



September 2011

## SOLAR ENERGY DEVELOPMENT IN THAILAND

### 1. Policies re Renewable Energy

On 26 December 2006, the National Energy Policy Council (NEPC) approved EGAT purchasing power from generators using renewable energy, and instructed EGAT to revise its regulations for purchase of power from SPPs using renewable energy.

On 28 January 2009, the Cabinet approved a 15-year alternative energy plan, and on 9 March 2009, the National Energy Policy Committee approved additional tariff “adders” for certain categories of alternative energy. The announced goal was for renewable energy to constitute up to 20% of total energy consumption by 2022.

During the 14<sup>th</sup> ASEAN Summit in Thailand 28 February – 1 March 2009, the meeting recognized the challenge of climate change, and agreed to cooperate on energy security, ASEAN energy cooperation, and development of renewable and alternative energy.

The Department of Alternative Energy Development and Efficiency (“DEDE”) is responsible for implementation of the alternative energy plan. See its website at [www.dede.co.th](http://www.dede.co.th).

On 23 August 2011, the Prime Minister presented the Policy Statement of the Council of Ministers, which included:

“3.5.4 Support the production, use, research and development of renewable and alternative energy sources, with the objective of replacing 25% of the energy generated by fossil fuels within the next decade. Comprehensive development of the energy industry will also be promoted.”

### 2. EGAT Regulations

On 18 April 2007, EGAT announced Regulations for the Purchase of Power from Small Power Producers exclusively for the generation from renewable energy. SPPs can obtain information from the Power Purchase Agreement Division, EGAT. The Regulations (as amended in 2009) can be found at [www.egat.co.th](http://www.egat.co.th).

The Regulations cover the following subjects:

- A. Objective of Power Purchase from Small Power Producers
- B. Enforcement
- C. Characteristics of the Power Generating Processes of SPPs
- D. Electrical System Standards of SPPs
- E. Procedures and Consideration Principles of Power Purchase from SPPs
- F. Conditions of the Power Purchase from SPPs
- G. Power Purchasing Point and Connection Point
- H. Costs Incurred for SPPs
- I. Conditions of the Power Generating Operation and the Maintenance Shutdown of SPPs

- J. Principles of the Tariff Determination for the Purchase of Power from SPPs
- K. Failure to Comply with the Power Purchase Agreement (PPA)
- L. Performance Security for Compliance to the Power Purchase Agreement after the Commercial Operation Date
- M. Bill Settlement Conditions
- N. Damages to the Power System
- O. Problems Arising from Compliance with the Regulations and Power Purchase Agreements
- P. Amendments to the Regulations
- Q. Solution to the Problems Arising from Compliance with the Regulations for Synchronization of Generators to the Power Utility System, the Power System Interconnection Criteria and the SPP Grid Code

EGAT has published standard forms of PPAs including Model Non-Firm Agreement (Renewable, without Supporting Fuel (Khor. 1), with Adder).

### 3. **PEA Regulations**

PEA also published standard forms of PPAs including Power Purchase Agreement for the Purchase of Power from a Very Small Power Producer (for the Generation using Renewable Energy). See Attachment No. 1. Features of PEA's PPAs signed after 19 August 2009.

- 5-year term, renewable without limit
- Requirement for a bank guarantee of Baht 200,000 per MW
- Delay LDs for delays exceeding 60 days in achieving SCOD: 0.33% of guaranteed amount per day

### 4. **Carbon Market Financing**

There is a growing market for carbon market finance. Thailand established a Designated National Authority ("DNA") to manage CDM projects, currently the Thailand Greenhouse Gas Management Organization ("TGO"). 143 letters of approval for CDM projects have been issued; there are 55 registered Thai CDM projects, and 6 projects have been certified, as of September 2011.

The TGO is drafting the rules for a carbon fund. It would provide low interest rate loans for CDM, and purchase carbon credits from project developers for sale to the international carbon trading markets.

### 5. **Adder Policy**

On 19 August 2009, PEA published a notification re prescription of increment of power purchase price for renewable energy small power producers (up to 10 MW). For wind energy, an adder of Baht 3.50 per unit was prescribed for ten years from COD. The special adder for 3 southern most provinces (Yala, Pattani, and Narathiwat) of Baht 1.50 was also prescribed.

On 15 January 2010, EGAT published a notification re prescription of increment of power purchase price for renewable energy small power producers. For solar energy, an adder of Baht 8.00 per unit was prescribed, for ten years from COD. The special adder for 3 southern most provinces (Yala, Pattani, and Narathiwat) of Baht 1.50 was also prescribed.

On 9 April 2010, PEA issued a notification suspending receipt of applications for sale of power for solar projects and wind projects. On 22 September 2010, PEA issued a notification continuing suspending receipt of application for solar projects.

On 5 April 2010, EGAT issued a notification suspending receipt of applications for sale of power from solar project. On 29 October 2010, EGAT issued a notification continuing suspending receipt of application for solar projects.

On 20 July 2010, the Thai Cabinet approved resolutions of NEPC adopted on 28 June, 2010, including confirming adder of Baht 8.00 per unit under PPAs which have been signed, and for projects for which acceptances to purchase electricity have been issued. In the case of applications for sale of electricity submitted and pending consideration, the adder of Baht 6.50 per unit would apply. For other renewable energy projects, the Cabinet approved NEPC's guidelines for coordination and follow-up of promotion of renewable power production in compliance with the policy, and establishment of a committee comprising representatives from such related agencies of MoE and NESDB, and to approve a Feed-in Tariff system.

## 6. Status of progress on solar energy promotion

The following status report on renewable energy promotion measures was published on the DEDE website in February 2011.

### Solar Energy: Promotion targeted at 500 MW

- “Presently, the private sector asking a request on promotion are more than 700 projects (i.e. 699 projects by VSPP and 8 projects by SPP) at a total installed capacity of 3,581 MW as submitted in their request forms. This makes the three electricity utilities (EGAT, PEA, MEA) temporarily suppress in accepting the request on electricity selling proposal from solar power generation.
- “The Energy Ministry would focus more on Solar Home by installing the roof-top PV system. This is under consideration on the **Feed-In Tariff** and a concept to integrate this measure with the **Building Energy Code**. So that large buildings to be new built in the future and the costly built housing may be forced to install the solar power generation system.
- “Installation of Solar Farm will be emphasized on promoting small size farm in non-agro zones then, **Feed-In Tariff** will be re-calculated.”

## 7. Department of Alternative Energy Development and Efficiency (DEDE)

Attached is a set of slides presented by Dr. Twarath Sutabutr, Deputy DG of DEDE on 2 June 2011 titled “Promotion and Development of Solar Energy in Thailand”.

## 8. Restrictions on amendments to PPAs

The Committee on Management of Measures for Promotion of Renewable Power Production, appointed under the National Energy Policy Board, No. 1/2554 on January 26, 2011, (No. 6), instructed the three power authorities to issue a notification prohibiting a change in or amendment to PPAs with renewable energy projects applying for (i) a change in the quantity of the power energy offered for sale, (ii) relocation of the power plant, or (iii) a change in the production technology. EGAT issued such notification dated 14 March 2011.

**It is PEA's internal policy to allow transfers of rights of generators under PPAs only to "affiliates" of the transferors; "affiliates" as defined in Section 39 of the Revenue Code.**

PEA's current practice on postponement of SCODs is to grant up to two 6-month extensions, to allow project owners who has actually started construction to avoid delay LDs.

**Attachments:**

1. PEA standard form of VSPP PPA (renewable energy).
2. Slides of Dr. Twarath Sutabutr, Deputy DG of DEDE on 2 June 2011.

**Attachment No. 1**  
**PEA standard form of VSPP PPA (renewable energy)**

**Power Purchase Agreement No. \_\_\_\_\_**  
**for the Purchase of Power from a Very Small Power Producer**  
**(for the Generation Using Renewable Energy)**  
**between**  
**\_\_\_\_\_ and the Provincial Electricity Authority**  
**\_\_\_\_\_**

This Power Purchase Agreement is executed and delivered at the Distribution Utility on \_\_\_\_\_ between \_\_\_\_\_, represented by \_\_\_\_\_, with the office located at \_\_\_\_\_, hereinafter called “the Power Producer,” of the one part, and the Provincial Electricity Authority, represented by \_\_\_\_\_, title: \_\_\_\_\_, office: \_\_\_\_\_, hereinafter called “the Utility,” of the other part.

WHEREAS both parties agree to purchase and sell electricity under the following terms and conditions:

**1. Purchase and Sale of Electricity**

- 1.1 The Power Producer and the Utility shall abide by the terms and conditions pertaining to the purchase of power and system interconnection as stipulated in the Regulations for the Purchase for Power from Very Small Power Producers (for the Generation Using Renewable Energy) and the Regulations for Synchronization of Generators with Net Output under 10 MW to the Distribution Utility System, B.E. 2549 (2006), as detailed in Appendices 1 and 2 attached to this Agreement respectively.
- 1.2 Appendices 1 and 2 annexed hereto shall form an integral part of this Agreement. In case of inconsistency between the provisions in this Agreement and those in Appendices 1 and 2, the former shall prevail.
- 1.3 The Utility agrees to purchase and the Power Producer agrees to sell electricity at a maximum capacity of \_\_\_\_\_ MW at the voltage level of \_\_\_\_\_ Volt, with the Purchasing Point located at \_\_\_\_\_, with details of the generation system as specified in the Application for Sale of Electricity and System Interconnection and the Power Producer agrees to sell electricity to the Utility within \_\_\_\_\_.
- 1.4 The Utility agrees to sell standby power to the Power Producer at the request of the latter, pursuant to the announcement on the standby power tariff and in line with the standby power purchase agreement between the Utility and the Power Producer.

**2. Agreement in Force and Termination**

This Agreement shall come into force as from the date of its signing by both parties for a period of five (5) years. The Agreement shall be automatically extended on a continual basis, each time for another period of five (5) years, and shall remain effective unless it is terminated in the event of the following:

- 2.1 The Power Producer gives a written notice to the Utility of his intention to discontinue the purchase/sale of electricity by terminating the Agreement.

- 2.2 If one party is in breach of any terms and conditions specified in the Agreement, the non-breaching party shall send a written notice to the breaching party to make necessary correction. If the breaching party fails to make such correction, the non-breaching party is entitled to terminate this Agreement.

### **3. Power System Interconnection**

- 3.1 The Power Producer will allow the Utility to enter its premises to install, to undertake the maintenance, to change and/or to relocate the power system interconnection equipment after the owner or the possessor of the location has been notified.
- 3.2 The Utility reserves the rights to specify the requirement of additional equipment, at a later stage, both for the Utility's distribution system and for the Power Producer's power plant, to be in line with the technical standards and the pattern of power dispatch of the Utility.
- 3.3 One party has to notify the other party in advance if any change has been made to its power system, which will affect the protective equipment in the power system of both parties. No action related to the interconnection equipment shall be taken without a written notice to the Utility in advance.

### **4. Control and Operation of the Power Plant**

- 4.1 The Power Producer must strictly abide by the switching order of the Utility's Control Center for the benefits of the operation and maintenance, except for the case where damage may be caused to the life or property of either party.
- 4.2 The Power Producer has to submit the information about the amount of fuel consumption per year and the Average Lower Heating Value of the primary and secondary fuels used for electricity generation.
- 4.3 The Power Producer, using commercial fuels, such as oil, natural gas and coal, as a secondary fuel at a ratio greater than 25% of the total heat consumption for power generation in that given year, must generate electricity efficiently by having the ratio of Primary Energy Saving (PES) at no less than 10% in each year. The PES ratio calculation method is provided in Attachment 2 of the Regulations for the Purchase of Power from Very Small Power Producers (for the Generation Using Cogeneration System). In case of the failure to comply with the requirements about the efficiency of the power generating processes, a fine shall be imposed, pursuant to the calculation method described in Item 4.4.
- 4.4 In the event that the PES ratio achieved by the Power Producer is less than 10%, the Utility will demand a refund from the revenue from the energy charge that the Utility has paid to the Power Producer in that given year, according to the difference of the PES ratio as required by the Regulations, i.e. 10%, and the actual PES ratio derived from the calculation using the calculation formula specified in the Regulations for the Purchase of Power from Very Small Power Producers (for the Generation Using Cogeneration System).

### **5. Billing Settlement**

- 5.1 The payment for the purchase/sale of electricity shall be in compliance with the provisions specified in the Regulations for the Purchase of Power from Very Small Power Producers (for the Generation Using Renewable Energy).
- 5.2 In case the Power Producer fails to make payment within the period specified in the

Regulations for the Purchase of Power from Very Small Power Producers, the Utility is entitled to take measures pursuant to the Utility's announcements or regulations.

- 5.3 In case the Utility fails to make payment within the period specified in the Regulations for the Purchase of Power from Very Small Power Producers, the Utility agrees that the Power Producer charge for the interest of the amount in arrears at the then MLR rate charged by Krung Thai Bank Public Company Limited, as from the date of default until the payment is made in full. In this connection, the imposed interest rate shall not exceed fifteen percent (15%) per annum.

## **6. Force Majeure**

- 6.1 "Force Majeure" denotes any event of which the happening or pernicious results could not be prevented even though a person against whom it happened or threatened to happen were to take such appropriate care as might be expected from him in his position and in such a situation, and shall include any or several of the following events:

- 6.1.1 acts of the government such as a change to the energy policy of the government;
- 6.1.2 acts of public enemies in a war situation (whether declared or undeclared), blockades, riots, insurrection, commotion, espionage, sabotage, strikes, work stoppages as stated in the labor law, any eviction, earthquakes, storms, fires, floods or explosions; and
- 6.1.3 interruptions in the distribution system resulting from detriments to the distribution system or any devices related to the system interconnection.

- 6.2 In the event that either party is unable to perform his obligations under this Agreement by reason of Force Majeure under Item 6.1 hereof, such party shall not be held in breach of the Agreement, and the other party shall not claim for any compensation whatsoever.

- 6.3 The party claiming Force Majeure shall:

- 6.3.1 notify the other party as soon as practicable of the Force Majeure, together with the detailed information of the event and the period of time necessary to cure the damages resulting from such Force Majeure; and
- 6.3.2 use, at its own cost, all reasonable efforts to remedy the situation as soon as possible and such implementation must be within the ability of the party.

## **7. Settlement of Disputes and Arbitration**

- 7.1 Any dispute or difference arising out of, or in connection with, the Agreement or the implementation of any of the provisions of the Agreement which cannot be settled amicably shall be referred to arbitration. If no settlement can be reached by arbitration, the dispute or the difference shall be referred to a Thai court for a final decision.

- 7.2 Unless both parties agree in the appointment of a single arbitrator, any dispute or difference shall be referred to two (2) arbitrators. Either party shall serve upon the other a notice of intention to submit the dispute or difference to arbitration and specify the name of an arbitrator to be appointed by him. Then, the other party shall appoint the other arbitrator within thirty (30) days after receipt of the said notice. If the two arbitrators are unable to compromise such dispute or difference, an umpire shall be appointed by the two arbitrators within thirty (30) days from the date of disagreement. The umpire so appointed shall resolve the dispute or difference. The arbitration proceedings shall follow either the Rules of

Arbitration of the Ministry of Justice’s Arbitration Office, mutatis mutandis, or the Rules of Arbitration and Conciliation of the International Chamber of Commerce, as agreed by both parties. The arbitration proceedings shall be conducted in the Thai language.

- 7.3 The appointed arbitrators must have qualifications illustrating expertise in the field of development, debt financing, construction, power plant operation or power plant maintenance and shall not be employees or agents of, or advisors to either party.
- 7.4 Should either party decline to appoint an arbitrator, or in case the two arbitrators cannot reach an agreement regarding the appointment of an umpire, each party is entitled to refer the matter to a Civil Court for the appointment of arbitrator or umpire as the case may be.
- 7.5 Any decision or award given by the arbitrators or the umpire, as the case may be, shall be final, conclusive and binding upon the parties hereto. If the arbitrators or the umpire cannot settle the dispute or difference, or the notified party pursuant to Item 7.2 hereof fails to appoint an arbitrator on his side, wishing to exercise the right of institution of court action, then the dispute or difference shall be deferred to the relevant Provincial Court for a decision.
- 7.6 Each party shall bear the cost of his own arbitrator’s service and share equally other cost of all proceedings. In case a single arbitrator or an umpire is appointed, the cost of the single arbitrator’s service or the cost of the umpire’s service shall be decided by the arbitrator or the umpire, as the case may be.

This Agreement is executed in two identical counterparts. Both parties have thoroughly read and understood the contents hereof and have hereto appended their respective signatures and affixed their seals (if any) in the presence of witnesses. Both parties shall keep each copy of the Agreement.

Power Producer

Provincial Electricity Authority

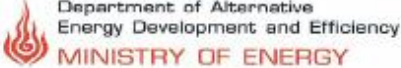
Signature: ..... Power Producer  
( \_\_\_\_\_ )  
Title  
\_\_\_\_\_

Signature: ..... Utility  
( \_\_\_\_\_ )  
Title  
\_\_\_\_\_


Signature: ..... Witness  
( \_\_\_\_\_ )  
Title  
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Signature: ..... Witness  
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Title  
\_\_\_\_\_

Attachment No. 2  
Slides of Dr. Twarath Sutabutr, Deputy DG of DEDE on 2 June 2011



Department of Alternative Energy Development and Efficiency  
 MINISTRY OF ENERGY



# Promotion and Deployment of Solar Energy In Thailand

Dr. Twarath Sutabutr  
 Department of Alternative Energy Development and Efficiency (DEDE)  
 Thailand's Ministry of Energy

**Deployment of Solar Energy in Southeast Asia**  
**Shangri-La Hotel, Bangkok**

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2 June 2011



Department of Alternative Energy Development and Efficiency  
 MINISTRY OF ENERGY

## Thailand energy policies and targets

**Industrial and Commercial Sectors**

**Policy 1**

**Securing Energy Supply**

- Oil
- Natural Gas
- Electricity
- Emergency Response

**Policy 2**

**Set Renewable Energy as National Agenda**

- E10/E20/E85+FFV
- Ethanol Production
- Bio-Diesel /B2-B3/B5
- R&D on 3<sup>rd</sup> gen Non-food Biofuels
- NGV
- Wind /Solar /MSW/ Biogas/ Biomass/ Small Hydro

**Policy 3**

**Encouraging Energy Conservation**

- Conservation Measures
- Efficiency Standards and Labeling
- Stand-by Power
- Building Energy Code
- Private-led Investment

**Policy 4**

**Ensure Fair Energy Price**

- Cost-reflectivity pricing
- Strategic Pricing for RE
- Ensure Services Quality and Safety

**Policy 5**

**Preserving Environment coupled with Energy Development and Consumption**

- Committed to Low-Carbon Pathway
- Green house Emission Reduction
- Support CDM proj





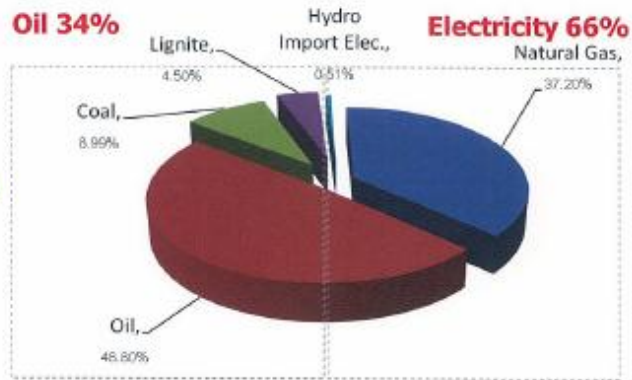


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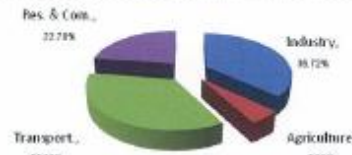
Thailand energy Situation 2010

- In 2010, the energy consumption in Thailand costs 1.52 trillion Baht
- The energy use in domestic commercial was 1.2 million barrels of oil equivalent per day

Commercial fuels



Energy Consumption by sectors

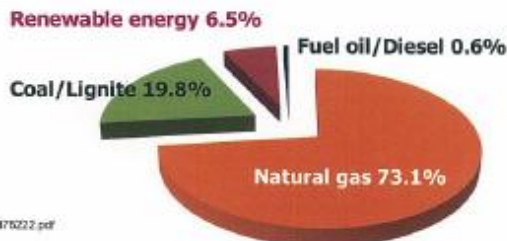
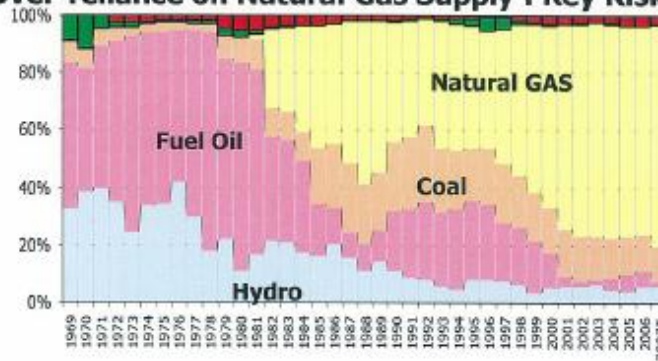


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Thailand's Energy Situation 2010

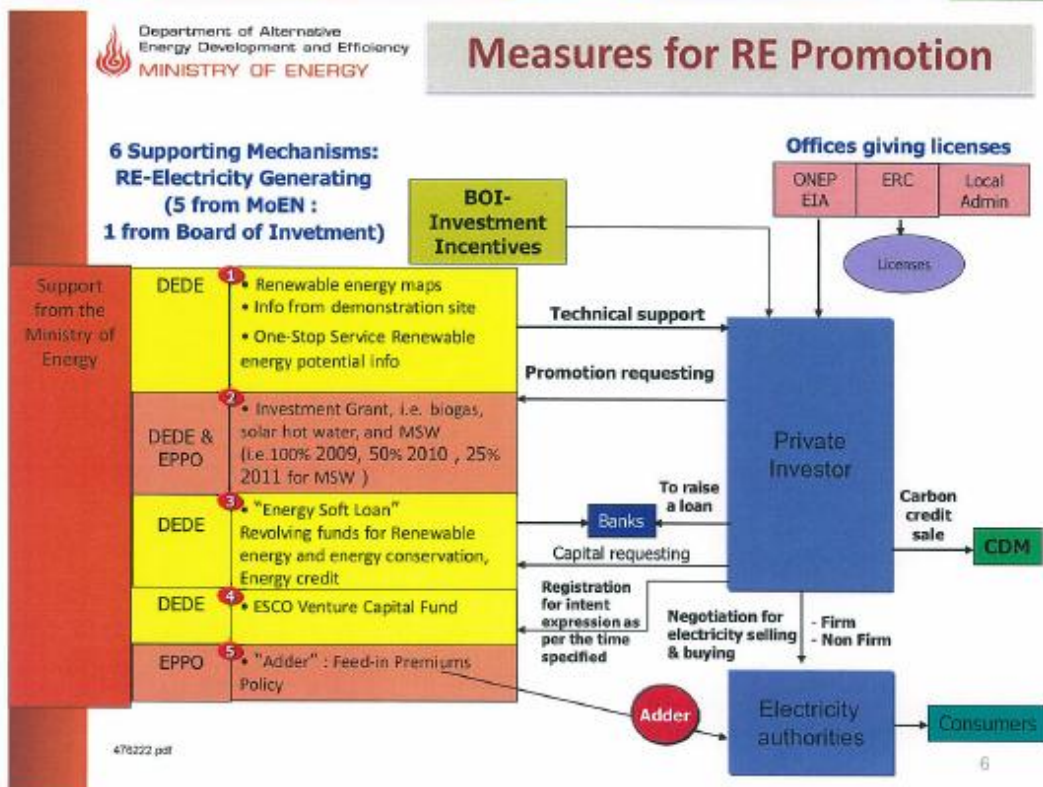
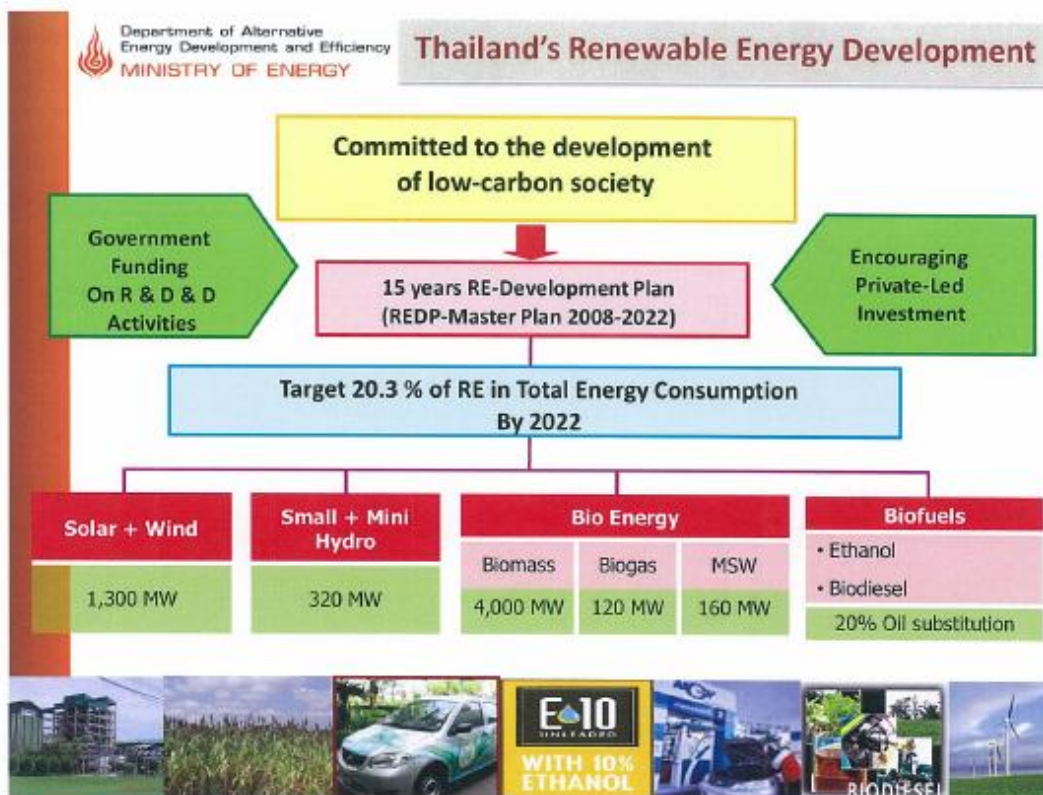
Over-reliance on Natural Gas Supply : Key Risk Area



Power generation 2010 by energy sources

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### Thailand's solar Map

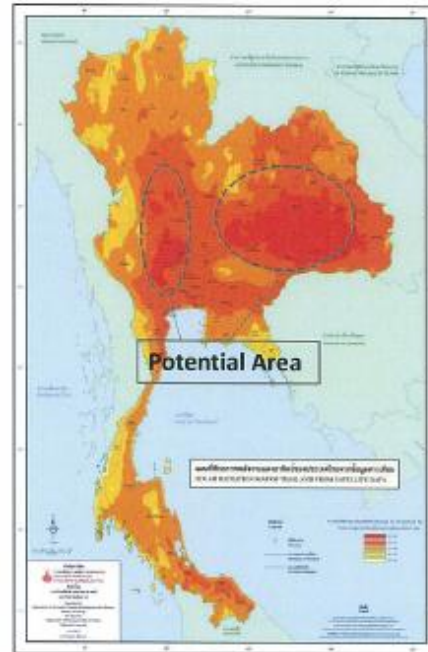
Updated September 2010

#### Solar map

- **Average solar irradiance 18 MJ/m<sup>2</sup>-d (5 kWh/m<sup>2</sup>-day)**
- **Maximum : 20-24MJ/m<sup>2</sup>-d**
- **Solar map developed by DEDE using satellite images and ground station measurement ( 38 Stations)**



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### Energy Soft Loan

- Provided via financial institutions for investment in:
  - Renewable energy development and utilization projects
  - Energy efficiency improvement projects

11 local financial institutions have participated.



Max. interest rate: 4%  
Max. loan period: 7 years

January 2003 – present  
7000M Baht

- Local banks with better technical understanding are more confident on Solar Energy involve more in financial support

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**Tax Incentives**

Thailand's Board of Investment (BOI)'s tax incentives for renewable energy

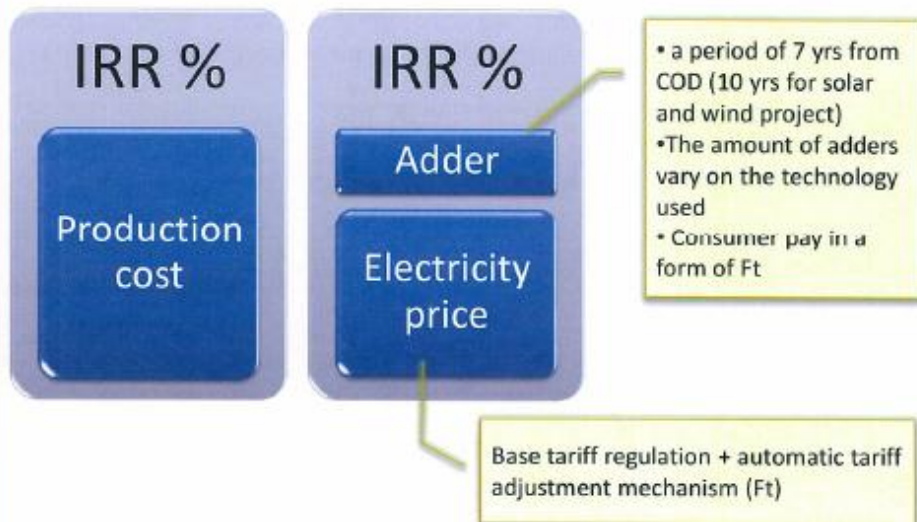
- Corporate income tax holidays up to 8 yrs. Additional 50% reductions of corporate income tax for 5 yrs
- Import duty reductions or exemptions on equipment and raw materials
- Double deduction of public utility costs
- Deductions for infrastructure construction/installation costs

Note: Projects must be submitted by end of 2012

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**ADDER program**



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**"Adder" : Feed-in Premiums**

Fuel	Adder (Baht/kWh)		Adder-VSPP (USD Cents /kWh)**	Special adder * (Baht/kWh)	Supporting period (Year)
	VSPP	SPP			
☐ Biomass - Installed capacity <= 1 MW - Installed capacity > 1 MW	0.50	Bidding	1.54	1.00	7
	0.30		0.93	1.00	7
☐ Biogas (all categories of production sources) - Installed capacity <= 1 MW - Installed capacity > 1 MW	0.50	Bidding	1.54	1.00	7
	0.30		0.93	1.00	7
☐ Waste (community waste, not hazardous industrial waste, and inorganic waste) - AD & b LFG - Thermal Process	2.50	2.50	7.72	1.00	7
	3.50	3.50	10.81	1.00	7
☐ Wind power - Installed capacity <= 50 kW - Installed capacity > 50 kW	4.50	3.50	13.89	1.50	10
	3.50		10.81	1.50	10
☐ Mini and micro hydropower - capacity 50-200 kW - capacity < 50 kW	0.80	-No-	2.47	1.00	7
	1.50		4.63	1.00	7
☐ Solar power	8.00	8.00	24.70	1.50	10

\* Note : Special Adders for  
- Facilities in 3 Southern Provinces  
- Diesel-Gen. replacement on PEA system  
\*\* 1 AUD=33.061 Baht

Revised by National Energy Policy Council on 29<sup>th</sup> June 2010

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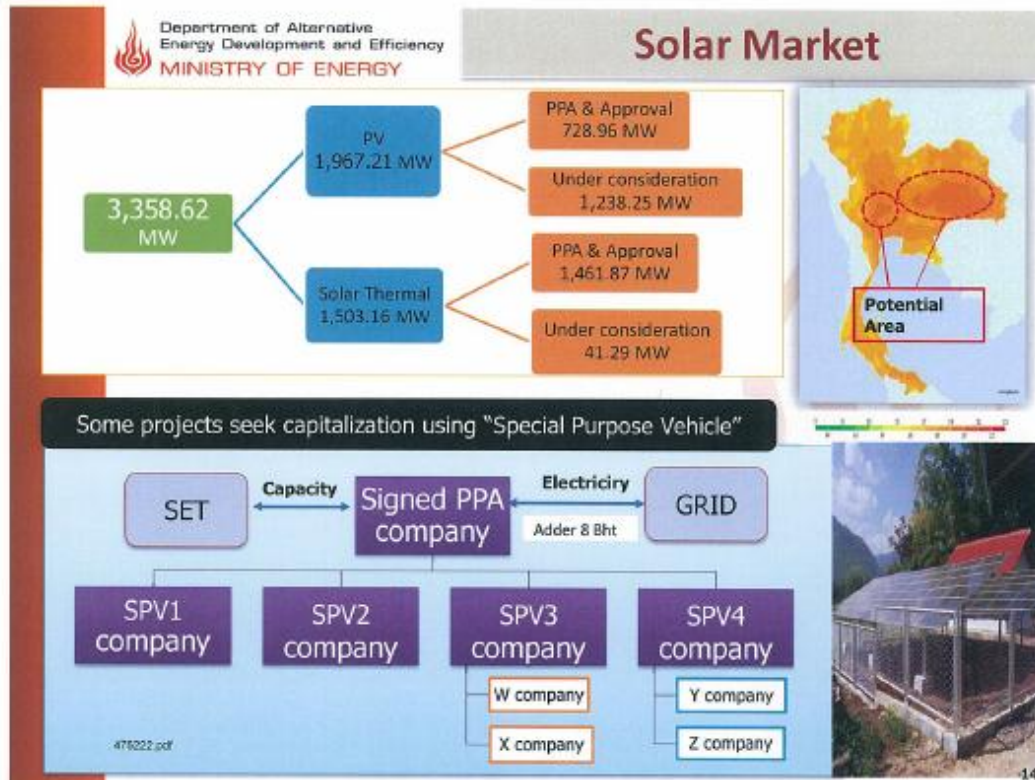
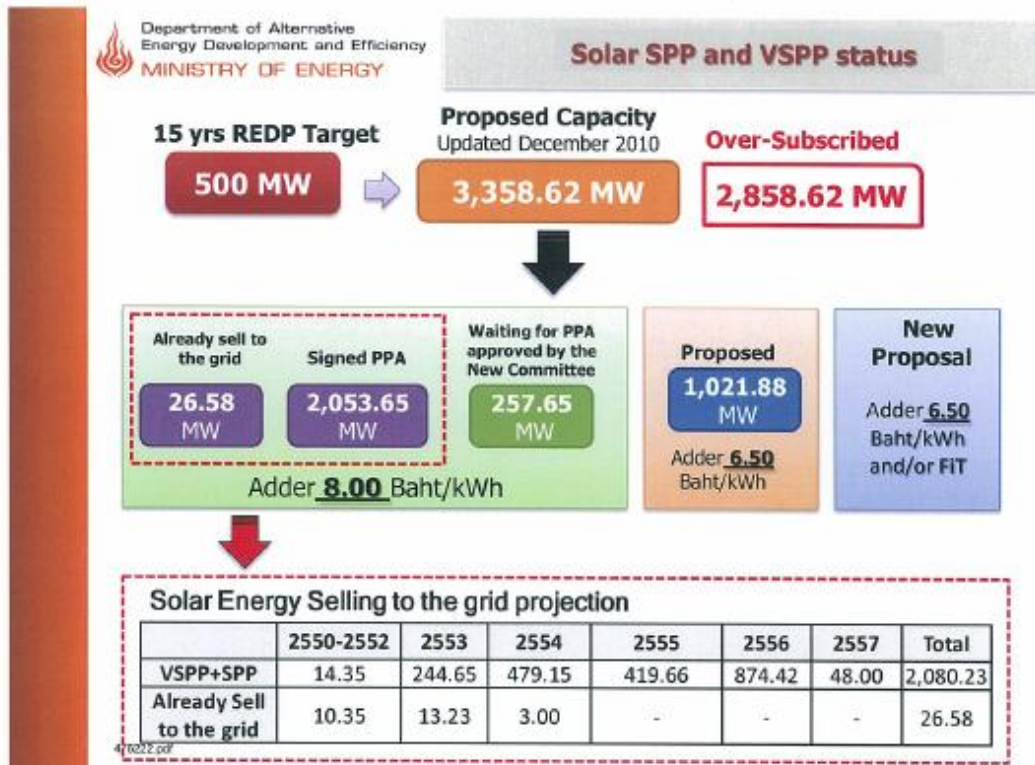
**Status of VSPP+SPP Project**

**Status of VSPP+SPP Project categorized by technology (updated December 2010)**

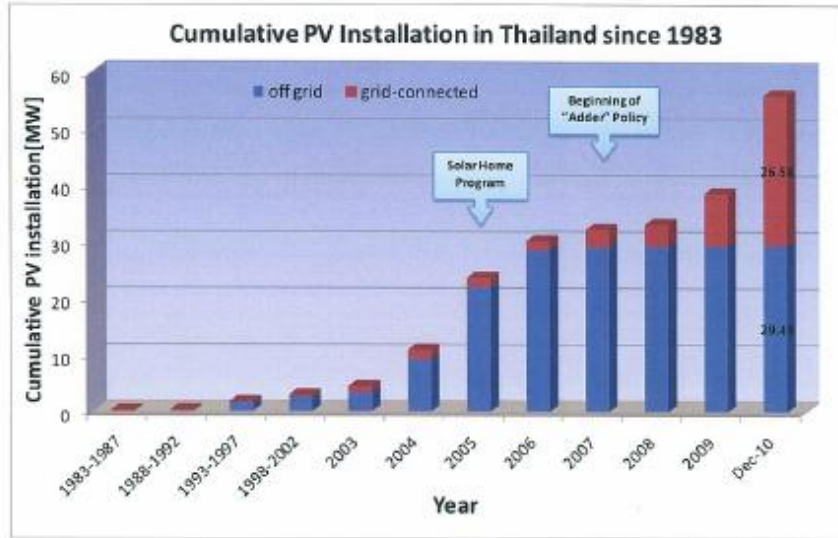
Technology	Proposed Project		Waiting for PPA		Signed PPA		Already sell to grid		Total	
	Project (no.)	Capacity (MW)	Project (no.)	Capacity (MW)	Project (no.)	Capacity (MW)	Project (no.)	Capacity (MW)	Project (no.)	Capacity (MW)
<b>Renewable Energy</b>										
1 <b>Solar Energy</b>	<b>139</b>	<b>1,021.88</b>	<b>83</b>	<b>257.65</b>	<b>412</b>	<b>2,052.50</b>	<b>64</b>	<b>26.58</b>	<b>698</b>	<b>3,358.62</b>
PV	171	1,019.36	68	218.88	158	702.38	64	26.58	428	1,967.21
Thermal	1	2.52	15	38.77	254	1,350.12	0	-	302	1,503.16
2										
3										
4										
5										
6										
7 <b>Used Oil*</b>	6	-	0	-	1	0.025	0	-	1	0.025
<b>Total VSPP+SPP Project</b>	<b>202</b>	<b>1,024.40</b>	<b>148</b>	<b>296.42</b>	<b>680</b>	<b>3,405.12</b>	<b>64</b>	<b>26.58</b>	<b>815</b>	<b>3,728.12</b>

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### Solar Energy Installation up to 2010



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### Solar Thermal Power Plant

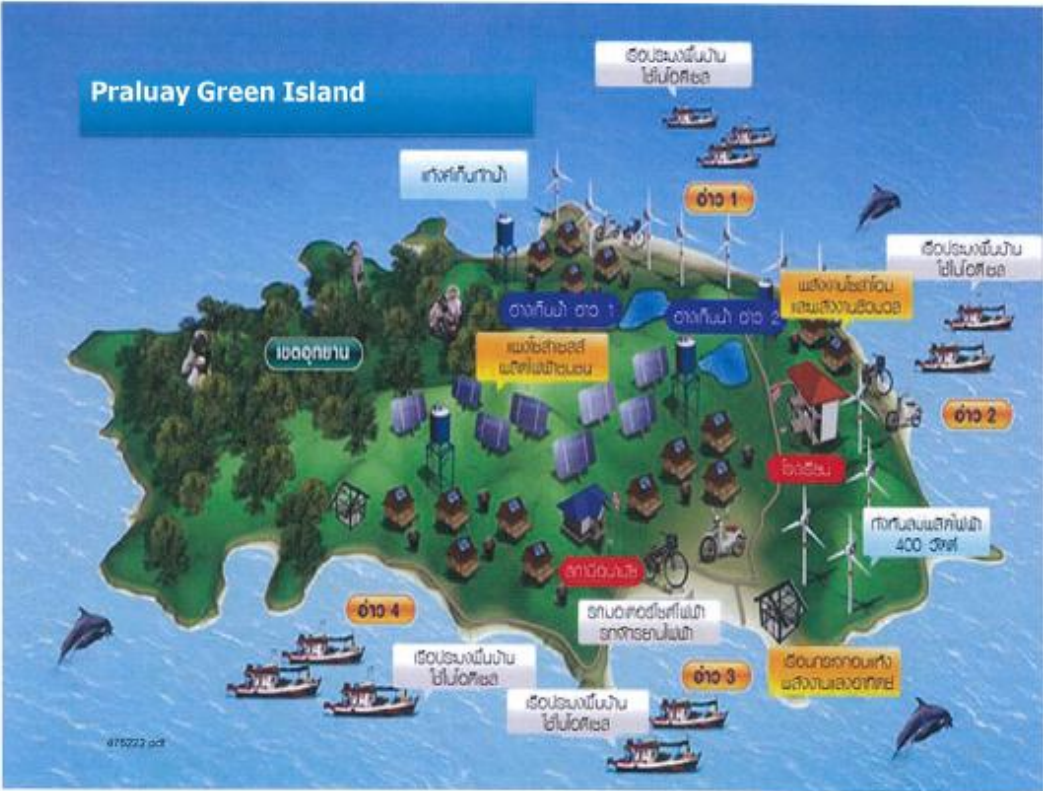
#### 1st solar thermal power plant of Asean



The TS1 project of 5MW is located in the Kanchanaburi province, using the Direct Steam Generation (DSG) technology specially developed to adapt to the Southeast Asian climate. COD is fixed for March 2011 but until now (May 2011) is still not on the grid

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## Lessons Learned and Ways Forward

1. New Rooftop solar systems will be promoted using FITs based on total kWh generated, and on net-metered kWh.
2. Increasing RE utilisation for community
3. Financial measures are not enough for some publics
4. Some Technical and Safety regulations are subject to revision
5. Following the development of CSP and its utilisation in low direct radiation area

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