



HEATSPOT OFF-GRID

CRITICAL OFF-GRID THERMAL PROTECTION



PROTECT WHAT MATTERS. EXACTLY WHERE IT MATTERS.

1 THE PROBLEM

Cold damages critical assets when grid power is unavailable.



CRITICAL INFRASTRUCTURE

- Frozen pipes
- Electronic failure
- Costly maintenance



AGRICULTURE & BEEKEEPING

- Frost damage
- Crop loss
- Hive temperature risk



BATTERY ENERGY STORAGE

- Capacity drop
- Shutdown risk
- Reduced autonomy



Remote assets need localized, autonomous and low-power thermal protection.

2 OUR SOLUTION

Heat only what matters.

HeatSpot OFF-GRID delivers intelligent low-power thermal protection exactly where it is needed.

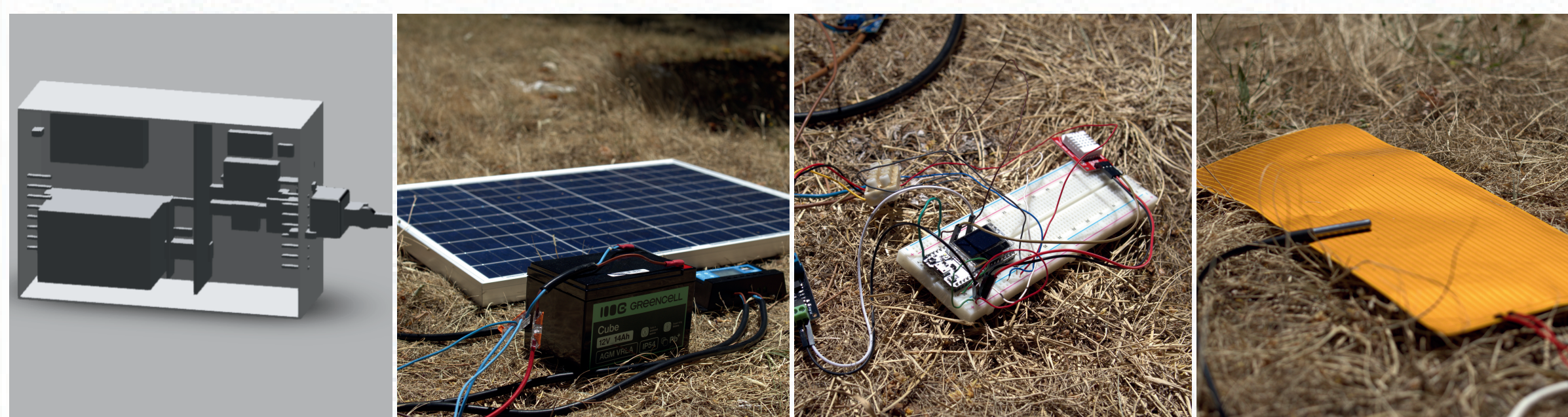


3 SYSTEM ARCHITECTURE



4 FUNCTIONAL PROTOTYPE

A functional prototype has been assembled, integrated and tested.



HEATSPOT OFF-GRID

Portal local do dispositivo esp32-001

Temperatura 40.6 C

Humidade 49.4 %

Aquecedor Ligado

Potencia aquecedor 30 %

PWM duty 76

DASHBOARD REAL-TIME VIEW



Autonomous solar-powered spot heating for remote assets.

3D PRINTED ENCLOSURE BATTERY & SOLAR CONTROLLER ESP32 & SENSORS Temperature Sensor & HEATING PAD DASHBOARD REAL-TIME VIEW

- ✓ Functional prototype developed
- ✓ System architecture defined
- ✓ Bill of Materials prepared
- ✓ Thermal control logic implemented
- ✓ Dashboard operational
- ✓ Moving into real-world validation

5 KEY FEATURES



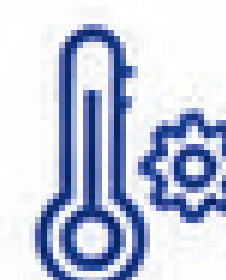
SOLAR POWERED

Clean, renewable and sustainable energy.



BATTERY BACKED

Reliable operation day and night.



SMART THERMAL CONTROL

Intelligent heating only when needed.



LOCALIZED HEATING

Protects only the critical zone.



REMOTE MONITORING

Real-time data anywhere.



MODULAR & SCALABLE

Designed to adapt to multiple assets.

7 WHO BENEFITS?



- GREENHOUSES:** Protect crops from frost.
- BATTERY SYSTEMS:** Maintain optimal temperature.
- TELECOM EQUIPMENT:** Ensure uptime in remote locations.
- REMOTE SENSORS:** Keep monitoring systems running.
- PIPELINES:** Prevent freezing in critical pipelines.
- BEEKEEPING:** Protect hives during cold seasons.

ONE PLATFORM. MULTIPLE CRITICAL APPLICATIONS.

8 COST-EFFICIENT PROTECTION

COST OF PROTOTYPE (APPROX.)	BENEFITS	COMPARISON
		TRADITIONAL HEATING HEATSPOT OFF-GRID
€188	✓ Lower energy consumption	✗ High energy consumption
	✓ Reduced losses	✗ Grid dependent
	✓ Lower maintenance	✗ Heats entire spaces
	✓ No grid dependency	✗ Complex installation
	✓ Solar-powered operation	✗ High operational cost
	✓ Modular deployment	✓ Low-power consumption
		✓ 100% autonomous
		✓ Localized heating only
		✓ Simple & modular
		✓ Low operational cost

SMART PROTECTION. LOW COST. HIGH IMPACT.

6 ACHIEVED RESULTS

- ✓ Low-power off-grid thermal protection demonstrated
- ✓ Controlled localized heating validated
- ✓ PV generation, battery storage and ESP32 control integrated
- ✓ Preliminary tests show stable temperature control
- ✓ Multi-day autonomy potential depending on conditions
- ✓ Agriculture identified as primary market opportunity in Portugal

30 - 50W TARGET HEATING RANGE

12V SYSTEM VOLTAGE

36W HEATING PAD POWER

ESP32 SMART CONTROL

100% SOLAR-POWERED OPERATION

9 MEET THE TEAM

- LEONEL (Power Electronics):** Heater Driver, Protection Circuitry, Power Switching
- NICOLLAS (Energy Systems):** PV System, Battery Management, Energy Optimization
- SÉBASTIEN (Project Manager):** System Integration, Dashboard Development, Database Architecture
- CATARINA (IoT & Communications):** IoT Integration, Database Support, Technical Communication
- VASCO (Embedded Control):** Firmware Development, Control Logic, Low-Power Operation

10 LEARN MORE

SCAN ME!

- Scan to access:
- Website
- Dashboard
- Technical Documentations

