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The emergence of the crowdfunding platforms for renewable energy in
Taiwan: an actor in the governance of energy transition?

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Abstract

The aim of this thesis is to explore the development of the crowdfunding platform for renewable energy in Taiwan in order to address the main question: To which extent do the crowdfunding platform become an actor in the governance for the energy transition in Taiwan? Crowdfunding is a new financial mechanism to enroll more people who are excluded from the energy sector previously. The existing energy transition regime leads to the innovation niche, the Crowdfunding platform for renewable energy. This innovation not only appeals to startups, but it also attracts existing companies to take part in the market. When the platforms want to improve its efficiency and reduce the cost, they benefit from technological improvements such as cost reduction and progress of the monitor system. Also, the platform tries to manage the public relationships to contact the potential collaborators and customers. The events such as local conferences, energy lectures, and manage social media help them to promote their idea. Nevertheless, when the platform participates in the energy governance more actively, they face several challenges, and its impact is yet to be discovered. As for the policy design, they are hardly to join the Green Rooftop Project. As the platform aims to improve the crowdfunding model and introduce the new financial technology like blockchain, they face the limitation of the regulatory framework. As the platform wants to participate in the emerging RE retailer industry, it is challenges for them to integrate the crowdfunding model and Re retailer. All these cases reveal that even though the platform has tried to lobby and negotiate they can barely influence the regime now. In sum, most of them conform and fit the existed regime to operate their business. Although the crowdfunding platforms shows potential to change the energy regime fundamentally and some platforms have tried to influence the government, it still takes time to examine the impact of the crowdfunding.

Keywords: Energy transition, Crowdfunding, Protective space, Multi-level perspective

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Yu Hsiang Huang, Taiwan, January 2021.

List of Acronyms

RE - Renewable Energy

CIP - Copenhagen Infrastructure Partners

TSMC - Taiwan Semiconductor Manufacturing Company

PV system - Photovoltaic system

IRENA - the International Renewable Energy Agency

SDGs - the Sustainable Development Goals

MLP - Multi-level Prospective

NGO - non-governmental organization

ICT - Information and Communication Technology

CCS - Carbon Capture and Storage

CSR - Corporate Social Responsibility

Tai-Power Company - Taiwan Power Company-

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Chapter 1 Introduction

Developing the renewable energy is an urgent project around the world. This topic raises several discussions around the energy governance, environmental justice and international development. For nearly four years, Taiwan has made a significant progress in the energy transition. The average annual growth rate of solar power generation in the past ten years is nearly 90% (Chung,2019). Except for the considerable growth rate, the regulatory framework is also changing. Before the transition, the government controlled the electricity industry completely and limited the private sector participation. Also, thermal power and nuclear power are two major energy sources for electricity. The government established the clear transition agenda in 2016. The goal of the transition is to reach 20% renewable energy, and the total nuclear power phase-out will be in in 2025 (Ministry of Economic Affairs, 2019). To achieve this goal, electricity liberalization, which open the private sector to invest in the electricity production and distribution, is a necessary step. Also, the government took more actively measures to promote the RE. They create several policy tools to create the incentives for the stakeholders like the developers, landowners, and banks to have willing to participate in the transition.

Offshore wind and solar PV system are the major RE that the government wants to promote. In July 2020, Taiwan Semiconductor Manufacturing Company (TSMC), signs the world's largest renewable corporate power purchase agreement (920 MW) with Ørsted, a major offshore wind farm developer (Ørsted, 2020). This important trade represents the milestone for the energy transition in Taiwan, as the private company started to purchase a huge amount of electricity from another private company directly. Except for this case, Taiwan attracts many large funds like the Copenhagen Infrastructure Partners (CIP), Macquarie, WPD and MHI Vestas to invest in the offshore wind.

Compared with Offshore wind, Solar PV system is local and small-scale. In the Taiwan energy transition agenda in 2016, the government wanted to achieve 6.5GW in 2020 and 20GW in 2025 for solar PV system. Until July 2020, the capacity had reached 4.8GW (楊, 2020). Unlike the offshore wind that relies on the transnational corporates and foreign technology, solar power requires smaller scale capital, local technology and

industry chain. These features attract more local actors to participate in.

Either the offshore wind or solar PV system, investing in the RE require a huge fund. The fund is a barrier for the developers to participate in the industry. Except for the original capital from financial institutions, crowdfunding is an emerging way to raise money to develop renewable energy. In general, crowdfunding refers to the effort made by entrepreneurial individuals and groups – cultural, social, and for-profit – to fund their ventures by drawing on relatively small contributions from a relatively large number of individuals using the internet, without standard financial intermediaries (Mollick, 2014). This model is revolutionary and appealing to some supporters.

Crowdfunding for RE is an emerging business model in Taiwan. It provides a new pathway for people who are with less capital to participate in the industry. The supporters of crowdfunding consider this innovation would attract more people to join the expansion of renewable energy projects to boost the energy transition (陳蕙萍, 2017). Nevertheless, this business model still needs to compete with other developers. According to the regulatory framework, this model is only applicable to the small scale RE projects like the solar PV system. Also, this model raises some controversy about the Ponzi scheme, which may violate the existed regulatory frameworks. These debates around crowdfunding for RE inspires this research and raise the following questions: To which extent do crowdfunding platforms develop into an actor in the governance of energy transition in Taiwan?

To address this question, Multi-level Prospective (MLP) and its expansion, protective space, are useful analysis tools. This approach was developed by several scholars to analyze the dynamic relations between the niche and the external factors including the regulatory framework and the political and economic context (Geels, 2002a; Genus & Coles, 2008). This approach will help us to realize how the crowd funding platform became mature and how many potential fundamental changes they may bring to the energy transition.

This research addresses how crowdfunding participates in the governance of the energy transition agenda. The thesis is structured as follow: Chapter 1 is the introduction.

Chapter 2 is the literature review. This part will try to review the relevant research in the academic field and reveals the insight of the multi-level perspective approach and the expansion it brings. Chapter 3 will introduce the main research question along with three sub questions and conceptual framework in the thesis. Also, this chapter will indicate the methodology that will be used. Chapter 4 will address the first sub question: To what extent the electricity regulatory framework facilitates the crowdfunding for RE projects? This chapter will review the regulatory framework through the document analysis to reveal how the framework incubate crowdfunding platforms for RE projects. Chapter 5 will address the second sub question: How did crowdfunding platforms become mature and expand its network in this context? Although the existed regulatory framework incubates the crowdfunding model, the competition among different platforms is inevitable. Improving efficiency and expanding the network are two crucial steps to help them mature. Chapter 6 will address the final question: How crowdfunding platforms interact with governments and influence the policy? This chapter will examine three cases to describe how the platform participated in the energy governance. Even though the platform creates a promising vision for the energy transition, they can barely change the regulatory framework fundamentally. Chapter 7 is the conclusion.

Chapter 2 Literature review

2.1 Introduction

This review aims to elicit several keywords and concepts: Energy transition, governance for energy transition, Crowdfunding and Multi level prospective. Energy transition becomes a buzzword in the academic and governance fields. The following two sections will trackback the original of these terms: how transition and governance evolve to the modern meanings. Besides, these parts will reveal the significance of the fund, which was often ignored in the past research. The following section will introduce the development of the crowdfunding and how it is applied in the renewable energy. Some scholars find its potential contribution this financial innovation can be brought to the energy transition. Nevertheless, knowledge between the crowdfunding for RE and the governance for energy transition is rather essential. How the crowdfunding for RE participates in the governance of energy transition and their potential to challenge the existed regime. The final section will introduce the multi-level prospective and protective space approach, which are helpful lens to analyze this question.

2.2 Vision to energy transition

The basic concept of energy transition typically refers to major shifts in the role of different fuel types, access, delivery and conversion technologies within national energy systems and/or on a global scale (Araújo, 2014; Berkhout et al., 2012). In contemporary context, it implies the ultimate goal of the transition is to zero-carbon emission. The International Renewable Energy Agency (IRENA) defines 'energy transition' as a pathway toward the transformation of the global energy sector from fossil-based to zero-carbon by the second half of this century. It also indicates that while a global energy transition is underway, further action on a global scale is needed to reduce carbon emissions and mitigate climate change (IRENA, n.d.). This definition indicates the global action is necessary for the transition. The transition involves in complex negotiation and cooperation among different scale actors ranging from international organizations to the individuals.

Environmental crisis makes energy transition become a buzzword in the international and national agendas. In 2015, United Nations presented the Sustainable Development Goals (SDGs). This agenda indicates that access to be affordable, reliable, sustainable,

and modern energy for all is a basic right (SGD 7) and taking urgent action to combat climate change and its impacts are necessary for sustainability (United Nations, n.d.). Similarly, European Commission announced the 2030 climate & energy framework in which there are three key targets: at least 40% cuts in greenhouse gas emissions, at least 32% share for renewable energy, and at least 32.5% improvement in energy efficiency (European Commission, 2020.). On the national and urban levels, each country has its energy transition agenda and progress. Dutch government announced the Klimaatakkoord in 2019 to set the energy transition goal in which closing all coal-fired power plants in 2030 and achieving zero carbon emissions electricity system in 2050 (Den Haag, 2019). Energy transition and the relevant agenda are urgent and necessary in contemporary society.

Although the number of relevant political agendas is booming, there is no universally accepted definition of energy transition (Araújo, 2014). To be more specific, each international organization and country or region develop its own energy transition agenda according to its specific context. That's why organizations have different goals and solutions about the energy transition. Nevertheless, the definition from the IRENA is still useful to provide some insight about how to facilitate the transition.

The energy transition will be enabled by information technology, smart technology, policy frameworks and market instruments. (IRENA, n.d.)

This definition reveal that the transition includes multi-scalar process. It is a new concept in the study of transition. To review the history of the energy transition study, the concept of the term "Transition" has a root in biology and population dynamic, which is between birth rate and death rate and implies that there is a stabilization that is from an unbalanced situation to equilibrium (Rotmans & et al, 2001). In this context, Grubler (2012) indicates when the energy study emerged in the 1950s, scholars focused on energy use at a global scale. This global scale provides a general contour of the energy type and usage. To elaborate on the energy transition, the second wave is the national level study in which the scholars focus on improving the efficiency and cost-controlled of the energy supply. This approach implies optimism about technology progress and how new energy like nuclear power could enhance energy efficiency. In this period, the progress of the technology is a major solution to promote the transition.

Nevertheless, the progress of technology is not the only reason to drive the transition. Some scholars consider the institutional and social dimension are important for energy transition. They blend historical macro-perspectives with actor-based microeconomic and institutional foundations to develop the multi-level perspective approach, which is also called Dutch school (Grubler, 2012). Dutch school refers the transition to large-scale transformations within society or important subsystems, during which the structure of the societal system fundamentally changes (Loorbach et al., 2008). Bergh and Bruinsma (2008) try to distill four main dimensions in transition: First, transition is a multi-level process that involves micro, meso, and macro levels; Second, transition develops through different temporal phases which refer to concept, stabilization and saturation; Third, transition involves a long wave in which the innovation would evolve and complementary; Fourth, the transition would involve a complex structural change in resource, supply, demand, institution, and culture. This category indicates the complexity of the transition.

In brief, the transition is not merely a technology selection or institutional reform. Energy transitions are wide-ranging, encompassing shifts not only in fuels and technologies of energy use, but also infrastructures, cultural practices, and the organization of society more broadly (Bridge et al., 2018). To achieve transition, reformulating the framework to facilitate the transition is a challenge for the international organizations and governments. This challenge also indicates the emerging of the governance of energy transition.

2.3 The governance of energy transition

Energy transition is an urgent and complex process. Therefore, how to promote energy transitions in order to tackle the environmental crisis has been a challenge, including how to govern it. Although the definition is eclectic, governance is an essential concept in social science. The term governance can be traced back to the classical Latin and ancient Greek words for the 'steering' of boats. It originally referred mainly to the action or manner of governing, guiding, or steering conduct and overlapped with 'government.' (Jessop, 2018). Traditionally, governance is a synonym for government. Nevertheless, the growing work on governance redirects in its use and import (Stoker, 1998). The emergence of the governance may attribute to dissatisfaction with the capacity of social science which tend to approach simplistic dichotomies, including market vs. hierarchy

in economics; market vs. plan in policy studies; private vs. public in politics; and anarchy vs. sovereignty in international relations, to describe and explain the real world in the 1970s and 1980s (Jessop, 2018). This trend indicates that no matter in the international affairs and domestic issues, the traditional government's function is changing, and the original academic discipline is not enough to describe it. Stoker (1998) also indicates that "the rise of governance undoubtedly reflects a degree a search for reductions in the resource commitment and spending of government "(p.18). In this context, some researchers view governance as a change in the meaning of government, referring to a new process of governing, or a changed condition of the ordered rule, or the new method by which society is governed, which includes a multiplicity of non-state actors (private, civil society, etc.) (Rhodes, 2000).

Many scholars present different approaches to elucidate the governance. For example, Rhode defines governance as "sets of formal and informal institutional linkages between governmental and other actors structured around shared interests in public policymaking and implementation to analysis the British government." (R.A.W. Rhodes, 2007, p.1244). He also identifies four features in contemporary governance issue: 1) governance is broader than government, as it includes non-state actors. Although the boundaries between public, private, and civil society becomes blurred, their relations are interdependent. 2) As the actors they need to exchange resources and negotiate with others, they must interact with each other continually. 3) Third, they share a common regulation to maintain a game-like interaction. Fourth, governance actors are partially autonomous from the state. Nevertheless, the state is able to steer the networks indirectly and imperfectly (Rhodes, 2007). Healey (2006), who also have a similar perspective about governance states:

.....the general meaning of governance used to encompass all forms of collective action focused on the public realm (sphere) in one way or another, from those orchestrated by formal government agencies, to lobby groups, self-regulating groups and social campaigns and movements targeted at resistance or challenge to dominant governance relations (p.302).

This trend shows that new actors are involved in governing complex issues, not only the central government. The private sector and civil society become significant players in the governance, including in the governance of energy transition.

Governance is playing a significant role in the transition studies. Patterson et al. (2017) argue that governance and politics are essential to understand and analyze sustainable transition. They claim that "governance is inherently implicated in any intentional effort to shape 'transformations towards sustainability', and transformations towards sustainability are deeply and unavoidably political, and need to be recognized as such" (p.2). How to analyze the governance in the real world is an urgent issue. From the analytical perspective, governance can be analyzed in terms of three dimensions: actor, institution, and policy (Treib et al., 2007). Nilsson (2012) indicates:

1. "The actor dimension is about how different actors and interests are represented in the policy processing, in particular the relationship and balance between private and public actors in the policymaking process.
2. The institutional dimension is about how (according to what rules) different actors interact, for instance, through hierarchical control, through market transactions or through different types of networking. Here, transitions management literature has aligned strongly with the broader call for more horizontal and networked types of governance (Loorbach et al., 2008).
3. Finally, in the policy dimension, governance pertains to which instruments are used, including regulatory standards such as product standards, bans and regulations, market-oriented measures such as market designs, deregulations, green taxing, and which "soft" approaches actors rely on, including voluntary and informational processes, co-regulation and cooperative procedures such as private-public partnerships. Governance is thus a multifaceted concept, involving both the rules and actors that shape the process of policymaking, and the characteristics of policy outputs. (p.298)

Even though the government's role has changed and other actors like private sectors and civil society participate in governing complex social and environmental issues, many scholars consider the government still plays a vital role in setting the framework

and steer the boat in the low-carbon transition (Nilsson, 2012; van der Loo & Loorbach, 2012)

How to govern the energy transition is a vital question in the field. The tension among different levels of governance will affect the transition progress. Hamilton & Kellett (2013) try to understand which the best way is to promote energy transition. They focus on researching the dynamic among different levels of governance when they try to promote RE in Austria. They conclude that even though target setting at the global scale seems important in renewable energy development, it will not necessarily lead to success at the local level. The dynamic among different levels of governance would determine the outcome of the transition. Parpairis & Lagos (2013) try to analyze the tension between the tourist industry and renewable energy. They suggest that without the local mobilization in the tourist industry at the scale at which RE is deployed, the centralized RE approaches will not achieve their goals. These research indicate that even though the central government set ambitious targets and design policies to promote energy transition, how the local actors respond is a crucial factor of the transition.

Except for the scale issue among different levels of actors, how to form the effective policy to facilitate the transition is another topic that concerns the scholars. Koster & Anderies (2013) apply the Institutional Analysis and Development Framework (IADF) to do the comparative case study to analyze the governance for the energy transition. They reveal that a singular policy is hard to encourage enough actors to participate in the transition. In contrast, multiple policies are necessary for the transition. For example, cultural norms and values and how they interact with the government will impact on the RE transitions. The government needs to use polycentric governance designs to integrate with cultural values to leverage relevant policies. Besides, they claim that without broad participation of stakeholders, government commitment alone will not work well.

In addition to the policies and regulations, the financial factor is also significant factor. For climate mitigation, the role of financial institutions has been to an extent underestimated (Geels, 2013). This means that for future climate and energy governance, engaging in a debate with the financial sector on the enabling conditions

to close the funding gap for renewable energy transition is important. In this debate, crowdfunding can play a role, not only for enabling additional functionality (Vasileiadou et al., 2016).

2.4 Crowdfunding for RE projects

Crowdfunding represents the disintermediation of financial markets as funders and promoters are brought together directly. It has also seen the emergence of new institutional forms, as the crowdfunding platforms themselves play an increased role as actors in the market (Harrison, 2013). Nevertheless, Crowdfunding is not a new concept. It is built on the previous models like cooperatives and microfinancing (Vasileiadou et al., 2016). The difference between the previous model and crowdfunding is how they contact potential participants. In the cooperative model, the relationships in the local community determine the strength of the network and form the cooperation. The geographical boundary limits participation. Nevertheless, ICT innovation makes crowdfunding beyond the limit of the geographical boundary, which is the limitation of the original cooperative model. The internet is a powerful enabler for the crowdfunding (Bocken et al., 2014) and mandatory to develop crowdfunding platform (Bonzanini et al., 2016). The online platform is the mediator who negotiates investors and proposers to make the proposal possible. As a mediator, crowdfunding projects have their own goals. Generally, they could be financial or non-financial purposes. There are four types as bellowed (Bonzanini et al., 2016).

- equity-based: crowd funders become shareholders of the project and have the right to share the profits (sometimes with differential voting power and dividend distribution rights, compared to the sponsor);
- lending-based: funds are paid back, and the crowd funders have the right to receive an interest payment contractually promised.
- donation-based: funds are provided with no other compensation, for philanthropic or sponsorship proposal.
- reward-based: funds are provided in exchange for nonmonetary benefits (for example, a release of the product to be realized, or gifts, vouchers.).

Even though the crowdfunding is flourishing, the disadvantage should not be ignored. Mollick (2014) finds that although the vast majority of founders seem to fulfill their

obligations to funders, over 75% deliver products later than expected, with the degree of delay predicted by the level and amount of funding a project receives. Contrary to professional investors like banks or venture capitalists, they are not able to impose covenants or agreements. The risk of fraud is not negligible, and information asymmetries are massive (Bonzanini et al., 2016). The same situation is common when applying the crowdfunding to the development of renewable energy.

Crowdfunding for renewable energy is also an emerging research field. Lam and Law (2016) conducted a case study to categorize eight ongoing crowdfunding for RE projects which are located in Asia, Africa and Europe to classify their types and reveal the potential for the renewable energy start-ups. Although the crowdfunding has some weaknesses, for example, there is not enough guarantee to protect the investors and lack of liquidity as no secondary market (Lam & Law, 2016), it is optimal when complemented with other traditional financing methods in the whole life-cycle of renewable projects like solar PV (Lam & Law, 2016; Lu et al., 2018). This complement is precious for developing and emerging countries, which have limited budget to invest in renewable energy (Bonzanini et al., 2016). Except for financial aid, it also represents a way to promote to develop corporate activities, which increase greater awareness of energy issues (Lam & Law, 2016). Beyond the economic and policy analysis, Vasileiadou et al (2016) applies the MLP approach to assess the potential of crowdfunding for the RE project to challenge the original energy and fiscal regime in a broader framework. They see crowdfunding as a niche and try to use four proxies, namely Scale, Learning, Support, and Heterogeneity, to evaluate the contribution of crowdfunding. They conclude that even though crowdfunding lack support from the regime, which means a low level of niche stabilization and limited potential to breakthrough, the heterogeneity, which creates broader support from people, is promising. Besides, they also indicate two future research directions: first, the relationship between public policy and crowdfunding in energy market; second: exploring the differences and similarities in different spatial contexts under the broader socio-economic and political conditions.

This approach, which connects the individual niche and its social context, provides a new way to explore the crowdfunding for RE projects. Nevertheless, some factors are still missing in the dynamic between the regime and crowdfunding for RE project. As

they admit that the relationship between public policy and crowdfunding in energy market is not well explored in their study, the dynamic between the niche and regime seems like a one-direction on which the socio-regime influence on the niche and the agency of the niche is rarely discussed. In other words, the agency of actors, like the crowdfunding owners, governments and participators are missing. It is still unclear how the crowdfunding participates in the energy governance for energy transition and the capacity crowdfunding has to challenge and influence the policy. Also, different regimes formulate different regulatory frameworks to facilitate the crowdfunding. The cases study would contribute to the academic field. This missing part is so obviously that Vasileiadou et al also suggest the future research can put emphasis on them. To fill the gap, reviewing the Multilevel Prospective approach is an essential step to help us to understand the dynamic between the niche and governance.

2.5 Multilevel prospective, its critics and protective space approach.

In transition studies, Multiple-level perspective (MLP) is a popular theory which is a middle theory between innovation management and the STS studies (Bergh & Bruinsma, 2008; Chen, 2019). MLP approach proposes that there are three levels in the transition: landscape, socio-regime, and niches. According to Geels (Geels, 2002), Landscape means fixed, hardness factors like oil prices, economic growth, wars, emigration, broad political coalitions, cultural and normative values, and environmental problems. Socio-technical regime which functions as selection and retention mechanism refers to the semi-coherent rules carried by different social groups. Niches means the immature innovative technology needs a space to develop. In order to achieve the transition, the innovation niche needs to be in the protected zone which provides a learning process and social networks like supply chains, user producer relationships until it becomes mature and has the capacity to challenge the existed socio-technical regime. The specific socio-technical regime institution, policy, and regulations established the protected zone. This approach is widely deployed in the energy transition study in Dutch and UK solar power and offshore wind farms (Smith et al., 2014; Verhees et al., 2013).

There are some critics about the original MLP approach. First, the tendency of the elite drive and niche focused in MLP approach led to the bias assumption that the “winning” technology is undoubtedly the most effective one in techno-economic approaches. This

tendency over emphasizes the innovation and ignore other factors (Genus & Coles, 2008). In addition, original approach focuses on the singular niche in the transition. Nevertheless, the transition may involve a plurality of niches and regimes which have a complex interaction (Geels & Schot, 2007; Smith et al., 2010). Also, the MLP has been criticized for giving limited attention to politics and power (Geels, 2019). Other approaches help to improve the MLP approach. Political ecology provides a useful approach to improve the MLP approach. Lawhon & Murphy provide four pathways with insights from political ecology to improve the MLP approach: 1) Identifying interrelated problems and competing interventions, considering a broader range of actors and their knowledge, 2) Power relations and their influence on human-environment relations and 3) Explaining socio-technical transition outcomes and their impacts (Lawhon & Murphy, 2012). Besides, literature on governance brings the same insights which suggested that policymakers should orchestrate and facilitate social inter-actions, discussions, learning processes, foresight, and information exchange for socio-technical transition researchers (Loorbach & Verbong, 2012). Except for the funding for the R&D, the articulation to actors like NGOs, city governments and users are also necessary (Smith, 2012).

To enhance the approach, some scholars try to explore how the niche advocate change the regime through socio-political activities (Geels, 2019). Protective space approach is one of them. Smith and Raven develop the concept of protective space to deepen the understanding of the niches. According to Smith and Raven (2012a)'s elaboration on the "protective space," three functional properties should be identified: shield, nurture, and empower. Shield means to keep innovation niche from the selection pressure of the current environment which is dominated by the mainstream incumbent technology. Nurture refers to efforts to support niche technology development, usually including articulation of expectation, social network building, and the learning process. Empowerment represents maturity of niche technology, meaning that the niche technology becomes more competitive under current selected environment without challenging current criteria (called fit-and-conform empowerment), or even, niche technology is strong enough to change and restructure the environment to make it favorable to itself (called stretch-and-transform empowerment) (Chen, 2019; Smith & Raven, 2012). This approach also deepens our understanding of the 'outward-oriented socio-political work which is representing, promoting and enrolling support for that

development and performed by technology advocates (Kern et al., 2015; Smith & Raven, 2012a).

Practically, Kern et al (2015) deploy this protective space approach to analyze six low-carbon technology cases: PV-solar, offshore-wind and CCS (Carbon Capture and Storage), in the UK and the Netherlands. Their assumption assumes that the passive space, which means the indirect support from the institution, often exists before the active space, which means direct support, is not wholly right. They also reveal that their relation is not liner and the niche advocates may take advantage of the active and passive shields at the same time. Also, the actor network is complex and the niche supporters who try to link narratives to the prominent socio-political agendas is also influenced by the network need to make effort to do it. Kern et al. (2015) using the protective niche approach to compare the UK and Dutch offshore wind developments. Although both countries adapt the 'fit and conform' as well as 'stretch and transform' strategies, the existence of the system builders and the salience of climate change and renewable energy targets lead the UK to a better advancement in offshore wind development. They also suggest that futures research should pay more attention to how institutional contexts such as regime rules constrain and provide room for empowering strategies of niche development and which kinds of processes enable the building up of a sufficient power base to challenge dominant rules (Kern et al., 2015).

Chen (2019) also introduces this approach to analyze the development of PV solar and Off-shore wind in Taiwan. Chen indicates that as a latecomer country, the local niche which refers to Solar PV system in Taiwan benefits from the foreign experiences, and it is useful to ease the pressure on the local niche brings to the socio-technical regime. Although the PV system industry is booming, its popularity is still low in Taiwan. The domestic environment was unfriendly for the RE in the beginning, yet Solar PV system enhance its capabilities and networking in the foreign environment. When it is well-developed and the domestic environment becomes friendly, the niche could swim back to its hometown. In other words, the niche, which is not solid in the primary environment, matures in the secondary environment and seizes the opportunity to come back. The secondary environment helps the niche to develop in the hometown. Also, the government plays a significant role in influencing the policy. It has an impact on the energy transition process, which is a different picture of the development of the

niche.

2.6 Conclusion: the knowledge gap between the crowdfunding and RE

Energy transition is a booming topic in the academic field. Recent scholars tend to consider it as a complex process which involves technological innovation, money market instrument, policy frameworks and cultural values. Because of this complexity, how to govern the transition is a big challenge for the organizations and governments. The fund is one of the significant factors in the governance of energy transition. The investment in developing RE is a massive investment programme that cannot be done by a single company or government. Except for the traditional financial tools, crowdfunding emerges and creates a promising future for the energy transition. Despite its limited volume and scale, it is still a worth considering alternative.

Nevertheless, the knowledge gap between the crowdfunding and energy transition has not been filled. The agency of the crowdfunding and its potential to participate in the governance is still unknown. This thesis will do the exploratory research to bridge the gap through the MLP and the protective approach to analyze how the innovation participates in the energy transition. Exploring the role of crowdfunding platform in the energy transition agenda can help us to understand its potential impact. Also, this case study in Taiwan presents the valuable knowledge and experience which are different from European contexts.

Chapter 3 Research question and Conceptual framework

3.1 Research question

The main objective of this research is to understand the potential of crowdfunding platform for the energy transition in Taiwan. This research assumes that crowdfunding for the RE project is not only a business innovation but also a new pathway for the actors to participate in the governance of energy transition. However, whether the crowdfunding platform have the capacity to structure itself as an actor enables to influence the whole energy transition agendas is still unclear. This doubt mainly results from two factors: First, although crowdfunding can solve the financial issue in the transition agendas, its potential is limited by the existed regulatory framework; Second, as the MLP approach scholars indicates, the socio-technical regimes and the landscapes are not easily altered, and the transition takes a long time (Geels, 2002a). Researching the potential of crowdfunding platform for the energy transition in Taiwan would help us to understand to what extent of the regulatory framework limit the development of the crowdfunding and whether it has enough momentum to challenge the regime. Also, Taiwanese case study would shed light on the energy transition agenda and academic fields. This objective leads to the main research question:

To which extent do the crowdfunding platform become an actor in the governance for the energy transition in Taiwan?

To answer this question, it is necessary to address three sub-questions:

- 1) To which extent the electricity regulatory framework facilitates the crowdfunding for RE projects?

This question enables us to understand the context in which these platforms operate in Taiwan. Different regulations frame energy transition in Taiwan: international environmental agendas, like the Kyoto protocol, Paris agreements, international CSR, and national requirements, including The Electricity Act in 2017, Greenhouse Gas Reduction and Management act in 2015, and Renewable Energy Development Act in 2009. These regulations frame Taiwanese energy transition agenda and shape its green energy market. This question aims to understand to what extent the Taiwan government

develops a protective policy to promote renewable energy and creates a space for innovation, such as the crowdfunding platform for renewable energy. In short, this question aims to explore how the regulated market context enables and limits the emergence of the new instruments.

- 2) How crowdfunding platforms become mature and ready to expand its network in this context?

Platforms need to enhance its efficiency to reduce enormous costs and become appeal to more people to take part in it. The protective space provides a space for the innovator to do the learning process like “learning by doing” (Geels, 2002b). It is necessary to examine the learning process of the crowdfunding platform and the amount and diversity of the participants. This part could reveal the content of the participation and how the niche strengthens its network.

- 3) How crowdfunding platforms interact with governments and influence on policy?

Although energy transition policies and regulations create a space for innovation, this latter still faces challenges when the existed regime resists a change. This concern explains how the platforms operate in specific situations. There are three cases to show the challenges the platforms are facing and how they respond to the governance. First, the Green Rooftop project shows the dynamic between the platform and local and central governments. Second, the introduction of fin-tec represents the complexity of energy governance when involving the financial administration. Finally, the emergence of the RE retailer industry indicates the policy framework still limit the integrations for crowdfunding and RE retailers.

This research will reveal how the platform becomes an actor and the potential they bring in the governance of the energy transition in Taiwan through these three questions. To answer these questions, the research will build on the prospective space approach.

3.2 Conceptual framework

This research adapts the Prospective space approach, which is based on the MLP

approach, to analyze crowdfunding for the RE project in Taiwan. Except for the key concepts, shielding and maturing, in the MLP approach, protective space approach deepens the original concepts to add one more dimension: empowering. The framework not only focuses on niche-level processes (nurturing and shielding) but also explores niche-regime dynamics through the concept of empowering (Kern et al., 2014). There are two kinds of empowering strategies: conform and fit, stretch and transform. Past researchers reveal that both of them are necessary for the platform to survive (Smith & Raven, 2012b). To deploy this approach, it is necessary to define three key concepts which are schematically presented in Table 1.

First, shielding represents a cover that keeps the niche from competitive pressure. It could be divided into active and passive kind. The active shield means creating a specific shield to keep the niche from the pressure of existed socio-technical regime. For example, specific financial support and policy are a useful tool to protect the niche. The passive shield means the mobilization, which modifies the niche into the existed space (Smith et al., 2014). Second, the maturing means decreasing the cost and enhancing the efficiency of the innovation under the shield. The learning process is a significant step to do so. Besides, expanding the network to enroll more potential actors is another way. Finally, empowerment indicates how innovation interacts with the existed regime. There are two different strategies. Fit-and-conform mean innovation success in the existed regime without extra protection. This strategy means the shield is no longer necessary. The other strategy is stretch and transformation, which try to institutionalize the shield to form the new normality. This strategy makes a real change in the original regime.

Adapting different strategies also means other narratives the advocator use and vision about the future. Smith and Raven take solar power as an example. In the case of fit-and-conform, actors are arguing that large solar arrays are providing scale economies that will lead to similar price with conventional electricity-generating technologies. Utilities, institutional investors, and energy policymakers are being targeted and encouraged to back the expansion of this centralized form of PV socio-technical configuration providing large (MW) electrical capacity. In contrast, a stretch-and-transform narrative argues that small solar PV units (kW capacity) across hundreds of thousands of buildings can facilitate a transition to much more decentralized electricity

systems. This form of socio-technical configuration involves households, community groups, new energy companies, as well as utilities with new business models, all becoming prosumers in this new energy system. A summary of the different concepts used is presented in Table 1. Each concept lens corresponds to the sub questions which mentioned in the following table1. The similar research framework was adapted in the solar power, offshore wind and energy transition study (Kern et al., 2015; Raven et al., 2016). This framework will help to address the research question. This conceptual framework was based on the process in which the historical description is essential. The chronology is necessary and helps to explore who, what, and how to involve in facilitating the innovation. After building the storyline, it is necessary to analyze the storyline through three conceptual lenses. The detail of these concepts as follows.

Concept lens	Description	Look for evidence of	Correspond research questions
Shielding	<p>create a specific shield to keep niche from the pressure of existed socio regime deliberately (Active)</p> <p>Mobilize existed resource to form the shield (Passive)</p>	<p>Political and financial support (Active)</p> <p>Implement the institution in a specific space (Passive)</p>	Q1: To what extent the electricity regulatory framework facilitates the crowdfunding for RE projects
Nurturing	Improving the performance/price	<p>Learning process</p> <p>Expanding the network</p>	Q2: How crowdfunding platforms become mature and ready to expand its network in this context
Empowering	<p>Remove shielding (Conform and fit)</p> <p>Institutionalize shielding (Stretch and transform)</p>	<p>Arguing no radical change need to do</p> <p>framing shielding as temporary</p> <p>framing nurturing as targeting performance improvement</p> <p>Arguing the existed regime need to change</p> <p>framing shielding as manifestation of sustainable values</p> <p>framing nurturing as learning process towards sustainability</p>	Q3: How crowdfunding platforms interact with governments and influence on policy

Table 1: Concepts, functions and indicators. Production by the author, adapted from (Smith & Raven, 2012a; Verhees et al., 2013)

3.3 Methodology

This research analyzes how the regulatory framework incubates crowdfunding platforms and how the platform participates in energy transition governance. It is necessary to know the Taiwanese energy policy framework and how the actor responds to the framework. Because of these reasons, this research adopts a qualitative methodology, for the case study strategy. The qualitative case study is an approach that uses multiple data sources to explore the phenomenon in its context (Baxter & Jack, 2008). This strategy is a useful tool to address the contextual conditions that are assumed to be highly pertinent to the study phenomenon (Yin, 2009). Because the conceptual framework of this research is based on the protective approach and will focus on narratives and policy, the qualitative case study is a suitable methodology to address the question. The research question focuses on how the platform becomes an actor in the energy transition. This research attempts to explore a "how and why" in a specific context. A qualitative case study is an appropriate methodology for this kind of research question. According to Yin (2003), the researchers should consider a case study design when:

- (a) the purpose of the study is to solve how and why questions.
- (b) the researchers cannot manipulate the behavior of those involved in the study.
- (c) the researchers want to address contextual conditions as they consider the conditions are relevant to the phenomenon; or
- (d) the boundaries are not clear between the phenomenon and context.

Except for the first key point Yin reveals, the other issues correspond to the research question. First, the researcher is not able to influence the behavior of the actors in the study. Second, this research framework assumes that the specific context that includes the external pressure and domestic environment like a regulatory framework facilitates and guides the platforms' development. Also, the causes and effects that need to be elucidated in this phenomenon. These reasons indicate why qualitative methodology is appropriate.

The qualitative case study needs multi-data sources to achieve its reliability. The data is collected from three data: semi-structured interviews with experts, policy documents, and second-hand sources like newspaper and magazine articles. The collected data will

be verified with each other to form a reliable storyline. The detail for each data source will be presented in the following sections.

Semi-structured interviews

First, the semi-structured interviews with the experts are the primary way to understand each crowdfunding platform and its initiatives. Compared with the lay, expert means the human beings have particular information and capacities to allow them to deal with their everyday life; one can thus speak in a general sense of a specific advantage in terms of knowledge relating to personal arrangements (Bogner et al., 2009). Following this definition, people who operate the platform are the experts in this research.

There are approximately ten platforms in Taiwan. The study tried to contact all of them through phone calls and e-mails and received a positive answer from four respondents. They have different backgrounds and relevant jobs in industry, including the first platform in Taiwan and the newest participators. The semi-structured interviews consist of questions related to the shield, nurturing, and empowering concepts mentioned in the previous section. Besides, some people who have relevant experience in the energy transition are also experts. Another data source which comes from the NGO and the RE consultant help us to understand and validate the information. They are familiar with the energy transition in Taiwan and have relevant experience. One is the co-op, who is the pioneer of the anti-nuclear and pro-RE civil group in Taiwan. Also, the co-op has their own experience in developing the renewable energy co-op for four years. The other one is an energy consultant who is familiar with the energy transition agenda in Taiwan. The data is collected from a few semi structured interviews and informal chats to get the data. The informal chat includes the bar chat and Facebook messages. The questions are similar to the question for the platforms to confirm the perspectives from different actors in the transition.

Semi-structured interviews strike a balance between a structured interview and an unstructured interview. The questions are open-ended in the semi-structured interviews, thus not limiting the respondents/interviewee's choice of answers (Gubrium & Holstein, 2002; McCracken, 1988). Besides, this type aims to provide a setting/atmosphere where the interviewer and interviewee can discuss the topic in detail (Srivastava & Thomson,

2009). This type allows the research to deepen the questions and responses from the interviewees.

Organization	Type of Organization	Position of interviewee	Time	Interview code	Data type
Renewables Consulting Company	Renewables Consultant	Associate	2020/01/08	RCA11	Formal interview Transcript
			2020/07/17	RCA12	Chat Fieldnote
Backer founder	Crowdfunding Consultant	Financial	2020/01/08	CCA1	Phone-Fieldnote
Sunnyfounder	Crowdfunding platforms	Project manager	2020/04/12	CPA1	Interview Transcript
		Research	2020/07/03	CPA2	Interview Transcript
HCAT		Founder	2020/07/08	CPB1	Interview Transcript
Hellosolarman		Manager	2020/07/15	CPC1	Interview Transcript
SOLA Bloc		Project manager	2020/07/17	CPD1	Interview Transcript
Green Advocates Energy Co-op	Energy co-operative	Director	2020/07/22	COA1	Interview Transcript

Table 2: Interviewee list,

Policy documents research

Secondly, to understand the policy on energy transition in Taiwan, it is essential to read and analyze the policies that affect the researched areas. Policy research is of importance as it provides information and context to the research area. The document analysis is used to understand the policy. Document analysis is a systematic procedure for reviewing or evaluating documents—both printed and electronic (computer-based and Internet-transmitted) material (Bowen, 2009). Bowen (2009) indicates that the document analysis can present five advantages:

1. provide data on the context.
2. information contained in documents can suggest some questions for the researcher to ask and the situations the researchers should care.
3. provide supplementary research data.
4. provide a means of tracking change and development.
5. and documents can be analyzed as a way to verify findings or corroborate evidence from other sources.

Based on these advantages presented, documentary analysis approach is used. In fact, the documents, which includes the Taiwanese environment and electricity laws and relevant regulations among the central and local governments content and the media reports, represents the RE's development and crowdfunding platform's background. This research will track the transition of energy structure and regulations since the beginning of Taiwan's electricity. The history of the shift and regulations revision provide the context for the energy transition. Also, it indicates the distinctions of the energy transition in Taiwan. In parallel with the fundamental change, the crisis and debates are inevitable. The reports and newspapers will provide information on the energy transition agendas and the controversies around RE's crowdfunding. The newspaper source is the primary newspaper like UDN, Liberty times, and China times. The Website articles are the main sources of the Environmental Information Center founded by an NGO that advocates environmental movement and renewable energy. These news, reports and articles will indicate the development of crowdfunding platform for RE and its controversies. These controversies not only present the background but give the direction for the interview questions. Overall, the documents analysis will show the context for developing the crowdfunding platforms and the design of interview questions. This analysis will help to answer the research questions.

Data processing: framework analysis

After collecting the data collected through the interviews and documents needs to be dealt with. Framework analysis is a flexible analysis process that allows the researchers to collect all the data and then analyze it or do data analysis during the collection process (Srivastava & Thomson, 2009). This analysis includes five phases:

1. familiarization.

2. identifying a thematic framework.
3. indexing.
4. charting
5. mapping and interpretation.

Familiarization means the researcher needs to immerse in the collected data, including the transcript, documents, and study of the fields. The more familiar with the data, the research will understand more in the research field. The thematic framework is formed by the key concepts and issues that helps the researchers filter and classify the data. Indexing means the researchers need to organize the data to correspond to each sub-theme. Charting means theme arrangement in a chart. Visualization is an excellent way to manage the messy data to present relationships. Mapping and interpretation mean to clarify each factor, reveal the associations, causation, and explain accordingly.

This research adopts this process. The data collection is mentioned in the previous section. First, this research does the transcript and open coding to familiarize with the collected dates. Open coding is a way to present how the interviewee thinks and responds to the questions. The researcher also tries to get more information through news reports and the informal chart with the relevant experts. After the initial familiarization process, there are several themes in the field. These themes include the platforms that want to expand the public influence, improving its efficiency, try to influence the government, and so on. These themes will be the category of the axial coding to summarize. Each open coding will be classified in the axial coding. Also, all themes correspond to the three elements of the thematic framework, the protective space present. The elements include shielding, nurturing, and empowerment. Through the indexing and charting process, this research tries to form the storyline to addressing the main research question and three sub-questions: how the platforms emerge as actors, how they mature, and how they participate in energy governance.

The validity is vital in the case study. Yin (2009) indicates several ways to use several multiple sources of evidence, a chain of evidence, and reviewed by key informants. to confirm it. The triangulation of data sources countered threats to trustworthiness, such as reactivity, researcher bias, and respondent bias (Bowen, 2009). This solution helps to verify the data from the different interviews and document analysis.

Chapter 4. Energy transition in Taiwan: actors and discourses

4.1 Introduction

This part presents the governance structure of the electricity sector in Taiwan and the energy transition policies agenda. The historical review would present the context of the electricity sector and its political influence associated with the energy transition agenda. The historical development would help us to understand how the energy transition agenda was formulated and its content in Taiwan. The chapter is structured in four parts. The first part, which a brief history of electricity development in Taiwan, will help us to understand the background of the electricity sector. The second part is the development of nuclear power, which was seen as the low-carbon energy solution during the 2000s, but it has also been contested by Fukushima disaster and its critics in Taiwan. Despite its debatable nature, this part will further explore how nuclear power becomes a potential competitor of the RE. The third part presents the current development of the energy transition agenda in Taiwan, which aims to achieve 27GW in RE in 2025. The relevant policies and regulations aim to achieve 20% RE in total energy supplements and promote electricity liberalization, allows private capital to invest and operate the electricity industry, which was a state monopoly. The energy transition agenda alters the regulatory framework, and RE open possibilities for innovative forms of participation: Crowdfunding platforms for RE. The fourth part will conclude this chapter and indicate the specific protective space for the crowdfunding for RE project.

4.2 The beginning of the electricity in Taiwan

The first electricity system was established in 1888. The small coal generator and streetlamps were imported and operated in Taipei city. Because of the cost, it just operated for a month (台灣電力股份有限公司, n.d.-a). In 1905, the Japanese colonial government established the first hydropower station for the supply of electricity in Taipei city. The electricity industry was fully developed during Japanese colonial period. Many regional cooperatives built small generators for electricity supply in the neighborhoods. Hydropower was the primary source of electricity in this period. The Sun Moon Lake hydraulic power plant, which supplies 100 MW, was the most significant hydropower in Asia in 1934 (鄭金龍, 2016). This mega project resulted in the merge and acquisitions in the business and energy system. Taiwan Power

Kabushiki Kaisha, which is invested by the Japanese government and private companies, was founded in 1919 and took responsibility for the plan of the Sun Mood Lake hydraulic power plant and the new grid that connects south and north area(鄭, 2016). The connected grid also leads to the consolidation of the electricity system in Taiwan. After the grid established, Taiwan Power Kabushiki Kaisha, which started to acquire the regional and local electricity cooperatives and intergraded them in the grid. At the end of World War Two (WWII), we finally had a whole connected electricity system in Taiwan.

After WWII, under the reign of the Kuomintang (KMT) Taiwan Power Kabushiki Kaisha was reformed and become Taiwan Power Company (Tai-Power), which monopolized electricity production, consumption, and distribution. Among all the choices of energy types, oil-fired become the dominant one of electricity production. The oil-fired station developed quickly and occupied 80% of the total volume production in 1966. However, the dependence on a single energy type is risky. The geopolitics influences the price of the energy sources that mainly imported from the Middle East area. How to increase the source of the energy is urgent.

4.3 Nuclear power: a controversial solution for reducing carbon emission

In the 1960s, nuclear power was emerging in the world. Taiwan established the first experimental reactor in 1960 at Tsing Hua University. After early success, the first Nuclear power station was introduced in Taiwan in 1971 and started to operate 1979 .. As the 1970s energy crisis, the second and third nuclear stations were also introduced and constructed. Nuclear power occupied above 52.4% in 1985 (台灣電力股份有限公司, n.d.-b) Besides, the rising price of the oil pushes the energy structure to have a significant shift from oil-based to the coal-based and nuclear power structure. Afterwards, nuclear power becomes a significant part of the electricity system until now. For society, nuclear power also becomes a national myth commonly used in KMT's propaganda. In this propaganda, nuclear power is on the top of “The Ten Major Construction Projects”, which leads to the economic miracle, the high economic growth rate from 1970 to 1990, and KMT promotes it as a ruling myth to identify the authoritarian rule. The success of nuclear power and its propaganda last 20 years and created a support base for nuclear power. However, due to the rising concern of safety

and nuclear waste, the anti-nuclear movements emerge with democratic movements. "Non-nuclear homeland" is the Democratic Progressive Party (DPP) program. The deposit of nuclear waste has remained controversial for decades. Nuclear waste was placed on the Lanyu island, in which the indigenous Tao is living, and the decision-making was debatable. The negotiation led to the debate and protest. This movement was facilitated with the other environmental movements and democratize movement in the 1980~1990s. These anti-nuclear movements halted the construction of the fourth nuclear power plant. The KMT government started the construction in 1999.

The process of democratization affected the fate of nuclear power. The first party alternation leads to the Democratic Progressive Party (DPP), which is the anti-nuclear party, govern this country. They halted the fourth nuclear power plant in 2001, which faced stiff opposition from the former resulting party, KMT, who just lost the election in 2000 yet still held majority in Legislative Yuan (Congress) and created huge pressure on the DPP government. The stress restarted the construction in 2001. After 2001, Climate change and low carbon emissions become an urgent agenda in the governance, Nuclear power became a feasible solution for the low-carbon transition. The Academia Sinica report in 2008 reveals that compared with the no- nuclear home, reducing warm-house gas is an urgent issue, and the government should take nuclear power as a solution in the next 50 years until renewable energy becomes mature (中研院環境與能源研究小組, 2008) .

Nevertheless, the Fukushima tsunami in 2011 makes people aware of the danger of nuclear power and revitalize the anti-nuclear movement in Taiwan. The crisis leads to several demonstrations in 2013 and 2014 (友義, 2014; 林楠森, 2013) The growing pressure makes the government reconsider the necessity if nuclear power. The construction of the fourth nuclear plant was mothballed in 2014. In 2016. The third-party alternation brought the DDP back to take the authority and the proactive renewable energy agenda. Solar power and wind turbines become two significant parts of the development.

The construction of the fourth nuclear plant is terminated in 2018. Also, its fuel rods were sent back to the USA in 2019. Although nuclear power seems to be fade out, the

debate about nuclear power is still ongoing. The rebel of the pro-nuclear power party and lobby group hold the referendum on canceling the 2025 non-nuclear power law, and the referendum was approved in 2018 (陳俊華, 2019) . This outcome pushes the government to revise the electricity act to remove the 2025 non-nuclear act. The pro-nuclear group also wants to revitalize the fourth nuclear power station construction plan. They will hold another referendum on reactivating the fourth-nuclear power station in 2021(蔡, 2019). The tension between the existed regime and the new regime still exists.

4.4 Renewable Energy (RE): The energy transition agenda and its regulatory framework

The slow introduction of RE has taken more than ten years in Taiwan. In 2003, the Taiwan government set the RE's goal to achieve 10% of total energy supplements in 2010 (環境資訊中心, 2019) . In 2008, the government reset the goal to achieve 8% RE in 2025 (行政院, 2008) . Except for the statement, the government modified the regulatory framework to encourage the investment of the RE. The government introduced the Renewable Energy Development Act in 2009 and required the Tai-Power company to buy the green electricity through Feed-In Trades (FITs). The Greenhouse Gas Reduction and Management Act were legalized in 2015 and set emissions goals, a 50% reduction, was set in 2050. Despite the policies and regulations, the speed of energy transition is slow. In the past ten years, the RE production only pose from 3.6% to 6%. However, under the DPP regime, the development of RE is vigorous. The revision of the electricity act in 2017 opened the gate for electricity liberalization. Electricity liberalization was seen as a catalyst to facilitate the transition as it introduces competition mechanism in the energy sector. Many RE supporters believe that the liberalization will create more incentives for the developers.

Except for the national regulation, the growing concern about the Corporate Social Responsibility (CSR) agenda for private sectors in global scale has never ceased. The international companies like Apple, Facebook, and Google set up their own CSR agenda to regulate its suppliers in their supply chain. Encouragingly, some non-governmental organizations also construct relevant agenda to invite more enterprise to participate in. For example, RE100, which is led by the Climate Group and CDP, is a

global corporate leadership initiative bringing together influential businesses committed to 100% renewable electricity around the world (*RE100 overview - RE100*, n.d.). Some top-notch corporations, like Google, Facebook, and Apple, also took part in this initiative. Not only the members, their suppliers are also required to achieve the same goal i.e. 100% RE. Taking Apple as an example, it starts the Supplier Clean Energy program to require its supplier need to produce materials through 100% RE. Many enterprises, like Foxconn, TSMC, and Pegatron, belong to the supply chain and join the program in Taiwan (Apple, 2019). Besides, RE100 demands members to buy the local renewable energy. It urges transnational companies to purchase RE abroad. For example, Google has constructed two data centers and plans to construct the third center in Taiwan. Although Google has already achieved 100% RE in global in 2017, and it still wants to purchase RE in Taiwan to comply the program (陳文姿, 2018).

These initiatives not only create demands for RE, but also urges the government to establish relevant institutions. As Google wants to purchase RE and get the RE certificate in Taiwan, there is no existing institution to guarantee the certified RE. Google's demand force the Taiwan government to set National Renewable Energy Certification Center to match the RE production and consumers and issue the Renewable Energy Certificate (T-REC) to help Google to get the certified RE. (陳文姿, 2017; RCA11, 2020) The demand from the private sectors facilitates the energy transition. Besides, due to the requirements, the electricity consumers become more active in participating in the energy market. They not only purchase the existing RE, but also searching for the available land for the investment of the RE plants to assure the future availability.

As Tai-Power company monopolizes Taiwan's electricity system, the restructuring of the regulatory framework is a significant step toward energy transition. The original electricity act (2014) prohibited the private companies from producing and selling electricity (陳文姿, 2016). As the demand for power in the 1980s increased and the environmental movements which concern the pollutions of the power generations emerged, the new national plants plan face the obstacles. In order to avoid the potential energy shortage crisis, the government convinces the private capital to invest the power plants in compensating for the potential shortage of electricity. However, they cannot

sell electricity to the customers directly or indirectly. Tai-power company is the only buyer who would negotiate with the private producers to buy the electricity. The Tai-power company also controls electricity transmission and distribution. In other words, even though the private sector could participate in electricity production, the electricity distribution is still monopolized by the Tai-power company before the electricity act revision.

Renewable Energy Development acts in 2009, in response to the Kyoto protocol aimed to promote and subsidize the development of renewable energy to achieve a low-carbon transition. The act introduced a new Feed-In-Tariff (FIT) instrument, which was popular in Europe and considered a useful policy tool to attract the private capital to invest in the RE and to facilitate the development in Taiwan. Even though the private sector has participated in the electricity generation since 1980s, they are only allowed to sell the electricity to Tai-power in the average electricity fee. The new FIT institution creates more incentives for the private sectors. The FIT is exclusive for the renewable energy to provide a fourfold higher profit margin than the average electricity fee in 2009. Besides, the act designs a 20 years long contract between the Tai power company which represents the government, and renewable energy producers. This contract guarantees Tai-power to buy RE produced electricity at a fixed price. The government will adjust the exclusive FIT fee annually, and the actual amount depends on when the generation is complete and when the electricity is exported to the grid. The act encourages private capital to invest in renewable energy like solar power, on-shore, and off-shore wind turbine. This instrument appeals to domestic and foreign investors like CIP, Osttrom, WPD, and Macquaire. Also, FITs create the space for local and community renewable energy projects like Green Advocates Energy Cooperative¹, New Taipei City Folks Energy Cooperative², and so on (Green Advocates Energy Cooperative, personal interview, July 22, 2020). The FIT creates the incentive for new actors, including transnational capital, domestic enterprises, and civil society, to invest in RE production and consequently become actors in this market.

Except for the FIT, some RE advocates claim that the free electricity market, which

¹ Green Advocates Energy Cooperative is a co-op to promote the energy transition and support the RE.

² New Taipei City Folks Energy Cooperative is the first co-op RE project supported by a local community in Taiwan.

allows the producer to sell the electricity to consumers, is beneficial to the energy transition. This public pressure urged the government to work on the Electricity act revision in 2017 in order to liberalize the electricity sector and promote renewable energy. This act divides the electricity sector into three parts: Production, Transmission, and Distribution. The restructuring of the electricity sector also changes the role of the state-owned enterprise. The Tai-power company, which was the major actor before the revision, will be reorganized as a company that holds two subsidiaries that are separated from the original company. One is responsible for electricity production, the other one responsible for transmission and distribution. The intersection is not allowed between them. The disintegration will happen in the next five years.

Except for the transmission and distribution sector, which is still entirely controlled by Tai-power company for energy security issues, the electricity generations and sales activities are open exclusively to private RE developers and RE retailers. Traditional energy enterprises like the private plant founded in the 1980s are still forbidden to participate in the sales activities freely. The RE developers could participate in the electricity production and sales sectors. This revision also changes the operation of the electricity market. Before the revision, the generation needs to sell electricity back to the Tai-Power Company. After the revision, the RE producers can choose the buyers freely. They can sell the electricity to the Tai Power Company or other consumers, including end-users or RE electricity retailing enterprises through its cables or Tai-power company's grid. It also allows private companies to start the RE electricity retailing business to provide service to the end-users. In other words, the revision allows the consumers to choose their electricity from different sources, which includes the Tai-power company or Private RE retailers freely. This framework forms electricity liberalization in Taiwan. Besides, the act also gives the RE industry a ticket to enter the electricity market.

The revision also sets a regulation called the Carbon Emission Index (CEI) to regulate the quality of the electricity retailers' sales. The CEI is a ratio which calculates the amount of carbon emissions of different types of electricity generation. As the Taiwanese government set the energy transition goal at about the 20% RE in 2025, which was also legalized in 2019, the designed index is 0.492kg CO₂/KWh, calculated

by 20% RE, 50% natural gas and 30% coal-fired (行政院環保署, 2018). CEI was designed for electricity retailers. As the electricity retailer is open to the RE retailer market exclusively, this regulation is specific for the Tai-power company whose electricity source is mixing together the traditional energy, like the fossil fuel and hydro power, and RE. This regulation expands its RE production and its purchase from the private sectors (倪茂庭與林木興, 2017).

Very recently, in 2019, a new revision of the Renewable Energy Development Act, which aims to achieve 27 GW RE equipment in 2025, boosts the RE development and helps the existing actors adjust their operational strategies due to the changing context. The revision asks the public sector and private sectors to invest in RE (陳文姿, 2019). The public construction, like the public school, government buildings are required to construct the RE equipment to fulfill the energy compliance. The revision requires the large electricity consumers whose annual consumption exceeds 5000kw to switch 10% of the energy production to RE before 2025. There are four pathways for the consumers to follow to achieve the goal: Building their own RE plants, building electrical storage infrastructure, purchasing the Renewable Energy Certificate (T-REC), and paying the relevant fees. According to an interview, building a RE generator or buying T-REC is a reasonable and cost-effective choice for large consumers (Sunnyfounder, personal interview, April 12, 2020). Besides, as the Electricity act revision in 2017 allows the RE enterprises to sell electricity to consumers directly, it creates a debate about whether the RE producers can opt-out of the existed FIT contract which is signed with Tai Power Company to enter the new RE market to get the better profits. The revision allows the RE producers to opt-out of the existed contract with Tai-power company to sell RE to other consumers. This policy is also retrospective. If the RE market price is lower than the FIT price, the RE producers can switch back to the original FIT contract. Some RE producers are considering switching from FIT to the purchase agreements with private consumers (Sunnyfounder, personal interview, April 12, 2020).

Above all, these regulatory framework changes guide the energy transition and alter the three energy sectors, which are energy generation, transmission, and distribution. A summarize table as follows.

	Generation	Transmission	Distribution
Original regulatory framework	Although Private sector is allowing to join the production, they need to sell it back to Tai-Power Company.	Tai-Power Company	Tai-Power Company is the only actor who sell the electricity.
Renewable Energy Development acts in 2009	The act encourages RE developers through FITs which is higher than normal rate in the electricity production.	Unaltered	Unaltered
Electricity act revision in 2017	The revision gives RE developers the privilege which allow them to select their consumers. The traditional energy is still limited.	The grid is open for the RE retailers to get the electricity through the existed grid. RE producers can establish its grid to connect to the end-users or transmit electricity through Tai-Power Company's Grid.	The revision opens the electricity market for the private RE retailers to sell RE. All electricity retailers need to sell the electricity complied with the CEI Consumers could select their electricity suppliers freely.
The revision of the Renewable Energy Development Act in 2019	Reach 27GW RE in 2025 RE producers are allowed to opt-out of the existed FIT contract with Tai-power company to sell RE to other consumers.	Unaltered	Electricity consumers whose annual consumption exceeded 5000kw must consume 10% of the energy from RE energy before 2025

Table 3: The regulatory framework for renewable electricity.

Except for the act which directly forms the regulatory framework directly, some existed environment regulations also influence the framework indirectly. Environmental Impact Assessment (EIA) take the ratio of green energy as a significant factor. EIA's legalization in 1994 gave the EIA committee right to evaluate large-scale construction and permit the construction. The committee also suggests the developers adjust the plan of the construction. Recently, the committee starts to take the RE as a significant factor in evaluating the feasibility of the construction. The TSMC plan for the new 3nm factory in Hsinchu Science park promises to adopt 20% RE in the new factory to get permission from the EIA committee (翁至威, 2019). Greenhouse Gas Reduction and Management Act in 2015 set the reduction of the greenhouse gas (GHG) to no more than 50% of 2005 GHG emission by 2050. This act requires the industry to register the amount of the emissions as a legal obligation. It also urges the Tai power company to improve the existing electricity generation and establish more RE plants to reduce the emissions.

4.5 Conclusion

As a review of the relevant regulatory framework which aims to reduce carbon emissions, increase RE production and electricity liberalization, we can conclude that the trend toward low-carbon and the new legislation facilitates the development of RE. In terms of the demand for RE, the international requirements and domestic regulations urge the large enterprises need to purchase the RE to fit the compliance. Regarding the RE supply, this framework, which is partly exclusive for the RE, opens the gate for the private sectors and the general public to participate in the RE generation. To be more specific, the revision enrolls new actors, who were excluded as they were with little funds before the new regulatory framework as it lowers the financial barrier and create the new incentives. Besides, the restructuring also improves to gives the private enterprises, the RE producers, and consumers more flexibility to modify their operational strategies. This context provides the fertile land to the new niche: crowdfunding platform for RE to emerge.

Chapter 5 Crowdfunding for Renewable Energy projects in Taiwan

5.1 Introduction

In this chapter, I will address the second sub-question: How did crowdfunding platforms emerge, become mature, and expand their network in this context? The first section will introduce a brief history of the development of Crowdfunding in Taiwan. It provides the background for the crowdfunding for the RE project. The second section will introduce how Crowdfunding platforms for RE operate and why its business model attracts tremendous attention in Taiwan. The third section will reveal what kind of challenges the platforms need to overcome. In the beginning, funding, space, and the construction of a social network are three critical factors which affect the development of the RE. Although crowdfunding in itself is a solution for the funding, the platforms need to overcome the other two obstacles: space and the development of a network. Based on this context, the platform will try to adopt strategies like the crossover and education events to expand its network. Building the network with the local contractors also helps them to overcome the space issue. Later, the platforms need to control their risks and improve their performance. Planning and construction, maintenance, and insurance are three factors that the developers need to address. The network with reliable contractors and learning by doing are essential for the platforms to control risk and improve its efficiency.

5.2 Crowdfunding in Taiwan

The first crowdfunding platform weReport was established in 2011 in Taiwan. This platform was inspired by the USA crowdfunding platform, Spot.us, which provides the journalists to raise fund to do the non-profit and independent new reports (柯, 2016). The other crowdfunding platforms, such as zezec and flyingV, emerged in 2012 (CrowdWatch & Backer-Founder, 2016). Except for the regular projects like the fundraising for manufacturing consumer products like watches, 3D printers, immersed experience, exhibition, documentary films, and social movement are usual projects in the platform. The social movements such as anti-nuclear movement, which raise money to make the short films and Sunflower Student Movement, which was advertised in the New York Times in 2014 take advantage of the crowdfunding platform and gain more attention from the public. The crowdfunding growth rate is rapid; the annual amount of money is from three hundred thousand to seventeen million between 2011 and 2015. In

2019, there were 35 projects receives more than three million dollars fund. The imported project, which is importing existing products from abroad, is more common and expected to occupy 40% in the crowdfunding market in 2020 (CrowdWatch & Backer-Founder, 2020). The rewards-based crowdfunding project is the mainstream in Taiwan.

Although the crowdfunding platform has made enormous progress, there is no special laws to regulate crowdfunding in Taiwan. Generally, the reward crowdfunding, which encourages investors to sponsor some practical products like the ornaments, coffee grinder, or virtual products or special service, is the mainstream in Taiwan. This type of crowdfunding is regulated by the traditional commercial law in Taiwan. The loose regulation decreases the entry barrier for the potential developers. In contrast, the equity crowdfunding, which mean investors pay the money to become the shareholder in the projects, faces the strong regulation imposed by the Financial Supervisory Commission and Taipei Exchange (TPEX) the authority of Taiwanese stock market. This regulation guides yet limits the devolvement of platforms that tend to adapt the equity model. For example, one of the interviewees, SOLA Bloc, had applied this model to raise money. However, when they try to contact the administration to confirm details of the regulation, they found it was not feasible as there were many unreasonable regulations like the limited maximum annual investment amount, NTD.60.000³, for each normal person annually (SOLA Bloc, personal interview, July 17, 2020). This situation influences the development of the RE platform in Taiwan. First, almost all RE platforms are focus on the solar PV system as the amount of the investment is not a huge number like the offshore wind, each generator is equal to NTD.1.1 Billion in 2019 (陳文姿, 2019) . Secondly, almost all platforms adapt the lease model to operate the plants. It means the platform will lease solar panels from investors to form a power plant to generate electricity. This model will be elucidated in the next section. Finally, it makes some people suspect that the crowdfunding for RE is a Ponzi scheme , which is an investment fraud that involves the payment of profit to original investors from funds contributed by new investors (U.S. Securities and Exchange Commission, 2013). Some platforms care about it and lobby for the government to renew the regulations (Sunnyfounder, personal interview, April 12, 2020).

³ NTD. 34.39 equal to EUR. 1 on 2020/10/05

In sum, the Crowdfunding is not a new thing in Taiwan. This business model has been operated for five years before the emergence of the Crowdfunding platform for RE. However, the incomplete regulation, which restricts the development of the equity type crowdfunding leads to the boom of the specific type of crowdfunding platform for RE. This specific type is a mixture of reward and interests and will be elucidated in the next section.

5.3 Crowdfunding platform for RE in Taiwan

Crowdfunding for RE emerged in 2016 in Taiwan. The mission is to raise the fund from the those who want to invest in RE to build the solar station and earn the revenue. Sunnyfounder, which is the first platform to promote this business model, is also the most popular platform for RE in Taiwan. After four years of development, this model is gaining its popularity in the RE market. The new 499KW project which announced on the Sunnyfounder's website with 1570 panels sold out in 3 minutes (林上祚, 2020). The Crowdfunding for RE is all the rage and attracts more companies to carry out business from 2017 (Sunnyfounder, personal interview, April 12, 2020). Now, there are ten RE platforms in Taiwan.

Unlike the traditional investment which demands large capital, crowdfunding lowers the barrier for investors. In general, the small-scale solar power plant whose capacity is 10KW volume and occupies 100m² is a common size of Taiwanese household rooftop, which costs NTD 600,000~800,000 (張惠雯與劉力仁, 2017). The cost is high for normal people. In contrast, the unit of the investment in the crowdfunding platform for RE could be a single panel that equals NTD. 15,000~NTD 20,000⁴. This cost is more appealing to the people who are interested in RE. Also, stable interest revenue is another factor to attracts potential investors. The FIT, which is the contract between the RE producers and the Tai-Power company represents the government and provides stable revenues for the producers. The platform functions as a wholesaler for those who tend to design their products to sell to the investors based on the FIT contract. Compared with the average bank deposit rate which is 1% annually depending on the internal rate

⁴ EUR. 436~582

of return (IRR) of the solar panel for investors varies from 4~8% annually depended on the different platforms and the situation of the power production (Sunnyfounder, personal interview, July 4, 2020; Hellsolarman, personal interview, July 15, 2020; 林上祚, 2020). Besides, the government-guaranteed contract seems like a low-risk investment. The government is more reliable and unlikely to default the contract (HCAT, personal interview, July 8, 2020). These factors attract people to try this investment. This business model created by the Sunnyfounder and the latecomers learn and imitate it. The quote below represents this interesting learning process.

I received a call in 2017, the person who represents Chailease stated that they wanted to sell the power plant to us. I was thrilled because it is a big company and then I told him how to close the deal and what details we both need. After the call, I was reported to my boss that Chailiease just called us and their offer. A few days later, I received another call from Chailease, asking whether they can buy our power plant. I was puzzled so I asked him. Didn't you ask for a sale a few days ago? He said that because they represent different departments, they are evaluating different things. Okay, I also told him how to make the purchase and what details we both need. After several months, Chailease launched its platform (Finamart). (Sunnyfounder, personal interview, April 12, 2020)

Most of the platforms operate through the website to approach customers. The solar plant information like the location, environment, capacity volume, and the internal rate of return will be publicized on the website (Sunnyfounder, personal interview, July 4, 2020; Hellosolarman, personal interview, July 15, 2020). The investment is madethrough online transactions. Each purchase will be recorded, and the buyers can monitor and manage the panels through the website. The relevant information like power generation, system situation, and electricity fees are available for the investors—besides, the information updated in time and visualization. For example, the solar eclipse occurred at 2:49 pm and ended at 5:24 pm on June 23, 2020. The power generation collapsed drastically during the period and all the information was recorded and shown on the website (Sunnyfounder, personal interview, July 4, 2020)

Besides the website, some platform provides unique apps for the buyers to monitor and

manage it (Hellosolarman, interview, July 15, 2020). Some platforms also try to introduce financial innovation like the blockchain⁵ for the system record and future application. (Hellosolarman, personal interview, July 15, 2020; HCAT, personal interview, July 8, 2020; SOLA Bloc, personal interview, July 17, 2020). In brief, the IT tools are essential tools for the crowdfunding to operate their business.

The contract between the buyer and platform is complicated due to the specific financial regulation. In brief, the investor buys and owns the panels and enjoys the right they deserve. After the plants were established, the platform will have a rental agreement with the owners. The owners need to pay the administrative fee for the platform to operate and maintain the plants (Sunnyfounder, personal interview, July 4, 2020; Hellosolarman, personal interview, July 15, 2020; HCAT, personal interview, July 8, 2020), and in exchange, the owner will get the stable IRR return. In other words, the investor owns the panel, yet does not have to worry about the operation. The platform, which allows all the investors to make a deal with the Tai-power company, will be responsible for the operation and maintenance.

After collecting enough funds range from NTD.600,000~NTD. 600,000 which is depend on the scale of the generation, the platform will build a solar power plant. They need to collaborate with the contractor called EPC through Engineering, procurement, construction, and commissioning (EPCC) contracts. The EPCs will design, construct, and maintain the field. During the installation, the EPCs needs to complete three permission, which involves three actors: first, a building permit from the local government, a connecting grid permit from the Tai-Power Company and Finally, a use license from the Bureau of Energy (the Bureau of Energy, n.d.). Regardless of the plants' size, the administrative process will take 4~6 months (Hellosolarman, personal interview, July 15, 2020). Generally, the development schedule will vary from 6~8 months due to the field scale and administrative process.

After completing all the administrative process and the plant start to generate electricity,

⁵ “The technology behind bitcoin lets people who do not know or trust each other build a dependable ledger. This has implications far beyond the crypto currency” (The Economist, 2016)

the EPC will operate and maintain the field. They will do the maintenance work twice annually. The maintenance includes clearing the panel to ensure electricity generation's efficiency and checking the structure and crew to ensure stability during the typhoon and earthquake, which are frequent two natural disasters in Taiwan. The monitor system, which has been popular in recent five years (SOLA Bloc, personal interview, July 17, 2020), helps the EPCs to operate the plants. The monitor system could detect the error and report it automatically. As the monitor system and solar PV system are built locally, and the industry chain is complete, the EPC could solve the error and replace the broken module in one day. When the platform will operate and maintain the plants, and the investors receive the revenue every two months. The platform will represent all the investors to claim the FIT fees from the Tai-Power Company.

Now there are nearly ten platforms we can find through the website in Taiwan. Some of them have exited the market (Sunnyfounder, personal interview, April 12, 2020). This research conducts the interviews with four platforms and tries to find the information through the website and new article. Five platforms will present in the study. Although they have a similar operation and business model, they have different backgrounds, strategies to plan and vision for the future. This table below lists the features of the five platforms.

Platform	Founded	Company type	Cumulative power generation (Till 2020)	Relationship with investors
Sunnyfounder	2016	Startup, without the experience of operating the solar plants.	10,700,000KW	Investors own the panel, the platform operates and maintain the plant
Finmart	2017	Subsidiary belongs to Chailease, the largest Leasing company in Taiwan. Chailasse own 1903 solar plants.	3,716,275KW	
Hellosolarman	2017	Solar PV system contractor, with the experience of operating the solar plants in Japan and Taiwan	4,689,866KW	
HCAT	2019	Startup, without the experience of operating the solar plants.	0KW	Shareholders of the nine power plants, the platform operates and maintain the plants.

Table 4: Platforms in Taiwan, Summarized by author. (Sunnyfounder, nd; Finmart,nd; Hellosolarman, nd; HCAT, nd; SOLA Bloc,nd)

5.3.1 The importance of funding, space and the network

Developing a solar plant in Taiwan needs to address three significant challenges: funding, space, and network. As the solar PV system becomes mature, and the construction cost decreases sharply from NTD.54 per W to NTD. 10 per W in the recent ten years (萬, 2020), the barrier to entry becomes lower. Also, the FIT creates a stable RE demand, and the developer does not need to worry about the potential buyers of electricity.

As the RE demand is no longer a problem, the next question is how to get the fund for development. Developing the plant could be simplified into three phases: design, construction, and after construction. Most of the funding is necessary for the construction phase as the developer need money to pay for the system and contractors. Traditionally, supposed the developer wants to build the plant without any external investors. During the construction phase, they need to make the bridge loan, which is a short-term loan with high interest rate provided by the leasing company, during the construction phase. After the construction, the developer will repay the bridge loan and make the long-term loan from the bank (Hellosolarman, personal interview, July 15, 2020; HCAT, personal interview, July 8, 2020). As the bridge loan come with a higher interest rate, it will create more capital risks and erode the developer's profits. In contrast, the crowdfunding provides an alternative pathway for the developers. The crowdfunding offers the complete fund that the developer does not need to make the bridge loan or long-term loan. That's why some EPCs prefer to cooperate with the crowdfunding platforms (Sunnyfounder, personal interview, April 12, 2020). Even though some EPCs decide to set up the Crowdfunding platform by themselves. (Hellosolarman, personal interview, July 15, 2020). In our case study, Hellosolarman and SOLA Bloc are derived from the EPC. They are experienced contractors for the solar PV system.

Available space is a critical problem for developers. When the branding crowdfunding platform tries to sell the panel to the investor, they find the market demand is so strong that the product is in short supply.

(Our scale reach) around 5MW in 2019, the growth began to slow down a bit. Not

because people did not want to buy, it was because we could not find the supply. As soon as we release the product, it sold out immediately. (Sunnyfounder, personal interview, April 12, 2020)

To solve the problem, speeding up the development of the field is necessary. However, there are several obstacles the platforms need to overcome. First, the electricity infrastructure is limited. As the solar plant generates the electricity, it needs to transmit electricity to the main grid through the distribution feeder, operated by the Tai-Power Company. The distribution feeder limits the volume of the electricity in the specific area. Developers need to confirm the rest of the distribution feeder's volume to know whether they can construct the powerplants. The infrastructure cost so much that the regular developers could not afford. This can become an obstacle for the developers. (尹俞歡, 2016; Hellosolarman, personal interview, July 15, 2020; SOLA Bloc, personal interview, July 17, 2020).

Besides, the controversies of land use also create tension between the developers and the local. In recent years, the solar developer has tried to find the idle land to develop ground-mounted PV Systems. In the beginning, the government wants to guide the developer to develop the unfavorable farming area land, like the subsidence area. Nevertheless, this developer argues it is difficult to develop as the complex property rights and lack of the distribution feeder (孫文臨, 2020). Changing the land use to build the plant also raises the controversies about destroying agriculture. For example, Taiwan Sugar Corporation, a state-owned enterprise, followed the national policy and wants to release several thousand-hectare idle lands for solar plants construction. Most of the unused land is afforestation, and Taiwan Sugar Corporation intends to remove it to build ground-mounted PV Systems. Ironically, this afforestation was planted for another national policy about the carbon reduction in 2006 (呂清郎, 2020). This plan arouses great controversies. Some environmentalists and locals argue that it is the "deforestation to develop energy." This tension throws pressure back to the government. The Council of Agriculture, responsible for the agriculture policy, announces that except for the specific situation, any changes in the agriculture lands less than 20000m² are forbidden. The land ranging from 20000m² to 300000m² needs to get permission from the Council of Agriculture (林上祚, 2020). This policy also raises the debate that

the solar power developer argues that the plan is not practical and contradicts the government's energy transition plan. Although the discussion is ongoing, it is evident that developing ground-mounted PV Systems needs to face more obstacles around land-use and environmental issues.

Compared with the vast agricultural land having contestation, the rooftop PV system is seemed unobjectionable. The rooftop PV system is installed on the building top, ranging from resident house, factory to cottage, and stables. Also, the development of the rooftop PV system has made more progress than the original expectation. The government modifies the policy goal, which is the 20GW of solar energy by 2025, including 3GW for rooftop and 17GW for the ground. As the rooftop PV system have already has 3.5GW in 2020, the ministry adjusts its proportion, which is 6GW for roof and 14GW for ground-mounted PV system (孫文臨, 2020).

Nevertheless, the boom of solar power makes the competition for the available land more intense. The more competitors increase, the higher the rent. Three out of the four interviewees responded to the situation of competition in the field.

(The landowner says) You are the thirty-fifth manufacturer that came to me, and others have promised 13% rent. What percentage do you want to give?
(Hellosolarman, personal interview, July 15, 2020)

The owner understands this business. He realized that his roof is valuable, and everyone wants it. Then you talk about the rent... 8%, 10%, I even have heard about 20% rent. (Sunnyfounder, personal interview, April 12, 2020)

Although it is not a bottleneck, the solar energy world becomes very cutthroat from this year on. Everyone is competing for the cases. It is not so difficult to acquire, is it not. But you will know that this competition is fierce. (SOLA Bloc, personal interview, July 17, 2020)

A strong network is essential to develop crowdfunding project. It can help solve the fund and space issues. Although crowdfunding is a pathway to address the fund issue,

the platform needs time and initial investment to become mature. In other words, they need the first pot of gold to start the business. The network helps them to overcome the initial fund obstacle, especially for the startup. For example, when Sunnyfoundry launched its first project with 44 panels in 2016, Homemakers Union Consumers Co-op, founded in 1993 and supported RE, bought 20 panels (Sunnyfounder, personal interview, April 12, 2020). This connection could be traced back to the time when one of the founders of Sunnyfounder, Dr. Chen, did her doctoral thesis to research PV solar development in Taiwan. She has collaborated with the Homemakers Union Consumers Co-op to do the relevant fieldwork (Green Advocates Energy Cooperative, personal interview, July 22, 2020). Sunnyfounder also conducted the energy lecture which is like a popular energy education for the related events the Homemakers Union Consumers Co-op held. They continue to cooperate to launch the first Community Renewable Energy Projects project in 2020 (Sunnyfounder, personal interview, July 4, 2020). In contrast, HCTC is another startup in our case study. They are leas of this connection. When they started the first project, they need to use the bridge loan as the immediate cash flow because the crowdfund was not in place (HCAT, personal interview, July 8, 2020).

Also, the contractor network helps the crowdfunding platform develop the field, especially for the startup with little local knowledge. How to enroll in the available space is an essential issue to expand the scale. Almost all platforms provide the contact information for the space owners interested in providing the house owners or landowners to counsel to lease the space to build the PV system. However, there are almost no successful cases through the pathway.

Interviewer: How many fields did you acquire through your website link?

Sunnyfounder: Very few cases. We received five hundred applications in 2017, and only two of them were successful. (Sunnyfounder, personal interview, April 12, 2020)

In contrast, some local contractors are more familiar with the locals. They have more local information about who has the appropriate space to build the PV system. Although they have valuable information, they have no funds to invest. In the background, crowdfunding and the contractors with no money are complementing each other.

Contractors bring the fields for the platform, and the platform provides the fund for construction. Most of the projects the platform develop were brought by the contractors (Sunnyfounder, personal interview, April 12, 2020; HCAT, personal interview, July 8, 2020).

Besides space and fund issues, the network can enroll more people who do not understand the energy transition and the RE. Even though energy transition is a hot topic, many people are still not familiar with it. Some rural people consider it as a financial scam (SOLA Bloc, personal interview, July 17, 2020). Besides, the pro-nuclear group and the media have the intense propaganda to spread misleading information like the solar panel is poisonous, with the radiation pollution, using the chemical solvent that damages the land to clean the panel in annual maintenance. All of the interviewees mention that they received similar responses when promoting it to the locals. Some developers consider that crowdfunding itself is a pathway to let more people know more about the solar power, and to become a "RE believer" (Hellosolarman, personal interview, July 15, 2020). When there are more and more RE believers, it will also expand the understanding of RE.

5.3.2 Expanding the network through crossover and energy education

Expanding the network needs to contact more different stakeholders. NGOs who share a similar energy vision are excellent partners to cooperate with. Especially some founders of the platforms have the relevant experience and network to the NGOs. Except for the Sunnyfounder, which has the connection with the Homemakers Union Consumers Co-op mentioned previously, one of the founders of the SOLA Bloc has a similar background. He participated in Taiwan Independent Power Plants, a social enterprise that promotes community renewable energy projects, since 2015. These relevant backgrounds inspire the platform to try to do no-profit projects. Sunnyfounder have cooperated with CITI Bank and Cathay Financial Holdings Co., the largest financial holding co in Taiwan, to donate a solar plant for a special education school and the minority group in the rural areas (呂清郎, 2020; 謝奇璋, 2019). Also, Sunnyfounder has cooperated with the Taiwan Mobile Co, which is the second-largest telecommunications company in Taiwan, to do the Green Power for Charity project since 2016. This project raises donations for charity institutions to build solar plants to

generate the electricity to earn a stable FIT interest (Taiwan Mobile Co, 2019). This kind of project not only enhances their reputation but also expands the network for future development.

“The charity program is more like an enhancement of the enterprise's reputation. Although it brings little benefits, it creates the opportunity to cooperate with enterprises, local governments, and institutions. It also brings some business opportunities. For example, when we collaborate with Taiwan Mobile Co, they are interested in our investment platform. Maybe they would like to invest; maybe their employees want to buy, or in business... when they realize that we can sell green electricity, they will become the first to contact us to ask if there was any green electricity for sale. (Sunnyfounder, personal interview, April 12, 2020)

Except for the cooperation with the giant enterprise to do the charity and non-profits project, some cooperation is local-based and small-scale organizations. SOLA Bloc tries to work with the independent bookstores, which face fierce competition with the online bookstore, to enhance their performance by providing an extra 15% discount generated by the FITs (SOLA Bloc, personal interview, July 17, 2020). HCAT plans to cooperate with the aquaculture fisher to install a PV system on the rooftop of indoor aquaculture faculty. They also plan to sell the fishery products, which are breeds in the indoor aquaculture faculty in its platform (HCAT, personal interview, July 8, 2020). These crossover initiations enhance the platform's network to contact more and more people and create a more potential business opportunities for the future.

Besides business cooperation, energy education is another pathway to deepen the influence and let more people understand the RE. When Sunnyfounder provides the energy lectures for Homemakers Union Consumers Co-op, they also advertise itself at the same time. The other platform has a similar strategy to expand the network.

We are now connecting with many organizations, some business schools, C2C circular economy, B Corp, and some official organizations such as the European Chamber of Commerce Taiwan. We are now building links with many organizations like this. In fact, everyone...These organizations are very interested in these topics, in which they have not participated. They want to learn about our

experience. (Hellosolarman, personal interview, July 15, 2020)

Besides, most of the platforms also operates social marketing. The platforms will film the video from the energy knowledge to the plant construction record. All of them will be shown in public on the website and YouTube channels (Sunnyfounder, personal interview, April 12, 2020).

5.3.3 Learning process: control the risk and improve efficiency

Because the FIT is a 20-years long contract, the accidents are likely to happen. In 2015, several solar plants owned by Chailease were damaged by the typhoon. The insurance claim closed to nearly NTD. 20 million in 2015. Because of this disaster, several insurance companies were unwilling to provide the insurance or increasing the insurance premium substantially for the solar plants in 2016 (林上祚, 2020). This event also raises concerns about the risk of natural disasters for solar plants. Yet actually, the risk is controllable for the platforms.

Interviewer: Based on your experience, is the (natural) risk controllable?

Interviewee: There are three tasks. Insurance is the final one. The first task is planning. Do you want to install it on the building with corrosion? Someone insisted it. That was why Chailease's plants damaged in 2015, They learned a lesson at that time.

Interviewer: Because they install in the inappropriate space?

Interviewee: Yes. Then all insurance premiums jumped high at that time because of the damage. This is first task. The second task is maintenance, you need check if the screws are loose. Even if construction quality is good, the structure will rust, and the crews will be loose without maintenance. They will fall down in the next typhoon. This is second task. The third task is insurance.

The risk control and performance depend on these factors: planning and construction, maintenance, and insurance. If the developers are good at dealing with tasks, they will reduce the risk and extra costs.

First, planning and construction is the essential know-how for the developers.

Compared with the vertical structure, the solar PV system is a horizontal structure. It needs a large number of workers in a short time during the construction (Hellosolarman, personal interview, July 15, 2020). Because most of the workers are temporary, and their performance varies widely, the contractor's ability to supervise will determine the construction quality. Most of the platforms would evaluate the contractors and sub-contractors to find reliable partners to cooperate with. The contractors also take responsibility for the maintenance, which is the second factor. Besides, evaluating the feasibility of the fields needs professional experience. It is common to install the PV system on the existed building. Because after decades, building may have some problems like leaking or illegal expansion, it is necessary to evaluate whether the strength of building structure and layout is strong enough to support the PV system. The strength of the structure also determines the environmental risk when it faces a natural disaster.

Because the evaluation costs a lot of time and traffic fees, the process of the evaluation, based on the developer's ability, will determine the performance. The experienced platforms and contractors can evaluate it effectively. Also, they can convince the landowners to lend the lands. This process is complicated and needs the integration of different domain knowledge and profession.

...But the fundamental thing (developing fields) is difficult, because every roof is different, every homeowner's needs are different, and they don't understand this thing (Solar power) . You have to solve the problems related to the construction site through business, engineering, and construction approach. (Hellosolarman, personal interview, July 15, 2020)

The newcomer with fewer knacks, called "mei jiao" in Taiwanese, need to visit the field several times to confirm the environment and convince the owner. In contrast, the senior developers just need to visit the landowners to confirm space and achieve agreement at one time (Hellosolarman, personal interview, July 15, 2020).

Second, maintenance has changed a lot since the prevalence of the monitor system. Even though the monitor system that helps the contractors maintain the plant has appeared in the last five years, there are still many 'mei jiao' in maintenance. Take

clearing the panel appearance as an example:

It (Maintenance) is very technical. If solar plant is located in the agriculture area include farmland, stables and cottages, the harvest time is the key factor. When harvesting, the farmer will do the solid disturbance. It results in the dust emissions. It's an important "mei jiao". (Hellosolarman, personal interview, July 15, 2020)

That is why the platform, especially the startup, needs to find reliable senior contractors and sub-contractors to cooperate with. This situation also indicates that the integration among the platform and contractor may be essential as they want to reduce development costs.

They (A platform which is founded by EPC) take the first-hand price. We provide 6% interest rate for the investors as we have extra cost in purchasing the field from the other contractors, who provide 8% for the investors. (Sunnyfounder, personal interview, April 12, 2020)

Because they (Sunnyfounder) need to get cases from others, it is hard to reduce their costs. If they want to give investors a higher IRR, they need to decrease its gross profit. If they can't solve the problem, they will bear some risks in the future. (Hellosolarman, personal interview, July 15, 2020)

Finally, compared with the previous two tasks, insurance is much simpler. After the disaster in 2015, the Chailease fixed the risk, so the insurance company is willing to provide the insurance for the solar power developers. The insurance company also modifies its insurance content to make sure they can benefit from it. First, instead of the full coverage, they tend to provide the partial coverage, which sets the limitation. Second, they have the blacklist to exclude some contractors with bad reputation or local contractors who have more quality problems (張惠雯與廖千瑩, 2018). All of the interviewees confirm that they will not purchase the full insurance as the cost. Also, the partial coverage, which includes 80% is enough for the platform owners to operate.

5.4 Conclusion

Crowdfunding is a financial solution to the developers who lack funds. However, fund is just one of the obstacles the RE developers need to face. When the platforms want to survive in the energy market, it is limited by the fundamental factor: field development, which is determined by the fund, space, and network. Even though crowdfunding solves the fund and network problem partly, the platform needs to make a lot of effort to expand the public network and contractors to develop their business. Besides, learning by doing is another aspect the platforms need to improve its efficiency. These efforts are the key points that must be done when the platform become mature and survive in the market.

There are three initiatives the platforms try to develop. First, connecting with other stakeholders like famous enterprises and institutions, holding the energy lecture and media exposure, helps platforms influence more people to understand the platform. Energy education is significant to reduce the misunderstanding people have and lessen the development barrier when the platforms approach the potential cooperators. Also, this cooperation of energy education leads to more potential business opportunities in the future. Even students could be the investors or the space owner who rent the space for the platforms. The cooperators may invest in the projects and find other opportunities for cooperation. The media exposure also has similar effects to improve the networking.

Second, expanding the network with reliable contractors helps the platforms to improve its efficiency to keep steady revenue and growth. The reliable network with the contractors helps them find the appropriate space to develop, operate and maintain the field stably to reduce the environmental risks and sustain the revenue. As the platform provides the initial fund, the contractors who lack of money also have the incentives for participation. This creates a win-win situation for both. Besides, the integration between the platforms and contractors is considered necessary for the future. This integration would let them reduce the operation costs and control the risk.

Third, learning by doing is a necessary step when the platforms operate its business. Some local know-how like the maintenance in the different fields and negotiation with different stakeholders need times to learn and practice. This step forces the developers to learn the know-how and improve their efficiency; otherwise, they will be out of the

game.

These efforts indicate how the platforms become mature to compete with the other competitors in the energy market. When the platforms become a stable actor in the energy market, changes in the energy agendas can be expected. This potential leads to the next sub-question: how the crowdfunding platform participates in the governance of energy transition and changes the existing energy regime? This is the question to be addressed in the next chapter.

Chapter 6. How crowdfunding platforms participate in governance

6.1 Introduction

This chapter will address the third-sub question: How crowdfunding platforms interact with governments and influence on policy? It will indicate how the platform engages in the governance through three cases: The Green Rooftop project, business model innovation, and RE retailer. The introduction of the Green Rooftop project will be in the first section, in which the central government wants to encourage people to install a solar PV system, and the local government executes the project. However, the project did not succeed due to several problems. The second section will explain why the platform tries to create a new business model, beyond the original crowdfunding model. These initiatives not only involve in the crowdfunding, but also challenge a more irreconcilable energy governance's issue: financial regulatory framework. There are two attempts, the shareholder model and the blockchain. The Sola block tries to introduce a shareholder model to make it more flexible and attractive to the investors. These attempts also raise some debates. Besides, some platforms try to apply blockchain technology to the crowdfunding platform. These financial innovation faces strict regulations which prohibit its development.

Finally, the third section will illustrate why and how the platforms want to participate in the RE retail market. The RE retailer market is a pathway for the private sector to participate in energy governance. Electricity retailer is an emerging industry monopolized by the Tai-Power Company before the revision of the electricity act. As the FIT's gradual fade away and the available filed becomes saturated after 3~4 years, some platforms start to plan to become the RE retailer. Giving the RE industry the privilege to become an electricity retailer is an important policy tool that the government wishes to increase the energy transition. However, this policy tool faces many challenges. Although the platforms have some experience in the RE industry, it is hard to integrate into the RE retailer's crowdfunding platform. They need to overcome several obstacles like the administrative issue and financial barriers. These barriers also reveal the potentiality and limitation of the crowdfunding platform in the governance of energy transition. All the cases and their strategy are as follows.

	Content of the cases	Conform and fit	Stretch and transform
Green rooftop project	Governments play a mediator to help developers to solve the space issue	Hardly to conform as the policy tool is not helpful for the platforms	
Shareholder model	Platforms develop new financial tool to improve the original model and	Research the possible solution, and Conform the Company act finally.	Raised the controversy.
Blockchain	Platforms develop new financial tool to improve the original model and	Prepare for the ability and practice it in the inner system.	Try to lobby the government to loosen the regulation
Re retailer	Platforms develop new business models to overcome the disappearance of the FIT	Applying for the retailer license	Try to lobby the government to loosen the regulations and the bank loosen the loan requirements

Table 5: How the platforms deploy the strategies in different initiatives.

6.2 Green Rooftop project: a failure pathway for the crowdfunding platform

As mentioned in the previous chapter, the space issue is the developer's challenge to carry out their project. The central government understands that the space issue is a significant obstacle for the developers. The energy affair, the central government bureau, therefore creates the Public Green roof project to encourage developers and space owners to start their solar PV system. The policy's main goal is that the government plays as a mediator to mediator the developers and space owners. This mediation may help to reduce the cost of the negotiation between the actors. Besides, this policy creates a privilege for the developers with the right and relevant information to develop a specific area. In practically, the local government has an obligation to design the detailed to execute the policy. It will announce the developers' contact information like phone number and email tot rooftop owners. The local government will collect available rooftop's information like the location, and the owners' contact information. When the local government collects the specific parochial data, they will tender it for the public interested developers. The interested developers need to bid it to get the information. This project wants to create a win-win situation. Although the developer needs to pay the bid bond to get it, this policy also provides extra benefits, ranging from 3% to 15% in the original FIT (江睿智, 2019). The rooftop owners will get a 10%

FIT fee return as the rent, and the local government also gets 3% revenue to promote the RE development.

However, this policy is not popular. First, the filed information the government collects it too raw, and the developers need to make an effort to confirm it again. Many fields the government collects are not feasible for the developers to install a solar PV system. This situation is similar to when the platform receives the application from the interested people through itself. Compared with it; some developers tend to develop the field by themselves.

...People provide the roof, and the government collects them and bids it out. The contractors bid it. After the bidding, they go to evaluate the fields one by one. Maybe half of the areas are not feasible. (Sunnyfounder, personal interview, April 12, 2020).

Second, the bid is very costly for small developers. The developers need to invest a lot of dollars to bid the franchise. The bid competition also limits the developers' participation. Only the large-scale developers have the capital to participate in. On the other hand, most large-scale developers tend to develop and focus on creating a single large-scale field. The small-scale area is not attractive to them, or they will face many challenges because of the know-how it requires.

Yes, yes, but the government also has a commission, like 3%, 3% for each roof. The point is, do the developers have so much profit? Even though you spent tens of millions to bid the whole area, do you have the know-how and enough sales to promote and develop? Or are you just a company with deep pockets and have no enough capability to do? There is a lot of wisdom in it, so that's why we think so many sunny roofs projects are stagnant (Hellsolarman, personal interview, July 15, 2020).

In sum, these factors limit the performance of the project. Although the government wants to promote the PV system by playing the role of mediators, their effort is limited to the developers. For the crowdfunding owners, they have such capital to bid the project, yet, they still have to confirm the fields. This policy is not valuable for

crowdfunding platforms. As most of the platforms are small capital, this policy did not create enough incentives.

6.3 Beyond the reward-crowdfunding: shareholder model and bloc chain

Crowdfunding belongs to financial innovation, and the government has a relevant bureau, The Financial Commission, to take responsibility for the financial regulation. As the conventional crowdfunding model is popular, some platforms try to use other business models to do their project. Adapting the preferred shareholder model, SOLA Bloc tries to create a new business model to participate in the RE market. The investors invest the preferred stock to earn the bonus and create the plants. This model creates another solution to control the risk. For example, Sola Bloc bundles nine plants together to be a investment assert. This assert, which includes nine plants. Can distribute natural and human risks the solo plant needs to face.

To reduce this risk, we don't just let investors' money in a power plant because natural and human errors will escalate the risk. It is a basket of power plants. Several of them are assembled. The investors buy the portfolio. It does not mean that all the money is spent on a power plant. This model is more flexible. It is the difference between the original leasing model and us. (SOLA Bloc, personal interview, July 17, 2020)

The Company Act regulates this model, and there is more strict regulation for the investors. Unlike the traditional crowdfunding model, everyone with money can participate in it. The investors need to do the Know your Customer form (KYC) and Investment Account Risk Profiling Questionnaire (501 Form), which allows the government to regulate the investor information to avoid money laundry. Because of these requirements, the investors cannot purchase the product through the Internet directly. They have to make a phone call and make an appointment in person. In other words, this model raises the threshold for the potential investors.

This model is taking more steps to financialize the FIT contract and raises the controversies. For some people who work in related industries, this model is like a financial leverage, which is a risky for the investors (Sunnyfounder, personal interview, April 12, 2020; Hellosolarman, personal interview, July 15, 2020; AAA, informal chat,

July 17, 2020). Sola bloc has thought about it because they are the first to apply this model, and the public is not familiar with it. Although this model is seen on edge, the government does not make a clear statement to prohibit it.

In terms of the current policy, the government gives everyone a space to try. Therefore, the regulations are not very strict or strange. (SOLA Bloc, personal interview, July 17, 2020)

On the other hand, as the government did not make a clear statement, it blurs the line between legal and illegal for the platforms. As the SOLA Bloc has finished the first phase fundraising, it still needs time to see how it will be.

Except for the shareholder model, the Bloc chain is another initiative the platform adapts. The bloc chain is a virtual token and de-centered information system that allows developers to keep the record steadily distributed. In the case study, three platforms have relevant technology. Some platforms apply it in the inner system to record the system information like the power generation and investor record.

Besides, these technologies can be applied in the financial system, like bitcoin. The developers' ultimate goal is to use it to tokenize their power plant to sell it to the investors. It will create more space for the platforms as it is beyond existed regulatory framework. For example, the most common crowdfunding cases are the reward-crowdfunding for RE in Taiwan. It limits the RE type to a solar PV system as this type as it can be divided into a single panel that is reasonable for the investors. The application of virtual coin can be more flexible, which further facilitates other RE like the offshore wind. Also, the virtual coin is highly adaptable to penetrate the national boundary, which is also friendly to the foreign investors.

The solution to our platform is to take a further step to crypto. In that world, the law is not able to limit it. For example, our virtual machine allows us to define the quantity unit we need. We sell one unit of virtue machine, and then we even accept USDT or VTC as a form of payment. (HCAT, personal interview, July 8, 2020).

Besides, it creates the secondary market space, which allows the investor to trade their

assets easily. Not only the electricity but also the REC can be virtualized and tokenized.

It could be international in the blockchain market. People can trade the European or American REC on it. That is what I think will be interesting in the future.

(HCAT, personal interview, July 8, 2020).

Nevertheless, this application is regulated by the Financial commission. The virtual coin is seen as the precious metals in Taiwan now. The regulation is rigid for the developers.

In sum, the crowdfunding platform raises the debate about the financial issues. Although the original model has been tested and operated for four years, some platforms try to introduce the new shareholder and blockchain models. These new models raise controversies and violate the existed regulatory framework. Even though the platforms hope the government will release the relevant regulations, these regulations still existed. It still takes time to see whether these model would succeed in the future. Before the transformation, the platform still needs to conform and fit the existed regime.

6.4 Beyond the FIT: an emerging RE retailer industry

As the boom of solar power these years, the end of this trend is coming. The development of solar power will face two significant challenges in the next 3 to 4 years: space's limitation and the end of the FITs rate. Many interviewees assume that the solar industry will face the shift after 3 to 4 years (SOLA Bloc, personal interview, July 17, 2020; AAA, informal chat, July 17, 2020). Because of this trend, some platforms would have another strategy for the future. RE retailer is a possible way for them to participate in. As the electricity liberalization starts, the RE retailer, which was exclusive to the Tai Power Company is open for the private developers. This change allows the developers sell the electricity to anyone who wants to buy the electricity, and the users could purchase the electricity from the producers or retailers freely. Opening the electricity market is seen as a significant milestone in the energy transition in Taiwan. After the revision, Sunnyfounder is the first company to get the retailer license in 2019. Now there are 7 RE retailers in Taiwan. Except for Sunnyfounder, two platforms confirm they plant to become the RE retailers in our case study.

The emergence of the RE market is facing the competition between the traditional electricity market. The external and internal requirements and incentives facilitate the development of the RE market. Even though the average electricity fee is still higher than RE energy, domestic regulation, and international trade pressure result in the RE's strong demand of RE energy . The intersection between the FIT price and the market price is very close, and it seems valuable for the developers.

If the user requires a T-REC, he might... Solar energy can only save him three dollars. On average, he can only save three dollars per kilowatt-hour, and he has a T-REC requirement of two dollars. He can accept the price of five dollars. It is higher than the current FIT price, 4 to 4.5 dollars. That is why the RE trade is feasible. (Sunnyfounder, personal interview, July 4, 2020).

Nevertheless, participants in the retailers need to overcome several challenges. First, the platforms need to change the types of energy generation. When the private generation started in the 1980s, the electricity law was set to regulate it. As the government legalized the Renewable Energy act in 2009, the existing regulation, which requires the equity funds and complete evaluation is rigid and costly for the developers. The renewable energy act presents an easier approach which complies with fewer rules and requirements for the developers. Now there are three types of power generation in the regulatory framework. They have different requirements and regulations. The type 1 and type 3 are commonly adopted by the RE developers. All the detail as follows.

	Type-1 equipment	Type-2 equipment	Type-3 equipment
Definition	RE generation	RE generation >2000KW for self-use	RE generation <2000 KW for self-use
Applied regulation	Electricity law	Electricity law	Renewable energy act
Electricity sale	FIT/Power wheeling	Self-sufficient	FIT/Self-sufficient
Requirement	Building permit User permit Electricity industry regulatory authority To do the FIT/Power wheeling, the developer need to own 18% equity funds to apply for Power supply license	Building permit User permit from Electricity industry regulatory authority	Building permit User permit from local government

Table 6, The list of three type equipment, Author edit. (公民電廠資訊網, 2019, 2020)

Type-1 is the conventional type to regulate the larger scale, electricity producers. It has the strictest regulation and verification process. Type-3 is specifically designed for the RE with less requirement to attract the small stakeholders to invest in the RE. It provides more flexible regulations to encourage small-scale RE. In other words, it cost less for the developers. In this research, all the platforms confirm that their power generation belongs to type three.

However, this type has an exclusive limitation for the FIT. The type-3 plants are not allowed to sell the electricity to the consumer directly. This regulation limits the platform to sell the electricity generated by the existed plants directly to the consumers. If the platforms want to utilize the existed type-3 plants, they need to apply for the shift from type-3 to type-1. This shift involves not only the administrative process but also the business model. As the type1 have more regulations and requirements e.g. the developer needs to have the 18% available equity fund for each plant to ensure their operation. The platforms view the shift as an obstacle, and they expect the government to change the regulations.

To be more specific, the shift for the existed plants is difficult. First, the cash flow is always an issue. Most of the developers will use the existed plan as the mortgage. They need to negotiate with the bank to reset the loan agreement. After the plants are completed, the developers will use the plant as the mortgage to get the bank's long-term loan. From the bank's perspective, the RE loan's most valuable part is the FIT contract between the plants and the Tai-Power company. When the developers want to change from the FIT to the energy market to earn more profits, the bank is often reluctant to do so as they need to take another risk.

After the power plant was completed, the developer had already taken a loan, so he mortgaged it to the bank that owned it. Why is the bank supposed to approve the loan? The bank doesn't care what equipment they have. What they want is the contract, Tai-Power Company FIT contract. The FIT contract is valuable. It sells electricity to us...always sends me the electricity bill. Now you say that you want to cancel the FIT contract and sign other contracts. How can the bank say yes? (Sunnyfounder, personal interview, April 12, 2020).

Even though the bank accepts this proposal, the developers need to cancel the original loan contract. It means the developers need to pay off the loan and reapply for the new loan. Most developers will not hold such amount of ready money to pay off.

Besides, most of the business model of the crowdfunding platform for RE is to let the investors own the panels. As the business model is that the platform owners rent the investor's panels, i.e. the investor has the panels' property. If the platforms want to jump out of the FIT to participate in the market, they need all investor's permission. The number of inventors could range from dozens to hundreds. If one of the investors refuse to change, the deal will fail.

If there are forty investors in the power plant, all investors must agree. If Sunnyfounder wants to do it, everyone must agree. (Hellosolarman, personal interview, July 15, 2020)

Above, these rules create multi barriers such as the huge cash flow and complex

property right for the platforms to shift the original FIT to the RE market. As they try to lobby and discuss with the government officials, these obstacles still remained.

6.5 Conclusion: remove or institutionalize shielding?

As the platforms become more and more popular, knowing how they participate in energy governance is essential. As the niche study reveals, the strategy is to: fit and conform or stretch and transform. This chapter takes three cases as an example of how the platform participates in energy transition governance in Taiwan.

First, the Green Rooftop project is a policy tool the central government promotes to help developers overcome the space issue. However, this policy tool is not helpful for the platforms as the date is too rough to use and the bidding cost is too high. In this situation, the platform has no motivation to join in it. Secondly, the crowdfunding platform is a financial innovation to help the RE developers to get the fund. Some improvements and applications are emerging. The shareholder model and blockchain application are two initiatives the platform tries to adapt. Under the rigid regulations and requirements, these initiatives raise the debate about financial speculation. Sola Bloc tries to utilize another regulatory framework: The Company Act to conform fit in. The Blockchain is another application the developers attempt. As the regulatory framework is not complete, the platforms put the technology into practice in the inner system.

Although they try to lobby for the government, it still needs time to mature to challenge the existing regulatory framework. Finally, FIT functions as shielding to protect the solar PV system and crowdfunding for RE. It will disappear in the next five years. All the platforms believe so it as the emerging green market is seen on the way. How to move on to the Electricity market is a big task for them. The platform will be facing several challenges to integrate the existed plant into the new emerging industry. The administration demands them to reapply their plants to fit more stringent requirements. It requires the platform owners to change their business model to have enough cash flow. This change forces the investors who own the panels as the planforms to negotiate to get the permission. These multitask platforms create an obstacle for integrating the existing plants and new market unless the government changes the current regulatory framework.

All these case studies reveal that although the platforms have some promising tools and ability to engage in energy transition governance, they are not powerful enough to change the existing regulatory framework now. They still need to conform to the current regulatory framework to mature to have more voice to make a statement. Although they have tried to change the framework, their influence is still limited.

Chapter 7 Conclusion

7.1 Research finding

As the energy transition is a popular topic in the contemporary academic field. The transition not only consists of the energy source, but also the new type of generation and distribution. This transition also causes the new business model to emerge. This research addressed how crowdfunding platforms develop as actors in energy transition governance by addressing the three sub-questions.

First, the specific background results in the emergence of crowdfunding for RE. Like the FIT, the new regulatory framework creates strong incentives for the developers to do their projects. Besides, international trade and the requirements from the global enterprise create RE demands. These domestic regulatory frameworks and foreign requirements make the RE market solid. Similarly, the crowdfunding platform's mature also provides the background to develop the crowdfunding for RE projects. The developers are familiar with this model, and the potential investors are confident with it. This background encourages the active and passive shield for the crowdfunding platform for RE to develop.

Second, even though this environment facilitates the emergence of RE's platform, the platform still needs to improve its performance to compete with other competitors. Crowdfunding is a financial tool that gives the developers have another pathway to get the fund. This innovation solves the fund problem, which is a significant challenge that limited RE developments. However, the platforms still need to solve the obstacles in the developing field and enlarging network. Collaborating with the contractors and holding the public event help them to overcome the barriers. The learning process involves risk control and maintenance, which also enables the platforms to improve efficiency. These initiatives give platform owners opportunities to learn. Besides, this trend also indicates the vertical integration is a solution to improve its performance. That is, the platforms need to control the supply chain to reduce its cost.

Finally, the platforms need to participate in the changing energy governance to survive in the future. The dynamic tension between different levels of government and developers to reflect the complexity. The platform also brings some innovation in the

business model. The government still controls the regulation and leaves a small space for the crowdfunding platform. The platform is trying to change the regime, yet they have few advancements. Participating in the RE retail, which is a common strategy among the platforms. As the FIT will end in the next five years, participating in the RE energy market and lobby for adopting financial innovation are two pathways for the platforms. However, as crowdfunding's a small-scale natural, their effort is limited. The lobby is making little progress. From this perspective, even though crowdfunding shows some potential, it is still not powerful to influence Taiwan's regulations at present.

In sum, this research indicates that crowdfunding represents the potentiality for creating more energy transition participation. It enrolls more people who are not familiar with this topic or not financially capable enough to join in. Nevertheless, the limitation is evident that the platforms still face many challenges to make a stunning change in the energy regime. This research presents three contributions to the relevant research: First, a different country regulatory framework that incubates the crowdfunding platform. Second, it offers the dynamic between different actors: the government, the competitors, and stakeholders and why the crowdfunding platform becomes an actor in the energy transition. Finally, it reveals the potential of crowdfunding for RE.

7.2 Theoretical reflection

Compared with the original MLP approach, the protective space approach provides a useful analytical approach to explain how the actor participates in the crowdfunding platform case's energy transition. As the politic and power become an issue in the transition study, this approach provides a clear framework to reveal different strategies that include the learning process to enhance its efficiency and socio-political activity to influence more actors to participate. Through the internal and exterior analysis, this approach avoids several biases like the wining technology, ignoring the power and politics, and overemphasize the singular technology the original MLP approach may involve. For example, the platform is not a flawless finical solution in this case study. The advocators need to improve its efficiency and promote it to the existed energy regime. The advocators need to cooperate with other technology like IT innovation and monitor system to operate. Besides, this research presents the potential of this approach in the non-west culture context. Even though Taiwan has a different regulatory framework and political authority, this approach provides a perusable analysis in a

particular case study.

Nevertheless, there are a lot of efforts the scholars need to make. As the protective space approach focuses on empowerment, which tries to reveal how the innovation interacts with the outer world, the external world's content is not well shown and structured. For example, the approach treats all the policy as an independent event to show how the actor responds to the specific challenge. This focus may ignore the dynamic of the external world. As this research indicates, different government levels have their own goals and influence in the transition. There is a lot of conflict among them. Their relation may be horizontal or vertical. It means each actor has unequal power and influence due to a specific context. The unknown exterior power typology leads to more new questions: Who is the key actor? Who has the significant power to guide the transition? What kind of power? Why the strategy the platforms take creates enough momentum to change the regime? These unanswered questions will challenge this approach.

There are two feasible ways to improve the protective space approach. First, a governance study involving the power relation and negotiation between different departments may contribute to the field. To do this, it needs more data from the stakeholders in energy governance. More expert-interviews are necessary. Second, the actor-network theory (ANT) provides different assumptions and pathways to this question. This theory assumes that the influence emerges in the actant's connection and network, including human and non-human (Latour, 1987). The platform owners play an entrepreneur role in managing all the actants to form a stable network. However, these actants and non-actants have their agency and may betray the network. This approach will need more fieldwork to reveal how the platform enrolls and non-actant to assemble the network.

7.3 Recommendation

As this research reveal, crowdfunding is a useful tool to enhance the energy transition. However, if people want to take advantage of it, it needs to reform the regulatory framework. The negotiation with the other actors is crucial when the platform owners try to change the existed regime. The government should do more coordination work to help the platforms. Reforming a specific bureau to manage the energy transition may

be a solution to reduce the barrier and contradiction among different actors in the energy sector.

7.4 Research limitation and further potential Research Topics

There are two limitations in the research: First, this research focuses on the platform and reveals how they participate in Taiwan's energy transition. The role of the government is not well explored. As this research indicated, the energy transition involves negotiating different government bureaus among energy policy, economic development, environmental policy, and rural area development. This missing point needs more data from the actors in the government. Second, there are a few platforms that refuse to do the interviews. The data from the crowdfunding platforms may be partial.

Besides, there are two potential research topics for future research. First, Crowdfunding For RE is also popular in other areas like the Netherlands. The comparative study between Taiwan and European countries will help understand crowdfunding for RE projects in different contexts. Second, crowdfunding is just a kind of fund solution to the energy project. A comparative study between other funding solutions to the energy project may contribute to the field.

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Appendix

Appendix I: Interview guide

The interviewees were asked several questions about how they start their business. After which they will be questions a series of questions about Shielding, Nurturing, and empowerment.

General questions

- G1: Why did you decide to start this platform? (ask to explain the process)
- G2: How is the process of opening a platform? (administrative, etc.)
- G3: There are several existed crowdfunding platforms, why do you design your own platform?

Shielding

(keep niche technology from the selection pressure of the current environment)

- S1: How is the regulatory framework for the development of these platforms?
- S2: How do you design the business model?
- S3: What the position of the government? Do you get any subsidy? Other important elements?
- S4: The financial supervisory commission promote the Green finance; does it help your operation?
- S5: The government announce that they will support civil power plant in the revision of the Renewable Energy Development Act in 2019, does it help your operation?
- S6: Now the government propose several policies like ‘Green energy rooftop’, ‘Solar Community’ and ‘PV-ESCO model’, do they help you to contact the potential customers or facilitate your business?

Nurturing

(articulation of expectation, social network building, and learning process.)

- N1: How do you develop new clients? What kinds of your clients? What are their perspectives about the energy transition?
- N2: Except for the investment, what kind of the participations the clients do?
- N3: How do you develop the field?

- N4: What challenge do you face when building the projects?
- N5: How long do you need to develop a project?
- N6: How the FIT rate which changed annually affect your construction plan?
- N7: What are the risks now in these platforms and how do you protect from them?
- N8: What kind of the SOP when you build and operate the field?
- N9: How to improve the performance and reduce operational cost?
- N10: Except for Tai Power company, is there any RE consumers try to contact you?
- N11: How do you participate in the RE retail? Have you considered to opt out the existed FIT contract?

Empowering

(fit-and-conform or stretch-and-transform)

- E1: FITs or green energy market, Which kind of the sale pathway do you prefer?
- E2: Do you need you modify existed business model to shift to the RE market?
- E3: Have you ever lobby for the government? Which department you need to communicate? What kind of the help or regulation reform do you want?

Appendix II: Coding list

Questions	Interviewees	Respond	Open coding	Axial coding	Corresponding Concepts
N4	CPA1	could not find supply it sold out immediately	Many people want to invest	Coopetition for case Lack of Supply	Nurturing: Learning process
N4	CPA1	realized that his roof is valuable 20% rent	Fields are mere and valuable	Coopetition for case Lack of Supply	Nurturing: Learning process
N4	CPD1	Everyone is competing for the cases this competition is fierce	Developing filed is fierce	Coopetition for case Lack of Supply	Nurturing: Learning process
N4	CPA1	received 500 applications only two of them were successful	Hard to develop field	Lack of Supply	Nurturing: Learning process
S1	CPA1	cooperate with enterprises, local governments, and institutions brings some business opportunities.	Cooperation with other stakeholders to develop the business	Developing potential business opportunity	Nurturing: Expanding connection
S2	CPB1	some business schools, C2C circular economy, B- type enterprises, the European Chamber of Commerce Taiwan	Cooperation with other stakeholders to influence more people	Developing potential public influence	Nurturing: Expanding connection
N10 S5	CPA2	requires a T-REC higher than the current FIT price, 4 to 4.5 yuan	The competitive privilege for RE retailer	Strong RE demand	Shielding: passive
S2 S3	CPD1	government policy not create very strict or strange regulations	Government regulation is not well developed	Existed Regulatory framework	Shielding:passive Empowering: Stretch and transform
N7 N8 N9	CPC1	(Maintenance) is very professional	maintenance is the key	Improve efficiency	Nurturing: Learning process
N7 N8 N9	CPC1	purchases cases from others, it is hard to reduce their cost	Acquiring the filed through others raise the	Improve efficiency	Nurturing: Learning process

			cost		
N7	CPA1	There are three tasks. Insurance is the final one. The first task is planning Maintenance... This is second task	Planning, maintenance and insurance are significant	Improve efficiency	Nurturing: Learning process
S6	CPA1	government collect them half of the fields are not feasible	Government policy work not well	Lack of Supply ineffective official policy	Shielding: active
S6	CPC1	he government also has to get a rebate, like 3% the results were not good.	Government policy work not well	Lack of Supply ineffective official policy	Shielding: active
N4 S6	CPC1	(Filed development) you can't do it because you don't know how	Planning the filed need know how	Improve efficiency	Nurturing: Learning process
S2 N7	CPD1	Reduce the risk don't just let investors' money go to a power plant a basket of power plants	New business model	Improve efficiency	Empowering: Stretch and transform
E2 E3	CPC1	(change the type of the generation) all investors must agree	The barrier for participating Retailer market	Existed Regulatory framework	Empowering: Stretch and transform
S3	CPB1	No support from government for Blockchain	The barrier for participating New business model	Existed Regulatory framework	Empowering: Stretch and transform
N3	CPB1	Distributors and Cooperation with the fish farm (Field place)	Cooperation with other stakeholders to enhance the influence	Developing potential public influence	Nurturing: Expanding connection
S4	CPB1	Regulatory frame limit shareholder model	The barrier for participating New business model	Existed Regulatory framework	Empowering: Stretch and transform
N3	CPA1	Help the co-op, held the lecture and energy	Cooperation with other	Developing potential public	Nurturing: Expanding

		education	stakeholders to influence more people	influence	connection
N3	CPA1	Contractors bring the case for us	Cooperation with other stakeholders to develop the field	Improve efficiency	Nurturing: Expanding connection
N3	CPA1	(the competitor) held the lecture in the local, manage the YouTube channel.	Cooperation with other stakeholders to influence more people	Developing potential public influence	Nurturing: Expanding connection
N10	CPA1	We have many B2C cases People know the brand We try to participate retailer	The motivation for joining the Retailer market		Empowering: Conform and fit
N4	CPA1	(Rooftop project) is hard to success	Government policy work not well	Ineffective official policy	Shielding: active
S6	CPA2	(Rooftop project, Green community and PV ESCO) Government projects are not well No Initial evaluation Low budget	Government policy work not well	Ineffective official policy	Shielding: active
E3	CPA2	The barrier for funding is the transmission	The barrier for participating Retailer market	Existed Regulatory framework	Empowering: Stretch and transform
E3	CPA2	Regulation limits the change for the generation type	The barrier for participating Retailer market	Existed Regulatory framework	Empowering: Stretch and transform
E3	CPA2	The requirement for the fund excludes the fund from crowdfunding Limit the shift (form type3 to type1)	The barrier for participating Retailer market	Existed Regulatory framework	Empowering: Stretch and transform
E3	CPA2	The consumer needs the Smart meter to purchase	The barrier for participating	Existed Regulatory	Empowering: Stretch and

		the green energy	Retailer market	framework	transform
E3	CPA2	Funding, type 3 generation and certification, we have tried to cooperate with the government	Lobby the government	Try to change the regulatory framework	Empowering: Stretch and transform
N3	CPD1	Promote through education Solar power school	Cooperation with other stakeholders to influence more people	Developing potential public influence	Nurturing: Expanding connection