Political Economy of Energy Sector: Nepal

2018

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PREAMBLE

The present time is a very abnormal time in the history of economic development in Nepal. This is a euphoric moment when Nepal has successfully drafted and passed the new Constitution through the constituent assembly. Nepal feels proud of the democratic process followed. And, it is also a time when Nepal's close neighbour India has not only rejected this constitution, but also has taken advantage of Nepal's geographic condition of being India-locked, to punitively imposing the undeclared trade embargo (for more than four months).

This has alienated nearly all Nepalese from India. The impacts in the future, of this "hard Indian pressure", is also likely to be an equally "hard defiance" on the part of Nepal. The nationalist sentiments are likely to reach new heights. It is clear that the development strategy in future will take Nepal into a more "non-aligned" and more "self-reliant" path. Many new alliances will be sought and the old ones will be strengthened, to gain the "lost" national pride.

The major concern at the present is that of *energy security*. This is very likely to build the "nationalist" pressure to build national energy security, through the *take-up legislations* in the new constitution. A major shift will thus emerge in the energy sector, where, market based liberalism was allowed to play a free hand in the past. The role of the private sector, both domestic and international, will most likely be restrained, through the imperatives of energy security.

The present paper thus focuses on, *socially unrestrained free-market type* behaviour, of the donors / external commercial vested interests (the multinationals). Naturally, paper has also to deal with, the "unobligated", short-sighted and power centric, political parties, who are in *collusion* with the commercial group. It is this *unholy collusion,* which poses the challenge to formulating the new energy strategy for the hydropower and the renewable energy sector. For the sake of a simplified, *stock-taking and analysis*, the paper deals with these sectors separately.

COUNTRY CONTEXT

Nepal is located in South Asia with an estimated population of 28.17 million[1]. Geographically Nepal is landlocked, located between China and India with a total surface area of 147,181 km^2[2].

Demography

According to 2011 National Population Census (CBS, 2012), Nepal's population is 26.5 million in 5.4 million households. The rural population constitutes 83 percent of the population. About 7 percent of the population lives in the mountain region, 43 percent in the hills and 50 percent in the Tarai. Around 74 percent of the households (4.1 million) are agricultural households with land. The average population growth rate is 1.35 percent. The average household size is 4.88. According to the Census, there are 94.2 males for every 100 females. About 26% of the households in Nepal are female-headed. Nepal's overall literacy rate is about 66%. Male literacy rate is 75% compared to female literacy rate of just over 57%.

[1] World Bank, http://data.worldbank.org accessed in May 2016.
[2] United Nations, http://data.un.org accessed in May 2016

Macroeconomic Context

The Gross Domestic Product (GDP) for the fiscal year 2014/15 is estimated at Rupees 2,124.6 billion or about USD 20.1 billion. The contribution of agriculture (including forestry and fisheries) to GDP has been declining and stood at 33.1 percent. The contribution of industrial and service sectors together was 66.9 percent (MoF, 2015). The per capita GDP stood at USD 762. The GDP growth rate was around 5 to 6 percent during the 1990s but it declined due to the armed conflict in the country from 1996 to 2006. According to the Government of Nepal's Approach Paper for the Thirteenth Plan, the GDP growth rate declined to 3.6 percent in 2012/13.This was mostly attributed to political instability and energy crisis. With the expected stabilization of the political situation in the country, Thirteenth Plan projects economic growth during 2013 to 2016 at 6 percent (NPC, 2013). In the FY 2014/2015, the total income from remittance was estimated to be NRs. 589.5 billion. This amounts to about 27.7% of GDP and was an 8.5% increase from the previous year (MoF 2016).

Socio-economic Context

The poverty incidence (headcount rate) for Nepal in 2010-11 is 25.16 percent. The poverty rate is much lower in urban areas (15.46 percent) than in rural areas (27.43 percent). Within urban areas, poverty ranges from 9 percent in urban Hills to 22 percent in urban Tarai. Within rural hills, poverty ranges from 16 percent in Eastern region to 37 percent in mid and Far Western region. Within rural Tarai, poverty ranges from 21 percent in Eastern region to 31 percent in mid and Far Western region. Within each of the development region except the Eastern, hills have higher poverty rates than Tarai. The depth and severity of poverty is highest in rural hills of Western and Mid-Far-Western region (CBS, 2012). However, the disparity between the incomes of the lowest quintile and highest quintile of the population is narrowing. This is attributed to increased remittance from Nepalese migrant workers in foreign countries, which is estimated at 27.7 percent of the GDP in 2015 (MoF 2015).

Human Development Index (HDI) in Nepal varies by urban-rural divide, by ecological belt, and by development region and sub-regions. On average, urban dwellers have much higher human development (HDI=0.63) than their rural counterparts (HDI=0.482). The hill population enjoys the highest standards (HDI=0.543), while the mountain population has the lowest (HDI=0.436). Among the development regions, the Mid-Western region has the lowest level of human development (HDI=0.452). The people of three caste and ethnic groups— Madhesi Brahman and Chhetris, Newar and Hill Brahman—have a higher HDI value (0.6 and above)—than that of Dalits and Janajatis, both from the Hills and the Tarai. Muslims (HDI=0.401) have a lower HDI than that for Dalits as a whole (HDI=0.424), but higher than Madhesi Dalits (HDI=0.383) (UNDP, 2009).

Nepal's traditional social and geographical stratification system as well as a patriarchal society gave rise to social and gender exclusion in the country. The Constitution of 1990 recognized Nepal as a multi-ethnic, multi-lingual state and declared all citizens as equal. The armed conflict further brought social and gender inclusion issues to the forefront. The Government of Nepal has shown its commitment to social and gender inclusion by amending discriminatory laws and signing relevant international treaties. Furthermore, it has mainstreamed gender and social inclusion in its strategies, planning process and programs. However, there still remain gaps related to mainstreaming gender and social inclusion in the energy sector. These include low representation in decision making, insufficient gender and social inclusion related indicators for monitoring and evaluation, lack of separate budget and component for gender mainstreaming activities, insufficient support and incentives to encourage women and

disadvantaged community members to start enterprises, get financing, get employment etc.[3]

ENERGY SCENARIO

Energy has been accepted as a crucial for development at different levels. At the micro level energy is needed in all the activities one performs on a daily basis, whereas at the macro level, energy drives economic growth and leads to poverty reduction. Reliable and efficient energy services underpin the expansion of economic and employment opportunities, the continuing progress in social development, and the sustained improvement in standards of living. Nepal's energy sources have been categorized under three broad types (i) traditional, (ii) commercial and (iii) alternative energy sources. Alternative energy is synonymous with new, renewable and non-conventional forms of energy. This categorization pertains to the modality of use of the resources in abstracting the inherent energy contents. Traditional source of energy include biomass fuels particularly fuel wood, agricultural residues and animal dung used in the traditional way which is direct combustion, wherein traditional energy sources undergo transformations into modern types of fuels. Commercial sources of energy are fossil fuels and electricity. Alternative sources of energy include micro hydro, solar, wind power, biogas and briquettes etc. Biomass, hydropower and Solar are the three major indigenous energy resource bases in the country.

The per capita energy consumption in Nepal is merely 14.8 GJ which is one of the lowest values in South Asian region. It has been growing at an annual rate of 2%[4]. Nepal's consumption is merely one fifth of the world's average and less than half of the Asian's average. In the context of electricity consumption, Nepal's case is the worst with just 90 kWh per capita (IEA, 2010). One of the main reasons for this is the fact that about 33 percent of households still do not have access to electricity and those who are connected to national grid has in average more than 8 hours load shedding per day (CBS 2011)[5].

Electricity demand of Integrated Nepal Power System (INPS) in fiscal year 2012/13 is estimated at 5,446 GWh, out of which only 4,218 GWh (77.5%) could be supplied. The rest 228 GWh (22.55%) deficit was resorted to load shedding. Of the total supplied energy volume 3,468 GWh (82.56%) was contributed by domestic generation and 792.5 GWh (17.44%) by import from India. Domestic supply included 1,176 GWh (34%) from Independent Power Producers (IPPs) and rest 2,292 (66%) from Nepal Electricity Authority (NEA) owned power stations with a share of 2,273 GWh from hydro and 18.82 GWh from thermal. The energy demand of INPS in fiscal year 2012/13 grew by 7.7% over previous year's energy demand. (NEA2012/13)

Table 1 shows the total supply and their share of energy consumption by various fuel types in Fiscal Year 2014/15. It reveals the share of fuel types in total energy demand system of the country. According to WECS 2017, total energy consumption in FY 2014/15 is 500 million Giga Joule (GJ); among which, fuel-wood is the largest energy resources and occupies about 70.47% of the total energy demand. Other sources of bio-masses are agricultural residues and animal dung which contribute about 3.48% and 3.68%, respectively. Share of petroleum fuels in the total energy system is about 12.53 %. Other sources of commercial energy are coal and electricity, which contribute about 3.97% and 3.39%, respectively in the total energy supply. In aggregate, the share of traditional fuel is 77.63%, Commercial (coal, petroleum and electricity) is 19.88 % and Renewable (Solar, Biogas, Micro hydro, Wind) is 2.49%

[3] Based on ADB Report entitled *Overview of Gender Equality and Social Inclusion in Nepal*, 2010
[4] Ministry of Finance, 2015, Economic Survey: Fiscal Year 2014/2015
[5] Central Bureau of Statistics, 2011, National Census, Government of Nepal

Table 1: Distribution of Energy Consumption by fuel types in FY 2014/15

S. No.	Fuel Types	Amount (000GJ)	Percentage share
1	Fuel Wood	352229.10	70.47
2	Agriculture-residue	17408.43	3.48
3	Animal dung	18401.96	3.68
4	Coal	19819.09	3.97
5	Petroleum	62618.27	12.53
6	Electricity	16932.75	3.39
7	Renewable	12430.26	2.49
Total		499839	

Source: WECS, 2017[6]

ENERGY USES AN RESOURCES

The energy resources are classified into three categories namely i) Traditional; ii) Commercial; and iii) Alternative. Traditional energy resource includes all types of biomass used for producing energy conventionally. Energy resources with well-established market prices are grouped into commercial energy, which comprises coal, hydropower (except micro-hydro) and petroleum products, whereas indigenous renewable energy resources comprising biogas, micro-hydro, solar and wind energy are grouped into alternative or renewable category.

Table 2: Energy Supply and Consumption Trend, 1990–2014 (ktoe)

Item	1990	1995	2000	2005	2010	2014
Total Primary Energy Supply	5,789	6,712	8,108	9.132	10,211	11,690
Coal	49	74	258	248	303	484
Oil products	244	501	713	724	983	1,359
Hydro	75	100	140	216	276	326
Biomass	5,425	6,039	6,988	7.928	8.592	9,403
Total Final Energy Consumption	5,761	6,667	8,041	9,050	10,107	11,534
Industry	106	161	379	388	449	665
Transport	111	203	270	275	637	858
Residential	5,465	6,170	7,199	8,128	8,718	9,624
Commercial and public services	43	60	97	165	171	219
Agriculture/Forestry	33	60	75	72	118	151

Source: International Energy Agency (IEA). http://www.iea.org/statistics

Table 2 shows how energy supply and consumption in the various sectors have increased since 1990. The country's energy imports—mainly oil products, coal, and electricity—have been growing fast, from 312 ktoe in 1990 (5.4% of the supply of primary energy that year) to 2,069 ktoe in 2014 (17.7%). On the other hand, the increase in the production of indigenous primary energy has been moderate, from 5,501 ktoe in 1990 to 9,740 ktoe in 2014.

[6] Water and Energy Commission Secretariat, Electricity Demand Forecast Report (2015-2040), Ministry of Energy, GoN

Water Resources: The theoretical, technical and economical potentials of hydropower are presented in Table 3.

As of 2014/15, Nepal has a total installed capacity of 855.886 MW in which 53.41MW are thermal (multifuel) power plants and 100 KW solar plant. Unfortunately both thermal plants and solar plants are not in operation. Despite a huge potential for hydro-electricity, Nepal has not been able to fully harness its water resource for energy generation purpose. As a result, electricity is available to only 70% of the population. Table 4 gives the current status of power plants and their capacity.

Table 3: Theoretical, Technical and Economical Hydropower Potential of Nepal

Major River Basins	Theoretical Potential in MW			Technical Potential		Economical Potential	
	Major river courses having catchments areas above 1000 km2	Small river courses having catchments areas 300-1000 km2	Total	Number of Project Sites	Technical Potential in MW	Number of Project Sites	Economical Potential in MW
Sapta Koshi	18750	3600	22350	53	11400	40	10860
Sapta Gandaki	17950	2700	20650	18	6660	12	5270
Karnali and Mahakali	32680	3500	36180	34	26570	9	25125
Southern River	3070	1040	4110	9	980	5	878
Country Total	72450	10840	83290	114	45610	66	42133

Source: WECS, 2017[7]

Table 4: Power Plants Installed up to year 2015

		2011	2012	2013	2014	2015
1	Total Major Hydro (NEA) - Grid Connected	472,994	473394	473394	473394	473394
2	Total Small Hydro (NEA) – Isolated	4,536	4536	4536	4536	4536
3	Total Hydro (NEA)	477,530	477,930	477,930	477,930	477,930
4	Total Hydro (IPP)	187,581	230589	255647	255647	324446
5	Total Hydro (Nepal)	665,111	708,519	733,577	733,577	802,376
6	Total Thermal (NEA)	53,410	53410	53410	53410	53410
7	Total Solar (NEA)	100	100	100	100	100
8	Total Installed Capacity (Including Private & Others)	718,621	762,029	787,087	787,087	855,886
9	Total Installed Capacity (NEA& IPP)-Grid	713985	757393	782451	782451	851250

IPP = independent power producer, MW = megawatt, NEA = Nepal Electricity Authority.
Source: Nepal Electricity Authority. 2016. A Year in Review: Fiscal Year 2015/2016. Kathmandu

[7] Water and Energy Commission Secretariat, Electricity Demand Forecast Report (2015-2040), Ministry of Energy, GoN

Modern energy for productive uses in the thermal application for different economic sectors shows that coal is mostly used in the industries, whereas petroleum products are predominant in the transport sector. Agriculture sector uses petroleum products and electricity for farm machinery and irrigation purposes respectively. Industries and commercial sector still consumes sizable volume of solid biomass for thermal uses.

Table 5: Share of Modern energy carriers for different sectors in 2010

Economic sectors	Petroleum products	coal	electricity	Solid Biomass	Modern renewables	Total
Industry	8.2%	59.3%	22.8%	9.7%	0.0%	100%
Residential	1.3%	0.0%	1.1%	96.7%	0.8%	100%
Commercial	54.1%	0.0%	13.5%	32.4%	0.0%	100%
Transport	99.9%	0.0%	0.1%	0.0%	0.0%	100%
Agriculture	94.0%	0.0%	6.0%	0.0%	0.0%	100%
Others	0.0%	0.0%	100.0%	0.0%	0.0%	100%

Commercial entities such as hotels and restaurants use LPG and solid biomass for cooking purposes mostly. (Please refer to table 3 for the consumption of modern energy forms).

Apart from electricity, modern energy carriers such as petroleum products and coal used for industrial end-uses such as boilers, furnaces and process heat have to be imported. Most of the imported fossil fuels can be substituted by electricity but, supply of electricity is very unreliable and power cuts have become usual practice at huge losses to the industrial and commercial sectors. They have to rely on fossil fuels for the generation of electricity by diesel generating sets. For the sustainable development and energy security power supply needs to be drastically improved.

Table 6: Energy intensity in various economic sectors of Nepal

Energy intensity	2000	2005	2010	Period 2000-2010
Energy intensity level of final energy (MJ/$2005 PPP)	15.3	14.6	13.1	-1.52%
Energy intensity level of primary energy (MJ/$2005 PPP)	15.4	14.7	13.2	-1.52%
Energy intensity of agricultural sector (MJ/$2005)	0.4	0.3	0.5	1.58%
Energy intensity of industrial sector (MJ/$2005)	4.3	4.0	3.2	-2.97%
Energy intensity of other sectors (MJ/$2005)	33.3	32.2	27.4	-1.93%

Nepal is rich in hydro resources, with development potential of 83,000 megawatts (MW) and commercially exploitable hydropower generating potential of about 42,000 MW.4 However, by the end of fiscal year (FY) 2016, existing hydropower stations had a total installed capacity of only 802.4 MW, or less than 2% of the total commercially exploitable generation potential.

The slow progress of hydropower development is attributable to (i) inadequate planning and investment

in generation, transmission, and distribution capacity; (ii) concerns about the ability of the Nepal Electricity Authority (NEA) to honour take-or-pay contract obligations; and (iii) delays in project development, caused partly by legal and regulatory inadequacies. As a result, Nepal now suffers from a severe shortage of power. Load shedding is frequent, and the country ranks 137th out of 147 countries in quality of electricity supply.5 Furthermore, since most of the existing hydropower plants are of the run-of-the-river type, electricity generation fluctuates and is highly seasonal.

Coal: Some peat, lignite, and coal deposits are known to exist in different parts of Nepal, and 19 small coal mines are currently operating.3 However, coal production is insignificant—only about 10 ktoe per year—and coal makes up only about 4.4% of total final energy consumption, most of it consumed by the industry sector. In 2014, more than 97% of coal demand in Nepal was met by imports.

Oil and Gas: Nepal has no oil refinery and produces no oil. For its refined oil product needs, it depends entirely on imports from India. The country increasingly relies on petroleum products to meet its energy demand. Annual demand for petroleum products, such as motor spirit, high-speed diesel, superior kerosene oil, air turbine fuel, and liquefied petroleum gas, is about 1.0 million tons of oil equivalent (Mtoe) and is growing by around 10% each year on average. Petroleum products represented about 11% of final energy consumption in 2014, and this share is projected to increase to over 12% by 2035. 10. The seaport nearest to Nepal is Kolkata, India, about 900 km away from the India–Nepal border. Long transportation distance is the main constraint on imports of petroleum products from third countries. All the petroleum products consumed in Nepal are imported from the Indian Oil Corporation under a 5-year contract agreement signed on 27 April 2012.

Nepal has no known deposits of oil, gas, or coal except for some lignite deposits.2 Biomass, oil products, coal, hydro, and electricity are its main sources of primary energy. Among these, biomass, in the form of firewood, agricultural waste, and animal dung, has consistently dominated supply because of the lack of other alternative energy sources and the poor state of the economy, particularly in the rural areas. The largest share of energy consumption goes to the residential sector. The share of industry and transport is now small, but these sectors are growing fast. From 1990 to 2014, total final energy consumption rose from 106 kilotons of oil equivalent (ktoe) to 665 ktoe for the industry sector, and from 111 ktoe to 858 ktoe for the transport sector.

Renewable Energy: Nepal is richly endowed with renewable energy resources, comprising hydropower, solar, wind, biogas, and various forms of biomass energy. As of 2013, around 12% of the population had access to electricity through renewable energy sources.10 Around 23 MW of electricity generation came from micro hydro schemes, 12 MW from solar photovoltaic (PV) systems, and less than 20 kilowatts (kW) from wind energy. Nepal should transform its energy supply system into a more sustainable system using clean and renewable energy resources, given the high costs of grid connection, the low consumption rate, and the scattered population, especially in remote areas. Decentralized renewable energy supply systems, such as micro hydro, solar PV, biogas, and improved cooking stoves, can provide feasible and environment-friendly supply options. Renewable energy technologies that can be used in Nepal include

(i) micro hydro (up to 100 kW);
(ii) biomass and biogas (coal briquettes, gasifire, improved cooking stoves);
(iii) solar PV (solar home systems, solar water pumps, solar battery chargers); and
(iv) Solar thermal energy (solar water heaters, solar dryers, solar cookers).

To enable access to these technologies the government issued a subsidy policy for renewable energy in 2013 to accelerate the delivery of better quality renewable energy services, using various technologies, to households, communities, and micro, small, and medium enterprises in rural areas. The intent is to benefit all social groups, leading to equitable economic growth. The Alternative Energy Promotion Centre (AEPC) has prepared a subsidy delivery mechanism for renewable energy, and this is now being considered by the Parliament.

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UPTAKE OF SPECIAL MEASURES FOR ELECTRIFICATION

Recently, many countries have embraced both grid and off-grid approaches, executed by various types of institutions that might include public or private companies, along with large and small nongovernmental or micro-finance organizations. The approaches involve a variety of technologies, service levels, and costs.

Policies Related to Energy in Nepal and Provisions of Rural Electrification

Decision makers in governments around the world are confronted by an array of complex challenges as they endeavour to predict the impact of existing and prospective policies on future social, economic and environmental well-being. The ability to estimate accurately the impact of a given policy is essential since it increases the likelihood that the most suitable policy instruments are chosen and applied, assisting governments in allocating their and society's scarce resources in the most effective and efficient manner (Zurich, 2006).

The 1990s saw an explosion of energy policy changes around the globe (Marriot et. al, 2002). Driven by economic, environmental, security, and social concerns, energy regulation has been in great flux. Many of the changes are having a profound influence on renewable energy, both from policies explicitly designed to promote renewable energy and from other policies that indirectly influence incentives and barriers for renewable energy. The need for enacting policies to support renewable energy is often attributed to a variety of "barriers" or conditions that prevent investments from occurring. Often the result of barriers is to put renewable energy at an economic, regulatory, or institutional disadvantage relative to other forms of energy supply.

Energy policies development in Nepal started from the Fifth Plan (1975-1980) which incorporated the first sector specific policy statement in the energy sector. In the plan, the government emphasized the need to reduce heavy dependence on traditional source of biomass and imported oil, and increase the supply of renewable energy sources including hydropower to meet the increasing demand for energy.

In Nepal, policies in the energy sector currently are scattered in various documents and executive orders. These include policy statements of the government made in periodic development plans, subsector policies, government orders and notices, and laws passed by the legislature. Experience in the past showed that any change in energy policy direction (e.g. adjustments to energy prices, shifts to alternatives like nuclear, or policies directed at the environmental aspects of energy utilization) had unexpected and unpredictable effects. Energy price increases had profound flow on effects every economy, but also influenced the social and political situations (WECS, 2010).

The policy documents related to hydropower, energy or electricity development and use have different objectives, strategies, policies and plans in them.

The provisions specifically related to rural electrifications are summarized below.

Hydropower Development Policies 1992 and 2001 with the following objective:
To render support to the development of rural economy by extending the rural electrification. S

Strategies: To extend hydropower services to the rural economy from the perspective of socio-equity with the realization of the fact that development of power sector, having a direct concern with agricultural and industrial development, is a pre-requisite.

Policies: Electrification of remote rural areas shall be encouraged by operating small and mini hydropower projects at the local level.

Rural electrification shall be extended in order to make electric service available to as many people as possible. In addition to mobilization of public participation, a Rural Electrification Fund shall also be established for the purpose.

The existing institutions in the public sector shall be restructured to create competitive environment by encouraging the involvement of community/cooperative institutions, local bodies and private sector in generation, transmission and distribution of hydropower in order to extend reliable and qualitative electricity service throughout the Kingdom at a reasonable price.

Development of Rural Electrification:

His Majesty's Government shall gradually extend rural electrification. Appropriate institutional arrangement shall be made for this.

- Appropriate arrangement to undertake rural electrification shall be made while awarding the distribution license.
- Rural electrification shall be encouraged in the rural areas affected directly from the electricity generation project. Energy royalty on the electric energy consumed in such an area shall be exempted. Such exemption shall be given until the first fifteen years of the commencement of commercial production.
- One per cent of the royalty obtained by His Majesty's Government from a hydropower project shall be provided to the Village Development Committees that are directly affected by the hydropower infrastructure with the sole purpose of expanding electrification of these Village Development Committees.
- A Rural Electrification Fund shall be established for the development of micro hydropower and rural electrification by pooling in a certain percentage of the amount received as royalty.
- His Majesty's Government shall provide grant through the Alternative Energy Promotion Center to the domestic private sector to generate and distribute electricity by building hydropower centre of up to 100 kW capacities at the rural level. Moreover, such projects shall be included in the prioritized loan sector, and facilities shall be provided to such projects accordingly.

- Electricity shall be supplied from small hydropower projects in the mountainous rural area falling outside the access of the national power system. Provision shall be made to hand over the responsibility of operation and maintenance of such small hydropower projects to the local cooperative groups and these groups shall also be involved in the course of formulation and implementation of plans.
- For the private sector operated hydropower projects with capacities up to one MW and not linked to the National Grid System, the private producer may sell and distribute the electricity by determining the tariff rate of the electricity on its own.

Provision on License:

- Provision shall be made such that the local people can also be directly benefited from the operation of the hydropower generation project. Such provision shall be included in the agreement to be made with the licensee. In addition, ten per cent of the amount obtained for royalty shall be provided to the District Development Committees of those Districts affected from the dam, reservoir and powerhouse constructed for the generation of hydropower, to be spent in development and construction work of those Districts, pursuant to the Local Self-governance Rules.
- No license shall be required for hydropower project up to a capacity of one MW. Such hydropower project shall be registered with the District Water Resources Committee prior to commencement of the works of such project. Information of such registration shall be given to the Department of Electricity Development. The basis for registration of such projects shall be as determined by His Majesty's Government. Such projects shall be entitled to the facilities in accordance with this Policy.

Private sector in hydro power development

Private Sector in Hydro Power Development Upto 7th PLAN

The first private sector project Andhi Khola (5.1 MW) was constructed by BPC/UMN, private sector donor, UMN, otherwise active, in hospitals and technical training from about 1953 (after they were granted the permission by the government in Nepal). Andhi Khola project evolved out of UMN projects, such as, Tinau.

Andhi Khola was a remarkable project, initiated and executed by Mr. Odd Hoftun at UMN. He was a Lutheran from Norway (a non-colonizing European country), a teacher-entrepreneur, who contributed to Nepal's development immensely by setting up the technical training centre, BTI, consulting engineering service institution, DCS, and a number of hydropower projects, namely, Tinau, Andhikhola and Jimruk. His reputation had attracted a surprise visit by the then Crown Prince Birendra to BTI in 1982 (DoA, 1988)[8].

Deregulation and the Private Participation

The liberal policies of the 8th PLAN started with the de-regulation of many sectors, such as, aviation,

[8] Ancient Nepal, Journal of Department of Archeology, Department of Archeology, Nepal, June-July 1988

broadcasting, telecommunication and hydropower. The government was pushing the middle sized hydro, such as, the Arun-3, and Kali Gandaki-A with the donors consortia. And at the same time, it was planning the hydropower deregulation strategy, to draw in the domestic and foreign private sector into the hydro power development process. Mr. Hoftun's main contribution to the 8th PLAN, was "***transplanting***" the idea of ***private sector funding in hydropower development,*** from Norway's successful experience to Nepal. He also catalysed the first Norwegian grant to design the legislative framework under which deregulation of hydropower sector could take place (through his personal contacts through Prof Dr Hveding, the then Norwegian Minister of Energy). This in turn led to the first international private funded Khimti project (Svalheim, 2015).

The efforts were focused on the preparation of the legislative and judicial frameworks required, and getting the process through preparing the Acts and Regulation through the parliament, and preparing the necessary institutional set-up, Water Resources Act 1992, and Electricity Act 1992. The Hydropower Development Policies 1992 and 2001, were the outcomes of the process.

The hydro capacity at the end of the 7th PLAN was 240 MW. The progress in Hydro electricity generating capacity, during the 8th PLAN (2049-54: 1992-1998), was only 12.5 MW (Jhimruk) in the private sector, and another 5 MW (from Tatopani, Achham and Chatara) in the public sector (not on- grid). With the addition of thermal Duhabi (47 MW), the installed capacity rose to about 300 MW by the end of the 8th PLAN. This compared well with the projected peak demand made by NEA of about 310 MW (NEA, 2052 B.S.). Further, there were eight other projects envisioned, with installed capacity of 1781 MW, for export, including the West Seti (750 MW). The total stipulated outlay was more than 11 billion Rupees.

The 9th PLAN (2055-59 B.S.: 1998-2003) saw the Kaligandaki-A (144 MW), Puwa (6.2 MW) and Modi (14 MW) commissioned by NEA in the public sector. Khimti (60 MW), Bhote Koshi (36 MW) and Indrawati (7.5 MW) were added from the private sector. A total of about 268 MW hydro capacities were added to the system along with 10 MW thermal capacity at Duhabi. The total peaking hydro capacity reached to more than 521 MW. Then the Water Resources Strategy 2002 was also prepared.

In contrast, the 10th PLAN (2060-64: 2003-08) saw an addition of only about 39 MW, through Chilime, Indrawati and Piluwa, in the public sector. This is much less than the target capacity of about 315 MW in total, and about 214 MW envisaged for the private sector. National Water Plan 2005 was prepared in this plan period.

By the end of the 10th PLAN the total installed capacity was 570 MW. The performance during the 10th PLAN, suffered due to the political unrest, during the ***2062*** B.S. ***Jana Andolan (2005-06),*** and the turmoil that followed after, the ***Royal Palace Massacre (1st June: 2001)***. The continued political transition and turmoil, and ***bundhs***, heavily affected the performance of the government institutions and the implementation capacity. Many hydro projects suffered due to the agitations of the labour force too, on the instigation of the political parties.

These disturbances meant that the target for the 3-year-plan (2065-67: 2008-11) was set at only 105 MW. Similarly, the installed capacity during the 3-year Plan was only, 83 MW; with the cumulative hydro capacity at 637 MW. Middle-Marsyangdi (70 MW) came on line from the public sector. The private sector, all domestic, was able to add about 13 MW through 9 small hydro plants (the largest was Mardi was 3.1 MW).
The deficit capacity by the end of 3-year-plan was nearly 370 MW, and the load shedding was increased to more than 12 hours a day. This induced the government to declare "Energy Crisis" during this period

in 2065 B.S. (2008).
The PPA process, which had been stalled for some time now, was reopened to process projects within 25 MW (within three months). This resulted in 64 hydro projects getting their PPA processed, with a total of 379 MW capacity by the end of 2066 B.S. (2009). The Nepal Electricity Regulatory Commission Bill was also prepared in 2008.

An "Energy Crisis" mitigation plan, called, National Electricity Crisis Resolution Action Plan 2008, was publicly announced to rapidly develop 8 projects of small and medium size, to overcome the "Energy Crisis"; and the government invited the private sector for bids on these.

However, one precondition set was very difficult for the developers; they were required to deposit 10% of the project cost to the government. This meant that all the 16 or so willing investors were indeed serious about their bids. As expected, projects with immediate access to road and transmission lines were preferred by the bidders; with maximum number of bids. Two inaccessible projects actually did not get any bids at all.

Task Force for Hydropower development Report: Government of Nepal (GON) had formed a task force in December 2008 to formulate programs for developing 10,000 MW in 10 years. The task force provided the list of storage and run-off projects with time-line for development. The report also recommended the required improvements in the institutional aspects.

Private Sector Investment

During the 8th PLAN, the Electricity Act 1992 was passed by the parliament (Nepali Congress was then in majority), and the Electricity Development Center was setup in 1993, along with the Tariff Commission to gather confidence of the private sector to invest in hydro sector in Nepal.

The Electricity Act 1992 also assured the private investors of the following: 1) no nationalisation of the investments, 2) guarantee for repatriation of earning in dollars, 3) exemption from income tax and duties and 4) guarantee of power purchase at the given rates (PPA). This ultimately led to the construction and operation of Khimti (60 MW), Bhote Kosi (36 MW) and Indrawati (7.5 MW) by the foreign private sector, during the 9th PLAN. The total foreign investment amounted to about 250 million dollars for these three projects only (NEA & WINROCK 2002).

The credit goes to the then Water Resources Minister Ms Shailaja Acharya, who promoted the domestic investment in Hydro in 1998. She asked NEA to announce the PPA rates for purchase of electricity from domestic IPP for projects under a megawatt capacity. The agreement period was 25 Years and the differentiated tariff rates for the wet monsoon period (Rs 3/KWH) and dry winter period (Rs. 4.25). An annual increment of 6% was to be applied to these rates for first 5 years.

However, **it was required that IPPs provide the connection to the grid at their own cost**. For larger projects, up to 5MW, it was envisaged that the same PPA rates were to be applied, but only after 2002/3. For projects with ***higher capacity up to 10 MW, an arrangement with a competitive PPA r***ates was decided. Sangye (0.185 MW), Piluwa (3MW) and Chaku (1 MW) came into the grid into the 9th PLAN, from domestic IPPs soon after this announcement.

The response from both the domestic and external private sector was commendable, given the conditions of high risks presented by the Maoist insurgency, up till this time. Given the mediocre

performance during the 10th PLAN and the 11th 3-year-plan, there were capacity *deficits of 426 MW and 648 MW during the 9th and 10th PLAN* ***respectively***, which continued into the 11th Plan, leading to a severe form of load shedding (lasting more than 12 hours a day). This precipitated the so called ***"Energy Crisis"*** in 2009.

RENEWABLE ENERGY SECTOR

The present situation in Nepal is very critical from the point of energy availability caused specially by the recent Indian trade embargo. The energy security issue has now attained a very important place in energy planning in the county. Renewable Energy sector has now attained the significance of being the foundation stone for creating energy security in Nepal. So the present report foregoes the task of surveying the status of the past policies and progresses achieved; these information are readily available at the web site of Alternate Energy Promotion Center, AEPC, and GON. The paper focuses more on the future, especially on the imperatives of energy security concerns (such as new legislative and new policy initiatives, taken and yet to be taken).

In the event of another embargo that may be set-up by the southern neighbour, Nepal has the imperatives of fulfilling her immediate energy needs, to whatever extent possible, through her own indigenous resources, which are mostly of renewable energy type. The acceleration of adoption and deployment of various renewable energy technologies will vary considerably on how much the present polity learns from the recent oil embargo. A set of ***policy imperatives*** have to be noted where ***energy security*** is the main concern.

In the immediate future, the priorities will lie in catering the needs of the general consumers, for energy needed for cooking and transportation (through induction cookers, electric vehicles, trolley buses etc.) The energy needs of agriculture and industry will follow in the next step, with the deployment and market penetration of bio-liquid-fuels, compressed biogas, micro-mini hydroelectricity and gasifire engines.

Enhanced Market Penetration: The renewable energy has thus to be provided ***a level playing field for enhanced market penetration through*** *a public private partnership mechanism, which are already tried successfully in mini hydro schemes.*

General Economic Incentives: A common set of general economic incentives, such as, soft loans, reduced capital investment tax, production premiums or accelerated depreciation rates etc., and legislative and institutional measures to ensure easy access to the renewable energy (including electricity grid and the distribution infrastructure), are essential to ensure the level playing field for the renewable energy technology and services (RETS).

Take-Up Legislation: The policy packages for RETS need to be designed so as to be quite ***effective against the specific barriers*** to market penetration. Thus the policy packages would be distinct for each renewable energy technology, such as, wind, solar thermal, biomass gasification, biogas, photo-voltaic etc. The institutional policies / innovations, legislative

measures and economic incentives would also have to be differentiated and fine-tuned to each renewable technology. **PPP** can be promoted through ***take-up legislation***, **subsidy**, and ***cost sharing*** for ***power pooling***.

Financing barriers can be overcome through legislative interventions to redefine ***financial assessment criteria***-to reduce the transaction costs of financing.

Take-off campaigns, may be launched with financial incentives provided to participate in the ***power-pools***. If and when, renewable based utilities tend to lose out, often through disasters, ***cost recovery schemes should be in place***, through appropriate institutions and legislation, to compensate for the loss; and to ***ensure continued participation*** in the commercialization processes.

GOVERNMENT SECTOR PLANS, POLICY, STRATEGIES AND TARGETS

Energy services are indispensable input into each of the economic, social and environmental aspects of human development. They accentuate economic development by putting emphasis on industrial growth, increasing productivity and providing access to global markets and trade. Modern energy services are very essential for social development especially by providing assistance in basic human needs of nutrition, health, household heating, lighting, cooking, and helping in getting education and public health. Modern energy services no doubt protect the local and global environment by reducing deforestation, natural calamities like landslides and floods, and mitigating greenhouse gases. Provision of adequate, affordable and reliable energy services to the people is of paramount importance in achieving the millennium development goals (UNDP, 2005).

Energy in national development and poverty reduction strategies and plans

In the interim plan (2011-2013), some of the key strategies to assist in economic progress and social development through developing access to modern energy are:

- Develop electricity access as an inseparable part of poverty alleviation
- Increase electricity generation capacity to mitigate the current power crisis in the country
- Extend transmission line with high priority
- Enhance public, private, community/cooperative investment in electricity generation and transmission
- Prepare investment friendly environment for construction and development of hydropower projects
- Emphasize the development and expansion of renewable energy under decentralized energy system
- Develop rural energy in consideration with sustainability and appropriateness
- Promote partnership and coordination with related stakeholders like local bodies, private sector etc. for the development and expansion of alternative energy

Some of the working policies related to the above key strategies are:

- Generation of electricity and extension of transmission line projects intended for domestic use will be implemented through Government investment

- Power purchase rate will be reviewed to increasing domestic private investment and special encouragement and tax exemption in construction materials will be provided in accordance with electricity purchase price for those projects getting completion in the plan period
- Private sector will be attracted to undertake construction of transmission line under the policy of Public Private Partnership (PPP) such as BT/BOT/BOOT.
- Electricity tariff will be reviewed and made timely adjustment
- In the selection of the power plant development, 30% of the planned development will be for the reservoir type of hydropower plants
- New Electricity Act, National Electricity Regulation Commission Act, National Water Plan, Water Resources Policy, and the recommendations of the task forces of ten -year and twenty - year hydropower development will be gradually implemented
- Micro and small hydro, solar energy, bio-energy and wind energy will be promoted and expanded in rural areas
- Priority will be given on micro hydro, solar system development where there is no possibility of immediate grid expansion
- Solar systems will be expanded to urban areas to address the current energy crisis
- Generation of energy through municipality waste will be promoted and pilot projects in this context will be promoted with the local bodies and private sector
- Investment friendly environment will be created in the financial institutions for sustainable and appropriate development of rural energy by expanding the current Rural Energy Fund as a Central Rural Energy Fund
- Close coordination between NEA, AEPC and the district development committees (DDC) needs to be strengthened in order to achieve the targets
- Regular and periodic interactions are needed between concerned ministries and public sector enterprises involved in the energy sector such as the Ministry of Energy (MOE), Ministry of Commerce and Supplies (MOCS), Ministry of Environment, Science and Technology (MOEST), NEA, NOC and AEPC etc.

THE HYDRO POWER SECTOR OVER THE YEARS

THE RANA PERIOD

The Rana period saw very little development of electricity for public distribution despite its early start (Pharping started as early as 1910 AD). The second hydro system, Sundarijal, was taken up after 23 years in 1935/36 AD (soon after the earth quake of 1990 BS). The planning for development started only in 2013 BS (1955/56 AD). During the 1st Plan (2013-2018 BS) only about 1000 KW, of installed electricity, mostly thermal, was achieved. The focus was more on rural development rather than on electricity. During the 2nd Plan, although the target was 22 MW, only one MW was developed. The 1ST and 2nd Plans, spanning over the decade (2013-2022 BS), as such did not build any hydro plants at all.

THE PANCHAYAT ERA: SUBDUED VESTED INTERESTS AT PLAY

The early part of the Panchayat era was a period of self-assertion; characteristic of an era of moving away from the influence of Indian polity and Bureaucracy, with the help of the western donors. The influence of the later was rather positive.

Much of the efforts went into the access roads and setting up of the needed institutions in the power sector.

The setting up of the ***Bijuli Adda or Bidyut Bivag*** in 2018 BS***,*** and later, ***Bidhyut Corporation / Pradhikaran in*** 2020 BS was really the starting point of energy planning in Nepal. This was a natural but a rapid process of bringing together, much of the scattered diesel and small hydro projects, during a short time. This was the beginning of the hydro power planning in Nepal.

Third hydro, Panauti (2.4 MW), had to wait till 3rd PLAN (2023-2027 BS). During this plan Trisuli-I (9 MW) and Fewa (1.1 MW) were also added, with total installed capacity of about 12.5 MW. 3rd Plan achieved about 70% of the target capacity. A host of hydro projects, such as, Gandak, Tinau etc. were identified, but lack of skilled manpower, did not allow the detailed study of these projects. The inaccessibility was also responsible for the low level of achievement in the hydro sector.

The energy centres in the central and eastern part of Nepal, and the expansion of the local electricity grids, quickly grew into the transmission grids and regional electricity authorities. The local institutions became soon integrated and transformed into a national level hydro power institution (at the behest of the bilateral and multilateral donors). This was set up within the Ministry of Water Resources (MOWR).

The growth of hydro started during the 4th PLAN, with larger projects, Trisuli-II (12 MW), Sunkosi (10 MW), and Kosi (6.8 Mw). These were all constructed through technical and financial donor assistance , and raised the installed capacity to a significant, 42.5 MW. (NPC, 2022 BS). The focus during the 4th Plan shifted towards the small hydro schemes, by setting up Small Hydel Board. Main target for the Board was the electrification of district headquarters. But, only half of the target was achieved. This was due to the delay in signing the Trade and Transit Treaty with India, which affected all the development projects.

The 5th Plan ended with about 52 MW of hydro and 14 MW of diesel capacity.(NPC, 2022 BS) This was only about a third of the target; and thus a big gap existed between the supply and demand of electricity during this Plan and many Districts were still left without electricity. Rural electrification was not started yet.

The 6th Plan saw the advent of large projects such as Kulekhani-I (60 MW), Gandak (15 MW), and Devighat (14.1 MW). An addition of about 90.6 MW of capacity resulted during the 6th PLAN. During this plan, the first storage project, Kulekhani-I (60 MW), was built and the first small hydro schemes were initiated. The demand grew by about 15% per annum and the installed capacity increased to 157 MW during this plan period. The process led to the establishment of the Nepal Electricity Authority (NEA) through an Act (2042 B.S.).

By the 6th Plan period, the rise of the idea of ***electricity exports*** as part of an economic development strategy evolved (e. g through George Varghese's "Waters of Hope"). Bhutan was an example frequently quoted; indicating that the *electricity export option was real.*

However, the idea also had critiques, who pointed out that, under a *bilateral monopoly trade*, the tariff negotiated by the seller (Nepal) would tend towards marginal cost. So, it is argued that there is no expectation of "profit" by exporting electricity to a single buyer. Instead, there are opportunities to convert raw electricity into high value commodities such as aluminium, alloy steel and fertilizer, in domestic industries. These commodities could be then exported to the north, the south and elsewhere. And the multipliers from energy could be captured within Nepal (Bhadra, 1983, 2004 and 2008 and Dixit,

2008).

However, the Ministry of Water Resources, in 1981, formulated a policy to develop the export oriented hydro projects, along with the smaller hydros for domestic industries. This shows that the planning process was rather weak in Nepal, at this time, and ambivalence existed between self-reliant and electricity-export based economic development strategy (Dixit, 2008).

The government's policy initiatives in the energy sector include the Electricity Act of 1992, which was adopted to develop and manage the hydropower regime in Nepal and to standardize and safeguard electricity services. This was followed by the Hydropower Development Policy of 2001, which listed objectives and laid down governing rules for the hydropower sector. It specified the generation, transmission, and distribution functions for the creation of an independent power systems operation. To address sector needs resulting from demand growth and the responsiveness required from the NEA, ADB assisted the government in drafting the Nepal Electricity Act and the Nepal Electricity Regulatory Commission Act. These were approved by the cabinet and submitted to the Parliament, but have been stalled at the legislature since May 2012. The former piece of legislation is aimed at restructuring the NEA by unbundling its operations; the latter, at setting up an independent regulatory regime for the power sector, long needed to attract investment into the sector.

The Water Resources Strategy of 2002 requires a commercially viable NEA through corporatization, improved management, and separation of its rural electrification operations. It also calls for generation to become the responsibility of a separate corporation. Moreover, the country's 3-year plans have dealt with such issues as (i) effectively regulating electricity generation, transmission, and distribution; (ii) adopting a one-window approach to hydropower development to encourage investments; and (iii) making consistent efforts to expand electricity generation and transmission.

In 2008, the government approved the National Electricity Crisis Resolution Action Plan with immediate and long-term strategies for dealing with the worsening power situation. These strategies included increasing power imports from India, building thermal power plants, expanding transmission capacity, and addressing electricity theft. In December 2008, the government also formed a task force to prepare a road map for developing an additional 10,000 MW of hydropower generation capacity within 10 years. The task force recommended that the production of hydropower to meet domestic demand be given priority over production for export.

Other government initiatives to mitigate the power crisis included the Rural Energy Policy of 2006, which was targeted at the installation of improved biomass technologies, off-grid micro hydro systems for rural electrification (capable of being connected to the national grid when it is extended), and light-emitting-diode (LED) and PV-based solar lights to replace kerosene lamps. The policy provided for special programs to enhance the benefits of rural energy for women and other marginalized groups, and increase their representation in community based organizations through social mobilization.

In view of its major financing responsibilities in many other sectors, the government is aware that it will be unable to make sufficient investments on its own to fully develop Nepal's hydropower potential. To leverage investments it can make, share the risks, and use the efficiencies and innovations of private enterprise, it is considering public–private partnerships (PPPs) as a preferred model of hydropower generation. It is setting up a facility to implement large-scale PPP hydropower projects and to provide related transaction advice. PPPs already exist in power distribution through the community electrification initiatives of the NEA.

In February 2016, a cabinet meeting endorsed an action plan for ending the energy crisis within 2 years. The cabinet meeting also directed the Ministry of Energy to prepare a concrete action plan for reducing the power shortage within a year and achieving zero power shortage within 2 years. In addition, the cabinet meeting declared National Energy Crisis Reduction and Electricity Development Decades. The action plan consists of 99 specific activities covering (i) legal reform provisions, (ii) policy decisions, (iii) administrative decisions and procedural reforms, and (iv) structural provisions and reforms.

Key programs under the action plan, are summarized below.
(i) Legal Reform Provisions
(a) Formulate a new Electricity Act and submit it to the Parliament together with the National Electricity Regulatory Commission Bill.
(b) Approve and implement the Energy Crisis Bill.
(c) Simplify the licensing of projects and make the procedures more systematic to ensure their affiliation with the electricity transmission and distribution system.
(d) Provide for the development of electricity projects of at least 500 MW.
(e) Provide for income tax exemptions under the Electricity Act of 1992.
(f) Amend the Electricity Theft Control Act of 2002.

(ii) Policy Decisions
(a) Formulate and implement a National Energy Security Policy.
(b) Fund hydroelectric projects by mobilizing internal resources.
(c) Restructure the Ministry of Energy and its Department of Electricity Development.
(d) Complete the construction of high-priority hydroelectricity projects as follows: 200 MW within 1 year, an additional 850 MW within 2 years, and 400 MW more within 3 years.
(e) Construct reservoir-based projects as a priority.
(f) Determine and adjust electricity tariff rates, power purchase rates, and wheeling charges in accordance with the weather and the time.
(g) Ensure payment in return for purchase of power.
(h) Follow take-or-pay instead of take-and-pay provisions.
(i) Construct transmission lines and substations under the build–transfer model through a consortium of promoters.
(j) Make electricity generation, transmission, and distribution projects national priority projects. (k) Make special provisions for the acquisition of land for electricity projects, transmission lines, and substations.
(l) Review land compensation.
(m) Provide a community support program.
(n) Gradually install time-of-day meters to be able to charge all consumers peak and off-peak tariff rates.
(o) Ensure that electricity services reach all the people of Nepal within the next 10 years.
(p) Gradually implement the smart meter and smart grid concepts.
(q) Develop and implement an electricity distribution master plan.
(r) Develop an action plan for controlling electricity distribution system leakage and implement the plan.
(s) Activate the National Transmission Grid Company.
(T) connect solar or wind power to the national grid.
(u) Invite competitive bids for photovoltaic solar and wind electricity projects.
(v) Negotiate and finalize purchase agreements for solar electricity and wind electricity based on the take-or pay principle.
(w) Conduct an electricity conservation program to control technical and nontechnical leakage. (x) Carry

out technical audits of large electricity consumers.

(iii) Administrative Decisions and Procedural Reforms
(a) Simplify exchange facilities for paying consultants and contractors in foreign currency.
(b) Simplify the granting of work visas and Labor permits.
(c) Develop hydroelectric projects in the government basket.
(d) Conclude power purchase agreements in convertible currency.
(e) Provide inflation benefits to hydroelectric projects with a capacity of 25 MW equal to the benefits for projects with a capacity of over 25 MW and up to 100 MW.
(f) Simplify the provisions relating to environmental impact assessment (EIA) or initial environmental examination (IEE) for applications to the NEA for a power sale or purchase agreement.
(g) Assign high priority to the completion of transmission lines under construction. (h) Complete the new 220 kV Marsyangdi–Matatirtha transmission line as quickly as possible, as a matter of high priority.
(i) Complete the construction of the new 132 kV Kataiya–Kushaha and Raxaul–Parwanipur transmission lines and substations to enable the country to import an additional 100 MW of electricity.
(j) Strengthen and extend the national electricity system.
(k) Give high priority to the construction of 400 kV substations.
(l) Make suitable arrangements for any required access to forest areas for EIAs or IEEs.
(m) Simplify EIA or IEE studies of hydroelectric and transmission lines and their approval.
(n) Simplify the process of obtaining approval for the felling of trees and the taking of a lease of land for the development of hydroelectric and transmission projects.
(o) Provide for a 10% equity share in projects for affected communities and individuals in the project districts.
(p) Forecast load demand on the basis of actual electricity demand.
(q) Expand and strengthen the NEA in an organized way.
(r) Develop an underground distribution system and modern distribution kiosk technology.
(s) Remove obstructions to the construction and extension of 11 kV and 33 kV lines.

(iv) Structural Provisions and Reforms
(a) Form a Central Energy Crisis Prevision Coordination Committee and a District Level Energy Crisis Prevention Coordination Committee for the effective implementation of the Energy Crisis Prevention Decade.
(b) Make the necessary arrangements for interagency coordination at the Joint Secretary level for the development of electricity projects.
(c) Form a Facilitation Committee chaired by the chief secretary and with the secretaries of the related ministries as members.
(d) Provide for a mechanism for the development and construction of reservoir-based projects. (e) Restructure and revitalize the Water and Energy Commission.
(f) Carry out a rural electrification campaign.
(g) Establish a National Electricity Generation Company.
(h) Create an empowered and resourceful consulting company at the appropriate government level.
(i) Carry out the financial and institutional restructuring of the National Transmission Grid Company.
(j) Establish a National Power Trade Company.
(k) Form power generation companies as holding companies of the NEA.

Besides issuing the Energy Crisis Prevention Decade action plan, the government issued “People Investment in Nepal Hydropower” in September 2016, outlining 37 specific medium- to long-term actions for electricity sector development, including the following:

(i) Bring visible progress to the electricity supply situation through improvements in aging distribution assets, leakage control, efficient operation of the No-light unit of the NEA, timely provision of meters for new connections, and effective implementation of the load-shedding schedule.

(ii) Transform the NEA from a loss-making entity to a profitable and efficient institution through
(a) Financial and institutional restructuring,
(b) revenue-generating activities,
(C) sustained recovery of arrears and control of power leakage,
(d) Adoption of the right-man-in-the-right position principle with performance contracting and availability of the required human resources,
(e) Implementation of hydropower development through NEA subsidiaries, and
(f) Efficient use of available NEA resources.

(iii) Eliminate load shedding within 2 years through the effective implementation of the action plan for the National Energy Crisis Prevention and Electricity Development Decade, 2016.

(iv) Develop 10,000 MW by 2025 through an appropriate combination of storage, run-of-the-river, peaking run-of-the-river, and pump storage plants.

(i) Promote the participation of citizens in hydropower investments by mobilizing available resources from financial institutions.

(ii) Model hydropower development with the active participation of the security sector including the Nepalese Army.

(iii) Undertake a Government with Poor Program by providing shares in state-owned hydropower projects to poor, marginalized, and conflict-affected families.

(iv) Implement attractive projects by mobilizing the participation of more than 10,000 youths.

(v) Carry out a self-employment and income program providing loans amounting to NRs1 lakh to poor, Dalit (members of the lowest caste), and marginalized people.

(vi) Implement a biomass energy generation program to create jobs for people in the Terai region.

(vii) (xi) Develop a program linking hydropower with agriculture, tourism, industry, education, science and technology, and health.

(viii) (xii) Create a conducive environment for the mobilization of foreign investment in the development of large-scale hydropower projects and high-voltage transmission lines.

(ix) (xiii) Establish a currency hedge fund to minimize the foreign exchange risk in power purchase agreements denominated in a foreign currency.

(x) (xiv) Establish an Electricity Generation Company with the government and government-owned financial and commercial institutions as shareholders. Also establish a Power Trading Company and an Engineering Company.

(xi) (xv) Prepare and implement a distribution master plan along with the upgrading of distribution assets

(xii) (xvi) Initiate the implementation of an underground distribution system in cities.

(xiii) (xvii) Promote the use of solar-powered streetlights.

(xiv) (xviii) Develop separate institutional arrangements for rural electrification.

(xv) (xix) Develop an action plan for controlling electricity theft and organize a national campaign to implement the plan.

(xvi) (xx) Forecast electricity demand over the next 20 years.

(xvii) (xxi) Develop and implement a scientific and automatic tariff mechanism. Set wheeling charges for the use of the electricity transmission system.

(xviii) (xxii) Establish different electricity purchase rates for run-of-the-river, peaking run-of-the-river, and reservoir hydropower plants.

(xix) (xxiii) Simplify licensing procedures.

(xx) (xxiv) Shorten the EIA procedure for electricity projects. Simplify forest clearance and land acquisition procedures for projects that have undergone EIA.

(xxi) (xxv) Update the river basin master plan. (xxvi) Restructure the institutional setup of the Water and Energy Commission Secretariat and the Ministry of Energy.

(xxii) (xxvii) Take appropriate action to implement the power trade agreement between India and Nepal, and the South Asian Association for Regional Cooperation (SAARC) framework agreement. Also establish appropriate mechanisms for power trading between Nepal and India.

(xxiii) (xxviii) Initiate the establishment of open access to the retail and wholesale transmission markets.

(xxiv) (xxix) Submit the Nepal Electricity Regulatory Commission Act to the Parliament within 2 months to ensure the effective regulation of the electricity sector. Develop a National Energy Security Policy focusing on the development of hydro resources. Prepare an Integrated National Water Resource Policy in consultation with all stakeholders.

(xxv) (xxx) Require industries that employ more than 5,000 people to provide 24 hours of electricity supply at a specified rate.

To address the oil crisis, the Government of Nepal is set to diversify its import sources, which now include the PRC and Saudi Arabia, and to increase storage capacity from the current 20 days of national total sales to 30 days. Recognizing the urgency and importance of reducing the impact of climate change and implementing climate adaptation action, the Government of Nepal submitted its Intended Nationally Determined Contributions (INDC) to the United Nations Framework Convention on Climate Change (UNFCCC) Secretariat in February 2016, indicating its full commitment to making efforts to implementing its INDC and thereby contribute to the global efforts of reducing greenhouse gas emissions. The INDC has the following salient features:

(i) Nepal places climate change adaptation at the centre of its development plans and policies. It aims to strengthen implementation of Environment-Friendly Local Government (EFLG) Framework in Village Development Committee and municipalities, and water conservation and green development.

(ii) Nepal plans to formulate the Low Carbon Economic Development Strategy that will envision country's future plan to promote economic development through low carbon emission with particular focus on
(a) Energy,
(b) Agriculture and livestock,
(c) Forests,
(d) Industry,
(e) Human settlements and wastes;
(f) Transport,
(g) Commercial sectors.

(iii) By 2050, Nepal will achieve 80% electrification through renewable energy sources having appropriate energy mix. Nepal will also reduce its dependency on fossil fuels by 50%.

(iv) Nepal aims to achieve the following targets under the Nepal Rural Renewable Energy Programme, reducing its dependency on biomass and making it more efficient.

Table 11: Nepal Rural Renewable Energy Programme Targets

Technologies	Targets
Mini and Micro Hydropower	25 MW

Solar Home System	600,000 systems
Institutional Solar Power System (solar photovoltaic and solar pump systems)	1,500 systems
Improved Water Mill	4,000 numbers
Improved Cooking Stoves	475,000 stoves
Biogas	130,000 household systems, 1,000 institutional and 200 community biogas plants

Source: Ministry of Population and Environment. 2016. Intended Nationally Determined Contributions. Kathmandu.

(v) Nepal will develop its electrical (hydro powered) rail network by 2040 to support mass transportation of goods and public commuting.
(vi) Nepal will maintain 40% of the total area of the country under forest cover and forest productivity and products will be increased through sustainable management of forest. Emphasis will equally be given to enhance carbon sequestration and forest carbon storage and improve forest governance.
(vii) By 2025, Nepal will strive to decrees the rate of air pollution through proper monitoring of sources of air pollutants like wastes, oil and unmaintained vehicles, and industries.

The government recognizes that it must accelerate the development of its abundant hydropower potential as an important step forward in its efforts to reduce poverty and stimulate economic growth. Hydropower development will (i) provide clean energy to enhance economic and social development in the rural and urban areas, and (ii) enable Nepal to generate revenue from exports of excess energy to neighbouring countries.

The key drivers of change affecting energy sector in the country have been the need for economic growth, energy conservation and energy productivity enhancement measures, measures for reducing poverty, fast depleting biomass resources, dependency on imported oil and gas; and adverse impact on the environment of the rapidly developing urban and rural areas.

DEREGULATION OF HYDRO POLICY AND PROMOTION OF RENEWABLES (AEPC)

A ***significant level of deregulation was initiated during this plan,*** in energy, as well as telecom, aviation, education, transportation and others sectors. ***The Electricity Act 1992 was promulgated to deregulate the hydro power sector and the Hydro Power Development Policy (2049 B.S) was set up.*** The major preparations for the private sector investments in hydro projects, namely, ***Khimti*** and ***Bhote Koshi***, also took place during this plan. The total installed capacity reached 300 MW, with about 14% of the population being served (525,000 consumers). The total investment in the sector?? During the 5th to the 8th plan, reached about 56.5 billion rupees.

Although, a long-term ***Perspective Energy Plan*** was being discussed or initiated by NPC, at this time, the deregulation of the electricity sector is more significant, from an economic perspective. The promotion of the renewable energy was also given top priority.

During the major part of the 8th Plan, the National Planning Commission (NPC) was active in formulating deregulation policies, and acts. It should also be noted that, the ***idea of deregulation came from the Nepalese planners and*** it had not been an idea promoted by major donors, be they, bilateral or multilateral. This was true of hydro sector as well.

NPC was aware that the experience of deregulating hydropower sector was rare in the world. The Norwegians, were the ones, who had a very large cumulated experience, both judicially and operationally, in deregulation of hydro sector. And fortunately, they were helping Nepal presently, through United Mission to Nepal, UMN.

BPC, the private sector entity, supported by Norwegians, had been rather effective in local level technical skills development and their innovative use of second-hand construction equipment (from Norway) in hydro projects, such as, Andhi Khola. It also had acquired a very good reputation in turbine manufacturing and constructing biogas plants; and had good working relations with Nepali institutions, such as, the Agricultural Development Bank.

It was also noted by the then NPC that, Norway's good experience of hydro power development using private sector, could benefit Nepal. By then Norway was already helping Nepal in Andhi Khola, Jimruk and Tinau, through BPC.

NPC, with the help from Norway, prepared the judicial framework required for deregulation based on Norwegian experience. Drafts of the ***Electricity Act*** was made, and it was finally endorsed through Parliament with a large majority supporting it.

The act was originally thought suitable for small and medium run-of-the-river projects; to meet the domestic needs. The expectations were that, the Nepali private sector would come forward to take advantage of the incentives provided. However, it soon became obvious that it had enough incentives for other foreign investors as well, e.g. in Khimti and Bhote Koshi projects.

The 8th Plan also set up the ***Alternative Energy Promotion Center (AEPC)***, to promote the use of renewable energies, such as, micro-hydro, biogas and biomass, solar, wind and geo-thermal, which are also present at significant levels in Nepal. NPC had made arrangements on AEPC, as a need of the Biogas Support Program. (Covered in a later section).

Energy policies development in Nepal started from the Fifth Plan (1975-1980) which incorporated the first sector specific policy statement in the energy sector. In the plan, the government emphasized the need to reduce heavy dependence on traditional source of biomass and imported oil, and increase the supply of renewable energy sources including hydropower to meet the increasing demand for energy.

In Nepal, policies in the energy sector currently are scattered in various documents and executive orders. These include policy statements of the government made in periodic development plans, subsector policies, government orders and notices, and laws passed by the legislature. Experience in the past showed that any change in energy policy direction (e.g. adjustments to energy prices, shifts to alternatives like nuclear, or policies directed at the environmental aspects of energy utilization) had unexpected and unpredictable effects. Energy price increases had profound flow on effects every economy, but also influenced the social and political situations (WECS, 2010).

The policy documents related to hydropower, energy or electricity development and use have different objectives, strategies, policies and plans in them.

Water Resources Act 1992

Priority Order on the Utilization of Water Resources is forth after drinking, irrigation, animal husbandry and fisheries. No license shall be required for running water-mill or water-grinder as cottage industry.

Electricity Act 1992

No person shall be entitled to conduct survey, generation, transmission or distribution of electricity without obtaining license under this Act. Provided that no license shall be required to be obtained by a national or a corporate body for the generation, transmission or distribution of electricity up to 1000 kilowatt and for conducting necessary survey thereof. Before generating, transmitting or distributing hydroelectricity of the capacity ranging from 100 kilowatt to 1000 kilowatt, information to that effect shall be given to the prescribed officer in a manner as prescribed.

Royalty to be paid

- The licensee shall have to pay royalty to His Majesty's Government at a rate of Rs. 100 for each installed kilowatt of electricity per year plus 2 percent of the average tariff per unit per kilowatt hour) for a term of up to fifteen years from the date of generation of electricity for commercial purpose.
- The licensee shall have to pay royalty to His Majesty's Government at a rate of Rs. 1000 for each installed kilowatt of electricity per year plus 10 percent of the average tariff per unit per kilowatt hour).

Facilities Relation to Income Tax and Other Tax and Charge - No income tax shall be levied to a person or a corporate body who is generating, transmitting and distributing hydropower up to 1000 kW.

Sale of Generated Electricity - If any person desires to sell in bulk the electricity generated pursuant to this Act, His Majesty's Government may purchase or cause to purchase such electricity to the national grid.

No Nationalization to be made

The land, building, equipment and structure related to electricity generation, transmission or distribution should not be nationalized. Provided that the land, building equipment and structure related to the generation, transmission or distribution of 1000 kilowatt or less of hydro-electricity, His Majesty's Government may, for the extensive public use take over such property and develop and develop that itself.

Purchase of Electricity Generation Plant etc.

In case where the licensee is going to distribute electricity in an area where any person or corporate body is already distributing electricity by generating up to 1000 Kilowatt of hydro-electricity, such person or corporate body who is generating hydro-electricity up to 1000 Kilowatt if desires to sell the hydro-electricity plant, transmission and distribution line which is operated by him, the said licensee shall have to purchase such hydro-electricity plant, transmission and distribution line on the price after deducting wear, tear and general depreciation) as fixed by mutual agreement.

Security of Electricity Structure:

- His Majesty's Government may make necessary arrangement for the security of any electricity generation plant, transmission plant, sub-station, or any reservoir made for generating electricity or any other structure related to electricity, on the request of the licensee or by itself, if it deems it necessary to provide such security.
- If the security arrangement is made on the request of the licensee, all the expenses incurred for such security shall be borne by the licensee.

National Transport Policy 2001:
Policy: The utilization of means of transport to be conducted by the solar power and electricity shall be expanded throughout the Kingdom.

Action Plans-Transport infrastructures -Where major projects such as for agriculture or hydro power development are to be implemented in areas with little or no transport infrastructure, the provision of basic transport infrastructure serving the locality shall be included in the project, and from part of the It economic cost/benefit Analysis for the project.

Sector Transport Policy - Rail Transport: Taking in mind the reasonable utilization of hydropower production electrical rail service shall be developed.

Water Resources Strategy 2002:
Water Sector Needs and Issues: Hydropower Issues - Improving power system planning, · Increasing access to electrification in rural areas, Encouraging private investment in hydropower. Reducing cost of development.

Cost-Effective Hydropower Developed in a Sustainable Manner - Activities -Develop cost-effective small (including micro- and mini-) and medium hydropower projects to meet domestic demand at an affordable price.

2007, 820 MW hydropower capacity developed to meet projected demand, including 70 MW for export; 25% of households supplied with electricity;

- by 2017, 2230 MW hydropower developed to meet projected demand of 2230 MW, including 400 MW for export; 38% of household supplied with electricity;
- by 2027, 60% of households have access to electricity;

National Water Plan 2005
- Hydropower Development - Rural electrification is a costly investment but at the same time essential for the economic uplift of the rural people. In order to make rural electrification more cost effective and financially sustainable in terms of O&M, this programme needs to be expanded and linked up with rural economic activities.
- Targets -By 2007: Up to 700 MW generating hydropower capacities are developed to meet the projected domestic demand at base case scenario without export. 35% of the households are supplied with INPS electricity, 8% by isolated (micro and small) hydro system and 2% by alternative energy. Per capita electricity consumption of 100 KWh is achieved.
- By 2017 : Up to 2035 MW hydropower electricity is developed to meet the projected domestic demand at base case scenario, excluding export.55% of households are supplied with INPS electricity, 12% by isolated (micro and small) hydro system s and 3%by alternative energy.ª Per capita electricity consumption of 160 KWh is achieved. And NEA is corporatized.
- By 2027: Up to 4,000 MW of hydropower is developed to meet the projected domestic demand at base case scenario, excluding export.75% of the households are supplied with INPS electricity, 20% by isolated (micro and small) hydro system s and 5% by alternative energy. Per capita electricity consumption of over 400 KWh is achieved.

Rural Energy Policy 2006

The overall goal of this policy is to contribute to rural poverty reduction and environmental conservation by ensuring access to clean, reliable and appropriate energy in the rural areas. In order to achieve this goal, the "Rural Energy Policy 2006" will have following objectives:

- To reduce dependency on traditional energy and conserve environment by increasing access to clean and cost effective energy in the rural areas.
- To increase employment and productivity through the development of rural energy resources. • To increase the living standards of the rural population by integrating rural energy with social and economic activities.

  Policies:
- Emphasis will be given to the development of the environmental friendly Rural Energy Technologies.
- The capacity of the local bodies will be improved for playing a leadership role in rural energy project planning, implementation, monitoring and evaluation at the local level and involvement of cooperatives, user groups, NGOs, private sector will be increased.
- Rural Energy Fund will be established at the central level to mobilize financial resources to be availed from various sources and fund will be expanded to the local level as per need.
- Alternative Energy Promotion Centre under Ministry of Environment, Science and Technology, Government of Nepal will provide necessary support to the local bodies to develop its capacity to formulate and implement rural energy programmes.
- Emphasis will be given in the development of affordable and suitable rural energy resources.
- An arrangement will be made for increasing human resource capacity of rural population for rural energy development through human resource development activities that are integrated with activities of academic institutions for skill enhancement training and awareness improvement.
- Economic activities will be implemented in integrated way for increasing energy consumption capacity at rural level by development of Micro and Mini Hydro, Biogas, Improved Cook Stove, Improved Water Mills, Solar Energy Systems, etc. and expansion of the central grid.
- Private sector and non-governmental organizations will be involved in the rural energy development for development and expansion of new technologies. In this activity, the role of the Government of Nepal will be that of facilitator and promoter.
- Economic and industrial activities based on rural energy technologies will be encouraged.
- Community management through social mobilisation will be encouraged in activities of rural energy development and dissemination.
- Emphasis will be given to increase private sector participation by motivating the involvement of private sector in manufacturing of equipment's related to rural energy.
- Economic instruments will be used to mobilize the capital from banks and financial institutions, internal capital market, community capital for rural energy development.
- The local body, cooperatives, private sector, user organization or community management will be encouraged to purchase and distribute electricity from electricity production.
- The efficiency of rural energy technology will be increased and diversification of the productive end-use will be encouraged.
- A special emphasis will be given to bring improvement in social, economic and environmental aspect by coordinating rural energy with local bodies.
- The emphasis will be given for development and management of new technology to increase efficiency of use of traditional energy. Similarly the emphasis will be given for Research and Development of rural energy technology.
- Special programmes of promotional activities will be implemented that emphasize on access to rural energy and role of rural energy in sustainable development, poverty reduction and positive impacts on women and children.

- In order to ensure quality of rural energy, an arrangement will be made for quality standard tests and quality control by increasing capacity of Renewable Energy Test Station.
- Off-grid and small rural energy system can be integrated mini-grid with national grid.

Local Self-Governance Act, 2055 (1998)

DDC: To formulate, implement, operate, distribute and maintain and repair projects on mini and micro hydropower and other energy, and cause to be done the same.

Municipality: to generate and distribute or cause to be generated and distributed electricity in the Municipality area.

Community Electricity Distribution Bye Laws, 2060

- To promote public participation for bringing effectiveness in the present distribution arrangement by reducing theft and conducting maintenance and distribution system on community basis through the Distributing Institution.
- To encourage community management in the extension of distribution lines through the Distributing Institution in the protection and promotion of electricity distribution system.
- To attract private investment in the field of rural electrification through the Distributing Institution as the pace of rural electrification in the present context has been very slow to meet the need of the people.

To promote technical and managerial capability of rural community in the field of electricity distribution through Distributing Institution

Targets

Energy uses are of utmost importance for cooking from historical times. Since, Nepal uses traditional solid biomass energy carriers 85% of the total final energy consumption in 2010 and that is also mostly in the residential sector (87%). Rural households uses mostly solid fuels especially fuel-wood, whereas urban households uses mostly non-solid fuels.

Usage of LPG is increasing in double digits for the past couple of years especially in the urban households and commercial sector and the people using LPG for cooking more than doubled to 18% in 2010 from 8% in 2003 (NLSS II, 2004: NLSS III, 2011). The statistics showed that only people in the richest quintile have been using it. However, affordability for the people in the lowest quintile virtually is insignificant at 0.1% in 2011. Poorer people are still using 80 % fuel-wood.

Domestic Energy

The required thermal energy for the household sector is catered by the traditional biomass fuels such as fuelwood, agriculture residue and animal dung, and the imported petroleum products such as Liquefied Petroleum gas (LPG) and kerosene. The current energy overview indicates that 98% of thermal energy is supplied by solid biomass and which have to collect from the forests and animal waste. With the equalization of market prices of kerosene and diesel since 2008 to control adulteration, the demand for LPG in the urban areas and recently even in the rural areas is growing at higher pace as the Government through NOC is providing indirectly a subsidy in the rage of 30% of its market price.

The sustainable supply of fuelwood is less than its consumption and it is assumed that more than 30% of forests are getting denuded by the collection of fuelwood. The growth of forest outputs is in the range of 4% and tree plantation cannot meet the growing requirement of the demand for fuelwood (WECS,

2010).

Imports of LPG is growing in double digits for the past several years as it has become the cheapest energy carrier for cooking, even though the current energy economic analysis indicates that it is cost effective for the urban household to cook on electricity.

There are no government policy, strategy and plans announced and published to curtail the dependence on imported petroleum products and rapid deforestation of forestry resources.

AEPC has come out with its rural renewable energy subsidy policy 2013 and has the target of installing mud ICS of 115,000 units and 22,000 units of biogas plants per year in its plan period of 2012- 2016.

Fuelwood is collected from the forests free of costs, and the market prices for a cylinder of 14.2 kg LPG is NR 1,470. (US$17.00) for which the government is providing an indirect subsidy through NOC an amount equivalent to 30% of its market price. Kerosene is supplied at a market price NR 99.00 (US$1.15) litter and NOC makes some money in its supply. The current electricity tariff for domestic use in the range of 151 kWh to 250 kWh/month is NR 9.50 (US$ 0.11) per kWh which was recently adjusted in August 2012.

Power sector:

There is a big power crisis in Nepal and people have to bear power cuts of around 14 hours a day in the dry season like March/April. The peak demand in 2012 as per NEA is around 1,000 MW and the installed capacity is around 720 MW only. But with captive gensets being used for power supply, the peak demand should surpass above 1,200 MW. The load forecast of NEA is given in the figure 6 above.

The expected target as per interim plan (2010 -2013) is:

- installation of 281 MW, out of which 75 MW is to be constructed under PPP principle
- Expansion of 700 km of transmission line
- 735,000 households will be connected to grid i.e. around 33% of the current domestic consumers
- Electricity through hydropower will reach to 65% of the population
- Per capita consumption will attain a consumption of 100 kWh of electricity

Apart from the above government targets for power development, Government of Nepal had formed various task forces for the development of hydropower. The latest action plan from the Ministry of Energy in 2012 states:

- Multi fuel plant of 200 MW to be installed within one year
- 2,600 MW of hydro storage plant to be constructed on long term

Similarly, a task force for hydropower development in 2009 brought out a 20 year plan. The major targets are as follows:

- First five year period 2009 - 2014 has a target of 1,100 MW hydropower development:
  - Development of 127 MW by private sector
  - Development of 231 MW by NEA
  - Development of 743 MW by NEA subsidiary

- Second five year period from 2015 - 2019 will have 1,600 MW of hydropower plant
- Third five year plan from 2020 -2024 will have 5,100 MW of power plant
- Fourth five year period from 2025 to 2029 will have installed capacity of 18,000 MW hydropower, totalling 26,000 MW by 2029

ANALYSIS AND DISCUSSION OF ISSUES IN ENERGY POLICIES

A quick review of the existing energy related Acts and Policies bring some of the issues those need to be looked into in the future energy policy formulation.

2.1 Lack of integrated dynamic modelling in energy forecast Energy policies are formulated in the ad hoc on the crisis management basis; there is lack of integrated policies based on the various dimensions of economic as well as climate change issues. It is important however to distinguish between an integrated and comprehensive approach to policy and planning. By definition, comprehensive means all-inclusive. In contrast, the integrated approach while similar to the comprehensive approach, does not seek to analyse all components and interconnections, but concentrates on those that are critical to the policy issue or set of issues being analysed.

2.2 Gap between policy and law: Many policies suffer from weak implementation because of absence of timely reform in law. On the other hand people suffer from weak implementation of the law. As it is seen that Hydropower Development Policy 1992 and Electricity Act 1992 has made most of the provision but the regulatory framework to implement them are weak or not exiting, no plan of action to achieve envisaged objectives.

2.3 Policies focus of hydropower development Though Nepal has huge hydro potential but hydro development is long and resource intensive. Despite the focus on hydropower development for meeting domestic needs, implementation has been weak. Either there is total lack of energy planning or is not working. Weak implementation of one-window policy and lack of consistency or continuity of taxation policy on energy generation have been identified as causes for slow rate of progress in implementing planned hydropower projects. Hydropower Development Policy 1992 and Electricity Act 1992 has made most of the provision for development and use of hydro power no other new and renewable energy technologies are mentioned or thought of in the major polices.

2.4 Not addresses special issues of rural electrification: The issues of rural electrification are special on their own, high infrastructure costs due to sparsely distributed settlements and need of long transmission and distribution networks, low consumption of electricity mainly for lighting purpose only. So separate set of rural electrification policies which use combination of off grid and on grid electricity to serve rural areas are in need. These rural electrification policies should have objective to increase access to electricity to rural areas for social cause and then slowly it should increase economic activities for other developments. Rural Energy Policy 2006 states many important provisions for the rural electrification by use of renewable energy solutions but no clear plan of resources and action to achieve tangible results. Community Electricity Distribution Bye Laws, 2060 provisioned rural electrification modality to sell bulk electricity to community/co-operative and to rest the responsibility to manage distribution on them so working but needs sufficient financial resources and more robust mechanism to control tariff collection and payment to NEA and off course sufficient power in national grid. Many provisions were made in the to avoid duplication and make state subsidy and user's equity economically viable and technologically sustainable rural electrification.

2.5 Energy Security and energy mix: There is absence of a clear policy and law on storage of fossil fuels. Oil is a strategic source of energy and Nepal is hundred percent dependent on imports, so energy security should be of high concerns. Even in hydro generation which plan for 30-40 years

climate change effect must be considered for long term security of energy generation. Similarly, no policy in the proper energy mix based on the available resources and technologies to make uninterrupted energy supply for modern society.

2.6 Energy generation and climate change Energy generation is main source of carbon emission and global warning. Effect of global warming in rainfall patterns and glacier melting is major concern of hydro energy developers. But, Nepal lacks good homework and clear policies in hydro energy development and climate change issues. No policies have made the mitigation and adaptation measures to minimise the effect of climate change in the hydropower generation.

2.7 Regulation of the petroleum sector Petroleum products occupy an important place in the supply and distribution of energy in the country. There is lack of clear policy, law for regulation of this sector. It suffers from lack of transparency and political intervention in its management import and pricing. The import of petroleum products has increased by five folds since 2000 and in terms of value exceeded the total export earning to import it, but there exist no clear petroleum policy and strategies to replace it by other energy system.

2.8 Lack of a clear policy on sustainable forest use Biomass or forest product is the main source of current energy (more than 75%), there is lack of clear policy and laws on the use of biomass as energy source. Forest policies do not focus on sustainable forest management and strategies to replace cooking fuel by electricity.

2.9 Energy Efficiency economy Energy efficiency is the most effective source for reducing the supply gap, carbon emissions and reliance on expensive imports of petroleum products. No serious attention has been paid in the demand side management. Both supply and demand side efficiencies need to be addressed but no such polices to encourage efficient appliance and technologies to save scarce energy. A substantial portion of electricity is misuse through theft but strong measure to implement to stop it.

2.10 Energy-sector reform and restructuring there is lack of effective implementation of power sector restructuring programmes. Nepal Electricity Authority (NEA) is sole agency to transmit and distribute electricity in Nepal reforms in this sector include unbundling the power utility (NEA), creating an independent regulatory mechanism, and introducing competition in power generation. Especially the unbundling of NEA for its generation, transmission and distribution functions is needed. Progress has been slow partly due to delays in enabling legislation and lack of time bound roadmaps and political will. A number of policy decisions are made in this direction but poor implementation has not realised it. No major reform and restructuring power sector even after acute load shedding for many years.

2.11 Research and Development in energy: There is lack of research and development activities in energy sector for national capacity building and adaption technologies. There is virtual absence of a policy that promotes research on technology promotion and use of modern technologies and to improve on the existing issues and problem for adoptive research to localise the energy technology.

2.12 Regional Cooperation for power exchange Regional cooperation can play an important role in ensuring energy security in the region. Sub-regional power trade can be an effective way of meeting energy demand by utilizing complementary technologies and power utilization patterns. By utilizing different peak times of neighbouring countries, regional power trade can reduce the need for building new power generation plants in each country and reduce energy crisis. different policy documents on rural electrification but lack sufficient had institutional back up and integration

CORE SECTOR ISSUES, CONSTRAINTS, AND OPPORTUNITIES

Energy Crisis

Nepal is now facing an unprecedented energy crisis due to the acute shortage of power and petroleum products. Because of inadequate planning, delays in project implementation, and significant underinvestment in base load generating capacity, the country has a total installed hydro power generation capacity of only 802.4 MW14—less than 2% of its commercially exploitable hydropower generation potential. Imports from India supplement this low generation capacity, but the supply is still inadequate to meet the ever-increasing demand. The result is up to 11 hours of daily load shedding, and the situation could get worse if action is not immediately taken. Moreover, the blockade by people in the Terai region along the Indian border has created a serious fuel crisis since September 2015. The government allowed people, for a while, to drive their cars only on alternate days, and asked them to use charcoal and firewood for cooking. This energy crisis has seriously constrained economic and social development. In addition, many households, defying restrictions switch to electricity for cooking, causing some distribution transformers to burn because of overloading.

High Dependence on Import for Fossil Fuel Supply, and Inadequate Storage Capacity
In the absence of proven fossil fuel reserves, except for an insignificant amount of lignite deposits, and the extremely limited transportation options available, nearly all fossil fuel demand in Nepal is met by imports from India. For the past 4 decades, the Indian Oil Corporation has been supplying petroleum products (gasoline, diesel, and kerosene) to the country at Indian market rates under a long-term contract. However, the blockade has paralyzed this agreement. Nepal's oil storage capacity is also just enough for 20 days of national sales, compared with 270 days in Israel, 240 days in the Republic of Korea, and 137 days in the United States. Nepal must address this storage capacity problem soon by increasing it in a phased manner from 20 days to 160–180 days to improve the country's energy security, while import sources are diversified.

Inadequate Power Supply Systems" Despite its abundant hydropower resources and significant potential to export electricity, Nepal is a net importer of electricity, and the amount of imports has doubled, from 694 GWh in FY2011 to 1,758 GWh in FY2016, for an average annual growth rate of 20.4%, compared with a 0.3% annual increase in NEA generation. On the other hand, storage-type hydropower plants represent only 13% of the total hydropower capacity.

The dominance of runoff-the-river hydropower plants has led to acute capacity shortages especially during the dry season (winter), when demand rises sharply but water flow decreases, adversely affecting power generation. The existing plan envisages the installation of over 2,000 MW of new capacity by 2022, but funding constraints suggest that this target may not be achieved. Country diagnostic studies identify this as a major hindrance to Nepal's inclusive economic growth. The government's approach to addressing this issue is to prioritize reservoir-based projects over run-of-the-river projects.

Sustainable development of hydropower potential can provide Nepal with the following key benefits:

(xxvi) higher potential for improving electricity access;
(xxvii) reliable supply to narrow the current acute energy deficit;
(xxviii) electricity exports to generate much-needed foreign exchange through sales of electricity to India and other neighbouring countries; and
(xxix) Reduced reliance on carbon-intensive fossil fuels and other conventional fuel sources.

The timely commissioning of transmission lines will be critical to evacuating power from new hydropower generation plants. Several IPPs have been unable to undertake new hydropower development initiatives because of difficulties in evacuating power from remote sites Except for border areas and parts of the Far Western region of Nepal, transmission connectivity with India is also limited. Poor connectivity has hampered large-scale, export-focused hydropower development in Nepal. The distribution network of substandard reliability, coupled with inadequate power generation and transmission facilities, has likewise kept the electrification ratio low. In response to the ongoing power crisis, a cross-border transmission line (400 kV) to the national grid is being constructed, to allow additional power imports from India.

Poor Operational and Financial Performance of Nepal Electricity Authority 35. As a government corporation, the NEA has dominated Nepal's power sector since its establishment in 1985. Its operational and financial performance has been below par. By the end of FY2015, its accumulated losses had reached NRs26.8 billion ($251 million). In FY2015 alone, the NEA incurred losses of NRs6.5 billion ($60.9 million).

The further deterioration in the agency's financial position is due to a number of factors, including

i. the absence of a tariff adjustment since August 2012 till September 2016;17
ii. the high cost of service, on account of the higher internal purchase price at generation point, annual escalation in the cost of power purchased from IPPs, the operation of thermal plants, the import of high-cost seasonal energy, and increased operation and maintenance costs;
iii. high system losses of over 24%; and
iv. Increased arrears, largely due from the public sector, including municipalities.

Electricity Uses, Scarcity and Disparity

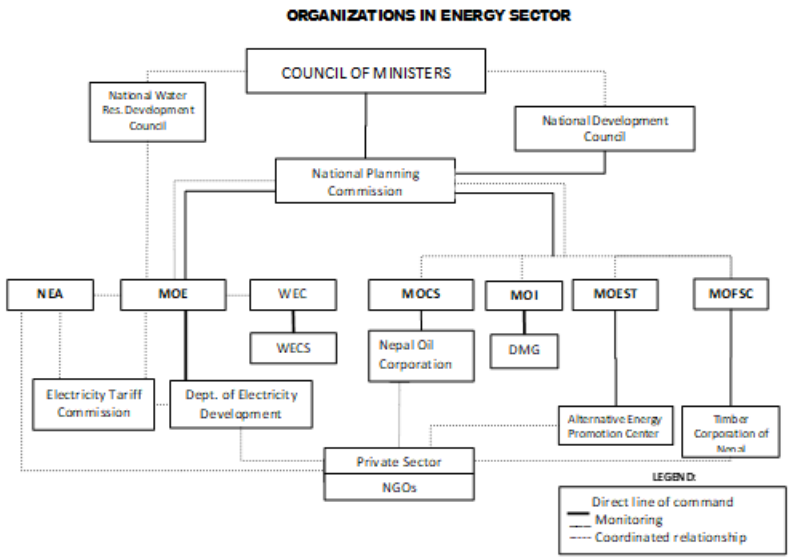
There is a stark disparity in terms of access, where almost 90 percent of urban households are connected, rural has just 30 percent (CBS, 2011). The share of traditional biomass resources, commercial energy resources and renewable energy resources are 87%, 12% and 1% respectively. Lack of modern means of usage of traditional biomass results in environmental degradation and reduced production from agro and allied sectors. There has also been adverse impact on the health of rural population mainly women and children because of in-efficient use of traditional energy resources.

Electricity demand of Integrated Nepal Power System (INPS) in fiscal year 2012/13 is estimated at 5,446 GWh, out of which only 4,218 GWh (77.5%) could be supplied. The rest 228 GWh (22.55%) deficit was resorted to load shedding. Of the total supplied energy volume 3,468 GWh (82.56%) was contributed by domestic generation and 792.5 GWh (17.44%) by import from India. Domestic supply included 1,176 GWh (34%) from Independent Power Producers (IPPs) and rest 2,292 (66%) from Nepal Electricity Authority (NEA) owned power stations with a share of 2,273 GWh from hydro and 18.82 GWh from thermal. The energy demand of INPS in fiscal year 2012/13 grew by 7.7% over previous year's energy demand. (NEA2012/13)

Institutional Setup

Considering the importance of energy services, Government of Nepal in its interim plan (2010-2013) has focused on production and distribution of the hydropower in the economic and social development by providing access of modern energy to the people. For the past few years, a separate ministry has been

established to focus on energy sector but subsequently due to political interf erence it is focusing on power sector only.



(Courtesy: Energy Resources Strategy of Nepal, 2009)

(NEA: Nepal Electricity Authority; MOE: Ministry of Energy; WEC: Water & Energy Commission; WECS: Water & Energy Commission Secretariat; MOCS: Ministry of Commerce & Supplies; MOI: Ministry of Industries; MOEST: Ministry of Environment, Science & Technology; MOFSC: Ministry of Forestry & Soil Conservation; DMG: Department of Mining & Geology)

Figure 1: Institutional set-up in the energy sector

Ministry of Energy (MOE) is the apex body in the power sector which formulates policy, strategy and plan on power sector. Department of electricity development (DOED) is the body which is involved in licensing and the development activities of hydropower in the country. NEA is a publicly owned enterprise and is also vertically integrated organization which is involved in the total supply chain of power from generation and transmission to distribution. In 1990s the hydropower policy introduced private sector in the generation of electricity and the independent power producers (IPP) account for 25% of the total generation of power in the country.

There is no independent regulatory body in the power sector, though a bill is still pending for the formation of an independent regulatory commission.

The Nepal Oil Corporation, a state-owned trading company established in 1980, imports, transports, stores, and distributes all petroleum products in the country. At present, the country's oil storage capacity is only 71,662 kiloliters, just enough for 20 days of oil product sales. Given its vulnerability to supply shocks—border blockades in 1989 and the most recent border closure in late 2015 resulted in rationing and long queues for the fuel—Nepal should build larger storage facilities across the country in a phased manner. It can increase its storage capacity to 60 days to start with, and later to 120–180 days.

It should build quickly to be able to take advantage of the low oil prices at this time.

The Ministry of Energy is the line ministry with primary jurisdiction and authority for the energy sector.13 the country has four levels of institutional arrangements (Figure 5): (i) policy, (ii) regulatory, (iii) operational, and (iv) implementation. The activities of institutions at each level are stated below. (i) Policy-Level Institutions (a) Ministry of Energy: Power sector policy formulation, water resource development, oversight and regulation of the NEA and private power development (b) National Planning Commission: Coordination and development of the government's 5-year multisector investment program (c) Water and Energy Commission: Policy advice to the government on technical, legal, environmental, financial, and institutional matters related to water resource planning and development (d) National Water Resources Development Council: Government guidance on strategic issues and policy regarding integrated water resource development (e) Environment Protection Council: Policy development and preparation of environmental regulations and environmental protection guidelines for environmental assessments, permits, licensing, inspection, and monitoring of environmental licenses

Regulatory-Level Institution ETFC: Review and approval of tariff applications submitted by the NEA (iii) Operational-Level Institutions (a) NEA: electricity generation, transmission, and distribution throughout Nepal; energy exchange with India; and purchase of electricity from IPPs as single-buyer agency (b) Butwal Power Company: Non-profits organization under the United Mission of Nepal, undertaking rural electrification in Nepal (c) IPPs: Development of private power plants and generation of electricity (iv) Implementation-Level Institution Department of Electricity Development, Ministry of Energy: Implementation and promotion of the government's private power policy, management of bidding process for IPPs, issuance of survey licenses, provision of guidance to private investors and technical support to the ETFC

Alternative Energy Promotion Center (AEPC), Ministry of Environment, Science & Technology (MOEST), is solely responsible government agency for the promotion of renewable energy in the country. Solid biomass fuels come into purview of the Timber Corporation of Nepal, MOFSC.

The institutional set-up in the energy sector reveals that the whole energy sector does not come under the purview of one organization but is dispersed in various ministries and the coordination among them is one of the major problems being faced in the country for the integrated energy policy and development aspect.

Nepal Electricity Authority (NEA), Nepal Oil Corporation (NOC) and Alternative Energy Promotion Center (AEPC) are the major government agencies in the development of power sector, imports and distribution of petroleum products, and promotion and development renewable energy technology respectively. Water and Energy Commission Secretariat (WECS) is involved in the energy systems planning and policy advices to the Government of Nepal

FOREIGN INVESTORS AND INFLUENCE ON NEA

However, the seeds for the crisis were contained within the "political opportunities" being exploited by the ***vested interests*** of the external and domestic private sector, political parties and some foreign donors. The fluid political situation allowed *the commission agents* to influence the outcomes of *the PPA negotiations* and even arrange for the appointments of *"good"* officers at the helms of *NEA or the tariff*

*commission***.** The appointment decisions have been at the heart of ***the nexus of corruption*** between the *commission agents* and *the political leaders (Thapa, 2012; Pun, 2008*).
The main development partners in Nepal's energy sector are ADB, the governments of Denmark and Norway, the European Commission, the European Investment Bank, the Japan International Cooperation Agency (JICA), KfW, the Netherlands Development Organization, the United Nations Development Programme, and the World Bank, all of which are focusing on the power subsector.

Among these, ADB, JICA, KfW, the Government of Norway, and the World Bank have been the most active in the on-grid subsector. Nepal's other development partners are more involved in off-grid development. The country's development partners regularly coordinate with one another on sector investments and support for establishing an enabling institutional and regulatory framework. 47. ADB has been the leading partner in Nepal's power sector, focusing in particular on on-grid support for the NEA's expansion of generation, transmission, and distribution capacity, with six loan projects and one grant amounting to $521 million and 21 technical assistance projects amounting to $13.7 million since 1999

Among other projects, ADB and JICA financed the Kali Gandaki "A" Hydroelectric Project, a 144 MW power plant commission in 2002 to increase generation capacity.20 ADB also supported the expansion of the NEA's transmission capacity through assistance projects in 2009–2011, cofinanced by Norway, to strengthen transmission infrastructure from the western border to the central region of Nepal and for the evacuation of electricity from generation sites to the load centre in Kathmandu Valley. In distribution, ADB assistance has focused on increasing access, rehabilitating small hydropower plants, and supporting other clean-energy interventions, such as solar street lighting and energy-efficient lighting. ADB has also assisted several rural electrification projects with the participation of local communities.

ADB approved the 140 MW Tanahu Hydropower Project in 2013 to address the issue of limited generation of electricity from storage-type hydropower plants in Nepal (footnote 15). The project was cofinanced by JICA, the European Investment Bank, and the Abu Dhabi Fund for Development. The project included pilot programs to expand access by women and other marginalized groups to energy resources and energy-based livelihoods, in partnership with the NEA, the AEPC, and nongovernment agencies.

In July 2014, ADB approved the South Asia Sub regional Economic Cooperation Power System Expansion Project, cofinanced by the European Investment Bank and the Government of Norway, to assist Nepal's energy sector development by facilitating (i) expansion of domestic power transmission capacity, (ii) power exchange with India, (iii) augmentation and expansion of distribution networks, and (iv) mini-grid-based renewable energy access in rural areas.

In 2016, ADB approved a $20 million solar project under a Public Private Partnership model, using grant funding from the Scaling up Renewable Energy Programs in Low Income Countries (SREP) for Nepal. The project will engage the private sector to develop, install, and operate a minimum of 25 MW aggregated, grid-connected, utility-scale solar plants (defined as 4 MW or larger for each individual site) for a 25 year period. These would become the first utility scale solar systems in the country, and as such, are being fast tracked to be constructed and commissioned, with a target of 2018, to address the chronic power and fuel supply deficits.

Since 2009, ADB operations in Nepal's energy sector have been instrumental in supporting the reform

process, including the preparation of the NEA's financial restructuring and a tariff increase in 2012 after 12 years of no adjustment. However, the implementation of projects, including the procurement of consultants and contractors, has been slow. The NEA's decision making has also been slow. Land acquisition has been a major problem, mainly because of changes in the alignment of transmission lines. Project readiness has been low.

ADB's main focus in the country partnership strategy 2013–2017 will be to make Nepal's energy sector a key driver of inclusive economic growth. This will be achieved through investments in both on-grid and off-grid solutions. ADB's on-grid investments will include support for the development of large-scale hydropower projects and related transmission infrastructure. ADB will provide transaction advisory services to the government to explore suitable PPP modalities and catalyse private sector investment in large-scale hydropower development. Its investments in transmission will include support for strengthening the in-country network for evacuating electricity from generation sites to domestic load centres, as well as for cross-border lines for power exchange with India.

Gaps and Barriers

Energy sector is in poor status in Nepal due to poor governance. If we see the plan and programs of the country, it seems optimistic but the problem lies in non-implementation of plans and programs of the government and due to this reasons the energy sector is facing the energy crisis and it is becoming severe every day. In order to achieve the main objectives of the SE4ALL program, following institutions and policy should be in place.

- Independent Energy Regulatory Body. Energy carriers are inter- substitutable and hence, electricity can substitute thermal energy like fuelwood, coal, petroleum products such as kerosene, diesel, gasoline, LPG, fuel oils etc. In order to address the interlinkages among the energy carriers and independent energy regulatory body is essential as separate regulations cannot address the inter-linkages.

- Integrated Energy Policy. There is hydropower development policy 2003, but downstream petroleum marketing does not have any policy till now. The country is spending 126% of its commodity exports in 2012 in imports of petroleum products, but it does not have any regulations. Renewable energy sector has Renewable Energy Policy 2009 and the Renewable Energy Subsidy Policy 2013 which has been instrumental in the promotion of renewable energy at a faster pace compared to other energy sectors. Integrated energy policy is essential for addressing the cross-cutting issues among the individual energy subsectors.

- Enforcement capacity of the public enterprises in the energy sector such as NEA and NOC, and government agencies are dismally poor due to heightened political meddling and fluid situation in the country. Construction of power plants and transmission lines extension are hampered due to strong protest from political parties

- Deregulation of the energy sector and market-oriented pricing mechanism. Without deregulation and private participation, development of energy sector looks dim in order to achieve the objectives of universal access to modern fuels. Pricing of petroleum

products and electricity tariff should be based on markets and it will encourage participation of private sector in the energy sector.

- Conducive business environment. This is another factor that is very essential for attracting private sector, whether domestic or foreign direct investment. If the business confidence level increases with proper legal institutions, proper regulatory body, and market-oriented tariff structure, private sector will definitely will be attracted but the current FDI in the current is very low compared to land-locked countries in Asia.

- Supply chain (access to capital, technologies and know-how)

  Due to monopolistic structure of NOC, consumers are bound to bear sub-standard quality of thermal energy and energy services. Participation of private sector brings advanced technologies, advance know-how, high quality of products and services as there is ample scope of multinational oil companies coming in the downstream marketing as before once the marketing of petroleum products.

  Many NGOs and INGOs are involved in the development of renewable technology for thermal energy especially in solid biomass and the pace of biogas plants being installed by AEPC can meet the partial requirement of clean energy cooking in rural areas. For the ICS, AEPC should increase the target from 115,000 units of installation to 170,000 units per annum in order to have converted all the biomass cook stoves to ICS by 2030 to make the kitchen smoke free. For making smoke free kitchen in the rural households by 2017, Nepal needs to install at least 1 million units annually in the rural areas which are just ten times the current target.

  With the use of more efficient cooking by ICS, use of biogas plants and use of modern energy carriers like LPG and electricity in the rural areas, the consumption of fuelwood in the combined scenario will be sustainable by 2020 (figure 17).

- Households (capacities and access to capital/affordability)

  Modern energy are mostly used by the richest quintile of the population (58%) and the poorest quintile is using only 0.1% of modern energy (NLSS III, 2011). It shows that modern energy is still beyond affordability of the poor.

I. Power sector:

- Governance (existence of enabling regulatory framework for investment, enforcement capacities)

  For achieving the main goals of SE4ALL, power sector is the most crucial in the energy sector. For sustainable economic development and energy security, power sector needs to be developed at the level of battle level since the country is facing acute energy crisis, and the current organization structure of NEA cannot develop the power sector at the pace needed to achieve the main objectives. A structure with private sector involvement will be much more business-like in quicker decision- making. Government of Nepal formed Investment Board under the office of the Prime Minister for fast tract development of infrastructure. The government has established Hydroelectricity Investment & Development Co. Ltd. for providing financing to the private investors. Investment boards are actively involved in the finalizing project development agreement (PDA) with some of the foreign direct investors in recent times.

Major issues raised in the thermal sector apply here the most (Please refer sub-section I of this section.

- Supply chain (access to grid, capital, technologies, and know-how)

For achieving the goals of SE4ALL, Nepal has to provide electricity access to 75% of the people by 2030 and needs to develop installed capacity for high electrification in households, commercial, industrial, agriculture and partially transport sector.

The power requirement with 25% reserve on peak power (table 24) is as follows:
The capital requirement is huge and the power development requirement for domestic consumption in achieving the goals of SE4ALL programs is just half the projected power development as recommended by the 20 year task force in 2009. As solar PV power plant for grid connection is the most promising among other renewable energy technology for power generation due to high irradiation in Nepal, for its promotion, 100 MW and 500 MW are added on purchase obligation principles. International Renewable Energy Agency (2012) projects the capital cost of utility level PV power plant will be cheaper than the hydropower plant after 2025 due to high learning curve of the PV module technology and the economy of scale, and hence, GoN should entice private investors through developing conducing policies and environment. The potential of 2, 5000 MW of solar plant as shown by Solar Wind Energy Resources Assessment in Nepal (AEPC, 2008) can be developed since commissioning time is short for PV power plants..

- End-users (affordability and access to capital)

The current household economics in the urban areas indicates that the monthly life cycle cost for cooking on electricity is cheaper than coking on kerosene and LPG. If the power supply is reliable, people will switch over to cooking on electricity, which is sustainable from the point of energy security, no GHG emission and total costs. Hence, end-users will be much more pleased to have clean energy choice for cooking which is indigenous and the supply will be continuous. In the rural areas, modern energy needs high upfront costs and hence, microfinance through rural development banks/financial institutions needs to be mobilized and enhanced.

II. Modern energy for productive sectors:

- Governance (existence of enabling regulatory framework for investment, enforcement capacities)

As stated above, the biggest hurdle is the governance issue (Please refer previous subs-sections).

- Supply chain (access to capital, technologies, and know-how)

In the supply chain of modern energy, NEA and NOC are major suppliers. In NOC's case private dealers reach out to the end-users for petroleum related modern fuels. Access to capital through financial institutions is available but due to current government meddling in pricing of modern energy, the NOC and NEA are running at huge losses. Once the sector is deregulated, new technology and know-how will be brought in by private sector for efficient operations of the companies in the supply chain.

- End-users, agricultural and industrial enterprises, SME (capacities and access to capital)

Till now, the modern energy is being accessed by the end-users and there will not be any problem for the industrial and agricultural enterprises and they are much willing to pay for the access to electricity as electricity is cheaper than fossil fuels.

CONCLUSION

It is found that Hydropower Policy 1992 and Electricity Act 1992 are the main act and policy documents which have made different provisions of generation and distribution of hydroelectricity in general. Whereas Rural Energy Policy 2006 is dedicated in the development and use of renewable energy technologies and it also covers rural electrification. These policies are made basic provision but are lack in the clear plan of action and tools to achieve them. Water Resources Strategy 2002 and National Water Plan 2005 bring out some planned statistics of hydro power generation and percentage of household electrification but the figure are inconsistent and not reflected in periodic plan and budget published every year. Other Acts like local self-governance Act 2056 simply mentions that DDC and municipalities can generate their own energy or electricity and use in local level. Community Electricity Distribution Bye Laws, 2060 had made provision to buy electricity in bulk from Nepal Electricity Authority and use for rural electrification network and manage the distribution system locally, these provisions are also now are not continued and so not very effective

For the given the complexities and connection of different aspects continuation of past ad hoc and piecemeal approaches to energy policy formulation and implementation will lead to outcomes that does not best serve Nepal. An integrated approach requires which covers the whole range of economic, social and environmental values to be considered and evaluated. Further this integrated approach requires, strong legal and implementation framework and strong political will to implement the provision of different policies are very important.

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