

**RESPONSE TO THE EXECUTIVE BOARDS REQUEST OF ADDITIONAL
INFORMATION FOR THE PROJECT ACTIVITY: "ELECTRICITY GRID
INTERCONNECTION SAN GABÁN - MAZUKO - PUERTO MALDONADO"
(REF. NO. 1901)**

1) THE DOE IS REQUESTED TO PROVIDE RELIABLE EVIDENCE THAT CDM WAS CONSIDERED PRIOR TO THE PROJECT START DATE AND THAT CONTINUING AND REAL ACTIONS WERE TAKEN TO SECURE CDM STATUS FOR THE PROJECT ACTIVITY IN PARALLEL WITH ITS IMPLEMENTATION, FOLLOWING THE GUIDELINES FROM PARAGRAPH 5, EB 41, ANNEX 46. THE RESPONSE SHOULD PROVIDE A DETAILED TIMELINE OF PROJECT IMPLEMENTATION.

As establish in the PDD (section B.5):

*“For the present project activity, the feasibility approval form the Economic and Financial Ministry is considered the start date of the project activity in order to be conservative, since the Final Study (investment phase) started soon after this approval. The approval of the project was on **March 31st, 2006**. The CDM factor was considered at the moment of evaluation of the project activity, before the start date since at the moment of developing the feasibility study, CERs were taken into account (the feasibility study was the document presented and evaluated in order to obtain the ministry approval). There was also a **CDM study** of the interconnection project activity before the start date with the title: “Estudio sobre bonos de carbono para la Línea de Transmisión San Gabán Puerto Maldonado” (Study on carbon bonds for Transmission Line St. Gabán Puerto Maldonado). The final version was presented on January 2006.”*

A formal study with an independent and qualified professional was developed in order to evaluate the emission reduction potential of the interconnection project in the CDM and the eligibility of the project before the start date. This was considered a reliable and strong evidence since it was a formal study requested by ELSE by public contest and developed by an independent consultant. The professional in charge of the study is recognized in the sector.

The publication of the public contest, N° AMC-0111-2005-ELSE named CDM Study for the Transmission Line San Gabán – Puerto Maldonado ("Estudio sobre bonos de carbono par ala linea de transmision San Gaban Puerto Maldonado") was published on 19/12/2005. Evidence of the process is still publicly available; please see reference in Table 1 item 4. Before the formal emission of a public contest, the purpose of it and the associated budget has to be analyzed and approved by the company. This study had to be analyzed and approved by Else before December 2005 and then the CDM consideration dates from middle of 2005.

The experience is verified during the public contest process and is listed in the curriculum vitae of the professional Luis Geng.

Information according to document: “Luis Geng Experience” (PDF)¹ and public contest web information.

¹ Lead author selected by the IPCC, GTZ consultant, and other important references. Also has experience in other similar CDM studies for Peruvian projects.

The CDM incomes were introduced in the economic evaluation during the developing of the feasibility study. Else's excel document used to develop the available "Appendix 1 - investment analysis" is the one of feasibility study named "Anex- E - Formatos-MEF-ok v2 Evaluación economica - From Feasibility Study".

Information according to document presented during validation: "Anex- E - Formatos-MEF-ok v2 Evaluación economica - From Feasibility Study" (xls).

As establish in the Validation Report (4.4):

"DNV was able to verify that CDM benefits were taken into account before the starting date of the project. The starting date of the project activity is 31 March 2006, corresponding to the feasibility study approval /4/. On January 2006, a formal study was carried out to verify the eligibility of the project as a CDM project activity /5/. The long time from the date of decision making and the start of the validation has been justified as the consultant Deuman was hired to start the validation process by developing a new methodology during the year of 2006, considering that no approved methodology was available at that time. Finally, after the approval of AM0045 in December 2006, a new PDD was prepared based on the methodology AM0045. During July to October 2007, Deuman started the negotiation with DNV, and finally in October 2007 the validation process started."

The CDM was taken into account before the start date, and the time until the start of the validation process was due to 1) initial inexistence of an approved methodology applicable to the project activity (as established in the Validation Report), which was approved in December 2006 and 2) the non expected problem for ELSE to hire the DOE. DOEs are not domiciled in Peru and then, none of them have been accredited by the government of Peru to participate in public contests requested by companies with governmental capital like ELSE. The possibility of accrediting different DOEs was evaluated, but the process was going to be very time demanding and needed internal information from them. Due to the impossibility of ELSE to directly contract the DOE and the difficulty of accrediting them in order to participate in the public contest, Deuman had to sign the contract with the finally selected DOE (DNV). Since this situation was not covered in the original contract between Deuman and ELSE, a negotiation was carried out and an addendum had to be signed.

A detailed timeline for the project activity is presented below:

Table 1 Detailed Timeline of the Project Implementation

Item	Activity	Date	Evidence	Observations
1	Initial presentation of the project to the “OPI Energy – Investment Project Office” (OPI Energía – Oficina de Proyectos de Inversion)	22/09/2003	-	With this item, the project started the process needed to achieve the Approval from the Economy and Finance Ministry. ELSE presented an initial description of the project, then a pre – feasibility study and finalized with the feasibility study.
2	Letters requesting logistic support for the census of small mines in Huaypetuhue and Mazuco which is part of the market study.	09/11/2004	Copy of the original document: "Letters requesting logistic support for the census" (PDF)	
3	Letter to present the report of the mines census.	18/11/2004	Copy of the original document: "Letter to present the report of the mines census" (PDF)	
4	Publication of the public contest for the CDM study No AMC-0111-2005-ELSE named CDM Study for the Transmission Line San Gabán – Puerto Maldonado (“Estudio sobre bonos de carbono par ala linea de transmision San Gaban Puerto Maldonado”)	19/12/2005	http://www.seace.gob.pe/Default.asp?CALIFICADOR_=PORTLET.1.47.0.3.10&_REGIONID_=1&_PORTLETID_=47&_PRIVILEGEID_=5&_ORDERID_=0&_PAGEID_=3&_CONTENID_=10&_USERID_=%3C%21--USERID--%3E&_EVENTNAME_=&_OBJECTFIRE_=&_OBJECTEVENT_=&scriptdo=PKU_OPNEGOCIO.doviewoportunidades&Ipcodentidad=&aplicatribunal=&Ipinproclose=0&Ipnombre_sigla_entidad=ELSE&Ipf_registro=&Ipcodobjeto=5&Ipproc_tipo=9&Ipcodtiposubasta=&Ipproc_num=&Ipanhoentidad=2005&Ipproc_sigla=&Ipdep_codigo=&Iitem_descripcion=&Ipproc_numtrib=&Ipanhoentidadtrib=2008	See public contest number 11 in the list and find there the date, the terms of reference and the winner, among others. SEACE is the web where every public contest is published.

			<p>http://www.seace.gob.pe/Default.asp?_CALIFICADOR_=PORTLET.1.47.0.3.10&_REGIONID_=1&_PORTLETID_=47&_PRIVILEGEID_=5&_ORDERID_=0&_PAGEID_=3&_CONTENTID_=10&_USERID_=%3C%21--USERID--%3E&_EVENTNAME_&_OBJECTFIRE_&_OBJECTEVENT_&scriptdo=PKU_OPNEGOCIO.doviewficha&lpnombre_sigla_entidad=ELSE&lpf_registro=&lpcodigo_bjeto=5&lpproc_tipo=9&lpproc_num=&lpanhoentidad=2005&lpproc_sigla=&lpdep_codigo=&lpitem_descripcion=&lpgrupobien=&lpagenum=&lpinproclo_se=0&lpcodentidad=&lpcodtiposubasta=&aplicatribunal=&lpproc_numtrib=&lpanhoentidadtrib=2008&lpnconvoca=272163</p>	<p>This is the specific webpage for this public contest. Find there the date, the terms of reference and the winner, among others. SEACE is the web where every public contest is published</p>
5	<p>Eng. Luis Geng final version of the “CDM Study for the transmission line San Gabán – Puerto Maldonado”</p>	<p>January 2006</p>	<p>Copy of the original document: "Informe_Final_ELSE-LuchoG" (PDF)</p>	
6	<p>Communication to the DNA (CONAM at that time) to inform 1) the development of the study named “CDM Study for the Transmission Line San Gabán – Puerto Maldonado” (“Estudio sobre bonos de carbono par ala linea de transmision San Gaban Puerto Maldonado”), 2) that the project will request the LoA soon, and 3) requesting to include the project in the Peruvian CDM portfolio.</p>	<p>08/02/2006</p>	<p>Copy of the original document: “G-142-06 request LoA” (PDF)</p>	
7	<p>Approval of the start of the stages of the CDM project Cycle for the Interconnection Project, Transmission Line San Gaban - Puerto Maldonado</p>	<p>14/03/2006</p>	<p>Copy of the original document: “SLD 010-06 CDM actions approval” (PDF)</p>	

8	Start date of the Project. Approval from the Economy and Finance Ministry	31/03/2006	Copy of the original document: "Start Date Else" (PDF)	
9	ELSE elaborates Term Sheet for the CMD-Project tendering process	01/06/2006	-	See here the terms of reference of the contest. "Contraloria" is the organization that evaluates the transparency in the transactions of the government.
10	Public Contest opening "CONCURSO PUBLICO N° CP-0014-2006-ELSE" named "Study contract for the certification and trading of the greenhouse gases reduction achieved in the context of the Clean Development Mechanism, Transmission Line San Gabán - Puerto Maldonado" ("Contratación de una consultoría para la certificación y comercialización de las reducciones de emisiones de gases de efecto invernadero del proyecto logradas en el marco del proyecto de Mecanismo de Desarrollo Limpio, Línea de Transmisión San Gabán - Puerto Maldonado")	16/06/2006	http://www.seace.gob.pe/Default.asp?_CALIFICADOR_=PORTLET.1.47.0.3.10&_R EGIONID_=1&_PORTLETID_=47&_PRIVILEGEID_=5&_ORDERID_=0&_PAGE ID_=3&_CONTENTID_=10&_USERID_=%3C%21--USERID--%3E&_EVENTNAME_=&_OBJECTFIRE_=&_OBJECTEVENT_=&scriptido=PKU _OPNEGOCIO.doviewficha&lpnombre_sigla_entidad=ELSE&lpf_registro=&lpcodigo=5&lpproc_tipo=4&lpproc_num=14&lpanhoentidad=2006&lpproc_sigla=&lpdp _codigo=&lpitem_descripcion=&lpipobien=&lpgrupobien=&lppagenum=&lpinproc lose=0&lpcodentidad=&lpcodtiposubasta=&aplicatribunal=&lpproc_numtrib=&lppanh oentidadtrib=2008&lpnconvoca=391385	Find there the date, the terms of reference and the winner, among others. SEACE is the web where every public contest is published.
11	Winner approval for the public contest CP-0014-2006 named "Study contract for the certification and trading of the greenhouse gases reduction achieved in the context of the Clean Development Mechanism, Transmission Line San Gabán - Puerto Maldonado"	19/07/2006	Copy of the original document: "ACTA BUENA PRO CP-0014-2006 - Winner approval" (PDF)	

	("Contratación de una consultoría para la certificación y comercialización de las reducciones de emisiones de gases de efecto invernadero del proyecto logradas en el marco del proyecto de Mecanismo de Desarrollo Limpio, Línea de Transmisión San Gabán - Puerto Maldonado")			
12	ELSE'S acceptance as the executing unit for the interconnection project - Transmission Line San Gabán - Puerto Maldonado	19/09/2006	Copy of the original document: "G-949-06 acceptance letter" (PDF)	
13	ELSE officially communicates the approval of DEUMAN's technical and economical proposal as the consultant firm to develop the CMD Project Cycle	26/10/2006	http://www.seace.gob.pe/Default.asp?_CALIFICADOR_=PORTLET.1.47.0.3.10&_REGIONID_=1&_PORTLETID_=47&_PRIVILEGEID_=5&_ORDERID_=0&_PAGEID_=3&_CONTENTID_=10&_USERID_=%3C%21--USERID--%3E&_EVENTNAME_=&_OBJECTFIRE_=&_OBJECTEVENT_=&scriptdo=PKU_OPNEGOCIO.doviewficha&lpnombre_sigla_entidad=ELSE&lpf_registro=&lpcodigo=5&lpproc_tipo=4&lpproc_num=14&lpanhoentidad=2006&lpproc_sigla=&lpdep_codigo=&lpitem_descripcion=&lpipobien=&lpgrupobien=&lpnumtrib=&lpinproclose=0&lpcodentidad=&lpcodtiposubasta=&aplicatribunal=&lpproc_numtrib=&lpanhoentidadtrib=2008&lpnconvoca=391385	
14	Contract signed with Deuman S.A.C for CDM assessment and development	14/08/2006	Copy of the original document: "Contract ELSE 0103-2006" (PDF)	
15	Deuman starts working in the analysis of a NM.	Since august 2006	-	Page 2 (4.1.1) of the Contract considers the analysis and/or development of a new methodology of Baseline and

					Monitoring Plan because there was not an applicable approved methodology.
16	Approval resolution of the project activity with initial budget of USD 17 million. Leads to first public contest for project construction	30/10/2006		Copy of the original document: " E-073-2006 APSD approval resolution 1" (PDF)	
17	Public Contest opening "LP .8-2006/ELSE (first call) Linea de Transmision San Gaban - Puerto Maldonado" ("Transmission Line San Gaban - Puerto Maldonado") with initial budget of USD 17 million.	01/12/2006		http://www.seace.gob.pe/Default.asp?_CALIFICADOR_=PORTLET.1.47.0.3.10&_REGIONID_=1&_PORTLETID_=47&_PRIVILEGEID_=5&_ORDERID_=0&_PAGEID_=3&_CONTENTID_=10&_USERID_=%3C%21--USERID--%3E&_EVENTNAME_=&_OBJECTFIRE_=&_OBJECTEVENT_=&scriptdo=PKU_OPNEGOCIO.doviewficha&lpnombre_sigla_entidad=ELSE&lp_registro=&lp_codigo=3&lpproc_tipo=&lpproc_num=&lpnoentidad=2006&lpproc_sigla=&lpdep_codigo=&lpitem_descripcion=&lpipobien=&lpgrupobien=&lppagnum=1&lpinproceso=0&lpcodentidad=&lpcodtiposubasta=&aplicatribunal=&lpproc_numtrib=&lpnoentidadtrib=&lpnoconvoca=507371	Find here the terms of reference for the public contest and the declaration as a desert one. This public contest was declared desert since no company presented a proposal. A later analysis determined that the initial budget had to be adjusted in order to achieve market costs and attract the construction companies.
18	New Methodology NM 152 with the name of AM0045 is approved	22/12/2006		http://cdm.unifccc.int/methodologies/DB/0XHXS8OSSITEWX2YMKTBIL4R050X5/view.html	
19	Approval resolution of the project activity final initial budget of USD 20 million. Leads to second public contest for project construction	28/12/2006		Copy of the original document: " E-091-2006 APSD approval resolution 2" (PDF)	
20	Public Contest opening "LP .8-2006/ELSE (second call) Linea de Transmision San Gaban - Puerto Maldonado" ("Transmission Line San Gaban - Puerto Maldonado") with initial budget of USD 20 million.	29/12/2006		http://www.seace.gob.pe/Default.asp?_CALIFICADOR_=PORTLET.1.47.0.3.10&_REGIONID_=1&_PORTLETID_=47&_PRIVILEGEID_=5&_ORDERID_=0&_PAGEID_=3&_CONTENTID_=10&_USERID_=%3C%21--USERID--%3E&_EVENTNAME_=&_OBJECTFIRE_=&_OBJECTEVENT_=&scriptdo=PKU	Find here the terms of reference for the public contest, important dates of the process and the winner.

				<p>_OPNEGOCIO.doviewficha&lpnombre_sigla_entidad=ELSE&lpf_registro=&lpcodigo_bjeto=3&lpproc_tipo=&lpproc_num=&lpanhoentidad=2006&lpproc_sigla=&lpdep_codigo=&lpitem_descripcion=&lpitipobien=&lpgrupobien=&lppagenum=1&lpinproceso=0&lpcoentidad=&lpco tiposubasta=&aplicatribunal=&lpproc_numtrib=&lpanhoentidadtrib=&lpnconvoca=524767</p>		
21	Deuman starts the elaboration of new PDD with new methodology AM0045 version 1 (Valid from 22 Dec 06 to 01 Nov 07)	Since Jan 2006				In order to obtain better success possibilities in the issuance of the CERs the development of a new methodology was discarded. The AM0045 was applicable.
22	Invitations for the additional local consultation where the environmental benefits of the project activity were exposed.	23/01/2007		Copy of a sample of invitations in document named "Invitation to local consultation" (PDF)		
23	Approval of the Environmental Impact Study by the Mines and Energy Ministry	29/01/2007		http://www.minem.gob.pe/archivos/dgaee/publicaciones/evaluacion/106-2007.pdf		Source: Energy and Mines Ministry (MINEM by the acronyms in Spanish)
24	Validation Proposal from SGS	06/02/2007		Attachment of original document: "SGS proposal 2007" (PDF)		
25	Official recognition of the winner company in charge of construction (from public contest in second call)	07/02/2007		Copy of the original document: "Winner company in charge of construction" (PDF)		
26	Start of the actions to obtain the LoA	15/03/2007		Copy of Else's signed declarations requested by the DNA for the LoA process: "Signed declarations requested by the DNA" (PDF). Copy of the procedure of the DNA used to asses this process: "DNA procedure to obtain the LoA" (PDF)		At that time Conam was the Peruvian DNA, now is the Environmental Ministry
27	Validation Proposal from DNV	16/03/2007		Attachment of original document: "DNV proposal 2007 - 1" (PDF)		
28	Development of the terms of reference for the	13/04/2007		Copy of the original document: "TDRs ELSE validación 13_04_07" (PDF)		

	contract of the DOE by ELSE				
29	Actions for accreditation of DOEs in the Peruvian registry (RNP) that allow participation in public contests	16/05/2007	Copy of some of the original e-mails: "DNV initial response - RNP requirements" (outlook element) and "RV TDR SGS Validación"(outlook element)		
30	Budget approval for the supervision of the project construction	04/06/2007	Copy of the original document: "Budget approval for the supervision of the project construction" (PDF)		
31	Emission of the Letter of Approval (LoA) issued by Peruvian DNA	08/06/2007	Copy of the original document: "LoA Else"(PDF)		
32	Contract signed between DNV and Deuman for the project validation	01/08/2007	Copy of the original document: "D5_300_8447_20070827_141150" (PDF)		
33	Formal addendum between Deuman S.A.C and Else S.A.A signed in order to allow Deuman to hire the DOE	29/08/2007	Copy from the original Addendum: "Addendum 0136 -2007" (PDF)	The contract between DNV and Deuman was signed before in order to gain some of the time lost (due to ELSE's impossibility to contract a DOE)	
34	Start Of Commenting Period	11/10/2007	http://cdm.unfccc.int/Projects/Validation/DB/YL/DL66Z75UMMMKHJC3YMO32536/ISIM/view.html		
35	Visit of the DOE	20/12/2007	See Validation Report		
36	Request of registration	01/07/2008	http://cdm.unfccc.int/Projects/DB/DNV-CUK1214842351.64/view		
37	Expected start of the experimental operation	December 2008			
38	Expected start of the commercial operation	January 2009			

2. A CLEAR INVESTMENT COMPARISON ANALYSIS BETWEEN THE PROPOSED PROJECT ACTIVITY AND THE SELECTED ALTERNATIVE SHOULD BE PRESENTED. SPREADSHEETS OF THE INVESTMENT ANALYSIS AND SENSITIVITY ANALYSIS THAT ALLOW REPLICATION OF THE CALCULATIONS SHOULD ALSO BE PROVIDED.

Financial indicator and assumptions

As stated in the PDD net present value (NPV) was selected as the most suitable financial indicator because applies for the evaluation of every alternative of the project and the CDM project activity itself. IRR was shown only when it applied.

The relevant assumptions for the evaluation of the project (established in the PDD) are:

- *Difference in demand patterns for scenarios WITH and WITHOUT the project. Based on market forecasts from the project proponent (ELSE) the difference is due to:*
 - (i) *WITH the project demand is likely to increase gradually each year as a result of improvement in service quality and lower electricity costs for end users. While on the other hand,*
 - (ii) *WITHOUT the project demand is expected to grow at a lower pace given the fact that it will not be satisfied, quality will not improve significantly and electricity cost for end users is considered to be too high.*
- *A discount rate of 12% has been used for Net present Value calculations. This rate has been established by the Ministry of Energy and Mining (MINEM) for every energy-related project assessment.²*

In the project activity, for instance, investment includes: power lines joining the grid systems, purchase of equipments for each substation (project investment outlay in year 0). From year 1, maintenance costs of equipment are included in the calculations. Electro Sur Este (ELSE) covers all project-related costs.

In alternative 2- In order to meet the growing energy demand in isolated systems purchase of new equipments has been considered. Operation and maintenance costs are also taken into account for accurate calculations (including those from fossil fuels necessary to run the equipments- diesel 2-)³.

The “Appendix 1 - investment analysis” available in the UNFCCC website was based on the spreadsheets in “Anex- E - Formatos-MEF-ok v2 Evaluación económica - From Feasibility Study” presented before during the validation process⁴.

The evaluation of the project was developed using an incremental approach (incremental cash flow), where it is compared the investment, the increment in the incomes and the increment in the costs, and then uses incremental costs and incomes. This is an appropriate analysis since is

² Article 79° Electricity concessions Law. (Decree -Law 25844).

<http://www.minem.gob.pe/archivos/dge/publicaciones/compendio/dl25844.pdf>

³ The generation units are bought as the demand grows, and then there is not a big initial investment cost like in the interconnection project that has to be developed in base of a future estimated demand.

⁴ Additional to the DOE audit to the input data, the Economical and Financial Ministry sent a message from Mr. Fernando Valenzuela confirming that the parameters considered for investment analysis were fully assessed for project’s feasibility approval (this is already mentioned in the Validation Report)

a new project for the company in a location with already existing electricity supply (diesel in on site generators).

The initial cash flow at year 0 is the investment cost of the project activity. The cash flow for years 1 to 20 is the incremental operational cash flow. For the determination of the incremental costs it is used the difference between the costs with project and the costs without project (costs with project minus costs without project). The incremental incomes are calculated in the same way.

For the original document, developed in Peruvian money: Nuevos Soles (S/.) the following spreadsheets were used:

- The spreadsheet named “Ctermica” contains the details of investment for the alternative with no interconnection project, which is the same as the Alternative 2. Expansion of the actual installed capacity using Diesel as fuel used in the CDM evaluation. In this spreadsheet are the investment in new generators, hours and costs of operation and overhaul.
- In the spreadsheet named “F-01” is a brief description of the other alternative (different to the current situation) to achieve the goal of supplying electricity to the objective people which is the interconnection project.
- In the spreadsheet named “F-02” is the demand estimation with and without the implementation of the interconnection project. It is stated the number of people attended, energy and power demand.
- In the spreadsheet named “F-03” it is a general analysis of the service indicating the interconnection point, source of the energy that will be bought, characteristics of the supply and estimation of the start of operations among others.
- In the spreadsheet named “F-04” it is an offer – demand balance of energy and different notes for the better understanding of the calculation.
- In the spreadsheet named “F-05-Cost-Priv” it is calculated the incremental costs of the implementation of the project. A calculation of project costs (from “F-02”) minus baseline costs (from “Ctermica”). This is using normal costs (private costs includes legal taxes)
- In the spreadsheet named “F-05-Cost-Soci” is the same as the “F-05-Cost-Priv” but at social prices (no taxes) in order to respond to the national regulations that require both approaches (private and social).
- In the spreadsheet named “F-06-Beneficios” is the calculation of incremental benefits at private prices and social prices based on “F-02” values. The tariffs used and other variables are presented.
- In the spreadsheet named “F-07-Eval” it is the economic evaluation at private prices and social prices based on “F-06-Beneficios” and “F-05-Cost-Priv” or “F-05-Cost-Soci” values. In this spreadsheet the income of CER sales are taken into account.
- In the spreadsheet named “F-08-Sost” is the analysis of the sustainability if the project.

- In the spreadsheet named “F-09” is a preliminary sensitivity analysis. In this document, the variables analyzed were the demand, investment, fuel price, energy tariffs and CER participation.
- In the spreadsheet named “F-10” is the logical framework of the interconnection project.
- In the spreadsheet named “Res-Inver” is the estimated investment cost at November 2005 of S/. 45,708 thousands or USD 13,396 thousands (estimated at the feasibility stage since real investment discovered later was over USD 20 million).

The “Appendix 1 - investment analysis” document (xls) considers the evaluation for the *Alternative 1 – Project* (that is the project activity without CDM incomes), *Alternative 2 – Without Project* (that is the situation with no interconnection and the expansion of energy based in new diesel generator units) and *Project CDM* (that is the proposed project activity considering the CDM incomes). For all of these alternatives the net income is the difference between the incremental incomes and the incremental costs to evaluate the savings (e.g. diesel) and incomes (e.g. electricity) with the incremental costs due to the project implementation. With this annual net income is calculated the NPV for the alternative (and in some cases the IRR is additionally calculated⁵)

In order to develop the “Appendix 1 - investment analysis” document (xls) the next procedure was performed:

For Inversiones-Con&Sin:

- *Conversion factor: cell C1*

Data extracted from the “Anex- E - Formatos-MEF-ok v2 Evaluación economica - From Feasibility Study”, spreadsheet “Ctermica” F311, or “F-05-Cost-Priv” D140 or “F-05-Cost-Soci” D131 or “F-06-Beneficios” K56 or “Res-Inver” D8.

- *Total Cost with Project (original value in thousand of nuevos soles S/.): cells C7:W7*

Data extracted from the “Anex- E - Formatos-MEF-ok v2 Evaluación economica - From Feasibility Study”, spreadsheet “F-05-Cost-Priv” D125:X125 (years 2006 -2026⁶)

- *Total Cost without Project (original value in thousand of nuevos soles S/.): cells C8:W8*

Data extracted from the “Anex- E - Formatos-MEF-ok v2 Evaluación economica - From Feasibility Study”, spreadsheet “F-05-Cost-Priv” D127:X127

- *Total Income with Project (original value in thousand of nuevos soles S/.): cells C9:W9*

Data extracted from the “Anex- E - Formatos-MEF-ok v2 Evaluación economica - From Feasibility Study”, spreadsheet “F-06-Beneficios” D8:X8

⁵ Incremental analysis may lead to flows where the IRR indicator is not valid (“# Div/0”). Following an EB suggestion the IRR evaluation for alternative 2 was deleted

⁶ As established in the spreadsheet named “F-02”, for the evaluation was considered that the project started in 2006 and its operation in 2007.

- *Total Income without Project (original value in thousand of nuevos soles S/.): cells C10:W10*

Data extracted from the “Anex- E - Formatos-MEF-ok v2 Evaluación economica - From Feasibility Study”, spreadsheet “F-06-Beneficios” D15:X15

- *Incremental cost (original value in thousand of nuevos soles S/.): cells C11:W11*

Cell C11 remains the same (45,708) since it is the investment in year 0 and from D11:W11 in the incremental operational costs (cost with project minus cost without project)

- *Incremental income (original value in thousand of nuevos soles S/.): cells C12:W12*

Cell C11 remains the zero (0) since it is the investment year (no operation of the project activity) and from D11:W11 in the incremental operational incomes (income with project minus income without project)

- *CDM income (in thousand of USD): cells D19:K19*

Data extracted from the “Anex- E - Formatos-MEF-ok v2 Evaluación economica - From Feasibility Study”, spreadsheet “F-07-Eval” E9:L9.

The other spreadsheets and calculations are related to this in-put information.

We have developed a new version of the “Appendix 1 - investment analysis” where we included the spreadsheets from “Anex- E - Formatos-MEF-ok v2 Evaluación economica - From Feasibility Study” used in the calculation and links the “Inversiones-Con&Sin” spreadsheet to them. This version is named “Appendix 1 - investment analysis –v2

We also have developed the document “Anex- E - Formatos-MEF-ok v2 Evaluación economica - From Feasibility Study” in the english version”. This version is named “Anex- E - Formatos-MEF-ok v2 Evaluación economica – English version – sen. an”.

The sensitivity analysis $\pm 10\%$ is in “Appendix 1 - investment analysis –v2” (same as in the original version) spreadsheets “Tables”, “VAN-TIR Alt1 Project”, “VAN-TIR Alt2 without project” and “VAN-TIR Project CDM”. The sensitivity analysis determining the value that leads to the benchmark for the Alternative 1 (project without CDM) is presented in:

- *The variation of income and cost:* In “Appendix 1 - investment analysis –v2” (calculation already in the original version), table named “Sensitivity analysis to variables - achieving the benchmark” in spreadsheet “Tables”. This values come from the spreadsheet “VAN-TIR Alt1 Project”.
- *The variation of electricity demand:* Since the detail of the information in “Appendix 1 - investment analysis” did not allow the development of this sensitivity analysis, it was performed in the original excel document translated to English “Anex- E - Formatos-MEF-ok v2 Evaluación economica – English version – sen. an”, spreadsheet “F-02”. In this spreadsheet we have introduce the variables for the sensitivity analysis of the

electricity demand; the values affected are in green (lines 155, 168, 176 and 178). Changing the values in G176 and G178 you will obtain the data of the table “Variation of IRR due to variation of electricity demand” in the PDD (page 16). It is necessary to erase the CDM incomes in line 9 (E9:L9) in spreadsheet “F-07-Eval” in order to obtain the values without this income. Use 186% in both cells (G176 and G178) to have the IRR benchmark value without CDM incomes (12%).

Information according to documents: “Appendix 1 - investment analysis –v2” (XLS), “Anex- E - Formatos-MEF-ok v2 Evaluación economica - From Feasibility Study” (XLS), “Anex- E - Formatos-MEF-ok v2 Evaluación economica – English version – sen. an.” and project PDD.

3. THE DOE IS REQUESTED TO FURTHER EXPLAIN HOW IT HAS VALIDATED THE COMMON PRACTICE ANALYSIS, IN PARTICULAR: A) THE FUNDAMENTAL DIFFERENCES BETWEEN THE PROPOSED PROJECT ACTIVITY AND OTHER COMPLEMENTARY TRANSMISSION SYSTEMS AND; B) THE EXCLUSION OF SIMILAR PROJECTS UNDER CONSTRUCTION.

The Complementary System

As stated in the Article 1º, item 29 of the “Efficient electricity generation development law”. (Law N° 28832⁷) the Complementary System is the conjunction of actives and transmission facilities that do not form the Guarantee Transmission System.

In Article 27º, item 27.1 it is considered a complementary system facility the one that is part of the Transmission Plan and that its construction is result of the private initiative from one or several agents.

Information according to document: “Efficient Electricity Generation Development Law N° 28832” (PDF)

Transitory Transmission Plan 2007-2008

In order to analyze other complementary transmission projects it is use the transmission line projects included in the Transitory Transmission Plan 2007-2008, which compile the projects with an advance development and/or under construction in Peru. These projects have similar entrance dates to the proposed project activity (ELSE expected to start operations at the end of 2008, now it is expected for January 2009).

Information according to document: “Transitory Transmission Plan 2007 – 2008” (PDF)

The transmission line projects presented in Table 2 (and in the PDD) belong to both systems: the guaranteed and the complementary transmission system⁸.

⁷ <http://www.minem.gob.pe/archivos/dge/publicaciones/compendio/L28832.pdf>

⁸ Please see that from this document we only analyzed the transmission line projects, then “Transformador 40 MVA 138/60 KV Y Enlace Pierina – Huaraz” (installation of a transformer), “Compensación Reactiva en la Zona de San Mateo - Casapalca - Morococha-Pachachaca 6 MVAR, 50 kV” (compensation project), “Compensación reactiva en el área de Tacna, 12 MVAR, 60 kV (compensation project), “Cambiar configuración de "T" a "PI" en Subestaciones Machahuay y Huanta 60 kV” (change of a substation configuration project), “4 Interruptores 60 kV en SE Tacna” (installation of circuit breakers) and “Cambiar configuración de "T" a "PI" en Subestaciones: La Cruz, Nautilus, Cabeza de Baca 60 kV” (change of a substation configuration project) were not considered in the evaluation as they are not even in the same project category.

Table 2. Transmission Line Projects included in the Transitory Transmission Plan 2007 – 2008

Name of the project	Estimated entrance date
Guaranteed transmission system	
Transmission Line Chilca-Planicie-Zapallal 220 kV ó 500 kV	2008
Line 220 kV Machupicchu – Cotaruse	2009
Complementary transmission system	
Transmission Line 138 kV y 66 kV San Gaban – Mazuco – Puerto Maldonado (Project activity)	2008
Line Huayucachi - Huancayo eastern – Industrial Park 60 kV and SE Huancayo Eastern 60/22,9/10 kV, 25 MVA	2007
T. L. Carhuaquero -Jaén 140 km, 138 kV, y Substations Jaén 138/60 kV and Carhuaquero 220/138/22,9 kV	2007
T.L Azángaro - Putina -Ananea - Huancané 60 kV Substations Azángaro 138/60/22,9 kV, Ananea 60/22,9/10 kV and Huancané 60/22,9/10 kV	2007
T.L Tocache – Bellavista	2007
T.L. Anta mina - Huari, 60 kV and Huari substation 60/22,9/10 kV	2007
T.L. Cajamarca-Cerro Corona, 33 km, 220 kV and Cerro Corona substation	2008

Source: Transitory Transmission Plan 2007-2008

The projects in the guarantee transmission system are not considered similar to the project due to legal implications. As explained in the PDD, the project is classified under the complementary transmission system because it is not a government's priority. Consequently, it is very unlikely that the project could be classified as being part of the guaranteed transmission system in the medium or long term. In the guaranteed transmission system the project would have incentives and subsidies from the government because has certain mandatory nature, and for this reason the project would not faces any investment or technical barrier⁹. As it can be seen, government's priorities tend to be focused on those projects with higher transmission capacity (refer to guaranteed transmission projects), while projects with lower capacity are intended to be developed by private agents since such projects are not classified as a national priority and most of them are not financially feasible.

⁹ For example: In Article 23 of Law N° 28832, it is established the determination of charges for the Guarantee Transmission System in order to 1) Guarantee the incomes in the Guarantee Transmission System, 2) Achieve stability and predictability of payment from generators and the demand, as well as the incomes from transmission concessionaries, and c) establish the mandatory payment for all the users of the Guarantee Transmission System. These benefits are not valid in any degree for the complementary system projects.

A further analysis of the projects in the complementary system is presented below:

- *Project activity*

The proposed project activity is the “Transmission Line 138 kV y 66 kV San Gaban – Mazuco – Puerto Maldonado” in the plan. As stated in the PDD (from the technical studies) is a **226 km** transmission line (**68 km in 138 kV (40MVA)** and **158 km in 66 kV (15 MVA)**).

Includes 3 sub stations (**San Gaban power substation** (Substation cell enlargement - 138 kV), **Mazuko Substation** (01 Power transformer of 138/66/33kV 20-26/12.3-16/8-10.5 MVA, and Substation cells: 138 kV, 66 kV and 33kV) and **Puerto Maldonado Substation** (01 Power transformer of 66/33/10kV-16-12,3/3,9-5/12,3-16MVA and Substation cells: 66 kV, 33 kV).

Its main purpose is **connecting a major isolated system** to the national grid (SEIN).

It is located in the Peruvian **southern forest area**.

Its initial investment cost was of USD **13 million** and ended in USD **20 million**¹⁰.

Figure 1. Peruvian Map showing the delimitations of the Coast, Andean and Forest Areas¹¹



¹⁰ This are the real cost of the projects actualized at the Electricity Reference Plan 2006 - 2015.

¹¹ The Peruvian land is very diverse and then different locations imply different cost structure, accessibility, construction time and needed technology, among others.

- *Line Huayucachi - Huancayo eastern – Industrial Park 60 kV and SE Huancayo Eastern 60/22,9/10 kV, 25 MVA (2007)*

This project is not considered similar to the project activity since it is of a different magnitude, location, investment and purpose.

This project is of 60 kV and has one 60/22,9/10 kV transformer, one substation, only 12 km of transmission line and 25 MVA.

The project has a different purpose since it is developed to improve the reliability of the system of sub transmission in the area of Huancayo, to meet increased loads of the east area of the city of Huancayo and transport loads of an Industrial Park.

It is located in the middle Andean area.

The investment cost is of USD1.5 million.

Figure 2. Location of the Line Huayucachi - Huancayo



- *T. L. Carhuaquero -Jaén 140 km, 138 kV, y Substations Jaén 138/60 kV and Carhuaquero 220/138/22,9 kV (2007)*

The evaluation of this project is presented below when the major isolated systems are evaluated.

- *T.L. Azángaro - Putina -Ananea - Huancané 60 kV Substations Azángaro 138/60/22,9 kV, Ananea 60/22,9/10 kV and Huancané 60/22,9/10 kV (2007)*

This project is not considered similar to the project activity since it is of a different magnitude, location, investment and purpose.

The project is to give energy to areas with no electricity supply (not an isolated system).

It is a smaller transmission line of 122 km and 60 kV (15 MVA) that will only cost USD 7.5 million (only of 60 kV).

Is located in the southern Andean area

Figure 3. Location of the Line Azángaro - Putina -Ananea - Huancané



- *T.L Tocache – Bellavista (2007)*

The evaluation of this project is presented below when the major isolated systems are evaluated.

- *T.L. Antamina - Huari, 60 kV and Huari substation 60/22,9/10 kV (2007)*

This project is not considered similar to the project activity since it of a different magnitude, location, investment and purpose.

This project is to connect Huari and an associated rural area to the SEIN. Not an isolated system. Will construct only one new (and smaller) substation of 60/22.9/10 kV, 7 MVA and work with another existing one.

It is a transmission line of only 60 kV (30 MVA) and 100 km.

The investment cost is only of USD 6.1 million

Is located in the northern of the northern coast area

Figure 4. Location of the Line Antamina - Huari



- T.L. Cajamarca-Cerro Corona, 33 km, 220 kV and Cerro Corona substation (2008)
This project is not considered similar to the project activity since it is of a different magnitude, location, investment and purpose.
The project will supply electricity to the Mine Cerro Corona and the citizen immediately around.
It's a big transmission line of 220 kV (180 MVA) with only 33 km. Will construct only one new (and bigger) substation of 220/22.9 kV and work with another existing one.
The investment cost is only of USD 13.4 million
Is located in the northern of the northern Andean area

Figure .5 Location of the Line Cajamarca-Cerro Corona



Information of the projects was extracted from the official transmission portfolio of the Energy and Mines Ministry (MINEM) which has only the projects from the Transitory Transmission Plan 2007 – 2008 presented before.

Information according to document: “Transmission Portfolio MINEM” (PDF)¹²

Major Isolated Systems

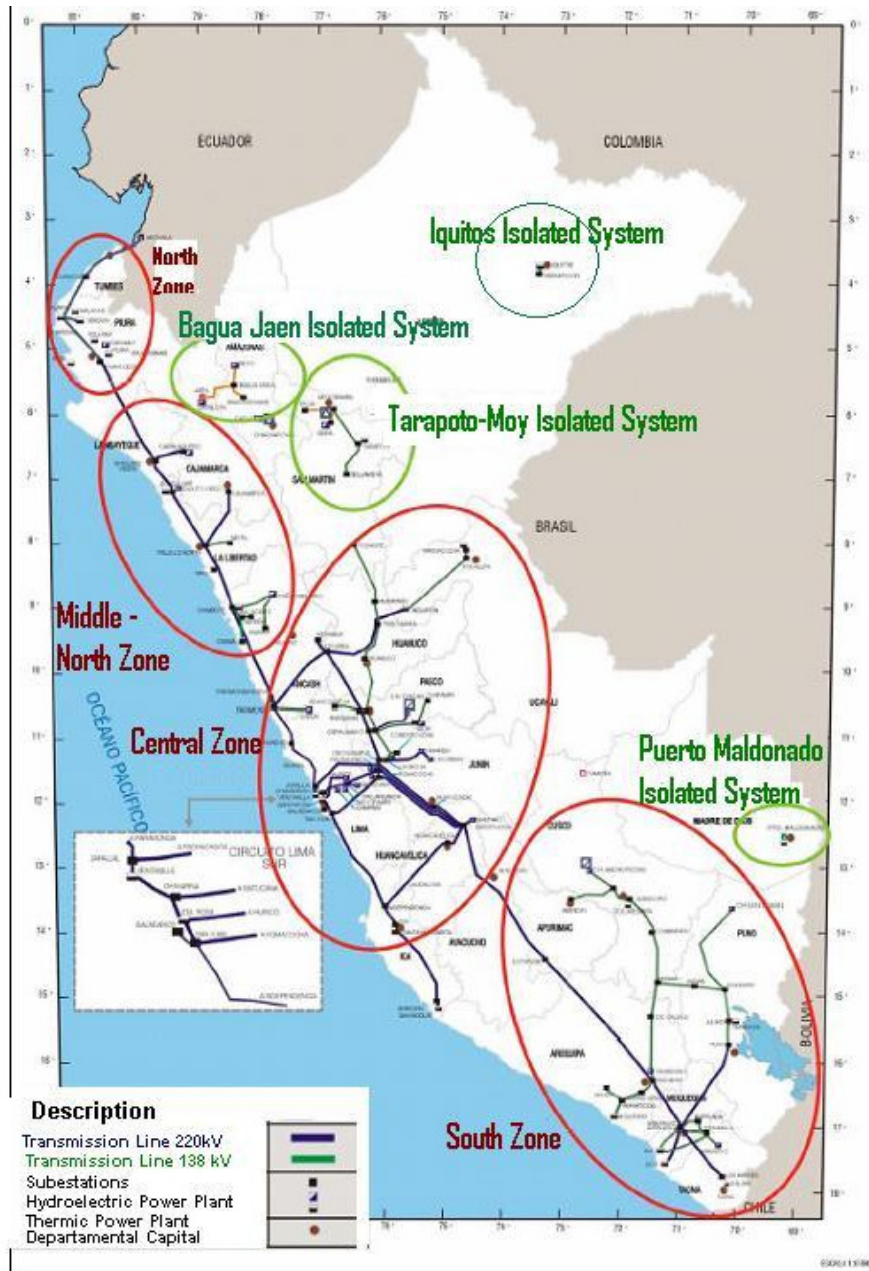
As Puerto Maldonado is considered a major isolated system, another analysis is with the rest of the major isolated systems in Peru. These are identified in the Electricity Reference Plan 2005 – 2014:

- Isolated system Iquitos
- Isolated system Tarapoto – Moyabamba – Bellavista
- Isolated system Bagua – Jaén
- Isolated system Puerto Maldonado (project activity)

See them in the next map:

¹² Also available in http://www.minem.gob.pe/archivos/dge/publicaciones/Portafolio_%20LLTT.pdf

Figure 6. Major Isolated Systems in Peru at 2005



From the 4 major isolated systems in Peru only two has a project for interconnection to the national grid like the proposed project activity and are not considered similar¹³. The four systems are evaluated:

- *Isolated system Iquitos*

The electric system is located in the region denominated Loreto. (Department of Loreto) It supplies electricity to Iquitos city. This is one of the biggest and oldest isolated systems in Peru. The installed capacity is 46, 7 MW, mainly with medium speed diesel

¹³ According to the “Tool for the demonstration and assessment of additionality”.

generators using residual oil. The company Electro Oriente S.A. has the concession for this system.

The conservative demand scenario in this isolated system estimates 175.4 GWh of demand and 33.49 MW of power for 2007 compared to the 21.6 GWh and 5.4 MW of the project location. This system is more than 8 times bigger than the Puerto Maldonado system.

This system is located far away from the SEIN and in the forest, and then the Electricity Reference Plan considers the expansion of generation based in on site thermal generators.

- *Isolated system Tarapoto – Moyabamba – Bellavista*¹⁴

The system comprises three main load centers. The centers are connected by a transmission line of 138 kV and some other loads or individual generation plants connected to a 60kV system. The system is operated by Electro Oriente S.A.

The Tarapoto – Moyabamba – Bellavista isolated system will be interconnected to the SEIN, but this will occur under different conditions compared to the proposed project activity. This interconnection project is not considered similar to the project activity since it of a different magnitude, location, investment and purpose.

The conservative demand scenario in this isolated system estimates 114.1 GWh of electricity demand and 27.17 MW of power demand for 2007 compared to the 21.6 GWh and 5.4 MW of the project location. This system is more than 5 times bigger than the Puerto Maldonado system.

The project is for an initial interconnection of the isolated system (short and medium term) and a long term project is needed. ELSE'S project if for the long term period.

Considers only modifications in already existing substations but includes the installation of a telecommunication system.

It is a 138 kV transmission line of only 149.2 km with an investment cost of USD 18.36 million.

Is located in the northern forest area

All of this condition makes this interconnection by far, more feasible than the project activity.

- *Isolated system Bagua – Jaén*¹⁵

This system includes 2 main load centers connected by transmission lines of 60 kV and some other loads or individual generation plants connected by lines of 22, 9 kV. These centers are located in Cajamarca and Amazonas regions. Electro Oriente S.A. is in charge of operation reporting to ADINELSA.

¹⁴ Some of the characteristics of the project are from official transmission portfolio of the Energy and Mines Ministry.

¹⁵ Some of the characteristics of the project are from official transmission portfolio of the Energy and Mines Ministry.

The Jaen – Bagua isolated system will be interconnected to the SEIN, but this will occur under different conditions compared to the proposed project activity. This interconnection project is not considered similar to the project activity since it is of a different magnitude, location, investment and purpose.

This interconnection will have a 138 kV (with 30 MVA) transmission line of only 140 km – 150 km, which results in a lower real investment of USD 14.7 MM (at 2006 in the Electricity Reference Plan 2006 – 2015) and USD 11.6 (at 2006 in the transmission portfolio). The estimated investment of this project at 2005 was USD 15 million (Electricity Reference Plan 2005 – 2014). This particular project has reduced the estimated investment cost from 2005 while the proposed project activity increment it in more than 50% (from USD 13 million to USD 20 million).

Will construct only one new substation and work with another existing one of 220/138 kV.

The conservative demand scenario in this isolated system estimates 35 GWh of demand and 8.66 MW of power for 2007 compared to the 21.6 GWh and 5.4 MW of the project location. This system is almost twice bigger than the Puerto Maldonado system and has to construct a considerably shorter line.

Is located in the northern forest area

All of this condition makes this interconnection by far, more feasible than the project activity.

- *Isolated system Puerto Maldonado (project activity)*

The electricity reference plan states that generation plants within Puerto Maldonado isolated systems will be out of service in 2008 and SEIN will supply electricity in the region¹⁶. This is to say that this connection as being part of the Complementary transmission plan does not affect electricity supply offer or its quality.

Information according to the Transitory Transmission Plan 2007 – 2008 and the Electricity Reference Plan 2005 – 2014.

In the next table we summarize some of the transmission line project characteristics to see the differences compared with the proposed project activity.

¹⁶ Chart 35 – Chapter 3 from the electricity reference plan 2005 - 2014

Table 3. Summary of transmission line characteristics

Project	Purpose	kV	Length (km)	MVA	Investment (million USD)	Location - Area	Energy Demand (GWh)	Power Demand (MW)
Transmission Line 138 kV y 66 kV San Gaban – Mazuco – Puerto Maldonado	Connecting a major isolated system to the national grid (SEIN)	138	226	40	13 to 17 to 20	Southern Forest	21.6	5.4
Line Huayucachi - Huancayo eastern – Industrial Park 60 kV	Improve the reliability of the system and increased demand	60	12	25	1.5	Middle Andean	-	-
T.L. Azángaro - Putina -Ananea - Huancané 60 kV	Give energy to areas with no electricity supply (not an isolated system)	60	122	15	7.5	Southern Andean	-	-
T.L. Antamina - Huari, 60 kV	Connect Huari and an associated rural area to the SEIN. Not an isolated system.	60	100	30	6.1	Northern Coast	-	-
T.L. Cajamarca-Cerro Corona, 33 km, 220 kV	Supply electricity to the Mine Cerro Corona and the citizen immediately around.	220	33	180	13.4	Northern Andean	-	-
T. L. Carhuaquero -Jaén 140 km, 138 kV, y Substations Jaén 138/60 kV and Carhuaquero 220/138/22,9 kV	Interconnect the isolated system Jaen – Bagua	138	140	30	15 to 11.6	Northern Forest	35	8.66
T.L.Tocache – Bellavista	Interconnect the isolated system Tarapoto – Moyabamba – Bellavista in the short and medium term	138	149.2	-	18.36	Northern Forest	114.1	22.7

Transmisión Lines Already operating

The “Efficient electricity generation development law” (Law N° 28832) was approved on July 21st, 2006. This law established the Guarantee and Complementary Transmission Systems and requested the development of a Transmission Plan (the first developed plan was the Transitory Transmission Plan, already evaluated in this document). This Transitory Transmission Plan¹⁷ covers the transmission projects at 2006 (including ELSE’s project activity) and then the law applies for all of these projects in development and the projects to be developed after the emission of this law.

All the already operating transmission lines are not covered by this important law, and they are not considered similar since they are not under the same regulatory framework. Older operative transmission line projects are also under different political and/or investment conditions.

Then, these projects are not further evaluated.

¹⁷ This plan was published in the official Peruvian newspaper on November 23th, 2006 by the Energy and Mines Ministry (MINEM) as the Ministry Resolution N° 552-2006-MEM-DM

4. THE DOE IS REQUIRED TO EXPLAIN HOW IT HAS VALIDATED THE VALUE OF LEAKAGE EMISSIONS DUE TO DEFORESTATION AND THE CONSERVATIVENESS OF THE DIRECTLY MEASURED SF6 VALUE.

Deforestation

In order to determine the value of the carbon stock (Lc) to be used in the calculation of the leakage was selected national values from studies in the Peruvian forest. The study used and presented to the DOE is from Wagner Guzman Castillo from the IIAP (Investigation Institute for the Peruvian Amazon – “Instituto de Investigaciones de la Amazonia Peruana”¹⁸) and Luis Arevalo Lopez from the ICRAF¹⁹ (International Center for Researching in Agroforestry). The document “Environmental services from carbon storage as an assets for development in the Peruvian Amazon: Progress and Challenges (22 August 2003) uses information from ICRAF: “Answer to new technological demand, strengthen of agroindustrial investigation and natural resources management, final document, BID-ICRAF ATN/SF-5209-PE” (“Respuesta a nuevas demandas tecnológicas, fortalecimiento de la investigación en agroindustria y el manejo de recursos naturales, Informe Final Convenio BID-ICRAF ATN/SF-5209-PE”).

Applying conservative criteria, the value used in the calculations from Pucallpa (table N° 2) which has the higher of the values attributable to non touch primary forest between the two locations mentioned (Pucallpa and Yurimaguas) and is also the closest location to the project activity. The project is in Madre de Dios, Pucallpa in Ucayali and Yurimaguas in Loreto. Please se map below:

Figure 7. Geopolitical Peruvian Map



¹⁸ <http://www.iiap.org.pe/>

¹⁹ www.worldagroforestry.org

The use of the mentioned value is presumed as conservative since not all the transmission line goes through non touch primary forest and it is used the higher value in the document.

The value of tC/Ha includes the tree, undergrowth, litter, root and soil component and is of 450.36 tC/Ha

The final value of 0.4518 ha used in the emission reduction calculation corresponds (as detailed in the validation report) to the multiplication of the length of the transmission line and the width trail of 20 m for the transmission lines laying established in the Electricity Supply National Code, table 219, where is established the safety area that has to be liberated (“servidumbre” in Spanish) for transmission lines of 115 to 145 kV.

Information according to documents: “Estudio servicios amb de almacenamiento de carbono” (PDF) and “Codigo Nacional de Electricidad suministro 2002- Electricity Supply National Code 2002” (PDF)

SF₆

Manufacturer’s information (manual of the equipments) does not consider annual leaks of SF₆. The equipment is expected to lose SF₆ when is over the acceptable pressure range and it has to be performed a correction action. In order to be conservative the calculations are made assuming a total leakage from the 9 SF₆ circuit breakers.

Since in the manual there is no information of the amount of SF₆ in kg for the circuit breakers to be use in the project activity, a direct contact with the manufacturer was performed. At May 20th, 2008 Samjnan Simh from Crompton Greaves informed that the approximate amount of SF₆ gas in 145kV GCB type 120-SFM-32B is 7.5Kg. This information was considered valid since is from a direct communication of the manufactured and the methodology indicates that the value shall be determined using the equipment manufacturer’s information and/or amount of SF₆ injected in the equipments during maintenance to maintain their operation standards.

As established in the PDD, leaks of SF₆ will be measured during the project operation when the SF₆ has to be injected in the equipment. In case of leaks ELSE will fill the breaker or, in case of an abnormal leak, will send it to the manufacturer to be fixed and refilled (in both cases, will be an evidence of the situation). There will be a constant control of the pressure by switches and gauges²⁰ (≅barometer) that monitors the variations of SF₆, and then leaks will be evident when there is a change in the pressure levels below the established standards and limits. The maintenance team will notice the leak and proceed to fix and refill or, in case of the abnormal leaks, the alarm²¹ of the barometer will be activated and the staff will be alerted (in these cases the staff will immediately evaluate the situation in order to determine if there is a real leak or if there is a problem with the barometer; in case of leak, the staff will fix and refill the equipment or will decide to send it to the manufacturer). All data will be monitored and can be confirmed during verification process.

The PDD adopted a conservative 10% leakage as the already registered “Celtins and Cemat grid connection of isolated systems” using the same version of the AM0045 methodology.

²⁰ The switches and gauges are included in every circuit breaker by the manufacturer.

²¹ There is a first alarm when the reduced gas pressure reaches the first limit. In the second limit there is a lockout gas pressure and the circuit breaker stops operation. Please see chapter 2.7 of the manufacturer manual of the equipment (in English) “GCB 66-145 kV 31.5kA,Sp-SP” specifically items 2.7.1 and 2.7.2.

Then the 7.5 kg value is multiplied by 9 and 10% to obtain the value used for MSF₆, which is 0.00675 tons of SF₆ per year.

We find a three pole operation live tank²² (as the project activity circuit breakers) LTB E 72,5 - 245 kV²³ that has 11 kg is SF₆ and indicates that the risk of leak is considered non significant (less than 0.5%per year). Then the 10% of estimated leakage is considered conservative.

Information according to document: “GCB 66-145 kV 31.5kA,Sp-SP” (PDF), “Fw SF₆ Gas Circuit Breaker” (outlook element), “RV Saludos ABB” (outlook element) and document referenced in foot note number 20.

²² Other circuit breakers found were dead tank types or one pole operation or for a different kV.

²³ See document in

[http://library.abb.com/global/scot/scot245.nsf/veritydisplay/46d7130dd98044fbc12574e4004e0477/\\$File/Guia%20para%20el%20comprador%20Interruptores%20de%20Tanque%20Vivo%20Ed4%20es.pdf](http://library.abb.com/global/scot/scot245.nsf/veritydisplay/46d7130dd98044fbc12574e4004e0477/$File/Guia%20para%20el%20comprador%20Interruptores%20de%20Tanque%20Vivo%20Ed4%20es.pdf)