National Hydrogen Association

NEWSLETTER

November 2022 E- Newsletter:14

YOU ARE INVITED TO THE 7TH INTERNATIONAL HYDROGEN TECHNOLOGIES CONGRESS (IHTEC-2023)

Dear Academicians, Researchers, Industrialists,

The Seventh International Hydrogen Technologies Congress (IHTEC-2023), which is a multi-disciplinary international congress, will be held between 10-12 May 2023 in Elazığ, Türkiye.

This congress, including presentations, plenary sessions and talks, serves as a forum that promulgates ideas, experience, and knowledge of hydrogen researchers and engineers working on energy and its technologies. Topics of congress include but are not limited by hydrogen economy, hydrogen infrastructures, hydrogen management, safety, production and conversion. Many aspects of hydrogen technologies will be focused in the conference.

The 100th anniversary of the foundation of the Türkiye Republic, which is a circle of ancient Türk civilization march will be celebrated in 2023. We invite you to be part of our event focusing on a very important and strategic topic to make a note of history in this meaningful year. We would like to thank you in advance for your invaluable contribution to this important conference hosted by Fırat University and coordinated by Hydrogen Technologies Association.

Best Regards

Prof. Dr. Fahrettin GÖKTAŞ
Rector of Fırat University

Fuel Cell / Hydrogen Technologies Studies at Fırat University-Elazığ Türkiye

Assoc. Prof. Mahmut Temel ÖZDEMİR
Chairperson of IHTEC2023 Congress

Fırat University, which has a deep-rooted history, started its education service in Elazig, which has a rich cultural life, in 1967. Elazig State Academy of Engineering and Architecture (EDMMA), as the Faculty of Engineering, other higher education institutions in Elazig were united and gathered under a single roof on April 11, 1975 under the name "Fırat University". Fırat University is a university that makes significant contributions to the development of higher education in Eastern and Southeastern Anatolia by opening higher education institutions in the districts of Elazığ, in the provinces of Bingöl, Muş and Tunceli and in the Kemaliye district of Erzincan in the following years, and by training academic staff for universities with its graduate activities.

Fırat University has become the 6th best university in Turkey by repeating its success in the field of engineering for years. Fırat University is one of the Research Universities in our country with the significant impact of this dynamism in the field of Engineering. Our university has been matched in the fields of Electronics (Robotics and Mechatronics), Machine-Electric Equipment (Fluid Power Dynamics and Fluid Machines), Automotive and Rail Systems (Rail Systems) and Chemistry (Process Chemistry and Technology, Fluid Dynamics and Heat/Mass Transfer). Hydrogen and fuel cell technologies related to these matching areas have been studied and are currently being studied by academicians in our university.

Researches are carried out on hybrid production systems in the Departments of Ener-

Continued on Page 2 >>

gy Engineering and Mechanical Engineering, and on microbial fuel cells, hydrogen production and membrane technologies in Chemical Engineering and Environmental Engineering.

In the Department of Electrical and Electronics Engineering, researches are carried out on hydrogen / fuel cell modeling, domestic applications, hybrid production, the effects of fuel cells on power systems and cyber-attacks on fuel cell systems. We will host the 7th International Conference on Hydrogen Technologies (IHTEC 2023) as one of the 50th anniversary events of our educational activities.

We will be pleased to see and host you valuable researchers at our congress.

Associate Professor Dr. Mahmut Temel ÖZDEMİR was born in 1977 in Tokat/ Reşadiye. He received his Bachelor's degree in 1999, his Master's degree in 2003 and his Ph.D. in 2012. He has been working as an Associate Professor in Electrical and Electronics Engineering at Fırat University since 2021. His main topics of study are electrical power generation systems, renewable energy sources, hydrogen production, fuel cells, microgrids, stability in power systems, load frequency control, AVR and programmable logic controller applications.

Clean Energy Technologies Institute is Founded for a Sustainable Future at Yildiz Technical University

Yildiz Technical University (YTU) Clean Energy Technologies (CET) Institute is founded in July 2022 as a multi-disciplinary energy ecosystem focusing on activity areas including "Research, Innovation, Education, Commercialization and Service". Prof. Dr. Aysel Kanturk Figen, a National Hydrogen Association board member, is assigned as the chair of the institute.

Development of clean energy technologies based on renewable and alternative energy sources, advancement of knowledge, graduate education, the realization of research innovation, and commercialization studies will be done at YTU CET Institute. Thanks to these studies transfer into technology from knowledge will be practiced but also technique, technological, economic, environmental, industrial, social, and cultural studies, and their coordination will be actualized.

CET provides technical, social, and cultural solutions based on clean energy technologies to contribute to sustainable energy, the environment, and industry. These solutions will contribute to decarbonization and reduction of the reasons for global warming with the help of a qualified labor force with the ability to research and develop educated in this institute.

The vision of CET is to be one of the World's Excellence Centers in the area of clean energy technologies under the shelter of Yildiz Technical University. The mission that is tasked as a result of this vision is;

- To create a world-class research cluster
- To primarily consider research, innovation, and technology development
- To work with local partners for the sustainable development of Turkey
- To conduct cutting-edge research for current problems and future technologies and their development

For this purpose the objectives that lead to this mission and vision can be defined as;

- To excel in research, development, and innovation
- To play a key role in technology development and transfer
- To develop partnerships with industry, government agencies, and other institutions
- To advance knowledge
- To educate and train people, students, researchers, scientists, etc.
- To serve the local community for solving their problems
- To organize local and international events to disseminate new developments

Picture 1. **YTU Clean Energy Institute Stakeholder Triangle**

CET has a world-class Advisory Board consisting of respected scientists from all over the world and the chair of the board is also National Hydrogen Association's chair Prof. Dr. Ibrahim Dincer from Ontario Tech University / Yildiz Technical University. The Advisory board members are Prof. Dr. Neven Duić from the University of Zagreb, Prof. Dr. Feridun Hamdullahpur from the University of Waterloo, Prof. Dr. Bruce Logan from Penn State University, Prof. Dr. Mihri Özkan from the University of California-Riverside, Prof. Dr. Seeram Ramakrishna from the National University of Singapore, Prof. Dr. S. Ravi P. Silva from the University of Surrey,

Continued on Page 3 >>

Prof. Dr. Benjamin K. Sovacool from the University of Sussex, Prof. Dr. Peter Strasser from Technische Universität Berlin, Olcay Unver from Arizona State University and Zafer Ure from Phase Change Material Products Limited.

In addition, research groups on 8 primary research fields are established. Within this scope, hydrogen and alternative fuel technologies, energy storage technologies, renewable energy technologies, energy logistics, policies and strategies, smart grid and energy management, waste-to-energy, economic, social impact and sustainability, modeling, simulation, and optimization of energy systems are the main topics that researchers are going to focus on.

1. The Smart Grid and Energy Management Research Group

The Smart Grid and Energy Management research group aims to provide innovative solutions to the complex problems of electric power system operation from different stakeholders' perspectives. The mentioned innovative solutions include artificial intelligence and optimization-based decision-making mechanisms as well as planning tools for production, transmission, distribution, and consumption centers together with techno-economic players. Last but not the least, multi-energy solutions including the simultaneous operation of different energy types' infrastructures are also within the scope of this research group.

Picture 2. **YTU- Clean Energy Institute Research Groups**

2. The Waste-to-Energy Research Group

The Waste-to-Energy Research Group is dedicated to developing biological, chemical, and bioelectrochemical bioenergy production technologies from various waste streams to offer low-cost and environmentally sustainable solutions for waste management, recycling, and recovery.

The research group has been centered on academic research projects carried out with different industries to include wastes in a circular economy model and observe the life cycle assessment of processes. We focused on building up new technologies for sustainable waste management, environmentally friendly energy production, and storage.

3. The Energy Storage Technologies Research Group

The Energy Storage Technologies Group at the Institute of Clean Energy Technologies aims to cover all important aspects of energy storage technologies, in particular novel energy storage technologies. The Energy Storage working group is focusing on the theory and applications of mechanical, electrochemical, chemical, electrical, and thermal energy storage systems. In addition, different aspects of energy storage technologies in electrified transportation, off-grid systems, portable electronic system, and grid-scale electrical storage will be considered. Demand and management of intermittency in large-scale low-carbon power generation with energy storage systems will be considered. Another indispensable research subject in the group is Vehicle-to-grid, energy storage integrated with buildings, and multi-purpose and hybrid storage systems. Furthermore, life cycle costs, life cycle assessment, the safety of energy storage systems and their economic, policy, and regulatory aspects, and market introduction concepts will be studied.

4. The Energy Logistics, Policies and Strategies Research Group

The Energy Logistics, Policies, and Strategies Research Group (ELPS) aims to analyze and discuss the related policies and strategies of energy based on clean and renewable energy alternatives. Additionally, the group aims to analyze future energy perspectives of countries to obtain a road map for energy management. The ELPS group also concentrates on designing the most ideal logistics strategy for energy management. The group also tries to determine the best network design for logistics with respect to the right locations, methods, tools, and transport strategies between destinations for all of the energy types.

5.The Hydrogen and Alternative Fuel Technologies Research Group

The Hydrogen and Alternative Fuel Technologies Research group pioneers research and development in energy strategy solutions based on hydrogen and alternative fuels. The formulation of solutions to the CO2-free energy systems to the hydrogen-related industries assessing the challenges in technological trends and creating alternative pathways for realization. We have been focused on different aspects of key research areas, proposing new projects in cooperation, and launching new activities.

Especially balancing the electrical power consumption has a significant effect in the perspective of investments and carbon-free energy production as it has peaks and valleys due to its own characteristics. In other words, the storage of excess energy due to the intermittent energy production of renewable energy sources and using this energy in the peak times when the load demand is generally supplied by fossil fuels provides new opportunities not only for decreasing environmental anxiety but also for the reducing the energy plants investments. Hydrogen energy with its high energy density and portability is a prominent key solution technology for the near future in this area. Hydrogen generation, storage, transportation, certification, and injecting hydrogen into natural gas, etc. are the research topics studied by the experts of this research group. R&D studies for green hydrogen production, hydrogen vehicles, fuel cells, and auxiliary equipment for hydrogen storage and technologies are the priorities of this research group.

6. The Modeling, Simulation and Optimization of Energy Systems Research Group

Modeling, Simulation, and Optimization of Energy Systems Research Group focused on the classical and advanced Modeling, Simulation, and Optimization Technics (theoretical, statistical, and Artificial Neural Network (ANN) models) to develop better Energy Systems by using Art and Science as Tools.

The group focuses on cross-disciplinary research in energy system modeling, simulation, and optimization;

to improve understanding of the energy processes,

to optimize process design/operating conditions,

to design a control strategy for the energy process,

to simulate a model to optimize system performance or to make predictions about a real system,

to study the characteristics of a real-life or fictional system by manipulating variables that cannot be controlled in a real system.

7. The Renewable Energy Technologies Research Group

The Renewable Energy Technologies Research Group (RETRG) contributes to the research and development of new renewable energy technologies that are cost-effective, stable, sustainable, and environmentally friendly, as well as improving existing renewable technologies in innovative ways, by developing new materials and concepts for reducing carbon footprint. In addition to energy production with renewable technologies, energy saving is also our area of interest. We envision new scientific projects based on the energy systems of a sustainable future. On the other hand, we participate in social responsibility activities/projects to raise awareness about the benefits of energy saving and understanding global warming and its serious consequences.

8. The Economic, Social Impact and Sustainability Research Group

The Economic, Social Impact and Sustainability Research Group measures the economic impacts of both developed and planned clean energy technologies and evaluate their possible societal impacts. It also examines the relation between those technologies and the sustainability goals, especially the United Nations Sustainability Goals.

In addition, it helps to develop economic and social impact analyzes of projects that are led by other research groups.

With all the mentioned specialties, the young and dynamic CET Institute is inviting you to join this ecosystem which consists of research groups including interdisciplinary national and international experts, strong industry relationships, and solution partnerships. CET aims to finance its own R&D investments with the help of stakeholder systems, and sustainable solution partnerships for sustainable energy. For this purpose, founding an institute that has a mission to convert technology to an economic outcome with the rule of science to technology and technology to products. The widely open doors for national and international project partnerships and considering the socio-cultural part of the technology setting apart the CET institute and transforming it into a next-generation R&D ecosystem.

The WESCE 2023 where the leading researchers will attend as invited speakers (https://wesce.org/) will be organized by Yildiz Technical University and Clean Energy Technologies Institute on 20-23 August 2023. The general chair will be the rector of Yildiz Technical University, Prof. Dr. Tamer Yilmaz, and the technical chair of the conference will be Prof. Dr. Ibrahim Dincer and it will be held on Yildiz Technical University Davutpasa Conference Center in Istanbul Turkiye.

National Hydrogen Association
November 2022
E- Newsletter:14
NEWSLETTER

NEW TECHNOLOGIES FOR HYDROGEN PRODUCTION

Yusuf Furkan ERGÜR, *Phoenix Energy*

Interview with Yusuf Furkan Ergür, Phoenix Energy Co-founder and inventor

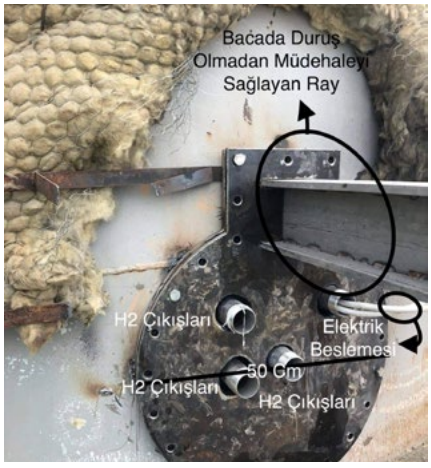
HTD Vice President İnci Eroğlu met online with Phoenix Energy Founding Partners Yusuf Furkan Ergür and Serkan Günel on 17 November 2022. A brief summary of the meeting is below..

1. Can you tell us a little about your venture? How did the idea come about? What purpose does it serve?

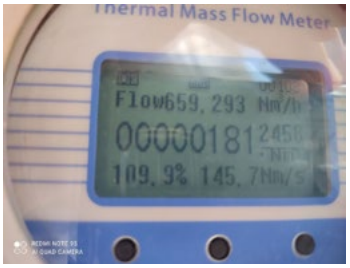
Our venture came about due to my interest in the automotive industry. While examining the technology of spraying water into the combustion chamber used in automotive, we noticed that the CO+H2O=>CO2+H2 reaction occurs in engines. However, this reaction was carried out in conditions far from the ideal temperature of 227 degrees. This reaction was done at 700 degrees during combustion. This was the case with both the Ford Escort RS and the BMW M4 GTS. On the other hand, we associated the reason for this reaction to be carried out in the engine with the absence of a unit that decomposes hydrogen. The only thing missing was separating the hydrogen from other gases so that this reaction would be carried out at the ideal temperature in the exhaust. By working on this issue, we created the membrane that separates hydrogen from all other gases. Thanks to this membrane, hydrogen could be filtered purely from all other gases.

2. What were the problems and challenges you faced while developing your enterprise and then putting the system into operation?

This membrane thanks to the automotive industry, we first thought of using it there. Brisa's pioneers of the journey received an award for making a hydrogen hybrid vehicle for the first time in the world. Then, when we wanted to apply this product to existing cars, a huge problem arose after dozens of successful tests. In our system, only hydrogen gas was present when the vehicle was running. But all safety and crash tests were done with the vehicle turned off. This meant that if we wanted to test this system we would have to recreate all the security tests. No automotive company has rightfully taken such a difficult action.

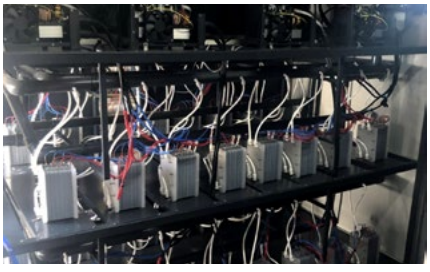


While we were thus disappointed, one day during our Safranbolu trip, we paid attention to the factory chimneys. They were actually big car exhausts. For this reason, we decided to change the direction of our project towards heavy industry, and by convincing a cement factory to implement our project, we succeeded in creating and separating 650 cubic meters of hydrogen in the chimney of the cement factory, thanks to our patented membrane. Then, due to the difficulties of explaining this product, we decided to use this membrane as a second product. This is the electrolysis device that is on the agenda of the whole world right now. In electrolysis devices, electricity is consumed in 2 situations. The first is to split water into hydrogen and oxygen, and the second is to separate these two gases. When we separate these two gases with the membrane we use in the chimney, not with electricity as in the current methods, we have created an electrolysis product that produces the same hydrogen gas with 50% less energy. Now, our commercialization process continues with both of our products.



3. What kind of investments did you receive? What is your future projection?

Our products have proven themselves very recently. Receiving investment up to this point would lower the value of the company. For this reason, we have just started looking for investments. However, we are closing the 3rd quarter of 2022 with a turnover of 300 000 USD by issuing the first payments of our two industrial product sales.

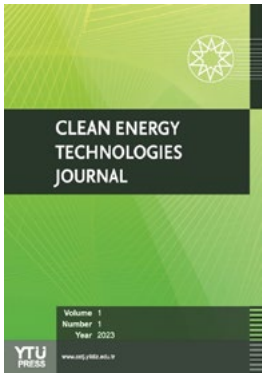


National Hydrogen Association
Esentepe Mah. Sağlam Fikir Sok. Esen Palas Apt. A Blok No:2 D:9 Esentepe / Şişli / İstanbul
Communication Association Coordinator: Fatma Taşçı / 0 533 726 72 55 / fatma.tasci@hidrojenteknolojileri.org
www.hidrojenteknolojileri.org

National Hydrogen Association
November 2022
E- Newsletter:14
NEWSLETTER

The Clean Energy Technologies Journal Begins to Publish

Yıldız Technical University, Clean Energy Technologies Institute, established recently, is preparing to publish a periodical scientific journal called Clean Energy Technologies Journal (CETJ), which includes academic research and developments on the fields of its activity, starting from January 2023.



With this new journal, the Clean Energy Technologies Institute begins a new journey towards the scientific fields of engineering and technology to achieve a sustainable and clean energy. CETJ aims to be a platform where the issues of providing energy in a sustainable and clean way are discussed. The journal intent to present knowledge, innovative ideas, research and development in the fields of clean and sustainable energy and to provide outstanding academic resources for scientists, academics, engineers and industry professionals. CETJ will feature articles in the form of high quality original research, reviews and short letters.

CETJ magazine covers all topics related to clean energy, especially the following topics:

- Smart Grid and Energy Management
- Waste-to-Energy Technologies
- Energy Logistics, Policies and Strategies
- Renewable Energy
- Economy, Social Impact and Sustainability,
- Hydrogen and Alternative Fuel Technologies
- Energy Storage Technologies
- Energy Modeling, Simulation and Optimization

CETJ, which is planned to be published twice a year, in January and July, is an open access, transdisciplinary, peer-reviewed international journal, and its editorial staff includes distinguished academics and industrial professionals from different countries of the world. The Journal of Clean Energy Technologies invites researchers and practitioners interested in clean energy products and processes to contribute and at the same time benefit from this new and dynamic platform.

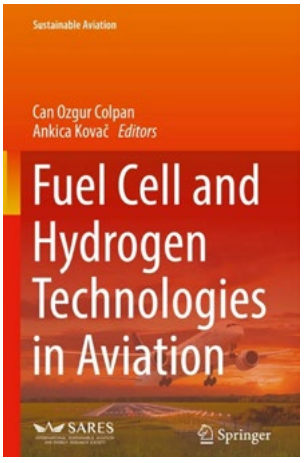
News from Members of the Hydrogen Technology Association

GREETING

Prof. Dr. Murat Öztürk was appointed as the Vice Rector of Isparta Applied Sciences University. We congratulate him and wish him success in his new position.

BOOK PUBLISHED

Professor Can Özgür Çolpan at Dokuz Eylul University and Associate Professor Dr. Ankica Kovac, edited the book named 'Fuel Cell and Hydrogen Technologies in Aviation', was published by Springer in 2022. This book provides an overview of the use of hydrogen and fuel cell technologies in aviation and their potential to reduce the environmental impact of aircraft. The technological and economic requirements in aircraft design and airport infrastructure are discussed. Different hydrogen storage technologies that can be used in aircraft are covered, including compressed gaseous hydrogen, cryogenic compressed hydrogen, cryogenic liquid hydrogen, metal hydride hydrogen, chemical hydrogen, organic hydrogen, and adsorption hydrogen storage. Since liquid hydrogen is particularly promising for long-haul flights, a separate chapter is devoted to this fuel to illustrate its use and trend in aviation. The infrastructure, logistics and security requirements required at the airport for hydrogen powered aircraft are also covered in this book.



Applications of fuel cells in unmanned aerial vehicles and passenger planes and various topologies that can be used are discussed. Sizing and optimizing energy management of fuel cell-based aircraft powertrain components is important to achieve long range and operate at low cost. A method for achieving an optimized energy management strategy for fuel cell powered aircraft is also discussed in this book. The use of solid oxide fuel cells as auxiliary power units and in a hybrid propulsion unit with gas turbines is also discussed in detail. This book is an essential guide for students, researchers and engineers working on the performance and environmental analysis of hydrogen and fuel cell powered aircraft.

National Hydrogen Association
Esentepe Mah. Sağlam Fikir Sok. Esen Palas Apt. A Blok No:2 D:9 Esentepe / Şişli / İstanbul
Communication Association Coordinator: Fatma Taşçı / 0 533 726 72 55 / fatma.tasci@hidrojenteknolojileri.org
www.hidrojenteknolojileri.org

HYDROGEN NEWS FROM THE WORLD

You may go to the given links for details of these news. More news from FALL 2022 are listed in National Hydrogen Association web page.

Bloom Energy's Newark facility is now manufacturing electrolyzers – technology that produces hydrogen fuel using electricity instead of natural gas. The company touts the expansion as a boon for clean energy and Delaware's economy, but some environmental groups question the technology's promise.

More

CaetanoBus, a bus and chassis manufacturer in Portugal, has selected Hexagon Purus, a Hexagon Composites company, to supply hydrogen fuel system for their serially produced fuel cell transit buses, over the next four years.

More

India's ReNew Power Pvt Ltd. is looking for opportunities to set up green hydrogen hubs locally and overseas as companies and governments seek greener alternatives to fossil fuels.

More

Singapore Launches National Hydrogen Strategy to Accelerate Transition to Net Zero Emissions and Strengthen Energy Security

More

SFC Energy – H2genset, The Emission-free and Mobile Hydrogen Power Generator, Wins Lower Austrian Main Innovation Award

More

Researchers in Singapore have developed a new light-triggered coupled oxygen evolution mechanism that builds on past oxygen evolution research.

Dore

Meet the world's first hydrogen fuel cell-powered container handler

More

Blue Spirit Aero Accelerates the Development of Its Hydrogen Powered Aircraft with Dassault Systèmes

More

ORLEN to build three new hydrogen stations in Poland

As part of its 'Hydrogen Eagle' project, the company aims to create a network of 100 sites for hydrogen fueling in Central Europe.

More

Green hydrogen corridor aims to harness Spanish sunshine and decarbonize Europe's industrial north

More

Google Wants More Restrictive Green Hydrogen Rules

More

Waste firm wins BEIS funding to explore hydrogen-powered machinery

More

Hydrogen Fuel Cell Technology: The Future Of Sustainable Aviation

More

Singapore to use low-carbon hydrogen to reach 2050 net zero target

More

Oman Plans to Produce One Million Tonnes of Green Hydrogen Per Year by 2030

More

Scientists retrofit diesel engines to use hydrogen as fuel, increasing efficiency %26

More

German researchers find a solution to the hydrogen storage problem: salts.

More

New electrolysis technique produces clean hydrogen fuel from seawater

More

National Hydrogen Association
Esentepe Mah. Sağlam Fikir Sok. Esen Palas Apt. A Blok No:2 D:9 Esentepe / Şişli / İstanbul
Communication Association Coordinator: Fatma Taşçı / 0 533 726 72 55 / fatma.tasci@hidrojenteknolojileri.org
www.hidrojenteknolojileri.org

OUR NEW CORPORATE MEMBERS

Solar Energy, one of the biggest renewable energy sources of the future and today, has come to the fore with land installations in Turkey since 2012, while the demand for industrial facilities started to rise with the regulation change made in 2018.

OzEnergy, headquartered in İzmir, has accomplished important projects on land and industrial roofs with its Professional staff since its founding. The Group also has a subsidiary headquartered in Hamburg, Germany where it manages its activities in Europe. It is also the sole authorized partner of Enerparc, the largest EPC company in Europe, in Turkey. OzEnergy group, which has made installations not only in Turkey but also in many regions of Europe, has been successfully continuing its path by taking part in more than 320 MWp projects in total since 2017.

OzEnergy experts manage the process for a solar power plant from scratch and guarantee correct engineering. All details are taken into consideration from the Project idea and realistic production estimates are presented to our investors.

What is the reason why solar energy, which has been on our agenda lately, has become so important recently?

- The European Union's target of reducing carbon emissions to 55% by 2030 and the Green Deal and border solar energy a necessity, not a target.
- One of the most important reasons for the acceleration of the demand for solar power plant investments in Turkey is the incentives applied.
- Regular hikes in electricity prices have also been accelerating.

As a result, thanks to solar energy, you can produce your electricity, reduce/reset your electricity bill, and contribute to a cleaner future. In this process, you can own your power plant, which you can use for many years with OzEnergy quality, with high efficiency and quality standards.

TOPKAPI ENDÜSTRİ Malları Ticaret A.Ş.

Founded in 1985, TOPKAPI INDUSTRY is an energy and engineering company. Headquartered in Istanbul, Turkey, TOPKAPI INDUSTRY operates in the fields of Energy Systems and Compression Systems.

Topkapı Industry provides engineering, sales, installation, maintenance and repair solutions to the sector with its 120 employees.

It has reached an installed capacity of 910 MWe with Jenbacher gas engines, which it has installed to its customers, first with natural gas and then with biogas. With the launch of gas engines that can burn 100% hydrogen at the beginning of 2022, it is getting ready for new projects.

With the use of hydrogen as a fuel, which we see as one of the most important factors in reducing the greenhouse effect, and especially with the EU's transition to the hydrogen economy, we aim to create value for our customers, employees, suppliers and society by working especially on renewable-based green energy production and gas separation systems.