ELECTROCAP PROJECT PITCH DECK

PIC 1 - GROUP 7

WEB APPLICATION ON MONITORING THE POTENTIAL OF SUSTAINABLE BS LOCATIONS FOR MOBILE NETWORKS

TÉCNICO LISBOA

CELFINET
A CYIENT COMPANY

instituto de telecomunicações

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GONÇALO MENDONÇA	106093	MARIA GUILHERME	106767
TOMÁS CLÁUDIO	106310	LUNA FERREIRA	106915

OUTLINE

1.1 ADVISORS AND MENTOR

Scientific Advisors	Prof. João Monteiro Felício - IST Prof. Emmanuel Cruzeiro - IST
Scientific Co-advisors	Eng. Luís Mata - Cyient Prof. António Rodrigues - IST
Mentor	João Gonçalves - IST

1.2 OUR TEAM


Maria do Mar Vieira
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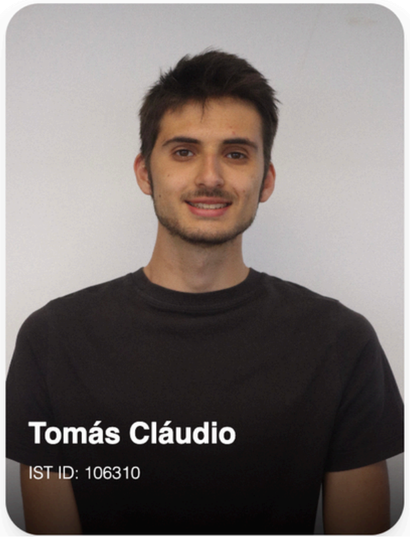
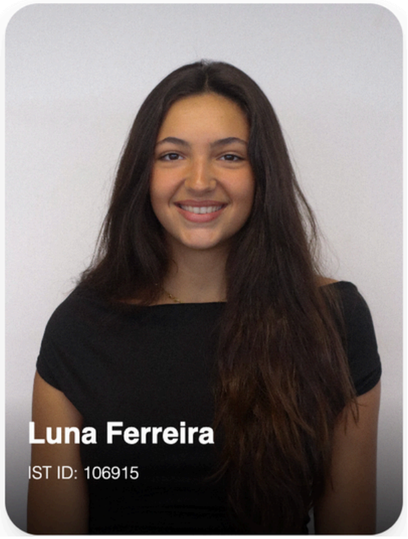

Tomás Cláudio
IST ID: 106310


Luna Ferreira
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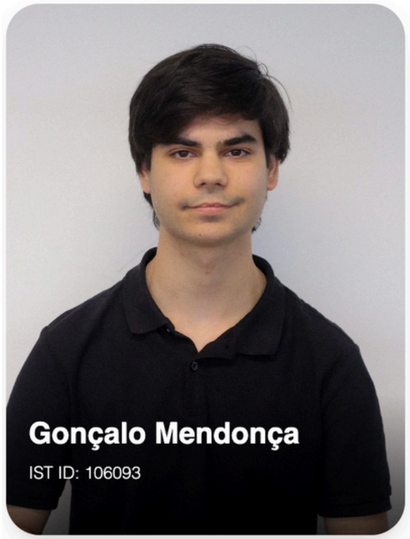
Gonçalo Mendonça
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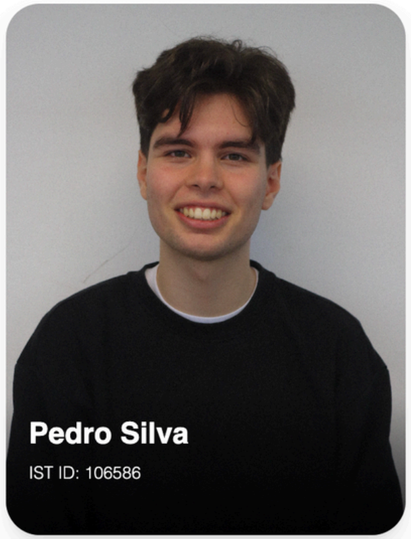
Pedro Silva
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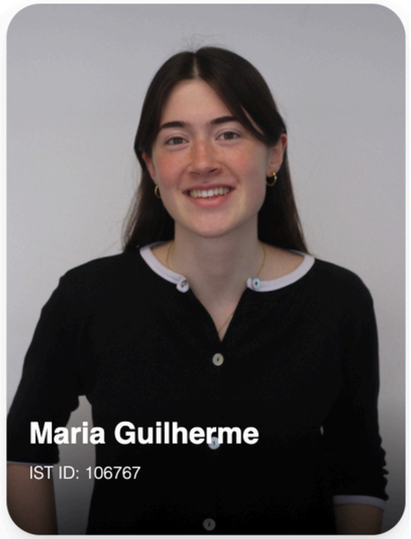

Maria Guilherme
IST ID: 106767

1.3 PARTNERS

Cyient provides data and supports the project with expertise in energy efficiency and financial analysis. To learn more about the company, click here!

CELFINET
A CYIENT COMPANY

"Instituto de Telecomunicações" supports the project with technical guidance and material funding. To learn more about the institute, click here!

instituto de telecomunicações

2.1 PROBLEM DEFINITION AND MOTIVATION

PROBLEM

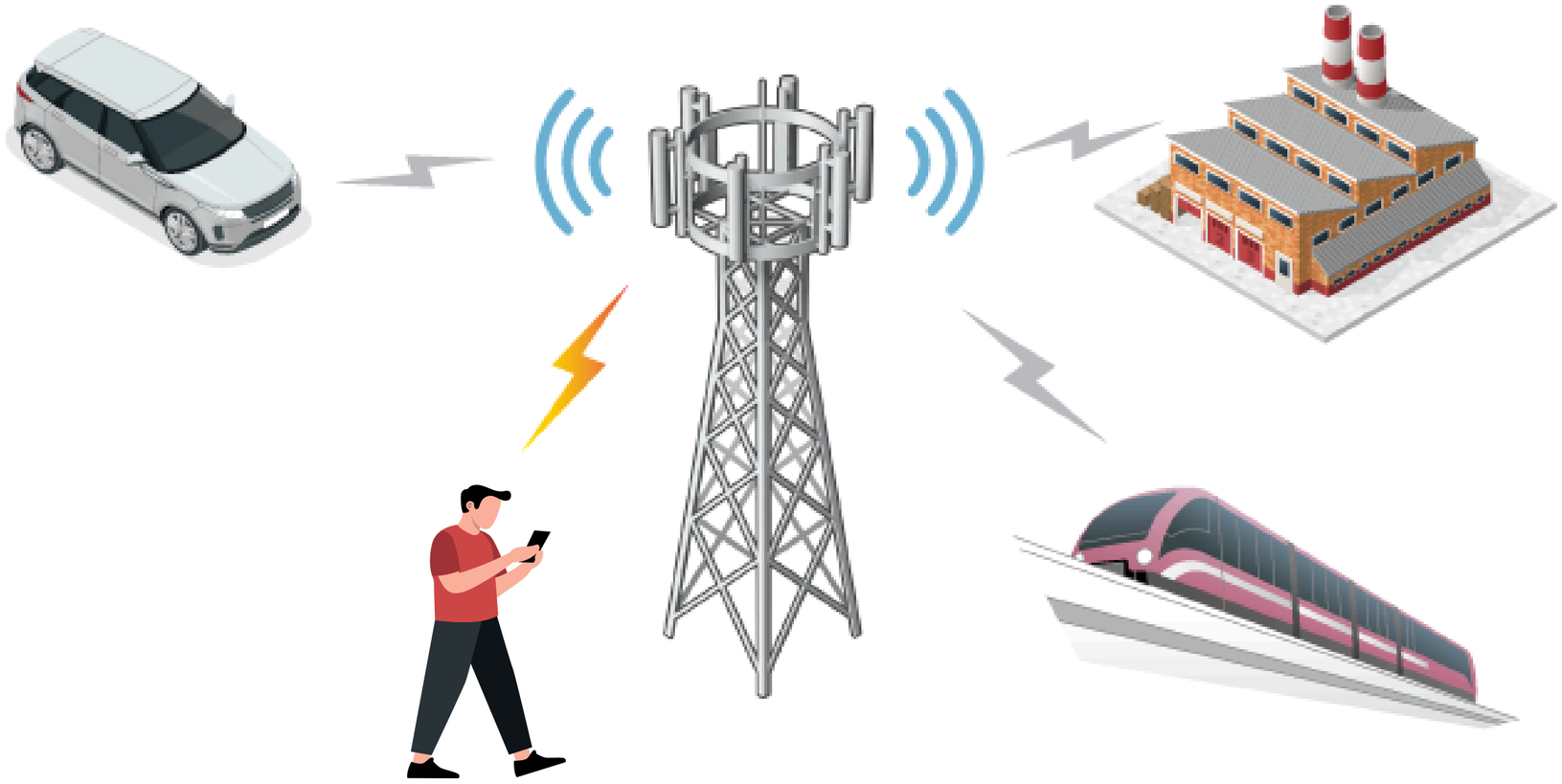
The mobile sector faces **low revenue** growth, **high Operational Expenditure** (**OPEX**), rising **energy costs**, and pressure to meet **ESG** and **Net Zero** targets.

MOTIVATION

To develop more **cost-effective** and **sustainable solutions** for the mobile communications sector.

2.2 PROBLEM DEFINITION

A **base station** is a **fixed** communication **point** in a mobile network that **connects mobile devices** to the **network**. It **transmits** and **receives radio signals** to and from users' phones, enabling **voice calls**, **text messages**, and **mobile data services**.



3. SOLUTION BENEFICIARIES

Mobile Network Operators (MNOs)

- Greener Networks
- Lower operational costs
- Remote/rural focus
- Increased sustainability

Network Users

- Better sustainable coverage
- Reliable connectivity
- Improved quality of service

Society

- Greener connectivity
- Digital inclusion
- Less polluting energy and energy savings

4.1 OUR SOLUTION: CONCEPT

PURPOSE

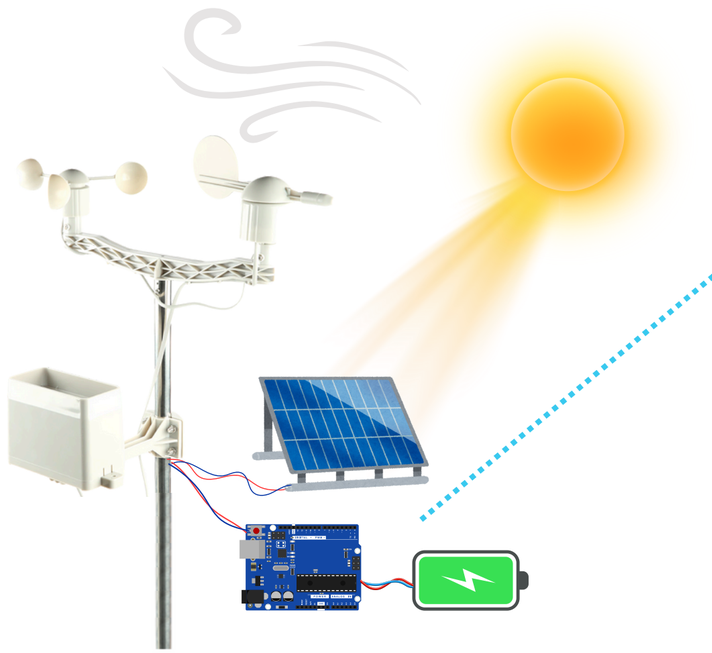
Evaluate the **potential** of integrating **solar** and **wind** energy in base stations **power supply.**

HOW IT WORKS

Development of an integrated **hardware/software** solution to measure **solar** and **wind** power and estimate the **energy performance** of a **hybrid-powered** base station (solar, wind, and wireline).

4.2 OUR SOLUTION: ARCHITECTURE

Hardware

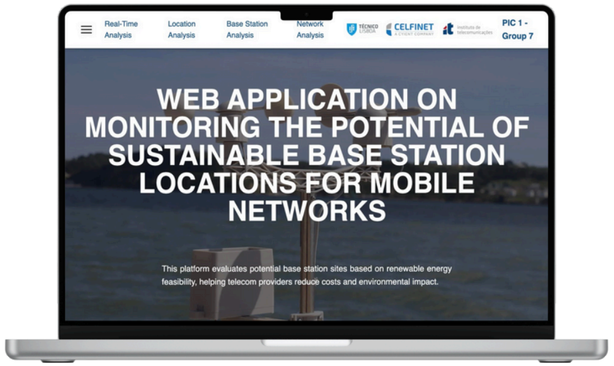


- Weather station collects environmental data
- Microcontroller processes the data
- Battery powers the system

Microcontroller sends the data to the cloud via Wi-Fi

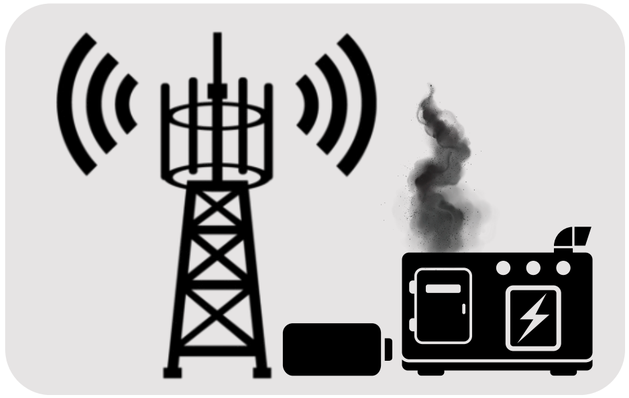
Software

Cloud stores the data

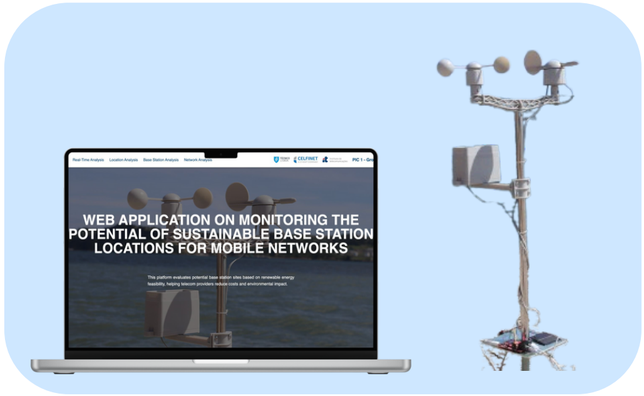


- Wi-Fi provides connectivity
- WebApp displays the data

4.3 OUR SOLUTION: VALUE AND FINAL GOALS



BEFORE



AFTER

- **Identify** top solar/wind **locations** for future base stations.
- **Quantify** hybrid power **gains** (new/existing base stations).
- **Estimate** financial **savings** from hybrid adoption.
- **Assess** feasibility of **integrating** solar/wind in operator networks.

4.4 CONTRIBUTION OF EACH TEAM MEMBER (I)

Maria do Mar	Main connection between the group and the company	Initial and intermediate presentation development	Interview conduction and analysis	Energy analysis and calculations
	Financial analysis	Poster	Pitch deck	WebApp mockup development
Luna Ferreira	Website implementation	Initial and intermediate presentation development	WebApp implementation	Energy analysis and calculations
	Conducting interviews and analysis	Company data evaluation	Pitch deck support	3D printing

4.4 CONTRIBUTION OF EACH TEAM MEMBER (II)

Tomás Cláudio	Initial software planning	Prototype testing	Prototype and WebApp communication	Conducting interviews	Excel to code conversion support
Gonçalo Mendonça	Research on hardware components	Research on project beneficiaries	Collection and processing of IPMA data	Conducting interviews	Excel to code conversion support
Pedro Silva	Initial software planning	Research on hardware components	Research on potential competitors	Conducting interviews	Excel-to-code implementation
Maria Guilherme	Blog posts and updates	Video production	Physical prototype design	Conducting interviews	Logo and initial poster design

4.5 OUR SOLUTION: KEY FEATURES

REAL TIME ANALYSIS

Visualize real-time data from solar and wind measurements.

LOCATION ANALYSIS

Evaluate sites for future base station deployment based on local renewable potential.

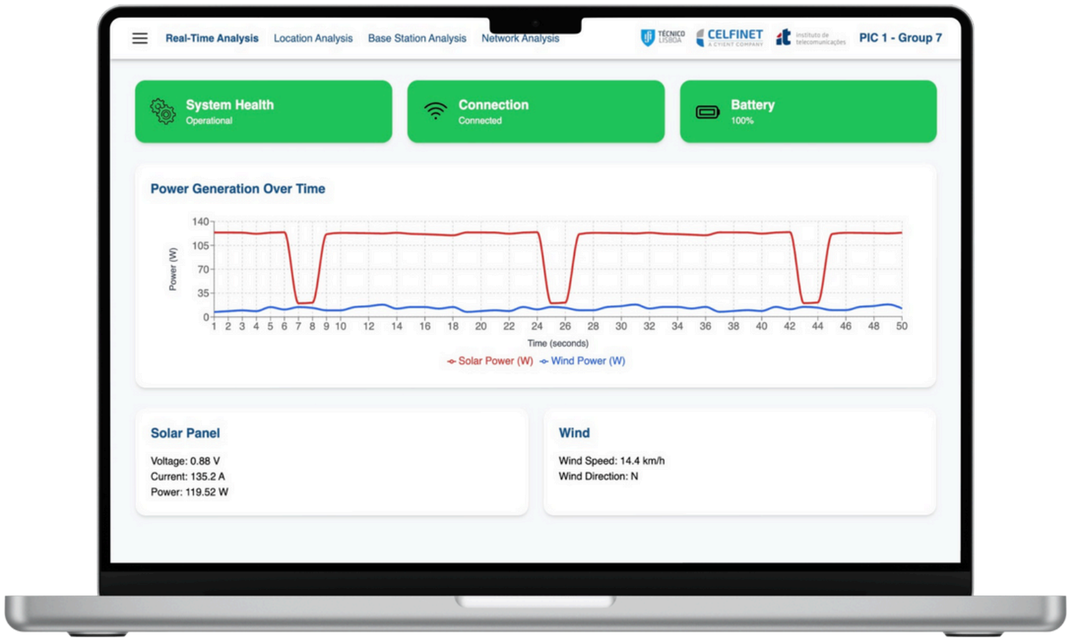
BASE STATION ANALYSIS

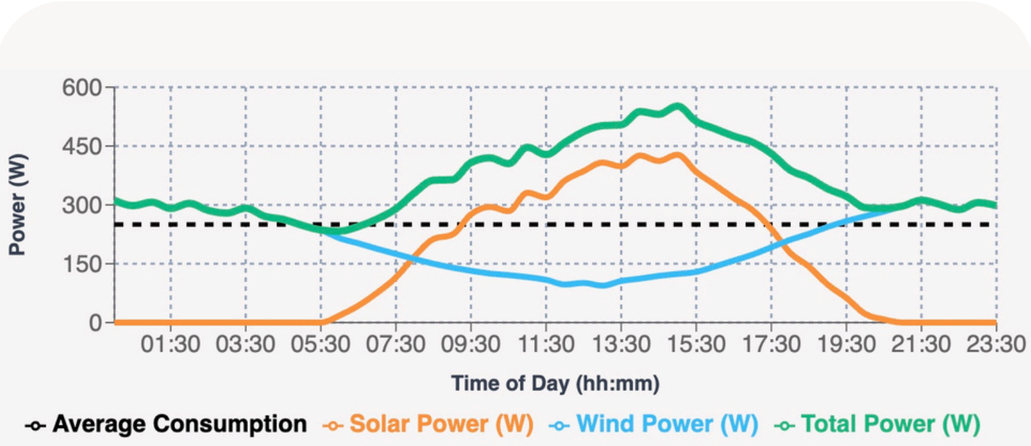
Estimate energy, savings, and sustainability of hybrid-powered base stations.

NETWORK ANALYSIS

Extrapolate results to district or national scale to support planning.

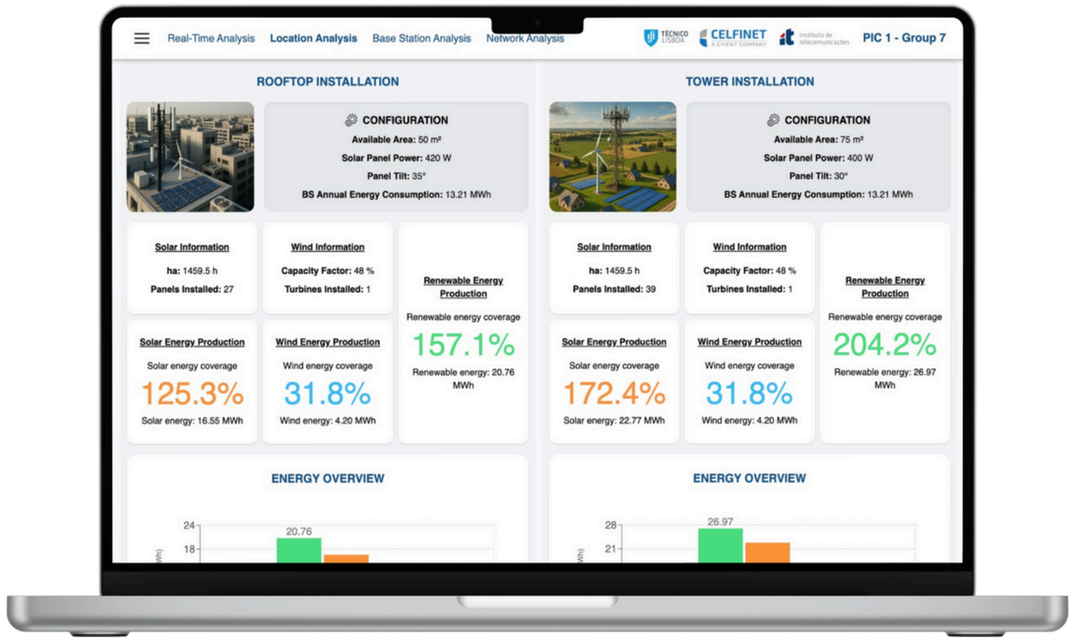
5.1 RESULTS: REAL TIME ANALYSIS





Real-time data revealed that **solar** and **wind complement each other**, making **renewable energy** significantly **more reliable** when both sources are combined.

5.2 RESULTS: LOCATION ANALYSIS



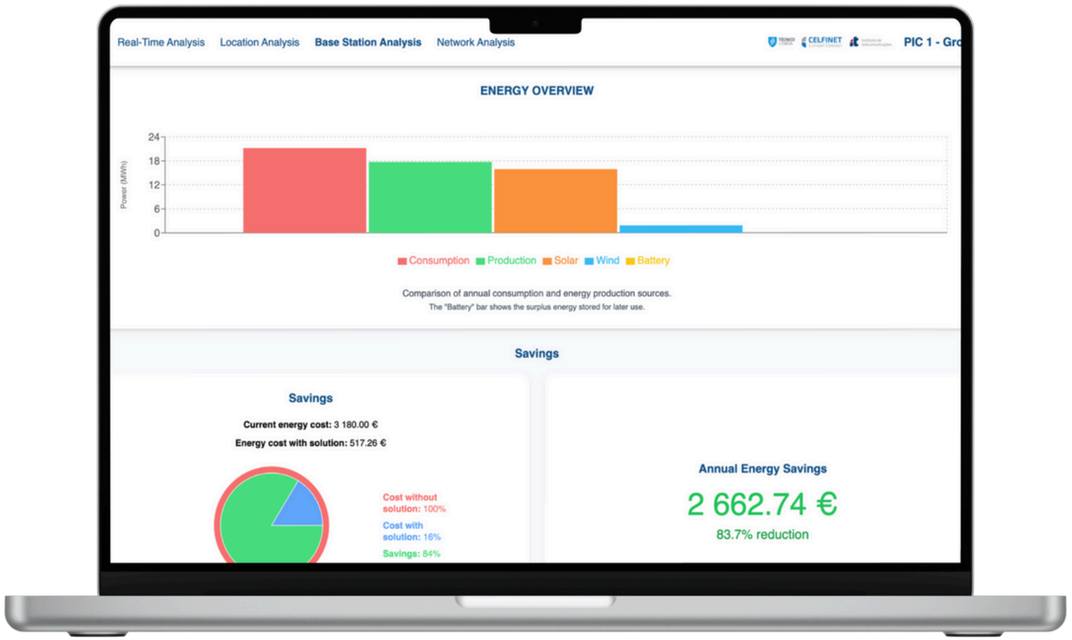
Energy Savings:

RURAL	SUBURBAN
100%	90%

For instance, in a rural setting like **Beja**, **1 base station** can be **fully powered** by **renewable power sources.**

88% Solar	12% Wind

5.3 RESULTS: BASE STATION ANALYSIS

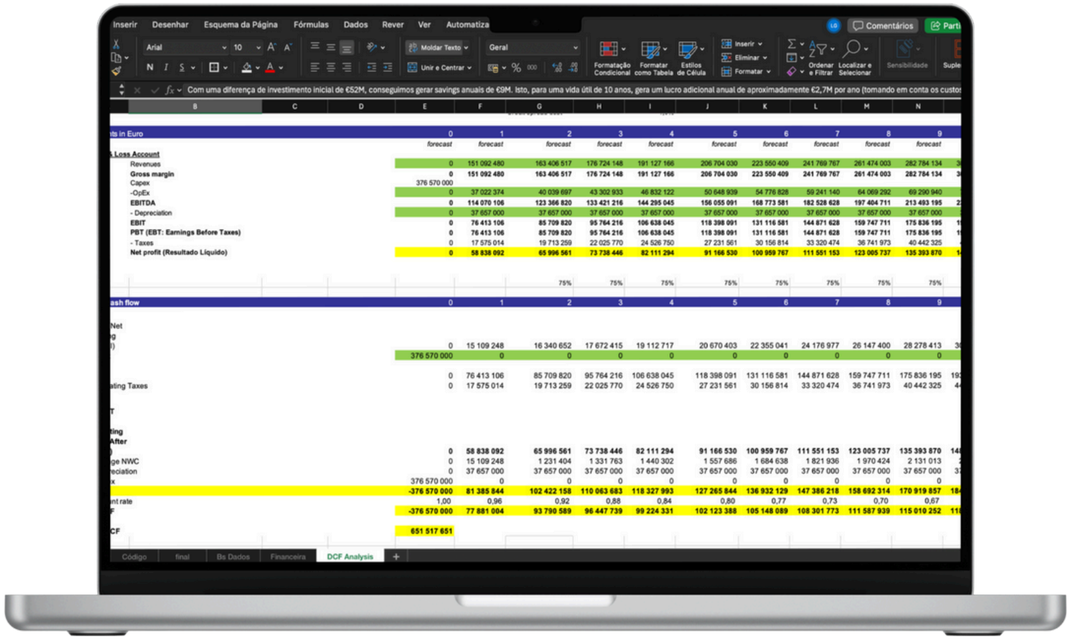


Average annual energy savings per **base station:**

DENSE URBAN	URBAN
1 240€	2 070€
SUBURBAN	**RURAL**
3 100€	1 800€

Sustainable energy actually saves money!

5.4 RESULTS: NETWORK - FINANCIAL ANALYSIS



Financial Assumptions & Valuation Approach

- **Time Horizon:** 10-year lifespan per base station
- **Corporate Tax Rate:** 23%
- **WACC**: 4.5% - Represents the average cost of capital (debt + equity)
- **Telecom Market Return:** 8.2% annually
  ~7% above assumed risk-free rate (1.2%)

Valuation Method:

DCF analysis applied to project costs, earnings, and estimate NPV, profitability and savings.

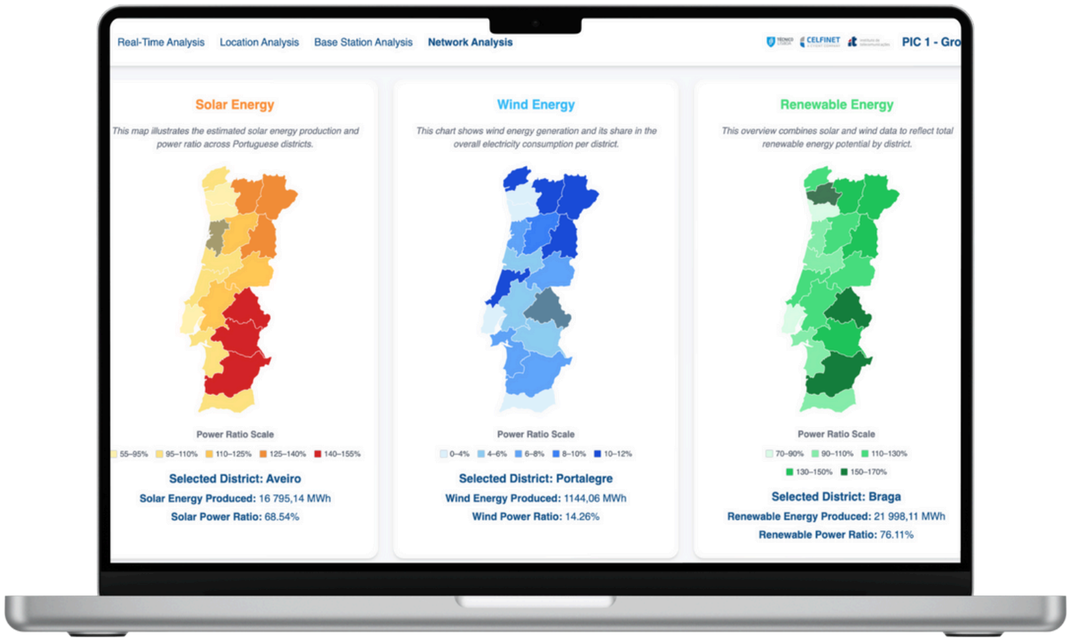
5.4 RESULTS: NETWORK - FINANCIAL ANALYSIS

Assuming our solution is **deployed** across all **4 000** base stations of a **telecom operator**, our analysis shows:

+3M€/year (+3%) in increased profit

- 9M€/year (–24%) in reduced operational costs

5.5 RESULTS: NETWORK ANALYSIS



Leading renewable districts:

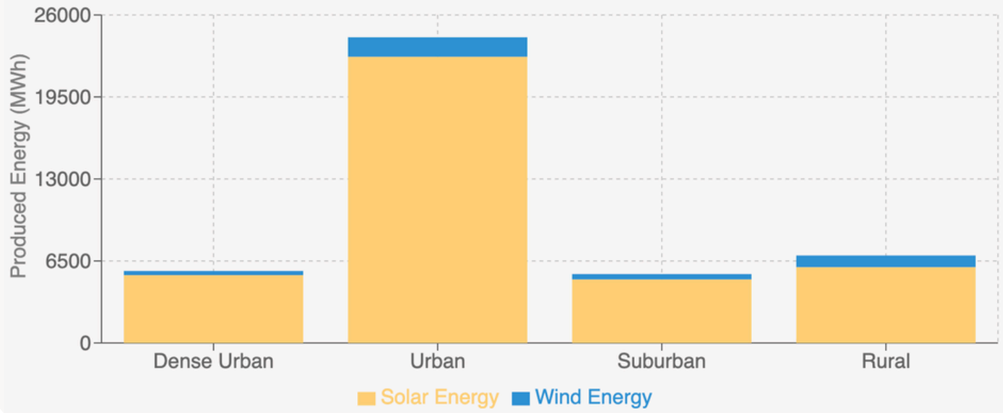
BRAGANÇA

75%

ÉVORA

67%

Energy produced in **Lisbon** from **solar** and **wind**, by environment type.



6. CONCLUSIONS

Base stations **stay operational** during **blackouts**, ensuring service continuity.

Our solution **reduces operational costs by 24%** and **increases annual profit by 3%** across **4 000** base stations.

CO_2 emissions avoided are **3.2 tons per base station per year** and **12 880 tons per year nationwide** (based on 0.23 kg CO_2/kWh).

Aligned with **ESG** and **net zero** targets via **CO_2 reduction** and **renewables.**

7. FIND OUT MORE

For **more information** about our project and developments, please visit:

Project Website

https://pic-4e922f.webflow.io

Web Application

https://pic-ecru.vercel.app


THANK YOU!