Kadir Has University
Center for Energy and Sustainable Development

GSCESD-2025

7TH GRADUATE STUDENT CONFERENCE ON ENERGY AND SUSTAINABLE DEVELOPMENT

21 November 2025
KHAS Cibali Campus, İstanbul

PROGRAM & ABSTRACTS

CENTER FOR
ENERGY AND SUSTAINABLE DEVELOPMENT

GSCESD-2025

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21 November 2025
Friday

Fener Hall
Kadir Has University
Cibali Campus

https://gscesd.khas.edu.tr/

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PROGRAM

10:00-10:20 **Opening Session**
Necla Serter, Organizing Committee Chairperson
Prof. Dr. Volkan Ş. Ediger, Conference Chairperson

Session I **Energy Economy and Markets**
Moderators and Discussants: *Prof. Dr. Meltem Ucal & Prof. Dr. Gökhan Kirkil*

10:20–10:40 Impact of Renewable Energy Penetration on Day-Ahead Electricity Prices and Price Volatility: Evidence from the Turkish Market
Saiqa Dilawaiz, Electronics Engineering PhD Program, Kadir Has University, İstanbul, Turkey.

10:40–11:00 Transition from Dollar Dependence to Multi-Polar Financial System: China's De-Dollarization Pragmatic Strategy
Hani Hilow, Department of Electronics Engineering, PhD Program, Kadir Has University, Istanbul, Türkiye.

11:00-11:20 Exploring the Transformation of the Electric Vehicle Business Ecosystems in Türkiye
Süleyman Sağlık, Energy and Sustainable Development MSc Program, Kadir Has University, İstanbul, Turkey.

11:20-11:40 The Triple Nexus: Technology, Policy, and Geopolitics in Advancing All-Solid-State Lithium-Ion Batteries Toward Sustainable Mobility
Muhammed Nadir Kemal, Energy and Sustainable Development MSc Program, Kadir Has University, Türkiye.

11:40-13:00 **Lunch Break**

Session II **Energy Transition**
Moderators and Discussants: *Prof. Dr. Ahmet Yücekaya & Asst. Prof. Dr. Zeynep Bektaş*

13:00-13:20 Nord Stream's Past and Present in Line with the EU's Energy De-Russification Policy
Ainaz Akhmetova, Department of International Relations, Karabük University, Turkiye

13:20-13:40 GENeSYS-MOD: An Open-Source Framework for Global and Regional Energy System Transformation
Oluremi Oyejide, Energy and Sustainable Development, Kadir Has University, Türkiye.

13:40-14:00 Analyzing the Iran-Qatar Oil Strategies through Game Theory Perspective
Necla Serter, Energy and Sustainable Development MSc Program, Kadir Has University, Turkey.

14:00-14:20 Understanding Green Hydrogen Futures in Türkiye with the Sociotechnical Imagineries
Hazal Mengi, İstanbul University, Türkiye; Spatial Planning and Environment, University of Groningen, Netherlands.

14:20-15:00 **Coffee Break**

Session III **Sustainable Energy and Decarbonization**
Moderators and Discussants: *Prof. Dr. Volkan Ş. Ediger & Asst. Prof. Dr. Burcu Ç. Yılmaz*

15:00-15:20 Can CORSIA Survive the 2026 EU Review? A SWOT Analysis of International Aviation's Climate Policy Clash
Uğur Deniz Kutlu, Kadir Has University Center for Energy and Sustainable Development, Turkey; Boğaziçi University Department of Political Science and International Relations, Turkey.

15:20-15:40 Environmental Sustainability Performance Analysis of Higher Education Institutions in Turkey
Batuhan Sarı, Center for Energy and Sustainable Development; Industrial Engineering, Istanbul Bilgi University, Turkey.

15:40-16:00 The Future of Nuclear Energy: From Fission's Limits to Fusion's Sustainable Promise
Büşra Avcu, Industrial Engineering MSc Program, Galatasaray University, Türkiye.

16:00-16:20 NIMBY Politics and Hegemonic Competition Dynamics: A Comparative Study of the US and China
Necla Serter, Energy and Sustainable Development MSc Program, Kadir Has University, Turkey.

Special Session

16:20-16:40 Cambridge Prisms: Energy Transitions – Scope, Mission, and Opportunities for Researchers
Prof. Dr. Meltem Ucal, Senior Editor of Cambridge Prisms: Energy Transitions; *Kadir Has University, Turkey.*

16:40-17:00 **Closing Remarks and Certificate Ceremony**
Asst. Prof. Dr. Zeynep Bektaş, Scientific Committee Chairperson

ABSTRACTS

7th Graduate Student Conference on Energy and Sustainable Development
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Transition from Dollar Dependence to Multi-Polar Financial System: China's De-Dollarization Pragmatic Strategy

Hani Hilow[a]

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Abstract

This paper is aimed at exploring China's pragmatic strategy against unrivaled dominance of the US dollar leading to achieving the first historic milestone where Renminbi overtook the USD and made up a greater share of China's trade settlements in March, 2023 and growing ever since. A strategy paralleled by fellow BRICS group members (Brazil, Russia, India, China, and South Africa). "*What happens in China doesn't stay in China, it affects the rest of the world*", leading to an evolving multipolar financial landscape.

A brief lateral portrait will be demonstrated to illustrate China's pivotal legacy in historic global trade network links up to Europe through the Silk Route exporting native products including: silk, paper, tea, spices, gunpowder, porcelain. China revitalizes its historic position in ancient times at the global commerce arena and increase its domestic growth through exports of goods and innovations away from the vulnerabilities of the US dollar and imposed tariffs and sanctions on BRICS and the global south.

The paper will revisit the Bretton Woods Agreement in 1944 after WWII at when the US dollar is established as the cornerstone of the global financial system. Currencies were pegged to the dollar backed by gold, then the dollar become entrenched in international trade. Central banks held the US dollar as the world's primary reserve currency for stability and liquidity. The petro-dollar system is established for the international purchase of oil. However, geopolitical resistance lead countries to diversify their central bank reserves to euro, yuan, yen, or gold. BRICS aims to shift trade settlements to local currencies. The US retaliates by protectionist trade practices to preserve its supremacy. China remains the second largest economy with trade surplus with trading partners despite a trade war. Market experts predict moving oil trade out of the petro-dollar into the petro-yuan. Russia selling its exports in ruble, Venezuela and Iran already accepting the petro-yuan for their exports and India paying in rupees for its crude oil imports.

Data will be collected from international trade sources including World Bank, census bureau on US-China Trade Balance. The purpose is to illustrate the dynamic shift of trade diversification and projection towards partial or full de-dolarization lead by China leveraging on its innovation and technology sector prospects.

Keywords: *De-Dolarization, BRICS, Global South, Multipolar, Financial Landscape, Diversification.*

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Impact of Renewable Energy Penetration on Day-Ahead Electricity Prices and Price Volatility: Evidence from the Turkish Market

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Abstract

Rapid growth of renewable energy sources has fundamentally transformed global electricity market. In Turkey, wind and solar energy have become increasingly significant components of generation mix, reshaping supply–demand balance and influencing market-clearing prices. This study investigates short and medium-term effects of renewable energy penetration on day-ahead electricity prices and price volatility in Turkish market. Analysis utilizes hourly data from EPİAŞ, including day-ahead market prices, generation by fuel type, and system load, spanning the period from 2019 to 2024. Meteorological variables such as temperature, wind speed, and solar irradiance are incorporated from the ERA5 reanalysis database to account for weather-driven variation in renewable output. Combined dataset enables comprehensive evaluation of both market and environmental determinants of electricity pricing dynamics. Multi-stage empirical methodology is used, where descriptive and correlation analyses reveal general trends and patterns in renewable generation and prices, highlighting growing share of variable renewable energy and its preliminary association with reduced average prices. Econometric model using ordinary least squares with hour-of-day and day-of-week fixed effects quantifies marginal impact of renewable generation share on day-ahead prices while controlling for load and temperature. The core specification is expressed as:

$$Price_t = \beta_0 + \beta_1 VRE\_share_t + \beta_2 Load_t + \gamma_h + \delta_d + \varepsilon_t \quad (1)$$

where $Price_t, VRE\_share_t, \gamma_h \; and \; \delta_d$ denotes hourly day-ahead market price, share of renewables in total generation, and fixed effects capturing diurnal and weekly patterns, respectively.

To address potential endogeneity from simultaneous determination of prices and generation, instrumental variable (IV) estimation is performed using weather-driven forecast errors in wind and solar output as instruments. The dynamic relationships among prices, demand, and renewable generation are further explored through a vector autoregressive (VAR) model, allowing assessment of impulse responses following renewable generation shocks. Also, GARCH framework models the effect of renewable penetration on conditional price volatility. Preliminary results indicate that higher renewable energy shares lower average market prices (merit-order effect) but increase short-term price volatility due to system flexibility constraints. Findings highlight the need for adaptive market designs and support mechanisms to balance renewable integration with economic efficiency and reliability in Turkey's electricity market.

Keywords: *Renewable penetration; Day-ahead market; Price volatility; EPİAŞ; VAR; GARCH; Turkey*

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Can CORSIA Survive the 2026 EU Review? A SWOT Analysis of International Aviation's Climate Policy Clash

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Abstract

A significant dispute exists between the European Union (EU), which regulates aviation emissions through its Emissions Trading System (EU-ETS), and the International Civil Aviation Organization (ICAO), the United Nations body overseeing the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). In 2026, the EU will assess the effectiveness of CORSIA and decide the future of its aviation emission regulations. This paper contributes to the literature as the first study to evaluate whether CORSIA can withstand the upcoming EU review in 2026, employing a SWOT analysis to examine its prospects. The findings suggest that CORSIA will likely fail the review due to structural weaknesses, particularly its limited scope and inadequate integration of sustainable aviation fuels (SAF). This study suggests that a CORSIA reform in certain aspects may lead to the approval of the European Commission.

Keywords: *Aviation sector, GHG emissions, Regulation, CORSIA*

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Environmental Sustainability Performance Analysis of Higher Education Institutions in Turkey

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Abstract

Higher Education Institutions play a central role in shaping sustainable futures through education, research, and public engagement. Universities serve as role models for society, particularly in addressing social and environmental challenges. These reasons make HEIs a valuable asset for leading the transformation towards national sustainability.

This study offers an approach to assess the level of environmental sustainability in Turkey, with a yearly examination of institutions. Recognizing the absence of a standardized national ranking system, this research develops a tailored evaluation framework by applying an index creation approach. First assessing institutions based on given YOK metrics, then building a composite n to rank the level of environmental sustainability. Thus, using a national and reliable source of data increases the accuracy and allows for consistent evaluation across all types of higher education institutions.

Commonly accepted sustainable applications on a campus are defined as key performance indicators. To conduct the analysis, Principal Component Analysis (PCA) will be used to construct a composite environmental sustainability index. The study benefits from the "Green Campus" concept through the indicator definition phase. Results reveal performance gaps among institutions and highlight the feasibility of transitioning toward more sustainable campus models. Furthermore, the study introduces the environmental sustainability index as a benchmarking tool that can evaluate more institutions than the global sustainability ranking platforms such as UI GreenMetric, THE Impact Rankings, or QS Sustainability Rankings. In the post-analysis phase, the correlation between the proposed ranking results and globally recognized ranking systems will be examined to ensure the validity of the research.

In conclusion, this paper offers a framework that provides practical insights for policymakers, administrators, and sustainability practitioners by attempting to understand the level of environmental sustainability of higher education institutions in Turkey.

Keywords: *Environmental Sustainability, Higher Education Institutions, Green Campuses, Sustainability Ranking, Sustainability Index, Universities, Turkey.*

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Nord Stream's Past and Present in Line with the EU's Energy De-Russification Policy

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Abstract

This study explores the transformation of energy relations between the European Union (EU) and the Russian Federation from the early 2000s to 2023, focusing on the Nord Stream 1 and 2 natural gas pipelines. It examines the technical, economic, and political characteristics of the Nord Stream projects and analyzes their impact on the energy security and geopolitical dynamics of both sides. The research adopts the conceptual framework of energy security and pipeline politics, addressing not only supply continuity and price stability but also geopolitical dependence, infrastructure resilience, and environmental sustainability.

The findings reveal that EU–Russia energy cooperation, once shaped by mutual dependence, has undergone a profound rupture following the 2014 Crimea and 2022 Ukraine crises. The EU's REPowerEU strategy emerged as a turning point, marking a structural effort to eliminate dependence on Russian energy and accelerate the green transition. The 2022 Nord Stream explosions symbolized the collapse of this partnership, with significant political and economic repercussions.

Overall, the study concludes that the EU has diversified its energy sources, strengthened its security framework, and institutionalized renewable energy investments, while Russia has reoriented its export strategy toward the Asia–Pacific region.

Keywords: *Energy Security, Nord Stream, EU–Russia Relations, REPowerEU, Geopolitics*

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The Future of Nuclear Energy: From Fission's Limits to Fusion's Sustainable Promise

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Abstract

Global energy demand remains dependent on fossil fuels, raising concerns about sustainability and long-term energy security despite the rapid growth of renewable energy technologies. While nuclear energy is one of the most efficient methods for power generation, the current technology—nuclear fission—depends on radioactive elements that cause long-term nuclear waste as a result of the atom-splitting process. In contrast, nuclear fusion merges two light nuclei to create a heavier nucleus, releasing an immense amount of energy while causing minimal radioactive waste. Furthermore, fusion energy relies on sustainable resources contrary to fission. This contrast highlights the potential of fusion energy as a sustainable alternative to fission; however, every atomic process exhibits unique challenges. Fusion energy faces several limitations, including high construction and operational costs and technological complexity. Consequently, it remains in a pre-launch stage, despite significant achievements accomplished by ITER (International Thermonuclear Experimental Reactor) and NIF (National Ignition Facility). This research examines the sustainability of nuclear power by comparing fission and fusion, reviewing their limitations, potential, and also the economic aspects of fusion energy. The analysis emphasizes that, despite the obstacles, fusion energy offers a clean, sustainable and environmentally friendly alternative for the future.

Keywords: *Nuclear Energy, Sustainability, Development, Fission, Fusion, Energy Transition, Future of Power*

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Exploring the Transformation of the Electric Vehicle Business Ecosystem in Türkiye: Comparative Analysis of Electric Vehicle Adoption and Charging Infrastructure

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Abstract

This thesis examines the development and dynamics of Türkiye's electric vehicle business ecosystem (EVBE) from 2010 to 2023, comparing electric vehicle (EV) adoption and charging point development with other countries. Comprehensive data analysis, it highlights the growth of global EV stock and charging points alongside Türkiye's EV ecosystem. The research utilizes numerical trend analysis to categorize and compare Türkiye's EV stock and charging point development with other nations. Findings indicate a yearly increase in Türkiye's EV stock, with its share of the total vehicle stock rising, although progress remains limited compared to leading countries. There is significant year-on-year growth in charging point development, particularly in public fast-charging points, outperforming some other countries. Despite Türkiye's progress on the path to charging point development, a more aggressive development approach is necessary for EV stock to achieve its 2030 targets. Recommendations include expanding financial incentives, fostering public-private partnerships and continuing the development of charging infrastructure at the same pace. The results underscore the need for structured policies in Türkiye's EV ecosystem to position it as a leader in the global market and meet future expectations. This thesis contributes significantly to academic discussions on sustainable transportation by providing diversified metrics for understanding Türkiye's EVBE development in a comparative context.

Keywords: *EVBE (electric vehicle business ecosystem), electric vehicle stock, publicly available charging points, global electric vehicle development, energy transition, comparative analysis, Türkiye electric vehicle market, sustainable transportation, 2030 scenario analysis.*

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Understanding Green Hydrogen Futures in Türkiye with the Sociotechnical Imaginaries

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Abstract

Green hydrogen is increasingly seen as a key alternative for decarbonizing energy systems, particularly as it is considered a potential replacement for fossil fuels in hard-to-abate sectors such as heavy industry and transport. In recent years, many countries have developed comprehensive national strategies, roadmaps, and pilot projects to accelerate this transition and strengthen their positions in the emerging hydrogen economy. However, understanding green hydrogen transitions solely through technical and economic risks overlooking crucial societal, political, and cultural dimensions that shape how this technology is envisioned, governed, and ultimately implemented. Building on the concept of sociotechnical imaginaries, this study investigates the evolving landscape of green hydrogen transition in Türkiye. It explores the key drivers, institutional arrangements, and narratives that influence policy directions and public discourse, with particular attention to the dominant visions that guide national priorities. Furthermore, the research examines how these visions intersect with broader issues of energy justice, inclusivity, and sustainability, offering insights into the societal implications of green hydrogen as part of Türkiye's low-carbon future.

Keywords: *Green hydrogen, Socio-technical imaginaries, Türkiye's energy policy*

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Analyzing the Iran-Qatar Oil Strategies through Game Theory Perspective

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Abstract

The management of shared fossil fuel resources is a critical challenge for countries whose economies heavily depend on petroleum revenues. Iran and Qatar, which share the South Pars/North Dome gas field, face strategic conflicts over the extraction of their shared resources. By modeling these conflicts through game-theoretic frameworks, the research explores how strategic decision-making is influenced by both cooperative and non-cooperative behaviors. The findings suggest that while cooperation can maximize long-term benefits, achieving it requires effective policy interventions and mutual commitment to sustainable resource management.

Keywords: *Conflict, Game Theory, Prisoner's Dilemma, Strategy*

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NIMBY Politics and Hegemonic Competition Dynamics: A Comparative Study of the US and China

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Abstract

This research examines the role of NIMBY politics in shaping the competition for hegemony. Since there is a primary aim to make renewables the main energy source in the international agenda, and because the primary energy source has historically been associated with the hegemonic power of the time, many countries are making considerable investments in this area. While states make these investments, the social consequences of the situations are often ignored. This brings together crucial concepts such as NIMBY. The study examines how NIMBY movements emerge and vary under different government structures, so the US and China are selected as case studies. No matter how other countries' political structures, government attitudes against NIMBY cases, and mobilization processes may be, the conclusion is always tied to ecological imperialism and states' ambitions or interests for global leadership. Without public acceptance and the support of local communities, a complete green transition cannot truly happen.

Keywords: *Energy politics, Hegemony, Mobilization, NIMBY*

GENeSYS-MOD: An Open-Source Framework for Global and Regional Energy System Transformation

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Abstract

The Global Energy System Model (GENeSYS-MOD) is a linear, cost optimization, open-source framework for analyzing global, regional, and national energy systems. It is based on OSeMOSYS and provides an open and adaptable platform for evaluating decarbonization pathways in the transportation, heat, electricity, and hydrogen sectors. GENeSYS-MOD v3.0 has shown its strength in exploring low-carbon futures through national and regional (NUTS-1) scenarios that are in line with European decarbonization strategies in recent applications in Turkey. According to the results, regional differentiation increases the estimation of renewable resources, particularly solar and wind, and boosts the production and use of hydrogen. These results validate the effectiveness of GENeSYS-MOD as a decision-support tool for directing the development of policies and Turkey's transition to sustainable energy.

Keywords: *Energy Transition, Hydrogen, Energy Modelling, Turkey*

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The Triple Nexus: Technology, Policy, and Geopolitics in Advancing All-Solid-State Lithium-Ion Batteries Toward Sustainable Mobility

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Abstract

The global pursuit of sustainable transportation has positioned electric vehicles (EVs) at the center of decarbonization strategies, yet the success of this transition ultimately depends on the evolution of battery technology. Current lithium-ion batteries face persistent challenges related to safety, energy density, and the geopolitical fragility of their supply chains. All-solid-state lithium-ion batteries (ASSLIBs) have therefore emerged as the most promising candidate for next-generation energy storage, offering higher efficiency, thermal stability, and improved lifecycle performance. This study argues that the development and deployment of ASSLIBs are not determined by technological innovation alone but by a critical synergy among technology, policy, and geopolitics. While the United States and its allies hold a technological advantage through research leadership and manufacturing capabilities, China's dominance in rare-earth materials and processing capacity grants it strategic leverage over global supply chains. Meanwhile, emerging players such as Türkiye, South Korea, and other Asian economies are seeking to transform their mineral reserves and industrial capacities into positions of influence within this rapidly evolving field. By integrating insights from materials engineering and international policy analysis, this research highlights how advancements in solid-state battery architectures intersect with global power dynamics to shape the future of sustainable mobility. The study contends that achieving a truly emissions-free transportation sector requires not only overcoming technical barriers in energy storage but also navigating the geopolitical realignments that underpin access to resources, knowledge, and industrial sovereignty.

Keywords: *All-solid-state lithium-ion batteries, electric vehicles, geopolitics of energy, sustainable mobility, critical materials and rare earths.*