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# CONSISTENCY OF THAILAND NATIONAL ENERGY PLAN AND STRATEGIC POLICY FOR ENERGY MANAGEMENT TOWARD SDG

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## ABSTRACT

**Objective:** The objective of this study is to a) compare the National Energy Plan (NEP) and Energy Strategy in a consistent manner. b) consistency of National Policy with statistical information from government agencies with the policies and concepts of stakeholders involved in national energy in relation to SDGs

**Theoretical Framework:** This qualitative research is conducted gathering literature, including directives from the National Energy Plan (NEP) and its stakeholders along the stream line to the building manager, to study the consistency of the NEP with comparative results from national statistics.

**Method:** By We are conducting a specific interview with a sample group of corporate energy executives, including policymakers, architects, engineers, and facility managers, as well as vendors from each category of energy materials.

**Results and Discussion:** According to the NEP, according to the COP 26 conference, the government set the policy for the energy sector in line with the NEP, aiming to reduce electricity purchasing from fossils and increase the efficiency of machinery. The Building Energy Code, (BEC) and Subsidization are determined, and other campaigns are prioritized. and the RE incentives are taken to promote in terms of taxonomy.

**Research Implications:** As a result of the interviews, no agency mentioned R&D on renewable energy technology relevant to the education field; it emphasized the need to support investment in new technology research and development projects to increase efficiency and reduce investment costs and ROI. The discussion represented the recent policies are in line with the results of reducing energy consumption in the business sector, then the policies should be continually supported.

**Keywords:** NZEB (Net Zero Energy Building), national energy plan, sustainable development goal (SDGs), energy management, strategic energy management, facility management.

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## 1 INTRODUCTION

The NZEB policy has become important from many points of view (Pantong, 2011), including to reduce the impact on the environment, especially the greenhouse effect. The NZEB will reduce numbers of carbon dioxide and other greenhouse gases emitted, which will help reduce global warming and the impact of climate change. Indirect benefit is to reduce costs. Although the NZEB may have a higher initial cost than a normal building, the long-term energy savings will reduce the cost of operation and maintenance. In addition, there is a by-product of promoting health and well-being.

Government agencies have jointly issued guidelines for building design. The design the use of safe and non-toxic construction materials, good ventilation, and natural light, all of which will have a positive effect on the health of those living and working in the building. In addition, it also increases the value of real estate and promotes sustainability. Environmentally friendly and energy-saving buildings tend to have higher values in the real estate market. Applying the NZEB policy as part of sustainable development in the current situation will help communities and cities grow and develop without destroying the environment or natural resources. The literatures in both locally and internationally, it was found that the design and management of building resources in the current world tends to use the NZEB policy (Hasan, 2015). Therefore, NZEB plays an important role in creating a sustainable future for both humans and the world in the long term.

The MoE, via the Energy Policy and Planning Office (EPPO), has prepared details of the NEP (Piti Anantapant et al., 2023) that are in line with the approach to achieving the goal of reducing net carbon dioxide emissions to zero (carbon

neutrality) by 2065-2070, which will have an impact on the direction of important energy development, consisting of Electricity by increasing the proportion of renewable energy and clean energy from new power plants, with a proportion of RE to be targeted not less than 50 percent.

## 2 THEORETICAL FRAMEWORK

The NEP is a significant tool to use as a roadmap to help set the direction for Thailand's energy policy to be driven towards goals and efficient energy development for sustainable economic and social development. The Energy Policy and Planning Office of the National Energy Policy Council (NEPC) has considered and approved the NEP framework, pushing for an increase in the proportion of renewable energy electricity production by 50%. By August 2021, the NEPC meeting lead by Prime Minister approved the NEP framework, which sets energy sector policies with the goals of supporting Thailand to move towards clean energy and reduce net carbon dioxide emissions by introducing modern energy management technologies and innovations. To increase the efficiency of energy management, restructuring the energy business to support the energy transition trend.

Therefore, the EGAT has assigned the MoE to take urgent actions as follows: a) Create a NEP under a policy framework that enables the energy sector to drive the economy to support the long-term transition to a neutral-carbon economy, covering energy drives in electricity, natural gas, fuel, renewable energy, and energy conservation (Chokchai Champeeruang et al., 2023). b) Consider increasing electricity production capacity from various forms of clean energy and reduce the proportion of electricity purchases from fossil fuels under PDP2018 over the next 10 years (2021-2030) as appropriate, such as adjusting the proportion of electricity production to include fossil fuels only as necessary and able to support an increase in the proportion of clean energy production in the long term, taking into account costs and technological advancements as important factors, in order to make the assessment and planning of the

country's power system security more accurate. c) Improve the infrastructure of the electricity transmission and distribution system to be flexible, efficient, and cover potential areas of various forms of renewable energy to support the amount of electricity production capacity from renewable energy in the future. And can respond to electricity production promptly without affecting national security. d) Release net carbon dioxide (carbon neutrality) by 2065-2070, or approximately 50 years from the year of initiation, and designate the MoE as the operator as a committee member. The essence of the research operation has been raised from the resolution of the National Energy Policy Committee (NEPC) in detail, designating the MoE, the Energy Regulatory Commission, and other relevant agencies to accelerate the relevant parts to drive the issues according to the national energy reform plan to achieve tangible results, including accelerating the study and determining clear guidelines, criteria, and operational plans to support the increasing demand for electricity from new industries and economic activities.

According to the Net Zero Energy Management approach, there are steps (Paul, 2006). In the first step, it is to focus on reducing energy consumption in buildings and start using renewable energy in buildings, such as installing PV on the rooftop and using other technologies such as studying the use of wind systems in parking lots, renewable energy sources to achieve the NZEB as targeted. The NZEB strategic management approach is one of the feasible approaches, Vian Ahmed (2024). To promote more energy-efficient buildings While the linkage of the SDGs is also considered to achieve sustainable development goals.

The sequence of energy management towards NZEB is separated into 3 steps: first, to reduce energy consumption in the area through low-energy generation technology using the fundamental energy management as consider natural daylighting, high-efficiency HVAC equipment, natural ventilation, evaporative cooling, etc. The second step is to self-supply options by using renewable energy sources available within the building, e.g., PV, solar hot water, and wind located on the building, then considering using renewable energy

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sources available in the area. (Self-production energy). The third step is using renewable energy sources available outside the building to produce energy for use on site, e.g., biomass, wood pellets, ethanol, or biodiesel that can be imported from off-site or waste from off-site processes and in-building electricity and heat generation, then considering purchasing off-site renewable energy sources, e.g., utility greenhouse gas emission credits or other "outside energy" purchasing options.

In this research, the researcher has applied specific on strategic No. 070203, the national strategy for "Creating growth on quality of life that is friendly to the environment, which is one of the country's strategic topics in Section No.7", which has important development goals to lead to the achievement of sustainable development goals in all dimensions, including social, economic, environmental, and governance dimensions.

Table 1

*The national strategy No.7 & its sub-goals focus on efficient energy*

| National Strategic Code | 07-0203 |
|---|---|
| Sub-goals under the National Strategy | The country's energy efficiency has increased. |
| Strategy Goal Under Code 07-02-03 | Development of infrastructure and intelligent energy management systems to lead to efficient energy production and use. |
| SDG in relation to the National Strategy | SDG 0703, SDG 0901 and SDG 1201<br>(0703) Addresses the need to double the rate of improvement in global energy efficiency by 2030.<br>(0901) Develop quality, reliable, sustainable and resilient infrastructure, including regional infrastructure, to support economic development and human well-being, and to be affordable and accessible.<br>(1201) Achieve the sustainable management and efficient use of natural resources by 2030. |
| Final energy intensity target | Final energy intensity reflects the efficiency of energy use in production to generate income.<br>((Unit : Final energy intensity, KToe)<br>In 2027, it must not exceed 6.85 thousand tons of crude oil equivalent/billion baht) |

| | |
|---|---|
| | And in 2032, it must not exceed 6.40 thousand tons of crude oil equivalent/billion baht<br>And in 2037, it must not exceed 5.89 thousand tons of crude oil equivalent/billion baht |

Source: NEP, National Economic and Social Development Board )2022(.

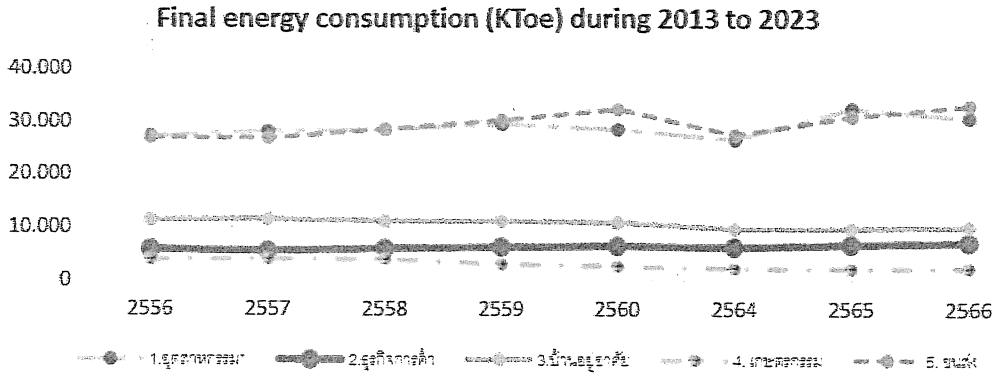
The Table 1 has shown the international linkage has linkage between the SDGs and NZEB with six interconnected dimensions as follows: 1) Clean Energy Dimension Linked to SDG 7: Affordable and Clean Energy NZEB focuses on high-efficiency energy use and renewable energy production, which reduces the use of energy from unclean and unsustainable sources. It also reduces energy use by designing and constructing buildings that can produce the same or more energy than used, which will promote the use of clean energy. 2) Community Dimension Linked to SDG 11: Sustainable Cities and Communities NZEB building development helps reduce greenhouse gas emissions and energy use in cities, helping to create sustainable cities by designing buildings that reduce energy use and greenhouse gas emissions, which will result in cities with better quality of life and a better environment. 3) Consumption Dimension Linked to SDG 12: Responsible Consumption and Production NZEB promotes the use of sustainable materials and high-efficiency building design, which reduces resource waste. By promoting sustainable consumption and production through the use of efficient construction materials and reducing the use of natural resources to reduce environmental impacts. 4) Climate Change Dimension Linked to SDG 13: Climate Action NZEB plays a part in reducing greenhouse gas emissions, which is a key factor in combating climate change, in line with the international goal of requiring all countries to reduce greenhouse gas emissions. 5) Infrastructure Dimension Linked to SDG 9: Industry, Innovation, and Infrastructure NZEB development and implementation supports energy innovation by participating in supporting the development of innovations and technologies that reduce energy use in sustainable buildings and infrastructure.

In summary, the development and implementation of NZEB not only reduces energy use and greenhouse gas emissions but also supports the achievement of multiple sustainable development goals simultaneously by

integrating various activities. Integrating the NZEB concept into the implementation of the SDGs will tie into linkage with the strategy, Thailand's National Economic and Social Development Board has made the link. The relationship between the Sustainable Development Goals (SDGs) and the National Strategy Plan in the category of efficient energy management is interconnected in three sub-categories as follows: SDG 0703, SDG 0901, and SDG 1201 (National Economic and Social Development Office, 2022.) SDG0703 addresses the need to double the global energy efficiency rate by 2030; SDG0901 develops quality, reliable, sustainable, and resilient infrastructure, including regional infrastructure, to support economic development and human well-being with a focus on affordability and access; SDG1201 achieves sustainable management and efficient use of natural resources by 2030.

**Figure 1**

*Final energy consumption by Sector in 2013- 2017 & 2021-2023*




Note *Industrial includes manufacturing, mining and construction industries. Source: Energy Conservation Plan 2018-2037 (EEP 2024), MoE, June 2024 and Department of Alternative Energy Development and Energy Conservation )2024(

Figure 1 has shown that the data from the overall energy management of the country showed that the energy consumption rate of the business group was close to that of the household sector which are the indicators of revenue collection for the country. Data from the seminar, in collaboration with DEDE and overall energy management of the country and the NEP data, it was found that the energy consumption rate of the business group increased by 10 percent.

This makes the assessment of the potential for energy conservation significantly focused on management in the business sector.

## 3 METHODOLOGY

From the research assumption the strategic factors for net-zero energy management to the buildings, one of the important factors is the government's policy, which considering the most important factor. The researcher has studied various international plans from EPBD, including the International Conference on Climate Change from the COP 26 lead to Thailand National Policy in action which has set energy sector policies with the goal of supporting country to move towards reducing greenhouse gas emissions, and it is allied to international policies and activities, namely the Sustainable Development Goal

By reviewing the compliance Thai energy management policy, Researcher created 3 specific questions in relation to a) national energy policy which allied to the COP26 National Plan The interview form on the policy aspect with content to specifically ask representatives of various agencies, including representatives at the head level of the MoE, representatives of the EGAT, DEDE, hospital building management, engineering practitioners in hospital buildings, architectural designers to hospital buildings, facility managers of hospital building, distributors of architectural products related to building shells, distributors of architectural and engineering products related to energy-saving glass, distributors of engineering products related to energy-saving machinery, distributors of engineering products related to energy-saving air conditioning systems, representatives of the Air Conditioning Association of Thailand, representatives of the Building Resource Management Association of Thailand, representatives of the Association of Architects of Thailand, and representatives of the EIT. The questions are open-ended question therefore interviewees can present their own point of view clearly.

## 4 RESULTS AND DISCUSSIONS

From all question sequencing interview, Question No. 1. From the 26th COP, Thailand participated in the meeting and had a zero-energy management approach, which was applied to the NEP. As a policy-level organization, what do you think are the concrete guidelines?

According to the meeting, Thailand has shown its intention to reduce greenhouse gas emissions and reduce energy consumption. Various agencies in the country have implemented policies and measures to support this goal. The Electricity Generating Authority of Thailand (EGAT) has promoted the production of energy from renewable energy sources, such as solar power, wind power, and biomass power, and has developed various dams to be more useful. There is also the development of floating solar power plant projects at various EGAT dams.

A representative of DEDE said that the department has set standards for energy use in new buildings and buildings that are being renovated by promoting the installation of solar energy systems in households and the industrial sector. The representative of the MoE said that Thailand needs to implement the signed agreements to create economic balance. Implementing a national energy policy that focuses on increasing the share of renewable energy and energy saving in the industrial and public sectors.

In addition, there are policies to provide tax privileges or subsidies for the installation of renewable energy systems and high-efficiency electrical appliances. In addition to government agencies, the private sector and the public sector also play an important role in reducing energy consumption by changing energy use behavior and using more efficient technologies. These policies and measures will help enhance the sustainability of energy use and reduce environmental impacts in the long term.

Question No. 2 The recent COP26 meeting was significant because Thailand signed an agreement to reduce greenhouse gas emissions, which allowed the energy sector, represented by DEDE, to participate in policy-making. How do you

think policy factors to reduce fossil fuel energy consumption can be applied to hospital buildings?

The policy factors that hospital executives have commented on to reduce fossil fuel energy consumption can be applied to hospital buildings. They have been considered and adjusted by applying policies and measures that emphasize efficient energy use and the use of renewable energy. Examples of policy factors that can be applied include using the Cradle to Grave concept, starting at the Cradle, which is energy-efficient design and construction; designing hospital buildings with good ventilation and maximum use of natural light to reduce electricity usage; using energy-saving construction materials such as highly efficient heat insulators; and using architecture, such as installing walls, windows, roofs, and doors that are efficient in keeping cool and heat; as well as implementing green building projects, which are the first steps and can also consider developing biomass energy production systems in large hospitals. The hospital executives who provided the interview mentioned the use of high-efficiency technologies and equipment, installing high-efficiency air conditioners and ventilation systems, using LED bulbs, and low-energy electrical equipment, including considering the procurement of medical equipment that uses energy efficiently. The initial approach for hospital buildings is energy management (energy management), such as ISO 50001 or green building as local certification. Installing automatic energy control systems such as Smart Grid that can adjust energy consumption according to needs. The concept of the Facility Management Director is that there must be continuous monitoring and analysis of energy consumption in the hospital to find ways to improve and reduce energy consumption. And provide knowledge through training (education and training) focusing on educating hospital personnel about energy saving and methods to reduce energy consumption in daily activities, including creating manuals or guidelines for using energy efficiently in hospitals. Policy of the executives of a hospital in the Bang Phli area Emphasis has been placed on promoting the use of electric vehicles (Electric Vehicle Promotion) by setting up electric vehicle charging stations in hospitals to promote the use of

electric vehicles in organizations and encouraging personnel to use electric vehicles to travel to and from the hospital. Implementing these policy factors will help reduce reliance on fossil fuels and enhance the sustainability of energy use in hospitals, which will benefit both the environment and reduce costs in the long run.

Question No. 3: The NEP document, it mentioned the goal of increasing the efficiency of energy use in the country. And in Table 1, it mentioned the intensity of final energy use compared to the amount of crude oil used. What factors do you think public policy will help reduce fossil energy in a practical?

The interviews with the representatives mentioned above, the researcher summarized the interview results from representatives of government agencies, engineering and architectural product distributors, and those involved in facility management. Reducing fossil energy in a tangible way requires many factors covering both public policy and economics to create incentives and support changes, including the main factors that can help reduce fossil energy use. In terms of macroeconomics, there are tax measures and subsidies (taxation and subsidies), such as carbon tax, collecting taxes on greenhouse gas emissions to motivate producers and consumers to reduce fossil energy use and switch to renewable energy (taxonomy system). In addition, there are international trade approaches, namely reducing taxes and subsidies for renewable energy, reducing taxes for technologies and products that use renewable energy, such as solar panels, and providing subsidies for the installation and use of renewable energy. Government representatives, represented by the MoE and the Department of Alternative Energy Development and Efficiency It was mentioned that the Standards and Regulations were applied by applying existing standards such as ASHRAE 189.1 and seriously enforcing the Building Energy Efficiency Standards, BEC, including setting strict energy standards for new and renovated buildings. This also includes the Renewable Energy Mandates by enacting laws that require energy companies and manufacturers to use renewable energy in specified proportions. In addition, consumers and distributors emphasized the importance of promoting

the use of renewable energy (Renewable Energy Promotion) by asking for consideration of granting benefits for the installation of renewable energy in households and businesses, granting tax benefits or subsidies for the installation of solar panels or wind power systems, and supporting large-scale renewable energy projects (Solar Farm), developing large-scale renewable energy projects such as solar farms and wind farms. It also mentioned Planning and Policy Making by relying on the advice of consulting engineers and planners, consulting and planning net-zero energy projects in collaboration with government agencies and the private sector to proceed with the setting of standards and regulations, developing standards and regulations related to the design and construction of high-energy efficient buildings. The Engineering Institute of Thailand, the Air-Conditioning Association of Thailand, and the Association of Siamese Architects, which are organizations related to engineering standards and management control, commented that Net Zero Energy Management is very relevant to the Engineering Institute because achieving this goal requires effective planning, design, and implementation from engineers of various disciplines. The following are the ways in which the Engineering Institute participates in Net Zero Energy Management, which involves various engineering disciplines, ranked by activity as follows:

a) Building Design and Construction: Civil engineers and architects work together to design high-energy efficient buildings using energy-saving building materials, designs that utilize natural light, and good ventilation. b) Mechanical and Electrical Engineers: They are involved in designing high-efficiency HVAC (heating, ventilation, and air conditioning) systems, installing low-energy electrical systems, and using other energy-saving technologies. c) Energy Engineers: They are involved in energy management, both in terms of data analysis and renewable energy utilization, which requires the collaboration of energy and electrical engineers to plan and install renewable energy systems such as solar panels, wind turbines, and biomass power generation systems, as well as managing the energy produced from these renewable energy sources. d)

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Environmental engineers: They are responsible for assessing the environmental impacts of using renewable energy and finding ways to reduce the potential impacts.

To perform the role of energy management and, increasingly important today, systems engineers and computer engineers are responsible for developing smart grids and using IoT (Internet of Things) to monitor and control energy usage in real time, as well as linking various communications to access and forward information. Net-zero energy management is a collaboration of many parties, especially engineers from various fields who must work together to design, develop, and implement guidelines that help reduce the use of fossil fuels and increase the efficient use of renewable energy. For Facility Management Directors, it is important to provide education and training, provide knowledge to those involved in the building about energy saving by using the 8 guidelines from the Department of Alternative Energy Development and Efficiency, or ISO50001, which is an international standard guideline, organize activities to promote knowledge sharing among personnel in the organization about energy saving methods and renewable energy use, and train renewable energy experts. Integrating these factors together will help create an environment conducive to reducing fossil fuel consumption and promoting the use of renewable energy, which will benefit both the environment and the economy in the long run.

From the above questions, the representative of the MoE (DEDE), the Electricity Generating Authority of Thailand, the Department of Energy Development and Efficiency, the representative of hospital buildings, engineering practitioners in hospital buildings, architectural product distributors related to building shells, architectural product distributors related to energy-saving glass, engineering product distributors related to energy-saving machinery, engineering product distributors related to energy-saving air-conditioning systems, the representative of the Air Conditioning Association of Thailand, the representative of the Building Resource Management Association of Thailand, the representative of the Association of Architects of

Thailand, and the representative of the Engineering Institute of Thailand have the following observations:

Representatives from government agencies express giving importance to policies, including tax policies, and the use of renewable energy. For entrepreneurs related to buildings, including architecture, engineering, and various facilities, they give importance to tax policies, investment support, and the use of renewable energy, but do not mention personnel development, knowledge development, or knowledge management. Engineering practitioners in hospital buildings and architectural practitioners in hospital buildings give importance to engineering design and management, investment support, and the use of renewable energy, but do not mention tax policies, organizational management, and personnel development and knowledge development. Policymakers mentioned education and training for practicing engineers through education and training channels, including the development of curricula and training for engineers and personnel involved in net zero energy management, to cover knowledge dissemination and awareness raising, educating and raising public awareness about the benefits of net zero energy management.

Relevant trade associations focused on almost every topic, including architectural and engineering design and management, understanding and organizational development, workforce support and knowledge management, and renewable energy use. Tax exemptions, which will be a trend in line with their role in society, as trade associations represent buildings spread across the business sector.

R&D was mentioned only from educational institutions, which found a shortage of researchers and develop new technologies that will increase energy efficiency and reduce greenhouse gas emissions, such as high-efficiency batteries and energy storage technologies. However, no agencies mentioned Experimentation and Testing, which covers the testing and evaluation of new technologies and innovations before they are put into use.

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## 5 CONCLUSION

From the comparative study of the NEP and energy strategy for consistency with the practical strategy, it was found that the current energy-saving policies are consistent and can cover many aspects, from promoting efficient energy use according to the national strategic plan, section 070203, covering the development of new technologies to creating incentives for the public and business sectors to reduce energy use. The main policies related to efficient energy use, if separated to relate to the current national regulations and standards, can be separated into 4 categories:

5.1 Building Energy Codes and Standards, which stipulate efficient energy use standards in new buildings and buildings that are being renovated, such as installing heat insulation, using energy-saving construction materials, and designing to utilize natural light. Karsten Voss. (2011). Consistent with Karsten's document that discusses various impacts that influence the energy balance approach using the concept of controlling the efficiency of energy use in buildings.

5.2. Emphasize campaign activities to create awareness in energy saving according to the ISO50001 standard to encourage buildings to have ideas to improve their efficient energy use, such as installing high-efficiency electrical appliances, using LED bulbs, and installing solar panels. It is a source of renewable energy.

5.3. There are measures to promote the use of renewable energy (renewable energy incentives) by considering tax benefits or subsidies for the installation of renewable energy systems such as solar panels, wind turbines, or biomass power generation systems in the form of a taxonomy, which is consistent with the guidelines of Dionysia (2012). Which mentioned the methods for evaluating the characteristics of the energy to be used in accordance with the guidelines of the energy source and using energy-saving techniques.

5.4. Support educational organizations to provide education and training Education and Training Scheme) by educating the public and business sector on how to save energy and use energy efficiently, including training energy

management specialists and energy auditing. According to Linda (2021), nZEB concept in the European Union (EU) for energy-saving buildings requires different construction processes and the upgrading of vocational education and training (VET) to provide technical knowledge in energy.

These policies can help reduce energy use and greenhouse gas emissions, which will benefit both the environment and the economy in the long run. In addition, there is a need to support research and development (Research and Development) or support the research and development of renewable energy technologies. Except for the interviewees who worked in the education sector, they emphasized investment in research and development projects for new technologies that would increase efficiency and reduce the cost and promoting research and development in energy storage technology by supporting the development of high-efficiency batteries and energy storage technology. When considering the linkages between various strategies and the ideas given by executives of various organizations. it was found that executives of related organizations had information to set policies to enable the country to move towards NZEB with linkage of SDGs. The statistics, it was found that the quantity of crude oil consumption in KToe units in the business sector tends to decrease, which may be due to any of the above factors, which are applied in the category of increasing energy efficiency according to the strategic plan, section 07-02-03, to be practical in the above-mentioned approaches.

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