solute

Multidisciplinary technical engineering consultancy

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About solute

About solute

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Multidisciplinary engineering consultancy

+120	20	12
employees in 4 offices	years of experience	areas of knowledge

- **Multidisciplinar**: work in more than 6 industries and 12 areas of knowledge
- **International**: projects and collaborations on a global scale
- **Innovation**: R&D as SOLUTE's backbone

ISO 9001 ISO 27001 ISO 14001 ISO 45001

PYME INNOVADORA

International presence

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Europe

Portugal
Spain
France
Italy
UK
Poland
Sweden
Netherlands
Lithuania
Serbia
Turkey
Germany
Denmark
Finland
Austria
Romania

North & South America

USA
Canada
Mexico
Colombia
Ecuador
Peru
Brazil
Uruguay
Argentina
Chile

Africa & Middle East

Morocco
South Africa
Saudi Arabia
UAE
Tanzania
Oman
Tunisia
Jordan

Asia & Ocenia

India
China
Australia

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About TSRWIND

About TSRWIND

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2008 founded | 10-20 employees | Acquired by SOLUTE (2022)

Robotics and engineering applied to O&M within the wind energy industry (wind turbine inspection)

Eolos
Blade external inspection

Cerberus
Blade internal inspection

Kratos
Tower welding inspection

About TSRWIND

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Eolos

External blade inspection

- Complete blade surface photographing (4 surfaces per blade)
- Remote control magnetic platform
- High resolution device with powerful optical zoom and minimum distance between camera and blade
- Single picture mapping by photo processing
- Capable of inspecting an average of 5 wtg/day
- Allows systematic observation of blade aging

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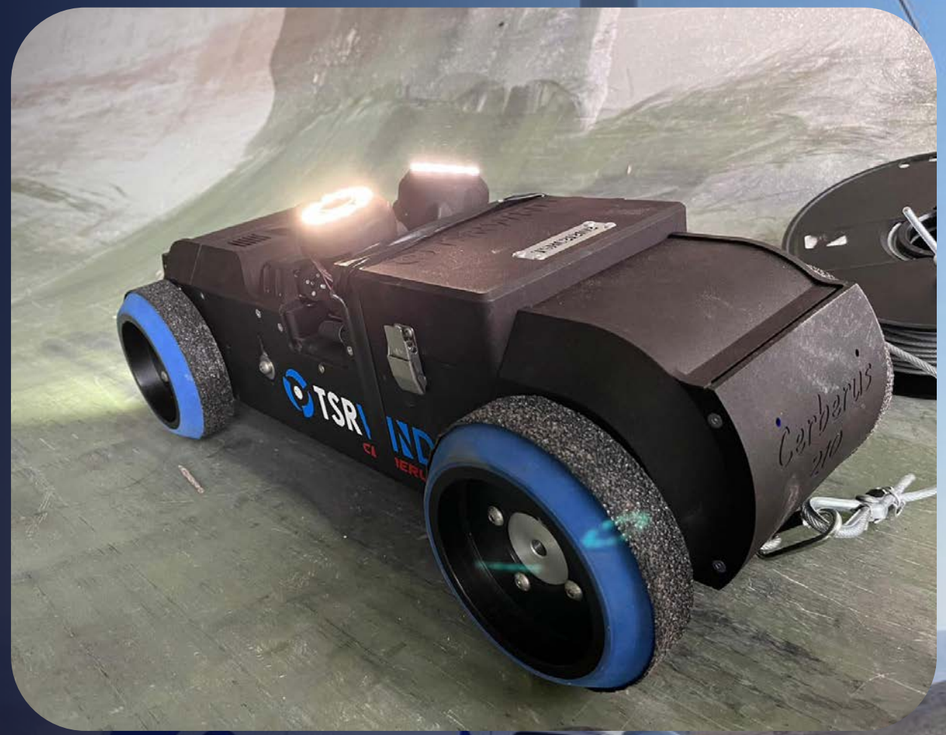
Cerberus

Internal blade inspection

- The robot has 2 moving high resolution lateral cameras with led lighting and 1 additional camera in the front for direction.
- TSR Inspector adds on the video the distance to the root and allows to estimate the dimension of the damages found.
- New functionalities could be developed according to the client's needs
- This device enables deep inspection into the blade
- Reduced inspection time 1 to 2 wtg/day
- Employee safety



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Kratos

Tower weldings inspection

- Bidirectional magnetic coupling robot. Climbs any metallic surface following the welding cords.
- Operates autonomously always records its location. The operator can take control over at any time if necessary.
- Powerful industrial device with phase array and TOFD technology.
- Ready to attach other tools and perform other types of work according to the client needs.
- Data acquired can be supervised in real time or downloaded to be inspected later.

Our capabilities and sectors

Capabilities and sectors

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Sectors

Energy
Wind
Solar
Nuclear
Others

Transport
Automotive
Railway
Aerospace

Software solutions

Machinery industries

Meteorology

Heavy industries

Areas

Mechanical loads analysis

Wind resource assessment

Operation & maintenance

Structural mechanics

Weather forecasting

Energy forecasting

Software engineering

Electrical engineering

Civil engineering

Virtualization

CFD

Artificial intelligence

Wind and solar energy

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Advanced technical solutions within all phases of a wind energy development project

Wind Data

- Meteorological analysis of a site
- Design, installation, and management of campaigns
- Pre-feasibility studies or preliminary assessements
- Meteorological and SCADA analysis for root cause analysis (RCA)
- More than 230 campaings managed in the last three years

WRA & micrositing

- WRA for developers, operators, and manufacturers
- EYA and SCA
- Layout optimization (energy & economics including preliminary electrical and civil)
- Repowering
- Terrain assessment (IEC 61400-12)
- Economical and financial analysis
- Micrositing studies (electrical losses, shadow flicker, noise analysis, WSM design, bats and birds analysis, derrating, among others)

Wind and solar energy

solute

Advanced technical solutions within all phases of a wind energy development project

Other capabilities

- Permitting
- Hybrid plant studies (wind and solar) with the SRA team
- MLA analysis
- Development of basic and detail engineering projects with the support of several teams

Furow

- Complete wind resource assessment software

furow

Wind and solar energy

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Aerolastic loads calculations

- Creation of aeroelastic models.
- Control adjustments.
- Natural frequencies analysis using Campbell diagrams.
- Calculation of extreme and fatigue loads according to certification standards IEC and DIBt.
- Post-processing of the calculated loads.
- Development and application of load reduction strategies.
- Detailed analysis of the design driving extreme and fatigue DLCs.
- Creation of certification loading documents.
- Elaboration of load comparison documents for different machinery components.
- Communication and agreement reach with the certification authority (TÜV Nord/DNV).
- Power curve calculation for certification and site-specific conditions. AEP analysis and control strategies influence.

Nuclear

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Nuclear engineering services

Detailed design of nuclear plants in civil engineering field:

- Design of commercial reactors under the American nuclear standards.
- Design and evaluation of structural components under nuclear standards.
- Design of the containment building for the nuclear reactor.
- Design of electrical supports under nuclear standards.

Design of electrical systems within nuclear plants under the American nuclear standards:

- 2D/3D rendering.
- Design of electrical cable routing systems.

Construction assistance at nuclear plants in execution:

- Provide solutions and generate changes to the original design of structural components to solve deviations of design failures.

Structural dimensioning of the nuclear island (containment building, auxiliary building and foundations)

Calculations of resistance of different areas of the plant

Engineering support for decommissioning projects. Analysis of demolition process

Verification of structural drawings

Multidisciplinary capacity and global knowledge of the plant

Structural mechanical engineering

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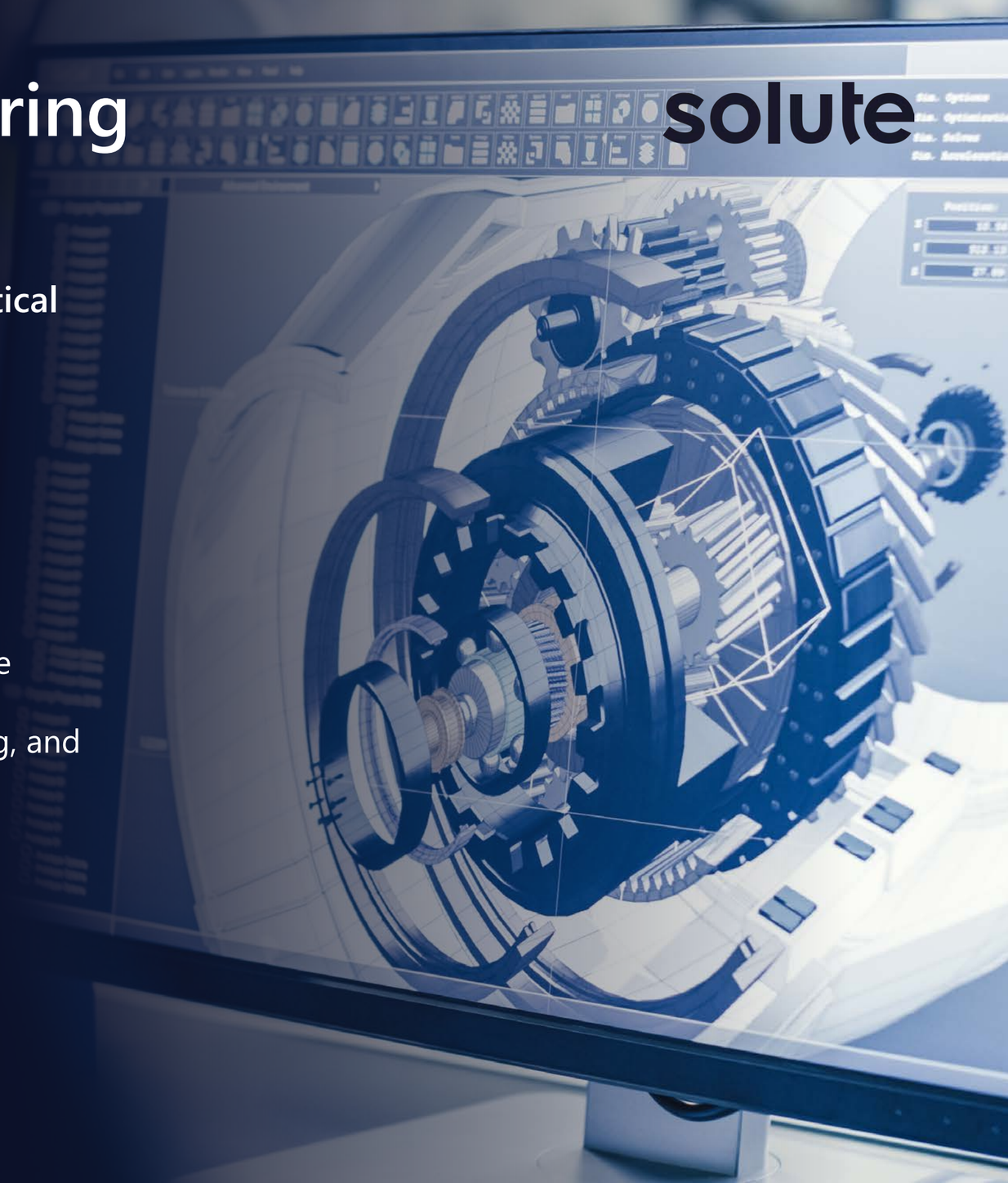
Development of mechanical structural products by analytical calculations or CAE (or combination of both)

- Design, development & certification of WT rotor and nacelle components
- Mathematical simulation by means of FEM and CFD of different physics involved.
- Design and study of WT machinery elements.
- Root Cause Analysis (RCA) of singular events, edition of expertise reports.
- Assistance to manufacturing engineering, O&M activities, testing, and monitoring.
- Computational simulation tools: FEM, CFD, among others



Wind | Railway | Automotive

Nuclear | Machinery

Automotive

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CAE services and specialization in advanced numerical simulation (disciplines related to a vehicle´s design, development and its components)

- HVAC
- Aerodynamic analysis
- Motor cooling
- Pedestrian safety
- Low speed crash
- Interior modules
- Add-on stiffness
- Passive safety sensors
- Crashworthiness
- Optimization
- NVH

- Components CAE development
- CAE vs. Test correlation

Software development

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Any software-related service derived from programming, development and software maintenance

- Frontend, backend (webs, mobile apps, etc.)
- Database design and management
- Business Intelligence
- Predictive modelling, monitoring, and deployment of models
- Ad-hoc solutions and cloud computing
- Systems transformation and migration (legacy systems)
- Data analysis, storage, and management

Meteorological and energy forecasting

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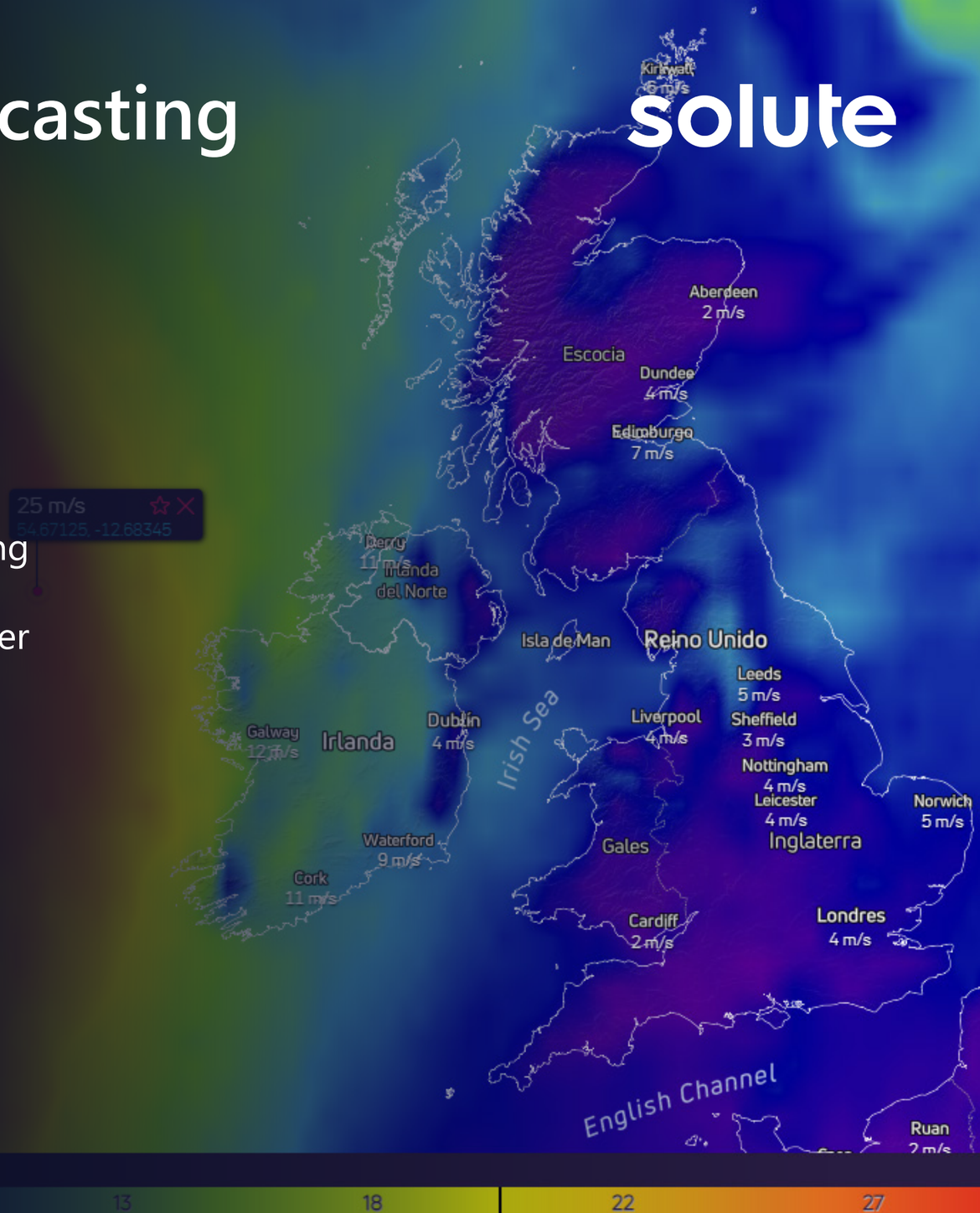
Weather forecasting services applied to the energy and agricultural sectors

- Team of meteorologists and data scientists
- Weather and energy forecasting using different Machine Learning models
- Analysis of meteorological variables using numerical weather models (NWP)
- Weather forecasting for O&M tasks
- Seasonal forecast studies
- AI model development
- Database management
- GIS data visualization



Virtualization EVE

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Scanning and/or virtualization services of environments or tools applied to the industrial sector

- Scanning and virtual tours of industrial environments (nacelles, towers, establishments, etc.)
- Digital replicas of real components and objects for studies and analysis
- Virtualization of industrial processes for technical staff training (tutorials, courses and interactive evaluation modules)
- Tools to support operators and installers of industrial complexes.
- Data warehousing, data management and analysis

Civil engineering

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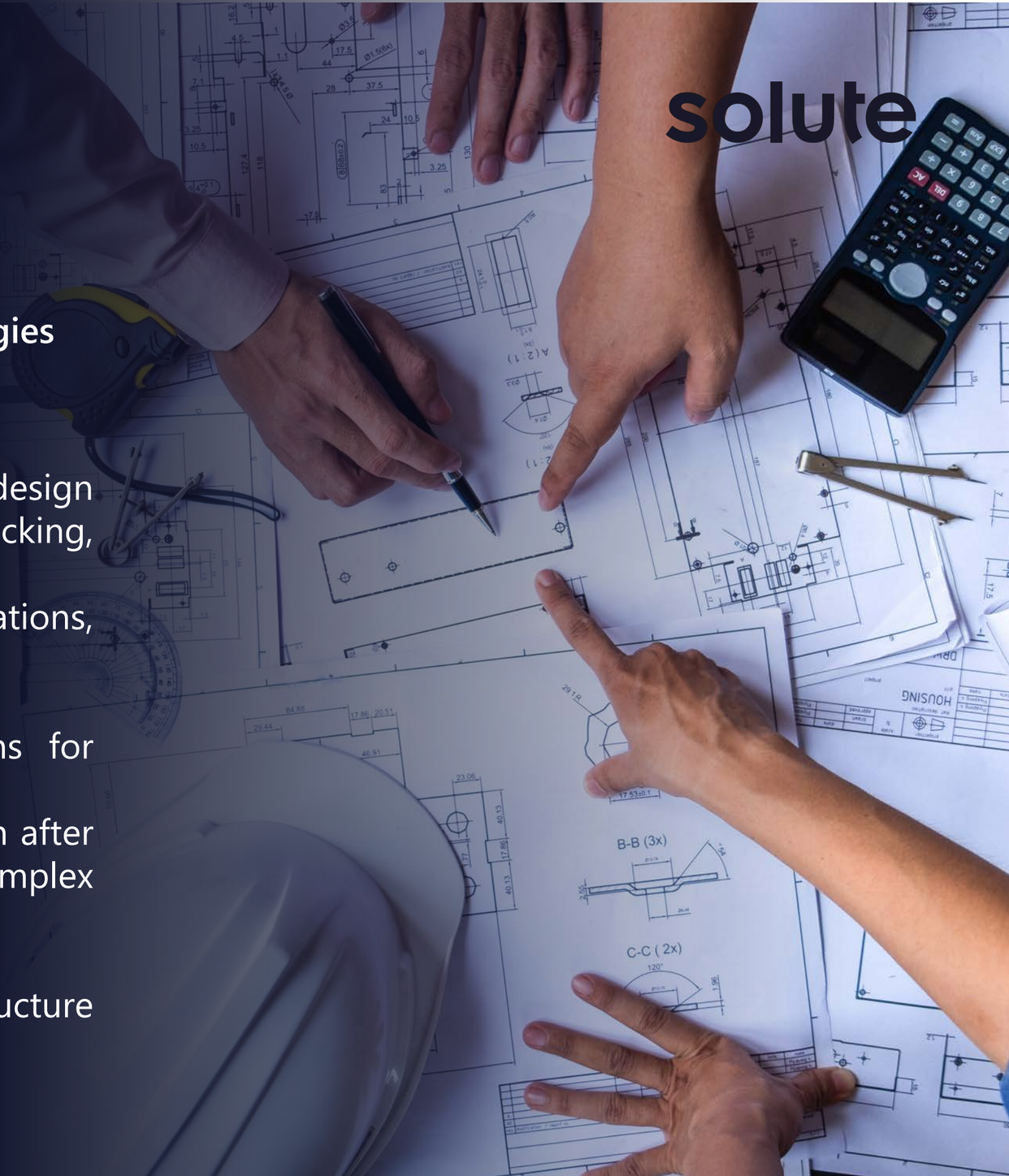
Civil engineering capabilities applied to renewable energies and classic engineering

- Civil engineering designs applied to energy projects: roads design and optimization, platforms and accesses (vehicle tracking, visibility, drainage, road signs), calculation of earthworks...
- Pre-design, design, certification and peer review of foundations, steel and hybrid towers, and tower internals
- Life extension assessment
- Root Cause Analysis (RCA) and proposal of solutions for pathologies in hybrid towers and foundation
- Analysis of singular/advanced problems: residual strength after accidental events, non-standard structural details, and complex problems (ovallization)
- Design of tooling
- Analytical studies and application of FEM models on each structure
- Design and review of structural systems for PV plants



Electrical engineering

Control and automation of renewable plants

- Monitoring and control strategies for wind and solar farms
- Implementation of secondary SCADA and CMS systems for wind and solar farms
- Real-time and historical data analysis with cloud service deployment (IIOT)

Electrical design and calculations of renewable evacuations

- Calculation and design of overhead and underground LV/MV/HV power grids
- Development of electrical evacuation infrastructures for wind and solar farms
- Electrical substations calculations and design

Computational Fluid Dynamics (CFD)

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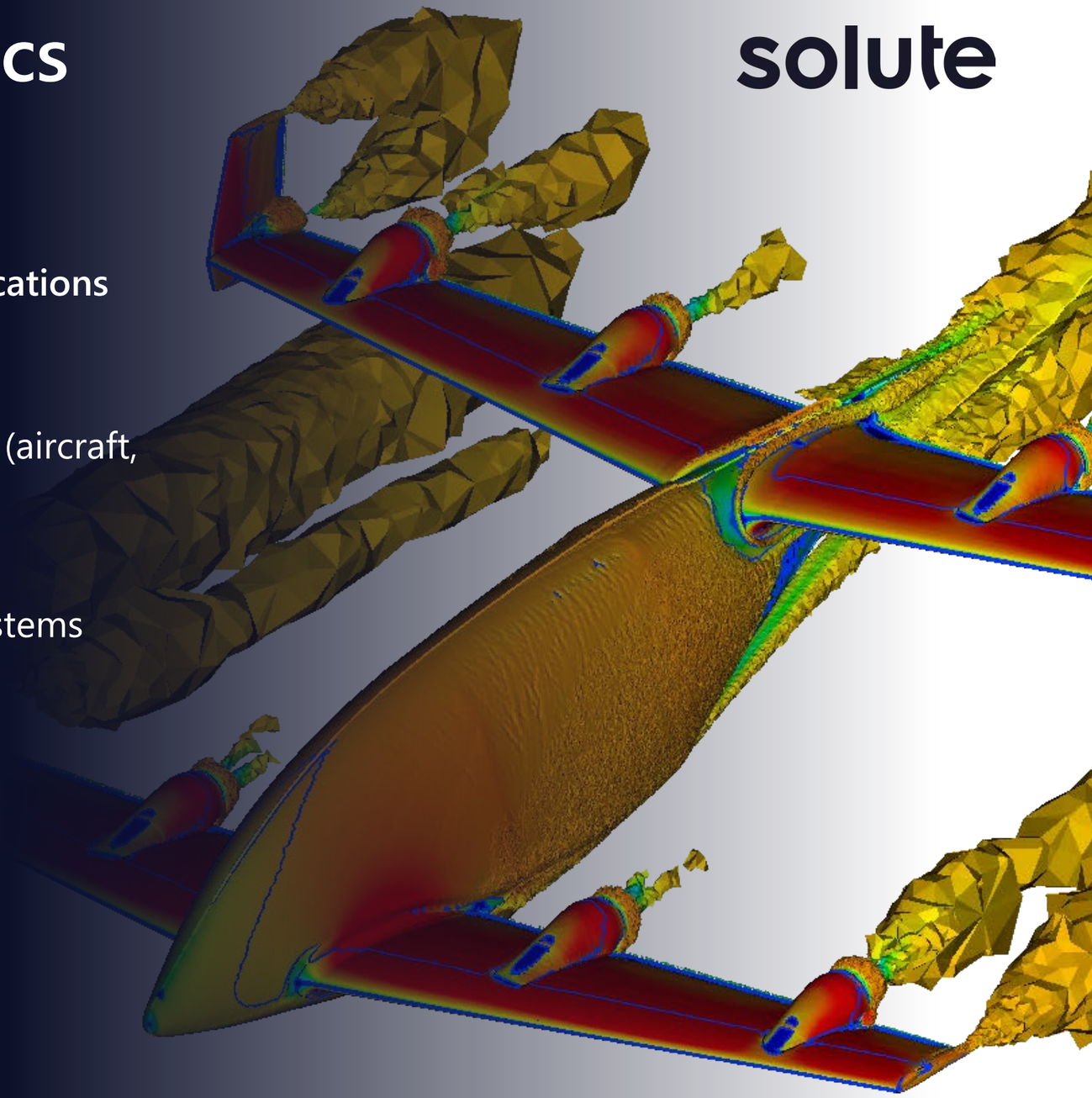
Modelling the behavior of fluids in engineering applications

- Calculation and aerodynamic optimization of vehicles (aircraft, cars, etc.)
- Engine Cooling Analysis
- Wind resource assessment calculations with CFD
- Analysis of air conditioning and occupational safety systems
- Modelling and validation of aeroelastic phenomena
- Calculation of hydraulic systems



Artificial Intelligence

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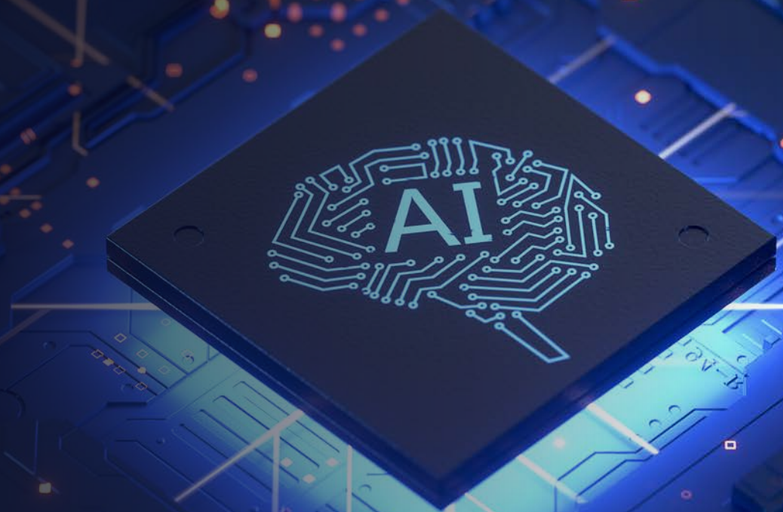
Automating procedures or replacing computational costly processes

- Tabular data
- Forecasting
- Artificial vision
- Natural language processing
- Generative AIs for images (broadcast models) or text (applications and other open source models)
- Computer vision: object detection, tracking and classification
- Energy Forecasting
- Optimization problems



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R+D Projects

R+D projects

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R+D as SOLUTE´s backbone

furow

aphelion

EOLIAN

Projects in development

TWIND
WIND ENERGY FORECASTS WITH DIGITAL TWINS

WindTwin

Aeronautical Technology Project

Blade inspection drone

R+D projects

Furow

Wind data analysis, wind resource assessment and wind farm layout and optimization design software in one interface.

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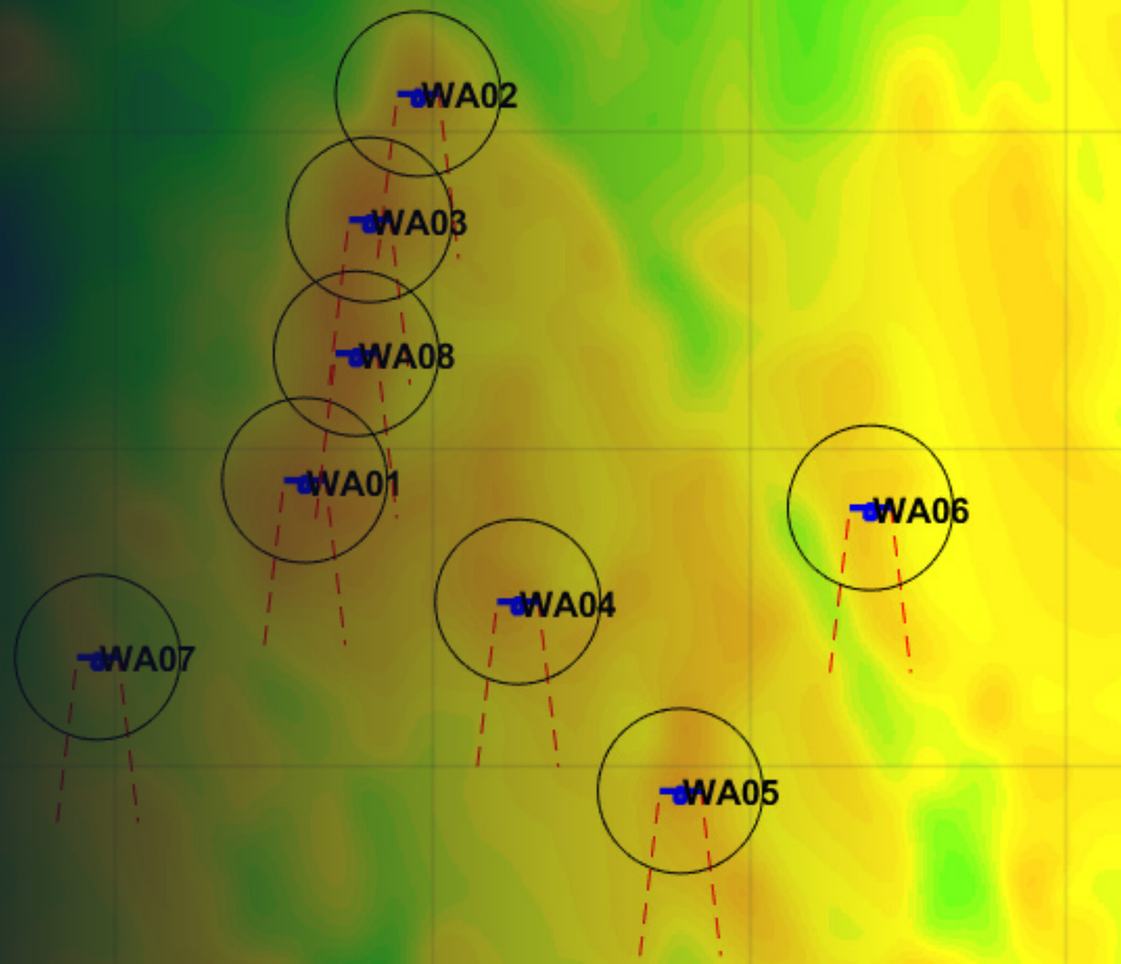


R+D projects

Aphelion

Aphelion is a multi-function weather forecast visualization platform, and a wind power and agrometeorology forecasting software.

aphelion

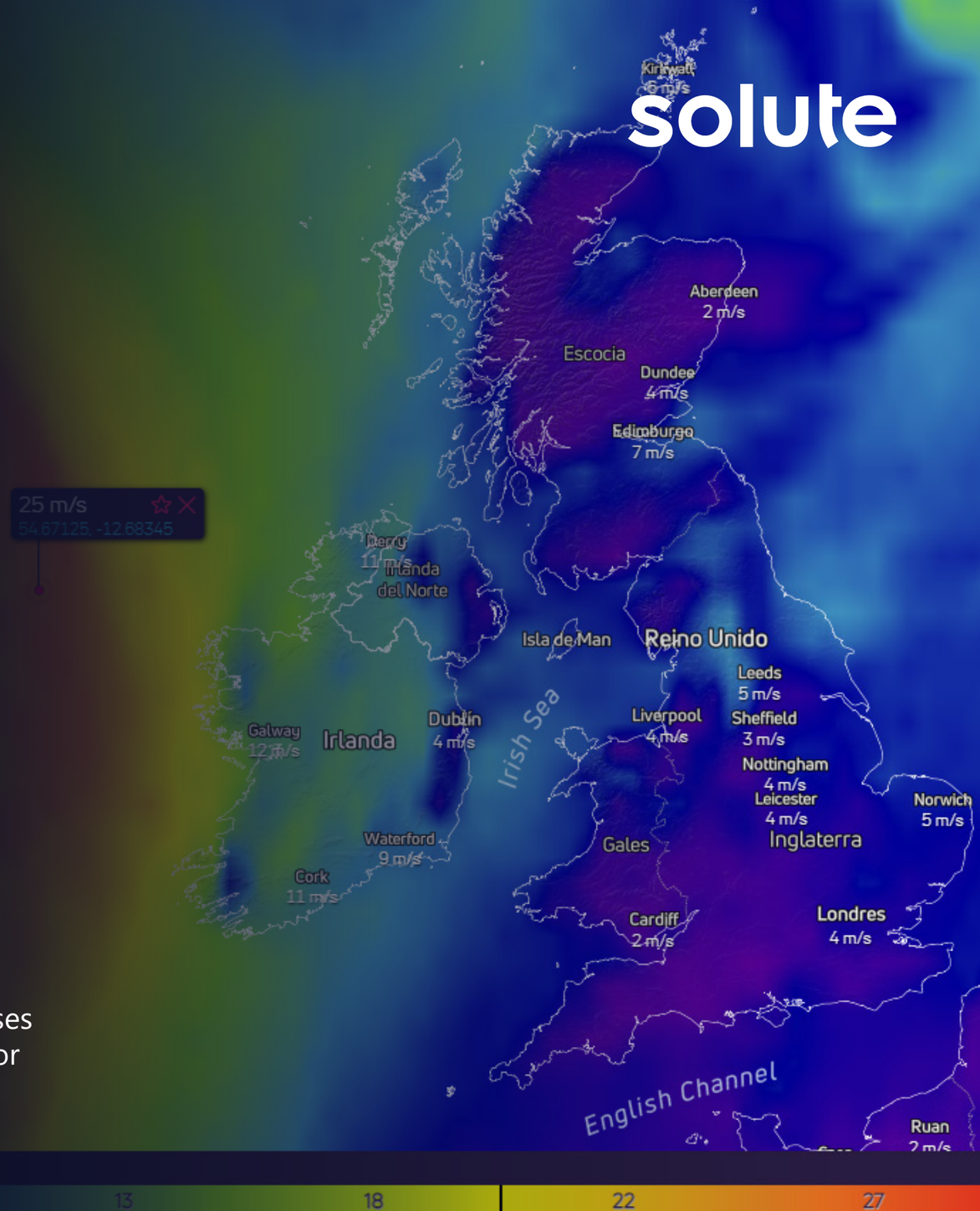
Weather platform and app for individuals

aphelion wind

Wind & Solar production forecasting services

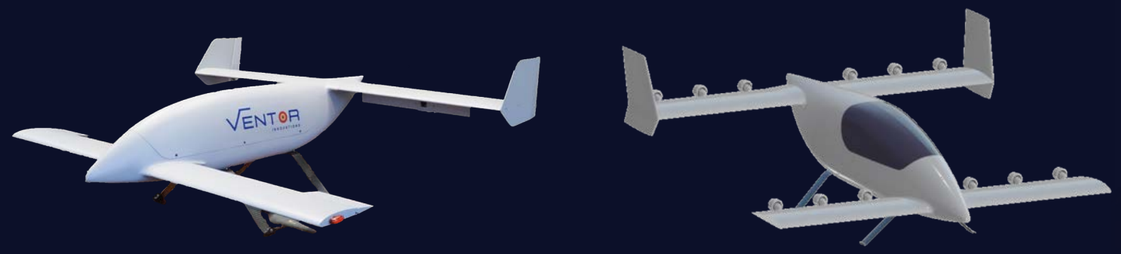
aphelion agro

Agrometeorological Forecasting for businesses in the agricultural sector



R+D projects

Aeronautical Technological Project (PTA-ZEROeVTOL)



Development of two UAV VTOL:

- V-Pelican: last mile logistic. 220 kg MTOM
- AltaCab: aerotaxi. 600 kg MTOM

Innovation elements:

- Hydrogen cell
- Ammonia fuel cell technological demonstrator
- Two wing plans
- Engines at the flap trailing exit

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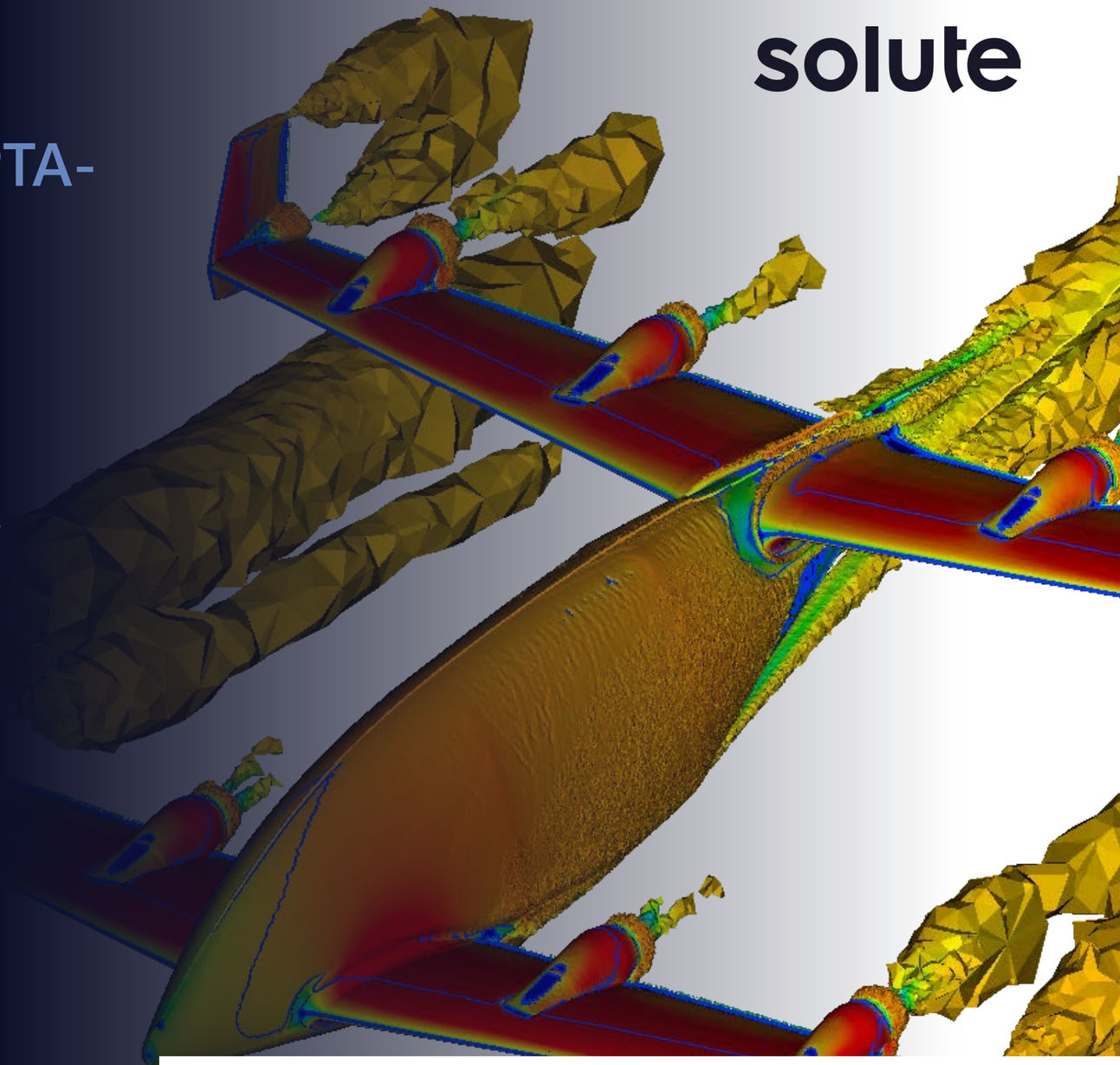


GOBIERNO DE ESPAÑA MINISTERIO DE CIENCIA E INNOVACIÓN

Plan de Recuperación, Transformación y Resiliencia

VENTOR INNOVATIONS

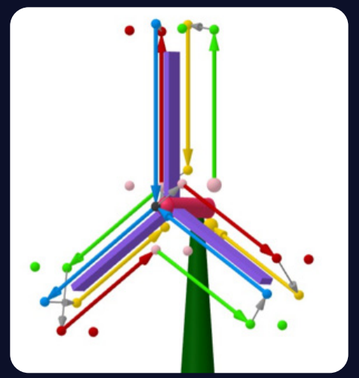
Jalvasub engineering

ATD ESPAÑA ADVANCED THERMAL DEVICES S.L.

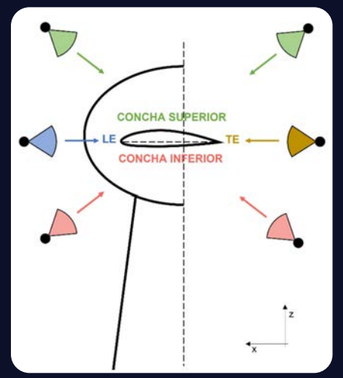
R+D projects

Wind turbine inspection drone

- Commercial drone: Matrice 350 + H20T
- Autonomy - 50 min - 40 min
- Thermographic and photographic camera



Inspectioned surfaces



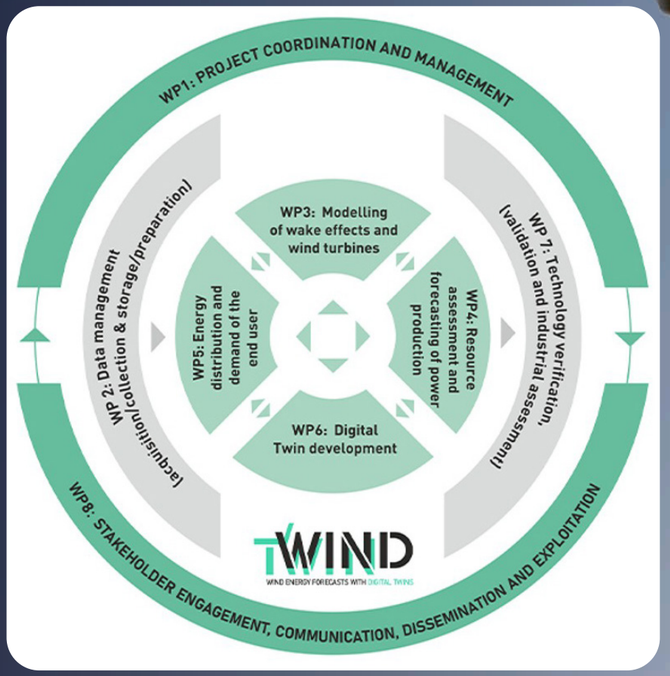
Surface inspection

R+D projects

WindTwin

Digital twin for forecasting of power production to wind energy demand

- WindTwin aims to develop and validate an advanced offshore wind farm digital twin (DT) that significantly enhances the precision of power production forecasts and end-user energy demand projections.
- Enhanced digital transformation of wind energy sector by delivering the next generation of digital twins.



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