreground, there are green rectangular panels arranged in a grid, representing solar panels. A large green circle is positioned at the bottom right, partially overlapping the solar panels. A thick black curved line arches over the scene, possibly representing a horizon or a structural element.

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● Expertise
over entire
asset lifecycle

The diagram features a horizontal line with three dark blue circles. From each circle, a vertical line extends downwards. The text for each pillar is positioned to the right of its respective vertical line.

● Our value
proposition

● Our four pillars
of expertise

Expertise over entire asset lifecycle

With our technical expertise, Laborelec guides you all along your project from origination to repowering.

Development phase

Resource measurement & environmental monitoring

LIDAR (basement/nacelle)
Met Mast

Design

Design review

Due diligence
Review of equipment spec
Factory audits

Operation and Maintenance

Performance and lifetime assessment

YAW Scan
North alignment
Pitch misalignment
Power curve assessments
End of Warranty inspect

Failure Management

Multidisciplinary RCA

Electrical
Mechanical
Materials
Corrosion/coating

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● Expertise
over entire
asset lifecycle

● Our Value
proposition

● Our four pillars
of expertise

○ Our Value proposition



PROJECT
PLANNING



OPERATIONAL
STATUS



WARRANTY
EXPIRATION



FAILURE
MANAGEMENT

PROJECT PLANNING

We support and advise you in all preliminary steps to evaluate the relevance and profitability of your project and reassure your potential investors.



○ Our Value proposition



PROJECT
PLANNING



OPERATIONAL
STATUS



WARRANTY
EXPIRATION



FAILURE
MANAGEMENT

OPERATIONAL STATUS

We analyse your assets and make recommendations to improve their performance and reduce unplanned costs.



○ Our Value proposition



PROJECT
PLANNING



OPERATIONAL
STATUS



WARRANTY
EXPIRATION



FAILURE
MANAGEMENT

WARRANTY EXPIRATION

We conduct all the necessary inspections for condition assessment and mitigate the risk of unplanned costs and failures.



○ Our Value proposition



PROJECT
PLANNING



OPERATIONAL
STATUS



WARRANTY
EXPIRATION



FAILURE
MANAGEMENT

FAILURE MANAGEMENT

We perform a quick assessment of your wind farm's failures to determine the causes and guide you to take corrective measures.



○ Our Value proposition



PROJECT
PLANNING



OPERATIONAL
STATUS



WARRANTY
EXPIRATION



FAILURE
MANAGEMENT

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● Expertise
over entire
asset lifecycle

● Our Value
proposition

● Our four pillars of
expertise

Our four pillars of expertise

Laborelec maximizes
your asset's potential.



Optimized Performance
and Profitability



Underperformance and
Downtime Risk Prevention



Failure Analysis



Innovation

Our four pillars of expertise



Optimized Performance
and Profitability

We optimise the long-term performance and profitability of your current or future wind farm.

Included services

- Wind resource assessment (LIDAR)
- Performance validation and optimization
- YAW Misalignment
- North alignment
- Power Curve Assessment
- O&M optimization: get the most out of your asset and contracts



Underperformance and
Downtime Risk Prevention



Failure Analysis

● Our four pillars of expertise



Optimized Performance
and Profitability



Underperformance and
Downtime Risk Prevention



Failure Analysis



Innovation

Our four pillars of expertise



Optimized Performance
and Profitability



Underperformance and
Downtime Risk Prevention

We reduce the uncertainty
due to the risk of failures and
outages at your wind farm.

Included services

- EoW Inspections
(Gearbox, Generator, Oil analysis)
- Blade Inspections
- Corrosion, coating expertise, vibration
- CyberSecurity of Offshore assets



Failure /

● Our four pillars of expertise



Optimized Performance
and Profitability



Underperformance and
Downtime Risk Prevention



Failure Analysis



Innovation

Our four pillars of expertise

We rapidly identify underperformance and outages at your wind farm.

Included services

- RCA of failures / RCA of assets:
Transformer, Switchgear,
Cables & connectors



Failure Analysis



Innovation

Performance and
Risk Prevention

● Our four pillars of expertise



Optimized Performance
and Profitability



Underperformance and
Downtime Risk Prevention



Failure Analysis



Innovation

Our four pillars of expertise



Performance and Risk Prevention



Failure Analysis

We co-construct innovative solutions tailored to your asset's future challenges.

Included services

- Deployment & validation of novel solutions



Innovation

● Our four pillars of expertise



Optimized Performance
and Profitability



Underperformance and
Downtime Risk Prevention



Failure Analysis



Innovation

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