December 22, 2010

IBRD response to questions submitted by the United Kingdom on the approval of CTF funding for the Indonesia: Geothermal Clean Energy Investment Project

– GHG savings need to be evaluated in relation to Indonesia's target (from the G20, 2009) of a 26% reduction from BAU. The base and target years for this figure are not given in the proposal. Could these please be provided?

The Government of Indonesia Technology Needs Assessment (TNA) as noted in the CTF Investment Plan for Indonesia estimate that in 2010, the CO_2 emissions will be 478 million tonnes in 2010; and under a business as usual (BAU) scenario in the absence of mitigation measures, the emissions are estimated to increase to 1,365 million tonnes of CO_2 by 2025

- A full calculation of marginal abatement costs (as discussed in the CTF guidelines) has not been included. Would it be possible to provide this?

We haven't found any specific guidelines in the CTF design documents. Using the methodology of abatement cost calculation in McKinsey's *McKinsey Global GHG Abatement Cost Curve* , version 2.0 , the CO2 abatement costs for the project are calculated as follows:

Abatement cost formula (source: Exhibit A.III.2)

$$\text{Abatement cost} = \frac{[\text{Full cost of } CO_2\text{e efficient alternative}] - [\text{Full cost of reference solution}]}{[CO_2\text{e emissions from reference solution}] - [CO_2\text{e emissions from alternative}]}$$

Based on the above formula, the numbers for the proposed CTF/World Bank project would focus on the difference between geothermal and coal (business as usual). Based on the calculation, the combined marginal abatement costs come out to about $21 per ton. This is coincidentally consistent with the work that McKinsey did for Indonesia (See IP Page 17, figure 7, attached), which estimates the marginal abatement at about $23 (if using a $1.3 per Euro exchange rate). All data in the below table are from the PAD.

Annual CO2 abatement (tCO2)	880,000
Present value of CO2 abatement @ 10% social discount rate(tCO2)	7,987,795
Present value of geothermal generation cost@ 10% social discount rate (US$ million)	637.23
Present value of coal generation cost @ 10% social discount rate (US$ million)	473.79
Incremental cost - Geothermal vs. Coal (US$ million)	163.44
CO2 abatement cost (US$/tCO2)	**20.46**

– Is there potential for specific cost reductions through learning during the course of the project term?

As noted in the Project Appraisal Document (PAD), the proposed geothermal development program being spearheaded by the Government of Indonesia, if successfully implemented, will lead to a 40 percent increase on global geothermal capacity (4,000 MW of new capacity from the current 10,000 MW available in the world), and almost a doubling if they achieve the long-term target of 9,500 MW.

Therefore, there are opportunities for geothermal to become more competitive with alternative resources due to economies of scale.

With regards to the impact of the specific project that is proposed for CTF/World Bank financing, efficiency improvements and cost reductions can arise from several factors:

a) The project preparation grant that was facilitated by the World Bank has helped PGE retain experts to assist them prepare the project to industry as well as international standards. Such efficiency improvements will also lead to reducing the cost of PGE's investments and operations. Moreover, the technical assistance was specifcally designed to transfer knowledge so that experience gained through it would subsequently benefit the quality of project design and implementation of the significant future developments that are planned by PGE, hence reducing investment costs.

b) By confirming resources in (undeveloped) green field geothermal sites, this investment will reduce the resource risks and subsequently lower the cost of further expansion in those fields.

c) The proposed project is expected to catalyze significant investments into geothermal energy development which has a potential to achieve economy of scale that can drive down costs especially if it leads to greater domestic content due to development of local industries.

d) The World Bank requires internationally competitive bidding for key contracts for the power plant and steam gathering systems in the project. Having open competition will maximize the number of bidders and as a result lead to better pricing for the contracts and lower costs.

- The proposal states that in the past project plans have been modified if people do not want to sell their property if located on the proposed site. Is this in fact the case? Bank guidelines

The World Bank applies stringent guidelines for land acquisition and involuntary resettlement, as per its Operational Policy 4.12. In the case of the proposed project, its implementing agency, Pertamina Geothermal Energy (PGE) does not usually resort to land expropriation, and instead acquires the necessary land for its geothermal operations through a willing-buyer willing-seller approach. This approach is made possible because the land required for geothermal developments is relatively small, is non-continuous; and the nature of geothermal development provides for flexibility in locating its well pads that are used for drilling to extract the steam supply. Therefore, if PGE is unable to acquire a specific land parcel for its operation, it has the flexibility to adjust the location of the drill pads and use mutli-directional drilling techniques to reach the steam reservoirs. It is important to note that this is part of the normal course of developing a geothermal field where adjustments are made based on field and other conditions, and it does not amount to a change in the project concept or major shift in design. However, this flexibility proved important when acquiring land because it provides the land owners the option of refusing to sell the land and PGE the flexibility to make adjustments rather than resort to expropriations. This approach to land acquisition is non-confrontational and PGE and the local communities have had success with it thus far. There has been two instances where land owners either refused to sell or were not able to very the ownership of the land – and in both instances, PGE was able to make adjustment to its drilling locations and proceed with the project without any additional social impact. The approach used by PGE for land acquisition is fully consistent with World Bank operational policies.