USAID ENERGY POLICY PROGRAM

REVIEW AND ASSESSMENT REPORT

GOMAL ZAM MULTIPURPOSE DAM

May 2010

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Submitted on: May 12, 2010

Contract No: AID-EPP-I-00-03-00004
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REVIEW AND ASSESSMENT REPORT
GOMAL ZAM DAM MULTIPURPOSE PROJECT

Submitted to: USAID /Pakistan

Under: Contract: EPP-I-00-03-0000-4-00, Task Order No. 8
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Submitted on: May 12, 2010

Date: May 12, 2010

To: **Charles Moseley**
Director, Office of Energy, USAID|Pakistan,
US Embassy, Pakistan.

Re: Review and Assessment of Gomal Zam Dam Project

Under directions from USAID this assessment was conducted by AEAI to address funding feasibility of the proposed Gomal Zam Dam Project; and to determine the current construction progress and status of the project for purposes of updating cost and schedule estimates to completion. The assessment included a site visitation, interview of WAPDA officials, and discussions with the project director and field staff.

The project consists of three components; dam, hydro plant, and an irrigation system. The dam and the hydro plant are about 80% complete but the irrigation system is only 12 % complete.

Major findings of our assessment are delineated as follows:

- Funding the completion of existing works to project completion has sound basis; economic benefit would be well served. In view of the criteria of USG's desire to assist the GOP in alleviating load shedding and a relative quick impact, the Gomal Zam Dam project is also an obvious choice. Other energy sector investments in Pakistan may provide higher benefits to cost, but the Gomal Zam Dam project, with its substantial completion to date, and relatively low budget to completion, is one of the quickest opportunities for USG funding.

- Presently, the irrigation system is least developed and would require the most funding and time for completion.

- While it is difficult to measure security problems, the Greenfield risks of the project have been substantially consumed, and the risk of cost overruns are in an acceptable range. Regarding sustainability problems, these are systematic risks throughout the Pak energy sector anyway; the situation is the same with all of the generation projects.

- The issue of paying for outstanding payables should also be discussed with WAPDA. WAPDA is wise to offer USG funding opportunities in the troubled areas and it alleviates that much of their budget. Furthermore for political reasons GOP moves commitments from one project to another during the life of their constructions in order to make new announcements of projects in recent budget cycles. Their strategy to ask USG and counterparts to cherry-pick existing

projects that have substantial progress, works hand in hand. But as they do have serious budget constraints, they are likely going to ask for this help too. An additional $34 million outlay does not alter the positive aspects mentioned above; and AEAI's reported estimate of a 2 year-payback, doubling at least/probably more to 6 years by taking on the additional $34 million, is still acceptable.

AEAI recommends conducting a financial audit to ensure all cost data provided by WAPDA for the purposes of the project are valid and acceptable. Based on the verification of costs, funding towards completion of this project will greatly benefit GOP efforts to improve economic growth in the Tank and D.I. Khan districts.

Yours Sincerely,

Zahid K. Khan, P.E.
Senior Energy Specialist

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Summary

At the request of the Government of Pakistan (GOP), the United States Government (USG) is considering a significant investment of grant funds into energy projects of medium size and considerable impact that would demonstrate USG commitment to the GOP and the people of Pakistan. The time period of these proposed projects is preferred one to two years. One of the potential candidate projects is the Gomal Zam Dam, which is a multi-purpose hydro project that would provide energy, irrigation, and water storage benefits to the people of Pakistan. This candidate project may take 1 year to complete. The main dam, powerhouse and transmission line is estimated to be 80% complete. Within 2 years the irrigation network which is at this stage only 12% developed, can be completed. While the project would only add a modest amount of generation capacity, it holds the potential of adding significant amount of water storage capacity that is badly needed in the Tank and Dera Ismail (D.I.) Khan districts. A special benefit of this project is its strategic location in an under-developed, politically sensitive belt of Federally Administered Tribal Areas (FATA).

Description:	Gomal Zam Dam is a Greenfield project located on the Gomal River in South Waziristan (FATA). The irrigation canal system is situated in Tank and D.I. Khan districts.
Benefits:	The project would provide 17.4 MW of power and 91 GWh/yr of energy to the national grid, store 1.14 million acre-feet of water (0.89 million acre-feet of live storage), and irrigate 191,062 acres of land.
Estimated Completion Costs:	Dam and Powerhouse completion construction costs - $24.50 million Transmission line - $2.0 million **Subtotal construction – power and transmission - $26.50 million** Irrigation System - $68.25 million **Total for Project Completion – US $94.75 million**
Other Costs:	Dam & Powerhouse Incurred Costs not yet paid - $34.0 million
Estimated Schedule:	1-2 years (dam and power plant 12 months)
Implementation Mechanism:	WAPDA is executing the work through an EPC/Turnkey Contract[1] awarded to Frontier Works Organization (FWO) as main contractor with site supervision by a consortium of local and foreign consultants acting as owner's representative. WAPDA will operate this dam and power plant. The irrigation system would be operated by the provincial government.

[1] **EPC** stands for **Engineering, Procurement and Construction**.
It is a common form of contracting arrangement within the construction industry. Under an EPC contract, the contractor will design the installation, procure the necessary materials and construct it, either through own labor or by subcontracting part of the work.

Risk Factors:	Although there is satisfactory confidence that put in place construction values are adequate, detailed engineering and accounting audits (which are recommended) may result in revised cost estimates
	Security is expected to remain an issue given its location in South Waziristan (FATA)
	Sustainability: Tribal area customers do not pay for electricity which leads to system abuse and lack of conservation measures.

The original PC-1 was approved on August 31, 2001 for a project cost of US$ 211 million. The draft revised PC-1 estimates projected costs of US$ 256 million.

After some progress, the initial contract ended in 2004, and in January 2007 WAPDA awarded an EPC contract to the Frontier Works Organization (FWO). Sino-Hydro and Teksar are the two subcontractors for FWO. The total contract value was US$ 172 million. Out of this, the dam and power house portion was US$ 101.5 million, Irrigation system US$ 63 and Security portion US$ 7.5 million.

Based on site visitation by AEIA in April, 2010, assessment of outstanding works, liabilities of work done but payment not made by WAPDA and discussion with field WAPDA officials, the estimated cost for completion of the EPC contract has been assessed as US$ 128.75 million.

Note that there are substantial cost discrepancies between various documents provided by WAPDA. AEAI's cost estimates are strictly based on the EPC contract with escalation as provided in the contract in order to arrive at the funds actually required to complete the works. This figure has been based on the most recent statement of Cost Estimates sent by Project Director Gomal Zam Dam Project dated May 11th 2010. This US$ 128.75 million does not include any other WAPDA overhead, administrative expenses, interest payments, further devaluation of the rupee, etc. WAPDA may seek USAID assistance for these costs, however, in absence of any audit, it is not possible to quantify or even come up with a good estimate of such costs.

Project Description

The project site is located at Gomal River about 60 km west of Tank and D.I. Khan in the South Waziristan Agency of the Federally Administered Tribal Areas (FATA). The project will provide 17.4 MW of generation capacity, produce 91 GWh/yr of electricity, and provide 0.89 million acre feet (MAF) of live water storage which will support a new irrigation system and supplement an existing one with a combined area of about 191,062 acres. The project will enhance agriculture and bring employment opportunities to the strategically important South Waziristan, Tank and D. I. Khan areas. FWO, Army and Frontier Constabulary are providing necessary security from D.I. Khan up to the site and to the project works area.

Supporting the GOP in this endeavor provides the USG with an opportunity to contribute to both the quantity of power and volume of water stored at a very reasonable cost. The addition of 17.4 MW and 91 GWH of energy production will cater the needs of at least 25000 house-holds covering a population of about 200,000 people besides generating economic and industrial activity in that remote undeveloped and sensitive area. The creation of storage of 1.1 MAF would be a very significant addition to the Pakistan's existing aggregate storage of about 20 MAF of which over 20% has already silted. Further, this storage will be sufficient to irrigate 191,062 acres of agricultural land besides providing drinking water to the local population, through storing mainly the monsoon flood waters while mitigating the flood at the same time. In addition, the USG would be assisting in utilizing an indigenous renewable energy resource to provide low-cost electricity to the national grid as stated above.

Additional Project Details

The purpose of the project is to more effectively use the water resources of the Gomal and Zhob Rivers. The project would generate electricity, provide a reservoir on the Gomal Zam River, and irrigate additional areas on the Tank and D.I. Khan plains leading to an improvement in cropping intensity of these areas. The project will provide irrigation to 191,062 acres for the first time by creating new canals. The storage capacity to be built is 1.14 million acre-feet (MAF), of which 0.89 MAF will be live storage.

Listed below are the salient features of the project. The project layout is shown in Figure 2.

Gomal Zam Multipurpose Dam Project Features	
Water Storage:	
Dam Height	436.4 ft.
Gross Storage	1.1 MAF
Live Storage	0.9 MAF
Power Generation:	
Power House Unit No. 1	8.7 MW
Power House Unit No. 2	8.7 MW
Total Power Capacity	17.4 MW
MAF = million acre-feet	

A detailed feasibility study for the project was completed by Coyne et Bellier, France in 1983 and later revised in 1995. About 5,350 acres of land is being acquired for the storage area and the various civil works and canals. This will negatively affect a population of only 30 people, one house in a reservoir area and 2 or 3 in the irrigation area. A No-Objection decision from the Maliks/Elders of the area has been obtained and WAPDA has already acquired 909 acres of land. The main dam and water storage area

was gifted by the 'maliks' (elders) of South Waziristan to WAPDA free of cost where construction of the main dam is already near completion. The project is thus considered to have the support of local FATA elders.

Estimated Costs and Schedule

The construction contract for the dam including hydropower generation and the irrigation facilities which have a barrage at Kot-Murtaza just near the FATA boundary and the canal/distributaries has been already awarded to FWO in year 2007 at a negotiated price of US$ 172 million. Two sub-contractors: Sino-Hydro for the dam and hydropower component for US$ 100.5 million, and Tekser (Turkish Firm) for the irrigation component for US$ 63 million, continue the work of the contract. The main dam, hydropower plant and other associated works are at advanced stages of construction and only 19% of works are outstanding. The irrigation component which has a 63 km main canal and 204 km distributaries is only 12% complete. Work is in progress but slow due to lack of funds from WAPDA. A 132 Kv double circuit 55 km transmission line from the dam site to Tank grid station (which is already supplying power to Wana on a 66 Kv transmission line) will be erected by PESCO. The equivalent of US$ 2 million already has been paid with an equal amount yet to be paid upon completion as per agreed estimates. As per statement of the Project Director, Gomal Zam Dam project, PESCO has committed to complete this line by October 2010. However, it is estimated that at least 12 months are required from date of this writing to complete this line through the best possible efforts, even if expedited at highest levels.

Table – 1 below summarizes the estimated cost of the outstanding works, the progress of the project and expected completion period.

Table 1: Project Status

No.	Description of Work	Completion Status (As of March 1, 2010)	Outstanding Works	Est. Cost of outstanding works US$ Million	Expected Completion Period
1.	Dam and Power House (FWO/Sino-Hydro)	81.1%	18.9%	58.50*	12 months
2.	Irrigation System (FWO/Tekser)	12.1%	87.9%	68.25	24 months
3.	132 kV Power Transmission Line	15% (50% Advance paid to PESCO)	85%	2	12 months
4.	Total Funding Required			**USD 128.75**	

Notes:

* Note that for the Dam/Power House related work, WAPDA has about US$ 34 million incurred costs which are yet not paid to contractors. The costs of remaining works are estimated at another US$ 24.50 million in order to complete the Dam and Powerhouse.

WAPDA has indicated that additional security and administrative costs are about US$ 9.0 million. However, such costs have not been substantiated and in any event a detailed accounting audit is recommended for verification of all above stated cost estimates.

Implementation Arrangements

Based on the milestones agreed in the EPC/Turn Key Contract between WAPDA and FWO, the physical progress of various components of the project is as provided in Table-1. ***Overall physical progress of the project is about 55.6%,*** whereas the ***overall financial progress is around 32%.*** This difference is due to significant liabilities owed by WAPDA to its contractors for the works already completed. Currently, construction is at a minimal level because of WAPDA's non-payment.

Benefits

The remaining works and incurred costs of the main dam, powerhouse and transmission line will cost US$ 60.50 million and would be completed within 12 months. The power plant portion would generate energy up to 91 GWh/year. This would replace thermal energy and therefore provide Pakistan with an annual revenue benefit of US$ 10 million in savings in cost of electricity produced, calculated on the basis of 11 cents per KWh as replacement cost of furnace oil needed for thermal based electricity production. The payback period of the powerhouse portion would therefore be in six years. This assumes an investment of US$ 60.50 million which is the cost of the remaining works for the dam and powerhouse only. The expected return on investment is 17% (by taking the benefit of electricity produced of 91 GWh @ 11 cents per KWh as the replacement cost of thermal energy). It is noteworthy that the electricity produced on Furnace oil power plants currently ranges between 11 cents to 18 cents in Pakistan depending on the types of plants and their characteristics. The electricity produced will serve 25000 House-holds (with estimated 200,000 persons), besides catering the small industrial and commercial activities.

The construction of Dam will ensure protection from floods and mitigate the damages which are estimated @ US$ 2.6 million annually. This will lead to construction of an extensive Irrigation network of about 60 km main canal and 200 km of distributaries to irrigate 191,062 acres of land.

The addition of the envisioned irrigation component would certainly provide additional benefits, with multiplier effect. It is estimated that 30,000 families (150,000 persons) would benefit from the irrigation portion of the project. Almost 20,000 persons of these (13%) are from tribal areas within South Waziristan. The remaining 130,000 persons are from settled areas of Tank and D.I. Khan districts. The estimated additional cost of the irrigation component is US$ 68.25 million. The overall projected Internal Rate of Return for the project is 12.71% with a benefit cost ratio of 1.70:1, as per the feasibility report made by Coyne et Bellier, France in 1995.

Risk Factors

Cost Overrun:

Although there is satisfactory confidence that put in place construction values are adequate, detailed engineering and accounting audits (which are recommended) may result in revised cost estimates

Project Delay

There is a risk of some delay due to delayed progress payments by WAPDA. At present, WAPDA has an outstanding liability of US$ 34 million to be paid to the EPC Contractor. Besides that, WAPDA has an estimated liability of US$ 4 million on account of security arrangements to be provided by FWO under main contract and US$ 9.036 million for Administrative costs, over-heads and consultancy services for remaining period till the project completion.

Security Issues:

Security remains a major concern given the location of the project. WAPDA has awarded a security contract to FWO/Army and they are providing security at the works and from D.I. Khan to the project site.

Sustainability Issues:

Given the financial frailty of the Pakistan energy sector and the heavy demands on the GOP budget, the sustainability of any investment in the sector must be seen as a risk factor. Improving the flow of resources throughout the sector to both sustain current operations and support public and private investment in badly needed expansion will require strategic physical investments, commercial enhancement of operations, and GOP political will to introduce the needed economic reforms. Three examples can serve to illustrate the needed changes.

First, while the World Bank and the Asian Development Bank are making investments to reduce technical losses and improve the efficiency of both the distribution and transmission networks, they must also make sure that sufficient metering is put in place to monitor the energy balances within the system as power is transferred between and within the power sector enterprises (e.g., a generation company or GENCO selling power to an electricity distribution company or DISCO). Such metering is critical to supporting

commercial transactions between the enterprises, as well as narrowing the space for non-technical losses (e.g., theft).

Second, the distribution companies must concentrate on improving customer metering, billing, and collections in order to prevent theft from existing customers, improve revenues, and identify major non-payers, such as government enterprises. Increasing tariffs as per the ADB/World Bank/IMF agreement will not improve the commercial performance of the sector nor encourage customers to rationalize their energy consumption as effectively as possible unless collections bring the price increases home to consumers.

Third, the GOP needs to support the distribution companies in their efforts to increase funds flowing to the sector by:

1) Allowing non-paying and thieving customers to be cut off;
2) Budgeting for and requiring government entities to pay their electric bills in cash; and
3) Rationalizing tariff and subsidy schemes to cover the costs of service provision and attract investment while protecting the socially needy.

In addition to the above, a rigorous preventive maintenance program is required for upkeep of the equipment.

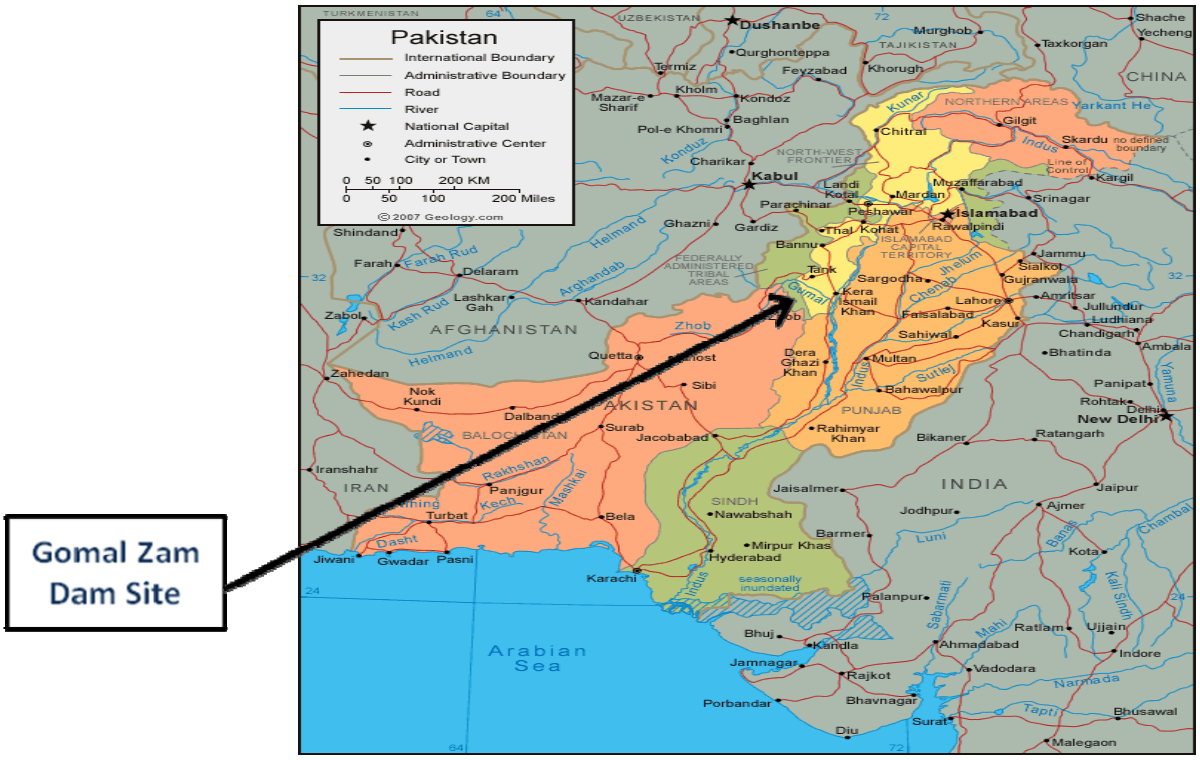

Figure 1: Project Location Map

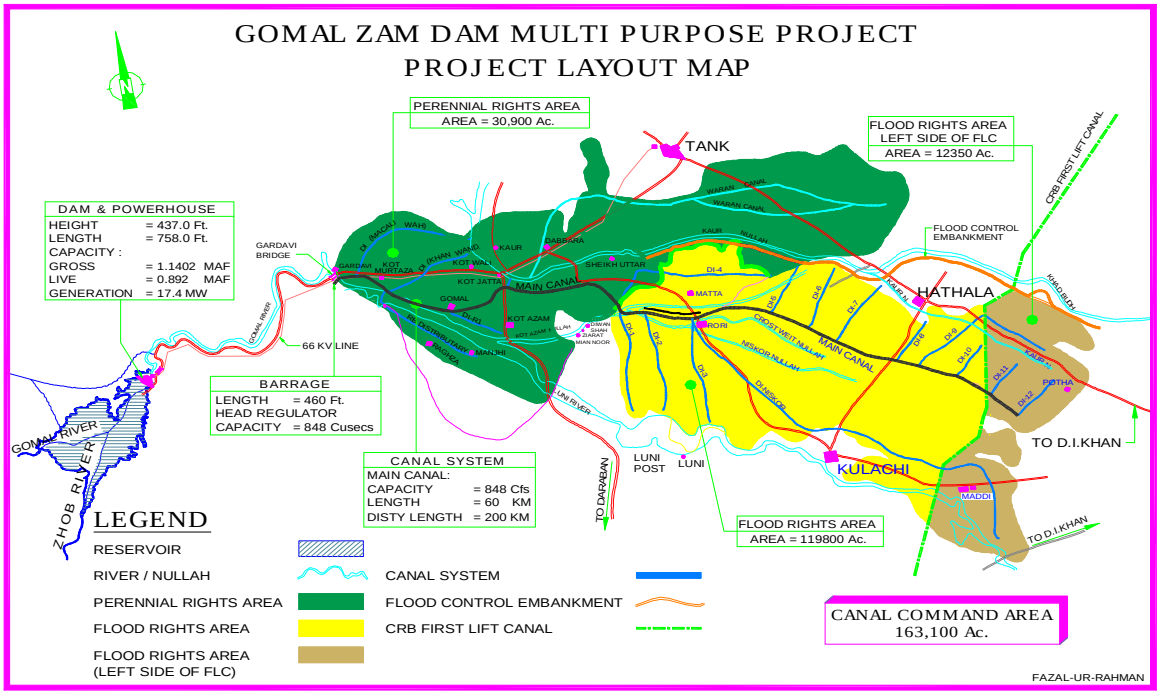

Figure 2: Project Layout Map

Appendix - Project Site Photographs

MAIN DAM – UNDER CONSTRUCTION

MAIN DAM – ANOTHER VIEW

POWER HOUSE – CONSTRUCTION IN PROGRESS

POWER HOUSE – ANOTHER VIEW

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