

# Faculty of Power Engineering

2023 წ

№	Grant Name	Supervisor	Project Start and End dates	Amount (GEL)	Status (finished/ongoing)	Grant Code
1	Implementation of innovative technology for effective use of local heating and energy resources with low-emission impact on the environment	Nodar Kevkhishvili	2022-2025	300 000	Ongoing	AR -22-509

## Results/Recommendations

In Georgia, as a country focused on imported energy resources, efficient use of local energy resources, introduction of innovative technologies and practical implementation of energy-saving measures are one of the main prerequisites for ensuring energy security and economic sustainability.

The number of local energy resources includes residual biomass of plant origin (residues from the processing of various fruits and grapes, sunflower seeds, hazelnut shells, etc.) and forest wood resources (residues from forestry exploitation and lumber industry), finely dispersed solid heating (lignite) of the Tkibuli-Shaori mine). The established reserve of fine-fraction solid fuel of the Tkibuli-Shaori mine is 330 million tons, and the energy potential of residual biomass of vegetable origin is equal to  $1.1 \times 10^6$  MWh. Only in Kakheti wineries, the remaining dry biomass after grape processing is 8000-9000 tons every year, which is equivalent to 4-4.5 million m<sup>3</sup> of natural gas.

Despite the fact that residual biomass is a renewable source of energy and is spread over almost the entire territory of the country, is cheaper than fossil heating and significantly reduces the emission of GHG into the atmosphere, its use is currently limited due to the lack of appropriate combustion technologies and devices. For the same reason, the use of low-caloric fine-fraction solid fuel of the Tkibuli-Shaori mine is also limited. As a result of the researches conducted in 2002-2016 at the "Scientific Center of High-Temperature Thermophysical Processes" of the Technical University of Georgia, Prof. Under the leadership of Nodar Kevkhishvili, a combustion device (combustion chamber) implementing the "High-temperature Fluidized Bed" technology was created, which ensures the effective combustion of various types of solid fine-fraction fuels.

The creation and introduction of innovative combustion devices working on combustion technology in the "High-temperature Fluidized Bed" of solid fuel in Georgia will allow us to make the most of the energy potential of renewable biomass and fine-fraction solid fuel and to replace with local energy resources a significant amount of expensive imported natural gas and firewood widely used in the industrial and household sectors, which along with ensuring energy security, it will also be one of the important prerequisites for maintaining the emissions of harmful substances in the atmosphere within the permissible limits and avoiding the impending ecological disaster caused by the uncontrolled exploitation of timber.

№	Grant Name	Supervisor	Project Start and End dates	Amount (GEL)	Status (finished/ongoing)	Grant Code
2	Sustainable pesticide-free technology based on solar energy for export-oriented bio-organic wine production for Georgian small and medium wine producers	Lena Shatakishvili	2022-2024	240 000	ongoing	AR-22-2370

**Results/Recommendations**

Georgia has thousands of small and medium-size enterprises (SMEs)—farmers producing different types of wine. In order to keep competitive with a dozen large market players, SMEs are using large amounts of health-damaging pesticides to increase production. Use of chemicals cuts off SMEs from any possibility of exporting their productions to EU, whereas higher costs due to small size limits their ability to grow on domestic market. Current Pilot provides Georgian wine farmers—SMEs a combined technology based on Solar engineering solution in Agro-photovoltaics and pesticide-free Bio-technology. The group of researchers consisting of professionals in Engineering, Energy and Bio-technologies have developed the idea and provided early tests proving the concept. Opportunity to validate the Pilot in real environment is provided. Successful Pilot allows multiplication of the technology countrywide. Further plans include technology transfer to other fruit and vegetable SME producers to decrease production costs and increase the quality.

The project is based on the plan proposed by the European Commission to transform the EU's agricultural system to more sustainable and safer for health. This plan envisages a 50% reduction in pesticide use over the next decade and increase of organic farming by 25%. Directives of the EU aim to create a framework for achieving sustainable use of pesticides-reducing negative impacts of pesticide use on human health and the environment, through integrated pest management and use of alternative approaches and methods, such as non-chemical pesticides Alternatives.

We propose an advanced solar ozone generator system that solves the a.m. problems. Moreover, the technology will positively affect the entire spectrum of problems in agriculture, related to the weakening of the fertile layer (humus), water pollution, low yields, reduction of losses, long-term storage of crops. Even complete elimination of the use of pesticides is possible, proven by no trace elements in crops.