



YEAUM

Renewable Energy Research & Development
Application and Research Center

Balıkesir University

Connecting the energy potential of the South Marmara region with research infrastructure



Education



Research



Technology



Collaboration

YEAUM at a glance

From its founding to today: a multidisciplinary research and application platform

2013

Year founded

An application and research center within Balıkesir University

3

Renewable Energy Laboratories

Solar, wind and biogas laboratories

27

Researchers

A multidisciplinary team from engineering, science and social sciences

YEAUM

408

Beneficiary graduates

Aged 18–29, trained in renewable energy; Balıkesir University share: 210

Vocational Qualifications Authority certificate

In solar, wind and biogas

RE-YOU PROJECT

€791k

Erasmus+ CBHE budget

DIGI4ENERGYS Project — Coordinator: Balıkesir University

14 / 6

Partners / countries

DIGI4ENERGYS consortium: TR, AL, ME, NO, RO, UZ

DIGI4ENERGYS PROJECT

Sources: yeaum.balikesir.edu.tr · Erasmus+ CBHE project profile · EU Delegation to Türkiye RE-YOU closing notice (2024)

About the Center

Since 2013, we have brought education, research and industry collaboration together on a shared infrastructure

Operating with contributions from 27 academics across different disciplines and departments, the Center offers a multidisciplinary research platform for hands-on training, measurement, data collection and experimental validation in renewable energy technologies.

Our infrastructure supports different levels of use, from undergraduate and graduate student training to academic research and industry-focused applications.



Education

Skills to set up, operate and measure systems



Research

Real-time data collection and analysis



Collaboration

Industry-focused technical competence building

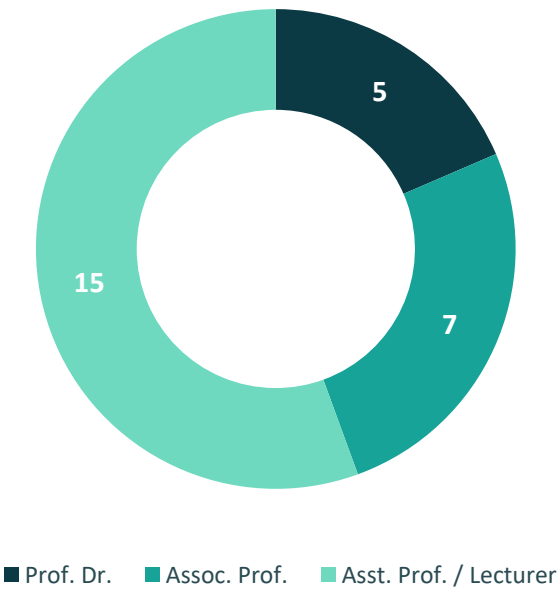


LET'S ADD
ANOTHER IMAGE
HERE

Our research team

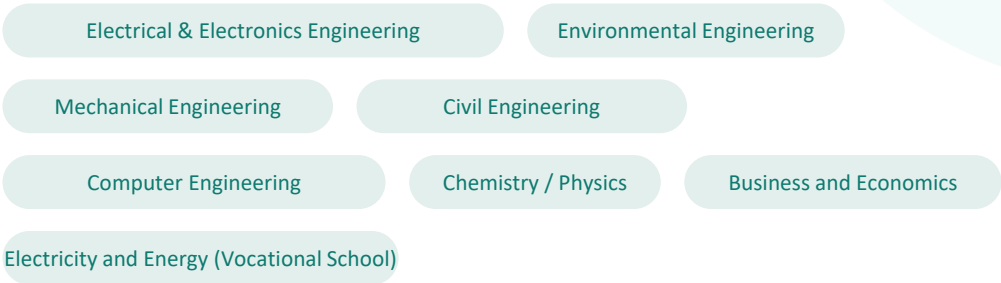
27 researchers reading a single energy question from different disciplines

Distribution by academic title



Source: yeaum.balikesir.edu.tr/arastirmacilar (as of August 2026)

Disciplines represented



This diversity lets us address an energy system not only through conversion efficiency, but together with its environmental impact, materials, structural design, data infrastructure and techno-economic feasibility.

02

Research Infrastructure

From source to grid: we generate, measure, analyze and control



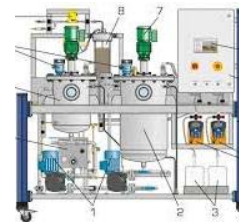
Research Infrastructure



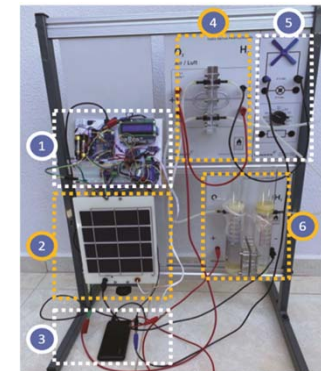
Energy generation, characterization and performance analysis in photovoltaic systems



Wind energy conversion, generator control and grid behavior



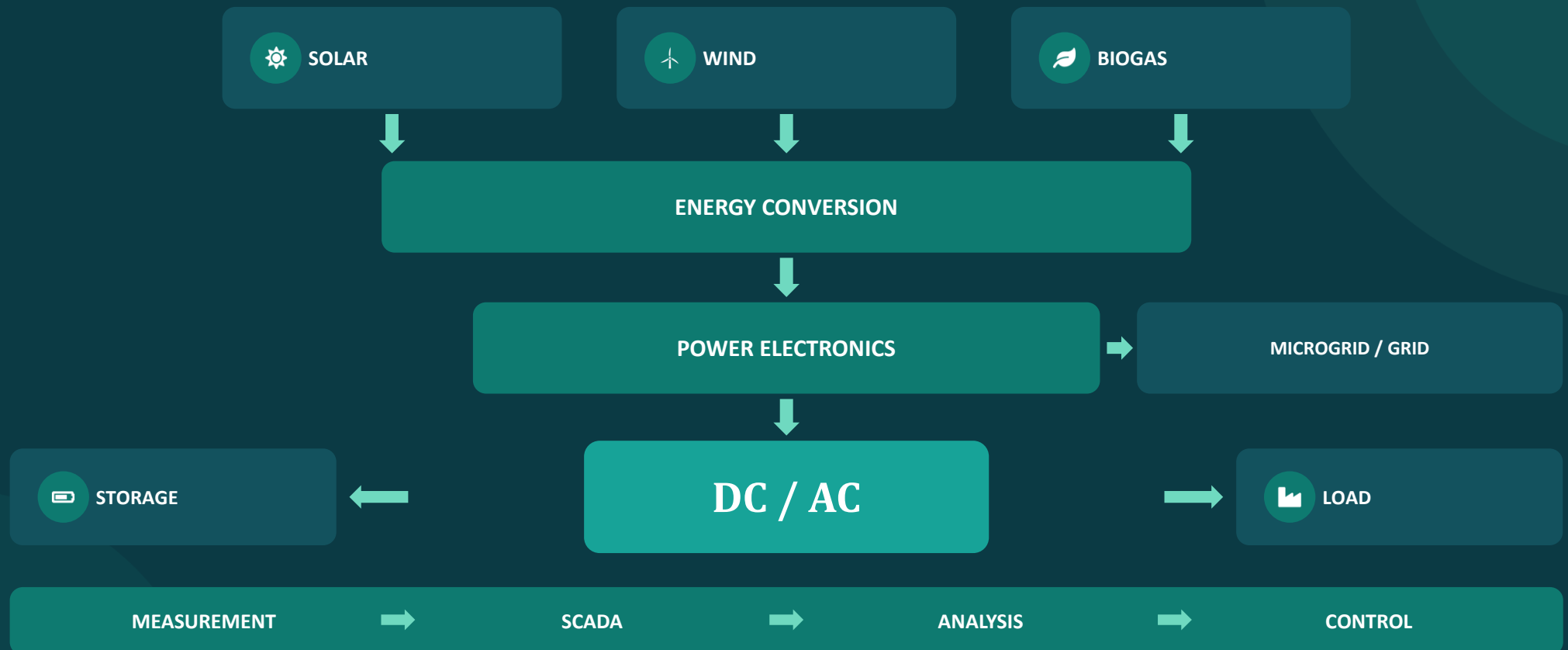
Biogas production, process control and gas composition analysis



Green hydrogen production via electrolysis, remote system monitoring and efficiency analysis

The YEAUM energy ecosystem

We study not a single source, but the entire energy system





Photovoltaic Energy Experiment Infrastructure

EESFC (Computer-Controlled PV System)

From irradiance to electrical energy.

- ✓ **Hardware:** 66W polycrystalline panels (36 cells), 8×400W halogen solar simulation.
- ✓ **Analysis:** I-V and P-V curves, MPP (Maximum Power Point) tracking.
- ✓ **Applications:** Effect of irradiance, angle and temperature on output. Series/parallel analyses.
- ✓ **Control:** Real-time data acquisition and battery charge control via SCADA.



Sensors

Voltage, current, speed, irradiance, temperature, pressure, humidity, pH



Data acquisition

High-speed DAQ interface, LabVIEW-based SCADA



Analysis

Real-time signal monitoring, I-V and P-V characteristics

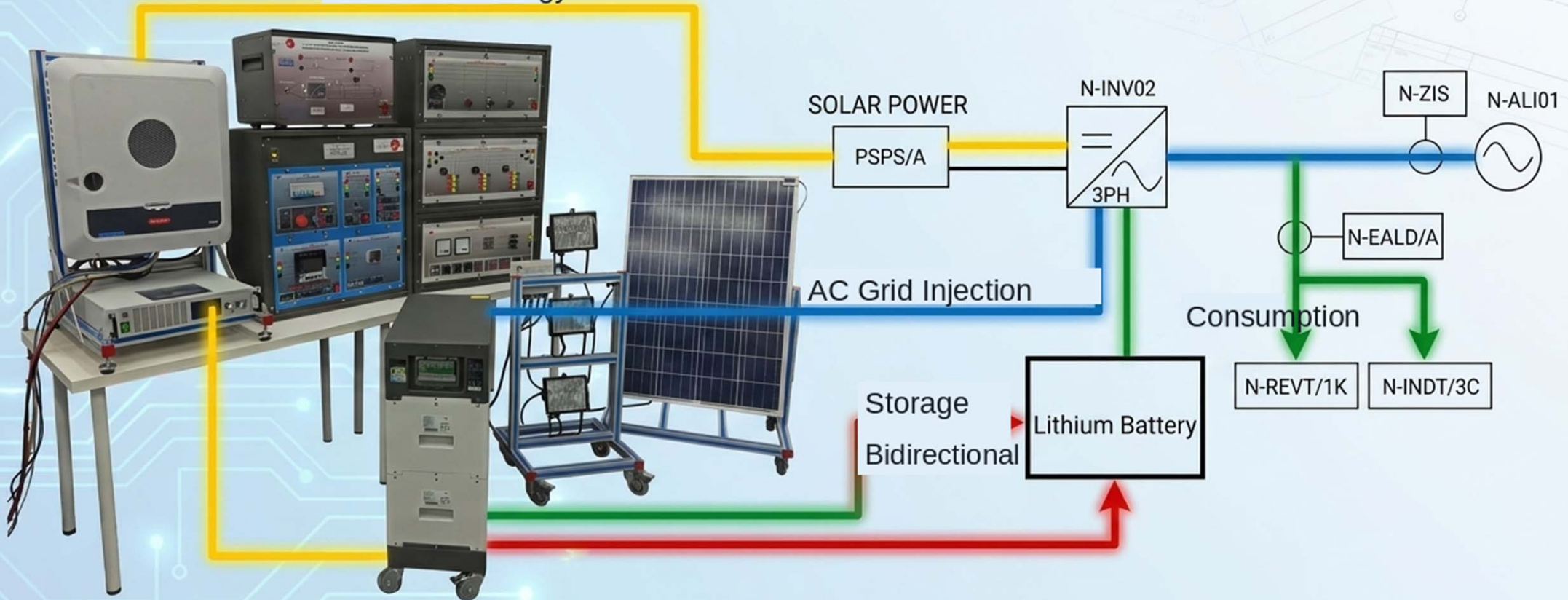


Control

Remote laboratory control via actuators

AEL-PHVG: Integrated System and Energy Flow

Solar / DC Energy



It manages power flow in real time by providing a one-to-one simulation of physical hardware, grid and solar energy dynamics.

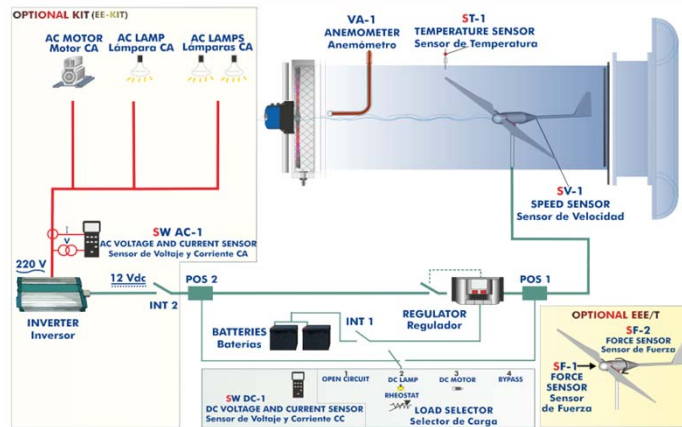
Wind Energy Experiment System

EEEC (Computer-Controlled Wind Energy Unit)



Wind / Fan Rotor Generator Electricity Measurement

- **Hardware:** Axial fan, 6-blade rotor, three-phase asynchronous generator.
- **Sensors:** Anemometer (speed), voltage, current, power and temperature measurement.
- **Experiments:** Effect of wind speed (Rayleigh/Weibull statistics) on output; maximum power (Pmax) determination.
- **Control:** Instant data logging with advanced SCADA and load (resistance) analysis.



Asynchronous Generator Experiment System

Experimental study of grid-connected asynchronous generation

Edibon AEL-WPPI Experiment System

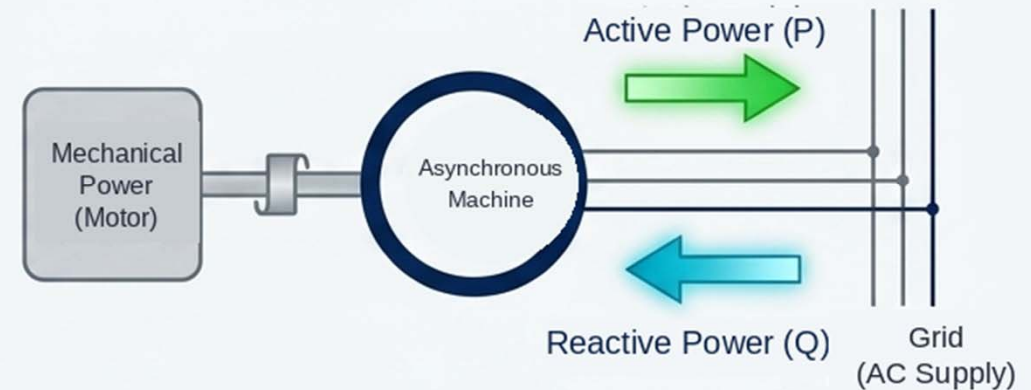
Experiment Set



edibon

Asynchronous Generators in Wind Energy

The active/reactive power responses and grid compatibility of non-self-excited asynchronous generators are analyzed in a laboratory environment.



Active power (P) feeds the grid; reactive power (Q) is drawn from it.



Synchronous Speed and Slip Analysis



Generator Operating Region Study



Active (P) & Reactive (Q) Power Measurement



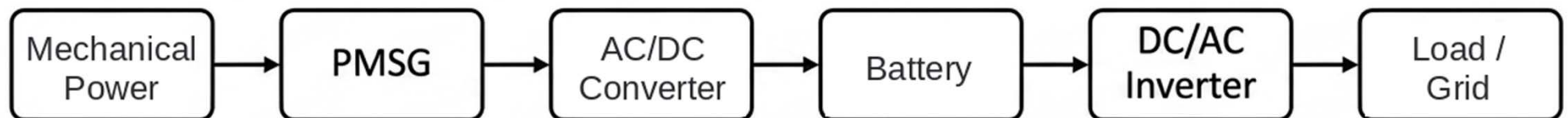
Power Factor and Capacitive Compensation

Permanent Magnet Generator / PMSG



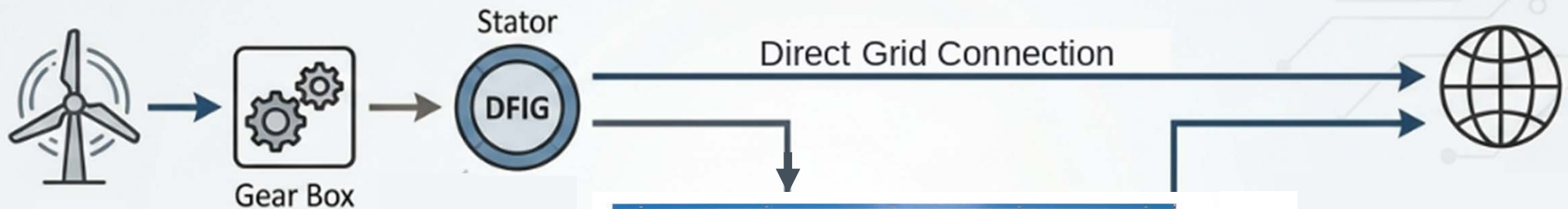
Starting from the wind's mechanical energy, **all conversion and storage** steps toward the grid or directly to the load are tested in hardware.

- Variable-speed wind generator characterization
- Three-phase AC generation and rectification
- Charge regulator and battery integration
- Grid-independent (off-grid) operation tests



DFIG | Doubly-Fed Asynchronous Generator

Studying the operating principle of modern variable-speed wind turbines in the lab



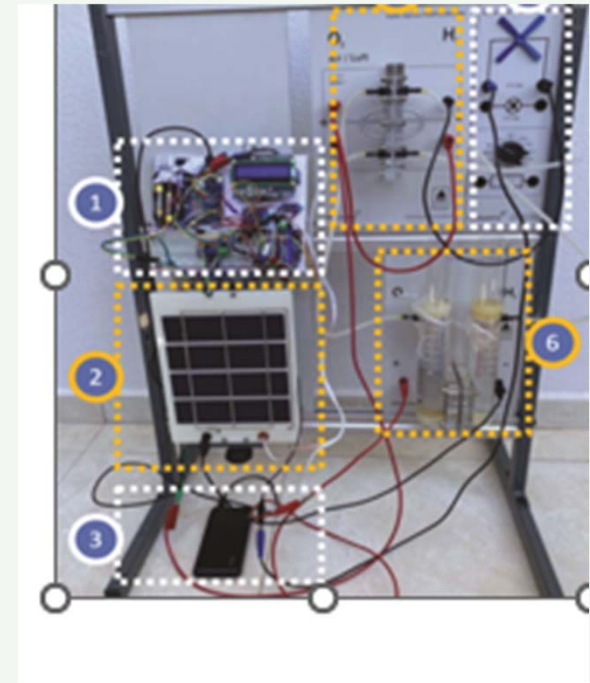
A DFIG-based wind energy training system enables hands-on study of the generator's sub- and super-synchronous operating regions, stator-rotor power sharing, and the control functions of the converters. Wind profile, shaft speed, DC-bus voltage, currents and active-reactive power are monitored via SCADA, while the grid behavior of modern wind power plants is analyzed under safe conditions through voltage-sag and FRT (fault ride-through) simulations.



Green Hydrogen Production and Fuel Cell Experiment System

It enables hands-on study of hydrogen production from solar energy and the reconversion of that hydrogen back into electrical energy in a fuel cell.

- Photovoltaic panel and PEM electrolyzer
- Fuel cell
- Current–voltage measurements with DC loads
- Production, conversion and energy-efficiency analysis
- IoT-based monitoring and data analysis



Biogas Energy Laboratory

From organic waste to biogas: production, analysis and process control.



A two-stage anaerobic biogas system enables hands-on study of the conversion of organic matter into biogas under controlled conditions. In its PLC-supported setup, pH and temperature are controlled; the production process and system performance are evaluated in real time through measurements of gas flow rate, CH_4 - CO_2 ratio, humidity and temperature.

ORGANIC
FEEDSTOCK

HYDROLYSIS /
ACIDIFICATION

METHANOGENIC
REACTOR

BIOGAS

DRYING

CH_4/CO_2
ANALYSIS

Our research outputs

The infrastructure translates directly into international publications



Green hydrogen and CBAM

Dynamic techno-economic optimization of renewable-based hydrogen systems; scenario analyses aligned with the Carbon Border Adjustment Mechanism.



Hybrid system optimization

Multi-objective optimization of hybrid systems combining wind–solar–hydrogen–battery and seawater pumped storage.



GIS-MCDM infrastructure planning

Siting of hydrogen infrastructure for South Marmara using a consensus-based geographic information system and multi-criteria decision-making model.



IoT and cloud-based monitoring

Remote monitoring of electrolysis and fuel cell systems over the Internet of Things.



Wave generation and control

Regular wave generation with an FPGA-based controller in a wave channel, and position control of a hydraulic servo cylinder.



Materials and gas sensing

Sensing behavior of thin-film and calixarene-based structures toward volatile organic compounds.

Source: yeaum.balikesir.edu.tr/faaliyetler — publications from 2019, 2025 and 2026

Our projects

Two major internationally funded operations: one we coordinate, one that built our infrastructure

ERASMUS+ CBHE · COORDINATOR

DIGI4ENERGYS

Digitalization and hands-on capacity building in renewable energy education

€791,000

Total budget

14

Project partners

6

Countries

Türkiye · Albania · Montenegro · Norway · Romania · Uzbekistan

Coordinated by Balıkesir University YEAUM, the project aims to strengthen digitalization in renewable energy education, increase hands-on training capacity, and build new skills for the green-digital transition.

IPA · HUMAN RESOURCES DEVELOPMENT

RE-YOU — Renewable Youth Energy Operation

A significant part of the Center's current laboratory infrastructure was acquired under the supply-procurement component of the RE-YOU Operation, co-financed by the Republic of Türkiye and the European Union.

~€8M

EU support

2020–2024

Implementation period

408

Beneficiary graduates

210

Balıkesir Uni.

South Marmara Development Agency · Balıkesir University · Çanakkale Onsekiz Mart University

Sources: Erasmus+ CBHE project profile · HRD / Ministry of Labour contract profile (TREEESP2.3.RE-YOU, 05.08.2020–05.11.2024) · EU Delegation to Türkiye closing notice

Our collaboration models

Our infrastructure is open to partners at four different levels



Joint R&D projects

Participating as partner or coordinator in Horizon Europe, Erasmus+ and TÜBİTAK calls



Mobility and training

Student and staff mobility, joint summer schools and hands-on training programs



Testing and measurement services

Characterization, calibration support and experimental validation for industry



Graduate thesis infrastructure

A measurement and validation environment for master's and doctoral studies



Technical training for industry

Tailored competence programs for wind, solar and biogas systems



Joint publications

Producing joint articles and book chapters based on experimental data

Building the energy systems of the future, together

Renewable Energy R&D Application and Research Center · Balıkesir University

For collaboration and visit requests, you can contact our Center directly.



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