

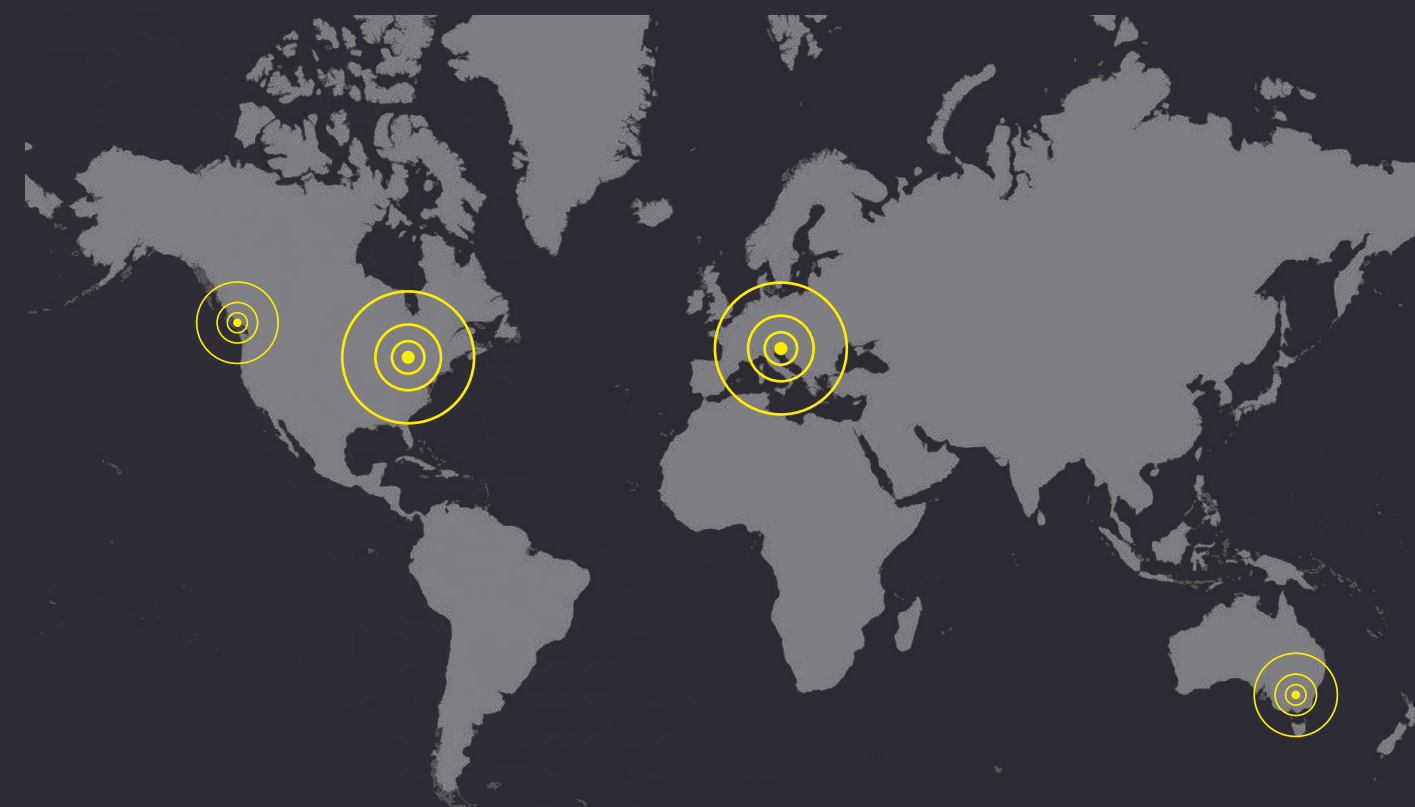


# NOMAD HOUSE

# CONCEPT

Based on the needs of people in the organization of their living space in the modern world, you can see how trends are changing. The main criterios ussally are: sustainability, environmental friendliness, functionality, technology, and safety. Also, the quality of life for the 21st-century generation has changed dramatically. Now, this quality is defined not by an apartment in a prestigious area, a high-class car, and an expensive suit, but by the ability to move freely around the world and live in a comfortable climate all year round. Such people are called digital nomads. These are people who do not give up their everyday life in favor of travel, but instead enjoy all the privileges of technology and can harmoniously combine both. Car-sharing, couch-surfing, airbnb - all these services are based on the reluctance of modern people to stay in one place.

The concept comes out of the idea of creating a mobile home, which will pass all the parameters and norms of the roadways. The main feature is the folding system, which increases the area, and thus providing a more comfortable environment for everyday life. The house is fully autonomous, but also will be able to connect to the technical infrastructure. The house also has a Smart home system, which will allow you to adapt to different climatic conditions.



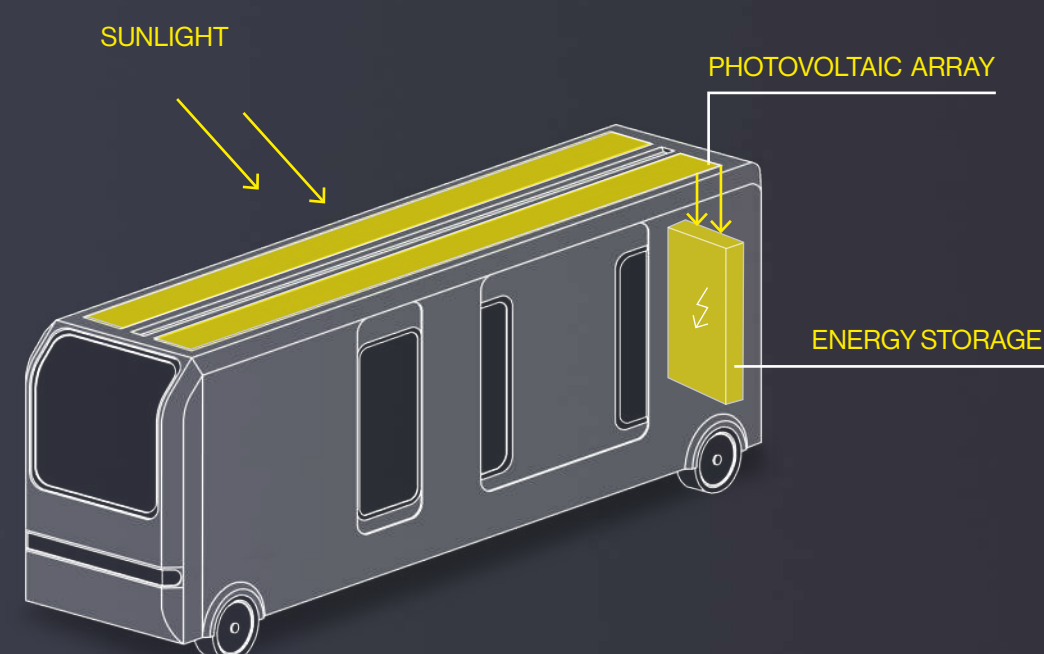
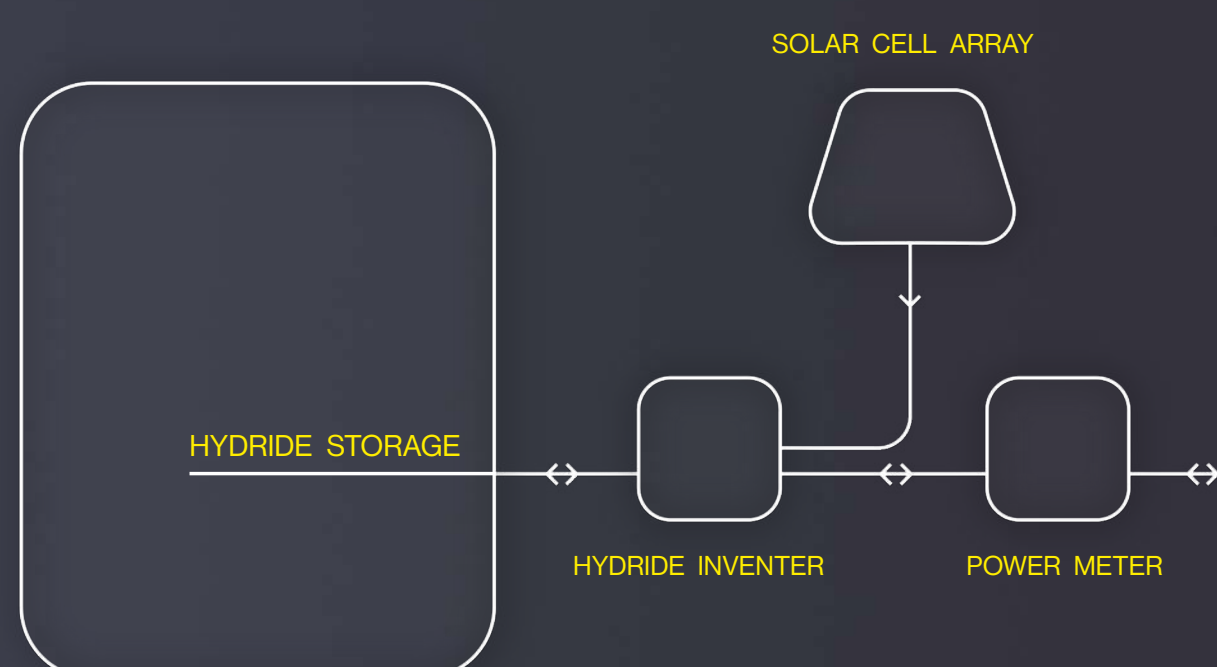


# HOUSE AUTONOMY

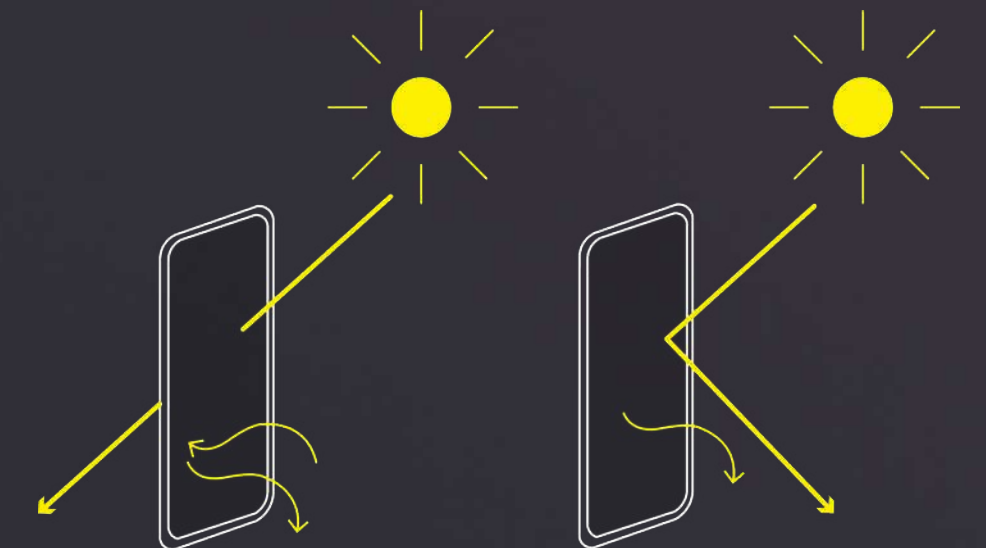
**A |** Despite the fact that cloudy or snowy weather can decrease the solar panels' energy output by 20-30% of their normal capacity, the panels still generate enough power to sustain the house for several days. If the weather is particularly severe, the house will automatically switch to low power mode to maximize battery life.

The solar panels on the roof will generate nominal power, which will be stored in the LAVO battery backup system. This system uses a patented metal hydride technology to store up to 60 kWh of hydrogen, which can be converted into approximately 40 kWh of usable electricity. This is enough power for most commercial and residential applications for about three days of operation.

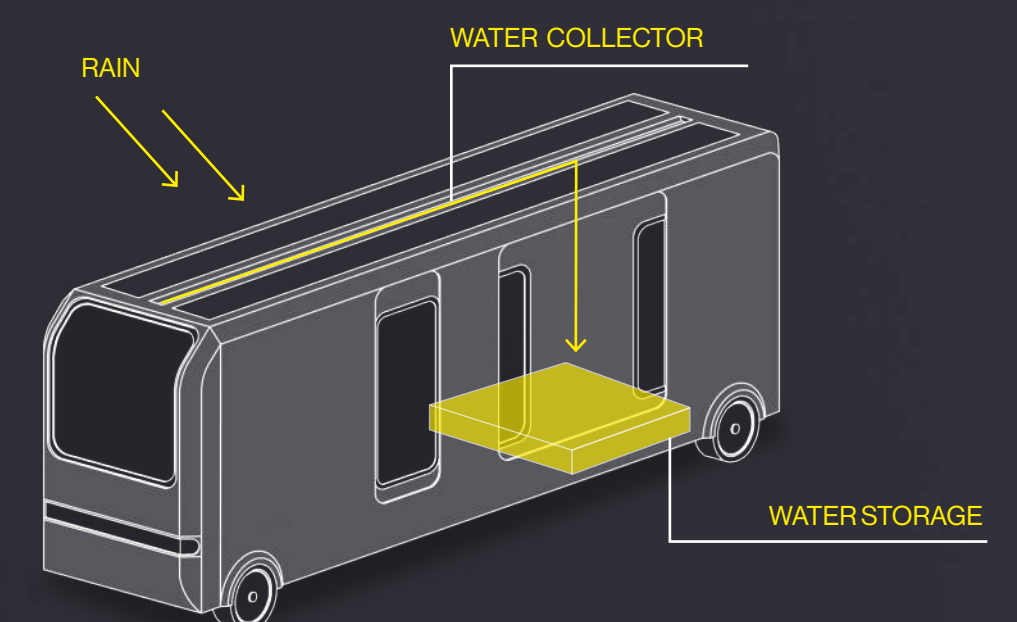
The LAVO system is designed to work with standard solar systems and can generate hydrogen from water using an electrolyzer powered by solar energy, store the hydrogen in its metal hydride unit, and convert it back into electricity using a fuel cell. This electricity can then be used to power commercial and domestic applications.



**B |** The STR smart window is designed to provide both heating and cooling for different environments. In cold climates, the window has a high solar transmittance of 65.5% to allow sunlight to heat the interior during the day, and a high thermal reflectivity of 64.8% to insulate the interior from the cold at night. In hot climates, the window has a low solar transmittance of 7.1% to reduce the amount of heat entering the interior during the day, and a low thermal reflectance of 7.7% or high thermal emittance of 92.3% to help dissipate heat from the interior at night. This versatile design allows the window to provide comfortable conditions year-round.

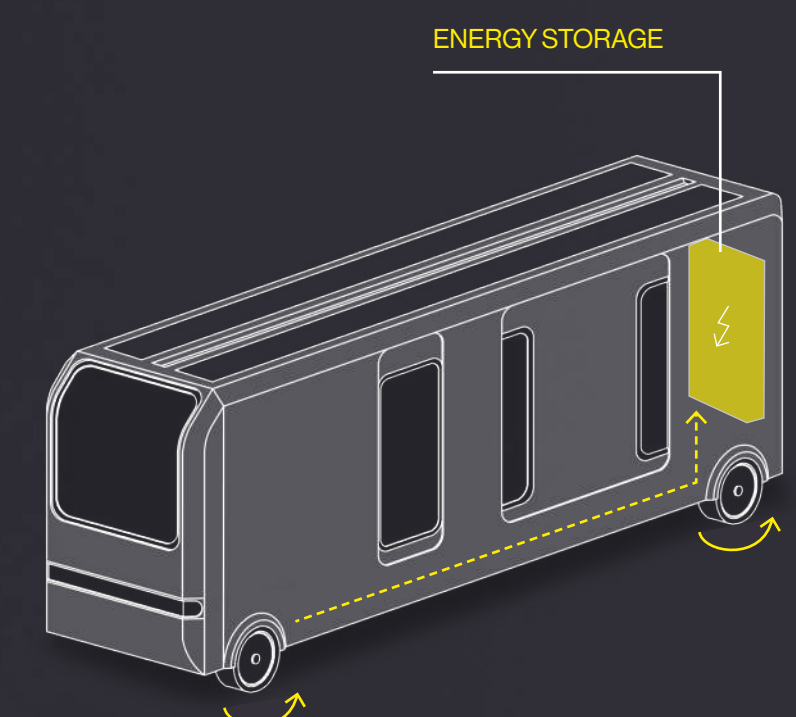


**C |** The Nomad house is designed to minimize heat loss and maximize the collection of rainwater. This water is directed into a large storage tank, where it is filtered to remove impurities. The tank can be filled from any water source, such as a lake or river, and the water will be treated with a range of filters, including a reverse osmosis filter. Additionally, drinking water is provided directly from the taps, thanks to filters installed at the point of use.



The toilets in the microdome are waterless and use a composting system to break down waste. This is an environmentally friendly and efficient way to manage waste, as it reduces the need for water and helps to produce nutrient-rich compost that can be used for gardening or other purposes.

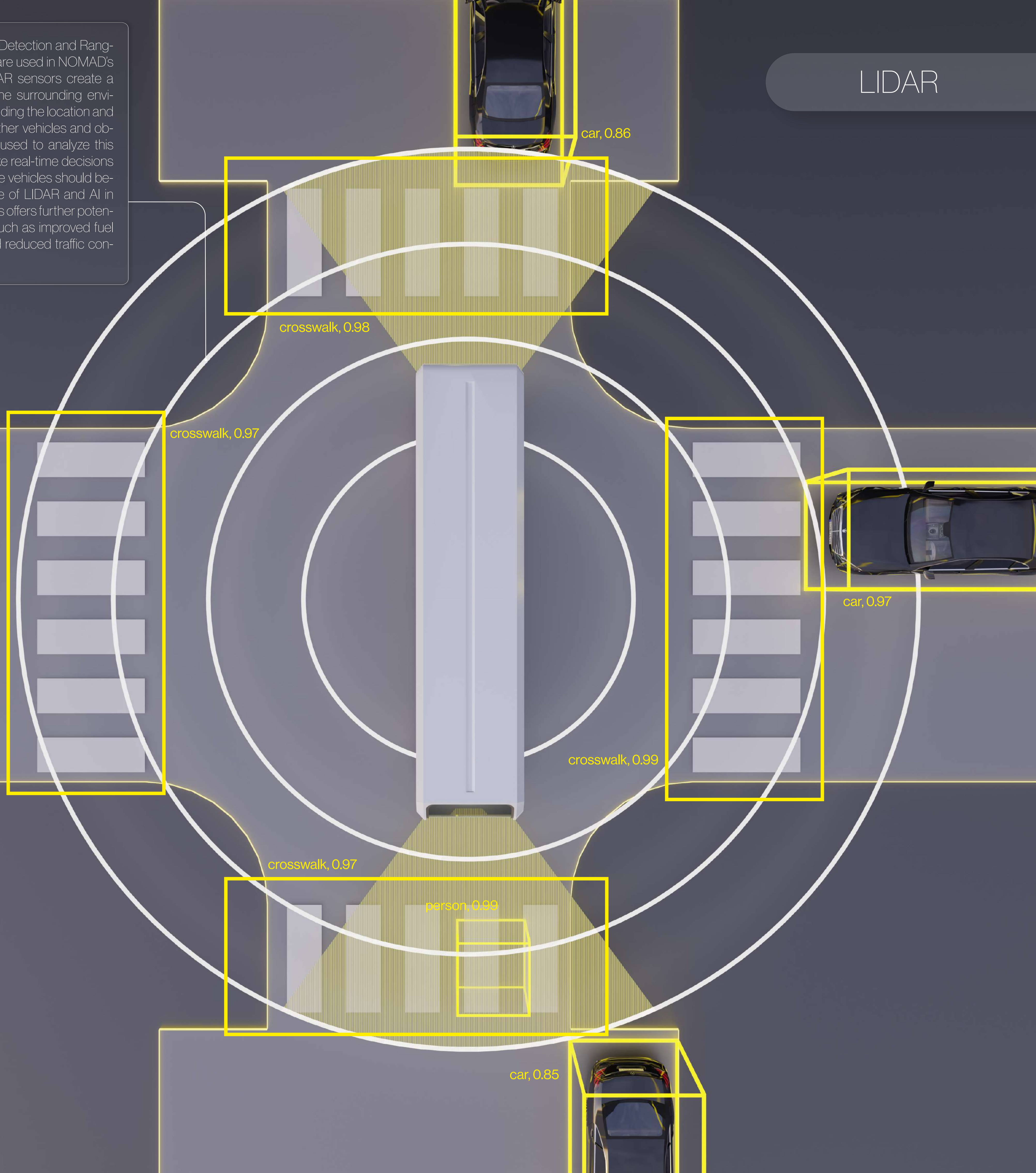
**D |** The wheels rotate and drive the rotor as they drive. This movement of the rotor within the generator creates a magnetic field, which in turn produces electricity. The battery stores this electricity until it is needed, at which point it can be used to power various electrical devices and machines. This process is known as kinetic energy conversion, and it is a common way to generate electricity for use in vehicles, such as cars and buses, as well as in other applications, such as wind turbines and hydroelectric dams.





LIDAR (Light Detection and Ranging) sensors are used in NOMAD's HOUSE. LIDAR sensors create a 3D map of the surrounding environment, including the location and distance of other vehicles and obstacles. AI is used to analyze this data and make real-time decisions about how the vehicles should behave. The use of LIDAR and AI in these systems offers further potential benefits such as improved fuel efficiency and reduced traffic congestion.

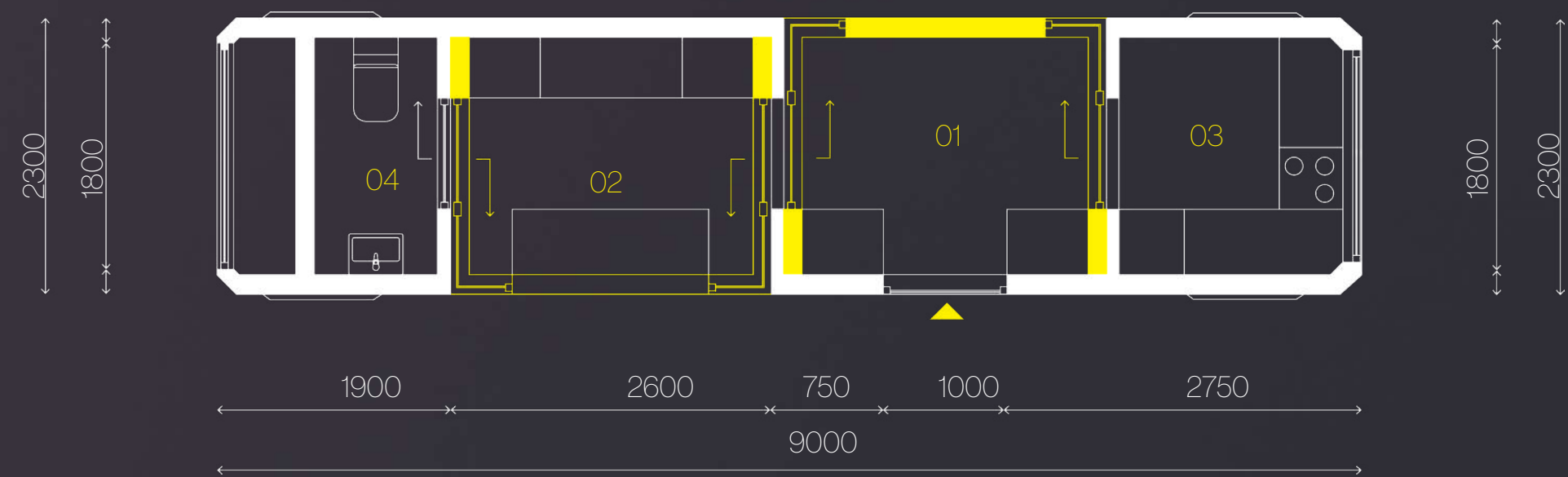
## LIDAR





# DESIGN OF THE HOUSE

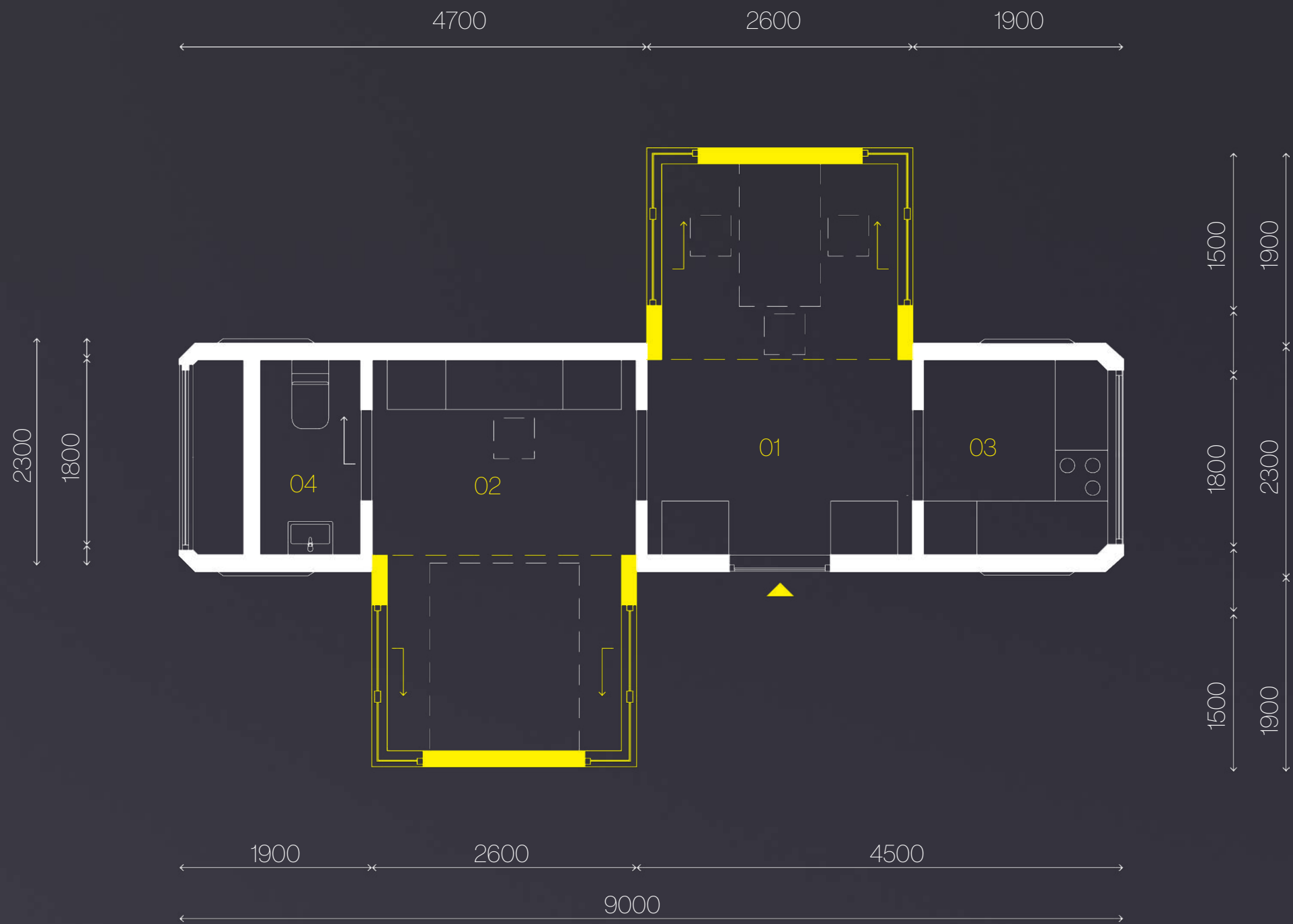
PLAN (m1:50)



## LEGEND

- 01 - hallway (dining room) - 5,06 m<sup>2</sup>      03 - kitchen - 3,96 m<sup>2</sup>      05 - tech. room - 1 m<sup>2</sup>  
02 - living room (bed room) - 5,06 m<sup>2</sup>      04 - WC - 2 m<sup>2</sup>

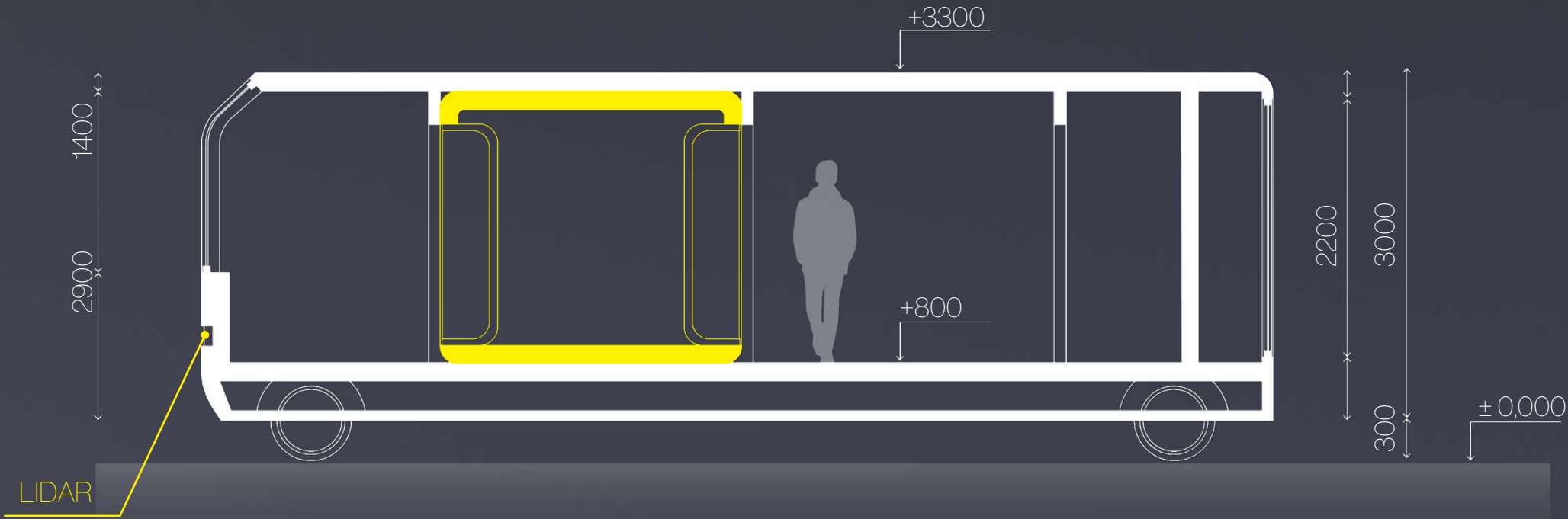
PLAN with sliding modules (m1:50)



## LEGEND

- 01 - hallway (dining room) - 10 m<sup>2</sup>      03 - kitchen - 3,96 m<sup>2</sup>      05 - tech. room - 1 m<sup>2</sup>  
02 - living room (bed room) - 10 m<sup>2</sup>      04 - WC - 2 m<sup>2</sup>

SECTION (m1:50)

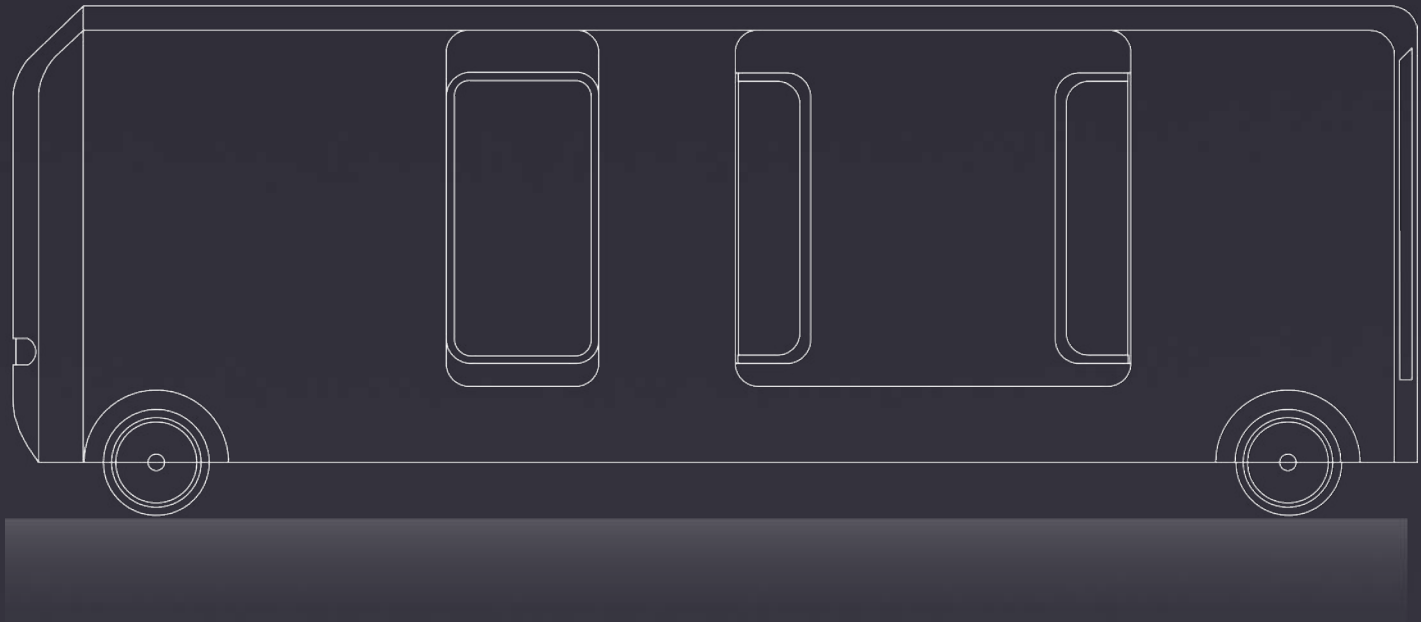


When assembled, the area of the house is 16 m<sup>2</sup>. When unfolded, the area increases by another 10 m<sup>2</sup>, which provides more comfortable living in this house. In the enlarged rooms there is room for a dining room and a bedroom. These rooms have sliding panoramic windows that will be used for natural ventilation. For example, in the summer, the dining room or bedroom can be used as a terrace thanks to the open windows. In the technical room are the battery Lavo, also there are pipes, so house can connect to the city technical infrastructure.

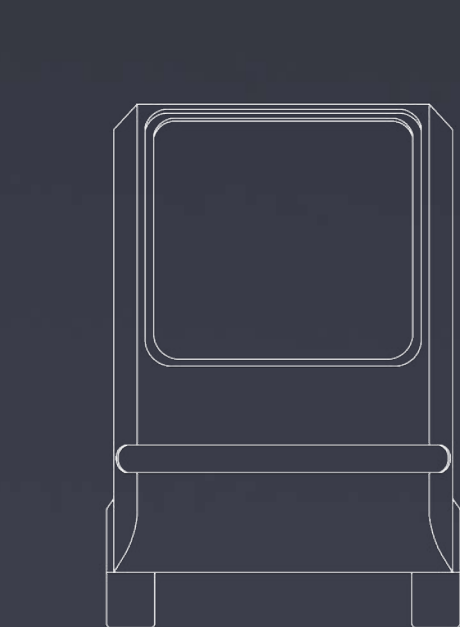
1st SIDE VIEW (m1:50)



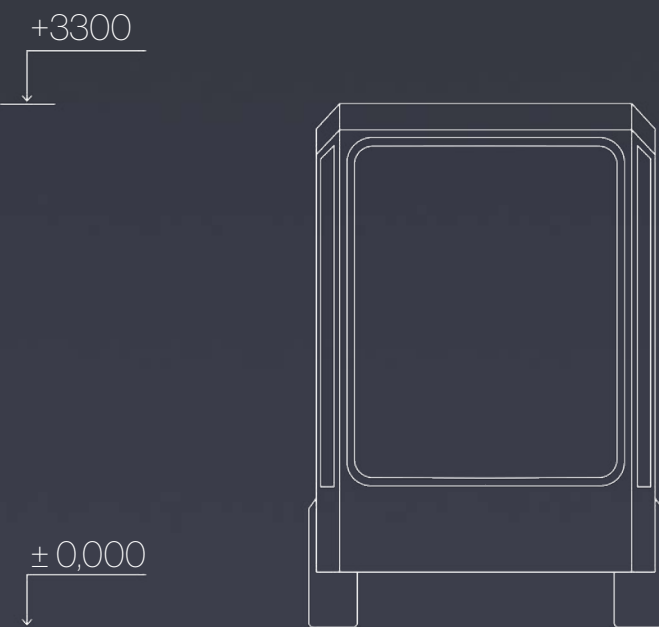
2nd SIDE VIEW (m1:50)



FRONT VIEW (m1:50)



BACK VIEW (m1:50)



# DISTRIBUTED AXONOMETRY

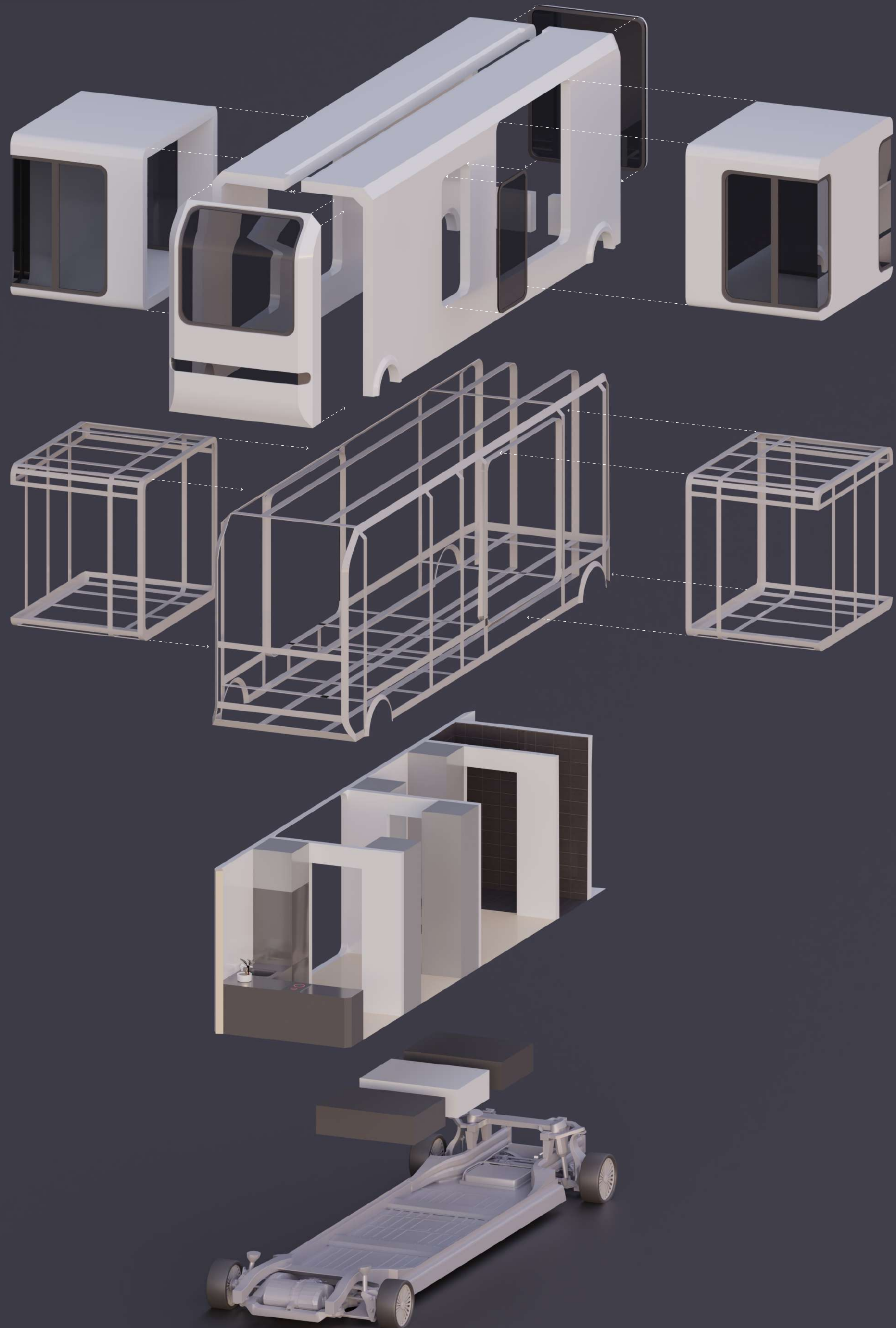
3d printed body made of sandwich panels

Aluminium body frame

Interior

Water tanks for gray, white and black water

Electric engine with car battery storage

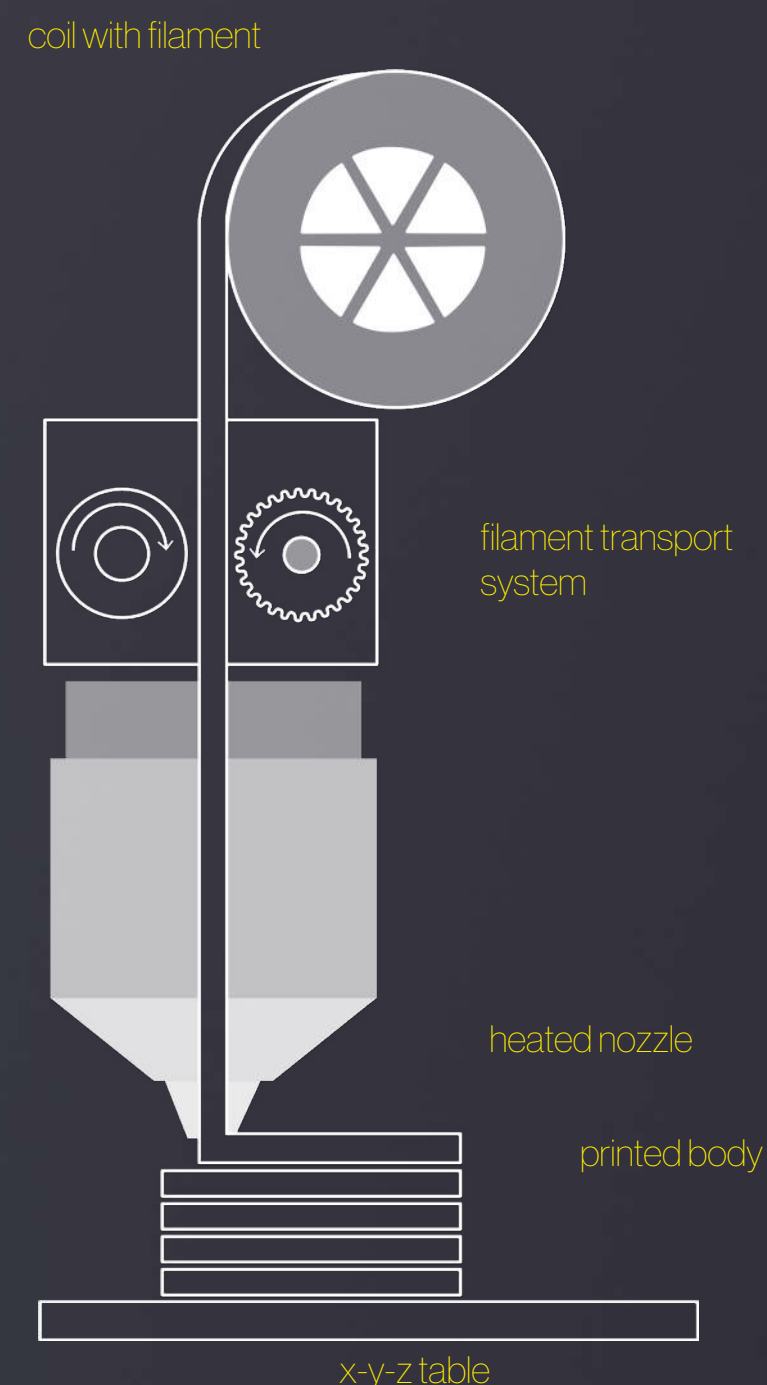




# MATERIAS OF THE DESIGN

## A | FFF technology

The modern way of manufacturing light-weight sandwich structures from plastic, composite and metal materials is additive manufacturing technology. Additive manufacturing technology involves layer-by-layer application of material, the main purpose of which is to convert digital models into physical objects. This particular design will use **Fused Filament Fabrication (FFF)** technology because it allows the use of a wide range of materials, is quiet and safe, and allows the production of usable objects and components.

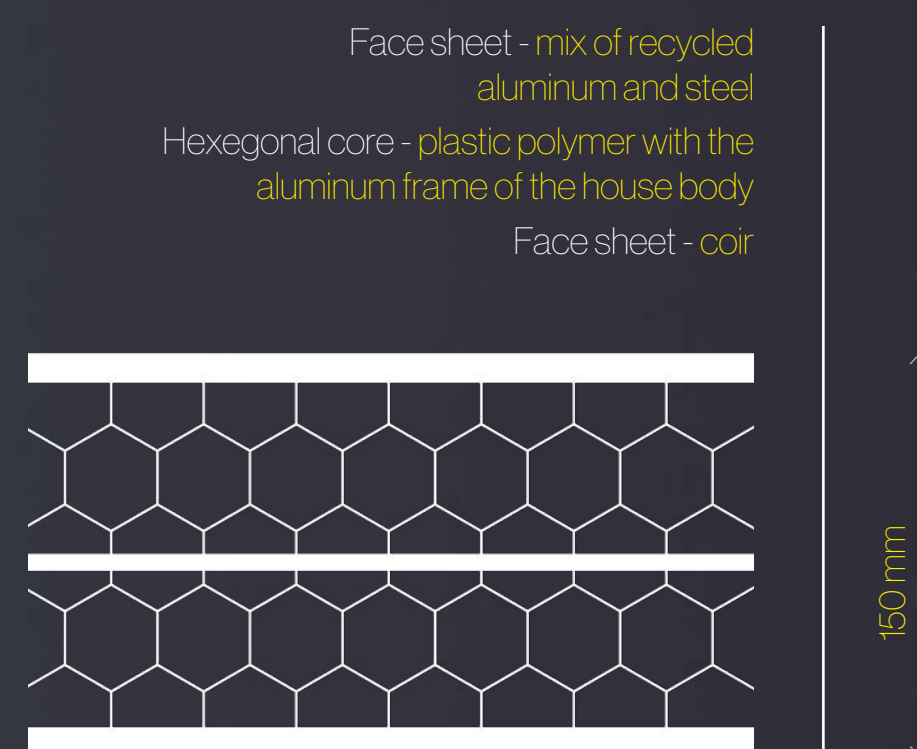


## B | Bio based materials of the sandwich panels

1) Due to their high strength, stiffness and combination with low weight, fiberglass plastics are used today for various structures. They are usually made of epoxy resin and synthetic fibers. They are commonly referred to as high performance composites. Due to various advantages such as light weight, biodegradability, low cost and excellent mechanical properties of polymer composites reinforced with natural fibers (NFRPC), they are becoming more and more in demand. In this case, **coir** is used as a natural reinforced composite. It has high mechanical properties. This composite will be part of the sandwich panel.

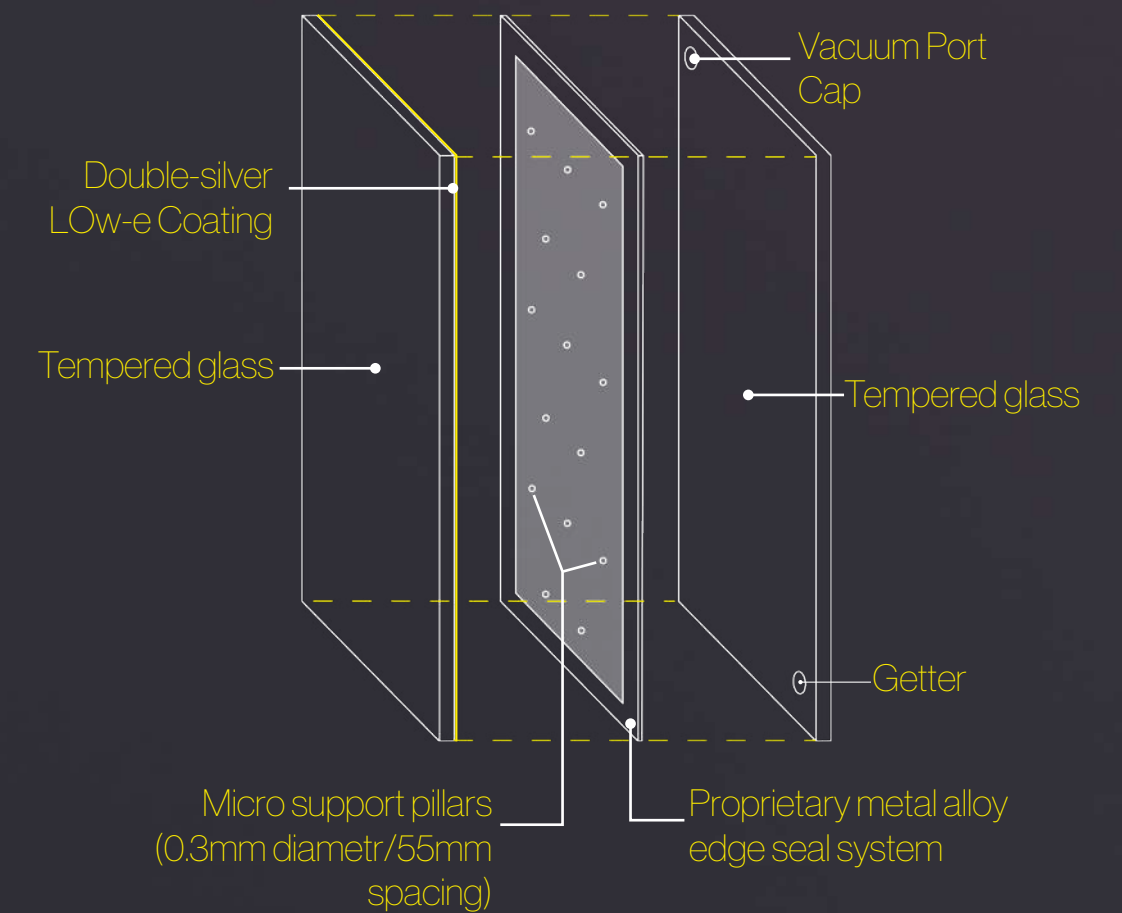
2) The outer layer is made of a **mix of recycled aluminum and steel**. This material has good mechanical properties, it is lightweight, stainless and durable.

3) The core of the sandwich panels will be recycled **plastic polymer**, which has excellent mechanical and thermal properties.



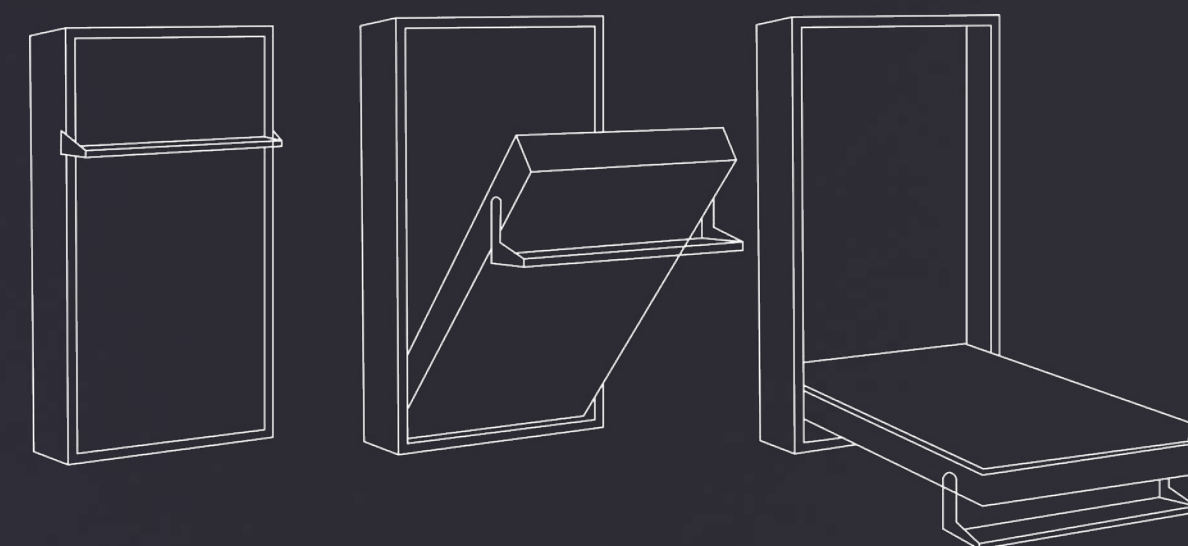
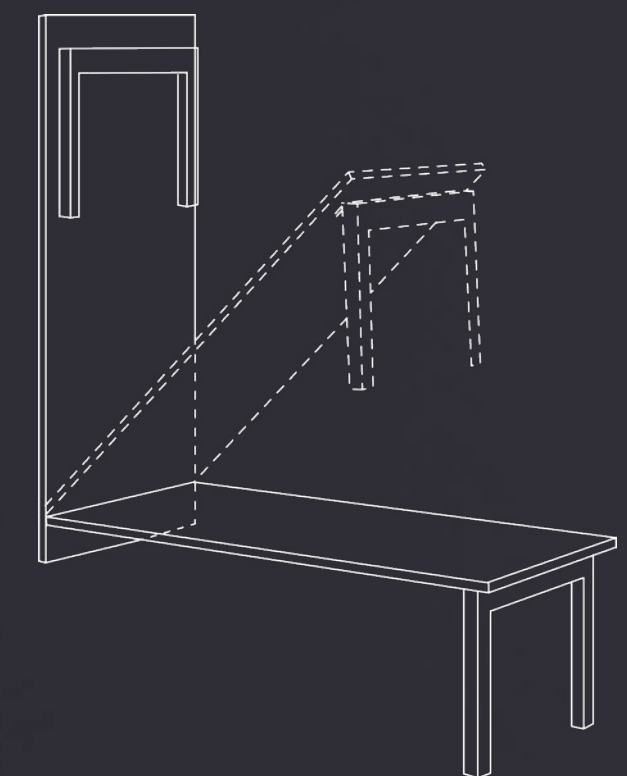
## C | Windows

**Vacuum insulated glass (VIG)** is a type of high-performance glass consisting of two pieces of glass bonded together with a vacuum layer between them. The glass used is a combination of white glass and low emissivity glass, which are bonded together to form a vacuum layer between 0.1 and 0.2 mm thick. This vacuum layer provides increased thermal resistance and improved thermal insulation. The glass is also very light and thin, which helps reduce the weight.



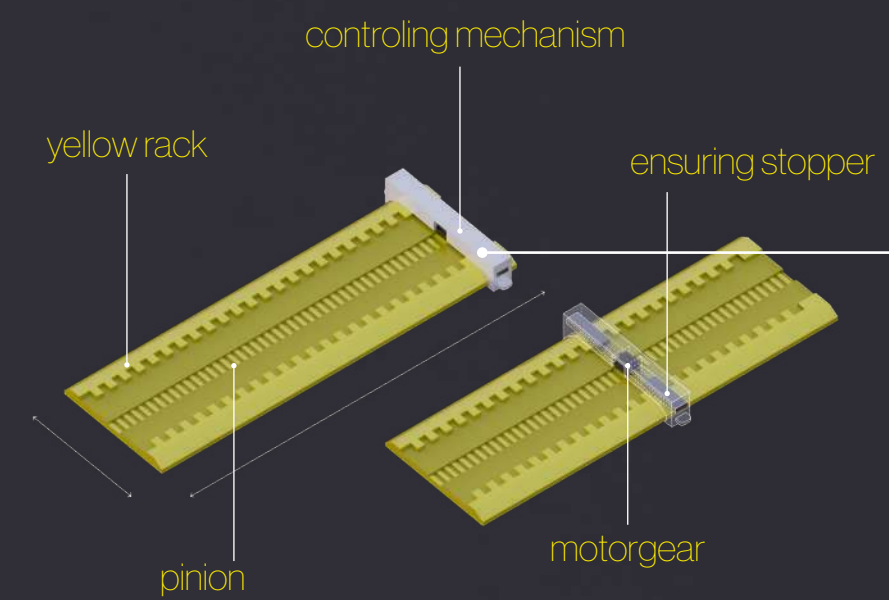
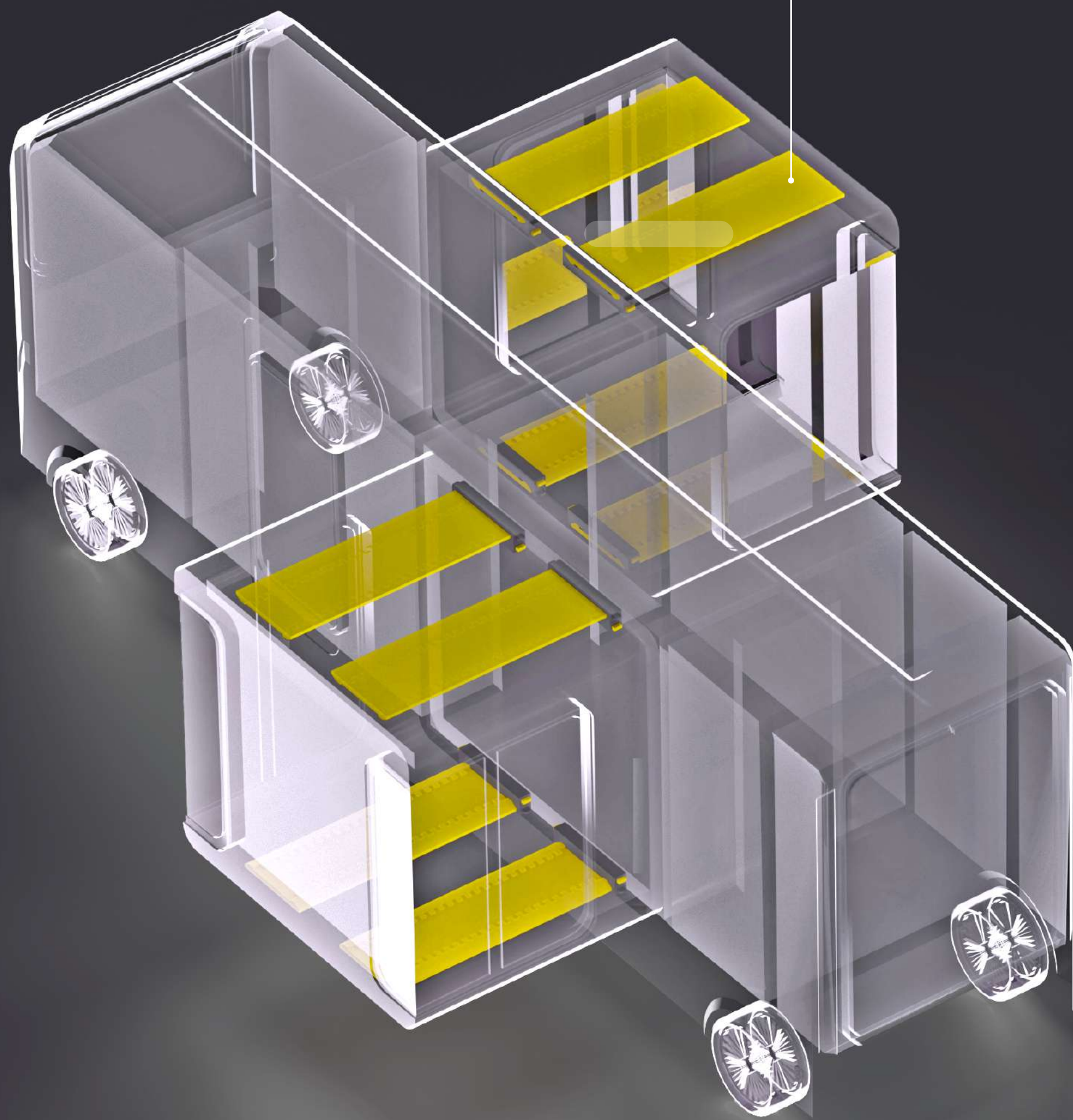
## D | Saving furniture

**Servo-Drive** is probably the most famous "smart furniture" opening system from **Blum**, it has an **electric drive** that can be connected to several modules. All these developments can be used in combination to get the most comfortable effect from the use of saving furniture. One of the pieces of saving furniture for a tiny house is a wall bed. This type of bed is designed to fold up against the wall when not in use, creating a lot of extra space in the living area. Fold-out desk can be used to create a workspace that can be stored away when not in use.

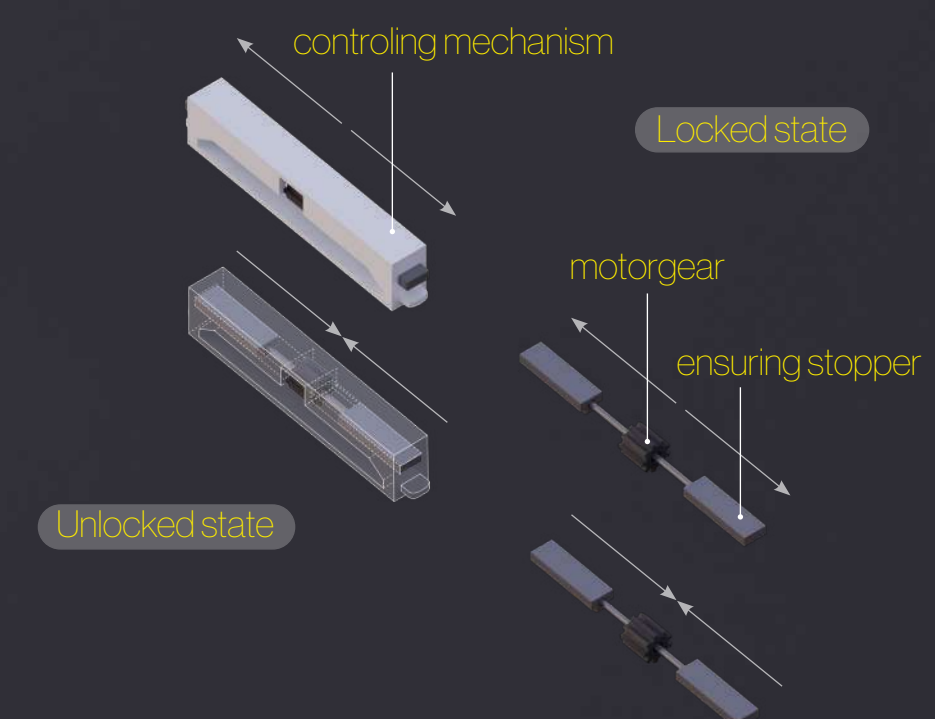




# SLIDE-OUT SYSTEM



The yellow part is a rack anchored to the slide-out module. In total, there are 4 racks attached to the module, 2 on top, 2 on bottom. The part has trapezoidal shape and is 1.8m long and 0.6m wide. The rack has two pinions on the sides and one on the bottom. The side pinions are used to block the module firmly to assure the best safety. The pinion on the bottom is a part of the slide-out system described below.



Stoppers are placed on the side of the mechanism and assure the module immobility, controlled by the smart system. Before the engine starts the system assure the module to slide-in, controlling the presense of obstacles. If the obstacles check is not passed, the home cannot move. While driving, the stoppers are extended to lock the modules. The smart system assures that the home can unfold securely. Stoppers are made of titan, since it has the best strength-to-weight ratio.

There are two motor gears, one on top, one on bottom. The motor gears are connected to the electric engine moving the module in and out. Furthermore, when the module locked it helps the stoppers to keep the system locked.