HANUMAN GANGA HYDRO (4.95 MW) PLANT AT UTTARAKHAND

Document Prepared by EKI Energy Services Limited

Project Title	Hanuman Ganga Hydro (4.95 MW) Plant at Uttarakhand
Version	2
Report ID	274
Date of Issue	24-March-2021
Project ID	274
Monitoring Period	01-April 2010 to 27-March-2016
Prepared By	Tapti Saha Asst. Manager- Operations,EKI Energy Services Limited
Contact	EnKing Embassy, Office No. 201, Plot 48, Scheme 78, Part 2 Vijay Nagar, Near brilliant Convention Centre, Indore- 452010 Madhya Pradesh, India Website: www.enkingint.org Email ID: tapti@enkingint.org / registry@enkingint.org M: +91 9770900207

CONTENTS

1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

Project Activity:

The project activity consists of a small hydro project, the total installed capacity being 4.95 MW to generate clean electricity using the energy of the flowing stream. The project is a run-of- the- river type with minimum environmental impacts. The technology or electricity generation process using hydro resources is converting the potential energy available in the stream flowing from higher altitudes into mechanical energy using hydro turbines and then to electrical energy using alternators. The project activity sells electricity to the state electricity utility (Uttarakhand Power Corporation Limited (UPCL)) through NEWNE grid, and thus will reduce dependence on fossil fuels and thereby reducing CO_2 emissions.

The Hanuman Ganga project with its total capacity of 4.95 MW has got commissioned in two phases. The first phase with capacity of 3 MW was commissioned in March 2005 and the second phase with capacity of 1.95 MW was commissioned in April 2008.)

Commissioning of Phase I (3 MW) : 24-March-2005

Commissioning of Phase II (1.95 MW) : 19-April-2008

The site is located on Hanuman Ganga Nallah near Hanuman Chatti village in Uttarkashi District, Uttarakhand State of India.

It was estimated that project would be able to export around 26.017 GWh of electricity (in total) per year to the Uttarakhand State Electricity Board. It was also estimated that this project will help to mitigate climate change and lead to green house gas emission reductions of 184,228 tCO_{2e} for the crediting period of 10 years.

During this monitoring period, 01-April-2010 to 27-March-2016 (both days included) the GHGs emissions reductions achieved by the project activity is 39,492 tCO2e by displacing 49,183.66 MWh electricity that, in the absence of the project activity, would have been supplied by a fossil-fuel dominated electricity grid.

1.2 Sectoral Scope and Project Type

Sectoral Scope: Energy (renewable/non-renewable)

Project Type: According to small-scale CDM modalities the project activity falls under:

Type I – Renewable Energy Projects

Category ID – Grid connected renewable electricity generation, (Version 13, EB 36). Project is not a grouped project.

1.3 Project Proponent

Organization name	M/s Regency Aquaelectro & Motelresorts Ltd.
Contact person	Mr. Arun Sharma
Title	Managing Director
Address	River View Lane, Regency Complex, Paonta Sahib, Himachal Pradesh
Telephone	01704-223431, 01704-224431
Email	aphregency@yahoo.co.in

1.4 Other Entities Involved in the Project

Organization name	**EKI Energy Services Limited**
Role in the Project	Project Consultant
Contact person	Tapti Saha
Title	Assistant Manager
Address	EnKing Embassy, Office No 201, Plot 48, Scheme 78, Part 2, Vijay Nagar, Indore- 452010, Madhya Pradesh, India.
Telephone	+91 9770900207
Email	tapti@enkingint.org/ registry@enkingint.org

1.5 Project Start Date

24-March-2005 which is the date of commissioning of the Phase I (3 MW) of the Project.

1.6 Project Crediting Period

Crediting Period Start date: 28-March-2006

Crediting Period End date: 27-March-2016

The project activity adopts fixed crediting period of 10 years period.

1.7 Project Location

Host Party : India
Region : Northern Region of India
State : Uttarakhand.
City (District) : Uttarkashi
Town : Hanuman Ganga Nallah
Community (Village) : Hanuman Chatti Village

Access to project site*:*

Hanuman Chatti is 165 km from Dehradun via Mussoorie. The distance from the National Capital, New Delhi is 420 KM. The nearest Railway Station and Airport is at Dehradun.

Geographical Coordinates**:**

Latitude	N 30^0 55' 50''
Longitude	E 78^0 24' 20''

Project Boundary:

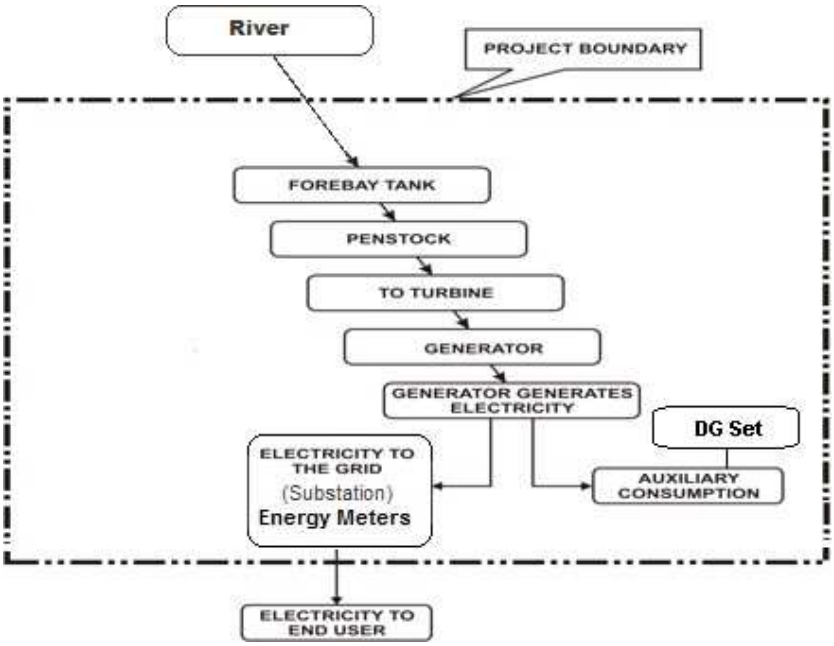
As per paragraph 6 of AMS I.D, Version 13,

The Project Boundary encompasses the physical, geographical site of the renewable energy generation source.

As already described in the registered VCS PD, section 2.3, the project boundary includes the power house, water inlet and outlet, transmission set up. The Project boundary is shown by dotted line box in diagram below:

Hence the project boundary is from the point of river water intake in the Forebay tank to the point of interconnection at the substation where electricity is exported to the grid. The auxiliary consumption of power used to generate the electricity is within the project boundary.

One DG set of 160 kVA capacity was being used as a emergency lighting source



1.8 Title and Reference of Methodology

As defined under Appendix B of the simplified modalities and procedures for small-scale CDM project activities, the project activity falls under following project types and categories:

Type : I – Renewable Energy Projects

Project Category : I.D – Grid connected renewable electricity generation

Version 13(EB 36, 14/12/2007)

The monitoring of Emission Reductions generated by the project follows the same principles that have been adopted for the monitoring of emission reductions under the Clean Development Mechanism.

In accordance with the AMS I.D methodology, the Monitoring shall consist of the metering of electricity generated by renewable technology. As per monitoring report in the PDD, the data to be monitored is net electricity exported to the grid.

1.9 Participation under other GHG Programs

The project has neither been registered[1] under any other GHG programs. The project is seeking registration only in VCS program.

1.10 Other Forms of Credit

Emission Trading Programs and Other Binding Limits:

Net GHG emission reductions or removals generated by the Project will not be used for compliance with an emissions trading program or to meet binding limits on GHG emissions in any Emission Trading program or other binding limits.

Other Forms of Environmental Credit:

Not applicable, as the project is not registered in any other GHG mechanism other than VCS. Also, the project activity is not availing any REC benefits and the same can be confirmed from publically available link of REC generators.

Web-link: https://www.recregistryindia.nic.in/index.php/general/publics/registered_regens

1.11 Sustainable Development

Contribution to sustainable development:

Ministry of Environment and Forests, has stipulated economic, social, environment and technological well-being as the four indicators of sustainable development. The project contributes to sustainable development using the following ways.

Social well-being: The project would help in generating employment opportunities during the construction and operation phases. The project activity will lead to development in infrastructure in the region like development of roads and also may promote business with improved power generation.

Economic well-being: The project is a clean technology investment in the region, which would not have been taken place in the absence of the VCS benefits the project activity will also help to reduce the demand supply gap in the state.

Technological well-being: The successful operation of project activity would lead to promotion of solar based power generation and would encourage other entrepreneurs to participate in similar projects.

Environmental well-being: Solar being a renewable source of energy, it reduces the dependence on fossil fuels and conserves natural resources which are on the verge of

[1] Project was applied in CDM but did not move forward for registration due to internal decision taken by management.

depletion. Due to its zero emission the project activity also helps in avoiding significant amount of GHG emissions and specific pollutants like SOx, NOx, and SPM associated with the conventional thermal power generation facilities.

2 SAFEGUARDS

2.1 No Net Harm

The facility does not produce any pollution in process of power generation as it utilizes renewable energy source that is hydro energy to generate electricity for captive consumption. Hence there is positive impact on the environment due to this small-scale project activity of reducing the pollution caused by fossil fuels would have been used in baseline scenario. Further this project will have no air pollution, no water pollution and no noise pollution. The project activity has obtained the No Objection Certificate for Consent to Establish from the concern agencies. The project activity does not cause any harm to the local ecology. It primarily requires the installation of the Hydro power project, interfacing the generators with the State Electricity Board by setting up HT transmission lines and installation of other accessories.

Also as per the Central Pollution Control Board of India notification24 small hydro project of less than 25 MW falls under White Category and are practically non-polluting.[2]

2.2 Local Stakeholder Consultation

Detailed local stakeholders consultation was conducted during the registration of the project – by identification of stakeholders, identification of local stakeholders, invitation of them, held meeting where project activity was explained in details and the PP also took due care of comments/suggestions of the local stakeholders.The process of local stakeholder consultation is continuous. During the current monitoring period, the project proponent has kept grievance register in plant site office and sought comments/grievances/suggestions from local stakeholders including local community, government agencies and NGOs. Besides, the PP has also kept provision for submitting comments/grievances/suggestions from local stakeholders through direct mail. However, no major comments/grievances/suggestions have been received from the aforementioned stakeholders during the current monitoring period and all such minor suggestions have been take care by the PP.

2.3 AFOLU-Specific Safeguards

[2] http://moef.gov.in/wp-content/uploads/2017/07/Latest_118_Final_Directions.pdf

Not Applicable.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

The project activity is in operation since 19-April-2008 for full capacity of the plant i.e. 4.95 MW. However, it was completed in 2 phases; 3 MW since 24-March-2005 and additional 1.95 MW since 19-April-2008.

The power generating equipment installed details of the project activity:

DESCRIPTION	**3 MW**	**1.95 MW**
Type of Diversion Weir	Trench	Trench
Length of Power Tunnel	1380 m	1380 m
Design Discharge of Power Tunnel	2.65 cumec	1.51 cumec
Design Discharge of Penstock	2.3 cumec	1.5 cumec
Shape of Tail Race	Trapezoidal	Trapezoidal
Design Head	155 M	155 M
Turbine Details		
Type	Horizontal Francis	Horizontal Francis
No	2	1
Output at Max. Head of	1580 KW	1950 KW

154 M		
Rated Speed (RPM)	1500	1500
Runaway Speed (RPM)	2712	2712
Rated Flow (at 100 % Load)(cumec)	1.141	1.323
GENERATOR DETAILS		
Phase	3	3
Connections	Star	Star
Rated Speed (RPM)	1500	1500
Capacity (KW)	1500	1950
Power Factor	0.85	0.85
Terminal Voltage (V)	3300	3300
Exciter	Brush Less Excitation System Voltage 63V Current 350 Amp Excitation Voltage 80 V Excitation Current 8 Amp Class of Insulation 'f'	Brush Less Excitation System Voltage 106V Current 213 Amp Excitation Voltage 76 V Excitation Current 6.2Amp Class of Insulation 'f'

No changes / modifications in the plant equipment take placed as of date.

3.2 Deviations

2.3.1 Methodology Deviations

No methodology deviations during current monitoring period.

2.3.2 Project Description Deviations

No Project description deviations during current monitoring period. Also, no deviation applied during the previous monitoring

3.3 Grouped Projects

Not Applicable

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	$EF_{OM,y}$
Data unit	tCO_2/MWh
Description	Operating Margin Grid Emission factor of the regional grid (NEWNE grid in India)
Source of data	Calculated from CO_2 baseline database for the Indian Power Sector –Central Electricity Authority (CEA), Ministry of Power, Version 4.0, September 2008.
Value applied	1.0086
Justification of choice of data or description of measurement methods and procedures applied	Calculated as an average 3 years vintage data and option of ex-ante calculation based on Simple OM Method. Computed once during PDD finalization.
Purpose of Data	The parameter is used in calculating the emission reductions that are taking place due to the project activity in a conservative and transparent manner.
Comments	The CEA databases are maintained and made publicly available by CEA

Data / Parameter	$EF_{BM,y}$
Data unit	tCO_2/MWh

Description	Build Margin Grid Emission factor of the regional grid (NEWNE grid in India)
Source of data	CO_2 baseline database for the Indian Power Sector –Central Electricity Authority (CEA), Ministry of Power, Version 4.0, September 2008.
Value applied	0.5977
Justification of choice of data or description of measurement methods and procedures applied	Calculated for the most recent data and option of ex-ante calculation based on "20% of total generation approach". Computed once during PDD finalization (ex-ante).
Purpose of Data	The parameter is used in calculating the emission reductions that are taking place due to the project activity in a conservative and transparent manner. The data has been published by CEA, which is the nodal agency for all power related activities in the country.
Comments	The CEA databases are maintained and made publicly available by CEA

Data / Parameter	EF_y
Data unit	tCO_2/MWh
Description	Combined Margin CO_2 emission factor of the regional grid (NEWNE grid in India)
Source of data	CO_2 baseline database for the Indian Power Sector –Central Electricity Authority (CEA), Ministry of Power, Version 4.0, September 2008.[3]
Description of measurement methods and procedures to be applied	The data will be used ex-ante for the project activity during the crediting period. CEA has estimated the simple operating margin and build margin emission factors for the southern regional grid. For calculating the CO_2 emission factor as per combined margin method for the hydro based electricity generation project activities the weights of 0.5 each for operating margin and build margin are considered as per 'Tool to calculate the emission factor for an electricity system'(Version 01.1). For details of the calculation please refer to the Grid Emission factor calculation excel sheet which is a part of the VCS PD.

[3] https://cea.nic.in/wp-content/uploads/baseline/2020/07/user_guide_ver4.pdf

Frequency of monitoring/recording	
Value monitored	0.803
Monitoring equipment	
QA/QC procedures to be applied	The parameter is used in calculating the emission reductions that are taking place due to the project activity in a conservative and transparent manner. The data has been published by CEA, which is the nodal agency for all power related activities in the country.
Purpose of the data	
Calculation method	
Comments	The CEA databases are maintained and made publicly available by CEA

4.2 Data and Parameters Monitored

Data / Parameter	**EGy**
Data unit	MWh
Description	**Net electricity exported to the grid** (electricity exported by hydro power plant (electricity generated minus auxiliary electricity) minus electricity imported from the NEWNE grid,)
Source of data	Data type : Measured The data is measured using the trivector energy meters installed at the substation next to the plant and recorded in JMR reports issued by UPCL
Description of measurement methods and procedures to be applied	For measuring the net electricity exported to the grid by the project activity at the interconnection point, one set of Main meter (part of interconnection facility) and check meter are provided at the substation of the State Electricity Board which is placed next to the plant. The meters are in sealed condition and in the jurisdiction of the UPCL. Monthly joint meter reading of the meter at the interconnection point is taken by the designated officials of the company and UPCL. The joint meter readings are recorded and signed by the authorized representatives of both parties on each of the above instances. UPCL will be the responsible authority for this measurement.
Frequency of monitoring/recording	Daily
Value monitored	49,183.66
Monitoring equipment	Monitoring: Data is monitored by main energy gross meter Manufacturing No.: upc00095

	Make: Secure Accuracy: +/- 0.5% Archiving policy: Paper & Electronic Responsibility: Manager (Power Plant) Calibration: Once in 3 years
QA/QC procedures to be applied	The meter installed is of 0.5% accuracy class. The main meter and check meter will be test checked for accuracy at site. The Meters will be calibrated regularly and at least once in 3 years as per the requirements of Annex 20 of EB 41. The test for the main meter and the check meter will be done with reference to a portable Sub Standard meter, which will be of accuracy class compatible with the class of meter under test. The calibration of the energy meters is done at the discretion of UPCL. Electricity sales bills / receipts may be used for cross-checking the net amount of electricity exported to the grid.
Purpose of the data	Calculation of baseline emissions
Calculation method	
Comments	Data will be archived on paper and also electronically. Archived data will be kept during the crediting period plus 2 years or the last issuance of VERs for this project activity, whichever occurs later.

4.3 Monitoring Plan

As described in the Section 3.4 of the Registered VCS PD for this project, the description of the monitoring plan is as follows:

The authority and responsibility for monitoring, measurement, reporting and reviewing of the data rests with the Chief Project Officer. The identified person will be in charge of the GHG monitoring activities within project's functioning. The Chief Project Officer will be assisted by a team of experienced personnel for the project. The primary responsibility of the team is to measure, monitor, and record and report the information on various data items to the Chief Project Officer. Periodic calibration of various instruments used in the monitoring of GHG related data and record keeping of the same also will be the responsibility of the team.

The responsibility of review, storage and archiving of information in good condition lies with the Chief Project Officer. The Chief project Officer will undertake periodic verifications and onsite inspections to ensure the quality of the data collected by the team and initiate

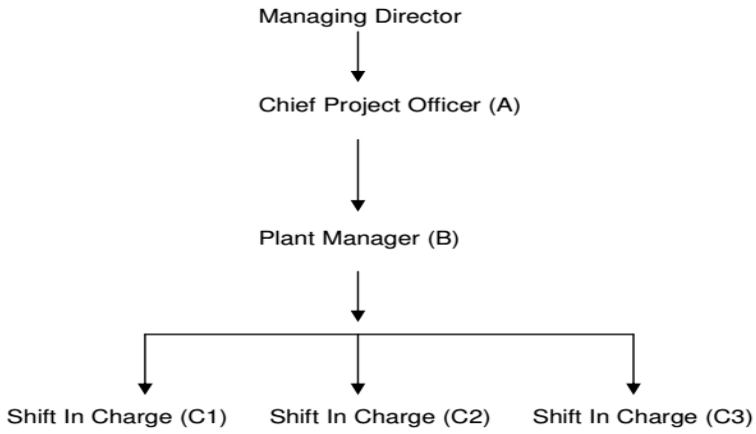
steps in case of any abnormal conditions. The Chief Project Officer will review the data collected by the team and suggest corrective actions wherever required.

The total electricity generated by the project activity (both phases) will be monitored through state-of-the-art sealed and tested meters at a common metering point. The metering system will comprise of one main meter and one check meter in the sub-station, recording net electricity exported. The net metered electricity export data will be used to calculate and monitor the greenhouse gas emission reductions from the project. All meter data will be stored in electronic and paper formats.

Calibration of the energy meters are done as per the standard industry practice and minimum once in every three years by some reputed third party. The calibration certificates of the meters will be stored.

Invoices for the quantity of electricity exported and sold will be archived for two years beyond the crediting period.

The organization structure of the project activity is as given below:



A	=	Chief Project Officer is responsible for the overall project activities
B	=	Plant Manger is responsible for the technical aspects of the project.
C1, C2, C3,	=	3 Shift In Charge will be there who will be placed in 3 shifts and also take care of the technical faults occurring in the plant

Personnel /authority	**Responsibility**

Shift In charge	*Generation/electricity* - Collection of meter reading for electricity generation, export by the project activity. Report is sent to the Plant Manager on daily basis.
Plant Manager	Review of the monitored parameters for correctness, corrective measures in case of minor errors in the monitored data and preparation of a daily summary on project operation and electricity generation to the Chief Project Officer on monthly basis. The Plant Manager will be responsible for calibration of the energy meters in due time and keep its records.
Chief Project Officer	Review of the monthly reports submitted by Plant Manager and also compilation of the data on electricity export to the grid system on a monthly basis for submission to the board of directors. The responsibility of Chief Project Officer also include modification of the structure of monitoring reports and data recording formats as and when required
Managing Director	Review of the reports submitted by Chief Project Officer and preparing the brief summary of information on important aspects, such as, plant operational conditions, total power export, etc.

- Retention period:

All these data will be retained up to 2 years after the end crediting period.

The meter installed at the project activity show readings of electricity exported and electricity imported. The generated electricity is exported into the grid after meeting the in-house auxiliary consumption of the plant. Hence, Electricity exported, therefore, takes into account auxiliary consumption.

In case of main meter failure, check meter is used to calculate the electricity exported to the grid. In case the check meter is faulty it is immediately replaced by a new meter and meter reading from the replaced meter will be used thereafter. The faulty meters are sent to Electricity Board for calibration and accuracy and are duly replaced by a new meter. In case error is identified during annual accuracy testing which is beyond the permissible

limits of error, the meter shall be immediately calibrated and replaced, if necessary. The error that is identified in the annual accuracy testing would be applied to all the readings of electricity exported as indicated in the JMR from the date of last accuracy testing. JMR for the period thereafter shall be as per the calibrated meter.

There was no delayed in calibration during monitoring period

Details of the calibration have been provided in the table below:

Meter	Make	Accuracy Class	Serial Number	Calibration Date	Validity	Calibrating Entity
Main Meter	Secure	0.5%	UPC00095	18-February-2008	17-February-2011	UPCL
Check Meter	L&T	0.5%	06763268	18-February-2008	17-February-2011	UPCL

Meter	Make	Accuracy Class	Serial Number	Calibration Date	Validity	Calibrating Entity
Main Meter	Secure	0.5%	UPC00095	14-February-2011	13-February-2014	UPCL
Check Meter	L&T	0.5%	06763268	14-February-2011	13-February-2014	UPCL

Meter	Make	Accuracy Class	Serial Number	Calibration Date	Validity	Calibrating Entity
Main Meter	Secure	0.5%	UPC00095	05-February-2014	04-February-2017	UPCL
Check Meter	L&T	0.5%	06763268	05-February-14	04-February-2017	UPCL

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

Baseline Emissions: Baseline emissions due to the project activity are calculated as follow:

Baseline Emissions (BE_y) = Combined Margin CO_2 emission factor of the regional grid (EF_y) X Net electricity exported to the grid (EG_y)

5.2 Project Emissions

The project activity is a run-of-river hydroelectric project. There are no anthropogenic emissions by sources of GHGs in the equipment/ technology involved as a whole as a result of the project activity.

Thus, PEy = 0.

There is no 100 kVA D G Set in the project location since 2010 because of restoration work due to flood. A dry battery backup has been installed in the project location and it is maintainence free. So there is no project emission in this project.

Therefore, PEy= 0.

5.3 Leakage

Emissions related to the manufacture and transport of equipment, and other transportation based emissions are not included as they do not occur at the physical or geographic site of the project. Emissions associated with the construction of the project have been excluded as the construction of a fossil fuel fired plant would generate a similar quantity of emissions.

Thus, LEy = 0

5.4 Net GHG Emission Reductions and Removals

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
2010	7,941	0	0	7,941
2011	13,688	0	0	13,688
2012	7,442	0	0	7,442
2013	0	0	0	0
2014	4,167	0	0	4,167
2015	5,315	0	0	5,315
2016	939	0	0	939
Total	39,492	0	0	39,492[4]

From Aug 12 to Feb 14, there was non-operative period of 577 days due to flood loss. Due to restoration work in August, 2012, flood in April, 2013 to February, 2014 there was no generation in the plant.

Hence these number of days are subtracted from current monitoring period to determine ER estimation. It is to be noted here that as per the estimated emission reduction to be achieved from the project activity for the current monitoring period is 81,309 tCO_2e, whereas actual emission reductions achieved are 39,492 tCO_2e, which is approximately 51.4% lower than the estimated emission reductions. The generation of electricity depends upon many other climatic conditions, and not within the control of the project participant. The lower generation during the current verification period is hence due to certain natural conditions and hence acceptable.

[4] Round down figure

APPENDIX I : < BREAK DOWN DETAIL>

Sr. No	Year	Breakdown Period		Remarks
		From	To	
1	2010	01-May-2010	31-July-2010	Construction of Diversion Modification D-Tank
2	2011	01-February-2011	31-March-2011	Construction of Diversion Modification D-Tank
3	2011	01-June-2011	31-July-2011	Construction of Diversion Modification D-Tank
4	2012	03-August-2012	31-August-2012	Flood
5	2013	01-January-2013	20-April-2013	Flood
6	2013	21-April-2013	31-December-2013	Restoration Work
7	2014	01-January-2014	28-February-2014	Restoration Work
8	2015	16-February-2015	16-February-2015	Replacement of Cylinder Plate Bolt (10 hrs)
9	2015	30-August-2015	30-August-2015	Replacement of Cylinder Plate Bolt (9 hrs)
10	2016	23-March-2016	23-March-2016	Replacement of Cylinder Plate Bolt (14 hrs)
11	2016	14-March-2016	14-March-2016	Replacement of Cylinder Plate Bolt (16 hrs)