

ANNEXES

Annex 1: Status of Renewable Energy Uptake and Policies in Lower Mekong Basin Countries

Cambodia

<p>a) Electric Power Industry</p> <ul style="list-style-type: none">• Electricity tariff: Domestic sector = US\$0.18/kWh, Industrial sector = US\$0.1858/kWh
<p>b) Subsidy for electricity tariff</p>
<p>c) Current status and challenges of RE policy</p> <p>System that is currently implemented:</p> <ul style="list-style-type: none">• To promote power generation by RE, the Renewable Energy Action Plan 2002–2012 was formulated in May 2003, supported by the World Bank. The target was to raise the RE energy generation capacity to 6,000 kW.• The introduction schedule or political measures were not specified for the target, and the implementation results were not disclosed.• The government approved the Rural Electrification by Renewable Energy Policy in 2006 to expand access to electricity. This policy included the achievement of 100% electrification for rural areas by 2020, and supplying grid-quality electricity to 70% of households by 2030, among others.

Lao PDR

<p>a) Electric Power Industry</p> <p>Electricity tariff: Domestic sector = US\$ 0.042/kWh, Industrial sector = US\$ 0.092/kWh</p>
<p>b) Subsidy for electricity tariff</p> <ul style="list-style-type: none">● Subsidy is for small consumers (residential), industries, and agriculture
<p>c) Current status and challenges of RE policy</p> <p>System that is currently implemented:</p> <ul style="list-style-type: none">● None of the approaches has yet been implemented as RE policies are still in the process of being drafted.● The 'Renewable Energy Development Strategy' announced in October 2011 specified 30% by 2025 as the ratio of introduced RE to the overall energy consumption, focusing on hydropower and biofuel (10% to reduce fossil fuel import).● The policy is to promote the introduction of RE integrated with the local electrification policy. The construction of power systems and introduction of distributed RE power sources will be promoted simultaneously.● In the local electrification policy, the target is to achieve a 90% national average electrification rate by 2020. To facilitate the introduction of distributed power sources, the Law on Electricity (effective since 1997) ensures the freedom of entry of small power generation business operators with 15,000 kW or less, based on the judgment of local governments.● As Lao PDR does not have RE policies yet, the key domestic challenges and constraints on RE development will be as follows:<ul style="list-style-type: none">– No specific policies or strategies on RE promotion.– Lack of coordination among stakeholders in RE.– RE policy has not yet been clearly stated in the National Socioeconomic Development Plan.– Lack of specific regulations and laws on RE.– It was not yet clear as to who is responsible for RE project approval.– Users have insufficient knowledge and understanding of RE.– Lack of public funding to support RE.– The absence of energy pricing regulation is a risk for investors.– Rural households prefer grid electricity rather than off-grid one.– Insufficient information on RE potential at the provincial level.– Electricity access rate in remote areas is still low.● For further reference: http://www.edl.com.la/en/page.php?post_id=6

Myanmar

a) Electric Power Industry

Electricity tariff. Myanmar currently uses 'Capacity Basis Tariff'.

	Units	MK (kyats)
Household	Below 100	35
	101 to 200	40
	Over 201	50
Industrial	Below 500	75
	501 to 10,000	100
	10,001 to 50,000	125
	50,001 to 200,000	150
	200,001 to 300,000	125
	3200,001 and above	100

b) Subsidy for electricity tariff. The new tariff system helps the Ministry of Electric Power (MOEP) to remove the subsidy in the power sector. Currently, the subsidy is at break-even point.

c) Current status and challenges of RE policy

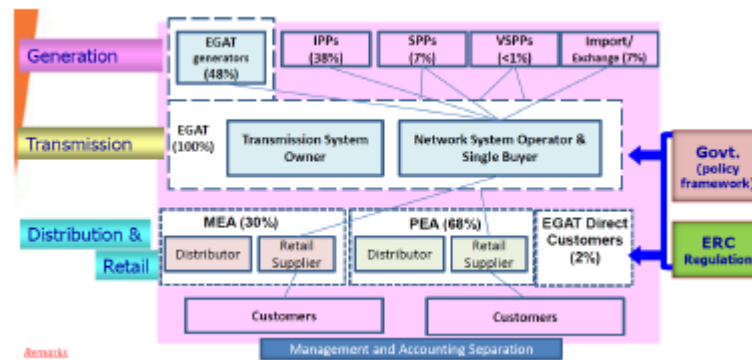
System that is currently implemented:

- To strengthen the rules and regulation in the power sector, the Ministry of Electric Power (MOEP) enacted the new Electricity Law and continues drafting the Electricity Regulation. After this stage, MOEP will proceed to formulate the necessary law, rules, and regulations (IPP, SPP, VSPP, FIT, etc.).
- MOEP has drafted the National Electricity Master Plan by coordinating with the Japan International Cooperation Agency (JICA). The MOEP is also getting the approval from the government. Based on the National Electricity Master Plan, the contribution of RE in power generation mix is 9% in 2030 and the capacity is at 2,000 MW.
- The Ministry of Energy considers hydropower as an important source of energy in its energy policy, and has policies to promote the development of small-scale hydropower. However, specific preferential treatment or measures to aid its achievement have not been implemented.
- To promote the development of small-scale hydropower, MOEP developed a new process. Under this scheme, the private sector can build and operate small and medium hydropower plants with the approval of regional governments.

Thailand

a) Electric Power Industry

- Electricity tariff: Domestic sector = 3.4286 Baht/kWh, Industrial sector = 3.5570 Baht/kWh
- Vertically integrated in generation and transmission.
- Single-buyer model



Source: Dr Romeo Pacudan, ERIN WS, 20 April 2015.

b) Subsidy for electricity tariff

Rural area customers are cross-subsidised by urban area customers.

c) Current status and challenges of RE policy

System currently implemented:

A target to raise the RE ratio in the final energy consumption to 25% by 2021 was established. The 'Alternative Energy Development Plan' (AEDP Master Plan, 2012–2021) was announced in July 2013. The target of RE electric power plant capacity was set at 13,927 MW.

A programme to purchase electricity from small power producers or SPPs (10 MW–90 MW) was started in 1994, while those from very small power producers or VSPPs (10 MW or less) started in 2002. Based on these, in April 2007, the Adder programme was introduced, where the purchase prices and the period were fixed by adding a premium on the purchase prices of SPP and VSPP programmes. Through revisions of the premium, the premium price and the purchase prices from SPP and VSPP were consolidated at the end of 2011, and the transition to the feed-in tariff system was announced. Specific system design is a pending issue.

Viet Nam

a) Electric Power Industry¹

Electricity tariff

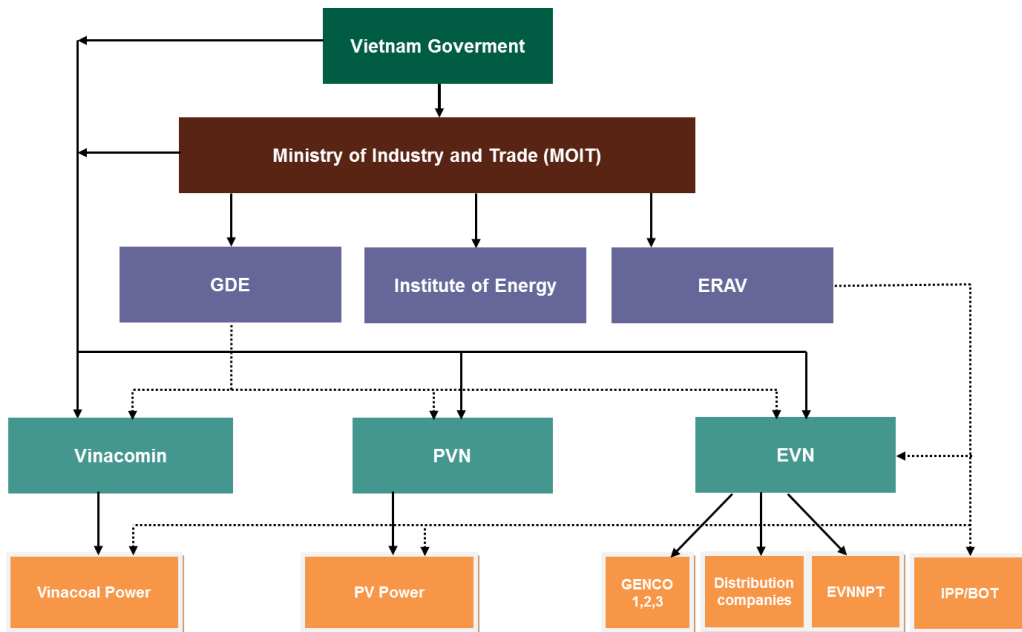
- The latest electricity tariff of Viet Nam was promulgated by the Ministry of Industry and Trade in Decision No. 2256/QD-BCT dated 12 March 2015 and is applicable starting 16 March 2015. According to this decision, the average retail tariff is VND 1,622.01 per kWh, or US\$ 7.56 per kWh.
- The electricity tariff is divided into retail tariff and wholesale tariff, which are then further divided into groups of customers, voltage levels, consumption levels, and peak-off-peak hours. The following table presents a summary of the electricity tariff.

Electricity Tariff of Viet Nam (from 16/03/2015)		
No.	Group of Customers	Tariff Range
Retail Tariff		
1	Manufacturers	US\$4.05–US\$12.75 per kWh
2	Administrative and non-profit units	US\$6.8–US\$7.8 per kWh
3	Businesses	US\$5.5–US\$18.6 per kWh
4	Electricity for living	US\$6.9–US\$12.1 per kWh
Wholesale tariff		
1	Rural areas	US\$5.7–US\$ 9.5
2	Residential blocks or clusters	US\$6.1–US\$11.1 per kWh
3	Commercial – Service – Residential complexes	US\$6.2–US\$17.6 per kWh
4	Industrial zones	At 110 kilovolt busbar: US\$3.8–US\$11.2 per kWh At medium-voltage side of the substation: US\$4.1–US\$12.1 per kWh

- The Electricity of Viet Nam (EVN) group, established as a national company in 1995, owns and manages main power plants, load-dispatching offices, transmission companies, distribution companies, and others. A power development plan, reform proposal for electricity tariff, among others, were formulated and implemented.

¹ The Electric Power Industry in the World, Japan Electric Power Information Center, Inc. (2014).

Figure A1: Organisational Structure of the Power Industry in Viet Nam



- The National Power Development Plan is developed every 5 years by the Institute of Energy and approved and promulgated by the Prime Minister. This is the plan for the next 10 years with outlook to the subsequent period of 10–20 years. It serves as the orientation document for the development of power industry in Viet Nam. The current plan is called PDP VII and a revised PDP VII is now being prepared for approval.
- The power market of Viet Nam is now at a competitive generation market stage, and is preparing for the pilot stage of electricity wholesale market.

Figure A2: Viet Nam’s Power Market Development Roadmap



- Electricity tariff is regulated by Ministry of Industry and Trade. The current price is low and does not cover the actual cost, causing pressure to the EVN, which finances the development of the power system.

b) Subsidy for electricity tariff²

- Retail prices are the same throughout the country.
- Electricity prices are regulated, albeit less rigid than before. As of April 2011, EVN was allowed to adjust electricity prices by up to 5% every 3 months according to changes in production costs, while retail price adjustment over 5% require the approval of the Ministry of Finance (MOF) and the Ministry of Industry and Trade (MOIT). According to latest regulation, EVN is allowed to adjust electricity prices by 7%–10% every 6 months under a regulated pricing framework and in line with changes in production costs, with approval by the MOIT. Retail price adjustment over 10% or beyond the framework requires the approval of the MOF and the MOIT.

c) Current status and challenges of RE policy

System that is currently implemented:

To support RE projects, MOIT issued a regulation on the avoided cost-based tariff and standard power sale contract applicable to small power plants that use RE. The avoided cost-based tariff is set based on the avoidable cost on the national power system when 1 kWh is generated from the small power plant to the power distribution grid. The avoided cost tariff will be calculated by the seasons and is published annually.

For wind energy, the Government of Viet Nam has approved the fit-in tariff (FIT). The FIT is equal to US\$7.8 per kWh and the EVN is responsible for purchasing all electricity from wind power plants with contract period of 20 years, with possible extension or renewal.

The supporting mechanism for biomass power projects is promulgated in 2014. According to this decision, EVN is responsible for purchasing all electricity generation from on-grid biomass power plants, has a contract period of 20 years, with potential extension or renewal. The FIT applied to power-thermal cogeneration biomass plants is US\$5.8 per kWh. For on-grid biomass power plants other than power-thermal cogeneration plants, the power purchase price is according to the avoided cost-based tariff for biomass power projects promulgated by MOIT annually. All on-grid and off-grid biomass power plants also benefit from other incentives, such as investment credit incentives from the state, exemption from import tax for equipment and materials not yet produced locally, discount on corporate income tax, and exemption and reduction on land-use levy and fee.

- The supporting mechanism for on-grid power generation from solid waste projects is promulgated in 2014. Similar to the regulations on wind and biomass power projects, EVN is required to purchase all power generated from on-grid solid waste power plants, with a contract period of 20 years and with possible extension or renewal. Waste-to-power projects also benefit from other incentives on investment credit, import tax exemption, corporate income tax discount, and land-use levy and tax exemption and reduction that are similar to biomass power plants. The FIT applied for solid waste thermal power plants is US\$10.05 per kWh, and the FIT applied for power plants burning gas recovered from solid waste landfill is US\$7.28 per kWh.
- The supporting mechanism for on-grid biogas power projects has been proposed in a study implemented by the Institute of Energy with GIZ fund, but has not been approved yet by the Prime Minister.
- The revised PDP VII specified a target to raise the ratio of installed capacity of RE from 3.5% in 2010 to 6.3% by 2020, then to 8.1% by 2025 and to 10.1% by 2030.
- The amount and distribution of resources were not closely investigated and legal development and others are required. The use of RE is seen as an immediate measure to realising the objective of local electrification and for poverty alleviation; hence, commercial introduction is considered difficult.

Results:

- The mechanism on avoided cost tariff seems to have an effect on the development of SHP. Currently, 157 (SHP) projects with total capacity of 1,269.4 MW are in operation and 163 small hydropower (SHP) projects with total capacity of 1,683.0 MW are under construction. Over 260 SHP projects with total capacity of 2,028.2 MW are also preparing for investment report while 127 SHP projects with total capacity of 660.7 MW are being planned.³

² The Electric Power Industry in the World, Japan Electric Power Information Center, Inc. (2014).

³ Statistics Data, General Directorate of Energy, MOIT, (2012).

- As of the end of July 2014, Viet Nam has 52 wind power projects with a total capacity of 4,452 MW, and all are located in the central and southern provinces. Three are already in operation with a total installed wind power capacity of 52 MW. The rest are in various stages of development, such as investment report preparation or construction stages.
- The support price for wind power is still low and benefits from wind power projects also do not compensate the investment costs and other operations and maintenance (O&M) costs. So far, the first wind power project, located in Tuy Phong District, Binh Thuan Province, has completed the first phase of building to become operational with an installed capacity of 30 MW. The second project, also located in Phu Quy Island has an installed capacity of 6 MW. The third wind power project with 16 MW capacity was implemented in the Mekong Delta, province of Bac Lieu. This has been completed and connected to the national grid in September 2013, as the first phase.
- The potential of biomass to power in Viet Nam is high, but now there is only 150MW of installed capacity using bagasse for power generation, mainly for the sugar plants' own consumption, with residual generation sold to EVN.

Cost-sharing method:

- The FIT for wind power is US\$7.8 per kWh, of which US\$6.8 is paid by EVN and US\$1.0 is subsidised by the state through the Environment Protection Fund.
- The FIT for cogeneration biomass power is US\$5.8 per kWh and is paid by EVN
- The FIT for municipal solid waste power is US\$10.05 per kWh for incineration and US\$7.28 per kWh for landfill and is paid by EVN.

Annex 2: Assessment Results of the Prioritised Renewable Energy Technology Options

Table A1: Small Hydropower Plants

Co-benefits		Specifications	Grading (1 – 5)
GHG emission reduction	* GHG reduction potential	* Fourth highest with 129.3 million tonnes CO ₂ .equivalent	5
	* Abatement cost	* Second high benefit with –US\$9.3 per tonne CO ₂ .equivalent	
Alignment with government priorities		Encourage investors to invest in small hydropower plants through avoided costs.	3
Economic benefits	* Economic development	Create opportunity for new business.	4
	* Increased energy security	Reduce electricity demand or reduce dependence on imported coal.	
Social benefits	* Creation of new jobs	Create work opportunities and improve incomes.	3
	* Health conditions	Improve health conditions.	
Local environmental benefits	* Air quality	Reduce the concentration of toxic gases and dust.	2
	* Biodiversity	Pressure on deforestation and flood prevention during construction and operation.	
Total (5–25)			17

Source: Result from IE's group meeting.

Table A2: Biomass Power Plants

Co-benefits		Specifications	Grading (1–5)
GHG emission reduction	* GHG reduction potential	* Third highest with 143.9 million tonnes CO ₂ .equivalent	5
	* Abatement cost	* Highest range of benefit with -US\$ 12.0 per tonne CO ₂ .equivalent	
Alignment with government priorities		Encourage investors to invest in wind power plants through feed-in tariffs.	4
Economic benefits	* Economic development	Create opportunity for new business.	4
	* Increased energy security	Reduce electricity demand or reduce dependence on imported coal.	
Social benefits	* Creation of new jobs	Create work opportunities and improve incomes.	3
	* Health conditions	Improve health conditions.	
Local environmental benefits	* Air quality	Reduce the concentration of toxic gases and dust.	2
	* Biodiversity	Ensure the natural balance and protect the ecosystem.	
Total (5–25)			18

Source: Result from IE's group meeting.

Table A3: Wind Power Plants

Co-benefits		Specifications	Grading (1–5)
GHG emission reduction	* GHG reduction potential	* Highest with 175.2 million tonnes CO ₂ .equivalent	3
	* Abatement cost	* Last range of benefit with US\$9.2 per tonne CO ₂ .equivalent	
Alignment with government priorities		Encourage investors to invest in wind power plants through feed-in tariffs.	5
Economic benefits	* Economic development	Create opportunity for new business.	4
	* Increased energy security	Reduce electricity demand or reduce dependence on imported coal.	
Social benefits	* Creation of new jobs	Create work opportunities and improve incomes.	3
	* Health conditions	Improve health conditions.	
Local environmental benefits	* Air quality	Reduce the concentration of toxic gases and dust.	5
	* Biodiversity	Ensure the natural balance and protect the ecosystem.	
Total (5–25)			20

Source: Result from IE's group meeting.

Table A4: Solar Photovoltaic

Co-benefits		Specifications	Grading (1–5)
GHG emission reduction	* GHG reduction potential	* Second highest with 147.5 milliontonneCO ₂ .equivalent	3
	* Abatement cost	* Fourth range of benefit with US\$7.0 per tonne CO ₂ .equivalent	
Alignment with government priorities		Encourage investors to invest in solar PV power plants through feed-in tariffs.	5
Economic benefits	* Economic development	Create opportunity for new business.	3
	* Increased energy security	Reduce electricity demand or reduce dependence on imported coal.	
Social benefits	* Creation of new jobs	Create work opportunities and improve incomes.	3
	* Health conditions	Improve health conditions.	
Local environmental benefits	* Air quality	Reduce the concentration of toxic gases and dust.	5
	* Biodiversity	Ensure the natural balance and protect the ecosystem.	
Total (5–25)			19

Source: Result from IE's group meeting.

Table A5: Biogas Power Plants

Co-benefits		Specifications	Grading (1–5)
GHG emission reduction	* GHG reduction potential	* Lowest with 9.5 milliontonnesCO ₂ .equivalent	2
	* Abatement cost	* Third range of benefit with -US\$ 3.0 per tonne CO ₂ .equivalent	
Alignment with government priorities		Feed-in tariffs mechanism is being prepared.	3
Economic benefits	* Economic development	Create opportunity for new business.	3
	* Increased energy security	Reduce electricity demand or reduce dependence on imported coal.	
Social benefits	* Creation of new jobs	Create work opportunities and improve incomes.	4
	* Health conditions	Improve health conditions.	
Local environmental benefits	* Air quality	Reduce the concentration of toxic gases and dust.	4
	* Biodiversity	Ensure the natural balance and protect the ecosystem.	
Total (5–25)			16

Source: Result from IE's group meeting.