

Legal analysis on bankability of Hydro Floating Solar project in Thailand



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การวิเคราะห์ทางกฎหมายเกี่ยวกับการสร้างผลกำไรจากการปล่อยสินเชื่อแก่ระบบผลิตไฟฟ้าจาก
เซลล์แสงอาทิตย์บนทุ่นลอยน้ำในประเทศไทย



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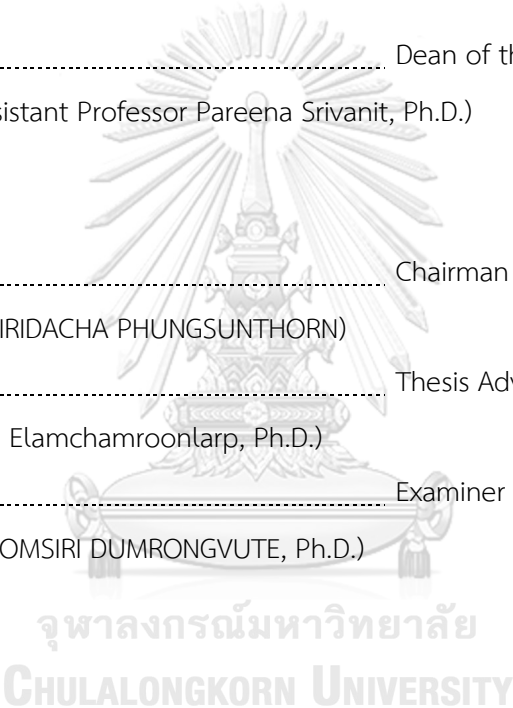
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ณัฐดนัย อร่ามเจียรธำรง : การวิเคราะห์ทางกฎหมายเกี่ยวกับการสร้างผลกำไรจากการปล่อยสินเชื่อ
แก่ระบบผลิตไฟฟ้าจากเซลล์แสงอาทิตย์บนทุ่นลอยน้ำในประเทศไทย. (Legal analysis on
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เมื่อเปรียบเทียบกับโครงการพลังงานหมุนเวียนประเภทอื่น ๆ โครงการผลิตไฟฟ้าจากเซลล์
แสงอาทิตย์บนทุ่นลอยน้ำมีความซับซ้อนมากกว่า เนื่องจากมีการใช้แหล่งน้ำสาธารณะเป็นที่ตั้งของ
โครงการ แต่การผลิตไฟฟ้าเกิดจากพลังงานแสงอาทิตย์ ดังนั้น จึงไม่มีความชัดเจนว่าการดำเนินงานของ
โครงการดังกล่าวอยู่ในนิยามของการใช้น้ำซึ่งอยู่ภายใต้บังคับของพระราชบัญญัติทรัพยากรน้ำ พ.ศ. 2561
หรือไม่ เช่นนี้ การตีความที่หลากหลายของนิยามการใช้น้ำในมาตรา 4 ของพระราชบัญญัตินี้อาจทำให้
เกิดความท้าทายเกี่ยวกับการสร้างผลกำไรจากการปล่อยสินเชื่อของโครงการ ในการจัดหาเงินทุนให้กับ
โครงการโดยทั่วไปแล้ว บริษัทผู้ดำเนินโครงการมักอาศัยเงินกู้จากสถาบันการเงิน ความไม่แน่นอนเกี่ยวกับ
สิทธิที่บริษัทผู้ดำเนินโครงการมีอยู่ในการดำเนินการก่อให้เกิดปัญหาในเรื่องความเชื่อมั่นของสถาบัน
การเงินในการปล่อยสินเชื่อแก่โครงการ วิทยานิพนธ์ฉบับนี้กล่าวถึงหลักเกณฑ์ที่สถาบันการเงินใช้ในการ
พิจารณาเพื่อปล่อยสินเชื่อ วิเคราะห์กฎหมายในประเทศไทยที่เกี่ยวข้องกับโครงการผลิตไฟฟ้าจากเซลล์
แสงอาทิตย์บนทุ่นลอยน้ำและเปรียบเทียบกฎหมายเกี่ยวกับแหล่งน้ำสาธารณะในประเทศไทยกับประเทศ
ญี่ปุ่นและประเทศออสเตรเลีย นอกจากนี้ จะกล่าวถึงข้อเสนอแนะเพื่อเพิ่มโอกาสสร้างผลกำไรให้แก่
โครงการอันจะนำไปสู่การปล่อยสินเชื่อของสถาบันการเงินเพื่อให้โครงการพลังงานแสงอาทิตย์ลอยน้ำของ
ธนาคารในประเทศไทยดำเนินต่อไปได้

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In comparison to other types of renewable energy projects, hydro floating solar projects are more complicated as public water resources are used as the location of the project but the electricity is generated from solar power. Accordingly, it is unclear whether the operation of the project falls within the definition of water use that is subject to the Water Resources Act B.E.2561(2018) or not. Several interpretations on the definition of water use in Section 4 of this Act may cause challenges in the bankability of the project. In order to fund the project, the project company generally relies on the loan from financial institutions. The presence of uncertainty in the rights that the project company triggers the problem in the bankability of the project. This thesis will address the criteria that the financial institutions take into consideration, analyze the laws in Thailand that are relevant to the project and compare the law regulating public water resources in Thailand with those in Japan and Australia. Ultimately, the recommendation will be provided to facilitate the bankability of hydro floating solar project in Thailand.



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Chapter I Introduction

1.1 Background and statement of the problem

A hydro floating solar system is an alternative selection in generating electricity. Crystalline double glass panels along with inverters and cables are installed on the water surface. The panels then collect solar energy from sunlight during the day and act as a generator converting the sunlight into clean and renewable energy. While this system is relatively new for Thailand, many countries around the globe have proven benefits from this intervention.

Although Thailand has the Energy Industry Act B.E.2550 as the law relating to the regulation of the hydro floating solar system, this Act only provides for the licensing agreement to develop this project. There is still a problem with how to develop the hydro floating solar system in terms of financing. A large sum of money is required to facilitate the project. From the perspective of financial institutions, there is a high level of risks involved in this project so it is likely that the financial institutions will not provide funding for the project.

Therefore, there is a need to analyze a regulatory framework governing the right to use the water surface for hydro floating solar system installation as it poses challenges to the bankability of the project.

1.2 Thesis Objectives

1.2.1 To understand and analyze provisions relating to the regulation of the hydro floating solar system in Thailand in the Energy Industry Act B.E.2550, the Factory Act (No.2) B.E.2562, the Water Resources Act B.E.2561 and the Navigation in the Thai Water Act B.E.2456.

1.2.3 To examine the legal problems on the bankability of the hydro floating solar system in Thailand.

1.2.4 To compare and contrast with the countries that have a regulatory framework on the right relating to the hydro floating solar system.

1.2.5 To provide recommendation to facilitate the bankability concerning of hydro floating solar project in Thailand.

1.3 Thesis Hypothesis

Several possible interpretations of laws relating to hydro floating solar operation cause legal uncertainty and, inevitably may trigger challenges in the bankability of the hydro floating solar project from a financial perspective.

1.4 Scope of the thesis

The scope of this thesis is limited to analyzing Thai law regulating the right related to the hydro floating solar system on the surface of public water

resources in comparison to the regulatory framework used in Australia and Japan.

1.5 Thesis Methodology

1.5.1 Conducting documentary research on the Thai legislation concerning to hydro floating solar system including The Energy Industry Act B.E.2550, The Factory Act (No.2) B.E.2562 and The Water Resources Act B.E.2561.

1.5.2 Analyzing the regulatory frameworks used to facilitate bankability of the hydro floating solar system in Japan, Australia and Germany.

1.5.3 The empirical study must be used by interviewing lenders for practical inputs on granting a loan to project developers.

1.6 Contributions of the thesis

1.6.1 To recognize and make aware of the problem of financing hydro floating solar system projects in Thailand.

1.6.2 To understand the right that should be used for enhancing the bankability of hydro floating solar project in Thailand.

1.6.3 To provide recommendations for guidelines on regulating the rights related to the hydro floating solar system in Thailand.

1.6.4 To ensure bankability for private sectors who are interested in investing in Hydro Floating Solar Project in Thailand.

Chapter II Legal and financial analysis related to Hydro floating Solar Project in Thailand

Electricity is undeniably becoming one of the most critical factors for human to survive. It plays an essential role in economic prosperity as the population grows. In order to serve escalating electricity demand, the Thai government, together with the Ministry of Energy and EGAT, has developed a Power Development Plan (“PDP”) to ensure a sufficient and sustainable power supply.

According to PDP2018, the government forecasted a total of 56,431 MW supply of electricity during 2018-2037, 37% of which contributes from renewable energy Table1.¹

Table 1: Forecasted electricity supply during 2018-2037

Power Plant Type	MW	% Contribution
Renewable Power Plant	20,766	36.8%
Pumped-Storage Hydro Power Plant	500	0.9%

¹ Ministry of Energy, "แผนพัฒนากำลังผลิตไฟฟ้าของประเทศไทย พ.ศ.2561-2580 (Pdp2018)."

Co-Generation Power Plant	2,112	3.7%
Combined Cycle Power Plant	13,156	23.3%
Coal-Fired Power Plant	1,740	3.1%
Others	18,157	32.2%
Total	56,431	100.0%

Source: PDP2018

The table above indicates the importance of renewable power plant as a future primary source of energy that the government emphasizes. During the past few years, we have seen a significant growth in power purchase agreement (PPA) granted to renewable power plants. Several types of power plants include solar and wind power plant, in which each type of power plant has its own benefits and drawbacks. Key benefits from the renewable power plant are that it operates with almost zero pollution, and there is no raw material cost in producing electricity. However, we cannot ignore the crucial drawback of renewable energy that it has no consistency in producing electricity e.g. solar power plant requires sunlight or wind power plant requires wind to produce electricity. Even though there is a battery innovation that helps renewable power plants store the electricity when the condition is not appropriate, there is no guarantee that the government can provide the consistency in electricity generation. This is where

hybrid renewable energy comes into play, the example exhibits in this thesis is a hydro floating solar power plant.

The hydro floating solar system is the system that involves the installation of photovoltaic solar panels above open-air waterways and water bodies.² The system is the integration of hydropower and solar power. There are two main kinds of this system.

The first kind is floating photovoltaic power plant which means the solar panels float directly on the water's surface via the use of a unique racking system.³ Floatovoltaics are more commonly used in projects across the world including Thailand.⁴ The plants are popular since they can receive more sunlight as there are fewer blockage of sunlight when compared to overland installed solar panels.⁵ Moreover, they enhance water quality by limiting seaweed growth and preventing evaporation.⁶

Another kind of hydro floating solar system is canal-top solar projects which depend on supporting beams installed on the banks of canal to place solar panel directly above the canal. Installing floating solar system has recently been

² Eden Cohen and Ryan Hogan, "Made in the Shade: Promoting Solar over Water Projects," *Idaho Law Review* 54 No. 1 (2018).

³ Kelly Pickerel, "Riding the New Wave of Floatovoltaic Installations," *SOLAR POWER WORLD*

⁴ Kate Zerrenner, " Floating Solar Panels Are a Perfect Fit for Drought-Stricken States," *Environmental Defense Fund*.

⁵ Neha Yadav Alok Sahu, K. Sudhakar, "Floating Photovoltaic Power Plant: A Review," (2016).

⁶ *Ibid.*

an emerging trend around the world.⁷ In Asia, leading countries like China and Japan installed floating solar farm to generate electricity.⁸

The world market for floating solar photovoltaic (FPV) has been surging over the past few years and the installed capacities of individual projects are increasing year on year.⁹ There are several reasons behind the emerging trend of Hydro Floating Solar System installation. In comparison with traditional fossil fuel, solar over water projects generate cleaner and renewable energy which help reduce greenhouse gas emission from burning fossil fuels. As between conventional solar panels and hydro panels, the FPV helps slow down water evaporation rate.¹⁰ As climate change brings management of scarce resources to light, less evaporation helps in reducing the problem of water shortage.¹¹ An additional benefit from the financial aspect is that the panels have longer use-life on water. The solar system panels degrade faster in a high-temperature environment. Therefore, installing them on water sources helps reduce temperature and hence lengthen the solar system panel's useful life.¹²

⁷ Ibid., Footnote 4.

⁸ Adam Vaughan, "Japan Begins Work on 'World's Largest' Floating Solar Farm."

⁹ ESMAP and SERIS. World Bank Group, "Where Sun Meets Water: Floating Solar Market Report," (2019).

¹⁰ Phillip Warburg, "Floating Solar Is O Win-Win Energy Solution for Drought Stricken Us Lakes."

¹¹ Cohen and Hogan, "Made in the Shade."

¹² Jessica Pirro, " Floating Solar Advantages and Disadvantages."

The hydro floating solar system implemented in Thailand is a hybrid system that involves both hydropower and solar power.¹³ Thus power generation can be operated regardless of the water level in the dam. The system can be put in use all year round from summer drought to rainy season. In a scenario of sufficient water, the system utilizes water in the dam to generate power.¹⁴ On the other hand, when water resources are limited, the solar cells generate power from sunlight during the day and at night, hydropower will be used to support a period of high electricity demand (peak period).¹⁵

It is vital to make clear of different types of water resources in Thailand so as to acknowledge the authority that is responsible for governing the hydro floating solar project in Thailand. Water resources in Thailand are divided into four categories based on the types of use. Royal Irrigation Department under the Ministry of Agriculture and Cooperatives is responsible for the water used for agricultural purposes. The Marine Department is responsible for water used in transportation. Department of Ground Water Resources is responsible for the use of groundwater. For the use of water for producing electricity, the Electricity Generating Authority of Thailand has the authority over this part.

¹³ Electricity Generating Authority of Thailand, "Egat's First Floating Solar Project at Sirindhorn Dam Combining Hydropower and Solar Power Is the Largest Hybrid Power Generation in the World."

¹⁴ Ibid., Footnote 11.

¹⁵ Ibid., Footnote 11.

Electricity Generating Authority of Thailand (EGAT) is state-owned power utility under the Ministry of Energy.¹⁶ The main roles of EGAT are electric power generation and transmission for the entire country.¹⁷ EGAT is the largest power producer in Thailand.¹⁸ Hydro floating solar system is relatively new idea for Thailand. In order to ensure promising outcomes, EGAT has conducted two Development Projects on this system.¹⁹

The first Development Project is located at Sirindhorn Dam in Ubon Ratchathani Province.²⁰ This project is considered as the first complete pilot project that aims to study technical and economic variables large-scale solar floating installation and the impacts on the environment.²¹ The installed capacity of this project is 0.2496 MW.²² The power generated from the solar cells has been connected to a low voltage power system (400V) and supplied to the dam since May 2, 2018.²³ The expected commercial operation date for the electricity generated by this project is in 2020.²⁴ Furthermore, EGAT has developed a system a hydro-floating solar hybrid system, which is an integration of hydropower from the dam and solar power from the solar cells floating on the

¹⁶ Electricity Generating Authority of Thailand, "Egat Profile," <https://www.egat.co.th/en/about-egat/egat-profile>.

¹⁷ Ibid.

¹⁸ Ibid

¹⁹ Electricity Generating Authority of Thailand, "Floating Solar Power Generation System."

²⁰ Ibid.

²¹ Ibid.

²² Ibid.

²³ Ibid., Footnote 19.

²⁴ Ibid., Footnote 19.

dam.²⁵ This hydro floating solar system was first installed at Sirindhorn Dam in Ubon Ratchathani Province with the contracted capacity of 45 MW.²⁶

The second Development Project is located at Ubonratana Dam in Khon Kaen Province with the contract capacity of 24 MW.²⁷ The electricity generated from this dam is expected to be available for commercial purposes in 2023.²⁸ Besides from these two projects, EGAT will proceed in installing the hydro floating solar hybrid project in other EGAT dams in the near future.²⁹

2.1 Underwriting of a hydro floating solar project in Thailand

Prior to the operation of the project, the project requires a large sum of money for the operation. The project company seeks for the fund from financial institutions. From the perspective of financial institutions, the investment bankers must perform an appraisal on the creditworthiness of the project company in order to examine the risks and the capability of the project.³⁰ The financial institutions need to make sure that there is a high possibility that the project company will be able to make repayment as expected. If there is a possibility that there will be a default in payment, the financial institutions will

²⁵ Ibid., Footnote 19.

²⁶ Ibid., Footnote 19.

²⁷ Ibid., Footnote 19.

²⁸ Ibid., Footnote 19.

²⁹ Ibid., Footnote 9.

³⁰ The Economic Times, "Underwriting in Banking."

need to consider whether such possibility is acceptable or not. Underwriting is important process that determines whether the loan will be provided or not. Three keys areas that financial institution will be examined thoroughly before making the decision are credit, capacity and collateral.³¹ Concerning the credit of the project, a credit appraisal on the amount of debt and the payment record of the project company must be scrutinized.³² For capacity of the borrower, it is the ability to make repayment to the lenders. Debt-to-income ratio plays an important role in determining the creditworthiness of the project company. It is a proportion of debt to the income that the company can generate on monthly basis.³³ The ratio must be within the number that is acceptable for financial institutions. Collateral is important in the event of the default of payment. In the scenario when the project company cannot repay as planned, collateral is the instrument that protects the financial institution from the failure of payment.³⁴

In evaluating the risk of the project, underwriting is an important process to set appropriate borrowing rate.³⁵ The underwriting process help the financial institution to determine the bankability of the project from the early stage of project development before accepting the request to provide the loan to the project.³⁶ Bankability assessment involves the analysis on credits and risks. In

³¹ First Heritage Mortgage, "What Happens During the Underwriting Process? ."

³² Ibid.

³³ Chris B. Murphy, " Debt-to-Income (Dti) Ratio."

³⁴ Ibid., Footnote 31.

³⁵ Caroline Banton, " Underwriting."

³⁶ Fida Rana, "Preparing Bankable Infrastructure Projects."

determining bankability of the project, the financial institution must examine various criteria as follows.

Bank's criterion when offering loans

The first criterion concerns economic and political environment. For economic risks, there are several conditions that may affect the profit of the project company. A loan from financial institutions generally comes with interest rates. An increase in interest rates can lead to a reduction in the profit of the project company.³⁷ Another risk is a change in market price of the product which is electricity.³⁸ Demand and supply in the market play an important role on the pricing of the product.³⁹ If the market price decreases, the profitability of the project will be adversely affected.⁴⁰ For political issue, a failure of national governance can pose significant impact to the operation of the project as government has the responsibility to provide private sectors with the environment that is friendly for investment.⁴¹ Instability of government has an impact on the economic which also include renewable energy project.

The second criterion is legal and regulatory environment. Legality is very important for the bankability of the project. Legality refers to lawfulness and

³⁷ LexisNexis, "Economic Risk-What Is It and How to Effectively Manage It."

³⁸ Ibid.

³⁹ Ibid.

⁴⁰ Ibid.

⁴¹ Sophie Perryer, "Top 5 Economic Risk Factors."

conformity with law.⁴² The project must operate in compliance to the relevant laws. For hydro floating solar project, prior to the operation of the project, an analysis on the laws regulating the project must be conducted in order to identify the relevant laws that the project company must follow. The project company must obey the rules and regulations stated by the law so as to minimize the chance that the project will be revoked by the authorities in the future. It is critical to find out the right that the project company has over the project under Thai law. To elaborate, without right stated by the law, the project operated by the project company cannot be regarded as legal. The inability to pursue legality will adversely affect the bankability of the project as the company cannot provide assurance to the financial institutions from the legal perspective. Furthermore, regulatory environment contributes to determining bankability of the project. The regulatory environment indicates the boundaries and limits that the country can take. The laws and regulations are critical in examining the bankability of the project as they give the idea on the legal liabilities and consequences that may arise from certain action. Examining the legal environment that the project is subject to will help both financial institution and project company to make appropriate business decision.

⁴² Peter Quayle and Xuan Gao, *International Organizations and the Promotion of Effective Dispute Resolution* (Brill, 2019).

The third criterion is project specificity. The capacity of the project must be shown. The hydro floating solar project must indicate the amount of energy that can be generated.

The fourth criterion is third party risk allocation. Third party risks can be found in a large-scale project as it involves third party to complete the project. The effectiveness of risk allocation affects the performance of the project. Effective risk allocation is one of the criteria that financial institutions consider before making the decision whether to grant the loan or not.⁴³ The process of risk allocation is the process of deciding how to allocate risk and to what extent of allocation.⁴⁴ There are six main categories of risks that must be allocated; financial, information, integrity, operational, strategic and technology.⁴⁵ These categories should be studied and allocated to the right parties to mitigate risks in the project.

The fifth criterion is contract arrangement. In operating a project, contracts must be formed to determine the rights and obligations of the relevant parties. The most important contract that the lenders will seriously consider in renewable energy project is the power purchase agreement as it will indicate the project company's ability to make repayment to the lenders.

⁴³ Wei Xiao-ping Wu Shen-fa, "The Rule and Method of Risk Allocation in Project Finance," *The 6th International Conference on Mining Science & Technology*.

⁴⁴ Ibid.

⁴⁵ The Institute of Internal Auditors, "Managing Third-Party Risks."

From the social aspect, another criterion is community relation. Community relation is important for the project as it represents good relationship between the project and the surrounding community. Although other criteria are met, underwriting will not be completed without showing the existence of relation of the project to the community. In the application of this criterion to hydro floating solar project, the project company must conduct public hearing to gather opinions from interested parties.

In performing the analysis of the bankability of the project, there are many risks need to be investigated before or even though the project is in the operation process. The project company must examine very potential risk that may arise in the operation of the project so that each of these risks will be carefully allocated and monitored.

The first risk concerns the performance risk.⁴⁶ The performance risk is the risk that the project company will not be able to perform as decent as it expected. The problem concerning the efficiency of production can arise in any project. For the generation of electricity, this kind of risk occurs when the project cannot generate the electricity in the expected quantity or quality.

The second risk is offtake risk which concerns the revenue of the project company.⁴⁷ The offtake risk is the risk when the project company cannot reach

⁴⁶ "Types of Risk in Project Management," <https://project-management.com/types-of-risk-in-project-management/>.

⁴⁷ Dentons, "Project Risks."

the target of the expected revenue. If the company fails to generate sufficient revenue, the problem on the ability to make repayment arises. Although an off-take agreement between the project company and buyers has been made prior to the operation of the project, there is still a possibility that the buyers will not be able to pay for the electricity at the agreed price within the agreed period of time. The involved parties should agree on how to address revenue shortfalls in order to mitigate offtake risk.

The environmental and social risk is also important to the project especially for renewable energy project.⁴⁸ The assessment on the impact of the project on the environment must be done. In many countries, laws and regulations concerning environment are not well established so there is no clear interpretation on such laws and regulation.⁴⁹ The lack of clarity in the environmental law can pose serious problem to the project company in the case that the government officials later determine that the operation of the project is not in compliance with the environmental laws.

Construction risk is fundamental for all parties as it is the risk that is closely related to construction phase of the project.⁵⁰ The period of construction

⁴⁸ LexisNexis, "Economic Risk-What Is It and How to Effectively Manage It." Ibid., Footnote 38.

⁴⁹ Ibid.

⁵⁰ SuretyLearn, "A Quick Introduction to Construction Risks and Contracting Practices " http://suretylearn.org/wp-content/uploads/2014/01/M8_SuretyLearn-Construction-Risks-2013.pdf.

is the period of time when the project faces construction risks arise.⁵¹ The significant concerns in relation to the process of construction are the cost overruns and construction delays.⁵² Cost overruns are the situation when the final exceeds the base price.⁵³ For other types of energy generation such as coal-fired power plant and thermal power plant, the degree of risk in relation to construction is high.⁵⁴ On the other hand, in comparison to other types of energy production, although the construction of hydro floating solar project requires technical engineering and various details, the degree of construction risk in this renewable project is not as high as the risks found in other types of energy project.⁵⁵ Apart from the risk arising from the construction process, construction risk also includes construction delays. Construction delays are critical issue as it signifies potential losses to the project company.⁵⁶ The late initiation of the project will affect the revenue of the project company.⁵⁷ Although the clauses on the liability of delays in completion are agreed, the compensation may not cover the losses resulting from construction delays.⁵⁸ As floating pontoons which are the main component of the project are designed to be compatible with multiple

⁵¹ Ibid.

⁵² Ibid.

⁵³ Dominic Ahiaga-Dagbui Abdulelah Aljohani, and David Moore, "Construction Projects Cost Overrun: What Does the Literature Tell Us? ," *International Journal of Innovation, Management and Technology* 8 (April, 2017).

⁵⁴ Ravinder Kumar, "Coal-Fired Power Plant Risk Evaluation Strategy."

⁵⁵ Ibid.

⁵⁶ The International Bank for Reconstruction and Development, "Financing of Private Hydropower Projects."

⁵⁷ Ibid.

⁵⁸ Ibid.

configurations and solar panels, the process of installation is not complicated. It is easy to install so there is low possibility that the construction phase will be delayed.⁵⁹

The next risk that will be taken into consideration is force majeure is unavoidable situations that intervene the expected events and prevent the related parties from being able to fulfill the obligations.⁶⁰ Force majeure is an unforeseeable event that the parties in the contract cannot expect.⁶¹ In order to mitigate negative consequences arising from force majeure in the future, a force majeure clause must be agreed by the contracting parties stating that the party that will be liable for such circumstances. In application of force majeure to renewable energy project, force majeure can cause a pause or a delay in the operation of hydro floating solar project. For instance, an unexpected situation may impact the continuity in the generation of electricity. Thus, force majeure is one of the risks that should be concerned so the term of force majeure should be agreed in advance.

Conducting feasibility study only gives the projection of the performance of the project company. It does not act as confirmation that the project will definitely as originally planned. Even though the project company predicts that

⁵⁹ SCG, "Scg Floating Solutions " <https://www.scgchemicals.com/en/products-services/technology-solutions/floating-solar-solution>.

⁶⁰ Marshall Hargrave, "Business Essentials," <https://www.investopedia.com/terms/f/forcemajeure.asp>.

⁶¹ International Bank for Reconstruction and Development/The World Bank, "Draft Report on Recommended Ppp Contractual Provisions."

it will receive certain amount of revenue, there is no guarantee that the profitability of the project will be as well as expected.

Project financing is defined as "the financing of a particular economic unit in which a lender is satisfied to look initially to the cash flows and earnings of that economic unit as the source of funds from which a loan will be repaid and to the assets of the economic unit as collateral for the loan".⁶²

The project will entail many risks which is necessary to examine or inevitable part that even the project company acknowledge the risks, it still maybe occurs. When the project company starts to install the hydro floating solar project, construction phase is an important step as it is the beginning of the source of income for the project. The risk related to the construction phase may occur. As constructing photovoltaic modules required expertise and complicated procedures, it is possible that delays in construction may occur. Such construction delays will postpone the date of electricity generation which will ultimately affect the income of the project company.

2.1.1 Financing the hydro floating solar project

In terms of financing the renewable project, there are many options that contribute to financing the project. Utilizing several ways to finance the project can help in diversifying the risks. There are two main ways that the renewable

⁶² *Project Financing – Mogul Liquefies Gas*, Establishing and Operating a Foreign Investment.

company can source capital.⁶³ The first way is to borrow money from commercial bank as a loan. The second way of sourcing money to facilitate the project is through equity capital from selling a stake in the business itself. Most project operators prefer receiving finance from the financial institutions.⁶⁴ The financial institution is viewed as the main source in financing renewable energy project. Before granting a loan to the project operator, an assessment must be made to examine company's financial strength and stability.⁶⁵ These financial institutions will place some restrictions and conditions on how the project operator will manage the project using the loan granted from the financial institution. In considering whether to grant a loan to the renewable energy project or not, there are various requirements that must be presented to the financial institutions. The project operator must present financial information including financial analysis report that shows the current assets and debt to ratio.⁶⁶ Moreover, information concerning creditworthiness such as assets for collateral and any credit guarantees must also be provided.⁶⁷ The next requirement is project documents including financial model, technical feasibility study, financial feasibility study and legal authorization.⁶⁸ The aforementioned

⁶³ Sophie Justice, "Private Financing of Renewable Energy – a Guide for Policymakers."

⁶⁴ E. Scannella, "Project Finance in the Energy Industry: New Debt-Based Financing Models," *International Business Research* (2012).

⁶⁵ Ibid.

⁶⁶ United Nations Economic and Social Commission for Western Asia, "A Guidebook for Project Developers for Preparing Energy Efficiency Investments Business Plans," (2015).

⁶⁷ Ibid.

⁶⁸ Ibid.

requirements are basic requirements for most projects. However, for renewable energy projects, more requirements need to be fulfilled. A report conducted by third-party expert must be submitted. The report must include the viability of the technology, reasonableness of budget, compliance with regulation and the possibility of financial projection. The documents that represents the government's approval of the project must be presented to the financiers.⁶⁹ However, it is important to analyze other possible ways that can finance the renewable project such as different types of equity. The examples of equity that can be used to finance renewable energy companies are capital markets, private equity funds, infrastructure funds and pension funds. These options also came up with interesting conditions that the project operators should take into consideration. Different types of equity are applied to the companies depending on the type of business, the stage of development of the technology, and degree of risk associated with the production of such renewable energy.⁷⁰ For the renewable energy companies that are in the early stage or growth stage, venture capital is likely to be involved.⁷¹ For the companies that upgrade into more advanced stage, private equity will be involved with the expectation of making returns within 3 to 5 years.⁷²

⁶⁹ Ibid.

⁷⁰ Ibid.

⁷¹ Ibid.

⁷² Ibid.

Another possible way to finance the project is to issue bonds. The project company can seek for the fund to operate the project through issuing bonds. Bonds is a type of fixed-income securities as bonds pay a fix amount of interest rate to the investors. The project company can raise capital from issuing fixed-income securities to investors.⁷³ In issuing bonds to the purchasers, the project company must comply with the laws and regulations stipulated by the authority. In Thailand, The Securities and Exchange Commission (SEC) is responsible for issuing rules and regulations concerning capital market.⁷⁴ The Securities and Exchange Commission (SEC) plays an important role in regulating debt securities as the bond issuers must ask for the approval from The Securities and Exchange Commission (SEC).⁷⁵ This means a preliminary examination on the issuer must be conducted before the issuers are allowed to issue bonds to the market.⁷⁶ There are several steps that the project company must follow in seeking fund through issuing bonds. The first step is that there must be an approval from the general meeting shareholders to issue bonds.⁷⁷ After receiving the approval, it is advisable that the company appoints the financial advisor and underwriter to facilitate the process of underwriting. Their duty is to assume the risk of

⁷³ Chris B. Murphy, "Fixed-Income Security," <https://www.investopedia.com/terms/f/fixed-incomesecurity.asp#:~:text=Fixed%2DIncome%20securities%20are%20debt,form%20of%20fixed%2Dincome%20securities.>

⁷⁴ Thailand The Securities and Exchange Commission, "Our Roles," <https://www.sec.or.th/EN/Pages/AboutUs/Whatwedo.aspx>; *ibid.*

⁷⁵ Thailand The Securities and Exchange Commission, "Debt Securities," <https://www.sec.or.th/EN/Pages/LawandRegulations/DebtInstrument.aspx>; *ibid.*

⁷⁶ *Ibid.*

⁷⁷ The Thai Bond Market Association, "Bond Issuance Manual."

buying the newly issued bonds from the company. Due diligence must be conducted in order to provide the information on the accountability of the project to the bond purchasers and prevent the false information from being published to the public.⁷⁸ The information that must be examine in conducting due diligence includes the state control, license, legal dispute that may arise in the future and the structure of capital.⁷⁹ The scope of due diligence includes the competitive conditions, the production, government control, legal disputes, environment management, agenda, objective, organizational structure, the structure of shareholders and the performance of the company.⁸⁰ The five Cs is being used to determine the creditworthiness of the company which are character, capacity, capital, collateral and conditions.⁸¹ The character of the company is defined by its credit history.⁸² The capacity of the company can be shown through debt-to-income ratio.⁸³ For capital, it is the amount of money that the project company possess which will reflect its ability to make repayment.⁸⁴ Collateral is also essential as it is the asset that acts as a security for the loan in order to make the financial institutions certain that they will get paid even in the situation of default in payment.⁸⁵ Conditions include the objective of the loan

⁷⁸ Ibid.

⁷⁹ Ibid.

⁸⁰ Ibid.

⁸¹ Troy Segal, "Five Cs of Credit," <https://www.investopedia.com/terms/f/five-c-credit.asp#2-the-five-cs-of-credit-capacity>.

⁸² Ibid.

⁸³ Ibid.

⁸⁴ Ibid.

⁸⁵ Ibid.

and the interest rates agreed between parties.⁸⁶ After gathering necessary information, the bond issuer must perform the filing to obtain permission from Securities and Exchange Commission (SEC).⁸⁷ There are various checklists that the companies have the obligation to fulfill prior to issuing bonds. After the approval, a disclosure of information concerning the issuers must be presented to provide the information to facilitate the investors in making decision in buying bonds.⁸⁸

In issuing bonds, it is important to examine the laws and regulation from Securities and Exchange Commission (SEC) regulating the bonds. Division 3 of the Securities and Exchange Act B.E.2535 stipulate about the issuance of secured debentures. To elaborate, Section 41 describes the process that the applicant shall follow in applying for an approval to sell newly issued securities.⁸⁹ The applicant which is the project company in this case must submit the terms and conditions stating the rights and duties of the debenture issuers and debenture holders.⁹⁰ Accordingly, the applicant must submit a draft agreement and obtain approval for a person to be regarded as a debenture holder representative.⁹¹ In general, the applicant must undertake the actions as specified in the notification of Capital Market Supervisory Board.⁹² The Capital Market Supervisory Board has an

⁸⁶ Ibid.

⁸⁷ Ibid.

⁸⁸ Ibid.

⁸⁹ "Securities and Exchange Act B.E. 2535. Section 41."

⁹⁰ Ibid.

⁹¹ Ibid.

⁹² Ibid.

important role as the Board have the authority to issue rules and procedures in relation to debentures.⁹³

A joint venture is very popular among many businesses. A joint venture is a strategic alliance between two or more individuals or entities to engage in a specific project or undertaking.⁹⁴ Many businesses prefer using joint venture to operate the project as it has several advantages. The first advantage is that it provides companies with the opportunity to gain new capacity and expertise.⁹⁵ Joint venture also allows the participants to access to greater resources including gaining new capacity and expertized staffs.⁹⁶ Unlike partnership, the nature of joint venture is not in a long run but rather for a single business project. One of the key features of joint venture is that the entity will cease when it meets the goal of the project. For hydro floating solar project, it requires a large amount of fund and expertise to run the project. Joint venture may be useful for the project in the sense that it allows the participants in the project to get access to broader range of technology and expertise which are crucial in installing the floating solar plant. However, the private sector who was granted license for operating hydro floating solar project will definitely want to operate the project to produce electricity in a long run. It takes a certain period of time to actually generate income from selling electricity as a large amount of money is initially invested

⁹³ "Securities and Exchange Act B.E. 2535. Section 46."

⁹⁴ VR Business Sales Edmonton, "Advantages and Disadvantages of Joint Venture."

⁹⁵ Ibid.

⁹⁶ Ibid.

in installing the whole system. The main objective of hydro floating solar project is to produce electricity and sell electricity through transmission to state agencies. It is evident that the project will run for a long period of time so it is less likely that the project operator will expect to cease the project after a short period of time. One of the key features why business parties participate in joint venture is its limited lifespan. Since the nature of hydro floating solar project operated by private sectors was not a short lifespan project, joint venture may not be a great choice for the project operator to finance the hydro floating solar project. All in all, it depends on each private operator whether they will use this joint venture method alone or they will combine with other manners.

2.1.2 Bankability

Given that the hydro floating solar project can operate profitably, the project requires a tremendous amount of capital expenditures, which mainly used for material procurement, land leasing, and etc. On the equity side, the Project Company can find equity investors, who invest their money in the project and receives an attractive return in the form of dividends.⁹⁷ An equity investor can be only one sponsor, or it can come in a joint venture, or a consortium. By being a sole sponsor to the project, the sponsor receives full control and returns from

⁹⁷ Christina Majasaki, "Debt Financing Vs. Equity Financing: What's the Difference?," (March 12, 2020.).

the project, as well as full responsibility for any risk that might occurred.⁹⁸ The minimum required by the bank's share of own capital or equity will range from 20% to 30% of the total investment cost.⁹⁹ It depends on the viability and financial robustness and strength of the private operators of renewable energy project.¹⁰⁰ However, 30% is the most common share required by financial institutions to contribute to the financing renewable energy projects.¹⁰¹ On the other hand, by forming a joint venture or a consortium, the project's risks and rewards are shared among the investors.¹⁰² Forming a joint venture or a consortium could also bring synergy from each party's expertise, leveraging a know-how from different aspects to construct a competent project, which in this case, a hydro floating solar project. However, equity investors usually require a higher rate of return compared to debt financing, as they faced a higher risk from the corresponding project.¹⁰³

Debt financing, on the other hand, becomes a cheaper alternative to equity financing as the cost of debt could be determined by the agreeing on the interest rates with the financial institutions.¹⁰⁴ The debt financing model is the bank loan.¹⁰⁵ Debt capital is provided by large financial institutions as banks are the

⁹⁸ Ibid.

⁹⁹ Ibid.

¹⁰⁰ Ibid.

¹⁰¹ Ibid.

¹⁰² Ibid.

¹⁰³ M. Horton, "How Risky Are Private Equity Investments Versus Other Investments?."

¹⁰⁴ Ibid.

¹⁰⁵ Ibid.

largest providers of debt project finance.¹⁰⁶ The main focus of the bank is the ability of the private operators to make loan repayments. The ability to make repayment relies on the creditworthiness of the private operators. Creditworthiness is one of the main criteria to determine the amount of loan that the financial institutions will grant to the project. The components of credit analysis are capacity, capital, conditions, collateral and character.¹⁰⁷

As a result, when it comes to project financing, the Project Company usually goes for the highest debt financing as possible. Nevertheless, the amount of debt that the Project Company can take depends on the project's bankability, which will be determined by the financial institutions lending money to the company.

Bankability is a term used in the renewable energy sector to describe the likelihood that any particular technology or manufacturer will be funded by banks or financial institutions.¹⁰⁸ If a technology is new and unproven, there is a slight chance that banks and other financial institutions will fund associated projects. The hydro floating solar project is relatively new in the renewable energy sector as the data and records about the performance of this system have not developed to the point that it is credible for the banks or financial institutions

¹⁰⁶ Ibid.

¹⁰⁷ Tracy Sheppard, "The 5 C's of Credit," <https://www.liveoakbank.com/wine-and-craft-beverage-resources/the-5-cs-of-credit/#:~:text=Credit%20analysis%20by%20a%20lender,associated%20with%20making%20a%20loan.&text=Credit%20analysis%20is%20governed%20by,are%20honest%20and%20have%20integrity.>

¹⁰⁸ Dan Holloway, "Storage and Bankability," *Sustainable Capital Finance* (2017).

to fund the project. The private investors who are interested in seeking loan from banks or financial institutions must be able to have to show financial stability and a strong balance sheet to prove to financiers that they are capable of supporting the warranties that they provide with their systems.¹⁰⁹ If private investors of the hydro floating solar project can meet these minimum criteria such as Debt Service Coverage Ratio (DSCR), Debt to Equity Ratio (D/E Ratio) and/or Debt to EBITDA Ratio (D/EBITDA Ratio), there is a high possibility that the financing groups will fund the project as they consider the project as bankable.¹¹⁰ Being able to provide financial institutions with warranties is one of the critical elements in order to make the hydro floating solar project bankable. Therefore, it is crucial to find out the rights that the project investors have over the hydro floating solar project because these rights are the tools that act as warranties for the financial institutions. In finding out such rights, there is a need for the analysis of regulations related to water resources in each country.

All in all, the power purchase agreement helps to facilitate the bankability by paying the loan back solid enough for 20 years.¹¹¹ There is an example of power purchase agreement that has a period of 20 years in Western Wind Energy Corporation in Canada had closed a 23.5 million dollars financing for its Dark

¹⁰⁹ Tim Berry, "10 Things the Bank Will Ask When You Need a Business Loan."

¹¹⁰ Adam Hayes, "Debt-Service Coverage Ratio (Dscr)," (2020).

¹¹¹ Joanne Jungmin Lee and Aleksii Lumijarvi (IRENA) Henning Wuester, "Unlocking Renewable Energy Investment: The Role of Risk Mitigation and Structured Finance."

Harbour wind project with New Brunswick Power.¹¹² Therefore, creditworthiness depends on the PPA.

A power purchase agreement in practice can be divided into two schemes. The first scheme is Adder which is rarely used nowadays as most projects prefer using Feed-in Tariff instead. Adder is the scheme that provides financial support for the private operator in the renewable energy industry by the surplus from base tariff (market price for electricity).¹¹³ The purchase price for electricity will correspond to the market price. The advantages of Adder are increased revenue and stable income.¹¹⁴ The payback period of 7-10 years is a good incentive for the private operator.¹¹⁵ However, the cost of electricity for the end-user will be high. When the period of government's subsidy is over, the private operator must sell electricity in wholesale float time charge(ft) plus Adder which can fluctuate and depend on price mechanism and cost of producing electricity.¹¹⁶ This means private operators have to take a risk of price fluctuation. Due to the uncertainty of the price, the private operator may be out of business when the period of Adder is over (7-10 years).

The second scheme is Feed-in Tariff (FIT). In this scheme, the prices of electricity are fixed and the price is paid to the renewable energy producers for

¹¹² B. B. Ozkol, "The Possible Ways to Finance the Renewable Energy Projects in Terms of Project Finance and Law."

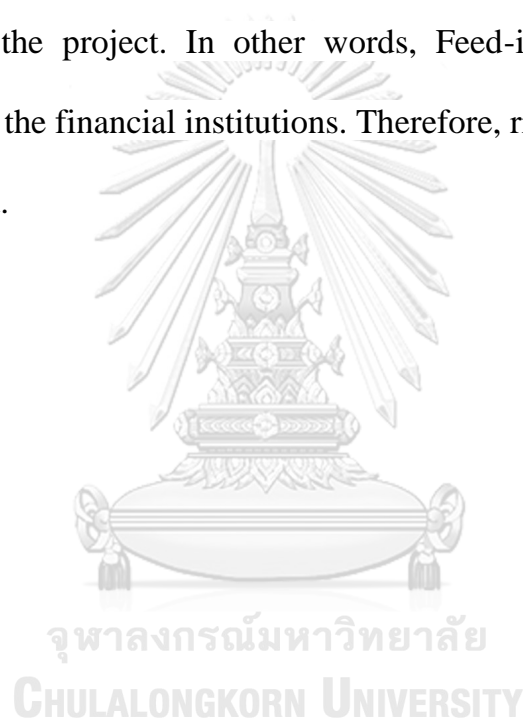
¹¹³ Energy for Environment Foundation, "Adder or Feed-in Tariff ?."

¹¹⁴ Ibid.

¹¹⁵ Ibid.

¹¹⁶ Ibid.

each unit of energy produced and inserted into the electricity grid.¹¹⁷ Feed-in Tariff is very significant to the bankability of the renewable project in the way that it can guarantee that the renewable energy producers will be able to sell electricity for a certain period of time. The period of this scheme usually lasts for approximately 15-25 years.¹¹⁸ The benefit of Feed-in Tariff is that the financial institutions can know the projection of the profitability of the renewable energy through the project. In other words, Feed-in Tariffs provide more predictability for the financial institutions. Therefore, risks related to the project will be alleviated.



¹¹⁷ Energypedia, "Feed-in Tariff (Fit)."

¹¹⁸ Ibid.

Figure 1¹¹⁹: Example of Feed-in Tariff (FIT) price of renewable energy.

Feed-in Tariff for VSPP of Renewable (2018)				
Type of renewable energy	FIT (THB/kWh)			Period of support
	FiT(F) 1/	FiT(V2018) 2/	Total caculated FiT	
1. Biomass				
Capacity ≤ 1 MW	3.13	2.22	5.35	20
Capacity >1-3 MW	2.61	2.22	4.83	20
Capacity >3 MW	2.39	1.86	4.25	20
2. Biogas (waste water/other waste)				
All size	3.76	-	3.76	20
3. Biogas (energy crop)				
All size	2.79	2.56	5.35	20
4. MSW (waste management)				
Capacity ≤ 1 MW	3.13	3.23	6.36	20
Capacity >1-3 MW	2.61	3.22	5.83	20
Capacity >3 MW	2.39	2.71	5.10	20
5. MSW (landfill)	5.60	-	5.60	10
6. Industry waste (VSPP new plant)	3.39	2.71	6.10	20
7. Wind				
All size	6.06	-	6.06	20
8. Hydropower				
Capacity ≤200 kW	4.9	-	4.90	20
9. Solar				
Solar farm	5.66	-		25
Rooftop (residential) capacity 0-10 kWp	6.85	-		25
Rooftop (building/factory) capacity>10-250 kWp	6.40	-		25
capacity>250-1,000 kWp	6.01	-		25
10. SPP hybrid firm	1.81	1.86	3.67	20

Source: EPPO, ERC
Note:
1/ FIT is fixed component e.g.cost of electricity plant construction, operating/maintenance expense, land rent.
2/ FiT(v2018) is variable component for some type of renewable energy, which is adjusted depending on feedstock cost and inflation

¹¹⁹ Narin Tunpaiboon, "Power Generation," (June 2019).

According to this figure, The Feed-in Tariff price of Solar energy is around 5.66 to 6.85 THB per kWh depending on whether it is located in solar farm or rooftop.¹²⁰

The Feed-in Tariff provides that energy producers receive a fixed price for the energy they sell to the authorities including the Metropolitan Electricity Authority (MEA) or Provincial Electricity Authority (PEA). Through the process of forming power purchase agreement, MEA or PEA will conclude a power purchase agreement with the energy producers. The main objective of such an agreement is to guarantee the Feed-in Tariff for a definite period of time as agreed in the agreement.¹²¹ When the fixed price of selling electricity is agreed upon, the investment in renewable energy will become more secured for the financial institution. This is because the financial institutions can perceive that the project owners who are asking for the loan will have the capability to make the repayment in accordance with the repayment plan. The project owners will receive certain amount of profit from selling electricity at the price that is agreed upon in the power purchase agreement. It can be said that the profitability of the renewable energy project, including the hydro floating solar project relies on the power purchase agreement.

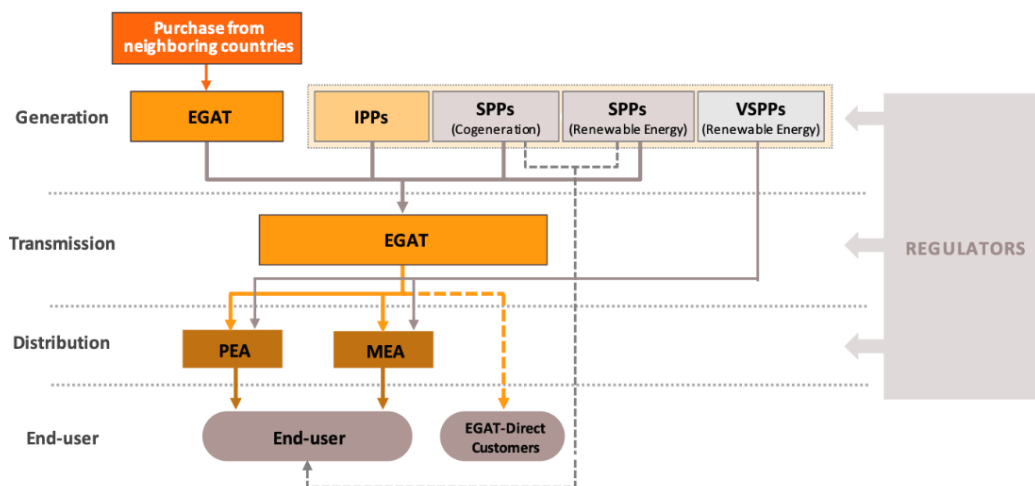
¹²⁰ Ibid.

¹²¹ Lorenz & Partners, "Renewable Energy in Thailand July 2019."

2.1.4 Right to sell electricity generated in hydro floating solar project

Prior to looking into the right to sell electricity, it is essential to understand the supply chain of electricity in Thailand from the generator to the end-user. Understanding the roles of different players will help to visualize the relationship between Independent Power Producers (IPPs), Small Power Producers (SPPs), Very Small Power Producers (VSPPs) and Electricity Generation Authority of Thailand (EGAT), Metropolitan Electricity Authority (MEA) or Provincial Electricity Authority (PEA) which are the main players in electricity supply chain.

Figure 2¹²²: Thailand's electricity supply chain



Source: EPPO, compiled by Krungsri Research

¹²² Ibid.

The figure above present Thailand's Electricity Supply Chain. There are many parties involve in the supply chain, beginning with the generation process to the end-user. The parties that are involved in electricity generation in Thailand are Electricity Generation Authority of Thailand (EGAT), Independent Power Producers (IPPs), Small Power Producers (SPPs) and Very Small Power Producers (VSPPs). This thesis will focus on the bankability of hydro floating solar project from the perspective of SPPs and VSPPs.

Small Power Producers (SPPs) are the electricity producers whose total installed capacity is between 10 megawatts to 90 megawatts.¹²³ There are two type of SPP: firm and non-firm. Firm SPP supply electricity to EGAT in long-term contract which is usually 25 years, while non-firm SPP commit to shorter contract that last for five years.¹²⁴ The source of power usually come from both non-renewable and renewable energy.

Very Small Power Producers (VSPPs) are the electricity producer with total installed capacity below 10 megawatts. In general, VSPPs generate electricity from renewable sources for their own use and distribute the surplus electricity production to Metropolitan Electricity Authority (MEA) or Provincial Electricity Authority (PEA) at rates determined by the feed-in tariff (FiT).¹²⁵ In

¹²³ Ibid.

¹²⁴ Ibid.

¹²⁵ Ibid.

generating electricity from hydro floating solar project, the total installed capacity stays within 90 megawatts. Thus, the project operators usually fall within the categories of Very Small Power Producers (VSPPs) or Small Power Producers (SPPs).

In this chapter, we will focus on procedures of applying for the right to sell electricity in Thailand. In the past, Thailand does not allow private sector to contribute in the business related to infrastructure as providing infrastructure is the main duty of the government. Electricity is considered as one of the basic infrastructures, so private sectors did not take part in selling electricity in the past. Until 1992, The National Energy Policy Committee had the resolution concerning the regulation of purchasing electricity from small power producers (SPP) that has the objective of allowing EGAT to purchase electricity from small power producers. This led to a change in the concept of selling electricity in Thailand as private sector are allowed to participate in the process of selling electricity.

The next step of evolution concerning the right to sale electricity was when the cabinet approved the recommendation of The National Energy Policy Committee concerning the procedures and guidelines that allowed private sectors to get more contribution in electricity business in Thailand. Independent Power Producer which is also known as IPP was introduced to the process of selling electricity in Thailand as the producers are enabled to sell electricity that they produced to EGAT. The trend is expanding as the volume of purchasing

electricity from Independent Power Producers are increasing through the process of bidding to EGAT.¹²⁶ In this process, EGAT offers the invitation to bids to the power producers. The power producers who are interested in selling electricity then bided to EGAT to obtain the right to sell electricity. The mentioned facts are the underlying background that led to a legislation of the Energy Industry Act B.E. 2550.

The Energy Industry Act, B.E. 2550 (2007) acts as an entrance for the licensing of energy businesses. This Act allows the licensing agreement between the government and licensee who wants to operate energy industry. Licensee who meets all requirements stipulated by the Energy Regulatory Commission (ERC) will be granted license of energy industry operation. This applies to the case that EGAT invites sealed bids of Floating Solar Power Plant for Sirindhorn Dam Hydro-Floating Solar Hybrid Pilot Project.

It must be noted that the Energy Industry Act, B.E. 2550 (2007) only stipulates the requirements and details related to licensing of power generation system. There are no provisions stated the kind of right that belongs to the license over the floating solar panels. Therefore, the lack of definite provision issuing the licensee's right leads to an issue of uncertainty in the licensee's right. Consequently, the problem of bankability of the hydro floating solar project arises as the investors are aware of the project risks. In order to determine the

¹²⁶ Energy Policy and Planning Office MINISTRY OF ENERGY, "การรับซื้อไฟฟ้าจากเอกชน."

bankability of the project, the project risks can be minimized by asset-based guarantee. However, it is different for the case of hydro floating solar system. Since the nature of hydro floating solar system is different from other kinds of assets, there is a problem on how to use unasset-based finance to reduce project risks and increase bankability.

According to Section 51, the criteria, procedures and conditions of license issuance stipulated by the ERC under Section 50 shall take into account the difference of the categories, capacities and characteristics of the energy industry and shall not create an undue burden on the energy industry operation of the licensees and shall not lead to the limitation of market competition. Also, they shall not be discriminately applied to the licensees who operate the energy industry of the same category, capacity and characteristics.

For the procedures of applying for the right to sell electricity, Energy Regulatory Commission (ERC) is the key player of this procedure. Energy Regulatory Commission has announced the regulation, announcement and declaration to elaborate the provisions stated in the Energy Industry Act B.E. 2550. The provisions in the Act only provide general concept of allowing private sectors to be involved with the government in the process of selling electricity. Accordingly, in order to apply into practices, we must consider the provisions stipulated in the Act together with the details provided in regulation, announcement and declaration by ERC. In addressing the process of purchasing electricity from Independent Power Producer (IPP), the process of selecting IPP

is through bidding. Independent Power Producers who are interested in selling electricity must submit Request for Proposals to the ERC.¹²⁷ Such application must include the technique and price. The bidder who qualified will be invited to negotiate the Power Purchase Agreement with ERC. The procedure of obtaining the right to sell electricity from ERC shall be the same for electricity that derive from various sources as the main role of this procedure is to allow private sector to be involved in electricity business. Thus, the process of obtaining the right to sell electricity produced from hydro floating solar system should follow aforementioned steps that are set by ERC. The private operators of hydro floating solar projects can obtain the right to sell the electricity produced from their projects.

However, the EGAT is not only considered the distributor in buying electricity from our hydro floating project but also PEA and MEA.

2.1.3 Power purchase agreement

Power purchase agreement is one of the parts in selling electricity. Power purchase agreement is a reciprocal financial relationship between an electricity generator and the purchaser.¹²⁸ In this relation, the electricity generator acts as a

¹²⁷ Energy Regulatory Commission, "ประกาศ กกพ. เรื่อง ประกาศเชิญชวนการรับซื้อไฟฟ้าจากผู้ผลิตไฟฟ้าเอกชนรายใหญ่ (Independent Power Producer - Ipp)."

¹²⁸ Erin Decker, "The Evolving Structure of Power Purchase Agreements (Ppas)."

seller that sells the electricity to the purchaser. There are many forms of power purchase agreement. One of the interesting forms is a Corporate Power Purchase Agreement.¹²⁹ It is an agreement between an entity that owns and operates solar project and the buyer which is an organization.¹³⁰ From the view of the project company, the project company will have to consider the power purchase agreement before making any further decision. The project company definitely wants to ensure that the project is subject to a certain kind of agreement. Therefore, the power purchase agreement is the first priority that will be taken into consideration. Although the project company is granted a license, receiving a license is a different story from forming power purchase agreement (PPA) as license and PPA have different objectives. The objective of the license is to grant the licensee with permission to produce electricity from the hydro floating solar project. On the other hand, the objective of the power purchase agreement is to make the agreement about selling electricity. Without the power purchase agreement, the electricity cannot be sold to the distributor.

Power Purchase Agreement (PPA) is an essential point that we need to understand to be able to analyze the profitability and bankability of renewable energy project. PPA is known as a Power Purchase Agreement. A PPA is a long-term agreement for an energy buyer to purchase a quantity of electricity

¹²⁹ Business Renewables Centre Australia, "Corporate Renewable Power Purchase Agreements in Australia: State of the Market 2019."

¹³⁰ Ibid.

generated by an off-site renewable energy project, such as a solar or wind farm.¹³¹

It is the main contract in the Independent Power Project (IPP). The PPA obligates performance and creates expectations in relation to both the foreign investor and the host developing country. It has four essential functions of a PPA. The first function is to provide a reliable increase in available power generation capacity for the host country due to a definite schedule that stated the specified amount of power generation capacity. Consequently, the power purchaser will be able to make sure that the amount of power generated is sufficient for the demand in the market. The second purpose of PPA is to assist with the financing of the private sector because the private sector can borrow in reliance on the host country's payment obligations. The third purpose of PPA is to provide procedures and schedules for operation and maintenance, which includes the yearly production of energy. For the final purpose of PPA, the main provisions relating to risk allocation of IPP model are found within PPA.

PPA is an off-take contract that can ensure a minimum amount of project income that is required to cover all some of the capital investment.¹³² It provides long-term certainty that there is a demand for the product or service that will be produced by Project Company. An important characteristic of the PPA and the

¹³¹ Norton Rose Fulbright and WWF-Australia Energetics, "Nsw Guide to Corporate Power Purchase Agreements."

¹³² International Finance Corporation, "Project Finance in Developing Countries," (1999).

firm capacity payments is that the host developing country's payment obligations are not triggered until the capacity is available for dispatch which means the power generation meets the specifications that are included in the agreement. From the power purchaser's perspective, the obligations to remunerate are conditional depending on whether the project has passed its completion tests or not. Following the completion of the project, the generation facility must operate in a manner that it will be available for dispatch by the time agreed in the agreement.

Moreover, there is another type of off-take structure in project finance. It is known as a take or pay agreement. In this type of structure, the purchaser has the obligation to take at least a given amount of output or make a payment corresponding to that amount of output in order to guarantee the purchase of a minimum amount of output at a stipulated price as long as the project is capable of delivering this amount of output.¹³³ Since this structure ensures that the purchaser must pay even though the purchaser did not choose to pay, this mechanism thus provides income security for the Project Company.¹³⁴

Concerning the price of the power output, the parties use the price as agreed during the time of contract formation. However, the price may change as it is

¹³³ Nevitt and Fabozzi, "Project Financing."

¹³⁴ Henrik M. Inadomi, *Independent Power Projects in Developing Countries*.

subject to indexation.¹³⁵ Power Purchase Agreement will be the factor that determines the profitability of the energy project. The long-term power purchase agreement is placed at the center of any project finance arrangements.¹³⁶ In order to receive profit, the project operator must be able to sign the power purchase agreement with the government or the authority that has the power to authorize the right to sell electricity to the private sectors. The profitability of the project will derive from the price of selling electricity as agreed in the power purchase agreement.

As hydro floating solar projects in many countries have been successful in providing renewable energy, private investors are interested in installing hydro floating power plants. However, the hydro floating solar project requires a large sum of money to facilitate in the long run. There are financial risks involved in this project. Thus, the bankability of this project must be examined thoroughly before the local banks, or private institutions can provide loans to the projects. The power purchase agreement confirms bankability as it assures the loan can be paid back for the specific period of time that is agreed by the parties. Hence, PPA affects the credibility of the project.

The power purchase agreement can be considered as administrative agreement as it is an agreement between the private operator who has a plan to

¹³⁵ Ibid.

¹³⁶ N. Zhang, "Market the Dilemma of Project Finance in the Wake of the Asian Financial Crisis," *Moving Towards a Competitive Electricity*.

operate the hydro floating solar project and state-owned enterprise which is Electricity Generating Authority of Thailand (EGAT), Provincial Electricity Authority (PEA), Metropolitan Electricity Authority (MEA). If the financial institutions consider the fixed price of electricity that is agreed in the power purchase agreement and found that the project has the potential to repay the money back to the bank, there is a high possibility that the project will commence as the financial institutions will grant a loan to that private operators. It must be noted that the power purchase agreement is one of the issues that can ensure the bankability. Therefore, the creditworthiness of the project operator is dependent on power purchase agreement.

2.2 Regulatory framework of a hydro floating solar project

In regulating the hydro floating solar project, there are various laws governing different aspects of the project. For the permission to operate energy business, the private operators must obtain license so as to operate the hydro floating solar project in accordance to the Energy Industry Act B.E. 2550(2007). The operation of the photovoltaic pontoons to generate electricity is subject to The Factory Act B.E. 2535. The critical law that should be analyzed is the Water Resources Act B.E.2561(2018) as this Act is closely linked to the use of public water resources.

2.2.1 Electricity license

To operate an energy business, it is obligatory for the project company to have the license permitting the activity of energy generation which is found in Section 47 of the Energy Industry Act B.E.2550(2007).

Section 47 stipulate that " Energy industry operation, either with or without remuneration, shall have to obtain a license from the Commission.

In issuing a license, the Commission shall announce and determine the type and term of license that corresponds with capacity and characteristics of the individual energy industry category, taking into account impact on people, worthiness in economic, social and investment aspects, including the competitive features of each industry category, and may impose conditions on a case by case basis.

The determination of categories, capacities and characteristics of energy industry that is exempt from the license requirement shall be promulgated through the issuance of a Royal Decree.

For the benefit of data and statistics collection, the Commission may announce and prescribe that the energy industry exempt from license requirement under paragraph three shall have to notify the Office of their operation."¹³⁷

¹³⁷"Energy Industry Act B.E.2550. Section 47."

According to Section 47 of the Energy Industry Act B.E. 2550, the provision acts as a door of permission for those who are interested in operating the energy business. In order to obtain the license, the project developer shall have the obligation to follow the announcement of the Energy Regulatory Commission (ERC). A license must be granted in order to operate energy industry. ERC has appointed the types and duration of the license in accordance to the size and nature of different kinds of energy industries. However, there are some exceptions to certain kinds of energy industry, so these industries do not have to be granted license in order to operate electricity business. Section 47 of the Energy Industry Act B.E. 2550 only provides the concept to the operators that they must obtain license to operate the business lawfully. The details that elaborate the qualifications of the operators who wish to obtain the license is stipulated in the regulations by ERC. One of the qualifications is that the operators must have ownership, possessory right, or the right to use the area or property used in operating the energy industry. Unlike other kinds of renewable energy project, hydro floating solar is installed on the surface of the water. Thus, it is critical to examine the right that the private operator has over the water surface. From my perspective, the private operator of hydro floating solar project has the right to use the water surface, so the private operator falls within this qualification. This is because water surface is the main component of the existence of the project. Without the existence of water surface, electricity cannot be generated. If the private operator is able to install the hydro floating

equipment on the water surface, this means that the operator has the right to utilize the water surface. Accordingly, the private operator is qualified to obtain the license from ERC to operate the project.

Apart from Section 47, Section 48 of the Energy Industry Act B.E. 2550(2007) also governs the operation of energy industry in Thailand. Section 48 stipulates that "In the case that the building construction or factory establishment for the purpose of energy industry operation must comply with the law on factories, the law on building control, the law on town and country planning or the law on energy development and promotion, the granting of permission under the laws on those respective matters shall be under the authority and duties of the Commission under this Act. In this regard, the Commission shall have to solicit for comments from the authoritative agencies under those respective laws, and such agencies must notify the Commission of their comments and amount of fees chargeable under those respective laws.

The Office shall deliver the fees collected by the Commission under paragraph one hereof to the respective authoritative agencies under those respective laws for further action."¹³⁸

According to Section 48 of the Energy Industry Act B.E.2550, it provides the concept concerning the relevant laws and the authority involved in the process of obtaining permission to operate energy industry including hydro

¹³⁸ Section 48 Energy Industry Act B.E.2550.

floating solar project. To elaborate, the establishment of factory for the purpose of energy industry operation are subject to the law on factories, the law on building control, the law on town and country planning or the law on energy development and promotion. It is also provided that the Energy Regulatory Commission is the authority that can issue the permission to operate the energy industry to the project. Section 48 is a linkage to the application of The Factory Act B.E.2562 which set the control of factory establishment and operation. The first thing that should be taken into consideration is the definition of "factory". Another legislation that is related to the installation of photovoltaic pontoons to generate electricity is the Factory Act B.E.2535. To apply this legislation to the project, the project must fall within the definition of factory which is found in Section 5. Section 5 states that "In Factory Act B.E.2535 "factory" means building, premises, or vehicle using machine or machines with total power or an equivalent of five horsepower or more, or which employs seven workers or more with or without machinery to manufacture, produce, assemble, pack, repair, maintain, test, improve, process, convey, keep, or destroy anything in accordance with the type or kind of factory as prescribed in the Ministerial Regulations."¹³⁹

The important part is that factory includes machines with total power or an equivalent of five horsepower or more.¹⁴⁰ Hydro floating solar project generally

¹³⁹ "Factory Act B.E.2535. Section 5."

¹⁴⁰ Ibid.

generates a large amount of electricity so the nature of this project uses the power more than five horsepower and more than seven workers. Hence, the project falls within the definition of factory so the provisions of the Factory Act B.E.2535 applies to the case.

After regarding the project as factory, the next issue that must be analyzed is the category of the factory as different categories have different requirements. The categories of factory are found in Section 7 of the Factory Act B.E.2535. Section 7 states that "The Minister shall have the power to prescribe in Ministerial Regulations categorizing factory of any type, kind, or size to be as Category 1 factory, Category 2 factory, or Category 3 factory, as the case may be, by taking into account the necessity for control and supervision, prevention of nuisance, prevention of damage, and prevention of danger in accordance with the severity of impact on the people or environment, by the following categorization:

- (1) Category 1 factory is a factory of the type, kind, and size, capable of factory operation immediately as desired by the factory operator;
- (2) Category 2 factory is a factory of the type, kind, and size, which requires a notice to be made to the license grantor prior to its operation;
- (3) Category 3 factory is a factory of the type, kind, and size, the setting up of which requires a license.

The factory prescribed in the Notifications of the Minister under Section 32 (1), when published, shall be Category 3 factory."¹⁴¹

According to this Section, factories are divided into three categories. In the first category, license for the operation is not required. For the second category, the license is not required but the private operator must notify the official before operating. For the third category, this category of factory may cause pollution or danger to the environment so it requires special attention from the officials. The license must be granted before the private operators are allowed to launch the project. The hydro floating solar project is installed on the water surface so it may pose danger to the environment on the surrounding around the location of the project so it is considered as Category 3. Accordingly, the project company must apply for the license to operate the project which is considered as factory.

Section 47 of the Factory Act B.E.2535 leads to the application of the Ministerial Regulations No.23, B.E.2557 (2014) issued pursuant to the Factory Act, B.E.2535 (1992).¹⁴² In addition, Section 12 paragraph one and two of the Factory Act B.E.2535 (1992) also provides the details in applying for the license to operate factory. Section 12 states that "The operator of Category 3 factory shall have to obtain a license from the license grantor and shall comply with the

¹⁴¹ "Factory Act B.E.2535. Section 7."

¹⁴² "Ministerial Regulation No.23 B.E.2557 (2014) Issued Pursuant to the Factory Act, B.E.2535 (1992)."

criteria prescribed in the Ministerial Regulations issued under Section 8, the Notifications of the Minister issued under the said Ministerial Regulations, and the Notifications of the Minister issued under Section 32. No person shall set up a factory before a license is obtained."¹⁴³ This provision emphasizes that the project company must possess a license in order to operate factory in Category 3. To elaborate, without a license granted from the authority, the project company is not allowed to operate the factory.

Hydro floating solar projects are the projects that use large quantity of machinery and workforce. In the structure of hydro floating project, buoyancy with solar plant on the top is floating on the water surface. Thus, this project is about solar electricity generating plant and falls within Category 3 under Section 7 of the Factory Act B.E.2535. As a result, the private operator must ask for license from the authority before initiating hydro floating solar project in accordance to Section 12 paragraph one of the Factory Act B.E.2535. If the private operator operates the project without having license, the certainty of the project will decline as there is a possibility that the authority may claim that the private operator runs the project without license which is in contradictory with Section 12 paragraph two of the Factory Act B.E.2535.

In the use of the area as location for energy generation, the Town Planning Act B.E. 2562 (2019) must be considered in operating this project as well. The


¹⁴³ "Factory Act B.E.2535. Section 12."

objective of Town Planning Act is to regulate the usage of land which area are able to build the construction for operating the industry. The definition of "Town planning" is found in Section 4 of this Act. Section 4 states that "Town planning" means the formulation, preparation and implementation of town plans at varying levels as a framework for physical development at a national level, a regional level, a provincial level, a town level and a rural level as well as in specific areas alongside the national economic and social development plans for the purpose of putting forth urban development and the development of related areas or the countryside towards the obtainability or amelioration of sanitary conditions, comfort, orderliness, exquisiteness, property use, communication and transport, public safety, social welfare, disaster prevention and land-use conflict prevention, in the interest of promoting the economy, society and surroundings, preserving or renovating places or objects possessing artistic, architectural, historical or archeological interests or value or maintaining and conserving natural resources and the environment as well as picturesque or naturally valuable landscapes."¹⁴⁴ According to this Section, hydro floating solar project is installed on the water surface to generate electricity so the implementation of this project must comply with the Town Planning Act B.E. 2562 (2019) to maximize the utilization of land use. In order to identify the location where the installation of factory is allowed, the first issue that must be taken into consideration is the

¹⁴⁴ "Town Planning Act B.E.2562, Section 4."

location of the project as each province in Thailand has different structure of town planning. For instance, there are more available land that can be used for installation of factories in Samutprakan than Bangkok. The second issue is the purpose of utilization allowed in each zone. It is crucial to identify whether installation of factories is allowed in such area or not. The table below represents different zones with specific land utilization.

Table 2: The colors of different zones show the utilization of different areas.



Yellow Zone	๖.1-๖.5	Low density residential zone
Orange Zone	๖.6-๖.10	Medium density residential zone
Brown Zone	๖.11-๖.15	High density residential zone
Red Zone	๗.1-๗.8	Commercial zone
Purple Zone	๘.1-๘.2	Industrial zone
Lilac Zone	๘.3	Warehouse zone
White with green diagonal Zone	๗.1-๗.2	Rural and agricultural preservation zone
Green Zone	๗.3-๗.4	Rural and agricultural area
Light brown zone	๘.1-๘.2	Preservation and promotion of Thai culture area
Blue Zone	๘.	Government Institute, utilities, and amenities zone

According to Table 2, purple and lilac zone represent industrial and warehouse zone. Factories can be built in these zones. However, they cannot be installed in residential, commercial, agricultural, rural and cultural zones. In other words, they cannot be located in yellow, orange, brown, red, white with green diagonal, green, light brown and blue zones. Since hydro floating solar

project is considered as factory under the Factory Act B.E. 2535, it must be installed in industrial and warehouse zones (Purple and Lilac). If the factory is not located in appropriate zones, there is a chance of license revocation. License to operate the project is one of the criteria which banks take into consideration both when granting loan and during the period of loan. Before making the decision in granting loan to the private operator, financial institutions must be certain that the private operator has the license required for the operation of the project. In the situation when the private operators select the wrong zones for building hydro floating solar project, the authority is unlikely to give license to the private operators. This will affect the bankability of the project as the financial institution will not grant the loan to the private operator. In another situation after the loan is permitted, if the private operator installs the project in the inappropriate zone, the license may be revoked. Thus, uncertainty arises in the operation of the project as the bankability of the project is affected because the private operator may not run the project so there is a risk in returning the loan and interest to the financial institution.

2.2.2 Environmental regulation and land usage restriction

Environmental Impact Assessment (EIA) is the study for forecasting the environmental impacts, both negative and positive impacts from development projects or significant activities. EIA has been used to establish the appropriate mitigation measures for preventing and mitigating environmental impacts for

these projects or activities.¹⁴⁵ EIA must be conducted before operating a project.

This means that the operator will have to pay the cost to conduct EIA at the time that the operator is uncertain whether he will be granted the license for that project or not. There are many aspects to consider before making a decision of conducting EIA.

Thai law that contains the provisions related to EIA is The Enhancement and Conservation of National Environmental Quality Act, B.E. 2535 (1992) and Regulation of Energy Regulatory Commission (ERC) B.E.2559 concerning the procedures to obtain energy operator license under Section 47 and Section 48 of the Energy Industry Act B.E.2550.

In operating hydro floating solar project, this project falls into Category 3 under Section 7 of the Factory Act B.E.2535. In general, Category 3 factory must conduct the Environmental Impact Assessment (EIA) report when applying for a license. In considering whether to grant factory license, the Division of Environmental Impact Assessment development must consider EIA report, location of the factory and authenticity of the related documents.¹⁴⁶ In other words, the authority must consider not only land usage but also the environmental effect in running the project which will be discussed in environmental regulation and land use restriction topic.

¹⁴⁵ Issarapun Karnjanareka, "Environmental Impact Assessment (Eia)," (August 10, 2016).

¹⁴⁶ กรมโรงงานอุตสาหกรรม, "ขั้นตอนการพิจารณาอนุญาตโรงงาน," (July 2557).

In the case when EIA applies in hydro floating solar project, it is likely that the Expert Review Committee will approve the project if EIA report is well conducted. A decent EIA report should include all information and assessment as stated in these guidelines: General Guideline, Sector Guideline including guideline for industry, transportation, power plant and water resources and Specific Guideline including guideline for Public participation and Health Impact Assessment.¹⁴⁷

However, Regulation of the Energy Regulatory Commission on protection measure and investigation of environmental impact for floating photovoltaic electricity generator B.E. 2562.¹⁴⁸ Article 3 states that " In this regulation licensee means a person who apply for license to operate floating photovoltaic which Environmental Impact Assessment (EIA) under Supporting and maintaining the quality of national environment Act B.E. 2535(1992) is not required."

According to this Article, floating photovoltaic electricity operators do not have an obligation to conduct Environmental Impact Assessment (EIA). Although Environmental Impact Assessment (EIA) is not required in floating photovoltaic project, the Regulation of the Energy Regulatory Commission on protection measure and investigation of environmental impact for floating

¹⁴⁷ Ibid.

¹⁴⁸ Energy Regulatory Commission, "ระเบียบคณะกรรมการกำกับกิจการพลังงาน ว่าด้วยมาตรการป้องกันและติดตามตรวจสอบผลกระทบสิ่งแวดล้อม สำหรับผู้ประกอบการ ผลิตไฟฟ้าจากพลังงานแสงอาทิตย์ด้วยเทคโนโลยีโฟโตโวลเทอิกแบบทุ่นลอยน้ำ พ.ศ. ๒๕๖๒."

photovoltaic electricity generator B.E. 2562 Article 4 state that " Those who apply for the license and those who are qualified for the license must follow environmental procedure and assess environmental impact on nearby community in accordance with Code of Practice (CoP) attached with this regulation."¹⁴⁹

With regards to the Code of Practice (CoP), public hearing is a critical procedure as multiple parties must involve in this process. The objective of public hearing is to allow people, stakeholder and related authorities to express their opinions towards the operation of the project. Through this process, comments will be taken into account so as to determine protective measures and solve the environmental impact. These opinions must be included in this report.

The Code of Practice consists of five parts which are general measures, pre-construction measures, installation measures, operation measures and deconstruction measures.¹⁵⁰

To follow the general measures, the project operator must adhere to the Code of Practice as a guideline for the government authorities to regulate the operation of the project.

For pre-construction measure, the area selected for hydro floating solar project must not be in contradictory to these laws including the Factory Act

¹⁴⁹ Energy Regulatory Commission, "การผลิตไฟฟ้าจากพลังงานแสงอาทิตย์ (เทคโนโลยีแผงโฟโตโวลเทอิกแบบทึบลอยน้ำ)." 

¹⁵⁰ Electricity Regulatory Commission, "รายการตรวจสอบด้านสิ่งแวดล้อม (Checklist) ตามเอกสารแนบท้าย ระเบียบคณะกรรมการกำกับกิจการพลังงาน ว่าด้วยมาตรการป้องกัน และติดตามตรวจสอบผลกระทบสิ่งแวดล้อมสำหรับผู้ประกอบกิจการผลิตไฟฟ้าจากพลังงานแสงอาทิตย์ด้วยเทคโนโลยีโฟโตโวลเทอิก แบบทึบลอยน้ำ พ.ศ. 2562."

B.E.2535, the Building Control Act B.E.2522, Enhancement and Conservation of National Environmental Quality Act (No.2) B.E.2561 and the announcement of the marine department and Department of National Parks.¹⁵¹ To comply with installation measures, operator must follow the regulation concerning quality of water, transportation, air quality, noise and waste management.¹⁵² For operation measures, regulation concerning quality of water waste management, sanitary, safety, health, efficiency of the project must be followed.¹⁵³

In conclusion, the project operators of hydro floating solar project must act in accordance with the Code of Practice (CoP) attached with the Regulation of the Energy Regulatory Commission on protection measure and investigation of environmental impact for floating photovoltaic electricity generator B.E. 2562, but does not have to follow EIA regulations.

2.2.3 Right to use public water resources for the project

The underlying rationale of the Water Resources Act B.E.2561 is to limit individual's right and freedom as necessary in order to develop, manage and preserve water resources in Thailand. The provision that is related to the right to use public water resources in renewable energy project is Section 41.

Section 41 " The use of public water resources " is classified into three types, viz:

¹⁵¹ Ibid.

¹⁵² Ibid.

¹⁵³ Ibid.

(1) water use of Type One, which signifies the use of public water resources for the living, household consumption, agriculture or livestock farming for subsistence, household industry, ecosystem conservation, customs, public disaster mitigation, communications and the use of water in a small quantity;

(2) water use of Type Two, which signifies the use of public water resources for the industry, tourism industry, electricity generation, waterworks and other undertakings;

(3) water use of Type Three, which signifies the use of public water resources for a large-sized undertaking which requires the use of a large quantity of water or possibly has effects across drainage basins or covering large areas.

The nature and descriptions of the water use of each type under (1), (2) and (3) shall be as prescribed in the Ministerial Regulation issued by the Prime Minister with the approval of the N.W.R.C.

The issuance of the Ministerial Regulation under paragraph two shall be upon prior public hearing.¹⁵⁴

According to Section 41 of this Act, the usage of water is divided into three types which lead to different requirements as prescribed under Ministerial Regulations stipulated by The National Water Resource Committee (NWRC). The use of water to generate electricity in hydro solar system falls under Type 2

¹⁵⁴ "Water Resources Act B.E. 2561. Section 41."

of water usage stipulated in the Water Resources Act B.E. 2561 which is for the production of electricity.¹⁵⁵

Section 43 " The water use of Type Two requires a licence from the Director- General of the Royal Irrigation Department, Director-General of the Department of Water Resources or Director-General of the Department of Groundwater Resources, as the case may be, with the approval of the drainage basin committee in whose area such water resources are located."¹⁵⁶

Consequently, in order to use water resources stated in Type 2, there is a need to obtain a license from the Director General of the Irrigation Department. Director General of the Department of Water Resources or the Director General of the Department of Groundwater Resources with the approval of the watershed committee which water resource is located.¹⁵⁷

Section 46 states that "In considering whether to issue a license for water use of Type Two and Type Three to the applicant therefor, regard shall be had to the balance of water in the public water resources as well as drainage basins concerned in order to prevent adverse effects on the overall balance of drainage basins."¹⁵⁸

In granting a license, Thai authorities must take the balance of water in public water resources into consideration.¹⁵⁹ Furthermore, the Water Resources

¹⁵⁵ Ibid.

¹⁵⁶ "Water Resources Act B.E. 2561. Section 43."

¹⁵⁷ Ibid.

¹⁵⁸ "Water Resources Act B.E. 2561. Section 46."

¹⁵⁹ Ibid.

Act B.E.2561 also specifies all the details of water usage that must be found in the application for a license.

The organization that regulate the water outside irrigation area is the national water resource committee (NWRC). The main duty and responsibility of the national water resource committee (NWRC) is to outline the legislation and condition of the allocation and control of water resource usage to fulfill the demand for consumption, agriculture, industry, preservation of biodiversity, water transportation, hydro electricity production or other relevant purposes.¹⁶⁰ It must be noted the use of water to generate electricity through hydro floating power plant in Thailand is categorized within Type 2 of water usage in the Act. Despite having provisions stating procedures to be granted license from the Director General of the Department of Groundwater Resources, there is no provision in this Act that mentions the kind of right that an entity who receive the license possess. Therefore, the right of entity who owns the license granted from Director General of the Department of Groundwater Resources to use water from the dam to generate electricity is insecure under the Water Resources Act B.E. 2561.

There are many issues that the financial institutions will consider in determining the bankability of the renewable energy project. As the installation of hydro floating solar project is located on water surface, the right to use water

¹⁶⁰ Office of the National Water Resources, "The National Water Resources Committee (Nwrc)."

surface is one of the criteria that will be considered to ensure bankability of the project. In other words, although the right to use water surface is just a part to ensure the certainty, it must be noted that hydro floating solar project is the project whose bankability partially depends on the right to use water surface.

Furthermore, there is an overlapping authority of government institution which are Provincial Administrative Organization (PAO) and Subdistrict Administration Organization (SAO) over the use of surface water in the hydro floating solar project. The question is whether the private operators have to receive permission from these two government institutions in order to start the project or not.

Provincial Administrative Organization (PAO) is a government institution that supports Subdistrict Administration Organization in order to develop the subdistrict. For the duty of provincial administrative organization, which is related to the use of surface water, Section 45(7) of Provincial Administration Organization Act, B.E. 2540 states that " Provincial Administration Organization has to protect, supervised and maintain natural resources and environment."¹⁶¹

Under this Section, Provincial Administration Organization must look after the natural resources and environment including water areas. However, it does not have the power to grant the license in case where the private operators need to operate hydro floating solar project (water use of Type Two) since this

¹⁶¹ "Provincial Administration Organization Act, B.E. 2540, Section 45(7)."

power belongs to the National Water Resource Committee (NWRC) following Section 41 and Section 43 of the Water resources Act B.E. 2561. In short, the private operators do not need to apply for license to Provincial Administration Organization.

Subdistrict Administration Organization (SAO) is a local unit of government which is smaller unit than Provincial Administrative Organization (PAO). For the Powers and Duties of the Tambon Administrative Authority, Tambon Council and Tambon Administrative Authority Act, B.E. 2537 (1994) Section 67(1) and (7) states that "Subject to the law, it is the duty of the Tambon Administrative Authority to do the following in its territory:

- (1) provide and maintain waterways and land routes;
- (7) protect, look after and maintain natural resources and the environment; [as amended]."¹⁶²

According to Section 67(1) and (7), Subdistrict Administration Organization have general responsibility to preserve waterways and environment. Even though Subdistrict Administration Organization authority seem to have authority over the use of surface water, the Water resources Act B.E. 2561 Section 41 together with Section 43 stipulates that private operators must apply for a license to the National Water Resource Committee (NWRC). Therefore, there is no need to obtain the permission from Subdistrict

¹⁶² "Tambon Council and Tambon Administrative Authority Act, B.E. 2537 (1994), Section 67."

Administration Organization again because there is a specific Act that regulates the application of water use license.

Nevertheless, the private operators should notify Subdistrict Administration Organization and Provincial Administrative Organization about the use of surface water in areas where these two government organizations are responsible in order to comply with the objective of each government institution that established for specific purpose.



Chapter III Analysis on Laws regulating Floating Solar Project in Australia and Japan

Australia and Japan are successful in installing floating photovoltaic plants to generate electricity to meet the demand of the users in the countries. The success of the projects in these countries signify that the regulatory framework used in these three countries make the project bankable meaning that the financial institutions and banks are willing to fund the projects because there is a high possibility that the projects will succeed and sufficient warranties are provided for the institutions. Analyzing the Hydro floating Solar project together with the laws regulating the projects in each country will provide useful insights for Thailand on the bankability of Hydro floating Solar project.

3.1 Australia

Australia is large country but the amount of water in the country is relatively little in comparison to the size of the area. Thus, the water resources in Australia is heavily regulated by law. There are six states and two territories in Australia. The six states include New South Wales (NSW), Queensland (QLD), Western Australia, South Australia (SA), Victoria and Tasmania. Meanwhile, the two territories include the Australian Capital Territory (ACT)

and Northern Territory.¹⁶³ New South Wales (NSW) is the state located on the east coast of Australia. The state's capital city is Sydney which is the largest city in Australia.¹⁶⁴ Queensland (QLD) is Australia's second biggest state and Brisbane is the state capital city. Since it is located in the North East of the country and near the Coral Sea, it is warmer than other states and territories.¹⁶⁵ Western Australia (WA) is Australia biggest state and almost covered the western of Australia. The state's capital is Perth which is the fourth most populous city in Australia.¹⁶⁶ South Australia (SA) is the southern central part of Australia; the state's capital Adelaide. The region is characterized by the lack of water.¹⁶⁷ Victoria (VIC) is the smallest state among the mainland states but has second most populated city which is Melbourne.¹⁶⁸ Tasmania (TAS) is a small island state to the South of Australian mainland separated by the Bass Strait. This state bounds its capital city, Hobart, and has many mountains.¹⁶⁹ The Australian Capital City Territory (ACT) is home to Australian Capital city of Canberra. There are many significant National Institutions such as Parliament House, the Australian War Memorial and the National Gallery of Australia.¹⁷⁰ Northern

¹⁶³ Australia, "Cities, States and Territories," <https://www.australia.com/en/facts-and-planning/about-australia/cities-states-and-territories.html>.

¹⁶⁴ Ibid.

¹⁶⁵ Ibid.

¹⁶⁶ Ibid.

¹⁶⁷ Ibid.

¹⁶⁸ Ibid.

¹⁶⁹ Ibid.

¹⁷⁰ Ibid.

Territory contain central northern area of Australia and the mid-point of Australia which is Alice Springs.¹⁷¹

3.1.1 Power purchase agreement in Australia

Renewable energy market in Australia is in expanding stage.¹⁷² Most power purchase agreement in Australia are made in the form of Corporate Power Purchase Agreement.

There are many forms of PPA that are used in renewable energy project. However, the most common form in Australia is corporate PPA. Analyzing the PPA used in Australia will give implications for Thailand in forming PPA in the way that will facilitate hydro floating solar project. A corporate PPA is an agreement where a large energy buyer acquires electricity, directly or indirectly, from a new or existing energy generator. It is difference from a wholesale PPA that is an agreement between a generator and a retailer.¹⁷³

For PPA in Australia, there are several parties involved which are electricity buyer, generator, financier, retailer and regulator.

The first stakeholder is the electricity buyer. The buyers can be in various forms including single energy buyer or a member of an energy buyers' group.¹⁷⁴

¹⁷¹ Ibid.

¹⁷² Ibid.

¹⁷³ Norton Rose Fulbright and WWF-Australia Energetics, "Nsw Guide to Corporate Power Purchase Agreements," (October 2018).

¹⁷⁴ Ibid.

The buyer in the form of group must be capable of providing sufficient credit support to the generator.¹⁷⁵

The second stakeholder is the generator. In general, the generators who are involve in PPA generate electricity greater than 5MW grid connected system as it is a large project, so a large sum of money is needed to run the project.¹⁷⁶ In financing energy project, the generator will establish the form of business as Special Purpose Vehicle or SPV owned by its sponsors and financed externally.¹⁷⁷

The third stakeholder is the financier. The financier has an important role in the project as the financier is the source of money. Therefore, the financier is the party that will determine the projection of the project so as to ensure the profitability of the project in the long run. There are certain requirements assigned by the financier that must be met before making the decision to lend the money.¹⁷⁸ The requirements usually concern the price and risk allocation as these two issues must be carefully examined in order to make sure that the sponsor will get the money back as planned.¹⁷⁹

The fourth stakeholder is retailer. The retailer is the party who is granted with license to sell electricity. The license is granted by National Electricity Market (NEM) which is responsible for wholesale generation that is transported

¹⁷⁵ Ibid.

¹⁷⁶ Ibid.

¹⁷⁷ Ibid.

¹⁷⁸ Ibid.

¹⁷⁹ Ibid.

via high voltage transmission lines from generators to large industrial energy users and to local electricity distributors before sending it to homes and businesses.¹⁸⁰ In Australia, The Australian Energy Market Operator manages the NEM on behalf of the federal and state governments.¹⁸¹

The fifth stakeholder is regulator. In operating electricity in Australia, there are various regulators which are Australian Energy Market Operator (AEMO), Clean Energy Regulator (CER) and other potential regulators. The first regulator is AEMO which has the role in operating the National Electricity Market. Another key regulator is Clean Energy Regulator that has the role in administering the scheme of Renewable Energy Target (RET).¹⁸² Although Australia has a large area, the total surface area available for hydro floating solar system is only 4,991km² which is relatively small comparing to the total area of Australia.¹⁸³



¹⁸⁰ AEMO, "About the National Electricity Market (Nem)."

¹⁸¹ Ibid.

¹⁸² Ibid.

¹⁸³ SERIS calculations based on the Global Solar Atlas and Lehner, (2010-2011).

3.1.2 Right to use public water resources for the project in Australia.

Law regulating Floating Solar Project in Australia

The problem of scarcity of water resources can lead to conflict between water users.¹⁸⁴ Therefore, Australian governments have to introduce or revise legislation governing access to water in order to maximize the use of limited resources. The Water Act 2007 is the primary act concerning the use of water resources. This Act establishes the Murray-Darling Basin Authority (MDBA) with the functions and powers, including enforcement powers, needed to ensure that Basin water resources are managed in an integrated and sustainable way. According to the legislation, the governments have the power to issue water rights, to influence the allocation of water resources, and regulate water works and water use.¹⁸⁵ The legislative framework of Australia also provides the definition of the rights of water users, liabilities, the administration of water rights and allocation of water among various users.¹⁸⁶ The authority that is accountable for the use of water rely on the single level of government.

The primary water legislation defines water rights, provides the framework for allocating water between consumptive and non-consumptive uses, administering and monitoring and enforcing water rights. In Australia,

¹⁸⁴ Australian Government Productivity Commission, "Water Rights Arrangements in Australia and Overseas," (2003).

¹⁸⁵ Ibid.

¹⁸⁶ Ibid.

water rights refer to rights, licenses, permits, allocations or entitlements of water.¹⁸⁷ A water right is a legal authority to take water from a water source.¹⁸⁸ It can be vary depending on location of extraction and use, the nature of the use, the rate of extraction and time of use. Water rights are granted for specific users for specific uses.¹⁸⁹ There are different types of water rights within the jurisdiction of Australia. Each type of water right has distinct characteristic. This thesis will focus on the rights relating to hydro floating solar project which is surface water right. Surface water right refers to the right to extract and use surface water from regulated or unregulated watercourses.¹⁹⁰ This type of right is granted by the State or the court to water users.¹⁹¹

Water resources in Australia

The law concerning water resource in Australia is Water Resources Act 2007. This Act concerns the management and protection of water resource. The mechanism of hydro floating solar project requires the use of water surface to install the photovoltaic pontoons. Therefore, this project is related to surface water and water access entitlement.

Section 8 in Water Resources Act 2007 provides the definition of surface water. According to this Section, water surface is a part of surface water since it is a

¹⁸⁷ Ibid.

¹⁸⁸ Ibid.

¹⁸⁹ Ibid.

¹⁹⁰ Ibid.

¹⁹¹ Ibid.

water that flow over land regardless of existing location. Apart from the water that is available in nature, the word "water surface" also includes water that locates within artificial structure such as dam, reservoir and rainwater tank.¹⁹² In order to use water surface in operating the hydro floating solar project, Section 18 and Section 19 which concern water access entitlement in this Act must be taken into consideration. Section 18 stipulates the guidelines for the amounts of water that is reasonable for uses.¹⁹³ The amount of water that are reasonable amount for particular used is essential in giving out license and water access entitlement.¹⁹⁴ The definition and details concerning water access entitlements are found in Section 19.¹⁹⁵ In the application of Section 19 to the project at issue, using water as a base for floating pontoons in hydro floating can be considered as part of water access entitlement since the project requires right to use water surface. Therefore, to follow the restrictions in Section 19, the amount of water surface used as the location to install pontoons in this project must not be higher than surface water available for taking and maximum volume. However, this amount of water used to install the photovoltaic pontoons can fluctuate from time to time as water levels in each season vary.

¹⁹² "Water Resources Act 2007. Section 8."

¹⁹³ "Water Resources Act 2007. Section 18."

¹⁹⁴ Ibid.

¹⁹⁵ "Water Resources Act 2007. Section 19."

3.2 Japan

Hydro floating solar project in Japan

Japan is the country that is a leading manufacturer of photovoltaics.¹⁹⁶ Japan is one of first group of countries that started Hydro Floating Solar Project. Japan was amongst the top 5 global solar markets in 2018 with 55.9 GW of total installed capacity, equating to a global share of 11%.¹⁹⁷ The world's second-largest floating photovoltaic installation after the installation China is on the Yamakura water retention dam in Chiba Prefecture which has a capacity of 13.7 MWP.¹⁹⁸ The Yamakura Dam in Japan is very useful to Japan as the implementing of this dam will offset more than eight thousand tons of carbon emissions and provide power to nearly five thousand homes.¹⁹⁹ Equipped with highly effective technology, Japan is the country with the longest history of MW-scale floating PV installations.²⁰⁰ The first 20 KWP project was completed in 2007 in Aichi, Japan, as a research prototype by the National Institute of Advanced Industrial Science and Technology.²⁰¹ Floating photovoltaic offers many benefits to Japan as the topography is mountainous and heavily forested terrain. Over 70 percent of Japan's area is inappropriate for ground-mounted

¹⁹⁶ Earth Policy Institute, "Cumulative Installed Solar Photovoltaics Capacity in Leading Countries and the World," (October 27, 2011).

¹⁹⁷ Solar Asset Management Asia, "Top 50 Portfolios in Japan."

¹⁹⁸ Ibid.

¹⁹⁹ Kate Zerrenner, "Floating Solar Panels Are a Perfect Fit for Drought-Stricken States. Here's Why," (May 25, 2016).

²⁰⁰ Ibid.

²⁰¹ Ibid.

photovoltaic.²⁰² Consequently, there is a need for Japan to seek for technology that can help in producing electricity under such constraints. Since Japan has abundant water surfaces, Japan can make utmost benefit from water surface by installing floating solar panel to generate electricity.²⁰³

Few countries have provided financial incentives specifically for FPV systems.²⁰⁴ However, Japanese government encourages the installation of floating photovoltaic system by introducing renewable energy feed-in tariffs system. The objective of this system is to accelerate the adoption of renewable energy. The FIT system was designed to stimulate investment in renewable energy generation by guaranteeing the purchase of electricity over the long term.²⁰⁵ This policy attracted local commercial banks in Japan to invest in the floating photovoltaic projects as they can benefit from long-term feed-in tariffs.²⁰⁶ Because the FIT for solar energy is high, floating photovoltaic plants usually sell their generated solar electricity to the grid.²⁰⁷ However, Japanese revised this FIT system later so floating photovoltaic systems larger than 2 MWP no longer benefit from a FIT. Accordingly, there was a shift toward self-consumption.²⁰⁸

²⁰² Ibid.

²⁰³ Ibid.

²⁰⁴ Ibid.

²⁰⁵ Ichigo Green Infrastructure Investment Corporation (9282), "About Japan's Feed-in Tariff (Fit)."

²⁰⁶ Ibid.

²⁰⁷ Ibid.

²⁰⁸ Ibid.

In the past, electricity businesses were separated into three categories: general electricity utilities, specified electricity utilities and specified-scale electricity utilities. In 2016, the categories were reform into five categories: power generators, general transmission and distribution operators, transmitters, specified transmission and distribution operators and retailers.²⁰⁹

Power generator and specified transmission and distribution operators need to submit a filing to notify Ministry of Economy, Trade and Industry (METI). For hydro floating solar project, construction plan must be submitted to Ministry of Economy, Trade and Industry (METI). Also, private operator must have safety protocol and self-inspection.²¹⁰ Meanwhile, general transmission and distribution operators must have license to start their businesses. Retailer need to be registered as a retailer but the license is not required under the law.²¹¹

Another authority that is responsible for water resources in Japan is Ministry of Land, Infrastructure and Transport (MLIT). MLIT is responsible for planning drafting and promotion of basic plan for water resource development.²¹² Moreover, MLIT also has the authority in the management of rivers, stream and water surfaces.²¹³

²⁰⁹ Mori Hamada & Matsumoto Takahiro Kobayashi and Shigeki Okatani, "Electricity Regulation in Japan: Overview."

²¹⁰ Ibid.

²¹¹ Ibid.

²¹² K. Moriyasu, "Outline of the Water Resources Policy in Japan. I. A. T. Ministry of Land," (2006).

²¹³ Ibid.

3.2.1 Power Purchase Agreement in Japan

In Japan, the major government participants are the Ministry of Economy, Trade and Industry (METI) and its affiliated agency, the Agency for Natural Resources and Energy.²¹⁴ The mentioned Japanese authorities have the responsibility in the enforcement of the laws and regulations concerning the energy industry.²¹⁵ The business of generating energy from renewable resources is also under the responsibility of such authorities.²¹⁶ In addition, these authorities are in charge of implementing the feed-in tariff (FIT) programme in Japan and issuing certificates that make renewable energy projects eligible for mandatory power purchase arrangements under the FIT programme.

In general, Feed-in-tariff program is the legal framework that is applied to most renewable projects in Japan.²¹⁷ The legal framework that generally applicable to selling power from renewable energy projects is the FIT programme under the Renewable Energy Act. There are three main steps in enter power purchase agreement in Japan.²¹⁸ The first step is planning and facility approval. The renewable project owners who want to operate renewable energy project in Japan must be granted a license from Ministry of Economy, Trade and Industry (METI).²¹⁹

²¹⁴ Nishimura & Asahi, "Renewable Energy in Japan."

²¹⁵ Ibid.

²¹⁶ Ibid.

²¹⁷ Ibid.

²¹⁸ Naoki Watanabe, "Japan's Feed-in- Tariff System."

²¹⁹ Ibid.

The second step is Grid Connection and Power Purchase Agreement.²²⁰

In order to obtain Feed-in tariffs, the project owner or the supplier must enter into an agreement to secure a power grid connection and a power purchase agreement with an electric utility operator. The project owners with certification have the right to request a transmission utility to enter into a power purchase agreement. The parties that are involved in the power purchase agreement are the transmission utility and the project owner of renewable energy.²²¹ The key point of power purchase agreement is to agree on a fixed price and purchase the electrical power generated from the project.²²² According to the Renewable Energy Act of Japan, by principle, the transmission utility must accept the request to agree on the power purchase agreement with the project owners who was granted with the certification except there are reasonable grounds defined under the Renewable energy Act for not entering such agreement.

The final step is Commencement of Operations.²²³ The private operators start supplying electricity after the test run following the date agreed in the power purchase agreement. Furthermore, the operator must notify METI about building cost and operating cost annually.²²⁴

The utilities that are required to purchase electric power from renewable energy projects have the right to receive a renewable energy subsidy, the cost of

²²⁰ Ibid.

²²¹ Ibid.

²²² Ibid.

²²³ Ibid.

²²⁴ Ibid.

which is ultimately borne by the end users who are required to pay renewable energy surcharges under the FIT program.

3.2.2 Environmental Impact Assessment in Japan

Since building power plants can be harmful to the environment, negative consequences on the environment must be taken into consideration by conducting EIA. Environmental Impact Assessment (EIA) consists of both positive and negative impact on the environment which can be crucial for private operators in the process of applying for license to operate power plants.²²⁵

In Japan, Environmental Impact Assessment Law was legislated in 1997. Certain type of project such as waste disposal site, industrial estate development project and new residential area development project have an obligation to perform EIA. These projects are divided into two types which are Class-1 projects and Class-2 projects.²²⁶ All Class-1 projects must follow EIA requirement but some of Class-2 projects are not required to follow the requirements.²²⁷ In other words, the obligation to conduct EIA for Class-2 projects depends on the discretion of authorities. Class-1 projects are usually large-scale projects while Class-2 projects are medium to small-scale projects.²²⁸

²²⁵ Ministry of the Environment, "Environmental Impact Assessment in Japan."

²²⁶ Ibid.

²²⁷ Ibid.

²²⁸ Ibid.

The process for choosing whether EIA should be carried out in Class-2 projects is called screening.²²⁹ This process depends on the size and location of the project. For instance, if the power plant is located near school, it might be required to follow EIA requirement.²³⁰ The first step in this process is environment minister providing guideline for screening. Second, the private operators must submit the outline of the project to authorizing agency. Third, authorizing agency creates judgement criteria and makes judgement on whether the project needs to follow EIA requirement or not. For example, Ministry of Infrastructure, Land and Transport is the authorizing agency for road project. After submission, the judgement must be made within 60 days. Fourth, prefectural governor provides opinion for authorizing agency to help the judgement. In conclusion, screening is only applying to Class-2 projects.

²²⁹ Ibid.

²³⁰ Ibid.

Figure 3²³¹: The List of Class-1 and Class-2 projects in Japan

List of projects subject to the Environmental Impact Assessment Law		
	Class-1 project (EIA is always required)	Class-2 project (The necessity of EIA is judged by project)
1. Road		
national expressway	all	
metropolitan expressway	4 lanes or more	
national roads	4 lanes or more, 10km or longer	4 lanes or more, 7.5km-10km
large-scale forest road	2 lanes or more, 20km or longer	2 lanes or more, 15km-20km
2. River		
dam, weir	reservoir area:100ha or larger	reservoir area:75ha-100ha
diversion channel, lake-related development	area of land alteration:100ha or larger	area of land alteration:75ha-100ha
3. Railway		
shinkansen(super express train)	all	
railway, track	length:10km or longer	length:7.5km-10km
4. Airport	runway:2,500m or longer	runway:1875m-2500m
5. Power plant		
hydraulic power plant	output:30,000kw or over	output:22,500kw-30,000kw
thermal power plant	output:150,000kw or over	output:112,500kw-150,000kw
geothermal power plant	output:10,000kw or over	output:7,500kw-10,000kw
nuclear power plant	all	
6. Waste disposal site	area:30ha or larger	area:25ha-30ha
7. Landfill and reclamation	area:exceeding 50ha	area:40ha-50ha
8. Land readjustment project	area:100ha or larger	area:75ha-100ha
9. New Residential area development project	area:100ha or larger	area:75ha-100ha
10. Industrial estate development project	area:100ha or larger	area:75ha-100ha
11. New town infrastructure development project	area:100ha or larger	area:75ha-100ha
12. Distribution center complex development project	area:100ha or larger	area:75ha-100ha
13. Residential or industrial land development by specific organizations	area:100ha or larger	area:75ha-100ha
Port and harbor planning	Total reclaimed and excavated land:300ha or larger	

²³¹ Ibid.

Under the National Environmental Impact Assessment Law in Japan, there is no requirement to conduct EIA reports before operating hydro floating solar project. However, hydraulic power plant, thermal power plant and geothermal power plant with certain capacities must comply with EIA regulation. Nuclear power plant, regardless of size, needs to conduct EIA.

3.2.3 Right to use public water resources for the project in Japan

The law that regulates water use in Japan is The River Law. The old River Law was put into effect in 1968 but was later replaced by the new River Law in 1997. This main content of this legislation includes natural disaster management, water resources utilization, and river administration.²³² The objective of this law is to contribute to land conservation and the development of the country, and maintain public security and promote public welfare, by administering rivers comprehensively to prevent occurrence of damage due to unexpected incidents.²³³ The River law regulates the use of water and construction of structure on water and land nearby. It also provides safety measure to alleviate natural disaster in emergency situation. Furthermore, there are river administrators who supervise the use of water for generating electricity, irrigation, industrial and domestic uses and grant permission for water uses. The

²³² Ministry of Construction JAPAN River Bureau, "The River Law with Commentary by Article Legal Framework for River and Water Management in Japan."

²³³ Ibid.

hydro floating solar project has the objective of generating electricity so the project in Japan is subject to the supervision of the river administrators.

The water that is the location of the project must primarily be considered as river so that the Act can be applied. The definition of river is in Article 2. According to Article 2, a river is public property and its conservation, utilization, and other forms of administration shall be properly performed so as to attain the purposes of the River law.²³⁴ The water of a river cannot be made the subject of private rights.²³⁵ Under this Article, the right to use water can be used for certain period of time which means it is not permanent. This is because a river is owned by the people of Japan not individuals. Moreover, the users of water resources must receive permission from authorities before using the resources. Also, the users have an obligation to use certain amount of water for specific purpose. As a result, the rights to use the water resource will disappear when there is no purpose of exercising the rights. In conclusion, there are no private rights to access water resource.

Rivers are categorized by the level of importance into three types: class A river systems, class B river systems and independent river systems. The River Law regulates class A river systems and class B river systems. Article 4 of this law concerns class A river systems, while Article 5 is about class B river systems.

²³⁴ Ibid.

²³⁵ Ibid.

The designation of river into classes is stipulated in Article 4 and Article 5. Following Article 4 paragraph 1, the Minister of Construction designates rivers which is located in important water system. When the Minister of Construction plan to designates class A river, he or she has to consult with the Ministry of International Trade and Industry, the Ministry of Agriculture, Forestry and Fisheries and the Ministry of Health and Welfare in accordance with Article 4 paragraph 3. The administration of class A rivers is the duty of Minister of Construction following Article 9. The designation of class B river is in Article 5. According to Article 5 paragraph 1, the prefectural governor has a responsibility to designate class B rivers which are situated in other water system. Designation of these rivers must be notified to the public through prefectural gazette. The administration of class B rivers is carried out by prefectural governor whose areas have the rivers under Article 10.

Concerning the permission to conduct activities on river, the key Article in this River law is Article 23 which stipulated the permission for River Water Use. Article 23 states that "Any person who intends to use the water of a river shall obtain the permission of the river administrator as may be provided for in detail by Ministry of Construction Ordinance."²³⁶ From the interpretation of this Article, obtaining permission to use water in Japan is divided into two main categories. The River Law divided the river into class a river and class b river. This is different from Thailand as the Water Resources Act B.E.2561(2018)

²³⁶ Ibid.

divides the water use into three types depending on the activities. To obtain permission for using water resources in class A rivers, the application for permission must be filed to the Minister of Construction. Meanwhile, if a person wishes to use water resource in class B rivers, the person must ask permission from prefectural governor who acts as a river administrator for class B rivers. The application must include information about outline of the project relating to water use, amount of water usage, calculation about discharge and intake and effects of the water use following Ministry of Construction Ordinance Article 11.

As for hydro floating solar project, the private operator must obtain permission from river administrators depending on the types of river following Article 23 since the operators need water surface to install photovoltaic which mean they are using water resources for the operation of the project.

In deciding whether to grant permission or not, the river administrators will consider the various aspects which are the harmful effects of water use on the prevention of disasters, effects on existing water uses, contribution to public welfare and reliability, whether or not arranged quantity of water can be taken out in a safe manner, allowable limits of influences from water uses and effects of structures to be constructed on flood control management. In order to increase the possibility of receiving the license, the project company must take all actions to make sure that all aspects are met. If the river administrators decide to grant permission, the period during which the private operators are allowed to use the

water resources is usually 30 years. Even though the private operators receive a permission from authorities, they might have an obligation to pay the fee to the government as stipulated in Article 32. Following this Article, using water to generate electricity, supply drinking water, supply mining and industrial water must be charged by the river administrator. In addition, no fees are gathered for the use of water for national and public projects. To conclude, after being allowed to use water resources, the private operators might have to pay fees to prefectural governor.

The standard of imposing the charge in Article 32 paragraph 2 is stated in government ordinance Article 18. First, the amount of charge has to be fair and reasonable for the purpose of water usage. Furthermore, the charge must be within the limits that the Minister of Construction determines in consideration of the expenditure for river administration, the impact of water usage, and the manner of water usage.

The River Law in Japan also allows the licensee to transfer the right to other entities under certain restrictions in Article 34. Following this Article, holder of the right to use water resource based on Article 23 of The River law must receive approval from river administrators which might be Ministry of Construction or prefectural governor depending on the types of river before transferring the right to another person. This indicates that the right to use water resource is not private since the government has control over the transfer of the permission.

Law regulating hydro floating solar project in Japan

Japan has periodically suffered from severe water shortages, particularly since the rapid economic and population growth. Therefore, it will be useful to study government policies, supporting institutional, legal frameworks together with reinforcement that Japan used to tackle such problems effectively. The lessons from Japan will provide some useful insights for Thailand in regulating floating photovoltaic system.

Under Japanese regime, surface water and ground water are managed in a different manner.²³⁷ The installing of hydro floating solar is relevant to surface water. The law that regulates hydro floating solar project in Japan is Act on Special Measures concerning the Procurement of Renewable Energy Sources by Electric Utilities. In order to install hydro floating solar plants, the project must be granted license by competent authorities. The project owner who is granted license has certain rights relating to the production of electricity over water surface of the dams. Among top 50 portfolios that run floating photovoltaic plants in Japan, 78 percent of the producers are Independent Power Producers.²³⁸ Private sector participation contracts are one of the most useful methods to improve the efficiency of operation and management of water utilities.²³⁹

²³⁷ World Bank Analytical and Advisory Assistance (AAA) Program China: Addressing Water Scarcity Background Paper No.1, "Water Resources Management in Japan Policy, Institutional and Legal Issues," (April 2006).

²³⁸ Ibid.

²³⁹ Ibid.

3.3 Comparison of the law regulating water in Thailand, Australia and Japan

	Thailand	Japan	Australia
State property	The Treasury Department	Ministry of Finance	Ministry of Finance
Water Resources Regulation	Water Resources Act B.E.2561(2018)	River Law 1964	Water Act 2007 (All territories)
License	Type 2 water usage: Director-General of the Royal Irrigation Department, Director-General of the Department of Water Resources or Director-General of the Department of Groundwater Resources, as the case may be, with the approval of the drainage basin committee	Class a river - Minister of Construction Class b river - prefectural governor	National Water Initiative (NWI) by the Australian Government
Regulator	National Water Resources Committee	Water Resources Department of Ministry of Land,	(Western Australia) The Department of Water and

		Infrastructure, Transport and Tourism	Environment Regulation
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After considering the power purchase agreement, regulatory framework and right to use public water in Japan and Australia, the table below compares the public domain, water resources regulation, water license and regulator in Thailand, Japan and Australia.

The hydro floating solar system is located on the public water which serves for the public purposes so it is critical to examine the law relating public domain in these three countries. All three countries have the law concerning public domain. For the Water Resources Regulation, Thailand has the Water Resources Act B.E.2561(2018). The main provision is Section 4 and Section 41. To elaborate, Section 4 gives the definition of water use with is used in complimentary with Section 41 stipulates the type of water use. Water resources in Japan is subject to River law 1964. In Australia, Water Act 2007 is the law that applies to all territories as it provides the legislative framework for to manage Australia's largest water resource which is the Murray-Darling Basin.²⁴⁰ This Act also recognizes that Australian states in the Murray-Darling Basin continue to manage Basin water resources within their jurisdictions.

²⁴⁰ Department of Agriculture, "Water and the Environment, Commonwealth Water Legislation."

For the license, all three countries have the laws stipulating that the operator who want to utilize water resources must have the license granted by the authority. For Thailand, Section 41 and Section 43 of Water resources stipulates Type 2 water usage requires a license from Director-General of the Royal Irrigation Department, Director-General of the Department of Water Resources or Director-General of the Department of Groundwater Resources, as the case may be, with the approval of the drainage basin committee. According to River Law 1964, the license in Japan is categorized into class a and class b. Class a river is the river designated by the Minister of Construction, which belongs to such a water system especially important from the view of land conservation and national economy as is designated by Government Ordinance.²⁴¹ Class B river is the river other than class a river. It is designated by the prefectural governor. For Australia, National Water Initiative (NWI) is responsible for granting the license in order to use water resources.

The water regulator is the key player in regulating water law. The regulator in Thailand is National Water Resources Committee. The regulator in Japan is Water Resources Department of Ministry of Land, Infrastructure, Transport and Tourism. For Western Australia, the water regulator is The Department of Water and Environment Regulation.

²⁴¹ Japan, "River Law 1964."

Chapter IV Analysis on Rights in relation to bankability of Floating Solar Project in Thailand

4.1 Water use in Thailand

Hydro floating solar project in Thailand is relatively new in comparison to other renewable energy projects such as wind and rooftop solar. The mechanism of hydro floating solar project is different from hydroelectric power. For hydroelectric power, the electricity is directly generated from water. It is different scenario for hydro floating solar system as this system is installed on water surface but the motion of water itself does not directly generate electricity. To elaborate, hydro floating solar system does not rely on the kinetic energy of the movement of water to produce electricity. Nonetheless, this kind of system must be installed on water surface so that it can produce electricity from solar power. This leads to an ambiguity on the issue whether the operation of this project is considered as water use or not. The question on whether the operation of hydro floating solar project is considered as water use is very significant to determine the relevant laws.

Prior to considering the issue of water use, the water area used to install the photovoltaic pontoons must first be considered as public water resources. Such water is publicly used or reserved for common use by the public as it does not belong to any particular person or entity. Therefore, the water which is the location of the project is public water resources.

As the water region is public water resources, the next legal issue that should be examined is whether the operation of the project will be considered as "water use". The provision related to water use in Thailand is Section 4 of the Water Resources Act B.E.2561. Section 4 of the Water Resources Act B.E.2561 stipulates that "water use means a pursuit of activities in relation to public water resources for the purpose of consumption, ecosystem conservation, customs, public disaster mitigation, agriculture, industry, commerce, tourism, communication, waterworks or energy generation or for any other purpose, whether it may result in a change in the quantity of water or not."²⁴² There are two key points of this Section that are important to characterize water use. The first point is the purpose of the activities. The second point that must be emphasized is that the quantity of water may or may not change through the activity.

In interpreting the wording of water use, the purposes of activities should come together with the nature of the project in relation to water. For hydroelectric power, it is evident that the operation is regarded as water use as the nature of the project is to generate electricity through the conversion of the energy of flowing water into mechanical energy by using a hydraulic turbine.²⁴³ It can be seen that the energy from flowing water is the critical part to generate electricity so it is not debatable on whether this operation is the water use or not.

²⁴² "Water Resources Act B.E.2561. Section 4."

²⁴³ USGS, "Hydroelectric Power: How It Works."

Without the kinetic energy of the moving water, the electricity cannot be generated. Thus, the activity of hydroelectric water falls within the definition of water use in Section 4 of the Water Resources Act B.E.2561. Unlike hydroelectric power, hydro floating solar system is more complicated as it is more difficult to examine whether the operation of the project falls within the meaning of water use or not. To plainly name the activity as energy generation is not sufficient for the activity to be considered as water use. Considering the example from hydroelectric power, water is literally utilized to generate electricity so hydroelectric power is considered as water use. The activity that will be considered as water use must require the kinetic energy of water as an important part to produce electricity. To explain, not every project that generates electricity situating on the water should be considered as water use. In determining whether the operation of the project is considered as water use or not, an appraisal on the nature of the project is also another important point to consider. Although hydro floating solar project has the purpose of generating electricity, there must be a physical act on the water that is necessary for energy generation. In such interpretation, the activity must directly utilize the water for certain purposes to be categorized as water use. For hydro floating solar system, although the system is installed on the water surface, water is not directly used to produce electricity. There is no extraction of water to generate electricity. The source of energy that is used to generate electricity in hydro floating solar project is solar power. Water is only required to act as a location for the installation of

the mechanism. This project simply stays on the water surface without using the water to generate electricity. The nature of hydro floating solar project is to locate on the water surface but it does not depend on the kinetic energy of the water to generate electricity. Thus, the operation of hydro floating solar should not be considered as water use. If the word “water use” is interpreted in this manner, hydro floating solar is not the activity that is regarded as water use. As the operation of hydro floating solar project does not fall within the meaning of water use in Section 4, the project thus does not subject to the Water Resources Act B.E.2561. Accordingly, it is not necessary to examine the type of water use and the authority that has the power to grant a license to the project.

Nonetheless, a counterargument can be made that hydro floating solar should be regarded as water use. One of the main characteristics of hydro floating solar project is that the pontoons together with photovoltaic modules float on the water surface. In this sense, water surface is essential for the existence of hydro floating solar project. Without water surface, the project cannot commence as it lacks the location for the photovoltaic modules to generate electricity. Although the kinetic energy of water is not literally used to generate power, the project relies on water surface in order to fulfill the objective of generating electricity power. From the aforementioned reasons, the operation of this project can be considered as water use. If the activity of producing electricity through hydro floating solar is viewed as water use, the laws governing water use in Thailand take the part in regulating such activity. Considering the characteristics of hydro

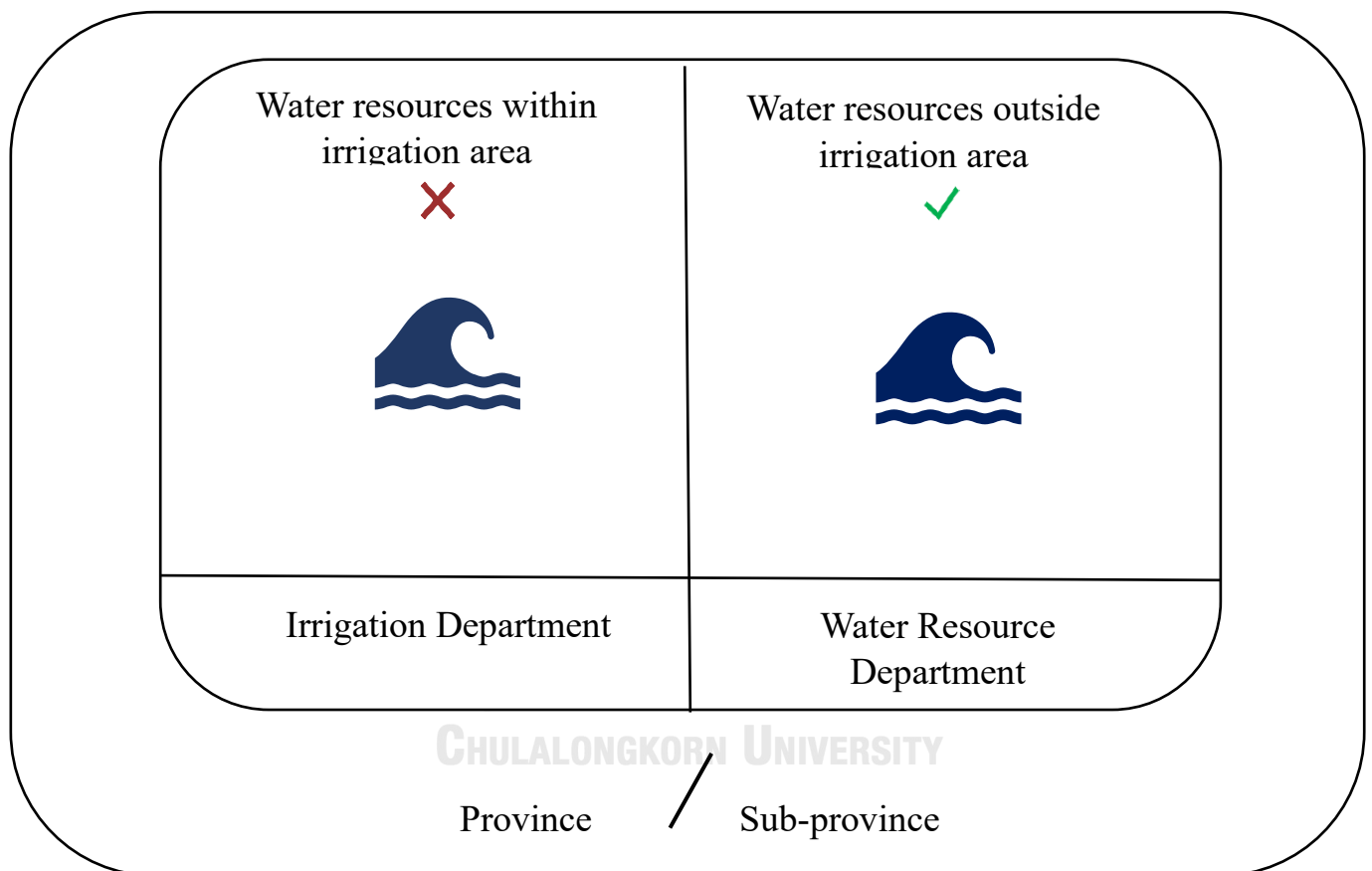
floating solar project together with Section 4 of the Water Resources Act B.E.2561 which is a pursuit of activities in relation to public water resources for the purpose of energy generation, the project has the purpose of generating electricity by using photovoltaic modules that float on the water surface which is public water resource. Thus, it is the activity in relation to public water resource for the purpose of energy generation. The change in quantity of water is not a requirement of water use. Although the quantity of water remains unchanged during the process of electricity generation, the use of water surface for hydro floating solar project in Thailand is considered as water use in accordance with Section 4.

The argument that the operation of the project constitutes a safeguard measure is not dispositive as it is a form of interpretation on the definition of water use. This implies the uncertainty on the issue whether the hydro floating solar project is subject to the Water Resources Act B.E.2561 or not. As far as the law does not directly stipulate that the water use includes the operation of hydro floating solar system, the project company as well as the financial institutions do not certainty on the rights that the project company have in using the water as a location to install the photovoltaic plants to generate electricity. In other words, the unclearness of the definition of water use in Thai law adversely affects the bankability of the project.

In this case, Section 47 and Section 48 in the Energy Industry Act B.E.2550 does not provide certainty to the bankability of the project as these

provisions only concern the license for the operation of energy business but does not give the permission on the use of water for the activity of hydro floating solar project.

Figure 4 : Diagram show the scope of water resources



This diagram divided water resource according to the state agencies that regulate such area. The public water resource that is used to operate hydro floating solar plant is the part of public water resource that stays outside the irrigation area. This part of water resource is under the responsibility of Water Resource Department.

In the case of installing hydro floating solar plant over public water surface, the water surface that is used as the location to install the photovoltaic pontoons in the project is the water that is used or reserves for the use of the public so it is considered public water resources within the definition of public water resources in Section 4 of the Water Resources Act B.E. 2561. The purpose of this Act is to regulate the water resources that are intended for the public use. Nonetheless, an important point that acts as a door to the Water Resources Act B.E. 2561 is the word “water use”. The operation of the project must fall within the definition of water use so the project will be subject to the Water Resources Act B.E. 2561. Although hydro floating solar plant rely on the water surface as the site for the installation of photovoltaic pontoons, the water is not directly utilized in generating electricity. Hence, the operation of the project does not constitute the definition of water use, the Water Resources Act B.E. 2561 cannot be applied to the project.

In the case when the operation of hydro floating solar project is viewed as water use, an important step which is to apply for the license to use water is required. The project company will need to obtain license from the relevant authority. Installing the solar panels on the water surface to produce electricity constitutes the meaning of public water use Type 2 in Section 41. For water resources for Type 2 use, the project company of the project must be granted license from the Director-General of Water Resources Department with the approval of the drainage basin committee.

On the other hand, if the operation of this system is not considered as water use from the beginning, it is not necessary to examine the type of water use under Thai law. Therefore, the project company is not required to obtain license for Type 2 water use from Director-General of Water Resources Department with the approval of the drainage basin committee. Not having to obtain the license from the authority puts less burden on the project company as the project company does not have to go through complicated procedures in the application for the license. However, it is not beneficial to the project company because the company will not be certain about the right it has over the public water resource.

4.2 The right over public water surface in Thailand

Unlike the installation of solar system on land, the rights in relation to hydro floating solar system is more complicated as the project is located to the water surface. Even though the project company has already obtained license to operate energy business, there is a remark that such license does not provide any right concerning the water surface. The right that the project company has over public water resource is important as it can assure that the private operators with the license to use water are the only entity who have exclusive right to use the water to operate the project. Under the Thai Civil and Commercial Code, real right can only be established by law. Without the right specified by the laws, the

private operators do not have any right in operating hydro floating solar project. The question is what kind of right under Thai Civil and Commercial Code or other laws that the private operators have over the water surface.

The nature of the hydro floating solar project requires a large amount of money to facilitate the project. Such amount of money cannot derive solely from the project sponsor. Accordingly, the project company or special purpose vehicle (SPV) will need a loan from financial institutions. From the perspective of the financial institutions, they need to be certain that the project company or special purpose vehicle (SPV) of this project will be able to repay the money. The project must have sufficient collateral, future cashflow, and high probability of success so as to be acceptable to institutional lenders for financing. As a lender, the lender definitely wants to assure they will get the money back as planned. In the case of failure of repayment, it must be clearly shown that the rights owned by the operator can be enforced in order to make payment to the financial institutions. The securities given to the financial institutions in most projects are usually in the form of mortgages or ownership over property which are secure enough to ensure the repayment of the money borrowed. If the borrowers cannot provide certainty of repayment for the financial institutions, the loan will be rejected which lead to a pause to the project. Therefore, in order to ensure bankability of the hydro floating solar project, the rights under Thai law that are related to the project must be analyzed in order to determine the kind of right that can ensure the bankability of the project.

The right that is definitely secure enough to ensure bankability is real right. The sources of property rights under Thai law are stipulated in Section 1298 of Thai Civil and Commercial Code. According to this Section, real rights may be created only by the virtue of this Code or other laws.²⁴⁴ There are various kinds of real rights stated in Thai Civil and Commercial Code which will be examined as follows. If the right that the operator who is granted with license for installation of hydro floating power plant is secured under Thai law, there is a high possibility that financial institutions will approve the loan for the project.

In identifying the rights of floating solar over water surface under Thai law, we will primarily look into the private law under Civil and Commercial Code. Ownership is form of real right that is stated in Section 1336 of Thai Civil and Commercial Code. Ownership provides the owner of the property with the right to use, dispose and acquires the fruits of the property.²⁴⁵ The owner of the property also has the right to follow and recover it from any person not entitled to detain it and has the right to prevent unlawful interference. Being an owner of any property gives the person or the entity the highest level of real right under Thai law as other forms of real rights only allow some uses of the property and there is more limitation to the use of certain right. There is a great difference between ownership and other kinds of real rights. In terms of financing, ownership is the kind of real right that gives the owner all the rights related to

²⁴⁴ "Thai Civil and Commercial Code. Section 1298."

²⁴⁵ Ibid.

the property as it is the highest form of real right under Thai law. If an entity is an owner of a property and uses such property as a collateral to a loan, there is a high possibility that the financial institution will approve the loan as this kind of property right can ensure the highest standard of repayment.

For the application of ownership under Thai civil law to hydro floating solar plant, a clear distinction must be made between the installation of hydro floating solar plant over the water surface on private area and the installation of hydro floating solar plant over public water surface since there is a difference concerning the property rights in relation to the installation over these two areas. For the installation of hydro floating solar over the area owned by private sector, the ownership stated in Section 1336 of Thai Civil and commercial Code applies to the owner of the area. The owner of the land area has the right to use the water area because of ownership supported by the law. Private waters, which were those located below, along or upon privately owned land, could be freely utilized subject to certain limitations of a statutory nature such as servitudes and rights of way.²⁴⁶ The right to use such private waters, both surface and underground, derived from land ownership which recognized the owner's right to use at pleasure the water existing upon his land without any limitation.²⁴⁷ Accordingly, the owner of such water area is allowed to install floating solar plant on the water surface in his area as long as the purpose is not in contradictory to the law. The

²⁴⁶ Food and Agriculture Organization of the United Nations, "Modern Water Rights - Theory and Practice," (2006).

²⁴⁷ Ibid.

purpose of installing floating solar plant over the surface area to generate electricity is lawful as it does not contradict to the law. All in all, the issue concerning the property over floating solar plants will not arise in the case that such photovoltaic pontoons are floating over the water surface located in an area owned by private owners or private sectors.

On the other hand, the installation of hydro floating solar plant over the public water resources yields different outcomes concerning the property rights in relation to the hydro floating solar plant. According to Section 7 of the Water Resources Act B.E. 2561, public water resources belong to the public, not for any private sector in particular. Primarily, there is a need to make a distinction on the parts of public water sources so as to make clear of the part of water that this thesis concerns. Public water sources are mainly divided into four areas according to the authority that is responsible for each area. The first area is the water that stays within the responsibility of the provincial administration organization. The second part of water area is under the supervision of sub-district administration organization. The third area is the water that situated in the irrigation area is subject to Irrigation Department. The final part of public water area that stays outside the scope of irrigation area is under the supervision of Water Resources department. The water surface area that is used for the purpose of the production of electricity lies within this category. This thesis will focus on examining the rights that the hydro floating solar plant has over this part of water surface. Since public water resources cannot be owned by any

private sector. Therefore, the determination of rights related to the hydro floating solar plant installed over the water surface located in public area differs from the determination of rights related to the hydro floating solar plant installed over private areas. In operating any activity concerning energy production, the operator is required to apply for a license from the authority. The license granted from Energy Regulatory Commission (ERC) only gives the permission for the purpose of the activity which is to generate electricity. Such license does not provide any right or the permission concerning the right to use water surface. For the companies who are granted with the license for the production of electricity, they do not own the water surface on the area that the permission is given. Consequently, ownership provided in Section 1336 of Thai Civil and Commercial Code does not apply to the case of installing hydro floating solar projects over the water surface of public water sources.

After not being able to identify the real right that the project company has over the water resources, the next kind of right that is closely related to water is water surface right. Since hydro floating solar project is installed on the water surface, this project is closely related to water surface. It is likely that the lenders will have the expectation that the project company has a right that is secure enough over such water surface. If the project company cannot identify the right that it has to use water surface to implement hydro floating solar plant, the lender would not be so certain about the legality of the project as legality of the project is one of the key factors that financial institution will take into account before

granting a loan. Water surface right is not stipulated in Thai Civil and Commercial Code and other Thai laws. As there is no law giving the water surface right to the project company, the project company does not have water surface right over the water resources as the location of the project. The lack of water surface right contributes to the challenges in the bankability of hydro floating solar project in Thailand.

4.3 The right in the operation of hydro floating project in Thailand

The water surface that is the location of the hydro floating solar project is publicly used for common use by the public so it falls within the definition of public water resources under Section 4 of the Water Resources Act B.E.2561. The water surface thus belongs to the State. Any private sector cannot claim ownership over the public water resources so it is critical to examine whether it falls within the definition of Ratchaphatsadu Land or not. In the case that the area is regarded as Ratchaphatsadu Land, the law that plays a role in regulating is the Ratchaphatsadu Land Act B.E. 2562 (2019) which is an administrative law that concerns the relation between the state and private sector. The central rule of administrative law is that "No laws, no power". The administrative authority has the authority only as stated by the law. In the application of Section 26 to the operation of hydro floating solar project, project company can enter into a lease contract with the authority that has the power over Ratchaphatsadu Land. In identifying the relating parties in the lease contract, Section 8 stipulates that "The

Ministry of Finance is the state agency that has the ownership of Ratchaphatsadu land and the Treasury Department has the duty in governing and conserving the Ratchaphatsadu land."²⁴⁸ From this Section, it can be interpreted that Ministry of Finance which has the ownership over the water area that hydro floating solar project takes place is the party in the lease contract with the project company. The lease contract between Ministry of Finance and project company is regulated by the Ratchaphatsadu Land Act B.E. 2562 (2019) so the contract is subject to administrative law, not civil law. If the water area that is used for the project constitutes the definition of Ratchaphatsadu Land, the project company can have the right to install photovoltaic pontoons on the water surface by entering into a lease contract with the authority. The lease contract between project company operating hydro floating solar and Treasury Department is not ordinary lease contract under Civil and Commercial Code but it is rather and administrative contract which is the contract that at least one of the parties is an administrative agency. Therefore, the project company has the rights established by the lease contract under administrative law. To elaborate, entering a lease contract with Treasury Department has given the project company the right under the lease contract which is administrative contract. The project company has the right to possess the particular water surface that is the subject of the contract. This means that others cannot intervene the possession throughout the duration agreed in the contract. The project company has the real right established by other law in

²⁴⁸ "Ratchaphatsadu Act B.E.2562. Section 8."

accordance to Section 1298 of Civil and Commercial Code. This right can be claimed against third parties, meaning that the operation of hydro floating solar project will not be disrupted by third parties. All in all, the right under the lease contract in accordance to the Ratchaphatsadu Land Act B.E.2562(2019) is beneficial for the bankability of the project in the way that it provides more certainty to the financial institution that the project company will be capable of running the project. This will increase the practicality of the proposed project in the feasibility conducted by the financial institution.

To regard the water area as Ratchaphatsadu Land will increase the bankability of the project as the project company can claim the right under the lease contract with Treasury Department. This scenario provides the project company with the most secured form of right that the company can have in utilizing the water area for energy generation. However, through the textual analysis on the definition of Ratchaphatsadu Land in Section 6 and Section 7. Apart from the general rule, the exception of Ratchaphatsadu Land must also be analyzed. According to Section 6 and 7(2) of the Ratchaphatsadu Land Act B.E.2562(2019), Ratchaphatsadu Land means every kind of immovable property which is State property except immovable property which is in use for the people or reserved for the common use of the people. Even though the water surface that is the location of the project is an immovable property which is the State Property, such water area stays out of the irrigation area so it is the immovable property that is reserved for common use of people. This means it falls into the

exception of Ratchaphatsadu Land so it is not regarded as Ratchaphatsadu Land. Accordingly, the right that the project operator has in using the water surface as a location to install photovoltaic pontoons cannot be identified as the project is not subject to the Ratchaphatsadu Land Act B.E.2562(2019). The project company cannot claim the right under the lease contract with Treasury Department. Being unable to identify such right affects the bankability of the project as the financial institutions are not able to recognize the right that the borrower has in operating energy business over the water surface.

In conclusion, identifying the right that project company has over the project is essential for the bankability of the project from the legal perspective. As the water surface used for the installation of hydro floating solar project is not Ratchaphatsadu Land, the project company is not capable to claim the right in accordance with the lease contract with the government authority which is one of the challenges in the bankability of the project in Thailand.

4.4 Case study for uncertainty of right to operate renewable power plant

Occupation of land is an important factor in operating hydro floating solar project. Problems about land usage may lead to the uncertainty of the project. In Thailand, there is agricultural land reform project by the government. It refers to development of land ownership and usage for people whose occupation is related to agriculture. For instance, government regulates land leasing to prevent

exploitation on farmers.²⁴⁹ The government agency which is responsible for agricultural land reform is Agricultural Land Office (ALRO). It allocates land for farmer under the Agricultural Land Reform Act.²⁵⁰

Section 4 of Agricultural Land Reform Act states "agricultural land reform" means the improvements concerning rights and holding of agricultural land, including allocation of places for living on such agricultural land, whereby the state brings its land or the land purchased or expropriated by it from the landowner who does not utilize his land by himself or who has land in excess of the right under this Act, for allocation to farmers who have no land of their own or who have little land insufficient for making a living and to farmers' institutions for hire-purchase, lease or utilization with the assistance of the state in developing agricultural occupation, improvement of resources and factors of production as well as production and distribution;

"agriculture" means rice farming, farming, fruit farming, animal raising, aquaculture and other activities as prescribed by the Minister of Agriculture and Cooperatives in a notification published in the Government Gazette.

"farmer" means a person whose principal occupation is agriculture, and shall include those who are poor or who have finished agricultural study or who are children of farmers who have no agricultural land of their own and wish to

²⁴⁹ Agricultural Land Reform Office, "Introduction of Alro Responsibility."

²⁵⁰ Ibid.

carry on agricultural occupation as their principal occupation, pursuant to the rules and conditions prescribed in the Royal Decree.²⁵¹

The lands are categorized into public and private land.²⁵² Example of public land include forest and land for common use. ALRO allocate this type of land to farmer by giving land acquisition document (ALRO 4-28) and land use certificate (ALRO 4-01) following Agricultural Land Reform Act.²⁵³ ALRO obtain private land from land possessors who do not use their land or possess land in excess of their rights.²⁵⁴ In conclusion, Agricultural land reform is designed to benefit farmers.

In 2016, there is a dispute about the permission granted by government authority for the construction of Thep Sathit Wind Farm on Sor Por Kor land (Agricultural land reform). The Supreme Administrative Court ruled that the Agricultural Land Reform Office's decision to allocate Sor Por Kor land to Thep Sathit Wind Farm Corporation for the purpose of wind farm is an unlawful act following the Supreme Administrative Court's judgement No.Or.1728/2559 (2016).

The reason behind the court's ruling is Agricultural Land Reform Office (ALRO) does not have the power to allocate Sor Por Kor land to Theb Satit Wind farm corporation.

²⁵¹ "Section 4 of Agricultural Land Reform Act B.E. 2518 (1975)."

²⁵² Ibid.

²⁵³ Ibid.

²⁵⁴ Ibid.

The power of Agricultural Land Reform Office (ALRO) is stated in Section 30 of the Agricultural Land Reform Act B.E. 2518 (1975).

Section 30 paragraph 1 states that "For all lands or immovable properties acquired by ALRO, ALRO shall have the power to allocate them to farmers or farmers' institutions in accordance with the rules, procedure and conditions prescribed by the Board according to the size of holdings of those lands as follows:

the amount of not more than 50 rais for a farmer and persons in the same family who operate agriculture other than raising large animals under (2);

the amount of not more than 100 rais for a farmer and persons in the same family who operate agriculture of raising large animals as prescribed in the notification of Minister of Agriculture and Cooperatives; the amount of land deemed appropriate by the Board for a farmers' institution, taking into account the type and nature of operation of that farmers' institution."²⁵⁵

Section 30 paragraph 5 states that "In addition to allocation of land to a person under (1), (2) and (3), ALRO shall have the power to allocate land or immovable property to any person to lease, hire- purchase, purchase or utilize for use in other activities that support or are related to land reform as prescribed in the notification of the Minister of Agriculture and Cooperatives published in the Government Gazette, according to the size of holding of land deemed appropriate by the Board, which must not exceed 50 rais. The rules, procedure

²⁵⁵ "Section 30 of Agricultural Land Reform Act B.E. 2518 (1975)."

and conditions for granting permission or for compliance by the person granted permission shall be as specified by the Board with the approval of the Council of Ministers."²⁵⁶

Apart from ALRO's power to allocate land or immovable property to farmers who operate agriculture and large animal raising according to Section 30 paragraph 1 (1)(2)(3), it can allocate land or immovable property to other people who operate activities that support or are related to land reform prescribe in notification of the Minister of Agriculture and Cooperatives following Section 30 paragraph 5.²⁵⁷

The notification of the Minister of Agriculture and Cooperatives B.E. 2532 (1989) No.1.5 concerning activities that support or are related to land reform stipulate that " business which economically and socially serve or relate to the livelihoods of farmers in the land reform areas is an activity that support land reform. "

Under this notification and Section 30 paragraph 5 of Agricultural Land Reform Act, a person involved in business which economically and socially serve or relate to the livelihoods of farmers in the land reform areas can file an application for the allocation of Sor Por Kor land to Agricultural Land Reform Office (ALRO) through the process of lease, hire- purchase, purchase.

²⁵⁶ Ibid.

²⁵⁷ Ibid.

According to the facts, Thep Sathit Wind Farm corporation filed an application for the allocation of Sor Por Kor land through the process of leasing on 23 July 2009 to Agricultural Land Reform Office (Chaiyaphum Province), indicating that this company wants to build wind farm at Amphoe Thep Satit. Later, the Agricultural Land Reform Committee granted permission because it interprets that wind farm is a business which economically and socially serves or relates to the livelihoods of farmers in the land reform areas following the notification of the Minister of Agriculture and Cooperatives B.E. 2532 (1989) No.1.5. However, the fact then arises that the wind farm is for the commercial purpose, not for the wellbeing of the farmers as expected in the first place. The permission granted to the wind farm was based on the fact that the objective of the project to facilitate the quality of living for the farmers. Since the wind farm failed to prove such objective, the Administrative Court revoked the permission. The dispute was appealed to the Supreme Administrative Court then upheld the decision to revoke the permission given to the wind farm.

The key takeaway of this Supreme Administrative Court Decision is that the license or permission that is granted by the authority can be revoked if the license is granted inappropriately. This dispute is a decent example for the license given to the private operator to operate the hydro floating solar system. The implication arising from this dispute is that being granted license to operate the project may not last for the entire period of the power purchase agreement as

it is possible that the license will be revoked in the case that the license is given on the wrong basis under the law.

4.5 Analysis on the rights over hydro floating solar project in Thailand, Japan and Australia

From the analysis of the laws related to water resources in Japan and Australia, it can be seen that the law in Japan and Australia lack the provisions that directly concerns the right to use water surface. The definition of water use in River Law of Japan and Water Act 2007 of Australia does not explicitly include the use of water surface to install hydro floating buoyant to generate electricity as the nature of hydro floating solar plant is different from hydroelectric power that uses water as the main source in generating electricity. For hydro floating solar project, the quantity of water remains the same as the water acts as the location for the installation of the buoyant. The word “water use” that is subject to the water law in Japan and Australia does not include the wording that includes any other purpose whether it may result in a change in the quantity of water or not. In comparison to Thailand, the definition of “water use” in Section 4 of the Water Resources Act B.E. 2561(2018) includes any other purpose whether it may result in a change in the quantity of water or not. The presence of this phrase makes it possible to consider the hydro floating solar project as water use which is subject to the Water Resources Act B.E. 2561(2008). However, it is still a possibility in the interpretation of the wordings

in the law. Therefore, the law regulating hydro floating solar system in Thailand is more evident than those of Japan and Australia. Nonetheless, there are still some drawbacks in Thai law that should be taken into consideration. The first point that should be amended is the definition of water use. The definition of water use in Section 4 of the Water Resources Act B.E. 2561(2018) currently stipulates that water use means a pursuit of activities in relation to public water resources for the purpose of energy generation whether it may result in a change in quantity of water or not.²⁵⁸ From the wording in this provision, it is unclear whether the water use includes the operation of hydro floating solar project or not. The lack of clarity in the definition of water use leads to the legal problem concerning the laws that are used to regulate the project as water use is the key entrance for the applicability of the Water Resources Act B.E. 2561(2018). In order to make the regime of regulating hydro floating solar system as clear as possible, there should be an amendment in the definition of water use in the way that it includes the use of water surface for hydro floating solar system to generate electricity. To elaborate, there should be by-law that clearly specifies that water use includes the use of water surface for the purpose of electricity generation to end the confusion on whether hydro floating solar project is included or not. Another current drawback in Thai law is that the factory license that is granted to the operator to operate hydro floating solar project only lasts for 5 years. In contrary to the power purchase agreement between private

²⁵⁸ "Section 4 of Water Resources Act B.E. 2561(2018)."

operators and the buyers that generally enter into the agreement that has a longer period of time. As the license is granted by the official, to grant or revoke the license is the exercise of power under the law by an official to establish or extinguish the individual's status of rights and duty. Thus, the license is an administrative act under Section 5 of the Administrative Procedure Act B.E. 2539(1996). There is a possibility that the official may revoke the license granted to the private operators. If the license is revoked, the private operators are not allowed to generate electricity from hydro floating power plant as agreed in the power purchase agreement. When there is no income from selling electricity as expected when initiating the project. The financial institution will not be certain about the ability to repay of the private operators as they are not able to generate income as expected when they asked for the loan. Therefore, this will affect the bankability of the project.

Focusing on how the lack of clarification of Section 4 of the Water Resources Act B.E.2561(2018) triggers challenges on the bankability of hydro floating solar project in Thailand, the issue on whether the operation of hydro floating solar project is considered as water use or not causes challenges from the initiation period as well as the operation period. For the initiation period of the project, receiving fund from financial institution is an important part for the commencement of the following periods. In order to grant a loan to the project, the financial institutions must consider all the relevant criteria that can provide them with the assurance that the project company will be able to make

repayment. One of the criteria is that the company must possess the right to carry out the activity in generating electricity. As the definition of water use is not clear, there are two possible ways to interpret such definition. Having several possible ways to interpret the definition of water use poses uncertainty on the rights that the project company has over public water resources where the project is located. The financial institutions recognizes the uncertainty of the rights of the project company so there is a high possibility that the loan will not be granted. As the challenges arise from the initiation period of the project, the operation period of the project which is the following phase will also be affected.

Although a legislation of by-law stipulating that the water use includes the use of water surface will help to ensure bankability in the legal aspect, it cannot be guaranteed that the people in the surrounding areas will be satisfied with the installation of the project. From the social aspect, it is important to conduct the public hearing that allows the relevant sectors to comment and exchange opinions which will help the implementation of the project for the maximum benefit. The details and procedures of public hearing is stipulated in Regulations of the Office of the Prime Minister on Public Hearing B.E. 2548(2005). The information related to the project published to the public must include the objectives, content, operator, place, procedures and duration, results and possible impact on nearby areas or community.²⁵⁹ In conclusion, the

²⁵⁹ "Regulations of the Office of the Prime Minister on Public Hearing B.E. 2548(2005). ."

operation of hydro floating solar project will not be complete without conducting public hearing.

4.6 Environmental issues in relation to the project

Apart from the legality of the project, environment issues are critical aspects that cannot be overlooked. The impact of the project on environment must be examined as a part of underwriting. The environment risks should also be taken into consideration before the initiation of the project. The photovoltaic pontoons are installed on the water surface so the project may have an impact on the water and surrounding. The installations of hydro floating solar project are proven to have positive environmental effects in many aspects.²⁶⁰ The mechanism of photovoltaic pontoons involves the cooling of panels which can help to offset a large amount of carbon dioxide emission in comparison to the installation of solar panels on land.²⁶¹ On the other hand, although floating solar system does not suppress vegetation, there may be detrimental impacts on the bottom of the lake due to the anchoring, cabling structure, and trenching on soil used in connecting the floating structure to the substation.²⁶² The installation Moreover, the environmental impacts may include the change in water quality

²⁶⁰ Frederik Christoffel Prinsloo, "Environmental Impact and Assessment for Floating Solar Systems on Wine Farms in the Western Cape Wine Region," (January 2017).

²⁶¹ Ibid.

²⁶² Gardenio Diogo Pimentel Da Silva, "Is Floating Photovoltaic Better Than Conventional Photovoltaic? Assessing Environmental Impacts," (28 May 2018).

and increase of water turbidity caused by the turnover of sediments in bottom of the lake during anchoring.²⁶³



²⁶³ Ibid.

Chapter V Conclusion and Recommendation

5.1 Conclusion

According to the analysis on the current applicable legislation and regulations in relation to initiation and operation of a hydro floating solar project in Thailand, the definition of “water use” stipulated in Section 4 of the Water Resources Act B.E.2561(2018) poses challenges on the bankability of hydro floating project. The definition of water use only involves the activities for the purpose of energy generation without directly stating about the use of water surface for hydro floating solar project. The lack of clarification in the definition of water use causes the problem of interpretation in determining whether hydro floating solar system is considered as water use or not. Focusing on the process of energy generation, water is not used to generate electricity as the electricity is actually generated from the solar energy. From this point of view, the operation of hydro floating solar project does not fall within the definition so it is not subject to the Water Resources Act B.E. 2561(2018). Nonetheless, it can be argued that, through textual analysis of Section 4, a hydro floating solar project relies on the public water surface as a location for the purpose of energy generation so it could be considered as water use. Through such interpretation, the Water Resources Act B.E.2561(2018) will be apply to the project, posing different outcomes concerning the bankability of the project. From the aforementioned examples of interpretation, it can be concluded that several

possible interpretations trigger challenges on the bankability of the project. In the situation when the project company regards the operation of the project as water use that is subject to the Water Resources Act B.E. 2561(2018), there is still uncertainty on whether the project company has the right in accordance to this Act or not. Accordingly, the financial institutions will be reluctant to grant the loan to the project. Therefore, the lack of clarification in the definition of water use bring about the uncertainty in the bankability of hydro floating power project.

Section 41 together with Section 43 of this Act are the provisions that act as an entrance to the right to use public water resources lawfully. These two provisions require the project operator to obtain license from the authorities which are the Director-General of the Royal Irrigation Department, Director-General of the Department of Water Resources or Director-General of the Department of Groundwater Resources with the approval of the drainage basin committee is not applied to the operation of the project. As the operation of hydro floating solar project is not considered as water use, Section 41 and Section 43 will not apply to this project. Thus, there is no entrance to the right to use public water resources under current Thai legal framework for hydro floating solar project.

Another directly applicable law that is relevant to the operation of energy business is the Energy Industry Act B.E.2550 (2007). Section 47 stipulates that the energy license holder must obtain a license from the authority to operate

energy business. Such license only gives permission for the project company to perform the activity concerning energy production. It does not provide any right concerning the use of water to the licensee. Obtaining the license to operate energy business does not support the bankability of the project as it is not able to assure the right that the project company has in installing photovoltaic pontoons on water surface.

Concerning to the right that the project company has over the project, if the project is installed on the water surface that stays out of the irrigation area, the water surface in such area does not belong to any private entity so it is public water resources. When the location of the project is a state property, an ownership under the Thai Civil and Commercial Code cannot be established. In identifying the right over the state property, the Ratchaphatsadu Land Act B.E. 2562 (2019) plays an important role in regulating state property. However, the public water resources that are used as the location for the project is the immovable property which is reserved for the common use of people. Hence, the water surface used for the project is not Ratchaphatsadu Land. The project company cannot claim the right under the lease contract with Treasury Department. All in all, the project company cannot rely on the right provided by the Ratchaphatsadu Land Act B.E. 2562 (2019) as an entrance to the right to operate this project on the water surface.

In the situation when the photovoltaic pontoons are installed on the water area that is under the supervision of Marine Department, the water obstruction

that shall obtain license from the Marine Department does not include photovoltaic pontoons. Accordingly, the operation of the project currently is allowed by the Marine Department unless there is an amendment to provision concerning the characteristic and definition of building and water obstruction in the Ministerial Regulation No. 63 (B.E. 2537) in pursuant to the Navigation Act B.E. 2456 to include the installation of hydro floating solar system.

At the present time, the lack of clarification in several area of laws in Thailand leads to challenges in the operation of hydro floating solar system in terms of the bankability of the project. The project company cannot assure the right that the company has in operating the project on the water surface to the financial institution. In conclusion, to improve the bankability of the project, there should be an amendment in the laws in relation to the project to become more comprehensive. Additionally, it is important to assure that the project is socially accepted by the interested parties through the process of public hearing as stipulated in Regulations of the Office of the Prime Minister on Public Hearing B.E. 2548(2005).

5.2 Recommendation

According to the analysis on the laws related to water resources in Thailand, Australia and Japan, the laws that regulate hydro floating solar system in Thailand provides a more comprehensive legal basis than the regulatory regime in Japan. Nonetheless, it is not comprehensive as there are some points that need to be amended to provide more clarification. Currently, the details on the nature and descriptions of water use of Type Two in Section 41 of the Water Resources Act B.E. 2561(2018) does not directly include the use of water surface for the installation of hydro floating solar project. The lack of clarification on the definition of water use poses challenges in the bankability of the project as it leads to uncertainty in the interpretation of the project. The details concerning nature and descriptions of water use of Type Two are very crucial for determining the applicability of law. To include the use of water surface for the electricity generation as water use of Type Two will completely lead to different outcome as the operation of the project will be considered the water use of Type Two which requires a license from the Director-General of the Department of the Royal Irrigation Department, Director-General of the Department of Water Resources or Director-General of the Department of Groundwater Resources with the approval of the drainage basin committee. Therefore, it is recommended that there should be a legislation of by-law defining the water use of Type Two to include the use of water surface for the purpose of hydro floating solar system so as to create a more comprehensive legal regime regulating hydro floating solar

project which will eventually enhance the bankability of the project in the future. In order to facilitate the installation of hydro floating solar project on the water area which is under the responsibility of Marine Department, the definition of encroachment of the river that is required to obtain license from the authority should be amended in the way that it includes the installation of photovoltaic pontoons to generate electricity. The foregoing recommendation will be the way forward for the bankability of hydro floating solar projects in Thailand in the future.

As Section 41 of the Water Resources Act B.E.2561(2018) only generally classified the use of public water resources into three categories. The water use of Type Two includes the use of public water resources for electricity generation. The paragraph two of this Section provides that the nature and description of the water use shall be prescribed in the Ministerial Regulation issued by the Prime Minister with the approval of the National Water Resources Committee. Therefore, in order to solve the problem on the unclearness of law regulating hydro floating solar project in Thailand in the meanwhile, there should be a legislation of by-law that clearly providing a clear description of the water use of Type Two to include the use of water surface for electricity generation. The proposed draft of the Ministerial Regulation prescribing the nature and descriptions of water use states as follows:

Ministerial Regulation
Prescribing the nature and descriptions of water use

By virtue of Section 5 and Section 41 paragraph two of the Water Resources Act B.E. 2561(2018), the Prime Minister with the approval of the National Water Resources Committee (NWRC) hereby issues the ministerial regulation as follows:

Chapter II
the nature and descriptions of water use of Type Two

Clause .. the use of public water resources for electricity generation means the use of water or water surface in the process of generation in order to transform certain types of energy from any energy sources into electricity in accordance with the law regulating energy industry, whether it may result in a change in the quantity of water or not, operated by government agency or private sectors in accordance with the law regulating energy industry.

As there is no legal entrance for the operation of hydro floating solar project in Thailand in the current time, the legislation of this Ministerial Regulation may solve the current problem of several interpretations on whether hydro floating solar project is subject to the Water Resources Act B.E.2561(2018) or not. The clarification on the details of water use of Type Two may contribute in enhancing the bankability of the project and provide the forward for the operation of hydro floating solar project in Thailand.

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สำหรับผู้ประกอบกิจการผลิตไฟฟ้าจากพลังงานแสงอาทิตย์ด้วยเทคโนโลยีโฟโตโวลเทอิก แบบฟูนลอยน้ำ พ.ศ. 2562."

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