



PV ROOFTOP DEVELOPMENT IN THAILAND

Analysis of Regulations and Challenges

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Author

Jan-Benjamin Spitzley

Email: jbs@eclareon.com

Co-Author

Robert Brückmann

Email: rb@eclareon.com

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Contact

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Email: pep-southeastasia@giz.de

Web: www.giz.de/projektentwicklungsprogramm

Web: www.thai-german-cooperation.info/renewables-sea.html

Web: www.renewables-made-in-germany.com

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Measurement

W	Watt	Wp	Watt peak	Wh	Watt hour
kW	Kilowatt	kWp	Kilowatt peak	kWh	Kilowatt hour
MW	Megawatt	MWp	Megawatt peak	MWh	Megawatt hour
GW	Gigawatt	GWp	Gigawatt peak	GWh	Gigawatt hour

List of Acronyms

AEDP	Alternative Energy Development Plan
BMWi	German Federal Ministry of Economic Affairs and Energy
BoS	Balance of System
DIW	Department of Industrial Works
ERC	Energy Regulatory Commission
EU	European Union
FiT	Feed-in-Tariff
GIZ	Gesellschaft für Internationale Zusammenarbeit
MEA	Metropolitan Electricity Authority
PDP	Project Development Programme
PEA	Provincial Electricity Authority
PPA	Power Purchase Agreement
PV	Photovoltaic

Introduction

The strong economic growth of Thailand throughout the last two decades had a decisive influence also on the demand for energy of the country, especially regarding the need to build more generation capacities. Regarding the electricity consumption an average yearly growth of around 3% over the last 3 years can be identified.

At the same time, Thailand is highly depending on energy imports. Despite its large domestic natural gas deposits, the country imported in 2011 almost 25% of its natural gas supply and over 50% of its primary energy supply (measured in tons of oil equivalent).

The government has recognized the need for a higher share of self-sufficiency and has identified different means to reach this aim; one being the diversification of the energy mix through the development of domestic renewable energy generation. Thailand's Alternative Energy Development Plan calls in this regard for a 25% objective of total energy consumption by 2022.

One solution for this challenge would be the accelerated deployment of photovoltaic energy (PV), which currently is responsible for less than 1.5% of the total electricity generation. The first promotional programs for solar farms and currently for small rooftop installations have been executed. To support the further development of renewables and especially of solar PV in Thailand, not at least to ensure the realization of official targets, GIZ through its Project Development Programme (PDP) South-East Asia, is dedicated to support the Thai government in its ambitions for a greener future of the country. In the framework of this project, GIZ aims at identifying the existing development steps for the realization of a rooftop solar PV installation as well as the inherent challenges, which are decelerating or even preventing the implementation of the project.

Among other activities, experiences from successful projects at EU level were sought, to identify lessons learned, which could also help Thailand to streamline its existing framework. GIZ involved the consultant company eclareon GmbH to share its experience from the European Project PV LEGAL, which eclareon conducted under the leadership of the German Solar Association (BSW-Solar) in the period 2009-2012. PV LEGAL was initiated by 12 national and European solar associations and funded by the European Commission through means of the Intelligent Energy Europe program. The goal of this unique initiative was to analyze and assess the administrative processes for solar systems in 12 EU Member States, identify existing challenges and roadblocks for an accelerated development of PV systems and finally, propose and disseminate solutions for overcoming these barriers. Due to the great support from the national solar industry and the openness of national political decision-makers and grid operators, the PV LEGAL consortium managed to live up to the high expectations and to overcome several administrative barriers during the project period. The project was considered a great success and was consequently continued in the PV GRID project, which is also assessing solutions for the integration of PV system in the national grids. Moreover, parts of the methodology of PV LEGAL were integrated into the Solar Guidelines India Project. In this project eclareon researches, examines and presents on behalf of GIZ the processes and challenges for solar projects in India.

To ensure a broad stakeholder involvement for the analysis of the regulatory framework as well as the existing challenges for the development of rooftop solar PV in Thailand, GIZ in cooperation with the Energy Research Institute initiated the workshop on "Removing Barriers for PV Rooftop Systems" of 12 December 2013 in Bangkok (hereafter "the Bangkok workshop"). The workshop embraced a high variety of stakeholder involved in the implementation of solar rooftop projects in Thailand. In a first part, participants received an update from ERC as well as PEA on the administrative and application processes for rooftop solar PV projects in Thailand as well as on the latest figures of applied and realized projects from the first tender round. ERC also presented some preliminary finding of its own research on existing challenges in the procedures and regulations and outlined on potential revisions for a new tender round for rooftop solar.

In the second part of the session, the author presented its preliminary findings of the eclareon research on regulations and challenges for the development of rooftop solar PV in Thailand. Participants were asked to comment on the finding and/or report additional challenges, which they considered especially relevant for the analysis.

The following report is summarizing the key findings of the Bangkok workshop and an interview series, which was carried out after the workshop. In a first chapter, it will give an introduction to the general concept of administrative processes and the challenges that can be encountered within these processes. A qualitative and quantitative assessment will explain the reasons why administrative barriers ought to be resolved. The second chapter will be dedicated to the administrative processes and identified challenges in Thailand. After a short introduction to the peculiarities of the Thai case, the report will look at the sequence of processes for PV rooftop installations and outline identified challenges and possible recommendations.

This report has been made possible by the extensive input of stakeholders, whether in interviews or in the workshops. The author would like to thank all interviewed experts for their very valuable input and support for this study. Their expert knowledge and availability are highly appreciated.

Moreover, the author would like to thank the team of the GIZ office Bangkok, especially Thomas Chrometzka, for the organizational support and the valuable comments before, during and after the workshop.

Executive summary

In July 2013, the National Energy Policy Council decided to implement a regulation as well as the inherent procedure for the development of a solar PV rooftop support scheme for Thailand. Already in September 2013, the official opening of the first call for solar PV rooftop projects was publically announced, making the Thai solar PV rooftop support scheme one of the fastest implemented support programs around the world. Considering this very short handling time, the outcome has to be appreciated.

Special attention is to be given to the degree of detail of the regulation and the corresponding notifications. The Thai solar PV rooftop program is considering a number of aspects, which generally are only addressed in more mature markets. In this regard, the dispute settlement arrangement of regulation B.E. 2556 in its division 7 is to highlight as well as detailed provisions on the installation of solar rooftop systems through certified installers.

In addition, the encouraging initiatives of several Thai public authorities, in first line of the Energy Regulatory Commission (ERC) are to emphasize, which pro-actively initiated an analysis of the existing regulations and procedures for the development of solar PV rooftop in Thailand to identify existing challenges and issues in order to streamline procedures for a smoother implementation of solar PV projects in the future.

Even though the before mentioned aspects mark a very encouraging starting point for solar development in Thailand, there are a number of challenges, which are hindering a smooth development of the rooftop solar segment and which should be addressed to support the development of this technology further.

The below listed issues can be identified as central challenges for the development of a solar PV rooftop segment in Thailand. In the course of the report, the issues are however not presented in relation to their dominance but in chronological order of the respective development steps, on which the challenges impact.

Challenge	Issue/Impact	Recommendation
FiT Selection & Evaluation Process	<ul style="list-style-type: none"> • Difference between the legally defined selection process (selection criteria) and the practically applied process (lottery) • Indication of an application period of several weeks; in reality, only projects that registered on first day of registration period prior to 8:30 a.m. were admitted to lottery • Missing information to projects that were not considered – only selected projects were informed • Missing clearing process – i.e. process to consider projects on a waiting list in case selected projects fail to realize their installations. 	<ul style="list-style-type: none"> • Define and apply a transparent selection process • Apply defined procedure (incl. indicated deadlines) exclusively and uniformly • Introduce a waiting list for projects that generally fulfill FiT criteria but were not selected in first place, in order to replace failing projects • Introduce “milestone-approach”, whereby selected projects have to prove the realization of defined milestones in a defined period of time to ensure progress of projects.
Legal Selection Criteria	<ul style="list-style-type: none"> • Legal selection criteria (e.g. first come first served and availability of grid connection capacities) defined by Regulation B.E. 2556 	<ul style="list-style-type: none"> • Define and apply a transparent selection method and procedure • Apply defined procedure exclusively and uniformly

	<ul style="list-style-type: none"> • Legal criteria were not applied for the last call of projects; but selection on the basis of a lottery • Availability of grid connection capacities no qualified selection criteria, as the availability is not in the action sphere of the applicant 	<ul style="list-style-type: none"> • Where grid connection capacity shortages exists, reduce the eligible capacities for the respective region (currently equal capacities for all regions)
Requirement to apply in person for FiT	<ul style="list-style-type: none"> • Obligation for applicants of FiT to apply in person at distributor's offices • Discrimination of applicants from remote areas of Thailand 	<ul style="list-style-type: none"> • Introduce online-based application procedure • European best practice example: Portuguese "Sistema de Registro Microprodução" (SRM)
Factory Operation License	<ul style="list-style-type: none"> • Out-of-time definition of "power plant" of the Factory Act 1992 - electrical installation with more than 5 Horse Powers (~3.73 kWp) • Confusion and inconsistency regarding the moment in time, in which the factory license has to be presented (e.g. at registration/ prior to constructions) • Further restriction for rooftop solar PV installations ("power plants") regarding the location of installations under the urban planning law • Very short realization period for projects and consequently short period to obtain factory license (gateway for "accelerating payments") 	<ul style="list-style-type: none"> • Define clear and transparent requirements for the factory license and apply them exclusively and uniformly • Support for encouraging ERC position to waive the factory license (at least) for rooftop solar PV installations • Introduce reasonable timelines for the realization of projects under the FiT to allow for a proper and sound implementation of projects • Define suitable timelines for the application of the factory license, which is in conformity with the general timeline for rooftop projects under the FiT
Inverter Certification	<ul style="list-style-type: none"> • Different inverter testing procedures for MEA and PEA • Type testing for selected inverter of a defined series to certify all inverters of the same series • Routine testing for all applied inverters required • Confusion as to the "official bodies" that are allowed to perform testing 	<ul style="list-style-type: none"> • Harmonize testing procedures between both authorities (PEA/MEA) • Involve Thai solar association and through this the industry in the definition process for solar standards in Thailand
Building Permit	<ul style="list-style-type: none"> • General requirement for PV solar rooftop installations to obtain a building permit, if structural weight of the roof is exceeded by 10% • Very low threshold (10%-rule) – even very small rooftop installations require for building permit under current definition 	<ul style="list-style-type: none"> • Generally, waive building permit for PV rooftop installations • Under Thai circumstances, general exemption probably not possible – highly differing construction methods, materials and age of buildings • Introduce leaner procedures – minimize state control; shift responsibilities to building owner

	<ul style="list-style-type: none"> Exemption of certain types of buildings/construction materials from building permit 	<ul style="list-style-type: none"> Reconsider 10%-rule; raise threshold to exempt at least very small installations
Predictability of future FiT Process	<ul style="list-style-type: none"> Purchase opportunities shall be announced “from time to time” Ad hoc nature of process is not providing for long term perspective for developers & investors Roadblock for investments and solar development – high uncertainties 	<ul style="list-style-type: none"> Define more precise technology specific objectives within the overall 25% renewable target for 2022 Include targets in a Renewable Energy Development Roadmap/Action Plan, indicating clear actions, timelines and resources
Legal Regulations & Involvement of high Number of Authorities	<ul style="list-style-type: none"> No central renewable energy act, but regulation B.E. 2556 plus specifying notifications & additionally applying acts Unclear and confusing interactions of regulations and acts Involvement of high number of authorities – with individual interests 	<ul style="list-style-type: none"> Introduce central renewable energy act to define clear framework – process has been initiated Screen existing norms and regulations on unnecessary requirements and conflicting competencies.
Influence of dominant Stakeholders/”Extra-Administrative Fees”	<ul style="list-style-type: none"> Concerns that dominant stakeholders had influence on selection process for the FiT – pre-access to capacities Occurrence of “extra administrative and accelerating fees” also in the rooftop process 	<ul style="list-style-type: none"> Provide for full transparency of decisions and process Stakeholders should be able to relate to the process and the decisions of authorities

Administrative Processes and Challenges – experience from previous projects

Defining administrative barriers

The term “administrative barriers” is not officially defined. Based on the experiences in the PV LEGAL project (www.pvlegal.eu), the following definition is proposed:

“Administrative barriers are rules and processes during the PV development process (i.e. permitting process as well as the grid connection process), which are set by public authorities or grid operators and which can hamper or even prevent the development of individual PV systems or overall PV markets.”

The term “administrative barriers” covers the complete development process of a PV system and is not restricted to the steps when public authorities are involved. Most notably, it also concerns project steps in which interaction with grid operators is foreseen. In general, these processes – the connection of PV systems to the distribution or even to the transmission grid – can cause several barriers also due to the interaction with the grid operators.

The proposed definition of “administrative barriers” does not differentiate between barriers which specifically apply only to the development of PV systems and administrative barriers that apply to any interaction with public authorities. Typical examples of the latter would be the administrative process taking a long time because the authorities do not react in a prompt manner; a high number of public authorities being involved; or a public authority using its discretion in an improper manner. Usually, such roadblocks do not appear only during the development process of PV systems but would also apply if the applicant interacted with the authorities for another reason, for example if the applicant applied for a driver’s-license. The differentiation between barriers that apply only to PV systems and those which apply to any other administrative activity becomes relevant when solutions for overcoming the roadblocks are sought. In the latter case, an overall reform of the administrative process would be necessary, a solution that is very difficult to realize.

Relevance of efficient and effective Administrative Processes

Efficient and effective administrative processes for the development of PV projects can have a positive impact on the overall society. At the very least, they lower costs for the development of a national PV sector and can help to ensure national energy security.

Financial Impact of Administrative Barriers

The discussion of efficient and effective administrative processes for the development of PV projects has spread in past years. This is partly due to studies that have shown the financial impact of administrative barriers on the overall system costs of PV installations. A study by the Lawrence Berkeley National Laboratory¹ and the National Renewable Energy Laboratory on behalf of the US Department of Energy compared the system costs of PV installations in Germany and those in the United States. The study broke down the cost categories prices for modules, inverter, other hardware and soft BoS + profit. The authors found that the overall system costs in the U.S. were twice as high as in Germany: in the U.S., the system costs amounted to \$6.19 per Watt while in Germany they were only \$3.00 per Watt.

¹ Study “Why are residential PV Prices in Germany so much lower than in the US – a scoping analysis”; Joachm Seel, Galen Barbose, Ryan Wiser, Lawrence Berkeley national Laboratory, February 2013 Revision, on behalf of the US Department of Energy; at <http://emp.lbl.gov/sites/all/files/german-us-pv-price-ppt.pdf> (last visited on 08.02.2014).

This striking result was mainly caused by the differing cost categories soft BoS + profit, which in Germany reached only \$0.62, while amounting to \$3.34 in the U.S. In the second largest cost category (in Germany actually the largest), the module price, the two markets were almost even, and the cost for other technical components were not that significant. Given the fact that the module prices have globally continued to decrease in the past two years, it has to be expected that today, the impact of the soft BoS + profit will be even larger.

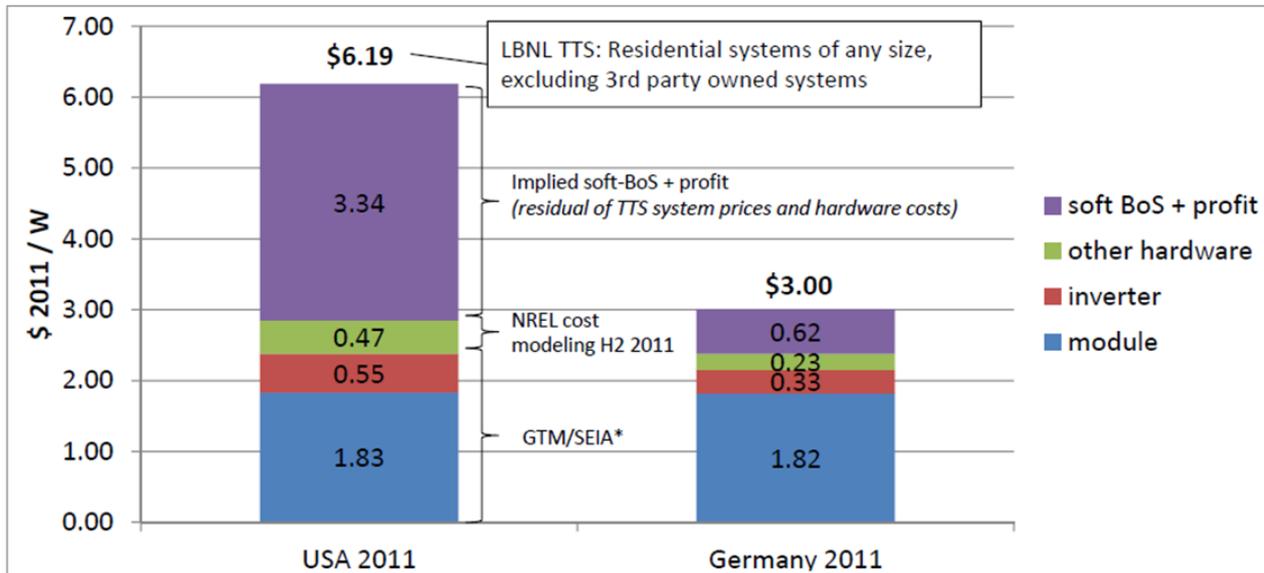


Figure 1 - Soft cost, including administrative efforts, can significantly drive up PV systems costs. Source: Lawrence Berkeley National Laboratory & NREL on behalf of the US Department of Energy

It is evident that the cost category of “soft BoS + profit” consists of several components, many of them not related to administrative processes and barriers. Nevertheless, administrative barriers have a significant impact on the overall system costs.

First of all, the share of administrative costs can make up the bulk of overall system development costs. The following figure from the PV GRID project compares the share of legal administrative costs over total project development costs (excluding PV equipment and other materials) for PV projects in European markets. It shows that in some markets project developers have to spend a large part of their budget in order to secure the authorization needed to build and connect a PV system. This burden is normally reflected in national system prices.

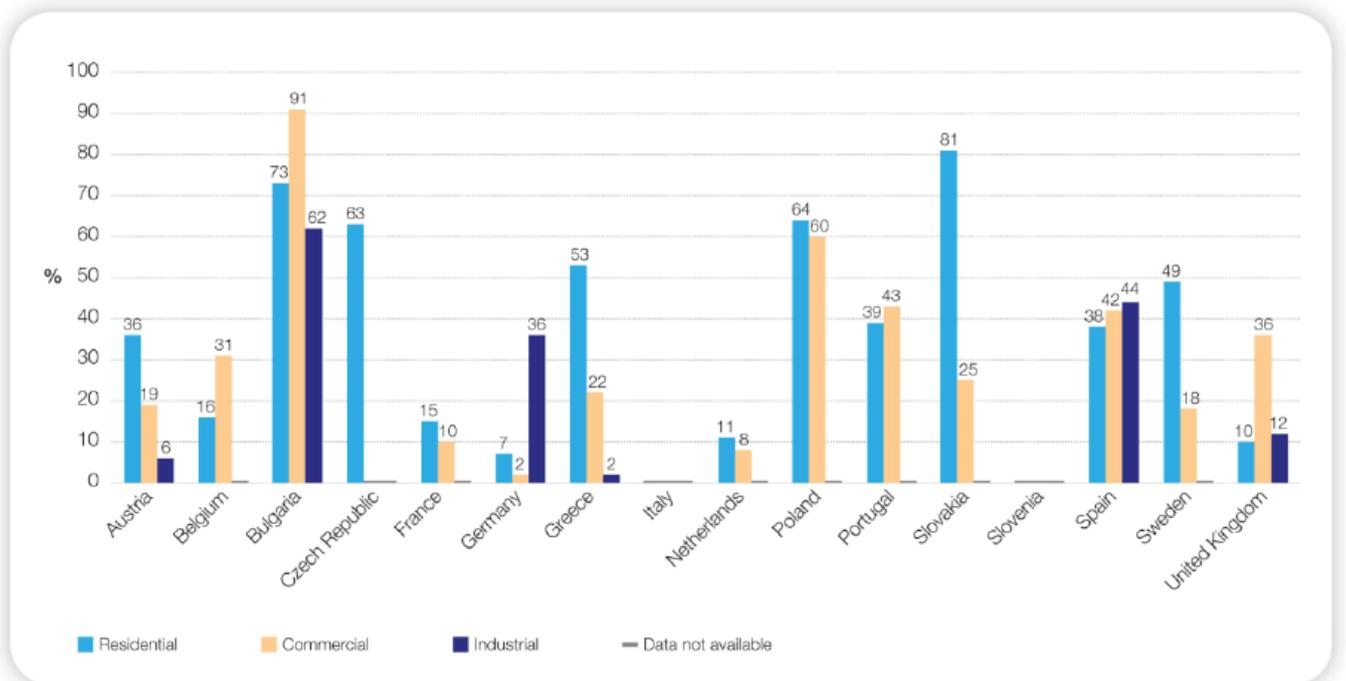


Figure 2: PV project development: Legal Administrative Cost Share – Source: PV GRID project

Moreover, administrative costs have an indirect effect on other soft costs components such as capital costs and profit. High administrative costs indicate inadequate administrative risks, which reduce the predictability and cost security of the overall PV project. As a reaction to increased risks, investors will usually demand a risk premium and, consequently, capital costs will increase. On the other hand, this also implies that governmental politics which increase investment security can drive down the costs for the development of the PV sector. Thus, the government can influence the PV sector a lot while the development of the prices of the PV modules depend more on the development of the world market.

Impact of Administrative Barriers on National Energy Security

A high share of domestically produced PV power can enhance national energy security and help increase national energy independence. Thailand is confronted with decreasing national fossil resources, especially in the Gulf of Thailand as well as with shifting energy partnerships in course of regional developments. In this regard, Burma has accorded new supply agreements with China, resulting in a decreased availability of the export resources for Thailand.

An ambitious program to make administrative processes more efficient would result in lower PV system costs and may lead to an increased deployment of PV installations. The grown use of domestic energy sources will ultimately help to contribute to a higher share of domestically produced energy and thus to a higher national energy security.

Administrative Processes in Thailand

Regulatory Framework

On 16 July 2013 (2556) the National Energy Policy Council approved regulation No. 2/2556 (hereafter B.E. 2556), determining the purchase of power from solar PV rooftop systems under a Feed-in Tariff (FiT) scheme for a total of 200 MW, which received wide support within the Thai solar sector.

The eligible amount of purchase of 200 MW was distributed over two system types, being on the one hand residential systems with a capacity up to 10 kWp (type 1); and on the other hand, small business building systems with a capacity from 10 to 250 kWp as well as medium to big business building and factory systems with a capacity from 250 to 1.000 kWp (type 2).

Type 1 and type 2 received both a total amount of purchase of 100 MW. The Feed-in-Tariff was granted for a period of 25 years for the before mentioned types of installations. While residential systems receive a FiT of 6.96 Baht/kWh, small business building systems receive 6.55 Baht/kWh and medium to big business building and factory systems obtain 6.16 Baht/kWh.

According to a notification of the Energy Regulatory Commission (ERC), the eligible total amount of purchase of 200 MW was further distributed to the areas of responsibility of the two distribution utilities, namely the Metropolitan Electricity Authority (MEA) and the Provincial Electricity Authority (PEA).

To this end, MEA received a total amount of purchase of 40 MW for residential systems (type 1) and additional 40 MW for small business building systems and medium to big business building and factory systems (type 2).

PEA was awarded 60 MW for residential systems (type 1) and additional 60 MW for type 2 systems (small business building systems and medium to big business building and factory systems).

The respective batches of the two distribution operators were then further distributed to regional areas of Thailand.

The regulation foresaw an application process with the following general milestones:

- Applications for the FiT for eligible systems were accepted between 23 September and 11 October 2013.
- As of 14 October 2013, applications were evaluated and applicants were gradually informed about successful applications, based on a first come, first served principle.
- Successful applicants had then a period until 31 December 2013 (later extended until 31 January 2014) to realize the awarded capacities and to prove the commercial operation of the installation on the grid.

Sequence of the Administrative Process in Thailand

The sequence of the administrative process in Thailand is laid down in the regulation B.E 2556 in several corresponding notifications of the Energy Regulatory Commission (ERC) as well as in notifications of the two distribution operators, MEA and PEA.

Regulation B.E. 2556:

Links to original source: www.ratchakitcha.soc.go.th/DATA/PDF/2556/E/111/1.PDF **AND**

<http://www.erc.or.th/ERCWeb2/Front/StaticPage/StaticPage.aspx?p=200&Tag=SolarRooftop>

Translation: http://www.thai-german-cooperation.info/download/20130918_giz_translation_solar_rooftop.pdf

Based on these sources the simplified process structure of Figure 3 can be derived.

Throughout the research of eclareon, stakeholders flagged the issue that the development process was not precisely enough defined and that there was confusion as to the process flow as well as the pre-requirements of certain development steps. This issue is in detailed addressed in the section on “identified challenges” below.

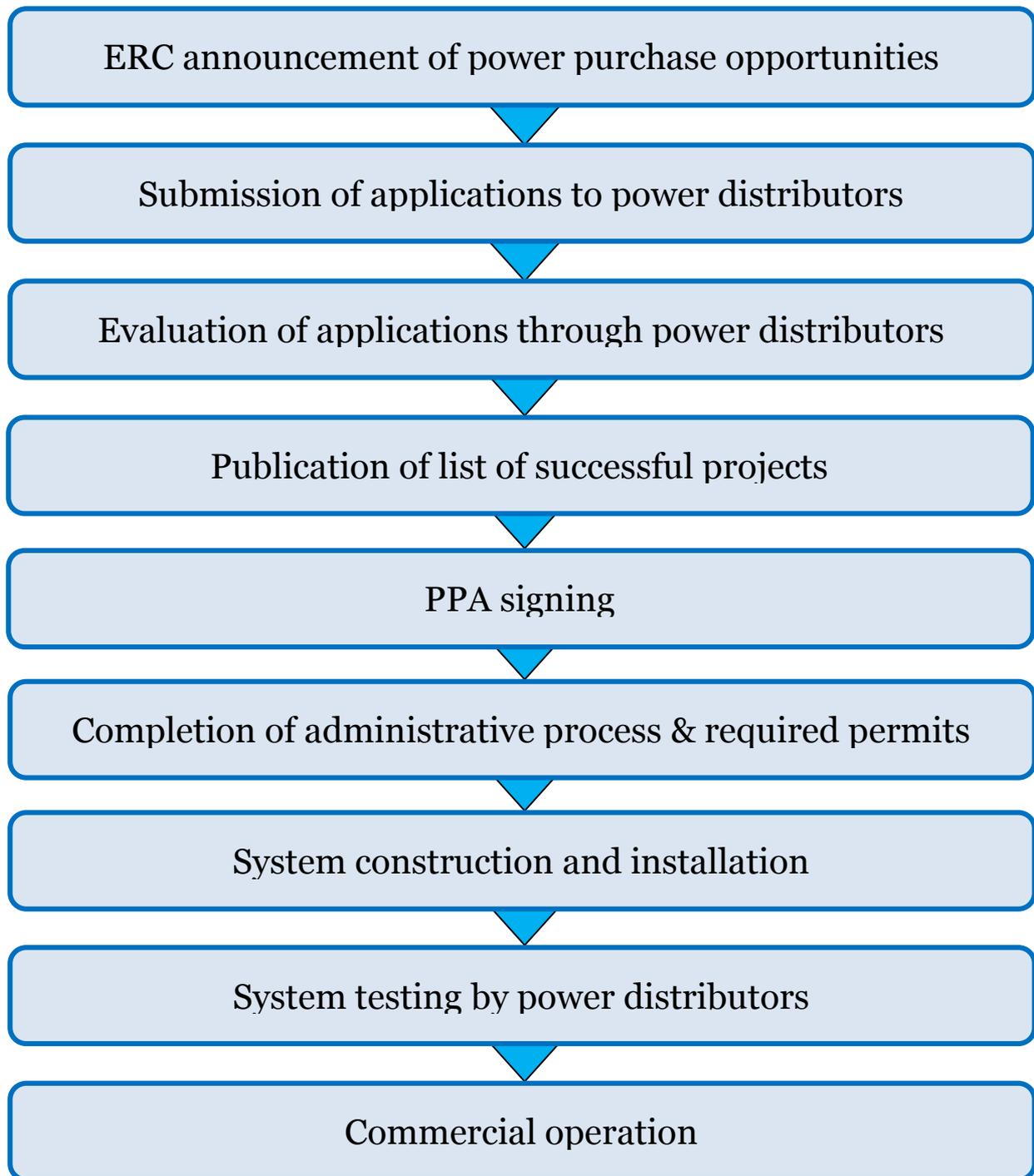


Figure 3: Simplified overview of the PV Rooftop process in Thailand. Source: eclareon research

Identified Challenges for Rooftop Solar PV

In course of eclareon research as well as the corresponding Bangkok workshop many stakeholders expressed their support for the rooftop programme. At the same time, a series of challenges for the development of PV rooftop systems were identified. Most of the barriers can be categorized according to the above described development process steps. Other challenges however are of general nature and do not apply to a specific development step but to the development of PV in general and are therefore presented comprehensively at the end of the section. In the following, only those development steps will be addressed, for which challenges have been identified in the course of the eclareon research.

Before addressing the identified challenges for the development of rooftop solar PV in Thailand, the author wishes to highlight that the research also identified very positive aspects of the current development process, which may serve as lead model for other PV markets in the region.

In this regard, it is to recall that the existing rooftop regulation and the inherent procedure were developed in a very short period of time, with a general decision of the National Energy Policy Council in July 2013 and the official opening of the call in September 2013. By international comparison is this one of the fastest implemented solar support programmes. Considering this short handling time, the outcome has to be appreciated. Particular worth mentioning is the degree of detail of the regulation and the corresponding notifications. A lot of aspects are already considered which generally have only been addressed in more mature markets around the world. It is therefore to assume, that the competent authorities and institutions that have been involved in the legislative and administrative process have carefully analyzed a lot of lessons learned from other markets to address critical aspects already at a very early stage of market development.

Particular notice deserves for example the dispute settlement arrangement of regulation B.E. 2556 in its division 7. A dispute settlement procedure has been defined to ensure that arising issues regarding the regulation or the PPA can be processed accordingly. There may be recommendations how to further improve the existing procedure; the positive aspect however remains that the topic has been addressed at all; while other regulations in different markets around the world remain silent on this issue.

Furthermore, the current regulations as well as the corresponding notifications also contain detailed provisions on the installation of solar rooftop systems through certified installers. The requirement of certified installers can ensure that installations are mounted correctly and that systems are set up in a way to ensure an optimal performance; which is ultimately also raising the public acceptance of the technology.

An adequate formation and training system is a pre-requisite for this approach, through which installers can be trained and eventually be certified for the work with solar rooftop installations.

Even though the before mentioned aspects mark a very encouraging starting point for solar development in Thailand, there are a number of challenges, which are hindering a smooth development of the rooftop solar segment and which should be addressed to support the development of this technology further.

A very encouraging initiative in this regard has been taken by the Thai Energy Regulatory Commission (ERC), which has already started identifying existing challenges in the regulation and procedures and is evaluating potential solution options to remove existing issues, respectively to reduce their impact.

Challenges at step “ERC announcement of power purchase opportunities”

For the development step “ERC announcement of power purchase opportunities”, one challenge has been identified regarding the long term perspective of the promotional scheme, respectively the predictability of the future process.

Predictability of the future process

Regulation B.E. 2556 is setting out in its section 12 that ERC shall announce purchase opportunities “from time to time”. The legal wording has to be identified as first challenge for the development of solar PV rooftop project; not at least as the regulation remains unclear concerning future application tender rounds for the FiT.

Only on an ad hoc basis will developers and investors be informed of purchase opportunities, leading to difficulties concerning the preparation of participation to the call and any required administrative procedure therefore, respectively the realization of the projects itself.

Especially for a healthy and lasting development of a Thai solar industry, stable market conditions are crucial. Being faced with the vague outlook of future FiT application processes, arising from the legal wording “from time to time”, Thai developers and investors will be reluctant to hire new personnel or to open new local branches of their businesses and to risk to be eventually forced to discharge employees or to close branches due to missing perspective for solar in Thailand. The stop-and-go policy under which solar is currently developed is preventing companies to draft long term strategies for their businesses and to develop lasting capacities and structures. The situation is equally difficult for international developers and investors, who consider penetrating the Thai market.

At the same time, the ad hoc nature of application opportunities as well as the very short realization period of the first rooftop tender round almost required for the presence of developers and investors in Thailand. Only if they are entirely familiarized upfront with the required development processes and the related permits and regulations, developers and investors will have a chance to realize awarded capacities in due time. The current call has even proven that the given realization period until 31 December 2013 was apparently too short as to allow for the construction and installation of projects; as no project has been realized until the indicated deadline. Also the extension of the deadline to 31 January 2014 has not led to any projects being connected to the grid within that timeframe.

To this end, the missing long term perspective of the current promotional scheme as well as the ad hoc nature of tenders is decisively influencing the attractiveness of the Thai market, even with its decisive solar potential.

Proposed solution(s)/ international experience(s):

Generally, the Alternative Energy Development Plan (AEDP) is providing for a general 25% renewables target until the year 2022. Within the overall target of 25% sectorial technology specific objectives are defined. However, sectorial trajectories or interim targets as well as concrete measures on how to achieve these targets could define a more precise development path for the various renewables and the respective technology specific interim targets towards the 25% objective in 2022.

Such technology specific targets and interim targets could be defined to allow for a progress monitoring of the development of the different technologies and provide the PV industry in Thailand with better planning and investment security and thus help ensuring jobs and growths in the sector. These objectives could be included in a specific Renewable Energy Development Roadmap. This Roadmap (or Action Plan) could be shaped similar to Thailand’s Energy Efficiency Development 2011-2030 which has been followed up by a 5-year Action Plan with clear actions, timelines and resources indicated.

Such a comprehensive approach for all relevant renewable technologies in Thailand would allow for an anticipation of required reforms and challenges but also of potentials and benefits for the Thai nation. To this end, grid operators would much better be enabled to predict required grid reinforcement or extensions; but also to analyse the potential to benefit from grid reliefs through on spot self-consumption, especially in case of small solar installations.

The sectoral renewable strategy shall also provide for a timeline regarding upcoming purchase opportunities. If Thailand chooses to operate the solar development further on a tender system, whereby batches of MW will be called on a regular basis, it is advised to communicate the upcoming purchase opportunities with sufficient lead time to allow for the participation of all interested stakeholders. The current ad hoc approach should no longer be pursued, as it is preventing the development of a lasting Thai solar industry and risks to result in a bad quality of projects, caused by insufficient preparation and realisation time. In addition, the short realisation periods also raise the attractiveness of “accelerating payments”, which the developer or investor might deem necessary to obtain required permits in due time or to speed up certain development steps.

Challenges at step “submission of application to power distributors (PEA/MEA)”

For the steps “submission of application to power distributors” a challenge has been identified in form of the requirement to present the application for the FiT in person at one of the power distributors offices. The barrier is however closely linked to the selection and evaluation process in general as an early physical presence of applicants at the distributors offices was required to have a high list position in the registration process, which had a decisive influence on the applicants chance to be considered for the FiT. In this regard, it is advised to also consider the next chapter on “challenges at step evaluation of applications through power distributors”.

Requirement to apply for FiT in person

The ERC notification of 6 September 2013 in its clause 3 is providing that applicants have to apply in person for the FiT at one of the distributors offices.

This requirement resulted in conditions, where applicants queued at 4 a.m. in the morning in front of the distributor’s offices to be registered. In this regard, it is to flag that an early registration resulted in a high list position for the selection and evaluation process, which was decisively influencing the chances to be considered for the FiT.

The registration in person is however a limiting factor for the access to the FiT for small PV rooftop projects. Developers from remote areas of Thailand for example had to take substantial more burdens as developers being situated in Bangkok or near one of the other registration offices to apply for the support scheme.

Proposed solution(s)/ international experience(s):

Based on the before described situation, it a mode to broaden the applicant base could be conceived. An option could be an online registration process, through which stakeholders could not only register for the FiT, but would also receive information on other projects that were already registered. Such an approach would provide full transparency as to the number of registered projects and their registration number in line.

Throughout the seminar on “removing barriers for PV rooftop system” of 12 December 2013 in Bangkok, ERC as well as PEA were generally open for such an approach. However, they also flagged potential technical difficulties in terms of internet availability and internet server capacities for a respective process. Both mentioned that the current technical standards of both companies were most likely not suitable to introduce such an online process on a short term basis. In addition, they also addressed concern regarding the internet security of such an online portal. Any online registration system would have to ensure the highest security possible to avoid any misuse or fraud.

An international good practice example in this regard may be identified in form of the “Sistema de Registro Micro-produção” (SRM) in Portugal, being an online registration system for micro generation installations. Through the renewable industry online portal “Portal Renováveis na Hora” (www.renovaveisnagora.pt) developers are able to perform the required project registration as well as all required permitting procedures. At the same time, one single authority is taking care of the entire process; thus providing a true one-stop-shop.

Challenges at step “evaluation of application through power distributors”

Regarding the “evaluation of applications through power distributors”, several challenges were identified, respectively flagged by stakeholders. These regard on the one hand the legal selection criteria; on the other hand, there is confusion about the actual evaluation and selection process of filed applications.

Selection and evaluation process

Throughout the analysis of the selection and evaluation procedure, applied for the allocation of purchase capacities, it appeared that the actual practice differed from the legally defined proceedings. While the legal texts defined the first come first served principle as decisive element for the selection of projects; the practice appeared to be different. Several stakeholders reported in this regard that the first come first served principle was not the basis for the actual selection of projects, but served as prequalification criteria for a lottery, based on which projects were finally selected. A comprehensive description of this process and the difference between the practice and the legally defined procedure is provided in the following sub-chapter on “legal selection criteria”.

For the present development step however this differing proceeding regarding the application of the first come first served principle also had an important influence, as only a limited number of projects were actually admitted to participate to the lottery. These projects were preselected on the basis of the first come first served principle. In this regard, stakeholders outlined that for the two distribution grid operators only a predefined number of projects were considered for the lottery. Stakeholders explained further that they were told that only projects, which were registered prior to 8:30 on 22 September 2013, were actually admitted for the lottery. Any other project, being registered after this deadline was not considered. It was further reported that the two distribution operators performed the lottery differently: while MEA applied a computer-based lottery, PEA actually drew lots in form of the registration number ticket of participants from a lottery box.

Assuming that the congruent reporting of stakeholders on the actual registration and selection process is correct, it has to be stated that this would be a violation of the legally defined process as set out by the regulation B.E 2556 and the relevant notifications. Stakeholders outlined in this regard that the competent authorities realized in the course of implementation of the legally defined process that the first come first served criteria might not be an admissible selection criteria under the Thai laws. In addition, the first come first served principle was also considered to render the proceeding more prone for corruptive influence.

Based on this assessment the authorities decided to apply in practice the differing procedure, whereby the first come first served principle was applied; however, only as prequalification criteria for the subsequent lottery selection process.

The chance of the registration process, respectively of the evaluation and selection procedure might have been based on valid assumptions; still, it has to be flagged that any change of the procedure and the selection criteria should have been communicated publically to inform all involved stakeholders equally. Presently, it appeared that not all stakeholders got aware of this change of process as they reported inconsistently about the actual procedure.

Furthermore, the official timeline foresaw an application period between 22 September and 11 October 2013. In reality, only projects that were registered on 22 September 2013 prior to 8:30 a.m. were actually successful. The long announced application period of almost three weeks (22 September to 11 October 2013) was therefore redundant and even misleading as it signaled interested stakeholders a longer application corridor and thus a longer preparation period, which did not exist in reality.

Finally, stakeholders flagged two additional challenges regarding the selection process, being on the hand the missing information for a denial of the FiT; on the other hand the missing clearing process, whereby failing projects could be replaced by other project that have not been considered in the first round but which are generally eligible.

Regarding the first aspect, stakeholders outlined that only those projects that were officially considered for the purchase of capacities received an official letter. Projects that did not receive a purchase offer were neither informed of

the fact that they would not be considered, nor did they receive any reasoning why their offer was refused. Considering the actual selection method in form of a lottery it appears comprehensible why no reasoning was provided, as the selection was not based on justifiable grounds, but was left to chance.

The second aspect however is of even bigger relevance; not at least regarding the realization of the entire planned capacity. The current process for the purchase of capacities under the FiT for PV rooftop installations does not provide for a procedure, whereby in a first round projects would be selected with a total capacity equivalent to the targeted MW and additional projects would be lined up on a waiting list; to be considered in case a selected project fails throughout the process of realization.

It remains unclear how nascent capacities, especially in the business segment would be “replaced” to realize the entire planned capacity.

Proposed solution(s)/ international experience(s):

Considering the before mentioned issues, several suggestions can be made:

In first, it is advised to introduce a clear and transparent application and selection process, which is defined by law. Implementing authorities should strictly follow the defined procedure. If any correction to the procedure is required (prior to a call or even within an open tender) there should be an official announcement, which is clearly outlining on the changes of the procedure and their respective effects. Under such circumstances, it appears reasonable to even stop open tenders and to reopen them after a certain period of time to allow for all stakeholders to adapt equally to the new procedures.

In the present case of the solar PV rooftop tender, the reasons for the change of procedure appear to be valid and comprehensible. In addition, the lottery process is an appropriate method to select projects, which are entitled for the purchase of capacities. Still, the newly applied proceeding is not in line with the legally defined registration and selection process and thus should not have been applied for the selection. Stakeholders appeared to have different information levels on the change of procedures, resulting in conditions, where an equal access of participants to the available capacities of the tender is at least doubtful.

Regarding the announced application period of almost three weeks and the actual practice, which allowed only projects that were registered on the first day of the application period prior to 8:30 a.m. to participate to the lottery, a more transparent communication is advised. The lottery should either have been opened for all projects that were registered within the defined application period of three week, regardless if they were registered on day one or any following day; or the application period should have been decisively shortened. In both cases, a clear communication would have allowed interested developers to adapt to the requirements, to be potentially considered for the FiT.

On the subject of missing information for a denial of projects under the FiT procedure as well as the missing reasoning for the non-consideration, it is advised to also apply a transparent and clear process. Applicants should be informed if their project is awarded with a purchase opportunity or if the applied capacities are not considered.

Depending on the selection method, reasons for the non-consideration should be communicated to the applicant. If the Thai authorities decide to also base future selection processes on a lottery format, a respective reasoning for the non-consideration is obviously obsolete. Where the below described waiting list approach is applied, applicants could also be informed about their consideration on the waiting list and their position in line.

In relation to the second identified issue regarding the unclear procedure for a project succession in case of project failure of awarded capacities, it is advised to introduce a waiting list procedure, whereby in a first round the competent authority would select a first batch of projects with a total capacity equivalent to the targeted one. Additional projects, which are generally also eligible, would then be lined up on a waiting list (for example on a first come first

served basis) to succeed failing projects of the first selection batch. Such a procedure is ensuring that finally all targeted capacities are actually realised. Incomplete applications would not be considered for the waiting list. The waiting list should be applied per call, i.e. if all targeted capacities are eventually realised within a given tender round, the waiting list will be closed and remaining projects are not transferred to any future tender round. Consequently, any new tender would be opened virgin.

In addition to the waiting list, a milestone approach should also be applied, defining milestones for the selected projects that are to be achieved in a defined period of time; not at least to ensure progress of the projects and avoid speculative conditions. Projects failing to meet the defined milestones in the foreseen time period might receive an additional short deadline and would be taken out of the process if they also fail to meet the additional deadline.

The milestone approach has successfully been applied in a number of European countries, with France being the first state to have implemented the approach. Lessons learned from these countries have shown that a careful definition of the milestones and the respective time periods is advised. The allowed realisation period for the different milestone should be as long as to allow for a realistic and healthy implementation of the project; it should however also be as short as to ensure a timely realisation of targeted capacities. Where projects are taken out of the process due to the non-compliance with milestones and/or deadlines, new projects from the waiting list would enter the realisation process with a new timeline.

Legal selection criteria

Regulation B.E. 2556 is setting out in its sections 11 and 13 that the selection and evaluation of applications has to be based on several legally defined criteria; the most important one being the first come first served principle. In addition, further selection elements may be considered, such as the criteria of connection possibilities to the power network. As outlined above, the legally defined criteria were not applied as foreseen by the law, but a lottery format was chosen for the selection of projects under the FiT.

The eclaration analysis of the process, however, has also identified challenges regarding the legally defined selection criteria, which would have been a hindering factor for the development of PV rooftop installations if they had been applied as defined by the law.

As for the additional criterion “connection possibilities to power network”, it is to highlight that the developer has no influence on the availabilities of grid connection capacities, respectively the required grid infrastructure. Consequently, the developer is confronted with a criterion that is out of action sphere, but which might result in a denial of the FiT.

Proposed solution(s)/ international experience(s):

In general, the selection process and its inherent methods should be clearly defined, preferentially by the law and uniformly applied by the involved authorities. All stakeholders should equally be aware of the requirements, arising from the applicable procedure.

Regarding the additional selection criterion of “connection possibilities to power network”, it is to advise to apply only those criteria, which are actually in the action sphere of the applicant, i.e. factors that the applicant can actually influence to comply with the requirements. Existing insufficient grid (connection) capacities should be addressed differently; for example by reducing the eligible capacities for the concerned regions from the beginning. In this regard, the current call equally distributed the 200 MW over the grid operators areas and furthermore to the different Thai regions. Here would have been a chance to reduce the eligible capacities for some regions from the foreseen 5 MW to only 2 or 3 MW and to raise the capacities for those areas, where higher grid connection capacities are available.

Challenges at step “completion of administrative process and required permits”

Regarding the “administrative process and the required permits” a number of challenges have been identified, especially regarding the factory operation license. In addition, the required building permit also bears the potential to lengthen the realization period for PV roof top projects. Finally, the current practice for the certification of inverters for rooftop systems is a further hurdle for project developers.

Factory Operation License

The factory operation license has to be considered as a central challenge for the further development of PV in Thailand; still, the issue is well known and several attempts to overcome the subject have been undertaken. The core issue regards the historical definition of a power plant under the Factory Act 1992. Electrical installations with a capacity of more than 5 Horse Powers (~3.73 kWp) are considered as power plant, requiring for a factory operation license issued by the Department of Industrial Works (DIW). For the calculation of the Horse Power of a PV installation, the definition is referring to the capacity of the installation as well as of the used inverter. Regarding rooftop PV, the application of this principle and definition results in condition, where even very small rooftop installations on private households will be treated as power plant.

In addition, stakeholders flagged their confusion as to the moment in time in which the factory license has to be on hand. In this regard, different dates were communicated; while some received the information that the factory license has to be presented already with the application documents at the registration for the FiT, others mentioned that the license has to be presented prior to the start of construction of the installation. Stakeholders furthermore highlighted the inconsistent information policy and practice of different authorities in regards to the factory operation license.

Given the already mentioned delay of projects under the current call, stakeholders in addition reported that authorities asked project developers to start construction of installations even in absence of a factory operation license to minimize any further delay of these projects. In this context, the very short realization time for awarded projects is again to highlight, resulting in conditions, where stakeholders expressed even doubts if in this period the factory operation license could be actually obtained. This situation is a gateway for “accelerating payments” of developers to authorities in order to receive the required license in due time and thus comply with the regulation and the given timeline.

A further dimension of the factory operation license issue has been flagged by stakeholders in form of additional existing restrictions for the installation of “power plants” in urban areas (residential as well as commercial). In this regard, it was outlined that the construction of rooftop installation, as far as they are considered as power plant, is generally not allowed in urban areas. Stakeholders flagged in addition that power plants are not permitted on buildings and would generally have to respect a 200 m “safety zone” around buildings. This restriction would put serious restriction to the installation of rooftop solar PV installations in Thailand; not at least as even very small rooftop installation on private households will fall under the definition of a “power plant”, as outlined above.

Proposed solution(s)/ international experience(s):

Generally, it is advised to define clear requirements, procedures and deadlines for obtaining the factory operation license. The information should be made publically available and equally known to all involved stakeholders. In addition, procedures, requirements and deadlines should be applied transparently and uniformly by the competent authorities.

Regarding the historical definition of a “power plant” under the Factory Act 1992, the encouraging position of ERC, to waive the factory operation license for solar installation with higher capacities, should be advocated to facilitate the process. The use of decentralised power generation through the broad application of renewable energies has

changed the historical picture of power plants dramatically. Seeing the broad potential for solar (rooftop) PV in Thailand, the capacity limits of the current power plant definition should be revised to reflect market realities of today. At least small to medium sized installations shall no longer be considered as power plant; thus, not requiring for a factory production license. A different case may be seen in large ground mounted PV installations of several MW.

Still, considering the above outlined issues, it is also worth highlighting that even if higher capacities would be exempt from the factory production license, additional restrictions would remain regarding the fact that power plants have to respect certain “safety zones” around building and may not be attached to a building’s roof. These limiting elements would also have to be revised to streamline the existing procedure entirely.

As parliamentary law, the revision of the Factory Act 1992 will however require the involvement of the Thai National Assembly, consisting of the Senate and the House of Representatives. Considering that the House of Representatives is currently dissolved, the issue may only be addressed after the election and the constitution of a new House of Representatives and a new Thai Government.

In case, the new government still wishes to keep the current procedure and definition of a power plant and of the factory operation license, deadlines for the calls of the development batches of solar PV should be defined in a way to allow for a proper compliance with the defined process. If the development of projects has to be realised in a very short period of time, the government should consider the introduction of fast track procedures for selected projects, to ensure that developers can comply with the defined timeline of the call and at the same time obtain the required permits and licenses, which are necessary to plan, install and construct the installation; without a recourse to “accelerating payments”.

Building permit

A further challenge regarding the administrative process, respectively the required permits has been identified in form of necessary building permits for solar PV rooftop installations. Under the Building Control Act 1979, building permits (also called licenses of modification of building) from local authorities may be required for the construction of a PV rooftop installation.

As a general rule, a building permit is required if more than 10% of the structural weight of the roof (kg/m²) is added to the building. Given the very small upper limit of 10% almost all (rooftop) solar PV installations will fall under the definition, respectively will require for a permit.

Certain exemptions have been made for several types of buildings, respectively their construction materials: In this regard, buildings with a concrete tile or slab as well as buildings with a metal sheet or asbestos cement roof are not requiring for a building permit.

All other buildings need a building permit and have to perform the foreseen procedure, including a survey of the building and the installation, executed by a competent civil engineer. The survey will also comprise the documentation of the project, the necessary calculations and engineering drawings as well as photos of the project. The realization period will decisively be lengthened by this process.

Proposed solution(s)/ international experience(s):

In general, it is advised to exempt at least small rooftop PV installations from the building permit requirement to allow for a burden-free development of this segment. This is common practice in a large number of European markets and has proven to be an effective measure to streamline procedures.

Considering, however, the current building stock in Thailand, a general regulation, respectively the general exemption from the building permit for all buildings and roof types does not seem appropriate: construction methods, used materials and the age of buildings is highly differing and requires for an individual assessment.

In this regard, ERC has presented a very encouraging and sophisticated approach, whereby those buildings are exempt from the building permit requirement for which certain material have been used, ensuring a sufficient load-bearing capacity and a general stability of the building. In contrast however, the ERC approach requires for a detailed examination of those buildings, for which doubts exist regarding the integrity of the structure.

Still, even for those buildings, which generally require for a building permit it is to ask whether a leaner procedure can be implemented which is ensuring the required safety and at the same time can be implemented with less administrative effort. A potential solution could be to require from the building owner a statical report from a certified expert, stating the sufficient bearing capacity of the building. The building owner would then have to present the report with the administrative documents for a rooftop system, certifying the general compliance with the legal requirements. No administrative procedure would have to be performed.

Such an approach would render the building permit obsolete and would transfer the obligation to comply with the safety requirements and the inherent risks to the building owner. At the same time, the control of the state would be minimised.

In case the building does bear the load capacities of the installation and collapses, even though the statical report of the certified expert is stating the compliance with regulations, the building owner may subrogate against the certified expert. In case the statical report has been obtained illegally and without the consultation of a certified expert, the building owner would be even criminally liable. The transfer of responsibilities to the building owner is also common practice in European markets and assumes that the owner has an increased self-interest to prevent his own building from any damage; thus, taking all required measures to ensure a safe installation and operation of the rooftop PV system.

Finally, concerning the 10%-rule regarding the structural weight, it is advised to reconsider the exact percentage, until which a building permit is not required. The current threshold is quite low, resulting in conditions, whereby almost every rooftop installation, even with a very small capacity, requires for a building permit. An uprating of the threshold may therefore be advised, exempting at least small rooftop installations on private households.

Inverter Certification

The two distribution operators, namely the Provincial Electricity Authority (PEA) as well as the Metropolitan Electricity Authority (MEA), require for a certification of applied inverters for rooftop systems in their operation areas. In this regard, PEA is responsible for 73 Thai provinces; MEA is covering 3 Thai provinces, including the capital Bangkok. Both operators defined different details for the inverter performance certification, adapted to their respective operation areas, which are specified in respective regulations.

For the certification two testing procedures are commonly applied by both operators: a type testing, evaluating around 12 test items, as well as a routine testing, considering only 3-4 test items.

While under the type testing procedure only a few randomly selected inverters of a certain model series are actually tested, certifying eventually all inverters of the same model series; the routine testing has in fact to be performed for every single inverter separately.

The type testing has to be performed by an “official body”, being a certified authority for the test procedure. Certification may also be performed outside of Thailand, if the testing procedure is considering all requirements of the Thai regulation and is performed by an authorized institution. The inverter performance certification for Thailand is gen-

erally referring to international standards and norms; yet certain test requirements exceed the international standards and have therefore to be specifically addressed. A type testing report is published by the “official body”, certifying all inverters of the same series model for the use in Thailand.

The routine testing consists of less test items; instead it requires that the single inverter is subject to the test procedure; prior to its use for a PV installation. The routine testing may be performed by the inverter manufacturer himself at the production site. The inverter would then be delivered with a test certificate that has to be presented to the distribution operator. If a routine testing cannot already be realized through the manufacturer, the testing would also have to be performed through an “official body” in Thailand, prior to the installation and use of the inverter.

Regarding the certification requirements, stakeholders flagged two challenges for the development of rooftop solar in Thailand. On the one hand, stakeholders mentioned that the existing certification scheme, respectively the effort to comply with the requirements were disproportionate to the envisaged aim of a safe operation and results in longer project realization periods and higher costs for the developers. On the other hand, stakeholders also highlighted their confusion as to the definition of the “official body”, being a certified authority to perform the type testing. It was outlined that the requirements for a test laboratory that wishes to be certified as “official body” were not clear, resulting ultimately in only a limited number of eligible test facilities, on which developers can rely for the required certification.

In addition, a number of stakeholders appeared to be confused about the actual certification requirements as they were not able to precisely describe the required procedures, respectively were not aware of the two different test procedures, which are to be performed in parallel. This situation may be an indication for an insufficient availability of information on the existing requirement and procedures regarding the certification of inverters.

Finally, there is a differing analysis among stakeholders regarding the existence and application of standards for PV rooftop in Thailand. While some stakeholders are assuming that sufficient standards have been defined and are applied for the development of rooftop PV; others doubt this view and are requesting a broader definition and use of standards for the development of solar PV in Thailand.

Proposed solution(s)/ international experience(s):

Regarding the certification of inverters, it is first of all positively to underline that the Thai authorities have given substantial thoughts to this topic. The taken measures are able to provide security for the operation of inverters in solar installations. In addition, the above outlined approach is also addressing the issue of different grid conditions and requirements in developed markets and developing countries. Inverter standards that are operated in European markets may not necessarily be compatible with Thai grid conditions. To this end, certification of products on local conditions is reasonable.

It is however to ask whether there is a need for two different standards that are operated independently by PEA and MEA. In this regard, a harmonisation of requirements and standards may be advised to develop a unified certification procedure and standard and to facilitate procedures for developers.

In addition, the author also pleads for a strong involvement of the solar association in the definition process for such a unified standard. The association as representation of the Thai solar industry is able to provide a different and very practical dimension to the discussion. The involvement of the industry at an early stage of the definition of standards will allow developing procedures and requirements, which ensure safe operation; yet, at the same time also allows for an easy compliance with requirements by developers. Only if both sides are equally able to flag their issues but also their requirements, it will be possible to define a national Thai standard that will bring benefits to the market for all sides. Such a unified agreed standard, adapted to the local conditions, will also be a powerful signal to the entire ASEAN region.

General challenges for the development of solar PV rooftop systems

As mentioned before, a series of challenges exist, which are not necessarily specific to a single development step, but apply to the general development process as such. The challenges include the structure of the relevant laws and regulations and the inherent differing competencies of a high number of governmental authorities. In addition, it also comprises the general concern regarding the influence of dominant or influential stakeholders and the existence of accelerating and extra-administrative payments.

Legal regulations and involvement of high number of authorities

The current purchase of power from solar PV rooftop systems under a Feed-in Tariff is mainly regulated by regulation B.E. 2556, which is however not exclusive in its scope, but requires for a multitude of specifying notifications to define the legal framework of PV rooftop development. In addition, further laws and regulations have decisive influence on the development of rooftop PV installations. In this regard, the Factory Act 1992, the Energy Industry Act 2007, the Building Control Act 1979 and the Energy Production and Development Act 1992 are at least to mention. This situation is resulting in a confusing regulation and a difficult interaction of norms and law.

In addition, the fragmented regulation is also leading to the involvement of a high number of authorities with differing competencies and at times conflicting interests. This situation is leading to complicated procedures and requirements, which will cost developers more time to comply with and which will ultimately lead to higher costs for the development of rooftop PV in Thailand.

Finally, the complicated framework as well as the high number of involved authorities and their individual interests is leading to a complicated framework, which is making the identification of existing challenges and their removal even more challenging.

Proposed solution(s)/ international experience(s):

It is advised to define a clear legal framework; at best in form of a central renewable law and further specifying ordinances, regulating individual technology subjects.

In this regard, the very encouraging initiative of the Thai government for a Renewable Energy Act is to salute. Such a law would ultimately lead to a clear regulatory framework for renewables technologies and will be accessible also for foreign investors.

In preparation of the new law, but also for future additional calls for PV, for the remaining period until a new renewable energy act has entered into force, it is advised to carefully screen the existing norms and regulations and to identify unnecessary requirements, as well as conflicting competencies and interests, which are delaying or even blocking the development of solar PV.

In this regard, the already taken actions of ERC to identify existing challenges and potential solutions is a very encouraging initiative, underlying again the model role that Thailand can play for the entire ASEAN region.

Influence of dominant stakeholders/extra-administrative fees

Throughout the eclareon research, stakeholders repeatedly expressed their concerns as to the influence of dominant and influential stakeholders on the procedure for the selection of eligible developers for the purchase of power under the FiT. In this regard, stakeholders feared that influential or dominant stakeholders might have had pre-access to tendered capacities; thus, not participating in due form to the tender procedure. Stakeholders especially underlined their concerns regarding the missing transparency of the procedure and the awarded capacities.

In addition, stakeholders highlighted that accelerating and extra-administrative fees also occurred in the framework of the tender for PV rooftop development; in some cases it was pointed out that such fees are at times required to perform certain development steps in general, respectively in due time.

Proposed solution(s)/ international experience(s):

Irrespectively of the question, if the before mentioned concerns of stakeholders are accurate or not, a selection and development process for rooftop PV installations has to be designed, which ensures full transparency of decisions. Stakeholders should be enabled to comprehend and to relate to the outcome of the process and its genesis.

The authors of this study plead for a transparent and clean process for the development of rooftop PV. It has to be stressed that unless transparency especially with regard to administrative fees is not provided to the full extent, foreign investment will only very limitedly be available; constraining the full solar potential of the country.

