Monitoring report form for CDM project activity
(Version 06.0)

MONITORING REPORT		
Title of the project activity	Community-Based Renewable Energy Development in the Northern Areas and Chitral (NAC), Pakistan	
UNFCCC reference number of the project activity	1713	
Version number of the PDD applicable to this monitoring report	10	
Version number of this monitoring report	n/a	
Completion date of this monitoring report	08/06/2018	
Monitoring period number	Fourth monitoring period	
Duration of this monitoring period	01/01/2015 to 28/10/2016 (both days included)	
Monitoring report number for this monitoring report	n/a	

Project participants	• Aga Khan Rural Support Programme (AKRSP)
	• Statkraft Markets GmbH
	• Swedish Energy Agency
	• Electrabel SA
	• Enel Trade S.p.A.
	• JX Nippon Oil & Energy Corporation
	• Bilateral and Multilateral Funds:
	  ○ Community Development Carbon Fund (CDCF)
	  ○ Managing company: International Bank for Reconstruction and Development (IBRD) as Trustee of the Community Development Carbon Fund (CDCF)	

Host Party	Pakistan	
Sectoral scopes	1 : Energy industries (renewable - / non-renewable sources	
Applied methodologies and standardized baselines	Applied methodology(ies): AMS-I.A. version 12 - Electricity generation by the user	
Amount of GHG emission reductions or net anthropogenic GHG removals achieved by the project activity in this monitoring period	Amount achieved before 1 January 2013	Amount achieved from 1 January 2013
	0	14,701

Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD	186,093

SECTION A. Description of project activity

A.1. General description of project activity

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The project “Community-Based Renewable Energy Development in the Northern Areas and Chitral (NAC), Pakistan” is to invest in micro and mini hydropower projects (MHP) to serve remote rural communities in Gilgit-Baltistan (previously known as Northern Areas),which has now been given internal autonomy and self-governance under a Presidential Order, and now enjoys a quasi-provincial status and district Chitral Khyber-Pakhtunkhwa province (previously known as N.W.F.P)1, Pakistan. The project aims to generate electricity from 90 sub-projects ranging in size from 30 kW to 800 kW not exceeding 15 MW of total power. These sub-projects will supply electricity through local mini-grids, which will be isolated from any regional and national grids existing in the region. The projects will provide much needed power for meeting community energy needs at the same time substituting for the use of diesel fuel, thereby contributing to reduction of greenhouse gas emissions.

A.2. Location of project activity

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The projects are located across the three regions, including Gilgit region (Gilgit, Ghizer, Hunza-Nagar and Astore districts), Baltistan region (Ghanche and Skardu districts), and Chitral region (district Chitral Khyber Pakhtunkhawa). Table A.1 shows the location of 56 sub-projects initiated in three regions, the provinces, districts and GPS Coordinates of individual project.

Table 1 Names of 53 initiated projects, with location of Province, District and GPS Coordinates

ID. No.	Name of MHP Project	Province	District	GPS					
				DegN	MinN	SecN	DegE	MinE	SecE
1	Besil	Gilgit Baltistan	Skardu	35	52	20	74	45	42
2	Memushthang	Gilgit Baltistan	Skardu	34	42	28	76	9	37
3	Brep	Chitral	Chitral	36	25	51	72	40	1
4	Onawich	Chitral	Chitral	36	39	26	72	54	29
5	Bilphok	Chitral	Chitral	36	0	5	71	47	44
6	Terich Bala	Chitral	Chitral	36	20	47	72	0	
7	Kishmanja	Chitral	Chitral	36	48	41	73	12	22
8	Baleem Laspur	Chitral	Chitral	36	3	56	72	26	41
9	Overik	Chitral	Chitral	36	3	56.05	72	26	40.93
10	Chatpa Katisho	Gilgit Baltistan	Skardu	35	7	31	0.7575	49	17.18
11	Ahmedabad	Gilgit Baltistan	Hunza	36	18	29	74	43	40.35
12	Hushay	Gilgit Baltistan	Ghanche	35	28	2.65	76	21	12.23
13	Izh	Chitral	Chitral	35	59	20	71	33	22
14	Dapa	Gilgit Baltistan	Skardu	35	6	48.31	75	45	54.88
15	Katisho	Gilgit Baltistan	Skardu	35	6	43.54	75	53	11
16	Memush	Gilgit Baltistan	Skardu	34	42	34.99	76	8	4.99
17	Bireer	Chitral	Chitral	35	38	38	71	41	41
18	Chowar	Gilgit Baltistan	Ghanche	34	55	0.58	0.76	42	0.76
19	Shahsalim	Chitral	Chitral	35	55	48.95	71	31	20.36
20	Hango	Gilgit Baltistan	Skardu	35	33	0.22	75	10	6.78
22	Gobor Merdeen	Chitral	Chitral	36	4	18	71	21	43
23	Doko	Gilgit Baltistan	Skardu	35	47	45	0.75	23	42
24	Haltanmosa Hargosil	Gilgit Baltistan	Skardu	34	45	23.8	76	4	34.88
25	Zhitur	Chitral	Chitral	35	54	25	71	29	56
26	Shagram	Chitral	Chitral	36	27	52	72	25	26

27	Beshgram	Chitral	Chitral	36	4	59	71	48	54
28	Diezgh	Chitral	Chitral	35	36	28	36.28	72	43
29	Begust	Chitral	Chitral	35	56	9	71	31	59
30	Whaat	Chitral	Chitral	36	35	59	8.25	71	30
31	Wazirpoor	Gilgit Baltistan	Skardu	35	30	24.85	75	36	33.02
32	Momi	Chitral	Chitral	36	2	21	71	42	59
33	Zondarngram	Chitral	Chitral	36	23	35.73	72	12	26.99
34	Sunich	Chitral	Chitral	36	2	50	71	45	46
36	Arkari	Chitral	Chitral	36	16	56	71	34	3
38	Yourjogh	Chitral	Chitral	35	58	26	71	33	3
43	Yalbo Sabsar	Gilgit Baltistan	Skardu	35	38	4.36	0.75	56	2.16
21	Shagarthang	Gilgit Baltistan	Skardu	35	39	22	75	45	40
35	Ganuk	Gilgit Baltistan	Skardu	34	46	55.07	76	24	51.3
37	Moorkhun	Gilgit Baltistan	Hunza	36	36	51	74	52	11.97
39	Lunkha	Gilgit Baltistan	Ghanche	35	53	48	76	28	1.08
40	Bargo	Gilgit Baltistan	Skardu	36	36	51	74	52	11.97
41	Arundu	Chitral	Chitral	35	18	35	71	32	52
42	Gartanza Shishkat	Gilgit Baltistan	Hunza	36	20	31.20	74	58	30.60
44	Handrap	Gilgit Baltistan	Ghizer	36	10	26	73	5	13
45	Susum	Chitral	Chitral	36	5	40	71	50	5
46	Koghuzi	Chitral	Chitral	35	56	21.45	71	56	15.19
47	Kiyar	Chitral	Chitral	36	6	4	71	51	16
51	Konar	Gilgit Baltistan	Skardu	34	38	1.50	75	48	59.91
52	Pawoor	Chitral	Chitral	36	34	59.5	72	49	03
53	Kunjokshal	Gilgit Baltistan	Hunza	36	26	27	74	71	14.6
55	Shogore	Chitral	Chitral	36	0	48	71	45	48
62	Gazeen	Chitral	Chitral	36	36	6.6	72	54	45.21
73	Birzeen	Chitral	Chitral	35	59	57	71	27	39
79	Golan Istor	Chitral	Chitral	36	16	40.8	71	39	49.50
78	Oveer Arkari	Chitral	Chitral	35	57	48.6	71	4	11
80	Raman-Harcheen	Chitral	Chitral	36	03	25.8	72	77	14.1

A.3. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Pakistan (Host)	Aga Khan Rural Support Programme (AKRSP)	No
Germany	Statkraft Markets GmbH	No
Sweden	Swedish Energy Agency	Yes
Belgium	Electrabel SA	Yes
Italy	Enel Trade S.p.A.	Yes
Japan	JX Nippon Oil & Energy Corporation	No

Bilateral and Multilateral Funds: Community Development Carbon Fund (CDCF). Managing company: International Bank for Reconstruction and Development (IBRD) as Trustee of the Community Development Carbon Fund (CDCF)

A.4. Reference to applied methodologies and standardized baselines

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The baseline and monitoring methodology applied to the project activity is as follows:

The baseline and monitoring methodology that applies for the project is based on the list of the small-scale CDM project activity categories contained in Appendix B of the Simplified Modalities and Procedures for Small-Scale CDM Project Activities.

The project falls under:
Type I – Renewable Energy projects

Category I A – Electricity Generation by the User, version 12

The approved baseline and monitoring methodology, given in Appendix B of the Simplified Modalities and Procedures for Small Scale CDM Project Activities, relevant to this project are available at:
http://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_AM_VECB8EZJV6NSM13KPOVCDLO9PBR4OY

A.5. Crediting period type and duration

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The start date of the project activity is 03/03/2006. A seven years crediting period (renewable twice) is selected for the activity. The first crediting period is from 29/10/2009 to 28/10/2016.

SECTION B. Implementation of project activity

B.1. Description of implemented project activity

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Micro and Mini Hydropower Technology

Micro and mini hydropower units offer a proven and reliable source of electricity in locations where the hydrological resources are available, and the topography is favourable for their development. The turbine converts the energy of falling water to mechanical energy, which can be used directly or be converted to electrical energy, through an alternator, for use in lighting, refrigeration, milling or a number of other small productive uses. The basic components of all completed mini-micro hydropower units in Gilgit-Baltistan and Chitral have been summarized as:

- Water from stream is diverted into the power channel, through temporary diversion/intake;
- Silt and other particulate material (if there is any) in the water settle in the settling basin;
- Power channel, that conveys water from the intake to the fore-bay tank;
- Waste way, carrying overflowing water from the fore-bay tank back to the stream.
- Penstock pipe transports water from fore-bay tank to the powerhouse;
- Turbine, (Cross Flow and/or Pelton) in the powerhouse converts the energy of the falling water into mechanical/rotational energy;
- Generator, (Alternator) in the powerhouse converts mechanical/rotational energy into electricity;
- Governor and/or Electric Load Controller (ELC) keeps the frequency and system voltage at constant levels in response to changes in load demand;
- Tailrace channel, to run the water from powerhouse back to the stream;

- Panel Board, in the powerhouse regulates and records the voltage and frequency;
- kWh meter/Energy Meter, records the energy supplied and consumed by the beneficiary households in the villages;
- Step up Transformer and power lines (11 KVA) transfer power to load centers;
- Step down Transformers at load centers distribute the power to the households and consumers at tail end.

In the following diagram, a schematic diagram of a typical mini/micro hydropower has been given:

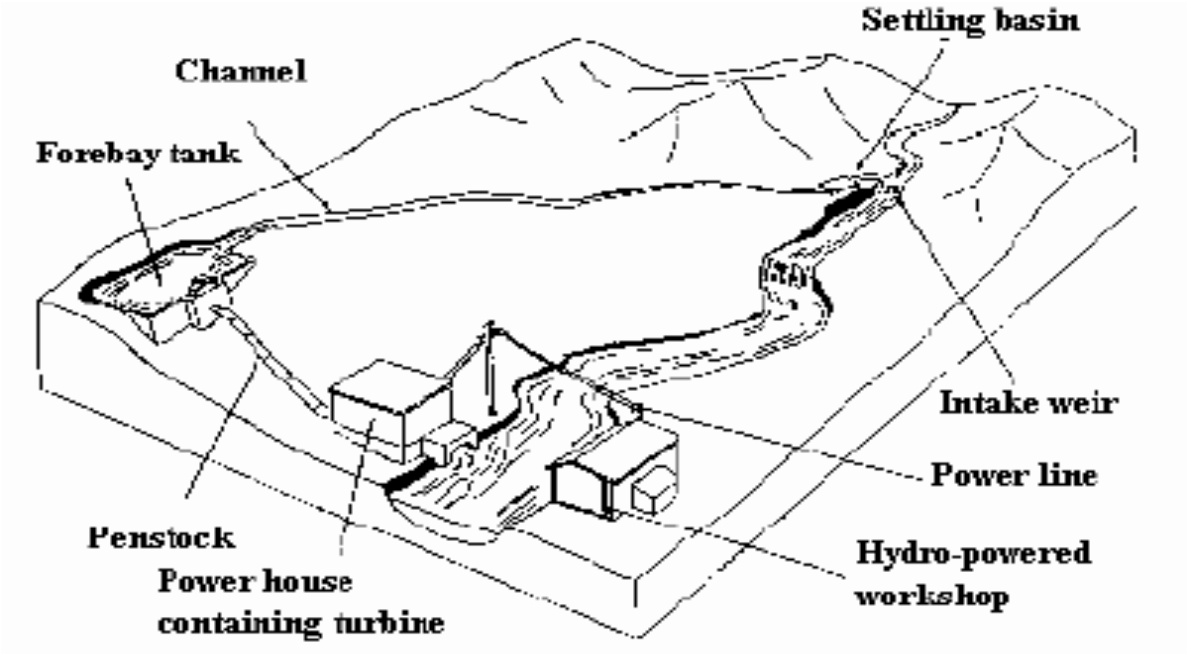

Figure 1. Schematic diagram of a typical mini/micro hydropower

The following Table 2 lists the list of the 42 Micro Hydro Power plants which are included in the monitoring period, along with the dates of initiation and competition:

Table 2 Projects included in this monitoring period, with capacities and dates

ID. No.	Region	Name of MHP Project	Capacity (kW)	Date of Initiation	Date of Completion[1]
1	Skardu	Besil	200	29/05/2006	30/12/2008
2	Skardu	Memushthang	50	18/11/2006	15/10/2007
3	Chitral	Brep	200	28/12/2005	01/12/2007
4	Chitral	Onawich	50	06/05/2006	30/06/2007
5	Chitral	Bilphok	50	28/09/2006	30/06/2007
6	Chitral	Terich Bala	80	24/09/2007	01/06/2008
7	Chitral	Kishmanja	50	25/10/2007	01/06/2008
8	Chitral	Baleem Laspur	80	24/10/2007	01/06/2008
9	Chitral	Overik	50	24/10/2007	01/06/2008
10	Skardu	Chatpa Katisho	100	20/02/2008	30/12/2009
11	Gilgit	Ahmedabad	400[2]	23/05/2006	30/06/2009
12	Skardu	Hushay	160	09/11/2007	10/04/2009

[1] The date of completion is related to PP´s final payment issuance, which is not the date of commission.

[2] The capacity of Ahmedabad was changed from 400 kW to 350 kW on 09/05/2015.

13	Chitral	Izh	108	22/09/2008	17/01/2009
14	Skardu	Dapa	160	12/10/2008	30/06/2009
15	Skardu	Katisho	100	30/04/2008	30/12/2008
16	Skardu	Memush	30	18/03/2008	30/05/2009
17	Chitral	Bireer	80	04/07/2008	04/01/2009
18	Skardu	Chowar	160	27/02/2008	31/12/2009
19	Chitral	Shahsalim	50	03/07/2008	03/01/2009
20	Skardu	Hango	100	30/12/2007	01/06/2010
22	Chitral	Gobor Merdeen	108	02/03/2009	03/12/2011
23	Skardu	Doko	160	26/03/2009	15/12/2011
24	Skardu	Haltanmosa Hargosil	120	29/11/2008	02/06/2010
25	Chitral	Zhitur	108	13/03/2008	01/06/2010
26	Chitral	Shagram	168	11/11/2008	01/06/2010
27	Chitral	Beshgram	200	08/11/2008	01/06/2010
28	Chitral	Diezgh	240	12/11/2008	01/04/2010
29	Chitral	Begust	108	13/03/2008	01/01/2010
30	Chitral	Whaat	108	06/04/2009	01/06/2010
31	Skardu	Wazirpoor	100	19/02/2009	03/06/2010
32	Chitral	Momi	240	08/11/2008	01/05/2010
33	Chitral	Zondarngram	240	06/04/2009	01/08/2010
34	Chitral	Sunich	125	08/11/2008	01/05/2010
35	Skardu	Ganuk	150	14/10/2010	31/12/2012
36	Chitral	Arkari	320	08/11/2008	30/08/2011
38	Chitral	Yourjogh	160	13/03/2008	18/08/2012
43	Skardu	Yalbo Sabsar	200	06/03/2009	25/09/2011
47	Chitral	Susum	108	01/10/2010	20/10/2012
39	Skardu	Lunkha	100	14/10/2010	01/12/2013
48	Chitral	Koguzi	108	01/03/2009	11/07/2013
49	Chitral	Kiyar	108	01/06/2012	01/11/2013
50	Chitral	Birzeen	200	14/10/2010	28/12/2013
Total (KW)			5,737		

B.2. Post-registration changes

B.2.1. Temporary deviations from the registered monitoring plan, applied methodologies or standardized baselines

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Not applicable

B.2.2. Corrections

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Not applicable

B.2.3. Changes to the start date of the crediting period

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Not applicable

B.2.4. Inclusion of monitoring plan

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Not applicable

B.2.5. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other applied standards or tools

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Not applicable

B.2.6. Changes to project design

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Not applicable

SECTION C. Description of monitoring system

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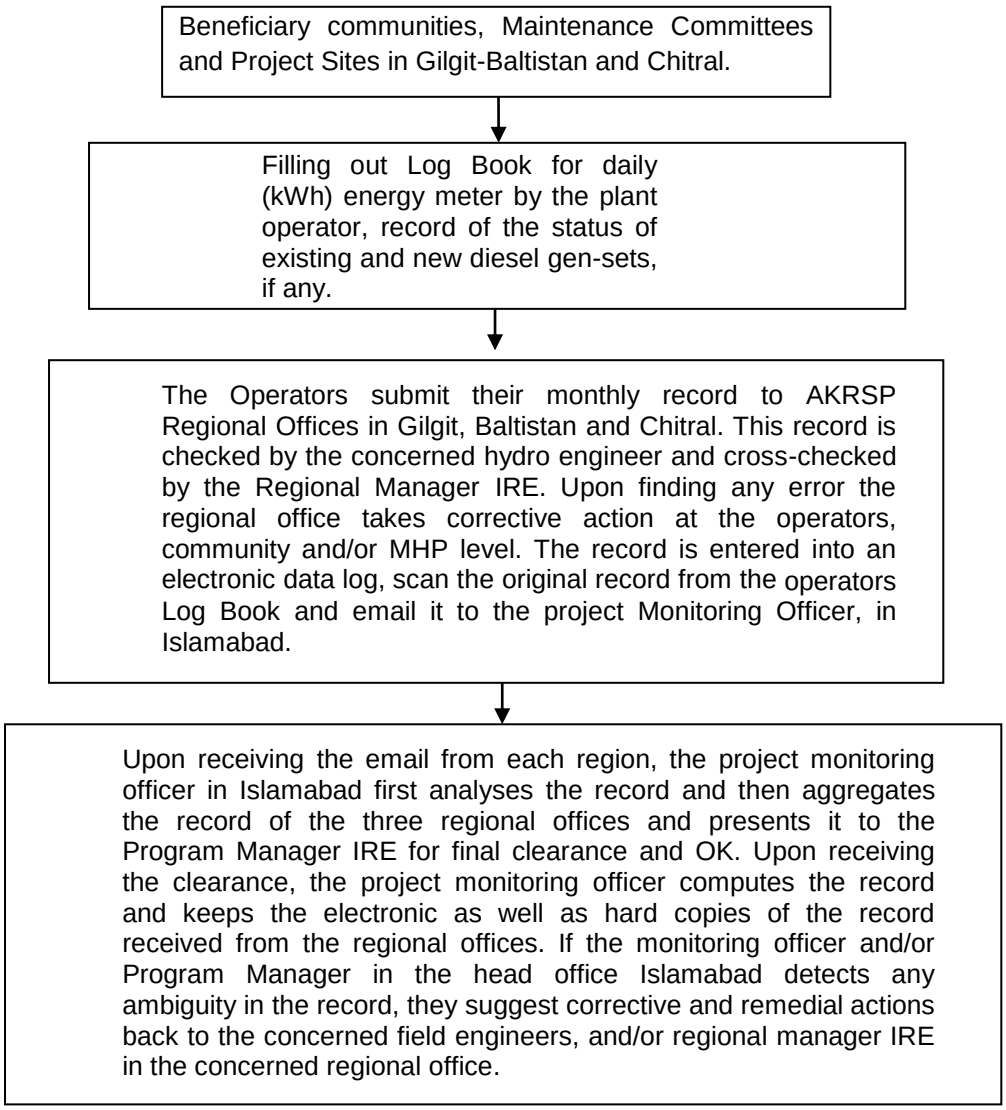
Monitoring system of “Community-based Renewable Energy Development in the NAC” project consist of filling out the Log Book each day by power house operators in each project site, with the reading from the energy (kWh) meters, situated in the power houses, for each of the commissioned and operational power plant. The meter readings recorded in the Log Book by each operator submitted to AKRSP regional offices located in Gilgit, Skardu and Chitral on a monthly basis. The AKRSP regional offices are collecting the Log Book data sheets, and enter them electronically for the projects in their respective regions. The data is kept in the regional office in hard as well as soft forms. The electronically entered data and scanned copies of operators Log Book are then sent by email to the project monitoring officer in Islamabad, who is adding up the energy production each month for all power plants included in the CDM project. The monitoring officer verifies the data from the scanned copies of Log Book and data electronically entered at regional offices and computes the data on aggregate energy production of all the power plant on monthly and annual basis. After necessary verification the hard copies of data generated are also signed by the concerned engineer in each of the three regional offices followed by the monitoring officer in Islamabad. All the data is stored in hard copies and in an electronic data log at the three regional offices as well as in Islamabad office. The data is regularly updated and will be available for verification of the DOE. Monthly readings at each plant are monitored by AKRSP and site visits are made by the field engineers for investigation in case of unusual variation in the meter readings.

AKRSP has developed a comprehensive CDM Project Monitoring Register/Log-Book to record the kWh meter reading, status of existing diesel gen-sets in each project site. This Log Book is also to record status of new gen-sets purchased for the project villages and/or any diesel gen-sets sold outside the project village to keep the record of project leakages. The Log Book also records new businesses initiated in the project village after commissioning of the MHP units. Record kept by the plant operators is duly certified by the maintenance committee of each project, with comments of the concerned field engineer on it. The plant operator submits this record to the AKRSP regional offices every month, along with kWh meter readings. The regional offices keep the monthly record of status of diesel gen-sets in each project village. The three regional offices scan the original record from the operators and pass it on to the Project Monitoring Officer in Islamabad. This record is kept both in soft and hard forms in the regional as well as Islamabad office for verification of DOE. Before passing the record to project monitoring officer based in Islamabad, the record is also cross-checked by the concerned Regional Manager, Infrastructure and Renewable Energy (IRE) in the respective regional offices. This is for two purposes: first to take corrective action if there is any variation in the record and second is to instruct the field engineer to take remedial action in case of any indication of unnecessary variation in meter readings detected in any unit. The concerned engineer and/or Project Monitoring Officer verifies the record before putting it into the project files. The record maintained by the project monitoring officer in Islamabad is also cross checked by the Program Manager CPI/CDM, randomly and suggest appropriate actions, wherever it is necessary AKRSP’s field engineers and operators have been trained to assess any malfunctioning of the energy meters, turbines, alternators, panel boards and to take action for rectifying the problems. The monitoring steps for CDM are as under:



Management structure for monitoring: The Program Manager IRE based in Islamabad is responsible for overall implementation of the project activities. The Program Manager reports to the CEO of AKRSP. The project monitoring officer, is responsible for record keeping and data consolidation and she reports to the Program Manager IRE. The three regional managers of IRE in the three regional offices are responsible for daily operations of the projects. The managers administratively report to the Regional Program Managers in their respective regions and are technically report to the Program Manager IRE based in Islamabad. A pool of engineers and sub engineers (hydropower/electrical, mechanical and civil cadres) in each regional office report to the Regional Manager IRE. The field engineers are directly responsible to supervise the field operations and providing guidance to the projects committees, maintenance committees, plant operators, village organizations (VOs), women's organizations (WOs) and beneficiary communities. The communities and operators directly approach the Regional Manager IRE and Regional Program Manager in each regional office for various matters related to the projects in their catchments. Moreover, male and female social mobilizers are work with the project communities, through local support organizations (LSOs). LSOs are legal intermediary institutions evolved from the federation of VOs, WOs, Civil Society Organizations and representation of elected representatives in each union council. The LSOs have their offices located in their catchments with a few paid staff. Communication channels of AKRSP staff with all tiers of community institutions are open as and when a need for meeting arises.

AKRSP has provided appropriate training to the engineers, data operators and plant operators in data monitoring, data entry and recording both in soft and hard form. AKRSP has trained the field

engineers to asses any malfunctioning of the energy meters and to take action on rectifying the problems. AKRSP's Regional and Islamabad Office staff members in charge of the database have received training on entering data from log books into the database (excel sheets), electronic logging of information, analysis of this information, and production of regular reports.

AKRSP is monitoring the connections of the micro hydropower projects, included under the CDM activity, to the grid. So far no connection to the national grid has occurred. Any MHP that opts to connect to the national grid, which may be extended to the project area in the future, will be excluded from the project.

Leakage is monitored by preparing an inventory of all diesel gen-sets being used in each community where a micro- hydropower project is being installed and monitoring that they are either scrapped or remain in the community as back-up generators after the MHP starts operation. The communities if purchase any generator for these purposes before it gets sold outside the community as per the Terms of Partnership with AKRSP. Should any gen-sets be sold outside the project boundary, in violation of the TOP, the leakage emissions is monitored by AKRSP and records kept for verification by the DOE.

It will not be necessary to monitor the actual amount of kWh produced by backup gen-sets which remain inside the project boundary. Any kWh produced as backup power generated by diesel gen-sets remaining in the communities, either during the hours when the hydro is not operational or not producing sufficient power to meet all community needs, will be considered as the component of the baseline emissions which would also exist in the project scenario and would thus cancel out. The energy from the micro-hydropower project which is not supplied to the user of the back-up generator, during its operation, will not be recorded at the kWh meter in the power house and will thus not be recorded as baseline emissions. As the monitoring methodology being used for the project is to record the actual kWh being produced by the MHP, it will thus not be necessary to monitor the kWh produced by back up diesel gen-sets which remain with the project boundary. Also, please note that no diesel gen-sets are used to start-up the MHPs as the MHP plants use small —self-exciting alternators.

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante

Data/Parameter	**Emission factor of operating diesel gen-sets**
Unit	kg CO2eq /kWh
Description	This emission factor was derived from the results of a survey of existing diesel generator sets operating in the region where the project activity is to be carried out.
Source of data	Survey of existing generator sets
Value(s) applied	1.24 kg CO2eq /kWh
Choice of data or measurement methods and procedures	As per the registered PDD.
Purpose of data/parameter	The emission factor is used to calculation of baseline emissions.
Additional comments	Not applicable

D.2. Data and parameters monitored

Data/Parameter	**Energy production by each power plant**
Unit	kWh (kilowatt hour)

Description	Three phase kWh (energy) meters at each power house measure energy supplied to the distribution system of the mini grid
Measured/calculated/ default	As per actual daily reading
Source of data	Log book placed at each power house
Value(s) of monitored parameter	9,824,087 kWh
Monitoring equipment	For all commissioned projects high quality three-phase energy (kWh) meters manufactured by Syed Bhais (Pvt.) Ltd, Pakistan has been used in each powerhouse to record the total power supplied to the beneficiary communities. The information of the electricity meters used during the monitoring period can be seen in Table 2 below. Syed Bhais is ISO-9000: 1994 Certified by DNV International in 1999 and ISO-9000:2000 by RWTUV in 2002. Syed Bhaies energy meters are also approved by Water and Power Development Authority (WAPDA) Pakistan for its projects. As a standard practice all meters are calibrated and stamped by Syed Bhais before selling it in the market. The standard requirement as confirmed and stipulated in the letter from the Syed Bhais, meters once installed and calibrated are not required calibration unless any errors are reported. With taking into consideration the guidance from Syed Bhais, the analogue meters will be calibrated once they will achieve two years of use and/or detection of any error in readings.
Measuring/reading/recording frequency	As per actual daily reading
Calculation method (if applicable)	Current Transformers (CT) have been installed in the panel boards to regulate the current. In the CT operated panel boards, the CT ratio is embedded on the CTs fixed in the panel boards. According to the requirement of manufacturer (Syed Bhais), the kWh meter reading has to be multiplied with the CT ratio to get the actual kWh readings. The CT ratio is more than 1, in projects above 100 kW.
QA/QC procedures	Regular monitoring of the schemes is carried out during and after construction by AKRSP to ensure high quality construction and sustainable operation of the MHP schemes. AKRSP is carefully monitoring the monthly energy production, status of diesel gen-sets and end-uses data submitted by each unit and providing guidance to improve the load factor and increase energy use in the productive uses. As per the manufacture's confirmation on accuracy, the deduction in kWh: 1 % for digital meters and 2 % for analogue meters will be applied in case of the delay of calibration and no calibration is needed in case of digital meters.
Purpose of data/parameter	Energy production by each plant is used along with the emission factor to calculate the baseline emissions reductions and derive the emissions reductions for the monitoring period.
Additional comments	n/a

Table 3. Information of the electricity meters used during the monitoring period

ID. No.	Region	Name of MHP Project	Capacity (kW)	Due Date of Calibration	Actual Date of Calibration/ Replacement/ Installation	Type of Meter	Status of kWh Meter
1	Skardu	Besil	200	Not needed	13/02/2014	Digital	Replaced with Digital
2	Skardu	Memushthang	50	19/06/2011	20/03/2012	Analog	Not Calibrated/Replaced
3	Chitral	Brep	200	Not needed	19/10/2011	Digital	Replacded with Digital
4	Chitral	Onawich	50	Not needed	04/04/2012	Digital	Replaced with Digital
5	Chitral	Bilphok	50	Not needed	07/11/2011	Digital	Replaced with Digital
6	Chitral	Terich Bala	80	04/07/2011	09/07/2013	Analog	Replaced with Analog
7	Chitral	Kishmanja	50	Not needed	16/04/2012	Digital	Replaced with Digital
8	Chitral	Baleem Laspur	80	Not needed	04/05/2012	Digital	Replaced with Digital
9	Chitral	Overik	50	Not needed	Not Calibrated/Replaced	Digital	Not Calibrated/Replaced
10	Skardu	Chatpa Katisho	100	Not needed	13/12/2012	Digital	Replaced with Digital
11	Gilgit	Ahmedabad	400	26/10/2011	01/07/2012	Analog	Replaced with Analog
12	Skardu	Hushay	160	11/11/2012	20/11/2012	Analog	Not Calibrated/Replaced
13	Chitral	Izh	108	Not needed	Not Calibrated/Replaced	Digital	Not Calibrated/Replaced
14	Skardu	Dapa	160	Not needed	04/04/2014	Digital	Replaced with Digital
15	Skardu	Katisho	100	10/11/2012	17/04/2012	Analog	Not Calibrated/Replaced
16	Skardu	Memush	30	24/06/2011	21/03/2012	Analog	Not Calibrated/Replaced
17	Chitral	Bireer	80	Not needed	Not Calibrated/Replaced	Digital	Not Calibrated/Replaced
18	Skardu	Chowar	160	Not needed	03/06/2013	Digital	Replaced with Digital
19	Chitral	Shahsalim	50	Not needed	13/11/2013	Digital	Replaced with digital
20	Skardu	Hango	100	12/01/2013	14/06/2013	Analog	Not Calibrated/Replaced
22	Chitral	Gobor Merdeen	108	Not needed	01/01/2012	Digital	Replaced with Digital
23	Skardu	Doko	160	Not needed	12/02/2014	Digital	Replaced with Digital
24	Skardu	Haltanmosa Hargosil	120	30/10/2012	12/06/2014	Analog	Not Calibrated/Replaced
25	Chitral	Zhitur	108	Not needed	12/06/2014	Digital	Not Calibrated/Replaced
26	Chitral	Shagram	168	05/12/2012	12/06/2014	Analog	Not Calibrated/Replaced
27	Chitral	Beshgram	200	Not needed	12/06/2014	Digital	Replaced with digital
28	Chitral	Diezgh	240	Not needed	12/06/2014	Digital	Replaced with Digital
29	Chitral	Begust	108	Not needed	12/06/2014	Digital	Replaced with Digital
30	Chitral	Whaat	108	Not needed	12/06/2014	Digital	Replaced with Digital
31	Skardu	Wazirpoor	100	02/10/2012	16/06/2013	Analog	Not Calibrated/Replaced
32	Chitral	Momi	240	Not needed	Not Calibrated/Replaced	Digital	Analogue replaced before the due date
33	Chitral	Zondarngram	240	26/12/2012	Not Calibrated/Replaced	Analog	Not Calibrated/Replaced
34	Chitral	Sunich	125	09/12/2012	19/01/2012	Analog	Replaced with Analog
35	Skardu	Ganuk	150	start operating in this monitoring period	01/08/2014	Analog	Not Calibrated/Replaced
36	Chitral	Arkari	320	Not needed	25/10/2012	Digital	Replaced with Digital
38	Chitral	Yourjogh	160	Not needed	01/10/2011	Digital	Not yet due
43	Skardu	Yalbo Sabsar	200	start operating in this monitoring period	01/10/2011	Analog	Not Calibrated/Replaced
47	Chitral	Susum	108	Not needed	20/14/2012	Digital	Replaced with digital
39	Skardu	Lunkha	100	start operating in this monitoring period	15/12/2013	Analog	Not Calibrated/Replaced
48	Chitral	Koguzi	108	Not needed	15/12/2013	Digital	Replaced with digital
49	Chitral	Kiyar	108	Not needed		Digital	Replaced with digital
50	Chitral	Birzeen	200	Not needed		Digital	Replaced with digital

Data/Parameter	Energy production by new diesel gen set purchased in the project boundary
Unit	kWh (kilowatt hour)
Description	If new diesel generator sets are purchased by participating communities in the project boundary, due to increasing demand, long-term failure of hydro plants, these will be considered as project emissions. For this monitoring period, diesel gen-set were used in Village Izh 108 kW MHP Project in the Micro Finance Bank (4.8 kW.)
Measured/calculated/ default	Measured
Source of data	A log book associated with each diesel gen set will be maintained by the operator
Value(s) of monitored parameter	76.8 kWh
Monitoring equipment	The operator will keep daily logs of kWh produced through diesel gen sets. At the end of the month, the operator will send this information to the AKRSP office, where this information will be compiled for all sites, where the gen-sets are used. All the data will be consolidated and stored in an electronic data log at the AKRSP office. The data will be regularly updated and shared with the DOE to enable verification of ERs.
Measuring/reading/recording frequency	Daily reading, monthly recording
Calculation method (if applicable)	Not applicable
QA/QC procedures	Power output of each diesel gen-set will be verified by AKRSP field engineers during routine field visits to the project sites. AKRSP will coordinate and monitor the monthly diesel gen set energy production and end-uses data submitted by each of the participating communities. AKRSP will also train the diesel gen set operators in maintaining the kWh reading.
Purpose of data/parameter	Produced electricity is used along with the diesel gen-sets emission factor to calculate the project emissions.
Additional comments	n/a

D.3. Implementation of sampling plan

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Not Applicable.

SECTION E. Calculation of emission reductions or net anthropogenic removals

E.1. Calculation of baseline emissions or baseline net removals

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The calculation of baseline emissions are presented as described in the registered CDM-PDD as follows.

$E_B = \Sigma iO_i / (1-l)$

Where:

- E_B = annual energy baseline in kWh per year
- **Σi=** the sum over the group of "i" renewable energy technologies (e.g. solar home systems, solar pumps) implemented as part of the project.
- O_i = the estimated annual output of the renewable energy technologies of the group of "i" renewable energy technologies installed (in kWh per year)
- l = average technical distribution losses that would have been observed in diesel powered mini-grids installed by public programs or distribution companies in isolated areas, expressed as a fraction. As per the registered PDD, technical distribution losses on mini-grid distribution systems = 0.2

The aggregations of the annual kWh meter readings of all the micro-hydro systems give the (ΣiOi)

The annual energy baseline in kWh per year (EB) comes out to be the sum of all the annual meter readings at the hydro power houses divided by (1-0.2), to take into account the avoided transmission losses from locally generated power

The annual energy baseline (EB) includes 42 projects operational during the monitoring period.

ΣiOi = 9,824,087 kWh

E_B= 9,824,087 / (0.8) = 12,280,108 kWh

Total annual emission reductions can be calculated by multiplying EB by the emission coefficient of the displaced fuel. An emission coefficient of 1.24 kg CO2eq/kWh is used in the calculations as discussed in Section B.4 of the PDD.

Baseline Emissions (tCO2/yr) = E_B (kWh) * 1.24 kg CO2eq/kWh * 1/1,000

= 12,280,108 * 1.24 * 1/1000

= 15,227 tCO2eq

E.2. Calculation of project emissions or actual net removals

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Project Emissions (tCO2/yr) = EP (kWh) * 1.24 kg CO2eq/kWh * 1/1000 (only case of new diesel gen-sets being purchased)

According to the previous monthly monitoring reports from the field, in January 2011, two (2) new diesel gen-sets have been brought into a project village Izh (with 108 kW operational MHP) in Chitral. It has been reported that the two new diesel gen-sets have been purchased, one by a Bank and another by a Community Center to use them as back-up.

As per the monitoring requirements, it will thus not be necessary to monitor the kWh produced by back up diesel gen-sets used by the consumers which remain with the project boundary as far as the gen-set outputs don't flow through the meter as used to record the power output of the hydropower plant. Also, please note that no diesel generators are used to start-up the MHPs as the MHP plants use small —self-exciting alternators. Thus, the emissions from the two gen-sets

in Izh village are not actual project emissions. However, for conservativeness, the project participant deducts them from the emissions reductions.

The total backup usage of these two newly purchased diesel gen sets have been recorded, which is 76.8 kWh.

The project emissions are therefore calculated as:

76.8 kWh x 1.24 kg CO2 eq /kWh *1/1000 = 0.095, which has been rounded up to 1 tCO_2e

E.3. Calculation of leakage emissions

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During this reporting period there has not been any sale of diesel gen-sets by the communities to communities outside the project villages/ boundary. Therefore, leakage is considered as "0" (zero).

E.4. Calculation of emission reductions or net anthropogenic removals

	Baseline GHG emissions or baseline net GHG removals (t CO_2e)	Project GHG emissions or actual net GHG removals (t CO_2e)	Leakage GHG emissions (t CO_2e)	GHG emission reductions or net anthropogenic GHG removals (t CO_2e)		
				Before 01/01/2013	From 01/01/2013	Total amount
Total	15,227	1	0	0	15,226	15,226

E.5. Comparison of emission reductions or net anthropogenic removals achieved with estimates in the registered PDD

Amount achieved during this monitoring period (t CO_2e)	Amount estimated ex ante (t CO_2e)
15,226	186,093

E.6. Remarks on increase in achieved emission reductions

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No increase in achieved emission reductions is experienced in this monitoring period.

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Document information

Version	*Date*	*Description*
06.0	7 June 2017	Revision to: • Ensure consistency with version 01.0 of the "CDM project standard for project activities" (CDM-EB93-A04-STAN); • Make editorial improvements.
05.1	4 May 2015	Editorial revision to correct version numbering.
05.0	1 April 2015	Revisions to: • Include provisions related to delayed submission of a monitoring plan; • Provisions related to the Host Party; • Remove reference to programme of activities; • Overall editorial improvement.
04.0	25 June 2014	Revisions to: • Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1; • Change the reference number from *F-CDM-MR* to *CDM-MR-FORM*; • Editorial improvement.
03.2	5 November 2013	Editorial revision to correct table in page 1.
03.1	2 January 2013	Editorial revision to correct table in section E.5.
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB 70, Annex 11).
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01.0	28 May 2010	EB 54, Annex 34. Initial adoption.

Decision Class: Regulatory
Document Type: Form
Business Function: Issuance
Keywords: monitoring report