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Indonesia`s EV Public Charging Business Regulation in Creating Nation`s Competitive Advantage

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Abstract - **Indonesia's aim to reduce carbon emission is reflected through comprehensive policy setting and regulatory acts since the Paris Agreement of global commitment to achieve sustainable future and net zero by 2050. The transportation sector has been the focus to explore for further carbon improvement through Electric Vehicle or EV adoption programs. To minimize carbon footprint in daily transportation, the government has delivered number of incentives and subsidy in effort to increase consumer's preference to transition to Electric Vehicle. In lieu of this attempt, government has committed to build infrastructures around Electric Vehicle ecosystem as the support to meet the growing demand. Through regulations from President and Ministry of Energy & Mineral Resources the government seek to accelerate the infrastructure for Electric Vehicle charging station. Policy's effectiveness and evaluation shall be the focus of the research to ensure charging station infrastructure development traction and implant nation's competitive advantage through charging station.**

Keywords - **EV, EV charging station, SPKLU, Competitive advantage, Policy evaluation, Business model**

I. INTRODUCTION

The global aim to decarbonizing transportation sector is based on the agenda to tackling climate change while sustain development around technology advancement [1]. The race to adopt cleaner transportation technology between many countries become the highlight of every agenda in any sectors. While some countries have successfully managed the transition through intensive policy, others find difficulties to transition due to internal and external conditions of the country. Indonesia as one of the developing economy giants in Asia, has established strong footing in the transition of EV through various policy and incentives [2]. With the projection of EV market reaching quarter-million unit by 2030, the government has committed to build 25,000 SPKLU to meet the demand. The initiatives of government through President Regulation (PerPres No/55/2019) and MEMR Ordinance (PerMen No/13/2020) have specific regulations around SPKLU in aspects of technology, business scheme, regulatory body, and tariff policies. However, practical implementation of SPKLU development has been shown to not expected up to the target as of date only 267 SPKLU have been installed and operated.

The research will break down the policy evaluation and potential analysis through cross-referencing to regulation evaluation literature references and benchmarks to other countries' policies, while empirical approach to the analysis shall be gathered through various interviews with EV charging station players in the country. Furthermore, analysis of competitive advantage will be made in ensuring industry's growth influence on the nation-wide benefits.

II. LITERATURE STUDY

Regulation & Policy Evaluation

Regulation Evaluation analysis of regulation and policies for developing countries in infrastructure sectors have been conducted since the dawn of economy boom in 1990s. Developing countries' pace to attain sustainable growth were influenced by the regulations around infrastructure such as telecommunication, and utility. On that basis, several literature studies have reviewed how the regulations' evaluation could impact the sustainable growth by analyzing the attractiveness to investors, safeguard method to financial institutions, and other stakeholders such as private businesses, state-owned enterprises, and the government.

Based on the Regulatory Governance studies, infrastructure sectors' regulation has played significant roles to incremental development. Being very capital intensive and ergo highly reliable for private investments, there are several criteria which are essential to bring good governance in regulatory system in utility/telecom infrastructure [3]. The criteria are:

- Clarity of roles and objectives (between Ministry (policymakers) and regulators)
- Autonomy of regulatory bodies
- Accountability
- Participation
- Transparency
- Predictability

Continuing the study, Stern's research on Regulation Effectiveness had been performed with detailed studies on approaching effective regulatory function in order to

gain a high rate of investments in important capital sector (such as utility or telecommunication) but also maintain the productivity of the investments, the productivity as highlighted revolves around the tendency of dominant model of dominancy of telco/utility sector by state-owned national monopolies which had been relatively unproductive and unnecessarily high capital-output ratios [4].

Considering stakeholder's safeguard in regulation set up, Warrick Smith has done studies around the importance of single regulatory body of independence [5], which is essential to protect consumers (from abusive dominant power of firms), investors (from government arbitrary action), and to promote economic efficiency.

It is suggested that independent entity (that has an arm-length distance to political authorities and pressure) to be the regulator. As such, regulatory bodies must at least satisfy the following safeguards.

- Providing regulator with distinct legal mandate
- Prescribing professional criteria for appointment
- Involving both executive and legislative parties in appointment
- Appointing regulators for fixed term and protect them from arbitrary removal
- Staggering terms so regulations would not clash with election cycles
- Exempting agencies from civil service salary rules to maintain high-quality staffs
- Providing the agency with well-funding

Benchmarks

Further analysis is performed by benchmarks of countries resembling similarities with Indonesia for infrastructure development. Equal footing in developing country such as Indonesia, India has also established the need and commitment to EV infrastructure development acceleration to cater the following growing EV demand. The government issued The Government of India's guideline (No.12/2/2018-EV, 2022) to express ambitious program of Public Charging Station (PCS) infrastructure as well as regulation around PCS business [6]. With regards to technology adaptation and enablers, the guideline has instructed specific Governmental & private agencies to become an active supporter, for example, The Public Charging Station (PCS) is regulated to be connected to NSP (network service providers, can be either state-owned or private NSP) with aim to enabling remote booking in advance to the EV owners/consumers. Other example, the guideline instructed that PCS' consumption data to be gathered, collected, and analyzed by the Bureau of Energy Efficiency (BEE) with State Nodal Agency (SNA). This guideline also complements its function as regulatory basis of tariff, subsidy, and even permit/regulation.

As one of the leading nations in ASEAN for EV adoption and growth, Thailand has set its ambitious target following the Paris Agreement initiatives. Thailand's government has established policies, incentives, and regulation in agenda to moving EV adoption for full growth acceleration. The National Energy Policy Board set operation phases from (1) Preparation for EV utilization as public transportation; (2)Preparation for EV utilization as personal transportation by maturing EV infrastructure; (3) Expansion of EV ecosystem across nation by implementing smart EV charging system, V2G (vehicle to grid) system to optimize demand and supply [7]. Moreover, to centralize data exchange, specification interoperability, and direction to lead EV roadmap, Electric Vehicle Association of Thailand (EVAT) was founded. EVAT is consortium-based organization comprises of different EV players from different industries (providers, utility, energy, machinery/technology, automotive, service) in Thailand.

Malaysia has been leading introduction and initiatives to adopt EV in earlier stage. The government had identified opportunities to include EV implementation in agenda since 2009 when the country officiated National Green Technology Policy (NGTP) [8]. To move forward this initiative, the government set up Malaysian Green Technology Corporation (MGTC) which was founded as agency under the Ministry of Environment and Water (KASA). The agency role is defined as catalyst to ensure the implementation of NGTP while enabling growth. The agency has committed to increase availability of EV charging station significantly. Established partnership with Malaysia's Tenaga Berhad (state-utility company), MGTC launched chargEV as charging solution branding whose focus to lead infrastructure of EV charging station across country.

Analysis of Nation's Competitive Advantage

In assessing industrial leadership in a country, the analysis of Porter's Diamond of Nation's Competitive Advantage is vastly practical. The essence of this analysis was introduced to overview 4 major aspects underlying the competitiveness of a nation in relation to specific industry [9]. The 4 major aspects interrelationship is illustrated below

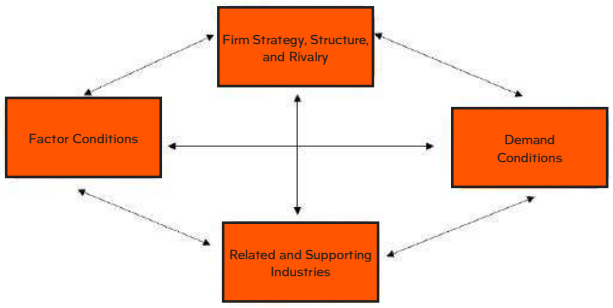

Fig. 1. The Diamond of Nation's Competitive Advantage by Michael Porter [9]

The model encompasses the causes and effects of a certain business innovation that may be effective to a nation and/or might not be possible in others. The overall idea of the Porter's Diamond is also applicable to companies in certain industry within a country to assess the market's prominent potential and future growth since the development of the business is highly reliable of the factors as mentioned in the Diamond.

III. METHODOLOGY

This research will align its focus through qualitative approach to review and evaluate the business regulations around EV charging station (SPKLU). Activity to addressing the research questions shall be fulfilled by three methods.

1) The first method will utilize literature study which focused on policy evaluation for developing countries and enable the similar assessment to the current policies and regulations in Indonesia. The analysis will be continued by comparing benchmarks and reviewing lessons learned from other countries with more mature EV industry.

2) Qualitative observation through interviews shall be conducted to gather feedbacks from related industry-players within Indonesia which comprise of different stakeholders (private and government).

3) The analysis by using Diamond of Nation's Competitive Advantage [9] of policy performance will be cross referenced with benchmarks to synthesize recommendation in meeting the nation's target and to create nation's competitive advantage through EV charging business development.

IV. RESULTS

A. Findings and Arguments

The Government-issued policies and regulation shall be examined to establish how the regulation may satisfy the mentioned criteria. The criteria are gathered in two matrices to establish overlapping purpose and with which, the key indicators are combined and defined.

MATRIX 1

Key criteria of John Stern performance evaluation model [3]

1. Clarity of roles between Ministries and regulatory bodies
2. Autonomy of regulatory body
3. Accountability
4. Participation
5. Transparency
6. Predictability

MATRIX 2

Key criteria of regulation to safeguard stakeholders [5]

a. Providing regulator with distinct legal mandate
b. Prescribing professional criteria for appointment
c. Involving both executive and legislative parties in appointment
d. Appointing regulators for fixed term and protect them from arbitrary removal
e. Staggering terms so regulations would not clash with election cycles
f. Exempting agencies from civil service salary rules to maintain high-quality staffs
g. Providing the agency with well-funding

Table 1 - Key Indicators to Determine Regulation Performance based on Stern and Smith Matrices

No	Key Indicators (KI)	Matrix Criteria Fulfilment	Remarks
I	Determination of **autonomy regulatory body** with clear scope, responsibility, and mandate	(1), (2), (a), (b), (d)	Aims to streamline regulation and ensure decision-making to gain focus and traction in industry development
II	Clarification of underlying **law power and assurance** of safe & fair business practices	(3), (a), (d), (f)	To ensure clarity of law underlying the regulation which will safeguard investors, and business owners from any misconducts
III	**Wide involvement** level between stakeholders (government agencies, private sectors, law officers, investors, suppliers, landowners)	(4), (5), (c)	By leveraging widespread benefits between parties, industry will gain traction for development and innovation
IV	Deep-rooted / **steadfast long-term plan & roadmap** to ensure sustainable and continuous positive impact	(6), (e)	Foundation for politics-free policy and safe business conducts without negative external influences
V	**Strong financial background & support** to maintain regulation's performance and implementation	(f), (g)	Required as the financial safety-net and assurance from government to keep the industry running

Based on Table 1, following evaluation has been selected to see how the policies around EV charging station business in Indonesia (President Regulation Perpres No/55/2019 and Ministry MEMR Ordinance PerMen No/13/2020) shall satisfy the key indicators.

- The need of autonomous regulatory body has been fulfilled by the government mandate to PLN however based responsibilities have not been cleared during implementation and business practice. The government needs to clarify further on the roles & responsibilities of PLN as the single-authority to lead the infrastructure of SPKLU while maintaining and fulfilling its task to liaise with private-sectors, other SoE and agencies for supporting EV charging business developments.

- Assurance of rules and law authority has been expressed by clear rules and sanctions from the Ordinance PerMen No.13, 2020. However, to ensure safe business practice and gain investor's trust, fair regulations need to be addressed to all stakeholders (including private business, SoE, auto-makers, law authorities, regional and national government). Clarification of law will prevent any business misconducts and unfairness of business model between stakeholders thus creating healthy business environment to grow and attractiveness appeal to investors.

- The policy and regulation have mandated the need of wide level of coordination and cooperation to involve all stakeholders, however the current involvement is only limited to socialization, and training, with no specific level of engagement in the regulation.

- Grand strategy and Roadmap are key factors to maintaining the course of business growth. While clear roadmap is currently absent, the government has set its target to achieve the goal in foreseeable future. With this ambitious goal, the roadmap should be clarified with clearer timeline, program definition, stakeholders' involvement, and cross-function policies in ensuring well execution.

- Financial assistances are crucial as strong foundation to boost the infrastructure and deliver good quality of product and service to citizens. Although incentives and subsidies have been granted by government of Indonesia, the government still needs the additional push of investment from private sectors both locally and abroad. The policy needs to indulge attractiveness towards investors and ensuring safe business practice for a sustainable fund support.

B. Interview & Data Collection from Stakeholders

In continuation of the policy evaluation, interviews are conducted with key industry players in Indonesia in development of EV charging stations. The following interviewees played important roles in addressing issues, roadblocks, while giving feedbacks to the current regulation (through survey).

Table 2 - Interviewees' Information and Background

Interviewees*	Company & Background
Mr. SG	PT. Jababeka Mr SG is manager for development and new businesses in PT. Jababeka (industry-estate enterprise) based in West Java region, Indonesia.
Mr. PF	PT. PLN (Persero) Mr PF is involved primarily in the Strategic and Business Development syndicate in the State-owned Utility Enterprise PLN. As part of the S&BD function, the department is in charge for the development of SPKLU infrastructure in Indonesia as mandated by the government .
Mr. ER ***) Anonymous for privacy protection**	PT. Exelly Elektrik Indonesia "EVCuzz" Mr ER is the founder and CEO of the start-up venture EVCuzz based in Indonesia. As one of the pioneers in EV public charging, the company seeks to expand their business nation-wide.

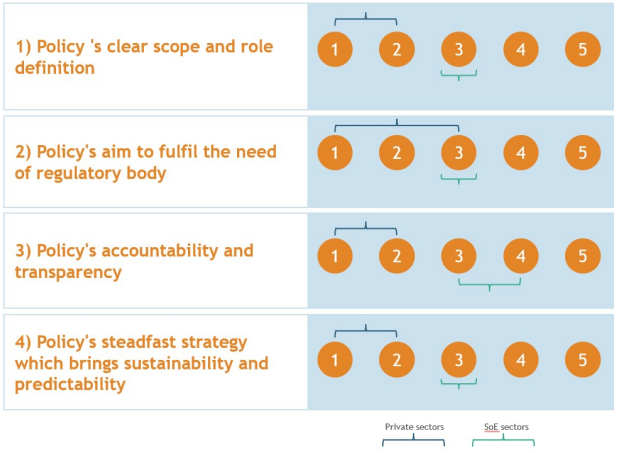

Fig. 2. Survey Result on Existing Regulation Feedbacks

The interviewee's diverse background also encompasses different messages and takeaways going into the interview, with different and unique remarks addressing the current industry issues of the ecosystem [10],[11],[12].

a. Business Challenges

- o No clarification and rules for revenue and profit sharing
- o Fixed tariffs are still not profitable for type 3 EV chargers which present more expensive product

b. Unclarified role and responsibility

- o Many enterprises in Energy played different approaches to captivate EV charging business opportunities: without clear role & responsibility
- o SoEs and private sectors invent own application for EV charging facility which are not interactable

c. Slow market growth

- o The market of EV has not been growing with quite the expected pace; therefore, investment in the infrastructure has also been relatively slow
- o Government 's incentives to reduce EV price has not been significant to meet the market's purchasing capability
- o Localization attempt for boosting EV numbers in Indonesia have not been successful

V. DISCUSSION

Continuing the analysis of policy review, the industry of EV public charging stations shall be examined by implementing analyses on the 4 main components in the Porter's Diamond for Competitive Advantage. The current conditions of the evaluation shall give recommendations and improvement focus in the sector to achieve the nation's competitive advantage.

1. Factor conditions are broken down into 3 major aspects with the following assessment
   - o Material availability has been supported by the technological introduction to Indonesia unfortunately the OEM manufacturers are still based outside of Indonesia
   - o Human resources are vastly available however require proper education / training and skillset to implement the knowledge & know-how to the technology
   - o Knowledge of basic know-how has been familiar limitedly to amongst EV charging business players, unfortunately knowledge for EV charging integration and communication for data exchange enabler is still limited
2. Supporting Industries comprised of 4 major foundations
   - o EV charger (OEM) portion, which comprised of the key components in EV charger. The OEM value stream has been weighted heavily in variables in import activities. This also leads to relatively more price per unit which heavily contributes to the business' profitability ratio. EV Charger supplier spans from different region comprising of famous brands and name such as Delta, ABB, and Schneider which provide best solutions in charging facility, however, based on existing pricing on the charging

units, investment on EV charging is still both risky and has long payback period in nature.

- Electricity played essential role in meeting the continuous demand with stable supply and set pricing. The main source comes from electricity grid which is regulated, operated, and managed by the PLN distribution and transmission. With the current plan to expand EV charging station in nation-wide scale, electricity supply must be widely available across region. The PLN roadmap to achieve 35,000 MW and 100% electrification ration has been set and executed with good achievement however the plan was still on-going progress with 33% of power generated target in COD & installed stage and 99,46% electrification ratio achieved (Gatrik, 2021). Expansion would also not be enough due to the fluctuated demand condition by the charging electricity. The need of smart grid would influence flexibility and adaptability of the grid to fulfil the EV charging demand in anytime. Later stage shall be explored to implement V2G system (vehicle to grid) which would be substantial development to the EV ecosystem.

- The land availability and EPCs as the two significant value stream foundation also play important roles. Land (or space) for EV charging location is abundantly available in Indonesia - although there might be scarcity of ideal location within densely populated city such as the capital city Jakarta, EV charging stations are quite flexible to be installed in parking area, terminals, offices, apartment/high rise building, malls and many else. Construction companies (EPCs) are quite varied and available for providing expertise and capabilities in building the facility. EPC companies are available from both private and state-owned sectors which brings many opportunities to accelerate EV charging infrastructure. The high competition and variance in the EPC companies also brought development of know-how, material and skill set in building / facility construction.

3. Demand conditions directly reflects to the EV users projected growth and market condition. With various externalities influencing demand, the business projection for EV is currently blooming with expected value of 250,000 units by 2030 [1]. However, there are many considerations underlying the demand influence which can ultimately alter the outcome [13]. These considerations include Financial Attributes (price, expenses of adoption), Technical Attributes (driving range, charging time, engine power, and many else), Infrastructure Attributes (EV charging station), and Policy Attributes (Taxes, other legal issues related).

4. Firm structure & rivalry pertains to the key industry players which dominating the EV charging players at the moment. The following players come from different background however placed similar interests in tapping into new EV ecosystem infrastructure of charging station. These players include PLN (Utility state-owned company), Pertamina (Energy & Oil state-owned company), BPPT (research and development agency from the government). There are also more players from automakers such as Hyundai, Mitsubishi, BMW and Mercedes Benz that seek to increase brand awareness for EV transition. Private enterprises have tapped into the EV charging ventures which include prominent start-ups such as Starvo, and EVCuzz. The industry players have different background thus adapting different strategy for developing EV public charging stations (as shown below). Additionally, with the 10 business schemes introduced by MEMR Ordinance PerMen No/13/2020, the government needs to examine the business players' preference into the industry through supportive incentives and subsidy in order to grow the healthy competition to the business.

Fig. 3. Strategy categorization of EV charging players in Indonesia

VI. CONCLUSION

The EV charging infrastructure is key component factor in ensuring growing EV industry transition in the future. With regard to the policy evaluation by Stern and Smith, the research examined the missing key indicators' essence within Perpres No/55/2019 and PerMen No/13/2020 to understand the gaps to improving the regulation in answering the infrastructure goal. Moreover, benchmarks have been synthesized in understanding the differences and innovations from other countries with more mature EV adoption stage in order to capture lessons learned and success story (as shown in the table below).

Table 3 - Benchmark of Policy & Strategy Comparison

EV Charging and EV Adoption Strategy	Implementing countries (*)
Government incentives for taxes in EV charging stations, road, and other infrastructure	
Roadmap for increasing electric vehicle production and transition	
Roadmap for EV charging infrastructure	
Single autonomically and inclusive body which leads EV charging infrastructure	
Integration of utility company to specify grid control and smart grid system implementation	
Business schemes for EV charging station to ensure scope of roles and responsibilities	
Clear EV charging technology specification, adopted models, standards, and system as acknowledged by the country	
Rules and sanctions for misconducts in business practice of EV public charging station	
Government's demand-pulling and technology-push strategy to solve the 'chicken-and-egg' dilemma of EV charging station	

In summary, the following recommendations are proposed for implementation in fulfilling the identified gaps through policy evaluation, benchmarks, and conditional analysis through Porter's Diamond model.

Furthermore, implementation plan shall be evaluated based on the recommendation's priority mapping on ease of implementation and duration factors in order to capture the best outlook for the EV charging infrastructure development in Indonesia.

1. EV Charging infrastructure development needs to be led, overlooked, and monitored by single autonomically regulatory body which has government support, inclusiveness, accountability and best-practice and expertise in adhering to the latest technological approach to ensure development in industry.

2. The regulatory body shall act as a forum of communication for all stakeholders (state-owned enterprises, private EV charging stations, EV charging machine OEM, automakers, software developers, and EV users' community) to address situation on the progressing EV charging development to ensure prevention on any misconducts, maintain regulation effectiveness and sustainable business practice.

3. Clear Roadmap on EV infrastructure (include charging station, battery swapping, battery waste management system, and many more), which shall include clear timeline, involved stakeholders, and implementation action program required.

4. Active demand-pulling and technology-push from the government by prioritizing infrastructure (EV charging station) development which will influence the rise of EV adoption in Indonesia. While the demand in EV will continue to rise, the infrastructure readiness needs to be placed as priority for the government to ensure market fulfilment.

5. Maintaining the healthy competition landmark for EV charging business in Indonesia. As depicted in Chapter 3, the varying EV charger industry players in Indonesia bring innovations and advancement which are crucial for the EV industry – therefore the government's (and autonomically regulatory body) roles are to ensure safe and fair business practice to boost uniform growth across players.

6. Continuing improvement while bringing cost leadership, government needs to support research and continued development to adopt EV charger technology which can be manufactured in Indonesia. Through BPPT, R&D will lead to bring local innovations which will drive growth of the business.

7. The identified ten business schemes as coordinate in Ordinance PerMen No.13, 2020 have been useful to segregate roles and scope of responsibility. Further analysis in Chapter 3 has summarized the rationale process of each business scheme implementation to each player under certain condition. Access to land, technology and knowledge must be secured and prioritized to all EV charging players by the regulatory body and the government to ensure business growth and leaderships from all different business models.

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