

SANTA TERESA HYDRPOWER PLANT

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Contact Information

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1 PROJECT DETAILS

1.1 Summary Description of the Project and its Implementation Status

The project is a run-of-river hydropower plant known as Santa Teresa Hydropower Plant, which use the turbinated flow hydro-biological resources of the existing Machu Picchu Hydropower Plant, so there was no need to build a reservoir. The purpose of the project is to generate electricity without emissions of greenhouse gases (GHGs) (zero emission), which will be supplied to the Peruvian National Inter-connected Grid (SEIN). The project is located in the Republic of Peru in the Region of Cusco, in the provinces of La Convención and Urubamba, Santa Teresa and Machu Picchu districts, respectively.

The Santa Teresa Hydropower Plant have an installed capacity of 103.86 MW, corresponding to a gross head of 186.8 m and a flow of 61 m³/s, with an estimated average annual generation of 648.61 GWh. It is estimated that the project will displace 272,517 tons of carbon dioxide equivalent (tCO₂e) per year, giving a total of 8,175,501 tCO₂e for the 30-years of crediting period, generating the equivalent amount of Certified Emission Reductions (CERs).

The Santa Teresa Hydropower Plant take advantage of the existing head between the Machu Picchu Hydropower Plant tailrace works and the Ccollpani area. The scheme of works includes the connection with the Machu Picchu Hydropower Plant tailrace, the forebay, the pressure conveyance tunnel, the surge shaft, the powerhouse and the tailrace tunnel, as well as the hydro and electromechanical equipment of generation and control and the transmission system to SEIN integration through the 220 kV Machu Picchu-Abancay-Cotaruse line.

Regarding the main mechanical equipment, the Santa Teresa Hydropower Plant is equipped with two vertical shafts Francis turbines coupled via an intermediate shaft to the generator.

The project contributes to reducing CO₂ emissions and to the country's sustainable development through:

- Generating direct and indirect jobs, businesses and local services;
- Increasing the national power generation capacity, and catalyzing new industrial and mining projects, which together will contribute to the overall development of the country;
- Improving some access roads to the work areas associated with the construction phase, which may provide better accessibility for tourism and better opportunities for export of fruit products, such as peaches, from the area
- Enhances the local investment environment and therefore improves the local economy
- Diversifies the sources of electricity generation in Peru, important for meeting growing energy demands and the transition away from diesel and coal-supplied electricity generation
- Will use a portion of CER revenue to develop micro-projects to support sustainable development in the region; these projects will be chosen and designed in collaboration with the local communities.

1.2 Sectoral Scope and Project Type

Sectoral Scope: 1. VCS sectoral scope: Energy Industries (renewable/non-renewable)

The project is not part of a grouped project.

1.3 Project Proponent

Organization name	INLAND ENERGY SAC
Contact person	Mr. Mile Cacic Enriquez
Title	Chief Executive Officer
Address	Canaval y Moreyra avenue, 380, piso 20. San Isidro. Lima27, Peru.
Telephone	51-1-421 3184
Email	mcacic@luzdelsur.com.pe

1.4 Other Entities Involved in the Project

Not applicable since as per de latest version of the VCS Standard (version.3.7). The proposed project activity is validated under CDM.

1.5 Project Start Date

The project has its start date on September 01st 2015. This is the date of commencement for the commercial operation¹ of the project.

1.6 Project Crediting Period

The project crediting period starts on September 01st 2015. That was the date of commencement for the commercial operation of the project.

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

According to the official documentation provided, the total power of the project is: 103.86 MW. That classifies the project activities into:

Project Scale	
Project	
Large project	X

Year	Estimated GHG emission reductions (tCO ₂ e)
2015 (01/09/2015 to 31/12/2015)	86,475
2016	287,106
2017	272,160

(1) According to the Peruvian System Operation Rules, all power plant have to fulfill several steps before be formally accepted as part of the Peruvian national grid (SEIN), then it could be able to trade their energy freely. When all these steps are fulfill then the plant receive the authorization from the National Authority and in this moment we say the project is in **commercial operation**.

Year	Estimated GHG emission reductions (tCO ₂ e)
2018	272,160
2019	272,160
2020	272,160
2021	272,160
2022	272,160
2023	272,160
2024	272,160
2025	272,160
2026	272,160
2027	272,160
2028	272,160
2029	272,160
2030	272,160
2031	272,160
2032	272,160
2033	272,160
2034	272,160
2035	272,160
2036	272,160
2037	272,160
2038	272,160
2039	272,160
2040	272,160
2041	272,160
2042	272,160
2043	272,160
2044	272,160
2045 (01/01/2045 to 31/08/2045)	181,440
Total estimated ERs	8,175,501
Total number of crediting years	30 ⁽¹⁾
Average annual ERs	272,517

⁽¹⁾ 2015 crediting year starts on September and finishes on December, 2045 crediting year starts on January and finishes on August, so together complete a calendar year.

1.8 Description of the Project Activity

The project aims to build a new run-of-river hydropower plant to be known as Santa Teresa Hydropower Plant, which will use the turbinated flow hydro-biological resources of the existing

Machu Picchu Hydropower Plant, so there will be no need to build a reservoir. The purpose of the project is to generate electricity without emissions of greenhouse gases (GHGs) (zero emission), which will be supplied to the Peruvian National Inter-connected Grid (SEIN). The project will be located in the department of Cusco, in the provinces of La Convencion and Urubamba, Santa Teresa and Machu Picchu districts, respectively.

The Santa Teresa Hydropower Plant will have an installed capacity of 98.12 MW, corresponding to a gross head of 186.8 m and a flow of 61 m³/s, with an estimated average annual generation of 722 GWh. It is estimated that the project will displace 272,517 tons of carbon dioxide equivalent (tCO₂e) per year, giving a total of 8,175,501 tCO₂e for 40-years crediting period, generating the equivalent amount of Verified Emission Reductions (VERs)

The Santa Teresa Hydropower Plant will take advantage of the existing head between the Machu Picchu Hydropower Plant tailrace works and the Ccollpani area. The scheme of works includes the connection with the Machu Picchu Hydropower Plant tailrace, the forebay, the pressure conveyance tunnel, the surge shaft, the powerhouse and the tailrace tunnel, as well as the hydro and electromechanical equipment of generation and control and the transmission system of SEIN integration through the 220 kV Machu Picchu-Abancay-Cotacuzco line.

Regarding the main mechanical equipment, the Santa Teresa Hydropower Plant will be equipped with two vertical shafts Francis turbines coupled via an intermediate shaft to the generator

The project will contribute to reducing CO₂ emissions and to the country's sustainable development through:

- Generating direct and indirect jobs, businesses and local services;
- Increasing the national power generation capacity, and catalyzing new industrial and mining projects, which together will contribute to the overall development of the country;
- Will improve some access roads to the work areas associated with the construction phase, which may provide better accessibility for tourism and better opportunities for export of fruit products, such as peaches, from the area
- Enhances the local investment environment and therefore improves the local economy
- Diversifies the sources of electricity generation in Peru, important for meeting growing energy demands and the transition away from diesel and coal-supplied electricity generation
- Will use a portion of VER revenue to develop micro-projects to support sustainable development in the region; these projects will be chosen and designed in collaboration with the local communities.

1.9 Project Location

The project is located in the Region of Cusco, in the provinces of La Convención and Urubamba, Santa Teresa and Machu Picchu districts, respectively. Specifically, the location is near the locality of Santa Teresa (2.5 km away) and the small town of Ccollpani Grande (1.0 km away) located on the right bank of the Vilcanota river.

The accesses to the project are via the Cusco - Santa Maria - Santa Teresa highway and the Cusco - Ollantaytambo – Machu Picchu Hydropower Plant railway line and from that point, via the road to Santa Teresa town.

The Central Point of the project can be considered as the location of the powerhouse, the coordinates are:

Coordinates	PSAD56		Geographical coordinates	
	East	North	Latitude (S)	Longitude (W)
Powerhouse	762,673	8,546,132	13.1433	72.5791

Location of the Powerhouse



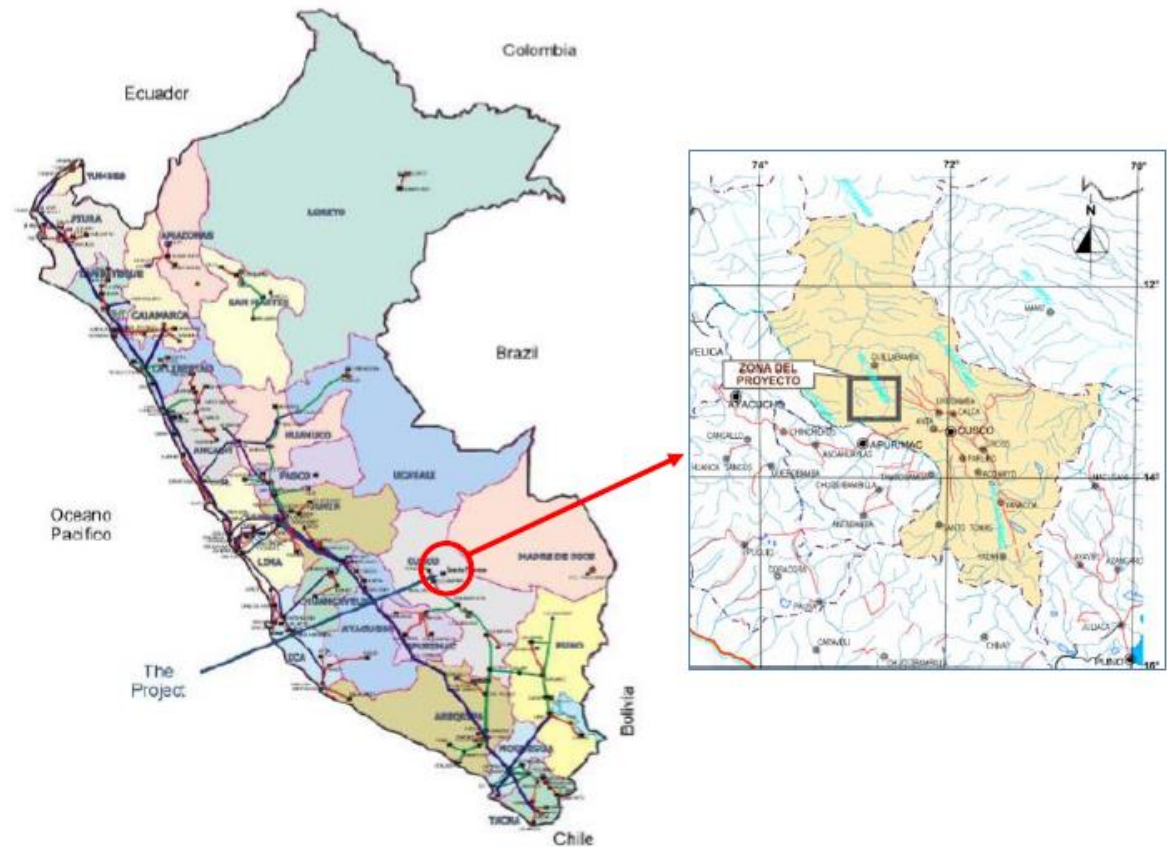
Coordinates of important location are available:

Project coordinates – Important locations of the project

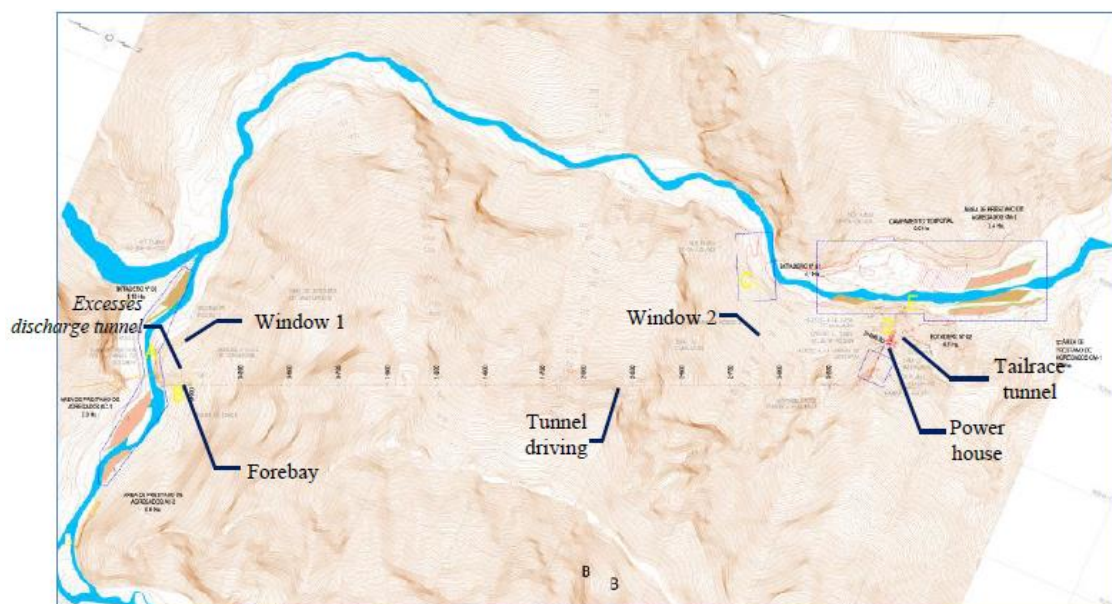
Main components	PSAD56		Geographical coordinates	
	East	North	Latitude (S)	Longitude (W)
Window 1	764,223	8,542,725	13.1739	72.5646
Forebay	764,330	8,542,910	13.1722	72.5636
Window 2	762,680	8,545,392	13.1500	72.5790
Powerhouse	762,673	8,546,132	13.1433	72.5791
Tailrace tunnel	762,457	8,546,212	13.1426	72.5811

The project is located in the Peruvian national electricity grid:

Project Location



Distribution maps units



1.10 Conditions Prior to Project Initiation

According to the Clean development mechanism project cycle procedure (version 03.2) and the guidelines on demonstration and assessment of prior consideration of the CDM (version 04), the Board decided that for project activities with a starting date on or after 2 August 2008, the project participant must inform a Host Party designated national authority (DNA) and the UNFCCC secretariat in writing of the commencement of the project activity and of their intention to seek CDM status. Such notification must be made within six months.

The Prior Consideration of the Santa Teresa Hydropower Plant was received by the DNA on March 11, 2011 and by the UNFCCC on May 13, 2011. This communication was within 180 days of the start of the start date of the project activity using the "Prior Consideration of the CDM Form (F-CDM- Prior consideration)"⁽²⁾.

For early considerations of the CDM component by the developer, it is important to mention that the Santa Teresa Hydropower Plant project is considered within the FONAM Carbon Portfolio⁽³⁾ since mid-2009.

On June 25, 2010 the Board of Directors of Inland, have been decided to incorporate the CDM component into the Santa Teresa Hydropower Project, in order to access to the benefit provided by the carbon markets.

On July 23, 2010, at a Public tender, the Private Investment Promotion Agency (ProInversion) (4) awarded Inland the construction of the Santa Teresa Hydropower Plant after offering to EGEMSA a higher percentage of the power produced (15%); however, no contract was signed.

Just the 23 February 2011, the Investment Commitment Agreement (Contract) between the company Inland S.A.A. and the Peruvian Government was signed (5); having considered prior to this signing that the carbon component is an essential part in the project. In this sense, this date has been considered the starting date of the Santa Teresa Hydropower Plant Project.

The real and continued actions taken to secure CDM status of the Project can be demonstrated by the relevant actions presented in the following table. The milestones demonstrate that CDM income was the key factor that allowed the Project to obtain its needed IRR, as the investor's (Inland S.A.A) interest is the acquisition of the emission reduction verifies (VERs) that the Project should generate.

Consideration of the CDM as a component of the project

Relevant actions	Date
Inclusion in the CDM projects portfolio of FONAM	June 2009
Prospectiva 2020 contract	May 24, 2010
Board of Directors Agreement, considering to incorporate the CDM component in the project	May 27, 2010

⁽²⁾ According to the UNFCCC Prior consideration search:

<http://cdm.unfccc.int/Projects/PriorCDM/notifications/index.html>

⁽³⁾ National Environmental Fund, promoting entity of CDM projects in Peru. Page 2 Code H-32. Available at: http://www.fonamperu.org/general/mdl/documentos/Summary_E.pdf

⁽⁴⁾ Proinversion is the Peruvian State agency engaged in the promotion of business opportunities.

⁽⁵⁾ Available at:

<http://proinversion.gob.pe/0/0/modulos/JER/PlantillaFichaHijoOpcion.aspx?ARE=0&PFL=0&JER=4385>

Relevant actions		Date
Board of Directors meeting (A bid in the auction is presented, considering the CERs sale and it is also reported the hiring of Prospectiva 2020)		June 25, 2010
Public Tender: Submission minutes and opening of sealed bids No. 1 and No. 2 and Award		July 13, 2010
Start date (contract signing with the Peruvian Government)		February 23, 2011
Prior Consideration Form		May 13, 2011 ⁽⁶⁾
Local stakeholder consultation		August 20, 2011
EPC Contracts	Design engineering and Construction Supervision contract	August 25, 2011
	Construction works contract	October 18, 2011
	Electro-mechanical Plant and Design- build contract	November 22, 2011
Starting date of construction works on site		November 02, 2011
Letter of Approval		November 08, 2011
Starting date of construction works on site		January 19, 2012
Inland Final Concession		February 18, 2012
Global Stakeholder consultation		February 21, 2012
Commissioning		Unit 1 - from April 28 to June 21, 2015
		Unit 2 - from June 06 to July 31, 2015

Finally, 3 months after the project Prior Consideration was published on the UNFCCC CDM website, Prospectiva 2020 carried out a public consultation for the project in the areas of influence (the small town of Ccollpani Grande and the locality of Santa Teresa). The preparation works, interviews and local consultations with inhabitants were performed during August 18-21, 2011.

To date, any Power Purchase Agreement (PPA) has been signed.

The following steps are used to demonstrate the additionality of the project according to the latest version of the "Tool for the demonstration and assessment of additionality" agreed by the Executive Board (Version 7.0)

1. Step 0: Demonstration whether the proposed project activity is the first-of-its-kind;
2. Step 1: Identification of alternatives to the project activity;
3. Step 2: Investment analysis;
4. Step 3: Barriers analysis; and
5. Step 4: Common practice analysis.

Step 0: Demonstration whether the proposed project activity is the first-of-its-kind.

⁽⁶⁾ Date received by UNFCCC http://cdm.unfccc.int/Projects/PriorCDM/notifications/index_html

According to the last version of the “Tool the demonstration and assessment of additionality” (version 7.0), this step is optional, so project participants decide not apply to this additionality analysis as the Santa Teresa hydropower plant is not the first- of- its kind.

Step 1: Identification of alternatives to the project activity consistent with current laws and regulations.

Sub-step 1a: Define alternatives to the project activity

As per Tool the demonstration and assessment of additionality (version 7.0) there are two realistic and credible alternatives identified and available for the developer; they would provide comparable results to the proposed CDM project activity:

- a) *The proposed project activity undertaken without being registered as a CDM project activity:* Generate electric power by implementing the Santa Teresa Hydropower Plant without considering the assistance of the CDM component.
- b) *Continuation of the current situation:* Do not implement any project to generate electric power. The electricity will continue being generated by the existing configuration of the SEIN.

The first alternative would be less likely for the developer since the profitability of the Santa Teresa Hydropower Plant, without considering the benefits from the CERs sale, is below the profitability required by the Inland S.A.A. shareholders, which is at least 13%. It is also below the industry benchmark in energy projects, which is 12%. This is stated in the **minutes of the non-presential meeting on February 23, 2011:**

"In this regard, Mr. Cacic presented to the directors the sensitivity analysis that is attached to this minutes, considering the different amounts of estimated investment for the Santa Teresa project and the 15% of firm power and energy that society will have to deliver to EGEMSA in accordance to the bid made in the International Public Auction for promoting the private investment in the Santa Teresa Hydropower Plant Project, which was awarded on July 13, 2010. In the sensitivity analysis the aforementioned scenarios were presented, with and without additionality of the carbon credits, in which the manager pointed out that it was clear that the minimum return percentage of 13% over the investment demanded by the shareholders, can only be obtained in the scenario with the additionality of the carbon credits. In view of this, after an extensive analysis and debate about the information presented and considering the Board of Directors Agreement of June 25, 2010, the Board of Directors unanimously approved the Santa Teresa project with the additionality of the carbon credits in order to obtain a return over the investment not under 13%, stipulating that the Santa Teresa project has to be registered as a project of the Clean Development Mechanism under the Kyoto Protocol before the Executive Board of the United Nations Framework Convention on Climate Change (...)"⁽⁷⁾

As is shown in the paragraph before, from the minute of the non-presential meeting, the 15% of firm power and energy for deliver to EGEMSA is part of the contract accepted and it had been previously concerted by the bid made in the international public auction for promoting the private investment in the Santa Teresa hydropower plant project.

Finally, the alternative of not implementing the project could also be considered due to the main risks that the developer would face to implement the hydropower project, especially if the CDM extraordinary revenues are not considered.

Sub-step 1b: Consistency with mandatory laws and regulations

⁽⁷⁾ Non-presential meeting Minutes. February 23, 2011. Inland S.A.A.

The alternatives identified above are in compliance with all mandatory applicable legal and regulatory requirements, including the Electricity Concessions Law (Law 25844)⁽⁸⁾ and its Regulations (ECL), which is complemented by the Law to Ensure Efficient Development of Electricity Generation (LADEFE: Law N° 28832)

Applicable articles to the identified alternatives of the Electricity Concessions Law (ECL)

- a) Article 1: The Secretariat of Energy and Mines and the OSINERGMIN (Supervisory Agency for Investment in Energy and Mining), representing the Government, are responsible for ensuring compliance with this Law, and who may delegate some of the functions conferred to them. The generation, transmission and distribution activities may be performed by, either national or foreign, individuals or corporations. Corporations shall be constituted under Peruvian laws.
- b) Article 3⁽⁹⁾: A final concession is required for the development of each of the following activities:
 - The generation of electric power using water resources with an installed capacity greater than 500 kW;
- c) Article 4⁽¹⁰⁾: An authorization is required to develop thermoelectric power generation activities, when the installed capacity exceeds 500 KW;
- d) Article 6: Awards and authorizations will be granted by the Secretariat of Energy and Mines of Peru, and will establish for that purpose a registry of Electricity Concessions.
- e) Article 7: The generation, transmission and distribution activities, not requiring a concession or authorization may be carry out freely in compliance with technical standards and rules for environmental conservation and Cultural Heritage of the country. The developer must inform the Secretariat of Energy and Mines about the beginning of the operation and technical characteristics of the works and facilities;
- f) Article 9: The Peruvian Government preserves environmental conservation and Cultural Heritage of the country, and the rational use of natural resources in the development of activities related to the electric power generation, transmission and distribution.

The Secretariat of Energy and Mines, as the governing entity of the Electricity Sector, is committed to continue improving the regulatory framework, so that the electricity market is served in an efficient and competitive form for the contribution to the socio-economic and sustainable development of the country.³

Applicable articles to the identified alternatives in the Law to Ensure Efficient Development of Electricity Generation (LADEFE)

Prior to the analysis of the articles, it is important to highlight the most important criteria that encourage investment in generation (considered in the LADEFE):

- Clear procedures by granting the electricity rights for the development of studies, construction and operation of power generation plants.

⁽⁸⁾ Available at: <http://www.coes.org.pe/dataweb3/2010/djr/baselegal/LeydeConcesionesElectricas.pdf> (Spanish);

http://www.minem.gob.pe/minem/archivos/file/institucional/publicaciones/biblioteca/mineria/peru/01_Law_Electrical%20Concession%20Law.pdf (English).

⁽⁹⁾ Current Text in accordance with the Legislative Decree amending 1002-2008, Page 3. available at: <http://intranet2.minem.gob.pe/web/archivos/dge/publicaciones/compendio/DLEG-1002-2008.pdf>

⁽¹⁰⁾ Current Text in accordance with the Legislative Decree amending 1002-2008, available at: <http://intranet2.minem.gob.pe/web/archivos/dge/publicaciones/compendio/DLEG-1002-2008.pdf>

- Mechanisms of demand and bid auctions addressed to not only existing generating agents but the new ones in the market so that the implementation of projects takes place within a competitive environment.

Article 4: The Auction as a preventive measure for the appropriate supply of electric power

- The appropriate and efficient supply of electric power for the regulated market will be ensured through Auctions. The process will be carried out early enough to facilitate and promote the development of new investment in generation, exploit economies of scale, promote market competition and ensure the supply of regulated market.
- In the process of contract award, it will be applied a discount factor to the financial bids in regards to hydropower projects for assessment purposes. The winning bidders with hydropower projects must submit a performance guarantee of work equal to a percentage of the appraisal of energy to be supplied during the contract period, which will be returned at the entry of commercial operation of the hydropower plant.

In view of what has been exposed, none of the three identified alternatives contradicts any legal or regulatory requirement. Moreover, none of them goes against the regulations related to environmental, social or cultural conservation. Since they are all realistic and credible alternatives available to the project participants, the Project is considered as additional under Step 1.

STEP 2 – Investment Analysis

Sub-step 2a: Determine appropriate analysis method

According to the "Tool for the demonstration and assessment of additionality", three options can be applied to conduct the investment analysis:

- Option I: Simple Cost Analysis
- Option II: The Investment Comparison Analysis
- Option III: The Benchmark Analysis

Simple cost analysis applies if the CDM project activity and the alternatives identified in step 1 generate no financial or economic benefits other than CDM related income. Since this project will generate financial/economic benefits, through the sale of generated electricity, Option I (Simple Cost Analysis) is not applicable.

Then, according to the "Guidelines on the Assessment of Investment Analysis" (version 05) if the proposed baseline scenario leaves the project participant no other choice than to make an investment to supply the same (or substitute) products or services, the Investment Comparison Analysis shall be use.

In this case, if the project is not developed, the power would be supplied by the SEIN; that means that Option II (The Investment Comparison Analysis) is not applicable.

Finally, as the Santa Teresa Hydropower Plant will supply of electricity from a grid this is not to be considered an investment and a benchmark approach is considered appropriate. That means that Option III (Benchmark Analysis) will be applicable.

Sub-step 2b: Option III – Apply benchmark analysis

The basis of this analysis lies in the choice of the most appropriate economic/financial indicators for the type of project and the context of decision making. In this sense, the application was based on market standard parameters, considering specific features for the type of project.

Given this, the financial indicator that will be used is the project's post-tax internal rate of return (IRR). The calculated internal rate of return will be compared with the discount rate that investors in Peru would normally expect in such projects. Thus, the benchmark choice lies on official sources approved by the government, which have been used for similar investment decisions. Based on this, it is taken as a reference a discount rate of 12% (11), which is used to assess the feasibility of potential investments in the Peruvian electricity sector. This rate is registered in many studies as well as official documents (regulations) of the Government for the evaluation of investment projects within this sector.

This 12% rate officially appeared for first time in December 1992 with the issuance of the Electric Concession Law as the cost opportunity of investment for new additions to the system aiming to anticipate and determine the regulated price in Peru. In this way, the Article 79 states: "The readjustment rate to be used in this Law shall be real annual 12%". This rate is involved in the calculation of the regulated price in Peru. It is also mentioned that the Rate Base will include the calculated annual investment by applying this readjustment rate, so it would refer to this rate as the opportunity cost and minimum return required for new electric power investments (12) that would be affected by the regulated price, in accordance with the Article 22 of the Transmission Regulations (Supreme Decree N° 027-2007-EM).

In 2007, the Secretariat of Economy and Finance issued Decree 015-2007 "Terms of Reference for feasibility studies for rural electrification in Peru." In section number 5.2, the document describes that - to evaluate the private sector investment - a 12% discount rate shall be used for rural electrification projects, including electric generation projects (renewable and non-renewable). Prior to this, the Ministry of Economy and Finance of Peru issued in May 2005 the "Technical report 085-2005-EF/68.1" in regards to projects evaluation in the electric sector. This report sets that the discount rate is 12% for the private sector evaluation.

Additionally, the article 15° of the Electricity Supply Auctions Regulations (Supreme Decree N° 052-2007-EM), Bid evaluation and Contract award, establishes that the stipulated 12% in the ECL aforementioned article is one of the options for assessing the financial bids of hydropower projects. An extract from this article is quoted below:

"...By approving the Bases, OSINGERMIN will include the discount factor that will be applied for evaluation purposes of economic bids corresponding to hydropower projects. The discount factors will be determined considering at least the following criteria: i) The monomial price at the current generation level, ii) Efficient investment costs, the discount rate stated in the ECL Article 79 (12%), a commercial operation period of thirty (30) years, as well as operation and maintenance costs..."

Parameters	Unit	Value	Data Source
Current Price – Energy for Free Market	US\$ per MWh	47.61	Osingermin. Long- Term Public Bidding 2009 ⁽¹³⁾
Current Price- Energy for Spot Market	US\$ per MWh	32	Osingermin. Marginal Average Cost - 2009 ⁽¹⁴⁾
Current Price- Capacity for	US\$ per MW-	5,885.61	Osingermin. Long- Term

⁽¹¹⁾ Law Decree N° 25844. Electricity concessions Law Article 79. Regarding the issue of tariff applicability, Peru does not have a special tariff for non-renewable or renewable power projects. The 12% discount rate for the electric sector applies to both renewable and non-renewable projects.

⁽¹²⁾ It involves renewable and non-renewable power projects

⁽¹³⁾ Public Bidding Process. According to Quitaracsa HP prices. Available at: <http://www2.osinerg.gob.pe/>

⁽¹⁴⁾ Available at: http://www2.osinerg.gob.pe/web_osinerg/includes/marcos4.html

Parameters	Unit	Value	Data Source
Free Market	month		Public Bidding 2009
Current Energy bus bar Price	US\$ per MWh	30.85	Osinermin. Bus bar price January 4, 2010. ⁽¹⁵⁾
Projected Price – Energy for Free Market	US\$ per MWh	50.70	Inland S.A.A, Santa Teresa Hydropower Plant Unlevered Evaluation
Projected Price- Energy for Spot Market	US\$ per MWh	32	Inland S.A.A, Santa Teresa Hydropower Plant Unlevered Evaluation
Projected Price- Capacity for Free Market	US\$ per MW-month	5,989.90	Inland S.A.A, Santa Teresa Hydropower Plant Unlevered Evaluation
Projected Energy bus bar Price	US\$ per MWh	32.86	Inland S.A.A, Santa Teresa Hydropower Plant Unlevered Evaluation
Initial Investment: Building and constructions	US\$ million	74	Inland S.A.A, Santa Teresa Hydropower Plant Unlevered Evaluation
Initial Investment: Machinery & Equipment	US\$ million	74	Inland S.A.A, Santa Teresa Hydropower Plant Unlevered Evaluation
Depreciation- Building and construction	% per year	20	Legislative Decree N° 1058, Article 1. ⁽¹⁶⁾ Law N° 29764, Article 1 ⁽¹⁷⁾
Depreciation- Machinery & Equipment	% per year	20	Legislative Decree N° 1058, Article 1 Law N° 29764, Article 1
Generation capacity	MW	98.12	Inland S.A.A, Descriptive Memory: Santa Teresa Hydropower Plant
Annual Generation	MWh	722,175	Teresa HPP Annual Generation ⁽¹⁸⁾
Investment related Taxes (IGV)	%	19	Inland S.A.A, Santa Teresa Hydropower Plant Unlevered Evaluation
Energy & Capacity Delivered to EGEMSA	%	15	Inland S.A.A., Public Tender: (Submission minutes and opening of sealed bids No. 1 and No. 2 and Award), July 13, 2010.
Discount rate	%	12	Law 25844 – Electric Concessions Law, Article 79. ⁽¹⁹⁾
Water use contribution (tariff)	% of revenues per year	1	Supreme Decree N° 009-93-EM, Rulebook for the

⁽¹⁵⁾ Available at: <http://www2.osinermin.gob.pe/gart.htm>

⁽¹⁶⁾ Provides accelerated depreciation —as much as 20% per year— for investments in hydroelectric and other renewable energy sources. Available at:

<http://www.osinermin.gob.pe/newweb/uploads/GFE/Normativa/3%20Normativa%20sobre%20Generacion%20Electrica/17-0-DL.1058.pdf>

⁽¹⁷⁾ Law that extends the validity of the tax benefit approved by Legislative Decree N° 1058. Available at: <http://www.congreso.gob.pe/ntley/imagenes/Leyes/29764.pdf>

⁽¹⁸⁾ According to “Datos de Perseo”, available at: www2.osinermin.gob.pe

⁽¹⁹⁾ Available at:

http://www.minem.gob.pe/minem/archivos/file/institucional/publicaciones/biblioteca/mineria/peru/01_Law_Electrical%20Concession%20Law.pdf

Parameters	Unit	Value	Data Source
			Electric Concessions Law 25844, Article 214. ⁽²⁰⁾
Workers participation	% per year	5	Legislative Decree N°892, Article 2. ⁽²¹⁾
Income tax	% per year	30	Consolidated Text of the Income Tax Law, Supreme Decree N° 179- 2004- EF, Chapter VII, Article 55°. ⁽²²⁾
Fixed contribution to COES	US\$	20,000	Committee on Economic Operation of the Electric System – COES Administrative Procedure N°8: Determination of Contribution from Registered Member of the COES to Cover Annual Budget. ⁽²³⁾
Personnel expenses	US\$	634,508	Inland S.A.A, Santa Teresa Hydropower Plant Unlevered Evaluation. ⁽²⁴⁾
Insurance cost	US\$ million	1	Inland S.A.A, Santa Teresa Hydropower Plant Unlevered Evaluation
CPI- USA	%	1.7	Minutes of The Federal Open Market Committee. November 2009. Page 1 of the Summary of Economic Projection. ⁽²⁵⁾
CPI- Peru	%	2.5	Multiannual Macroeconomic Framework 2010- 2012. Approved on August 28, 2009. Page 17.
Exchange rate	S/. per US\$	2.95	Multiannual Macroeconomic Framework 2010- 2012. Approved on August 28, 2009. Page 17. ⁽²⁶⁾
Price - Camisea Natural Gas (% growth)	%	5	Inland S.A.A, Santa Teresa Hydropower Plant Unlevered Evaluation ⁽²⁷⁾
Selling costs	%	0.25	Inland S.A.A, Santa Teresa Hydropower Plant Unlevered Evaluation
Legal Reserve	%	10	Law N°26887 - General Corporation Law, Article 229°. ⁽²⁸⁾
Operation and Maintenance	%	3	International Energy Agency. Renewable Energy Essential:

⁽²⁰⁾ Available at: <http://www.minem.gob.pe/minem/archivos/file/Electricidad/normatividad/ds009-93.pdf>

⁽²¹⁾ Available at: <http://www.mintra.gob.pe/contenidos/archivos/prodlab/D.%20Leq.%20892%2011-11-96.pdf>

⁽²²⁾ Available at: <http://www.sunat.gob.pe/legislacion/renta/ley/capvii.htm>

⁽²³⁾ Available at: http://www.coes.org.pe/wcoes/coes/organizacion/marco/procedimientos_adm.aspx

⁽²⁴⁾ According to Law N° 27735; Rulebook for Law N°29351; Supreme Decree N° 001- 97- TR

⁽²⁵⁾ Available at: <http://www.federalreserve.gov/newsevents/press/monetary/fomcminutes20091104.pdf>

⁽²⁶⁾ Available at: http://www.mef.gob.pe/contenidos/pol_econ/marco_macro/MMM_2010_2012_Rev.pdf

⁽²⁷⁾ According to the License Agreement for the Exploitation of Hydrocarbons in Block 88 and the Fifth Amendment of the Contract.

Pág 2. Available at: http://www.minem.gob.pe/minem/archivos/acta_lote88.pdf

⁽²⁸⁾ Available at: <http://www.congreso.gob.pe/ntley/Imagenes/Leyes/26887.pdf>

Parameters	Unit	Value	Data Source
			Hydropower.
Regulator Contribution	%	1	Law 25844 – Electric Concessions Law, Article 31. ⁽²⁹⁾
Weight factor	%	30	Inland S.A.A, Santa Teresa Hydropower Plant Unlevered Evaluation ⁽³⁰⁾
Weight factor	%	70	Inland S.A.A, Santa Teresa Hydropower Plant Unlevered Evaluation ⁽³¹⁾
Weight factor	%	22	Inland S.A.A, Santa Teresa Hydropower Plant Unlevered Evaluation ⁽³²⁾
Weight factor	%	78	Inland S.A.A, Santa Teresa Hydropower Plant Unlevered Evaluation ⁽³³⁾

Then, according to the General Law of Rural Electrification regulations (Supreme Decree No. 025-2007-EM), the Article 11 states that the economic evaluation of the project will be made considering the market prices for all its cost components, fee revenues including the direct tax collection, and when appropriate, the benefit will be determined using the discount rate of 12%. In addition, referring to the Emergency Decree of the Secretariat of Economy and Finance (D.U.015-2007) which specifies the minimum content of a rural electrification project profile with renewable or non-renewable resources for the evaluation of private investment, it is requested to take the cash flow at private costs and obtain the profitability indicator with the discount rate of 12%.

Additionally, the Secretariat of Environment and the Secretariat of Energy and Mines have sent letters supporting various projects registered before the executive board that confirm that 12% is widely used as a benchmark for the government to assess the investments feasibility in the electric sector in Peru. Even independent studies, such as one performed by the World Bank in 2009 and another one by the Peruvian Agency for the Promotion of Private Investment (Proinversion) confirm the use of 12% as a benchmark for investment decisions in the sector.

Sub-step 2c: Calculation and comparison of financial indicators

The revenues for this project are based only in the sale of electricity to the SEIN, according to declaration of the Inland Company.

Furthermore, the project baseline scenario considers the projected price for the Unlevered Evaluation. The formula used to project energy prices is from OSINERGMIN.

The main parameters of the IRR analysis are based on conservative assumptions available to the Project developer at the time of the investment decision, and are shown below:

Main parameters for the calculation of financial indicators

Regarding costs, some of them are described in the following paragraphs:

Initial investment

⁽²⁹⁾ Available at:

http://www.minem.gob.pe/minem/archivos/file/institucional/publicaciones/biblioteca/mineria/peru/01_Law_Electrical%20Concession%20Law.pdf

⁽³⁰⁾ According to : Long- term contract for electricity supply

⁽³¹⁾ According to : Long- term contract for electricity supply

⁽³²⁾ According to : Long- term bidding for electricity supply (bases)

⁽³³⁾ According to : Long- term bidding for electricity supply (bases)

Initial investment is detailed in the following table:

N°	Description	Thousands of US \$
1	Construction works ⁽³⁴⁾	89,000
2	Electromechanical equipment ⁽³⁵⁾	30,885
3	Detailed engineering ⁽³⁶⁾	5,000
4	Construction supervision ⁽³⁷⁾	10,000
5	EGEMSA asset purchase ⁽³⁸⁾	2,139
6	ProInversión payment ⁽³⁹⁾	1,000
7	Contingencies	10,000
	TOTAL investment project	148,024

Operation and Maintenance Costs (O&M)

The regulatory institution through the Deputy Manager Rate Regulation (GART - Gerencia Adjunta de Regulación Tarifaria) considers for O&M a value of around 3% for plants with investment costs of 1,500 US\$ / kW, and for other investment costs that % rate is adjusted. For Santa Teresa hydropower plant was estimated an initial investment amount of US\$ 148 million, by applying the 3% mentioned, it obtained an O&M annual cost of US\$ 4.44 thousand, and in units of total energy produced was obtained a value of US\$ 6.15 per MWh.

In this regard, the IEA (International Energy Agency) said that the costs of operation and maintenance of hydropower plants for medium to large capacity power is estimated between US\$ 5-20 per energy produced (MWh), and in the case of small plants this cost may be twice about. The agency classifies medium plants as those with an installed capacity of 10 to 100 MW for run-of plants (run-of-river), which corresponds to the case of Santa Teresa (IEA, Renewable Energy Essentials: Hydropower, 2010).

Fixed contribution to COES

The fixed contribution to COES is established in order to cover the annual COES budget of operating expenses and investment. For Santa Teresa hydropower plant has been estimated an annual fixed amount of US\$20,000, calculated as provided in the COES Administrative Procedure N° 8: "Determination of input from the registered members of the COES for cover the Annual Budget".

Personnel expenses

It was estimated the number of workers (staff) expected for the project building and during the commercial operation. The total annual cost was estimated at US\$647,458 and consisting of 9 persons with basic salary, two bonuses, a holiday allowance, payment for a bond and an additional fee of 20% for other contributions, health insurance contributions and Compensation for Time of Service (CTS). The following table shows a breakdown by position:

Personnel	Monthly salary	Annual salary	Bonuses	Vacations	Other bonifications	Total annual salary	Social charges	Annual company cost
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⁽³⁴⁾ According to proposal from CRU

⁽³⁵⁾ According to proposal from SFECO

⁽³⁶⁾ According to proposal from MWH

⁽³⁷⁾ According to proposal from MWH

⁽³⁸⁾ According to International Public Bidding EGEMSA Circular N° 13 (11/06/2010)

⁽³⁹⁾ According to International Public Bidding for Santa Teresa hydropower plant (Proinversión)

Personnel	Monthly salary	Annual salary	Bonuses	Vacations	Other bonifications	Total annual salary	Social charges	Annual company cost
Manager	40,000	480,000	93,333	40,000	40,000	653,333	130,667	784,000
Superintendent	20,000	240,000	46,667	20,000	20,000	326,667	65,333	392,000
Employee 1	10,000	120,000	23,333	10,000	10,000	163,333	32,667	196,000
Employee 2	8,000	96,000	18,667	8,000	8,000	130,667	26,133	156,800
Employee 3	5,000	60,000	11,667	5,000	5,000	81,667	16,333	98,000
Technician 1	3,500	42,000	8,167	3,500	3,500	57,167	11,433	68,600
Technician 2	3,000	36,000	7,000	3,000	3,000	49,000	9,800	58,800
Technician 3	3,000	36,000	7,000	3,000	3,000	49,000	9,800	58,800
Technician 4	3,000	36,000	7,000	3,000	3,000	49,000	9,800	58,800
TOTAL S/.						1,559,833	311,967	1,871,800
TOTAL US\$						528,757	105,751	634,508

It has been estimated for the construction project (three years), staff costs would represent 50% of total staff costs and for the commercial operation would be 100% of the total cost estimated. Thus staff costs would be as follow:

Description	Building			Commercial operation
	2011	2012	2013	2014 - 2043
Staff expenses (US\$)	323,729	323,729	323,729	647,458

Insurance costs

The insurance costs were calculated considering the Santa Teresa two phases: building and commercial operation.

In the case of the building phase, it took into account the two main coverages that are hired for this phase of the project: Construction All Risk (CAR) and Advance Loss of Profit (ALOP), it was consulted with Inland insurance brokers on the approximate costs that would result from hiring an insurance policy with this kind of coverage, and stated that for an investment of \$ 148 million should apply a combined rate of 8.1 per thousand, so it was obtained a total cost during the three years of construction: US\$ 1,200 thousand. Due to the nature of the budget execution, the pay-out of the insurance premium would result in increasingly, year 1: US\$ 200 thousand, year 2: US\$ 400 thousand and year 3: US\$ 600 thousand.

Regarding the insurance premium for commercial operation, it was estimated an annual amount equal to 80% of the total premium CAR & ALOP calculated, so as indicated equals to US\$ 960 thousand and approximately to \$ 1 million per year.

Selling costs

Regarding selling costs was considered an annual amount of US\$ 100,000 (estimated by Inland at approximately 0.25% of sales), representing the same expenditures for activities related to the signing of contracts and maintaining commercial relations with free customers.

Depreciation expense

The calculation of the income tax considers the depreciation expense. Annual depreciation is calculated considered a tax benefit of accelerated depreciation in investment in machinery, equipment and civil works, up to a maximum of 20% per year (5 year of depreciation). By D.L. 1058 published on 28 June 2008, this tax benefit is granted to all investments in power generation using water and other renewable resources. Subsequently, through Law No. 29764 published on July 22, 2011 this benefit was extended until 31 December 2020.

Salvage value

During the evaluation process are analyzed different scenarios, in which it was decided not to include a salvage value at the end of year 30, since the commercial operation is for an indefinite period and if it had seen a recovery investment via the salvage value, would have involved a culmination of the commercial operation. Similarly, it was not considered a return of working capital in the last year of assessment, since it has been assumed business continuity beyond the horizon of evaluation, which was not considered a recovery support working capital in the last year.

Should be mentioned that estimate was also assessed a perpetuity at the end of year 30, but "from the mathematical point of view, if the flows of the project are projecting in a large future timeline, it will have lower incidence in the present value calculation: the discount factor grows exponentially, which is further accentuated when the cost of capital is high"⁽⁴⁰⁾. Indeed, taking into account the required return for the project, the present value of the perpetuity was irrelevant in the economic evaluation. Thus, it was decided not to include perpetuity, in order to simplify the evaluation model and consequently its explanation.

15% of power and energy delivered to EGEMSA

The process carried out by the Private Investment Promotion Agency (PROINVERSIÓN) stipulated as a competence delivering a percentage of the power and energy, at least 10% (see Circular No. 5 of that agency). The percentage of 15% set in the economic evaluation model was considered by the company as the upper limit that was willing to hand in power and energy, and to participate in international bidding. Thus, during the bidding process conducted on July 13, 2010, the consortium competitor offered a percentage of 11.15%, which was lower than that offered by Inland, which allowed it to win this competition and grant awarded the concession.

Comparison of Project IRR to benchmark: according to the analysis, a comparison between the calculated IRR for the project without CDM benefits (11.23%) and the selected benchmark (12%) is made, resulting that the first one turns out to be lower than the reference provided. Therefore, it is shown that the project is not economically/financially attractive without the assistance of the CDM component (with the contribution of which an IRR of 13.17% is reached).

This low IRR compared to the hurdle rate indicates that the Project is not financially attractive without CDM assistance. The low return does not justify the high risks (geological, social, environmental, regulatory, etc.) associated with implementing this new renewable energy project; therefore any investor should expect return higher than 12%.

Comparison of financial indicator with and without CER revenue

Project IRR without CDM benefits:	Benchmark IRR	Project IRR with CDM benefits:
11.23%	12.00%	13.17%

⁽⁴⁰⁾ SAPAG, J.M. (2007), *Evaluación de Proyectos. Guía de Ejercicios Problemas y Soluciones*, Tercera Edición, Colombia.

Sub-step 2d: Sensitivity analysis

According to the Guidelines on the Assessment of Investment Analysis, the following financial parameters were taken as uncertainty factors for the sensitivity analysis as they constitute around or more than 20% of the Project revenues and expenses

- Initial investment
- Current Energy Price for Free Market
- Projected Energy Price for Free Market
- Annual Generation
- Operation and Maintenance Costs (O&M)

Also, as a general point of departure variations in the sensitivity analysis should cover a range of +10% and – 10%.

The results are summarized in the following table:

Sensitivity analysis of Project IRR

Parameter	-10%	Base Case	+10%
Initial Investment	12.45%	11.23%	10.17%
Current Energy Price for Free Market	9.28%	11.63%	11.63%
Projected Energy Price for Free Market	9.99%	11.23%	12.41%
O&M costs	11.42%	11.23%	11.04%
Annual generation	10.63%	11.23%	11.84%

Turning point condition to reach the benchmark of 12%

Parameter	+/-	Value to achieve benchmark
Initial Investment	- 6.38%	US\$ 138,558 (thousand)
Current Energy Price for Free Market	+ 13.3%	US\$ 53.94 per MWh
Projected Energy Price for Free Market	+ 6.40%	US\$ 53.95 per MWh
O&M costs	- 40.81%	US\$ 3.64 per MWh
Annual Generation	+ 12.87%	815,199 MWh

The probability of such variations in any of these parameters is considered improbable in practical terms, as detailed below:

Initial Investment costs of the project are in the range of US\$ 1.5 million/installed MW, being within the standard for the region and are based on quotations already price- adjusted by the contractors after a negotiation process. The initial investment was calculated based on early conditions in 2010. Since then, the price of crude oil has increased as well as the price of metals and other resources like cement; the initial investment is more likely to increase, and is unlikely to decrease. However, the most important evidence of this statement is that the investment carried out up to October 2013 (contracts that have already signed) plus the projected investment (contracts for close) is USD 154MM as we show in the next table:

N°	Description	Thousand US \$	Status
1	Construction works	84,860	Contract Closed
2	Electromechanical equipment	35,529	Contract Closed
3	Design engineering	5,246	Contract Closed
4	Construction Supervision	10,322	Contract Closed
5	EGEMSA Asset Purchase	2,140	Contract Closed
6	ProInversión payment	1,000	Invoice Paid
7	Provisional substation and power	1,650	Contract for Close
8	Electrical equipment	4,000	Contract for Close
9	Transmission line CH ST - SE Suriray	800	Contract for Close
10	Reserve for contingencies	9,000	Contract for Close
Total investment		154,547	

In this sense, a variation of -10% for the initial investment is unlikely to happen. The energy price in the free market, according to the current prices of electricity supply contracts, will not increase in a short and medium term, because of the evidence provided in recent auctions for energy and Power Purchase Agreements (PPAs) signed by free customers with similar projects to the Santa Teresa Hydropower Plant. Even the latest results show that there is a downward trend in the awarded prices.

The annual generation in the base case, 722,175 MWh, is based on the hydrological conditions of the region where the project will be located. Information from 1965 onward about the hydrological conditions was considered to make this estimate in the feasibility study. It is unlikely that over the next 30 years, conditions will change in a way that will enable more generation than expected based on the feasibility study, since climate change is predicted to decrease the water resources available for hydropower in the region.

It is likely that the O&M Costs could be reduced by 40.81%. The budgeted O&M Costs are comparable to the O&M Costs assumed with similar hydropower projects in Peru.

For this project, the cost of O&M is not a critical parameter. First of all, an increase of almost 50% of the O&M would make it impossible any project. On the other hand, hydroelectric projects are a mature renewable technology, so that the O&M costs are more standardized. As we pointed out on previous occasions, according to studies conducted by International Sector Institutions (IEA, Renewable Energy Essentials: Hydropower, 2010) all hydroelectric projects down the O&M costs as a percentage of total investment. These same studies suggest taking a referential factor of 2.5% of the total investment for O&M costs (Santa Teresa project takes 3%)

Additionally once built and put into operation, hydro usually requires very little maintenance and operating costs can be kept low because hydropower plants have no recurring costs in terms of

fuel, for example. In that sense, expect the project reaches the benchmark rate (12%) due to an increase of 13 times the cost of O&M, it is not a realistic scenario.

Therefore, considering the impossibility to reach acceptable levels of IRR, it can be concluded that the Project is not financially attractive for private investors and requires CDM revenues from the sale of CERs to become viable. The sensitivity analyses conducted above confirm that the Project is not as financially attractive as other alternatives available in the market, and that successful implementation of the Project depends on CDM registration. As a result, the Project is considered additional under Step 2.

Step 4: Common Practice Analysis

According to sub-step 4a in the last version of the Tool for the demonstration and assessment of additionality (version 10.0):

Since, the project activity falls in the type of:

(ii) Switch of technology with or without change of energy source including energy efficiency improvement as well as use of renewable energies (example: energy efficiency improvements, **power generation based on renewable energy**);

The last version of the Guidelines on common practice (version 02.0) shall be applied in the following paragraph:

Step 1: calculate applicable capacity or output range as +/- 50% of the total design capacity or output of the proposed project activity:

The capacity of the proposed project is 98.12 MW, so the range will be from 49 MW and 147 MW.

Step 2: identify similar projects (both CDM and non-CDM) which fulfil all of the following conditions:

(a) *The projects are located in the applicable geographical area:*

According to project boundaries, geographical area is the whole country (Peru).

(b) *The projects apply the same measure as the proposed project activity:*

It will be considered renewable energy project.

(c) *The projects use the same energy source/fuel and feedstock as the proposed project activity, if a technology switch measure is implemented by the proposed project activity:*

Hydropower projects will be considered.

(d) *The plants in which the projects are implemented produce goods or services with comparable quality, properties*

Hydropower project that delivered electricity to SEIN (Peruvian grid)

(e) *The capacity or output of the projects is within the applicable capacity or output range calculated in Step 1:*

49 MW and 147 MW

(f) *The projects started commercial operation before the project design document (CDM-PDD) is published for global stakeholder consultation or before the start date of proposed project activity, whichever is earlier for the proposed project activity.*

It will be considered projects before start date of proposed project activity: 23rd February, 2011 (earlier than global stakeholder consultation – on 21st February, 2012).

Similar projects identified are listed in the follow table:

Addition to the SEIN before 23rd February 2011

Company	Plant	Unit	Type of Resource	Installed capacity plant (MW)	Interval (MWh): (49.06 - 147.18)	Similar projects (CDM / no CDM)
AIPSAA	C.T. PARAMONGA	TV1	Chaff	23.0		
AYEPSA	C.H. PÍAS	G2	Hydro	6.3		

Company	Plant	Unit	Type of Resource	Installed capacity plant (MW)	Interval (MWh): (49.06 - 147.18)	Similar projects (CDM / no CDM)
CELEPSA	PLATANAL	G1	Hydro	220.0		
		G2	Hydro			
CHINANGO	CHIMAY	G1	Hydro	142.8	yes	yes
		G2	Hydro			
	YANANGO	G1	Hydro	42.3		
SOC.MIN.CORONA	HUANCHOR	G1	Hydro	18.4		
		G2	Hydro			
EDEGEL	CALLAHUANCA	G1	Hydro	82.6	yes	yes
		G2	Hydro			
		G3	Hydro			
		G4	Hydro			
	HUAMPANI	G1	Hydro	31.4		
		G2	Hydro			
	HUINCO	G1	Hydro	258.4		
		G2	Hydro			
		G3	Hydro			
		G4	Hydro			
	MATUCANA	G1	Hydro	120.0	yes	yes
		G2	Hydro			
	MOYOPAMPA	G1	Hydro	75.4	yes	yes
		G2	Hydro			
		G3	Hydro			
	SANTA ROSA	UTI-5	NG	246.7		
		UTI-6	NG			
		WTG-7	NG			
	SANTA ROSA II	TG8	NG	200.0		
	VENTANILLA	TG3+TG4 CCOMB F.DIREC.	NG	522.0		
EEPSA	MALACAS	TG-1	NG	135.7	yes	no
		TG-2	NG			
		TG-4	NG			
EGASA	CHARCANI I	G1	Hydro	1.8		
		G2	Hydro			
	CHARCANI II	G1	Hydro	0.6		
		G2	Hydro			
		G3	Hydro			
	CHARCANI III	G1	Hydro	4.2		
		G2	Hydro			
	CHARCANI IV	G1	Hydro	15.5		
		G2	Hydro			
		G3	Hydro			
	CHARCANI V	G1	Hydro	145.4	yes	yes
		G2	Hydro			
		G3	Hydro			

Company	Plant	Unit	Type of Resource	Installed capacity plant (MW)	Interval (MWh): (49.06 - 147.18)	Similar projects (CDM / no CDM)
	CHARCANI VI	G1	Hydro	9.0		
	CHILINA	C. COMBINADO	Diesel 2	48.5		
		SULZER1	Residual 6			
		SULZER2	Residual 6			
		TV2	Residual 500			
		TV3	Residual 500			
	MOLLENDO	MIRLESS 1	Residual 500	31.7		
		MIRLESS 2	Residual 500			
		MIRLESS 3	Residual 500			
	PISCO	TG-1	NG	74.8	yes	no
		TG-2	NG			
EGEMSA	MACHUPICCHU	G1	Hydro	90.5	yes	yes
		G2	Hydro			
		G3	Hydro			
EGENOR	CAÑA BRAVA	G1	Hydro	5.3		
	CAÑON DEL PATO	G1	Hydro	246.6		
		G2	Hydro			
		G3	Hydro			
		G4	Hydro			
		G5	Hydro			
		G6	Hydro			
	CARHUAQUERO	G1	Hydro	95.1	yes	yes
		G2	Hydro			
		G3	Hydro			
	CARHUAQUERO IV	G4	Hydro	10.0		
	CHICLAYO OESTE	GMT-1	Residual 6	26.7		
		GMT-2	Residual 6			
		GMT-3	Residual 6			
		SULZER-1	Residual 6			
		SULZER-2	Residual 6			
	CHIMBOTE	TG-3	Diesel 2	21.0		
	LAS FLORES	TG-1	NG	192.5		
	PIURA	GMT-1	Residual 6	34.7		
		GMT-2	Residual 6			
		MIRLEES-1	Diesel 2			
		MIRLEES-4	Diesel 2			
		TG	Residual 6			
EGESUR	ARICOTA I	G1	Hydro	23.8		
		G2	Hydro			
	ARICOTA II	G1	Hydro	11.9		
	INDEPENDENCIA	WARTSILA 1	NG	22.9		
		WARTSILA 2	NG			

Company	Plant	Unit	Type of Resource	Installed capacity plant (MW)	Interval (MWh): (49.06 - 147.18)	Similar projects (CDM / no CDM)
ELECTROPERU		WARTSILA 3	NG			
		WARTSILA 4	NG			
	MANTARO	G1	Hydro	798.0		
		G2	Hydro			
		G3	Hydro			
		G4	Hydro			
		G5	Hydro			
		G6	Hydro			
		G7	Hydro			
	RESTITUCION	G1	Hydro	274.4		
		G2	Hydro			
		G3	Hydro			
	EMERGENCIA TRUJILLO	40 units MTU	Diesel 2	64.0	yes	no
	TUMBES	MAK1	Residual 6	18.7		
		MAK2	Residual 6			
ENERSUR	YUNCAN	G1	Hydro	130.1	yes	yes
		G2	Hydro			
		G3	Hydro			
	CHILCA	TG1	NG	559.8		
		TG2	NG			
		TG3	NG			
	ILO 1	CATKATO	Diesel 2	238.6		
		TG-1	Diesel 2			
		TG-2	Diesel 2			
		TV2	Residual 500			
		TV3	Residual 500			
	ILO 2	TV4	Residual 500	135.0	yes	no
		TVC1	Carbon			
GEPSA	LA JOYA	G1	Hydro	10.0		
		G2	Hydro			
KALLPA GENERACION S.A.	KALLPA	TG1	NG	629.0		
		TG2	NG			
		TG3	NG			
MAJA ENERGÍA	RONCADOR	G1 - G2	Hydro	3.8		
PETRAMAS	C.TB. HUAYCOLORO (4)	G1-G2-G3	Biogas	4.8		
SAN GABAN	SAN GABAN II	G1	Hydro	110.0	yes	yes
		G2	Hydro			
	BELLAVISTA	ALCO	Diesel 2	4.8		
		MAN 1	Diesel 2			
	TAPARACHI	MAN 1	Diesel 2	6.7		
		MAN 3	Diesel 2			
		MAN 4	Diesel 2			

Company	Plant	Unit	Type of Resource	Installed capacity plant (MW)	Interval (MWh): (49.06 - 147.18)	Similar projects (CDM / no CDM)
		SKODA 1	Diesel 2			
SANTA CRUZ	SANTA CRUZ I	G1	Hydro	7.0		
		G2	Hydro			
	SANTA CRUZ II	G1	Hydro	7.0		
		G2	Hydro			
SANTA ROSA	C.H. PURMACANA (5)	G1	Hydro	1.8		
SDF ENERGÍA	OQUENDO	TG1	NG	31.0		
SHOUGESA	SAN NICOLAS	CUMMINS	Diesel 2	68.5	yes	no
		TV-1	Residual 500			
		TV-2	Residual 500			
		TV-3	Residual 500			
SINERSA	POECHOS II	G1	Hydro	15.0		
		G2	Hydro			
SN POWER	CAHUA	G1	Hydro	43.6		
		G2	Hydro			
	GALLITO CIEGO	G1	Hydro	34.0		
		G2	Hydro			
	MALPASO	G1	Hydro	54.4	yes	yes
		G2	Hydro			
		G3	Hydro			
		G4	Hydro			
	OROYA	G1	Hydro	9.0		
		G2	Hydro			
		G3	Hydro			
	PACHACHACA	G1	Hydro	9.0		
		G2	Hydro			
		G3	Hydro			
	PARIAC	CH2 G1	Hydro	4.9		
		CH2 G2	Hydro			
		CH3 G1	Hydro			
		CH3 G2	Hydro			
		CH4 G1	Hydro			
		CH4 G2	Hydro			
	YAUPI	G1	Hydro	108.0	yes	yes
		G2	Hydro			
		G3	Hydro			
		G4	Hydro			
		G5	Hydro			
	HUAYLLACHO	G1	Hydro	0.3		
	MISAPUQUIO	G1	Hydro	3.9		
		G2	Hydro			
	SAN ANTONIO	G1	Hydro	0.6		
	SAN IGNACIO	G1	Hydro	0.5		
TERMOSELVA	AGUAYTIA	TG-1	NG	191.9		

Company	Plant	Unit	Type of Resource	Installed capacity plant (MW)	Interval (MWh): (49.06 - 147.18)	Similar projects (CDM / no CDM)
		TG-2	NG			

Step 3: within the projects identified in Step 2, identify those that are neither registered CDM project activities, project activities submitted for registration, nor project activities undergoing validation.

Project activities submitted for registration nor undergoing validation

Company	Plant	Unit	Technology	Type of Resource	Installed capacity plant (MW)	CDM registered or validation?
CHINANGO	CHIMAY	G1	FRANCIS	Hydro	142.8	no
		G2	FRANCIS	Hydro		
EDEGEL	CALLAHUANCA	G1	PELTON	Hydro	82.6	Registered (Ref. 1245)
		G2	PELTON	Hydro		
		G3	PELTON	Hydro		
		G4	PELTON	Hydro		
	MATUCANA	G1	PELTON	Hydro	120.0	no
		G2	PELTON	Hydro		
	MOYOPAMPA	G1	PELTON	Hydro	75.4	no
		G2	PELTON	Hydro		
		G3	PELTON	Hydro		
		TG-2	TG	NG		
	CHARCANI V	G1	PELTON	Hydro	145.4	no
		G2	PELTON	Hydro		
		G3	PELTON	Hydro		
		TG-2	TG	NG		
EGEMSA	MACHUPICCHU	G1	PELTON	Hydro	90.5	no
		G2	PELTON	Hydro		
		G3	PELTON	Hydro		
	CARHUAQUERO	G1	PELTON	Hydro	95.1	no
		G2	PELTON	Hydro		
ENERSUR	YUNCAN	G1	PELTON	Hydro	130.1	At validation
		G2	PELTON	Hydro		
		G3	PELTON	Hydro		
SAN GABAN	SAN GABAN II	G1	PELTON	Hydro	110.0	no
		G2	PELTON	Hydro		
		TV-1	TV	Residual 500		
		TV-2	TV	Residual 500		
		TV-3	TV	Residual 500		
	MALPASO	G1	FRANCIS	Hydro	54.4	no
		G2	FRANCIS	Hydro		

Company	Plant	Unit	Technology	Type of Resource	Installed capacity plant (MW)	CDM registered or validation?
		G3	FRANCIS	Hydro		
		G4	FRANCIS	Hydro		
	YAUPI	G1	PELTON	Hydro	108.0	no
		G2	PELTON	Hydro		
		G3	PELTON	Hydro		
		G4	PELTON	Hydro		
		G5	PELTON	Hydro		

As per the pervious table: $N_{all} = 9$

Step 4: within similar projects identified in Step 3, identify those that apply technologies that are different to the technology applied in the proposed project activity.

Plants with different technologies to the project proposed

Company	Plant	Unit	Technology	Type of Resource	Installed capacity plant (MW)	Different technology?	Date of entry to SEIN
CHINANGO	CHIMAY	G1	FRANCIS	Hydro	142.8	no	2000
		G2	FRANCIS	Hydro			2000
	MATUCANA	G1	PELTON	Hydro	120.0	yes (a)	1971
		G2	PELTON	Hydro			1971
	MOYOPAMPA	G1	PELTON	Hydro	75.4	yes (b)	1951
		G2	PELTON	Hydro			1951
		G3	PELTON	Hydro			1954
	CHARCANI V	G1	PELTON	Hydro	145.4	yes (c)	1988
		G2	PELTON	Hydro			1988
		G3	PELTON	Hydro			1988
EGEMSA	MACHUPICCHU	G1	PELTON	Hydro	90.5	yes (d)	Jun. 2001
		G2	PELTON	Hydro			Jul. 2001
		G3	PELTON	Hydro			Oct. 2001
	CARHUAQUERO	G1	PELTON	Hydro	95.1	yes (e)	1990
		G2	PELTON	Hydro			1900
		G3	PELTON	Hydro			1990
	SAN GABAN II	G1	PELTON	Hydro	110.0	no	2000
		G2	PELTON	Hydro			2000
SAN GABAN	MALPASO	G1	FRANCIS	Hydro	54.4	yes (f)	1936
		G2	FRANCIS	Hydro			1936
		G3	FRANCIS	Hydro			1936
		G4	FRANCIS	Hydro			1936
	YAUPI	G1	PELTON	Hydro	108.0	yes (g)	1957
		G2	PELTON	Hydro			1957
		G3	PELTON	Hydro			1957
		G4	PELTON	Hydro			1957

Company	Plant	Unit	Technology	Type of Resource	Installed capacity plant (MW)	Different technology?	Date of entry to SEIN
		G5	PELTON	Hydro			1957

Different technologies according to definition (a) in the *Guidelines on common practice* (version 02.0):

- (a) *Energy source/fuel (example: energy generation by different energy sources such as wind and hydro and different types of fuels such as biomass and natural gas);*

A number of plants identified under this definition in the table, are as follow:

- Thermal plants: Malacas (NG), Pisco (NG), Emergencia Trujillo (Diesel), Ilo 2 (carbon) and San Nicolas (Diesel/R500), which have technology and energy (fuel source) different to proposed project activities.

1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks

In the other hand, an important regulation had occurred in Peru, with the Electric Concessions Law (Law 25884 in 1992⁽⁴¹⁾), that included desegregation in distribution, transmission and generation activities and companies, creation of a wholesale market and regulated market, concession system, among others). Some of hydropower plants were different regulatory and economic conditions on the date of its construction and investment decision.

According to the description in the previous paragraph, some of plants in the table were identified under definition (d) of different technologies:

- (d) *Investment climate on the date of the investment decision, inter alia:*
- (i) *Access to technology;*
 - (ii) *Subsidies or other financial flows;*
 - (iii) *Promotional policies;*
 - (iv) *Legal regulations;*
- Hydropower plants with different investment climate on the date of the investment decision⁽⁴²⁾:
 - (iv) Legal regulations:**
 - (a) Matucana (1971 - 1972), is a hydropower implemented by *Empresas Eléctricas Asociadas* (now EDEGEL), that was nationalized in 1974 with the name of Electrolima S.A. and in 1994, under actual regulations (Law 25884), was privatized and called EDEGEL.
 - (b) Moyopampa (1951 - 1955), is a hydropower implemented by *Empresas Eléctricas Asociadas* (now EDEGEL) and under similar conditions to Matucana.
 - (iv) Legal regulations and (ii) Subsidies or other financial flows:**
 - (c) Charcani V (1988 - 1988), is a hydropower implemented by EGASA that is a public company and is part of FONAFE (*Fondo Nacional de Financiamiento de la Actividad Empresarial del Estado* - National Fund for Financing State Enterprise Activity). In Peru, FONAFE is responsible for regulating and directing the business activities of the government, and then all productive companies where the government is the major shareholder are part of the corporation. As a conclusion, Charcani V faced a different investment climate in the date of the investment decision and is owned by a company with a different management structure compared to *Inland* which is private company.
 - (e) Carhuaquero (1990), hydropower plant that had started to building in 1980 by Electroperú and because of financial problems was implemented in 1990. Electroperú was a public

⁽⁴¹⁾ Law 25884, available in Spanish at:

<http://intranet2.minem.gob.pe/web/archivos/dge/publicaciones/compendio/dl25844.pdf>

⁽⁴²⁾ Information of each hydropower plants at:

<http://www.osinerg.gob.pe/newweb/uploads/GFE/1.2%20COMPENDIO%20CENTRALES%20ELECTRICAS%20SEIN.pdf>

company and the implementation of Carhuaquero was done under similar conditions of Charcani V. Electroperú was privatized in 1996 and called Dominion Energy, that in 1990 transferred it to the actual company: Duke Energy Egenor⁽⁴³⁾.

(f) Malpaso (1936) and (g) Yaupi (1957), that are hydropower plants implemented by ElectroAndes, which previously was a public company and faced investment climate very different to the project activity proposed.

(ii) Subsidies or other financial flows:

- Other hydropower with different technologies are:
 - (d) Machupicchu (2001), that is a hydropower implemented by EGEMSA which is a public company and its part of FONAFE. Under FONAFE promotional policies and financial flows, Machupicchu faced a different investment climate in the date of building and implementation.

According to explanation before, $N_{diff} = 7$

Step 5: calculate factor $F = 1 - N_{diff}/N_{all}$ representing the share of similar projects (penetration rate of the measure/technology) using a measure/technology similar to the measure/technology used in the proposed project activity that deliver the same output or capacity as the proposed project activity.

$$F = 1 - 7/9$$

$$F = 0.22$$

$$N_{all} - N_{diff} = 9 - 7$$

$$N_{all} - N_{diff} = 2$$

Finally, according to paragraph 10 from the Guidelines on common practice (version 02.0), the project activity is common practice if: F is greater than 0.2 and $N_{diff} - N_{all}$ is greater than 3.

F is greater than 0.2, but $N_{diff} - N_{all}$ is not greater than 3, so the project activity is not common practice.

Outcome of Step 4: If outcome of Step 4 is that the proposed project activity is not regarded as “common practice”, then the proposed project activity is additional.

According to the paragraph above, from the Tool for the demonstration and assessment of additionality (version 10.0), the project activity is additional.

1.12 Ownership and Other Programs

1.12.1 Project Ownership

The project ownership data is resume bellow:

Organization name	INLAND ENERGY SAC
Street/P.O. Box	Canaval y Moreyra avenue, 380, piso 20.San Isidro
Building	“Torre Siglo XXI”
City	Lima
State/Region	Lima

(43) Part of the history at: <http://infraestructuraperuana.blogspot.com/2010/05/central-hidroelectrica-de-carhuaquero.html>

Postcode	Lima 27
Country	Peru
Telephone	51-1-421 3184
Fax	51-1-421 4204
E-mail	mcacic@luzdelsur.com.pe
Website	www.luzdelsur.com.pe
Contact person	MILE CACIC ENRIQUEZ
Title	Chief Executive Officer
Salutation	Mr.
Last name	CACIC ENRIQUEZ
Middle name	-
First name	MILE
Department	-
Mobile	-
Direct fax	51-1-421 4204
Direct tel.	51-1-421 3184
Personal e-mail	mcacic@luzdelsur.com.pe

1.12.2 Emissions Trading Programs and Other Binding Limits

The project does not reduce GHG emissions from activities that are included in an emission trading program or any other mechanism that includes GHG allowance trading. There is no national program or cap, applicable to this project. The project will not use its GHG emission reductions and removals for compliance, under any such programs or mechanisms.

Peru is not an Annex I country of the Kyoto protocol so it is not participating in the Assigned Amount Unit (AAU) markets. Also the country has not implemented a national emission rights market

1.12.3 Other Forms of Environmental Credit

Santa Teresa Hydropower Plant is a renewable energy generation project, which discharges no emission during operation period. Thus, the project does not fall into categories that create GHG emissions primarily for the purpose of its subsequent removal or destruction.

The project has not created another form of environmental credit, now or in the future. This will be verified by the DOE.

1.12.4 Participation under Other GHG Programs

The project is registered under CDM scheme. CDM project had been registered in UNFCCC on 09th July 2015 with reference 9954 "Santa Teresa Hydropower Plant". But no GHG credits have been claimed under GHG programs.

1.12.5 Projects Rejected by Other GHG Programs

Not applicable since as per the latest version of the VCS Standard (version.3.7). The proposed project activity is validated under CDM.

1.13 Additional Information Relevant to the Project

Eligibility Criteria

Project is not classified as a group of projects.

Leakage Management

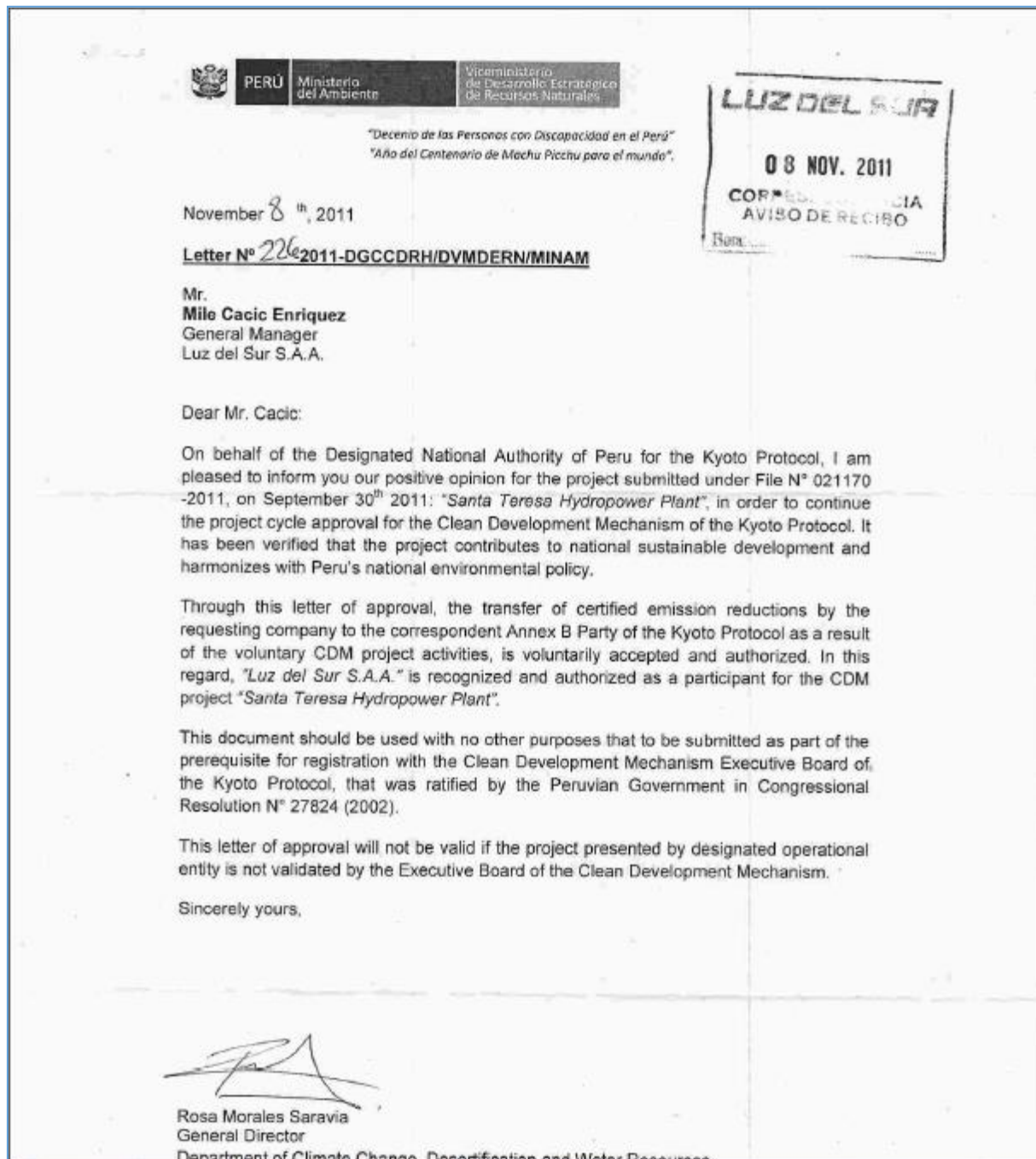
According to the methodology ACM0002 (Version 18.1), there are no leak emission in this project. Therefore, no leakage is expected and a leakage management plan is not necessary.

Commercially Sensitive Information

The project proponent has not excluded any commercially sensitive information from the public version of the project description.

Sustainable Development

The letter of approval from host Party (Secretariat of Environmental, Peruvian DNA) for the project activity is available at the time of submitting the PDD to the validating DOE.



Further Information

The Monitoring Plan defines the procedures and standards following by Inland S.A.A., in order to periodically review the CDM project performance in terms of meeting the reduction of GHG emissions.

Inland S.A.A., as the project developer and operator, has been systematically implemented the Monitoring Plan based on the follow-up of relevant indicators of the project activity. Therefore, parameters and procedures have been identified and stipulated, respectively, to measure,

monitor, calculate and verify the reduction of GHG emissions generated by the project activity each year. Also, for meeting the Monitoring Plan, necessary for Inland S.A.A., as the project operator, to prepare all data required for periodic audits and the annual verification process to be carried out in order to confirm the effective achievement of the emissions reduction.

Specifically, the Monitoring Plan is a tool that has allowed to Inland S.A.A. to establish and maintain an adequate system for monitoring key indicators of the VCS project, as well as to implement the necessary measures for the project activity operation. It is noteworthy that the Monitoring Plan can be periodically updated and adjusted to properly integrate with the operational requirements. These changes are approved by the Verifier (DOE) during the initial or periodic verification process. Changes may also be necessary as a result of new circumstances affecting the ability to monitor the emissions reduction described in the original Monitoring Plan or as a result of changed VCS rules.

The proper performance of the Monitoring Plan will depend on the proper fulfilment of the Operator obligations regarding the information collection and processing of the project operation. The Operator has the obligation to ensure that the information available for the calculation of the reductions is accurate and sufficient to allow the successful verification of these. This has required the help of computers that allow the storage of information that have been collected as well as measuring and registering equipment for the electricity generation of the plant and the net levels of electricity put into the grid. Other special monitoring equipment is not needed for this project, so the Operator has been based on the data collected by the COES to calculate the emission factor of the grid.

All measurements, data storage and related procedures are implemented according to the considerations set forth in the methodology ACM0002 in the version 18.1 (26/04/2018).

2 APPLICATION OF METHODOLOGY

2.1 Title and Reference of Methodology

Not applicable since as per de latest version of the VCS Standard (version.3.7). The proposed project activity is validated under CDM.

2.2 Applicability of Methodology

Not applicable since as per de latest version of the VCS Standard (version.3.7). The proposed project activity is validated under CDM.

2.3 Project Boundary

Not applicable since as per de latest version of the VCS Standard (version.3.7). The proposed project activity is validated under CDM).

Source		Gas	Included?	Justification/Explanation
Baseline	Source 1	CO ₂	X	Generated by fossil consumption in thermal units power displaced.
		CH ₄		According to methodology, other GEIs (non-CO2) could be not considered, because small emissions.
		N ₂ O		

Source		Gas	Included?	Justification/Explanation
Project	Source 2	Other		
		CO ₂		
		CH ₄		
		N ₂ O		
		Other		
	Source 1	CO ₂		No GEI emissions are identified in project activities
		CH ₄		
		N ₂ O		
		Other		
	Source 2	CO ₂		
		CH ₄		
		N ₂ O		
		Other		

2.4 Baseline Scenario

Not applicable since as per de latest version of the VCS Standard (version.3.7). The proposed project activity is validated under CDM.

2.5 Additionality

Not applicable since as per de latest version of the VCS Standard (version.3.7). The proposed project activity is validated under CDM.

2.6 Methodology Deviations

Not methodology deviations were identified by project activities.

3 ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

3.1 Baseline Emissions

Not applicable since as per de latest version of the VCS Standard (version.3.7). The proposed project activity is validated under CDM.

3.2 Project Emissions

Not applicable since as per de latest version of the VCS Standard (version.3.7). The proposed project activity is validated under CDM.

3.3 Leakage

Not applicable since as per de latest version of the VCS Standard (version.3.7). The proposed project activity is validated under CDM.

3.4 Estimated Net GHG Emission Reductions and Removals

Year	Estimated baseline emissions or removals (tCO ₂ e)	Estimated project emissions or removals (tCO ₂ e)	Estimated leakage emissions (tCO ₂ e)	Estimated GHG emission reductions (tCO ₂ e)
2015 (01/09/2015 to 31/12/2015)	86,475	0	0	86,475
2016	287,106	0	0	287,106
2017	272,160	0	0	272,160
2018	272,160	0	0	272,160
2019	272,160	0	0	272,160
2020	272,160	0	0	272,160
2021	272,160	0	0	272,160
2022	272,160	0	0	272,160
2023	272,160	0	0	272,160
2024	272,160	0	0	272,160
2025	272,160	0	0	272,160
2026	272,160	0	0	272,160
2027	272,160	0	0	272,160
2028	272,160	0	0	272,160
2029	272,160	0	0	272,160
2030	272,160	0	0	272,160
2031	272,160	0	0	272,160
2032	272,160	0	0	272,160

Year	Estimated baseline emissions or removals (tCO ₂ e)	Estimated project emissions or removals (tCO ₂ e)	Estimated leakage emissions (tCO ₂ e)	Estimated GHG emission reductions (tCO ₂ e)
2033	272,160	0	0	272,160
2034	272,160	0	0	272,160
2035	272,160	0	0	272,160
2036	272,160	0	0	272,160
2037	272,160	0	0	272,160
2038	272,160	0	0	272,160
2039	272,160	0	0	272,160
2040	272,160	0	0	272,160
2041	272,160	0	0	272,160
2042	272,160	0	0	272,160
2043	272,160	0	0	272,160
2044	272,160	0	0	272,160
2045 (01/01/2045 to 31/08/2045)	181,440	0	0	181,440
Total estimated ERs				8,175,501
Total number of crediting years				30 ⁽¹⁾
Average annual ERs				272,517

4 MONITORING

4.1 Data and Parameters Available at Validation

Data / Parameter	GWP _{CH₄}
Data unit	t CO ₂ e/t CH ₄
Description	Global warming potential of methane valid for the relevant commitment period
Source of data	IPCC
Value applied:	21
Justification of choice of data or description of measurement methods and procedures applied	For the first commitment period: 21 tCO ₂ e/tCH ₄ For the second commitment period: 25 tCO ₂ e/tCH ₄
Purpose of Data	-

Comments	-
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4.2 Data and Parameters Monitored

It is important to note that these comments were considered in the formulation of the social investment plan proposed to both communities. The following table presents the results of those interviews.

Data / Parameter	EF _{grid,CM,y}
Data unit	tCO ₂ /MWh
Description	Combined margin CO2 emission factor for grid connected power generation in year y, calculated using the last version of the "Tool to calculate the emission factor for an electricity system".
Source of data	Calculated by the Project developer as indicated in the "Tool to calculate the emission factor for an electricity system" (version 6). These calculations are based on information provided by the COES
Description of measurement methods and procedures to be applied	-
Frequency of monitoring/recording	Annually
Value monitored	EG _{grid,CM,2015} : 0.4730 tCO ₂ /MWh EG _{grid,CM,2016} : 0.4437 tCO ₂ /MWh EG _{grid,CM,2017} : 0.4387 tCO ₂ /MWh
Monitoring equipment	No especial monitoring equipment is needed
QA/QC procedures to be applied	Not applicable
Purpose of the data	Calculation of baseline emissions.
Calculation method	Not applicable
Comments	Calculated as a weighted average of the OM and BM factors.

Data / Parameter	EF _{grid,OM-DD,y}
Data unit	tCO ₂ /MWh
Description	Dispatch data Operating margin CO2 emission factor for year.
Source of data	Calculated by the Project developer as indicated in the "Tool to calculate the emission factor for an electricity system". These calculations are based on information provided by the COES
Description of measurement methods	Hourly electricity generation is provided by Dispatch center in Peru: COES.

and procedures to be applied	Fossil fuel consumption by power units is also provided by dispatch Center: COES.
Frequency of monitoring/recording	Annually
Value monitored	EG _{grid,OM-DD,2015} : 0.4621 tCO ₂ /MWh EG _{grid,OM-DD,2016} : 0.4437 tCO ₂ /MWh EG _{grid,OM-DD,2017} : 0.4387 tCO ₂ /MWh The information required comes from the COES, from the annual statistics, as well as from the energy production report in the grid every 15 minutes per connected unit
Monitoring equipment	No especial monitoring equipment is needed.
QA/QC procedures to be applied	Not applicable
Purpose of the data	Calculation of baseline emissions
Calculation method	Not applicable
Comments	No additional comments

Data / Parameter	EF _{grid,BM,y}
Data unit	tCO ₂ /MWh
Description	Build margin CO ₂ emission factor for year y.
Source of data	Calculated by the Project developer as indicated in the "Tool to calculate the emission factor for an electricity system". These calculations are based on information provided by the COES.
Description of measurement methods and procedures to be applied	Annual electricity generation is provided by Dispatch center in Peru: COES. Fossil fuel consumption by power units is also provided by dispatch Center: COES.
Frequency of monitoring/recording	Annually.
Value monitored	EG _{grid,BM,2015} : 0.59815 tCO ₂ /MWh EG _{grid,BM,2016} : 0.57775 tCO ₂ /MWh EG _{grid,BM,2017} : 0.3194 tCO ₂ /MWh The information required comes from the COES, from the annual statistics, as well as from the energy production report in the grid every 15 minutes per connected unit
Monitoring equipment	No especial monitoring equipment is needed.
QA/QC procedures to be applied	Not applicable
Purpose of the data	Calculation of baseline emissions

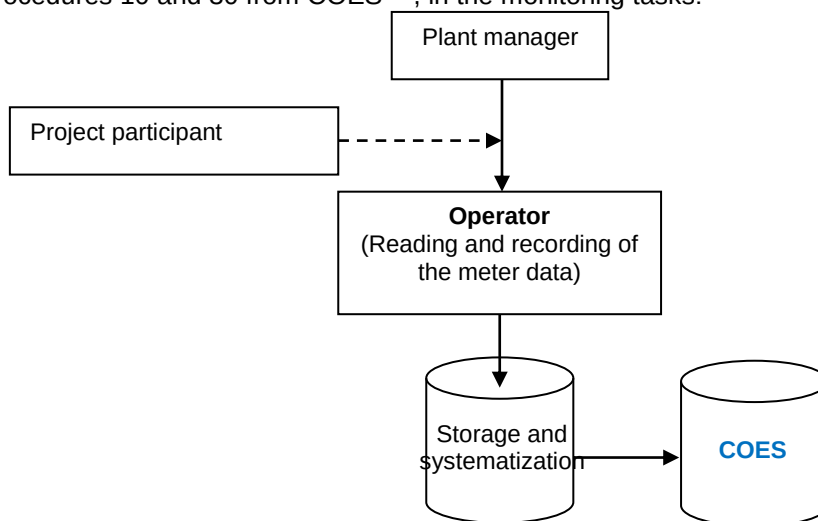
Calculation method	Not applicable
Comments	No additional comments

4.3 Monitoring Plan

Electric meters will be purchased from a reputable manufacturer, who will install the units and ensure their operation. These electric meters comply with the regulation: PR-20 “Income, modification and withdraw of facilities in SEIN” (Technical procedure from COES-SINAC), that regulates the minimum characteristics for electric meters at generation plants⁽⁴⁴⁾. Calibration, handling and reading of electricity meters as well as the storage and reporting will be performed according to regulations of the energy sector in Peru. The calibration will be only carry out if an error is detected in the annual testing of measuring equipment. This periodic testing is conducted as part of quality control of equipment and it has to be performed and conducted by an accredited entity, authorized by INDECOPI, according to R.M N° 496-2005-MEM/DGE, following the procedures in the Peruvian regulations and procedures of this normative.

Being a CDM project, the electromagnetic and physical records will be stored carefully until at least 2 years after the crediting period. These data, as specified in Section B.7.1, will serve for the direct calculation of the emissions reduction in the project.

The data measurement will be based on the official statistics reported by public institutions in the energy sector OSINERGMIN and especially, the COES. The following diagram shows the organization of staff, according to Procedures 10 and 30 from COES⁽⁴⁵⁾, in the monitoring tasks:



Assurance of energy and power measurements

Measurement of energy and power generated

The electronic meter for power and electricity generation measurement will be installed in the delivery point and measurement (at the beginning of the 220 kV transmission line). The coordinates for the preliminary location are:

Geographic coordinates	
Latitude (S)	Longitude (W)
13.1434	72.6059

⁽⁴⁴⁾ Approved by OSINERGMIN resolution N° 035-2013-OS/CD. For minimum characteristics please see: Annex 3, chapter 3

⁽⁴⁵⁾ Procedure 10: Valorisation of active power transfers between COES members generators.

Procedure 30: Valorisation of power transfers.

This equipment of power and electricity generation measurement will be electronic multifunction type, of 0.2 IEC class or better, with memory's capacity to store information at least thirty five (35) days with integration intervals every 15 minutes including modem for remote interrogation.

The requirements for measuring equipment have been established by the COES in Procedure N° 20, Annex C. The correct operation of the equipment must be demonstrated by current calibration certificates.

Control measures

Verification measures involving EGEMSA are established in the agreement "Coordination Agreement and Constitution of Easements" signed between Inland and EGEMSA.

- Inland must periodically carry out a testing of measuring equipment, in order to ensure the correct readings. Furthermore, EGEMSA may request a testing of measuring equipment at any time. This testing of measuring equipment is according to previous agreement with the client, but usually is done annually. According to R.M. 496-2005 EM/DM, only if an error is detected the equipment is calibrated by the own manufacturer or an international laboratory⁽⁴⁶⁾.
- EGEMSA will have access to the information recorded in the measuring equipment, via remote asking or direct reading. Additionally EGEMSA may also install similar measuring equipment in order to compare the readings and thus verify the correct registration.
- On the other hand, one of the main functions of COES is to determine electricity and power transfers among members of the SEIN (National Interconnected Electricity System in Peru) through measurements and calculations. On this way, for each transfer bar from the SEIN, COES make a balance of electricity deliveries and withdrawals (Procedure N°. 10 from COES)

Capacitation and Personal Training of O&M

Andritz Hydro GmbH is an Austrian company, which had an Electro-Mechanical Plant and Design-Built Contract with Inland.

According to the technical specifications established as part of the electromechanical equipment contract, Andritz will transfer to Inland and his staff all necessary knowledge for a safely and properly operation of the work and maintenance of Santa Teresa hydropower plant.

This transfer includes documentation (manuals, instructions, plans, etc.) and training, it will be according to needs: in the site or the manufacturer's installations.

Regarding O&M training, Andritz shall provide the employer with at least operation instructions like:

- Reservoirs and forebay water level and volume data.
- Discharge and spillage data for reservoirs.
- Production data and efficiency curves for each turbine.
- Instruction for control and preservation of plant safety.
- Instruction for control and maintenance of waterways including filling and dewatering.
- Instruction for sand and silt removal from desilting arrangements as well as waterways, etc.
- Firefighting instructions for powerhouse, switchyard, and other facilities.

And other activities specified at operation and maintenance document accepted by Andritz.

Training program:

- Andritz will develop and implement a practical training program in place for Inland staff.
- The objective of this program will be training the Inland's staff (previously qualified) in the total operation and troubleshooting of equipment and systems.
- The Practical training sessions will begin at least two months before the end of the installation of the equipment and it will have a minimum of 200 effective hours.

⁽⁴⁶⁾ Equipment replacement is recommended by the law, because considering investment for calibration, almost always the electricity generation company prefers to replace the measuring equipment before calibrating.

In addition, Inland staff will be trained on the Clean Development Mechanism (CDM), with the purpose of make known the importance of the proper implementation and development of the Santa Teresa Hydropower Plant, in order to meet the Kyoto Protocol and post Kyoto target of achieving the stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.

5 SAFEGUARDS

5.1 No Net Harm

Not applicable since as per de latest version of the VCS Standard (version.3.7). The proposed project activity is validated under CDM.

5.2 Environmental Impact

Not applicable since as per de latest version of the VCS Standard (version.3.7). The proposed project activity is validated under CDM.

5.3 Local Stakeholder Consultation

Not applicable since as per de latest version of the VCS Standard (version.3.7). The proposed project activity is validated under CDM.

5.4 Public Comments

Not applicable since as per de latest version of the VCS Standard (version.3.7). The proposed project activity is validated under CDM.

6 ACHIEVED GHG EMISSION REDUCTIONS AND REMOVALS

6.1 Data and Parameters Monitored

Data / Parameter	$EG_{facility,y} (EG_{PJ,y})$
Data unit	MWh/yr
Description	Quantity of net generation supplied by the Santa Teresa Hydropower Plant to the grid in the year y
Value applied:	$EG_{PJ,2015}$: 187, 141.89 MWh /(01/09/2015 to 31/12/2015) $EG_{PJ,2016}$: 647,134.32 MWh /(01/01/2016 to 31/12/2016) $EG_{PJ,2017}$: 650,091.99 MWh /(01/01/2017 to 31/12/2017)
Comments	<i>Provide any additional comments</i>

6.2 Baseline Emissions

The emissions reductions are estimated following the guidance of the last version of the methodology ACM0002 (version 18.1), as follows:

$$ER_y = BE_y - PE_y$$

Where:

ER_y = Emissions reduction in year y (tCO₂e/yr)

BE_y = Baseline emissions in year y (tCO₂e/yr)

PE_y = Project emissions in year y (tCO₂e/yr)

Baseline emissions (BE_y)

The baseline emissions are calculated as follows:

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y}$$

Where

BE_y = Baseline emissions in year y (tCO₂/year).

$EG_{PJ,y}$ = Quantity of net electricity generated and incorporated into the grid in year y (MWh/year).

$EF_{grid,CM,y}$ = Combined margin CO₂ emission factor for grid connected power generation in year y calculated using the latest version of the *Tool to calculate the emission factor for an electricity system* (tCO₂/MWh)

The Baseline emission factor is calculated as a combined margin ($EF_{grid,CM,y}$) following the guidance in the *Tool to calculate the emission factor for an electricity system* (version 6.0). According to this tool the baseline emission factor is calculated as the weighted average of the Operating Margin emission factor ($EF_{OM,y}$) and the Build Margin emission factor ($EF_{BM,y}$) where the weights w_{OM} and w_{BM} , for a kind of projects like Santa Teresa, are 50% (i.e., $w_{OM} = w_{BM} = 0.5$). This is presented below:

Parameter	SI unit	Description
$EF_{grid,CM,y}$	tCO ₂ / MWh	Combined margin CO ₂ emission factor for the project electricity system in year y
$EF_{grid,BM,y}$	tCO ₂ / MWh	Build margin CO ₂ emission factor for the project electricity system in year y
$EF_{grid,OM,y}$	tCO ₂ / MWh	Operating margin CO ₂ emission factor for the project electricity system in year y

Note: At the time of PDD's submission to DOE for validation, the available information was from 2010, but only few weeks before submission (February 2012) COES published its Annual Statistics Report 2011. Consequently, OM and BM were updated with information from 2011, according to the "Tool to calculate the emission factor for an electricity system" recommendation: the data used for the calculation has to be based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation

6.3 Project Emissions

Project emissions (PE_y)

According to the chosen baseline methodology (ACM0002, version 18.1), project emissions are not considered since the follow equation:

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y}$$

Where:

$PE_{FF,y}$ = project emissions from fossil fuel consumption in year y (tCO₂e / yr):

Santa Teresa hydropower not use fossil fuel for its operational activities, therefore $PE_{FF,y} = 0$

$PE_{GP,y}$ = project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year y (tCO₂e / yr):

Santa Teresa hydropower not include geothermal power plants. $PE_{GP,y} = 0$

$PE_{HP,y}$ = project emissions from water reservoirs of hydro power plants in year y (tCO₂e / yr):

Santa Teresa hydropower is a run-of-river and does not have a reservoir. Therefore, $PE_{HP,y} = 0$

According to the paragraph above, $PE_y = 0$

6.4 Leakage

Leakage is not included in the original formula from ACM0002 methodology

6.5 Net GHG Emission Reductions and Removals

According to monitoring:

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
2015	86,475	0	0	86,475
2016	287,106	0	0	287,106
2017	272,160	0	0	272,160
Total	645,741	0	0	645,741

APPENDIX 1: EMISSION FACTOR CALCULATION FOR SEIN 2017

Emission factors using the version 6 of the “Tool to calculate the emission factor for an electricity system” the following parameter are include:

Parameters for emission factor calculation

Parameter	SI unit	Description	Comments
$EF_{grid,CM,y}$	tCO ₂ /MWh	Combined margin CO ₂ emission factor for the project electricity system in year 2016.	CM is calculated as a result of BM and OM and weighted average (w_{BM} and w_{OM}). File: CM2017.xls
$EF_{grid,BM,y}$		Build margin CO ₂ emission factor for the project electricity system in year 2016.	It is calculated following step 5 from tool. File: ▪ BM 2017.xls
$EF_{grid,OM,y}$		Operating margin CO ₂ emission factor for the project electricity system in year 2016.	It is calculated following step 4 from tool. File: ▪ OM 2017.xls

Source: Own elaboration, based on table 1 of the tool

The following table resume the parameters for emission factor in SEIN 2016:

Parameter	Value	Units	Source
BM	0.3194	tCO ₂ /MWh	Build margin from BM2017.xls
OM	0.5580	tCO ₂ /MWh	Operation margin from OM2017.xls
CM	0.4387	tCO ₂ /MWh	Combined margin from CM2017.xls

APPENDIX 2: SUPPORT TO LOCAL STAKEHOLDERS

According to local stakeholder consultation, Inland Energy supports to local communities by: contracting local workers, training and workshops. They are describing bellow:

1. Works or physical benefits to the community, from the implementation of the project.

- School transport service for Santa Teresa and Ccollpani Grande community.
- Two courses: Bakery and Company Training Course to provide services to the HPP Santa Teresa.
- Local purchases of hardware, fuel, fruits, vegetables, general supplies for the preparation of food for a total value of S / . 23,9754.13

2. Number of personnel in the area, hired, by type and position (payroll, receipt for fee, etc.)

24 people hired on 2017 from Santa Teresa and Ccollpani Grande communities for the following services and companies:

- Limtek Company: 5 people in Hotel services and Laundry.
- Overall Company: 17 people in Camp Maintenance Service (operation of drinking water and wastewater plants), Drive service for school transport and transfer of personnel from HPP Santa Teresa, Service of maintenance of green areas and Deposits of Surplus Material and Cleaning service of the operating areas of HPP Santa Teresa
- Danaz Company: (2 people) Catering Services

3. Health campaigns that have been given to the community. SSOMA

- Awareness of children's rights.
- PRONOEI medical campaign of Huadquiña - Santa Teresa
- Medical campaign I.E.I. Nro. 1245 de Huadquiña - Santa Teresa

It should be noted that this schedule will be maintained throughout the period of validity of our EIA, and agreeing with the communities on the most relevant/interest issues.