

NEPALESE ENGINEERING CONSULTANTS' PRESPECTIVE FOR PROMOTING MICRO/MINI HYDROPOWER PROJECTS IN DEVELOPING COUNTRIES

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Author names and Affiliations: Prof. Dr. Ramesh Kumar Maskey and Er. Khimananda Kandel

Prof. Dr. Ramesh Kumar Maskey:

Doctorate in Engineering Science with MSc in Civil Engineering, 26 years of experience in civil engineering projects with specialization in hydraulic structures and renewable energy technology, particularly in hydropower: He has also worked in many countries in different role like Germany, European Countries, USA, Russia, Belarus, Nepal, India, Pakistan, Vietnam etc. Currently, he is professor of Hydraulics and Hydropower Engineering and Head of Department of Civil and Geomatics Engineering under School of Engineering of Kathmandu University. Dr. Maskey is the founder Chairperson and Life Member of Water and Energy Consultant's Association Nepal.

Tel: 9779851102669

Email: drrameshma@gmail.com

Er. Khimananda Kandel: Bachelor of Civil Engineering (BE)/ Master in Business Studies (MBS), is working as Hydropower Consultant in private hydropower sector, has mixed experience of survey, design and implementation of more than 350 micro hydro projects in Nepal and the design of a few Mega Hydro Projects over 10 Years. He has also gained experience of public service work through the Ministry of Energy (MoE) Nepal. and involved as a team member for the publication of "**Field Monitoring of Power Plants of Nepal Electricity Authority: Bhadra 2068**". Currently, he is Managing Director of Epsom Engineering Consulting Pvt. Ltd. and Life Member of Water and Energy Consultant's Association Nepal.

Tel: 9779851070202

Email: khimanandakandel@yahoo.com

ABSTRACT

Institutional development of micro-hydro sector dates back to 1960s through few private institutions supported by Swiss foundations and United Mission to Nepal (UMN) and took a new turn with the announcement of subsidy for rural electrification in 1985 AD. There are 52 national Consulting Firms working in micro/mini/small hydropower in many developing nations. At present, there are four Universities within the nation a large number of students are studying abroad, who have potential to return in the service to this sector. This paper makes a survey of enhanced capacity of Nepalese experts, mutual consulting opportunities and concludes that they can play a vital role for the development of Micro/mini-hydropower Sector in other Developing Countries too.

KEY WORDS

Micro-hydropower Development, Developing Countries, Engineering Consultant, Mini Grid, Universities, AEPC, DesignAids, Publications

I. INTRODUCTION

Alternative Energy Promotion Centre (AEPC) is working as a Government organization for the promotion of renewable energy technologies in Nepal. Pico/Micro/Mini Hydro projects are generally under the scope of AEPC. Projects above 100 kW are to be licensed from the Ministry of Energy and Department of Electricity Development (DoED).

II. SECTOR CAPACITY/ HUMAN RESOURCES

1. Universities within Nepal

Civil, Electrical and Mechanical engineers are generally recruited for survey, design, report preparation, supervision and installation works. For this, Nepalese Universities are being a backbone to some extents. Details of the universities in Nepal are presented in the table below.

Table 1: Faculty-wise enrollment capacity of University of Nepal

S. N.	Name of University	Bachelor Program in Engineering											
		Civil	Electrical	Electrical and Communication	Mechanical	Computer	Environmental	Electrical and Electronics	Software	Information Technology	Geomatics	Civil and Rural Engineering	Total
1	Tribhuvan University	921	228	636	48	524							2357
2	Pokhara University	720		384		336		144	42	192		48	1866
3	K.U.	60			60	60	35	60			30		305
4	Purbanchal University	672	60	421		360							1513
Total (Intake of Faculty)		2373	288	1441	108	1280	35	204	42	192	30	48	6041

2. Universities abroad Nepal

As of BS 2069-05-31, 19,066 engineers are registered in Nepal Engineering Council (NEC), a government institution formulated as per the provision of clause 37 of NEC Act, 2055 BS. 514 Universities around the globe have been registered in Nepal Engineering Council. By and large, Nepalese engineers from 38 different countries have been registered in Nepal Engineering Council. So, there is huge potential of engineering students to come in Pico/micro/mini hydro sector even from universities abroad Nepal.

3. AEPC Prequalified/ WECAN Consultants

AEPC has prequalified about 52 consulting companies. Among them, most of the consultants have been associated with Water and Energy Consultants Association Nepal (WECAN). WECAN is working as a main stakeholder for AEPC regarding consulting issues, guidelines/standards review and policy updates in related field.

4. Mega Hydro Consultants

The Government of Nepal has given high priority for the promotion of Hydropower Projects in Nepal. So, national and international Mega Hydro Consultants are actively working in Nepal. Some of the Nepalese consultants are Butwal Power Company (BPC), Sanima Hydro and Engineering Pvt. Ltd., Hydro Solutions, ITECO and others. These consultants are working for preparing feasibility study, detail engineering design, preparation of tender documents and construction supervision of mega hydro projects within and abroad Nepal as well.

III. GOVERNMENT/Other INSTITUTIONS

Micro hydel projects are subsidy supported till now. Renewable Energy Subsidy Policy 2013, has given Alternative Energy Promotion Centre (AEPC) a mandate for promoting Micro/Mini Hydro Projects upto 1 MW. Hydropower Development Policy 2001, has given mandate of licensing hydropower projects above 100 kW to Department of Electricity Development (DoED). Government of Nepal has launched National Rural and Renewable Energy Programme (NRREP) from Mid July 2012 to Mid July 2017. Similarly, Renewable Energy for Rural Livelihood (RERL) is also working as a program of AEPC funded by UNDP and the World Bank. Nepal Academy of Science and Technology (NAST) has the mandate to conduct Research and Development work in the promotion of Science and Technology. Different INGOs like WWF Nepal, ACAP, KAADORIE, Winrock International, SNV etc. are also working in Nepal for the promotion of micro hydropower projects.

IV. NEPALESE ENGINEERS: EXPERIENCE ABROAD

Many Nepalese engineers are working in different developing countries like Afghanistan, Kyrgyzstan, Uzbekistan, Libya, Bhutan, Kenya, South Africa, Tanzania, Liberia, India, Indonesia, Mauritius, Madagascar, Togo and other developing countries. Some experiences of Nepalese engineers in Afghanistan are presented below.

- UN-HABITAT had a Nepali MHP expert responsible for implementing 450 MHP under NSP and IRDP.
- UN-HABITAT Nepalese MHP expert helped all NSP engineers develop capacities on Surveying and Designing, Construction, Power Verification and Operation of MHPs in Afghanistan.
- The Mini-Hydropower Design Aids, developed in Nepal, was quite popular in Afghanistan to educate effectively and efficiently.
- MHP Policy strengthening: Warnock Nepal has been involved since 2006. A Nepali consultant was hired as the MHP chief advisor responsible for implementing about 1200 MHP under National Solidarity Project (MHP component similar to AEPC/DANIDA).

- GTZ has recruited a Nepali as the hydropower expert responsible for all its hydropower activities in Afghanistan.

V. INNOVATIVE DEVELOPMENTS IN NEPAL

A. ESTABLISHMENT OF RCEMH

Alternative Energy Promotion Centre (AEPC) in collaboration with the United State Agency for International Development (USAID), SARI/Energy has established Regional Centre of Excellence in Micro Hydro (RCEMH) in Nepal in April 19, 2010 at Khumaltar, Lalitpur, Nepal and is working for coordinating micro hydro activities especially in SAARC countries.

B. TYPICAL MINI GRID MODEL PROJECT

Renewable Energy for Rural Livelihood (RERL) has successfully piloted "Urja Upatyaka Mini Grid Project" in Baglung district. AEPC/NRREP/RERL is now seeking to develop more Mini Grid projects in different parts of the country.

Table 2 : Urja Upatyaka Mini Grid Project

S.N.	Name of the Scheme	Location	Power Output (kW)	Type of Turbine	Beneficiary Households
1	Upper Kalun Khola	Paiyun	12	Crossflow	115
2	Kalun Khola	Paiyun	22	Pelston	230
3	Urja Khola I	Rangkhani	26	Crossflow	274
4	Urja Khola II	Rangkhani	9	Crossflow	158
5	Urja Khola IV	Damek	14	Crossflow	133
6	Theule Khola	Sarkuwa	24	Crossflow	290
Total			107	1200	7.7

C. MICRO HYDRO DESIGN AIDS

Pushpa Chitrakar, one of the renowned Hydropower Experts of Nepal, has developed Micro Hydro Design Aid which is available freely in the web and is also one of the best contributions of Nepalese Engineers for the design of micro/mini hydropower projects, and is being used in more than 20 countries now.

D. PROCEDURES AND GUIDELINES

After the launching of Energy Sector Assistance Program (ESAP) and Rural Energy Development Program (REDP) under the umbrella of Alternative Energy Promotion Centre (AEPC), so many guidelines and standards have been developed in Nepal. Such guidelines may be useful for the promotion of micro hydro projects in other countries with minor modifications in local contexts.

VI. HYDROPOWER CONSULTING OPPORTUNITIES IN NEPAL

Nepal being one of the richest countries in hydropower resources and country's need for the development of large hydropower projects, some large hydropower projects are under construction as well. Now, the construction of 456 MW, Upper Tamakoshi Hydropower Project, Trishuli 3A Hydropower Project (90 MW) etc. are under construction and international consultants/Developers are working in these projects. Recently in August 2012, China Three Georges Corporation (CTGC) has signed a Memorandum of Understanding (MOU) for the development of the 750 MW West Seti Hydropower Project and Transmission Project. The list of some of the international consultants working inside Nepal is presented below.

Table 3 : International Consultants in Hydro Sector in Nepal

S.N.	Name of the Hydro Project	Installed Capacity	Consultant
1	Upper Tamakoshi	456 MW	Joint Venture Nor Consult AS-Lahmeyer International GmbH (JVNL)
2	Budhi Gandaki	600 MW	French firm Tractebel Engineering
3	Upper Trishuli 3 A	90 MW	Northwest Hydro Consulting Engineering , China

VII. EXCHANGE OF KNOWLEDGE AND TECHNOLOGY

Exchange of knowledge and transfer of technology among the developing countries not only covers people from Mount Everest to Sea/Ocean but also might have following mutual benefits.

- An effective means of economic linkage between different developing countries.
- Mutual exchange of knowledge, best project implementation models, and cost effective/sustainable technologies.
- Formulation of relevant Micro/Mini/Small hydro policies, guidelines and standards.
- Universal access to modern energy for poor.
- Improved life standard of poor people.

VIII. CHALLENGES

Basically, Micro Hydro Sector in most of the countries is supported by Government's Special Subsidy Programs and in long term the projects are facing sustainability problems. Injection of investment, grid promotion/connections issues in some countries, relatively higher cost per kW generation and

program to be implemented mostly in poor communities in remote locations and upgrading of existing technologies are the major challenges in the sector.

IX. CONCLUSIONS

Nepal has a long history of micro hydropower development. Governments' subsidy in this sector has created a platform for the institutional development. WECAN and many other organizations have been working in promotion of hydropower in Nepal and the flow is now increasing for experts and developers as well.

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XI. ABBERRVIATIONS

AEPC	:	Alternative Energy Promotion Centre
CTGC	:	China Three Georges Corporation
DANIDA	:	Danish International Development Agency
DoED	:	Department of Electricity Development
ESAP	:	Energy Sector Assistance Program
GTZ	:	German Technical Cooperation
ITDG	:	Intermediate Technology Development Group
KFW	:	Kreditanstalt für Wiederaufbau
MHDS	:	Micro Hydro Demonstration Scheme
MHP	:	Micro Hydro Project
MW	:	Mega Watt
MOU	:	Memorandum of Understanding
NAST	:	Nepal Academy of Science and Technology
NEC	:	Nepal Engineering Council
NRREP	:	National Rural and Renewable Energy Program
RCEMH	:	Regional Centre of Excellence in Micro Hydro
REDP	:	Rural Energy Development Program
RERL	:	Renewable Energy for Rural Livelihood
UK	:	United Kingdom
UMN	:	United Mission to Nepal
UN	:	United Nations
UNDP	:	United Nations Development Program
USAID	:	United State Agency for International Development
WECAN	:	Water and Energy Consultants' Association Nepal