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2022

ERU ENERGY EFFICIENCY STUDIES



Erciyes University Energy Transformation Research and Implementation Center (ERDÖM) has been carrying out The University has undertaken a guiding and awareness-raising mission on energy for students and all members of society through qualified scientific research. It continues its activities as a research center that acts on the principle of university-industry cooperation on the use of alternative renewable energy sources such as wind, solar, geothermal, biomass and continues its activities as a research center that conducts regional, national and international research studies on issues such as model, strategy, plan and project studies and guidance.

Although ERDÖM has many projects on various scopes of energy, the details of the YEVDDES projects, which it completed in April 2022 with **the Ministry of Energy and Natural Resources** in order to improve energy efficiency on the Erciyes University campus, with the support of financiers and consultants **from the European Union**, are summarized in this report.

In the first project completed within the scope of YEVDDES project: For Erciyes University Gevher Nesibe Hospital building; **(1) Installation of a trigeneration system** (simultaneous production of electricity, heating and cooling energies by utilizing a single energy source) and **(2) Replacement of all lighting equipment with LED system and switching to sensor automation** were extensively investigated. Descriptive information about the project is presented in the image below.

| PROJECT IDENTITY | |
|---------------------|--|
| Project Title | Technical Assistance for Renewable Energy and Energy Efficiency Support for the Municipalities and Universities |
| Project No. | EuropeAid/138822/IH/SER/TR |
| Contract No. | TR2015/EN/07/A1-02/001 |
| Beneficiary | Republic of Turkey Ministry of Energy and Natural Resources |
| Consortium | Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH - International Services (DE) (Leader), in Consortium with EPTISA Servicios de Ingeniería S.L (ES), Eptisa Müh. ve Müh. Hiz. Bil. Construction. Tic. Ltd. Şti. (TR), OBERMEYER Planen + Beraten GmbH (DE) and Life Climate and Energy Ltd. Şti. (TR) |
| Project Lifetime | 16.04.2019-16.01.2022 |
| Project Duration | 33 months |
| Value | EUR 4,499,520 |
| REPORT IDENTITY | |
| Unique Project Code | EE_65 |
| Report Type | Energy Audit Report |
| Project Description | <ul style="list-style-type: none"> Trigeneration (EEM1): It has been calculated that if the trigeneration system with a natural gas engine with a capacity of 2x432 kWe is put into operation, in line with the calculations made, an annual savings of 3.230.356,98 t/year will be achieved. Replacement of The Lighting with LED Lamps and Sensor Lighting Control (EEM2): It shows that savings of 12.16% can be achieved with LED conversion. The financial dimension of the aforementioned savings for the year 2020 is at the level of 1.667.259,58 t/year. <p>Financial evaluation is given in detail under the title of "Financial Analysis" of this report.</p> |

Visuals of the building planned to be implemented within the scope of energy efficiency are presented below.

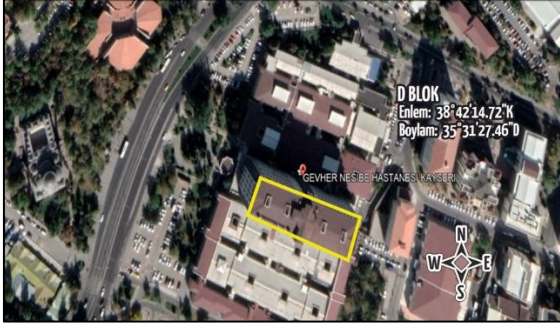


Figure 1. Hospital Building Location.



Figure 2. Pre-change detection studies.



Figure 3. Existing Heating System.

The results of the comprehensive feasibility study on the First Project are as follows.

1. The total energy consumption of the building before the trigeneration application was 43.125.083 kWh/year (Electricity-Primary) and 10.060.748

kWh/year (Natural Gas).

2. After the application of the trigeneration system, these consumption rates 24,222,523 kWh/year (Electricity-Primary) and 22,425,932 kWh/year (Natural Gas).
3. In case of implementation, a total of 6.5379.376 kWh/year energy gain will be achieved in the building.
4. With the installation of trigeneration, it is estimated that the hospital building will achieve an energy efficiency of 12.6% per year, while CO2 emissions will be reduced by 16% per year.
5. The annual cost of the energy gain for the hospital building is calculated to be approximately €326,598.
6. The investment cost of the project (EUR 764 thousand) is estimated to be recovered in 2.34 years.

In the second project completed within the scope of the YEVDES project: A comprehensive feasibility study was carried out for the **establishment of a solar power plant by identifying a suitable location on the Erciyes University campus**. Descriptive information about the project is presented in the image below.

| PROJECT IDENTITY | |
|---------------------|--|
| Project Title | Technical Assistance for Renewable Energy and Energy Efficiency Sup for the Municipalities and Universities |
| Project No. | EuropeAid/138822/IH/SER/TR |
| Contract No. | TR2015/EN/07/A1-02/001 |
| Beneficiary | Republic of Turkey Ministry of Energy and Natural Resources |
| Consortium | Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH International Services (DE) (Leader), in Consortium with EPTISA Serv de Ingenieria S.L. (ES), Eptisa Müh. ve Müh. Hiz. Bil. Construction. Tic. Ltd Şti. (OBERMEYER Planen + Beraten GmbH (DE) and Life Climate and Energy Sti. (TR) |
| Project Lifetime | 16.04.2019-15.04.2022 |
| Project Duration | 36 months |
| Value | EUR 4,499,520 |
| REPORT IDENTITY | |
| Unique Project Code | RE_54 |
| Project Type | Feasibility Study Report |
| Project Description | Construction of land SPP with a nominal power of 1,000 kWp / 1,224 MWh for the needs of the university. Annual electricity generation is 1.74 MWh. The equipment purchase investment is 575,000,00 Euro and expected simple payback period of the investment is 6 years 1 months. annual reduction of CO2 emissions is 1,128,52 tCO2. |
| Distribution | To: Erciyes University, KAYSERİ cc: Ministry of Energy and Natural Resources Directorate General of Energy Affairs (DGEA), Department of Energy Efficiency and Environment (DEE) and Directorate General of Foreign Relations (DGFR) cc: Central Finance and Contracts Unit (CFU) cc: European Union Delegation to Turkey (EUD) |

The visuals and system diagram of the locations identified for the application of solar power plants on campus are as follows.



Figure 4. Suitable area for ground mounted solar panels.



Figure 5. Location images of the site.

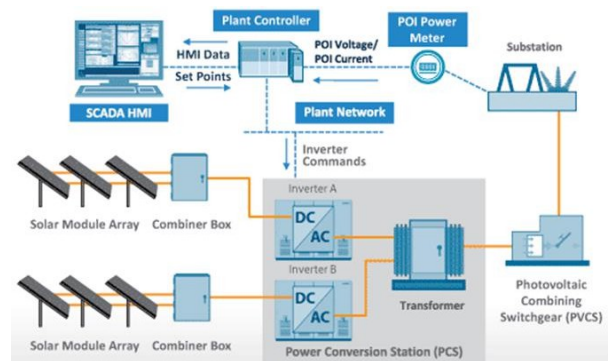


Figure 6. Design schematic of the system to be implemented.

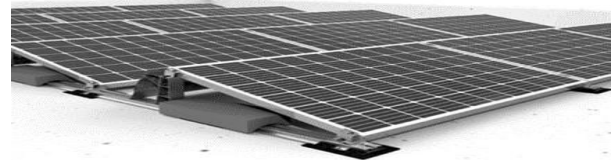


Figure 7. Example of a ground mounted solar panel.

The results of the comprehensive feasibility study on the Second Project are as follows.

1. The area of 14896 m² shown in Figure 4 was determined as the appropriate area for the rooftop application of SPP.
2. 2,788 pieces of 450 Wp panels and 10 pieces of 100 kW inverters were found to be suitable for use.

3. The SPPs to be established will generate 1,741.00 MWh annually. one Energy production is foreseen.
4. With the SPPs commissioning scenario, 1,128.52 tCO₂ emissions will be reduced annually.
5. The investment cost of SPPs is calculated as EUR 575,000.00.
6. The project's payback period for this amount is calculated as 6 years and 1 month.

In the end, energy efficiency and the use of renewable energy **for the Erciyes University campus will help to** reduce environmental damage and use resources more efficiently. In addition, by reducing energy costs, it will be possible for the campus to be more financially sustainable.

Energy efficiency and the use of renewable energy on campus will also have a positive impact on campus residents such as students, lecturers and staff.

These practices provide campus residents with information and awareness on energy conservation.

will be useful in helping them develop the habit of saving energy.

Finally, energy efficiency and the use of renewable energy on campuses will help reduce environmental damage, while reducing the use of fossil fuels will mean reducing greenhouse gas emissions, which is an important step for Erciyes University's mid-term climate action plans in the fight against climate change.