February 23, 2012

Response of ADB to United Kingdom on the Approval by Mail: Revised CTF Thailand Investment Plan

Replies are inserted below. We would be happy to arrange a conference call to expedite further clarification if necessary.

We have a few questions that we would be very grateful for further clarification on, as set out below. Once the design team has reviewed these I'm sure we would be happy to have a telecon if that would speed up the process.

1. We note the intention to seek carbon market revenues. Who will own the carbon credits and is the intention to sell these or to cancel them? What role is the ADB Future Carbon Fund going to play? Are there similar CDM projects already generating CERs and if so, how is this consistent with para 28 in the CTF investment criteria (cross referred to in the private sector operational guidelines)?

Reply:
Project owners will own the carbon credits and project owners will make decisions on disposition of carbon credits. ADB Future Carbon Fund (FCF) will consider buying some credits, but any offer would be based on registration and other risks, consistent with FCF operational guidelines. Based on unofficial feedback from the FCF team, carbon finance will not make any significant difference on upfront cofinancing. Regarding paragraph 28 of the CTF guidance, we note that CDM has not been effective to date in mobilizing finance for wind and solar deployment in Thailand. CDM might make a greater contribution to waste to energy projects, but in the current market it is doubtful that CDM will provide catalytic financing.

2. A grid emission factor of 0.7tCO2e/MWh is used to estimate the expected emission savings. What are the assumptions behind this, noting that suggested grid emission factors for registered CDM projects from http://www.iges.or.jp/en/cdm/report_grid.html are around 25% lower, around 0.55 tCO2/MWh. This assumption has a significant impact on the estimated expected emission savings and so it would be useful to know the justification of the 0.7 figure comes from. If the projects aims to seek carbon revenues it may need to be adjusted. With a lower grid factor, direct savings may be closer to 0.9MTCO2e p.a.

Reply:
Footnote "a" below the first table in the Appendix notes that 0.7 tCO_2e/MWh is assumed for displacing fossil power in the grid including future gas and coal-fired capacity additions. A mix of coal at > 0.9 tCO_2e/MWh and gas at about 0.5 tCO_2e/MWh suggests that 0.7 tCO_2e/MWh is reasonable. This estimate is not presented as the basis for CDM registration, which obviously would look at the entire grid mix, including large hydro imported from Nam Theun 2 and other large hydro plants in Lao PDR (which may have significant reservoir-related methane emissions).

The table at the link provides information on the various CDM projects in Thailand. The average of the "combined margins" is 0.53 tCO_2e/MWh, with values ranging from a low of 0.448 to a high

of 0.9058 (not inconsistent with the factor of 0.7 used by ADB). We agree that applying a grid factor of 0.55 is reasonable

3. Under results indicators in Table 5, the quoted cost-effectiveness of $9/tCO2e includes emission savings from replication and scale-up. We note that the Annex also sets out the cost-effectiveness of direct emission savings and think it would be useful if the results indicators table in the CIP did so as well. With a grid emission factor of 0.55 tCO2/MWh, cost-effectiveness would be around $115/tCO2e, which is to be expected in RE projects.

Reply:
We agree in principle with this assessment. Applying a grid factor of 0.55 tCO_2e/MWh yields estimated reductions of 843,150 tCO_2e/y, with cost-effectiveness of about CTF$119/ton/year. Over a 20-year project lifetime this would be equivalent to about CTF $6/ton. On a project lifetime basis, these estimates of cost-effectiveness are consistent with other CTF proposals (see table below). We believe replication and scale-up of at least 5x can be achieved.

Cost-effectiveness: Comparison of Various CTF Proposals

Program / Project	CTF Amount ($ million)	Cost-effectiveness of Direct Reductions	Cost-effectiveness with Replication and Scale-up
Egypt Urban Transport	$100	$66.67 / ton / year	$3.3 / ton
Morocco Wind & Pumped Storage [a]	$125	$73.53 / ton / year	$3.7 / ton
Philippines: IFC Renewable Energy Accelerator Program	19	$6.67 / ton	$1.33 / ton
Vietnam: IFC Energy Efficiency Program	28	$59 / ton / year	$4.2 – 6.5 / ton (15-year program lifetime)
Republic of South Africa (RSA): AfDB and IFC Energy Efficiency Program	$15	$5.56 / ton	$4.55 / ton
RSA Solar Water Heating Program	$50	$20 / ton	$4.35 / ton
RSA Sustainable Energy Accelerator Program (solar, wind, & cogeneration)	$83	$3.22 / ton	$0.65 / ton
Thailand: IFC Sustainable Energy Finance Program	$30	$4.44 / ton	n/a
Thailand: IFC Renewable Energy Accelerator Program	$40	$16.67 / ton	$1.67 / ton
Philippines: ADB EEEVs project (proposed)	$101	$43.72 / ton	$4.37 / ton

Source: project funding proposals approved by CTF Trust Fund Committee (except for Philippines EEEVs project)
Note: [a] Emissions reductions are for the entire program of 450 MW wind power + 520 MW hydro-pumped storage, with total investment of about $2.1 Billion.

4. How will replication benefits be ensured and maximised?

Reply:
GoT will continue to maintain tariff adders to ensure that long-term AEDP targets will be met. Aside from these, CTF cofinancing will provide meaningful support towards further developing a sustainable RE market by establishing a track record demonstrating the technical and financial viability of private sector RE projects and instituting replicable business models and processes within the context of local technology utilization. The demonstration effect will increase overall project implementation efficiency and lower technology costs for future project developers.

In addition, demonstrated track record of projects will reduce project financing and other perceived risks that will enable the accelerated scale-up of projects and encourage further investments in the sector.

5. What is the size of the projects envisaged under the ADB-PSOD in terms of installed capacity? How does this compare to the existing renewable energy installed capacity for solar, wind and Waste to Energy as of 2011 (in terms of size of project and overall capacity) as this is material to the issue of first mover risk?

Reply:
As noted in para. 29, the overall pipeline includes 50 MW of waste-to-energy, 350 MW of wind, and 120 MW of solar. WTE is spread over 7-8 projects, so average size will be between 5 and 10 MW per site. The wind projects under consideration will range in size 15 MW to 90 MW per site, but these will be built out in phases. The solar projects under consideration will range from 30 MW to 120 MW per site. The CTF confinancing will be less than $50 million per project in accordance with CTF guidance for private sector programs.[1]

6. Is there any long-term plan for energy storage to balance the system, given the estimated replication and scale-up potential?

Reply:
The projected mix of adding biomass, waste-to-energy (WTE), solar, and hydro electricity generating capacity will have a low impact in terms of grid stability. Biomass typically runs as baseload and should enhance grid stability, as the AEDP calls for biomass to account for 66% of RE capacity by 2022. Solar is expected to comprise the largest share of future RE capacity, and with its inherent load-following characteristics it does not present an insurmountable challenge, as the AEDP calls for solar to account for only 9% of RE capacity by 2022 (this would increase to 15% if the solar objective is increased to 1000 MW and the overall objective is increased to 6608 MW). Gas-fired generation and hydropower plants also provide flexible output to balance intermittent loads. Only wind systems may become the most problematic with respect to grid stability and dispatch, but wind is projected to comprise less than 3% of total RE capacity by 2022. [The AEDP objectives are presented in Table 2 of the main text of the original CIP; the table was not reproduced in the CIP-U for sake of brevity.]

7. The Investment Plan states that there is a considerable amount of untapped RE potential in Thailand. Figures of 1,500 MW for wind and 50,000 MW for solar are given, which seem reasonable. However it would be good to see the references for these estimates.

Reply:
The RE potentials are taken from the Alternative Energy Development Plan (AEDP) which is summarized in Table 2 of the original CIP (included below for quick reference).

8. Finally, could you please clarify the calculations in paragraph 3 of Appendix. 20.3% of current installed capacity of 29,211 MW is 5,929 MW. However, the Appendix says that the

[1] CTF Private Sector Operational Guidelines, 12 January 2009, paragraph 7.

2022 target is 5,608 MW for RE. This does not seem to take into account the average (annual?) growth rate of electricity demand of 4.22%.

Reply:

Paragraph 3 of the Appendix notes that the Alternative Energy Development Plan (AEDP) sets a target of 20.3% of primary commercial energy (ie not just power generation) to come from alternative energy sources including solar, wind, hydro, biomass, WTE, hydrogen, biofuels, and natural gas vehicles. The 2022 RE target of 5,608 MW is taken from the AEDP (see Table 2 of the original CIP – included below for quick reference).

Table 2: MOEN's Targets for Alternative Energy Development

Type of Energy	Potential	existing	2008 - 2011		2012 - 2016		2017 - 2022	
Electricity	**MW**	**MW**	**MW**	**ktoe**	**MW**	**ktoe**	**MW**	**ktoe**
Solar	50,000	32	55	6	95	11	500	56
Wind Energy	1,600	1	115	13	375	42	800	89
Hydro Power	700	56	165	43	281	73	324	85
Biomass	4,400	1,610	2,800	1,463	3,220	1,682	3,700	1,933
Biogas	190	46	60	27	90	40	120	54
Municipal Solid Waste	400	5	78	35	130	58	160	72
Hydrogen			0	0	0	0	3.5	1
Total		**1,750**	**3,273**	**1,587**	**4,191**	**1,907**	**5,608**	**2,290**
Thermal	**ktoe**	**ktoe**		**ktoe**		**ktoe**		**ktoe**
Solar Thermal	154	1		5		17.5		38
Biomass	7,400	2,781		3,660		5,000		6,760
Biogas	600	224		470		540		600
Municipal Solid Waste		1		15		24		35
Total		**3,007**		**4,150**		**5,582**		**7,433**
Biofuel	**m lt/d**	**m lt/d**	**m lt/d**	**ktoe**	**m lt/d**	**ktoe**	**m lt/d**	**ktoe**
Ethanol	3.00	1.24	3.00	805	6.20	1,686	9.00	2,447
Biodiesel	4.20	1.56	3.00	950	3.64	1,145	4.50	1,415
Hydrogen			0	0	0	0	01 mill kg	124
Total			**6.00**	**1,755**	**9.84**	**2,831**	**13.50**	**3,986**
Total Energy Consumption (ktoe)		66,248		70,300		81,500		97,300
Total Energy from R E (ktoe)		4,237		7,492		10,319		13,709
Renewable Energy Ratio		**6.4%**		**10.6%**		**12.7%**		**14.1%**
NGV (mmscfd - ktoe)		108.1	393.0	3,469	596	5,260	690	6,090
Total Energy from RE + NGV				10,961		15,579		19,799
Alternative Energy Ratio				**15.6%**		**19.1%**		**20.3%**

Source: Department of Alternative Energy Development and Efficiency. Ministry of Energy. July 2009.