Cooperation Between Indonesia Battery Cooperation (IBC) and Hyundai on the EV Battery Project in Indonesia as A Form of Renewable Energy Solution in Response to Climate Change

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Abstract

Energy frequently relates to bring up in relation to the Net Zero Emissions 2060 target. Finding a way to achieve zero carbon emissions with an energy sustainability solution in line with the seventeen Sustainable Development Goals (SDGs) is the goal. Indonesia and other nations follow the Energy Trilemma, which emphasized three primary factors—energy security, energy affordability, and sustainable energy—to become factors that are taken into account for planning and history in order to address all social, economic, and environmental aspects. More precisely, taking into consideration the capacities of both countries, South Korea and Indonesia have proposed several strategic alternatives, one of which is the EV battery project development strategy. In addition to resources and other forms of strategic support, South Korea invests in, owns, and controls technology for Indonesia. Indonesia is able to meet 52% of the world's nickel demand. This study examines how the Hyundai consortia and the Indonesian Battery Corporation consortia worked together to build an EV battery project in Indonesia, which had an impact on both nations to achieve the solution of how to be one of the renewable energy solutions in response to climate change.

Keywords: *EV Battery; Trilemma Energy; Global Value Chain; Hyundai; IBC.*

Abstrak

Istilah energi saat ini sering kali dikaitkan dengan adanya gagasan Net Zero Emission 2060. Tantangan selanjutnya adalah bagaimana solusi keberlangsungan energi ini bisa mencapai nol karbon berlandaskan tujuh belas Tujuan Pembangunan Berkelanjutan atau SDGs. Dalam penguatan energi berkelanjutan, negara-negara di dunia termasuk Indonesia telah melakukan penerapan yang berlandaskan Trilema Energi, dimana tiga aspek utama menjadi suatu aspek yang menjadi pertimbangan sejarah dan perencanaan hasil berupa keamanan energi, keterjangkauan energi, dan energi yang berkelanjutan sehingga mampu mencakup semua aspek sosial, ekonomi, hingga lingkungan. Lebih spesifik, strategi pembangunan proyek EV battery menjadi salah satu solusi strategis yang dibangun oleh Korea Selatan dan Indonesia melihat kemampuan masing - masing negara. Korea Selatan berkontribusi dalam investasi dan kepemilikan dan penguasaan teknologi, serta sumber daya dan dukungan strategis lainnya yang akan menjadi suplai. Indonesia sendiri memiliki potensi sebanyak lebih dari 30% kebutuhan dunia untuk nikel, cobalt, dan lainnya sebagai material. Penelitian ini akan mengelaborasikan bagaimana proses global value chain terbentuk antara perusahaan konsorsium Indonesia Battery Corporation dan Konsorsium Hyundai untuk membangun proyek EV battery di Indonesia sebagai bentuk tanggung jawab energi baru terbarukan dalam merespons perubahan iklim.

Kata Kunci: *EV Battery; Trilema Energi; Global Value Chain; Hyundai; IBC.*

Introduction

Electric vehicles became popular in the 21st century in the era of sustainable development, especially in non-renewable energy alternatives. The main product that exists in its development is the battery. The battery cost requirement in the total EV itself is 35% with the total weight of the battery being 12-25% of the weight of its own EV (IBC t.t). Besides, Indonesia is also a global lithium-ion supplier, ranked number 22 out of 30 countries according to Bloomberg NEF research in 2022 and as the world's largest nickel producer. Which this potential supports a lot of EV material that is already available in Indonesia. One of Indonesia's massive steps in its efforts to develop EV battery strategy was the signing of a memorandum of understanding between the Government of Indonesia and South Korea in forming a joint venture in the EV batteries industry project of PT HKLM Battery Indonesia (now renamed PT HLI Green Power Indonesia) in Karawang. The signing was conducted at LG Energy Solution headquarters, Seoul, South Korea, signed by the Indonesian Minister of Investment, Bahlil Lahadalia, CEO of Hyundai Mobis, Sung Hwan Cho and Jong Hyun Kim, president of LG Energy Solutions on July 28, 2021 (ASEAN Briefing 2021).

The partnership between Indonesia Battery Corporation and Hyundai-LG has reached an investment value of $1.2 billion. The consortium is divided into two parties: IBC from Indonesia, which consists of PLN, Pertamina, MIND ID, and Antam. While the Consortium from South Korea comprises Hyundai Motor Company, KIA Corporation, Hyundai Mobis, and LG Energy Solution. One of the projects that is proof of the industrialization of the sector in Indonesia provides an opportunity for the entry of investors - world investors to Indonesia especially in EV batteries. It is projected for the project to have a production capacity of up to 10 gigawatt hours (GwH) to supply production of Hyundai electric vehicles. It supports Indonesia's ambition to increase battery production to produce 140 GWh battery capacity by 2030. Another advantage in the implementation of this project for Indonesia is the plan to absorb the workforce to reach 1000 people (Perpres No 55 Tahun 2019).

Indonesia has formed a reinforcement in the follow-up to the energy transition in the Law No.30 of 2009 on Energy on how awareness has been gained over the limits of the reserves of non-renewable energy sources. Furthermore, there is also Government Regulation No.79 of 2014 which includes the National Energy Policy on the mandate of renewable energies priority at a minimum of 23% in 2023 and 31% by 2050. Directly related to electricity, the government in 2022 has formed the Command of

Accelerating the Development of Renewable Energy for the Supply of Electricity as written in Presidential Decree No. 112 Year 2022. Another Indonesian strategic step in protecting the development of its own EV battery strategy has been based on legislation, namely Perpres No. 55 Year 2019 On Acceleration of the Battery-Based Electric Vehicle Programme for Road Transport, Presidential Instruction No. 7 Year 2022 on the Use of Electric Motor Vehicles Based on Batteries(INPRES 2022). As well as Permenperin No. 6 Year 2022 which regulates specifications, development road maps, and provisions for the calculation of component level values for domestic and battery-based electric motor vehicles (Nada and Ferdian 2022). Electricity is the task, how to produce electricity to meet the needs of the Indonesian population, which is massive, but still cares about the environment and focuses on the transition to renewable energy that is used and implemented directly (Abdy et al 2023).

Indonesia has great potential in competition for the development of EV batteries along with the strengthening of the policies and challenges that exist with the formation of IBC cooperation with South Korean companies, Hyundai and LG in its acceleration. What's more, the real challenge is in the recovery process, seeing the cooperation of this battery project, at least investments from advanced countries like South Korea have been obtained. Referring to the research that has been carried out, this research will focus on how the process of implementation of the global value chain of the EV battery project in Indonesia which has a complex process and a great aim in its existence and fulfillment in accordance with the concept of GVC and the energy trilemma as one of form renewable energy strategy as response to climate change in the process of cooperation between Hyundai and IBC.

Methods

Authors use qualitative descriptive methods. This method is able to explain and describe all the elements of both individuals, groups, and others associated with the explanation. It is based also on the opinion of Lexy J. Moleong 2007 that this research is to have a procedure to produce descriptive data either written or oral word of what has been observed. In the context of this writing, this method is considered appropriate to explain how situations, conditions, and implications occur in the process of the GVC EV Battery IBC and Hyundai collaboration project to analyze its readiness, progress, obstacles and challenges (Umar 2016). The data collected in this study uses two methods of data collection according to Sugiyono 2018 namely primary and secondary data. Primary data itself is data obtained directly by its source, both literary in online sources, books, journals, and articles. It refers to the fact that this research gathers

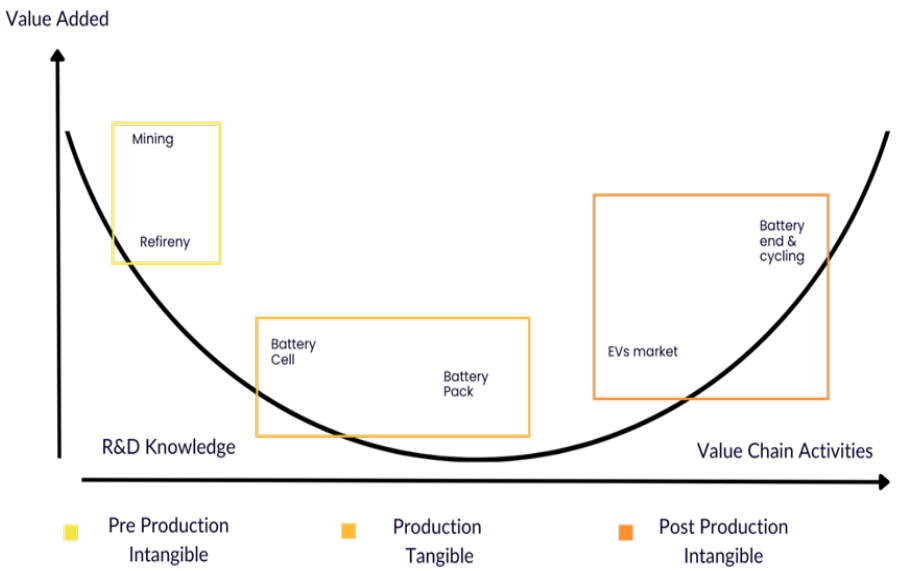
facts and data obtained from library studies that come from newspapers, books, journals, scientific articles, laws, as well as official websites of governments, companies-related companies, NGOs, and others that are related to answering the discussion to what extent and how this GVC process constitutes an implementation of energy policy recommendation developed through the theory of GVC and Trilema Energy.

Conceptual Framework

Global Value Chain

Gerry Gerrefi's 2005 opinion reveals that the global value chain is a study that seeks to explore the interaction that is embedded in the form of the mechanisms of distribution of value and companies functioning as producers and consumers that occur in international trade. Mechanisms are a series of processes from design, production, marketing processes, to distribution to the end consumer. Global Value Chain itself has a primary purpose in adding value or value added, this is called upgrading, increasing the value or the value of things to a higher level.

Chart 1. Smile Curve Illustration on GVC EVs Batteries



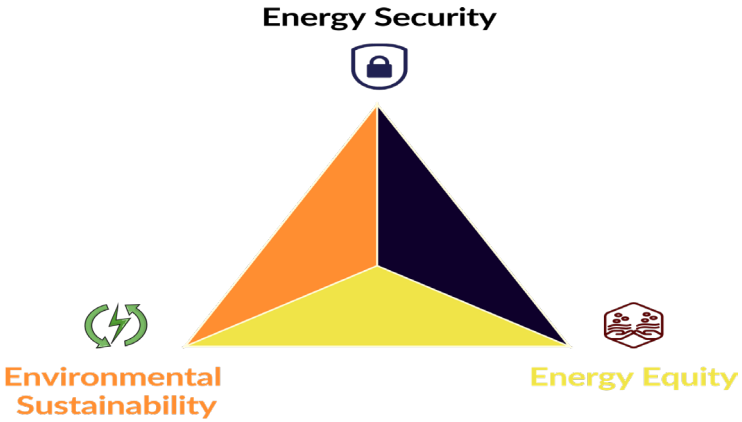
Source: Author's Illustration

On the above, influence based on research by Mudambi and Shin 2008 formed a framework of thought named the smile curve. The primary function of smile curves is to form and determine case studies of individuals in this case with stage identification, calculation, and evaluation level of data that is explicit as consideration in the network or network that will be used in the process of GVCs. This curve in its concept gives some attention, the first is the relationship formed between the developing and advanced countries in the process of production and distribution of value-added in GVCs. With this curve can be seen how the consideration process of either the alignment process and the formation of horizontal straight curves in the GVCs, or maybe the developers have done low end in the Process of GVSs. Indirectly, this gives the final result of policy recommendations or even policy making that supports future economic strategies. Besides, one of the key points in the global value chain process is location. In 1985, in his book entitled Competitive Advantage: Creating and Sustaining Superior Performance, Michael Porter 1985 revealed that there are five main activities: inbound logistics, operations, outbound Logistics, marketing and sales, and post-sale services. Where the main point in any activity in achieving competitive aspects, economic development, market, and sales costs as the goal of this GVC is the effectiveness of the location on each GVC process occurs (Mudambi, R. 2008).

Trilemma Energy

The World Energy Council's Energy Trilemma shapes three crucial things about how a country's energy can be achieved and planned. Harmonizing energy security, energy affordability, and what is not less important is the sustainability of the natural environment itself. The first aspect is energy security, which reflects the supply capacity of each country for current and future demand that is not in danger of shortages in the event of future disruptions. The second aspect is the affordability of energy that ensures that energy is universally accessible with affordability both quantity and price. The third aspect is the sustainability of energy which is the responsibility of the state for the forms of mitigation and potential environmental damage and natural sustainability that does not support the destruction of nature (WTO n.d; ILO 2017).

Picture 1. Trilemma Energy



Source: Author's Illustration

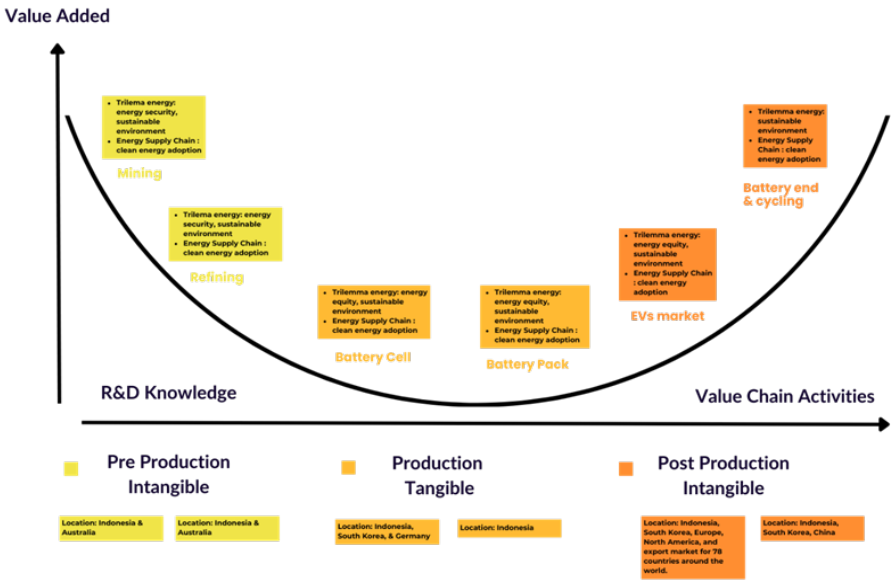
This idea emerges in parallel with the energy crisis and the weakening of environmental resilience and its related outputs, as well as the increasing demand for economic accessibility to sustain energy itself. Naturally, in addressing the three crucial aspects of the energy trilemma, each country or region has different focal points. Therefore, it is necessary to strategically strengthen the energy trilemma to foster development and enhance energy systems through policies, pricing strategies, and partnerships. These efforts aim to accelerate the achievement of clean and equitable energy resilience, both for the present and for future generations. The first aspect, energy security, reflects each country's capacity to meet current and future energy demands without risking shortages in the event of potential disruptions. The second aspect, energy affordability, ensures universal access to energy at a reasonable quantity and cost. The third aspect, energy sustainability, emphasizes the responsibility of nations to mitigate environmental damage and promote ecological preservation, ensuring that energy development does not contribute to environmental degradation (World Energy Council 2022). The researchers will use the energy trilemma basically as an analysis of energy hygiene and harmonization, security, along with the economic value it has (WTO n.d; ILO 2017). After that, the researchers are going to incorporate the three main aspects of the energy trilemma in the GVC phase where energy trilemma is involved. Finally, researchers with this framework from the OECD will be used to draw a straight line of continuity of the two theories in the case of the PT HLI Green Power EV Battery project.

Results and Discussion

Global Value Chain Strategy on the Development of EV Battery Industry by Hyundai and IBC in Indonesia

The analysis of how the Global Value Chain process is carried out is the use of the smile curve GVC in the below:

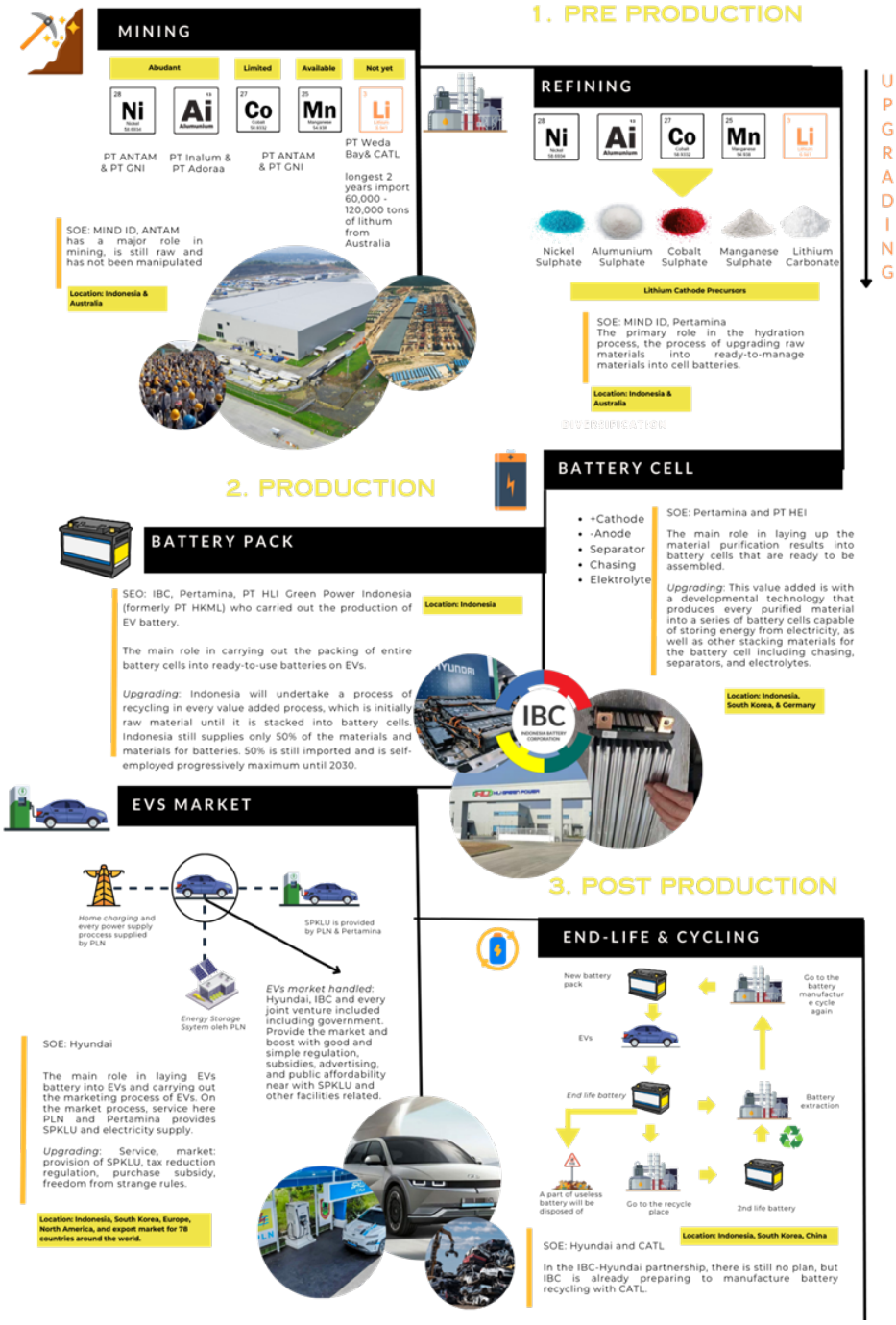
Chart 2. Smile Curve Illustration on GVC EVs Batteries Process on HLI Green Power Industry



Source: Author's Illustration

The supply chain process of an electric vehicle in this paper is more specific to the battery. Regardless, the battery has a value of up to 30-40% of the electric vehicle itself. A large percentage of it has to go through a long process so that it doesn't stop at waste. There are five stages on the chain of the EV battery rod as follows and explained in the picture below (Artha et al. 2023; International Energy Council 2022).

Picture 2. GVC Process of EV's Batteries Process on HLI Green Power Industry



Source: Author's Illustration

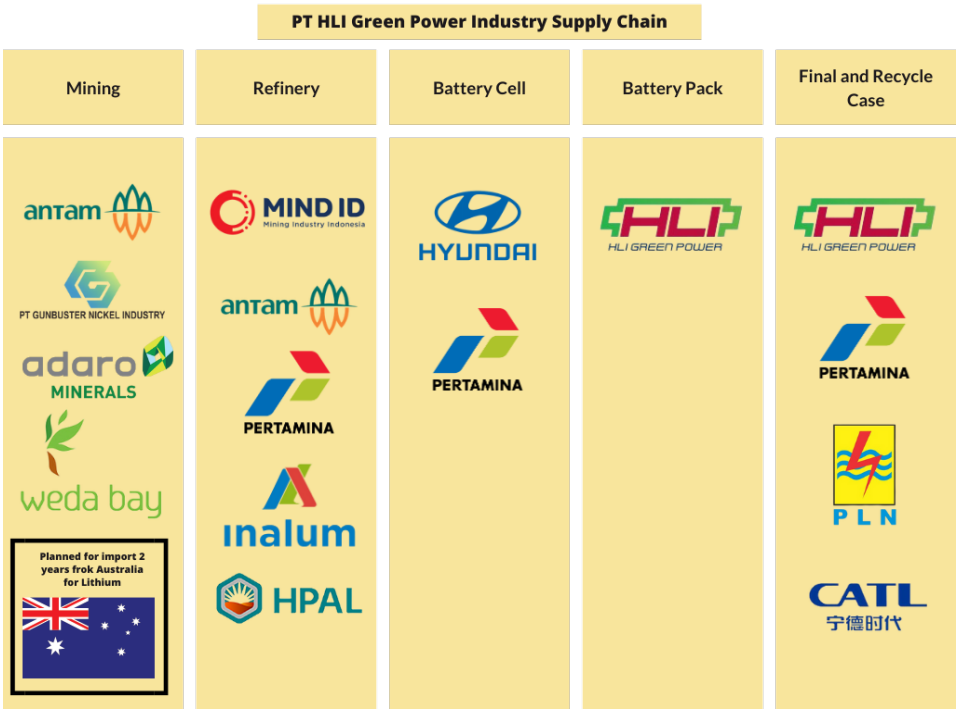
Firstly, mining, this process is the extraction of battery raw materials namely aluminum, manganese, cobalt, lithium, and others. At this stage, the extraction of nickel ore and other raw materials that produce this industrial ready material is an added value and an upgrading that has been done by Indonesia. Counted to have built 34 smelters and 17 under construction with a total investment of up to $11 billion. Seeing from how the progress of the project at this stage of flooding is at 4/5 counts of still lacking yields from aluminum mining. The locations involved in this are Indonesia for nickel, aluminum, manganese, and cobalt, then Australia for lithium. Countries involved: Indonesia and Australia. Secondly, the process of processing raw materials, in this process the raw materials that have been exploited are purified and processed into precursors. In short, the increase in nickel when the process has been carried out can reach hundreds of times. The highest value can reach up to 120, 94 times to 3.628 USD/tonne when the MHP has reached the downstream ready for the battery, whereas the raw nickel ore is only 30 USD / tonne. Besides, nickels ore can also be developed other such as NPI (Nickel Pig Iron) which can reach a value of up to 90 USD per tonne, Feronicle is 203 USD /tonne, and Nickel Matter is 3.117 USD / Tonne or a little more rising to 43.9%. Not only Nickel, the ore that has a lot of content with the abbreviations Lithium, Nickels, Manganese, and Cobalt can reach the value up to 642 times. In addition, Indonesian raw material export taxes and GDP inputs will also rise drastically to 510 trillion IDR from only 17 trillion IDR (Binekasri 2023). In this process GVC locations still have two countries namely Indonesia in processing nickel, manganese, cobalt, and aluminum, then Lithium by Australia. Countries involved: Indonesia and Australia.

The next stage is battery cells, production of cathodes, anodes, separators, casings, and electrolytes that are battery cells to be assembled. The location involved in this position is South Korea that meets the content of the 2021 MOU that the JV battery cell helps Hyundai and Kia in the supply of battery cells. Countries involved: Indonesia, South Korea, Germany. After the battery cell stage, the next process is the battery module assembly of battery cells for battery packing. On the EV Battery project by PT HLI Green Power this has been running 100% in April 2024. Countries involved: Indonesia and South Korea. Furthermore, Integration of EV batteries will definitely be integrated into the EV to be used and marketed to consumers. Many countries are involved in this marketing process and integration of the EV Battery into EV. Hyundai itself in the process is engaged in Europe and North America as a supplier of engines and transmission for its wheels. In addition, in the marketing process, EV will be exported to many countries. As a production site, Hyundai Indonesia has exported to more than 78 countries worldwide out of 50% of production (Dinsights 2023).

Countries involved: Indonesia, South Korea, Europe, North America, and 78 other countries around the world as markets. The last is recycling, anode and cathode recovery processes from recycling and reuse of used or used batteries. Countries involved: Indonesia, South Korea, and China.

From the explanation above, there are a lot of stakeholder involves, it illustrate in the table below:

Table 1. Stakeholder Involves GVC EVs Batteries Process on HLI Green Power Industry

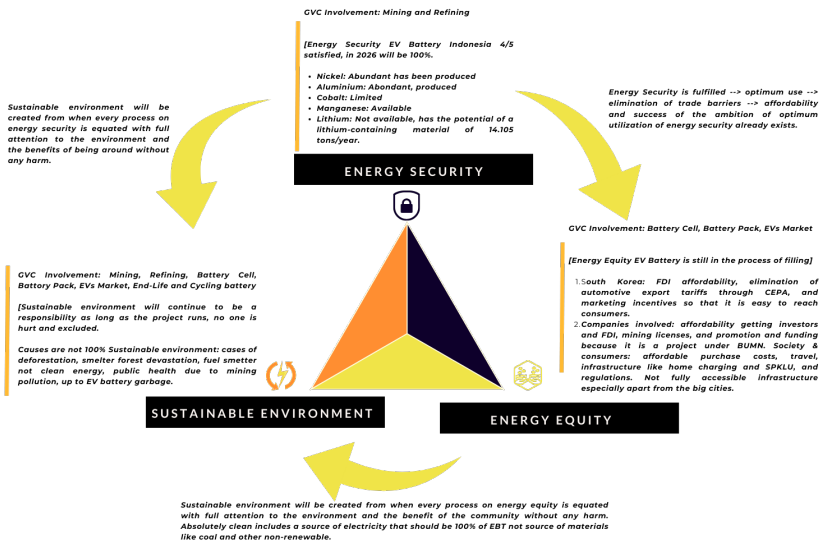


Source: Author's Illustration

Trilemma Policy On the EVs Battery's GVC Process HLI Green Power Industry

Trilemma energy came alongside the emergence of the energy crisis and the weakening of the environmental power and its own product, to the demand or demand for affordability to the economy that supports this energy itself. In the three crucial aspects of the energy trilemma each country even the region has a different focus, so there is a need for strategic strengthening of energy trilemma to undertake energy development and strengthening in terms of energy policy, prices, as well as partners in accelerating clean and equitable energy sustainability both for the present to the next generation (WTO n.d.). Furthermore, Here is the energy trilemma that was implemented in the case of EV Battery GVC in Indonesia by IBC and Hyundai

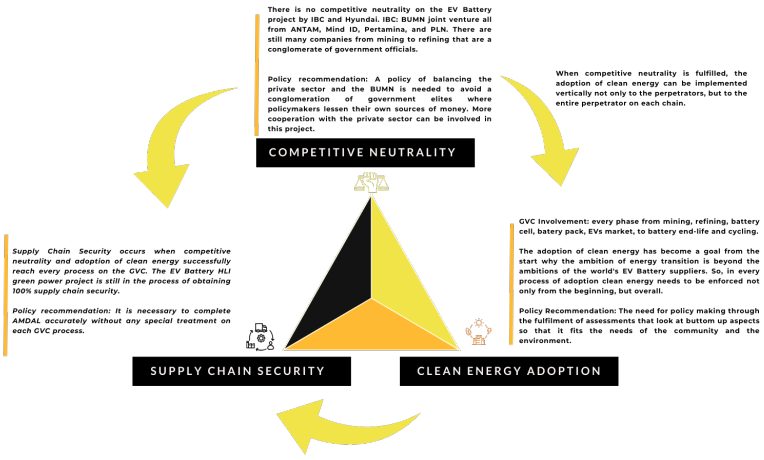
Picture 3. Trilemma Energy aspects on GVC EVs Batteries Process on HLI Green Power Industry



Source: Author's Illustration

Here is a little bit more of an overview of three aspects of the trilemma policy of the interaction of GVC EV battery HLI green power to create a security supply chain in Indonesia (Negara 2023; Hyundai ESG 2024).

Picture 4. Energy Trilemma Policy on GVC EVs Batteries Process on HLI Green Power Industry

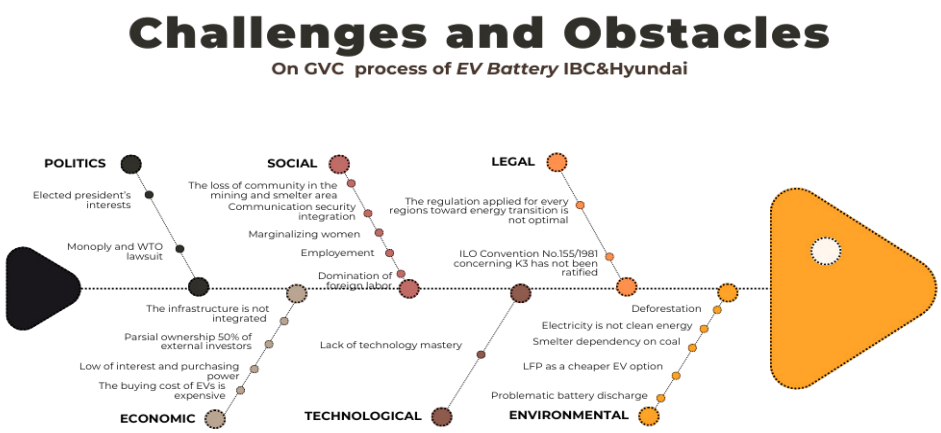


Source: author's Illustration

Challenge and Obstacle on the Development of EV Battery Industry by Hyundai and IBC in Indonesia

The relation between trilema relationship and the global value chain is at every process, the trilemma energy and trilemma policy should be crucial points in the process of the global supply chain EV battery of the IBC and Hyundai cooperation as illustrated in the following graph that illustrate the PESTLE framework:

Picture 5. Fishbone Diagram as Explanation the Root Cause of the Whole Challenges and Obstacles on GVC Process of EV Battery IBC & Hyundai



Source: Author's Illustration

The Framework explains the challenge and obstacles can be defined in 6 areas, political, economic, social, technological, legal, and environmental. The first Political, it's able to elaborate many aspects. (1) President-elect policy, after 10 years of President Jokowi's leadership with one of his ambitions of independent nickel production and downstream as well as strengthening the smelter, Indonesia's challenges are accompanying political times. The policy tendency is against the focused decisions of its own leaders. The challenge, however, is not just the willingness of the candidate leader to continue the clearance, but support on aspects and overcoming obstacles and other challenges such as the risk of deforestation, environmental damage from waste and melting construction, and possible social conflicts (Hafiyyan 2024). (2) WTO (World Trade Organization) has received a lawsuit from the European Union to Indonesia for the ban on exports of nickel ore in 2020 because it is considered to complicate the trade process and hamper competitive industry. However, in the end, Indonesia was able to find arguments to oppose in the European Union's claims because the 1994 GATT also provided an exemption to approve a policy of a country ceasing to export when its domestic needs are still estimated to be insufficient to meet, as well as the reason for the still abundant export activity of domestically purified material, as is the availability of nickel sources from other countries not only in Indonesia (Sihotang and Suandika 2023). In Europe itself, they have banned the

export of nickel since 2014 (EU policy 2022). However, it's like a monopoly that's not fair enough to see other countries like countries in Africa have already banned raw material exports, but no country is making claims to those countries(Clapperton 2023). (3) Conglomeration of Electric Vehicle Project. One of the solutions that does not lead to the dominance of pollutants and congestion is the induction of transportation throughout the territory of Indonesia (Haryanto 2023).

The second aspect is economic, there are several explanations for it: (1) Market challenges over initial purchase costs. The dominance of electric vehicles is not easy in Indonesia to see the affordability of electric cars is still a long way from conventional vehicles. So far the most affordable EV is the Hyundai Ioniq EV with a price of Rs 569.000.000 which has a battery capacity of 72.6 kWH so that it can travel a distance of up to 451 km with minimum SPKLU facilities especially in areas not priority electric vehicles. Different from conventional vehicles that can even only touch only Rs 103.000.000 for Daihatsu Ayla type for the category of cars with SPBU that is still buried (Andriarsi 2021; Hyundai Mobil Indonesia 2022). However, affordability is on the electric motor that can be the cheapest is Exotic Mizone with the price of 6.2 million with a mileage of 85 km in fully charged condition (Devano 2023). (2) Indonesian incentive aid is not 100% able to master the profits of the ambition of producing electric batteries, this is due to the continued dominance of the investors involved, as is the case with Indonesia and Hyundai cooperation. FDI or Foreign Direct Investment is the percentage of entering into the pockets of other countries is large enough to see how Hyundai company itself is producing its batteries, although it has supplied some materials that have been downstreamed (Nikel.co.id 2021).

Then, (3) National infrastructure development. It needs networks in more integrated electric charging and guarantees smart grids. However, the design of electric vehicles is not the same as conventional, electric vehicles are not prepared for long distances and have the capacity of conventional vehicles. Building and developing national structures is not easy and it is a challenge and an obstacle to the Indonesian government (Sidabatur 2020). (4) Advantages of external domination. In the advantage of the awakening of the EV battery industry by PT HLI Green Power as a business to business MoU for the profits of both IBC and Hyundai respectively is 50%. The challenge in optimization here is that although Indonesia is the main supplier in all the materials of EV batteries. (5) Acceptance and purchasing power of the public There have been several surveys of interest and interest in understanding the energy transition through the provision of EVs to the public. One survey by CNNIndonesia.com 2022 revealed that the public's interest in buying electric cars reached 608 out of a total of 1,127 respondents whose content was unfavorable. Other surveys were also

conducted by Tirto.id and Jakpat on the survey of 1,500 respondents. The criteria of respondents from Tirto.id and jakpat are also more variable with respondents of West Java 27.7%, Jakarta DKI 15.7%, as well as 21% other outside Java. Then seen from the age aspects, age in vulnerability 20-25 31.33%, 30 to 35 years of age 22.27%, and the rest from age 26 to 29 years which means all respondents are of productive age. Interest indicates that 262 respondents have already owned electric cars. Then 67.29% of respondents who haven't owned an electric car said they were interested in buying an electric vehicle at least within the next two years. The same survey also found that the influence of public purchasing power on electric car purchases was influenced by battery life by 62.27%, then 61.13% also due to minimal support infrastructure, and 57.8% said the cost of electric vehicle purchases. Respondents from Tirto.id also mentioned knowledge about electric cars that could reduce BBM by a deal of 70.86%, and approve environmentally friendly by 69.85% (Hartanto 2023).

Social is the third aspect that is also defined in many challenges and obstacles such as: (1) Ineffective communication. The need to integrate the security of communications, in the transition process of electric vehicles, communications systems in acceptance and normalization of existence must be done thoroughly to the society. Communication security integration is needed in the IoT or Internet of Things system as a means of infrastructure information, charging, and smart grid and management systems can be done in real time (BPS Indonesia 2023). (2)Unprepared employment. One of the social aspects is the labor force, not just the employment skills factor involved, but how locals are not taking many roles. Although the Indonesian government promises to dominate workers by domestic society, which is a challenge is which part of this role is given, will key players in technology also be developed to enrich the skills of domestic workers, whether the wages given do not occur disparities between domestic and foreign workers, will labor protection, and labor standards are met (Sidabutar 2020). (3)The next challenge is how the transfer of knowledge can be carried out quickly and the dominance of TKA in Indonesian companies can be dominated by domestic workers. Luhut Binsar Panjaitan, Minister of Maritime and Investment Coordinator mentioned that Indonesia has dominated 10 to 15 percent. According to Triyono, the researchers of the BRIN Center for Political Research say that 44.49% of foreign workers are Chinese workers with a figure of 59,320 people. Singapore's investment reached $13.28 billion with employment placement of only 1.35% or 1.811 people, unlike China's very high investment of only $8.22 billion (CNN Indonesia 2024; Madrim 2023). (4)Women's marginalization. In fact women's marginalization has also occurred in the nickel mining activity, one of which in Sulawesi as the first center to become a melting field. The deforestation to the looting of protected forests has destroyed the main source of income in the forest by the illegal expansion of the mining

industries in Indonesia. Besides, along with the disappearance of the majority of the men's jobs in the area near the smelter like one in the village of Tapunggaya also led to the loss of the jobs of the women, especially the housewives of the village. It's related to the majority of former jobs being fishermen who also do side work as Nipah leaf tickets from the forests along the banks of Lasolo Lake which causes two livelihoods from the sea and land that can contribute to their food shelter to be lost (Walhi 2021).

Furthermore, the other aspect is important and crucial, technology. Technology mastery of SDM Indonesia is still low with low technology mastery requiring a strategic R&D or research and development players as well as a stronger technological mastery, so that there is no wave of recruitment of foreign citizens for technology produced and used in Indonesia. There is no dedicated port that reaches the supply chain to be allocated in an industrial area formed in a single carriage, starting from the smelter, then the precursor, the battery cell, battery factory, to its clearance (Siahaan 2021). The challenge is how governments and related stakeholders take the dominant role including technology mastery with the transfer of knowledge by domestic human resources.

The fifth area of obstacles and challenges in GVC by HLY Battery industry that defines such as Territorial regulation has not been maximized. the improvement of standards or regulations per region is still unclear, EV-related incentives have been made as attractive, but drivers have not yet been made. So we need to raise emission standards to encourage people to participate in the transition to clean energy in transport (Yuzawa et al. 2019). Also, the last challenge of the legal area is legality in employment. The irrigation process requires a lot of workforce involved from the smelter process to the battery manufacturing industry itself. To date, Indonesia has not ratified ILO Convention No. 155/1981 on Occupational Health and Safety (K3), ILO No. 161/1985 on the obligation of every State to provide occupational health in every element of work, and there has not been a revision of Act No. 1 of 1970 on K3 which is already irrelevant and causes many unemployment in Indonesia (Trend Asia 2023; Heriani 2024).

Last but also the most important aspect that has become a challenge and obstacle of the development in EV battery industry is Environmental. Its areas include many examples such as (1)Electricity is not clean energy. The goal of developing EV batteries for EVs is to boost the transition rate of clean energy. However, this is not as easy as it is dealt with by Indonesia seeing its dependence on coal as a steam power plant producer that supports 61.60% of electricity in Indonesia. Coal itself in the mining

process leaves waste and contributes to emissions during the combustion process, and is not a renewable energy source. It remains a challenge for Indonesia in the implementation of renewable energy sources, because to date for the power plants still 7,655%, rented 7,16%, and other including the waste power plant and other combined support only 7,46% (Walhi 2021). (2)The dependence of coal in Smelters is still dependent on coal, not just coal as a source of electricity. In fact, according to the IMIP report in 2017, PLTUs with coal sources are still used up to 4 million tons to supply PT SMI, PT GCNS, and PT ITSS. This is linked to the pollution to the community which has resulted in more than 52% of citizens undergoing health checks having ISPAs because of the continuous coal dust that follows them so it is necessary to shut down all the ventilation of the house to be safe from polluted air (Pratama 2023). (3) Popularity of LFP as a cheap EV According to the description of Putra Adhiguna as an energy analysis Institute for Energy Economics and Financial Analysis (IEEFA), see how Indonesia has so far dominated the sale of cars from Wuling Air EV is an electric vehicle that does not contain nickel, but uses more affordable materials such as iron-based batteries or lithium iron phosphate (LFP). So, it's still not clear what Hyundai is (Dzikiy 2019).

The next, (4)Battery End-Life Battery life and battery waste: Generally, battery usage and warranty range from 8 to 10 years. Each year, the average battery capacity decreases by 2.3% per year. From the first manufacturer, Nissan claims that its 12 years of use or 100,000 miles of standing use is still safe using Nissan. Similarly, Tesla claims its average production age in the US is 200,000 miles and in the EU is up to 150,000 miles or the equivalent of 15 to a maximum of 20 years (Parson and DiPietro 2023). (5) Natural damage. Exploitation destroys nature, nickel becomes one of the adhesive components whose content rises along with EV normalization and downstream. There has been a lot of environmental impact and damage caused by mining activities, interfering with human life as well. The smelter process of course causes waste, this method of handling is called deep sea tailing disposal (DSTD). The process of discharge up to 250 meters and estimated up to 1 kilometers of sinking in the seabed above the tailing is potentially devastating for the change and deposition of the natural basin on the seafloor, the sea wealth is beginning to disappear, as well as the fertility of the waters that follow (Santosa 2013). Tailing can be a factor in underwater damage as it can result in fish ecosystem sedimentation and coral reef destruction and become toxic due to the interaction of chemicals, rocks, and elements that are toxic when exposed to open air and water as well as heavy metal content that is difficult to disaggregate (Shemas 2020). (5) The last is deforestation. There has been closure of forest land to 48.621.96 hectares for 74 Forest Area Loan Permissions (IPPKH) according to reports from the Ministry of Environment and Forestry and 3 IPPKH has also been issued for in the Luwu East region, South Sulawesi

with a land area of 9.711.77 hectares. Deforestation was also carried out by PT Vale Indonesia Tbk for 4,449,22 hectares out of 70,566 hectares granted by the government. This is a challenge because it has violated the Act No. 18 of 2013 on the prevention and prevention of deforestation when there has been a lot of data proving the occurrence of deforestation as a side effect of nickel construction (Walhi 2021).

Conclusion

The GVC process in the EV battery project that is the result of cooperation between the government and the private Indonesian and South Korean has produced a variety of data and supply research involving many parties. The development of the project seen in the GVC process has not been fully completed as it is still in development which will soon be completed in 2024, and is expected in April. Therefore some things that are a means in the process of building and mining sustainable projects for alignment with the initial objectives in meeting the NDC targets and increasing the value of the energy trilemma index. The recommendations of the researchers are described for many aspects. Government needs an emphasis that is thoroughly focused on meeting the well-being of the community and not being rude with the process until it is so easy to give development permission. Also, it has always focused on urban communities as energy transition markets and accelerators of the economy, but it is a paradox that destroys the communities of origin and the living environment and future generations of nations due to the still abundant impact on the level of poverty that is still rising in the smelter region. Governments also need to assure companies of the security and benefits that the market will get in order to participate in the energy transition process and not be afraid or have concerns about the cost, security and infrastructure of EVs, so that not only can Indonesia become a supplier country, but also a market and replace conventional vehicles. It would be better if the government enforced the corporate regulations on employment and environmental impact even more strictly. The second is Companies involved, it is recommended for the companies involved from the beginning to the end to take more care of the 3p aspect (Planet, People, Profit) as full responsibility not only to occur a slump in the profit alone, but also to carry out good CSR control, properly, and not destroy.

References

Books or Book Chapters

Bakry, Umar Suryadi. 2016. *Metode Penelitian Hubungan Internasional*. Pustaka Belajar.

Porter, Michael E. 1985. *Competitive Advantage: Creating and Sustaining Superior Performance*. New York: Free Press

Sugiyono. 2018. *Metode Penelitian Bisnis : Pendekatan Kuantitatif, Kualitatif, Kombinasi Dan R&D*. Bandung: Alfabeta.

Journal Article

Gereffi, Gary, John Humphrey, and Timothy Sturgeon. 2005. "The Governance of Global Value Chains." *Review of International Political Economy* 12, no. 1: 78–104. https://www.jstor.org/stable/25124009.

Mavhunga, Clapperton Chakanetsa. 2023. "Africa's Move from Raw Material Exports toward Mineral Value Addition: Historical Background and Implications." *Mrs Bulletin* 48, no. 4 (April): 395–406. https://doi.org/10.1557/s43577-023-00534-3.

Moleong, Lexy J. 2007. *Metodologi Penelitian Kualitatif*. PT Remaja Rosdakarya.

Mudambi, R. 2008. "Location, Control and Innovation in Knowledge-Intensive Industries." *Journal of Economic Geography* 8, no. 5 (July): 699–725. https://doi.org/10.1093/jeg/lbn024.

Negara, Dharma Setiawan . 2023. "PRINCIPLE of COMPETITIVE NEUTRALITY for STATE-OWNED ENTERPRISES to an ACCESS to JUSTICE on BUSINESS PRACTICES." *RUSSIAN LAW JOURNAL* XI: 3. https://www.ptun-surabaya.go.id/wp-content/uploads/2023/05/Jurnal-Dharma-Scopus-Q2.pdf.Siagian, Muhammad Abdhy Walid, and Rozin Falih Alify. 2023. "Menuju Transisi Energi 2050: Quo Vadis Energi Baru Dan Terbarukan." *Jurnal Hukum Lingkungan Indonesia* 9, no. 1 (April): 187–202. https://doi.org/10.38011/jhli.v9i1.47

Santosa, Rizky. 2013. "DAMPAK PENCEMARAN LINGKUNGAN LAUT OLEH PERUSAHAAN PERTAMBANGAN TERHADAP NELAYAN TRADISIONAL." *LEX ADMINISTRATUM* 1, no. 2 (November). https://ejournal.unsrat.ac.id/index.php/administratum/article/view/3017.

Sidabutar, Victor. 2020. "Kajian Pengembangan Kendaraan Listrik Di Indonesia: Prospek Dan Hambatannya Victor Tulus Pangapoi Sidabutar." *Jurnal Paradigma Ekonomika* 15, no. 1: 2684–7868. https://core.ac.uk/download/pdf/322516039.pdf.

Sihotang, Erikson, and I Nyoman Suandika. 2023. "Kebijakan Larangan Ekspor Bijih Nikel Yang Berakibat Gugatan Uni Eropa Di World Trade Organization" 6, no. 1 (February): 61–70. https://doi.org/10.47532/jirk.v6i1.826.

Official Documents

BloombergNEF. 2022. "Net-Zero Transition: Opportunities for Indonesia." https://assets.bbhub.io/professional/sites/24/BNEF-Net-Zero-Transition-Opportunities-for-Indonesia_FINAL.pdf.

International Energy Agency. 2022. "Global Supply Chains of EV Batteries." https://iea.blob.core.windows.net/assets/4eb8c252-76b1-4710-8f5e-867e751c8dda/GlobalSupplyChainsofEVBatteries.pdf.

Online Publications

Andriarsi, Melati Kristina. 2021. "Perbandingan Harga Mobil Listrik Dan Konvensional | Databoks." Databoks.katadata.co.id. 2021. https://databoks.katadata.co.id/datapublish/2021/06/17/perbandingan-harga-mobil-listrik-dan-konvensional.

Artha, Rima Prama , Sella F. Anindita, and Muhammad Ikbal Iskandar. 2023. "PERKEMBANGAN DAN RANTAI PASOK KENDARAAN LISTRIK (ELECTRIC VEHICLE)." https://danareksa.co.id/storage/2023/other/64bf9821544f5.pdf.

Badan Pusat Statistik Indonesia. 2023. "Perkembangan Jumlah Kendaraan Bermotor Menurut Jenis - Tabel Statistik." Bps.go.id. Badan Pusat Statistik Indonesia. 2023. https://www.bps.go.id/id/statistics-table/2/NTcjMg==/perkembangan-jumlah-kendaraan-bermotor-menurut-jenis--unit-.html.

Binekasri, Romys. 2023. "Dikritik Faisal Basri, Ini Hitungan Cuan Dari Hilirisasi." CNBC Indonesia. 2023. https://www.cnbcindonesia.com/market/20230814142338-17-462770/dikritik-faisal-basri-ini-hitungan-cuan-dari-hilirisas.

CNN Indonesia. 2022. "Survei: Minat Beli Kendaraan Listrik Di Indonesia." Otomotif. September 13, 2022. https://www.cnnindonesia.com/otomotif/20221013104729-603-859979/survei-minat-beli-kendaraan-listrik-di-indonesia.

———. 2024. “Luhut Akhirnya Ungkap Jumlah Buruh Asing Di Proyek Smelter.” Ekonomi. January 25, 2024. https://www.cnnindonesia.com/ekonomi/20240125121911-92-1054212/luhut-akhirnya-ungkap-jumlah-buruh-asing-di-proyek-smelter.

Devano, A. 2023. “8 Motor Listrik Murah Dengan Jarak Tempuh Terjauh : Okezone Otomotif.” Https://Otomotif.okezone.com/. October 17, 2023. https://otomotif.okezone.com/read/2023/10/17/53/2903032/8-motor-listrik-murah-dengan-jarak-tempuh-terjauh?page=2.

Directorate-General for Trade. 2022. “EU Launches Consultation on Use of Enforcement Regulation on Indonesian Nickel Export Restrictions.” Policy.trade.ec.europa.eu. 2022. https://policy.trade.ec.europa.eu/news/eu-launches-consultation-use-enforcement-regulation-indonesian-nickel-export-restrictions-2023-07-07_en.

Dzikiy, Phil. 2019. “Nissan Says Its Leaf Batteries Will Outlast the Car by 10-12 Years, Looks for Reuse Solutions.” Electrek. May 24, 2019. https://electrek.co/2019/05/24/nissan-leaf-batteries-outlast-car/.

Hafiyyan. 2024. “Tiga Capres Komitmen Lanjutkan Program Hilirisasi Nikel Hingga Sawit.” Bisnis.com. January 26, 2024. https://market.bisnis.com/read/20240126/94/1735667/tiga-capres-komitmen-lanjutkan-program-hilirisasi-nikel-hingga-sawit.

Hartanto, Alfons Yoshio. 2023. “Animo Tinggi, 82% Responden Survei Tertarik Beli Mobil Listrik.” Tirto.id. January 26, 2023. https://tirto.id/animo-tinggi-82-responden-survei-tertarik-beli-mobil-listrik-gBtW.

Haryanto, Nur. 2023. “Konglomerat Di Balik Bisnis Kendaraan Listrik.” Tempo. July 12, 2023. https://newsletter.tempo.co/read/1747323/konglomerat-di-balik-bisnis-kendaraan-listrik.

Heriani, Fitri Novia. 2024. “Diperlukan Revisi UU Keselamatan Kerja Demi Lindungi Pekerja.” Hukumonline.com. January 21, 2024. https://www.hukumonline.com/berita/a/diperlukan-revisi-uu-keselamatan-kerja-demi-lindungi-pekerja-lt65ad3dbfe097a/.

Hyundai ESG. 2024. “Suppliers | Society | HD HYUNDAI ESG.” Esg.hd.com. 2024. https://esg.hd.com/en/social/suppliers.

“Hyundai Indonesia to Export 50% of EV Production to 78 Countries | D-Insights.” 2023. Dinsights.katadata.co.id. 2023. https://dinsights.katadata.co.id/read/2023/07/12/hyundai-indonesia-to-export-50-of-ev-production-to-78-countries.

Hyundai Mobil Indonesia. 2022. "4 Cara Memaksimalkan Jarak Tempuh Mobil Elektrik Hyundai." Hyundai Mobil Indonesia. 2022. https://hyundaimobil.co.id/news/details/4-cara-memaksimalkan-jarak-tempuh-mobil-elektrik-hyundai.

IBC. 2022. "Indonesia Battery Corporation." Www.indonesiabatterycorp.com. 2022. https://www.indonesiabatterycorp.com/id/about-us.

ILO. 2017. "Relevant SDG Targets Related to Global Supply Chains." Www.ilo.org. June 6, 2017. https://www.ilo.org/global/topics/dw4sd/themes/supply-chains/WCMS_558569/lang--en/index.htm.

"INPRES No. 7 Tahun 2022 Tentang Penggunaan Kendaraan Bermotor Listrik Berbasis Baterai (Battery Electric Vehicle) Sebagai Kendaraan Dinas Operasional Dan/Atau Kendaraan Perorangan Dinas Instansi Pemerintah Pusat Dan Pemerintahan Daerah [JDIH BPK RI]." 2022. Peraturan.bpk.go.id. 2022. https://peraturan.bpk.go.id/Home/Details/225262/inpres-no-7-tahun-2022.

Madrim, Sasmito. 2023. "BRIN Soroti Jumlah Pekerja Asal China Yang Tidak Sebanding Dengan Investasi." VOA Indonesia. October 30, 2023. https://www.voaindonesia.com/a/brin-soroti-jumlah-pekerja-asal-china-yang-tidak-sebanding-dengan-investasi/7332577.html.

Medina, Ayman Falak. 2021. "Indonesia to Build Electric Vehicle Battery Plant, Production Starting in 2023." ASEAN Business News. July 8, 2021. https://www.aseanbriefing.com/news/indonesia-to-build-electric-vehicle-battery-plant-production-starting-in-2023.

"Menimbang PRESIDEN REPUBLIK INDONESIA PERATURAN PRESIDEN REPUBLIK INDONESIA." 2019. https://jdih.esdm.go.id/storage/document/Perpres%20Nomor%2055%20Tahun%202019.pdf.

Nanda, Aprida Mega, and Azwar Ferdian. 2022. "Tantangan Pemerintah Dalam Percepatan Kendaraan Listrik Di Indonesia." KOMPAS.com. September 27, 2022. https://otomotif.kompas.com/read/2022/09/27/190200115/tantangan-pemerintah-dalam-percepatan-kendaraan-listrik-di-indonesia.

Nikel.co.id. 2021. "Menakar Kebutuhan Investasi Indonesia Battery Corporation (IBC) Dan Ambisi Baterai Listrik." Media Nikel Indonesia. March 30, 2021. https://nikel.co.id/2021/03/30/menakar-kebutuhan-investasi-indonesia-battery-corporation-ibc-dan-ambisi-baterai-listrik/.

Shemas, S. 2020. "Morowali." Earthworks. November 3, 2020. https://earthworks.org/blog/morowali/.

Siahaan, Albert. 2021. "Rantai Pasok Industri Baterai Sel Untuk Mobil Listrik (Electrical Vehicle) Di Indonesia." Master of Industrial Enginering. September 20, 2021. https://mie.binus.ac.id/2021/09/20/analisis-penentuan-lokasi-fasilitas-dan-perumusan-rantai-pasok-industri-baterai-sel-mobil-listrik-ev-di-indonesia/.

Threewitt, Cherise. 2023. "How Long Do Tesla Batteries Last? ." US News and World Report. September 13, 2023. https://cars.usnews.com/cars-trucks/advice/tesla-batteries.

Trend Asia. 2023. "Kecelakaan Kerja Di PT GNI: Pengabaian Dan Pelanggaran Kemanusiaan Di Kawasan Industri Nikel Indonesia." Trend Asia. February 13, 2023. https://trendasia.org/kecelakaan-kerja-di-pt-gni-pengabaian-dan-pelanggaran-kemanusiaan-di-kawasan-industri-nikel-indonesia/.

Walhi. 2021. "Catatan Akhir Nikel Tahun 2021: Red Alert EKspansi Nikel Di Sulawes." https://www.walhi.or.id/uploads/blogs/Foto%20Rilis/Catatan%20Akhir%20Tahun%20Region%20Sulawesi_%20Red%20Alert%20Espansi%20Tambang%20Nikel%20di%20Sulawesi.pdf.

Wicaksono, Raden Aryo. 2023. "75 Persen Mobil Listrik Di Indonesia Tidak Pakai Baterai Nikel." Betahita.id. April 13, 2023. https://betahita.id/news/detail/8667/75-persen-mobil-listrik-di-indonesia-tidak-pakai-baterai-nikel.html?v=1700601085.

World Energy Council. 2022. "World Energy Trilemma Framework." World Energy Council. 2022. https://www.worldenergy.org/transition-toolkit/world-energy-trilemma-framework.

WTO. n.d. "World Energy Trilemma Framework." World Energy Council. https://www.worldenergy.org/transition-toolkit/world-energy-trilemma-framework.

Yuzawa, Kota, Goldman Sachs, George Galliers, Sachs Goldman, Sharmini Chetwode, L Pramod Kumar, India Spl, et al. 2020. "European Regulators Are Opening the Door to a New Method for Evaluating CO2 Emissions That Would Have Important Implications for the Auto Industry and for Investors Positioning for the Transition to Electric Vehicles. By Calling for Global Automobiles." https://www.goldmansachs.com/intelligence/pages/briefly/from_briefings_21-Jan-2020/new-era-in-co2-regulation.pdf.