Private Sector in the Development of Nepal's Micro Hydro

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Background

1st Mini Hydro Power Plant installed in 1911:
Pharpinng Hydropower in Kathmandu

Background..

- Huge potential of about 83000 MW of Hydropower in Nepal
- Difficult to develop large size hydro power due to high investment
- Difficult/expensive for transmission/distribution due to mountainous terrain & scattered settlement
- Only about 700 MW has been produced till the date

Background…

- Development of micro/mini hydro power is comparatively easier in Nepal
- All the equipment (expect Generator & valve) can be produced in Nepal up to 100 kW
- The complete work for the development of micro/mini hydro can be done by Nepalese professionals
- As a result micro/mini hydro projects development is rapidly increased in Nepal

Background….

~ 22 MW power has been generated (by mid July 2011)

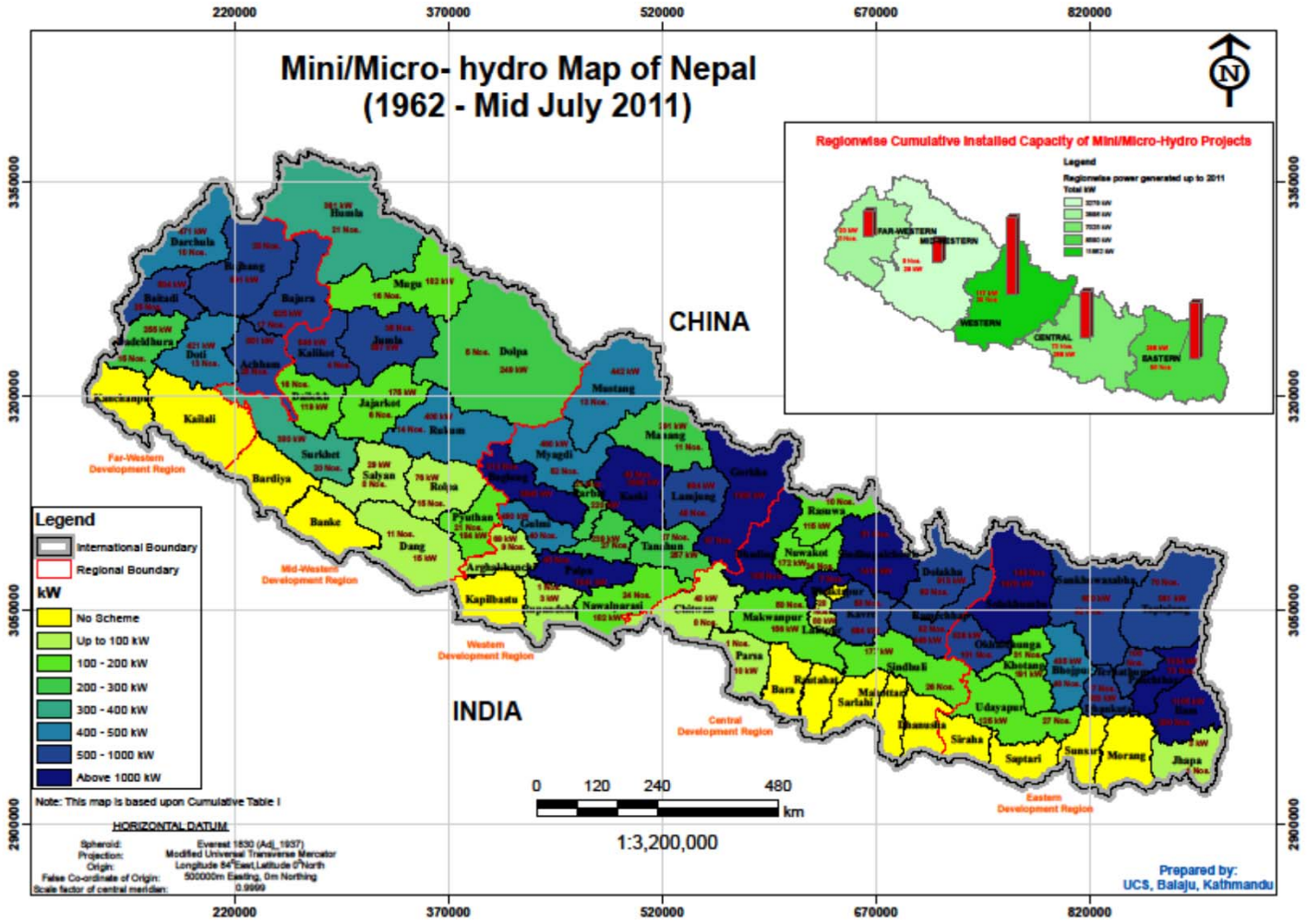
Out of which

999 Micro hydro
(5-100 kW) installed

1480 Pico hydro

(up to 5 kW)

~ 200,000 HH were electrified by MH in Nepal



Installed MHPs has been distributed in 60 out of 75 Districts of Nepal

Background....

- The success of development of micro hydro power project in Nepal is achieved by combined effort of

  - Private Institutions,
  - Financing Institution,
  - Governmental Institutions,
  - Non-Governmental Organization
  - Donor Organizations
  - Developers

in

Developing & dissemination of technology, formulation & providing financial support to developer.

MHP Development Scenario

- **The government Iniciative**
  - Lunched “Rural Electrification Project” through Agricultural Development Bank (ADB/N) and also waived the Licensing Requirement for MHP in 1980s
  - Started to fix the target for MH development in early 1990s
  - Established Alternative Energy Promotion Centre (AEPC) in 1996 & fixed the target of producing 5 MW MHP in five years through its programs (ESAP & REDP)
  - Established RCEMH (Regional Center of Excellence in Micro Hydro) **in** 2010
  - Initiated NRREP under single program modality in 2013 and set the target of 25 MW in 5 years

MH Development Scenario

Private Sector Initiative

- First Installation of MHP was done at Godavari fish pound in 1962 (5 kW propeller turbine)

The first Micro Hydro Installed by BYS

MH Development ……

- Fabrication and installation of **first** propeller turbine, by BYS in 1962
- Development and installation of **first** cross-flow turbine (for milling purpose) by BYS in 1973
- Development of Pelton turbine by BTI in 1975
- Cross-flow turbine installed for rural electrification by BYS in 1978

MH Development ……

- Design and Installation of Cross-flow turbine T-3 model by BYS in 1981
- First installation of T-7 cross-flow turbine by BYS in 1984
- Electric motor converted to induction generator by KMI in 1985
- Peltric set developed by KMI in 1990
- Developed T-12 cross-flow turbine by BYS in 1990
- Developed T-15 cross-flow turbine by BYS in 2004

MH Equipment Export Scenario

- No. of Countries: 12
- No. of Companies involved: 10

- Type & Sets of Equipment:
  - Turbine & Accessories: 29 Set
  - Electronic Load Controller (ELC): 5 Set

Turbines- Ready to Dispatch

Export of MHEquipment

SN	Company Name	Size (kW)	Country	Type of Turbine	Remarks
1	Kathmandu Metal Industries (KMI)	30 KW 2 KW 3 KW 7 KW 7 KW 1 Kw 30 KW 20 Kw 3 KW 1KW	Ethiopia New Zealand New Zealand New Zealand Sri lanka Sri lanka Pakistan India India Japan	Pelton Propeller Cross flow (3 Pcs) Cross flow (2 pcs) Propeller Turbine Peltric set (2 pcs) Cross flow Pelton Peltric Set Peltric Set	1995-2000
2	Balaju Yantra Shala (BYS)	40 kW 100 kW 70 kW	Malaysia Bhutan Bhutan	Crossflow Pelton Crossflow	1987 2005 2007
3	Nepal Machine & steel Structure (NMASS)	9 Kw 7 Kw 13 KW 15 Kw 9 KW 7KW	India (Ladakh) India (Ladakh) India (Ladakh) India (Ladakh) India (Ladakh) India (Ladakh)	Cross flow Cross flow Cross flow Cross flow Pelton Turbine Cross flow	1993-97

Export of MHEquipment

SN	Company Name	Size (kW)	Country	Type of Turbine	Remarks
4	Nepal Yantra Shala Energy (NYSE)	28 Kw 8Kw 1.5 Kw	Pakisthan Bhutan India (Sikim)	Pelton Cross Flow Peltric Set	2000-2006
3	Thapa Engineering Industry (TEI)	50 Kw 30 Kw	Laos Laos	Cross flow Cross flow	2010 supplied through SSPP/GTZ
6	Structo Nepal (P) Ltd	50 KW 20 KW	India India	Cross flow Pelton Turbine	2008-10 Including Installation work
8	Power Tech, Nepal	30 kW 22 kW	India (Kargil) India (Ladakh)	Cross flow Cross flow	2007-9
9	Preesu Electronics	-	Aufghansthan Pakisthan Bhutan Tibet India (Rorkee)	ELC Board	2005-9 For Demonstration
10	Radha Structure & Engineering Works Pvt. Ltd	100 KW	India (Bageshwori)	Cross Flow	2008

Sarawak Plant Malaysia - 1987

Chendebji, Bhutan, 70 kW - 1995

Sengor, Bhutan 100 kW - 1997

Nepal Micro/Mini Hydro Power Development Association (NMHDA)

- The umbrella organization of Surveying, manufacturer & installer companies

- Date of Establishment: 11th Dec. 1992 (30 Mangsir, 2049)
- Member Organizations: 57 Companies
- Member of AEPC Committees: TRC & others

- **Objective of NMHDA**
  - To contribute in National Economic progress by advancing micro hydro industry in Nepal with technical support of its member institutions
  - To play a vital role for welfare of the member companies
  - To support in human resource development of the sector

NMHDA Activities

- Operator Training

NMHDA Activities

Installer & operator Trainings

Activities of NMHDA-Training

SN	Description	Training Batches	No of Participants	Remarks
1	MH Operators' Training	45	905	ITDG/AEPC/REDP/ESAP / SARI/Energy- USAID
2	MH Advance Operators' Training	10	194	AEPC/REDP/ESAP
3	MH Surveyors' Training	4	49	REDP
4	AutoCAD Training	2	26	ESAP
5	Quality and Management Training	2	35	ESAP
6	Power Output Verification (POVI) Training	2	76	AEPC
7	Micro Hydro Managers' Training	1	15	SARI/Energy
8	MH End Use Promotion Training	1	15	SARI/Energy
9	MH End Use & Awareness Training for Women Users	5	125	SARI/Energy
10	Powerhouse Mgt.& Operation Hands on Training	5	25	SARI/Energy
11	Mini Hydro Operators' Training	1	11	AEPC/RERL
12	MH Trouble Shooting & POVI Training	1	27	AEPC/RERL
13	MH Installation Training	1	25	AEPC/RERL
14	Micro/Mini Hydro Survey & Design Training	1	16	AEPC
	Total	81	1544	

NMHDA Activities

MH End Use & Awareness Training for women in their MHP

Survey & Design Training

NMHDA Activities

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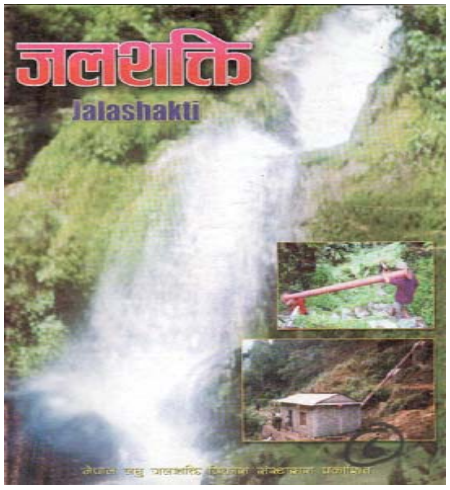
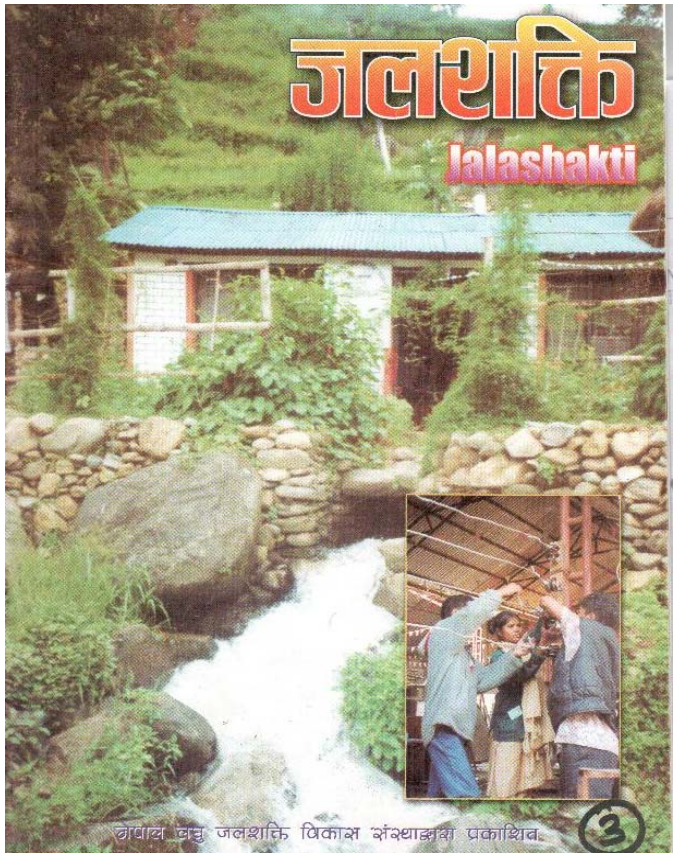
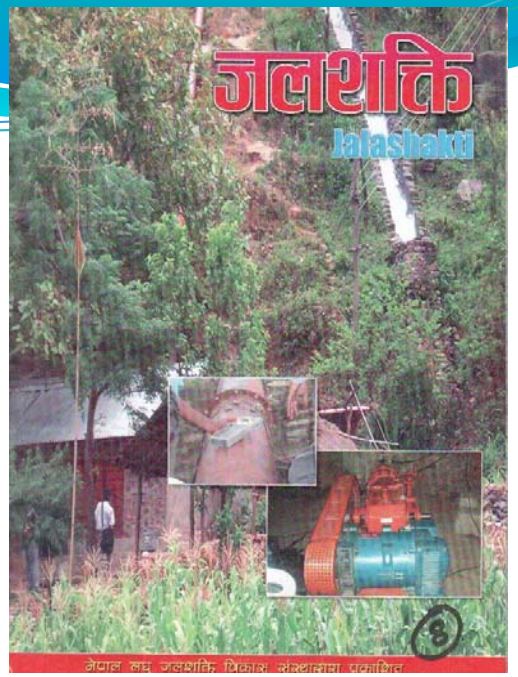
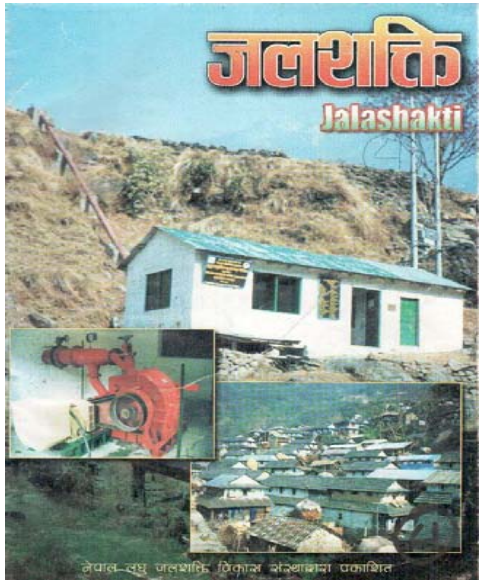








Publications

NMHDA Activities

Micro Hydro Technical Centre Pharping, Kathmandu

- Dedicated for
  - Trainings
  - Demonstration
  - Research
  - Grid Connection Demo
  - Similar activities

NMHDA Activities

Model Micro Hydro Project

Capacity of Private Sector

- Survey and Design
- Installation
- Manufacturing

Surveying/Installation/Manufacturing Capacity

Companies Pre-qualified by AEPC

No. of Companies	**Qualified for**
52	Surveying & Design
44	Installation up to 100 kW
13	Installation up to 5 kW

Installation Capacity Contd…

No. of Company Surveyed	No. Installation	Total kW	No of Yrs.	Average Nos./year	Avg. kW /year /company
9	131	3139	5	3	70.2

Findings:

- Minimum No. of MHP Installed by a company: 2/year
- Maximum No. of MHP Installed by a company: 4/year
- Maximum of size of MHP Installed : 100 kW

Capacity of Installation per year = 3990 kW

No. of Installation/year = 171

No. of Installation Companies: 57

Installation of MHP

Manufacturing Capacity Contd…

No. of Company Surveyed	No. of Mnf.	Total kW	No of Yrs.	Average Nos./year	Avg. kW/year
8	150	3539	5	4	85.5

Findings:

- Min. No. of turbine manufacturing by a company: 3/year
- Max. No. of turbine manufacturing by a company: 6/year

Capacity of manufacturing per year =2650 kW

No. of manufacturing per year =124

(No. of Manufacturing Companies= 31)

Manufacturing Workshops

Manufacturing Workshops

100 kW Cross Flow – Final Stage of Fabrication

MH Control Panel

Opportunities

- Focus of Government and Development Partners
- Employment generation;
- Establishment of local entrepreneurs through end use applications;
- Replication of Nepalese modalities of MH in other countries; and
- Transfer of technology and skilled manpower.

Opportunities - Employment in Companies

Human Resources	Avg. No. of HR	No. Companies	Total HR
Engineer/ Manager	4	109	436
Overseer	6	109	654
Technicians Installation	8	31	248
Technicians Manf.	15	26	390
Adm. staff	4	109	436
		Total	2164

Opportunities - Employment in Micro Hydro Projects

Description	No. of Plants	Human Resource			
		Operator	Manager	O & M	Total
No. MHP	999	2	1	3	2997
No. of Pico Set	1480	1		1	1480
			Total HR		4477

Requirement for Up-Scaling of MHP

- Financial support for companies for their expansion.
- Trained human resources
- Training on
  - Turbine Design
  - Quality Control
- Grid connection
- Technology transfer for Francis turbine and governor
- Piloting for mini/small hydro

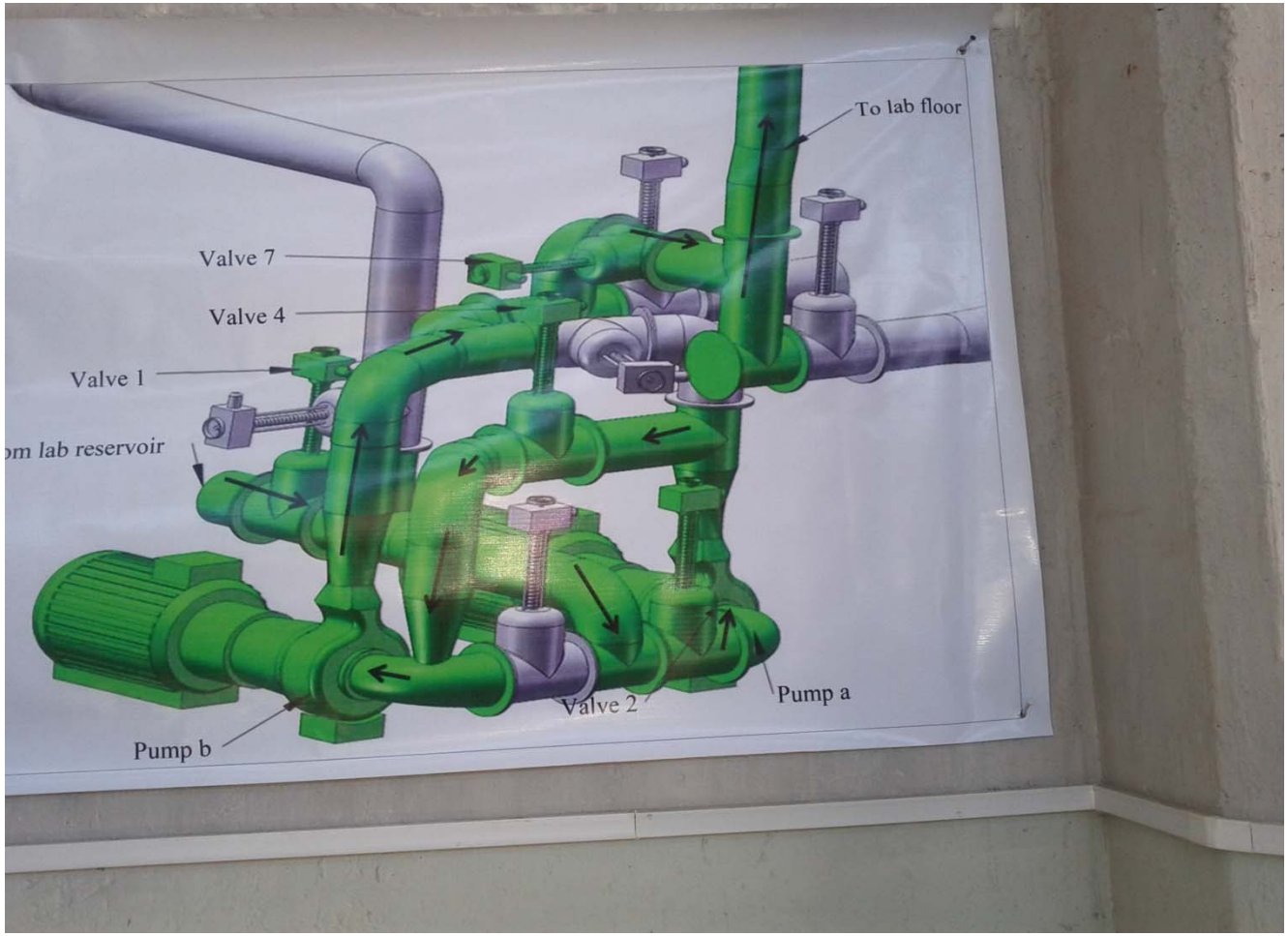
(Manufacturing/Installation)

Synchronising activities in Nepal

- Syange Hydro of 100kW has been grid connected
- Baglung Micro Hydro has made its mini grid
- Bhujung Micro Hydro has its small mini grid
- Gotikhel Micro Hydro has been connected to NEA as pilot program
- IOE and KEC has its hydro power lab for grid connection
- Very soon Midim MH of 100kW will be connected to grid

Governor and synchronising panel at Kathmandu Engineering College

Turbine Test Lab at Kathmandu University



Strength & Limitation of Private Sector

Strength

- Capacity to Survey/Design/Manufacturing & installation up to 100 kW
- Manufacturing of Pelton & Cross flow turbine
- Manufacturing of load controllers
- Continue Human Resource Development

Limitations

- Manufacturing of bigger size turbine & accessories
- Manufacturing Francis Turbine
- Mass production and Specilization

NMHDA's Future Plan

- Specialization
- Quality Control
- Trade Marking
- Up-scaling
- Human Resource Development
- Synchronization to Grid
- Marketing
- Collaboration/partnership with other countries
- Seek Government Support for Export/Import facilities

Micro Hydro is the Pride of Nepal

Thanks & wish you nice time in Nepal!!!

Power House for Peltric Set

Pelton +Electric= Peltric

Induction Generator Controller, IGC

Inside View of IGC