

## Appendix A<sup>1</sup> to the simplified modalities and procedures for small-scale CDM project activities

### CLEAN DEVELOPMENT MECHANISM SIMPLIFIED PROJECT DESIGN DOCUMENT FOR SMALL SCALE PROJECT ACTIVITIES (SSC-PDD) Version 01 (21 January, 2003)

#### Introductory Note

1. This document contains the clean development mechanism project design document for small-scale project activities (SSC-PDD). It elaborates on the outline of information in appendix B “Project Design Document” to the CDM modalities and procedures (annex to decision 17/CP.7 contained in document FCCC/CP/2001/13/Add.2) and reflects the simplified modalities and procedures (herewith referred as simplified M&P) for small-scale CDM project activities (annex II to decision 21/CP.8 contained in document FCCC/CP/2002/7/Add.3).
2. The SSC-PDD can be obtained electronically through the UNFCCC CDM web site (<http://unfccc.int/cdm/ssc.htm>), by e-mail ([cdm-info@unfccc.int](mailto:cdm-info@unfccc.int)) or in print from the UNFCCC secretariat (Fax: +49-228-8151999).
3. Explanations for project participants are in italicized font (*e.g. explanation*).
4. The Executive Board may revise the SSC-PDD if necessary. Revisions shall not affect small-scale CDM project activities validated prior to the date at which a revised version of the SSC-PDD enters into effect. Versions of the SSC-PDD shall be consecutively numbered and dated. The SSC-PDD will be available on the UNFCCC CDM web site in all six official languages of the United Nations.
5. In accordance with the CDM modalities and procedures, the working language of the Board is English. The completed SSC-PDD shall therefore be submitted to the Executive Board in English.
6. Small-scale activities submitted as a bundle, in accordance with paragraphs 9 (a) and 19 of the simplified M&P for small-scale CDM project activities, may complete a single SSC-PDD provided that information regarding A.3 (*Project participants*) and A.4.1 (*Location of the project activity*) is completed for each project activity and that an overall monitoring plan is provided in section D.
7. A small-scale project activity with different components eligible to be proposed<sup>2</sup> as a small-scale CDM project activity may submit one SSC-PDD, provided that information regarding subsections A.4.2 (*Type and category(ies) and technology of project activity*), and A.4.3 (*brief statement on how*

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<sup>1</sup> This appendix has been developed in accordance with the simplified modalities and procedures for small-scale CDM project activities (contained in annex II to decision 21/CP.8, see document FCCC/CP/2002/7/Add.3) and it constitutes appendix A to that document. For the full text of the annex II to decision 21/CP.8 please see <http://unfccc.int/cdm/ssc.htm>.

<sup>2</sup> In paragraph 7 of simplified M&P for small-scale CDM project activities, on clarifications by the Executive Board on small-scale CDM project activities, the Board agreed that in a project activity with more than one component that will benefit from simplified CDM modalities and procedures, each component shall meet the threshold criterion of each applicable type, e.g. for a project with both a renewable energy and an energy efficiency component, the renewable energy component shall meet the criterion for “renewable energy” and the energy efficiency component that for “energy efficiency”.

*anthropogenic emissions of greenhouse gases (GHGs) by sources are to be reduced by the proposed CDM project activity)* and sections B (*Baseline methodology*), D (*Monitoring methodology and plan*) and E (*Calculation of GHG emission reductions by sources*) is provided separately for each of the components of the project activity.

8. If the project activity does not fit any of the project categories in appendix B of the simplified M&P for small-scale CDM project activities, project proponents may propose additional project categories for consideration by the Executive Board, in accordance to paragraphs 15 and 16 of the simplified M&P for small-scale CDM project activities. The project design document should, however, only be submitted to the Executive Board for consideration after it has amended appendix B as necessary.

9. A glossary of terms may be found on the UNFCCC CDM web site or from the UNFCCC secretariat by e-mail ([cdm-info@unfccc.int](mailto:cdm-info@unfccc.int)) or in print (Fax: +49-228-8151999).

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## **A. General description of project activity**

### **A.1 Title of the project activity:**

Lohgarh, Chakbhai and Sidhana Mini Hydroelectric Projects

### **A.2 Description of the project activity:**

#### **Purpose**

The purpose of the project activity is to generate electricity by utilising water flowing through the existing canal system as a renewable energy resource to meet the ever-increasing demand for energy in the region. The development of the project activity contemplates the production of clean hydroelectric power that will contribute to reduce the CO<sub>2</sub> emissions, which would have occurred otherwise, in the absence of these projects.

Lohgarh with total installed capacity of 2.0 MW, Chakbhai 2.0 MW and Sidhana 1.2 MW would generate electricity and sell it to the state grid, Punjab State Electricity Board (PSEB) through Power Purchase Agreement (PPA) contract.

These projects are low head, canal drop based mini hydroelectric projects (project activity) located on the Bhatinda Branch Canal, District Sangrur, Punjab. The projects are run-off-river renewable hydroelectric generating plants, which include forebay, mechanical intake gates, trashracks, draft tubes, vertical turbine and a powerhouse with its discharge channel and adjoining roads. The projects do not involve any type of displacement, rehabilitation or relocation.

Lohgarh is located on the fifth fall on the Bhatinda branch and is being implemented by combining it with the fourth fall at upstream i.e. Maholi., Chakbhai is being implemented by combining sixth and seventh fall and Sidhana on the combination of ninth and tenth fall on Bhatinda Branch canal which off-takes from Bowani head regulator on combined branch of Sirhind canal. Sirhind canal off-takes upstream of Ropar Headworks from river Satluj, being fed with releases from Gobind Sagar reservoir of Bhakra Dam. The Bhatinda Branch canal flows through uneven terrain which necessitates provision of falls along its course.

Punjab being a dominant agricultural and industrial state is facing energy crisis. There are no coalmines or oil wells in Punjab. Geo-thermal and tidal power is also not available in the state. For thermal power, coal has to be transported from distant places. Similarly, the scope for exploiting wind energy is also very limited because of low velocity of winds. The scope for solar energy is very wide in the State. Bio-gas can meet the requirements of rural people to a limited extent. The main source of power in the State all along has been hydroelectric power. Three perennial rivers flow through the State and these along

with falls on the canals are being exploited to generate electricity. To improve the quality/reliability of power supply great importance is being given to strengthen the transmission and distribution system.

As a progressive forward-looking step, Punjab Energy Development Agency (PEDA), a state nodal agency of Government of Punjab is giving close attention to exploiting renewable energy resources. Various irrigation canals in the state flow through uneven terrain, which necessitates provision of falls along the course. If not utilized the power potential available at these canal drops would be wasted. PEDA has identified mini-hydel schemes on such canal falls among the prime sources in this category and has invited private promoters to develop these projects.

These schemes are being implemented through a special purpose vehicle in the name of Aqua Power Limited (APL).

### **Contribution of the project activity to sustainable development**

Government of India has stipulated social, economic, environmental and technological well-being as indicators for sustainable development in the interim approval guidelines<sup>3</sup> for CDM projects. APL believes that the project activity has beneficial effect on agriculture, rural industries and employment in the region and has the potential to shape the economic, environmental and social life of the people in the region.

#### **Environmental well being**

- The project activity, by generating clean power would eliminate an equivalent carbon dioxide, sulphur dioxide, nitrogen oxides, SPM *etc.* which would have been otherwise generated to produce electricity.

#### **Social well being**

- The project activity has helped to create employment in the area for skilled and unskilled labour during construction and operation.
- The project activity has also helped to create business opportunity for local stakeholders such as bankers, consultants, suppliers / manufacturers, contractors and other small shop owners *etc.*
- The individual schemes are equipped with mechanical trash racks to remove the trash in the canal. This helps to ensure flow of clean water in the canal for irrigation and drinking purposes
- Due to 24 hour operation of the plants, the area has been lighted with road reflectors and flash lights. This has provided security for the local people in the odd hours

#### **Economic well being**

- This electricity generation from the project activity would substitute the power generation by thermal power plants, which supply electricity to the state grid. It would contribute towards the

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<sup>3</sup> Ministry of Environment and Forest web site: [http://envfor.nic.in:80/divisions/ccd/cdm\\_iac.html](http://envfor.nic.in:80/divisions/ccd/cdm_iac.html)

reduction in (demand) use of finite natural resource like coal, natural gas etc. minimizing depletion or else increasing availability to other important processes.

- Project activity would help to reduce transmission losses due to generation of decentralised power close to load points.
- Project activity would help to reduce the demand-supply gap in the power deficit state grid.
- The setting up of these schemes has also helped in the upgradation of old rural grids and strengthening of country's rural electrification coverage.
- Project activity would help in preservation of irrigation canals/bridges/roads by up-gradation of these structures.
- Project activity would also contribute to the state exchequer.

Technological well being

- The technology selected for the power project is using Vertical Full Kaplan type turbines

### **A.3 Project participants:**

Project owner and : Aqua Power Limited  
developer

Aqua Power Limited is the official contact for this CDM project activity

Contact information of the parties involved in the project activity is provided in the Annex 1 of this document.

### **A.4 Technical description of the project activity:**

#### **A.4.1 Location of the project activity:**

**A.4.1.1** Host country Party(ies): India

**A.4.1.2** Region/State/Province etc.: Punjab

**A.4.1.3** City/Town/Community etc: District Sangrur

**A.4.1.4** Detailed description of the physical location, including information allowing the unique identification of this project activity (*max one page*):

#### **Lohgarh**

The scheme is located on the combination of fourth and fifth fall (road distance 39014 m) on Bhatinda branch canal located downstream of Bowani head regulator. Nearest trunk rail head is at Ahmedgarh

located about 20 km from the project site. The site is well connected by metalled road from Raikot town (14 km) to Malerkotla (30 km).

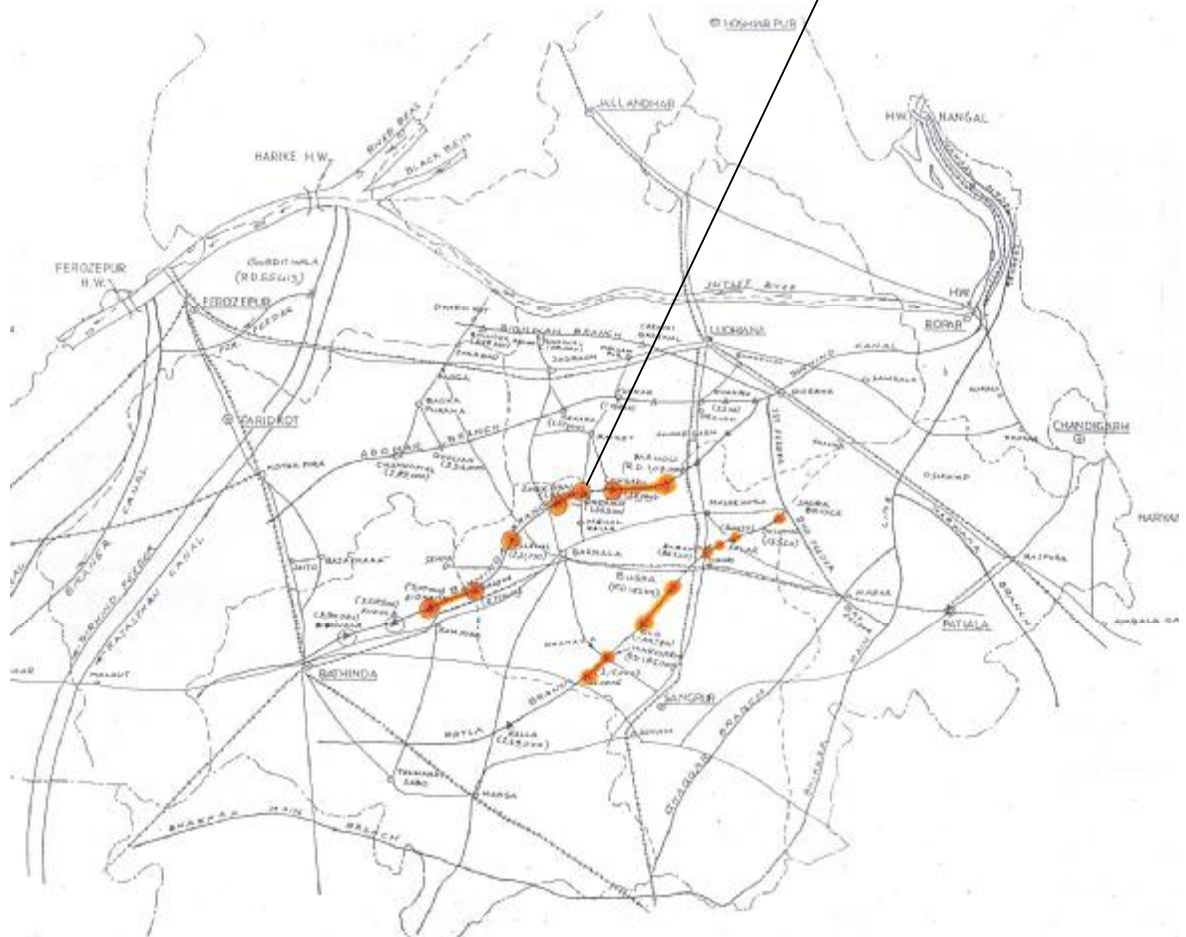
**Chakbhai**

The scheme is located on the combination of sixth and seventh fall (road distance 56388 m) on Bhatinda branch canal located downstream of Bowani head regulator. Nearest trunk rail head is at Jagroan located about 20 km from the project site. The site is well connected by metalled road from Raikot town (8 km) to Barnala (30 km).

**Sidhana**

The scheme is located on the combination of ninth and tenth fall (road distance 93574 m) on Bhatinda branch canal located downstream of Bowani head regulator. Nearest trunk rail head is at Rampura located about 10 km from the project site. The site is well connected by metalled road from Rampura town (10 km).

The geographical location of district Sangrur is detailed in the maps below.



#### **A.4.2 Type and category(ies) and technology of project activity**

Type I: Renewable Energy Project

Category-D: Renewable electricity generation for a grid

As per the provisions of Appendix B of Simplified Modalities and Procedures for Small Scale CDM Project Activities, (Version 04) Type ID “comprises renewables, such as photovoltaics, hydro, tidal/wave, wind, geothermal, and biomass, that supply electricity to an electricity distribution system that is or would have been supplied by at least one fossil fuel or non-renewable biomass fired generating unit.

Project activity comprises three renewable mini hydropower schemes with total capacity of 5.2 MW, which supply electricity to the Punjab state grid. With above considerations, the Type I.D. is the most appropriate category for the project under discussion. The project activity does not comprise any electricity generation from non-renewable energy sources.

The baseline and emission reductions calculations from the project would therefore be based on paragraph 7 of Type I.D. The monitoring methodology would be based on the guidance provided in the paragraph 7 of Type I.D.

#### **Technology of project activity**

There is no transfer of technology to the host country since the technology is available locally.

Lohgarh: The powerhouse comprises of two synchronous generators of capacity 1000 kW each coupled to two numbers of vertical Full-Kaplan turbines. The power is generated at a voltage of 6.6kV, which is further stepped-up to 11 kV to match the nearest substation voltage level.

Chakbhai: The powerhouse comprises of two synchronous generators of capacity 1000 kW each coupled to two numbers of vertical Full-Kaplan turbines. The power is generated at a voltage of 6.6kV, which is further stepped-up to 11 kV to match the nearest substation voltage level.

Sidhana: The powerhouse comprises of one synchronous generator of capacity 1200 kW coupled to a vertical Full-Kaplan turbine. The power is generated at a voltage of 6.6kV, which is further stepped-up to 11 kV to match the nearest substation voltage level.

The principal components of each scheme are:

- (a) Forebay and intake- Forebay is partly trapezoidal and RCC trough section where the water is diverted towards the powerhouse upon closure of main canal gates via the intake.
- (b) Power house- A semi outdoor type powerhouse has been provided to house the turbines, generators and related electro-mechanical equipment.

- (c) Draft tube- RCC draft tube has been provided to convey the tail water emerging from discharge side of the turbine to the main canal via tailrace channel.
- (d) Turbine- Vertical Full Kaplan has been provided for all the three projects.
- (e) Tailrace- The discharge emerging out of the draft tubes is carried back to main canal on downstream of the project by trapezoidal shaped tailrace channel connecting draft tube exit to the main canal.
- (f) Switchyard- Surface type switchyard has been provided with necessary equipment for interfacing with the grid.

**A.4.3 Brief statement on how anthropogenic emissions of greenhouse gases (GHGs) by sources are to be reduced by the proposed CDM project activity:**

The project activity, which utilises renewable hydraulic resources, would reduce anthropogenic GHG emissions as per the combined margin carbon intensity of the regional grid which is mainly dominated by fossil fuel based power plants. Since there is no storage of water in the project activity, there are no GHG emissions from the project activity.

Conventional energy equivalent of

- 87.99 million kWh-Lohgarh
- 114.72 million kWh-Chakbhai
- 66.11 million kWh-Sidhana

for a period of 10 years would be replaced by power generated from the project activity. The project would thereby result in total CO<sub>2</sub> emission reduction of 229,233 tons over the 10-year crediting period. In the absence of the project activity equivalent electricity would have to be supplied to the regional grid customers from a mix of power plants supplying power to grid.

**A.4.4 Public funding of the project activity:**

Total funding required in the project activity was mobilised through debt financing and equity capital. Debt portion, which is around 74% of the total investment, was funded by Canara Bank, Corporation Bank and UTI Bank and does not include any public funding from Annex I countries. The equity capital was mobilised by the project proponents at their own risk out of their resources. Apart from the above, no other funding is involved.

Hence, the project proponents hereby confirm that public funding from parties included in Annex-I is not involved in the project activity.

#### **A.4.5 Confirmation that the small-scale project activity is not a debundled component of a larger project activity:**

According to Appendix C of Simplified Modalities & Procedures for small scale CDM project activities, 'Debundling' is defined as the fragmentation of a large project activity into smaller parts. The three schemes are being presented as one project activity, with total capacity of 5.2 MW and are not part of any other large project activity. A small-scale project activity shall be deemed to be a debundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

- With the same project participants;
- In the same project category and technology/measure;
- Registered within the previous 2 years; and
- Whose project boundary is within 1 km of the project boundary of the small-scale activity at the closest point.

The project activity is not a de-bundled component of a large project activity as the project proponent has not registered or applied to register any other small scale CDM project activity of same project type/category within a project boundary of 1 km.

## **B. Baseline methodology**

### **B.1 Title and reference of the project category applicable to the project activity:**

Main Category: Type I - Renewable Energy Projects

Sub Category: I.D. - Renewable electricity generation for a grid

The reference has been taken from the list of the small-scale CDM project activity categories contained in 'Appendix B of the simplified M&P for small-scale CDM project activities-Version 4'

### **B.2 Project category applicable to the project activity:**

Appendix B of the simplified M&P for small-scale CDM project activities-Version 4 provides indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories. As per this document the project activity falls under Category I.D.-Renewable electricity generation for a grid.

Baseline for projects under Type I. D has been detailed in paragraph 7 of Type I.D. described in Annex B of the simplified modalities and procedures for small-scale CDM project activities It states that the baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kgCO<sub>2</sub>/kWh) calculated in a transparent and conservative manner as:

- a) The average of the “approximate operating margin” and the “build margin”, where:
  - i. The “approximate operating margin” is the weighted average emissions (in kgCO<sub>2</sub>equ/kWh) of all generating sources surviving the system, excluding hydro, geothermal, wind, low-cost biomass, nuclear and solar generation;
  - ii. The “build margin” is the weighted average emissions (in kgCO<sub>2</sub>equ/kWh) of recent capacity additions to the system, defined as the higher (in MWh) of most recent 20% of plants built or the 5 most recent plants;

OR

- b) The weighted average emissions (in kgCO<sub>2</sub>equ/kWh) of current generation mix.

Considering the available guidelines and the present project scenario, Punjab state grid has been chosen for baseline analysis by selecting “The average of the approximate operating margin and the build margin (combined margin)” for baseline calculations. The Operating Margin (OM) estimates the effect of the project activity on the operation of existing power plants and the Build Margin (BM) estimates the effect of the proposed project activity on the building of alternate power plants. Elements of operating and build margins are captured in the combined margin which is chosen as representative baseline for the credit period.

In the absence of the project activity, the same energy load would have been taken up by state grid comprised primarily of thermal power plants and emission of CO<sub>2</sub> would have occurred due to combustion of conventional fuels like coal / gas.

**Percentage generation from grid feeding sources<sup>4</sup> (Year: 2002-03)**

Coal - 55.03 %

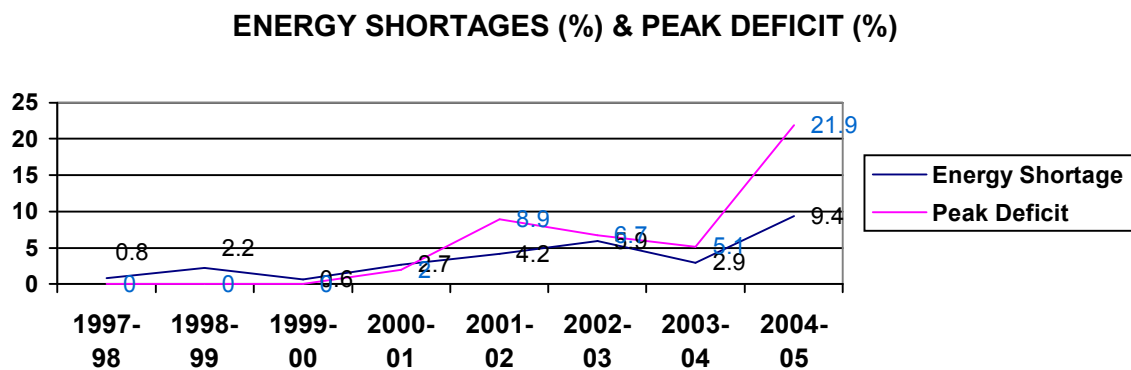
Gas - 6.98 %

Large Hydro - 33.67 %

Nuclear - 1.61 %

Co-generation/Banking/PTC/Net UI/Western region/small hydro - 2.71 %

The power sector profile as per Ministry of Power, for Northern Region<sup>5</sup> gives the energy shortage (%) and peak deficit (%) for the state of Punjab as shown below.



As per Ministry of Power, Government of India, Punjab recorded 6.7 % peak deficit and 5.9 % energy shortage during 2002-03. As per the 16<sup>th</sup> Electric Power Survey of India, conducted by Central Electrical Authority (CEA), the growth in energy requirement for Punjab is expected to be 7.05 %

<sup>4</sup> Source: Punjab State Electricity Regulatory Commission (PSERC)-tariff order for PSEB-FY2003-04

between 2002 and 2007 and 6.95 % between 2007 and 2012. This leads to the conclusion that replacement of grid electricity results in equivalent GHG (CO<sub>2</sub>) emission reductions related to corresponding reduction in fossil fuel usage in the power plants feeding the grid. If such replacement is brought about by a renewable resource like mini hydro power plants as in the project case, then project emission is zero and the entire emission reductions due to fossil fuel reduction in grid mix gets credited to the project activity.

### **B.3 Description of how the anthropogenic GHG emissions by sources are reduced below those that would have occurred in the absence of the proposed CDM project**

The implementation of the hydro power based project activity is a voluntary step undertaken by APL with no direct or indirect mandate by law. The main driving forces to this 'Climate change initiative' have been:

- GHG reduction and subsequent carbon financing against sale consideration of carbon credits.
- Rural Development of the region by creating job opportunities for the local people.
- Demonstration of developing such small hydropower projects on the canal drops to the other entrepreneurs

However, the project proponent was aware of the various barriers associated to project implementation. But it is felt that the availability of carbon financing against a sale consideration of carbon credits generated due to project activity would help to overcome these barriers. The barriers faced by the project activity are discussed below:

#### **Prevailing practice barrier:**

The prevailing and the common practice in the Indian power sector have been investments in the fossil fuel based power projects. This is mainly due to assured return on investments, economies of scale and easy availability of finances.

The share of energy generated from the small hydropower projects in India's total installed capacity is very small. According to the latest statistics as per Ministry of Non-conventional Energy Sources (MNES), the total installed capacity of small hydropower projects is only at 2181 MW<sup>6</sup> including projects under implementation whereas the India's total installed capacity is around 114,739 MW<sup>7</sup> as on March on 31 March 2005. This translates into a very small share of 1.9% for small hydropower sector.

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<sup>5</sup> [http://powermin.nic.in/indian\\_electricity\\_scenario/pdf/NR0105.pdf](http://powermin.nic.in/indian_electricity_scenario/pdf/NR0105.pdf)

<sup>6</sup> Pg. 62; Annual Report 2004-2005; Ministry of Non-Conventional Energy Sources

<sup>7</sup> Annual Report 2004-2005, Ministry of Power

Further, small/mini hydropower projects have been uncommon in the state of Punjab also. Out of total generation mix of Punjab of 28857 million kWh for year 2002-03 only 9 million kWh was supplied by four mini hydro power plants, which accounts for mere 0.03 % of the generation mix. None of these plants is operated by private parties rather they all are operated by government agency (PSEB). PSEB implemented these projects in late-eighties and has been facing various techno-commercial difficulties such as high down time of equipment, non-availability of grid/discharge, high cost of repair and maintenance resulting in obvious financial losses. This is corroborated by extremely low Plant Load Factor (PLF) figures for these plants over the last six years as given below<sup>8</sup>:

<b>Actual Gross Generation (MUs)</b>	<b>Total</b>	<b>PLFs</b>
1999-00	11.370	33%
2000-01	10.400	30%
2001-02	9.700	28%
2002-03	9.000	26%
2003-04	10.000	29%
2004-05	9.876	29%

Consequently PSEB was reluctant to further take up such projects. In early nineties, PSEB was sanctioned with grant-in-aid from Ministry of Non-conventional Energy Sources (MNES), Govt. of India for setting up four new small hydroelectric projects on Bhatinda branch canal. However, PSEB did not avail the said grant due to techno-commercial problems faced in earlier projects. The grants were then redirected to PEDDA that would lead to private sector participation in these projects.

In March 2003, APL decided to go ahead with the implementation of the project activity taking CDM funding into consideration. APL was the **second private sector** project proponent (first was Punjab Hydro Power Ltd. which is also trying to avail carbon credits through CDM) to start with implementation of the project activity in the state<sup>9</sup>. This illustrates the low penetration of such renewable energy projects and little willingness of entrepreneurs to change the current operating practices in the region. The practice of generating power from the potential available at these canal drops has not penetrated in the region due to prohibitive barriers to project implementation discussed in this section.

#### **Institutional barriers:**

As per the data available till 2001-02, PSEB has been incurring heavy commercial losses since last one decade. The commercial loss (with subsidy) for PSEB (off-taker) in the year 2000-01 was INR 1476.65

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<sup>8</sup> [www.pserc.nic.in](http://www.pserc.nic.in)

<sup>9</sup> Source: Hydroelectric Power Stations in Operation in India, 2003-Central Board of Irrigation and Power

billion<sup>10</sup>. For their cash in-flows the project proponent depends on the payments from PSEB against the sale of electricity to the grid and it is very likely that there could be problems with the cash inflows of project. However APL signed a PPA with PSEB in 2001 hoping that CDM funding would help to off-set the anticipated losses.

Such a situation had already arisen when PSEB filed a petition with the regulator for revision of terms under already signed PPAs. PSEB had originally signed a PPA with APL for purchase of power for a period of 10 years @ INR 3.01 per kWh (base year 2000-01) with a 5 % annual increment upto 2004-05 making it INR 3.66 per kWh now. As per the New and Renewable Sources of Energy (NRSE) Policy-2001 of Government of Punjab PSEB was supposed to purchase power from mini/micro hydro projects in the state @ INR 3.01 per kWh (base year 2000-01) with a 5 % annual increment upto 2004-05. However, in the year 2002 PSEB filed a petition with the Punjab State Electricity Regulatory Commission (PSERC) for revising the tariff to lower rates for purchase of power from these mini hydropower projects. Although the judgment has gone in the favour of developers of these mini hydroelectric projects but likelihood of the PPA being renegotiated at later stage cannot be ruled out in the future due to precarious situation of PSEB. These revisions are bound to severely affect the sustainability of the project activity.

If this scenario continues, then it would significantly affect the development of other such projects due to reluctance of the financial institutions to support them and would hamper the growth of eco-friendly non emissive power generation in the state.

In spite of these limitations, APL is one such enterprise to initiate this GHG abatement project under Clean Development Mechanism. APL's success would depend on securing the proposed carbon finance and it would definitely encourage other entrepreneurs to come up with similar project activities contributing further towards GHG emission reduction through the huge untapped small/mini hydro power potential.

In absence of the project proponent's initiative to implement the project, the equivalent electricity would be generated by the state grid mix dominated by fossil fuel based power plants and large hydro power plants.

#### **B.4 Description of the project boundary for the project activity:**

As per the guidelines mentioned in paragraph 4 of Type I.D. described in Annex B of the simplified modalities and procedures for small-scale CDM project activities, project boundary encompasses the physical and geographical site of the renewable generation source.

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<sup>10</sup> [http://powermin.nic.in/indian\\_electricity\\_scenario/pdf/NR0105.pdf](http://powermin.nic.in/indian_electricity_scenario/pdf/NR0105.pdf)

The Project Activity i.e. all three projects at Lohgarh, Chakbhai and Sidhana is located on various falls at the interval of every 5-6 kilometers downstream on the irrigation canal – Bhatinda Branch canal. The canal is an offshoot of a large canal network, which is being fed from one of the largest dams of the country i.e. Bhakra Nangal Dam.

The projects are geographically situated in District Sangrur, Punjab.

**Areas of Influence:**

The project activity has been divided into two areas of influence, which is the Direct area of Influence and the Indirect Area of Influence, briefly described as follows:

**Direct Area of Influence:**

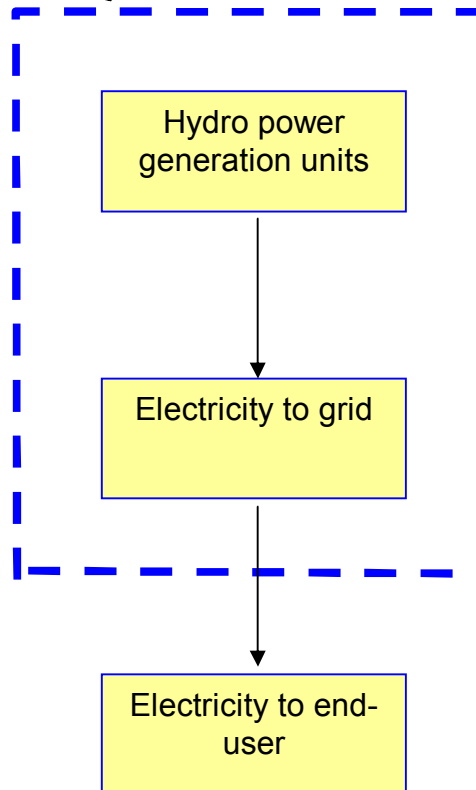
The direct area of influence of the project comprises the area where the civil works for the project is done i.e from the forebay to switchyard where the project proponent has a full control. Thus, boundary covers forebay, intake, trash rack, powerhouse, draft tube on downstream of turbine, tailrace, switchyard and all other accessory equipments.

**Indirect Area of Influence:**

The area of indirect influence comprises of about 1 km stretch of the Bhatinda branch canal downstream and upstream of the project activity.

For the purpose of calculation of baseline emissions, state grid is included in the system boundary.

Project Boundary



## **B.5 Details of the baseline and its development:**

**B.5.1** Specify the baseline for the proposed project activity using a methodology specified in the applicable project category for small-scale CDM project activities contained in appendix B of the simplified M&P for small-scale CDM project activities:

Using the methodology available in paragraph 7 of Type I.D. described in Annex B of the simplified modalities and procedures for small-scale CDM project activities, **the average of the approximate operating margin and the build margin** (in kgCO<sub>2</sub>equ/kWh) of current generation mix of Punjab state grid is used for the calculation of baseline.

### **Base line data**

#### *Carbon emission factor of grid*

Punjab's present generation mix, sector wise installed capacities, thermal efficiency, and emission coefficient are used to arrive at the net carbon intensity/baseline factor of the chosen grid. As per the provisions of the methodology the emission coefficient for the electricity displaced would be calculated in accordance with provisions of paragraph 7 of Type I.D. mentioned in Appendix B of Draft Simplified Modalities and Procedures for Small Scale CDM Project Activities for grid systems.

The provisions require the emission coefficient (measured in kg CO<sub>2</sub>equ/kWh) to be calculated in a transparent and conservative manner as:

- (a) The average of the “approximate operating margin” and the “build margin” (or combined margin)

OR

- (b) The weighted average emissions (in kg CO<sub>2</sub>equ/kWh) of the current generation mix.

Complete analysis of the electricity generation has been carried out for the calculation of the emission coefficient as per paragraph 7 (a) given above.

#### *Combined Margin*

The baseline methodology suggests that the project activity will have an effect on both the operating margin (i.e. the present power generation sources of the grid, weighted according to the actual participation in the state grid mix) and the build margin (i.e. weighted average emissions of recent

capacity additions) of the selected grid and the baseline emission factor would therefore incorporate an average of both these elements.

### *Operating Margin*

The “approximate operating margin” is defined as the weighted average emissions (in kg CO<sub>2</sub>equ/kWh) of all generating sources serving the system, excluding hydro, geothermal, wind, low-cost biomass, nuclear and solar generation;

The project activity would have some effect on the operating margin of the Punjab State Grid. The carbon emission factor as per the operating margin takes into consideration the power generation mix of 2002-2003 excluding hydro, geothermal, wind, low-cost biomass, nuclear and solar generation of the selected grid, thermal efficiency and the default value of emission factors of the fuel used for power generation.

The consumer of a state of Punjab gets a mix of power from the different sources. The figures of installed power capacity, share of the state in the central pool, and actual plant availability decides the content of power. The real mix of power in a particular year is however based on actual units generated from various sources of power. PSEB is operating major thermal and hydel power stations in Punjab. The state also gets share from the central sector generating plants and interstate power projects. The data collected and used are presented in Tables 1.1 to 1.4.

The most important parameter in estimating the emissions is the thermal efficiency of the power plant. As per the CEA report, it is assumed that all the coal & lignite based plants coming up in tenth & eleventh & plan will use pulverized coal sub-critical / super critical pressure technology with the thermal efficiency of around 34%. The percentage of carbon that is not burnt is very low therefore, complete combustion was assumed. The thermal efficiency of existing old power plants is less than 30% and for new modern power plants it is expected to be around 34%. Central Electricity Authority has presented the analysis of Station Heat Rates (SHR) for 43 thermal power plants using coal, in India, in the report ‘Performance Review of Thermal Power Stations 2003-04 Section 13’<sup>11</sup>. As per this report ‘Lehra Mohabbat’, a plant located in Punjab has the highest efficiency of 35.51 % among all the coal based power plants in Northern India. Hence the efficiency of ‘Lehra Mohabbat’ thermal power plant has been considered for the calculations. Average efficiency of gas/combustion turbine (peak load) works out to be 35 % and that for gas turbines in combined cycle works out to be 50 %<sup>12</sup>. On

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<sup>11</sup> [http://cea.nic.in/opm/0304/sec-13\\_sush777.pdf](http://cea.nic.in/opm/0304/sec-13_sush777.pdf)

<sup>12</sup> Emission Baselines-Estimating the Unknown, page 156: by International Energy Agency

conservative basis average efficiency for base line calculations is considered as 50%. Standard emission factors given in IPCC for coal and gas (thermal generation) are applied over the expected generation mix and net emission factor is determined.

The formulae are presented in Section-E and the calculations are presented in an excel sheet as Annex 3. Carbon Emission Factor of grid as per operating margin is 0.91 kg CO<sub>2</sub>/kWh electricity generation.

#### *Build Margin*

The “build margin” emission factor is the weighted average emissions (in kg CO<sub>2</sub>equ/kWh) of recent capacity additions to the system, which capacity additions are defined as the greater (in MWh) of most recent 20% of existing plants or the 5 most recent plants.

The project activity will have some effect on the build margin of the Punjab State Grid. The baseline factor as per the build margin takes into consideration the delay effect on the future projects and assumes that the past trend will continue in the future. Capacity additions of 5 most recent plants is greater than (in MWh) most recent 20 % of existing plants hence, for our build margin calculation we would take into consideration 5 most recent plants built in Punjab given in Table-1.5. The thermal efficiencies of coal and gas based plants for calculating build margin have been assumed same as that for calculating operating margin. Carbon Emission Factor of grid as per build margin is 0.80 kg CO<sub>2</sub>/kWh electricity generation.

Net Carbon Emission Factor Grid for 2002-2003 as per combined margin =  $(OM + BM)/2 = 0.85$  kg of CO<sub>2</sub> / kWh generation respectively. (Refer to Excel Sheet Annex 3 and 4).

**Table 1 Grid data for calculation of baseline emission factor of grid for 2002-03<sup>13</sup>**

Table 1.1: Power Generation Mix of Punjab from the State Generating Stations (net generation) <sup>14</sup>		
Sr. No.	Energy Source	2002-2003 (MkWh)
I.	Punjab State	
1.	Thermal (coal)	
	GNDTP, Bhatinda	2266
	GGSTP, Ropar	7565
	GHTP, Lehra Mohabat	2646
A.	Thermal (Coal) Total	<b>12477</b>
2.	Thermal (Gas)	
B.	Thermal (Gas) Total	<b>0</b>
C.	Thermal (Coal & Gas) Total: (A+B)	<b>12477</b>
3.	Hydro	
	Shanan (net after royalty of 55MU)	414
	UBDC	394
	Anandpur Sahib	750
	Mukerian	795
	RSDHEP (net after free share to HP of 54 MU)	1097
	Micro Hydel	9
	Less: Auxiliary consumption	<b>-13</b>
D.	Hydro Total:	<b>3446</b>
F.	State Sector Total (C+D)	<b>15923</b>

<sup>13</sup> Source: Punjab State Electricity Regulatory Commission (PSERC)-tariff order for PSEB-FY2003-04

<sup>14</sup> Net generation figures are provided after deducting for auxiliary consumption, free power and royalty to other state govt.

*Table 1.2: Power Generation Mix of Punjab from the Central Generating Stations*

Sr No	Energy Source	2002-2003 (MkWh)
II.	Punjab's share in Central Schemes	
1.	Thermal (Coal)	
	Dadri thermal	75
	Singrauli	1622
	Rihand	908
	Unchahar-I	352
	Unchahar-II	445
A.	Thermal (Coal) Total	<b>3402</b>
2.	Thermal (Gas)	
	Anta	357
	Auraiya	685
	Dadri gas	973
B.	Thermal (Gas) Total	<b>2015</b>
C.	Total Thermal (Coal & Gas)	<b>5417</b>
3.	Hydel	
	Salal	832
	Bairasuil	307
	Tanakpur	59
	Chamera-I	232
	Uri	333
D.	Total Hydro	<b>1763</b>
4.	Nuclear	
	NAPP	363
	RAPP	101
E.	Total Nuclear	<b>464</b>
F.	Central Sector Total	<b>7644</b>

<i>Table 1.3: Power Generation Mix of Punjab from the Power Stations in Partnership Projects</i>		
S.No	Energy Source	2002-2003 (MkWh) <sup>15</sup>
III.	Punjab's share in Partnership Projects	
1.	Hydel	
	BBMB Projects	<b>4515</b>

<i>Table 1.4: Power Generation Mix of Punjab from Other Sources</i>		
Sr No	Energy Source	2002-2003 (MkWh)
II.	Other Sources	
1.	Co-generation	78
2.	Banking	467
3.	PTC	126
4.	Net UI	98
5.	Western region	6
A.	Total	<b>775<sup>16</sup></b>

<i>Table 1.5: Five most recent plants built in Punjab</i>				
Sr. No.	Year of Commissioning	Energy Source	Generation (MkWh)	CO <sub>2</sub> Emission Factor (kg/kWh)
		Thermal		
I.	1997	GHTP, Lehra Mohabat (Unit 1)	1323	0.973
	1998	GHTP, Lehra Mohabat (Unit 2)	1323	0.973
	1992	GGSTP, Ropar (Unit 5)	1261	0.973
	1993	GGSTP, Ropar (Unit 6)	1261	0.973
		Hydel		
II.	2002	Ranjit Sagar Dam	1151	0

<sup>15</sup> Including 340 MkWh as share of common pool consumers

<sup>16</sup> Due to lack of information and to be on conservative side, this quantity has been taken as renewable energy for calculation of emission factor for the grid

**B.5.2** Date of completing the final draft of this baseline section (*DD/MM/YYYY*):

31/01/2005

**B.5.3** Name of person/entity determining the baseline:

Aqua Power Limited

The person/entity is also a project participant as listed in Annex 1 of this document.

<b>C. Duration of the project activity and crediting period</b>
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**C.1 Duration of the project activity:**

**C.1.1** Starting date of the project activity:

09/07/2003

**C.1.2** Expected operational lifetime of the project activity:

30 years

**C.2 Choice of the crediting period and related information:**

**C.2.1 Renewable crediting period**

**C.2.1.1** Starting date of the first crediting period

**C.2.1.2** Length of the first crediting period

**C.2.2 Fixed crediting period**

**C.2.2.1** Starting date

01/11/2004

**C.2.2.2** Length (max 10 years):

10 years

## **D. Monitoring methodology and plan**

### **D.1 Name and reference of approved methodology applied to the project activity:**

**Title:** Monitoring Methodology for the category I D – Renewable electricity generation for a grid

**Reference:** ‘Paragraph 9’ as provided in Type I.D. of Appendix B of the simplified modalities and procedures for small-scale CDM project activities - Indicative Simplified Baseline and Monitoring Methodologies for Selected Small-Scale CDM Project Activity Categories.

### **D.2 Justification of the choice of the methodology and why it is applicable to the project activity:**

As established in Section A.4.2 the project activity falls under Category I.D and can use the monitoring methodology for type I.D project activities.

The methodology requires the project-monitoring plan to consist of metering the electricity generated by the renewable technology. In order to monitor the mitigation of GHG due to the project activity, the total energy exported and imported need to be measured. The net energy supplied to grid (difference of energy exported and imported) by the project activity multiplied by emission factor for regional grid, would form the baseline for the project activity.

## **GHG SOURCES**

### **Direct on-site emissions**

There would be no direct on-site emissions after implementation of the project activity since it is a canal drop based mini hydroelectric project without any storage of water.

### **Direct off-site emissions**

Also there would be no direct off-site emissions after implementation of the project activity since it does not involve any transportation of fuel.

### **Indirect on-site emissions**

The indirect on site GHG source is the consumption of energy and the emission of GHGs involved in the construction of project activity.

Considering the life of the project activity and the emissions to be avoided in the life span of 30 years, emissions from the above-mentioned source is too small and hence neglected.

No other indirect on-site emissions are anticipated from the project activity.

### **Indirect off-site emissions**

No indirect off-site emissions are anticipated from the project activity

### **Key Project Parameters affecting Emission Reductions**

**Total Power generated by the project:** The power exported by APL would be monitored to the best accuracy and as per the table given in section D.3.

**Auxiliary consumption:** The power imported by APL would also be monitored to the best accuracy and as per the table given in section D.3. The total quantum of power consumed by the auxiliaries would affect the net power exported to the grid and therefore the amount of GHG reductions. Therefore any increase in the consumption pattern of the auxiliary system would be attended to.

**Net Power exported to the grid:** The project revenue is based on the net units exported by APL.

The general principles for monitoring above parameters are based on:

- Frequency
- Data recording
- Reliability
- Experience and training

#### **Frequency**

Monthly joint meter reading of main meters installed at interconnection point shall be taken and signed by authorised officials of APL and PSEB on any day of the first week of every month as mutual consent. Records of this joint meter reading would be maintained by APL.

#### **Data recording**

Records of the joint meter reading would be maintained by APL. Daily and monthly reports stating the generation, auxiliary consumption, and net power export would be prepared by the shift in-charge and verified by the plant manager

#### **Reliability**

For measuring the delivery and import of energy by APL one main meter shall be maintained at interconnection point and one check meter shall be maintained at grid substation of PSEB. Main meter

reading would form the basis of billing and emission reduction calculations. Main and check Energy meters of 0.5 class having kWh, kVAH and kVARH facility would be used

Monthly joint meter reading of main meters installed at interconnection point shall be taken and signed by authorised officials of APL and PSEB on any day of the first week of every month as mutual consent. Records of this joint meter reading would be maintained by APL.

APL would keep requisite sets of metering equipment, duly tested/calibrated, as spares, for replacement as and when required. Main or Check meter would be replaced by spare set of meter with, mutual consent of the parties when a faulty meter is required to be removed.

The Main and Check meter installed at interconnection point and grid sub-station respectively would be jointly inspected and sealed on behalf of the parties and shall not be interfered with, by either party except in presence of the other party.

The main and check meter would be test checked for accuracy every six months at PSEB's laboratory and sealed by PSEB and APL jointly.

If during half yearly test check, main meter is found to be within permissible limits of error and check meter is found to be beyond permissible limits, then billing as well as emission reduction calculation would be as per main meter as usual. However, the check meter would be calibrated and replaced with spare tested calibrated meter, as may be necessary.

If during half yearly test check, the main meter is found to be beyond permissible limits of error but check meter is found to be within permissible limits, then billing as well as emission reduction calculation for the month and upto date and time of the calibration/replacement of defective main meter shall be as per check meter. The main meter would be immediately calibrated and replaced with spare tested calibrated meter, as may be necessary where after billing as well as emission reduction calculation would be as per main meter.

If during half yearly test checks, the main meter and check meter are both found to be beyond permissible limits of error, then both meters would be immediately replaced with spare calibrated meters and correction would be applied to data recorded by main meter to arrive at correct energy figures for billing as well as emission reduction calculation purposes for period of the month and upto time of calibration/replacement of defective meter. Corrections in billing whenever necessary shall be applicable to the period between date and time of previous test calibration and date and time of test calibration in current month when error is observed and correction would be for full value of absolute error. For the purpose of correction to be

applied the meter shall be tested at 100, 75, 50, 25 and 10 % load at 1.0, 0.85 and 0.75 lag power factors. Of these fifteen values, the error at load and power factor nearest the average monthly load served at the point during the period shall be taken as error to be applied for correction

In case main meter at interconnection point becomes defective, the billing and emission reduction calculation would be based on readings of check meter installed at grid sub-station. The defective equipment would be immediately replaced by APL.

If both, main and check meters become defective, then emission reduction calculations for the month would be based on hourly generation and auxiliary consumption data recorded by APL at generation end.

The meter installed at generation end would be test checked for accuracy every six months. If during half yearly test check, meter is found to be beyond permissible limits, then the meter would be calibrated or replaced with spare tested calibrated meter, as may be necessary.

APL shall archive and preserve all the monthly invoices raised against net saleable energy, for at least two years after end of the crediting period. APL shall also archive the complete metering data at generation end on paper and all the data would be preserved for at least two years after end of the crediting period.

All the records pertaining to the site shall be kept at the respective site itself. The data pertaining to the previous years shall be archived separately at the plant office i.e Chakbhai. A copy of the daily generation report shall be sent to the Head Office also.

### **Experience and training**

The plant manager would be a qualified diploma/degree engineer with 5-7 year experience in power industry. All the shift incharges would be diploma/degree holders and would undergo related training including plant operations, data monitoring, report generation etc.

### D.3 Data to be monitored:

#### a) Parameters affecting the emission reduction potential of the project activity

ID number	Data type	Data variable	Data unit	Measured (m), calculated (c) or estimated (e)	Recording Frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	For how long is archived data to be kept?	Comment
1	Energy	Energy exported	kWh	M	Monthly	Total	Paper	2 years after end of crediting period	This is monitored at interconnection point
2	Energy	Energy imported	kWh	M	Monthly	Total	Paper	2 years after end of crediting period	This is monitored at interconnection point
3	Energy	Net saleable energy	kWh	C	Monthly	Total	Paper	2 years after end of crediting period	This is calculated as difference of 1 and 2. It would be based on monthly bills raised by APL to PSEB
4	Energy	Energy generated	kWh	M	Hourly	Total	Paper	2 years after end of crediting period	This is monitored at generation end
5	Energy	Auxiliary energy consumption	kWh	M	Hourly	Total	Paper	2 years after end of crediting period	This is monitored at the plant

**b) Quality control (QC) and quality assurance (QA) being undertaken for data monitored. (data items in table contained in section D.3 (a) above, as applicable)**

<b>Data</b>	<b>Uncertainty level of data (High Medium/Low)</b>	<b>Are QA/QC procedures planned for these data?</b>	<b>Outline explanation why QA/QC procedures are or are not being planned.</b>
D.3.(a)1	Low	Yes	This data will be used for calculation of emission reductions by project activity.
D.3.(a)2	Low	Yes	This data will be used for calculation of emission reductions by project activity.
D.3.(a)3	Low	Yes	This data will be used for calculation of emission reductions by project activity.
D.3.(a)4	Low	Yes	This data will be used for calculation of emission reductions by project activity in case D.3.(a)1 is not available
D.3.(a)5	Low	Yes	This data will be used for calculation of emission reductions by project activity in case D.3.(a)2 is not available

**D.4 Name of person/entity determining the monitoring methodology:**

Aqua Power Limited

The person/entity is also a project participant as listed in Annex 1 of this document.

## **E. Calculation of GHG emission reductions by sources**

### **E.1 Formulae used:**

#### **E.1.1 Selected formulae as provided in appendix B:**

No formulae for GHG emission reduction is specified for Category I.D of Appendix B of the Simplified Modalities and Procedures for Small-scale CDM Project Activities.

#### **E.1.2 Description of formulae when not provided in appendix B:**

**E.1.2.1** Describe the formulae used to estimate anthropogenic emissions by sources of GHGs due to the project activity within the project boundary:

There would be no GHG emissions of any kind, due to project activity within the project boundary as it is a canal drop based project producing clean energy with no storage of water.

**E.1.2.2** Describe the formulae used to estimate leakage due to the project activity, where required, for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project

As per paragraph 8 of Type I.D. of Appendix B of Simplified Modalities and Procedures for Small-scale CDM Project Activities no leakage calculation is required since the project activity is a renewable energy technology without transfer of equipment from another activity.

**E.1.2.3** The sum of E.1.2.1 and E.1.2.2 represents the project activity emissions:

Emissions due to project activity are zero.

**E.1.2.4** Describe the formulae used to estimate the anthropogenic emissions by sources of GHG's in the baseline using the baseline methodology for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities:

Punjab State Electricity Board (PSEB) grid to which project activity is supplying power has been considered as the baseline. Punjab's present power generation mix has been used to arrive at the net carbon intensity/baseline factor of the chosen grid. As per the provisions of the methodology the emission coefficient for the electricity displaced would be calculated in accordance with provisions of paragraph 7 (a) of Type I.D of '*Appendix B of Simplified Modalities and Procedures for Small Scale CDM Project Activities*'.

The emission coefficient has been calculated in a transparent and conservative manner as: **'the average of the approximate operating margin and the build margin'**.

The step-by-step calculation of base line emission is as follows:

<b>Step 1</b>	:	Thermal efficiency of coal based power plants	=	35.51 %
<b>Step 2</b>	:	Thermal efficiency of gas based power plants	=	50 %
<b>Step 3</b>	:	CO <sub>2</sub> emission factor for coal	=	96.10 kg CO <sub>2</sub> / GJ
<b>Step 4</b>	:	CO <sub>2</sub> emission factor for gas	=	56.10 kg CO <sub>2</sub> / GJ
<b>Step 5</b>	:	Actual emission factor for coal	=	CO <sub>2</sub> emission factor for coal/ Thermal efficiency of coal based power plants (kg CO <sub>2</sub> /kWh)
<b>Step 6</b>	:	Actual emission factor for gas	=	CO <sub>2</sub> emission factor for gas/ Thermal efficiency of gas based power plants (kg CO <sub>2</sub> /kWh)
<b>Step 7</b>	:	Net emission factor for coal	=	Actual emission factor for coal x % of generation by coal out of total generation excluding renewable, hydel and nuclear power generation. (kg CO <sub>2</sub> /kWh)
<b>Step 8</b>	:	Net emission factor for gas	=	Actual emission factor for gas x % of generation by gas out of total generation excluding renewable, hydel and nuclear power generation. (kg CO <sub>2</sub> /kWh)
<b>Step 9</b>	:	Net operating margin factor for grid	=	Net emission factor for coal + Net emission factor for gas (kg CO <sub>2</sub> /kWh)
<b>Step 10</b>	:	Net build margin factor for grid	=	Weighted average emissions of recent 5 plants built (kg CO <sub>2</sub> /kWh)
<b>Step 11</b>	:	Combined margin factor	=	(Net operating margin factor for grid + Net build margin factor for grid)/2 (kg CO <sub>2</sub> /kWh)
<b>Step 12</b>	:	Units supplied to grid	=	Net energy supplied after auxiliary consumption
<b>Step 13</b>	:	Baseline emission	=	Combined margin factor x Units supplied to grid

Since there is a gap between demand and supply in Punjab, the power supplied from the project activity would partially fulfil the power requirement for the state of Punjab.

If the same amount of electricity is generated by the state grid mix, it adds to the emissions that are ultimately getting reduced by the project activity. Hence, the baseline calculated using above methods / scenarios would represent the realistic anthropogenic emissions by sources that would occur in absence of the project activity.

The uncertainties in the baseline, arising out of capacity additions trends are already taken into consideration during calculation of combined margin factor.

Detailed calculation has been shown in Annex 3 and 4.

**E.1.2.5** Difference between E.1.2.4 and E.1.2.3 represents the emission reductions due to the project activity during a given period:

Following formula is used to determine Emission reduction

$$\text{CO}_2 \text{ emission reduction due to project activity} = \text{Baseline emission} - \text{Project Activity emission}$$

## **E.2 Table providing values obtained when applying formulae above:**

Emission reductions by project activity for 10 year crediting period have been calculated and tabulated as follows:

**Table 2: Emission Reductions**

<b>Sr. No.</b>	<b>Operating Years</b>	<b>Net Baseline Emission Factor (kg of CO<sub>2</sub> / kWh)</b>	<b>Baseline Emissions (Tons of CO<sub>2</sub>)</b>	<b>Project Emissions (Tons of CO<sub>2</sub>)</b>	<b>Emission Reductions, (Tons of CO<sub>2</sub>)</b>
1.	2004-2005	0.85	9783	0	9783
2.	2005-2006	0.85	24383	0	24383
3.	2006-2007	0.85	24383	0	24383
4.	2007-2008	0.85	24383	0	24383
5.	2008-2009	0.85	24383	0	24383
6.	2009-2010	0.85	24383	0	24383

<b>Sr. No.</b>	<b>Operating Years</b>	<b>Net Baseline Emission Factor (kg of CO<sub>2</sub> / kWh)</b>	<b>Baseline Emissions (Tons of CO<sub>2</sub>)</b>	<b>Project Emissions (Tons of CO<sub>2</sub>)</b>	<b>Emission Reductions, (Tons of CO<sub>2</sub>)</b>
7.	2010-2011	0.85	24383	0	24383
8.	2011-2012	0.85	24383	0	24383
9.	2012-2013	0.85	24383	0	24383
10.	2013-2014	0.85	24383	0	24383
		<b>Total ERs</b>	<b>229233</b>	<b>0</b>	<b>229233</b>

Therefore an conventional energy equivalent of 268.82 million kWh for a period of 10 years would be saved by exporting power from the project activity which in turn would reduce 229,233 tons of CO<sub>2</sub> emissions considering baseline calculations.

## **F. Environmental impacts**

### **F.1 If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:**

Amendment dated 13 June 2002 to the Environment Impact Assessment (EIA) notification of 27 Jan 1994 of Ministry of Environment and Forest, Govt. of India says that EIA notification does not apply to entry number 19 of Schedule I of the notification if investment is less than INR 100 crore for new project. Since the cost of Lohgarh is 12.69 crore, Chakbhai is 13.63 crore and Sidhana is 7.86 crore only; none of the projects fall under the purview of the EIA notification. Hence, documentation on analysis of environmental impacts is not required by the host party. However, the 'Consent to Establish' the Lohgarh, Chakbhai and Sidhana projects has been obtained from the Punjab Pollution Control Board.

Being run-of-river type mini hydroelectric project, the project activity does not result in any adverse environmental, social or economic impacts. Displacement of local population or disturbance to the eco-system is not involved due to project activity.

## **G. Stakeholders comments**

### **G.1 Brief description of the process by which comments by local stakeholders have been invited and compiled:**

APL organised stakeholder consultation meetings at individual sites with the objective to inform the interested stakeholders on the environmental and social impacts of the project activity and discuss their concerns regarding the project activity. Invitation for stakeholder consultation meetings were sent out requesting the stakeholders to participate and communicate any suggestions/objections regarding the project activity in writing. On the day of meeting, APL representatives presented the salient features of the company and the project activity to the stakeholders and requested their suggestions/objections. The opinions expressed by the stakeholders were recorded and are available on request.

Invitations were sent out to:

- Village Head (Sarpanch) and other members (Panchs) of village Panchayat (judicial body at village level) of adjoining villages.
- Principal of nearby school
- Nambardar of nearby villages
- Farmers from the adjoining villages.

The other stakeholders identified for the project activity are as under:

- State Government of Punjab
- Punjab State Electricity Regulatory Commission
- Punjab State Electricity Board
- Punjab Energy Development Agency
- Punjab Irrigation Department
- Ministry of Commerce & Industry
- Ministry of Environment and Forest
- UTI Bank Ltd., Canara Bank and Corporation Bank

Stakeholders list includes the government parties, which are involved in the project activity at various stages. At the appropriate stage of the project development, stakeholders were involved to get the clearances.

## **G.2 Summary of the comments received:**

As a result of the meetings with stakeholders and local population comprising of the local people in and around the project area, the following comments were received.

1. By generating clean power, the projects would provide energy to an energy deficit state and contribute in the economic development of the state and the nation.
2. The project activity provides good direct & indirect employment opportunities to the local populace.
3. There is no problem or any kind of trouble due to the project activity.
4. The project does not require displacement of any local population. Thus, the project will not cause any adverse social impacts on local population. Rather, it will help in improvising their quality of life.

As a buyer of the power, the PSEB is a major stakeholder in the project. They hold the key to the commercial success of the project. APL has already signed Power Purchase Agreements (PPA) with PSEB for a period of 30 years. The power tariff and various other terms and conditions have been approved by the Punjab State Electricity Regulatory Commission.

The Governor of Punjab, through Chief Executive, Punjab Energy Development Agency (PEDA), under the Department of Science, Technology and Environment and Non-conventional Energy Sources of Govt. of Punjab has accorded the permission for setting up all the three projects through Implementation Agreements.

Ministry of Environment and Forest has diverted the forest land in favour of APL for implementation of all the three schemes.

UTI Bank Ltd., Canara Bank and Corporation Bank have sanctioned the loan for Lohgarh, Chakbhai and Sidhana respectively.

## **G.3 Report on how due account was taken of any comments received:**

No major concern was raised during the stakeholder consultation meeting and satisfactory answers were provided to the issues raised by them.

Further as per UNFCCC requirement the PDD will be published at the validator's web site for public comments.

Annex 1

**CONTACT INFORMATION FOR PARTICIPANTS IN THE PROJECT ACTIVITY**

*(Please repeat table as needed)*

Organization:	Aqua Power Limited
Street/P.O.Box:	B-37, Sector-1, Noida – 201 301
Building:	--
City:	Gautam Budh Nagar
State/Region:	Uttar Pradesh
Postcode/ZIP:	201301
Country:	India
Telephone:	91 120 2443716-19
FAX:	91 120 2443723/24
E-Mail:	<a href="mailto:phpl@polyplex.com">phpl@polyplex.com</a>
URL:	--
Represented by:	
Title:	-
Salutation:	Mr.
Last Name:	Jindal
Middle Name:	Kumar
First Name:	Rajesh
Department:	--
Mobile:	91 9810092024
Direct FAX:	--
Direct tel:	91 120 2443720
Personal E-Mail:	<a href="mailto:rjindal@polyplex.com">rjindal@polyplex.com</a>

## Annex 2

### **INFORMATION REGARDING PUBLIC FUNDING**

Total funding required in the project activity was mobilised through debt financing and equity capital. Debt portion, which is around 74% of the total investment, was funded by Canara Bank, Corporation Bank and UTI Bank and does not include any public funding from Annex I countries. The equity capital was mobilised by the project proponents at their own risk out of their resources. Apart from the above, no other funding is involved.

Hence, the project proponents hereby confirm that public funding from parties included in Annex-I is not involved in the project activity.

## **ABBREVIATIONS**

<b>APL</b>	Aqua Power Limited
<b>BM</b>	Build Margin
<b>CEA</b>	Central Electricity Authority
<b>CO<sub>2</sub></b>	Carbon dioxide
<b>DPR</b>	Detailed Project Report
<b>EIA</b>	Environment Impact Assessment
<b>GHG</b>	Greenhouse gas
<b>IPCC</b>	Inter Governmental Panel On Climate Change
<b>IREDA</b>	Indian Renewable Energy Development Agency
<b>Kg</b>	Kilogram
<b>Km</b>	Kilometer
<b>kW</b>	Kilo watt
<b>kWh</b>	Kilo watt hour
<b>MW</b>	Mega watt
<b>OM</b>	Operating Margin
<b>PDD</b>	Project design document
<b>PEDA</b>	Punjab Energy Development Agency
<b>PPA</b>	Power Purchase Agreement
<b>PSEB</b>	Punjab State Electricity Board
<b>RCC</b>	Reinforced Cement Concrete
<b>SHR</b>	Station Heat Rate
<b>UNFCCC</b>	United Nations Framework Convention on Climate Change

**LIST OF REFERENCES**

<b>Sl. No.</b>	<b>Particulars of the references</b>
1.	Kyoto Protocol to the United Nations Framework Convention on Climate Change
2.	Website of United Nations Framework Convention on Climate Change (UNFCCC), <a href="http://unfccc.int">http://unfccc.int</a>
3.	UNFCCC document: Clean Development Mechanism, Simplified Project Design Document For Small Scale Project Activities (SSC-PDD), Version 01 (21 January, 2003)
4.	UNFCCC document: Simplified modalities and procedures for small-scale clean development mechanism project activities
5.	UNFCCC document: Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories, Version 04
6.	UNFCCC document: Determining the occurrence of debundling
7.	Statistics of Punjab State Electricity Board
8.	Power sector profile for Northern region as on 30.11.04-Ministry of Power
9.	Website of Ministry of Power (MoP), Govt. of India <a href="http://www.powermin.nic.in">www.powermin.nic.in</a>
10.	Punjab State Electricity Regulatory Commission (PSERC)-tariff order for PSEB-FY2003-04
11.	Central Electricity Authority (CEA), Govt. of India <a href="http://www.cea.nic.in">www.cea.nic.in</a>