Rio Hondo II Hydroelectric Project
Monitoring Plan (MP)

20 December 2004

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Acronyms Used

CER	Certified Emissions Reduction
CDM	Clean Development Mechanism
DOE	Designated Operational Entity
EB	Executive Board
ER	Emission Reduction
GHG	Green House Gas
IPCC	Intergovernmental Panel on Climate Change
M&P	Modalities and Procedures
MP	Monitoring Plan
PDD	Project Design Document
VVM	Validation and Verification Manual

1. The Monitoring Plan

1.1. Purpose of the Monitoring Plan

This document serves as the Monitoring Plan (MP) for the Rio Hondo II Hydroelectric Project. The MP presents a plan to meet the requirements for the collection, processing and auditing/verification of data required to fulfill the requirements in decision 17/CP.7, document FCCC/CP/2001/13/Add.2 of the Kyoto Protocol.

The rules of the Clean Development Mechanism (CDM) require that proposed emission reductions of a project activity are monitored over the crediting period. Monitoring entails collecting and archiving data used to determine the baseline, measuring anthropogenic emissions by sources of greenhouse gases (GHG) within the proposed project boundary, and if necessary determining leakage. According to the CDM rules, monitoring should be performed based on an approved monitoring methodology described in the Project Design Document (PDD). The monitored and archived data are then verified, defined as a periodic independent review and ex post determination of monitored reductions of anthropogenic emissions by sources of GHG over a defined period, by an accredited Operational Entity. Once emission reductions are verified they can be issued by the CDM Executive Board.

The Rio Hondo II Hydroelectric Project is a 32 MW hydroelectric generating facility located in the Zacapa region in the country of Guatemala. Guatemala is currently experiencing rapid economic growth with projections that healthy growth in energy consumption will continue over the next several decades. The government of Guatemala has clearly acknowledged the need for reliable power generation and distribution systems to support this economic growth. The Project is expected to generate an estimated average 130 GWh of energy per year and 32 MW of firm capacity. The Project will provide power to the Guatemalan Wholesale Electricity Market over a Project life of 50+ years. The Project consists of a concrete gravity dam, a small reservoir, a diversion tunnel, penstock, powerhouse, and provisions for downstream flow re-regulation. Auxiliary components include an access road, a step-up sub-station and upgrade of an existing transmission line and substation.

Managers of the Rio Hondo II Hydroelectric Project must develop and maintain credible, transparent, and adequate data estimation, measurement, collection, and tracking systems to record the information required for an audit of an emission reduction project. These records and monitoring systems are needed to allow the selected Operational Entity to verify project performance as part of the verification and certification process, as required in international standards developed by the UNFCCC. This process also reinforces that CO_2 reductions are real and credible to the buyers of the Certified Emissions Reductions (CERs). The MP is the document that lays out how this will be achieved.

The MP must become part of the routine administrative procedures of the project. The requirements of this MP are in line with the kind of information routinely collected by an electric power generator so internalizing the procedures should be simple and straight forward. If necessary, the MP can be updated and adjusted to meet operational requirements, provided such modifications are approved by an Operational Entity during the process of verification.

The MP provides the requirements and instructions for:

- Assigning monitoring responsibilities to personnel;
- Establishing and maintaining the appropriate monitoring systems for the CO_2 emissions reduction estimation;
- Preparing the necessary measurement and management operations;
- Calculating emission reductions;
- Data storage and filing system; and
- Preparing for the requirements of an independent, third party audit and verification.

The MP was developed by EcoSecurities, as CDM advisor, and S.D. Rio Hondo, Ltda., the project sponsor, in November 2004.

1.2. Structure of the MP

This MP consists of the following sections:

- Section 1 provides an introduction to the MP and defines the objectives of the MP.
- Section 2 explains the key concepts and principal assumptions applied in monitoring and calculating the performance of the Rio Hondo II Hydroelectric Project in terms of ERs. The section also discusses data sources and assumptions and explains why the MP is expected to compute the ERs conservatively;
- Section 3 presents instructions with regard to operational and monitoring obligations of the project operator;
- Section 4 explains the contents of the MP electronic workbook. The workbook consists of six Excel spreadsheets consisting of several data tables and is an important and integral part of the MP;
- Section 5 contains requirements and instructions regarding the monitoring and verification of the projects compliance with the CDM's sustainable development objectives;
- Section 6 describes the management and operational system that it is necessary to put in place in order to ensure consistent and high-quality monitoring of the project; and
- Section 7 informs the audit and verification system for the project and introduces the Validation and Verification Manual (VVM), which is to be used for this purpose.

2. Concepts and Principal Assumptions

2.1. Emission Reductions from the Rio Hondo II Hydroelectric Project

It is expected that the Rio Hondo II Hydroelectric Project will displace generation from one or more plants operating on the margin of the national grid in Guatemala.

The baseline emission rate should be computed by applying the approach defined Approved baseline methodology AM0005 - "Baseline methodology (barrier analysis, baseline scenario development and baseline emission factor, using combined margin) for small grid-connected

zero-emissions renewable electricity generation". Determination of actual ERs will be based on actual plant operating data, data on recent and ongoing plant construction, and data on actual electricity generation collected by Administrador del Mercado Mayorista (AMM) and possibly other government agencies in Guatemala. The methodology for carrying this out and the indicators and tools for monitoring and calculating the ERs are described in this document.

2.2. Geographic and System Boundaries for the MP

Guatemala's national grid defines the geographic and system boundary of the project for the purpose of identifying potential emissions and emission reductions during the project's lifetime. The project is not expected to have an impact on emissions outside of these boundaries.

2.3. Time Boundary and Baseline Review Protocol

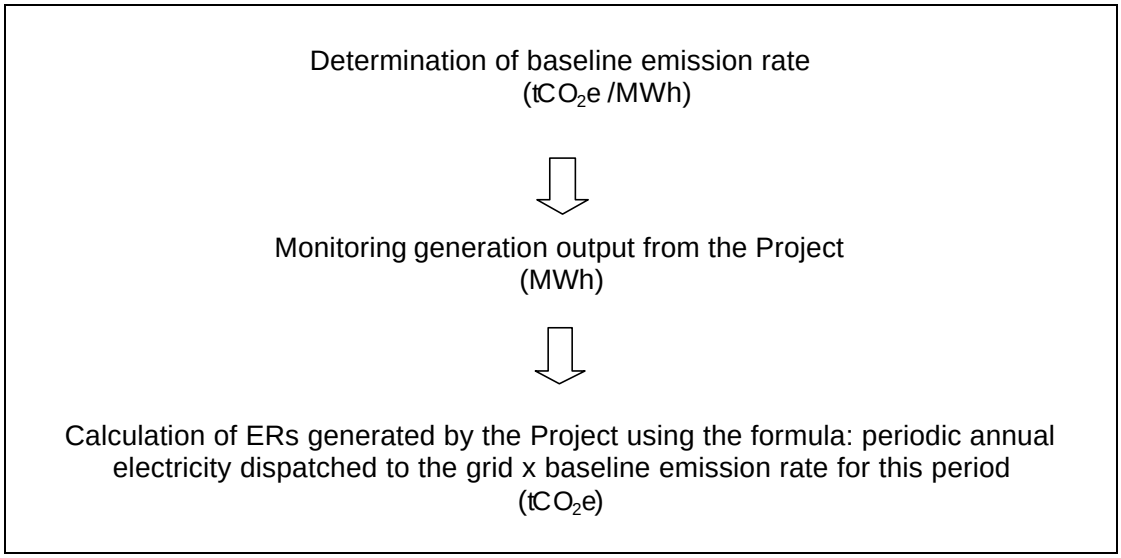
The algorithms for calculating baseline emissions and emission reductions are expected to remain in place for 21 years, subject to the renewal of the 7-year crediting period after year 7 and year 14. This reflects the crediting lifetime preferred by the project developer. The actual baseline emission rate must be calculated annually – using the formulae provided in this MP and official information and data. The annual baseline emission rate will be verified by a DOE prioir to issuance of any Certified Emission Reductions (CERs). Furthermore, confirmation every 7 years by a DOE of the recalculated emission factor and the project's continued compliance with the relevant Guatemalan environmental and other regulations, including possession of necessary permits and licenses, is expected to satisfy the requirements for renewal of the crediting period, unless CDM EB guidance require otherwise.

2.4 Calculation of Baseline Emission Rate

As of the end of 2003, 33% of energy in Guatemala was generated from hydroelectric sources and 55% from bunker, diesel and coal. Over the past several years, the Government of Guatemala has strived to attract energy investment. While investment in thermal generation has benefited from the 1996 passage of the Guatemalan Energy Law, investment in non-thermal or renewable energy projects such as hydropower has been minimal. In fact, Guatemala's energy mix has seen a substantial increase in thermal generation and in the last few years the market has grown from less than 40% to almost 55% thermal generation.

The ERs generated by the Rio Hondo II Hydroelectric Project are the amount of CO_2 emissions that is avoided by implementing the Rio Hondo II Hydroelectric Project displacing generation from thermal plants in the grid. The key steps in calculating the ERs can be summarized as follows:

Figure 1: Key steps in estimating tCO_2e emission reductions from Rio Hondo II Hydroelectric Project



2.5 Baseline CO_2 Emission Rate

The proposed project uses approved baseline methodology AM0005 - "Baseline methodology (barrier analysis, baseline scenario development and baseline emission factor, using combined margin) for small grid-connected zero-emissions renewable electricity generation". The baseline emission rate aims to establish the project's effects on both the operating margin (affecting the operation of current and/or future power plants) and the build margin (delaying or avoiding the construction of future power plants). The manner the methodology is applied is set out below:

The Emission Reductions during a given year (ER_y) are calculated using the following formula:

$$ER_y = EG_y * EF_y$$

Where EG_y is the electricity supplied to the grid by Rio Hondo, EF_y is the GHG emission factor of the grid.

The emission factor *EFy* of the grid is represented as a combination of the Operating Margin and the Build Margin. If we set the emission factor of associated method as *EF_OMy* and *EF_BMy*, the *EFy* is given by

$$EF_y = w_{\mathrm{OM}} * EF\_OM_y + w_{\mathrm{BM}} * EF\_BM_y$$

with respective weight factors *w*OM and *w*BM (where *w*OM + *w*BM = 1), and by default, are weighted equally (*w*OM = *w*BM = 0.5).

The Operating Margin emission factor *EF_OMy* is defined as the generation-weighted average emissions per electricity unit (tCO2 / MWh) of all generating sources serving the system, excluding zero- or low-operating cost power plants (hydro, geothermal, wind, low-cost biomass,

nuclear and solar generation), based on the latest year statistics data and are derived from the following equation:

$$EF\_OM_y = TEM_y / TGEN_y = [\sum_i F_{i,y} * COEF_i] / [\sum_j GEN_{j,y}]$$

Where *TEMy* and *TGENy* is the total GHG emissions and electricity generation supplied to the grid by the power plants connected to the grid excluding zero- or low-operating cost sources. *Fi,y* and *COEFi* are the fuel consumption and associated carbon coefficient of the fossil fuel *I* consumed in the grid. *GENj,y* is the electricity generation at the plant *j* connected to the grid excluding zero- or low-operating cost sources.

The Build Margin emission factor *EF_BMy* is given as the generation-weighted average emission factor of the selected representative set of recent power plants represented by the 5 most recent plants or the most 20% of the generating units built (summation is over such plants specified by *k*):

$$EF\_BM_y = [\sum_i F_{i,y} * COEF_i] / [\sum_k GEN_{k,y}]$$

as the default method. The summation over *i* and *k* is for the fuels and electricity generation of the plants mentioned above.

The project sponsor shall calculate the baseline emission rate at the beginning of the crediting period and annually thereafter using the provided equations and the most recent data on the Guatemalan electricity sector. If the CDM EB has altered the modalities and procedures for this project category, the baseline emission rate shall be calculated taking into account the revised modalities and procedures and any additional guidance provided. In either case, a designated operational entity shall determine and confirm that the baseline emission rate has either not changed or has been updated in accord with internationally agreed modalities and procedures every year.

3. Operational and Monitoring Obligations

The project operator must fulfil the following operational and data collection obligations in order to demonstrate the credibility of the ERs claimed from the project and ensure successful verification of these ERs.

The project operator shall ensure that:

- All reasonable steps are taken to maximize the credibility of CERs from the Rio Hondo II Hydroelectric Project facility and thereby ensure the credible demonstration in a transparent manner of emissions reductions;
- Sufficient information is collected to calculate ERs in a transparent manner and to allow for a successful verification of these ERs.
- The project operator shall comply with the data collection, testing and analysis, and data management obligations contained in this MP. The data required by this MP is in line with the information usually collected by an electric utility and by government authorities in Guatemala. The following key parameters define the performance of the Rio Hondo II Hydroelectric Project; and the operator shall integrate the data collection requirements below into the company's data base and information collection policies. The data shall be collected from the indicated sources and quality assurance and control activities shall be applied to ensure the quality of this data:

- The operator will record the net generation of the Rio Hondo II Hydroelectric Project at least every month. This data shall be obtained from the metering system of the Rio Hondo II Hydroelectric Project at the feed-in point to the grid. The meter used for this purpose must be an industrial quality sealed meter which will be maintained and calibrated according to relevant Guatemalan regulations. The data must be cross-checked with the metering and billing information provided by the grid operator. Additionally, this information will be corroborated with through continuous monitoring reports, maintenance and plant shut down records, and weather and rainfall reports.
- The metering apparatus will be acquired from a recognized experienced manufacturer, that complies with at least the ANSI norms and the precision zero point three (0.3). The official metering will be the average of the two measurements, as long as the difference is no greater that one percent (1%). If this difference is greater than one percent (1%) or one of the meters gets damaged or presents inexactness, the meter that has the most determined precision by means of a test, will be accepted as the official meter.
- Annually, information on generation and fuel consumption of all fossil fuel power plants in the grid as provided by Guatemalan generators shall be obtained from the Administrador del Mercado Mayorista (AMM). This data is considered trustworthy and no further quality assurance activities are necessary apart from ensuring data is correctly transposed and applied in the algorithms for calculation of baseline emission factors.
- If data on fuel consumption and plant efficiency are not available, similar conservative default values as those used to calculate the original baseline may be used. Current justification of the values must be provided.
- IPCC default values for carbon content are used. No further quality assurance and control activities are required on these data.

The project operator shall create and maintain data records that constitute the "paper trail" for the information collected. The MP workbook is the principle record for the purpose of the MP, but the workbook shall be supported with other relevant records that are created in the process of collecting the required information.

4. The Rio Hondo II Hydroelectric Project Workbook

This section explains and illustrates the steps required by the operator to enable the CO_2 emission reductions to be calculated on an annual basis using the Rio Hondo II Hydroelectric Project workbook. It presents the two general and four project specific worksheets contained in the workbook and explains their use. The section is intended as a user manual for the workbook. The assumptions and principles used in the workbook have been explained in the previous sections. The electronic workbook is an Annex to the MP and an integral part thereof.

The operator is responsible for entering the required data into the electronic workbook and completing the workbook at least monthly, starting with the month the Rio Hondo II Hydroelectric Project enters into operation, as required by the monitoring methodology and the data input templates in the electronic workbook.

The operator must retain a copy of every month's workbook. Each month's workbook must be saved under a unique name reflecting the month for which monitoring has been carried out and hard copies of the workbook shall be printed out, signed in accordance with company procedures, and stored in a safe location. In addition, after each data entry and/or modification of the workbook, electronic copies of the workbook shall be saved under a new name, and hard copies shall be signed and stored safely. Likewise, all other data collected and used for the purpose of this MP shall be safely stored, preferably with offsite backups in case of loss of originals.

The monthly workbooks together with the operator's database and monitoring records form the 'paper trail' which is essential for auditing purposes through verification. The annual workbooks will be a transparent record of electricity generation and ERs generated by the Rio Hondo II Hydroelectric Project. All data required for verification and issuance are to be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

4.1. Summary of the Workbook

The MP for the Rio Hondo II Hydroelectric Project workbook contains the following six worksheets:

Table 1: Summary of workbook

Sheet	Title	Description
Sheet One	*Instructions*	Introduction and instructions for MP worksheet use.
Sheet Two	*Factors and Assumptions*	Listing of the assumptions and conversion factors used in computing the energy baseline and the corresponding baseline emission rate.
Sheets Three to Seven	*Operating Margin Data* *Build Margin Data* *Baseline Calc* *Import and Export* *Sheet 7Rio Energy Generation + ERs*	Sheet 3 collects data for OM calc. Sheet 4 collects data for BM calc. Sheet 5 calculates the Baseline Sheet 6 corrects for imports and exports and provides Combined Margin CEF Sheet 7 records the annual net generation output from the Rio Hondo II Hydroelectric Project and calculates the CO_2 emission reductions due to the Rio Hondo II Hydroelectric Project.

Key to cell colors	
Title field	
Unit field	
Input field	
Calculation field	

Table 2: Key to cell colors

4.2. Conversion Factors and Assumptions

Sheet 2 consists of a list of conversion factors and assumptions to be determined at the project implementation initiation stage.

Carbon Emission Factors (tC/TJ)	
fuel oil	21.1
Nat. gas	15.3

diesel oil	20.2
Coal	25.8

Source: IPCC, 1996: *Greenhouse Gas Inventory Guidebook*

Conversion factors	Unit	Value
Carbon content	[tCO2/tC]	3.667
Energy	[TJ/GWh]	3.6

4.3. Calculation of the Energy Baseline

Sheet 3 and 4 calculate the energy baseline for the Rio Hondo II Hydroelectric Project. The project operator should input the required data in the tables in each Sheet. This information is collected and made publicly available by government authorities and agencies in the energy field in Guatemala, such as AMM. It can be obtained from the following website as well - http://www.amm.org.gt/.

Sheet 3: Operating Margin Data

Name	Technology	Fuel Type	GWh	MW Installed	Effective MW	Year Online
ADD NEW PLANTS						
El Canada	hydro	RE				Nov-03
Electrogeneracion	IC Motor	bunker				Nov-03
Amatex	IC Motor	bunker				Jun-03
Arizona	IC Motor	bunker				May-03
Calderas	geothermal	RE				Dec-02
Matanzas	hydro	RE				Jul-02
San Isidro	hydro	RE				Jul-02
Las Vacas	hydro	RE				May-02
Pasabien	hydro	RE				Jun-00
Poza Verde	hydro	RE				May-00
La Esperanza	IC Motor	bunker				May-00
San Jose	steam turbine	coal				Jan-00
Zunil	geothermal	RE				1999

Secacao	hydro	RE		1998
Genor	IC Motor	bunker		1998
Las Palmas	IC Motor	bunker		1998
Sistema Michatoya	hydro	RE		1997
Concepcion	bagasse	RE		1996
La Union	bagasse	RE		1996
Madre Tierra	bagasse	RE		1996
Magdalena	bagasse	RE		1996
Pantaleon	bagasse	RE		1996
Santa Ana	bagasse	RE		1996
Lagotex	IC Motor	bunker		1996
Tulula	bagasse	RE		1996
Rio Bobos	hydro	RE		1995
Sidegua	IC Motor	bunker		1995
Generadora Progresso	IC Motor	bunker		1993
PQPC	IC Motor	bunker		1993
GGG Stewart + Stevenson	Gas Turbine	diesel		1992
GGG Gas 4	Gas Turbine	diesel		1989
Esc. Gas 5	Gas Turbine	diesel		1985
Chixoy	hydro	RE		1983
Aguacapa	hydro	RE		1982
Chichaic	hydro	RE		1979
GGG Gas 2	Gas Turbine	diesel		1978
Esc. Vapor 2	steam turbine	bunker		1977
Esc. Gas 3	Gas Turbine	diesel		1976
Esc. Gas 4	Gas Turbine	diesel		1976
Jurun Marinala	hydro	RE		1970
Esc. Gas 2	Gas Turbine	diesel		1968
El Porvenir	hydro	RE		1968
Esclavos	hydro	RE		1966
Santa Maria	hydro	RE		1966
GGG Gas 1	Gas Turbine	diesel		1964
Esc. Vapor 4	steam turbine	bunker		1961

Esc. Vapor 3	steam turbine	bunker		1959

Source: DGE

Bunker		#DIV/0!
Diesel		#DIV/0!
Hydro		#DIV/0!
bagasse		#DIV/0!
geothermal		#DIV/0!
coal		#DIV/0!
Total		***0***

Sheet 4: Build Margin Data

Name	Technology	Fuel Type	GWh	Cum Gen	% of capacity
ADD NEW PLANTS					
El Canada	hydro	RE		**0.00**	**#DIV/0!**
Electrogeneracion	IC Motor	bunker		**0.00**	**#DIV/0!**
Amatex	IC Motor	bunker		**0.00**	**#DIV/0!**
Arizona	IC Motor	bunker		**0.0**	**#DIV/0!**
Calderas	geothermal	RE		**0.0**	**#DIV/0!**
Matanzas	hydro	RE		**0.0**	**#DIV/0!**
San Isidro	hydro	RE		**0.0**	**#DIV/0!**
Las Vacas	hydro	RE		**0.0**	**#DIV/0!**
Pasabien	hydro	RE		**0.0**	**#DIV/0!**
Poza Verde	hydro	RE		**0.0**	**#DIV/0!**
La Esperanza	IC Motor	bunker		**0.0**	**#DIV/0!**

4.4. Calculation of the Baseline Emission Rate

Sheet 5 and 6 calculate the CO_2 emission rate in the baseline scenario based on the data entered in Sheet 3 and 4, as per the approach defined in Section 2.5. The baseline emission rate is calculated *ex-ante* annually.

Sheet 5: Baseline Emission Rate:

CEF Calculation Operating Margin:

-	Annual Generation	Average Plant Efficiency*	Actual Fuel Consumption	IPCC 1996 Inventory Workbook Carbon Content	Emissions	CEF
	GWh/yr (GEN)	% (PE)	TJ/year (F)	tC/TJ (COEF)	tCO2/yr (TEM)	t CO2/MWh (EF_OM)
Bunker - Internal Combustion	-	30%	-	21.1	-	
Diesel - Gas Turbine	-	25%	-	20.2	-	
Coal - steam turbine	-	35%	-	25.8	-	
Total (TGEN)	**-**				**-**	**#DIV/0!**

CEF Calculation Build Margin:

-	Annual Generation	Average Efficiency*	Actual Fuel Consumption	IPCC 1996 Inventory Workbook Carbon Content	Emissions	CEF
	GWh/yr (GEN)	% (PE)	TJ/year (F)	tC/TJ (COEF)	tCO2/yr (TEM)	t CO2/MWh (EF_BM)
Bunker - Internal Combustion	-	30%	-	21.1	-	
RE	0.00	N/A	-	0	-	
Total	**-**				**-**	**#DIV/0!**

Combined Margin CEF (EF): **#DIV/0!**

Sheet 6: Import and Export Correction:

Input data:		
CEF		t CO2/MWh
EL (in)		GWh
TGEN		GWh
EF (in)		t CO2/MWh

EL (out)		GWH	
EF (out)		t CO2/MWh	
Adjustments:			
Ussing a low EF (in) (0,001)		t CO2/MWh	
Ussing a high EF (in) (0,999)		t CO2/MWh	
Max range of impact on CEF In %		t CO2/MWh	
Output:			
Combined Margin CEF corrected for export:			**t CO2/MWh**

The import of electricity ceases to be conservative and negligible if the percentage of imported electricity becomes greater than 3%. In this case, the baseline of the source country must be calculated and included in the EF(in).

4.5. Monitoring of the Generation Output from Rio Hondo II Hydroelectric Project and Calculation of the annual ERs from Rio Hondo II Hydroelectric Project

Sheet 7 records the amount of net electric-energy output annually generated by the Rio Hondo II Hydroelectric Project and calculates the emission reductions. The annual net generation of the Rio Hondo II Hydroelectric Project is obtained by the project operator from the metering system of the plant. This sheet is completed annually. However, it is suggested that the project operator complete the sheet at shorter intervals to assess and report on the quantity of ERs already generated.

Sheet 7:

Energy Generation by the Rio Hondo II Hydroelectric Project

	MWH	CEF	Emission Reductions
Year 1		**#DIV/0!**	**#DIV/0!**
Year 2		**#DIV/0!**	**#DIV/0!**
Year 3		**#DIV/0!**	**#DIV/0!**
Year 4		**#DIV/0!**	**#DIV/0!**
Year 5		**#DIV/0!**	**#DIV/0!**
Year 6		**#DIV/0!**	**#DIV/0!**
Year 7		**#DIV/0!**	**#DIV/0!**
Year 8		**#DIV/0!**	**#DIV/0!**

Year 9		**#DIV/0!**	**#DIV/0!**
Year 10		**#DIV/0!**	**#DIV/0!**
Year 11		**#DIV/0!**	**#DIV/0!**
Year 12		**#DIV/0!**	**#DIV/0!**
Year 13		**#DIV/0!**	**#DIV/0!**
Year 14		**#DIV/0!**	**#DIV/0!**
Year 15		**#DIV/0!**	**#DIV/0!**
Year 16		**#DIV/0!**	**#DIV/0!**
Year 17		**#DIV/0!**	**#DIV/0!**
Year 18		**#DIV/0!**	**#DIV/0!**
Year 19		**#DIV/0!**	**#DIV/0!**
Year 20		**#DIV/0!**	**#DIV/0!**
Year 21		**#DIV/0!**	**#DIV/0!**

5. Sustainable Development MP

The project operator will demonstrate to the DOE verifying the project that the project continues to comply with the relevant Guatemalan environmental and social regulations and possesses the necessary permits and licenses to operate legally. This shall be confirmed by the DOE before the project begins to generate ERs and at the time of the renewal of the crediting period.

In order to comply with this obligation, the project operator will obtain and maintain at all times such valid permits and licenses necessary to legally operate the project. The operator will collect information on the project's compliance with environmental and social regulations in Guatemala. Further, the project operator shall develop, prior to plant commissioning, a separate plan to measure and monitor the success of project's sustainable development objectives as outlined in the PDD.

6. Management and Operational Systems MP

In order to ensure the successful operation of the Rio Hondo II Hydroelectric Project and the credibility and verifiability of the ERs achieved, the project must have a well-defined management and operational system. It is the obligation of the operator to put such a system in place. It must include the operation and management of the monitoring and record keeping described in this MP. The proper functioning of the Rio Hondo II Hydroelectric Project management and operational system shall be monitored by the operator and will be subject to independent verification. The project management responsibilities regarding the MP are detailed in this section.

6.1 Allocation of Project Management Responsibilities

The management and operation of the project is the responsibility of the project operator. Ensuring the environmental credibility of the project through accurate and systematic monitoring of project implementation and operation for the purpose of achieving credible ERs is the key responsibility and accountability of the operator as far as this MP is concerned.

Independent verifiers will periodically audit the operator and its management systems in order to ensure credibility and transparency of the reported ERs and other performance indicators of the Rio Hondo II Hydroelectric Project.

6.2 Management and Operational Systems

It is the responsibility of the operator to develop and implement a management and operational system that meets the requirements of the project and of this MP. The MP can only offer general guidance in this regard. This includes:

Data Handling

- The establishment of a transparent system for the collection, computation, and storage of data, including adequate record keeping and data monitoring systems. The operator shall develop and implement this MP and develop specific protocols that provide for these critical functions and processes, which must be adequate for independent auditing.
- For electronic and paper-based data entry and record keeping systems, there must be clarity in terms of the procedures and protocols for collection and entry of data, use of workbooks and spreadsheets and any assumptions made so that compliance with requirements can be assessed by a third party. Stand-by processes and systems, e.g. paper based systems, must be outlined and used in the event of, and to provide for, the possibility of system failures. The record keeping system must provide a paper trail that can be audited.

Quality Assurance

- The operator shall designate a competent manager who will be in charge of and accountable for the generation of ER calculations and monitoring reports, including record keeping, computation of ERs, audits and verification. The manager shall officially sign off on all data collection and emissions reduction worksheets.
- Well-defined protocols and routine procedures, with good, professional data entry, extraction and reporting procedures will reduce costs and time needed, while making it considerably easier for the auditor and verifier to do their work. The better organized and transparent the organization, the easier it is to monitor, audit, and verify.
- The operator shall keep proper management processes and systems records as the auditors will request copies of such records to judge compliance with the required management system. Auditors will accept only one set of official information, and any discrepancies between the official, signed records and on-site records will be questioned.

Reporting

- The operator shall report regularly to the Guatemalan authorities as required by them.
- The operator shall prepare reports as needed for audit and verification purposes.
- The operator shall prepare a brief annual report which should include: information on overall project performance, ERs generated and verified, comparison with targets of ERs achieved, compliance with relevant Guatemalan regulations and standards, and information on adjustment, if any, to the MP, such as assumptions and concepts, calculation methods and other amendments of the MP and the monitoring system. These reports can be combined with the periodic verification report.

Training

- It is the responsibility of the operator to ensure that the required capacity and internal training is made available to the operational staff to enable them to undertake the tasks required by this Monitoring Plan. Initial staff training must be provided before the project starts to implement this Monitoring Plan.

Initial Verification

- The management and operational system and the capacity to implement this MP must be put in place before the project can start generating ERs.
- This will be verified (initial verification) before the project can generate any ERs.

6.3 Summary of Responsibilities

The following table summarizes the roles and responsibilities of the various project partners with regard to the monitoring and verification system.

Table 8: Management and Operation System: Roles of Project Partners

	Implementer of the Rio Hondo II Hydroelectric Project	AMM
Monitoring system	• Review MP and suggest adjustments if necessary • Develop and establish management and operations system • Establish and maintain monitoring system and implement MP • Prepare for initial verification and project commissioning	
Data Collection and Provision	• Establish and maintain data measurement and collection system and collect data for all MP indicators and inputs as required • Maintain valid permits and licenses and collect information on compliance with relevant Guatemalan regulations	• Collect relevant information on electricity generation and fuel consumption by power plants in Guatemala
Data computation	• Enter data in MP worksheets • Use MP worksheets to calculate ERs	
Data storage systems	• Implement record maintenance system • Store and maintain records (paper trail) • Implement sign-off- system for completed worksheets • Complete brief annual report	• Receive, store and maintain records (paper trail)
Performance monitoring and reporting	• Analyze data and compare project performance with project targets • Analyze system problems, recommend and implement improvements (performance management) • Prepare and forward periodic reports	• Receive reports
MP Training and Capacity Building	• Develop and establish MP training, skills review and feedback system • Ensure that operational staff is trained and enabled to meet the needs of this MP	
Quality assurance, audit and verification	• Establish and maintain quality assurance system with a view to ensuring transparency and allowing for audits and verification • Prepare for and facilitate audits and verification process	

7. Auditing and Verification Procedures

The validation, auditing and verification process for the project shall follow the procedures and requirements laid down in the latest version of the Validation and Verification Manual (VVM) available at the time of the validation or verification activity. The DOE for the project shall follow the VVM in conducting all validation and verification activities for the project, and the project operator shall consult the VVM in order to properly prepare for validation, audits and verification activities. The VVM is available online at http://www.VVManual.info or http://www.ieta.org/VVM/VVM.htm.