Haşim Özüdoğru, Muhammed Veysel Kaya and Ufuk Kaya (eds.)

Social & Economic Studies within the Framework of Emerging Global Developments - Volume 4

This book is the fourth volume of *Social and Economic Studies within the Framework of Emerging Global Developments*. It includes empirical and theoretical original chapters written by researchers from different countries and universities. The target audience of this book is researchers, students and academics who are interested in social and economic studies.

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Foreword

This book is the fourth in the series of "Social & Economic Studies within the Framework of Emerging Global Developments". The fourth volume includes empirical and theoretical original papers written by researchers from different countries and universities. The target audience of this book is researchers, students and academics interested in business, economics and social sciences.

Gunesch ("Art and Cultural Economics and Governmental Support for Creative Individuals and Industries from Economic, Political and Psychological Perspectives: For the Motion") combines historical, macroeconomic and sociopolitical perspectives in favor of government support and subsidies in cultural and creative industries. **Gunesch** ("**Rise of the Robots as Competitors in Human Healthcare, Compassion, and Emotion: An Interdisciplinary Literary Inquiry of Social, Cultural and Economic Implications**") contributes to the social awareness of implications of advanced artificial intelligence to all our lives in the area of healthcare. Challoumis's analysis is based on the money cycle, as well as the velocity of minimum escaped savings and the velocity of financial liquidity. **Oak** analyses the impact of the PAT scheme on the cement firms from cycles I to VI by estimating their energy efficiency scores using DEA models, for a sample period of 2010–2022. Results show that the firms that were not a part of the PAT cycles had higher efficiency scores in all years.

Misztal analyses the extent to which changes in the prices of imported goods are passed on to inflation in the European Union. The results of the conducted analysis indicate that changes in consumer prices in the EU were explained to the greatest extent by changes in the prices of imported consumer goods, and least by changes in the prices of imported capital goods. **Misztal and Kulakov** present the important and main factors determining the investment attractiveness of countries and to indicate various measures of this attractiveness on the examples. of Belarus and Poland. The research method is based on literature studies in the field of international economics, while statistical analysis and statistical inference were used in the work as well. The obtained research results show the main economic and non-economic determinants of the investment attractiveness of countries. **Savvopoulou** examines uncertainty and the belief process formation that leads to self-fulfilling sovereign debt crises to support forthcoming research. **Saseanu, Ghita and Gogonea** analyze the behavior of

European countries regarding the participation of Internet users in purchasing products and services through digital means, under the impact of social and economic factors. **Trifu** examines the importance and the impact of Generation Z on the operation of economic entities and on society in general. **Zhou, Chimucheka, Ayandibu, Masuku** review the literature on economic responses to the COVID-19 pandemic. They also compare responses from advanced economies with the South African case. **Enaifoghe** examines entrepreneurship and Small and Medium Enterprises in enhancing local economic development in South Africa. The study indicates that the promotion of LED is heavily dependent on small and medium-sized businesses. **Ahmadov, Gerstlberger and Bondegård** explore the motivators, enablers, and barriers to circular economy (CE) practices implementation in Swedish small and medium-sized enterprises (SMEs). Using a qualitative research approach, semi-structured interviews were conducted with managers and employees from twelve SMEs across different manufacturing companies.

Tanvir and Sarolta examine the impact of auctions on energy costs and their potential benefits to the local and national economy. The short study also examines the auction effect on the levelized cost of electricity (LCOE). Both qualitative and quantitative analyse-based research results suggest that a systematic auctioning scheme, coupled with socio-economic development instruments and a qualification requirement, can help emerging states with renewable energy resources to achieve various benefits in the society as well as the economy. **Siwek** aims to identify how pension adequacy is related to pensioners' subjective health assessment in Poland. **Knees** explores mutual expectations as to whether exchanges work or not, and what challenges professionals are confronted with in their everyday dealings with children. For this purpose, 20 future educators were interviewed at the end of their 3-year training. The interviewees all worked in different institutions, all of them in day care centers in rural areas in the western part of North Rhine-Westphalia near the Dutch border. The interviews were conducted in a qualitative design. **Peka** investigates the challenges in legal frameworks and the role that legislative measures play in promoting and protecting childern's rights from male abuse of children, and their rights, in any administration and public exercises of power. **Naletina, Stulec and Milkovic** analyse how companies that use maritime shipping services overcome the difficulties caused by the volatility of freight rates, as well as identify the most appropriate strategies for successfully overcoming disruptions in the market. **Luli** examines, through a brief general overview, the legal framework and the existing mechanisms and instruments applied in the pre-university educational environment (both elementary and secondary systems). **Yusof** and **Zolkaply**

investigate the learning outcomes and introduction of people to community relations, followed by discussions on relevant terms such as corporate and strategic philanthropy and community relations development in the USA and Malaysia.

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Tanvir Alam Shahi Md. and Somosi Sarolta

Increasing Renewable Energy Auctions for the Accessibility of Low-Cost Clean Energy and Its Local Socio-Economic Impacts

1. Introduction

The access to energy is no longer a binary marvel – it is the quality energy access high up on the energy ladder (Csereklyei et al., 2017; Burke, 2013) and not the mere quantity that is related to the economic development. In many places, renewable energy (RE) technologies have proven valuable and sometimes vital. They play a significant role in sustaining current social change and economic growth and have recently been instrumental in pushing the energy access boundaries around the world. The global scenario is changing rapidly, increasing with the share of RE in the energy mix. According to the IEA monthly electricity statistics report from the end of 2020, global RE production was 3,269.1 terawatt-hours (TWh) in 2020, 7.5 % higher than in 2019. The share of renewable electricity in the mix was 31.6 % in 2020, up from 28.6 % in 2019. Wind and solar production were mainly responsible for the increase in renewables, up by 95.8 TWh or 11.6 % and 73.0 TWh or 20.2 % respectively in 2020 compared to 2019.

The growing emphasis on environmental issues increases public and private awareness and growing support of the topic. There is increasing pressure on the industry to meet such needs. Fossil fuel (FF)-based power generation could also lose its earlier role in the energy mix due to price reductions in constantly increasing power generation from RE. This can be partially explained by the theory of learning curves. Although FF-based power generation may gain price benefits from higher efficiency or smart technologies, the RE market is moving at a much faster pace. Wright (1936) provided a framework for forecasting cost declines due to cumulative production. Moore (1965) referring to the transistor market development – predicted it would double every two years because of time. Others later explained the cost reductions by economies of scale (Goddard, 1982) or combined the abovementioned factors with each other (Swanson, 2011[1];

1 Swanson (2011) also formulated a "law" especially for the clean energy market. He projected a 20 % drop in the price of solar PV modules for every doubling of cumulated shipped volume.

Sinclair et al., 2000). Clean technology cost reductions arise from fundamental physics and lower input material costs from scale as well as lower labor costs through manufacturing automation and lower waste driven by higher efficiency. All these cost reductions appear naturally due to manufacturing scale and vertical integration rather than performance improvements. Thus, the advances in clean technology are a function of experience and production, closely related to "learning by doing."

Besides the learning curve-indicated technological progress, the new channels of support for RE generation have also contributed to the drastic fall in RE prices, thus improving the accessibility of low cost clean energy for wider consumer groups in the society. However, finance and sustainability are the most important design criteria for investing in RE. Studies show that significant results can arise from all support channels (Izgec et al., 2017), especially if designed carefully (del Río et al., 2021), while others also emphasise that support schemes may differ in their effect, depending on their design (Lilliestam et al., 2021). The features of cost-effectiveness, enabling real price discovery regarding the project and resulting in a lower support level mean that many countries worldwide are shifting from feed-in tariffs to a competitive auction process (Kreiss et al., 2017). Because, auctions provide an effective means of distribution for governments and a market-based approach that addresses several objectives such as promoting renewable energy, reducing tariffs, attracting foreign investment, improving reliability, regulating CO2 emissions, and supporting economic development (Hochberg & Poudineh, 2018).

For local industrial development, RE auction scheme may be seen as an opportunity and for this policy makers need to focus on the localization of production activities (Hansen et al., 2020; Bayer et al., 2018; Hochsteller & Kostka, 2015). For the Argentinian RE projects that source more than 60 % of the equipment and electro-mechanic components locally were eligible to receive tax credits equal to 20 % of the amount of equipment purchased locally (Menzis et al., 2019). Hansen et al. (2020) treated local content requirement (LCR)[2] as a focal tool in RE auction schemes motivating local industrial development by specifying the use of locally produced content. Mentioning the Brazilian case, they mention that if the domestic steel industry is well-developed that can contribute a congenial atmosphere as a steel supplier for producing steel turbine

2 LCR defines as the percentage of the total project cost secured locally through both equipment and services along with locally produced components, civil engineering work and consultancy fee (IRENA 2013; Hansen et al. 2020).

tower. del Rio (2017) mentions that for making LCR effective, it might be needed a minimum level of domestic manufacturing capability and the auctioneer should overview the local technological market. For manufacturing equipment of RE technologies on the relevant future market size, capacity-based volume auction is highly preferable and it can encourage innovation and supply chain improvement (del Rio, 2017; del Rio et al., 2016).

Not the end here, projects awarded in Morocco have been reporting the benefits achieved due to inclusion of socio-economic development goals as qualification requirement. Morocco's "Noor-Ouarzazate" RE project consisted of four phases. Phase-I indeed sourced 30–35 % of the project cost in local components and services. Throughout the four phases, 70 % i.e., 6,430 Moroccans were employed and a third of the jobs were sourced locally from the region of Ouarzazate. Yet again, Renewable Energy Independent Power Producer Procurement Program (REIPPPP) in South Africa consisted of seven rounds that attracted 14.64 billion USD by March 2019. When it comes to local content, 3.27 billion USD were spent locally out of total spending of 90.3 billion USD. In terms of job creation, the REIPPPP has created a total of 40,134 job-years for South African citizens. The procurement was surpassed with local equity shareholding across all around reaching 52 %. The REIPPPP contributes to Broad Based Black Economic Empowerment (BBBEE) and the creation of Black industrialists and Black South Africans means own on average 33 % of the projects (IRENA, 2019). Further, LCR has a contributory role in NIMBY syndrome/Nimbyism. Nimby, is a characterization of opposition by residents to proposed developments in their local area, as well as support for strict land use regulations. It carries the connotation that such residents are only opposing the development because it is close to them and that they would tolerate or support it if it were built farther away. The residents are often called Nimbys, and their viewpoint is called Nimbyism. In this connection, del Rio (2019) aurged for the local community support. Botta (2019) argues that for reducing/abolishing the NIMBY[3] syndrome, there is an obligation to offer a fixed percentage of project shares to local residents. This step not only mitigates the risk but also ensures financial gains to promote RE and expands support. Drawing a suggestion, AURES II (2021) states an obligation to provide a strategic plan with estimation on the impact of the installation on the local employment and industrial value chain. This LCR feature in the auction designing has a positive impact of the

3 https://www.rechargenews.com/transition/the-six-paradoxes-slowing-down-the-energy-transition/2-1-732488

society. The impacts of the learning curve and the various support channels work together and strengthen each other, enabling lower prices electricity to be the prime motivation for the further espousal of auction schemes globally for gaining wider positive socio-economic returns.

2. Methodology

It has been piloted systematic literature review focusing three aims: first, to find out the potentiality of auction; second, to identify the design features of the auction and third, to find out the gains of the auction following some country-specific empirical evidences. For examining how auction is used in relation to cost-effective renewable energy deployment, it has been steered the systematic literature review that comprised a reproducible search and applied explicit criteria for the inclusion and exclusion of studies (Sovacool et al., 2018). Based on the view of the Petticrew and Roberts (2006), a semi-structured approach was conducted.

Along with that the authors intended to investigate the levelized cost of energy (LCOE) from solar and wind sources for a country where competitive auction is not being implemented yet. The LCOE is being used to analyse global price trends that quantifies the average cost of producing a unit of electricity in a given power plant and represents the average minimum price at which electricity needs to be sold to break even (Reichelstein & Sahoo, 2015) as the lower production cost ensures lower supply cost for the end-users. In this situation, the authors selected two solar and one on-shore wind power plants of Bangladesh those are recently implemented/implementation stage under utility-scale (IPP model) as a study area. After that there followed per unit cost comparison with some countries where auction process are practicing. Due to the unavailability of data for Bangladesh in the international reliable sources, the base data has been collected from the companies through the authors' personal communication[4]. Data for other countries were collected from the International Energy Agency (IEA-NEA, 2020) database. It is needed to mention that the power projects in Bangladesh (both conventional and renewable energy) are still awarded on an unsolicited basis, such as through Power Purchase Agreements (PPAs) or Requests for Quotations (RFQs), and tariffs are determined through direct negotiation between the Bangladesh Power Development Board (BPDB) and Independent Power Producers (IPPs).

4 Md. Bellal Hossain, email to author, 30 December 2020.

To calculate the LCOE, the initial investment, i.e. the total average cost of building and operating the power plant over its entire life is divided by the total electricity production of the plant over its entire life (see Equation 1).

$$(1)\ \text{LCOE} = \frac{\text{Initial Investment} + \sum_{t=1}^{n} \frac{\text{O \& M Expenditure}_t}{(1+\text{CoC})^t}}{\sum_{t=1}^{n} \frac{\text{Electricity Generated}_t}{(1+\text{CoC})^t}}$$

Here, Initial Investment = the initial cost or capital cost/mega-watt (MW) (CAPEX) at t = 0

O & M Expenditure$_t$ = inflation adjusted operation & maintenance cost/MW and each year (OPEX)

Electricity Generated$_t$ = electricity generated in mega-watt-hours (MWh) per MW each year corresponding to the annual full-load hour (FLH)

n = the life time of the plant

t = year

CoC = the discount rate privately

3. Implications

Compared to some countries, the LCOE found higher in Bangladesh and the country has not been implemented auction scheme yet. Thus, the capital costs are higher here; for example, the total capital cost to establish a 7.4 MW solar PV is 44.45 USD/MWh, whereas a total capital cost of 31.91 USD/MWh was required in India to establish a 35 MW plant (Table 1). Another notable segment is discount rate, with a discount rate of 12 % each for the two solar and one on-shore wind plants for Bangladesh, which is higher than the current global trend. Discount rate (CoC) influences the LCOE significantly, because if the rate is high, then the LCOE will be enhanced and vice versa. For instance, if the CoC were 6 %, then the LCOE for India's 35 MW solar PV would be 32.92 USD/MWh, i.e. just a reduction of 3.68 USD/MWh for a 1 % reduction of CoC (IEA-NEA, 2020). The same scenarios (for both total capital and CoC) are depicted in the on-shore wind energy case (Table 2).

Table 1. LCOE for utility-scale solar PV

Country	Plant size (MW)	Construction costs (USD/MWh)	Refurbishment costs (USD/MWh)	Decommissioning costs (USD/MWh)	Total capital costs (USD/MWh)	Discount rate	LCOE (USD/MWh)
France	25	30.17	0	0.25	**30.42**	0.07	**33.94**
India	35	31.65	0	0.26	**31.91**	0.07	**35.60**
USA	100	38.55	0	0.32	**38.87**	0.07	**44.25**
Brazil	25	39.17	0	0.33	**39.5**	0.07	**46.02**
Canada	20	55.39	0	0.46	**55.85**	0.07	**62.47**
Bangladesh*	7.4	42.33	0	2.12	**44.45**	0.12	**45.41**
	50 (IPP model)	59.61	0	5.96	**65.57**	0.12	**70.62**

Source: IEA-NEA (2020).

* Base data for Bangladesh were collected through authors' personal communication.

Table 2. LCOE for utility-scale on-shore wind

Country	Plant Size (MW)	Construction costs (USD/MWh)	Refurbishment costs (USD/MWh)	Decommissioning costs (USD/MWh)	Total capital costs (USD/MWh)	Discount rate	LCOE (USD/MWh)
Brazil	30	27.38	0	0.23	**27.61**	0.07	**33.59**
India	65	31.92	0	0.27	**32.19**	0.07	**35.91**
Netherlands	50	25.42	0.3	0.21	**25.93**	0.07	**41.16**
Finland	30	37.62	0	0.31	**37.93**	0.07	**44.87**
Italy	10	37.65	0	0.31	**37.96**	0.07	**52.87**
	20	49.17	0	0.41	**49.58**	0.07	**59.52**
France	50	38.04	0	0.32	**38.36**	0.07	**56.09**
Bangladesh*	55 (IPP Model)	45.92	0	0	**45.92**	0.12	**54.19**

Source: IEA-NEA (2020).

* Base data for Bangladesh were collected through authors' personal communication.

But from 2010 to 2019, the global average contracted price for solar energy dropped by 78 % (IRENA, 2019). Similarly, the wind price also fell; however, compared to solar, the reduction rate did not reach the same level and the weighted average price of wind dropped only by 33 %. In 2020, the total per

kilowatt (kW) installed cost was 883 USD for solar photovoltaic, 3185 USD for off-shore wind and 1355 USD for on-shore wind.[5] The reduction in technology costs in this time resulted in global RE experts and decision makers firmly accepting the auction scheme as a medium to shape the market price of renewables in their precise framework and circumvent inventors' windfall earnings. Not only the technologically induced price reductions of RE sources but also the support system affects the final set of average prices. There is evidence for the impact of fiscal incentives for RE investments on the 16–33 % decrease of LCOE even in a developing country like Colombia (Castillo-Ramírez et al., 2017). The following figure (Figure 1) illustrates the trends of average total installed costs (USD/kW) and the levelized costs of energy (LCOE, in 2019 USD/kWh) witnessed in the last decade from 2010 to 2019.

The IEA (2019) stated that the use of competitive auctions has accelerated cost reductions for some renewable technologies, notably solar PV, on-shore wind and off-shore wind. However, these prices cannot be followed consistently, as each country and technology have different resource potentials, financing conditions and a different set of auction designs. IEA data show that from 2017 to 2020, the average auction prices for solar PV and wind were both higher for Europe than in other regions/countries worldwide. Figure 2 shows that the prices at solar and wind auctions have decreased significantly in the last decade.

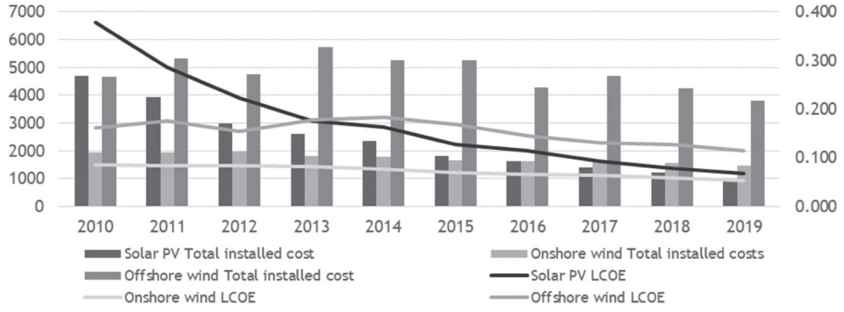

Figure 1. Global weighted average of total installed cost (in 2019 USD/kW) and LCOE (in 2019 USD/kWh) of selected RE (2010–2019).

Source: Authors' construction based on IRENA official data[6].

5 https://www.irena.org/Data/View-data-by-topic/Costs/Global-Trends

6 https://www.irena.org/Statistics/View-Data-by-Topic/Costs/Global-LCOE-and-Auction-values

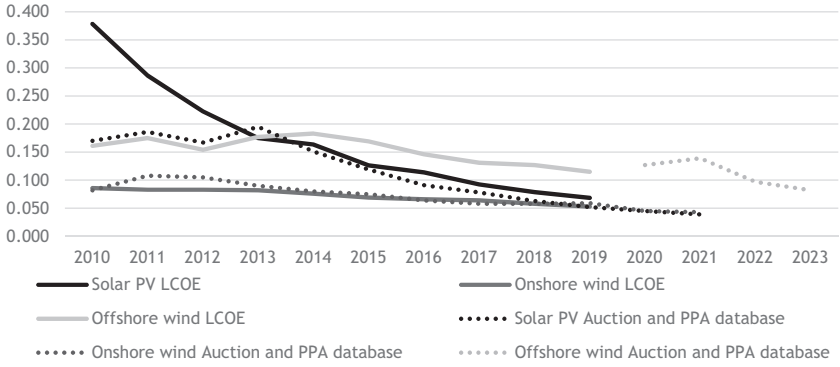

Figure 2. Global weighted average of LCOE and PPA/auction prices (in 2019 USD/kWh).

Source: Authors' construction based on IRENA official data[7].

The auction and PPA database indicates the cost of electricity from solar photovoltaic decline to USD 0.039/kWh in 2021, 43 % lower than the global weighted-average cost in 2019 whereas on-shore wind decline to USD 0.043/kWh in 2021, 19 % lower than the global weighted-average LCOE in 2019 and off-shore wind decline to USD 0.082/kWh in 2023, 29 % lower than the global weighted-average LCOE in 2019.[8] Further, there was a notable price decrease for on-shore wind in Brazil from 28.96 USD/MWh in December 2017 to 18.58 USD/MWh in April 2018. For solar PV, 17 GW capacity was solely owed by India at an average price of 42.3 USD/MWh and the Philippines received bids for a 50 MW capacity at a low cost of 43.9 USD/MWh (IRENA, 2019).

It should be acknowledged that comparisons between LCOEs and auction prices remain an important challenge. However, limited information is available on contract-winning projects, which makes it difficult to state whether these tender-determined prices will become benchmarks for future costs of RE generation. This can be a future study as well. Again, way forward for reducing CoC is another room for the policymakers for the next advance study.

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7 LCOEs usually reflect higher values. According to the IEA, among others, the three main reasons are: auction prices may not always represent full costs, aggressive bidding of certain players and current auction prices only reflect a small portion of the market.

8 https://www.irena.org/Data/View-data-by-topic/Costs/Global-Trends

The deployment of high volume renewable energy is being driven by a combination of factors, including the socio-economic benefits of RE, the decreasing costs of RE technologies, concerns about pollution and climate change, goals for accelerating RE deployment, advances in RE technology, the actions of corporations and investors to reduce their carbon footprint, and public support for RE (IRENA – GCGET, 2019). These trends are leading to an increased integration of clean energy into the economy, as demonstrated by its contribution to a country's GDP.

4. Conclusions and Policy Recommendations

Many countries have failed to adequately prepare for the adoption of alternative energy sources. Consequently, when the topic of "alternative energy sources" is raised, poorer and developing nations often present unjustifiable excuses for not implementing them. The concept of an immediate or temporary solution is not applicable to the energy sector. To achieve desired goals and attain societal and economic benefits, it is crucial for countries to incorporate low-cost, sustainable, and renewable energy sources into their long-term development plans. Developed nations have adopted such long-term energy planning strategies. However, many poorer and developing countries, such as Bangladesh, suffer from incorrect and inconsistent energy policies, coupled with mismanagement in this sector.

To ensure the progress of any sector, including renewable energy, it is crucial to have a clearly defined vision and well-structured strategies. Meeting renewable energy targets requires a detailed plan, budget, timeline, and a careful balance between application and productivity. By implementing these requirements and customizing technology-neutral, location-specific volume auctions, along with tools for socio-economic development and qualification criteria, it becomes feasible to generate various advantages for societies and economies with untapped renewable energy potential that have yet to adopt auction schemes.

Kunze and Becker (2015) and Hall and Klitgaard (2012) introduced the concept of energy technological politics. They argue that the use of centralized energy sources like fossil fuels leads to the concentration of economic and political power. This theory serves as the basis for the energy democracy movement, which advocates for the adoption of renewable energy sources to promote decentralized power and politics. The movement contends that renewable energy sources, being more widely dispersed, contribute to decentralization and enhance democracy, in contrast to centralized energy sources that weaken democratic systems. The relationship between energy and politics is often described as a

balance between centralization and decentralization. Fossil fuels, as centralized sources, result in concentrated political power and weakened democracy, while decentralized sources such as solar and wind energy foster distributed political power and stronger democracy. These theoretical connections underscore the importance of energy choices in shaping political systems. Therefore, a successful transition to clean energy necessitates political support at the systemic level as well as backing from local communities. This not only leads to economically sustainable outcomes but also drives the future development of renewable energy. Consequently, decisions made at the central level play a critical role, and sustainable energy policies, including short, medium, and long-term strategies, should guide these decisions. In other words, well-defined legal regulations are crucial for the production of clean energy.

To attract more investors to renewable energy generation, policymakers are reducing subsidies for fossil fuels. During this transition, it is important to encourage consumers to adopt energy-efficient practices and conserve energy. According to Szabo (2022), natural gas can serve as a transitional fuel because of its relatively cleaner characteristics compared to coal, liquefied natural gas (LNG), and high-speed furnace oil (HFO). Additionally, it is crucial to diversify energy sources as a means of ensuring energy security and promoting a sustainable future. Countries must prioritize their energy security and avoid relying solely on one source to meet their growing demand, thus necessitating the diversification of energy sources.

An inclusive approach to the future of the energy sector necessitates the involvement of leaders from prominent nations in developing a framework that is in line with the evolving energy landscape. Organizations such as the International Energy Agency (IEA), Organization of Petroleum Exporting Countries (OPEC) and commodity exchanges have played a significant role in shaping the hydrocarbon industry. However, the shift towards renewable energy calls for the establishment of new institutions, political agreements, and frameworks that take into account the perspectives of diverse stakeholders from both the public and private sectors. Neglecting this aspect could potentially result in geopolitical conflicts, with some parties emerging as winners while others as losers.

Lastly, the utilization of auctions to support renewable energy is justified by two primary reasons. Firstly, they facilitate the allocation of support based on competitive determination, accurately reflecting the actual costs of the chosen projects. Secondly, they promote a fair and competitive method of managing the deployment volume of renewable energy, steering clear of preferential treatment based on timing and effectively controlling support budgets. These

arguments can be persuasive to policymakers grappling with increasing support obligations that can burden consumers and taxpayers. Nevertheless, substantial empirical evidence indicates that the advantages of auction schemes surpass these arguments across various aspects.

Ethics Statements

The authors collected date from the published sources and taking consent from the concern companies where there are no violations of ethics. In this work, there was no involvement of human/animal subjects.

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Declaration of Interests

☐ The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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