

# **BUI HYDROELECTRIC PROJECT**

**CONFIDENTIAL**

## **PROGRESS REPORT**

October 2012 – December 2012



## Table of Contents

0.0	EXECUTIVE SUMMARY .....	2
1.0	ENVIRONMENTAL ISSUES .....	7
2.0	RESETTLEMENT AND COMMUNITY SUPPORT ....	10
3.0	PROJECT DESIGN.....	15
4.0	CONSTRUCTION AND SUPPORT FACILITIES .....	16
5.0	MAIN DAM WORKS .....	16
6.0	POWERHOUSE WORKS .....	21
7.0	SADDLE DAMS .....	34
8.0	TRANSMISSION LINES .....	35
9.0	LABORATORY .....	39
10.0	SURVEY .....	43
11.0	SECURITY, SAFETY AND HEALTH.....	44
12.0	WEATHER .....	45
13.0	HUMAN RESOURCES .....	45
14.0	COST AND FINANCIAL REVIEW .....	45
15.0	PROJECTIONS FOR THE NEXT QUARTER .....	50





## 0.0 EXECUTIVE SUMMARY

### 0.1 The Project

The Bui Hydroelectric Project (BHP) consists of a roller compacted concrete (RCC) gravity dam with 5-bay spillways arranged in the main dam, a powerhouse, switchyard, transmission lines and a downstream permanent bridge. Two saddle dams were to be built in addition to the main dam to contain the reservoir. Power will be generated from a surface powerhouse at the toe of the dam on the left bank by three Francis turbine-generator units with a total installed capacity of 400 MW (3×133 MW). A total of Two Hundred and Forty Four kilometres (244 km) of 161 kV transmission lines will be built to evacuate power from the Project site. The transmission lines were made up of two 18-km lines to Teselima which break into an existing Techiman–Sawla line to become Bui–Sawla and Bui–Techiman lines, a 138-km line to Sunyani and a 70-km line to Kintampo.

The Project will lead to the resettlement of seven (7) communities with a total population of one thousand two hundred and sixteen (1,216) people. The resettlement program has been divided into three parts. The first part, (Part A) involved the resettlement of communities that were living within the Project construction area. For this reason, the resettlement of these communities was undertaken prior to the commencement of construction activities. The second part (Part B) involves the resettlement of communities that reside at locations that will be inundated when the impoundment begins in 2011. The third and final part (Part C) involves the resettlement of the Bui Camp, the current residence of officers of the Game and Wildlife Division of the Forestry Commission which have been assigned to protect the Bui National Park.

### 0.2 Implementation Arrangements

The Project is being implemented under an Engineering, Procurement and Construction (EPC)/Turnkey Contract that has been awarded to SinoHydro Corporation Limited of China. The works were being supervised by Bui Power Authority (BPA) with the assistance of an Engineering Consultant; Tractebel Engineering/Coyne et Bellier (CoB) of France.

### 0.3 Implementation Schedule

The Project implementation commenced with detailed geological and hydro geological investigations that were carried out between October 2007 and March 2008.

Construction Phase I (Preparatory works) which included the erection of temporary facilities and support services required for the dam construction commenced in January 2008. Phase I activities were considered to have ended in December 2008 and was marked by the river closure ceremony held on December 02, 2008. This date has been chosen as the baseline date for the commencement of the Project.

Construction Phase II (main works) commenced in January 2009. Impoundment of the Black Volta River commenced on June 8, 2011. The reservoir which has full supply level of 183 masl and a maximum area of 444km<sup>2</sup> is expected to be formed over a period of 2 rainy seasons starting 2011. In the 2011 rainy season, the reservoir level rose from about 100m to about 132m. The expected completion date for the entire Project falls in the first half of 2013.

**0.4 Summary of Environmental Activities**

The mitigation measures for the associated environmental and social impacts of the Project were monitored for their conformity with the Contractor's Environmental Management Plan, EPA guidelines etc.

Inspection of the ongoing reservoir clearing was also carried out.

BPA commenced a Forest Resource Enhancement Project to among other things, curb erosion, siltation etc within the reservoir and the acquired area as a whole

Review of the final report on the fish stock assessment study by the Department of Oceanography and Fisheries, University of Ghana is ongoing. The collaborative efforts of some informants within the nearby communities led to several immigrant fishermen being turned away following stakeholder meetings held with all the communities in the catchment area to sensitize them on the need to regulate the influx of immigrant fishermen.

**0.5 Summary of Resettlement Activities**

The remaining 5 houses at Part A2 were completed in the period under review.

**Summary Table of Resettlement Activities**

	Total Qty	Status	Remarks
<b>Resettlement Houses</b>			
Part A2 Houses	52	100 %	Completed
Part B Houses	140	100 %	completed
Part C Houses	18	70%	
<b>Communal Facilities</b>			
Nursery/Primary/J.H.S.	1	100 %	Completed
Clinic	1	100%	completed
Market Square	1	100%	completed
<b>Township Services &amp; Utilities</b>			
Electrification	—	100 %	Completed
Water Supply	17(Boreholes)	100 %	Completed
Road works	—	100 %	Completed

**0.6 Summary of Community Support Activities**

BPA undertook a number of measures to support local communities to mitigate social, health and economic impacts of the Bui Hydroelectric Project. The community support was in the form of employment/income generation opportunities, provision of potable water and health care

Payment of Monthly Income support (MIS) allowances was honoured in full.

The final draft plans for Bongase, New Longoro, Kyingakrom and Agbelekame South, all communities within the Bui HP acquired land and also in the Brong Ahafo Region will be presented three times to the communities as mandated by law.

**Summary Table of Community Support Activities**

Community Support	Resttl.Part A	Resttl. Part B	Comments/Remarks
Resettlement Grant	Paid (100%)	Paid (100%)	Paid upon relocation
Land Development Grant	Paid (100%)	Paid (100%)	All households paid.
Monthly Income Support	Paid (100%)	Paid (100%)	All households paid.
Livelihood Enhancement Programme	Phase 1 complete	1 <sup>st</sup> phase completed	1 <sup>st</sup> phase of LEP completed. Cooperatives established Input support has been completed.
Crop compensation	Jama Farmers Mostly Paid	Farmers at Bui, Akanyakrom Bongase Dokokyina Mostly Paid	LVD issued additional cheques to recipients who have resolved their authentication issues. Compensation for transmission lines and substations are still outstanding.
Land compensation			Land Valuation Division is still receiving claims from land owners.

0.7 Summary of Progress of Engineering Work.

BPA maintained a field supervision team to ensure that the Contractor complied with the applicable standards and technical specifications stipulated in the EPC/Turnkey Project Contract.

**Summary Table of Progress of Engineering Work**

	TOTAL QUANTITY	PROGRESS TO DATE	STATUS (December 2012)
<b>MAIN DAM</b>			
RCC / CVC	1,064,398 m <sup>3</sup>	1,053,754m <sup>3</sup>	99 %
Grouting	19,250	19,057	99 %
Spillway	77,000 m <sup>3</sup>	76,230 m <sup>3</sup>	99 %
<b>POWERHOUSE</b>			
Civil Works	69,756 m <sup>3</sup>	66,030m <sup>3</sup>	94 %

ElectroMech (Manufacture & Install)	N/A	N/A	70%
<b>SADDLE DAM 1</b>			
Excavation	99,200 m <sup>3</sup>	114,092 m <sup>3</sup>	100%
Foundation	332 m	332 m	100%
Grouting	332 m	315.4m	100%
Backfilling	683,190 m <sup>3</sup>	683,190m <sup>3</sup>	100%
<b>SADDLE DAM 2</b>			
Excavation	25,254 m <sup>3</sup>	7,576 m <sup>3</sup>	30%
Foundation	-	-	Not started
Grouting	-	-	Not started
Backfilling	101,014 m <sup>3</sup>	- m <sup>3</sup>	Not started
<b>TRANSMISSION</b>			
Bui - Sawla	18 km	17 km	97%
Bui - Kintampo	70nr	68 nr	97%
Bui - Techiman	18 nr	17nr	98%
Bui - Sunyani	138 km	52km	38%
Substation works	3		51%
<b>PERMANENT BRIDGE</b>	159 m		90%

Concreting around the spiral case for unit 1 in the main powerhouse was completed with checks showing no positional deviation this time.

Concrete works for the guard rails at the dam crest were completed. Backfilling of filter 1 and 2 materials at the final elevation (EL 187) was commenced

A trial embankment test was conducted on soil material to be used for the filling works. The test was successful and the results are to be applied on the actual embankment works when it commences. The dam axis has been established with excavation works at 30% complete. Stockpiling of soil for the construction of the embankment was underway for approved borrow areas.

The progress of installations of the penstocks was at 90%, 100% and 100% for unit 1, 2 and 3 respectively. Non-destructive tests (NDT) such as UT and PT conducted on the welded penstock were successful.

Installation of the radial gates for the 2<sup>nd</sup> and 3<sup>rd</sup> orifices of the spillway was continued (90% and 75% complete for gate #2 and #3 respectively) during the period. The installation of the radial gate for the 1<sup>st</sup> orifice also commenced (30% complete)

Transmission line designs including design modifications for the diversion of the then Bui-Kenyase line to the Sunyani substation were completed. This also includes design modifications required for the Bui-Kintampo line to crossover the existing Techiman-Sawla line prior to breaking into the latter. The design of the Substations was 88% complete. Major outstanding design works are related to the expansion/modification of Sunyani Substation whereas the minor ones were the expansion/modification of the Sawla, Techiman and Kintampo as well as Bui switchyard

0.8 Security, Health and Safety

Averages of about Eight Hundred and Twenty Two (822) cases of diseases were reported at the site clinic. Cases of malaria were the most predominant along with other diseases such as diarrhoea, rheumatism joint pains and various occupational injuries were also recorded.

0.9 Labour Strength

The number of Ghanaians employed on site by the Contractor totalled Two Thousand and Fifty One (2051) at the end of the quarter. The Expatriate staffs of the Contractor, on the other hand, comprised Three Hundred and Sixty-Three (363) Chinese Nationals and Eight-Seven (87) Pakistani Nationals

## 1.0 ENVIRONMENTAL ISSUES

### 1.1 Environmental Monitoring

Daily and weekly environmental monitoring were carried out to ensure that the associated environmental and social impacts of the Project were being mitigated in consonance with the Contractor's Environmental Management Plan (EMP), Workforce and Employment Policy (WEP) as well as the conditions of the Environmental Permits (EPs). Routine environmental monitoring and inspection were carried out in the following areas; BPA, Hubei, Chinese and Pakistanis Camps, Quarry area, Fly ash warehouse, RCC batching plant, Main Dam area, Fuel depot, Common market, Mechanical workshop, Refuse dump site and all toilet facilities.

Some environmental challenges were identified and recommendation made for redress by the Contractor.

### 1.2 Bui Reservoir Clearance

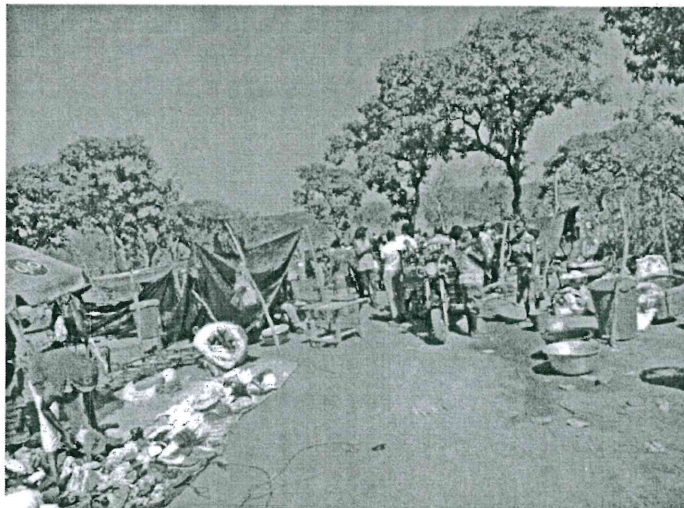
Joint monitoring of the fairways and reservoir clearing was carried out to assess the progress of work executed by the Sub-Contractors. The four Sub-Contractors contracted by SinoHydro to execute the works on the reservoir clearing continued to haul merchantable logs from the reservoir. Measurements of the volumes were carried out by Sub-Contractors. Merchantable tree species that were recorded were Mahogany, Senya (rose wood) and Krayie.

A total number of 15,891 merchantable trees had been hauled and volume measured for sharing as per the Contract agreement. Hauling of merchantable logs to designated staging points outside the reservoir also continued.

### 1.3 Stock assessment study and fisheries management plan

BPA continue to monitor and control access to the reservoir area by immigrant fishermen. The efforts by BPA were to ensure sustainable fishing within the reservoir. Some positive results have been recorded in this regard at the Brong Ahafo side of the reservoir.

Fishing activities at Jama seem to be booming and in line with ensuring sustainable fishing within the reservoir, collaborative efforts of some informants led to several immigrant fishermen being intercepted and turned away.



*Plate 1: Fishing activities at the Jama side of the lake*



#### 1.4 BPA Forest Resource Enhancement Programme

The BPA Forest Resource Enhancement Program (FREP) aimed at promoting sustainable utilization of the forests resources in the Black Volta Basin and other parts of the Acquired Land continued during the period under review.

Pursuant to the on-going efforts to implement the above Program, the following activities were carried out;

A fire ride was created around the 42.5 acres of land prepared for the planting of over 8,000 mahogany seedlings around the permanent BPA Staff village as a pilot scheme. A similar ride was created for the 21.67 acres of land (zone C) along the Dam Site to Jama road which was also being prepared for planting of teak, cedralla etc.

Bush fires sensitizations were carried out among the inhabitants to prevent any potential bush burning around the plantations whilst patrols were also initiated.

A proposal from a consultant on the creation of Memory Centre for the preservation of indigenous and traditional knowledge of the forest resources of the Black Volta Basin was being reviewed.

#### 1.5 Black Fly Nuisance Control Programme

An agreement with the Noguchi Memorial Institute for Medical Research (NMIMR) to undertake a study towards the development of a black fly nuisance control program is on-going.

The overall aim of the program is to develop strategies to control black fly and to eliminate the nuisance from its bites at the Bui dam area and its environs. To achieve these aims, short term activities including relevant research studies were conducted to develop the medium to long term strategic plans towards the management and control of the nuisance.

The immediate to short term activities have been completed and some of the keynotes are as follows:

- A thorough assessment of black fly nuisance levels at the Bui dam site and its environs
- Mapping of all relevant breeding sites and potential breeding site on lower Black Volta, R. Tain and Tombe, and insecticide treatment points on these rivers;
- Determination of insecticide susceptibility levels of black flies to the recommended organophosphate insecticide Temephos;
- Pilots of communication strategies and use of commercially available repellents for personal protection.

The baseline investigation of the aquatic fauna and experimental larviciding were put on hold owing to the little to no flow of the Black Volta downstream due to the reservoir impoundment. These activities would however be carried out during the early rainy season of 2013.

Meanwhile, the team has submitted an interim report on the above study and which is being reviewed.

#### 1.6 Water quality analysis during the quarter

Water samples were taken monthly to monitor the extent of pollution of the water downstream as a result of the construction activities.

Samples were collected at locations on both upstream and downstream of the Main dam and also at the outlet of the sedimentation pond. Samples were tested at the Water Research Institute in Accra.

The reports showed that the water from both upstream and downstream of the construction area continued to be unsuitable for drinking because they did not conform to the Ghana Standards GS 175 and WHO guidelines of zero total and faecal coliforms counts per 100ml. However, all the physico-chemical parameters analysis results were within acceptable limits of the EPA guideline values. The water could therefore continue to be used for other household chores such as washing and bathing.

#### 1.7 Environmental and Social Issues on Bui Transmission Lines

BPA in conjunction of the Land Valuation Division (LVD) of the Land Commission (LC) completed the inspection, enumerations, and valuation of properties within the Right of Way (RoW), on the Bui HP transmission lines.

##### Compensation Payment

##### **Bui – Teselima – Kintampo Transmission Line**

BPA in conjunction of the Land Valuation Division (LVD) of the Land Commission (LC) have completed the inspection, enumerations, and valuation of properties within the Right of Way (RoW), on the Bui HP transmission lines.

##### **Bui – Kenyase Transmission Line (now Bui – Sunyani)**

For the original Bui – Kenyase transmission line now Bui – Sunyani transmission line, the inspection, enumeration and valuation have been completed. The LVD during the quarter gave an approval for the crops and houses/structures within the right of way except the 6 km section of the re-routed section of the Bui – Sunyani transmission line. The attention of the LVD has been drawn to the anomaly for which they have assured that it will be corrected within the shortest possible time.

In a related development, a farmer - Oppong Degraft has sued BPA in Sunyani Circuit court for destruction of crops without payment of compensation. When the case was called Defendant Counsel explained that, the Bui Power Authority followed due process in the acquisition of the RoW where the Plaintiff properties were affected. The Counsel told the court that, properties within the Plaintiff's farm were inspected and enumerated and subsequently the valuation process was on-going by officials of the LVD (the official government mandatory institution). The counsel for the Defendant therefore prayed the court to adjourn the case to next month since the process was on-going.

On this, the Judge indicated that, the Plaintiff Counsel should have known better and accordingly advised his client on the matter. He further indicated that even if a ruling was passed on the matter, the due process would have to be followed. The case was therefore adjourned.

#### 1.8 Environmental Permit for Bui Irrigation Scheme

In conformity with the Environmental Assessment Regulations 1999 (LI 1652) which enjoins any proponent or person to register an undertaking with the Environmental Protection Agency to obtain an Environmental Permit prior to commencement of the project, BPA submitted an application form to the EPA regarding the Bui Irrigation Scheme.

Subsequent to this, the EPA responded and requested for a Scoping report which outlines the Terms of Reference. BPA submitted the draft which outlines the Terms of Reference for the Project. BPA is still awaiting a response from the EPA for a full blown Environmental and Social Impact Assessment to be carried out.

### 1.9 Environmental Issues

Zoom Lion Ghana Ltd continue to carry out spraying against mosquitoes and household pests within the Project Site. During the period under review, the company fumigated houses within the Resettlement Part B. This has helped keep away pests and reptiles from the area.



*Plate 2: Fumigation at one of the resettlement Part B houses*

## 2.0 RESETTLEMENT AND COMMUNITY SUPPORT

### 2.1 Resettlement Parts A

All house owners at the Jama Resettlement Part A have been relocated from the temporary houses to their permanent houses at the Resettlement Part A2. Sensitization meetings on the need to adapt the culture of maintenance and general upkeep of their housing units and their communal infrastructures were also carried out. Officials from the Land Valuation division were at the Jama community to issue out the standard form Fs to the affected farmers whose farms were captured during the enumeration of crops. These farms were part of the undetected farms that were later identified during the creation of the Bui reservoir. Farmers who received their Form Fs have been advised to keep their forms safely since it was only with the Form F that a farmer could make claim for compensation.

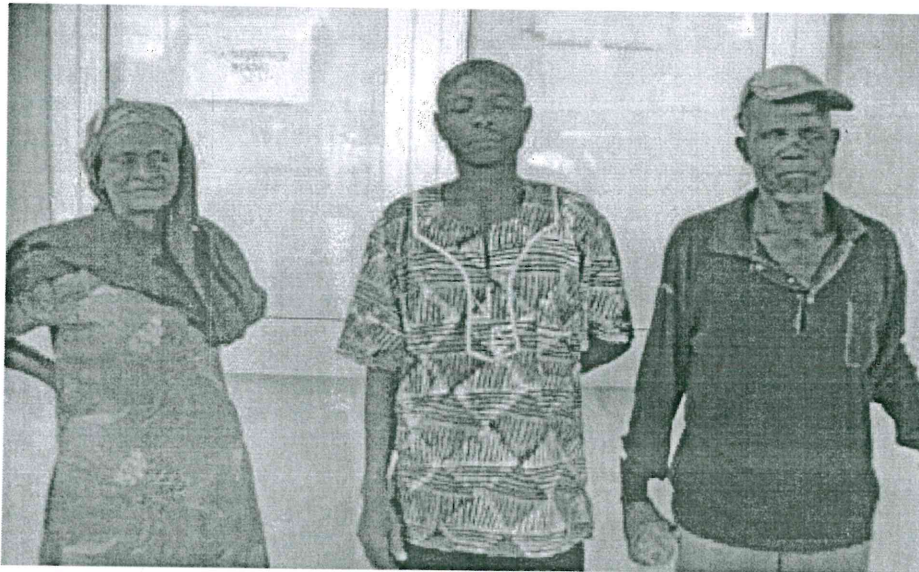
A number of meetings were organized at Resettlement Part A2 community to periodically update residents on the progress of the Bui Hydroelectric project and also to listen to their concerns/grievances for redress. Issues that were raised during these meetings included the need for BPA to construct new social infrastructures at the resettlement Part A2 following their relocation to that community, provision of title deeds to their new housing units, change of road sign post to the names of the various resettled communities (i.e. Brewohodi, Dam site, Agbegikuro and Lucene) to maintain their legacy, an update on their request for assistance to perform rituals for their

ancestors who were left behind at their previous settlement and extra plots for future expansion of their community.

### **Two Claimants to Two Bedroom House at Resettlement Part A2**

In February 2008, during the house enumeration and population census conducted in Brewohodi community, Mr. Iddisa Yahaya claimed ownership of a two bedroom house with number BD/BRE/014. In 2009, Mr. Yahaya informed BPA that he was a caretaker of the said house and rather Auntie Sietu was the owner of the house. In 2012, Mr. Sie Ababio Blorpor James who lives at Banda Ahenkro informed BPA that his deceased father (Kofi Bileh) built the house and as a result he was entitled Hse. No. 7 Moo Street. (the replacement for the two bedroom house at Brewohodi) at the Resettlement Part A2 community.

Following the counter claim by Sie Ababio James Blorpor to Hse. No. 7 Moo Street at the Resettlement Part A2 community, BPA still has in its possession the keys to the said house. The issue has been referred to BPA's legal counsel for advice.



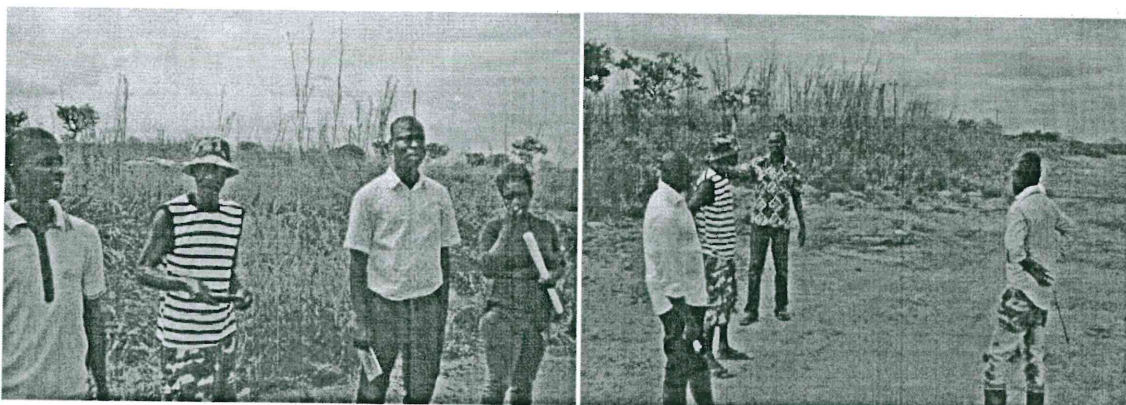
*Plate 3: From L-R (Auntie Sietu, Sie Ababio James Blorpor and Iddisa Yahaya)*

### **2.2 Resettlement Part B**

To enhance the cordial relationship between BPA and the project affected communities, routine durbars were organized at Resettlement Part B Township to listen to concerns/grievances and provide responses. These routine meetings were also used to sensitize the communities on the need for the residents to adopt the culture of maintenance in their various houses, the need to practice good sanitation lifestyles. The residents were also given updates on the Bui Hydroelectric Project.

In accordance with the developmental planning scheme drawn for the Resettlement Part B Township, the Muslim community within the Dokokyina community have been allotted an area of land in the community for the construction of a mosque. Construction works on the mosque has commenced. The Muslim community has been assured that BPA would ensure payment of the compensation for their mosque at their previous community.

The Authority has also shown residents of Part B an area earmarked for their gari processing factory.



*Plate 4: BPA shown the Bui Abusuapayin and the Assembly the Area to site the Gari Processing Plant*

#### Livelihood Activities for Residents of Resettlement Part B

Fishermen and fish mongers within the resettlement township also continue to make maximum yield on their livelihood activities due to the formation of the Bui reservoir. Several meetings have also been held with the fishermen at the Resettlement Part B Township and other communities within the Bui HP Catchment area to sensitize them on the need to ensure that the fishes in the Bui reservoir are exploited on an ecologically sustainable basis for the resource to be able to meet the needs and aspirations of the present and the future. The fishermen were informed during one of the meetings that BPA in conjunction with other relevant government institutions would soon come out with by-laws to manage the activities in the reservoir. Fishermen who were not members of the fishing cooperative have been advised to register with the fishing cooperative that was formed during the first phase of livelihood enhancement program. Through registering with the cooperative, the leadership of the cooperative will have a complete record of fishermen who access the Bui reservoir and that could assist in managing the influx of fishermen.

The farmers are also cultivating their farmlands with regular advice from the district agric extension officer.

#### Compensation for Religious Structures and Immovable Structures

BPA continued its policy not to replace religious related structures that existed in the projected affected communities but rather offer monetary compensation for them. BPA has submitted inventory report submitted by the LVD to the beneficiaries within the various communities. Religious leaders have been informed that the Authority will continue to conduct follow ups with the Government of Ghana for the release of compensation funds.

#### The Dokokyina Suit

Suit No. C/150/2011, Edward Kwadwo Kumah VRS the Attorney General and two others was called at the Sunyani High Court on December 21, 2012 and was subsequently adjourned to January 31, 2013.

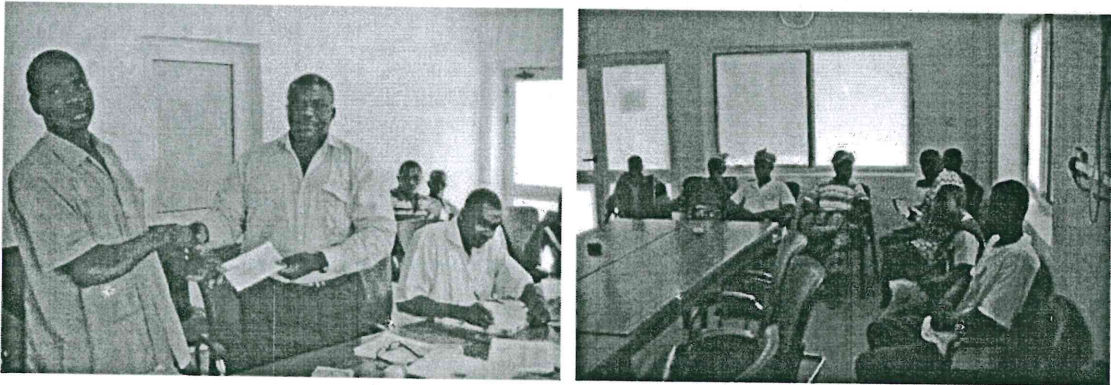
### 2.3 Resettlement Part C

Resettlement Part C which covers the personnel of the Game and Wildlife Division living at the old and dilapidated Bui Camp is the third part of the BPA resettlement programme. Construction work on the housing Units for the personnel of the Game and Wildlife was ongoing (70% complete).

### 2.4 Other issues

#### Compensation for Loss of Economic Assets

Land Valuation Division (LVD) issued out new cheques that bore the names of recipients who have received Power of Attorneys to enable them claim crops/economic trees compensation on behalf of deceased family relations.



*Plate 5: A cross section of receipt of economic loss compensation cheques*

#### Assessment of BPA's Properties at the Project Site

BPA is also awaiting a report from the LVD on the valuation of all BPA's properties at the project site. It is expected that the LVD report will establish the true value of these properties and as a precautionary measure; BPA will be seeking to have these properties insured.

#### Preparation of Planning Layouts for Communities within the Bui Acquired Land

The Brong Ahafo Town and Country Planning Department, on the other hand, have prepared draft development plans for Bongase, New Longoro and Ayorya. The draft plans have been shown once to the chiefs and elders of these communities for their comments and inputs. However, the draft development plans as per the planning regulations should be shown to communities thrice before the final development plan is submitted to the District Assembly to become operational.

The Northern Region Town and Country Planning Department (TCPD) has carried out preparatory works toward the drawing of a planning scheme to guide the developmental growth of the for the Jama township. The following activities have been carried out:

Classification of buildings

Collection of socio-economic data through issuing questionnaires to all the households visited.

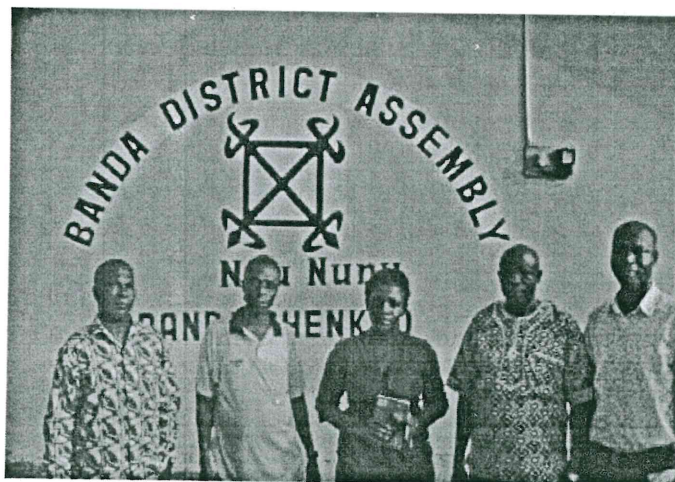
Soliciting land use inputs from the chief and elders for incorporation into the planning scheme

Implementation of development scheme

BPA plans to commence implementation of the planning scheme being drawn for the communities within the Acquired Land. Compliance with the planning scheme would ensure that the communities grow in an organized and well planned fashion. The demarcation of plots would enable resident in these communities attain plots of land for residential purposes. Several meeting has been held with officials from the Survey and Mapping unit for them to carry out their mandate by demarcating these plots of land according to the developmental plan on the planning scheme.

### Collaboration between BPA and stakeholder

To ensure the smooth completion of the Bui Hydroelectric Project, BPA continues to collaborate with the District Assemblies, Assemblymen, officials of the Bui National Park and all the relevant government agencies. In light of this a meeting was held with the District Chief Executive (Hon. Alex Bonsu) of the newly created Banda District within the Brong Ahafo Region. This meeting was to give an update of the ongoing works within the Bui Hydroelectric Project. During the meeting, BPA intimated the need for Banda District and BPA to work together to ensure the smooth transition of all documents concerning the social infrastructures within the Resettlement Part B Township that were handed to the Tain District to the Banda District. The DCE was very thankful for the meeting and assured us of his continues collaboration with BPA. He also promised to pay a working visit to the Project Site.



*Plate 6: BPA meets with Banda district assembly*

### 2.5 Resettlement Action Plan

In partial fulfilment of schedule 6.7.4 of the Environmental Protection Agency's by-laws for the Bui Hydroelectric Project, a draft RAP was prepared pending the release of the final report from the Land Valuation Board on the enumeration of farm crops and economic trees. The LVB report when finalized will complete the enumeration of the Bui HP project affected communities. The draft Bui Hydroelectric Project Resettlement Action Plan will be finalized when the report submitted by LVB are attached as an appendix to the draft RAP

### 2.6 Community Relations

BPA has undertaken a number of measures to support local communities to mitigate social, health and economic impacts of the Bui Hydroelectric Project. The community support is in the form of employment/income generation opportunities, potable water and health care.

#### Relocation of shrine at Bongase

The construction of the Saddle Dam 2 located near the Bui Game and Wildlife Camp and the Bongase Community has necessitated the relocation of a shrine belonging to the Bongase Community. BPA expressed its willingness to assist the Bongase people to relocate the shrine. The Bongase chief subsequently presented a list of things that they would require to enable them perform rituals for the relocation of the shrine. BPA agreed following the submission of the list to assist with the purchase of a horse, a donkey and a cow whilst the Bongase people provide the other items require for the relocation exercise.

#### Information Centre

The BPA information centres established at Banda Ahenkro and Bamboi to ensure that adequate information is provided to the project affected persons and other stakeholders in a timely and convenient manner and also to ensure that, the people were provide sufficient opportunity to make their concerns and opinions known to BPA for appropriate decision making. The Information Centre Attendants continued to update visitors on the progress of the Bui HP and also readily provided answers to questions asked about the Bui HP.

#### Employment

The youth in communities within the Bui Dam catchment area have been employed as labourers, masons, carpenters etc to work with the Contractor, Sinohydro and Bui Power Authority. These employees obtain extra income to add up to their income from the sale of farm crops.

Food vendors were provided free transportation once a week to Techiman to buy food stuff and ingredients to prepare food for the workers at the Bui Dam Site.

#### Healthcare support

BPA continued to educate communities about the dangers of fishing with DDT and also educated parents not to give their daughters to foreigners for monetary rewards due to the prevalence of HIV/AIDS.

BPA and the Contractor (Sinohydro) each made available a driver and a pick up during the National Immunization Exercises.

#### Income for Local Farmers

Bui Power Authority and the Contractor (Sinohydro) purchased most of their food stuff from the local farmers. This arrangement was aimed at providing income to the local farmers.

### **3.0 PROJECT DESIGN**

#### **3.1 Level 2 Engineering Design**

The review of Detailed Design drawings for construction and manufacturing of civil, mechanical, electrical and transmission lines works submitted by the Contractor continued. The Contractor was yet to provide the revised schedule of drawings.



**4.0 CONSTRUCTION AND SUPPORT FACILITIES**

**4.1 Aggregate Processing System**

Production of aggregates for concrete continued. Routine maintenance works were carried out on the various parts of the plant regularly to ensure the system was in good operating condition

**4.2 Power Supply System**

On the average six of the eleven no. generating sets (1.1 MW each) were operational daily to meet the electricity needs of the Project.

**4.3 Batching Plant**

The batching plant successfully produced all the concrete needed for all works on site. Maintenance works such as lubrication of bearings of motors, replacement of the steel liners of the inter-mixer, welding works to seal leakages were performed.

**4.4 Cable Crane System**

The cable crane successfully placed CVC at the various dam blocks. In addition, the cable crane was used to hoist other accessories of RCC placement such as mobile cranes, rollers, etc when necessary.

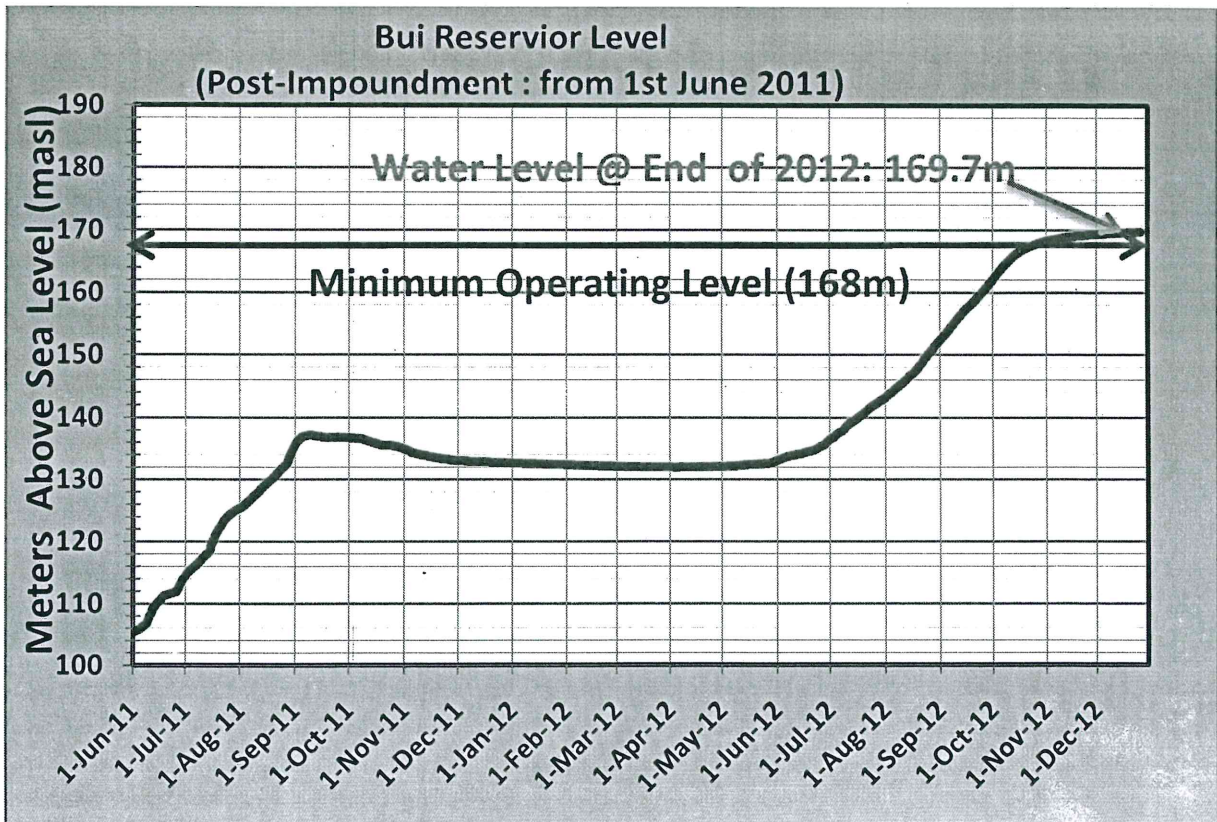
**4.5 M1000 Tower Cranes for Powerhouse and Spillway**

The tower cranes successfully placed CVC from the batching plant at the various units of the power house and spillway. They were also used in conveying materials on site.

**5.0 MAIN DAM WORKS**

**5.1 River Impoundment**

Impoundment of the Black Volta which commenced on the 8th of June 2011 continued. The post-impoundment reservoir level from June 8, 2011 was as presented on the chart below.



*Plate 7: Progress of the Bui reservoir level rise*

5.2 Main Dam

5.3 Concrete Placement for Main Dam Overflow Section

Placement of CVC lifts for the over flow section i.e. spillway on the dam blocks above elevation 150m and below elevation 145m was continued in the quarter. Fifty (50) lifts were placed in all to raise the Piers and overflow chutes. The dump trucks-cable/cable crane and truck agitators-concrete pump schemes were the means of concrete supply from the main and auxiliary batching plants to the works. In the absence of the tower crane, the contractor used pumping machines to transport concrete to the placement areas. The combined volume of CVC placed for the lifts was 5756m<sup>3</sup>.

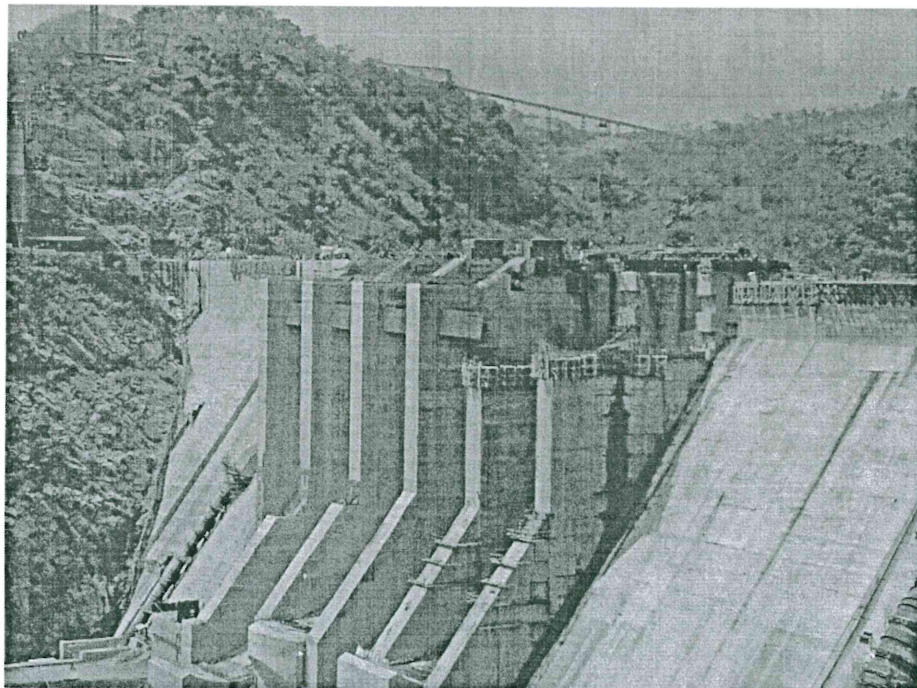
5.4 Concrete Placement for Main Dam Non-Overflow Section

Placement of CVC lifts for the Non-over flow section i.e. dam blocks 14-16 continued in the quarter under review with one (2) lifts placed to raise the aforementioned dam blocks to elevation 183m. The dump trucks and cable crane were the means of transporting concrete from the main batching plant to the location of the works. The volume of CVC placed for the lifts were 5213m<sup>3</sup>

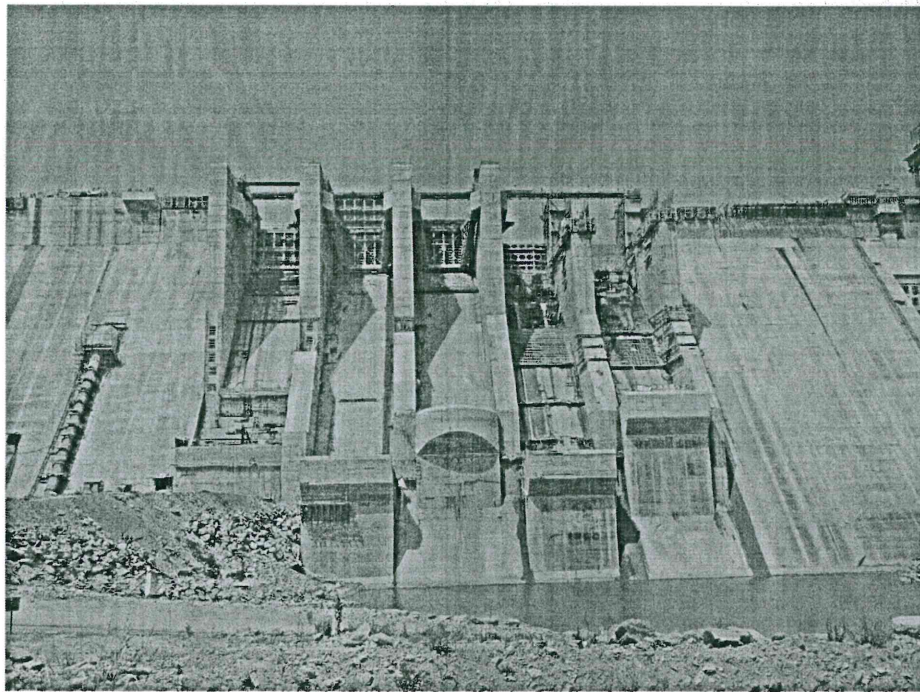
5.5 Dam Drainage

Drainage holes of 110mm diameter @ 3m centres to trap the seeping water that may leak through the body of the dam due to the pressure of the water from the upstream were drilled. These drains shall convey the seeping water to the drainage gallery at lower levels within the dam body.

Drilling of drains were completed and certified for the third level EL150m to second level EL122m drainage gallery within dam blocks # 20, 19, and 18



*Plate 8: A Perspectives of Spillway from the left bank as at December 31, 2012*



*Plate 9: Downstream Perspectives of the Spillway at the Close of December 2012*

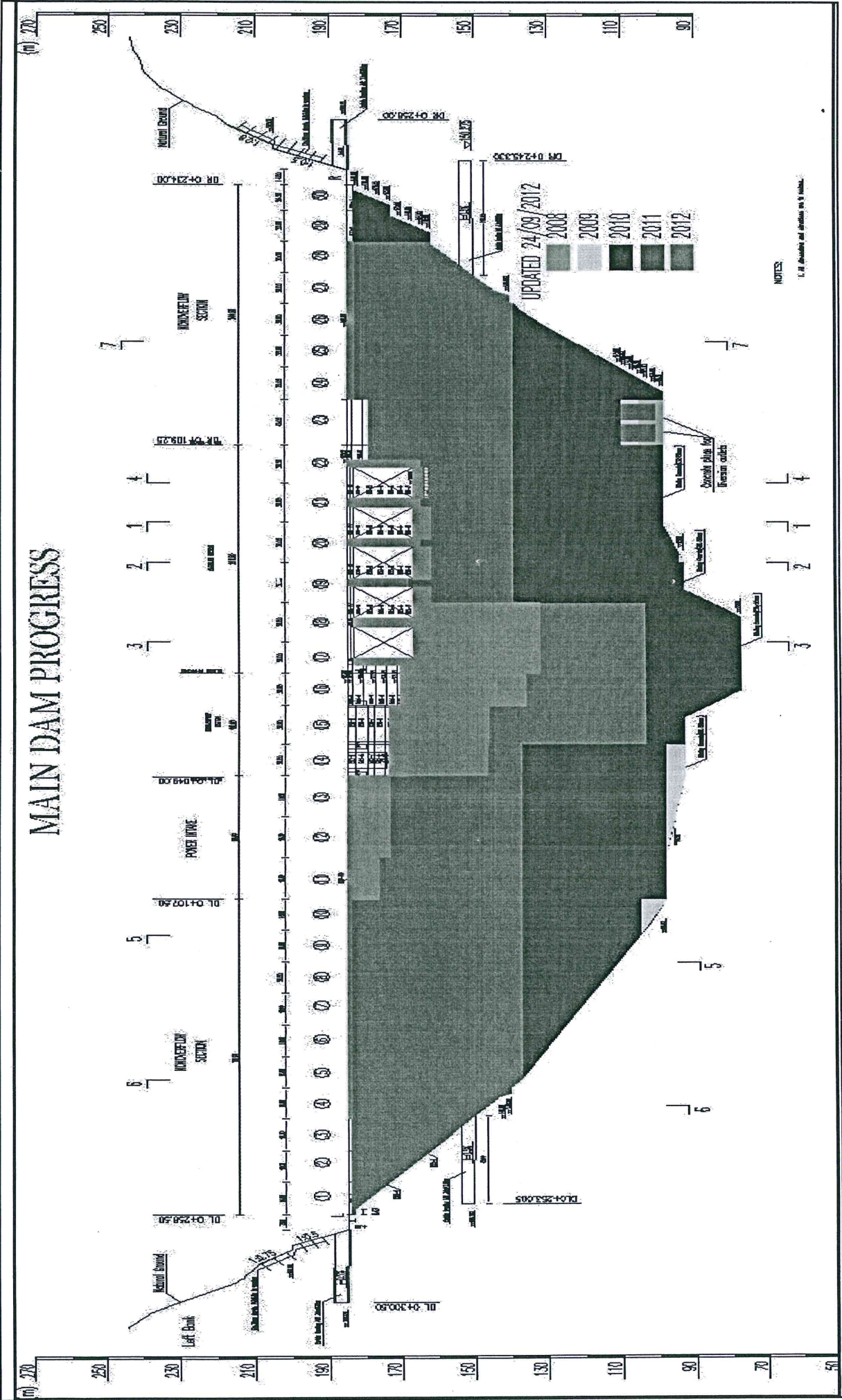
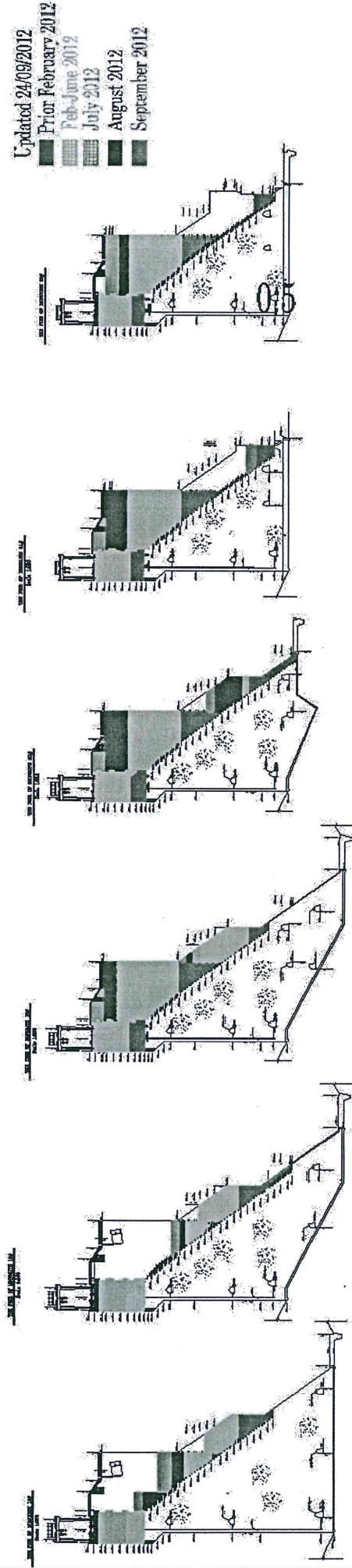


Plate 10: Main Dam Elevation at the Closing of December 2012

**SPILLWAY PROGRESS**

**SECTION THROUGH THE PIERS OF THE SPILLWAY**



**SECTION THROUGH THE OVERFLOW SURFACE OF THE SPILLWAY**

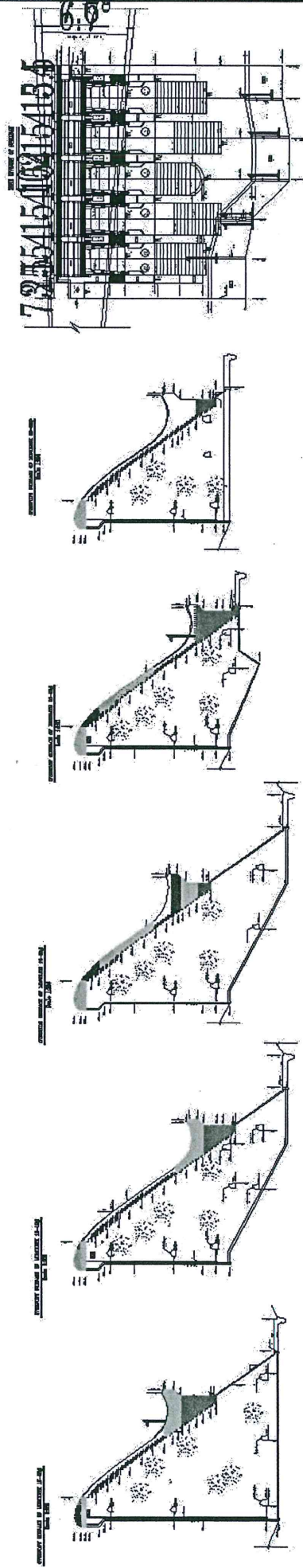


Plate 11: Spillway Elevation at the Closing of December 2012

## 6.0 POWERHOUSE WORKS

### 6.1 *Civil works*

All the units of the power house are divided into two parts with respect to concrete works that will be carried out. The reference point is picked from the axis of the units, such that works upstream of the units are referenced 'A' and those that are downstream on the axis are referenced 'B'.

The main works for the quarter under review included the preparation and casting of second stage concrete, mass concrete, columns, beams and slabs for the three units and the Tailrace right bay.

Placement of concrete continued for the three units and the tailrace channel. A total of 2,711.4m<sup>3</sup> of concrete was cast for the three units and the tailrace channel during the period under review. Cumulatively, 66,030m<sup>3</sup> of CVC had been completed representing over 94.67% of the total concrete volume to be placed for the Powerhouse. The finishing works of the control building and the main Power house also commenced

Block laying at the U/S Auxiliary power house was completed. Partitioning of offices and other rooms is complete for Unit 3 up to El. 118.7

Plastering of walls is complete at the downstream end of main power house building at Unit 3 and the Erection bay. The Right Side wall of the main power house building has also been plastered. Plastering work for the external walls of Unit 3 and erection bay have however been rejected for not meeting the design standards.

Plastering works was completed for the inner walls at the U/S Auxiliary Power house and the main power house below El 102.6.

Casting of concrete was also completed for the frame and concrete roof of the diesel generator house.

Table 1: Summary of the Work Progress

CHART 1 - Concrete Production for Powerhouse Works

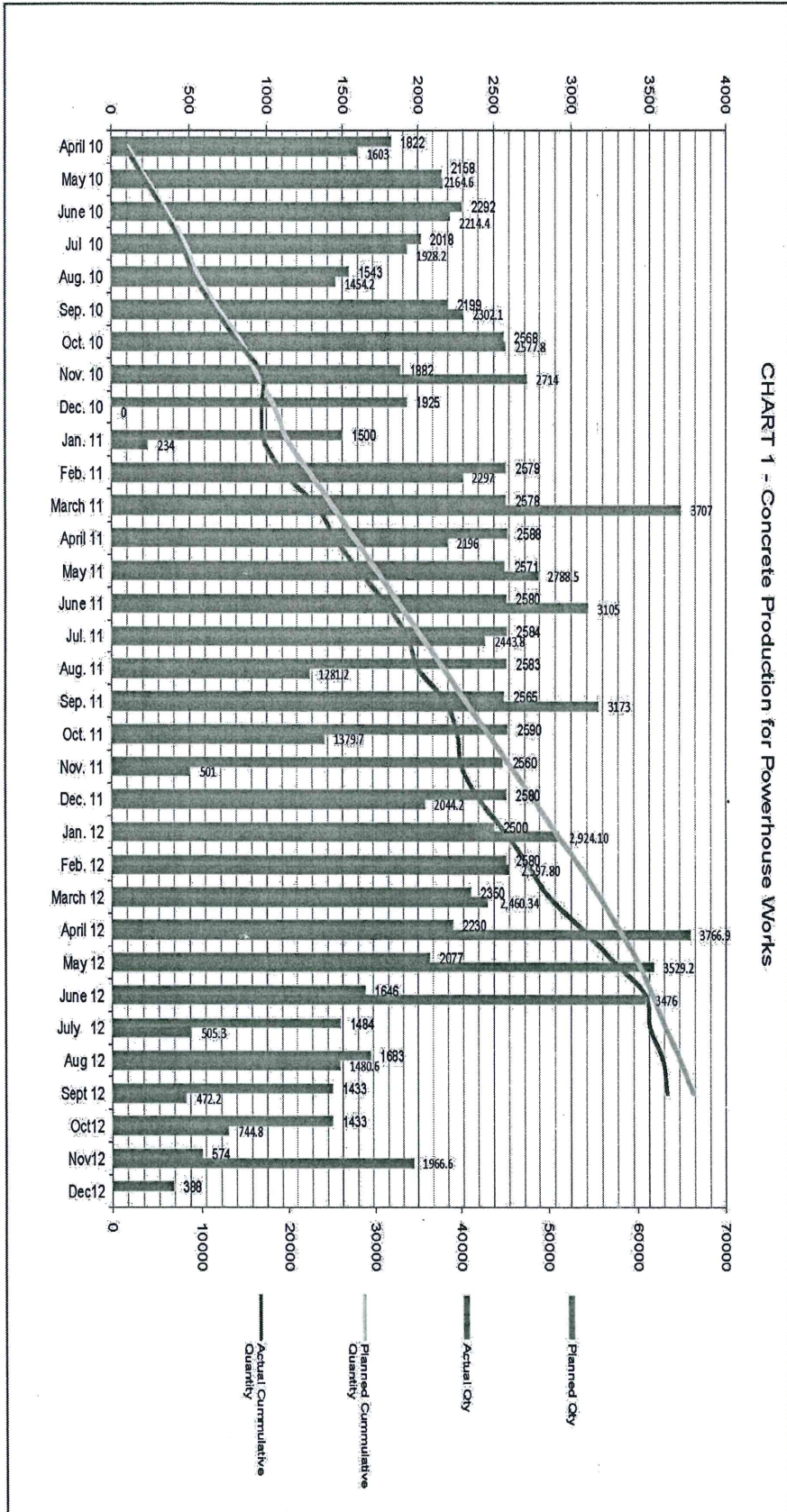
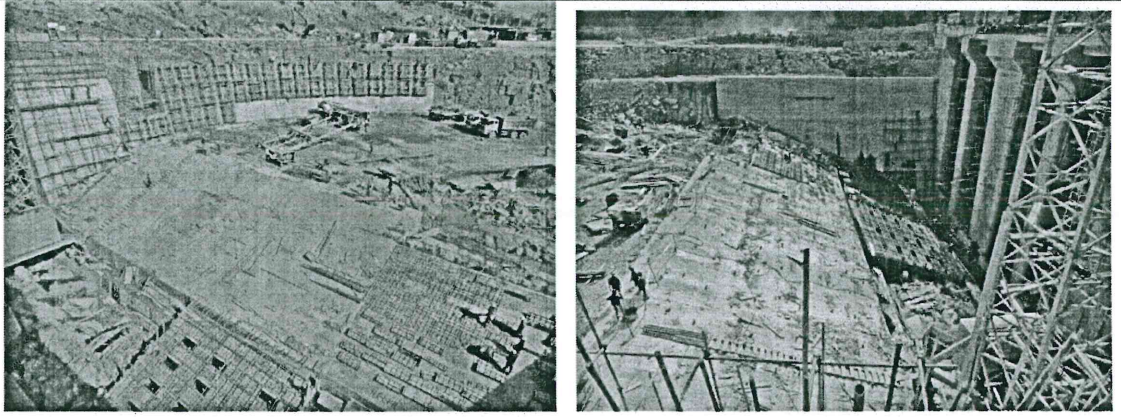
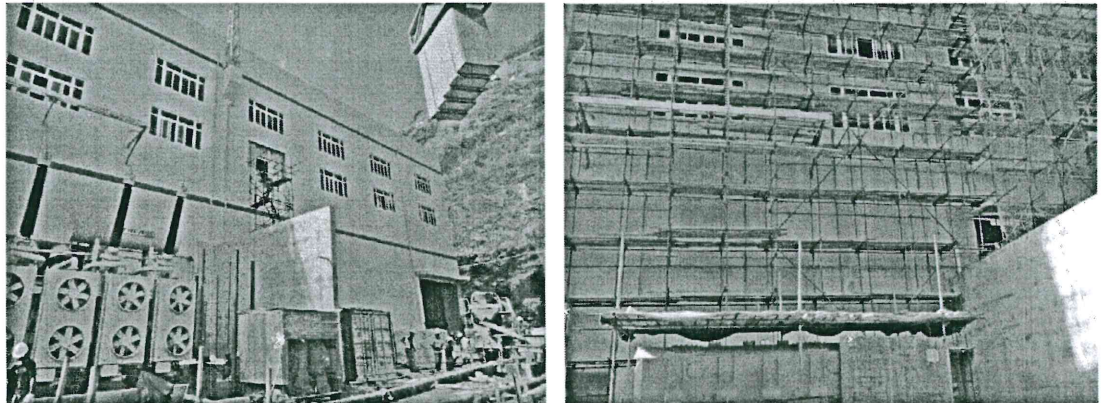


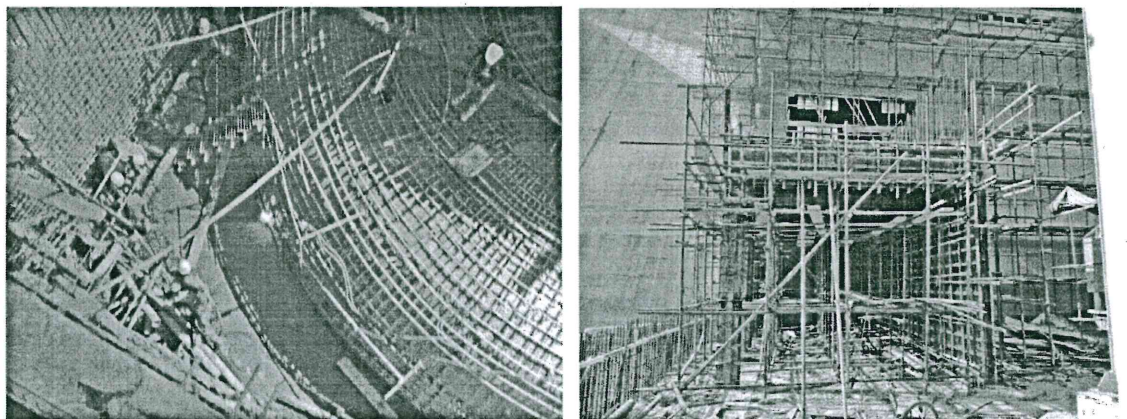
Plate 12: Concrete Production for Powerhouse Works



*Plate 13: A view of left and right wall of tailrace channel*



*Plate 14: Downstream view of Powerhouse*



*Plate 15: Casting of concrete around U1 spiral case and frame of DG house*

## 6.2 MECHANICAL WORK

### Unit 1

#### *Tilting of the Unit One Stay Ring*

Following the completion of the demolition of concrete around the spiral case, the stay ring was successfully repositioned. Further checks for the horizontality of the stay ring after concreting of the spiral case showed no positional deviation. Meanwhile, the Contractor has indicated that he would restore the roundness of both the lower and upper flanges of the stay ring after the concreting of the spiral case has been completed.



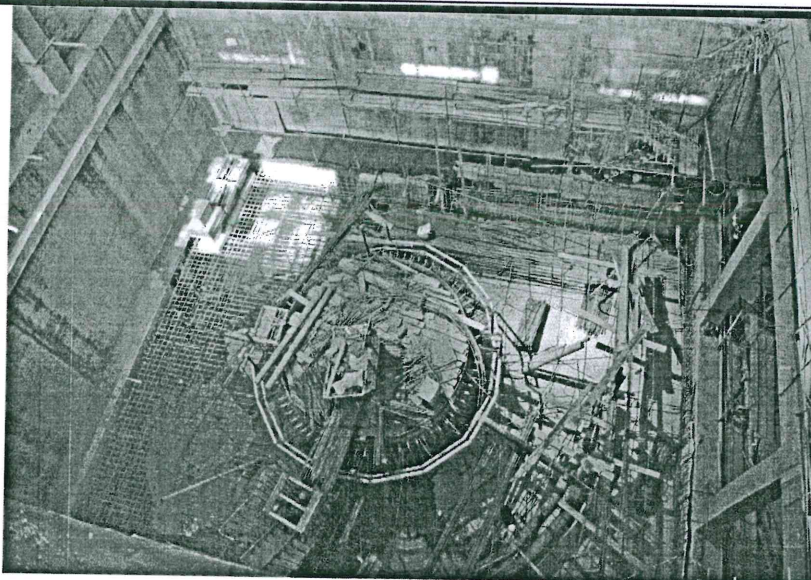


Plate 16: Aerial view of Unit 1 stay ring and pit liner

Unit 2*Installation of the Phase Bus Bars for Unit 2 (EL 102.5)*

Adjustment (80% complete) prior to the welding of the phase bus bars was continued in the period. Approval of the revised drawings to make way for two of the bus bars passing through the corbels at EL 102.5m was granted.

*Assembly/ Installation of the Turbine-Generator Components*

The assembly/installation of the above components was continued in the course of the month. The turbine shaft, stator lower layer bars and other components were installed. The following table summarises the overall works carried out on the above.

Table 2: Assembling and Installation Activities at U2

Component	Assembly (%)	Installation (%)	NDT/ Positional checks (PC) & other checks	Remarks
<i>TURBINE</i>				
Bottom ring	-	100	Thickness of bottom ring and roundness of lower labyrinth checked	
Head cover	70	0	*horizontality (max. Deviation: 0.02mm) inspection of wedges on stay ring checked; Inspection of head cover coupling studs carried out; radius of upper labyrinth checked	
Runner	-	90	*Clearance between runner and lower labyrinth ring checked; *horizontality of runner flanged checked	
Wicket gates		90		
Turbine Shaft		70	*elongation (0.43±0.04mm) of turbine shaft/runner coupling checked * clearance between turbine shaft and runner (turbine shaft centring (0.01~0.06mm) with runner) inspected; *horizontality (≤0.05mm) of shaft seal wearing ring checked	Installation of shaft seal in progress
Turbine Head Cover	70	70		

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<b>Overall Turbine Erection</b>	<b>45% complete</b>			Guide bearing, main shaft seal, automatic controls etc remain to be installed
<b>GENERATOR</b>				
Stator frame	100	100	NDT/ Positional checks carried out; inspection of the elongation stator frame bolt conducted	*Stator now in the generator pit.
Stator dovetail key bars/ lower finger boxes	100	100		
Stator Core (laminations)	-	100	Height and radius of core checked; Elongation of stator clamping bolts checked after final pressing checked; Insulation of the stator core bolts checked; Iron loss test of the stator core also checked; centre line of stator core inspected	Measurements satisfactory per the design specifications; stator winding to be carried out next month.
Stator winding	30	30	Insulation test of lower stator bars okay except for the polarization index values	*installation (40% complete) of upper stator bars ongoing; cleanliness of the stator winding fairly satisfactory
Rotor carrier	100	0	*level of rotor hub and concentricity of flanges checked; Radius of rotor carrier checked; NDT conducted	Rotor carrier now at the erection bay y
Wedge carrier of Rotor	-	10	*Radius and height of wedge carriers checked	
Lower bracket	100		NDT (UT & PT) carried out *rotor air brake elevation checked	
<b>Overall Generator erection</b>	<b>25% complete</b>			Stator winding ongoing. rotor, combined thrust and guide bearing, coolers, upper bracket, collector ring, automatic controls etc to be installed

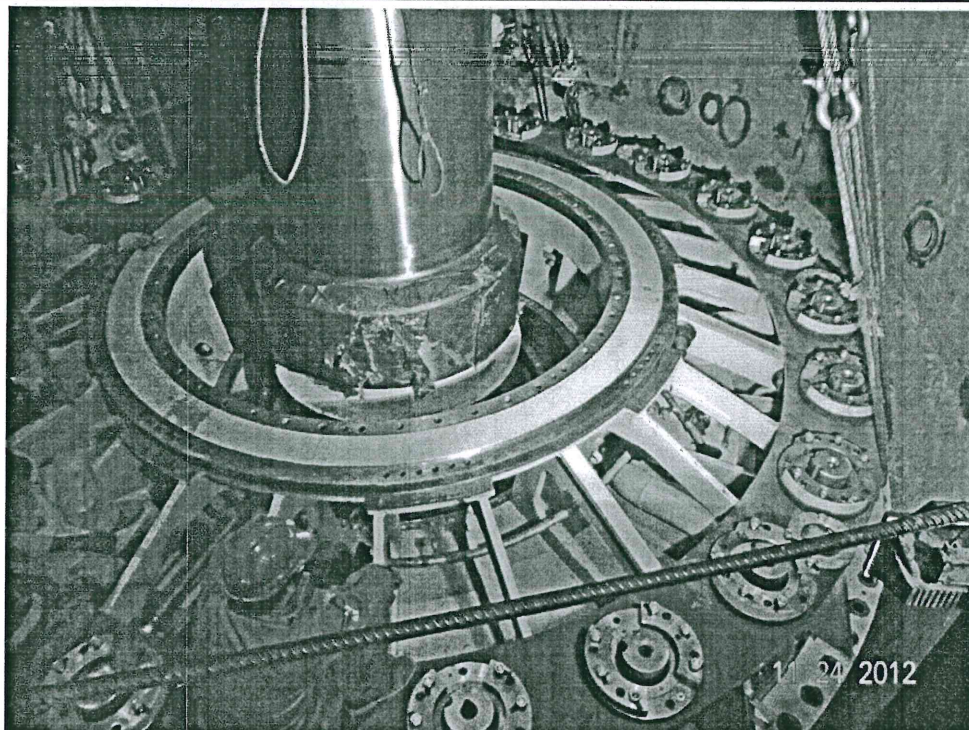


Plate 17: Turbine installation (Unit #2)

Unit 3*Assembly/ Installation of the Turbine-Generator Components*

The assembly/installation of the Turbine Generator components continued steadily within the period under review. The following table summarises the overall works carried out on the above.

Table 3: Assembling and Installation Activities at U3

Component	Assembly (%)	Installation (%)	NDT/ Positional checks (PC) & other checks	Remarks
<i>TURBINE</i>				
Bottom Ring	-	100	PC carried out	
Wicket Gates	-	100	*Wicket gates contact clearances checked; clearance between bottom ring and wicket gates checked;	
Runner	-	100	PC carried out	Clearance b/n runner and lower labyrinth ring okay; Clearance b/n runner and upper labyrinth ring okay
Head Cover	100	100	Clearance between head cover and wicket gates checked; head cover and wicket gates total clearance; torque of bolts for head cover and stay ring coupling checked	installation carried out
Turbine Shaft and accessories	-	80	Elongation of turbine shaft/runner coupling studs checked; Clearance between runner and shaft checked; inflatable seal clearance checked	Measurements satisfactory per the design specifications

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Servomotor	90	90	*stroke of servomotors checked; *stroke of servomotors against wicket gate openings checked	*installation of servomotor oil pipes in progress
Control ring	90	90	Clearance between control ring and head cover inspected	Wicket gate arms connections done
Turbine guide bearing	50	50		
<b>Overall Turbine Erection</b>	<b>80% complete</b>			Main shaft seal, piping works, automatic controls to be completed
<i>GENERATOR</i>				
Stator frame	100	100	NDT/PC carried out; stator frame bolt elongation measurement conducted	
Stator key bars	-	100	PC carried out by the Contractor	PC by Employer done
Stator Core (laminations)	-	100	Height and radius of core checked; Elongation of stator clamping bolts checked after final pressing checked; Insulation of the stator core bolts checked; Iron loss test of the stator core also checked; centre line of stator core inspected	
Stator winding	100	100	Insulation test of lower stator bars okay except for the polarization index values; Stator DC Resistance Test conducted but winding resistance per phase found not balanced; Stator whole high voltage test conducted but Polarization Index values found unmet	
Generator Surface Air Coolers	80	80		
Overall stator works	98% complete			*air gap sensors installed; *current transformers at the stator neutral terminals installed
Rotor Spider (Carrier)	100		NDT (UT & PT) conducted; PC conducted; radius inspection of rotor carrier after welding carried out	
Wedge carrier of Rotor	-	100	Radius and height of wedge carriers checked	
Rotor Rim stacking (rotor core)	-	100	Axial locking of the rotor rim carried out; Radius and height inspection of rotor rim after final pressing; okay; elongation of rotor clamping bolts checked	
Rotor 40# Poles		100	electrical test before poles installation done; order of rotor poles checked, radius and	

## Bui Hydroelectric Project

			elevation inspection rotor done; check of the transfer of centre line of pole to wedge carrier done; electrical test after pole installation done; compression high voltage test of the whole poles conducted.	
Rotor Air brakes/ brake track segments	100	100	level inspection of rotor brake tracks carried out; *brake elevation checked	
Overall rotor works	98% complete			Rotor finally installed
Lower Bracket/ Combined Thrust and Guide Bearing	90	90	NDT/PC carried out	Piping works for the combined thrust and guide bearing, coolers, dust suction device ongoing; thrust pads and block installed
Circular rail for lower bracket	100	100	-	*monorail hoist (5ton capacity) installed
Generator Lower Shaft	-	100	elongation of the coupling studs confirmed by the Employer's Representative (ER); *elongation (1.22±0.08mm) of lower shaft and rotor coupling certified	
Generator Upper Shaft	-	100	*elongation (1.13±0.11mm) of rotor/upper shaft coupling studs checked	
Upper Guide Bearing	20		*upper guide bearing oil cooler pressure test (0.75Mpa for 30min) done	*assembly of Oil Well Tube and Cooler ongoing.
Upper Bracket, collector ring, generator covers	50		*dimensions before and after welding of upper bracket checked	*Pre-installation of upper bracket carried out * CO <sub>2</sub> fire-fighting pipes installed
Overall Generator Erection	70%			*Upper guide bracket, upper shaft, upper guide bearing, collector ring being installed.
<b>GOVERNOR</b>				
Governor Oil Tank	65	65	PC carried out	*Installation of governor oil pipes ongoing

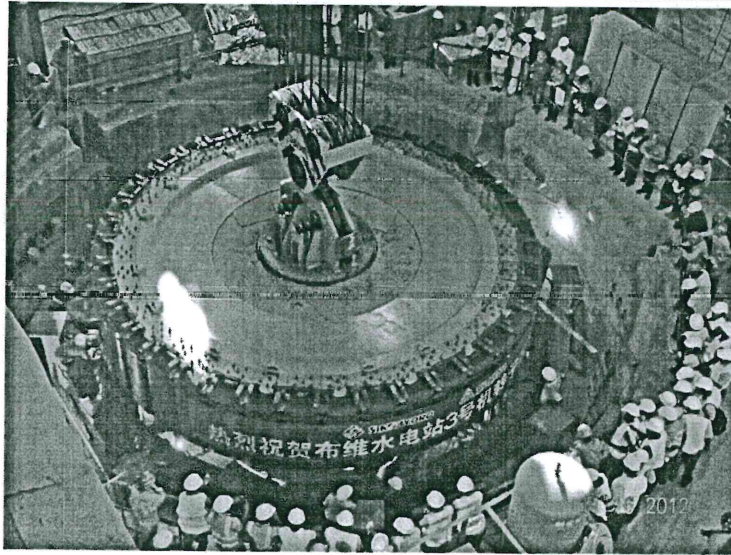


Plate 18: Rotor being lowered into position

#### *Installation of the Phase Bus Bars (EL 102.5)*

Welding (98% complete) of the phase bus bars was continued in the period. Erection of the supporting beams to make way for two of the bus bars coinciding with the corbels at EL 102.5m was completed.

Connections of the bus bars to the ET (Exciter Transformer), VT (Voltage Transformer), Generator Circuit Breaker (GCB), and the SST (Station Service Transformer) were also completed.

#### *Installation of 161kV main transformer for Unit 3*

The transformer installation continued (95% complete), with the radiators, tap changers, explosion vents, conservator, bushings, relief valves, buchoholz relays, transformer winding and oil temperatures detectors, transformer deluge pipes etc fixed. Hot oil circulation of the transformer oil was also completed. Inspection of the transformer accessories for their soundness was completed. Insulation Resistance Tests and High Voltage Tests were also conducted on the transformer components such as the bushing and windings. Other tests such as Ratio Measure Test, Medium Loss Test, and DC Leakage tests were also conducted successfully.

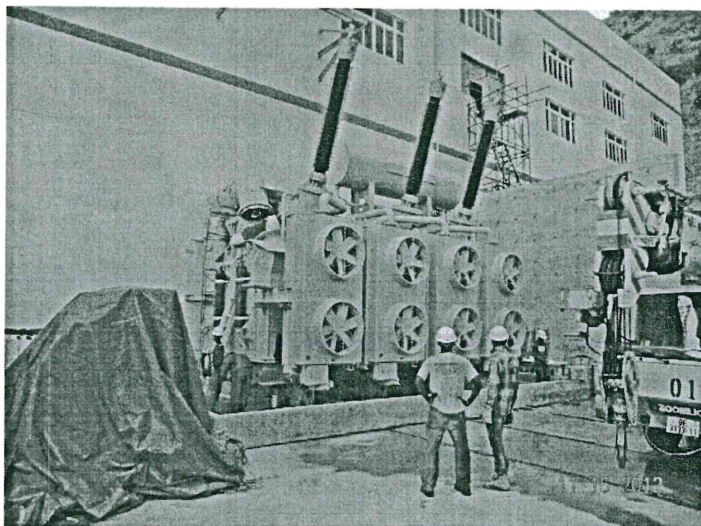


Plate 19: Progress of work on Main transformer

Penstocks

Installation of the penstocks was about 97% complete. Table 6 below gives the summary of work on the penstock.

Table 4: Progress of Works on Penstock Installations

Unit	Installation (%)	Ultrasonic Test (UT)	Penetration Test (PT)	Radiographic Test (RT)	Remarks
Unit 1 Penstock	90	87% complete	87% complete	75% complete	All defective welds repaired; sections or shells #2 to #3 remain to be installed
Unit 2 Penstock	100	100% complete	100% complete	75% complete	All defective welds repaired; welding of the remaining sections or shells #2 to #8 ongoing
Unit 3 Penstock	100	100% complete	100% complete	100% complete	Sandblasting of the penstock interior completed; Concreting of the penstock in progress.

Installation of Gates

Painting of the rails of the trash rack/ trash rakes, spillway radial gates, spillway bulkhead gates, and the damaged painted surfaces of the other hydraulic steel structures was continued.

Installation of the radial gates for the 2<sup>nd</sup> and 3<sup>rd</sup> orifices of the spillway was continued (90% and 75% complete for gate #2 and #3 respectively) during the period. The installation of the radial gate for the 1<sup>st</sup> orifice also commenced (30% complete).

Power Intake Gates

POWER INTAKE								
	Gate	Dimension(mm )	Assembly of gate (%)	NDT (%)	Gate Installation (%)	Slots/Rail Installation (%)	Hoist / Crane Install. (%)	Remarks
Unit 1	Bulkhead Gate	7580×8750	100% complete	100% complete	-	100% complete	1 main dam gantry crane (30% complete) to be used for all the 3 units; *rail for the crane about	1 gate to be used for all the 3 units

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							20% complete	
	Emergency Bulkhead Gate	7580×7750	100%	100%	100% complete	100%	5% (foundation works for hoist completed)	
	3# Trash racks	14540×5270	100	No NDT	100	100	0	All the 3# trash racks installed
	1# Trash rake guide		0	-	0	100		1 trash rake to be used for cleaning all the 9# trash racks
<b>Unit 2</b>	Bulkhead Gate	-	-	-	-	100	-	
	Emergency Bulkhead Gate	7580×7750	100	100	0	100	5% (foundation works for hoist completed)	
	3# Trash racks	14540×5270	100	No NDT	100	100	0	All the 3# trash racks installed
	1# Trash rake guide				0	100		
<b>Unit 3</b>	Bulkhead Gate	-	-	-	-	100	-	
	Emergency Bulkhead Gate	7580×7750	100	100	100%	100	5% (foundation works for hoist completed)	
	3# Trash racks	14540×5270	100	No NDT	100	100	0	All the 3# trash racks installed
	1# Trash rake guide				0	100	0	

### Tailrace Gates

#### *Unit #1*

The assembling of gates 1 and 2 were about 80% complete with NDT 60% for each. The installations of the slot/rails were 100% complete. The Gates installation of were yet to commence.

#### *Unit #2*



The assembling of gates 1 and 2 were also about 80% complete with NDT 60% for each. The installations of the slot/rails were 100% complete respectively. The Gates installation of were yet to commence.

*Unit #3*

The assembling of gates 1 and 2 were about 80% complete with NDT 60% for each. The installations of the slot/rails were 100% complete. The Gates installation of were yet to commence.

*Crane/Hoist*

The installation of the 1nr crane to be used by the three units was 95% complete

Spillway Gates

The reservoir level was at EL 169.5m and inspection to ascertain the water tightness of the two installed radial gates (#2 and #3) indicated that their seals are functioning acceptably.

SPILLWAY							
Gate	Dimension (mm)	Assembly of gate (%)	NDT (%)	Gate Installation (%)	Slots/Rail Installation (%)	Hoist Install. (%)	Remarks
Radial Gate 1	15000×18500	30	0	30	100	5	Awaiting the Contractor's response to remedy the shortened arm (by 28cm) of the gate; Orifice temporarily closed by Stop logs
Radial Gate 2		90	85	85	100	100	Pipe System Pressure Test outstanding; Debugging and Test outstanding
Radial Gate 3		75	75	75	100	100	Pipe System Pressure Test outstanding; Debugging and Test outstanding
Radial Gate 4		0	0	0	100	5	Orifice temporarily closed by Spillway Bulkhead Gate (stop logs)
Radial Gate 5		0	0	0	100	0	Orifice temporarily closed by Stop logs
Spillway Bulkhead Gate	16200×16980	No assembly	No NDT	Installation as when necessary	100%; 1 slot before each radial gate	To be operated by the Main Dam Gantry Crane	1 bulkhead gate to be used for all the 5 bulkhead gates slots

Installation of Water Treatment Equipment (EL 91.5m)

The pipe/valves connections to the installed equipment were 65% complete. Installation of the Draft Tube Discharge Valves was 60% complete. The installation of Cabinets for

equipment was also in progress. Installation of the cable tray at EL 102.6m was 91% complete.

Erection Bay

*Installation of the Tailrace Gantry Crane/Main Gantry Crane*

The load test of the tailrace gantry crane was still outstanding. The overall progress of work on the crane was about 95% complete.

Assembly of the Main Dam Gantry Crane was 35% complete. There was however no activity carried out on the installation (20% complete) of the rails during the period under review

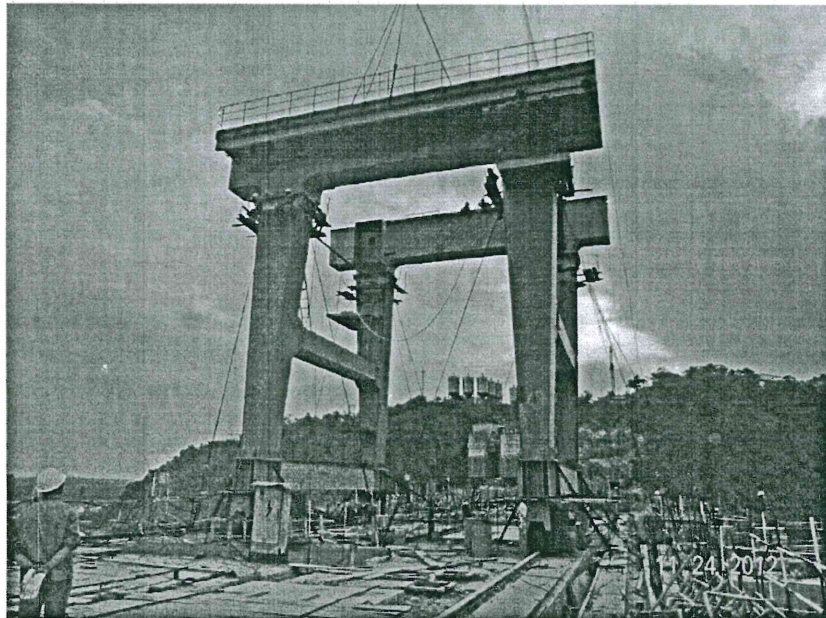


Plate 20: Assembly of the Main Dam Gantry Crane

Mini Power Plant

*Installation of the Embedded Parts of the Gates*

The table below provides a summary of the progress of work on the gates installation.

Table 5: Summary of the progress of work on the gates installation for the Mini Power Plant

Gate	Dimension (mm)	Assembly of gate	NDT (%)	Gate Installation	Slots/Rail Installation	Hoist Install.	Remarks
Bulkhead gate	2420×2000	100%	-	100	100%	0	No site weld on gate
Emergency gate	2420×2000	100%	-	0	100%	0	No site weld on gate
Trash rack/	3000×1700	100	No site weld	100	75%	0	
Trash rake		0		0	100%	0	

*Installation of the Penstock*

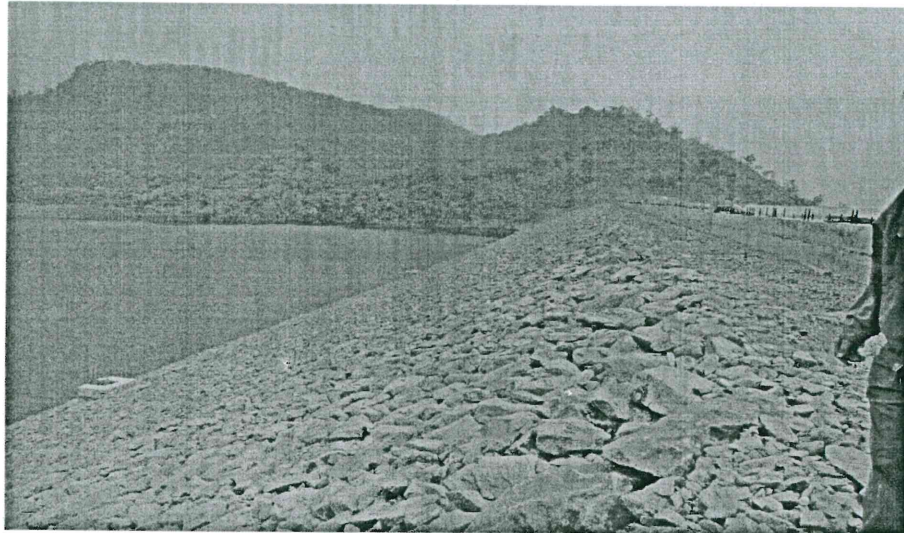
The non-destructive tests (Ultrasonic Test, Penetration Test, Radiographic Test, and Magnetic Powder Test) on the welded seams of the penstock was Completed. All the defects identified in the tests were successfully repaired.

As expected, the installed plunge valve at the exit of the penstock was being used to discharge water downstream for ecological purposes.

**7.0 SADDLE DAMS**

**7.1 Saddle Dam 1**

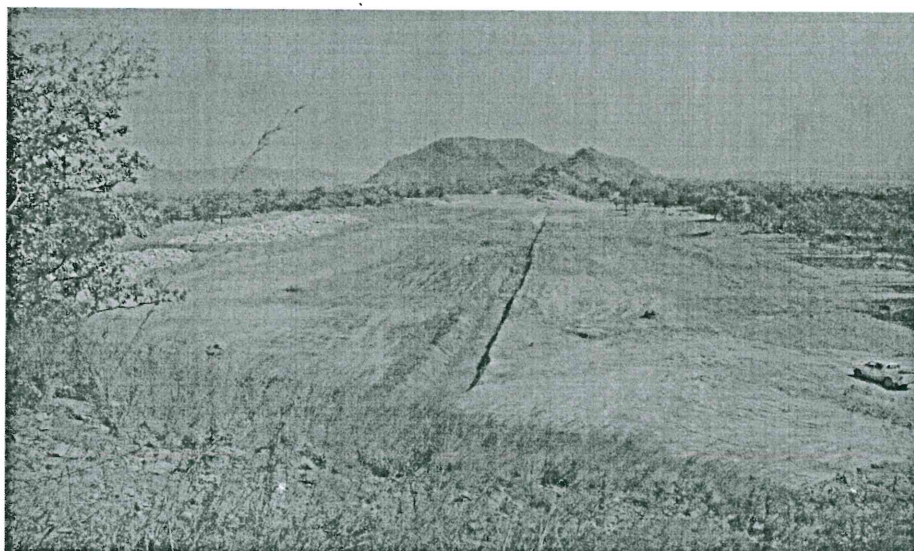
Concrete works for the guard rails at the dam crest were completed. Backfilling of filter 1 and 2 materials at the final elevation (EL 187) was commenced.



**Plate 21: Concrete work on guard rails**

**7.2 Saddle Dam 2**

A trial embankment test was conducted on soil material to be used for the filling works. The test was successful and the results are to be applied on the actual embankment works when it commences. The dam axis has been established with excavation works at 30% complete. Stockpiling of soil for the construction of the embankment was underway for approved borrow areas.



**Plate 22: Excavation work continued**

## 8.0 TRANSMISSION LINES

### 8.1 Engineering Design

The engineering designs for the Transmission lines are now 100% completed barring any future modifications. The design modification to enable the Bui-Kintampo line cross over the existing 161KV Techiman-Sawla line was also completed.

The designs for the switchyard and associated substation are about 88% complete. Major outstanding design works were related to the proposed expansion/modification of the Sunyani substation. The minor ones were to do with the on-going Bui Switchyard and also synchronisation/termination works at Sawla, Techiman and Kintampo substations

### 8.2 Bui Switchyard

#### Backfilling

Second stage backfilling of Switchyard is now 97% completed following 98% completion of the grounding mat installation. The Contract was granted conditional approval to proceed with these in order to save time so that the issues regarding the associated calculation and the disputes thereof can be resolved later on. Besides, He has been requested to indicate in advance, steps to be taken to rectify the situation if test results of step and touch voltages as well the overall resistance (switchyard, tailrace, main dam and powerhouse) is found to be flouting the IEC standards and/or GRIDCo norms.

Spreading of switchyard crush-rock finish over the compacted hardcore layer at EL. 111.15 was also commenced and at 94% completion due to ongoing excavation to install cable ducts for designated sections of each line bay.

#### Erection of steel support structures

The installation of equipment support structures commenced with the completion of the gantry structure comprising (15No. towers and 12No. beams) and also a total of 176 support structures for Disconnect switches, potential Transformers, current transformers, lightning arresters and bus bars for the switchyard. Erection of steel support structures have been done for 191 out of 419 pedestals representing 45% completion.

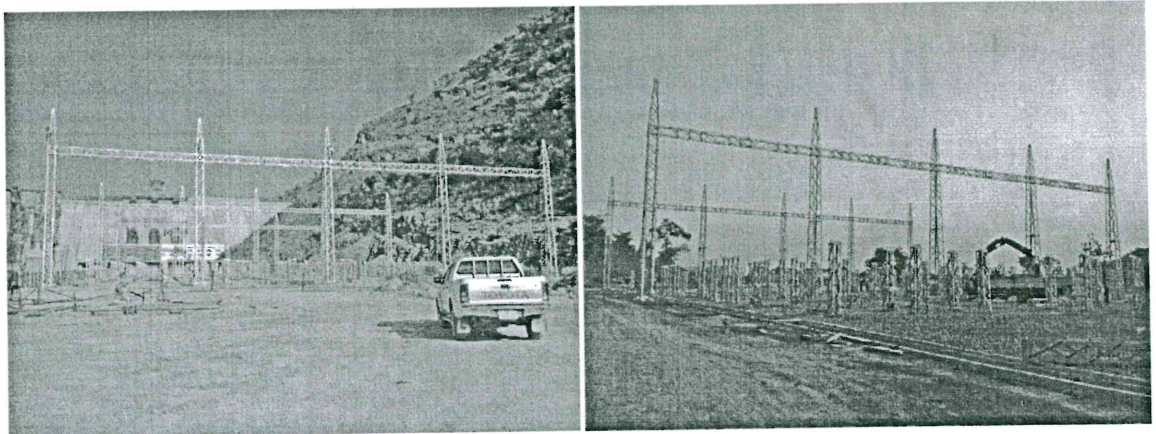


Plate 23: Steel support structures at switchyard

#### Cable Trenches

Outdoor cable trench is about 96% complete. The link trenches between control building and outdoor switchyard which are also about 40% completed. The trench connecting the switchyard to the powerhouse is currently about 85% completed

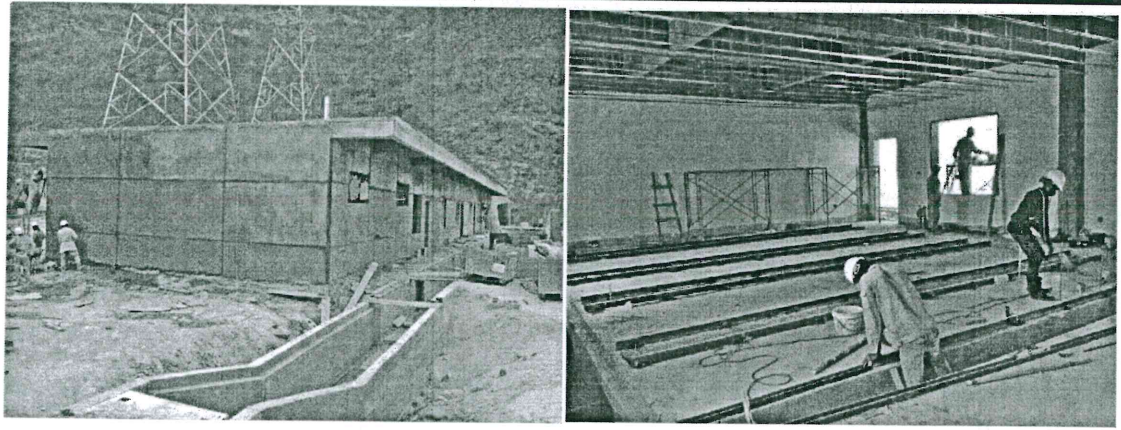


Plate 24: Status of cable trenches works

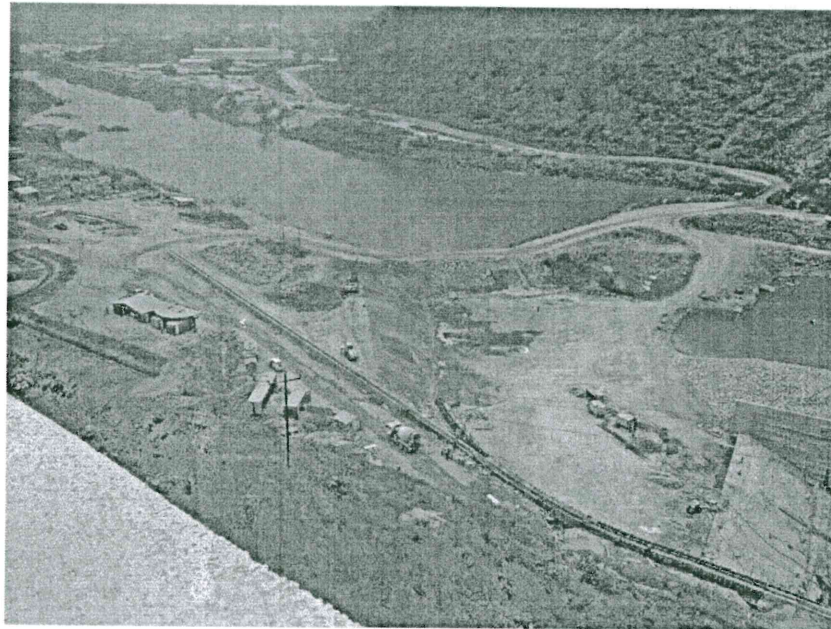


Plate 25: Cable trench connecting the switchyard to the powerhouse

Cable support installation

Installation of cable supports are about 65% done and currently on hold whereas placements of concrete cover slabs are outstanding.

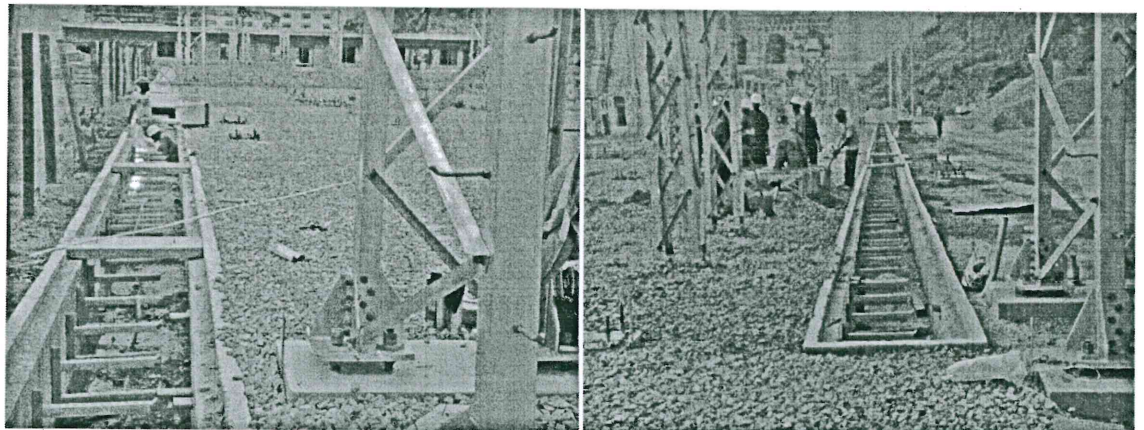


Plate 26: Cable support installation

Installation of equipments

During the period the main transformer was delivered to site and mounted on the transformer base and further secured by tack-welding to the imbedded 400mmx600mm metal plate in the cast concrete. Additionally, the conservator tank and its associated piping, pressure relief valve, radiator together with its cooling fans and motor on the transformer were installed. Other major parts such as the bushings were also installed whereas the tap changer is yet to be installed.

Installation of the other outdoor equipments is yet to commence.

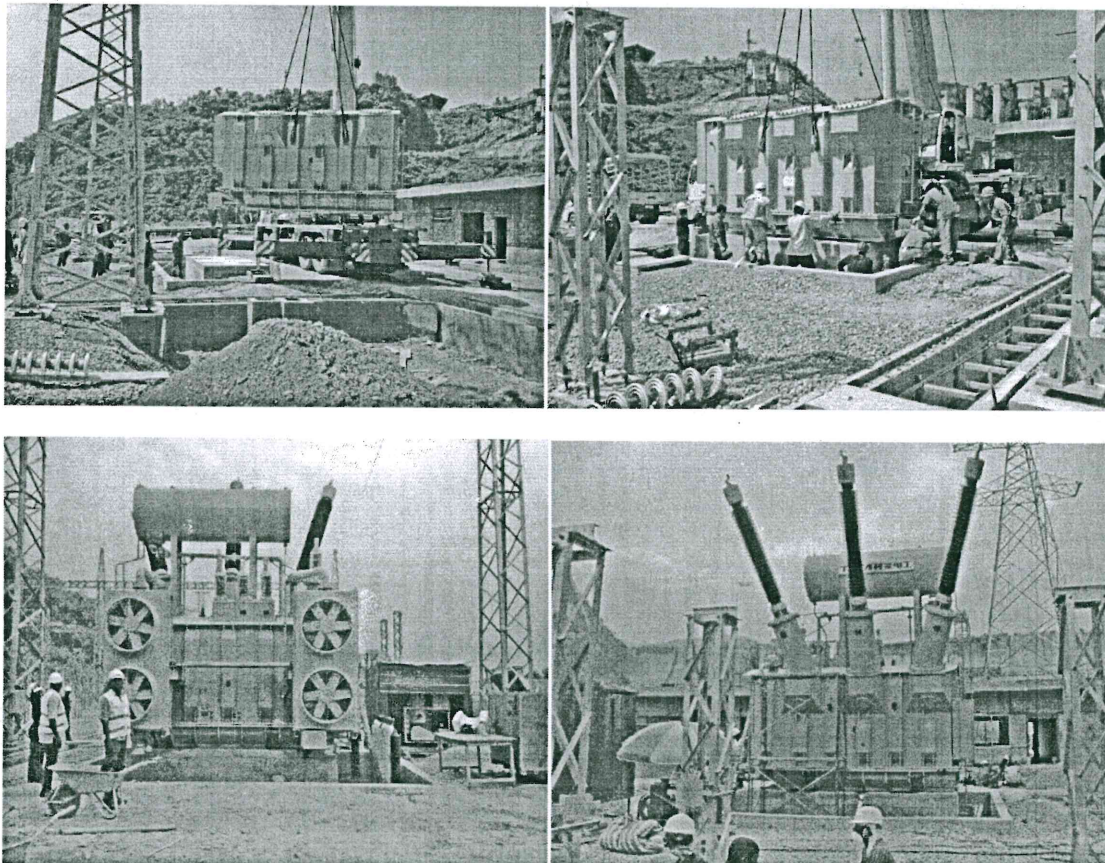


Plate 27: Progress of transformer installation works

#### Control-Utility Composite Building

Works involving the roof slab and beams, columns, lintels, floor slab and ground beams and column foundations are 100% completed. The progress for the block-laying was 98% completed.

Civil works, (i.e. foundation, column, beam, lintel, slab and block work), now stands at 97% completed.

#### 8.3 Line Route Survey and RoW Demarcation Works

Line route survey, right-of-way (RoW) demarcation and asset valuation works have been completed for all the four lines. However, payment of compensations to affected asset owners is yet to be commenced

#### 8.4 Bush Clearing within Transmission Line RoW, Access Roads & Tracks

Access roads and centreline tracks to allow for survey and concrete foundation works, were the only clearing done.

A total of 92.1% (i.e. 62.2 of ~68km) on the Bui-Kintampo line has so far been cleared whereas that of the Bui-Sunyani line route is still at 74.27% (102.5 of 138km).

## Bui Hydroelectric Project

No.	Line	Done this Quarter (km)	Cumulative % age attained at end of Quarter
1	Bui-Kintampo	66.42 out of 67.47	98
2	Bui-Sawla	16.52 of 16.52	100
3	Bui-Techiman	18.13 out of 18.13	100
4	Bui-Sunyani	107.13 out of 137.58	77

### 8.5 Excavations, Steel Reinforcements and Concreting of Tower Foundations

Tower foundation works executed so far was about 70% of the expected total. Thus, an average total of 177.40 out of 635 foundations had been fully prepared with details as follows:

Lot	Line	Expected Total	Total Done (cumulative)	%age
1	Bui-Sawla	43	43	100
2	Bui-Kintampo	180	178.2	99
3	Bui-Techiman	47	47	100
4	Bui-Sunyani	365	177.4	48

A total of two (2) towers were added to the 178 towers initially intended for Bui-Kintampo line; one at the terminal end to satisfy the slight shift in the position of the substation and the other to enable independent stringing of the line in context over the existing Techiman-Sawla line in the neighbourhood of tower BKT44.

### 8.6 Tower assembling and erection

The period ended with the erection of only four (4) towers; BKT1, BTE1 and 2No. Double-circuit towers T1 and T2. Apart from BKT2, BKT44a and BKT 44b, all the towers on the Bui-Kintampo line have been erected. However, Sawla (Wa) and Techiman lines respectively have towers BWA1 & 2 and BTE2 outstanding, due to the need to reorganize them to suit the shift in the Switchyard position. A cumulative total of 350 out of 635 towers have so far been erected constituting 55.12% progress.

Table 6: Progress of Erection Works on the Transmission lines

No.	Line	No. of Towers	%age attained as at the end of this Quarter (cumulative)
1	Bui-Sawla (Wa)	43	41
2	Bui-Kintampo	180	178
3	Bui-Techiman	47	47
4	Bui-Sunyani	365	86
5	<b>TOTAL</b>	<b>635</b>	<b>352</b>

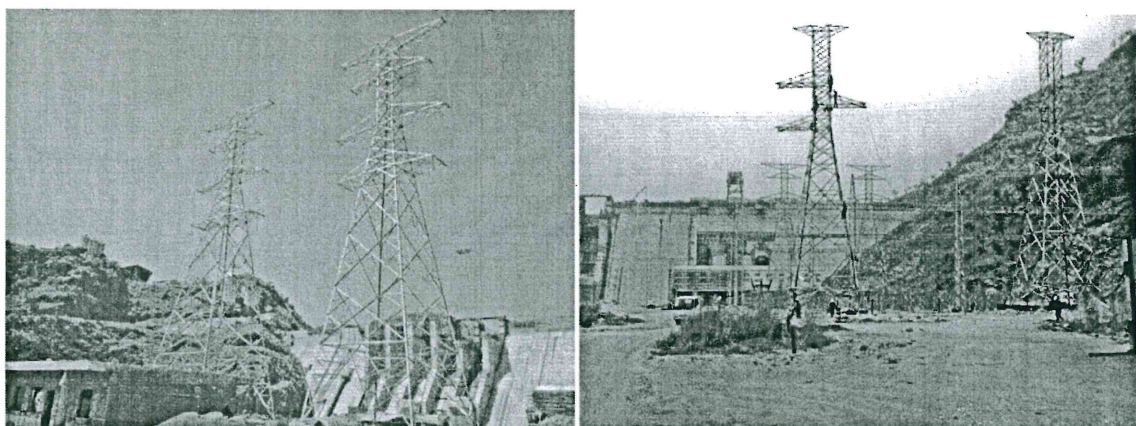


Plate 28: Erection of 2Nr double-circuit towers as well as BWA1 and BKT1

*Tower resistivity test*

No activity was recorded during the period as the Contractor concentrated on line auditing works including tower foundation, erection and stringing

**8.7: Stringing of conductors, shieldwire and OPGW.**

The shieldwires over the Switchyard were the only major stringing works done during the period. The cumulative total of stringing works done still covers **244** of the 635 towers representing 38.43% of transmission lines.

*Installation of accessories*

No such activity was recorded during the review period.

Stringing details for each circuit, based on number of towers strung with the **average** requisite number of lines (conductors, shieldwires and OPGW) are as follows;

Line Section	Targeted No. of Towers	No. of Towers Achieved	Percentage Done %
Bui – Sawla (Wa)	43	41.00	95.35
Bui – Kintampo	180	158.00	87.78
Bui – Techiman	47	45.00	95.74
Bui – Sunyani	365	00.00	0.00
Total	<b>635</b>	<b>244.00</b>	<b>38.43</b>

**9.0 LABORATORY****9.1 Tests on Aggregates:**

Processed aggregates of sizes 5mm-19mm and 20mm-40mm were sampled four times from conveyor belt leading to finished bin at the aggregate processing plant for routine qualitative tests. Aggregates from JA Quarry being stored near the small batching plant were also sampled and tested.

*Fine Aggregate for Concrete Works*

Artificial sand was sampled from the conveyor belt leading to the finish bin at the processing plant and tested once within the period.

Results indicate that the samples met specifications set in DL/T5144-2001.

A summary of results are shown in the table below:

**Table : Summary of Fine Aggregate Test Result**

Sampling source	Fineness modulus	Rock powder content (%)	Density (g/cm <sup>3</sup> )
<b>Results</b>	2.59	16.41	2.62
<b>Specification( DL/T 5144-2001)</b>	2.4 - 2.8	6-18	

*Coarse Aggregates for Concrete Works*

The oversize and undersize content of the coarse aggregate after the gradation generally, indicated that results attained were acceptable as they were within the limits set in DL/T 5144-2001.



Aggregates sampled during the period were tested twice for the loss percentage with the Los Angeles Abrasion Machine. The aggregates successfully passed the maximum percentage set at 50% for the aggregates from the Project Quarry (UQ319) and 30% for the aggregates from the JA Quarry

**Table : Summary of Los Angeles Test Results**

Quarry 319				JA Quarry			
Test Date	Sample no.	Loss %	Corrected Loss %	Test Date	Sample no.	Loss %	Corrected Loss %
20-Nov-12	G-12-43	41	44	20-Nov-12	GG-12-43	21	24
22-Nov-12	G-12-44	41	44	22-Nov-12	GG-12-44	21	24
Specification			<50%				<30%

A summary of results obtained for the aggregate crush index, flat/elongated percentage and density tests conducted within the month under review on aggregates sampled from the belt and J. A. Quarry stockpile are shown in Table 3 below. Results were satisfactory and showed consistency in the physical properties of the materials.

**Table 3: Summary of Test Results**

		Average Crush Index	Average Flat/Elongated (%)	Apparent Density(g/cm3)	Absorption (%)
	Test Times	1	1	1	1
Aggregate Source	J. A. Quarry (5-19)	8.3	2.9	2.67	0.48
	J. A. Quarry (19-40mm)		3.3	2.66	0.326
	Quarry 319 (5-19mm)	14.9	1.8	2.69	1.04
	Quarry 319 (19-40mm)		2.3	2.69	0.91
	Limits (%)	≤20	≤15	≥2.55	≤2.5

**9.2 Filter material**

During the period, filter 2 materials were sampled and test on two occasions. The materials were sampled from the stockpile at the production area at the aggregate processing plant. Sampling frequency was adequate since production rate has depreciated. No filter 1 material was produced during the period.

Results summarised in Table 4 and Fig 1 below, indicate that grading curves of the filter were within the design envelope and materials tested had the percentage of materials finer than 75µm below the 5% limit.

**Table 4: Summary of Filter Test Results**

	Filter 2
Test times	4
	Percent passing 75µm
Maximum	2.14%
Average	2.03%
Stand. Deviation	0.001
Technical Specification	≤5%

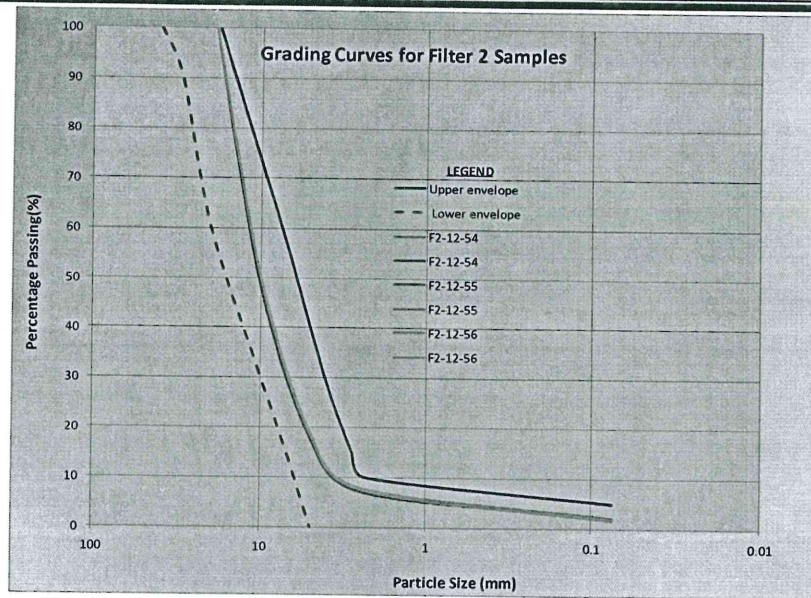


Plate 29: Grading Curve for Filter 2 Samples

9.3 Fly Ash

Two samples of fly ash were taken with sample numbers F-12-16 & F-12-17. The samples were tested for the loss of ignition, fineness, moisture content, water requirement ratio and the compressive strength ratio. Results of the water demand ratio indicate that the fly ash passes the Chinese Standards GB/T1596-2005

9.4 Cement

Cement of grade CEM I 42.5N were sampled three times during the month from the storage sheds and bulk carriers conveying GHACEM cement to the project site. The setting time, fineness, compressive strength and soundness tests were carried out on the samples taken. Sampling frequency was inadequate.

The table below indicates that the cement sampled meets specifications:

Table 4: Cement Test Results

Manufacturer		Specific Surface (m <sup>2</sup> /kg)	Initial (hh:min)	Final Setting (hh:min)
GHACEM	Maximum	421.90	02:03	03:00
	Minimum	348.80	01:55	02:57
	Average	385.35	01:57	02:58
	Sta. Dev.	51.69	00:04	00:01
BS-12			≥0:60	-
Technical Specifications		> 220	>0:45	<3:05

It is recommended that the Contractor be made to submit to the Employer on a regular basis, the alkali content report of cement used on site in order to keep track of the alkali content of the concrete being placed. This will inform the Employer that the alkali content is being controlled below 2.5kg/m<sup>3</sup> in order to mitigate the possible development of Alkali Aggregate Reaction (AAR).

Sampling of freshly mixed Concrete

Conventional vibrated concrete were sampled by the Contractor during placement for compressive strength test. Sampling was satisfactory except for that of the BPA Permanent Village and the Bui- Meji road.

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## Test on Hardened Concrete

### *Reinforced/Mass Concrete*

The compressive strength test of 28, 90, and 180 day-old concrete sampled from site and wet cured in the laboratory were tested at their respective ages. Generally, most crushed samples had compressive strengths well above the design range for the various concrete grades although the standard deviations of the concrete strength were high which is not satisfactory

### *Sandcrete Blocks*

Sampling of hollow blocks of sizes 200x200x400mm was undertaken by random selection at the powerhouse. Two sets (6 samples) of blocks with sample numbers B-25 and B-26 were taken and tested for their compressive strengths. The procedure was supervised to ensure compliance with the standards.

Average strength of blocks recorded was about 8.90Mpa with the minimum strength being 8.4MPa which meets the minimal strength requirement of 7.5MPa.

## 9.5 Steel Test

Sampling of rebars was undertaken by random selection from the steel yard for the strength test and the elongation at fracture. Sampling was supervised to ensure compliance to standards. The table below summarises the results of the test which confirms that steel tested meet BS 4449.

## 9.6 Instrumentation

### Seepage Monitoring

Seepage from the Main dam foundation was measured using the calibrated container method. There are 390 drainage holes in all at the main dam with 368 of them complete. The maximum flow recorded -0.439l/s - was from drainage hole number D5-6 at El 82m. The total flow was about 4.8l/s which is an increase of about 0.7l/s from the November 6 measurement. Increase in seepage is due to the increase in elevation of the reservoir. This method of seepage measurement is currently not an accurate assessment of the total discharge since there are now many boreholes which can affect the final results. Examples are the open tube piezometers and also the inverted pendulum boreholes. These holes are acting as discharge points for the ground water and their discharges are not taken account of when measuring the discharge from the main dam drainage holes which the Contractor considers as the **total drainage discharge**.

### Installation of Instruments

Installation of the static settlement instrument and upper supporting bracket of inverted pendulum IP3, PL-3 commenced during the period. However the Contractor has been cautioned to submit a detailed description of the instruments, equipment (including auxiliary devices), procedures of installation, testing, calibration and operation of the instrument supplied by the Manufacturer and the Supplier of the instruments before formal approval is given.

### Monitoring of instruments

Monitoring of installed instrument in the main dam, powerhouse and saddle dam were conducted once a week.

Vibrating Wire (VW) piezometers installed at block 12, 17, 24, the powerhouse and the Saddle dam 1 continued to record increasing pore water pressure. The recorded increasing pressure is attributed to the steady increase in the reservoir level. The maximum pore pressures were recorded from piezometers installed just before the drainage curtain at DD0+003m i.e. P01-17, P01-12 and P01-24 at block 17, 12 and 24 respectively.

All installed instruments were functioning with the exception of those detailed in Table 5 below.

The Contractor has commenced the monitoring of water level in the ground water observation holes at the Saddle dam 1 and that of the open tube piezometers at the main dam.

Table of malfunctioning instrument

Label	Location	Type of Instrument	Problem	Date of Malfunction
P04-24	Block 24	Foundation piezometer	Error in temperature readings	-
P01-17	Main Dam	Foundation Piezometer	Error in Reading	22/10/12

## 10.0 SURVEY

### 10.1 Positioning of Structures

To ensure conformity to design specifications in relation to positioning and alignment, BPA Survey team performed checks on all structures (formworks erected for casting/placement of concrete, pipes, penstocks gates etc) positioned during the quarter. Those elements which fell out of specification were corrected by the Contractor when notified.

Formworks established for casting of concrete (RCC/Conventional) at main Dam area and Powerhouse were checked for positioning and heightening.

The table below certifies the mechanical installations certified

Location	Description	Status	Tolerance Limits
Unit 1	Radius & Horizontality of Spiral Case, Draft Tube Cone & Stay Ring	Before Concreting	Acceptable
	Position of Tailrace Gates Rails	After Erection	Acceptable
Unit 2	Position of Tailrace Gates Rails	After Erection	Acceptable
	Position of Hydraulic Hoist Base Plate	Before Concreting	Acceptable
	Elevation of Lower Bracket Brakes	After Installation	Acceptable
Unit 3	Upper Bracket	Before Welding	Acceptable
Spillway No 1	Position of Hydraulic Hoist Foundation	After Welding	Acceptable

## 11.0 SECURITY, SAFETY AND HEALTH

### 11.1 Safety

Safety monitoring and inspections were carried out at the various job locations to ensure compliance with safety regulations at the site. The main areas of safety concerns were the Powerhouse, Tailrace, Spillway and Power Intake. There was a weekly safety meeting for BPA staffs. BPA Staff were educated on the general duties of the employee as specified in the corporate safety book. The meeting also stressed on the importance of all staff to report any unsafe work practices or hazards spotted whilst performing their duties. Among other training exercise, employees were educated on the following areas:

- Discussions on Safety Signs & Signals
- Accident Prevention
- Onchocerciasis drug administration for New technicians

### 11.2 Accidents, incidents and near misses

No accident was recorded during the quarter

### 11.3 Hazard Management

There was a daily routine inspection and monitoring at the Powerhouse and Tailrace Channel. Workers were constantly monitored at their various work points to ensure all safety rules were fully complied with.

### 11.4 Health

An average of about Nine Hundred and Seventy Six (976) cases of diseases was reported at the site clinic. Cases of malaria were the most predominant along with other diseases such as diarrhoea, rheumatism joint pains and various occupational injuries were also recorded.

The data below shows all the health related cases reported at the Bui Medical Centre until September 25, 2012.

Table 7: Reported Health Related Cases

MONTHLY OUTPATIENTS MOBILITY	Oct. 2012	Nov. 2012	Dec. 2012
UNCONFIRMED MALARIA	200	Not yet available	Not yet available
CONFIRMED MALARIA	25	Not yet available	Not yet available
HYPERTENSION	4	Not yet available	Not yet available
RHEUMATISM	6	Not yet available	Not yet available
EYE	47	Not yet available	Not yet available
DENTAL CASES	12		
UTI	2	Not yet available	Not yet available

DIARRHOEA	32	Not yet available	Not yet available
URTI	100	Not yet available	Not yet available
SKIN	15	Not yet available	Not yet available
OCCUPATIONAL INJURY	76	Not yet available	Not yet available
HOME INJURY	0	Not yet available	Not yet available
ALL OTHER DISEASES	303	Not yet available	Not yet available
<b>TOTAL</b>	<b>822</b>	Not yet available	Not yet available

## 12.0 WEATHER

The general state of the weather however was favourable for performance of construction works.

## 13.0 HUMAN RESOURCES

The Employer maintained a work force of about Fifty Six personnel which included consultants from the office of the Engineering Consultants, Tractebel Engineering and support staff.

The number of Ghanaians employed on site by the Contractor totaled Two Thousand and Fifty One (2051) at the end of the quarter. The Expatriate staffs of the Contractor, on the other hand, comprised Three Hundred and Sixty-Three (363) Chinese Nationals and Eight-Seven (87) Pakistani Nationals.

Summary of workforce

	Ghanaians	Foreigners	Total
Contractor's workforce	2,051	450	2,501
Employer's workforce	53	3	56

## 14.0 COST AND FINANCIAL REVIEW

### 14.1 Payments

Two interim payments (revised IP 30 and 31) were received from the Contractor in the Fourth quarter of 2012. The two IPs have since been certified for payment.

### 14.2 Cost Review

#### 14.2.1 Delayed Payments

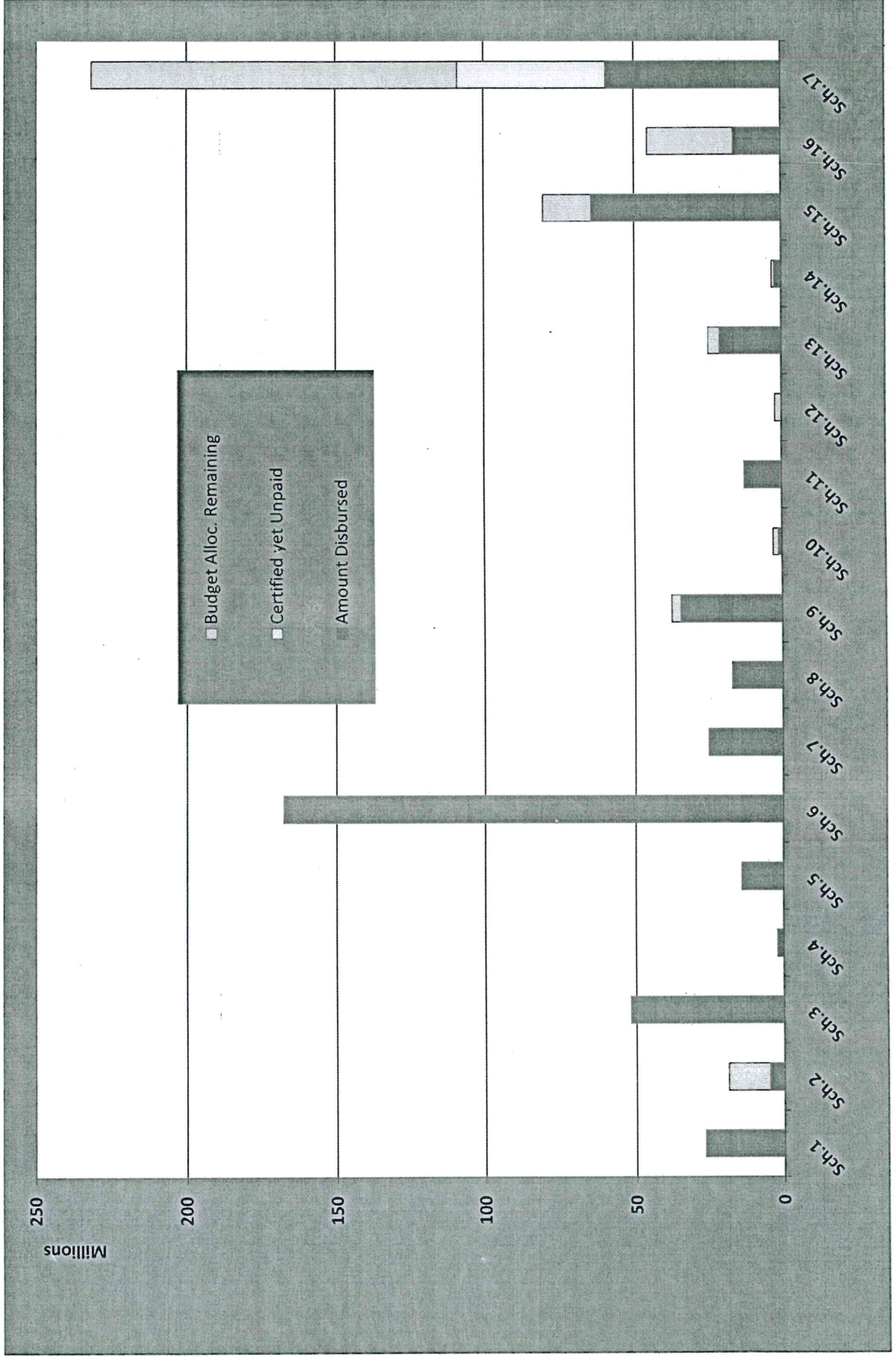
The contractor submitted four additional claims for financing charges during the quarter. The claims for financing charges due to late honouring of Interim Payment Certificates was at One Million, Two Hundred and Seventy Nine Thousand, Two Hundred and Fifty United States Dollars, Seventy Three Cents (USD 1,279,250.73) (See Table 1 below for details).

**Bui Hydroelectric Project**

**Table 1**

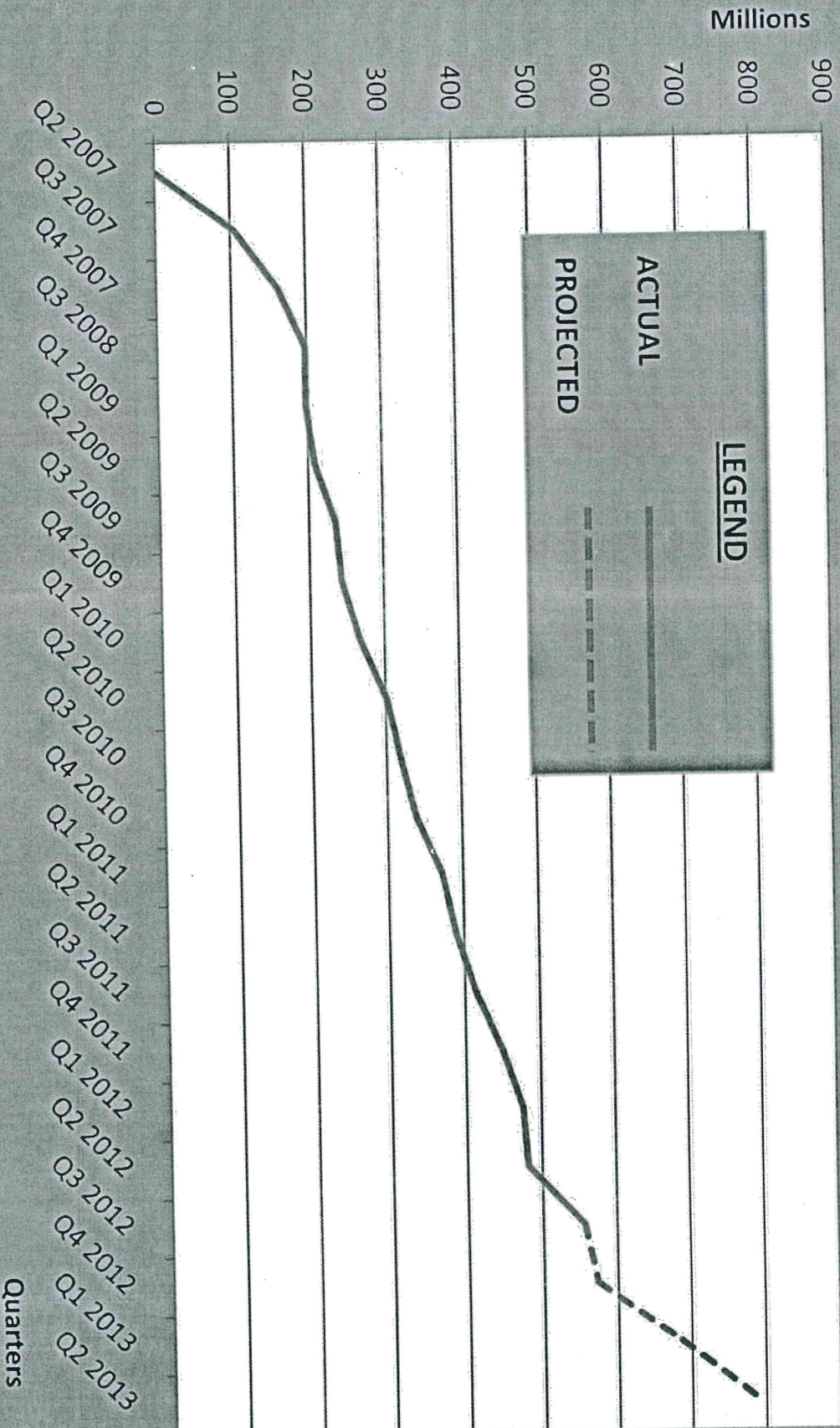
<b>Interim Payment(IP) No.</b>	<b>Certificate Amount USD</b>	<b>Submitted Date</b>	<b>Due Date</b>	<b>Actual Payment Date</b>	<b>Financing Charge</b>
IP Number 1.	<b>57,786,692</b>	October 28, 2008	<b>January 20, 2009</b>	May 26, 2009	<b>371,057.79</b>
				July 20, 2009	<b>196,264.33</b>
IP Number 2.	35,217,544	March 16, 2009	June 8, 2009	December 2, 2009	127,521.28
				November 17, 2009	118,102.49
IP Number 3.	<b>10,896,807</b>	June 30, 2009	<b>September 22, 2009</b>	December 2, 2009	<b>15,960.09</b>
				December 24, 2009	<b>20,126.51</b>
IP Number 4.	27,469,679	September 10, 2009	December 3, 2009	January 2, 2010	17,308.25
				February 25, 2010	47,458.10
IP Number 6.	<b>9,390,996</b>	January 25, 2010	<b>April 19, 2010</b>	May 17, 2010	<b>6,219.28</b>
				April 27, 2010	<b>2,450.02</b>
IP Number 7.	13,754,282	March 1, 2010	May 24, 2010	September 3, 2010	33,844.25
				June 3, 2010	4,744.52
IP Number 8.	<b>18,208,899</b>	April 26, 2010	<b>July 19, 2010</b>	September 3, 2010	<b>21,533.39</b>
				September 3, 2010	<b>21,533.39</b>
IP Number 9	6,755,424	May 27, 2010	August 19, 2010	September 26, 2010	5,805.74
				September 3, 2010	2,467.44
IP Number 10	<b>11,529,088</b>	June 24, 2010	<b>September 16, 2010</b>	September 26, 2010	<b>3,523.14</b>
				October 14, 2010	<b>7,750.91</b>
IP Number 12	6,563,979	September 13, 2010	December 6, 2010	January 21, 2011	7,084.53
				January 18, 2011	6,690.95
IP Number 13	<b>5,515,930</b>	October 12, 2010	<b>January 4, 2011</b>	January 21, 2011	<b>1,980.04</b>
				January 18, 2011	<b>1,650.03</b>
IP Number 14	10,704,311	November 17, 2010	February 9, 2011	April 6, 2011	12,870.25
				April 6, 2011	12,870.25
IP Number 15	<b>12,367,797</b>	December 22, 2010	<b>March 16, 2011</b>	April 6, 2011	<b>6,435.66</b>
				April 6, 2011	<b>6,435.66</b>
IP Number 17	7,321,338	February 23, 2011	May 18, 2011	May 18, 2011	652.90
				May 26, 2011	1,697.55
IP Number 19	<b>6,957,804</b>	May 23, 2011	<b>August 15, 2011</b>	September 27, 2011	<b>7,015.93</b>
				November 3, 2011	<b>12,105.92</b>
IP Number 20	16,330,456	July 4, 2011	September 26, 2011	December 15, 2011	32,278.17
				November 1, 2011	15,763.76
IP Number 21	<b>4,248,349</b>	August 3, 2011	<b>October 17, 2011</b>	December 23, 2011	<b>5,481.57</b>
				December 28, 2011	<b>5,890.64</b>
IP Number 23	19,056,524	January 13, 2012	January 13, 2012	February 1, 2012	8,899
				April 27, 2012	49,181
IP Number 24	<b>5,071,871</b>	February 20, 2012	<b>February 20, 2012</b>	April 26, 2012	<b>8,034</b>
				April 27, 2012	<b>8,156</b>
IP Number 25	6,955,729		April 23, 2012	April 26, 2012	495
				April 27, 2012	660
IP Number 26	<b>14,899,379</b>		<b>May 26, 2012</b>	June 12, 2012	<b>6021</b>
				June 14, 2012	<b>6,729</b>
IP Number 27	4,807,999		July 17, 2012	July 31, 2012	1,594
				July 20, 2012	342
IP Number 28	<b>39,543,053</b>		<b>September 17, 2012</b>	September 29, 2012	<b>9,105</b>
				September 27, 2012	<b>8,277</b>
				September 29, 2012	<b>6,100</b>
				September 27, 2012	<b>5,083</b>
<b>Total</b>					<b>1,279,250.73</b>

Bui Hydroelectric Project





### CUMULATIVE CERTIFIED PAYMENTS (USD)



14.2.2 Price Contingency

The escalation index for the period under review remained unchanged at 1.54 from the third to the end of the fourth quarter. However, the cap of 1.17 was used leading to Price Contingency increasing from the certified USD 75,481,954 at the end of the Third quarter of 2012 to USD 78,344,267 at the end of the fourth quarter of 2012. This figure represents 69% of the total price contingency amount of USD 114,055,000 as per the Supplementary Agreement Number 4.

14.3 Financial Review

14.3.1 Project Financial Position

The Total Capital Employed on the project as at September 30, 2012 was USD 599,061,332 comprising work certified of USD 570,512,902 Net Advance Payment of USD 3,548,430 and Insurance premium of USD 25,000,000. This amount had been funded by Amount Payable to the contractor of USD 76,073,607 Retention of USD 26,684,007 and Investment by the Government of Ghana of USD 599,063,332. The investment by Government of Ghana of USD 522,987,725 was made up of an equity contribution of USD 53,368,014 and drawdown on loans and credits of USD 469,619,711.

**Bui hydroelectric Project  
Statement of Financial Position  
as at December 31, 2012**

<b>ASSETS</b>	<b>USD</b>	<b>USD</b>
Capital works in progress (Certified Works)		570,512,902
Prepaid Insurance		25,000,000
Advance Payments	79,752,021	
Less: Advance payment Amortization	<u>76,203,591</u>	<u>3,548,430</u>
		<u>599,061,332</u>
 <b>LIABILITIES</b>		
Accounts Payable	49,389,600	
Retention	<u>26,684,007</u>	<u>76,073,607</u>
 <b>GOVERNMENT OF GHANA</b>		
Equity Contribution	53,368,014	
Exim- Buyers Credit	247,459,855	
Exim-Concessional Loan	222,159,856	<u>522,987,725</u>
		<u>599,061,332</u>

**15.0 PROJECTIONS FOR THE NEXT QUARTER**

The following were projected for the fourth quarter of 2012.

15.1 Environmental Issues

- Continue to hold regular interface with affected persons within the Bui Transmission line RoW
- Complete fireride around the piloted FREP plantation
- Hauling and sharing of logs with the Sub – contractors in the Bui reservoir area
- Hold a stakeholder forum on the fishing activities with the reservoir

15.2 Construction and Support Facilities

- Aggregate production and concrete production to continue

15.3 Main Dam

- Placement of CVC on dam blocks # 14-16 to attain elevation 185m.
- Placement of CVC on Midstream Piers at dam blocks # 17-18 to attain elevation 176m.

15.4 Powerhouse

- Masonry works continue
- Concrete for tail race
- Concrete around spiral case of U1
- Casting of cable trench
- Remedial works

15.5 Saddle Dam 2

- Completion of excavation
- Commencement of dam works

15.6 Transmission lines

- Bui – Kintampo
  - Tower foundation 100%
  - Tower erection 100%
  - Stringing 100%
- Bui – Sunyani
  - Tower foundation 100%
  - Tower erection 100%
  - Stringing 100%
- Bui – Teselima (overall) 100%
- Bui Switchyard 100%

15.7 Laboratory works

- Test on aggregates, cement, fly ash and admixture
- Test CVC samples
- Test on Blocks

15.8 Survey

- Checking of formworks
- Checking and inspecting positions of electro-mechanical installations
- Checking of works at Saddle Dam 1 & 2
- Any other ad-hoc surveys