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DIVISIONE GENERAZIONE ED ENERGY MANAGEMENT
AREA TECNICA ANALISI MERCATI E CAPACITY STRATEGY

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Issue 1: The DOE should clarify the changes between the PDD submitted for validation and the PDD submitted for registration, in particular, the removal of the description on the firewood being replaced by the electricity generated from the project activity.

Response from the project participant:

Most changes between the PDD submitted for validation and the PDD submitted for registration are based on the draft validation report and latest requirements of EB before the PDD submitted for registration. About the description on the firewood being replaced by the electricity generated from the project activity, please see the second paragraph of section A.2 in the PDD submitted for validation and the PDD submitted for registration, which both refer to "The construction of this hydropower station is for the express purpose of *Replacing Firewood by Electricity*", therefore, PDD submitted for registration did not remove the *description on the firewood being replaced by the electricity generated from the project activity*. In other word, the project will be as "*Replacing Firewood by Electricity*" project and supplies part electricity to local residents *through Grid Company*, namely, all the electricity generated by the project will be supplied to the grid (which can be proved by the Power Connection Agreement and approved Feasibility Study Report), and then the Grid Company supplies part electricity to local residents (which can be proved by the *Implementation Opinion about the "Replacing Firewood by Hydropower Stations"* published by the Dehong Dai-Jingpo Autonomous Prefecture People's Government).

Issue 2: The DOE is requested to further clarify the assumed electricity tariff and to confirm whether or not all the electricity output will be supplied to the power grid.

Response from the project participant:

a) About the assumed grid price

The assumed grid price in the PDD submitted for registration is 0.1375 Yuan RMB/kWh, which has been calculated by the 50% of the annual power supplied with the grid price of 0.10 Yuan RMB/kWh and 50% of the annual power supplied with the grid price of 0.175 Yuan RMB/kWh. Please see explanation below:

- ✧ Based on the *Implementation Opinion about the "Replacing Firewood by Hydropower Stations"* (the project is included in the document) published by the Dehong Dai-Jingpo Autonomous Prefecture People's Government, the grid price of the project is 0.10Yuan RMB/kWh.
- ✧ But now the project owner tries their best to get a higher price of 0.175 Yuan RMB/kWh, which has been calculated based on *Notice about the Grid Price of Dehong Dai-Jingpo Autonomous Prefecture* published by the Dehong Dai-Jingpo Autonomous Prefecture People's Government, in the document, the grid price in rainy season is 0.15 Yuan RMB/kWh and the grid price in dry season is 0.20 Yuna RMB/kWh, therefore the average gird price is 0.175 Yuan RMB/kWh. But only 50% of the annual power supplied to the grid maybe can get the higher price, and the price of 0.175 Yuan RMB/kWh for the 50% of the annual power supplied is only a probability (maybe they can not get the price). Therefore, the PDD submitted for registration used 0.175 Yuan RMB/kWh for 50% of the annual power supplied to the grid, it is conservative.
- ✧ The two grid price are both approved by the government, in China, the grid price is strictly regulated by China government and it is established on strict regulation rather than the market mechanism, so it is

hard to forecast the future tariff by the project owner. As the grid price is related tightly to the national economy and livelihood of people, the government of China has to make the tariff steady. Therefore, for all subsequent years the grid price of 0.1375 Yuan RMB/kWh will most likely to be achieved.

Therefore, the assumed grid price in the PDD submitted for registration is reasonable, conservative and appropriate.

b) About the all the electricity output will be supplied to the power grid

As explained in the issue 1, all the electricity generated by the project will be supplied to the grid, which can be proved by the Power Connection Agreement signed by the project owner and the Grid Company. And then the Grid Company supplies part (or all) electricity generated by the project to local residents (which can be proved by the document published by the Dehong Dai-Jingpo Autonomous Prefecture People's Government). Therefore, all the electricity generated by the project will be supplied to the grid.

Issue 3: The DOE is requested to clarify how it has validated the input values used in the investment analysis in line with EB 38, para. 54, including: a) the update in the investment cost and it is not clear how CL4 was closed; and b) the suitability of the coefficient of effective electricity used.

Response from the project participant:

According to paragraph 54 of the EB 38 report:

"54. The Board clarified that in cases where project participants rely on values from Feasibility Study Reports (FSR) that are approved by national authorities for proposed project activities, DOEs are required to ensure that:

(a) The FSR has been the basis of the decision to proceed with the investment in the project, i.e. that the period of time between the finalization of the FSR and the investment decision is sufficiently short for the DOE to confirm that it is unlikely in the context of the underlying project activity that the input values would have materially changed.

(b) The values used in the PDD and associated annexes are fully consistent with the FSR, and where inconsistencies occur the DOE should validate the appropriateness of the values.

(c) On the basis of its specific local and sectoral expertise, confirmation is provided, by cross-checking or other appropriate manner, that the input values from the FSR are valid and applicable at the time of the investment decision."

The Feasibility Study Report (FSR) was completed in August 2004 by the "Hangzhou Water Resource and Hydropower Reconnaissance Institute" before investment decision (March 16, 2005, the earliest starting date of the project, which is the date of starting construction). Therefore, the period of time between the finalization of the FSR and the investment decision is sufficiently short and the input values from the FSR are valid and applicable at the time of the investment decision. In addition, Hangzhou Water Resource and

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Hydropower Reconnaissance Institute is an independent organization which is qualified to compile design reports for hydropower projects (it has obtained a "grade B" in water conservancy industry and electricity industry, issued by the Construction Bureau of People's Republic of China). Additionally, the FSR has been approved by the Yunnan Province Development and Reform Committee (Yunnan Province DRC) in December 2004. Therefore, the FSR can be considered as an independent and realistic assessment of the proposed project activity, including the parameters listed and used as input values in the IRR calculation of the PDD submitted for registration.

Conclusion:
The FSR is the basis of the decision to proceed with the investment in the project and the the period of time between the finalization of the FSR and the investment decision is sufficiently short. Therefore, the input values from the FSR employed in the investment analysis are valid and applicable in consistent with the EB 38 guidance, paragraph 54(a).

As listed in the PDD submitted for registration, the most input values are cited from the approved FSR of the project, except the grid price, because the grid price in the FSR was only an assumed grid price and not official grid prices based on any policy [1].

The assumed grid price in the PDD submitted for registration is 0.1375 Yuan RMB/kWh, which has been calculated by the 50% of the Annual Power supplied with the grid price of 0.10 Yuan RMB/kWh and 50% of the Annual Power supplied with the grid price of 0.175 Yuan RMB/kWh. As explained in Issue 2, the grid price in the PDD submitted for registration is an instructional and proposed grid price of the project, which is more reasonable and appropriate than the assumed grid price in the FSR.

Conclusion:
The FSR and the grid price in the PDD submitted for registration are valid and applicable in consistent with the EB 38 guidance, paragraph 54(b).

Finally, to confirm the appropriateness of input values applied in the investment analysis, we have compared them to the actual values where possible.

Static Total Investment:

Up to January 2009, the actual investment is 160,000,000 Yuan RMB[2], which is far higher than the designed value of 94,890,000 Yuan RMB in the FSR. But the project construction is not yet completed (expected to be completed in July 2009), and therefore the actual investment will be exceeded

[1] According to the SL16-95 regulation page 17, main financial evaluation indexes refer to financial internal rate of return (IRR), and repayment period of fixed assets investment loan. Auxiliary indexes refer to financial net present value and financial net present value ratio. When the calculated IRR and repayment period of fixed assets investment loan both meet the standard, the financial evaluation would be considered feasible. Therefore, the FSR use the financial internal rate of return (IRR) benchmark of 10% and fixed assets investment loan repayment period to assume the grid price in the FSR. Therefore the grid price in the FSR is only a calculated grid price and not official grid prices based on any policy.
[2]The statement of the the Agriculture Bank of China

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220,000,000Yuan RMB[3]. Therefore, the lower static total investment from FSR used in IRR calculation is more conservative.

In the PDD submitted for registration, the static total investment is 94,890,000 Yuan RMB, and in the PDD submitted for validation, the value is 9,489,000€ (exchange rate: 1€=10Yuan RMB), therefore, the investment in the two version PDD is the same, not updated. Even if the ivestment is increased due to the bad geological condition (during the construction period, the project owner found the geological condition of the project site is very bad, and the relevant evidences have been validated by DOE during the operation period), but the lower investment in the FSR has been employed for conservative purpose.

Therefore, the lower total investment from FSR used in IRR calculation is appropriate and more *conservative*.

Net power supplied to the grid:

The project activity is only expected to be operated in July 2009, and it is therefore not feasible to compare the estimated annual net power supply from the FSR (i.e. 95,830MWh) to actual net power supply during the first year of operations.
We do however confirm the estimated value of power generation is calculated on a strong statistical basis, namely on 31 years of water flow measurements (1971-2001). Therefore, a significant change in power generation of the project during the crediting period is not likely to occur. Additionally, for the calculation of estimated power generation, it is assumed that the turbines/generators will operate at a 100% reliability level throughout the year, which is unlikely. Finally, during "the rainy seasons", the grid company might not off-take all electricity generated by the project activity due to an oversupply of electricity, during this period, the project will have to stop generating electricity. See details below.

The designed annual power generation and the net power supplied to the grid are both from the approved FSR; therefore, the two values are applicable and credible.
As described in PDD requesting registration,

- ✧ The average designed annual power generation is 110,320MWh, which was estimated in FSR according to the hydrological conditions in terms of water resource availability (31 years), does therefore differ from the actual power which will be generated, because full load conditions will be rarely set during the plant operation throughout the year due to the lack of absorption capability of the grid.
- ✧ And the net power supplied to the grid is estimated to be 95,830MWh.

The net power supplied to the grid of 95,830MWh is calculated based on coefficient of effective electricity (90%), the auxiliary power consumption (0.5%) and the line loss (3%):

$$95{,}830\text{MWh} = 110{,}320\text{MWh} \times 90\% \times (1\text{-}0.5\%) \times (1\text{-}3\%)$$ [4]

[3] The statement of the supervising company and the construction company of the project (third parties)
[4] In Section 3.2.1, 3.2.2, and 3.4 of the SL 16-95 regulation it is stated that the power supply to the grid by a project is calculated as the annual designed electricity generation × coefficient of effective electricity × (1 – auxiliary power consumption) × (1 – line loss). The annual designed electricity generation × coefficient of effective electricity is the effective electricity generation (which is based on amongst others the load factor, the electricity balance of the local grid). Section 3.4 of SL 16-95 further specifically states that for simplification purpose, the coefficient of effective

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The calculation formula comes from approved FSR which in turn bases its calculation on the "the Economic Evaluation Code for Small Hydropower Projects (SL16-95)[5]" (same guidance used by the design institute preparing the FSR). Therefore, the net power supplied to the grid employed in the IRR calculation is reasonable.

- The coefficient of effective electricity of 90% comes from approved FSR and is further confirmed by the Hydroenergy Design Code for Hydro Power Projects (SL76-94) approved by the Ministry of Water Resources of the People's Republic of China: [6]
  - For small scale hydropower stations (with an installed capacity up to 50MW), the coefficient of effective electricity and effective power generation should be calculated according to the Economic Evaluation Regulation for Small Scale Hydropower Projects (SL16-92), which was substituted by "the Economic Evaluation Code for Small Hydropower Projects (SL16-95)", whose in Table 3.4 provides an overview of applicable coefficients for energy efficiency as follows:

The coefficient of effective electricity for different type of hydropower stations:

Type of hydropower stations	The coefficient of effective electricity
1.Grid connected, annual/ multi-year regulating hydropower stations	0.95-1.00
2.Grid connected, seasonal regulating hydropower stations	0.90-0.95
3. Grid connected, monthly/weekly/daily/no regulating (run-of-river) hydropower stations **The grid will take all electricity generated in rainy season and night** **The grid will only take part of the electricity generated in rainy season and night**	 **0.80-0.90** **0.70-0.80**
4. Not connected to the grid, Daily/No regulating capacity	0.60-0.70

  - The installed capacity of the project is 20MW and the project is a run-of-river hydropower station. In accordance with the Table 3.4 in "the Economic Evaluation Code for Small Hydropower Projects (SL16-95)" as listed above, the coefficient of effective electricity should choose 0.70-0.90. The Design Institute has chosen to employ the higher value of 0.9 as the coefficient of electricity. This is

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electricity can be chosen from the Table 3.4 in the SL 16-95 document.
In the formula,

- 110,320MWh is the designed annual power generation, which is estimated in Feasibility Study Report according to the hydrological conditions in terms of water resource availability;
- 110,320MWh × 90% is the power generation with considering the lack of absorption capability of the grid;
- 110,320MWh × 90% × (1-0.5%) × (1-3%) is the net power exported to the grid.

In addition, the approved Feasibility Study Report of the project also used the formula.
[5]http://www.cws.net.cn/guifan/bz/SL16-95/. In 2002, the Ministry of Water Resources of the People's Republic of China issued the "Bulletin of Valid Hydropower Technical Standard" currently. According to this hydropower document No [2002]07 the "Revision of Economic Evaluation Code for Small Hydropower Project (SL16-95)", is still effective and enforceable, reference website: http://www.ches.com.cn/jishubiaozhun/001.htm, and the Water Resources and Hydropower Planning and Design General Institute of the Ministry of Water Resources of the People's Republic of China confirm that it is still in effect in 2008, reference website: http://www.giwp.org.cn/index.do?act=mess&modu=160&mess=361
[6] Please see: http://www.chinawater.net.cn/guifan/bz_pdf/SL76-94/05.pdf

the most *conservative* choice as a higher coefficient leads to higher power supply and therefore an overestimation of the IRR compared to employing a lower values as coefficient of electricity generation.

- ✧ In addition, the coefficient of effective electricity is the result of the balance between the local grid absorption capability in the dry and rainy seasons, taking into consideration the demand for power in the two periods. In particular has been evidenced the coefficient of effective electricity reflects the conditions of insufficient water availability during the dry season (October to May of each year) and the condition of "over the grid capability" available power during the rainy season (from June to September of each year). The result is a production which changes significantly throughout the year and in particular between the dry and the rainy season, therefore affecting the annual electricity which will export to the grid. The potential power production which has been estimated in Feasibility Study Report according to the hydrological conditions in terms of water availability, does therefore differ from the actual power which will be generated, because full load conditions will be rarely set during the plant operation throughout the year due to the lack of absorption capability of the grid. In other words, during the rainy season, a considerable hydropower potential, which in theory could allow the plant to reach 100% of the designed production, will be partially wasted due to the evidenced limits in the grid transmission and distribution system[7]

Therefore, the coefficient of effective electricity of 90% in FSR is *conservative* and credible. In addition, even if use the coefficient of effective electricity of 100%, the IRR of project is still much lower than the benchmark.

- ➢ The 0.5% for auxiliary power consumption is based on the "Economic Evaluation Code for Small Hydropower Projects (SL16-95)". According to this guidance, auxiliary power consumption is to be determined based on the actual situation or referred to from other similar projects. Based on "the regulation of development programming of electrical power in the region mainly supplied by rural hydropower (SL22-92)" [8], auxiliary power consumption has been determined as 0.5% by the

[7] Explanation for the coefficient of effective electricity, published by local grid company. In this document, local Grid Company (which the project connected) issued an explanation and the reasons to prove the validity of the coefficient of effective electricity of 80%-90%. The main reasons are as following:

- ✧ The structure of the local grid is frail and the transmission load capacity is limited (which caused the abandoned water in rainy seasons), so the bottleneck on transmission is rather common. Therefore, these factors resulting that the grid effective electricity could not reach the design standard.
- ✧ Due to low absorption ability and the lower load of local grid, the grid company is not able to buy all of the power that could potentially be generated by the plants during the rainy season and valley power consumption load periods, so during these periods, the projects have to stop operation..
- ✧ Comparing with the construction of hydropower stations, the construction of power grid in Dehong Dai-Jingpo Autonomous Prefecture (where the project is located) is lagging behind and it is beyond the capability of the power grid. The bottleneck on power generation will exist in long period, and the decreasing trend on coefficient of effective electricity will last for a few years.
- ✧ Therefore, the coefficient of effective electricity of 80%-90% is reasonable. The coefficient of effective electricity of 90% was employed by the project, it is conservative.

[8] Published by the Ministry of Water Resources of the People's Republic of China

independent design institute preparing the FSR. This is reasonable and in accordance with the public guidance.

- The line losses of 3% have been determined by the independent and certified Design Institute preparing the FSR based on its professional experience. Additionally, the average line losses of Yunnan Province are 6.28% [9], which is higher than the value of 3% in the FSR. The Design Institute has chosen to employ the lower value of 3% as the line losses. This is a ***conservative*** choice as a lower line losses leads to higher power supply and therefore an overestimation of the IRR compared to employing a higher values as line losses.

  It can be concluded that the net power supplied to the grid used in the IRR calculation is *reasonable and conservative* at the time of investment decision.

Grid price:

As explained in issue 2, the assumed grid price in the PDD submitted for registration is 0.1375 Yuan RMB/kWh, which has been calculated by the 50% of the annual power supplied with the grid price of 0.10 Yuan RMB/kWh and 50% of the annual power supplied with the grid price of 0.175 Yuan RMB/kWh. Please see explanation below:

- Based on the *Implementation Opinion about the "Replacing Firewood by Hydropower Stations"*(the project included in the document) published by the Dehong Dai-Jingpo Autonomous Prefecture People's Government, the grid price of the project is 0.10Yuan RMB/kWh.
- But now the project owner try their best to try for a higher price of 0.175 Yuan RMB/kWh, which has been calculated based on *Notice about the Grid Price of Dehong Dai-Jingpo Autonomous Prefecture* published by the Dehong Dai-Jingpo Autonomous Prefecture People's Government, in the document, the grid price in rainy season is 0.15 Yuan RMB/kWh and the grid price in dry season is 0.20 Yuan RMB/kWh, therefore the average gird price is 0.175 Yuan RMB/kWh. But only 50% of the annual power supplied to the grid maybe can get the higher price, and the price of 0.175 Yuan RMB/kWh for the 50% of the annual power supplied is only a probability (maybe they can not get the price). Therefore, the PDD submitted for registration used 0.175 Yuan RMB/kWh for 50% of the annual power supplied to the grid, it is conservative.
- The two grid price are both approved by the government, in China, the grid price is strictly regulated by China government and it is established on strict regulation rather than the market mechanism, so it is hard to forecast the future tariff by the project owner. As the grid price is related tightly to the national economy and livelihood of people, the government of China has to make the tariff steady. Therefore, for all subsequent years the grid price of 0.1375 Yuan RMB/kWh will most likely to be achieved.

Therefore, the assumed grid price in the PDD submitted for registration is reasonable, conservative and appropriate.

Annual operating cost

The annual operating cost are calculated according to the data from the approved FSR. Based on the FSR, the Interim Regulations of Hydropower Construction Project Financial Evaluation and hydropower No

[9] China Electric Power Yearbook 2006

[1995]186 documents, annual operating cost mainly include payroll, overhaul cost, welfare fund, material cost, reservoir maintenance fund and other cost. Based on the Interim Regulations of Hydropower Construction Project Financial Evaluation and hydropower No [1995]186 documents, the overhaul cost, welfare fund, material cost, reservoir maintenance fund and other cost should use the fixed values, and only the salary of the employees has been increased from 10,000 Yuan RMB/Person annually in the FSR to 20,900 Yuan RMB/Person annually[10]. Therefore, the actual annual operating cost is higher than the designed value in the FSR. Moreover, the average increasing rate of salary price index is 9.64% from 2002 to 2006 in Yunnan Province[11]. It is obvious that the salary indexes of annual operating cost increased during 2002-2006. Therefore, the IRR will be lower than that in the PDD obviously. As per conservativeness principle, the fixed input value of annual operating cost is reasonable, conservative and credible.

In addition, the unitary operating cost 0.027 Yuan/kWh (annual operating cost of 2,961,800 Yuan RMB/annual power generation of 110,320,000kWh, as listed in PDD) of the project has been confirmed to be a reasonable and conservative value according to the range 0.04-0.09 Yuan/kWh [12].

Therefore, the annual operating cost used in the IRR calculation in the PDD submitted for registration is reasonable, conservative and credible.

Conclusion:
If use the actual investment, the most conservative grid price (use the highest grid price of 0.175 Yuan RMB/kWh, which is the most conservative value), the actual annual operating cost above, the IRR is only about 2.43%, which is far lower than the IRR in the PDD submitted for registration.
Therefore, all the input values in the investment analysis are valid and applicable in consistent with the EB 38 guidance, paragraph 54(c).

Final Conclusion:

Therefore, the input values used in the investment analysis in line with EB 38, para. 54.

Issue 4: The data used to calculate the grid emission factor in the PDD submitted for registration was not available at the commencement of validation (June 2007). The PP and DOE are therefore requested to amend the grid emission factor using data, which was available as of this date and provide the corresponding calculation of the emission reductions.

Response from the project participant:

The PDD was published on UNFCCC website on June 27, 2007 for global stakeholder consultation, at that

[10] The payroll record of employees of the Lianghe Dayingjiang Hydropower Development Co., Ltd.
[11] China Statics Year Book 2003-2007 (http://www.stats.gov.cn/tjsj/ndsj/), which is public official website of local government
[12] Published by a local consulting (Beijing Hualing Sifang Investment Consultant Company) as the reference for this parameter as evidenced with an article issued on 2006 and published on Chinese research website on industrial projects (http://www.badassets.com)

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time, the available grid emission factor is published by China DNA on 15 December 2006. Then the DOE conducted validation in the end of July 2007. However, before 27 June 2007, the following sources for calculating the grid emission factor for the project were available and the most recent:

- China Electric Power Yearbook 2004-2006 (published November 2006);
- China Energy Statistical Yearbook 2004-2006 (published March 2007);
- 2006 IPCC guidelines (final version published end of 2006).

As the PDD published on 27 June 2007 used no data vintages after 2005, whereas data vintages from 2006 were already available, therefore based on the requirement of DOE, the emission factor has been updated based on the most recent data, as per the methodology. Therefore, the PDD submitted for registration used the most recent data available at the time of the commencement of validation.