



Carbon Emissions Services, Inc.

NOTIFICATION & REQUEST FOR APPROVAL

Notification / Requesting approval of changes and revision of monitoring plan from the project activity as described in the registered project design document.

Title of project activity:			
24 MW Perla Mini Hydel Project, Karnataka, India			
CDM reference number:		PJRCES project No.:	
2112		C-2-I-01-S-0177	
Type of request:	<input checked="" type="checkbox"/>	Notification of changes from project activity as described in the registered PDD (i.e. changes do <u>not</u> raise any concerns with regard to i) additionality, ii) the scale of CDM project activity and/or iii) the applicability and application of baseline methodology	
	<input type="checkbox"/>	Revision of monitoring plan to reflect current monitoring practice, from monitoring plan as described in the registered PDD	
	<input checked="" type="checkbox"/>	Request for approval of changes from project activity as described in the registered PDD	
Date	Work carried out by:	Work verified by:	Approved by:
28 April 2012	Team Member: Chirag Gajjar, Technical Expert: M.K. Halpeth Team Leader: Anjana Sharma	ITR: Mathsy Kutty	Bilal Anwar

1. Notification of changes from project activity as described in the registered PDD

1.1. Description of the changes as compared to the description in the registered PDD

Revised PDD:	Version 04, dated 20 April 2012
Registered PDD:	Version 03, dated 17 April 2009
Validation Report:	D.N.V: Validation Report of "24 MW Perla Mini Hydel Project, Karnataka, India", Report No.2007-1065, version 02 dated 12-May-2009.

An assessment of the changes in revised PDD, version 04, dated 20 April 2012, as compared with the registered PDD, version 03, dated 17 April 2009 is as per VVM, version 1.2, page 39, para 197: *Information (data and variables) provided in the monitoring report that is different from that stated in the registered PDD.*

Changes requested to the registered PDD, version 03, dated 17 April 2009 are:

- Capacity of the individual turbines (5 no.) considered under the project activity has been corrected to 5.0MW each from original capacity of 4.8MW each in the registered PDD. The resultant total rated capacity of the project has also been corrected accordingly in the relevant sections of the PDD as discussed below:

Registered PDD, version 03 dated 17 April 2009	Revised PDD, version 04 dated 20 April 2012
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<p>Section A.2: The project would use the potential energy in a flowing river by diversion weir for running horizontal full kaplan turbines to generate power. The components involved in the hydroelectric scheme consists of construction of intake cum power block, power house, tailrace pool and open tail channel discharging water back into the river, an outdoor yard. The powerhouse consists of five turbine generator sets of capacity 4.8 MW each. The gross electricity generation from the project is 73.34 GWh based on 90% dependable energy and 71.15 GWh would be exported to southern regional grid of India.</p>	<p>Section A.2: The project would use the potential energy in a flowing river by diversion weir for running horizontal full kaplan turbines to generate power. The components involved in the hydroelectric scheme consists of construction of intake cum power block, power house, tailrace pool and open tail channel discharging water back into the river, an outdoor yard. The powerhouse consists of five turbine generator sets of capacity 5.0 MW each. The gross electricity generation from the project is 71.5 GWh based on 90% dependable energy and 69.38 GWh would be exported to southern regional grid of India.</p>
<p>Section A.4.3: The total capacity of the turbine generators are 24 MW, which would generate electricity at 11 kV level and evacuated at 110 kV level. The annual export of power to the Southern regional grid would be 71.15 GWh from the hydroelectric project.</p>	<p>Section A.4.3: The total capacity of the turbine generators are 25 MW, which would generate electricity at 11 kV level and evacuated at 110 kV level. The annual export of power to the Southern regional grid would be 69.38 GWh from the hydroelectric project.</p>

2. a) Reduction in net electricity export to the grid due to change in the rated head, design discharge, rated speed and generator efficiency compared to registered PDD.
- b) Change in Substation location resulting in changes in transmission losses.

Proposed changes are as discussed below:

PP has included following justification in the PDD under section A.4.3:

“Although the installed capacity is 25 MW, the Government Order No: EN 443 NCE 2007, Government of Karnataka, Bangalore Dated 4th January 2008 licensed the project electricity export to the grid at 24.75MW. Form – B issued by KPTCL also indicates the plant capacity as 24.75MW only. Accordingly we have considered the net export from 24.75MW for estimation of emission reduction.”

Table A.1: Salient Features of the Project

Parameter	Specifications	Revised Specifications
	PDD, version 03 (registered PDD)	PDD, version 04 (with Proposed revisions)
Hydrology		



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Design Discharge	392 cumecs	340.40 cumecs
Max Head	8 m	9.20 m
Rated Head	7.31 m	8.7 m
Turbine		
Type of hydro turbine	Horizontal Full Kaplan	Horizontal Full Kaplan
No. of generating units	5	5
Capacity of each generating units	4.8 MW	5.0 MW
Efficiency	90 %	90 %
Rated Speed	140 rpm	158.46 rpm
Generator		
Type	Synchronous	Synchronous
Rated speed	750 rpm	750 rpm
Generation voltage	11 kV	11 kV
Power Factor	0.85 (lag)	0.85 (lag)
Efficiency	95 %	97.45 %
Frequency	50 Htz	50 Htz
Power Evacuation		
Transmission Voltage	110 kV Double Circuit ACSR Drake	110 kV Double Circuit ACSR Drake
KPTCL Substation	Netla Manur	BC Road
Substation distance from site	15 kms	10 kms
Substation Voltage	110 kV	110 kV
Energy (Optimum year)		
Net Energy Export to KPTCL grid	71.15 GWh	69.38 GWh

3. On Page 2: The actual commissioning date of the project activity has been added. PP proposes to add the following sentence on page 2 of the registered PDD.

“The project activity was commissioned on 12 September 2009” in place of
“The project activity is expected to be commissioned during July / August’08”

4. Changes in values of IRR: The value of IRR has been changed to **12.91** % from **13.38** % throughout the PDD. Also, the sensitivity has been changed to make it in-line with revised IRR calculations.
5. Estimation of overall emission reductions: Due to reduction in net electricity export to the grid, estimation of emission reduction has been revised from **60,816** tCO₂e annually to **59,290** tCO₂e annually.
6. Monitoring parameters: Under section B.7.1., for parameter EG_y, “value of data applied” has been changed to **69.38** GWh from **71.15** GWh. Similarly, the value of EG_{Gross,y} has been changed to **71.5** GWh from **73.34** GWh in the registered PDD.



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1.2. Assessment of the changes

1.2.1 Assessment of when the changes occurred:

All the above stated changes (section 1.1) happened during the actual implementation of the project activity. The project activity was commissioned on 12 September 2009 and has been operating since then with these changes.

In order to have an assessment of changes on the project activity, the PP had conducted an assessment¹ through a third party engineering consulting body “Gods consulting Engineers (GCE)” in December 2011. The scope of the study includes:

- a) The description of the estimation of gross and net electricity generation from the proposed project activity after commissioning;
- b) Comparison between the actual implemented project activity with the proposed project activity as per Detailed project report (DPR) made available by PP to the validating DOE during validation; and
- c) Assessment of changes in the salient features of the project activity.

The note from the “Gods consulting Engineers (GCE) was submitted to PJRCES and assessment of changes by PJRCES had been undertaken in consideration of this note.

Description below provides information on when the changes occurred.

Rated capacity of individual turbines (5 No.) and total project capacity:

Turbine capacity from 4.8MW to 5MW:

PJRCES has reviewed the contract agreement, dated 27 March 2007 between AMR Power private limited (PP) and Boving Fouress Limited (contractor) for supply of equipments & machineries. It was noted that the first page of agreement confirms that the contractor will supply 5 units of 4.8 MW rated capacity, however, appendix 1 of the same agreement mentions the rated output capacity of the turbines as 5.0 MW at generator² end. Hence, the rated output capacity of the turbines has been considered as 5.0 MW. Since the project is operational, the same was verified during the site visit as well, hence, the actual implementation is confirmed to be based on 5 MW turbine capacity. As stated above, this change happened during the actual implementation of the project activity.

Evaluation for the changes of capacity and its influence to power generation was compiled by GCE as part of assessment of changes. The study by GCE referred that PP procured the turbines with rated capacity of 5MW because 4.8MW capacity turbines were not available in market.

¹ Note dated 15.12.2012 prepared by GCE and submitted by PP

² government order no: EN 443 NCE 2007 dated 04-Jan-2008



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Rated Project Capacity from 24MW to 25MW:

Considering the above revised rated output capacity of the individual turbines (5x5MW), the total output of the project activity also changed from 24MW to 25MW.

It may please be noted that although the total installed capacity of the Project activity has changed to 25 MW, the Government of Karnataka order has capped the electricity export to the grid up to 24.75MW and Form – B provides the values of net electricity export for 24.75MW capacity only.

PJRCES has reviewed the official memorandum no: CEIG/EI-2/AEI-2/2304-8, issued on date 24 February 2010 by Chief Electrical Inspector to the Government which:

- a) Approves the commissioning of the project activity; and
- b) Confirms the individual capacity of the turbine as 5000 kW.

Water Head:

At the time of construction, the installation of turbines with higher capacity (as verified from the GCE study for project activity) lead to changes in water head to 8.7 meter in revised PDD, version 04, dated 20 April 2012. Further, PJRCES sought a technical expert opinion and was able to confirm the impact of the turbine capacity on the rated head and design discharge.

Since, PP installed 5MW turbines following parameters also underwent change at the time of project implementation. As indicated earlier, a fresh study on the project parameters was carried out by GCE on 15 December 2011 and results of the same have been discussed below.

Efficiency of the Generator:

The efficiency of the generator was verified through the operation manual of generator which confirms to be at 97.45%³.

Design Discharge:

During the implementation of the project activity, the design discharge (after changes in the rated capacities of the turbines) was estimated at 340.40 cumecs based on the performance curve submitted by PP. The same has been verified by verification team including the technical expert. The design discharge for the changed rated capacity of the project activity is also supported by the independent study undertaken by GCE.

Gross generation from the project:

During the implementation of the project activity, PP also carried out new hydrology studies with respect to flow data for longer continuous period of 25 years from 1977-78 to 2001-02 considering data for hydrological year from month of June to May. The study yielded that average annual energy increases to 78.51 million units (MU) from 77.78 MU at DPR stage, whereas due to longer period (i.e. additional single hydrological cycle of 5 years consideration) dependable energy decreases to 71.5 MU

³ Page#05, Maintenance & Operation user guide generator GSH 1120 K8 dated 13-Dec-2006



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from 73.34 MU. The same has been supported with the calculations which were cross checked by the technical expert and it was concluded that for 25 years of data with 90% dependable year works out to be 71.5 MU. Hence, as per this study, the gross as well as the net electricity generation from the project has reduced resulting in lesser annual emission reductions.

Hydrology:

There are no actual physical changes, especially for the installing equipment (turbines, generators and meters), viewed during the physical site visits by PJRCES during the 1st verification, after project implementation and during operation. At the time of commissioning of the project, the hydrology got changed. The same was verified during the site visit conducted on 24 August 2011 by the verification team including technical expert. The other changes are detailed in the section 1.1 of this report.

As it can be concluded from the above assessment of individual parameters the changes to the project activity occurred prior to the commissioning of the project activity. However the same were not part of the registered PDD, version 03 and the validation report.

1.2.2 Assessment of the reasons for these changes taking place

Rated capacity of individual turbines and the project capacity:

Turbine capacity from 4.8MW to 5MW:

The turbine capacity was changed from 4.8MW to 5MW because at the time of placement of order, the contractor supplied 5MW turbines stating that turbines with 4.8MW were not available in the market. The same is evident from contract document, dated 27 March 2007 between the PP and contractor. It has been further verified during the verification site visit that turbines with 5 MW capacity had been actually implemented at the project site.

Project Capacity from 24MW to 25MW:

Due to the increased capacity of turbines, the capacity of the project also changed from 24MW to 25MW (refer section 1.2 for detailed information) and the same is supported through Government Order, dated 04 January 2008, which licensed the project to operate but limited the export of power to the grid at 24.75 MW capacity. Furthermore, the confirmation of technical features of the project, including rated capacity of 5 MW for each turbine, was issued by the Government on 04 February 2010, i-e after the commissioning of the project activity [CEIG/EI-2/AEI-2/2304-8].

Other Changes:

- a) Water Head: In the registered PDD, version 03, dated 17 April 2009, the water head of 7.31 meter was sourced from the DPR⁴. However, at the time of construction, the installation of turbines with higher capacity (as verified from the GCE study for

⁴ Prepared by Design Group, Project consultants Pvt Ltd, Volume I and Volume II of January 2006



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project activity) lead to changes in water head to 8.7 meter in the revised PDD version 04, dated 20 April 2012. Further, PJRCES sought a technical expert opinion and was able to confirm that the impact of the turbine capacity on the rated head and design discharge was appropriate. Thus, it can be concluded that the change in the turbine capacity has lead to change in the rated head.

- b) Efficiency of Generator: The efficiency of the generator was verified through the operation manual of generator which confirms the same to be at 97.45% and the same was changed due to the change in the turbine prior commissioning of the project activity.
- c) Design Discharge: The procurement and installation of 5MW turbines instead of 4.8 MW turbines lead to changes in design discharge from 392 cumecs to 340.40 cumecs. The same was verified by verification team including technical expert through review of turbine (post commissioning) cross sections submitted by PP. The change in the capacities of individual turbines is also evident in the official memorandum of technical specifications issued by Chief Electoral inspectorate, dated 24 April 2010, which includes the assessment of project activity post commissioning and confirms the capacity of turbine as 5MW and rated speed as 158.46 rpm.
- d) Net electricity export to Southern regional grid: The study conducted by GCE, based on longer period data and addition of 1 more hydrological cycle and consideration of transformation & transmission losses, the estimated feed-in electricity to the Southern Regional Power Grid from the project accordingly changed from 71.15 to 69.38 GWh. This has been verified by review of the study and also based on the opinion from the technical expert.

1.2.3 Assessment of whether the changes would have been known to the project participants prior to registration of the project activity;

Turbine capacity from 4.8MW to 5MW:

Required change in turbine capacity was known to project participants prior to registration of the project activity. The same is evident from contract, dated 27 March 2007 between PP and contractor for supply of equipments & machineries.

It was observed by PJRCES that the capacity of the turbine (4.8MW) considered in the registered PDD was sourced from the DPR⁵. However, on reviewing the actual installed equipments, PJRCES was able to confirm that installed capacities were 5.0MW.

Project Capacity from 24MW to 25MW:

In view of change in the individual capacity of the turbine, the total project capacity changed from 24 MW to 25 MW, further capped at 24.75MW for generation of power to the grid, as per the Government Order. It was noted that the project participant were aware of the change prior to registration of the project activity as it is evident from the government order no: EN 443 NCE 2007, dated 04 January 2008. As discussed above the changes in the project capacity were not communicated during the validation and were identified by PJRCES during the verification site visit.

⁵ DPR dated January 2006 prepared by Design group project consultants private limited.



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Hydrology:

The project activity was registered with CDM Executive Board on 12 May 2009. At that time, the project activity was yet to be commissioned and since, the changes to hydrology occurred at the time of construction of the project activity and hence, this change was not known to PP prior registration of the project activity.

Other Changes:

Given that all “other changes”, i.e.: water head, design discharge and the net energy delivered to the grid were a direct implication of the change capacity of individual turbine capacity, the “other changes” were also known to the client prior to the submission for registration.

Efficiency of Generator: The operation manual of the generator was available to the PP at the time of the contract and hence, this change was known to PP prior registration of the project activity.

1.2.4 Assessment of how the changes may impact the overall operation/ability of the project activity to deliver emission reductions as stated in the PDD;

Project & Turbine Capacity:

Change in the project capacity from 24MW to 25MW and turbine capacity from 4.8MW to 5MW is result of negligence on the part of PP while writing PDD and would have very little impact on the operation or ability of the project activity to deliver emissions reductions as described in the PDD. The increased capacity ensures the delivery of CERs and in this case less number of CERs as compared to registered PDD due to limitation by the Government and also because of lower dependable energy to be supplied. And also 5MW turbines would have been installed under any circumstances.

Hydrology:

The changes in hydrology as supported by the GCE note results in lower dependable energy supplied by project activity and results in the lower operation/ability of the project to deliver emission reductions as stated in the registered PDD. In result, the annual emission reductions are reduced from 60,816 to 59,290 tonnes of CO₂e per year. PJRCES was able to confirm by comparison of PLF value as mentioned in the registered PDD i.e. 34.88% and current PLF, based on actual operations, achieved by project activity is 19.43⁶%. This has been verified through site visit and document review⁶. The actual generation achieved by the project activity in the verification period from 12/09/2009 till 30/06/2011 also favours the study that dependable energy reduction has lead to reduction in lower operation/ability of the project to deliver the emission reductions.

1.3. Assessment of the impact of the changes

Do the changes raise ☐ Additionality

⁶ Net generation is sourced from B-Forms issued by KPTCL. Also, includes shutdowns and non-running hours.



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concerns with regard to any of the following aspects?

- ☐ Scale of CDM project activity
- ☐ Applicability and application of baseline methodology
- ☒ Not applicable (the changes do not raise any concerns)

1.3.1 Assessment of impacts of the changes on additionality;

The additionality argument presented in the registered PDD is based on investment analysis and barrier analysis.

Investment analysis of the change in feed-in-electricity due to change in Turbine capacity & rated head:

This is the only change that has an impact on the investment analysis.

The direct impact from the changes in Turbine capacity and rated water head results in the change in the feed-in electricity. By application of current feed-in electricity of 71.50 GWh, while keeping the other financial parameters unchanged in the IRR sheet, the IRR results as 12.91%, which is lower than the 15.48% benchmark. Furthermore the $\pm 10\%$ variation of all factors would not lead the IRR to cross the benchmark.

Therefore, the changes of the project activity do not impact the additionality of the project. It is in PJRCES's opinion that the change to the project design has not changed the conclusion in the registered PDD of the proposed project that the project is additional.

1.3.2 Assessment of impacts of the changes on the applicability and application of baseline methodology

The project applied the approved consolidated methodology ACM0002 (version 06) – “Consolidated baseline methodology for grid-connected electricity generation from renewable sources” and “Consolidated monitoring methodology for grid-connected electricity generation from renewable sources”, which is applicable to the project activity as the project comprises the installation of a new renewable electricity generation plant harvesting hydro resources and is connected to Southern regional power Grid which is clearly identified, and information on the characteristics of this grid is publicly available. In addition, the project activity does not involve switching from fossil fuels to renewable energy at the site of the project activity.

Therefore, the applicability criteria of the applied methodology remain unaffected as there is no change in technology and the validated baseline scenario remains valid.

1.3.3 Assessment of impacts of the changes on the scale of the CDM project activity



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Although there is a change (increase) in the capacity of the project, there is no change to the scale of the CDM project activity as the capacity remains above 15MW a minimum threshold for large scale project activity.

2. Revision of monitoring plan to reflect current monitoring practice

No revisions have been proposed in the monitoring plan.

Validation opinion

The proposed notification of the changes as stated in the section 1 ensures that the level of accuracy and completeness in the monitoring and verification process is not reduced as a result of the notification change and does not affect the applicability of the approved monitoring methodology ACM0002 (version 06) – “Consolidated baseline methodology for grid-connected electricity generation from renewable sources” applicable to the proposed project.

We wish to seek permission on behalf of the project participant for the changes requested above. Considering the assessment presented above, PJRCES was able to confirm that the change in the turbine capacity, total project capacity, water head change, and net electricity export to the grid do not impact the additionality of project activity negatively and would not change the scale of CDM project activity.

Following supporting documentation along with this request is submitted for the consideration of the Executive Board:

- Revised PDD, version 04, dated 20 April 2012, reflecting the changes in the project activity;
- Updated financial analysis spreadsheet;
- Updated spreadsheet for calculation of emission reductions.

Yours faithfully
for PJRCES

Name
Bilal Anwar
Final Approver, PJRCES