

Currently, electricity in Poland is mostly produced in large power plants or combined heat and power plants, where the fuel is hard coal or lignite. These fuels in Poland are used also for heating purposes and for production of domestic hot water. Within large urban agglomerations the heat is produced in combined heat and power plants or heating plants while outside agglomerations heat is usually generated individually based on the use of gas-fired or coal-fired central heating boilers. Burning of fossil fuels causes the emission of harmful gases, including greenhouse gases, which, as shown by scientific research contribute to the so-called enhanced greenhouse effect, which could have an impact on the increase in global average ambient temperature. For this reason the reduction of greenhouse gas emissions is required. A way to reduce emissions of these gases, which is also indicated in the guidelines of leaders of the European Union, is the use for energy purposes of the so-called renewable energy sources (RES). In Poland a significant increase in the production of useful energy based on wind energy and solar energy is currently observed. Popularization of those sources, mainly in the field of small systems is expected in the coming years as a result of the statutory support for the so-called prosumers, thus for individual producers who produce more energy than they consume.

Currently, the interest of potential investors is focused on photovoltaic panels that allow the useful use of solar energy. Produced electricity can be used for the production of heat and for cooling, which requires the use of additional generation devices (e.g. electric heaters, air conditioners). Unfortunately, the production of these products in such systems is characterized by low efficiencies, what means that the amount of solar energy absorbed by the specified solar panel permits to produce a relatively small amount of heat or cold. The technology based on the use of photovoltaic cells is widely used in such countries as Germany and Czech Republic, thus in countries with climatic conditions similar to those prevailing in Poland.

In the proposed project it is planned to conduct analyzes in the field of fundamental research on energy technology, enabling the use of solar radiation for obtaining high-temperature heat, which may be the basis for obtaining electricity or cold, but without the use of photovoltaic cells. In such the system the basic element will be solar concentrators system consisting mainly of mirrors and so-called absorbers. Mirror has the task of concentrating solar radiation on the absorber, which is thus heated to high temperatures. Through absorber flows thermal oil, which receives heat from the absorber material, and in consequence is heated to temperatures of 200-300 °C. Indicated potential of solar concentrators in terms of thermal oil heating will be verified in project at the experimental installations. The hot thermal oil can transfer heat to the water used within the household for heating purposes or utility purposes. Additional application of absorption chillers, which for several years have also been gaining popularity in the energy sector, can enable the production of cold. In absorption chillers that instead of electricity, as is the case of commonly used compression air conditioner, high-temperature heat is using. The planned works will aim at increasing the amount of obtained useful energy, which in the future will allow to increase the investment attractiveness of the technology.