# GSCESD-2022
# 5TH GRADUATE STUDENT CONFERENCE ON ENERGY AND SUSTAINABLE DEVELOPMENT

***9 December 2022***

***Kadir Has University***
***Center for Energy and Sustainable Development***
***Online Event***

# PROGRAM & ABSTRACTS

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# PROGRAM

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| **09:00-09:30** | **Opening Session**<br>S. Erkan TAN, Organizing Committee Chairperson<br>Prof. Dr. Şener Oktik, Scientific Committee Chairperson |
| **Session I** | **Energy Security & Geopolitics**<br>Moderators and Discussants:<br>Assoc. Prof. Dr. Emrah Karaoğuz, International Relations Department, Kadir Has University<br>Dr. Öğretim Üyesi Emre Çelebi, Industrial Engineering Department, Yeditepe University |
| 09:30-09:50 | Energy crisis in Pakistan and its possible solutions<br>Muhammad Zohaib, Kadir Has University |
| 09:50-10:10 | Turkey: A new Ukraine between Russia and the EU<br>Salihe Kaya, Kadir Has University |
| 10:10-10:30 | Analysis of Greek press on energy issues in the Eastern Mediterranean Region<br>Dimitrios Karampalis, National and Kapodistrian University of Athens, Greece |
| 10:30-10:50 | Discussions |
| 10:50-11:15 | Break |
| **Session II** | **Green & Sustainable Energy**<br>Moderators and Discussants:<br>Prof. Dr. Ahmet Deniz Yücekaya, KHAS Center for Energy and Sustainable Development<br>Assoc. Prof. Dr. Emel Akçalı, KHAS Center for Energy and Sustainable Development |
| 11:15-11:35 | Will the transition from fossil fuels to renewable energies benefit Europe's economic growth?<br>Btissam Hajjaoui, Kadir Has University |
| 11:35-11:55 | Analysis of German green energy transition<br>Emine Yeşil, Mersin University |
| 11:55-12:15 | Carbon Border Adjustment Mechanism on cement industry: Sectoral energy analysis<br>Latife Nur Demir, Mustafa Berker Yurtseven, Ebru Acuner, Istanbul Technical University |
| 12:15-12:35 | The European Green Deal's energy transition strategies on the energy sector<br>S. Erkan Tan, Hazal Mengi, Kadir Has University |
| 12:35-12:55 | Discussions |
| 12:55-13:30 | Break |

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| **Session III** | **Energy Technology and Innovations**<br>Moderators and Discussants:<br>Assoc. Prof. Dr. Gökhan Kirkil, KHAS Center for Energy and Sustainable Development<br>Dr. Okan Yardımcı, Head of Digital Transformation Group, Energy Market Regulatory Authority of Turkey |
| 13:30-13:45 | Energy storage systems: Characteristics and comparison<br>A. Ali Shan, Kadir Has University |
| 13:45-14:00 | The shift to electric vehicle and its effectiveness in reducing carbon emissions<br>Mustafa Omar Mohammed Nabil, Kadir Has University |
| 14:00-14:15 | Simulation-based analysis of fuel stations: An outlook for the integration of EV charging units towards sustainable cities<br>Büşra Çelik, Gizem Demir, Merve Akgül, Nadi Serhan Aydın, İstinye University |
| 14:15-14:30 | Converting the momentum energy of blowing around local generators into electricity<br>Aryan Dlsoz, Hamid Farangis Zadeh, Komar University of Technology, Iraq |
| 14:30-14:45 | Discussions |
| 14:45-15:00 | Break |
| **Session IV** | **Energy Markets and Utilization**<br>Moderators and Discussants:<br>Assoc. Prof. Dr. İstemi Berk, Technology Transfer Office Coordinator, Dokuz Eylül University |
| 15:00-15:15 | Index decomposition analysis and energy consumption of Turkey<br>Aynur Yılmaz Ataman, Marmara University |
| 15:15-15:30 | Short term forecast of Turkey's electricity demand<br>Berk Dede, Kadir Has University |
| 15:30-15:45 | Being a female engineer in the energy sector in Turkey<br>Özlem Dilara Gültaş, Kadir Has University |
| 15:45-16:00 | Bibliometric Analysis on the well building standard, sick building syndrome and the effects of this syndrome on the mental health of employees<br>Çağla Özçelik, Bahar Çelik, Health Management Department, Kütahya Health Sciences University |
| 16:00-16:15 | Discussions |
| 16:15-16:30 | **Closing Remarks**<br>S. Erkan TAN, Organizing Committee Chairperson<br>Prof. Dr. Şener Oktik, Scientific Committee Chairperson |

# ABSTRACTS

C.E.S.D.
5th Graduate Student Conference on Energy and Sustainable Development
*9 December 2022, Kadir Has University Cibali Campus, Istanbul,*

# Energy Crisis in Pakistan and its Possible Solutions

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A B S T R A C T

The country's development and progress are directly proportional to the performance of the energy sector, as the energy sector operates the engine of every sector and Pakistan is still trembling around and dealing with continuous electrical supply problems. Therefore, there have been forced power outages from 8 to 12 hours per day in urban areas and up to 18 hours per day in rural areas over the past ten years. The main factors contributing to the widening gap between supply and demand are the rise of electrical demand and the decline of energy supply in parallel. In order to overcome this issue/problem the government has been implementing a number of technological solutions, including a partial restructuring of the electrical industry in accordance with recommendations from international finance organizations. Therefore, the nation currently faces not only a significant challenge in satisfying the demand for power but also a significant challenge in maintaining energy security in light of critically crucial global climate change challenges. The involvement of policymakers at this point is vital for not only evaluating and revising the present strategies to reduce the supply and demand gap for electricity, but also for the necessity to develop plans, providing affordable power with the effective generation, transmission, and distribution in order to promote sustainable development in the nation. This paper reviews renewable energy sources, and discusses how they can significantly and effectively contribute to the nation's energy independence and security. Additionally, this research will assist Pakistan's key government agencies in developing power capacity in accordance with the country's needs for energy and easing its energy crises.

**Keywords:** Energy crisis, Energy security, Energy demand, Renewable energy, Power generation, Pakistan

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# Turkey: A new Ukraine between Russia and the EU

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A B S T R A C T

Turkey's energy cooperation with Russia, which started in 1986, is now in its heyday. Turkey imports natural gas from different countries through pipelines and LNG to diversify its energy sources. However, Russia remains Turkey's largest natural gas supplier. In 2021, Turkey will import 58.7 billion cubic meters of natural gas, 44.8 percent of which will come from Russia. Turkey currently imports Russian gas through two pipelines. The first is the Blue Stream pipeline, which opened in 2003, and the second is the Turkish Stream gas pipeline, which opened in 2020. When the Turkish Stream gas pipeline was opened, Turkey started to have the potential to become an important energy hub for Europe. The critical point of the recent energy supply and demand security problem is which country will provide the gas transfer between the two regions. In addition, the question is whether Turkey has the power it might face in its role in the evolving geopolitical future to withstand or prevent any sanctions.

Source: BOTAŞ

Since Russia invaded Ukraine in February 2022, NATO member Turkey has been trying to walk a middle line between Moscow and the West. Russia has announced that it will invest in the Turkish Stream gas pipeline instead of Nord Stream and wants to see Turkey as an energy hub.

The main topic of this study is whether Turkey's becoming an energy hub poses risks for Turkey. As is well known, Ukraine played a key role in the energy relationship between Russia and European countries. This role is both an advantage and a disadvantage for Ukraine. The recent invasion clearly shows that Ukraine is facing a situation where more than 7 million people have been displaced and more than 13 thousand people have lost their lives because of its role in energy transit.
Yes, one of the reasons for Russia's invasion is the Russian population in Ukraine, but everyone knows that the main reason behind this invasion is energy. In this case, Turkey should take steps to become a country where energy prices are determined rather than a country where gas is transferred through pipelines. This study analyzes what Turkey needs to do to become an energy hub.

**Keywords:** Natural gas, Turkey, Russia, Ukraine, Hub, Transit, Supply Security

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# Analysis of Greek Press on Energy Issues in the Eastern Mediterranean Region

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A B S T R A C T

Energy is an increasingly hot topic in our region. The discovered fields in our century's early years increased the importance of the Eastern Mediterranean region in the "Energy world map". Russia's invasion of Ukraine forced the European nations to find a solution to their dependence on Russian natural resources and alternate their providers. Eastern Mediterranean could play an important role in this transition, although some political or geophysical obstacles remain. However, the desire of the states remains. Most countries in the region are investing in both traditional forms of energy and other forms that are in line with the energy-green transition, within the scope of sustainability, and the new European standards.
Greece saw the opportunity and tried to establish the preconditions to become a supplier and producer country. By creating strong alliances, it strengthened transnational cooperation and energy security, which are the pillars of the safe and beneficial exploitation-transportation of the region's natural resources, towards the Balkans and European markets.
In the present study, by researching the print archive of two of the largest Greek newspapers, Kathimerini, and Naftemporiki, we will attempt to demonstrate the rise of energy-related issues in the Greek press, focusing on the 21st century. Given that the above-mentioned daily newspapers have the highest sales numbers in Greece, the rise in energy-related issues shows the increase in the interest of the public, but also its gradual familiarization. The expanded search, with different keywords, shows the multi-level effect of energy in the Greek press, showing however certain fluctuations, which are explained by certain facts.

**Keywords:** Eastern Mediterranean, East Med, Gas, Explorations

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# Will Transitioning from Fossil Fuels to Renewable Energies Benefit Europe's Economic Growth?

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A B S T R A C T

Due to climate change and environmental concerns, the European Union aims to switch from fossil fuels to renewable energies in the coming decades. According to the European Commission, the European Green Deal announced in 2019 is a major step that aims to reduce net greenhouse gas emissions by at least 55% by 2030 and to make Europe the first continent in the world to be climate-neutral by 2050. Currently, the consumption of non-renewable energy in Europe is higher than that of renewable energy. Undoubtedly, the complete transition from fossil fuels to renewable energies is not going to be easy. The change requires time and significant investment by governments and investors to invent, develop, produce or purchase the technologies needed to convert renewables to electricity and build renewable power plants. So, will Europe bear these expenses without harming its economy?

Another problem is that if the energy transition is successful, other issues may arise, such as the fact that many people will lose their jobs once all the non-renewable power plants are closed. It is true that many jobs will be created with renewable energies, but will the number of jobs be sufficient? Will people, who are fossil fuel experts, find alternative jobs in a different field? As the employment rate is one of the components that whether GDP rises or falls, will the change in this factor benefit or harm the European economy? Some researchers see the need to continue and even increase natural gas consumption. Therefore, one can ask whether the transition from fossil fuels to renewable energies is an advantage or a disadvantage for the European economy. This study aims to determine whether or not the transition from fossil fuels to renewable energies will be beneficial for economic growth in Europe. Therefore, this article attempts to find answers to this research question using qualitative and quantitative methods. The plan set by the European Commission to achieve the objectives of the European Green Deal by 2050 is analyzed. The constraints associated with the transition to renewable energies are discussed. Additionally, the economic gains of non-renewable energies are compared with those of renewable energies. Finally, the budget needed for this energy transition is estimated to answer if Europe can afford the transition. However, although many research articles point out that the consumption of renewable energy benefits economic growth in Europe, they do not consider the financial costs or constraints that come with renewable energy. These costs and constraints can slow economic growth, as large investments are essential for the full energy transition, especially as the European economy has not fully recovered from the ramifications of the COVID-19 pandemic. Moreover, the Russian-Ukrainian war is accelerating the transition to make Europe independent of fossil fuels imported from Russia. However, at the same time, the war is costing Europe a lot of money because Europe is providing Ukraine with billions of euros. In the long run, the energy transition can benefit the European economy as Europe will only depend on its domestic resources if the energy transition is successful, but until then, how much can the economy suffer before it recovers? Many parameters are ignored in the literature to estimate how beneficial the transition to renewable energy is for the European economy; therefore, we try to narrow this gap in this paper.

**Keywords:** Energy Transition, Europe, Renewables, Fossil Fuels

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# Analysis of German Green Energy Transition

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A B S T R A C T

Humans, who are only part of nature, affect the environment and are also affected by the environment too. Especially since the First Industrial Revolution, excessive human intervention in natural processes, acceleration of economic growth rate, new generation technology, with the direct proportion of population increase, depletion of energy and sources swiftly, pollution of the environment and problems like climate change caused an increase of anxiety and concern of the environment.

In the late 1960s and the beginning of the 1970s, subjects like the protection of the environment, climate change, sustainable development etc. started to be discussed as important items of the agenda in the international environment. As a result of international concerns about the environment, environmental issues started to be included in the discipline of International Relations (IR). In the beginning, environmental issues were seen as social considerations in IR. However, with the end of the Cold War, both the change of the international system and the emergence of more liberal understandings in the system, the green theory has gained an important place in the discipline of environmental issues.

The green theory takes part among post-positivist theories. The theory challenges problem-solving theories in IR by questioning the status quo, trying to understand or correct it, and proposing normative societal changes for a better livable world. At this point, the theory, which is in the category of critical theories, chose nature as a study subject instead of adopting an individual and state-oriented approach, and pioneered the creation of a new and democratic world vision. In addition, the aim of the theory is not to solve the problems faced by society in daily life, as in other IR theories. The theory's purpose is to solve problems individuals may encounter throughout their lives.

The green theory rejects human-centered (anthropogenicentric) ethics. The green theory, which adopts an environmentally centered (eco-centric) approach in the IR discipline, expects each country to do its part in the environment for a sustainable world. For this purpose, Germany, which is considered as a case study in the study, has deep concerns about the environment, especially since the 1970s, taken steps to transition its energy, establish an economy based on renewable energy resources, and set an example for many countries in the energy transition process. For example, in 2011, Germany adopted the *energy transition (Energiewende)* policy in order to foresee faster and more radical changes in its energy policies. With the steps it has taken on the environment, the massive green movement in the country, and with its efforts for years to transform its energy from non-renewable energy sources to renewable energy sources, Germany is one of the countries that most comply with the principles and values of green theory.

The study will be discussed in the context of green theory. In the study, it will be shown that a state that has grown economically and completed its industrialization. Germany, as an example, could protect the sustainability of nature in the same direction while protecting human welfare, and that renewable energy sources could be applied at a lower cost more than expected. In addition, it will be mentioned that Germany's position as a leading country in energy transition policy is now used as a soft power.

**Keywords:** Green Theory, Energy Transition, Energiewende, Germany

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# Carbon Border Adjustment Mechanism on Cement Industry: Sectoral Energy Analysis

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A B S T R A C T

The European Commission has announced that they will adopt a new perspective which is called "the European Green Deal" in its strategies and will make it in the scope of climate change and mitigation. As part of the European Green Deal, "Fit For 55" package, which represents a 55% emission reduction in 2030, has announced thereafter. This package includes a number of actions, and one of the important actions is "the Carbon Border Adjustment Mechanism" (CBAM) because it affects the countries who (that) export to Europe. The main purpose of the Carbon Border Adjustment Mechanism is to struggle with "carbon leakage" into European Countries. Initially, this mechanism will cover only carbon intensive sectors, which are iron and steel, cement, aluminum, fertilizer, and electricity. Besides, it will cover only direct emissions that occur within production boundaries. However, scope of the sector and indirect emissions are under evaluation and may be included in regulation after the transitional period. The Carbon Border Adjustment Mechanism will be implemented and taken into force gradually as below.

**Gradual Phases of CBAM**

Transitional Phase (2023-2026): Embedded emissions in imported goods will be reported periodically and certificate fees will be excluded. The EU Commission will evaluate the mechanism's functioning and collect information such as actual emissions. As a preview of the mechanism, the transitional period may help to observe deficiencies and needs of the mechanism. The EU Commission will also consider expanding the scope of sectors and emissions. After the Transitional Phase (2026 onwards): Full mechanism will come into force, and importers will have to pay for certificates which represent total embedded emissions in imported goods in the reporting year.

Turkey is one of the leading countries exporting to Europe from sectors specified in CBAM. Especially for the cement industry, Turkey is the largest exporter to European Countries. Therefore, Turkish cement producers will be indirectly affected by CBAM regulation. First of all, producers will have to monitor, report, and verify (MRV) their embedded emissions. Otherwise, default values that will be more than the average emissions of European producers will be considered. Although certificates will be purchased by the declarant (importer) located in Europe, Turkish producers will be indirectly affected by CBAM regulations in terms of competition. The sectors covered by CBAM have great importance in the Turkish economy. In this context, it is crucial to eliminate negative effects of CBAM regulation by establishing a national Emission Trading System (ETS).

In this study, potential impacts of CBAM regulations on the cement producer as the significant exporter in the cement industry have been calculated and analyzed. First of all, according to the calculation method in the draft CBAM regulation, embedded emission value according to the average amount of exports carried out in the past five years, and the price of certificates to be paid have been calculated. On the other hand, another scenario has been revealed in the case of indirect emission come into account. Since the emissions are directly related to the energy used, the current energy situation is assessed and alternative energy sources are analyzed in line with the research. This study provides a comprehensive sectoral analysis and a roadmap in line with the results and evaluations.

**Keywords:** Carbon Border Adjustment Mechanism, Turkish Cement Industry, Energy Consumption, EU Green Deal, Scenario Analysis

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# The European Green Deal's Energy Transition Strategies on the Energy Sector

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A B S T R A C T

To halt climate change, greenhouse gas (GHG) emissions must first be reduced and then eliminated. When GHG emissions are classified, agriculture, industry, and waste emit the most GHGs, followed by the energy sector. These are the industries that use the most energy and rely on carbon-intensive fossil fuels for their energy. Energy sector is one of them, and it's essential to achieving the emission reduction goals because it accounts for more than 70% of EU GHG emissions. In the literature, decarbonization is defined as reducing GHG emissions to zero.

Climate change can be halted if carbon emissions are reduced on a regional and global scale. As a result, The European Union (EU) launched the European Green Deal (EGD) at the end of 2019, and established its decarbonization targets, six clean energy transition strategies, and eight policy areas. Climate, energy, agriculture, environment and oceans, transportation, finance, regional development, and research and innovations are the policy areas in issue. The EGD's energy policies have three fundamental tenets, which are (I) ensuring a reliable and affordable EU energy supply, (II) creating a fully integrated, interconnected, and digitalized EU energy market, (III) supplying energy efficiency as a top priority, enhancing building energy performance, and developing power sector that relies heavily on renewable sources. Energy system integration strategies, offshore renewable energy strategies, and trans-European networks for energy strategies are examples of energy transition strategies.

The current targets for 2030 were at least a 55% reduction in GHG emissions compared to 1990, at least a 40% share of renewable energy, and the energy efficiency to 36% for final and 39% primary energy consumption.

In this study, it simplifies and summarizes the relatively more complex energy transition policies and strategies among EU issues. First of all, the EGD's targets for the energy sector will be explained. Afterwards, the strategies determined by the EGD will be evaluated in order to reach the targets.

Considering the objectives of these strategies, the energy system integration aims to use and plan the energy system as a whole, including energy carriers, infrastructure, and consumer sectors, in order to make the energy system more efficient, affordable, and low-carbon. The hydrogen strategy seeks to use hydrogen as a raw material, fuel, energy carrier, or storage to accelerate the decarbonization of energy, transportation, construction, and other carbon-intensive industries such as steel and chemical. By renovating, recycling, and reusing building materials, the renovation wave strategy aims to make buildings more energy-efficient, sustainable, and low-carbon. The methane strategy aims to reduce methane emissions by preventing methane leakage, prohibiting venting and flaring, and improving methane emission measurement and reporting in the energy sector. The offshore renewable energy strategy focuses on five topics, which are (a) investment, (b) regional cooperation, (c) a predictable legal framework, (d) supply chain strengthening, and (e) continuous innovation support. The Trans-European Networks for Energy (TEN-E) policy aims to connect the energy infrastructure of EU countries by providing funds to improve existing energy corridors and networks and develop new ones.

**Keywords:** The European Green Deal, Clean Energy Transition Strategies, Energy Transition Policies, Decarbonization

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# Energy Storage Systems: Characteristics and Comparison

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A B S T R A C T

Developing technology to store electrical energy so that we can use it later to meet the demand whenever we need it would be considered a major breakthrough in electricity distribution. Trying to meet this goal during peak hours when there is an electricity demand, and electrical storage devices can manage the amount of power required. This paper focuses on a different technology that can be used as storage systems, such as flywheels, supercapacitors, superconducting energy storage, pumped hydroelectric storage, compressed air energy storage battery, and fuel cells. For each individual technology, the capital cost, running cost, advantages and disadvantages, efficiency, energy density, and some major breakthroughs in technology are discussed, and also the comparison is made to this technology in terms of application and technical characteristics.

**Keywords***:* Batteries**,** Compressed Air, Energy Storage, Flywheel, Fuel Cell, Hydrogen Storage, Pumped Hydro Storage, Storage Technologies

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# The Shift to Electric Vehicles and Their Effectiveness in Reducing Carbon Emissions

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A B S T R A C T

The modern automobile has been powered by the internal combustion engine for most of its history. Consequently, it has been, and continues to be, largely responsible for carbon emission (CE), jumping 8% up from the levels in 2021. The electric vehicle (EV) thus emerged as the awaited champion that could potentially steer us on the track toward a world of net-zero emissions. Governments, corporations, and international organizations have mobilized efforts to "electrify" transportation and rid the sector of its dependence on fossil fuels. But how effective have they been in achieving this objective? This paper studies the effectiveness of "EV-supporting" policies in different regions and their impact in reducing CE over the past decade. These policies are categorized based on region, and their impact is studied by looking at CE levels from transportation prior to policy implementation and after implementation. In addition, other factors that potentially contribute to the effectiveness of a CE reduction as a result of EV penetration in the transportation sector are discussed.

**Keywords:** Carbon Emissions, Climate Change, Electricity, Electric Vehicles, Sustainability

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# Simulation-Based Analysis of Fuel Stations: An Outlook for the Integration of EV Charging Units Towards Sustainable Cities

Büşra Çelik[a], Gizem Demir[a], Merve Akgül[a] and Nadi Serhan Aydın[a]

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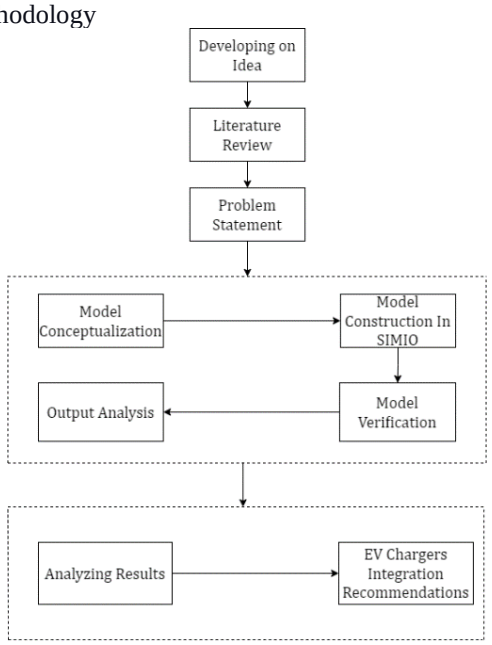
A B S T R A C T

In recent years, within the scope of the sustainability concept in transportation, the incentive to the use of electric vehicles (EVs) has been increasing to minimize the damage caused by fossil fuel vehicles (FVs) to the environment. The growing use of EVs raises two important issues, namely, the distribution and the correct positioning of the charging stations. On the otherhand, since the use of FVs will decrease over time, another significant problem arises that regards the future of today's fuel stations. Therefore, the conversion of fuel stations into hybrid stations comes into question, both to continue serving FVs and to adapt to the EV transformation by providing charging units in central locations. In the literature, studies on the conversion of fuel stations to hybrid stations have generally focused on the structural feasibility of the stations and concluded that the hybridization of these stations is structurally appropriate. Contrary to studies inthe literature, this research examines how conversion to a hybrid station affects the conventional station's performance metrics at the operational level such as but not limited to utilization, latency and bottlenecks –which may be argued to emphasize the contribution of the present study.

First, the scope of the study, consisting of 3 main titles, as making detailed analyzes about thegap of the research question, preparing a fuelstation simulation model and analyzing the model outputs, was determined and detailed as shown in Figure 1. In order to define the problem in more detail, a comprehensive literature review was conducted, studies on charging unit adaptation and the methodologies used were investigated. Based on the structure of a typical fuel station in Turkey, a conceptual model with 14 pumps, 10 of which serves diesel/gasoline, 4 of which provides LPG service, and 1 convenience store was prepared, and the components of this model were identified.

**Figure 1.** Visual description of paper methodology




In the model, customers, and servers (pump and staff) were considered as the two types of entities, and the characteristics of these entity types that have an impact on the system were specified. The system's events, activities, and limitations were also established. Additionally, the primary performance metrics, such as serverutilization rates, the amount of time customers spend in the system and queue, and the totalnumber of customers in the system and queue, were determined. Some crucial presumptions were established to properly set up the simulation model. Next, input modeling is done using the exponential distribution, which allows to describe arrival and service activities as

Markov processes and to represent the system as a whole and its underlying subsystems using M/M/c queue models. In line with these assumptions, a computer model was prepared using Simio Simulation Software. To verify the developed model, the computer model was run at 95% confidence interval and the basic outputs of the computer model were compared with its theoretical counterpart. It was shown that the theoretical outputs were within these intervals obtained from the simulation model.

In order to interpret the operation of a typical fuel station, confidence intervals were created for the actual performance indicators with a significance level ($\alpha$) of 0.01. Based on the established intervals, scenario and sensitivity analyses were performed to detail the operation of a typical fuel station. Controllable and uncontrollable input variables were determined and their effects on critical performance measures were examined. Thus, the present research thoroughly examines the current capability of a typical fuel station, which can serve as a steppingstone to its conversion to a hybrid station through adaptation of EV charging units. As an outlook, the simulation model can be extended to a more parametric model that is flexible enough to be adapted to fuel stations with different layouts and capacities. Furthermore, the present study can allow for developing a mathematical optimization model for deciding the locations of EV charging units in a district based on utilization levels of hybrid stations and recharging behavior of customers.

**Keywords:** EV Charging Units, Fuel Stations, Hybrid Stations, Sustainable Cities, System Simulation

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# Converting the Momentum Energy of Blowing Around Local Generators into Electricity

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A B S T R A C T

There are several different types of electricity productions in Kurdistan region, Iraq. The main provider is the government, which delivers grid electricity. The grid electricity is limited and prepared by several sources, namely:

1) Governmental and/or Private powerplants (hydro- and thermal-powerplants), and,
2) Grid electricity bought from the neighboring countries.

The grid or governmental electricity, from one hand is very expensive and from the other hand is not available all the time. Therefore, another sources for providing electricity is very required. Unfortunately, the energy consumption here is too high and at the same time the at hand alternatives are very limited. As a kind of immediate solution, there are thousands of big and small local generators which try to solve the huge power shortage for urban, rural and industrial applications. These local generators are consisting of very same components, namely a combustion engine, a generator and a cooling system. They all have an exhaust for blowing the burned gases out and a fan for engine ventilation. Both of these two components push the surrounding air very strongly away. Our idea is to build up a non-expensive and almost noiseless small windmill, which can be easily assembled on the exhaust and the fan in order to collect the linear momentum of the flowing air around the exhaust and the fan. The horizontal and spiral form propeller of our mill, after converting the linear momentum into a radial momentum, can rotate a small generator connected to its shaft. The rotation of this generator can produce a DC electric potential. The produced electricity can be used for several purposes, namely recharging a battery and/or converting it to AC through an inventor. The sizes of the exhaust and the fan of the local generators are different as some of them are designed for industrial needs and some only for house applications. This fact gives the opportunity to us to design a range of our windmill. For producing the spiral propeller, we can reuse plastic bottles of soft drinks. For producing a soft and low friction rotation of the shaft, we will reuse the second-hand ball bearings which can be collected from many local car workshops. The assembling process of our system will take less than two hours and no special professionality of the people using it is required.

From the sustainability point of view, several benefits can be achieved by our windmill, since it is a:

1) Clean,
2) Economical,
3) Environmentally Friendly,
4) Small,
5) Easy to Assemble and Use,
6) Recyclable.

**Keywords:** Clean Electricity, Local Generator, Recycle, Reuse, Small Windmill

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# Index Decomposition Analysis and Energy Consumption of Turkey: 2000-2014

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A B S T R A C T

As ecological constraints, rapidly increasing production and consumption activities, as well as their changing structures make continuous access to energy supply more critical than ever, energy policies are gaining increased attention not just for climate-related issues but also for reasons related to energy security. For this reason, breaking down energy demand into its driving factors becomes essential in evaluating the impact of each factor and, thus the effectiveness of economic and energy policies to meet the growing demand for energy.

In that regard, decomposition analysis which explains an observed change of an aggregate indicator of interest by distributing this change into its driving forces, has emerged as a new line of research in energy studies following the world oil crisis in the 1970s.

In decomposition analysis, studies are divided into two independently developed categories; structural decomposition analysis (SDA) and index decomposition analysis (IDA). While the underlying concept behind these analyses is the same, due to its straightforward mathematical formula enabling the use of lower-level data and its flexibility regarding application areas, periods, and methods, IDA has found an increasing place in the literature of energy studies.

Ang (2004a) and Ang & Goh (2019) summarize application areas of IDA in six categories: (1) energy supply and demand, (2) energy-related carbon/GHG emissions, (3) material use and other new areas, (4) national energy efficiency trend monitoring, (5) cross country comparison and (6) prospective studies.

Ang (2004a) also categorizes the methodological developments in IDA within three periods: "*introduction*", "*consolidation*", and "*further refinement*". Before 1985, in the "*introduction phase*", techniques were referred to as the "Laspeyres index-related decomposition approach" as they were later found similar to the Laspeyres index approach. In the "*consolidation phase*" over the years 1985-1995, attempts gained pace to establish a general framework for decomposition methods. Despite the increasing number of new methods and efforts to improve the existing ones, decomposition studies conducted during this period left unexplained residuals. After 1995, in the so-called "*further refinement period*", unexplained residual problems and the inability to handle zero values in big data sets led to the improvement of decomposition methods, and LMDI-I (Log-Mean Divisia Index -I) was proposed in this period by Ang et al. (1998) by using a different logarithmic weight function to decompose the differential change in energy demand or gas emissions over time.

In terms of the four criteria (theoretical foundation, adaptability, ease of use, and ease of result interpretation) recommended by Ang (2004b) to be taken into account in assessing the desirability of a decomposition method, the LMD-I method is recommended as the most appropriate choice.

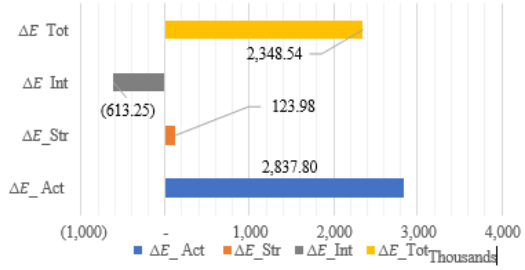
In Turkey, IDA has recently become a widely used methodology for energy and emission studies, but relatively few studies have focused on energy consumption. And these studies are based on the national energy balance tables, whose statistical approach is different from the national accounting framework. In this study, change in the energy consumption of Turkey between 2000-2014 is analyzed based on the 2016 release of the environment and socioeconomic accounts of the World Input-Output Database (WIOD) using the additive form of the LMDI-I method to see the contribution of economic growth, sectoral composition, and energy intensity to this change.

While WIOD energy accounts are based on energy balance tables, they are transformed in two ways. Since energy balance tables are based on the territorial principle in which emissions and energy use of an economic actor are allocated to countries where these activities occur, regardless of whether their economic actors are residents or non-residents of these countries, WIOD energy data was transformed to be in line with the residential principle, like the System of National Accounts (SNA), in which economic units

consuming energy are required to be resident in countries engaged in production. The second transformation were performed by distributing some energy flows into related sectors in accordance with the NACE Rev.2 sectoral classification used in SNA, as some energy flows in energy balance tables are categorized irrespective of the agent doing this transport. For example, “road transport” and “commerce and public services” items in energy balances are distributed across several industries, services, plus households in the WIOD energy accounts to set up a link between energy data and economic activities (Corsatea et al., 2019; Genty et al., 2012).

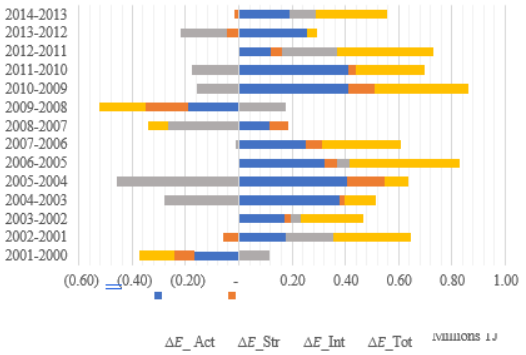
Figure 1 and Figure 2 show the results of the decomposition of period-wise and annual changes in energy consumption. Findings are coherent with previous studies, showing that the activity effect is the main contributing factor to the increase in energy demand during this period.It is also worth emphasizing that the structural effect generally has a very limited impact on changes in energy consumption, in contrast to the intensity effect, which turns out to be the main reason behind the large amount of energy savings during this period.

**Figure 1** *Decomposition of Energy Demand in Turkey, 2000-2014*




The impact of changes in the sectoral shares or energy intensities on the total change in energy consumption is related to the percentage of this economic activity in total energy demand. This indicates that structural changes and energy improvements in sectors of which shares in total energy consumption are higher than others have a larger impact on total energy demand than those with a small weight in total energy consumption.

**Figure 2** *Decomposition of Annual Changes in Energy Demand, 2000-2014*




As the analysis shows, IDA can be a very beneficial tool to distinguish the impacts of different factors on the change in energy consumption from each other. The extent to which changes in value-added share and energy intensity affect total energy demand would provide valuable input in establishing sectoral energy policies. In that regard, a multilevel analysis showing the impact of changes in value-added shares and energy intensity of sub-sectors at the lower hierarchical level on total demand can be more beneficial for the determination of targeted sectors.

**Keywords:** Energy Consumption, IDA, Turkey, WIOD

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# Short Term Forecast of Turkey's Electricity Demand

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A B S T R A C T

Technology is an integral part of our modern lives. At the same time, energy has become a basic need. Planning is highly significant due to generally generating electricity from limited resources and the need for a balance of production and consumption. Providing continuous, reliable, and accessible energy is only possible with well planning for the future. Many companies from many fields need forecasts for planning the future. Electrical systems are complex structures; therefore, many details must be considered for the prediction. Electricity demand forecast depends on many conditions such as climate, calendar effect (holidays, day of the week, etc.), demographic data, and economic data.

Geographically and population-wise, Turkey is a large country, consisting of 7 different regions with several climatic conditions that can be experienced simultaneously. The population distribution in Turkey is not homogenous and is concentrated in some regions and climatic conditions. Considering these conditions in Turkey, population-weighted meteorological data covering the dates 01.01.2016 00:00 – 31.12.2019 23:00 were used as independent variables. This data, licensed by NASA data information policy, was gathered from "renewables.ninja". Historical hourly electricity consumption data was obtained from the EPİAŞ transparency platform for the same dates.

Machine learning is a process for discovering necessary models to understand system behaviors. It uses specific trends and patterns in the data to explore them and make sense of them. Machine learning also forms the basis of artificial intelligence algorithms. Artificial intelligence algorithms are dynamic systems and can learn. Artificial neural networks result from people trying to transfer their abilities to machines and are an imitation of biological neuronal networks. To understand ANNs, we must first understand biological neurons. A single neuron has a simple structure, but billions of neurons are connected to solve complex problems efficiently. One of the simplest artificial neural networks is called perceptron. If perceptrons have hidden layers and an output layer in addition to the input layer, they are called multi-layer perceptrons. Recurrent neural networks (RNNs) have been developed due to developing methods and complex problems. The most significant difference between RNNs from other deep-learning models is their memory. However, it is not perfect, RNNs have defects, and as a solution, the long-short-term memory (LSTM) method has been developed, and thanks to its unique structure, it can memorize for a longer time by deciding which information will be memorized.

This study's purpose is to estimate Turkey's short-term electricity needs. Predicting the future is a challenging process. Therefore, two improved artificial intelligence models were developed for this estimation. The first model is a deep neural network (DNN) model and the second model is the stack (deep) LSTM model, which has become quite popular recently. Models were developed in Python, and Tensorflow and Keras libraries were used while establishing the models. The outputs of the models give the hourly electricity consumption, and the results are compared with the actual data. For this comparison, mean square error (mse), mean absolute error (mae), and mean absolute percentage error (mape) metrics are used.

**Keywords:** Short Term Electricity Demand Forecast, Lstm, Deep Learning, Artificial Intelligence, Time Series

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# Being a Female Engineer in The Energy Sector in Turkey

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A B S T R A C T

Gender inequality is one of the main social problems globally. Although women's rights have improved over the years, there is still a huge gap in every society, sector, and platform. In the beginning, the international communities organized conferences to discuss women's issues. Although there are many regulations, girls still study less in science, technology, engineering, and mathematics (STEM) than boys.

Since they cannot participate in education, women's participation in economic life is also lower. In addition, women's representation in social, economic, and political areas is lower than men. All these problems affect every woman in the world. Energy use, participation in energy policies, and involvement in the energy sector are also among the crucial elements that need to be solved for women.

Engineering is defined as dirty, difficult, and having physical risks. It is the norm for an engineer to prioritize his job, and the real engineer should spend all hours working, staying up late at the office, going to meetings, or the field. All these elements encourage gender discrimination in engineering.

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# Bibliometric Analysis on the Well Building Standard, Sick Building Syndrome and the Effects of This Syndrome on the Mental Health of Employees

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A B S T R A C T

With the development of technology and industry, issues such as global warming, reduction of energy resources, and pollution have led all sectors to the concept of sustainability. In particular, the building and construction sectors have enabled them to establish building-construction standards such as BREEAM, LEED, and WELL, which have a ubiquitous network around the world in line with the concept of sustainability. Standards such as BREEAM (UK) and LEED (USA) measure the sustainability and effectiveness of buildings in a number of categories ranging from ecology, water, energy use, air quality, and use of indoor materials. The WELL standard, on the other hand, focuses on the comfort, mental health, and well-being of the building occupants, which is not emphasized enough in these standards.

According to the Environmental Protection Agency (EPA) reports, an American spends 93% of his life in interior spaces. 97% of these interior spaces are buildings, and 6% are vehicles. One of these buildings is workplace. Working is beneficial for mental health, but an unfavorable work environment can lead to physical and mental health problems. It is known that mental health and working conditions affect each other bidirectionally. It is known that a good working environment increases productivity and improves collaboration and teamwork skills by keeping employees healthy. It also improves people's ability to be innovative by providing better job engagement. It is stated that if the conditions in the workplace are not good, negative situations such as burnout, loss of productivity, physical and mental deterioration can be seen in the employees. It is stated that mental health problems constitute 13% of the global burden of disease and approximately 32% of the years spent with disability (Vigo et al., 2016). Considering the reports of the World Health Organization, it is seen that even depression and anxiety alone cost the global economy approximately 1 trillion dollars due to loss of productivity. Sick Building Syndrome (SBS) is another factor that proves the effects of buildings on employees. Sick building syndrome (SBS); is a complaint related to the person's work area. Both the physical and psychological symptoms caused by the building syndrome can negatively affect the health of individuals and, accordingly, cause negative work results such as absenteeism and loss of performance. Considering the effects of buildings on employees and the global economic burden they cause, it is clear that healthy buildings should be created for employees.

This study aims to analyze bibliometrically the studies on the well-standard, sick building syndrome and the effects of this syndrome on the mental health of the employees. Since the study covers the subject of the master's thesis, it is thought that the findings to be obtained from the study will contribute to the development of the thesis.

**Keywords:** Mental Health, Sick Building Syndrome, Sustainability, Well Building Standard.

**Acknowledgment:**
This study was prepared within the scope of the first author's thesis.

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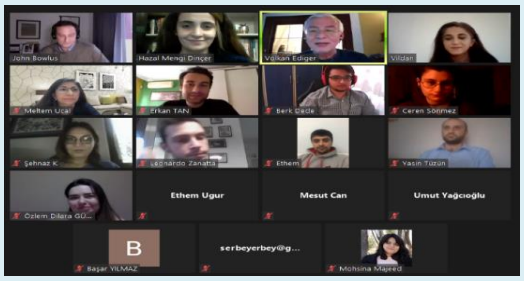





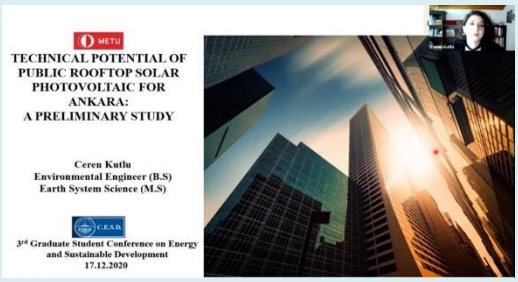


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