






Validation opinion for post registration changes

Title of project activity:		
Improving Kiln Efficiency in the Brick Making Industry in Bangladesh		
CDM reference number:	DNV project No.:	
5125	PRJC-442834-2013-CCS-NOR	
Date:	Validation of the changes were conducted:	
5 June 2014	<input checked="" type="checkbox"/> Prior to the commencement of a verification of the project activity <input type="checkbox"/> When performing a verification of the project activity	
Work carried out by (name & signature):	Work verified by (name & signature):	Approved by (name & signature):
Kakaraparthi Venkata Raman 	Ole A. Flagstad 	Ole A. Flagstad 

Overview of post registration changes

Type of post registration change		Are the changes of a type specified in Appendix 1 of the CDM Project Standard? Note: In case of "No", prior approval by the EB is required
A: Temporary deviations from the registered monitoring plan and/or monitoring methodology (refer to section A)		<input type="checkbox"/> Yes <input type="checkbox"/> No
Applicable period for proposed deviations (inclusive):		<input checked="" type="checkbox"/> No post registration change of this type
B: Corrections (refer to section B)		<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> No post registration change of this type
C: Changes to the start date of the crediting period (refer to section C) <i>Prior approval by the CDM EB is not required in case of (a) bringing forward the start date up to one year earlier or (b) postponing the start date by up to one year (by up to two years for project activities in LDCs).</i>		<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> No post registration change of this type
Proposed start date of the crediting period:	DD/MM/YYYY (changed from DD/MM/YYYY)	
D: Permanent changes from the registered monitoring plan or applied methodology (refer to section D)		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> No post registration

	change of this type
E a): Changes to the project design of a registered project activity (refer to section E)	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> No post registration change of this type
E b): Changes to the programme design of a registered PoA (refer to section E)	Note: All changes to the programme design of a registered PoA require prior approval by the EB. <input checked="" type="checkbox"/> No post registration change of this type
F. Changes specific to afforestation or reforestation project activities (refer to section F)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> No post registration change of this type

A. Temporary deviations from the registered monitoring plan and/or monitoring methodology

Not applicable

B. Corrections

Not applicable

C. Changes to the start date of the crediting period

Not applicable.

D. Permanent changes from the registered monitoring plan or applied methodology

The monitoring plan has been revised based on the FARs (FAR 2 and FAR 3) raised in the previous verification report. Revised monitoring details are elaborated below:

FC_{Diesel,i,y} (kilolitre/yr). Quantity of diesel (fuel type) combusted in process j during the year y:
As per the registered PDD, the source of this parameter is “invoices of purchase”, with the entire purchase being considered as consumption. However the actual practice as observed at the site was that, diesel procured is stored in drums and the consumption is monitored by measuring in standard measuring jars of capacities 1/2/5 liters. The overall diesel consumption can be cross checked against the diesel purchases at the end of monitoring period by tallying out the total purchase with opening stock and closing stock of diesel. It is DNVs opinion that this is a viable practice for small manufacturing units, where the installation of a storage tank and fuel metering with calibrated meters is not a viable option. It is DNVs opinion that the use of a ruler is also not a technically feasible option as the storage drums being made of thin sheets tend to lose the cylindrical shape with use. Moreover, the project emission from the diesel usage in the first monitoring period is 4.3% and thus below the materiality threshold of 5% as indicated in the Guideline on the application of materiality in verifications. The revised PDD also proposes to have a new set of measuring jars each year, as there is no proper institutional/laboratory set up available for easy calibration. The method

of diesel measurement was also raised by EB during the first issuance and the above provided justification was accepted. As a QA/QC procedure, in case of any delay in procuring new measuring cans after one year, the revised PDD proposes a suitable error to be applied on the measured readings for the period until next new equipment are procured. This is reasonable in DNVs opinion.

For measuring cans, the error value shall be estimated based on actual conditions during the verification in discussion with the verifying DOE. This is reasonable in DNVs opinion.

EC_{i, y} (MWh) Electricity Consumption in plant i per year: The QA/QC procedure has been strengthened to state that “Electricity consumption from the individual monthly electricity bills shall be cross checked with the electricity consumption calculated from the first and last month of the monitoring period”. The revised PDD also clarifies that “In cases where a single electricity meter is used by two kilns and unless there is proper sub-meter installed and consumption is monitored, the total power consumption of the meter will be considered for each of the kilns.” The revised PDD also clarifies that “In case of energy meters, there is no calibration method in practice in Bangladesh.” DNVs verification team has during the first verification site visit evidenced the letter from Bangladesh DNA to this effect and considers it appropriate. It is also DNVs opinion that for two units having a single electricity meter, the consideration of the aggregated meter readings for each of the unit is conservative.

TC_{Coal i, y} (Tonnes/year) Total consumption of coal for brick making in brick plant i in year y: As per the registered PDD, the source of the data is “invoices from the suppliers”. As per the actual practice observed at the site during the first verification, the PDD has been revised to document the source as “Measured using digital weighing scale”. The coal consumption will be measured by counting the number of buckets/sacks of coal consumed per day. Each of the bucket/sack of coal is weighed to determine the weight of a bucket of coal using a digital weighing scale. For the QA/QC procedures, the coal consumption is cross checked against the invoices (purchased) taking into account the balance of coal not consumed for the monitoring period concerned. Since there is no proper institutional / laboratory set up available for easy processing of calibration of weighing scales, new weighing scales will be purchased every year by the kilns to ensure the accuracy of measurements. This practice has also been raised by EB during the first issuance and the above provided justification was accepted. As a QA/QC procedure, in case of any delay in procuring new weighing scales after one year, the revised PDD proposes a suitable error (maximum permissible error as per the respective manufacturer specifications) will be applied on the measured readings for the period until next new equipment are procured. This is reasonable in DNVs opinion.

DMW_{HHK Bricks, di} Daily Mean Weight of baked HHK bricks in kiln i: As per the registered PDD, the sampling plan proposed to be followed was the random sampling with 90% confidence interval with +/- 10% error margin. Accordingly, on each production day, a sample size of 100 bricks would be taken and weighed separately and mean daily weight calculated.

As per the revised monitoring plan, the project proponent proposes to follow the multistage sampling in line with the “Standard - Sampling and surveys for CDM project activities and programme of activities, version 04.1” and “Guideline - Sampling and surveys for CDM project activities and programme of activities, version 03.0, EB 75”, as measuring all the elements in the selected clusters will be prohibitively expensive for a small project.

As per the revised PDD and the revised sampling procedure, the daily mean weight of the HHK brick is estimated by the following steps.

- Primary sampling unit - number of days to be selected per year: 24 (2 per month), this parameter would depend on the actual months of operation of a HHK unit. 2 days shall be randomly selected from every operational month based on the production pattern
- Secondary sampling unit – number of bricks to be sampled in each day: 20 bricks will be taken for every type of brick (solid, 3 holed, 6 holed, etc.) produced on a day. Sample selection within a day shall also be carried out by random.

The aforementioned sampling plan will be applied to each of the kiln included in the project. The total number of bricks to be sampled per year for each kiln is determined by 3 factors:

- (1). Number of operational months
- (2). The number of sampling day in a month and
- (3). The number of brick samples taken in a day.

While factor (2) and (3) are fixed, the total number of brick samples per year varies due to factor (1); for example, if a project kiln operates 12 months in the year, the number of brick sample would be 480 (12 months * 2 days/month * 20 bricks/day). Similarly, a minimum of 4 operational months will result in 160 bricks to be sampled in a year. This is still adequate compared to the minimum number of samples per year (i.e. 150) and therefore complies with the sampling guidelines (please refer to the following paragraph on sampling plan for the calculation of minimum number of samples per year). In case, any kiln is not operated for a minimum of 4 months, the project proponent will ensure that a minimum of 160 bricks are sampled in the operating months by either increasing the number of samples/day or the number of days/in a month.

It is DNVs opinion that measuring all the elements in the selected clusters will be prohibitively expensive for a small project with small brick manufacturing units as is required in a random selected sampling in contrast to multi-stage sampling where data are collected for only a random sample of the secondary units.

DNV has verified the working of the above sampling plan, which has been derived based on the data of the Kapita brick Kiln which has the highest capacity (100 000 bricks per day) in the project activity along with the Diamond Auto bricks unit. The calculations as provided in the excel have been verified to be correct, and the assumptions reasonable.

The sampling plan has been derived as follows:

- a) The assumptions for estimating the sample size were:
 - Primary sampling unit (PSU) = Each brick production day
 - Secondary sampling unit (SSU) = All fired bricks output on a production day
 - No. of bricks sampled per day = 10 (for initial analysis)
 - Max. brick output on day = 100,000
 - Max. no. of brick production days = 365
 - 90% confidence level and 10% precision
- b) The expected mean and standard deviation were calculated from brick weight measurements. The weight measurements were taken for 100 brick samples randomly selected on 11 random days.

Overall mean weight (brickmean)	3.028
Overall mean total weight of each day (daymean)	193,946
SD of total weight of days (SD _B)	46,175
Standard deviation within a day (SD _w)	0.041

c) Estimation of number of days to be selected

The number of days to be selected was calculated at 15 days a year based on the Equation 77 of the guidelines of “Sampling and surveys for CDM project activities and programmes of activities” Version 03.0.

$$c \geq \frac{\left(\frac{SD_B}{\text{daymean}} \right)^2 \times \left(\frac{M}{M-1} \right) + \left(\frac{1}{u} \right) \times \left(\frac{SD_w}{\text{brickmean}} \right)^2 \times \left(\frac{N-u}{N-1} \right)}{\left(\frac{0.1}{1.645} \right)^2 + \frac{1}{M-1} \left(\frac{SD_B}{\text{daymean}} \right)^2}$$

Where,

c	=	No. of days to be selected
M	=	Total number of days
N	=	Average number of bricks per day
u	=	Number of bricks to be sampled per day
1.645	=	Represents the 90% confidence required
0.1	=	Represents the required 10 % precision
SD _B	=	Standard deviation of weight of each day
SD _w	=	Standard deviation within a day
brickmean	=	Overall mean brick weight
daymean	=	Overall mean of total brick weight of each day

DNV also observes that the number of sampling days per year at 15 is the highest when calculated for the individual kilns. Also considering a sample number of 10 per day, the maximum number of samples in a year is 150. The sample size is dependent upon the standard deviation within a day (SD_w) and standard deviation of total weight of days (SD_B). The PP has also demonstrated that, for the given accuracy (10%) and confidence level (90%), the number of days per year required is not affected by the number of brick samples considered per day. It is also amply demonstrated (by para 179 of the sampling guideline) that for the given accuracy and confidence level, the number of days in a year (primary sampling units) to be selected does not vary, based on different number of samples selected per day (secondary sampling units). Hence it is DNVs opinion that the number of sample days at 15 and the number of brick samples per day at 10 is adequate and in line with the sampling guidelines.

d) Required sampling as per cluster sampling

From the above calculations, the minimum required brick sample size is 150 brick samples per year for each kiln in the project.

HHK kilns are designed to operate around the year. In actual practise, it may be shut down for 1-2 months to carry out annual maintenance. As long as, there is no major

equipment/production issue, the kilns will operate a minimum of 10 months per year. Hence, the total bricks sampling will be well above the required 150 samples. (10 months x 2 days x 20 samples = 400 samples).

The minimum sample size of 150 will be achieved even if the plant operates for 4 months itself (4 months x 2 days x 20 samples = 160 samples). Once production is started, any kiln will continuously operate for a minimum of 4 months in a year if there is no major equipment failure. The four months of minimum operation is reasonable as for a HHK kiln as a) to start operations and get the whole kiln into stable production, it will take around 1 month b) again, if the kilns must be completely shut down, it will again take a month and given these conditions, once production is started, any kiln will surely operate for a minimum of 4 months in a year if there is no major equipment failure. From the first crediting period (2011-2012) and second crediting period (2012-2013), the minimum kiln operation period was observed to be 5 months (Haair brick kiln). Considering all the above, The sampling plan is adequate in DNV's opinion.

E. Changes to the project or programme design of a registered project activity or PoA

E.1 Description of the changes as compared to the description in the registered PDD and description of the changes to the monitoring plan

The project activity in the registered PDD comprised of 8 HHK brick making units, whereas the revised PDD indicates the number of units to be 6. Of the two units removed, one of the units, SSL-1 Ceramics Bricks Limited (Kiln 1) was shut down due to technical problems and quality issues on 1 July 2012. This was verified by the verification team (during the period 25-27 February 2013) from the log books. The second unit, SSL-2 Ceramics Bricks Limited (kiln 2), was not implemented due to the technical problems faced in kiln 1 unit. The changes were noted during the site visit for the first verification of the project activity.

E.2 Assessment of the changes to the project design (*applicable to project activities only*)

Assessment of when the changes occurred

As stated above, of the two units removed from the project activity, SSL-1 Ceramics Bricks Limited (Kiln 1) was implemented and was operation for some time. The unit stopped production since 1 July 2012, due to operational issues resulting in very low quality of the bricks produced. The stoppage of the unit was verified during the site visit (of first verification) from the log books. The SSL-2 Ceramics Bricks Limited (Kiln 2) was not implemented at all due to the problems of SSL-1 unit.

Assessment of the reasons for these changes taking place

DNV observes that the reason of operational problems/quality issues in the produced bricks is valid enough for the changes taking place.

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

The project was registered on 18 August 2011, and the validation was completed on 18 July 2011. The unit of SSL-1 was shut down on 1 July 2012, hence the changes of the SSL-1 unit getting shutdown and SSL-2 unit not getting implemented would not have been known to the participants.

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

The above mentioned changes does have an impact on the overall operation / ability of the project activity to deliver emission reductions as stated in the PDD. The emission reductions, dues to the removal of two units decreases to 44 098 t CO₂e from 54 704 t CO₂e in the registered PDD.

E.3 Assessment of the impact of the changes to the project design (*applicable to project activities only*)

In the case of a project activity, do the changes adversely impact any of the following?

- ☐ The applicability and application of the applied methodology under which the project activity has been registered
- ☐ The additionally of the project activity
- ☐ The scale of the project activity
- ☒ None of the above

Assessment of impacts of the changes on the applicability and application of the applied methodology under which the project activity has been registered

The above mentioned changes do not have impact on the applicability and application of the applied methodology under which the project activity has been registered.

Assessment of impacts of the changes on the additionally of the project activity

The additionality of the project activity was demonstrated on a comparison of the financial indicators (project IRR, Equity IRR and payback period) of a commonly used brick manufacturing technology of Fixed Chimney Kiln (FCK) and the project technology of Hybrid Hoffman Kiln (HHK). Since the comparison was on a unit to unit basis, the removal of two units does not impact any changes on the additionality of the project activity.

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

The above mentioned changes do not have impact on the scale of the project activity.

E.4 Assessment of the change to a PoA (*applicable to PoAs only*)

Not applicable.

F. Changes specific to afforestation or reforestation project activities

Not applicable.

Validation opinion

It is DNV's opinion that:

- The proposed PRCs ensure that the level of accuracy or completeness in the monitoring and verification process is not reduced as a result of the proposed revisions.
- The proposed PRCs are in accordance with the approved monitoring methodology AMS-II.D, version 12, applicable to the project activity whilst maintaining the conservativeness of the emission reductions.

Hence, DNV recommends the approval of the PRCs submitted by the project participant.

Also DNV states that the transfer of information from the old form of the registered PDD (VVM mode version 15 dated 18 April 2011) to the new form (VVS mode, version 04 dated 16 March 2014) is correct and materially the same, except for the revisions as detailed in the above sections.

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