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LESSON LEARNING ENERGY SECURITY FROM SWEDEN TO INDONESIA (SYSTEMS THINKING)

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ABSTRAK

Krisis energi sedang dirasakan di Eropa termasuk Swedia karena terhentinya pasokan gas dari Rusia. Infus Rusia ke Ukraina menyebabkan negara-negara Eropa menjatuhkan sanksi ekonomi terhadap Rusia dan umpan balik yang diberikan Rusia adalah menghentikan pasokan energi ke negara-negara Eropa. Kelangkaan energi menyebabkan inflasi di berbagai negara termasuk Swedia. Hal ini menunjukkan bahwa pembahasan energi dan ekonomi merupakan dua hal yang tidak dapat dipisahkan. Tujuan dari penelitian ini adalah untuk menjelaskan bagaimana konsep sistem berpikir tentang terjadinya krisis energi yang disebabkan oleh perang Rusia dan Ukraina dan menggambarkan konsep pengembangan teknologi energi yang diperlukan sebagai upaya pertahanan negara dari sudut pandang ekonomi pertahanan dan menjadikan pembelajaran bagi Indonesia. Metode yang digunakan adalah metode kualitatif deskriptif dengan pendekatan penelitian studi pustaka menggunakan model pemikiran sistem. Hasil tulisan ini adalah gambaran aliran krisis energi dan perkembangan teknologi energi yang mempengaruhi pertahanan negara yang disebabkan oleh terganggunya pasokan gas yang menyebabkan krisis energi di Swedia mengharuskan pencarian energi alternatif dan pengembangan teknologi energi untuk mendukung ketersediaan ketahanan energi di negara tersebut sebagai upaya mempertahankan negara.

Keywords:
systems thinking, energy, energy crisis, energy security, national defense, defense economics

ABSTRACT

The energy crisis is being felt in Europe including Sweden due to the halt in gas supplies from Russia. Russia's infusion of Ukraine caused European countries to impose economic sanctions on Russia and the feedback Russia provided was to stop energy supplies to European countries. Energy scarcity causes inflation in various countries including Sweden. This shows that the discussion of energy and economics are two inseparable things. The purpose of this study is to explain how the concept of the system thinks of the occurrence of an energy crisis caused by the Russian and Ukrainian wars and describes the concept of developing the necessary energy technology as a state defense effort from the point of view of the defense economy and make a lesson learning for Indonesia. The method used is a descriptive qualitative method with a literature study research approach using a system thinking model. The result of this paper is a picture of the flow of the energy crisis and the development of energy technology that affects the country's defense caused by the interruption of gas supply which causes the energy crisis in Sweden to require the search for alternative energy and the development of energy technology to support the availability of energy security in the country as an effort to defend the country.

INTRODUCTION

The war between Russia and Ukraine had a great impact on politics and markets international because Russia had a large role as the supplier of oil, natural gas, and coal. The national power of a country is directed not only at ideological forces, diplomacy, and war but also at worries about competence, resources, environment, and goals. This power must be systematically integrated with other forces to run concurrently. This natural resource power is used by Russia to formulate its foreign policy strategy and energy policy, which is the most important part of the process of world economic globalization and also important for the question of climate change. Russia is a country that has a strategic energy source of natural gas which other countries have recognized it.

Energy in this case is a commodity that gives Russia an important position in world trade. Russia is one of the world countries that has the largest gas reserves in the world with a total of 1,680 TCF or a total amount of about 26% in the world. Further, more than 50% of the total gas exports by Russia are sent to the European Union.

Global criticism of Russia's aggression against Ukraine led to sanctions in the form of an economic embargo. In addition, this war caused a financial crisis caused by a surge in commodity prices, energy, and supply chain shocks. After the European Union and its allies imposed sanctions, Russia responded to the sanctions with several regulations to show that Russia could face the problem without the support of other countries. In return, Russia sanctioned the European Union and its allies in the form of new regulations on agricultural, food, and energy products trade. Furthermore, inflation occurs throughout the world so global economic development will decline and exports and imports will be disrupted.

Vladimir Putin, president of the Russian state, decided to halt gas supplies to the EU and its allies due to restricted energy purchases which would reduce Russia's opinion from the energy sector. On the other hand, the EU's dependence on natural gas is 50% and will increase to 70% by 2030 if no action is taken by the EU regarding the availability of Energy supply. [1]

effects of the Russian and Ukraine wars on EU energy security forced the authorities to reconsider coal-fired power plants to meet domestic needs. The countries that export energy sources influence politics and economics around the world and contribute to world energy security. As with other EU member states, Sweden is among those that have a dependence on gas supplies from Russia. Sweden's Energy Agency announced an early warning due to dwindling gas supplies.

Indonesia's target to make renewable energy by 23% will not only save fossil energy but will also strengthen energy security in terms of national defense in Indonesia. In this case, Indonesia can learn from Sweden in facing the impact of war with a successful energy transition. The limited energy felt by Sweden due to the interruption of gas supply so it experiences an energy crisis is a focus in the country's defense efforts, so the article on energy security is a problem that the author takes in this paper entitled "Lesson Learning Energy Security from Sweden to Indonesia (Thinking Systems)" will provide information about how the concept of an energy crisis occurs and how Sweden can solve it.

Systems Thinking Theory

A system is a combination of elemental elements intended to act together to achieve a goal [2]. A system is a collection of interacting parts and focuses on how all elements are bonded together and work together. Systems thinking is a way of looking at and talking about reality that provides a perspective on the work of the world as a whole. Systems thinking gives an idea of the influence of a variable by looking at the patterns that drive related events. Furthermore, a more effective way will be formed in dealing with variable-related problems by

thinking more strategically. According to Moani quoted by Trilestari & Almamalik, the systems thinking method is needed because:

1. Increased complexity and life changes
2. The growing and increasing dependence on this world.
3. The existence of a revolution of thought in the management of theory and practice.
4. Global awareness continues to rise, although decision-making is still local.
5. Increased appreciation of learning as a key to organizational ability
6. The problems that arise cannot be solved by the way of thinking that creates the problem. [3]

Systems thinking helps to view a problem from a broad perspective so that it can see a phenomenon as a whole that involves interrelated structures of patterns and events that occur. Systems thinking as a methodology contains a set of modeling and learning tools and technologies to understand the structure of a system, the interrelationships between components, and the changes that affect the entire system and parts in a given period.

METHOD

This paper use descriptive qualitative with a literature study approach. Literature studies are carried out including the collection of data and related information about the research theme. A descriptive study is a study that explains the position between the variables studied and the relationship between one variable and another through testing the hypothesis that has been formulated [4]. In addition, researchers also process the data obtained in a systematic way of thinking. The research stage is the first search for topics about energy in state defense and defense economics. Information is obtained through books and journals related to the topic. In the next step, the researcher group the references collected by year published. Finally, the researcher compares the information obtained and selects information according to the topic. The reference collection is carried out through the internet using the keywords "systems thinking", "energy", "energy crisis ", "energy security", "national defense", and "defense economics"

RESULT AND DISCUSSION

Energy Security for State Defense

Energy is a very important resource needed for human life. The use of energy is positively correlated to economic growth and community welfare, but there are various problems such as the insufficient supply of energy sources, uncertain energy supply, high energy prices, and environmental pollution due to energy production, distribution, and use [5]. Energy security is the uninterrupted availability of energy in various forms, in sufficient quantities and at an affordable price, without an unacceptable or irreversible impact on the environmental economy. [6]

In energy consumption activities by the people, the next problem that arises is the energy deficit in heating, lighting, and hot water. People need to spend part of their income to get energy [7]. Energy security is the continuous availability of energy to a particular country or region. The security of energy supply plays an important role related to the formulation of energy policy strategies. Regional energy production methods using a mixture of different resources need to be implemented with strong policies to reduce dependence on imports and increase energy security. Energy security is a key factor in economic and social development and meeting the basic needs of consumers. The current energy crisis is a major challenge for countries, energy companies, and electricity consumers hence energy price regulators have a big role in stabilizing the energy market. [8]

Energy security is a must-have for a country, including Sweden, which in recent years has become a country that feels its energy security is disrupted, although it is relatively small compared to other countries in the European region.
Starting from a fairly high-energy performance and a supportive and strong social system. However, in 2021 conditions have transformed and electricity prices have reached their peak, and this is a threat to meeting the needs of electricity and energy for the community. Add to that the Russian-Ukrainian war that drastically affected the energy market in Europe by causing price increases while accelerating the European energy transition. So that energy poverty is related to energy security which urges all countries, especially Sweden to innovate in distributing energy which is the main concern effectively and efficiently.

A small example is the low prevalence of energy poverty in Sweden with an estimated 2.3% of the population unable to keep their homes warm, and about 2.2% of the population having arrears on electricity bills. However, the low prevalence of energy poverty does not reduce the hardships experienced by affected households, which are instead at risk of experiencing a double burden as energy-poor people unknowingly.

And in fact, the health status among households living in energy poverty tends to be lower in countries with low levels of energy poverty, such as Sweden. Another way to understand energy poverty in Sweden is mainly centered on supply security to avoid situations of electricity scarcity as well as power outages since both types of scarcity tend to have more impact on vulnerable households; Electricity scarcity tends to raise energy prices and thus limit energy access of low-income households, and power outages tend to have more impact on households whose ability is limited to invest in additional façade insulation to increase thermal inertia or own energy production or storage. [9]

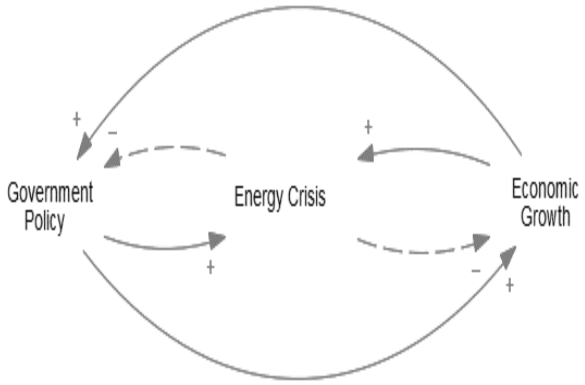
Systems Thinking of Energy Security for Sweden

Sweden is a country located in Northern Europe with a parliamentary democratic governance structure where the government is headed by the prime minister. Sweden's total population at the end of 2021 was 10,415,811 [10]. Sweden is geographically located at latitude 55 degrees, 69 degrees north latitude, and longitude 11 degrees to 23 degrees east longitude and has a land area of 408,150 km2. Urban areas occupy 3% of the national land area, rural areas of productive forests account for 58%, as well as agricultural land 8%, swamps 13%, up to 17% for sub-alpine and alpine forests, and other plots 2%. Enough for an entire water system that reaches more than 40, 000 km2 or more than 9% of the total area of the regional area. The geographical condition of Southern Sweden is a lowland with agricultural land at the southernmost point. the only mountain in Sweden that has peaks above 2,000 m sea level along the Norwegian border.

Before Russia and Ukraine wars, the IEA had begun to modernize by conducting studies focusing on some of the key energy challenges in today's rapidly changing energy markets. Sweden is leading the way to a low-carbon economy globally with the lowest use of fossil fuels in primary energy supplies among IEA member states. Furthermore, Sweden has the challenge of ensuring emissions reductions and maintaining supply security during the energy transition. In particular, Sweden needs to ensure the electric power market can provide a stable supply.

Appropriate policies and actions in the energy sector and economy are critical by focusing on creating well-functioning and competitive energy. The transformation of safe, affordable, and environmentally friendly energy is necessary and is an effort to maintain the security of energy supplies in Sweden and its contribution to a sustainable global energy system

Fig 1, Feedback Loop on Government Policy Relations, Energy Crisis, and Economic Growth



Sources: Secondary, processed by researchers, 2023

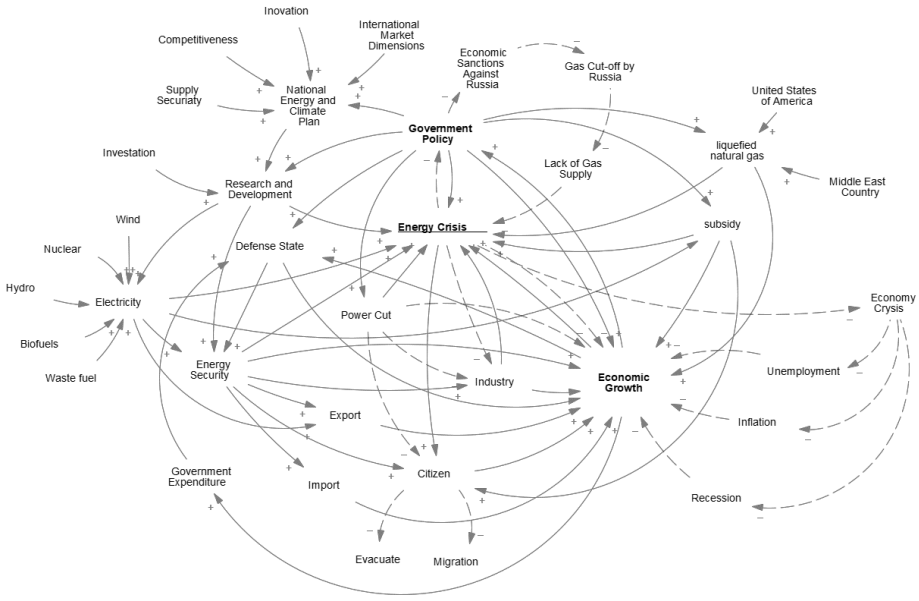
Sweden's energy policy by building a sustainable energy system focused on energy efficiency by switching from fossil fuels to renewable energy such as electricity use and district warming. Sweden issued an early warning regarding gas supply, resulting from the cessation of gas supply from Russia in retaliation for an economic embargo by the European Union. The energy crisis that occurs greatly affects the economic aspects of the country, and the prices of people's basic needs will increase. Moreover, in winter, the need for energy increases sharply because the use of warmers is a basic need of the community at that time

Fig 2, Chronology of the Sweden Energy Crisis

Sources: Secondary, processed by researchers. 2023

The European Union responded to the Russian-Ukrainian war by imposing an economic embargo on Russia. Feedback from the embargo that the European Union has put in place including Sweden against Russia is in the form of making ruble payment rules that end with the suspension of gas exports. Like other European countries, Sweden also relies on gas supplies from Russia so Sweden is in crisis due to the gas stoppage. The energy crisis in Sweden forced the government to provide policies to divert the use of natural gas energy.

Fig 3, Causal Loop for Sweden Energy Security



Sources: processed by researchers, 2023

Sweden has successfully transitioned from fossil energy to renewable energy and is deeply committed to the development of renewable energy. This is done for the sake of energy independence because Sweden does not have many fossil energy reserves so the solution to not relying on energy imports is to develop available energy sources. This is also supported by the EU's greenhouse gas emission targets. Sweden has managed to reduce greenhouse gases by 40% and has a target of achieving zero clean energy emissions by 2045.

Researchers conceptualize systems thinking Sweden energy security using Vensim PLE x64 software. From the concept in the causal loop Figure 3, the author can describe the reciprocal relationship between variables that affect each other, but here 4 variables that have a great influence, namely state defense, government policies, energy crises, and economic growth. There are 293 loops formed in the creation of the thinking system model but the author here mentions 5 feedback loops that build the model:

1) Loop Number 284 of length 9
   - Energy Crisis
   - Government Policy
   - Research and Development
   - Electricity
   - subsidy
   - Citizen
   - Economic Growth
   - Government Expenditure
   - Defense State
   - Energy Security
2) Loop Number 285 of length 9
   - Energy Crisis
   - Economy Crysis

- Inflation
- Citizen
- Economic Growth
- Government Policy
- Research and Development
- Electricity
- Energy Security
- Industry

3) Loop Number 286 of length 9
- Energy Crisis
- Government Policy
- Research and Development
- Electricity
- subsidy
- Citizen
- Economic Growth
- Defense State
- Energy Security
- Industry

4) Loop Number 287 of length 10
- Energy Crisis
- Government Policy
- National Energy and Climate Plan
- Research and Development
- Electricity
- subsidy
- Citizen
- Economic Growth
- Government Expenditure
- Defense State
- Energy Security

5) Loop Number 288 of length 10
- Energy Crisis
- Government Policy
- National Energy and Climate Plan
- Research and Development
- Electricity
- subsidy
- Economic Growth
- Government Expenditure
- Defense State
- Energy Security
- Industry

From several feedback loops formed from the model, it can be concluded that to overcome the crisis that occurs and that may occur, a strategy for energy security is needed. A

country's energy security is formed from strong state defense efforts and is supported by appropriate government policies. Energy security here will also affect economic growth so it also affects people's daily economic activities.

Lesson Learning Indonesia about Energy Security from Sweden

Indonesia is a country rich in natural resources, including energy resources for fossil and renewable. The huge potential of renewable energy such as solar, water, wind, biomass, and nuclear energy in Indonesia needs to be considered to achieve sustainable development goals. Renewable energy will increase energy equity and reduce limited fossil use. Fossil energy that is currently used in Indonesia around 90% of the energy mix in Indonesia causes environmental damage, greenhouse gas emissions, and air pollution so that renewable energy is a solution to the problem. Renewable energy will increase national energy security and support economic growth because the easier energy is obtained, it will increase people's productivity.

Indonesia's target in 2050 to increase the renewable energy mix by 2% needs support from all parties, both government, private sector, and community. Some things that Indonesia can learn from Sweden related to the transition and development of renewable energy are:

1. Indonesia needs to impose a carbon and intensive tax on energy producers and consumers to switch to clean energy.
2. Indonesia needs to increase investment and innovation in renewable energy and improve energy quality and new economic opportunities.
3. Indonesia needs to encourage citizens to be able to use renewable energy and optimize facilities for renewable energy consumers

CONCLUSION

Energy is an important resource in supporting human life. Picture the flow of the energy crisis and the development of energy technology caused by the disconnection of the gas supply which caused the energy crisis in Europe and Sweden to require the search for alternative energy and the development of energy technology to support the availability of energy security in the country as a state defense effort. Although it depends on gas supply, Sweden has succeeded in developing electricity so that the crisis experienced is not as severe as in other countries. However, it is worth emphasizing that the research has been conducted in the current economic conditions, and due to the high dynamics, the situation may change in a short-term perspective. The author realizes that energy security has many facets and includes several conditions.

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