International Journal of Engineering & Technology, 7 (3.25) (2018) 531-537

International Journal of Engineering & Technology

Website: www.sciencepubco.com/index.php/IJET

Research paper

Government Measures to Promote New Retrofitting Business and Financing Option in Indonesia

Ismiriati Nasip[1]*, Eka Sudarmaji[2]

[1]Bina Nusantara University
[2]University of Pancasila
**Corresponding author E-mail: ismiriati.nasip@binus.ac.id*

Abstract

The aim of this study is to investigate current government measures to encourage Building Energy Efficiency ("BEE") development in Indonesia. This study compiles and analyzes business models and financing options for retrofitting financing of BEE in Indonesia: establishing a framework for a critical comparative study, compare and assess the BEE government measures availability, and survey the customers' expectation of BEE measures. This study looks at the favorable measures that the Indonesian Government could take, and triangulate the findings of the comparative study and questionnaire survey to develop recommendations for BEE measures in Indonesia. It was found that the lack of economic incentives, diverse business models, and limited financing options might be the most prominent problems of the BEE promotion at the current stage in Indonesia. Un-consolidated policy among legislations is hampering the efforts of any BEE promotion. Tax incentives are likely to be more viable and efficient option for most of the Indonesian company, as well as active government interventions to promote BEE development. Illustrating the findings and regulatory analyses, as well as in-depth interviews with business representatives, this study identified several types of business models and some favorable financing option.

Keywords: *Building Energy Efficiency, Government Measures, Retrofitting.*

1. Introduction

This Indonesia is one of the developing countries that has grown above the average of other developing countries for more than a few decades, with large populations and vast areas [1]–[3]. Rapid economic growth requires substantial infrastructure to sustain the movement of economic machinery within it. The required infrastructure growth also requires massive energy investment. However, the need for energy is always an obstacle for many governments, especially Indonesia [4]–[6], and the enormous energy demand due to the increasing activities and the increasing number of customers to date has become an ongoing problem [7]–[9].

There are huge untapped opportunities for energy efficiency in many sectors in Indonesia, such as transportation sector, industrial sector, commercial building sectors, household sectors and many others [2], [3]. The untapped opportunities within the BEE sector may be tapped by stipulating some government measures such as disclosure, building rating and data collection [2], [8]. This measure can stimulate and help building owners understand current energy consumption, helps financial institution for better understanding in the risks and opportunity, as well as to provide insights for future policy making [10], [11]. Providing a robust, reliable, and informative disclosure of current BEE developments is crucial: achieving this may require the availability of database BEE disclosure and their rating that is updated real-time [10]. The government also can spur the adoption of the BEE disclosure and building rating through an incentive by using tax structure as a sweetener for the company to enter the BEE program and encouraging more larger scale projects [10].

Despite the abundance of opportunity, retrofitting as defined as the substitution of a conventional system with an improved system without the entire disposal of the old equipment (Hejazi, Ramanathan, & Jaffar, 2016; Oberman et al., 2012) is still rare in Indonesia, as is the case with other countries. As an example, a study conducted by The Rockefeller Foundation on 2012 provided an estimate of the potential savings of BEE developments in the US alone at billions of USD, however, only a small percentage of this potential can be achieved [16], [17]. A similar example can be found in a study by [18]: in the UK, the rate of retrofitting existing buildings is less than 1% of the building stocks.

Regardless of the growing importance of energy efficiency, many stakeholders remain deterred from investing in BEE developments due to several market barriers [19], [20]. The main factor that deters investment is the gap between investor/customer's expectation and the current technical limitations on BEE developments in Indonesia [21], [22]. Investors expect to obtain a relatively accurate and precise estimate on the actual energy savings that can be achieved through retrofitting to be able to confidently invest, but current technical limitations, and perhaps lack of experience on major projects in Indonesia is preventing accurate and precise estimates to be obtained. The customer behavior and other factors that are out of the control of the provider can undermine the energy efficiency savings performance, and thus the provider's incentives payment could be distressed [5], [6]. There were a few recorded cases where a possible improvement in average availability in the equipment is enough to motivate stakeholders to conduct a retrofit [23]–[25]. This situation is unideal as the main driver in retrofitting projects should be the energy-saving potential. In essence, accurate and precise estimates on capital costs, potential energy savings, and split incentives' payment may be considered

as critical decisions for customers and providers of current BEE developments.

In an attempt to gain a deeper understand the barriers in promoting BEE developments that were mentioned previously, this study investigates current government measures in Indonesia that encourage BEE developments in the country. This study also compiles and analyze business models and financing options that are available for retrofitting financing, specifically for BEE developments in Indonesia. By establishing a framework for a critical comparative study, assessing the BEE government measures availability, and surveying customers' expectation of BEE measures, this study aims to find favorable measures that the Indonesian Government could take, and triangulate the findings of the comparative study and questionnaire survey to develop recommendations for government measures specific for BEE development in Indonesia.

2. Literature Review

2.1. Market Barriers

Marker barrier, within the BEE industry, refers to the existence of the 'efficiency gap': the efficiency gap (a.k.a. the energy paradox) is a situation where projects with proven cost-effective energy saving potential are not utilized by consumers and business with unexplained reasons. This missing explanation has triggered debates in the literature: comparing different possible conceptualizations of the problem using different economic theories (Brown & Conover, 2009; Dobbs et al., 2013; Gerarden, Newell, & Stavins, 2015; O'Malley et al., 2003; Schleich & Gruber, 2008). Gerarden et al. (2015), tried to solve & understand the energy paradox through two framework analyses, which are; 1) exploring the energy-efficiency gap itself: market failures, behavioral anomalies, and model-measurement errors, and 2) elements of cost-minimizing energy-efficiency decisions. Previous academic debates have reached an agreement on an on what needs to be done in order to overcome the energy paradox. However, there still seemed to be a lot of disagreement over the size and importance of the efficiency gap problem, and the most optimal policies one should adopt to solve the problem [20], [29], [30]. The engineering-based method that was used by Gerarden et al. (2015) was not sufficient to explain the efficiency gap as it neglects the behavioral and economic aspects of the problem.

In the perspective of neoclassic economics, BEE market is perceived as a coordination of information among participants [31], meanwhile, the energy-efficiency innovation in the BEE market's function views as the information coordination and resources allocation for the production and distribution of the energy efficiency idea [32]. Thus, government intervention for the market failure approach in this energy-efficient innovation practices is necessary for which competitive markets failed to perform [33]. The neoclassic economic theory has explained the market failures that hinder the efficient functioning of a market [34]. According to neoclassic economic theory, there are 2 distinct market barriers: 1) market failure, 2) non-market-failure [20]. However, [6] argues that neoclassic market barriers failed to explain the energy efficiency gap that is observed within the BEE industry, and there are missing factors that were not investigated yet. They instead proposed that the term market barrier should be used to refer the missing factors that caused the energy paradox.

O'Malley et al. (2003) suggested that non-economic theories such as transaction cost economics, psychology, decision theory, and behavioral economic/organization theory may be the missing factor that explains the energy efficiency gap. Furthermore, NAPEE (2008) also suggested non-market barriers that could be the missing factor needed to explain the efficiency gap, which is 1) invisibility: energy efficiency improvements are invisible, 2) lack of standardized documentation, 3) lack of third-party verified certification, 4) time lag between upgrades and home sale, and 5) failure to assign qualified appraisers.

Regulations with regards to the market development of retrofitting projects within the BEE industry in Indonesia have been developed through discussions and proper documentation. However, the implementation of these regulations is challenging [35]. Another possible factor to explain the energy efficiency is the lack of data collection and asset rating disclosure [35]. By promoting the importance of energy improvements, it is hoped that more financing options will be available to retrofit projects, and the savings potential of retrofitting projects within the BEE industry can be unlocked through market pricing signals (low energy homes are expensive) [23], [24].

A suggested first step to minimize market barriers within the BEE industry is to develop a standardized method for capturing data measures. This should allow a universal tool and scoring system to be developed. His newly developed standard should then be publicized to the BEE community [11]. The next step will be for stakeholders such as governments and associations to have an educate and engage to the market itself [23], [36].

If the market failures within the BEE industry is viewed from policymakers' point of view, the failures may be viewed as a result information imperfection within the industry itself. These information imperfections induce risks to projects within the BEE industry and may explain the energy paradox [1], [20], [34]. Out of many possible missing factors, the lack of effective financial schemes may be considered as a critical factor. With an effective financial scheme, proper support for projects will greatly accelerate projects within the BEE industry and help unlock the saving potential [8], [24]. There are new financing schemes that promote the retrofitting projects within the BEE industry [37]. However, the financing program was not perceived to be an effective scheme. The reason is that the scheme requires a long-term commitment, substantial financial resources, and human resources. Furthermore, in many of the schemes, a very complicated credit evaluation process is required [8], [23]

2.2. Disclosure, Building Ratings, and Data Collection

As was previously discussed, data collection is crucial for BEE projects. In particular, the collected data are used for: home energy modeling, calculating financial payback, estimating utility cost recovery, policy implementation, applying for grants, evaluating a cost-effective public investment, and conducting a valuation of the BEE market as a whole [35]. Obtaining an accurate building rating are important for policymakers to be able to develop effective policies. Mandating data disclosure for projects are important to ensure that these data are available for policymakers [10], [36]. The energy building performance directive, disclosure, and building rating are some of the effective steps that can be taken by the Indonesian government to help promote BEE development. It is asserted that aggressive and expansive programs will be necessary to allow Indonesia to unlock the saving potential at a reasonable pace. The programs, if implemented, will also fill gaps on energy demands, increase energy efficiency, encourage retrofitting projects, reduces overall energy consumption, and reduces greenhouse gas emissions [22], [38].

The proposed disclosure mandate and data collection alongside other possible incentives and regulations can build the information that is required o spur the demand of BEE projects [39], [40]. An important key point to streamline the disclosure mandate is to properly inform consumers themselves on their current energy costs and the savings potential that can be achieved [36]. BEE developments considered to be novel solutions to improving energy efficiency in buildings, it is hoped that if the suggested actions were taken properly, new financing schemes would ease new projects to take place. Eventually, if BEE project performed well, an energy-efficient culture can be established [18].

Data collection on building performance should help government set up an energy efficiency baseline. This makes tracking the

overall progress of BEE projects easy. Being able to track progress will also allow trends in energy efficiency projects to be identified. Furthermore, data collection also allows for reasonable collective performance goals to be set. Standardized incentives program to be developed, and will keep policymakers well-informed in making future policies [29]. The databased that has been build could also be used as a prospecting tool to help financial institutions understand the risks and opportunities within the BEE sector. Providing information to the financial institution could also potentially promote investment into the BEE sector [41]. In practice, mandatory disclosure program has been implemented by Australia, EU countries, USA, China, New York City, and Japan. These programs demonstrated that effective policies and incentive disclosure programs are effective at reducing market barriers within the BEE sector [42].

There are several key lessons learned that has to be available to policymakers of BEE rating policies [43]. According to them, the BEE rating policies may benefit consumers, property owners, companies within utility industry, the public and government: 1) The information barriers solved - mandatory disclosure gives all participants a complete information on a building's performance; 2) It protects consumers - the energy performance disclosure gives consumers the appropriate tools to make decision; 3) It spurs participation in the energy efficiency programs - the new financing retrofitting can also leverage the information; 4) It creates a sustained market for audits and retrofits; and 5) It provides a feedback loop in the process of new building design [43].

The benefits of having access to high-quality data of building stocks within the building sector in Indonesia is that the government would have the necessary information to develop better policies and incentives program [11], [44]. These incentives (i.e. tax deductions can be implemented to encourage market transformation through long-term government commitment [42]. For example, the US has a federal tax credit for BEE projects such as the tax credit/incentive for energy efficiency investments [16]. However, there is a situation where these tax incentives can have major downsides, most commonly because there are many variables associated with reclaiming the taxes. Another example of tax incentives is the UK, there, 20% VAT is applied to retrofit projects, except for retrofit projects on new green buildings. China implemented 3 types of incentives for energy service companies on 2012: 1) abolishment of firm tax, 2) abolishment of value added tax, 3) interest subsidies [45].

3. Methodology

Adhering to the principles of Grounded Theory methodology, this study was conducted by analyzing the documents as secondary data, which is in the form of news, trade journals, business journals, government publications, laws, regulation, and press releases. A series of semi-structured questionnaire and interviews were conducted with owners and managers who manage daily operation and are directly involved with the activities and operations within BEE projects. Interviewing allows direct information to be obtained from company owners, corporate executives and general managers. This study aims to provide an insight into barriers to energy efficiency paradox, a methodology and quantifying the size of the main barrier to energy efficiency: Indonesia policy failure rationales in energy efficiency.

The proposed framework is shown in Figure 1 below, where the status of government measures for BEE developments in the USA, UK, and Spain, the policies and practices on BEE in those countries is reviewed and compared with current Indonesia's policies and implementation. The current model on BEE and retrofit development in the USA, UK, and Spain were used to identify the same target in the market's response to their current policies and practices against their target customers. The barriers of BEE implementation in Indonesia was reviewed and some recommendation from APEC countries and several ESCO companies in Indonesia was studied and reviewed. Then, recommendations on the government measures that the Indonesian government can adopt were formulated.

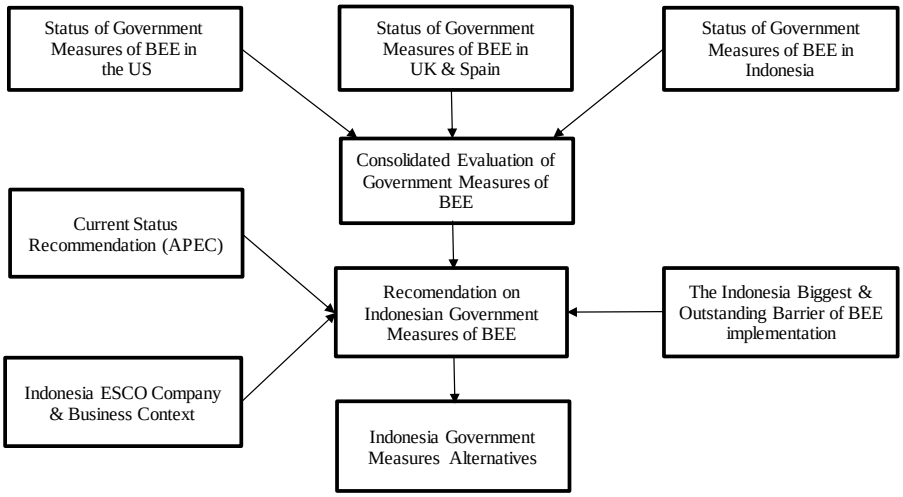

Figure 1: Methodology Framework

The main objective of this study is to provide information to the Indonesian government, researchers, and company' decision-makers who are concerned with energy efficiency regarding 1) current energy efficiency barriers, 2) new alternatives of Indonesian government measures on energy efficiency. Hence, this study assessed the validity of the cost-effective retrofitting projects within the BEE sector and the state of the new financing option schemes for investment in cost-effective energy opportunities.

Below are the propositions made as part of the conceptual framework of the study and is a key aspect that influences the design of this study.

Proposition 1: Market barriers (see chapter 1) are impeding the BEE retrofitting in Indonesia, the low acceptance among building owners in various industrial and commercial sectors in Indonesia may be partly explained by the energy paradox.

Proposition 2: Current government measures are not sufficiently aggressive nor expansive to encourage significant BEE development in Indonesia. Suitable economic and financial incentives will encourage the BEE customers to start investing in and be involved with current and future BEE retrofitting development.

4. Findings

4.1. BEE Industry in Indonesia

Some of the current major barriers in promoting BEE developments in Indonesia are the lack of economic incentives, overdiverse business models, limited financing options, and unconsolidated policy for relatively novel projects within the BEE sector. One of the financing schemes that could support BEE promotion is by retrofitting financing, which is technically feasible and economically viable [3].

Retrofitting financing is a promising investment mechanism. However, this business model does not have adequate support policy to be effective. Under Rencana Induk Konservasi Energi Nasional ("RIKEN") energy conservation target, the Indonesian government has set an energy conservation target for the industry and commercial sector. RIKEN estimates that 46% of Indonesia's energy usage can be cost-effectively reduced by 10-30%. These energy savings could generate an attractive return on investment for BEE projects, energy security, job creation, and might also create commercial or industry sectors improvement. Unfortunately, the implementation of RIKEN was not effective. A suggested reason for the ineffectiveness might be because the program did not include an adequately effective financing program, a strong policy, nor a nationwide education program [7], [8].

The Indonesian government's inability to implement and enforce the disclosure mandate and the lack of a standardized efficiency rating are the main problems of promoting BEE project. Other problem includes the unavailability of crucial components to the program's success such as a database on the BEE benchmark and disclosure policy, improper adoption, and implementation, lack of training and guidance, ineffective enforcement mechanisms, unavailability of release report, or other possible missing analysis of energy usage data. Moreover, current government measures and customer responses to retrofitting project is not optimal. This is because the retrofit business models and government measures might not satisfy the key stakeholders' interests. Current government measures might also be ineffective in reducing the mentioned problems and stimulate the new financial mechanism for retrofitting as one of the sweeteners to spurs the retrofitting to the whole system of energy conservatism in Indonesia.

There are several economic benefits from retrofitting BEE, which are: 1) six components that improve efficiency on the building's usage of electricity: efficient lighting, air-conditioner, usage/energy management, new efficient appliances, insulation & fittings/windows, and 2) three components that able to generate onsite power; solar thermal, co-generation & micro-generation. The BEE project is complicated because there are many stakeholders with different interest involved in a single project. In order for a project to be conducted, all stakeholder's interest needs to align. This is hard to achieve as often, stakeholders have differing interest in mind.

4.2. Indonesia Energy Efficiency Status

The Ministry of Energy and Mineral Resources is responsible for governing the Indonesian energy sector. Other ministries and agencies that handle policies regarding energy efficiencies include the Ministry of Finance, the National Development Planning Agency (BAPPENAS), the Ministry of State-Owned Enterprises, the Ministry of Environment and Forestry, Ministry of Trade and Ministry of Industry (MoI).

The Indonesian government has issued Regulation No. 28/2002 and developed the Indonesian National Standard (SNI) to cover regulations and standards for the commercial building sector. After the Government Law No. 32/2004 was issued, local governments are now more involved in BEE administration processes. Another regulation, DKI Jakarta's Governor No. 38/2012 was issued to regulate activities associated with green building such as energy efficiencies water usage efficiencies, indoor air quality, waste and soil treatment, and construction activities. The national standard SNI number of SNI 03-6197-2011 regulates the energy efficiency, energy conservation, and lighting system in commercial buildings.

To spur the implementation of energy efficiency within the industrial sectors, the Indonesian government has issued various incentives and disincentives policy No. 70 (2009) for any industrial activity that utilizes 6000 TOE (a ton of oil equivalent) units of energy or higher. The incentives comprise of tax facilities, reduction in provincial tax alleviation, customs facilities, and low-interest rate loans. The disincentives comprise of warning, negative media coverage, fines, and reduction of energy supply access to any companies that do not implement the energy conservation program.

The most recent regulation that the Indonesian government has issued is Regulation No. No: 22/2017 (p.48). The regulation contains the energy efficiency scenario. The scenario estimates that by 2050, energy demand in Indonesia could be reduced to 251 million TOE unit of energy. This is a 17% reduction as compared to the estimated energy demand in a BAU (business as usual) scenario. This saving is equivalent to 36% of the total energy consumption (within the building sector) in 2014. In 2050 the energy saving expected to reach 397 million TOE or 38% compared to in BAU scenario. At high-efficiency scenario, the total energy saving is expected to reach 25% in 2025 and 48% in 2050 or equivalent to 397 million TOE of saving in 2025 and 506 million TOE of saving in 2050.

The Indonesian Directorate General of New Renewable Energy and Energy Conservation (EBTKE), under the Ministry of Energy and Mineral Resources, has been issued the Rencana Induk Konservasi Energi Nasional (RIKEN) program. RIKEN aims to acts a guide for government, the provincial government, district/city government, employers and communities across sectors in implementing national energy conservation activities on the supply side of energy, exploitation of energy, and utilization of energy. The RIKEN program is to be implemented in the period of 2015-2025. RIKEN estimated 15-30% energy savings in the industrial sector, 25% in the commercial buildings sector, and 10-30% in the household sector can be achieved by end of the program. The expected saving for each sector is 17% for the industrial sector, 15% for the commercial sector, 20% for the transportation sector, and 15% for the household sector by 2025.

4.3. Overview of Existing BEE Retrofit Model

Climate & Strategy Partners in 2010 found that national consolidation policies are one of the most crucial groups of policies that affects many different business models and retrofitting financing options for companies, institutions, or organizations alike. In the absence of national consolidation policies, retrofitting projects within the BEE sector are unlikely to meet targets. Although governmental measures of the countries considered vary, one can identify the same policy typology/theme among the measures [39], [40], [45]. The measures implemented by the governments to improve BEE developments include direct economic incentives, such as subsidies/grants to reduce upfront investment costs, soft loans, and indirect fiscal incentives, such as tax credits [39], [40], [45]. Direct economic incentives are more commonly provided by the national banking systems rather than the national budget [46]. While indirect fiscal incentives are commonly provided in the form of tax deduction.

As shown on the Tabel 1, Indonesia is still in the early step of BEE development compare to other developed counties. Once the BEE industry grows and matures, it is expected that competition, and developments within the industry will flourish. This will allow measures concerning the BEE sector to be adoptedWith much less effort. The situation may be different in Indonesia, where the industry is young, developments are rare.

Table 1: Comparison of BEE's Business Model

Energy Performance Model / Business Model	Definition	Target Market Segment	Market Penetration	Initial Investment Paid By	Limiting Factor	Investment Performance Responsibility	Regulatory Support			
							US	U.K.	Spain	Indonesia
Utility Fixed Repayment Model (PACE & OBF/OBF)	Energy efficiency building retrofit financed by a utility and paid for through fixed monthly payments.	Residential Commercial and Industrial	Low	Utility or Government	Regulations	No One	1/2 Support 	1/2 Support 	Not Support 	Not Support 
Energy Performance Model (ESA/ESPC)	Energy Service Company (ESCO) finances the energy efficiency retrofit and is paid back from energy bill savings.	Municipal, University, School & Hotel (MUSH); Commercial and Industrial	High for Municipal, University, School & Hotel (MUSH): Low for Commercial and Industrial	Energy Service Provider	Energy Service Provider Balance Sheet	Energy Service Provider	1/2 Support 	1/4 Support 	1/4 Support 	Not Support 

To counteract this, the Indonesian government may need to re-evaluate the cost-effectiveness of the current measures in place and ensure proper consolidation with all other national institutions before setting up a national policy package. In terms of economic efficiency, it is crucial to minimize the costs of the national policy package. This can be achieved by combining the costs of different policy measures from other institution.

The findings of the case studies provide new insights into the factors that hamper building owners to adopt and proceed with the BEE retrofits project for energy efficiency. The results showed that most implementation of retrofit project[47], [48]s are cost-effective. The benefits of energy savings are the main factor within their consideration. The split incentive problem is the main discouraging factor that hampers building owners to proceed with a BEE project. Having access to a complete database o current retrofitting practices in Indonesia could help with encouraging more building owners to proceed with BEE projects. Other barriers such as the enactment of new accounting standards IFRS-16 or PSAK-73 together with a new threat on tax disputes are not the main concern [47], [48].

Considering many factors that affect retrofit projects within the BEE sector, these factors can be classified as technological and administrative factors. Both technological and administrative actors suggested and analyzed in this case study are supported by other work in the literature. This significantly increases the importance of the suggestion made by this study. Some of the participants of this study were convinced o adopt the suggestions and proceed with Bee retrofit projects. Therefore, this study confirms that "*Proposition 1: Market barriers are impeding the BEE retrofitting in Indonesia, the low acceptance among building owners in various industrial and commercial sectors in Indonesia may be partly explained by the energy paradox",* is correct.

4.4. The Policy Failure Rationales in Energy Efficiency

There are 3 different rationales that can be adopted to explain why some energy efficiency policies fail. First, the energy efficiency market does not affect the social distribution of wealth and/or income. Most companies are eager to maximize their economic utilities but are often hindered by imperfections in the market [49], [50]. Government measures are able to reduce these market failures. Secondly, the transaction costs on the investments in energy efficiency. Lastly, government measures need to help new companies enter the BEE sector. The notion of a market failure rationale is usually supported by the existence of operational coordination failures, hence, in government policy point of view, market failure has important implications for the whole operation.

The Energy efficiency industry developments approach needs to go further, three levels of energy efficiency policy from the government to encourage the adoption of the energy efficiency. The three policies consist of micro policy, meso policy and macro policy framework as the basis for the analysis of the market failure and the policy failure rationales in energy efficiency in Indonesia [51]. Indonesian Government measures recorded on 1) micro-level with regard to "individual"; motivation, business training, technical skills training, management training, internships, mentoring, marketing skills, exposure, seminars, socialization, communication forums and exhibition, 2) macro-level concerning the increase of "the number of companies" which adopted the program; energy efficiency disincentives/incentives, energy efficiency education, green products culture, energy efficiency infrastructure, and training for trainers. There is no government policy at the meso level widely explored as an incentive for the company, incentives for actors who adopt the appropriate energy efficiency technology.

Policies to provide incentives for projects in the BEE sectors at meso level might be possible. These projects are especially effective in overcoming the energy gap and increasing growth in the number of companies within BEE that enter the program. Theoretical models and design are great tools to help encourage companies within the BEE sector to look beyond the energy paradox.

The results showed that both economic and financial incentives are necessary. Retrofitting projects within the BEE sector is beneficial as it improves the country's economy by forming a new labor market, creating a new business that provides additional tax revenue. The retrofit project will also reduce carbon emissions and reduce the barriers to the availability of energy that hinders many industries in Indonesia. Therefore, this study confirms that the "*Proposition 2: Current government measures are not sufficiently aggressive nor expansive to encourage significant BEE development in Indonesia. Suitable economic and financial incentives will encourage the BEE customers to start investing in and be involved with current and future BEE retrofitting development*", is correct.

5. Conclusion

This study helps to understand how the government measures in the BEE development; understand the nature of the retrofitting development and the consequences; its business model, a value of the investment, and funding option issues surrounded. The retrofitting in Indonesia is technically feasible and economically viable. New technologies could increase energy efficiency and energy saving, where some of the technologies needed for the retrofitting are already available in the. However, the acceptance among the building owners varies across the industrial and commercial sectors in Indonesia is still small, it is due to the lack of awareness about the savings potential of the best available technologies. Hence, the retrofitting remains an anomaly same as it is found in many countries.

Indonesia requires a comprehensive set of government policy to spurs energy efficiency industry and avoid the "energy gap". By setting up the Indonesia Energy Performance of Buildings Directive, the policymakers are able to develop the best requirements for energy efficiency measurement and disclose the energy performance. Indonesia has to be able to learn and share the best practices and new ideas on rating and disclosure mandates in the developed countries. The biggest mission for Indonesian policymakers is to determine the most effective measurements on the building performance and disclosing that information to the marketplace.

The main obstacle lies in government measures for establishing clear market participants to step-in and supports the demand side on energy efficiency. The current government measures and customer response were not optimal – given the huge economic benefit from the opportunity. This is because the retrofit business models and government measures do not satisfy the key stakeholders' interests. The government measures also unable to reduce the problems, and stimulate the new financial mechanism for retrofitting as one of the sweeteners to spurs the retrofitting to the whole system of energy conservatism in Indonesia.

The energy building performance directive, disclosure, and building rating are the most important things to be done by the Indonesian government for having a good energy efficiency program. The aggressive and expansive programs are necessary to be able to catch-up the other countries as well as filling the gap on energy demands, valuing energy efficiency, encouraging retrofit, reducing energy consumption, and greenhouse gas emissions. The government disclosure target, efficiency rating systems, and data collection can build the information needed to spur demand side of building energy efficiency together with incentives and regulations. The measures to improve BEE are included economic incentives (directly), such as subsidies/grants by reducing upfront investment costs, soft loans, and fiscal incentives (indirectly), such as tax credits.

Limitation of this study did not discuss any behavior individual conceived of as boundedly rational with non-financial motives, a variety of social influences and behavior organization conceived of as social systems influenced by goals, routines, culture, power structures etc. In Indonesia, the company's ability to reduce energy and use green products has not been awarded, and can be compensated commercially, and can be reported as gains in the company's reputation and its balance sheet accounts. BEE development can create a business-room for Indonesian companies for what policy will benefit economically to the other supported industries such as leasing industries, green-technology business, and other related industries. Therefore, authors believe, there are so many factors that are not included in this study, especially the possibility of a lot of things that are specific to the presence or absence of favorable incentives to the BEE development, or whether there is any aspect of compliance in following the usage of public funds, local administration involvement, association of businesses, and tax structure that authors cannot find (hidden), and cannot count or describe quantitatively.

Acknowledgement

This is a text of acknowledgements. Do not forget people who have assisted you on your work. Do not exaggerate with thanks. If your work has been paid by a Grant, mention the Grant name and number here.

References

[1] ReEx Capital Asia, "South East Asia Energy Efficiency Market Report 2011." 2011.

[2] R. Oberman, R. Dobbs, A. Budiman, F. Thompson, and M. Rosse, "The archipelago economy: Unleashing Indonesia's potential," no. September. pp. 7–65, 2012.

[3] ASEA Brown Boveri, "Indonesia Energy Efficiency Report," *Country Report*, no. March. pp. 1–6, 2013.

[4] Asia-Pacific Economic Cooperation, "Peer Review on Energy Efficiency in Indonesia," *Report for the APEC Energy Working Group*. 2012.

[5] W. H. Golove and J. H. Eto, "Market Barriers to Energy Efficiency : A Critical Reappraisal of the Rationale for Public Policies to Promote Energy Efficiency," *Energy Environ.*, vol. 26, no. March, 1996.

[6] A. B. Jaffe and R. N. Stavins, "The energy-efficiency gap - What does it mean?," *Energy Policy*, no. October, 1994.

[7] J. Respati, "Indonesian Market Potentials for Energy Efficient Buildings," 2016.

[8] L. S. Eang, "A Review of Building Energy Efficiency Development in Indonesia," no. January, 2015.

[9] PT Perusahaan Listrik Negara (Persero), "Rencana Usaha Penyediaan Tenaga Listrik (RUPTL) 2015 - 2024." 2014.

[10] S. Nadel, J. Amann, S. Hayes, S. Bin, R. Young, E. Mackres, H. Misuriello, and S. Watson, "An Introduction to U.S. Policies to Improve Building Efficiency," *American Council for an Energy-Efficiency Economy*, no. 202. 2013.

[11] IPEEC, "Building Energy Rating Schemes: Assessing Issues and Impacts," *Building Energy Efficiency Taskgroup*, no. February. 2014.

[12] N. I. Husin, A. C. Ahmad, A. M. A. Wahid, and S. N. Kamaruzzaman, "Energy Efficiency Criteria for Green Highway," *Soc. Sci. Humanit.*, vol. 25, pp. 119–128, 2017.

[13] J. A. McWilliams and I. S. Walker, "Home Energy Article : A Systems Approach to Retrofitting Residential HVAC Systems," *Lawrence Berkeley Natl. Lab.*, 2005.

[14] F. A. Hejazi, R. A. Ramanathan, and M. S. Jaffar, "Seismic Response of a Light Rail Transit Station Equipped with Braced Viscous Damper," *Sci. Technol.*, vol. 24, no. 2, pp. 273–283, 2016.

[15] The Rockefeller Foundation, "United States Building Energy Efficiency Retrofits: Market Sizing and Financing Models." 2012.

[16] NAPEE, "Vision for 2025: A Framework for Change - A Resource of The National Action Plan For Energy Efficiency," *Natl. Action Plan Energy Effic.*, no. November, 2008.

[17] R. Dobbs, H. Pohl, D.-Y. Lin, J. Mischke, N. Garemo, J. Hexter, S. Martzinger, R. Palter, and R. Nanavatty, "Infrastructure productivity: How to save $1 trillion a year," no. January. p. 100, 2013.

[18] World Economic Forum, "A Profitable and Resource Efficient Future : Catalysing Retrofit Finance and Investing in Commercial Real Estate," *Finance*, no. October, p. 64, 2011.

[19] F. Zed, "Indonesia Energy Efficiency and Conservation Status, Gaps and Opportunities," 2015.

[20] E. O'Malley, S. Scott, and S. Sorrell, "The Economics of Energy Efficiency : Barriers to Cost-Effective Investment," in *Policy Research Series*, 2003, pp. 50–52.

[21] P. Tharakan, "Summary of Indonesia's Energy Sector Assessment," *ADB Papers on Indonesia*, no. 9. 2015.

[22] N. Adiwoso, "Towards Indonesia's Sustainable Future Through Sustainable Building and Construction," in *SB10SE*, 2010.

[23] G. Leventis, E. M. Fadrhonc, C. Kramer, and C. Goldman, *Current Practices in Efficiency Financing : An Overview for State and Local Governments*, no. November. 2016.

[24] WSGR, "Innovations and Opportunities in Energy Efficiency Finance," no. May, p. 12, 2012.

[25] H. L. F. De Groot, E. T. Verhoef, and P. Nijkamp, "Energy Saving by Firms: Decision-Making, Barriers and Policies," *Energy Econ.*, vol. 23, no. 6, pp. 717–740, 1999.

[26] M. H. Brown and B. Conover, "Recent Innovations in Financing for Clean Energy," *Southwest Energy Effic. Proj.*, no. October, 2009.

[27] T. D. Gerarden, R. G. Newell, and R. N. Stavins, "Assessing the Energy-Efficiency Gap," *Natl. Bur. Econ. Res. Work. Pap. Ser.*, no. January, pp. 1–74, 2015.

[28] J. Schleich and E. Gruber, "Beyond case studies : Barriers to energy efficiency in commerce and the services sector," *Energy Econ.*, vol. 30, pp. 449–464, 2008.

[29] J. a S. Laitner, S. Nadel, R. N. Elliott, H. Sachs, and a S. Khan, "The Long-Term Energy Efficiency Potential : What the Evidence Suggests," *Energy Effic. Econ.*, no. January, pp. 1–88, 2012.

[30] F. P. Torgal, C. Buratti, S. Kalaiselvam, C.-G. Grangvist, and G. V. Ivanov, *Nano and Biotech Based Materials for Energy Building Efficiency*. 2016.

[31] J. Potts, "Knowledge and Markets," *J. Evol. Econ.*, vol. 11, pp. 413–431, 2001.

[32] J. Sengupta, "Understanding economic growth: Modern theory and experience," *Sci. Bus. Media*, pp. 1–120, 2011.

[33] M. A. Brown, "Market Failures and Barriers as A Basis for Clean Energy Policies," *Energy Policy*, vol. 29, pp. 1197–1207, 2001.

[34] R. J. Sutherland, "International Association for Energy Economics," *Energy J.*, vol. 12, no. 3, pp. 39–66, 1991.

[35] C. Adams, "Valuing Energy Efficiency in the Real Estate Community," pp. 13–24, 2012.

[36] A. Burr, C. Majersik, and N. Zigelbaum, "The Future of Building Energy Rating and Disclosure Mandates: What Europe Can Learn From the United States," 2016.

[37] Climate & Strategy Partners, "Financing Energy Efficiency

Building Retrofits - International Policy and Business Model Review and Regulatory Alternatives for Spain." pp. 1–68, 2010.
[38] N. Anastasia, "The Way to Encourage Green Building in Indonesia," 2013, no. June, pp. 1–14.
[39] W. D. Chen, "Policy failure or success? Detecting market failure in China's housing market," *Econ. Model.*, vol. 56, pp. 109–121, 2016.
[40] Q. K. Qian and E. H. W. Chan, "Government measures needed to promote building energy efficiency (BEE) in China," *Facilities*, vol. 28, no. 11/12, pp. 564–589, 2010.
[41] International Energy Agency, *Technology Roadmap Energy efficient building envelopes*. 2013.
[42] International Energy Agency, "The Experience With Energy Efficiency Policies and Programmes in IEA Countries - Learning from the Critics." 2005.
[43] A. Hill and P. Dunsky, "Building Energy Rating and Disclosure Policies Update and Lessons From the Field," no. February. 2013.
[44] M. Mendelsohn and C. Kreycik, "Federal and State Structures to Support Financing Utility-Scale Solar Projects and the Business Models Designed to Utilize Them." 2012.
[45] X. Wang, M. Lu, W. Mao, J. Ouyang, B. Zhou, and Y. Yang, "Improving benefit-cost analysis to overcome financing difficulties in promoting energy-efficient renovation of existing residential buildings in China," *Appl. Energy*, vol. 141, pp. 119–130, 2015.
[46] International Energy Agency, *World Energy Outlook 2013*. 2013.
[47] E. Sudarmaji, "Managing The Impacts of New Retrofit Financing in Energy Saving Agreement (ESA) as Off-Balance Sheet Practices in Indonesia," in *Konferensi Ilmiah kuntansi 4*, 2017, pp. 1–18.
[48] I. Nasip and E. Sudarmaji, "Managing Tax Dispute Due to IFRS-16 on The Retrofits Implementation in Indonesia," in *ASIA International Multidisciplinary Conference 2017*, 2017.
[49] A. C. Fisher and M. H. Rothkopf, "Market failure and energy policy - A rationale for selective conservation," *Energy Policy*, vol. 17, no. 4, pp. 397–406, 1989.
[50] T. L. Cherry, S. Kallbekken, and S. Kroll, "Accepting market failure: Cultural Worldviews and the Opposition to Corrective Environmental Policies," *J. Environ. Econ. Manage.*, vol. 85, pp. 193–204, 2017.
[51] I. Nasip and Y. D. Pradipto, "Informality Trap Policy Revisited: Framework for Policy Design in Indonesia," 2016.