

PROJECT

HELIOPROFIL 'PHOTON-E'. ENERGY ACTIVE BUILDINGS WITH SOLAR HEATING AND SOLAR POWER GENERATION.



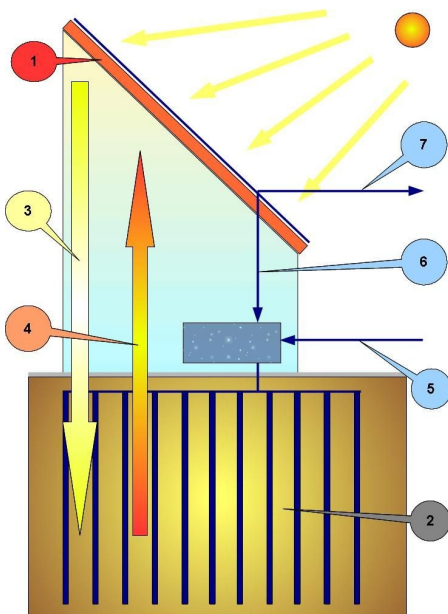
Project goal: heat supply of places of sustainable human presence on the long-term historical perspective without using the fossil energy sources.

Project objectives: creation of assembly production of **helioprofil PHOTON-E** (hereinafter “**helioprofil**” or ‘electrohelioprofil’) for the purpose of its widespread introduction into the structures of energy active buildings with solar heating and solar power generation.

Project description

Energy active buildings

The concept of an “energy active building”: Solar radiation that falls on a roof and facades of energy active buildings throughout the year (especially in warm weather) is absorbed and heats the heat transfer fluid. Heat transfer fluid transfers heat to a network of plastic heat-exchanging tubes of a soil heat storage unit and heats it up. The accumulated heat is transferred to a low temperature (+35 °C) heating system of a building during the heating season. The temperature of a soil heat storage unit changes during the year within the range of +40 °C - +60 °C in the steady-state mode (after 3 – 4 years from the beginning of operation). Some solar radiation is converted into electricity. The concept is based on the fact that within the territory of residence of the most of the world's population, the amount of incoming solar radiation at the Earth's surface exceeds 600 kWh/m² per year. Modern heat consumption indicators dropped down to the level of 15-60 kWh/m² of a heated area per year. This difference makes it possible to design and build energy active single- and multi-storied buildings with solar heating and



solar power generation, taking into account the heat loss through the building enclosing structures and heat loss of a soil heat storage unit.

An energy active building meets the conditions of heat consumption as “passive houses” and incorporates an energy active roof and facades made of the **helioprofil**, a heat pump, a seasonal soil heat storage unit and uses renewable energy sources: solar radiation, soil and air heat, including ventilation. A supply-and-exhaust system with air heat recuperator is used for ventilation. Air evaporative coolers consuming electricity 10-15 times less than compression air conditioners and more adapted to the human body are used in the air conditioning system. The load on the air conditioning system is reduced, due to the fact that most of the solar heat from a roof and facades of energy active building is carried away by heat transfer fluids.



A seasonal soil heat storage unit consists of a system of vertical plastic heat-exchanging tubes “2U” and an amount of soil between them and around them.

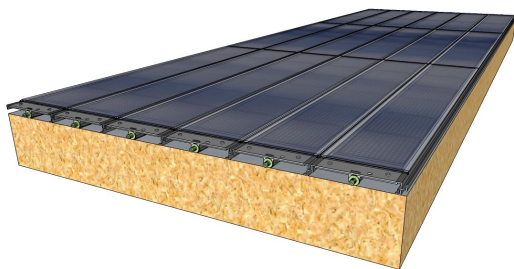
A heat pump is used to follow the norms of heat consumption in adverse weather conditions and prior to the sustainable operation mode of the system.

Houses within the “energy active building” concept can be either newly built or reconstructed.

The **helioprofil**, which is an external structural component of an energy active roof and facades, is a relatively small-sized structural unit for the construction of roofs and facades of buildings. Other elements of the power supply system of an energy active building are located inside and underneath. Accordingly, scalability of the system capacity depends mainly on the size and architecture of buildings, and their number. Also, a roof and facades of energy active buildings can be designed according to the architectural and cultural traditions of the country or region.

Energy active buildings will be structural and technology cellular units of the concept of a “seasonal thermal thyristor”: solar power coming to the building surface is immediately transmitted to the surface layer of soil and used in portions for heating purposes. In conjunction with CHP units, running on bio- and generator gases (natural waste of human communities is used), energy active buildings will form a basis for energy autonomous communities.

Helioprofil

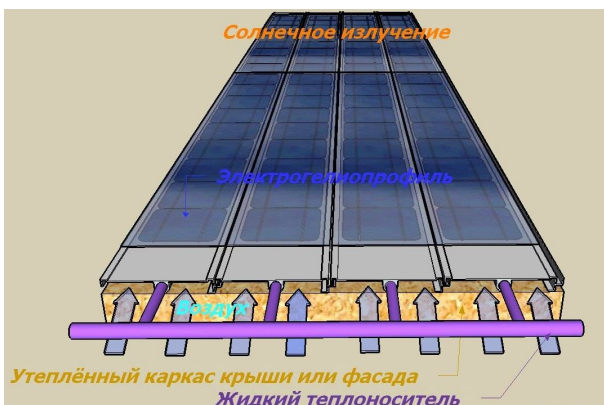


Helioprofil is a “3 in 1” product: a structural building material; a heat solar collector with air and liquid loops of heat transfer fluids; a solar panel. It is used in the construction of energy active roofs and facades as part of energy active buildings. Production of “solar” electricity increases due to the partial cooling of photoelectric converters, composing the **helioprofil**.

Design characteristics of the **helioprofil** option:
1) electric power of 45 W; 2) thermal power up to 350 W; 3) length of 3.1 m; 4) mounting width of 0.175 m; 5) effective area of 0.51 m².

The **helioprofil** is mounted on a heat-insulated frame of a building together with incorporated structural components of liquid and air loops of heat transfer fluids and a power grid of solar power generation.

The presence of liquid and air loops of heat transfer fluids allows to: 1) use a heat transfer fluid loop for heat storage in a seasonal soil accumulator, heating and hot water; 2) use an air heat transfer loop



for air heating; 3) use both air and fluid loop of heat transfer fluids and a “water-water” heat pump for receiving heat from the air, including ventilation, in cloudy weather and at night.



The **helioprofil** consists of a base profile (lining) film photoelectric converters, liquid loop fittings and transparent heat-insulation (glass, moulded polycarbonate).

A base profile is made by extrusion of aluminium alloy and has a heat-absorbing surface, a cylindrical hole of a heat transfer fluid loop, a cavity of an air loop, coupling elements with an adjacent **helioprofil** and seals. Photoelectric converters are stuck to a heat-absorbing surface. An air space is between them and transparent heat-insulation.

A base profile is a helioprofil: a “2 in 1” product itself: a structural building material and heat solar collector with heat transfer air and fluid loops. Production of a base profile is located at 2 plants in Ukraine.

Currently, three buildings (Lviv, Dnipro, Dnipro suburbs), which use the principles of an energy active building and helioprofil, has been built or are under construction in Ukraine.

Project implementation

Implementation of the plan to introduce the concept of an “energy active building” using the **helioprofil** comprises the following steps: 1) development of the **helioprofil** design; 2) development of the production technology and production of a pilot batch of the **helioprofil**; 3) full-scale testing and improving of the **helioprofil**; 4) development of installation and operating technologies of the **helioprofil** and systems therewith; 5) establishment of companies for the production of the **helioprofil** and components thereto; 6) development of a simulation model and an algorithm to calculate an energy active building; 7) construction of demonstration energy active buildings in different climatic zones; 8) creation of training and production centres for the design, construction (reconstruction) and operation of energy active buildings; 9) mass construction (appropriate reconstruction) of energy active buildings.



The widespread introduction of the energy active building concept using the **helioprofil** requires resolution of issues by two aspects: technical, and administrative and financial.

Technical aspects are resolved, while ensuring appropriate funding at local level involving cooperation with scientific and industrial companies and aimed at: 1) development of the **helioprofil** design; 2) development of the production technology and production of a pilot batch of the **helioprofil**; 3) full-scale testing and improving of the **helioprofil**; 4) development of installation and operating technologies of the **helioprofil** and systems therewith.

Administrative and financial aspects include addressing the following main issues: 1) search for investors to establish industrial and building capacity for the **helioprofil** production and construction/reconstruction of buildings according to the concept of an “energy active building” and

creation of an associated infrastructure; 2) legislative creation of economic conditions for the performance of work, including appropriate tax preferences, compensatory mechanisms, incentive mechanisms (for example, “green tariff”), and so on.

Project implementation results

The **helioprofil** can be applied in every building, whether it is a new building or a reconstructed building, in accordance with the concept of an “energy active building”. Short-term transformative impact will be obvious in gradual reduction of dependence on external heat distribution networks, reduction in the consumption of fossil fuels and reduction in related costs. Long-term transformative impact, in addition to the above, appears in the refusal to use district heating and related heat loss, in the improvement of environmental safety and steady heat and electric power supply in a time perspective. Personal and operational safety is stipulated by the principle of operation of the **helioprofil** and systems therewith (energy is generated and consumed at the same place). Raw material resource base allows us to organize the mass production of the **helioprofil**. In case of the ratio of 2 m² of a roof or facades made of the **helioprofil** for one person, up to $2 \cdot 10^8$ MWh of electricity and $7 \cdot 10^8$ MWh of heat per year can be received for 1 billion people living in the climatic conditions of Central Europe.

The widespread introduction of energy active buildings will entail creation of energy autonomous communities. The seasonal heat accumulation will be provided with seasonal soil heat storage units of buildings. The role of diurnal and seasonal batteries of “solar” electricity will be played by the existing power grid of the country or region. In the absence of an external power grid, chemical electrical batteries can also be used as a diurnal battery of “solar” electricity.

Achieving the project goal will allow us to: 1) solve the problem of heating of sustainable human presence on the long-term historical perspective without the use of fossil energy sources; 2) significantly increase the share of “solar” electricity in the total energy resource balance (without the use of additional land for solar power plants of an appropriate capacity); 3) reduce components for heating, hot water and power generation in the total amount of environmental pollution.

The widespread introduction of the concept of an “energy active building” with the helioprofil will be similar to the introduction of a “peaceful atom” by its civilizational consequences, but a priori safe for the mankind.

Author: Strashko Vitaly V.

Education: Physico-Technical Faculty. Dnipropetrovsk National University. Specialty: production of aircraft.

The main job:

Design Bureau "South"

Experimental Design Bureau "Photon"

Responsible executor of the project "Solar power plant with photovoltaic and solar radiation concentrators" for spacecraft AUOS-SM (1988-1994r.r.).

1) Copyright certificate the USSR №1702620 for the invention "Solar cell concentrators" priority of 02.08.1989r. By Strashko Vitaly V. and others listed in the description. <https://photo.online.ua/solar-at/271866/>

Research Institute of Energy at Dnipropetrovsk National University

Patents:

1) Helioprofil TEPS - Ukraine patent for the invention of 15.09.2006r №65474 (priority of 08.05.2003.). "Solar collector". Authors: Strashko Vitaly Vasilyevich Podlyepich Vyacheslav Yuryevich, Dmitry V. Beznoshchenko. http://solar-house.ucoz.com/_ph/10/309928744.jpg . The patent is the best invention in 2005 Ukraine's energy http://solar-house.ucoz.com/_ph/10/739566575.jpg .

2) The patent for invention №73254 Ukraine from 15.06.2005r. "Teplopohlynalna panel solar collector." Author: Vitaly V. Strashko. http://solar-house.ucoz.com/_ph/10/8044539.jpg .

3) The patent for invention №79328 Ukraine from 11.06.2007r. "Without enclosure solar collector." Author: Vitaly V. Strashko. http://solar-house.ucoz.com/_ph/10/26835501.jpg .

4) Elektrohelioprofil FOTON-E - Patent for invention №103003 Ukraine from 10.09.2013r. "Helioprofil." Author: Vitaly V. Strashko. http://solar-house.ucoz.com/_ph/10/513839500.jpg .

Scientific articles and presentations:

1) Presentation of the "Solar heating and power generation", 2017. http://solar-house.ucoz.com/load/sonjachne_opalennja_i_elektrogeneracija/1-1-0-92 .

2) Innovative suggestions Organization of elektrohelioprofilu, 2013. http://solar-house.ucoz.com/_ld/0/87_5_.pdf

3) Strashko V. The concept of "seasonal thermal diode" and the problem of global supplies. Abstracts. UDC: 620.9: 621.4: 662.9: 697. International scientific-practical forum "Science and business - the basis of economic development. Dnipropetrovsk, October 11-12, 2012. . http://solar-house.ucoz.com/_ld/0/64_.pdf

4) Strashko V. "Energy active Cottage: seasonal storage heater". UDC: 69,059: 624.01.001. Collection "Reconstruction of housing." Issue 9. 2012. http://solar-house.ucoz.com/_ld/0/24_Strashko_.pdf

5) Strashko V. "Joint work energy active enclosure, heat pump and ground heat the seasonal battery." UDC 662,987: 697.7. Magazine "Energy Technology and Efficiency», №2, 2011. http://solar-house.ucoz.com/_ld/0/18_Strashko.pdf

6) V. Strashko "Joint work energy active enclosure and seasonal ground heat the battery during charging." UDC 662,987: 697.7. Magazine "Energy Technology and Efficiency», №5, 2009. http://solar-house.ucoz.com/_ld/0/17_Strashko_5-09.pdf

7) Strashko V. "Calculation constructive factor helioprofilu TEPS case of liquid coolant." UDC 662,987: 697.7. Magazine "Energy Technology and Efficiency», №4, 2008. http://solar-house.ucoz.com/_ld/0/16_-.pdf

8) Strashko V. "Methods of experimental determination of the surface temperature teplopohlynalnoyi helioprofilu Teps." UDC 662,987: 697.7. Magazine "Energy Technology and Efficiency», №1, 2007. http://solar-house.ucoz.com/_ld/0/15_.pdf

9) Strashko V. "The temperature field energy active enclosure." The journal "Industrial heat". http://solar-house.ucoz.com/_ld/0/14_.pdf

10) V. Strashko "Current energy effect on the operation of energy active roof reconstructed buildings." UDC 69,059: 624.01.001. Collection "Reconstruction of housing." 10. Issue 2013.

http://solar-house.ucoz.com/_ld/0/11_____.pdf

11) V. Strashko "Helioprofil TEPS: assessment of thermal characteristics energy active building envelopes (walls, roofs)." UDC 662,987: 697.7. Magazine "Problems of General Energy» №14, 2006. http://solar-house.ucoz.com/_ld/0/13_06-14_-1-.pdf

12) V. Strashko "Methodology and calculation program coming solar radiation in arbitrarily oriented plane." UDC 662,987: 697.7. Magazine "Problems of the total energy." http://solar-house.ucoz.com/_ld/0/12_90v.pdf

13) V. Strashko "Some aspects of housing reconstruction using helioprofilu TEPS." UDC 69,059: 624.01.001. Collection "Reconstruction of housing." Issue 7. 2010. http://solar-house.ucoz.com/_ld/0/8_Strashko.pdf

14) V. Strashko "Solar roof with helioprofilu TEPS: A complete solution for hot water, heating, ventilation and air conditioning facilities." Magazine "Construction of Ukraine», №1, 2006. http://solar-house.ucoz.com/_ld/0/4_____.pdf

15) Strashko V.V., Kulagina V.S. "Calculation of energy active buildings". Magazine "Construction of Ukraine", 2011. http://solar-house.ucoz.com/_ld/0/7_____.pdf

At this time - independent inventor

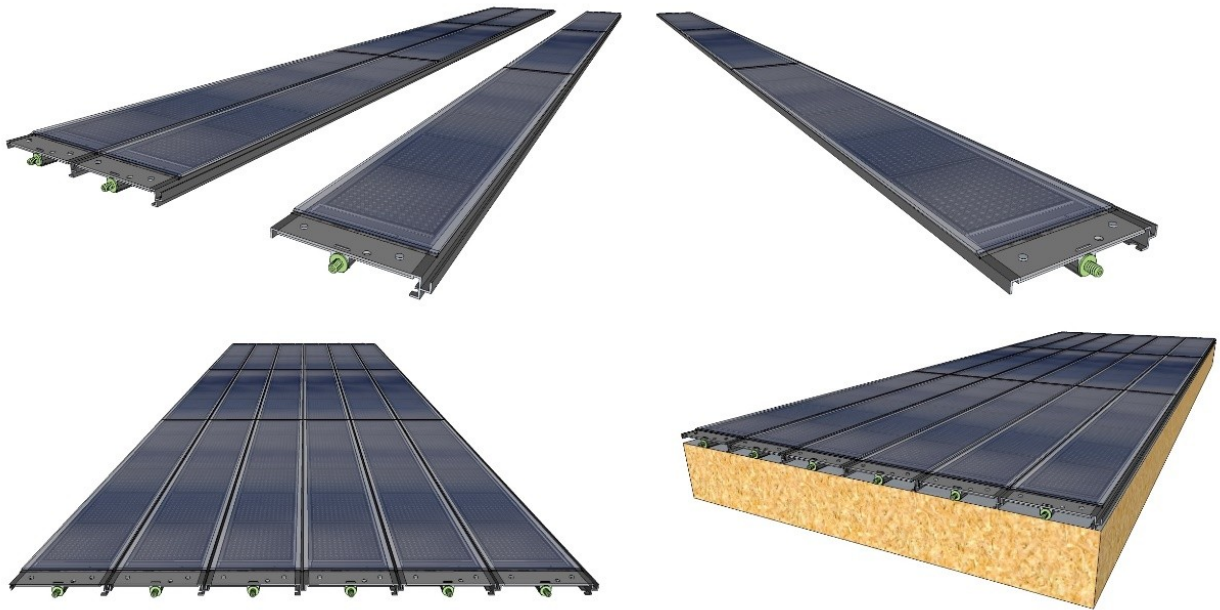
Since 1988, working in the field of solar energy

The inventors "helioprofil" and concepts of: "energy active building" and "seasonal thermal thyristor"

ALBUM PICTURES AND PHOTOS



Helioprofil PHOTON-E



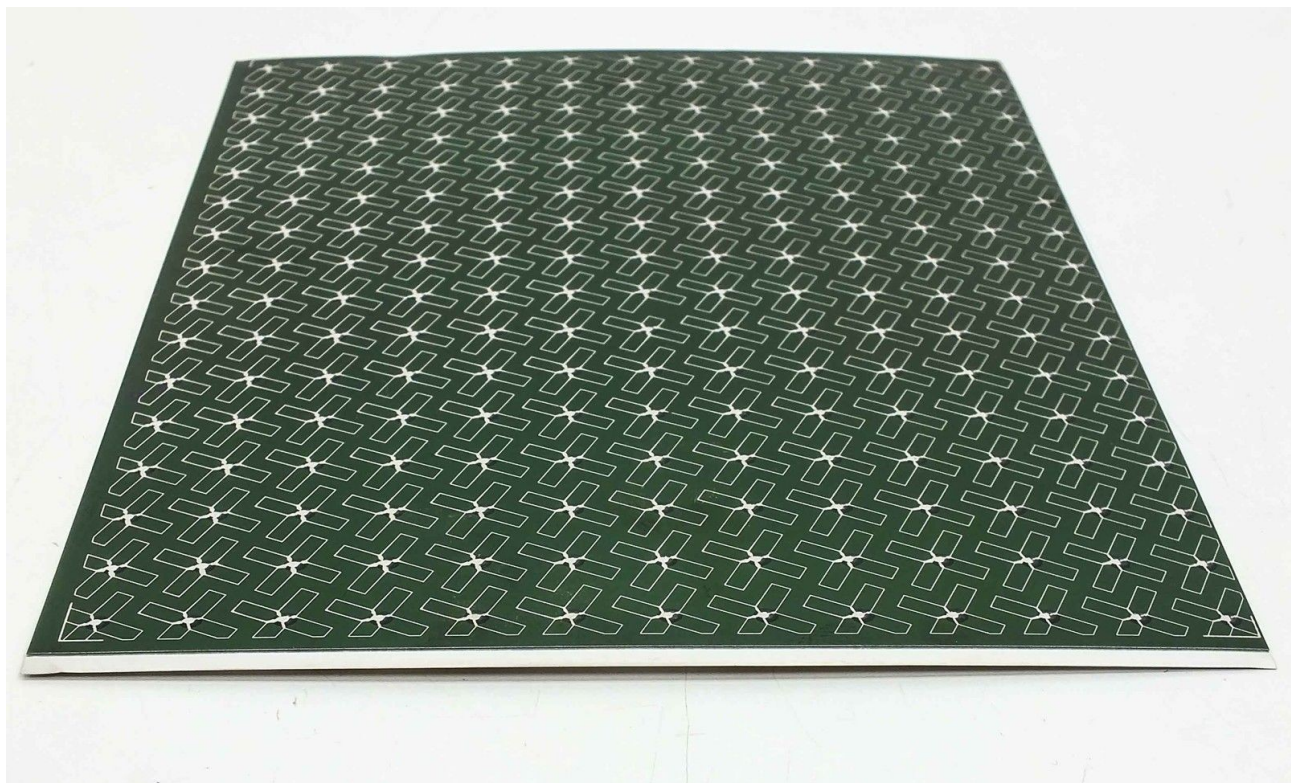
Helioprofil PHOTON-E. Overall



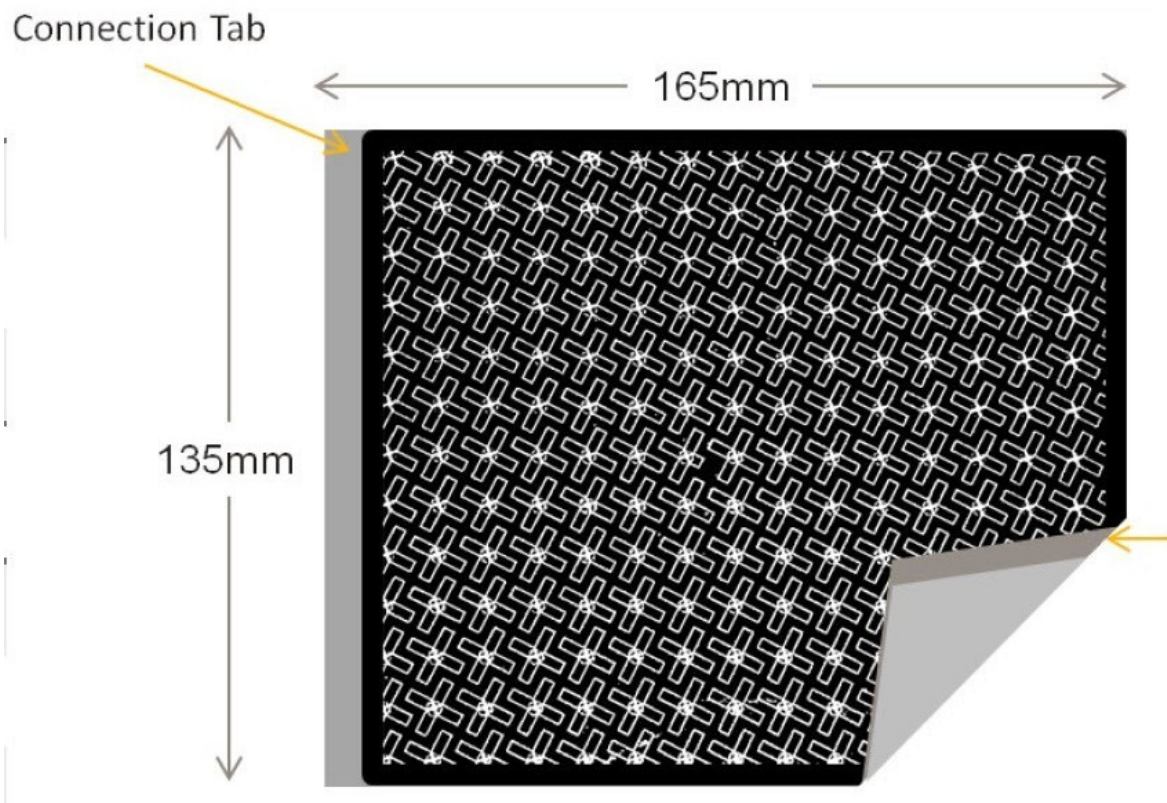
Helioprofil PHOTON-E (profile-substrate)



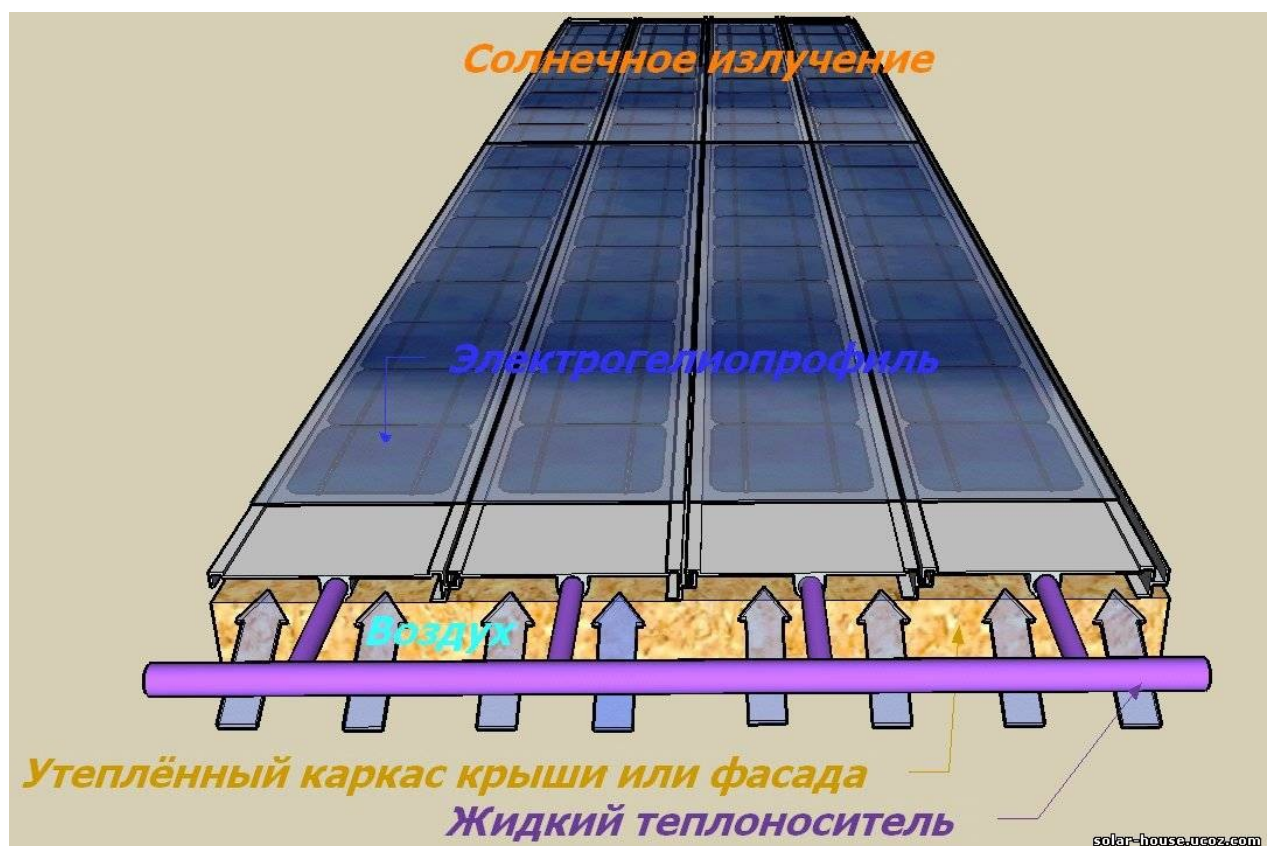
Helioprofil PHOTON-E (profile-substrate)



2.6 Watt Flexible CIGS Solar Cell for Helioprofil PHOTON-E



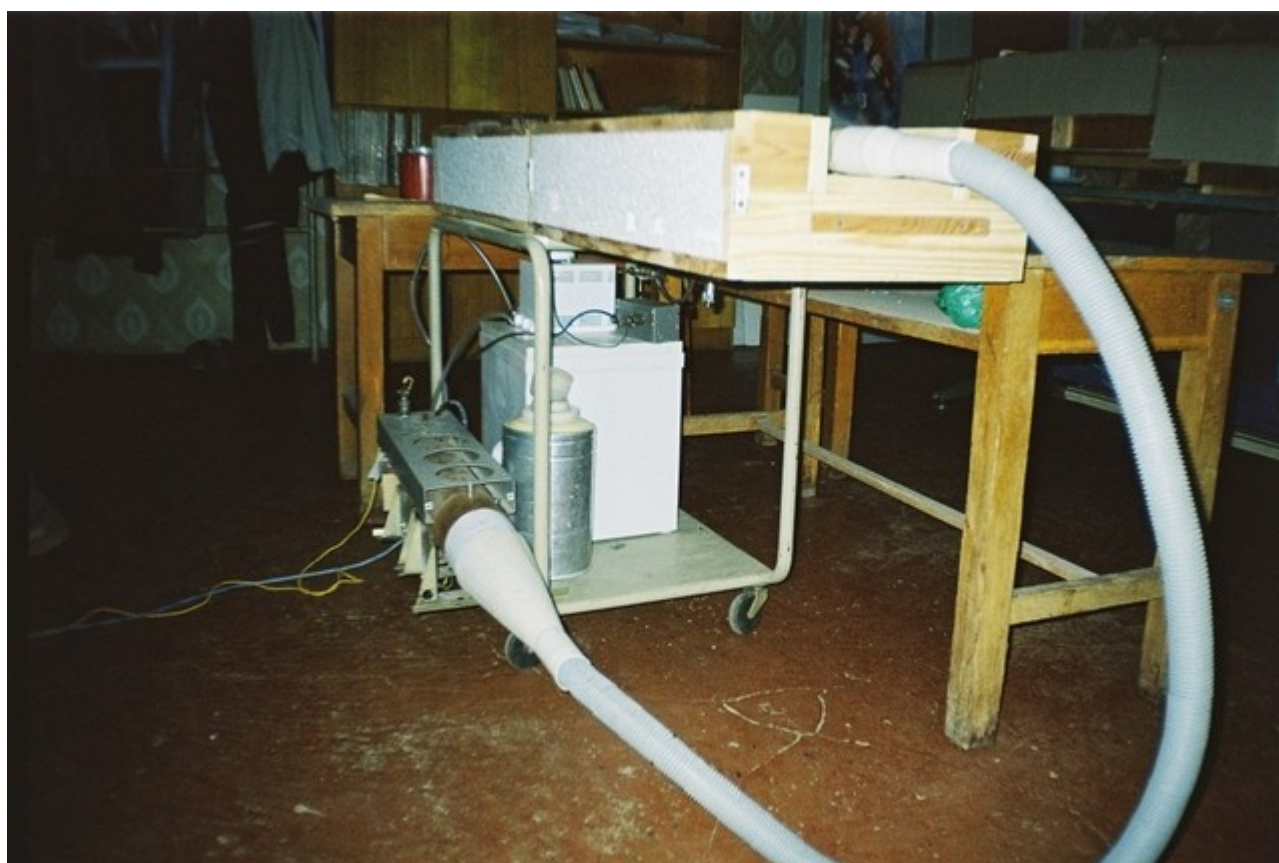
2.6 Watt Flexible CIGS Solar Cell (size)



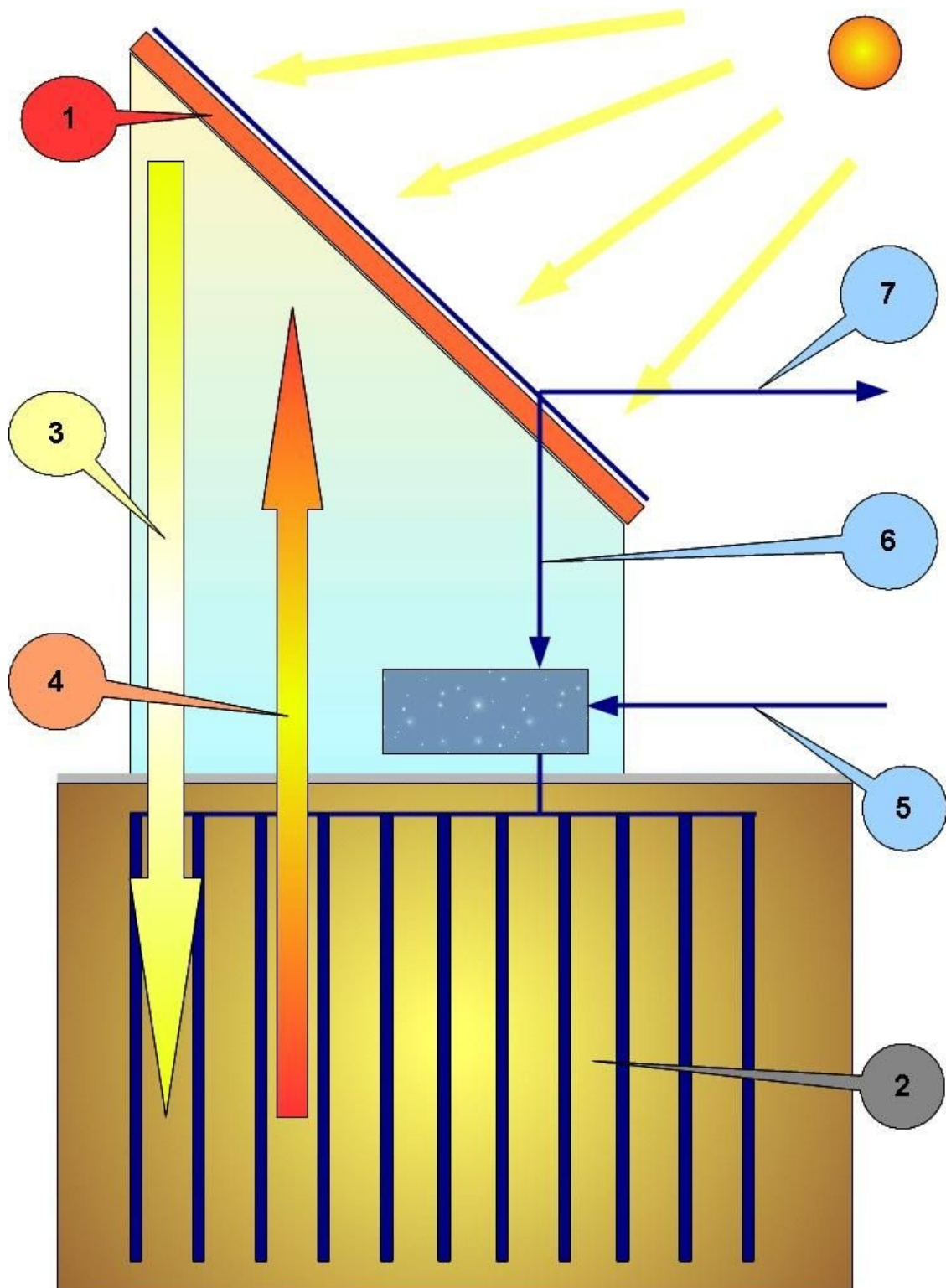
Scheme of Helioprofil PHOTON-E



Helioprofil TEPS



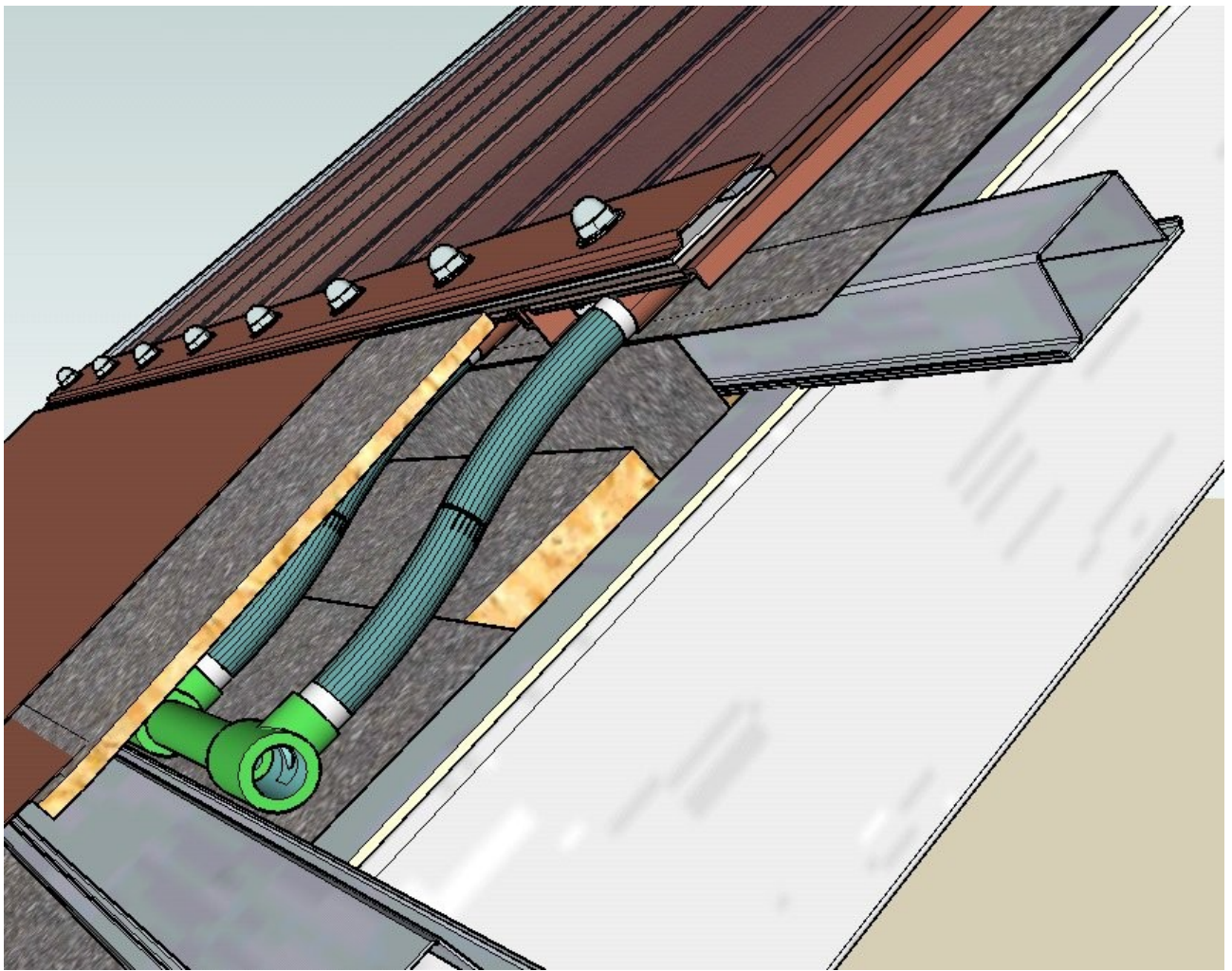
Stand for investigation helioprofilyu



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The system power energy active buildings

1. Energy active roof
2. Seasonal soil storage heater
3. Accumulation of solar heat
4. Heating buildings
5. Consumption of external electricity
6. Supply of electricity for the needs of the building
7. Electricity supply



Fragment of fence construction energy active (optional)



Energy active roof (construction)



Seasonal soil storage heater



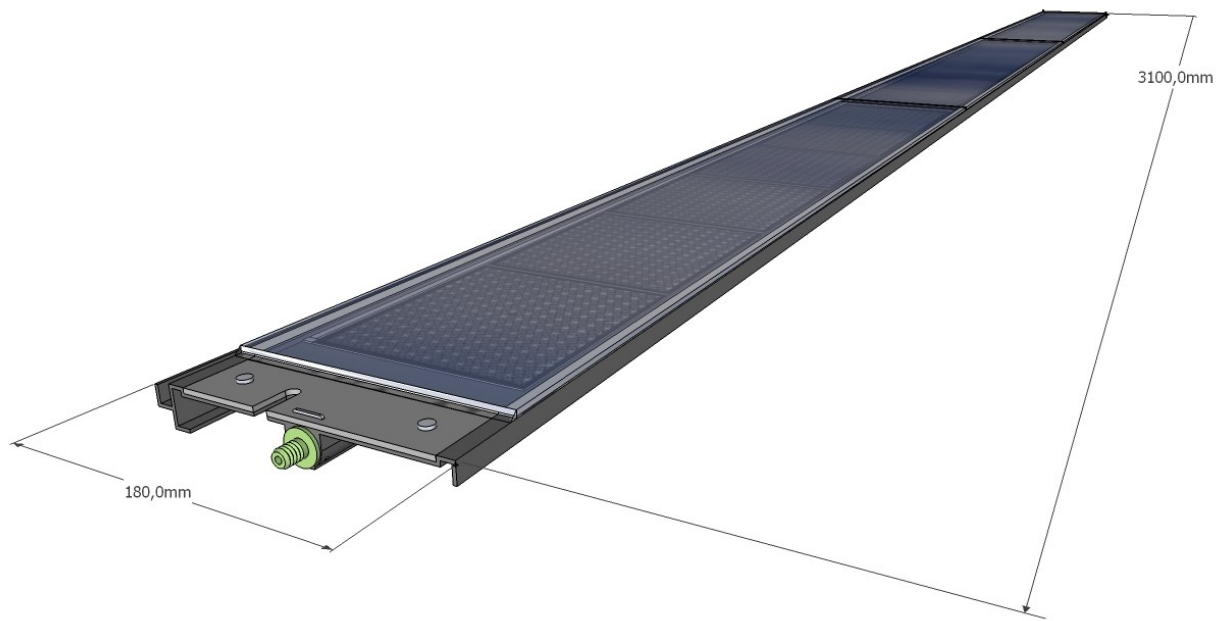
Seasonal soil storage heater (in the basement)



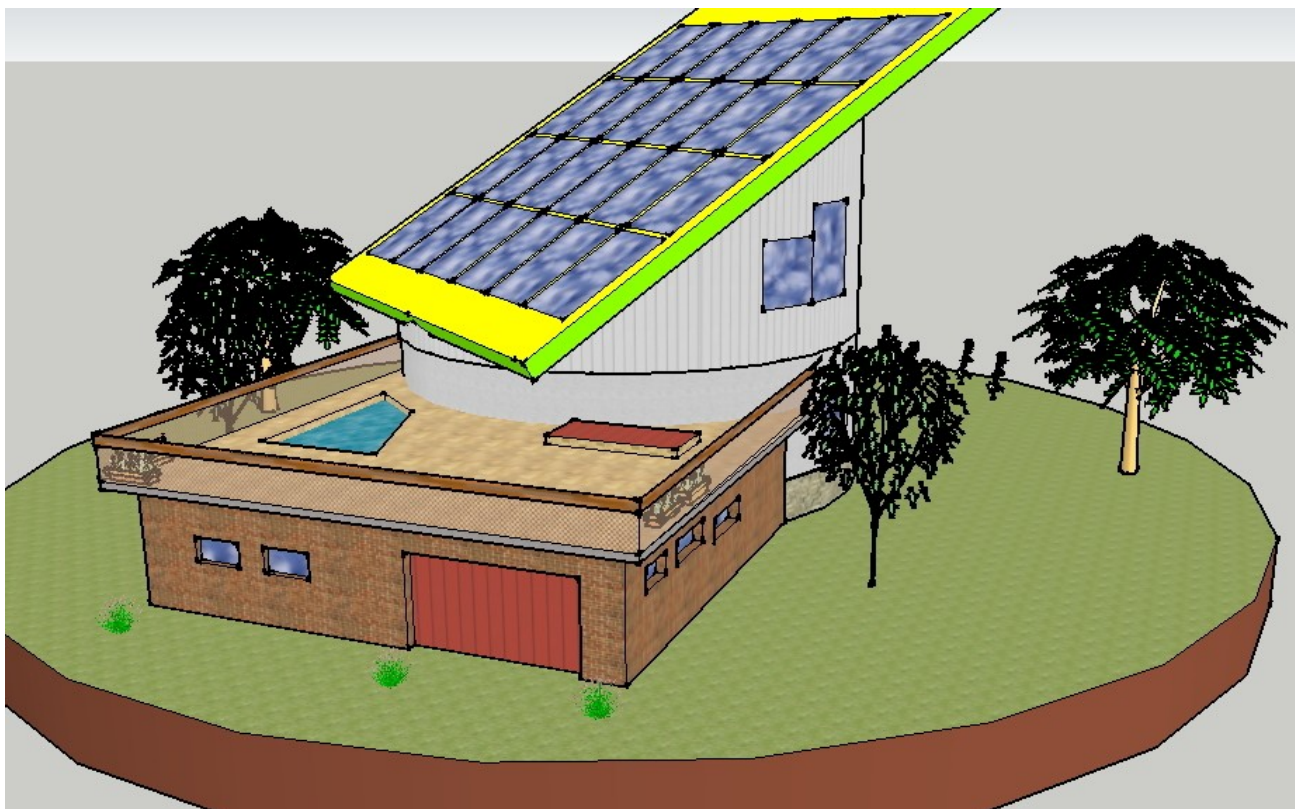
The building elements of the concept of "Energy active building" (Lviv, Ukraine)



The building elements of the concept of "energy active building" (Dnipro, Ukraine)



Helioprofil PHOTON-E (3.1m and 6.1m possible)

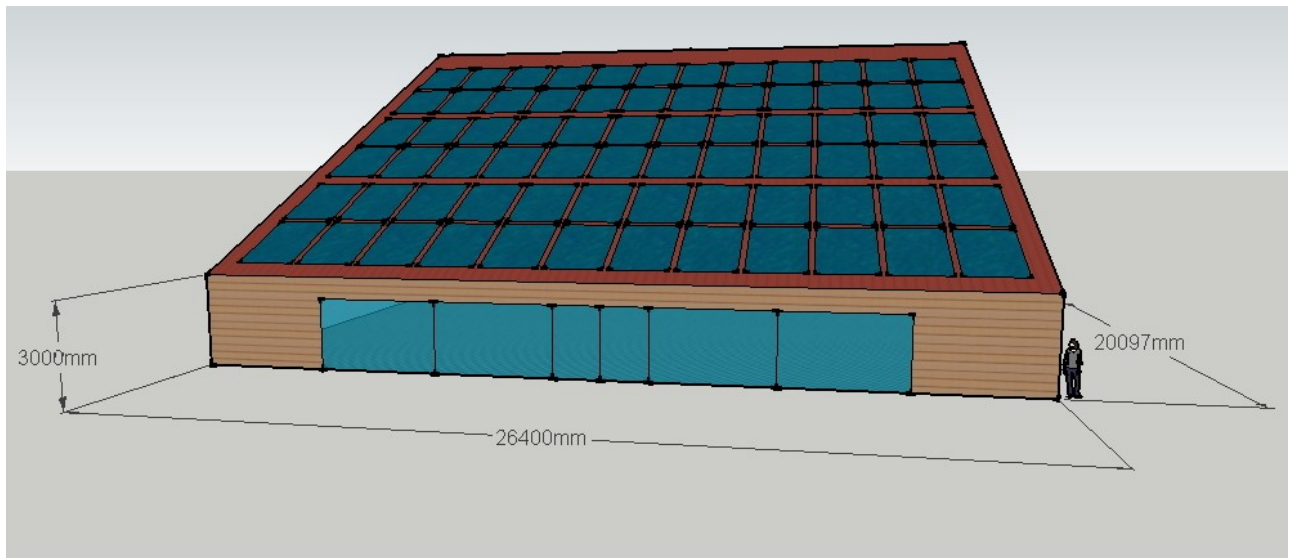


Energy active house with turning attic

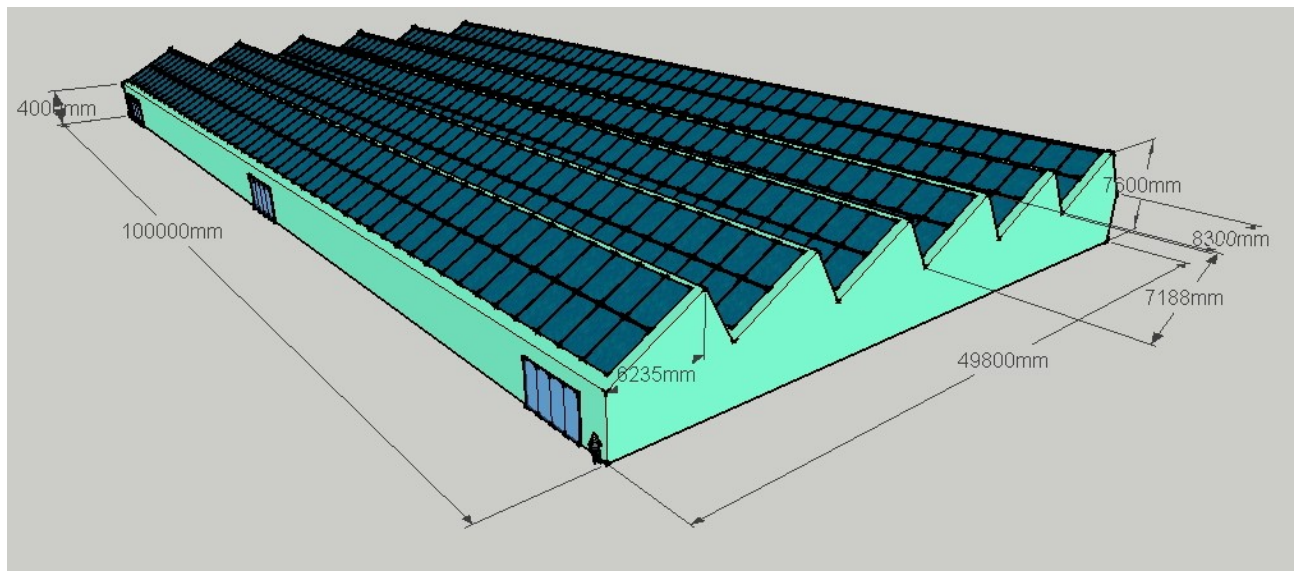


Electricity Energy autonomous settlement

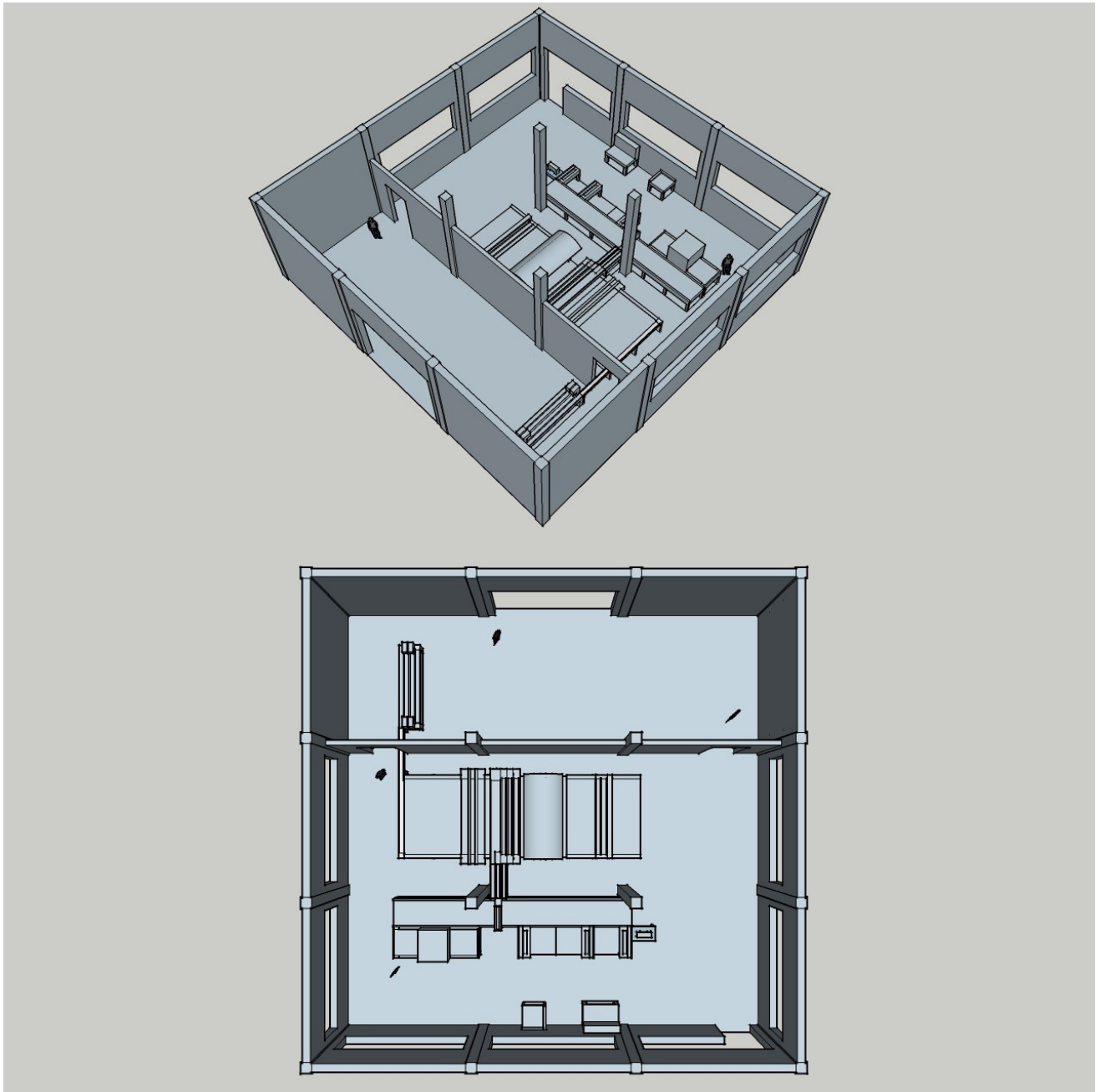
Solar radiation that falls on a roof and facades of energy active buildings throughout the year (especially in warm weather) is absorbed and heats the heat transfer fluid. Heat transfer fluid transfers heat to a network of plastic heat-exchanging tubes of a soil heat storage unit and heats it up. The accumulated heat is transferred to a low temperature (+35 °C) heating system of a building during the heating season. The temperature of a soil heat storage unit changes during the year within the range of +40 °C - +60 °C in the steady-state mode (after 3 – 4 years from the beginning of operation). Some solar radiation is converted into electricity. In conjunction with CHP units, running on bio- and generator gases (natural waste of human communities is used), energy active buildings will form a basis for energy autonomous communities.



Energy active building area of 500 m²



Energy active building area of 5000 m²



Helioprofile production workshop