

An assessment of Thailand's feed-in tariff program



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ABSTRACT

Thailand was one of the first Asian countries with a comprehensive feed-in tariff program, with streamlined interconnection regulations adopted by the Thai Cabinet in 2002 and technology-specific tariff 'Adders' in 2006. This paper presents an overview of the country's feed-in tariff, or Adder, program and its development. As of December 2011, Thailand has about 8000 MW of renewable energy projects in the pipeline seeking Adder and about 1000 MW already connected and selling power to the grid. Thailand's feed-in tariff program has undergone significant transitions especially since 2010 in tariff levels and screening criteria partly in response to applications for 471 solar electric power plants exceeding 2000 MW. A powerful new oversight committee comprising utility and Ministry of Energy representatives has raised concerns regarding transparency and consistency, and significantly reduced approval rates of new applications.

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1. Introduction

Feed-in tariffs (FiT) are the most widely used national renewable energy policy worldwide, and are recognized as one of the most effective and efficient drivers of renewable energy (RE) scale-up by creating investor security [1,2]. As of early 2012, feed-in tariffs are in place in at least 65 countries and 27 states [3]. Although most FiTs have been put in place in developed countries, 28 national FiTs are in place in developing economies [4].

Thailand was one of the first Asian countries to implement a feed-in tariff (FiT) program, with streamlined interconnection regulations and avoided-cost tariffs adopted by the Thai Cabinet in 2002 [5] and technology-specific renewable energy premium tariffs in 2006 [6,7]. The program is called "Adder" because it adds additional payment to RE generators on top of the normal prices that power producers would receive when selling electricity to the power utilities. This paper provides a summary and an analysis of Thailand's feed-in-tariff program, its strengths and weaknesses, and the evolving context in which it operates.

2. Thailand power sector and renewable energy policy

Compared with other Southeast Asian countries, Thailand has the highest electricity demand, with plans for increasing imports

from neighboring Laos, Myanmar, Cambodia, and China. Electricity consumption in 2012 was 150 billion kWh. Over the past 10 years, electricity demand has been growing at about 770 MW per year or about 3.2% per year. The current installed capacity is 32,200 MW, with the majority of energy sources from natural gas (66%) and coal (20%) [8]. Non-hydro renewable energy contributes a minor (around 5%) but increasing share of total electric power generation [9].

Over the past 20 years, Thailand's electricity sector has evolved from a government monopoly to a semi-unbundled structure called the "Enhanced Single Buyer" model. This model, shown in Fig. 1, consists of the state-owned Electricity Generating Authority (EGAT) of Thailand owning about 50% of generation assets and 100% of transmission assets. The other half of the generation assets are developed and owned by private companies, including Independent Power Producers (IPPs), Small Power Producers (SPPs), and Very Small Power Producers (VSPPs). IPPs and SPPs produce and sell power to the high-voltage transmission system owned by the only buyer, EGAT. VSPPs sell power through the two state-owned distribution systems, the Metropolitan Electricity Authority (MEA) and the Provincial Electricity Authority (PEA).

Thailand's policies related to energy, including electric power and renewable energy policies, are drafted and proposed by the Ministry of Energy (MoE). Policies related to electric power and natural gas transmission are regulated by the Energy Regulatory Commission (ERC).

Thailand's renewable energy policy is supported by the government's long-term renewable energy (RE) plans. The country's

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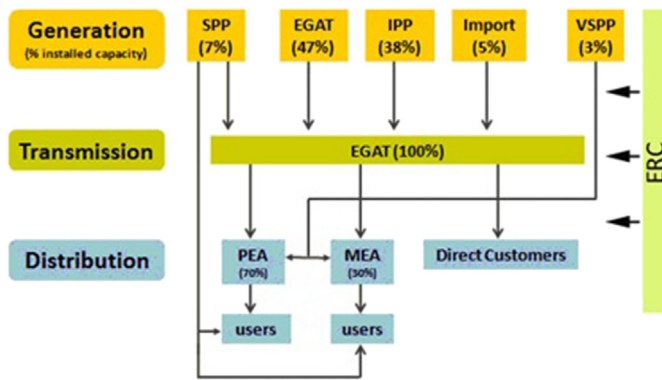


Fig. 1. The structure of Thailand's electric power industry. Source: Data as of December 2010, compiled from Ref. [10].

first RE plan, the 15-Year Renewable Energy Development Plan (REDP 2008–2022), sought to bring renewable energy to 20% of final energy consumption by 2020. In 2011, the REDP was subsequently replaced by the 10-Year Alternative Energy Development Plan (AEDP 2012–2021). The AEDP aims to increase the share of RE to 25% of final energy consumption, with the share of each type of renewable energy as shown in Fig. 2. Table 1 shows that many types of RE reached short-term targets of the original REDP plan.

A major impediment to Thailand's renewable energy development has been the lack of integration of RE plans with Thailand's long-term energy planning process. As shown in Table 2, Thailand currently has six separate long-term national energy plans for each type of energy, proposed and overseen by different government divisions. There is no overarching plan to ensure policy coordination and the accomplishment of policy goals. The most immediate manifestation of this policy ambivalence has been discontinuous support for the Adder measure, which – when operational – is one of the major mechanisms that will help the country meet its renewable energy targets. Discontinuous support for the Adder, in turn, has created a high level of uncertainty for investors.

3. Thailand's Adder program

Thailand's Adder program incentivizes renewable energy by guaranteeing attractive power purchasing rates. Eligible

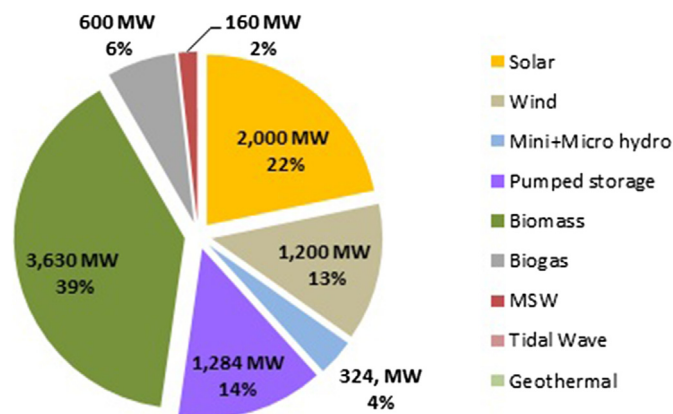


Fig. 2. Thailand's renewable energy targets according to the 10-Year Alternative Energy Development Plan (AEDP 2012–2021).

participants enter into long-term contracts with the local utility to sell electricity at a pre-specified tariff for a pre-specified period of time.

The program is implemented through Thailand's three electric utilities: the Electricity Generating Authority of Thailand (EGAT), the Metropolitan Electricity Authority (MEA), and the Provincial Electricity Authority (PEA). The three utilities purchase electricity from renewable electricity generators using two types of regulations:

- Very Small Power Producers (VSPP) regulations: for generators sized less than or equal to 10 MW. Electricity produced by the VSPP is sold to PEA or MEA.
- Small Power Producers (SPP) regulations: for generators sized greater than 10 MW and less than 90 MW. Electricity produced by the SPP is sold to EGAT.

Adder rates are distinguished by technology type, installed capacity, contracted capacity, and project location. The features of the program are summarized below.

3.1. Basic features of Thailand's Adder program

3.1.1. Eligibility

VSPPs and SPPs that utilize solar, wind, biomass, biogas, hydro, and waste energy are eligible to participate in the program. VSPPs and SPPs may be private or public entities, but not utilities.

3.1.2. Rate structure

The rate structure of feed-in tariffs used in Thailand since 2007 is a "premium-price FiT payment" [11] paid on top of the utility's avoided costs. In June 2010 the Thai government approved a plan to switch from a premium-price FiT payment to fixed-price FiT payment, and studies to determine the rate for each type of RE are underway.

3.1.3. Rates

Thailand's Adder rates are differentiated by technology, installed capacity, and geography. Higher Adders are paid in the three southernmost provinces which have experienced political unrest; and in off-grid areas where the PEA generates electricity from diesel power plants. The Adder rates are listed in Table 3.

3.1.4. Cost control mechanism: cap and deadline

The first phase of the Adder program had a deadline for submitting applications at the end of 2008. In March 2009, the program was resumed to accept more applications with no new deadline but the National Energy Policy Commission (NEPC) imposed a broad guideline that new project approval would be subject to acceptable cumulative impacts on pass-through cost to ratepayers.¹ This broad guideline did not specify the level at which pass-through cost becomes unacceptable. In practice this means that utilities, which are tasked with approving project applications, are aware of this eventual ceiling, but have no rule to guide them when to stop approving applications.

3.1.5. Approval process and criteria

In the early phase of the VSPP and SPP programs (from 2007 to 2009), the utility that owns the transmission or distribution system to which the applied project is to be connected was the sole party responsible for application approval and Power Purchase Agreement (PPA) signing approval. The main criterion for project

¹ NEPC Resolution 9 March 2009.

Table 1

A comparison of Thailand's renewable energy targets and 2011 status.

Type of RE	15-year target (until 2022), MW	2008–2011 target	Actual on-grid capacity (SPP + VSPP) as of Dec 2011	Difference (+ = above target – = below target)	%Difference (% above target or below target)
Solar	500	55	110.97	55.97	+101.76
Wind	800	115	0.38	–114.62	–99.67
Small/Micro Hydro	324	165	13.28	–151.72	–91.95
Biomass	3700	2800	724.72	–2075	–74.12
Biogas	120	60	98.69	38.69	+64.49
MSW	160	78	37.33	–40.67	–52.14
Hydrogen	3.5	0	0	0	n/a

approval was grid availability. Since June 2010, however, the final approval authority has moved to the Ministry of Energy and additional criteria were implemented, including projects' readiness in terms of access to loans, land, and government's permits. Furthermore, since August 2009 each new applied project has also been required to submit a security deposit to the utility, which is returned after project commissioning.

3.1.6. Contract term

Approved projects sign a 5-year Power Purchase Agreement (PPA) with the utility to which the project is connected, renewed automatically if none of the contract parties express the need to terminate the contract.²

3.1.7. Support period

The Adder is paid for 10 years (wind and solar projects) or 7 years (other renewables) starting once the project begins selling electricity to the grid.

3.1.8. Financing mechanism

The Adder is financed through a pass-through mechanism to all electric power customers as a component of a quarterly-adjusted automatic fuel price volatility adjustment tariff known as the "Ft charge". The Ft charge appears as a line-item on all customers' monthly electricity bills.

3.1.9. Program review

To date, the Adder program does not specify any timetable for program revision. However, the most recent draft policy revision proposes an annual review of the program and the FiT rates.

3.2. How FiT rates are determined in Thailand

There are four fundamental approaches for determining FiT rates [11], based on:

- (1) Actual levelized cost of electricity generation;
- (2) The "value" of renewable energy generation, either to society or to the utility (the avoided cost of utility);
- (3) Fixed-price incentives that are unrelated to the actual levelized cost of electricity generation or the value of renewable energy generation; and
- (4) The result of an auction or bidding process.

The studies that provided inputs into Thailand's Adder rate setting included consideration and comparison of all calculation

methods listed above, together with an effort to balance multiple policy goals listed in Box 1.

3.3. The evolution of Thailand's Adder program

The development of Thailand's Adder program can be divided into 3 phases, differentiated by changes to the rules and regulation of the program. In the first phase (between 2007 and July 2009), the rules and regulations were simplified and streamlined. Rules and regulations were drawn directly from an earlier phase of Thailand's grid-connected renewable energy support, which included a net-metering program designed for installations exporting no more than 1 MW. In 2006, the government eased the capacity restriction so that VSPPs included generators exporting up to 10 MW, and introduced Adder rates but the same rules and regulation were still used.

Fig. 3 shows the major process of planning for Thailand's Adder program and the involved stakeholders. The Ministry of Energy (MoE) drafted the program and proposed it to the NEPC. The Energy Regulatory Commission (ERC) has legal authority to set rules and regulate the implementation of power policies including the Adder.

When compared to other energy policy formulation in Thailand, the planning for the Adder program in its first two phases (between 2007 and June 2010) was systematic and transparent. As part of a sanctioned public consultation process, the Energy Policy and Planning Office (EPPO) within the MoE solicited comments from stakeholders for potential improvements to the Adder program. The consultation process detailed the assumptions used for rate setting but not the actual model used to calculate the rates. Feedback from the consultation process was integrated into the final draft before the policy was proposed to the NEPC. The planning in the later phases (from June 2010 to the present), however, was carried out without systematic public participation and resulted in major changes to the rate and the regulations.

The attractive Adder rates and streamlined application process in the first phase led to a rush of applicants eager to secure their rights to the Adder – sometimes with inadequate assessment of project feasibility.

In the second phase (August 2009–June 2010), a bid bond, or security deposit, of about \$6/kW was introduced in reaction to high interest in applications.³ The security deposit was applicable to new applications only and was designed to discourage the applicants that had the intention of reserving and reselling their Power Purchase Agreements (PPAs). The rest of the application process remained simplified and streamlined.

The third phase of the Adder program can be characterized by frequent rule changing. A combination of factors – including

² http://www.pea.co.th/vspp/vspp/PPA10MW_Renew.doc and <http://www.pea.co.th/vspp/>.

³ 200 Thai Baht/kW for installation sized larger than 100 kW, National Energy Policy Commission Resolution 9 March 2009, implemented since August 2009.

Table 2
Thailand's national energy plans.

Plan name	Government bureaucracy
Power Development Plan (PDP 2010–2030)	EGAT/EPPO
10-Year Alternative Energy Development Plan (AEDP 2012–2021)	DEDE
The 20-Year Energy Efficiency Development Plan (EEDP 2011–2030)	EPPO
Natural Gas Supply Plan (2012–2030)	PTT/EPPO
Natural Gas Pipeline Master Plan (2001–2011) revision 3	PTT/EPPO
Natural Gas Vehicle Roadmap 2015	PTT/EPPO

simplified and streamlined regulations in the first two phases; dropping solar module prices starting in the third quarter of 2008; and the December 2008 deadline for application filing, resulted in a rush to secure Power Purchase Agreements (PPAs) for renewable energy projects with the utilities. At the end of 2008, a total of 1075 applications for 5147 MW of renewable capacity was filed to receive Adders. The greatest numbers among those were the applications for the solar Adder of 8 Baht/kWh, with 471 applications exceeding 2000 MW, which exceeded the target of the renewable energy plan at the time (the REDP). This “solar gold rush” was not at first seen as a problem until most of them easily went through the simplified application process and secured PPAs to be selling power to the utilities. Many of these PPAs were made by small companies that lacked ability to develop the projects themselves and were apparently securing PPAs with the intention of reselling them – a business that has proven to be very lucrative: Thai solar PPAs currently sell for as high as US \$300,000 per MW.

It was not until the end of 2009, however, that the Ministry of Energy (MoE) began to take notice of the unexpected amount of the PPAs. From the perspectives of the MoE, the 2 GW solar applications exceeded the government's official target of 500 MW and could result in a sharp increase in the pass-through cost to consumers' power tariffs. Furthermore, the MoE has been concerned that many of these megawatts in the pipeline are “speculated megawatts” rather than potentially realizable projects.

Policymakers reacted with sudden changes in the third phase of the program which have affected not just solar projects but the whole renewable energy industry. On June 28, 2010, the National Energy Policy Commission (NEPC) passed a resolution to reduce the Adder rate for solar projects and establish a new committee that

Box 1

Policy goals expected to be achieved through the Adder program.

- More green energy
- Private sector participation and increase in competition
- Economic growth
- Rural development
- Utilization of agricultural waste
- Fuel diversification
- Local pollution reduction
- Less trade deficits from imported equipment

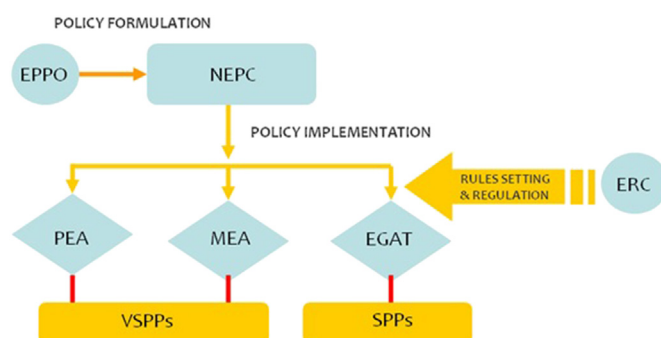


Fig. 3. Adder (Fit) policy process.

would oversee policy formulation and regulation of renewable energy policy. The Managing Committee on Power Generation from Renewable Energy Promotion (hereafter, the “Managing Committee”) was appointed to coordinate, follow up, and ensure that the implementation of measures promoting power generation from renewable energy is in compliance with policy. The new rules and regulations are summarized in Fig. 4.

Under the initial VSPP program design, utilities were required to grant projects permission to interconnect if they met basic safety and power quality standards, subject to substation capacity. New rules added by the committee involve additional paperwork requirements, including proof of sound financial status, which are

Table 3
Thailand's Adder rates (Exchange rate: 1 US Dollars = 30 Thai Baht).

Type of RE	Unit: US Dollars per kWh					Years supported
	2007 Adder rate	2009 Adder rate	2010 Adder rate	Special Adder for diesel replacement	Special Adder for three southernmost provinces	
Biomass						
Installed Capacity ≤ 1 MW	0.010	0.017	0.017	0.033	0.033	7
Installed Capacity > 1 MW	0.010	0.010	0.010	0.033	0.033	7
Biogas						
Installed Capacity ≤ 1 MW	0.010	0.017	0.017	0.033	0.033	7
Installed Capacity > 1 MW	0.010	0.010	0.010	0.033	0.033	7
Waste						
Landfill and Digester	0.083	0.083	0.083	0.033	0.033	7
Thermal Process	0.083	0.117	0.117	0.033	0.033	7
Wind						
Installed Capacity ≤ 50 kW	0.117	0.150	0.150	0.050	0.050	10
Installed Capacity > 50 kW	0.117	0.117	0.117	0.050	0.050	10
Small/Micro Hydro						
50 kW < Installed Capacity < 200 kW	0.013	0.027	0.027	0.033	0.033	7
Installed Capacity ≤ 50 kW	0.027	0.050	0.050	0.033	0.033	7
Solar	0.267	0.267	0.217	0.050	0.050	10

Note: the current (January 2013) Adder rate remains at 2010 levels, with the exception of solar power Adder program, which no longer accept new applications.

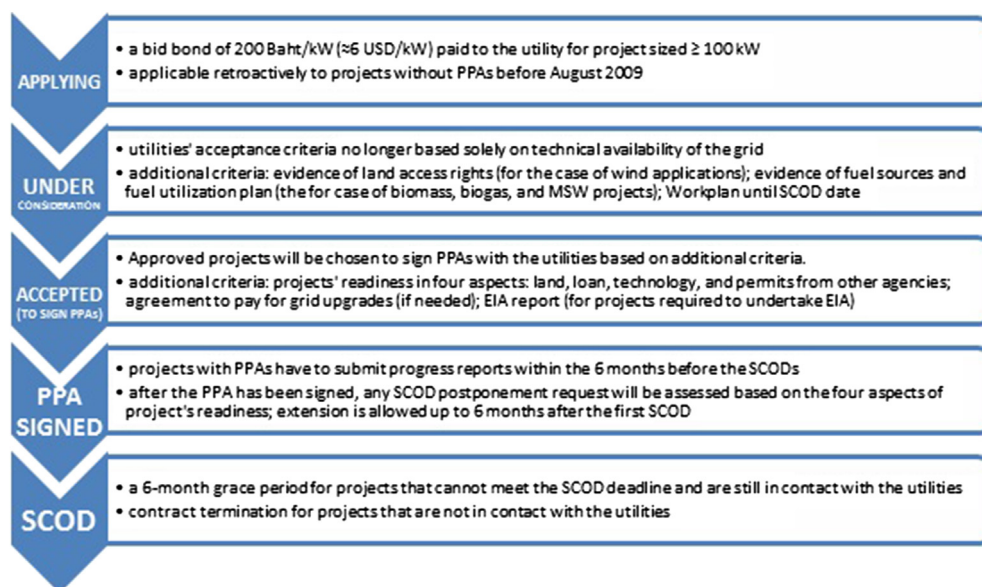


Fig. 4. Rules and regulations put in place by the MoE and the Managing Committee.

designed to prove the projects' readiness to follow through until project completion. This has introduced subjective judgment and stalled the applications process due to the lack definite timeline on how long the Committee would process applications.

In addition to passing new and more stringent regulations, the Managing Committee has also approved new projects and PPA signings, and canceled some old, idle contracts. The role of the Managing committee has hence been to centralize all decisions regarding renewable SPP and VSPP projects, taking on responsibilities for in policy design (the purview of EPPO) and regulation (the purview of the ERC).

Lack transparency has been a significant concern as there are limited channels for the public to monitor the work of this committee, hence causing confusion and doubts whether the process is fair and clean of business interests and political intervention (e.g., Refs. [12–15]). There are no clear guidelines on which projects will receive approval first and which projects advance in the queue, increasing the risk for rent-seeking by those with the authority to approve projects.

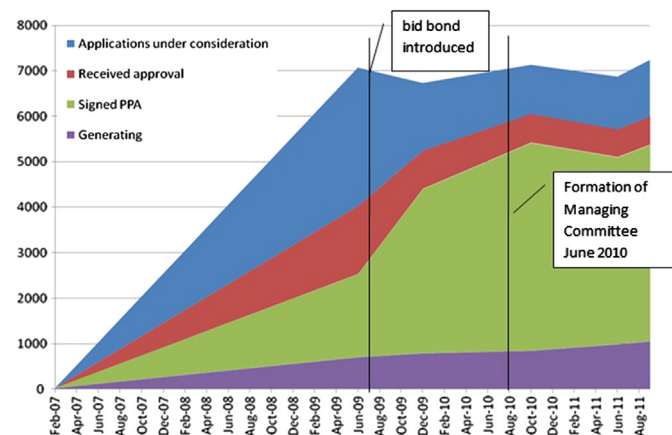


Fig. 5. MW of renewable energy under the VSPP program in various stages of development from “under consideration” (top) to “generating electricity” (bottom wedge).

While some of the measures imposed by the Managing Committee have reduced speculation in VSPP projects, this improvement comes at the cost of sharply reduced applications and application approval overall. Cumulative applications rose sharply in the first phase until June 2009, after which the cumulative applications began to decline due to the introduction of the bid bond. After the establishment of the Managing Committee in June 2010, few projects were approved and few projects have signed new PPAs with the utilities (Fig. 5).

3.4. Overall assessment of Thailand's Adder program: strengths and weaknesses

To summarize, the strengths of Thailand's Adder program lie in rates that have been set high enough to attract private investment in diverse forms of renewable energy and in its early framework for streamlined interconnection arrangements and standardized documents including Power Purchase Agreements. Special rates for the three southernmost provinces help address the increased risks of project development in those areas, and special rates for remote areas with PEA-supplied diesel generation helps lower utility costs in rural areas that are currently served with expensive diesel fired generation. The rate structure is simple and easy for investors to integrate into investment plans. The program provides secure contracts that ensure confidence to the investors that the support will not likely be revoked or canceled once they have signed the contracts. As a result, the Adder program has been able to induce an impressive amount of investment in RE since its implementation in 2007, as shown in Fig. 6. As of December 2011, the on-grid RE capacity of Thailand is 985.36 MW (589.96 MW of renewable VSPP and 395.40 MW of renewable SPP), and 7558 MW of RE capacity is in the pipeline⁴ (5547 MW of renewable VSPP and 2011 MW of renewable SPP). The combined on-grid capacity and the amount of

⁴ Projects that are in the pipeline are projects that are not yet selling power to the utility and are in one of the following stages of development: (1) the project's application has been proposed to the utility and awaiting approval to join the Adder program (2) the approved project prepares documents prior to the signing of the Power Purchase Agreement (PPA) and (3) the project has a PPA with the utility.

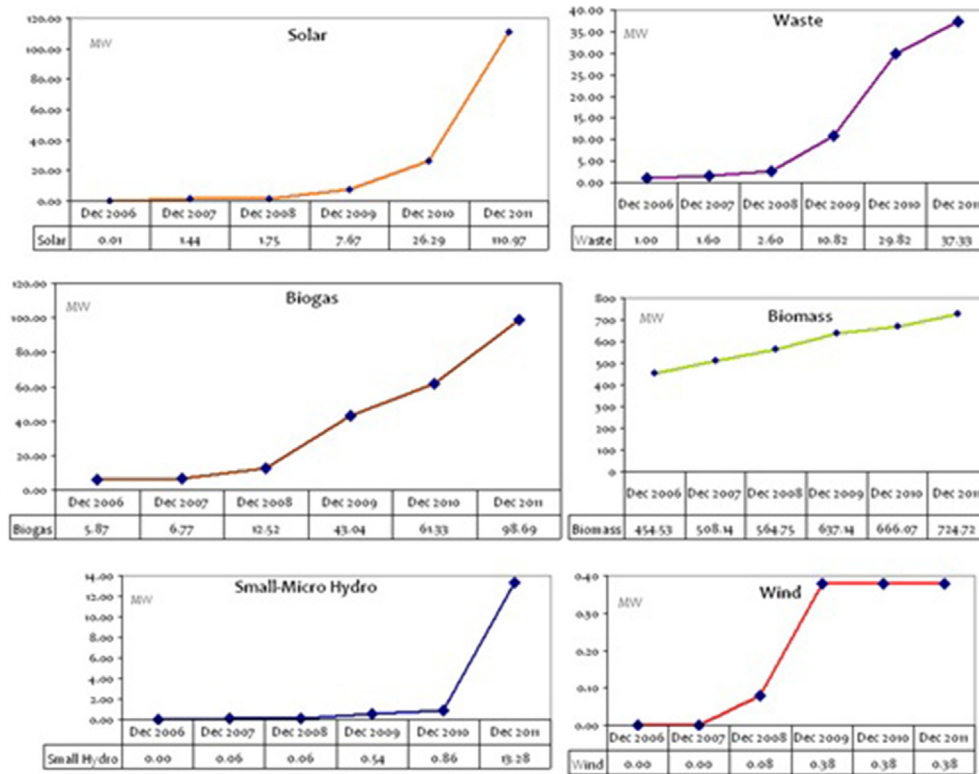


Fig. 6. Trends of SPP and VSPP as a result of Adder implementation since 2007.

RE in the pipeline amounts to 8543 MW or around 27% of the current installed capacity in Thailand.⁵

Despite the strong policy directives that have been successful at attracting interests from investors and project developers, the Adder program could benefit from a stronger regulatory framework. Weak regulatory support and a lack of a public discourse on the acceptable level of pass-through costs to ratepayers have been a fundamental problem in Thailand's FiT program. In its first two phases, the lack of a program cap in combination with a deadline resulted in greater than expected number of applications, raising MoE's concerns regarding ratepayers' impacts. In addition, the lack of a degression rate and an effective program review schedule, combined with substantial declines in global solar module prices have resulted in Thai solar farm projects that receive very high solar Adder rates and thus benefit from windfall profits when operational. But regulatory reaction to this concern has resulted in more red tape and a bottleneck for application processing in the third phase of the program. As shown in Fig. 5, application processing has been largely stalled since the major adjustment of the program in 2010 when the Managing Committee was established to revise and regulate the Adder program.

4. Conclusions and recommendations

Thailand has the foundations for a good feed-in tariff program but changes enacted after June 2010 have slowed down market expansion. As shown in Table 2, short-term targets according to the 15-Year REDP have been reached for solar and biogas energy, but other renewables are still far from reaching their short-term targets. And as the REDP has been replaced by a more ambitious

Alternative Energy Development Plan (AEDP 2012–2021), which set higher targets for most types of RE, effective implementing mechanisms become even more important. Unfortunately, recent policy changes discussed in this paper have served to hamper, rather than facilitate, greater renewable energy penetration.

The feed-in tariff has already been an attractive renewable energy support mechanism in Thailand, which could be strengthened through these areas: (1) planning and strategy; and (2) policy and regulatory framework for FiT:

- (1) *Planning and Strategy*: Major policy documents affect the renewable power industry are not integrated, including Thailand's long-term power procurement plan, or the Power Development Plan (PDP), and the 15-Year REDP. This lack of a unified energy policy makes the expansion of RE discontinuous and subject to the will and preferences of each new political administration that gains control of the Thai government. And unlike FiT programs of other countries, Thailand's FiT program is not backed up by a renewable energy law. Having such a law could provide legal mandates for the involved agencies to act in concerted effort and gives comfort to renewable energy investors.
- (2) *Policy and Regulatory framework for FiT*: The implementation of the FiT has been crippled by ad hoc responses to problems as they arise. Overall, the landscape for RE support can be characterized by a weak regulatory framework. Unforeseen problems that arose during the implementation process included the problem of speculation and the "solar gold rush". Ad hoc and non-transparent responses caused delays in the application process for Adder support and led to public criticism of poor governance. The planning process for an updated FiT scheme (currently underway) should incorporate lessons from the regulation of successful FiT schemes in other countries and practice light-handed regulation wherever possible.

⁵ The installed capacity of Thailand (as of December 2012) is 31,447 MW (Source: http://www.eppo.go.th/info/5electricity_stat.htm, Assessed December 2012).

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