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COLLECTiEF

What is COLLECTiEF

- **COLLECTiEF** stands for "Collective Intelligence for Energy Flexibility"

- 14 partners from 6 countries, and 4 pilot locations for testing the energy management system

- 3 level of end users: facility owners, building managers, and cities/counties

- The pilot buildings includes schools, residential condominiums, healthcare centers, campus buildings etc. representing 40% of the building models in Europe

- Virtual Manufacturing is involved in the task of developing the Human Building Interface and the Dashboard for COLLECTiEF

The Challenge

Malfunctioning of buildings and energy systems can unease people's lives. This is a serious concern in Europe as 75% of its building stock is not energy efficient

Climate change and extreme weather events can challenge **sustainable energy transition**, especially in urban areas

It is not easy to control the energy flow in urban areas at a large scale since there exist complex interactions affected by urbanisation, user behaviour, climate etc.

Most of the available solutions for the smart control of the energy flow are **expensive** and **need advanced IoT solutions**. This limits their large-scale application

Smart solutions that address both climate change mitigation and adaptation successfully and are **cost effective** and **computationally affordable** is not developed

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The solution

COLLECTiEF **implements**, **tests**, and **qualifies** an interoperable and scalable energy management system

The COLLECTiEF methodology **connects household appliances and energy systems** in the building using the **unique algorithms** developed in the project .
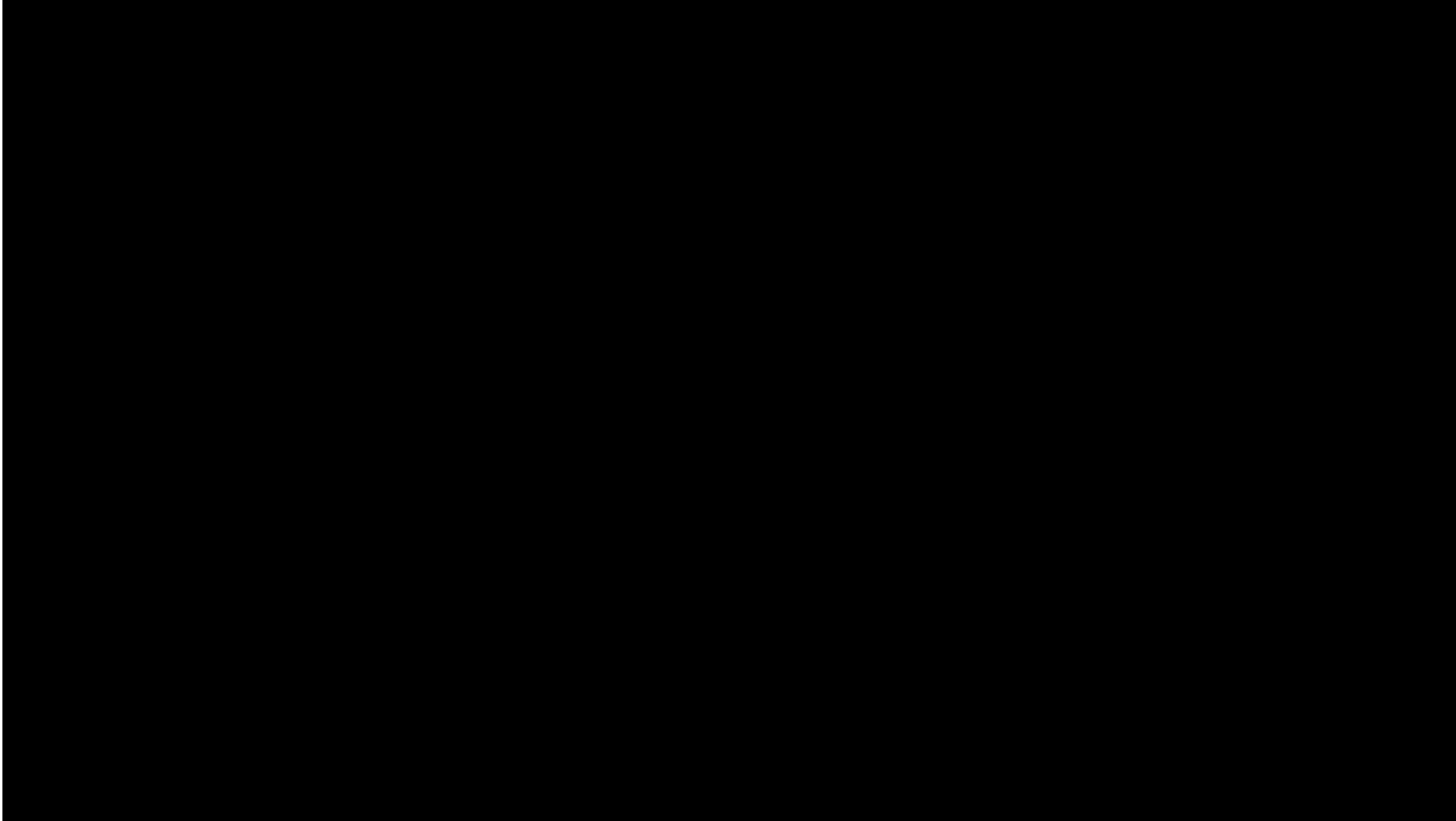
This approach allows our homes to **adapt their operation** to our needs and to be part of a collective effort for **energy saving** by larger numbers of buildings

Smarter buildings will contribute to **livable communities**, resulting in a more sustainable and climate resilient world

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The Solution

Project Objectives

- To create a CI-based energy flexible network that ensures **low-cost installation and maximum data security**

- To use **cost-effective components** to make our system **compatible across Europe**

- The system will be tested **in 14 buildings** across the EU to prove its efficiency and adaptability to different climate zones

- To achieve more accurate and **non-invasive environmental monitoring** through sensors **focusing on user needs**

- To design a **smart, user-centric and user-friendly platform** to improve building management and **maximize energy saving**
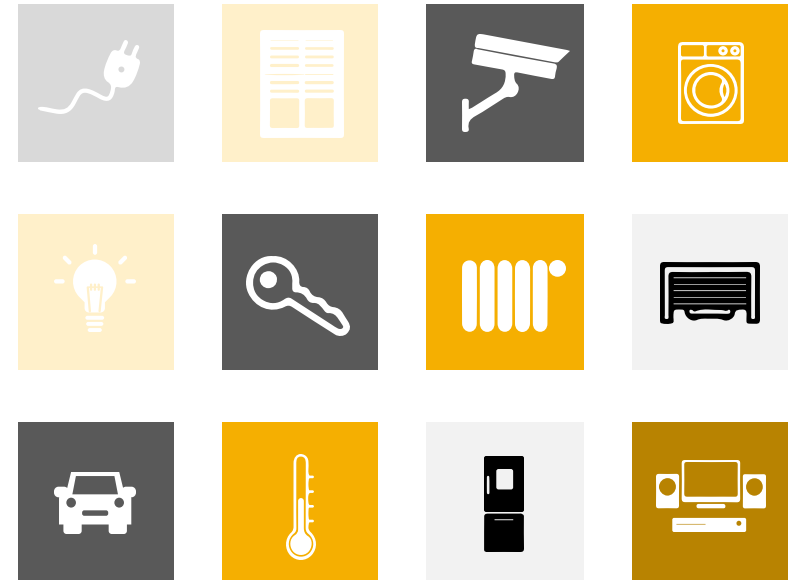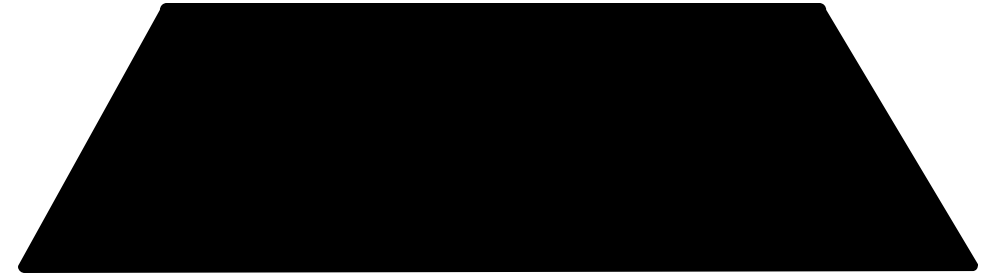
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Targets of The Project

Upgrade the smartness level of existing buildings:

16%
On average reduce the primary energy use

0.2-3 €/m²
annual energy cost savings

15%
Increase user satisfaction

24%
Increase the demand flexibility

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What is done

- Edge node users: First and second level users
- Indoor environmental data via Sphensor multi-sensory units
- Data transfer over SMQTT to Raspberry Pi
- SQLite lightweight database for independency
- Human-Building interface with interactive dashboard

Internet Of Things
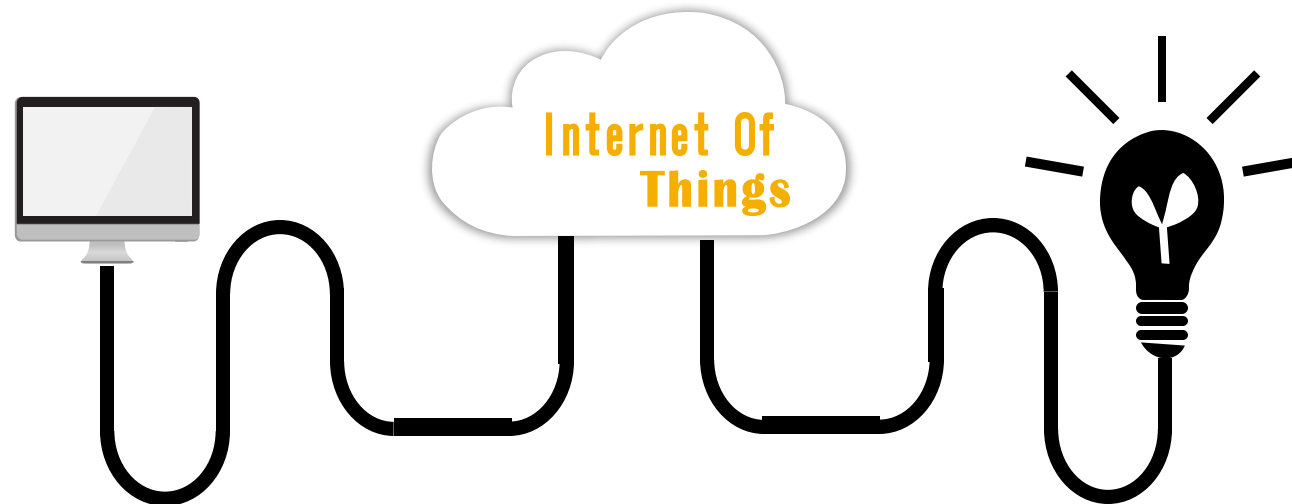
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Virtual's involvment

- Development of the Human Building Interface and the Dashboard for COLLECTiEF

- The Human Building Interface and Dashboard is developed to reflect:

  - The state of environment control devices

  - The quality of the environment

  - Optimization strategies for optimal control of the environment and energy conservation

  - Alarm conditions

  - Historical data and compare current operation modes with the other users' current behaviour in the building

  - Collect users' feedback

  - Override automatic controls to take manual control of devices

  - To provide cumulated reports on the indoor environmental quality and consumption trade-off over a given time period

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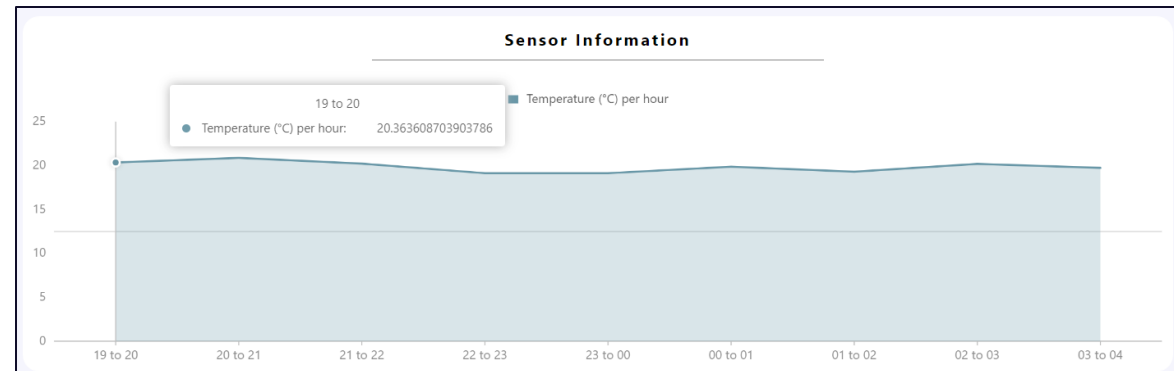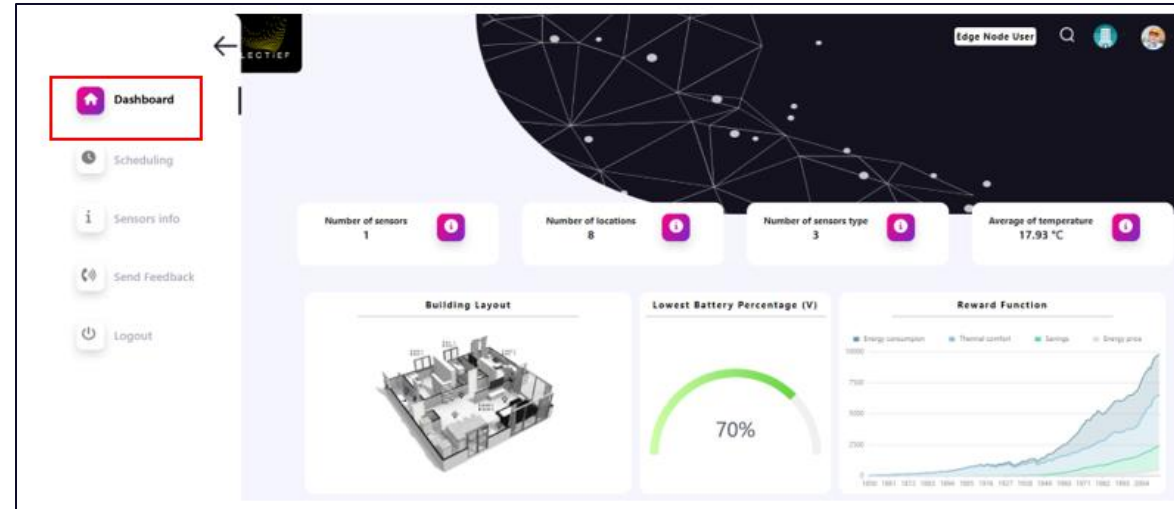# Components of The Human-Building Interface

- User Login/Logout
- Dashboard
- Scheduling
- Sensor info
- Send feedback
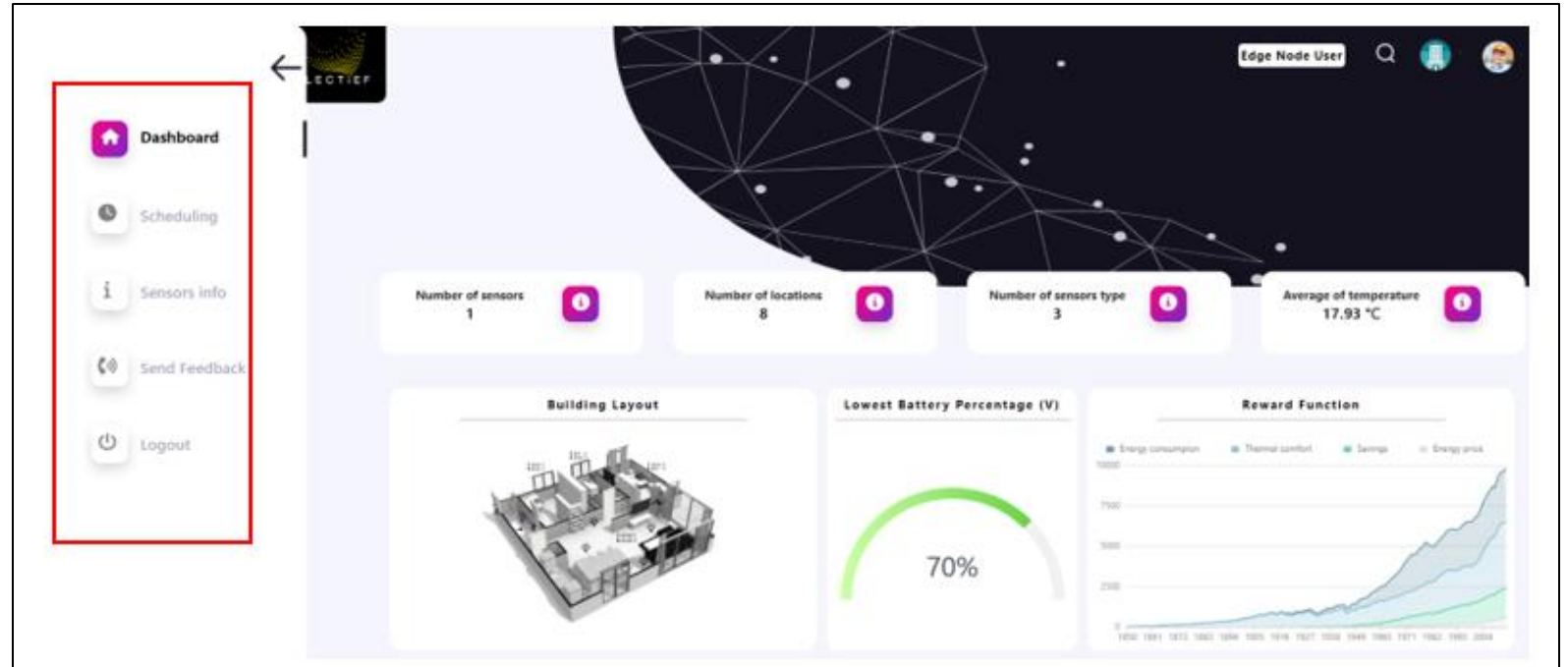
Components of The Human-Building Interface

Dashboard Tab

The dashboard tab is able to represent latest data points & query a series of data to be visualized for parameters such as, air temperature, relative humidity, pressure or any available parameter of the user's choice

Scheduling Tab

The scheduling functionality enables the user to create customized schedules on environmental parameters such as air temperature, relative humidity etc. depending on how flexible the user wants to be at a certain time of the day

Sensor Info Tab

The sensor info tab provides information to the user about indoor environment monitoring devices

Feedback Tab

The feedback tab allows the user to send feedback about the app for further improvements
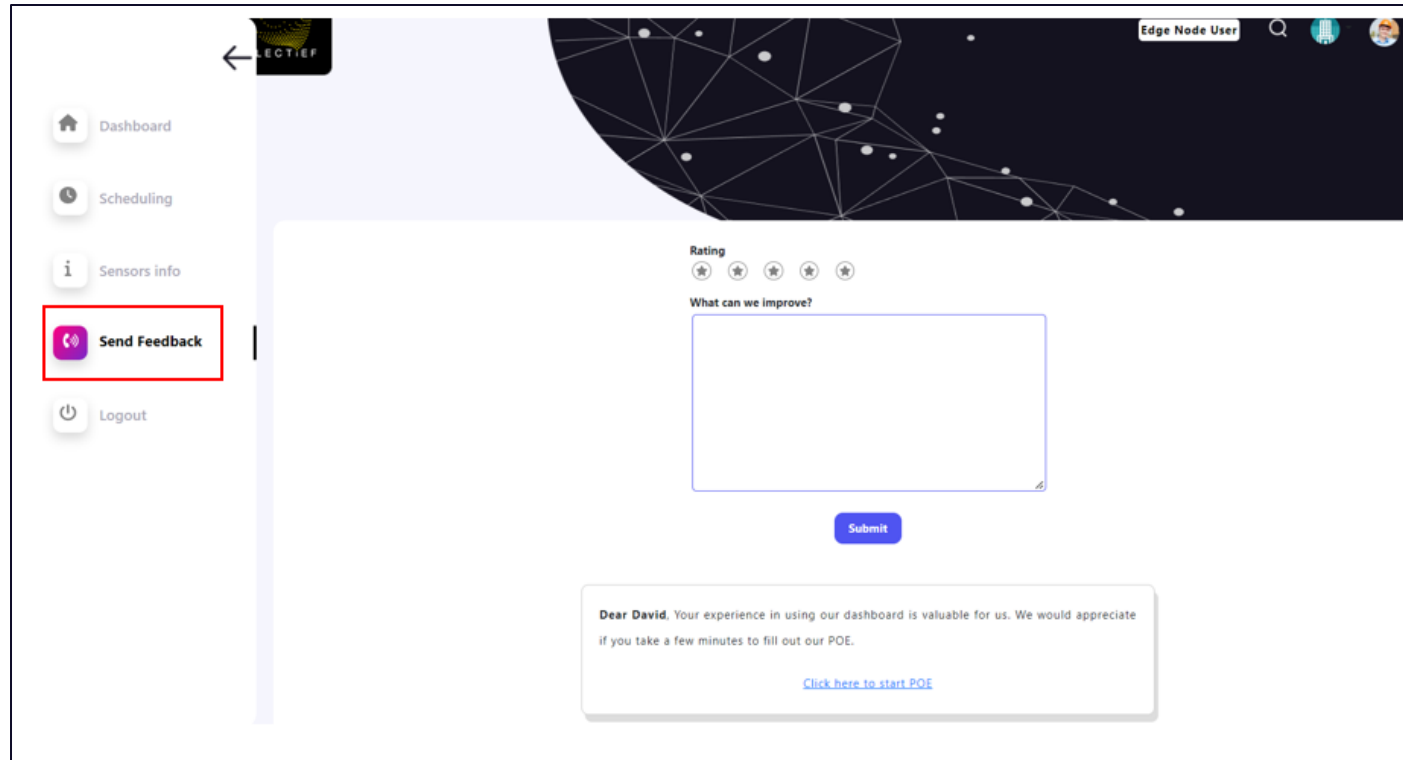
Gazpacho Energy

The Challenge

- Reducing **energy costs** in **manufacturing plants**

- This could be done by identifying inefficiencies in energy consumption patterns within manufacturing facilities

- Upon identifying where the energy is inefficiently utilized, the customer will be presented with strategies to overcome the inefficiencies using Gazpacho energy software anaylysis, smart equipment and energy management solutions

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Solution & How It Works

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2

3
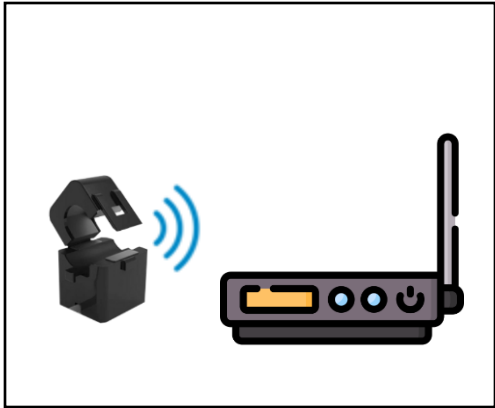
Plug & play hardware
Current monitoring sensors
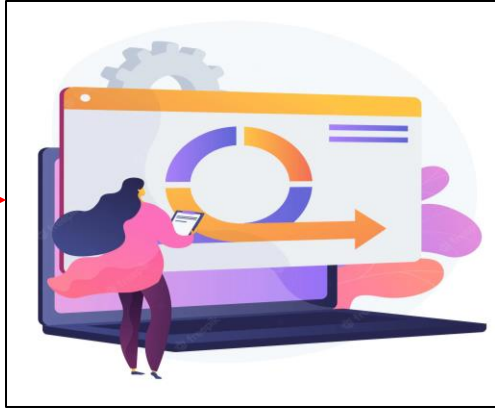
Smart Software
Gazpacho as a software platform
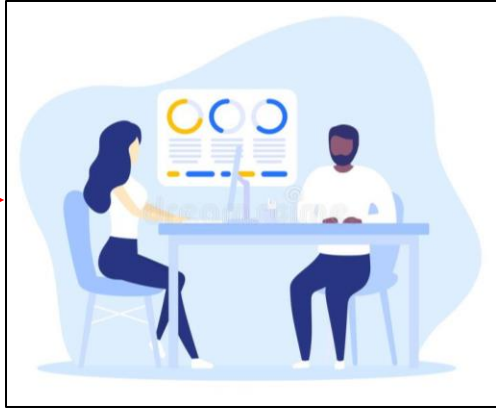
Energy consultancy
Energy consumption analysis, patterns, inefficiencies and suggest strategies to reduce inefficiencies

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Tool Box of Solutions

- Installing smart equipment/sensors

- Introduction of scheduling systems

- Introduction of notification systems for variations in power consumption

- Basic Energy Saving Solutions

Motion detectors

WiFi controlled bulbs

Door/window motion detecting sensors
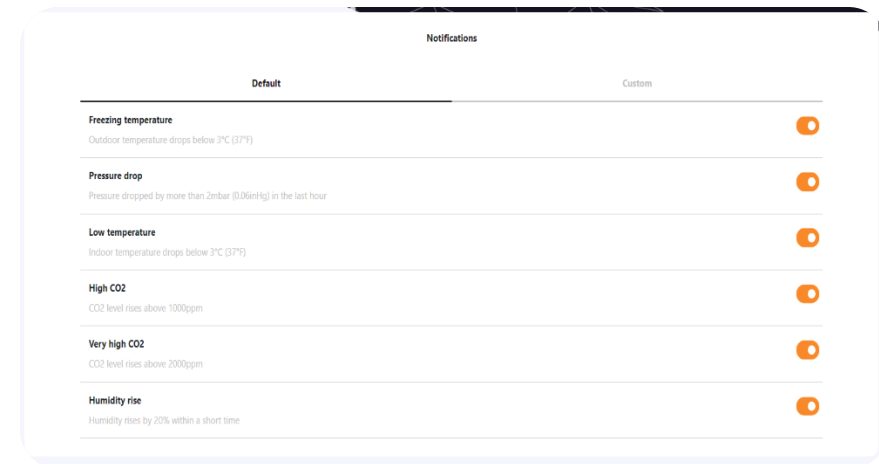
Notification system

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Energy Decision Tree / Toolbox

| Collect Data | → | Do we need to run this equipment? | → | Can it be run at a time when energy tariffs are lower? | → | Is the equipment the most efficient? | → | Do our costing tools reflect the real cost of energy? | → | Repeat |

Eliminate

Switch off and scrap/sell

Reduce

Move activity to night shift

Upgrade or Replace

Offset

Can the activity be outsourced more cost effectively?

Update costing templates so that product prices recover true costs

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User Interface Parameters

- Energy consumed by machines/ areas (daily/weekly/monthly/yearly)

- Energy cost for machines/ areas (daily/weekly/monthly/yearly)

- Total production vs. energy consumed (daily/weekly/monthly/yearly)

- Comparison between the present energy consumption/costs Vs. Previous references of energy consumption/ costs

- Overall energy consumption (daily/weekly/monthly/yearly)

- Customized dashboards as per customer's unique requirements

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Customer benifits

- To provide visibility of energy consumption at machine level to allow improvements to be made and monitored

- Save a considerable percentage in energy costs by identifying inefficiencies in energy consumption patterns

- Help identify inconsistencies in machine energy consumption patterns, to identify whether maintenance or repairs are needed for machines. Which can be an advance warning that could prevent breakdowns and unplanned downtime

- Adding smart solutions to the manufacturing facility

- Being able to plan ahead by analysing current electrical energy consumption patterns

- Using Gazpacho to understand more about the functions of the manufacturing facility (use more functions
  to optomize current factory layouts/processes)

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