Kunar Province
HydroPower Assessment
USAID Afghanistan Clean Energy Project (ACEP)
March, 2010

EXECUTIVE SUMMARY

The Kunar PRT has proposed hydro electrification projects for the towns of Asad-Abad and Nangalam. ACEP conducted a preliminary assessment of the hydro resource in Kunar and found that the hydro resource is very good for these areas. These two sites were identified with approximately 1.2 and 2.4 MW respectively of hydro potential. The recommended projects are for a 200-400 kW MHP system in Nangalam, and rehabilitate the existing 50% performing Asad-Abad MHP system back to its original 700 kW.

KUNAR PROVINCE

Kunar province is located in eastern Afghanistan and borders Nangarhar, Nuristan, and Laghman provinces, as well as sharing a border with Pakistan to the east. The province covers an area of 4339 km^2. Nearly nine tenths of the province is mountainous or semi mountainous terrain while the remaining area is made up of flat arable land. The total population of Kunar is estimated to be about 413,000 people, with Pashtuns comprising about 95 percent of the total population, with Nuristanis comprising 5 percent. About 96% of the population of Kunar lives in rural districts while 4% lives in urban areas. Asad-Abad is the most populous district with about 30,000 people.

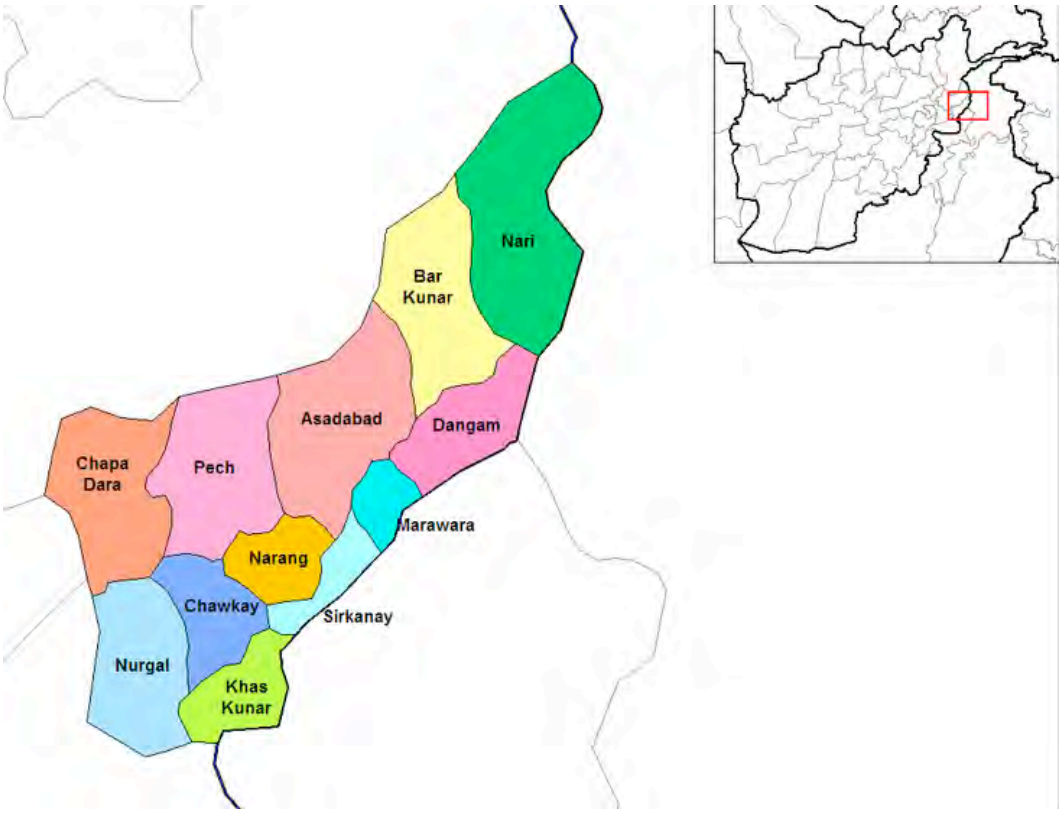

Fig. 1. Kunar Province and districts in eastern Afghanistan.

HYDROLOGICAL RESOURCE

The Kunar province hydrological resource is centered around the junction of the Pech and Kunar rivers near AsadAbad, with a minimum flowrate of 400 m^3/sec and maximum flows of about 1,500 m^3/sec. The Kunar river runs south across the province, carrying water from the mountains into Nangarhar Province. Unfortunately, Kunar province receives seasonal precipitation during the winter and averages less than 25 mm in a year in Asadabad, with more snow fall in the high mountains. There are no large water storage reservoirs in Kunar. Erosion is problematic and erosion control is essential to slow the water down and improve availability and quality.

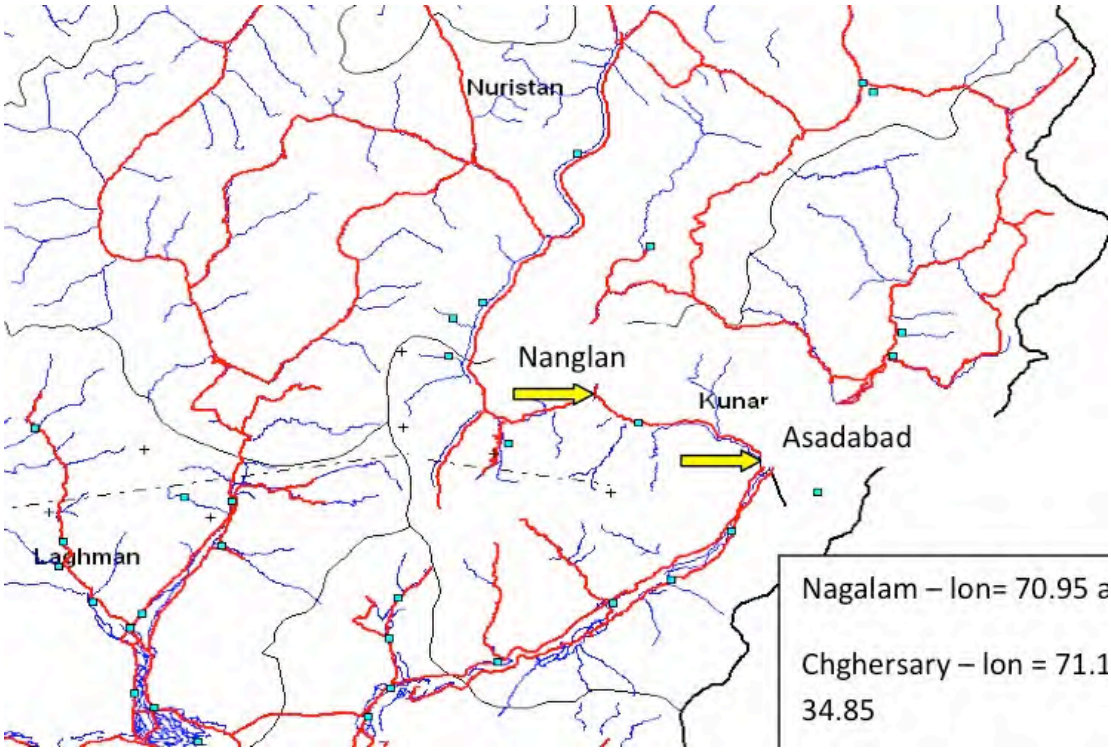

Fig. 2. Kunar hydrological resources and locations of Asad-Abad & Nangalam

Kunar Field Assessment
February 22-25, 2010

ACEP Field Assessment Team:
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Lt. White (PRT Kunar)
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Eng. Abdullah (DABM, Kunar)

The ACEP field team traveled from Kabul to Kunar via Jalalabad early on February 22 and arrived at 4 p.m. to Kunar. Upon arrival, the ACEP team immediately held a meeting with the Kunar Energy Company President Eng. Abdullah and discussed the current situation of the power house in Asad-Abad (existing MH system with two 180 kW turbines), which ACEP Eng. Rahmani had originally supervised installation of back in 1985.

On Feb. 23rd the ACEP assessment team met the Governor Wahidi of Kunar Province along with the local USAID representative Mohammad Safi to discuss the purpose of the ACEP Kunar site assessments. Mr. Safi also talked with Mr. Paul Megley of USAID about the Nangalam village in Manogai district. The ACEP team was updated about the security and road situation for the area. Arrangements were made to travel to the site the next day.

Fig. 3. ACEP team meeting with Kunar Gov. Wahidi and Eng. Abdullah (DABM).

Asad-Abad Power House

On Feb. 23rd, the ACEP team inspected the Asad-Abad Power house and canal intake. The Asad Abad Hydro Power Plant is located at approximately 34.85° ‘N and 71.15° ‘W. The site location, turbine technology, and installed capacity were originally chosen by the Siemens company in 1978, but due to the Soviet invasion soon afterwards was unable to install them. In 1985 this project was given to MEW. The construction civil works was completed by the Speenghar Company and turbine installation work given to Ghory Breshna of Pul-I Khumri (Eng. Rahmani was coincidentally the president of that authority at that time). Relatively low efficiency crossflow turbines were installed. After installation the power house capacity was 700kW comprised of two units each rated at 350 kW.

Fig. 4. Asad-Abad powerhouse with 2 crossflow turbines producing ~185 kW each.

For many years the power house was running in good condition. However, during the Afghan civil war the generators were overloaded and eventually failed. Later, the government acquired two low capacity Pakistani generators, which also were overloaded and failed. Finally, DABM made a contract with the INSET company from St. Petersburg, Russia of to install two new crossflow turbines and generators. One unit was installed but could not generate more than 185 kW since the flow regulation gate was broken. Finally they installed the old Siemens runner with the new INSET generators.

Both turbine/generator units are now operational, but only generate about half of their rated power at 185 kW instead of 350 kW each. Both units require a thorough inspection to determine the problems to be fixed. The old Siemens runner needs probably needs to be cleaned and may be full of silt. It is also possible to increase the capacity of the entire system to meet the growing power needs of the town of Kunar. A new power house could be installed downstream in a location to give more head (H) and the amount of flow is sufficient for generating more power by installation of propeller turbine to increase the capacity of the overall system to about 2,000 kW.

Fig. 5. Asad-Abad turbine and generator (notice rock on top). The system should be rehabilitated to double production back to the original 700 kW power rating.

Fig. 6. Asad-Abab MHP power house and transmission distribution.

Fig. 7. Asad-Abad canal intake for the MHP station.

Nangalam Village MHP Site Assessment

On Feb 24th, the ACEP team visited Nangalam village. After a short meeting with PRT to discuss the localneeds and security situation, the team traveled to the river site to conduct a preliminary survey. After the river assessment, the team had lunch with the community members to discuss the village power needs. The river water runs all year round and is clean with low sediments, so it is an excellent candidate for hydropower electrification.

Fig. 8. ACEP team meeting with Kunar PRT and USAID FPO in Nangalam village.

It was determined that the potential capacity for the site is 2,400 kW. Given that the community only has about 5,000 persons in about 1,000 homes, so not much this power is needed. If every household was provided 200 W, than the system would need to be about 200 kW in size. If other residences all along the valley are included, roughly doubling the needed system size to about 400 kW, which could supply power to most of the villages throughout the valley.

Fig. 8. Aerial view of Nangalam village and Kunar river.

Fig. 9. Upstream portion of Kunar river near Nangalam village.

Nangalam Village Data:

Latitude:	34° 59.1450 ‘N
Longitude:	70° 53.3612 ‘W
Elevation:	1080 meters
Population:	~5,000 persons in 1,000 homes
Slope of the river:	~6 %
Height of turbine at first variant:	10 meters
Q (flow rate):	Min. 8—10 m^3/sec
Length of canal (to build):	1,000 meters
Potential MH capacity:	2,400 kW

Recommended MHP Project Size: 200-400 kW (village vs. valley electrification need)

Fig. 10. Kunar river near Nangalam village and security base. MHP project and canal could be installed on the opposite side of the river along the cliff base.

Fig. 11. From security base, looking downstream of the Kunar river towards Nangalam village in the background.